1. Please answer the following either true (T) or false (F). (5 pts)

TRUE OR FALSE

___ All else being equal, water will flow faster through a soil layer with a low coefficient of permeability than through a layer with a high coefficient.

___ A sample of soil with a coefficient of uniformity equal to 6.3 and coefficient of curvature equal to 2.4 must be classified as a well graded sand.

___ The compression index, C_c represents the slope of the virgin consolidation curve.

___ A flexible foundation will generally have a uniform distribution of contact pressure with the soil.

___ The Standard Penetration Test (SPT) is an effective way to estimate the strength of sand.

___ If a clay layer takes 120 days the reach 40% average consolidation, then it will take twic that time (240 days) to read 80% average consolidation.

___ The scarp is the name given to the bottom portion slope that bulges during a landslide

___ Compaction is used to improve the density of soil that is being moved to a new locati

___ Clay slopes commonly fail due to rotational landslides.

___ Cone Penetration Tests (CPT) work well to measure the shear strength of sand or cl

2.

Briefly answer the following questions. (4 pts.)

a) **Describe the difference between a natural slope, a cut slope and a fill slope.**

b) Describe the difference between a pile foundation and a drilled shaft.

c) Describe the difference between an Unconsolidated-Undrained (UU) triaxial test and a Consolidated-Undrained (CU) triaxial test.

d) *Two sites have identical clay layers, except that at site A the clay layer is 2 m thick and at the site B the clay layer is 4 m thick. Which site will take longer to achieve 90% consolidation? Justify your answer.*

3. (3 pts.)

A proposed building wall will rest on a 3 ft wide strip foundation. The foundation is located at the soil surface. The soil has a unit weight of 123 pcf, a friction angle of 39° and a cohesion equal to 0.

1. *What is the bearing capacity of this foundation? Be sure to give appropriate units.*

2. If an overburden pressure was applied near the foundation, would the bearing capacity increase or decrease?

4.

(3 pts.)

A 12 in diameter concrete pile has been driven 35 ft into a sand layer. The sand has a unit weight of 123 pcf and a friction angle of 39°.

1. Determine the end bearing of the pile.

2. If the pile were made from steel instead of concrete, would you expect the friction between the soil and the pile to increase or decrease?

5.

(3 pts.)

A 6 m tall wall retains a soil that has the following properties: $c' = 0$, $\phi' = 30°$, $\gamma = 19.2\ kN/m^3$. The ground surface behind the wall is flat.

a) Calculate the active earth pressure distribution on the wall using Rankine's method. And draw a diagram of the pressure distribution.

b) Calculate the total active force and show the point of application on the diagram.

6. (3 pts.)

A slope shown has a height of 20 m, a soil unit weight of 20 kN/m3, and a friction angle of 40°.

a) What is the maximum angle of the slope in order for it to have a factor of safety against planar failure of 1.5?

b) Write the slope angle that you calculated in part a) in terms of a slope ratio.

7. (4 pts.)

A site profile is shown below in Figure 1. The water table is at a depth of 4 m from ground surface. Assume the soil below the water table is fully saturated. Samples have been taken from each soil layer and tested to determine the following soil parameters.

Sand:
Void ratio, e = 1.05
Sp. Gravity, G_s = 2.71
Water content: 0.35

Clay 1:
Void ratio, e = 1.11
Sp. Gravity, G_s= 2.67
K_o=0.52

Clay 2:
Water content, w = 0.95
Sat. Unit Wt., γ_{sat} = 18 kN/m^2
K_o=0.8

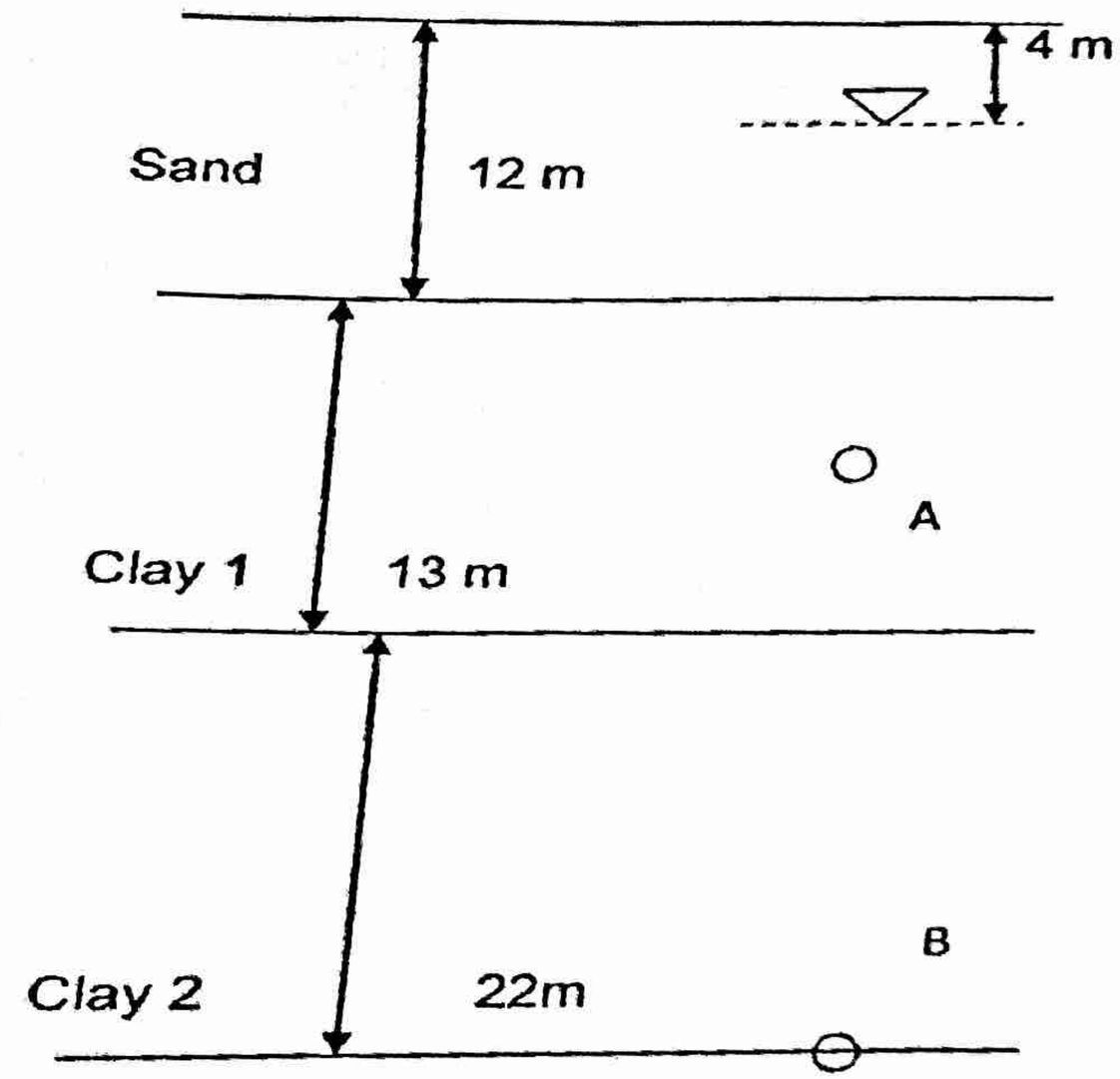


Figure 1: Soil site profile

a) Determine the unit weight of the sand.

b) Determine the unit weight of clay 1.

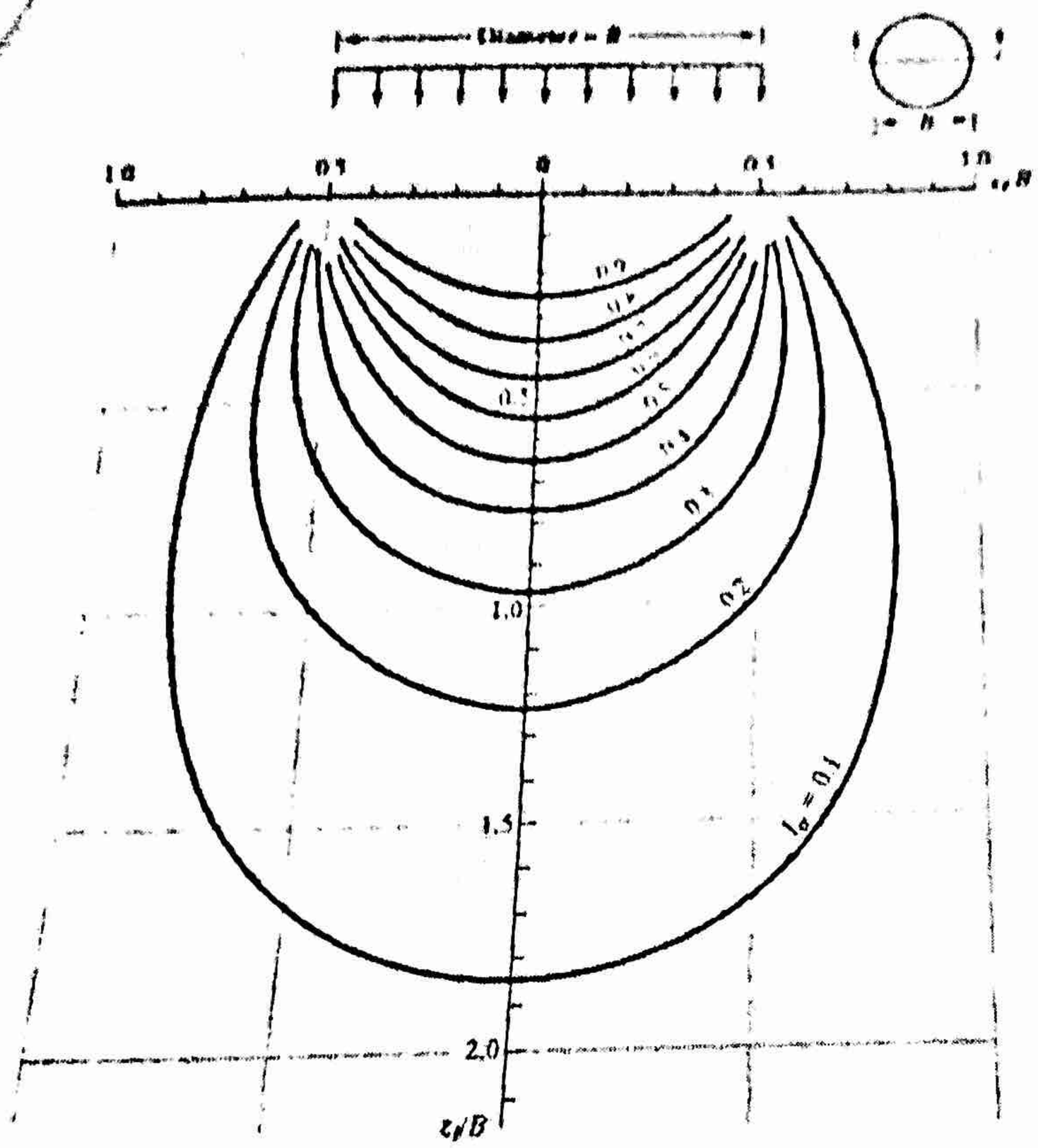
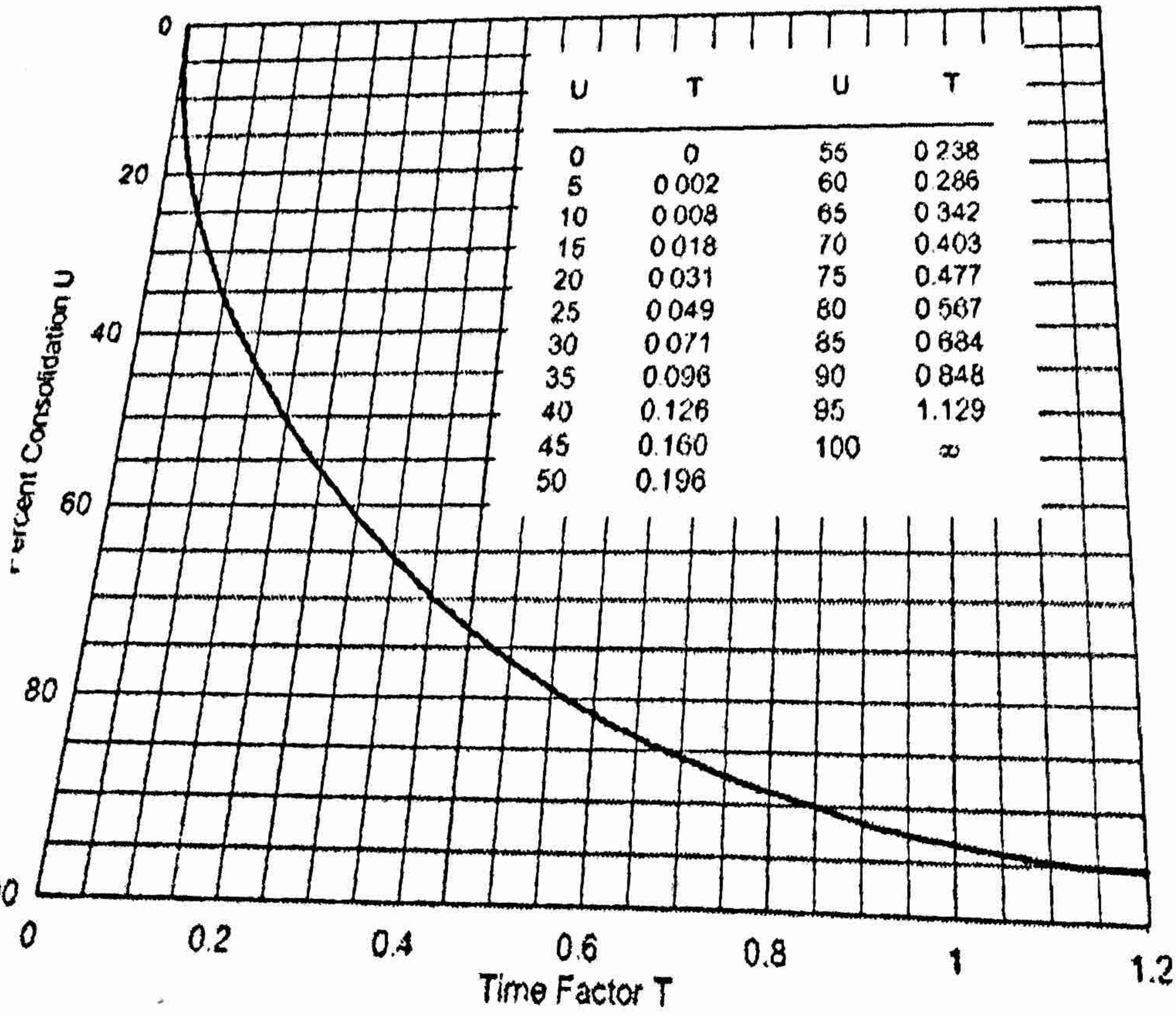


FIGURE 9.13 Influence factors for induced vertical stress under a circular loaded area, per Boussinesq.

U	T	U	T
0	0	55	0 238
5	0 002	60	0 286
10	0 008	65	0 342
15	0 018	70	0.403
20	0 031	75	0.477
25	0 049	80	0 567
30	0 071	85	0 684
35	0 096	90	0 848
40	0.126	95	1.129
45	0.160	100	∞
50	0.196		



GENERAL BEARING CAPACITY FACTORS