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I

SLOPE STABILITY CALCULATIONS

I1 Veneer Slope Stability
I2 Global Slope Stability
I3 Roadway Geotextile Stability

I1

Veneer Slope Stability

SUMMARY

Problem: Determine the geosynthetic liner veneer stability for the 2Hi1V sideslopes

References:

1) Koerner, R.M. + Soong, T.Y "Analysis and Design of Veneer Cover Soils (1998). (GRI-202)

2) Giroud, J.P., Bachus, R.C + Bonaparte R; "Influence of Water Flow on the Stability of Geosynthetic-Soil Layers Systems on Slopes", paper from Special Issue on Design of Geomembrane Applications; Geosynthetics International, Volume 2, No. 6 (1995)

3) Koerner, R.M. "Designing with Geosynthetics" Prentic-Hall, Englewood, NJ (1994)

Conclusions for Liner Veneer Analysis

1) The Liner system will be stable after construction, before filling the CAMU, on the sidewalls

2) The Liner system will be stable on the sidewalls after construction, when the CAMU is filled with water, prior to placing dredge spoils

3) The liner system will be stable on the sidewalls during dredge spoil placement, as long as water is maintained in the CAMU. It is OK to place dredge material on the sidewall if it is placed from the bottom up. DO NOT allow dredge material to flow down slope.

4) In order for the liner system to be stable, if the water was to be drained from the CAMU, before dredging is complete, for every 1ft up the sidewall dredge spoils are placed, the spoils must be a minimum of 2-ft thick perpendicular to the sidewall.

5) The liner system will not be in tension. The anchor trench design is therefore dictated by the other structures on the Top of Berm. Anchor trench will be.
5-ft runout; 3-ft anchor trench; 4-ft runout in anchor trench.

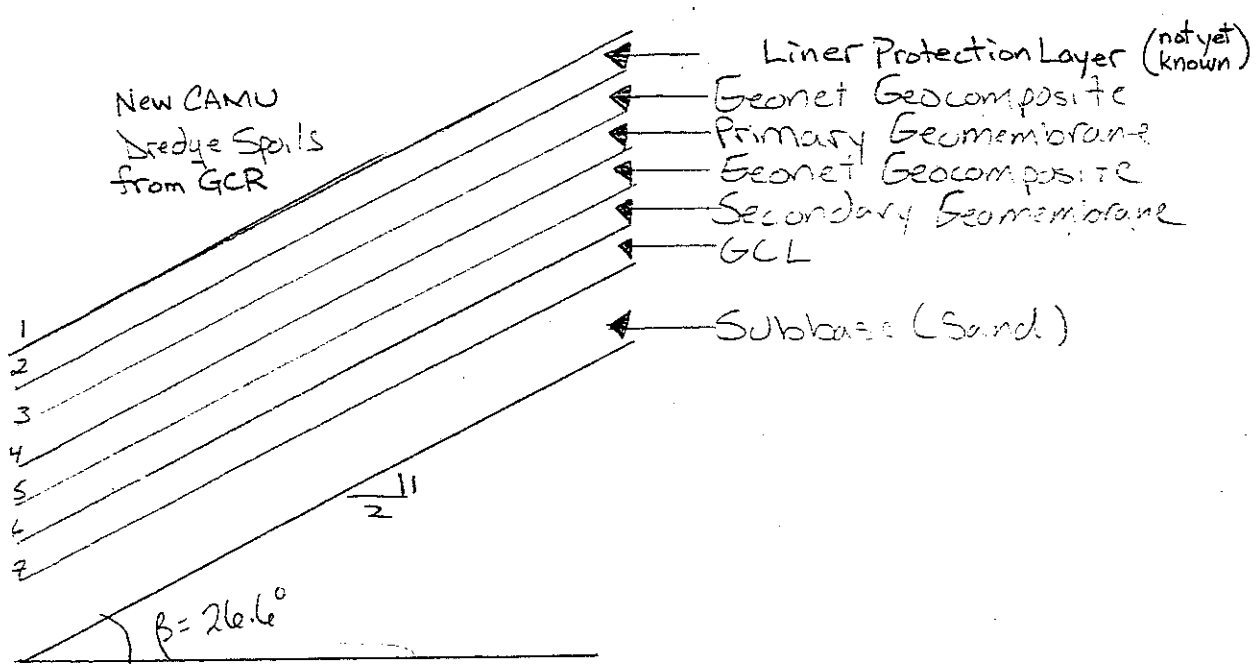
MONTGOMERY WATSON

BY V Ranavelli DATE 9/13/00 CLIENT U.S. Steel CAMU SHEET 1 OF 20

CHKD. BY (PAW) 10/23/00 DESCRIPTION Slope Stability - Veneer JOB NO. 1242330 01160101

I. Determine the veneer stability of the liner system components on the 2H:1V in-board slopes

Liner Configuration



EN 1S (10/78)

(A) Laboratory testing of the interfaces were performed using typical products. The following peak and residual values were obtained (refer to Appendix I1 of Permit Level Design Report, Dec. 1997):

	PEAK	Residual
• Native Sand/GCL ✓	27.9°	13.1°
Not applicable in current liner profile → • Native Sand/Geomembrane	30.4°	29.5°
• GCL/Geomembrane ✓	21.1°	20.8°
• Geomembrane/Geonet Geocomposite ✓	22.9°	20.6°

(B) Based on the peak frictional angles, the worse case interface is between the GCL/Geomembrane interface. ✓

Based on residual friction angles, the worse case interface friction is between the Native sand/GCL interface ✓

(C) The interface friction between the protection layer and the geonet geocomposite and the protection layer and the dredge spoils needs to be evaluated, prior to acceptance of the protection layer. ✓

Based on Literature values the friction angle between the geonet geocomposite/protection layer and protection layer and dredge spoils is in the range of 10°-16° ✓

(D) In order to evaluate the worse case, the residual interface friction angles will be used. The residual values represent the interface friction angles, after large displacement has occurred. ✓

MONTGOMERY WATSON

BY VRanquette DATE 9/28/00 CLIENT US Steel SHEET 3 OF 20
CHKD. BY (JAW) 10/23/00 DESCRIPTION Slope Stability Veneer JOB NO. 1242330 01160107

(E) Analyze the factor of safety for veneer stability of these three interfaces due to additional loadings that the Liner system may experience which may cause for destablizing of the slope.

Reference:
Koerner, R.M. + Soong, T.Y "Analysis and Design of Veneer cover soil" (1998) - (GRI-202).

Note: Though this paper is for cover soils, it is applicable to Liner systems.

The factor of safety for Veneer Stability can be solved as a quadratic equation.

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

where a, b + c are defined based on the scenario analyzed

Factors decreasing stability include
a) equipment loading
b) Seepage forces
c) seismic forces

For the CAMU Liner System, the applicability of the factors decreasing Stability are as follows:

a) equipment loading - not applicable, as there is no cover soil placed on the sidewalls and any installation of the geosynthetics will occur with either approved small 4-wheeler vehicles or with no equipment on the sidewall.

b) Seepage forces - not applicable, as the CAMU will initially have liquid in it prior to placing any dredge spoils. Therefore, no added forces due to saturated soils will occur. However, see later calcs to account for seepage if CAMU is drained.

EN 1S (10/78)

c) Seismic Forces - not applicable, as Gary Indiana is in a relatively low seismic activity area.

- Therefore, the leading factor that will decrease the stability of the sidewall, during and after construction, is the weight of the material itself

- The leading factor that will increase the stability of the sidewall, after construction is the stone granular drainage blanket at the base (24" thick).

∴ Since only the weight of the material is the factor in decreasing stability and no equipment or cover material will be placed on the slope, The geosynthetics will not be in tension during and after construction.

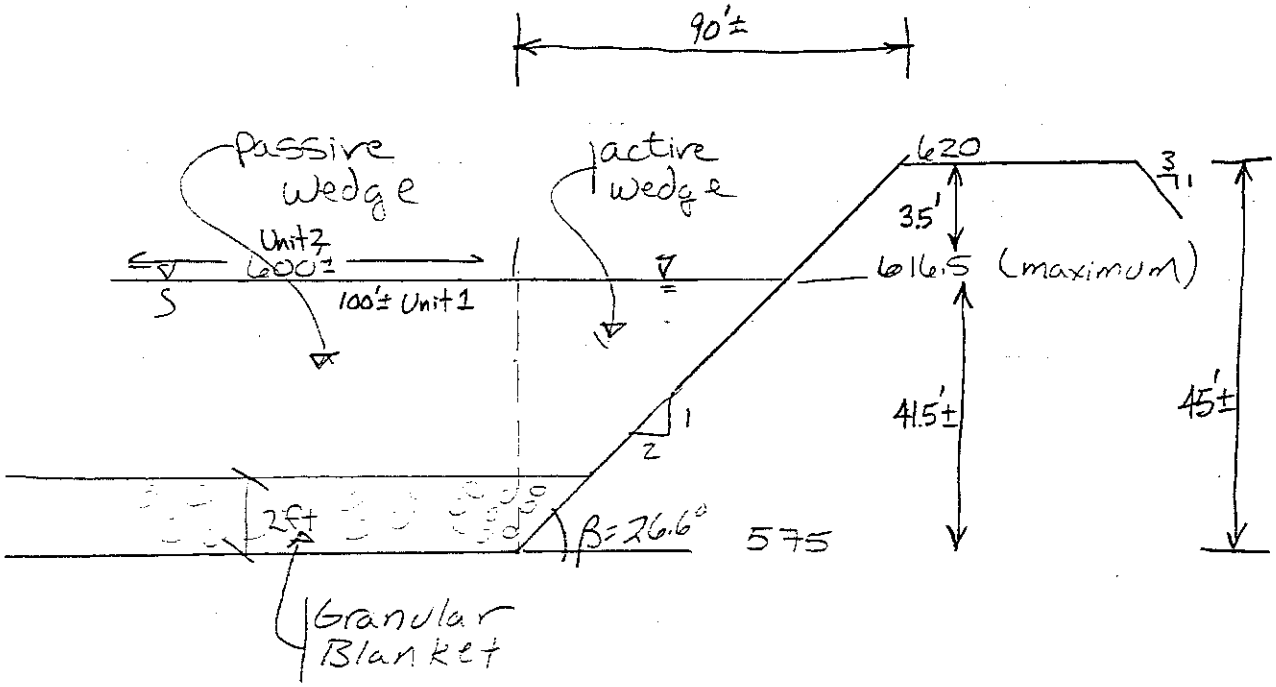
For this scenario (during and after construction) before filling of the CAMU, the anchor trench runout length and cover soil over the runout material will not be required to accommodate tension of the materials. Still a good practice to provide nominal runout and anchor trench for additional safety factor against unknown or unquantifiable conditions during or following liner installation.

(F) Determine if the addition of water in the CAMU may cause instability of the sidewall

- Prior to placing dredge spoils within the CAMU, some water from the GCR will be pumped into the CAMU in order to provide a watercolumn for floating the dredge spoil discharge barge ✓

- The added water in the CAMU will act both as an added weight over the sidewall (ie active wedge) and as a buttress to the active wedge for the weight of the water over the base (ie passive wedge) ✓

Intuitively, the liner will be stable because of balanced hydrostatic forces, but check calculation anyway. ✓



1) The weight of the active wedge Wa (Unit 1)

- assume that the weight on the granular store is insignificant, since it would be based on the effective unit weight, which is approximately equal to the unit weight of water.

$$W_a = \gamma_w \overbrace{(0.5)}^{1/2}\overbrace{(616.5-575)}^{\text{height}}\overbrace{(2)(616.5-575)}^{\text{base}}$$

$$(62.4)(.5)(41.5)(2)(41.5) = 107468 \text{ lb/ft}$$

2) The weight of the passive wedge (Unit 2)

$$W_p = (\underset{62.4}{\gamma_w})(616.5-575)(600) = 1{,}553{,}760 \text{ lb/ft}$$

3) The Factor of Safety is

$$FS = \frac{\text{resisting forces}}{\text{driving forces}} = \frac{W_p}{W_a}$$

$$= \frac{1553760}{107468}$$

$$FS = 14$$

∴ The liner is stable on the sidewall when just water is in the CAMU

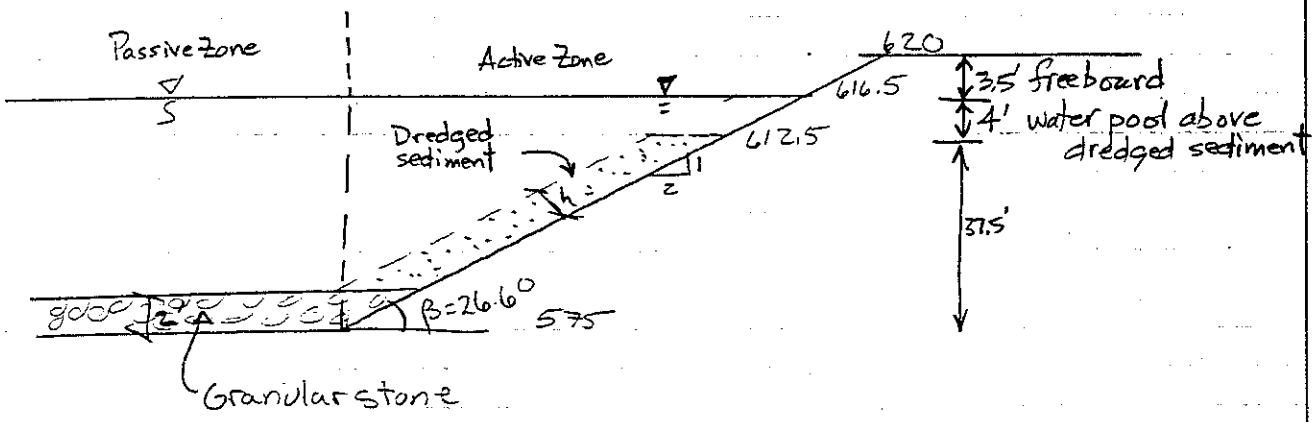
4) For Unit 1 the passive wedge is smaller

$$W_p = (\overset{62.4}{\gamma_w})(616.5-575)(100) = 258{,}960 \text{ lb/ft}$$

$$FS = \frac{W_p}{W_A} = \frac{258960}{107468} = 2.4$$

∴ The liner is stable on the sidewall

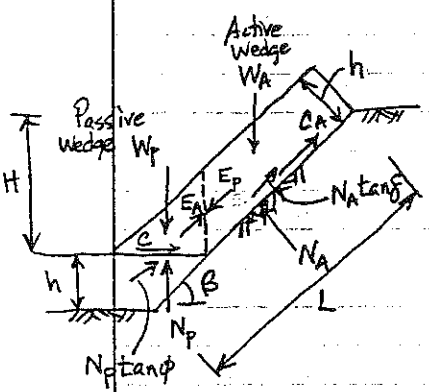
(6) Determine if the deposition of dredge spoils on the sidewall, under the water, will cause instability of the liner on sidewall



Note: The following analyses is for static loads and does not account for dynamic loads (e.g., "rolling" of dredged sediment down the slope).

From Koerner's paper, the a, b, + c of the quadratic equation are defined as follows:

- assuming no tensile reinforcement is recognized within the geosynthetics.



$$a = (W_a - N_a \cos\beta)\cos\beta$$

$$b = -\left[(W_a - N_a\cos\beta)\sin\beta\tan\phi + (N_a\tan\delta + \cancel{C_a}^{\,0})\sin\beta\cos\beta + \sin\beta(\cancel{c}^{\,0} + W_p\tan\phi)\right]$$

Assume $C_a = 0$ (adhesion between cover material and liner)

$$c = (N_a\tan\delta + \cancel{C_a}^{\,0})\sin^2\beta\tan\phi$$

Assume $C = 0$ (cohesion of cover material - mostly sand)

Where:

W_a = total weight of active wedge
W_p = total weight of passive wedge
N_A = effective force normal to the failure plane of the active wedge
β = slope angle
δ = interface friction angle of interface evaluated
ϕ = friction angle of cover material (i.e., material on liner)

γ = unit weight of cover material
L = Length of slope measured along the slope face.
H = vertical height of slope
h = thickness of cover material

With the following values

W_a, W_p + N_a = calculated on following sheets
β = 26.6° (2:1 slope)
δ = 13.1° (interface friction between GCL + Sand)
ϕ = 27° (the lowest value of direct shear, based on existing dredge spoils) (assume new dredge spoil act similar)
$\gamma = \gamma_{sub} = 130 - 62.4 = 67.6$ say 70 lb/ft³
$L = \sqrt{(37.5)^2 + (2(37.5))^2} = 83$ ft
H = 612.5 - 575 = 37.5 ft
h = vary for equation

1) For h (of dredged materials on the slope) = 5 ft.

$$W_a = \overbrace{\gamma h^2\left(\frac{L}{h} - \frac{1}{\sin\beta} - \frac{\tan\beta}{2}\right)}^{\text{dredged material (from Koerner paper)}} + \overbrace{(0.5)(H_w)(H_w)(2)(62.4)}^{\text{water} = (\frac{1}{2}bh)(\gamma_w)}$$

$$(70)(5)^2\left(\frac{83}{5} - \frac{1}{\sin 26.6} - \frac{\tan 26.6}{2}\right) + (0.5)(41.5)(41.5)(2)(62.4)$$

$$24{,}710 \quad + \quad 107{,}468 \quad = \quad 132{,}178$$

$N_a = W_a \cos\beta$ (from Koerner)

$N_a = (132{,}178)\cos 26.6 = 118{,}188$

$$W_p = \overbrace{\frac{\gamma h^2}{\sin 2\beta}}^{\text{dredge mat'l (from Koerner)}} + \overbrace{(\gamma_w)(h_w)(\text{distance})}^{\text{water} = (bh)(\gamma_w)}$$

$$\frac{(70)(5)^2}{\sin 2(26.6)} + (62.4)(41.5)(600)$$ Unit 2

$$2{,}185.5 + 1{,}553{,}760 = 1{,}555{,}945$$

$$a = (\overset{W_a}{132{,}178} - \overset{N_a\cos\beta}{118{,}188\cos 26.6})\overset{\cos\beta}{\cos 26.6} = 23{,}695$$

$$b = -\Big[(\overset{W_a}{132{,}178} - \overset{N_a\cos\beta}{118{,}188\cos 26.6})\overset{\sin\beta}{\sin 26.6}\overset{\tan\phi}{\tan 27} = 6{,}046$$

$$+ (\overset{N_a\tan\delta}{118{,}188\tan 13.1} + \overset{C_a}{C_A^{\circ}})\overset{\sin\beta}{\sin 26.6}\overset{\cos\beta}{\cos 26.6} = 11{,}011$$

$$+ (\overset{\sin\beta}{\sin 26.6}(\overset{C}{C^{\circ}} + \overset{W_p\tan\phi}{1{,}555{,}945\tan 27}))\Big] = 354{,}980$$

$$b = -(372{,}037)$$

$$c = (\overset{N_a\tan\delta}{118{,}188\tan 13.1} + \overset{C_a}{C_A^{\circ}})\overset{\sin^2\beta\tan\phi}{\sin^2 26.6\tan 27} = 2{,}810$$

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By V Ranguett Date 10/16/00 Client US Steel Sheet 10 of 20

Chkd. By [signature] 10/23/00 Description Slope Stability - Veneer Job No. 1242330 01160101

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{(-372{,}037) + \sqrt{(-372{,}037)^2 - (4)(23{,}695)(2{,}810)}}{(2)(23{,}695)}$$

371,679

$$= \frac{743716}{47{,}390}$$

FS = 15 ✓ ok

2) For h of soil on the slope = 2ft

$$W_a = (70)(2)^2\left(\frac{83}{2} - \frac{1}{\sin 26.6} - \frac{\tan 26.6}{2}\right) + 107{,}468$$

$$10{,}925 + 107{,}468 = 118{,}393$$

$$N_a = 118{,}393 \cos 26.6 = 105{,}862$$

$$W_p = \frac{(70)(2)^2}{\sin(2)(26.6)} + \overset{\text{Unit 2}}{1{,}553{,}760} = 1{,}554{,}110$$

$$a = (118{,}393 - 105{,}862 \cos 26.6)\cos 26.6 = 21{,}224$$

$$b = -\Big[(118{,}393 - 105{,}862 \cos 26.6)\sin 26.6 \tan 27 = 5{,}415$$

$$+ (105{,}862 \tan 13.1 + \overset{0}{\cancel{C_a}})\sin 26.6 \cos 26.6 = 9{,}863$$

$$+ \sin 26.6\,(\overset{0}{\cancel{C}} + 1{,}554{,}110 \tan 27)\Big] = 354{,}562$$

$$-369{,}840$$

$$c = (105{,}862 \tan 13.1 + \overset{0}{\cancel{C_A}})\sin^2 26.6 \tan 27 = 2{,}517$$

$$FS = \frac{-(-369{,}840) + \sqrt{(369{,}840)^2 - (4)(21{,}224)(2{,}517)}}{(2)(21{,}224)}$$

$FS = 17$

3) For h of soil on the slope = 2 ft, but in Unit 1, where the base is only 100 ft wide vers 600 ft wide.

$$W_a = (70)(2)^2\left(\frac{\cot 26.6}{2} - \frac{1}{\sin 26.6} - \frac{\tan 26.6}{2}\right) + (.5)(41.5+41.5)(2)(62.4)$$

$W_a = 118{,}393$

$N_a = 105{,}862$

$$W_p = \frac{(70)(2)^2}{\sin(2)(26.6)} + (62.4)(41.5)(100)$$

$350 + 258{,}960 = 259{,}310$

$a = 21{,}224$

$b = -[\ 5{,}415 + 9{,}863 + \sin 26.6\,(0 + 259{,}310 \tan 27) \rightarrow 59{,}160$

$= -(74{,}438)$

$c = 2{,}517$

$$FS = \frac{-(-74{,}438) \pm \sqrt{(74{,}438)^2 - (4)(21{,}224)(2{,}517)}}{(2)(21{,}224)}$$

$FS = 3.5$

(i.e. Unit 1 is worse case rather than Unit 2)

MONTGOMERY WATSON

By V Ranquette Date 10/16/00 Client V b Steel Sheet 12 of 20

Chkd. By [signature] 10/23/00 Description Slope Stability - Veneer Job No. 1242330

4) For h = 10 ft of soil on the slope in Unit 1

$$W_a = (70)(10)^2\left(\frac{83}{10} - \frac{1}{\sin 26.6} - \frac{\tan 26.6}{2}\right) + 107{,}468$$

$$(40{,}714 + 107{,}468) = 148{,}182$$

$$N_A = 148{,}182 \cos 26.6 = 132{,}497$$

$$W_p = \frac{(70)(10)^2}{\sin(2)(26.6)} + 258{,}960 = 267{,}702$$

$$a = (148{,}182 - 132{,}497 \cos 26.6)\cos 26.6 = 26{,}565$$

$$b = -\Big[(148{,}182 - 132{,}497 \cos 26.6)\sin 26.6 \tan 27 = 6{,}778$$

$$+ (132{,}497 \tan 13.1 + \cancel{C_a}^{0})\sin 26.6 \cos 26.6 = 12{,}344$$

$$+ \sin 26.6\,(\cancel{C}^{0} + 267{,}702 \tan 27) = 61075$$

$$-(80{,}197)$$

$$c = (132{,}497 \tan 13.1 + \cancel{C}^{0})\sin^2(26.6)\tan 27 = 3{,}150$$

$$FS = \frac{-(-80{,}197) + \sqrt{(80{,}197)^2 - (4)(26{,}565)(3{,}150)}}{(2)(26{,}565)}$$

$$FS = 3.0$$

5) For h = 40 ft of soil on sidewall of Unit 1

$$W_a = (70)(40)^2\left(\frac{83}{40} - \frac{1}{\sin 26.6} - \frac{\tan 26.6}{2}\right) + 107{,}468$$

$$W_a = 61{,}690$$

$$N_a = 61{,}690 \cos 26.6 = 55{,}161$$

$$W_p = \frac{(70)(40)^2}{\sin(2)(26.6)} + 258{,}960 = 398{,}832$$

$$a = (61{,}690 - 55{,}161 \cos 26.6)\cos 26.6 = 11{,}059$$

$$b = -\Big[(61{,}690 - 55{,}161\cos 26.6)\sin 26.6 \tan 27 = 2{,}822$$

$$(55{,}161 \tan 13.1 + 0)\sin 26.6 \cos 26.6 = 5{,}139$$

$$(0 + 398{,}832 \tan 27)\sin 26.6 = 90{,}991$$

$$-(98{,}952)$$

$$c = (55{,}161 \tan 13.1 + 0)\sin^2(26.6)\tan 27 = 1{,}311$$

$$FS = \frac{-(-98{,}952) + \sqrt{(98{,}952)^2 - (4)(11{,}059)(1{,}311)}}{(2)(11{,}059)}$$

$$FS = 8.9$$

SUMMARY TABLE

Thickness of Soil on Slope	FS Unit 1	FS Unit 2
2 ft	3.5	17
5 ft	–	15
10 ft	3.0	–
40 ft	8.9	–

Based on the trend: The worse case is likely when approximately 10 ft of soil is on the sidewall, even though this still has a factor of safety much greater than 1.3-1.5 (suggested minimum FS).

(H.) Determine the stability of the sidewall if there is a thickness of soil on the sidewall, and the CAMU is drained exposing dredged material on sidewall (e.g., before or during winter of 1st dredging year).

- If the CAMU is drained, there will be water flow in the soil on the side wall, whether or not the leachate system is turned on.

Reference:

Giroud J.P., Bachus, R.C., & Bonaparte R. "Influence of Water Flow on the stability of Geosynthetic-Soil Layers Systems on Slope", paper from Special Issue on Design of Geomembrane Applications; Geosynthetics International, Volume 2, No. 6 (1995)

For the case of water flow, the following two equations will be used:

- Factor of Safety - For A slip surface above the geomembrane

$$FS_A = \left(\frac{\gamma_b'}{\gamma_{sat}}\right)\left(\frac{\tan\delta_A}{\tan\beta}\right) + \left(\frac{a_A}{\gamma_{sat}\, t \sin\beta}\right) + \left(\frac{\gamma_b}{\gamma_{sat}}\right)\left(\frac{t}{h}\right)\left(\frac{\sin\phi}{2\sin\beta\cos\beta\cos(\beta+\phi)}\right) + \left(\frac{c}{\gamma_{sat}\, h}\right)\left(\frac{\cos\phi}{\sin\beta\cos(\beta+\phi)}\right) + \left(\frac{I}{\gamma_{sat}\, t\, h}\right)$$

A = Above slip surface

- Factor of Safety - for A slip surface below the geomembrane

$$FS_B = \left(\frac{\tan\delta_B}{\tan\beta}\right) + \left(\frac{a_B}{\gamma_{sat}\, t \sin\beta}\right) + \left(\frac{\gamma_b}{\gamma_{sat}}\right)\left(\frac{t}{h}\right)\left(\frac{\sin\phi}{2\sin\beta\cos\beta\cos(\beta+\phi)}\right) + \left(\frac{c}{\gamma_{sat}\, h}\right)\left(\frac{\cos\phi}{\sin\beta\cos(\beta+\phi)}\right) + \left(\frac{I}{\gamma_{sat}\, t\, h}\right)$$

B = Below slip surface

These equations assume water is flowing from the full thickness of dredged material on the slope (i.e., $t_{water} = t_{soil}$).

Where:

γ_b = buoyant unit weight of soil (i.e., dredged materials) above geomembrane (70 lb/ft³)

γ_{sat} = saturated unit weight of soil above geomembrane (140 lb/ft³ Assumed) ✓

a_A = adhesion of soil above geomembrane (0 for sandy soils)(dredged soils) ✓

a_B = adhesion of soil below geomembrane (0 for sandy soils)(native sands and constructed berms) ✓

δ_A = interface friction angle with material above (20.6° for geomembrane/geonet geo composite) ✓

δ_B = interface friction angle with material below (13.1° for GCL/sand) ✓

β = Slope angle (26.6°) ✓

T = Tensile forces of geosynthetics (0 for worse case) ✓

h = height of soil (dredged material) on slope (612.5 - 575) = 37.5 ft maximum ✓

c = cohesion of soil above slip plane (0 for sandy soils)(dredged materials) ✓

t = thickness of soil on the side wall. ✓

ϕ = friction angle of soil above slip plane (27° for existing dredge spoils) ✓

1) For $t = 5$ ft and full water flow:

$$FS_A = \left(\frac{70}{140}\right)\left(\frac{\tan 20.6}{\tan 26.6}\right) + 0 + \underbrace{\left(\frac{70}{140}\right)\left(\frac{5}{37.5}\right)\frac{\sin 27^\circ}{2 \sin 26.6 \cos 26.6 \cos(26.6+27)}}_{(.06667)(0.955)}$$

53.6°

$+0 \quad +0$

$FS_A = 0.375 + 0 + 0.0637 + 0 + 0 = 0.44 < 1$ failure ✓

$$FS_B = \frac{\overset{0.465}{\tan 13.1}}{\tan 26.6} + 0 + 0.0637 + 0 + 0 = 0.53 < 1 \text{ failure}$$ ✓

∴ For a thickness of soil of 5 ft on the slope there would be a slip surface both above and below the geosynthetics during full water flow. ✓

2) For $t = 10$ ft and full water flow:

$$FS_A = 0.375 + 0 + \underbrace{(.5)\left(\frac{10}{37.5}\right)(0.955)}_{0.127} + 0 + 0 = 0.50 < 1 \text{ failure}$$ ✓

$$FS_B = \frac{\overset{0.465}{\tan 13.1}}{\tan 26.6} + 0 + 0.127 = 0.59 < 1 \text{ failure}$$ ✓

3) Determine t for $FS_A = 1.3$ (minimum)

$$1.3 = FS_A = 0.375 + 0 + (0.5)\left(\frac{t}{37.5}\right)(0.955) + 0 + 0$$

$$\frac{(1.3 - 0.375)(37.5)}{(.5)(.955)} = t$$

$t = 73$ ft $\quad \left[\frac{t}{h} = \frac{73}{37.5} \sim 1.9\right]$ ✓

at $t = 73$ ft

$$FS_B = \frac{\overset{0.465}{\tan 13.1}}{\tan 26.6} + 0 + \underbrace{(.5)\left(\frac{73}{37.5}\right)(0.955)}_{0.93} = 1.39 \text{ OK}$$ ✓

4) Determine t for $FS_A = 1.5$

$$t = \frac{(1.5 - 0.375)(37.5)}{(0.5)(0.955)} = 88 \text{ ft}$$

Then $FS_B = 0.465 + (0.5)\left(\frac{88}{37.5}\right)(0.955) = 1.59$ OK ✓

$\left[\frac{t}{h} = \frac{88}{37.5} \sim 2.3\right]$

5) Summary - For every 1 foot up the sidewalls (height) that dredge spoil is placed, a minimum 2 ft thickness of spoil needs to be placed on the sidewall for $FS_A \geq 1.3$ above the liner system due to seepage forces.

Conclusions of Liner Veneer Analyses

✓ 1. The Liner system will be stable, after construction, before filling the CAMU, on the sidewalls.

✓ 2. The Liner system will be stable on the sidewalls after construction, when the CAMU is filled with water, prior to placing dredge spoils.

✓ 3. The Liner system will be stable on the sidewalls during dredge spoil placement, as long as water is maintained in the CAMU - OK to place dredge material on sidewall but do it from bottom up - do NOT allow dredge material to flow down slope.

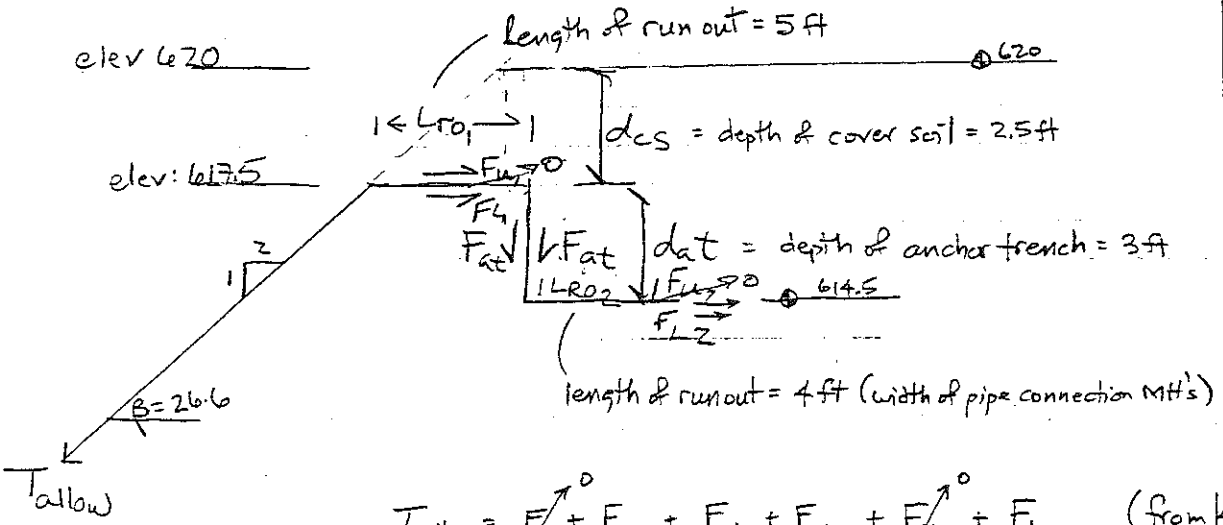
✓ 4. In order for the liner system to be stable, if the water was to be drained from the CAMU, before dredging is complete, for every 1 foot up the sidewall dredge spoils are placed, the spoils must be min 2 ft thick on the sidewall - i.e.,:

- 5 ft up the sidewall - dredge spoils min. 10 ft thick perpendicular to sidewall.
- 10 ft up the sidewall - dredge spoils min. 20 ft thick perpendicular to sidewall.
- 20 ft up the sidewall - dredge spoils min. 40 ft thick perpendicular to sidewall.
- 37.5 ft up the sidewall - dredge spoils min. 75 ft thick perpendicular to sidewall.

II. The geosynthetics on the sidewall will not be in tension during construction, after construction, during filling the CAMU with water, and during placement of the dredge spoils in the CAMU. Therefore the anchor trench design became a function of the piping systems and pipe connection manholes on top of the berm to avoid conflicts.

As long as dynamic forces on liner are avoided.

For the geosynthetic anchor trench system, determine the minimum tensile forces that the system can accomodate:



$$T_{allow} = \cancel{F_{u_1}}^{0} + F_{L_1} + F_{at} + F_{at} + \cancel{F_{u_2}}^{0} + F_{L_2} \quad \text{(from Koerner)}$$

Where:

T_{allow} = allowable stress in synthetic liner
β = slope angle
F_u = Force above geomembrane (assumed to be zero) ✓
F_L = Force below geomembrane
$= q \tan\delta (L_{RO})$ ✓
$q = d_{cs} \gamma_{cs}$ ✓
d_{cs} = depth of cover soil
γ_{cs} = unit weight of cover soil
δ = interface friction (lowest in liner profile)
L_{RO} = runout length

$\therefore F_L = d_{cs} \gamma_{cs} \tan\delta \, L_{ro}$

(next page)

F_{AT} = Force in anchor trench
$= \sigma_{h_{avg}} \tan\delta (d_{At})$ =

$\sigma_{h_{avg}} = K_0 \sigma_{v_{avg}}$

$K_0 = (1 - \sin\phi)$ (assume $\phi = 30°$) trench backfill

$\sigma_{v_{avg}} = \gamma_{trench} d_{Avg}$

γ_{trench} = unit weight of trench backfill

d_{avg} = avg. depth of anchor trench $= \frac{2.5+5.5}{2} = 4'$

$\therefore F_{at} = K_0 \gamma_{trench} d_{avg} \tan\delta \, d_{at}$

A. For the CAMU system the following values are used.

$\beta = 26.6°$

d_{cs} = (620-617.5) = (2.5 ft) at maximum average of the triangle wedge covering the geosynthetics is $\left(\frac{2.5}{3}\right) = 0.83$ ft

γ_{cs} = 120 lb/ft^3 (assumed)

L_{RO_1} = (2.5)(2) = 5.0 ft (it runs out until at least the inboard edge of top of berm on a 2H:1V)

$K_0 = (1 - \sin 30) = 0.5$

γ_{trench} = 120 lb/ft^3 (assumed)

d_{At} = 617.5 − 614.5 = 3 ft

L_{RO_2} = 4 ft (width of pipe connection Mtls)

d_{cs_2} (cover over L_{RO_2}) = 620 − 614.5 = 5.5 ft

MONTGOMERY WATSON

By V Ranquette Date 10·16·00 Client US Steel Sheet 20 of 20

Chkd. By RAW 10/24/00 Description Slope Stability - Veneer Job No. 1242330 01160101

B. $\tau_{all} = \cancel{F_{u_1}}^{0} + F_{L_1} + 2F_{at} + \cancel{F_{u_2}}^{0} + F_{L_2}$

$$\tau_{all} = (d_{cs})(\gamma_{cs})\tan\delta(L_{RO_1}) + (2)(K_o)(\gamma_{trench})(d_{avg})\tan\delta(d_{AT}) + (\gamma_{cs})(d_{cs}+d_{AT})(\tan\delta)(L_{RO2})$$

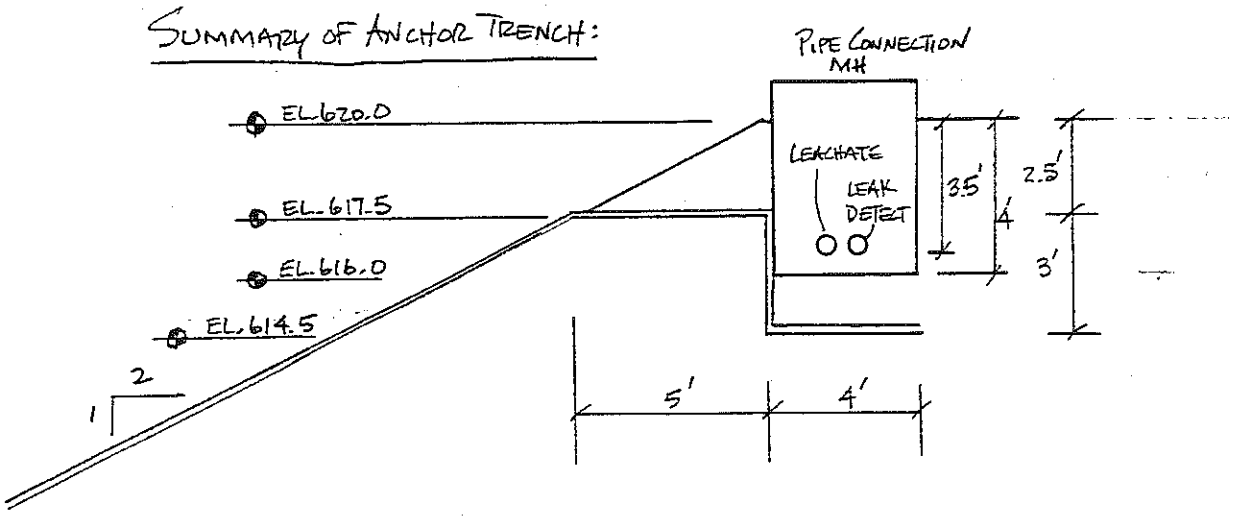
$$= \underbrace{(0.83)(120)(\tan 13.1)(5)}_{116} + \underbrace{(2)(0.5)(120)(4)\tan 13.1)(3)}_{335}$$

$$+ \underbrace{(120)(5.5)(\tan 13.1)(4)}_{614}$$

$\tau_{allow} = 116 + 335 + 614 = 1{,}065$ lb/ft ~ 89 lb/in

Tensile capacity of anchor trench design

SUMMARY OF ANCHOR TRENCH:



I2

Global Slope Stability

SUMMARY

Problem: Determine the global stability on the berms for a number of different scenarios.

References: The slope stability anaysis were performed using the following computer models.

1) U.S. Department of Transportation, Fedral Highway Administration's Reinforced Soil Slope (RSS) computer program.

2) Tensar Earth Technologies TENSLOI computer program.

Summary

1) The above grade portion of the berm will be reinforced in order to provide an acceptable factor of safety against slope failure. The below grade portion of the slope will not be reinforced.

2) The overall berm stability considers a surcharge, on the top of berm of 1,500 psf - which is representative of heavy equipment on the top of berm access roads

3) The berm will be reinforced with 7 layers of primary reinforcement, which will extend from the slope face back into the berm at different lengths, depending on the location of the reinforcing within the berm.

The allowable tensile strength of the primary reinforcement layers will be either 500 plf or 1000 plf (depending on which reinforcing layer.

4) Secondary reinforcing will be at the berm face for every 8 inch thick lift of soil placed. The secondary reinforcement will extend 4 ft back from the face of the slope This will help obtain compaction near the face

Conclusion

1) For the primary reinforcing layers as shown on page 3 the following factor of safeties were obtained.

a) For full berm height (45 ft) with reinforcements

- circular failure = 1.3
- Sliding block at the base of berm 1.7
- Sliding block at middle of berm 1.6
- Sliding block at top of berm 1.7
- Forced circular failure through the GCL at base of berm 1.5

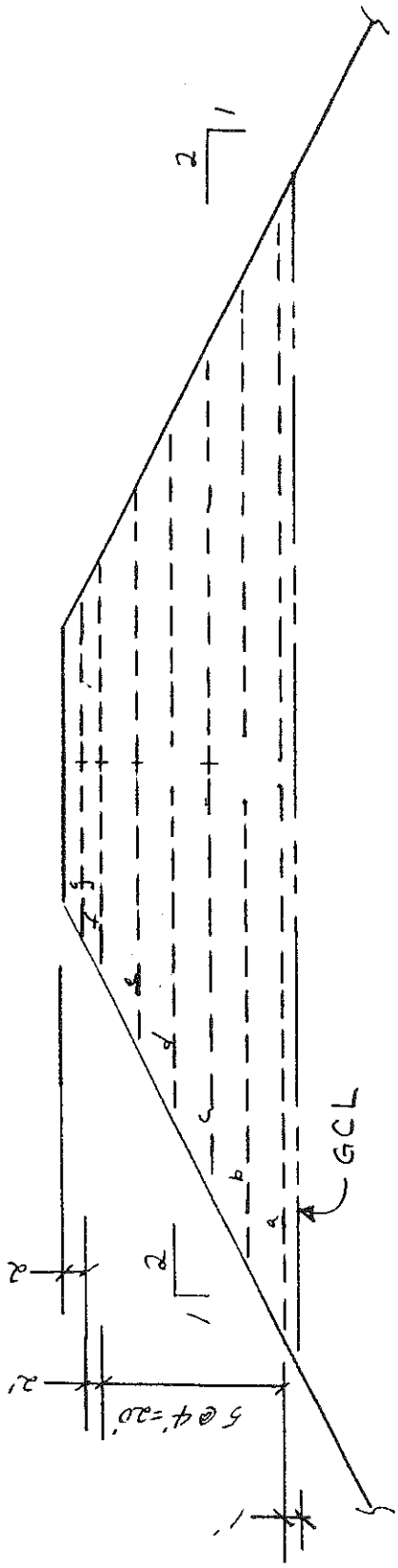
2) The proposed reinforced berm is stable.

MONTGOMERY WATSON

By RRB Date 11 OCT 00 Client US STEEL Sheet 1 of 2

Chkd. By VR Description BERM REINFORCEMENT Job No

PRIMARY REINFORCEMENT



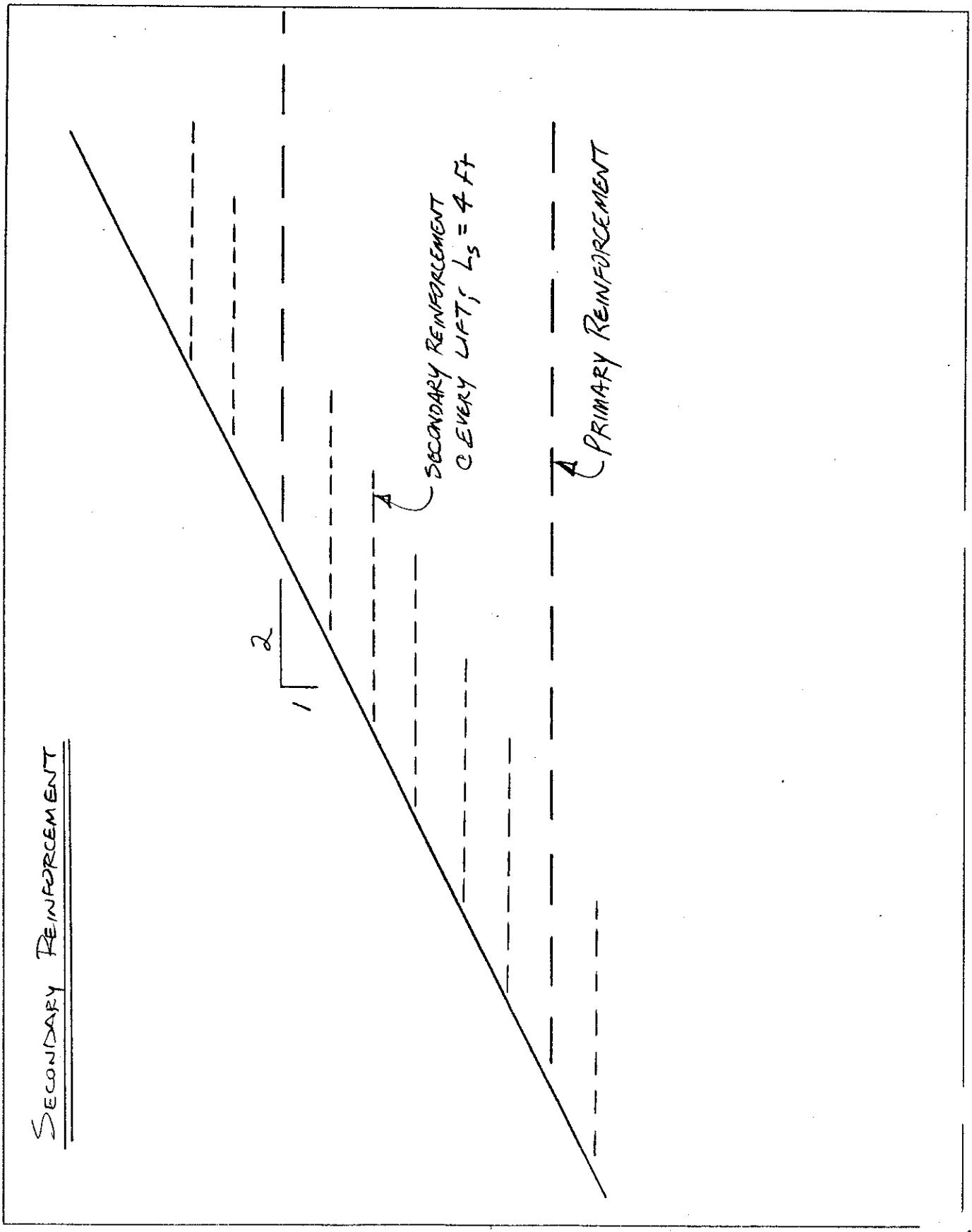
REINFORCEMENT	T_{ad}	L
a	1000 plf	60 ft
b	1000 "	50 "
c	1000 "	50 " *
d	1000 "	35 "
e	1000 "	35 " *
f	500 "	20 " *
g	500 "	20 " *

* SHORTER LENGTHS ON BACK TO BACK 2:1 SLOPE, TO BUTT ROLL ENDS. USE L MINIMUMS FOR 2:1 AND 3:1 EXTERIOR BERMS.

MONTGOMERY WATSON

By RPB Date 11 OCT 00 Client US STEEL Sheet 2 of 2

Chkd. By WJC Description BERM REINFORCEMENT Job No



MONTGOMERY WATSON

By RRB Date 10 OCT 00 Client US STEEL Sheet 1 of 1

Chkd. By VJL Description LOAD ON BERM Job No.

SCRAPER

ASSUME CAT 621F SCRAPER. THIS IS TO BE VERIFIED WITH SELECTED CONTRACTOR. SEE ATTACHED SPEC SHEET.

TOTAL LOADED WEIGHT = 118.7 K

WHEEL BASE = 25.3 FT

WIDTH TO OUTSIDE OF TIRES = 10 FT

LOADED FRONT AXLE WEIGHT = 62.9 K

LOADED BACK AXLE WEIGHT = 55.8 K

IF LOAD IS FULLY DISTRIBUTED OVER WHEEL AREA

$$q = \frac{118.7k}{25.3'(10')} = 470 \text{ psf}$$

WHEEL WIDTH ~ 2.75 FT. ASSUME CONTACT LENGTH ~ 5 FT.

LOAD PER FRONT WHEEL

$$q = \frac{62.9k/2}{2.75'(5')} = 2.3 \text{ KSF}$$

IF WHEEL LOAD IS PROJECTED THROUGH 12" BASE AT 0.5:1 RATIO

$$q = \frac{62.9/2}{3.75(6')} = 1.4 \text{ KSF}$$

IF 1:1 RATIO

$$q = \frac{62.9/2}{4.75(7)} = 950 \text{ psf}$$

EQUIPMENT

* Agricultural Tractors
* Cold Planers
* Forest Machines
* Harvesters
* Knuckleboom Loaders
* Off Highway Tractors
* Pipelayers
* Skid Steer Loaders
* Telehandlers
* Wheel Loaders
* Articulated Trucks
* Combines
* Forwarders
* Hydraulic Excavators
* Material Handlers
* Off Highway Trucks
* Road Reclaimers
* Skidders
* Track Loaders
* Wheel Tractors
* Backhoe Loaders
* Compactors
* Front Shovels
* Integrated Toolcarriers
* Motor Graders
* Paving Equipment
* **Scrapers**
* Soil Stabilizers
* Track-Type Tractors

SCRAPERS

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SEARCH CAT CO

GO

> 621F

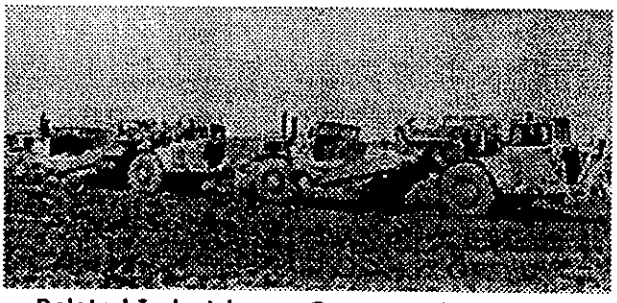
OTHER MODELS: 621F

> SPECIFICATIONS

FEATURES & BENEFITS: -- Select--

Product Overview

Cat scraper bowl design combined with hydraulic ejection provides fast cycle times for high productivity.



Related Industries: Construction, Heavy Construction

Engine	
Engine Model	3406C
Net Power	246 kW (330 hp)
Gross Power	259 kW (347 hp)
Flywheel Power	246 kW (330 hp)
Scraper Bowl	
Heaped Capacity, SAE Rated	15.3 m^3 (20 yd^3)
Rated Payload	21800 kg (48000 lb)

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EQUIPMENT

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* Soil Stabilizers
* Track-Type Tractors

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> 621F

OTHER MODELS: 621F

> SPECIFICATIONS

FEATURES & BENEFITS: -- Select--

Detailed Specifications

Engine	
Engine Model	3406C
Net Power	246 kW (330 hp)
Gross Power	259 kW (347 hp)
Flywheel Power	246 kW (330 hp)
Caterpillar Net Power	246 kW (330 hp)
ISO 9249	246 kW (330 hp)
EEC 80/1269	246 kW (330 hp)
SAE J1349	244 kW (327 hp)
DIN 70020	342PS
Bore	137 mm (5.4 in)
Stroke	165 mm (6.5 in)
Displacement	14.6 L (893 in^3)
Scraper Bowl	
Heaped Capacity, SAE Rated	15.3 m^3 (20 yd^3)
Rated Payload	21800 kg (48000 lb)
Struck Capacity, SAE Rated	10.7 m^3 (14 yd^3)
Maximum Depth of Cut	333 mm (13.08 in)
Width of Cut, Outside Router Bits	3023 mm (9.92 in)
Maximum Ground Clearance	522 mm (18 in)

Thickness of Optional Cutting Edge	29 mm (1.14 in)
Maximum Hydraulic Penetration Force	150.4 kN (33840 lb)
Maximum Depth of Spread	522 mm (20.6 in)
Apron Opening	1780 mm (70 in)
Apron Closure Force	107 kN (24075 lb)
Weights	
Total Shipping Weight	31591 kg (69658 lb)
Tractor Shipping Weight	21743 kg (47943 lb)
Scraper Shipping Weight	9848 kg (21715 lb)
Total Operating Weight	32085 kg (70715 lb)
Front Axle Weight	21818 kg (48109 lb)
Rear Axle Weight	10267 kg (22628 lb)
Loaded Total Weight	53860 kg (118707 lb)
Loaded Front Axle Weight	28546 kg (62915 lb)
Loaded Rear Axle Weight	25314 kg (55792 lb)
Dimensions	
Overall Machine Width	3454 mm (11.33 ft)
Cab Width	2972 mm (9.75 ft)
Width to Center of Rear Tires	2210 mm (7.25 ft)
Width to Inside of Bowl	2946 mm (9.67 ft)
Width to Outside of Tires	3048 mm (10 ft)
Overall Shipping Height	3353 mm (11 ft)
Height to Top of Cab	3378 mm (33.08 ft)
Height to Bottom of Rim	559 mm (1.83 ft)
Length to Front of Machine from Front Axle	3175 mm (10.42 ft)
Width from Center of Rim to Outside of Rim	432 mm (1.42 ft)
Maximum Scraper Blade Height	533 mm (1.75 ft)
Wheelbase	7722 mm (25.33 ft)
Overall Machine Length	12878 mm (42.25 ft)
Length to Rear of Machine from Rear Axle	2159 mm (7.08 ft)
Transmission	
1 Forward	5 kph (3.1 mph)
2 Forward	9 kph (5.6 mph)
3 Forward	11.4 kph (7.1 mph)
4 Forward	15.4 kph (9.6 mph)
5 Forward	20.8 kph (12.9 mph)
6 Forward	28.2 kph (17.5 mph)

7 Forward	38 kph (23.6 mph)
8 Forward	51.3 kph (31.9 mph)
Reverse	9.2 kph (5.7 mph)
Steering	
Width Required for Curb-to-Curb 180 Degree Turn	10.9 m (35.75 ft)
Steering Angle - Right	90 Degrees
Steering Angle - Left	85 Degrees
Hydraulic Output	197 L/min (52 gal/min)
Ground-Driven Secondary Steering System	150 L/min (39.9 gal/min)
Service Refill Capacities	
Fuel Tank	530 L (140 Gal)
Crankcase	36 L (9.5 Gal)
Transmission	72 L (19 Gal)
Differential	163 L (43 Gal)
Final Drive (each side)	19 L (5 Gal)
Cooling System	83 L (22 Gal)
Hydraulic Reservoir	140 L (37 Gal)
Wheel Coolant (each)	45 L (12 Gal)
Hydraulics	
Bowl Cylinder Bore	152 mm (6 in)
Bowl Cylinder Stroke	813 mm (32 in)
Apron Cylinder Bore	184 mm (7.25 in)
Apron Cylinder Stroke	600 mm (24 in)
Ejector Cylinder Bore	165 mm (6.5 in)
Ejector Cylinder Stroke	1549 mm (61 in)
Steering Circuit	197 L/min (52 gal/min)
Scraper Circuit	284 L/min (65.5 gal/min)
Cushion Hitch Circuit	35.5 L/min (9.7 gal/min)
Optional Supplemental Steering Circuit	140 L/min (37 gal/min)
Relief Valve Setting - Steering Circuit	15500 kPa (2250 PSI)
Relief Valve Setting - Implement Circuit	14.8 kPa (2150 PSI)

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STABILITY ANALYSIS OF 2:1 SLOPES
U.S. Steel CAMU — Gary, Indiana
Montgomery Watson Harza
9 October 2000

Run	Trial	Description	Model				Factor of Safety	Comments
			Soil		Reinforcement	Analysis		
			Fill	Cut				
			ϕ c	ϕ c				
Analyses completed with the U.S. Department of Transportation, Federal Highway Administration's Reinforced Soil Slope (RSS) computer program.								
F1	a	Full slope; no surcharge	27° 0	30° 0	none	circular	1.021	Surficial failures; Error message RC11; left failure initiation limit of 170
"	b	"	"	"	"	"	1.020	left failure initiation limit of 200; program terminated but with no error messages
"	c	"	"	"	"	"	1.020	left failure initiation limit of 201; analysis completed, no errors
F2	–	"	"	35° 0	"	"	1.020	Surficial failures
F3	–	Full slope; no surcharge; 2 ft thick zone of 200 psf cohesion along slope face	"	30° 0	"	"	1.125	Slightly deeper surficial failure
F4	–	"	"	35° 0	"	"	1.126	"
F5	a	Full slope; no surcharge	"	30° 0	"	sliding block	1.611	sliding block check
S1	a	Top slope only, H = 25 ft; no surcharge; Simple model, no GCL	"	"	Design reinforcement	circular & sliding block	1.30	Reinforcement strength and layer lengths defined

Run	Trial	Description	Model				Factor of Safety	Comments
			Soil		Reinforcement	Analysis		
			Fill	Cut				
			ϕ c	ϕ c				
S2	a	S1 case but with reinforcement refined; Simple model, no GCL	"	"	5 layers T_{al} = 1000 plf L = 49 to 15 ft	"	1.315	Simple refinement of reinforcement
F6	b	Full slope; no surcharge; reinforcement refined	"	"	7 layers; 3 @ T_{al} = 1000 plf 4 @T_{al} =500plf L = 50 to 20 ft	"	1.316	Practical reinforcement strengths and lengths
F7	a	"	"	35° 0	"	"	1.467	"
F8	a	Full slope; 500 psf surcharge 5 foot off slope crest	"	30° 0	"	"	1.314	"
F9	a	Full slope; 1000 psf surcharge 5 foot off slope crest	"	"	"	"	1.287	"
F10	a	Full slope; 1000 psf surcharge 2 foot off slope crest	"	"	"	"	1.272	"
F11	a	Full slope; 1000 psf surcharge 2 foot off slope crest	"	"	Increase length of 1 layer	"	1.277 circular	Increase Layer #4 L to 35 ft from 20 ft
F11	b	"	"	"	Increased strength of 1 layer	"	1.289 circular	Increased Layer #4 strength to 1000 plf from 500 plf
F11	c	"	"	"	Increased strength of 2 layers	"	1.292 circular	Increased Layers #4 & #5 strength to 1000 plf from 500 plf; failure now passes behind Layer # 5

Run	Trial	Description	Model				Factor of Safety	Comments
			Soil		Reinforcement	Analysis		
			Fill	Cut				
			ϕ c	ϕ c				
F11	d	"	"	"	Increase length of Layer #5	"	1.302 circular	Increase length of Layer # 5 to
T1	a	Top - fill - portion of slope only, with GCL modeled, 1000 psf surcharge	"	"	per F11 layout	"	1.370 circular	Block sliding not completed, error messages
T1	b	"	"	"	"	"	1.348 circular 1.087 sliding	Revise trial failure surface generation data
T1	c	Top - fill - portion of slope only, with GCL modeled, 500 psf surcharge	"	"	"	"	1.444 circular 1.206 sliding	
T1	d	"	"	"	Increase lengths	"	1.444 circular 1.206 sliding	Increase Layer #3 and #4 lengths to 50 ft from 35 ft
T1	e	"	"	"	Increase strengths	"	1.583 circular 1.206 sliding	Double strength, to 2000 plf, of Layers #1 - #5. Demonstrates that RSS sliding block analysis does not incorporate reinforcement resistance.

Run	Trial	Description	Model				Factor of Safety	Comments
			Soil		Reinforcement	Analysis		
			Fill	Cut				
			ϕ c	ϕ c				
T1	f	"	"	"	"	circular: sliding @ base: mid level sliding:	1.444 2.153 1.185	Reinforcement per T1c Run; Increased Layer #1 length to 75 feet from 50 feet
T1	g	"	"	"	"	circular: sliding @ base: mid level sliding:	1.444 1.726 2.192	Decrease Layer #1 to 60 feet; Increase Layer #3 to 50 feet
T1	h	Revised pullout factors	"	"	"	circular: sliding @ base: mid level sliding:	1.444 1.726 2.192	no change on results
F12	a	Run F11 with reinforcement lengths per T1h	"	"	"	circular: sliding @ base: middle sliding: top level sliding:	1.302 1.676 1.593 1.699	Layer #1 length = 60 feet; Layer #3 length = 50 feet

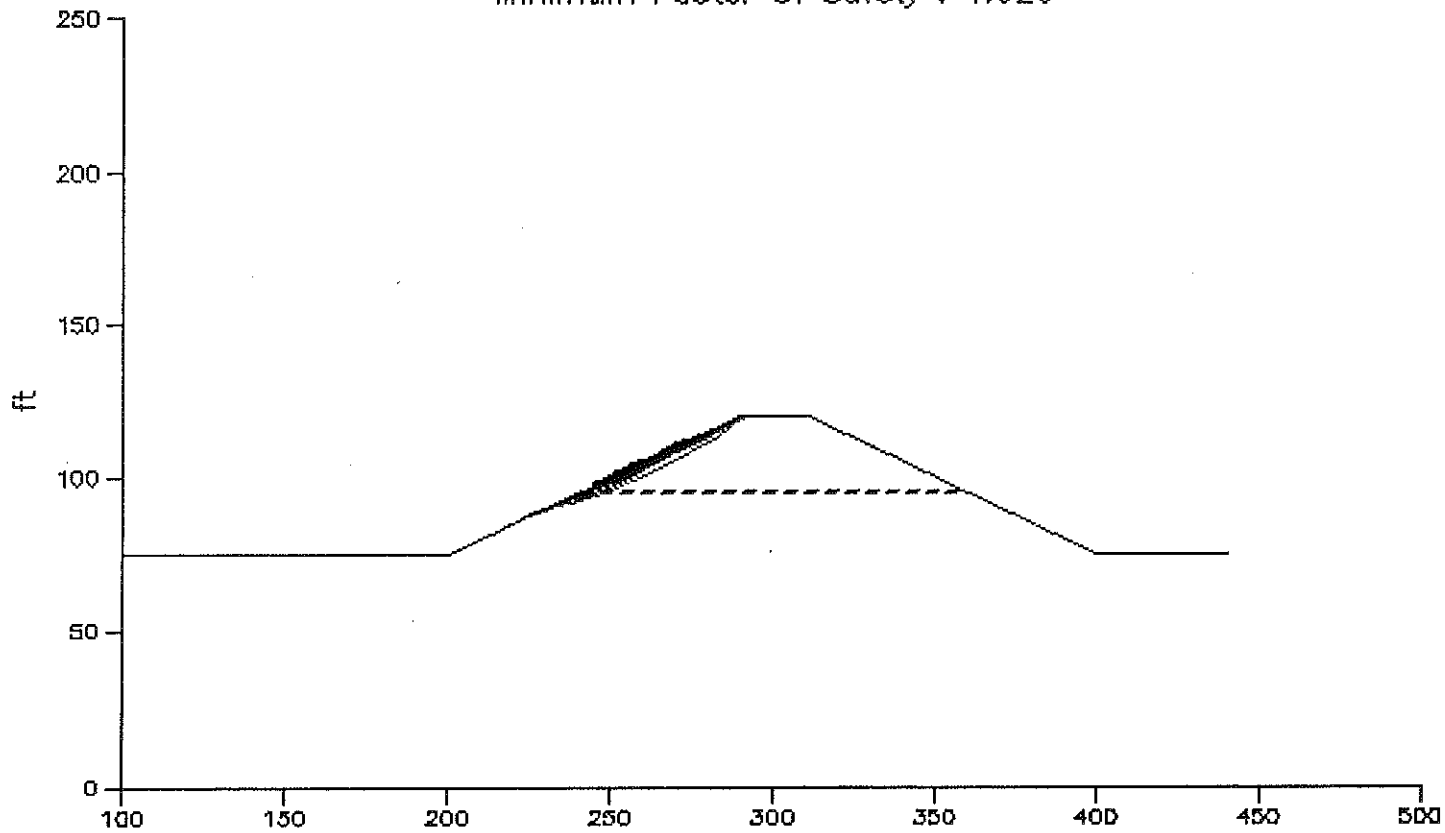
FOLLOWING ANALYSES WERE PERFORMED AS A CHECK ON RSS RESULTS.
Analyses completed with the Tensar Earth Technologies TENSLO1 computer program.

Run	Trial	Description	Model				Factor of Safety	Comments
			Soil		Reinforcement	Analysis		
			Fill	Cut				
			ϕ c	ϕ c				
F12	a	Same as F12 with RSS analysis, except w/o surcharge and with 2 ft zone of cohesive soil at face	"	"	"	circular	1.41	
F12	b	Same as F12, except w/o surcharge and w/o reinforcement and with 2 ft zone of cohesive soil at face	"	"	none	circular	1.23	Full height failure
F12	c	Same as F12 with RSS analysis, except w/o surcharge and with 2 ft zone of cohesive soil at face	"	"	Same as RSS F12	circular	1.39	Refined search from F12a
F12	d	"	"	"	"	circular	1.49	Forced failure to occur at elevation of GCL

Title : Full Slope
Description : Run F1c

Bishop Circular Surfaces – Most Critical Surfaces

Minimum Factor of Safety : 1.020



Press any key to continue or ESC to cancel ...

```
*****************************************************************************
*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   ***
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*****************************************************************************
```

File : C:\RSS\F1b.dat
Date : Tue 10-10-:0, 16:08:52
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run F1b
Remarks :

```
*****************************************************************************
*****                            INPUT DATA                             *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 11
Number of Top Boundaries : 9

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	75.00	200.00	75.00	1
2	200.00	75.00	240.00	95.00	1
3	240.00	95.00	241.00	95.50	4
4	241.00	95.50	290.00	120.00	2
5	290.00	120.00	310.00	120.00	2
6	310.00	120.00	359.00	95.50	2
7	359.00	95.50	360.00	95.00	4
8	360.00	95.00	400.00	75.00	1
9	400.00	75.00	440.00	75.00	1
10	241.00	95.50	359.00	95.50	4
11	240.00	95.00	360.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

```
*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       *****
  *****************************************************************************
```

Data for Generating Circular Surfaces

```
              Number of Initiation Points : 10
       Number of Surfaces From Each Point : 10
                   Left Initiation Point : 201.00 ft
                  Right Initiation Point : 250.00 ft
                  Left Termination Point : 270.00 ft
                 Right Termination Point : 330.00 ft
                       Minimum Elevation : 0.00 ft
                          Segment Length : 5.00 ft
                    Positive Angle Limit : 45.00 deg
                    Negative Angle Limit : 0.00 deg
```

```
*****************************************************************************
*****                          RESULTS                                  *****
*****************************************************************************
```

.itical Surfaces

No.	Safety Factor	Center X (ft)	Center Y (ft)	Circle Radius (ft)
1	1.020	-1917.33	4462.19	4870.95
2	1.033	213.67	192.29	100.99
3	1.035	-911.42	2426.47	2600.46
4	1.046	11.29	610.22	564.91
5	1.046	101.12	402.11	338.35
6	1.050	-538.78	1729.99	1811.66
7	1.064	192.68	241.16	156.15
8	1.068	235.32	153.60	57.07
9	1.070	202.81	194.61	108.52
10	1.071	243.95	138.22	38.69

```
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File : C:\RSS\F1c.dat
Date : Tue 10-10-:0, 16:13:08
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run F1c
Remarks :

```
*****************************************************************************
*****                            INPUT DATA                             *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 11
Number of Top Boundaries : 9

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	75.00	200.00	75.00	1
2	200.00	75.00	240.00	95.00	1
3	240.00	95.00	241.00	95.50	4
4	241.00	95.50	290.00	120.00	2
5	290.00	120.00	310.00	120.00	2
6	310.00	120.00	359.00	95.50	2
7	359.00	95.50	360.00	95.00	4
8	360.00	95.00	400.00	75.00	1
9	400.00	75.00	440.00	75.00	1
10	241.00	95.50	359.00	95.50	4
11	240.00	95.00	360.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

```
*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       *****
  *****************************************************************************


Data for Generating Circular Surfaces

              Number of Initiation Points : 10
       Number of Surfaces From Each Point : 10
                   Left Initiation Point : 201.00 ft
                  Right Initiation Point : 250.00 ft
                  Left Termination Point : 270.00 ft
                 Right Termination Point : 330.00 ft
                       Minimum Elevation : 0.00 ft
                          Segment Length : 5.00 ft
                    Positive Angle Limit : 45.00 deg
                    Negative Angle Limit : 0.00 deg


*****************************************************************************
*****                          RESULTS                                  *****
*****************************************************************************
```

Surface No. : 1
Factor of Safety : 1.020
Circle Center X : -1917.33 ft
Circle Center Y : 4462.19 ft
Circle Radius : 4870.95 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	246.80	98.39	4.48	5.1	0.0	0.0	4.6	2.3
2	2	251.27	100.61	4.48	13.7	0.0	0.0	12.3	6.1
3	2	255.75	102.84	4.47	19.1	0.0	0.0	17.1	8.5
4	2	260.22	105.07	4.47	21.3	0.0	0.0	19.0	9.5
5	2	264.69	107.31	4.47	20.2	0.0	0.0	18.1	9.0
6	2	269.16	109.55	4.47	16.0	0.0	0.0	14.3	7.1
7	2	273.63	111.80	4.47	8.5	0.0	0.0	7.6	3.8
8	2	276.59	113.29	1.46	0.7	0.0	0.0	0.6	0.3

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-104.51	104.51	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-41.81	83.61	93.48	116.56
Shear Force, lb :	41.79	20.89	46.72	26.56

Surface No. : 2
Factor of Safety : 1.033
Circle Center X : 213.67 ft
Circle Center Y : 192.29 ft
Circle Radius : 100.99 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	239.56	94.68	0.89	10.5	0.0	0.0	9.4	5.3
2	1	240.33	94.91	0.66	21.4	0.0	0.0	19.2	10.7
3	4	240.83	95.05	0.34	15.6	0.0	0.0	15.2	3.4
4	4	241.70	95.30	1.40	96.8	0.0	0.0	94.6	21.3
5	2	243.16	95.72	1.51	163.3	0.0	0.0	148.8	73.4
6	2	246.28	96.74	4.73	827.7	0.0	0.0	748.6	369.2
7	2	250.97	98.47	4.65	1168.9	0.0	0.0	1051.6	518.7
8	2	255.57	100.43	4.55	1336.4	0.0	0.0	1199.1	591.4
9	2	260.06	102.62	4.44	1338.4	0.0	0.0	1200.6	592.2
10	2	264.45	105.03	4.32	1186.1	0.0	0.0	1066.2	525.9
11	2	268.70	107.65	4.19	892.8	0.0	0.0	806.3	397.7
12	2	272.82	110.48	4.05	474.7	0.0	0.0	431.8	213.0
13	2	275.66	112.59	1.61	48.9	0.0	0.0	44.9	22.1

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-7581.35	7581.35	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-3015.78	6101.44	6806.06	116.30
Shear Force, lb :	2983.01	1479.91	3329.93	26.39

Surface No. : 3
Factor of Safety : 1.035
Circle Center X : -911.42 ft
Circle Center Y : 2426.47 ft
Circle Radius : 2600.46 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	225.03	87.48	4.50	17.9	0.0	0.0	15.6	8.7
2	1	229.52	89.67	4.49	50.5	0.0	0.0	44.2	24.6
3	1	234.01	91.87	4.49	77.1	0.0	0.0	67.4	37.6
4	1	238.13	93.89	3.74	80.2	0.0	0.0	70.1	39.1
5	1	240.19	94.91	0.37	8.7	0.0	0.0	7.6	4.2
6	4	240.56	95.09	0.37	8.6	0.0	0.0	8.7	2.0
7	4	240.87	95.25	0.26	6.1	0.0	0.0	6.2	1.4
8	4	241.19	95.40	0.39	9.2	0.0	0.0	9.3	2.1
9	2	243.30	96.45	3.84	96.6	0.0	0.0	86.7	42.7
10	2	247.46	98.51	4.48	120.4	0.0	0.0	108.0	53.2
11	2	251.93	100.75	4.47	122.7	0.0	0.0	110.1	54.2
12	2	256.40	102.99	4.47	119.1	0.0	0.0	106.8	52.6
13	2	260.87	105.24	4.46	109.4	0.0	0.0	98.2	48.3
14	2	265.33	107.50	4.46	93.8	0.0	0.0	84.2	41.4
15	2	269.79	109.76	4.45	72.2	0.0	0.0	64.8	31.9
16	2	274.24	112.04	4.45	44.7	0.0	0.0	40.1	19.8
17	2	278.27	114.11	3.61	12.0	0.0	0.0	10.7	5.3

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-1049.29	1049.29	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-419.81	839.59	938.70	116.57
Shear Force, lb :	419.55	209.70	469.04	26.56

8

Surface No. : 4
Factor of Safety : 1.046
Circle Center X : 11.29 ft
Circle Center Y : 610.22 ft
rcle Radius : 564.91 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	225.09	87.34	4.63	122.0	0.0	0.0	107.5	59.3
2	1	229.71	89.25	4.61	350.4	0.0	0.0	308.5	170.3
3	1	234.31	91.20	4.59	548.7	0.0	0.0	482.7	266.4
4	1	238.31	92.93	3.39	516.1	0.0	0.0	453.7	250.4
5	1	240.50	93.90	1.00	168.7	0.0	0.0	148.3	81.8
6	1	241.09	94.16	0.19	32.4	0.0	0.0	28.5	15.7
7	1	242.07	94.60	1.77	316.9	0.0	0.0	278.3	153.6
8	4	243.51	95.25	1.11	208.6	0.0	0.0	208.0	46.3
9	2	244.90	95.88	1.68	330.6	0.0	0.0	297.4	144.9
10	2	248.02	97.31	4.54	965.8	0.0	0.0	868.5	423.0
11	2	252.55	99.42	4.52	1046.6	0.0	0.0	940.9	458.3
12	2	257.06	101.58	4.50	1098.7	0.0	0.0	987.7	481.1
13	2	261.55	103.77	4.48	1122.5	0.0	0.0	1009.2	491.6
14	2	266.02	106.01	4.46	1118.4	0.0	0.0	1005.6	489.8
15	2	270.47	108.28	4.44	1086.7	0.0	0.0	977.3	476.0
16	2	274.91	110.59	4.42	1027.9	0.0	0.0	924.6	450.1
17	2	279.32	112.95	4.40	942.2	0.0	0.0	847.8	412.9
18	2	283.71	115.34	4.38	830.2	0.0	0.0	747.3	364.0
19	2	287.95	117.70	4.10	655.2	0.0	0.0	590.1	287.4
20	2	290.13	118.92	0.26	34.9	0.0	0.0	31.4	15.3
21	2	291.14	119.50	1.75	110.2	0.0	0.0	99.3	48.4

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-12633.48	12633.48	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-5018.99	10164.79	11336.37	116.28
Shear Force, lb :	5008.49	2468.68	5583.85	26.24

Surface No. : 5
Factor of Safety : 1.046
Circle Center X : 101.12 ft
Circle Center Y : 402.11 ft
Circle Radius : 338.35 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	225.10	87.31	4.65	143.6	0.0	0.0	126.8	70.0
2	1	229.74	89.17	4.62	404.4	0.0	0.0	356.4	196.7
3	1	234.35	91.11	4.60	614.7	0.0	0.0	540.8	298.5
4	1	238.33	92.84	3.35	554.7	0.0	0.0	487.4	269.0
5	1	240.50	93.81	1.00	180.3	0.0	0.0	158.4	87.4
6	1	241.11	94.08	0.22	40.0	0.0	0.0	35.2	19.4
7	1	242.16	94.56	1.88	356.3	0.0	0.0	312.7	172.6
8	4	243.64	95.25	1.08	211.4	0.0	0.0	211.2	47.0
9	2	244.96	95.87	1.58	318.6	0.0	0.0	286.5	139.5
10	2	248.00	97.32	4.50	949.2	0.0	0.0	853.4	415.7
11	2	252.49	99.52	4.47	964.8	0.0	0.0	867.4	422.5
12	2	256.95	101.79	4.44	934.0	0.0	0.0	840.0	409.1
13	2	261.37	104.13	4.40	857.9	0.0	0.0	771.9	376.0
14	2	265.75	106.53	4.37	737.6	0.0	0.0	664.1	323.5
15	2	270.10	108.99	4.33	574.4	0.0	0.0	517.6	252.1
16	2	274.42	111.52	4.29	369.4	0.0	0.0	333.3	162.3
17	2	278.63	114.07	4.13	124.2	0.0	0.0	112.2	54.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-8335.41	8335.41	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-3335.57	6682.13	7468.39	116.53
Shear Force, lb :	3323.98	1653.28	3712.43	26.44

Surface No. : 6
Factor of Safety : 1.050
Circle Center X : -538.78 ft
Circle Center Y : 1729.99 ft
Circle Radius : 1811.66 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	219.60	84.71	4.54	50.3	0.0	0.0	44.2	24.[illegible]
2	1	224.14	86.81	4.54	146.4	0.0	0.0	128.6	70.[illegible]
3	1	228.67	88.92	4.53	233.5	0.0	0.0	205.1	112.[illegible]
4	1	233.20	91.05	4.52	311.7	0.0	0.0	273.7	150.[illegible]
5	1	237.72	93.19	4.52	380.9	0.0	0.0	334.4	183.[illegible]
6	1	239.99	94.26	0.02	1.9	0.0	0.0	1.7	0.[illegible]
7	1	240.50	94.51	1.00	93.0	0.0	0.0	81.6	44.[illegible]
8	1	241.27	94.87	0.53	50.8	0.0	0.0	44.6	24.[illegible]
9	4	242.06	95.25	1.05	101.8	0.0	0.0	102.1	22.[illegible]
10	2	243.54	95.96	1.91	193.7	0.0	0.0	174.3	84.[illegible]
11	2	246.74	97.50	4.51	492.8	0.0	0.0	443.4	215.[illegible]
12	2	251.25	99.67	4.50	535.5	0.0	0.0	481.8	233.[illegible]
13	2	255.74	101.86	4.49	569.4	0.0	0.0	512.3	248.[illegible]
14	2	260.23	104.06	4.49	594.6	0.0	0.0	534.9	259.[illegible]
15	2	264.72	106.27	4.48	611.0	0.0	0.0	549.7	266.[illegible]
16	2	269.20	108.49	4.48	618.8	0.0	0.0	556.7	270.[illegible]
17	2	273.67	110.73	4.47	617.9	0.0	0.0	555.9	269.[illegible]
18	2	278.13	112.98	4.46	608.4	0.0	0.0	547.4	265.[illegible]
19	2	282.59	115.24	4.46	590.3	0.0	0.0	531.1	257.[illegible]
20	2	287.05	117.51	4.45	563.7	0.0	0.0	507.2	246.[illegible]
21	2	289.64	118.84	0.73	89.2	0.0	0.0	80.3	39.[illegible]
22	2	290.95	119.51	1.89	115.2	0.0	0.0	103.7	50.[illegible]

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-7570.89	7570.89	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-3001.20	6095.26	6794.07	116.21
Shear Force, lb :	2999.01	1475.62	3342.39	26.20

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Surface No. : 7
Factor of Safety : 1.064
Circle Center X : 192.68 ft
Circle Center Y : 241.16 ft
Circle Radius : 156.15 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	230.65	89.72	4.85	366.5	0.0	0.0	332.6	180.4
2	1	235.48	91.01	4.81	1037.3	0.0	0.0	934.1	506.8
3	1	238.94	92.04	2.12	644.7	0.0	0.0	576.7	312.9
4	1	240.50	92.54	1.00	339.3	0.0	0.0	303.5	164.7
5	1	241.82	92.96	1.64	606.1	0.0	0.0	542.3	294.2
6	1	245.00	94.06	4.71	2025.5	0.0	0.0	1802.1	977.7
7	1	247.48	94.95	0.26	124.3	0.0	0.0	110.1	59.7
8	4	248.25	95.25	1.27	617.8	0.0	0.0	611.2	133.6
9	2	250.45	96.11	3.12	1603.1	0.0	0.0	1449.7	694.1
10	2	254.31	97.71	4.59	2551.5	0.0	0.0	2303.2	1102.8
11	2	258.87	99.76	4.53	2647.5	0.0	0.0	2388.0	1143.4
12	2	263.36	101.95	4.46	2637.1	0.0	0.0	2379.2	1139.1
13	2	267.78	104.28	4.38	2525.0	0.0	0.0	2280.9	1092.1
14	2	272.12	106.76	4.30	2316.4	0.0	0.0	2097.3	1004.2
15	2	276.39	109.37	4.22	2017.5	0.0	0.0	1832.7	877.5
16	2	280.56	112.12	4.13	1634.8	0.0	0.0	1491.6	714.1
17	2	284.65	115.00	4.04	1175.7	0.0	0.0	1078.5	516.4
18	2	288.34	117.77	3.33	582.9	0.0	0.0	538.2	257.7
19	2	290.31	119.30	0.61	53.5	0.0	0.0	49.4	23.6
20	2	290.89	119.77	0.55	15.7	0.0	0.0	14.6	7.0

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-25522.03	25522.03	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-10158.12	20626.30	22991.99	116.22
Shear Force, lb :	10006.59	4895.73	11140.01	26.07

Surface No. : 8
Factor of Safety : 1.068
Circle Center X : 235.32 ft
Circle Center Y : 153.60 ft
Circle Radius : 57.07 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	247.00	97.79	4.89	435.1	0.0	0.0	404.1	192.9
2	2	251.84	99.03	4.79	1133.1	0.0	0.0	1034.4	493.7
3	2	256.56	100.68	4.64	1505.3	0.0	0.0	1361.2	649.7
4	2	261.10	102.74	4.46	1565.5	0.0	0.0	1413.2	674.5
5	2	265.46	105.20	4.24	1343.5	0.0	0.0	1220.1	582.3
6	2	269.58	108.02	4.00	883.8	0.0	0.0	813.7	388.4
7	2	273.16	110.95	3.17	251.2	0.0	0.0	236.4	112.8

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-7117.48	7117.48	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-2820.52	5771.30	6423.64	116.05
Shear Force, lb :	2754.54	1346.18	3065.89	26.05

Surface No. : 9
Factor of Safety : 1.070
Circle Center X : 202.81 ft
Circle Center Y : 194.61 ft
Circle Radius : 108.52 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	230.64	89.75	4.83	342.4	0.0	0.0	309.9	167.2
2	1	235.44	91.15	4.77	938.0	0.0	0.0	840.5	453.6
3	1	238.91	92.30	2.18	587.3	0.0	0.0	522.2	281.8
4	1	240.50	92.88	1.00	296.3	0.0	0.0	263.4	142.2
5	1	241.76	93.34	1.52	481.3	0.0	0.0	428.0	231.0
6	1	244.16	94.31	3.29	1137.5	0.0	0.0	1005.8	542.8
7	4	246.40	95.25	1.19	438.7	0.0	0.0	436.0	94.8
8	2	247.06	95.53	0.13	50.4	0.0	0.0	45.6	21.7
9	2	249.39	96.63	4.52	1728.8	0.0	0.0	1560.8	743.3
10	2	253.85	98.88	4.41	1679.3	0.0	0.0	1517.7	722.8
11	2	258.20	101.33	4.30	1488.5	0.0	0.0	1349.5	642.7
12	2	262.44	103.98	4.18	1168.4	0.0	0.0	1065.0	507.2
13	2	266.55	106.83	4.05	733.5	0.0	0.0	673.5	320.8
14	2	270.24	109.62	3.32	206.0	0.0	0.0	191.0	90.9

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-11276.37	11276.37	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-4500.07	9104.65	10156.05	116.30
Shear Force, lb :	4432.89	2171.73	4936.29	26.10

Surface No. : 10
Factor of Safety : 1.071
Circle Center X : 243.95 ft
Circle Center Y : 138.22 ft
Circle Radius : 38.69 ft

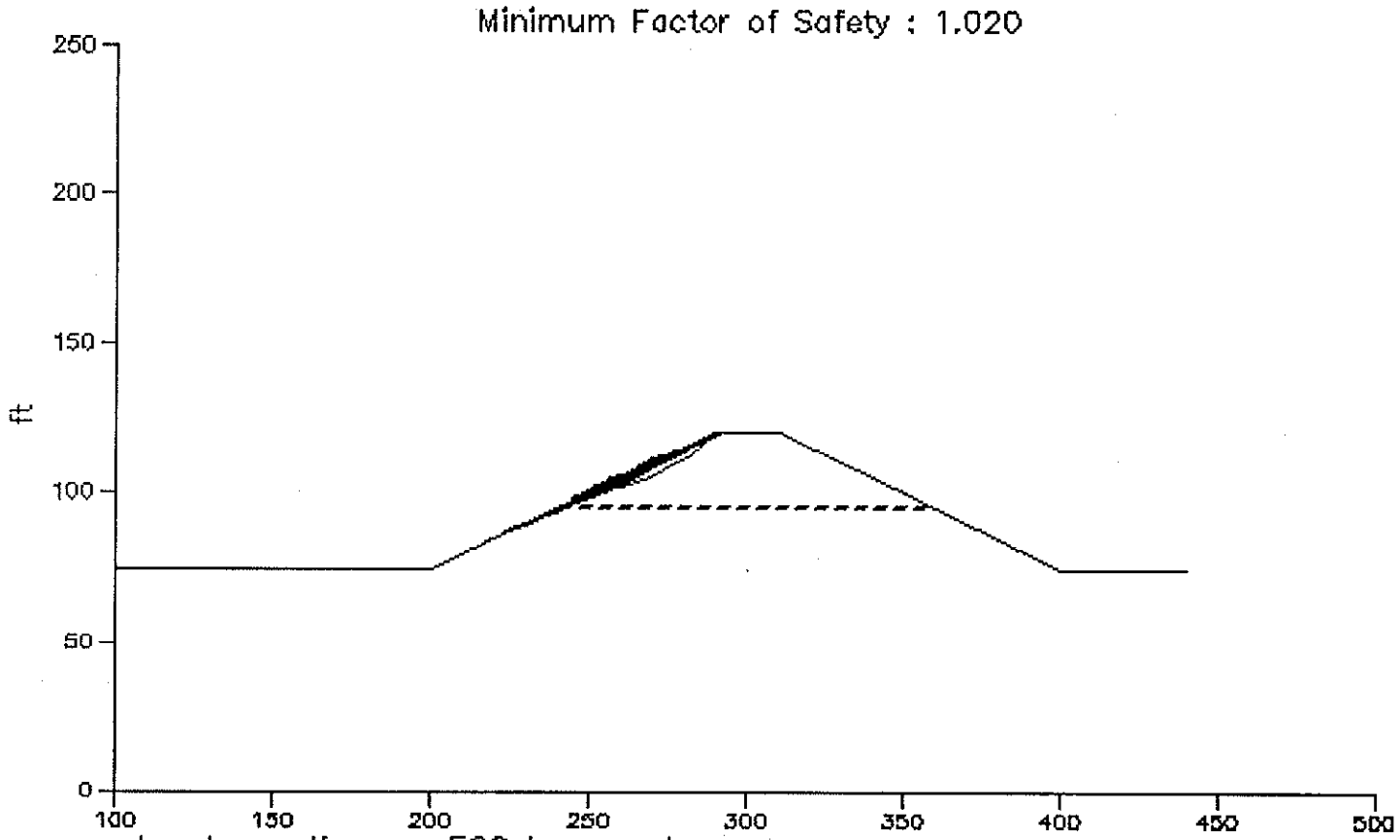
	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	252.44	100.55	4.88	408.3	0.0	0.0	378.0	179.9
2	2	257.23	101.96	4.70	970.5	0.0	0.0	880.2	418.8
3	2	261.79	103.97	4.43	1064.9	0.0	0.0	962.2	457.9
4	2	266.06	106.56	4.10	752.3	0.0	0.0	688.7	327.7
5	2	269.40	109.17	2.58	171.3	0.0	0.0	161.7	76.9

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-3367.33	3367.33	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-1333.56	2732.77	3040.79	116.01
Shear Force, lb :	1300.35	634.55	1446.92	26.01

Title : Full Slope
Description : Run F2

Bishop Circular Surfaces – Most Critical Surfaces



Press any key to continue or ESC to cancel ...

10

```
*****************************************************************************
*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   *****
  ***                (c)1995 by GEOCOMP Corp, Concord, MA                *****
*****           licensed to FHWA for distribution by FHWA only          *****
*****************************************************************************


         File : C:\RSS\f2.dat
         Date : Tue 10-10-:0, 16:20:16
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run F2
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 11
        Number of Top Boundaries : 9


Soil Parameters

        Number of Soil Types : 4


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
                   Right Termination Point : 330.00 ft
                         Minimum Elevation : 0.00 ft
                            Segment Length : 5.00 ft
                      Positive Angle Limit : 45.00 deg
                      Negative Angle Limit : 0.00 deg
```

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.020
Circle Center X : -1917.33 ft
Circle Center Y : 4462.19 ft
Circle Radius : 4870.95 ft

```
*****************************************************************************
*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   *****
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*****************************************************************************
```

File : C:\RSS\f2.dat
Date : Tue 10-10-:0, 16:23:00
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run F2
Remarks :

```
*****************************************************************************
*****                            INPUT DATA                             *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 11
Number of Top Boundaries : 9

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	75.00	200.00	75.00	1
2	200.00	75.00	240.00	95.00	1
3	240.00	95.00	241.00	95.50	4
4	241.00	95.50	290.00	120.00	2
5	290.00	120.00	310.00	120.00	2
6	310.00	120.00	359.00	95.50	2
7	359.00	95.50	360.00	95.00	4
8	360.00	95.00	400.00	75.00	1
9	400.00	75.00	440.00	75.00	1
10	241.00	95.50	359.00	95.50	4
11	240.00	95.00	360.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	35.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

```
*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       ****
*****************************************************************************
```

Data for Generating Circular Surfaces

Number of Initiation Points :	10
Number of Surfaces From Each Point :	10
Left Initiation Point :	201.00 ft
Right Initiation Point :	250.00 ft
Left Termination Point :	270.00 ft
Right Termination Point :	330.00 ft
Minimum Elevation :	0.00 ft
Segment Length :	5.00 ft
Positive Angle Limit :	45.00 deg
Negative Angle Limit :	0.00 deg

```
*****************************************************************************
*****                          RESULTS                                  *****
*****************************************************************************
```

Surface No. : 1
Factor of Safety : 1.020
Circle Center X : -1917.33 ft
Circle Center Y : 4462.19 ft
Circle Radius : 4870.95 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	246.80	98.39	4.48	5.1	0.0	0.0	4.6	2.3
2	2	251.27	100.61	4.48	13.7	0.0	0.0	12.3	6.1
3	2	255.75	102.84	4.47	19.1	0.0	0.0	17.1	8.5
4	2	260.22	105.07	4.47	21.3	0.0	0.0	19.0	9.5
5	2	264.69	107.31	4.47	20.2	0.0	0.0	18.1	9.0
6	2	269.16	109.55	4.47	16.0	0.0	0.0	14.3	7.1
7	2	273.63	111.80	4.47	8.5	0.0	0.0	7.6	3.8
8	2	276.59	113.29	1.46	0.7	0.0	0.0	0.6	0.3

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-104.51	104.51	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-41.81	83.61	93.48	116.56
Shear Force, lb :	41.79	20.89	46.72	26.56

Surface No. : 2
Factor of Safety : 1.034
Circle Center X : 213.67 ft
Circle Center Y : 192.29 ft
Circle Radius : 100.99 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	239.56	94.68	0.89	10.5	0.0	0.0	9.2	6.2
2	1	240.33	94.91	0.66	21.4	0.0	0.0	18.7	12.6
3	4	240.83	95.05	0.34	15.6	0.0	0.0	15.2	3.4
4	4	241.70	95.30	1.40	96.8	0.0	0.0	94.6	21.3
5	2	243.16	95.72	1.51	163.3	0.0	0.0	148.9	73.3
6	2	246.28	96.74	4.73	827.7	0.0	0.0	748.7	368.9
7	2	250.97	98.47	4.65	1168.9	0.0	0.0	1051.8	518.2
8	2	255.57	100.43	4.55	1336.4	0.0	0.0	1199.3	590.9
9	2	260.06	102.62	4.44	1338.4	0.0	0.0	1200.8	591.7
10	2	264.45	105.03	4.32	1186.1	0.0	0.0	1066.5	525.5
11	2	268.70	107.65	4.19	892.8	0.0	0.0	806.5	397.4
12	2	272.82	110.48	4.05	474.7	0.0	0.0	431.9	212.8
13	2	275.66	112.59	1.61	48.9	0.0	0.0	44.9	22.1

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-7581.35	7581.35	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-3016.20	6101.90	6806.66	116.30
Shear Force, lb :	2983.20	1479.44	3329.90	26.38

Surface No. : 3
Factor of Safety : 1.068
Circle Center X : 235.32 ft
Circle Center Y : 153.60 ft
Circle Radius : 57.07 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	247.00	97.79	4.89	435.1	0.0	0.0	404.1	192.9
2	2	251.84	99.03	4.79	1133.1	0.0	0.0	1034.4	493.7
3	2	256.56	100.68	4.64	1505.3	0.0	0.0	1361.2	649.7
4	2	261.10	102.74	4.46	1565.5	0.0	0.0	1413.2	674.5
5	2	265.46	105.20	4.24	1343.5	0.0	0.0	1220.1	582.3
6	2	269.58	108.02	4.00	883.8	0.0	0.0	813.7	388.4
7	2	273.16	110.95	3.17	251.2	0.0	0.0	236.4	112.8

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-7117.48	7117.48	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-2820.52	5771.30	6423.64	116.05
Shear Force, lb :	2754.54	1346.18	3065.89	26.05

Surface No. : 4
Factor of Safety : 1.071
Circle Center X : 243.95 ft
Circle Center Y : 138.22 ft
Circle Radius : 38.69 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	252.44	100.55	4.88	408.3	0.0	0.0	378.0	179.9
2	2	257.23	101.96	4.70	970.5	0.0	0.0	880.2	418.8
3	2	261.79	103.97	4.43	1064.9	0.0	0.0	962.2	457.9
4	2	266.06	106.56	4.10	752.3	0.0	0.0	688.7	327.7
5	2	269.40	109.17	2.58	171.3	0.0	0.0	161.7	76.9

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-3367.33	3367.33	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-1333.56	2732.77	3040.79	116.01
Shear Force, lb :	1300.35	634.55	1446.92	26.01

Surface No. : 5
Factor of Safety : 1.075
Circle Center X : -84.43 ft
Circle Center Y : 871.54 ft
Circle Radius : 840.90 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	252.29	101.00	4.58	82.7	0.0	0.0	74.7	35.4
2	2	256.87	103.02	4.57	237.9	0.0	0.0	215.0	101.9
3	2	261.43	105.06	4.56	373.3	0.0	0.0	337.4	160.0
4	2	265.98	107.13	4.55	489.1	0.0	0.0	442.0	209.0
5	2	270.52	109.23	4.53	585.5	0.0	0.0	529.1	250.8
6	2	275.05	111.35	4.52	662.5	0.0	0.0	598.7	283.8
7	2	279.56	113.50	4.51	720.4	0.0	0.0	650.9	308.0
8	2	284.06	115.68	4.49	759.2	0.0	0.0	686.0	325.3
9	2	288.15	117.69	3.69	640.8	0.0	0.0	579.1	274.0
10	2	290.39	118.80	0.79	118.7	0.0	0.0	107.3	50.9
11	2	291.79	119.50	2.01	126.3	0.0	0.0	114.1	54.1

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-4796.38	4796.38	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-1857.46	3915.75	4333.97	115.38
Shear Force, lb :	1856.46	880.62	2054.73	25.38

Surface No. : 6
Factor of Safety : 1.085
Circle Center X : 11.29 ft
Circle Center Y : 610.22 ft
Circle Radius : 564.91 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	225.09	87.34	4.63	122.0	0.0	0.0	104.3	67.3
2	1	229.71	89.25	4.61	350.4	0.0	0.0	299.0	193.0
3	1	234.31	91.20	4.59	548.7	0.0	0.0	467.5	301.8
4	1	238.31	92.93	3.39	516.1	0.0	0.0	439.1	283.5
5	1	240.50	93.90	1.00	168.7	0.0	0.0	143.5	92.6
6	1	241.09	94.16	0.19	32.4	0.0	0.0	27.5	17.8
7	1	242.07	94.60	1.77	316.9	0.0	0.0	269.2	173.8
8	4	243.51	95.25	1.11	208.6	0.0	0.0	208.6	44.8
9	2	244.90	95.88	1.68	330.6	0.0	0.0	299.3	140.6
10	2	248.02	97.31	4.54	965.8	0.0	0.0	874.2	410.7
11	2	252.55	99.42	4.52	1046.6	0.0	0.0	947.3	445.0
12	2	257.06	101.58	4.50	1098.7	0.0	0.0	994.5	467.2
13	2	261.55	103.77	4.48	1122.5	0.0	0.0	1016.2	477.4
14	2	266.02	106.01	4.46	1118.4	0.0	0.0	1012.7	475.7
15	2	270.47	108.28	4.44	1086.7	0.0	0.0	984.3	462.4
16	2	274.91	110.59	4.42	1027.9	0.0	0.0	931.3	437.5
17	2	279.32	112.95	4.40	942.2	0.0	0.0	854.1	401.2
18	2	283.71	115.34	4.38	830.2	0.0	0.0	752.9	353.7
19	2	287.95	117.70	4.10	655.2	0.0	0.0	594.6	279.3
20	2	290.13	118.92	0.26	34.9	0.0	0.0	31.7	14.9
21	2	291.14	119.50	1.75	110.2	0.0	0.0	100.1	0

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-12633.48	12633.48	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-5026.43	10171.79	11345.94	116.30
Shear Force, lb :	5011.98	2461.69	5583.90	26.16

Surface No. : 7
Factor of Safety : 1.086
Circle Center X : -911.42 ft
Circle Center Y : 2426.47 ft
Circle Radius : 2600.46 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shea (lb
1	1	225.03	87.48	4.50	17.9	0.0	0.0	15.1	9.
2	1	229.52	89.67	4.49	50.5	0.0	0.0	42.8	27.
3	1	234.01	91.87	4.49	77.1	0.0	0.0	65.2	42.
4	1	238.13	93.89	3.74	80.2	0.0	0.0	67.9	43.
5	1	240.19	94.91	0.37	8.7	0.0	0.0	7.4	4.
6	4	240.56	95.09	0.37	8.6	0.0	0.0	8.7	1.
7	4	240.87	95.25	0.26	6.1	0.0	0.0	6.2	1.
8	4	241.19	95.40	0.39	9.2	0.0	0.0	9.3	2.
9	2	243.30	96.45	3.84	96.6	0.0	0.0	87.5	41.
10	2	247.46	98.51	4.48	120.4	0.0	0.0	109.0	51.
11	2	251.93	100.75	4.47	122.7	0.0	0.0	111.1	52.
12	2	256.40	102.99	4.47	119.1	0.0	0.0	107.8	50.
13	2	260.87	105.24	4.46	109.4	0.0	0.0	99.1	46.
14	2	265.33	107.50	4.46	93.8	0.0	0.0	85.0	39.
15	2	269.79	109.76	4.45	72.2	0.0	0.0	65.4	30.
16	2	274.24	112.04	4.45	44.7	0.0	0.0	40.5	19.
17	2	278.27	114.11	3.61	12.0	0.0	0.0	10.8	5.

sultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-1049.29	1049.29	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-419.94	839.70	938.86	116.57
Shear Force, lb :	419.62	209.59	469.05	26.54

Surface No. : 8
Factor of Safety : 1.089
Circle Center X : 242.96 ft
Circle Center Y : 165.99 ft
Circle Radius : 66.37 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	252.47	100.36	4.95	543.4	0.0	0.0	514.2	240.7
2	2	257.39	101.26	4.88	1484.4	0.0	0.0	1377.1	644.6
3	2	262.22	102.53	4.78	2140.9	0.0	0.0	1959.1	916.9
4	2	266.94	104.16	4.66	2512.2	0.0	0.0	2280.6	1067.4
5	2	271.53	106.14	4.51	2608.0	0.0	0.0	2362.2	1105.6
6	2	275.96	108.46	4.34	2448.2	0.0	0.0	2225.0	1041.4
7	2	280.19	111.11	4.14	2062.3	0.0	0.0	1891.5	885.3
8	2	284.22	114.07	3.91	1488.4	0.0	0.0	1385.7	648.6
9	2	288.01	117.32	3.67	772.6	0.0	0.0	734.5	343.8
10	2	289.92	119.10	0.15	16.5	0.0	0.0	16.1	7.5
11	2	290.38	119.59	0.76	38.6	0.0	0.0	37.7	17.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-16115.40	16115.40	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-6353.53	13141.71	14596.98	115.80
Shear Force, lb :	6150.83	2973.70	6831.95	25.80

Surface No. : 9
Factor of Safety : 1.089
Circle Center X : -538.78 ft
Circle Center Y : 1729.99 ft
Circle Radius : 1811.66 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shea (lb
1	1	219.60	84.71	4.54	50.3	0.0	0.0	42.7	27.
2	1	224.14	86.81	4.54	146.4	0.0	0.0	124.3	79.
3	1	228.67	88.92	4.53	233.5	0.0	0.0	198.2	127.
4	1	233.20	91.05	4.52	311.7	0.0	0.0	264.4	170.
5	1	237.72	93.19	4.52	380.9	0.0	0.0	323.1	207.
6	1	239.99	94.26	0.02	1.9	0.0	0.0	1.6	1.
7	1	240.50	94.51	1.00	93.0	0.0	0.0	78.8	50.
8	1	241.27	94.87	0.53	50.8	0.0	0.0	43.1	27.
9	4	242.06	95.25	1.05	101.8	0.0	0.0	102.4	21.
10	2	243.54	95.96	1.91	193.7	0.0	0.0	175.5	82.
11	2	246.74	97.50	4.51	492.8	0.0	0.0	446.4	208.
12	2	251.25	99.67	4.50	535.5	0.0	0.0	485.1	227.
13	2	255.74	101.86	4.49	569.4	0.0	0.0	515.8	241.
14	2	260.23	104.06	4.49	594.6	0.0	0.0	538.6	252.
15	2	264.72	106.27	4.48	611.0	0.0	0.0	553.5	259.
16	2	269.20	108.49	4.48	618.8	0.0	0.0	560.6	262.
17	2	273.67	110.73	4.47	617.9	0.0	0.0	559.8	262.
18	2	278.13	112.98	4.46	608.4	0.0	0.0	551.3	258.
19	2	282.59	115.24	4.46	590.3	0.0	0.0	534.9	250.
20	2	287.05	117.51	4.45	563.7	0.0	0.0	510.9	239.
21	2	289.64	118.84	0.73	89.2	0.0	0.0	80.9	37.
22	2	290.95	119.51	1.89	115.2	0.0	0.0	104.4	48.

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-7570.89	7570.89	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-3002.81	6096.72	6796.09	116.22
Shear Force, lb :	2999.80	1474.16	3342.45	26.17

Surface No. : 10
Factor of Safety : 1.094
Circle Center X : 246.32 ft
Circle Center Y : 140.14 ft
Circle Radius : 40.31 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	2	252.47	100.38	4.94	527.0	0.0	0.0	497.4	231.7
2	2	257.35	101.45	4.81	1336.5	0.0	0.0	1226.9	571.4
3	2	262.05	103.11	4.60	1676.1	0.0	0.0	1520.3	708.0
4	2	266.51	105.34	4.32	1574.7	0.0	0.0	1433.3	667.5
5	2	270.67	108.11	3.98	1105.5	0.0	0.0	1025.5	477.6
6	2	274.44	111.37	3.57	380.0	0.0	0.0	365.2	170.1

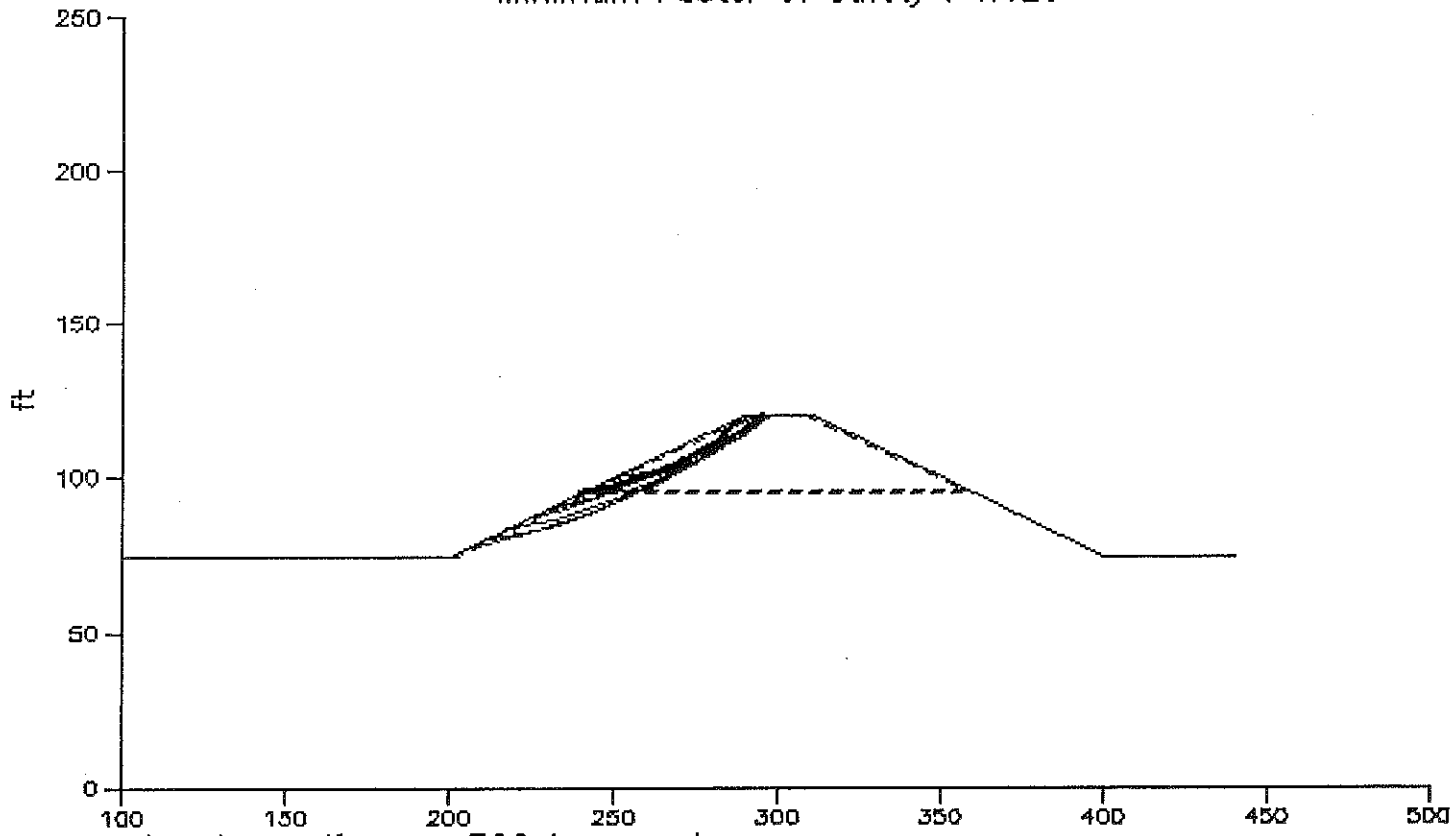
Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-6599.81	6599.81	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-2601.87	5388.02	5983.35	115.78
Shear Force, lb :	2509.41	1211.79	2786.67	25.78

Title : Full Slope
Description : Run F3

Bishop Circular Surfaces – Most Critical Surfaces

Minimum Factor of Safety : 1.125



Press any key to continue or ESC to cancel ...

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*****************************************************************************
*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   ****
*****              (c)1995 by GEOCOMP Corp, Concord, MA                 ***
*****          licensed to FHWA for distribution by FHWA only           *****
*****************************************************************************


         File : C:\RSS\f3.dat
         Date : Tue 10-10-:0, 16:31:46
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run F3
      Remarks :


*****************************************************************************
*****                            INPUT DATA                             *****
*****************************************************************************


Profile Boundaries

           Number of Boundaries : 15
       Number of Top Boundaries : 9


Soil Parameters

       Number of Soil Types : 5


*****************************************************************************
*****                      TRIAL SURFACE GENERATION                     *****
*****************************************************************************


Data for Generating Circular Surfaces

              Number of Initiation Points : 10
       Number of Surfaces From Each Point : 10
                    Left Initiation Point : 201.00 ft
                   Right Initiation Point : 250.00 ft
                   Left Termination Point : 270.00 ft
                  Right Termination Point : 330.00 ft
                        Minimum Elevation : 0.00 ft
                           Segment Length : 5.00 ft
                     Positive Angle Limit : 45.00 deg
                     Negative Angle Limit : 0.00 deg
```

```
*****************************************************************************
*****                          RESULTS                                  *****
  *****************************************************************************
```

Critical Surface

Factor of Safety : 1.125
Circle Center X : 213.53 ft
Circle Center Y : 228.61 ft
Circle Radius : 136.47 ft

```
*****************************************************************************
*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   ***
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*****************************************************************************
```

File : C:\RSS\f3.dat
Date : Tue 10-10-:0, 16:35:26
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run F3
Remarks :

```
*****************************************************************************
*****                            INPUT DATA                             *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 15
Number of Top Boundaries : 9

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	75.00	200.00	75.00	1
2	200.00	75.00	240.00	95.00	3
3	240.00	95.00	241.00	95.50	4
4	241.00	95.50	290.00	120.00	5
5	290.00	120.00	310.00	120.00	2
6	310.00	120.00	359.00	95.50	5
7	359.00	95.50	360.00	95.00	4
8	360.00	95.00	400.00	75.00	3
9	400.00	75.00	440.00	75.00	1
10	243.00	95.50	292.00	120.00	2
11	308.00	120.00	357.00	95.50	2
12	241.00	95.50	359.00	95.50	4
13	240.00	95.00	360.00	95.00	1
14	202.00	75.00	242.00	95.00	1
15	200.00	75.00	202.00	75.00	1

Soil Parameters

Number of Soil Types : 5

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0

2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	30.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0
5	125.0	135.0	200.0	27.0	0.00	0.0	0

```
*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       *****
*****************************************************************************
```

Data for Generating Circular Surfaces

```
              Number of Initiation Points : 10
       Number of Surfaces From Each Point : 10
                    Left Initiation Point : 201.00 ft
                   Right Initiation Point : 250.00 ft
                   Left Termination Point : 270.00 ft
                  Right Termination Point : 330.00 ft
                        Minimum Elevation : 0.00 ft
                           Segment Length : 5.00 ft
                     Positive Angle Limit : 45.00 deg
                     Negative Angle Limit : 0.00 deg
```

```
*****************************************************************************
***                              RESULTS                                  *****
*****************************************************************************
```

Surface No. : 1
Factor of Safety : 1.125
Circle Center X : 213.53 ft
Circle Center Y : 228.61 ft
Circle Radius : 136.47 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	239.56	94.65	0.89	14.3	0.0	0.0	-17.4	152.5
2	1	240.50	94.85	1.00	50.4	0.0	0.0	46.5	23.8
3	1	241.11	94.98	0.23	16.6	0.0	0.0	15.3	7.9
4	4	242.11	95.19	1.77	192.9	0.0	0.0	188.9	39.1
5	4	243.31	95.44	0.61	93.1	0.0	0.0	91.1	18.8
6	2	243.81	95.54	0.39	66.9	0.0	0.0	62.5	28.3
7	2	246.43	96.19	4.85	1231.5	0.0	0.0	1140.6	516.5
8	2	251.26	97.48	4.81	1892.4	0.0	0.0	1742.2	788.9
9	2	256.04	98.95	4.75	2417.1	0.0	0.0	2214.9	1002.9
10	2	260.76	100.59	4.69	2806.6	0.0	0.0	2563.3	1160.7
11	2	265.42	102.41	4.62	3063.4	0.0	0.0	2792.3	1264.4
12	2	270.00	104.39	4.55	3190.9	0.0	0.0	2906.8	1316.2
13	2	274.52	106.55	4.47	3193.8	0.0	0.0	2911.6	1318.4
14	2	278.95	108.86	4.39	3078.1	0.0	0.0	2811.8	1273.2
15	2	283.29	111.34	4.30	2850.4	0.0	0.0	2612.8	1183.1
16	2	287.54	113.97	4.20	2518.9	0.0	0.0	2320.0	1050.5
17	2	289.82	115.45	0.36	200.9	0.0	0.0	186.2	84.3
18	2	291.00	116.28	2.00	930.2	0.0	0.0	862.1	390.3
19	2	292.87	117.59	1.74	524.6	0.0	0.0	486.2	220.1
20	2	294.94	119.10	2.40	270.6	0.0	0.0	252.7	11[illegible] 4

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-28603.59	28603.59	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-10952.33	23624.69	26039.96	114.87
Shear Force, lb :	10790.72	4978.90	11883.99	24.77

Surface No. : 2
Factor of Safety : 1.145
Circle Center X : 225.91 ft
Circle Center Y : 202.95 ft
Circle Radius : 109.19 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	239.56	94.62	0.89	17.5	0.0	0.0	-4.7	154.
2	1	240.50	94.76	1.00	61.6	0.0	0.0	58.0	29.
3	1	241.46	94.90	0.93	96.9	0.0	0.0	91.3	46.
4	1	241.96	94.97	0.07	9.1	0.0	0.0	8.5	4.
5	1	242.09	94.99	0.18	23.1	0.0	0.0	21.8	11.
6	4	242.59	95.06	0.82	127.2	0.0	0.0	124.9	25.
7	4	243.53	95.20	1.06	207.7	0.0	0.0	203.8	41.
8	4	244.65	95.39	1.18	285.8	0.0	0.0	280.1	56.
9	2	247.10	95.86	3.73	1256.1	0.0	0.0	1178.3	524.
10	2	251.40	96.80	4.86	2370.0	0.0	0.0	2201.9	980.
11	2	256.23	98.08	4.80	3024.9	0.0	0.0	2789.7	1241.
12	2	261.00	99.58	4.73	3506.4	0.0	0.0	3216.8	1432.
13	2	265.70	101.29	4.66	3816.7	0.0	0.0	3490.4	1553.
14	2	270.31	103.22	4.57	3960.2	0.0	0.0	3617.9	1610.
15	2	274.83	105.36	4.47	3943.8	0.0	0.0	3606.7	1605.
16	2	279.24	107.70	4.36	3776.5	0.0	0.0	3464.5	1542.
17	2	283.55	110.24	4.25	3469.2	0.0	0.0	3199.5	1424.
18	2	287.73	112.97	4.12	3035.2	0.0	0.0	2820.0	1255.
19	2	289.90	114.47	0.21	141.6	0.0	0.0	132.8	59.
20	2	291.00	115.30	2.00	1174.2	0.0	0.0	1101.5	490.
21	2	292.89	116.73	1.78	726.9	0.0	0.0	681.9	303.
22	2	295.34	118.70	3.12	505.4	0.0	0.0	479.7	213.

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-35536.04	35536.04	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-13471.47	29538.83	32465.72	114.52
Shear Force, lb :	13170.82	5997.21	14471.93	24.48

Surface No. : 3
Factor of Safety : 1.149
Circle Center X : 192.68 ft
Circle Center Y : 241.16 ft
Circle Radius : 156.15 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	230.23	89.61	4.01	250.7	0.0	0.0	69.2	754.8
2	1	232.65	90.22	0.84	115.7	0.0	0.0	106.0	53.3
3	1	235.48	91.01	4.81	1037.3	0.0	0.0	943.4	474.1
4	1	238.94	92.04	2.12	644.7	0.0	0.0	583.1	293.0
5	1	240.50	92.54	1.00	339.3	0.0	0.0	306.9	154.2
6	1	241.50	92.86	1.00	361.8	0.0	0.0	327.2	164.4
7	1	242.32	93.12	0.64	244.4	0.0	0.0	221.0	111.1
8	1	242.82	93.29	0.36	139.6	0.0	0.0	125.7	63.2
9	1	245.18	94.12	4.35	1885.9	0.0	0.0	1698.1	853.4
10	1	247.48	94.95	0.26	124.3	0.0	0.0	111.6	56.1
11	4	248.25	95.25	1.27	617.8	0.0	0.0	614.8	124.5
12	2	250.45	96.11	3.12	1603.1	0.0	0.0	1466.8	650.6
13	2	254.31	97.71	4.59	2551.5	0.0	0.0	2332.5	1034.6
14	2	258.87	99.76	4.53	2647.5	0.0	0.0	2420.6	1073.6
15	2	263.36	101.95	4.46	2637.1	0.0	0.0	2414.0	1070.7
16	2	267.78	104.28	4.38	2525.0	0.0	0.0	2316.4	1027.4
17	2	272.12	106.76	4.30	2316.4	0.0	0.0	2131.9	945.6
18	2	276.39	109.37	4.22	2017.5	0.0	0.0	1864.7	827.1
19	2	280.56	112.12	4.13	1634.8	0.0	0.0	1519.1	673.8
20	2	284.65	115.00	4.04	1175.7	0.0	0.0	1099.5	487.7
21	2	288.22	117.68	3.10	555.0	0.0	0.0	522.9	2[illegible]
22	5	289.88	118.97	0.23	27.9	0.0	0.0	-3.2	4[illegible].5
23	2	290.31	119.30	0.61	53.5	0.0	0.0	50.4	22.3
24	2	290.89	119.77	0.55	15.7	0.0	0.0	14.9	6.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-25522.03	25522.03	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-10252.81	20740.12	23135.96	116.31
Shear Force, lb :	10051.61	4781.91	11131.10	25.44

Surface No. : 4
Factor of Safety : 1.157
Circle Center X : 164.88 ft
Circle Center Y : 297.04 ft
Circle Radius : 218.47 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shea (lb
1	3	225.13	87.06	4.70	293.7	0.0	0.0	54.9	872.
2	1	227.53	87.75	0.11	13.4	0.0	0.0	12.2	6.
3	1	229.97	88.51	4.77	877.5	0.0	0.0	795.3	397.
4	1	234.73	90.06	4.74	1364.5	0.0	0.0	1232.5	615.
5	1	238.55	91.39	2.91	1049.1	0.0	0.0	944.9	471.
6	1	240.50	92.09	1.00	394.4	0.0	0.0	355.2	177.
7	1	241.40	92.42	0.79	325.2	0.0	0.0	292.8	146.
8	1	241.90	92.60	0.21	86.3	0.0	0.0	77.5	38.
9	1	242.50	92.84	1.00	426.3	0.0	0.0	383.0	191.
10	1	244.73	93.71	3.45	1578.4	0.0	0.0	1418.2	708.
11	1	247.20	94.69	1.49	730.8	0.0	0.0	655.4	327.
12	4	248.55	95.25	1.20	604.8	0.0	0.0	604.4	121.
13	2	250.11	95.90	1.92	997.2	0.0	0.0	912.7	402.
14	2	253.36	97.31	4.57	2495.4	0.0	0.0	2283.6	1006.
15	2	257.90	99.39	4.52	2580.6	0.0	0.0	2362.4	1040.
16	2	262.40	101.57	4.47	2590.6	0.0	0.0	2373.5	1045.
17	2	266.85	103.85	4.42	2527.7	0.0	0.0	2319.0	1021.
18	2	271.24	106.24	4.37	2394.4	0.0	0.0	2200.8	969.
19	2	275.58	108.72	4.31	2193.6	0.0	0.0	2021.1	890.
20	2	279.86	111.30	4.25	1928.4	0.0	0.0	1782.0	785.
21	2	284.08	113.98	4.19	1602.1	0.0	0.0	1485.6	654.
22	2	288.09	116.65	3.82	1141.3	0.0	0.0	1062.6	468.
23	2	290.15	118.07	0.31	74.0	0.0	0.0	68.9	30.
24	2	291.15	118.78	1.69	258.3	0.0	0.0	241.6	106.
25	2	292.43	119.69	0.85	32.5	0.0	0.0	30.4	13.

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-28560.66	28560.66	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-11424.47	23224.93	25882.74	116.19
Shear Force, lb :	11253.83	5335.73	12454.67	25.37

Surface No. : 5
Factor of Safety : 1.157
Circle Center X : 240.77 ft
Circle Center Y : 152.71 ft
Circle Radius : 58.18 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	239.56	94.56	0.89	24.0	0.0	0.0	21.6	164.4
2	1	240.50	94.58	1.00	84.3	0.0	0.0	83.7	41.8
3	1	241.09	94.58	0.17	20.5	0.0	0.0	20.3	10.1
4	1	241.59	94.59	0.83	124.5	0.0	0.0	123.6	61.7
5	1	242.50	94.60	1.00	205.7	0.0	0.0	204.2	101.9
6	1	243.56	94.62	1.11	299.5	0.0	0.0	297.4	148.4
7	1	245.96	94.81	3.69	1459.8	0.0	0.0	1397.0	696.9
8	4	248.44	95.06	1.28	667.1	0.0	0.0	657.2	132.1
9	4	250.07	95.31	1.97	1159.2	0.0	0.0	1136.5	228.5
10	2	252.52	95.78	2.95	2021.2	0.0	0.0	1899.1	836.1
11	2	256.41	96.73	4.82	3897.5	0.0	0.0	3603.6	1586.4
12	2	261.16	98.28	4.68	4272.6	0.0	0.0	3916.6	1724.3
13	2	265.75	100.23	4.51	4315.8	0.0	0.0	3951.7	1739.7
14	2	270.17	102.57	4.31	4052.3	0.0	0.0	3733.7	1643.7
15	2	274.36	105.28	4.08	3521.7	0.0	0.0	3289.8	1448.3
16	2	278.31	108.34	3.82	2776.8	0.0	0.0	2650.1	1166.7
17	2	281.99	111.72	3.53	1881.0	0.0	0.0	1849.0	814.0
18	2	285.35	115.41	3.21	906.9	0.0	0.0	926.1	407.7
19	2	287.03	117.44	0.16	21.1	0.0	0.0	22.6	9.9
20	5	287.65	118.33	1.08	67.3	0.0	0.0	-212.5	230.9

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-31778.60	31778.60	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-12188.15	26202.08	28898.10	114.95
Shear Force, lb :	11576.89	5576.52	12849.98	25.72

Surface No. : 6
Factor of Safety : 1.182
Circle Center X : 169.20 ft
Circle Center Y : 278.18 ft
Circle Radius : 203.39 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	208.11	78.55	3.32	207.7	0.0	0.0	89.0	616.[illegible]
2	1	210.56	79.04	1.58	244.7	0.0	0.0	227.4	111.[illegible]
3	1	213.79	79.75	4.88	1309.5	0.0	0.0	1209.4	590.[illegible]
4	1	218.65	80.90	4.85	2075.5	0.0	0.0	1906.3	931.[illegible]
5	1	223.49	82.18	4.82	2749.9	0.0	0.0	2513.5	1227.[illegible]
6	1	228.29	83.57	4.78	3332.7	0.0	0.0	3033.1	1481.[illegible]
7	1	233.05	85.08	4.75	3824.0	0.0	0.0	3467.6	1693.[illegible]
8	1	237.71	86.69	4.57	4099.1	0.0	0.0	3705.8	1809.[illegible]
9	1	240.07	87.53	0.13	125.5	0.0	0.0	113.5	55.[illegible]
10	1	240.57	87.72	0.87	818.9	0.0	0.0	738.5	360.[illegible]
11	1	241.50	88.08	1.00	958.6	0.0	0.0	864.6	422.[illegible]
12	1	242.50	88.47	1.00	972.9	0.0	0.0	877.4	428.[illegible]
13	1	243.90	89.01	1.80	1785.1	0.0	0.0	1610.0	786.[illegible]
14	1	247.11	90.31	4.62	4758.1	0.0	0.0	4283.4	2092.[illegible]
15	1	251.70	92.28	4.57	4894.0	0.0	0.0	4400.5	2149.[illegible]
16	1	255.78	94.15	3.59	3927.4	0.0	0.0	3529.3	1723.[illegible]
17	4	258.04	95.22	0.93	1017.9	0.0	0.0	1030.3	202.[illegible]
18	4	258.57	95.47	0.12	135.3	0.0	0.0	137.8	27.[illegible]
19	2	260.80	96.59	4.34	4779.3	0.0	0.0	4396.9	1895.[illegible]
20	2	265.17	98.87	4.41	4804.5	0.0	0.0	4427.8	1908.[illegible]
21	2	269.55	101.28	4.35	4618.0	0.0	0.0	4266.2	1838.[illegible]
22	2	273.87	103.80	4.29	4358.6	0.0	0.0	4038.6	1740.[illegible]
23	2	278.13	106.43	4.22	4030.0	0.0	0.0	3747.6	1615.[illegible]
24	2	282.31	109.16	4.16	3636.1	0.0	0.0	3395.7	1463.[illegible]
25	2	286.44	111.99	4.09	3181.3	0.0	0.0	2985.4	1286.[illegible]
26	2	289.24	113.99	1.52	1070.0	0.0	0.0	1009.6	435.[illegible]
27	2	291.00	115.30	2.00	1174.2	0.0	0.0	1108.0	477.[illegible]
28	2	292.25	116.23	0.49	231.8	0.0	0.0	218.7	94.[illegible]
29	2	294.46	117.95	3.94	1008.8	0.0	0.0	957.8	412.[illegible]
30	2	296.74	119.75	0.62	19.7	0.0	0.0	18.8	8.[illegible]

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-70149.00	70149.00	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-27496.19	57664.66	63884.69	115.49
Shear Force, lb :	26922.53	12484.33	29676.27	24.88

Surface No. : 7
Factor of Safety : 1.185
Circle Center X : 186.72 ft
Circle Center Y : 258.77 ft
Circle Radius : 177.76 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	218.94	83.97	3.22	201.2	0.0	0.0	91.6	597.7
2	1	221.40	84.44	1.69	267.4	0.0	0.0	249.2	121.4
3	1	224.69	85.13	4.88	1351.4	0.0	0.0	1250.2	609.2
4	1	229.56	86.27	4.85	2129.9	0.0	0.0	1957.7	954.0
5	1	234.39	87.54	4.82	2803.2	0.0	0.0	2562.2	1248.6
6	1	238.40	88.70	3.20	2197.9	0.0	0.0	1999.4	974.3
7	1	240.50	89.35	1.00	737.0	0.0	0.0	670.5	326.7
8	1	241.29	89.60	0.58	436.4	0.0	0.0	397.0	193.5
9	1	241.79	89.76	0.42	324.2	0.0	0.0	293.7	143.1
10	1	242.50	90.00	1.00	781.2	0.0	0.0	707.9	344.9
11	1	244.66	90.73	3.31	2729.5	0.0	0.0	2473.2	1205.2
12	1	248.65	92.17	4.69	4194.6	0.0	0.0	3788.7	1846.2
13	1	253.32	93.97	4.64	4452.1	0.0	0.0	4011.8	1954.9
14	1	255.73	94.96	0.20	199.9	0.0	0.0	179.8	87.6
15	4	256.41	95.25	1.14	1137.0	0.0	0.0	1142.8	224.5
16	2	258.60	96.21	3.24	3272.5	0.0	0.0	3006.3	1292.9
17	2	262.48	97.98	4.52	4669.1	0.0	0.0	4291.8	1845.7
18	2	266.97	100.17	4.46	4634.4	0.0	0.0	4265.7	1834.4
19	2	271.40	102.49	4.40	4508.8	0.0	0.0	4159.0	1788.6
20	2	275.76	104.94	4.33	4296.3	0.0	0.0	3974.7	1709.3
21	2	280.05	107.50	4.26	4001.6	0.0	0.0	3716.0	15[illegible]1
22	2	284.27	110.19	4.18	3629.7	0.0	0.0	3386.0	145[illegible].2
23	2	288.18	112.83	3.64	2850.0	0.0	0.0	2673.0	1149.5
24	2	290.23	114.26	0.46	329.4	0.0	0.0	309.0	132.9
25	2	291.23	114.99	1.54	965.1	0.0	0.0	910.8	391.7
26	2	293.24	116.48	2.48	1091.2	0.0	0.0	1029.8	442.9
27	2	296.14	118.70	3.32	540.9	0.0	0.0	514.1	221.1

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-58731.90	58731.90	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-22785.21	48570.42	53649.34	115.13
Shear Force, lb :	22307.13	10161.48	24512.52	24.49

Surface No. : 8
Factor of Safety : 1.188
Circle Center X : 163.21 ft
Circle Center Y : 328.72 ft
Circle Radius : 248.27 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	230.52	89.76	4.59	286.9	0.0	0.0	62.9	833.6
2	1	232.92	90.44	0.22	28.3	0.0	0.0	25.8	12.6
3	1	235.43	91.20	4.78	907.0	0.0	0.0	825.9	401.3
4	1	238.91	92.28	2.18	593.2	0.0	0.0	538.6	261.7
5	1	240.50	92.80	1.00	306.4	0.0	0.0	278.2	135.2
6	1	241.50	93.12	1.00	328.2	0.0	0.0	298.0	144.8
7	1	242.29	93.38	0.57	197.3	0.0	0.0	179.1	87.1
8	1	242.79	93.55	0.43	152.3	0.0	0.0	137.9	67.0
9	1	244.97	94.31	3.95	1567.0	0.0	0.0	1419.1	689.6
10	4	247.12	95.06	0.34	150.9	0.0	0.0	149.6	29.1
11	4	247.80	95.31	1.02	459.1	0.0	0.0	456.6	89.4
12	2	250.15	96.18	3.66	1783.4	0.0	0.0	1641.1	703.8
13	2	254.31	97.78	4.65	2543.3	0.0	0.0	2338.4	1002.8
14	2	258.94	99.66	4.61	2773.2	0.0	0.0	2548.9	1093.0
15	2	263.53	101.63	4.57	2933.6	0.0	0.0	2696.3	1156.1
16	2	268.08	103.70	4.53	3025.8	0.0	0.0	2782.2	1193.1
17	2	272.59	105.86	4.49	3051.4	0.0	0.0	2808.1	1204.2
18	2	277.06	108.11	4.44	3012.2	0.0	0.0	2775.4	1190.2
19	2	281.48	110.44	4.40	2910.1	0.0	0.0	2685.7	1151.8
20	2	285.85	112.87	4.35	2747.2	0.0	0.0	2540.6	1089.5
21	2	289.01	114.69	1.98	1188.3	0.0	0.0	1101.7	472.5
22	2	291.00	115.88	2.00	1031.0	0.0	0.0	955.8	409.9
23	2	292.16	116.57	0.32	138.0	0.0	0.0	127.9	54.8
24	2	294.44	117.98	4.24	1069.5	0.0	0.0	994.4	426.4
25	2	297.10	119.65	1.07	46.3	0.0	0.0	43.2	18.5

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-33230.05	33230.05	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-12775.63	27514.53	30335.89	114.91
Shear Force, lb :	12643.63	5715.52	13875.47	24.33

Surface No. : 9
Factor of Safety : 1.195
Circle Center X : 242.96 ft
Circle Center Y : 165.99 ft
Circle Radius : 66.37 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	5	251.41	100.20	2.82	176.0	0.0	0.0	102.5	520.0
2	2	253.88	100.56	2.13	367.4	0.0	0.0	349.6	149.1
3	2	257.39	101.26	4.88	1484.4	0.0	0.0	1388.8	592.1
4	2	262.22	102.53	4.78	2140.9	0.0	0.0	1981.0	844.6
5	2	266.94	104.16	4.66	2512.2	0.0	0.0	2312.2	985.8
6	2	271.53	106.14	4.51	2608.0	0.0	0.0	2401.2	1023.8
7	2	275.96	108.46	4.34	2448.2	0.0	0.0	2267.8	966.9
8	2	280.19	111.11	4.14	2062.3	0.0	0.0	1932.9	824.1
9	2	284.22	114.07	3.91	1488.4	0.0	0.0	1420.0	605.4
10	2	287.90	117.22	3.44	745.6	0.0	0.0	728.5	310.6
11	5	289.73	118.91	0.23	27.0	0.0	0.0	-8.0	48.3
12	5	289.92	119.10	0.15	16.5	0.0	0.0	-11.2	33.0
13	2	290.38	119.59	0.76	38.6	0.0	0.0	38.8	16.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-16115.40	16115.40	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-6418.96	13247.52	14720.73	115.85
Shear Force, lb :	6183.18	2867.88	6815.90	24.88

Surface No. : 10
Factor of Safety : 1.212
Circle Center X : 199.06 ft
Circle Center Y : 200.59 ft
Circle Radius : 120.33 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	213.23	81.12	2.69	168.1	0.0	0.0	105.7	497.8
2	1	215.71	81.44	2.27	403.2	0.0	0.0	383.1	182.4
3	1	219.31	82.00	4.93	1635.5	0.0	0.0	1534.4	730.1
4	1	224.22	82.95	4.89	2545.8	0.0	0.0	2362.7	1125.1
5	1	229.09	84.09	4.84	3299.2	0.0	0.0	3034.5	1445.6
6	1	233.90	85.44	4.79	3894.4	0.0	0.0	3556.3	1693.5
7	1	238.15	86.81	3.71	3364.9	0.0	0.0	3056.1	1455.1
8	1	240.50	87.63	1.00	952.4	0.0	0.0	865.0	411.9
9	1	241.01	87.81	0.02	14.6	0.0	0.0	13.2	6.1
10	1	241.51	88.01	0.98	953.9	0.0	0.0	863.2	411.1
11	1	242.50	88.40	1.00	981.5	0.0	0.0	888.2	422.9
12	1	244.33	89.12	2.66	2678.4	0.0	0.0	2423.7	1154.2
13	1	247.95	90.67	4.57	4744.2	0.0	0.0	4284.8	2040.4
14	1	252.47	92.79	4.48	4728.7	0.0	0.0	4269.9	2033.1
15	1	255.71	94.45	2.00	2102.9	0.0	0.0	1901.7	905.6
16	4	257.17	95.25	0.91	949.9	0.0	0.0	980.2	188.1
17	2	258.36	95.90	1.47	1521.9	0.0	0.0	1410.6	592.8
18	2	261.24	97.60	4.28	4291.0	0.0	0.0	3998.0	1680.1
19	2	265.46	100.27	4.17	3888.0	0.0	0.0	3647.8	1533.6
20	2	269.57	103.12	4.05	3377.6	0.0	0.0	3196.8	1343.5
21	2	273.56	106.13	3.93	2773.0	0.0	0.0	2652.5	1114.7
22	2	277.42	109.31	3.79	2088.5	0.0	0.0	2022.7	850.1
23	2	281.14	112.64	3.66	1339.6	0.0	0.0	1316.2	553.1
24	2	284.08	115.47	2.22	435.0	0.0	0.0	434.4	182.6
25	5	285.84	117.25	1.29	107.9	0.0	0.0	-108.4	258.4
26	5	286.76	118.21	0.56	11.6	0.0	0.0	-90.9	98.2

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-53251.54	53251.54	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-21111.64	43553.94	48400.90	115.86
Shear Force, lb :	20403.31	9697.60	22590.67	25.42

Title : Full Slope
Description : Run F4

Bishop Circular Surfaces – Most Critical Surfaces

Press any key to continue or ESC to cancel ...

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*****************************************************************************
*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   *****
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*****************************************************************************


         File : C:\RSS\f4.dat
         Date : Tue 10-10-:0, 16:37:17
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run F4
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 15
        Number of Top Boundaries : 9


Soil Parameters

        Number of Soil Types : 5


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
                   Right Termination Point : 330.00 ft
                         Minimum Elevation : 0.00 ft
                            Segment Length : 5.00 ft
                      Positive Angle Limit : 45.00 deg
                      Negative Angle Limit : 0.00 deg
```

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*****************************************************************************
*****                          RESULTS                                   ***
*****************************************************************************
```

Critical Surface

Factor of Safety : 1.126
Circle Center X : 213.53 ft
Circle Center Y : 228.61 ft
Circle Radius : 136.47 ft

```
*****************************************************************************
*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   *****
  ***                (c)1995 by GEOCOMP Corp, Concord, MA               *****
*****          licensed to FHWA for distribution by FHWA only           *****
*****************************************************************************
```

File : C:\RSS\f4.dat
Date : Tue 10-10-:0, 16:43:24
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run F4
Remarks :

```
*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 15
Number of Top Boundaries : 9

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	75.00	200.00	75.00	1
2	200.00	75.00	240.00	95.00	3
3	240.00	95.00	241.00	95.50	4
4	241.00	95.50	290.00	120.00	5
5	290.00	120.00	310.00	120.00	2
6	310.00	120.00	359.00	95.50	5
7	359.00	95.50	360.00	95.00	4
8	360.00	95.00	400.00	75.00	3
9	400.00	75.00	440.00	75.00	1
10	243.00	95.50	292.00	120.00	2
11	308.00	120.00	357.00	95.50	2
12	241.00	95.50	359.00	95.50	4
13	240.00	95.00	360.00	95.00	1
14	202.00	75.00	242.00	95.00	1
15	200.00	75.00	202.00	75.00	1

Soil Parameters

Number of Soil Types : 5

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	35.0	0.00	0.0	0

2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	35.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0
5	125.0	135.0	200.0	27.0	0.00	0.0	0

```
*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       *****
*****************************************************************************
```

Data for Generating Circular Surfaces

```
              Number of Initiation Points : 10
       Number of Surfaces From Each Point : 10
                    Left Initiation Point : 201.00 ft
                   Right Initiation Point : 250.00 ft
                   Left Termination Point : 270.00 ft
                  Right Termination Point : 330.00 ft
                        Minimum Elevation : 0.00 ft
                           Segment Length : 5.00 ft
                     Positive Angle Limit : 45.00 deg
                     Negative Angle Limit : 0.00 deg
```

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*****************************************************************************
*****                          RESULTS                                  ****
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```

Surface No. : 1
Factor of Safety : 1.126
Circle Center X : 213.53 ft
Circle Center Y : 228.61 ft
Circle Radius : 136.47 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	239.56	94.65	0.89	14.3	0.0	0.0	-17.0	150.8
2	1	240.50	94.85	1.00	50.4	0.0	0.0	45.5	28.3
3	1	241.11	94.98	0.23	16.6	0.0	0.0	15.0	9.4
4	4	242.11	95.19	1.77	192.9	0.0	0.0	188.9	39.1
5	4	243.31	95.44	0.61	93.1	0.0	0.0	91.1	18.8
6	2	243.81	95.54	0.39	66.9	0.0	0.0	62.5	28.1
7	2	246.43	96.19	4.85	1231.5	0.0	0.0	1140.6	516.1
8	2	251.26	97.48	4.81	1892.4	0.0	0.0	1742.3	788.6
9	2	256.04	98.95	4.75	2417.1	0.0	0.0	2215.0	1002.5
10	2	260.76	100.59	4.69	2806.6	0.0	0.0	2563.5	1160.1
11	2	265.42	102.41	4.62	3063.4	0.0	0.0	2792.5	1263.5
12	2	270.00	104.39	4.55	3190.9	0.0	0.0	2907.0	1315.7
13	2	274.52	106.55	4.47	3193.8	0.0	0.0	2911.8	1317.5
14	2	278.95	108.86	4.39	3078.1	0.0	0.0	2812.1	1272.8
15	2	283.29	111.34	4.30	2850.4	0.0	0.0	2613.1	1182.7
16	2	287.54	113.97	4.20	2518.9	0.0	0.0	2320.2	1050.1
17	2	289.82	115.45	0.36	200.9	0.0	0.0	186.2	84.
18	2	291.00	116.28	2.00	930.2	0.0	0.0	862.1	390.
19	2	292.87	117.59	1.74	524.6	0.0	0.0	486.2	220.
20	2	294.94	119.10	2.40	270.6	0.0	0.0	252.7	114.

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-28603.59	28603.59	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-10953.02	23625.58	26041.06	114.87
Shear Force, lb :	10791.03	4978.01	11883.90	24.76

Surface No. : 2
Factor of Safety : 1.146
Circle Center X : 225.91 ft
Circle Center Y : 202.95 ft
Circle Radius : 109.19 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	239.56	94.62	0.89	17.5	0.0	0.0	-4.6	153.9
2	1	240.50	94.76	1.00	61.6	0.0	0.0	57.2	34.9
3	1	241.46	94.90	0.93	96.9	0.0	0.0	90.0	55.0
4	1	241.96	94.97	0.07	9.1	0.0	0.0	8.4	5.1
5	1	242.09	94.99	0.18	23.1	0.0	0.0	21.5	13.1
6	4	242.59	95.06	0.82	127.2	0.0	0.0	124.9	25.4
7	4	243.53	95.20	1.06	207.7	0.0	0.0	203.8	41.4
8	4	244.65	95.39	1.18	285.8	0.0	0.0	280.1	56.9
9	2	247.10	95.86	3.73	1256.1	0.0	0.0	1178.4	523.9
10	2	251.40	96.80	4.86	2370.0	0.0	0.0	2202.2	979.0
11	2	256.23	98.08	4.80	3024.9	0.0	0.0	2790.1	1240.4
12	2	261.00	99.58	4.73	3506.4	0.0	0.0	3217.4	1430.3
13	2	265.70	101.29	4.66	3816.7	0.0	0.0	3491.1	1552.0
14	2	270.31	103.22	4.57	3960.2	0.0	0.0	3618.7	1608.8
15	2	274.83	105.36	4.47	3943.8	0.0	0.0	3607.6	1603.8
16	2	279.24	107.70	4.36	3776.5	0.0	0.0	3465.5	1540.6
17	2	283.55	110.24	4.25	3469.2	0.0	0.0	3200.5	1422.8
18	2	287.73	112.97	4.12	3035.2	0.0	0.0	2820.9	1254.1
19	2	289.90	114.47	0.21	141.6	0.0	0.0	132.9	59.1
20	2	291.00	115.30	2.00	1174.2	0.0	0.0	1101.9	489.8
21	2	292.89	116.73	1.78	726.9	0.0	0.0	682.1	3[illegible]3
22	2	295.34	118.70	3.12	505.4	0.0	0.0	479.9	2[illegible]3

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-35536.04	35536.04	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-13474.63	29543.30	32471.09	114.52
Shear Force, lb :	13172.29	5992.74	14471.42	24.46

Surface No. : 3
Factor of Safety : 1.181
Circle Center X : 240.77 ft
Circle Center Y : 152.71 ft
Circle Radius : 58.18 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	239.56	94.56	0.89	24.0	0.0	0.0	21.6	163.4
2	1	240.50	94.58	1.00	84.3	0.0	0.0	83.6	49.6
3	1	241.09	94.58	0.17	20.5	0.0	0.0	20.3	12.0
4	1	241.59	94.59	0.83	124.5	0.0	0.0	123.5	73.2
5	1	242.50	94.60	1.00	205.7	0.0	0.0	203.9	121.0
6	1	243.56	94.62	1.11	299.5	0.0	0.0	297.0	176.2
7	1	245.96	94.81	3.69	1459.8	0.0	0.0	1384.5	821.1
8	4	248.44	95.06	1.28	667.1	0.0	0.0	657.4	129.6
9	4	250.07	95.31	1.97	1159.2	0.0	0.0	1137.3	224.2
10	2	252.52	95.78	2.95	2021.2	0.0	0.0	1902.0	820.9
11	2	256.41	96.73	4.82	3897.5	0.0	0.0	3611.3	1558.6
12	2	261.16	98.28	4.68	4272.6	0.0	0.0	3927.6	1695.1
13	2	265.75	100.23	4.51	4315.8	0.0	0.0	3965.1	1711.1
14	2	270.17	102.57	4.31	4052.3	0.0	0.0	3748.8	1617.9
15	2	274.36	105.28	4.08	3521.7	0.0	0.0	3305.2	1426.5
16	2	278.31	108.34	3.82	2776.8	0.0	0.0	2664.3	1149.9
17	2	281.99	111.72	3.53	1881.0	0.0	0.0	1860.2	802.8
18	2	285.35	115.41	3.21	906.9	0.0	0.0	932.4	402.4
19	2	287.03	117.44	0.16	21.1	0.0	0.0	22.7	9.8
20	5	287.65	118.33	1.08	67.3	0.0	0.0	-208.5	228.1

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-31778.60	31778.60	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-12241.27	26273.24	28985.03	114.98
Shear Force, lb :	11600.55	5505.36	12840.62	25.39

Surface No. : 4
Factor of Safety : 1.195
Circle Center X : 242.96 ft
Circle Center Y : 165.99 ft
Circle Radius : 66.37 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	5	251.41	100.20	2.82	176.0	0.0	0.0	102.5	520.0
2	2	253.88	100.56	2.13	367.4	0.0	0.0	349.6	149.1
3	2	257.39	101.26	4.88	1484.4	0.0	0.0	1388.8	592.1
4	2	262.22	102.53	4.78	2140.9	0.0	0.0	1981.0	844.6
5	2	266.94	104.16	4.66	2512.2	0.0	0.0	2312.2	985.8
6	2	271.53	106.14	4.51	2608.0	0.0	0.0	2401.2	1023.8
7	2	275.96	108.46	4.34	2448.2	0.0	0.0	2267.8	966.9
8	2	280.19	111.11	4.14	2062.3	0.0	0.0	1932.9	824.1
9	2	284.22	114.07	3.91	1488.4	0.0	0.0	1420.0	605.4
10	2	287.90	117.22	3.44	745.6	0.0	0.0	728.5	310.6
11	5	289.73	118.91	0.23	27.0	0.0	0.0	-8.0	48.3
12	5	289.92	119.10	0.15	16.5	0.0	0.0	-11.2	33.0
13	2	290.38	119.59	0.76	38.6	0.0	0.0	38.8	16.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-16115.40	16115.40	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-6418.96	13247.52	14720.73	115.85
Shear Force, lb :	6183.18	2867.88	6815.90	24.88

Surface No. : 5
Factor of Safety : 1.199
Circle Center X : 192.68 ft
Circle Center Y : 241.16 ft
Circle Radius : 156.15 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	230.23	89.61	4.01	250.7	0.0	0.0	74.6	733.4
2	1	232.65	90.22	0.84	115.7	0.0	0.0	104.1	60.8
3	1	235.48	91.01	4.81	1037.3	0.0	0.0	924.7	540.0
4	1	238.94	92.04	2.12	644.7	0.0	0.0	570.3	333.0
5	1	240.50	92.54	1.00	339.3	0.0	0.0	300.1	175.3
6	1	241.50	92.86	1.00	361.8	0.0	0.0	320.0	186.9
7	1	242.32	93.12	0.64	244.4	0.0	0.0	216.2	126.2
8	1	242.82	93.29	0.36	139.6	0.0	0.0	122.7	71.6
9	1	245.18	94.12	4.35	1885.9	0.0	0.0	1657.4	967.9
10	1	247.48	94.95	0.26	124.3	0.0	0.0	108.7	63.4
11	4	248.25	95.25	1.27	617.8	0.0	0.0	616.7	119.7
12	2	250.45	96.11	3.12	1603.1	0.0	0.0	1476.0	627.2
13	2	254.31	97.71	4.59	2551.5	0.0	0.0	2348.3	997.9
14	2	258.87	99.76	4.53	2647.5	0.0	0.0	2438.2	1036.1
15	2	263.36	101.95	4.46	2637.1	0.0	0.0	2432.7	1033.8
16	2	267.78	104.28	4.38	2525.0	0.0	0.0	2335.6	992.5
17	2	272.12	106.76	4.30	2316.4	0.0	0.0	2150.7	913.9
18	2	276.39	109.37	4.22	2017.5	0.0	0.0	1882.1	799.8
19	2	280.56	112.12	4.13	1634.8	0.0	0.0	1534.0	651.9
20	2	284.65	115.00	4.04	1175.7	0.0	0.0	1110.9	472.0
1	2	288.22	117.68	3.10	555.0	0.0	0.0	528.6	224.6
2	5	289.88	118.97	0.23	27.9	0.0	0.0	-2.0	47.9
23	2	290.31	119.30	0.61	53.5	0.0	0.0	50.9	21.6
24	2	290.89	119.77	0.55	15.7	0.0	0.0	15.1	6.4

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-25522.03	25522.03	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-10297.22	20784.01	23194.99	116.36
Shear Force, lb :	10071.82	4738.02	11130.61	25.19

Surface No. : 6
Factor of Safety : 1.218
Circle Center X : 164.88 ft
Circle Center Y : 297.04 ft
Circle Radius : 218.47 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	225.13	87.06	4.70	293.7	0.0	0.0	64.4	839.9
2	1	227.53	87.75	0.11	13.4	0.0	0.0	12.0	6.9
3	1	229.97	88.51	4.77	877.5	0.0	0.0	779.4	448.1
4	1	234.73	90.06	4.74	1364.5	0.0	0.0	1206.1	693.4
5	1	238.55	91.39	2.91	1049.1	0.0	0.0	923.4	530.9
6	1	240.50	92.09	1.00	394.4	0.0	0.0	347.1	199.6
7	1	241.40	92.42	0.79	325.2	0.0	0.0	286.2	164.5
8	1	241.90	92.60	0.21	86.3	0.0	0.0	75.7	43.5
9	1	242.50	92.84	1.00	426.3	0.0	0.0	373.8	214.9
10	1	244.73	93.71	3.45	1578.4	0.0	0.0	1384.1	795.7
11	1	247.20	94.69	1.49	730.8	0.0	0.0	638.7	367.2
12	4	248.55	95.25	1.20	604.8	0.0	0.0	606.8	115.9
13	2	250.11	95.90	1.92	997.2	0.0	0.0	919.9	384.8
14	2	253.36	97.31	4.57	2495.4	0.0	0.0	2302.5	963.3
15	2	257.90	99.39	4.52	2580.6	0.0	0.0	2383.0	996.9
16	2	262.40	101.57	4.47	2590.6	0.0	0.0	2395.2	1002.0
17	2	266.85	103.85	4.42	2527.7	0.0	0.0	2341.2	979.5
18	2	271.24	106.24	4.37	2394.4	0.0	0.0	2222.9	930.0
19	2	275.58	108.72	4.31	2193.6	0.0	0.0	2042.3	854.4
20	2	279.86	111.30	4.25	1928.4	0.0	0.0	1801.4	753.6
21	2	284.08	113.98	4.19	1602.1	0.0	0.0	1502.5	6[illegible]
22	2	288.09	116.65	3.82	1141.3	0.0	0.0	1075.2	44[illegible].8
23	2	290.15	118.07	0.31	74.0	0.0	0.0	69.7	29.2
24	2	291.15	118.78	1.69	258.3	0.0	0.0	244.6	102.3
25	2	292.43	119.69	0.85	32.5	0.0	0.0	30.8	12.9

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-28560.66	28560.66	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-11469.36	23268.01	25941.22	116.24
Shear Force, lb :	11274.33	5292.65	12454.82	25.15

Surface No. : 7
Factor of Safety : 1.222
Circle Center X : 163.21 ft
Circle Center Y : 328.72 ft
rcle Radius : 248.27 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	230.52	89.76	4.59	286.9	0.0	0.0	66.9	819.4
2	1	232.92	90.44	0.22	28.3	0.0	0.0	25.3	14.9
3	1	235.43	91.20	4.78	907.0	0.0	0.0	807.3	462.7
4	1	238.91	92.28	2.18	593.2	0.0	0.0	525.7	301.3
5	1	240.50	92.80	1.00	306.4	0.0	0.0	271.6	155.7
6	1	241.50	93.12	1.00	328.2	0.0	0.0	290.8	166.7
7	1	242.29	93.38	0.57	197.3	0.0	0.0	174.9	100.2
8	1	242.79	93.55	0.43	152.3	0.0	0.0	134.4	77.1
9	1	244.97	94.31	3.95	1567.0	0.0	0.0	1383.1	792.8
10	4	247.12	95.06	0.34	150.9	0.0	0.0	149.8	28.5
11	4	247.80	95.31	1.02	459.1	0.0	0.0	457.4	87.1
12	2	250.15	96.18	3.66	1783.4	0.0	0.0	1647.3	687.1
13	2	254.31	97.78	4.65	2543.3	0.0	0.0	2347.7	979.2
14	2	258.94	99.66	4.61	2773.2	0.0	0.0	2559.5	1067.5
15	2	263.53	101.63	4.57	2933.6	0.0	0.0	2708.1	1129.5
16	2	268.08	103.70	4.53	3025.8	0.0	0.0	2795.0	1165.8
17	2	272.59	105.86	4.49	3051.4	0.0	0.0	2821.6	1176.8
18	2	277.06	108.11	4.44	3012.2	0.0	0.0	2789.3	1163.4
19	2	281.48	110.44	4.40	2910.1	0.0	0.0	2699.7	1126.0
20	2	285.85	112.87	4.35	2747.2	0.0	0.0	2554.3	1065.4
1	2	289.01	114.69	1.98	1188.3	0.0	0.0	1107.9	462.1
2	2	291.00	115.88	2.00	1031.0	0.0	0.0	961.2	400.9
23	2	292.16	116.57	0.32	138.0	0.0	0.0	128.6	53.0
24	2	294.44	117.98	4.24	1069.5	0.0	0.0	1000.2	417.2
25	2	297.10	119.65	1.07	46.3	0.0	0.0	43.4	18.1

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-33230.05	33230.05	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-12803.90	27545.15	30375.57	114.93
Shear Force, lb :	12656.71	5684.90	13874.81	24.19

Surface No. : 8
Factor of Safety : 1.256
Circle Center X : 246.07 ft
Circle Center Y : 142.13 ft
Circle Radius : 44.88 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	5	245.60	97.30	2.09	130.8	0.0	0.0	122.4	383.0
2	2	248.10	97.36	2.91	615.7	0.0	0.0	610.3	247.7
3	2	252.03	97.72	4.96	2041.2	0.0	0.0	1953.1	792.6
4	2	256.94	98.66	4.85	2915.1	0.0	0.0	2728.1	1107.1
5	2	261.70	100.14	4.69	3346.3	0.0	0.0	3102.0	1258.8
6	2	266.28	102.14	4.46	3347.2	0.0	0.0	3112.1	1262.9
7	2	270.60	104.63	4.18	2963.3	0.0	0.0	2798.3	1135.6
8	2	274.62	107.60	3.85	2270.6	0.0	0.0	2206.0	895.2
9	2	278.28	110.99	3.48	1370.9	0.0	0.0	1389.2	563.8
10	2	280.79	113.78	1.54	310.9	0.0	0.0	333.5	135.3
11	5	282.19	115.60	1.26	78.5	0.0	0.0	-194.0	248.8

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-19390.49	19390.49	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-7470.52	16092.21	17741.70	114.90
Shear Force, lb :	7063.71	3298.28	7795.81	25.03

Surface No. : 9
Factor of Safety : 1.279
Circle Center X : 252.49 ft
Circle Center Y : 138.77 ft
Circle Radius : 38.85 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	5	251.00	100.00	2.00	125.1	0.0	0.0	125.0	362.7
2	2	253.50	100.00	3.00	655.7	0.0	0.0	655.7	261.2
3	2	257.48	100.32	4.96	2117.5	0.0	0.0	2030.3	808.8
4	2	262.38	101.28	4.83	2964.5	0.0	0.0	2774.4	1105.2
5	2	267.11	102.86	4.63	3294.6	0.0	0.0	3060.8	1219.3
6	2	271.60	105.04	4.35	3133.2	0.0	0.0	2938.0	1170.4
7	2	275.77	107.77	4.00	2556.1	0.0	0.0	2460.6	980.2
8	2	279.56	111.02	3.58	1683.0	0.0	0.0	1693.2	674.5
9	2	282.60	114.34	2.50	610.7	0.0	0.0	654.8	260.8
10	5	284.15	116.31	0.60	58.0	0.0	0.0	-65.6	125.8
11	5	284.68	117.07	0.46	15.6	0.0	0.0	-122.5	91.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-17213.90	17213.90	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-6588.77	14349.57	15789.94	114.66
Shear Force, lb :	6195.53	2864.33	6825.61	24.81

Surface No. : 10
Factor of Safety : 1.290
Circle Center X : 186.72 ft
Circle Center Y : 258.77 ft
Circle Radius : 177.76 ft

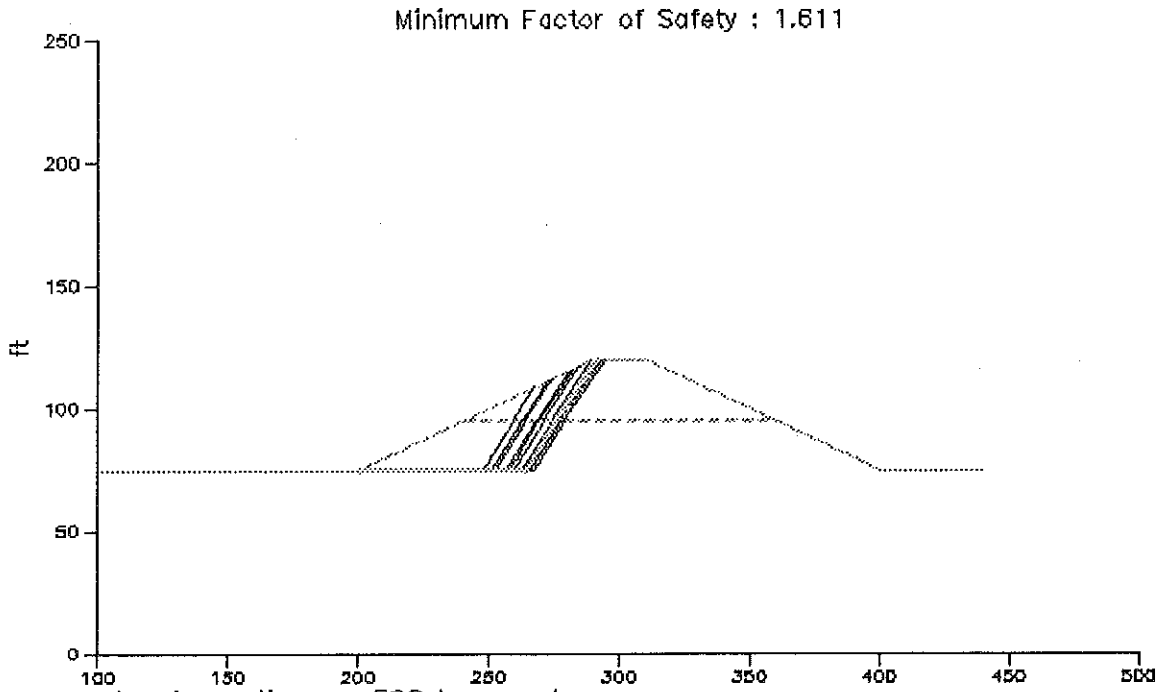
	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	3	218.94	83.97	3.22	201.2	0.0	0.0	98.5	561.3
2	1	221.40	84.44	1.69	267.4	0.0	0.0	246.8	134.0
3	1	224.69	85.13	4.88	1351.4	0.0	0.0	1236.6	671.2
4	1	229.56	86.27	4.85	2129.9	0.0	0.0	1933.9	1049.6
5	1	234.39	87.54	4.82	2803.2	0.0	0.0	2527.9	1372.0
6	1	238.40	88.70	3.20	2197.9	0.0	0.0	1970.1	1069.3
7	1	240.50	89.35	1.00	737.0	0.0	0.0	660.6	358.6
8	1	241.29	89.60	0.58	436.4	0.0	0.0	391.2	212.3
9	1	241.79	89.76	0.42	324.2	0.0	0.0	289.0	156.9
10	1	242.50	90.00	1.00	781.2	0.0	0.0	696.6	378.1
11	1	244.66	90.73	3.31	2729.5	0.0	0.0	2433.8	1320.9
12	1	248.65	92.17	4.69	4194.6	0.0	0.0	3723.7	2021.0
13	1	253.32	93.97	4.64	4452.1	0.0	0.0	3938.1	2137.4
14	1	255.73	94.96	0.20	199.9	0.0	0.0	176.3	95.7
15	4	256.41	95.25	1.14	1137.0	0.0	0.0	1150.3	207.5
16	2	258.60	96.21	3.24	3272.5	0.0	0.0	3045.7	1202.8
17	2	262.48	97.98	4.52	4669.1	0.0	0.0	4351.7	1718.6
18	2	266.97	100.17	4.46	4634.4	0.0	0.0	4328.8	1709.6
19	2	271.40	102.49	4.40	4508.8	0.0	0.0	4224.2	1668.3
20	2	275.76	104.94	4.33	4296.3	0.0	0.0	4040.5	1595.7
21	2	280.05	107.50	4.26	4001.6	0.0	0.0	3780.7	14[illegible]
22	2	284.27	110.19	4.18	3629.7	0.0	0.0	3448.0	136[illegible].8
23	2	288.18	112.83	3.64	2850.0	0.0	0.0	2724.3	1075.9
24	2	290.23	114.26	0.46	329.4	0.0	0.0	314.9	124.4
25	2	291.23	114.99	1.54	965.1	0.0	0.0	929.1	366.9
26	2	293.24	116.48	2.48	1091.2	0.0	0.0	1050.5	414.9
27	2	296.14	118.70	3.32	540.9	0.0	0.0	524.9	207.3

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-58731.90	58731.90	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-22952.84	48738.90	53873.12	115.22
Shear Force, lb :	22372.41	9993.00	24502.75	24.07

Title : Full Slope
Description : Run F5a

Rankine Block Surfaces — Most Critical Surfaces



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*****************************************************************************
*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   ***
*****              (c)1995 by GEOCOMP Corp, Concord, MA                 ***
*****          licensed to FHWA for distribution by FHWA only           *****
*****************************************************************************
```

File : C:\RSS\f5.dat
Date : Wed 10-11-:0, 00:12:28
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run F5a
Remarks :

```
*****************************************************************************
*****                            INPUT DATA                             *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 11
Number of Top Boundaries : 9

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	75.00	200.00	75.00	1
2	200.00	75.00	240.00	95.00	1
3	240.00	95.00	241.00	95.50	4
4	241.00	95.50	290.00	120.00	2
5	290.00	120.00	310.00	120.00	2
6	310.00	120.00	359.00	95.50	2
7	359.00	95.50	360.00	95.00	4
8	360.00	95.00	400.00	75.00	1
9	400.00	75.00	440.00	75.00	1
10	241.00	95.50	359.00	95.50	4
11	240.00	95.00	360.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

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*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       *****
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Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	201.00	75.00	202.00	75.00	0.00
2	244.90	75.00	397.30	75.00	0.00

```
*****************************************************************************
*****                          RESULTS                                  *****
*****************************************************************************
```

Surface No. : 1
Factor of Safety : 1.611

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Sh r)
1	1	200.85	75.15	0.52	17.9	0.0	0.0	26.1	9.4
2	1	220.56	75.00	38.89	49961.4	0.0	0.0	49961.4	17905.5
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	907.2
4	1	252.64	75.00	23.28	76597.3	0.0	0.0	76597.3	27451.5
5	1	270.06	85.00	11.55	36124.1	0.0	0.0	44577.1	15975.9
6	4	276.03	95.25	0.40	881.5	0.0	0.0	1199.4	173.3
7	2	283.11	106.74	13.77	16903.8	0.0	0.0	21338.4	6749.0
8	2	290.62	118.99	1.24	156.6	0.0	0.0	197.7	62.5

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-183173.86	183173.86	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-57893.73	163399.52	173352.49	109.51
Shear Force, lb :	57927.05	19774.34	61209.21	18.85

Surface No. : 2
Factor of Safety : 1.611

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shea (lb
1	1	201.11	75.19	0.67	30.2	0.0	0.0	44.0	15.
2	1	220.72	75.00	38.56	49934.9	0.0	0.0	49934.9	17891.
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	906.
4	1	251.68	75.00	21.36	69000.0	0.0	0.0	69000.0	24722.
5	1	268.14	85.00	11.55	34738.7	0.0	0.0	42871.9	15360.
6	4	274.11	95.25	0.40	833.9	0.0	0.0	1134.7	163.
7	2	281.66	107.50	14.71	15313.4	0.0	0.0	19332.6	6113.

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-172382.44	172382.44	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-54478.55	153747.08	163113.69	109.51
Shear Force, lb :	54510.26	18635.36	57607.68	18.87

Surface No. : 3
Factor of Safety : 1.614

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Sh r)
1	1	201.23	75.21	0.74	36.9	0.0	0.0	53.7	19.2
2	1	220.80	75.00	38.40	49920.5	0.0	0.0	49920.5	17853.6
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	905.3
4	1	250.07	75.00	18.14	56766.6	0.0	0.0	56766.6	20302.0
5	1	264.91	85.00	11.55	32413.5	0.0	0.0	40030.2	14316.4
6	4	270.89	95.25	0.40	754.0	0.0	0.0	1026.2	147.9
7	2	277.73	106.34	13.29	12494.0	0.0	0.0	15782.9	4981.5

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-154916.65	154916.65	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-48901.08	138164.60	146563.20	109.49
Shear Force, lb :	48930.56	16752.05	51718.76	18.90

Surface No. : 4
Factor of Safety : 1.614

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	201.20	75.21	0.72	35.2	0.0	0.0	51.2	18.3
2	1	220.78	75.00	38.44	49924.2	0.0	0.0	49924.2	17854.9
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	905.3
4	1	253.35	75.00	24.69	82325.9	0.0	0.0	82325.9	29443.0
5	1	271.47	85.00	11.55	37142.0	0.0	0.0	45869.8	16404.9
6	4	277.44	95.25	0.40	916.5	0.0	0.0	1247.4	179.8
7	2	283.82	105.59	12.36	17496.4	0.0	0.0	22102.2	6976.0
8	2	291.32	117.84	2.65	716.0	0.0	0.0	904.5	285.5

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-191087.39	191087.39	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-60292.19	170557.21	180900.28	109.47
Shear Force, lb :	60327.46	20530.18	63725.12	18.79

Surface No. : 5
Factor of Safety : 1.616

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Sh r)
1	1	201.01	75.18	0.61	25.3	0.0	0.0	36.8	13.1
2	1	220.66	75.00	38.68	49945.5	0.0	0.0	49945.5	17847.1
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	904.5
4	1	249.26	75.00	16.52	50874.4	0.0	0.0	50874.4	18179.0
5	1	263.30	85.00	11.55	31247.1	0.0	0.0	38602.5	13793.9
6	4	269.27	95.25	0.40	713.8	0.0	0.0	971.7	140.0
7	2	275.76	105.76	12.58	11187.6	0.0	0.0	14136.8	4458.1

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-146525.03	146525.03	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-46226.96	130675.00	138610.56	109.48
Shear Force, lb :	46255.31	15850.03	48895.57	18.91

Surface No. : 6
Factor of Safety : 1.617

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	200.83	75.14	0.50	16.8	0.0	0.0	24.4	8.7
2	1	220.54	75.00	38.92	49963.9	0.0	0.0	49963.9	17842.7
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	903.9
4	1	248.70	75.00	15.40	46888.0	0.0	0.0	46888.0	16744.3
5	1	262.18	85.00	11.55	30439.0	0.0	0.0	37613.0	13432.1
6	4	268.15	95.25	0.40	686.1	0.0	0.0	934.0	134.4
7	2	274.39	105.36	12.08	10324.8	0.0	0.0	13049.3	4112.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-140849.78	140849.78	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-44419.43	125609.74	133232.48	109.48
Shear Force, lb :	44446.99	15240.04	46987.17	18.93

Surface No. : 7
Factor of Safety : 1.621

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear)
1	1	201.02	75.18	0.61	25.4	0.0	0.0	36.9	13.1
2	1	220.66	75.00	38.68	49945.4	0.0	0.0	49945.4	17784.9
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	901.3
4	1	254.16	75.00	26.31	89052.9	0.0	0.0	89052.9	31710.7
5	1	273.08	85.00	11.55	38310.0	0.0	0.0	47391.1	16875.4
6	4	279.06	95.25	0.40	956.7	0.0	0.0	1303.0	187.0
7	2	284.63	104.27	10.75	17523.4	0.0	0.0	22169.0	6966.7
8	2	292.13	116.52	4.27	1857.9	0.0	0.0	2350.4	738.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-200202.89	200202.89	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-62950.09	178878.59	189631.91	109.39
Shear Force, lb :	62988.32	21324.30	66500.03	18.70

Surface No. : 8
Factor of Safety : 1.622

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	201.35	75.24	0.81	44.6	0.0	0.0	64.9	23.1
2	1	220.88	75.00	38.25	49903.8	0.0	0.0	49903.8	17768.6
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	901.3
4	1	246.56	75.00	11.11	32338.2	0.0	0.0	32338.2	11514.3
5	1	257.89	85.00	11.55	27342.6	0.0	0.0	33825.1	12043.7
6	4	263.86	95.25	0.40	579.6	0.0	0.0	789.4	113.3
7	2	269.15	103.81	10.19	7339.4	0.0	0.0	9285.4	2917.7

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-120079.56	120079.56	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-37796.22	107084.50	113558.99	109.44
Shear Force, lb :	37820.94	12995.06	39991.18	18.96

Surface No. : 9
Factor of Safety : 1.622

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear)
1	1	201.00	75.18	0.61	24.8	0.0	0.0	36.0	12.8
2	1	220.65	75.00	38.69	49946.6	0.0	0.0	49946.6	17774.5
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	900.8
4	1	246.05	75.00	10.10	29053.2	0.0	0.0	29053.2	10339.1
5	1	256.87	85.00	11.55	26607.6	0.0	0.0	32922.3	11716.1
6	4	262.84	95.25	0.40	554.3	0.0	0.0	755.1	108.3
7	2	267.91	103.44	9.74	6705.3	0.0	0.0	8484.6	2664.7

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-115422.93	115422.93	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-36319.21	102926.07	109146.05	109.44
Shear Force, lb :	36343.23	12496.86	38431.78	18.98

Surface No. : 10
Factor of Safety : 1.627

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	200.99	75.17	0.60	23.9	0.0	0.0	34.7	12.1
2	1	220.64	75.00	38.72	49948.5	0.0	0.0	49948.5	17728.6
3	1	240.50	75.00	1.00	2531.3	0.0	0.0	2531.3	898.4
4	1	244.20	75.00	6.41	17707.2	0.0	0.0	17707.2	6284.9
5	1	253.18	85.00	11.55	23947.5	0.0	0.0	29660.6	10527.1
6	4	259.15	95.25	0.40	462.9	0.0	0.0	630.7	90.1
7	2	263.41	102.12	8.11	4650.0	0.0	0.0	5889.2	1844.7

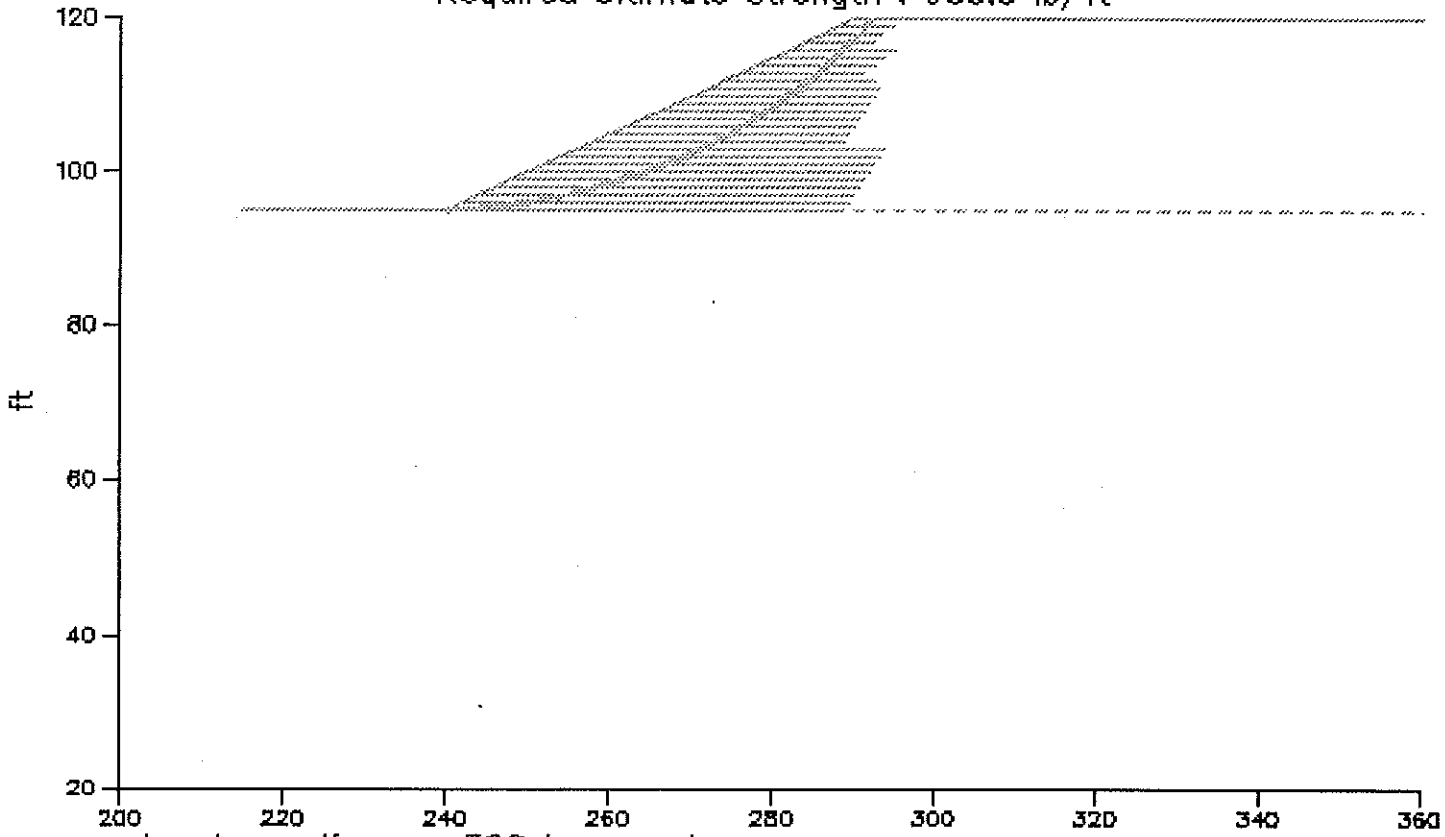
Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-99271.23	99271.23	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-31184.83	88516.60	93849.25	109.41
Shear Force, lb :	31206.44	10754.63	33007.63	19.02

Title : Simple Problem
Description : Run S2, Short Slope

Strength Design – Required Reinforcement

Minimum Reinforced Factor of Safety : 1.300
Total Reinforcement Length : 696.58 ft/ft
Required Ultimate Strength : 965.3 lb/ft



Press any key to continue or ESC to cancel ...

74

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*****************************************************************************
*****                          R S S                                    *****
*****                 Reinforced Slope Stability                        *****
*****                                                                   *****
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*****************************************************************************
```

File : C:\RSS\s1.dat
Date : Wed 10-11-:0, 06:40:22
Name :
Problem Title : Simple Problem
Description : Run S2, Short Slope
Remarks :

```
*****************************************************************************
*****                          INPUT DATA                               *****
*****************************************************************************
```

Data for Generating Simple Problem

Note: The following data reflect the data used by Simple Problem to automatically generate a data file. Changes made by editing that data are not reflected in the Simple Problem data.

X-Coordinate for Toe of Slope : 240.00 ft
Y-Coordinate for Toe of Slope : 95.00 ft
Height of Slope : 25.00 ft
Angle of Slope : 26.6 deg
Angle Above Crest of Slope : 0.0 deg
Surcharge Above Crest of Slope : 0.0 psf
Depth to Water from Crest of Slope : 100.00 ft
Unit Weight of Soil in Slope : 125.00 pcf
Cohesion for Soil in Slope : 0.00 psf
Friction Angle for Soil in Slope : 27.0 deg
Unit Weight of Soil in Foundation : 125.00 pcf
Cohesion for Soil in Foundation : 0.00 psf
Friction Angle for Soil in Foundation : 30.0 deg
Required Internal Factor of Safety : 1.30
Required Sliding Factor of Safety : 1.30

Profile Boundaries

Number of Boundaries : 4
Number of Top Boundaries : 3

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	215.00	95.00	240.00	95.00	2
2	240.00	95.00	289.92	120.00	1

3	289.92	120.00	364.92	120.00	1
4	240.00	95.00	364.92	95.00	2

Soil Parameters

Number of Soil Types : 2

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	0.0	27.0	0.00	0.0	0
2	125.0	125.0	0.0	30.0	0.00	0.0	1

Piezometric Surfaces

Number of Surfaces : 1
Unit Weight of Water : 62.43 pcf

Piezometric Surface No. : 1
Number of Coordinate Points : 2

Point No.	X (ft)	Y (ft)
1	215.00	20.00
2	364.92	20.00

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 240.00 ft
Right Initiation Point : 277.44 ft
Left Termination Point : 289.92 ft
Right Termination Point : 340.93 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 23.94 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	241.00	95.00	242.00	95.00	0.00
2	264.96	95.00	349.60	95.00	0.00

****
***** REINFORCEMENT DATA *****
****

Data for Reinforcement Strength Design

Required Internal Factor of Safety : 1.30
Required Sliding Factor of Safety : 1.30
Lowest Elevation for Reinforcement : 95.00 ft
Highest Elevation for Reinforcement : 120.00 ft
Minimum Embedment Length : 3.00 ft
Vertical Spacing : 1.00 ft

Extension Factor : 1.00 - GEOSYNTHETIC
Reduction Factor : 10.00
Pullout Factor of Safety : 2.00
Pullout Resistance Factor : 0.31
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Unreinforced Circular Surface Tmax

Circle Center X : 238.65 ft
Circle Center Y : 164.77 ft
Circle Radius : 69.78 ft
Surface Height : 25.00 ft
Factor of Safety : 1.131
Driving Moment : 9.936273E+005 lb-ft/ft
Required Reinforcement : 2413.3 lb/ft

Bottom Critical Zone Factor of Safety : 1.301

Reinforcement length due to Bottom Critical Zone search

Layer No.	Elevation (ft)	Length (ft)
1	95.00	48.88
2	96.00	47.50
3	97.00	46.12
4	98.00	44.73
5	99.00	43.35
6	100.00	41.96
7	101.00	40.58
8	102.00	39.20
9	103.00	37.81
10	104.00	17.95
11	105.00	17.68
12	106.00	17.27
13	107.00	16.83
14	108.00	16.24
15	109.00	15.64
16	110.00	14.91
17	111.00	14.18
18	112.00	13.34
19	113.00	12.49
20	114.00	11.56
21	115.00	10.61
22	116.00	9.61
23	117.00	8.56
24	118.00	7.51
25	119.00	7.10

Middle Critical Zone Factor of Safety : 1.314

Reinforcement length due to Middle Critical Zone search

Layer No.	Elevation (ft)	Length (ft)
1	95.00	48.88
2	96.00	47.50
3	97.00	46.12
4	98.00	44.73
5	99.00	43.35
6	100.00	41.96
7	101.00	40.58
8	102.00	39.20
9	103.00	37.81
10	104.00	30.80
11	105.00	29.41
12	106.00	28.03
13	107.00	26.65
14	108.00	25.26
15	109.00	23.88
16	110.00	22.49
17	111.00	21.11
18	112.00	13.34
19	113.00	12.49

20	114.00	11.56
21	115.00	10.61
22	116.00	9.61
23	117.00	8.56
24	118.00	7.51
25	119.00	7.10

Top Critical Zone Factor of Safety : 1.390

Reinforcement length due to Top Critical Zone search

Layer No.	Elevation (ft)	Length (ft)
1	95.00	48.88
2	96.00	47.50
3	97.00	46.12
4	98.00	44.73
5	99.00	43.35
6	100.00	41.96
7	101.00	40.58
8	102.00	39.20
9	103.00	37.81
10	104.00	30.80
11	105.00	29.41
12	106.00	28.03
13	107.00	26.65
14	108.00	25.26
15	109.00	23.88
16	110.00	22.49
17	111.00	21.11
18	112.00	15.17
19	113.00	13.78
20	114.00	12.40
21	115.00	11.01
22	116.00	9.63
23	117.00	8.56
24	118.00	7.51
25	119.00	7.10

****
***** REINFORCEMENT DESIGN *****
****

Reinforcement Length per Layer

Layer No.	Elevation (ft)	Length (ft)
1	95.00	48.88
2	96.00	47.50
3	97.00	46.12
4	98.00	44.73
5	99.00	43.35
6	100.00	41.96

7	101.00	40.58
8	102.00	39.20
9	103.00	37.81
10	104.00	30.80
11	105.00	29.41
12	106.00	28.03
13	107.00	26.65
14	108.00	25.26
15	109.00	23.88
16	110.00	22.49
17	111.00	21.11
18	112.00	18.60
19	113.00	15.47
20	114.00	14.70
21	115.00	13.88
22	116.00	13.00
23	117.00	8.56
24	118.00	7.51
25	119.00	7.10

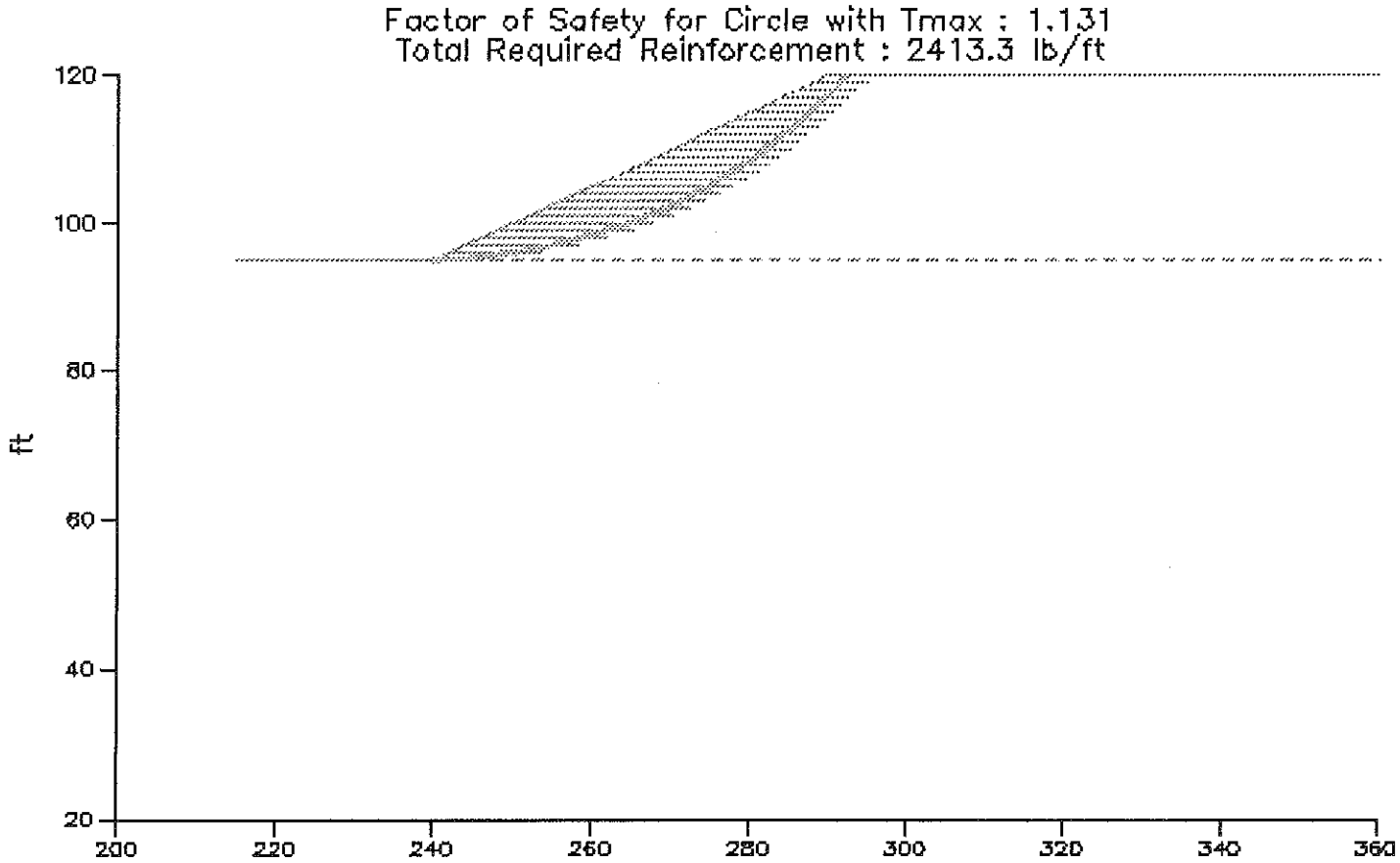
NOTE: The lengths of reinforcement at each height are the minimum lengths of reinforcement necessary to obtain the required factor of safety. For final design, these lengths should be adjusted to values convenient for construction with a given material. If this adjustment results in shorter lengths than computed for some layers, the Reinforcement Analysis option of the program should be used to determine the factor of safety for the adjusted reinforcement pattern.

Minimum Reinforced Factor of Safety : 1.300
Total Reinforcement Length : 696.58 ft/ft
Required Ultimate Strength : 965.3 lb/ft

NOTE: The total required length of reinforcement per unit width of slope results from the minumum lengths of reinforcement at each height necessary to obtain the required factor of safety. This value is provided to help compare reinforcement requirements from alternate analyses. Since additional reinforcement will be required for overlaps, face wraps and contruction tolerances, this value should not be used directly to estimate construction quatities.

Title : Simple Problem
Description : Run S2, Short Slope

Strength Design – Reinforcement for Critical Surface



Press any key to continue or ESC to cancel ...

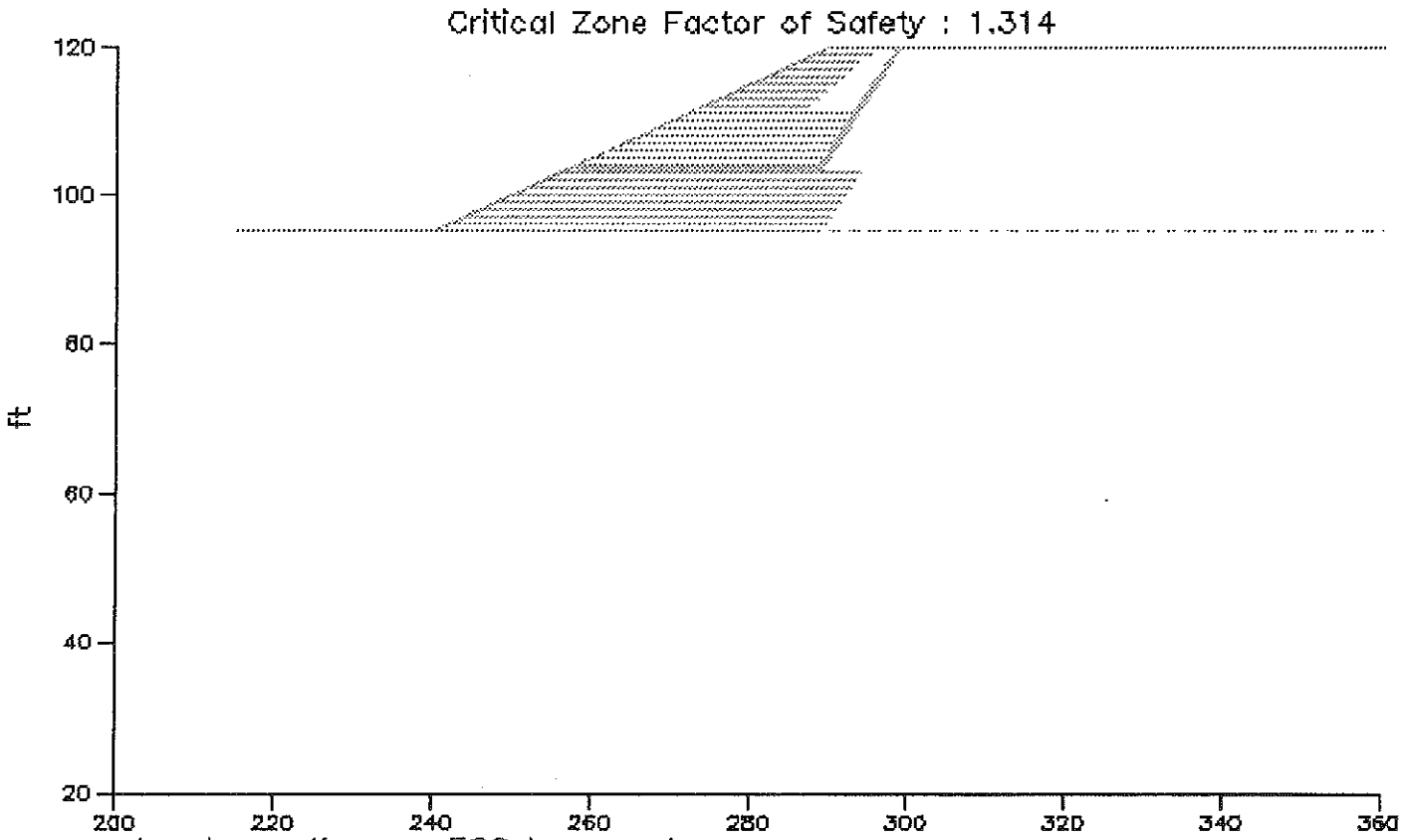
Title : Simple Problem
Description : Run S2, Short Slope

Strength Design – Reinforcement for Critical Zone

Press any key to continue or ESC to cancel ...

Title : Simple Problem
Description : Run S2, Short Slope

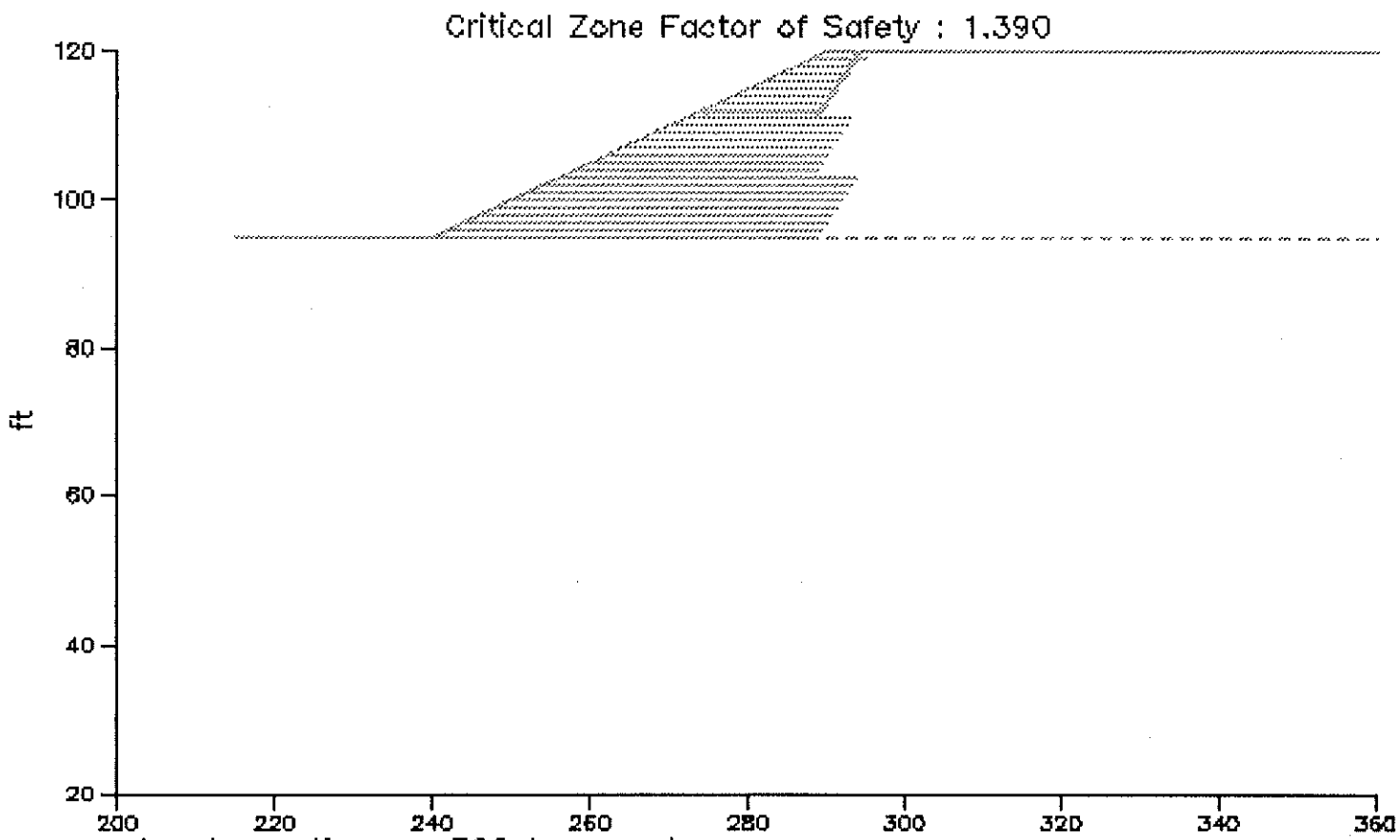
Strength Design – Reinforcement for Critical Zone



Press any key to continue or ESC to cancel ...

Title : Simple Problem
Description : Run S2, Short Slope

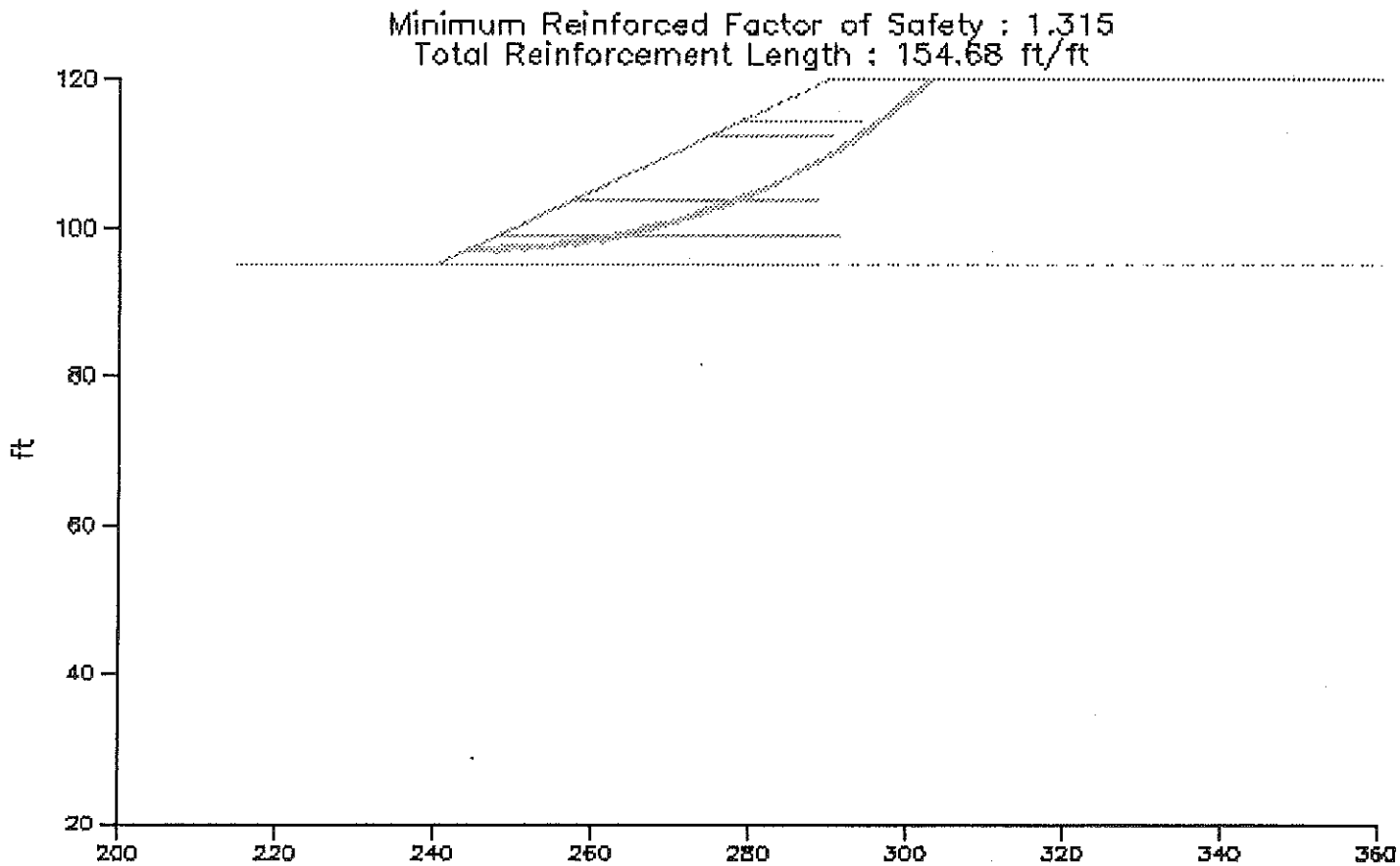
Strength Design – Reinforcement for Critical Zone



Press any key to continue or ESC to cancel ...

Title : Simple Problem
Description : Run S2b, Short Slope

Spacing Design – Required Reinforcement



Press any key to continue or ESC to cancel ...

```
*****************************************************************************
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*****                                                                   ***
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*****************************************************************************
```

```
         File : C:\RSS\s1b.dat
         Date : Wed 10-11-:0, 06:59:33
         Name :
Problem Title : Simple Problem
  Description : Run S2b, Short Slope
      Remarks :
```

```
*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************
```

Data for Generating Simple Problem

Note: The following data reflect the data used by Simple Problem to automatically generate a data file. Changes made by editing that data are not reflected in the Simple Problem data.

```
          X-Coordinate for Toe of Slope : 240.00 ft
          Y-Coordinate for Toe of Slope : 95.00 ft
                        Height of Slope : 25.00 ft
                         Angle of Slope : 26.6 deg
             Angle Above Crest of Slope : 0.0 deg
          Surcharge Above Crest of Slope : 0.0 psf
     Depth to Water from Crest of Slope : 100.00 ft
           Unit Weight of Soil in Slope : 125.00 pcf
             Cohesion for Soil in Slope : 0.00 psf
        Friction Angle for Soil in Slope : 27.0 deg
       Unit Weight of Soil in Foundation : 125.00 pcf
         Cohesion for Soil in Foundation : 0.00 psf
    Friction Angle for Soil in Foundation : 30.0 deg
       Required Internal Factor of Safety : 1.30
        Required Sliding Factor of Safety : 1.30
```

Profile Boundaries

```
        Number of Boundaries : 4
    Number of Top Boundaries : 3
```

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	215.00	95.00	240.00	95.00	2
2	240.00	95.00	289.92	120.00	1

3	289.92	120.00	364.92	120.00	1
4	240.00	95.00	364.92	95.00	2

Soil Parameters

Number of Soil Types : 2

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	125.0	0.0	27.0	0.00	0.0	0
2	125.0	125.0	0.0	30.0	0.00	0.0	1

Piezometric Surfaces

Number of Surfaces : 1
Unit Weight of Water : 62.43 pcf

Piezometric Surface No. : 1
Number of Coordinate Points : 2

Point No.	X (ft)	Y (ft)
1	215.00	20.00
2	364.92	20.00

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 240.00 ft
Right Initiation Point : 277.44 ft
Left Termination Point : 289.92 ft
Right Termination Point : 340.93 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 23.94 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	241.00	95.00	242.00	95.00	0.00
2	264.96	95.00	349.60	95.00	0.00

****
***** REINFORCEMENT DATA *****
****

Data for Reinforcement Spacing Design

Required Internal Factor of Safety : 1.30
Required Sliding Factor of Safety : 1.30
Lowest Elevation for Reinforcement : 95.00 ft
Highest Elevation for Reinforcement : 120.00 ft
Minimum Embedment Length : 3.00 ft
Thickness of Each Fill Lift : 0.67 ft

Tensile Strength : 3150.00 lb/ft
Long Term Tensile Strength : 1000.00 lb/ft
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.31
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Unreinforced Circular Surface with Tmax

Circle Center X : 238.65 ft
Circle Center Y : 164.77 ft
Circle Radius : 69.78 ft
Surface Height : 25.00 ft
Factor of Safety : 1.131
Driving Moment : 9.936E+005 lb-ft/ft
Moment Arm : 69.78 ft
Allowable Tensile Strength : 1000.0 lb/ft

Total Required Reinforcement : 2413.3 lb/ft

Bottom Third
Required Reinforcement : 1206.6 lb
Number of Layers : 2
Theoretical Spacing : 4.17 ft

Middle Third
Required Reinforcement : 804.4 lb
Number of Layers : 1
Theoretical Spacing : 8.33 ft

Top Third
Required Reinforcement : 402.2 lb
Number of Layers : 1
Theoretical Spacing : 8.33 ft

REINFORCEMENT LENGTH DUE TO CIRCLE WITH Tmax

Layer No.	Elevation ft	Length ft
1	95.00	3.00
2	99.00	18.07
3	103.66	18.87
4	112.32	15.80

Reinforced Factor of Safety : 1.411

Bottom Critical Zone Factor of Safety : 1.301

Reinforcement length due to Bottom Critical Zone search

Layer No.	Elevation (ft)	Length (ft)
1	95.00	48.88
2	99.00	43.35
3	103.66	18.87
4	112.32	15.80

Middle Critical Zone Factor of Safety : 1.314

Reinforcement length due to Middle Critical Zone search

Layer No.	Elevation (ft)	Length (ft)
1	95.00	48.88
2	99.00	43.35
3	103.66	31.27
4	112.32	15.80

Top Critical Zone Factor of Safety : 1.390

Reinforcement length due to Top Critical Zone search

Layer No.	Elevation (ft)	Length (ft)
1	95.00	48.88
2	99.00	43.35
3	103.66	31.27
4	112.32	15.80

****
***** REINFORCEMENT DESIGN *****
****

Reinforcement Length per Layer

Layer No.	Elevation (ft)	Length (ft)
1	95.00	48.88
2	99.00	43.35
3	103.66	31.27
4	112.32	15.80
5	114.31	15.38

NOTE: The lengths of reinforcement at each height are the minimum lengths of reinforcement necessary to obtain the required factor of safety. For final design, these lengths should be adjusted to values convenient for construction with a given material. If this adjustment results in shorter lengths than computed for some layers, the Reinforcement Analysis option of the program should be used to determine the factor of safety for the adjusted reinforcement pattern.

Minimum Reinforced Factor of Safety : 1.315
Total Reinforcement Length : 154.68 ft/ft

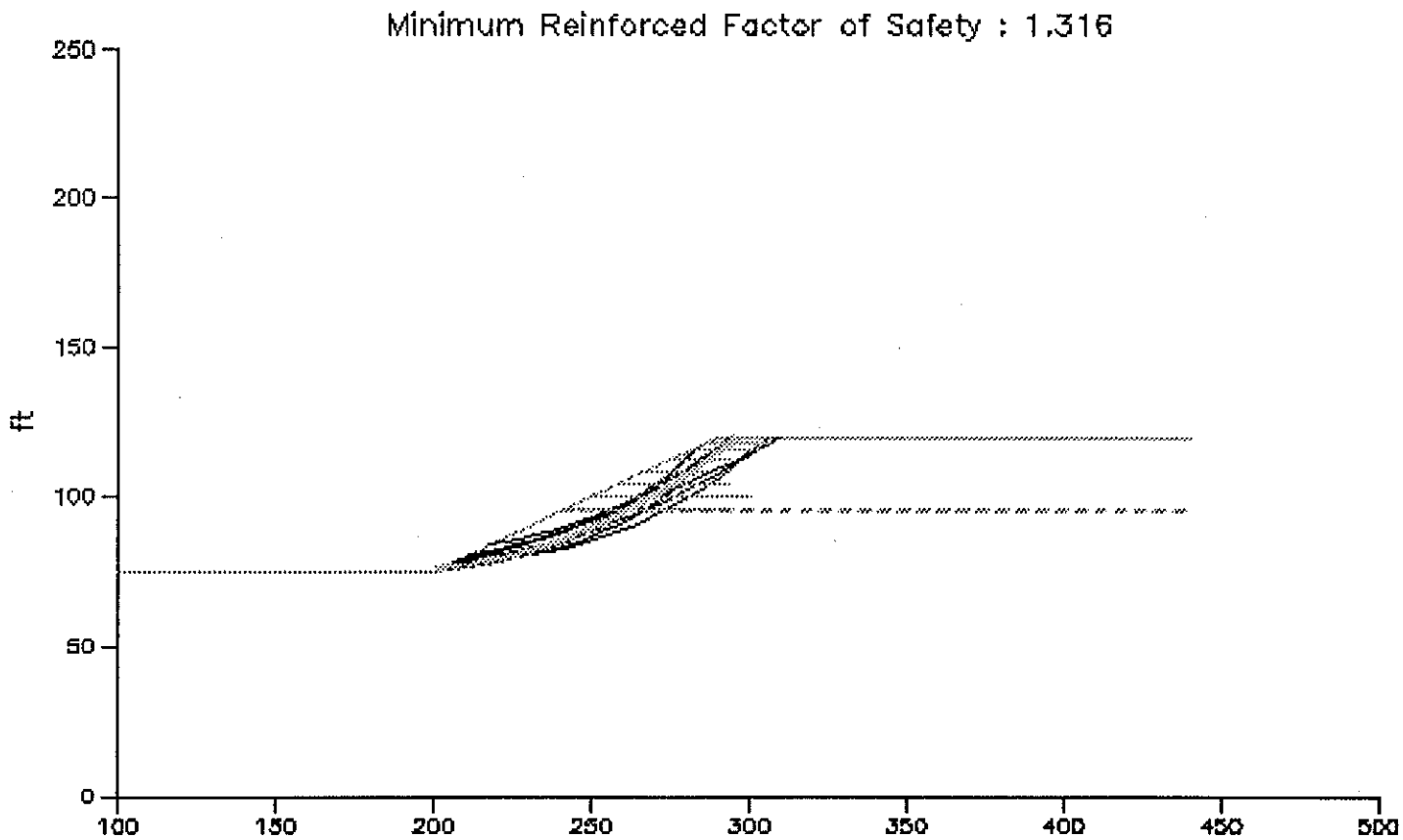
NOTE: The total required length of reinforcement per unit width of slope results from the minumum lengths of reinforcement at each height necessary to obtain the required factor of safety. This value is provided to help compare reinforcement requirements from alternate analyses. Since additional reinforcement will be required for overlaps, face wraps and contruction tolerances, this value should not be used directly to estimate construction quatities.

WARNING: Vertical spacing between some reinforcement layers

exceeds the recommended maximum value of 2 ft. Add intermediate reinforcement as necessary to provide local stability of the slope face. Intermediate reinforcement needs not be as long or as strong as primary reinforcement. See Thielen and Collin (1993) for assistance.

Title : Full Slope
Description : Run F6b

Reinforcement Analysis – Most Critical Surfaces

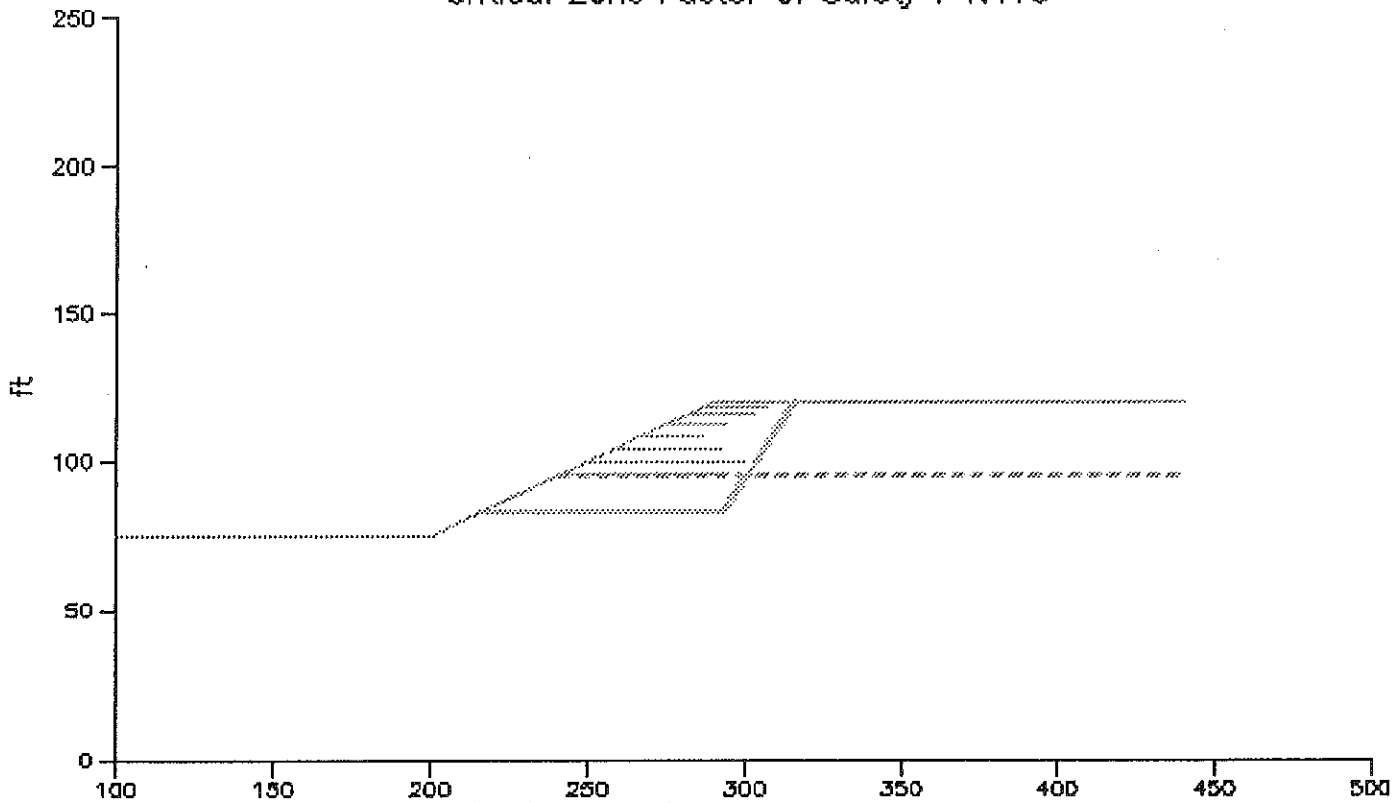


Press any key to continue or ESC to cancel ...

Title : Full Slope
Description : Run F6b

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 1.416



Press any key to continue or ESC to cancel ...

```
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*****                              R S S                                *****
*****                   Reinforced Slope Stability                      *****
*****                                                                   ***
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*****************************************************************************


         File : C:\RSS\F6b.dat
         Date : Wed 10-11-:0, 08:53:47
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run F6b
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
                   Right Termination Point : 330.00 ft
                         Minimum Elevation : 0.00 ft
                            Segment Length : 5.00 ft
                      Positive Angle Limit : 45.00 deg
                      Negative Angle Limit : 0.00 deg
```

```
*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       *****
  *****************************************************************************
```

Data for Generating Rankine Block Surfaces

```
        Number of Trial Surfaces : 100
                 Number of Boxes : 2
                  Segment Length : 45.00 ft
```

Data for Reinforcement Analysis

```
          Lowest Elevation for Reinforcement : 96.00 ft
         Highest Elevation for Reinforcement : 118.00 ft
                   Minimum Embedment Length : 3.00 ft
                            Strength Option : Long Term Strength
                           Extension Factor : 1.00
                           Reduction Factor : 3.15
                   Pullout Factor of Safety : 1.50
                  Pullout Resistance Factor : 0.54
                      Embedded Scale Factor : 0.67
              Slope Coefficient of Friction : 0.31
          Foundation Coefficient of Friction : 0.35
```

```
*****************************************************************************
*****                          RESULTS                                  *****
*****************************************************************************
```

Critical Surface

```
        Factor of Safety : 1.316
        Circle Center X : 181.96 ft
        Circle Center Y : 238.25 ft
        Circle Radius : 163.86 ft
```

CRITICAL ZONE SEARCH IN BOTTOM

```
        Critical Zone Factor of Safety : 1.445
```

ITICAL ZONE SEARCH IN MIDDLE

```
        Critical Zone Factor of Safety : 1.416
```

CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 1.431

```
*****************************************************************************
*****                              R S S                                *****
*****                    Reinforced Slope Stability                     *****
*****                                                                   *****
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*****************************************************************************
```

File : C:\RSS\F6b.dat
Date : Wed 10-11-:0, 08:54:20
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run F6b
Remarks :

```
*****************************************************************************
*****                              INPUT DATA                           *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 7
Number of Top Boundaries : 5

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	75.00	200.00	75.00	1
2	200.00	75.00	240.00	95.00	1
3	240.00	95.00	241.00	95.50	4
4	241.00	95.50	290.00	120.00	2
5	290.00	120.00	440.00	120.00	2
6	241.00	95.50	440.00	95.50	4
7	240.00	95.00	440.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

```
*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       *****
```

****

Data for Generating Circular Surfaces

Number of Initiation Points	: 10
Number of Surfaces From Each Point	: 10
Left Initiation Point	: 201.00 ft
Right Initiation Point	: 250.00 ft
Left Termination Point	: 270.00 ft
Right Termination Point	: 330.00 ft
Minimum Elevation	: 0.00 ft
Segment Length	: 5.00 ft
Positive Angle Limit	: 45.00 deg
Negative Angle Limit	: 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces	: 100
Number of Boxes	: 2
Segment Length	: 45.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	201.00	75.00	202.00	75.00	0.00
2	244.90	75.00	397.30	75.00	0.00

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement	: 96.00 ft
Highest Elevation for Reinforcement	: 118.00 ft
Minimum Embedment Length	: 3.00 ft
Strength Option	: Long Term Strength
Extension Factor	: 1.00
Reduction Factor	: 3.15
Pullout Factor of Safety	: 1.50
Pullout Resistance Factor	: 0.54
Embedded Scale Factor	: 0.67
Slope Coefficient of Friction	: 0.31
Foundation Coefficient of Friction	: 0.35

Layer No	Elevation (ft)	Length (ft)	Long Term Strength (lb/ft)	Ultimate Strength (lb/ft)
1	96.00	50.00	1000.00	0.00
2	100.00	50.00	1000.00	0.00

3	104.00	35.00	1000.00	0.00
4	108.00	20.00	500.00	0.00
5	112.00	20.00	500.00	0.00
6	116.00	20.00	500.00	0.00
7	118.00	20.00	500.00	0.00

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***** RESULTS *****
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Surface No. : 1
Factor of Safety : 1.316
Circle Center X : 181.96 ft
Circle Center Y : 238.25 ft
Circle Radius : 163.86 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	203.48	75.83	4.96	564.4	0.0	0.0	538.0	236.0
2	1	208.42	76.56	4.93	1635.4	0.0	0.0	1546.2	678.3
3	1	213.34	77.44	4.91	2594.4	0.0	0.0	2434.9	1068.1
4	1	218.24	78.48	4.88	3439.2	0.0	0.0	3207.3	1407.0
5	1	223.09	79.66	4.84	4168.7	0.0	0.0	3866.7	1696.2
6	1	227.91	80.99	4.80	4782.3	0.0	0.0	4416.2	1937.3
7	1	232.69	82.46	4.75	5280.2	0.0	0.0	4859.0	2131.5
8	1	237.42	84.08	4.70	5663.1	0.0	0.0	5198.1	2280.3
9	1	239.89	84.97	0.23	283.3	0.0	0.0	259.6	113.9
10	1	240.50	85.21	1.00	1254.5	0.0	0.0	1149.6	504.3
11	1	242.71	86.09	3.42	4394.9	0.0	0.0	4027.6	1766.8
12	1	246.72	87.75	4.59	6091.2	0.0	0.0	5578.2	2447.0
13	1	251.28	89.80	4.53	6141.5	0.0	0.0	5625.7	2467.9
14	1	255.78	91.98	4.46	6087.1	0.0	0.0	5582.5	2448.9
15	1	259.75	94.05	3.48	4712.8	0.0	0.0	4331.3	1900.0
16	4	261.95	95.25	0.91	1219.5	0.0	0.0	1266.3	223.9
17	4	262.41	95.50	0.01	13.0	0.0	0.0	13.6	2.4
18	2	264.57	96.76	4.31	5668.9	0.0	0.0	5354.1	2072.8
19	2	268.84	99.34	4.24	5341.4	0.0	0.0	5072.0	1963.6
20	2	273.04	102.06	4.16	4916.7	0.0	0.0	4698.4	1818.9
21	2	277.15	104.90	4.07	4414.4	0.0	0.0	4249.4	16[illegible]1
22	2	281.18	107.86	3.98	3841.6	0.0	0.0	3728.9	144[illegible].6
23	2	285.11	110.95	3.88	3205.9	0.0	0.0	3141.0	1216.0
24	2	288.53	113.80	2.95	2014.7	0.0	0.0	1994.4	772.1
25	2	290.42	115.43	0.84	478.7	0.0	0.0	473.9	183.5
26	2	292.68	117.48	3.69	1160.8	0.0	0.0	1162.3	450.0
27	2	294.95	119.58	0.85	44.2	0.0	0.0	44.8	17.4

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-89413.10	89413.10	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-35878.75	74716.97	82884.92	115.65
Shear Force, lb :	31222.03	14696.12	34507.84	25.21

Surface No. : 2
Factor of Safety : 1.328
Circle Center X : 172.87 ft
Circle Center Y : 259.74 ft
Circle Radius : 184.60 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.90	78.71	4.90	452.4	0.0	0.0	424.5	184.5
2	1	213.79	79.75	4.88	1304.6	0.0	0.0	1217.6	529.3
3	1	218.65	80.93	4.84	2056.4	0.0	0.0	1910.1	830.3
4	1	223.47	82.23	4.81	2707.1	0.0	0.0	2504.6	1088.8
5	1	228.26	83.67	4.77	3256.9	0.0	0.0	3003.5	1305.6
6	1	233.01	85.23	4.73	3706.2	0.0	0.0	3409.4	1482.1
7	1	237.69	86.92	4.63	4007.2	0.0	0.0	3679.8	1599.6
8	1	240.03	87.79	0.05	48.8	0.0	0.0	44.8	19.5
9	1	240.53	88.00	0.95	859.3	0.0	0.0	788.3	342.7
10	1	242.84	88.94	3.69	3448.6	0.0	0.0	3163.6	1375.2
11	1	246.98	90.69	4.58	4463.7	0.0	0.0	4093.7	1779.5
12	1	251.53	92.76	4.52	4525.9	0.0	0.0	4152.5	1805.1
13	1	254.95	94.41	2.33	2348.8	0.0	0.0	2157.6	937.9
14	4	256.61	95.25	0.99	998.0	0.0	0.0	1027.0	179.9
15	2	257.68	95.79	1.14	1150.5	0.0	0.0	1079.7	414.2
16	2	260.45	97.26	4.40	4381.2	0.0	0.0	4124.3	1582.2
17	2	264.82	99.69	4.34	4181.5	0.0	0.0	3951.6	1515.9
18	2	269.12	102.24	4.27	3902.3	0.0	0.0	3704.8	1421.3
19	2	273.35	104.91	4.19	3548.2	0.0	0.0	3386.7	1299.3
20	2	277.51	107.69	4.12	3124.1	0.0	0.0	3000.3	1151.0
1	2	281.59	110.58	4.04	2635.5	0.0	0.0	2548.6	977.7
2	2	285.59	113.58	3.96	2087.9	0.0	0.0	2034.7	780.6
23	2	288.78	116.09	2.43	1002.5	0.0	0.0	985.3	378.0
24	2	290.72	117.67	1.44	419.9	0.0	0.0	412.7	158.3
25	2	292.45	119.13	2.02	219.1	0.0	0.0	217.4	83.4

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-60836.76	60836.76	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-24827.16	50861.89	56597.87	116.02
Shear Force, lb :	20778.24	9974.87	23048.50	25.64

Surface No. : 3
Factor of Safety : 1.329
Circle Center X : 191.30 ft
Circle Center Y : 213.30 ft
Circle Radius : 138.14 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	203.49	75.72	4.98	637.8	0.0	0.0	616.5	267.8
2	1	208.46	76.25	4.96	1847.1	0.0	0.0	1765.5	766.9
3	1	213.41	76.96	4.94	2925.3	0.0	0.0	2768.5	1202.6
4	1	218.33	77.85	4.90	3868.6	0.0	0.0	3630.2	1576.9
5	1	223.21	78.92	4.86	4674.2	0.0	0.0	4354.9	1891.7
6	1	228.06	80.16	4.82	5340.7	0.0	0.0	4947.2	2149.0
7	1	232.85	81.58	4.77	5867.6	0.0	0.0	5411.2	2350.5
8	1	237.59	83.17	4.71	6255.9	0.0	0.0	5751.3	2498.3
9	1	239.97	84.02	0.06	76.8	0.0	0.0	70.5	30.6
10	1	240.50	84.23	1.00	1377.6	0.0	0.0	1264.2	549.1
11	1	242.80	85.14	3.59	5053.2	0.0	0.0	4637.1	2014.3
12	1	246.88	86.86	4.58	6625.7	0.0	0.0	6077.2	2639.8
13	1	251.42	88.95	4.50	6614.6	0.0	0.0	6071.9	2637.5
14	1	255.88	91.21	4.42	6479.6	0.0	0.0	5960.7	2589.2
15	1	260.26	93.63	4.33	6227.2	0.0	0.0	5748.2	2496.9
16	1	262.52	94.94	0.20	279.2	0.0	0.0	258.9	112.5
17	4	263.02	95.25	0.80	1125.0	0.0	0.0	1196.0	209.4
18	2	265.04	96.51	3.24	4460.6	0.0	0.0	4243.7	1626.8
19	2	268.73	98.93	4.14	5400.7	0.0	0.0	5178.2	1985.1
20	2	272.82	101.81	4.04	4844.5	0.0	0.0	4687.5	1797.0
21	2	276.80	104.83	3.93	4206.3	0.0	0.0	4113.1	15[illegible]3
22	2	280.67	108.00	3.81	3497.1	0.0	0.0	3460.8	13[illegible].7
23	2	284.42	111.30	3.69	2728.6	0.0	0.0	2736.9	1049.2
24	2	288.05	114.74	3.57	1913.3	0.0	0.0	1948.1	746.8
25	2	289.92	116.57	0.16	69.3	0.0	0.0	71.8	27.5
26	2	291.58	118.33	3.16	660.4	0.0	0.0	683.6	262.1

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-93056.96	93056.96	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-37492.47	77775.52	86340.70	115.74
Shear Force, lb :	32425.88	15281.44	35846.34	25.23

Surface No. : 4
Factor of Safety : 1.352
Circle Center X : 177.44 ft
Circle Center Y : 293.47 ft
Circle Radius : 217.19 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.92	78.58	4.95	540.8	0.0	0.0	514.4	219.7
2	1	213.86	79.37	4.93	1578.7	0.0	0.0	1492.9	637.5
3	1	218.78	80.26	4.91	2532.0	0.0	0.0	2382.0	1017.2
4	1	223.67	81.27	4.89	3399.8	0.0	0.0	3183.4	1359.4
5	1	228.54	82.39	4.86	4181.1	0.0	0.0	3898.9	1664.9
6	1	233.39	83.62	4.83	4875.7	0.0	0.0	4530.2	1934.5
7	1	237.90	84.88	4.19	4757.7	0.0	0.0	4407.2	1882.0
8	1	240.30	85.58	0.61	725.4	0.0	0.0	672.0	287.0
9	1	240.80	85.73	0.39	476.4	0.0	0.0	440.2	188.0
10	1	243.19	86.48	4.37	5527.3	0.0	0.0	5107.3	2180.9
11	1	247.74	87.98	4.73	6437.8	0.0	0.0	5936.8	2535.2
12	1	252.45	89.66	4.69	6786.1	0.0	0.0	6249.0	2668.5
13	1	257.12	91.44	4.65	7049.6	0.0	0.0	6485.8	2769.6
14	1	261.75	93.32	4.61	7229.8	0.0	0.0	6649.0	2839.3
15	1	264.84	94.65	1.57	2512.2	0.0	0.0	2310.8	986.8
16	4	266.19	95.25	1.11	1789.3	0.0	0.0	1820.5	313.3
17	2	267.68	95.92	1.87	3026.6	0.0	0.0	2837.5	1069.3
18	2	270.87	97.42	4.51	7346.4	0.0	0.0	6899.0	2599.9
19	2	275.36	99.62	4.46	7287.0	0.0	0.0	6858.3	2584.6
20	2	279.80	101.92	4.41	7152.2	0.0	0.0	6750.0	2543.8
1	2	284.18	104.33	4.35	6944.9	0.0	0.0	6575.9	2478.2
2	2	288.18	106.64	3.64	5665.7	0.0	0.0	5385.3	2029.5
23	2	290.33	107.92	0.65	988.7	0.0	0.0	939.8	354.2
24	2	292.77	109.44	4.24	5590.0	0.0	0.0	5336.7	2011.2
25	2	296.98	112.15	4.17	4097.1	0.0	0.0	3930.7	1481.3
26	2	301.12	114.95	4.11	2595.5	0.0	0.0	2503.8	943.6
27	2	305.20	117.84	4.04	1090.5	0.0	0.0	1058.4	398.9
28	2	307.67	119.66	0.90	38.7	0.0	0.0	37.8	14.2

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-112222.87	112222.87	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-41305.36	95975.25	104486.27	113.29
Shear Force, lb :	38413.31	16247.62	41708.12	22.93

Surface No. : 5
Factor of Safety : 1.356
Circle Center X : 107.00 ft
Circle Center Y : 472.78 ft
Circle Radius : 406.90 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.86	78.85	4.84	353.6	0.0	0.0	329.0	140.1
2	1	213.70	80.13	4.83	1037.0	0.0	0.0	963.2	410.1
3	1	218.51	81.47	4.81	1675.2	0.0	0.0	1553.4	661.4
4	1	223.31	82.87	4.79	2268.2	0.0	0.0	2100.3	894.2
5	1	228.10	84.33	4.77	2816.2	0.0	0.0	2604.2	1108.7
6	1	232.86	85.85	4.75	3319.1	0.0	0.0	3065.7	1305.2
7	1	237.61	87.42	4.74	3777.2	0.0	0.0	3485.4	1483.9
8	1	239.99	88.23	0.03	22.1	0.0	0.0	20.4	8.7
9	1	240.50	88.41	1.00	855.0	0.0	0.0	788.3	335.6
10	1	242.84	89.24	3.69	3313.6	0.0	0.0	3054.9	1300.6
11	1	247.04	90.75	4.69	4559.9	0.0	0.0	4201.0	1788.6
12	1	251.72	92.50	4.67	4885.0	0.0	0.0	4498.0	1915.0
13	1	256.10	94.19	4.09	4526.4	0.0	0.0	4166.1	1773.7
14	4	258.43	95.11	0.56	640.1	0.0	0.0	644.5	110.6
15	4	259.05	95.36	0.68	778.5	0.0	0.0	785.9	134.9
16	2	261.36	96.31	3.95	4626.1	0.0	0.0	4332.3	1627.8
17	2	265.64	98.09	4.60	5599.7	0.0	0.0	5246.4	1971.2
18	2	270.23	100.07	4.58	5752.5	0.0	0.0	5392.6	2026.2
19	2	274.80	102.10	4.56	5863.4	0.0	0.0	5500.6	2066.8
20	2	279.34	104.19	4.53	5933.0	0.0	0.0	5570.8	2093.1
21	2	283.86	106.34	4.50	5961.8	0.0	0.0	5603.7	21 5
22	2	288.05	108.39	3.89	5174.8	0.0	0.0	4869.7	18 .7
23	2	290.29	109.51	0.58	765.2	0.0	0.0	720.1	270.5
24	2	292.81	110.79	4.45	5119.4	0.0	0.0	4824.1	1812.6
25	2	297.24	113.10	4.42	3810.3	0.0	0.0	3595.8	1351.1
26	2	301.65	115.47	4.39	2487.3	0.0	0.0	2351.2	883.4
27	2	306.02	117.89	4.36	1151.9	0.0	0.0	1090.8	409.9
28	2	308.97	119.55	1.54	85.8	0.0	0.0	81.5	30.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-87158.51	87158.51	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-31584.01	74897.16	81284.28	112.87
Shear Force, lb :	29326.91	12261.36	31786.93	22.69

Surface No. : 6
Factor of Safety : 1.359
Circle Center X : 190.31 ft
Circle Center Y : 239.82 ft
Circle Radius : 158.48 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	219.79	84.13	4.91	468.6	0.0	0.0	441.4	187.5
2	1	224.69	85.14	4.88	1344.8	0.0	0.0	1258.7	534.7
3	1	229.55	86.30	4.84	2103.6	0.0	0.0	1958.6	832.0
4	1	234.37	87.61	4.80	2744.6	0.0	0.0	2544.3	1080.9
5	1	238.39	88.83	3.23	2161.8	0.0	0.0	1997.5	848.5
6	1	240.50	89.52	1.00	716.6	0.0	0.0	662.1	281.3
7	1	241.27	89.77	0.53	389.2	0.0	0.0	359.6	152.8
8	1	243.88	90.70	4.71	3673.6	0.0	0.0	3386.6	1438.7
9	1	248.56	92.46	4.65	3964.1	0.0	0.0	3649.7	1550.4
10	1	252.76	94.19	3.75	3369.9	0.0	0.0	3101.7	1317.6
11	4	255.06	95.18	0.84	771.7	0.0	0.0	782.8	134.0
12	4	255.62	95.43	0.29	268.3	0.0	0.0	274.3	47.0
13	2	257.88	96.50	4.23	3940.9	0.0	0.0	3702.2	1388.0
14	2	262.23	98.63	4.46	4170.6	0.0	0.0	3930.0	1473.4
15	2	266.65	100.96	4.38	4030.5	0.0	0.0	3813.4	1429.7
16	2	270.99	103.44	4.30	3794.0	0.0	0.0	3607.9	1352.6
17	2	275.25	106.05	4.22	3467.1	0.0	0.0	3317.3	1243.7
18	2	279.43	108.80	4.13	3056.2	0.0	0.0	2945.1	1104.1
19	2	283.52	111.68	4.04	2568.6	0.0	0.0	2495.6	935.6
20	2	287.51	114.68	3.95	2011.8	0.0	0.0	1972.9	739.6
1	2	289.74	116.43	0.51	220.3	0.0	0.0	218.3	81.8
2	2	291.67	118.02	3.34	825.5	0.0	0.0	818.0	306.7
23	2	293.68	119.70	0.67	25.0	0.0	0.0	25.1	9.4

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-50087.14	50087.14	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-20446.24	42199.59	46891.94	115.85
Shear Force, lb :	16537.43	7887.55	18322.12	25.50

Surface No. : 7
Factor of Safety : 1.372
Circle Center X : 204.60 ft
Circle Center Y : 176.13 ft
Circle Radius : 97.92 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.94	78.33	5.00	710.5	0.0	0.0	698.1	293.7
2	1	213.93	78.68	4.98	2041.8	0.0	0.0	1971.7	829.4
3	1	218.89	79.29	4.95	3190.1	0.0	0.0	3036.2	1277.2
4	1	223.81	80.14	4.90	4146.5	0.0	0.0	3900.3	1640.8
5	1	228.69	81.25	4.85	4905.2	0.0	0.0	4572.5	1923.5
6	1	233.50	82.60	4.78	5463.7	0.0	0.0	5060.8	2128.9
7	1	237.94	84.09	4.11	5077.6	0.0	0.0	4685.6	1971.1
8	1	240.29	84.95	0.58	745.3	0.0	0.0	687.8	289.3
9	1	240.79	85.15	0.42	532.1	0.0	0.0	490.4	206.3
10	1	243.09	86.12	4.19	5454.9	0.0	0.0	5028.1	2115.2
11	1	247.43	88.11	4.50	5963.1	0.0	0.0	5504.8	2315.7
12	1	251.87	90.41	4.38	5762.0	0.0	0.0	5341.0	2246.8
13	1	256.19	92.93	4.25	5396.9	0.0	0.0	5036.4	2118.7
14	1	258.85	94.62	1.08	1325.8	0.0	0.0	1249.0	525.4
15	4	259.75	95.25	0.72	868.0	0.0	0.0	945.1	160.2
16	2	261.27	96.30	2.31	2690.3	0.0	0.0	2603.4	966.5
17	2	264.40	98.63	3.96	4242.5	0.0	0.0	4165.4	1546.4
18	2	268.28	101.78	3.80	3493.4	0.0	0.0	3489.9	1295.6
19	2	271.99	105.13	3.63	2660.1	0.0	0.0	2711.9	1006.8
20	2	275.53	108.66	3.45	1767.7	0.0	0.0	1844.8	684.9
21	2	278.88	112.37	3.26	843.1	0.0	0.0	903.6	3[illegible]5
22	2	281.13	115.07	1.25	77.0	0.0	0.0	85.0	3[illegible].6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-67357.53	67357.53	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-27198.68	56557.80	62757.89	115.68
Shear Force, lb :	23005.77	10799.73	25414.56	25.15

Surface No. : 8
Factor of Safety : 1.376
Circle Center X : 208.94 ft
Circle Center Y : 182.99 ft
Circle Radius : 104.80 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.94	78.22	5.00	781.2	0.0	0.0	781.2	327.9
2	1	213.94	78.34	4.99	2265.7	0.0	0.0	2223.7	933.2
3	1	218.93	78.70	4.98	3586.4	0.0	0.0	3463.7	1453.6
4	1	223.89	79.29	4.95	4733.0	0.0	0.0	4509.2	1892.4
5	1	228.82	80.13	4.91	5697.5	0.0	0.0	5367.6	2252.7
6	1	233.70	81.19	4.86	6474.6	0.0	0.0	6046.2	2537.4
7	1	238.07	82.35	3.87	5648.0	0.0	0.0	5240.3	2199.2
8	1	240.46	83.06	0.93	1413.7	0.0	0.0	1311.7	550.5
9	1	240.96	83.21	0.07	109.2	0.0	0.0	100.9	42.3
10	1	243.33	84.03	4.65	7349.9	0.0	0.0	6790.9	2850.0
11	1	247.97	85.76	4.64	7669.3	0.0	0.0	7072.7	2968.2
12	1	252.57	87.74	4.55	7698.1	0.0	0.0	7102.0	2980.5
13	1	257.06	89.92	4.44	7553.3	0.0	0.0	6987.0	2932.3
14	1	261.44	92.33	4.33	7245.5	0.0	0.0	6735.7	2826.8
15	1	264.71	94.29	2.21	3601.4	0.0	0.0	3372.5	1415.3
16	4	266.20	95.25	0.78	1245.9	0.0	0.0	1336.6	226.1
17	2	267.20	95.89	1.22	1940.4	0.0	0.0	1863.6	690.2
18	2	269.84	97.74	4.07	6194.9	0.0	0.0	6020.4	2229.8
19	2	273.84	100.74	3.93	5484.5	0.0	0.0	5406.3	2002.3
20	2	277.69	103.93	3.77	4675.6	0.0	0.0	4686.6	1735.8
1	2	281.38	107.30	3.61	3788.8	0.0	0.0	3871.9	1434.1
.2	2	284.91	110.84	3.44	2846.6	0.0	0.0	2973.8	1101.4
23	2	288.27	114.55	3.27	1872.3	0.0	0.0	2005.3	742.7
24	2	289.95	116.50	0.10	44.0	0.0	0.0	48.4	17.9
25	2	291.34	118.28	2.69	575.9	0.0	0.0	634.2	234.9

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-100495.69	100495.69	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-40185.96	84690.73	93741.30	115.38
Shear Force, lb :	34234.59	15804.96	37706.81	24.78

Surface No. : 9
Factor of Safety : 1.382
Circle Center X : 199.70 ft
Circle Center Y : 195.57 ft
Circle Radius : 115.27 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	214.37	81.26	4.96	571.4	0.0	0.0	546.7	228.5
2	1	219.31	82.01	4.93	1632.0	0.0	0.0	1544.7	645.4
3	1	224.22	82.96	4.89	2531.8	0.0	0.0	2375.0	992.4
4	1	229.08	84.13	4.83	3267.6	0.0	0.0	3044.0	1271.9
5	1	233.88	85.51	4.78	3838.2	0.0	0.0	3557.4	1486.5
6	1	238.14	86.92	3.73	3331.2	0.0	0.0	3077.7	1286.0
7	1	240.49	87.77	0.98	913.3	0.0	0.0	843.8	352.6
8	1	240.99	87.95	0.02	21.7	0.0	0.0	20.0	8.4
9	1	243.30	88.89	4.61	4467.4	0.0	0.0	4122.1	1722.4
10	1	247.88	90.88	4.54	4576.8	0.0	0.0	4225.7	1765.7
11	1	252.37	93.06	4.45	4514.5	0.0	0.0	4178.4	1745.9
12	1	255.29	94.60	1.39	1397.9	0.0	0.0	1299.5	543.0
13	4	256.42	95.25	0.88	873.2	0.0	0.0	917.0	154.4
14	2	257.90	96.09	2.08	2039.4	0.0	0.0	1939.7	715.3
15	2	261.06	98.01	4.23	3975.2	0.0	0.0	3812.0	1405.7
16	2	265.23	100.77	4.11	3520.7	0.0	0.0	3410.6	1257.7
17	2	269.28	103.70	3.99	2960.5	0.0	0.0	2903.0	1070.5
18	2	273.20	106.80	3.85	2309.7	0.0	0.0	2297.2	847.1
19	2	276.98	110.07	3.71	1584.5	0.0	0.0	1601.9	590.7
20	2	280.61	113.50	3.56	802.6	0.0	0.0	826.6	304.8
21	2	283.21	116.13	1.63	95.7	0.0	0.0	100.6	[illegible]

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-49225.33	49225.33	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-20207.69	41379.60	46050.21	116.03
Shear Force, lb :	16421.68	7845.74	18199.65	25.54

Surface No. : 10
Factor of Safety : 1.388
Circle Center X : 206.32 ft
Circle Center Y : 216.81 ft
Circle Radius : 138.59 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.94	78.27	5.00	751.4	0.0	0.0	745.7	310.2
2	1	213.94	78.45	4.99	2194.0	0.0	0.0	2148.1	893.6
3	1	218.93	78.82	4.98	3512.8	0.0	0.0	3398.3	1413.7
4	1	223.90	79.36	4.96	4701.8	0.0	0.0	4500.7	1872.4
5	1	228.84	80.09	4.93	5756.3	0.0	0.0	5459.8	2271.4
6	1	233.76	80.99	4.90	6672.5	0.0	0.0	6279.5	2612.4
7	1	238.10	81.94	3.79	5740.3	0.0	0.0	5367.5	2233.0
8	1	240.50	82.51	1.00	1592.3	0.0	0.0	1488.9	619.4
9	1	241.04	82.64	0.07	115.2	0.0	0.0	107.7	44.8
10	1	243.48	83.32	4.82	8080.7	0.0	0.0	7517.4	3127.4
11	1	248.27	84.75	4.77	8571.2	0.0	0.0	7943.5	3304.6
12	1	253.01	86.35	4.71	8920.0	0.0	0.0	8246.3	3430.6
13	1	257.68	88.11	4.64	9129.4	0.0	0.0	8430.0	3507.0
14	1	262.29	90.05	4.57	9202.5	0.0	0.0	8498.5	3535.5
15	1	266.83	92.15	4.50	9143.6	0.0	0.0	8456.3	3517.9
16	1	270.73	94.12	3.31	6718.3	0.0	0.0	6230.3	2591.9
17	4	272.86	95.25	0.94	1905.2	0.0	0.0	1980.6	332.1
18	2	273.41	95.54	0.17	334.8	0.0	0.0	317.2	116.5
19	2	275.66	96.84	4.33	8652.9	0.0	0.0	8244.7	3027.0
20	2	279.94	99.42	4.24	8235.1	0.0	0.0	7901.2	2900.9
1	2	284.13	102.15	4.14	7713.2	0.0	0.0	7462.2	2739.7
2	2	288.10	104.95	3.80	6704.7	0.0	0.0	6549.7	2404.7
23	2	290.12	106.42	0.23	390.3	0.0	0.0	381.3	140.0
24	2	292.19	108.06	3.92	5858.1	0.0	0.0	5786.5	2124.5
25	2	296.06	111.23	3.81	4178.6	0.0	0.0	4179.7	1534.5
26	2	299.81	114.53	3.69	2522.8	0.0	0.0	2559.1	939.5
27	2	303.44	117.97	3.57	904.9	0.0	0.0	932.3	342.3
28	2	305.35	119.86	0.26	4.6	0.0	0.0	4.8	1.8

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-138207.44	138207.44	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	0.00	0.00	0.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-51498.04	118256.99	128983.58	113.53
Shear Force, lb :	46995.07	19950.44	51054.45	23.00

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.445

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.416

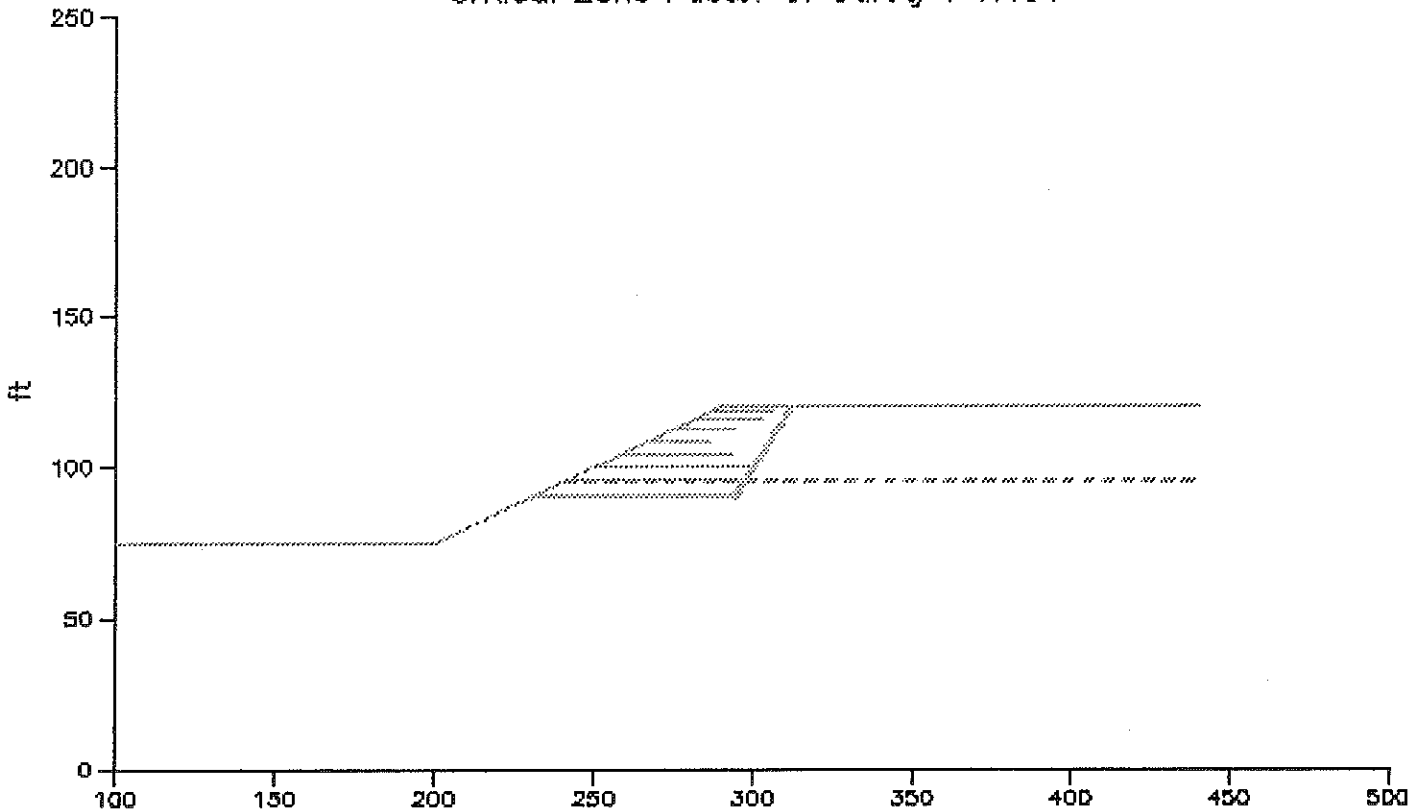
CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 1.431

Title : Full Slope
Description : Run F6b

Reinforcement Analysis – Critical Zone

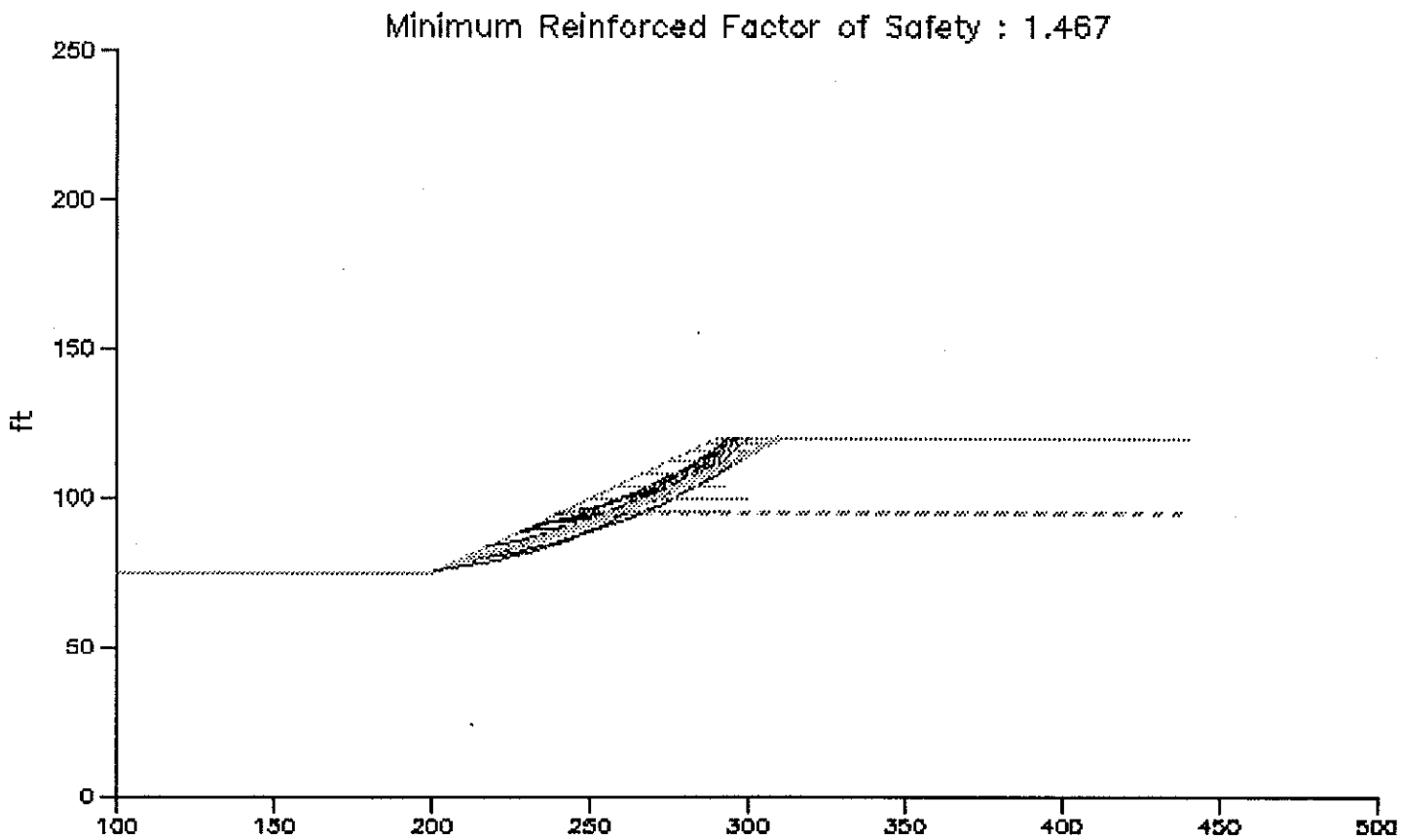
Critical Zone Factor of Safety : 1.431



Press any key to continue or ESC to cancel ...

Title : Full Slope
Description : Run F7a

Reinforcement Analysis – Most Critical Surfaces



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         File : C:\RSS\F7a.dat
         Date : Wed 10-11-:0, 09:39:47
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run F7a
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
                   Right Termination Point : 330.00 ft
                         Minimum Elevation : 0.00 ft
                            Segment Length : 5.00 ft
                      Positive Angle Limit : 45.00 deg
                      Negative Angle Limit : 0.00 deg
```

```
*****************************************************************************
*****                    TRIAL SURFACE GENERATION                       ****
*****************************************************************************
```

Data for Generating Rankine Block Surfaces

```
        Number of Trial Surfaces : 100
                 Number of Boxes : 2
                  Segment Length : 45.00 ft
```

Data for Reinforcement Analysis

```
          Lowest Elevation for Reinforcement : 96.00 ft
         Highest Elevation for Reinforcement : 118.00 ft
                   Minimum Embedment Length : 3.00 ft
                            Strength Option : Long Term Strength
                           Extension Factor : 1.00
                           Reduction Factor : 3.15
                   Pullout Factor of Safety : 1.50
                  Pullout Resistance Factor : 0.54
                      Embedded Scale Factor : 0.67
              Slope Coefficient of Friction : 0.31
          Foundation Coefficient of Friction : 0.35
```

```
*****************************************************************************
*****                          RESULTS                                  *****
*****************************************************************************
```

Critical Surface

```
        Factor of Safety : 1.467
        Circle Center X : 107.00 ft
        Circle Center Y : 472.78 ft
        Circle Radius : 406.90 ft
```

CRITICAL ZONE SEARCH IN BOTTOM

```
        Critical Zone Factor of Safety : 1.534
```

CRITICAL ZONE SEARCH IN MIDDLE

```
        Critical Zone Factor of Safety : 1.487
```

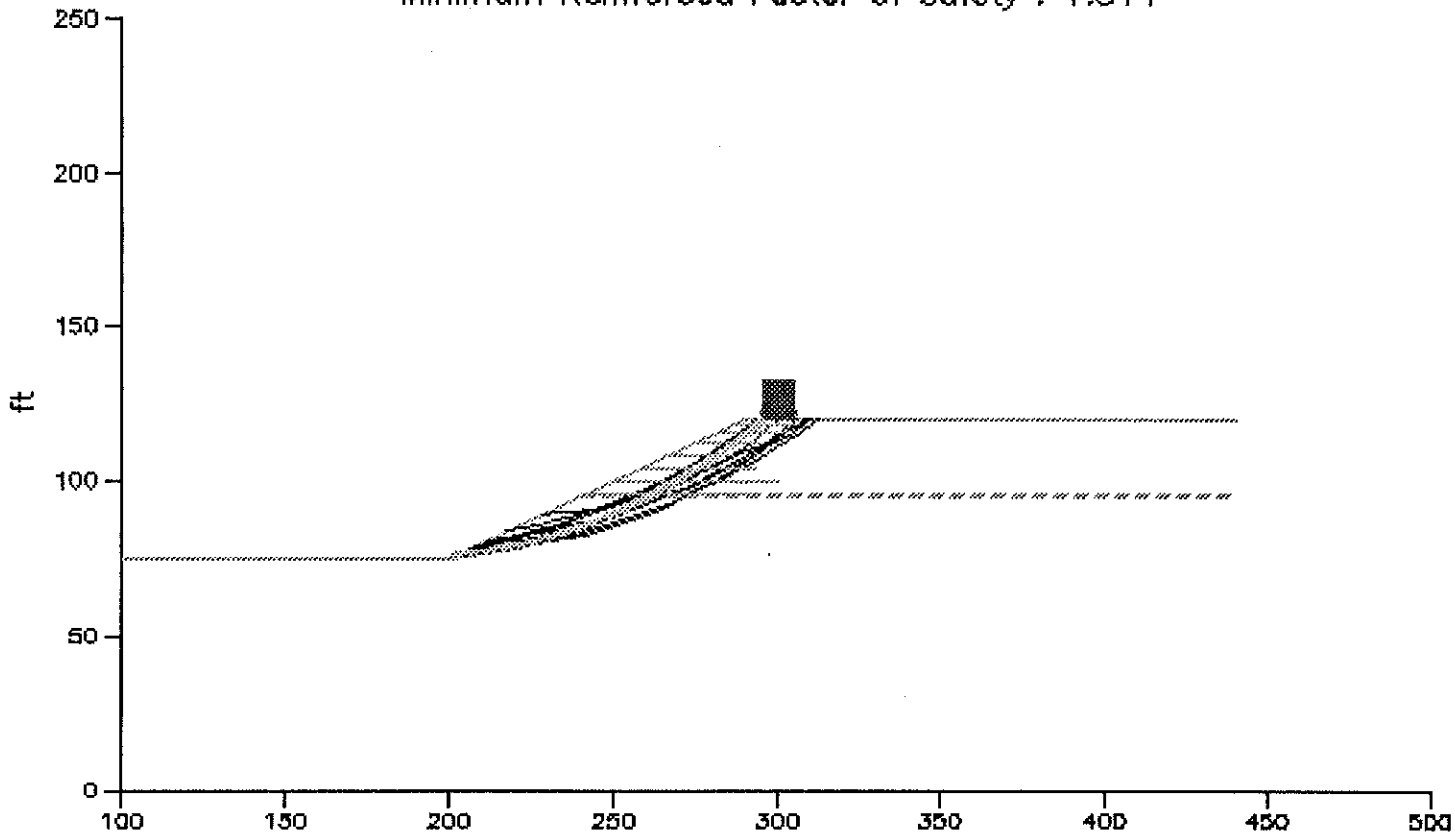
CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 1.472

Title : Full Slope
Description : Run F8a

Reinforcement Analysis – Most Critical Surfaces

Minimum Reinforced Factor of Safety : 1.314



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         File : C:\RSS\f8a.dat
         Date : Wed 10-11-:0, 10:04:36
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run F8a
      Remarks :


*****************************************************************************
*****                              INPUT DATA                           *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
```

Right Termination Point : 330.00 ft
Minimum Elevation : 0.00 ft
Segment Length : 5.00 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.314
Circle Center X : 181.96 ft
Circle Center Y : 238.25 ft
Circle Radius : 163.86 ft

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.392

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.342

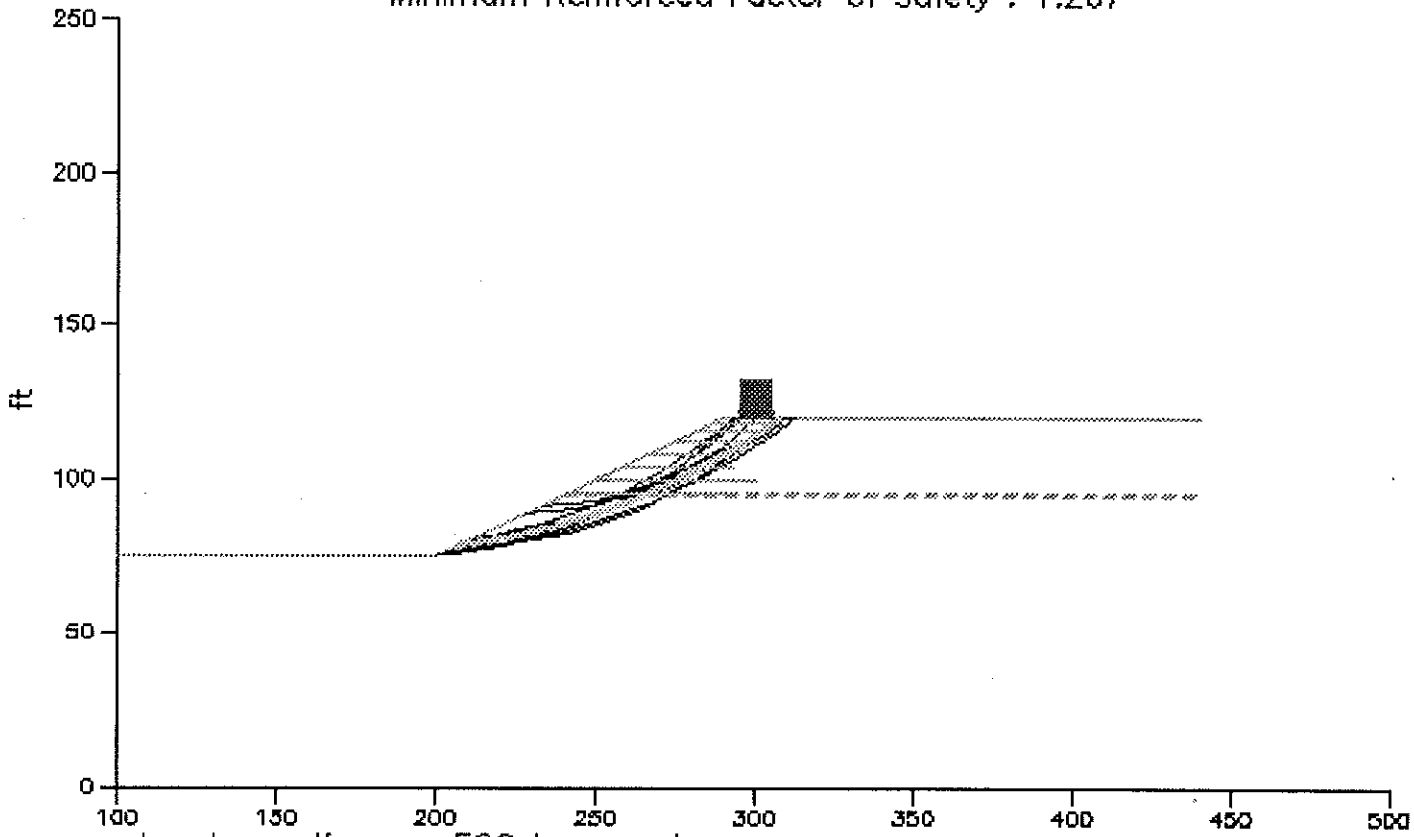
CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 1.321

Title : Full Slope
Description : Run F9a

Reinforcement Analysis – Most Critical Surfaces

Minimum Reinforced Factor of Safety : 1.287



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120

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         File : C:\RSS\f9a.dat
         Date : Wed 10-11-:0, 10:08:27
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run F9a
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
```

Right Termination Point : 330.00 ft
Minimum Elevation : 0.00 ft
Segment Length : 5.00 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.287
Circle Center X : 177.44 ft
Circle Center Y : 293.47 ft
Circle Radius : 217.19 ft

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.343

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.280

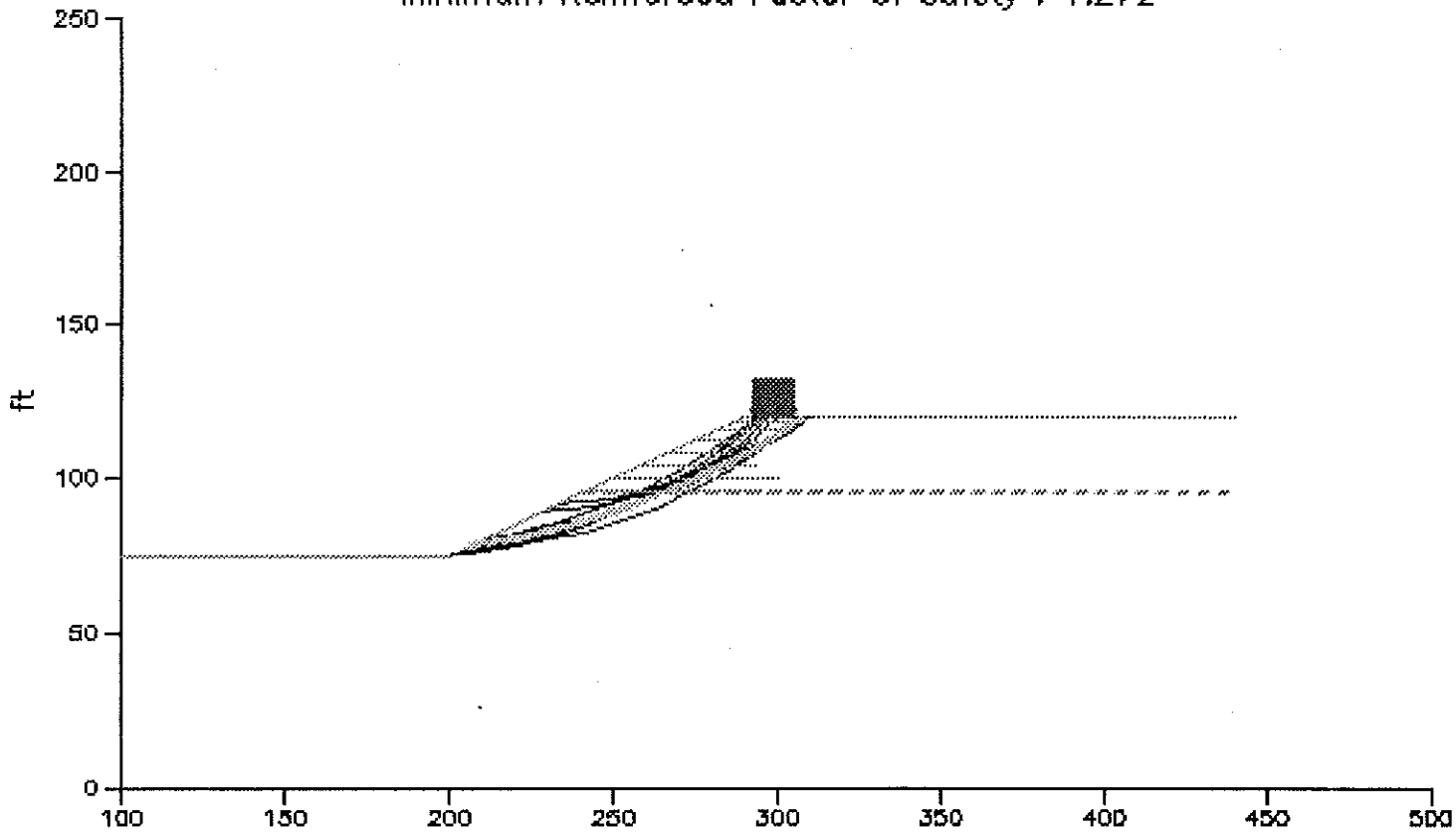
CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 1.233

Title : Full Slope
Description : Run 10a

Reinforcement Analysis – Most Critical Surfaces

Minimum Reinforced Factor of Safety : 1.272



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         File : C:\RSS\F10a.dat
         Date : Wed 10-11-:0, 10:13:55
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run 10a
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
```

Right Termination Point : 330.00 ft
Minimum Elevation : 0.00 ft
Segment Length : 5.00 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.272
Circle Center X : 177.44 ft
Circle Center Y : 293.47 ft
Circle Radius : 217.19 ft

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.343

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.258

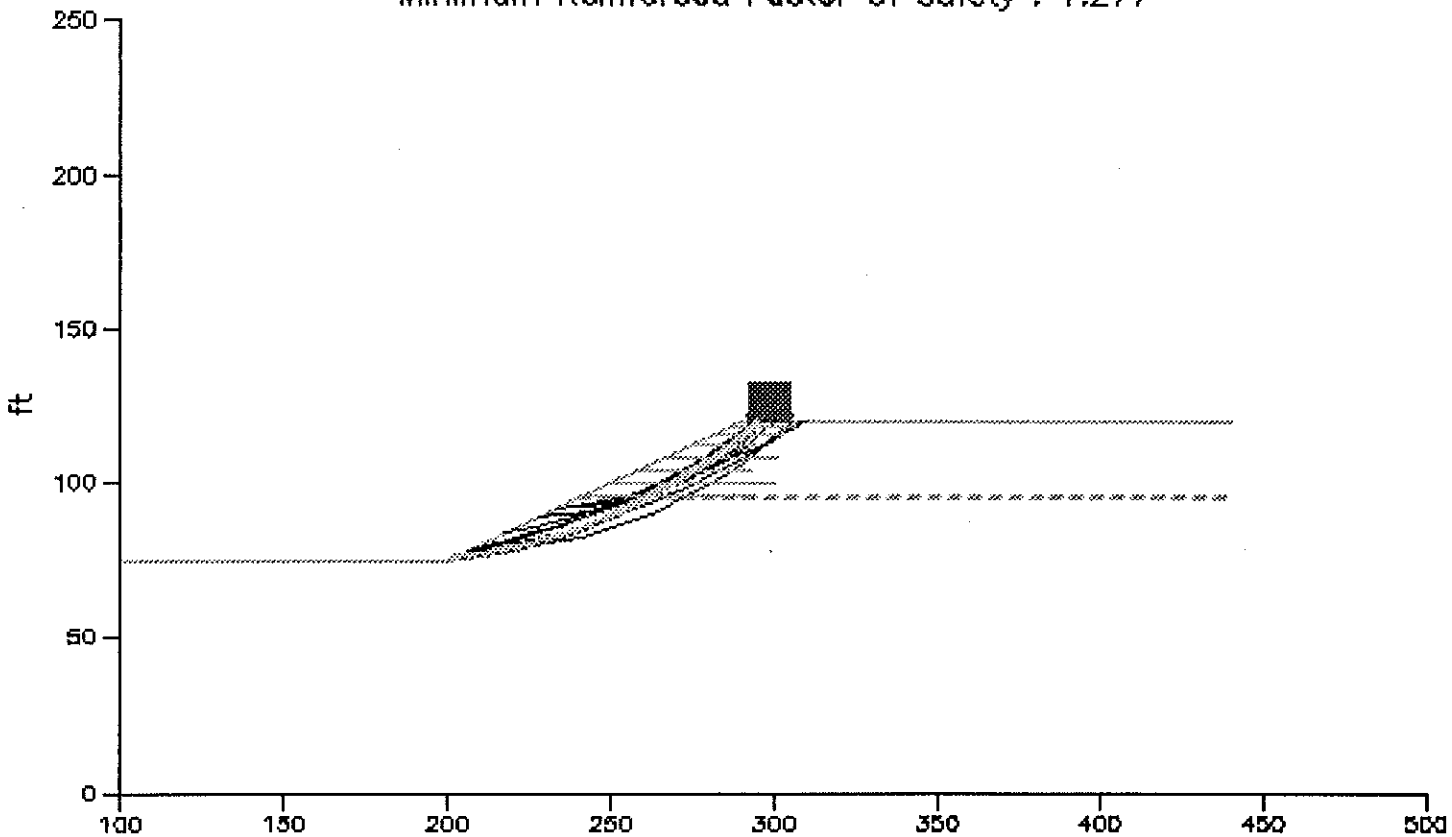
CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 1.223

Title : Full Slope
Description : Run 11a

Reinforcement Analysis – Most Critical Surfaces

Minimum Reinforced Factor of Safety : 1.277



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         File : C:\RSS\F11a.dat
         Date : Wed 10-11-:0, 10:22:25
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run 11a
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
```

Right Termination Point : 330.00 ft
Minimum Elevation : 0.00 ft
Segment Length : 5.00 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.277
Circle Center X : 181.96 ft
Circle Center Y : 238.25 ft
Circle Radius : 163.86 ft

```
*****************************************************************************
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         File : C:\RSS\F11b.dat
         Date : Wed 10-11-:0, 10:25:56
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run 11b
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
```

Right Termination Point : 330.00 ft
Minimum Elevation : 0.00 ft
Segment Length : 5.00 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.289
Circle Center X : 181.96 ft
Circle Center Y : 238.25 ft
Circle Radius : 163.86 ft

```
*****************************************************************************
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         File : C:\RSS\F11c.dat
         Date : Wed 10-11-:0, 10:28:00
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run 11c
      Remarks :


*****************************************************************************
*****                              INPUT DATA                           *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
```

Right Termination Point : 330.00 ft
Minimum Elevation : 0.00 ft
Segment Length : 5.00 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

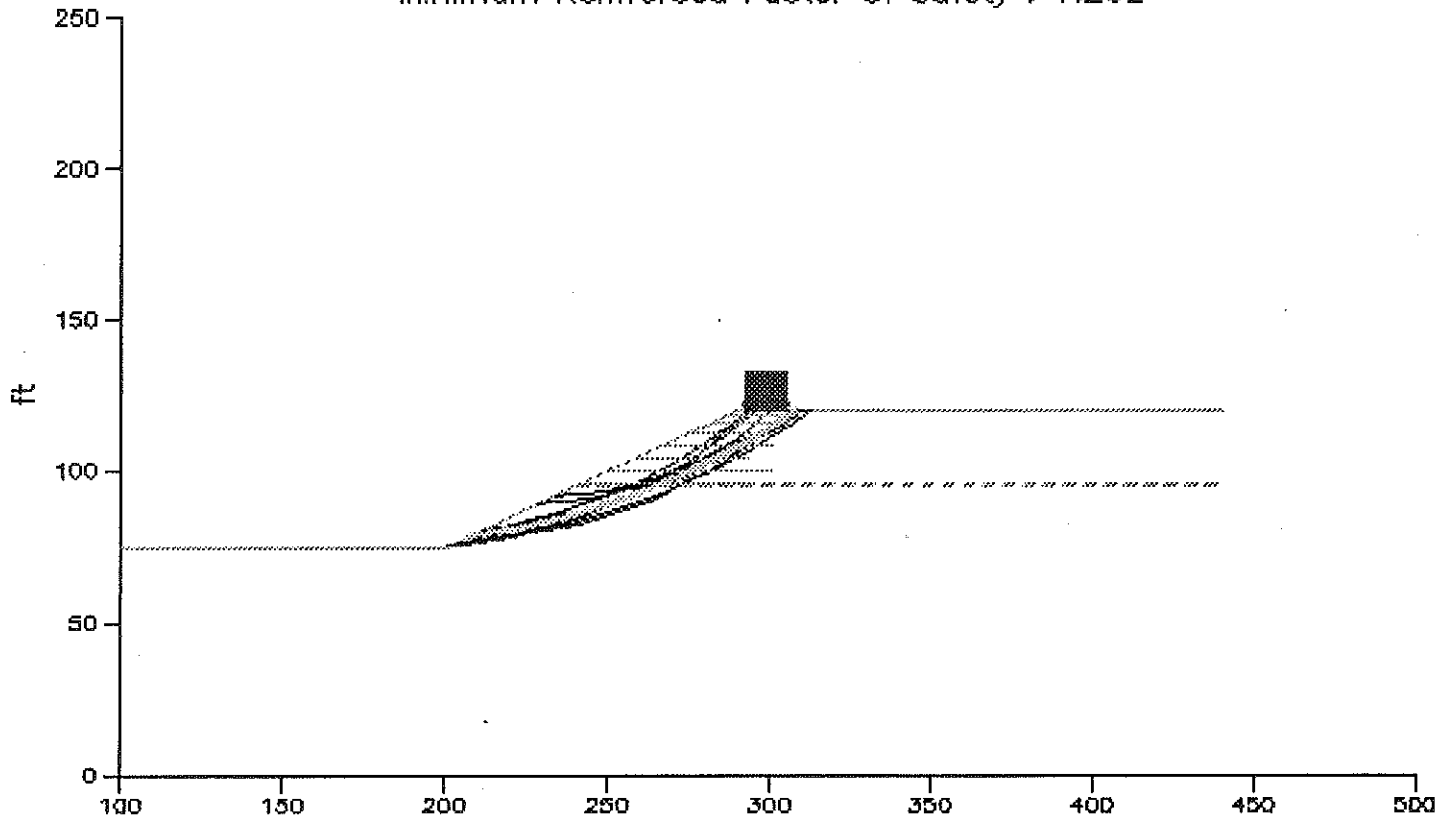
Critical Surface

Factor of Safety : 1.292
Circle Center X : 177.44 ft
Circle Center Y : 293.47 ft
Circle Radius : 217.19 ft

Title : Full Slope
Description : Run 11c

Reinforcement Analysis – Most Critical Surfaces

Minimum Reinforced Factor of Safety : 1.292



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         File : C:\RSS\F11d.dat
         Date : Wed 10-11-:0, 10:32:10
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run 11d
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 7
        Number of Top Boundaries : 5


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 201.00 ft
                    Right Initiation Point : 250.00 ft
                    Left Termination Point : 270.00 ft
```

Right Termination Point : 330.00 ft
Minimum Elevation : 0.00 ft
Segment Length : 5.00 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.302
Circle Center X : 181.96 ft
Circle Center Y : 238.25 ft
Circle Radius : 163.86 ft

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.343

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.258

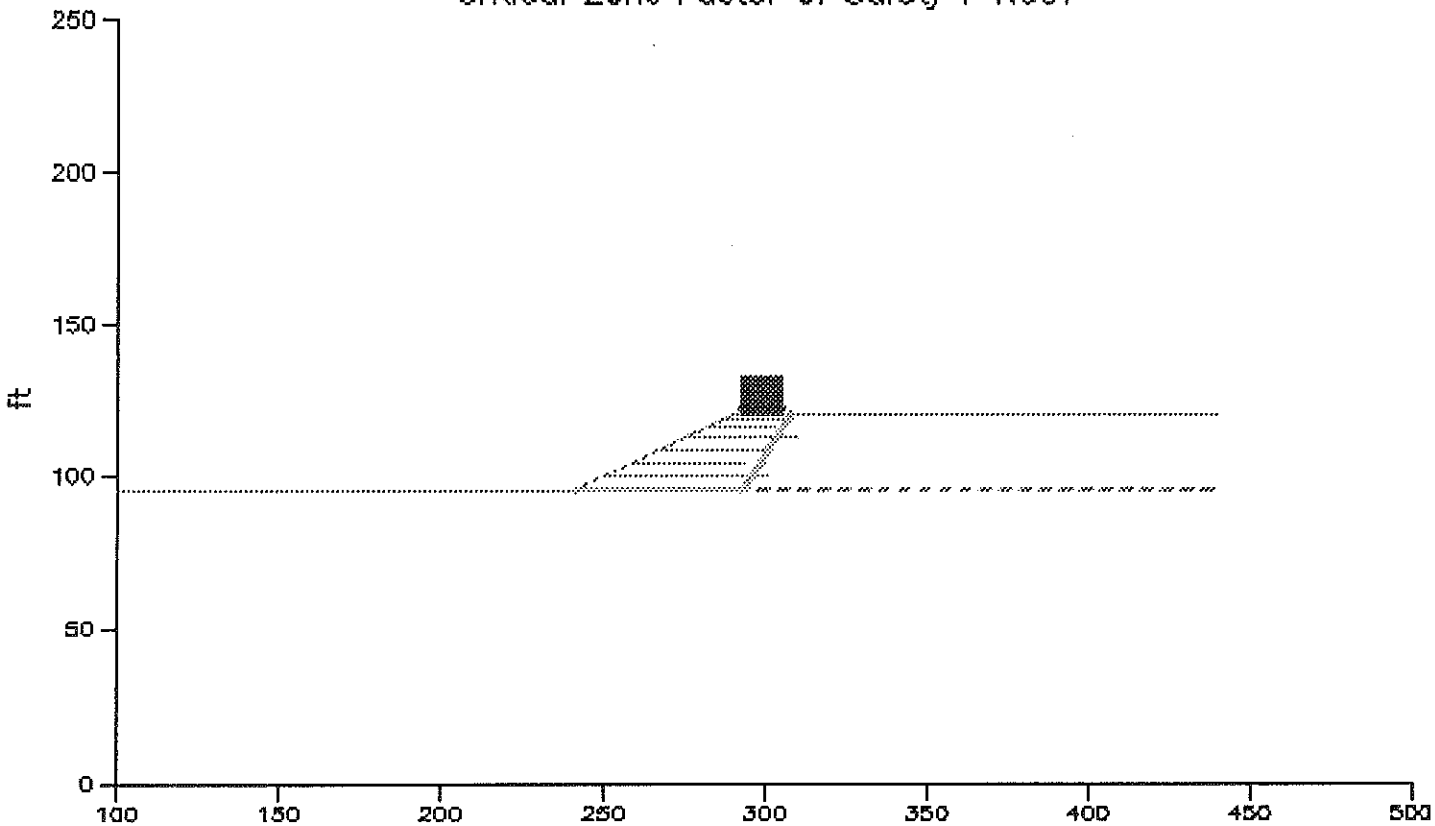
CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 1.223

Title : Full Slope
Description : Run T1b

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 1.087

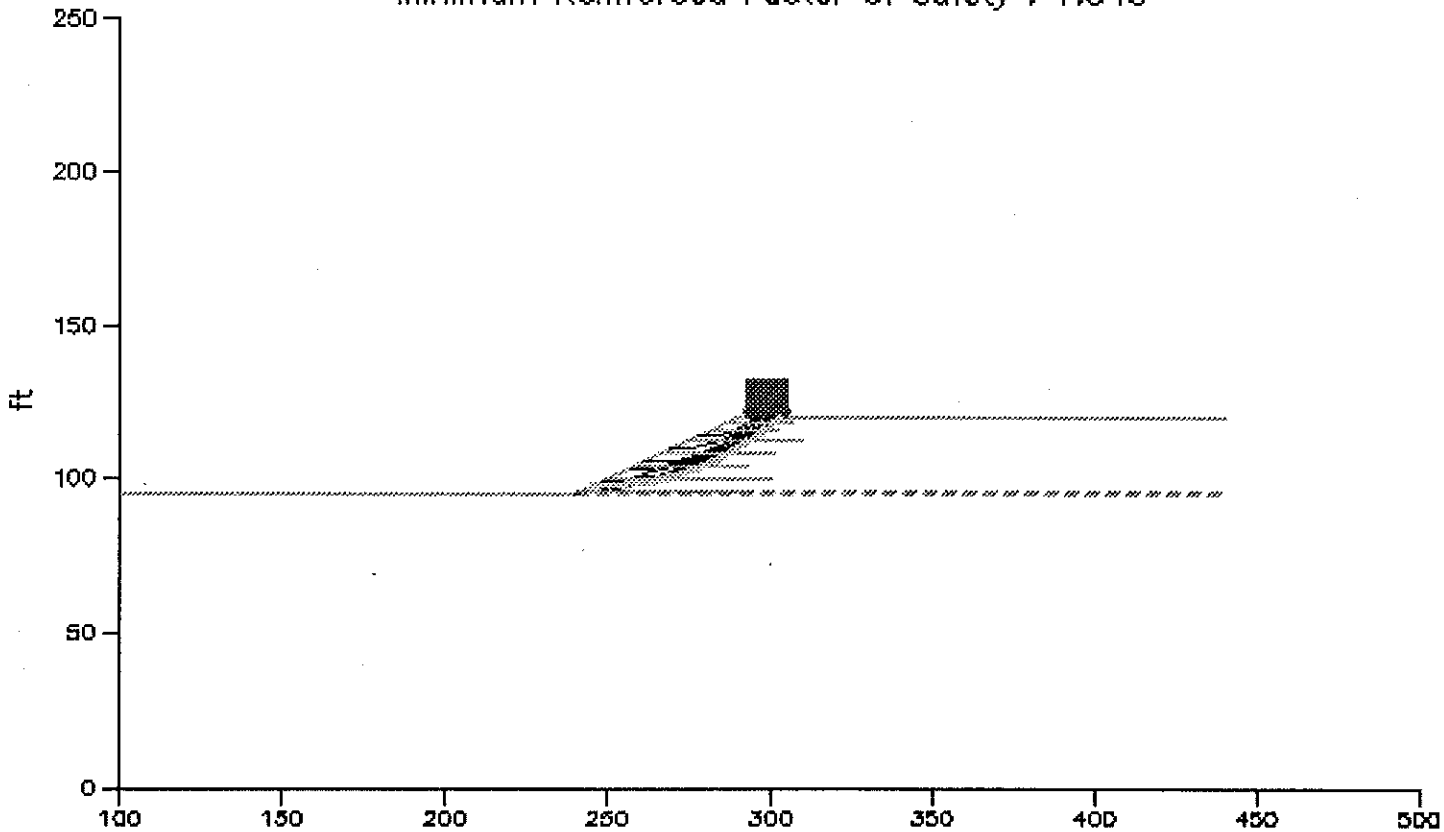


Press any key to continue or ESC to cancel ...

Title : Full Slope
Description : Run T1b

Reinforcement Analysis – Most Critical Surfaces

Minimum Reinforced Factor of Safety : 1.348



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```

File : C:\RSS\T1b.dat
Date : Wed 10-11-:0, 10:56:55
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run T1b
Remarks :

```
*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 6
Number of Top Boundaries : 4

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	95.00	240.00	95.00	1
2	240.00	95.00	241.00	95.50	4
3	241.00	95.50	290.00	120.00	2
4	290.00	120.00	440.00	120.00	2
5	241.00	95.50	440.00	95.50	4
6	240.00	95.00	440.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

Boundary Loads

Number of Loads : 1

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Inclination (deg)
1	292.00	305.00	1000.0	0.0

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 240.00 ft
Right Initiation Point : 277.40 ft
Left Termination Point : 289.90 ft
Right Termination Point : 340.90 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	241.00	95.00	242.00	95.00	0.00
2	264.90	95.00	349.60	95.00	0.00

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54

Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

Layer No	Elevation (ft)	Length (ft)	Long Term Strength (lb/ft)	Ultimate Strength (lb/ft)
1	96.00	50.00	1000.00	0.00
2	100.00	50.00	1000.00	0.00
3	104.00	35.00	1000.00	0.00
4	108.00	35.00	1000.00	0.00
5	112.00	35.00	1000.00	0.00
6	116.00	20.00	500.00	0.00
7	118.00	20.00	500.00	0.00

****
***** RESULTS *****
****

Critical Surfaces

No.	Safety Factor	Center X (ft)	Center Y (ft)	Circle Radius (ft)
1	1.348	245.83	179.39	82.33
2	1.351	279.07	138.14	24.49
3	1.359	231.94	204.88	110.17
4	1.366	262.00	160.15	54.77
5	1.371	270.18	149.82	40.29
6	1.373	248.62	170.59	71.44
7	1.376	242.55	170.89	73.83
8	1.389	224.03	228.32	134.27
9	1.392	258.24	163.53	60.24
10	1.415	216.15	246.36	151.89

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.087

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.029

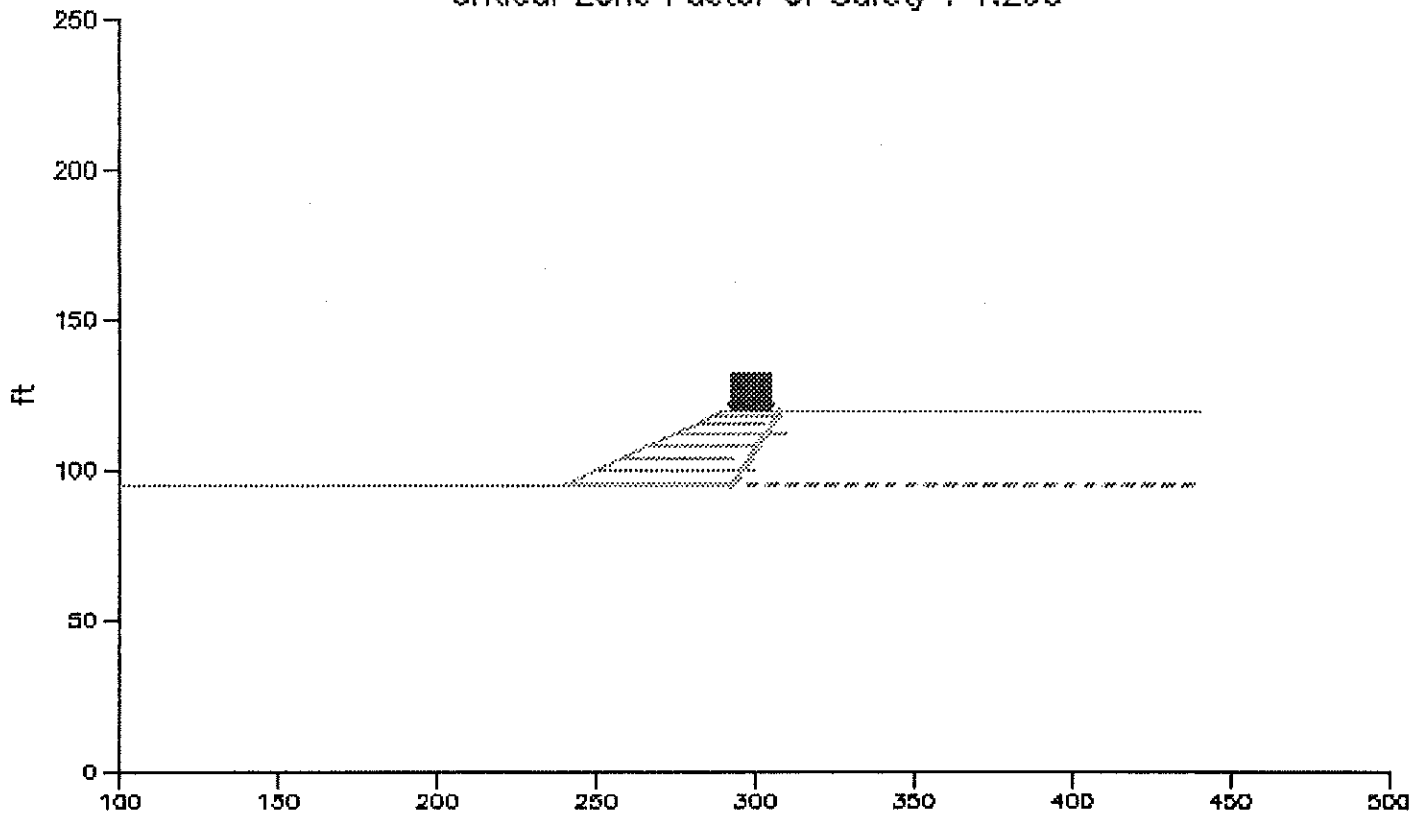
ITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 3.309

Title : Full Slope
Description : Run T1c

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 1.206



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```

File : C:\RSS\T1c.dat
Date : Wed 10-11-:0, 11:10:39
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run T1c
Remarks :

```
*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 6
Number of Top Boundaries : 4

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	95.00	240.00	95.00	1
2	240.00	95.00	241.00	95.50	4
3	241.00	95.50	290.00	120.00	2
4	290.00	120.00	440.00	120.00	2
5	241.00	95.50	440.00	95.50	4
6	240.00	95.00	440.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

Boundary Loads

Number of Loads : 1

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Inclination (deg)
1	292.00	305.00	500.0	0.0

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 240.00 ft
Right Initiation Point : 277.40 ft
Left Termination Point : 289.90 ft
Right Termination Point : 340.90 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	241.00	95.00	242.00	95.00	0.00
2	264.90	95.00	349.60	95.00	0.00

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54

Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

Layer No	Elevation (ft)	Length (ft)	Long Term Strength (lb/ft)	Ultimate Strength (lb/ft)
1	96.00	50.00	1000.00	0.00
2	100.00	50.00	1000.00	0.00
3	104.00	35.00	1000.00	0.00
4	108.00	35.00	1000.00	0.00
5	112.00	35.00	1000.00	0.00
6	116.00	20.00	500.00	0.00
7	118.00	20.00	500.00	0.00

****
***** RESULTS *****
****

Critical Surfaces

No.	Safety Factor	Center X (ft)	Center Y (ft)	Circle Radius (ft)
1	1.444	242.55	170.89	73.83
2	1.447	231.94	204.88	110.17
3	1.447	245.83	179.39	82.33
4	1.474	248.62	170.59	71.44
5	1.477	224.03	228.32	134.27
6	1.502	254.10	153.95	52.74
7	1.506	216.15	246.36	151.89
8	1.509	262.00	160.15	54.77
9	1.527	258.24	163.53	60.24
10	1.531	238.78	186.64	88.00

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.206

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.185

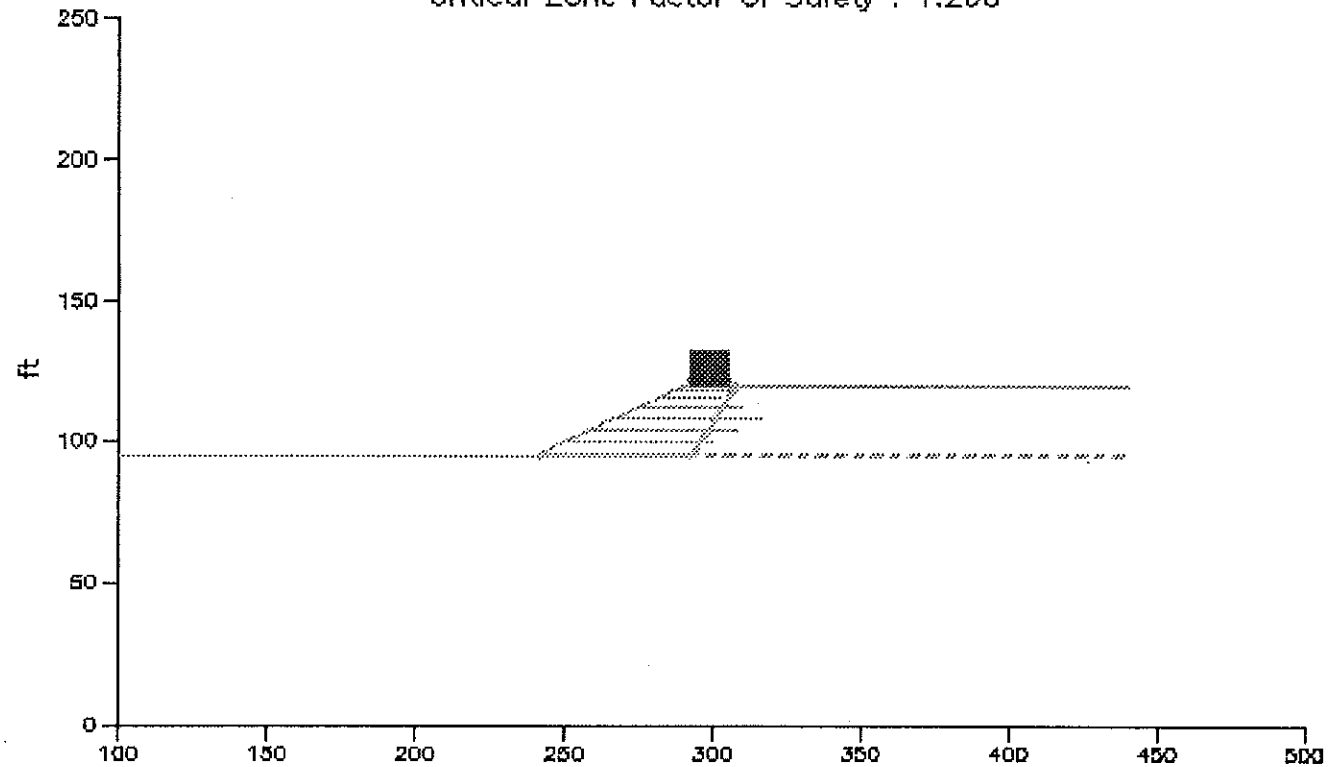
ITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 2.986

Title : Full Slope
Description : Run T1d

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 1.206



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```

File : C:\RSS\T1d.dat
Date : Wed 10-11-:0, 11:14:58
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run T1d
Remarks :

```
*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 6
Number of Top Boundaries : 4

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	95.00	240.00	95.00	1
2	240.00	95.00	241.00	95.50	4
3	241.00	95.50	290.00	120.00	2
4	290.00	120.00	440.00	120.00	2
5	241.00	95.50	440.00	95.50	4
6	240.00	95.00	440.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

Boundary Loads

Number of Loads : 1

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Inclination (deg)
1	292.00	305.00	500.0	0.0

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 240.00 ft
Right Initiation Point : 277.40 ft
Left Termination Point : 289.90 ft
Right Termination Point : 340.90 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	241.00	95.00	242.00	95.00	0.00
2	264.90	95.00	349.60	95.00	0.00

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54

Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

Layer No	Elevation (ft)	Length (ft)	Long Term Strength (lb/ft)	Ultimate Strength (lb/ft)
1	96.00	50.00	1000.00	0.00
2	100.00	50.00	1000.00	0.00
3	104.00	50.00	1000.00	0.00
4	108.00	50.00	1000.00	0.00
5	112.00	35.00	1000.00	0.00
6	116.00	20.00	500.00	0.00
7	118.00	20.00	500.00	0.00

****
***** RESULTS *****
****

Critical Surfaces

No.	Safety Factor	Center X (ft)	Center Y (ft)	Circle Radius (ft)
1	1.444	242.55	170.89	73.83
2	1.447	231.94	204.88	110.17
3	1.447	245.83	179.39	82.33
4	1.474	248.62	170.59	71.44
5	1.477	224.03	228.32	134.27
6	1.502	254.10	153.95	52.74
7	1.506	216.15	246.36	151.89
8	1.509	262.00	160.15	54.77
9	1.527	258.24	163.53	60.24
10	1.531	238.78	186.64	88.00

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.206

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 2.192

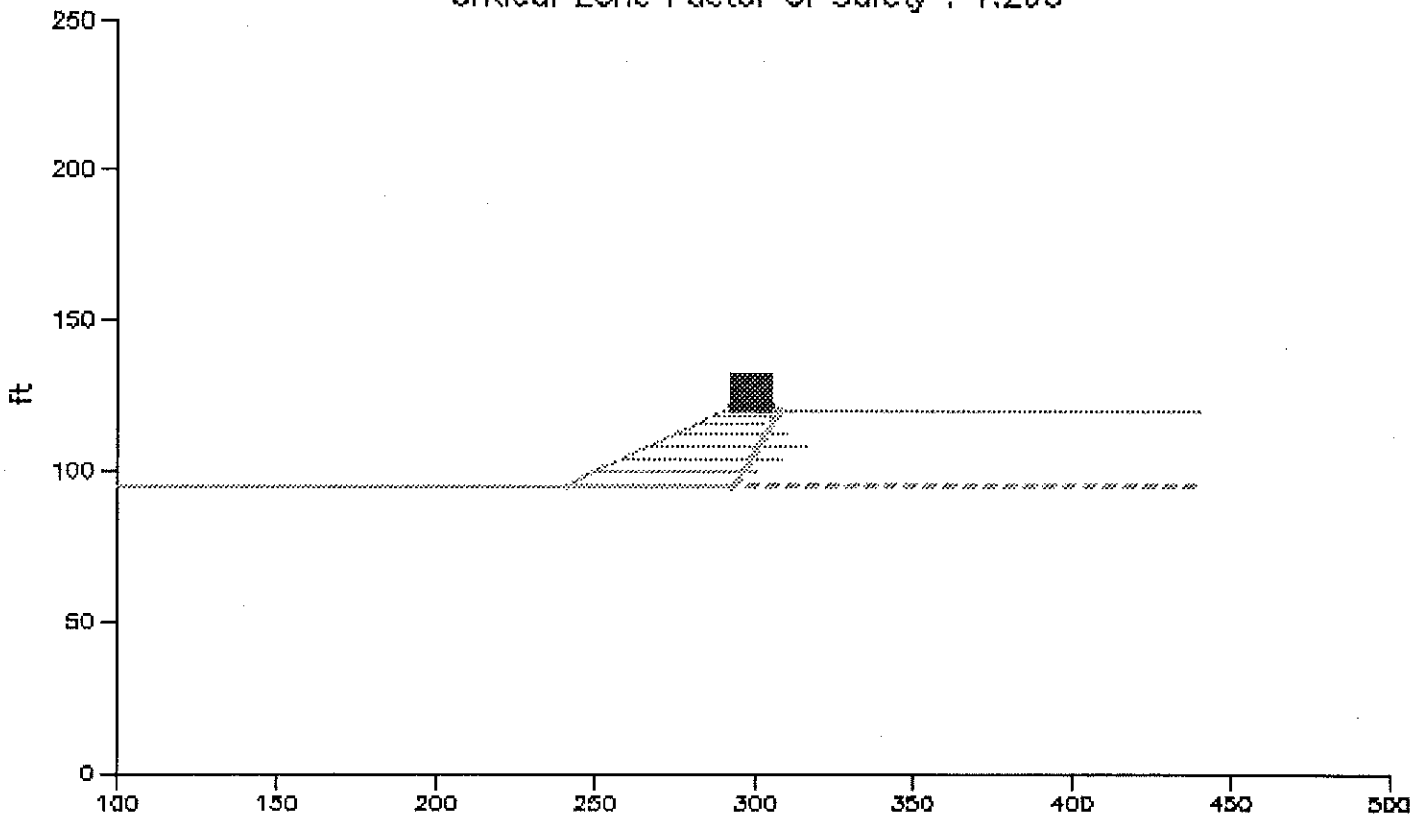
ITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 2.986

Title : Full Slope
Description : Run T1e

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 1.206



Press any key to continue or ESC to cancel ...

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*****                                                                   *****
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*****************************************************************************


         File : C:\RSS\T1e.dat
         Date : Wed 10-11-:0, 11:19:51
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run T1e
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 6
        Number of Top Boundaries : 4


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 240.00 ft
                    Right Initiation Point : 277.40 ft
                    Left Termination Point : 289.90 ft
```

Right Termination Point : 340.90 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.583
Circle Center X : 279.07 ft
Circle Center Y : 138.14 ft
Circle Radius : 24.49 ft

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.206

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 2.192

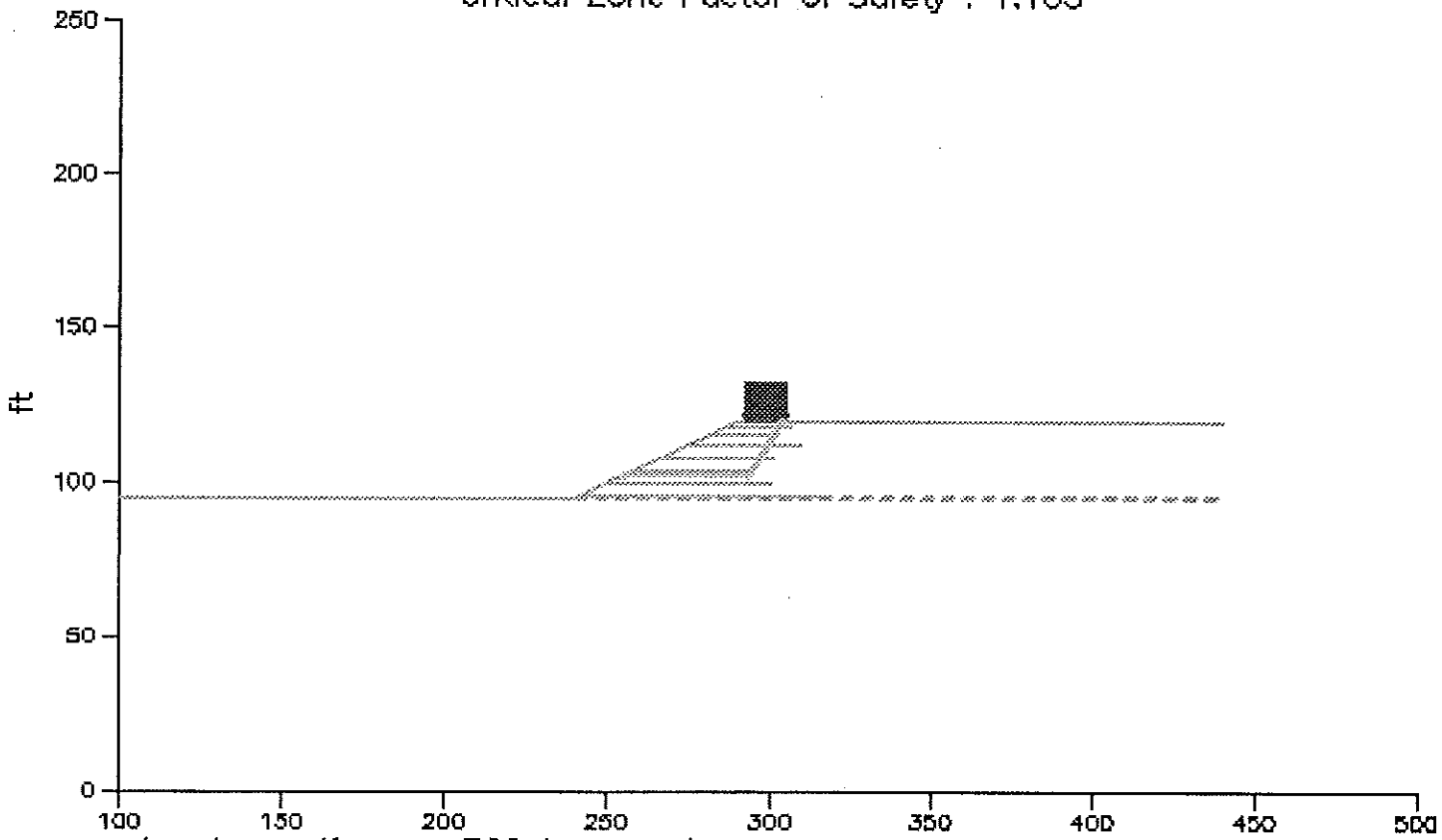
CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 2.986

Title : Full Slope
Description : Run T1f

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 1.185

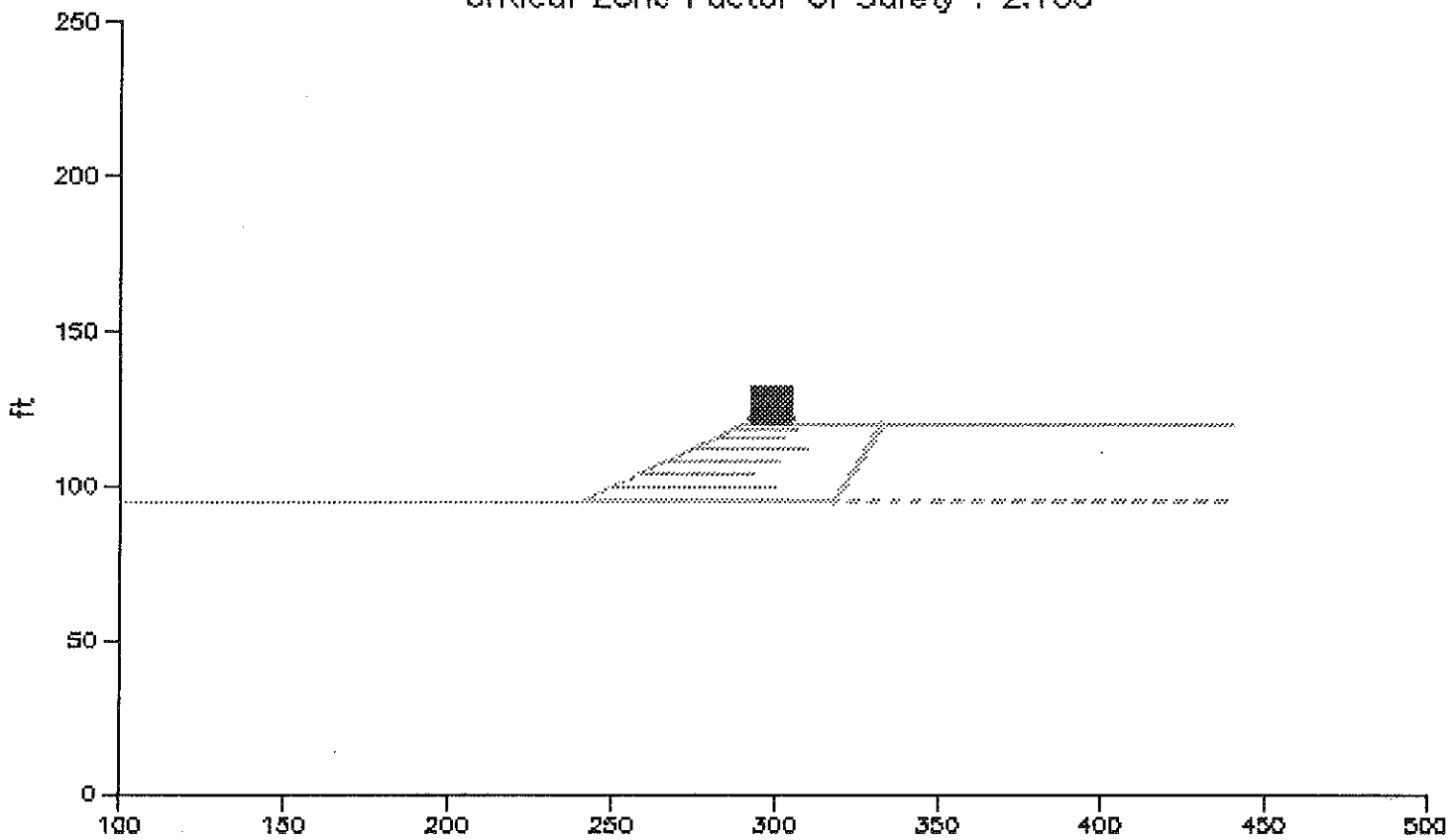


Press any key to continue or ESC to cancel ...

Title : Full Slope
Description : Run T1f

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 2.153



Press any key to continue or ESC to cancel ...

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         File : C:\RSS\t1f.dat
         Date : Wed 10-11-:0, 11:24:52
         Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
  Description : Run T1f
      Remarks :


*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************


Profile Boundaries

            Number of Boundaries : 6
        Number of Top Boundaries : 4


Soil Parameters

        Number of Soil Types : 4


Boundary Loads

        Number of Loads : 1


*****************************************************************************
*****                       TRIAL SURFACE GENERATION                    *****
*****************************************************************************


Data for Generating Circular Surfaces

               Number of Initiation Points : 10
        Number of Surfaces From Each Point : 10
                     Left Initiation Point : 240.00 ft
                    Right Initiation Point : 277.40 ft
                    Left Termination Point : 289.90 ft
```

Right Termination Point : 340.90 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54
Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

****
***** RESULTS *****
****

Critical Surface

Factor of Safety : 1.444
Circle Center X : 242.55 ft
Circle Center Y : 170.89 ft
Circle Radius : 73.83 ft

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 2.153

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.185

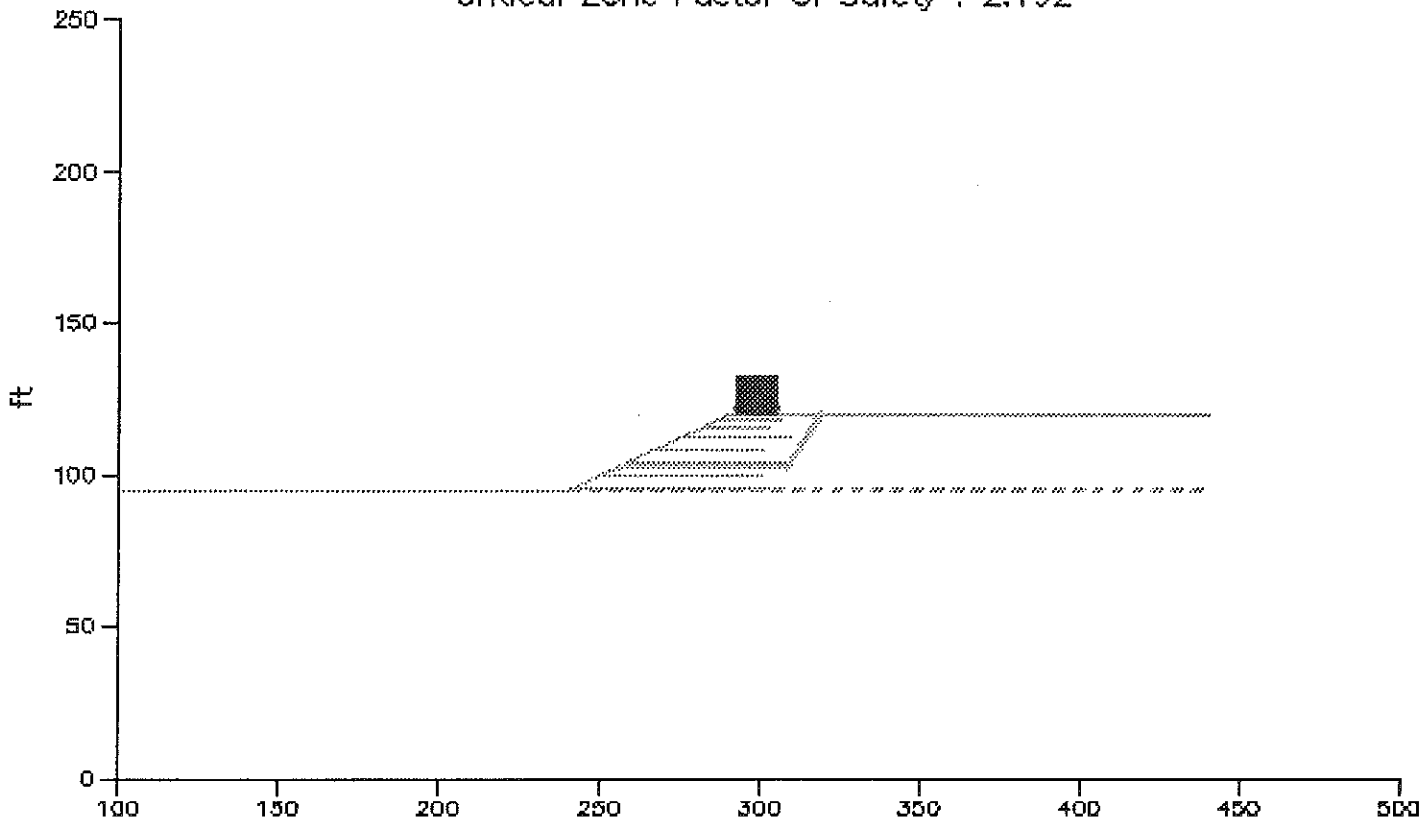
CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 2.986

Title : Full Slope
Description : Run T1g

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 2.192



Press any key to continue or ESC to cancel ...

171

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*****************************************************************************
```

File : C:\RSS\t1g.dat
Date : Wed 10-11-:0, 11:32:04
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run T1g
Remarks :

```
*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 6
Number of Top Boundaries : 4

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	95.00	240.00	95.00	1
2	240.00	95.00	241.00	95.50	4
3	241.00	95.50	290.00	120.00	2
4	290.00	120.00	440.00	120.00	2
5	241.00	95.50	440.00	95.50	4
6	240.00	95.00	440.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

Boundary Loads

Number of Loads : 1

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Inclination (deg)
1	292.00	305.00	500.0	0.0

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 240.00 ft
Right Initiation Point : 277.40 ft
Left Termination Point : 289.90 ft
Right Termination Point : 340.90 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	241.00	95.00	242.00	95.00	0.00
2	264.90	95.00	349.60	95.00	0.00

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.54

Embedded Scale Factor : 0.67
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

Layer No	Elevation (ft)	Length (ft)	Long Term Strength (lb/ft)	Ultimate Strength (lb/ft)
1	96.00	60.00	1000.00	0.00
2	100.00	50.00	1000.00	0.00
3	104.00	50.00	1000.00	0.00
4	108.00	35.00	1000.00	0.00
5	112.00	35.00	1000.00	0.00
6	116.00	20.00	500.00	0.00
7	118.00	20.00	500.00	0.00

****
***** RESULTS *****
****

Critical Surfaces

No.	Safety Factor	Center X (ft)	Center Y (ft)	Circle Radius (ft)
1	1.444	242.55	170.89	73.83
2	1.447	231.94	204.88	110.17
3	1.447	245.83	179.39	82.33
4	1.474	248.62	170.59	71.44
5	1.477	224.03	228.32	134.27
6	1.502	254.10	153.95	52.74
7	1.506	216.15	246.36	151.89
8	1.509	262.00	160.15	54.77
9	1.527	258.24	163.53	60.24
10	1.531	238.78	186.64	88.00

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.726

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 2.192

CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 2.986

```
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```

File : C:\RSS\t1h.dat
Date : Wed 10-11-:0, 12:49:14
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run T1h
Remarks :

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*****************************************************************************
*****                             INPUT DATA                            *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 6
Number of Top Boundaries : 4

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	95.00	240.00	95.00	1
2	240.00	95.00	241.00	95.50	4
3	241.00	95.50	290.00	120.00	2
4	290.00	120.00	440.00	120.00	2
5	241.00	95.50	440.00	95.50	4
6	240.00	95.00	440.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

Boundary Loads

Number of Loads : 1

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Inclination (deg)
1	292.00	305.00	500.0	0.0

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 240.00 ft
Right Initiation Point : 277.40 ft
Left Termination Point : 289.90 ft
Right Termination Point : 340.90 ft
Minimum Elevation : 0.00 ft
Segment Length : 3.35 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 25.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	241.00	95.00	242.00	95.00	0.00
2	264.90	95.00	349.60	95.00	0.00

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50
Pullout Resistance Factor : 0.34

Embedded Scale Factor : 0.80
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

Layer No	Elevation (ft)	Length (ft)	Long Term Strength (lb/ft)	Ultimate Strength (lb/ft)
1	96.00	60.00	1000.00	0.00
2	100.00	50.00	1000.00	0.00
3	104.00	50.00	1000.00	0.00
4	108.00	35.00	1000.00	0.00
5	112.00	35.00	1000.00	0.00
6	116.00	20.00	500.00	0.00
7	118.00	20.00	500.00	0.00

****
***** RESULTS *****
****

Critical Surfaces

No.	Safety Factor	Center X (ft)	Center Y (ft)	Circle Radius (ft)
1	1.444	242.55	170.89	73.83
2	1.447	231.94	204.88	110.17
3	1.447	245.83	179.39	82.33
4	1.474	248.62	170.59	71.44
5	1.477	224.03	228.32	134.27
6	1.502	254.10	153.95	52.74
7	1.506	216.15	246.36	151.89
8	1.509	262.00	160.15	54.77
9	1.527	258.24	163.53	60.24
10	1.531	238.78	186.64	88.00

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.726

CRITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 2.192

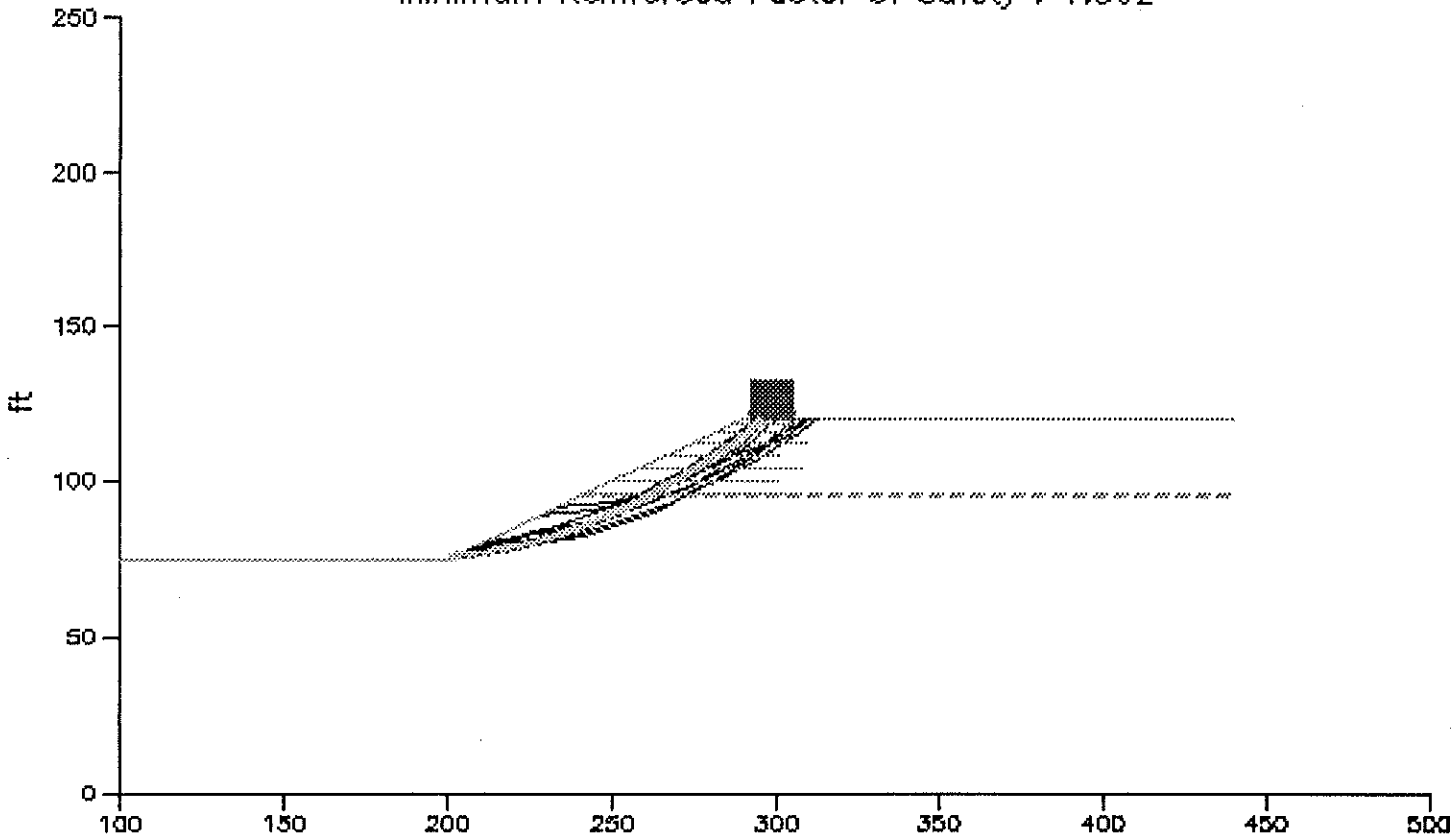
ITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 2.986

Title : Full Slope
Description : Run 12a

Reinforcement Analysis – Most Critical Surfaces

Minimum Reinforced Factor of Safety : 1.302

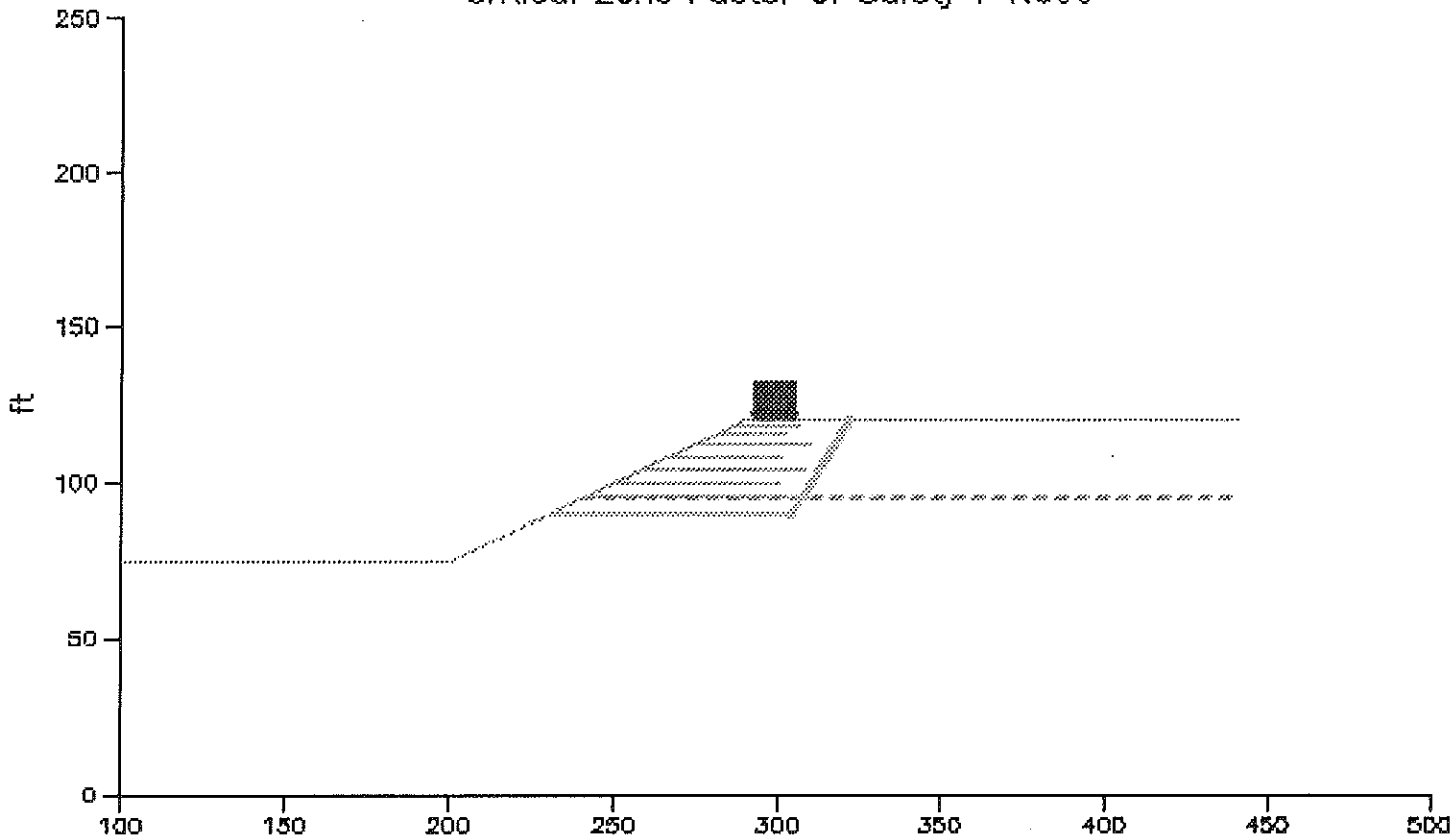


Press any key to continue or ESC to cancel ...

Title : Full Slope
Description : Run 12a

Reinforcement Analysis – Critical Zone

Critical Zone Factor of Safety : 1.699



Press any key to continue or ESC to cancel ...

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```

File : C:\RSS\f12a.dat
Date : Wed 10-11-:0, 13:06:17
Name : US Steel -- Interior 2:1 Slopes
Problem Title : Full Slope
Description : Run 12a
Remarks :

```
*****************************************************************************
*****                              INPUT DATA                           *****
*****************************************************************************
```

Profile Boundaries

Number of Boundaries : 7
Number of Top Boundaries : 5

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	100.00	75.00	200.00	75.00	1
2	200.00	75.00	240.00	95.00	1
3	240.00	95.00	241.00	95.50	4
4	241.00	95.50	290.00	120.00	2
5	290.00	120.00	440.00	120.00	2
6	241.00	95.50	440.00	95.50	4
7	240.00	95.00	440.00	95.00	1

Soil Parameters

Number of Soil Types : 4

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125.0	135.0	0.0	30.0	0.00	0.0	0
2	125.0	135.0	0.0	27.0	0.00	0.0	0
3	125.0	135.0	200.0	27.0	0.00	0.0	0
4	125.0	135.0	0.0	13.1	0.00	0.0	0

Boundary Loads

Number of Loads : 1

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Inclination (deg)
1	292.00	305.00	1000.0	0.0

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Circular Surfaces

Number of Initiation Points : 10
Number of Surfaces From Each Point : 10
Left Initiation Point : 201.00 ft
Right Initiation Point : 250.00 ft
Left Termination Point : 270.00 ft
Right Termination Point : 330.00 ft
Minimum Elevation : 0.00 ft
Segment Length : 5.00 ft
Positive Angle Limit : 45.00 deg
Negative Angle Limit : 0.00 deg

****
***** TRIAL SURFACE GENERATION *****
****

Data for Generating Rankine Block Surfaces

Number of Trial Surfaces : 100
Number of Boxes : 2
Segment Length : 45.00 ft

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	201.00	75.00	202.00	75.00	0.00
2	244.90	75.00	397.30	75.00	0.00

Data for Reinforcement Analysis

Lowest Elevation for Reinforcement : 96.00 ft
Highest Elevation for Reinforcement : 118.00 ft
Minimum Embedment Length : 3.00 ft
Strength Option : Long Term Strength
Extension Factor : 1.00
Reduction Factor : 3.15
Pullout Factor of Safety : 1.50

Pullout Resistance Factor : 0.34
Embedded Scale Factor : 0.80
Slope Coefficient of Friction : 0.31
Foundation Coefficient of Friction : 0.35

Layer No	Elevation (ft)	Length (ft)	Long Term Strength (lb/ft)	Ultimate Strength (lb/ft)
1	96.00	60.00	1000.00	0.00
2	100.00	50.00	1000.00	0.00
3	104.00	50.00	1000.00	0.00
4	108.00	35.00	1000.00	0.00
5	112.00	35.00	1000.00	0.00
6	116.00	20.00	500.00	0.00
7	118.00	20.00	500.00	0.00

****
***** RESULTS *****
****

Surface No. : 1
Factor of Safety : 1.302
Circle Center X : 181.96 ft
Circle Center Y : 238.25 ft
Circle Radius : 163.86 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	203.48	75.83	4.96	564.4	0.0	0.0	537.7	238.5
2	1	208.42	76.56	4.93	1635.4	0.0	0.0	1545.1	685.2
3	1	213.34	77.44	4.91	2594.4	0.0	0.0	2432.8	1078.9
4	1	218.24	78.48	4.88	3439.2	0.0	0.0	3204.1	1421.0
5	1	223.09	79.66	4.84	4168.7	0.0	0.0	3862.4	1713.0
6	1	227.91	80.99	4.80	4782.3	0.0	0.0	4410.7	1956.2
7	1	232.69	82.46	4.75	5280.2	0.0	0.0	4852.3	2152.0
8	1	237.42	84.08	4.70	5663.1	0.0	0.0	5190.3	2301.9
9	1	239.89	84.97	0.23	283.3	0.0	0.0	259.2	114.9
10	1	240.50	85.21	1.00	1254.5	0.0	0.0	1147.8	509.0
11	1	242.71	86.09	3.42	4394.9	0.0	0.0	4021.0	1783.3
12	1	246.72	87.75	4.59	6091.2	0.0	0.0	5568.5	2469.6
13	1	251.28	89.80	4.53	6141.5	0.0	0.0	5615.2	2490.3
14	1	255.78	91.98	4.46	6087.1	0.0	0.0	5571.4	2470.9
15	1	259.75	94.05	3.48	4712.8	0.0	0.0	4322.1	1916.9
16	4	261.95	95.25	0.91	1219.5	0.0	0.0	1265.1	226.1
17	4	262.41	95.50	0.01	13.0	0.0	0.0	13.6	2.4
18	2	264.57	96.76	4.31	5668.9	0.0	0.0	5343.3	2091.4
19	2	268.84	99.34	4.24	5341.4	0.0	0.0	5061.1	1980.9
20	2	273.04	102.06	4.16	4916.7	0.0	0.0	4687.8	1834.8
1	2	277.15	104.90	4.07	4414.4	0.0	0.0	4239.3	1659.3
2	2	281.18	107.86	3.98	3841.6	0.0	0.0	3719.6	1455.8
23	2	285.11	110.95	3.88	3205.9	0.0	0.0	3132.7	1226.2
24	2	288.53	113.80	2.95	2014.7	0.0	0.0	1989.0	778.5
25	2	290.42	115.43	0.84	478.7	0.0	0.0	472.6	185.0
26	2	291.42	116.32	1.16	534.0	0.0	0.0	533.2	208.7
27	2	293.26	118.01	2.52	626.8	2523.5	0.0	3145.2	1231.0
28	2	294.95	119.58	0.85	44.2	852.0	0.0	905.9	354.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-89413.10	89413.10	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-3375.52	3375.52	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-38111.65	77058.40	85967.99	116.32
Shear Force, lb :	32478.03	15730.22	36086.87	25.84

Surface No. : 2
Factor of Safety : 1.311
Circle Center X : 177.44 ft
Circle Center Y : 293.47 ft
Circle Radius : 217.19 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.92	78.58	4.95	540.8	0.0	0.0	513.4	226.1
2	1	213.86	79.37	4.93	1578.7	0.0	0.0	1489.8	656.0
3	1	218.78	80.26	4.91	2532.0	0.0	0.0	2376.3	1046.3
4	1	223.67	81.27	4.89	3399.8	0.0	0.0	3175.0	1398.0
5	1	228.54	82.39	4.86	4181.1	0.0	0.0	3887.5	1711.8
6	1	233.39	83.62	4.83	4875.7	0.0	0.0	4515.8	1988.4
7	1	237.90	84.88	4.19	4757.7	0.0	0.0	4392.0	1933.9
8	1	240.30	85.58	0.61	725.4	0.0	0.0	669.7	294.9
9	1	240.80	85.73	0.39	476.4	0.0	0.0	438.5	193.1
10	1	243.19	86.48	4.37	5527.3	0.0	0.0	5088.4	2240.5
11	1	247.74	87.98	4.73	6437.8	0.0	0.0	5913.3	2603.8
12	1	252.45	89.66	4.69	6786.1	0.0	0.0	6222.7	2740.0
13	1	257.12	91.44	4.65	7049.6	0.0	0.0	6456.8	2843.1
14	1	261.75	93.32	4.61	7229.8	0.0	0.0	6617.6	2913.9
15	1	264.84	94.65	1.57	2512.2	0.0	0.0	2299.3	1012.4
16	4	266.19	95.25	1.11	1789.3	0.0	0.0	1816.4	322.4
17	2	267.68	95.92	1.87	3026.6	0.0	0.0	2824.8	1097.7
18	2	270.87	97.42	4.51	7346.4	0.0	0.0	6866.4	2668.2
19	2	275.36	99.62	4.46	7287.0	0.0	0.0	6824.3	2651.9
20	2	279.80	101.92	4.41	7152.2	0.0	0.0	6715.0	2609.4
21	2	284.18	104.33	4.35	6944.9	0.0	0.0	6540.2	25[illegible]5
22	2	288.18	106.64	3.64	5665.7	0.0	0.0	5354.8	20[illegible].8
23	2	290.33	107.92	0.65	988.7	0.0	0.0	934.5	363.1
24	2	291.33	108.54	1.35	1927.1	0.0	0.0	1828.9	710.7
25	2	293.45	109.87	2.89	3662.9	2891.6	0.0	6220.5	2417.2
26	2	296.98	112.15	4.17	4097.1	4174.5	0.0	7886.9	3064.8
27	2	301.12	114.95	4.11	2595.5	4110.0	0.0	6427.2	2497.6
28	2	304.09	117.04	1.82	676.0	1823.9	0.0	2410.0	936.5
29	2	306.11	118.51	2.22	414.6	0.0	0.0	399.7	155.3
30	2	307.67	119.66	0.90	38.7	0.0	0.0	37.5	14.6

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-112222.87	112222.87	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-13000.00	13000.00	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-48033.97	105857.70	116245.93	114.41
Shear Force, lb :	43440.40	19365.17	47561.31	24.03

Surface No. : 3
Factor of Safety : 1.321
Circle Center X : 223.93 ft
Circle Center Y : 198.45 ft
Circle Radius : 109.42 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	230.72	89.27	4.99	681.5	0.0	0.0	664.7	290.6
2	1	235.70	89.69	4.97	1962.7	0.0	0.0	1885.0	824.1
3	1	239.09	90.10	1.82	1009.5	0.0	0.0	956.8	418.3
4	1	240.50	90.32	1.00	616.5	0.0	0.0	584.4	255.5
5	1	242.06	90.56	2.12	1453.3	0.0	0.0	1377.4	602.2
6	1	245.58	91.22	4.90	4024.6	0.0	0.0	3772.9	1649.4
7	1	250.45	92.32	4.85	4794.1	0.0	0.0	4454.9	1947.6
8	1	255.27	93.64	4.79	5385.8	0.0	0.0	4971.5	2173.5
9	1	258.59	94.68	1.84	2207.6	0.0	0.0	2028.6	886.9
10	4	260.22	95.25	1.43	1762.9	0.0	0.0	1759.1	310.0
11	2	261.66	95.75	1.45	1829.6	0.0	0.0	1707.8	658.9
12	2	264.71	96.94	4.64	6039.5	0.0	0.0	5635.2	2174.2
13	2	269.30	98.91	4.55	6109.2	0.0	0.0	5709.8	2203.0
14	2	273.80	101.09	4.45	6016.4	0.0	0.0	5644.3	2177.7
15	2	278.20	103.47	4.34	5770.5	0.0	0.0	5445.6	2101.1
16	2	282.48	106.04	4.22	5383.2	0.0	0.0	5120.9	1975.8
17	2	286.64	108.81	4.10	4867.8	0.0	0.0	4678.1	1804.9
18	2	289.34	110.75	1.31	1462.4	0.0	0.0	1423.0	549.0
19	2	291.00	112.03	2.00	1993.1	0.0	0.0	1939.3	748.2
20	2	292.32	113.05	0.65	564.8	650.0	0.0	1182.0	456.1
1	2	294.56	114.91	3.82	2428.2	3818.2	0.0	6167.8	2379.7
2	2	298.30	118.23	3.67	813.1	3666.7	0.0	4499.3	1736.0
23	2	300.17	119.96	0.07	0.3	73.1	0.0	75.2	29.0

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-67176.88	67176.88	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-8207.98	8207.98	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-30787.94	63390.85	70471.96	115.91
Shear Force, lb :	25143.31	11994.01	27857.53	25.50

Surface No. : 4
Factor of Safety : 1.321
Circle Center X : 206.32 ft
Circle Center Y : 216.81 ft
Circle Radius : 138.59 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.94	78.27	5.00	751.4	0.0	0.0	745.4	325.7
2	1	213.94	78.45	4.99	2194.0	0.0	0.0	2145.7	937.7
3	1	218.93	78.82	4.98	3512.8	0.0	0.0	3392.0	1482.3
4	1	223.90	79.36	4.96	4701.8	0.0	0.0	4489.3	1961.8
5	1	228.84	80.09	4.93	5756.3	0.0	0.0	5442.2	2378.2
6	1	233.76	80.99	4.90	6672.5	0.0	0.0	6255.1	2733.5
7	1	238.10	81.94	3.79	5740.3	0.0	0.0	5343.0	2334.9
8	1	240.50	82.51	1.00	1592.3	0.0	0.0	1482.1	647.7
9	1	241.04	82.64	0.07	115.2	0.0	0.0	107.2	46.9
10	1	243.48	83.32	4.82	8080.7	0.0	0.0	7478.3	3268.0
11	1	248.27	84.75	4.77	8571.2	0.0	0.0	7897.0	3451.0
12	1	253.01	86.35	4.71	8920.0	0.0	0.0	8192.8	3580.3
13	1	257.68	88.11	4.64	9129.4	0.0	0.0	8369.9	3657.6
14	1	262.29	90.05	4.57	9202.5	0.0	0.0	8432.5	3685.0
15	1	266.83	92.15	4.50	9143.6	0.0	0.0	8385.2	3664.3
16	1	270.73	94.12	3.31	6718.3	0.0	0.0	6174.0	2698.0
17	4	272.86	95.25	0.94	1905.2	0.0	0.0	1972.5	347.4
18	2	273.41	95.54	0.17	334.8	0.0	0.0	314.6	121.3
19	2	275.66	96.84	4.33	8652.9	0.0	0.0	8172.5	3151.8
20	2	279.94	99.42	4.24	8235.1	0.0	0.0	7827.3	3018.7
21	2	284.13	102.15	4.14	7713.2	0.0	0.0	7387.9	28[illegible]3
22	2	288.10	104.95	3.80	6704.7	0.0	0.0	6480.4	24[illegible].3
23	2	290.12	106.42	0.23	390.3	0.0	0.0	377.3	145.5
24	2	291.12	107.21	1.77	2830.4	0.0	0.0	2764.5	1066.2
25	2	293.08	108.76	2.15	3027.7	2154.3	0.0	5061.3	1952.0
26	2	296.06	111.23	3.81	4178.6	3809.9	0.0	7895.8	3045.1
27	2	299.81	114.53	3.69	2522.8	3690.7	0.0	6223.9	2400.3
28	2	303.33	117.86	3.35	894.2	3345.1	0.0	4310.0	1662.2
29	2	305.11	119.61	0.22	10.7	0.0	0.0	10.9	4.2
30	2	305.35	119.86	0.26	4.6	0.0	0.0	4.7	1.8

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-138207.44	138207.44	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-13000.00	13000.00	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-59683.92	127101.34	140416.96	115.15
Shear Force, lb :	52754.80	24106.09	58001.49	24.56

Surface No. : 5
Factor of Safety : 1.339
Circle Center X : 191.30 ft
Circle Center Y : 213.30 ft
Circle Radius : 138.14 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	203.49	75.72	4.98	637.8	0.0	0.0	616.7	266.0
2	1	208.46	76.25	4.96	1847.1	0.0	0.0	1766.1	761.7
3	1	213.41	76.96	4.94	2925.3	0.0	0.0	2769.8	1194.6
4	1	218.33	77.85	4.90	3868.6	0.0	0.0	3632.2	1566.6
5	1	223.21	78.92	4.86	4674.2	0.0	0.0	4357.8	1879.6
6	1	228.06	80.16	4.82	5340.7	0.0	0.0	4950.9	2135.4
7	1	232.85	81.58	4.77	5867.6	0.0	0.0	5415.8	2335.9
8	1	237.59	83.17	4.71	6255.9	0.0	0.0	5756.7	2482.9
9	1	239.97	84.02	0.06	76.8	0.0	0.0	70.5	30.4
10	1	240.50	84.23	1.00	1377.6	0.0	0.0	1265.5	545.8
11	1	242.80	85.14	3.59	5053.2	0.0	0.0	4642.0	2002.1
12	1	246.88	86.86	4.58	6625.7	0.0	0.0	6084.1	2624.1
13	1	251.42	88.95	4.50	6614.6	0.0	0.0	6079.4	2622.1
14	1	255.88	91.21	4.42	6479.6	0.0	0.0	5968.6	2574.3
15	1	260.26	93.63	4.33	6227.2	0.0	0.0	5756.4	2482.8
16	1	262.52	94.94	0.20	279.2	0.0	0.0	259.3	111.9
17	4	263.02	95.25	0.80	1125.0	0.0	0.0	1196.8	208.1
18	2	265.04	96.51	3.24	4460.6	0.0	0.0	4249.5	1617.5
19	2	268.73	98.93	4.14	5400.7	0.0	0.0	5185.7	1973.9
20	2	272.82	101.81	4.04	4844.5	0.0	0.0	4694.8	1787.0
1	2	276.80	104.83	3.93	4206.3	0.0	0.0	4119.9	1568.2
2	2	280.67	108.00	3.81	3497.1	0.0	0.0	3466.9	1319.6
23	2	284.42	111.30	3.69	2728.6	0.0	0.0	2741.9	1043.7
24	2	288.05	114.74	3.57	1913.3	0.0	0.0	1951.8	742.9
25	2	289.92	116.57	0.16	69.3	0.0	0.0	71.9	27.4
26	2	291.00	117.72	2.00	571.0	0.0	0.0	592.3	225.4
27	2	292.58	119.39	1.16	89.4	1164.1	0.0	1300.2	494.9

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-93056.96	93056.96	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-1164.15	1164.15	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-38418.22	78694.48	87571.57	116.02
Shear Force, lb :	32548.62	15526.63	36062.30	25.50

Surface No. : 6
Factor of Safety : 1.341
Circle Center X : 172.87 ft
Circle Center Y : 259.74 ft
Circle Radius : 184.60 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.90	78.71	4.90	452.4	0.0	0.0	424.8	182.9
2	1	213.79	79.75	4.88	1304.6	0.0	0.0	1218.7	524.6
3	1	218.65	80.93	4.84	2056.4	0.0	0.0	1912.0	823.0
4	1	223.47	82.23	4.81	2707.1	0.0	0.0	2507.3	1079.3
5	1	228.26	83.67	4.77	3256.9	0.0	0.0	3007.1	1294.4
6	1	233.01	85.23	4.73	3706.2	0.0	0.0	3413.7	1469.5
7	1	237.69	86.92	4.63	4007.2	0.0	0.0	3684.9	1586.2
8	1	240.03	87.79	0.05	48.8	0.0	0.0	44.9	19.3
9	1	240.53	88.00	0.95	859.3	0.0	0.0	789.5	339.8
10	1	242.84	88.94	3.69	3448.6	0.0	0.0	3168.2	1363.8
11	1	246.98	90.69	4.58	4463.7	0.0	0.0	4100.1	1764.9
12	1	251.53	92.76	4.52	4525.9	0.0	0.0	4159.4	1790.5
13	1	254.95	94.41	2.33	2348.8	0.0	0.0	2161.4	930.4
14	4	256.61	95.25	0.99	998.0	0.0	0.0	1027.8	178.3
15	2	257.68	95.79	1.14	1150.5	0.0	0.0	1081.4	410.8
16	2	260.45	97.26	4.40	4381.2	0.0	0.0	4131.2	1569.4
17	2	264.82	99.69	4.34	4181.5	0.0	0.0	3958.5	1503.8
18	2	269.12	102.24	4.27	3902.3	0.0	0.0	3711.6	1410.0
19	2	273.35	104.91	4.19	3548.2	0.0	0.0	3393.3	1289.1
20	2	277.51	107.69	4.12	3124.1	0.0	0.0	3006.4	1142.1
21	2	281.59	110.58	4.04	2635.5	0.0	0.0	2554.0	9[illegible]3
22	2	285.59	113.58	3.96	2087.9	0.0	0.0	2039.2	7[illegible]4.7
23	2	288.78	116.09	2.43	1002.5	0.0	0.0	987.6	375.2
24	2	290.72	117.67	1.44	419.9	0.0	0.0	413.7	157.1
25	2	291.72	118.50	0.56	104.2	0.0	0.0	103.6	39.4
26	2	292.73	119.37	1.46	115.0	1461.4	0.0	1567.6	595.5

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-60836.76	60836.76	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-1461.40	1461.40	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-25817.71	52043.50	58095.43	116.39
Shear Force, lb :	21026.46	10254.67	23393.81	26.00

Surface No. : 7
Factor of Safety : 1.346
Circle Center X : 107.00 ft
Circle Center Y : 472.78 ft
Circle Radius : 406.90 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	208.86	78.85	4.84	353.6	0.0	0.0	328.8	141.0
2	1	213.70	80.13	4.83	1037.0	0.0	0.0	962.5	412.7
3	1	218.51	81.47	4.81	1675.2	0.0	0.0	1552.2	665.6
4	1	223.31	82.87	4.79	2268.2	0.0	0.0	2098.6	899.8
5	1	228.10	84.33	4.77	2816.2	0.0	0.0	2602.0	1115.7
6	1	232.86	85.85	4.75	3319.1	0.0	0.0	3063.1	1313.4
7	1	237.61	87.42	4.74	3777.2	0.0	0.0	3482.2	1493.1
8	1	239.99	88.23	0.03	22.1	0.0	0.0	20.4	8.7
9	1	240.50	88.41	1.00	855.0	0.0	0.0	787.5	337.7
10	1	242.84	89.24	3.69	3313.6	0.0	0.0	3052.1	1308.7
11	1	247.04	90.75	4.69	4559.9	0.0	0.0	4197.0	1799.6
12	1	251.72	92.50	4.67	4885.0	0.0	0.0	4493.6	1926.8
13	1	256.10	94.19	4.09	4526.4	0.0	0.0	4161.9	1784.5
14	4	258.43	95.11	0.56	640.1	0.0	0.0	644.2	111.3
15	4	259.05	95.36	0.68	778.5	0.0	0.0	785.5	135.8
16	2	261.36	96.31	3.95	4626.1	0.0	0.0	4328.2	1637.8
17	2	265.64	98.09	4.60	5599.7	0.0	0.0	5241.2	1983.4
18	2	270.23	100.07	4.58	5752.5	0.0	0.0	5387.2	2038.6
19	2	274.80	102.10	4.56	5863.4	0.0	0.0	5494.9	2079.4
20	2	279.34	104.19	4.53	5933.0	0.0	0.0	5564.9	2105.8
1	2	283.86	106.34	4.50	5961.8	0.0	0.0	5597.6	2118.2
2	2	288.05	108.39	3.89	5174.8	0.0	0.0	4864.2	1840.7
23	2	290.29	109.51	0.58	765.2	0.0	0.0	719.2	272.2
24	2	291.29	110.01	1.42	1768.2	0.0	0.0	1664.3	629.8
25	2	293.52	111.16	3.03	3351.2	3031.5	0.0	6007.6	2273.4
26	2	297.24	113.10	4.42	3810.3	4419.8	0.0	7757.7	2935.6
27	2	301.65	115.47	4.39	2487.3	4390.8	0.0	6493.8	2457.3
28	2	304.42	116.99	1.16	435.8	1157.8	0.0	1507.3	570.4
29	2	306.60	118.21	3.20	716.1	0.0	0.0	677.3	256.3
30	2	308.97	119.55	1.54	85.8	0.0	0.0	81.3	30.8

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-87158.51	87158.51	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-13000.00	13000.00	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-37321.34	85638.89	93417.89	113.55
Shear Force, lb :	33600.04	14519.63	36603.04	23.37

Surface No. : 8
Factor of Safety : 1.350
Circle Center X : 234.13 ft
Circle Center Y : 176.38 ft
Circle Radius : 84.55 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	236.17	91.89	5.00	743.3	0.0	0.0	735.9	314.7
2	1	239.33	92.01	1.33	443.3	0.0	0.0	429.6	183.7
3	1	240.50	92.11	1.00	392.9	0.0	0.0	380.7	162.8
4	1	242.32	92.26	2.65	1292.0	0.0	0.0	1251.9	535.3
5	1	246.12	92.72	4.95	3302.4	0.0	0.0	3143.5	1344.1
6	1	251.05	93.58	4.90	4252.8	0.0	0.0	3992.0	1706.9
7	1	255.22	94.54	3.45	3485.7	0.0	0.0	3238.3	1384.7
8	4	257.64	95.18	1.38	1486.1	0.0	0.0	1470.5	253.4
9	4	258.53	95.43	0.40	442.9	0.0	0.0	441.3	76.1
10	2	260.90	96.22	4.35	5014.1	0.0	0.0	4695.1	1771.8
11	2	265.40	97.86	4.65	5710.6	0.0	0.0	5343.8	2016.5
12	2	269.98	99.85	4.53	5740.6	0.0	0.0	5387.0	2032.8
13	2	274.44	102.10	4.39	5559.4	0.0	0.0	5250.1	1981.2
14	2	278.76	104.61	4.25	5184.2	0.0	0.0	4944.5	1865.9
15	2	282.93	107.38	4.08	4636.7	0.0	0.0	4482.7	1691.6
16	2	286.92	110.38	3.90	3942.7	0.0	0.0	3878.2	1463.5
17	2	289.44	112.45	1.13	1022.2	0.0	0.0	1026.9	387.5
18	2	291.00	113.86	2.00	1534.7	0.0	0.0	1541.8	581.8
19	2	292.29	115.03	0.59	365.3	587.9	0.0	957.6	361.4
20	2	294.34	117.07	3.51	1283.2	3508.7	0.0	4937.2	1863.1
21	2	296.60	119.43	1.00	71.6	1001.3	0.0	1138.5	4 5

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-55906.72	55906.72	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-5097.95	5097.95	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-25385.42	51417.42	57342.57	116.28
Shear Force, lb :	19675.83	9587.25	21887.30	25.98

Surface No. : 9
Factor of Safety : 1.353
Circle Center X : 188.51 ft
Circle Center Y : 283.62 ft
Circle Radius : 204.02 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	214.37	81.26	4.96	572.3	0.0	0.0	547.1	233.5
2	1	219.32	81.96	4.94	1670.8	0.0	0.0	1586.7	677.1
3	1	224.25	82.77	4.92	2679.8	0.0	0.0	2529.8	1079.6
4	1	229.16	83.71	4.90	3597.9	0.0	0.0	3378.3	1441.8
5	1	234.05	84.76	4.87	4424.0	0.0	0.0	4134.4	1764.4
6	1	238.24	85.77	3.51	3667.3	0.0	0.0	3413.2	1456.6
7	1	240.50	86.34	1.00	1113.2	0.0	0.0	1036.0	442.1
8	1	241.17	86.51	0.33	376.9	0.0	0.0	350.8	149.7
9	1	243.74	87.23	4.81	5797.5	0.0	0.0	5377.1	2294.7
10	1	248.54	88.65	4.78	6344.6	0.0	0.0	5867.5	2504.0
11	1	253.30	90.18	4.74	6798.8	0.0	0.0	6273.4	2677.3
12	1	258.02	91.82	4.70	7161.1	0.0	0.0	6596.6	2815.2
13	1	262.70	93.58	4.66	7432.3	0.0	0.0	6839.2	2918.7
14	1	265.63	94.75	1.21	1984.7	0.0	0.0	1825.5	779.0
15	4	266.84	95.25	1.19	1964.7	0.0	0.0	1987.0	341.8
16	2	268.53	95.96	2.20	3664.6	0.0	0.0	3431.7	1292.5
17	2	271.92	97.45	4.56	7707.9	0.0	0.0	7226.7	2721.8
18	2	276.45	99.54	4.51	7716.2	0.0	0.0	7247.5	2729.6
19	2	280.94	101.76	4.46	7641.3	0.0	0.0	7194.4	2709.6
20	2	285.37	104.07	4.40	7486.0	0.0	0.0	7069.5	2662.6
1	2	288.78	105.96	2.43	4083.6	0.0	0.0	3870.4	1457.7
2	2	290.95	107.20	1.91	3055.9	0.0	0.0	2896.3	1090.8
23	2	291.95	107.77	0.09	138.4	0.0	0.0	131.7	49.6
24	2	294.09	109.06	4.19	5725.9	4188.4	0.0	9436.5	3554.1
25	2	298.30	111.67	4.21	4385.6	4214.3	0.0	8225.3	3097.9
26	2	302.48	114.42	4.15	2894.3	4147.1	0.0	6771.7	2550.4
27	2	304.77	115.97	0.45	226.6	450.2	0.0	655.0	246.7
28	2	306.81	117.42	3.63	1169.7	0.0	0.0	1131.8	426.3
29	2	309.49	119.35	1.73	139.8	0.0	0.0	136.2	51.3

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-111621.36	111621.36	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-13000.00	13000.00	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-46568.97	106529.90	116263.88	113.61
Shear Force, lb :	42132.82	18091.46	45852.76	23.24

Surface No. : 10
Factor of Safety : 1.358
Circle Center X : 178.87 ft
Circle Center Y : 292.55 ft
Circle Radius : 218.18 ft

	Soil	X (ft)	Y (ft)	Width (ft)	Weight (lb)	Load (lb)	Water (lb)	Normal (lb)	Shear (lb)
1	1	203.48	75.78	4.97	596.1	0.0	0.0	572.3	243.4
2	1	208.44	76.40	4.95	1745.9	0.0	0.0	1665.2	708.2
3	1	213.39	77.14	4.94	2812.6	0.0	0.0	2666.8	1134.1
4	1	218.32	77.99	4.92	3794.9	0.0	0.0	3578.7	1521.9
5	1	223.22	78.95	4.90	4691.5	0.0	0.0	4402.8	1872.3
6	1	228.11	80.02	4.87	5501.6	0.0	0.0	5140.8	2186.2
7	1	232.96	81.20	4.84	6224.5	0.0	0.0	5794.4	2464.1
8	1	237.69	82.47	4.61	6560.7	0.0	0.0	6087.7	2588.8
9	1	240.10	83.14	0.20	299.2	0.0	0.0	277.7	118.1
10	1	240.60	83.29	0.80	1199.0	0.0	0.0	1109.5	471.8
11	1	242.99	84.02	3.98	6209.0	0.0	0.0	5745.8	2443.4
12	1	247.36	85.42	4.75	7868.8	0.0	0.0	7266.1	3089.9
13	1	252.09	87.04	4.71	8243.0	0.0	0.0	7599.2	3231.6
14	1	256.78	88.77	4.67	8531.6	0.0	0.0	7856.5	3341.0
15	1	261.42	90.61	4.63	8735.7	0.0	0.0	8039.8	3418.9
16	1	266.03	92.56	4.58	8856.7	0.0	0.0	8150.7	3466.1
17	1	269.88	94.28	3.12	6100.9	0.0	0.0	5617.2	2388.7
18	4	271.98	95.25	1.08	2122.9	0.0	0.0	2167.6	371.5
19	2	272.69	95.58	0.34	672.7	0.0	0.0	631.6	237.0
20	2	275.10	96.76	4.49	8856.9	0.0	0.0	8332.0	3127.0
21	2	279.56	99.02	4.44	8740.4	0.0	0.0	8243.1	30[illegible]6
22	2	283.97	101.38	4.38	8549.5	0.0	0.0	8087.7	30[illegible].3
23	2	288.08	103.69	3.84	7360.6	0.0	0.0	6988.0	2622.6
24	2	290.24	104.95	0.49	919.0	0.0	0.0	872.5	327.4
25	2	291.24	105.55	1.51	2730.1	0.0	0.0	2602.6	976.8
26	2	293.38	106.85	2.75	4526.9	2754.9	0.0	6941.8	2605.2
27	2	296.86	109.05	4.21	5757.4	4205.7	0.0	9542.3	3581.2
28	2	301.03	111.80	4.14	4246.1	4142.6	0.0	8076.3	3031.0
29	2	304.05	113.87	1.90	1452.7	1896.8	0.0	3243.5	1217.3
30	2	306.09	115.32	2.18	1275.5	0.0	0.0	1235.1	463.5
31	2	309.19	117.59	4.01	1209.3	0.0	0.0	1178.4	442.3
32	2	311.78	119.54	1.18	67.6	0.0	0.0	66.3	24.9

Resultant Forces

	X	Y	R	Angle
Weight, lb :	0.00	-146459.39	146459.39	-90.00
Earthquake Load, lb :	0.00	0.00	0.00	0.00
Surcharge Load, lb :	0.00	-13000.00	13000.00	-90.00
Top Water, lb :	0.00	0.00	0.00	0.00
Bottom Water, lb :	0.00	0.00	0.00	0.00
Normal Force, lb :	-59364.71	136123.39	148505.03	113.56
Shear Force, lb :	54552.02	23336.00	59333.74	23.16

CRITICAL ZONE SEARCH IN BOTTOM

Critical Zone Factor of Safety : 1.676

ITICAL ZONE SEARCH IN MIDDLE

Critical Zone Factor of Safety : 1.593

CRITICAL ZONE SEARCH IN TOP

Critical Zone Factor of Safety : 1.699

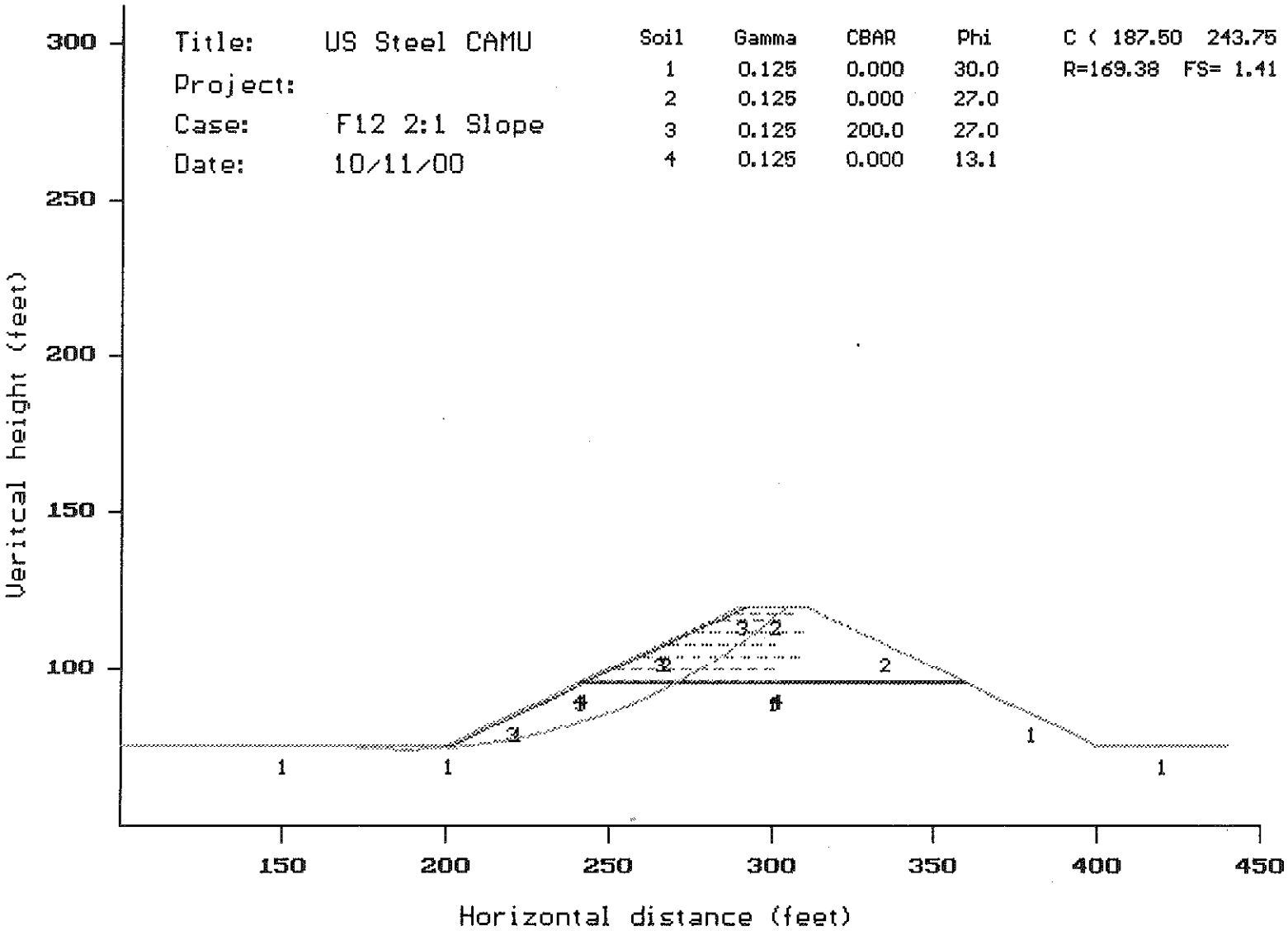
End

'TENSLOPE' Geometry Plot

Title: US Steel CAMU
Project:
Case: F12 2:1 Slope
Date: 10/11/00

Soil	Gamma	CBAR	Phi
1	0.125	0.000	30.0
2	0.125	0.000	27.0
3	0.125	200.0	27.0
4	0.125	0.000	13.1

C (187.50 243.75)
R=169.38 FS= 1.41



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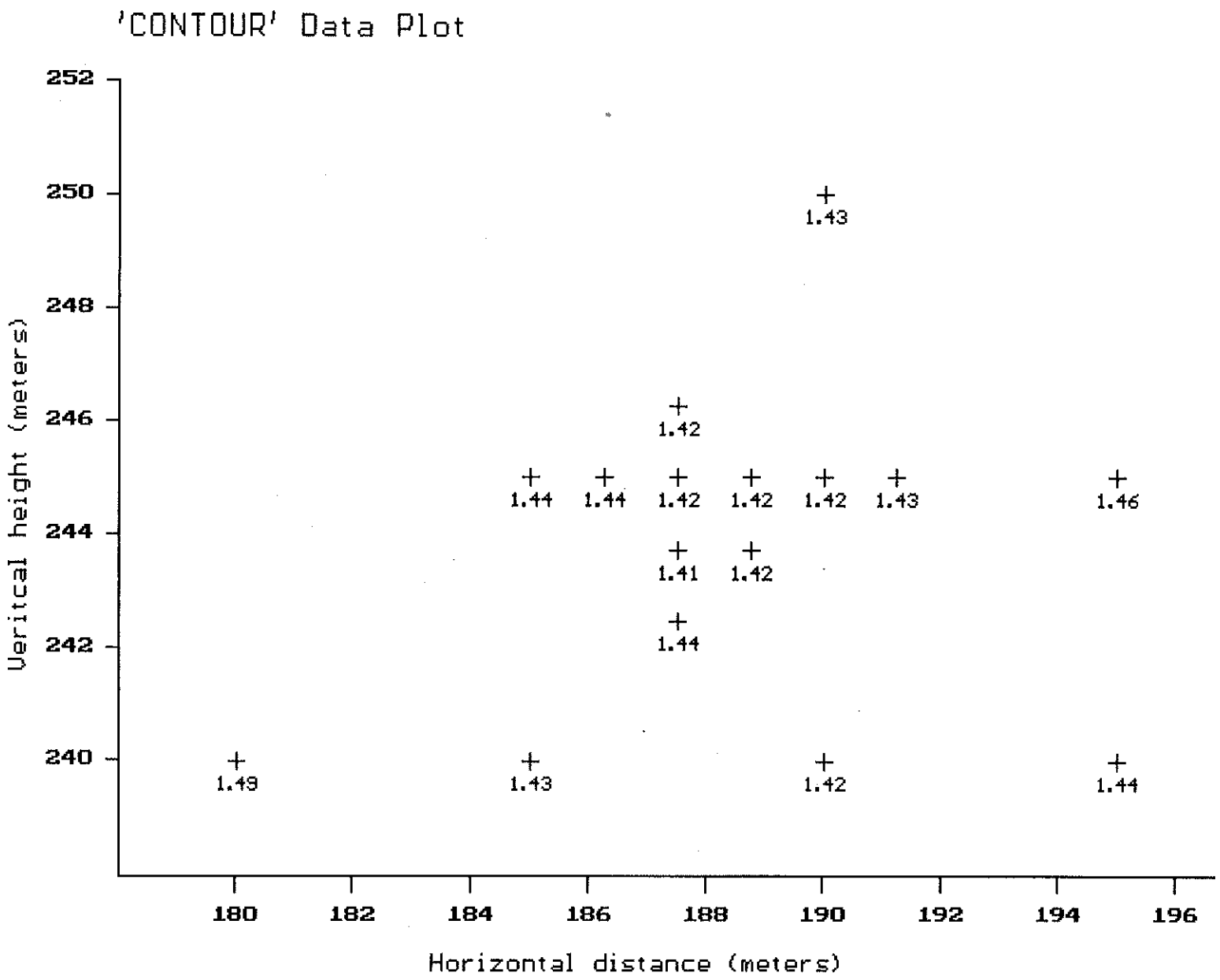

'CONTOUR' Data Plot
Veritcal height (meters)
252
250
248
246
244
242
240
1.43
1.42
1.44
1.44
1.42
1.42
1.42
1.43
1.46
1.41
1.42
1.44
1.49
1.43
1.42
1.44
180
182
184
186
188
190
192
194
196
Horizontal distance (meters)

2

TENSLO1 PROGRAM - VERSION 2.1 (AUG. 9, 1989):
SLOPE STABILITY BY THE MODIFIED BISHOP METHOD.
TENSAR GEOGRID REINFORCEMENT CAN BE INCLUDED.
PROGRAM BY THE TENSAR CORPORATION, APRIL 1986.

DATE 10-11-2000
TIME 15:24

US Steel CAMU$$F12 2:1 Slope$10/11/00

*** UNITS - FEET AND KIPS

NO SEISMIC FORCES

SOIL INFORMATION:

NO.	GAMMA	CBAR	TAN(PHIBAR)	RU	MU
1	.125	.000	.577	.00	.66
2	.125	.000	.510	.00	.66
3	.125	200.000	.510	.00	.66
4	.125	.000	.233	.00	.66

LINE ARRAY:

NO.	X-LEFT	Y-LEFT	X-RIGHT	Y-RIGHT	SLOPE	SOIL	TOPLINE
1	100.00	75.00	200.00	75.00	.0000	1	*
2	200.00	75.00	240.00	95.00	.5000	3	*
3	240.00	95.00	241.00	95.50	.5000	4	*
4	241.00	95.50	290.00	120.00	.5000	3	*
5	290.00	120.00	292.00	120.00	.0000	3	*
6	292.00	120.00	310.00	120.00	.0000	2	*
7	310.00	120.00	359.00	95.50	-.5000	2	*
8	243.00	95.50	360.00	95.00	-.0043	4	*
9	360.00	95.00	400.00	75.00	-.5000	1	*
10	400.00	75.00	440.00	75.00	.0000	1	*
11	200.00	75.00	202.00	75.00	.0000	1	
12	202.00	75.00	242.00	95.00	.5000	1	
13	240.00	95.00	242.00	95.00	.0000	3	
14	240.00	95.00	360.00	95.00	.0000	1	
15	241.00	95.50	243.00	95.50	.0000	4	
16	243.00	95.50	359.00	95.50	.0000	4	
17	243.00	95.50	292.00	120.00	.5000	2	

NO STONE COLUMNS.

TENSAR GEOGRID PLACEMENT:

LAYER	ELEVATION	X-LEFT	X-RIGHT	%COVERAGE
1	96.00	242.10	302.00	100.
2	100.00	250.10	300.00	100.
3	104.00	258.10	308.00	100.
4	108.00	266.10	301.00	100.
5	112.00	274.10	309.00	100.
6	116.00	282.10	302.00	100.
7	118.00	286.10	306.00	100.

TENSAR GEOGRID STRENGTH DATA:

LAYER	ULT STREN KIPS/FT	WRKG STREN KIPS/FT	FS-PULL OUT
1	3.00	1.00	1.5
2	3.00	1.00	1.5
3	3.00	1.00	1.5
4	3.00	1.00	1.5
5	3.00	1.00	1.5
6	1.50	.50	1.5
7	1.50	.50	1.5

NO DERATING OF GEOGRID FORCES

APPROXIMATELY 100. SLICES WILL BE USED AT RMAX.
THE MINIMUM TANGENT ELEVATION FOR ANY FAILURE CIRCLE IS 70.00
THE MAXIMUM TANGENT ELEVATION FOR ANY FAILURE CIRCLE IS 105.00

THERE ARE 14 INCREMENTS BETWEEN TANGENT LEVELS

AUTOMATIC SEARCH FOR CRITICAL CIRCLE:
INITIAL X = 180.00, INITIAL Y = 240.00.
DELX = 5.00, DELY = 5.00.

X = 180.00 , Y = 240.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
170.00	1.700	1.910	1.585	9914.8	.115	105
167.50	1.530	1.821	1.377	7541.7	.153	96
165.00	19.867	20.247	19.677	5224.3	.190	59
169.38	1.658	1.888	1.536	9318.2	.122	104
168.75	1.616	1.864	1.485	8723.8	.131	102
168.13	1.574	1.841	1.432	8131.7	.141	98
166.88	1.486	1.804	1.320	6953.9	.166	93
166.25	13.336	13.651	13.179	6368.4	.157	92
-- 2 FAILURE SURFACES FOR R= 165.63 (IDENTIFIED LEFT TO RIGHT)						
165.63 F.O.S. VERY LARGE (SUMWSA LESS THAN .01)						
165.63	17.567	17.913	17.395	5789.7	.172	64
162.50	73.946	74.577	73.631	3102.4	.315	52
160.00	219.619	220.797	219.031	1360.1	.588	40
157.50	*******	*******	*******	200.0	2.361	24

TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 137.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 135.00.

THE LOWEST FACTOR OF SAFETY WAS 1.486 AT R = 166.88.

X = 185.00 , Y = 240.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
170.00	1.653	1.814	1.564	11672.6	.089	106
167.50	1.508	1.724	1.384	9299.5	.124	97
165.00	13.733	14.010	13.590	6967.6	.143	65
169.38	1.619	1.789	1.520	11076.1	.099	104
168.75	1.585	1.766	1.476	10481.7	.109	102
168.13	1.546	1.743	1.430	9889.5	.116	98
166.88	1.469	1.706	1.337	8711.8	.133	93
166.25	1.432	1.693	1.289	8126.2	.143	89

-- 2 FAILURE SURFACES FOR R= 165.63 (IDENTIFIED LEFT TO RIGHT)
165.63 F.O.S. VERY LARGE (SUMWSA LESS THAN .01)

165.63	12.549	12.804	12.417	7542.9	.132	67
162.50	21.402	21.810	21.197	4791.7	.204	58
160.00	64.955	65.637	64.615	2829.6	.340	51
157.50	258.390	259.859	257.657	1181.2	.733	39
155.00	*******	*******	*******	121.8	5.085	20

TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 137.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 135.00.

HE LOWEST FACTOR OF SAFETY WAS 1.432 AT R = 166.25.

X = 190.00 , Y = 240.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
170.00	1.640	1.776	1.568	13289.4	.072	107
167.50	1.501	1.673	1.410	10916.7	.090	97
165.00	10.572	10.771	10.456	8580.0	.116	67
169.38	1.604	1.753	1.529	12693.3	.075	103
168.75	1.568	1.724	1.489	12098.9	.079	101
168.13	1.534	1.698	1.450	11506.8	.084	98
166.88	1.470	1.652	1.371	10329.0	.099	93
166.25	1.443	1.637	1.332	9743.4	.111	90
165.63	1.421	1.626	1.295	9160.0	.125	85
162.50	14.755	15.049	14.601	6370.6	.154	62
160.00	23.269	23.708	23.048	4355.2	.221	56
157.50	45.848	46.591	45.477	2550.4	.371	50
155.00	308.503	310.185	307.663	1015.1	.840	37
152.50	*******	*******	*******	59.4	7.688	13

TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
OPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 137.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 135.00.

THE LOWEST FACTOR OF SAFETY WAS 1.421 AT R = 165.63.

X = 195.00 , Y = 240.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
170.00	1.645	1.722	1.593	14694.3	.051	106
167.50	1.528	1.659	1.451	12385.0	.077	97
165.00	8.697	8.862	8.614	10055.5	.083	74
169.38	1.611	1.697	1.557	14119.7	.054	104
168.75	1.586	1.681	1.521	13543.2	.065	102
168.13	1.559	1.668	1.485	12964.9	.074	100
166.88	1.498	1.651	1.417	11803.3	.081	94
166.25	1.470	1.637	1.384	11219.9	.085	91
165.63	1.444	1.621	1.354	10636.6	.090	86
162.50	11.332	11.541	11.210	7826.7	.122	66
160.00	15.980	16.291	15.813	5777.6	.167	61
157.50	25.560	26.036	25.319	3918.8	.242	54
155.00	51.538	52.360	51.127	2267.4	.411	47
152.50	338.012	340.139	336.950	861.5	1.062	37
150.00	*******	*******	*******	15.3	19.590	9

TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 137.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 135.00.

THE LOWEST FACTOR OF SAFETY WAS 1.444 AT R = 165.63.

X = 190.00 , Y = 245.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
175.00	1.653	1.761	1.584	14047.8	.070	107
172.50	1.511	1.678	1.426	11619.9	.085	97
170.00	10.162	10.348	10.058	9212.7	.104	69
174.38	1.617	1.746	1.544	13442.8	.073	105
173.75	1.581	1.729	1.505	12836.0	.077	104
173.13	1.546	1.705	1.466	12227.5	.080	99
171.88	1.478	1.654	1.387	11014.6	.090	93
171.25	1.447	1.633	1.349	10411.4	.098	91
170.63	1.421	1.618	1.313	9810.4	.107	86
167.50	13.932	14.197	13.786	6934.9	.146	62
165.00	21.278	21.678	21.074	4854.4	.205	56
162.50	39.243	39.898	38.916	2986.9	.327	50
160.00	219.690	221.104	218.984	1360.1	.706	40
157.50	*******	*******	*******	200.0	3.147	21

TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.

TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.

THE LOWEST FACTOR OF SAFETY WAS 1.421 AT R = 170.63.

X = 190.00 , Y = 250.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
180.00	1.659	1.748	1.601	14785.9	.058	106
177.50	1.526	1.687	1.444	12321.2	.082	98
175.00	9.806	9.985	9.715	9845.5	.092	70
179.38	1.632	1.730	1.562	14172.8	.070	104
178.75	1.597	1.715	1.522	13557.6	.074	103
178.13	1.561	1.702	1.483	12940.4	.078	100
176.88	1.492	1.662	1.405	11700.1	.087	94
176.25	1.459	1.639	1.368	11079.4	.092	91
175.63	1.430	1.620	1.332	10460.9	.098	86
172.50	13.240	13.478	13.101	7499.1	.139	63
170.00	19.681	20.047	19.490	5353.6	.191	57
167.50	34.430	35.016	34.135	3423.7	.294	50
165.00	101.106	102.250	100.535	1735.0	.571	42
162.50	*******	*******	*******	399.9	1.624	27

TOPLINE NOT COMPLETELY DEFINED FOR R = 160.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 157.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.

THE LOWEST FACTOR OF SAFETY WAS 1.430 AT R = 175.63.

X = 195.00 , Y = 245.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
175.00	1.655	1.730	1.615	15402.6	.040	107
172.50	1.543	1.645	1.471	13060.4	.072	98
170.00	8.474	8.635	8.394	10688.2	.080	75
174.38	1.625	1.704	1.578	14820.0	.047	105
173.75	1.597	1.679	1.542	14235.4	.055	103
173.13	1.565	1.657	1.506	13648.9	.059	99
171.88	1.516	1.637	1.437	12470.1	.079	95
171.25	1.487	1.633	1.405	11877.9	.083	91
170.63	1.462	1.631	1.375	11283.9	.087	87
167.50	10.901	11.102	10.796	8391.1	.105	67
165.00	15.109	15.388	14.951	6277.4	.158	60
162.50	23.407	23.840	23.182	4357.4	.224	54
160.00	44.143	44.871	43.780	2647.2	.363	47
157.50	200.277	201.887	199.472	1175.5	.804	39
155.00	*******	*******	*******	121.8	3.813	17

TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.

TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.

THE LOWEST FACTOR OF SAFETY WAS 1.462 AT R = 170.63.

X = 185.00 , Y = 245.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
175.00	1.654	1.809	1.574	12446.1	.080	106
172.50	1.514	1.708	1.396	10002.7	.118	96
170.00	12.948	13.202	12.813	7600.2	.135	66
174.38	1.616	1.780	1.530	11832.0	.086	103
173.75	1.581	1.754	1.486	11220.0	.095	103
173.13	1.548	1.730	1.441	10610.3	.106	99
171.88	1.476	1.689	1.349	9397.4	.127	93
171.25	1.439	1.673	1.303	8794.2	.136	91

-- 2 FAILURE SURFACES FOR R= 170.63 (IDENTIFIED LEFT TO RIGHT)
170.63 F.O.S. VERY LARGE (SUMWSA LESS THAN .01)

170.63	11.898	12.128	11.772	8193.3	.126	67
167.50	19.538	19.910	19.350	5355.3	.188	58
165.00	35.373	35.970	35.074	3326.8	.298	52
162.50	189.153	190.411	188.524	1552.1	.628	42
160.00	*******	*******	*******	292.9	2.183	26

TOPLINE NOT COMPLETELY DEFINED FOR R = 157.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.

THE LOWEST FACTOR OF SAFETY WAS 1.439 AT R = 171.25.

X = 191.25 , Y = 245.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
175.00	1.652	1.744	1.590	14410.9	.062	106
172.50	1.518	1.680	1.436	12002.2	.082	98
170.00	9.660	9.838	9.567	9594.6	.093	69
174.38	1.622	1.727	1.551	13811.5	.071	105
173.75	1.587	1.713	1.512	13210.3	.074	103
173.13	1.552	1.700	1.474	12607.1	.078	101
171.88	1.485	1.655	1.399	11396.9	.087	93
171.25	1.454	1.633	1.362	10793.7	.092	91
170.63	1.427	1.617	1.328	10192.7	.099	87
167.50	13.014	13.256	12.876	7310.8	.138	65
165.00	19.305	19.672	19.115	5220.4	.190	57
162.50	33.708	34.294	33.415	3337.7	.293	50
160.00	119.018	120.160	118.449	1686.1	.570	43
157.50	*******	*******	*******	393.4	2.000	27

TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.

THE LOWEST FACTOR OF SAFETY WAS 1.427 AT R = 170.63.

X = 188.75 , Y = 245.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
175.00	1.651	1.781	1.579	13668.3	.072	107
172.50	1.506	1.679	1.417	11228.8	.089	96
170.00	10.730	10.926	10.615	8822.2	.116	68
174.38	1.614	1.762	1.539	13057.7	.075	106
173.75	1.578	1.733	1.499	12446.1	.079	101
173.13	1.541	1.705	1.458	11836.3	.083	99
171.88	1.473	1.656	1.377	10623.5	.096	94
171.25	1.444	1.637	1.337	10020.3	.107	90
170.63	1.420	1.625	1.299	9419.4	.121	85
167.50	15.001	15.292	14.847	6551.2	.154	62
165.00	23.687	24.125	23.466	4481.7	.222	55
162.50	46.667	47.410	46.296	2631.4	.371	48
160.00	315.175	316.856	314.336	1048.4	.839	38
157.50	*******	*******	*******	56.0	8.429	13

TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.

THE LOWEST FACTOR OF SAFETY WAS 1.420 AT R = 170.63.

X = 187.50 , Y = 245.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
175.00	1.650	1.796	1.576	13272.3	.074	106
172.50	1.504	1.683	1.409	10828.9	.095	97
170.00	11.370	11.583	11.248	8423.3	.122	67
174.38	1.613	1.766	1.535	12658.1	.078	104
173.75	1.575	1.736	1.494	12046.2	.082	101
173.13	1.539	1.709	1.452	11436.4	.088	99
171.88	1.474	1.663	1.367	10223.5	.107	94
171.25	1.445	1.647	1.325	9620.4	.120	90
170.63	1.417	1.635	1.285	9019.4	.132	86
167.50	16.257	16.572	16.093	6160.0	.164	61
165.00	26.677	27.160	26.435	4102.8	.242	53
162.50	76.051	76.912	75.621	2271.5	.430	47

160.00	491.955	494.261	490.804	764.0	1.151	34

TOPLINE NOT COMPLETELY DEFINED FOR R = 157.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.

THE LOWEST FACTOR OF SAFETY WAS 1.417 AT R = 170.63.

X = 186.25 , Y = 245.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
175.00	1.650	1.801	1.574	12863.6	.076	106
172.50	1.508	1.694	1.402	10420.2	.106	97
170.00	12.103	12.335	11.975	8015.9	.128	67
174.38	1.613	1.771	1.532	12249.4	.081	104
173.75	1.576	1.743	1.489	11637.5	.087	102
173.13	1.541	1.716	1.446	11027.7	.095	100
171.88	1.477	1.675	1.358	9814.8	.120	93
171.25	1.443	1.658	1.314	9211.7	.129	89
170.63	7.174	7.386	7.054	8610.7	.120	87
167.50	17.747	18.089	17.572	5761.3	.175	59
165.00	30.462	30.997	30.195	3717.6	.267	53
162.50	139.857	140.882	139.346	1907.8	.512	45
160.00	794.209	797.346	792.642	510.4	1.566	30

TOPLINE NOT COMPLETELY DEFINED FOR R = 157.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.

THE LOWEST FACTOR OF SAFETY WAS 1.443 AT R = 171.25.

X = 187.50 , Y = 246.25 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
176.25	1.653	1.795	1.579	13465.1	.073	106
173.75	1.506	1.683	1.413	11004.7	.093	97
171.25	11.245	11.452	11.124	8581.5	.120	67
175.63	1.615	1.767	1.538	12847.1	.077	104
175.00	1.578	1.738	1.497	12230.7	.081	102
174.38	1.541	1.709	1.455	11616.6	.086	100
173.13	1.473	1.661	1.371	10394.9	.103	94
172.50	1.445	1.644	1.329	9787.4	.116	90
171.88	1.419	1.632	1.289	9182.0	.130	86
168.75	15.990	16.299	15.828	6301.0	.161	61

166.25	25.982	26.453	25.746	4227.3	.237	54
163.75	60.251	61.079	59.838	2380.2	.413	47
161.25	438.535	440.653	437.477	838.3	1.058	34

TOPLINE NOT COMPLETELY DEFINED FOR R = 158.75.
OPLINE NOT COMPLETELY DEFINED FOR R = 156.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 153.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 151.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 148.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 146.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 143.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 141.25.

THE LOWEST FACTOR OF SAFETY WAS 1.419 AT R = 171.88.

X = 187.50 , Y = 243.75 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
173.75	1.647	1.794	1.573	13078.9	.074	105
171.25	1.504	1.685	1.406	10653.1	.099	96
168.75	11.500	11.719	11.377	8265.1	.123	67
173.13	1.610	1.764	1.532	12469.1	.078	105
172.50	1.573	1.736	1.490	11861.6	.083	101
171.88	1.538	1.709	1.448	11256.2	.090	99
170.63	1.474	1.665	1.363	10052.2	.111	94
170.00	1.445	1.649	1.321	9453.4	.124	90
169.38	1.415	1.638	1.281	8856.8	.134	85
166.25	16.536	16.858	16.370	6019.0	.166	60
163.75	27.418	27.914	27.171	3978.1	.248	53
161.25	93.336	94.233	92.888	2162.8	.448	47
158.75	555.822	558.115	554.677	692.9	1.145	34

TOPLINE NOT COMPLETELY DEFINED FOR R = 156.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 153.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 151.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 148.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 146.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 143.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 141.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 138.75.

THE LOWEST FACTOR OF SAFETY WAS 1.415 AT R = 169.38.

X = 187.50 , Y = 242.50 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
172.50	1.644	1.793	1.569	12885.5	.075	106
170.00	1.505	1.687	1.402	10477.3	.103	96
167.50	11.636	11.860	11.512	8107.0	.125	66
171.88	1.607	1.763	1.528	12280.2	.079	104
171.25	1.571	1.735	1.487	11677.0	.085	102
170.63	1.536	1.708	1.445	11076.1	.091	98
169.38	1.475	1.668	1.359	9880.7	.115	94
168.75	1.444	1.652	1.317	9286.4	.127	91

168.13	1.484	1.712	1.350	8694.2	.134	86
165.00	16.831	17.159	16.662	5878.0	.169	60
162.50	28.211	28.719	27.957	3853.5	.254	53
160.00	112.335	113.272	111.867	2054.2	.468	46
157.50	630.577	633.099	629.318	625.1	1.259	33

TOPLINE NOT COMPLETELY DEFINED FOR R = 155.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 152.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 150.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 147.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 145.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 142.50.
TOPLINE NOT COMPLETELY DEFINED FOR R = 140.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 137.50.

THE LOWEST FACTOR OF SAFETY WAS 1.444 AT R = 168.75.

X = 188.75 , Y = 243.75 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
173.75	1.648	1.784	1.575	13477.5	.072	107
171.25	1.504	1.678	1.414	11053.0	.091	96
168.75	10.842	11.042	10.724	8664.1	.117	68
173.13	1.611	1.761	1.535	12869.1	.076	104
172.50	1.575	1.732	1.495	12261.5	.080	102
171.88	1.538	1.704	1.454	11656.2	.084	98
170.63	1.472	1.656	1.373	10452.1	.099	93
170.00	1.444	1.639	1.333	9853.3	.111	91
169.38	1.420	1.627	1.295	9256.7	.125	85
166.25	15.232	15.530	15.076	6410.2	.156	61
163.75	24.264	24.712	24.037	4357.0	.226	55
161.25	48.707	49.476	48.323	2522.4	.384	48
158.75	347.044	348.852	346.141	967.1	.903	36
156.25	*******	*******	*******	31.3	9.977	11

TOPLINE NOT COMPLETELY DEFINED FOR R = 153.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 151.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 148.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 146.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 143.75.
TOPLINE NOT COMPLETELY DEFINED FOR R = 141.25.
TOPLINE NOT COMPLETELY DEFINED FOR R = 138.75.

THE LOWEST FACTOR OF SAFETY WAS 1.420 AT R = 169.38.

X = 186.25 , Y = 243.75 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
173.75	1.648	1.800	1.571	12670.2	.077	106
171.25	1.509	1.697	1.399	10244.4	.111	97
168.75	12.257	12.495	12.127	7857.7	.130	68
173.13	1.611	1.771	1.529	12060.5	.082	104
172.50	1.575	1.743	1.486	11452.9	.088	101
171.88	1.541	1.719	1.443	10847.5	.099	99

170.63	1.477	1.678	1.354	9643.4	.122	93
170.00	1.441	1.662	1.310	9044.7	.131	90
169.38	7.512	7.729	7.390	8448.1	.122	87
166.25	18.091	18.439	17.912	5620.3	.178	60
163.75	31.437	31.986	31.163	3593.2	.274	52
161.25	151.922	152.999	151.384	1800.5	.538	45
158.75	874.383	877.911	872.621	450.2	1.762	30

```
TOPLINE NOT COMPLETELY DEFINED FOR R =   156.25.
TOPLINE NOT COMPLETELY DEFINED FOR R =   153.75.
TOPLINE NOT COMPLETELY DEFINED FOR R =   151.25.
TOPLINE NOT COMPLETELY DEFINED FOR R =   148.75.
TOPLINE NOT COMPLETELY DEFINED FOR R =   146.25.
TOPLINE NOT COMPLETELY DEFINED FOR R =   143.75.
TOPLINE NOT COMPLETELY DEFINED FOR R =   141.25.
TOPLINE NOT COMPLETELY DEFINED FOR R =   138.75.

THE LOWEST FACTOR OF SAFETY WAS    1.441 AT R =   170.00.


SUMMARY OF RESULTS FOR CRITICAL CIRCLE:
  X =  187.50.
  Y =  243.75.
  RADIUS OF CRITICAL CIRCLE = 169.38.

  MINIMUM FS =  1.415 (TENSAR GEOGRIDS AT WORKING STRESS).

  FS (TENSAR GEOGRIDS AT ULTIMATE STRESS) =  1.638.
  FS (UNREINFORCED) =  1.281.
  TOTAL DRIVING MOMENT =   8856.84  KIP-FT/FT
  CRITICAL CIRCLE EXTENDS TO ELEVATION   74.38.
  ELEVATION OF TENSAR GEOGRIDS INTERSECTED BY CRITICAL CIRCLE :
        96.00    (PULL OUT STRESS =     1.00 KIPS/FT )
       100.00    (PULL OUT STRESS =     1.00 KIPS/FT )
       104.00    (PULL OUT STRESS =     1.00 KIPS/FT )
       108.00    (PULL OUT STRESS =     1.00 KIPS/FT )
       112.00    (PULL OUT STRESS =     1.00 KIPS/FT )
       116.00    (PULL OUT STRESS =      .50 KIPS/FT )
       118.00    (PULL OUT STRESS =      .50 KIPS/FT )

CALCULATIONS HAVE BEEN COMPLETED.
```

'TENSLOPE' Geometry Plot

Title: US Steel CAMU

Project:

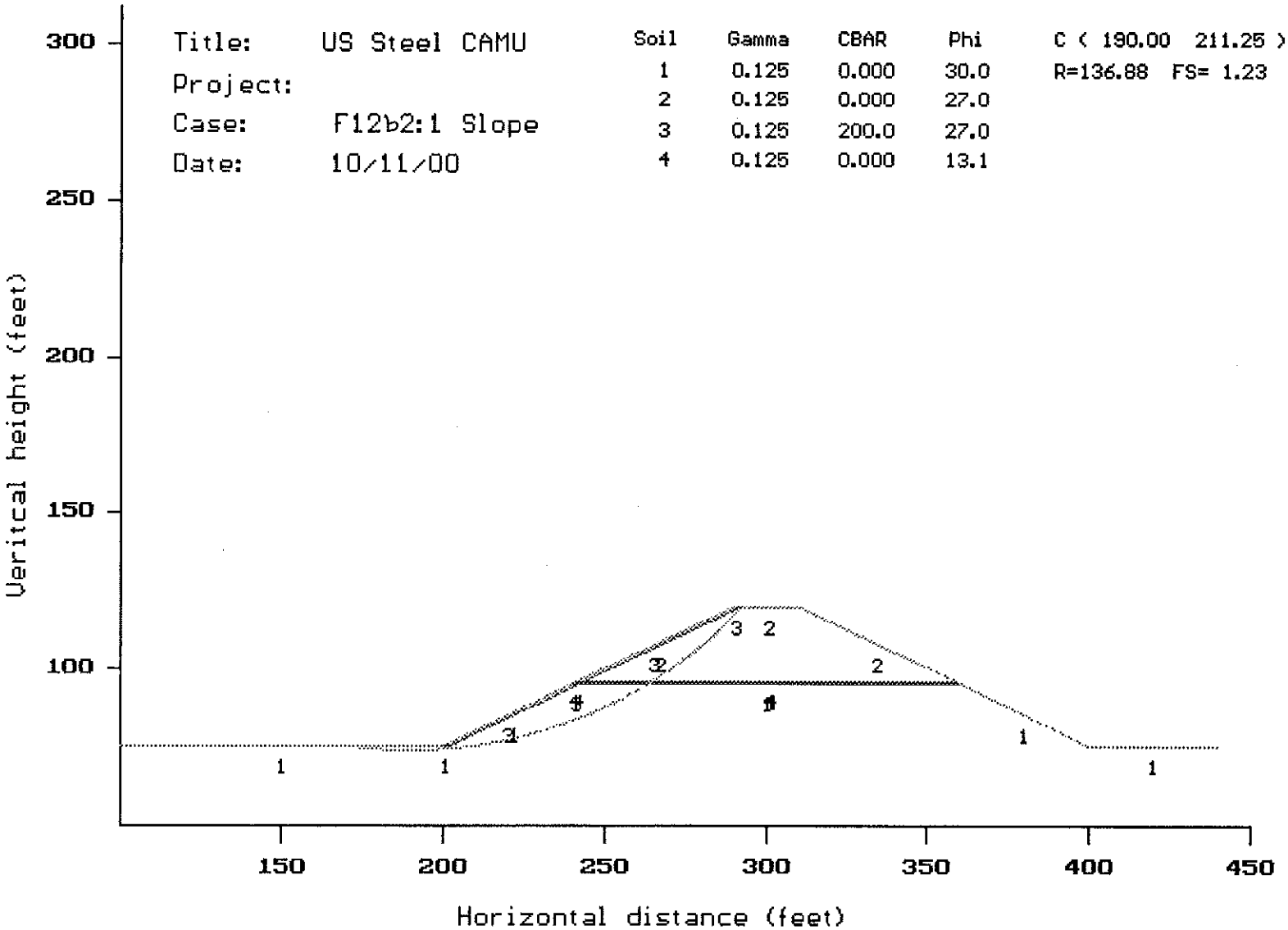
Case: F12b2:1 Slope

Date: 10/11/00

Soil	Gamma	CBAR	Phi
1	0.125	0.000	30.0
2	0.125	0.000	27.0
3	0.125	200.0	27.0
4	0.125	0.000	13.1

C (190.00 211.25)

R=136.88 FS= 1.23



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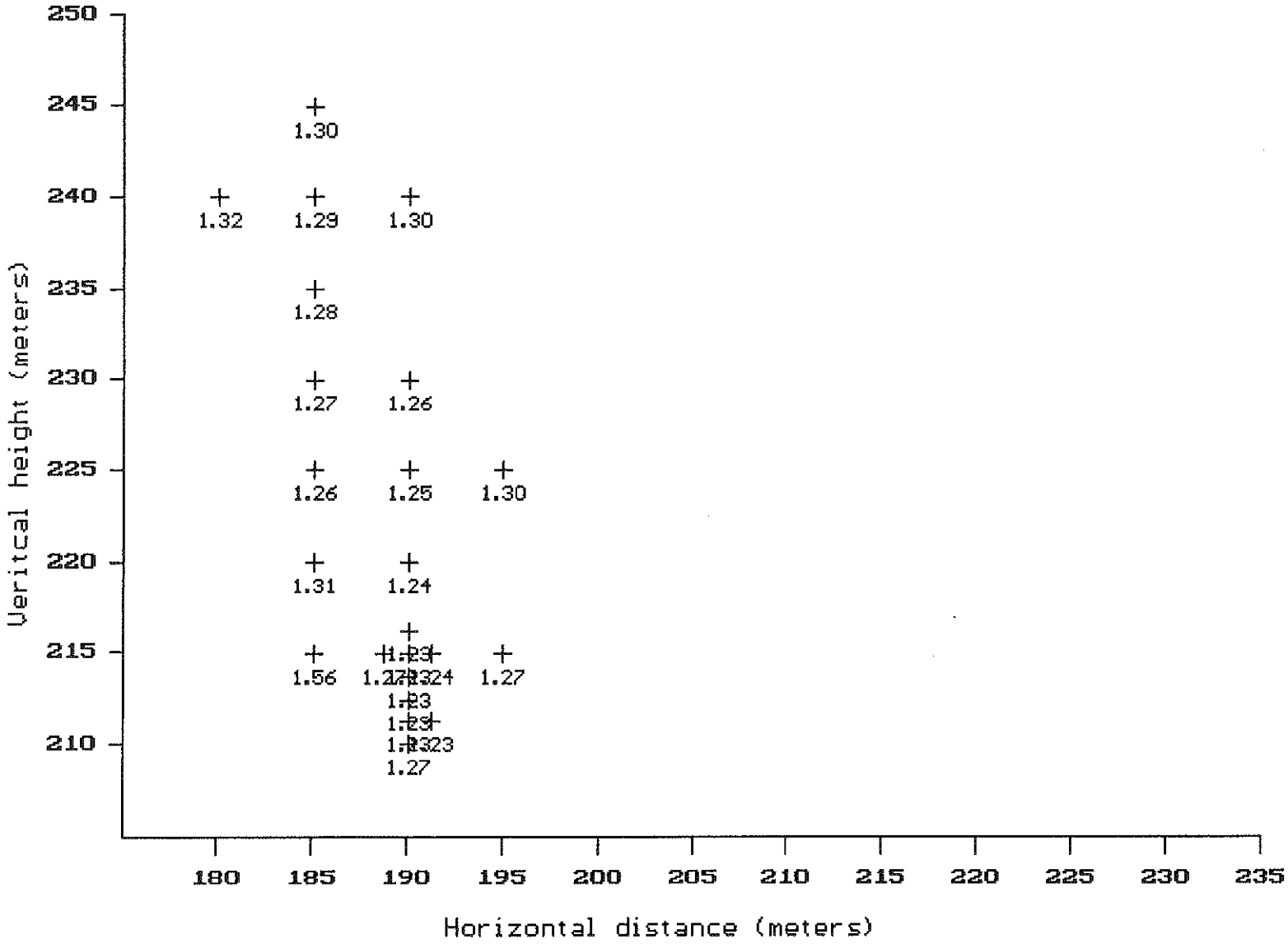
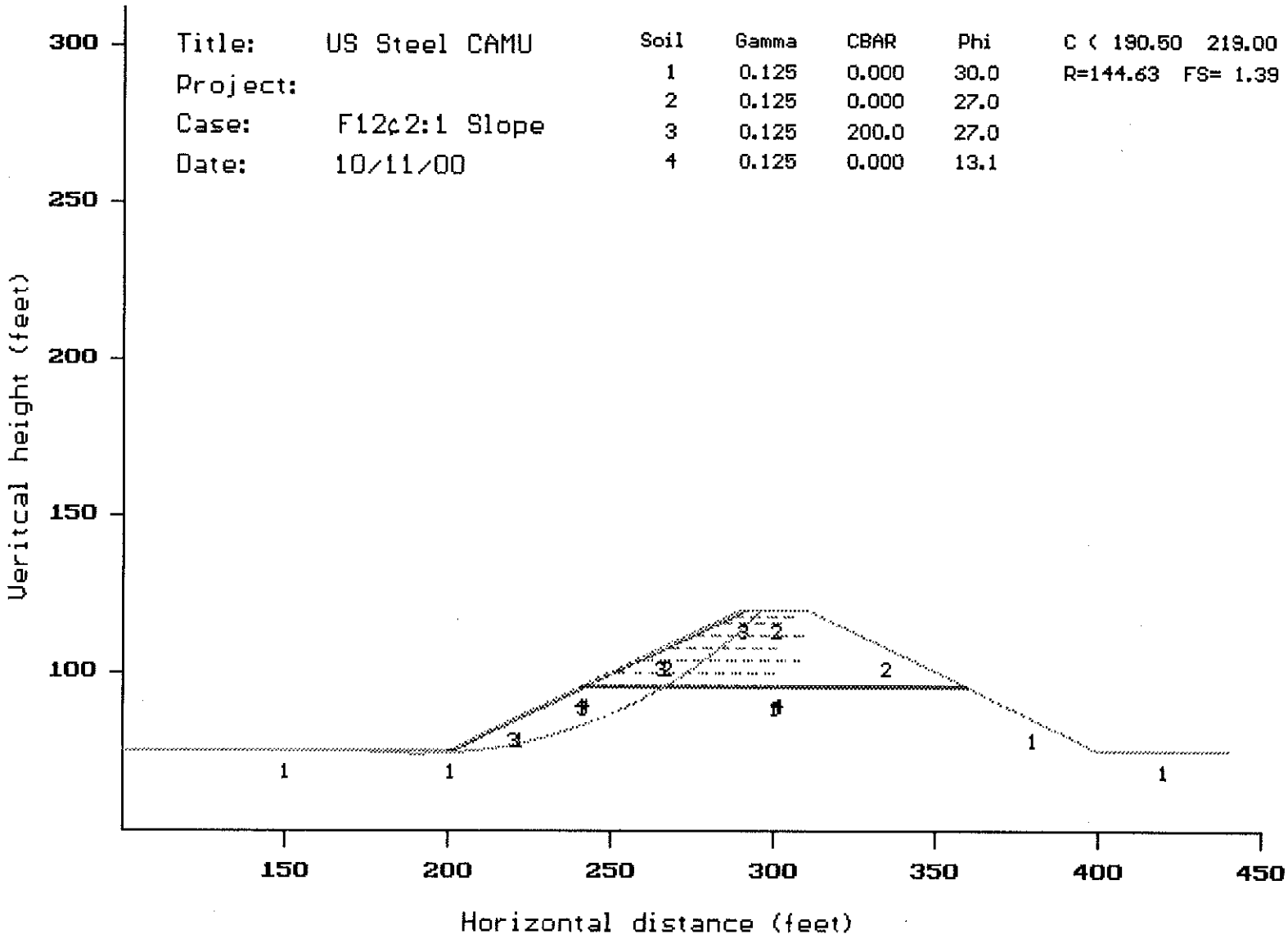
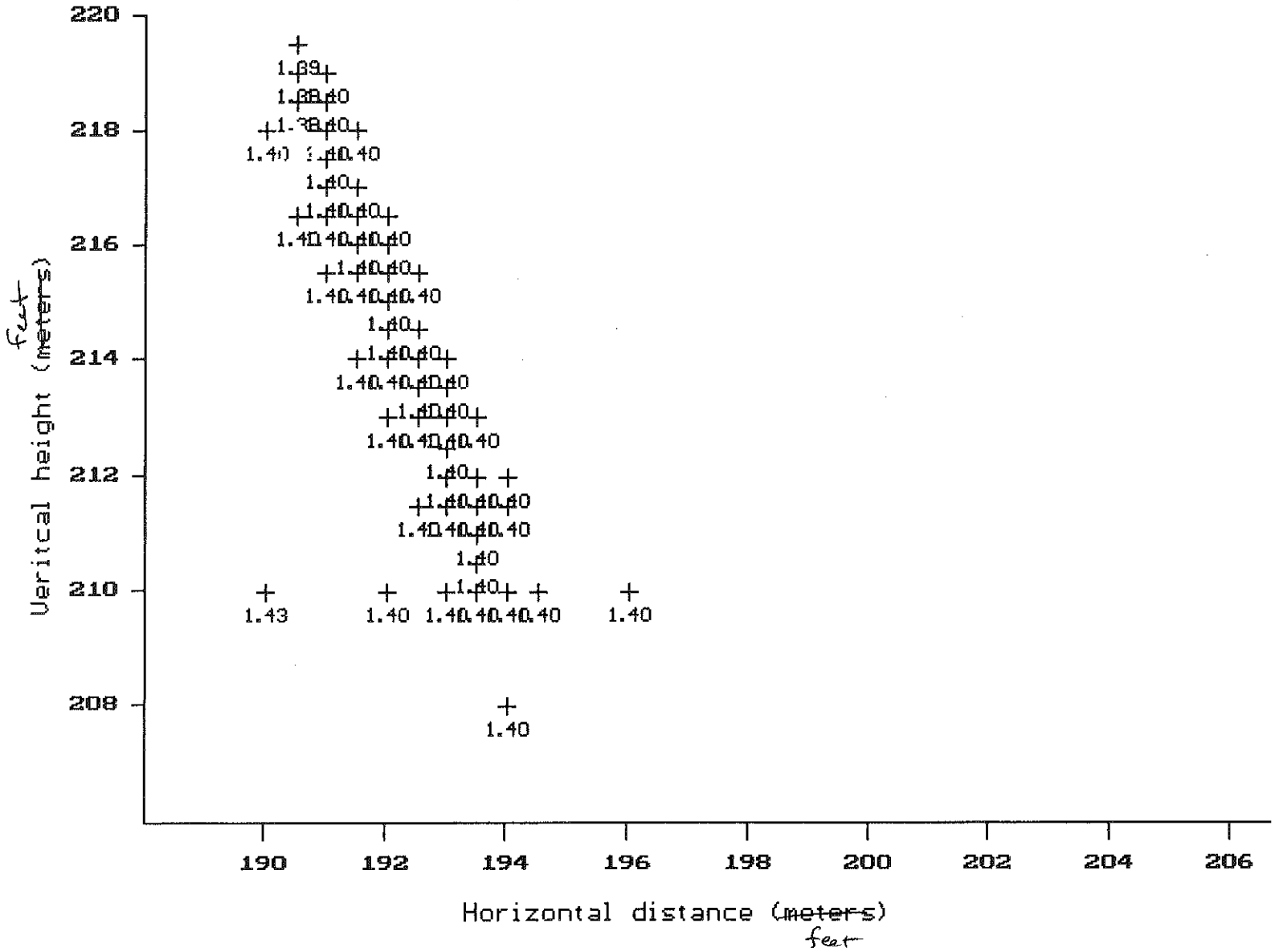
'CONTOUR' Data Plot F12b UNREINFORCED



'TENSLOPE' Geometry Plot



'CONTOUR' Data Plot Fig c



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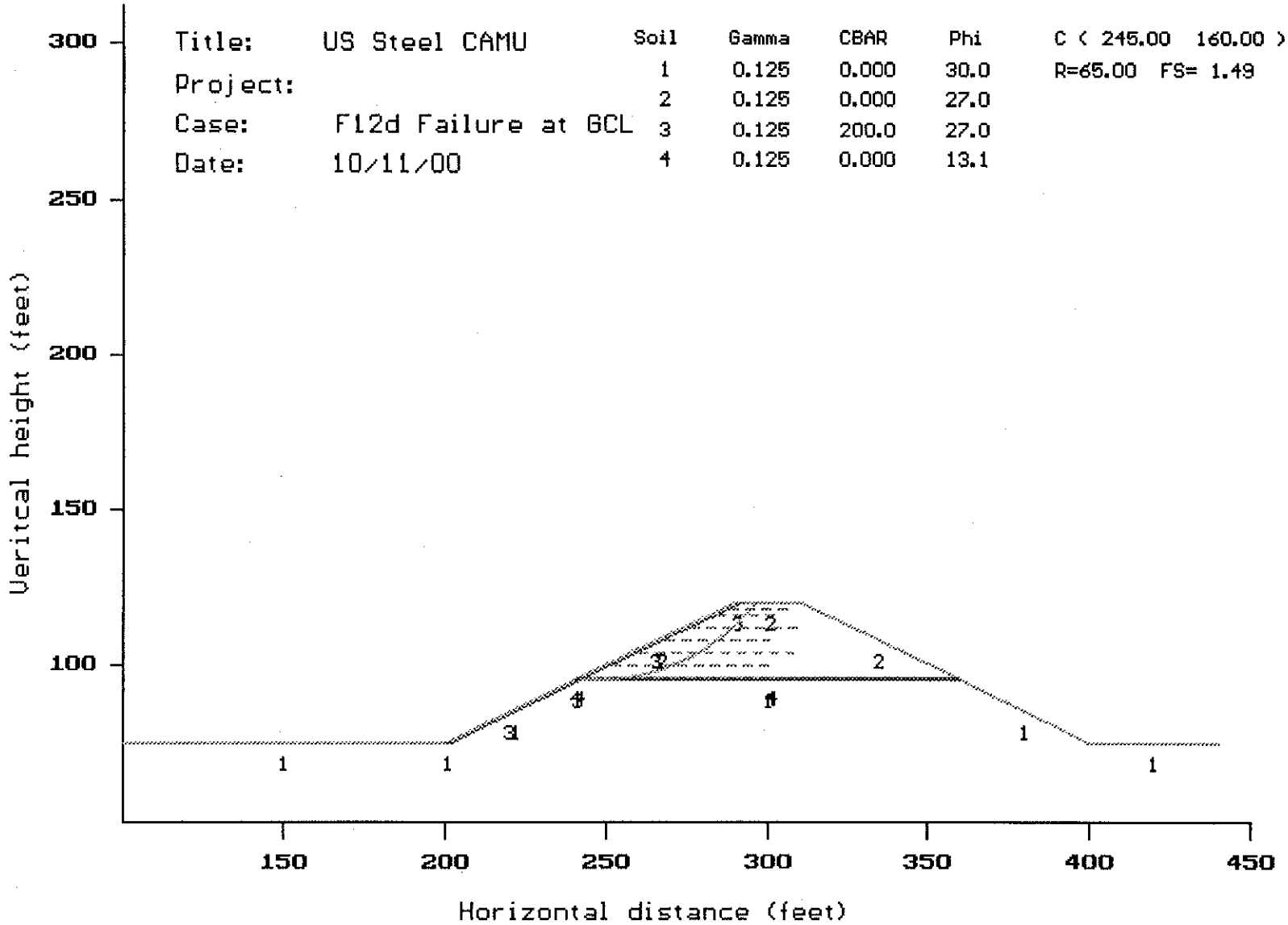
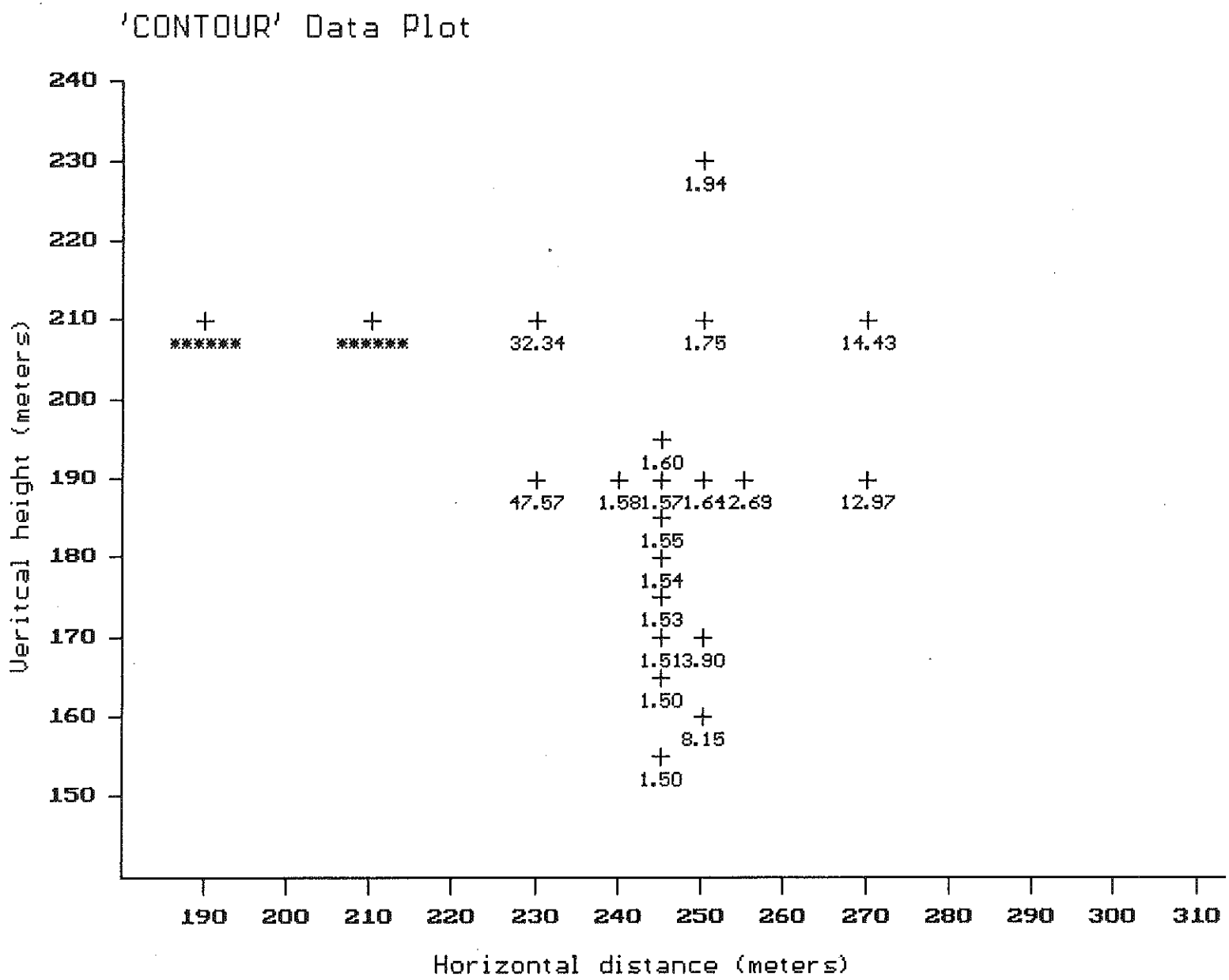
'TENSLOPE' Geometry Plot



18


'CONTOUR' Data Plot
Veritcal height (meters)
240
230
220
210
200
190
180
170
160
150
1.94
******
******
32.34
1.75
14.43
1.60
47.57
1.58
1.57
1.64
2.69
12.97
1.55
1.54
1.53
1.51
3.90
1.50
8.15
1.50
190
200
210
220
230
240
250
260
270
280
290
300
310
Horizontal distance (meters)

TENSLO1 PROGRAM - VERSION 2.1 (AUG. 9, 1989):
SLOPE STABILITY BY THE MODIFIED BISHOP METHOD.
TENSAR GEOGRID REINFORCEMENT CAN BE INCLUDED.
PROGRAM BY THE TENSAR CORPORATION, APRIL 1986.

DATE 10-11-2000
TIME 15:40

US Steel CAMU$$F12d Failure at GCL$10/11/00

*** UNITS - FEET AND KIPS

NO SEISMIC FORCES

SOIL INFORMATION:

NO.	GAMMA	CBAR	TAN(PHIBAR)	RU	MU
1	.125	.000	.577	.00	.66
2	.125	.000	.510	.00	.66
3	.125	200.000	.510	.00	.66
4	.125	.000	.233	.00	.66

LINE ARRAY:

NO.	X-LEFT	Y-LEFT	X-RIGHT	Y-RIGHT	SLOPE	SOIL	TOPLINE
1	100.00	75.00	200.00	75.00	.0000	1	*
2	200.00	75.00	240.00	95.00	.5000	3	*
3	240.00	95.00	241.00	95.50	.5000	4	*
4	241.00	95.50	290.00	120.00	.5000	3	*
5	290.00	120.00	292.00	120.00	.0000	3	*
6	292.00	120.00	310.00	120.00	.0000	2	*
7	310.00	120.00	359.00	95.50	-.5000	2	*
8	243.00	95.50	360.00	95.00	-.0043	4	*
9	360.00	95.00	400.00	75.00	-.5000	1	*
10	400.00	75.00	440.00	75.00	.0000	1	*
11	200.00	75.00	202.00	75.00	.0000	1	
12	202.00	75.00	242.00	95.00	.5000	1	
13	240.00	95.00	242.00	95.00	.0000	3	
14	240.00	95.00	360.00	95.00	.0000	1	
15	241.00	95.50	243.00	95.50	.0000	4	
16	243.00	95.50	359.00	95.50	.0000	4	
17	243.00	95.50	292.00	120.00	.5000	2	

NO STONE COLUMNS.

TENSAR GEOGRID PLACEMENT:

LAYER	ELEVATION	X-LEFT	X-RIGHT	%COVERAGE
1	96.00	242.10	302.00	100.
2	100.00	250.10	300.00	100.
3	104.00	258.10	308.00	100.
4	108.00	266.10	301.00	100.
5	112.00	274.10	309.00	100.
6	116.00	282.10	302.00	100.
7	118.00	286.10	306.00	100.

TENSAR GEOGRID STRENGTH DATA:

LAYER	ULT STREN KIPS/FT	WRKG STREN KIPS/FT	FS-PULL OUT
1	3.00	1.00	1.5
2	3.00	1.00	1.5
3	3.00	1.00	1.5
4	3.00	1.00	1.5
5	3.00	1.00	1.5
6	1.50	.50	1.5
7	1.50	.50	1.5

NO DERATING OF GEOGRID FORCES

APPROXIMATELY 100. SLICES WILL BE USED AT RMAX.
THE MINIMUM TANGENT ELEVATION FOR ANY FAILURE CIRCLE IS 95.00
THE MAXIMUM TANGENT ELEVATION FOR ANY FAILURE CIRCLE IS 105.00

THERE ARE 10 INCREMENTS BETWEEN TANGENT LEVELS

AUTOMATIC SEARCH FOR CRITICAL CIRCLE:
INITIAL X = 190.00, INITIAL Y = 210.00.
DELX = 20.00, DELY = 20.00.

X = 190.00 , Y = 210.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
TOPLINE NOT COMPLETELY DEFINED FOR R = 115.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 114.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 113.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 112.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 111.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 110.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 109.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 108.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 107.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 106.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 105.00.						

THE LOWEST FACTOR OF SAFETY WAS********* AT R = .00.

X = 210.00 , Y = 210.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
TOPLINE NOT COMPLETELY DEFINED FOR R = 115.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 114.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 113.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 112.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 111.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 110.00.						
TOPLINE NOT COMPLETELY DEFINED FOR R = 109.00.						

TOPLINE NOT COMPLETELY DEFINED FOR R = 108.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 107.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 106.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 105.00.

THE LOWEST FACTOR OF SAFETY WAS********* AT R = .00.

X = 230.00 , Y = 210.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
115.00	32.341	33.003	31.983	1928.8	.358	103
114.00	41.161	41.842	40.801	1587.7	.359	96
D(FS)/DR IS NEGATIVE AT RMAX.						
113.00	54.853	55.716	54.408	1268.4	.446	88
112.00	77.745	78.883	77.169	972.1	.576	80
111.00	120.703	121.973	120.069	700.3	.634	72
110.00	219.394	221.328	218.428	455.3	.966	64
109.00	717.164	719.883	715.806	240.7	1.357	52
108.00	*******	*******	*******	64.4	3.350	36

TOPLINE NOT COMPLETELY DEFINED FOR R = 107.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 106.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 105.00.

THE LOWEST FACTOR OF SAFETY WAS 32.341 AT R = 115.00.

X = 250.00 , Y = 210.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
115.00	1.748	1.972	1.635	3322.5	.113	105
114.00	15.533	15.684	15.442	3022.5	.090	98
D(FS)/DR IS NEGATIVE AT RMAX.						
113.00	17.308	17.508	17.143	2730.5	.165	95
112.00	19.430	19.757	19.247	2446.7	.183	92
111.00	22.102	22.511	21.897	2171.5	.204	87
110.00	25.481	25.828	25.308	1904.9	.173	83
109.00	30.011	30.408	29.812	1647.5	.198	80
108.00	36.188	36.652	35.957	1399.6	.231	75
107.00	44.835	45.386	44.527	1166.2	.307	70
106.00	57.205	57.672	56.884	950.1	.321	64
105.00	76.055	76.722	75.636	751.9	.419	58

THE LOWEST FACTOR OF SAFETY WAS 1.748 AT R = 115.00.

X = 270.00 , Y = 210.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
-- 2 FAILURE SURFACES FOR R= 115.00 (IDENTIFIED LEFT TO RIGHT)						
115.00	14.435	14.516	14.395	2829.8	.040	104

115.00	50.937	50.937	50.937	18.1	.000	23
114.00	15.686	15.686	15.683	2642.4	.003	99

D(FS)/DR IS NEGATIVE AT RMAX.

113.00	16.695	16.787	16.649	2459.2	.046	96
112.00	17.861	17.990	17.763	2280.4	.098	93
111.00	19.161	19.371	19.056	2106.0	.105	89
110.00	20.625	20.738	20.568	1936.1	.057	87
109.00	22.413	22.536	22.352	1770.8	.061	84
108.00	24.545	24.679	24.478	1610.3	.067	80
107.00	27.116	27.263	27.043	1454.6	.073	77
106.00	30.257	30.293	30.176	1303.8	.081	75
105.00	34.208	34.390	34.065	1158.1	.143	71

THE LOWEST FACTOR OF SAFETY WAS 14.435 AT R = 115.00.

X = 250.00 , Y = 230.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
135.00	1.943	2.166	1.830	3854.6	.113	105
134.00	15.990	16.141	15.914	3530.1	.076	99

D(FS)/DR IS NEGATIVE AT RMAX.

133.00	17.580	17.746	17.497	3214.2	.083	96
132.00	19.525	19.707	19.416	2907.2	.109	92
131.00	21.972	22.234	21.774	2609.2	.198	88
130.00	24.886	25.166	24.718	2320.7	.168	84
129.00	28.658	29.037	28.468	2041.8	.189	80
128.00	33.574	34.007	33.357	1773.1	.217	76
127.00	40.167	40.671	39.916	1515.0	.251	72
126.00	49.237	49.635	49.038	1267.9	.199	67
125.00	62.583	63.068	62.315	1032.8	.268	63

THE LOWEST FACTOR OF SAFETY WAS 1.943 AT R = 135.00.

X = 250.00 , Y = 190.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
95.00	1.643	1.957	1.447	2687.4	.196	105
94.00	15.587	15.896	15.432	2415.4	.155	99

D(FS)/DR IS NEGATIVE AT RMAX.

93.00	17.591	17.937	17.418	2150.9	.173	96
92.00	20.157	20.546	19.963	1893.9	.194	90
91.00	23.483	23.925	23.260	1648.6	.223	85
90.00	27.830	28.212	27.615	1416.7	.216	80
89.00	33.829	34.280	33.538	1198.6	.291	75
88.00	42.255	42.839	41.902	994.6	.354	70
87.00	54.711	55.491	54.279	805.0	.432	65
86.00	74.190	74.943	73.781	630.3	.409	59
85.00	107.838	108.870	107.297	471.2	.541	53

THE LOWEST FACTOR OF SAFETY WAS 1.643 AT R = 95.00.

X = 250.00 , Y = 170.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
75.00	3.900	4.293	3.695	1928.8	.205	104
74.00	16.650	16.997	16.447	1704.8	.203	99
D(FS)/DR IS NEGATIVE AT RMAX.						
73.00	19.200	19.600	18.955	1491.5	.244	93
72.00	22.525	23.010	22.246	1288.9	.279	88
71.00	27.018	27.612	26.694	1097.3	.323	83
70.00	33.241	33.816	32.935	916.7	.305	78
69.00	42.492	43.203	42.123	747.4	.369	73
68.00	57.008	57.917	56.547	589.6	.461	67
67.00	81.951	83.161	81.348	443.8	.604	62
66.00	130.972	132.248	130.335	310.7	.637	54
65.00	318.928	320.971	317.909	191.2	1.020	48

THE LOWEST FACTOR OF SAFETY WAS 3.900 AT R = 75.00.

X = 270.00 , Y = 190.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
-- 2 FAILURE SURFACES FOR R= 95.00 (IDENTIFIED LEFT TO RIGHT)						
95.00	12.967	13.043	12.930	2493.0	.038	103
95.00	51.304	51.304	51.304	13.5	.000	22
94.00	14.111	14.192	14.069	2323.2	.042	99
D(FS)/DR IS NEGATIVE AT RMAX.						
93.00	15.031	15.174	14.945	2157.3	.086	96
92.00	16.053	16.237	15.961	1995.3	.092	93
91.00	17.248	17.445	17.149	1837.5	.099	89
90.00	18.604	18.710	18.551	1683.7	.053	86
89.00	20.278	20.394	20.220	1534.1	.058	83
88.00	22.293	22.420	22.230	1388.8	.063	79
87.00	24.839	24.999	24.686	1247.8	.154	77
86.00	27.885	28.059	27.731	1111.3	.154	74
85.00	31.752	32.042	31.579	979.4	.173	70

THE LOWEST FACTOR OF SAFETY WAS 12.967 AT R = 95.00.

X = 230.00 , Y = 190.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
95.00	47.574	48.569	47.077	1148.0	.497	103
94.00	68.062	69.146	67.521	868.8	.541	94
D(FS)/DR IS NEGATIVE AT RMAX.						
93.00	151.524	153.052	150.761	609.6	.763	86
92.00	419.308	421.286	418.320	372.5	.988	74
91.00	*******	*******	*******	175.6	1.813	59
90.00	*******	*******	*******	37.3	4.823	34

TOPLINE NOT COMPLETELY DEFINED FOR R = 89.00.

TOPLINE NOT COMPLETELY DEFINED FOR R = 88.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 87.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 86.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 85.00.

THE LOWEST FACTOR OF SAFETY WAS 47.574 AT R = 95.00.

X = 255.00 , Y = 190.00 :

-- 2 FAILURE SURFACES FOR R= 95.00 (IDENTIFIED LEFT TO RIGHT)

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
95.00	12.691	12.894	12.590	2807.9	.101	105
95.00	13.862	13.862	13.862	26.3	.000	25
94.00	14.030	14.176	13.930	2559.9	.100	99
D(FS)/DR IS NEGATIVE AT RMAX.						
93.00	15.514	15.712	15.354	2318.2	.160	96
92.00	17.283	17.602	17.107	2083.1	.176	92
91.00	19.499	19.892	19.303	1854.6	.196	88
90.00	22.277	22.608	22.112	1632.9	.165	85
89.00	25.985	26.361	25.797	1418.3	.188	80
88.00	30.934	31.370	30.714	1213.9	.221	75
87.00	37.709	38.220	37.410	1022.5	.300	70
86.00	47.169	47.599	46.870	844.4	.300	65
85.00	61.242	61.845	60.867	679.9	.375	60

HE LOWEST FACTOR OF SAFETY WAS 12.691 AT R = 95.00.

X = 245.00 , Y = 190.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
95.00	1.571	1.995	1.352	2435.1	.219	104
94.00	18.595	18.946	18.417	2146.6	.178	97
D(FS)/DR IS NEGATIVE AT RMAX.						
93.00	21.657	22.055	21.439	1872.2	.218	91
92.00	25.717	26.175	25.436	1612.0	.281	87
91.00	31.220	31.788	30.887	1366.4	.333	82
90.00	38.929	39.491	38.612	1135.6	.317	76
89.00	50.499	51.224	50.112	920.1	.387	70
88.00	68.893	69.831	68.404	720.4	.489	64
87.00	100.988	102.263	100.341	537.4	.647	58
86.00	165.303	166.692	164.610	372.1	.693	52
85.00	331.307	333.561	330.181	226.4	1.126	43

THE LOWEST FACTOR OF SAFETY WAS 1.571 AT R = 95.00.

X = 240.00 , Y = 190.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES

95.00	1.578	2.074	1.271	2083.4	.307	104
94.00	24.190	24.638	23.928	1794.1	.262	97

D(FS)/DR IS NEGATIVE AT RMAX.

93.00	29.427	29.983	29.121	1520.0	.306	91
92.00	36.903	37.595	36.538	1261.6	.365	85
91.00	48.151	49.015	47.704	1019.4	.446	80
90.00	66.219	67.110	65.766	794.0	.453	73
89.00	98.763	99.979	98.156	586.3	.607	65
88.00	167.397	169.170	166.511	397.6	.885	58
87.00	431.292	433.565	430.158	229.9	1.135	50
86.00	*******	*******	*******	87.0	1.974	39

85.00 F.O.S. VERY LARGE (SUMWSA LESS THAN .01)

THE LOWEST FACTOR OF SAFETY WAS 1.578 AT R = 95.00.

X = 245.00 , Y = 195.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
100.00	1.603	2.016	1.391	2628.7	.213	105
99.00	18.175	18.516	18.005	2326.6	.170	98

D(FS)/DR IS NEGATIVE AT RMAX.

98.00	21.036	21.421	20.841	2037.5	.194	92
97.00	24.792	25.232	24.550	1763.3	.241	87
96.00	29.851	30.366	29.537	1504.2	.313	83
95.00	36.778	37.273	36.477	1260.6	.301	78
94.00	46.925	47.577	46.561	1032.9	.364	71
93.00	62.522	63.372	62.070	821.6	.453	65
92.00	88.435	89.565	87.849	627.4	.586	59
91.00	136.421	137.612	135.817	451.5	.604	52
90.00	243.662	245.493	242.748	295.3	.914	45

THE LOWEST FACTOR OF SAFETY WAS 1.603 AT R = 100.00.

X = 245.00 , Y = 185.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
90.00	1.546	1.983	1.314	2239.8	.232	104
89.00	19.112	19.475	18.911	1966.6	.201	97

D(FS)/DR IS NEGATIVE AT RMAX.

88.00	22.414	22.829	22.160	1706.9	.255	91
87.00	26.812	27.319	26.514	1460.8	.298	87
86.00	32.903	33.538	32.553	1228.6	.350	81
85.00	41.637	42.267	41.300	1010.6	.336	75
84.00	55.135	55.933	54.719	807.3	.416	69
83.00	77.523	78.576	76.987	619.3	.536	63
82.00	119.020	120.121	118.470	447.4	.550	56
81.00	212.565	214.226	211.736	292.9	.829	49
80.00	625.851	628.893	624.332	157.9	1.519	42

THE LOWEST FACTOR OF SAFETY WAS 1.546 AT R = 90.00.

X = 245.00 , Y = 180.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
85.00	1.538	1.991	1.276	2044.4	.262	105
84.00	19.747	20.127	19.512	1786.6	.234	98
D(FS)/DR IS NEGATIVE AT RMAX.						
83.00	23.312	23.775	23.043	1541.5	.269	92
82.00	28.164	28.735	27.850	1309.5	.313	87
81.00	35.026	35.732	34.655	1090.8	.371	82
80.00	45.143	45.837	44.782	885.6	.361	76
79.00	61.367	62.261	60.912	694.5	.455	70
78.00	89.813	91.018	89.210	518.2	.602	63
77.00	147.528	148.822	146.882	357.5	.646	56
76.00	360.301	362.436	359.236	213.9	1.065	49
75.00	*******	*******	*******	90.0	1.665	38

THE LOWEST FACTOR OF SAFETY WAS 1.538 AT R = 85.00.

X = 245.00 , Y = 175.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
80.00	1.534	2.016	1.238	1849.1	.296	104
79.00	20.503	20.931	20.257	1606.6	.246	98
D(FS)/DR IS NEGATIVE AT RMAX.						
78.00	24.432	24.954	24.148	1376.2	.283	93
77.00	29.880	30.515	29.548	1158.3	.332	86
76.00	37.783	38.558	37.384	952.9	.399	81
75.00	49.848	50.626	49.454	760.6	.394	75
74.00	70.154	71.173	69.645	581.8	.509	68
73.00	108.574	109.976	107.874	417.1	.700	62
72.00	253.953	255.569	253.146	267.6	.807	55
71.00	*******	*******	*******	135.1	1.575	46
70.00	*******	*******	*******	34.5	3.039	28

THE LOWEST FACTOR OF SAFETY WAS 1.534 AT R = 80.00.

X = 245.00 , Y = 170.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
75.00	1.514	2.052	1.201	1653.8	.312	103
74.00	21.459	21.946	21.200	1426.6	.259	97
D(FS)/DR IS NEGATIVE AT RMAX.						
73.00	25.867	26.446	25.565	1210.9	.301	92
72.00	32.126	32.824	31.768	1007.0	.357	86
71.00	41.497	42.362	41.062	815.1	.435	80
70.00	56.471	57.354	56.031	635.6	.440	75
69.00	83.402	84.581	82.814	469.0	.588	67
68.00	206.178	207.902	205.318	316.0	.861	61
67.00	606.508	608.763	605.381	178.4	1.126	52

66.00	*******	*******	*******	69.2	2.383	38
65.00	*******	*******	*******	3.3	19.430	14

THE LOWEST FACTOR OF SAFETY WAS 1.514 AT R = 75.00.

X = 245.00 , Y = 165.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
70.00	1.499	2.102	1.166	1458.5	.332	103
69.00	22.704	23.240	22.428	1246.6	.277	97
D(FS)/DR IS NEGATIVE AT RMAX.						
68.00	27.769	28.408	27.444	1045.6	.325	91
67.00	35.182	35.965	34.791	855.8	.391	85
66.00	46.759	47.735	46.272	677.3	.487	79
65.00	69.682	70.702	69.172	510.6	.509	74
64.00	183.796	185.236	183.077	356.3	.719	65
63.00	401.991	404.312	400.832	217.4	1.159	57
62.00	*******	*******	*******	104.6	1.480	45
61.00	*******	*******	*******	24.7	4.933	27

TOPLINE NOT COMPLETELY DEFINED FOR R = 60.00.

THE LOWEST FACTOR OF SAFETY WAS 1.499 AT R = 70.00.

X = 245.00 , Y = 160.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
65.00	1.492	2.153	1.134	1263.2	.358	103
64.00	24.383	24.979	24.083	1066.6	.300	97
D(FS)/DR IS NEGATIVE AT RMAX.						
63.00	30.399	31.115	30.042	880.3	.358	90
62.00	39.572	40.453	39.132	704.5	.440	84
61.00	80.200	81.334	79.633	539.5	.566	79
60.00	163.922	165.169	163.299	385.9	.622	71
59.00	287.448	289.336	286.506	250.4	.943	62
58.00	644.450	647.401	642.977	137.7	1.473	51
57.00	*******	*******	*******	51.5	2.212	37
56.00	*******	*******	*******	1.4	.000	11

TOPLINE NOT COMPLETELY DEFINED FOR R = 55.00.

THE LOWEST FACTOR OF SAFETY WAS 1.492 AT R = 65.00.

X = 245.00 , Y = 155.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
60.00	1.500	2.233	1.107	1067.9	.393	103
59.00	26.760	27.426	26.427	886.6	.332	96
D(FS)/DR IS NEGATIVE AT RMAX.						
58.00	46.543	47.358	46.137	715.0	.407	90

57.00	90.613	91.647	90.097	553.3	.516	84
56.00	133.119	134.503	132.427	405.5	.691	75
55.00	216.833	218.230	216.136	276.1	.697	67
54.00	422.947	425.223	421.811	166.3	1.136	56
53.00	*******	*******	*******	78.3	2.029	45
52.00	*******	*******	*******	16.9	6.147	26

TOPLINE NOT COMPLETELY DEFINED FOR R = 51.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 50.00.

THE LOWEST FACTOR OF SAFETY WAS 1.500 AT R = 60.00.

X = 250.00 , Y = 160.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
65.00	8.146	8.595	7.893	1538.4	.253	105
64.00	17.739	18.172	17.502	1344.9	.237	98
D(FS)/DR IS NEGATIVE AT RMAX.						
63.00	20.754	21.270	20.483	1160.9	.271	92
62.00	24.839	25.447	24.526	986.5	.314	87
61.00	30.598	31.328	30.227	821.7	.371	82
60.00	39.053	39.771	38.693	666.7	.360	77
59.00	52.621	53.526	52.168	521.8	.452	71
58.00	76.491	77.691	75.892	387.1	.599	65
57.00	213.533	215.267	212.667	263.3	.866	59
56.00	515.521	517.724	514.421	152.7	1.100	49
55.00	*******	*******	*******	65.1	2.111	37

THE LOWEST FACTOR OF SAFETY WAS 8.146 AT R = 65.00.

X = 240.00 , Y = 160.00 :

RADIUS	FS GEOGRIDS AT WORK STRESS	FS GEOGRIDS AT ULT STRESS	FS WITHOUT GEOGRIDS	DRIVING MOMENT: KIP-FT/FT	DELTA FS DUE TO GEOGRIDS	# SLICES
65.00	12.703	13.596	12.255	911.5	.448	101
64.00	81.224	82.125	80.775	714.1	.449	95
D(FS)/DR IS NEGATIVE AT RMAX.						
63.00	116.825	118.011	116.232	532.8	.592	86
62.00	184.104	185.605	183.355	372.5	.749	77
61.00	337.410	339.752	336.241	234.7	1.169	66
60.00	830.558	833.520	829.079	121.6	1.479	53
59.00	*******	*******	*******	37.8	4.672	36

TOPLINE NOT COMPLETELY DEFINED FOR R = 58.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 57.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 56.00.
TOPLINE NOT COMPLETELY DEFINED FOR R = 55.00.

THE LOWEST FACTOR OF SAFETY WAS 12.703 AT R = 65.00.

SUMMARY OF RESULTS FOR CRITICAL CIRCLE:
X = 245.00.
Y = 160.00.

```
RADIUS OF CRITICAL CIRCLE =  65.00.

MINIMUM FS =  1.492 (TENSAR GEOGRIDS AT WORKING STRESS).

FS (TENSAR GEOGRIDS AT ULTIMATE STRESS) =  2.153.
FS (UNREINFORCED) =  1.134.
TOTAL DRIVING MOMENT =   1263.21  KIP-FT/FT
CRITICAL CIRCLE EXTENDS TO ELEVATION   95.00.
ELEVATION OF TENSAR GEOGRIDS INTERSECTED BY CRITICAL CIRCLE :
      96.00    (PULL OUT STRESS =     1.00 KIPS/FT )
     100.00    (PULL OUT STRESS =     1.00 KIPS/FT )
     104.00    (PULL OUT STRESS =     1.00 KIPS/FT )
     108.00    (PULL OUT STRESS =     1.00 KIPS/FT )
     112.00    (PULL OUT STRESS =     1.00 KIPS/FT )
     116.00    (PULL OUT STRESS =      .50 KIPS/FT )
     118.00    (PULL OUT STRESS =      .50 KIPS/FT )

CALCULATIONS HAVE BEEN COMPLETED.
```

30 End

I3

Roadway Geotextile Stability

MONTGOMERY WATSON

By V Ranguette Date 10/24/00 Client U.S. Steel Sheet 1 of 11

Chkd. By L. Busse 10/25/00 Description Roadway Geotextile Job No. 1242330 01160101

Problem: Determine the thickness of soil (surface + base course) required above the geotextile on the top of berm roads

References:

1) Koerner, R.M. (1994) "Designing with Geosynthetics" Prentice-Hall, Englewood Cliffs, New Jersey

2) Holtz, R.D.; Christopher, B.R.; & Berg, R.R. (1997) "Geosynthetic Engineering", Bi-Tech Publishers, Richmond, British Columbia.

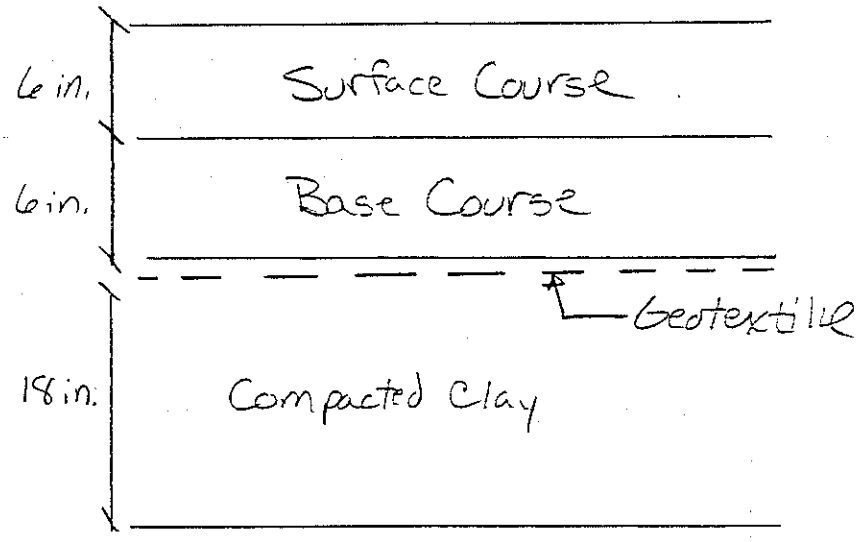
Conclusions:

1) Based on the three techniques performed to determine thickness of aggregate needed, a minimum of approximately 7.5 inches is required. Therefore proposed design of 12 inches of combined base and surface course is acceptable.

2) The geotextile will need to satisfy the following requirements

- Grab Strength = 320 lbs
- Puncture Resistance = 115 lbs
- Tear Resistance = 115 lbs
- Thickness 140z/sy

I. The proposed design of the top of berm access road consists of the following layers:



A. For a worse case representation look at the site as an unpaved road using an emperical formula presented in Koerner (1994)

1) By adding geosynthetic reinforcement, there is an increase in soil strength as indicated by comparing the following equations

a) $p_e = \pi C_{uN} + \gamma h_0$

b) $p_{lim} = (1+\pi) C_{uN} + \gamma h$

where:

P_e = the bearing-capacity pressure based on the elastic limit (non-reinforced case)

P_{Lim} = the bearing-capacity pressure based on the plastic limit (reinforced case)

C_{uN} = the undrained soil strength at the N_{th} vehicle passage

γ = unit weight of soil

h_0 = the aggregate thickness without reinforcement

h_1 = the aggregate thickness with reinforcement

2) By adding reinforcement, there is improved load distribution to the soil subgrade due to load spreading, which is quantified on the basis of pyramidal geometric shape

$$\frac{\tan\alpha}{\tan\alpha_0} \geq 1$$

where:

α = angle for reinforced case

α_0 = angle for unreinforced case

3) A tensioned membrane effect, which is a function of the tensile modulus and elongation of the geosynthetic reinforcement and the deformed surface of the subgrade soil (i.e. soil rut depth)

4) By using these empirical formulas a design chart was developed (see page _)

a) to be conservative, the membrane effect has been ignored & a rut depth of $r = 0.15$ m

b) It was assumed that a standard loaded vehical of 18K = 9 tons

c) For a worse case assume 100 passes a day

d) Assume that the constructed berm and compacted clay provide a good subbase with a CBR (California Bearing Ratio) of 2

e) using the right side of the chart, with CBR = 2 + F = 0.15 m
Project over to right hand side of chart to curve (2)

f) from the intersection of curve 2 + R curves
R = 0.40

g) plug into the following equation to determine thickness of aggregate over geotextile

$$h = R h_o$$
$$(.4)(.18) = 7.2$$

B. Using the geotextile design chart from Koerner (1994) page ___

1) For a CBR = 2
2) Loads = 9 ton (average)
3) Passes = 100/day

$\Delta h = 0.18$ m (ie = 7 inches) ✓

C. Check the above calculations using the design procedures for unpaved roads following U.S. Forest Service as presented in Holtz, Christopher + Berg (1997)

1) determine subgrade strength
— previously CBR = 2

undrained strength C (in kPa)

$$C = 30 \times CBR$$
$$C = 30 \times 2 = 60 \text{ kPa}$$

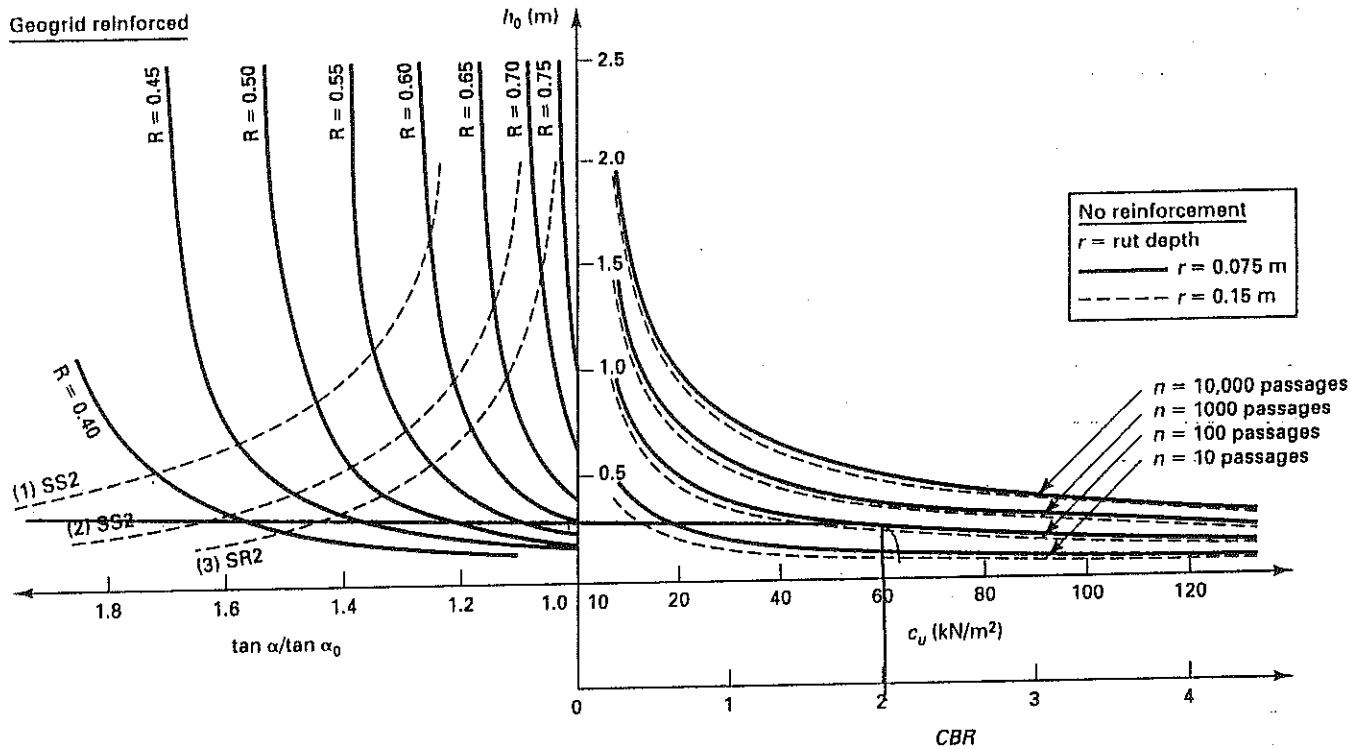


Figure 3.11 Design chart for geogrid-reinforced (left side) and nonreinforced (right side) unpaved roads (after Giroud et al. [20]).

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By combining Equations 2.33, 2.35, and 2.37 using $p^* = p - p_s$, Equation 2.38 results, in which h is the unknown aggregate thickness. It can be plotted for various rut-depth thicknesses and various moduli of fabrics.

$$(\pi + 2)c = \frac{P}{2(B + 2h \tan \alpha)(L + 2h \tan \alpha)} + \frac{E\epsilon}{\alpha\sqrt{1 + (a/2S)^2}} \quad (2.38)$$

With these two sets of equations, the design method is essentially complete, since both h_o (thickness without geotextile) and h (thickness with geotextile) can be calculated. From these two values $\Delta h = h_o - h$ can be obtained, which represents the savings in aggregate due to the presence of fabric. For convenience, however, it can be read directly from Figure 2.35. This figure also considers the effects of

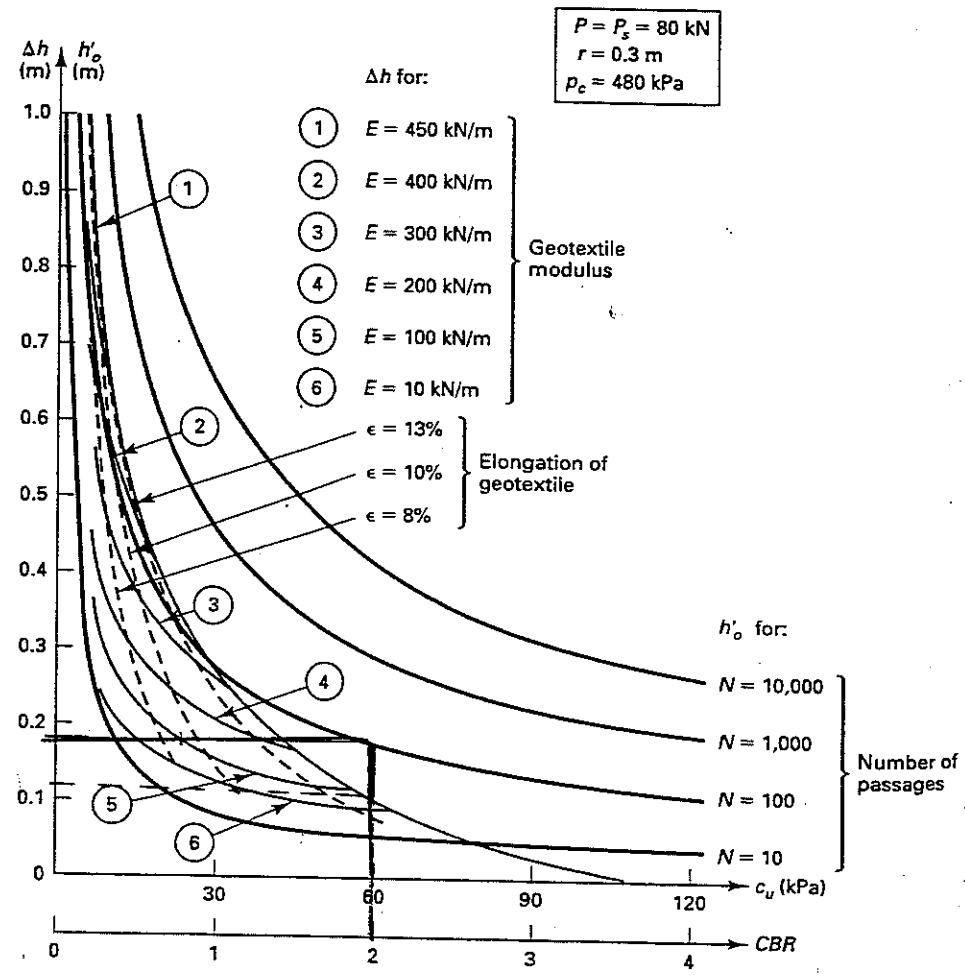

Figure 2.35 Reducing aggregate thickness with a geotextile (after Giroud and Noiray [61]). Aggregate thickness h'_o without geotextile when traffic is taken into account; possible change in aggregate thickness (Δh) resulting from the use of a geotextile rather than relying on subgrade soil cohesion. Chart related to an on-highway truck with standard-axle load.

2) Determine the wheel loading
- assume 80 kN (≈ 19 tons)

3) Estimate Passes
100 passes/day

4) Tolerable ruts
< 50 mm (2 inch ruts ±)

5) Determine bearing capacity

Table 5-3
Bearing Capacity Factors for Different Ruts and Traffic Conditions both with and without Geotextile Separators
(after Steward, Williamson, and Mohney, 1977)

	Ruts (mm)	Traffic (Passes of 80 kN axle equivalents)	Bearing Capacity Factor, N_c
Without Geotextile:	<50	>1000	2.8
	>100	<100	3.3
With Geotextile:	<50	>1000	5.0
	>100	<100	6.0

From: Holtz, Christopher - Berg (1997)

- without reinforcement
$2.8 < N_c < 3.3$
assume = 3.0

- with reinforcement
$5.0 < N_c < 6.0$
assume 5.5

6) Determine the required aggregate thickness
(using Fig 5-6 (page —))

- without reinforcement

$CN_c = (60)(3) = 180$ kPa

- depth = 250 mm → 9.8 in. ✓
(proposed design has 12 in)

- with reinforcement
$CN_c = (5.5)(60) = 330$ kPa
- depth = 175 mm → 6.9 in. ✓

7) Check Survivability.

- Based on Table 5-1 (page 10)

• Survivability class is high ✓

- Based on Table 5-2 the physical requirements are

- Grab Strength = 1400 N → 315 lbs
(1N = 0.225 lb)

- Puncture Resistance = 500 N → 113 lbs

- Tear Strength = 500 N → 113 lbs

8) Based on GFR's Specifier Guide in order to satisfy these survivability requirements a minimum 16 oz/sy geotextile will be required.

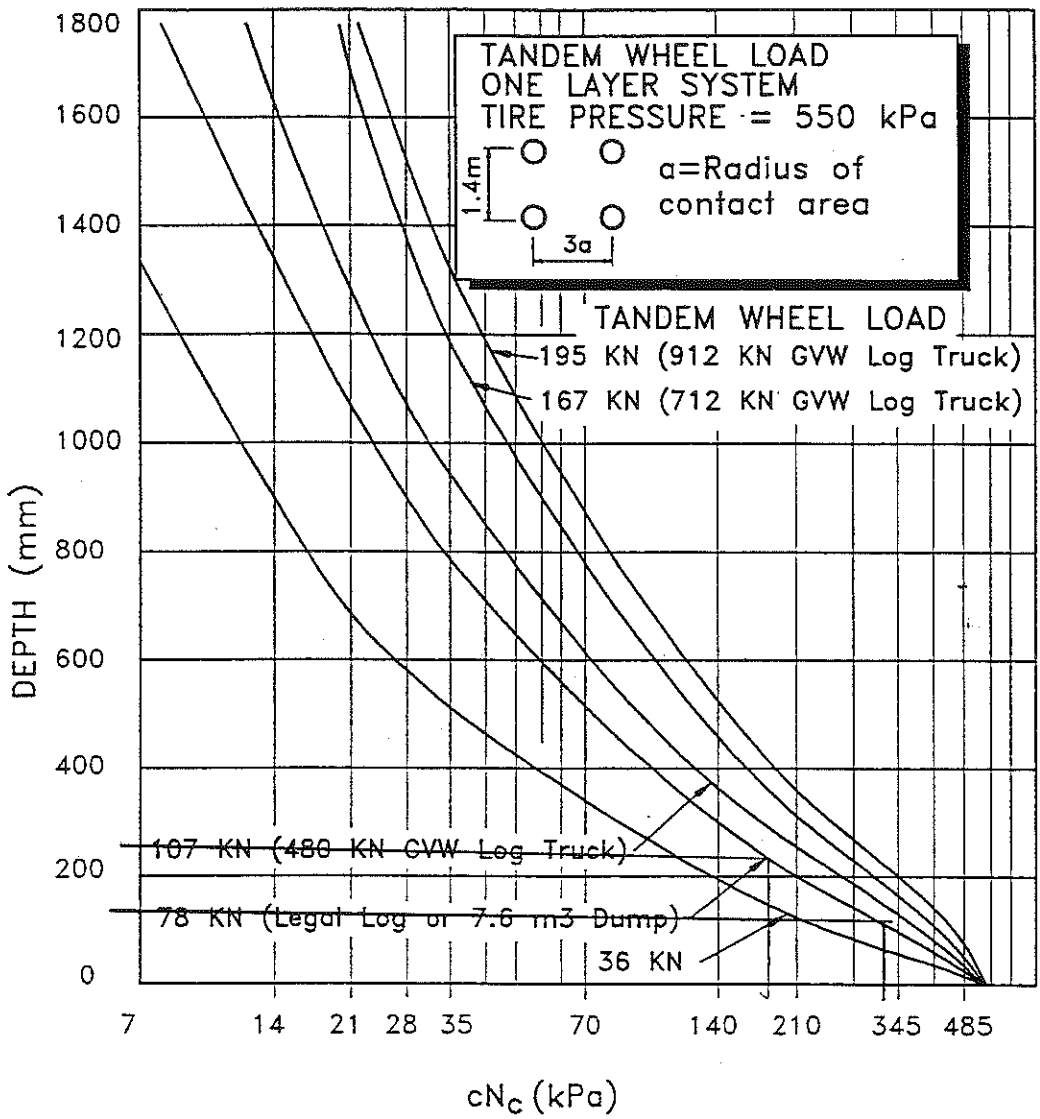

Figure 5-6 *U.S. Forest Service thickness design curve for tandem wheel load (Steward et al., 1977).*

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Table 5-1
Construction Survivability Ratings
(after AASHTO, 1990 and 1996)

Site Soil CBR at Installation[1]	< 1		1 to 2		> 3	
Equipment Ground Contact Pressure (kPa)	> 350	< 350	> 350	< 350	> 550	< 550
Cover Thickness[2] (compacted, mm)						
100[3,4]	NR[6]	NR	H[6]	H	M[6]	M
150[5]	NR	NR	H	H	M	L[6]
300	NR	H	M	M	M	L
450	H	M	M	M	M	L

NOTES:

1. Assume saturated CBR unless construction scheduling can be controlled.
2. Maximum aggregate size not to exceed one-half the compacted cover thickness
3. For low-volume, unpaved roads (ADT < 200 vehicles).
4. The 100 mm minimum cover is limited to existing road bases and is not intended for use in new construction.
5. Maximum aggregate size ≤ 30 mm
6. NR = NOT RECOMMENDED; L = LOW; M = MODERATE; and H = HIGH

These tests could be performed during design or after the contract was let, similar to the recommendations for riprap placement (Section 3.8-1, Item 6e). In the latter case, the contractor is required to demonstrate that the proposed subgrade condition, equipment, and aggregate placement will not damage the geotextile. If necessary, additional subgrade preparation, increased lift thickness, and/or possibly different construction equipment could be utilized. In rare cases, the contractor may even have to supply a different geotextile.

The selected geotextile must also retain the underlying subgrade soils, allowing the subgrade to drain freely, consolidate, and gain strength. Thus, the geotextile must be checked, using the drainage and filtration requirements discussed in Chapter 2 and summarized in Table 5-2.

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Table 5-2
Physical Property Requirements[1]
(after AASHTO, 1990 and 1996)

Survivability Level	Grab Strength[4] ASTM D 4632 (N)		Puncture Resistance[4] ASTM D 4833 (N)		Tear Strength[4] ASTM D 4533 (N)	
	< 50% Geotextile Elongation[2,3]	> 50% Geotextile Elongation[2,3]	< 50% Geotextile Elongation	> 50% Geotextile Elongation	< 50% Geotextile Elongation	> 50% Geotextile Elongation
High (Class 1)	1400	900	500	350	500	350
Moderate (Class 2)	1100	700	400	250	400	250
Low (Class 3)	800	500	300	180	300	180

Additional Requirements	Test Method
Apparent Opening Size 1. < 50% soil passing 0.075 mm sieve, AOS < 0.6 mm 2. > 50% soil passing 0.075 mm sieve, AOS < 0.3 mm	ASTM D 4751
Permeability k of the geotextile > k of the soil (permittivity x the nominal geotextile thickness)	ASTM D 4491
Ultraviolet Degradation At 500 hours of exposure, 50% strength retained	ASTM D 4355
Geotextile Acceptance	ASTM D 4759

NOTES:

1. For the index properties, the first value of each set is for geotextiles which fail at less than 50% elongation, while the second value is for geotextiles which fail at greater than 50% elongation. Elongation is determined by ASTM D 4632
2. Values shown are minimum roll average values. Strength values are in the weakest principal direction.
3. The values of the geotextile elongation do not relate to the allowable consolidation properties of the subgrade soil. These must be determined by a separate investigation.
4. AASHTO classification.