

Appendix A

Tables

Results for Example Problems

See Appendix B for figures showing
example slopes and critical slip surfaces.

Table 4: Factor of Safety Summary Table

Slope	Slope No.1	Slope No.2	Slope No.3	Slope No.4	Slope No.5	Slope No.6	Slope No.7	Slope No.8	Slope No.9	Slope No.10	Slope No.11	
Title	Unreinforced Homogenous Slope	Unreinforced Homogenous Slope with a Crack	Unreinforced Layered Slope	Tiedback Wall in Layered Soils	Tiedback Wall in Homogenous Sand	Tiedback Wall in Fill Over Residual Soil	Soil Nailed Wall in Homogenous Clay	Soil Nailed Wall in Layered Soil	Soil Nailed Wall in Silty Sand	15-Ft Geogrid Wall in Homogenous Sand	35-Ft Geogrid Wall in Homogenous Sand	
Best Estimate of F	1.27 to 1.32	1.28 to 1.33	1.37 to 1.42	1.12 to 1.16	0.60 to 0.65	very uncertain	1.00 to 1.05	1.08 to 1.12	1.11 to 1.16	1.30 to 1.35	1.41 to 1.46	
UTEXAS4	Spencer	1.30	1.29	1.42	1.14	0.65	0.98	1.02	1.12	1.13	1.34	1.41
	Bishop	1.29	1.28	1.41	1.14	0.56	1.45	1.00	1.20	1.13	1.34	1.41
	Simp. Janbu	1.15	1.14	1.20	1.13	0.64	1.35	1.08	1.07	1.10	1.33	1.39
	L&K	1.32	1.31	1.12	1.20	0.76	1.48	1.00	1.26	1.20	1.37	1.44
SLOPEW	Spencer	1.30	1.29	1.40	1.14	0.60	0.78	1.02	1.09	1.14	1.35	1.42
	Bishop	1.29	1.28	1.39	1.14	0.60	0.67	1.01	1.20	1.14	1.35	1.41
	Simp. Janbu	1.15	1.14	1.21	1.05	0.61	0.76	1.07	0.99	1.08	1.33	1.39
	M & P	1.28	1.28	1.37	1.14	0.60	0.80	1.03	-	1.13	1.36	1.40
	Ordinary	1.04	1.02	0.85	1.12	0.62	0.12	1.00	1.00	1.10	1.34	1.41
SLIDE	Spencer	1.31	1.30	1.40	1.15	0.62	1.48	1.02	1.10	1.06	1.34	1.43
	Bishop	1.29	1.29	1.39	1.15	0.58	1.50	1.00	1.21	0.97	1.33	1.43
	Simp. Janbu	1.15	1.14	1.22	1.06	0.62	1.35	1.06	0.98	1.03	1.32	1.38
	L & K	1.32	1.31	1.39	1.19	0.61	0.81	1.04	1.30	1.06	1.33	1.41
	Ordinary	1.05	1.04	0.94	1.13	0.63	1.42	1.00	1.00	1.04	1.34	1.42
XSTABL	Simp. Janbu*	1.24	1.23	1.34	+	+	+	+	+	+	+	+
	Bishop	1.29	1.28	1.41	+	+	+	+	+	+	+	+
WINSTABL	Spencer	1.34	1.32	1.45	1.20	0.59	1.23	0.99	1.06	1.16	1.39	1.50
	Bishop	1.34	1.31	1.39	1.16	0.74	0.63	1.06	1.13	1.13	1.35	1.41
	Simp. Janbu	1.20	1.18	1.23	1.12	0.76	0.30	1.10	1.08	1.18	1.55	1.55
RSS	Simp. Janbu	1.15	1.13	1.24	⊗	⊗	⊗	⊗	⊗	⊗	1.24	0.91
	Bishop	1.29	1.28	1.41	⊗	⊗	⊗	⊗	⊗	⊗	1.28	1.18
SNAIL	Wedge Method	1.22	1.18	1.39	1.03	0.65	1.16	0.84	1.26	1.11	1.36	1.44
GOLD-NAIL	Circular Method	1.32	1.30	1.40	1.19	0.62	0.69	0.91	1.20	1.12	1.35	1.41

* Simplified Janbu with empirical approximate adjustment

- Solution did not converge.

+ XSTABL has no provision for reinforcement.

⊗ RSS only allows for horizontal reinforcement.

Table 5: Factors of Safety by Spencer's Method

Slope	Slope No.1	Slope No.2	Slope No.3	Slope No.4	Slope No.5	Slope No.6	Slope No.7	Slope No.8	Slope No.9	Slope No.10	Slope No.11
Title	Unreinforced Homogenous Slope	Unreinforced Homogenous Slope with a Crack	Unreinforced Layered Slope	Tiedback Wall in Layered Soils	Tiedback Wall in Homogenous Sand	Tiedback Wall in Fill Over Residual Soil	Soil Nailed Wall in Homogenous Clay	Soil Nailed Wall in Layered Soil	Soil Nailed Wall in Silty Sand	15-Ft Geogrid Wall in Homogenous Sand	35-Ft Geogrid Wall in Homogenous Sand
UTEXAS4 Spencer	1.30	1.29	1.42	1.14	0.65	0.98	1.02	1.12	1.13	1.34	1.41
SLOPE/W Spencer	1.30	1.29	1.40	1.14	0.60	0.78	1.02	1.09	1.14	1.35	1.42
SLIDE Spencer	1.31	1.30	1.40	1.15	0.62	1.48	1.02	1.10	1.06	1.34	1.43
XSTABL ⁽¹⁾ Spencer	+	+	+	+	+	+	+	+	+	+	+
WINSTABL Spencer	1.34	1.32	1.45	1.20	0.59	1.23	0.99	1.06	1.16	1.39	1.50
RSS ⁽²⁾	1.29	1.28	1.41	⊗	⊗	⊗	⊗	⊗	⊗	1.28	1.18
SNAIL ⁽³⁾	1.22	1.18	1.39	1.03	0.65	1.16	0.84	1.26	1.11	1.36	1.44
GOLDNAIL ⁽³⁾	1.32	1.30	1.40	1.19	0.62	0.69	0.91	1.20	1.12	1.35	1.41

- Solution did not converge.

+ XSTABL has no provision for reinforcement.

⊗ RSS only allows for horizontal reinforcement.

Notes: (1) XSTABL does not search using the Spencer Method.

(2) RSS does not use the Spencer Method. Factors of safety for Bishop's Modified Method are shown here for comparison with the Spencer Method values.

(3) The Programs SNAIL and GoldNail do not use the Spencer Method. They use their own unique methods. Factors of safety are shown here for comparison with the Spencer Method values.

Table 6: Factors of Safety by Bishop's Modified Method

Slope	Slope No.1	Slope No.2	Slope No.3	Slope No.4	Slope No.5	Slope No.6	Slope No.7	Slope No.8	Slope No.9	Slope No.10	Slope No.11
Title	Unreinforced Homogenous Slope	Unreinforced Homogenous Slope with a Crack	Unreinforced Layered Slope	Tiedback Wall in Layered Soils	Tiedback Wall in Homogenous Sand	Tiedback Wall in Fill Over Residual Soil	Soil Nailed Wall in Homogenous Clay	Soil Nailed Wall in Layered Soil	Soil Nailed Wall in Silty Sand	15-Ft Geogrid Wall in Homogenous Sand	35-Ft Geogrid Wall in Homogenous Sand
UTEXAS4 Bishop	1.29	1.28	1.41	1.14	0.56	1.45	1.00	1.20	1.13	1.34	1.41
SLOPE/W Bishop	1.29	1.28	1.39	1.14	0.60	0.67	1.01	1.20	1.14	1.35	1.41
SLIDE Bishop	1.29	1.29	1.39	1.15	0.58	1.50	1.00	1.21	0.97	1.33	1.43
XSTABL Bishop	1.29	1.28	1.41	+	+	+	+	+	+	+	+
WINSTABL Bishop	1.34	1.31	1.39	1.16	0.74	0.63	1.06	1.13	1.13	1.35	1.41
RSS Bishop	1.29	1.28	1.41	⊗	⊗	⊗	⊗	⊗	⊗	1.28	1.18
SNAIL ⁽¹⁾	1.22	1.18	1.39	1.03	0.65	1.16	0.84	1.26	1.11	1.36	1.44
GOLDNAIL ⁽¹⁾	1.32	1.30	1.40	1.19	0.62	0.69	0.91	1.20	1.12	1.35	1.41

+ XSTABL has no provision for reinforcement.

⊗ RSS only allows for horizontal reinforcement.

Notes: (1) The Programs SNAIL and GoldNail do not use the Bishop Method. They use their own unique methods. Factors of safety are shown here for comparison with the Bishop Method values.

Table 7: Factors of Safety by Janbu's Simplified Method

Slope	Slope No.1	Slope No.2	Slope No.3	Slope No.4	Slope No.5	Slope No.6	Slope No.7	Slope No.8	Slope No.9	Slope No.10	Slope No.11
Title	Unreinforced Homogenous Slope	Unreinforced Homogenous Slope with a Crack	Unreinforced Layered Slope	Tiedback Wall in Layered Soils	Tiedback Wall in Homogenous Sand	Tiedback Wall in Fill Over Residual Soil	Soil Nailed Wall in Homogenous Clay	Soil Nailed Wall in Layered Soil	Soil Nailed Wall in Silty Sand	15-Ft Geogrid Wall in Homogenous Sand	35-Ft Geogrid Wall in Homogenous Sand
UTEXAS4 Simp. Janbu	1.15	1.14	1.20	1.13	0.64	1.35	1.08	1.07	1.10	1.33	1.39
SLOPE/W Simp. Janbu	1.15	1.14	1.21	1.05	0.61	0.76	1.07	0.99	1.08	1.33	1.39
SLIDE Simp. Janbu	1.15	1.14	1.22	1.06	0.62	1.35	1.06	0.98	1.03	1.32	1.38
XSTABL ⁽²⁾ Simp. Janbu	1.24	1.23	1.34	+	+	+	+	+	+	+	+
WINSTABL Simp. Janbu	1.20	1.18	1.23	1.12	0.76	0.30	1.10	1.08	1.18	1.55	1.55
RSS Simp. Janbu	1.15	1.13	1.24	⊗	⊗	⊗	⊗	⊗	⊗	1.24	0.91
SNAIL ⁽¹⁾	1.22	1.18	1.39	1.03	0.65	1.16	0.84	1.26	1.11	1.36	1.44
GOLDNAIL ⁽¹⁾	1.32	1.30	1.40	1.19	0.62	0.69	0.91	1.20	1.12	1.35	1.41

+ XSTABL has no provision for reinforcement.

Notes: (1) The Programs SNAIL and GoldNail do not use the Simplified Janbu Method. They use their own unique methods. Factors of safety are shown here for comparison with the Simplified Janbu Method values.

(2) XSTABL reports the factor of safety using Janbu's correction factor. Uncorrected values are provided for comparison with other uncorrected values.

Slope	Slope No.1	Slope No.2	Slope No.3
XSTABL Simp. Janbu*	1.241	1.231	1.344
Correction Factor	1.079	1.080	1.086
Janbu's "F _o "	1.15	1.14	1.24

Table 8: Difficulty Index (DI)

Slope	Slope No.1	Slope No.2	Slope No.3	Slope No.4	Slope No.5	Slope No.6	Slope No.7	Slope No.8	Slope No.9	Slope No.10	Slope No.11
Title	Unreinforced Homogenous Slope	Unreinforced Homogenous Slope with a Crack	Unreinforced Layered Slope	Tiedback Wall in Layered Soils	Tiedback Wall in Homogenous Sand	Tiedback Wall in Fill Over Residual Soil	Soil Nailed Wall in Homogenous Clay	Soil Nailed Wall in Layered Soil	Soil Nailed Wall in Silty Sand	15-Ft Geogrid Wall in Homogenous Sand	35-Ft Geogrid Wall in Homogenous Sand
UTEXAS4 Spencer Unreinforced	1.30	1.29	1.42	1.06	0.17	0.10	0.84	0.78	0.13	0.15	0.15
UTEXAS4 Spencer	1.30	1.29	1.42	1.14	0.65	0.98	1.02	1.12	1.13	1.34	1.41
Difficulty Index	1.00	1.00	1.00	1.08	3.89	9.81	1.22	1.43	9.02	9.24	9.61

SLOPE/W Spencer Unreinforced	1.30	1.29	1.40	1.06	0.11	0.11	0.78	0.82	0.11	0.16	0.11
SLOPE/W Spencer	1.30	1.29	1.40	1.14	0.60	0.78	1.02	1.09	1.14	1.35	1.42
Difficulty Index	1.00	1.00	1.00	1.08	5.27	7.40	1.32	1.33	10.51	8.34	12.56

Note: (1) Factors of safety are by Spencer's Method.

(2) The value of DI depends on the values of factor of safety with and without reinforcement, which can result in different values of DI for different programs, as illustrated here.