

Slope Section F1 and F2 - Post Drain and GDL Installation Overlain by Soils

[Calculates stability of veneer covered slope](#)

Model F1.2a1
1 in 5

Post Drain and
Final
0.4 Saturated

Construction plant loading(after Koerner & Soong (1998) 6th Int Conf on Geosynthetics)

weight of equipment		Wb	200	kN	
length of track		w	3	m	
width of track		b	0.6	m	
influence factor		I	0		- 0 if no plant loading
track pressure		q	55.56	kN/m ²	
equivalent equipment force on geomembrane		We	0.00	kN/m	- add to weight of upper wedge
acceleration ratio		(a/g)	0		- 0 if pushing up slope
dynamic force parallel to slope		Fe	0.00	kN/m	- apply as active thrust

Vertical component of inter-slice force neglected to simplify analysis

Data Input

Interface details:	Lower material		formation	Formation	LLDPE	GDL (G4S)
	Upper material		geotextile	LLDPE	GDL (G4S)	Soils
height of slope base (actual)	H	m	24.00	120.00	120.00	120.00
lining thickness	T1	m	1.00	1.00	1.00	1.00
slope of liner (actual)	Cot(alpha)		5.00	5.00	5.00	5.00
dry density	Gamdry-1	kN/m ³	18.00	18.00	18.00	18.00
saturated density	Gamsat-1	kN/m ³	20.00	21.00	21.00	21.00
saturated thickness interface	Tw	m	0.00	0.00	0.40	0.40
saturated thickness cover soil			1.30	0.00	0.00	0.00
interface cohesion	C1	kN/m ²	0.00	0.00	4.00	23.10
interface friction angle	Phi-1	deg	30.00	30.00	27.00	35.00
soil cohesion	C2	kN/m ²	5.00	0.00	0.00	0.00
soil friction angle	Phi-2	deg	30.00	30.00	30.00	30.00
active thrust at top of slope	Pa	kN	0.00	0.00	0.00	0.00
reinforcement	Tr	kN	0.00	0.00	0.00	0.00

Calculations

nett active force		kN	0.00	0.00	0.00	0.00
slope of liner	alpha	rads	0.42	0.20	0.20	0.20
length of interface	L1	m	75.89	611.88	611.88	611.88
length of soil	L2	m	3.16	5.10	5.10	5.10
weight of upper wedge	W1	kN	1366.10	11013.88	11013.88	11013.88
weight of lower wedge	W2	kN	46.80	46.80	46.80	46.80
pwp on interface	U'	kN	0.00	0.00	2354.40	2354.40
pwp in cover soil	U''	kN	24.87	0.00	0.00	0.00
Disturbing force	D+Pa-Tr	kN	432.10	2160.00	2160.00	2160.00
Resisting Forces	T1	kN	148.25	6235.38	6750.78	20048.15
	Ts	kN	20.83	27.02	27.02	27.02
Factor of Safety	Fs		1.68	2.90	3.14	9.29
FoS greater than 1.3 reported in the SRA			YES	YES	YES	YES
Ignore lower wedge	Fs = T1/D		1.73	2.89	3.13	9.28
		Lower material	formation	Formation	LLDPE	GDL (G4S)
		Upper material	geotextile	LLDPE	GDL (G4S)	Soils

Critical Interface

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Model F1.2a2 Final
1 in 5 0.2 Saturated

Construction plant loading(after Koerner & Soong (1998) 6th Int Conf on Geosynthetics)

weight of equipment		Wb	200	kN	
length of track		w	3	m	
width of track		b	0.6	m	
influence factor		I	0		- 0 if no plant loading
track pressure		q	55.56	kN/m2	
equivalent equipment force on geomembrane		We	0.00	kN/m	- add to weight of upper wedge
acceleration ratio		(a/g)	0		- 0 if pushing up slope
dynamic force parallel to slope		Fe	0.00	kN/m	- apply as active thrust

Vertical component of inter-slice force neglected to simplify analysis**Data Input**

Interface details:	Lower material		formation	Formation	LLDPE	GDL (G4S)
	Upper material		geotextile	LLDPE	GDL (G4S)	Soils
height of slope base (actual)	H	m	24.00	120.00	120.00	120.00
lining thickness	T1	m	1.00	1.00	1.00	1.00
slope of liner (actual)	Cot(alpha)		3.00	5.00	5.00	5.00
dry density	Gamdry-1	kN/m3	18.00	18.00	18.00	18.00
saturated density	Gamsat-1	kN/m3	20.00	21.00	21.00	21.00
saturated thickness interface	Tw	m	0.00	0.00	0.20	0.20
saturated thickness cover soil			2.30	0.00	0.00	0.00
interface cohesion	C1	kN/m2	0.00	0.00	4.00	23.10
interface friction angle	Phi-1	deg	30.00	30.00	27.00	35.00
soil cohesion	C2	kN/m2	5.00	0.00	0.00	0.00
soil friction angle	Phi-2	deg	25.00	30.00	30.00	30.00
active thrust at top of slope	Pa	kN	0.00	0.00	0.00	0.00
reinforcement	Tr	kN	0.00	0.00	0.00	0.00

Calculations

nett active force		kN	0.00	0.00	0.00	0.00
slope of liner	alpha	rads	0.20	0.20	0.20	0.20
length of interface	L1	m	75.89	611.88	611.88	611.88
length of soil	L2	m	3.16	5.10	5.10	5.10
weight of upper wedge	W1	kN	1366.10	11013.88	11013.88	11013.88
weight of lower wedge	W2	kN	24.63	46.80	46.80	46.80
pwp on interface	U'	kN	0.00	0.00	1177.20	1177.20
pwp in cover soil	U''	kN	24.87	0.00	0.00	0.00
Disturbing force	D+Pa-Tr	kN	452.00	2160.00	2160.00	2160.00
Resisting Forces	T1	kN	248.25	6235.38	7350.59	20872.44
	Ts	kN	20.83	27.02	27.02	27.02
Factor of Safety	Fs		1.76	2.90	3.42	9.68
FoS greater than 1.3 reported in the SRA			YES	YES	YES	YES
Ignore lower wedge	Fs = T1/D		1.73	2.89	3.40	9.66
	Lower material	formation	Formation	LLDPE	GDL (G4S)	
	Upper material	geotextile	LLDPE	GDL (G4S)	Soils	

Critical Interface

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Construction plant loading(after Koerner & Soong (1998) 6th Int Conf on Geosynthetics)

weight of equipment		Wb	200	kN	
length of track		w	3	m	
width of track		b	0.6	m	
influence factor		l	0		- 0 if no plant loading
track pressure		q	55.56	kN/m2	
equivalent equipment force on geomembrane		We	0.00	kN/m	- add to weight of upper wedge
acceleration ratio		(a/g)	0		- 0 if pushing up slope
dynamic force parallel to slope		Fe	0.00	kN/m	- apply as active thrust

Vertical component of inter-slice force neglected to simplify analysis

Data Input

Interface details:	Lower material		Formation	Formation	LLDPE	GDL (G4S)
	Upper material		geotextile	LLDPE	GDL (G4S)	Soils
height of slope base (actual)	H	m	24.00	227.00	227.00	227.00
lining thickness	T1	m	1.00	1.00	1.00	1.00
slope of liner (actual)	Cot(alpha)		2.00	5.00	5.00	5.00
dry density	Gamdry-1	kN/m3	18.00	18.00	18.00	18.00
saturated density	Gamsat-1	kN/m3	20.00	21.00	21.00	21.00
saturated thickness interface	Tw	m	0.00	0.00	0.40	0.40
saturated thickness cover soil			2.22	0.00	0.00	0.00
interface cohesion	C1	kN/m2	0.00	0.00	4.00	23.10
interface friction angle	Phi-1	deg	30.00	30.00	27.00	35.00
soil cohesion	C2	kN/m2	5.00	0.00	0.00	0.00
soil friction angle	Phi-2	deg	25.00	30.00	30.00	30.00
active thrust at top of slope	Pa	kN	0.00	0.00	0.00	0.00
reinforcement	Tr	kN	0.00	0.00	0.00	0.00

Calculations

nett active force		kN	0.00	0.00	0.00	0.00
slope of liner	alpha	rads	0.20	0.20	0.20	0.20
length of interface	L1	m	75.89	1157.48	1157.48	1157.48
length of soil	L2	m	3.16	5.10	5.10	5.10
weight of upper wedge	W1	kN	1366.10	20834.59	20834.59	20834.59
weight of lower wedge	W2	kN	46.80	46.80	46.80	46.80
pwp on interface	U'	kN	0.00	0.00	4453.74	4453.74
pwp in cover soil	U''	kN	24.87	0.00	0.00	0.00
Disturbing force	D+Pa-Tr	kN	452.00	4086.00	4086.00	4086.00
Resisting Forces	T1	kN	746.25	11795.27	12770.22	37924.43
	Ts	kN	20.83	27.02	27.02	27.02
Factor of Safety	Fs		2.76	2.89	3.13	9.29
FoS greater than 1.3 reported in the SRA			YES	YES	YES	YES
Ignore lower wedge	Fs = T1/D		1.73	2.89	3.13	9.28
	Lower material	Formation	Formation	LLDPE	GDL (G4S)	
	Upper material	geotextile	LLDPE	GDL (G4S)	Soils	

Critical Interface

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Model F2.a2
1 in 5

Post Drain and
Final
0.2 Saturated

Construction plant loading(after Koerner & Soong (1998) 6th Int Conf on Geosynthetics)

weight of equipment		Wb	200	kN	
length of track		w	3	m	
width of track		b	0.6	m	
influence factor		l	0		- 0 if no plant loading
track pressure		q	55.56	kN/m2	
equivalent equipment force on geomembrane		We	0.00	kN/m	- add to weight of upper wedge
acceleration ratio		(a/g)	0		- 0 if pushing up slope
dynamic force parallel to slope		Fe	0.00	kN/m	- apply as active thrust

Vertical component of inter-slice force neglected to simplify analysis

Data Input

Interface details:	Lower material		formation	Formation	LLDPE	GDL (G4S)
	Upper material		geotextile	LLDPE	GDL (G4S)	Soils
height of slope base (actual)	H	m	24.00	227.00	227.00	227.00
lining thickness	T1	m	1.00	1.00	1.00	1.00
slope of liner (actual)	Cot(alpha)		2.00	5.00	5.00	5.00
dry density	Gamdry-1	kN/m3	18.00	18.00	18.00	18.00
saturated density	Gamsat-1	kN/m3	20.00	21.00	21.00	21.00
saturated thickness interface	Tw	m	0.00	0.00	0.20	0.20
saturated thickness cover soil			2.20	0.00	0.00	0.00
interface cohesion	C1	kN/m2	0.00	0.00	4.00	23.10
interface friction angle	Phi-1	deg	30.00	30.00	27.00	35.00
soil cohesion	C2	kN/m2	5.00	0.00	0.00	0.00
soil friction angle	Phi-2	deg	25.00	30.00	30.00	30.00
active thrust at top of slope	Pa	kN	0.00	0.00	0.00	0.00
reinforcement	Tr	kN	0.00	0.00	0.00	0.00

Calculations

nett active force		kN	0.00	0.00	0.00	0.00
slope of liner	alpha	rads	0.20	0.20	0.20	0.20
length of interface	L1	m	75.89	1157.48	1157.48	1157.48
length of soil	L2	m	3.16	5.10	5.10	5.10
weight of upper wedge	W1	kN	1366.10	20834.59	20834.59	20834.59
weight of lower wedge	W2	kN	46.80	46.80	46.80	46.80
pwp on interface	U'	kN	0.00	0.00	2226.87	2226.87
pwp in cover soil	U''	kN	24.87	0.00	0.00	0.00
Disturbing force	D+Pa-Tr	kN	4086.00	4086.00	4086.00	4086.00
Resisting Forces	T1	kN	11795.27	13904.87	39483.70	
	Ts	kN	20.83	27.02	27.02	27.02
Factor of Safety	Fs		2.89	2.89	3.41	9.67
FoS greater than 1.3 reported in the SRA			YES	YES	YES	YES
Ignore lower wedge	Fs = T1/D		1.73	2.89	3.40	9.66
			Lower material	formation	Formation	LLDPE
			Upper material	geotextile	LLDPE	GDL (G4S)

Critical Interface