

Units: kN,m

Stage No. 13 Change properties of soil type 3 to soil type 5
 Ko pressures will not be reset

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method
 Factor of safety on soil strength

				FoS for toe elev. = 48.00	Toe elev. for FoS = 1.000
				-----	-----
Stage No.	--- G.L. Act.	--- G.L. Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.
13	58.50	52.00		More than one strut	Toe Wall Penetr-ation

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 20.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached
 Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
 Passive side 8.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m2/m
1	58.50	4.70	0.004	-1.70E-04	0.0	0.0		254400
2	58.00	0.12	0.004	-1.70E-04	1.2	0.6	0.5	322000
		2.72	0.004	-1.70E-04	0.7	0.6		
3	57.60	5.14	0.004	-1.72E-04	2.2	0.8		322000
4	57.00	19.03	0.004	-1.78E-04	9.5	4.7		322000
5	56.50	31.50	0.004	-1.94E-04	22.1	13.1		322000
6	55.92	44.67	0.004	-2.41E-04	44.0	31.7		322000
7	55.35	56.83	0.004	-3.38E-04	73.2	65.1	224.0	322000
		56.83	0.004	-3.38E-04	-150.8	65.1		
8	54.98	64.45	0.004	-3.89E-04	-128.1	12.7		322000
9	54.60	71.93	0.005	-3.78E-04	-102.5	-30.7		322000
10	54.00	83.72	0.005	-2.65E-04	-55.8	-78.7		322000
11	53.40	95.42	0.005	-8.39E-05	-2.1	-94.9		322000
12	52.95	104.17	0.005	6.01E-05	42.8	-85.8		322000
13	52.50	112.90	0.005	1.76E-04	91.7	-55.7		322000
		42.56	0.005	1.76E-04	91.7	-55.7		
14	52.32	43.95	0.005	2.09E-04	99.5	-38.5	93.5	322000
		43.95	0.005	2.09E-04	5.9	-38.5		
15	52.00	46.44	0.005	2.55E-04	20.4	-34.3		254400
		23.08	0.005	2.55E-04	20.4	-34.3		
16	51.50	-1.95	0.005	3.11E-04	25.7	-22.3		254400
17	51.00	-16.14	0.004	3.43E-04	21.2	-10.1		254400
18	50.40	-11.06	0.004	3.55E-04	13.0	-0.0		254400
19	49.80	-10.19	0.004	3.48E-04	6.6	5.7		254400
20	49.20	-10.12	0.004	3.32E-04	0.5	7.8		254400
21	48.60	-12.72	0.004	3.16E-04	-6.3	6.2		254400
22	48.00	-12.88	0.003	3.08E-04	-14.0	-0.0	-14.0	---
At elev. 58.00		Strut force =		0.5 kN/strut =	0.5 kN/m run			
At elev. 55.35		Strut force =		224.0 kN/strut =	224.0 kN/m run			
At elev. 52.32		Strut force =		93.5 kN/strut =	93.5 kN/m run			

(continued)

Stage No.13 Change properties of soil type 3 to soil type 5
 Ko pressures will not be reset

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	58.50	0.00	0.00	0.00	104.24	4.70	4.70	23529
2	58.00	0.00	9.50	0.00	136.83	0.12	0.12	3059
		0.00	9.50	0.00	21.86	2.72	2.72	3627
3	57.60	0.00	17.50	5.14	29.86	5.14	5.14a	3601
4	57.00	0.00	31.39	19.03	43.75	19.03	19.03a	3969
5	56.50	0.00	43.86	31.50	56.22	31.50	31.50a	4274
6	55.92	0.00	57.03	44.67	69.39	44.67	44.67a	4626
7	55.35	0.00	69.19	56.83	81.55	56.83	56.83a	4978
8	54.98	0.00	76.81	64.45	89.17	64.45	64.45a	5207
9	54.60	0.00	84.29	71.93	96.65	71.93	71.93a	5437
10	54.00	0.00	96.08	83.72	108.44	83.72	83.72a	5804
11	53.40	0.00	107.78	95.42	120.14	95.42	95.42a	6171
12	52.95	0.00	116.53	104.17	128.89	104.17	104.17a	6446
13	52.50	0.00	125.26	112.90	137.62	112.90	112.90a	6721
		0.00	125.26	42.56	385.06	42.56	42.56a	7116
14	52.32	0.00	128.76	43.95	395.15	43.95	43.95a	7165
15	52.00	0.00	134.98	46.44	413.10	46.44	46.44a	7251
16	51.50	0.00	144.70	50.32	441.18	50.32	50.32a	7385
17	51.00	0.00	154.44	54.20	469.29	54.20	54.20a	7519
18	50.40	0.00	166.14	58.87	503.09	59.12	59.12	7680
19	49.80	0.00	177.87	63.55	536.94	66.77	66.77	7842
20	49.20	0.00	189.62	68.24	570.87	74.16	74.16	8003
21	48.60	0.00	201.38	72.94	604.85	80.36	80.36	57785
22	48.00	0.00	213.17	77.64	638.88	87.94	87.94	58925

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	58.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	58.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	57.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	57.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	56.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	55.92	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	55.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	54.98	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	54.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	54.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	53.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	52.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	52.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	52.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	52.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	23.36	23.36	23.36p	18031
16	51.50	0.00	10.01	0.00	52.27	52.27	52.27p	18364
17	51.00	0.00	20.11	0.59	81.41	70.34	70.34	18698
18	50.40	0.00	32.42	5.50	116.97	70.18	70.18	19099
19	49.80	0.00	45.05	10.54	153.43	76.96	76.96	19500
20	49.20	0.00	58.05	15.73	190.98	84.28	84.28	19900
21	48.60	0.00	71.45	21.08	229.68	93.08	93.08	68079
22	48.00	0.00	85.25	26.59	269.51	100.81	100.81	69422

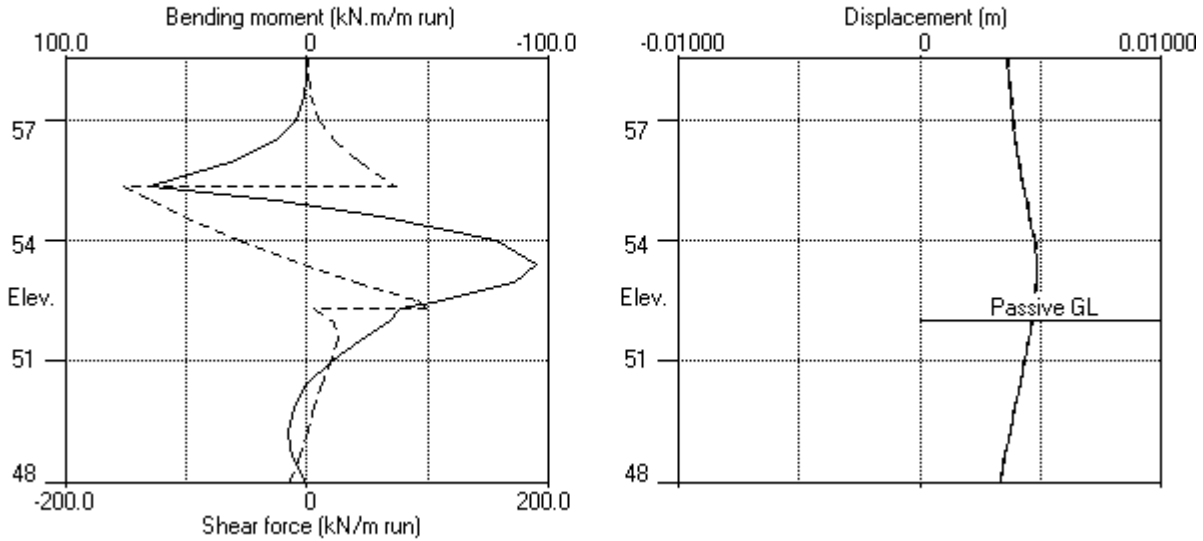
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Stage No.13 Change properties of soil type 3 to soil type 5
Ko pressures will not be reset

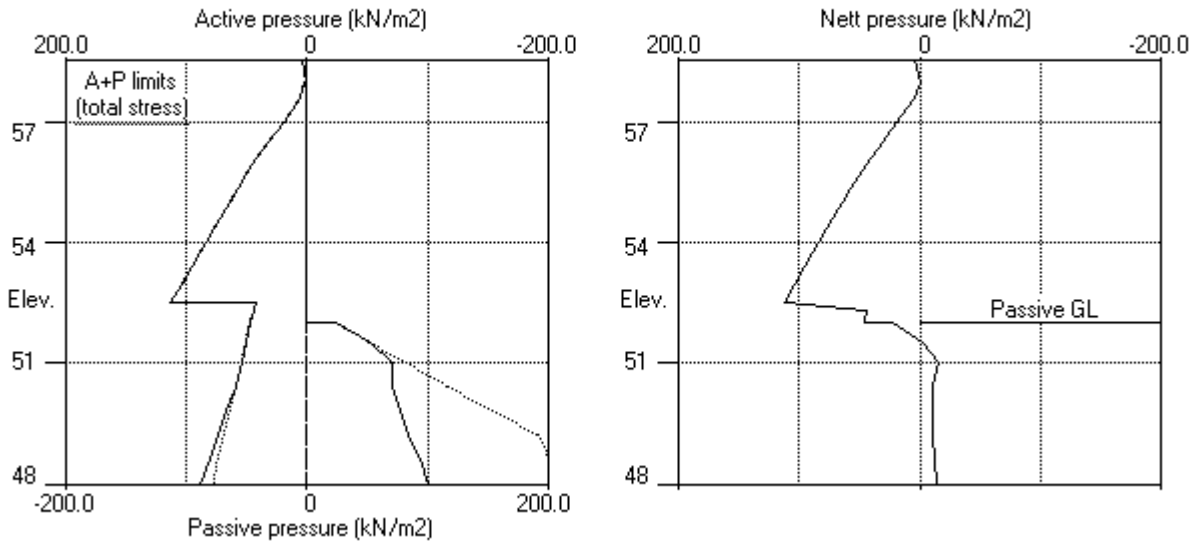
Note: 54.20a Soil pressure at active limit
52.27p Soil pressure at passive limit

Units: kN,m

Stage No.13 Change soil type 3 to soil type 5



Stage No.13 Change soil type 3 to soil type 5



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 Units: kN,m

Summary of results

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method
 Factor of safety on soil strength

Stage No.	G.L.		Strut Elev.	FoS for toe elev. = 48.00		Toe elev. for FoS = 1.000	
	Act.	Pass.		Factor of Safety	Moment at elev.	Toe elev.	Wall Penetration
1	58.50	58.50	Cant.	Conditions not suitable for FoS calc.			
2	58.50	58.50	Cant.	Conditions not suitable for FoS calc.			
3	58.50	58.50	Cant.	Conditions not suitable for FoS calc.			
4	58.50	56.50	Cant.	8.702	48.74	56.26	0.24
5	58.50	56.50		No analysis at this stage			
6	58.50	52.00	57.00	3.709	n/a	51.76	0.24
7	58.50	52.00		No analysis at this stage			

All remaining stages have more than one strut - FoS calculation n/a

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 20.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached
 Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
 Passive side 8.00 from wall

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	58.50	0.004	0.000	0.0	-0.0	0.0	0.0
2	58.00	0.004	0.000	2.0	-0.1	6.5	-0.4
3	57.60	0.004	0.000	6.6	-0.4	14.8	-1.3
4	57.00	0.004	0.000	18.8	-1.5	22.3	-52.4
5	56.50	0.004	0.000	13.1	-5.6	22.1	-48.0
6	55.92	0.004	0.000	31.7	-31.4	44.0	-41.4
7	55.35	0.004	0.000	65.1	-53.0	73.2	-150.8
8	54.98	0.004	0.000	12.7	-64.3	0.3	-128.1
9	54.60	0.005	0.000	11.0	-73.1	0.8	-102.5
10	54.00	0.005	0.000	10.9	-81.5	1.7	-55.8
11	53.40	0.005	0.000	10.8	-94.9	7.2	-14.5
12	52.95	0.005	0.000	10.8	-85.8	42.8	-0.2
13	52.50	0.005	0.000	11.0	-61.9	91.7	0.0
14	52.32	0.005	0.000	11.1	-55.3	99.5	0.0
15	52.00	0.005	0.000	11.1	-40.8	51.0	-0.1
16	51.50	0.005	0.000	10.9	-22.3	34.5	-0.3
17	51.00	0.004	0.000	10.7	-10.1	21.7	-0.4
18	50.40	0.004	0.000	10.4	-1.4	13.0	-0.4
19	49.80	0.004	0.000	10.0	0.0	6.6	-1.1
20	49.20	0.004	0.000	9.1	0.0	1.5	-3.2
21	48.60	0.004	0.000	6.4	0.0	0.0	-7.4
22	48.00	0.003	0.000	0.0	-0.0	0.0	-14.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	0.0	49.20	-2.5	54.98	0.8	52.50	-1.3	56.50
2	0.2	49.80	-4.6	54.98	1.6	52.95	-2.4	56.50
3	7.8	49.20	-4.7	54.98	3.1	52.00	-14.0	48.00
4	11.1	52.00	-0.0	58.50	9.6	56.50	-14.0	48.00
5	No calculation at this stage							
6	18.8	57.00	-81.5	54.00	51.0	52.00	-52.4	57.00
7	No calculation at this stage							
8	No calculation at this stage							
9	28.7	55.35	-49.4	52.95	34.6	52.00	-58.8	55.35
10	No calculation at this stage							
11	No calculation at this stage							
12	No calculation at this stage							
13	65.1	55.35	-94.9	53.40	99.5	52.32	-150.8	55.35

Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.000	54.00	0.000	58.50	Apply surcharge no.1 at elev. 57.60
2	0.000	54.60	0.000	58.50	Apply surcharge no.2 at elev. 57.60
3	0.000	48.00	0.000	58.50	Apply load no.1 at elev. 48.00
4	0.003	58.50	0.000	58.50	Excav. to elev. 56.50 on PASSIVE side
5	No calculation at this stage				Install strut no.1 at elev. 57.00
6	0.005	52.95	0.000	58.50	Excav. to elev. 52.00 on PASSIVE side
7	No calculation at this stage				Install strut no.2 at elev. 52.32
8	No calculation at this stage				Install strut no.3 at elev. 55.35
9	0.004	52.95	0.000	58.50	Remove strut no.1 at elev. 57.00
10	No calculation at this stage				Install strut no.4 at elev. 58.00
11	No calculation at this stage				Change EI of wall to 322000kN.m ² /m run
12	No calculation at this stage				Change soil type 2 to soil type 4
13	0.005	52.95	0.000	58.50	Change soil type 3 to soil type 5

Summary of results (continued)

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 --- at elev. 57.00		--- Strut no. 2 --- at elev. 52.32		--- Strut no. 3 --- at elev. 55.35	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
6	74.63	223.90	---	---	---	---
9	---	---	slack	slack	84.04	84.04
13	---	---	93.52	93.52	224.04	224.04

Stage no.	--- Strut no. 4 --- at elev. 58.00	
	kN/m run	kN/strut
13	0.53	0.53

* Indicates that the total force shown is the sum of the force in the strut plus a force applied at the same elevation which may represent temperature load or other forces which are part of the strut load. Force components are listed in the detailed results for individual stages.

Units: kN,m

Bending moment, shear force, displacement envelopes

