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24 May 2021

Adam Bier
ANX Developments Limited
1st Floor Office
155 Regents Park Road
London
NW1 8BB

Our ref: CG/28978c

Please reply to: Thomas Perry / Richard Ball

Dear Mr. Bier,

Land between Gondar House and South Mansions – Revised Basement Impact Assessment

Card Geotechnics Limited (CGL) has undertaken a review of the revised development plans for development located between Gondar House and South Mansions, West Hampstead. It has been previously agreed with London Borough of Camden's independent engineers, Campbell Reith, that a fully revised basement impact assessment (BIA) is not required given the similarities of the latest development plans with the previous scheme. This letter has therefore been produced to summarise the pertinent design changes and the impact they will have on the neighbouring properties compared to the previous BIA report.

CGL has previously undertaken a BIA for the site in May 2020[1] and a subsequent revised BIA in December 2020[2]. The previous BIA assessed the impact of the proposed development along four critical section lines, as shown in Figure 1. This review addresses the impact of the proposed changes to the basement (May 2021) on the conclusions of the previous BIA and on the sections analysed.

The changes made in the May 2021 basement design are as below:

- The footprint of the basement has been reduced by moving the south-east basement elevation approximately 3m to the north-west and moving the western extent of the basement 0.55m to the east (see Figure 1).
- The basement is shallower; former formation levels were -1.71m above site datum (mSD) and -3.050mSD ; current proposed levels are -0.803mSD and -1.333mSD .
- A permanent prop has been added at Critical Section 2 to support the wall in this location (see Figure 1).

Revised structural plans are provided in Appendix A.

The impact from the updated design at each critical section line is considered below.

Critical Section 1 and 1a
The revised design has kept the distance from the basement wall to the neighbouring building at South Mansions the same, as shown in Figure 1. The depth of the basement has been reduced, with the new top of

[1] Card Geotechnics Limited. *Land Between Gondar House & South Mansions, West Hampstead – Geotechnical and Geoenvironmental Interpretative Report and Basement Impact Assessment*. May 2020.
[2] Card Geotechnics Limited. *Land Between Gondar House & South Mansions, West Hampstead – Geotechnical and Geoenvironmental Interpretative Report and Revised Basement Impact Assessment*. Revision 1. December 2020.

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concrete at basement at approximately -0.803mSD compared to -1.71mSD in the previous design. As a result of the change in basement depth, it is expected that the lateral retaining wall deflections will reduce and thereby reduce the impact on the building.

The changes are therefore positive, and no change is proposed to the building damage assessment in this location.

Critical Section 2

The revised design has kept the distance from the basement wall and the outbuilding at 3 Hillfield Road the same. The single concrete beam propping the basement wall at ground level in the previous plans[2] has been replaced by two steel beams. In addition, the depth of the basement has been reduced, with the top of concrete at basement level changed to approximately -0.803mSD from -1.71mSD.

To assess the impact from the addition of the permanent prop and the reduced depth of the basement, the WALLAP model along this critical section line has been updated. The output from the updated WALLAP model can be found in Appendix B. The results have been used to update the building damage category for this critical section line. The updated results presented in Plate 1 and Plate 2 show a slight increase in the deflection ratio but the resulting damage category is within Category 1 ('very slight' damage), which is consistent with the results of the previous assessment[2].

Plate 1. Building Damage Assessment: Critical Section 2 (Outbuilding to 3 Hillfield Road)

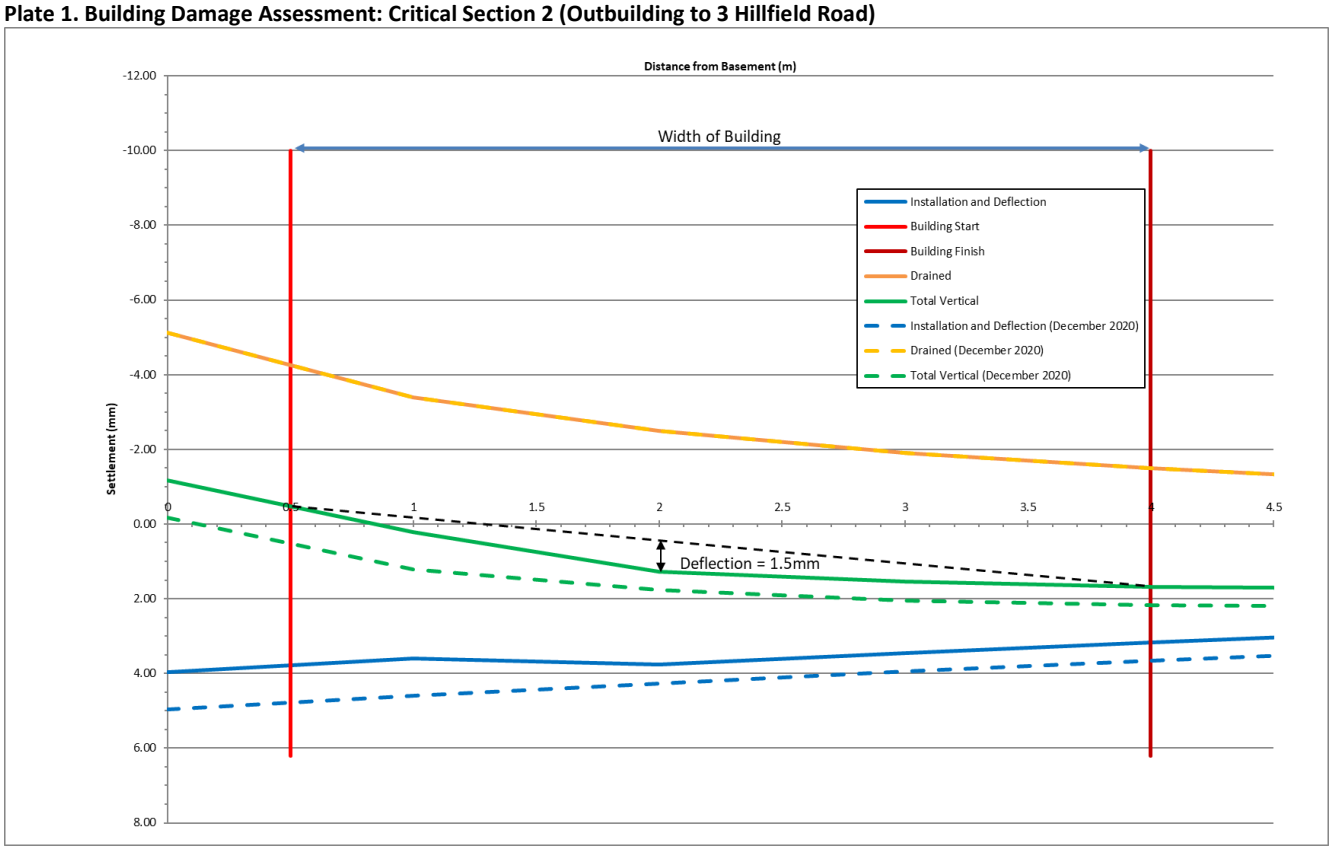
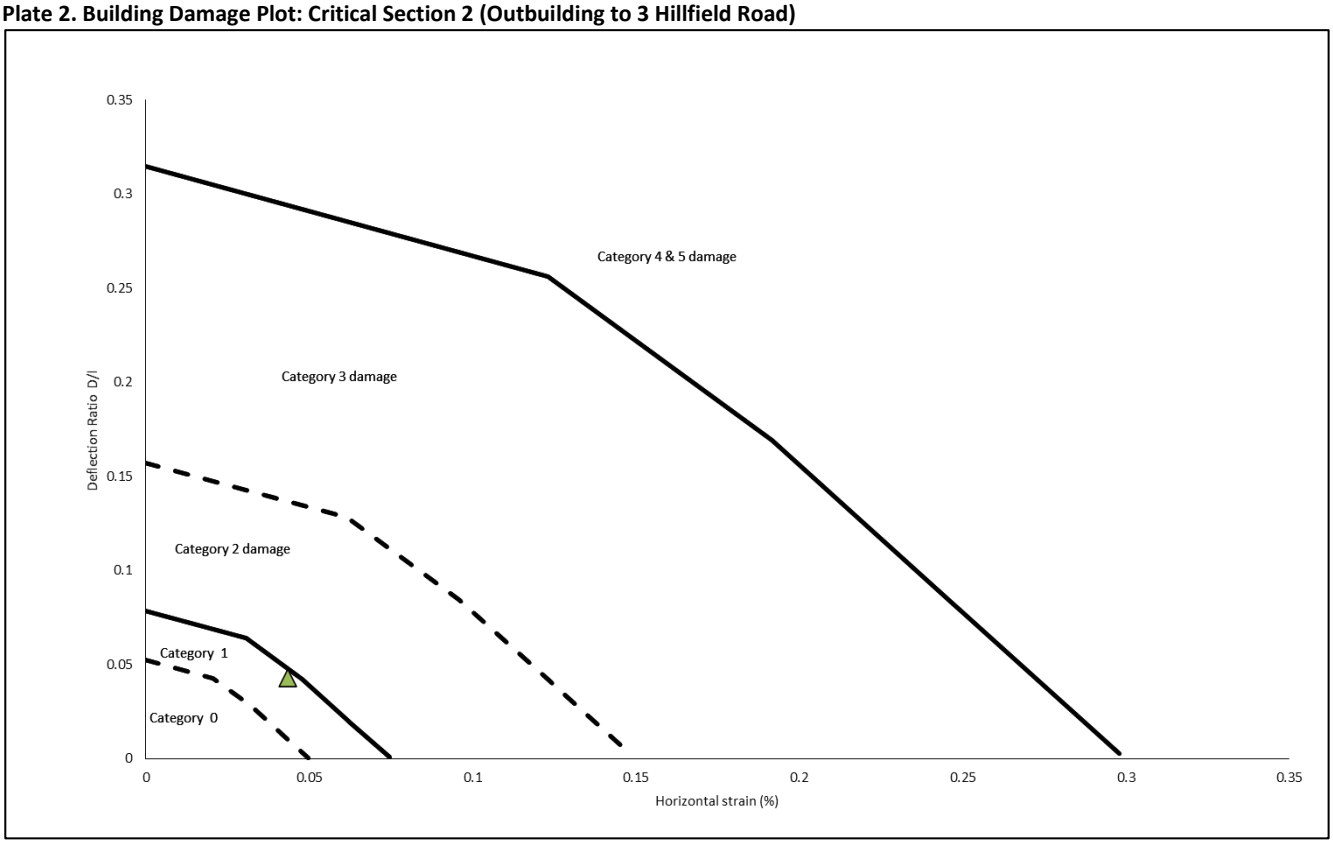


Plate 2. Building Damage Plot: Critical Section 2 (Outbuilding to 3 Hillfield Road)



Critical Section 3

The revised basement footprint has moved the south-east basement elevation away from the property at 3 Hillfield Road, as shown in Figure 1. Given that the property is now adjacent to the corner of the basement and the basement depth is reduced, the resulting horizontal ground movements are predicted to be reduced by corner effects, whereby the corner of the basement wall stiffens the wall and reduces it lateral deflection. It is therefore anticipated that the impact on the property at 3 Hillfield Road will be reduced compared to the previous assessment[2], which predicted the damage to not exceed Category 1 'very slight' damage.

No further assessment is proposed at this location.

Critical Section 4

As shown in Figure 1, the revised development plans have moved the basement wall approximately 3.02m away from the property at 1 Hillfield Road. In addition, the formation level has been increased of the basement has been reduced from -3.05mSD to -1.333mSD . It is anticipated that these changes will reduce the vertical and horizontal ground movements across this property and therefore the impact from the proposed development will be lower compared to the previous assessment[2] (previous predicted damage category was Category 0 'negligible').

Gondar House

The revised basement plan drawings show that the distance from the neighbouring property at Gondar House has been increased from 2.74m to 5.26m, as shown in Figure 1, which will reduce the impact from the proposed development to this property compared to the previous basement plans. In the previous BIA report[2] no assessment of the impact on this property was undertaken, however the impact is not expected to exceed the previous damage category along Critical Section 4 which was Category 1 ('very slight' damage). This can be justified given that the distance from the basement to Gondar House (5.26m) is greater than the previous

distance from the basement to the property at 1 Hillfield Road (4.17m) and that the formation level of the basement has been increased from -3.05mSD to -1.333mSD .

Conclusion

CGL have carried out a review of the impact from the revised basement level plans on the neighbouring properties. The revised plans involve reducing the depth of the basement level and moving the south-east and south-west basement elevations away from the properties at 1 Hillfield Road, 3 Hillfield Road and Gondar House.

In general, it is anticipated that the revised basement design will reduce the impact on the neighbouring properties and that the anticipated damage category will not exceed the Category 1 'very slight' damage predicted during the previous BIA[2].

Yours sincerely,

Thomas Perry

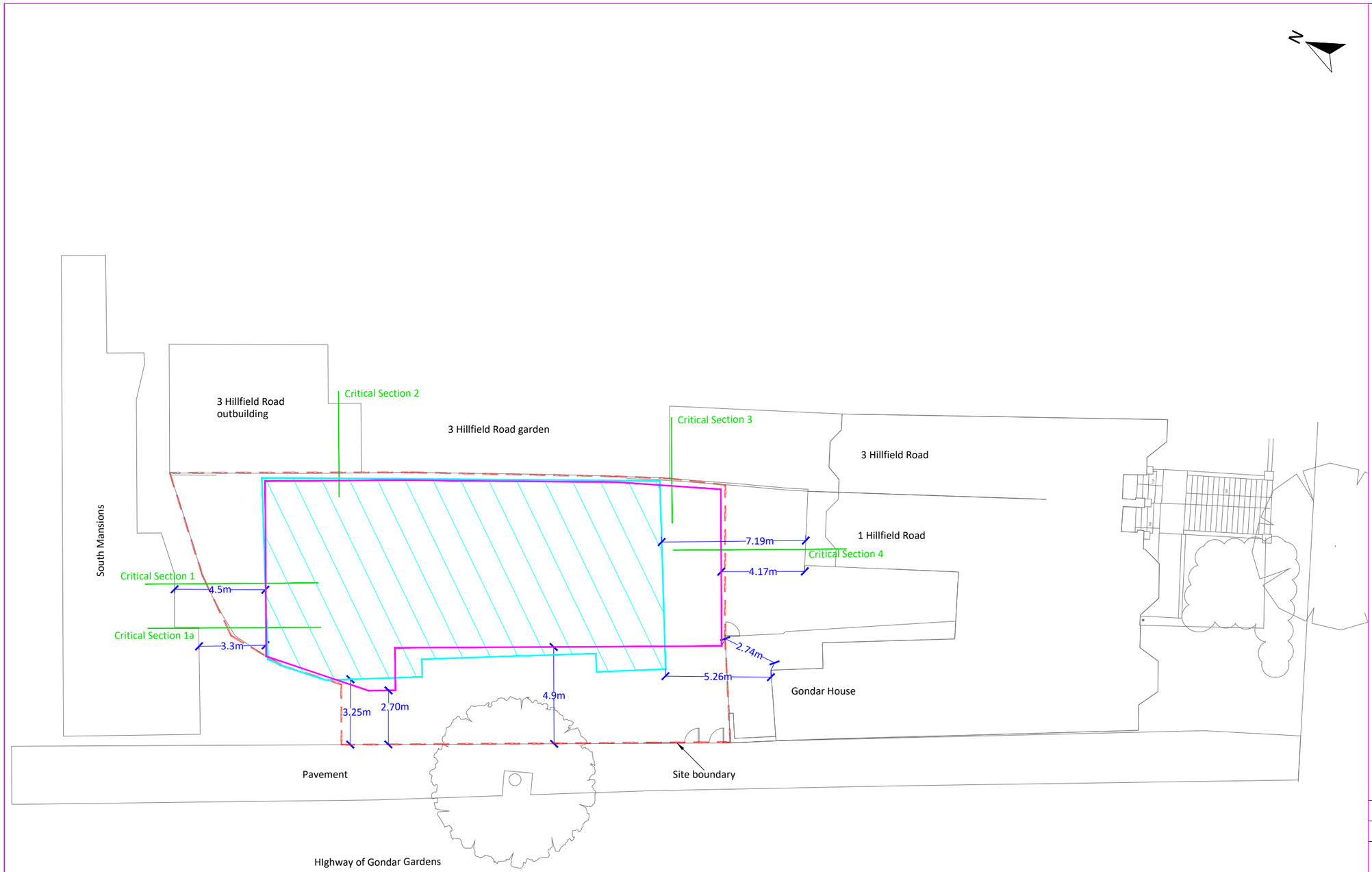
Thomas Perry, Engineer
Card Geotechnics Limited

Enclosed:

Figure 1 – Site Layout Plan

Appendix A – Revised Development Plans
Appendix B – WALLAP Output for Critical Line 2

FIGURE



KEY

- Basement Footprint (May 2021)
- Basement Footprint (December 2020)
- Critical Section
- Site Boundary

Rev	Date	Comments
0	20/05/21	

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Project: **Land between Gondar House and South Mansions**

Client: **ANX Developments Limited**

Drawing title: **Figure 1 - Site Layout Plan**

Scale(s): **NTS**

Job No.: **CG/28978C**

Drawn	TBP	xx/xx/18
Checked		
Approved		

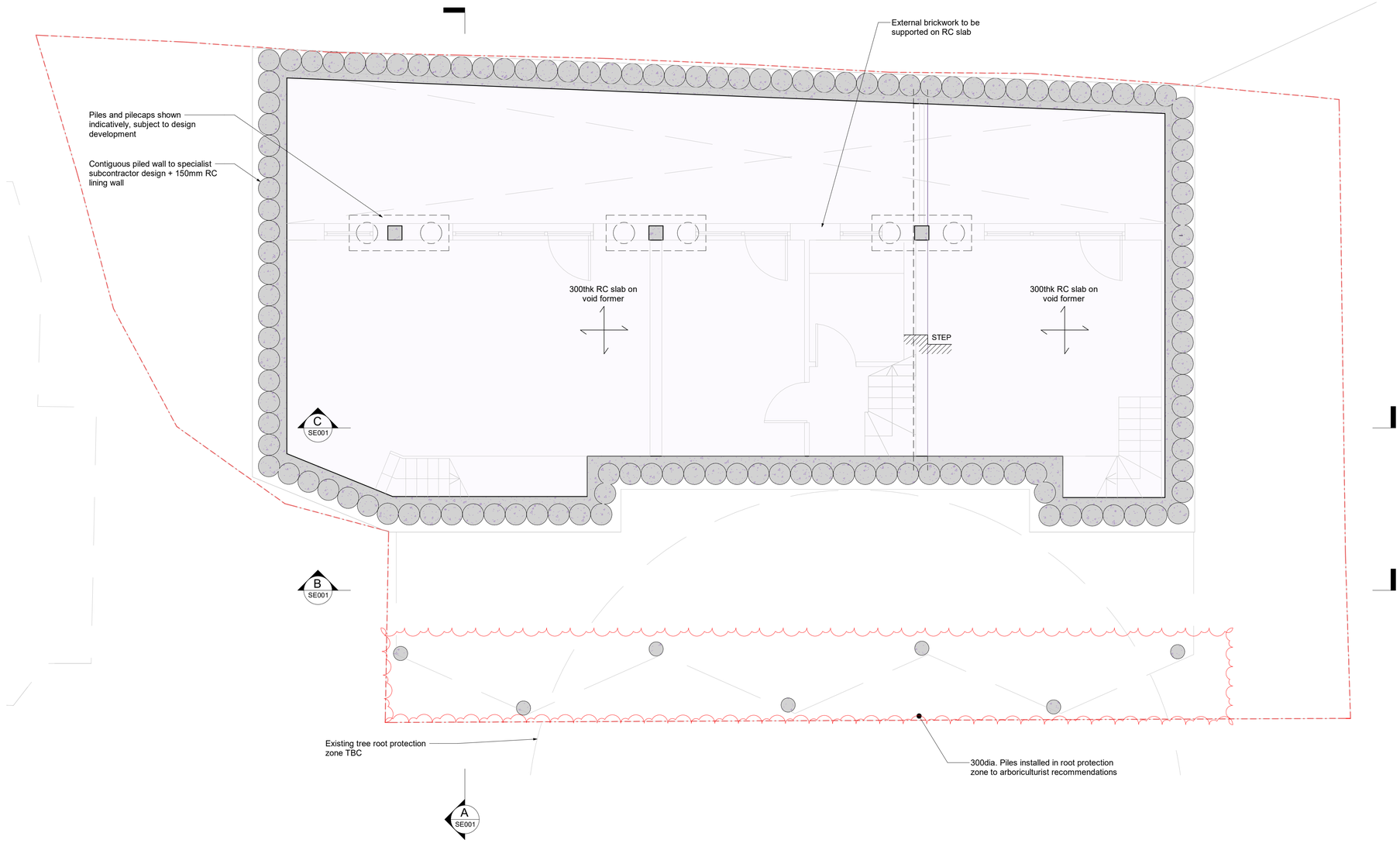
Dwg No.: **CG/28978C-001**

Rev.: **0**

APPENDIX A

Revised Development Plans

KEY LEGEND	
&	Retained existing structure - Masonry & Concrete
	Existing Timber stud wall
	New brickwork
	New blockwork
	New RC concrete structure
	100x50 C24 studs Headers and Sole plate. Stud @ 400c/c U.N.O.
	Ground level
	New floor span
EX	Existing floor span
▶	Moment Connection Frame
DJ / TJ	Double joist / Triple joist
DS	Double stud
or CB	Column Below
	Assumed boundary line
CP	Crank Point Location
	Lateral Restraint Straps
	Step on slab
Lx	Lintel above opening (Refer to schedule for size)



BASEMENT FLOOR PLAN

Scale 1 : 50

Notes:

1. These drawings are not to be used for setting out purposes. Refer to the latest Architects information and site measure as required.
2. Contact SD Structures in the event of any discrepancies between findings on site and these drawings.
3. Drawing is to be read in conjunction with the SD Structures Engineer's Specification and General Notes.
4. 3D views are indicative only and any conflicting 2D information should take precedence. If in doubt contact SD Structures prior to starting work

sd-structures.com
60 Grays Inn Road, London WC1X 8AQ

STRUCTURES

PRELIMINARY

Gondar Gardens | Eng: JN
SDS795 | Drawn: EP
Basement Plan

Rev	Amendment	Date	Drawn	Eng
P0	Preliminary	14/05/2021	EP	JN

Scale: As indicated @A1

SDS795 - PL001 Rev: **P0**

KEY LEGEND	
&	Retained existing structure - Masonry & Concrete
	Existing Timber stud wall
	New brickwork
	New blockwork
	New RC concrete structure
	100x50 C24 studs Headers and Sole plate. Stud @ 400c/c U.N.O.
	Ground level
	New floor span
EX	Existing floor span
▶	Moment Connection Frame
DJ / TJ	Double joist / Triple joist
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	Lateral Restraint Straps
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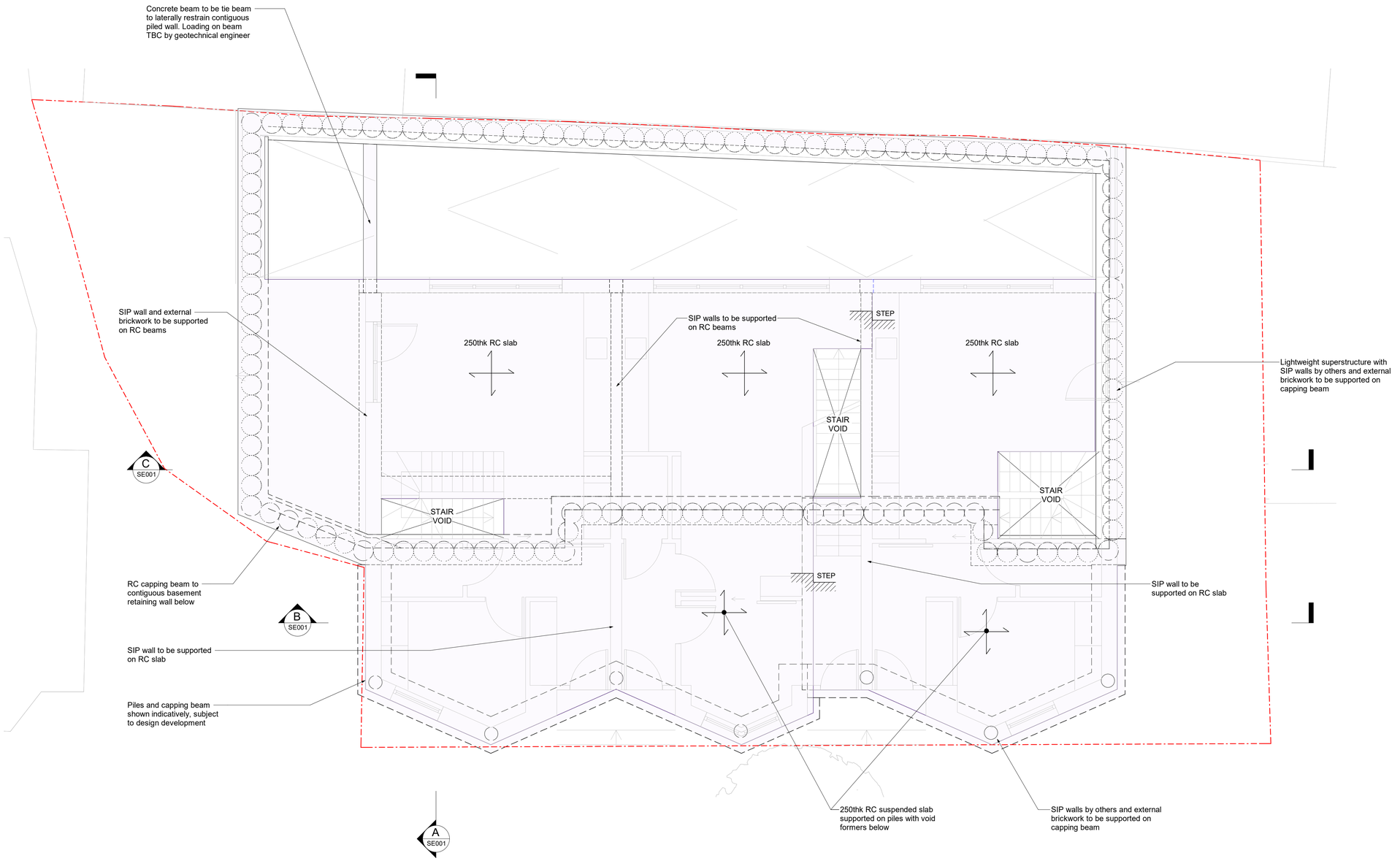
Lx	Lintel above opening (Refer to schedule for size)



GROUND FLOOR PLAN

Scale 1 : 50

Notes:

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STRUCTURES
60 Grays Inn Road, London WC1X 8AQ
sd-structures.com

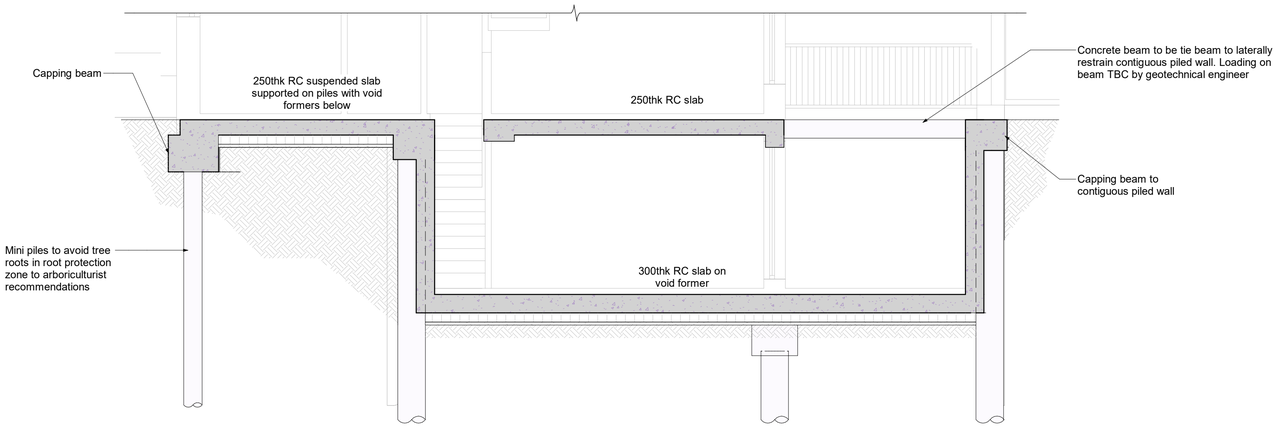
PRELIMINARY

Gondar Gardens | Eng: JN
SDS795 | Drawn: EP
Ground Floor Plan

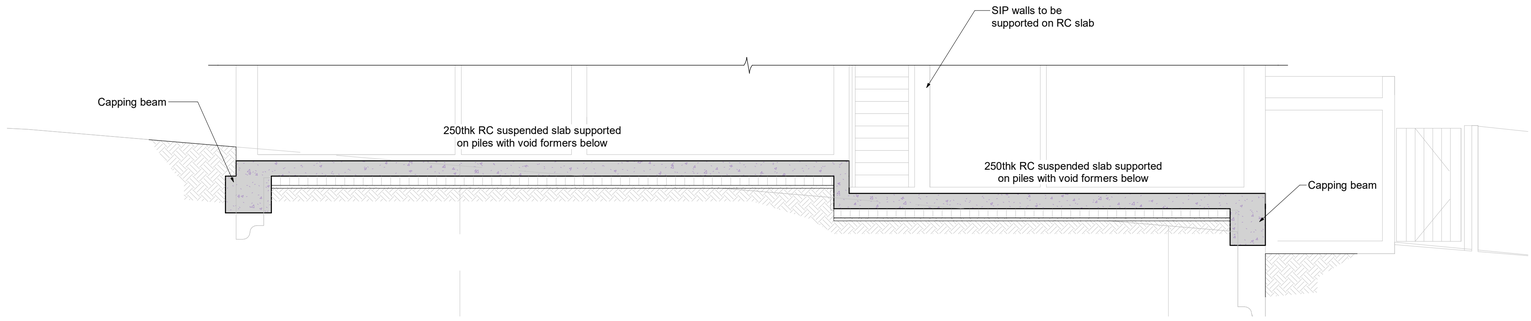
Rev	Amendment	Date	Drawn	Eng
P0	Preliminary	14/05/2021	EP	JN

Scale: As indicated @A1

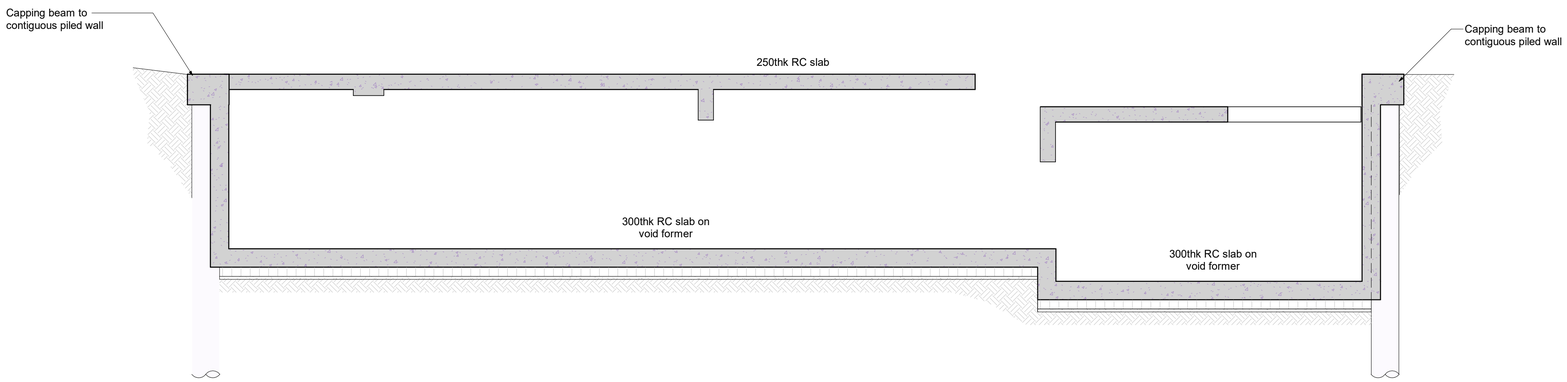
SDS795 - PL002 Rev: **P0**



SECTION A - A
Scale 1 : 50



SECTION B - B
Scale 1 : 50



SECTION C - C
Scale 1 : 50

Notes:

1. These drawings are not to be used for setting out purposes. Refer to the latest Architects information and site measure as required.
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STRUCTURES
60 Grays Inn Road, London WC1X 8AQ sd-structures.com

PRELIMINARY

Gondar Gardens | Eng: JN
SDS795 | Drawn: EP
Sections

Rev	Amendment	Date	Drawn	Eng
P0	Preliminary	14/05/2021	EP	JN

Scale: 1 : 50 @A1

SDS795 - SE001 Rev: **P0**

APPENDIX B

WALLAP Output for Critical Line 2

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types Left side	Soil types Right side
1	2.05	2 LC Undr	2 LC Undr

SOIL PROPERTIES

-- Soil type -- No.	Description (Datum elev.)	Bulk density kN/m3	Young's Modulus Eh,kN/m2 (dEh/dy)	At rest coeff. Ko (dKo/dy)	Consol state. NC/OC (Nu)	Active limit Ka (Kac)	Passive limit Kp (Kpc)	Cohesion kN/m2 (dc/dy)
1	LC Drained	20.00	18000	0.600	OC	0.422	2.371	5.000d
	(0.00)		(2700)		(0.200)	(1.299)	(3.080)	
2	LC Undr	20.00	24000	0.600	OC	1.000	1.000	40.00u
	(0.00)		(3600)		(0.490)	(2.328)	(2.328)	(6.000)

Additional soil parameters associated with Ka and Kp

------- Soil type ------- No.	Description	--- parameters for Ka --- Soil friction angle	Wall adhesion coeff.	Back-fill angle	--- parameters for Kp --- Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	LC Drained	24.00	0.000	0.00	24.00	0.000	0.00
2	LC Undr	0.00	0.400	0.00	0.00	0.400	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Left side	Right side
Initial water table elevation	-10.50	-10.50

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = -5.95
Maximum finite element length = 0.40 m
Youngs modulus of wall E = 3.0000E+07 kN/m2
Moment of inertia of wall I = 4.0258E-03 m4/m run
E.I = 120774 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	-0.80	1.00	0.300000	3.000E+07	10.00	0.00	0	No
2	2.05	10.00	0.100000	2.100E+08	10.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge	Far edge	Equiv. soil type	Partial factor/ Category
1	1.45	0.25(L)	4.50	3.50	15.00	=	N/A	1.00 -

Note: L = Left side, R = Right side
Limit State Categories P/U = Permanent Unfavourable
P/F = Permanent Favourable
Var = Variable (unfavourable)

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 1.45
2	Excavate to elevation 1.00 on RIGHT side
3	Install strut or anchor no.2 at elevation 2.05
4	Excavate to elevation -0.80 on RIGHT side
5	Install strut or anchor no.1 at elevation -0.80
6	Change properties of soil type 2 to soil type 1 Ko pressures will be reset

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: Serviceability Limit State
All loads and soil strengths are unfactored

Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 8.000 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 8.00 m

Width of excavation on Left side of wall = 20.00 m
Width of excavation on Right side of wall = 10.00 m

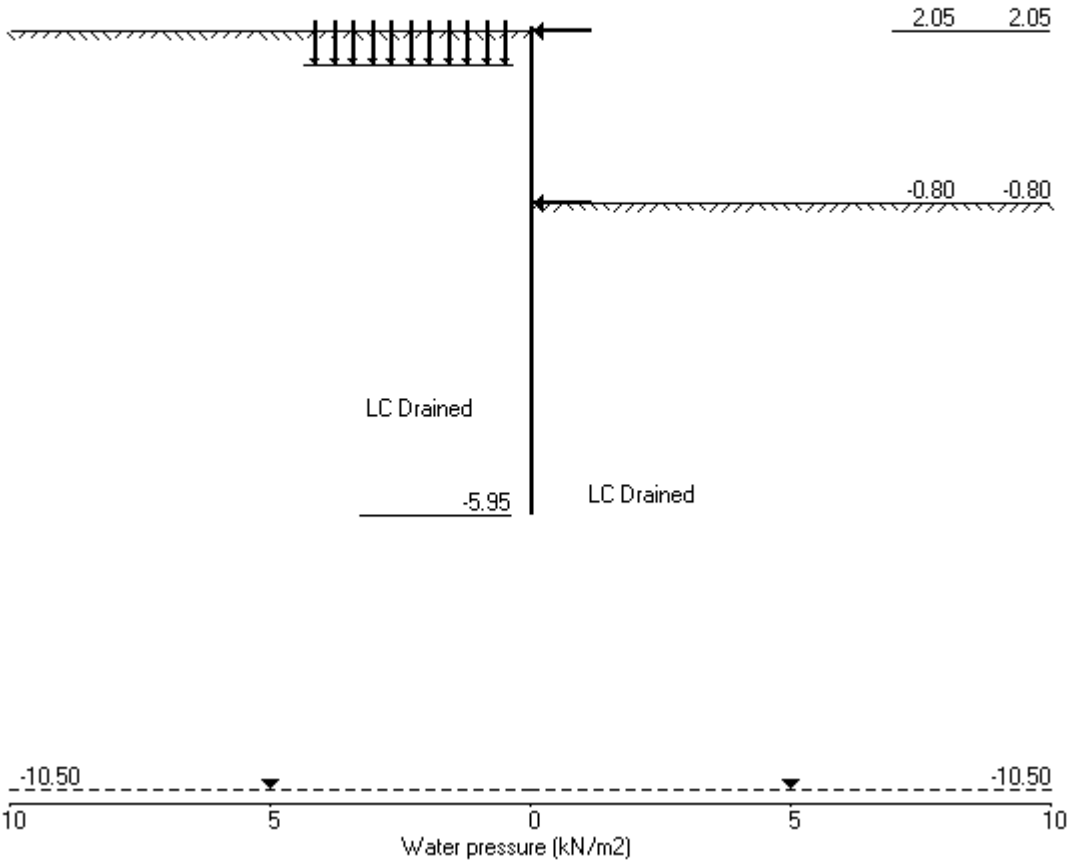
Distance to rigid boundary on Left side = 20.00 m
Distance to rigid boundary on Right side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options: Displacement, Bending mom., Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 1.45	Yes	Yes	Yes
2	Excav. to elev. 1.00 on RIGHT side	Yes	Yes	Yes
3	Install strut no.2 at elev. 2.05	Yes	Yes	Yes
4	Excav. to elev. -0.80 on RIGHT side	Yes	Yes	Yes
5	Install strut no.1 at elev. -0.80	Yes	Yes	Yes
6	Change soil type 2 to soil type 1	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

Units: kN,m

Stage No.6 Change soil type 2 to soil type 1



Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 1.45

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = -5.95 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation	Direction of failure
1	2.05	2.05	Cant.	Conditions not suitable for FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 8.00m
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: Left side 20.00 from wall
Right side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

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
1	2.05	-2.05	0.000	-3.90E-05	0.0	-0.0	
2	1.75	-4.36	0.000	-3.88E-05	-1.0	-0.1	
3	1.45	-4.95	0.000	-3.79E-05	-2.4	-0.6	
4	1.23	-3.12	0.000	-3.63E-05	-3.3	-1.2	
5	1.00	0.21	0.000	-3.33E-05	-3.6	-2.0	
6	0.70	2.46	0.000	-2.71E-05	-3.2	-3.0	
7	0.40	3.24	0.000	-1.85E-05	-2.3	-3.9	
8	0.00	3.23	0.000	-4.70E-06	-1.0	-4.5	
9	-0.40	2.68	0.000	1.05E-05	0.1	-4.7	
10	-0.60	2.30	0.000	1.82E-05	0.6	-4.6	
11	-0.80	1.91	0.000	2.57E-05	1.1	-4.4	
12	-1.20	1.12	0.000	3.94E-05	1.7	-3.9	
13	-1.60	0.41	0.000	5.10E-05	2.0	-3.1	
14	-2.00	-0.17	0.000	6.00E-05	2.0	-2.3	
15	-2.40	-0.60	0.000	6.64E-05	1.9	-1.6	
16	-2.80	-0.88	0.000	7.05E-05	1.6	-0.9	
17	-3.20	-1.02	0.000	7.24E-05	1.2	-0.3	
18	-3.60	-1.03	0.000	7.29E-05	0.8	0.1	
19	-4.00	-0.93	0.000	7.23E-05	0.4	0.3	
20	-4.40	-0.73	0.000	7.13E-05	0.1	0.3	
21	-4.80	-0.45	0.000	7.02E-05	-0.2	0.3	
22	-5.20	-0.07	0.000	6.94E-05	-0.3	0.2	
23	-5.58	0.36	0.000	6.91E-05	-0.2	0.1	
24	-5.95	0.86	0.000	6.90E-05	0.0	0.0	

(continued)

Stage No.1 Apply surcharge no.1 at elevation 1.45

LEFT side

Node no.	Y coord	Water press.	Effective stresses: Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Coeff. of subgrade reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	2.05	Total>	0.00	0.00	64.49	0.00	0.00a	5940
2	1.75	Total>	6.00	1.50m	74.69	1.50	1.50a	6326
3	1.45	Total>	12.00	3.00m	84.88	4.73	4.73	6712
4	1.23	Total>	18.74	4.12m	94.76	9.42	9.42	7002
5	1.00	Total>	27.05	5.25m	106.22	15.61	15.61	7291
6	0.70	Total>	35.85	6.75m	119.21	21.68	21.68	7677
7	0.40	Total>	43.09	8.25m	130.64	26.27	26.27	8063
8	0.00	Total>	51.60	10.25m	144.73	31.31	31.31	8578
9	-0.40	Total>	59.44	12.25m	158.16	35.75	35.75	9092
10	-0.60	Total>	63.24	13.26m	164.78	37.87	37.87	9352
11	-0.80	Total>	66.99	14.26m	171.34	39.96	39.96	9611
12	-1.20	Total>	74.29	16.26m	184.20	44.02	44.02	10124
13	-1.60	Total>	81.53	18.25m	197.01	48.10	48.10	10636
14	-2.00	Total>	88.80	20.25m	209.87	52.26	52.26	11151
15	-2.40	Total>	96.10	22.25m	222.76	56.51	56.51	11666
16	-2.80	Total>	103.45	24.25m	235.70	60.86	60.86	12180
17	-3.20	Total>	110.86	26.25m	248.70	65.31	65.31	12695
18	-3.60	Total>	118.33	28.25m	261.75	69.84	69.84	13210
19	-4.00	Total>	125.85	30.25m	274.86	74.46	74.46	13724
20	-4.40	Total>	133.42	32.25m	288.02	79.16	79.16	14239
21	-4.80	Total>	141.04	34.25m	301.23	83.92	83.92	14754
22	-5.20	Total>	148.70	36.25m	314.47	88.74	88.74	15268
23	-5.58	Total>	155.91	38.13m	326.93	93.32	93.32	15751
24	-5.95	Total>	163.15	40.00m	339.41	97.95	97.95	16233

RIGHT side

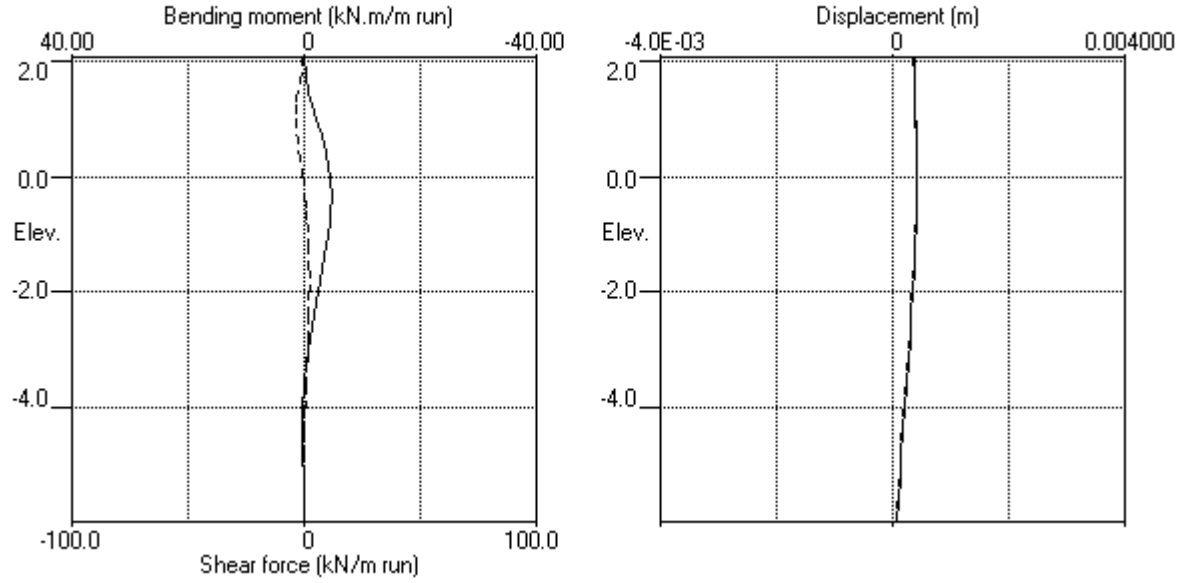
Node no.	Y coord	Water press.	Effective stresses: Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Coeff. of subgrade reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	2.05	Total>	0.00	0.00	64.49	2.05	2.05	5940
2	1.75	Total>	6.00	1.50m	74.69	5.86	5.86	6326
3	1.45	Total>	12.00	3.00m	84.88	9.67	9.67	6712
4	1.23	Total>	16.50	4.12m	92.52	12.54	12.54	7002
5	1.00	Total>	21.00	5.25m	100.16	15.40	15.40	7291
6	0.70	Total>	27.00	6.75m	110.35	19.22	19.22	7677
7	0.40	Total>	33.00	8.25m	120.55	23.03	23.03	8063
8	0.00	Total>	41.00	10.25m	134.13	28.08	28.08	8578
9	-0.40	Total>	49.00	12.25m	147.72	33.08	33.08	9092
10	-0.60	Total>	53.03	13.26m	154.57	35.57	35.57	9352
11	-0.80	Total>	57.06	14.26m	161.41	38.05	38.05	9611
12	-1.20	Total>	65.03	16.26m	174.95	42.90	42.90	10124
13	-1.60	Total>	73.00	18.25m	188.49	47.69	47.69	10636
14	-2.00	Total>	81.00	20.25m	202.07	52.43	52.43	11151
15	-2.40	Total>	89.00	22.25m	215.66	57.11	57.11	11666
16	-2.80	Total>	97.00	24.25m	229.25	61.74	61.74	12180
17	-3.20	Total>	105.00	26.25m	242.84	66.32	66.32	12695
18	-3.60	Total>	113.00	28.25m	256.43	70.87	70.87	13210
19	-4.00	Total>	121.00	30.25m	270.01	75.40	75.40	13724
20	-4.40	Total>	129.00	32.25m	283.60	79.89	79.89	14239
21	-4.80	Total>	137.00	34.25m	297.19	84.36	84.36	14754
22	-5.20	Total>	145.00	36.25m	310.78	88.81	88.81	15268
23	-5.58	Total>	152.50	38.13m	323.52	92.96	92.96	15751
24	-5.95	Total>	160.00	40.00m	336.25	97.08	97.08	16233

(continued)

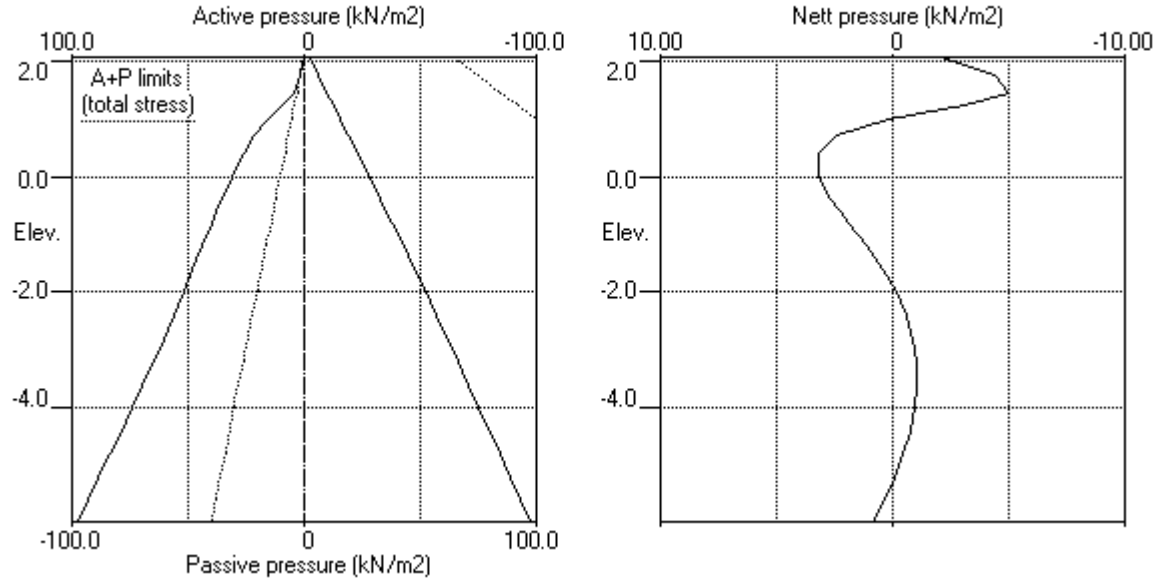
Stage No.1 Apply surcharge no.1 at elevation 1.45
Note: 1.50a Soil pressure at active limit
123.45p Soil pressure at passive limit

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 1.45



Stage No.1 Apply surcharge no.1 at elev. 1.45



Units: kN,m

Stage No. 2 Excavate to elevation 1.00 on RIGHT side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = -5.95 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation	Direction of failure
2	2.05	1.00	Cant.	7.061	-5.37	0.84	0.16	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 8.00m
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: Left side 20.00 from wall
Right side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

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
1	2.05	0.00	0.002	2.56E-04	0.0	-0.0	
2	1.75	1.50	0.002	2.56E-04	0.2	0.0	
3	1.45	3.00	0.002	2.55E-04	0.9	0.2	
4	1.23	4.12	0.002	2.55E-04	1.7	0.5	
5	1.00	5.25	0.002	2.53E-04	2.8	1.0	
		-7.05	0.002	2.53E-04	2.8	1.0	
6	0.70	-2.76	0.002	2.50E-04	1.3	1.8	
7	0.40	-0.66	0.002	2.45E-04	0.8	2.1	
8	0.00	-0.07	0.002	2.38E-04	0.6	2.3	
9	-0.40	0.00	0.001	2.29E-04	0.6	2.6	
10	-0.60	-0.05	0.001	2.25E-04	0.6	2.7	
11	-0.80	-0.13	0.001	2.20E-04	0.6	2.8	
12	-1.20	-0.33	0.001	2.11E-04	0.5	3.0	
13	-1.60	-0.51	0.001	2.00E-04	0.3	3.2	
14	-2.00	-0.65	0.001	1.90E-04	0.1	3.3	
15	-2.40	-0.72	0.001	1.79E-04	-0.2	3.2	
16	-2.80	-0.73	0.001	1.69E-04	-0.5	3.1	
17	-3.20	-0.67	0.001	1.59E-04	-0.7	2.8	
18	-3.60	-0.55	0.001	1.50E-04	-1.0	2.4	
19	-4.00	-0.35	0.001	1.43E-04	-1.2	2.0	
20	-4.40	-0.08	0.001	1.37E-04	-1.3	1.5	
21	-4.80	0.29	0.001	1.33E-04	-1.2	1.0	
22	-5.20	0.76	0.001	1.31E-04	-1.0	0.5	
23	-5.58	1.31	0.001	1.30E-04	-0.6	0.1	
24	-5.95	1.97	0.001	1.29E-04	0.0	-0.0	

(continued)

Stage No.2 Excavate to elevation 1.00 on RIGHT side

Node no.	Y coord	LEFT side						
		Water press. kN/m2	Effective stresses Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
1	2.05	Total>	0.00	0.00	64.49	0.00	0.00a	7302
2	1.75	Total>	6.00	1.50m	74.69	1.50	1.50a	7777
3	1.45	Total>	12.00	3.00m	84.88	3.00	3.00a	8251
4	1.23	Total>	18.74	4.12m	94.76	4.12	4.12a	8607
5	1.00	Total>	27.05	5.25m	106.22	5.25	5.25a	8963
6	0.70	Total>	35.85	6.75m	119.21	9.40	9.40	9437
7	0.40	Total>	43.09	8.25m	130.64	14.17	14.17	9912
8	0.00	Total>	51.60	10.25m	144.73	19.51	19.51	10544
9	-0.40	Total>	59.44	12.25m	158.16	24.28	24.28	11177
10	-0.60	Total>	63.24	13.26m	164.78	26.57	26.57	11496
11	-0.80	Total>	66.99	14.26m	171.34	28.82	28.82	11815
12	-1.20	Total>	74.29	16.26m	184.20	33.20	33.20	12445
13	-1.60	Total>	81.53	18.25m	197.01	37.57	37.57	13075
14	-2.00	Total>	88.80	20.25m	209.87	41.99	41.99	13708
15	-2.40	Total>	96.10	22.25m	222.76	46.46	46.46	14340
16	-2.80	Total>	103.45	24.25m	235.70	51.00	51.00	14973
17	-3.20	Total>	110.86	26.25m	248.70	55.60	55.60	15606
18	-3.60	Total>	118.33	28.25m	261.75	60.28	60.28	16238
19	-4.00	Total>	125.85	30.25m	274.86	65.03	65.03	16871
20	-4.40	Total>	133.42	32.25m	288.02	69.85	69.85	17504
21	-4.80	Total>	141.04	34.25m	301.23	74.74	74.74	18136
22	-5.20	Total>	148.70	36.25m	314.47	79.71	79.71	18769
23	-5.58	Total>	155.91	38.13m	326.93	84.45	84.45	19362
24	-5.95	Total>	163.15	40.00m	339.41	89.26	89.26	19955

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Effective stresses Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
1	2.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	79.16	12.30	12.30	8873
6	0.70	Total>	6.00	1.50m	89.35	12.16	12.16	9342
7	0.40	Total>	12.00	3.00m	99.55	14.83	14.83	9812
8	0.00	Total>	20.01	5.00m	113.14	19.59	19.59	10438
9	-0.40	Total>	28.02	7.00m	126.75	24.28	24.28	11065
10	-0.60	Total>	32.07	8.01m	133.60	26.62	26.62	11380
11	-0.80	Total>	36.11	9.01m	140.46	28.95	28.95	11696
12	-1.20	Total>	44.12	11.01m	154.04	33.53	33.53	12320
13	-1.60	Total>	52.14	13.00m	167.63	38.08	38.08	12944
14	-2.00	Total>	60.22	15.00m	181.29	42.63	42.63	13570
15	-2.40	Total>	68.31	17.00m	194.97	47.18	47.18	14196
16	-2.80	Total>	76.42	19.00m	208.67	51.73	51.73	14823
17	-3.20	Total>	84.54	21.00m	222.38	56.28	56.28	15449
18	-3.60	Total>	92.69	23.00m	236.11	60.83	60.83	16075
19	-4.00	Total>	100.85	25.00m	249.86	65.38	65.38	16701
20	-4.40	Total>	109.03	27.00m	263.63	69.92	69.92	17328
21	-4.80	Total>	117.22	29.00m	277.41	74.45	74.45	17954
22	-5.20	Total>	125.43	31.00m	291.21	78.95	78.95	18580
23	-5.58	Total>	133.14	32.88m	304.15	83.14	83.14	19168

(continued)

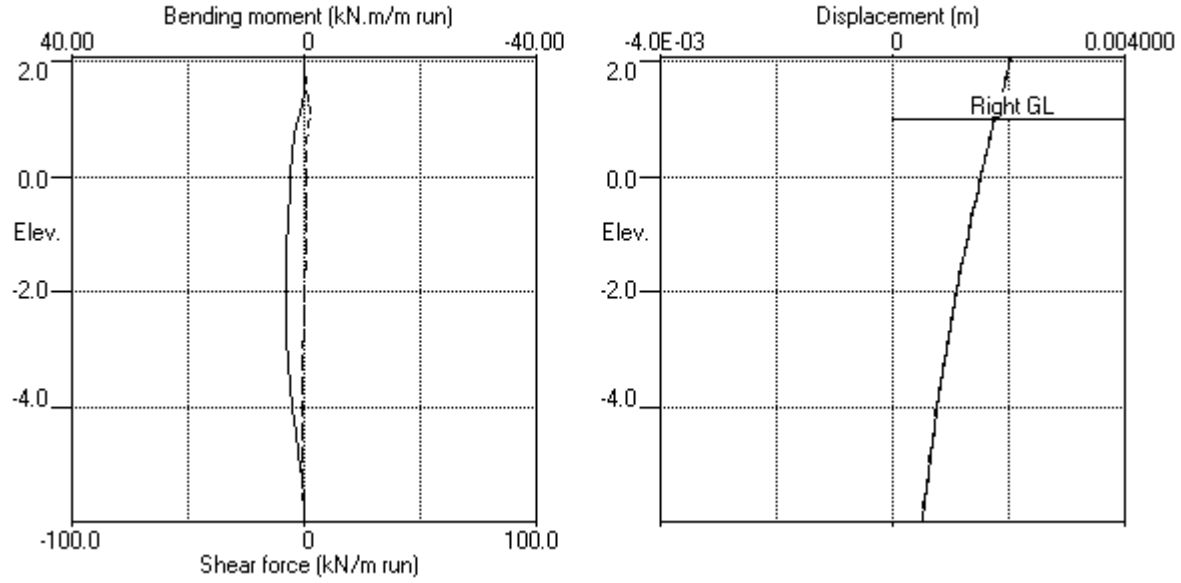
Stage No.2 Excavate to elevation 1.00 on RIGHT side

Node no.	Y coord	RIGHT side						
		Effective stresses				Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Active limit	Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
24	-5.95	Total>	140.85	34.75m	317.11	87.29	87.29	19755

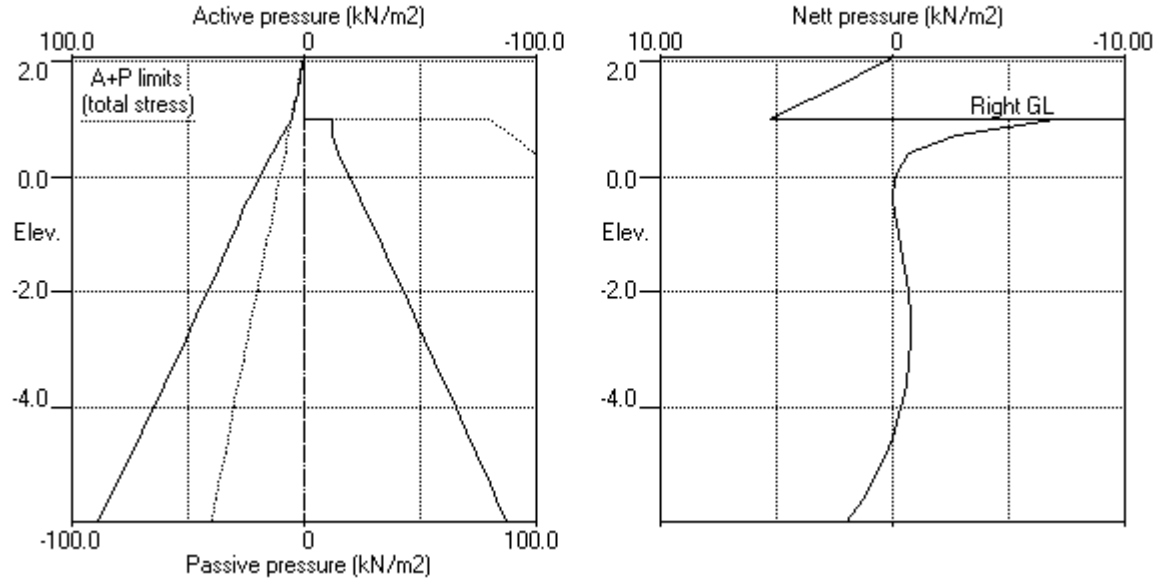
Note: 5.25a Soil pressure at active limit
123.45p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 1.00 on RIGHT side



Stage No.2 Excav. to elev. 1.00 on RIGHT side



Units: kN,m

Stage No. 4 Excavate to elevation -0.80 on RIGHT side

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = -5.95 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation	Direction of failure
4	2.05	-0.80	2.05	4.455	n/a	-0.94	0.13	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 8.00m
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: Left side 20.00 from wall
Right side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

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
1	2.05	0.00	0.002	-3.65E-04	-14.7	-0.0	14.7
2	1.75	1.50	0.002	-3.60E-04	-14.5	-4.4	
3	1.45	3.00	0.002	-3.44E-04	-13.8	-8.6	
4	1.23	4.12	0.002	-3.25E-04	-13.0	-11.6	
5	1.00	5.25	0.002	-3.01E-04	-12.0	-14.4	
6	0.70	6.75	0.003	-2.61E-04	-10.2	-17.6	
7	0.40	8.25	0.003	-2.14E-04	-7.9	-20.3	
8	0.00	10.25	0.003	-1.42E-04	-4.2	-22.7	
9	-0.40	12.75	0.003	-6.68E-05	0.4	-23.2	
10	-0.60	14.21	0.003	-2.83E-05	3.1	-22.9	
11	-0.80	15.68	0.003	9.05E-06	6.1	-22.0	
		1.41	0.003	9.05E-06	6.1	-22.0	
12	-1.20	2.93	0.003	7.71E-05	7.0	-19.3	
13	-1.60	1.61	0.003	1.35E-04	7.9	-16.3	
14	-2.00	-0.38	0.003	1.84E-04	8.1	-13.0	
15	-2.40	-1.84	0.003	2.22E-04	7.7	-9.8	
16	-2.80	-2.80	0.002	2.49E-04	6.8	-6.9	
17	-3.20	-3.32	0.002	2.68E-04	5.5	-4.4	
18	-3.60	-3.46	0.002	2.80E-04	4.2	-2.5	
19	-4.00	-3.27	0.002	2.86E-04	2.8	-1.1	
20	-4.40	-2.81	0.002	2.88E-04	1.6	-0.3	
21	-4.80	-2.09	0.002	2.88E-04	0.6	0.1	
22	-5.20	-1.14	0.002	2.88E-04	-0.0	0.2	
23	-5.58	-0.04	0.002	2.87E-04	-0.2	0.1	
24	-5.95	1.26	0.002	2.87E-04	0.0	-0.0	

At elev. 2.05 Strut force = 147.1 kN/strut = 14.7 kN/m run

(continued)

Stage No.4 Excavate to elevation -0.80 on RIGHT side

LEFT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
1	2.05	Total>	0.00	0.00	64.49	0.00	0.00a	5752
2	1.75	Total>	6.00	1.50m	74.69	1.50	1.50a	6126
3	1.45	Total>	12.00	3.00m	84.88	3.00	3.00a	6500
4	1.23	Total>	18.74	4.12m	94.76	4.12	4.12a	6780
5	1.00	Total>	27.05	5.25m	106.22	5.25	5.25a	7061
6	0.70	Total>	35.85	6.75m	119.21	6.75	6.75a	7435
7	0.40	Total>	43.09	8.25m	130.64	8.25	8.25a	7808
8	0.00	Total>	51.60	10.25m	144.73	10.25	10.25a	8307
9	-0.40	Total>	59.44	12.25m	158.16	12.75	12.75	8805
10	-0.60	Total>	63.24	13.26m	164.78	14.21	14.21	9056
11	-0.80	Total>	66.99	14.26m	171.34	15.68	15.68	9307
12	-1.20	Total>	74.29	16.26m	184.20	18.69	18.69	9804
13	-1.60	Total>	81.53	18.25m	197.01	21.91	21.91	10300
14	-2.00	Total>	88.80	20.25m	209.87	25.42	25.42	10799
15	-2.40	Total>	96.10	22.25m	222.76	29.22	29.22	11297
16	-2.80	Total>	103.45	24.25m	235.70	33.29	33.29	11796
17	-3.20	Total>	110.86	26.25m	248.70	37.62	37.62	12294
18	-3.60	Total>	118.33	28.25m	261.75	42.18	42.18	12793
19	-4.00	Total>	125.85	30.25m	274.86	46.95	46.95	13291
20	-4.40	Total>	133.42	32.25m	288.02	51.90	51.90	13789
21	-4.80	Total>	141.04	34.25m	301.23	57.02	57.02	14288
22	-5.20	Total>	148.70	36.25m	314.47	62.30	62.30	14786
23	-5.58	Total>	155.91	38.13m	326.93	67.38	67.38	15253
24	-5.95	Total>	163.15	40.00m	339.41	72.60	72.60	15721

RIGHT side

Node no.	Y coord	Water press. kN/m2	Effective stresses: Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
1	2.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	-0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		Total>	0.00	0.00	104.35	14.27	14.27	10107
12	-1.20	Total>	7.97	1.99m	117.89	15.76	15.76	10646
13	-1.60	Total>	15.95	3.99m	131.44	20.31	20.31	11185
14	-2.00	Total>	23.98	5.99m	145.05	25.81	25.81	11727
15	-2.40	Total>	32.04	7.99m	158.70	31.05	31.05	12268
16	-2.80	Total>	40.12	9.99m	172.37	36.09	36.09	12809
17	-3.20	Total>	48.25	11.99m	186.09	40.94	40.94	13350
18	-3.60	Total>	56.42	13.99m	199.85	45.64	45.64	13891
19	-4.00	Total>	64.64	15.99m	213.66	50.22	50.22	14433
20	-4.40	Total>	72.91	17.99m	227.51	54.71	54.71	14974
21	-4.80	Total>	81.23	19.99m	241.42	59.11	59.11	15515
22	-5.20	Total>	89.60	21.99m	255.38	63.44	63.44	16056
23	-5.58	Total>	97.49	23.86m	268.51	67.42	67.42	16564

(continued)

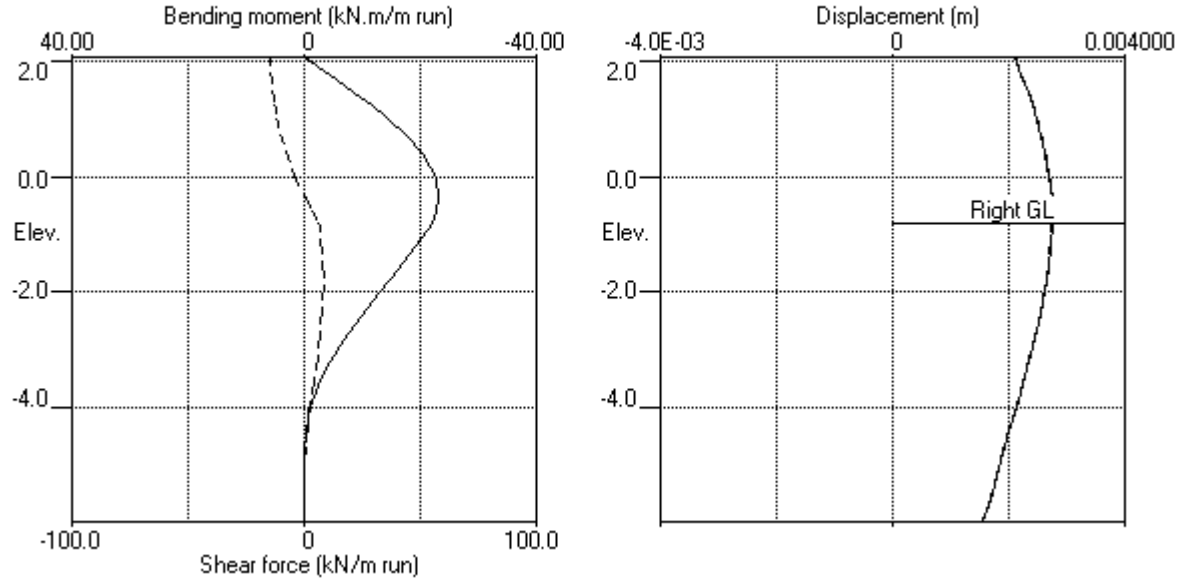
Stage No.4 Excavate to elevation -0.80 on RIGHT side

Node no.	Y coord	RIGHT side						
		Water press.	Effective stresses Vertic -al	Active limit	Passive limit	Earth pressure	Total earth pressure	Coeff. of subgrade reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
24	-5.95	Total>	105.43	25.73m	281.68	71.34	71.34	17071

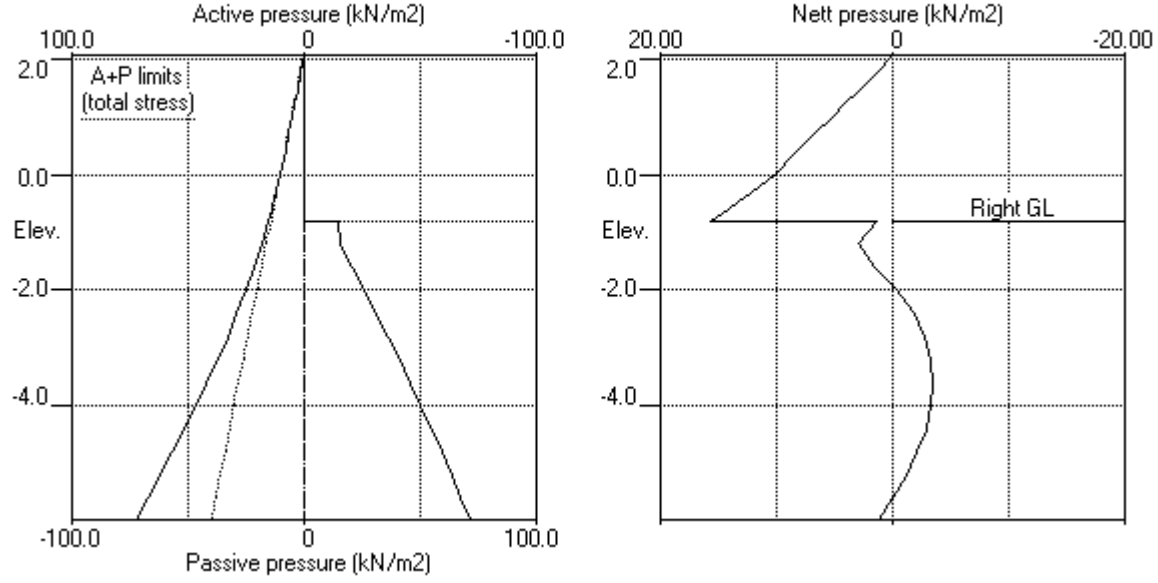
Note: 10.25a Soil pressure at active limit
123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. -0.80 on RIGHT side



Stage No.4 Excav. to elev. -0.80 on RIGHT side



Units: kN,m

Stage No. 6 Change properties of soil type 2 to soil type 1
Ko pressures will be reset

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

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = -5.95 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation	Direction of failure
6	2.05	-0.80		More than one strut. No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options
Length of wall perpendicular to section = 8.00m
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: Left side 20.00 from wall
Right side 20.00 from wall
Limit State: Serviceability Limit State
Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

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
1	2.05	0.03	0.002	-3.46E-04	-13.6	-0.0	13.6
2	1.75	3.67	0.002	-3.41E-04	-13.0	-4.0	
3	1.45	7.31	0.002	-3.27E-04	-11.4	-7.7	
4	1.23	11.39	0.002	-3.10E-04	-9.3	-10.0	
5	1.00	16.40	0.002	-2.90E-04	-6.2	-11.8	
6	0.70	21.70	0.003	-2.59E-04	-0.4	-12.6	
7	0.40	26.04	0.003	-2.29E-04	6.7	-11.7	
8	0.00	31.04	0.003	-1.99E-04	18.1	-6.8	
9	-0.40	35.50	0.003	-1.93E-04	31.4	3.4	
10	-0.60	37.59	0.003	-2.05E-04	38.8	10.4	
11	-0.80	39.56	0.003	-2.29E-04	46.6	19.0	88.0
		24.66	0.003	-2.29E-04	-41.5	19.0	
12	-1.20	25.87	0.003	-2.68E-04	-31.4	4.6	
13	-1.60	23.37	0.003	-2.66E-04	-21.6	-5.8	
14	-2.00	19.49	0.003	-2.36E-04	-13.0	-12.6	
15	-2.40	15.64	0.003	-1.88E-04	-6.0	-16.2	
16	-2.80	11.93	0.003	-1.33E-04	-0.5	-17.4	
17	-3.20	8.44	0.003	-7.67E-05	3.6	-16.6	
18	-3.60	5.22	0.003	-2.51E-05	6.3	-14.5	
19	-4.00	2.25	0.003	1.80E-05	7.8	-11.6	
20	-4.40	-0.48	0.003	5.10E-05	8.2	-8.3	
21	-4.80	-3.04	0.003	7.32E-05	7.5	-5.1	
22	-5.20	-5.47	0.003	8.57E-05	5.8	-2.4	
23	-5.58	-7.70	0.003	9.05E-05	3.3	-0.7	
24	-5.95	-9.91	0.003	9.15E-05	0.0	0.0	

At elev. 2.05 Strut force = 135.9 kN/strut = 13.6 kN/m run
At elev.-0.80 Strut force = 88.0 kN/strut = 88.0 kN/m run

(continued)

Stage No.6 Change properties of soil type 2 to soil type 1
Ko pressures will be reset

Node no.	Y coord	LEFT side						
			Effective stresses				Total	Coeff. of
		Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	subgrade reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	2.05	0.00	0.00	0.00	15.40	0.03	0.03	5938
2	1.75	0.00	6.00	0.00	29.63	3.67	3.67	6324
3	1.45	0.00	12.00	0.00	43.85	7.31	7.31	6710
4	1.23	0.00	18.74	1.41	59.84	11.39	11.39	6999
5	1.00	0.00	27.05	4.91	79.55	16.40	16.40	7288
6	0.70	0.00	35.85	8.62	100.41	21.70	21.70	7674
7	0.40	0.00	43.09	11.68	117.58	26.04	26.04	8060
8	0.00	0.00	51.60	15.27	137.76	31.04	31.04	8574
9	-0.40	0.00	59.44	18.57	156.34	35.50	35.50	6109
10	-0.60	0.00	63.24	20.18	165.36	37.59	37.59	6283
11	-0.80	0.00	66.99	21.75	174.23	39.56	39.56	6457
12	-1.20	0.00	74.29	24.83	191.55	43.10	43.10	6802
13	-1.60	0.00	81.53	27.89	208.72	46.30	46.30	7146
14	-2.00	0.00	88.80	30.95	225.95	49.29	49.29	7492
15	-2.40	0.00	96.10	34.03	243.27	52.18	52.18	7838
16	-2.80	0.00	103.45	37.13	260.71	55.04	55.04	8184
17	-3.20	0.00	110.86	40.26	278.27	57.95	57.95	8529
18	-3.60	0.00	118.33	43.41	295.98	60.93	60.93	8875
19	-4.00	0.00	125.85	46.58	313.81	63.99	63.99	9221
20	-4.40	0.00	133.42	49.77	331.77	67.14	67.14	9567
21	-4.80	0.00	141.04	52.99	349.83	70.35	70.35	9913
22	-5.20	0.00	148.70	56.22	367.99	73.59	73.59	10258
23	-5.58	0.00	155.91	59.26	385.09	76.64	76.64	10582
24	-5.95	0.00	163.15	62.31	402.27	79.66	79.66	10907

Node no.	Y coord	RIGHT side						
			Effective stresses				Total	Coeff. of
		Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure	subgrade reaction
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	2.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	-0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	-0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	-0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	15.40	14.90	14.90	6457
12	-1.20	0.00	7.97	0.00	34.30	17.23	17.23	6802
13	-1.60	0.00	15.95	0.23	53.23	22.93	22.93	7146
14	-2.00	0.00	23.98	3.62	72.26	29.79	29.79	7492
15	-2.40	0.00	32.04	7.02	91.36	36.54	36.54	7838
16	-2.80	0.00	40.12	10.43	110.54	43.11	43.11	8184
17	-3.20	0.00	48.25	13.85	129.81	49.51	49.51	8529
18	-3.60	0.00	56.42	17.30	149.19	55.71	55.71	8875
19	-4.00	0.00	64.64	20.77	168.68	61.74	61.74	9221
20	-4.40	0.00	72.91	24.25	188.29	67.62	67.62	9567
21	-4.80	0.00	81.23	27.76	208.02	73.39	73.39	9913
22	-5.20	0.00	89.60	31.29	227.87	79.06	79.06	10258

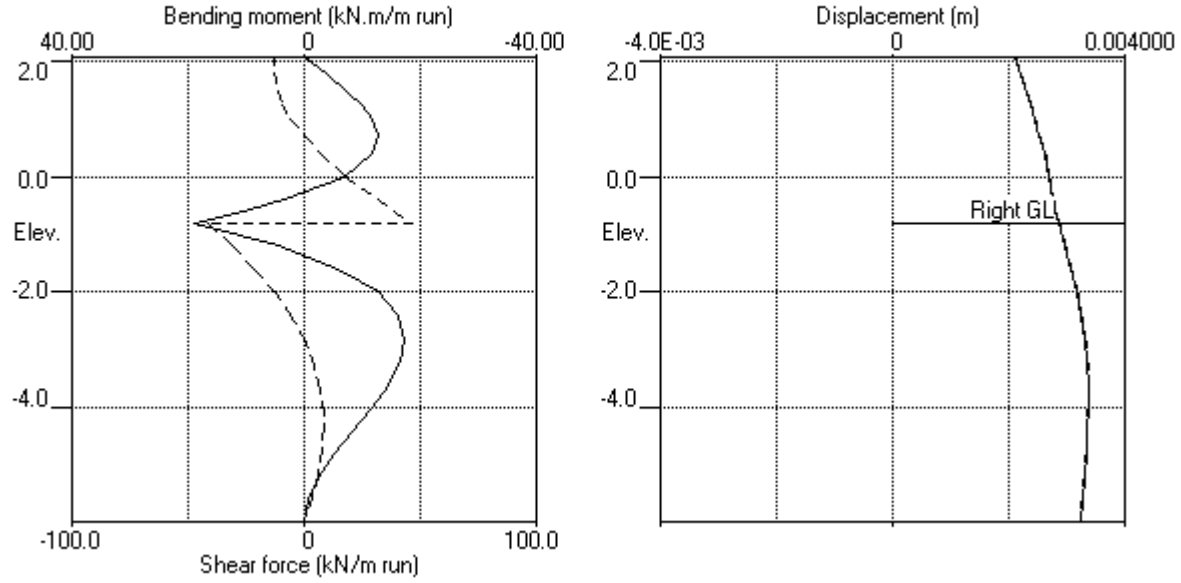
(continued)

Stage No.6 Change properties of soil type 2 to soil type 1
Ko pressures will be reset

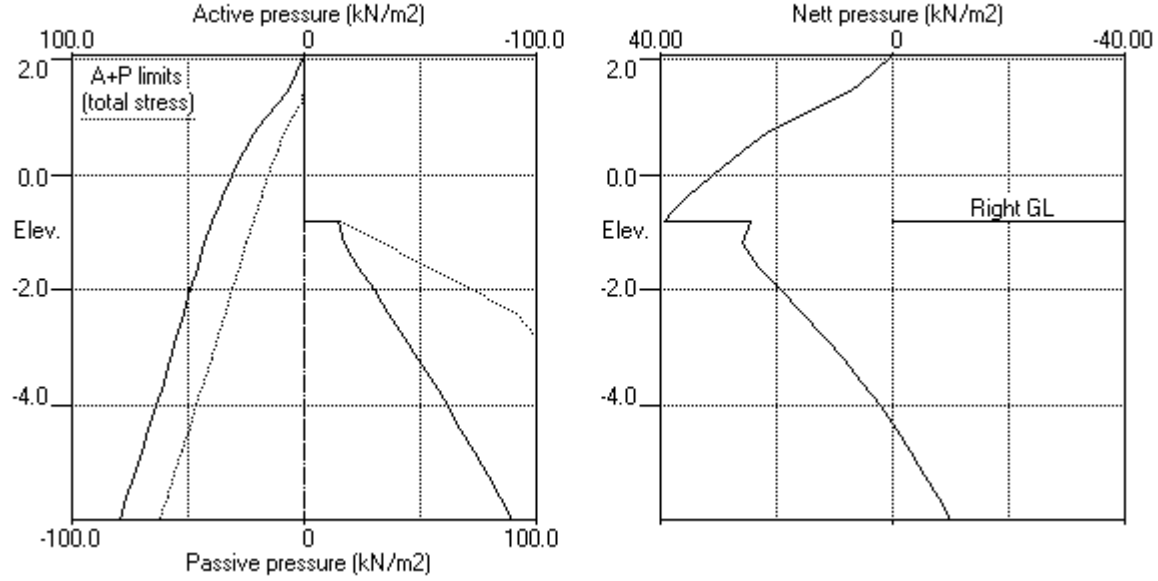
Node no.	Y coord	RIGHT side						
			Effective stresses				Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Active limit	Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
23	-5.58	0.00	97.49	34.62	246.58	84.33	84.33	10582
24	-5.95	0.00	105.43	37.97	265.38	89.57	89.57	10907

Units: kN,m

Stage No.6 Change soil type 2 to soil type 1



Stage No.6 Change soil type 2 to soil type 1



Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: Serviceability Limit State
All loads and soil strengths are unfactored

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act.	Pass.	Strut Elev.	FoS for toe elev. = -5.95 Factor of Safety	Moment equilib. at elev.	Toe elev. for FoS = 1.000 Toe elev.	Wall Penetr -ation	Direction of failure
1	2.05	2.05	Cant.	Conditions not suitable for FoS calc.				
2	2.05	1.00	Cant.	7.061	-5.37	0.84	0.16	L to R
3	2.05	1.00		No analysis at this stage				
4	2.05	-0.80	2.05	4.455	n/a	-0.94	0.13	L to R
5	2.05	-0.80		No analysis at this stage				
6	2.05	-0.80		More than one strut. No FoS calc.				

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 8.00m
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: Left side 20.00 from wall
Right side 20.00 from wall

Limit State: Serviceability Limit State

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment Calculated		Bending moment Factored		Shear force Calculated		Shear force Factored	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
		m	m	kN.m/m		kN.m/m		kN/m	kN/m	kN/m	kN/m
1	2.05	0.002	0.000	0	-0	0	-0	0	-15	0	-20
2	1.75	0.002	0.000	0	-4	0	-6	0	-14	0	-20
3	1.45	0.002	0.000	0	-9	0	-12	1	-14	1	-19
4	1.23	0.002	0.000	1	-12	1	-16	2	-13	2	-18
5	1.00	0.002	0.000	1	-14	1	-19	3	-12	4	-16
6	0.70	0.003	0.000	2	-18	2	-24	1	-10	2	-14
7	0.40	0.003	0.000	2	-20	3	-27	7	-8	9	-11
8	0.00	0.003	0.000	2	-23	3	-31	18	-4	24	-6
9	-0.40	0.003	0.000	3	-23	5	-31	31	0	42	0
10	-0.60	0.003	0.000	10	-23	14	-31	39	0	52	0
11	-0.80	0.003	0.000	19	-22	26	-30	47	-41	63	-56
12	-1.20	0.003	0.000	5	-19	6	-26	7	-31	9	-42
13	-1.60	0.003	0.000	3	-16	4	-22	8	-22	11	-29
14	-2.00	0.003	0.000	3	-13	4	-18	8	-13	11	-18
15	-2.40	0.003	0.000	3	-16	4	-22	8	-6	10	-8
16	-2.80	0.003	0.000	3	-17	4	-23	7	-0	9	-1
17	-3.20	0.003	0.000	3	-17	4	-22	6	-1	7	-1
18	-3.60	0.003	0.000	2	-15	3	-20	6	-1	9	-1
19	-4.00	0.003	0.000	2	-12	3	-16	8	-1	11	-2
20	-4.40	0.003	0.000	1	-8	2	-11	8	-1	11	-2
21	-4.80	0.003	0.000	1	-5	1	-7	7	-1	10	-2
22	-5.20	0.003	0.000	0	-2	1	-3	6	-1	8	-1
23	-5.58	0.003	0.000	0	-1	0	-1	3	-1	4	-1
24	-5.95	0.003	0.000	0	-0	0	-0	0	0	0	0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment Calculated max.	elev.	min.	elev.	Bending moment Factored max.	min.	Shear force Calculated max.	elev.	min.	elev.	Shear force Factored max.	min.
	kN.m/m		kN.m/m		kN.m/m		kN/m		kN/m		kN/m	kN/m
1	0	-4.40	-5	-0.40	0	-6	2	-2.00	-4	1.00	3	-5
2	3	-2.00	-0	2.05	4	-0	3	1.00	-1	-4.40	4	-2
3	No calculation at this stage											
4	0	-5.20	-23	-0.40	0	-31	8	-2.00	-15	2.05	11	-20
5	No calculation at this stage											
6	19	-0.80	-17	-2.80	26	-23	47	-0.80	-41	-0.80	63	-56

Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	Displacement maximum m	elev.	minimum m	elev.	Stage description
1	0.000	0.00	0.000	2.05	Apply surcharge no.1 at elev. 1.45
2	0.002	2.05	0.000	2.05	Excav. to elev. 1.00 on RIGHT side
3	No calculation at this stage				Install strut no.2 at elev. 2.05
4	0.003	-0.80	0.000	2.05	Excav. to elev. -0.80 on RIGHT side
5	No calculation at this stage				Install strut no.1 at elev. -0.80
6	0.003	-4.00	0.000	2.05	Change soil type 2 to soil type 1

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1 at elev.-0.80 --Calculated-- kN per m run	kN per strut	Factored kN per strut	Strut no. 2 at elev. 2.05 --Calculated-- kN per m run	kN per strut	Factored kN per strut
4	---	---	---	15	147	199
6	88	88	119	14	136	183

Units: kN,m

Bending moment, shear force, displacement envelopes