

Bedford Passage Development

Secant Pile Design Report



Report reference: T19116-DES-01 C02

4P reference: 54X003-KLB-XX-XX-RP-X-1001



PROJECT DETAILS

Designer Organisation: Keltbray Piling
Client: Morgan Sindall

DOCUMENT

Title: Bedford Passage Development
Reference: T19116-DES-01

DOCUMENT ISSUE

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C02	19/05/20	First Issue	Pile Designs	Pile Designs	DR
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C02	12/06/20	Basement level reduced	Pile Designs	Pile Designs	DR
		Response to Engineers comments	DS	JH	

This design is in accordance with the principles set out in current Standards, Codes of Practice and Industry Specifications. Reference to a Standard, Code of Practice or Specification does not imply total compliance within the whole document. Standards, Codes of Practice and Specifications are complied with where, in the experience of Keltbray, they are appropriate. In the event of a conflict between Specifications, Standards and Codes of Practice, Keltbray will generally design in accordance with the ICE Specification for Piling and Embedded Retaining Walls (SPERW) 2016.



SECANT PILED RETAINING WALL DESIGN
FOR TEMPORARY AND PERMANENT CONDITIONS
AT
MIDDLESEX HOSPITAL ANNEXE
44 CLEVELAND STREET
FITZROVIA
LONDON, W1

Revision	C2	Design Calculations for Comment / Approval	12 th June 2020
Stage	Revision	Comments	Date

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1.0 INTRODUCTION

As part of the redevelopment of a site at Middlesex Hospital Annexe, 44 Cleveland Street, Fitzrovia, London W1, it is proposed to demolish or refurbish some of the buildings on the site and construct new multi-storey mixed use buildings, including a single level basement beneath.

The site can be located by Latitude 51.520622, Longitude -0.137919 and lies off the East side of Cleveland Street, which provides the site access. The piling area for these works is restricted to the Southern area of the site. The Western boundary of the piling area adjoins South House, while the Southern boundary adjoins Middlesex House. The Eastern boundary adjoins 13 Tottenham Mews and Astor College, while the remainder of the site lies to the North (see aerial view below).



To allow construction of the proposed basement secant piled walls are proposed along the Southern and Eastern sides of the basement.

The plan positions of the new basement and the proposed retaining walls are shown on the site plan, given on Figure 1 – see page 4. This also shows the sections taken for the design.

These calculations cover the design of the temporary / permanent piled retaining walls only.

The calculations have been carried out by Piledesigns Limited on behalf of Keltbray Piling.

This revision covers a reduced Basement structural slab level of 22.215mAD.

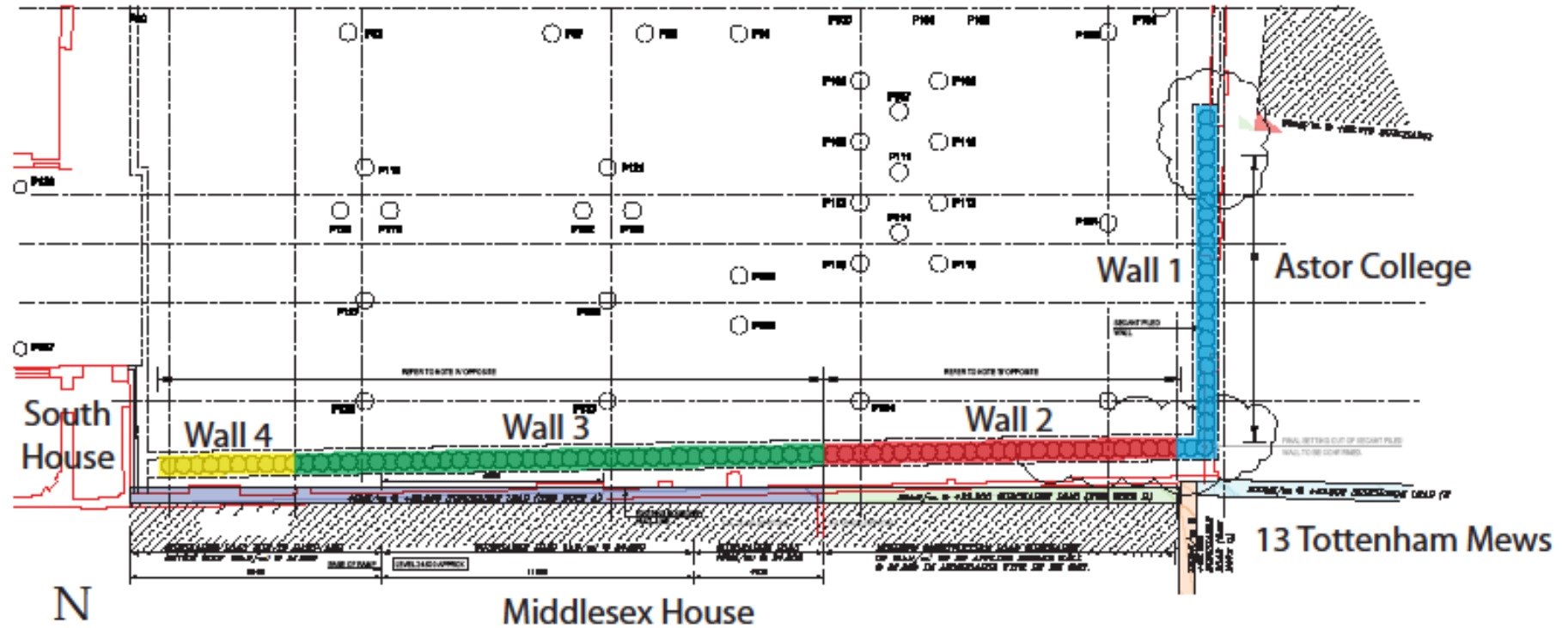


Figure 1 - Site Plan

2.0 INFORMATION PROVIDED

2.1 General and Structural Arrangements for the Proposed Development

Details of the proposed retaining walls have been taken from the relevant drawings provided, which are from Aecom, Consultant Engineers for the project under their project no: 60516144. Further clarification has been provided following email and verbal communication with the Piling Contractor.

The main retaining wall drawings can be summarised as follows:

MHA-ACM-BW.2-XX-DR-S-1001 revision C4: Proposed Secant Pile Wall – Layout to Boundary Walls

MHA-ACM-XX-P1-DR-S-1001 revision C3: Proposed Secant Pile Wall – Layout to Boundary Walls Loading Plan

MHA-ACM-BW.2-XX-DE-S-1002 revision C2: South Boundary Wall with Middlesex House – Section 2 - 2

MHA-ACM-BW.2-XX-DE-S-1006 revision C2: East Boundary Wall to Astor College – Section 6 – 6

An additional drawing from Llewelyn Davies, Architects for the project, has been provided to confirm the revised Basement structural slab level; Drawing No: BPD-LDW-NB-B1-DR-A-200002 revision P1 – Floor Slab Setting Out – Level B1

Four wall sections have been identified for this analysis, labelled Walls 1 to 4. The sections have been indicated on Figure 1, and has been chosen to represent the general soil and structural criteria for the site.

The piling platform level has been given as 26.75mAD, but Walls 3 and 4 have been modelled from 24.6mAD to reflect the lower ground level on the active side.

Wall 1 covers the Eastern side of the basement adjoining Astor College and 13 Tottenham Mews, for which the Basement structural slab level is given as 22.215mAD. With a 900mm deep adjacent ground beam, 225mm of Cellcore and 50mm of blinding concrete the SLS dig level has been taken as 21.04mAD. A further allowance of 480mm for possible (unplanned) over-dig has been taken for the ULS case. A general surcharge of 10kN/m² has been taken behind the wall for the temporary and permanent conditions.

Wall 2 covers the Southern side of the basement adjoining Middlesex House between Grid H and just beyond Grid E, for which the Basement structural slab level is also given as 22.215mAD. With a similar makeup as Wall 1 the SLS dig level has also been taken as 21.04mAD. A further allowance of 480mm for possible (unplanned) over-dig has been taken for the ULS case. A general surcharge of 10kN/m² has been taken behind the wall for the temporary and permanent conditions, along with a further surcharge for the adjoining foundations of 24kN/m² at a distance of 400mm from the retaining wall (i.e. 100mm clearance from the edge of the piles), at a level of 23.25mAD and over a width of 1.25m.

Wall 3 covers the Southern side of the basement adjoining Middlesex House from Wall 2 to Grid B, for which the Basement structural slab level is also given as 22.215mAD. With a similar makeup as Wall 1 the SLS dig level has also been taken as 21.04mAD. A further allowance of 360mm for possible (unplanned) over-dig has been taken for the ULS case. A general surcharge of 18kN/m² has been taken behind the wall for the temporary and permanent conditions, along with a further surcharge for the adjoining foundations of 48kN/m² at a distance of 400mm from the retaining wall (i.e. 100mm clearance from the edge of the piles), at a level of 23.25mAD and over a width of 0.95m.

Wall 4 covers the Southern side of the basement adjoining Middlesex House between Grid A and B, for which the Basement structural slab level is also given as 22.215mAD. With a similar makeup as Wall 1 the SLS dig level has also been taken as 21.04mAD. A further allowance of 360mm for possible (unplanned) over-dig has been taken for the ULS case. A general surcharge of 15kN/m² has been taken behind the wall for the temporary and permanent conditions, along with a further surcharge for the adjoining foundations of 57kN/m² at a distance of 400mm from the retaining wall (i.e. 100mm clearance from the edge of the piles), at a level of 23.25mAD and over a width of 0.8m.

Although the adjacent ground beams are mostly at a distance from the retaining wall it has been decided to include these as the general excavation level for the basement.

The surcharges assumed above have been interpreted from drawings MHA-ACM-BW.2-XX-DR-S-1001 and MHA-ACM-XX-P1-DR-S-1001. These drawings note that further investigation into the exact position of the adjacent foundations is still to be carried out and the outcome of these investigations could impact on the retaining wall design. Also note that where more than one surcharge is given for a particular wall section the worst case surcharge has been taken.

2.2 Ground Conditions

Ground conditions have been taken from Ground Investigation Reports carried out by Aecom; report reference: 60516144/MHA-ACM-00-REP-G-0001 revision 01, dated 12th October 2018 and 60516144/MHA-ACM-XX-XX-RP-GE-01 revision P01, dated 15th April 2020. The investigations contain the records of three Cable Percussive boreholes relevant to the piling area and taken to a maximum depth of 35.0m (Boreholes BH02 and BH03 from the 2018 report and BH04 from the 2020 report).

The boreholes showed the ground conditions to comprise Made Ground over Lynch Hill Gravel over London Clay over Lambeth Group.

The Made Ground generally comprised gravelly sandy clay, gravelly sand and clayey sandy gravel all with flint, brick and concrete fragments, while the Lynch Hill Gravel (LHG) was described as loose to very dense gravelly sand and medium dense very sandy gravel. The London Clay was noted as stiff to very stiff, brown, sandy silty clay with pockets of silt, partings of sand and claystone bands.

A summary of the borehole results is presented in Table 1.

Table 1: Borehole Results

Borehole No	Location	Ground Level (mAD)	Level of LHG / London Clay (mAD)	Ground water levels in boreholes / monitoring (mAD)
BH02	SW corner	27.61	26.1 / 18.5	-0.39 / 21.44
BH03	South side	26.84	22.5 / 18.1	- / 21.34
BH04	SE corner	26.75	21.2 / 18.4	14.65 / 20.72

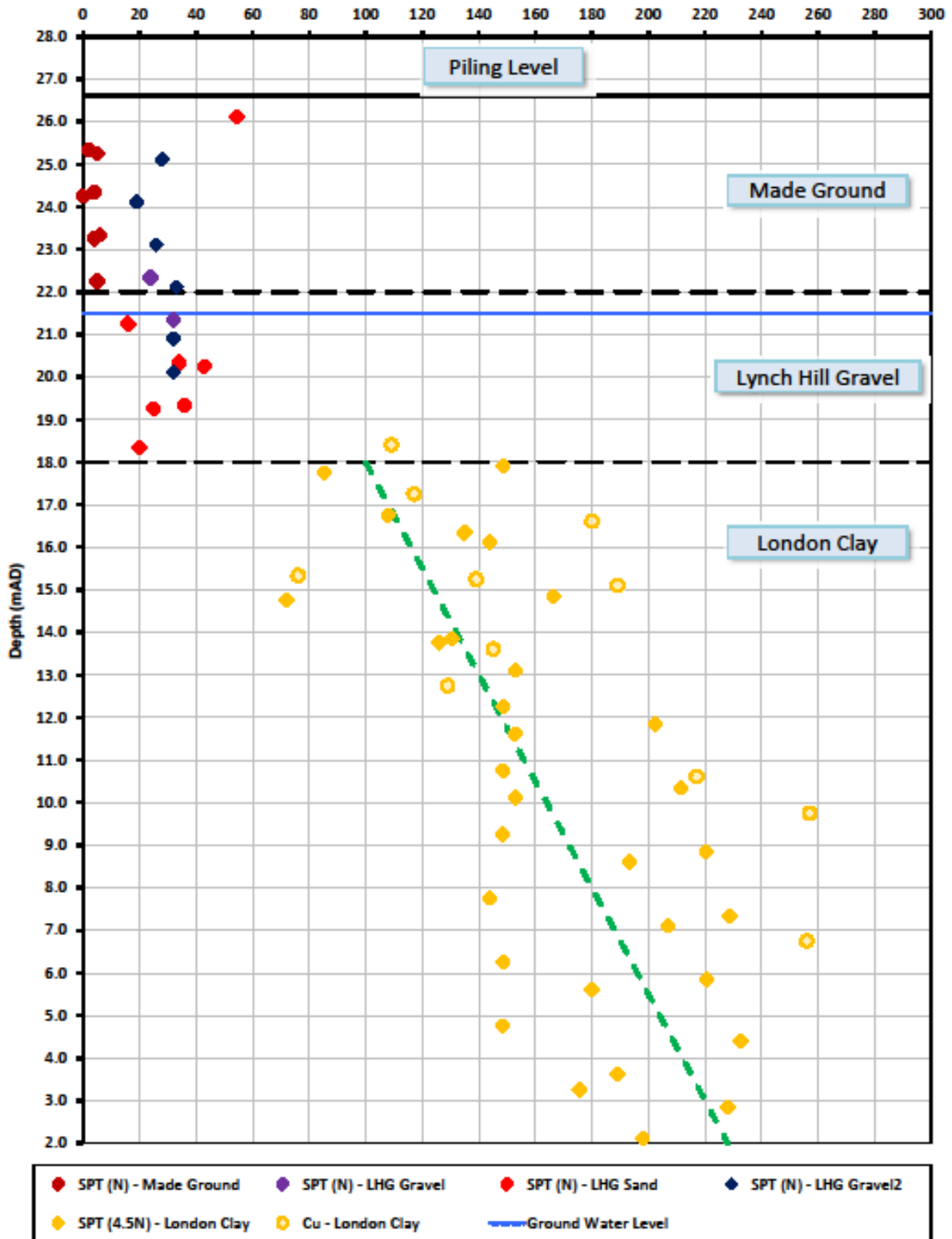
A plot of SPT 'N' values and undrained shear test results is presented in Figure 2 – see page 7.

For the purpose of the retaining wall design the Made Ground has been taken to a level of 22.0mAD, the Lynch Hill Gravel to a level of 18.0AD, with the London Clay taken to depth.

Groundwater was recorded in the boreholes and during groundwater monitoring at a highest level of 21.44mAD.

The assumed soil profile and design parameters should be checked during initial piling operations and any variations notified to the designer.

All against level for all boreholes



3.0 DESIGN PARAMETERS

3.1 Geotechnical

The pile design calculations have been based on the information provided. The soil parameters employed have generally been taken from the soils information provided and checked against published data and other ground investigation reports in the area. The analysis has considered drained conditions for the Made Ground and Lynch Hill Gravel strata and undrained conditions for the London Clay when applied to the temporary condition. For the permanent condition all strata have been changed to drained.

The sections shown on Figures 3 and 4 on sheets 11 and 12 show the typical soil profile used in the analysis and the soil parameters for the drained and undrained conditions.

Groundwater for the temporary condition has been taken at a level of 21.5mAD. For the permanent condition groundwater has been taken at the underside of the Basement slab on the passive side and at about 1.0m below ground level on the active side.

3.2 Construction / Design Sequence

Walls 1, 2 & 4

- Carry out piling from the assumed piling platform level (26.75mAD)
- Excavate to a level of 25.25mAD (after adequate curing of the piles)
- Install temporary propping (to be designed by others) at a level of 25.75mAD
- Excavate to Basement slab formation level (21.04mAD)
- Construct Basement RC slab (22.06mAD)
- Construct Ground Floor RC slab (26.1mAD)
- After adequate curing of the Basement and Ground Floor RC slabs remove temporary propping at 25.75mAD
- Apply long term parameters to piles and soils
- Apply long term high water check

Wall 3

- Carry out piling from the assumed piling platform level (26.75mAD)
- Excavate to Basement slab formation level (21.04mAD)
- Construct Basement RC slab (22.06mAD)
- Construct Ground Floor RC slab (26.1mAD)
- Apply long term parameters to piles and soils
- Apply long term high water check

3.3 Structural Design Parameters

The male secant retaining wall piles will be constructed using Auger Bored piling techniques with a minimum C30/37 designed concrete pump mix and 'B' (500N/mm²) grade main reinforcement bars with helical shear links. A minimum of 75mm cover to the main reinforcement will be provided by propriety spacers.

The main structural design parameters used in the retaining wall analysis have been summarized in Table 2, for 600mm diameter piles at approximately 900mm centres.

Table 2 – Main Structural Design Parameters

Material	Short Term Parameters	Long Term Parameters
Concrete 600mm diameter @ 900mm centres	$E = 1.96 \times 10^{+7} \text{ kN/m}^2$ $I = 7.06 \times 10^{-3} \text{ m}^4/\text{m run}$ $E.I = 138544 \text{ kN.m}^2 / \text{m run}$	$E = 1.40 \times 10^{+7} \text{ kN/m}^2$ $I = 7.06 \times 10^{-3} \text{ m}^4/\text{m run}$ $E.I = 98960 \text{ kN.m}^2 / \text{m run}$
Steel	$E = 2.05 \times 10^{+8} \text{ kN/m}^2$	$E = 2.05 \times 10^{+8} \text{ kN/m}^2$

Notes:

Short term EI = 70% of the initial value.

Long term EI = 50% of the initial value.

The female piles will be unreinforced and constructed using low strength concrete (typically P280 or C8/10).

The female piles will be installed to 1m below basement formation level (20mOD).

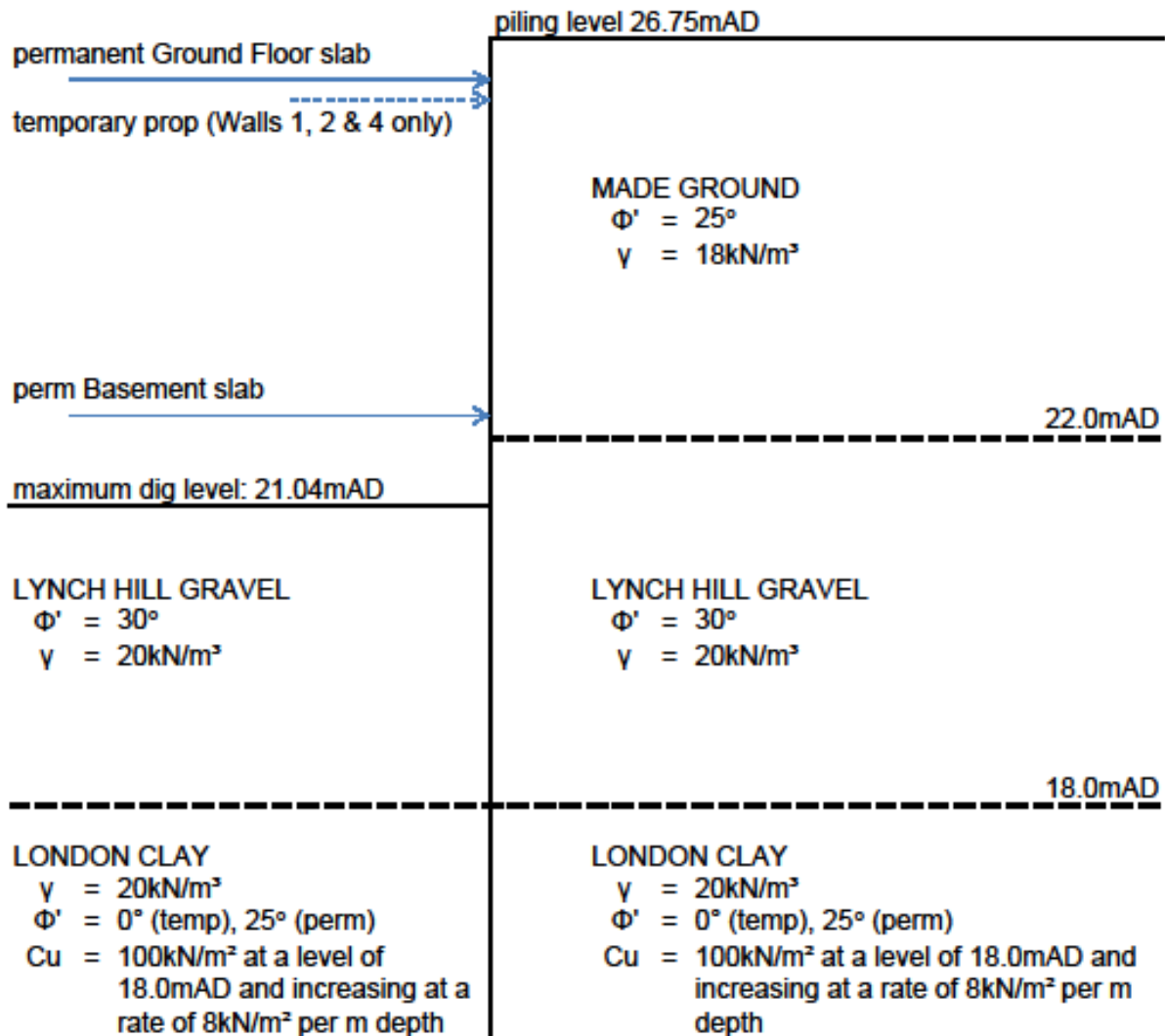
A correctly installed Hard / Firm Secant wall may provide an acceptable level of water retention if a low grade of substructure / basement water retention is required (not greater than Grade 1 in BS 8102:2009). For higher grades of water retention, structural facings walls and / or drained cavities should also be provided.

TYPICAL SECTION FOR SLS CONDITIONS - Figure 3

General surcharge of 10-18kN/m² allowed along with adjacent foundation surcharges

PASSIVE

ACTIVE



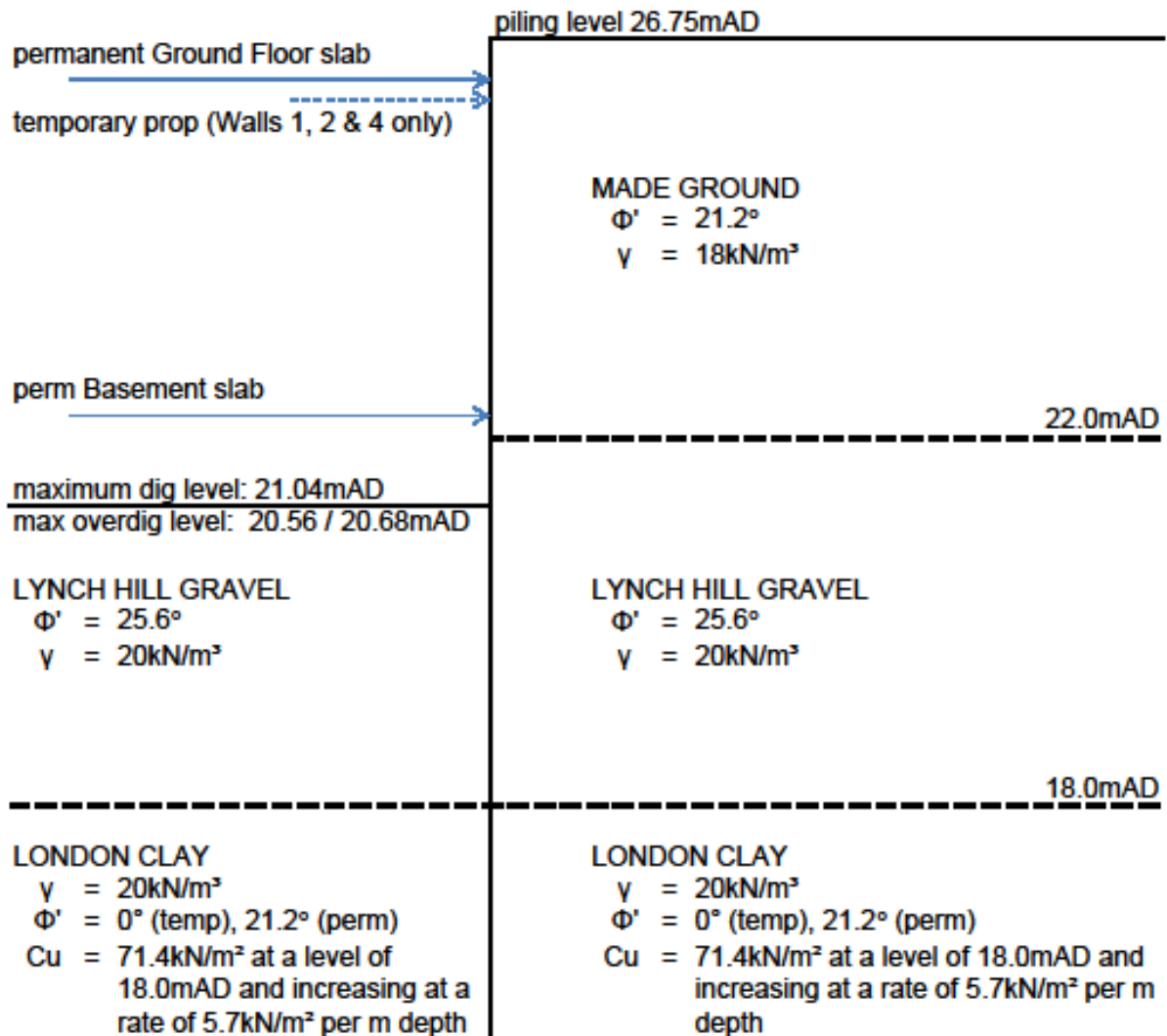
A typical initial water level of 21.5mAD has been taken on the passive and active sides for the temporary condition. For the permanent condition groundwater has been taken at 1.0m below ground level on the active side and to the underside of the basement slab on the passive side.

TYPICAL SECTION FOR ULS CONDITIONS - Figure 4

General surcharge of 10-18kN/m² allowed along with adjacent foundation surcharges

PASSIVE

ACTIVE



A typical initial water level of 21.5mAD has been taken on the passive and active sides for the temporary condition. For the permanent condition groundwater has been taken at 1.0m below ground level on the active side and to the underside of the basement slab on the passive side.

3.4 Retaining Wall and Propping Geometry

Walls 1, 2 and 4 will act as propped cantilevers in the temporary condition utilising temporary props (to be designed by others) and be propped by the Basement and Ground Floor slabs in the permanent condition.

Wall 3 will act as an unpropped cantilever in the temporary condition and be propped by the Basement and Ground Floor slabs in the permanent condition.

Table 3 presents the structural and geometrical properties of the propping that has been used in the design of the retaining wall.

Table 3: Assumed details of horizontal propping

Wall no / Prop no (Perm/Temp)	Prop Elevation (mAD)	Prop Spacing (m)	Prop Sectional area (m ²)	Prop Young's modulus (kN/m ²)	Prop free length (m)
1, 2 & 4 / 1 (Temp)	25.75	5.0	0.015	2.05 x 10 ⁺⁸	5.00
1, 2 & 4 / 2 (Perm) Basement slab	22.06	1.0	0.300	1.4 x 10 ⁺⁷	5.00
1, 2 & 4 / 3 (Perm) – Ground Floor slab	26.10	1.0	0.300	1.4 x 10 ⁺⁷	5.00
3 / 1 (Perm) Basement slab	22.06	1.0	0.300	1.4 x 10 ⁺⁷	5.00
3 / 2 (Perm) – Ground Floor slab	26.10	1.0	0.300	1.4 x 10 ⁺⁷	5.00

Prop levels taken as the approximate midpoint of the structural slabs.

Should the construction sequence or propping system be changed from that assumed then the retaining wall design will require to be reassessed which could result in changes to the pile length and / or reinforcement.

4.0 DESIGN METHODOLOGY

4.1 Geotechnical Analysis for Secant Bored Pile Retaining Wall

The retaining wall analysis has been carried out using the computer program 'WALLAP' Version 6.06 developed by Geosolve.

The design has been carried out using the 'Strength Factor' approach with partial factors in accordance with BS EN 1997-1: 2004 Eurocode 7 and to the approach as prescribed in the UK National Annex of BS EN 1997-1. Using this approach three runs for each section may be carried out and these are typically referenced as:-

SLS	service limit state
ULS-comb 1	ultimate limit state – structural (STR)
ULS-comb 2	ultimate limit state – geotechnical (GEO)

With respect to the above the wall design is checked in its ultimate state by applying partial factors and carrying out two separate checks (combinations), as shown in Table 4 which have been taken from Tables NA.A1. (B) and (C) of the UK National Annex to BA EN 1990+A1; 2005 for the actions and Table A. NA.4 of the National annex to BS EN 1997-1: 2004 for the soil parameters.

Both represent ultimate conditions with combination 1 the structural ultimate case (ULS-STR), and combination 2 the geotechnical ultimate case (ULS-GEO). Combination 1 applies partial factors to actions (A) - (temporary/permanent actions, G_k , and variable actions, Q_k) while soil parameters (M1) and pile resistances (R1) are kept un-factored ($R1$ & $M1 = 1.0$). Combination 2 applies partial factors to the soil parameters (M2) and partial factors of smaller magnitude to the variable actions (A). For both these cases the design is mainly to verify that the proposed embedment length i.e. reinforced pile length / toe level, provides a nominal factor of safety against failure. Bending and shear forces are unfactored in any subsequent structural calculations for ULS-comb 2, but factored by 1.35 for ULS-comb 1. An allowance for overdig within both ultimate cases is included and taken as up to a maximum of 10% of the retained height (or 0.5m whichever is the lesser).

Table 4 Partial factors adopted for design (Retaining Wall Earth Pressures).

	Notation	Partial Factor		
		SLS	DA1 Comb. 1	DA1 Comb. 2
ACTIONS: (A)				
Permanent Action (Unfavourable)	G_k	1.0	1.35 (A1)	1.0 (A2)
Variable Action (Unfavourable)	Q_k	1.0	1.50 (A1)	1.3 (A2)
SOIL FACTORS: (M)				
Effective angle of shearing resistance	$\tan \phi'$	1.0	1.0 (M1)	1.25 (M2)
Effective cohesion	C'	1.0	1.0 (M1)	1.25 (M2)
Undrained shear strength	C_u	1.0	1.0 (M1)	1.40 (M2)
RESISTANCES: (R)				
Earth resistance	γ_{Re}	1.0	1.0 (R1)	1.0 (R1)

Notes – factors given above apply to Actions which refer to unfavourable conditions

- Combination 1 (ULS-STR): A1 + M1 + R1.
- Combination 2 (ULS-GEO): A2 + M2 + R1.

A further analysis is included which represents SLS conditions and usually carried out to determine wall deflections. The analysis assumes moderately conservative soil parameters, with a partial factor (M2) taken as 1.0 and no allowance for overdig. This calculation also provides bending moments and shear forces which are factored up by 1.35 in any subsequent structural calculations. The results from this analysis are provided per metre run and therefore amended to the particular pile diameter and spacing.

The input and output data from the WALLAP analyses are presented in Appendix B. The Ultimate Limit State (ULS) conditions employ factored soil parameters as required for the (ULS-GEO), DA1 Combination 2 conditions.

Calculated wall displacements and corresponding program outputs may be considered to be an upper bound estimate of long-term movements, due to the following factors:

- Geotechnical parameters, pile stiffness and surcharges are considered to be reasonably conservative values. A more accurate assessment of wall displacements would require the input of 'actual' parameters to be obtained from more sophisticated laboratory testing.
- The computer program does not consider the beneficial effects of structural elements such as a capping beam.

- (c) The computer program is a two-dimensional analysis program and does not consider the beneficial effects of geometrical features such as internal or external wall corners which increase its overall stiffness.
- (d) The computer program uses a Winkler spring analysis to determine the wall displacements, in which springs are used to represent a continuum and there is no transfer of shear stresses between springs. In general, the application of this concept leads to an overestimation of structural deformations; hence the resulting displacements may be over-predicted.

The results of the WALLAP analysis are given in Appendix B. These are summarised in Tables 5, 6 and 7 and given below. Table 5 provides the results of the stability analysis from WALLAP and calculated deflections. It includes varying sets of bending moments and shear forces. Reinforcement calculations are based on the worst case bending moments and shear values determined from the un-factored ULS-comb 2 and factored SLS and ULS-comb 1 results. Table 6 details the temporary and permanent prop forces and Table 7 shows the details of the sections with the proposed pile length.

Actual deflections are expected to be in the region of 50 to 70% of the calculated figures. Additional ground movements may be generated due to pile installation and reference should be made to CIRIA C760. Horizontal movement and settlement will vary with distance from the piles. A maximum horizontal movement of 8mm is indicated using CIRIA C760 guidance.

4.2 Individual Pile Section Structural Analysis

Reinforcement requirements have been analysed for the shear forces and bending moments indicated within the WALLAP outputs (Appendix B) and summarized in the wall schedule, (Table 7). Using the Oasys ADC software, all bending moments and shear force calculations have been carried out in accordance with the requirements of BS EN 1992, Eurocode No. 2 'Design of Concrete Structures'.

The results of the ADC analyses are given in Appendix C. For all cases the concrete grade has been taken as a minimum C30/37 and a worst case axial load of 0kN compression.

TABLE 5 - Results of Retaining Wall Analysis (Wall 1)

Sections Ref	Case	Pile diameter	Pile spacing (approx)	Calculated deflection	Estimated deflection	Bending Moments			Shear		Ultimate Design Values per pile at spacing given		
						Maximum	Factor	Ultimate	Maximum	Factor	Ultimate	Moment	Shear
						kN.m/m		kN.m/m	kN/m		kN/m	kN.m	kN
Temp / Perm	mm	mm	mm	mm									
SLS	T/P	600	900	11	7	132.0	1.35	178.2	67.0	1.35	90.5	160.4	81.4
ULS1	T/P	600	900			180.0	1.35	243.0	81.0	1.35	109.4	218.7	98.4
ULS2	T/P	600	900			254.9	1.00	254.9	108.3	1.00	108.3	229.4	97.5
										Max	600	229.4	98.4

TABLE 5 - Results of Retaining Wall Analysis (Wall 2)

Sections Ref	Case	Pile diameter	Pile spacing (approx)	Calculated deflection	Estimated deflection	Bending Moments			Shear		Ultimate Design Values per pile at spacing given		
						Maximum	Factor	Ultimate	Maximum	Factor	Ultimate	Moment	Shear
						kN.m/m		kN.m/m	kN/m		kN/m	kN.m	kN
Temp / Perm	mm	mm	mm	mm									
SLS	T/P	600	900	9	5	134.0	1.35	180.9	61.0	1.35	82.4	162.8	74.1
ULS1	T/P	600	900			179.0	1.35	241.7	73.0	1.35	98.6	217.5	88.7
ULS2	T/P	600	900			244.3	1.00	244.3	93.5	1.00	93.5	219.9	84.2
										Max	600	219.9	88.7

TABLE 5 - Results of Retaining Wall Analysis (Wall 3)

Sections Ref	Case	Pile diameter	Pile spacing (approx)	Calculated deflection	Estimated deflection	Bending Moments			Shear		Ultimate Design Values per pile at spacing given		
						Maximum	Factor	Ultimate	Maximum	Factor	Ultimate	Moment	Shear
						kN.m/m		kN.m/m	kN/m		kN/m	kN.m	kN
Temp / Perm	mm	mm	mm	mm									
SLS	T/P	600	900	40	24	159.0	1.35	214.7	60.0	1.35	81.0	193.2	72.9
ULS1	T/P	600	900			276.0	1.35	372.6	95.0	1.35	128.3	335.3	115.4
ULS2	T/P	600	900			390.8	1.00	390.8	168.8	1.00	168.8	351.7	151.9
										Max	600	351.7	151.9

TABLE 5 - Results of Retaining Wall Analysis (Wall 4)

Sections Ref	Case	Pile diameter	Pile spacing (approx)	Calculated deflection	Estimated deflection	Bending Moments			Shear		Ultimate Design Values per pile at spacing given		
						Maximum	Factor	Ultimate	Maximum	Factor	Ultimate	Moment	Shear
						kN.m/m		kN.m/m	kN/m		kN/m	kN.m	kN
Temp / Perm	mm	mm	mm	mm									
SLS	T/P	600	900	6	4	89.0	1.35	120.2	35.0	1.35	47.3	108.1	42.5
ULS1	T/P	600	900			112.0	1.35	151.2	43.0	1.35	58.1	136.1	52.2
ULS2	T/P	600	900			161.2	1.00	161.2	57.6	1.00	57.6	145.1	51.8
										Max	600	145.1	52.2

TABLE 6 - Details of Prop Forces

Wall Ref	Strut Ref	Type	Level mAD	SLS Results	ULS Results	
				Prop Force unfactored kN/m run	Prop Force unfactored	ULS1 kN/m run
1	1	Temporary	25.75	74.0	90.0	119.9
	2	Basement Slab	22.06	47.0	55.0	66.8
	3	GF Slab	26.10	71.0	80.0	105.7
2	1	Temporary	25.75	64.0	76.0	97.2
	2	Basement Slab	22.06	32.0	39.0	49.1
	3	GF Slab	26.10	58.0	67.0	85.7
3	1	Basement Slab	22.06	7.0	11.0	24.4
	2	GF Slab	26.10	6.0	5.0	2.2
4	1	Temporary	25.75	30.0	36.0	50.2
	2	Basement Slab	22.06	17.0	21.0	28.9
	3	GF Slab	26.10	27.0	32.0	44.1

TABLE 7 - Details of Retaining Wall Piles

Wall Section	Pile diameter mm	Pile spacing mm	Assumed Piling Level mAD	RW Pile Length m	RW Pile Toe Level mAD	No	Reinforcement				
							Main Bars size mm	*	length m	*	Helical size @ spacing mm @ mm
1	600	900	26.750	9.5	17.250	6	B25	*	9.5	*	B8 @ 250
2	600	900	26.750	9.5	17.250	6	B25	*	9.5	*	B8 @ 250
3	600	900	26.750	12.5	14.250	6	B32	*	12.5	*	B10 @ 250
4	600	900	26.750	9.5	17.250	6	B20	*	9.5	*	B8 @ 250

5.0 SUMMARY OF RESULTS AND GENERAL COMMENTS

Summary results of the various wall analyses are presented in Table 5. Temporary and permanent prop forces are presented in Table 6. The pile summary schedule indicating pile lengths and reinforcement is presented in Table 7.


The CDM Risk Register is presented in Appendix A.

The detailed retaining wall analysis comprising the computer print outs are presented in Appendix B.

Reinforcement calculations comprising the computer printouts from the ADC design software and the Helical check are presented in Appendix C.

APPENDIX A

CDM Risk Register

			CDM Risk Register
Project: Fitzrovia – Middlesex Hospital Annexe			Date: 12 th June 2020
Design By: DBS	Job No:	Design Ref: 23198	Rev: C2

STATEMENT ON CDM REGULATIONS (2015) AND RESIDUAL RISKS

CDM Regulations (2015)

The Client and Designer for this project are subject to certain duties under the CDM (2015) Regulations. It is the duty of the Designer to ensure that the client is aware of these duties prior to commencing the design. Piledesigns Ltd are responsible for an 'elemental' part of the design only and are not the 'overall' scheme designer. This 'elemental' design has been undertaken on the premise that this duty has been carried out by the scheme designer, and that no separate approach, in respect of this elemental design, by Piledesigns Ltd is required.

Residual Risks – In accordance with the CDM Regulations (2015) any specific residual design risks and construction sequences relevant to this design are given below. As stated in the CDM Regulations (2015), whilst we have assessed the design risks for our works we have only listed the risks we consider significant to the design and which we consider are not likely to be obvious to a competent contractor or other designer. It does not constitute or remove the need for task related risk assessments for the activities carried out in the implementation of the design. Furthermore, it is the responsibility of the client and principal designer to ensure a competent principal contractor is appointed for these works.

The residual risks below should be added to any relevant construction drawing or method statements and copied to relevant designers and contractors on site.

Project: Fitzrovia – Middlesex Hospital Annexe

Date: 12th June 2020

Design By: DBS

Job No:

Design Ref: 23198

Rev: C2

Item No	Risk	Potential Effects	Risk Management / Mitigation
1	Unforeseen ground conditions	Pile performance could be compromised.	Ground conditions encountered during pile construction should be logged and checked against the assumed design profile and any variations from that assumed in the design must be reported immediately to the designer.
2	Obstructions	Unable to achieve proposed design lengths.	Ensure all known existing obstructions are removed prior to piling works.
3	Unable to install reinforcement cages in CFA piles	Pile reinforcement does not achieve the required level.	Reinforcement stated within the design is the minimum required. Reinforcement can be increased in bar diameter and number to increase cage stiffness for pile installation and to ensure adequate rigidity.
4	Construction sequence	Excessive deflection / wall failure	The design construction sequence shown above must be followed to ensure stability.
5	Deflection of pile walls	Movement of adjacent ground and structures	Monitor retaining wall and compare actual wall movements to that calculated throughout the construction process.
6	Piling adjacent to neighbouring structures.	Damage to structures	Ensure all piling activities are agreed with the required third parties and the appropriate sign off have been completed before commencement.

APPENDIX B

Ref No	Description
1-SLS	WALLAP analysis for wall section 1, moments and deflection.
1-ULS1	WALLAP analysis for wall section 1, moments and embedment.
1-ULS2	WALLAP analysis for wall section 1, moments and embedment.
2-SLS	WALLAP analysis for wall section 2, moments and deflection.
2-ULS1	WALLAP analysis for wall section 2, moments and embedment.
2-ULS2	WALLAP analysis for wall section 2, moments and embedment.
3-SLS	WALLAP analysis for wall section 3, moments and deflection.
3-ULS1	WALLAP analysis for wall section 3, moments and embedment.
3-ULS2	WALLAP analysis for wall section 3, moments and embedment.
4-SLS	WALLAP analysis for wall section 4, moments and deflection.
4-ULS1	WALLAP analysis for wall section 4, moments and embedment.
4-ULS2	WALLAP analysis for wall section 4, moments and embedment.

WALLAP

1-SLS

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Left side	Right side
1	26.75	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES

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 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

	Left side	Right side
Initial water table elevation	21.50	21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
2	1	25.75	25.75	0.0	1	21.64	21.64	0.0 MC+WC
					2	21.64	25.75	40.3

WALL PROPERTIES

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 17.25
Maximum finite element length = 0.50 m
Youngs modulus of wall E = 1.9600E+07 kN/m2
Moment of inertia of wall I = 7.0686E-03 m4/m run
E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge Near edge Far edge	----- kN/m ² -----	Equiv. soil type	Partial factor/ Category
1	26.75	0.50(L)	20.00	20.00	10.00	=	N/A	1.00 Var
2	21.64	-0.00(R)	20.00	20.00	41.00	=	N/A	1.00 P/F

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 26.75
2	Excavate to elevation 25.25 on RIGHT side
3	Install strut or anchor no.1 at elevation 25.75
4	Apply water pressure profile no.1 (Mod. Conserv.)
5	Excavate to elevation 21.04 on RIGHT side
6	Fill to elevation 21.64 on RIGHT side with soil type 1
7	Install strut or anchor no.2 at elevation 22.06
8	Install strut or anchor no.3 at elevation 26.10
9	Remove strut or anchor no.1 at elevation 25.75
10	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
11	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
12	Apply surcharge no.2 at elevation 21.64 No analysis at this stage
13	Apply water pressure profile no.2 (Mod. Conserv.)

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 = 1.50

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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m

Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m

Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options		
		Displacement	Active,	Graph.
		Bending mom.	Passive	output
		Shear force	pressures	
1	Apply surcharge no.1 at elev. 26.75	No	No	No
2	Excav. to elev. 25.25 on RIGHT side	Yes	Yes	Yes
3	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
4	Apply water pressure profile no.1	Yes	Yes	Yes
5	Excav. to elev. 21.04 on RIGHT side	Yes	Yes	Yes
6	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
7	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
8	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
9	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
10	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
11	Change soil type 3 to soil type 4	Yes	Yes	Yes
12	Apply surcharge no.2 at elev. 21.64	Yes	Yes	Yes
13	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 26.75

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. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.500	Wall Penetr-ation	Direction of failure
1	26.75 26.75	Cant.					<u>Conditions not suitable for FoS calc.</u>

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.001	7.77E-05	0.0	0.0		138544
2	26.43	-1.70	0.001	7.76E-05	-0.3	0.0		138544
3	26.10	-0.99	0.001	7.78E-05	-0.7	-0.2		138544
4	25.75	-0.34	0.001	7.86E-05	-0.9	-0.5		138544
5	25.25	0.25	0.001	8.12E-05	-1.0	-1.0		138544
6	24.88	0.55	0.001	8.42E-05	-0.8	-1.3		138544
7	24.50	0.78	0.001	8.81E-05	-0.6	-1.6		138544
8	24.00	1.02	0.001	9.41E-05	-0.1	-1.7		138544
9	23.50	1.22	0.001	1.00E-04	0.4	-1.7		138544
10	23.00	1.39	0.001	1.05E-04	1.1	-1.3		138544
11	22.53	1.53	0.001	1.08E-04	1.8	-0.6		138544
12	22.06	1.66	0.001	1.09E-04	2.5	0.4		138544
13	22.00	1.68	0.001	1.09E-04	2.6	0.5		138544
		-2.69	0.001	1.09E-04	2.6	0.5		
14	21.64	-2.27	0.000	1.06E-04	1.7	1.3		138544
15	21.50	-2.12	0.000	1.05E-04	1.4	1.5		138544
16	21.04	-1.62	0.000	9.95E-05	0.6	2.0		138544
17	20.77	-1.35	0.000	9.56E-05	0.2	2.1		138544
18	20.50	-1.09	0.000	9.16E-05	-0.2	2.0		138544
19	20.00	-0.65	0.000	8.46E-05	-0.6	1.8		138544
20	19.50	-0.25	0.000	7.87E-05	-0.8	1.4		138544
21	19.00	0.12	0.000	7.43E-05	-0.9	1.0		138544
22	18.50	0.46	0.000	7.15E-05	-0.7	0.6		138544
23	18.00	0.80	0.000	6.99E-05	-0.4	0.3		138544
		-0.39	0.000	6.99E-05	-0.4	0.3		
24	17.63	0.51	0.000	6.94E-05	-0.4	0.1		138544
25	17.25	1.48	0.000	6.92E-05	0.0	0.0		---

(continued)

Stage No.1 Apply surcharge no.1 at elevation 26.75

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1052
2	26.43	0.00	6.61	2.32	21.50	2.65	2.65	1052
3	26.10	0.00	14.45	5.08	47.00	6.72	6.72	1052
4	25.75	0.00	22.50	7.90	73.18	10.96	10.96	1052
5	25.25	0.00	33.03	11.60	107.43	16.71	16.71	1052
6	24.88	0.00	40.48	14.22	131.67	20.87	20.87	1052
7	24.50	0.00	47.71	16.76	155.20	24.96	24.96	1052
8	24.00	0.00	57.15	20.08	185.91	30.35	30.35	1052
9	23.50	0.00	66.44	23.34	216.12	35.69	35.69	1052
10	23.00	0.00	75.63	26.57	246.00	41.00	41.00	1052
11	22.53	0.00	84.20	29.58	273.88	45.97	45.97	1052
12	22.06	0.00	92.72	32.57	301.61	50.93	50.93	1052
13	22.00	0.00	93.81	32.95	305.14	51.56	51.56	1052
		0.00	93.81	26.58	409.88	42.79	42.79	5261
14	21.64	0.00	101.03	28.63	441.42	46.60	46.60	5261
15	21.50	0.00	103.83	29.42	453.67	48.08	48.08	5261
16	21.04	4.51	108.50	30.74	474.10	50.67	55.18	5261
17	20.77	7.16	111.24	31.52	486.04	52.18	59.34	5261
18	20.50	9.81	113.96	32.29	497.95	53.68	63.49	5261
19	20.00	14.71	118.99	33.72	519.93	56.43	71.15	5261
20	19.50	19.62	124.01	35.14	541.83	59.17	78.79	5261
21	19.00	24.52	129.00	36.55	563.65	61.88	86.41	5261
22	18.50	29.43	133.98	37.96	585.42	64.59	94.02	5261
23	18.00	34.34	138.96	39.37	607.15	67.28	101.61	5261
		Total>	173.29	43.75m	412.29	208.39	208.39	23008
24	17.63	Total>	180.69	45.63m	426.86	217.45	217.45	23698
25	17.25	Total>	188.09	47.50m	441.43	226.53	226.53	24389

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1052
2	26.43	0.00	5.85	2.05	19.03	4.35	4.35	1052
3	26.10	0.00	11.70	4.11	38.06	7.70	7.70	1052
4	25.75	0.00	18.00	6.32	58.55	11.31	11.31	1052
5	25.25	0.00	27.00	9.48	87.82	16.46	16.46	1052
6	24.88	0.00	33.75	11.86	109.78	20.32	20.32	1052
7	24.50	0.00	40.50	14.23	131.74	24.18	24.18	1052
8	24.00	0.00	49.50	17.39	161.01	29.33	29.33	1052
9	23.50	0.00	58.50	20.55	190.29	34.47	34.47	1052
10	23.00	0.00	67.50	23.71	219.56	39.61	39.61	1052
11	22.53	0.00	75.96	26.68	247.08	44.44	44.44	1052
12	22.06	0.00	84.42	29.65	274.60	49.26	49.26	1052
13	22.00	0.00	85.50	30.03	278.11	49.88	49.88	1052
		0.00	85.50	24.23	373.58	45.48	45.48	5261
14	21.64	0.00	92.70	26.27	405.04	48.87	48.87	5261
15	21.50	0.00	95.50	27.06	417.28	50.20	50.20	5261
16	21.04	4.51	100.19	28.39	437.76	52.29	56.80	5261
17	20.77	7.16	102.94	29.17	449.78	53.53	60.69	5261
18	20.50	9.81	105.69	29.95	461.80	54.77	64.58	5261
19	20.00	14.71	110.79	31.39	484.06	57.09	71.80	5261
20	19.50	19.62	115.88	32.83	506.32	59.42	79.04	5261

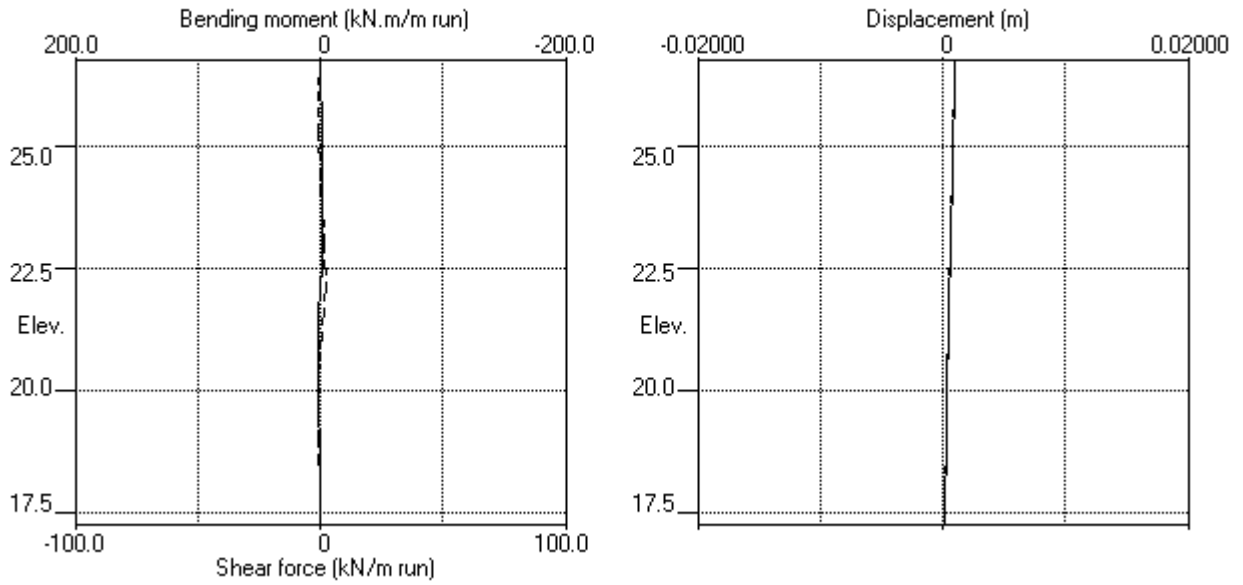
(continued)

Stage No.1 Apply surcharge no.1 at elevation 26.75

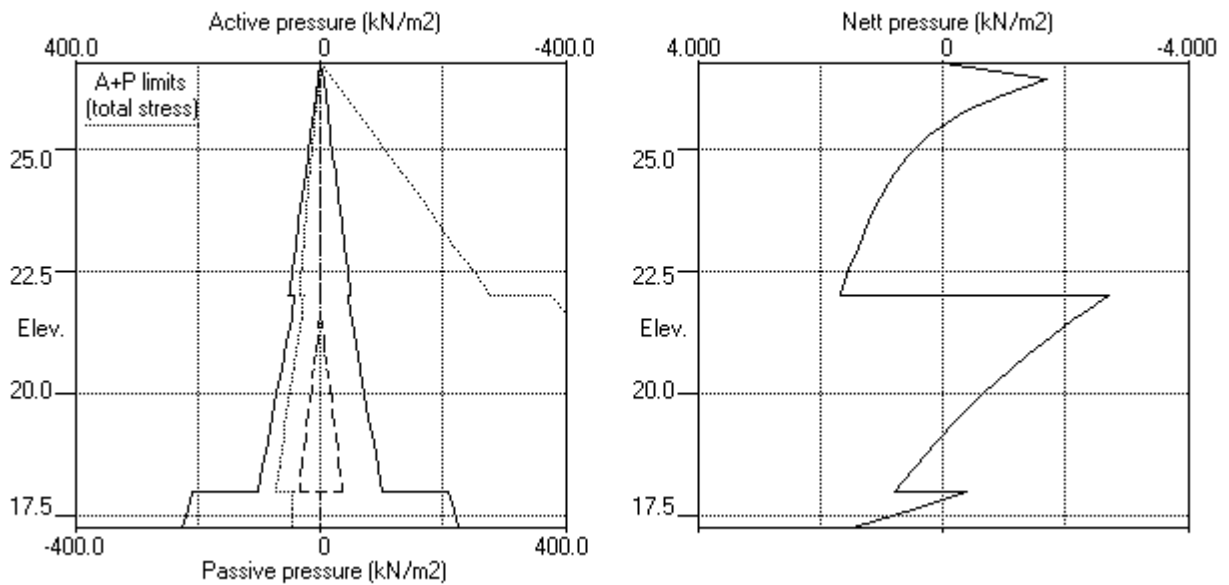
Node no.	Y coord	----- RIGHT side -----						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
21	19.00	24.52	120.98	34.28	528.59	61.77	86.29	5261
22	18.50	29.43	126.07	35.72	550.85	64.12	93.55	5261
23	18.00	34.34	131.17	37.17	573.11	66.48	100.82	5261
		Total>	165.50	43.75m	404.49	208.79	208.79	23008
24	17.63	Total>	173.00	45.63m	419.16	216.93	216.93	23698
25	17.25	Total>	180.50	47.50m	433.83	225.05	225.05	24389

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 26.75



Stage No.1 Apply surcharge no.1 at elev. 26.75



Units: kN,m

Stage No. 2 Excavate to elevation 25.25 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.	--- G.L. --- Pass.	Strut Elev.	FoS for toe elev. =	Moment of equilib. at elev.	Toe elev. for FoS =	Wall Penetr-ation	Direction of failure
2	26.75	25.25	Cant.	3.609	18.01	17.25	3.00	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall
 Right side 50.00 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/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	0.008	1.32E-03	0.0	0.0		138544
2	26.43	2.32	0.008	1.32E-03	0.4	0.1		138544
3	26.10	5.08	0.007	1.32E-03	1.6	0.4		138544
4	25.75	7.90	0.007	1.32E-03	3.9	1.3		138544
5	25.25	11.60	0.006	1.31E-03	8.7	4.4		138544
6	24.88	-4.84	0.006	1.29E-03	10.0	8.2		138544
7	24.50	-3.40	0.005	1.27E-03	8.4	11.8		138544
8	24.00	-1.41	0.005	1.22E-03	7.2	15.6		138544
9	23.50	0.43	0.004	1.15E-03	7.0	19.1		138544
10	23.00	2.14	0.003	1.08E-03	7.6	22.6		138544
11	22.53	3.61	0.003	1.00E-03	9.0	26.4		138544
12	22.06	4.93	0.002	9.03E-04	11.0	31.1		138544
13	22.00	5.09	0.002	8.89E-04	11.3	31.7		138544
		-21.61	0.002	8.89E-04	11.3	31.7		
14	21.64	-17.19	0.002	8.03E-04	4.3	34.4		138544
15	21.50	-15.59	0.002	7.68E-04	2.0	34.8		138544
16	21.04	-10.88	0.002	6.54E-04	-4.1	34.1		138544
17	20.77	-8.48	0.001	5.89E-04	-6.7	32.6		138544
18	20.50	-6.33	0.001	5.27E-04	-8.7	30.5		138544
19	20.00	-2.97	0.001	4.26E-04	-11.0	25.4		138544
20	19.50	-0.29	0.001	3.45E-04	-11.8	19.5		138544
21	19.00	1.87	0.001	2.85E-04	-11.4	13.6		138544
22	18.50	3.66	0.001	2.46E-04	-10.0	8.1		138544
23	18.00	5.22	0.000	2.25E-04	-7.8	3.5		138544
		6.32	0.000	2.25E-04	-7.8	3.5		
24	17.63	10.38	0.000	2.19E-04	-4.7	1.0		138544
25	17.25	14.65	0.000	2.18E-04	0.0	-0.0		---

(continued)

Stage No.2 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	----- LEFT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1408
2	26.43	0.00	6.61	2.32	21.50	2.32	2.32a	1408
3	26.10	0.00	14.45	5.08	47.00	5.08	5.08a	1408
4	25.75	0.00	22.50	7.90	73.18	7.90	7.90a	1408
5	25.25	0.00	33.03	11.60	107.43	11.60	11.60a	1408
6	24.88	0.00	40.48	14.22	131.67	14.22	14.22a	1408
7	24.50	0.00	47.71	16.76	155.20	18.80	18.80	1408
8	24.00	0.00	57.15	20.08	185.91	25.00	25.00	1408
9	23.50	0.00	66.44	23.34	216.12	31.12	31.12	1408
10	23.00	0.00	75.63	26.57	246.00	37.14	37.14	1408
11	22.53	0.00	84.20	29.58	273.88	42.73	42.73	1408
12	22.06	0.00	92.72	32.57	301.61	48.25	48.25	1408
13	22.00	0.00	93.81	32.95	305.14	48.95	48.95	1408
		0.00	93.81	26.58	409.88	29.74	29.74	7042
14	21.64	0.00	101.03	28.63	441.42	35.43	35.43	7042
15	21.50	0.00	103.83	29.42	453.67	37.58	37.58	7042
16	21.04	4.51	108.50	30.74	474.10	42.14	46.65	7042
17	20.77	7.16	111.24	31.52	486.04	44.64	51.80	7042
18	20.50	9.81	113.96	32.29	497.95	47.03	56.84	7042
19	20.00	14.71	118.99	33.72	519.93	51.15	65.86	7042
20	19.50	19.62	124.01	35.14	541.83	54.95	74.57	7042
21	19.00	24.52	129.00	36.55	563.65	58.50	83.02	7042
22	18.50	29.43	133.98	37.96	585.42	61.88	91.31	7042
23	18.00	34.34	138.96	39.37	607.15	65.15	99.48	7042
		Total>	173.29	43.75m	412.29	199.38	199.38	29803
24	17.63	Total>	180.69	45.63m	426.86	209.91	209.91	30697
25	17.25	Total>	188.09	47.50m	441.43	220.55	220.55	31591

Node no.	Y coord	----- RIGHT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1606
6	24.88	0.00	6.75	2.37	21.96	19.06	19.06	1606
7	24.50	0.00	13.50	4.74	43.91	22.20	22.20	1606
8	24.00	0.00	22.50	7.90	73.19	26.42	26.42	1606
9	23.50	0.00	31.50	11.07	102.46	30.68	30.68	1606
10	23.00	0.00	40.50	14.23	131.74	35.00	35.00	1606
11	22.53	0.00	48.96	17.20	159.26	39.12	39.12	1606
12	22.06	0.00	57.42	20.17	186.78	43.31	43.31	1606
13	22.00	0.00	58.50	20.55	190.30	43.86	43.86	1606
		0.00	58.50	16.58	255.62	51.36	51.36	8029
14	21.64	0.00	65.70	18.62	287.09	52.61	52.61	8029
15	21.50	0.00	68.50	19.41	299.32	53.17	53.17	8029
16	21.04	4.51	73.19	20.74	319.81	53.02	57.53	8029
17	20.77	7.16	75.95	21.52	331.84	53.12	60.28	8029
18	20.50	9.81	78.70	22.30	343.87	53.36	63.17	8029
19	20.00	14.71	83.80	23.74	366.15	54.12	68.83	8029

(continued)

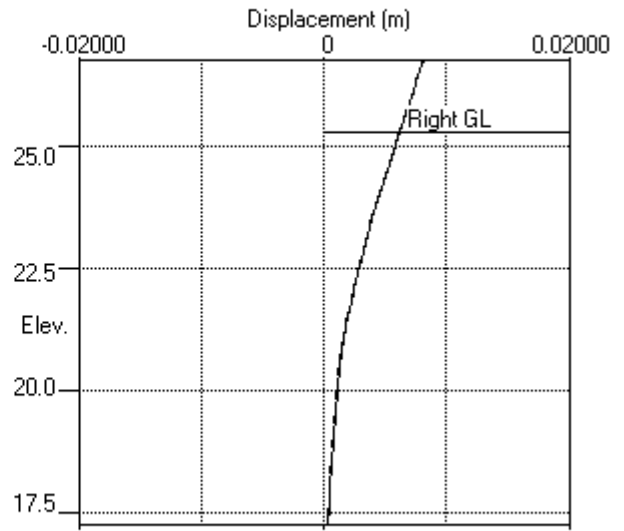
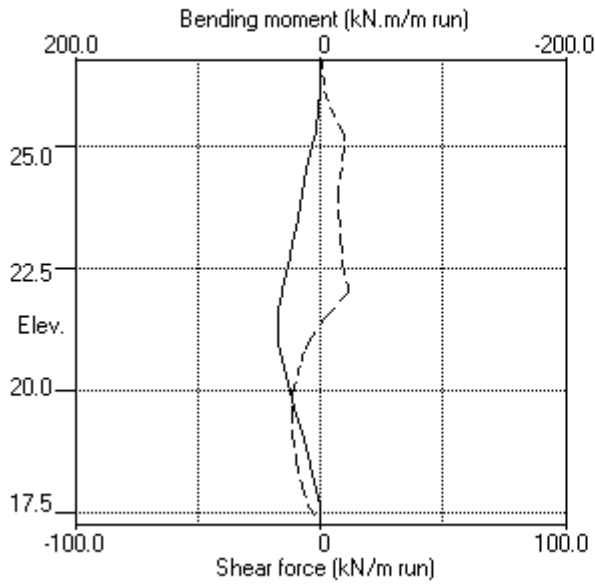
Stage No.2 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	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
20	19.50	19.62	88.90	25.19	388.43	55.24	74.86	8029
21	19.00	24.52	94.00	26.63	410.71	56.63	81.16	8029
22	18.50	29.43	99.10	28.08	433.00	58.22	87.65	8029
23	18.00	34.34	104.20	29.52	455.29	59.92	94.26	8029
		Total>	138.53	36.25m	377.53	193.06	193.06	33623
24	17.63	Total>	146.04	38.13m	392.20	199.53	199.53	34631
25	17.25	Total>	153.55	40.00m	406.88	205.90	205.90	35640

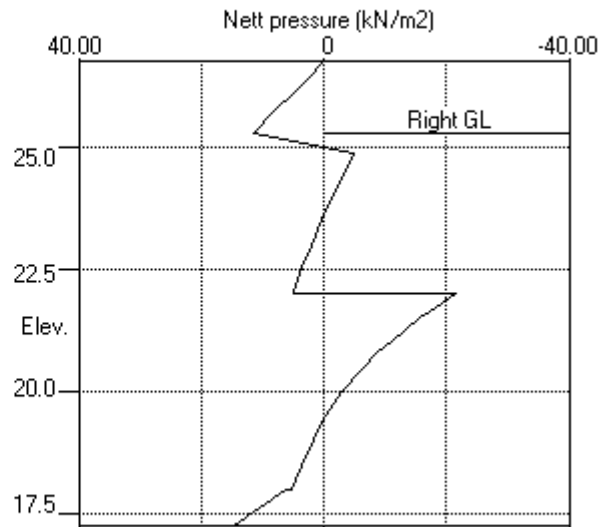
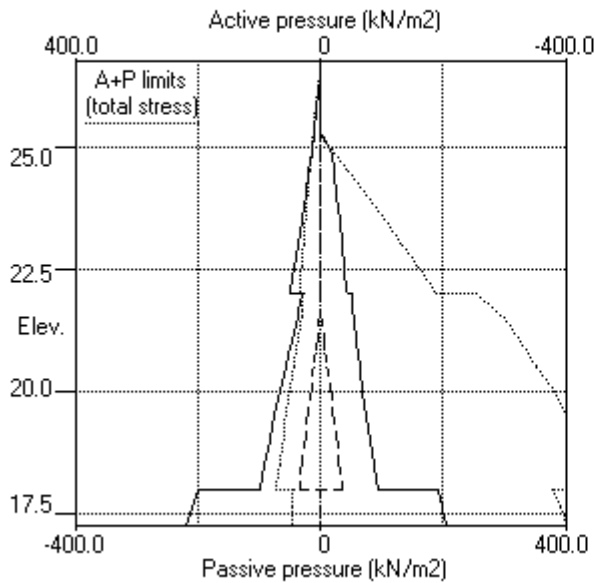
Note: 14.22a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 25.25 on RIGHT side



Stage No.2 Excav. to elev. 25.25 on RIGHT side



Units: kN,m

Stage No. 4 Apply water pressure profile no.1 (Mod. Conserv.)

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

				FoS for toe elev. = 17.25		Toe elev. for FoS = 1.500		
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall	Direction
No.	Act.	Pass.	Elev.	of	equilib.	elev.	Penetr	of
				Safety	at elev.		-ation	failure
4	26.75	25.25	25.75	8.561	n/a	24.39	0.86	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.008	1.24E-03	0.0	0.0		138544
2	26.43	2.56	0.008	1.24E-03	0.4	0.1		138544
3	26.10	5.19	0.007	1.24E-03	1.7	0.4		138544
4	25.75	7.90	0.007	1.24E-03	4.0	1.4	0.4	138544
		7.90	0.007	1.24E-03	3.6	1.4		
5	25.25	11.60	0.006	1.23E-03	8.4	4.3		138544
6	24.88	-4.91	0.006	1.21E-03	9.7	8.1		138544
7	24.50	-3.59	0.005	1.19E-03	8.1	11.5		138544
8	24.00	-1.68	0.005	1.14E-03	6.8	15.1		138544
9	23.50	0.09	0.004	1.08E-03	6.4	18.3		138544
10	23.00	1.73	0.004	1.01E-03	6.8	21.5		138544
11	22.53	3.14	0.003	9.34E-04	8.0	24.9		138544
12	22.06	4.40	0.003	8.42E-04	9.8	29.0		138544
13	22.00	4.55	0.003	8.30E-04	10.0	29.6		138544
		-24.30	0.003	8.30E-04	10.0	29.6		
14	21.64	-20.07	0.002	7.50E-04	2.0	31.7		138544
15	21.50	-18.55	0.002	7.18E-04	-0.7	31.8		138544
16	21.04	-11.03	0.002	6.16E-04	-7.5	29.6		138544
17	20.77	-6.94	0.002	5.61E-04	-9.9	27.2		138544
18	20.50	-3.09	0.002	5.11E-04	-11.2	24.3		138544
19	20.00	0.25	0.001	4.34E-04	-12.0	18.3		138544
20	19.50	3.03	0.001	3.79E-04	-11.1	12.3		138544
21	19.00	5.41	0.001	3.43E-04	-9.0	7.1		138544
22	18.50	7.53	0.001	3.24E-04	-5.8	3.3		138544
23	18.00	9.50	0.001	3.16E-04	-1.5	1.3		138544
		-3.32	0.001	3.16E-04	-1.5	1.3		
24	17.63	1.97	0.001	3.14E-04	-1.8	0.5		138544
25	17.25	7.58	0.000	3.13E-04	0.0	0.0		---
At elev. 25.75 Strut force =			2.0 kN/strut =			0.4 kN/m run		

(continued)

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	4693
2	26.43	0.00	6.61	2.32	21.50	2.56	2.56	4693
3	26.10	0.00	14.45	5.08	47.00	5.19	5.19	4693
4	25.75	0.00	22.50	7.90	73.18	7.90	7.90a	961
5	25.25	0.00	33.03	11.60	107.43	11.60	11.60a	961
6	24.88	0.00	40.48	14.22	131.67	14.22	14.22a	961
7	24.50	0.00	47.71	16.76	155.20	18.71	18.71	961
8	24.00	0.00	57.15	20.08	185.91	24.87	24.87	961
9	23.50	0.00	66.44	23.34	216.12	30.94	30.94	961
10	23.00	0.00	75.63	26.57	246.00	36.94	36.94	961
11	22.53	0.00	84.20	29.58	273.88	42.50	42.50	961
12	22.06	0.00	92.72	32.57	301.61	47.98	47.98	961
13	22.00	0.00	93.81	32.95	305.14	48.68	48.68	961
		0.00	93.81	26.58	409.88	28.40	28.40	4807
14	21.64	0.00	101.03	28.63	441.42	33.99	33.99	4807
15	21.50	0.00	103.83	29.42	453.67	36.10	36.10	4807
16	21.04	4.51	108.50	30.74	474.10	40.56	45.07	4807
17	20.77	7.16	111.24	31.52	486.04	43.02	50.18	4807
18	20.50	9.81	113.96	32.29	497.95	45.38	55.19	4807
19	20.00	14.71	118.99	33.72	519.93	49.49	64.20	4807
20	19.50	19.62	124.01	35.14	541.83	53.34	72.96	4807
21	19.00	24.52	129.00	36.55	563.65	57.00	81.52	4807
22	18.50	29.43	133.98	37.96	585.42	60.54	89.97	4807
23	18.00	34.34	138.96	39.37	607.15	64.02	98.35	4807
		Total>	173.29	43.75m	412.29	194.36	194.36	21320
24	17.63	Total>	180.69	45.63m	426.86	205.51	205.51	21960
25	17.25	Total>	188.09	47.50m	441.43	216.82	216.82	22599

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	961
6	24.88	0.00	6.75	2.37	21.96	19.13	19.13	961
7	24.50	0.00	13.50	4.74	43.91	22.30	22.30	961
8	24.00	0.00	22.50	7.90	73.19	26.55	26.55	961
9	23.50	0.00	31.50	11.07	102.46	30.85	30.85	961
10	23.00	0.00	40.50	14.23	131.74	35.21	35.21	961
11	22.53	0.00	48.96	17.20	159.26	39.36	39.36	961
12	22.06	0.00	57.42	20.17	186.78	43.58	43.58	961
13	22.00	0.00	58.50	20.55	190.30	44.12	44.12	961
		0.00	58.50	16.58	255.62	52.70	52.70	4807
14	21.64	0.00	65.70	18.62	287.09	54.06	54.06	4807
15	21.50	0.00	68.50	19.41	299.32	54.65	54.65	4807
16	21.04	0.00	77.71	22.02	339.53	56.10	56.10	4807
17	20.77	0.00	83.11	23.55	363.13	57.13	57.13	4807
18	20.50	0.00	88.51	25.08	386.73	58.28	58.28	4807
19	20.00	4.90	93.61	26.52	409.01	59.05	63.95	4807

(continued)

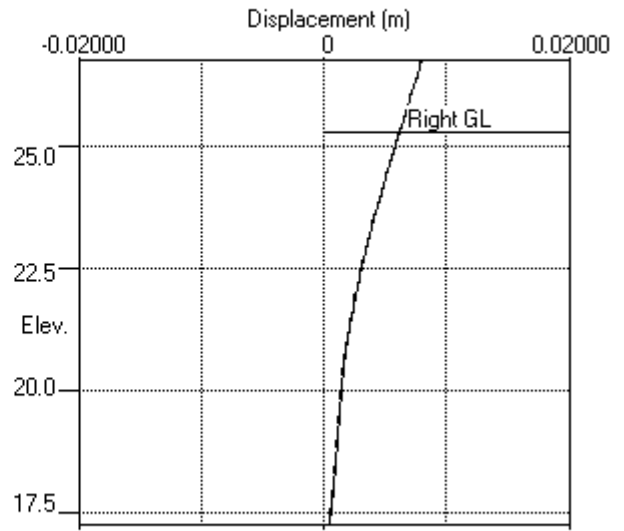
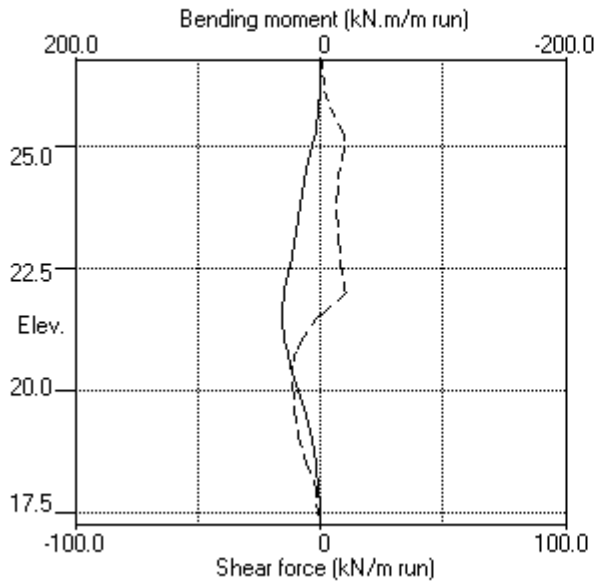
Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	----- RIGHT side -----						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
20	19.50	9.81	98.71	27.97	431.29	60.12	69.93	4807
21	19.00	14.71	103.81	29.41	453.57	61.40	76.12	4807
22	18.50	19.62	108.91	30.86	475.86	62.83	82.45	4807
23	18.00	24.52	114.01	32.30	498.15	64.33	88.85	4807
		Total>	138.53	36.25m	377.53	197.69	197.69	21320
24	17.63	Total>	146.04	38.13m	392.20	203.55	203.55	21960
25	17.25	Total>	153.55	40.00m	406.88	209.24	209.24	22599

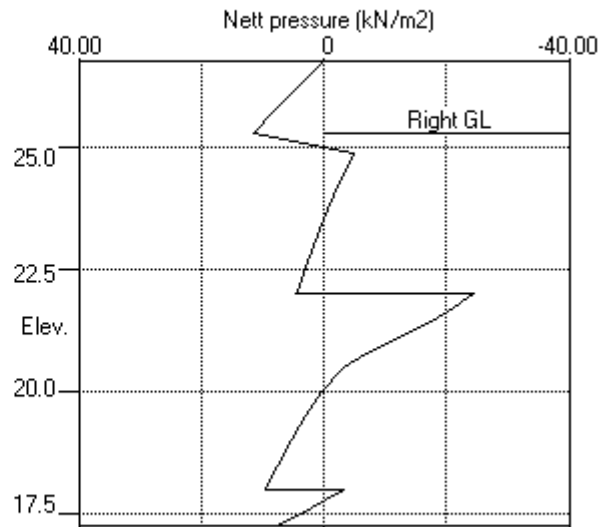
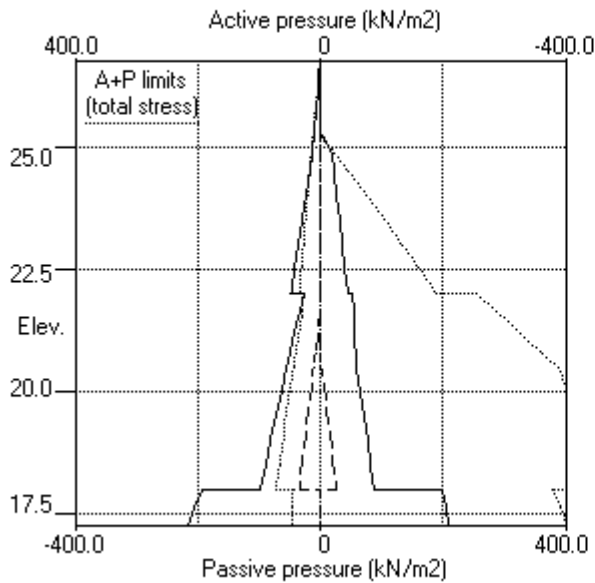
Note: 14.22a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)



Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)



(continued)

Stage No.5 Excavate to elevation 21.04 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	5407
2	26.43	0.00	6.61	2.32	21.50	9.93	9.93	5407
3	26.10	0.00	14.45	5.08	47.00	7.44	7.44	5407
4	25.75	0.00	22.50	7.90	73.18	7.90	7.90a	995
5	25.25	0.00	33.03	11.60	107.43	11.60	11.60a	995
6	24.88	0.00	40.48	14.22	131.67	14.22	14.22a	995
7	24.50	0.00	47.71	16.76	155.20	16.76	16.76a	995
8	24.00	0.00	57.15	20.08	185.91	20.08	20.08a	995
9	23.50	0.00	66.44	23.34	216.12	24.71	24.71	995
10	23.00	0.00	75.63	26.57	246.00	29.96	29.96	995
11	22.53	0.00	84.20	29.58	273.88	35.06	35.06	995
12	22.06	0.00	92.72	32.57	301.61	40.33	40.33	995
13	22.00	0.00	93.81	32.95	305.14	41.02	41.02	995
		0.00	93.81	26.58	409.88	26.58	26.58a	4975
14	21.64	0.00	101.03	28.63	441.42	28.63	28.63a	4975
15	21.50	0.00	103.83	29.42	453.67	29.42	29.42a	4975
16	21.04	4.51	108.50	30.74	474.10	30.74	35.26a	4975
17	20.77	7.16	111.24	31.52	486.04	31.52	38.68a	4975
18	20.50	9.81	113.96	32.29	497.95	32.29	42.10a	4975
19	20.00	14.71	118.99	33.72	519.93	33.72	48.43a	4975
20	19.50	19.62	124.01	35.14	541.83	35.14	54.76a	4975
21	19.00	24.52	129.00	36.55	563.65	36.55	61.08a	4975
22	18.50	29.43	133.98	37.96	585.42	44.30	73.73	4975
23	18.00	34.34	138.96	39.37	607.15	52.54	86.88	4975
		Total>	173.29	43.75m	412.29	143.77	143.77	21939
24	17.63	Total>	180.69	45.63m	426.86	169.65	169.65	22597
25	17.25	Total>	188.09	47.50m	441.43	196.60	196.60	23255

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	21.04	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	8069
17	20.77	0.00	5.40	1.53	23.59	23.59	23.59p	8069
18	20.50	0.00	10.80	3.06	47.19	47.19	47.19p	8069
19	20.00	4.90	15.90	4.50	69.45	69.45	74.36p	8069
20	19.50	9.81	20.99	5.95	91.72	75.58	85.39	8069

(continued)

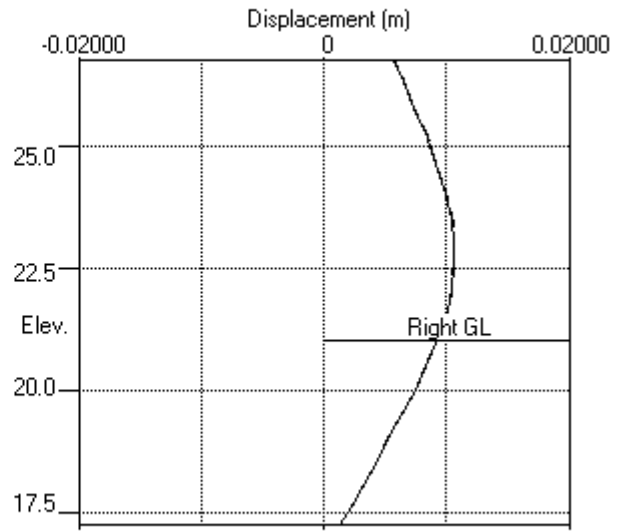
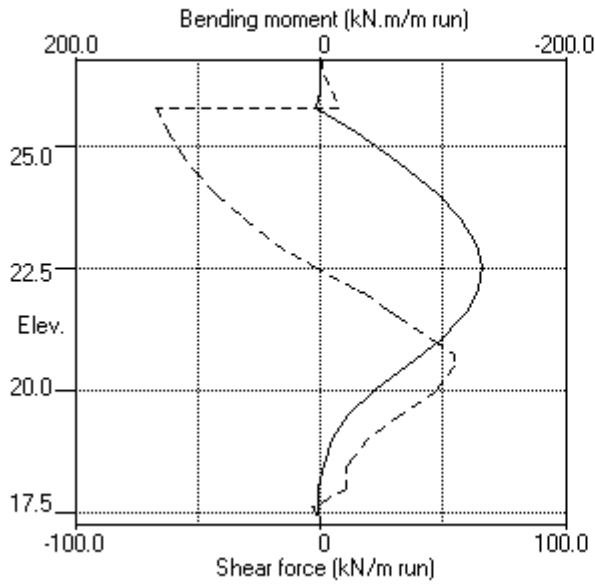
Stage No.5 Excavate to elevation 21.04 on RIGHT side

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
21	19.00	14.71	26.09	7.39	113.99	69.48	84.20	8069
22	18.50	19.62	31.19	8.84	136.26	63.26	82.88	8069
23	18.00	24.52	36.28	10.28	158.54	57.03	81.55	8069
		Total>	60.81	15.20m	299.80	200.91	200.91	33780
24	17.63	Total>	68.31	17.08m	314.48	184.09	184.09	34793
25	17.25	Total>	75.82	18.95m	329.15	165.70	165.70	35807

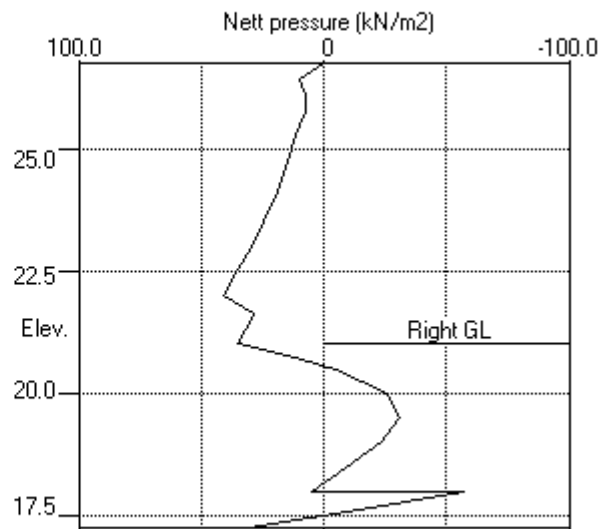
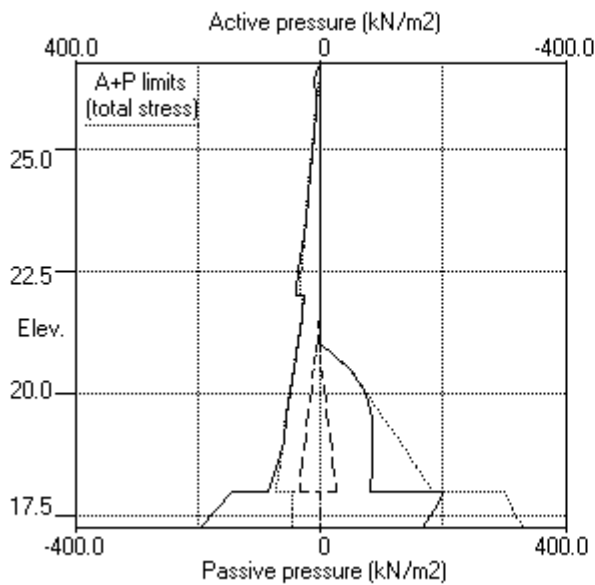
Note: 61.08a Soil pressure at active limit
 74.36p Soil pressure at passive limit

Units: kN,m

Stage No.5 Excav. to elev. 21.04 on RIGHT side



Stage No.5 Excav. to elev. 21.04 on RIGHT side



Units: kN,m

Stage No. 6 Fill to elevation 21.64 on RIGHT side with soil type 1

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. =	Moment of equilib. at elev.	Toe elev. for FoS =	Wall Penetr -ation	Direction of failure
6	26.75 21.64	25.75	2.191	n/a	17.25 1.500	18.18 3.46	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.006	-1.59E-03	0.0	0.0		138544
2	26.43	9.74	0.006	-1.59E-03	1.6	0.1		138544
3	26.10	7.36	0.007	-1.60E-03	4.4	1.2		138544
4	25.75	7.91	0.007	-1.60E-03	7.0	3.2	74.1	138544
		7.91	0.007	-1.60E-03	-67.1	3.2		
5	25.25	11.63	0.008	-1.55E-03	-62.2	-29.2		138544
6	24.88	14.27	0.009	-1.45E-03	-57.3	-51.5		138544
7	24.50	16.84	0.009	-1.28E-03	-51.5	-71.8		138544
8	24.00	20.18	0.010	-9.81E-04	-42.3	-95.4		138544
9	23.50	24.85	0.010	-6.04E-04	-31.0	-113.6		138544
10	23.00	30.12	0.010	-1.72E-04	-17.3	-125.8		138544
11	22.53	35.25	0.010	2.62E-04	-1.9	-130.5		138544
12	22.06	40.54	0.010	6.99E-04	15.9	-127.3		138544
13	22.00	41.23	0.010	7.54E-04	18.4	-126.3		138544
		27.62	0.010	7.54E-04	18.4	-126.3		
14	21.64	29.74	0.010	1.07E-03	28.7	-117.9		138544
15	21.50	29.68	0.010	1.18E-03	32.8	-113.6		138544
16	21.04	32.69	0.009	1.53E-03	47.2	-95.4		138544
		33.42	0.009	1.53E-03	47.2	-95.4		
17	20.77	14.24	0.009	1.70E-03	53.6	-81.7		138544
18	20.50	-5.87	0.008	1.85E-03	54.8	-67.0		138544
19	20.00	-26.61	0.007	2.04E-03	46.6	-41.4		138544
20	19.50	-31.28	0.006	2.15E-03	32.2	-20.0		138544
21	19.00	-23.77	0.005	2.20E-03	18.4	-7.9		138544
22	18.50	-9.84	0.004	2.22E-03	10.0	-0.8		138544
23	18.00	4.58	0.003	2.22E-03	8.7	3.0		138544
		-55.06	0.003	2.22E-03	8.7	3.0		
24	17.63	-12.24	0.002	2.21E-03	-3.9	2.3		138544
25	17.25	33.21	0.001	2.21E-03	0.0	0.0		---

At elev. 25.75 Strut force = 370.6 kN/strut = 74.1 kN/m run

(continued)

Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	4722
2	26.43	0.00	6.61	2.32	21.50	9.74	9.74	4722
3	26.10	0.00	14.45	5.08	47.00	7.36	7.36	4722
4	25.75	0.00	22.50	7.90	73.18	7.91	7.91a	962
5	25.25	0.00	33.03	11.60	107.43	11.63	11.63	962
6	24.88	0.00	40.48	14.22	131.67	14.27	14.27	962
7	24.50	0.00	47.71	16.76	155.20	16.84	16.84	962
8	24.00	0.00	57.15	20.08	185.91	20.18	20.18	962
9	23.50	0.00	66.44	23.34	216.12	24.85	24.85	962
10	23.00	0.00	75.63	26.57	246.00	30.12	30.12	962
11	22.53	0.00	84.20	29.58	273.88	35.25	35.25	962
12	22.06	0.00	92.72	32.57	301.61	40.54	40.54	962
13	22.00	0.00	93.81	32.95	305.14	41.23	41.23	962
		0.00	93.81	26.58	409.88	27.62	27.62	4812
14	21.64	0.00	101.03	28.63	441.42	29.74	29.74	4812
15	21.50	0.00	103.83	29.42	453.67	30.57	30.57	4812
16	21.04	4.51	108.50	30.74	474.10	31.97	36.48	4812
17	20.77	7.16	111.24	31.52	486.04	32.78	39.94	4812
18	20.50	9.81	113.96	32.29	497.95	33.59	43.40	4812
19	20.00	14.71	118.99	33.72	519.93	35.05	49.77	4812
20	19.50	19.62	124.01	35.14	541.83	36.49	56.11	4812
21	19.00	24.52	129.00	36.55	563.65	37.90	62.43	4812
22	18.50	29.43	133.98	37.96	585.42	45.64	75.07	4812
23	18.00	34.34	138.96	39.37	607.15	53.85	88.19	4812
		Total>	173.29	43.75m	412.29	149.56	149.56	21340
24	17.63	Total>	180.69	45.63m	426.86	175.49	175.49	21981
25	17.25	Total>	188.09	47.50m	441.43	202.49	202.49	22621

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1137
15	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1137
16	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1137
		0.00	10.80	3.06	47.19	3.06	3.06a	5686
17	20.77	0.00	16.20	4.59	70.78	25.70	25.70	5686
18	20.50	0.00	21.60	6.12	94.38	49.26	49.26	5686
19	20.00	4.90	26.70	7.56	116.65	71.48	76.38	5686

(continued)

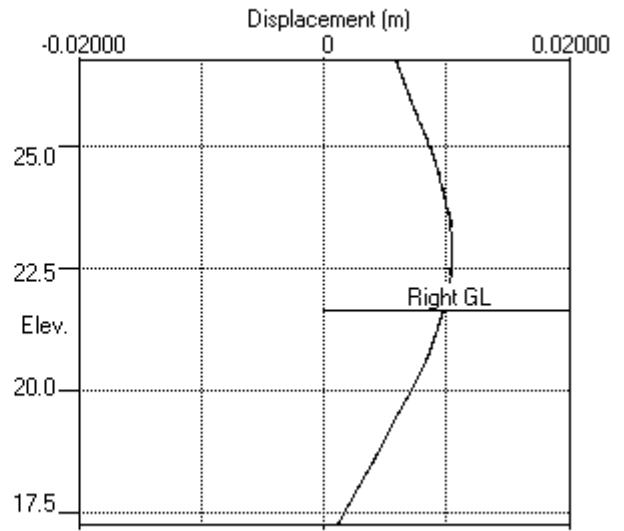
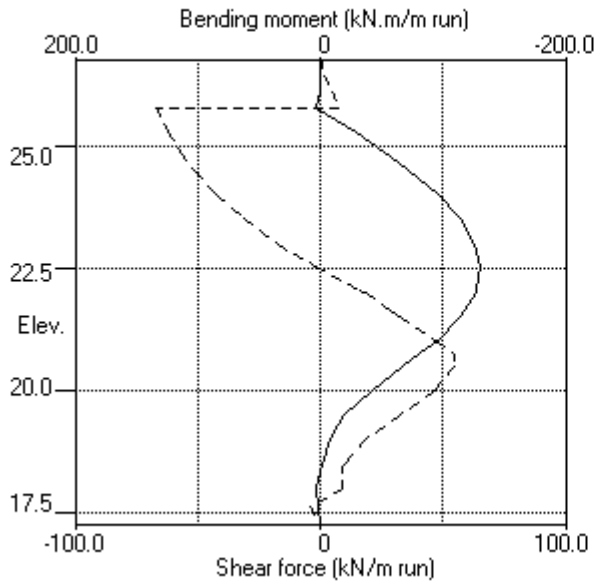
Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
20	19.50	9.81	31.79	9.01	138.92	77.58	87.39	5686
21	19.00	14.71	36.89	10.45	161.19	71.48	86.20	5686
22	18.50	19.62	41.99	11.90	183.47	65.29	84.91	5686
23	18.00	24.52	47.09	13.34	205.75	59.09	83.61	5686
		Total>	71.62	18.20m	310.61	204.62	204.62	24611
24	17.63	Total>	79.12	20.08m	325.28	187.73	187.73	25349
25	17.25	Total>	86.63	21.95m	339.96	169.29	169.29	26088

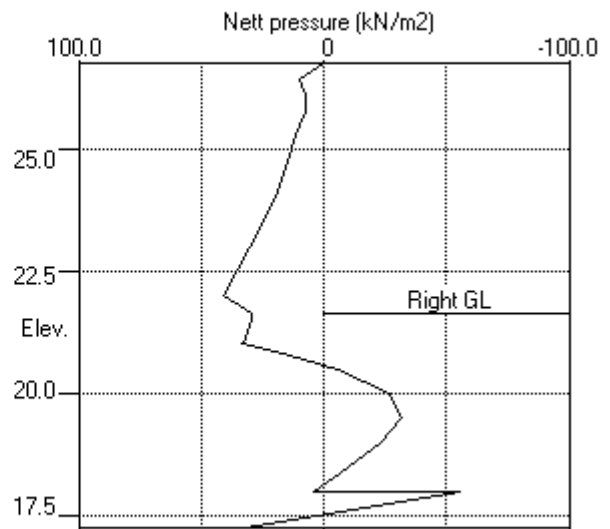
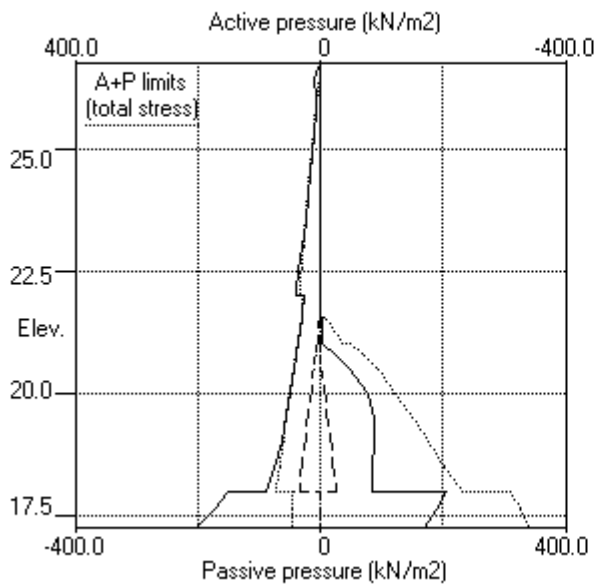
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Fill to elev. 21.64 on RIGHT side



Stage No.6 Fill to elev. 21.64 on RIGHT side



Units: kN,m

Stage No. 9 Remove strut or anchor no.1 at elevation 25.75

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

			FoS for toe	Toe elev. for			
			elev. = 17.25	FoS = 1.500			
			-----	-----			
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of
			Safety	at elev.		-ation	failure
9	26.75 21.64		More than one	strut.	No	FoS	calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 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/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	0.006	-1.76E-03	0.0	0.0		138544
2	26.43	9.71	0.006	-1.76E-03	1.6	0.1		138544
3	26.10	7.25	0.007	-1.76E-03	4.3	1.1	65.8	138544
		7.25	0.007	-1.76E-03	-61.4	1.1		
4	25.75	7.90	0.008	-1.74E-03	-58.8	-19.9		138544
5	25.25	11.60	0.008	-1.62E-03	-53.9	-48.1		138544
6	24.88	14.22	0.009	-1.46E-03	-49.1	-67.3		138544
7	24.50	16.76	0.009	-1.26E-03	-43.3	-84.5		138544
8	24.00	20.08	0.010	-9.20E-04	-34.0	-103.9		138544
9	23.50	24.65	0.010	-5.20E-04	-22.9	-118.1		138544
10	23.00	29.99	0.011	-7.94E-05	-9.2	-126.2		138544
11	22.53	35.18	0.010	3.50E-04	6.1	-127.1		138544
12	22.06	40.52	0.010	7.69E-04	23.9	-120.2	10.4	138544
		40.52	0.010	7.69E-04	13.5	-120.2		
13	22.00	41.22	0.010	8.21E-04	16.0	-119.3		138544
		27.57	0.010	8.21E-04	16.0	-119.3		
14	21.64	29.83	0.010	1.12E-03	26.3	-111.8		138544
15	21.50	29.81	0.010	1.23E-03	30.5	-107.8		138544
16	21.04	32.92	0.009	1.56E-03	44.9	-90.7		138544
		33.65	0.009	1.56E-03	44.9	-90.7		
17	20.77	14.78	0.009	1.72E-03	51.4	-77.7		138544
18	20.50	-5.27	0.008	1.86E-03	52.7	-63.5		138544
19	20.00	-25.99	0.007	2.04E-03	44.9	-38.8		138544
20	19.50	-30.68	0.006	2.15E-03	30.7	-18.2		138544
21	19.00	-23.24	0.005	2.19E-03	17.3	-6.8		138544
22	18.50	-9.41	0.004	2.20E-03	9.1	-0.2		138544
23	18.00	4.89	0.003	2.20E-03	8.0	3.2		138544
		-53.73	0.003	2.20E-03	8.0	3.2		
24	17.63	-11.26	0.002	2.19E-03	-4.2	2.4		138544
25	17.25	33.81	0.001	2.19E-03	0.0	0.0		---

At elev. 26.10 Strut force = 65.8 kN/strut = 65.8 kN/m run

At elev. 22.06 Strut force = 10.4 kN/strut = 10.4 kN/m run

(continued)

Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	17123
2	26.43	0.00	6.61	2.32	21.50	9.71	9.71	1421
3	26.10	0.00	14.45	5.08	47.00	7.25	7.25	1421
4	25.75	0.00	22.50	7.90	73.18	7.90	7.90a	1421
5	25.25	0.00	33.03	11.60	107.43	11.60	11.60a	1421
6	24.88	0.00	40.48	14.22	131.67	14.22	14.22a	1421
7	24.50	0.00	47.71	16.76	155.20	16.76	16.76a	1421
8	24.00	0.00	57.15	20.08	185.91	20.08	20.08a	1421
9	23.50	0.00	66.44	23.34	216.12	24.65	24.65	1421
10	23.00	0.00	75.63	26.57	246.00	29.99	29.99	1421
11	22.53	0.00	84.20	29.58	273.88	35.18	35.18	1421
12	22.06	0.00	92.72	32.57	301.61	40.52	40.52	1421
13	22.00	0.00	93.81	32.95	305.14	41.22	41.22	1421
		0.00	93.81	26.58	409.88	27.57	27.57	7104
14	21.64	0.00	101.03	28.63	441.42	29.83	29.83	6536
15	21.50	0.00	103.83	29.42	453.67	30.69	30.69	6536
16	21.04	4.51	108.50	30.74	474.10	32.20	36.71	6536
17	20.77	7.16	111.24	31.52	486.04	33.05	40.21	6536
18	20.50	9.81	113.96	32.29	497.95	33.88	43.69	6536
19	20.00	14.71	118.99	33.72	519.93	35.36	50.08	6536
20	19.50	19.62	124.01	35.14	541.83	36.79	56.41	6536
21	19.00	24.52	129.00	36.55	563.65	38.17	62.69	6536
22	18.50	29.43	133.98	37.96	585.42	45.85	75.28	6536
23	18.00	34.34	138.96	39.37	607.15	54.01	88.34	6536
		Total>	173.29	43.75m	412.29	150.22	150.22	27857
24	17.63	Total>	180.69	45.63m	426.86	175.98	175.98	28693
25	17.25	Total>	188.09	47.50m	441.43	202.79	202.79	29529

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1307
15	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1307
16	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1307
		0.00	10.80	3.06	47.19	3.06	3.06a	6536
17	20.77	0.00	16.20	4.59	70.78	25.43	25.43	6536
18	20.50	0.00	21.60	6.12	94.38	48.96	48.96	6536
19	20.00	4.90	26.70	7.56	116.65	71.16	76.07	6536

(continued)

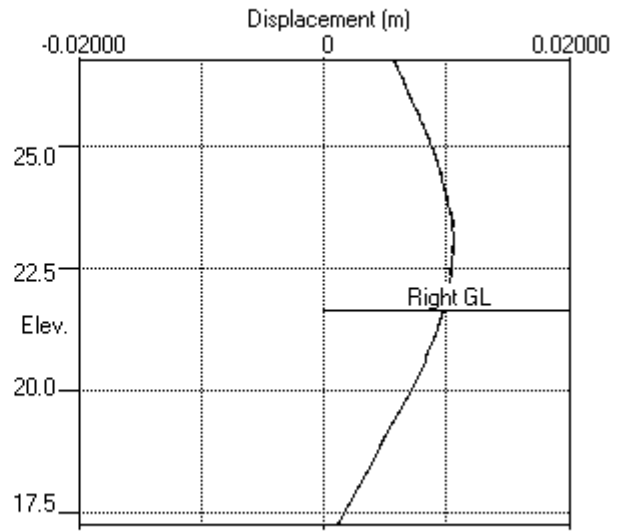
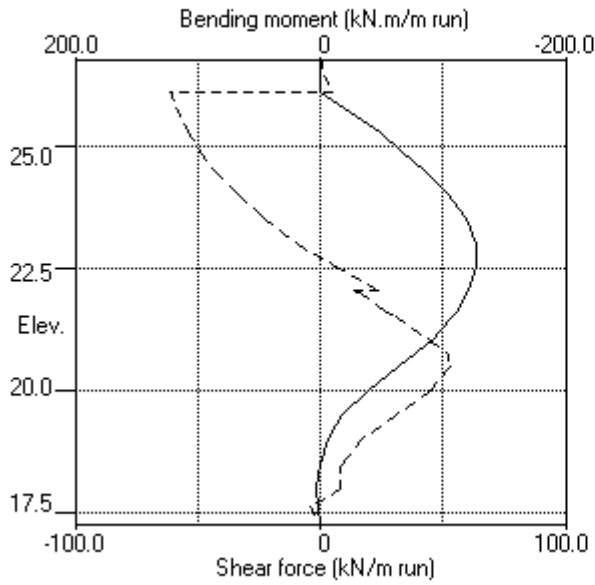
Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	19.50	9.81	31.79	9.01	138.92	77.28	87.09	6536
21	19.00	14.71	36.89	10.45	161.19	71.22	85.94	6536
22	18.50	19.62	41.99	11.90	183.47	65.07	84.69	6536
23	18.00	24.52	47.09	13.34	205.75	58.93	83.45	6536
		Total>	71.62	18.20m	310.61	203.95	203.95	27857
24	17.63	Total>	79.12	20.08m	325.28	187.24	187.24	28693
25	17.25	Total>	86.63	21.95m	339.96	168.99	168.99	29529

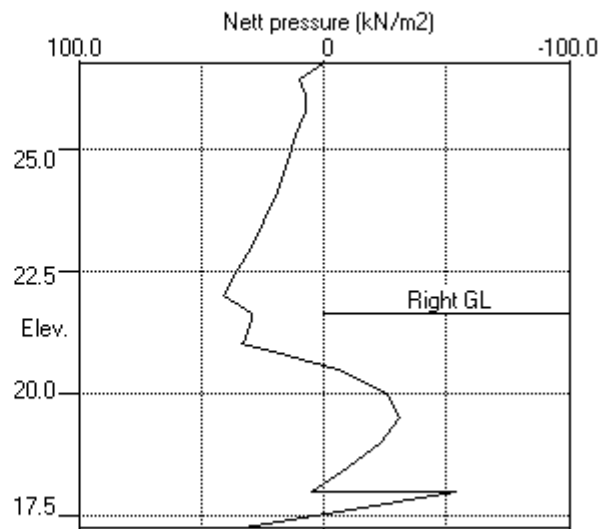
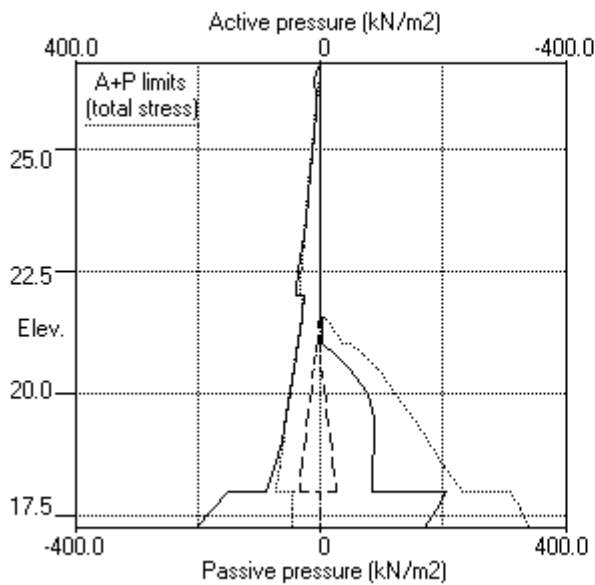
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.9 Remove strut no.1 at elev. 25.75



Stage No.9 Remove strut no.1 at elev. 25.75



PILEDESIGNS LTD	Sheet No.
Program: WALLAP Version 6.06 Revision A51.B69.R54	Job No. 23198
Licensed from GEOSOLVE	Made by : DBS
Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_SLS	Date:12-06-2020
Fitzrovia - Middlesex Hospital Annexe	Checked :
Wall 1, Secant-SLS, 600 dia @ 900 - run 03	

Units: kN,m

Stage No. 10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

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

			FoS for toe elev. = 17.25	Toe elev. for FoS = 1.500	
Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.
10	26.75	21.64			
				Toe elev.	Wall Penetr-ation
					Direction of failure
				More than one strut. No FoS calc.	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.006	-1.89E-03	0.0	0.0		98960
2	26.43	10.01	0.006	-1.89E-03	1.6	0.1		98960
3	26.10	7.31	0.007	-1.89E-03	4.4	1.2	56.4	98960
		7.31	0.007	-1.89E-03	-52.0	1.2		
4	25.75	7.90	0.008	-1.87E-03	-49.3	-17.2		98960
5	25.25	11.60	0.008	-1.72E-03	-44.4	-41.8		98960
6	24.88	14.22	0.009	-1.54E-03	-39.6	-58.2		98960
7	24.50	16.76	0.010	-1.31E-03	-33.8	-72.7		98960
8	24.00	20.08	0.010	-9.22E-04	-24.6	-88.4		98960
9	23.50	24.42	0.011	-4.74E-04	-13.4	-98.9		98960
10	23.00	29.81	0.011	5.93E-06	0.1	-103.4		98960
11	22.53	35.06	0.011	4.57E-04	15.4	-100.9		98960
12	22.06	40.49	0.010	8.74E-04	33.1	-90.6	30.5	98960
		40.49	0.010	8.74E-04	2.6	-90.6		
13	22.00	41.19	0.010	9.24E-04	5.0	-90.2		98960
		27.43	0.010	9.24E-04	5.0	-90.2		
14	21.64	29.94	0.010	1.21E-03	15.3	-85.8		98960
15	21.50	30.00	0.010	1.32E-03	19.5	-83.0		98960
16	21.04	33.37	0.009	1.64E-03	34.1	-69.8		98960
		34.11	0.009	1.64E-03	34.1	-69.8		
17	20.77	15.98	0.008	1.81E-03	40.9	-59.0		98960
18	20.50	-3.80	0.008	1.94E-03	42.5	-47.0		98960
19	20.00	-24.09	0.007	2.10E-03	35.6	-26.1		98960
20	19.50	-28.52	0.006	2.17E-03	22.4	-9.0		98960
21	19.00	-21.02	0.005	2.19E-03	10.0	-0.6		98960
22	18.50	-7.31	0.004	2.17E-03	2.9	3.4		98960
23	18.00	6.72	0.003	2.15E-03	2.8	4.6		98960
		-45.88	0.003	2.15E-03	2.8	4.6		

(continued)

Stage No.10 Change EI of wall to 98960 kN.m²/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
24	17.63	-4.33	0.002	2.13E-03	-6.6	2.7		98960
25	17.25	39.67	0.001	2.13E-03	0.0	0.0		---
At elev. 22.10 Strut force =				56.4 kN/strut =		56.4 kN/m run		
At elev. 22.06 Strut force =				30.5 kN/strut =		30.5 kN/m run		

Node no.	Y coord	LEFT side					Total earth pressure kN/m ²	Coeff. of subgrade reaction kN/m ³
		Water press. kN/m ²	Vertic -al kN/m ²	Effective Active limit kN/m ²	Effective Passive limit kN/m ²	Earth pressure kN/m ²		
1	26.75	0.00	0.00	0.00	0.00	0.00	5716	
2	26.43	0.00	6.61	2.32	21.50	10.01	5716	
3	26.10	0.00	14.45	5.08	47.00	7.31	5716	
4	25.75	0.00	22.50	7.90	73.18	7.90	1473	
5	25.25	0.00	33.03	11.60	107.43	11.60	1473	
6	24.88	0.00	40.48	14.22	131.67	14.22	1473	
7	24.50	0.00	47.71	16.76	155.20	16.76	1473	
8	24.00	0.00	57.15	20.08	185.91	20.08	1473	
9	23.50	0.00	66.44	23.34	216.12	24.42	1473	
10	23.00	0.00	75.63	26.57	246.00	29.81	1473	
11	22.53	0.00	84.20	29.58	273.88	35.06	1473	
12	22.06	0.00	92.72	32.57	301.61	40.49	1473	
13	22.00	0.00	93.81	32.95	305.14	41.19	1473	
		0.00	93.81	26.58	409.88	27.43	7366	
14	21.64	0.00	101.03	28.63	441.42	29.94	6309	
15	21.50	0.00	103.83	29.42	453.67	30.88	6309	
16	21.04	4.51	108.50	30.74	474.10	32.65	6309	
17	20.77	7.16	111.24	31.52	486.04	33.65	6309	
18	20.50	9.81	113.96	32.29	497.95	34.62	6309	
19	20.00	14.71	118.99	33.72	519.93	36.31	6309	
20	19.50	19.62	124.01	35.14	541.83	37.87	6309	
21	19.00	24.52	129.00	36.55	563.65	39.28	6309	
22	18.50	29.43	133.98	37.96	585.42	46.90	6309	
23	18.00	34.34	138.96	39.37	607.15	54.92	6309	
		Total>	173.29	43.75m	412.29	154.14	26985	
24	17.63	Total>	180.69	45.63m	426.86	179.45	27795	
25	17.25	Total>	188.09	47.50m	441.43	205.72	28604	

Node no.	Y coord	RIGHT side					Total earth pressure kN/m ²	Coeff. of subgrade reaction kN/m ³
		Water press. kN/m ²	Vertic -al kN/m ²	Effective Active limit kN/m ²	Effective Passive limit kN/m ²	Earth pressure kN/m ²		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.43	0.00	0.00	0.00	0.00	0.00	0.0	
3	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.75	0.00	0.00	0.00	0.00	0.00	0.0	
5	25.25	0.00	0.00	0.00	0.00	0.00	0.0	
6	24.88	0.00	0.00	0.00	0.00	0.00	0.0	
7	24.50	0.00	0.00	0.00	0.00	0.00	0.0	
8	24.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	23.50	0.00	0.00	0.00	0.00	0.00	0.0	
10	23.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	22.53	0.00	0.00	0.00	0.00	0.00	0.0	

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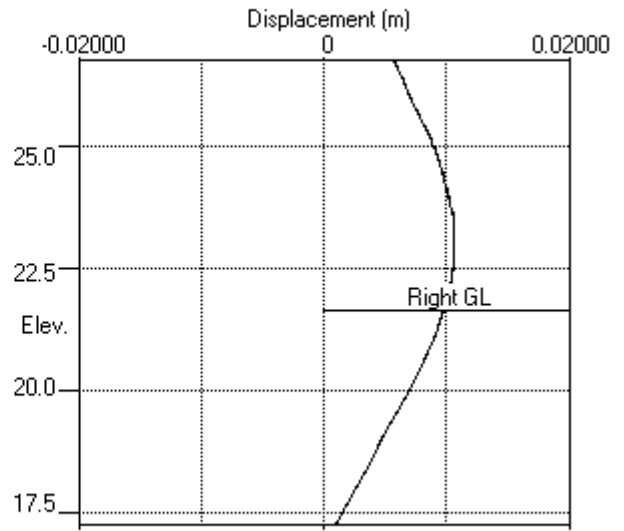
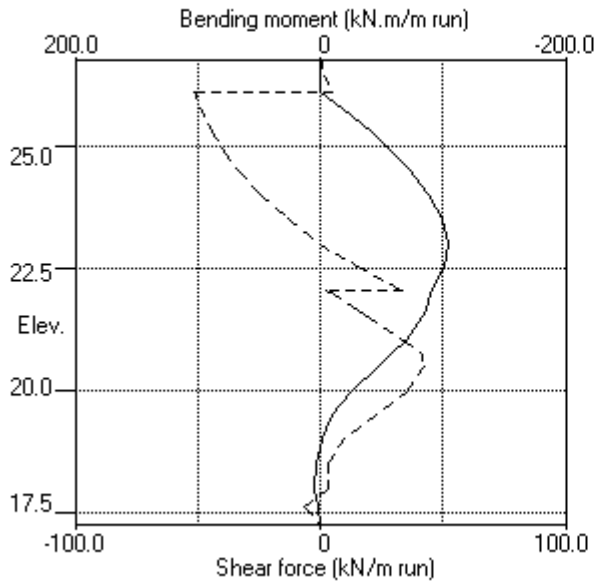
Stage No.10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Earth pressure kN/m2		
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	0.00	1262	
15	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1262	
16	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1262	
		0.00	10.80	3.06	47.19	3.06	3.06a	6309	
17	20.77	0.00	16.20	4.59	70.78	24.83	24.83	6309	
18	20.50	0.00	21.60	6.12	94.38	48.23	48.23	6309	
19	20.00	4.90	26.70	7.56	116.65	70.21	75.12	6309	
20	19.50	9.81	31.79	9.01	138.92	76.20	86.01	6309	
21	19.00	14.71	36.89	10.45	161.19	70.11	84.82	6309	
22	18.50	19.62	41.99	11.90	183.47	64.02	83.64	6309	
23	18.00	24.52	47.09	13.34	205.75	58.01	82.54	6309	
		Total>	71.62	18.20m	310.61	200.03	200.03	26985	
24	17.63	Total>	79.12	20.08m	325.28	183.78	183.78	27795	
25	17.25	Total>	86.63	21.95m	339.96	166.06	166.06	28604	

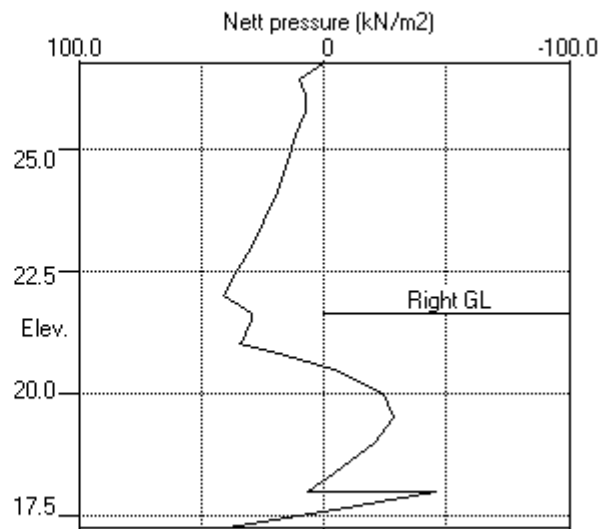
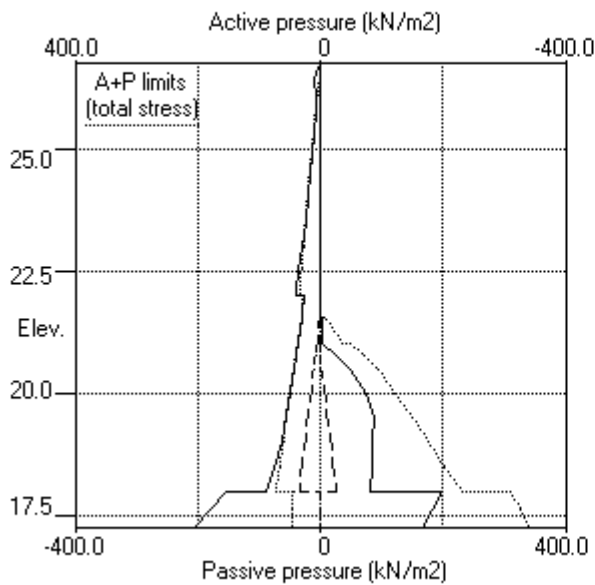
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.10 Change EI of wall to 98960kN.m²/m run



Stage No.10 Change EI of wall to 98960kN.m²/m run



Units: kN,m

Stage No. 13 Apply water pressure profile no.2 (Mod. Conserv.)

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. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.500	Wall Penetr -ation	Direction of failure
13	26.75 21.64			More than one strut.	No FoS calc.		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.005	-2.21E-03	0.0	0.0		98960
2	26.43	10.58	0.006	-2.21E-03	1.7	0.1		98960
3	26.10	7.28	0.007	-2.21E-03	4.6	1.2	71.5	98960
		7.28	0.007	-2.21E-03	-66.8	1.2		
4	25.75	7.90	0.008	-2.17E-03	-64.2	-22.4		98960
5	25.25	14.78	0.009	-1.98E-03	-58.5	-54.3		98960
6	24.88	19.79	0.009	-1.75E-03	-52.0	-75.7		98960
7	24.50	24.72	0.010	-1.44E-03	-43.7	-94.3		98960
8	24.00	31.21	0.011	-9.34E-04	-29.7	-113.9		98960
9	23.50	38.51	0.011	-3.54E-04	-12.3	-125.4		98960
10	23.00	47.30	0.011	2.53E-04	9.2	-127.4		98960
11	22.53	55.83	0.011	8.04E-04	33.4	-118.6		98960
12	22.06	64.59	0.010	1.27E-03	61.7	-97.4	46.7	98960
		64.59	0.010	1.27E-03	15.0	-97.4		
13	22.00	65.72	0.010	1.33E-03	18.9	-96.2		98960
		52.94	0.010	1.33E-03	18.9	-96.2		
14	21.64	57.76	0.010	1.63E-03	38.9	-85.1		98960
		17.21	0.010	1.63E-03	38.9	-85.1		
15	21.50	17.65	0.009	1.73E-03	41.3	-79.2		98960
16	21.04	19.22	0.009	2.02E-03	49.8	-57.3		98960
		19.60	0.009	2.02E-03	49.8	-57.3		
17	20.77	3.59	0.008	2.14E-03	52.9	-42.8		98960
18	20.50	-16.92	0.007	2.23E-03	51.1	-28.1		98960
19	20.00	-35.72	0.006	2.29E-03	38.0	-4.5		98960
20	19.50	-39.30	0.005	2.25E-03	19.2	12.4		98960
21	19.00	-31.58	0.004	2.16E-03	1.5	17.8		98960
22	18.50	-18.20	0.003	2.07E-03	-11.0	16.2		98960
23	18.00	-4.85	0.002	2.00E-03	-16.7	9.1		98960
		10.97	0.002	2.00E-03	-16.7	9.1		
24	17.63	19.92	0.001	1.98E-03	-10.9	3.2		98960

(continued)

Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)

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
25	17.25	38.34	0.000	1.97E-03	0.0	0.0		---
		At elev. 26.10 Strut force =		71.5 kN/strut =		71.5 kN/m run		
		At elev. 22.06 Strut force =		46.7 kN/strut =		46.7 kN/m run		

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	6741
2	26.43	0.00	6.61	2.32	21.50	10.58	10.58	6741
3	26.10	0.00	14.45	5.08	47.00	7.28	7.28	1463
4	25.75	0.00	22.50	7.90	73.18	7.90	7.90a	1463
5	25.25	4.90	28.12	9.88	91.48	9.88	14.78a	1463
6	24.88	8.58	31.90	11.20	103.75	11.20	19.79a	1463
7	24.50	12.26	35.45	12.45	115.32	12.45	24.72a	1463
8	24.00	17.17	39.99	14.05	130.06	14.05	31.21a	1463
9	23.50	22.07	44.37	15.59	144.32	16.44	38.51	1463
10	23.00	26.98	48.65	17.09	158.25	20.32	47.30	1463
11	22.53	31.59	52.61	18.48	171.14	24.25	55.83	1463
12	22.06	36.20	56.52	19.86	183.86	28.39	64.59	1463
13	22.00	36.79	57.02	20.03	185.48	28.94	65.72	1224
		36.79	57.02	16.16	249.15	16.16	52.94a	6122
14	21.64	40.32	60.71	17.20	265.25	17.45	57.76	6122
15	21.50	41.69	62.14	17.61	271.50	18.29	59.98	6122
16	21.04	46.21	66.81	18.93	291.93	21.19	67.39	6122
17	20.77	48.85	69.55	19.71	303.87	22.78	71.63	6122
18	20.50	51.50	72.27	20.48	315.78	24.26	75.76	6122
19	20.00	56.41	77.30	21.90	337.76	26.69	83.10	6122
20	19.50	61.31	82.31	23.32	359.66	28.66	89.97	6122
21	19.00	66.22	87.31	24.74	381.48	30.15	96.37	6122
22	18.50	71.12	92.29	26.15	403.25	37.58	108.70	6122
23	18.00	76.03	97.26	27.56	424.98	45.22	121.24	6122
		76.03	97.26	34.17	316.37	118.43	194.45	13209
24	17.63	79.71	100.99	35.47	328.49	139.56	219.26	13606
25	17.25	83.39	104.71	36.78	340.58	161.59	244.97	14002

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		40.32	0.68	0.24	2.21	0.24	40.56a	1224

(continued)

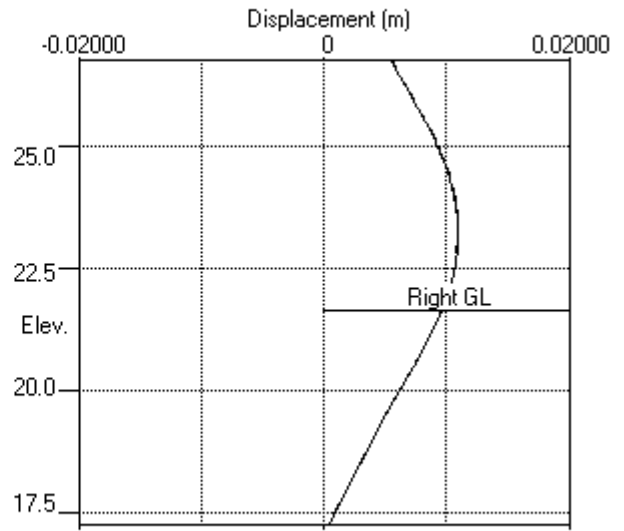
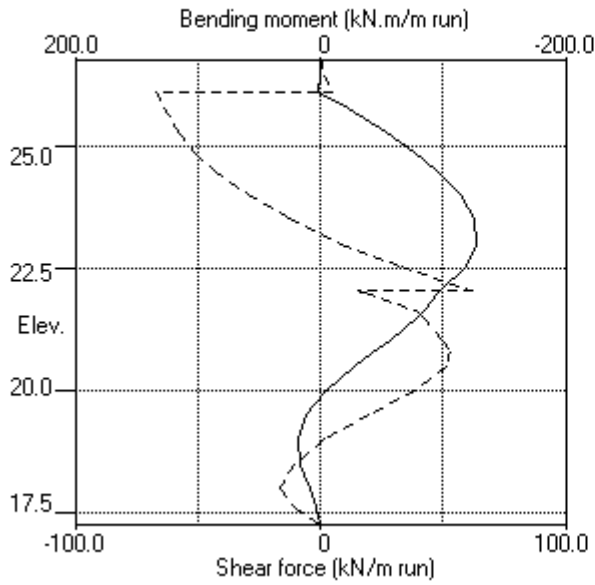
Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
15	21.50	41.69	1.82	0.64	5.93	0.64	42.33a	1224
16	21.04	46.21	5.59	1.96	18.18	1.96	48.17a	1224
		46.21	5.59	1.58	24.42	1.58	47.79a	6122
17	20.77	48.85	8.33	2.36	36.41	19.19	68.04	6122
18	20.50	51.50	11.07	3.14	48.37	41.18	92.68	6122
19	20.00	56.41	16.11	4.57	70.41	62.41	118.82	6122
20	19.50	61.31	21.12	5.98	92.27	67.96	129.27	6122
21	19.00	66.22	26.07	7.39	113.92	61.73	127.95	6122
22	18.50	71.12	30.97	8.78	135.34	55.78	126.90	6122
23	18.00	76.03	35.82	10.15	156.49	50.06	126.09	6122
		76.03	35.82	12.58	116.50	107.46	183.49	13209
24	17.63	79.71	39.41	13.84	128.18	119.64	199.35	13606
25	17.25	83.39	42.97	15.09	139.76	123.25	206.63	14002

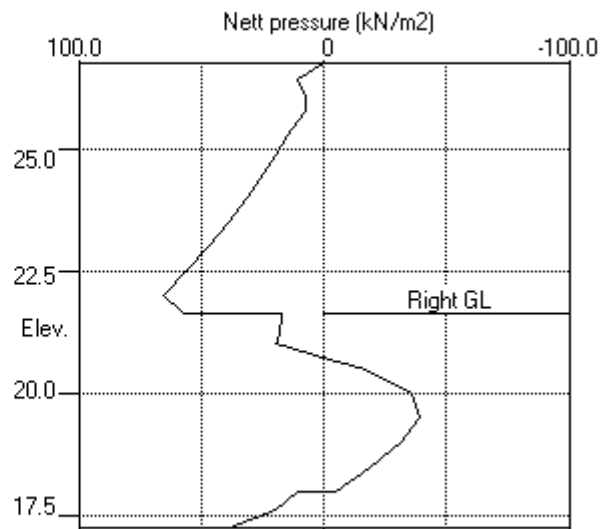
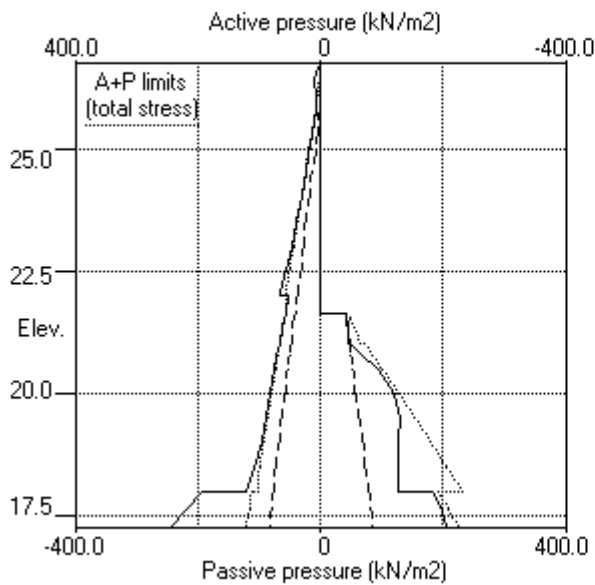
Note: 47.79a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)



Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)



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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

 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.		Strut Elev.	FoS for toe elev. = 17.25		Toe elev. for FoS = 1.500		Direction of failure
	Act.	Pass.		Factor of Safety	Moment at elev.	Toe elev.	Wall Penetration	
1	26.75	26.75	Cant.	Conditions not suitable for FoS calc.				
2	26.75	25.25	Cant.	3.609	18.01	22.25	3.00	L to R
3	26.75	25.25		No analysis at this stage				
4	26.75	25.25	25.75	8.561	n/a	24.39	0.86	L to R
5	26.75	21.04	25.75	1.875	n/a	17.65	3.39	L to R
6	26.75	21.64	25.75	2.191	n/a	18.18	3.46	L to R
7	26.75	21.64		No analysis at this stage				

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

PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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				Shear force			
		max. m	min. m	Calculated		Factored		Calculated		Factored	
				max. kN.m/m	min. kN.m/m	max. kN.m/m	min. kN.m/m	max. kN/m	min. kN/m	max. kN/m	min. kN/m
1	26.75	0.008	0.000	0	0	0	0	0	0	0	0
2	26.43	0.008	0.000	0	0	0	0	2	-0	2	-0
3	26.10	0.007	0.000	1	-0	2	-0	5	-67	6	-90
4	25.75	0.008	0.000	3	-22	4	-30	7	-67	10	-91
5	25.25	0.009	0.000	4	-54	6	-73	9	-62	12	-84
6	24.88	0.009	0.000	8	-76	11	-102	10	-58	13	-78
7	24.50	0.010	0.000	12	-94	16	-127	8	-52	11	-70
8	24.00	0.011	0.000	16	-114	21	-154	7	-43	10	-58
9	23.50	0.011	0.000	19	-125	26	-169	7	-31	9	-42
10	23.00	0.011	0.000	23	-127	31	-172	9	-18	12	-24
11	22.53	0.011	0.000	26	-132	36	-178	33	-2	45	-3
12	22.06	0.010	0.000	31	-129	42	-174	62	0	83	0
13	22.00	0.010	0.000	32	-128	43	-173	19	0	26	0
14	21.64	0.010	0.000	34	-120	46	-162	39	0	52	0
15	21.50	0.010	0.000	35	-116	47	-156	41	-1	56	-1
16	21.04	0.009	0.000	34	-98	46	-132	50	-7	67	-10
17	20.77	0.009	0.000	33	-84	44	-114	54	-10	72	-13
18	20.50	0.008	0.000	31	-70	41	-94	55	-11	74	-15
19	20.00	0.007	0.000	25	-44	34	-59	47	-12	63	-16
20	19.50	0.006	0.000	20	-22	26	-30	33	-12	44	-16
21	19.00	0.005	0.000	18	-10	24	-13	19	-11	26	-15
22	18.50	0.004	0.000	16	-2	22	-3	11	-11	15	-15
23	18.00	0.003	0.000	9	0	12	0	10	-17	14	-23
24	17.63	0.002	0.000	3	0	4	0	0	-11	0	-15
25	17.25	0.001	0.000	0	-0	0	-0	0	0	0	0

Summary of results (continued)

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

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	Calculated		Factored		Calculated		Factored	
min.	max. elev.	min. elev.	max. elev.	max. elev.	min. elev.	max. elev.	min. elev.	max. elev.
	kN.m/m	kN.m/m	kN.m/m	kN/m	kN/m	kN/m	kN/m	kN/m
1	20.77	-2 24.00	3 -2	3 22.00	-1 25.25	4		
-1	35 21.50	-0 17.25	47 -0	11 22.00	-12 19.50	15		
-16	No calculation at this stage							
3	32 21.50	0 26.75	43 0	10 22.00	-12 20.00	14		
-16	3 25.75	-132 22.53	4 -178	55 20.50	-67 25.75	74		
-91	3 25.75	-130 22.53	4 -176	55 20.50	-67 25.75	74		
-91	No calculation at this stage							
8	No calculation at this stage							
9	3 18.00	-127 22.53	4 -172	53 20.50	-61 26.10	71		
-83	5 18.00	-103 23.00	6 -140	43 20.50	-52 26.10	57		
-70	No calculation at this stage							
11	No calculation at this stage							
12	18 19.00	-127 23.00	24 -172	62 22.06	-67 26.10	83		
-90								

Maximum and minimum displacement at each stage

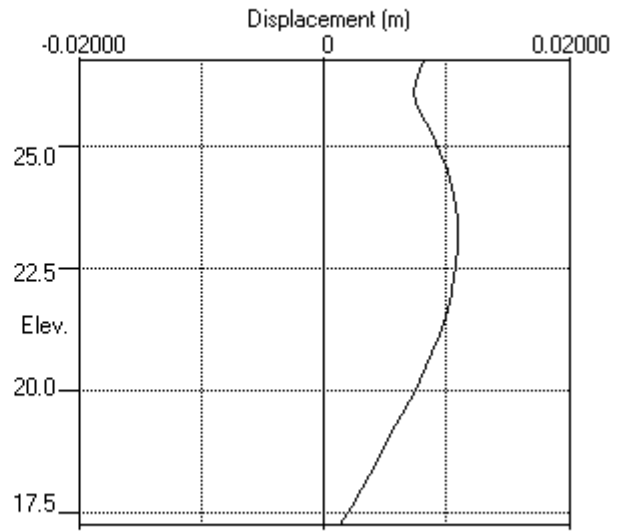
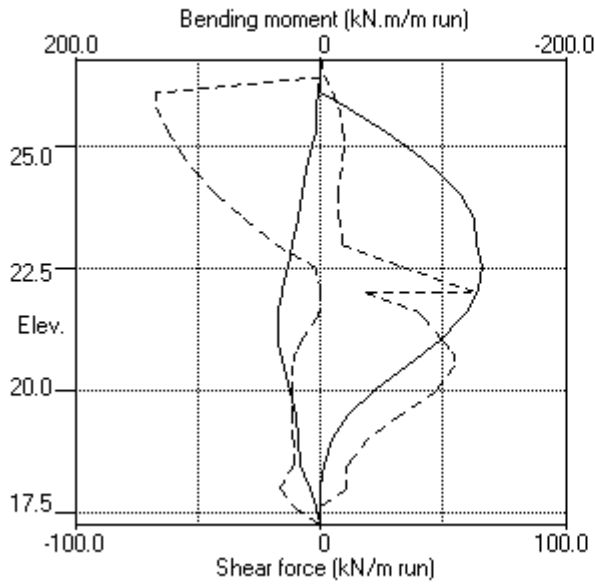
Stage no.	Displacement				Stage description
	maximum elev.	minimum elev.	maximum elev.	minimum elev.	
	m	m	m	m	
1	0.001 26.75	0.000 26.75	26.75	26.75	Apply surcharge no.1 at elev. 26.75
2	0.008 26.75	0.000 26.75	26.75	26.75	Excav. to elev. 25.25 on RIGHT side
3	No calculation at this stage				Install strut no.1 at elev. 25.75
4	0.008 26.75	0.000 26.75	26.75	26.75	Apply water pressure profile no.1
5	0.011 22.53	0.000 26.75	26.75	26.75	Excav. to elev. 21.04 on RIGHT side
6	0.010 23.00	0.000 26.75	26.75	26.75	Fill to elev. 21.64 on RIGHT side
7	No calculation at this stage				Install strut no.2 at elev. 22.06
8	No calculation at this stage				Install strut no.3 at elev. 26.10
9	0.011 23.00	0.000 26.75	26.75	26.75	Remove strut no.1 at elev. 25.75
10	0.011 23.00	0.000 26.75	26.75	26.75	Change EI of wall to 98960kN.m ² /m run
11	No calculation at this stage				Change soil type 3 to soil type 4
12	No calculation at this stage				Apply surcharge no.2 at elev. 21.64
13	0.011 23.00	0.000 26.75	26.75	26.75	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1			Strut no. 2			Strut no. 3		
	at elev. 25.75			at elev. 22.06			at elev. 26.10		
	--Calculated--	Factored	Factored	--Calculated--	Factored	Factored	--Calculated--	Factored	Factored
	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut
4	0	2	3	---	---	---	---	---	---
5	74	372	503	---	---	---	---	---	---
6	74	371	500	---	---	---	---	---	---
9	---	---	---	10	10	14	66	66	89
10	---	---	---	31	31	41	56	56	76
13	---	---	---	47	47	63	71	71	96

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

1-ULS1

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	26.75	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES (Unfactored SLS soil strengths)

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 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

	Left side	Right side
Initial water table elevation	21.50	21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
	2	1	25.75	25.75	0.0	1	21.64	21.64
2						21.64	25.75	40.3

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 17.25
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge Near edge Far edge	Surcharge kN/m ² -----	----- soil type	Partial factor/ Category
1	26.75	0.50(L)	20.00	20.00	10.00	=	N/A	1.10 Var
2	21.64	-0.00(R)	20.00	20.00	41.00	=	N/A	1.00 P/F

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 26.75
2	Excavate to elevation 25.25 on RIGHT side
3	Install strut or anchor no.1 at elevation 25.75
4	Apply water pressure profile no.1 (Mod. Conserv.)
5	Excavate to elevation 20.56 on RIGHT side
6	Fill to elevation 21.64 on RIGHT side with soil type 1
7	Install strut or anchor no.2 at elevation 22.06
8	Install strut or anchor no.3 at elevation 26.10
9	Remove strut or anchor no.1 at elevation 25.75
10	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
11	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
12	Apply surcharge no.2 at elevation 21.64 No analysis at this stage
13	Apply water pressure profile no.2 (Mod. Conserv.)

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 1
 Water pressures : Moderately Conservative
 Partial factor on C' = 1.000
 Partial factor on Phi' = 1.000
 Partial factor on Cu = 1.000
 Partial factor on Soil Modulus = 1.000
 Partial factor on Permanent Unfavourable loads = 1.000
 Partial factor on Permanent Favourable loads = 1.000
 Partial factor on Variable Unfavourable loads = 1.100
 Design factor on calculated Bending Moments = 1.350

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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m

Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m

Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 26.75	No	No	No
2	Excav. to elev. 25.25 on RIGHT side	Yes	Yes	Yes
3	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
4	Apply water pressure profile no.1	Yes	Yes	Yes
5	Excav. to elev. 20.56 on RIGHT side	Yes	Yes	Yes
6	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
7	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
8	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
9	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
10	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
11	Change soil type 3 to soil type 4	Yes	Yes	Yes
12	Apply surcharge no.2 at elev. 21.64	Yes	Yes	Yes
13	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 26.75

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.001	8.54E-05	0.0	0.0		138544
2	26.43	-1.87	0.001	8.54E-05	-0.3	0.0		138544
3	26.10	-1.08	0.001	8.56E-05	-0.8	-0.2		138544
4	25.75	-0.38	0.001	8.65E-05	-1.0	-0.5		138544
5	25.25	0.28	0.001	8.93E-05	-1.1	-1.1		138544
6	24.88	0.60	0.001	9.26E-05	-0.9	-1.4		138544
7	24.50	0.86	0.001	9.69E-05	-0.6	-1.7		138544
8	24.00	1.12	0.001	1.03E-04	-0.1	-1.9		138544
9	23.50	1.34	0.001	1.10E-04	0.5	-1.8		138544
10	23.00	1.53	0.001	1.16E-04	1.2	-1.4		138544
11	22.53	1.69	0.001	1.19E-04	2.0	-0.7		138544
12	22.06	1.83	0.001	1.20E-04	2.8	0.4		138544
13	22.00	1.85	0.001	1.19E-04	2.9	0.6		138544
		-2.96	0.001	1.19E-04	2.9	0.6		
14	21.64	-2.50	0.001	1.17E-04	1.9	1.4		138544
15	21.50	-2.33	0.001	1.15E-04	1.6	1.7		138544
16	21.03	-1.77	0.000	1.09E-04	0.6	2.2		138544
17	20.56	-1.26	0.000	1.01E-04	-0.1	2.3		138544
18	20.50	-1.20	0.000	1.00E-04	-0.2	2.2		138544
19	20.00	-0.72	0.000	9.31E-05	-0.7	2.0		138544
20	19.50	-0.28	0.000	8.66E-05	-0.9	1.6		138544
21	19.00	0.13	0.000	8.17E-05	-0.9	1.1		138544
22	18.50	0.51	0.000	7.86E-05	-0.8	0.6		138544
23	18.00	0.87	0.000	7.69E-05	-0.4	0.3		138544
		-0.43	0.000	7.69E-05	-0.4	0.3		
24	17.63	0.56	0.000	7.63E-05	-0.4	0.1		138544
25	17.25	1.63	0.000	7.61E-05	0.0	0.0		---

Node no.	Y coord	----- LEFT side -----						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		----- Effective stresses -----							
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2			
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1052	
2	26.43	0.00	6.69	2.35	21.75	2.58	2.58	1052	
3	26.10	0.00	14.72	5.17	47.89	6.71	6.71	1052	
4	25.75	0.00	22.95	8.06	74.64	11.02	11.02	1052	
5	25.25	0.00	33.63	11.81	109.39	16.82	16.82	1052	
6	24.88	0.00	41.15	14.46	133.86	21.01	21.01	1052	
7	24.50	0.00	48.44	17.01	157.55	25.12	25.12	1052	
8	24.00	0.00	57.92	20.34	188.39	30.53	30.53	1052	

(continued)

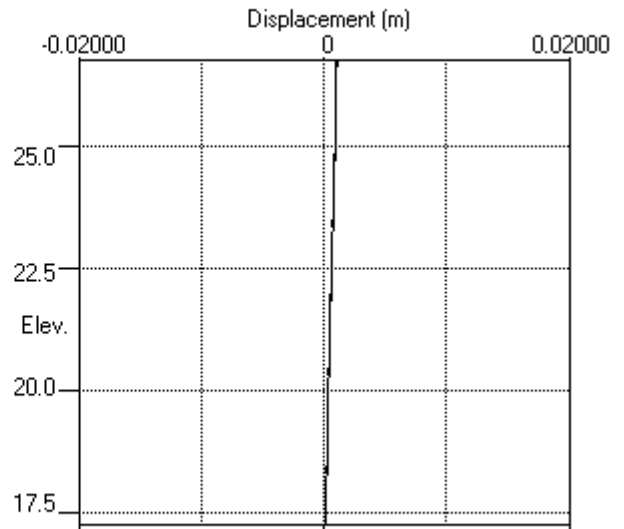
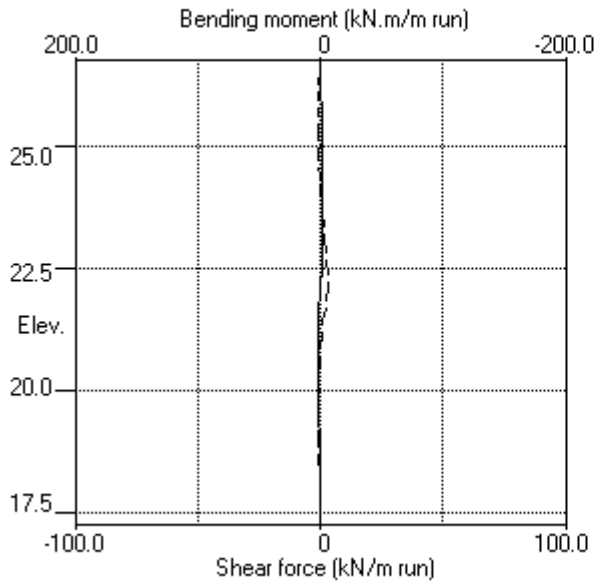
Stage No.1 Apply surcharge no.1 at elevation 26.75

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
9	23.50	0.00	67.24	23.62	218.70	35.88	1052	
10	23.00	0.00	76.44	26.85	248.65	41.20	1052	
11	22.53	0.00	85.02	29.87	276.56	46.18	1052	
12	22.06	0.00	93.55	32.86	304.31	51.15	1052	
13	22.00	0.00	94.64	33.24	307.84	51.78	1052	
		0.00	94.64	26.81	413.51	42.80	5261	
14	21.64	0.00	101.86	28.86	445.06	46.63	5261	
15	21.50	0.00	104.66	29.65	457.30	48.11	5261	
16	21.03	4.61	109.44	31.01	478.17	50.78	5261	
17	20.56	9.22	114.19	32.35	498.92	53.42	5261	
18	20.50	9.81	114.79	32.52	501.56	53.76	5261	
19	20.00	14.71	119.81	33.95	523.51	56.54	5261	
20	19.50	19.62	124.82	35.37	545.37	59.29	5261	
21	19.00	24.52	129.80	36.78	567.16	62.02	5261	
22	18.50	29.43	134.77	38.19	588.88	64.74	5261	
23	18.00	34.34	139.73	39.59	610.55	67.45	5261	
		Total>	174.07	43.75m	413.10	208.75	23008	
24	17.63	Total>	181.46	45.63m	427.66	217.84	23698	
25	17.25	Total>	188.85	47.50m	442.22	226.97	24388	

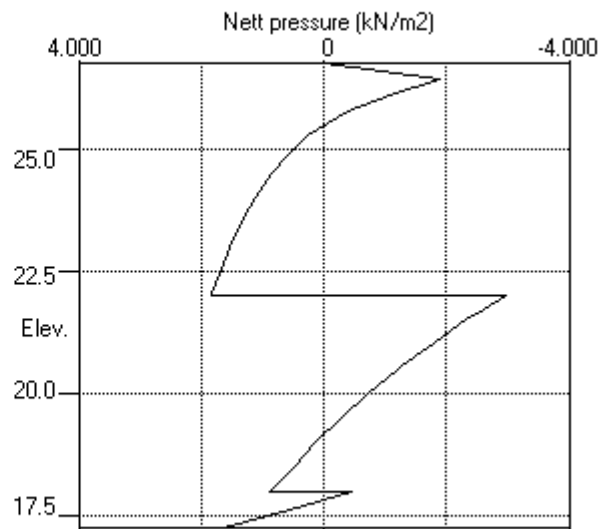
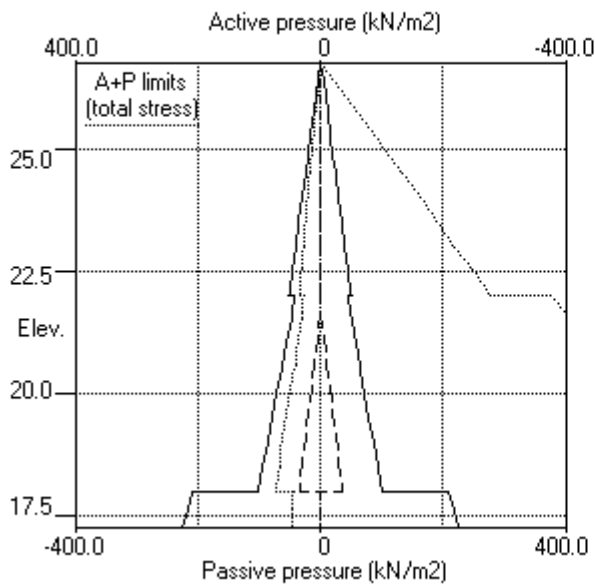
Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	1052	
2	26.43	0.00	5.85	2.05	19.03	4.45	1052	
3	26.10	0.00	11.70	4.11	38.06	7.80	1052	
4	25.75	0.00	18.00	6.32	58.55	11.40	1052	
5	25.25	0.00	27.00	9.48	87.82	16.55	1052	
6	24.88	0.00	33.75	11.86	109.78	20.41	1052	
7	24.50	0.00	40.50	14.23	131.74	24.26	1052	
8	24.00	0.00	49.50	17.39	161.01	29.40	1052	
9	23.50	0.00	58.50	20.55	190.29	34.54	1052	
10	23.00	0.00	67.50	23.71	219.56	39.67	1052	
11	22.53	0.00	75.96	26.68	247.08	44.50	1052	
12	22.06	0.00	84.42	29.65	274.60	49.32	1052	
13	22.00	0.00	85.50	30.03	278.11	49.93	1052	
		0.00	85.50	24.23	373.58	45.75	5261	
14	21.64	0.00	92.70	26.27	405.04	49.13	5261	
15	21.50	0.00	95.50	27.06	417.28	50.44	5261	
16	21.03	4.61	100.29	28.42	438.20	52.56	5261	
17	20.56	9.22	105.08	29.77	459.13	54.69	5261	
18	20.50	9.81	105.69	29.95	461.80	54.96	5261	
19	20.00	14.71	110.79	31.39	484.06	57.26	5261	
20	19.50	19.62	115.88	32.83	506.32	59.57	5261	
21	19.00	24.52	120.98	34.28	528.58	61.89	5261	
22	18.50	29.43	126.07	35.72	550.85	64.23	5261	
23	18.00	34.34	131.17	37.16	573.11	66.57	5261	
		Total>	165.50	43.75m	404.53	209.18	23008	
24	17.63	Total>	173.00	45.63m	419.20	217.28	23698	
25	17.25	Total>	180.50	47.50m	433.87	225.34	24388	

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 26.75



Stage No.1 Apply surcharge no.1 at elev. 26.75



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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 25.25 on RIGHT side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.008	1.35E-03	0.0	-0.0		138544
2	26.43	2.35	0.008	1.35E-03	0.4	0.1		138544
3	26.10	5.17	0.007	1.35E-03	1.6	0.4		138544
4	25.75	8.06	0.007	1.35E-03	3.9	1.3		138544
5	25.25	11.81	0.006	1.34E-03	8.9	4.4		138544
6	24.88	-4.80	0.006	1.32E-03	10.2	8.4		138544
7	24.50	-3.49	0.005	1.29E-03	8.6	12.0		138544
8	24.00	-1.45	0.005	1.24E-03	7.4	15.9		138544
9	23.50	0.45	0.004	1.18E-03	7.2	19.5		138544
10	23.00	2.20	0.003	1.10E-03	7.8	23.1		138544
11	22.53	3.70	0.003	1.02E-03	9.2	27.0		138544
12	22.06	5.06	0.002	9.23E-04	11.3	31.8		138544
13	22.00	5.22	0.002	9.09E-04	11.6	32.4		138544
		-22.08	0.002	9.09E-04	11.6	32.4		
14	21.64	-17.55	0.002	8.21E-04	4.4	35.2		138544
15	21.50	-15.93	0.002	7.86E-04	2.1	35.6		138544
16	21.03	-11.02	0.002	6.66E-04	-4.2	34.9		138544
17	20.56	-6.93	0.001	5.53E-04	-8.4	31.7		138544
18	20.50	-6.47	0.001	5.40E-04	-8.8	31.1		138544
19	20.00	-3.03	0.001	4.37E-04	-11.2	25.9		138544
20	19.50	-0.30	0.001	3.54E-04	-12.1	19.9		138544
21	19.00	1.91	0.001	2.93E-04	-11.7	13.8		138544
22	18.50	3.74	0.001	2.53E-04	-10.2	8.3		138544
23	18.00	5.34	0.000	2.32E-04	-8.0	3.6		138544
		6.43	0.000	2.32E-04	-8.0	3.6		
24	17.63	10.58	0.000	2.26E-04	-4.8	1.1		138544
25	17.25	14.94	0.000	2.24E-04	0.0	0.0		---

Node no.	Y coord	----- LEFT side -----						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		----- Effective stresses -----							
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2			
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1412	
2	26.43	0.00	6.69	2.35	21.75	2.35	2.35a	1412	
3	26.10	0.00	14.72	5.17	47.89	5.17	5.17a	1412	
4	25.75	0.00	22.95	8.06	74.64	8.06	8.06a	1412	
5	25.25	0.00	33.63	11.81	109.39	11.81	11.81a	1412	
6	24.88	0.00	41.15	14.46	133.86	14.46	14.46a	1412	
7	24.50	0.00	48.44	17.01	157.55	18.88	18.88	1412	
8	24.00	0.00	57.92	20.34	188.39	25.12	25.12	1412	

(continued)

Stage No.2 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
9	23.50	0.00	67.24	23.62	218.70	31.26	1412	
10	23.00	0.00	76.44	26.85	248.65	37.31	1412	
11	22.53	0.00	85.02	29.87	276.56	42.92	1412	
12	22.06	0.00	93.55	32.86	304.31	48.45	1412	
13	22.00	0.00	94.64	33.24	307.84	49.15	1412	
		0.00	94.64	26.81	413.51	29.66	7059	
14	21.64	0.00	101.86	28.86	445.06	35.39	7059	
15	21.50	0.00	104.66	29.65	457.30	37.56	7059	
16	21.03	4.61	109.44	31.01	478.17	42.26	7059	
17	20.56	9.22	114.19	32.35	498.92	46.58	7059	
18	20.50	9.81	114.79	32.52	501.56	47.10	7059	
19	20.00	14.71	119.81	33.95	523.51	51.26	7059	
20	19.50	19.62	124.82	35.37	545.37	55.08	7059	
21	19.00	24.52	129.80	36.78	567.16	58.65	7059	
22	18.50	29.43	134.77	38.19	588.88	62.05	7059	
23	18.00	34.34	139.73	39.59	610.55	65.33	7059	
		Total>	174.07	43.75m	413.10	199.80	29869	
24	17.63	Total>	181.46	45.63m	427.66	210.38	30765	
25	17.25	Total>	188.85	47.50m	442.22	221.06	31661	

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.43	0.00	0.00	0.00	0.00	0.00	0.0	
3	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.75	0.00	0.00	0.00	0.00	0.00	0.0	
5	25.25	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	1611	
6	24.88	0.00	6.75	2.37	21.96	19.26	1611	
7	24.50	0.00	13.50	4.74	43.91	22.38	1611	
8	24.00	0.00	22.50	7.90	73.19	26.57	1611	
9	23.50	0.00	31.50	11.07	102.46	30.81	1611	
10	23.00	0.00	40.50	14.23	131.74	35.11	1611	
11	22.53	0.00	48.96	17.20	159.26	39.22	1611	
12	22.06	0.00	57.42	20.17	186.78	43.39	1611	
13	22.00	0.00	58.50	20.55	190.30	43.93	1611	
		0.00	58.50	16.58	255.62	51.74	8054	
14	21.64	0.00	65.70	18.62	287.09	52.95	8054	
15	21.50	0.00	68.50	19.41	299.32	53.48	8054	
16	21.03	4.61	73.30	20.77	320.26	57.89	8054	
17	20.56	9.22	78.09	22.13	341.20	62.73	8054	
18	20.50	9.81	78.70	22.30	343.87	63.38	8054	
19	20.00	14.71	83.80	23.74	366.15	69.00	8054	
20	19.50	19.62	88.90	25.19	388.42	75.00	8054	
21	19.00	24.52	94.00	26.63	410.71	81.27	8054	
22	18.50	29.43	99.10	28.08	432.99	87.74	8054	
23	18.00	34.34	104.20	29.52	455.28	94.33	8054	
		Total>	138.53	36.25m	377.55	193.38	33721	
24	17.63	Total>	146.04	38.13m	392.23	199.80	34732	
25	17.25	Total>	153.55	40.00m	406.91	206.11	35744	

Run ID. Fitzrovia_Wall_1_600mm_rev_03_ULS1
Fitzrovia - Middlesex Hospital Annexe
Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

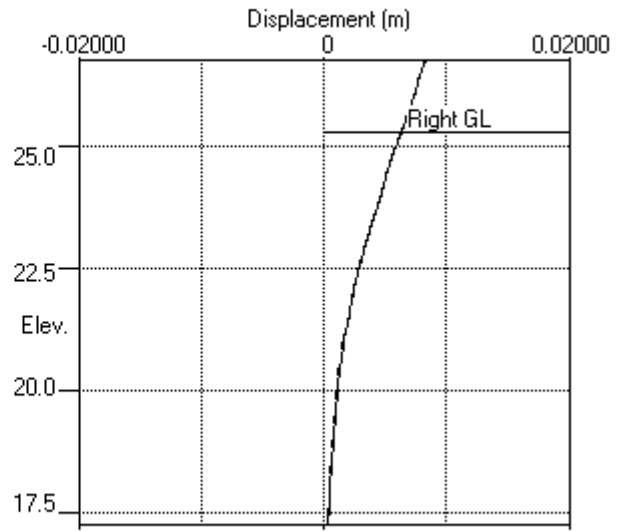
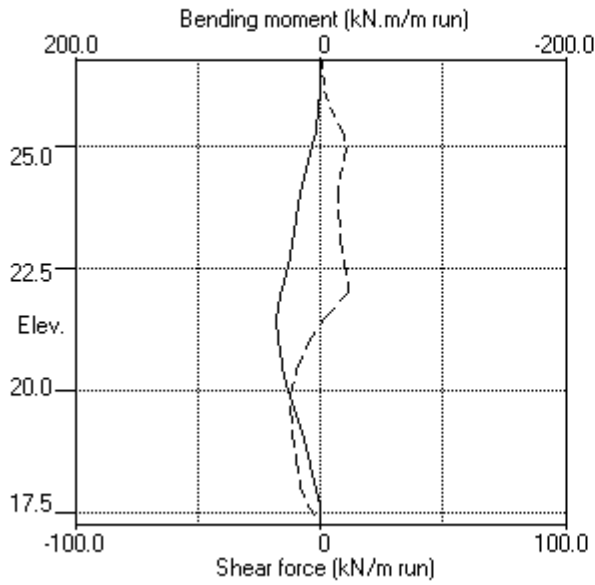
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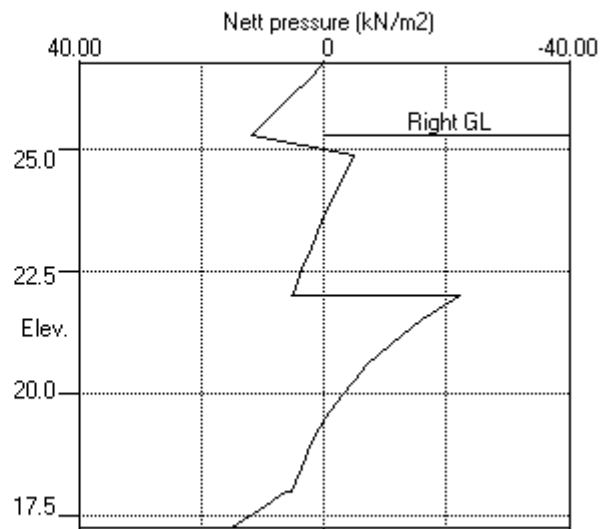
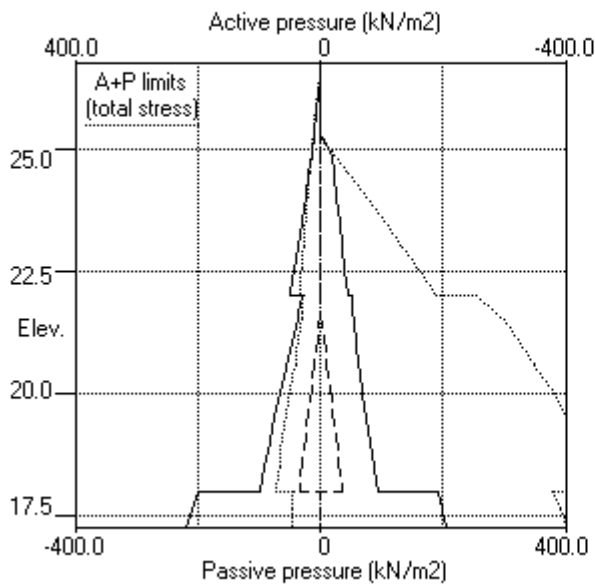
Stage No.2 Excavate to elevation 25.25 on RIGHT side
Note: 14.46a Soil pressure at active limit
123.45p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 25.25 on RIGHT side



Stage No.2 Excav. to elev. 25.25 on RIGHT side



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Apply water pressure profile no.1 (Mod. Conserv.)

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.008	1.27E-03	0.0	-0.0		138544
2	26.43	2.58	0.008	1.27E-03	0.4	0.1		138544
3	26.10	5.29	0.007	1.27E-03	1.7	0.4		138544
4	25.75	8.06	0.007	1.27E-03	4.0	1.4	0.4	138544
		8.06	0.007	1.27E-03	3.6	1.4		
5	25.25	11.81	0.006	1.26E-03	8.6	4.4		138544
6	24.88	-4.87	0.006	1.24E-03	9.9	8.2		138544
7	24.50	-3.69	0.005	1.22E-03	8.3	11.7		138544
8	24.00	-1.72	0.005	1.17E-03	7.0	15.4		138544
9	23.50	0.11	0.004	1.11E-03	6.6	18.7		138544
10	23.00	1.79	0.004	1.03E-03	7.0	22.0		138544
11	22.53	3.23	0.003	9.56E-04	8.2	25.5		138544
12	22.06	4.53	0.003	8.63E-04	10.0	29.7		138544
13	22.00	4.68	0.003	8.50E-04	10.3	30.3		138544
		-24.77	0.003	8.50E-04	10.3	30.3		
14	21.64	-20.44	0.002	7.68E-04	2.2	32.4		138544
15	21.50	-18.88	0.002	7.35E-04	-0.6	32.5		138544
16	21.03	-11.10	0.002	6.29E-04	-7.6	30.3		138544
17	20.56	-4.07	0.002	5.34E-04	-11.2	25.6		138544
18	20.50	-3.22	0.002	5.23E-04	-11.4	24.9		138544
19	20.00	0.19	0.001	4.44E-04	-12.2	18.8		138544
20	19.50	3.02	0.001	3.87E-04	-11.4	12.7		138544
21	19.00	5.45	0.001	3.51E-04	-9.3	7.4		138544
22	18.50	7.61	0.001	3.31E-04	-6.0	3.5		138544
23	18.00	9.62	0.001	3.23E-04	-1.7	1.4		138544
		-3.22	0.001	3.23E-04	-1.7	1.4		
24	17.63	2.17	0.001	3.20E-04	-1.9	0.6		138544
25	17.25	7.88	0.000	3.19E-04	0.0	0.0		---

At elev. 25.75 Strut force = 2.0 kN/strut = 0.4 kN/m run

Node no.	Y coord	LEFT side						
		Effective stresses					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	4693
2	26.43	0.00	6.69	2.35	21.75	2.58	2.58	4693
3	26.10	0.00	14.72	5.17	47.89	5.29	5.29	4693
4	25.75	0.00	22.95	8.06	74.64	8.06	8.06a	961
5	25.25	0.00	33.63	11.81	109.39	11.81	11.81a	961
6	24.88	0.00	41.15	14.46	133.86	14.46	14.46a	961

(continued)

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
7	24.50	0.00	48.44	17.01	157.55	18.79	18.79	961
8	24.00	0.00	57.92	20.34	188.39	24.99	24.99	961
9	23.50	0.00	67.24	23.62	218.70	31.09	31.09	961
10	23.00	0.00	76.44	26.85	248.65	37.11	37.11	961
11	22.53	0.00	85.02	29.87	276.56	42.68	42.68	961
12	22.06	0.00	93.55	32.86	304.31	48.19	48.19	961
13	22.00	0.00	94.64	33.24	307.84	48.88	48.88	961
		0.00	94.64	26.81	413.51	28.32	28.32	4807
14	21.64	0.00	101.86	28.86	445.06	33.95	33.95	4807
15	21.50	0.00	104.66	29.65	457.30	36.08	36.08	4807
16	21.03	4.61	109.44	31.01	478.17	40.68	45.29	4807
17	20.56	9.22	114.19	32.35	498.92	44.93	54.15	4807
18	20.50	9.81	114.79	32.52	501.56	45.45	55.26	4807
19	20.00	14.71	119.81	33.95	523.51	49.60	64.31	4807
20	19.50	19.62	124.82	35.37	545.37	53.47	73.09	4807
21	19.00	24.52	129.80	36.78	567.16	57.15	81.68	4807
22	18.50	29.43	134.77	38.19	588.88	60.71	90.14	4807
23	18.00	34.34	139.73	39.59	610.55	64.20	98.54	4807
		Total>	174.07	43.75m	413.10	194.79	194.79	21320
24	17.63	Total>	181.46	45.63m	427.66	205.98	205.98	21959
25	17.25	Total>	188.85	47.50m	442.22	217.33	217.33	22599

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	961
6	24.88	0.00	6.75	2.37	21.96	19.33	19.33	961
7	24.50	0.00	13.50	4.74	43.91	22.47	22.47	961
8	24.00	0.00	22.50	7.90	73.19	26.71	26.71	961
9	23.50	0.00	31.50	11.07	102.46	30.98	30.98	961
10	23.00	0.00	40.50	14.23	131.74	35.32	35.32	961
11	22.53	0.00	48.96	17.20	159.26	39.45	39.45	961
12	22.06	0.00	57.42	20.17	186.78	43.66	43.66	961
13	22.00	0.00	58.50	20.55	190.30	44.20	44.20	961
		0.00	58.50	16.58	255.62	53.08	53.08	4807
14	21.64	0.00	65.70	18.62	287.09	54.39	54.39	4807
15	21.50	0.00	68.50	19.41	299.32	54.96	54.96	4807
16	21.03	0.00	77.91	22.07	340.40	56.40	56.40	4807
17	20.56	0.00	87.31	24.74	381.49	58.22	58.22	4807
18	20.50	0.00	88.51	25.08	386.73	58.48	58.48	4807
19	20.00	4.90	93.61	26.52	409.01	59.22	64.12	4807
20	19.50	9.81	98.71	27.97	431.29	60.26	70.07	4807
21	19.00	14.71	103.81	29.41	453.57	61.52	76.23	4807
22	18.50	19.62	108.91	30.86	475.86	62.92	82.54	4807
23	18.00	24.52	114.01	32.30	498.15	64.40	88.92	4807
		Total>	138.53	36.25m	377.56	198.00	198.00	21320
24	17.63	Total>	146.04	38.13m	392.23	203.81	203.81	21959

Run ID. Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

| Sheet No.
 | Date:12-06-2020
 | Checked :

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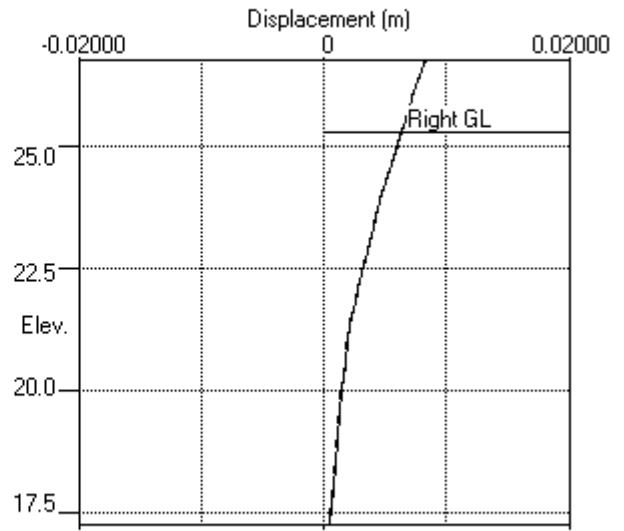
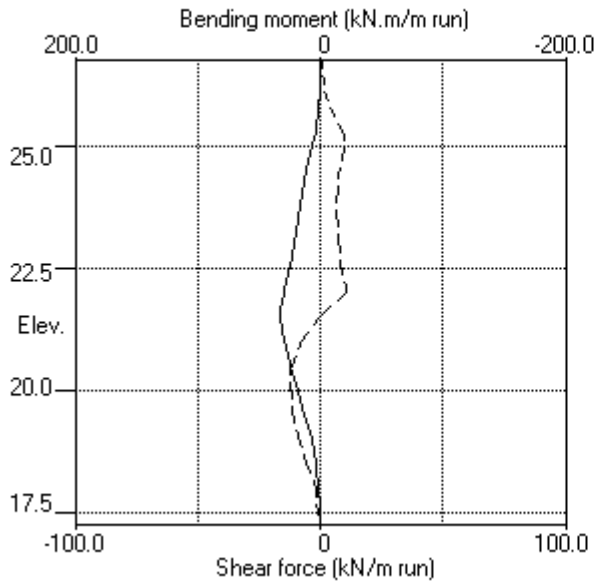
Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
25	17.25	Total>	153.55	40.00m	406.91	209.45	209.45	22599

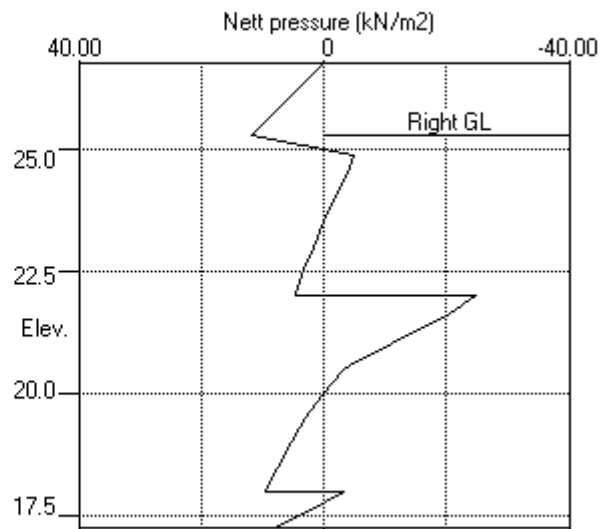
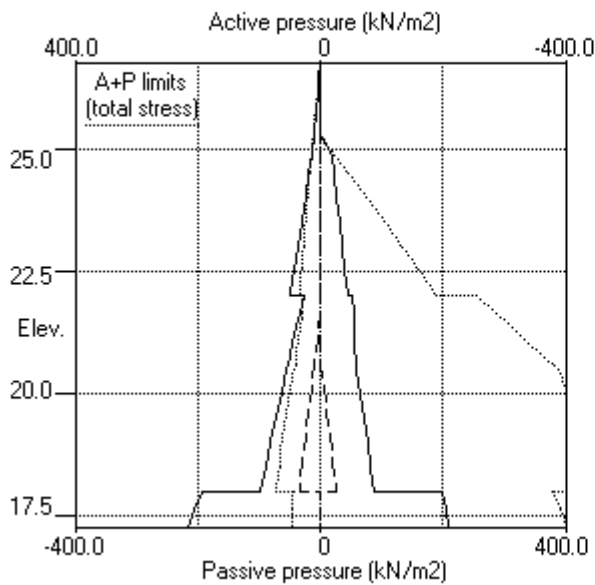
Note: 14.46a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)



Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)



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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 5 Excavate to elevation 20.56 on RIGHT side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DAI Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.005	-2.68E-03	0.0	-0.0		138544
2	26.43	12.90	0.006	-2.68E-03	2.1	0.1		138544
3	26.10	8.79	0.007	-2.68E-03	5.6	1.5		138544
4	25.75	8.06	0.008	-2.69E-03	8.6	4.1	89.6	138544
		8.06	0.008	-2.69E-03	-81.1	4.1		
5	25.25	11.81	0.009	-2.63E-03	-76.1	-35.3		138544
6	24.88	14.46	0.010	-2.50E-03	-71.2	-62.8		138544
7	24.50	17.01	0.011	-2.29E-03	-65.3	-88.3		138544
8	24.00	20.34	0.012	-1.92E-03	-55.9	-118.7		138544
9	23.50	23.62	0.013	-1.45E-03	-44.9	-144.1		138544
10	23.00	27.47	0.013	-8.97E-04	-32.2	-163.1		138544
11	22.53	32.29	0.014	-3.24E-04	-18.1	-175.0		138544
12	22.06	37.36	0.014	2.77E-04	-1.8	-179.8		138544
13	22.00	38.02	0.014	3.55E-04	0.5	-179.9		138544
		26.81	0.014	3.55E-04	0.5	-179.9		
14	21.64	28.86	0.013	8.20E-04	10.5	-178.0		138544
15	21.50	29.65	0.013	9.99E-04	14.6	-176.2		138544
16	21.03	35.62	0.013	1.58E-03	30.0	-166.0		138544
17	20.56	41.57	0.012	2.11E-03	48.1	-148.0		138544
18	20.50	37.09	0.012	2.17E-03	50.5	-145.0		138544
19	20.00	16.25	0.010	2.64E-03	63.8	-116.1		138544
20	19.50	-4.59	0.009	3.00E-03	66.7	-83.2		138544
21	19.00	-25.45	0.008	3.25E-03	59.2	-51.4		138544
22	18.50	-29.38	0.006	3.38E-03	45.5	-23.4		138544
23	18.00	-8.23	0.004	3.43E-03	36.1	-3.4		138544
		-118.94	0.004	3.43E-03	36.1	-3.4		
24	17.63	-49.22	0.003	3.43E-03	4.6	1.8		138544
25	17.25	24.92	0.002	3.43E-03	-0.0	-0.0		---

At elev. 25.75 Strut force = 448.2 kN/strut = 89.6 kN/m run

Node no.	Y coord	LEFT side						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2			
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	5288	
2	26.43	0.00	6.69	2.35	21.75	12.90	12.90	5288	
3	26.10	0.00	14.72	5.17	47.89	8.79	8.79	5288	
4	25.75	0.00	22.95	8.06	74.64	8.06	8.06a	993	
5	25.25	0.00	33.63	11.81	109.39	11.81	11.81a	993	
6	24.88	0.00	41.15	14.46	133.86	14.46	14.46a	993	

(continued)

Stage No.5 Excavate to elevation 20.56 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
7	24.50	0.00	48.44	17.01	157.55	17.01	17.01a	993
8	24.00	0.00	57.92	20.34	188.39	20.34	20.34a	993
9	23.50	0.00	67.24	23.62	218.70	23.62	23.62a	993
10	23.00	0.00	76.44	26.85	248.65	27.47	27.47	993
11	22.53	0.00	85.02	29.87	276.56	32.29	32.29	993
12	22.06	0.00	93.55	32.86	304.31	37.36	37.36	993
13	22.00	0.00	94.64	33.24	307.84	38.02	38.02	993
		0.00	94.64	26.81	413.51	26.81	26.81a	4963
14	21.64	0.00	101.86	28.86	445.06	28.86	28.86a	4963
15	21.50	0.00	104.66	29.65	457.30	29.65	29.65a	4963
16	21.03	4.61	109.44	31.01	478.17	31.01	35.62a	4963
17	20.56	9.22	114.19	32.35	498.92	32.35	41.57a	4963
18	20.50	9.81	114.79	32.52	501.56	32.52	42.33a	4963
19	20.00	14.71	119.81	33.95	523.51	33.95	48.66a	4963
20	19.50	19.62	124.82	35.37	545.37	35.37	54.99a	4963
21	19.00	24.52	129.80	36.78	567.16	36.78	61.30a	4963
22	18.50	29.43	134.77	38.19	588.88	38.19	67.62a	4963
23	18.00	34.34	139.73	39.59	610.55	47.26	81.59	4963
		Total>	174.07	43.75m	413.10	120.02	120.02	21896
24	17.63	Total>	181.46	45.63m	427.66	155.31	155.31	22553
25	17.25	Total>	188.85	47.50m	442.22	192.29	192.29	23209

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	21.03	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	20.56	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	8786
18	20.50	0.00	1.20	0.34	5.24	5.24	5.24p	8786
19	20.00	4.90	6.30	1.78	27.51	27.51	32.41p	8786
20	19.50	9.81	11.39	3.23	49.77	49.77	59.58p	8786
21	19.00	14.71	16.49	4.67	72.04	72.04	86.75p	8786
22	18.50	19.62	21.58	6.12	94.31	77.38	97.00	8786
23	18.00	24.52	26.68	7.56	116.58	65.29	89.82	8786
		Total>	51.21	12.80m	290.21	238.96	238.96	36563
24	17.63	Total>	58.71	14.67m	304.88	204.53	204.53	37660
25	17.25	Total>	66.21	16.55m	319.56	167.37	167.37	38757

Run ID. Fitzrovia_Wall_1_600mm_rev_03_ULS1
Fitzrovia - Middlesex Hospital Annexe
Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

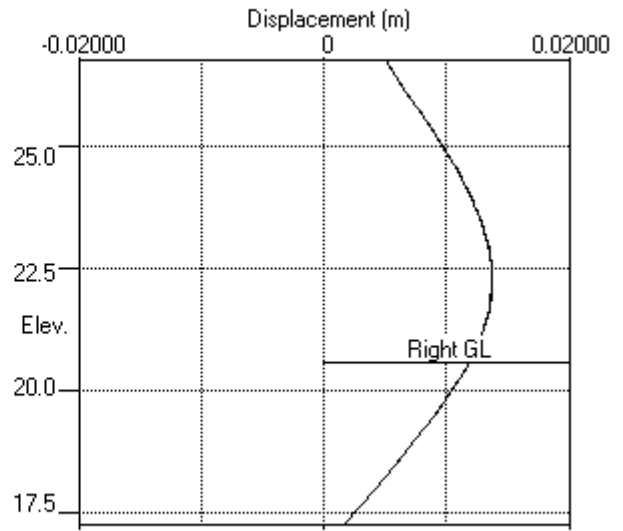
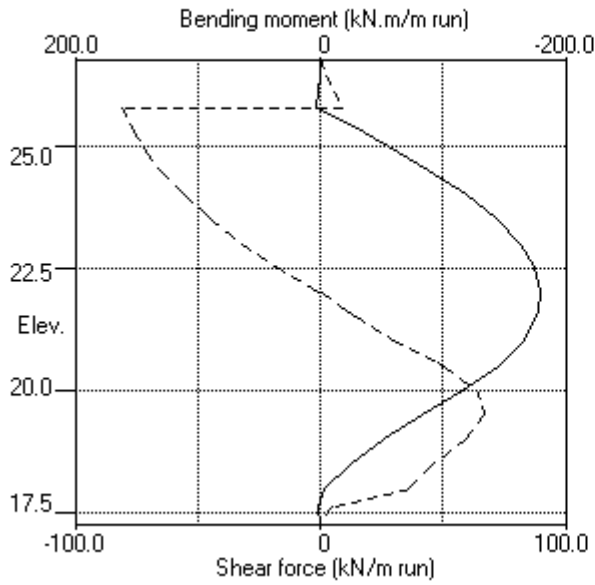
| Sheet No.
| Date:12-06-2020
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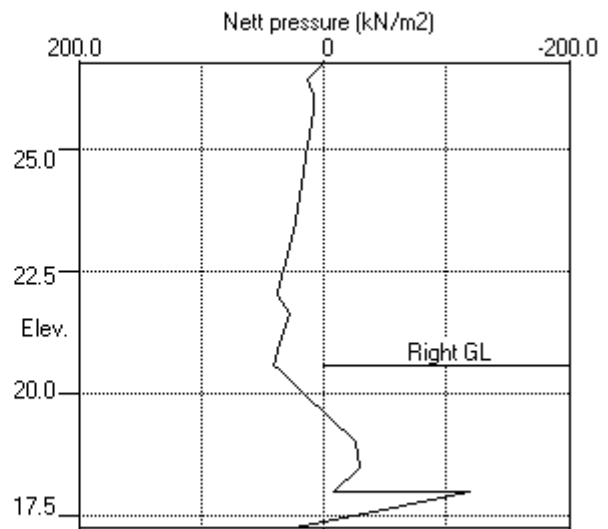
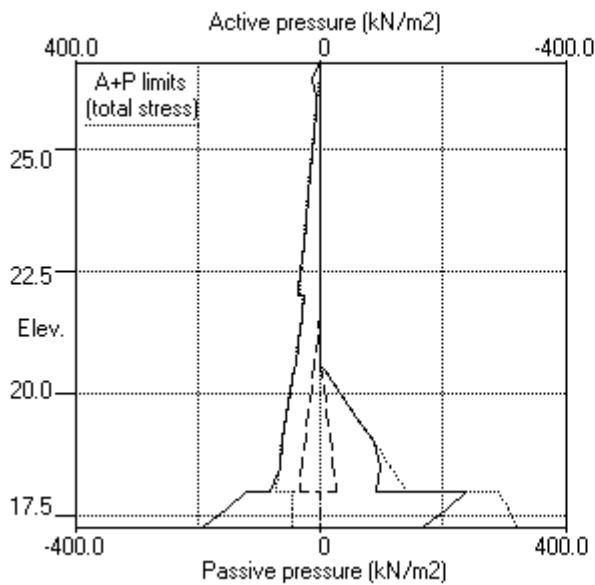
Stage No.5 Excavate to elevation 20.56 on RIGHT side
Note: 67.62a Soil pressure at active limit
86.75p Soil pressure at passive limit

Units: kN,m

Stage No.5 Excav. to elev. 20.56 on RIGHT side



Stage No.5 Excav. to elev. 20.56 on RIGHT side



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 6 Fill to elevation 21.64 on RIGHT side with soil type 1

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.005	-2.57E-03	0.0	-0.0		138544
2	26.43	12.59	0.006	-2.57E-03	2.0	0.1		138544
3	26.10	8.64	0.007	-2.58E-03	5.5	1.5		138544
4	25.75	8.06	0.008	-2.58E-03	8.4	4.0	89.1	138544
		8.06	0.008	-2.58E-03	-80.7	4.0		
5	25.25	11.87	0.009	-2.53E-03	-75.7	-35.2		138544
6	24.88	14.55	0.010	-2.39E-03	-70.7	-62.5		138544
7	24.50	17.15	0.011	-2.19E-03	-64.8	-87.8		138544
8	24.00	20.53	0.012	-1.82E-03	-55.4	-118.0		138544
9	23.50	23.85	0.013	-1.35E-03	-44.3	-143.1		138544
10	23.00	27.74	0.013	-8.03E-04	-31.4	-161.7		138544
11	22.53	32.61	0.013	-2.34E-04	-17.2	-173.3		138544
12	22.06	37.72	0.013	3.60E-04	-0.7	-177.6		138544
13	22.00	38.39	0.013	4.37E-04	1.6	-177.6		138544
		28.63	0.013	4.37E-04	1.6	-177.6		
14	21.64	30.81	0.013	8.95E-04	12.3	-175.2		138544
15	21.50	30.77	0.013	1.07E-03	16.6	-173.1		138544
16	21.03	33.91	0.012	1.63E-03	31.8	-162.0		138544
17	20.56	37.02	0.011	2.15E-03	48.5	-143.3		138544
		38.34	0.011	2.15E-03	48.5	-143.3		
18	20.50	35.58	0.011	2.21E-03	50.7	-140.4		138544
19	20.00	14.92	0.010	2.67E-03	63.3	-111.6		138544
20	19.50	-5.83	0.009	3.01E-03	65.6	-79.0		138544
21	19.00	-26.67	0.007	3.24E-03	57.5	-47.9		138544
22	18.50	-30.65	0.005	3.37E-03	43.2	-20.9		138544
23	18.00	-9.59	0.004	3.41E-03	33.1	-2.3		138544
		-115.22	0.004	3.41E-03	33.1	-2.3		
24	17.63	-45.23	0.002	3.41E-03	3.0	2.1		138544
25	17.25	29.15	0.001	3.41E-03	-0.0	-0.0		---

At elev. 25.75 Strut force = 445.4 kN/strut = 89.1 kN/m run

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical limit kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	4700
2	26.43	0.00	6.69	2.35	21.75	12.59	12.59	4700
3	26.10	0.00	14.72	5.17	47.89	8.64	8.64	4700
4	25.75	0.00	22.95	8.06	74.64	8.06	8.06a	969
5	25.25	0.00	33.63	11.81	109.39	11.87	11.87	969

(continued)

Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
6	24.88	0.00	41.15	14.46	133.86	14.55	969	
7	24.50	0.00	48.44	17.01	157.55	17.15	969	
8	24.00	0.00	57.92	20.34	188.39	20.53	969	
9	23.50	0.00	67.24	23.62	218.70	23.85	969	
10	23.00	0.00	76.44	26.85	248.65	27.74	969	
11	22.53	0.00	85.02	29.87	276.56	32.61	969	
12	22.06	0.00	93.55	32.86	304.31	37.72	969	
13	22.00	0.00	94.64	33.24	307.84	38.39	969	
		0.00	94.64	26.81	413.51	28.63	4846	
14	21.64	0.00	101.86	28.86	445.06	30.81	4846	
15	21.50	0.00	104.66	29.65	457.30	31.66	4846	
16	21.03	4.61	109.44	31.01	478.17	33.16	4846	
17	20.56	9.22	114.19	32.35	498.92	34.63	4846	
18	20.50	9.81	114.79	32.52	501.56	34.81	4846	
19	20.00	14.71	119.81	33.95	523.51	36.32	4846	
20	19.50	19.62	124.82	35.37	545.37	37.78	4846	
21	19.00	24.52	129.80	36.78	567.16	39.20	4846	
22	18.50	29.43	134.77	38.19	588.88	40.59	4846	
23	18.00	34.34	139.73	39.59	610.55	49.61	4846	
		Total>	174.07	43.75m	413.10	130.45	21464	
24	17.63	Total>	181.46	45.63m	427.66	165.87	22108	
25	17.25	Total>	188.85	47.50m	442.22	202.97	22752	

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.43	0.00	0.00	0.00	0.00	0.00	0.0	
3	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.75	0.00	0.00	0.00	0.00	0.00	0.0	
5	25.25	0.00	0.00	0.00	0.00	0.00	0.0	
6	24.88	0.00	0.00	0.00	0.00	0.00	0.0	
7	24.50	0.00	0.00	0.00	0.00	0.00	0.0	
8	24.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	23.50	0.00	0.00	0.00	0.00	0.00	0.0	
10	23.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	22.53	0.00	0.00	0.00	0.00	0.00	0.0	
12	22.06	0.00	0.00	0.00	0.00	0.00	0.0	
13	22.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	21.64	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	1137	
15	21.50	0.00	2.52	0.89	8.20	0.89	1137	
16	21.03	0.00	10.98	3.86	35.72	3.86	1137	
17	20.56	0.00	19.44	6.83	63.23	6.83	1137	
		0.00	19.44	5.51	84.94	5.51	5686	
18	20.50	0.00	20.64	5.85	90.19	9.04	5686	
19	20.00	4.90	25.74	7.29	112.45	31.21	5686	
20	19.50	9.81	30.83	8.74	134.72	53.42	5686	
21	19.00	14.71	35.93	10.18	156.99	75.68	5686	
22	18.50	19.62	41.03	11.63	179.27	81.05	5686	
23	18.00	24.52	46.13	13.07	201.56	69.01	5686	
		Total>	70.66	18.20m	309.66	245.68	24611	

Run ID. Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

| Sheet No.
 | Date:12-06-2020
 | Checked :

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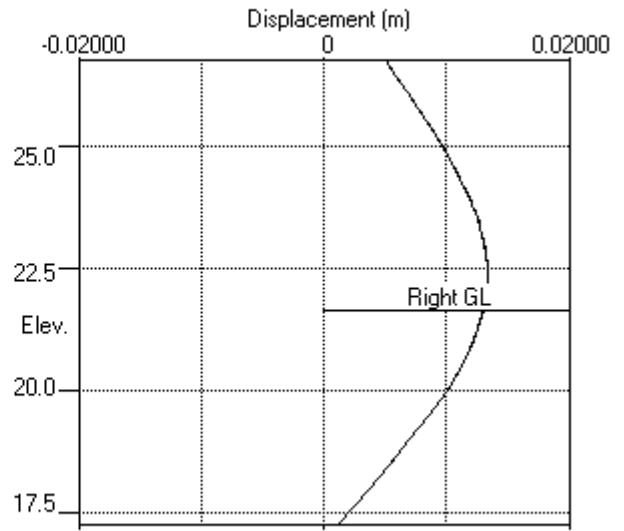
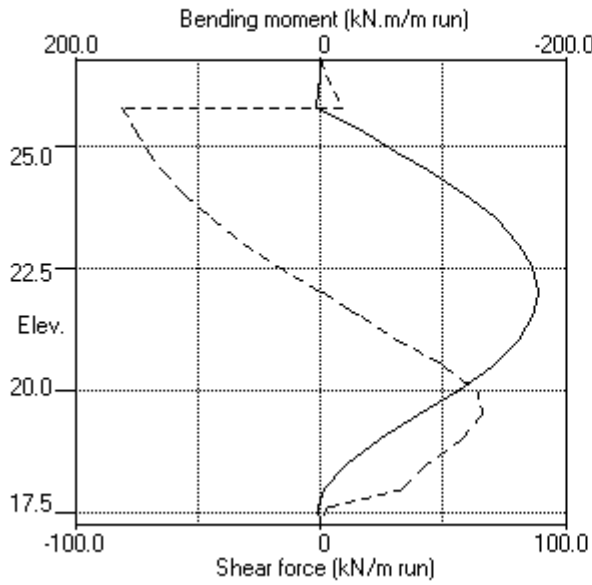
Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
24	17.63	Total>	78.16	20.08m	324.34	211.10	211.10	25349
25	17.25	Total>	85.67	21.95m	339.01	173.81	173.81	26088

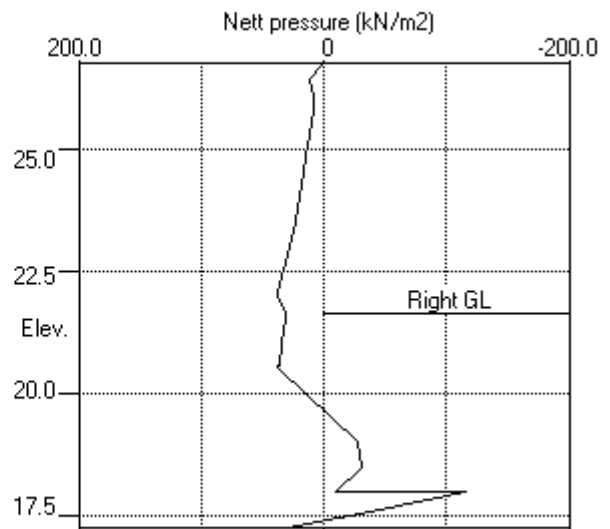
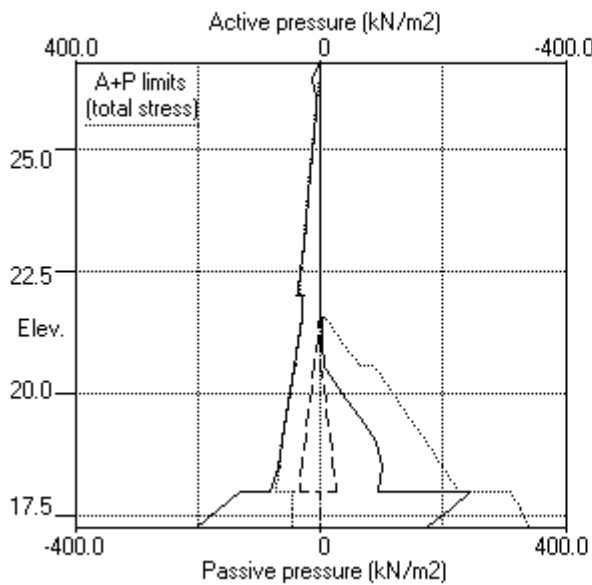
Note: 5.51a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Fill to elev. 21.64 on RIGHT side



Stage No.6 Fill to elev. 21.64 on RIGHT side



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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 9 Remove strut or anchor no.1 at elevation 25.75

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	0.005	-2.78E-03	0.0	-0.0		138544
2	26.43	12.55	0.006	-2.78E-03	2.0	0.1		138544
3	26.10	8.50	0.007	-2.78E-03	5.5	1.5	79.0	138544
		8.50	0.007	-2.78E-03	-73.6	1.5		
4	25.75	8.06	0.008	-2.75E-03	-70.7	-23.7		138544
5	25.25	11.81	0.009	-2.60E-03	-65.7	-57.9		138544
6	24.88	14.46	0.010	-2.41E-03	-60.8	-81.4		138544
7	24.50	17.01	0.011	-2.16E-03	-54.9	-103.0		138544
8	24.00	20.34	0.012	-1.75E-03	-45.5	-128.3		138544
9	23.50	23.62	0.013	-1.25E-03	-34.5	-148.4		138544
10	23.00	27.59	0.013	-6.91E-04	-21.7	-162.2		138544
11	22.53	32.53	0.013	-1.29E-04	-7.6	-169.2		138544
12	22.06	37.70	0.013	4.44E-04	8.9	-169.1	12.4	138544
		37.70	0.013	4.44E-04	-3.5	-169.1		
13	22.00	38.37	0.013	5.18E-04	-1.2	-169.2		138544
		28.56	0.013	5.18E-04	-1.2	-169.2		
14	21.64	30.92	0.013	9.56E-04	9.5	-167.8		138544
15	21.50	30.93	0.013	1.12E-03	13.9	-166.2		138544
16	21.03	34.20	0.012	1.67E-03	29.2	-156.3		138544
17	20.56	37.37	0.011	2.17E-03	46.0	-138.9		138544
		38.69	0.011	2.17E-03	46.0	-138.9		
18	20.50	36.30	0.011	2.23E-03	48.2	-136.1		138544
19	20.00	15.68	0.010	2.67E-03	61.2	-108.4		138544
20	19.50	-5.10	0.009	3.00E-03	63.9	-76.9		138544
21	19.00	-26.03	0.007	3.23E-03	56.1	-46.5		138544
22	18.50	-30.13	0.005	3.35E-03	42.0	-20.2		138544
23	18.00	-9.21	0.004	3.39E-03	32.2	-2.0		138544
		-113.60	0.004	3.39E-03	32.2	-2.0		
24	17.63	-44.04	0.002	3.39E-03	2.7	2.1		138544
25	17.25	29.88	0.001	3.38E-03	-0.0	-0.0		---
At elev. 26.10 Strut force =			79.0 kN/strut =		79.0 kN/m run			
At elev. 22.06 Strut force =			12.4 kN/strut =		12.4 kN/m run			

(continued)

Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	17138
2	26.43	0.00	6.69	2.35	21.75	12.55	12.55	1421
3	26.10	0.00	14.72	5.17	47.89	8.50	8.50	1421
4	25.75	0.00	22.95	8.06	74.64	8.06	8.06a	1421
5	25.25	0.00	33.63	11.81	109.39	11.81	11.81a	1421
6	24.88	0.00	41.15	14.46	133.86	14.46	14.46a	1421
7	24.50	0.00	48.44	17.01	157.55	17.01	17.01a	1421
8	24.00	0.00	57.92	20.34	188.39	20.34	20.34a	1421
9	23.50	0.00	67.24	23.62	218.70	23.62	23.62a	1421
10	23.00	0.00	76.44	26.85	248.65	27.59	27.59	1421
11	22.53	0.00	85.02	29.87	276.56	32.53	32.53	1421
12	22.06	0.00	93.55	32.86	304.31	37.70	37.70	1421
13	22.00	0.00	94.64	33.24	307.84	38.37	38.37	1421
		0.00	94.64	26.81	413.51	28.56	28.56	7103
14	21.64	0.00	101.86	28.86	445.06	30.92	30.92	6536
15	21.50	0.00	104.66	29.65	457.30	31.81	31.81	6536
16	21.03	4.61	109.44	31.01	478.17	33.45	38.06	6536
17	20.56	9.22	114.19	32.35	498.92	34.98	44.20	6536
18	20.50	9.81	114.79	32.52	501.56	35.17	44.98	6536
19	20.00	14.71	119.81	33.95	523.51	36.70	51.41	6536
20	19.50	19.62	124.82	35.37	545.37	38.14	57.76	6536
21	19.00	24.52	129.80	36.78	567.16	39.52	64.04	6536
22	18.50	29.43	134.77	38.19	588.88	40.85	70.28	6536
23	18.00	34.34	139.73	39.59	610.55	49.80	84.14	6536
		Total>	174.07	43.75m	413.10	131.26	131.26	27855
24	17.63	Total>	181.46	45.63m	427.66	166.47	166.47	28691
25	17.25	Total>	188.85	47.50m	442.22	203.33	203.33	29526

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1307
15	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1307
16	21.03	0.00	10.98	3.86	35.72	3.86	3.86a	1307
17	20.56	0.00	19.44	6.83	63.23	6.83	6.83a	1307
		0.00	19.44	5.51	84.94	5.51	5.51a	6536
18	20.50	0.00	20.64	5.85	90.19	8.68	8.68	6536
19	20.00	4.90	25.74	7.29	112.45	30.83	35.73	6536

(continued)

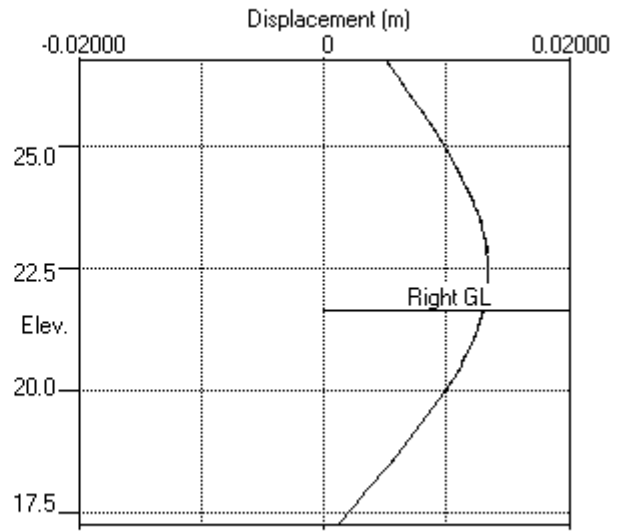
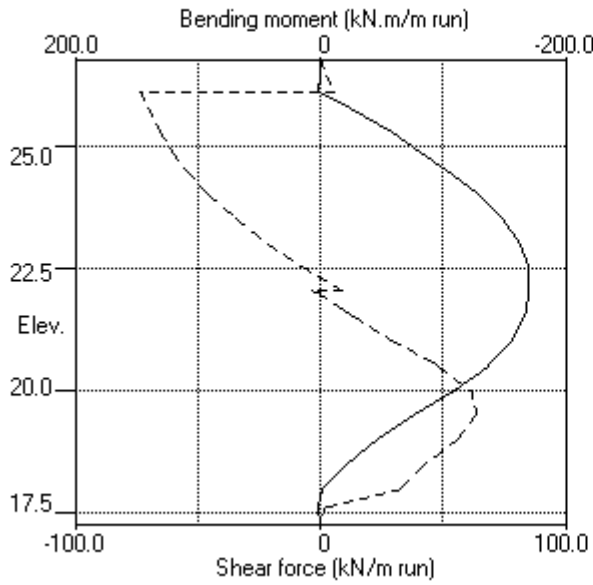
Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertical	Active limit	Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
20	19.50	9.81	30.83	8.74	134.72	53.05	62.86	6536
21	19.00	14.71	35.93	10.18	156.99	75.36	90.07	6536
22	18.50	19.62	41.03	11.63	179.27	80.79	100.41	6536
23	18.00	24.52	46.13	13.07	201.56	68.82	93.35	6536
		Total>	70.66	18.20m	309.66	244.87	244.87	27855
24	17.63	Total>	78.16	20.08m	324.34	210.51	210.51	28691
25	17.25	Total>	85.67	21.95m	339.01	173.45	173.45	29526

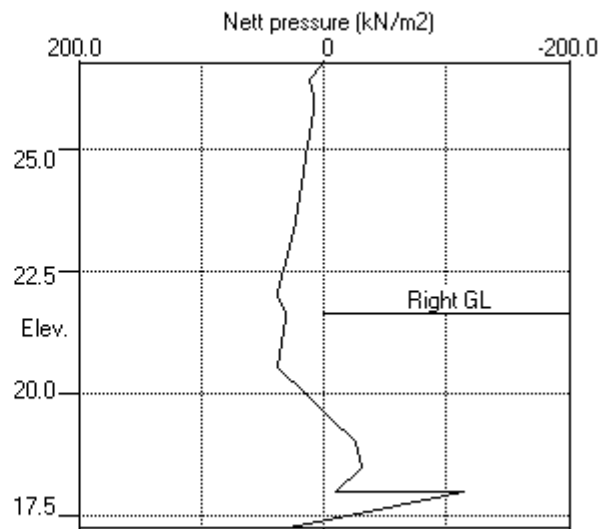
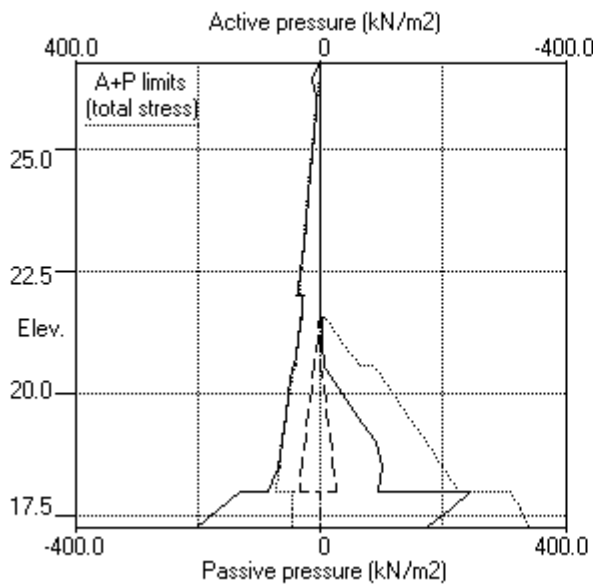
Note: 5.51a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.9 Remove strut no.1 at elev. 25.75



Stage No.9 Remove strut no.1 at elev. 25.75



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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.005	-2.88E-03	0.0	-0.0		98960
2	26.43	12.81	0.006	-2.88E-03	2.1	0.1		98960
3	26.10	8.59	0.007	-2.88E-03	5.6	1.5	65.3	98960
		8.59	0.007	-2.88E-03	-59.7	1.5		
4	25.75	8.06	0.008	-2.85E-03	-56.8	-19.9		98960
5	25.25	11.81	0.009	-2.69E-03	-51.8	-48.7		98960
6	24.88	14.46	0.010	-2.48E-03	-46.9	-68.2		98960
7	24.50	17.01	0.011	-2.20E-03	-41.0	-85.7		98960
8	24.00	20.34	0.012	-1.75E-03	-31.7	-105.6		98960
9	23.50	23.62	0.013	-1.21E-03	-20.7	-120.3		98960
10	23.00	27.45	0.013	-6.32E-04	-7.9	-128.8		98960
11	22.53	32.44	0.013	-6.48E-05	6.2	-130.7		98960
12	22.06	37.65	0.013	4.87E-04	22.7	-125.5	39.6	98960
		37.65	0.013	4.87E-04	-17.0	-125.5		
13	22.00	38.33	0.013	5.56E-04	-14.7	-126.3		98960
		28.34	0.013	5.56E-04	-14.7	-126.3		
14	21.64	30.77	0.013	9.78E-04	-4.0	-128.7		98960
15	21.50	30.73	0.013	1.14E-03	0.3	-128.6		98960
16	21.03	34.11	0.012	1.69E-03	15.5	-123.7		98960
17	20.56	37.44	0.011	2.21E-03	32.3	-111.2		98960
		38.76	0.011	2.21E-03	32.3	-111.2		
18	20.50	36.48	0.011	2.27E-03	34.6	-109.0		98960
19	20.00	16.33	0.010	2.73E-03	47.8	-86.7		98960
20	19.50	-3.86	0.008	3.07E-03	50.9	-60.3		98960
21	19.00	-24.16	0.007	3.29E-03	43.9	-34.9		98960
22	18.50	-27.71	0.005	3.40E-03	30.9	-13.1		98960
23	18.00	-6.37	0.003	3.42E-03	22.4	1.0		98960
		-101.80	0.003	3.42E-03	22.4	1.0		
24	17.63	-30.93	0.002	3.41E-03	-2.5	2.9		98960
25	17.25	44.16	0.001	3.41E-03	-0.0	-0.0		---
At elev. 26.10 Strut force =			65.3 kN/strut =		65.3 kN/m run			
At elev. 22.06 Strut force =			39.6 kN/strut =		39.6 kN/m run			

(continued)

Stage No.10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	LEFT side						Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3	
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	5318	
2	26.43	0.00	6.69	2.35	21.75	12.81	12.81	5318	
3	26.10	0.00	14.72	5.17	47.89	8.59	8.59	5318	
4	25.75	0.00	22.95	8.06	74.64	8.06	8.06a	1468	
5	25.25	0.00	33.63	11.81	109.39	11.81	11.81a	1468	
6	24.88	0.00	41.15	14.46	133.86	14.46	14.46a	1468	
7	24.50	0.00	48.44	17.01	157.55	17.01	17.01a	1468	
8	24.00	0.00	57.92	20.34	188.39	20.34	20.34a	1468	
9	23.50	0.00	67.24	23.62	218.70	23.62	23.62a	1468	
10	23.00	0.00	76.44	26.85	248.65	27.45	27.45	1468	
11	22.53	0.00	85.02	29.87	276.56	32.44	32.44	1468	
12	22.06	0.00	93.55	32.86	304.31	37.65	37.65	1468	
13	22.00	0.00	94.64	33.24	307.84	38.33	38.33	1468	
		0.00	94.64	26.81	413.51	28.34	28.34	7340	
14	21.64	0.00	101.86	28.86	445.06	30.77	30.77	7340	
15	21.50	0.00	104.66	29.65	457.30	31.69	31.69	7340	
16	21.03	4.61	109.44	31.01	478.17	33.39	38.00	7340	
17	20.56	9.22	114.19	32.35	498.92	35.05	44.27	8999	
18	20.50	9.81	114.79	32.52	501.56	35.26	45.07	8999	
19	20.00	14.71	119.81	33.95	523.51	37.02	51.74	8999	
20	19.50	19.62	124.82	35.37	545.37	38.76	58.38	8999	
21	19.00	24.52	129.80	36.78	567.16	40.45	64.98	8999	
22	18.50	29.43	134.77	38.19	588.88	42.06	71.49	8999	
23	18.00	34.34	139.73	39.59	610.55	51.22	85.56	8999	
		Total>	174.07	43.75m	413.10	137.17	137.17	37389	
24	17.63	Total>	181.46	45.63m	427.66	173.02	173.02	38511	
25	17.25	Total>	188.85	47.50m	442.22	210.47	210.47	39632	

Node no.	Y coord	RIGHT side						Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Active limit	Passive limit	Earth pressure	earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3	
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	0.00	4706	
15	21.50	0.00	2.52	0.89	8.20	0.96	0.96	4706	
16	21.03	0.00	10.98	3.86	35.72	3.89	3.89	4706	
17	20.56	0.00	19.44	6.83	63.23	6.83	6.83a	1800	
		0.00	19.44	5.51	84.94	5.51	5.51a	8999	

(continued)

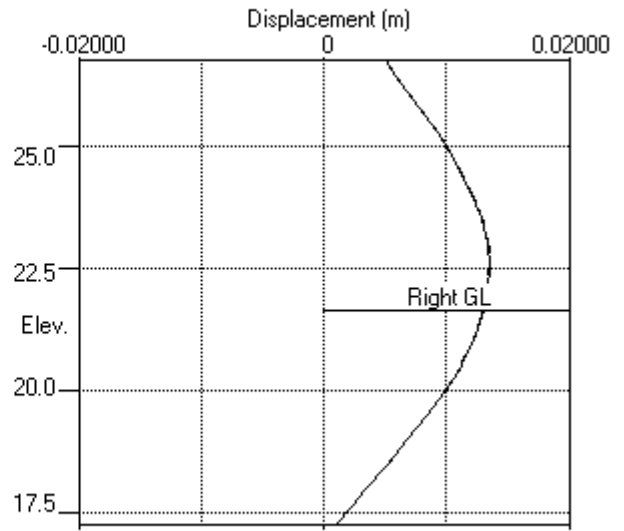
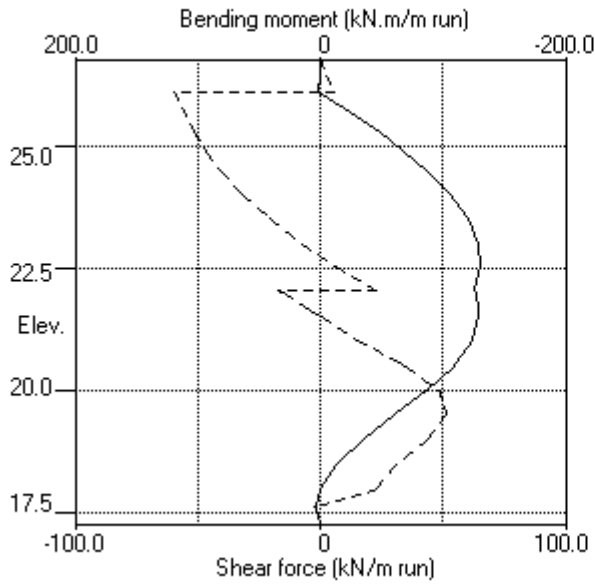
Stage No.10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
18	20.50	0.00	20.64	5.85	90.19	8.59	8.59	8999
19	20.00	4.90	25.74	7.29	112.45	30.50	35.41	8999
20	19.50	9.81	30.83	8.74	134.72	52.43	62.24	8999
21	19.00	14.71	35.93	10.18	156.99	74.42	89.14	8999
22	18.50	19.62	41.03	11.63	179.27	79.58	99.20	8999
23	18.00	24.52	46.13	13.07	201.56	67.40	91.92	8999
		Total>	70.66	18.20m	309.66	238.96	238.96	37389
24	17.63	Total>	78.16	20.08m	324.34	203.95	203.95	38511
25	17.25	Total>	85.67	21.95m	339.01	166.31	166.31	39632

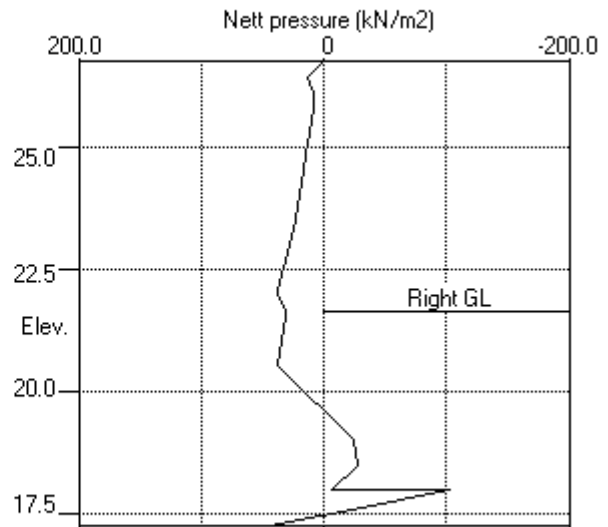
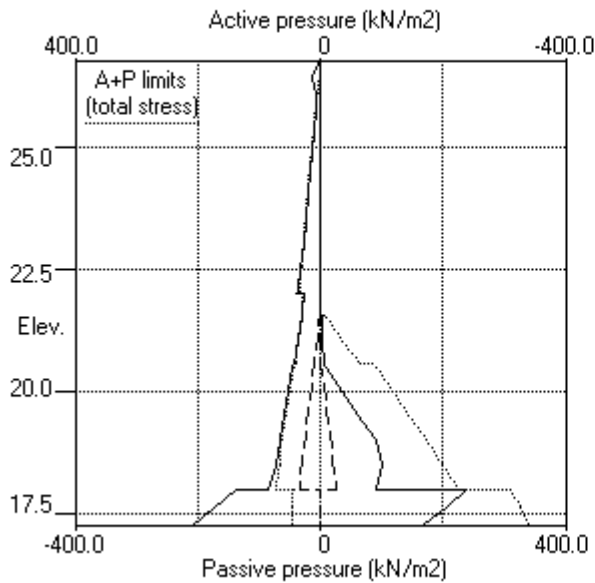
Note: 5.51a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.10 Change EI of wall to 98960kN.m²/m run



Stage No.10 Change EI of wall to 98960kN.m²/m run



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 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 13 Apply water pressure profile no.2 (Mod. Conserv.)

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.005	-3.18E-03	0.0	-0.0		98960
2	26.43	13.35	0.006	-3.18E-03	2.2	0.1		98960
3	26.10	8.57	0.007	-3.18E-03	5.7	1.5	79.7	98960
		8.57	0.007	-3.18E-03	-74.0	1.5		
4	25.75	8.06	0.008	-3.14E-03	-71.1	-24.9		98960
5	25.25	15.00	0.009	-2.93E-03	-65.3	-60.6		98960
6	24.88	20.02	0.011	-2.67E-03	-58.7	-84.9		98960
7	24.50	24.97	0.011	-2.32E-03	-50.3	-106.4		98960
8	24.00	31.48	0.013	-1.75E-03	-36.2	-129.8		98960
9	23.50	37.94	0.013	-1.10E-03	-18.8	-145.3		98960
10	23.00	44.98	0.014	-3.97E-04	1.9	-150.9		98960
11	22.53	53.23	0.014	2.59E-04	25.0	-146.2		98960
12	22.06	61.75	0.013	8.58E-04	52.0	-129.7	54.9	98960
		61.75	0.013	8.58E-04	-2.9	-129.7		
13	22.00	62.86	0.013	9.29E-04	0.8	-129.6		98960
		53.18	0.013	9.29E-04	0.8	-129.6		
14	21.64	58.61	0.013	1.34E-03	21.0	-124.8		98960
		18.05	0.013	1.34E-03	21.0	-124.8		
15	21.50	18.46	0.013	1.50E-03	23.5	-121.2		98960
16	21.03	19.91	0.012	2.00E-03	32.5	-106.9		98960
17	20.56	21.07	0.011	2.42E-03	42.2	-88.1		98960
		21.71	0.011	2.42E-03	42.2	-88.1		
18	20.50	21.84	0.011	2.47E-03	43.5	-85.4		98960
19	20.00	3.76	0.009	2.80E-03	49.9	-60.5		98960
20	19.50	-16.35	0.008	3.01E-03	46.7	-34.6		98960
21	19.00	-37.43	0.006	3.11E-03	33.3	-12.9		98960
22	18.50	-42.49	0.005	3.13E-03	13.3	1.9		98960
23	18.00	-23.14	0.003	3.10E-03	-3.1	5.4		98960
		-14.10	0.003	3.10E-03	-3.1	5.4		
24	17.63	2.85	0.002	3.08E-03	-5.2	2.7		98960
25	17.25	25.04	0.001	3.08E-03	-0.0	-0.0		---
At elev. 26.10 Strut force =			79.7 kN/strut =		79.7 kN/m run			
At elev. 22.06 Strut force =			54.9 kN/strut =		54.9 kN/m run			

(continued)

Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	6747
2	26.43	0.00	6.69	2.35	21.75	13.35	13.35	6747
3	26.10	0.00	14.72	5.17	47.89	8.57	8.57	1464
4	25.75	0.00	22.95	8.06	74.64	8.06	8.06a	1464
5	25.25	4.90	28.73	10.09	93.44	10.09	15.00a	1464
6	24.88	8.58	32.57	11.44	105.94	11.44	20.02a	1464
7	24.50	12.26	36.17	12.71	117.66	12.71	24.97a	1464
8	24.00	17.17	40.75	14.31	132.55	14.31	31.48a	1464
9	23.50	22.07	45.16	15.86	146.90	15.86	37.94a	1464
10	23.00	26.98	49.46	17.38	160.90	18.00	44.98	1464
11	22.53	31.59	53.44	18.77	173.81	21.64	53.23	1464
12	22.06	36.20	57.35	20.15	186.56	25.56	61.75	1464
13	22.00	36.79	57.85	20.32	188.18	26.07	62.86	1375
		36.79	57.85	16.39	252.77	16.39	53.18a	6876
14	21.64	40.32	61.54	17.44	268.89	18.29	58.61	6876
15	21.50	41.69	62.97	17.84	275.13	19.10	60.79	6876
16	21.03	46.30	67.74	19.19	296.00	21.90	68.20	6876
17	20.56	50.91	72.49	20.54	316.75	24.41	75.32	6876
18	20.50	51.50	73.10	20.71	319.39	24.70	76.20	6876
19	20.00	56.41	78.12	22.13	341.34	26.93	83.34	6876
20	19.50	61.31	83.13	23.55	363.20	28.69	90.01	6876
21	19.00	66.22	88.11	24.97	384.99	29.97	96.19	6876
22	18.50	71.12	93.08	26.37	406.71	30.79	101.91	6876
23	18.00	76.03	98.04	27.78	428.38	38.91	114.94	6876
		76.03	98.04	34.44	318.91	95.84	171.87	14856
24	17.63	79.71	101.76	35.74	330.99	126.25	205.95	15302
25	17.25	83.39	105.46	37.05	343.06	157.44	240.83	61287

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		40.32	0.68	0.24	2.21	0.24	40.56a	1375
15	21.50	41.69	1.82	0.64	5.93	0.64	42.33a	1375
16	21.03	46.30	5.67	1.99	18.45	1.99	48.30a	1375
17	20.56	50.91	9.50	3.34	30.91	3.34	54.25a	1375
		50.91	9.50	2.69	41.52	2.69	53.61a	6876
18	20.50	51.50	10.11	2.86	44.18	2.86	54.37a	6876
19	20.00	56.41	15.15	4.29	66.21	23.17	79.58	6876

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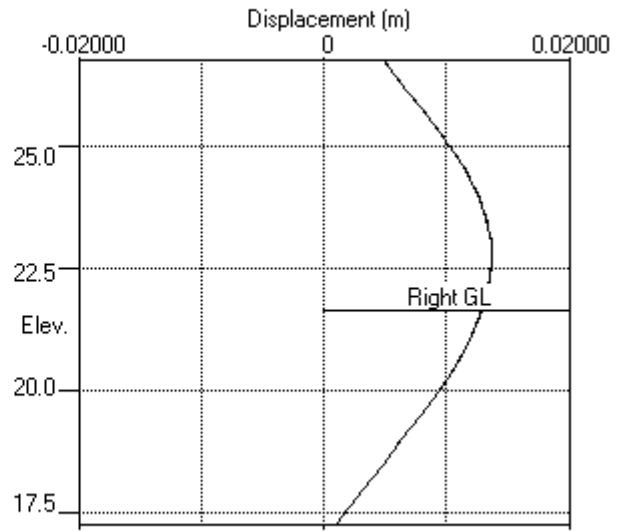
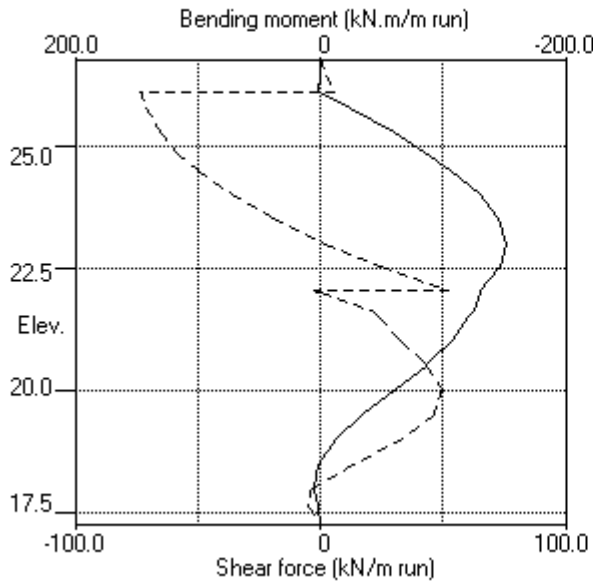
Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	19.50	61.31	20.16	5.71	88.08	45.05	106.36	6876
21	19.00	66.22	25.11	7.12	109.73	67.40	133.62	6876
22	18.50	71.12	30.01	8.50	131.14	73.28	144.40	6876
23	18.00	76.03	34.86	9.88	152.30	62.05	138.08	6876
		76.03	34.86	12.24	113.38	109.94	185.97	14856
24	17.63	79.71	38.45	13.51	125.06	123.40	203.11	15302
25	17.25	83.39	42.01	14.76	136.64	132.40	215.78	61287

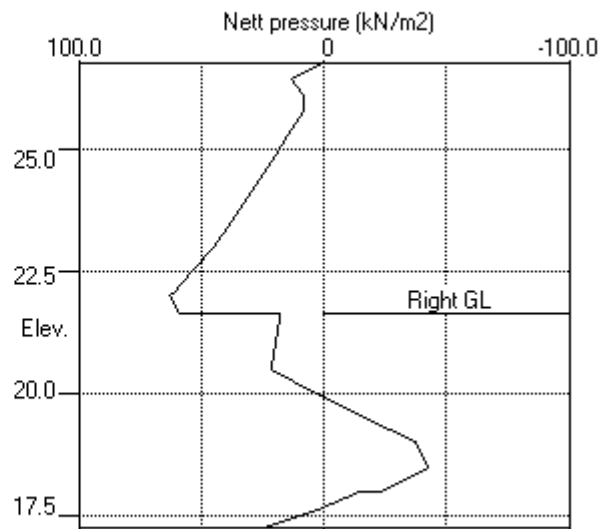
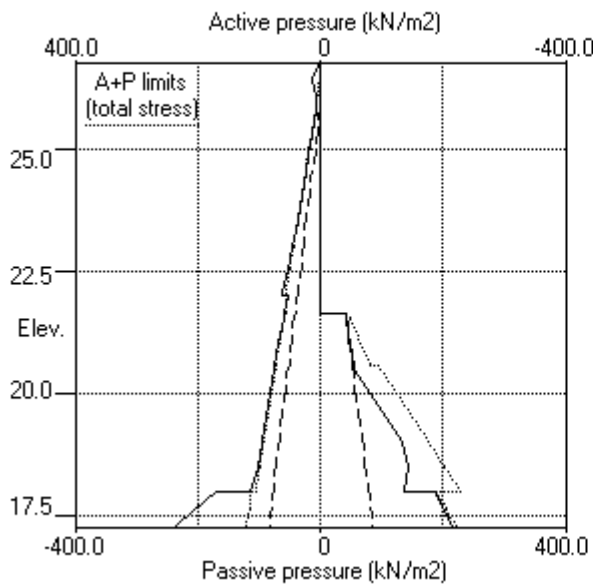
Note: 54.37a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)



Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)



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 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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				Shear force			
		max. m	min. m	Calculated kN.m/m		Factored kN.m/m		Calculated kN/m		Factored kN/m	
1	26.75	0.008	0.000	0	-0	0	-0	0	0	0	0
2	26.43	0.008	0.000	0	0	0	0	2	-0	3	-0
3	26.10	0.007	0.000	2	-0	2	-0	6	-74	8	-100
4	25.75	0.008	0.000	4	-25	5	-34	9	-81	12	-109
5	25.25	0.009	0.000	4	-61	6	-82	9	-76	12	-103
6	24.88	0.011	0.000	8	-85	11	-115	10	-71	14	-96
7	24.50	0.011	0.000	12	-106	16	-144	9	-65	12	-88
8	24.00	0.013	0.000	16	-130	22	-175	7	-56	10	-76
9	23.50	0.013	0.000	19	-148	26	-200	7	-45	10	-61
10	23.00	0.014	0.000	23	-163	31	-220	8	-32	11	-43
11	22.53	0.014	0.000	27	-175	36	-236	25	-18	34	-24
12	22.06	0.014	0.000	32	-180	43	-243	52	-17	70	-23
13	22.00	0.014	0.000	32	-180	44	-243	12	-15	16	-20
14	21.64	0.013	0.000	35	-178	47	-240	21	-4	28	-5
15	21.50	0.013	0.000	36	-176	48	-238	24	-1	32	-1
16	21.03	0.013	0.000	35	-166	47	-224	33	-8	44	-10
17	20.56	0.012	0.000	32	-148	43	-200	48	-11	65	-15
18	20.50	0.012	0.000	31	-145	42	-196	51	-11	68	-15
19	20.00	0.010	0.000	26	-116	35	-157	64	-12	86	-16
20	19.50	0.009	0.000	20	-83	27	-112	67	-12	90	-16
21	19.00	0.008	0.000	14	-51	19	-69	59	-12	80	-16
22	18.50	0.006	0.000	8	-23	11	-32	45	-10	61	-14
23	18.00	0.004	0.000	5	-3	7	-5	36	-8	49	-11
24	17.63	0.003	0.000	3	0	4	0	5	-5	6	-7
25	17.25	0.002	0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

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

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force					
	Calculated		Factored		Calculated		Factored			
min.	max. elev.	min. elev.	max. elev.	max. elev.	min. elev.	max. elev.	min. elev.	max. elev.		
	kN.m/m		kN.m/m		kN/m		kN/m			
1	20.56	-2	24.00	3	-3	3	22.00	-1	25.25	
-1	36	21.50	-0	26.75	48	-0	12	22.00	-12	19.50
-16	No calculation at this stage									
3	33	21.50	-0	26.75	44	-0	10	22.00	-12	20.00
-16	4	25.75	-180	22.00	5	-243	67	19.50	-81	25.75
-109	4	25.75	-178	22.06	5	-240	66	19.50	-81	25.75
-109	No calculation at this stage									
8	No calculation at this stage									
9	2	17.63	-169	22.53	3	-228	64	19.50	-74	26.10
-99	3	17.63	-131	22.53	4	-176	51	19.50	-60	26.10
-81	No calculation at this stage									
12	No calculation at this stage									
13	5	18.00	-151	23.00	7	-204	52	22.06	-74	26.10
-100										

Maximum and minimum displacement at each stage

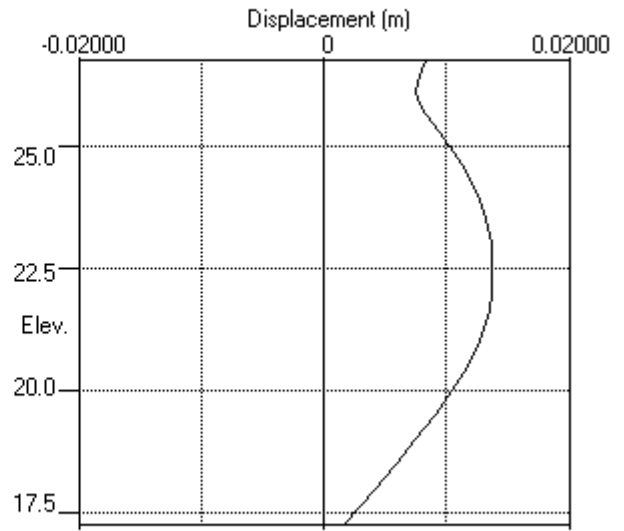
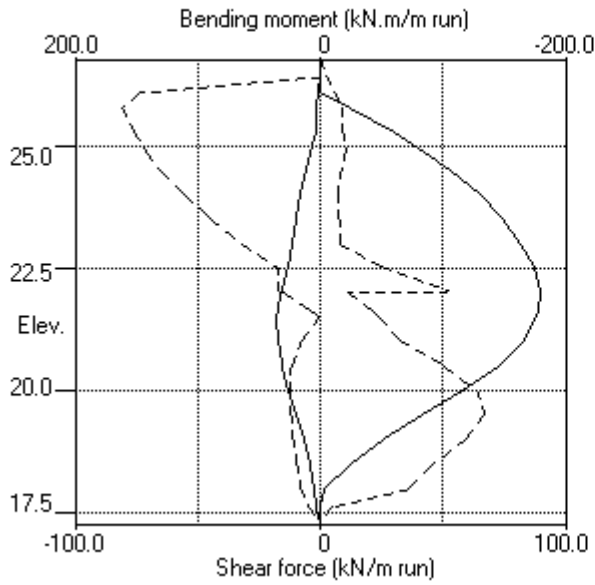
Stage no.	Displacement				Stage description
	maximum elev.	minimum elev.	maximum elev.	minimum elev.	
	m		m		
1	0.001	26.75	0.000	26.75	Apply surcharge no.1 at elev. 26.75
2	0.008	26.75	0.000	26.75	Excav. to elev. 25.25 on RIGHT side
3	No calculation at this stage				Install strut no.1 at elev. 25.75
4	0.008	26.75	0.000	26.75	Apply water pressure profile no.1
5	0.014	22.06	0.000	26.75	Excav. to elev. 20.56 on RIGHT side
6	0.013	22.53	0.000	26.75	Fill to elev. 21.64 on RIGHT side
7	No calculation at this stage				Install strut no.2 at elev. 22.06
8	No calculation at this stage				Install strut no.3 at elev. 26.10
9	0.013	22.53	0.000	26.75	Remove strut no.1 at elev. 25.75
10	0.013	22.53	0.000	26.75	Change EI of wall to 98960kN.m ² /m run
11	No calculation at this stage				Change soil type 3 to soil type 4
12	No calculation at this stage				Apply surcharge no.2 at elev. 21.64
13	0.014	22.53	0.000	26.75	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1			Strut no. 2			Strut no. 3		
	at elev. 25.75			at elev. 22.06			at elev. 26.10		
	--Calculated--	Factored	Factored	--Calculated--	Factored	Factored	--Calculated--	Factored	Factored
	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut
4	0	2	3	---	---	---	---	---	---
5	90	448	605	---	---	---	---	---	---
6	89	445	601	---	---	---	---	---	---
9	---	---	---	12	12	17	79	79	107
10	---	---	---	40	40	53	65	65	88
13	---	---	---	55	55	74	80	80	108

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

1-ULS2

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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	26.75	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES (Unfactored SLS soil strengths)

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

	Left side	Right side
Initial water table elevation	21.50	21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
	2	1	25.75	25.75	0.0	1	21.64	21.64
2						21.64	25.75	40.3

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 17.25
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge Near edge	Surcharge Far edge	Equiv. soil type	Partial factor/ Category
1	26.75	0.50(L)	20.00	20.00	10.00	=	N/A	1.30 Var
2	21.64	-0.00(R)	20.00	20.00	41.00	=	N/A	1.00 P/F

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 26.75
2	Excavate to elevation 25.25 on RIGHT side
3	Install strut or anchor no.1 at elevation 25.75
4	Apply water pressure profile no.1 (Worst Cred.)
5	Excavate to elevation 20.56 on RIGHT side
6	Fill to elevation 21.64 on RIGHT side with soil type 1
7	Install strut or anchor no.2 at elevation 22.06
8	Install strut or anchor no.3 at elevation 26.10
9	Remove strut or anchor no.1 at elevation 25.75
10	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
11	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
12	Apply surcharge no.2 at elevation 21.64 No analysis at this stage
13	Apply water pressure profile no.2 (Worst Cred.)

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 2
Water pressures : Worst Credible
Partial factor on C' = 1.250
Partial factor on Phi' = 1.250
Partial factor on Cu = 1.400
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Variable Unfavourable loads = 1.300

Stability analysis:

Method of analysis - Strength Factor method
Overall 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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m
Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m
Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 26.75	No	No	No
2	Excav. to elev. 25.25 on RIGHT side	Yes	Yes	Yes
3	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
4	Apply water pressure profile no.1	Yes	Yes	Yes
5	Excav. to elev. 20.56 on RIGHT side	Yes	Yes	Yes
6	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
7	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
8	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
9	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
10	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
11	Change soil type 3 to soil type 4	Yes	Yes	Yes
12	Apply surcharge no.2 at elev. 21.64	Yes	Yes	Yes
13	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 26.75

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.	Overall FoS for toe elev. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.000	Wall Penetr -ation	Direction of failure
1	26.75 26.75	Cant.					<u>Conditions not suitable for FoS calc.</u>

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.001	1.08E-04	0.0	0.0		138544
2	26.43	-1.78	0.001	1.08E-04	-0.3	-0.0		138544
3	26.10	-1.35	0.001	1.08E-04	-0.8	-0.2		138544
4	25.75	-0.51	0.001	1.09E-04	-1.1	-0.5		138544
5	25.25	0.27	0.001	1.12E-04	-1.2	-1.1		138544
6	24.88	0.67	0.001	1.16E-04	-1.0	-1.5		138544
7	24.50	0.97	0.001	1.20E-04	-0.7	-1.8		138544
8	24.00	1.29	0.001	1.27E-04	-0.1	-2.1		138544
9	23.50	1.56	0.001	1.34E-04	0.6	-2.0		138544
10	23.00	1.79	0.001	1.41E-04	1.4	-1.5		138544
11	22.53	1.98	0.001	1.44E-04	2.3	-0.6		138544
12	22.06	2.15	0.001	1.44E-04	3.3	0.7		138544
13	22.00	2.17	0.001	1.44E-04	3.4	0.9		138544
		-3.54	0.001	1.44E-04	3.4	0.9		
14	21.64	-2.99	0.001	1.40E-04	2.2	1.9		138544
15	21.50	-2.78	0.001	1.38E-04	1.8	2.2		138544
16	21.03	-2.11	0.001	1.30E-04	0.7	2.7		138544
17	20.56	-1.50	0.000	1.20E-04	-0.2	2.8		138544
18	20.50	-1.43	0.000	1.19E-04	-0.3	2.8		138544
19	20.00	-0.85	0.000	1.10E-04	-0.8	2.5		138544
20	19.50	-0.32	0.000	1.02E-04	-1.1	2.0		138544
21	19.00	0.16	0.000	9.60E-05	-1.2	1.4		138544
22	18.50	0.61	0.000	9.21E-05	-1.0	0.8		138544
23	18.00	1.04	0.000	9.00E-05	-0.6	0.4		138544
		-0.46	0.000	9.00E-05	-0.6	0.4		
24	17.63	0.72	0.000	8.93E-05	-0.5	0.1		138544
25	17.25	1.98	0.000	8.91E-05	-0.0	0.0		---

(continued)

Stage No.1 Apply surcharge no.1 at elevation 26.75

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1063
2	26.43	0.00	6.84	2.91	17.42	2.91	2.91a	1063
3	26.10	0.00	15.27	6.49	38.90	6.67	6.67	1063
4	25.75	0.00	23.85	10.14	60.75	11.11	11.11	1063
5	25.25	0.00	34.84	14.81	88.74	17.02	17.02	1063
6	24.88	0.00	42.50	18.07	108.26	21.27	21.27	1063
7	24.50	0.00	49.88	21.20	127.06	25.42	25.42	1063
8	24.00	0.00	59.45	25.27	151.44	30.87	30.87	1063
9	23.50	0.00	68.82	29.26	175.32	36.25	36.25	1063
10	23.00	0.00	78.07	33.19	198.87	41.60	41.60	1063
11	22.53	0.00	86.67	36.85	220.79	46.60	46.60	1063
12	22.06	0.00	95.21	40.48	242.55	51.58	51.58	1063
13	22.00	0.00	96.30	40.94	245.32	52.22	52.22	1063
		0.00	96.30	34.13	309.61	42.78	42.78	5315
14	21.64	0.00	103.52	36.69	332.83	46.66	46.66	5315
15	21.50	0.00	106.33	37.68	341.84	48.16	48.16	5315
16	21.03	4.61	111.10	39.37	357.19	50.89	55.50	5315
17	20.56	9.22	115.84	41.05	372.43	53.58	62.80	5315
18	20.50	9.81	116.45	41.27	374.37	53.92	63.73	5315
19	20.00	14.71	121.46	43.04	390.48	56.75	71.46	5315
20	19.50	19.62	126.44	44.81	406.51	59.54	79.16	5315
21	19.00	24.52	131.41	46.57	422.48	62.31	86.83	5315
22	18.50	29.43	136.36	48.32	438.39	65.06	94.49	5315
23	18.00	34.34	141.29	50.07	454.26	67.79	102.13	5315
		Total>	175.63	43.75m	346.37	209.49	209.49	23210
24	17.63	Total>	183.00	45.63m	358.87	218.66	218.66	23906
25	17.25	Total>	190.37	47.50m	371.36	227.87	227.87	24602

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1063
2	26.43	0.00	5.85	2.49	14.90	4.68	4.68	1063
3	26.10	0.00	11.70	4.97	29.80	8.02	8.02	1063
4	25.75	0.00	18.00	7.65	45.85	11.61	11.61	1063
5	25.25	0.00	27.00	11.48	68.78	16.75	16.75	1063
6	24.88	0.00	33.75	14.35	85.98	20.60	20.60	1063
7	24.50	0.00	40.50	17.22	103.17	24.45	24.45	1063
8	24.00	0.00	49.50	21.04	126.10	29.57	29.57	1063
9	23.50	0.00	58.50	24.87	149.02	34.70	34.70	1063
10	23.00	0.00	67.50	28.70	171.95	39.82	39.82	1063
11	22.53	0.00	75.96	32.29	193.50	44.62	44.62	1063
12	22.06	0.00	84.42	35.89	215.05	49.43	49.43	1063
13	22.00	0.00	85.50	36.35	217.80	50.05	50.05	1063
		0.00	85.50	30.30	274.88	46.32	46.32	5315
14	21.64	0.00	92.70	32.85	298.03	49.65	49.65	5315
15	21.50	0.00	95.50	33.84	307.03	50.95	50.95	5315
16	21.03	4.61	100.29	35.54	322.43	53.00	57.61	5315
17	20.56	9.22	105.08	37.24	337.83	55.08	64.31	5315
18	20.50	9.81	105.69	37.46	339.79	55.35	65.16	5315
19	20.00	14.71	110.79	39.26	356.17	57.59	72.31	5315
20	19.50	19.62	115.88	41.07	372.55	59.86	79.48	5315

(continued)

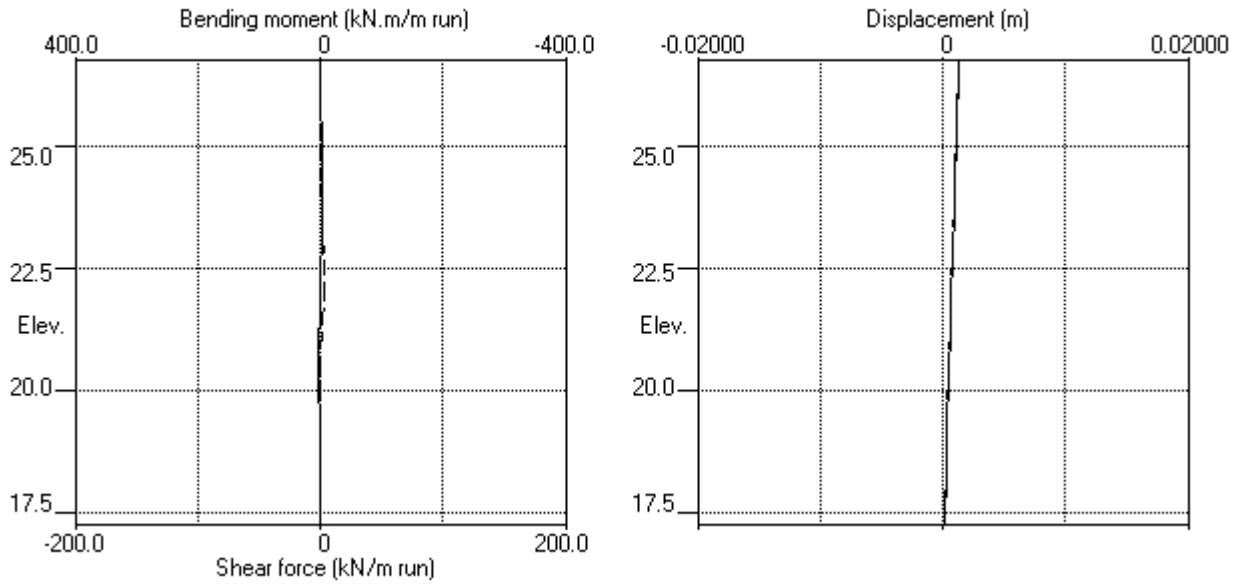
Stage No.1 Apply surcharge no.1 at elevation 26.75

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
21	19.00	24.52	120.98	42.87	388.93	62.15	86.67	5315
22	18.50	29.43	126.07	44.68	405.32	64.44	93.87	5315
23	18.00	34.34	131.17	46.48	421.70	66.75	101.08	5315
		Total>	165.50	43.75m	336.24	209.94	209.94	23210
24	17.63	Total>	173.00	45.63m	348.86	217.94	217.94	23906
25	17.25	Total>	180.50	47.50m	361.49	225.89	225.89	24602

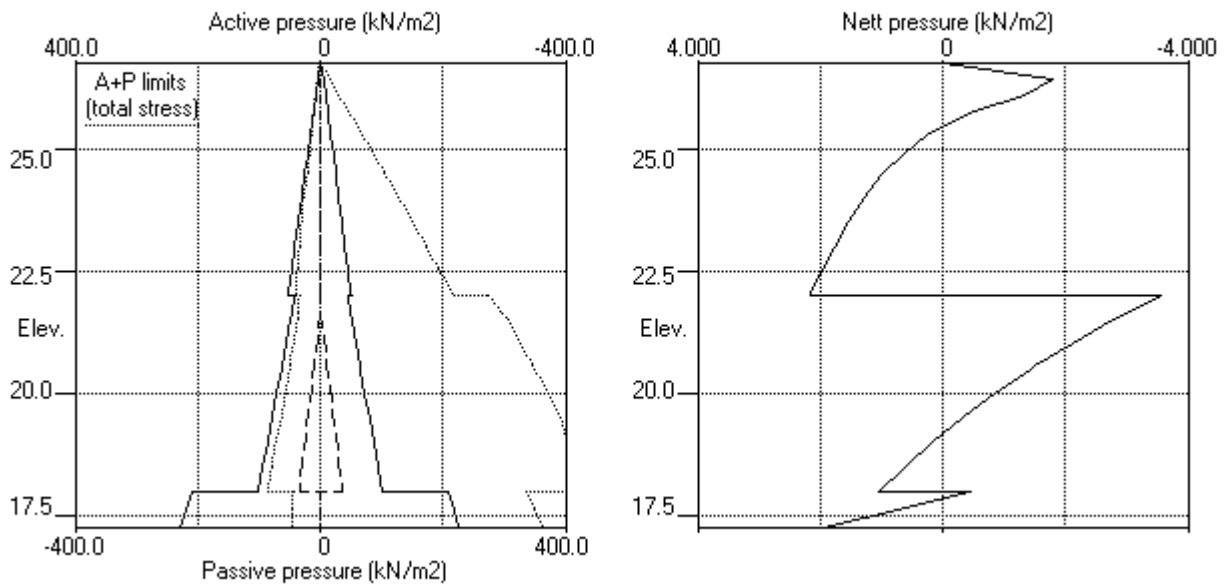
Note: 2.91a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 26.75



Stage No.1 Apply surcharge no.1 at elev. 26.75



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 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 25.25 on RIGHT side

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

			Overall		Toe elev. for			
			FoS for toe		FoS = 1.000			
			elev. = 17.25					
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction	
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of	
			Safety	at elev.		-ation	failure	
2	26.75 25.25	Cant.	2.740	18.07	22.84	2.41	L to R	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.011	1.79E-03	0.0	0.0		138544
2	26.43	2.91	0.010	1.79E-03	0.5	0.1		138544
3	26.10	6.49	0.009	1.79E-03	2.0	0.5		138544
4	25.75	10.14	0.009	1.79E-03	4.9	1.6		138544
5	25.25	14.81	0.008	1.78E-03	11.1	5.5		138544
6	24.88	0.87	0.007	1.75E-03	14.1	10.4		138544
7	24.50	-3.54	0.007	1.72E-03	13.6	15.9		138544
8	24.00	-3.31	0.006	1.65E-03	11.9	22.2		138544
9	23.50	-2.11	0.005	1.56E-03	10.5	28.0		138544
10	23.00	0.24	0.004	1.45E-03	10.1	33.0		138544
11	22.53	2.25	0.004	1.33E-03	10.6	37.7		138544
12	22.06	4.05	0.003	1.19E-03	12.1	43.0		138544
13	22.00	4.26	0.003	1.17E-03	12.4	43.7		138544
		-21.68	0.003	1.17E-03	12.4	43.7		
14	21.64	-19.54	0.003	1.06E-03	4.9	46.7		138544
15	21.50	-18.80	0.002	1.01E-03	2.3	47.2		138544
16	21.03	-14.47	0.002	8.55E-04	-5.6	46.6		138544
17	20.56	-9.12	0.002	7.04E-04	-11.1	42.4		138544
18	20.50	-8.51	0.002	6.85E-04	-11.6	41.7		138544
19	20.00	-4.07	0.001	5.47E-04	-14.8	34.8		138544
20	19.50	-0.58	0.001	4.36E-04	-15.9	26.9		138544
21	19.00	2.17	0.001	3.53E-04	-15.5	18.9		138544
22	18.50	4.40	0.001	2.99E-04	-13.9	11.4		138544
23	18.00	6.31	0.000	2.70E-04	-11.2	4.9		138544
		9.81	0.000	2.70E-04	-11.2	4.9		
24	17.63	14.91	0.000	2.61E-04	-6.6	1.4		138544
25	17.25	20.23	0.000	2.59E-04	-0.0	-0.0		---

(continued)

Stage No.2 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1436
2	26.43	0.00	6.84	2.91	17.42	2.91	2.91a	1436
3	26.10	0.00	15.27	6.49	38.90	6.49	6.49a	1436
4	25.75	0.00	23.85	10.14	60.75	10.14	10.14a	1436
5	25.25	0.00	34.84	14.81	88.74	14.81	14.81a	1436
6	24.88	0.00	42.50	18.07	108.26	18.07	18.07a	1436
7	24.50	0.00	49.88	21.20	127.06	21.20	21.20a	1436
8	24.00	0.00	59.45	25.27	151.44	25.27	25.27a	1436
9	23.50	0.00	68.82	29.26	175.32	30.37	30.37	1436
10	23.00	0.00	78.07	33.19	198.87	36.70	36.70	1436
11	22.53	0.00	86.67	36.85	220.79	42.55	42.55	1436
12	22.06	0.00	95.21	40.48	242.55	48.28	48.28	1436
13	22.00	0.00	96.30	40.94	245.32	49.01	49.01	1436
		0.00	96.30	34.13	309.61	34.13	34.13a	7178
14	21.64	0.00	103.52	36.69	332.83	36.69	36.69a	7178
15	21.50	0.00	106.33	37.68	341.84	37.68	37.68a	7178
16	21.03	4.61	111.10	39.37	357.19	40.97	45.58	7178
17	20.56	9.22	115.84	41.05	372.43	45.86	55.08	7178
18	20.50	9.81	116.45	41.27	374.37	46.45	56.26	7178
19	20.00	14.71	121.46	43.04	390.48	51.07	65.78	7178
20	19.50	19.62	126.44	44.81	406.51	55.24	74.86	7178
21	19.00	24.52	131.41	46.57	422.48	59.06	83.59	7178
22	18.50	29.43	136.36	48.32	438.39	62.64	92.07	7178
23	18.00	34.34	141.29	50.07	454.26	66.06	100.40	7178
		Total>	175.63	43.75m	346.37	202.18	202.18	30329
24	17.63	Total>	183.00	45.63m	358.87	213.19	213.19	31239
25	17.25	Total>	190.37	47.50m	371.36	224.30	224.30	32149

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1653
6	24.88	0.00	6.75	2.87	17.20	17.20	17.20p	1653
7	24.50	0.00	13.50	5.74	34.39	24.75	24.75	1653
8	24.00	0.00	22.50	9.57	57.32	28.58	28.58	1653
9	23.50	0.00	31.50	13.39	80.24	32.48	32.48	1653
10	23.00	0.00	40.50	17.22	103.17	36.46	36.46	1653
11	22.53	0.00	48.96	20.81	124.73	40.30	40.30	1653
12	22.06	0.00	57.42	24.41	146.28	44.24	44.24	1653
13	22.00	0.00	58.50	24.87	149.03	44.75	44.75	1653
		0.00	58.50	20.73	188.09	55.81	55.81	8267
14	21.64	0.00	65.70	23.28	211.24	56.23	56.23	8267
15	21.50	0.00	68.50	24.28	220.24	56.48	56.48	8267
16	21.03	4.61	73.30	25.98	235.65	55.44	60.05	8267
17	20.56	9.22	78.09	27.67	251.05	54.98	64.20	8267
18	20.50	9.81	78.70	27.89	253.02	54.96	64.77	8267
19	20.00	14.71	83.80	29.70	269.41	55.14	69.85	8267

(continued)

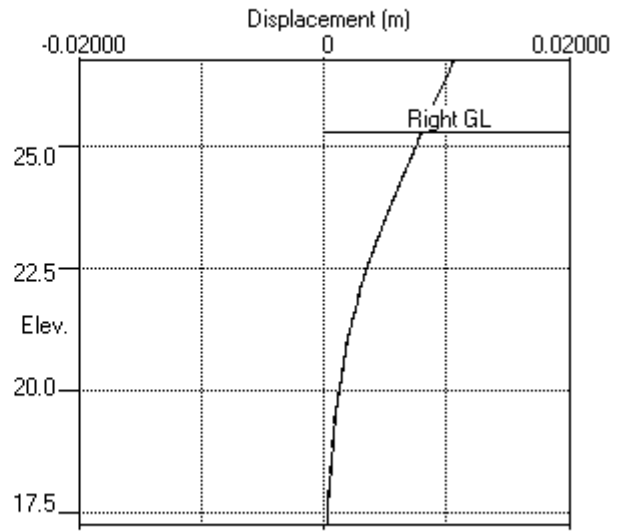
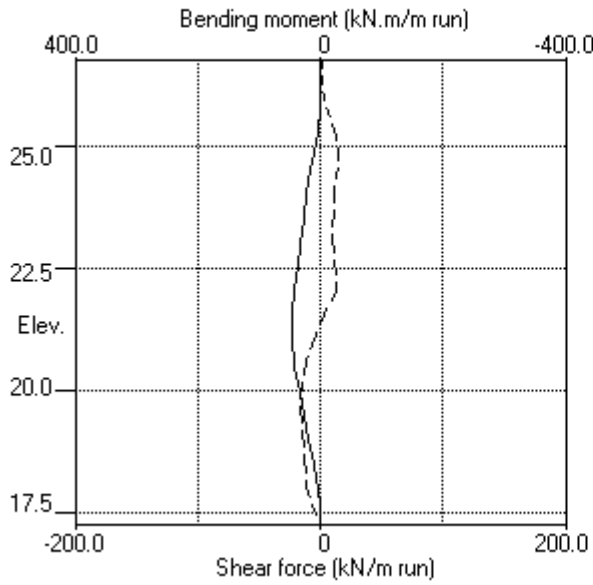
Stage No.2 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	19.50	19.62	88.90	31.50	285.80	55.82	75.44	8267
21	19.00	24.52	94.00	33.31	302.20	56.89	81.42	8267
22	18.50	29.43	99.10	35.12	318.60	58.24	87.67	8267
23	18.00	34.34	104.20	36.93	335.00	59.75	94.09	8267
		Total>	138.53	36.25m	309.27	192.36	192.36	34547
24	17.63	Total>	146.04	38.13m	321.90	198.27	198.27	35583
25	17.25	Total>	153.55	40.00m	334.53	204.07	204.07	36619

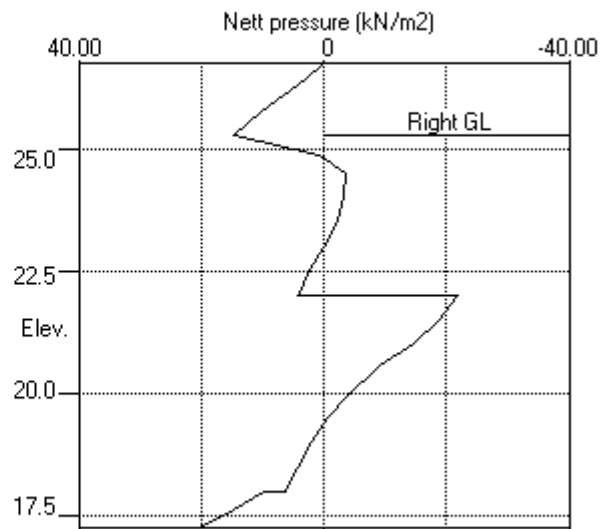
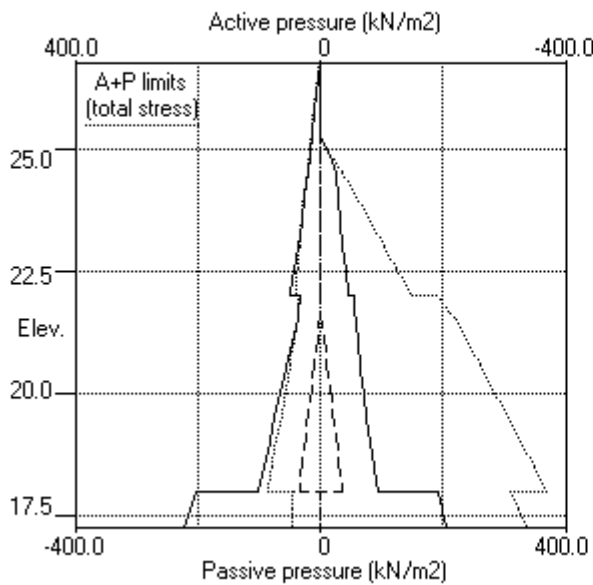
Note: 37.68a Soil pressure at active limit
 17.20p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 25.25 on RIGHT side



Stage No.2 Excav. to elev. 25.25 on RIGHT side



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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Apply water pressure profile no.1 (Worst Cred.)

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

			Overall							
			FoS for toe	Toe elev. for						
			elev. = 17.25	FoS = 1.000						

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure		
4	26.75	25.25	25.75	6.266	n/a	24.60	0.65	L to R		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.011	1.70E-03	0.0	0.0		138544
2	26.43	3.18	0.010	1.70E-03	0.5	0.1		138544
3	26.10	6.62	0.009	1.70E-03	2.1	0.5		138544
4	25.75	10.14	0.009	1.70E-03	5.0	1.7	0.7	138544
		10.14	0.009	1.70E-03	4.3	1.7		
5	25.25	14.81	0.008	1.68E-03	10.6	5.3		138544
6	24.88	0.87	0.007	1.66E-03	13.5	10.0		138544
7	24.50	-3.66	0.007	1.63E-03	13.0	15.2		138544
8	24.00	-3.46	0.006	1.56E-03	11.2	21.2		138544
9	23.50	-2.51	0.005	1.48E-03	9.7	26.6		138544
10	23.00	-0.24	0.004	1.37E-03	9.0	31.2		138544
11	22.53	1.70	0.004	1.26E-03	9.4	35.4		138544
12	22.06	3.45	0.003	1.13E-03	10.6	39.9		138544
13	22.00	3.65	0.003	1.11E-03	10.8	40.6		138544
		-23.21	0.003	1.11E-03	10.8	40.6		
14	21.64	-21.16	0.003	1.01E-03	2.8	42.9		138544
15	21.50	-20.46	0.003	9.67E-04	-0.1	43.1		138544
16	21.03	-14.73	0.002	8.24E-04	-8.4	41.2		138544
17	20.56	-6.55	0.002	6.93E-04	-13.4	35.8		138544
18	20.50	-5.56	0.002	6.77E-04	-13.8	35.0		138544
19	20.00	-1.09	0.002	5.65E-04	-15.4	27.4		138544
20	19.50	2.54	0.001	4.80E-04	-15.1	19.6		138544
21	19.00	5.56	0.001	4.22E-04	-13.0	12.4		138544
22	18.50	8.17	0.001	3.88E-04	-9.6	6.6		138544
23	18.00	10.54	0.001	3.71E-04	-4.9	2.8		138544
		-0.03	0.001	3.71E-04	-4.9	2.8		
24	17.63	6.47	0.001	3.66E-04	-3.7	0.9		138544
25	17.25	13.32	0.000	3.65E-04	-0.0	-0.0		---
At elev. 25.75 Strut force =			3.6 kN/strut =			0.7 kN/m run		

(continued)

Stage No.4 Apply water pressure profile no.1 (Worst Cred.)

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	4777
2	26.43	0.00	6.84	2.91	17.42	3.18	3.18	4777
3	26.10	0.00	15.27	6.49	38.90	6.62	6.62	4777
4	25.75	0.00	23.85	10.14	60.75	10.14	10.14a	960
5	25.25	0.00	34.84	14.81	88.74	14.81	14.81a	960
6	24.88	0.00	42.50	18.07	108.26	18.07	18.07a	960
7	24.50	0.00	49.88	21.20	127.06	21.20	21.20a	960
8	24.00	0.00	59.45	25.27	151.44	25.27	25.27a	960
9	23.50	0.00	68.82	29.26	175.32	30.17	30.17	960
10	23.00	0.00	78.07	33.19	198.87	36.46	36.46	960
11	22.53	0.00	86.67	36.85	220.79	42.27	42.27	960
12	22.06	0.00	95.21	40.48	242.55	47.98	47.98	960
13	22.00	0.00	96.30	40.94	245.32	48.70	48.70	960
		0.00	96.30	34.13	309.61	34.13	34.13a	4798
14	21.64	0.00	103.52	36.69	332.83	36.69	36.69a	4798
15	21.50	0.00	106.33	37.68	341.84	37.68	37.68a	4798
16	21.03	4.61	111.10	39.37	357.19	39.37	43.98a	4798
17	20.56	9.22	115.84	41.05	372.43	44.07	53.29	4798
18	20.50	9.81	116.45	41.27	374.37	44.66	54.47	4798
19	20.00	14.71	121.46	43.04	390.48	49.29	64.00	4798
20	19.50	19.62	126.44	44.81	406.51	53.53	73.15	4798
21	19.00	24.52	131.41	46.57	422.48	57.49	82.01	4798
22	18.50	29.43	136.36	48.32	438.39	61.25	90.68	4798
23	18.00	34.34	141.29	50.07	454.26	64.91	99.24	4798
		Total>	175.63	43.75m	346.37	197.06	197.06	21286
24	17.63	Total>	183.00	45.63m	358.87	208.77	208.77	21925
25	17.25	Total>	190.37	47.50m	371.36	220.65	220.65	22563

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	960
6	24.88	0.00	6.75	2.87	17.20	17.20	17.20p	960
7	24.50	0.00	13.50	5.74	34.39	24.86	24.86	960
8	24.00	0.00	22.50	9.57	57.32	28.74	28.74	960
9	23.50	0.00	31.50	13.39	80.24	32.68	32.68	960
10	23.00	0.00	40.50	17.22	103.17	36.70	36.70	960
11	22.53	0.00	48.96	20.81	124.73	40.57	40.57	960
12	22.06	0.00	57.42	24.41	146.28	44.54	44.54	960
13	22.00	0.00	58.50	24.87	149.03	45.05	45.05	960
		0.00	58.50	20.73	188.09	57.34	57.34	4798
14	21.64	0.00	65.70	23.28	211.24	57.85	57.85	4798
15	21.50	0.00	68.50	24.28	220.24	58.14	58.14	4798
16	21.03	0.00	77.91	27.61	250.47	58.71	58.71	4798
17	20.56	0.00	87.31	30.94	280.70	59.84	59.84	4798
18	20.50	0.00	88.51	31.37	284.56	60.03	60.03	4798
19	20.00	4.90	93.61	33.17	300.95	60.19	65.10	4798

(continued)

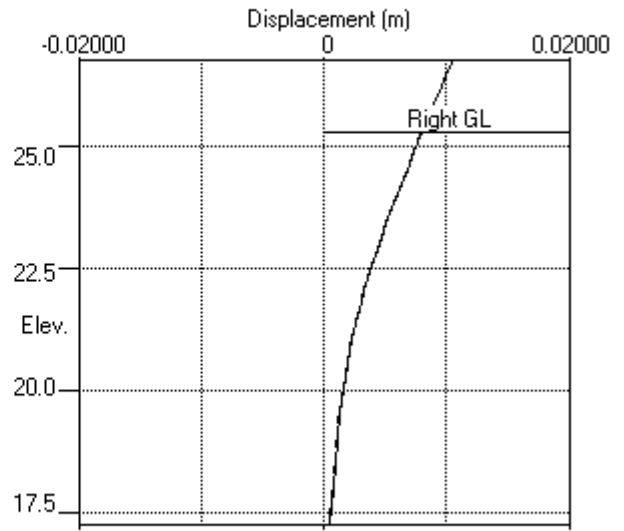
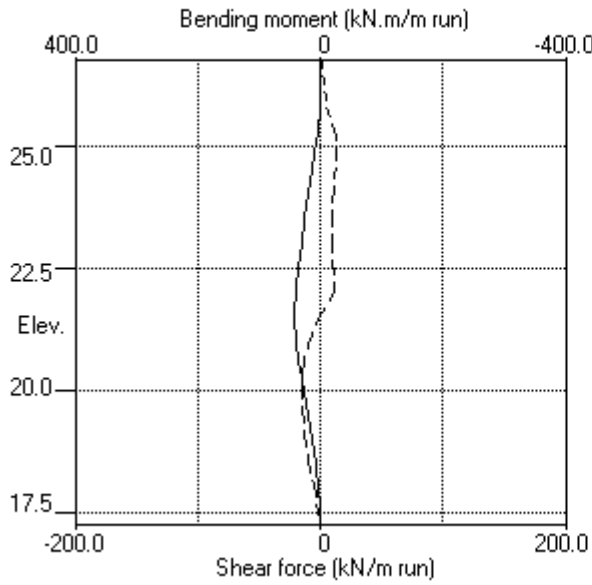
Stage No.4 Apply water pressure profile no.1 (Worst Cred.)

Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2			
20	19.50	9.81	98.71	34.98	317.34	60.80	70.61	4798	
21	19.00	14.71	103.81	36.79	333.74	61.73	76.45	4798	
22	18.50	19.62	108.91	38.60	350.14	62.89	82.51	4798	
23	18.00	24.52	114.01	40.40	366.54	64.18	88.70	4798	
		Total>	138.53	36.25m	309.27	197.09	197.09	21286	
24	17.63	Total>	146.04	38.13m	321.90	202.30	202.30	21925	
25	17.25	Total>	153.55	40.00m	334.53	207.33	207.33	22563	

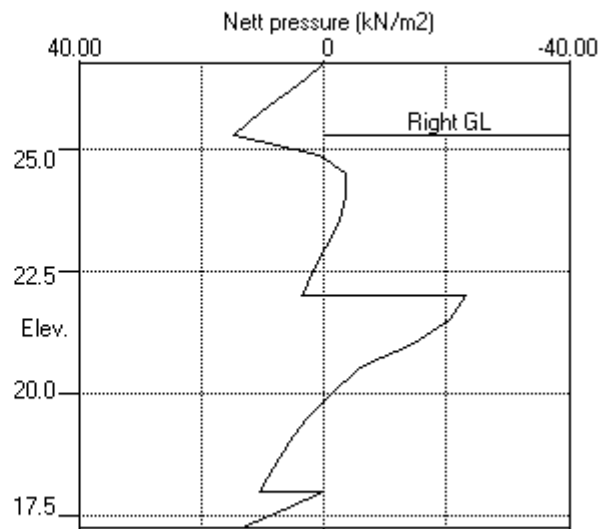
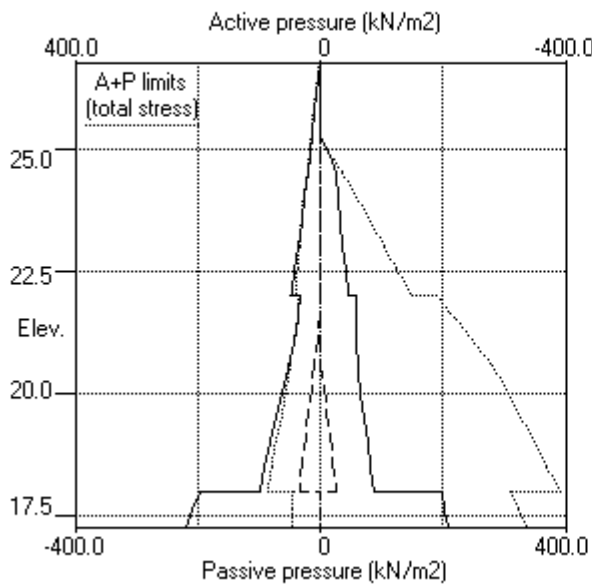
Note: 43.98a Soil pressure at active limit
 17.20p Soil pressure at passive limit

Units: kN,m

Stage No.4 Apply water pressure profile no.1 (Worst Cred.)



Stage No.4 Apply water pressure profile no.1 (Worst Cred.)



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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 5 Excavate to elevation 20.56 on RIGHT side

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

			Overall					
			FoS for toe		Toe elev. for			
			elev. = 17.25		FoS = 1.000			

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure
5	26.75	20.56	25.75	1.195	n/a	17.57	2.99	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	0.006	-4.03E-03	0.0	0.0		138544
2	26.43	17.42	0.007	-4.03E-03	2.8	0.3		138544
3	26.10	12.06	0.008	-4.04E-03	7.6	2.0		138544
4	25.75	10.14	0.010	-4.04E-03	11.5	5.5	119.9	138544
		10.14	0.010	-4.04E-03	-108.3	5.5		
5	25.25	14.81	0.012	-3.97E-03	-102.1	-47.2		138544
6	24.88	18.07	0.013	-3.79E-03	-95.9	-84.4		138544
7	24.50	21.20	0.015	-3.52E-03	-88.6	-118.8		138544
8	24.00	25.27	0.016	-3.01E-03	-77.0	-160.4		138544
9	23.50	29.26	0.018	-2.37E-03	-63.3	-195.3		138544
10	23.00	33.19	0.019	-1.62E-03	-47.7	-223.3		138544
11	22.53	36.85	0.019	-8.31E-04	-31.3	-242.0		138544
12	22.06	40.48	0.019	7.64E-06	-13.1	-252.5		138544
13	22.00	40.94	0.019	1.17E-04	-10.7	-253.2		138544
		34.13	0.019	1.17E-04	-10.7	-253.2		
14	21.64	36.69	0.019	7.77E-04	2.1	-254.9		138544
15	21.50	37.68	0.019	1.03E-03	7.3	-254.2		138544
16	21.03	43.98	0.018	1.88E-03	26.5	-246.2		138544
17	20.56	50.27	0.017	2.68E-03	48.6	-228.7		138544
18	20.50	47.22	0.017	2.78E-03	51.6	-225.7		138544
19	20.00	32.61	0.016	3.54E-03	71.5	-194.8		138544
20	19.50	18.00	0.014	4.17E-03	84.2	-155.8		138544
21	19.00	3.38	0.011	4.66E-03	89.5	-112.2		138544
22	18.50	-11.26	0.009	4.98E-03	87.6	-67.7		138544
23	18.00	-24.48	0.007	5.15E-03	78.6	-23.9		138544
		-151.42	0.007	5.15E-03	78.6	-23.9		
24	17.63	-115.77	0.005	5.19E-03	28.5	-5.3		138544
25	17.25	-36.33	0.003	5.19E-03	0.0	0.0		---

At elev. 25.75 Strut force = 599.3 kN/strut = 119.9 kN/m run

(continued)

Stage No.5 Excavate to elevation 20.56 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	5220
2	26.43	0.00	6.84	2.91	17.42	17.42	17.42p	5220
3	26.10	0.00	15.27	6.49	38.90	12.06	12.06	5220
4	25.75	0.00	23.85	10.14	60.75	10.14	10.14a	984
5	25.25	0.00	34.84	14.81	88.74	14.81	14.81a	984
6	24.88	0.00	42.50	18.07	108.26	18.07	18.07a	984
7	24.50	0.00	49.88	21.20	127.06	21.20	21.20a	984
8	24.00	0.00	59.45	25.27	151.44	25.27	25.27a	984
9	23.50	0.00	68.82	29.26	175.32	29.26	29.26a	984
10	23.00	0.00	78.07	33.19	198.87	33.19	33.19a	984
11	22.53	0.00	86.67	36.85	220.79	36.85	36.85a	984
12	22.06	0.00	95.21	40.48	242.55	40.48	40.48a	984
13	22.00	0.00	96.30	40.94	245.32	40.94	40.94a	984
		0.00	96.30	34.13	309.61	34.13	34.13a	4920
14	21.64	0.00	103.52	36.69	332.83	36.69	36.69a	4920
15	21.50	0.00	106.33	37.68	341.84	37.68	37.68a	4920
16	21.03	4.61	111.10	39.37	357.19	39.37	43.98a	4920
17	20.56	9.22	115.84	41.05	372.43	41.05	50.27a	4920
18	20.50	9.81	116.45	41.27	374.37	41.27	51.08a	4920
19	20.00	14.71	121.46	43.04	390.48	43.04	57.76a	4920
20	19.50	19.62	126.44	44.81	406.51	44.81	64.43a	4920
21	19.00	24.52	131.41	46.57	422.48	46.57	71.09a	4920
22	18.50	29.43	136.36	48.32	438.39	48.32	77.75a	4920
23	18.00	34.34	141.29	50.07	454.26	50.07	84.41a	4920
		Total>	175.63	43.75m	346.37	70.50	70.50	21736
24	17.63	Total>	183.00	45.63m	358.87	118.78	118.78	22388
25	17.25	Total>	190.37	47.50m	371.36	169.77	169.77	23040

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	21.03	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	20.56	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	8467
18	20.50	0.00	1.20	0.43	3.86	3.86	3.86p	8467
19	20.00	4.90	6.30	2.23	20.24	20.24	25.14p	8467
20	19.50	9.81	11.39	4.04	36.62	36.62	46.43p	8467

(continued)

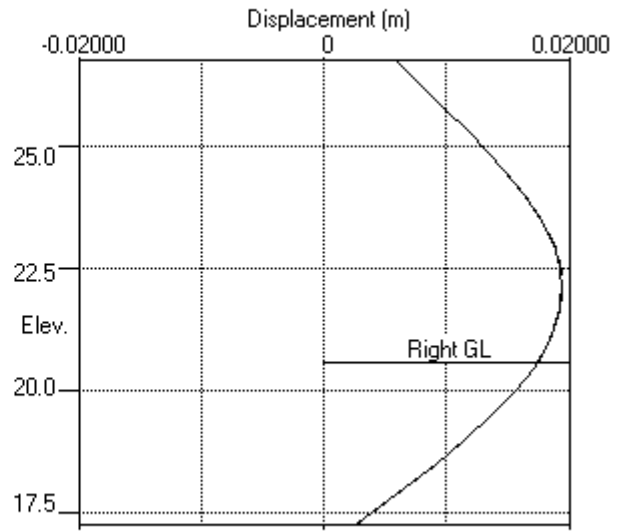
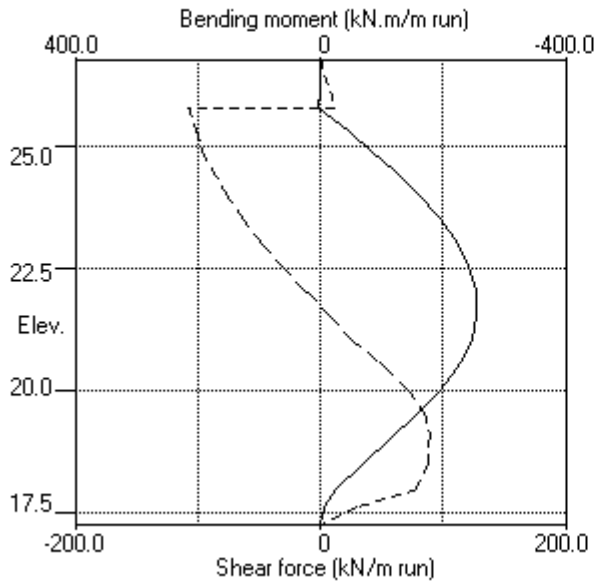
Stage No.5 Excavate to elevation 20.56 on RIGHT side

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
21	19.00	14.71	16.49	5.84	53.00	53.00	67.72p	8467
22	18.50	19.62	21.58	7.65	69.39	69.39	89.01p	8467
23	18.00	24.52	26.68	9.46	85.78	84.36	108.89	8467
		Total>	51.21	12.80m	221.92	221.92	221.92p	35322
24	17.63	Total>	58.71	14.67m	234.55	234.55	234.55p	36381
25	17.25	Total>	66.21	16.55m	247.18	206.10	206.10	37441

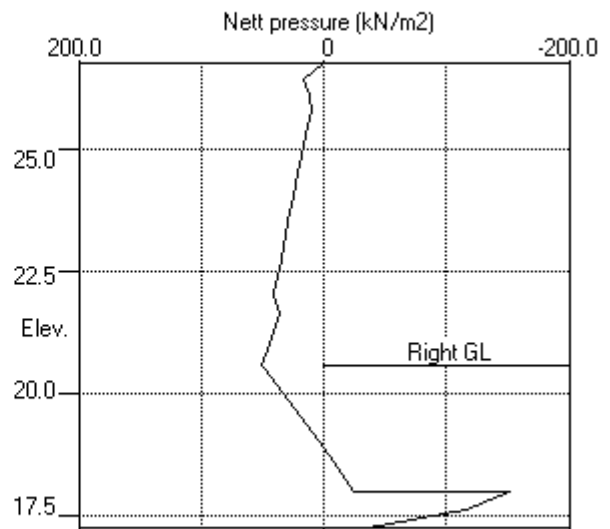
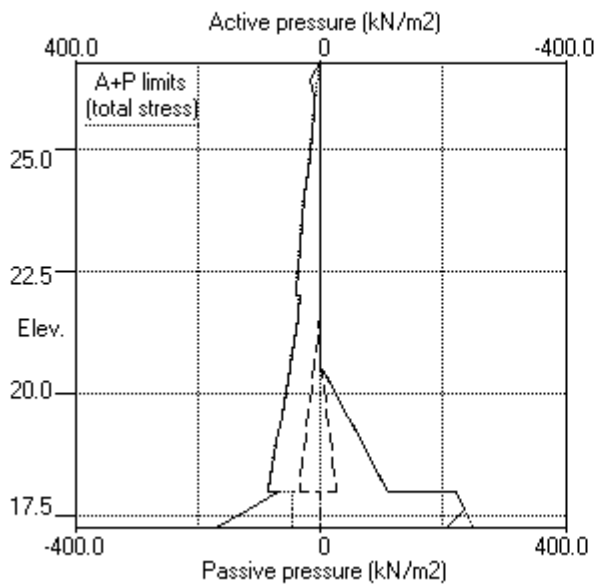
Note: 84.41a Soil pressure at active limit
 234.55p Soil pressure at passive limit

Units: kN,m

Stage No.5 Excav. to elev. 20.56 on RIGHT side



Stage No.5 Excav. to elev. 20.56 on RIGHT side



Units: kN,m

Stage No. 6 Fill to elevation 21.64 on RIGHT side with soil type 1

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

				Overall				
				FoS for toe		Toe elev. for		
				elev. = 17.25		FoS = 1.000		
				-----		-----		
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.		Elev.	of	equilib.	elev.	Penetr	of
				Safety	at elev.		-ation	failure
6	26.75 21.64		25.75	1.619	n/a	18.98	2.66	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.006	-3.92E-03	0.0	0.0		138544
2	26.43	17.08	0.007	-3.92E-03	2.8	0.3		138544
3	26.10	11.90	0.008	-3.92E-03	7.5	2.0		138544
4	25.75	10.14	0.010	-3.93E-03	11.3	5.4	119.2	138544
		10.14	0.010	-3.93E-03	-107.8	5.4		
5	25.25	14.87	0.012	-3.86E-03	-101.6	-47.1		138544
6	24.88	18.17	0.013	-3.68E-03	-95.4	-84.0		138544
7	24.50	21.35	0.015	-3.40E-03	-88.0	-118.2		138544
8	24.00	25.47	0.016	-2.90E-03	-76.3	-159.4		138544
9	23.50	29.51	0.017	-2.26E-03	-62.5	-194.0		138544
10	23.00	33.48	0.018	-1.52E-03	-46.8	-221.5		138544
11	22.53	37.19	0.019	-7.37E-04	-30.2	-239.8		138544
12	22.06	40.86	0.019	9.26E-05	-11.8	-249.8		138544
13	22.00	41.32	0.019	2.00E-04	-9.4	-250.4		138544
		36.06	0.019	2.00E-04	-9.4	-250.4		
14	21.64	38.76	0.019	8.52E-04	4.1	-251.4		138544
15	21.50	38.73	0.019	1.10E-03	9.5	-250.5		138544
16	21.03	41.58	0.018	1.94E-03	28.4	-241.4		138544
17	20.56	44.39	0.017	2.72E-03	48.6	-223.5		138544
		45.76	0.017	2.72E-03	48.6	-223.5		
18	20.50	45.95	0.017	2.82E-03	51.4	-220.5		138544
19	20.00	31.50	0.015	3.56E-03	70.7	-189.9		138544
20	19.50	16.94	0.013	4.18E-03	82.8	-151.3		138544
21	19.00	2.30	0.011	4.65E-03	87.6	-108.6		138544
22	18.50	-12.43	0.009	4.96E-03	85.1	-65.2		138544
23	18.00	-25.79	0.006	5.12E-03	75.5	-22.8		138544
		-147.46	0.006	5.12E-03	75.5	-22.8		
24	17.63	-111.67	0.004	5.16E-03	27.0	-5.0		138544
25	17.25	-32.14	0.002	5.16E-03	0.0	0.0		---
At elev. 25.75 Strut force =			595.9 kN/strut =			119.2 kN/m run		

(continued)

Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	4723
2	26.43	0.00	6.84	2.91	17.42	17.08	17.08	4723
3	26.10	0.00	15.27	6.49	38.90	11.90	11.90	4723
4	25.75	0.00	23.85	10.14	60.75	10.14	10.14	961
5	25.25	0.00	34.84	14.81	88.74	14.87	14.87	961
6	24.88	0.00	42.50	18.07	108.26	18.17	18.17	961
7	24.50	0.00	49.88	21.20	127.06	21.35	21.35	961
8	24.00	0.00	59.45	25.27	151.44	25.47	25.47	961
9	23.50	0.00	68.82	29.26	175.32	29.51	29.51	961
10	23.00	0.00	78.07	33.19	198.87	33.48	33.48	961
11	22.53	0.00	86.67	36.85	220.79	37.19	37.19	961
12	22.06	0.00	95.21	40.48	242.55	40.86	40.86	961
13	22.00	0.00	96.30	40.94	245.32	41.32	41.32	961
		0.00	96.30	34.13	309.61	36.06	36.06	4806
14	21.64	0.00	103.52	36.69	332.83	38.76	38.76	4806
15	21.50	0.00	106.33	37.68	341.84	39.80	39.80	4806
16	21.03	4.61	111.10	39.37	357.19	41.64	46.25	4806
17	20.56	9.22	115.84	41.05	372.43	43.43	52.65	4806
18	20.50	9.81	116.45	41.27	374.37	43.65	53.46	4806
19	20.00	14.71	121.46	43.04	390.48	45.50	60.22	4806
20	19.50	19.62	126.44	44.81	406.51	47.30	66.92	4806
21	19.00	24.52	131.41	46.57	422.48	49.04	73.57	4806
22	18.50	29.43	136.36	48.32	438.39	50.76	80.19	4806
23	18.00	34.34	141.29	50.07	454.26	52.44	86.78	4806
		Total>	175.63	43.75m	346.37	81.02	81.02	21319
24	17.63	Total>	183.00	45.63m	358.87	129.36	129.36	21958
25	17.25	Total>	190.37	47.50m	371.36	180.39	180.39	22598

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1137
15	21.50	0.00	2.52	1.07	6.42	1.07	1.07a	1137
16	21.03	0.00	10.98	4.67	27.97	4.67	4.67a	1137
17	20.56	0.00	19.44	8.26	49.52	8.26	8.26a	1137
		0.00	19.44	6.89	62.50	6.89	6.89a	5686
18	20.50	0.00	20.64	7.31	66.36	7.51	7.51	5686
19	20.00	4.90	25.74	9.12	82.74	23.81	28.72	5686

(continued)

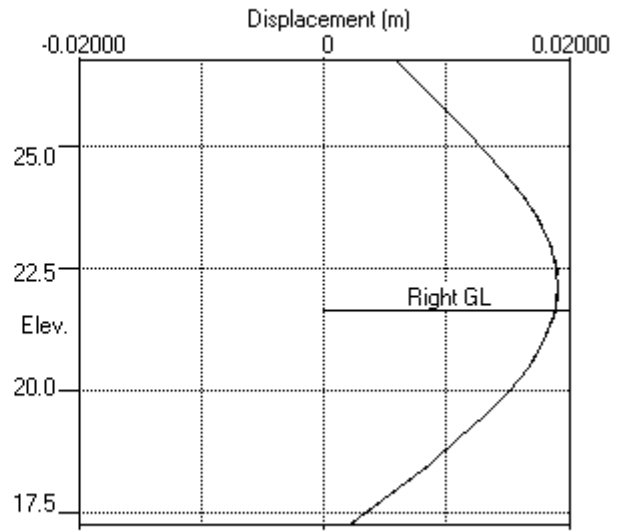
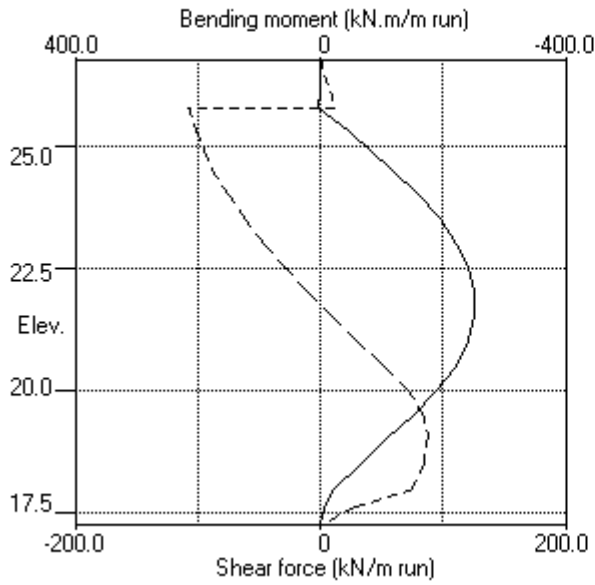
Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	19.50	9.81	30.83	10.93	99.13	40.16	49.97	5686
21	19.00	14.71	35.93	12.73	115.52	56.56	71.27	5686
22	18.50	19.62	41.03	14.54	131.91	72.99	92.61	5686
23	18.00	24.52	46.13	16.35	148.31	88.04	112.57	5686
		Total>	70.66	18.20m	241.38	228.47	228.47	24611
24	17.63	Total>	78.16	20.08m	254.00	241.02	241.02	25349
25	17.25	Total>	85.67	21.95m	266.63	212.53	212.53	26088

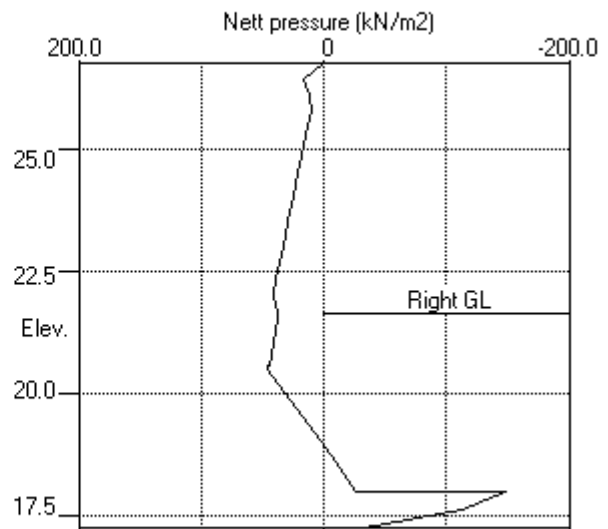
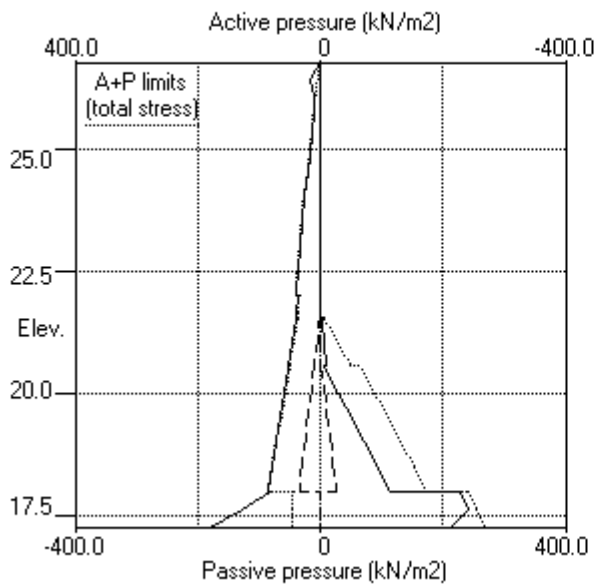
Note: 6.89a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Fill to elev. 21.64 on RIGHT side



Stage No.6 Fill to elev. 21.64 on RIGHT side



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 9 Remove strut or anchor no.1 at elevation 25.75

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

			Overall						
			FoS for toe	Toe elev. for					
			elev. = 17.25	FoS = 1.000					

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure	
9	26.75	21.64		More than one strut.	No FoS calc.				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m	
1	26.75	0.00	0.006	-4.19E-03	0.0	0.0		138544	
2	26.43	17.03	0.007	-4.19E-03	2.8	0.3		138544	
3	26.10	11.72	0.009	-4.19E-03	7.4	2.0	105.7	138544	
		11.72	0.009	-4.19E-03	-98.3	2.0			
4	25.75	10.14	0.010	-4.15E-03	-94.5	-31.7		138544	
5	25.25	14.81	0.012	-3.96E-03	-88.2	-77.4		138544	
6	24.88	18.07	0.014	-3.70E-03	-82.1	-109.4		138544	
7	24.50	21.20	0.015	-3.37E-03	-74.7	-138.6		138544	
8	24.00	25.27	0.016	-2.81E-03	-63.1	-173.2		138544	
9	23.50	29.26	0.018	-2.13E-03	-49.5	-201.3		138544	
10	23.00	33.27	0.019	-1.37E-03	-33.8	-222.3		138544	
11	22.53	37.07	0.019	-5.95E-04	-17.3	-234.4		138544	
12	22.06	40.83	0.019	2.06E-04	1.0	-238.4	16.5	138544	
		40.83	0.019	2.06E-04	-15.5	-238.4			
13	22.00	41.31	0.019	3.09E-04	-13.1	-239.2		138544	
		35.96	0.019	3.09E-04	-13.1	-239.2			
14	21.64	38.89	0.019	9.34E-04	0.4	-241.6		138544	
15	21.50	38.94	0.019	1.17E-03	5.9	-241.2		138544	
16	21.03	41.96	0.018	1.98E-03	24.9	-233.8		138544	
17	20.56	44.87	0.017	2.74E-03	45.3	-217.5		138544	
		46.24	0.017	2.74E-03	45.3	-217.5			
18	20.50	46.64	0.017	2.84E-03	48.1	-214.7		138544	
19	20.00	32.53	0.015	3.56E-03	67.9	-185.7		138544	
20	19.50	17.93	0.013	4.16E-03	80.5	-148.4		138544	
21	19.00	3.16	0.011	4.62E-03	85.7	-106.7		138544	
22	18.50	-11.73	0.009	4.93E-03	83.6	-64.1		138544	
23	18.00	-25.28	0.006	5.09E-03	74.3	-22.4		138544	
		-145.26	0.006	5.09E-03	74.3	-22.4			
24	17.63	-110.06	0.004	5.13E-03	26.5	-4.9		138544	
25	17.25	-31.15	0.002	5.13E-03	0.0	0.0		---	
At elev. 26.10 Strut force =			105.7 kN/strut =		105.7 kN/m run				
At elev. 22.06 Strut force =			16.5 kN/strut =		16.5 kN/m run				

(continued)

Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	17080
2	26.43	0.00	6.84	2.91	17.42	17.03	17.03	1420
3	26.10	0.00	15.27	6.49	38.90	11.72	11.72	1420
4	25.75	0.00	23.85	10.14	60.75	10.14	10.14a	1420
5	25.25	0.00	34.84	14.81	88.74	14.81	14.81a	1420
6	24.88	0.00	42.50	18.07	108.26	18.07	18.07a	1420
7	24.50	0.00	49.88	21.20	127.06	21.20	21.20a	1420
8	24.00	0.00	59.45	25.27	151.44	25.27	25.27a	1420
9	23.50	0.00	68.82	29.26	175.32	29.26	29.26a	1420
10	23.00	0.00	78.07	33.19	198.87	33.27	33.27	1420
11	22.53	0.00	86.67	36.85	220.79	37.07	37.07	1420
12	22.06	0.00	95.21	40.48	242.55	40.83	40.83	1420
13	22.00	0.00	96.30	40.94	245.32	41.31	41.31	1420
		0.00	96.30	34.13	309.61	35.96	35.96	7102
14	21.64	0.00	103.52	36.69	332.83	38.89	38.89	6535
15	21.50	0.00	106.33	37.68	341.84	40.01	40.01	6535
16	21.03	4.61	111.10	39.37	357.19	42.02	46.63	6535
17	20.56	9.22	115.84	41.05	372.43	43.91	53.13	6535
18	20.50	9.81	116.45	41.27	374.37	44.14	53.95	6535
19	20.00	14.71	121.46	43.04	390.48	46.01	60.73	6535
20	19.50	19.62	126.44	44.81	406.51	47.79	67.41	6535
21	19.00	24.52	131.41	46.57	422.48	49.48	74.00	6535
22	18.50	29.43	136.36	48.32	438.39	51.11	80.54	6535
23	18.00	34.34	141.29	50.07	454.26	52.70	87.03	6535
		Total>	175.63	43.75m	346.37	82.11	82.11	27853
24	17.63	Total>	183.00	45.63m	358.87	130.16	130.16	28689
25	17.25	Total>	190.37	47.50m	371.36	180.89	180.89	29524

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1307
15	21.50	0.00	2.52	1.07	6.42	1.07	1.07a	1307
16	21.03	0.00	10.98	4.67	27.97	4.67	4.67a	1307
17	20.56	0.00	19.44	8.26	49.52	8.26	8.26a	1307
		0.00	19.44	6.89	62.50	6.89	6.89a	6535
18	20.50	0.00	20.64	7.31	66.36	7.31	7.31a	6535
19	20.00	4.90	25.74	9.12	82.74	23.30	28.20	6535

(continued)

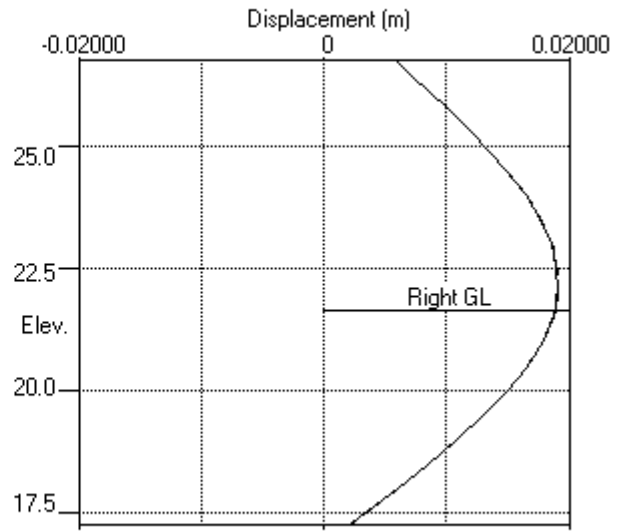
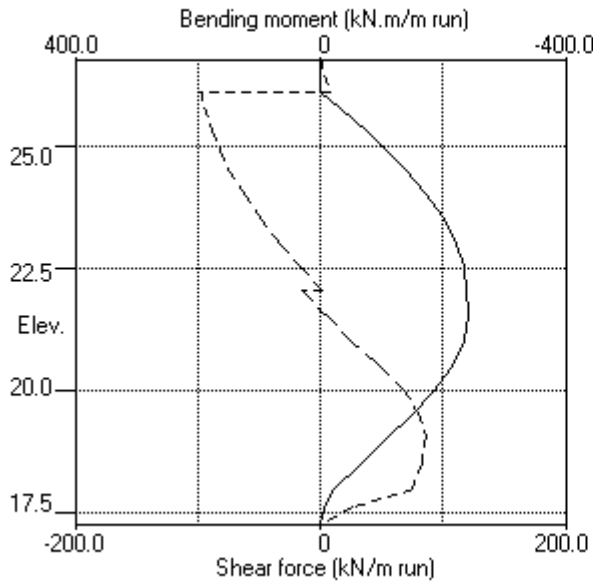
Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	19.50	9.81	30.83	10.93	99.13	39.67	49.48	6535
21	19.00	14.71	35.93	12.73	115.52	56.13	70.84	6535
22	18.50	19.62	41.03	14.54	131.91	72.64	92.26	6535
23	18.00	24.52	46.13	16.35	148.31	87.79	112.31	6535
		Total>	70.66	18.20m	241.38	227.38	227.38	27853
24	17.63	Total>	78.16	20.08m	254.00	240.22	240.22	28689
25	17.25	Total>	85.67	21.95m	266.63	212.04	212.04	29524

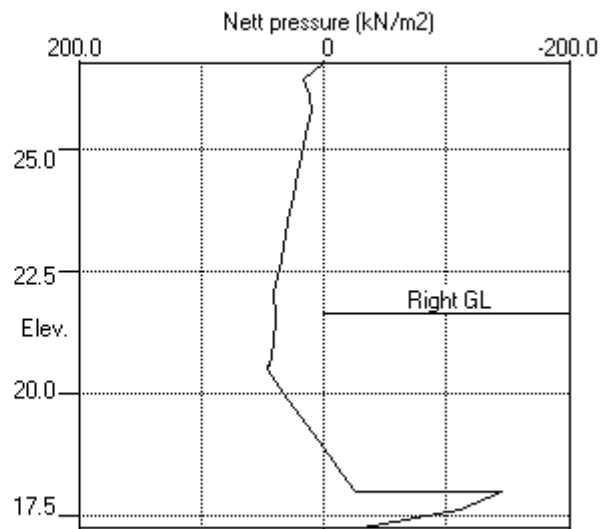
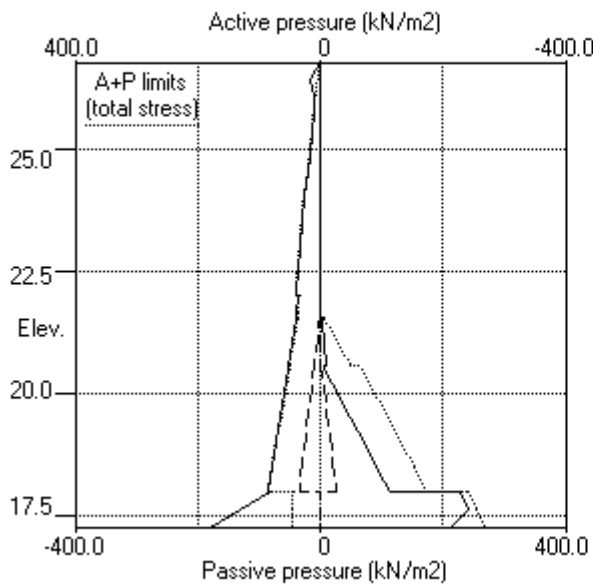
Note: 7.31a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.9 Remove strut no.1 at elev. 25.75



Stage No.9 Remove strut no.1 at elev. 25.75



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

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

		Overall					
		FoS for toe		Toe elev. for			
		elev. = 17.25		FoS = 1.000			
		-----		-----			
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
10	26.75 21.64		More than one strut.	No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.006	-4.29E-03	0.0	0.0		98960
2	26.43	17.32	0.007	-4.29E-03	2.8	0.3		98960
3	26.10	11.84	0.009	-4.30E-03	7.6	2.0	85.9	98960
		11.84	0.009	-4.30E-03	-78.3	2.0		
4	25.75	10.14	0.010	-4.26E-03	-74.5	-26.2		98960
5	25.25	14.81	0.012	-4.04E-03	-68.2	-64.2		98960
6	24.88	18.07	0.014	-3.77E-03	-62.1	-90.3		98960
7	24.50	21.20	0.015	-3.40E-03	-54.7	-113.7		98960
8	24.00	25.27	0.017	-2.80E-03	-43.1	-140.5		98960
9	23.50	29.26	0.018	-2.09E-03	-29.5	-160.8		98960
10	23.00	33.19	0.019	-1.31E-03	-13.8	-174.0		98960
11	22.53	37.01	0.019	-5.50E-04	2.7	-178.8		98960
12	22.06	40.78	0.019	2.11E-04	20.9	-175.5	53.7	98960
		40.78	0.019	2.11E-04	-32.7	-175.5		
13	22.00	41.26	0.019	3.07E-04	-30.3	-177.2		98960
		35.74	0.019	3.07E-04	-30.3	-177.2		
14	21.64	38.63	0.019	9.02E-04	-16.9	-184.4		98960
15	21.50	38.56	0.019	1.14E-03	-11.5	-185.8		98960
16	21.03	41.47	0.018	1.95E-03	7.3	-184.8		98960
17	20.56	44.30	0.017	2.74E-03	27.5	-175.0		98960
		45.12	0.017	2.74E-03	27.5	-175.0		
18	20.50	45.51	0.017	2.84E-03	30.2	-173.0		98960
19	20.00	31.53	0.015	3.60E-03	49.4	-151.0		98960
20	19.50	17.33	0.013	4.24E-03	61.7	-121.1		98960
21	19.00	3.29	0.011	4.73E-03	66.8	-86.7		98960
22	18.50	-9.77	0.008	5.06E-03	65.2	-51.5		98960
23	18.00	-21.35	0.006	5.22E-03	57.4	-16.7		98960
		-129.35	0.006	5.22E-03	57.4	-16.7		
24	17.63	-87.55	0.004	5.25E-03	16.8	-3.3		98960

(continued)

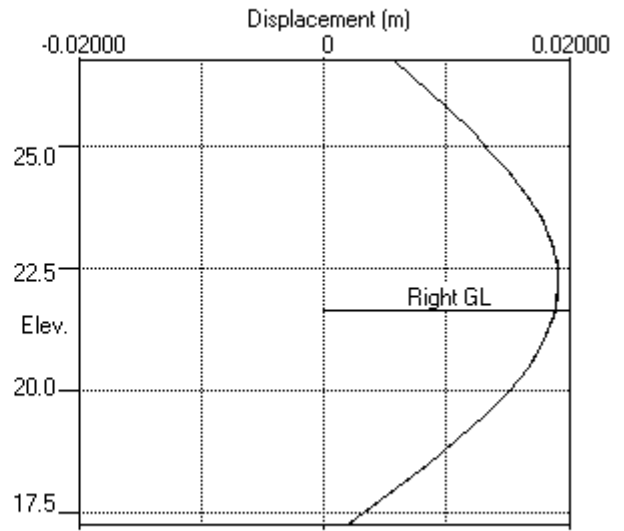
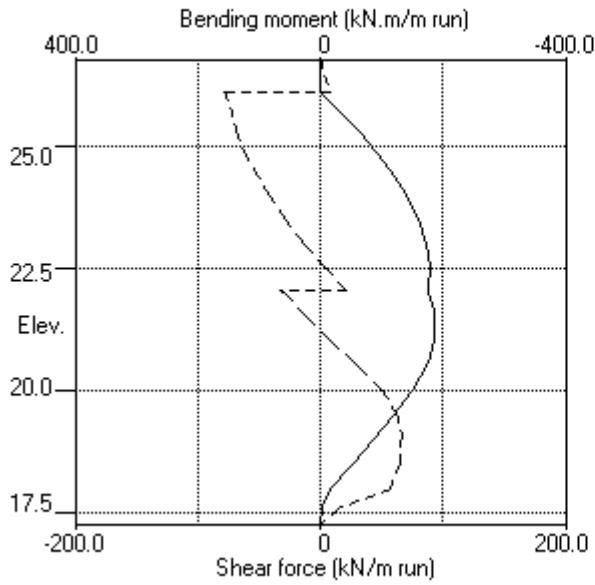
Stage No.10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3	
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	0.00	1692	
15	21.50	0.00	2.52	1.07	6.42	1.17	1.17	1692	
16	21.03	0.00	10.98	4.67	27.97	4.79	4.79	1692	
17	20.56	0.00	19.44	8.26	49.52	8.41	8.41	1692	
		0.00	19.44	6.89	62.50	7.59	7.59	8461	
18	20.50	0.00	20.64	7.31	66.36	8.02	8.02	8461	
19	20.00	4.90	25.74	9.12	82.74	23.92	28.83	8461	
20	19.50	9.81	30.83	10.93	99.13	40.04	49.85	8461	
21	19.00	14.71	35.93	12.73	115.52	56.06	70.77	15175	
22	18.50	19.62	41.03	14.54	131.91	71.67	91.29	15175	
23	18.00	24.52	46.13	16.35	148.31	85.82	110.35	15175	
		Total>	70.66	18.20m	241.38	219.42	219.42	61444	
24	17.63	Total>	78.16	20.08m	254.00	228.96	228.96	63287	
25	17.25	Total>	85.67	21.95m	266.63	197.36	197.36	65130	

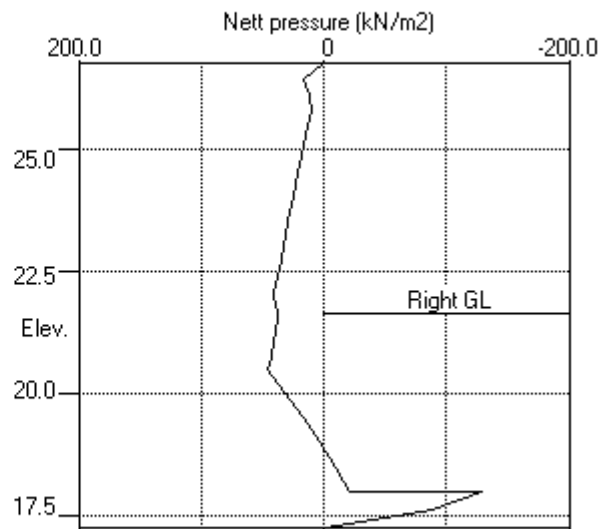
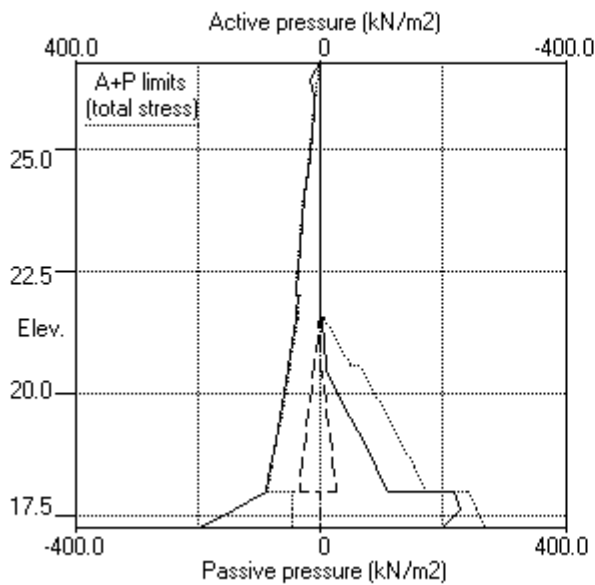
Note: 33.19a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.10 Change EI of wall to 98960kN.m²/m run



Stage No.10 Change EI of wall to 98960kN.m²/m run



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 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_1_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 13 Apply water pressure profile no.2 (Worst Cred.)

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

		Overall					
		FoS for toe		Toe elev. for			
		elev. = 17.25		FoS = 1.000			
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of
			Safety	at elev.		-ation	failure
13	26.75 21.64		More than one strut.	No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.006	-4.57E-03	0.0	0.0		98960
2	26.43	17.42	0.007	-4.57E-03	2.8	0.3		98960
3	26.10	11.82	0.009	-4.57E-03	7.6	2.0	99.1	98960
		11.82	0.009	-4.57E-03	-91.6	2.0		
4	25.75	10.14	0.010	-4.52E-03	-87.7	-30.8		98960
5	25.25	17.73	0.012	-4.27E-03	-80.8	-75.3		98960
6	24.88	23.33	0.014	-3.94E-03	-73.1	-105.9		98960
7	24.50	28.84	0.015	-3.51E-03	-63.3	-133.0		98960
8	24.00	36.14	0.017	-2.81E-03	-47.0	-163.0		98960
9	23.50	43.43	0.018	-1.98E-03	-27.1	-183.7		98960
10	23.00	50.75	0.019	-1.09E-03	-3.6	-193.8		98960
11	22.53	57.83	0.019	-2.54E-04	21.9	-191.8		98960
12	22.06	64.89	0.019	5.40E-04	50.8	-177.0	66.8	98960
		64.89	0.019	5.40E-04	-16.1	-177.0		
13	22.00	65.79	0.019	6.37E-04	-12.1	-177.6		98960
		60.30	0.019	6.37E-04	-12.1	-177.6		
14	21.64	66.53	0.019	1.22E-03	10.7	-176.7		98960
		25.92	0.019	1.22E-03	10.7	-176.7		
15	21.50	26.42	0.019	1.44E-03	14.4	-174.4		98960
16	21.03	27.64	0.018	2.17E-03	27.1	-162.7		98960
17	20.56	28.18	0.017	2.84E-03	40.2	-145.2		98960
		29.29	0.017	2.84E-03	40.2	-145.2		
18	20.50	29.35	0.016	2.92E-03	41.9	-142.5		98960
19	20.00	17.59	0.015	3.52E-03	53.7	-116.7		98960
20	19.50	2.03	0.013	3.99E-03	58.6	-86.4		98960
21	19.00	-14.80	0.011	4.31E-03	55.4	-55.5		98960
22	18.50	-34.31	0.009	4.50E-03	43.1	-28.2		98960
23	18.00	-54.42	0.006	4.58E-03	20.9	-7.8		98960
		-46.45	0.006	4.58E-03	20.9	-7.8		
24	17.63	-31.86	0.005	4.59E-03	6.2	-2.2		98960
25	17.25	-1.42	0.003	4.60E-03	0.0	0.0		---
At elev. 26.10		Strut force =		99.1 kN/strut =		99.1 kN/m run		
At elev. 22.06		Strut force =		66.8 kN/strut =		66.8 kN/m run		

(continued)

Stage No.13 Apply water pressure profile no.2 (Worst Cred.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	6747
2	26.43	0.00	6.84	2.91	17.42	17.42	17.42p	6747
3	26.10	0.00	15.27	6.49	38.90	11.82	11.82	1467
4	25.75	0.00	23.85	10.14	60.75	10.14	10.14a	1467
5	25.25	4.90	29.93	12.72	76.25	12.83	17.73	1467
6	24.88	8.58	33.91	14.42	86.39	14.75	23.33	1467
7	24.50	12.26	37.62	15.99	95.82	16.58	28.84	1467
8	24.00	17.17	42.28	17.97	107.71	18.97	36.14	1467
9	23.50	22.07	46.75	19.87	119.09	21.36	43.43	1467
10	23.00	26.98	51.09	21.72	130.15	23.78	50.75	1467
11	22.53	31.59	55.08	23.42	140.32	26.24	57.83	1467
12	22.06	36.20	59.02	25.09	150.34	28.70	64.89	1467
13	22.00	36.79	59.51	25.30	151.60	29.01	65.79	1664
		36.79	59.51	21.09	191.33	23.51	60.30	8318
14	21.64	40.32	63.21	22.40	203.21	26.21	66.53	8318
15	21.50	41.69	64.63	22.91	207.80	27.20	68.89	8318
16	21.03	46.30	69.41	24.60	223.15	30.17	76.48	8318
17	20.56	50.91	74.15	26.28	238.39	32.66	83.57	8318
18	20.50	51.50	74.75	26.49	240.33	32.94	84.44	8318
19	20.00	56.41	79.76	28.27	256.44	34.87	91.27	8318
20	19.50	61.31	84.75	30.03	272.47	36.09	97.40	8318
21	19.00	66.22	89.72	31.79	288.44	36.65	102.87	8318
22	18.50	71.12	94.66	33.55	304.35	35.93	107.06	17795
23	18.00	76.03	99.60	35.30	320.21	35.30	111.32a	17795
		76.03	99.60	42.34	253.72	42.34	118.37a	38686
24	17.63	79.71	103.29	43.91	263.14	66.08	145.79	39847
25	17.25	83.39	106.98	45.48	272.53	105.59	188.97	41007

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.53	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		40.32	0.68	0.29	1.73	0.29	40.61a	1664
15	21.50	41.69	1.82	0.78	4.65	0.78	42.47a	1664
16	21.03	46.30	5.67	2.41	14.45	2.54	48.84	1664
17	20.56	50.91	9.50	4.04	24.21	4.48	55.39	1664
		50.91	9.50	3.37	30.55	3.37	54.28a	8318
18	20.50	51.50	10.11	3.58	32.50	3.58	55.09a	8318
19	20.00	56.41	15.15	5.37	48.72	17.27	73.68	8318

(continued)

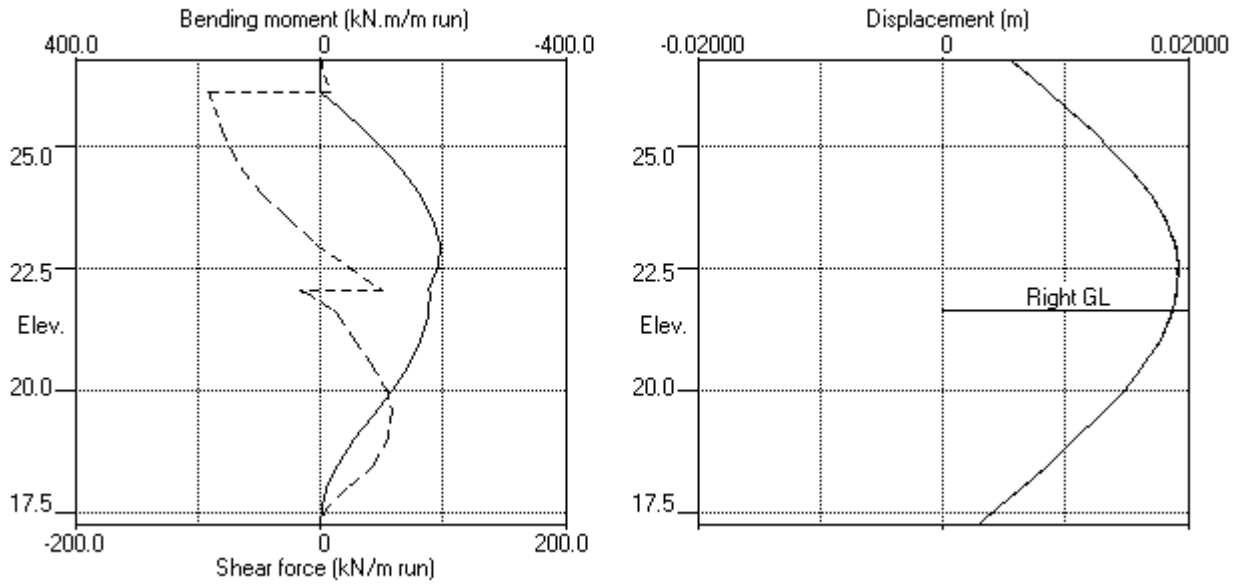
Stage No.13 Apply water pressure profile no.2 (Worst Cred.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	19.50	61.31	20.16	7.14	64.81	34.06	95.37	8318
21	19.00	66.22	25.11	8.90	80.74	51.45	117.67	8318
22	18.50	71.12	30.01	10.64	96.49	70.25	141.37	17795
23	18.00	76.03	34.86	12.35	112.06	89.71	165.74	17795
		76.03	34.86	14.82	88.79	88.79	164.82p	38686
24	17.63	79.71	38.45	16.34	97.94	97.94	177.65p	39847
25	17.25	83.39	42.01	17.86	107.01	107.01	190.39p	41007

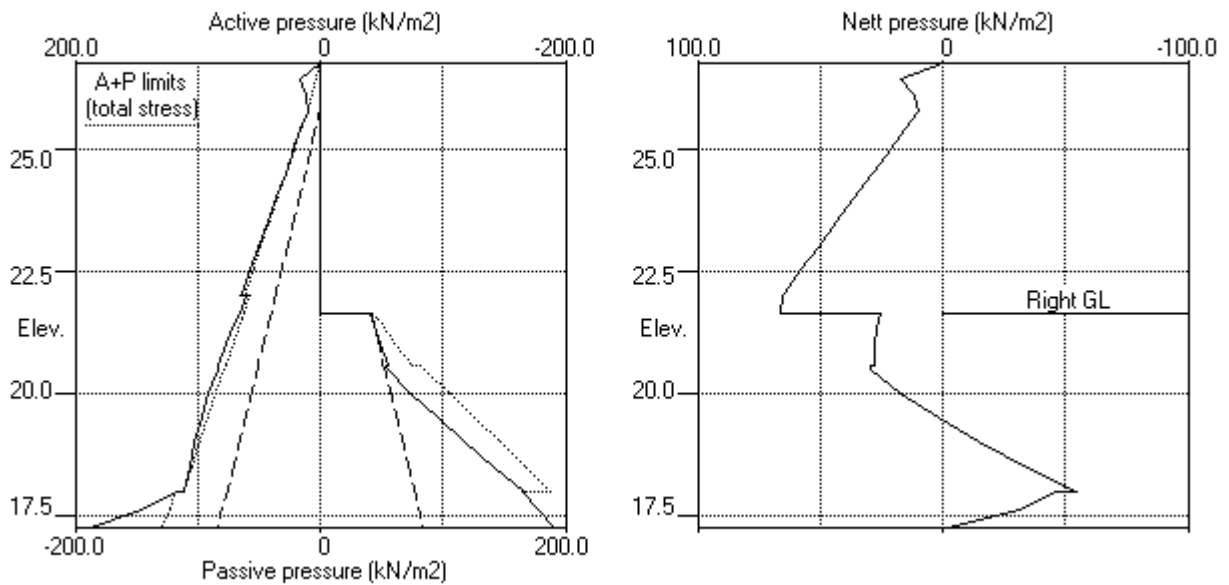
Note: 55.09a Soil pressure at active limit
 190.39p Soil pressure at passive limit

Units: kN,m

Stage No.13 Apply water pressure profile no.2 (Worst Cred.)



Stage No.13 Apply water pressure profile no.2 (Worst Cred.)



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: ULS DA1 Combination 2
 Water pressures : Worst Credible
 Partial factor on C' = 1.250
 Partial factor on Phi' = 1.250
 Partial factor on Cu = 1.400
 Partial factor on Soil Modulus = 1.000
 Partial factor on Permanent Unfavourable loads = 1.000
 Partial factor on Permanent Favourable loads = 1.000
 Partial factor on Variable Unfavourable loads = 1.300

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

				Overall							
				FoS for toe	Toe elev. for						
				elev. = 17.25	FoS = 1.000						
				-----		-----					
Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure			
1	26.75	26.75	Cant.	Conditions not suitable for FoS calc.							
2	26.75	25.25	Cant.	2.740	18.07	22.84	2.41	L to R			
3	26.75	25.25	No analysis at this stage								
4	26.75	25.25	25.75	6.266	n/a	24.60	0.65	L to R			
5	26.75	20.56	25.75	1.195	n/a	17.57	2.99	L to R			
6	26.75	21.64	25.75	1.619	n/a	18.98	2.66	L to R			
7	26.75	21.64	No analysis at this stage								
All remaining stages have more than one strut - FoS calculation n/a											

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 Fitzrovia - Middlesex Hospital Annexe
 Wall 1, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.011	0.000	0.0	0.0	0.0	0.0
2	26.43	0.010	0.000	0.3	-0.0	2.8	-0.3
3	26.10	0.009	0.000	2.0	-0.2	7.6	-98.3
4	25.75	0.010	0.000	5.5	-31.7	11.5	-108.3
5	25.25	0.012	0.000	5.5	-77.4	11.1	-102.1
6	24.88	0.014	0.000	10.4	-109.4	14.1	-95.9
7	24.50	0.015	0.000	15.9	-138.6	13.6	-88.6
8	24.00	0.017	0.000	22.2	-173.2	11.9	-77.0
9	23.50	0.018	0.000	28.0	-201.3	10.5	-63.3
10	23.00	0.019	0.000	33.0	-223.3	10.1	-47.7
11	22.53	0.019	0.000	37.7	-242.0	21.9	-31.3
12	22.06	0.019	0.000	43.0	-252.5	50.8	-32.7
13	22.00	0.019	0.000	43.7	-253.2	12.4	-30.3
14	21.64	0.019	0.000	46.7	-254.9	10.7	-16.9
15	21.50	0.019	0.000	47.2	-254.2	14.4	-11.5
16	21.03	0.018	0.000	46.6	-246.2	28.4	-8.4
17	20.56	0.017	0.000	42.4	-228.7	48.6	-13.4
18	20.50	0.017	0.000	41.7	-225.7	51.6	-13.8
19	20.00	0.016	0.000	34.8	-194.8	71.5	-15.4
20	19.50	0.014	0.000	26.9	-155.8	84.2	-15.9
21	19.00	0.011	0.000	18.9	-112.2	89.5	-15.5
22	18.50	0.009	0.000	11.4	-67.7	87.6	-13.9
23	18.00	0.007	0.000	4.9	-23.9	78.6	-11.2
24	17.63	0.005	0.000	1.4	-5.3	28.5	-6.6
25	17.25	0.003	0.000	0.0	-0.0	0.0	-0.0

Summary of results (continued)

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	2.8	20.56	-2.1	24.00	3.4	22.00	-1.2	25.25
2	47.2	21.50	-0.0	17.25	14.1	24.88	-15.9	19.50
3	No calculation at this stage							
4	43.1	21.50	-0.0	17.25	13.5	24.88	-15.4	20.00
5	5.5	25.75	-254.9	21.64	89.5	19.00	-108.3	25.75
6	5.4	25.75	-251.4	21.64	87.6	19.00	-107.8	25.75
7	No calculation at this stage							
8	No calculation at this stage							
9	2.0	26.10	-241.6	21.64	85.7	19.00	-98.3	26.10
10	2.0	26.10	-185.8	21.50	66.8	19.00	-78.3	26.10
11	No calculation at this stage							
12	No calculation at this stage							
13	2.0	26.10	-193.8	23.00	58.6	19.50	-91.6	26.10

Maximum and minimum displacement at each stage

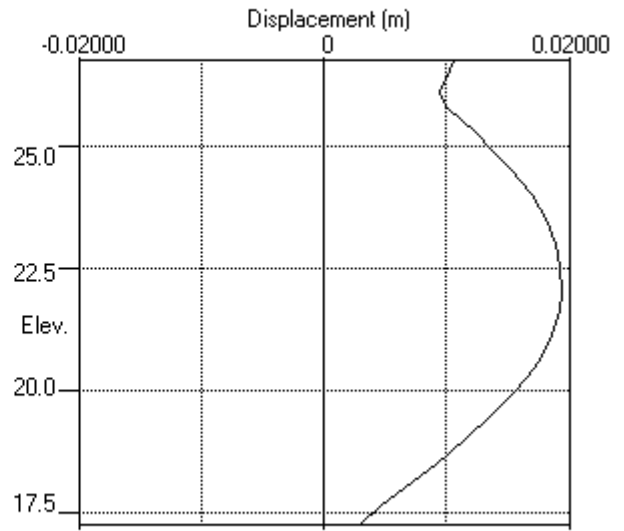
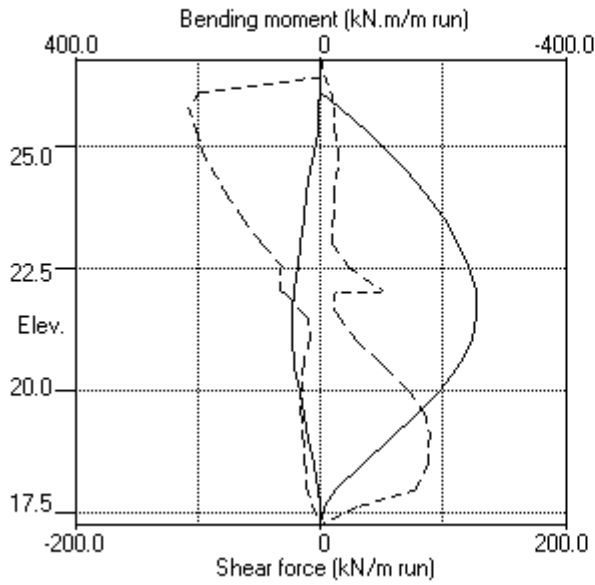
Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.001	26.75	0.000	26.75	Apply surcharge no.1 at elev. 26.75
2	0.011	26.75	0.000	26.75	Excav. to elev. 25.25 on RIGHT side
3	No calculation at this stage				Install strut no.1 at elev. 25.75
4	0.011	26.75	0.000	26.75	Apply water pressure profile no.1
5	0.019	22.06	0.000	26.75	Excav. to elev. 20.56 on RIGHT side
6	0.019	22.06	0.000	26.75	Fill to elev. 21.64 on RIGHT side
7	No calculation at this stage				Install strut no.2 at elev. 22.06
8	No calculation at this stage				Install strut no.3 at elev. 26.10
9	0.019	22.06	0.000	26.75	Remove strut no.1 at elev. 25.75
10	0.019	22.06	0.000	26.75	Change EI of wall to 98960kN.m ² /m run
11	No calculation at this stage				Change soil type 3 to soil type 4
12	No calculation at this stage				Apply surcharge no.2 at elev. 21.64
13	0.019	22.53	0.000	26.75	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1		Strut no. 2		Strut no. 3	
	at elev. 25.75 kN/m run	kN/strut	at elev. 22.06 kN/m run	kN/strut	at elev. 26.10 kN/m run	kN/strut
4	0.72	3.62	---	---	---	---
5	119.86	599.28	---	---	---	---
6	119.17	595.85	---	---	---	---
9	---	---	16.53	16.53	105.74	105.74
10	---	---	53.68	53.68	85.86	85.86
13	---	---	66.83	66.83	99.14	99.14

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

2-SLS

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m ² ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	26.32	1.65(L)	20.00	20.00	10.00	=	N/A	1.00 Var
2	23.25	0.40(L)	20.00	1.25	24.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	41.00	=	N/A	1.00 P/F

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	Excavate to elevation 26.32 on LEFT side
2	Apply surcharge no.1 at elevation 26.32
3	Apply surcharge no.2 at elevation 23.25
4	Excavate to elevation 25.25 on RIGHT side
5	Install strut or anchor no.1 at elevation 25.75
6	Apply water pressure profile no.1 (Mod. Conserv.)
7	Excavate to elevation 21.04 on RIGHT side
8	Fill to elevation 21.64 on RIGHT side with soil type 1
9	Install strut or anchor no.2 at elevation 22.06
10	Install strut or anchor no.3 at elevation 26.10
11	Remove strut or anchor no.1 at elevation 25.75
12	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
13	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
14	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
15	Apply water pressure profile no.2 (Mod. Conserv.)

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 = 1.50

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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m
Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m
Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Excav. to elev. 26.32 on LEFT side	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 26.32	Yes	Yes	Yes
3	Apply surcharge no.2 at elev. 23.25	No	No	No
4	Excav. to elev. 25.25 on RIGHT side	Yes	Yes	Yes
5	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
6	Apply water pressure profile no.1	Yes	Yes	Yes
7	Excav. to elev. 21.04 on RIGHT side	Yes	Yes	Yes
8	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
9	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
10	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
11	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
12	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
13	Change soil type 3 to soil type 4	Yes	Yes	Yes
14	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
15	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Excavate to elevation 26.32 on LEFT side

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

Stage No.	--- G.L. --- Act.	--- G.L. --- Pass.	Strut Elev.	FoS for toe elev. =	Moment of equil. at elev.	Toe elev. for FoS =	Wall Penetr-ation	Direction of failure
1	26.75	26.32	Cant.	17.25	18.14	1.500	0.68	R to L

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	-0.001	-2.03E-04	0.0	-0.0		138544
2	26.32	-2.82	-0.001	-2.02E-04	-0.6	-0.1		138544
3	26.10	0.64	-0.001	-2.02E-04	-0.8	-0.3		138544
4	25.75	0.46	-0.001	-2.01E-04	-0.7	-0.6		138544
5	25.32	0.23	-0.001	-1.99E-04	-0.5	-0.8		138544
6	25.25	0.20	-0.001	-1.98E-04	-0.5	-0.9		138544
7	24.88	0.01	-0.001	-1.96E-04	-0.5	-1.0		138544
8	24.50	-0.18	-0.001	-1.93E-04	-0.5	-1.2		138544
9	24.00	-0.43	-0.001	-1.88E-04	-0.6	-1.5		138544
10	23.63	-0.61	-0.001	-1.84E-04	-0.8	-1.7		138544
11	23.25	-0.79	-0.001	-1.78E-04	-1.1	-2.1		138544
12	22.95	-0.92	-0.001	-1.73E-04	-1.4	-2.5		138544
13	22.65	-1.06	-0.001	-1.68E-04	-1.6	-2.9		138544
14	22.36	-1.18	-0.001	-1.61E-04	-2.0	-3.4		138544
15	22.06	-1.30	-0.000	-1.53E-04	-2.4	-4.1		138544
16	22.00	-1.33	-0.000	-1.51E-04	-2.4	-4.2		138544
		3.68	-0.000	-1.51E-04	-2.4	-4.2		
17	21.64	3.00	-0.000	-1.39E-04	-1.2	-4.9		138544
18	21.50	2.75	-0.000	-1.34E-04	-0.8	-5.0		138544
19	21.04	2.00	-0.000	-1.18E-04	0.3	-5.1		138544
20	20.77	1.61	-0.000	-1.08E-04	0.8	-4.9		138544
21	20.50	1.24	-0.000	-9.89E-05	1.1	-4.7		138544
22	20.00	0.66	-0.000	-8.33E-05	1.6	-3.9		138544
23	19.50	0.16	-0.000	-7.07E-05	1.8	-3.1		138544
24	19.00	-0.27	-0.000	-6.13E-05	1.8	-2.1		138544
25	18.50	-0.64	-0.000	-5.52E-05	1.6	-1.3		138544
26	18.00	-0.99	-0.000	-5.19E-05	1.2	-0.6		138544
		-0.64	-0.000	-5.19E-05	1.2	-0.6		
27	17.63	-1.53	-0.000	-5.09E-05	0.8	-0.2		138544
28	17.25	-2.47	-0.000	-5.07E-05	-0.0	0.0		---

(continued)

Stage No.1 Excavate to elevation 26.32 on LEFT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.96	1.39	12.88	5.80	5.80	1313
4	25.75	0.00	10.26	3.60	33.37	9.35	9.35	1313
5	25.32	0.00	18.00	6.32	58.55	13.70	13.70	1313
6	25.25	0.00	19.26	6.77	62.65	14.41	14.41	1313
7	24.88	0.00	26.01	9.14	84.60	18.21	18.21	1313
8	24.50	0.00	32.76	11.51	106.56	22.00	22.00	1313
9	24.00	0.00	41.76	14.67	135.84	27.07	27.07	1313
10	23.63	0.00	48.51	17.04	157.79	30.87	30.87	1313
11	23.25	0.00	55.26	19.41	179.75	34.68	34.68	1313
12	22.95	0.00	60.62	21.29	197.17	37.70	37.70	1313
13	22.65	0.00	65.97	23.17	214.59	40.72	40.72	1313
14	22.36	0.00	71.33	25.06	232.01	43.75	43.75	1313
15	22.06	0.00	76.68	26.94	249.43	46.78	46.78	1313
16	22.00	0.00	77.76	27.32	252.94	47.39	47.39	1313
		0.00	77.76	22.03	339.77	43.35	43.35	6567
17	21.64	0.00	84.96	24.07	371.23	46.60	46.60	6567
18	21.50	0.00	87.76	24.87	383.47	47.88	47.88	6567
19	21.04	4.51	92.45	26.20	403.96	49.84	54.35	6567
20	20.77	7.16	95.20	26.98	415.98	51.01	58.17	6567
21	20.50	9.81	97.96	27.76	428.00	52.21	62.02	6567
22	20.00	14.71	103.05	29.20	450.27	54.45	69.17	6567
23	19.50	19.62	108.15	30.64	472.54	56.75	76.37	6567
24	19.00	24.52	113.25	32.09	494.81	59.08	83.61	6567
25	18.50	29.43	118.34	33.53	517.08	61.44	90.87	6567
26	18.00	34.34	123.44	34.98	539.36	63.81	98.15	6567
		Total>	157.77	41.60m	396.77	200.86	200.86	27975
27	17.63	Total>	165.28	43.48m	411.44	209.06	209.06	28814
28	17.25	Total>	172.78	45.35m	426.11	217.23	217.23	29653

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1276
2	26.32	0.00	7.74	2.72	25.18	2.82	2.82	1276
3	26.10	0.00	11.70	4.11	38.06	5.16	5.16	1276
4	25.75	0.00	18.00	6.32	58.55	8.89	8.89	1276
5	25.32	0.00	25.74	9.04	83.73	13.47	13.47	1276
6	25.25	0.00	27.00	9.48	87.82	14.21	14.21	1276
7	24.88	0.00	33.75	11.86	109.78	18.20	18.20	1276
8	24.50	0.00	40.50	14.23	131.74	22.19	22.19	1276
9	24.00	0.00	49.50	17.39	161.01	27.50	27.50	1276
10	23.63	0.00	56.25	19.76	182.97	31.49	31.49	1276
11	23.25	0.00	63.00	22.13	204.92	35.47	35.47	1276
12	22.95	0.00	68.35	24.01	222.34	38.62	38.62	1276
13	22.65	0.00	73.71	25.89	239.76	41.78	41.78	1276
14	22.36	0.00	79.06	27.77	257.18	44.93	44.93	1276
15	22.06	0.00	84.42	29.65	274.60	48.08	48.08	1276
16	22.00	0.00	85.50	30.03	278.11	48.72	48.72	1276
		0.00	85.50	24.23	373.58	39.66	39.66	6379

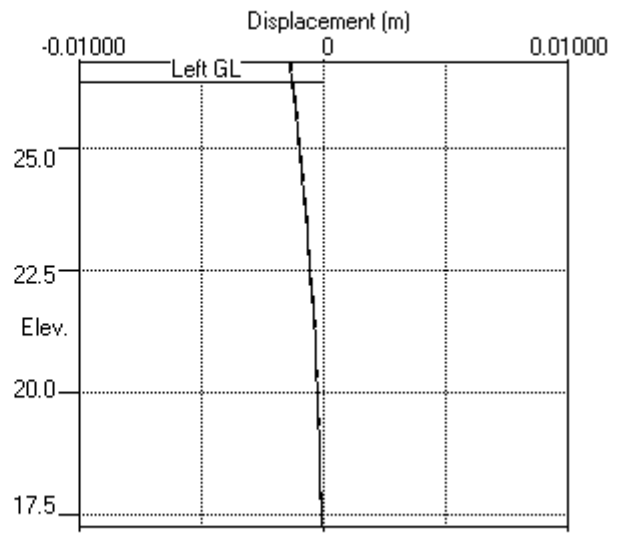
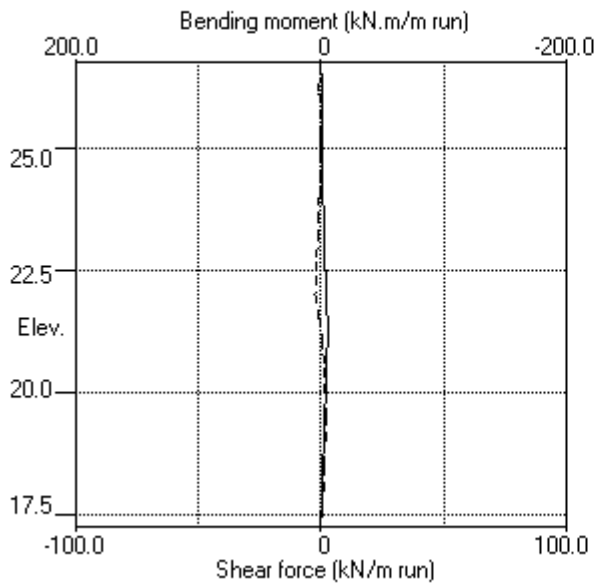
(continued)

Stage No.1 Excavate to elevation 26.32 on LEFT side

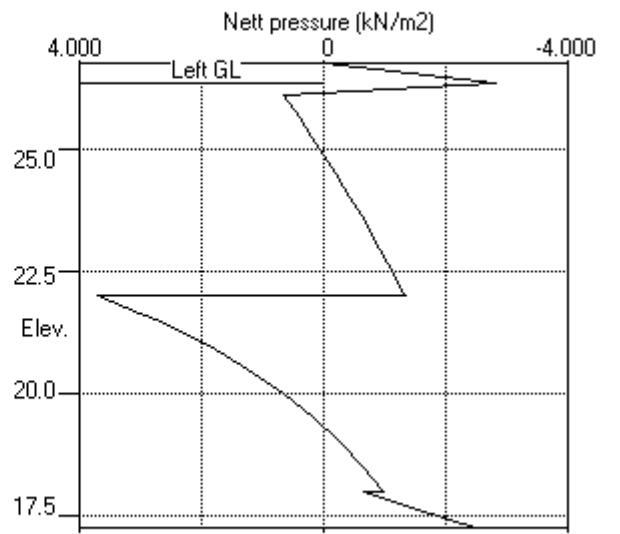
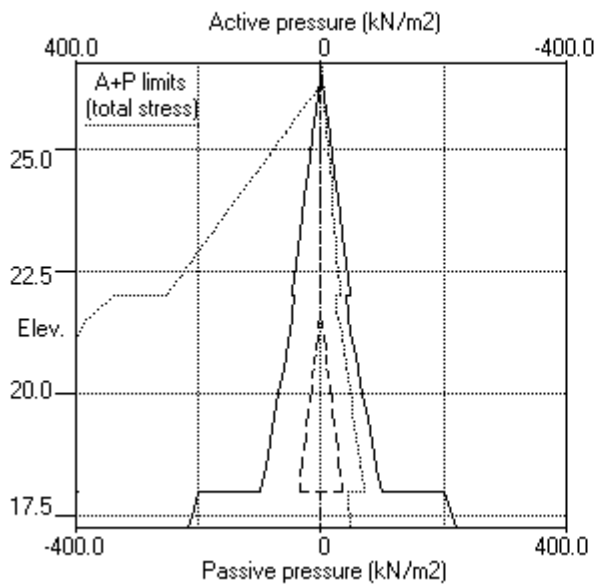
Node no.	Y coord	RIGHT side						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Effective stresses		
17	21.64	0.00	92.70	26.27	405.04	43.60	43.60	6379	
18	21.50	0.00	95.50	27.06	417.28	45.12	45.12	6379	
19	21.04	4.51	100.19	28.39	437.76	47.84	52.35	6379	
20	20.77	7.16	102.94	29.17	449.78	49.41	56.57	6379	
21	20.50	9.81	105.69	29.95	461.80	50.96	60.77	6379	
22	20.00	14.71	110.79	31.39	484.06	53.80	68.51	6379	
23	19.50	19.62	115.88	32.83	506.32	56.59	76.21	6379	
24	19.00	24.52	120.98	34.28	528.59	59.35	83.87	6379	
25	18.50	29.43	126.07	35.72	550.85	62.08	91.51	6379	
26	18.00	34.34	131.17	37.17	573.11	64.80	99.13	6379	
		Total>	165.50	43.75m	404.49	201.50	201.50	27254	
27	17.63	Total>	173.00	45.63m	419.16	210.59	210.59	28072	
28	17.25	Total>	180.50	47.50m	433.83	219.70	219.70	28890	

Units: kN,m

Stage No.1 Excav. to elev. 26.32 on LEFT side



Stage No.1 Excav. to elev. 26.32 on LEFT side



Units: kN,m

Stage No. 2 Apply surcharge no.1 at elevation 26.32

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. =	Moment of equil. at elev.	Toe elev. for FoS =	Wall Penetr-ation	Direction of failure
2	26.75	26.32	Cant.	23.086	18.79	25.64	0.68	R to L

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
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 50.00 from wall
Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	-0.001	-2.02E-04	0.0	-0.0		138544
2	26.32	-3.13	-0.001	-2.02E-04	-0.7	-0.1		138544
3	26.10	0.02	-0.001	-2.02E-04	-1.0	-0.3		138544
4	25.75	-0.12	-0.001	-2.00E-04	-1.0	-0.7		138544
5	25.32	-0.18	-0.001	-1.97E-04	-1.1	-1.2		138544
6	25.25	-0.18	-0.001	-1.97E-04	-1.1	-1.2		138544
7	24.88	-0.15	-0.001	-1.93E-04	-1.2	-1.7		138544
8	24.50	-0.10	-0.001	-1.88E-04	-1.2	-2.1		138544
9	24.00	-0.04	-0.000	-1.79E-04	-1.3	-2.7		138544
10	23.63	-0.02	-0.000	-1.71E-04	-1.3	-3.2		138544
11	23.25	-0.02	-0.000	-1.62E-04	-1.3	-3.6		138544
12	22.95	-0.03	-0.000	-1.54E-04	-1.3	-4.0		138544
13	22.65	-0.05	-0.000	-1.45E-04	-1.3	-4.4		138544
14	22.36	-0.07	-0.000	-1.35E-04	-1.3	-4.8		138544
15	22.06	-0.10	-0.000	-1.24E-04	-1.3	-5.2		138544
16	22.00	-0.11	-0.000	-1.22E-04	-1.3	-5.3		138544
		2.69	-0.000	-1.22E-04	-1.3	-5.3		
17	21.64	2.18	-0.000	-1.08E-04	-0.5	-5.6		138544
18	21.50	2.00	-0.000	-1.02E-04	-0.2	-5.6		138544
19	21.04	1.45	-0.000	-8.42E-05	0.6	-5.5		138544
20	20.77	1.16	-0.000	-7.37E-05	1.0	-5.3		138544
21	20.50	0.91	-0.000	-6.37E-05	1.2	-5.0		138544
22	20.00	0.52	0.000	-4.72E-05	1.6	-4.2		138544
23	19.50	0.21	0.000	-3.35E-05	1.8	-3.4		138544
24	19.00	-0.04	0.000	-2.31E-05	1.8	-2.4		138544
25	18.50	-0.24	0.000	-1.59E-05	1.8	-1.5		138544
26	18.00	-0.42	0.000	-1.20E-05	1.6	-0.7		138544
		-1.60	0.000	-1.20E-05	1.6	-0.7		
27	17.63	-2.12	0.000	-1.08E-05	0.9	-0.2		138544
28	17.25	-2.66	0.000	-1.06E-05	-0.0	0.0		---

(continued)

Stage No.2 Apply surcharge no.1 at elevation 26.32

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.39	12.91	5.49	5.49	854
4	25.75	0.00	10.41	3.66	33.87	9.08	9.08	854
5	25.32	0.00	18.64	6.55	60.64	13.60	13.60	854
6	25.25	0.00	20.01	7.03	65.09	14.34	14.34	854
7	24.88	0.00	27.42	9.63	89.20	18.36	18.36	854
8	24.50	0.00	34.88	12.25	113.47	22.40	22.40	854
9	24.00	0.00	44.77	15.73	145.64	27.77	27.77	854
10	23.63	0.00	52.11	18.31	169.51	31.77	31.77	854
11	23.25	0.00	59.37	20.86	193.12	35.75	35.75	854
12	22.95	0.00	65.08	22.86	211.68	38.89	38.89	854
13	22.65	0.00	70.74	24.85	230.09	42.02	42.02	854
14	22.36	0.00	76.36	26.82	248.38	45.14	45.14	854
15	22.06	0.00	81.95	28.79	266.56	48.25	48.25	854
16	22.00	0.00	83.07	29.18	270.21	48.88	48.88	854
17	21.64	0.00	83.07	23.54	362.97	43.72	43.72	4268
18	21.50	0.00	90.50	25.64	395.45	47.10	47.10	4268
19	21.04	0.00	93.38	26.46	408.03	48.42	48.42	4268
20	21.04	4.51	98.30	27.85	429.49	50.52	55.03	4268
21	20.77	7.16	101.15	28.66	441.98	51.77	58.93	4268
22	20.50	9.81	104.00	29.47	454.41	53.04	62.85	4268
23	20.00	14.71	109.23	30.95	477.25	55.40	70.12	4268
24	19.50	19.62	114.41	32.42	499.91	57.81	77.43	4268
25	19.00	24.52	119.56	33.88	522.42	60.24	84.76	4268
26	18.50	29.43	124.69	35.33	544.80	62.69	92.12	4268
26	18.00	34.34	129.79	36.77	567.08	65.15	99.48	4268
		Total>	164.12	41.60m	403.12	203.41	203.41	19382
27	17.63	Total>	171.61	43.48m	417.77	211.78	211.78	19964
28	17.25	Total>	179.09	45.35m	432.42	220.14	220.14	20545

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	837
2	26.32	0.00	7.74	2.72	25.18	3.13	3.13	837
3	26.10	0.00	11.70	4.11	38.06	5.48	5.48	837
4	25.75	0.00	18.00	6.32	58.55	9.20	9.20	837
5	25.32	0.00	25.74	9.04	83.73	13.78	13.78	837
6	25.25	0.00	27.00	9.48	87.82	14.52	14.52	837
7	24.88	0.00	33.75	11.86	109.78	18.51	18.51	837
8	24.50	0.00	40.50	14.23	131.74	22.50	22.50	837
9	24.00	0.00	49.50	17.39	161.01	27.81	27.81	837
10	23.63	0.00	56.25	19.76	182.97	31.79	31.79	837
11	23.25	0.00	63.00	22.13	204.92	35.77	35.77	837
12	22.95	0.00	68.35	24.01	222.34	38.92	38.92	837
13	22.65	0.00	73.71	25.89	239.76	42.07	42.07	837
14	22.36	0.00	79.06	27.77	257.18	45.21	45.21	837
15	22.06	0.00	84.42	29.65	274.60	48.36	48.36	837
16	22.00	0.00	85.50	30.03	278.11	48.99	48.99	837
		0.00	85.50	24.23	373.58	41.03	41.03	4184

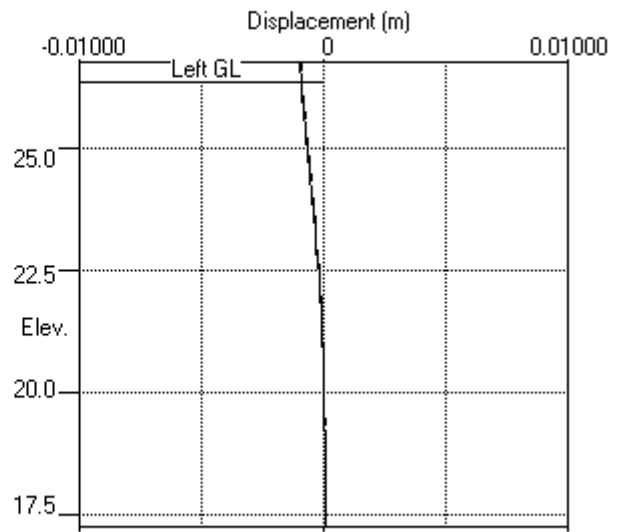
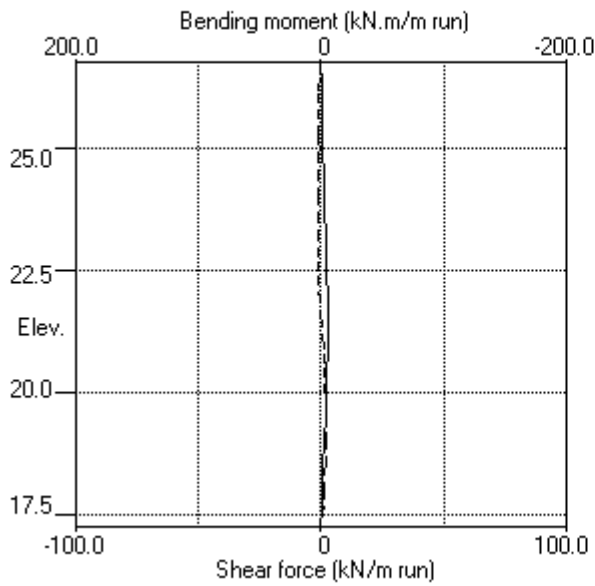
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Stage No.2 Apply surcharge no.1 at elevation 26.32

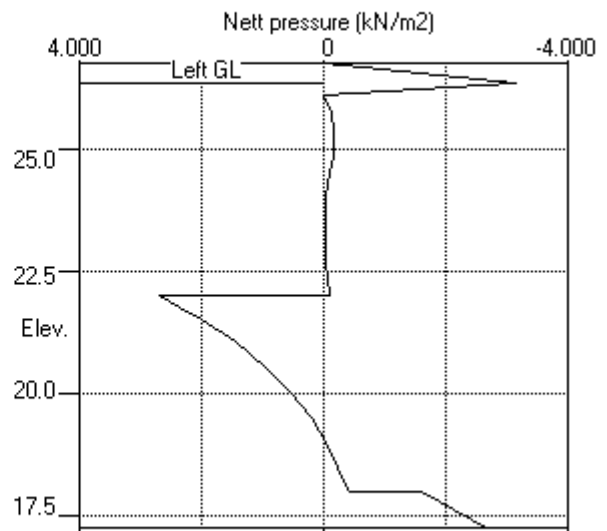
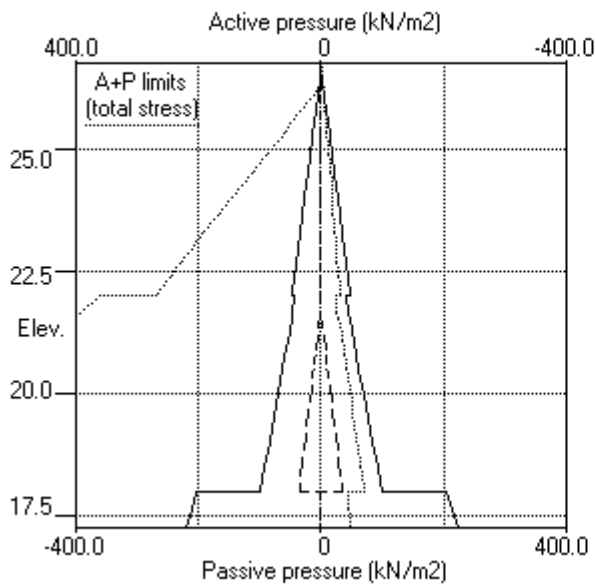
Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
17	21.64	0.00	92.70	26.27	405.04	44.92	44.92	4184
18	21.50	0.00	95.50	27.06	417.28	46.43	46.43	4184
19	21.04	4.51	100.19	28.39	437.76	49.08	53.59	4184
20	20.77	7.16	102.94	29.17	449.78	50.61	57.77	4184
21	20.50	9.81	105.69	29.95	461.80	52.12	61.93	4184
22	20.00	14.71	110.79	31.39	484.06	54.89	69.60	4184
23	19.50	19.62	115.88	32.83	506.32	57.60	77.22	4184
24	19.00	24.52	120.98	34.28	528.59	60.28	84.81	4184
25	18.50	29.43	126.07	35.72	550.85	62.93	92.36	4184
26	18.00	34.34	131.17	37.17	573.11	65.57	99.90	4184
		Total>	165.50	43.75m	404.49	205.00	205.00	19092
27	17.63	Total>	173.00	45.63m	419.16	213.90	213.90	19665
28	17.25	Total>	180.50	47.50m	433.83	222.80	222.80	20238

Units: kN,m

Stage No.2 Apply surcharge no.1 at elev. 26.32



Stage No.2 Apply surcharge no.1 at elev. 26.32



(continued)

Stage No.3 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.39	12.91	5.25	5.25	844
4	25.75	0.00	10.41	3.66	33.87	8.83	8.83	844
5	25.32	0.00	18.64	6.55	60.64	13.33	13.33	844
6	25.25	0.00	20.01	7.03	65.09	14.07	14.07	844
7	24.88	0.00	27.42	9.63	89.20	18.07	18.07	844
8	24.50	0.00	34.88	12.25	113.47	22.09	22.09	844
9	24.00	0.00	44.77	15.73	145.64	27.44	27.44	844
10	23.63	0.00	52.11	18.31	169.51	31.43	31.43	844
11	23.25	0.00	59.37	20.86	193.12	35.40	35.40	844
12	22.95	0.00	67.47	23.70	219.47	39.34	39.34	844
13	22.65	0.00	78.21	27.47	254.39	44.15	44.15	844
14	22.36	0.00	87.04	30.57	283.11	48.34	48.34	844
15	22.06	0.00	94.08	33.05	306.02	51.94	51.94	844
16	22.00	0.00	95.35	33.49	310.15	52.61	52.61	844
17	21.64	0.00	95.35	27.02	416.62	46.02	46.02	4222
18	21.50	0.00	103.03	29.19	450.17	49.49	49.49	4222
19	21.50	0.00	105.80	29.98	462.29	50.78	50.78	4222
20	21.04	4.51	109.99	31.17	480.60	52.69	57.20	4222
21	20.77	7.16	112.31	31.82	490.71	53.80	60.96	4222
22	20.50	9.81	114.59	32.47	500.67	54.92	64.73	4222
23	20.00	14.71	118.81	33.66	519.11	57.06	71.77	4222
24	19.50	19.62	123.08	34.88	537.80	59.28	78.90	4222
25	19.00	24.52	127.44	36.11	556.81	61.59	86.11	4222
26	18.50	29.43	131.86	37.36	576.16	63.96	93.39	4222
27	18.00	34.34	136.35	38.64	595.78	66.38	100.71	4222
28	17.63	Total>	170.69	41.60m	409.68	205.36	205.36	19223
29	17.25	Total>	177.77	43.48m	423.94	213.80	213.80	19800
30	17.25	Total>	184.88	45.35m	438.22	222.29	222.29	20376

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	829
2	26.32	0.00	7.74	2.72	25.18	3.36	3.36	829
3	26.10	0.00	11.70	4.11	38.06	5.71	5.71	829
4	25.75	0.00	18.00	6.32	58.55	9.45	9.45	829
5	25.32	0.00	25.74	9.04	83.73	14.04	14.04	829
6	25.25	0.00	27.00	9.48	87.82	14.79	14.79	829
7	24.88	0.00	33.75	11.86	109.78	18.79	18.79	829
8	24.50	0.00	40.50	14.23	131.74	22.79	22.79	829
9	24.00	0.00	49.50	17.39	161.01	28.12	28.12	829
10	23.63	0.00	56.25	19.76	182.97	32.12	32.12	829
11	23.25	0.00	63.00	22.13	204.92	36.10	36.10	829
12	22.95	0.00	68.35	24.01	222.34	39.26	39.26	829
13	22.65	0.00	73.71	25.89	239.76	42.42	42.42	829
14	22.36	0.00	79.06	27.77	257.18	45.57	45.57	829
15	22.06	0.00	84.42	29.65	274.60	48.71	48.71	829
16	22.00	0.00	85.50	30.03	278.11	49.34	49.34	829
17	22.00	0.00	85.50	24.23	373.58	42.80	42.80	4143

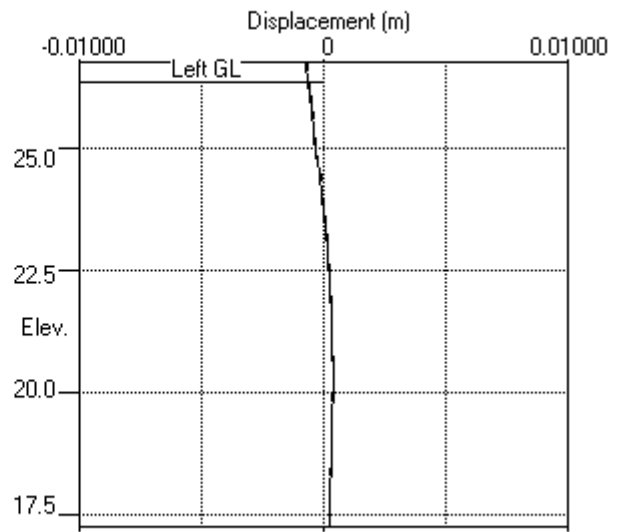
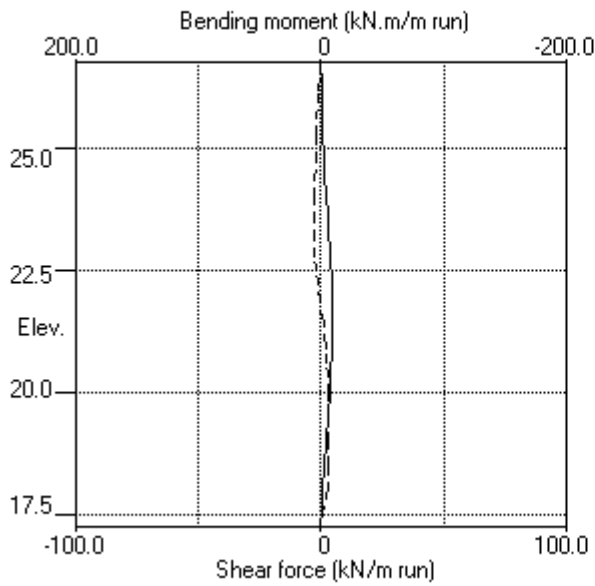
(continued)

Stage No.3 Apply surcharge no.2 at elevation 23.25

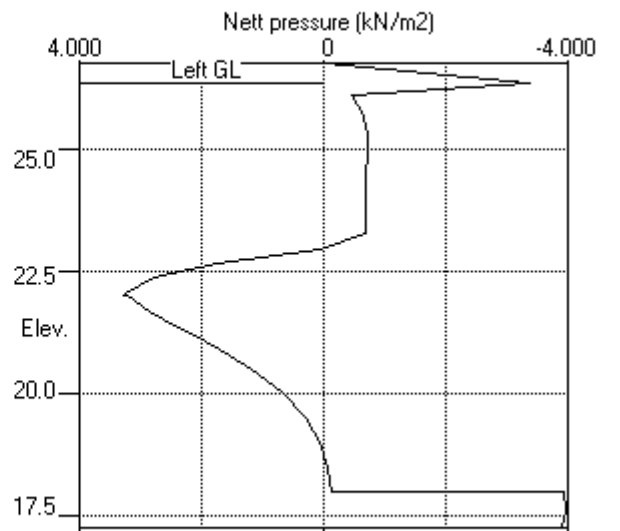
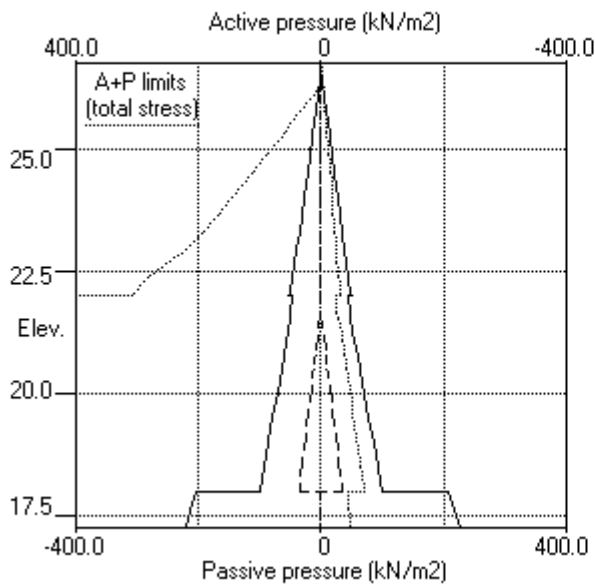
Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
17	21.64	0.00	92.70	26.27	405.04	46.67	46.67	4143
18	21.50	0.00	95.50	27.06	417.28	48.17	48.17	4143
19	21.04	4.51	100.19	28.39	437.76	50.77	55.29	4143
20	20.77	7.16	102.94	29.17	449.78	52.27	59.43	4143
21	20.50	9.81	105.69	29.95	461.80	53.74	63.55	4143
22	20.00	14.71	110.79	31.39	484.06	56.40	71.11	4143
23	19.50	19.62	115.88	32.83	506.32	58.99	78.61	4143
24	19.00	24.52	120.98	34.28	528.59	61.53	86.05	4143
25	18.50	29.43	126.07	35.72	550.85	64.03	93.46	4143
26	18.00	34.34	131.17	37.17	573.11	66.51	100.84	4143
		Total>	165.50	43.75m	404.49	209.30	209.30	18948
27	17.63	Total>	173.00	45.63m	419.16	217.75	217.75	19517
28	17.25	Total>	180.50	47.50m	433.83	226.17	226.17	20085

Units: kN,m

Stage No.3 Apply surcharge no.2 at elev. 23.25



Stage No.3 Apply surcharge no.2 at elev. 23.25



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 25.25 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. =	Moment of equil. at elev.	Toe elev. for FoS =	Wall Penetr-ation	Direction of failure
4	26.32 25.25	Cant.	17.25	17.87	1.500	1.90	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.005	6.95E-04	0.0	0.0		138544
2	26.32	0.00	0.005	6.95E-04	0.0	-0.0		138544
3	26.10	1.39	0.005	6.95E-04	0.2	-0.0		138544
4	25.75	3.66	0.004	6.95E-04	1.0	0.2		138544
5	25.32	7.07	0.004	6.93E-04	3.3	1.2		138544
6	25.25	7.91	0.004	6.92E-04	3.9	1.5		138544
7	24.88	-3.59	0.004	6.86E-04	4.7	3.4		138544
8	24.50	-2.56	0.004	6.74E-04	3.5	4.9		138544
9	24.00	-1.23	0.003	6.54E-04	2.6	6.3		138544
10	23.63	-0.29	0.003	6.36E-04	2.3	7.2		138544
11	23.25	0.60	0.003	6.15E-04	2.3	8.1		138544
12	22.95	2.07	0.003	5.97E-04	2.7	8.8		138544
13	22.65	4.39	0.002	5.77E-04	3.7	9.7		138544
14	22.36	6.05	0.002	5.55E-04	5.3	11.0		138544
15	22.06	7.10	0.002	5.29E-04	7.2	12.9		138544
16	22.00	7.25	0.002	5.23E-04	7.6	13.3		138544
		-12.86	0.002	5.23E-04	7.6	13.3		
17	21.64	-10.02	0.002	4.86E-04	3.5	15.3		138544
18	21.50	-9.06	0.002	4.71E-04	2.2	15.7		138544
19	21.04	-6.28	0.002	4.19E-04	-1.3	15.7		138544
20	20.77	-4.89	0.001	3.89E-04	-2.8	15.1		138544
21	20.50	-3.65	0.001	3.60E-04	-4.0	14.2		138544
22	20.00	-1.66	0.001	3.13E-04	-5.3	11.7		138544
23	19.50	-0.01	0.001	2.76E-04	-5.7	8.8		138544
24	19.00	1.39	0.001	2.50E-04	-5.4	5.9		138544
25	18.50	2.64	0.001	2.33E-04	-4.4	3.4		138544
26	18.00	3.79	0.001	2.24E-04	-2.8	1.5		138544
		0.58	0.001	2.24E-04	-2.8	1.5		
27	17.63	3.65	0.001	2.22E-04	-2.0	0.5		138544
28	17.25	6.96	0.000	2.21E-04	0.0	-0.0		---

(continued)

Stage No.4 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.39	12.91	1.39	1.39a	1402
4	25.75	0.00	10.41	3.66	33.87	3.66	3.66a	1402
5	25.32	0.00	18.64	6.55	60.64	7.07	7.07	1402
6	25.25	0.00	20.01	7.03	65.09	7.91	7.91	1402
7	24.88	0.00	27.42	9.63	89.20	12.40	12.40	1402
8	24.50	0.00	34.88	12.25	113.47	16.90	16.90	1402
9	24.00	0.00	44.77	15.73	145.64	22.88	22.88	1402
10	23.63	0.00	52.11	18.31	169.51	27.32	27.32	1402
11	23.25	0.00	59.37	20.86	193.12	31.72	31.72	1402
12	22.95	0.00	67.47	23.70	219.47	35.99	35.99	1402
13	22.65	0.00	78.21	27.47	254.39	41.12	41.12	1402
14	22.36	0.00	87.04	30.57	283.11	45.61	45.61	1402
15	22.06	0.00	94.08	33.05	306.02	49.49	49.49	1402
16	22.00	0.00	95.35	33.49	310.15	50.22	50.22	1402
		0.00	95.35	27.02	416.62	34.03	34.03	7008
17	21.64	0.00	103.03	29.19	450.17	39.05	39.05	7008
18	21.50	0.00	105.80	29.98	462.29	40.91	40.91	7008
19	21.04	4.51	109.99	31.17	480.60	44.47	48.98	7008
20	20.77	7.16	112.31	31.82	490.71	46.43	53.59	7008
21	20.50	9.81	114.59	32.47	500.67	48.31	58.12	7008
22	20.00	14.71	118.81	33.66	519.11	51.65	66.36	7008
23	19.50	19.62	123.08	34.88	537.80	54.84	74.46	7008
24	19.00	24.52	127.44	36.11	556.81	57.93	82.46	7008
25	18.50	29.43	131.86	37.36	576.16	60.96	90.39	7008
26	18.00	34.34	136.35	38.64	595.78	63.96	98.29	7008
		Total>	170.69	41.60m	409.68	195.10	195.10	29672
27	17.63	Total>	177.77	43.48m	423.94	205.02	205.02	30562
28	17.25	Total>	184.88	45.35m	438.22	215.07	215.07	31452

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1532
7	24.88	0.00	6.75	2.37	21.96	15.99	15.99	1532
8	24.50	0.00	13.50	4.74	43.91	19.47	19.47	1532
9	24.00	0.00	22.50	7.90	73.19	24.11	24.11	1532
10	23.63	0.00	29.25	10.27	95.14	27.61	27.61	1532
11	23.25	0.00	36.00	12.65	117.10	31.12	31.12	1532
12	22.95	0.00	41.36	14.53	134.52	33.92	33.92	1532
13	22.65	0.00	46.71	16.41	151.94	36.73	36.73	1532
14	22.36	0.00	52.07	18.29	169.36	39.55	39.55	1532
15	22.06	0.00	57.42	20.17	186.78	42.39	42.39	1532
16	22.00	0.00	58.50	20.55	190.30	42.96	42.96	1532
		0.00	58.50	16.58	255.62	46.89	46.89	7658

(continued)

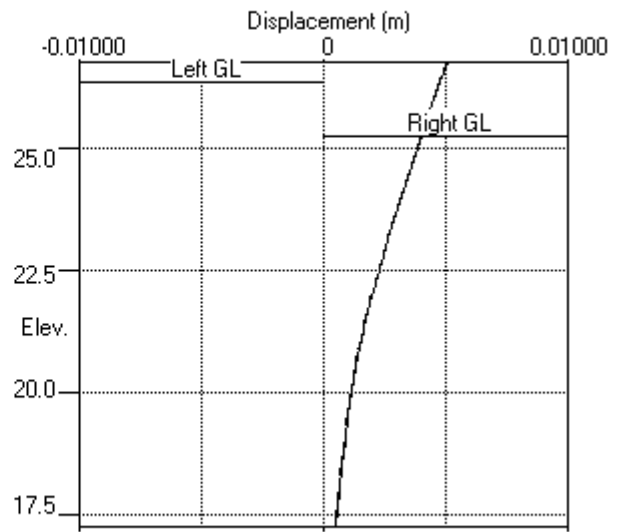
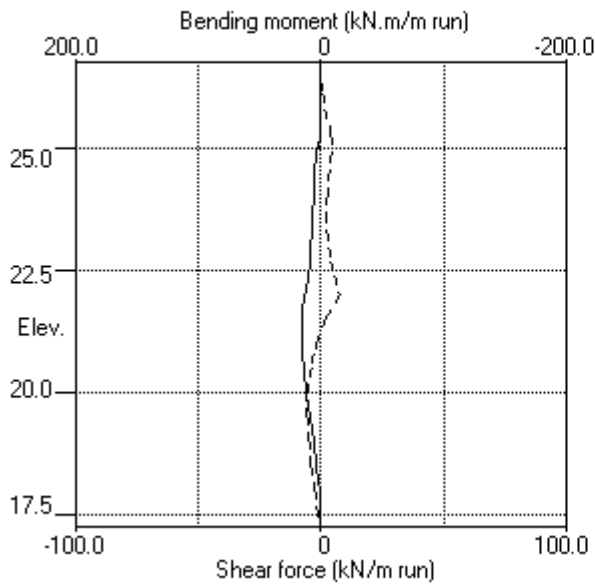
Stage No.4 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
17	21.64	0.00	65.70	18.62	287.09	49.08	49.08	7658
18	21.50	0.00	68.50	19.41	299.32	49.96	49.96	7658
19	21.04	4.51	73.19	20.74	319.81	50.76	55.27	7658
20	20.77	7.16	75.95	21.52	331.84	51.32	58.48	7658
21	20.50	9.81	78.70	22.30	343.87	51.96	61.77	7658
22	20.00	14.71	83.80	23.74	366.15	53.31	68.03	7658
23	19.50	19.62	88.90	25.19	388.43	54.85	74.47	7658
24	19.00	24.52	94.00	26.63	410.71	56.54	81.06	7658
25	18.50	29.43	99.10	28.08	433.00	58.32	87.75	7658
26	18.00	34.34	104.20	29.52	455.29	60.16	94.50	7658
		Total>	138.53	36.25m	377.53	194.52	194.52	32185
27	17.63	Total>	146.04	38.13m	392.20	201.37	201.37	33150
28	17.25	Total>	153.55	40.00m	406.88	208.11	208.11	34116

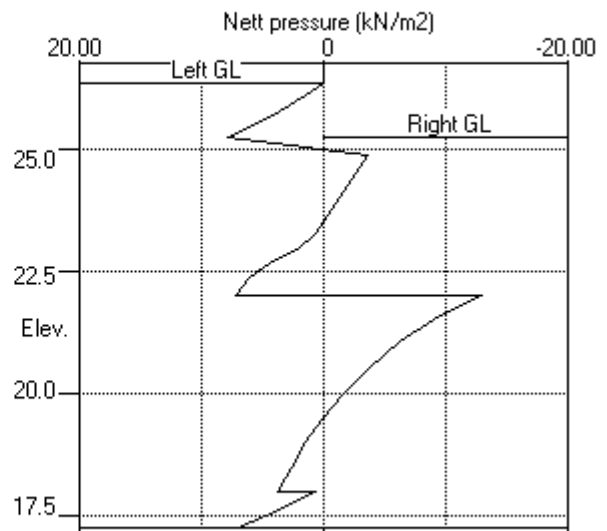
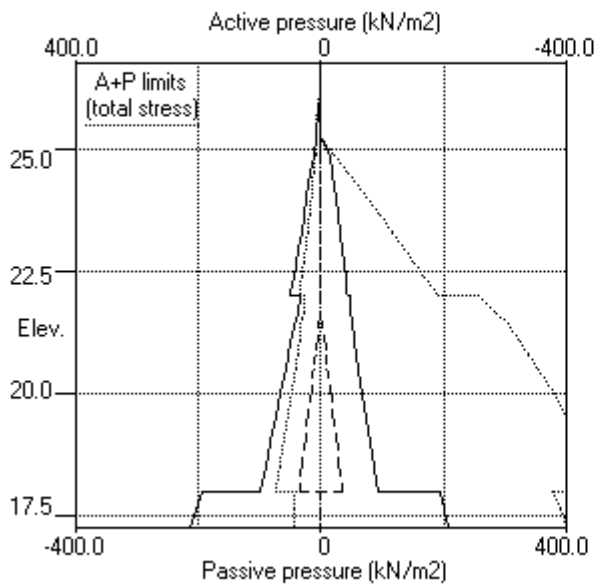
Note: 3.66a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 25.25 on RIGHT side



Stage No.4 Excav. to elev. 25.25 on RIGHT side



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 6 Apply water pressure profile no.1 (Mod. Conserv.)

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. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.500	Wall Penetr- ation	Direction of failure
6	26.32 25.25	25.75	9.070	n/a	24.65	0.60	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.005	6.16E-04	0.0	0.0		138544
2	26.32	0.00	0.005	6.16E-04	0.0	-0.0		138544
3	26.10	1.58	0.005	6.16E-04	0.2	-0.0		138544
4	25.75	3.66	0.004	6.16E-04	1.1	0.2	0.3	138544
		3.66	0.004	6.16E-04	0.8	0.2		
5	25.32	7.04	0.004	6.14E-04	3.1	1.2		138544
6	25.25	7.87	0.004	6.13E-04	3.6	1.4		138544
7	24.88	-3.73	0.004	6.07E-04	4.4	3.2		138544
8	24.50	-2.76	0.004	5.96E-04	3.2	4.6		138544
9	24.00	-1.50	0.003	5.77E-04	2.1	5.8		138544
10	23.63	-0.61	0.003	5.61E-04	1.7	6.5		138544
11	23.25	0.22	0.003	5.42E-04	1.7	7.1		138544
12	22.95	1.65	0.003	5.26E-04	1.9	7.7		138544
13	22.65	3.93	0.003	5.09E-04	2.8	8.3		138544
14	22.36	5.56	0.002	4.90E-04	4.2	9.3		138544
15	22.06	6.57	0.002	4.68E-04	6.0	10.8		138544
16	22.00	6.72	0.002	4.64E-04	6.4	11.2		138544
		-15.55	0.002	4.64E-04	6.4	11.2		
17	21.64	-12.91	0.002	4.33E-04	1.3	12.5		138544
18	21.50	-12.01	0.002	4.20E-04	-0.5	12.5		138544
19	21.04	-6.43	0.002	3.81E-04	-4.7	11.2		138544
20	20.77	-3.36	0.002	3.61E-04	-6.1	9.7		138544
21	20.50	-0.40	0.002	3.44E-04	-6.6	7.9		138544
22	20.00	1.56	0.001	3.21E-04	-6.3	4.6		138544
23	19.50	3.31	0.001	3.10E-04	-5.1	1.6		138544
24	19.00	4.93	0.001	3.08E-04	-3.0	-0.5		138544
25	18.50	6.51	0.001	3.11E-04	-0.1	-1.4		138544
26	18.00	8.07	0.001	3.15E-04	3.5	-0.7		138544
		-9.06	0.001	3.15E-04	3.5	-0.7		
27	17.63	-4.76	0.001	3.16E-04	0.9	0.0		138544

(continued)

Stage No.6 Apply water pressure profile no.1 (Mod. Conserv.)

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
28	17.25	-0.10	0.001	3.16E-04	0.0	-0.0		---
At elev. 25.75		Strut force =		1.4 kN/strut =		0.3 kN/m run		

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	7236
3	26.10	0.00	3.97	1.39	12.91	1.58	1.58	7236
4	25.75	0.00	10.41	3.66	33.87	3.66	3.66a	962
5	25.32	0.00	18.64	6.55	60.64	7.04	7.04	962
6	25.25	0.00	20.01	7.03	65.09	7.87	7.87	962
7	24.88	0.00	27.42	9.63	89.20	12.33	12.33	962
8	24.50	0.00	34.88	12.25	113.47	16.81	16.81	962
9	24.00	0.00	44.77	15.73	145.64	22.74	22.74	962
10	23.63	0.00	52.11	18.31	169.51	27.16	27.16	962
11	23.25	0.00	59.37	20.86	193.12	31.54	31.54	962
12	22.95	0.00	67.47	23.70	219.47	35.78	35.78	962
13	22.65	0.00	78.21	27.47	254.39	40.89	40.89	962
14	22.36	0.00	87.04	30.57	283.11	45.36	45.36	962
15	22.06	0.00	94.08	33.05	306.02	49.22	49.22	962
16	22.00	0.00	95.35	33.49	310.15	49.95	49.95	962
		0.00	95.35	27.02	416.62	32.69	32.69	4808
17	21.64	0.00	103.03	29.19	450.17	37.61	37.61	4808
18	21.50	0.00	105.80	29.98	462.29	39.43	39.43	4808
19	21.04	4.51	109.99	31.17	480.60	42.90	47.41	4808
20	20.77	7.16	112.31	31.82	490.71	44.81	51.97	4808
21	20.50	9.81	114.59	32.47	500.67	46.66	56.47	4808
22	20.00	14.71	118.81	33.66	519.11	49.99	64.70	4808
23	19.50	19.62	123.08	34.88	537.80	53.23	72.85	4808
24	19.00	24.52	127.44	36.11	556.81	56.43	80.96	4808
25	18.50	29.43	131.86	37.36	576.16	59.62	89.05	4808
26	18.00	34.34	136.35	38.64	595.78	62.83	97.16	4808
		Total>	170.69	41.60m	409.68	190.09	190.09	21325
27	17.63	Total>	177.77	43.48m	423.94	200.62	200.62	21965
28	17.25	Total>	184.88	45.35m	438.22	211.34	211.34	22605

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	962
7	24.88	0.00	6.75	2.37	21.96	16.06	16.06	962
8	24.50	0.00	13.50	4.74	43.91	19.56	19.56	962
9	24.00	0.00	22.50	7.90	73.19	24.25	24.25	962
10	23.63	0.00	29.25	10.27	95.14	27.77	27.77	962

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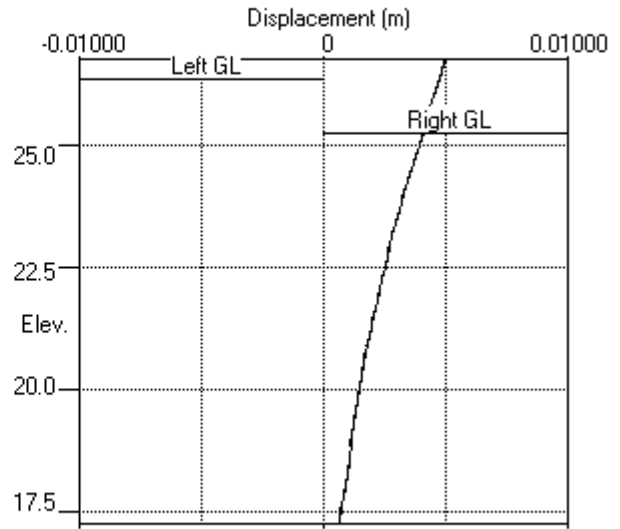
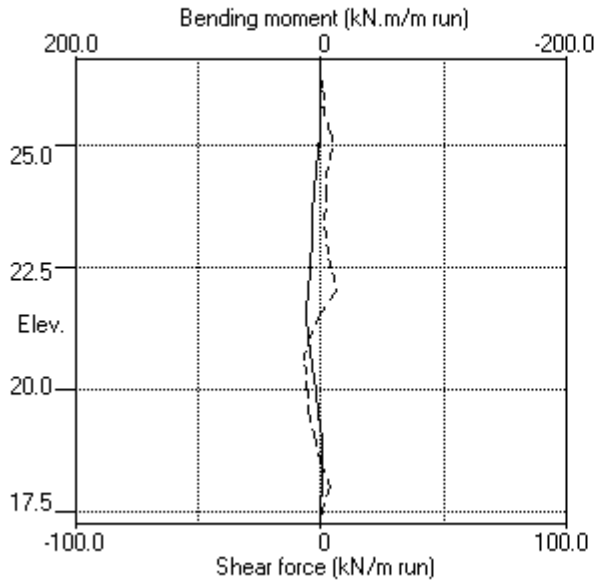
Stage No.6 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
11	23.25	0.00	36.00	12.65	117.10	31.31	31.31	962
12	22.95	0.00	41.36	14.53	134.52	34.13	34.13	962
13	22.65	0.00	46.71	16.41	151.94	36.96	36.96	962
14	22.36	0.00	52.07	18.29	169.36	39.80	39.80	962
15	22.06	0.00	57.42	20.17	186.78	42.65	42.65	962
16	22.00	0.00	58.50	20.55	190.30	43.23	43.23	962
		0.00	58.50	16.58	255.62	48.24	48.24	4808
17	21.64	0.00	65.70	18.62	287.09	50.52	50.52	4808
18	21.50	0.00	68.50	19.41	299.32	51.44	51.44	4808
19	21.04	0.00	77.71	22.02	339.53	53.84	53.84	4808
20	20.77	0.00	83.11	23.55	363.13	55.33	55.33	4808
21	20.50	0.00	88.51	25.08	386.73	56.88	56.88	4808
22	20.00	4.90	93.61	26.52	409.01	58.24	63.15	4808
23	19.50	9.81	98.71	27.97	431.29	59.73	69.54	4808
24	19.00	14.71	103.81	29.41	453.57	61.31	76.02	4808
25	18.50	19.62	108.91	30.86	475.86	62.93	82.55	4808
26	18.00	24.52	114.01	32.30	498.15	64.57	89.09	4808
		Total>	138.53	36.25m	377.53	199.15	199.15	21325
27	17.63	Total>	146.04	38.13m	392.20	205.38	205.38	21965
28	17.25	Total>	153.55	40.00m	406.88	211.45	211.45	22605

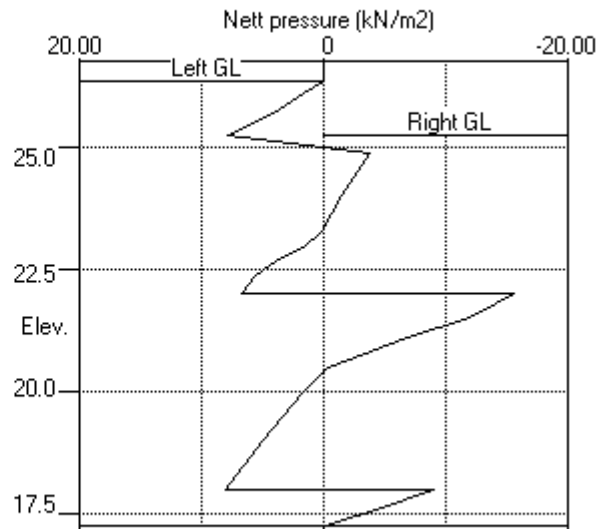
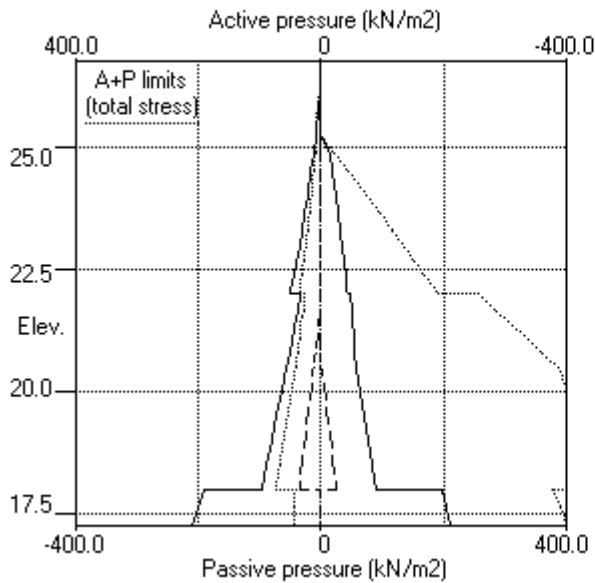
Note: 3.66a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Apply water pressure profile no.1 (Mod. Conserv.)



Stage No.6 Apply water pressure profile no.1 (Mod. Conserv.)



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 21.04 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. =	Moment of equil. at elev.	Toe elev. for FoS =	Wall Penetr-ation	Direction of failure
7	26.32	21.04	25.75	1.907	n/a	17.25	3.36	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.003	-2.03E-03	0.0	0.0		138544
2	26.32	0.00	0.004	-2.03E-03	0.0	-0.0		138544
3	26.10	5.55	0.004	-2.03E-03	0.6	-0.0		138544
4	25.75	3.66	0.005	-2.03E-03	2.2	0.6	63.6	138544
		3.66	0.005	-2.03E-03	-61.4	0.6		
5	25.32	6.55	0.006	-1.99E-03	-59.2	-25.2		138544
6	25.25	7.03	0.006	-1.98E-03	-58.7	-29.3		138544
7	24.88	9.63	0.007	-1.87E-03	-55.6	-50.6		138544
8	24.50	13.15	0.007	-1.71E-03	-51.3	-70.7		138544
9	24.00	18.02	0.008	-1.41E-03	-43.5	-94.5		138544
10	23.63	21.75	0.009	-1.13E-03	-36.1	-109.4		138544
11	23.25	25.55	0.009	-8.25E-04	-27.2	-121.3		138544
12	22.95	29.43	0.009	-5.57E-04	-19.0	-128.2		138544
13	22.65	34.27	0.009	-2.77E-04	-9.5	-132.5		138544
14	22.36	38.55	0.009	8.78E-06	1.3	-133.8		138544
15	22.06	42.31	0.009	2.93E-04	13.3	-131.6		138544
16	22.00	43.03	0.009	3.50E-04	15.9	-130.8		138544
		27.02	0.009	3.50E-04	15.9	-130.8		
17	21.64	29.19	0.009	6.80E-04	26.0	-123.3		138544
18	21.50	29.98	0.009	8.03E-04	30.1	-119.4		138544
19	21.04	35.68	0.008	1.17E-03	45.2	-102.2		138544
20	20.77	15.39	0.008	1.35E-03	52.1	-89.0		138544
21	20.50	-4.91	0.008	1.51E-03	53.5	-74.6		138544
22	20.00	-25.98	0.007	1.74E-03	45.8	-49.4		138544
23	19.50	-26.56	0.006	1.88E-03	32.7	-28.3		138544
24	19.00	-19.40	0.005	1.95E-03	21.2	-14.5		138544
25	18.50	-7.03	0.004	1.99E-03	14.6	-6.4		138544
26	18.00	5.46	0.003	2.00E-03	14.2	0.0		138544
		-56.29	0.003	2.00E-03	14.2	0.0		
27	17.63	-19.53	0.002	2.00E-03	-0.0	1.4		138544

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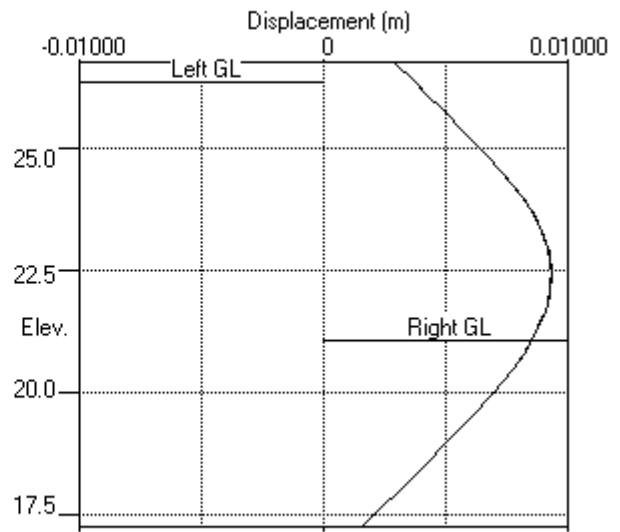
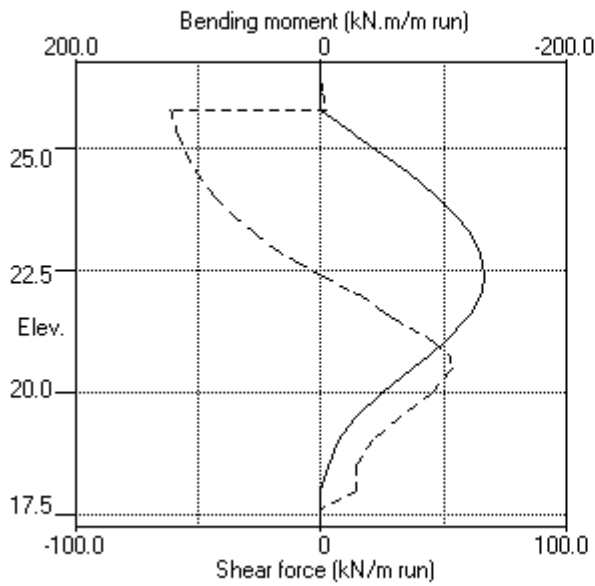
Stage No.7 Excavate to elevation 21.04 on RIGHT side

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	21.04	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	7973
20	20.77	0.00	5.40	1.53	23.59	23.59	23.59p	7973
21	20.50	0.00	10.80	3.06	47.19	47.19	47.19p	7973
22	20.00	4.90	15.90	4.50	69.45	69.45	74.36p	7973
23	19.50	9.81	20.99	5.95	91.72	71.24	81.05	7973
24	19.00	14.71	26.09	7.39	113.99	66.38	81.09	7973
25	18.50	19.62	31.19	8.84	136.26	61.34	80.96	7973
26	18.00	24.52	36.28	10.28	158.54	56.24	80.76	7973
		Total>	60.81	15.20m	299.80	198.13	198.13	33405
27	17.63	Total>	68.31	17.08m	314.48	184.75	184.75	34408
28	17.25	Total>	75.82	18.95m	329.15	169.97	169.97	35410

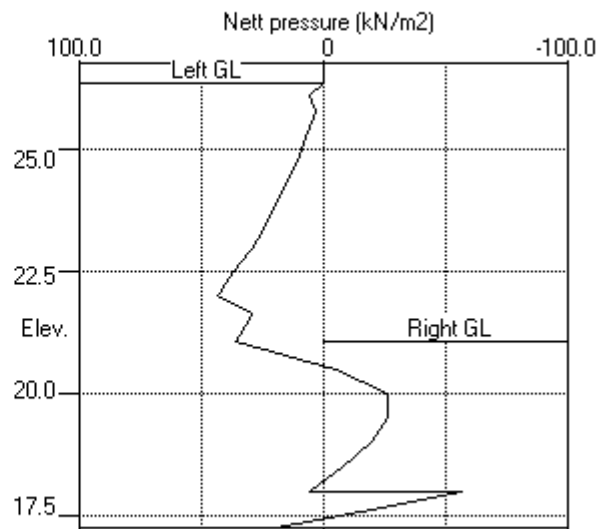
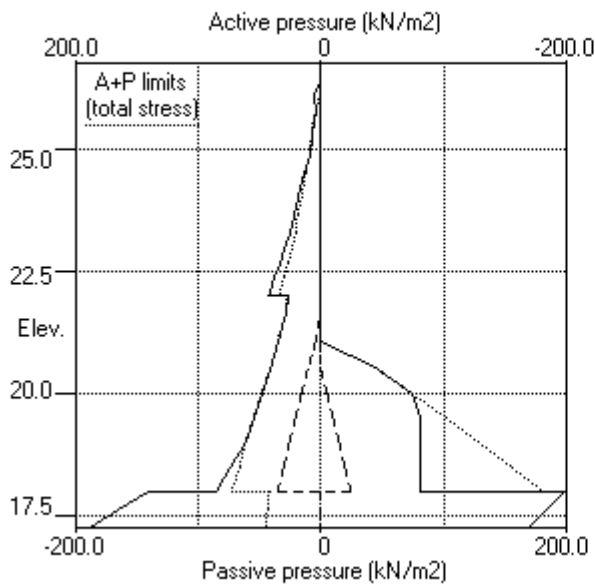
Note: 54.50a Soil pressure at active limit
 74.36p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. 21.04 on RIGHT side



Stage No.7 Excav. to elev. 21.04 on RIGHT side



Units: kN,m

Stage No. 8 Fill to elevation 21.64 on RIGHT side with soil type 1

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

				FoS for toe elev. = 17.25		Toe elev. for FoS = 1.500		
				-----		-----		
Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure
8	26.32	21.64	25.75	2.227	n/a	18.25	3.39	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.003	-1.97E-03	0.0	0.0		138544
2	26.32	0.00	0.004	-1.97E-03	0.0	-0.0		138544
3	26.10	5.41	0.004	-1.97E-03	0.6	-0.0		138544
4	25.75	3.66	0.005	-1.97E-03	2.2	0.6	63.3	138544
		3.66	0.005	-1.97E-03	-61.1	0.6		
5	25.32	6.58	0.006	-1.93E-03	-58.9	-25.1		138544
6	25.25	7.06	0.006	-1.92E-03	-58.4	-29.2		138544
7	24.88	9.69	0.007	-1.81E-03	-55.3	-50.4		138544
8	24.50	13.23	0.007	-1.65E-03	-51.0	-70.3		138544
9	24.00	18.12	0.008	-1.35E-03	-43.2	-93.9		138544
10	23.63	21.87	0.008	-1.07E-03	-35.7	-108.8		138544
11	23.25	25.70	0.009	-7.69E-04	-26.7	-120.5		138544
12	22.95	29.60	0.009	-5.03E-04	-18.5	-127.3		138544
13	22.65	34.45	0.009	-2.25E-04	-9.0	-131.4		138544
14	22.36	38.74	0.009	5.78E-05	1.9	-132.5		138544
15	22.06	42.52	0.009	3.39E-04	14.0	-130.2		138544
16	22.00	43.24	0.009	3.95E-04	16.6	-129.2		138544
		28.06	0.009	3.95E-04	16.6	-129.2		
17	21.64	30.31	0.009	7.21E-04	27.1	-121.5		138544
18	21.50	30.24	0.009	8.42E-04	31.3	-117.4		138544
19	21.04	33.11	0.008	1.20E-03	45.9	-99.8		138544
		33.84	0.008	1.20E-03	45.9	-99.8		
20	20.77	14.55	0.008	1.38E-03	52.4	-86.4		138544
21	20.50	-5.69	0.007	1.53E-03	53.6	-72.0		138544
22	20.00	-26.67	0.007	1.75E-03	45.5	-46.9		138544
23	19.50	-27.20	0.006	1.88E-03	32.1	-26.0		138544
24	19.00	-20.05	0.005	1.95E-03	20.2	-12.6		138544
25	18.50	-7.72	0.004	1.98E-03	13.3	-5.0		138544
26	18.00	4.71	0.003	1.99E-03	12.5	0.7		138544
		-54.20	0.003	1.99E-03	12.5	0.7		

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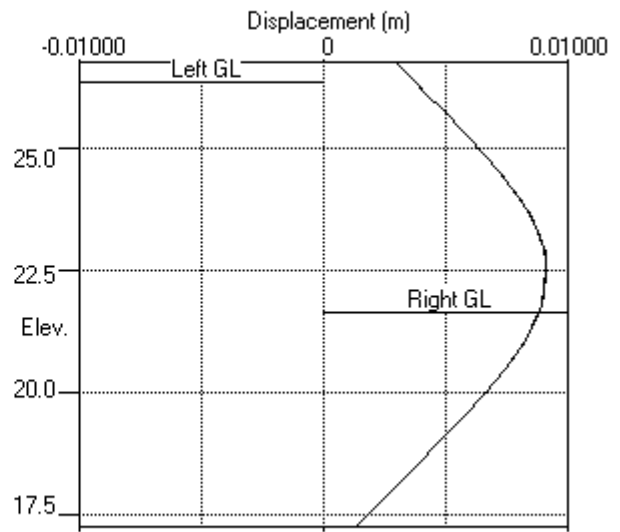
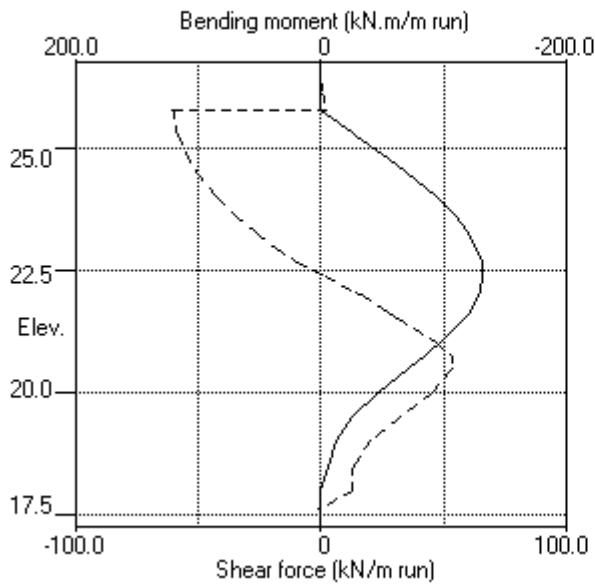
Stage No.8 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	Effective stresses					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
11	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1137
18	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1137
19	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1137
		0.00	10.80	3.06	47.19	3.06	3.06a	5686
20	20.77	0.00	16.20	4.59	70.78	25.70	25.70	5686
21	20.50	0.00	21.60	6.12	94.38	49.26	49.26	5686
22	20.00	4.90	26.70	7.56	116.65	71.47	76.38	5686
23	19.50	9.81	31.79	9.01	138.92	73.24	83.05	5686
24	19.00	14.71	36.89	10.45	161.19	68.38	83.09	5686
25	18.50	19.62	41.99	11.90	183.47	63.36	82.98	5686
26	18.00	24.52	47.09	13.34	205.75	58.29	82.82	5686
		Total>	71.62	18.20m	310.61	201.83	201.83	24611
27	17.63	Total>	79.12	20.08m	325.28	188.39	188.39	25349
28	17.25	Total>	86.63	21.95m	339.96	173.56	173.56	26088

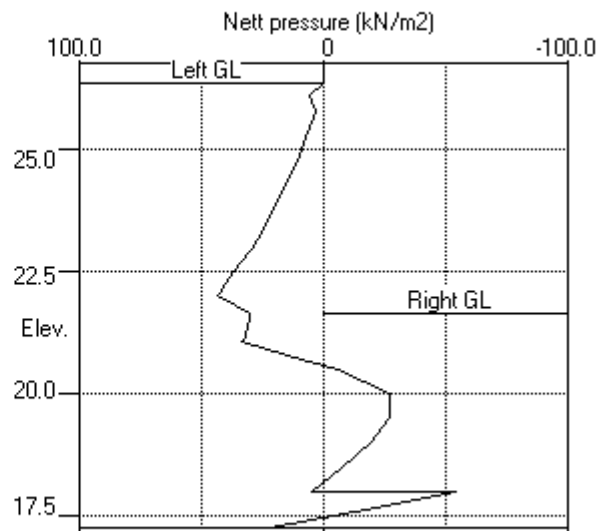
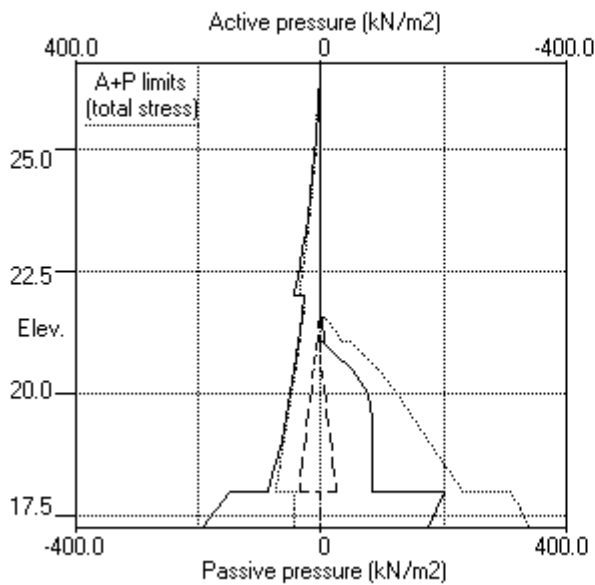
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Fill to elev. 21.64 on RIGHT side



Stage No.8 Fill to elev. 21.64 on RIGHT side



Units: kN,m

Stage No. 11 Remove strut or anchor no.1 at elevation 25.75

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

Stage No.	G.L. Act.	G.L. Pass.	Strut Elev.	FoS for toe		Toe elev. for		Direction of failure
				Factor of Safety	Moment of equil. at elev.	elev. = 17.25	FoS = 1.500	
11	26.32	21.64		More than one strut.	No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	0.003	-2.11E-03	0.0	0.0		138544
2	26.32	0.00	0.004	-2.11E-03	0.0	-0.0		138544
3	26.10	5.31	0.004	-2.11E-03	0.6	-0.0	56.1	138544
		5.31	0.004	-2.11E-03	-55.5	-0.0		
4	25.75	3.66	0.005	-2.09E-03	-53.9	-19.1		138544
5	25.32	6.55	0.006	-1.99E-03	-51.8	-41.7		138544
6	25.25	7.03	0.006	-1.97E-03	-51.3	-45.3		138544
7	24.88	9.63	0.007	-1.82E-03	-48.2	-63.8		138544
8	24.50	12.99	0.007	-1.63E-03	-43.9	-81.0		138544
9	24.00	17.91	0.008	-1.30E-03	-36.2	-101.1		138544
10	23.63	21.69	0.009	-1.01E-03	-28.8	-113.4		138544
11	23.25	25.56	0.009	-6.92E-04	-19.9	-122.5		138544
12	22.95	29.49	0.009	-4.24E-04	-11.7	-127.3		138544
13	22.65	34.37	0.009	-1.48E-04	-2.2	-129.4		138544
14	22.36	38.70	0.009	1.28E-04	8.7	-128.5		138544
15	22.06	42.51	0.009	3.99E-04	20.7	-124.1	8.8	138544
		42.51	0.009	3.99E-04	12.0	-124.1		
16	22.00	43.23	0.009	4.52E-04	14.5	-123.3		138544
		28.01	0.009	4.52E-04	14.5	-123.3		
17	21.64	30.38	0.009	7.64E-04	25.0	-116.3		138544
18	21.50	30.35	0.009	8.79E-04	29.3	-112.5		138544
19	21.04	33.31	0.008	1.22E-03	43.9	-95.8		138544
		34.04	0.008	1.22E-03	43.9	-95.8		
20	20.77	15.01	0.008	1.39E-03	50.6	-83.0		138544
21	20.50	-5.18	0.007	1.54E-03	51.9	-69.0		138544
22	20.00	-26.14	0.007	1.75E-03	44.1	-44.7		138544
23	19.50	-26.70	0.006	1.87E-03	30.8	-24.5		138544
24	19.00	-19.61	0.005	1.94E-03	19.3	-11.7		138544
25	18.50	-7.36	0.004	1.97E-03	12.5	-4.5		138544
26	18.00	4.98	0.003	1.97E-03	11.9	0.9		138544
		-53.07	0.003	1.97E-03	11.9	0.9		

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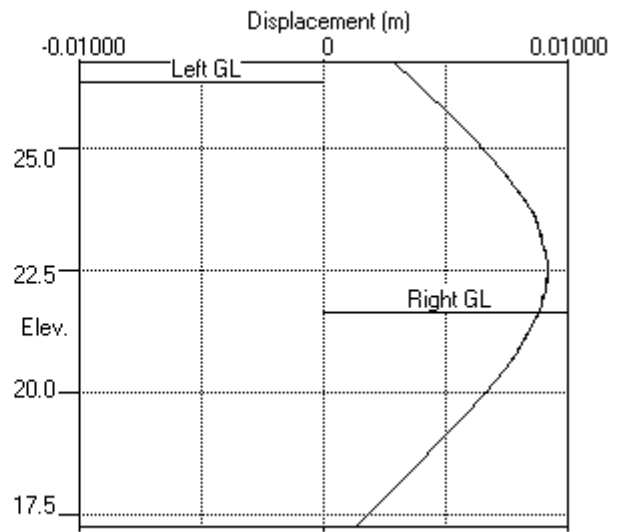
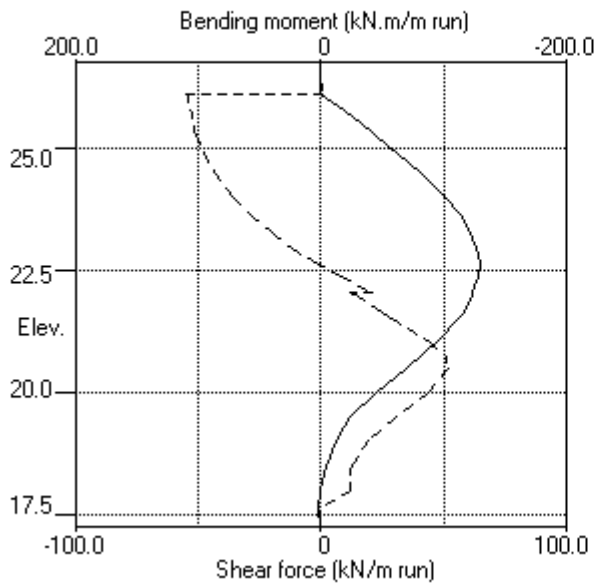
Stage No.11 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
10	23.63	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1307
19	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1307
		0.00	10.80	3.06	47.19	3.06	3.06a	6536
20	20.77	0.00	16.20	4.59	70.78	25.47	25.47	6536
21	20.50	0.00	21.60	6.12	94.38	49.01	49.01	6536
22	20.00	4.90	26.70	7.56	116.65	71.21	76.11	6536
23	19.50	9.81	31.79	9.01	138.92	72.99	82.80	6536
24	19.00	14.71	36.89	10.45	161.19	68.15	82.87	6536
25	18.50	19.62	41.99	11.90	183.47	63.18	82.80	6536
26	18.00	24.52	47.09	13.34	205.75	58.16	82.69	6536
		Total>	71.62	18.20m	310.61	201.26	201.26	27857
27	17.63	Total>	79.12	20.08m	325.28	187.98	187.98	28693
28	17.25	Total>	86.63	21.95m	339.96	173.31	173.31	29528

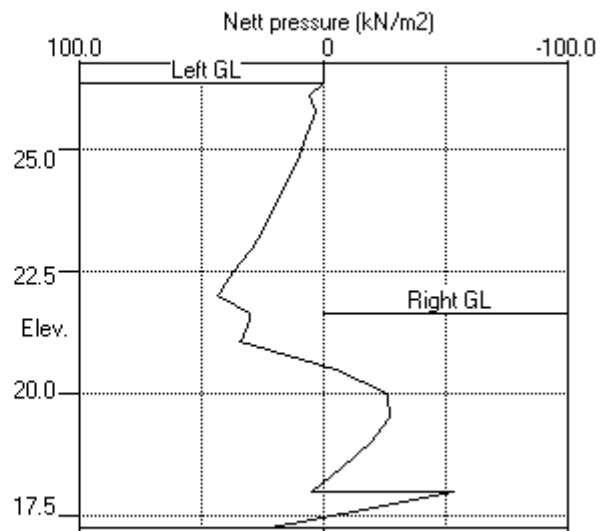
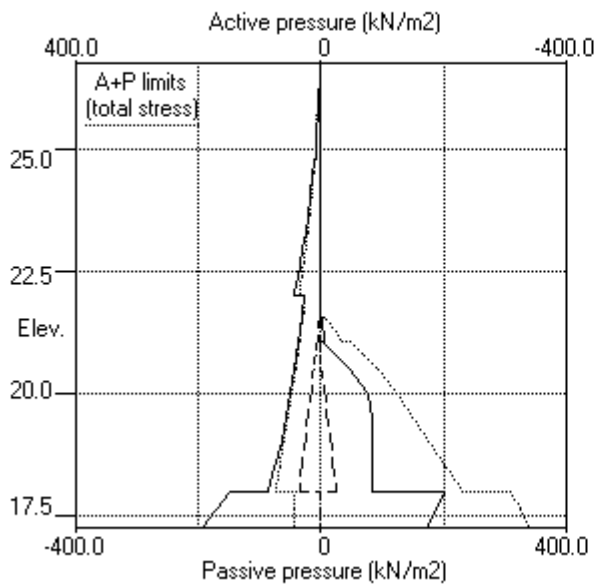
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.11 Remove strut no.1 at elev. 25.75



Stage No.11 Remove strut no.1 at elev. 25.75



PILEDESIGNS LTD	Sheet No.
Program: WALLAP Version 6.06 Revision A51.B69.R54	Job No. 23198
Licensed from GEOSOLVE	Made by : DBS
Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_SLS	Date:12-06-2020
Fitzrovia - Middlesex Hospital Annexe	Checked :
Wall 2, Secant-SLS, 600 dia @ 900 - run 03	

Units: kN,m

Stage No. 12 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 17.25	Toe elev. for FoS = 1.500			
Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe Wall Penetr-ation elev. No FoS calc.	Direction of failure
12	26.32	21.64					

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.003	-2.22E-03	0.0	0.0		98960
2	26.32	0.00	0.004	-2.22E-03	0.0	-0.0		98960
3	26.10	5.44	0.004	-2.22E-03	0.6	-0.0	46.4	98960
		5.44	0.004	-2.22E-03	-45.8	-0.0		
4	25.75	3.66	0.005	-2.19E-03	-44.2	-16.4		98960
5	25.32	6.55	0.006	-2.09E-03	-42.0	-35.7		98960
6	25.25	7.03	0.006	-2.06E-03	-41.5	-38.8		98960
7	24.88	9.63	0.007	-1.89E-03	-38.4	-54.5		98960
8	24.50	12.80	0.008	-1.67E-03	-34.2	-68.8		98960
9	24.00	17.70	0.008	-1.30E-03	-26.5	-85.2		98960
10	23.63	21.49	0.009	-9.85E-04	-19.2	-94.6		98960
11	23.25	25.38	0.009	-6.36E-04	-10.4	-101.0		98960
12	22.95	29.34	0.009	-3.48E-04	-2.3	-103.5		98960
13	22.65	34.26	0.009	-5.89E-05	7.2	-103.5		98960
14	22.36	38.62	0.009	2.24E-04	18.0	-100.4		98960
15	22.06	42.47	0.009	4.91E-04	30.1	-93.9	29.0	98960
		42.47	0.009	4.91E-04	1.1	-93.9		
16	22.00	43.20	0.009	5.42E-04	3.6	-93.6		98960
		27.88	0.009	5.42E-04	3.6	-93.6		
17	21.64	30.46	0.009	8.46E-04	14.1	-89.6		98960
18	21.50	30.50	0.009	9.61E-04	18.4	-87.0		98960
19	21.04	33.69	0.008	1.30E-03	33.2	-74.2		98960
		34.43	0.008	1.30E-03	33.2	-74.2		
20	20.77	16.05	0.008	1.47E-03	40.0	-63.6		98960
21	20.50	-3.88	0.007	1.61E-03	41.6	-51.9		98960
22	20.00	-24.42	0.006	1.80E-03	34.5	-31.4		98960
23	19.50	-24.70	0.006	1.90E-03	22.3	-14.7		98960
24	19.00	-17.51	0.005	1.94E-03	11.7	-5.0		98960

(continued)

Stage No.12 Change EI of wall to 98960 kN.m²/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
25	18.50	-5.31	0.004	1.95E-03	6.0	-0.6		98960
26	18.00	6.84	0.003	1.94E-03	6.4	2.4		98960
		-45.09	0.003	1.94E-03	6.4	2.4		
27	17.63	-9.07	0.002	1.93E-03	-3.8	2.0		98960
28	17.25	29.17	0.001	1.93E-03	0.0	-0.0		---
At elev. 26.10		Strut force =		46.4 kN/strut =		46.4 kN/m run		
At elev. 22.06		Strut force =		29.0 kN/strut =		29.0 kN/m run		

Node no.	Y coord	LEFT side					Total earth pressure kN/m ²	Coeff. of subgrade reaction kN/m ³
		Water press. kN/m ²	Vertic -al kN/m ²	Effective Active limit kN/m ²	Effective Passive limit kN/m ²	Earth pressure kN/m ²		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.32	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	10831	
3	26.10	0.00	3.97	1.39	12.91	5.44	10831	
4	25.75	0.00	10.41	3.66	33.87	3.66	1466	
5	25.32	0.00	18.64	6.55	60.64	6.55	1466	
6	25.25	0.00	20.01	7.03	65.09	7.03	1466	
7	24.88	0.00	27.42	9.63	89.20	9.63	1466	
8	24.50	0.00	34.88	12.25	113.47	12.80	1466	
9	24.00	0.00	44.77	15.73	145.64	17.70	1466	
10	23.63	0.00	52.11	18.31	169.51	21.49	1466	
11	23.25	0.00	59.37	20.86	193.12	25.38	1466	
12	22.95	0.00	67.47	23.70	219.47	29.34	1466	
13	22.65	0.00	78.21	27.47	254.39	34.26	1466	
14	22.36	0.00	87.04	30.57	283.11	38.62	1466	
15	22.06	0.00	94.08	33.05	306.02	42.47	1466	
16	22.00	0.00	95.35	33.49	310.15	43.20	1466	
		0.00	95.35	27.02	416.62	27.88	7331	
17	21.64	0.00	103.03	29.19	450.17	30.46	6390	
18	21.50	0.00	105.80	29.98	462.29	31.39	6390	
19	21.04	4.51	109.99	31.17	480.60	32.98	6390	
20	20.77	7.16	112.31	31.82	490.71	33.84	6390	
21	20.50	9.81	114.59	32.47	500.67	34.67	6390	
22	20.00	14.71	118.81	33.66	519.11	36.12	6390	
23	19.50	19.62	123.08	34.88	537.80	37.48	6390	
24	19.00	24.52	127.44	36.11	556.81	39.79	6390	
25	18.50	29.43	131.86	37.36	576.16	47.03	6390	
26	18.00	34.34	136.35	38.64	595.78	54.26	6390	
		Total>	170.69	41.60m	409.68	152.18	27296	
27	17.63	Total>	177.77	43.48m	423.94	175.19	28114	
28	17.25	Total>	184.88	45.35m	438.22	199.11	28933	

Node no.	Y coord	RIGHT side					Total earth pressure kN/m ²	Coeff. of subgrade reaction kN/m ³
		Water press. kN/m ²	Vertic -al kN/m ²	Effective Active limit kN/m ²	Effective Passive limit kN/m ²	Earth pressure kN/m ²		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.32	0.00	0.00	0.00	0.00	0.00	0.0	
3	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.75	0.00	0.00	0.00	0.00	0.00	0.0	

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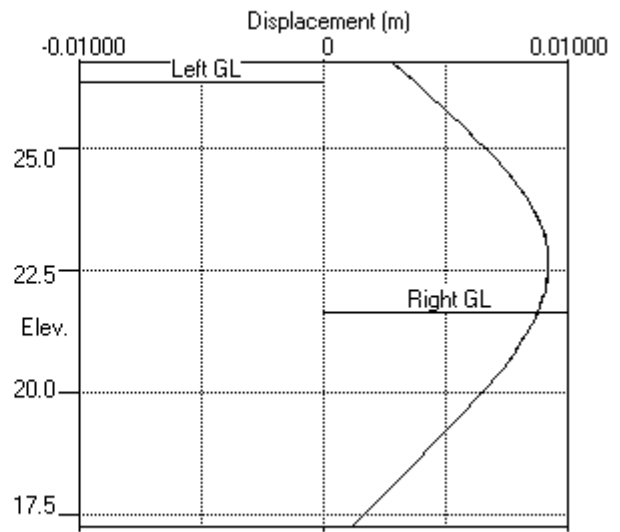
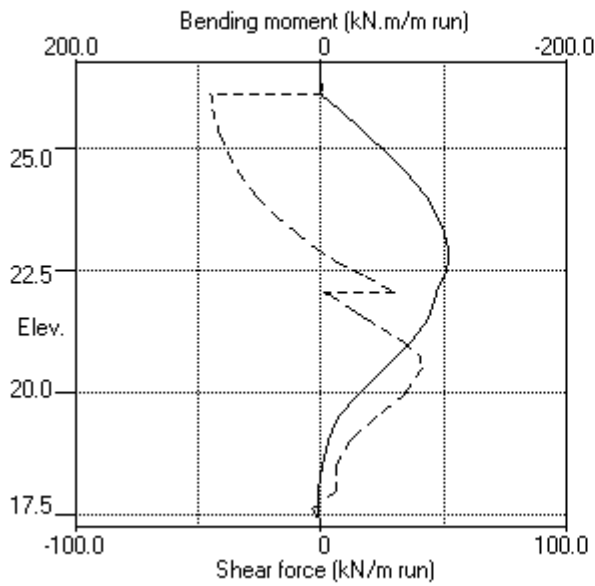
Stage No.12 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Earth pressure kN/m2		
5	25.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
7	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
8	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
10	23.63	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
18	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1278	
19	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1278	
		0.00	10.80	3.06	47.19	3.06	3.06a	6390	
20	20.77	0.00	16.20	4.59	70.78	24.95	24.95	6390	
21	20.50	0.00	21.60	6.12	94.38	48.36	48.36	6390	
22	20.00	4.90	26.70	7.56	116.65	70.35	75.26	6390	
23	19.50	9.81	31.79	9.01	138.92	71.99	81.80	6390	
24	19.00	14.71	36.89	10.45	161.19	67.11	81.82	6390	
25	18.50	19.62	41.99	11.90	183.47	62.16	81.78	6390	
26	18.00	24.52	47.09	13.34	205.75	57.23	81.75	6390	
		Total>	71.62	18.20m	310.61	197.27	197.27	27296	
27	17.63	Total>	79.12	20.08m	325.28	184.26	184.26	28114	
28	17.25	Total>	86.63	21.95m	339.96	169.94	169.94	28933	

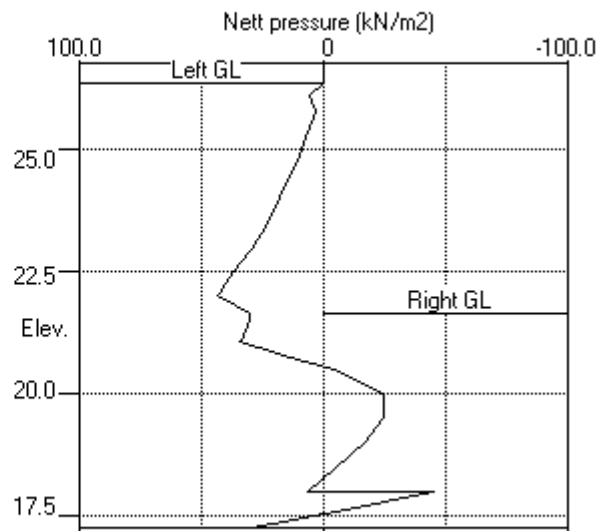
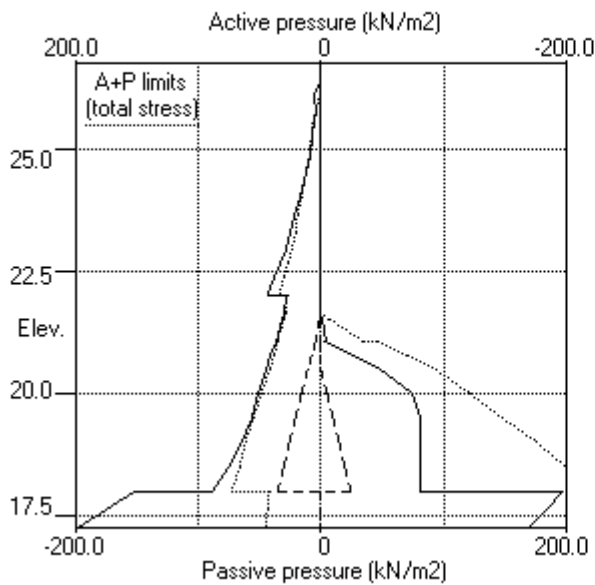
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.12 Change EI of wall to 98960kN.m²/m run



Stage No.12 Change EI of wall to 98960kN.m²/m run



Units: kN,m

Stage No. 15 Apply water pressure profile no.2 (Mod. Conserv.)

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. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.500	Wall Penetr-ation	Direction of failure
15	26.32 21.64					No FoS calc.	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 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	EI of wall kN.m2/m
1	26.75	0.00	0.003	-2.50E-03	0.0	0.0		98960
2	26.32	0.00	0.004	-2.50E-03	0.0	-0.0		98960
3	26.10	5.42	0.004	-2.50E-03	0.6	-0.0	58.3	98960
		5.42	0.004	-2.50E-03	-57.7	-0.0		
4	25.75	3.66	0.005	-2.47E-03	-56.2	-20.6		98960
5	25.32	6.55	0.006	-2.33E-03	-54.0	-45.1		98960
6	25.25	7.48	0.006	-2.30E-03	-53.5	-49.0		98960
7	24.88	12.46	0.007	-2.08E-03	-49.7	-69.1		98960
8	24.50	17.61	0.008	-1.80E-03	-44.1	-87.5		98960
9	24.00	25.73	0.009	-1.32E-03	-33.3	-108.0		98960
10	23.63	31.98	0.009	-9.16E-04	-22.4	-119.4		98960
11	23.25	38.38	0.009	-4.72E-04	-9.2	-126.2		98960
12	22.95	44.38	0.009	-1.10E-04	3.1	-127.8		98960
13	22.65	51.36	0.009	2.48E-04	17.3	-125.4		98960
14	22.36	57.82	0.009	5.92E-04	33.5	-118.5		98960
15	22.06	63.78	0.009	9.05E-04	51.6	-106.5	32.2	98960
		63.78	0.009	9.05E-04	19.4	-106.5		
16	22.00	64.94	0.009	9.64E-04	23.3	-105.1		98960
		50.36	0.009	9.64E-04	23.3	-105.1		
17	21.64	55.63	0.009	1.29E-03	42.3	-92.6		98960
		15.07	0.009	1.29E-03	42.3	-92.6		
18	21.50	15.53	0.008	1.41E-03	44.5	-86.2		98960
19	21.04	17.04	0.008	1.72E-03	52.0	-63.1		98960
		17.42	0.008	1.72E-03	52.0	-63.1		
20	20.77	1.62	0.007	1.86E-03	54.5	-48.0		98960
21	20.50	-18.86	0.007	1.95E-03	52.2	-32.9		98960
22	20.00	-37.61	0.006	2.04E-03	38.1	-9.0		98960
23	19.50	-36.77	0.005	2.02E-03	19.5	7.8		98960
24	19.00	-29.12	0.004	1.96E-03	3.0	14.6		98960
25	18.50	-17.05	0.003	1.88E-03	-8.5	13.2		98960

(continued)

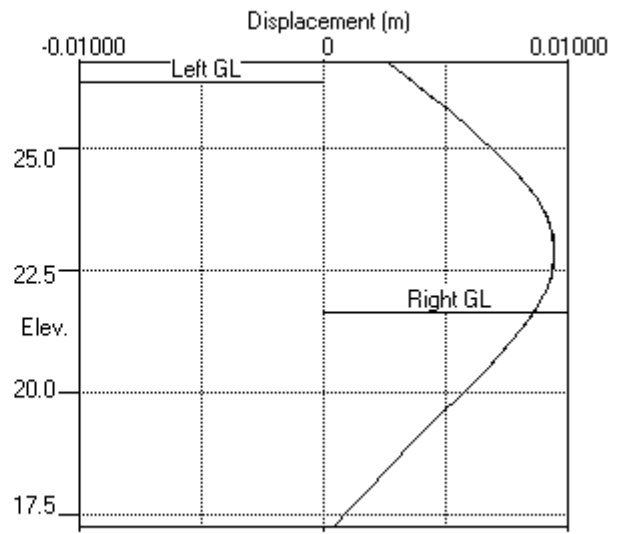
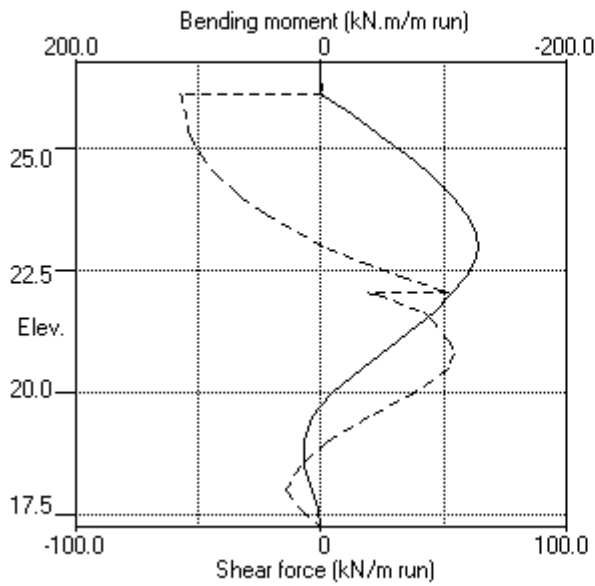
Stage No.15 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
8	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.63	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		40.32	0.68	0.24	2.21	0.24	40.56a	1234
18	21.50	41.69	1.82	0.64	5.93	0.64	42.33a	1234
19	21.04	46.21	5.59	1.96	18.18	1.96	48.17a	1234
		46.21	5.59	1.58	24.42	1.58	47.79a	6168
20	20.77	48.85	8.33	2.36	36.41	18.92	67.77	6168
21	20.50	51.50	11.07	3.14	48.37	40.83	92.33	6168
22	20.00	56.41	16.11	4.57	70.41	61.92	118.33	6168
23	19.50	61.31	21.12	5.98	92.27	62.99	124.30	6168
24	19.00	66.22	26.07	7.39	113.92	57.85	124.07	6168
25	18.50	71.12	30.97	8.78	135.34	52.93	124.05	6168
26	18.00	76.03	35.82	10.15	156.49	48.22	124.25	6168
		76.03	35.82	12.58	116.50	105.17	181.19	13310
27	17.63	79.71	39.41	13.84	128.18	117.15	196.86	13709
28	17.25	83.39	42.97	15.09	139.76	124.45	207.84	14109

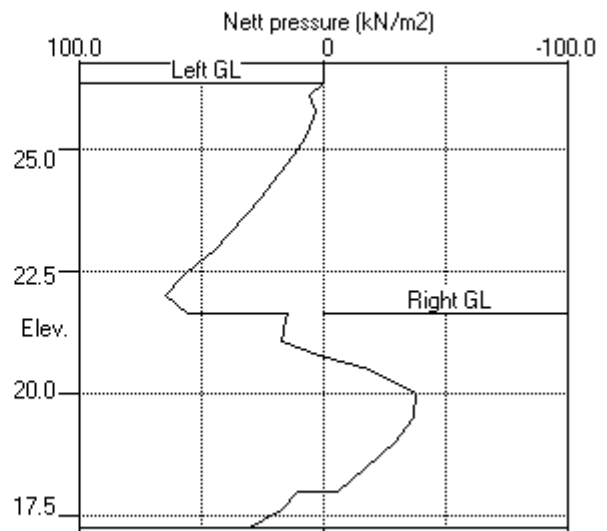
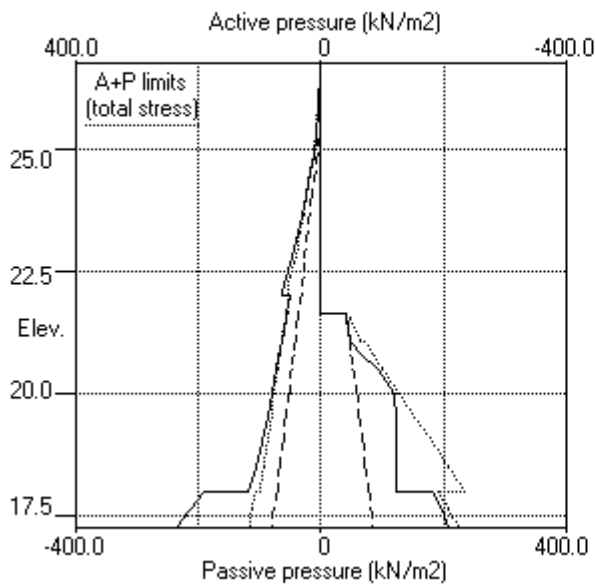
Note: 47.79a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.15 Apply water pressure profile no.2 (Mod. Conserv.)



Stage No.15 Apply water pressure profile no.2 (Mod. Conserv.)



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

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.		Strut Elev.	FoS for toe elev. = 17.25		Toe elev. for FoS = 1.500		Direction of failure
	Act.	Pass.		Factor of Safety	Moment at elev.	Toe elev.	Wall Penetration	
1	26.75	26.32	Cant.	15.879	18.14	25.64	0.68	R to L
2	26.75	26.32	Cant.	23.086	18.79	25.64	0.68	R to L
3	26.75	26.32	Cant.	21.117	20.62	25.64	0.68	R to L
4	26.32	25.25	Cant.	4.632	17.87	23.35	1.90	L to R
5	26.32	25.25	No analysis at this stage					
6	26.32	25.25	25.75	9.070	n/a	24.65	0.60	L to R
7	26.32	21.04	25.75	1.907	n/a	17.68	3.36	L to R
8	26.32	21.64	25.75	2.227	n/a	18.25	3.39	L to R
9	26.32	21.64	No analysis at this stage					

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

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 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
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 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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				Shear force			
		max. m	min. m	Calculated kN.m/m		Factored kN.m/m		Calculated kN/m		Factored kN/m	
1	26.75	0.005	-0.001	0	-0	0	-0	0	0	0	0
2	26.32	0.005	-0.001	0	-0	0	-0	0	-1	0	-1
3	26.10	0.005	-0.001	0	-0	0	-0	1	-58	1	-78
4	25.75	0.005	-0.001	1	-21	1	-28	2	-61	3	-83
5	25.32	0.006	-0.001	1	-45	2	-61	3	-59	5	-80
6	25.25	0.006	-0.001	2	-49	2	-66	4	-59	5	-79
7	24.88	0.007	-0.001	3	-69	5	-93	5	-56	6	-75
8	24.50	0.008	-0.001	5	-87	7	-118	4	-51	5	-69
9	24.00	0.009	-0.001	6	-108	9	-146	3	-44	3	-59
10	23.63	0.009	-0.001	7	-119	10	-161	2	-36	3	-49
11	23.25	0.009	-0.001	8	-126	11	-170	2	-27	3	-37
12	22.95	0.009	-0.001	9	-128	12	-173	3	-19	4	-26
13	22.65	0.009	-0.001	10	-133	13	-179	17	-10	23	-13
14	22.36	0.009	-0.001	11	-134	15	-181	34	-2	45	-3
15	22.06	0.009	-0.000	13	-132	17	-178	52	-2	70	-3
16	22.00	0.009	-0.000	13	-131	18	-177	23	-2	31	-3
17	21.64	0.009	-0.000	15	-123	21	-166	42	-1	57	-2
18	21.50	0.009	-0.000	16	-119	21	-161	44	-1	60	-1
19	21.04	0.008	-0.000	16	-102	21	-138	52	-5	70	-6
20	20.77	0.008	-0.000	15	-89	20	-120	55	-6	74	-8
21	20.50	0.008	-0.000	14	-75	19	-101	54	-7	72	-9
22	20.00	0.007	-0.000	12	-49	16	-67	46	-6	62	-8
23	19.50	0.006	-0.000	9	-28	12	-38	33	-6	44	-8
24	19.00	0.005	-0.000	15	-15	20	-20	21	-5	29	-7
25	18.50	0.004	-0.000	13	-6	18	-9	15	-9	20	-12
26	18.00	0.003	-0.000	8	-1	10	-1	14	-14	19	-19
27	17.63	0.002	-0.000	3	-0	4	-0	1	-9	2	-12
28	17.25	0.002	-0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

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

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force							
	Calculated		Factored		Calculated		Factored					
min.	max. elev.	min. elev.	max. elev.	max. min.	max. min.	max. elev.	min. elev.	max. min.				
	kN.m/m		kN.m/m		kN/m		kN/m					
1	0	17.25	-5	21.04	0	-7	2	19.50	-2	22.00	2	
-3	2	0	17.25	-6	21.50	0	-8	2	19.00	-1	22.00	2
-2	3	0	26.75	-10	21.64	0	-13	3	19.00	-3	22.95	4
-4	4	16	21.04	-0	26.32	21	-0	8	22.00	-6	19.50	10
-8	5	No calculation at this stage										
	6	13	21.50	-1	18.50	17	-2	6	22.00	-7	20.50	9
-9	7	1	17.63	-134	22.36	2	-181	54	20.50	-61	25.75	72
-83	8	2	17.63	-132	22.36	2	-179	54	20.50	-61	25.75	72
-82	9	No calculation at this stage										
	10	No calculation at this stage										
	11	2	17.63	-129	22.65	2	-175	52	20.50	-56	26.10	70
-75	12	2	18.00	-104	22.95	3	-140	42	20.50	-46	26.10	56
-62	13	No calculation at this stage										
	14	No calculation at this stage										
	15	15	19.00	-128	22.95	20	-172	55	20.77	-58	26.10	74
-78												

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.000	26.75	-0.001	26.75	Excav. to elev. 26.32 on LEFT side
2	0.000	17.25	-0.001	26.75	Apply surcharge no.1 at elev. 26.32
3	0.000	20.00	-0.001	26.75	Apply surcharge no.2 at elev. 23.25
4	0.005	26.75	0.000	26.75	Excav. to elev. 25.25 on RIGHT side
5	No calculation at this stage				Install strut no.1 at elev. 25.75
6	0.005	26.75	0.000	26.75	Apply water pressure profile no.1
7	0.009	22.36	0.000	26.75	Excav. to elev. 21.04 on RIGHT side
8	0.009	22.36	0.000	26.75	Fill to elev. 21.64 on RIGHT side
9	No calculation at this stage				Install strut no.2 at elev. 22.06
10	No calculation at this stage				Install strut no.3 at elev. 26.10
11	0.009	22.36	0.000	26.75	Remove strut no.1 at elev. 25.75
12	0.009	22.65	0.000	26.75	Change EI of wall to 98960kN.m ² /m run
13	No calculation at this stage				Change soil type 3 to soil type 4
14	No calculation at this stage				Apply surcharge no.3 at elev. 21.64
15	0.009	22.95	0.000	26.75	Apply water pressure profile no.2

Summary of results (continued)

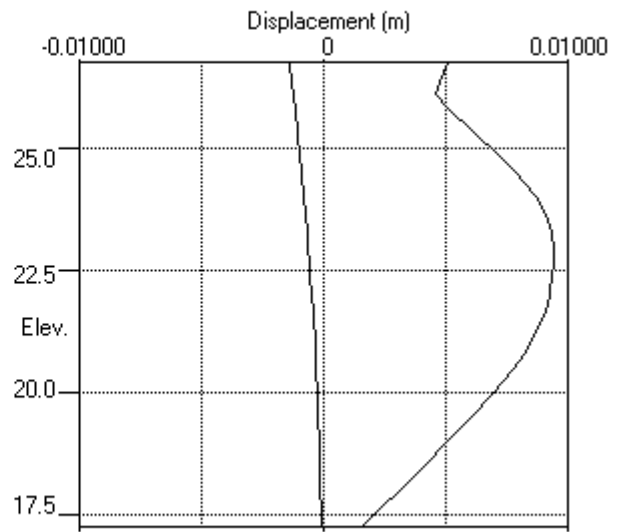
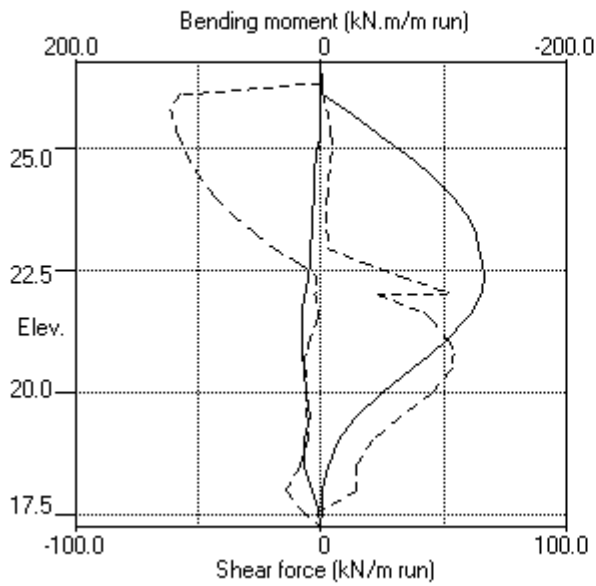
Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Strut forces at each stage (horizontal components)

Stage no.	----- Strut no. 1 ----- at elev. 25.75			----- Strut no. 2 ----- at elev. 22.06			----- Strut no. 3 ----- at elev. 26.10		
	--Calculated-- kN per m run	Factored kN per strut	Factored kN per strut	--Calculated-- kN per m run	Factored kN per strut	Factored kN per strut	--Calculated-- kN per m run	Factored kN per strut	Factored kN per strut
6	0	1	2	---	---	---	---	---	---
7	64	318	429	---	---	---	---	---	---
8	63	316	427	---	---	---	---	---	---
11	---	---	---	9	9	12	56	56	76
12	---	---	---	29	29	39	46	46	63
15	---	---	---	32	32	44	58	58	79

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

2-ULS1

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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	26.75	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES (Unfactored SLS soil strengths)

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

Initial water table elevation Left side Right side
 21.50 21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
	2	1	25.32	25.32	0.0	1	21.64	21.64
2						21.64	25.75	40.3

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 17.25
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	26.32	1.65(L)	20.00	20.00	10.00	=	N/A	1.10 Var
2	23.25	0.40(L)	20.00	1.25	24.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	41.00	=	N/A	1.00 P/F

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	Excavate to elevation 26.32 on LEFT side
2	Apply surcharge no.1 at elevation 26.32
3	Apply surcharge no.2 at elevation 23.25
4	Excavate to elevation 25.25 on RIGHT side
5	Install strut or anchor no.1 at elevation 25.75
6	Apply water pressure profile no.1 (Mod. Conserv.)
7	Excavate to elevation 20.56 on RIGHT side
8	Fill to elevation 21.64 on RIGHT side with soil type 1
9	Install strut or anchor no.2 at elevation 22.06
10	Install strut or anchor no.3 at elevation 26.10
11	Remove strut or anchor no.1 at elevation 25.75
12	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
13	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
14	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
15	Apply water pressure profile no.2 (Mod. Conserv.)

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 1

Water pressures : Moderately Conservative

Partial factor on C' = 1.000

Partial factor on Phi' = 1.000

Partial factor on Cu = 1.000

Partial factor on Soil Modulus = 1.000

Partial factor on Permanent Unfavourable loads = 1.000

Partial factor on Permanent Favourable loads = 1.000

Partial factor on Variable Unfavourable loads = 1.100

Design factor on calculated Bending Moments = 1.350

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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m

Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m

Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Excav. to elev. 26.32 on LEFT side	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 26.32	Yes	Yes	Yes
3	Apply surcharge no.2 at elev. 23.25	No	No	No
4	Excav. to elev. 25.25 on RIGHT side	Yes	Yes	Yes
5	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
6	Apply water pressure profile no.1	Yes	Yes	Yes
7	Excav. to elev. 20.56 on RIGHT side	Yes	Yes	Yes
8	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
9	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
10	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
11	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
12	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
13	Change soil type 3 to soil type 4	Yes	Yes	Yes
14	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
15	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Excavate to elevation 26.32 on LEFT side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	-0.001	-2.03E-04	0.0	0.0		138544
2	26.32	-2.82	-0.001	-2.02E-04	-0.6	-0.1		138544
3	26.10	0.64	-0.001	-2.02E-04	-0.8	-0.3		138544
4	25.75	0.46	-0.001	-2.01E-04	-0.7	-0.6		138544
5	25.32	0.23	-0.001	-1.99E-04	-0.5	-0.8		138544
6	25.25	0.20	-0.001	-1.98E-04	-0.5	-0.9		138544
7	24.88	0.00	-0.001	-1.96E-04	-0.5	-1.0		138544
8	24.50	-0.18	-0.001	-1.93E-04	-0.5	-1.2		138544
9	24.00	-0.43	-0.001	-1.88E-04	-0.6	-1.5		138544
10	23.63	-0.61	-0.001	-1.83E-04	-0.8	-1.7		138544
11	23.25	-0.79	-0.001	-1.78E-04	-1.1	-2.1		138544
12	22.95	-0.92	-0.001	-1.73E-04	-1.4	-2.5		138544
13	22.65	-1.06	-0.001	-1.68E-04	-1.7	-2.9		138544
14	22.36	-1.18	-0.001	-1.61E-04	-2.0	-3.4		138544
15	22.06	-1.30	-0.000	-1.53E-04	-2.4	-4.1		138544
16	22.00	-1.33	-0.000	-1.51E-04	-2.4	-4.2		138544
		3.68	-0.000	-1.51E-04	-2.4	-4.2		
17	21.64	3.00	-0.000	-1.39E-04	-1.2	-4.9		138544
18	21.50	2.75	-0.000	-1.34E-04	-0.8	-5.0		138544
19	21.03	1.98	-0.000	-1.17E-04	0.3	-5.1		138544
20	20.56	1.32	-0.000	-1.00E-04	1.1	-4.7		138544
21	20.50	1.24	-0.000	-9.88E-05	1.1	-4.7		138544
22	20.00	0.66	-0.000	-8.33E-05	1.6	-3.9		138544
23	19.50	0.16	-0.000	-7.06E-05	1.8	-3.1		138544
24	19.00	-0.27	-0.000	-6.13E-05	1.8	-2.1		138544
25	18.50	-0.64	-0.000	-5.52E-05	1.6	-1.3		138544
26	18.00	-0.99	-0.000	-5.19E-05	1.2	-0.6		138544
		-0.64	-0.000	-5.19E-05	1.2	-0.6		
27	17.63	-1.53	-0.000	-5.09E-05	0.8	-0.2		138544
28	17.25	-2.47	-0.000	-5.06E-05	-0.0	-0.0		---

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical limit kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.32	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	1313	
3	26.10	0.00	3.96	1.39	12.88	5.80	1313	
4	25.75	0.00	10.26	3.60	33.37	9.35	1313	

(continued)

Stage No.1 Excavate to elevation 26.32 on LEFT side

Node no.	Y coord	----- LEFT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
5	25.32	0.00	18.00	6.32	58.55	13.70	1313	
6	25.25	0.00	19.26	6.77	62.65	14.41	1313	
7	24.88	0.00	26.01	9.14	84.60	18.20	1313	
8	24.50	0.00	32.76	11.51	106.56	22.00	1313	
9	24.00	0.00	41.76	14.67	135.84	27.07	1313	
10	23.63	0.00	48.51	17.04	157.79	30.87	1313	
11	23.25	0.00	55.26	19.41	179.75	34.68	1313	
12	22.95	0.00	60.62	21.29	197.17	37.70	1313	
13	22.65	0.00	65.97	23.17	214.59	40.72	1313	
14	22.36	0.00	71.33	25.05	232.01	43.75	1313	
15	22.06	0.00	76.68	26.94	249.43	46.78	1313	
16	22.00	0.00	77.76	27.32	252.94	47.39	1313	
		0.00	77.76	22.03	339.77	43.35	6567	
17	21.64	0.00	84.96	24.07	371.23	46.60	6567	
18	21.50	0.00	87.76	24.87	383.47	47.88	6567	
19	21.03	4.61	92.55	26.22	404.40	49.88	6567	
20	20.56	9.22	97.34	27.58	425.33	51.94	6567	
21	20.50	9.81	97.96	27.75	428.00	52.21	6567	
22	20.00	14.71	103.05	29.20	450.27	54.45	6567	
23	19.50	19.62	108.15	30.64	472.54	56.75	6567	
24	19.00	24.52	113.25	32.09	494.81	59.08	6567	
25	18.50	29.43	118.34	33.53	517.08	61.44	6567	
26	18.00	34.34	123.44	34.98	539.35	63.81	6567	
		Total>	157.77	41.60m	396.80	200.86	27977	
27	17.63	Total>	165.28	43.48m	411.47	209.06	28816	
28	17.25	Total>	172.78	45.35m	426.14	217.23	29656	

Node no.	Y coord	----- RIGHT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	1276	
2	26.32	0.00	7.74	2.72	25.18	2.82	1276	
3	26.10	0.00	11.70	4.11	38.06	5.17	1276	
4	25.75	0.00	18.00	6.32	58.55	8.89	1276	
5	25.32	0.00	25.74	9.04	83.73	13.47	1276	
6	25.25	0.00	27.00	9.48	87.82	14.21	1276	
7	24.88	0.00	33.75	11.86	109.78	18.20	1276	
8	24.50	0.00	40.50	14.23	131.74	22.19	1276	
9	24.00	0.00	49.50	17.39	161.01	27.50	1276	
10	23.63	0.00	56.25	19.76	182.97	31.49	1276	
11	23.25	0.00	63.00	22.13	204.92	35.47	1276	
12	22.95	0.00	68.35	24.01	222.34	38.63	1276	
13	22.65	0.00	73.71	25.89	239.76	41.78	1276	
14	22.36	0.00	79.06	27.77	257.18	44.93	1276	
15	22.06	0.00	84.42	29.65	274.60	48.08	1276	
16	22.00	0.00	85.50	30.03	278.11	48.72	1276	
		0.00	85.50	24.23	373.58	39.67	6380	
17	21.64	0.00	92.70	26.27	405.04	43.60	6380	
18	21.50	0.00	95.50	27.06	417.28	45.12	6380	
19	21.03	4.61	100.29	28.42	438.20	47.90	6380	
20	20.56	9.22	105.08	29.77	459.13	50.62	6380	
21	20.50	9.81	105.69	29.95	461.80	50.96	6380	

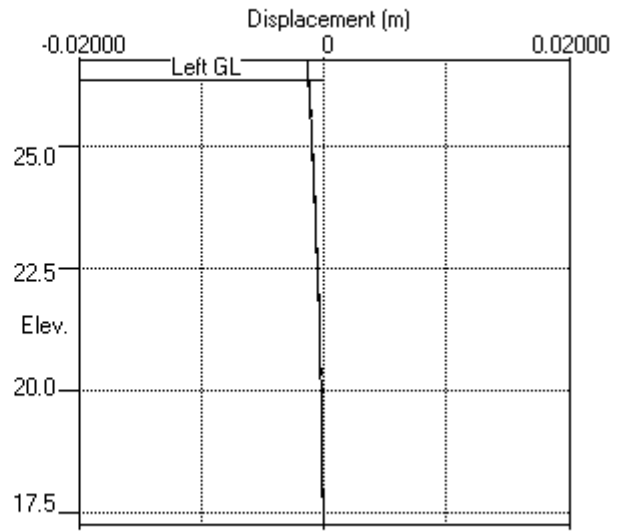
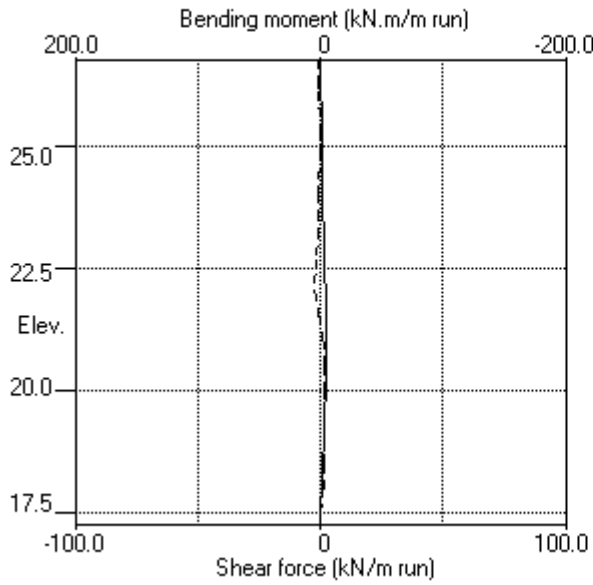
(continued)

Stage No.1 Excavate to elevation 26.32 on LEFT side

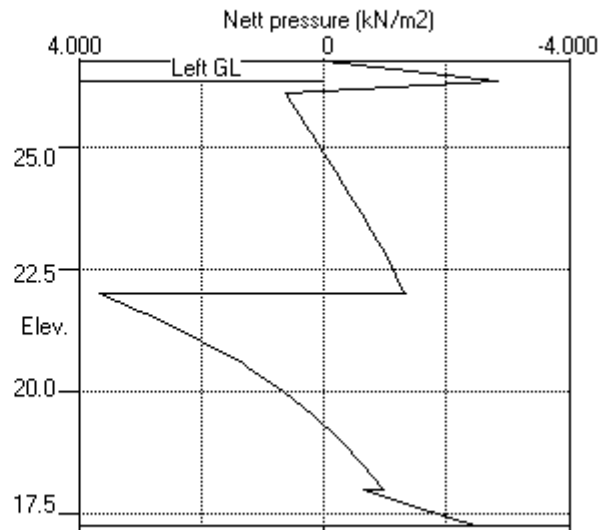
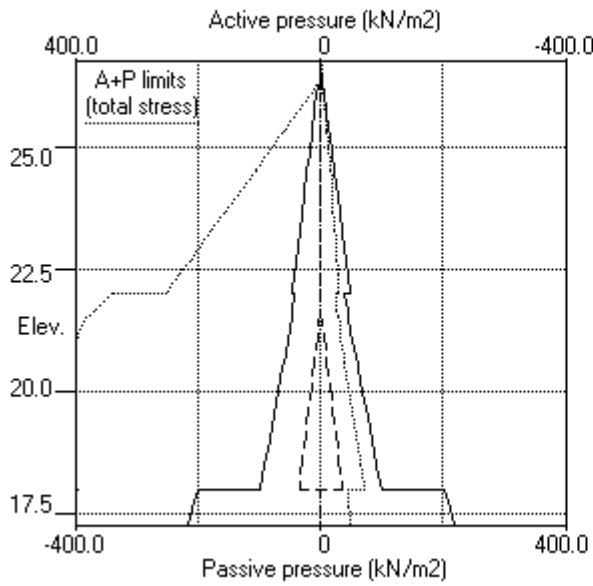
Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertical	Active limit	Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
22	20.00	14.71	110.79	31.39	484.06	53.80	68.51	6380
23	19.50	19.62	115.88	32.83	506.32	56.59	76.21	6380
24	19.00	24.52	120.98	34.28	528.58	59.35	83.87	6380
25	18.50	29.43	126.07	35.72	550.85	62.08	91.51	6380
26	18.00	34.34	131.17	37.16	573.11	64.80	99.13	6380
		Total>	165.50	43.75m	404.53	201.50	201.50	27257
27	17.63	Total>	173.00	45.63m	419.20	210.59	210.59	28074
28	17.25	Total>	180.50	47.50m	433.87	219.70	219.70	28892

Units: kN,m

Stage No.1 Excav. to elev. 26.32 on LEFT side



Stage No.1 Excav. to elev. 26.32 on LEFT side



PILEDESIGNS LTD
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 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 2 Apply surcharge no.1 at elevation 26.32

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	-0.001	-2.02E-04	0.0	0.0		138544
2	26.32	-3.16	-0.001	-2.02E-04	-0.7	-0.1		138544
3	26.10	-0.05	-0.001	-2.02E-04	-1.0	-0.3		138544
4	25.75	-0.18	-0.001	-2.00E-04	-1.1	-0.7		138544
5	25.32	-0.22	-0.001	-1.97E-04	-1.2	-1.2		138544
6	25.25	-0.22	-0.001	-1.97E-04	-1.2	-1.3		138544
7	24.88	-0.16	-0.001	-1.93E-04	-1.2	-1.7		138544
8	24.50	-0.09	-0.001	-1.87E-04	-1.3	-2.2		138544
9	24.00	-0.00	-0.000	-1.78E-04	-1.3	-2.8		138544
10	23.63	0.04	-0.000	-1.70E-04	-1.3	-3.3		138544
11	23.25	0.06	-0.000	-1.60E-04	-1.3	-3.8		138544
12	22.95	0.06	-0.000	-1.52E-04	-1.3	-4.2		138544
13	22.65	0.05	-0.000	-1.42E-04	-1.3	-4.6		138544
14	22.36	0.04	-0.000	-1.32E-04	-1.2	-4.9		138544
15	22.06	0.02	-0.000	-1.21E-04	-1.2	-5.3		138544
16	22.00	0.01	-0.000	-1.19E-04	-1.2	-5.4		138544
		2.59	-0.000	-1.19E-04	-1.2	-5.4		
17	21.64	2.10	-0.000	-1.05E-04	-0.4	-5.7		138544
18	21.50	1.92	-0.000	-9.93E-05	-0.1	-5.7		138544
19	21.03	1.38	-0.000	-8.03E-05	0.7	-5.5		138544
20	20.56	0.93	0.000	-6.23E-05	1.2	-5.1		138544
21	20.50	0.88	0.000	-6.02E-05	1.3	-5.0		138544
22	20.00	0.50	0.000	-4.35E-05	1.6	-4.2		138544
23	19.50	0.21	0.000	-2.98E-05	1.8	-3.4		138544
24	19.00	-0.02	0.000	-1.92E-05	1.8	-2.5		138544
25	18.50	-0.20	0.000	-1.20E-05	1.8	-1.5		138544
26	18.00	-0.36	0.000	-8.02E-06	1.6	-0.7		138544
		-1.69	0.000	-8.02E-06	1.6	-0.7		
27	17.63	-2.17	0.000	-6.85E-06	0.9	-0.2		138544
28	17.25	-2.68	0.000	-6.59E-06	-0.0	-0.0		---

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical limit kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.32	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	854	
3	26.10	0.00	3.97	1.39	12.92	5.46	854	
4	25.75	0.00	10.43	3.66	33.92	9.05	854	

(continued)

Stage No.2 Apply surcharge no.1 at elevation 26.32

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
5	25.32	0.00	18.71	6.57	60.85	13.59	854	
6	25.25	0.00	20.09	7.06	65.34	14.34	854	
7	24.88	0.00	27.56	9.68	89.66	18.38	854	
8	24.50	0.00	35.09	12.33	114.15	22.44	854	
9	24.00	0.00	45.08	15.83	146.62	27.83	854	
10	23.63	0.00	52.47	18.43	170.68	31.86	854	
11	23.25	0.00	59.78	21.00	194.45	35.85	854	
12	22.95	0.00	65.52	23.02	213.12	39.01	854	
13	22.65	0.00	71.21	25.02	231.64	42.15	854	
14	22.36	0.00	76.86	27.00	250.02	45.28	854	
15	22.06	0.00	82.47	28.97	268.27	48.40	854	
16	22.00	0.00	83.60	29.37	271.94	49.03	854	
		0.00	83.60	23.69	365.29	43.76	4268	
17	21.64	0.00	91.06	25.80	397.87	47.15	4268	
18	21.50	0.00	93.95	26.62	410.49	48.47	4268	
19	21.03	4.61	98.99	28.05	432.51	50.64	4268	
20	20.56	9.22	103.97	29.46	454.28	52.83	4268	
21	20.50	9.81	104.60	29.64	457.04	53.12	4268	
22	20.00	14.71	109.84	31.12	479.94	55.50	4268	
23	19.50	19.62	115.04	32.59	502.64	57.91	4268	
24	19.00	24.52	120.20	34.06	525.18	60.36	4268	
25	18.50	29.43	125.32	35.51	547.57	62.81	4268	
26	18.00	34.34	130.42	36.95	569.85	65.28	4268	
		Total>	164.76	41.60m	403.78	203.66	19381	
27	17.63	Total>	172.24	43.48m	418.44	212.06	19963	
28	17.25	Total>	179.72	45.35m	433.09	220.43	20544	

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	837	
2	26.32	0.00	7.74	2.72	25.18	3.16	837	
3	26.10	0.00	11.70	4.11	38.06	5.51	837	
4	25.75	0.00	18.00	6.32	58.55	9.23	837	
5	25.32	0.00	25.74	9.04	83.73	13.81	837	
6	25.25	0.00	27.00	9.48	87.82	14.55	837	
7	24.88	0.00	33.75	11.86	109.78	18.54	837	
8	24.50	0.00	40.50	14.23	131.74	22.53	837	
9	24.00	0.00	49.50	17.39	161.01	27.84	837	
10	23.63	0.00	56.25	19.76	182.97	31.82	837	
11	23.25	0.00	63.00	22.13	204.92	35.80	837	
12	22.95	0.00	68.35	24.01	222.34	38.95	837	
13	22.65	0.00	73.71	25.89	239.76	42.10	837	
14	22.36	0.00	79.06	27.77	257.18	45.24	837	
15	22.06	0.00	84.42	29.65	274.60	48.38	837	
16	22.00	0.00	85.50	30.03	278.11	49.02	837	
		0.00	85.50	24.23	373.58	41.17	4184	
17	21.64	0.00	92.70	26.27	405.04	45.05	4184	
18	21.50	0.00	95.50	27.06	417.28	46.56	4184	
19	21.03	4.61	100.29	28.42	438.20	49.26	4184	
20	20.56	9.22	105.08	29.77	459.13	51.91	4184	
21	20.50	9.81	105.69	29.95	461.80	52.24	4184	

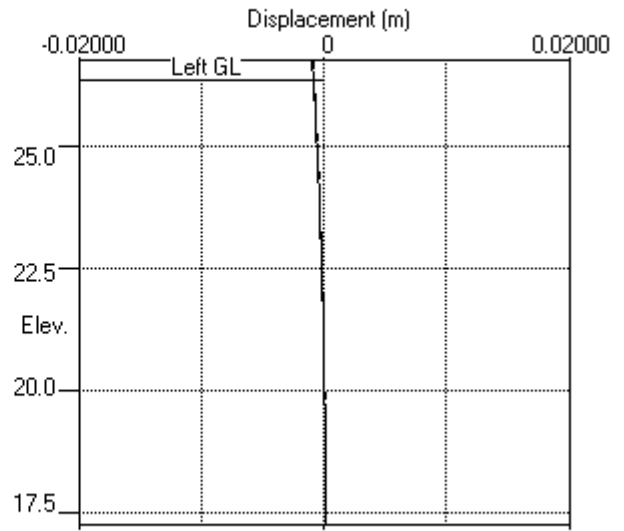
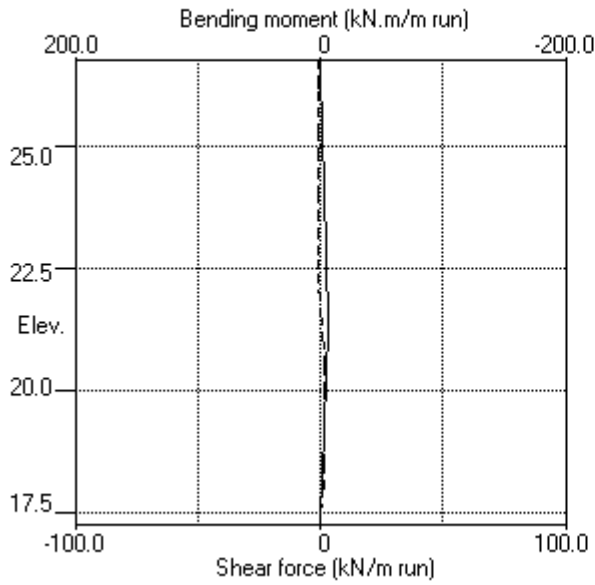
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Stage No.2 Apply surcharge no.1 at elevation 26.32

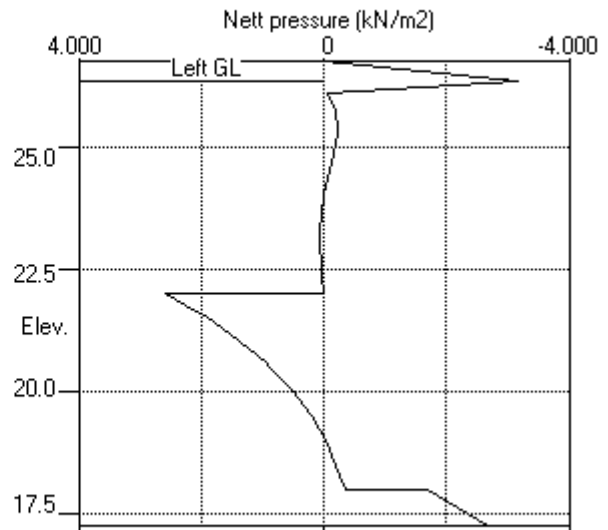
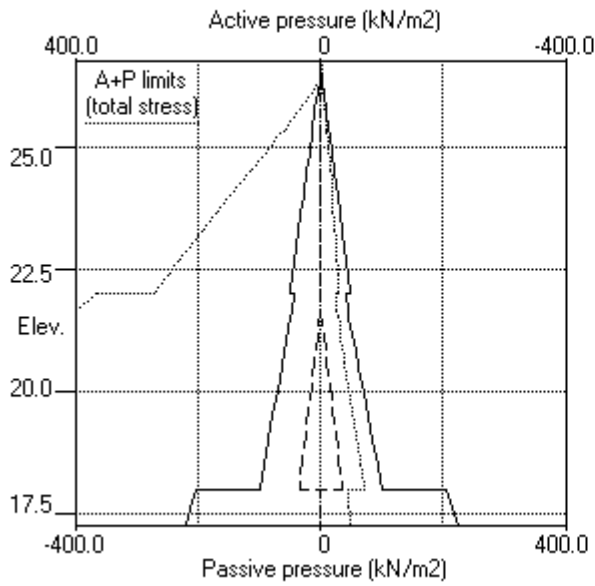
Node no.	Y coord	----- RIGHT side -----						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
22	20.00	14.71	110.79	31.39	484.06	54.99	69.71	4184
23	19.50	19.62	115.88	32.83	506.32	57.70	77.32	4184
24	19.00	24.52	120.98	34.28	528.58	60.37	84.90	4184
25	18.50	29.43	126.07	35.72	550.85	63.02	92.45	4184
26	18.00	34.34	131.17	37.16	573.11	65.64	99.98	4184
		Total>	165.50	43.75m	404.53	205.35	205.35	19091
27	17.63	Total>	173.00	45.63m	419.20	214.23	214.23	19664
28	17.25	Total>	180.50	47.50m	433.87	223.11	223.11	20237

Units: kN,m

Stage No.2 Apply surcharge no.1 at elev. 26.32



Stage No.2 Apply surcharge no.1 at elev. 26.32



PILEDESIGNS LTD
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 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 3 Apply surcharge no.2 at elevation 23.25

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	-0.001	-2.51E-04	0.0	-0.0		138544
2	26.32	-3.39	-0.001	-2.51E-04	-0.7	-0.1		138544
3	26.10	-0.52	-0.001	-2.50E-04	-1.2	-0.4		138544
4	25.75	-0.68	-0.000	-2.49E-04	-1.4	-0.8		138544
5	25.32	-0.76	-0.000	-2.45E-04	-1.7	-1.4		138544
6	25.25	-0.76	-0.000	-2.45E-04	-1.7	-1.6		138544
7	24.88	-0.74	-0.000	-2.39E-04	-2.0	-2.3		138544
8	24.50	-0.69	-0.000	-2.32E-04	-2.3	-3.1		138544
9	24.00	-0.64	-0.000	-2.19E-04	-2.6	-4.3		138544
10	23.63	-0.62	0.000	-2.06E-04	-2.8	-5.3		138544
11	23.25	-0.62	0.000	-1.90E-04	-3.1	-6.4		138544
12	22.95	0.16	0.000	-1.75E-04	-3.2	-7.3		138544
13	22.65	1.84	0.000	-1.59E-04	-2.9	-8.2		138544
14	22.36	2.89	0.000	-1.40E-04	-2.2	-9.0		138544
15	22.06	3.35	0.000	-1.20E-04	-1.2	-9.5		138544
16	22.00	3.39	0.000	-1.16E-04	-1.0	-9.6		138544
		3.12	0.000	-1.16E-04	-1.0	-9.6		
17	21.64	2.73	0.000	-9.16E-05	0.0	-9.7		138544
18	21.50	2.54	0.000	-8.18E-05	0.4	-9.7		138544
19	21.03	1.85	0.000	-4.98E-05	1.4	-9.2		138544
20	20.56	1.22	0.000	-1.99E-05	2.2	-8.4		138544
21	20.50	1.15	0.000	-1.63E-05	2.2	-8.2		138544
22	20.00	0.65	0.000	1.10E-05	2.7	-7.0		138544
23	19.50	0.30	0.000	3.37E-05	2.9	-5.6		138544
24	19.00	0.08	0.000	5.11E-05	3.0	-4.1		138544
25	18.50	-0.03	0.000	6.32E-05	3.0	-2.6		138544
26	18.00	-0.07	0.000	6.99E-05	3.0	-1.1		138544
		-4.04	0.000	6.99E-05	3.0	-1.1		
27	17.63	-4.01	0.000	7.17E-05	1.5	-0.3		138544
28	17.25	-3.90	0.000	7.21E-05	0.0	-0.0		---

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical limit kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.32	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	844	
3	26.10	0.00	3.97	1.39	12.92	5.22	844	
4	25.75	0.00	10.43	3.66	33.92	8.80	844	

(continued)

Stage No.3 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
5	25.32	0.00	18.71	6.57	60.85	13.32	13.32	844
6	25.25	0.00	20.09	7.06	65.34	14.06	14.06	844
7	24.88	0.00	27.56	9.68	89.66	18.09	18.09	844
8	24.50	0.00	35.09	12.33	114.15	22.13	22.13	844
9	24.00	0.00	45.08	15.83	146.62	27.51	27.51	844
10	23.63	0.00	52.47	18.43	170.68	31.52	31.52	844
11	23.25	0.00	59.78	21.00	194.45	35.51	35.51	844
12	22.95	0.00	67.92	23.86	220.92	39.46	39.46	844
13	22.65	0.00	78.68	27.64	255.94	44.28	44.28	844
14	22.36	0.00	87.54	30.75	284.75	48.48	48.48	844
15	22.06	0.00	94.61	33.23	307.73	52.08	52.08	844
16	22.00	0.00	95.88	33.68	311.88	52.76	52.76	844
		0.00	95.88	27.17	418.94	46.05	46.05	4222
17	21.64	0.00	103.58	29.35	452.59	49.54	49.54	4222
18	21.50	0.00	106.36	30.14	464.74	50.84	50.84	4222
19	21.03	4.61	110.66	31.36	483.53	52.80	57.41	4222
20	20.56	9.22	114.68	32.49	501.09	54.75	63.97	4222
21	20.50	9.81	115.19	32.64	503.31	55.00	64.81	4222
22	20.00	14.71	119.42	33.84	521.80	57.15	71.87	4222
23	19.50	19.62	123.71	35.05	540.53	59.39	79.01	4222
24	19.00	24.52	128.07	36.29	559.57	61.71	86.23	4222
25	18.50	29.43	132.50	37.54	578.93	64.09	93.52	4222
26	18.00	34.34	136.99	38.81	598.55	66.51	100.85	4222
		Total>	171.32	41.60m	410.35	205.61	205.61	19223
27	17.63	Total>	178.41	43.48m	424.60	214.07	214.07	19799
28	17.25	Total>	185.51	45.35m	438.88	222.58	222.58	20376

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	829
2	26.32	0.00	7.74	2.72	25.18	3.39	3.39	829
3	26.10	0.00	11.70	4.11	38.06	5.74	5.74	829
4	25.75	0.00	18.00	6.32	58.55	9.48	9.48	829
5	25.32	0.00	25.74	9.04	83.73	14.07	14.07	829
6	25.25	0.00	27.00	9.48	87.82	14.82	14.82	829
7	24.88	0.00	33.75	11.86	109.78	18.82	18.82	829
8	24.50	0.00	40.50	14.23	131.74	22.82	22.82	829
9	24.00	0.00	49.50	17.39	161.01	28.15	28.15	829
10	23.63	0.00	56.25	19.76	182.97	32.15	32.15	829
11	23.25	0.00	63.00	22.13	204.92	36.13	36.13	829
12	22.95	0.00	68.35	24.01	222.34	39.29	39.29	829
13	22.65	0.00	73.71	25.89	239.76	42.45	42.45	829
14	22.36	0.00	79.06	27.77	257.18	45.59	45.59	829
15	22.06	0.00	84.42	29.65	274.60	48.74	48.74	829
16	22.00	0.00	85.50	30.03	278.11	49.37	49.37	829
		0.00	85.50	24.23	373.58	42.93	42.93	4143
17	21.64	0.00	92.70	26.27	405.04	46.81	46.81	4143
18	21.50	0.00	95.50	27.06	417.28	48.30	48.30	4143
19	21.03	4.61	100.29	28.42	438.20	50.95	55.56	4143
20	20.56	9.22	105.08	29.77	459.13	53.53	62.75	4143
21	20.50	9.81	105.69	29.95	461.80	53.85	63.66	4143

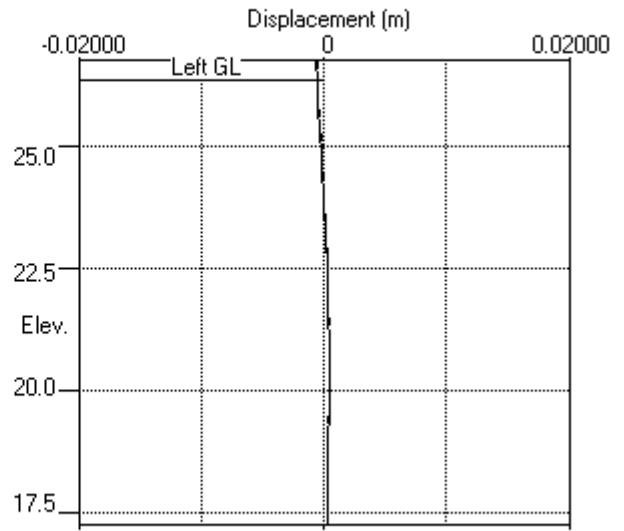
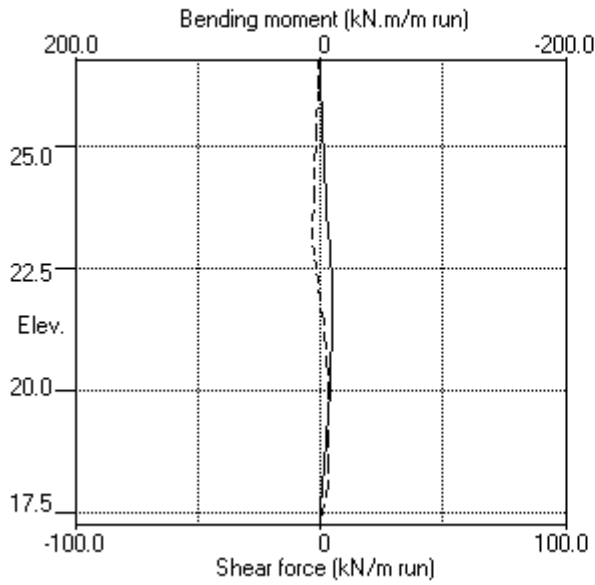
(continued)

Stage No.3 Apply surcharge no.2 at elevation 23.25

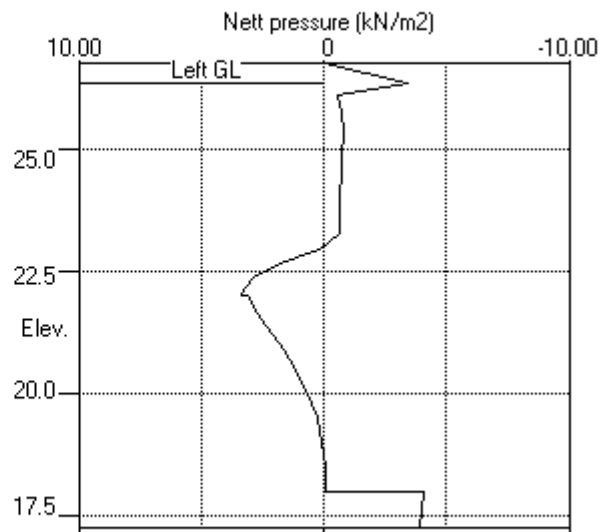
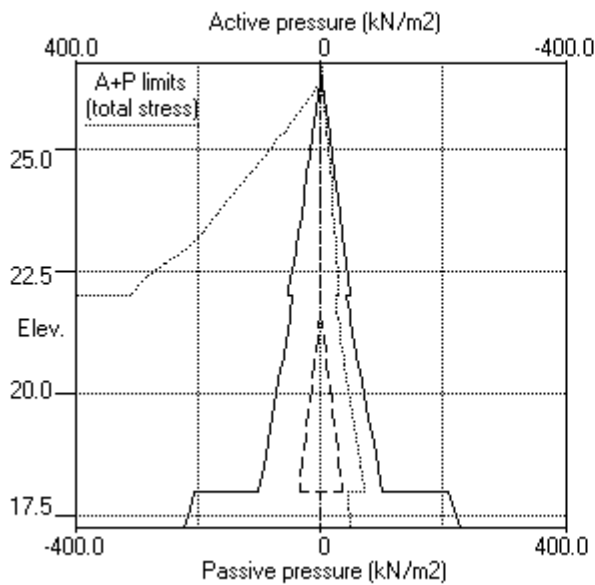
Node no.	Y coord	----- RIGHT side -----						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
22	20.00	14.71	110.79	31.39	484.06	56.51	71.22	4143
23	19.50	19.62	115.88	32.83	506.32	59.09	78.71	4143
24	19.00	24.52	120.98	34.28	528.58	61.62	86.15	4143
25	18.50	29.43	126.07	35.72	550.85	64.11	93.54	4143
26	18.00	34.34	131.17	37.16	573.11	66.58	100.92	4143
		Total>	165.50	43.75m	404.53	209.65	209.65	18948
27	17.63	Total>	173.00	45.63m	419.20	218.08	218.08	19517
28	17.25	Total>	180.50	47.50m	433.87	226.48	226.48	20085

Units: kN,m

Stage No.3 Apply surcharge no.2 at elev. 23.25



Stage No.3 Apply surcharge no.2 at elev. 23.25



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 25.25 on RIGHT side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.005	6.99E-04	0.0	0.0		138544
2	26.32	0.00	0.005	6.99E-04	0.0	-0.0		138544
3	26.10	1.39	0.005	6.99E-04	0.2	-0.0		138544
4	25.75	3.66	0.004	6.99E-04	1.0	0.2		138544
5	25.32	7.04	0.004	6.96E-04	3.3	1.3		138544
6	25.25	7.88	0.004	6.96E-04	3.9	1.5		138544
7	24.88	-3.64	0.004	6.89E-04	4.7	3.4		138544
8	24.50	-2.58	0.004	6.78E-04	3.5	4.9		138544
9	24.00	-1.22	0.003	6.58E-04	2.5	6.3		138544
10	23.63	-0.25	0.003	6.40E-04	2.3	7.2		138544
11	23.25	0.66	0.003	6.19E-04	2.3	8.0		138544
12	22.95	2.14	0.003	6.01E-04	2.8	8.8		138544
13	22.65	4.48	0.002	5.81E-04	3.8	9.7		138544
14	22.36	6.16	0.002	5.59E-04	5.3	11.0		138544
15	22.06	7.21	0.002	5.33E-04	7.3	12.9		138544
16	22.00	7.37	0.002	5.27E-04	7.8	13.4		138544
		-12.98	0.002	5.27E-04	7.8	13.4		
17	21.64	-10.12	0.002	4.90E-04	3.6	15.3		138544
18	21.50	-9.15	0.002	4.75E-04	2.3	15.7		138544
19	21.03	-6.29	0.002	4.21E-04	-1.4	15.8		138544
20	20.56	-3.95	0.001	3.70E-04	-3.8	14.4		138544
21	20.50	-3.68	0.001	3.64E-04	-4.0	14.2		138544
22	20.00	-1.67	0.001	3.17E-04	-5.3	11.7		138544
23	19.50	-0.00	0.001	2.80E-04	-5.8	8.8		138544
24	19.00	1.42	0.001	2.54E-04	-5.4	5.9		138544
25	18.50	2.68	0.001	2.37E-04	-4.4	3.4		138544
26	18.00	3.85	0.001	2.28E-04	-2.8	1.5		138544
		0.51	0.001	2.28E-04	-2.8	1.5		
27	17.63	3.61	0.001	2.25E-04	-2.0	0.5		138544
28	17.25	6.96	0.000	2.25E-04	0.0	-0.0		---

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical limit kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.0	
2	26.32	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	1403	
3	26.10	0.00	3.97	1.39	12.92	1.39	1403	
4	25.75	0.00	10.43	3.66	33.92	3.66	1403	

(continued)

Stage No.4 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
5	25.32	0.00	18.71	6.57	60.85	7.04	7.04	1403
6	25.25	0.00	20.09	7.06	65.34	7.88	7.88	1403
7	24.88	0.00	27.56	9.68	89.66	12.40	12.40	1403
8	24.50	0.00	35.09	12.33	114.15	16.93	16.93	1403
9	24.00	0.00	45.08	15.83	146.62	22.94	22.94	1403
10	23.63	0.00	52.47	18.43	170.68	27.40	27.40	1403
11	23.25	0.00	59.78	21.00	194.45	31.82	31.82	1403
12	22.95	0.00	67.92	23.86	220.92	36.10	36.10	1403
13	22.65	0.00	78.68	27.64	255.94	41.25	41.25	1403
14	22.36	0.00	87.54	30.75	284.75	45.74	45.74	1403
15	22.06	0.00	94.61	33.23	307.73	49.63	49.63	1403
16	22.00	0.00	95.88	33.68	311.88	50.36	50.36	1403
		0.00	95.88	27.17	418.94	34.06	34.06	7013
17	21.64	0.00	103.58	29.35	452.59	39.10	39.10	7013
18	21.50	0.00	106.36	30.14	464.74	40.96	40.96	7013
19	21.03	4.61	110.66	31.36	483.53	44.61	49.22	7013
20	20.56	9.22	114.68	32.49	501.09	47.98	57.20	7013
21	20.50	9.81	115.19	32.64	503.31	48.40	58.21	7013
22	20.00	14.71	119.42	33.84	521.80	51.75	66.46	7013
23	19.50	19.62	123.71	35.05	540.53	54.95	74.57	7013
24	19.00	24.52	128.07	36.29	559.57	58.05	82.57	7013
25	18.50	29.43	132.50	37.54	578.93	61.09	90.52	7013
26	18.00	34.34	136.99	38.81	598.55	64.09	98.43	7013
		Total>	171.32	41.60m	410.35	195.36	195.36	29694
27	17.63	Total>	178.41	43.48m	424.60	205.30	205.30	30585
28	17.25	Total>	185.51	45.35m	438.88	215.37	215.37	31475

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1533
7	24.88	0.00	6.75	2.37	21.96	16.04	16.04	1533
8	24.50	0.00	13.50	4.74	43.91	19.51	19.51	1533
9	24.00	0.00	22.50	7.90	73.19	24.15	24.15	1533
10	23.63	0.00	29.25	10.27	95.14	27.65	27.65	1533
11	23.25	0.00	36.00	12.65	117.10	31.16	31.16	1533
12	22.95	0.00	41.36	14.53	134.52	33.96	33.96	1533
13	22.65	0.00	46.71	16.41	151.94	36.76	36.76	1533
14	22.36	0.00	52.07	18.29	169.36	39.58	39.58	1533
15	22.06	0.00	57.42	20.17	186.78	42.42	42.42	1533
16	22.00	0.00	58.50	20.55	190.30	42.99	42.99	1533
		0.00	58.50	16.58	255.62	47.04	47.04	7665
17	21.64	0.00	65.70	18.62	287.09	49.22	49.22	7665
18	21.50	0.00	68.50	19.41	299.32	50.10	50.10	7665
19	21.03	4.61	73.30	20.77	320.26	50.90	55.52	7665
20	20.56	9.22	78.09	22.13	341.20	51.93	61.15	7665

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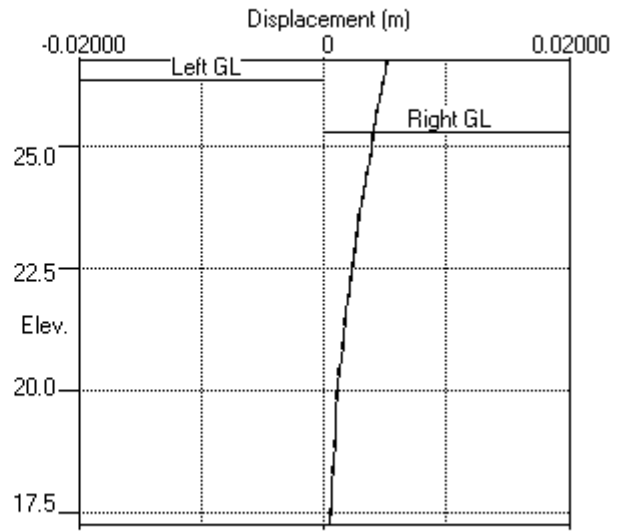
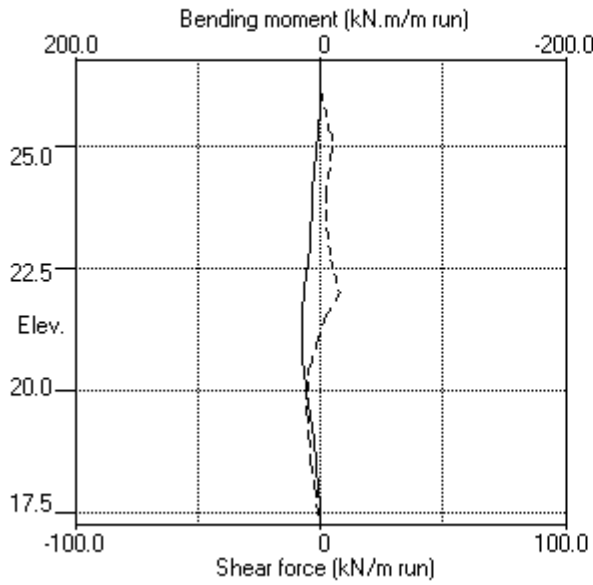
Stage No.4 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
21	20.50	9.81	78.70	22.30	343.87	52.08	61.89	7665
22	20.00	14.71	83.80	23.74	366.15	53.42	68.13	7665
23	19.50	19.62	88.90	25.19	388.42	54.95	74.57	7665
24	19.00	24.52	94.00	26.63	410.71	56.63	81.15	7665
25	18.50	29.43	99.10	28.08	432.99	58.40	87.83	7665
26	18.00	34.34	104.20	29.52	455.28	60.24	94.57	7665
		Total>	138.53	36.25m	377.55	194.86	194.86	32212
27	17.63	Total>	146.04	38.13m	392.23	201.69	201.69	33178
28	17.25	Total>	153.55	40.00m	406.91	208.41	208.41	34144

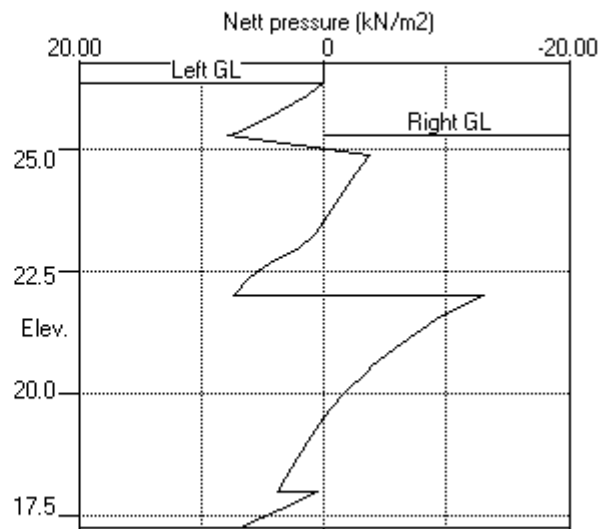
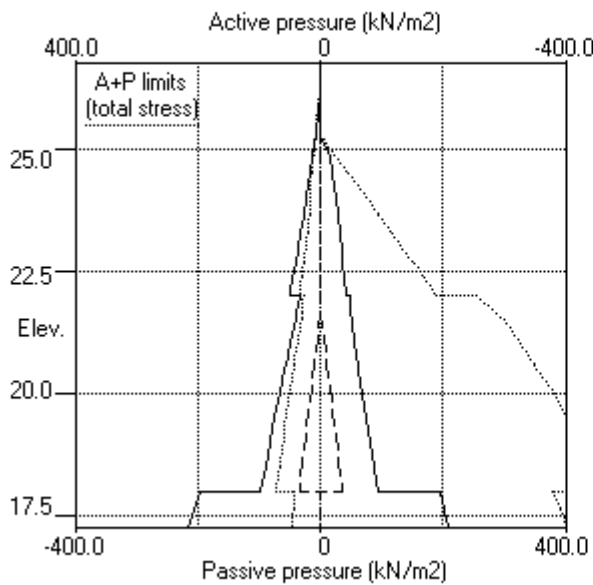
Note: 3.66a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 25.25 on RIGHT side



Stage No.4 Excav. to elev. 25.25 on RIGHT side



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 6 Apply water pressure profile no.1 (Mod. Conserv.)

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.005	6.19E-04	0.0	0.0		138544
2	26.32	0.00	0.005	6.19E-04	0.0	-0.0		138544
3	26.10	1.58	0.005	6.20E-04	0.2	-0.0		138544
4	25.75	3.66	0.004	6.19E-04	1.1	0.2	0.3	138544
		3.66	0.004	6.19E-04	0.8	0.2		
5	25.32	7.01	0.004	6.17E-04	3.1	1.2		138544
6	25.25	7.84	0.004	6.17E-04	3.6	1.4		138544
7	24.88	-3.78	0.004	6.10E-04	4.4	3.2		138544
8	24.50	-2.77	0.004	6.00E-04	3.2	4.6		138544
9	24.00	-1.48	0.003	5.81E-04	2.1	5.8		138544
10	23.63	-0.57	0.003	5.65E-04	1.7	6.5		138544
11	23.25	0.29	0.003	5.46E-04	1.7	7.1		138544
12	22.95	1.73	0.003	5.30E-04	2.0	7.6		138544
13	22.65	4.02	0.003	5.13E-04	2.8	8.3		138544
14	22.36	5.66	0.002	4.94E-04	4.2	9.3		138544
15	22.06	6.68	0.002	4.73E-04	6.1	10.9		138544
16	22.00	6.83	0.002	4.68E-04	6.5	11.2		138544
		-15.67	0.002	4.68E-04	6.5	11.2		
17	21.64	-13.01	0.002	4.37E-04	1.3	12.6		138544
18	21.50	-12.10	0.002	4.24E-04	-0.4	12.6		138544
19	21.03	-6.38	0.002	3.84E-04	-4.8	11.2		138544
20	20.56	-1.09	0.002	3.51E-04	-6.5	8.3		138544
21	20.50	-0.44	0.002	3.47E-04	-6.6	7.9		138544
22	20.00	1.55	0.002	3.25E-04	-6.3	4.6		138544
23	19.50	3.32	0.001	3.13E-04	-5.1	1.6		138544
24	19.00	4.96	0.001	3.11E-04	-3.0	-0.5		138544
25	18.50	6.55	0.001	3.15E-04	-0.1	-1.4		138544
26	18.00	8.13	0.001	3.19E-04	3.5	-0.7		138544
		-9.14	0.001	3.19E-04	3.5	-0.7		
27	17.63	-4.80	0.001	3.20E-04	0.9	0.0		138544
28	17.25	-0.11	0.001	3.20E-04	0.0	-0.0		---
At elev. 25.75		Strut force =		1.4 kN/strut =		0.3 kN/m run		

(continued)

Stage No.6 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.39	12.92	1.58	1.58	7236
4	25.75	0.00	10.43	3.66	33.92	3.66	3.66a	962
5	25.32	0.00	18.71	6.57	60.85	7.01	7.01	962
6	25.25	0.00	20.09	7.06	65.34	7.84	7.84	962
7	24.88	0.00	27.56	9.68	89.66	12.33	12.33	962
8	24.50	0.00	35.09	12.33	114.15	16.83	16.83	962
9	24.00	0.00	45.08	15.83	146.62	22.80	22.80	962
10	23.63	0.00	52.47	18.43	170.68	27.24	27.24	962
11	23.25	0.00	59.78	21.00	194.45	31.64	31.64	962
12	22.95	0.00	67.92	23.86	220.92	35.89	35.89	962
13	22.65	0.00	78.68	27.64	255.94	41.02	41.02	962
14	22.36	0.00	87.54	30.75	284.75	45.50	45.50	962
15	22.06	0.00	94.61	33.23	307.73	49.37	49.37	962
16	22.00	0.00	95.88	33.68	311.88	50.09	50.09	962
		0.00	95.88	27.17	418.94	32.72	32.72	4808
17	21.64	0.00	103.58	29.35	452.59	37.65	37.65	4808
18	21.50	0.00	106.36	30.14	464.74	39.48	39.48	4808
19	21.03	4.61	110.66	31.36	483.53	43.03	47.64	4808
20	20.56	9.22	114.68	32.49	501.09	46.34	55.56	4808
21	20.50	9.81	115.19	32.64	503.31	46.75	56.56	4808
22	20.00	14.71	119.42	33.84	521.80	50.09	64.80	4808
23	19.50	19.62	123.71	35.05	540.53	53.34	72.96	4808
24	19.00	24.52	128.07	36.29	559.57	56.55	81.07	4808
25	18.50	29.43	132.50	37.54	578.93	59.75	89.18	4808
26	18.00	34.34	136.99	38.81	598.55	62.96	97.30	4808
		Total>	171.32	41.60m	410.35	190.35	190.35	21325
27	17.63	Total>	178.41	43.48m	424.60	200.90	200.90	21964
28	17.25	Total>	185.51	45.35m	438.88	211.64	211.64	22604

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	962
7	24.88	0.00	6.75	2.37	21.96	16.11	16.11	962
8	24.50	0.00	13.50	4.74	43.91	19.61	19.61	962
9	24.00	0.00	22.50	7.90	73.19	24.29	24.29	962
10	23.63	0.00	29.25	10.27	95.14	27.81	27.81	962
11	23.25	0.00	36.00	12.65	117.10	31.35	31.35	962
12	22.95	0.00	41.36	14.53	134.52	34.17	34.17	962
13	22.65	0.00	46.71	16.41	151.94	36.99	36.99	962
14	22.36	0.00	52.07	18.29	169.36	39.83	39.83	962
15	22.06	0.00	57.42	20.17	186.78	42.68	42.68	962
16	22.00	0.00	58.50	20.55	190.30	43.26	43.26	962
		0.00	58.50	16.58	255.62	48.39	48.39	4808

(continued)

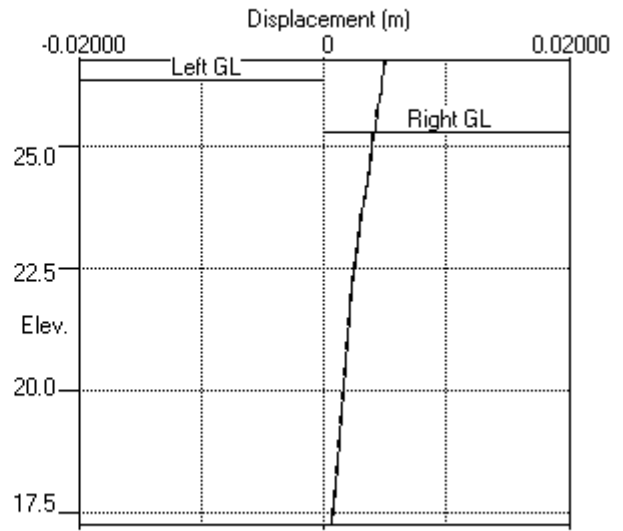
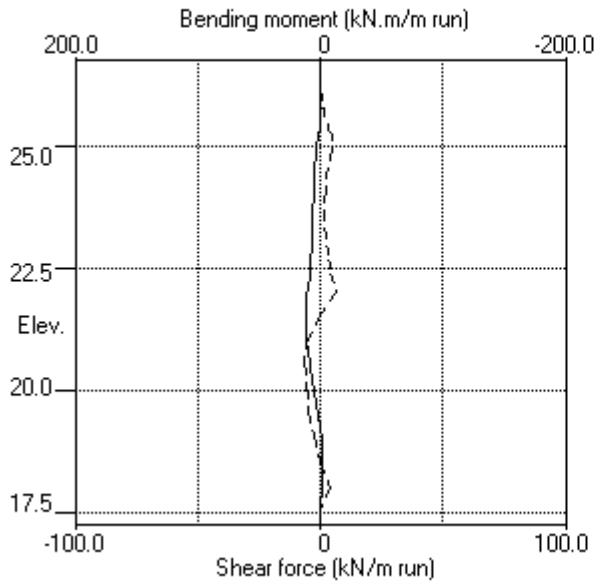
Stage No.6 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
17	21.64	0.00	65.70	18.62	287.09	50.66	50.66	4808
18	21.50	0.00	68.50	19.41	299.32	51.58	51.58	4808
19	21.03	0.00	77.91	22.07	340.40	54.02	54.02	4808
20	20.56	0.00	87.31	24.74	381.49	56.65	56.65	4808
21	20.50	0.00	88.51	25.08	386.73	57.00	57.00	4808
22	20.00	4.90	93.61	26.52	409.01	58.35	63.25	4808
23	19.50	9.81	98.71	27.97	431.29	59.83	69.64	4808
24	19.00	14.71	103.81	29.41	453.57	61.40	76.11	4808
25	18.50	19.62	108.91	30.86	475.86	63.01	82.63	4808
26	18.00	24.52	114.01	32.30	498.15	64.64	89.16	4808
		Total>	138.53	36.25m	377.56	199.49	199.49	21325
27	17.63	Total>	146.04	38.13m	392.23	205.71	205.71	21964
28	17.25	Total>	153.55	40.00m	406.91	211.75	211.75	22604

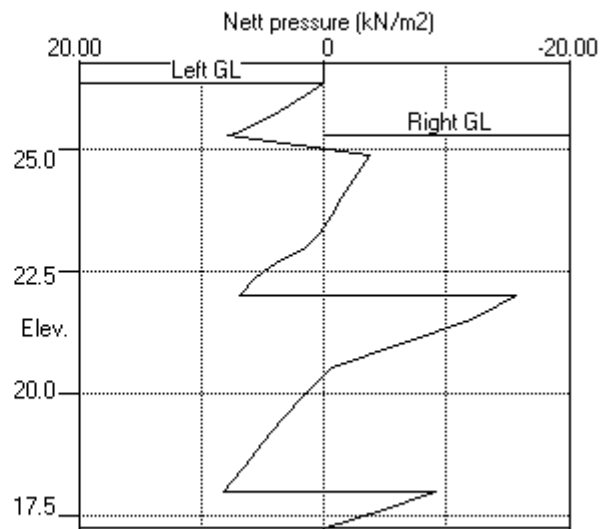
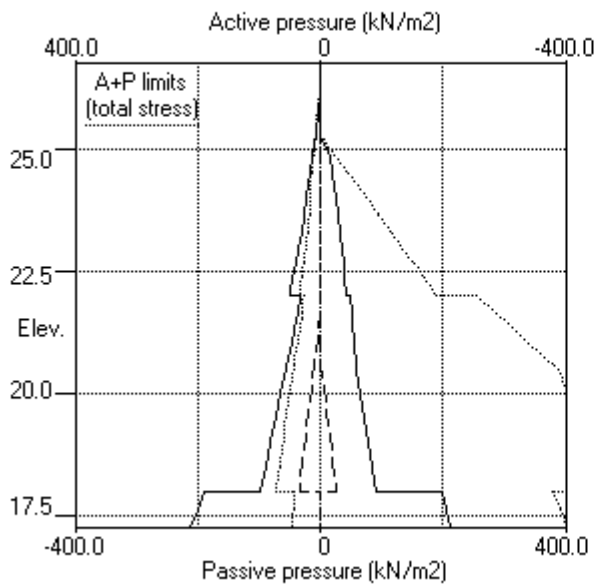
Note: 3.66a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Apply water pressure profile no.1 (Mod. Conserv.)



Stage No.6 Apply water pressure profile no.1 (Mod. Conserv.)



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 20.56 on RIGHT side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.002	-2.98E-03	0.0	0.0		138544
2	26.32	0.00	0.003	-2.98E-03	0.0	-0.0		138544
3	26.10	7.51	0.004	-2.98E-03	0.8	-0.0		138544
4	25.75	3.66	0.005	-2.98E-03	2.8	0.8	75.5	138544
		3.66	0.005	-2.98E-03	-72.7	0.8		
5	25.32	6.57	0.006	-2.93E-03	-70.5	-29.9		138544
6	25.25	7.06	0.007	-2.92E-03	-70.1	-34.8		138544
7	24.88	9.68	0.008	-2.79E-03	-66.9	-60.4		138544
8	24.50	12.33	0.009	-2.59E-03	-62.8	-84.7		138544
9	24.00	16.41	0.010	-2.23E-03	-55.6	-114.2		138544
10	23.63	19.86	0.011	-1.90E-03	-48.8	-133.8		138544
11	23.25	23.41	0.011	-1.51E-03	-40.7	-150.6		138544
12	22.95	27.11	0.012	-1.18E-03	-33.2	-161.6		138544
13	22.65	31.79	0.012	-8.24E-04	-24.4	-170.2		138544
14	22.36	35.93	0.012	-4.52E-04	-14.3	-176.0		138544
15	22.06	39.58	0.012	-7.20E-05	-3.1	-178.6		138544
16	22.00	40.28	0.012	5.31E-06	-0.7	-178.8		138544
		27.17	0.012	5.31E-06	-0.7	-178.8		
17	21.64	29.35	0.012	4.67E-04	9.5	-177.3		138544
18	21.50	30.14	0.012	6.46E-04	13.6	-175.7		138544
19	21.03	35.97	0.012	1.22E-03	29.2	-165.8		138544
20	20.56	41.72	0.011	1.75E-03	47.4	-148.0		138544
21	20.50	37.20	0.011	1.82E-03	49.8	-145.1		138544
22	20.00	16.14	0.010	2.29E-03	63.1	-116.5		138544
23	19.50	-4.91	0.009	2.65E-03	65.9	-83.9		138544
24	19.00	-25.94	0.007	2.90E-03	58.2	-52.5		138544
25	18.50	-26.45	0.006	3.04E-03	45.1	-25.1		138544
26	18.00	-6.51	0.004	3.09E-03	36.9	-4.9		138544
		-111.35	0.004	3.09E-03	36.9	-4.9		
27	17.63	-50.17	0.003	3.10E-03	6.6	1.1		138544
28	17.25	15.01	0.002	3.09E-03	0.0	-0.0		---
At elev. 25.75 Strut force =			377.6 kN/strut =		75.5 kN/m run			

(continued)

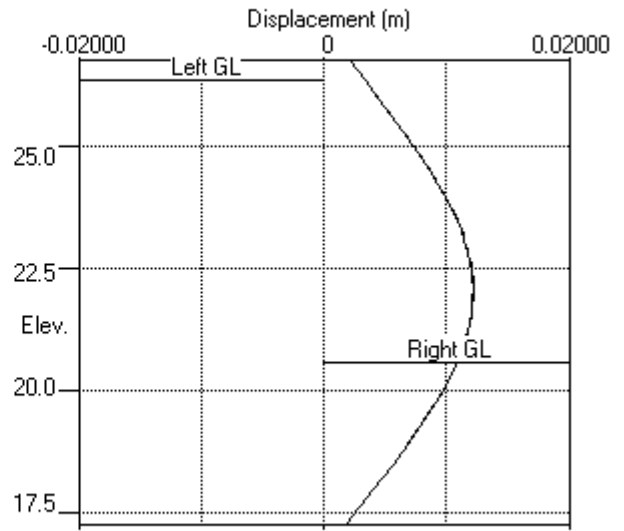
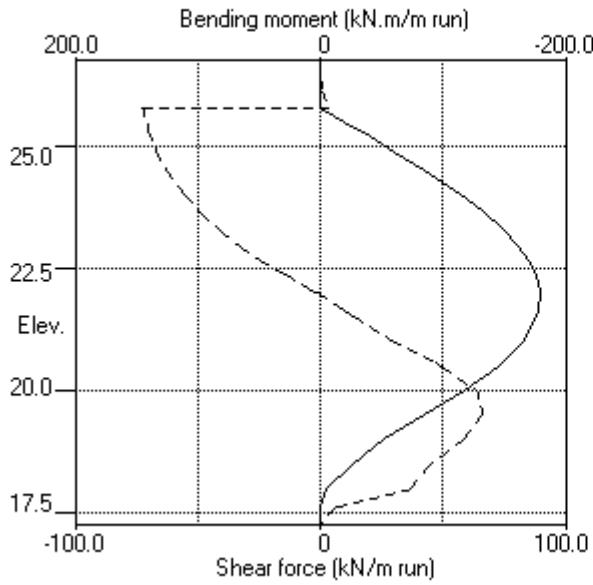
Stage No.7 Excavate to elevation 20.56 on RIGHT side

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
18	21.50	0.00	0.00	0.00	0.00	0.00	0.0	
19	21.03	0.00	0.00	0.00	0.00	0.00	0.0	
20	20.56	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	8713	
21	20.50	0.00	1.20	0.34	5.24	5.24	5.24p 8713	
22	20.00	4.90	6.30	1.78	27.51	27.51	32.41p 8713	
23	19.50	9.81	11.39	3.23	49.77	49.77	59.58p 8713	
24	19.00	14.71	16.49	4.67	72.04	72.04	86.75p 8713	
25	18.50	19.62	21.58	6.12	94.31	73.80	93.42 8713	
26	18.00	24.52	26.68	7.56	116.58	63.42	87.94 8713	
		Total>	51.21	12.80m	290.21	231.70	231.70 36277	
27	17.63	Total>	58.71	14.67m	304.88	202.45	202.45 37366	
28	17.25	Total>	66.21	16.55m	319.56	170.76	170.76 38454	

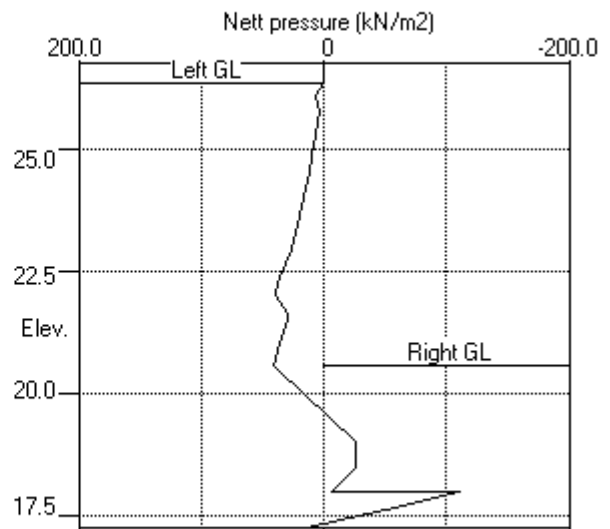
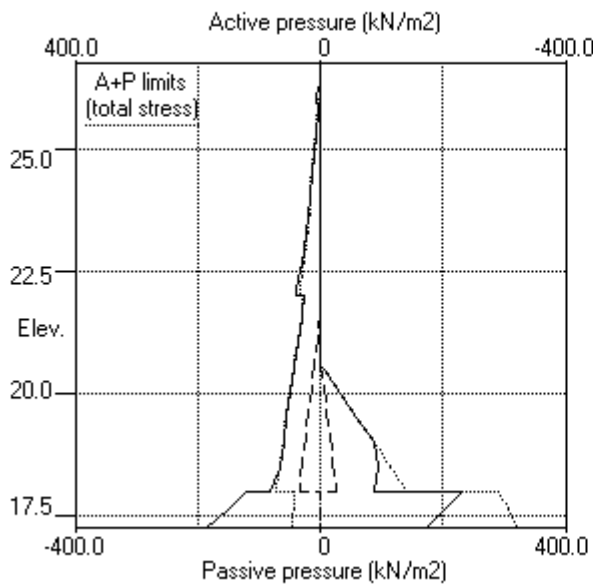
Note: 66.97a Soil pressure at active limit
 86.75p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. 20.56 on RIGHT side



Stage No.7 Excav. to elev. 20.56 on RIGHT side



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 8 Fill to elevation 21.64 on RIGHT side with soil type 1

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.002	-2.87E-03	0.0	0.0		138544
2	26.32	0.00	0.003	-2.87E-03	0.0	-0.0		138544
3	26.10	7.27	0.004	-2.87E-03	0.8	-0.0		138544
4	25.75	3.67	0.005	-2.87E-03	2.7	0.7	75.1	138544
		3.67	0.005	-2.87E-03	-72.3	0.7		
5	25.32	6.62	0.006	-2.83E-03	-70.1	-29.7		138544
6	25.25	7.11	0.006	-2.81E-03	-69.7	-34.6		138544
7	24.88	9.78	0.007	-2.68E-03	-66.5	-60.0		138544
8	24.50	12.46	0.008	-2.49E-03	-62.3	-84.2		138544
9	24.00	16.59	0.010	-2.13E-03	-55.1	-113.4		138544
10	23.63	20.08	0.010	-1.80E-03	-48.2	-132.8		138544
11	23.25	23.67	0.011	-1.41E-03	-40.0	-149.4		138544
12	22.95	27.39	0.011	-1.08E-03	-32.4	-160.2		138544
13	22.65	32.09	0.012	-7.33E-04	-23.5	-168.5		138544
14	22.36	36.26	0.012	-3.65E-04	-13.4	-174.1		138544
15	22.06	39.94	0.012	1.03E-05	-2.0	-176.4		138544
16	22.00	40.64	0.012	8.67E-05	0.4	-176.4		138544
		28.99	0.012	8.67E-05	0.4	-176.4		
17	21.64	31.30	0.012	5.42E-04	11.2	-174.4		138544
18	21.50	31.26	0.012	7.17E-04	15.6	-172.5		138544
19	21.03	34.26	0.011	1.28E-03	31.0	-161.8		138544
20	20.56	37.16	0.010	1.80E-03	47.8	-143.4		138544
		38.48	0.010	1.80E-03	47.8	-143.4		
21	20.50	35.70	0.010	1.86E-03	50.0	-140.4		138544
22	20.00	14.82	0.009	2.31E-03	62.7	-111.9		138544
23	19.50	-6.14	0.008	2.66E-03	64.8	-79.7		138544
24	19.00	-27.16	0.007	2.89E-03	56.5	-49.0		138544
25	18.50	-27.71	0.005	3.02E-03	42.8	-22.6		138544
26	18.00	-7.87	0.004	3.07E-03	33.9	-3.8		138544
		-107.63	0.004	3.07E-03	33.9	-3.8		
27	17.63	-46.17	0.002	3.07E-03	5.0	1.4		138544
28	17.25	19.24	0.001	3.07E-03	0.0	-0.0		---
At elev. 25.75		Strut force =		375.3 kN/strut =		75.1 kN/m run		

(continued)

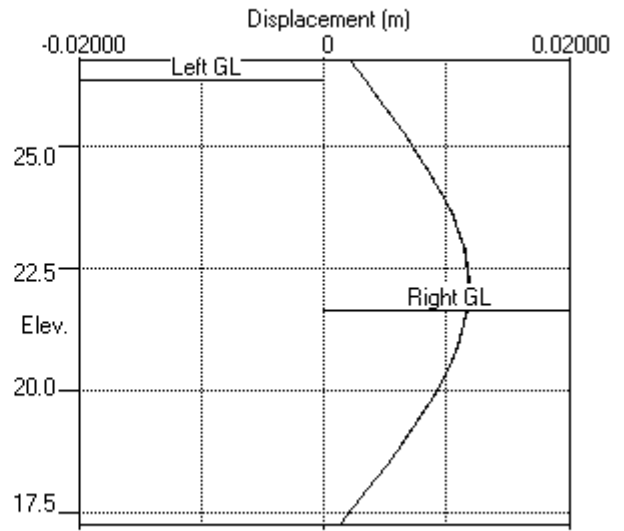
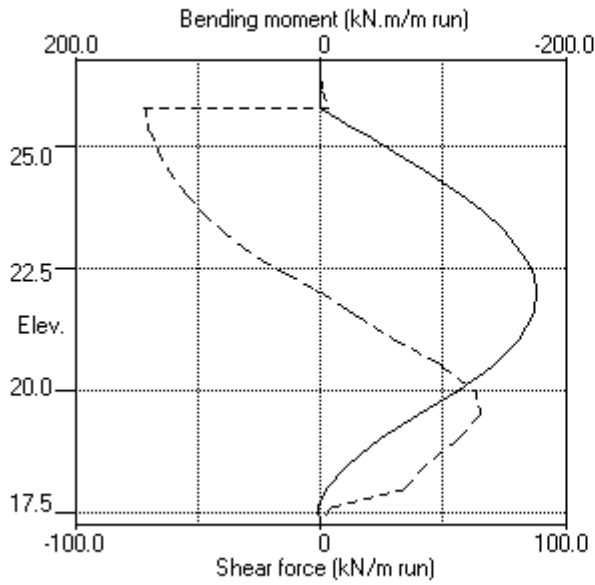
Stage No.8 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Earth pressure kN/m2		
18	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1137	
19	21.03	0.00	10.98	3.86	35.72	3.86	3.86a	1137	
20	20.56	0.00	19.44	6.83	63.23	6.83	6.83a	1137	
		0.00	19.44	5.51	84.94	5.51	5.51a	5686	
21	20.50	0.00	20.64	5.85	90.19	9.04	9.04	5686	
22	20.00	4.90	25.74	7.29	112.45	31.20	36.11	5686	
23	19.50	9.81	30.83	8.74	134.72	53.42	63.23	5686	
24	19.00	14.71	35.93	10.18	156.99	75.67	90.39	5686	
25	18.50	19.62	41.03	11.63	179.27	77.46	97.08	5686	
26	18.00	24.52	46.13	13.07	201.56	67.13	91.66	5686	
		Total>	70.66	18.20m	309.66	238.41	238.41	24611	
27	17.63	Total>	78.16	20.08m	324.34	209.02	209.02	25349	
28	17.25	Total>	85.67	21.95m	339.01	177.20	177.20	26088	

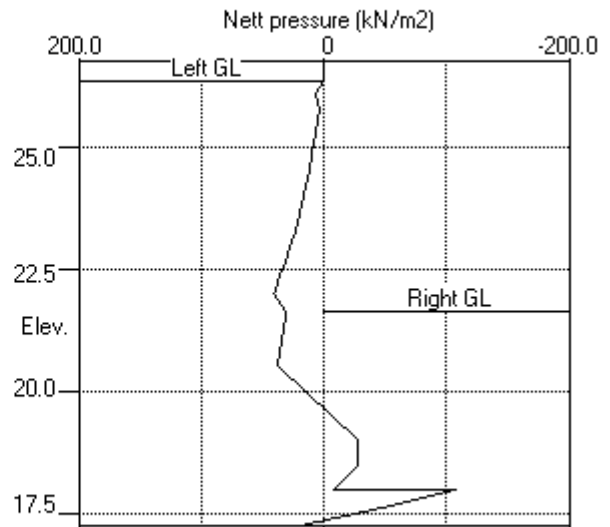
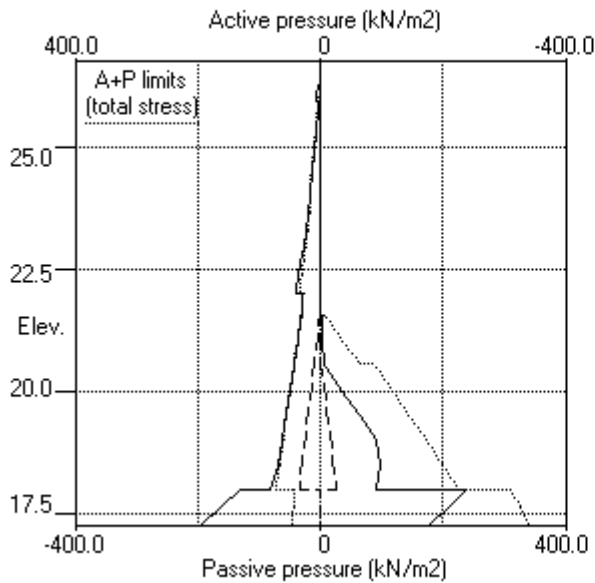
Note: 5.51a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Fill to elev. 21.64 on RIGHT side



Stage No.8 Fill to elev. 21.64 on RIGHT side



Units: kN,m

Stage No. 11 Remove strut or anchor no.1 at elevation 25.75

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.002	-3.04E-03	0.0	0.0		138544
2	26.32	0.00	0.003	-3.04E-03	0.0	-0.0		138544
3	26.10	7.16	0.004	-3.04E-03	0.8	-0.0	66.6	138544
		7.16	0.004	-3.04E-03	-65.8	-0.0		
4	25.75	3.66	0.005	-3.01E-03	-63.9	-22.6		138544
5	25.32	6.57	0.006	-2.90E-03	-61.7	-49.4		138544
6	25.25	7.06	0.007	-2.87E-03	-61.2	-53.7		138544
7	24.88	9.68	0.008	-2.70E-03	-58.1	-76.0		138544
8	24.50	12.33	0.009	-2.46E-03	-53.9	-97.0		138544
9	24.00	16.34	0.010	-2.07E-03	-46.8	-122.0		138544
10	23.63	19.87	0.011	-1.72E-03	-40.0	-138.3		138544
11	23.25	23.50	0.011	-1.32E-03	-31.9	-151.8		138544
12	22.95	27.27	0.011	-9.92E-04	-24.3	-160.2		138544
13	22.65	32.01	0.012	-6.42E-04	-15.5	-166.2		138544
14	22.36	36.21	0.012	-2.82E-04	-5.3	-169.3		138544
15	22.06	39.92	0.012	8.14E-05	6.0	-169.2	10.4	138544
		39.92	0.012	8.14E-05	-4.4	-169.2		
16	22.00	40.63	0.012	1.54E-04	-2.0	-169.4		138544
		28.93	0.012	1.54E-04	-2.0	-169.4		
17	21.64	31.39	0.012	5.93E-04	8.9	-168.3		138544
18	21.50	31.39	0.012	7.62E-04	13.3	-166.7		138544
19	21.03	34.50	0.011	1.31E-03	28.8	-157.0		138544
20	20.56	37.46	0.010	1.81E-03	45.7	-139.7		138544
		38.78	0.010	1.81E-03	45.7	-139.7		
21	20.50	36.30	0.010	1.87E-03	47.9	-136.9		138544
22	20.00	15.45	0.009	2.31E-03	60.9	-109.3		138544
23	19.50	-5.53	0.008	2.65E-03	63.4	-77.9		138544
24	19.00	-26.62	0.007	2.88E-03	55.3	-47.9		138544
25	18.50	-27.28	0.005	3.01E-03	41.8	-22.0		138544
26	18.00	-7.55	0.004	3.05E-03	33.1	-3.5		138544
		-106.27	0.004	3.05E-03	33.1	-3.5		
27	17.63	-45.17	0.002	3.05E-03	4.7	1.4		138544
28	17.25	19.85	0.001	3.05E-03	0.0	-0.0		---
At elev. 26.10		Strut force =		66.6 kN/strut =	66.6 kN/m run			
At elev. 22.06		Strut force =		10.4 kN/strut =	10.4 kN/m run			

(continued)

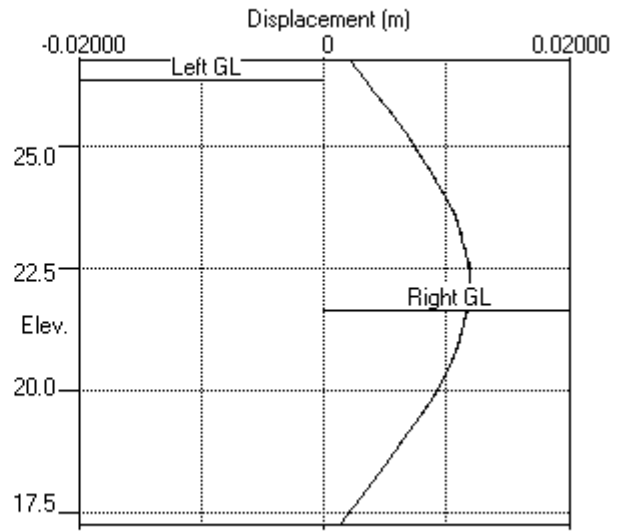
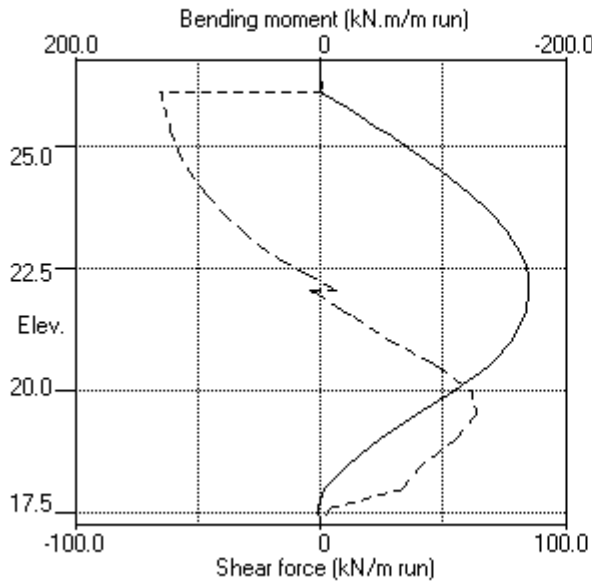
Stage No.11 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
18	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1307
19	21.03	0.00	10.98	3.86	35.72	3.86	3.86a	1307
20	20.56	0.00	19.44	6.83	63.23	6.83	6.83a	1307
		0.00	19.44	5.51	84.94	5.51	5.51a	6536
21	20.50	0.00	20.64	5.85	90.19	8.74	8.74	6536
22	20.00	4.90	25.74	7.29	112.45	30.88	35.79	6536
23	19.50	9.81	30.83	8.74	134.72	53.11	62.92	6536
24	19.00	14.71	35.93	10.18	156.99	75.41	90.12	6536
25	18.50	19.62	41.03	11.63	179.27	77.24	96.86	6536
26	18.00	24.52	46.13	13.07	201.56	66.97	91.50	6536
		Total>	70.66	18.20m	309.66	237.73	237.73	27855
27	17.63	Total>	78.16	20.08m	324.34	208.52	208.52	28691
28	17.25	Total>	85.67	21.95m	339.01	176.90	176.90	29526

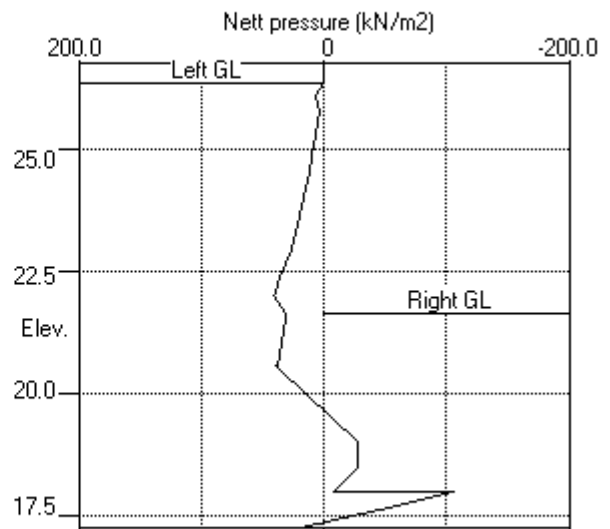
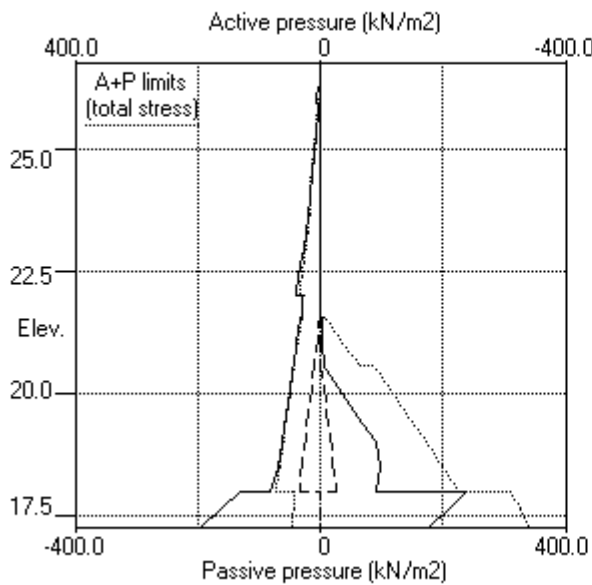
Note: 5.51a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.11 Remove strut no.1 at elev. 25.75



Stage No.11 Remove strut no.1 at elev. 25.75



Units: kN,m

Stage No. 12 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.75	0.00	0.002	-3.12E-03	0.0	0.0		98960
2	26.32	0.00	0.003	-3.12E-03	0.0	-0.0		98960
3	26.10	7.30	0.004	-3.12E-03	0.8	-0.0	52.8	98960
		7.30	0.004	-3.12E-03	-52.0	-0.0		
4	25.75	3.66	0.005	-3.09E-03	-50.1	-18.8		98960
5	25.32	6.57	0.006	-2.97E-03	-47.9	-41.0		98960
6	25.25	7.06	0.007	-2.94E-03	-47.4	-44.6		98960
7	24.88	9.68	0.008	-2.75E-03	-44.3	-62.8		98960
8	24.50	12.33	0.009	-2.50E-03	-40.2	-79.9		98960
9	24.00	16.19	0.010	-2.07E-03	-33.0	-99.5		98960
10	23.63	19.73	0.011	-1.70E-03	-26.3	-111.8		98960
11	23.25	23.38	0.011	-1.29E-03	-18.2	-121.4		98960
12	22.95	27.16	0.011	-9.46E-04	-10.7	-126.6		98960
13	22.65	31.92	0.012	-5.91E-04	-1.9	-129.4		98960
14	22.36	36.15	0.012	-2.35E-04	8.2	-129.4		98960
15	22.06	39.87	0.012	1.13E-04	19.5	-126.2	37.0	98960
		39.87	0.012	1.13E-04	-17.5	-126.2		
16	22.00	40.58	0.012	1.82E-04	-15.1	-127.0		98960
		28.71	0.012	1.82E-04	-15.1	-127.0		
17	21.64	31.22	0.012	6.06E-04	-4.3	-129.5		98960
18	21.50	31.16	0.012	7.74E-04	0.0	-129.4		98960
19	21.03	34.34	0.011	1.33E-03	15.4	-124.6		98960
20	20.56	37.44	0.010	1.85E-03	32.3	-112.1		98960
		38.73	0.010	1.85E-03	32.3	-112.1		
21	20.50	36.30	0.010	1.91E-03	34.6	-109.9		98960
22	20.00	15.92	0.009	2.37E-03	47.6	-87.6		98960
23	19.50	-4.45	0.008	2.72E-03	50.5	-61.3		98960
24	19.00	-24.88	0.006	2.95E-03	43.2	-36.2		98960
25	18.50	-24.93	0.005	3.06E-03	30.7	-14.8		98960
26	18.00	-4.74	0.003	3.09E-03	23.3	-0.5		98960
		-94.61	0.003	3.09E-03	23.3	-0.5		
27	17.63	-32.00	0.002	3.09E-03	-0.5	2.2		98960
28	17.25	34.43	0.001	3.08E-03	0.0	-0.0		---
At elev. 26.10		Strut force =		52.8 kN/strut =		52.8 kN/m run		
At elev. 22.06		Strut force =		37.0 kN/strut =		37.0 kN/m run		

(continued)

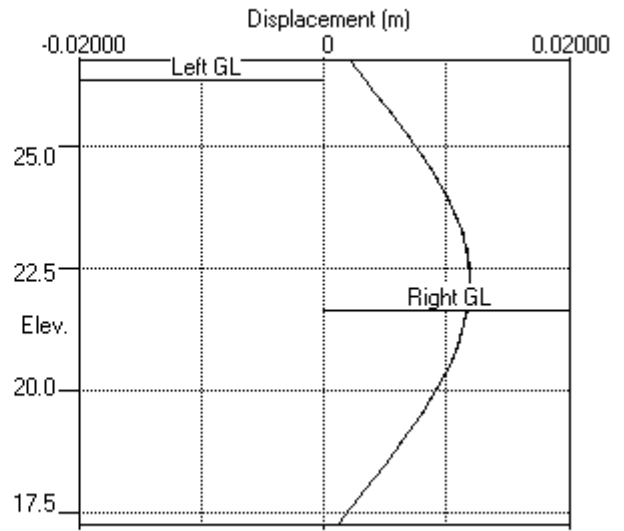
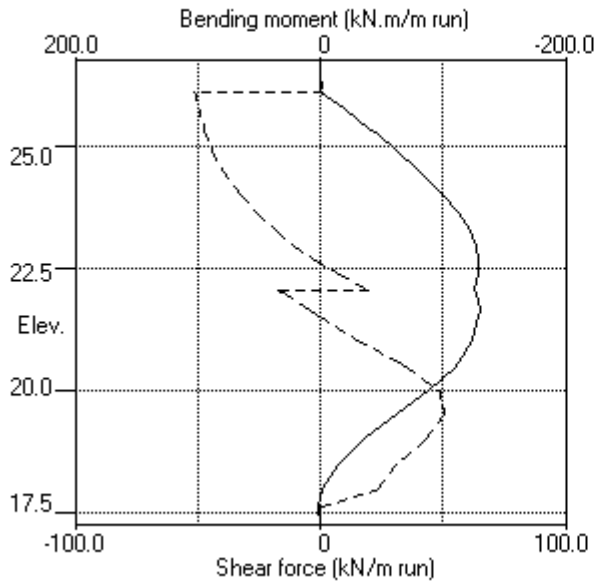
Stage No.12 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	3452
18	21.50	0.00	2.52	0.89	8.20	0.96	0.96	3452
19	21.03	0.00	10.98	3.86	35.72	3.91	3.91	3452
20	20.56	0.00	19.44	6.83	63.23	6.84	6.84	3452
		0.00	19.44	5.51	84.94	5.55	5.55	17260
21	20.50	0.00	20.64	5.85	90.19	8.73	8.73	9415
22	20.00	4.90	25.74	7.29	112.45	30.65	35.55	9415
23	19.50	9.81	30.83	8.74	134.72	52.57	62.38	9415
24	19.00	14.71	35.93	10.18	156.99	74.53	89.25	9415
25	18.50	19.62	41.03	11.63	179.27	76.07	95.69	9415
26	18.00	24.52	46.13	13.07	201.56	65.57	90.09	9415
		Total>	70.66	18.20m	309.66	231.90	231.90	39010
27	17.63	Total>	78.16	20.08m	324.34	201.93	201.93	40180
28	17.25	Total>	85.67	21.95m	339.01	169.61	169.61	41350

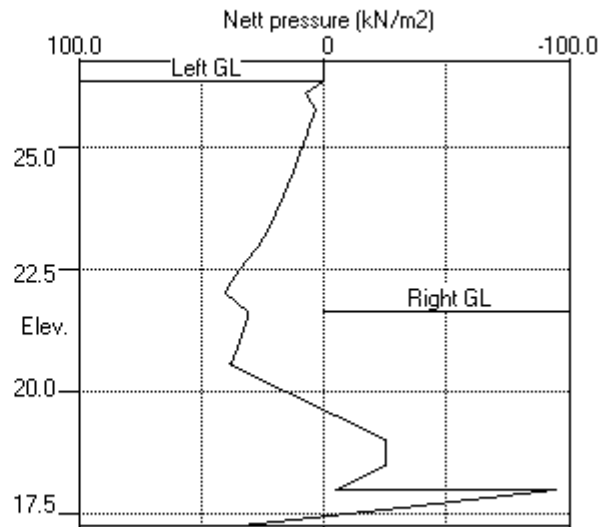
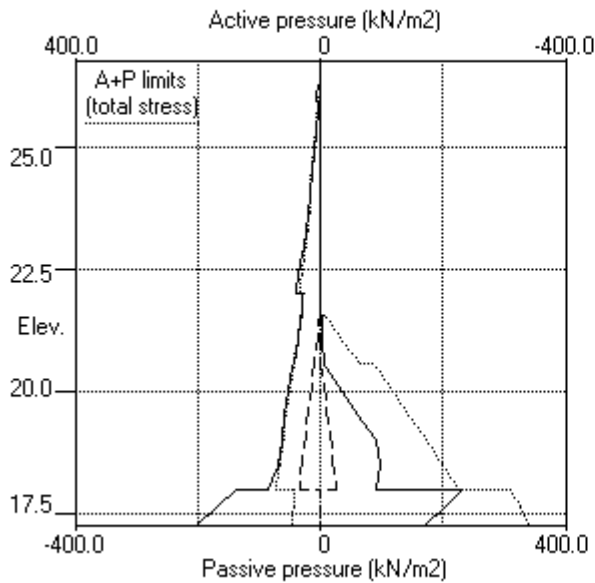
Note: 12.33a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.12 Change EI of wall to 98960kN.m²/m run



Stage No.12 Change EI of wall to 98960kN.m²/m run



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 15 Apply water pressure profile no.2 (Mod. Conserv.)

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	0.002	-3.39E-03	0.0	0.0		98960
2	26.32	0.00	0.003	-3.39E-03	0.0	-0.0		98960
3	26.10	7.28	0.004	-3.39E-03	0.8	-0.0	64.5	98960
		7.28	0.004	-3.39E-03	-63.7	-0.0		
4	25.75	3.66	0.005	-3.35E-03	-61.8	-22.9		98960
5	25.32	6.57	0.007	-3.20E-03	-59.6	-50.1		98960
6	25.25	7.50	0.007	-3.17E-03	-59.1	-54.5		98960
7	24.88	12.51	0.008	-2.93E-03	-55.3	-77.0		98960
8	24.50	17.55	0.009	-2.61E-03	-49.7	-97.9		98960
9	24.00	24.25	0.010	-2.09E-03	-39.2	-121.5		98960
10	23.63	30.24	0.011	-1.63E-03	-29.0	-135.5		98960
11	23.25	36.41	0.012	-1.13E-03	-16.5	-145.3		98960
12	22.95	42.22	0.012	-7.16E-04	-4.8	-149.4		98960
13	22.65	49.05	0.012	-2.96E-04	8.8	-149.8		98960
14	22.36	55.36	0.012	1.14E-04	24.3	-145.8		98960
15	22.06	61.19	0.012	5.03E-04	41.6	-136.9	38.7	98960
		61.19	0.012	5.03E-04	2.9	-136.9		
16	22.00	62.32	0.012	5.79E-04	6.6	-136.5		98960
		50.56	0.012	5.79E-04	6.6	-136.5		
17	21.64	56.37	0.012	1.02E-03	25.8	-129.7		98960
		15.81	0.012	1.02E-03	25.8	-129.7		
18	21.50	16.21	0.011	1.18E-03	28.1	-125.5		98960
19	21.03	17.57	0.011	1.69E-03	36.0	-109.3		98960
20	20.56	18.61	0.010	2.12E-03	44.5	-89.1		98960
		19.25	0.010	2.12E-03	44.5	-89.1		
21	20.50	19.36	0.010	2.17E-03	45.7	-86.2		98960
22	20.00	1.61	0.009	2.51E-03	50.9	-60.5		98960
23	19.50	-18.31	0.007	2.72E-03	46.8	-34.4		98960
24	19.00	-39.13	0.006	2.82E-03	32.4	-12.8		98960
25	18.50	-40.29	0.004	2.83E-03	12.5	1.3		98960
26	18.00	-21.67	0.003	2.81E-03	-2.9	4.7		98960
		-11.43	0.003	2.81E-03	-2.9	4.7		
27	17.63	3.13	0.002	2.80E-03	-4.5	2.3		98960
28	17.25	20.90	0.001	2.79E-03	0.0	-0.0		---
At elev. 26.10 Strut force =				64.5 kN/strut =	64.5 kN/m run			
At elev. 22.06 Strut force =				38.7 kN/strut =	38.7 kN/m run			

(continued)

Stage No.15 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.39	12.92	7.28	7.28	1464
4	25.75	0.00	10.43	3.66	33.92	3.66	3.66a	1464
5	25.32	0.00	18.71	6.57	60.85	6.57	6.57a	1464
6	25.25	0.69	19.40	6.81	63.10	6.81	7.50a	1464
7	24.88	4.37	23.20	8.15	75.46	8.15	12.51a	1464
8	24.50	8.04	27.05	9.50	87.99	9.50	17.55a	1464
9	24.00	12.95	32.13	11.29	104.50	11.30	24.25	1464
10	23.63	16.63	35.84	12.59	116.59	13.62	30.24	1464
11	23.25	20.31	39.47	13.87	128.40	16.10	36.41	1464
12	22.95	23.23	44.69	15.70	145.37	19.00	42.22	1464
13	22.65	26.14	52.54	18.46	170.90	22.90	49.05	1464
14	22.36	29.06	58.48	20.54	190.22	26.30	55.36	1464
15	22.06	31.98	62.63	22.00	203.71	29.21	61.19	1464
16	22.00	32.57	63.31	22.24	205.94	29.76	62.32	1278
		32.57	63.31	17.94	276.63	17.99	50.56	6389
17	21.64	36.10	67.48	19.12	294.85	20.27	56.37	6389
18	21.50	37.47	68.89	19.52	301.00	21.07	58.55	6389
19	21.03	42.08	73.19	20.74	319.79	23.78	65.87	6389
20	20.56	46.70	77.21	21.88	337.35	26.16	72.86	6389
21	20.50	47.28	77.72	22.02	339.57	26.44	73.73	6389
22	20.00	52.19	81.95	23.22	358.07	28.61	80.80	6389
23	19.50	57.09	86.23	24.43	376.79	30.37	87.46	6389
24	19.00	62.00	90.59	25.67	395.84	31.69	93.69	6389
25	18.50	66.90	95.02	26.92	415.19	32.59	99.49	6389
26	18.00	71.81	99.51	28.20	434.81	41.44	113.25	6389
		71.81	99.51	34.96	323.70	99.88	171.69	13793
27	17.63	75.49	102.92	36.15	334.77	127.48	202.97	14207
28	17.25	79.17	106.35	37.36	345.93	156.44	235.61	14621

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	23.63	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		40.32	0.68	0.24	2.21	0.24	40.56a	1278

(continued)

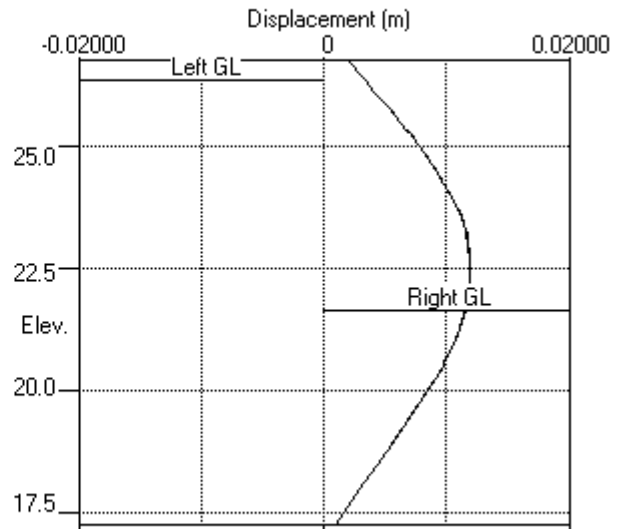
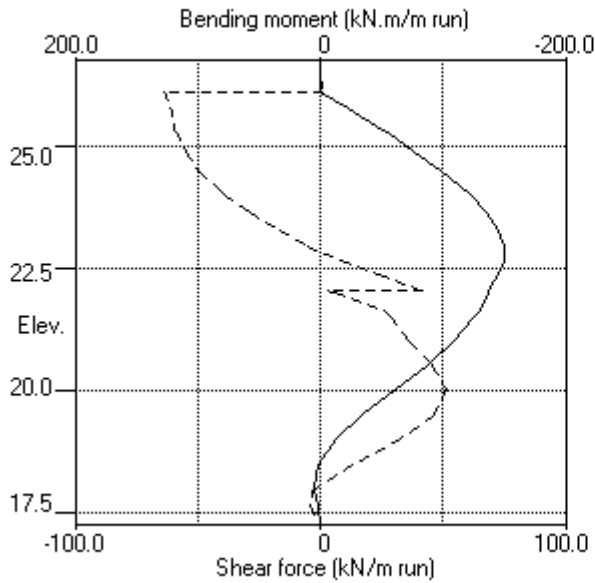
Stage No.15 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
18	21.50	41.69	1.82	0.64	5.93	0.64	42.33a	1278
19	21.03	46.30	5.67	1.99	18.45	1.99	48.30a	1278
20	20.56	50.91	9.50	3.34	30.91	3.34	54.25a	1278
		50.91	9.50	2.69	41.52	2.69	53.61a	6389
21	20.50	51.50	10.11	2.86	44.18	2.86	54.37a	6389
22	20.00	56.41	15.15	4.29	66.21	22.78	79.19	6389
23	19.50	61.31	20.16	5.71	88.08	44.46	105.77	6389
24	19.00	66.22	25.11	7.12	109.73	66.60	132.81	6389
25	18.50	71.12	30.01	8.50	131.14	68.65	139.78	6389
26	18.00	76.03	34.86	9.88	152.30	58.90	134.92	6389
		76.03	34.86	12.24	113.38	107.09	183.12	13793
27	17.63	79.71	38.45	13.51	125.06	120.13	199.84	14207
28	17.25	83.39	42.01	14.76	136.64	131.32	214.71	14621

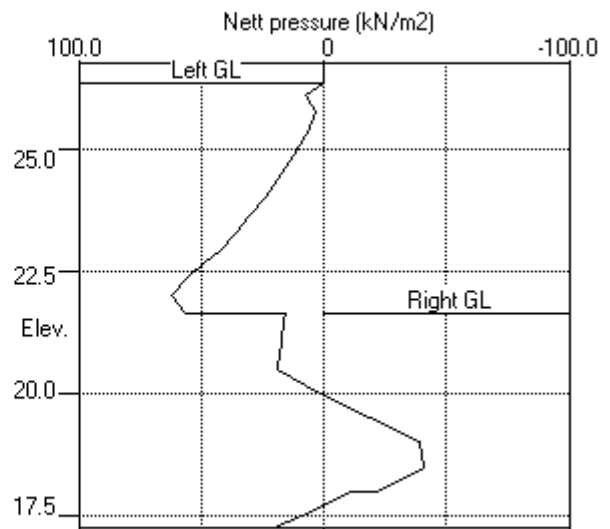
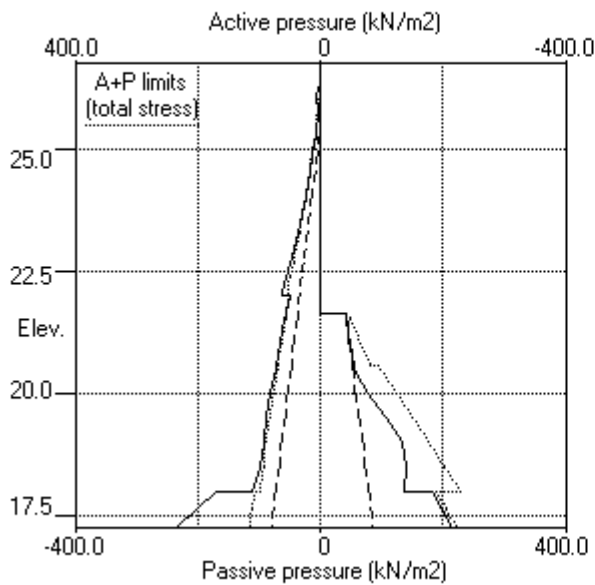
Note: 54.37a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.15 Apply water pressure profile no.2 (Mod. Conserv.)



Stage No.15 Apply water pressure profile no.2 (Mod. Conserv.)



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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				Shear force			
		max. m	min. m	Calculated kN.m/m		Factored kN.m/m		Calculated kN/m		Factored kN/m	
1	26.75	0.005	-0.001	0	-0	0	-0	0	0	0	0
2	26.32	0.005	-0.001	0	-0	0	-0	0	-1	0	-1
3	26.10	0.005	-0.001	0	-0	0	-0	1	-66	1	-89
4	25.75	0.005	-0.001	1	-23	1	-31	3	-73	4	-98
5	25.32	0.007	-0.001	1	-50	2	-68	3	-71	5	-95
6	25.25	0.007	-0.001	2	-54	2	-74	4	-70	5	-95
7	24.88	0.008	-0.001	3	-77	5	-104	5	-67	6	-90
8	24.50	0.009	-0.001	5	-98	7	-132	3	-63	5	-85
9	24.00	0.010	-0.001	6	-122	9	-165	3	-56	3	-75
10	23.63	0.011	-0.001	7	-138	10	-187	2	-49	3	-66
11	23.25	0.012	-0.001	8	-152	11	-205	2	-41	3	-55
12	22.95	0.012	-0.001	9	-162	12	-218	3	-33	4	-45
13	22.65	0.012	-0.001	10	-170	13	-230	9	-24	12	-33
14	22.36	0.012	-0.001	11	-176	15	-238	24	-14	33	-19
15	22.06	0.012	-0.000	13	-179	17	-241	42	-18	56	-24
16	22.00	0.012	-0.000	13	-179	18	-241	8	-15	10	-20
17	21.64	0.012	-0.000	15	-177	21	-239	26	-4	35	-6
18	21.50	0.012	-0.000	16	-176	21	-237	28	-1	38	-1
19	21.03	0.012	-0.000	16	-166	21	-224	36	-5	49	-6
20	20.56	0.011	-0.000	14	-148	19	-200	48	-7	65	-9
21	20.50	0.011	-0.000	14	-145	19	-196	50	-7	68	-9
22	20.00	0.010	-0.000	12	-117	16	-157	63	-6	85	-9
23	19.50	0.009	-0.000	9	-84	12	-113	66	-6	89	-8
24	19.00	0.007	-0.000	6	-53	8	-71	58	-5	79	-7
25	18.50	0.006	-0.000	3	-25	5	-34	45	-4	61	-6
26	18.00	0.004	-0.000	5	-5	6	-7	37	-3	50	-4
27	17.63	0.003	-0.000	2	-0	3	-0	7	-5	9	-6
28	17.25	0.002	-0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

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

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment						Shear force					
	Calculated		Factored		Calculated		Factored					
min.	max. elev.	min. elev.	max. elev.	max. elev.	min. elev.	max. elev.	min. elev.	max. elev.	min. elev.	max. elev.	max.	
	kN.m/m		kN.m/m		kN.m/m		kN/m		kN/m		kN/m	
1	0	26.75	-5	21.03	0	-7	2	19.50	-2	22.00	2	
-3	2	0	26.75	-6	21.50	0	-8	2	19.00	-1	24.00	2
-2	3	0	26.75	-10	21.64	0	-13	3	18.50	-3	22.95	4
-4	4	16	21.03	-0	26.32	21	-0	8	22.00	-6	19.50	10
-8	5	No calculation at this stage										
	6	13	21.50	-1	18.50	17	-2	6	22.00	-7	20.50	9
-9	7	1	17.63	-179	22.00	1	-241	66	19.50	-73	25.75	89
-98	8	1	17.63	-176	22.00	2	-238	65	19.50	-72	25.75	88
-98	9	No calculation at this stage										
	10	No calculation at this stage										
-89	11	1	17.63	-169	22.00	2	-229	63	19.50	-66	26.10	86
-70	12	2	17.63	-130	21.64	3	-175	50	19.50	-52	26.10	68
	13	No calculation at this stage										
	14	No calculation at this stage										
-86	15	5	18.00	-150	22.65	6	-202	51	20.00	-64	26.10	69

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.000	26.75	-0.001	26.75	Excav. to elev. 26.32 on LEFT side
2	0.000	17.25	-0.001	26.75	Apply surcharge no.1 at elev. 26.32
3	0.000	20.00	-0.001	26.75	Apply surcharge no.2 at elev. 23.25
4	0.005	26.75	0.000	26.75	Excav. to elev. 25.25 on RIGHT side
5	No calculation at this stage				Install strut no.1 at elev. 25.75
6	0.005	26.75	0.000	26.75	Apply water pressure profile no.1
7	0.012	22.00	0.000	26.75	Excav. to elev. 20.56 on RIGHT side
8	0.012	22.06	0.000	26.75	Fill to elev. 21.64 on RIGHT side
9	No calculation at this stage				Install strut no.2 at elev. 22.06
10	No calculation at this stage				Install strut no.3 at elev. 26.10
11	0.012	22.06	0.000	26.75	Remove strut no.1 at elev. 25.75
12	0.012	22.06	0.000	26.75	Change EI of wall to 98960kN.m ² /m run
13	No calculation at this stage				Change soil type 3 to soil type 4
14	No calculation at this stage				Apply surcharge no.3 at elev. 21.64
15	0.012	22.36	0.000	26.75	Apply water pressure profile no.2

Summary of results (continued)

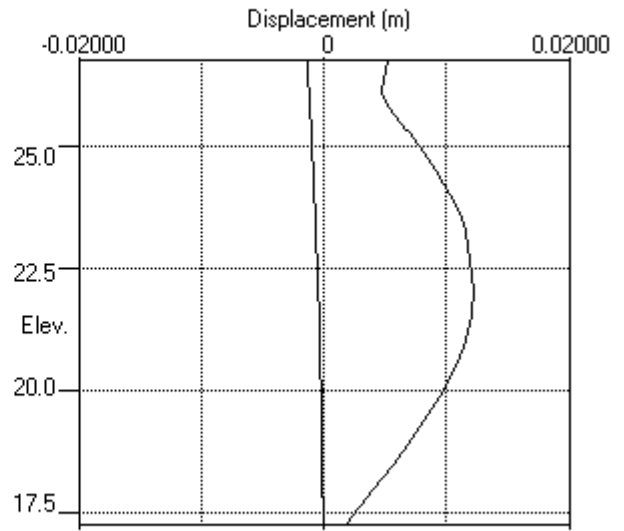
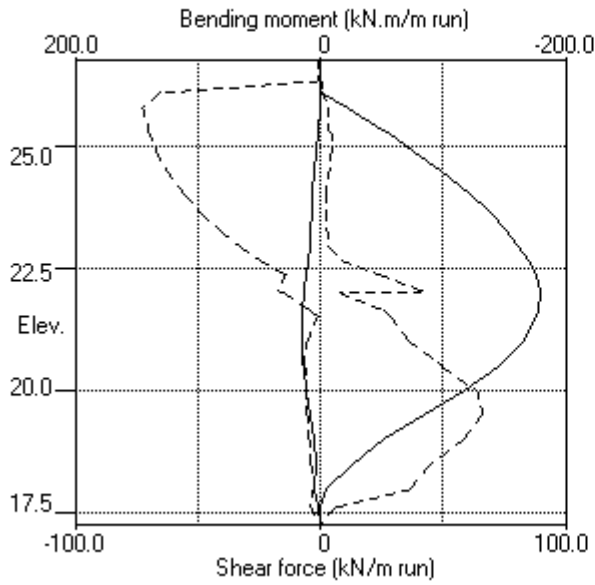
Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

Strut forces at each stage (horizontal components)

Stage no.	----- Strut no. 1 ----- at elev. 25.75			----- Strut no. 2 ----- at elev. 22.06			----- Strut no. 3 ----- at elev. 26.10		
	--Calculated--		Factored	--Calculated--		Factored	--Calculated--		Factored
	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut
6	0	1	2	---	---	---	---	---	---
7	76	378	510	---	---	---	---	---	---
8	75	375	507	---	---	---	---	---	---
11	---	---	---	10	10	14	67	67	90
12	---	---	---	37	37	50	53	53	71
15	---	---	---	39	39	52	64	64	87

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

2-ULS2

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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	26.75	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES (Unfactored SLS soil strengths)

No. Description	Bulk density kN/m3	Young's Modulus Eh, kN/m2	At rest coeff. Ko	Consol state. NC/OC	Active limit Ka	Passive limit Kpc	Cohesion kN/m2
(Datum elev.)		(dEh/dy)	(dKo/dy)	(Nu)	(Kac)	(Kpc)	(dc/dy)
1 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

Initial water table elevation Left side Right side
 21.50 21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
	2	1	25.32	25.32	0.0	1	21.64	21.64
2						21.64	25.75	40.3

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 17.25
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- Near edge Far edge		----- Equiv. soil type	Partial factor/ Category
1	26.32	1.65(L)	20.00	20.00	10.00	=	N/A	1.30 Var
2	23.25	0.40(L)	20.00	1.25	24.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	41.00	=	N/A	1.00 P/F

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	Excavate to elevation 26.32 on LEFT side
2	Apply surcharge no.1 at elevation 26.32
3	Apply surcharge no.2 at elevation 23.25
4	Excavate to elevation 25.25 on RIGHT side
5	Install strut or anchor no.1 at elevation 25.75
6	Apply water pressure profile no.1 (Worst Cred.)
7	Excavate to elevation 20.56 on RIGHT side
8	Fill to elevation 21.64 on RIGHT side with soil type 1
9	Install strut or anchor no.2 at elevation 22.06
10	Install strut or anchor no.3 at elevation 26.10
11	Remove strut or anchor no.1 at elevation 25.75
12	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
13	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
14	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
15	Apply water pressure profile no.2 (Worst Cred.)

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit state options: ULS DA1 Combination 2
Water pressures : Worst Credible
Partial factor on C' = 1.250
Partial factor on Phi' = 1.250
Partial factor on Cu = 1.400
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Variable Unfavourable loads = 1.300

Stability analysis:

Method of analysis - Strength Factor method
Overall 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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m
Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m
Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Excav. to elev. 26.32 on LEFT side	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 26.32	Yes	Yes	Yes
3	Apply surcharge no.2 at elev. 23.25	No	No	No
4	Excav. to elev. 25.25 on RIGHT side	Yes	Yes	Yes
5	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
6	Apply water pressure profile no.1	Yes	Yes	Yes
7	Excav. to elev. 20.56 on RIGHT side	Yes	Yes	Yes
8	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
9	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
10	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
11	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
12	Change EI of wall to 98960kN.m2/m run	Yes	Yes	Yes
13	Change soil type 3 to soil type 4	Yes	Yes	Yes
14	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
15	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Excavate to elevation 26.32 on LEFT side

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

			Overall		Toe elev. for			
			FoS for toe		FoS = 1.000			
			elev. = 17.25					
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction	
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of	
			Safety	at elev.		-ation	failure	
1	26.75 26.32	Cant.	12.594	18.21	25.81	0.51	R to L	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	-0.001	-2.09E-04	0.0	0.0		138544
2	26.32	-3.29	-0.001	-2.09E-04	-0.7	-0.1		138544
3	26.10	0.71	-0.001	-2.09E-04	-1.0	-0.3		138544
4	25.75	0.52	-0.001	-2.07E-04	-0.8	-0.6		138544
5	25.32	0.29	-0.001	-2.05E-04	-0.6	-0.9		138544
6	25.25	0.25	-0.001	-2.04E-04	-0.6	-1.0		138544
7	24.88	0.06	-0.001	-2.02E-04	-0.5	-1.2		138544
8	24.50	-0.14	-0.001	-1.98E-04	-0.5	-1.4		138544
9	24.00	-0.40	-0.001	-1.93E-04	-0.7	-1.6		138544
10	23.63	-0.58	-0.001	-1.88E-04	-0.9	-1.9		138544
11	23.25	-0.76	-0.001	-1.82E-04	-1.1	-2.3		138544
12	22.95	-0.90	-0.001	-1.77E-04	-1.4	-2.6		138544
13	22.65	-1.04	-0.001	-1.71E-04	-1.6	-3.1		138544
14	22.36	-1.17	-0.001	-1.64E-04	-2.0	-3.6		138544
15	22.06	-1.29	-0.000	-1.55E-04	-2.3	-4.3		138544
16	22.00	-1.32	-0.000	-1.53E-04	-2.4	-4.4		138544
		3.73	-0.000	-1.53E-04	-2.4	-4.4		
17	21.64	3.04	-0.000	-1.41E-04	-1.2	-5.0		138544
18	21.50	2.78	-0.000	-1.36E-04	-0.8	-5.2		138544
19	21.03	2.00	-0.000	-1.18E-04	0.3	-5.2		138544
20	20.56	1.33	-0.000	-1.01E-04	1.1	-4.9		138544
21	20.50	1.25	-0.000	-9.95E-05	1.2	-4.8		138544
22	20.00	0.65	-0.000	-8.36E-05	1.7	-4.0		138544
23	19.50	0.15	-0.000	-7.06E-05	1.9	-3.1		138544
24	19.00	-0.28	-0.000	-6.11E-05	1.8	-2.2		138544
25	18.50	-0.65	-0.000	-5.48E-05	1.6	-1.3		138544
26	18.00	-1.00	-0.000	-5.14E-05	1.2	-0.6		138544
		-0.69	-0.000	-5.14E-05	1.2	-0.6		
27	17.63	-1.57	-0.000	-5.04E-05	0.8	-0.2		138544
28	17.25	-2.51	-0.000	-5.02E-05	0.0	-0.0		---

(continued)

Stage No.1 Excavate to elevation 26.32 on LEFT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.96	1.68	10.09	5.84	5.84	1323
4	25.75	0.00	10.26	4.36	26.14	9.38	9.38	1323
5	25.32	0.00	18.00	7.65	45.85	13.73	13.73	1323
6	25.25	0.00	19.26	8.19	49.06	14.44	14.44	1323
7	24.88	0.00	26.01	11.06	66.26	18.23	18.23	1323
8	24.50	0.00	32.76	13.93	83.45	22.03	22.03	1323
9	24.00	0.00	41.76	17.75	106.38	27.09	27.09	1323
10	23.63	0.00	48.51	20.62	123.58	30.89	30.89	1323
11	23.25	0.00	55.26	23.49	140.77	34.69	34.69	1323
12	22.95	0.00	60.62	25.77	154.41	37.71	37.71	1323
13	22.65	0.00	65.97	28.05	168.06	40.73	40.73	1323
14	22.36	0.00	71.33	30.32	181.70	43.76	43.76	1323
15	22.06	0.00	76.68	32.60	195.34	46.78	46.78	1323
16	22.00	0.00	77.76	33.06	198.09	47.39	47.39	1323
17	21.64	0.00	77.76	27.56	250.01	43.37	43.37	6613
18	21.50	0.00	84.96	30.11	273.16	46.62	46.62	6613
19	21.03	4.61	87.76	31.10	282.16	47.89	47.89	6613
20	20.56	9.22	92.55	32.80	297.56	49.89	54.50	6613
21	20.50	9.81	97.34	34.50	312.96	51.94	61.16	6613
22	20.00	9.81	97.96	34.71	314.93	52.21	62.02	6613
23	20.00	14.71	103.05	36.52	331.31	54.45	69.17	6613
24	19.50	19.62	108.15	38.33	347.70	56.75	76.37	6613
25	19.00	24.52	113.25	40.13	364.08	59.08	83.60	6613
26	18.50	29.43	118.34	41.94	380.47	61.44	90.87	6613
26	18.00	34.34	123.44	43.75	396.86	63.81	98.14	6613
		Total>	157.77	41.60m	328.51	200.84	200.84	28152
27	17.63	Total>	165.28	43.48m	341.14	209.04	209.04	28997
28	17.25	Total>	172.78	45.35m	353.76	217.21	217.21	29841

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	1285
2	26.32	0.00	7.74	3.29	19.72	3.29	3.29a	1285
3	26.10	0.00	11.70	4.97	29.80	5.13	5.13	1285
4	25.75	0.00	18.00	7.65	45.85	8.86	8.86	1285
5	25.32	0.00	25.74	10.94	65.57	13.44	13.44	1285
6	25.25	0.00	27.00	11.48	68.78	14.18	14.18	1285
7	24.88	0.00	33.75	14.35	85.98	18.18	18.18	1285
8	24.50	0.00	40.50	17.22	103.17	22.17	22.17	1285
9	24.00	0.00	49.50	21.04	126.10	27.49	27.49	1285
10	23.63	0.00	56.25	23.91	143.29	31.47	31.47	1285
11	23.25	0.00	63.00	26.78	160.49	35.46	35.46	1285
12	22.95	0.00	68.35	29.06	174.13	38.62	38.62	1285
13	22.65	0.00	73.71	31.34	187.77	41.77	41.77	1285
14	22.36	0.00	79.06	33.61	201.41	44.93	44.93	1285
15	22.06	0.00	84.42	35.89	215.05	48.08	48.08	1285
16	22.00	0.00	85.50	36.35	217.80	48.71	48.71	1285
		0.00	85.50	30.30	274.88	39.64	39.64	6423

(continued)

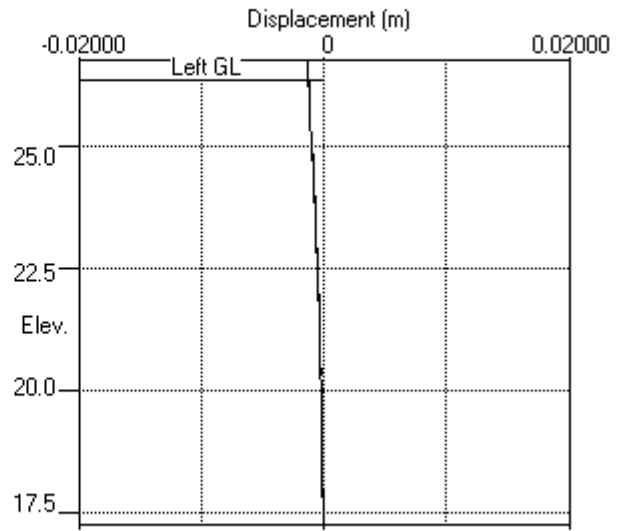
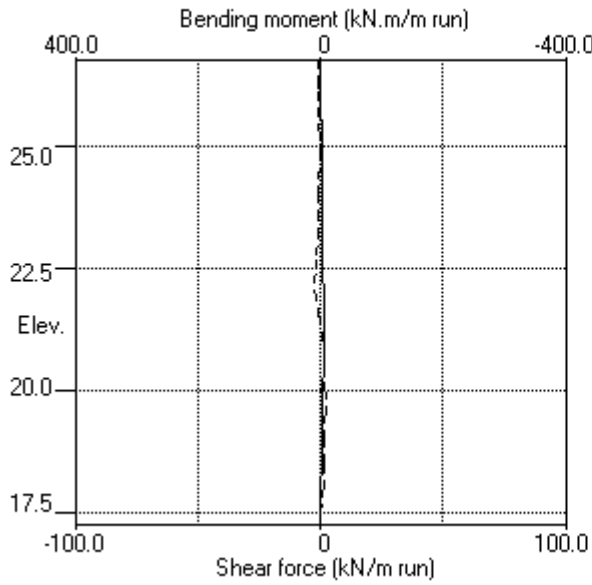
Stage No.1 Excavate to elevation 26.32 on LEFT side

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
17	21.64	0.00	92.70	32.85	298.03	43.58	43.58	6423
18	21.50	0.00	95.50	33.84	307.03	45.11	45.11	6423
19	21.03	4.61	100.29	35.54	322.43	47.89	52.50	6423
20	20.56	9.22	105.08	37.24	337.83	50.62	59.84	6423
21	20.50	9.81	105.69	37.46	339.79	50.96	60.77	6423
22	20.00	14.71	110.79	39.26	356.17	53.80	68.52	6423
23	19.50	19.62	115.88	41.07	372.55	56.60	76.22	6423
24	19.00	24.52	120.98	42.87	388.93	59.35	83.88	6423
25	18.50	29.43	126.07	44.68	405.32	62.09	91.52	6423
26	18.00	34.34	131.17	46.48	421.70	64.80	99.14	6423
		Total>	165.50	43.75m	336.24	201.53	201.53	27423
27	17.63	Total>	173.00	45.63m	348.86	210.61	210.61	28246
28	17.25	Total>	180.50	47.50m	361.49	219.72	219.72	29068

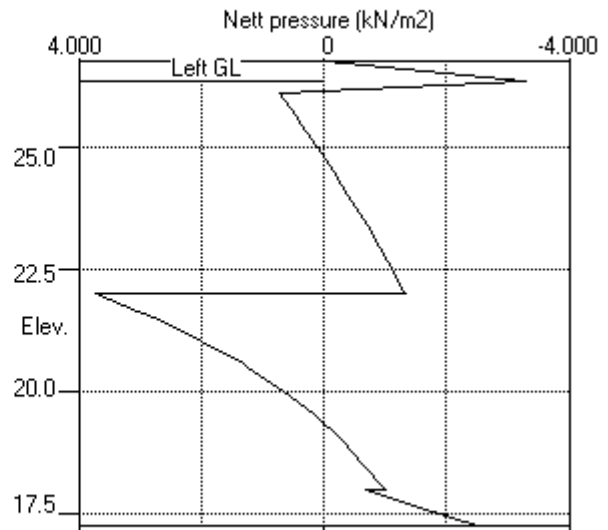
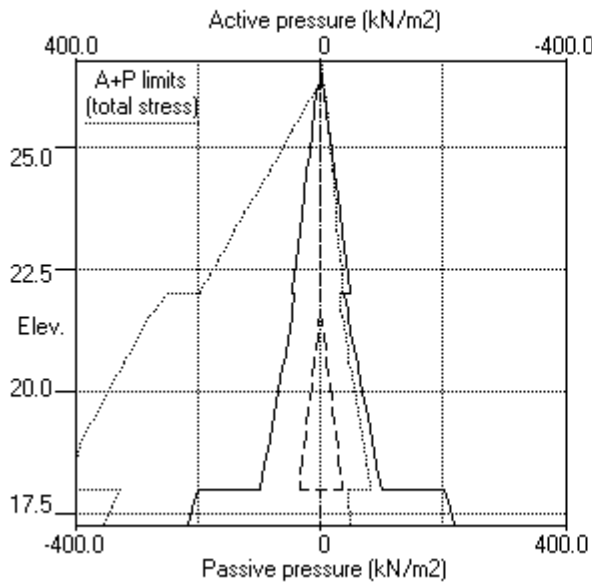
Note: 3.29a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.1 Excav. to elev. 26.32 on LEFT side



Stage No.1 Excav. to elev. 26.32 on LEFT side



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 2 Apply surcharge no.1 at elevation 26.32

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

			Overall		Toe elev. for			
			FoS for toe		FoS = 1.000			
			elev. = 17.25					
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction	
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of	
			Safety	at elev.		-ation	failure	
2	26.75 26.32	Cant.	20.000	19.22	25.82	0.50	R to L	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	-0.001	-2.09E-04	0.0	0.0		138544
2	26.32	-3.69	-0.001	-2.09E-04	-0.8	-0.1		138544
3	26.10	-0.10	-0.001	-2.08E-04	-1.2	-0.4		138544
4	25.75	-0.23	-0.001	-2.07E-04	-1.3	-0.8		138544
5	25.32	-0.24	-0.001	-2.03E-04	-1.4	-1.3		138544
6	25.25	-0.23	-0.001	-2.03E-04	-1.4	-1.4		138544
7	24.88	-0.14	-0.001	-1.98E-04	-1.5	-2.0		138544
8	24.50	-0.03	-0.000	-1.92E-04	-1.5	-2.5		138544
9	24.00	0.11	-0.000	-1.82E-04	-1.5	-3.3		138544
10	23.63	0.18	-0.000	-1.72E-04	-1.4	-3.8		138544
11	23.25	0.23	-0.000	-1.61E-04	-1.3	-4.3		138544
12	22.95	0.26	-0.000	-1.51E-04	-1.3	-4.7		138544
13	22.65	0.27	-0.000	-1.41E-04	-1.2	-5.0		138544
14	22.36	0.27	-0.000	-1.30E-04	-1.1	-5.4		138544
15	22.06	0.27	-0.000	-1.18E-04	-1.0	-5.7		138544
16	22.00	0.26	-0.000	-1.15E-04	-1.0	-5.8		138544
		2.44	-0.000	-1.15E-04	-1.0	-5.8		
17	21.64	1.97	-0.000	-1.00E-04	-0.2	-6.0		138544
18	21.50	1.80	-0.000	-9.46E-05	0.0	-6.0		138544
19	21.03	1.28	0.000	-7.47E-05	0.8	-5.8		138544
20	20.56	0.86	0.000	-5.61E-05	1.3	-5.2		138544
21	20.50	0.82	0.000	-5.38E-05	1.3	-5.2		138544
22	20.00	0.47	0.000	-3.66E-05	1.7	-4.4		138544
23	19.50	0.21	0.000	-2.23E-05	1.8	-3.5		138544
24	19.00	0.02	0.000	-1.13E-05	1.9	-2.6		138544
25	18.50	-0.13	0.000	-3.81E-06	1.9	-1.6		138544
26	18.00	-0.26	0.000	4.03E-07	1.8	-0.7		138544
		-1.93	0.000	4.03E-07	1.8	-0.7		
27	17.63	-2.34	0.000	1.63E-06	1.0	-0.2		138544
28	17.25	-2.76	0.000	1.89E-06	0.0	-0.0		---

(continued)

Stage No.2 Apply surcharge no.1 at elevation 26.32

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.69	10.12	5.43	5.43	854
4	25.75	0.00	10.46	4.45	26.64	9.03	9.03	854
5	25.32	0.00	18.84	8.01	47.98	13.60	13.60	854
6	25.25	0.00	20.24	8.60	51.55	14.35	14.35	854
7	24.88	0.00	27.85	11.84	70.94	18.43	18.43	854
8	24.50	0.00	35.52	15.10	90.48	22.54	22.54	854
9	24.00	0.00	45.68	19.42	116.36	27.99	27.99	854
10	23.63	0.00	53.19	22.61	135.50	32.05	32.05	854
11	23.25	0.00	60.60	25.76	154.38	36.08	36.08	854
12	22.95	0.00	66.41	28.23	169.18	39.25	39.25	854
13	22.65	0.00	72.17	30.68	183.84	42.42	42.42	854
14	22.36	0.00	77.87	33.10	198.37	45.56	45.56	854
15	22.06	0.00	83.53	35.51	212.78	48.70	48.70	854
16	22.00	0.00	84.66	35.99	215.67	49.33	49.33	854
		0.00	84.66	30.00	272.20	43.86	43.86	4268
17	21.64	0.00	92.17	32.66	296.32	47.27	47.27	4268
18	21.50	0.00	95.07	33.69	305.65	48.60	48.60	4268
19	21.03	4.61	100.16	35.49	322.00	50.78	55.39	4268
20	20.56	9.22	105.17	37.27	338.14	53.00	62.22	4268
21	20.50	9.81	105.81	37.50	340.18	53.29	63.10	4268
22	20.00	14.71	111.08	39.36	357.11	55.69	70.40	4268
23	19.50	19.62	116.29	41.21	373.87	58.12	77.74	4268
24	19.00	24.52	121.46	43.04	390.49	60.58	85.11	4268
25	18.50	29.43	126.59	44.86	406.99	63.06	92.49	4268
26	18.00	34.34	131.69	46.67	423.38	65.54	99.88	4268
		Total>	166.02	41.60m	336.77	204.15	204.15	19381
27	17.63	Total>	173.51	43.48m	349.37	212.58	212.58	19963
28	17.25	Total>	180.98	45.35m	361.97	221.00	221.00	20544

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	837
2	26.32	0.00	7.74	3.29	19.72	3.69	3.69	837
3	26.10	0.00	11.70	4.97	29.80	5.53	5.53	837
4	25.75	0.00	18.00	7.65	45.85	9.26	9.26	837
5	25.32	0.00	25.74	10.94	65.57	13.84	13.84	837
6	25.25	0.00	27.00	11.48	68.78	14.59	14.59	837
7	24.88	0.00	33.75	14.35	85.98	18.58	18.58	837
8	24.50	0.00	40.50	17.22	103.17	22.57	22.57	837
9	24.00	0.00	49.50	21.04	126.10	27.88	27.88	837
10	23.63	0.00	56.25	23.91	143.29	31.87	31.87	837
11	23.25	0.00	63.00	26.78	160.49	35.84	35.84	837
12	22.95	0.00	68.35	29.06	174.13	39.00	39.00	837
13	22.65	0.00	73.71	31.34	187.77	42.15	42.15	837
14	22.36	0.00	79.06	33.61	201.41	45.29	45.29	837
15	22.06	0.00	84.42	35.89	215.05	48.43	48.43	837
16	22.00	0.00	85.50	36.35	217.80	49.07	49.07	837
		0.00	85.50	30.30	274.88	41.42	41.42	4184

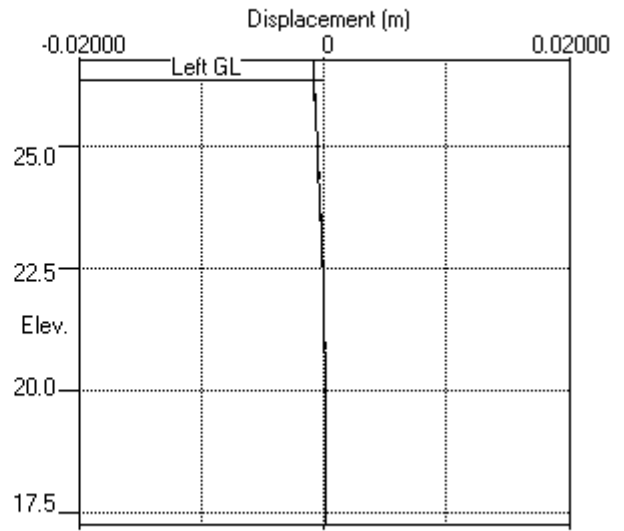
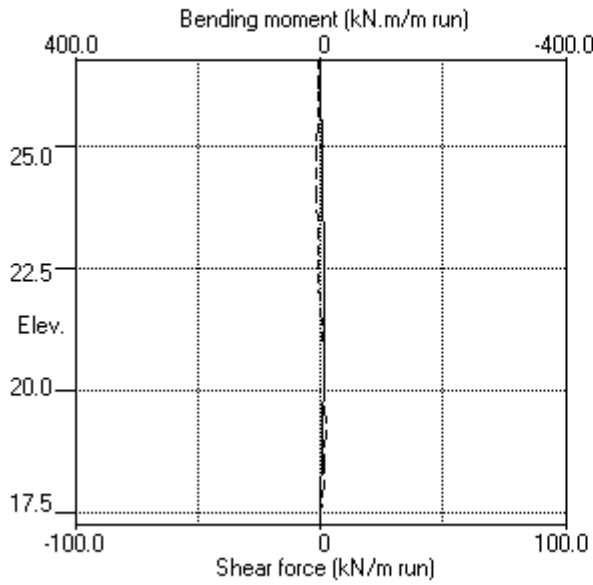
(continued)

Stage No.2 Apply surcharge no.1 at elevation 26.32

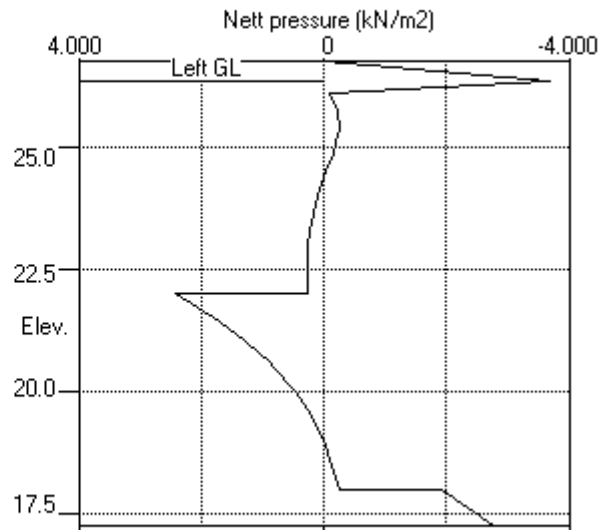
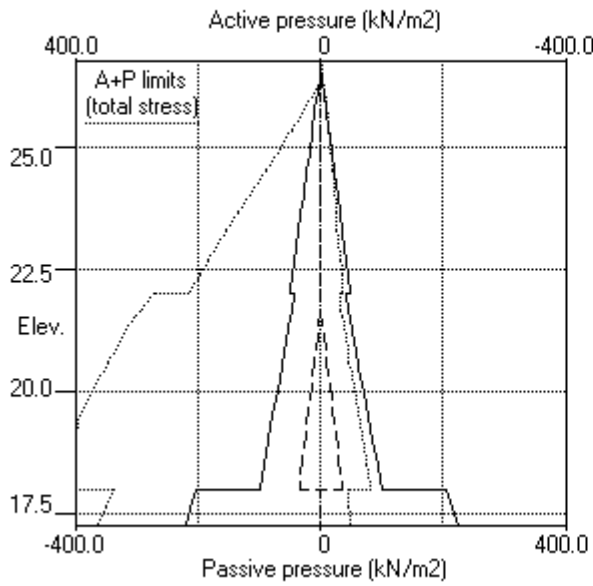
Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
17	21.64	0.00	92.70	32.85	298.03	45.30	45.30	4184
18	21.50	0.00	95.50	33.84	307.03	46.80	46.80	4184
19	21.03	4.61	100.29	35.54	322.43	49.50	54.11	4184
20	20.56	9.22	105.08	37.24	337.83	52.14	61.36	4184
21	20.50	9.81	105.69	37.46	339.79	52.47	62.28	4184
22	20.00	14.71	110.79	39.26	356.17	55.21	69.93	4184
23	19.50	19.62	115.88	41.07	372.55	57.91	77.53	4184
24	19.00	24.52	120.98	42.87	388.93	60.56	85.09	4184
25	18.50	29.43	126.07	44.68	405.32	63.19	92.62	4184
26	18.00	34.34	131.17	46.48	421.70	65.80	100.14	4184
		Total>	165.50	43.75m	336.24	206.08	206.08	19091
27	17.63	Total>	173.00	45.63m	348.86	214.91	214.91	19664
28	17.25	Total>	180.50	47.50m	361.49	223.75	223.75	20237

Units: kN,m

Stage No.2 Apply surcharge no.1 at elev. 26.32



Stage No.2 Apply surcharge no.1 at elev. 26.32



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 3 Apply surcharge no.2 at elevation 23.25

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

			Overall		Toe elev. for			
			FoS for toe		FoS = 1.000			
			elev. = 17.25					
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction	
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of	
			Safety	at elev.		-ation	failure	
3	26.75 26.32	Cant.	15.641	21.02	25.82	0.50	R to L	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	-0.001	-2.57E-04	0.0	0.0		138544
2	26.32	-3.92	-0.001	-2.57E-04	-0.8	-0.1		138544
3	26.10	-0.57	-0.000	-2.57E-04	-1.3	-0.4		138544
4	25.75	-0.73	-0.000	-2.55E-04	-1.6	-0.9		138544
5	25.32	-0.78	-0.000	-2.51E-04	-1.9	-1.6		138544
6	25.25	-0.78	-0.000	-2.51E-04	-1.9	-1.7		138544
7	24.88	-0.72	-0.000	-2.45E-04	-2.2	-2.5		138544
8	24.50	-0.63	-0.000	-2.37E-04	-2.5	-3.4		138544
9	24.00	-0.53	0.000	-2.22E-04	-2.8	-4.7		138544
10	23.63	-0.48	0.000	-2.08E-04	-3.0	-5.8		138544
11	23.25	-0.45	0.000	-1.91E-04	-3.1	-6.9		138544
12	22.95	0.36	0.000	-1.75E-04	-3.1	-7.8		138544
13	22.65	2.06	0.000	-1.57E-04	-2.8	-8.7		138544
14	22.36	3.12	0.000	-1.38E-04	-2.0	-9.4		138544
15	22.06	3.60	0.000	-1.17E-04	-1.0	-9.9		138544
16	22.00	3.65	0.000	-1.13E-04	-0.8	-9.9		138544
		2.97	0.000	-1.13E-04	-0.8	-9.9		
17	21.64	2.60	0.000	-8.73E-05	0.2	-10.0		138544
18	21.50	2.42	0.000	-7.71E-05	0.6	-10.0		138544
19	21.03	1.75	0.000	-4.42E-05	1.5	-9.5		138544
20	20.56	1.15	0.000	-1.37E-05	2.2	-8.5		138544
21	20.50	1.09	0.000	-1.00E-05	2.3	-8.4		138544
22	20.00	0.62	0.000	1.80E-05	2.7	-7.1		138544
23	19.50	0.30	0.000	4.11E-05	2.9	-5.7		138544
24	19.00	0.12	0.000	5.90E-05	3.1	-4.2		138544
25	18.50	0.04	0.000	7.14E-05	3.1	-2.7		138544
26	18.00	0.03	0.000	7.83E-05	3.1	-1.1		138544
		-4.27	0.000	7.83E-05	3.1	-1.1		
27	17.63	-4.17	0.000	8.02E-05	1.5	-0.3		138544
28	17.25	-3.98	0.000	8.05E-05	0.0	0.0		---

(continued)

Stage No.3 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.69	10.12	5.20	5.20	844
4	25.75	0.00	10.46	4.45	26.64	8.78	8.78	844
5	25.32	0.00	18.84	8.01	47.98	13.33	13.33	844
6	25.25	0.00	20.24	8.60	51.55	14.08	14.08	844
7	24.88	0.00	27.85	11.84	70.94	18.14	18.14	844
8	24.50	0.00	35.52	15.10	90.48	22.23	22.23	844
9	24.00	0.00	45.68	19.42	116.36	27.67	27.67	844
10	23.63	0.00	53.19	22.61	135.50	31.72	31.72	844
11	23.25	0.00	60.60	25.76	154.38	35.73	35.73	844
12	22.95	0.00	68.81	29.25	175.29	39.70	39.70	844
13	22.65	0.00	79.64	33.85	202.87	44.55	44.55	844
14	22.36	0.00	88.55	37.64	225.57	48.76	48.76	844
15	22.06	0.00	95.66	40.67	243.68	52.39	52.39	844
16	22.00	0.00	96.94	41.21	246.95	53.07	53.07	844
17	21.64	0.00	96.94	34.36	311.67	46.15	46.15	4222
18	21.50	0.00	104.69	37.10	336.58	49.66	49.66	4222
19	21.50	0.00	107.49	38.09	345.57	50.96	50.96	4222
20	21.03	4.61	111.83	39.63	359.54	52.95	57.56	4222
21	20.56	9.22	115.89	41.07	372.58	54.92	64.14	4222
22	20.50	9.81	116.40	41.25	374.22	55.17	64.98	4222
23	20.00	14.71	120.66	42.76	387.92	57.34	72.06	4222
24	19.50	19.62	124.96	44.28	401.75	59.60	79.22	4222
25	19.00	24.52	129.33	45.83	415.80	61.93	86.46	4222
26	18.50	29.43	133.77	47.40	430.06	64.33	93.76	4222
27	18.00	34.34	138.26	49.00	444.50	66.77	101.11	4222
		Total>	172.59	41.60m	343.34	206.10	206.10	19223
27	17.63	Total>	179.67	43.48m	355.54	214.59	214.59	19799
28	17.25	Total>	186.78	45.35m	367.76	223.14	223.14	20376

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.75	0.00	0.00	0.00	0.00	0.00	0.00	829
2	26.32	0.00	7.74	3.29	19.72	3.92	3.92	829
3	26.10	0.00	11.70	4.97	29.80	5.77	5.77	829
4	25.75	0.00	18.00	7.65	45.85	9.51	9.51	829
5	25.32	0.00	25.74	10.94	65.57	14.11	14.11	829
6	25.25	0.00	27.00	11.48	68.78	14.85	14.85	829
7	24.88	0.00	33.75	14.35	85.98	18.86	18.86	829
8	24.50	0.00	40.50	17.22	103.17	22.86	22.86	829
9	24.00	0.00	49.50	21.04	126.10	28.20	28.20	829
10	23.63	0.00	56.25	23.91	143.29	32.19	32.19	829
11	23.25	0.00	63.00	26.78	160.49	36.18	36.18	829
12	22.95	0.00	68.35	29.06	174.13	39.34	39.34	829
13	22.65	0.00	73.71	31.34	187.77	42.49	42.49	829
14	22.36	0.00	79.06	33.61	201.41	45.64	45.64	829
15	22.06	0.00	84.42	35.89	215.05	48.79	48.79	829
16	22.00	0.00	85.50	36.35	217.80	49.42	49.42	829
		0.00	85.50	30.30	274.88	43.18	43.18	4143

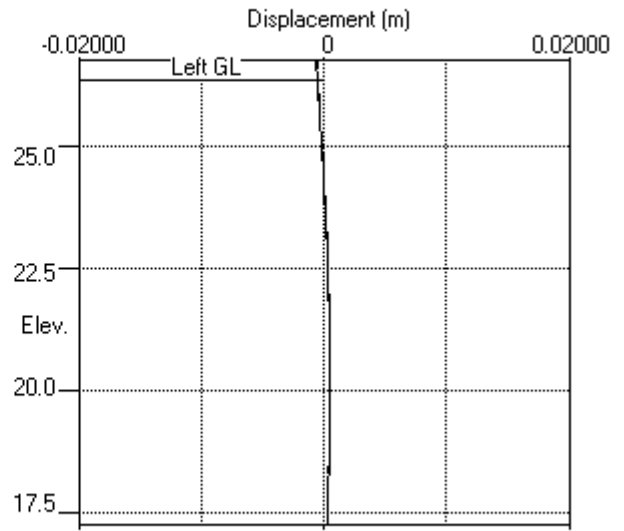
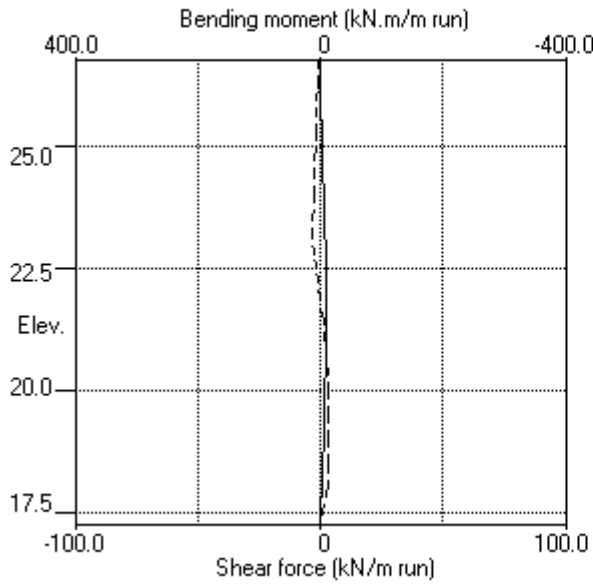
(continued)

Stage No.3 Apply surcharge no.2 at elevation 23.25

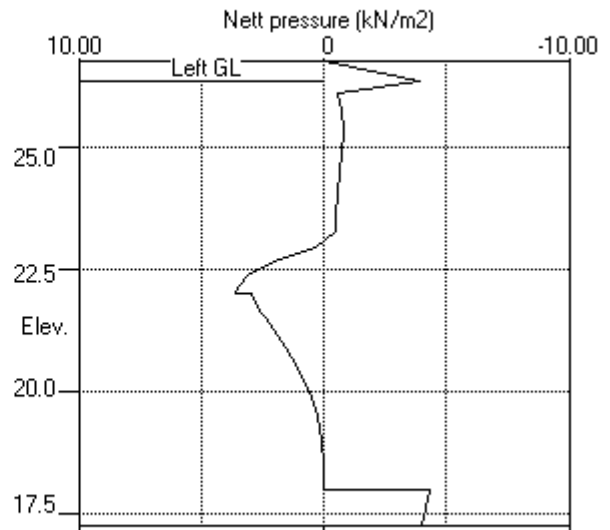
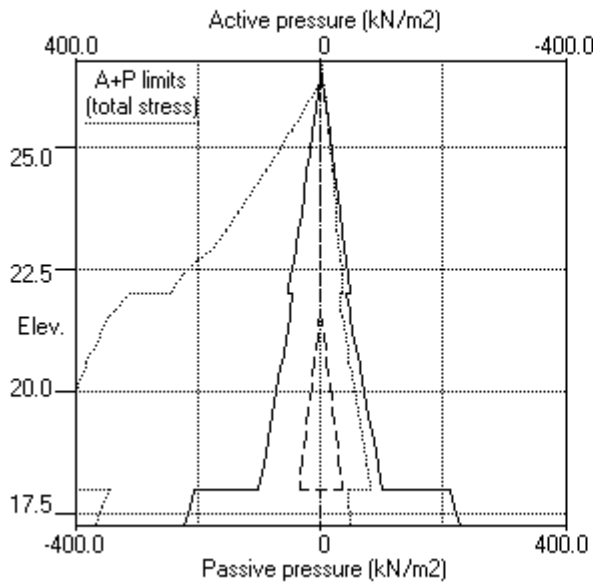
Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
17	21.64	0.00	92.70	32.85	298.03	47.05	47.05	4143
18	21.50	0.00	95.50	33.84	307.03	48.54	48.54	4143
19	21.03	4.61	100.29	35.54	322.43	51.19	55.80	4143
20	20.56	9.22	105.08	37.24	337.83	53.76	62.98	4143
21	20.50	9.81	105.69	37.46	339.79	54.08	63.89	4143
22	20.00	14.71	110.79	39.26	356.17	56.73	71.44	4143
23	19.50	19.62	115.88	41.07	372.55	59.30	78.92	4143
24	19.00	24.52	120.98	42.87	388.93	61.81	86.34	4143
25	18.50	29.43	126.07	44.68	405.32	64.29	93.72	4143
26	18.00	34.34	131.17	46.48	421.70	66.74	101.08	4143
		Total>	165.50	43.75m	336.24	210.37	210.37	18948
27	17.63	Total>	173.00	45.63m	348.86	218.77	218.77	19517
28	17.25	Total>	180.50	47.50m	361.49	227.13	227.13	20085

Units: kN,m

Stage No.3 Apply surcharge no.2 at elev. 23.25



Stage No.3 Apply surcharge no.2 at elev. 23.25



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 25.25 on RIGHT side

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

			Overall		Toe elev. for			
			FoS for toe		FoS = 1.000			
			elev. = 17.25					
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction	
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of	
			Safety	at elev.		-ation	failure	
4	26.32 25.25	Cant.	3.586	17.89	23.76	1.49	L to R	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	0.005	7.54E-04	0.0	0.0		138544
2	26.32	0.00	0.005	7.53E-04	0.0	0.0		138544
3	26.10	1.69	0.005	7.53E-04	0.2	0.0		138544
4	25.75	4.45	0.005	7.53E-04	1.3	0.2		138544
5	25.32	8.01	0.004	7.51E-04	3.9	1.3		138544
6	25.25	8.60	0.004	7.50E-04	4.5	1.6		138544
7	24.88	-4.21	0.004	7.43E-04	5.3	3.9		138544
8	24.50	-3.04	0.004	7.30E-04	4.0	5.6		138544
9	24.00	-1.53	0.003	7.06E-04	2.8	7.2		138544
10	23.63	-0.46	0.003	6.86E-04	2.5	8.2		138544
11	23.25	0.54	0.003	6.62E-04	2.5	9.1		138544
12	22.95	2.09	0.003	6.42E-04	2.9	9.9		138544
13	22.65	4.49	0.002	6.19E-04	3.9	10.9		138544
14	22.36	6.22	0.002	5.95E-04	5.4	12.2		138544
15	22.06	7.32	0.002	5.66E-04	7.5	14.1		138544
16	22.00	7.49	0.002	5.60E-04	7.9	14.6		138544
		-13.29	0.002	5.60E-04	7.9	14.6		
17	21.64	-10.74	0.002	5.19E-04	3.6	16.8		138544
18	21.50	-9.69	0.002	5.02E-04	2.1	17.2		138544
19	21.03	-6.63	0.002	4.44E-04	-1.7	17.2		138544
20	20.56	-4.13	0.001	3.88E-04	-4.2	15.6		138544
21	20.50	-3.84	0.001	3.82E-04	-4.5	15.4		138544
22	20.00	-1.70	0.001	3.31E-04	-5.8	12.6		138544
23	19.50	0.06	0.001	2.91E-04	-6.2	9.5		138544
24	19.00	1.55	0.001	2.62E-04	-5.8	6.4		138544
25	18.50	2.86	0.001	2.44E-04	-4.7	3.6		138544
26	18.00	4.07	0.001	2.35E-04	-3.0	1.6		138544
		0.76	0.001	2.35E-04	-3.0	1.6		
27	17.63	3.96	0.001	2.32E-04	-2.1	0.5		138544
28	17.25	7.39	0.001	2.31E-04	0.0	-0.0		---

(continued)

Stage No.4 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.69	10.12	1.69	1.69a	1417
4	25.75	0.00	10.46	4.45	26.64	4.45	4.45a	1417
5	25.32	0.00	18.84	8.01	47.98	8.01	8.01a	1417
6	25.25	0.00	20.24	8.60	51.55	8.60	8.60a	1417
7	24.88	0.00	27.85	11.84	70.94	12.18	12.18	1417
8	24.50	0.00	35.52	15.10	90.48	16.79	16.79	1417
9	24.00	0.00	45.68	19.42	116.36	22.90	22.90	1417
10	23.63	0.00	53.19	22.61	135.50	27.43	27.43	1417
11	23.25	0.00	60.60	25.76	154.38	31.91	31.91	1417
12	22.95	0.00	68.81	29.25	175.29	36.23	36.23	1417
13	22.65	0.00	79.64	33.85	202.87	41.42	41.42	1417
14	22.36	0.00	88.55	37.64	225.57	45.95	45.95	1417
15	22.06	0.00	95.66	40.67	243.68	49.87	49.87	1417
16	22.00	0.00	96.94	41.21	246.95	50.61	50.61	1417
		0.00	96.94	34.36	311.67	34.36	34.36a	7085
17	21.64	0.00	104.69	37.10	336.58	38.99	38.99	7085
18	21.50	0.00	107.49	38.09	345.57	40.89	40.89	7085
19	21.03	4.61	111.83	39.63	359.54	44.65	49.26	7085
20	20.56	9.22	115.89	41.07	372.58	48.10	57.32	7085
21	20.50	9.81	116.40	41.25	374.22	48.52	58.33	7085
22	20.00	14.71	120.66	42.76	387.92	51.94	66.65	7085
23	19.50	19.62	124.96	44.28	401.75	55.19	74.81	7085
24	19.00	24.52	129.33	45.83	415.80	58.32	82.85	7085
25	18.50	29.43	133.77	47.40	430.06	61.38	90.81	7085
26	18.00	34.34	138.26	49.00	444.50	64.41	98.74	7085
		Total>	172.59	41.60m	343.34	196.10	196.10	29969
27	17.63	Total>	179.67	43.48m	355.54	206.07	206.07	30869
28	17.25	Total>	186.78	45.35m	367.76	216.18	216.18	31768

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1551
7	24.88	0.00	6.75	2.87	17.20	16.39	16.39	1551
8	24.50	0.00	13.50	5.74	34.39	19.83	19.83	1551
9	24.00	0.00	22.50	9.57	57.32	24.42	24.42	1551
10	23.63	0.00	29.25	12.43	74.51	27.89	27.89	1551
11	23.25	0.00	36.00	15.30	91.71	31.37	31.37	1551
12	22.95	0.00	41.36	17.58	105.35	34.14	34.14	1551
13	22.65	0.00	46.71	19.86	118.99	36.93	36.93	1551
14	22.36	0.00	52.07	22.13	132.64	39.73	39.73	1551
15	22.06	0.00	57.42	24.41	146.28	42.54	42.54	1551
16	22.00	0.00	58.50	24.87	149.03	43.11	43.11	1551
		0.00	58.50	20.73	188.09	47.65	47.65	7755

(continued)

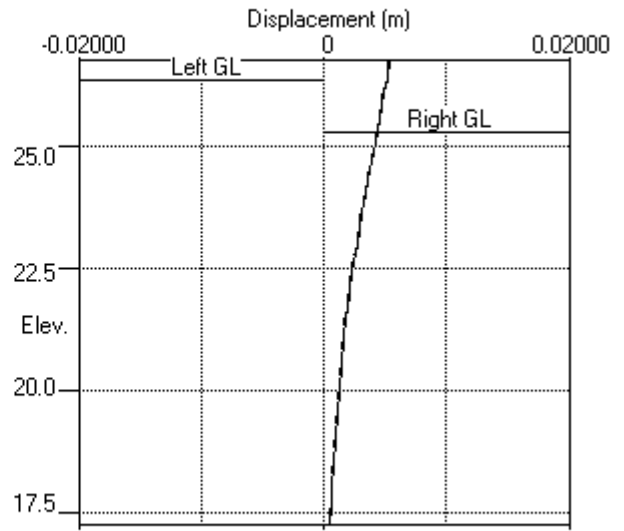
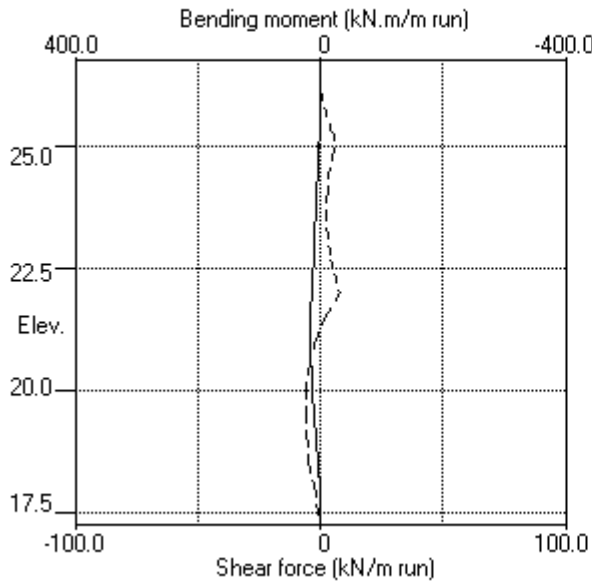
Stage No.4 Excavate to elevation 25.25 on RIGHT side

Node no.	Y coord	----- RIGHT side -----						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
17	21.64	0.00	65.70	23.28	211.24	49.73	49.73	7755	
18	21.50	0.00	68.50	24.28	220.24	50.58	50.58	7755	
19	21.03	4.61	73.30	25.98	235.65	51.28	55.89	7755	
20	20.56	9.22	78.09	27.67	251.05	52.23	61.45	7755	
21	20.50	9.81	78.70	27.89	253.02	52.36	62.17	7755	
22	20.00	14.71	83.80	29.70	269.41	53.64	68.36	7755	
23	19.50	19.62	88.90	31.50	285.80	55.13	74.75	7755	
24	19.00	24.52	94.00	33.31	302.20	56.77	81.30	7755	
25	18.50	29.43	99.10	35.12	318.60	58.52	87.95	7755	
26	18.00	34.34	104.20	36.93	335.00	60.34	94.68	7755	
		Total>	138.53	36.25m	309.27	195.33	195.33	32561	
27	17.63	Total>	146.04	38.13m	321.90	202.12	202.12	33538	
28	17.25	Total>	153.55	40.00m	334.53	208.79	208.79	34515	

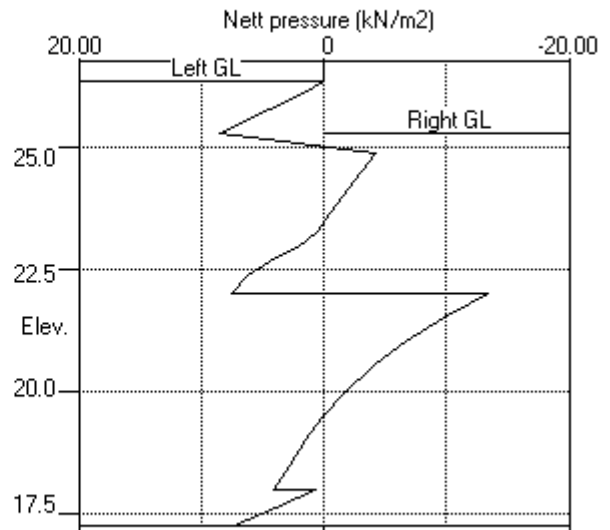
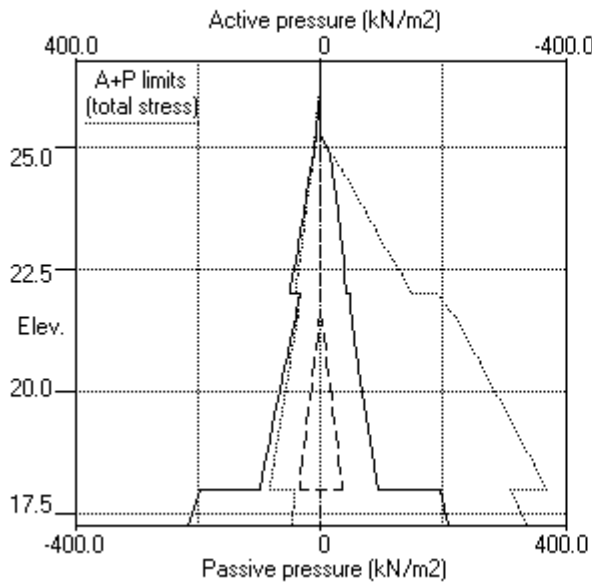
Note: 34.36a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 25.25 on RIGHT side



Stage No.4 Excav. to elev. 25.25 on RIGHT side



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 6 Apply water pressure profile no.1 (Worst Cred.)

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

		Overall							
		FoS for toe		Toe elev. for					
		elev. = 17.25		FoS = 1.000					
		-----		-----					
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure		
6	26.32 25.25	25.75	6.727	n/a	24.81	0.44	L to R		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.005	6.71E-04	0.0	0.0		138544
2	26.32	0.00	0.005	6.71E-04	0.0	0.0		138544
3	26.10	1.88	0.005	6.71E-04	0.2	0.0		138544
4	25.75	4.45	0.005	6.71E-04	1.3	0.3	0.4	138544
		4.45	0.005	6.71E-04	1.0	0.3		
5	25.32	8.01	0.004	6.69E-04	3.6	1.2		138544
6	25.25	8.60	0.004	6.68E-04	4.2	1.5		138544
7	24.88	-4.36	0.004	6.61E-04	5.0	3.7		138544
8	24.50	-3.24	0.004	6.49E-04	3.6	5.2		138544
9	24.00	-1.81	0.004	6.28E-04	2.3	6.6		138544
10	23.63	-0.79	0.003	6.09E-04	1.8	7.4		138544
11	23.25	0.15	0.003	5.88E-04	1.7	8.0		138544
12	22.95	1.66	0.003	5.70E-04	2.0	8.6		138544
13	22.65	4.02	0.003	5.51E-04	2.8	9.3		138544
14	22.36	5.71	0.003	5.30E-04	4.3	10.3		138544
15	22.06	6.78	0.002	5.06E-04	6.1	11.8		138544
16	22.00	6.94	0.002	5.01E-04	6.6	12.2		138544
		-14.67	0.002	5.01E-04	6.6	12.2		
17	21.64	-13.69	0.002	4.67E-04	1.4	13.9		138544
18	21.50	-12.71	0.002	4.53E-04	-0.4	14.0		138544
19	21.03	-6.77	0.002	4.08E-04	-5.0	12.5		138544
20	20.56	-1.32	0.002	3.71E-04	-6.9	9.5		138544
21	20.50	-0.65	0.002	3.67E-04	-6.9	9.1		138544
22	20.00	1.47	0.002	3.40E-04	-6.7	5.5		138544
23	19.50	3.34	0.001	3.26E-04	-5.5	2.3		138544
24	19.00	5.07	0.001	3.22E-04	-3.4	-0.1		138544
25	18.50	6.71	0.001	3.24E-04	-0.5	-1.1		138544
26	18.00	8.34	0.001	3.28E-04	3.3	-0.6		138544
		-8.91	0.001	3.28E-04	3.3	-0.6		
27	17.63	-4.46	0.001	3.28E-04	0.8	0.0		138544
28	17.25	0.35	0.001	3.28E-04	0.0	-0.0		---
At elev. 25.75		Strut force =		1.8 kN/strut =		0.4 kN/m run		

(continued)

Stage No.6 Apply water pressure profile no.1 (Worst Cred.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	3.97	1.69	10.12	1.88	1.88	7297
4	25.75	0.00	10.46	4.45	26.64	4.45	4.45a	960
5	25.32	0.00	18.84	8.01	47.98	8.01	8.01a	960
6	25.25	0.00	20.24	8.60	51.55	8.60	8.60a	960
7	24.88	0.00	27.85	11.84	70.94	12.11	12.11	960
8	24.50	0.00	35.52	15.10	90.48	16.69	16.69	960
9	24.00	0.00	45.68	19.42	116.36	22.76	22.76	960
10	23.63	0.00	53.19	22.61	135.50	27.26	27.26	960
11	23.25	0.00	60.60	25.76	154.38	31.72	31.72	960
12	22.95	0.00	68.81	29.25	175.29	36.02	36.02	960
13	22.65	0.00	79.64	33.85	202.87	41.18	41.18	960
14	22.36	0.00	88.55	37.64	225.57	45.69	45.69	960
15	22.06	0.00	95.66	40.67	243.68	49.59	49.59	960
16	22.00	0.00	96.94	41.21	246.95	50.33	50.33	960
		0.00	96.94	34.36	311.67	34.36	34.36a	4802
17	21.64	0.00	104.69	37.10	336.58	37.52	37.52	4802
18	21.50	0.00	107.49	38.09	345.57	39.37	39.37	4802
19	21.03	4.61	111.83	39.63	359.54	43.04	47.65	4802
20	20.56	9.22	115.89	41.07	372.58	46.43	55.65	4802
21	20.50	9.81	116.40	41.25	374.22	46.85	56.66	4802
22	20.00	14.71	120.66	42.76	387.92	50.26	64.97	4802
23	19.50	19.62	124.96	44.28	401.75	53.56	73.18	4802
24	19.00	24.52	129.33	45.83	415.80	56.81	81.34	4802
25	18.50	29.43	133.77	47.40	430.06	60.04	89.47	4802
26	18.00	34.34	138.26	49.00	444.50	63.28	97.61	4802
		Total>	172.59	41.60m	343.34	191.06	191.06	21302
27	17.63	Total>	179.67	43.48m	355.54	201.67	201.67	21941
28	17.25	Total>	186.78	45.35m	367.76	212.47	212.47	22580

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	26.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	25.32	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	960
7	24.88	0.00	6.75	2.87	17.20	16.46	16.46	960
8	24.50	0.00	13.50	5.74	34.39	19.93	19.93	960
9	24.00	0.00	22.50	9.57	57.32	24.56	24.56	960
10	23.63	0.00	29.25	12.43	74.51	28.05	28.05	960
11	23.25	0.00	36.00	15.30	91.71	31.56	31.56	960
12	22.95	0.00	41.36	17.58	105.35	34.36	34.36	960
13	22.65	0.00	46.71	19.86	118.99	37.16	37.16	960
14	22.36	0.00	52.07	22.13	132.64	39.98	39.98	960
15	22.06	0.00	57.42	24.41	146.28	42.82	42.82	960
16	22.00	0.00	58.50	24.87	149.03	43.39	43.39	960
		0.00	58.50	20.73	188.09	49.03	49.03	4802

(continued)

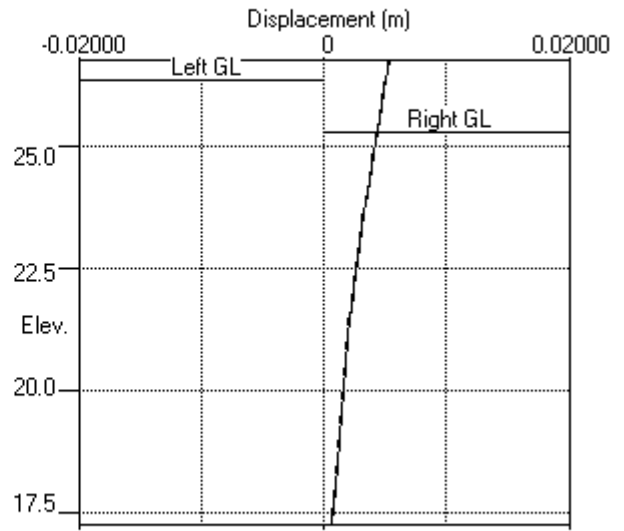
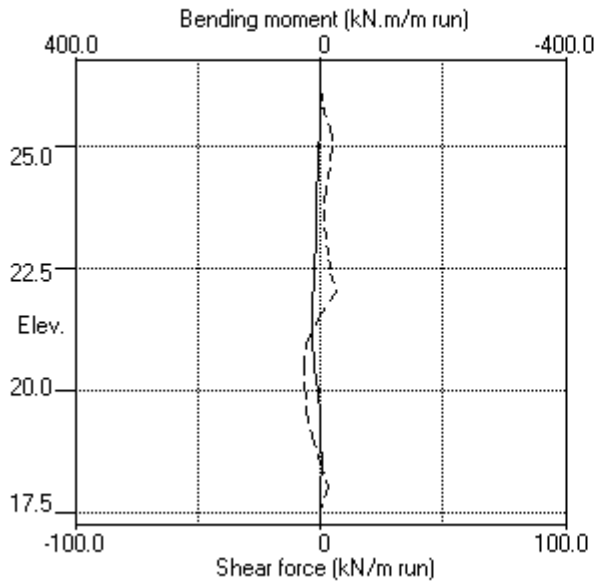
Stage No.6 Apply water pressure profile no.1 (Worst Cred.)

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
17	21.64	0.00	65.70	23.28	211.24	51.21	51.21	4802
18	21.50	0.00	68.50	24.28	220.24	52.09	52.09	4802
19	21.03	0.00	77.91	27.61	250.47	54.42	54.42	4802
20	20.56	0.00	87.31	30.94	280.70	56.97	56.97	4802
21	20.50	0.00	88.51	31.37	284.56	57.31	57.31	4802
22	20.00	4.90	93.61	33.17	300.95	58.59	63.50	4802
23	19.50	9.81	98.71	34.98	317.34	60.03	69.84	4802
24	19.00	14.71	103.81	36.79	333.74	61.55	76.27	4802
25	18.50	19.62	108.91	38.60	350.14	63.14	82.76	4802
26	18.00	24.52	114.01	40.40	366.54	64.74	89.27	4802
		Total>	138.53	36.25m	309.27	199.98	199.98	21302
27	17.63	Total>	146.04	38.13m	321.90	206.13	206.13	21941
28	17.25	Total>	153.55	40.00m	334.53	212.12	212.12	22580

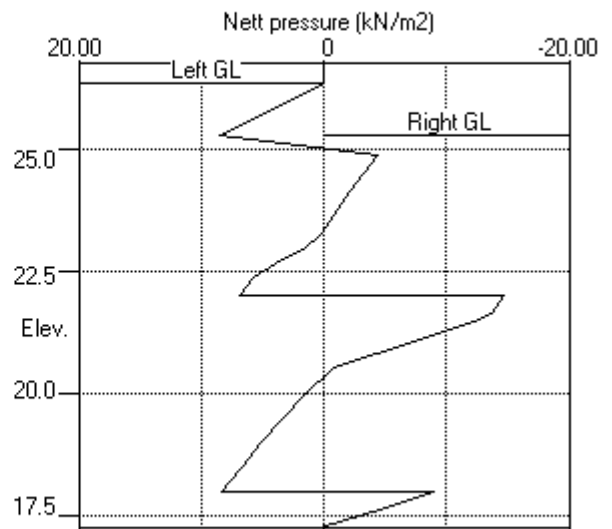
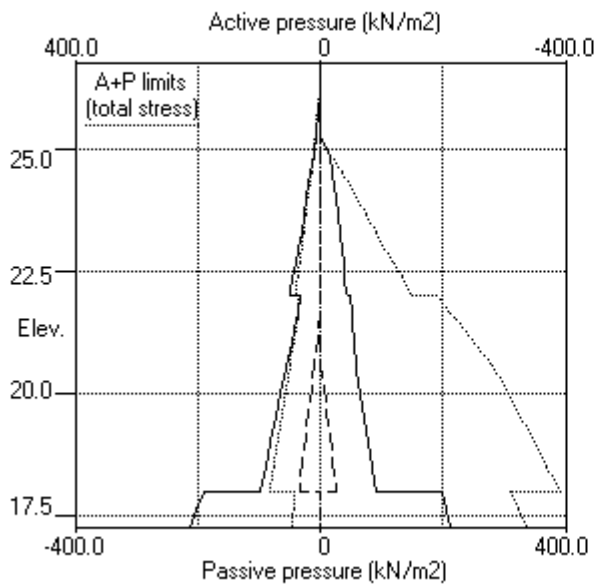
Note: 34.36a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Apply water pressure profile no.1 (Worst Cred.)



Stage No.6 Apply water pressure profile no.1 (Worst Cred.)



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 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 20.56 on RIGHT side

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

			Overall					
			FoS for toe		Toe elev. for			
			elev. = 17.25		FoS = 1.000			

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure
7	26.32	20.56	25.75	1.219	n/a	17.59	2.97	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.001	-4.31E-03	0.0	0.0		138544
2	26.32	0.00	0.003	-4.31E-03	0.0	0.0		138544
3	26.10	10.12	0.004	-4.31E-03	1.1	0.1		138544
4	25.75	4.45	0.005	-4.31E-03	3.7	1.0	97.1	138544
		4.45	0.005	-4.31E-03	-93.5	1.0		
5	25.32	8.01	0.007	-4.25E-03	-90.8	-38.7		138544
6	25.25	8.60	0.008	-4.23E-03	-90.2	-45.0		138544
7	24.88	11.84	0.009	-4.07E-03	-86.4	-77.9		138544
8	24.50	15.10	0.011	-3.81E-03	-81.3	-109.4		138544
9	24.00	19.42	0.012	-3.35E-03	-72.7	-148.0		138544
10	23.63	22.61	0.014	-2.91E-03	-64.8	-173.9		138544
11	23.25	25.76	0.015	-2.41E-03	-55.8	-196.5		138544
12	22.95	29.25	0.015	-1.97E-03	-47.6	-211.9		138544
13	22.65	33.85	0.016	-1.50E-03	-38.2	-224.7		138544
14	22.36	37.64	0.016	-1.01E-03	-27.6	-234.6		138544
15	22.06	40.67	0.016	-5.04E-04	-15.9	-241.1		138544
16	22.00	41.21	0.016	-4.00E-04	-13.5	-241.9		138544
		34.36	0.016	-4.00E-04	-13.5	-241.9		
17	21.64	37.10	0.016	2.31E-04	-0.6	-244.3		138544
18	21.50	38.09	0.016	4.78E-04	4.7	-244.0		138544
19	21.03	44.24	0.016	1.29E-03	24.0	-237.5		138544
20	20.56	50.29	0.015	2.07E-03	46.2	-221.2		138544
21	20.50	47.20	0.015	2.16E-03	49.2	-218.3		138544
22	20.00	32.33	0.014	2.90E-03	69.0	-188.5		138544
23	19.50	17.47	0.012	3.51E-03	81.5	-150.7		138544
24	19.00	2.64	0.010	3.98E-03	86.5	-108.4		138544
25	18.50	-12.18	0.008	4.29E-03	84.1	-65.5		138544
26	18.00	-20.13	0.006	4.45E-03	76.1	-23.6		138544
		-142.45	0.006	4.45E-03	76.1	-23.6		
27	17.63	-112.98	0.004	4.49E-03	28.2	-5.2		138544
28	17.25	-37.29	0.003	4.50E-03	0.0	-0.0		---

At elev. 25.75 Strut force = 485.7 kN/strut = 97.1 kN/m run

(continued)

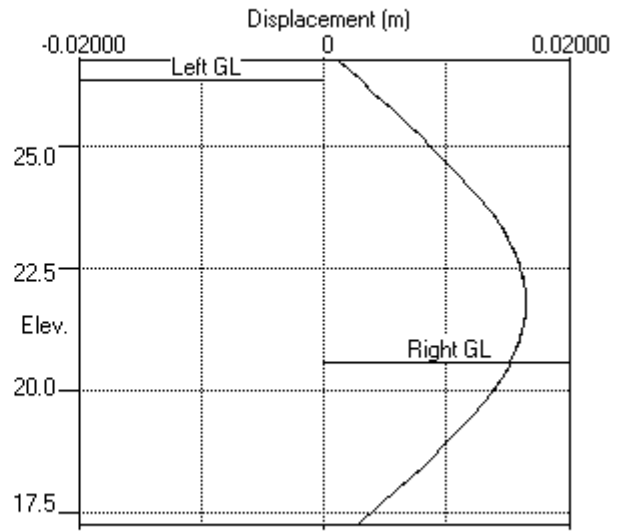
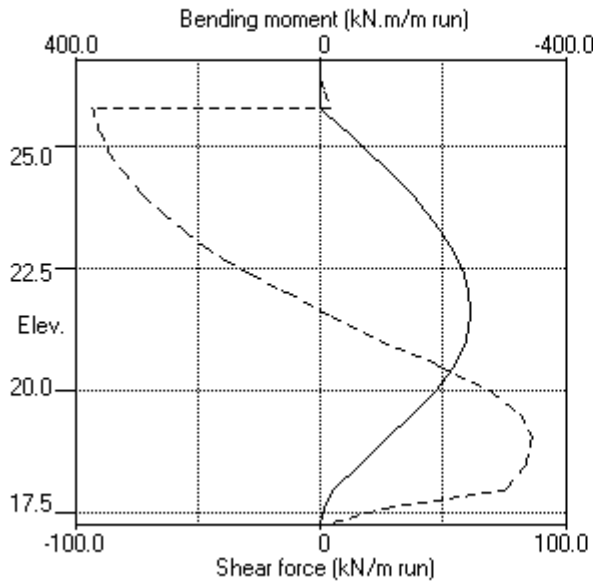
Stage No.7 Excavate to elevation 20.56 on RIGHT side

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
18	21.50	0.00	0.00	0.00	0.00	0.00	0.0	
19	21.03	0.00	0.00	0.00	0.00	0.00	0.0	
20	20.56	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	8430	
21	20.50	0.00	1.20	0.43	3.86	3.86	3.86p 8430	
22	20.00	4.90	6.30	2.23	20.24	20.24	25.14p 8430	
23	19.50	9.81	11.39	4.04	36.62	36.62	46.43p 8430	
24	19.00	14.71	16.49	5.84	53.00	53.00	67.72p 8430	
25	18.50	19.62	21.58	7.65	69.39	69.39	89.01p 8430	
26	18.00	24.52	26.68	9.46	85.78	78.93	103.46 8430	
		Total>	51.21	12.80m	221.92	221.92	221.92p 35181	
27	17.63	Total>	58.71	14.67m	234.55	234.55	234.55p 36236	
28	17.25	Total>	66.21	16.55m	247.18	203.35	203.35 37292	

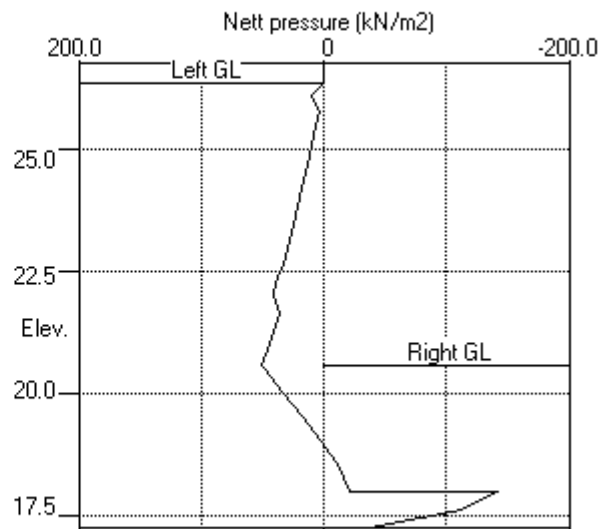
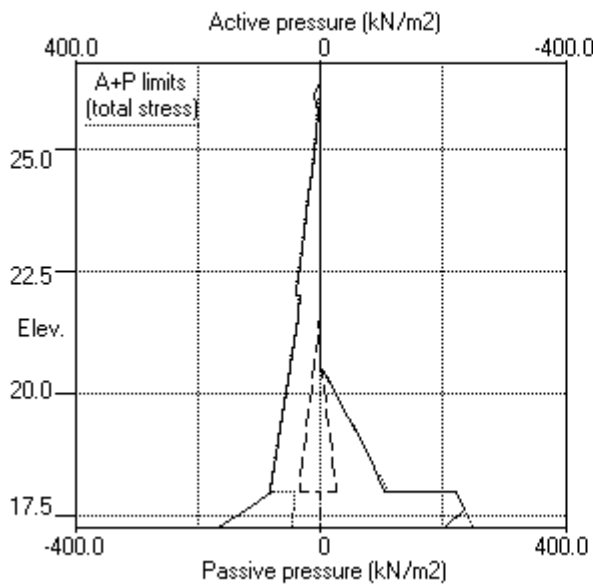
Note: 83.33a Soil pressure at active limit
 234.55p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. 20.56 on RIGHT side



Stage No.7 Excav. to elev. 20.56 on RIGHT side



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 8 Fill to elevation 21.64 on RIGHT side with soil type 1

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

		Overall							
		FoS for toe		Toe elev. for					
		elev. = 17.25		FoS = 1.000					
		-----		-----					
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction		
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of		
			Safety	at elev.		-ation	failure		
8	26.32 21.64	25.75	1.652	n/a	19.05	2.59	L to R		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.75	0.00	0.001	-4.20E-03	0.0	0.0		138544
2	26.32	0.00	0.003	-4.20E-03	0.0	0.0		138544
3	26.10	9.86	0.004	-4.20E-03	1.1	0.1		138544
4	25.75	4.45	0.005	-4.20E-03	3.6	1.0	96.6	138544
		4.45	0.005	-4.20E-03	-93.0	1.0		
5	25.32	8.06	0.007	-4.14E-03	-90.3	-38.5		138544
6	25.25	8.66	0.008	-4.12E-03	-89.7	-44.8		138544
7	24.88	11.94	0.009	-3.95E-03	-85.8	-77.4		138544
8	24.50	15.24	0.011	-3.70E-03	-80.7	-108.7		138544
9	24.00	19.61	0.012	-3.24E-03	-72.0	-147.1		138544
10	23.63	22.85	0.013	-2.81E-03	-64.1	-172.6		138544
11	23.25	26.04	0.014	-2.31E-03	-54.9	-195.0		138544
12	22.95	29.55	0.015	-1.87E-03	-46.6	-210.1		138544
13	22.65	34.18	0.015	-1.41E-03	-37.2	-222.6		138544
14	22.36	38.00	0.016	-9.24E-04	-26.4	-232.1		138544
15	22.06	41.05	0.016	-4.19E-04	-14.7	-238.3		138544
16	22.00	41.60	0.016	-3.16E-04	-12.2	-239.1		138544
		36.29	0.016	-3.16E-04	-12.2	-239.1		
17	21.64	39.17	0.016	3.06E-04	1.4	-240.8		138544
18	21.50	39.14	0.016	5.50E-04	6.9	-240.2		138544
19	21.03	41.84	0.016	1.35E-03	25.9	-232.7		138544
20	20.56	44.40	0.015	2.11E-03	46.2	-215.9		138544
		45.78	0.015	2.11E-03	46.2	-215.9		
21	20.50	45.94	0.015	2.20E-03	48.9	-213.0		138544
22	20.00	31.22	0.013	2.92E-03	68.2	-183.6		138544
23	19.50	16.42	0.012	3.51E-03	80.1	-146.2		138544
24	19.00	1.56	0.010	3.96E-03	84.6	-104.8		138544
25	18.50	-13.34	0.008	4.27E-03	81.7	-63.0		138544
26	18.00	-21.43	0.006	4.42E-03	73.0	-22.4		138544
		-138.48	0.006	4.42E-03	73.0	-22.4		
27	17.63	-108.87	0.004	4.46E-03	26.6	-5.0		138544

(continued)

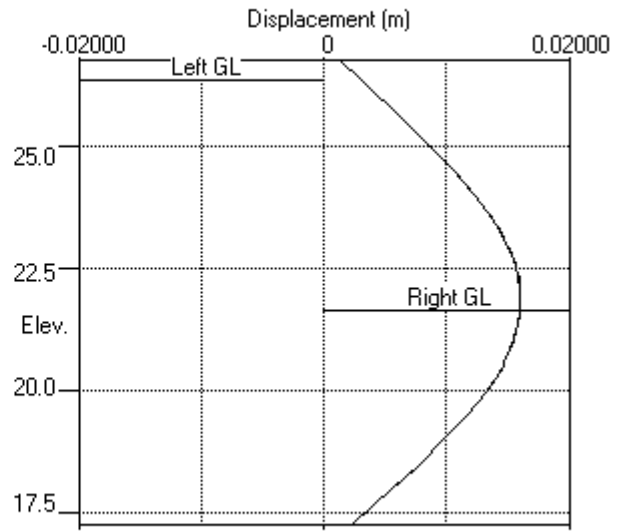
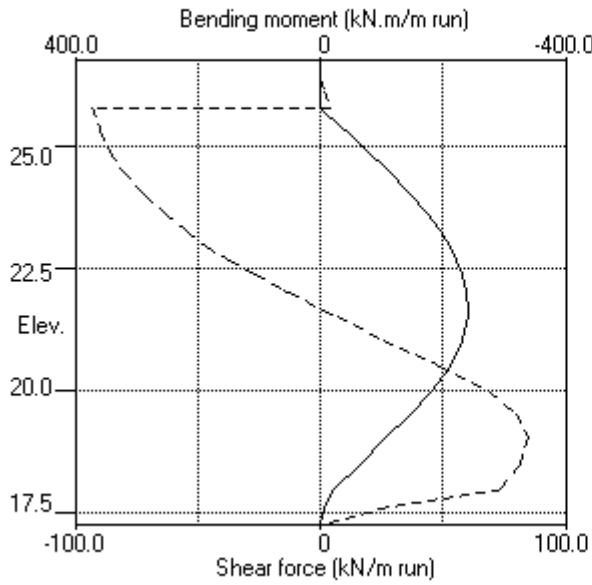
Stage No.8 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1137
18	21.50	0.00	2.52	1.07	6.42	1.07	1.07a	1137
19	21.03	0.00	10.98	4.67	27.97	4.67	4.67a	1137
20	20.56	0.00	19.44	8.26	49.52	8.26	8.26a	1137
		0.00	19.44	6.89	62.50	6.89	6.89a	5686
21	20.50	0.00	20.64	7.31	66.36	7.51	7.51	5686
22	20.00	4.90	25.74	9.12	82.74	23.81	28.71	5686
23	19.50	9.81	30.83	10.93	99.13	40.16	49.97	5686
24	19.00	14.71	35.93	12.73	115.52	56.56	71.27	5686
25	18.50	19.62	41.03	14.54	131.91	72.99	92.61	5686
26	18.00	24.52	46.13	16.35	148.31	82.61	107.13	5686
		Total>	70.66	18.20m	241.38	228.47	228.47	24611
27	17.63	Total>	78.16	20.08m	254.00	241.02	241.02	25349
28	17.25	Total>	85.67	21.95m	266.63	209.78	209.78	26088

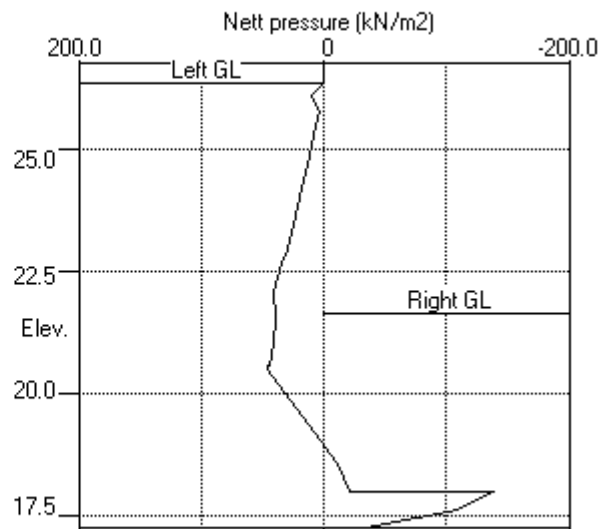
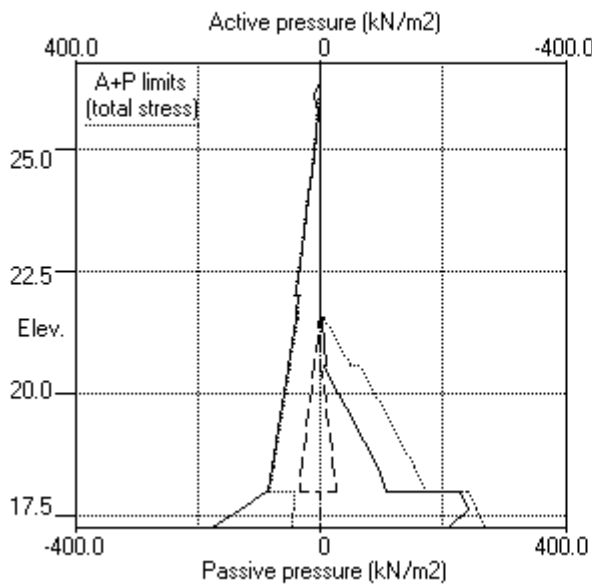
Note: 6.89a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Fill to elev. 21.64 on RIGHT side



Stage No.8 Fill to elev. 21.64 on RIGHT side



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 11 Remove strut or anchor no.1 at elevation 25.75

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

		Overall					
		FoS for toe		Toe elev. for			
		elev. = 17.25		FoS = 1.000			
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of
			Safety	at elev.		-ation	failure
11	26.32 21.64		More than one strut.	No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.001	-4.41E-03	0.0	0.0		138544
2	26.32	0.00	0.003	-4.41E-03	0.0	0.0		138544
3	26.10	9.71	0.004	-4.41E-03	1.1	0.1	85.7	138544
		9.71	0.004	-4.41E-03	-84.6	0.1		
4	25.75	4.45	0.006	-4.38E-03	-82.1	-29.0		138544
5	25.32	8.01	0.007	-4.23E-03	-79.5	-63.8		138544
6	25.25	8.60	0.008	-4.20E-03	-78.9	-69.4		138544
7	24.88	11.84	0.009	-3.97E-03	-75.0	-98.0		138544
8	24.50	15.10	0.011	-3.67E-03	-70.0	-125.2		138544
9	24.00	19.42	0.012	-3.16E-03	-61.4	-158.2		138544
10	23.63	22.61	0.014	-2.70E-03	-53.5	-179.8		138544
11	23.25	25.82	0.015	-2.19E-03	-44.4	-198.2		138544
12	22.95	29.39	0.015	-1.75E-03	-36.2	-210.2		138544
13	22.65	34.07	0.016	-1.29E-03	-26.7	-219.6		138544
14	22.36	37.93	0.016	-8.16E-04	-16.0	-226.0		138544
15	22.06	41.03	0.016	-3.27E-04	-4.3	-229.1	13.4	138544
		41.03	0.016	-3.27E-04	-17.6	-229.1		
16	22.00	41.58	0.016	-2.28E-04	-15.2	-230.1		138544
		36.21	0.016	-2.28E-04	-15.2	-230.1		
17	21.64	39.28	0.016	3.72E-04	-1.6	-232.9		138544
18	21.50	39.31	0.016	6.08E-04	3.9	-232.7		138544
19	21.03	42.15	0.015	1.38E-03	23.1	-226.6		138544
20	20.56	44.79	0.015	2.12E-03	43.5	-211.1		138544
		46.17	0.015	2.12E-03	43.5	-211.1		
21	20.50	46.53	0.015	2.22E-03	46.3	-208.4		138544
22	20.00	32.05	0.013	2.92E-03	65.9	-180.1		138544
23	19.50	17.22	0.012	3.50E-03	78.2	-143.9		138544
24	19.00	2.26	0.010	3.95E-03	83.1	-103.3		138544
25	18.50	-12.78	0.008	4.25E-03	80.5	-62.2		138544
26	18.00	-21.02	0.006	4.40E-03	72.0	-22.1		138544
		-136.72	0.006	4.40E-03	72.0	-22.1		

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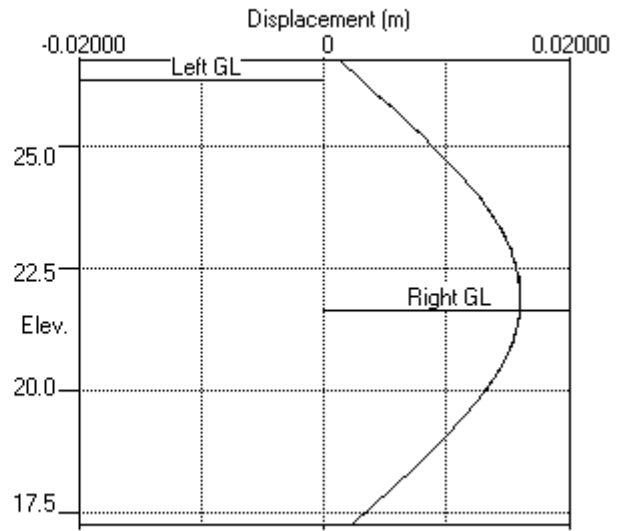
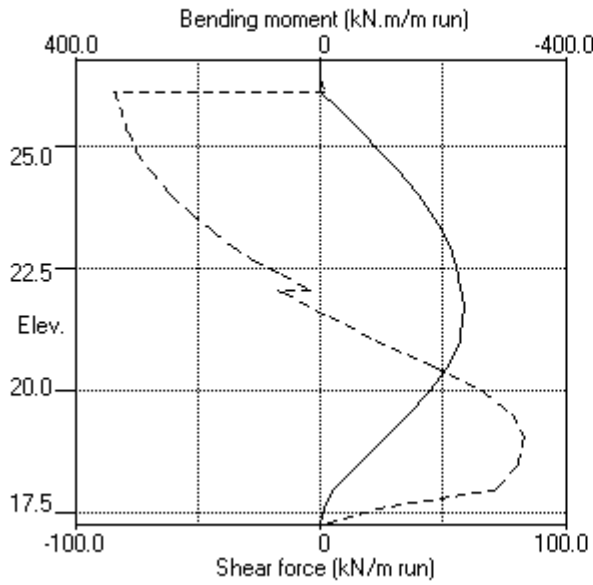
Stage No.11 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
10	23.63	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1307
18	21.50	0.00	2.52	1.07	6.42	1.07	1.07a	1307
19	21.03	0.00	10.98	4.67	27.97	4.67	4.67a	1307
20	20.56	0.00	19.44	8.26	49.52	8.26	8.26a	1307
		0.00	19.44	6.89	62.50	6.89	6.89a	6535
21	20.50	0.00	20.64	7.31	66.36	7.31	7.31a	6535
22	20.00	4.90	25.74	9.12	82.74	23.39	28.30	6535
23	19.50	9.81	30.83	10.93	99.13	39.76	49.57	6535
24	19.00	14.71	35.93	12.73	115.52	56.21	70.92	6535
25	18.50	19.62	41.03	14.54	131.91	72.71	92.33	6535
26	18.00	24.52	46.13	16.35	148.31	82.40	106.93	6535
		Total>	70.66	18.20m	241.38	227.58	227.58	27854
27	17.63	Total>	78.16	20.08m	254.00	240.37	240.37	28690
28	17.25	Total>	85.67	21.95m	266.63	209.38	209.38	29525

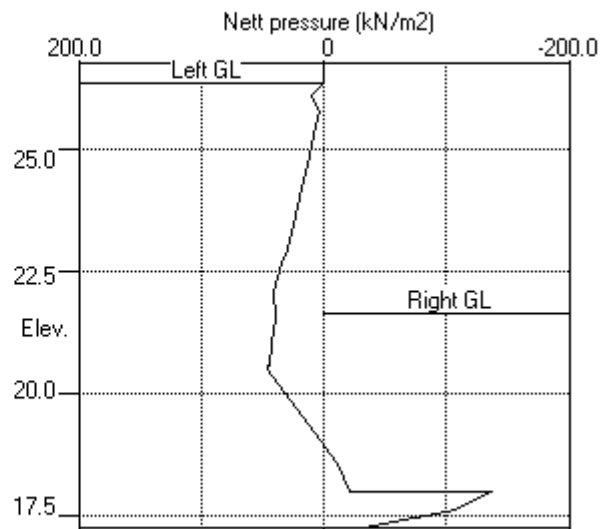
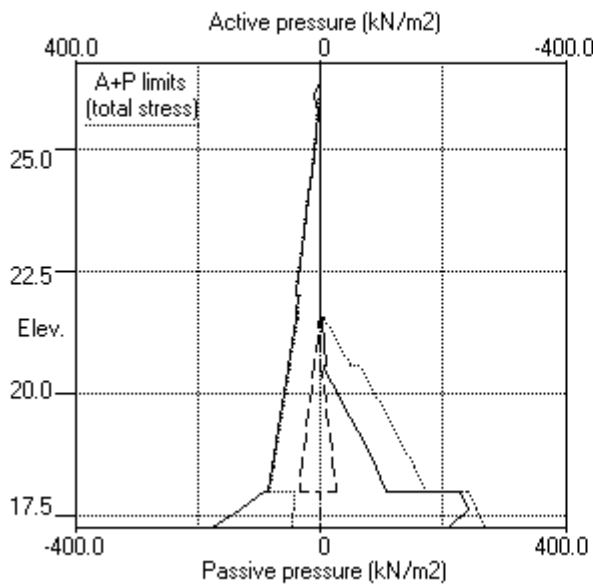
Note: 7.31a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.11 Remove strut no.1 at elev. 25.75



Stage No.11 Remove strut no.1 at elev. 25.75



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 12 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

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

		Overall					
		FoS for toe		Toe elev. for			
		elev. = 17.25		FoS = 1.000			

Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
12	26.32 21.64		More than one strut.	No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DAL Combination 2

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	26.75	0.00	0.001	-4.49E-03	0.0	0.0		98960
2	26.32	0.00	0.003	-4.49E-03	0.0	0.0		98960
3	26.10	9.88	0.004	-4.49E-03	1.1	0.1	66.7	98960
		9.88	0.004	-4.49E-03	-65.6	0.1		
4	25.75	4.45	0.006	-4.45E-03	-63.1	-23.9		98960
5	25.32	8.01	0.008	-4.30E-03	-60.4	-52.3		98960
6	25.25	8.60	0.008	-4.26E-03	-59.8	-56.8		98960
7	24.88	11.84	0.009	-4.02E-03	-56.0	-79.8		98960
8	24.50	15.10	0.011	-3.70E-03	-51.0	-101.5		98960
9	24.00	19.42	0.013	-3.16E-03	-42.3	-127.1		98960
10	23.63	22.61	0.014	-2.68E-03	-34.4	-143.2		98960
11	23.25	25.76	0.015	-2.16E-03	-25.4	-156.0		98960
12	22.95	29.33	0.015	-1.72E-03	-17.2	-163.6		98960
13	22.65	34.02	0.016	-1.26E-03	-7.8	-168.6		98960
14	22.36	37.89	0.016	-8.01E-04	2.9	-170.7		98960
15	22.06	40.98	0.016	-3.39E-04	14.7	-169.3	48.4	98960
		40.98	0.016	-3.39E-04	-33.8	-169.3		
16	22.00	41.54	0.016	-2.46E-04	-31.3	-171.1		98960
		36.00	0.016	-2.46E-04	-31.3	-171.1		
17	21.64	39.01	0.016	3.30E-04	-17.8	-178.4		98960
18	21.50	38.90	0.016	5.61E-04	-12.3	-180.0		98960
19	21.03	41.61	0.016	1.34E-03	6.6	-179.8		98960
20	20.56	44.17	0.015	2.12E-03	26.7	-170.4		98960
		44.92	0.015	2.12E-03	26.7	-170.4		
21	20.50	45.28	0.015	2.21E-03	29.4	-168.5		98960
22	20.00	30.92	0.013	2.96E-03	48.5	-146.9		98960
23	19.50	16.49	0.012	3.58E-03	60.3	-117.6		98960
24	19.00	2.17	0.010	4.06E-03	65.0	-84.0		98960
25	18.50	-11.09	0.008	4.37E-03	62.8	-49.9		98960

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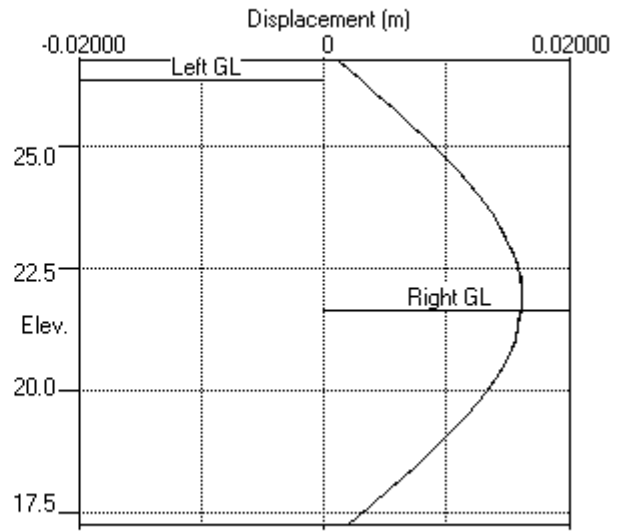
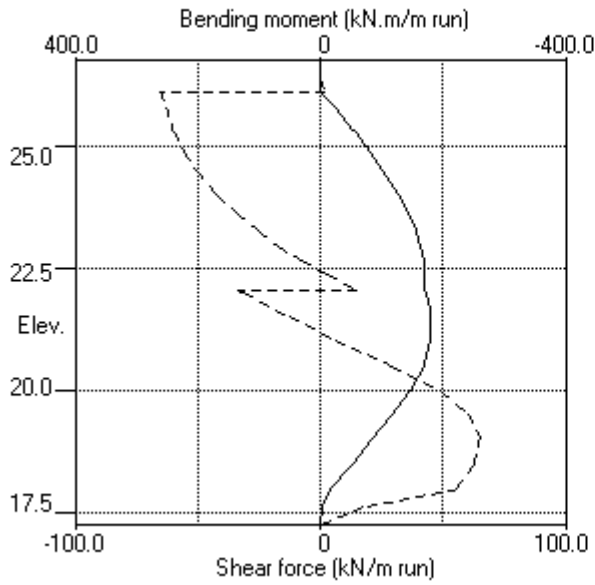
Stage No.12 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Earth pressure kN/m2		
6	25.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
7	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
8	24.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
9	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
10	23.63	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	0.00	1674	
18	21.50	0.00	2.52	1.07	6.42	1.17	1.17	1674	
19	21.03	0.00	10.98	4.67	27.97	4.80	4.80	1674	
20	20.56	0.00	19.44	8.26	49.52	8.42	8.42	1674	
		0.00	19.44	6.89	62.50	7.67	7.67	8372	
21	20.50	0.00	20.64	7.31	66.36	8.10	8.10	8372	
22	20.00	4.90	25.74	9.12	82.74	24.10	29.01	8372	
23	19.50	9.81	30.83	10.93	99.13	40.22	50.03	8372	
24	19.00	14.71	35.93	12.73	115.52	56.26	70.97	8372	
25	18.50	19.62	41.03	14.54	131.91	71.87	91.49	15539	
26	18.00	24.52	46.13	16.35	148.31	80.55	105.07	15539	
		Total>	70.66	18.20m	241.38	220.08	220.08	62859	
27	17.63	Total>	78.16	20.08m	254.00	229.50	229.50	64744	
28	17.25	Total>	85.67	21.95m	266.63	195.01	195.01	66630	

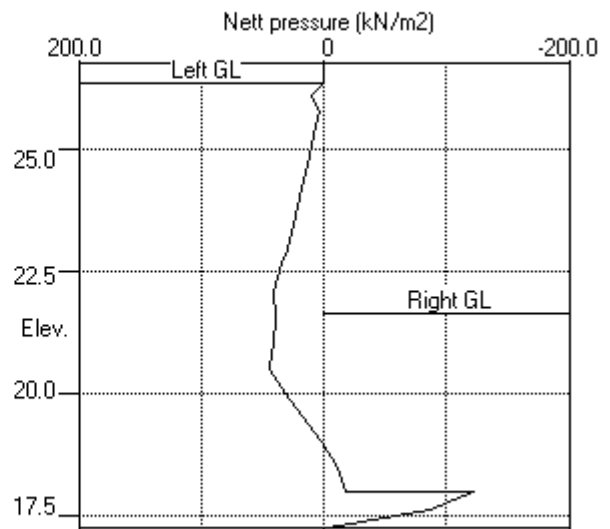
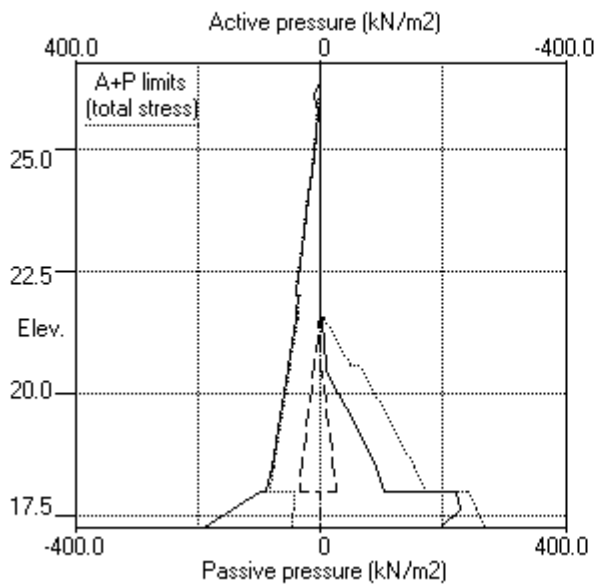
Note: 25.76a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.12 Change EI of wall to 98960kN.m²/m run



Stage No.12 Change EI of wall to 98960kN.m²/m run



Units: kN,m

Stage No. 15 Apply water pressure profile no.2 (Worst Cred.)

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

			Overall				
			FoS for toe		Toe elev. for		
			elev. = 17.25		FoS = 1.000		
			-----		-----		
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of
			Safety	at elev.		-ation	failure
15	26.32 21.64		More than one strut.	No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.00	0.001	-4.73E-03	0.0	0.0		98960
2	26.32	0.00	0.003	-4.73E-03	0.0	0.0		98960
3	26.10	9.87	0.004	-4.73E-03	1.1	0.1	77.3	98960
		9.87	0.004	-4.73E-03	-76.2	0.1		
4	25.75	4.45	0.006	-4.69E-03	-73.7	-27.6		98960
5	25.32	8.01	0.008	-4.51E-03	-71.1	-60.6		98960
6	25.25	9.00	0.008	-4.46E-03	-70.5	-65.8		98960
7	24.88	14.35	0.010	-4.18E-03	-66.1	-92.8		98960
8	24.50	19.98	0.011	-3.80E-03	-59.6	-118.0		98960
9	24.00	27.53	0.013	-3.17E-03	-47.8	-147.2		98960
10	23.63	33.19	0.014	-2.62E-03	-36.4	-164.6		98960
11	23.25	38.85	0.015	-2.01E-03	-22.9	-177.4		98960
12	22.95	44.44	0.015	-1.51E-03	-10.5	-183.7		98960
13	22.65	51.18	0.016	-1.00E-03	3.7	-186.0		98960
14	22.36	57.12	0.016	-4.89E-04	19.8	-183.8		98960
15	22.06	62.30	0.016	2.30E-06	37.6	-176.6	49.1	98960
		62.30	0.016	2.30E-06	-11.5	-176.6		
16	22.00	63.28	0.016	9.91E-05	-7.8	-176.9		98960
		57.87	0.016	9.91E-05	-7.8	-176.9		
17	21.64	64.23	0.016	6.79E-04	14.2	-174.3		98960
		23.62	0.016	6.79E-04	14.2	-174.3		
18	21.50	24.12	0.016	9.02E-04	17.6	-171.6		98960
19	21.03	25.27	0.015	1.62E-03	29.2	-159.1		98960
20	20.56	25.72	0.014	2.27E-03	41.2	-141.0		98960
		26.77	0.014	2.27E-03	41.2	-141.0		
21	20.50	26.82	0.014	2.35E-03	42.8	-138.3		98960
22	20.00	15.44	0.013	2.93E-03	53.3	-112.4		98960
23	19.50	0.12	0.011	3.38E-03	57.2	-82.5		98960
24	19.00	-16.44	0.009	3.68E-03	53.1	-52.6		98960
25	18.50	-33.14	0.008	3.86E-03	40.7	-26.8		98960
26	18.00	-49.60	0.006	3.94E-03	20.1	-7.2		98960
		-48.71	0.006	3.94E-03	20.1	-7.2		

(continued)

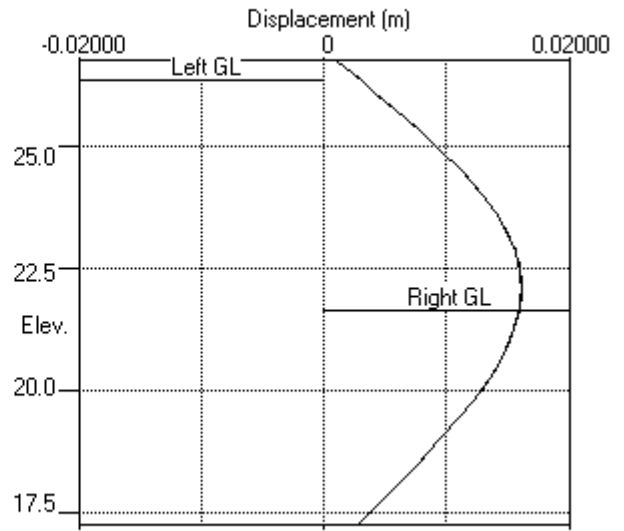
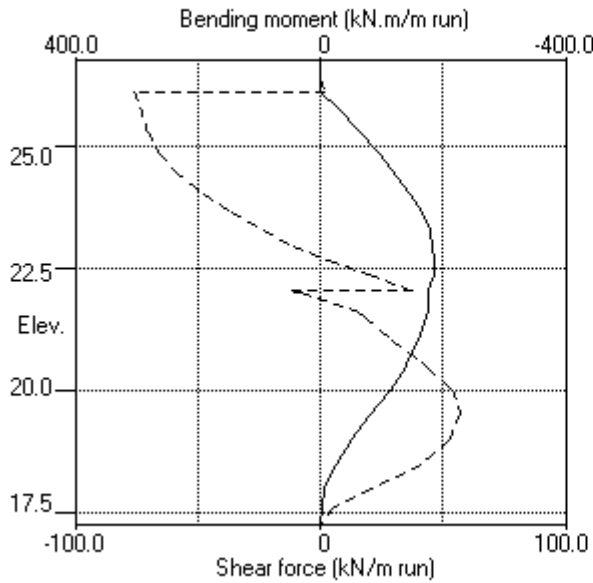
Stage No.15 Apply water pressure profile no.2 (Worst Cred.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
10	23.63	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		40.32	0.68	0.29	1.73	0.29	40.61a	1574
18	21.50	41.69	1.82	0.78	4.65	0.78	42.47a	1574
19	21.03	46.30	5.67	2.41	14.45	2.50	48.80	1574
20	20.56	50.91	9.50	4.04	24.21	4.41	55.33	1574
		50.91	9.50	3.37	30.55	3.37	54.28a	7869
21	20.50	51.50	10.11	3.58	32.50	3.58	55.09a	7869
22	20.00	56.41	15.15	5.37	48.72	16.82	73.22	7869
23	19.50	61.31	20.16	7.14	64.81	33.36	94.67	7869
24	19.00	66.22	25.11	8.90	80.74	50.50	116.72	7869
25	18.50	71.12	30.01	10.64	96.49	67.80	138.92	7869
26	18.00	76.03	34.86	12.35	112.06	81.56	157.58	20907
		76.03	34.86	14.82	88.79	88.79	164.82p	45479
27	17.63	79.71	38.45	16.34	97.94	97.94	177.65p	46843
28	17.25	83.39	42.01	17.86	107.01	107.01	190.39p	48207

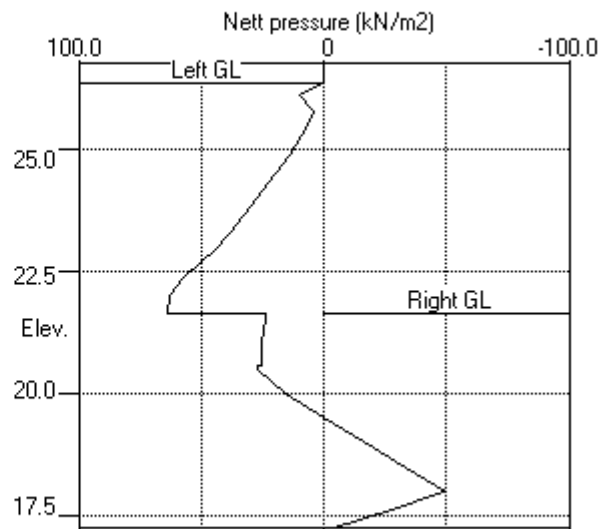
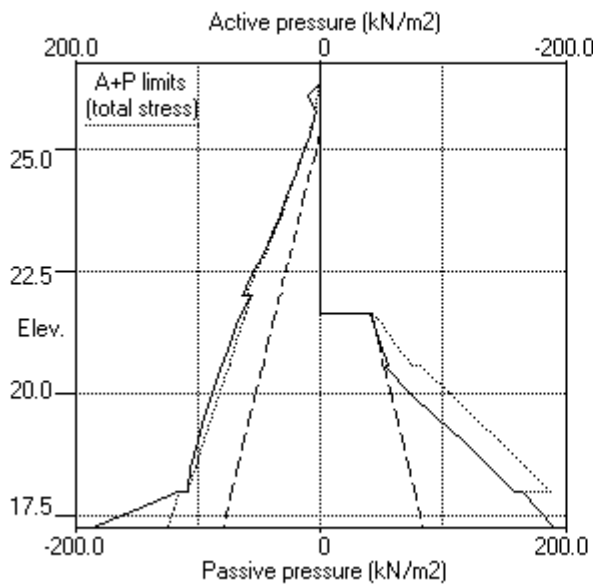
Note: 55.09a Soil pressure at active limit
 190.39p Soil pressure at passive limit

Units: kN,m

Stage No.15 Apply water pressure profile no.2 (Worst Cred.)



Stage No.15 Apply water pressure profile no.2 (Worst Cred.)



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 Data filename/Run ID: Fitzrovia_Wall_2_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: ULS DA1 Combination 2
 Water pressures : Worst Credible
 Partial factor on C' = 1.250
 Partial factor on Phi' = 1.250
 Partial factor on Cu = 1.400
 Partial factor on Soil Modulus = 1.000
 Partial factor on Permanent Unfavourable loads = 1.000
 Partial factor on Permanent Favourable loads = 1.000
 Partial factor on Variable Unfavourable loads = 1.300

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	G.L.		Strut Elev.	Overall		Toe elev.	Wall Penetr	Direction of failure
	Act.	Pass.		Factor of Safety	Moment at elev.			
1	26.75	26.32	Cant.	12.594	18.21	25.81	0.51	R to L
2	26.75	26.32	Cant.	20.000	19.22	25.82	0.50	R to L
3	26.75	26.32	Cant.	15.641	21.02	25.82	0.50	R to L
4	26.32	25.25	Cant.	3.586	17.89	23.76	1.49	L to R
5	26.32	25.25		No analysis at this stage				
6	26.32	25.25	25.75	6.727	n/a	24.81	0.44	L to R
7	26.32	20.56	25.75	1.219	n/a	17.59	2.97	L to R
8	26.32	21.64	25.75	1.652	n/a	19.05	2.59	L to R
9	26.32	21.64		No analysis at this stage				

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

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 Fitzrovia - Middlesex Hospital Annexe
 Wall 2, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.75	0.005	-0.001	0.0	0.0	0.0	0.0
2	26.32	0.005	-0.001	0.0	-0.1	0.0	-0.8
3	26.10	0.005	-0.001	0.1	-0.4	1.1	-84.6
4	25.75	0.006	-0.001	1.0	-29.0	3.7	-93.5
5	25.32	0.008	-0.001	1.3	-63.8	3.9	-90.8
6	25.25	0.008	-0.001	1.6	-69.4	4.5	-90.2
7	24.88	0.010	-0.001	3.9	-98.0	5.3	-86.4
8	24.50	0.011	-0.001	5.6	-125.2	4.0	-81.3
9	24.00	0.013	-0.001	7.2	-158.2	2.8	-72.7
10	23.63	0.014	-0.001	8.2	-179.8	2.5	-64.8
11	23.25	0.015	-0.001	9.1	-198.2	2.5	-55.8
12	22.95	0.015	-0.001	9.9	-211.9	2.9	-47.6
13	22.65	0.016	-0.001	10.9	-224.7	3.9	-38.2
14	22.36	0.016	-0.001	12.2	-234.6	19.8	-27.6
15	22.06	0.016	-0.000	14.1	-241.1	37.6	-33.8
16	22.00	0.016	-0.000	14.6	-241.9	7.9	-31.3
17	21.64	0.016	-0.000	16.8	-244.3	14.2	-17.8
18	21.50	0.016	-0.000	17.2	-244.0	17.6	-12.3
19	21.03	0.016	-0.000	17.2	-237.5	29.2	-5.0
20	20.56	0.015	-0.000	15.6	-221.2	46.2	-6.9
21	20.50	0.015	-0.000	15.4	-218.3	49.2	-6.9
22	20.00	0.014	-0.000	12.6	-188.5	69.0	-6.7
23	19.50	0.012	-0.000	9.5	-150.7	81.5	-6.2
24	19.00	0.010	-0.000	6.4	-108.4	86.5	-5.8
25	18.50	0.008	-0.000	3.6	-65.5	84.1	-4.7
26	18.00	0.006	-0.000	1.6	-23.6	76.1	-3.0
27	17.63	0.004	-0.000	0.5	-5.2	28.2	-2.1
28	17.25	0.003	-0.000	0.0	-0.0	0.0	0.0

Summary of results (continued)

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	26.75	-5.2	21.03	1.9	19.50	-2.4	22.00
2	0.0	26.75	-6.0	21.50	1.9	19.00	-1.5	24.50
3	0.0	26.75	-10.0	21.64	3.1	18.00	-3.1	22.95
4	17.2	21.50	-0.0	17.25	7.9	22.00	-6.2	19.50
5	No calculation at this stage							
6	14.0	21.50	-1.1	18.50	6.6	22.00	-6.9	20.50
7	1.0	25.75	-244.3	21.64	86.5	19.00	-93.5	25.75
8	1.0	25.75	-240.8	21.64	84.6	19.00	-93.0	25.75
9	No calculation at this stage							
10	No calculation at this stage							
11	0.1	26.10	-232.9	21.64	83.1	19.00	-84.6	26.10
12	0.1	26.10	-180.0	21.50	65.0	19.00	-65.6	26.10
13	No calculation at this stage							
14	No calculation at this stage							
15	0.1	26.10	-186.0	22.65	57.2	19.50	-76.2	26.10

Maximum and minimum displacement at each stage

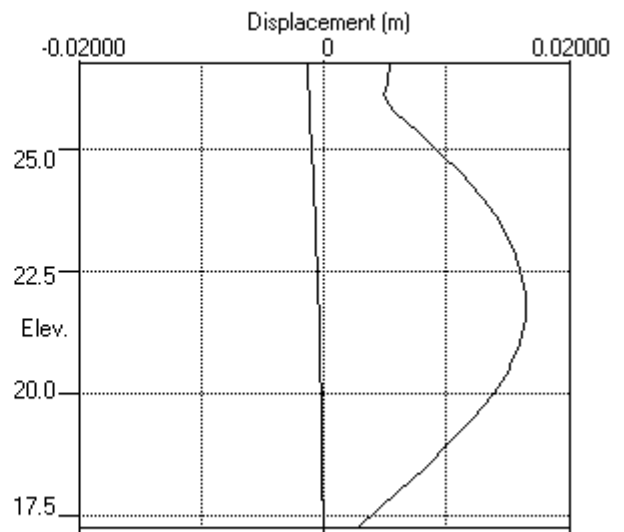
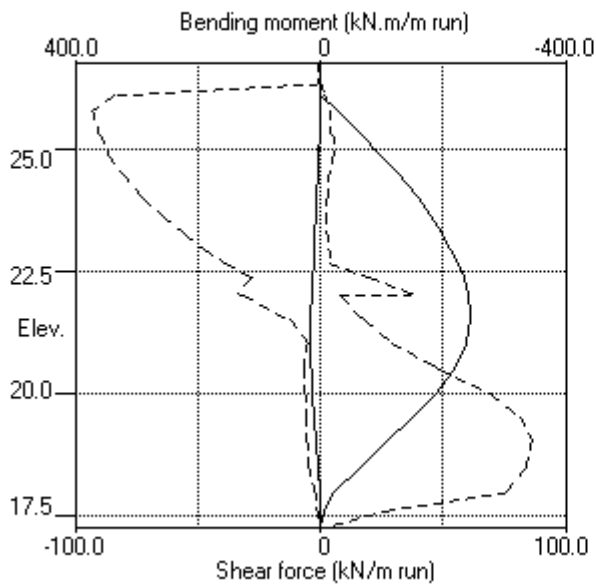
Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.000	26.75	-0.001	26.75	Excav. to elev. 26.32 on LEFT side
2	0.000	18.00	-0.001	26.75	Apply surcharge no.1 at elev. 26.32
3	0.000	20.50	-0.001	26.75	Apply surcharge no.2 at elev. 23.25
4	0.005	26.75	0.000	26.75	Excav. to elev. 25.25 on RIGHT side
5	No calculation at this stage				
6	0.005	26.75	0.000	26.75	Install strut no.1 at elev. 25.75
7	0.016	21.64	0.000	26.75	Apply water pressure profile no.1
8	0.016	21.64	0.000	26.75	Excav. to elev. 20.56 on RIGHT side
9	No calculation at this stage				
10	No calculation at this stage				
11	0.016	22.00	0.000	26.75	Fill to elev. 21.64 on RIGHT side
12	0.016	22.00	0.000	26.75	Install strut no.2 at elev. 22.06
13	No calculation at this stage				
14	No calculation at this stage				
15	0.016	22.06	0.000	26.75	Install strut no.3 at elev. 26.10
					Remove strut no.1 at elev. 25.75
					Change EI of wall to 98960kN.m ² /m run
					Change soil type 3 to soil type 4
					Apply surcharge no.3 at elev. 21.64
					Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1		Strut no. 2		Strut no. 3	
	at elev. 25.75 kN/m run	kN/strut	at elev. 22.06 kN/m run	kN/strut	at elev. 26.10 kN/m run	kN/strut
6	0.35	1.77	---	---	---	---
7	97.15	485.73	---	---	---	---
8	96.56	482.82	---	---	---	---
11	---	---	13.36	13.36	85.68	85.68
12	---	---	48.44	48.44	66.70	66.70
15	---	---	49.13	49.13	77.33	77.33

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

3-SLS

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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	24.60	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES

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 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

	Left side	Right side
Initial water table elevation	21.50	21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
	2	1	23.60	23.60	0.0	1	21.64	21.64
2						21.64	23.60	19.2

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 14.25
 Maximum finite element length = 0.60 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
2	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m ² ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	24.60	1.35(L)	20.00	20.00	18.00	=	N/A	1.00 Var
2	23.25	0.40(L)	20.00	0.95	48.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	20.00	=	N/A	1.00 P/F

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 24.60
2	Apply surcharge no.2 at elevation 23.25
3	Apply water pressure profile no.1 (Mod. Conserv.)
4	Excavate to elevation 21.04 on RIGHT side
5	Fill to elevation 21.64 on RIGHT side with soil type 1
6	Install strut or anchor no.1 at elevation 22.06
7	Install strut or anchor no.2 at elevation 26.10
8	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
9	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
10	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
11	Apply water pressure profile no.2 (Mod. Conserv.)

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 = 1.50

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) = 12.50 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m
Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m
Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 24.60	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 23.25	No	No	No
3	Apply water pressure profile no.1	Yes	Yes	Yes
4	Excav. to elev. 21.04 on RIGHT side	Yes	Yes	Yes
5	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
6	Install strut no.1 at elev. 22.06	Yes	Yes	Yes
7	Install strut no.2 at elev. 26.10	Yes	Yes	Yes
8	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
9	Change soil type 3 to soil type 4	Yes	Yes	Yes
10	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
11	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 24.60

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. =	Moment of equil. at elev.	Toe elev. for FoS =	Wall Penetr-ation	Direction of failure
1	24.60 24.60	Cant.	14.25		1.500		
<u>Conditions not suitable for FoS calc.</u>							

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.001	3.06E-05	0.0	0.0		138544
2	25.65	0.00	0.001	3.06E-05	0.0	-0.0		138544
3	25.20	0.00	0.001	3.06E-05	0.0	-0.0		138544
4	24.60	0.00	0.001	3.06E-05	0.0	-0.0		138544
5	24.10	-0.80	0.001	3.06E-05	-0.2	0.0		138544
6	23.60	-0.28	0.001	3.09E-05	-0.5	-0.2		138544
7	23.25	0.21	0.001	3.15E-05	-0.5	-0.3		138544
8	22.65	1.04	0.001	3.34E-05	-0.1	-0.5		138544
9	22.06	1.70	0.001	3.54E-05	0.7	-0.4		138544
10	22.00	1.76	0.001	3.56E-05	0.8	-0.3		138544
		-1.47	0.001	3.56E-05	0.8	-0.3		
11	21.64	-1.08	0.001	3.62E-05	0.4	-0.1		138544
12	21.50	-0.94	0.001	3.64E-05	0.2	-0.1		138544
13	21.04	-0.53	0.001	3.67E-05	-0.1	-0.1		138544
14	20.50	-0.13	0.001	3.73E-05	-0.3	-0.2		138544
15	20.15	0.09	0.000	3.80E-05	-0.3	-0.3		138544
16	19.80	0.30	0.000	3.90E-05	-0.2	-0.4		138544
17	19.20	0.61	0.000	4.12E-05	0.0	-0.5		138544
18	18.60	0.88	0.000	4.32E-05	0.5	-0.4		138544
19	18.00	1.13	0.000	4.40E-05	1.1	0.0		138544
		-1.18	0.000	4.40E-05	1.1	0.0		
20	17.40	-0.86	0.000	4.29E-05	0.5	0.5		138544
21	16.80	-0.56	0.000	4.06E-05	0.0	0.6		138544
22	16.20	-0.29	0.000	3.81E-05	-0.2	0.5		138544
23	15.60	-0.05	0.000	3.63E-05	-0.3	0.3		138544
24	15.00	0.20	0.000	3.53E-05	-0.3	0.1		138544
25	14.63	0.36	0.000	3.50E-05	-0.2	0.0		138544
26	14.25	0.53	0.000	3.50E-05	0.0	0.0		---

(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	722
5	24.10	0.00	9.33	3.28	30.35	4.85	4.85	722
6	23.60	0.00	19.82	6.96	64.46	10.55	10.55	722
7	23.25	0.00	27.55	9.68	89.63	14.67	14.67	722
8	22.65	0.00	40.64	14.28	132.20	21.66	21.66	722
9	22.06	0.00	53.27	18.71	173.27	28.49	28.49	722
10	22.00	0.00	54.51	19.15	177.32	29.17	29.17	722
		0.00	54.51	15.45	238.19	23.95	23.95	3611
11	21.64	0.00	62.61	17.74	273.56	27.89	27.89	3611
12	21.50	0.00	65.71	18.62	287.13	29.41	29.41	3611
13	21.04	4.51	71.26	20.19	311.37	32.11	36.62	3611
14	20.50	9.81	77.54	21.97	338.81	35.19	45.00	3611
15	20.15	13.24	81.50	23.09	356.11	37.15	50.39	3611
16	19.80	16.68	85.39	24.19	373.10	39.09	55.77	3611
17	19.20	22.56	91.92	26.04	401.61	42.37	64.93	3611
18	18.60	28.45	98.30	27.85	429.52	45.61	74.06	3611
19	18.00	34.34	104.57	29.63	456.93	48.81	83.15	3611
		Total>	138.91	33.00m	377.90	159.77	159.77	15907
20	17.40	Total>	150.98	36.00m	401.45	173.80	173.80	16671
21	16.80	Total>	162.98	39.00m	424.92	187.78	187.78	17435
22	16.20	Total>	174.92	42.00m	448.33	201.72	201.72	18198
23	15.60	Total>	186.81	45.00m	471.70	215.62	215.62	18962
24	15.00	Total>	198.67	48.00m	495.02	229.51	229.51	19725
25	14.63	Total>	206.07	49.87m	509.59	238.19	238.19	20202
26	14.25	Total>	213.45	51.75m	524.15	246.87	246.87	20680

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	722
5	24.10	0.00	9.00	3.16	29.27	5.65	5.65	722
6	23.60	0.00	18.00	6.32	58.55	10.83	10.83	722
7	23.25	0.00	24.30	8.54	79.04	14.46	14.46	722
8	22.65	0.00	35.01	12.30	113.88	20.62	20.62	722
9	22.06	0.00	45.72	16.06	148.72	26.79	26.79	722
10	22.00	0.00	46.80	16.44	152.23	27.41	27.41	722
		0.00	46.80	13.26	204.49	25.42	25.42	3611
11	21.64	0.00	54.00	15.30	235.95	28.98	28.98	3611
12	21.50	0.00	56.80	16.09	248.18	30.36	30.36	3611
13	21.04	4.51	61.49	17.42	268.66	32.64	37.15	3611
14	20.50	9.81	66.99	18.98	292.71	35.32	45.13	3611
15	20.15	13.24	70.56	19.99	308.29	37.06	50.30	3611
16	19.80	16.68	74.12	21.00	323.87	38.79	55.47	3611
17	19.20	22.56	80.24	22.73	350.59	41.76	64.32	3611

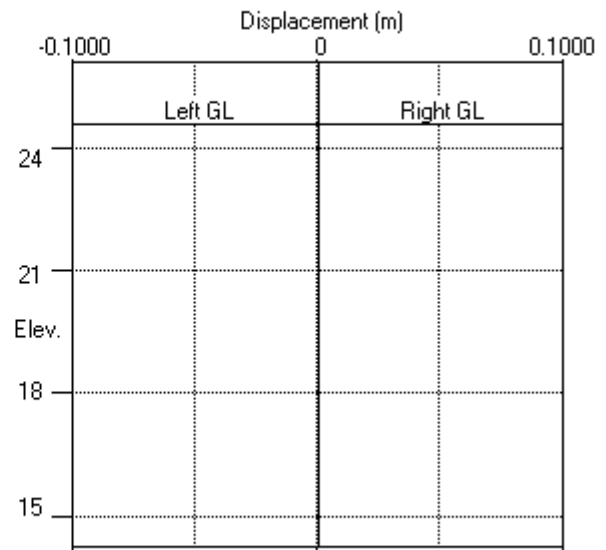
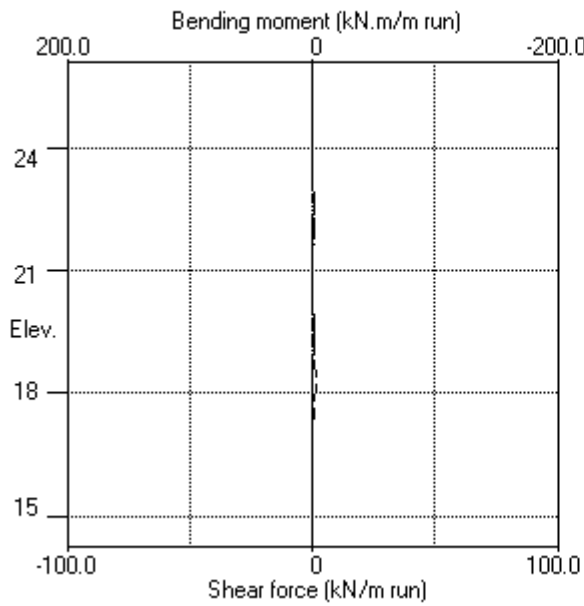
(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

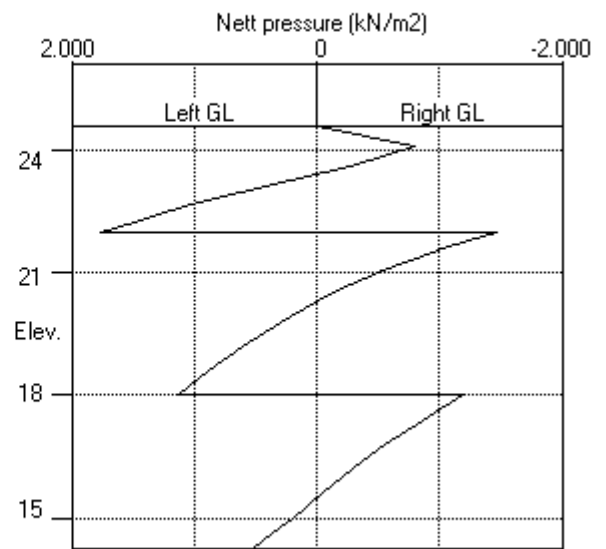
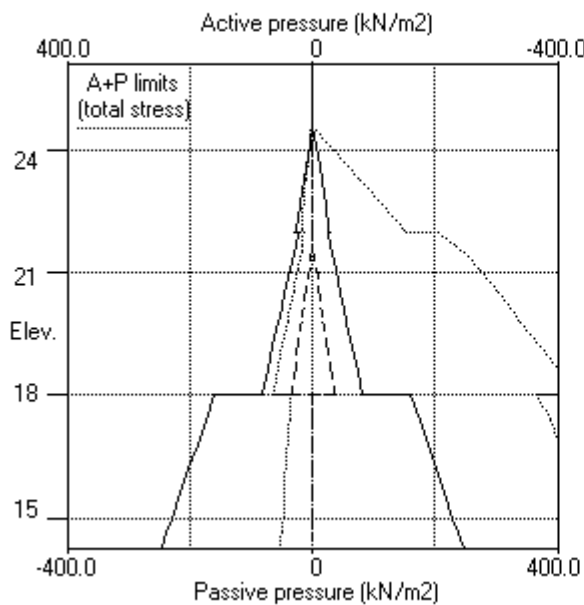
Node no.	Y coord	----- RIGHT side -----						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
18	18.60	28.45	86.35	24.47	377.30	44.73	73.17	3611
19	18.00	34.34	92.47	26.20	404.02	47.69	82.02	3611
		Total>	126.80	33.00m	365.79	160.95	160.95	15907
20	17.40	Total>	138.80	36.00m	389.27	174.65	174.65	16671
21	16.80	Total>	150.80	39.00m	412.74	188.34	188.34	17435
22	16.20	Total>	162.80	42.00m	436.21	202.01	202.01	18198
23	15.60	Total>	174.80	45.00m	459.68	215.67	215.67	18962
24	15.00	Total>	186.80	48.00m	483.15	229.32	229.32	19725
25	14.63	Total>	194.30	49.87m	497.82	237.83	237.83	20202
26	14.25	Total>	201.80	51.75m	512.49	246.33	246.33	20680

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 24.60



Stage No.1 Apply surcharge no.1 at elev. 24.60



Units: kN,m

Stage No. 2 Apply surcharge no.2 at elevation 23.25

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

				FoS for toe elev. = 14.25	Toe elev. for FoS = 1.500		
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction
No.	Act.	Pass.	Elev.	of	elev.	Penetr	of
				Safety	at elev.	-ation	failure
2	24.60	24.60	Cant.	<u>Conditions not suitable for FoS calc.</u>			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
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 50.00 from wall
Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.002	1.19E-04	0.0	-0.0		138544
2	25.65	0.00	0.002	1.19E-04	0.0	-0.0		138544
3	25.20	0.00	0.002	1.19E-04	0.0	-0.0		138544
4	24.60	0.00	0.002	1.19E-04	0.0	-0.0		138544
5	24.10	-2.69	0.002	1.19E-04	-0.7	0.0		138544
6	23.60	-2.08	0.002	1.20E-04	-1.9	-0.6		138544
7	23.25	-1.53	0.002	1.23E-04	-2.5	-1.4		138544
8	22.65	4.18	0.001	1.32E-04	-1.7	-2.8		138544
9	22.06	7.50	0.001	1.44E-04	1.8	-2.9		138544
10	22.00	7.61	0.001	1.45E-04	2.2	-2.8		138544
		-1.65	0.001	1.45E-04	2.2	-2.8		
11	21.64	-0.97	0.001	1.52E-04	1.8	-2.1		138544
12	21.50	-0.82	0.001	1.54E-04	1.6	-1.9		138544
13	21.04	-0.49	0.001	1.59E-04	1.3	-1.2		138544
14	20.50	-0.21	0.001	1.62E-04	1.1	-0.6		138544
15	20.15	-0.01	0.001	1.64E-04	1.1	-0.2		138544
16	19.80	0.21	0.001	1.64E-04	1.1	0.2		138544
17	19.20	0.63	0.001	1.61E-04	1.4	0.8		138544
18	18.60	1.09	0.001	1.56E-04	1.9	1.8		138544
19	18.00	1.54	0.001	1.45E-04	2.7	3.1		138544
		-4.07	0.001	1.45E-04	2.7	3.1		
20	17.40	-2.91	0.001	1.30E-04	0.6	3.9		138544
21	16.80	-1.80	0.001	1.14E-04	-0.8	3.7		138544
22	16.20	-0.79	0.000	9.98E-05	-1.6	2.9		138544
23	15.60	0.17	0.000	8.99E-05	-1.8	1.7		138544
24	15.00	1.15	0.000	8.49E-05	-1.4	0.6		138544
25	14.63	1.82	0.000	8.37E-05	-0.8	0.2		138544
26	14.25	2.57	0.000	8.35E-05	0.0	0.0		---

(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	953
5	24.10	0.00	9.33	3.28	30.35	3.91	3.91	953
6	23.60	0.00	19.82	6.96	64.46	9.65	9.65	953
7	23.25	0.00	27.55	9.68	89.63	13.80	13.80	953
8	22.65	0.00	55.00	19.32	178.89	25.62	25.62	953
9	22.06	0.00	75.21	26.42	244.63	35.04	35.04	953
10	22.00	0.00	76.58	26.90	249.11	35.77	35.77	953
		0.00	76.58	21.70	334.62	27.54	27.54	4767
11	21.64	0.00	84.37	23.91	368.67	31.58	31.58	4767
12	21.50	0.00	87.06	24.67	380.38	33.03	33.03	4767
13	21.04	4.51	90.76	25.72	396.59	35.38	39.89	4767
14	20.50	9.81	94.77	26.85	414.08	38.02	47.83	4767
15	20.15	13.24	97.38	27.59	425.50	39.74	52.99	4767
16	19.80	16.68	100.06	28.35	437.20	41.49	58.17	4767
17	19.20	22.56	104.81	29.70	457.94	44.53	67.09	4767
18	18.60	28.45	109.73	31.09	479.45	47.62	76.07	4767
19	18.00	34.34	114.79	32.53	501.56	50.73	85.06	4767
		Total>	149.13	33.00m	388.12	163.23	163.23	20262
20	17.40	Total>	160.18	36.00m	410.64	177.19	177.19	21234
21	16.80	Total>	171.31	39.00m	433.25	191.16	191.16	22207
22	16.20	Total>	182.50	42.00m	455.91	205.11	205.11	23179
23	15.60	Total>	193.75	45.00m	478.63	219.06	219.06	24152
24	15.00	Total>	205.03	48.00m	501.39	233.04	233.04	25124
25	14.63	Total>	212.11	49.87m	515.63	241.82	241.82	25732
26	14.25	Total>	219.19	51.75m	529.89	250.64	250.64	26340

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	953
5	24.10	0.00	9.00	3.16	29.27	6.59	6.59	953
6	23.60	0.00	18.00	6.32	58.55	11.73	11.73	953
7	23.25	0.00	24.30	8.54	79.04	15.33	15.33	953
8	22.65	0.00	35.01	12.30	113.88	21.44	21.44	953
9	22.06	0.00	45.72	16.06	148.72	27.55	27.55	953
10	22.00	0.00	46.80	16.44	152.23	28.16	28.16	953
		0.00	46.80	13.26	204.49	29.19	29.19	4767
11	21.64	0.00	54.00	15.30	235.95	32.55	32.55	4767
12	21.50	0.00	56.80	16.09	248.18	33.85	33.85	4767
13	21.04	4.51	61.49	17.42	268.66	35.87	40.38	4767
14	20.50	9.81	66.99	18.98	292.71	38.23	48.04	4767
15	20.15	13.24	70.56	19.99	308.29	39.75	53.00	4767
16	19.80	16.68	74.12	21.00	323.87	41.28	57.96	4767
17	19.20	22.56	80.24	22.73	350.59	43.90	66.46	4767

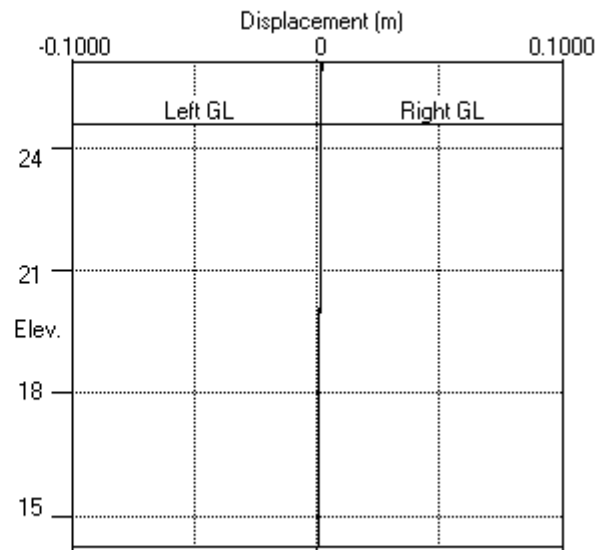
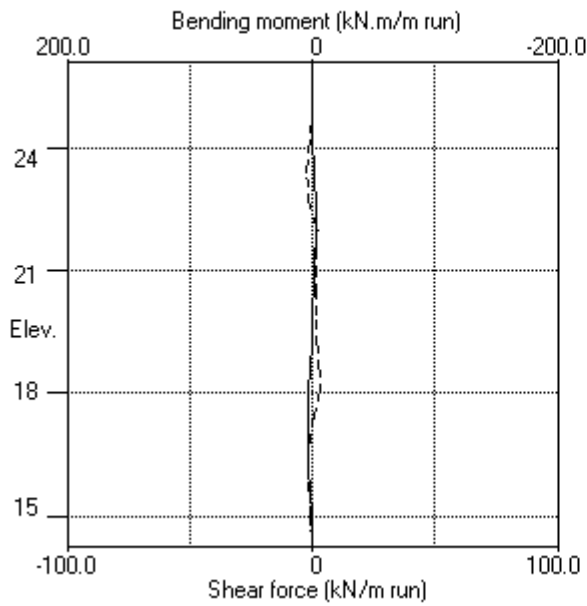
(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

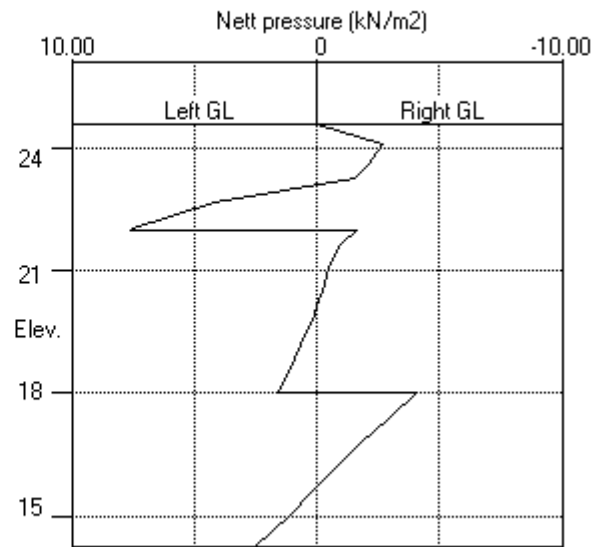
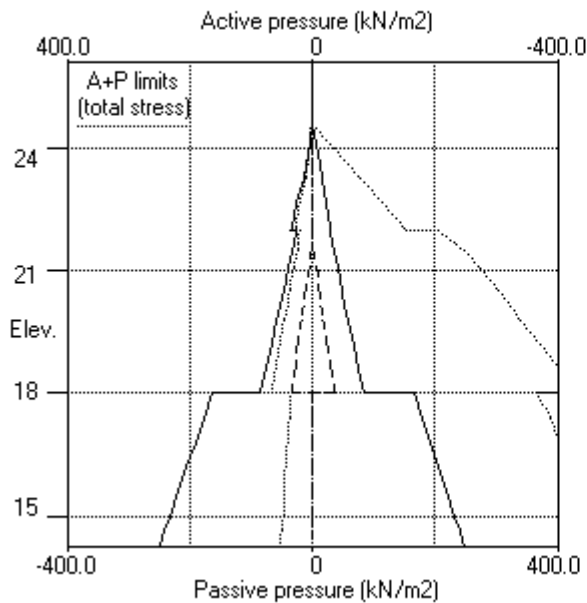
Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
18	18.60	28.45	86.35	24.47	377.30	46.53	74.98	4767	
19	18.00	34.34	92.47	26.20	404.02	49.18	83.52	4767	
		Total>	126.80	33.00m	365.79	167.30	167.30	20262	
20	17.40	Total>	138.80	36.00m	389.27	180.10	180.10	21234	
21	16.80	Total>	150.80	39.00m	412.74	192.96	192.96	22207	
22	16.20	Total>	162.80	42.00m	436.21	205.90	205.90	23179	
23	15.60	Total>	174.80	45.00m	459.68	218.89	218.89	24152	
24	15.00	Total>	186.80	48.00m	483.15	231.90	231.90	25124	
25	14.63	Total>	194.30	49.87m	497.82	240.00	240.00	25732	
26	14.25	Total>	201.80	51.75m	512.49	248.08	248.08	26340	

Units: kN,m

Stage No.2 Apply surcharge no.2 at elev. 23.25



Stage No.2 Apply surcharge no.2 at elev. 23.25



Units: kN,m

Stage No. 3 Apply water pressure profile no.1 (Mod. Conserv.)

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

			FoS for toe	Toe elev. for		
			elev. = 14.25	FoS = 1.500		

Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr
			Safety	at elev.		-ation
						failure
3	24.60 24.60	Cant.	<u>Conditions not suitable for FoS calc.</u>			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.002	8.81E-05	0.0	-0.0		138544
2	25.65	0.00	0.002	8.81E-05	0.0	-0.0		138544
3	25.20	0.00	0.002	8.81E-05	0.0	-0.0		138544
4	24.60	0.00	0.002	8.81E-05	0.0	-0.0		138544
5	24.10	-3.18	0.002	8.81E-05	-0.8	0.0		138544
6	23.60	-2.60	0.002	8.95E-05	-2.2	-0.8		138544
7	23.25	-2.06	0.002	9.26E-05	-3.1	-1.7		138544
8	22.65	3.62	0.002	1.03E-04	-2.6	-3.6		138544
9	22.06	6.91	0.002	1.20E-04	0.5	-4.3		138544
10	22.00	7.02	0.002	1.22E-04	1.0	-4.2		138544
		-4.59	0.002	1.22E-04	1.0	-4.2		
11	21.64	-3.97	0.002	1.33E-04	-0.6	-4.2		138544
12	21.50	-3.84	0.002	1.37E-04	-1.1	-4.3		138544
13	21.04	-0.55	0.002	1.53E-04	-2.1	-5.1		138544
14	20.50	3.28	0.001	1.75E-04	-1.4	-6.2		138544
15	20.15	3.53	0.001	1.91E-04	-0.2	-6.5		138544
16	19.80	3.85	0.001	2.07E-04	1.1	-6.4		138544
17	19.20	4.55	0.001	2.32E-04	3.6	-5.0		138544
18	18.60	5.40	0.001	2.47E-04	6.6	-2.1		138544
19	18.00	6.32	0.001	2.46E-04	10.1	2.8		138544
		-11.36	0.001	2.46E-04	10.1	2.8		
20	17.40	-8.43	0.001	2.25E-04	4.2	6.8		138544
21	16.80	-5.59	0.001	1.94E-04	-0.0	7.7		138544
22	16.20	-3.06	0.001	1.62E-04	-2.6	6.6		138544
23	15.60	-0.84	0.000	1.38E-04	-3.8	4.5		138544
24	15.00	1.17	0.000	1.24E-04	-3.7	2.0		138544
25	14.63	4.44	0.000	1.21E-04	-2.6	0.7		138544
26	14.25	9.66	0.000	1.20E-04	0.0	0.0		---

(continued)

Stage No.3 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	797
5	24.10	0.00	9.33	3.28	30.35	3.66	3.66	797
6	23.60	0.00	19.82	6.96	64.46	9.39	9.39	797
7	23.25	0.00	27.55	9.68	89.63	13.53	13.53	797
8	22.65	0.00	55.00	19.32	178.89	25.34	25.34	797
9	22.06	0.00	75.21	26.42	244.63	34.75	34.75	797
10	22.00	0.00	76.58	26.90	249.11	35.48	35.48	797
		0.00	76.58	21.70	334.62	26.07	26.07	3986
11	21.64	0.00	84.37	23.91	368.67	30.08	30.08	3986
12	21.50	0.00	87.06	24.67	380.38	31.52	31.52	3986
13	21.04	4.51	90.76	25.72	396.59	33.84	38.36	3986
14	20.50	9.81	94.77	26.85	414.08	36.49	46.30	3986
15	20.15	13.24	97.38	27.59	425.50	38.25	51.49	3986
16	19.80	16.68	100.06	28.35	437.20	40.04	56.72	3986
17	19.20	22.56	104.81	29.70	457.94	43.22	65.78	3986
18	18.60	28.45	109.73	31.09	479.45	46.50	74.95	3986
19	18.00	34.34	114.79	32.53	501.56	49.84	84.18	3986
		Total>	149.13	33.00m	388.12	159.39	159.39	17300
20	17.40	Total>	160.18	36.00m	410.64	174.24	174.24	18131
21	16.80	Total>	171.31	39.00m	433.25	189.07	189.07	18961
22	16.20	Total>	182.50	42.00m	455.91	203.79	203.79	19792
23	15.60	Total>	193.75	45.00m	478.63	218.37	218.37	20622
24	15.00	Total>	205.03	48.00m	501.39	232.86	232.86	25079
25	14.63	Total>	212.11	49.87m	515.63	242.94	242.94	155255
26	14.25	Total>	219.19	51.75m	529.89	253.99	253.99	158923

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	797
5	24.10	0.00	9.00	3.16	29.27	6.84	6.84	797
6	23.60	0.00	18.00	6.32	58.55	11.99	11.99	797
7	23.25	0.00	24.30	8.54	79.04	15.59	15.59	797
8	22.65	0.00	35.01	12.30	113.88	21.72	21.72	797
9	22.06	0.00	45.72	16.06	148.72	27.84	27.84	797
10	22.00	0.00	46.80	16.44	152.23	28.46	28.46	797
		0.00	46.80	13.26	204.49	30.66	30.66	3986
11	21.64	0.00	54.00	15.30	235.95	34.05	34.05	3986
12	21.50	0.00	56.80	16.09	248.18	35.36	35.36	3986
13	21.04	0.00	66.00	18.70	288.38	38.91	38.91	3986
14	20.50	0.00	76.80	21.76	335.57	43.03	43.03	3986
15	20.15	3.43	80.37	22.77	351.15	44.52	47.96	3986
16	19.80	6.87	83.93	23.78	366.74	46.00	52.87	3986
17	19.20	12.75	90.05	25.51	393.45	48.48	61.23	3986

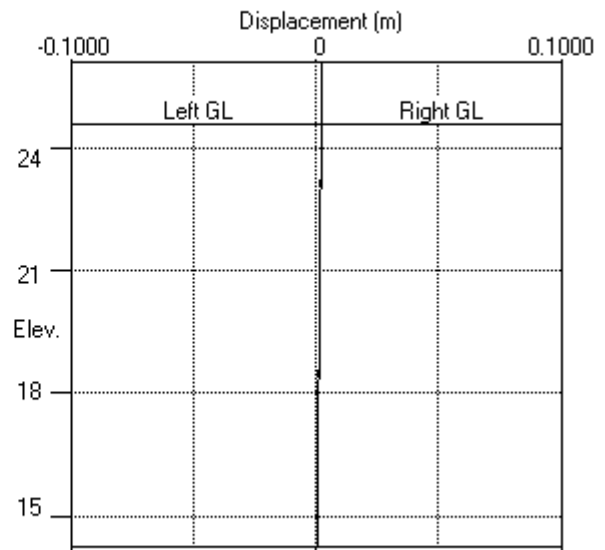
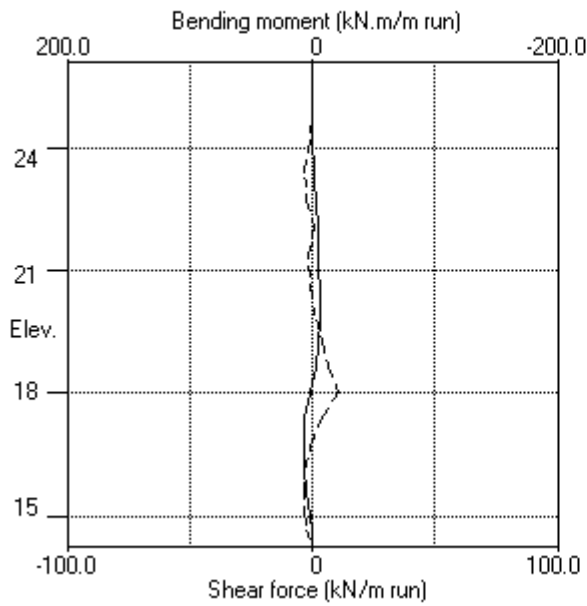
(continued)

Stage No.3 Apply water pressure profile no.1 (Mod. Conserv.)

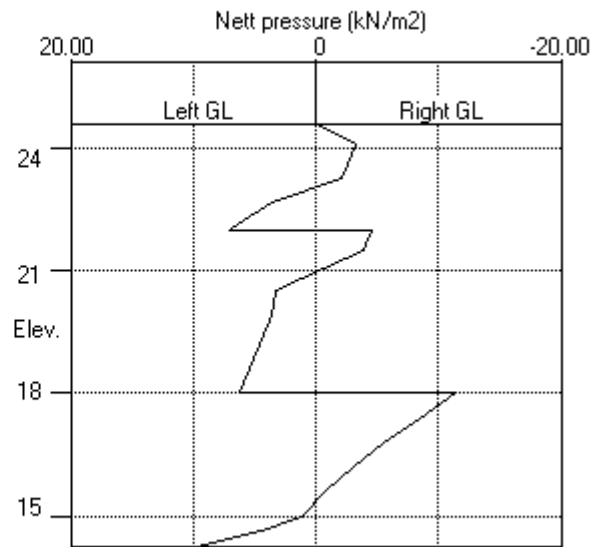
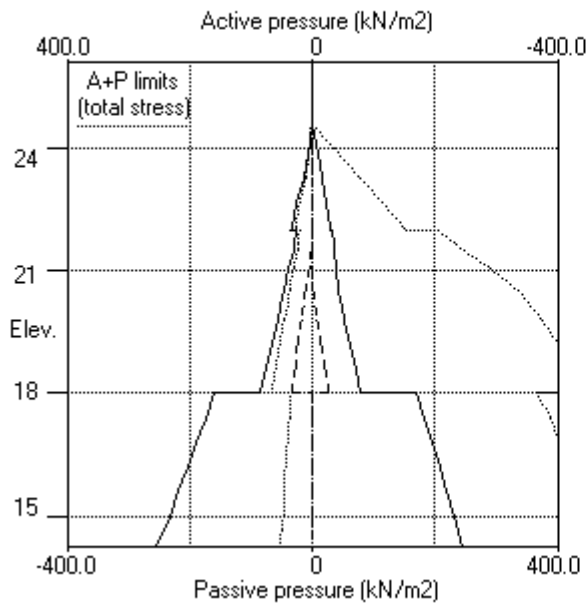
Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
18	18.60	18.64	96.16	27.25	420.16	50.91	69.55	3986	
19	18.00	24.52	102.28	28.98	446.88	53.34	77.86	3986	
		Total>	126.80	33.00m	365.79	170.75	170.75	17300	
20	17.40	Total>	138.80	36.00m	389.27	182.66	182.66	18131	
21	16.80	Total>	150.80	39.00m	412.74	194.66	194.66	18961	
22	16.20	Total>	162.80	42.00m	436.21	206.84	206.84	19792	
23	15.60	Total>	174.80	45.00m	459.68	219.20	219.20	20622	
24	15.00	Total>	186.80	48.00m	483.15	231.69	231.69	25079	
25	14.63	Total>	194.30	49.87m	497.82	238.50	238.50	155255	
26	14.25	Total>	201.80	51.75m	512.49	244.34	244.34	158923	

Units: kN,m

Stage No.3 Apply water pressure profile no.1 (Mod. Conserv.)



Stage No.3 Apply water pressure profile no.1 (Mod. Conserv.)



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 21.04 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.	--- G.L. --- Pass.	Strut Elev.	FoS for toe elev. =	Moment of equil. at elev.	Toe elev. for FoS =	Wall Penetr-ation	Direction of failure
4	24.60	21.04	Cant.	1.608	15.47	14.61	6.43	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.040	5.21E-03	0.0	-0.0		138544
2	25.65	0.00	0.038	5.21E-03	0.0	-0.0		138544
3	25.20	0.00	0.035	5.21E-03	0.0	0.0		138544
4	24.60	0.00	0.032	5.21E-03	0.0	-0.0		138544
5	24.10	3.28	0.030	5.21E-03	0.8	0.3		138544
6	23.60	6.96	0.027	5.21E-03	3.4	1.2		138544
7	23.25	9.68	0.025	5.20E-03	6.3	2.9		138544
8	22.65	19.32	0.022	5.18E-03	14.9	8.9		138544
9	22.06	26.42	0.019	5.11E-03	28.5	21.6		138544
10	22.00	26.90	0.019	5.10E-03	30.1	23.4		138544
		21.70	0.019	5.10E-03	30.1	23.4		
11	21.64	23.91	0.017	5.02E-03	38.3	35.7		138544
12	21.50	24.67	0.016	4.98E-03	41.7	41.3		138544
13	21.04	30.23	0.014	4.81E-03	54.4	63.3		138544
14	20.50	-10.53	0.011	4.50E-03	59.7	95.0		138544
15	20.15	-25.37	0.010	4.24E-03	53.4	114.9		138544
16	19.80	-40.20	0.009	3.93E-03	41.9	131.8		138544
17	19.20	-36.15	0.006	3.31E-03	19.0	152.8		138544
18	18.60	-21.36	0.005	2.64E-03	1.8	157.6		138544
19	18.00	-7.11	0.003	1.96E-03	-6.8	155.7		138544
		-93.15	0.003	1.96E-03	-6.8	155.7		
20	17.40	-39.62	0.002	1.33E-03	-46.6	134.8		138544
21	16.80	-4.32	0.002	8.27E-04	-59.8	99.7		138544
22	16.20	16.07	0.001	4.75E-04	-56.3	62.9		138544
23	15.60	26.28	0.001	2.70E-04	-43.6	32.0		138544
24	15.00	30.94	0.001	1.77E-04	-26.4	10.6		138544
25	14.63	34.76	0.001	1.59E-04	-14.1	2.8		138544
26	14.25	40.34	0.001	1.55E-04	-0.0	0.0		---

(continued)

Stage No.4 Excavate to elevation 21.04 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1253
5	24.10	0.00	9.33	3.28	30.35	3.28	3.28a	1253
6	23.60	0.00	19.82	6.96	64.46	6.96	6.96a	1253
7	23.25	0.00	27.55	9.68	89.63	9.68	9.68a	1253
8	22.65	0.00	55.00	19.32	178.89	19.32	19.32a	1253
9	22.06	0.00	75.21	26.42	244.63	26.42	26.42a	1253
10	22.00	0.00	76.58	26.90	249.11	26.90	26.90a	1253
		0.00	76.58	21.70	334.62	21.70	21.70a	6263
11	21.64	0.00	84.37	23.91	368.67	23.91	23.91a	6263
12	21.50	0.00	87.06	24.67	380.38	24.67	24.67a	6263
13	21.04	4.51	90.76	25.72	396.59	25.72	30.23a	6263
14	20.50	9.81	94.77	26.85	414.08	26.85	36.66a	6263
15	20.15	13.24	97.38	27.59	425.50	27.59	40.84a	6263
16	19.80	16.68	100.06	28.35	437.20	28.35	45.03a	6263
17	19.20	22.56	104.81	29.70	457.94	29.70	52.26a	6263
18	18.60	28.45	109.73	31.09	479.45	31.09	59.54a	6263
19	18.00	34.34	114.79	32.53	501.56	35.88	70.22	6263
		Total>	149.13	33.00m	388.12	101.39	101.39	26030
20	17.40	Total>	160.18	36.00m	410.64	136.45	136.45	27279
21	16.80	Total>	171.31	39.00m	433.25	164.25	164.25	28529
22	16.20	Total>	182.50	42.00m	455.91	186.10	186.10	29778
23	15.60	Total>	193.75	45.00m	478.63	203.88	203.88	31028
24	15.00	Total>	205.03	48.00m	501.39	219.44	219.44	32277
25	14.63	Total>	212.11	49.87m	515.63	229.74	229.74	33058
26	14.25	Total>	219.19	51.75m	529.89	240.95	240.95	33839

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	21.04	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	9635
14	20.50	0.00	10.80	3.06	47.19	47.19	47.19p	9635
15	20.15	3.43	14.37	4.07	62.77	62.77	66.21p	9635
16	19.80	6.87	17.93	5.08	78.36	78.36	85.23p	9635
17	19.20	12.75	24.05	6.81	105.08	75.66	88.41	9635
18	18.60	18.64	30.16	8.55	131.80	62.26	80.90	9635

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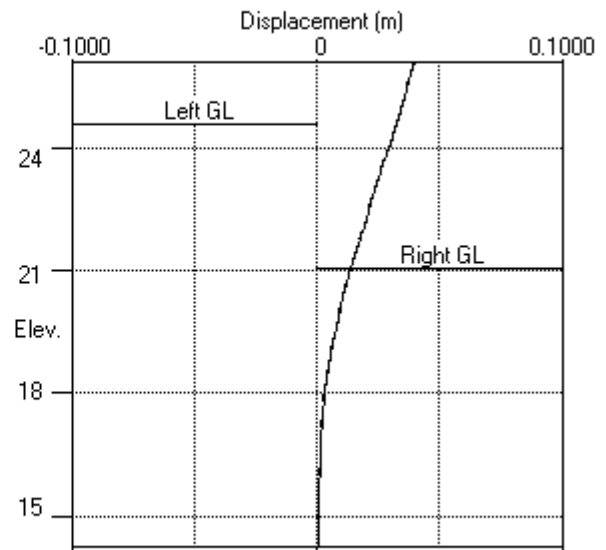
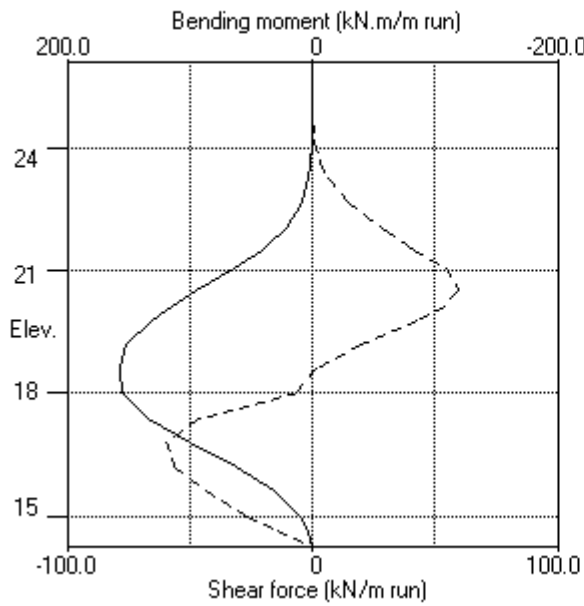
Stage No.4 Excavate to elevation 21.04 on RIGHT side

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
19	18.00	24.52	36.28	10.28	158.53	52.81	77.33	9635
		Total>	60.81	15.20m	299.80	194.54	194.54	39126
20	17.40	Total>	72.81	18.20m	323.28	176.07	176.07	41004
21	16.80	Total>	84.82	21.20m	346.76	168.58	168.58	42882
22	16.20	Total>	96.83	24.20m	370.24	170.04	170.04	44760
23	15.60	Total>	108.84	27.20m	393.72	177.60	177.60	46639
24	15.00	Total>	120.85	30.20m	417.20	188.50	188.50	48517
25	14.63	Total>	128.36	32.07m	431.88	194.98	194.98	49690
26	14.25	Total>	135.87	33.95m	446.56	200.61	200.61	50864

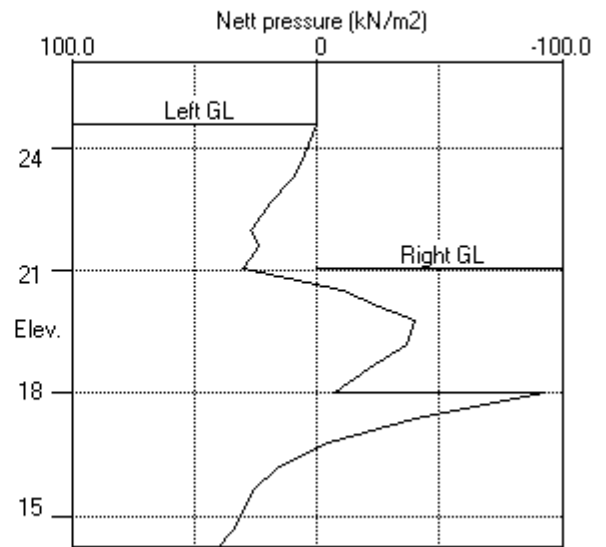
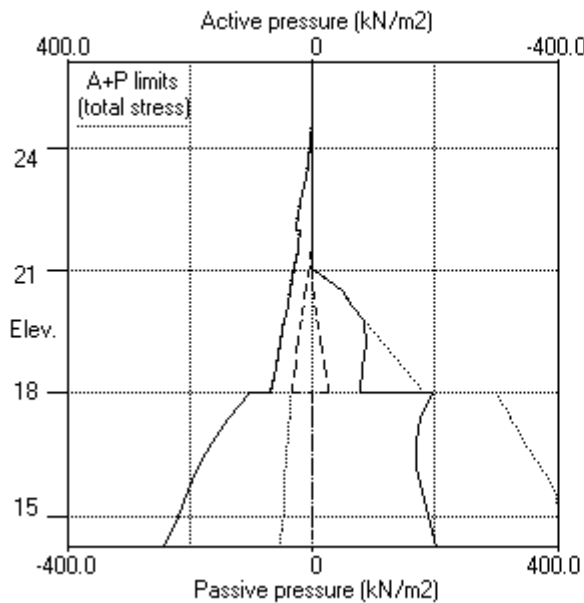
Note: 59.54a Soil pressure at active limit
 85.23p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 21.04 on RIGHT side



Stage No.4 Excav. to elev. 21.04 on RIGHT side



Units: kN,m

Stage No. 5 Fill to elevation 21.64 on RIGHT side with soil type 1

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

				FoS for toe elev. = 14.25		Toe elev. for FoS = 1.500		
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall	Direction
No.	Act.	Pass.	Elev.	of	equilib.	elev.	Penetr	of
				Safety	at elev.		-ation	failure
5	24.60	21.64	Cant.	1.963	15.50	15.77	5.87	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.040	5.22E-03	0.0	-0.0		138544
2	25.65	0.00	0.037	5.22E-03	0.0	-0.0		138544
3	25.20	0.00	0.035	5.22E-03	0.0	0.0		138544
4	24.60	0.00	0.032	5.22E-03	0.0	-0.0		138544
5	24.10	3.54	0.029	5.22E-03	0.9	0.3		138544
6	23.60	7.23	0.027	5.22E-03	3.6	1.3		138544
7	23.25	9.95	0.025	5.21E-03	6.6	3.1		138544
8	22.65	19.60	0.022	5.19E-03	15.4	9.3		138544
9	22.06	26.70	0.019	5.12E-03	29.1	22.3		138544
10	22.00	27.18	0.018	5.11E-03	30.8	24.1		138544
		23.10	0.018	5.11E-03	30.8	24.1		
11	21.64	25.32	0.017	5.03E-03	39.5	36.7		138544
12	21.50	25.20	0.016	4.99E-03	43.0	42.5		138544
13	21.04	27.86	0.014	4.81E-03	55.2	65.0		138544
		28.59	0.014	4.81E-03	55.2	65.0		
14	20.50	-11.08	0.011	4.50E-03	59.9	97.0		138544
15	20.15	-25.94	0.010	4.23E-03	53.5	117.0		138544
16	19.80	-40.81	0.008	3.91E-03	41.8	133.8		138544
17	19.20	-36.86	0.006	3.28E-03	18.5	154.6		138544
18	18.60	-22.18	0.004	2.61E-03	0.8	158.9		138544
19	18.00	-8.09	0.003	1.92E-03	-8.3	156.3		138544
		-91.94	0.003	1.92E-03	-8.3	156.3		
20	17.40	-38.60	0.002	1.29E-03	-47.5	134.7		138544
21	16.80	-3.55	0.001	7.91E-04	-60.1	99.2		138544
22	16.20	16.56	0.001	4.41E-04	-56.2	62.5		138544
23	15.60	26.47	0.001	2.37E-04	-43.3	31.7		138544
24	15.00	30.80	0.001	1.46E-04	-26.1	10.4		138544
25	14.63	34.39	0.000	1.28E-04	-13.9	2.8		138544
26	14.25	39.72	0.000	1.24E-04	-0.0	0.0		---

(continued)

Stage No.5 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	667
5	24.10	0.00	9.33	3.28	30.35	3.54	3.54	667
6	23.60	0.00	19.82	6.96	64.46	7.23	7.23	667
7	23.25	0.00	27.55	9.68	89.63	9.95	9.95	667
8	22.65	0.00	55.00	19.32	178.89	19.60	19.60	667
9	22.06	0.00	75.21	26.42	244.63	26.70	26.70	667
10	22.00	0.00	76.58	26.90	249.11	27.18	27.18	667
		0.00	76.58	21.70	334.62	23.10	23.10	3336
11	21.64	0.00	84.37	23.91	368.67	25.32	25.32	3336
12	21.50	0.00	87.06	24.67	380.38	26.08	26.08	3336
13	21.04	4.51	90.76	25.72	396.59	27.14	31.65	3336
14	20.50	9.81	94.77	26.85	414.08	28.27	38.08	3336
15	20.15	13.24	97.38	27.59	425.50	29.00	42.24	3336
16	19.80	16.68	100.06	28.35	437.20	29.74	46.41	3336
17	19.20	22.56	104.81	29.70	457.94	31.04	53.60	3336
18	18.60	28.45	109.73	31.09	479.45	32.38	60.83	3336
19	18.00	34.34	114.79	32.53	501.56	37.10	71.44	3336
		Total>	149.13	33.00m	388.12	106.83	106.83	14915
20	17.40	Total>	160.18	36.00m	410.64	141.81	141.81	15631
21	16.80	Total>	171.31	39.00m	433.25	169.49	169.49	16347
22	16.20	Total>	182.50	42.00m	455.91	191.21	191.21	17063
23	15.60	Total>	193.75	45.00m	478.63	208.85	208.85	17779
24	15.00	Total>	205.03	48.00m	501.39	224.25	224.25	18495
25	14.63	Total>	212.11	49.87m	515.63	234.45	234.45	18942
26	14.25	Total>	219.19	51.75m	529.89	245.53	245.53	19390

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	772
12	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	772
13	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	772
		0.00	10.80	3.06	47.19	3.06	3.06a	3859
14	20.50	0.00	21.60	6.12	94.38	49.15	49.15	3859
15	20.15	3.43	25.17	7.13	109.96	64.75	68.18	3859
16	19.80	6.87	28.73	8.14	125.55	80.35	87.22	3859
17	19.20	12.75	34.85	9.87	152.27	77.71	90.46	3859

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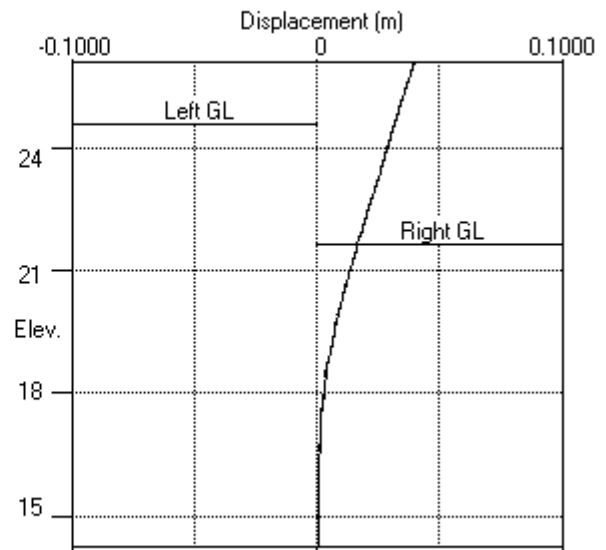
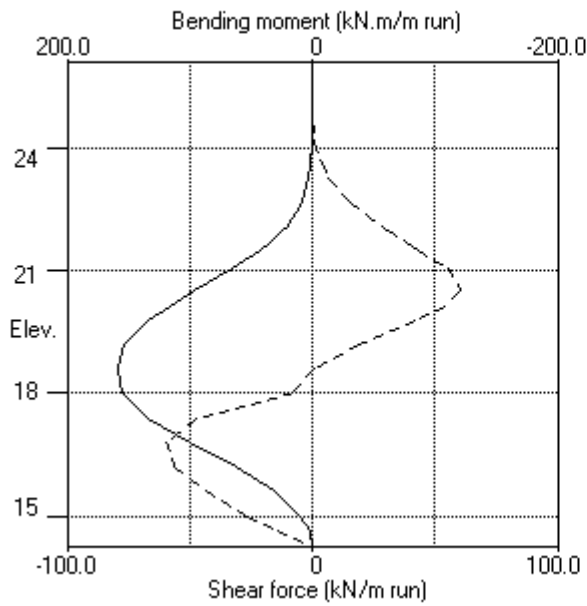
Stage No.5 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
18	18.60	18.64	40.97	11.61	179.00	64.37	83.01	3859	
19	18.00	24.52	47.08	13.34	205.73	55.00	79.53	3859	
		Total>	71.61	18.20m	310.60	198.77	198.77	16827	
20	17.40	Total>	83.61	21.20m	334.08	180.40	180.40	17634	
21	16.80	Total>	95.62	24.20m	357.56	173.04	173.04	18442	
22	16.20	Total>	107.63	27.20m	381.04	174.65	174.65	19250	
23	15.60	Total>	119.64	30.20m	404.52	182.38	182.38	20057	
24	15.00	Total>	131.65	33.20m	428.01	193.45	193.45	20865	
25	14.63	Total>	139.16	35.08m	442.69	200.05	200.05	21370	
26	14.25	Total>	146.67	36.95m	457.37	205.81	205.81	21875	

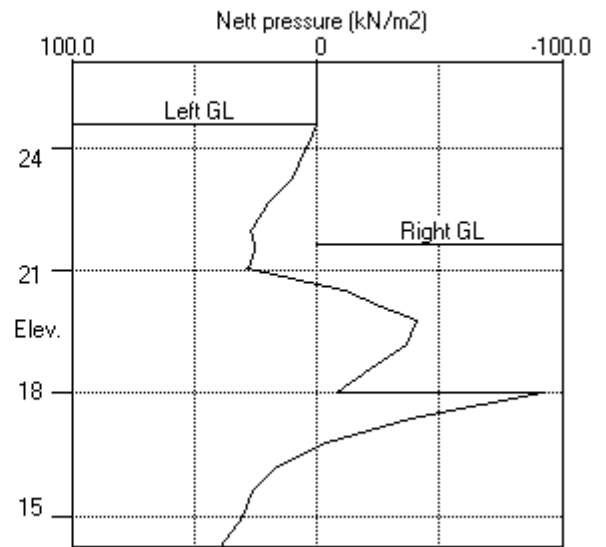
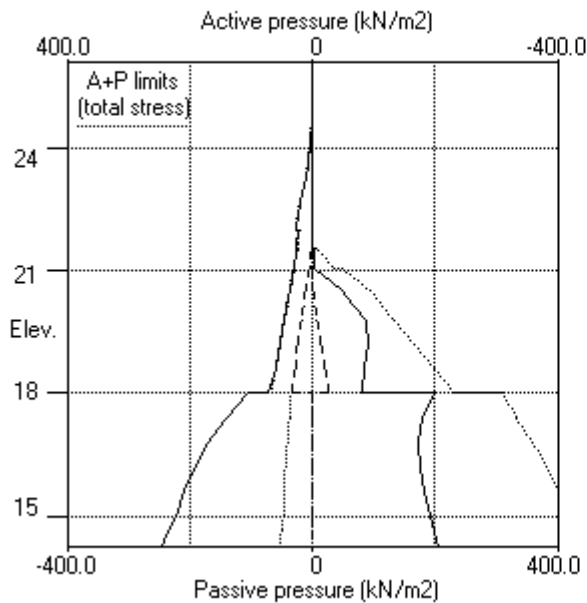
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.5 Fill to elev. 21.64 on RIGHT side



Stage No.5 Fill to elev. 21.64 on RIGHT side



PILEDESIGNS LTD	Sheet No.
Program: WALLAP Version 6.06 Revision A51.B69.R54	Job No. 23198
Licensed from GEOSOLVE	Made by : DBS
Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_SLS	Date:12-06-2020
Fitzrovia - Middlesex Hospital Annexe	Checked :
Wall 3, Secant-SLS, 600 dia @ 900 - run 03	

Units: kN,m

Stage No. 8 Change EI of wall to 98960 kN.m²/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 14.25	Toe elev. for FoS = 1.500		
Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe Wall Penetr-ation elev. No FoS calc.
8	24.60	21.64				Direction of failure

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.10	0.00	0.040	5.16E-03	-2.5	-0.0	2.5	98960
2	25.65	0.00	0.037	5.16E-03	-2.5	-0.9		98960
3	25.20	0.00	0.035	5.17E-03	-2.5	-1.7		98960
4	24.60	0.00	0.032	5.19E-03	-2.5	-2.9		98960
5	24.10	3.38	0.029	5.21E-03	-1.7	-3.6		98960
6	23.60	7.07	0.027	5.23E-03	1.0	-3.6		98960
7	23.25	9.80	0.025	5.25E-03	3.9	-2.5		98960
8	22.65	19.50	0.022	5.26E-03	12.6	2.4		98960
9	22.06	26.69	0.019	5.22E-03	26.4	14.2	6.5	98960
		26.69	0.019	5.22E-03	19.8	14.2		
10	22.00	27.18	0.018	5.21E-03	21.5	15.6		98960
		23.09	0.018	5.21E-03	21.5	15.6		
11	21.64	25.53	0.017	5.15E-03	30.2	25.6		98960
12	21.50	25.50	0.016	5.12E-03	33.8	30.3		98960
13	21.04	28.49	0.013	4.95E-03	46.2	49.6		98960
		29.23	0.013	4.95E-03	46.2	49.6		
14	20.50	-9.01	0.011	4.63E-03	51.7	77.8		98960
15	20.15	-23.40	0.009	4.34E-03	46.0	95.6		98960
16	19.80	-37.86	0.008	4.00E-03	35.3	110.5		98960
17	19.20	-33.50	0.006	3.32E-03	13.9	128.7		98960
18	18.60	-18.83	0.004	2.57E-03	-1.8	131.4		98960
19	18.00	-5.13	0.003	1.84E-03	-9.0	128.0		98960
		-79.51	0.003	1.84E-03	-9.0	128.0		
20	17.40	-28.65	0.002	1.17E-03	-41.5	107.8		98960
21	16.80	2.94	0.001	6.59E-04	-49.2	76.5		98960
22	16.20	19.34	0.001	3.22E-04	-42.5	45.8		98960
23	15.60	24.83	0.001	1.41E-04	-29.3	21.7		98960
24	15.00	21.26	0.001	6.66E-05	-15.4	6.8		98960

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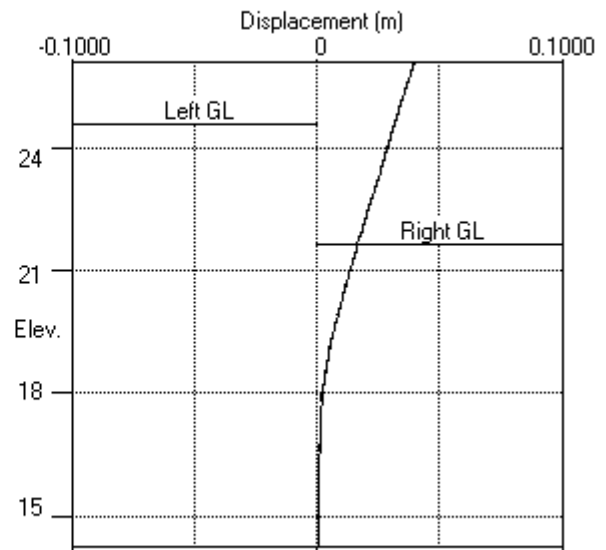
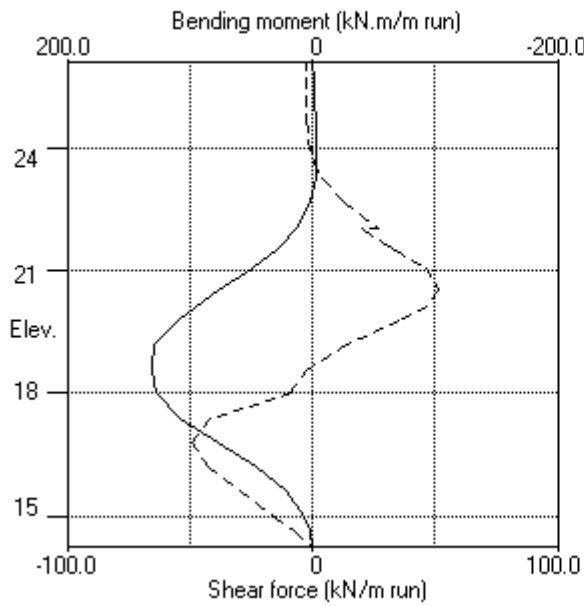
Stage No.8 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3	
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	0.00	1092	
12	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1092	
13	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1092	
		0.00	10.80	3.06	47.19	3.06	3.06a	5462	
14	20.50	0.00	21.60	6.12	94.38	48.12	48.12	5462	
15	20.15	3.43	25.17	7.13	109.96	63.48	66.91	5462	
16	19.80	6.87	28.73	8.14	125.55	78.88	85.75	5462	
17	19.20	12.75	34.85	9.87	152.27	76.03	88.78	5462	
18	18.60	18.64	40.97	11.61	179.00	62.70	81.34	5462	
19	18.00	24.52	47.08	13.34	205.73	53.52	78.04	5462	
		Total>	71.61	18.20m	310.60	192.56	192.56	22932	
20	17.40	Total>	83.61	21.20m	334.08	175.43	175.43	24033	
21	16.80	Total>	95.62	24.20m	357.56	169.80	169.80	25133	
22	16.20	Total>	107.63	27.20m	381.04	173.26	173.26	26234	
23	15.60	Total>	119.64	30.20m	404.52	183.20	183.20	72418	
24	15.00	Total>	131.65	33.20m	428.01	198.23	198.23	75334	
25	14.63	Total>	139.16	35.08m	442.69	207.17	207.17	77157	
26	14.25	Total>	146.67	36.95m	457.37	215.30	215.30	78980	

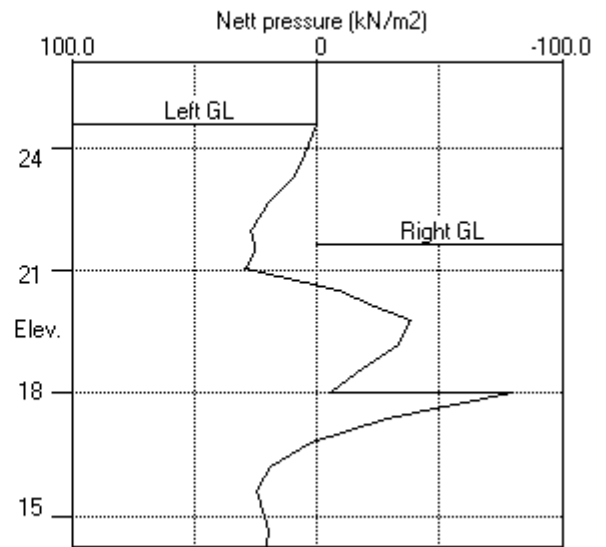
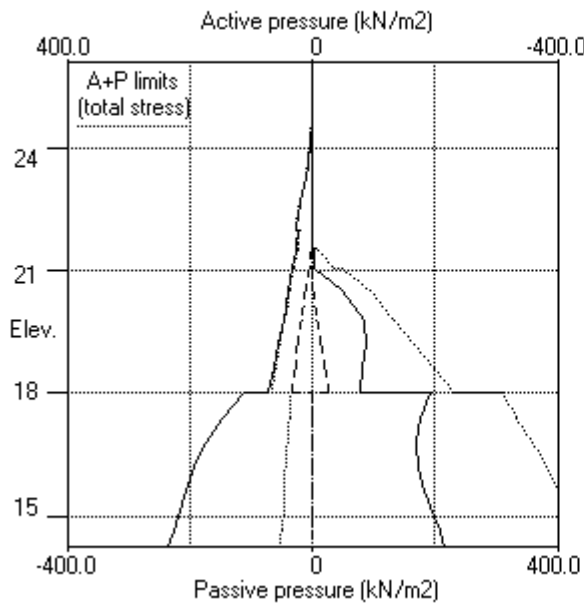
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Change EI of wall to 98960kN.m²/m run



Stage No.8 Change EI of wall to 98960kN.m²/m run



Units: kN,m

Stage No. 11 Apply water pressure profile no.2 (Mod. Conserv.)

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

			FoS for toe	Toe elev. for		
			elev. = 14.25	FoS = 1.500		

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe Wall Penetr -ation Direction of failure
11	24.60	21.64				More than one strut. No FoS calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall
Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.040	5.10E-03	-5.8	-0.0	5.8	98960
2	25.65	0.00	0.037	5.11E-03	-5.8	-2.4		98960
3	25.20	0.00	0.035	5.13E-03	-5.8	-4.7		98960
4	24.60	0.00	0.032	5.17E-03	-5.8	-7.9		98960
5	24.10	3.28	0.029	5.22E-03	-5.0	-10.2		98960
6	23.60	6.96	0.027	5.28E-03	-2.4	-11.9		98960
7	23.25	12.02	0.025	5.33E-03	0.9	-12.0		98960
8	22.65	25.70	0.022	5.40E-03	12.1	-8.2		98960
9	22.06	36.86	0.019	5.42E-03	30.7	4.6	-0.0	98960
10	22.00	37.76	0.018	5.42E-03	33.0	6.6		98960
		34.13	0.018	5.42E-03	33.0	6.6		
11	21.64	39.24	0.016	5.38E-03	46.2	21.5		98960
		19.74	0.016	5.38E-03	46.2	21.5		
12	21.50	19.87	0.016	5.35E-03	48.9	28.4		98960
13	21.04	20.36	0.013	5.18E-03	58.2	54.0		98960
		20.74	0.013	5.18E-03	58.2	54.0		
14	20.50	-18.40	0.010	4.82E-03	58.8	87.3		98960
15	20.15	-32.31	0.009	4.50E-03	50.0	107.0		98960
16	19.80	-46.39	0.007	4.11E-03	36.2	122.8		98960
17	19.20	-41.65	0.005	3.36E-03	9.8	140.0		98960
18	18.60	-26.89	0.003	2.56E-03	-10.8	138.7		98960
19	18.00	-13.28	0.002	1.80E-03	-22.8	128.5		98960
		-33.88	0.002	1.80E-03	-22.8	128.5		
20	17.40	-25.21	0.001	1.14E-03	-40.6	105.7		98960
21	16.80	1.67	0.001	6.34E-04	-47.6	75.3		98960
22	16.20	18.36	0.000	3.03E-04	-41.6	45.3		98960
23	15.60	24.17	0.000	1.24E-04	-28.9	21.6		98960
24	15.00	20.93	0.000	4.96E-05	-15.3	6.8		98960
25	14.63	20.03	0.000	3.59E-05	-7.7	1.8		98960
26	14.25	20.80	0.000	3.31E-05	-0.0	0.0		---

At elev. 26.10 Strut force = 5.8 kN/strut = 5.8 kN/m run

At elev. 22.06 The strut is slack

(continued)

Stage No.11 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	2104
5	24.10	0.00	9.33	3.28	30.35	3.28	3.28a	2104
6	23.60	0.00	19.82	6.96	64.46	6.96	6.96a	2104
7	23.25	3.43	24.12	8.47	78.46	8.59	12.02	2104
8	22.65	9.27	45.73	16.06	148.74	16.43	25.70	793
9	22.06	15.11	60.10	21.11	195.49	21.76	36.86	793
10	22.00	15.70	60.89	21.39	198.05	22.06	37.76	793
		15.70	60.89	17.25	266.04	18.43	34.13	3963
11	21.64	19.23	65.15	18.46	284.65	20.01	39.24	3963
12	21.50	20.60	66.45	18.83	290.36	20.54	41.14	3963
13	21.04	25.11	70.16	19.88	306.57	22.35	47.47	3963
14	20.50	30.41	74.17	21.01	324.06	24.34	54.75	3963
15	20.15	33.84	76.78	21.76	335.49	25.55	59.39	3963
16	19.80	37.28	79.46	22.51	347.19	26.67	63.95	3963
17	19.20	43.16	84.21	23.86	367.93	28.36	71.53	3963
18	18.60	49.05	89.13	25.25	389.44	29.72	78.77	3963
19	18.00	54.94	94.19	26.69	411.55	34.18	89.12	3963
		54.94	94.19	33.09	306.38	78.87	133.81	8541
20	17.40	60.82	99.35	34.90	323.18	106.77	167.59	8951
21	16.80	66.71	104.60	36.74	340.24	126.92	193.63	9361
22	16.20	72.59	109.91	38.61	357.50	141.01	213.61	9771
23	15.60	78.48	115.27	40.49	374.94	150.68	229.16	10181
24	15.00	84.37	120.67	42.39	392.50	156.36	240.73	10591
25	14.63	88.04	124.06	43.58	403.55	160.61	248.65	10847
26	14.25	91.72	127.47	44.78	414.63	165.71	257.43	11103

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		19.23	0.77	0.27	2.51	0.27	19.50a	793
12	21.50	20.60	1.92	0.67	6.24	0.67	21.27a	793
13	21.04	25.11	5.68	2.00	18.49	2.00	27.11a	793
		25.11	5.68	1.61	24.84	1.61	26.72a	3963
14	20.50	30.41	11.18	3.17	48.83	42.74	73.15	3963
15	20.15	33.84	14.73	4.17	64.35	57.85	91.70	3963
16	19.80	37.28	18.27	5.18	79.82	73.07	110.34	3963
17	19.20	43.16	24.32	6.89	106.25	70.01	113.17	3963

(continued)

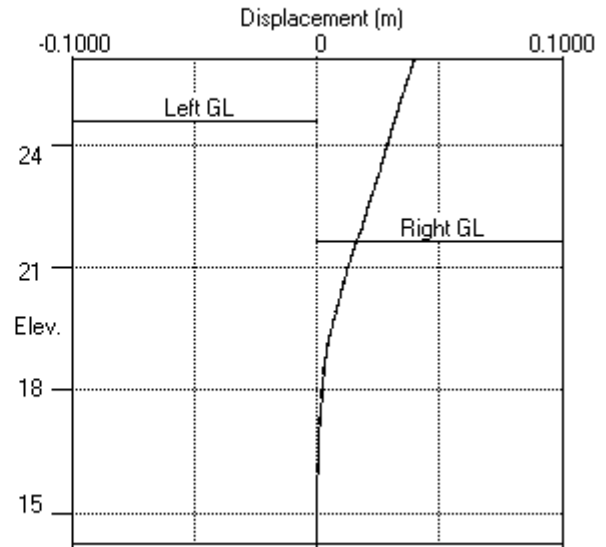
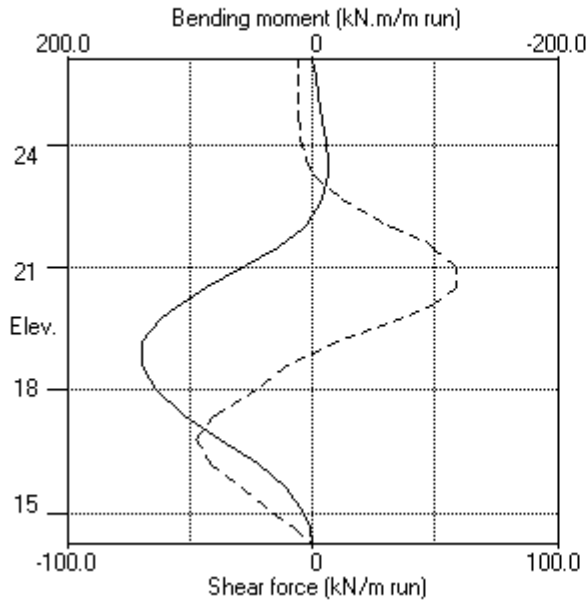
Stage No.11 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
18	18.60	49.05	30.33	8.59	132.51	56.61	105.66	3963
19	18.00	54.94	36.30	10.28	158.59	47.46	102.39	3963
		54.94	36.30	12.75	118.06	112.75	167.69	8541
20	17.40	60.82	42.22	14.83	137.35	131.98	192.81	8951
21	16.80	66.71	48.11	16.90	156.50	125.26	191.96	9361
22	16.20	72.59	53.96	18.95	175.52	122.65	195.24	9771
23	15.60	78.48	59.77	21.00	194.43	126.50	204.98	10181
24	15.00	84.37	65.56	23.03	213.25	135.44	219.80	10591
25	14.63	88.04	69.16	24.30	224.97	140.57	228.62	10847
26	14.25	91.72	72.76	25.56	236.66	144.90	236.63	11103

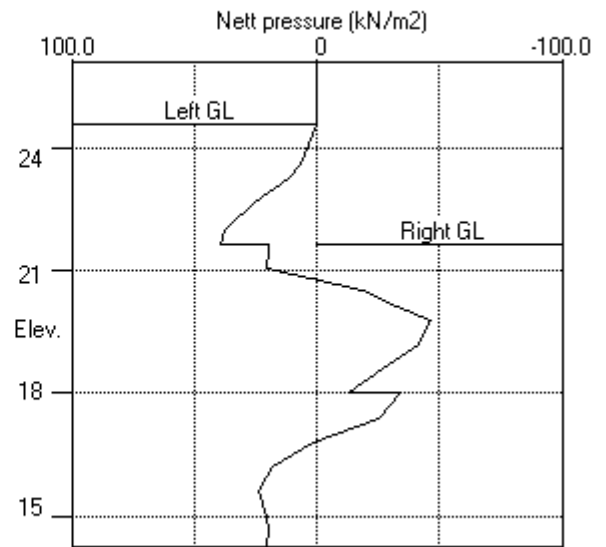
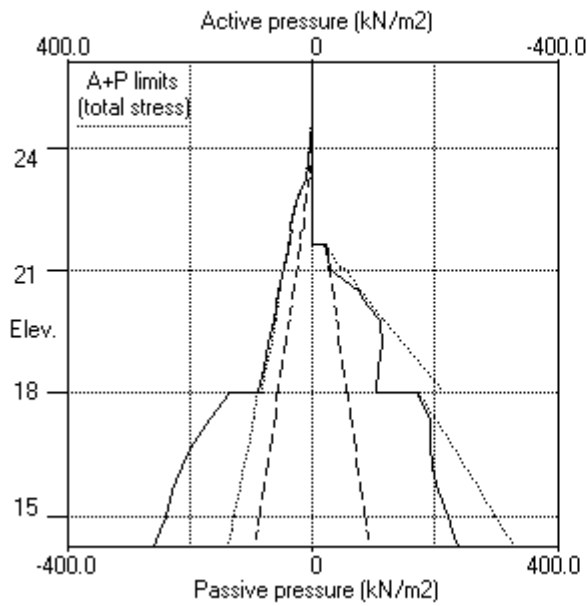
Note: 26.72a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.11 Apply water pressure profile no.2 (Mod. Conserv.)



Stage No.11 Apply water pressure profile no.2 (Mod. Conserv.)



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

 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.		Strut Elev.	FoS for toe elev. = 14.25		Toe elev. for FoS = 1.500		Direction of failure
	Act.	Pass.		Factor of Safety	Moment at elev.	Toe elev.	Wall Penetration	
1	24.60	24.60	Cant.	Conditions not suitable for FoS calc.				
2	24.60	24.60	Cant.	Conditions not suitable for FoS calc.				
3	24.60	24.60	Cant.	Conditions not suitable for FoS calc.				
4	24.60	21.04	Cant.	1.608	15.47	14.61	6.43	L to R
5	24.60	21.64	Cant.	1.963	15.50	15.77	5.87	L to R
6	24.60	21.64		No analysis at this stage				

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

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 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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				Shear force			
		max. m	min. m	Calculated kN.m/m		Factored kN.m/m		Calculated kN/m		Factored kN/m	
1	26.10	0.040	0.000	0	-0	0	-0	0	-6	0	-8
2	25.65	0.038	0.000	0	-2	0	-3	0	-6	0	-8
3	25.20	0.035	0.000	0	-5	0	-6	0	-6	0	-8
4	24.60	0.032	0.000	0	-8	0	-11	0	-6	0	-8
5	24.10	0.030	0.000	0	-10	0	-14	1	-5	1	-7
6	23.60	0.027	0.000	1	-12	2	-16	4	-2	5	-3
7	23.25	0.025	0.000	3	-12	4	-16	7	-3	9	-4
8	22.65	0.022	0.000	9	-8	13	-11	15	-3	21	-3
9	22.06	0.019	0.000	22	-4	30	-6	31	0	41	0
10	22.00	0.019	0.000	24	-4	33	-6	33	0	45	0
11	21.64	0.017	0.000	37	-4	50	-6	46	-1	62	-1
12	21.50	0.016	0.000	43	-4	57	-6	49	-1	66	-2
13	21.04	0.014	0.000	65	-5	88	-7	58	-2	79	-3
14	20.50	0.011	0.000	97	-6	131	-8	60	-1	81	-2
15	20.15	0.010	0.000	117	-6	158	-9	53	-0	72	-0
16	19.80	0.009	0.000	134	-6	181	-9	42	-0	57	-0
17	19.20	0.006	0.000	155	-5	209	-7	19	0	26	0
18	18.60	0.005	0.000	159	-2	215	-3	7	-11	9	-15
19	18.00	0.003	0.000	156	0	211	0	10	-23	14	-31
20	17.40	0.002	0.000	135	0	182	0	4	-47	6	-64
21	16.80	0.002	0.000	100	0	135	0	0	-60	0	-81
22	16.20	0.001	0.000	63	0	85	0	0	-56	0	-76
23	15.60	0.001	0.000	32	0	43	0	0	-44	0	-59
24	15.00	0.001	0.000	11	0	14	0	0	-26	0	-36
25	14.63	0.001	0.000	3	0	4	0	0	-14	0	-19
26	14.25	0.001	0.000	0	0	0	0	0	-0	0	-0

Summary of results (continued)

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

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	Calculated		Factored		Calculated		Factored	
min.	max. elev.	min. elev.	max. elev.	max. elev.	min. elev.	max. elev.	min. elev.	max. elev.
	kN.m/m	kN.m/m	kN.m/m	kN/m	kN/m	kN/m	kN/m	kN/m
1	16.80	-1 22.65	1 -1	18.00	-0 23.25	1		
-1	17.40	-3 22.06	5 -4	18.00	-2 23.25	4		
-3	16.80	-6 20.15	10 -9	18.00	-4 15.60	14		
-5	158 18.60	-0 24.60	213 -0	60 20.50	-60 16.80	81		
-81	159 18.60	-0 24.60	215 -0	60 20.50	-60 16.80	81		
-81	No calculation at this stage							
6	No calculation at this stage							
7	131 18.60	-4 24.10	177 -5	52 20.50	-49 16.80	70		
-66	No calculation at this stage							
9	No calculation at this stage							
10	No calculation at this stage							
11	140 19.20	-12 23.25	189 -16	59 20.50	-48 16.80	79		
-64								

Maximum and minimum displacement at each stage

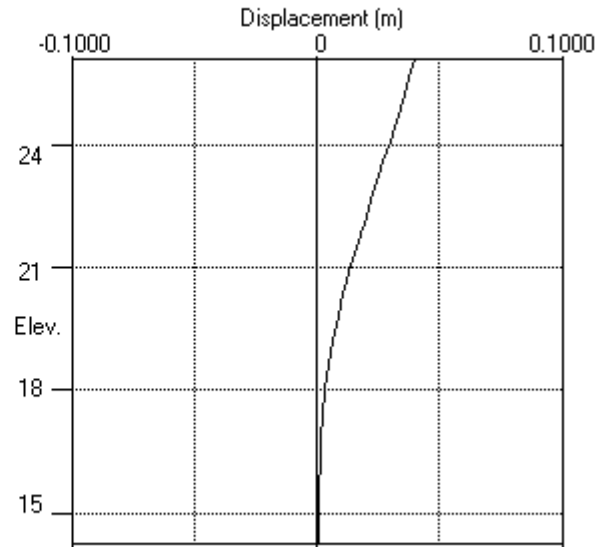
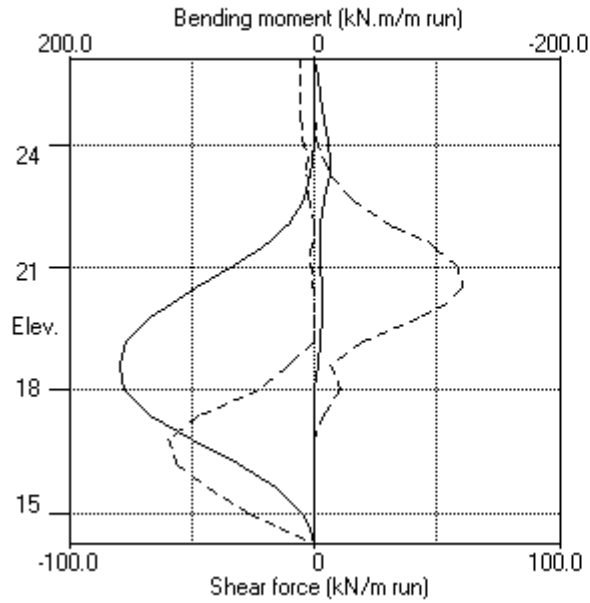
Stage no.	Displacement				Stage description
	maximum elev.	minimum elev.	maximum elev.	minimum elev.	
	m	m	m	m	
1	0.001	26.10	0.000	26.10	Apply surcharge no.1 at elev. 24.60
2	0.002	26.10	0.000	26.10	Apply surcharge no.2 at elev. 23.25
3	0.002	26.10	0.000	26.10	Apply water pressure profile no.1
4	0.040	26.10	0.000	26.10	Excav. to elev. 21.04 on RIGHT side
5	0.040	26.10	0.000	26.10	Fill to elev. 21.64 on RIGHT side
6	No calculation at this stage				Install strut no.1 at elev. 22.06
7	No calculation at this stage				Install strut no.2 at elev. 26.10
8	0.040	26.10	0.000	26.10	Change EI of wall to 98960kN.m ² /m run
9	No calculation at this stage				Change soil type 3 to soil type 4
10	No calculation at this stage				Apply surcharge no.3 at elev. 21.64
11	0.040	26.10	0.000	26.10	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1			Strut no. 2		
	at elev. 22.06			at elev. 26.10		
	Calculated	Factored	Calculated	Factored	Calculated	Factored
	kN per m run	kN per strut	kN per m run	kN per strut	kN per m run	kN per strut
8	7	7	9	2	2	3
11	slack	slack	slack	6	6	8

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

3-ULS1

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 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	24.60	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES (Unfactored SLS soil strengths)

No. Description	Bulk density kN/m3	Young's Modulus Eh, kN/m2	At rest coeff. Ko	Consol state. NC/OC	Active limit Ka	Passive limit Kp	Cohesion kN/m2
(Datum elev.)		(dEh/dy)	(dKo/dy)	(Nu)	(Kac)	(Kpc)	(dc/dy)
1 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

	Left side	Right side
Initial water table elevation	21.50	21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0
								MC+WC
2	1	23.60	23.60	0.0	1	21.64	21.64	0.0
					2	21.64	23.60	19.2

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 14.25
 Maximum finite element length = 0.60 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
2	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m ² ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	24.60	1.35(L)	20.00	20.00	18.00	=	N/A	1.10 Var
2	23.25	0.40(L)	20.00	0.95	48.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	20.00	=	N/A	1.00 P/F

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 24.60
2	Apply surcharge no.2 at elevation 23.25
3	Apply water pressure profile no.1 (Mod. Conserv.)
4	Excavate to elevation 20.68 on RIGHT side
5	Fill to elevation 21.64 on RIGHT side with soil type 1
6	Install strut or anchor no.1 at elevation 22.06
7	Install strut or anchor no.2 at elevation 26.10
8	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
9	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
10	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
11	Apply water pressure profile no.2 (Mod. Conserv.)

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 1
Water pressures : Moderately Conservative
Partial factor on C' = 1.000
Partial factor on Phi' = 1.000
Partial factor on Cu = 1.000
Partial factor on Soil Modulus = 1.000
Partial factor on Permanent Unfavourable loads = 1.000
Partial factor on Permanent Favourable loads = 1.000
Partial factor on Variable Unfavourable loads = 1.100
Design factor on calculated Bending Moments = 1.350

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) = 12.50 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m
Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m
Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 24.60	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 23.25	No	No	No
3	Apply water pressure profile no.1	Yes	Yes	Yes
4	Excav. to elev. 20.68 on RIGHT side	Yes	Yes	Yes
5	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
6	Install strut no.1 at elev. 22.06	Yes	Yes	Yes
7	Install strut no.2 at elev. 26.10	Yes	Yes	Yes
8	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
9	Change soil type 3 to soil type 4	Yes	Yes	Yes
10	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
11	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 24.60

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.001	3.37E-05	0.0	-0.0		138544
2	25.65	0.00	0.001	3.37E-05	0.0	0.0		138544
3	25.20	0.00	0.001	3.37E-05	0.0	0.0		138544
4	24.60	0.00	0.001	3.37E-05	0.0	-0.0		138544
5	24.10	-0.88	0.001	3.37E-05	-0.2	0.0		138544
6	23.60	-0.31	0.001	3.40E-05	-0.5	-0.2		138544
7	23.25	0.24	0.001	3.47E-05	-0.5	-0.4		138544
8	22.65	1.14	0.001	3.68E-05	-0.1	-0.6		138544
9	22.06	1.87	0.001	3.90E-05	0.8	-0.4		138544
10	22.00	1.94	0.001	3.92E-05	0.9	-0.4		138544
		-1.62	0.001	3.92E-05	0.9	-0.4		
11	21.64	-1.19	0.001	3.99E-05	0.4	-0.2		138544
12	21.50	-1.04	0.001	4.01E-05	0.2	-0.1		138544
13	21.09	-0.63	0.001	4.04E-05	-0.1	-0.1		138544
14	20.68	-0.28	0.001	4.08E-05	-0.3	-0.2		138544
15	20.50	-0.15	0.001	4.11E-05	-0.3	-0.3		138544
16	20.15	0.10	0.001	4.19E-05	-0.3	-0.4		138544
17	19.80	0.33	0.001	4.30E-05	-0.3	-0.5		138544
18	19.20	0.67	0.000	4.53E-05	0.0	-0.6		138544
19	18.60	0.97	0.000	4.76E-05	0.5	-0.4		138544
20	18.00	1.24	0.000	4.84E-05	1.2	0.0		138544
		-1.30	0.000	4.84E-05	1.2	0.0		
21	17.40	-0.94	0.000	4.72E-05	0.5	0.5		138544
22	16.80	-0.61	0.000	4.46E-05	0.0	0.7		138544
23	16.20	-0.32	0.000	4.19E-05	-0.2	0.6		138544
24	15.60	-0.05	0.000	3.99E-05	-0.3	0.4		138544
25	15.00	0.22	0.000	3.88E-05	-0.3	0.1		138544
26	14.63	0.39	0.000	3.85E-05	-0.2	0.0		138544
27	14.25	0.59	0.000	3.85E-05	0.0	0.0		---

Node no.	Y coord	LEFT side						
		Effective stresses					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	722
5	24.10	0.00	9.36	3.29	30.46	4.82	4.82	722

(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
6	23.60	0.00	20.00	7.03	65.05	10.57	10.57	722
7	23.25	0.00	27.88	9.79	90.68	14.74	14.74	722
8	22.65	0.00	41.20	14.47	134.03	21.80	21.80	722
9	22.06	0.00	54.02	18.98	175.72	28.70	28.70	722
10	22.00	0.00	55.28	19.42	179.83	29.39	29.39	722
		0.00	55.28	15.66	241.56	24.00	24.00	3612
11	21.64	0.00	63.47	17.98	277.32	27.98	27.98	3612
12	21.50	0.00	66.60	18.87	291.02	29.51	29.51	3612
13	21.09	4.02	71.64	20.30	313.01	31.95	35.97	3612
14	20.68	8.04	76.50	21.68	334.28	34.33	42.37	3612
15	20.50	9.81	78.60	22.27	343.42	35.36	45.17	3612
16	20.15	13.24	82.60	23.40	360.89	37.34	50.58	3612
17	19.80	16.68	86.52	24.51	378.02	39.29	55.97	3612
18	19.20	22.56	93.08	26.37	406.72	42.60	65.16	3612
19	18.60	28.45	99.50	28.19	434.74	45.85	74.30	3612
20	18.00	34.34	105.79	29.97	462.22	49.07	83.41	3612
		Total>	140.12	33.00m	379.14	160.29	160.29	15910
21	17.40	Total>	152.20	36.00m	402.69	174.34	174.34	16674
22	16.80	Total>	164.20	39.00m	426.16	188.34	188.34	17438
23	16.20	Total>	176.13	42.00m	449.57	202.29	202.29	18201
24	15.60	Total>	188.02	45.00m	472.93	216.20	216.20	18965
25	15.00	Total>	199.86	48.00m	496.24	230.09	230.09	19729
26	14.63	Total>	207.24	49.87m	510.80	238.77	238.77	20206
27	14.25	Total>	214.62	51.75m	525.35	247.45	247.45	20683

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	722
5	24.10	0.00	9.00	3.16	29.27	5.69	5.69	722
6	23.60	0.00	18.00	6.32	58.55	10.87	10.87	722
7	23.25	0.00	24.30	8.54	79.04	14.50	14.50	722
8	22.65	0.00	35.01	12.30	113.88	20.66	20.66	722
9	22.06	0.00	45.72	16.06	148.72	26.83	26.83	722
10	22.00	0.00	46.80	16.44	152.23	27.45	27.45	722
		0.00	46.80	13.26	204.49	25.63	25.63	3612
11	21.64	0.00	54.00	15.30	235.95	29.17	29.17	3612
12	21.50	0.00	56.80	16.09	248.18	30.55	30.55	3612
13	21.09	4.02	60.98	17.28	266.44	32.58	36.61	3612
14	20.68	8.04	65.16	18.46	284.69	34.61	42.66	3612
15	20.50	9.81	66.99	18.98	292.70	35.50	45.31	3612
16	20.15	13.24	70.56	19.99	308.29	37.23	50.48	3612
17	19.80	16.68	74.12	21.00	323.87	38.96	55.64	3612
18	19.20	22.56	80.24	22.73	350.59	41.92	64.49	3612
19	18.60	28.45	86.35	24.47	377.30	44.88	73.33	3612
20	18.00	34.34	92.47	26.20	404.01	47.83	82.17	3612
		Total>	126.80	33.00m	365.82	161.59	161.59	15910
21	17.40	Total>	138.80	36.00m	389.29	175.28	175.28	16674

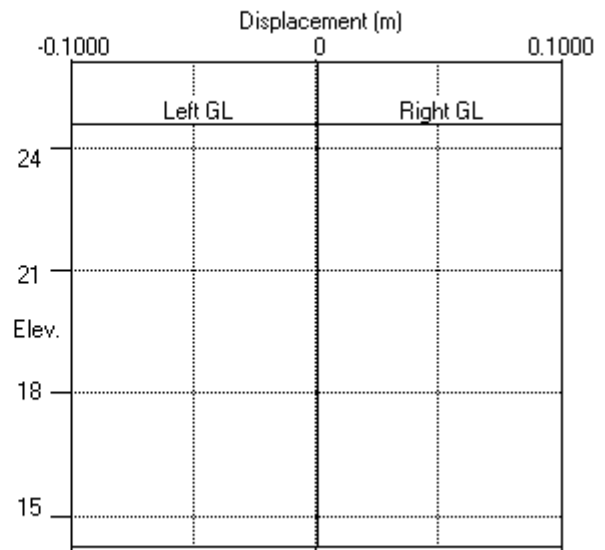
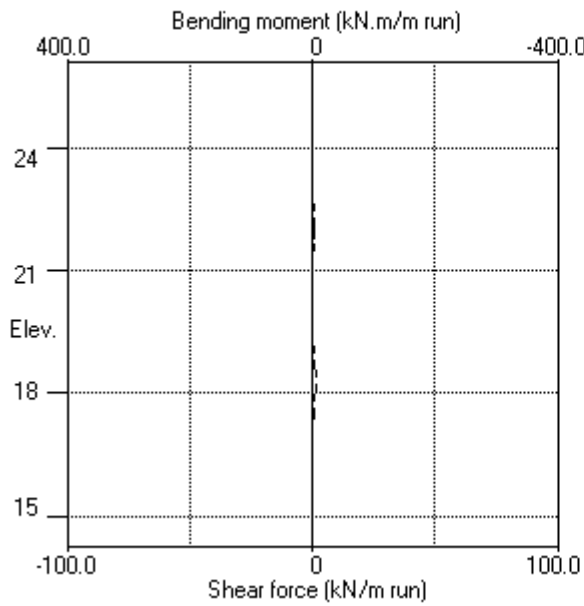
(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

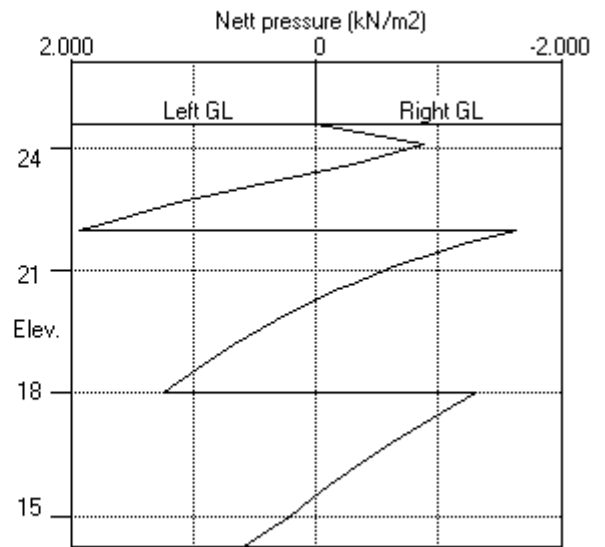
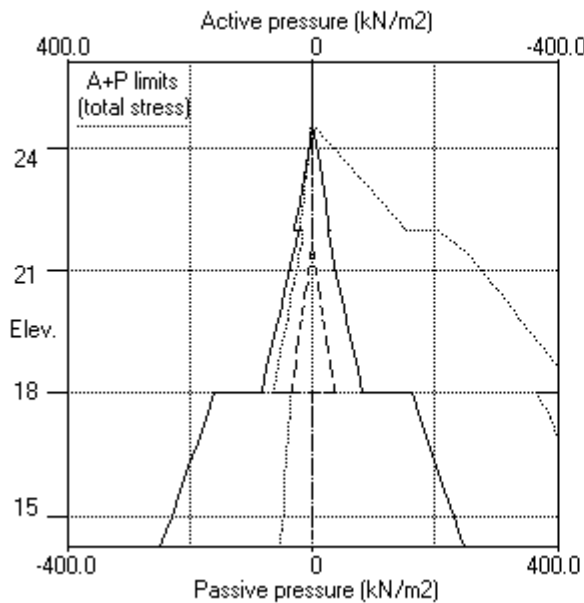
Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
22	16.80	Total>	150.80	39.00m	412.76	188.95	188.95	17438
23	16.20	Total>	162.80	42.00m	436.24	202.61	202.61	18201
24	15.60	Total>	174.80	45.00m	459.71	216.25	216.25	18965
25	15.00	Total>	186.80	48.00m	483.18	229.88	229.88	19729
26	14.63	Total>	194.30	49.87m	497.85	238.38	238.38	20206
27	14.25	Total>	201.80	51.75m	512.52	246.87	246.87	20683

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 24.60



Stage No.1 Apply surcharge no.1 at elev. 24.60



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 2 Apply surcharge no.2 at elevation 23.25

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.002	1.22E-04	0.0	-0.0		138544
2	25.65	0.00	0.002	1.22E-04	0.0	-0.0		138544
3	25.20	0.00	0.002	1.22E-04	0.0	0.0		138544
4	24.60	0.00	0.002	1.22E-04	0.0	-0.0		138544
5	24.10	-2.77	0.002	1.22E-04	-0.7	0.0		138544
6	23.60	-2.11	0.002	1.23E-04	-1.9	-0.7		138544
7	23.25	-1.51	0.002	1.26E-04	-2.5	-1.5		138544
8	22.65	4.29	0.001	1.35E-04	-1.7	-2.9		138544
9	22.06	7.67	0.001	1.48E-04	1.8	-3.0		138544
10	22.00	7.79	0.001	1.49E-04	2.3	-2.8		138544
		-1.80	0.001	1.49E-04	2.3	-2.8		
11	21.64	-1.08	0.001	1.56E-04	1.8	-2.1		138544
12	21.50	-0.91	0.001	1.58E-04	1.6	-1.9		138544
13	21.09	-0.58	0.001	1.62E-04	1.3	-1.3		138544
14	20.68	-0.33	0.001	1.65E-04	1.2	-0.8		138544
15	20.50	-0.22	0.001	1.66E-04	1.1	-0.6		138544
16	20.15	0.00	0.001	1.67E-04	1.1	-0.2		138544
17	19.80	0.24	0.001	1.68E-04	1.1	0.1		138544
18	19.20	0.70	0.001	1.66E-04	1.4	0.8		138544
19	18.60	1.18	0.001	1.60E-04	1.9	1.7		138544
20	18.00	1.66	0.001	1.50E-04	2.8	3.1		138544
		-4.18	0.001	1.50E-04	2.8	3.1		
21	17.40	-3.00	0.001	1.34E-04	0.6	4.0		138544
22	16.80	-1.86	0.001	1.18E-04	-0.8	3.8		138544
23	16.20	-0.82	0.001	1.03E-04	-1.6	2.9		138544
24	15.60	0.16	0.000	9.35E-05	-1.8	1.7		138544
25	15.00	1.17	0.000	8.83E-05	-1.4	0.6		138544
26	14.63	1.86	0.000	8.72E-05	-0.8	0.2		138544
27	14.25	2.62	0.000	8.69E-05	-0.0	-0.0		---

Node no.	Y coord	----- LEFT side -----						
		----- Effective stresses -----					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	954
5	24.10	0.00	9.36	3.29	30.46	3.87	3.87	954

(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
6	23.60	0.00	20.00	7.03	65.05	9.66	954	
7	23.25	0.00	27.88	9.79	90.68	13.86	954	
8	22.65	0.00	55.56	19.52	180.73	25.77	954	
9	22.06	0.00	75.96	26.68	247.08	35.25	954	
10	22.00	0.00	77.35	27.17	251.62	35.99	954	
		0.00	77.35	21.92	337.99	27.59	4768	
11	21.64	0.00	85.24	24.15	372.43	31.67	4768	
12	21.50	0.00	87.95	24.92	384.27	33.13	4768	
13	21.09	4.02	91.35	25.88	399.16	35.26	4768	
14	20.68	8.04	94.47	26.77	412.78	37.30	4768	
15	20.50	9.81	95.82	27.15	418.69	38.19	4768	
16	20.15	13.24	98.48	27.90	430.28	39.93	4768	
17	19.80	16.68	101.19	28.67	442.12	41.69	4768	
18	19.20	22.56	105.97	30.03	463.04	44.76	4768	
19	18.60	28.45	110.92	31.43	484.67	47.86	4768	
20	18.00	34.34	116.00	32.87	506.85	50.98	4768	
		Total>	150.34	33.00m	389.36	163.76	20267	
21	17.40	Total>	161.39	36.00m	411.89	177.73	21240	
22	16.80	Total>	172.53	39.00m	434.49	191.72	22213	
23	16.20	Total>	183.71	42.00m	457.15	205.68	23185	
24	15.60	Total>	194.95	45.00m	479.86	219.64	24158	
25	15.00	Total>	206.22	48.00m	502.61	233.62	25131	
26	14.63	Total>	213.28	49.87m	516.84	242.41	25739	
27	14.25	Total>	220.36	51.75m	531.09	251.23	26347	

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.65	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.20	0.00	0.00	0.00	0.00	0.00	0.0	
4	24.60	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	954	
5	24.10	0.00	9.00	3.16	29.27	6.64	954	
6	23.60	0.00	18.00	6.32	58.55	11.78	954	
7	23.25	0.00	24.30	8.54	79.04	15.37	954	
8	22.65	0.00	35.01	12.30	113.88	21.48	954	
9	22.06	0.00	45.72	16.06	148.72	27.59	954	
10	22.00	0.00	46.80	16.44	152.23	28.20	954	
		0.00	46.80	13.26	204.49	29.39	4768	
11	21.64	0.00	54.00	15.30	235.95	32.75	4768	
12	21.50	0.00	56.80	16.09	248.18	34.05	4768	
13	21.09	4.02	60.98	17.28	266.44	35.84	4768	
14	20.68	8.04	65.16	18.46	284.69	37.63	4768	
15	20.50	9.81	66.99	18.98	292.70	38.41	4768	
16	20.15	13.24	70.56	19.99	308.29	39.93	4768	
17	19.80	16.68	74.12	21.00	323.87	41.45	4768	
18	19.20	22.56	80.24	22.73	350.59	44.06	4768	
19	18.60	28.45	86.35	24.47	377.30	46.68	4768	
20	18.00	34.34	92.47	26.20	404.01	49.33	4768	
		Total>	126.80	33.00m	365.82	167.94	20267	
21	17.40	Total>	138.80	36.00m	389.29	180.73	21240	

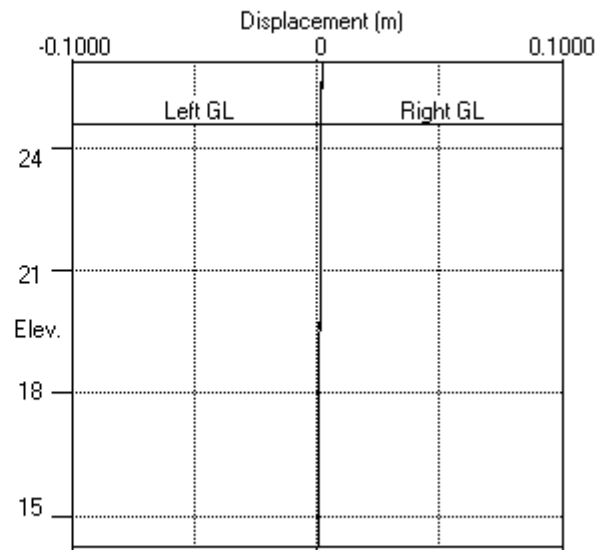
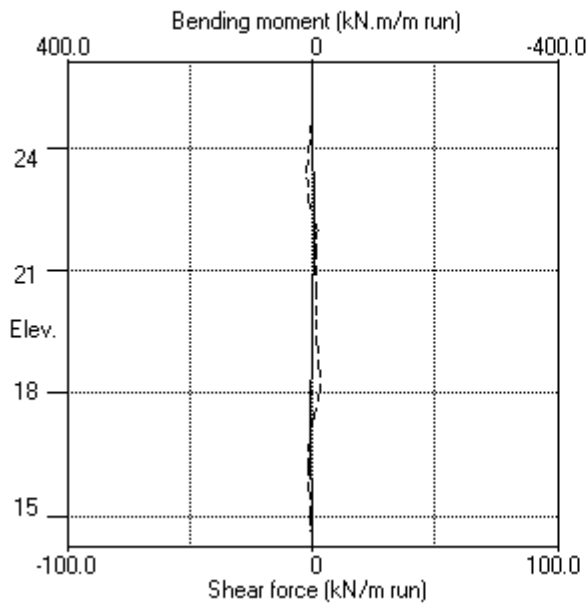
(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

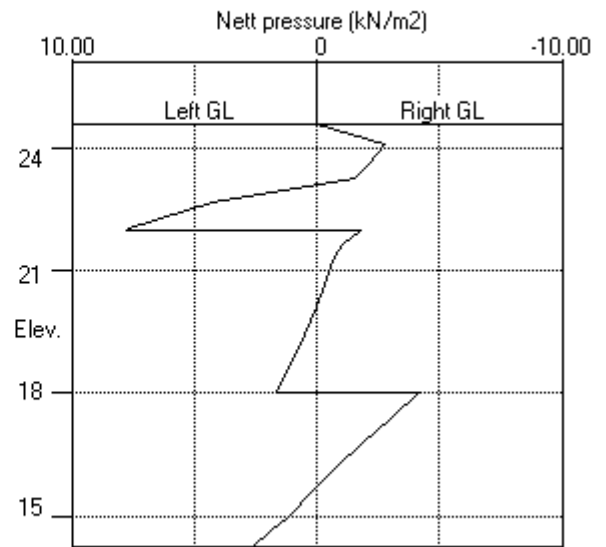
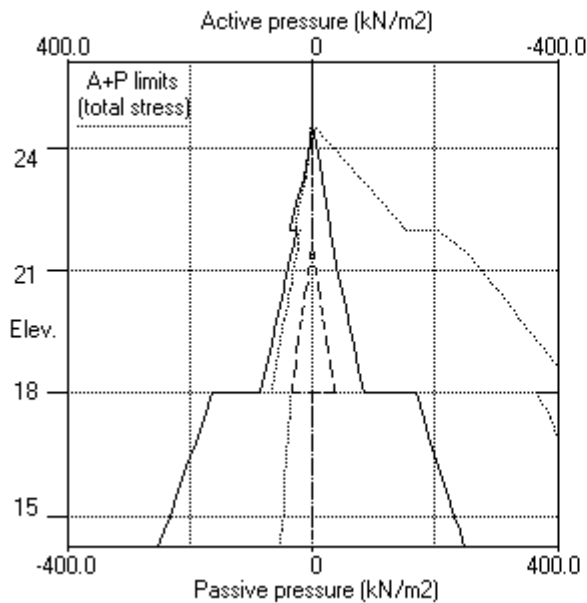
Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
22	16.80	Total>	150.80	39.00m	412.76	193.57	193.57	22213
23	16.20	Total>	162.80	42.00m	436.24	206.50	206.50	23185
24	15.60	Total>	174.80	45.00m	459.71	219.47	219.47	24158
25	15.00	Total>	186.80	48.00m	483.18	232.46	232.46	25131
26	14.63	Total>	194.30	49.87m	497.85	240.55	240.55	25739
27	14.25	Total>	201.80	51.75m	512.52	248.61	248.61	26347

Units: kN,m

Stage No.2 Apply surcharge no.2 at elev. 23.25



Stage No.2 Apply surcharge no.2 at elev. 23.25



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 3 Apply water pressure profile no.1 (Mod. Conserv.)

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.002	9.12E-05	0.0	0.0		138544
2	25.65	0.00	0.002	9.12E-05	0.0	-0.0		138544
3	25.20	0.00	0.002	9.12E-05	0.0	0.0		138544
4	24.60	0.00	0.002	9.12E-05	0.0	-0.0		138544
5	24.10	-3.26	0.002	9.12E-05	-0.8	0.0		138544
6	23.60	-2.63	0.002	9.26E-05	-2.3	-0.8		138544
7	23.25	-2.04	0.002	9.58E-05	-3.1	-1.7		138544
8	22.65	3.73	0.002	1.07E-04	-2.6	-3.6		138544
9	22.06	7.08	0.002	1.24E-04	0.6	-4.3		138544
10	22.00	7.20	0.002	1.26E-04	1.0	-4.3		138544
		-4.74	0.002	1.26E-04	1.0	-4.3		
11	21.64	-4.08	0.002	1.37E-04	-0.5	-4.2		138544
12	21.50	-3.94	0.002	1.41E-04	-1.1	-4.3		138544
13	21.09	-0.96	0.002	1.55E-04	-2.1	-5.0		138544
14	20.68	1.97	0.002	1.71E-04	-1.9	-5.9		138544
15	20.50	3.26	0.002	1.79E-04	-1.4	-6.2		138544
16	20.15	3.54	0.001	1.95E-04	-0.2	-6.5		138544
17	19.80	3.88	0.001	2.11E-04	1.1	-6.4		138544
18	19.20	4.61	0.001	2.36E-04	3.6	-5.1		138544
19	18.60	5.48	0.001	2.52E-04	6.6	-2.1		138544
20	18.00	6.43	0.001	2.50E-04	10.2	2.8		138544
		-11.47	0.001	2.50E-04	10.2	2.8		
21	17.40	-8.51	0.001	2.29E-04	4.2	6.8		138544
22	16.80	-5.64	0.001	1.98E-04	-0.0	7.8		138544
23	16.20	-3.08	0.001	1.66E-04	-2.7	6.7		138544
24	15.60	-0.84	0.001	1.42E-04	-3.8	4.5		138544
25	15.00	1.19	0.000	1.28E-04	-3.7	2.0		138544
26	14.63	4.48	0.000	1.24E-04	-2.7	0.7		138544
27	14.25	9.71	0.000	1.23E-04	-0.0	-0.0		---

Node no.	Y coord	LEFT side						
		Effective stresses					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	797
5	24.10	0.00	9.36	3.29	30.46	3.62	3.62	797

(continued)

Stage No.3 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
6	23.60	0.00	20.00	7.03	65.05	9.41	797	
7	23.25	0.00	27.88	9.79	90.68	13.60	797	
8	22.65	0.00	55.56	19.52	180.73	25.49	797	
9	22.06	0.00	75.96	26.68	247.08	34.96	797	
10	22.00	0.00	77.35	27.17	251.62	35.70	797	
		0.00	77.35	21.92	337.99	26.12	3986	
11	21.64	0.00	85.24	24.15	372.43	30.16	3986	
12	21.50	0.00	87.95	24.92	384.27	31.62	3986	
13	21.09	4.02	91.35	25.88	399.16	33.73	3986	
14	20.68	8.04	94.47	26.77	412.78	35.77	3986	
15	20.50	9.81	95.82	27.15	418.69	36.66	3986	
16	20.15	13.24	98.48	27.90	430.28	38.43	3986	
17	19.80	16.68	101.19	28.67	442.12	40.24	3986	
18	19.20	22.56	105.97	30.03	463.04	43.44	3986	
19	18.60	28.45	110.92	31.43	484.67	46.74	3986	
20	18.00	34.34	116.00	32.87	506.85	50.10	3986	
		Total>	150.34	33.00m	389.36	159.92	17301	
21	17.40	Total>	161.39	36.00m	411.89	174.78	18132	
22	16.80	Total>	172.53	39.00m	434.49	189.63	18962	
23	16.20	Total>	183.71	42.00m	457.15	204.35	19793	
24	15.60	Total>	194.95	45.00m	479.86	218.94	20623	
25	15.00	Total>	206.22	48.00m	502.61	233.44	25079	
26	14.63	Total>	213.28	49.87m	516.84	243.52	155254	
27	14.25	Total>	220.36	51.75m	531.09	254.58	158921	

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.65	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.20	0.00	0.00	0.00	0.00	0.00	0.0	
4	24.60	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	797	
5	24.10	0.00	9.00	3.16	29.27	6.88	797	
6	23.60	0.00	18.00	6.32	58.55	12.03	797	
7	23.25	0.00	24.30	8.54	79.04	15.64	797	
8	22.65	0.00	35.01	12.30	113.88	21.76	797	
9	22.06	0.00	45.72	16.06	148.72	27.88	797	
10	22.00	0.00	46.80	16.44	152.23	28.50	797	
		0.00	46.80	13.26	204.49	30.86	3986	
11	21.64	0.00	54.00	15.30	235.95	34.25	3986	
12	21.50	0.00	56.80	16.09	248.18	35.56	3986	
13	21.09	0.00	65.00	18.42	284.01	38.71	3986	
14	20.68	0.00	73.20	20.74	319.84	41.84	3986	
15	20.50	0.00	76.80	21.76	335.57	43.21	3986	
16	20.15	3.43	80.37	22.77	351.15	44.70	3986	
17	19.80	6.87	83.93	23.78	366.73	46.17	3986	
18	19.20	12.75	90.05	25.51	393.45	48.64	3986	
19	18.60	18.64	96.16	27.25	420.16	51.07	3986	
20	18.00	24.52	102.28	28.98	446.88	53.48	3986	
		Total>	126.80	33.00m	365.82	171.39	17301	
21	17.40	Total>	138.80	36.00m	389.29	183.29	18132	

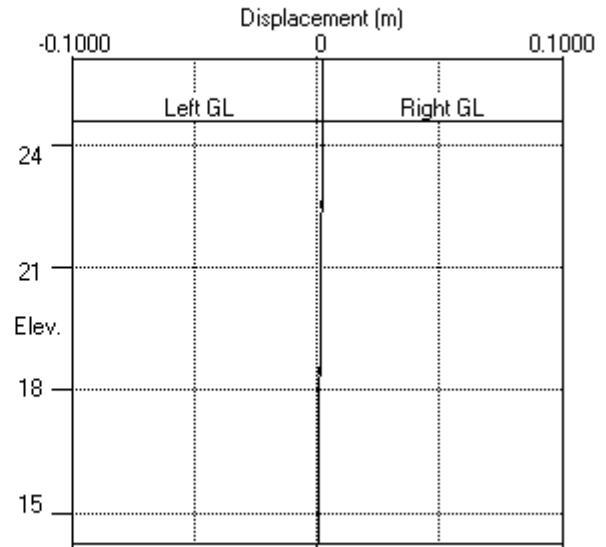
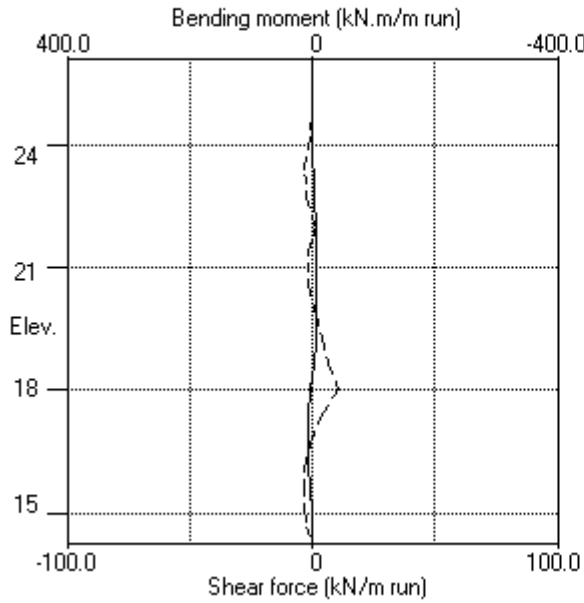
(continued)

Stage No.3 Apply water pressure profile no.1 (Mod. Conserv.)

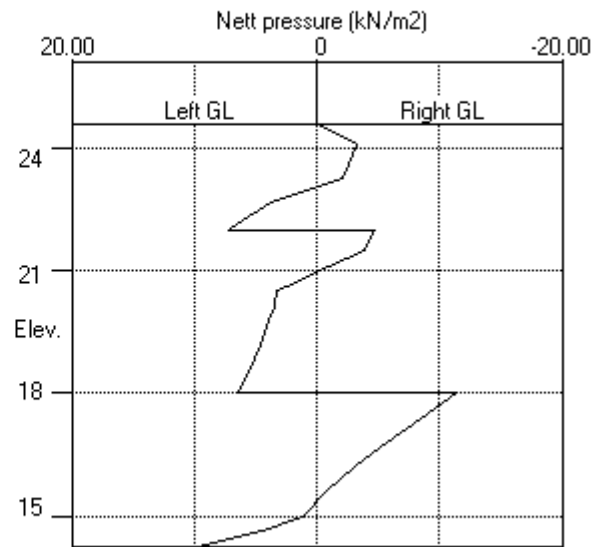
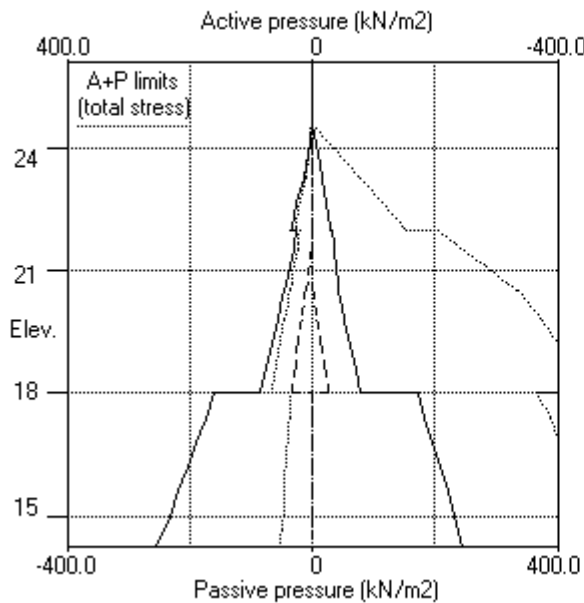
Node no.	Y coord	----- RIGHT side -----						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
22	16.80	Total>	150.80	39.00m	412.77	195.27	195.27	18962
23	16.20	Total>	162.80	42.00m	436.24	207.44	207.44	19793
24	15.60	Total>	174.80	45.00m	459.71	219.78	219.78	20623
25	15.00	Total>	186.80	48.00m	483.19	232.25	232.25	25079
26	14.63	Total>	194.30	49.87m	497.86	239.04	239.04	155254
27	14.25	Total>	201.80	51.75m	512.53	244.87	244.87	158921

Units: kN,m

Stage No.3 Apply water pressure profile no.1 (Mod. Conserv.)



Stage No.3 Apply water pressure profile no.1 (Mod. Conserv.)



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 20.68 on RIGHT side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.058	7.35E-03	0.0	0.0		138544
2	25.65	0.00	0.055	7.35E-03	0.0	0.0		138544
3	25.20	0.00	0.052	7.35E-03	0.0	0.0		138544
4	24.60	0.00	0.047	7.35E-03	0.0	-0.0		138544
5	24.10	3.29	0.044	7.35E-03	0.8	0.3		138544
6	23.60	7.03	0.040	7.34E-03	3.4	1.3		138544
7	23.25	9.79	0.037	7.34E-03	6.3	2.9		138544
8	22.65	19.52	0.033	7.31E-03	15.1	9.0		138544
9	22.06	26.68	0.029	7.25E-03	28.8	21.8		138544
10	22.00	27.17	0.028	7.24E-03	30.4	23.6		138544
		21.92	0.028	7.24E-03	30.4	23.6		
11	21.64	24.15	0.026	7.16E-03	38.7	36.0		138544
12	21.50	24.92	0.025	7.12E-03	42.2	41.7		138544
13	21.09	29.91	0.022	6.97E-03	53.4	61.2		138544
14	20.68	34.81	0.019	6.75E-03	66.7	85.7		138544
15	20.50	21.23	0.018	6.63E-03	71.7	98.2		138544
16	20.15	6.40	0.015	6.35E-03	76.5	124.3		138544
17	19.80	-8.42	0.013	6.00E-03	76.2	151.1		138544
18	19.20	-33.78	0.010	5.26E-03	63.5	193.7		138544
19	18.60	-43.31	0.007	4.34E-03	40.4	228.6		138544
20	18.00	-23.11	0.005	3.32E-03	20.5	244.9		138544
		-184.48	0.005	3.32E-03	20.5	244.9		
21	17.40	-88.06	0.003	2.30E-03	-61.3	223.9		138544
22	16.80	-21.55	0.002	1.44E-03	-94.2	171.3		138544
23	16.20	19.31	0.001	8.38E-04	-94.8	110.8		138544
24	15.60	42.08	0.001	4.74E-04	-76.4	57.4		138544
25	15.00	54.80	0.001	3.08E-04	-47.4	19.0		138544
26	14.63	62.74	0.001	2.76E-04	-25.3	5.1		138544
27	14.25	72.37	0.000	2.69E-04	-0.0	-0.0		---

Node no.	Y coord	LEFT side						
		Effective stresses					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1215
5	24.10	0.00	9.36	3.29	30.46	3.29	3.29a	1215

(continued)

Stage No.4 Excavate to elevation 20.68 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
6	23.60	0.00	20.00	7.03	65.05	7.03	7.03a	1215
7	23.25	0.00	27.88	9.79	90.68	9.79	9.79a	1215
8	22.65	0.00	55.56	19.52	180.73	19.52	19.52a	1215
9	22.06	0.00	75.96	26.68	247.08	26.68	26.68a	1215
10	22.00	0.00	77.35	27.17	251.62	27.17	27.17a	1215
		0.00	77.35	21.92	337.99	21.92	21.92a	6075
11	21.64	0.00	85.24	24.15	372.43	24.15	24.15a	6075
12	21.50	0.00	87.95	24.92	384.27	24.92	24.92a	6075
13	21.09	4.02	91.35	25.88	399.16	25.88	29.91a	6075
14	20.68	8.04	94.47	26.77	412.78	26.77	34.81a	6075
15	20.50	9.81	95.82	27.15	418.69	27.15	36.96a	6075
16	20.15	13.24	98.48	27.90	430.28	27.90	41.15a	6075
17	19.80	16.68	101.19	28.67	442.12	28.67	45.35a	6075
18	19.20	22.56	105.97	30.03	463.04	30.03	52.59a	6075
19	18.60	28.45	110.92	31.43	484.67	31.43	59.88a	6075
20	18.00	34.34	116.00	32.87	506.85	32.87	67.20a	6075
		Total>	150.34	33.00m	389.36	65.53	65.53	25301
21	17.40	Total>	161.39	36.00m	411.89	116.64	116.64	26515
22	16.80	Total>	172.53	39.00m	434.49	156.18	156.18	27729
23	16.20	Total>	183.71	42.00m	457.15	185.77	185.77	28944
24	15.60	Total>	194.95	45.00m	479.86	208.32	208.32	30158
25	15.00	Total>	206.22	48.00m	502.61	226.97	226.97	31373
26	14.63	Total>	213.28	49.87m	516.84	238.86	238.86	32132
27	14.25	Total>	220.36	51.75m	531.09	251.63	251.63	32891

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	21.09	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	20.68	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	9839
15	20.50	0.00	3.60	1.02	15.73	15.73	15.73p	9839
16	20.15	3.43	7.17	2.03	31.31	31.31	34.75p	9839
17	19.80	6.87	10.73	3.04	46.90	46.90	53.76p	9839
18	19.20	12.75	16.85	4.77	73.61	73.61	86.37p	9839
19	18.60	18.64	22.96	6.51	100.33	84.55	103.19	9839
20	18.00	24.52	29.08	8.24	127.06	65.79	90.32	9839
		Total>	53.60	13.40m	292.61	250.01	250.01	39921
21	17.40	Total>	65.61	16.40m	316.08	204.70	204.70	41838
22	16.80	Total>	77.61	19.40m	339.56	177.74	177.74	43754

(continued)

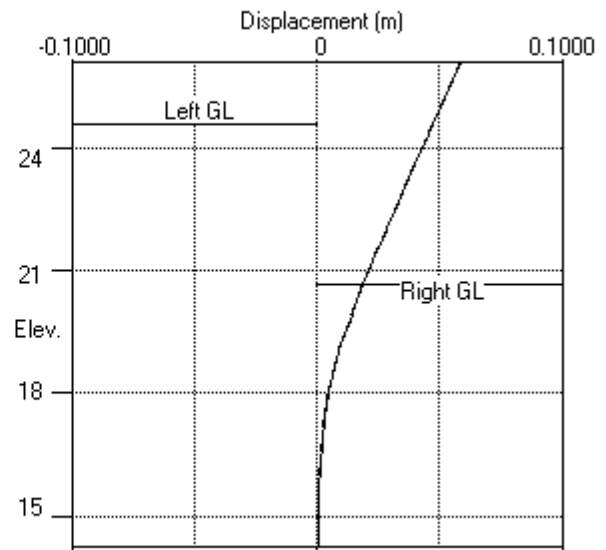
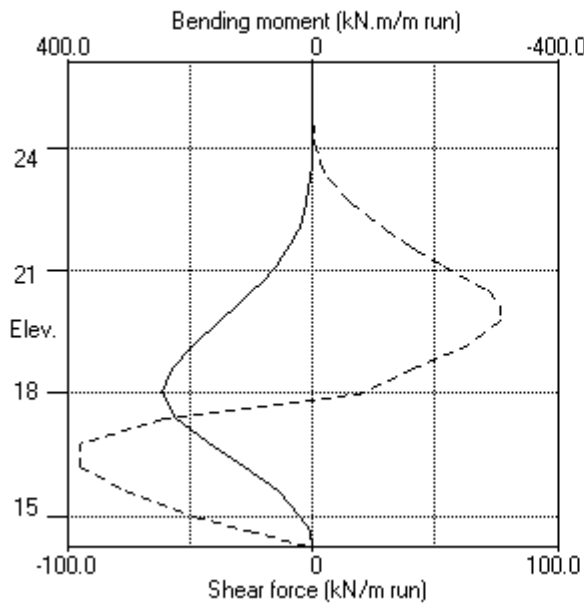
Stage No.4 Excavate to elevation 20.68 on RIGHT side

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
23	16.20	Total>	89.62	22.40m	363.04	166.46	166.46	45670
24	15.60	Total>	101.63	25.40m	386.53	166.25	166.25	47586
25	15.00	Total>	113.64	28.40m	410.01	172.18	172.18	49503
26	14.63	Total>	121.15	30.27m	424.69	176.12	176.12	50700
27	14.25	Total>	128.66	32.15m	439.37	179.26	179.26	51898

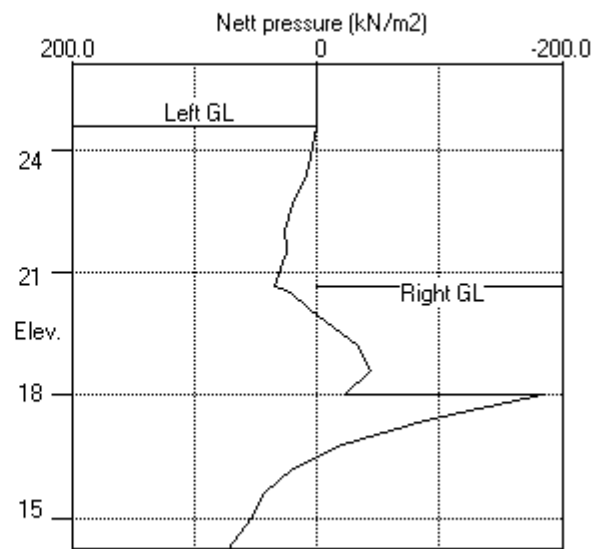
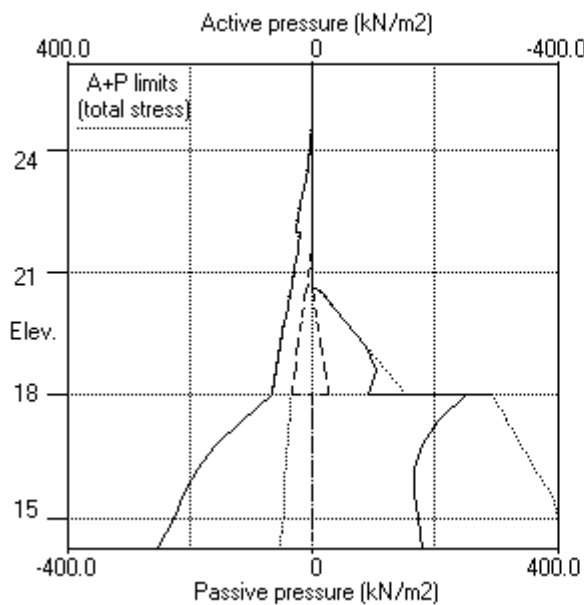
Note: 67.20a Soil pressure at active limit
 86.37p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 20.68 on RIGHT side



Stage No.4 Excav. to elev. 20.68 on RIGHT side



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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 5 Fill to elevation 21.64 on RIGHT side with soil type 1

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.058	7.38E-03	0.0	0.0		138544
2	25.65	0.00	0.054	7.38E-03	0.0	0.0		138544
3	25.20	0.00	0.051	7.38E-03	0.0	0.0		138544
4	24.60	0.00	0.047	7.38E-03	0.0	-0.0		138544
5	24.10	3.68	0.043	7.38E-03	0.9	0.3		138544
6	23.60	7.42	0.039	7.37E-03	3.7	1.3		138544
7	23.25	10.20	0.037	7.37E-03	6.8	3.2		138544
8	22.65	19.93	0.032	7.34E-03	15.7	9.6		138544
9	22.06	27.11	0.028	7.27E-03	29.7	22.9		138544
10	22.00	27.60	0.028	7.26E-03	31.4	24.7		138544
		24.04	0.028	7.26E-03	31.4	24.7		
11	21.64	26.30	0.025	7.18E-03	40.4	37.6		138544
12	21.50	26.20	0.024	7.14E-03	44.1	43.5		138544
13	21.09	28.61	0.021	6.98E-03	55.3	63.8		138544
14	20.68	30.94	0.018	6.75E-03	67.6	89.0		138544
		32.11	0.018	6.75E-03	67.6	89.0		
15	20.50	20.20	0.017	6.63E-03	72.3	101.6		138544
16	20.15	5.36	0.015	6.34E-03	76.7	127.8		138544
17	19.80	-9.49	0.013	5.98E-03	76.0	154.7		138544
18	19.20	-34.97	0.009	5.22E-03	62.7	197.0		138544
19	18.60	-44.67	0.006	4.29E-03	38.8	231.1		138544
20	18.00	-24.69	0.004	3.26E-03	18.0	246.2		138544
		-182.65	0.004	3.26E-03	18.0	246.2		
21	17.40	-86.46	0.002	2.24E-03	-62.8	224.1		138544
22	16.80	-20.31	0.001	1.39E-03	-94.8	170.8		138544
23	16.20	20.12	0.001	7.84E-04	-94.9	110.2		138544
24	15.60	42.42	0.000	4.22E-04	-76.1	56.9		138544
25	15.00	54.63	0.000	2.58E-04	-47.0	18.8		138544
26	14.63	62.22	0.000	2.26E-04	-25.1	5.0		138544
27	14.25	71.45	0.000	2.19E-04	-0.0	-0.0		---

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.65	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.20	0.00	0.00	0.00	0.00	0.00	0.0	
4	24.60	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	667	

(continued)

Stage No.5 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical	Effective Active limit	Effective Passive limit	Earth pressure		
5	24.10	0.00	9.36	3.29	30.46	3.68	3.68	667
6	23.60	0.00	20.00	7.03	65.05	7.42	7.42	667
7	23.25	0.00	27.88	9.79	90.68	10.20	10.20	667
8	22.65	0.00	55.56	19.52	180.73	19.93	19.93	667
9	22.06	0.00	75.96	26.68	247.08	27.11	27.11	667
10	22.00	0.00	77.35	27.17	251.62	27.60	27.60	667
		0.00	77.35	21.92	337.99	24.04	24.04	3336
11	21.64	0.00	85.24	24.15	372.43	26.30	26.30	3336
12	21.50	0.00	87.95	24.92	384.27	27.08	27.08	3336
13	21.09	4.02	91.35	25.88	399.16	28.07	32.09	3336
14	20.68	8.04	94.47	26.77	412.78	28.96	37.01	3336
15	20.50	9.81	95.82	27.15	418.69	29.35	39.16	3336
16	20.15	13.24	98.48	27.90	430.28	30.09	43.33	3336
17	19.80	16.68	101.19	28.67	442.12	30.84	47.52	3336
18	19.20	22.56	105.97	30.03	463.04	32.15	54.71	3336
19	18.60	28.45	110.92	31.43	484.67	33.47	61.92	3336
20	18.00	34.34	116.00	32.87	506.85	34.81	69.14	3336
		Total>	150.34	33.00m	389.36	74.19	74.19	14915
21	17.40	Total>	161.39	36.00m	411.89	125.20	125.20	15631
22	16.80	Total>	172.53	39.00m	434.49	164.57	164.57	16347
23	16.20	Total>	183.71	42.00m	457.15	193.95	193.95	17063
24	15.60	Total>	194.95	45.00m	479.86	216.29	216.29	17779
25	15.00	Total>	206.22	48.00m	502.61	234.70	234.70	18495
26	14.63	Total>	213.28	49.87m	516.84	246.42	246.42	18942
27	14.25	Total>	220.36	51.75m	531.09	259.00	259.00	19390

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical	Effective Active limit	Effective Passive limit	Earth pressure		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	772
12	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	772
13	21.09	0.00	9.90	3.48	32.20	3.48	3.48a	772
14	20.68	0.00	17.28	6.07	56.21	6.07	6.07a	772
		0.00	17.28	4.90	75.50	4.90	4.90a	3859
15	20.50	0.00	20.88	5.92	91.23	18.95	18.95	3859
16	20.15	3.43	24.45	6.93	106.82	34.54	37.98	3859
17	19.80	6.87	28.01	7.94	122.40	50.15	57.01	3859
18	19.20	12.75	34.13	9.67	149.13	76.92	89.68	3859
19	18.60	18.64	40.25	11.40	175.85	87.95	106.59	3859
20	18.00	24.52	46.36	13.14	202.58	69.31	93.83	3859
		Total>	70.89	18.20m	309.89	256.84	256.84	16827

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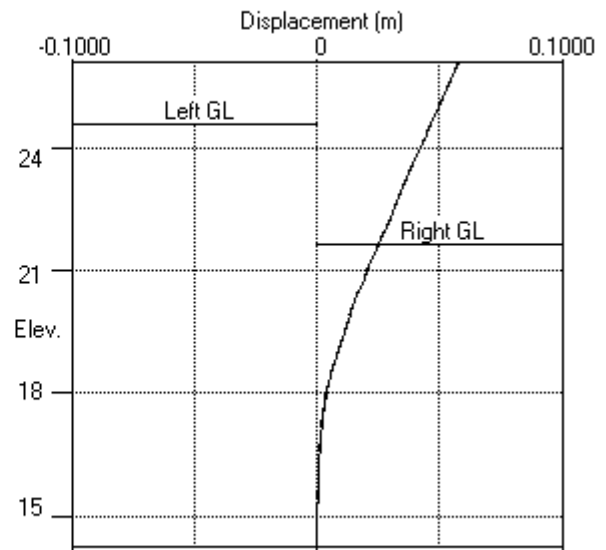
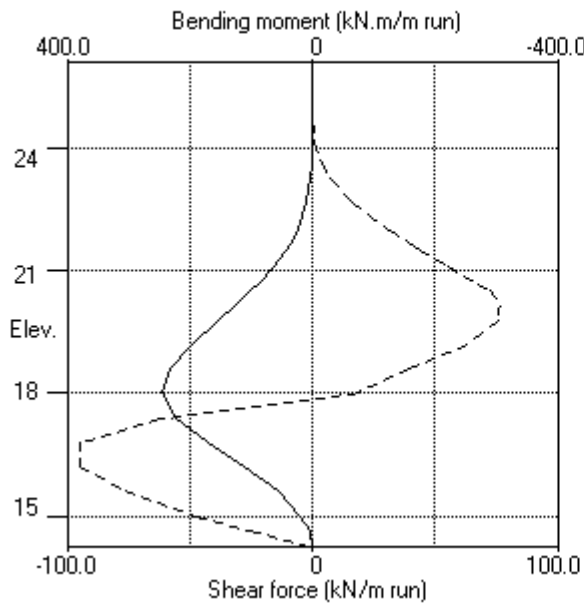
Stage No.5 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
21	17.40	Total>	82.89	21.20m	333.37	211.66	211.66	17634
22	16.80	Total>	94.90	24.20m	356.85	184.88	184.88	18442
23	16.20	Total>	106.91	27.20m	380.33	173.83	173.83	19250
24	15.60	Total>	118.92	30.20m	403.82	173.86	173.86	20057
25	15.00	Total>	130.93	33.20m	427.30	180.07	180.07	20865
26	14.63	Total>	138.44	35.08m	441.98	184.20	184.20	21370
27	14.25	Total>	145.95	36.95m	456.67	187.55	187.55	21875

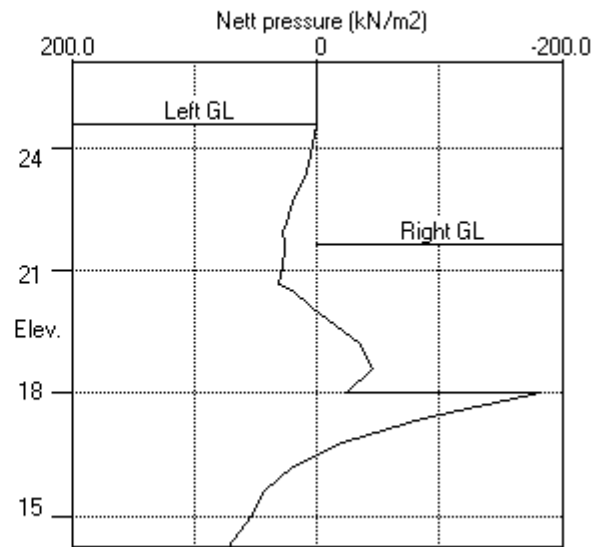
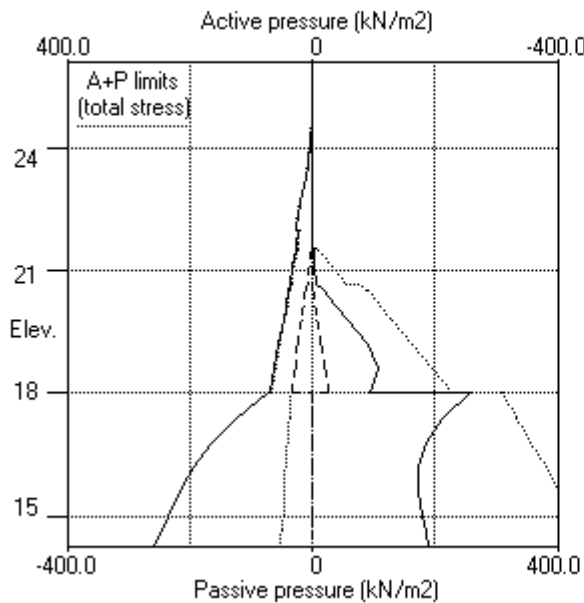
Note: 4.90a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.5 Fill to elev. 21.64 on RIGHT side



Stage No.5 Fill to elev. 21.64 on RIGHT side



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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 8 Change EI of wall to 98960 kN.m²/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DAL Combination 1

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/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.10	0.00	0.058	7.32E-03	-2.3	0.0	2.3	98960
2	25.65	0.00	0.055	7.32E-03	-2.3	-0.8		98960
3	25.20	0.00	0.051	7.33E-03	-2.3	-1.6		98960
4	24.60	0.00	0.047	7.34E-03	-2.3	-2.7		98960
5	24.10	3.53	0.043	7.36E-03	-1.4	-3.3		98960
6	23.60	7.27	0.039	7.38E-03	1.3	-3.2		98960
7	23.25	10.06	0.037	7.40E-03	4.3	-2.0		98960
8	22.65	19.84	0.032	7.40E-03	13.2	3.2		98960
9	22.06	27.09	0.028	7.36E-03	27.2	15.3	11.4	98960
		27.09	0.028	7.36E-03	15.8	15.3		
10	22.00	27.58	0.028	7.35E-03	17.4	16.5		98960
		23.98	0.028	7.35E-03	17.4	16.5		
11	21.64	26.46	0.025	7.29E-03	26.5	25.5		98960
12	21.50	26.44	0.024	7.25E-03	30.2	29.9		98960
13	21.09	29.14	0.021	7.11E-03	41.6	45.8		98960
14	20.68	31.79	0.018	6.91E-03	54.1	66.6		98960
		32.96	0.018	6.91E-03	54.1	66.6		
15	20.50	22.22	0.017	6.79E-03	59.1	77.3		98960
16	20.15	7.99	0.015	6.50E-03	64.4	100.1		98960
17	19.80	-6.25	0.012	6.13E-03	64.7	123.7		98960
18	19.20	-30.85	0.009	5.33E-03	53.5	161.1		98960
19	18.60	-40.08	0.006	4.32E-03	32.3	191.6		98960
20	18.00	-20.23	0.004	3.19E-03	14.2	204.3		98960
		-163.93	0.004	3.19E-03	14.2	204.3		
21	17.40	-70.11	0.002	2.09E-03	-56.1	183.0		98960
22	16.80	-8.62	0.001	1.19E-03	-79.7	135.1		98960
23	16.20	26.05	0.001	5.91E-04	-74.4	83.2		98960
24	15.60	42.61	0.000	2.55E-04	-53.8	40.2		98960
25	15.00	39.93	0.000	1.14E-04	-29.1	12.6		98960
26	14.63	38.41	0.000	8.93E-05	-14.4	3.2		98960
27	14.25	38.37	0.000	8.41E-05	-0.0	-0.0		---
At elev. 26.10		Strut force =		2.3 kN/strut =	2.3 kN/m run			
At elev. 22.06		Strut force =		11.4 kN/strut =	11.4 kN/m run			

(continued)

Stage No.8 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	LEFT side					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
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1556
5	24.10	0.00	9.36	3.29	30.46	3.53	3.53	1556
6	23.60	0.00	20.00	7.03	65.05	7.27	7.27	1556
7	23.25	0.00	27.88	9.79	90.68	10.06	10.06	1556
8	22.65	0.00	55.56	19.52	180.73	19.84	19.84	1556
9	22.06	0.00	75.96	26.68	247.08	27.09	27.09	1556
10	22.00	0.00	77.35	27.17	251.62	27.58	27.58	1556
		0.00	77.35	21.92	337.99	23.98	23.98	7781
11	21.64	0.00	85.24	24.15	372.43	26.46	26.46	5565
12	21.50	0.00	87.95	24.92	384.27	27.32	27.32	5565
13	21.09	4.02	91.35	25.88	399.16	28.59	32.61	5565
14	20.68	8.04	94.47	26.77	412.78	29.81	37.86	5565
15	20.50	9.81	95.82	27.15	418.69	30.35	40.16	5565
16	20.15	13.24	98.48	27.90	430.28	31.41	44.65	5565
17	19.80	16.68	101.19	28.67	442.12	32.46	49.14	5565
18	19.20	22.56	105.97	30.03	463.04	34.21	56.77	5565
19	18.60	28.45	110.92	31.43	484.67	35.76	64.21	5565
20	18.00	34.34	116.00	32.87	506.85	37.04	71.37	5565
		Total>	150.34	33.00m	389.36	83.55	83.55	23329
21	17.40	Total>	161.39	36.00m	411.89	133.37	133.37	24449
22	16.80	Total>	172.53	39.00m	434.49	170.42	170.42	25569
23	16.20	Total>	183.71	42.00m	457.15	196.92	196.92	26689
24	15.60	Total>	194.95	45.00m	479.86	216.38	216.38	38648
25	15.00	Total>	206.22	48.00m	502.61	227.35	227.35	81490
26	14.63	Total>	213.28	49.87m	516.84	234.52	234.52	83462
27	14.25	Total>	220.36	51.75m	531.09	242.46	242.46	85433

Node no.	Y coord	RIGHT side					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
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1113
12	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1113
13	21.09	0.00	9.90	3.48	32.20	3.48	3.48a	1113
14	20.68	0.00	17.28	6.07	56.21	6.07	6.07a	1113
		0.00	17.28	4.90	75.50	4.90	4.90a	5565

(continued)

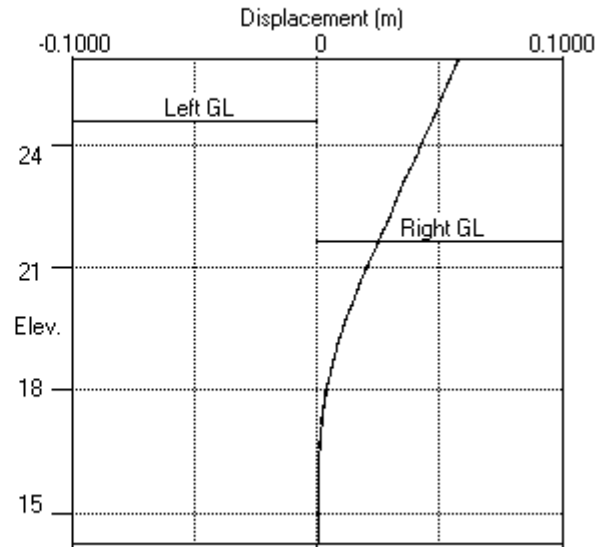
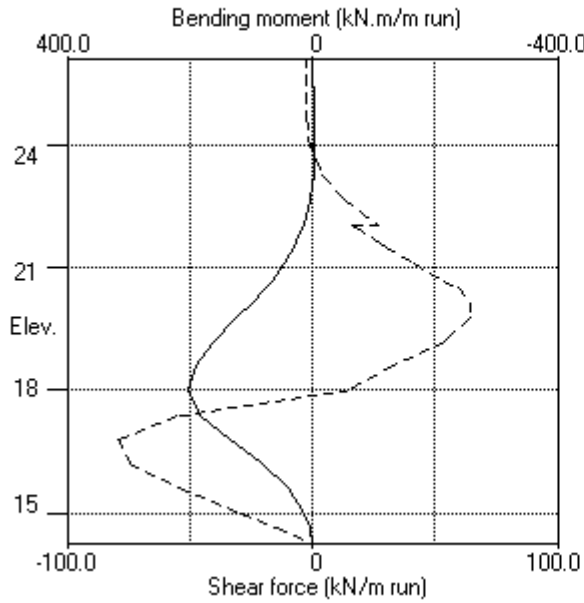
Stage No.8 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
15	20.50	0.00	20.88	5.92	91.23	17.94	17.94	5565
16	20.15	3.43	24.45	6.93	106.82	33.22	36.66	5565
17	19.80	6.87	28.01	7.94	122.40	48.52	55.39	5565
18	19.20	12.75	34.13	9.67	149.13	74.86	87.62	5565
19	18.60	18.64	40.25	11.40	175.85	85.66	104.29	5565
20	18.00	24.52	46.36	13.14	202.58	67.08	91.60	5565
		Total>	70.89	18.20m	309.89	247.48	247.48	23329
21	17.40	Total>	82.89	21.20m	333.37	203.49	203.49	24449
22	16.80	Total>	94.90	24.20m	356.85	179.04	179.04	25569
23	16.20	Total>	106.91	27.20m	380.33	170.87	170.87	26689
24	15.60	Total>	118.92	30.20m	403.82	173.77	173.77	38648
25	15.00	Total>	130.93	33.20m	427.30	187.42	187.42	81490
26	14.63	Total>	138.44	35.08m	441.98	196.11	196.11	83462
27	14.25	Total>	145.95	36.95m	456.67	204.09	204.09	85433

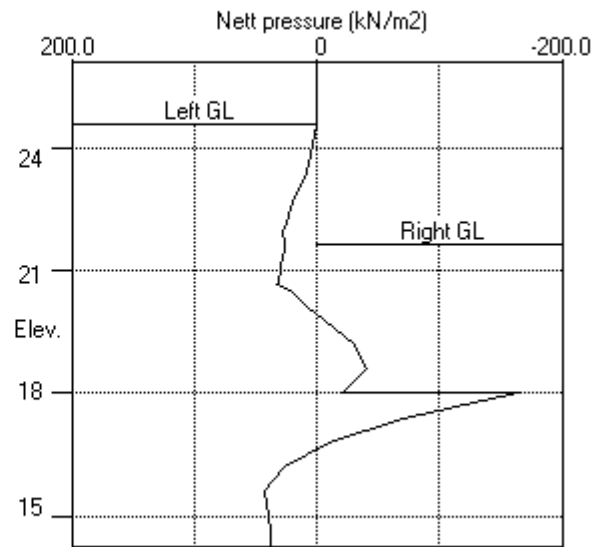
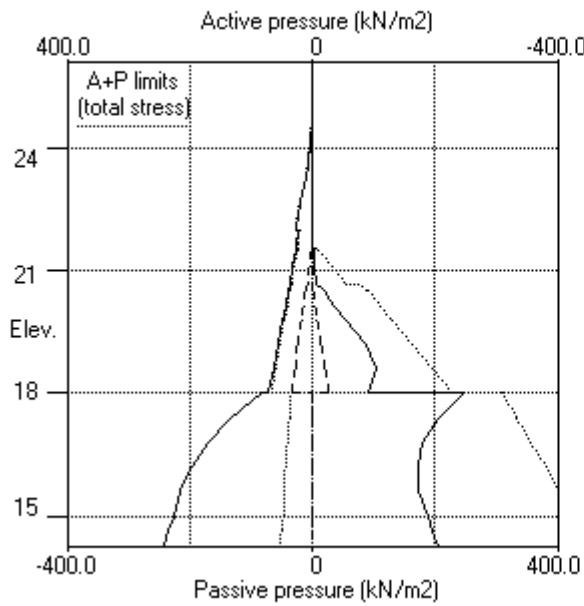
Note: 4.90a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Change EI of wall to 98960kN.m²/m run



Stage No.8 Change EI of wall to 98960kN.m²/m run



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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 11 Apply water pressure profile no.2 (Mod. Conserv.)

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.058	7.26E-03	-4.5	0.0	4.5	98960
2	25.65	0.00	0.055	7.26E-03	-4.5	-1.8		98960
3	25.20	0.00	0.051	7.28E-03	-4.5	-3.6		98960
4	24.60	0.00	0.047	7.31E-03	-4.5	-6.0		98960
5	24.10	3.39	0.043	7.35E-03	-3.7	-7.7		98960
6	23.60	7.13	0.040	7.40E-03	-1.0	-8.7		98960
7	23.25	12.22	0.037	7.43E-03	2.4	-8.3		98960
8	22.65	25.94	0.033	7.48E-03	13.7	-3.6		98960
9	22.06	37.16	0.028	7.47E-03	32.5	10.1	7.2	98960
		37.16	0.028	7.47E-03	25.3	10.1		
10	22.00	38.06	0.028	7.46E-03	27.5	11.9		98960
		34.52	0.028	7.46E-03	27.5	11.9		
11	21.64	39.65	0.025	7.41E-03	40.9	25.2		98960
		20.15	0.025	7.41E-03	40.9	25.2		
12	21.50	20.27	0.024	7.37E-03	43.7	31.6		98960
13	21.09	20.68	0.021	7.22E-03	52.1	52.4		98960
14	20.68	20.96	0.018	6.97E-03	60.6	76.8		98960
		21.55	0.018	6.97E-03	60.6	76.8		
15	20.50	11.26	0.017	6.83E-03	63.6	88.5		98960
16	20.15	-2.83	0.014	6.51E-03	65.0	112.1		98960
17	19.80	-17.14	0.012	6.10E-03	61.6	135.3		98960
18	19.20	-42.26	0.009	5.23E-03	43.7	168.9		98960
19	18.60	-52.37	0.006	4.21E-03	15.3	191.4		98960
20	18.00	-33.37	0.004	3.12E-03	-10.4	191.8		98960
		-71.73	0.004	3.12E-03	-10.4	191.8		
21	17.40	-48.02	0.002	2.10E-03	-46.3	168.2		98960
22	16.80	-20.81	0.001	1.26E-03	-67.0	128.1		98960
23	16.20	16.76	0.001	6.88E-04	-68.2	81.6		98960
24	15.60	36.91	0.000	3.55E-04	-52.1	40.7		98960
25	15.00	38.07	0.000	2.11E-04	-29.6	13.1		98960
26	14.63	39.03	0.000	1.84E-04	-15.1	3.4		98960
27	14.25	41.56	-0.000	1.79E-04	-0.0	-0.0		---
At elev. 26.10		Strut force =		4.5 kN/strut =	4.5 kN/m run			
At elev. 22.06		Strut force =		7.2 kN/strut =	7.2 kN/m run			

(continued)

Stage No.11 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1606
5	24.10	0.00	9.36	3.29	30.46	3.39	3.39	1606
6	23.60	0.00	20.00	7.03	65.05	7.13	7.13	1606
7	23.25	3.43	24.45	8.59	79.52	8.78	12.22	1606
8	22.65	9.27	46.29	16.26	150.57	16.67	25.94	1606
9	22.06	15.11	60.85	21.38	197.94	22.06	37.16	1384
10	22.00	15.70	61.66	21.66	200.56	22.37	38.06	1384
		15.70	61.66	17.47	269.41	18.83	34.52	6920
11	21.64	19.23	66.01	18.70	288.41	20.42	39.65	6920
12	21.50	20.60	67.35	19.08	294.26	20.94	41.54	6920
13	21.09	24.62	70.75	20.05	309.15	22.53	47.15	6920
14	20.68	28.65	73.87	20.93	322.76	23.99	52.64	6920
15	20.50	30.41	75.22	21.31	328.67	24.61	55.02	6920
16	20.15	33.84	77.88	22.07	340.27	25.73	59.57	6920
17	19.80	37.28	80.59	22.83	352.11	26.75	64.02	6920
18	19.20	43.16	85.37	24.19	373.03	28.21	71.38	6920
19	18.60	49.05	90.32	25.59	394.66	29.32	78.37	6920
20	18.00	54.94	95.40	27.03	416.84	30.14	85.08	17883
		54.94	95.40	33.51	310.32	44.00	98.93	38933
21	17.40	60.82	100.57	35.33	327.14	86.99	147.81	40802
22	16.80	66.71	105.82	37.17	344.20	119.14	185.85	42671
23	16.20	72.59	111.12	39.03	361.45	141.18	213.77	27341
24	15.60	78.48	116.47	40.91	378.85	156.51	234.99	28488
25	15.00	84.37	121.85	42.80	396.37	163.47	247.83	29635
26	14.63	88.04	125.24	43.99	407.38	168.17	256.21	30352
27	14.25	91.72	128.64	45.19	418.43	173.69	265.41	31069

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		19.23	0.77	0.27	2.51	0.27	19.50a	1384
12	21.50	20.60	1.92	0.67	6.24	0.67	21.27a	1384
13	21.09	24.62	5.27	1.85	17.16	1.85	26.48a	1384
14	20.68	28.65	8.63	3.03	28.06	3.03	31.68a	1384
		28.65	8.63	2.44	37.69	2.44	31.09a	6920
15	20.50	30.41	10.46	2.96	45.69	13.35	43.76	6920
16	20.15	33.84	14.01	3.97	61.20	28.56	62.40	6920

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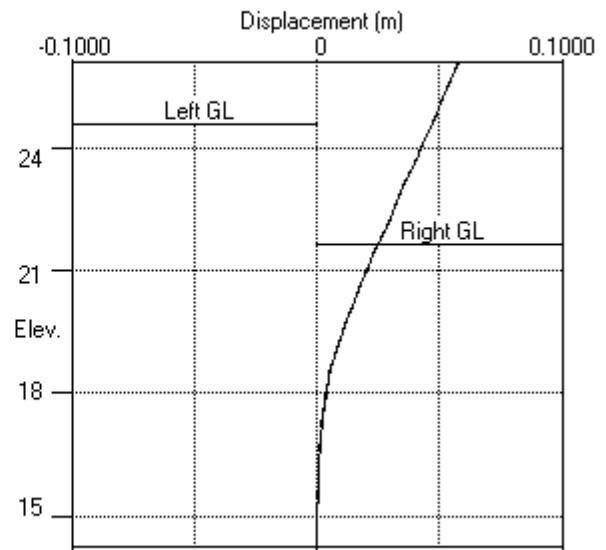
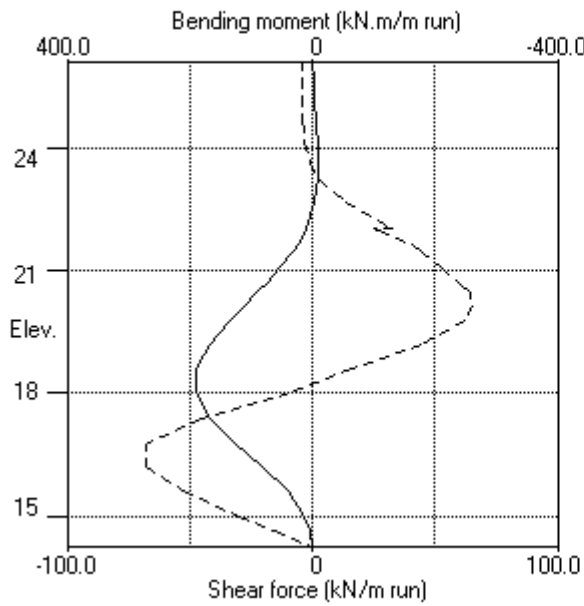
Stage No.11 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
17	19.80	37.28	17.55	4.97	76.68	43.88	81.16	6920
18	19.20	43.16	23.60	6.69	103.10	70.48	113.64	6920
19	18.60	49.05	29.61	8.39	129.36	81.69	130.74	6920
20	18.00	54.94	35.58	10.08	155.44	63.51	118.45	17883
		54.94	35.58	12.50	115.72	115.72	170.66p	38933
21	17.40	60.82	41.50	14.58	135.00	135.00	195.83p	40802
22	16.80	66.71	47.39	16.65	154.15	139.95	206.66	42671
23	16.20	72.59	53.24	18.70	173.18	124.41	197.01	27341
24	15.60	78.48	59.05	20.74	192.09	119.60	198.08	28488
25	15.00	84.37	64.84	22.78	210.91	125.40	209.76	29635
26	14.63	88.04	68.44	24.04	222.63	129.14	217.18	30352
27	14.25	91.72	72.04	25.30	234.32	132.13	223.85	31069

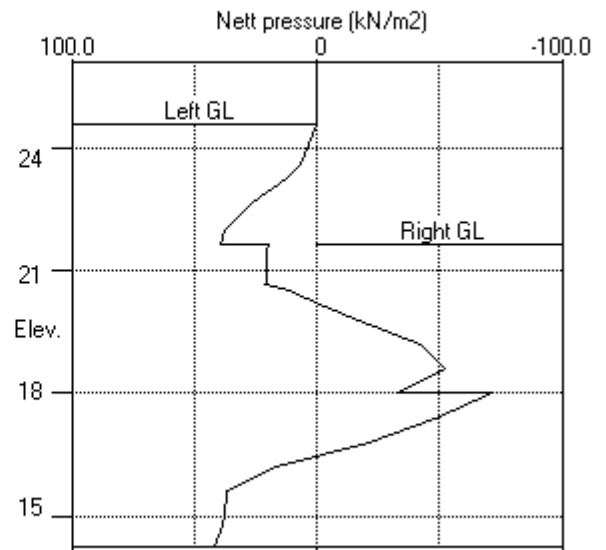
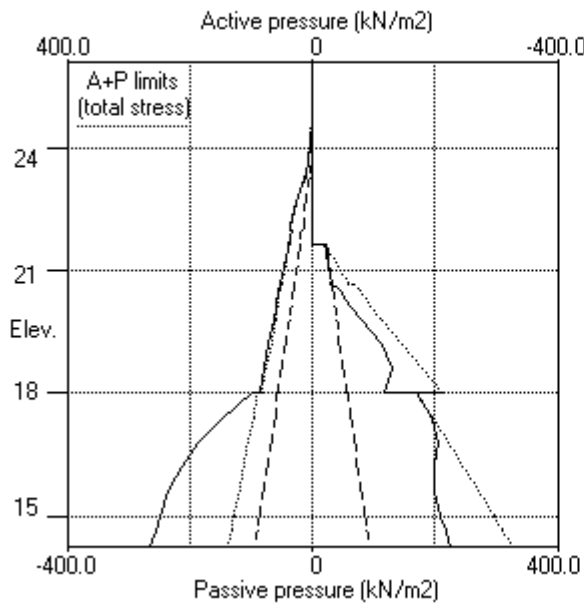
Note: 31.09a Soil pressure at active limit
 195.83p Soil pressure at passive limit

Units: kN,m

Stage No.11 Apply water pressure profile no.2 (Mod. Conserv.)



Stage No.11 Apply water pressure profile no.2 (Mod. Conserv.)



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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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				Shear force			
		max. m	min. m	Calculated kN.m/m		Factored kN.m/m		Calculated kN/m		Factored kN/m	
1	26.10	0.058	0.000	0	-0	0	-0	0	-5	0	-6
2	25.65	0.055	0.000	0	-2	0	-2	0	-5	0	-6
3	25.20	0.052	0.000	0	-4	0	-5	0	-5	0	-6
4	24.60	0.047	0.000	0	-6	0	-8	0	-5	0	-6
5	24.10	0.044	0.000	0	-8	0	-10	1	-4	1	-5
6	23.60	0.040	0.000	1	-9	2	-12	4	-2	5	-3
7	23.25	0.037	0.000	3	-8	4	-11	7	-3	9	-4
8	22.65	0.033	0.000	10	-4	13	-5	16	-3	21	-4
9	22.06	0.029	0.000	23	-4	31	-6	32	0	44	0
10	22.00	0.028	0.000	25	-4	33	-6	31	0	42	0
11	21.64	0.026	0.000	38	-4	51	-6	41	-1	55	-1
12	21.50	0.025	0.000	44	-4	59	-6	44	-1	60	-1
13	21.09	0.022	0.000	64	-5	86	-7	55	-2	75	-3
14	20.68	0.019	0.000	89	-6	120	-8	68	-2	91	-3
15	20.50	0.018	0.000	102	-6	137	-8	72	-1	98	-2
16	20.15	0.015	0.000	128	-7	173	-9	77	-0	104	-0
17	19.80	0.013	0.000	155	-6	209	-9	76	-0	103	-0
18	19.20	0.010	0.000	197	-5	266	-7	64	0	86	0
19	18.60	0.007	0.000	231	-2	312	-3	40	0	55	0
20	18.00	0.005	0.000	246	0	332	0	20	-10	28	-14
21	17.40	0.003	0.000	224	0	302	0	4	-63	6	-85
22	16.80	0.002	0.000	171	0	231	0	0	-95	0	-128
23	16.20	0.001	0.000	111	0	150	0	0	-95	0	-128
24	15.60	0.001	0.000	57	0	77	0	0	-76	0	-103
25	15.00	0.001	0.000	19	0	26	0	0	-47	0	-64
26	14.63	0.001	0.000	5	0	7	0	0	-25	0	-34
27	14.25	0.000	-0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

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

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	Calculated		Factored		Calculated		Factored	
min.	max. elev.	min. elev.	max. elev.	max. elev.	min. elev.	max. elev.	min. elev.	max. elev.
	kN.m/m		kN.m/m		kN/m		kN/m	
1	16.80	-1 22.65	1	-1	18.00	-1 23.25	2	
-1	17.40	-3 22.06	5	-4	3 18.00	-3 23.25	4	
-3	16.80	-7 20.15	10	-9	10 18.00	-4 15.60	14	
-5	245 18.00	-0 24.60	331	-0	77 20.15	-95 16.20	103	
-128	246 18.00	-0 24.60	332	-0	77 20.15	-95 16.20	104	
-128	No calculation at this stage							
6	No calculation at this stage							
7	204 18.00	-3 24.10	276	-4	65 19.80	-80 16.80	87	
-108	No calculation at this stage							
9	No calculation at this stage							
10	192 18.00	-9 23.60	259	-12	65 20.15	-68 16.20	88	
-92								

Maximum and minimum displacement at each stage

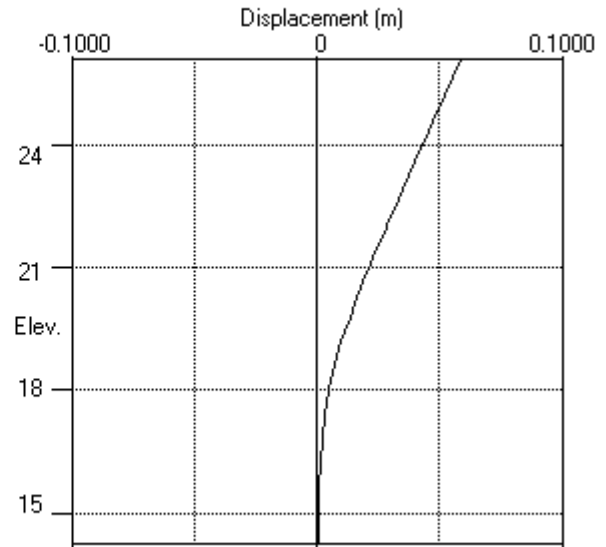
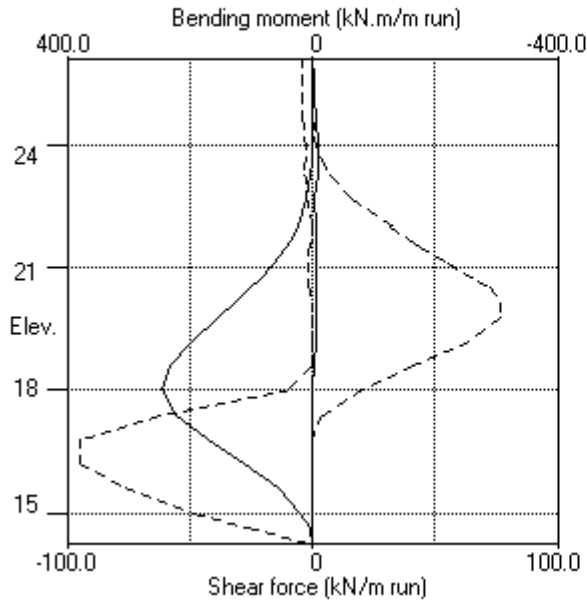
Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.001	26.10	0.000	26.10	Apply surcharge no.1 at elev. 24.60
2	0.002	26.10	0.000	26.10	Apply surcharge no.2 at elev. 23.25
3	0.002	26.10	0.000	26.10	Apply water pressure profile no.1
4	0.058	26.10	0.000	26.10	Excav. to elev. 20.68 on RIGHT side
5	0.058	26.10	0.000	26.10	Fill to elev. 21.64 on RIGHT side
6	No calculation at this stage				Install strut no.1 at elev. 22.06
7	No calculation at this stage				Install strut no.2 at elev. 26.10
8	0.058	26.10	0.000	26.10	Change EI of wall to 98960kN.m ² /m run
9	No calculation at this stage				Change soil type 3 to soil type 4
10	No calculation at this stage				Apply surcharge no.3 at elev. 21.64
11	0.058	26.10	-0.000	14.25	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1			Strut no. 2		
	at elev. 22.06			at elev. 26.10		
	Calculated	Factored	Calculated	Factored	Calculated	Factored
	kN per m run	kN per strut	kN per m run	kN per strut	kN per m run	kN per strut
8	11	11	15	2	2	3
11	7	7	10	5	5	6

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

3-ULS2

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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	24.60	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES (Unfactored SLS soil strengths)

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

Initial water table elevation Left side Right side
 21.50 21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
	2	1	23.60	23.60	0.0	1	21.64	21.64
2						21.64	23.60	19.2

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 14.25
 Maximum finite element length = 0.60 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
2	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- Near edge	Surcharge ----- Far edge	Equiv. soil type	Partial factor/ Category
1	24.60	1.35(L)	20.00	20.00	18.00	=	N/A	1.30 Var
2	23.25	0.40(L)	20.00	0.95	48.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	20.00	=	N/A	1.00 P/F

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 24.60
2	Apply surcharge no.2 at elevation 23.25
3	Apply water pressure profile no.1 (Worst Cred.)
4	Excavate to elevation 20.68 on RIGHT side
5	Fill to elevation 21.64 on RIGHT side with soil type 1
6	Install strut or anchor no.1 at elevation 22.06
7	Install strut or anchor no.2 at elevation 26.10
8	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
9	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
10	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
11	Apply water pressure profile no.2 (Worst Cred.)

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 2

Water pressures : Worst Credible

Partial factor on C' = 1.250

Partial factor on Phi' = 1.250

Partial factor on Cu = 1.400

Partial factor on Soil Modulus = 1.000

Partial factor on Permanent Unfavourable loads = 1.000

Partial factor on Permanent Favourable loads = 1.000

Partial factor on Variable Unfavourable loads = 1.300

Stability analysis:

Method of analysis - Strength Factor method

Overall 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) = 12.50 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m

Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m

Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 24.60	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 23.25	No	No	No
3	Apply water pressure profile no.1	Yes	Yes	Yes
4	Excav. to elev. 20.68 on RIGHT side	Yes	Yes	Yes
5	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
6	Install strut no.1 at elev. 22.06	Yes	Yes	Yes
7	Install strut no.2 at elev. 26.10	Yes	Yes	Yes
8	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
9	Change soil type 3 to soil type 4	Yes	Yes	Yes
10	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
11	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 24.60

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

			Overall						
			FoS for toe	Toe elev. for					
			elev. = 14.25	FoS = 1.000					

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure	
1	24.60	24.60	Cant.	<u>Conditions not suitable for FoS calc.</u>					

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.10	0.00	0.001	3.98E-05	0.0	0.0		138544
2	25.65	0.00	0.001	3.98E-05	0.0	-0.0		138544
3	25.20	0.00	0.001	3.98E-05	0.0	0.0		138544
4	24.60	0.00	0.001	3.98E-05	0.0	-0.0		138544
5	24.10	-1.04	0.001	3.98E-05	-0.3	0.0		138544
6	23.60	-0.36	0.001	4.02E-05	-0.6	-0.2		138544
7	23.25	0.28	0.001	4.11E-05	-0.6	-0.4		138544
8	22.65	1.35	0.001	4.35E-05	-0.1	-0.7		138544
9	22.06	2.21	0.001	4.62E-05	0.9	-0.5		138544
10	22.00	2.29	0.001	4.64E-05	1.1	-0.4		138544
		-1.92	0.001	4.64E-05	1.1	-0.4		
11	21.64	-1.41	0.001	4.72E-05	0.5	-0.2		138544
12	21.50	-1.23	0.001	4.73E-05	0.3	-0.1		138544
13	21.09	-0.75	0.001	4.77E-05	-0.1	-0.1		138544
14	20.68	-0.34	0.001	4.82E-05	-0.4	-0.2		138544
15	20.50	-0.17	0.001	4.86E-05	-0.4	-0.3		138544
16	20.15	0.12	0.001	4.95E-05	-0.4	-0.4		138544
17	19.80	0.39	0.001	5.08E-05	-0.3	-0.6		138544
18	19.20	0.79	0.001	5.36E-05	0.0	-0.7		138544
19	18.60	1.15	0.001	5.62E-05	0.6	-0.5		138544
20	18.00	1.47	0.001	5.72E-05	1.4	0.1		138544
		-1.54	0.001	5.72E-05	1.4	0.1		
21	17.40	-1.11	0.000	5.58E-05	0.6	0.6		138544
22	16.80	-0.72	0.000	5.27E-05	0.1	0.8		138544
23	16.20	-0.38	0.000	4.96E-05	-0.3	0.7		138544
24	15.60	-0.06	0.000	4.72E-05	-0.4	0.4		138544
25	15.00	0.25	0.000	4.59E-05	-0.4	0.2		138544
26	14.63	0.46	0.000	4.56E-05	-0.2	0.1		138544
27	14.25	0.69	0.000	4.55E-05	0.0	-0.0		---

(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	722
5	24.10	0.00	9.43	4.01	24.02	4.75	4.75	722
6	23.60	0.00	20.36	8.66	51.87	10.60	10.60	722
7	23.25	0.00	28.53	12.13	72.68	14.87	14.87	722
8	22.65	0.00	42.33	18.00	107.83	22.09	22.09	722
9	22.06	0.00	55.53	23.61	141.46	29.12	29.12	722
10	22.00	0.00	56.83	24.16	144.76	29.82	29.82	722
		0.00	56.83	20.14	182.70	24.11	24.11	3612
11	21.64	0.00	65.19	23.10	209.59	28.16	28.16	3612
12	21.50	0.00	68.39	24.24	219.87	29.72	29.72	3612
13	21.09	4.02	73.58	26.07	236.55	32.21	36.24	3612
14	20.68	8.04	78.57	27.84	252.60	34.64	42.69	3612
15	20.50	9.81	80.71	28.60	259.47	35.69	45.50	3612
16	20.15	13.24	84.78	30.05	272.58	37.71	50.95	3612
17	19.80	16.68	88.77	31.46	285.39	39.70	56.37	3612
18	19.20	22.56	95.42	33.82	306.77	43.05	65.61	3612
19	18.60	28.45	101.89	36.11	327.56	46.34	74.79	3612
20	18.00	34.34	108.21	38.35	347.89	49.59	83.92	3612
		Total>	142.54	33.00m	313.28	161.33	161.33	15910
21	17.40	Total>	154.63	36.00m	333.57	175.42	175.42	16674
22	16.80	Total>	166.63	39.00m	353.76	189.45	189.45	17438
23	16.20	Total>	178.55	42.00m	373.88	203.42	203.42	18201
24	15.60	Total>	190.42	45.00m	393.94	217.35	217.35	18965
25	15.00	Total>	202.23	48.00m	413.95	231.25	231.25	19729
26	14.63	Total>	209.60	49.87m	426.43	239.94	239.94	20206
27	14.25	Total>	216.95	51.75m	438.91	248.63	248.63	20683

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	722
5	24.10	0.00	9.00	3.83	22.93	5.78	5.78	722
6	23.60	0.00	18.00	7.65	45.85	10.96	10.96	722
7	23.25	0.00	24.30	10.33	61.90	14.59	14.59	722
8	22.65	0.00	35.01	14.88	89.18	20.75	20.75	722
9	22.06	0.00	45.72	19.44	116.47	26.91	26.91	722
10	22.00	0.00	46.80	19.90	119.22	27.53	27.53	722
		0.00	46.80	16.59	150.46	26.03	26.03	3612
11	21.64	0.00	54.00	19.14	173.61	29.57	29.57	3612
12	21.50	0.00	56.80	20.13	182.61	30.95	30.95	3612
13	21.09	4.02	60.98	21.61	196.04	32.96	36.99	3612
14	20.68	8.04	65.16	23.09	209.48	34.98	43.03	3612
15	20.50	9.81	66.99	23.74	215.37	35.87	45.68	3612
16	20.15	13.24	70.56	25.00	226.84	37.59	50.83	3612

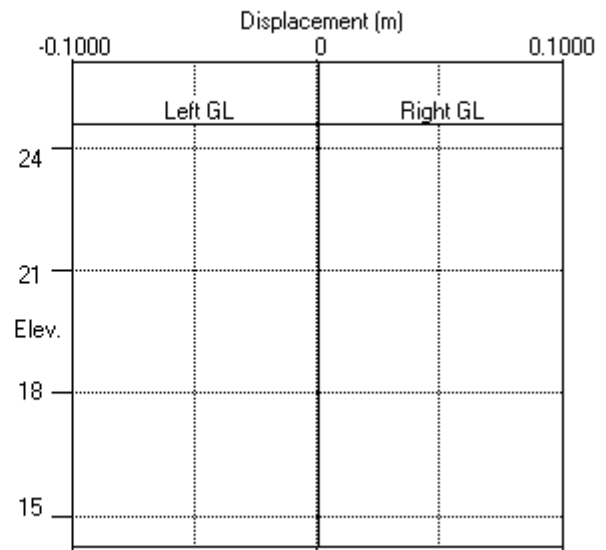
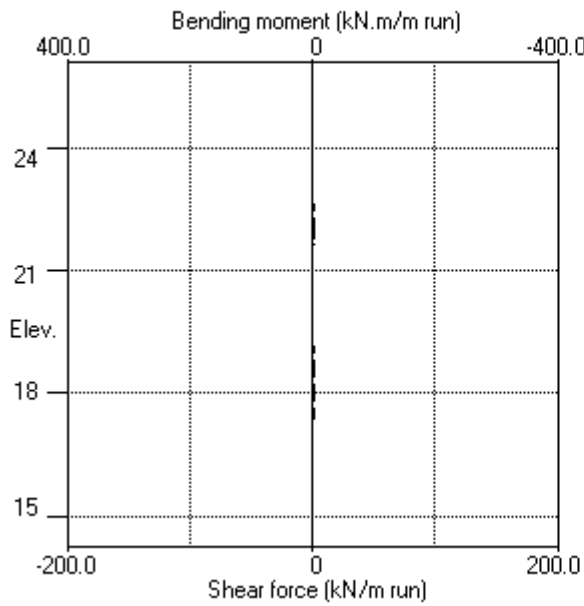
(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

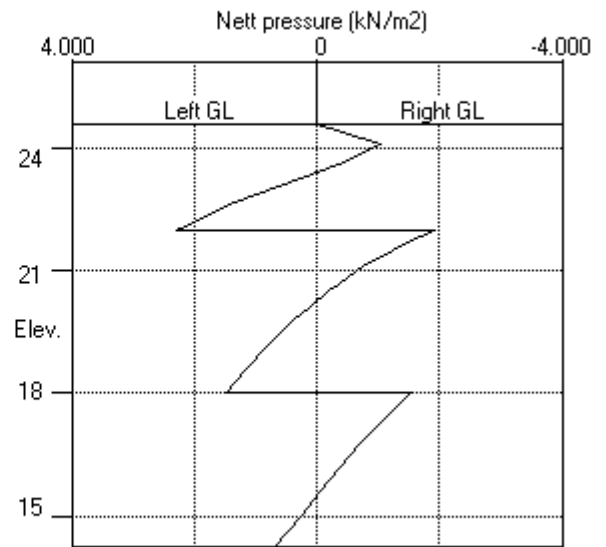
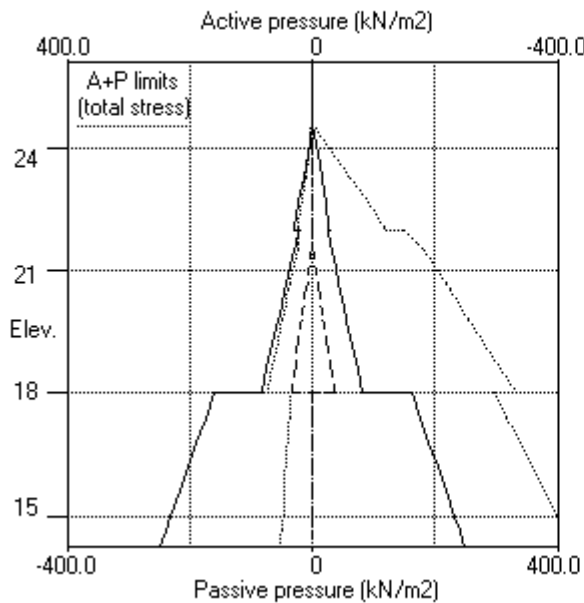
Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
17	19.80	16.68	74.12	26.27	238.31	39.31	55.99	3612	
18	19.20	22.56	80.24	28.44	257.96	42.25	64.82	3612	
19	18.60	28.45	86.35	30.60	277.62	45.19	73.64	3612	
20	18.00	34.34	92.47	32.77	297.28	48.12	82.46	3612	
		Total>	126.80	33.00m	297.53	162.87	162.87	15910	
21	17.40	Total>	138.80	36.00m	317.73	176.54	176.54	16674	
22	16.80	Total>	150.80	39.00m	337.92	190.18	190.18	17438	
23	16.20	Total>	162.80	42.00m	358.12	203.80	203.80	18201	
24	15.60	Total>	174.80	45.00m	378.31	217.41	217.41	18965	
25	15.00	Total>	186.80	48.00m	398.51	231.00	231.00	19729	
26	14.63	Total>	194.30	49.87m	411.13	239.47	239.47	20206	
27	14.25	Total>	201.80	51.75m	423.75	247.93	247.93	20683	

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 24.60



Stage No.1 Apply surcharge no.1 at elev. 24.60



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 2 Apply surcharge no.2 at elevation 23.25

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

			Overall					
			FoS for toe	Toe elev. for				
			elev. = 14.25	FoS = 1.000				

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure
2	24.60	24.60	Cant.	<u>Conditions not suitable for FoS calc.</u>				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.002	1.34E-04	0.0	0.0		138544
2	25.65	0.00	0.002	1.34E-04	0.0	-0.0		138544
3	25.20	0.00	0.002	1.34E-04	0.0	0.0		138544
4	24.60	0.00	0.002	1.34E-04	0.0	-0.0		138544
5	24.10	-2.74	0.002	1.34E-04	-0.7	-0.0		138544
6	23.60	-2.21	0.002	1.35E-04	-1.9	-0.7		138544
7	23.25	-1.50	0.002	1.38E-04	-2.6	-1.4		138544
8	22.65	4.46	0.002	1.47E-04	-1.7	-2.9		138544
9	22.06	7.98	0.002	1.60E-04	2.0	-2.9		138544
10	22.00	8.12	0.002	1.61E-04	2.5	-2.8		138544
		-1.89	0.002	1.61E-04	2.5	-2.8		
11	21.64	-1.39	0.001	1.67E-04	1.9	-1.9		138544
12	21.50	-1.19	0.001	1.69E-04	1.7	-1.7		138544
13	21.09	-0.76	0.001	1.73E-04	1.3	-1.1		138544
14	20.68	-0.43	0.001	1.76E-04	1.1	-0.6		138544
15	20.50	-0.29	0.001	1.76E-04	1.0	-0.4		138544
16	20.15	-0.01	0.001	1.77E-04	1.0	-0.1		138544
17	19.80	0.28	0.001	1.77E-04	1.0	0.2		138544
18	19.20	0.81	0.001	1.74E-04	1.3	0.9		138544
19	18.60	1.35	0.001	1.69E-04	2.0	1.8		138544
20	18.00	1.89	0.001	1.58E-04	2.9	3.2		138544
		-4.39	0.001	1.58E-04	2.9	3.2		
21	17.40	-3.13	0.001	1.42E-04	0.7	4.1		138544
22	16.80	-1.94	0.001	1.25E-04	-0.8	3.9		138544
23	16.20	-0.85	0.001	1.10E-04	-1.7	3.0		138544
24	15.60	0.17	0.001	9.99E-05	-1.9	1.8		138544
25	15.00	1.21	0.000	9.45E-05	-1.5	0.7		138544
26	14.63	1.92	0.000	9.33E-05	-0.9	0.2		138544
27	14.25	2.71	0.000	9.30E-05	0.0	-0.0		---

(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	964
5	24.10	0.00	9.43	4.01	24.02	4.01	4.01a	964
6	23.60	0.00	20.36	8.66	51.87	9.67	9.67	964
7	23.25	0.00	28.53	12.13	72.68	13.97	13.97	964
8	22.65	0.00	56.69	24.10	144.40	26.05	26.05	964
9	22.06	0.00	77.47	32.93	197.35	35.66	35.66	964
10	22.00	0.00	78.90	33.54	200.98	36.41	36.41	964
		0.00	78.90	27.96	253.66	27.96	27.96a	4820
11	21.64	0.00	86.96	30.82	279.57	31.80	31.80	4820
12	21.50	0.00	89.73	31.80	288.48	33.29	33.29	4820
13	21.09	4.02	93.29	33.06	299.94	35.49	39.52	4820
14	20.68	8.04	96.53	34.21	310.36	37.59	45.64	4820
15	20.50	9.81	97.93	34.71	314.86	38.51	48.32	4820
16	20.15	13.24	100.67	35.67	323.64	40.29	53.53	4820
17	19.80	16.68	103.44	36.66	332.56	42.09	58.76	4820
18	19.20	22.56	108.31	38.38	348.22	45.20	67.76	4820
19	18.60	28.45	113.31	40.16	364.31	48.35	76.80	4820
20	18.00	34.34	118.42	41.97	380.73	51.50	85.84	4820
		Total>	152.76	33.00m	323.50	164.81	164.81	20465
21	17.40	Total>	163.83	36.00m	342.76	178.83	178.83	21447
22	16.80	Total>	174.96	39.00m	362.09	192.85	192.85	22430
23	16.20	Total>	186.14	42.00m	381.46	206.83	206.83	23412
24	15.60	Total>	197.35	45.00m	400.87	220.79	220.79	24394
25	15.00	Total>	208.59	48.00m	420.31	234.79	234.79	25377
26	14.63	Total>	215.64	49.87m	432.47	243.57	243.57	25991
27	14.25	Total>	222.69	51.75m	444.65	252.39	252.39	26605

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	964
5	24.10	0.00	9.00	3.83	22.93	6.75	6.75	964
6	23.60	0.00	18.00	7.65	45.85	11.89	11.89	964
7	23.25	0.00	24.30	10.33	61.90	15.48	15.48	964
8	22.65	0.00	35.01	14.88	89.18	21.58	21.58	964
9	22.06	0.00	45.72	19.44	116.47	27.68	27.68	964
10	22.00	0.00	46.80	19.90	119.22	28.29	28.29	964
		0.00	46.80	16.59	150.46	29.85	29.85	4820
11	21.64	0.00	54.00	19.14	173.61	33.19	33.19	4820
12	21.50	0.00	56.80	20.13	182.61	34.48	34.48	4820
13	21.09	4.02	60.98	21.61	196.04	36.26	40.28	4820
14	20.68	8.04	65.16	23.09	209.48	38.02	46.07	4820
15	20.50	9.81	66.99	23.74	215.37	38.80	48.61	4820
16	20.15	13.24	70.56	25.00	226.84	40.30	53.55	4820

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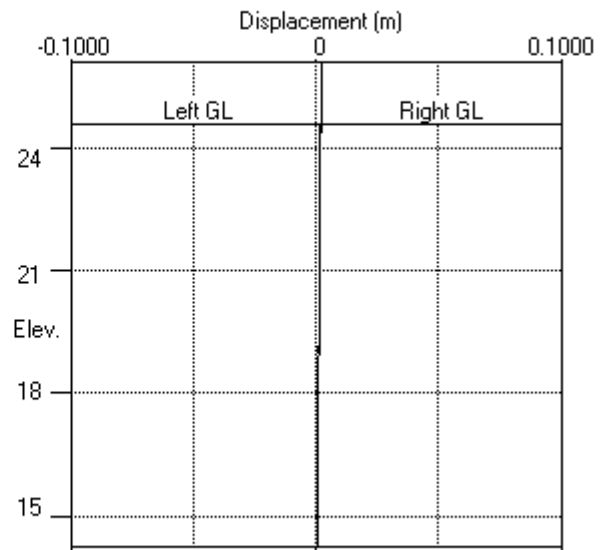
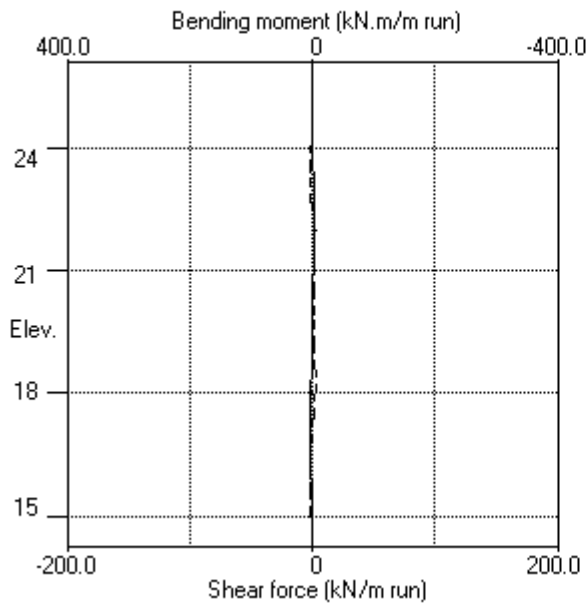
Stage No.2 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
17	19.80	16.68	74.12	26.27	238.31	41.81	58.49	4820
18	19.20	22.56	80.24	28.44	257.96	44.39	66.96	4820
19	18.60	28.45	86.35	30.60	277.62	46.99	75.44	4820
20	18.00	34.34	92.47	32.77	297.28	49.62	83.95	4820
		Total>	126.80	33.00m	297.53	169.21	169.21	20465
21	17.40	Total>	138.80	36.00m	317.73	181.97	181.97	21447
22	16.80	Total>	150.80	39.00m	337.92	194.78	194.78	22430
23	16.20	Total>	162.80	42.00m	358.12	207.68	207.68	23412
24	15.60	Total>	174.80	45.00m	378.31	220.62	220.62	24394
25	15.00	Total>	186.80	48.00m	398.51	233.57	233.57	25377
26	14.63	Total>	194.30	49.87m	411.13	241.64	241.64	25991
27	14.25	Total>	201.80	51.75m	423.75	249.68	249.68	26605

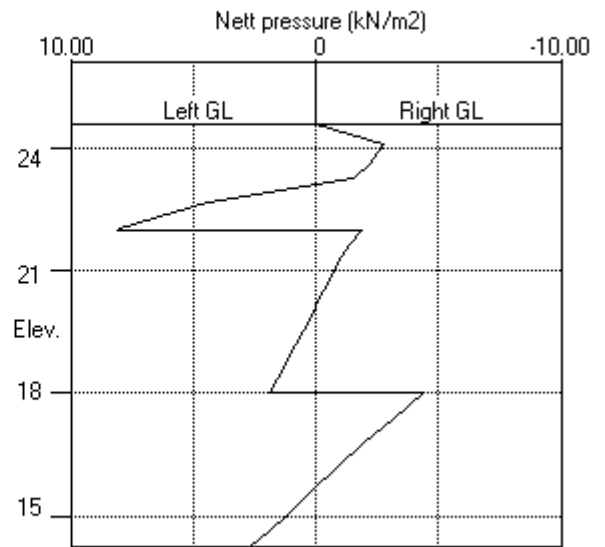
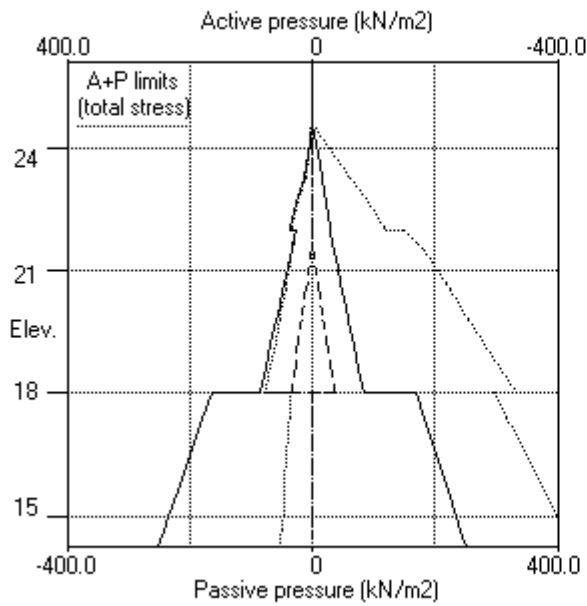
Note: 27.96a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.2 Apply surcharge no.2 at elev. 23.25



Stage No.2 Apply surcharge no.2 at elev. 23.25



Units: kN,m

Stage No. 3 Apply water pressure profile no.1 (Worst Cred.)

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

				Overall			
				FoS for toe		Toe elev. for	
				elev. = 14.25		FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of
			Safety	at elev.		-ation	failure
3	24.60 24.60	Cant.	<u>Conditions not suitable for FoS calc.</u>				

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.002	1.16E-04	0.0	0.0		138544
2	25.65	0.00	0.002	1.16E-04	0.0	-0.0		138544
3	25.20	0.00	0.002	1.16E-04	0.0	0.0		138544
4	24.60	0.00	0.002	1.16E-04	0.0	-0.0		138544
5	24.10	-3.04	0.002	1.16E-04	-0.8	-0.0		138544
6	23.60	-2.82	0.002	1.18E-04	-2.2	-0.7		138544
7	23.25	-2.12	0.002	1.21E-04	-3.1	-1.7		138544
8	22.65	3.83	0.002	1.32E-04	-2.6	-3.5		138544
9	22.06	7.34	0.002	1.48E-04	0.7	-4.2		138544
10	22.00	7.47	0.002	1.50E-04	1.2	-4.1		138544
		-3.51	0.002	1.50E-04	1.2	-4.1		
11	21.64	-4.00	0.002	1.61E-04	-0.2	-3.9		138544
12	21.50	-4.32	0.002	1.65E-04	-0.8	-3.9		138544
13	21.09	-1.35	0.002	1.77E-04	-1.9	-4.5		138544
14	20.68	1.69	0.002	1.92E-04	-1.8	-5.3		138544
15	20.50	3.04	0.002	1.99E-04	-1.4	-5.6		138544
16	20.15	3.40	0.002	2.13E-04	-0.3	-6.0		138544
17	19.80	3.81	0.002	2.28E-04	1.0	-5.9		138544
18	19.20	4.65	0.001	2.51E-04	3.5	-4.6		138544
19	18.60	5.62	0.001	2.65E-04	6.6	-1.7		138544
20	18.00	6.64	0.001	2.61E-04	10.3	3.2		138544
		-11.77	0.001	2.61E-04	10.3	3.2		
21	17.40	-8.67	0.001	2.39E-04	4.1	7.2		138544
22	16.80	-5.70	0.001	2.05E-04	-0.2	8.1		138544
23	16.20	-3.08	0.001	1.73E-04	-2.8	6.9		138544
24	15.60	-0.79	0.001	1.48E-04	-4.0	4.6		138544
25	15.00	1.28	0.000	1.33E-04	-3.8	2.1		138544
26	14.63	4.69	0.000	1.30E-04	-2.7	0.7		138544
27	14.25	9.78	0.000	1.29E-04	-0.0	-0.0		---

(continued)

Stage No.3 Apply water pressure profile no.1 (Worst Cred.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	803
5	24.10	0.00	9.43	4.01	24.02	4.01	4.01a	803
6	23.60	0.00	20.36	8.66	51.87	9.37	9.37	803
7	23.25	0.00	28.53	12.13	72.68	13.67	13.67	803
8	22.65	0.00	56.69	24.10	144.40	25.73	25.73	803
9	22.06	0.00	77.47	32.93	197.35	35.34	35.34	803
10	22.00	0.00	78.90	33.54	200.98	36.09	36.09	803
		0.00	78.90	27.96	253.66	27.96	27.96a	4017
11	21.64	0.00	86.96	30.82	279.57	30.82	30.82a	4017
12	21.50	0.00	89.73	31.80	288.48	31.80	31.80a	4017
13	21.09	4.02	93.29	33.06	299.94	33.86	37.88	4017
14	20.68	8.04	96.53	34.21	310.36	35.97	44.02	4017
15	20.50	9.81	97.93	34.71	314.86	36.90	46.71	4017
16	20.15	13.24	100.67	35.67	323.64	38.72	51.97	4017
17	19.80	16.68	103.44	36.66	332.56	40.58	57.26	4017
18	19.20	22.56	108.31	38.38	348.22	43.85	66.42	4017
19	18.60	28.45	113.31	40.16	364.31	47.21	75.66	4017
20	18.00	34.34	118.42	41.97	380.73	50.61	84.94	4017
		Total>	152.76	33.00m	323.50	160.93	160.93	17416
21	17.40	Total>	163.83	36.00m	342.76	175.87	175.87	18252
22	16.80	Total>	174.96	39.00m	362.09	190.77	190.77	19088
23	16.20	Total>	186.14	42.00m	381.46	205.52	205.52	19924
24	15.60	Total>	197.35	45.00m	400.87	220.12	220.12	20760
25	15.00	Total>	208.59	48.00m	420.31	234.63	234.63	25079
26	14.63	Total>	215.64	49.87m	432.47	244.76	244.76	151858
27	14.25	Total>	222.69	51.75m	444.65	255.74	255.74	155445

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	803
5	24.10	0.00	9.00	3.83	22.93	7.05	7.05	803
6	23.60	0.00	18.00	7.65	45.85	12.19	12.19	803
7	23.25	0.00	24.30	10.33	61.90	15.79	15.79	803
8	22.65	0.00	35.01	14.88	89.18	21.90	21.90	803
9	22.06	0.00	45.72	19.44	116.47	28.00	28.00	803
10	22.00	0.00	46.80	19.90	119.22	28.62	28.62	803
		0.00	46.80	16.59	150.46	31.47	31.47	4017
11	21.64	0.00	54.00	19.14	173.61	34.82	34.82	4017
12	21.50	0.00	56.80	20.13	182.61	36.12	36.12	4017
13	21.09	0.00	65.00	23.04	208.98	39.23	39.23	4017
14	20.68	0.00	73.20	25.94	235.34	42.33	42.33	4017
15	20.50	0.00	76.80	27.22	246.91	43.67	43.67	4017
16	20.15	3.43	80.37	28.48	258.38	45.14	48.57	4017

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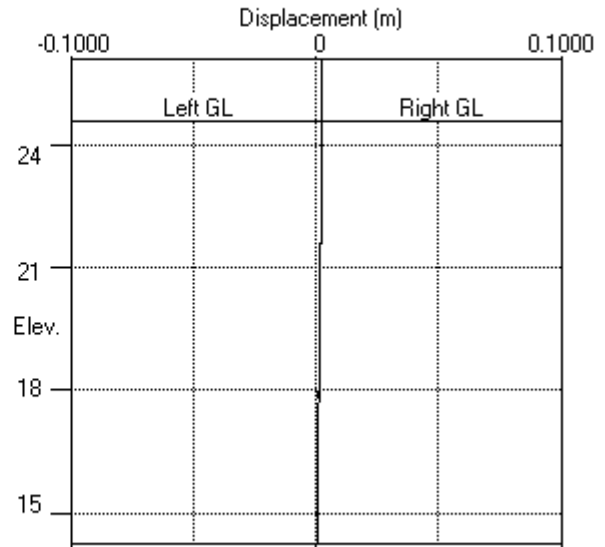
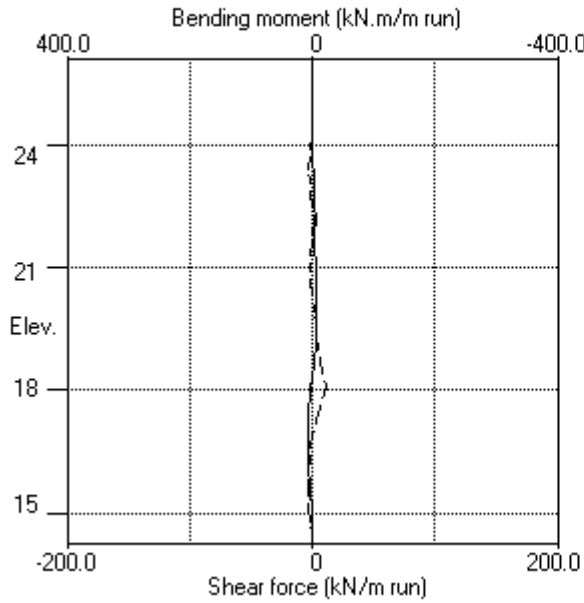
Stage No.3 Apply water pressure profile no.1 (Worst Cred.)

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
17	19.80	6.87	83.93	29.74	269.84	46.58	53.45	4017
18	19.20	12.75	90.05	31.91	289.50	49.01	61.76	4017
19	18.60	18.64	96.16	34.08	309.16	51.40	70.04	4017
20	18.00	24.52	102.28	36.25	328.81	53.78	78.31	4017
		Total>	126.80	33.00m	297.53	172.70	172.70	17416
21	17.40	Total>	138.80	36.00m	317.73	184.54	184.54	18252
22	16.80	Total>	150.80	39.00m	337.93	196.47	196.47	19088
23	16.20	Total>	162.80	42.00m	358.12	208.60	208.60	19924
24	15.60	Total>	174.80	45.00m	378.32	220.91	220.91	20760
25	15.00	Total>	186.80	48.00m	398.51	233.35	233.35	25079
26	14.63	Total>	194.30	49.87m	411.14	240.07	240.07	151858
27	14.25	Total>	201.80	51.75m	423.76	245.96	245.96	155445

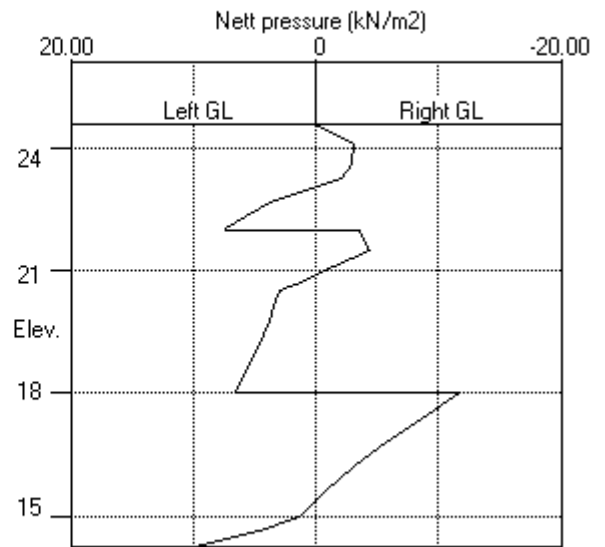
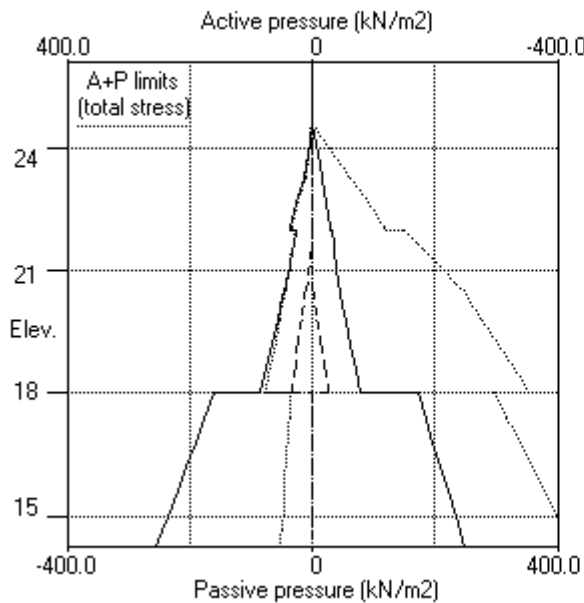
Note: 31.80a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.3 Apply water pressure profile no.1 (Worst Cred.)



Stage No.3 Apply water pressure profile no.1 (Worst Cred.)



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 20.68 on RIGHT side

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

		Overall							
		FoS for toe		Toe elev. for					
		elev. = 14.25		FoS = 1.000					
		-----		-----					
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment equilib. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure		
4	24.60 20.68	Cant.	1.081	15.43	14.65	6.03	L to R		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.10	0.00	0.098	1.18E-02	0.0	-0.0		138544
2	25.65	0.00	0.093	1.18E-02	0.0	0.0		138544
3	25.20	0.00	0.087	1.18E-02	0.0	0.0		138544
4	24.60	0.00	0.080	1.18E-02	0.0	-0.0		138544
5	24.10	4.01	0.074	1.18E-02	1.0	0.3		138544
6	23.60	8.66	0.068	1.18E-02	4.2	1.5		138544
7	23.25	12.13	0.064	1.18E-02	7.8	3.6		138544
8	22.65	24.10	0.057	1.18E-02	18.6	11.1		138544
9	22.06	32.93	0.050	1.17E-02	35.6	26.9		138544
10	22.00	33.54	0.049	1.17E-02	37.5	29.1		138544
		27.96	0.049	1.17E-02	37.5	29.1		
11	21.64	30.82	0.045	1.16E-02	48.1	44.6		138544
12	21.50	31.80	0.043	1.16E-02	52.5	51.6		138544
13	21.09	37.08	0.039	1.14E-02	66.6	76.0		138544
14	20.68	42.25	0.034	1.11E-02	82.9	106.5		138544
15	20.50	32.94	0.032	1.09E-02	89.7	122.1		138544
16	20.15	22.44	0.028	1.06E-02	99.4	155.3		138544
17	19.80	11.96	0.025	1.02E-02	105.4	191.2		138544
18	19.20	-5.97	0.019	9.24E-03	107.2	255.4		138544
19	18.60	-23.86	0.014	8.00E-03	98.2	317.5		138544
20	18.00	-41.71	0.009	6.51E-03	78.5	371.0		138544
		-191.32	0.009	6.51E-03	78.5	371.0		
21	17.40	-195.09	0.006	4.86E-03	-37.4	390.8		138544
22	16.80	-113.57	0.003	3.27E-03	-130.0	341.0		138544
23	16.20	-15.85	0.002	2.01E-03	-168.8	242.5		138544
24	15.60	45.13	0.001	1.18E-03	-160.0	138.4		138544
25	15.00	103.41	0.000	7.80E-04	-115.5	50.4		138544
26	14.63	153.89	0.000	6.93E-04	-67.2	14.4		138544
27	14.25	204.54	-0.000	6.73E-04	-0.0	-0.0		---

(continued)

Stage No.4 Excavate to elevation 20.68 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1174
5	24.10	0.00	9.43	4.01	24.02	4.01	4.01a	1174
6	23.60	0.00	20.36	8.66	51.87	8.66	8.66a	1174
7	23.25	0.00	28.53	12.13	72.68	12.13	12.13a	1174
8	22.65	0.00	56.69	24.10	144.40	24.10	24.10a	1174
9	22.06	0.00	77.47	32.93	197.35	32.93	32.93a	1174
10	22.00	0.00	78.90	33.54	200.98	33.54	33.54a	1174
		0.00	78.90	27.96	253.66	27.96	27.96a	5869
11	21.64	0.00	86.96	30.82	279.57	30.82	30.82a	5869
12	21.50	0.00	89.73	31.80	288.48	31.80	31.80a	5869
13	21.09	4.02	93.29	33.06	299.94	33.06	37.08a	5869
14	20.68	8.04	96.53	34.21	310.36	34.21	42.25a	5869
15	20.50	9.81	97.93	34.71	314.86	34.71	44.52a	5869
16	20.15	13.24	100.67	35.67	323.64	35.67	48.92a	5869
17	19.80	16.68	103.44	36.66	332.56	36.66	53.33a	5869
18	19.20	22.56	108.31	38.38	348.22	38.38	60.95a	5869
19	18.60	28.45	113.31	40.16	364.31	40.16	68.61a	5869
20	18.00	34.34	118.42	41.97	380.73	41.97	76.30a	5869
		Total>	152.76	33.00m	323.50	33.00	33.00a	24504
21	17.40	Total>	163.83	36.00m	342.76	49.43	49.43	25680
22	16.80	Total>	174.96	39.00m	362.09	120.25	120.25	26856
23	16.20	Total>	186.14	42.00m	381.46	172.64	172.64	28033
24	15.60	Total>	197.35	45.00m	400.87	210.47	210.47	29209
25	15.00	Total>	208.59	48.00m	420.31	250.55	250.55	100943
26	14.63	Total>	215.64	49.87m	432.47	284.22	284.22	103385
27	14.25	Total>	222.69	51.75m	444.65	317.98	317.98	105827

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	21.09	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	20.68	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	9194
15	20.50	0.00	3.60	1.28	11.57	11.57	11.57p	9194
16	20.15	3.43	7.17	2.54	23.04	23.04	26.47p	9194
17	19.80	6.87	10.73	3.80	34.51	34.51	41.37p	9194

(continued)

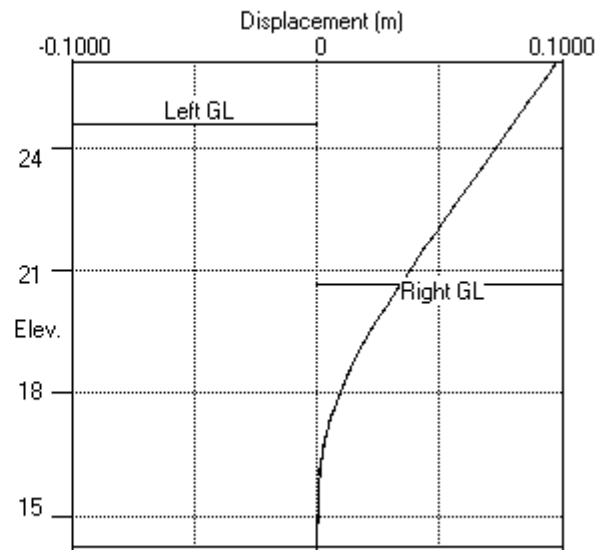
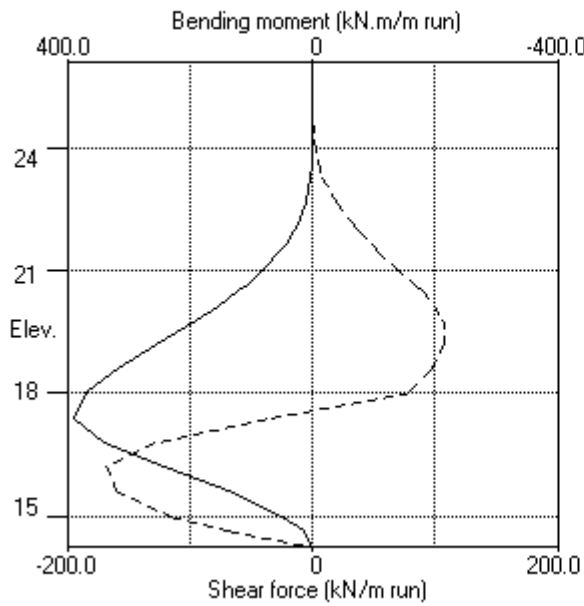
Stage No.4 Excavate to elevation 20.68 on RIGHT side

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertical	Active limit	Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
18	19.20	12.75	16.85	5.97	54.17	54.17	66.92p	9194
19	18.60	18.64	22.96	8.14	73.83	73.83	92.47p	9194
20	18.00	24.52	29.08	10.31	93.49	93.49	118.02p	9194
		Total>	53.60	13.40m	224.32	224.32	224.32p	37412
21	17.40	Total>	65.61	16.40m	244.52	244.52	244.52p	39208
22	16.80	Total>	77.61	19.40m	264.72	233.83	233.83	41004
23	16.20	Total>	89.62	22.40m	284.93	188.49	188.49	42799
24	15.60	Total>	101.63	25.40m	305.13	165.34	165.34	44595
25	15.00	Total>	113.64	28.40m	325.34	147.14	147.14	100943
26	14.63	Total>	121.15	30.27m	337.97	130.33	130.33	103385
27	14.25	Total>	128.66	32.15m	350.60	113.44	113.44	105827

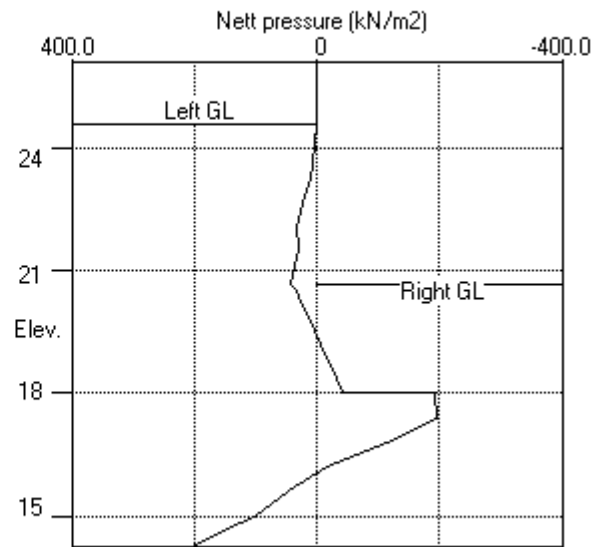
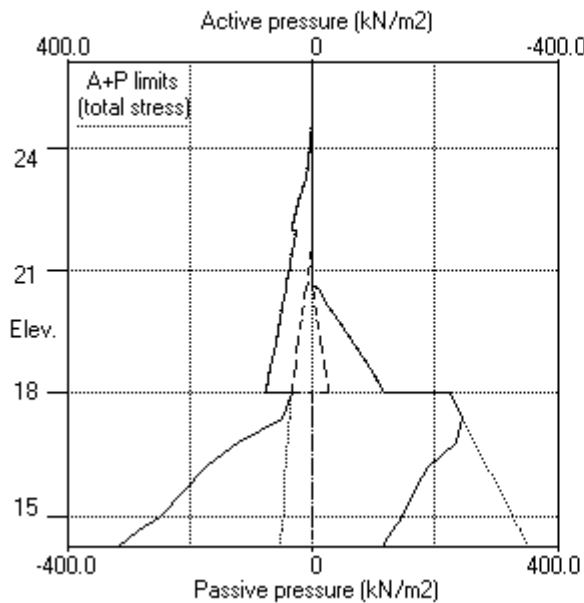
Note: 33.00a Soil pressure at active limit
 244.52p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 20.68 on RIGHT side



Stage No.4 Excav. to elev. 20.68 on RIGHT side



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 5 Fill to elevation 21.64 on RIGHT side with soil type 1

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

			Overall					
			FoS for toe		Toe elev. for			
			elev. = 14.25		FoS = 1.000			

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment at elev.	Toe elev.	Wall Penetr-ation	Direction of failure
5	24.60	21.64	Cant.	1.480	15.45	16.65	4.99	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.097	1.19E-02	0.0	-0.0		138544
2	25.65	0.00	0.092	1.19E-02	0.0	0.0		138544
3	25.20	0.00	0.087	1.19E-02	0.0	0.0		138544
4	24.60	0.00	0.079	1.19E-02	0.0	-0.0		138544
5	24.10	4.44	0.074	1.19E-02	1.1	0.3		138544
6	23.60	9.09	0.068	1.19E-02	4.5	1.6		138544
7	23.25	12.57	0.063	1.18E-02	8.3	3.8		138544
8	22.65	24.55	0.056	1.18E-02	19.3	11.7		138544
9	22.06	33.39	0.049	1.17E-02	36.6	28.0		138544
10	22.00	34.00	0.049	1.17E-02	38.6	30.3		138544
		30.25	0.049	1.17E-02	38.6	30.3		
11	21.64	33.12	0.044	1.16E-02	50.0	46.3		138544
12	21.50	33.03	0.043	1.16E-02	54.6	53.6		138544
13	21.09	35.19	0.038	1.14E-02	68.6	78.9		138544
14	20.68	37.22	0.033	1.11E-02	83.5	110.0		138544
		38.44	0.033	1.11E-02	83.5	110.0		
15	20.50	32.15	0.031	1.09E-02	89.8	125.6		138544
16	20.15	21.61	0.028	1.06E-02	99.2	158.7		138544
17	19.80	11.07	0.024	1.01E-02	104.9	194.6		138544
18	19.20	-7.03	0.018	9.19E-03	106.1	258.4		138544
19	18.60	-25.13	0.013	7.94E-03	96.5	319.6		138544
20	18.00	-43.23	0.009	6.45E-03	76.0	371.9		138544
		-189.22	0.009	6.45E-03	76.0	371.9		
21	17.40	-193.33	0.005	4.80E-03	-38.8	390.5		138544
22	16.80	-112.26	0.003	3.21E-03	-130.5	340.2		138544
23	16.20	-15.03	0.001	1.95E-03	-168.6	241.7		138544
24	15.60	45.43	0.000	1.13E-03	-159.5	137.8		138544
25	15.00	103.14	-0.000	7.28E-04	-115.0	50.2		138544
26	14.63	153.24	-0.000	6.41E-04	-66.9	14.3		138544
27	14.25	203.47	-0.001	6.22E-04	-0.0	-0.0		---

(continued)

Stage No.5 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	667
5	24.10	0.00	9.43	4.01	24.02	4.44	4.44	667
6	23.60	0.00	20.36	8.66	51.87	9.09	9.09	667
7	23.25	0.00	28.53	12.13	72.68	12.57	12.57	667
8	22.65	0.00	56.69	24.10	144.40	24.55	24.55	667
9	22.06	0.00	77.47	32.93	197.35	33.39	33.39	667
10	22.00	0.00	78.90	33.54	200.98	34.00	34.00	667
		0.00	78.90	27.96	253.66	30.25	30.25	3336
11	21.64	0.00	86.96	30.82	279.57	33.12	33.12	3336
12	21.50	0.00	89.73	31.80	288.48	34.11	34.11	3336
13	21.09	4.02	93.29	33.06	299.94	35.38	39.40	3336
14	20.68	8.04	96.53	34.21	310.36	36.52	44.57	3336
15	20.50	9.81	97.93	34.71	314.86	37.01	46.82	3336
16	20.15	13.24	100.67	35.67	323.64	37.96	51.20	3336
17	19.80	16.68	103.44	36.66	332.56	38.91	55.59	3336
18	19.20	22.56	108.31	38.38	348.22	40.57	63.13	3336
19	18.60	28.45	113.31	40.16	364.31	42.24	70.69	3336
20	18.00	34.34	118.42	41.97	380.73	43.93	78.27	3336
		Total>	152.76	33.00m	323.50	41.79	41.79	14915
21	17.40	Total>	163.83	36.00m	342.76	58.06	58.06	15631
22	16.80	Total>	174.96	39.00m	362.09	128.67	128.67	16347
23	16.20	Total>	186.14	42.00m	381.46	180.83	180.83	17063
24	15.60	Total>	197.35	45.00m	400.87	218.42	218.42	17779
25	15.00	Total>	208.59	48.00m	420.31	258.23	258.23	18495
26	14.63	Total>	215.64	49.87m	432.47	291.72	291.72	18942
27	14.25	Total>	222.69	51.75m	444.65	325.28	325.28	19390

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	772
12	21.50	0.00	2.52	1.07	6.42	1.07	1.07a	772
13	21.09	0.00	9.90	4.21	25.22	4.21	4.21a	772
14	20.68	0.00	17.28	7.35	44.02	7.35	7.35a	772
		0.00	17.28	6.12	55.56	6.12	6.12a	3859
15	20.50	0.00	20.88	7.40	67.13	14.67	14.67	3859
16	20.15	3.43	24.45	8.66	78.60	26.16	29.59	3859

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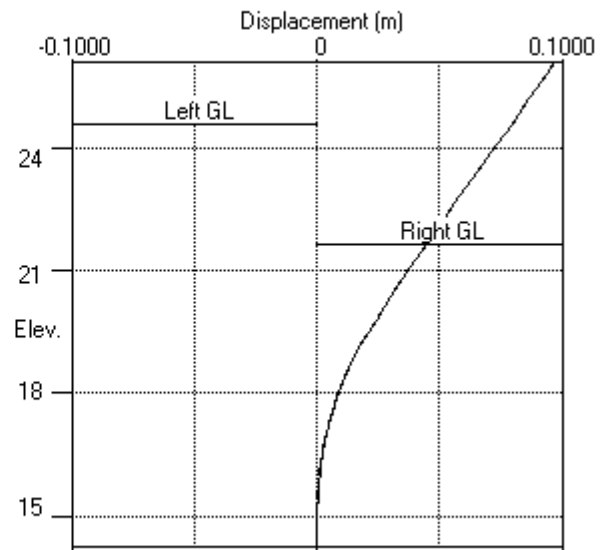
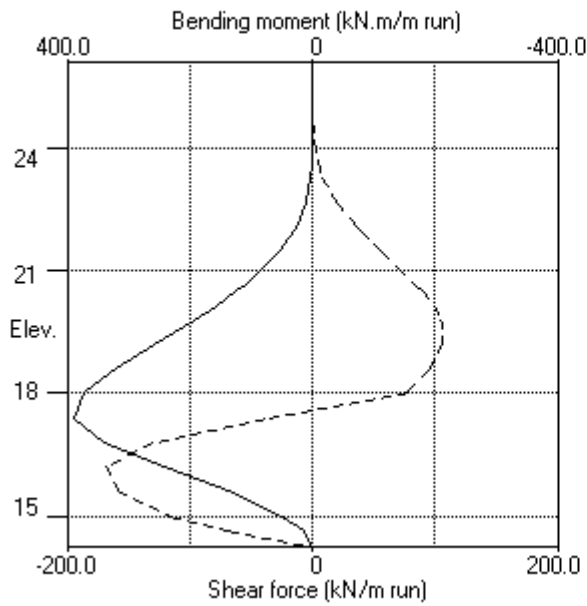
Stage No.5 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
17	19.80	6.87	28.01	9.93	90.07	37.66	44.53	3859
18	19.20	12.75	34.13	12.10	109.73	57.40	70.16	3859
19	18.60	18.64	40.25	14.26	129.39	77.18	95.82	3859
20	18.00	24.52	46.36	16.43	149.06	96.98	121.50	3859
		Total>	70.89	18.20m	241.61	231.01	231.01	16827
21	17.40	Total>	82.89	21.20m	261.81	251.39	251.39	17634
22	16.80	Total>	94.90	24.20m	282.01	240.93	240.93	18442
23	16.20	Total>	106.91	27.20m	302.22	195.86	195.86	19250
24	15.60	Total>	118.92	30.20m	322.42	172.99	172.99	20057
25	15.00	Total>	130.93	33.20m	342.63	155.09	155.09	20865
26	14.63	Total>	138.44	35.08m	355.26	138.48	138.48	21370
27	14.25	Total>	145.95	36.95m	367.90	121.82	121.82	21875

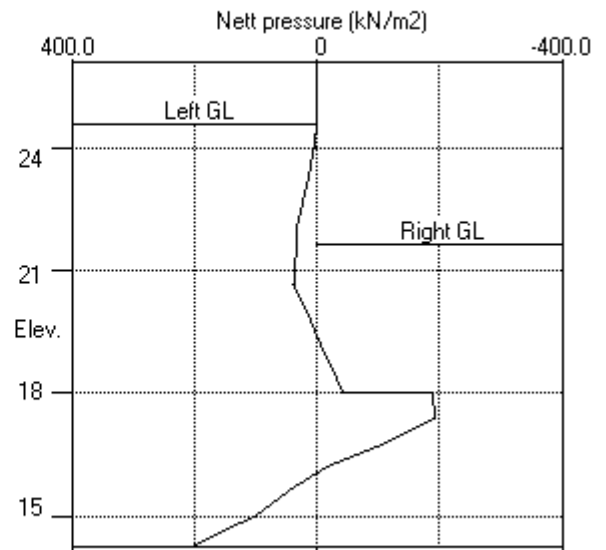
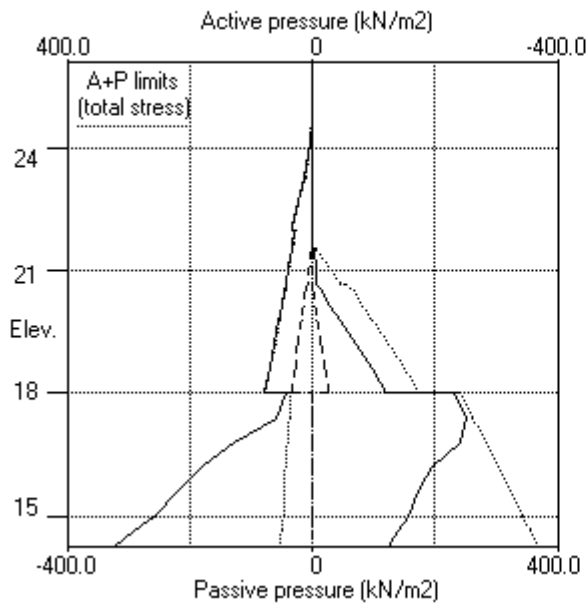
Note: 6.12a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.5 Fill to elev. 21.64 on RIGHT side



Stage No.5 Fill to elev. 21.64 on RIGHT side



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 8 Change EI of wall to 98960 kN.m²/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

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

		Overall					
		FoS for toe		Toe elev. for			
		elev. = 14.25		FoS = 1.000			
		-----		-----			
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr -ation	Direction of failure
8	24.60 21.64		More than one strut.	No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
1	26.10	0.00	0.097	1.18E-02	-2.2	-0.0	2.2	98960
2	25.65	0.00	0.092	1.18E-02	-2.2	-0.8		98960
3	25.20	0.00	0.087	1.18E-02	-2.2	-1.5		98960
4	24.60	0.00	0.080	1.18E-02	-2.2	-2.6		98960
5	24.10	4.30	0.074	1.18E-02	-1.1	-3.2		98960
6	23.60	8.95	0.068	1.19E-02	2.2	-2.7		98960
7	23.25	12.44	0.063	1.19E-02	5.9	-1.1		98960
8	22.65	24.45	0.056	1.19E-02	16.9	5.6		98960
9	22.06	33.36	0.049	1.18E-02	34.1	20.8	19.3	98960
		33.36	0.049	1.18E-02	14.8	20.8		
10	22.00	33.97	0.049	1.18E-02	16.8	22.1		98960
		30.11	0.049	1.18E-02	16.8	22.1		
11	21.64	33.18	0.044	1.17E-02	28.2	31.9		98960
12	21.50	33.16	0.043	1.17E-02	32.8	36.9		98960
13	21.09	35.57	0.038	1.15E-02	46.9	55.2		98960
14	20.68	37.92	0.033	1.12E-02	62.0	79.4		98960
		39.14	0.033	1.12E-02	62.0	79.4		
15	20.50	33.89	0.031	1.11E-02	68.5	92.0		98960
16	20.15	24.07	0.027	1.08E-02	78.7	119.5		98960
17	19.80	14.30	0.024	1.03E-02	85.4	149.8		98960
18	19.20	-2.42	0.018	9.39E-03	89.0	205.0		98960
19	18.60	-19.37	0.012	8.08E-03	82.4	258.9		98960
20	18.00	-36.85	0.008	6.48E-03	65.6	305.3		98960
		-162.50	0.008	6.48E-03	65.6	305.3		
21	17.40	-166.22	0.005	4.69E-03	-33.1	322.9		98960
22	16.80	-89.16	0.002	2.98E-03	-109.7	279.0		98960
23	16.20	0.16	0.001	1.64E-03	-136.4	193.4		98960
24	15.60	50.40	0.000	8.07E-04	-121.2	106.7		98960
25	15.00	82.58	0.000	4.07E-04	-81.3	37.7		98960

(continued)

Stage No.8 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

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
26	14.63	108.60	-0.000	3.24E-04	-45.5	10.5		98960
27	14.25	133.86	-0.000	3.07E-04	-0.0	-0.0		---
At elev. 26.10		Strut force =		2.2 kN/strut =		2.2 kN/m run		
At elev. 22.06		Strut force =		19.3 kN/strut =		19.3 kN/m run		

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.65	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.20	0.00	0.00	0.00	0.00	0.00	0.0	
4	24.60	0.00	0.00	0.00	0.00	0.00	0.0	
5	24.10	0.00	9.43	4.01	24.02	4.30	1520	
6	23.60	0.00	20.36	8.66	51.87	8.95	1520	
7	23.25	0.00	28.53	12.13	72.68	12.44	1520	
8	22.65	0.00	56.69	24.10	144.40	24.45	1520	
9	22.06	0.00	77.47	32.93	197.35	33.36	1520	
10	22.00	0.00	78.90	33.54	200.98	33.97	1520	
		0.00	78.90	27.96	253.66	30.11	7602	
11	21.64	0.00	86.96	30.82	279.57	33.18	5617	
12	21.50	0.00	89.73	31.80	288.48	34.23	5617	
13	21.09	4.02	93.29	33.06	299.94	35.76	5617	
14	20.68	8.04	96.53	34.21	310.36	37.22	5617	
15	20.50	9.81	97.93	34.71	314.86	37.88	5617	
16	20.15	13.24	100.67	35.67	323.64	39.19	5617	
17	19.80	16.68	103.44	36.66	332.56	40.53	5617	
18	19.20	22.56	108.31	38.38	348.22	42.87	5617	
19	18.60	28.45	113.31	40.16	364.31	45.12	5617	
20	18.00	34.34	118.42	41.97	380.73	47.12	5617	
		Total>	152.76	33.00m	323.50	55.15	23530	
21	17.40	Total>	163.83	36.00m	342.76	71.62	24660	
22	16.80	Total>	174.96	39.00m	362.09	140.22	25789	
23	16.20	Total>	186.14	42.00m	381.46	188.43	26919	
24	15.60	Total>	197.35	45.00m	400.87	220.90	28048	
25	15.00	Total>	208.59	48.00m	420.31	247.95	96309	
26	14.63	Total>	215.64	49.87m	432.47	269.40	98639	
27	14.25	Total>	222.69	51.75m	444.65	290.48	100969	

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.65	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.20	0.00	0.00	0.00	0.00	0.00	0.0	
4	24.60	0.00	0.00	0.00	0.00	0.00	0.0	
5	24.10	0.00	0.00	0.00	0.00	0.00	0.0	
6	23.60	0.00	0.00	0.00	0.00	0.00	0.0	
7	23.25	0.00	0.00	0.00	0.00	0.00	0.0	
8	22.65	0.00	0.00	0.00	0.00	0.00	0.0	

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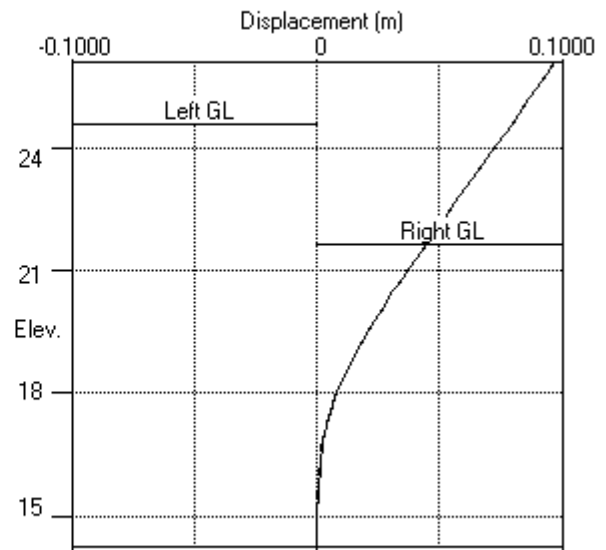
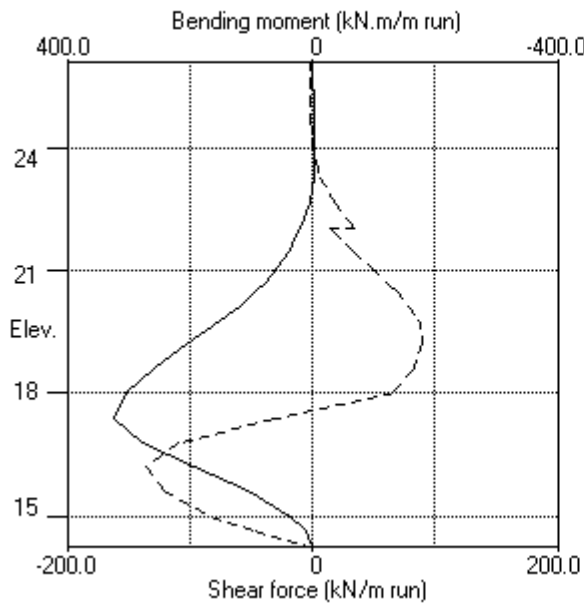
Stage No.8 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3	
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	0.00	1123	
12	21.50	0.00	2.52	1.07	6.42	1.07	1.07a	1123	
13	21.09	0.00	9.90	4.21	25.22	4.21	4.21a	1123	
14	20.68	0.00	17.28	7.35	44.02	7.35	7.35a	1123	
		0.00	17.28	6.12	55.56	6.12	6.12a	5617	
15	20.50	0.00	20.88	7.40	67.13	13.80	13.80	5617	
16	20.15	3.43	24.45	8.66	78.60	24.93	28.36	5617	
17	19.80	6.87	28.01	9.93	90.07	36.04	42.91	5617	
18	19.20	12.75	34.13	12.10	109.73	55.10	67.85	5617	
19	18.60	18.64	40.25	14.26	129.39	74.30	92.94	5617	
20	18.00	24.52	46.36	16.43	149.06	93.79	118.31	5617	
		Total>	70.89	18.20m	241.61	217.65	217.65	23530	
21	17.40	Total>	82.89	21.20m	261.81	237.84	237.84	24660	
22	16.80	Total>	94.90	24.20m	282.01	229.38	229.38	25789	
23	16.20	Total>	106.91	27.20m	302.22	188.27	188.27	26919	
24	15.60	Total>	118.92	30.20m	322.42	170.50	170.50	28048	
25	15.00	Total>	130.93	33.20m	342.63	165.37	165.37	96309	
26	14.63	Total>	138.44	35.08m	355.26	160.80	160.80	98639	
27	14.25	Total>	145.95	36.95m	367.90	156.62	156.62	100969	

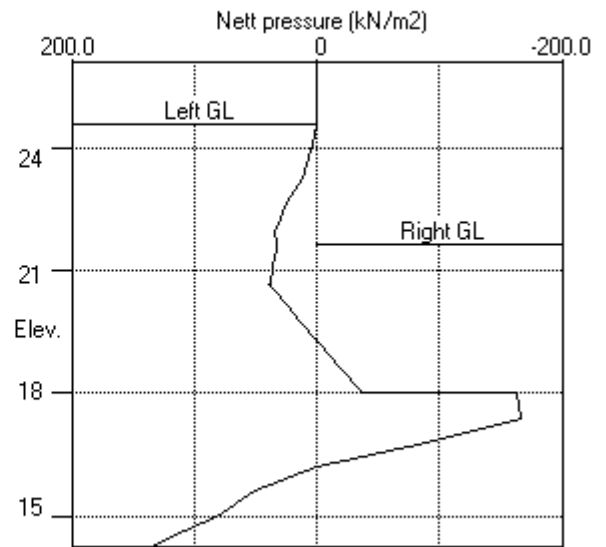
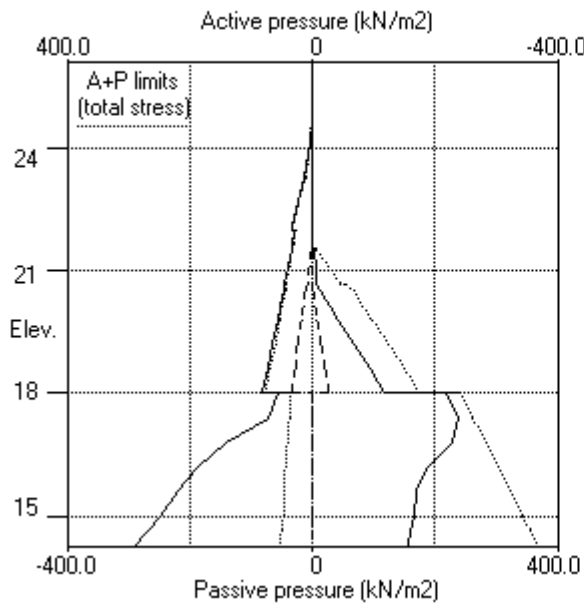
Note: 6.12a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Change EI of wall to 98960kN.m2/m run



Stage No.8 Change EI of wall to 98960kN.m2/m run



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 11 Apply water pressure profile no.2 (Worst Cred.)

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

		Overall						
		FoS for toe	Toe elev. for					
		elev. = 14.25	FoS = 1.000					
Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure	
11	24.60 21.64		More than one strut.		No	FoS calc.		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.097	1.18E-02	0.0	-0.0	-0.0	98960
2	25.65	0.00	0.092	1.18E-02	0.0	0.2		98960
3	25.20	0.00	0.087	1.18E-02	0.0	0.4		98960
4	24.60	0.00	0.079	1.18E-02	0.0	0.7		98960
5	24.10	4.57	0.073	1.18E-02	1.1	1.2		98960
6	23.60	9.19	0.068	1.18E-02	4.6	2.9		98960
7	23.25	14.94	0.063	1.18E-02	8.8	5.3		98960
8	22.65	30.76	0.056	1.18E-02	22.4	14.5		98960
9	22.06	43.42	0.049	1.16E-02	44.5	34.3	24.4	98960
		43.42	0.049	1.16E-02	20.1	34.3		
10	22.00	44.42	0.049	1.16E-02	22.7	35.9		98960
		40.48	0.049	1.16E-02	22.7	35.9		
11	21.64	45.51	0.044	1.15E-02	38.2	48.6		98960
		25.92	0.044	1.15E-02	38.2	48.6		
12	21.50	25.69	0.043	1.14E-02	41.8	54.9		98960
13	21.09	24.63	0.038	1.11E-02	52.1	76.2		98960
14	20.68	23.29	0.034	1.08E-02	62.0	101.6		98960
		22.78	0.034	1.08E-02	62.0	101.6		
15	20.50	15.48	0.032	1.06E-02	65.4	113.9		98960
16	20.15	3.78	0.028	1.02E-02	68.8	139.2		98960
17	19.80	-7.81	0.025	9.77E-03	68.1	164.7		98960
18	19.20	-27.14	0.019	8.73E-03	57.6	205.4		98960
19	18.60	-46.53	0.014	7.49E-03	35.5	236.0		98960
20	18.00	-65.70	0.010	6.13E-03	1.8	249.4		98960
		-49.04	0.010	6.13E-03	1.8	249.4		
21	17.40	-61.94	0.007	4.74E-03	-31.5	248.6		98960
22	16.80	-55.16	0.004	3.43E-03	-66.6	221.6		98960
23	16.20	-24.15	0.003	2.35E-03	-90.4	164.3		98960
24	15.60	9.70	0.001	1.62E-03	-94.7	100.3		98960
25	15.00	54.81	0.001	1.23E-03	-75.4	39.8		98960
26	14.63	89.44	0.000	1.14E-03	-48.3	12.9		98960

(continued)

Stage No.11 Apply water pressure profile no.2 (Worst Cred.)

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
27	14.25	168.40	-0.000	1.12E-03	-0.0	-0.0		---
At elev. 26.10 The strut is slack								
At elev. 22.06 Strut force = 24.4 kN/strut = 24.4 kN/m run								

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	9.43	4.01	24.02	4.57	4.57	1663
6	23.60	0.00	20.36	8.66	51.87	9.19	9.19	1663
7	23.25	3.43	25.10	10.67	63.93	11.51	14.94	1663
8	22.65	9.27	47.42	20.16	120.79	21.49	30.76	1663
9	22.06	15.11	62.36	26.51	158.87	28.31	43.42	1054
10	22.00	15.70	63.20	26.87	161.00	28.72	44.42	1054
		15.70	63.20	22.40	203.19	24.79	40.48	5268
11	21.64	19.23	67.73	24.00	217.75	26.28	45.51	5268
12	21.50	20.60	69.13	24.50	222.25	26.69	47.29	5268
13	21.09	24.62	72.69	25.76	233.71	27.56	52.18	5268
14	20.68	28.65	75.93	26.91	244.13	28.19	56.83	5268
15	20.50	30.41	77.33	27.41	248.62	28.41	58.82	5268
16	20.15	33.84	80.07	28.37	257.41	28.77	62.62	5268
17	19.80	37.28	82.84	29.36	266.33	29.36	66.63a	5268
18	19.20	43.16	87.71	31.08	281.99	31.08	74.25a	5268
19	18.60	49.05	92.71	32.86	298.07	32.86	81.91a	5268
20	18.00	54.94	97.82	34.67	314.50	34.67	89.60a	5268
		54.94	97.82	41.59	249.20	41.59	96.52a	11391
21	17.40	60.82	103.01	43.79	262.41	43.79	104.61a	11938
22	16.80	66.71	108.25	46.02	275.77	65.56	132.27	12485
23	16.20	72.59	113.54	48.27	289.24	111.47	184.07	13031
24	15.60	78.48	118.87	50.53	302.82	143.53	222.01	13578
25	15.00	84.37	124.23	52.81	316.47	171.11	255.48	14125
26	14.63	88.04	127.59	54.24	325.03	193.16	281.20	14467
27	14.25	91.72	130.97	55.68	333.63	237.38	329.10	428122

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		19.23	0.77	0.33	1.97	0.36	19.58	1054

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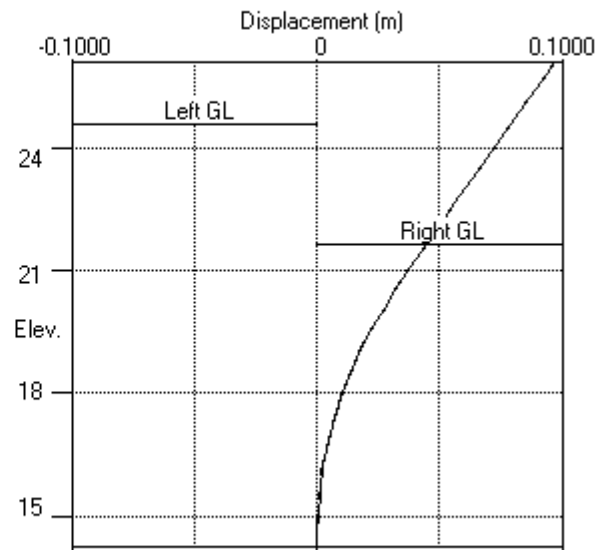
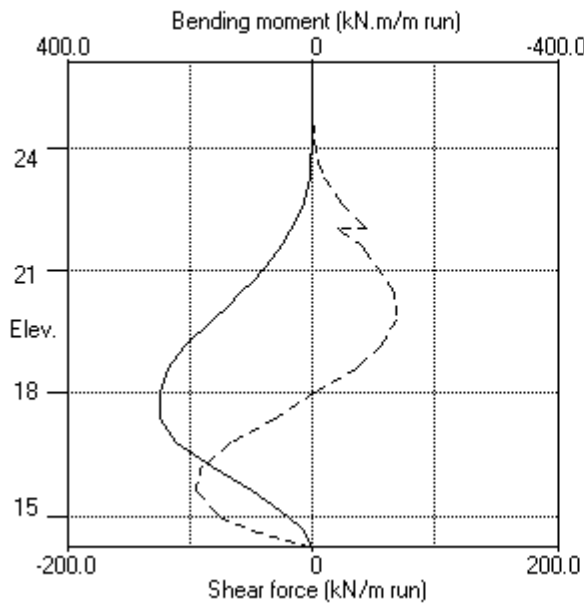
Stage No.11 Apply water pressure profile no.2 (Worst Cred.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
12	21.50	20.60	1.92	0.81	4.88	1.01	21.61	1054
13	21.09	24.62	5.27	2.24	13.44	2.93	27.56	1054
14	20.68	28.65	8.63	3.67	21.98	4.90	33.54	1054
		28.65	8.63	3.06	27.73	5.41	34.06	5268
15	20.50	30.41	10.46	3.71	33.62	12.93	43.34	5268
16	20.15	33.84	14.01	4.96	45.03	25.00	58.84	5268
17	19.80	37.28	17.55	6.22	56.42	37.17	74.44	5268
18	19.20	43.16	23.60	8.36	75.86	58.22	101.39	5268
19	18.60	49.05	29.61	10.49	95.18	79.39	128.44	5268
20	18.00	54.94	35.58	12.61	114.38	100.36	155.30	5268
		54.94	35.58	15.12	90.63	90.63	145.56p	11391
21	17.40	60.82	41.50	17.64	105.73	105.73	166.55p	11938
22	16.80	66.71	47.39	20.15	120.73	120.73	187.43p	12485
23	16.20	72.59	53.24	22.63	135.63	135.63	208.22p	13031
24	15.60	78.48	59.05	25.11	150.44	133.83	212.31	13578
25	15.00	84.37	64.84	27.56	165.18	116.30	200.67	14125
26	14.63	88.04	68.44	29.10	174.35	103.72	191.77	14467
27	14.25	91.72	72.04	30.62	183.51	68.98	160.71	428122

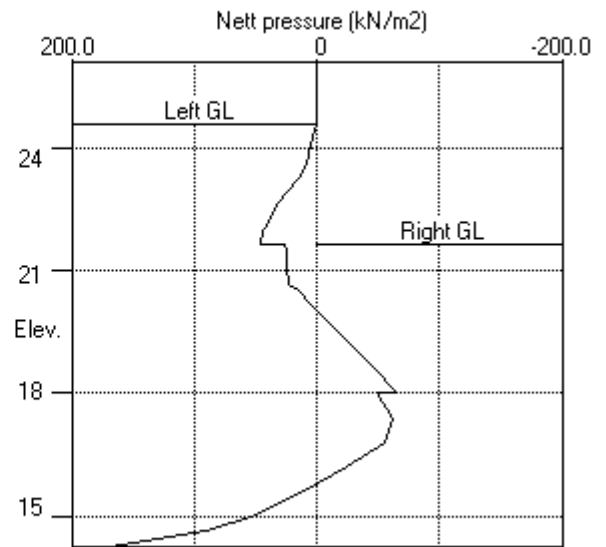
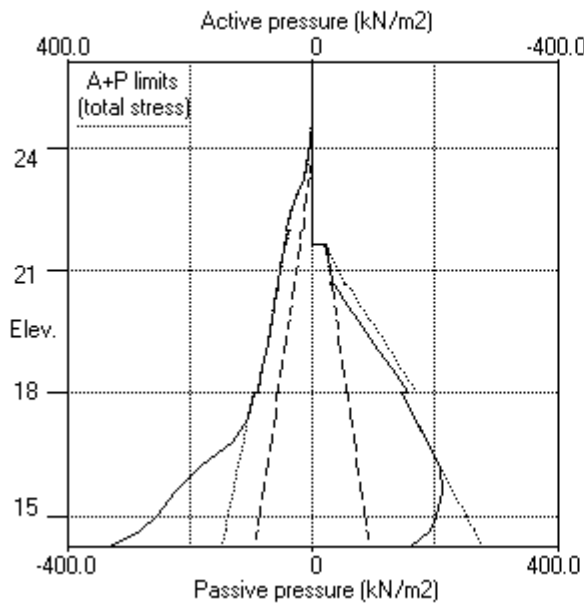
Note: 104.61a Soil pressure at active limit
 208.22p Soil pressure at passive limit

Units: kN,m

Stage No.11 Apply water pressure profile no.2 (Worst Cred.)



Stage No.11 Apply water pressure profile no.2 (Worst Cred.)



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 Data filename/Run ID: Fitzrovia_Wall_3_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: ULS DA1 Combination 2
 Water pressures : Worst Credible
 Partial factor on C' = 1.250
 Partial factor on Phi' = 1.250
 Partial factor on Cu = 1.400
 Partial factor on Soil Modulus = 1.000
 Partial factor on Permanent Unfavourable loads = 1.000
 Partial factor on Permanent Favourable loads = 1.000
 Partial factor on Variable Unfavourable loads = 1.300

STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method

Factor of safety on soil strength

			Overall					
			FoS for toe	Toe elev. for				
			elev. = 14.25	FoS = 1.000				

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equilib. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure
1	24.60	24.60	Cant.	Conditions not suitable for FoS calc.				
2	24.60	24.60	Cant.	Conditions not suitable for FoS calc.				
3	24.60	24.60	Cant.	Conditions not suitable for FoS calc.				
4	24.60	20.68	Cant.	1.081	15.43	14.65	6.03	L to R
5	24.60	21.64	Cant.	1.480	15.45	16.65	4.99	L to R
6	24.60	21.64	No analysis at this stage					
All remaining stages have more than one strut - FoS calculation n/a								

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 Fitzrovia - Middlesex Hospital Annexe
 Wall 3, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.098	0.000	0.0	-0.0	0.0	-2.2
2	25.65	0.093	0.000	0.2	-0.8	0.0	-2.2
3	25.20	0.087	0.000	0.4	-1.5	0.0	-2.2
4	24.60	0.080	0.000	0.7	-2.6	0.0	-2.2
5	24.10	0.074	0.000	1.2	-3.2	1.1	-1.1
6	23.60	0.068	0.000	2.9	-2.7	4.6	-2.2
7	23.25	0.064	0.000	5.3	-1.7	8.8	-3.1
8	22.65	0.057	0.000	14.5	-3.5	22.4	-2.6
9	22.06	0.050	0.000	34.3	-4.2	44.5	0.0
10	22.00	0.049	0.000	35.9	-4.1	38.6	0.0
11	21.64	0.045	0.000	48.6	-3.9	50.0	-0.2
12	21.50	0.043	0.000	54.9	-3.9	54.6	-0.8
13	21.09	0.039	0.000	78.9	-4.5	68.6	-1.9
14	20.68	0.034	0.000	110.0	-5.3	83.5	-1.8
15	20.50	0.032	0.000	125.6	-5.6	89.8	-1.4
16	20.15	0.028	0.000	158.7	-6.0	99.4	-0.4
17	19.80	0.025	0.000	194.6	-5.9	105.4	-0.3
18	19.20	0.019	0.000	258.4	-4.6	107.2	0.0
19	18.60	0.014	0.000	319.6	-1.7	98.2	0.0
20	18.00	0.010	0.000	371.9	0.0	78.5	0.0
21	17.40	0.007	0.000	390.8	0.0	4.1	-38.8
22	16.80	0.004	0.000	341.0	0.0	0.1	-130.5
23	16.20	0.003	0.000	242.5	0.0	0.0	-168.8
24	15.60	0.001	0.000	138.4	0.0	0.0	-160.0
25	15.00	0.001	-0.000	50.4	0.0	0.0	-115.5
26	14.63	0.000	-0.000	14.4	0.0	0.0	-67.2
27	14.25	0.000	-0.001	0.0	-0.0	0.0	-0.0

Summary of results (continued)

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	0.8	16.80	-0.7	22.65	1.4	18.00	-0.6	23.25
2	4.1	17.40	-2.9	22.06	2.9	18.00	-2.6	23.25
3	8.1	16.80	-6.0	20.15	10.3	18.00	-4.0	15.60
4	390.8	17.40	-0.0	26.10	107.2	19.20	-168.8	16.20
5	390.5	17.40	-0.0	26.10	106.1	19.20	-168.6	16.20
6	No calculation at this stage							
7	No calculation at this stage							
8	322.9	17.40	-3.2	24.10	89.0	19.20	-136.4	16.20
9	No calculation at this stage							
10	No calculation at this stage							
11	249.4	18.00	-0.0	26.10	68.8	20.15	-94.7	15.60

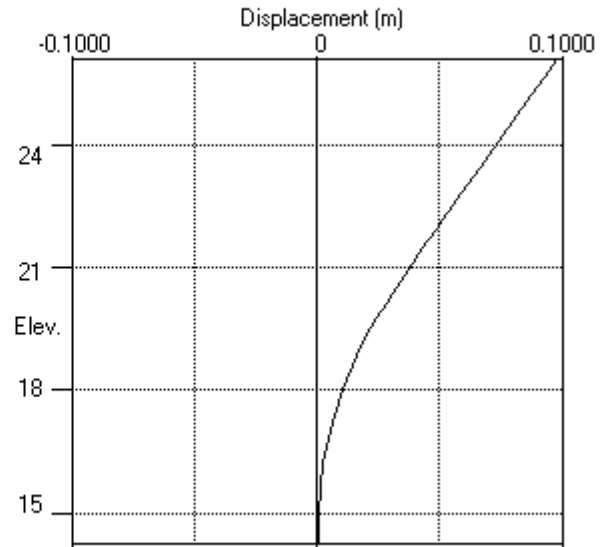
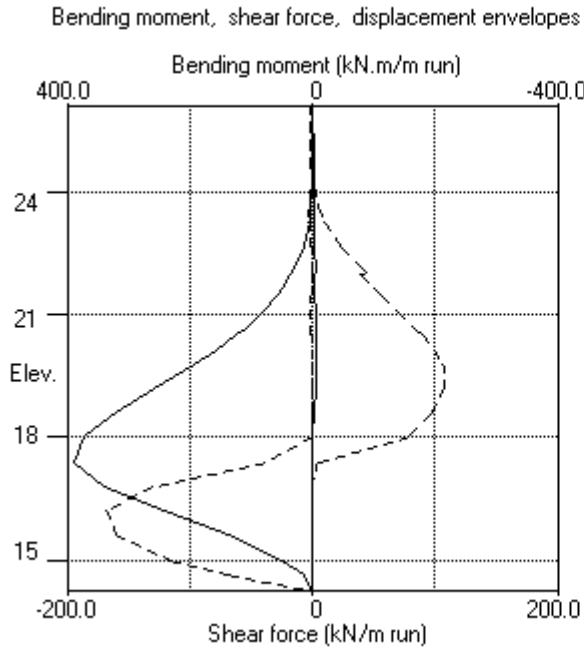
Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.001	26.10	0.000	26.10	Apply surcharge no.1 at elev. 24.60
2	0.002	26.10	0.000	26.10	Apply surcharge no.2 at elev. 23.25
3	0.002	26.10	0.000	26.10	Apply water pressure profile no.1
4	0.098	26.10	-0.000	14.25	Excav. to elev. 20.68 on RIGHT side
5	0.097	26.10	-0.001	14.25	Fill to elev. 21.64 on RIGHT side
6	No calculation at this stage				Install strut no.1 at elev. 22.06
7	No calculation at this stage				Install strut no.2 at elev. 26.10
8	0.097	26.10	-0.000	14.25	Change EI of wall to 98960kN.m ² /m run
9	No calculation at this stage				Change soil type 3 to soil type 4
10	No calculation at this stage				Apply surcharge no.3 at elev. 21.64
11	0.097	26.10	-0.000	14.25	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1		Strut no. 2	
	at elev. 22.06		at elev. 26.10	
	kN/m run	kN/strut	kN/m run	kN/strut
8	19.35	19.35	2.20	2.20
11	24.38	24.38	slack	slack

Units: kN,m



WALLAP

4-SLS

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Left side	Right side
1	24.60	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

	Left side	Right side
Initial water table elevation	21.50	21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
	2	1	23.60	23.60	0.0	1	21.64	21.64
2						21.64	23.60	19.2

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 17.25
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge Near edge Far edge	----- kN/m ² -----	Equiv. soil type	Partial factor/ Category
1	24.60	1.20(L)	20.00	20.00	15.00	=	N/A	1.00 Var
2	23.25	0.40(L)	20.00	0.80	57.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	20.00	=	N/A	1.00 P/F

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 24.60
2	Apply surcharge no.2 at elevation 23.25
3	Install strut or anchor no.1 at elevation 25.75
4	Apply water pressure profile no.1 (Mod. Conserv.)
5	Excavate to elevation 21.04 on RIGHT side
6	Fill to elevation 21.64 on RIGHT side with soil type 1
7	Install strut or anchor no.2 at elevation 22.06
8	Install strut or anchor no.3 at elevation 26.10
9	Remove strut or anchor no.1 at elevation 25.75
10	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
11	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
12	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
13	Apply water pressure profile no.2 (Mod. Conserv.)

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 = 1.50

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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m

Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m

Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 24.60	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 23.25	No	No	No
3	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
4	Apply water pressure profile no.1	Yes	Yes	Yes
5	Excav. to elev. 21.04 on RIGHT side	Yes	Yes	Yes
6	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
7	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
8	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
9	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
10	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
11	Change soil type 3 to soil type 4	Yes	Yes	Yes
12	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
13	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 24.60

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. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.500	Wall Penetr-ation	Direction of failure
1	24.60 24.60	Cant.					<u>Conditions not suitable for FoS calc.</u>

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.001	2.92E-05	0.0	-0.0		138544
2	25.75	0.00	0.001	2.92E-05	0.0	0.0		138544
3	25.46	0.00	0.001	2.92E-05	0.0	-0.0		138544
4	25.18	0.00	0.001	2.92E-05	0.0	0.0		138544
5	24.89	0.00	0.001	2.92E-05	0.0	0.0		138544
6	24.60	0.00	0.001	2.92E-05	0.0	0.0		138544
7	24.10	-0.75	0.000	2.92E-05	-0.2	0.0		138544
8	23.60	-0.21	0.000	2.95E-05	-0.4	-0.2		138544
9	23.25	0.27	0.000	3.01E-05	-0.4	-0.3		138544
10	22.95	0.66	0.000	3.09E-05	-0.3	-0.4		138544
11	22.65	1.01	0.000	3.18E-05	-0.0	-0.5		138544
12	22.36	1.31	0.000	3.28E-05	0.3	-0.4		138544
13	22.06	1.57	0.000	3.35E-05	0.7	-0.3		138544
14	22.00	1.62	0.000	3.36E-05	0.8	-0.2		138544
		-1.42	0.000	3.36E-05	0.8	-0.2		
15	21.64	-1.07	0.000	3.39E-05	0.4	-0.0		138544
16	21.50	-0.95	0.000	3.39E-05	0.2	0.0		138544
17	21.04	-0.58	0.000	3.38E-05	-0.1	0.1		138544
18	20.77	-0.40	0.000	3.37E-05	-0.2	0.0		138544
19	20.50	-0.22	0.000	3.38E-05	-0.3	-0.1		138544
20	20.00	0.06	0.000	3.44E-05	-0.4	-0.3		138544
21	19.50	0.32	0.000	3.56E-05	-0.3	-0.4		138544
22	19.00	0.55	0.000	3.73E-05	-0.0	-0.5		138544
23	18.50	0.77	0.000	3.90E-05	0.3	-0.5		138544
24	18.00	0.97	0.000	4.03E-05	0.7	-0.2		138544
		-1.27	0.000	4.03E-05	0.7	-0.2		
25	17.63	-0.96	0.000	4.06E-05	0.3	-0.0		138544
26	17.25	-0.63	0.000	4.07E-05	-0.0	0.0		---

(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	896
7	24.10	0.00	9.38	3.29	30.51	4.88	4.88	896
8	23.60	0.00	19.93	7.00	64.83	10.60	10.60	896
9	23.25	0.00	27.61	9.70	89.79	14.71	14.71	896
10	22.95	0.00	34.07	11.97	110.83	18.18	18.18	896
11	22.65	0.00	40.42	14.20	131.49	21.61	21.61	896
12	22.36	0.00	46.64	16.38	151.70	24.99	24.99	896
13	22.06	0.00	52.73	18.52	171.51	28.33	28.33	896
14	22.00	0.00	53.94	18.95	175.46	29.00	29.00	896
		0.00	53.94	15.28	235.69	23.88	23.88	4482
15	21.64	0.00	61.86	17.53	270.29	27.77	27.77	4482
16	21.50	0.00	64.90	18.39	283.58	29.28	29.28	4482
17	21.04	4.51	70.26	19.91	307.00	31.91	36.43	4482
18	20.77	7.16	73.33	20.78	320.42	33.44	40.60	4482
19	20.50	9.81	76.36	21.64	333.64	34.94	44.75	4482
20	20.00	14.71	81.86	23.19	357.66	37.70	52.42	4482
21	19.50	19.62	87.24	24.72	381.20	40.43	60.05	4482
22	19.00	24.52	92.54	26.22	404.36	43.12	67.65	4482
23	18.50	29.43	97.77	27.70	427.20	45.80	75.23	4482
24	18.00	34.34	102.94	29.17	449.79	48.46	82.80	4482
		Total>	137.28	33.00m	376.27	158.94	158.94	20140
25	17.63	Total>	144.80	34.88m	390.96	167.75	167.75	20745
26	17.25	Total>	152.30	36.75m	405.63	176.56	176.56	21349

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	896
7	24.10	0.00	9.00	3.16	29.27	5.63	5.63	896
8	23.60	0.00	18.00	6.32	58.55	10.81	10.81	896
9	23.25	0.00	24.30	8.54	79.04	14.44	14.44	896
10	22.95	0.00	29.65	10.42	96.46	17.52	17.52	896
11	22.65	0.00	35.01	12.30	113.88	20.60	20.60	896
12	22.36	0.00	40.36	14.18	131.30	23.68	23.68	896
13	22.06	0.00	45.72	16.06	148.72	26.76	26.76	896
14	22.00	0.00	46.80	16.44	152.23	27.38	27.38	896
		0.00	46.80	13.26	204.49	25.30	25.30	4482
15	21.64	0.00	54.00	15.30	235.95	28.85	28.85	4482
16	21.50	0.00	56.80	16.09	248.18	30.22	30.22	4482
17	21.04	4.51	61.49	17.42	268.66	32.50	37.01	4482

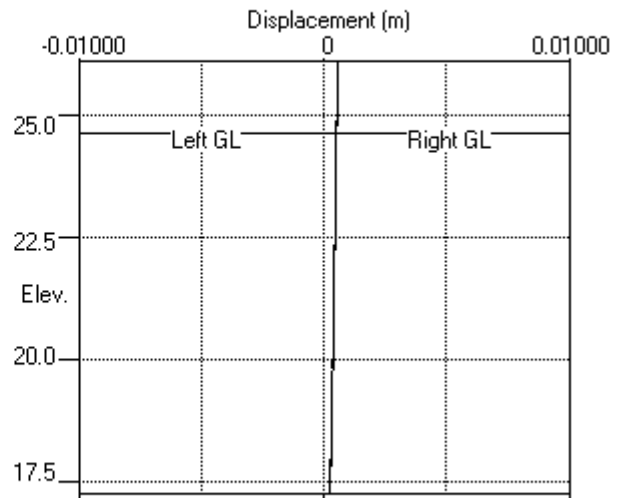
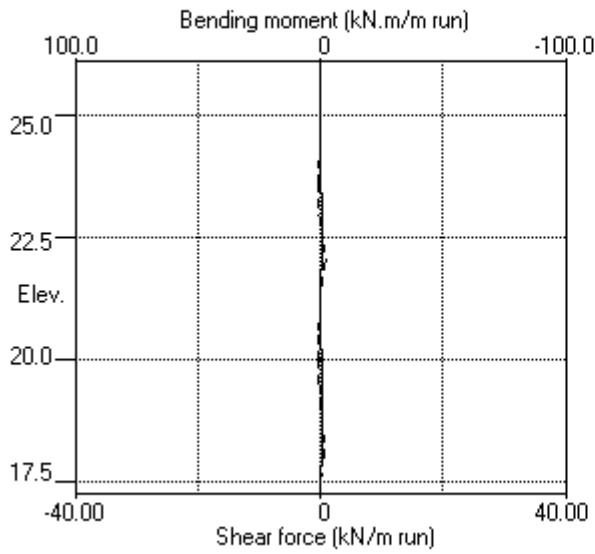
(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

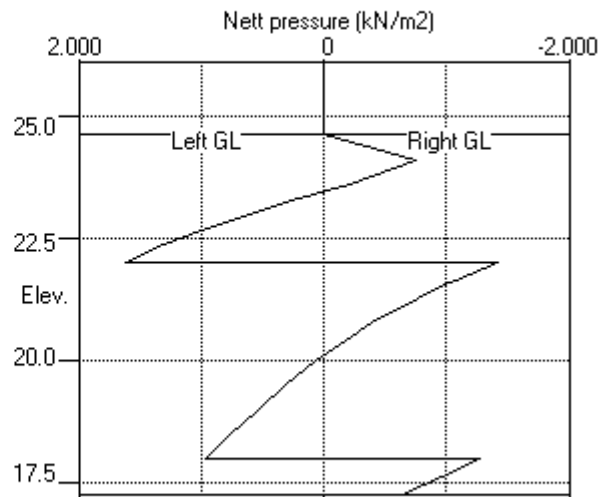
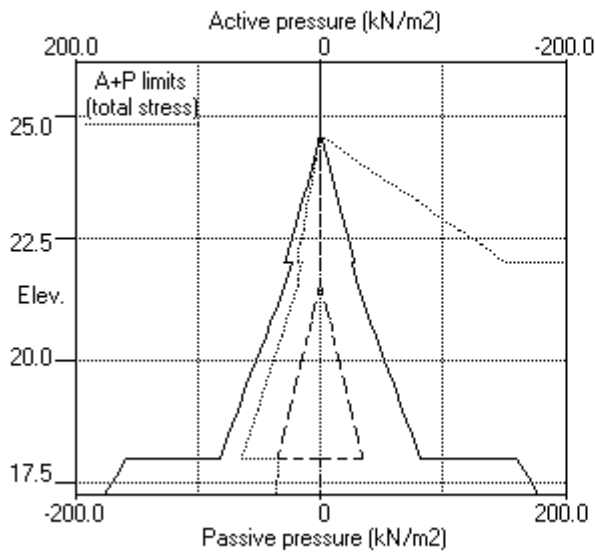
Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
18	20.77	7.16	64.24	18.20	280.68	33.83	40.99	4482
19	20.50	9.81	66.99	18.98	292.71	35.17	44.98	4482
20	20.00	14.71	72.09	20.43	314.97	37.64	52.35	4482
21	19.50	19.62	77.18	21.87	337.23	40.11	59.73	4482
22	19.00	24.52	82.28	23.31	359.49	42.57	67.10	4482
23	18.50	29.43	87.37	24.76	381.75	45.04	74.47	4482
24	18.00	34.34	92.47	26.20	404.02	47.49	81.83	4482
		Total>	126.80	33.00m	365.79	160.21	160.21	20140
25	17.63	Total>	134.30	34.88m	380.46	168.71	168.71	20745
26	17.25	Total>	141.80	36.75m	395.13	177.19	177.19	21349

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 24.60



Stage No.1 Apply surcharge no.1 at elev. 24.60



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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 2 Apply surcharge no.2 at elevation 23.25

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. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.500	Wall Penetr-ation	Direction of failure
2	24.60 24.60	Cant.					<u>Conditions not suitable for FoS calc.</u>

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.002	1.12E-04	0.0	-0.0		138544
2	25.75	0.00	0.002	1.12E-04	0.0	0.0		138544
3	25.46	0.00	0.002	1.12E-04	0.0	0.0		138544
4	25.18	0.00	0.002	1.12E-04	0.0	0.0		138544
5	24.89	0.00	0.002	1.12E-04	0.0	0.0		138544
6	24.60	0.00	0.002	1.12E-04	0.0	-0.0		138544
7	24.10	-2.86	0.001	1.12E-04	-0.7	0.0		138544
8	23.60	-2.23	0.001	1.14E-04	-2.0	-0.7		138544
9	23.25	-1.68	0.001	1.16E-04	-2.7	-1.5		138544
10	22.95	0.59	0.001	1.21E-04	-2.8	-2.3		138544
11	22.65	4.65	0.001	1.26E-04	-2.1	-3.1		138544
12	22.36	6.98	0.001	1.34E-04	-0.3	-3.5		138544
13	22.06	7.89	0.001	1.41E-04	1.9	-3.3		138544
14	22.00	7.97	0.001	1.42E-04	2.4	-3.1		138544
		-1.84	0.001	1.42E-04	2.4	-3.1		
15	21.64	-1.32	0.001	1.49E-04	1.8	-2.4		138544
16	21.50	-1.22	0.001	1.52E-04	1.6	-2.2		138544
17	21.04	-1.02	0.001	1.58E-04	1.1	-1.6		138544
18	20.77	-0.91	0.001	1.61E-04	0.8	-1.3		138544
19	20.50	-0.78	0.001	1.63E-04	0.6	-1.1		138544
20	20.00	-0.46	0.001	1.67E-04	0.3	-0.9		138544
21	19.50	-0.05	0.001	1.70E-04	0.2	-0.9		138544
22	19.00	0.44	0.001	1.73E-04	0.3	-0.8		138544
23	18.50	1.00	0.001	1.75E-04	0.6	-0.6		138544
24	18.00	1.60	0.001	1.77E-04	1.3	-0.2		138544
		-3.57	0.001	1.77E-04	1.3	-0.2		
25	17.63	-1.77	0.000	1.77E-04	0.3	0.0		138544
26	17.25	0.26	0.000	1.77E-04	0.0	0.0		---

(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1090
7	24.10	0.00	9.38	3.29	30.51	3.83	3.83	1090
8	23.60	0.00	19.93	7.00	64.83	9.59	9.59	1090
9	23.25	0.00	27.61	9.70	89.79	13.73	13.73	1090
10	22.95	0.00	39.56	13.90	128.68	19.06	19.06	1090
11	22.65	0.00	56.88	19.98	185.02	26.17	26.17	1090
12	22.36	0.00	68.98	24.23	224.36	31.55	31.55	1090
13	22.06	0.00	76.79	26.98	249.79	35.50	35.50	1090
14	22.00	0.00	78.05	27.42	253.89	36.20	36.20	1090
		0.00	78.05	22.12	341.05	27.69	27.69	5450
15	21.64	0.00	85.15	24.13	372.06	31.53	31.53	5450
16	21.50	0.00	87.59	24.82	382.71	32.92	32.92	5450
17	21.04	4.51	90.65	25.69	396.09	35.10	39.61	5450
18	20.77	7.16	92.38	26.17	403.63	36.36	43.52	5450
19	20.50	9.81	94.14	26.67	411.33	37.63	47.44	5450
20	20.00	14.71	97.58	27.65	426.35	40.06	54.78	5450
21	19.50	19.62	101.24	28.69	442.36	42.57	62.19	5450
22	19.00	24.52	105.10	29.78	459.24	45.16	69.69	5450
23	18.50	29.43	109.12	30.92	476.79	47.81	77.24	5450
24	18.00	34.34	113.26	32.09	494.88	50.50	84.83	5450
		Total>	147.60	33.00m	386.59	162.74	162.74	23719
25	17.63	Total>	154.44	34.88m	400.61	171.98	171.98	24430
26	17.25	Total>	161.34	36.75m	414.67	181.35	181.35	25142

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1090
7	24.10	0.00	9.00	3.16	29.27	6.69	6.69	1090
8	23.60	0.00	18.00	6.32	58.55	11.82	11.82	1090
9	23.25	0.00	24.30	8.54	79.04	15.41	15.41	1090
10	22.95	0.00	29.65	10.42	96.46	18.47	18.47	1090
11	22.65	0.00	35.01	12.30	113.88	21.52	21.52	1090
12	22.36	0.00	40.36	14.18	131.30	24.57	24.57	1090
13	22.06	0.00	45.72	16.06	148.72	27.62	27.62	1090
14	22.00	0.00	46.80	16.44	152.23	28.23	28.23	1090
		0.00	46.80	13.26	204.49	29.53	29.53	5450
15	21.64	0.00	54.00	15.30	235.95	32.85	32.85	5450
16	21.50	0.00	56.80	16.09	248.18	34.14	34.14	5450
17	21.04	4.51	61.49	17.42	268.66	36.11	40.63	5450

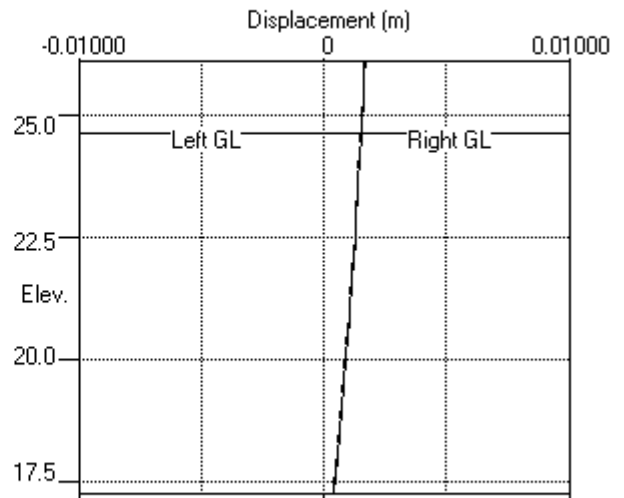
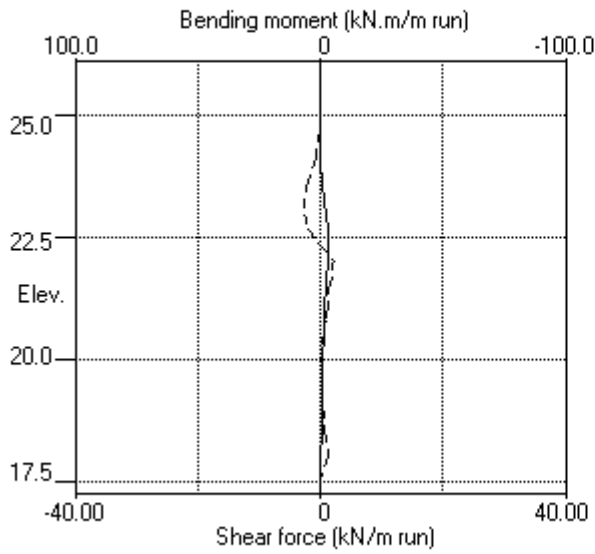
(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

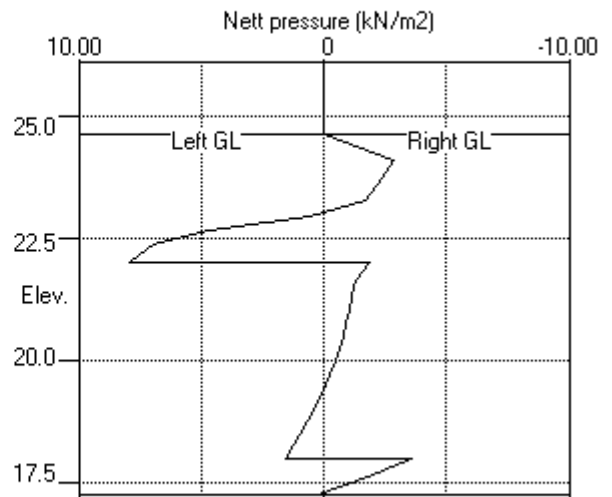
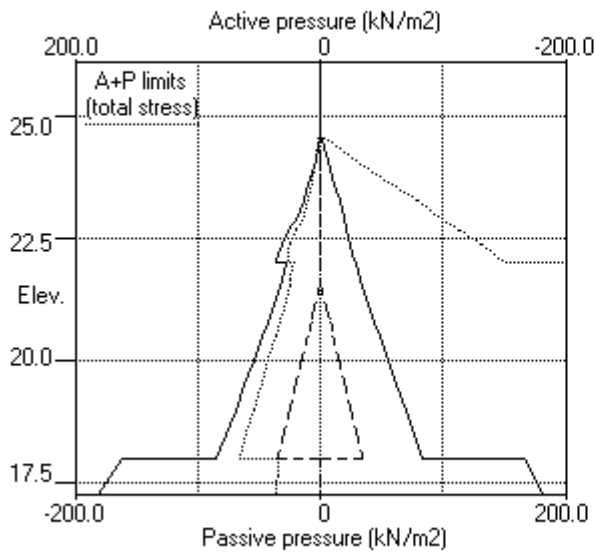
Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
18	20.77	7.16	64.24	18.20	280.68	37.26	44.42	5450
19	20.50	9.81	66.99	18.98	292.71	38.41	48.22	5450
20	20.00	14.71	72.09	20.43	314.97	40.52	55.24	5450
21	19.50	19.62	77.18	21.87	337.23	42.63	62.25	5450
22	19.00	24.52	82.28	23.31	359.49	44.72	69.25	5450
23	18.50	29.43	87.37	24.76	381.75	46.81	76.24	5450
24	18.00	34.34	92.47	26.20	404.02	48.90	83.23	5450
		Total>	126.80	33.00m	365.79	166.32	166.32	23719
25	17.63	Total>	134.30	34.88m	380.46	173.75	173.75	24430
26	17.25	Total>	141.80	36.75m	395.13	181.09	181.09	25142

Units: kN,m

Stage No.2 Apply surcharge no.2 at elev. 23.25



Stage No.2 Apply surcharge no.2 at elev. 23.25



(continued)

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	961
7	24.10	0.00	9.38	3.29	30.51	3.70	3.70	961
8	23.60	0.00	19.93	7.00	64.83	9.43	9.43	961
9	23.25	0.00	27.61	9.70	89.79	13.54	13.54	961
10	22.95	0.00	39.56	13.90	128.68	18.85	18.85	961
11	22.65	0.00	56.88	19.98	185.02	25.94	25.94	961
12	22.36	0.00	68.98	24.23	224.36	31.30	31.30	961
13	22.06	0.00	76.79	26.98	249.79	35.24	35.24	961
14	22.00	0.00	78.05	27.42	253.89	35.93	35.93	961
		0.00	78.05	22.12	341.05	26.34	26.34	4803
15	21.64	0.00	85.15	24.13	372.06	30.08	30.08	4803
16	21.50	0.00	87.59	24.82	382.71	31.43	31.43	4803
17	21.04	4.51	90.65	25.69	396.09	33.51	38.03	4803
18	20.77	7.16	92.38	26.17	403.63	34.73	41.89	4803
19	20.50	9.81	94.14	26.67	411.33	35.98	45.79	4803
20	20.00	14.71	97.58	27.65	426.35	38.40	53.11	4803
21	19.50	19.62	101.24	28.69	442.36	40.96	60.58	4803
22	19.00	24.52	105.10	29.78	459.24	43.66	68.18	4803
23	18.50	29.43	109.12	30.92	476.79	46.47	75.90	4803
24	18.00	34.34	113.26	32.09	494.88	49.37	83.70	4803
		Total>	147.60	33.00m	386.59	157.73	157.73	21305
25	17.63	Total>	154.44	34.88m	400.61	167.58	167.58	21944
26	17.25	Total>	161.34	36.75m	414.67	177.63	177.63	22583

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	961
7	24.10	0.00	9.00	3.16	29.27	6.82	6.82	961
8	23.60	0.00	18.00	6.32	58.55	11.99	11.99	961
9	23.25	0.00	24.30	8.54	79.04	15.60	15.60	961
10	22.95	0.00	29.65	10.42	96.46	18.68	18.68	961
11	22.65	0.00	35.01	12.30	113.88	21.75	21.75	961
12	22.36	0.00	40.36	14.18	131.30	24.82	24.82	961
13	22.06	0.00	45.72	16.06	148.72	27.88	27.88	961
14	22.00	0.00	46.80	16.44	152.23	28.50	28.50	961
		0.00	46.80	13.26	204.49	30.88	30.88	4803
15	21.64	0.00	54.00	15.30	235.95	34.30	34.30	4803
16	21.50	0.00	56.80	16.09	248.18	35.63	35.63	4803
17	21.04	0.00	66.00	18.70	288.38	39.20	39.20	4803

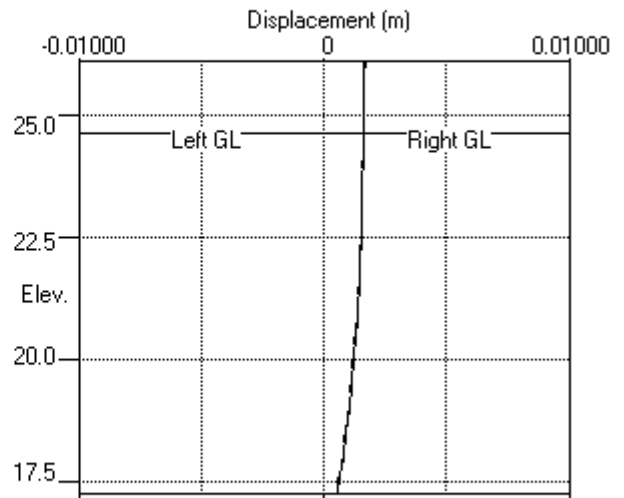
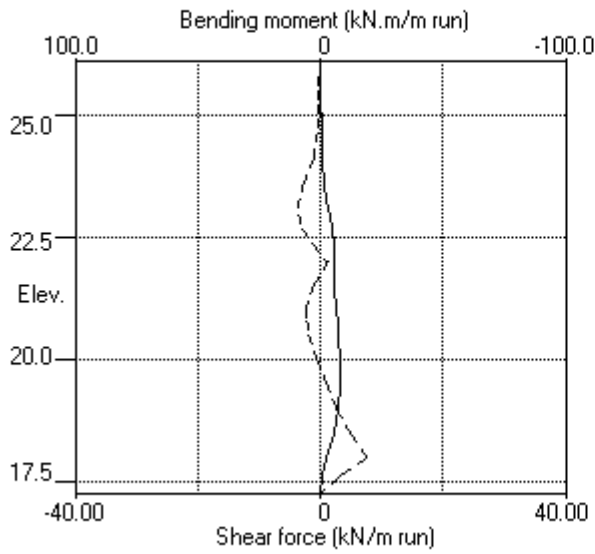
(continued)

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)

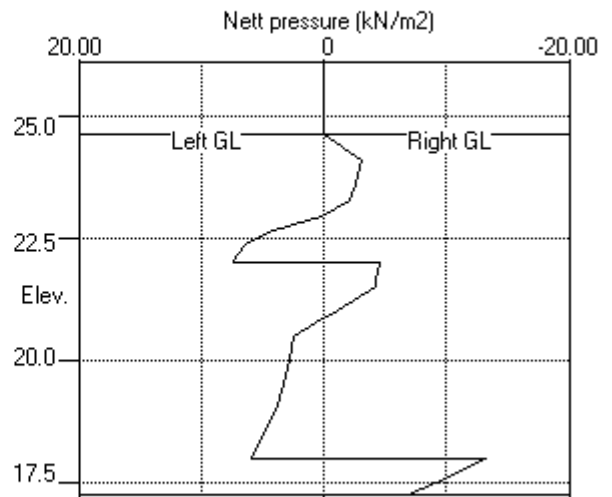
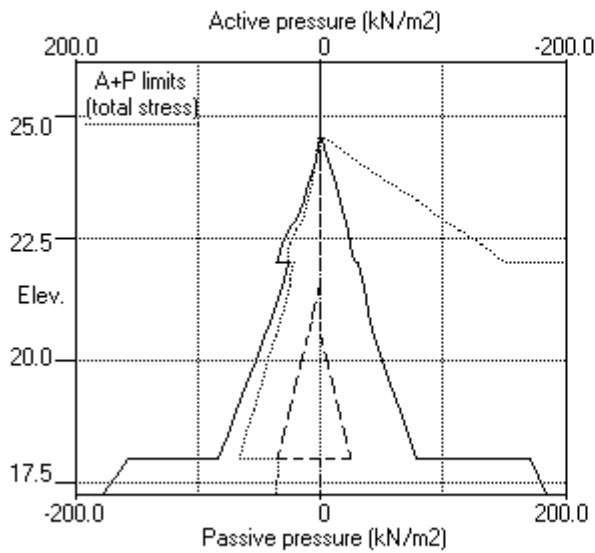
Node no.	Y coord	----- RIGHT side -----						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
18	20.77	0.00	71.40	20.23	311.97	41.27	41.27	4803
19	20.50	0.00	76.80	21.76	335.57	43.33	43.33	4803
20	20.00	4.90	81.90	23.20	357.83	45.45	50.36	4803
21	19.50	9.81	86.99	24.65	380.09	47.51	57.32	4803
22	19.00	14.71	92.09	26.09	402.35	49.49	64.21	4803
23	18.50	19.62	97.18	27.54	424.62	51.42	71.04	4803
24	18.00	24.52	102.28	28.98	446.88	53.30	77.82	4803
		Total>	126.80	33.00m	365.79	170.95	170.95	21305
25	17.63	Total>	134.30	34.88m	380.46	177.76	177.76	21944
26	17.25	Total>	141.80	36.75m	395.13	184.42	184.42	22583

Units: kN,m

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)



Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)



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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 5 Excavate to elevation 21.04 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. =	Moment of equil. at elev.	Toe elev. for FoS =	Wall Penetr-ation	Direction of failure
5	24.60 21.04	25.75	17.25	n/a	1.500	17.88 3.16	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.001	-1.51E-03	0.0	0.0		138544
2	25.75	0.00	0.002	-1.51E-03	0.0	0.0	30.3	138544
		0.00	0.002	-1.51E-03	-30.3	-0.0		
3	25.46	0.00	0.002	-1.50E-03	-30.3	-8.7		138544
4	25.18	0.00	0.003	-1.48E-03	-30.3	-17.4		138544
5	24.89	0.00	0.003	-1.43E-03	-30.3	-26.2		138544
6	24.60	0.00	0.004	-1.37E-03	-30.3	-34.9		138544
7	24.10	3.29	0.004	-1.22E-03	-29.5	-49.8		138544
8	23.60	7.00	0.005	-1.01E-03	-26.9	-64.0		138544
9	23.25	10.08	0.005	-8.43E-04	-23.9	-72.8		138544
10	22.95	15.15	0.005	-6.79E-04	-20.2	-79.4		138544
11	22.65	22.06	0.006	-5.03E-04	-14.7	-84.7		138544
12	22.36	27.28	0.006	-3.17E-04	-7.3	-88.0		138544
13	22.06	31.13	0.006	-1.28E-04	1.4	-88.9		138544
14	22.00	31.81	0.006	-8.96E-05	3.3	-88.7		138544
		22.12	0.006	-8.96E-05	3.3	-88.7		
15	21.64	24.13	0.006	1.37E-04	11.6	-86.1		138544
16	21.50	24.82	0.006	2.23E-04	15.0	-84.2		138544
17	21.04	30.20	0.006	4.87E-04	27.7	-74.5		138544
18	20.77	9.74	0.005	6.24E-04	33.1	-66.2		138544
19	20.50	-10.71	0.005	7.44E-04	32.9	-57.2		138544
20	20.00	-12.07	0.005	9.22E-04	27.2	-41.1		138544
21	19.50	-10.13	0.004	1.04E-03	21.7	-29.1		138544
22	19.00	-7.00	0.004	1.13E-03	17.4	-19.0		138544
23	18.50	-0.48	0.003	1.18E-03	15.5	-11.2		138544
24	18.00	6.31	0.003	1.21E-03	17.0	-3.5		138544
		-42.55	0.003	1.21E-03	17.0	-3.5		
25	17.63	-23.02	0.002	1.22E-03	4.7	-0.1		138544
26	17.25	-2.01	0.002	1.22E-03	0.0	0.0		---

At elev. 25.75 Strut force = 151.7 kN/strut = 30.3 kN/m run

(continued)

Stage No.5 Excavate to elevation 21.04 on RIGHT side

Node no.	Y coord	----- LEFT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	971
7	24.10	0.00	9.38	3.29	30.51	3.29	3.29a	971
8	23.60	0.00	19.93	7.00	64.83	7.00	7.00a	971
9	23.25	0.00	27.61	9.70	89.79	10.08	10.08	971
10	22.95	0.00	39.56	13.90	128.68	15.15	15.15	971
11	22.65	0.00	56.88	19.98	185.02	22.06	22.06	971
12	22.36	0.00	68.98	24.23	224.36	27.28	27.28	971
13	22.06	0.00	76.79	26.98	249.79	31.13	31.13	971
14	22.00	0.00	78.05	27.42	253.89	31.81	31.81	971
		0.00	78.05	22.12	341.05	22.12	22.12a	4857
15	21.64	0.00	85.15	24.13	372.06	24.13	24.13a	4857
16	21.50	0.00	87.59	24.82	382.71	24.82	24.82a	4857
17	21.04	4.51	90.65	25.69	396.09	25.69	30.20a	4857
18	20.77	7.16	92.38	26.17	403.63	26.17	33.34a	4857
19	20.50	9.81	94.14	26.67	411.33	26.67	36.48a	4857
20	20.00	14.71	97.58	27.65	426.35	27.65	42.36a	4857
21	19.50	19.62	101.24	28.69	442.36	28.69	48.31a	4857
22	19.00	24.52	105.10	29.78	459.24	30.57	55.10	4857
23	18.50	29.43	109.12	30.92	476.79	35.62	65.05	4857
24	18.00	34.34	113.26	32.09	494.88	40.81	75.14	4857
		Total>	147.60	33.00m	386.59	119.82	119.82	21506
25	17.63	Total>	154.44	34.88m	400.61	136.42	136.42	22151
26	17.25	Total>	161.34	36.75m	414.67	153.67	153.67	22796

Node no.	Y coord	----- RIGHT side -----					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.04	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	7379
18	20.77	0.00	5.40	1.53	23.59	23.59	23.59p	7379

(continued)

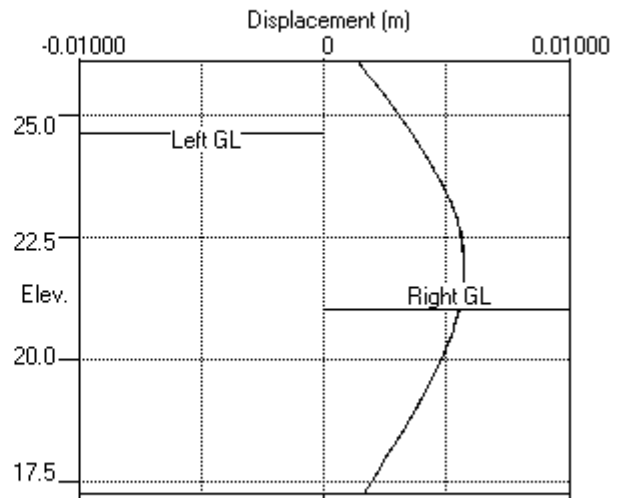
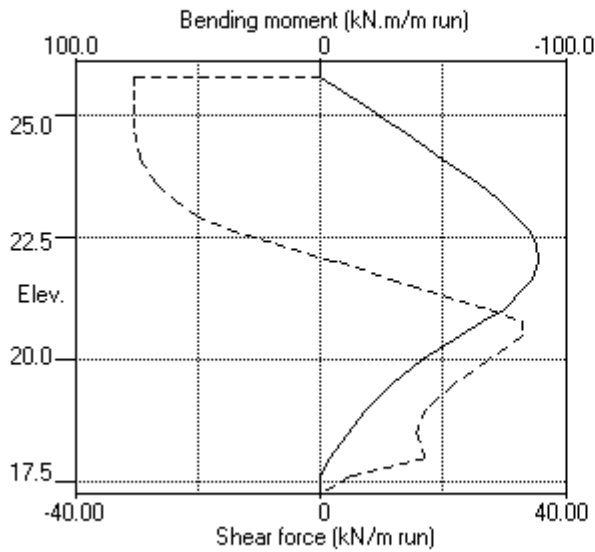
Stage No.5 Excavate to elevation 21.04 on RIGHT side

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
19	20.50	0.00	10.80	3.06	47.19	47.19	47.19p	7379
20	20.00	4.90	15.90	4.50	69.45	49.52	54.43	7379
21	19.50	9.81	20.99	5.95	91.72	48.63	58.44	7379
22	19.00	14.71	26.09	7.39	113.98	47.38	62.10	7379
23	18.50	19.62	31.18	8.84	136.25	45.91	65.53	7379
24	18.00	24.52	36.28	10.28	158.53	44.31	68.83	7379
		Total>	60.81	15.20m	299.80	162.37	162.37	31106
25	17.63	Total>	68.31	17.08m	314.47	159.43	159.43	32039
26	17.25	Total>	75.81	18.95m	329.15	155.68	155.68	32972

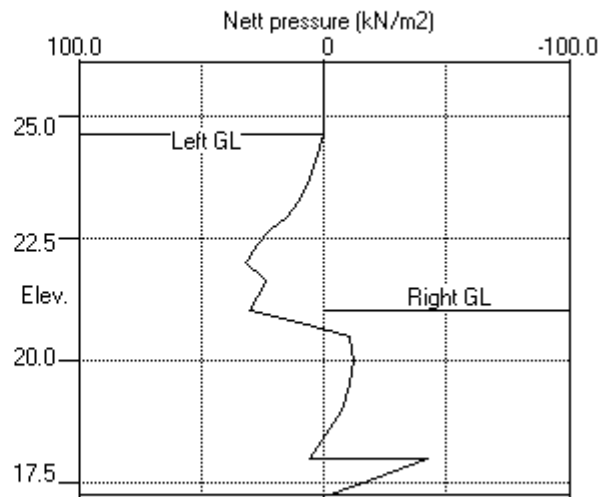
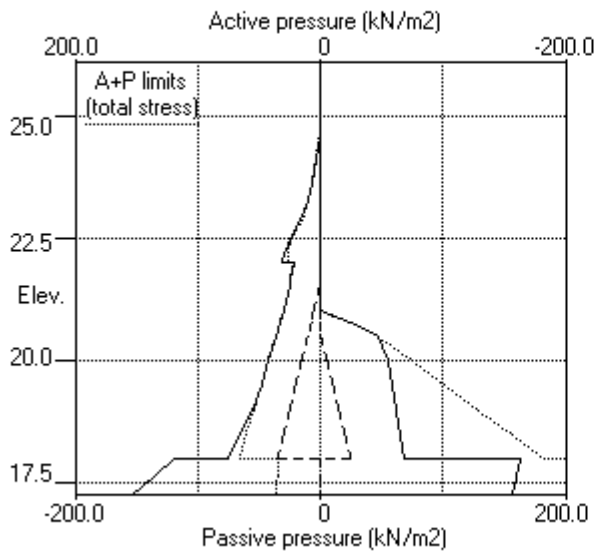
Note: 48.31a Soil pressure at active limit
 47.19p Soil pressure at passive limit

Units: kN,m

Stage No.5 Excav. to elev. 21.04 on RIGHT side



Stage No.5 Excav. to elev. 21.04 on RIGHT side



(continued)

Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	961
7	24.10	0.00	9.38	3.29	30.51	3.40	3.40	961
8	23.60	0.00	19.93	7.00	64.83	7.13	7.13	961
9	23.25	0.00	27.61	9.70	89.79	10.23	10.23	961
10	22.95	0.00	39.56	13.90	128.68	15.32	15.32	961
11	22.65	0.00	56.88	19.98	185.02	22.24	22.24	961
12	22.36	0.00	68.98	24.23	224.36	27.48	27.48	961
13	22.06	0.00	76.79	26.98	249.79	31.34	31.34	961
14	22.00	0.00	78.05	27.42	253.89	32.02	32.02	961
		0.00	78.05	22.12	341.05	23.17	23.17	4806
15	21.64	0.00	85.15	24.13	372.06	25.25	25.25	4806
16	21.50	0.00	87.59	24.82	382.71	25.97	25.97	4806
17	21.04	4.51	90.65	25.69	396.09	26.91	31.43	4806
18	20.77	7.16	92.38	26.17	403.63	27.44	34.60	4806
19	20.50	9.81	94.14	26.67	411.33	27.97	37.78	4806
20	20.00	14.71	97.58	27.65	426.35	28.98	43.70	4806
21	19.50	19.62	101.24	28.69	442.36	30.04	49.66	4806
22	19.00	24.52	105.10	29.78	459.24	31.92	56.45	4806
23	18.50	29.43	109.12	30.92	476.79	36.95	66.38	4806
24	18.00	34.34	113.26	32.09	494.88	42.11	76.45	4806
		Total>	147.60	33.00m	386.59	125.61	125.61	21317
25	17.63	Total>	154.44	34.88m	400.61	142.26	142.26	21957
26	17.25	Total>	161.34	36.75m	414.67	159.55	159.55	22596

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1137
16	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1137
17	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1137
		0.00	10.80	3.06	47.19	3.06	3.06a	5686

(continued)

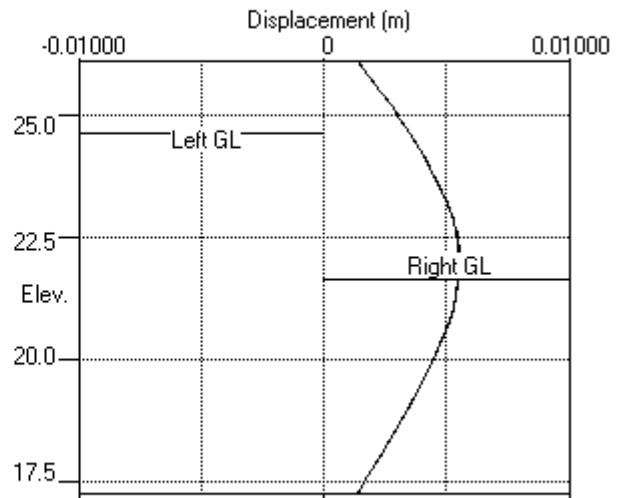
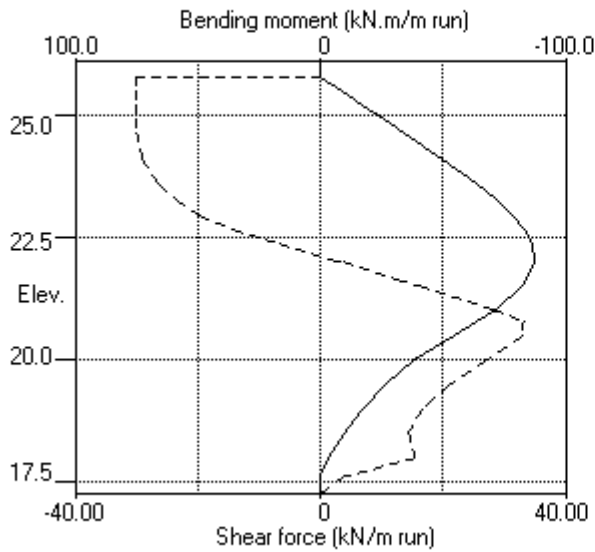
Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertical	Active limit	Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
18	20.77	0.00	16.20	4.59	70.78	25.70	25.70	5686
19	20.50	0.00	21.60	6.12	94.38	49.25	49.25	5686
20	20.00	4.90	26.70	7.56	116.64	51.54	56.45	5686
21	19.50	9.81	31.79	9.01	138.91	50.63	60.44	5686
22	19.00	14.71	36.89	10.45	161.18	49.38	64.09	5686
23	18.50	19.62	41.99	11.90	183.45	47.93	67.55	5686
24	18.00	24.52	47.08	13.34	205.73	46.36	70.89	5686
		Total>	71.61	18.20m	310.60	166.07	166.07	24611
25	17.63	Total>	79.11	20.08m	325.28	163.07	163.07	25349
26	17.25	Total>	86.62	21.95m	339.95	159.27	159.27	26088

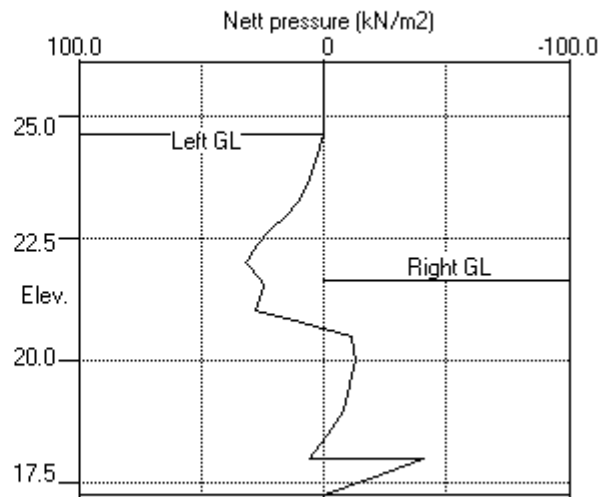
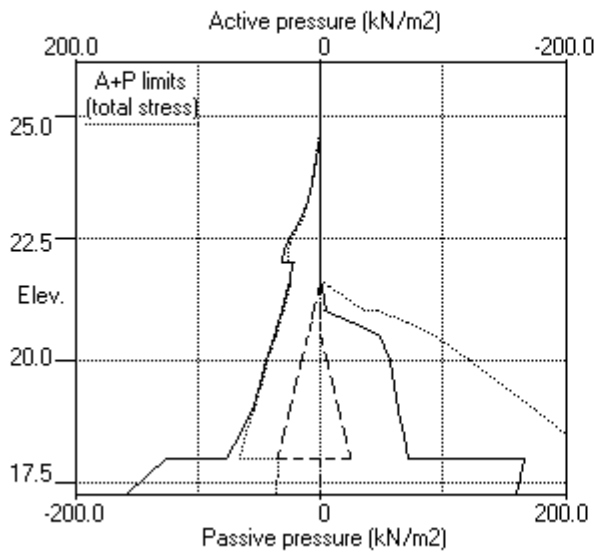
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Fill to elev. 21.64 on RIGHT side



Stage No.6 Fill to elev. 21.64 on RIGHT side



(continued)

Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	2096
7	24.10	0.00	9.38	3.29	30.51	3.29	3.29a	2096
8	23.60	0.00	19.93	7.00	64.83	7.01	7.01	2096
9	23.25	0.00	27.61	9.70	89.79	10.13	10.13	2096
10	22.95	0.00	39.56	13.90	128.68	15.24	15.24	2096
11	22.65	0.00	56.88	19.98	185.02	22.19	22.19	2096
12	22.36	0.00	68.98	24.23	224.36	27.45	27.45	2096
13	22.06	0.00	76.79	26.98	249.79	31.33	31.33	2096
14	22.00	0.00	78.05	27.42	253.89	32.01	32.01	2096
		0.00	78.05	22.12	341.05	23.13	23.13	10481
15	21.64	0.00	85.15	24.13	372.06	25.29	25.29	6536
16	21.50	0.00	87.59	24.82	382.71	26.02	26.02	6536
17	21.04	4.51	90.65	25.69	396.09	27.01	31.52	6536
18	20.77	7.16	92.38	26.17	403.63	27.55	34.71	6536
19	20.50	9.81	94.14	26.67	411.33	28.09	37.90	6536
20	20.00	14.71	97.58	27.65	426.35	29.11	43.83	6536
21	19.50	19.62	101.24	28.69	442.36	30.16	49.78	6536
22	19.00	24.52	105.10	29.78	459.24	32.03	56.55	6536
23	18.50	29.43	109.12	30.92	476.79	37.04	66.47	6536
24	18.00	34.34	113.26	32.09	494.88	42.17	76.51	6536
		Total>	147.60	33.00m	386.59	125.88	125.88	27858
25	17.63	Total>	154.44	34.88m	400.61	142.45	142.45	28693
26	17.25	Total>	161.34	36.75m	414.67	159.67	159.67	29529

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1307
16	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1307
17	21.04	0.00	10.80	3.79	35.13	3.79	3.79a	1307
		0.00	10.80	3.06	47.19	3.06	3.06a	6536

(continued)

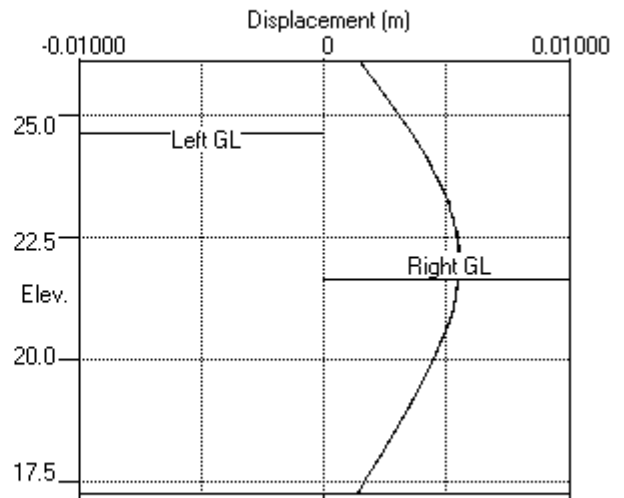
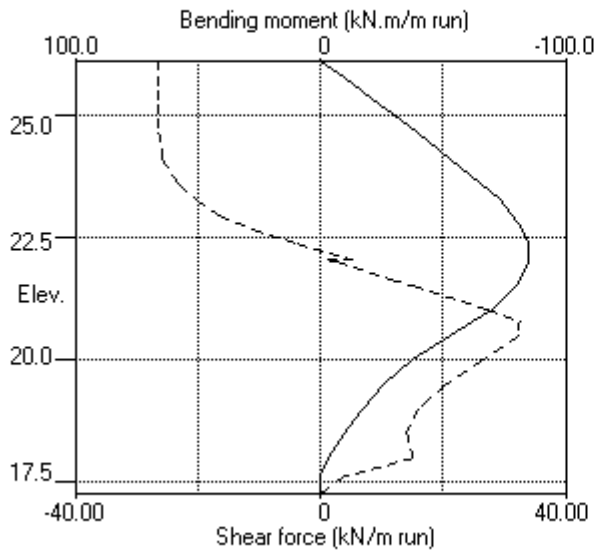
Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	RIGHT side						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Earth pressure kN/m2		
18	20.77	0.00	16.20	4.59	70.78	25.59	25.59	6536	
19	20.50	0.00	21.60	6.12	94.38	49.14	49.14	6536	
20	20.00	4.90	26.70	7.56	116.64	51.42	56.32	6536	
21	19.50	9.81	31.79	9.01	138.91	50.51	60.32	6536	
22	19.00	14.71	36.89	10.45	161.18	49.27	63.99	6536	
23	18.50	19.62	41.99	11.90	183.45	47.84	67.46	6536	
24	18.00	24.52	47.08	13.34	205.73	46.30	70.83	6536	
		Total>	71.61	18.20m	310.60	165.80	165.80	27858	
25	17.63	Total>	79.11	20.08m	325.28	162.87	162.87	28693	
26	17.25	Total>	86.62	21.95m	339.95	159.15	159.15	29529	

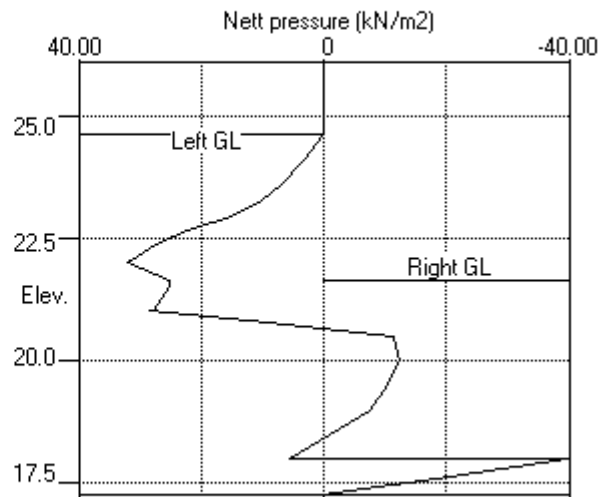
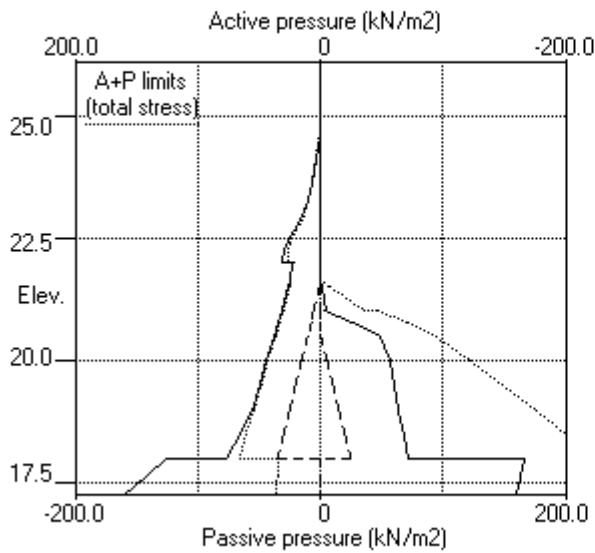
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.9 Remove strut no.1 at elev. 25.75



Stage No.9 Remove strut no.1 at elev. 25.75



(continued)

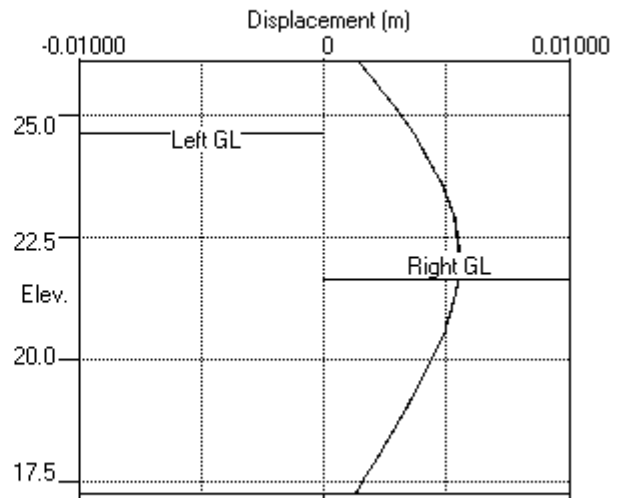
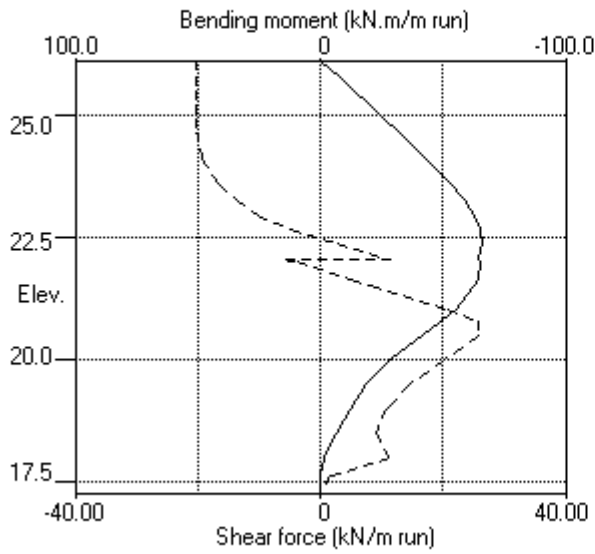
Stage No.10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	----- RIGHT side -----						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
16	21.50	0.00	0.00	0.00	0.00	0.00	0.00	20499	
17	21.04	0.00	2.52	0.89	8.20	0.89	0.89a	11624	
		0.00	10.80	3.79	35.13	3.79	3.79a	1420	
		0.00	10.80	3.06	47.19	3.06	3.06a	7102	
18	20.77	0.00	16.20	4.59	70.78	25.42	25.42	7102	
19	20.50	0.00	21.60	6.12	94.38	48.90	48.90	7102	
20	20.00	4.90	26.70	7.56	116.64	51.06	55.96	7102	
21	19.50	9.81	31.79	9.01	138.91	50.04	59.85	7102	
22	19.00	14.71	36.89	10.45	161.18	48.74	63.45	7102	
23	18.50	19.62	41.99	11.90	183.45	47.25	66.87	7102	
24	18.00	24.52	47.08	13.34	205.73	45.68	70.21	7102	
		Total>	71.61	18.20m	310.60	163.19	163.19	30035	
25	17.63	Total>	79.11	20.08m	325.28	160.13	160.13	30936	
26	17.25	Total>	86.62	21.95m	339.95	156.28	156.28	31837	

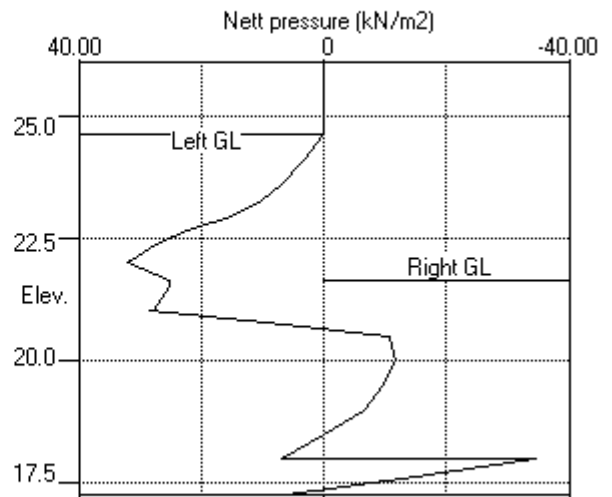
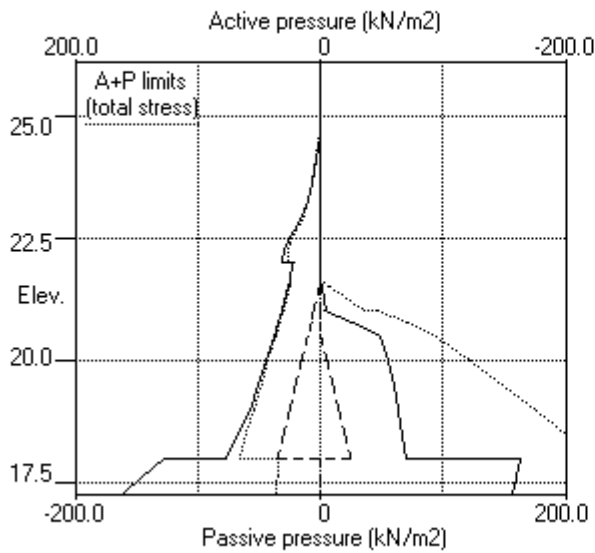
Note: 3.06a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.10 Change EI of wall to 98960kN.m²/m run



Stage No.10 Change EI of wall to 98960kN.m²/m run



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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_SLS
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 13 Apply water pressure profile no.2 (Mod. Conserv.)

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

				FoS for toe		Toe elev. for	
				elev. = 17.25		FoS = 1.500	
				-----		-----	
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of
			Safety	at elev.		-ation	failure
13	24.60 21.64		More than one strut.	No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall
Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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	EI of wall kN.m2/m
1	26.10	0.00	0.001	-1.65E-03	-24.0	0.0	24.0	98960
2	25.75	0.00	0.002	-1.64E-03	-24.0	-8.9		98960
3	25.46	0.00	0.002	-1.60E-03	-24.0	-16.2		98960
4	25.18	0.00	0.003	-1.55E-03	-24.0	-23.5		98960
5	24.89	0.00	0.003	-1.47E-03	-24.0	-30.8		98960
6	24.60	0.00	0.004	-1.38E-03	-24.0	-38.1		98960
7	24.10	3.29	0.004	-1.17E-03	-23.2	-50.5		98960
8	23.60	7.00	0.005	-9.02E-04	-20.6	-62.3		98960
9	23.25	12.10	0.005	-6.83E-04	-17.2	-69.3		98960
10	22.95	19.20	0.005	-4.80E-04	-12.6	-74.3		98960
11	22.65	28.16	0.005	-2.66E-04	-5.5	-77.4		98960
12	22.36	35.45	0.006	-4.77E-05	3.9	-78.1		98960
13	22.06	41.38	0.006	1.67E-04	15.3	-75.7	10.9	98960
		41.38	0.006	1.67E-04	4.5	-75.7		
14	22.00	42.48	0.005	2.09E-04	7.0	-75.3		98960
		33.61	0.005	2.09E-04	7.0	-75.3		
15	21.64	38.70	0.005	4.54E-04	20.0	-70.0		98960
		19.20	0.005	4.54E-04	20.0	-70.0		
16	21.50	19.32	0.005	5.43E-04	22.7	-66.8		98960
17	21.04	19.80	0.005	8.02E-04	31.7	-53.6		98960
		20.19	0.005	8.02E-04	31.7	-53.6		
18	20.77	1.97	0.005	9.25E-04	34.7	-44.2		98960
19	20.50	-19.22	0.004	1.02E-03	32.4	-34.7		98960
20	20.00	-18.94	0.004	1.14E-03	22.8	-19.2		98960
21	19.50	-15.75	0.003	1.20E-03	14.2	-9.5		98960
22	19.00	-11.77	0.003	1.22E-03	7.3	-3.3		98960
23	18.50	-4.77	0.002	1.23E-03	3.2	-0.6		98960
24	18.00	2.25	0.002	1.22E-03	2.5	0.9		98960
		-10.90	0.002	1.22E-03	2.5	0.9		
25	17.63	-8.19	0.001	1.22E-03	-1.1	0.9		98960

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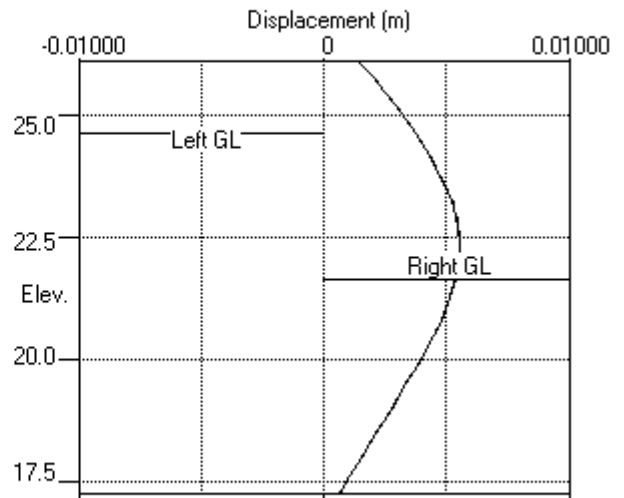
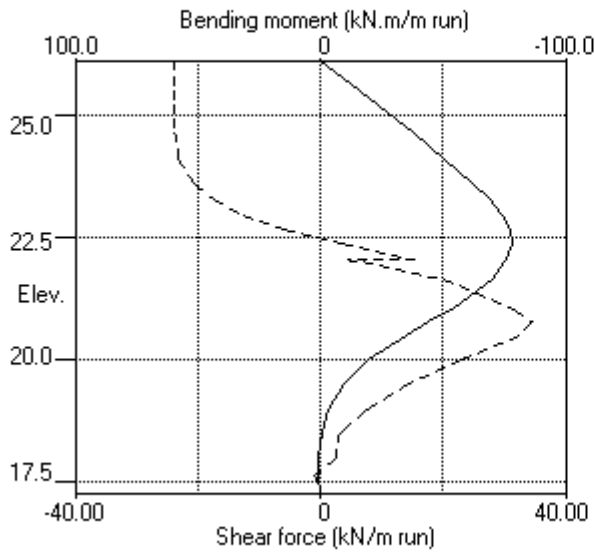
Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	RIGHT side						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Earth pressure kN/m2		
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		19.23	0.77	0.27	2.51	0.27	19.50a	1303	
16	21.50	20.60	1.92	0.67	6.24	0.67	21.27a	1303	
17	21.04	25.11	5.68	2.00	18.49	2.00	27.11a	1303	
		25.11	5.68	1.61	24.84	1.61	26.72a	6513	
18	20.77	27.76	8.43	2.39	36.84	20.86	48.62	6513	
19	20.50	30.41	11.18	3.17	48.83	43.05	73.46	6513	
20	20.00	35.32	16.25	4.60	70.98	44.56	79.87	6513	
21	19.50	40.22	21.30	6.03	93.05	43.03	83.25	6513	
22	19.00	45.13	26.32	7.46	115.02	41.34	86.47	6513	
23	18.50	50.03	31.32	8.88	136.87	39.61	89.65	6513	
24	18.00	54.94	36.30	10.28	158.59	37.88	92.82	6513	
		54.94	36.30	12.75	118.06	108.98	163.92	14065	
25	17.63	58.61	40.01	14.05	130.13	119.71	178.33	14487	
26	17.25	62.29	43.70	15.35	142.15	111.76	174.06	14909	

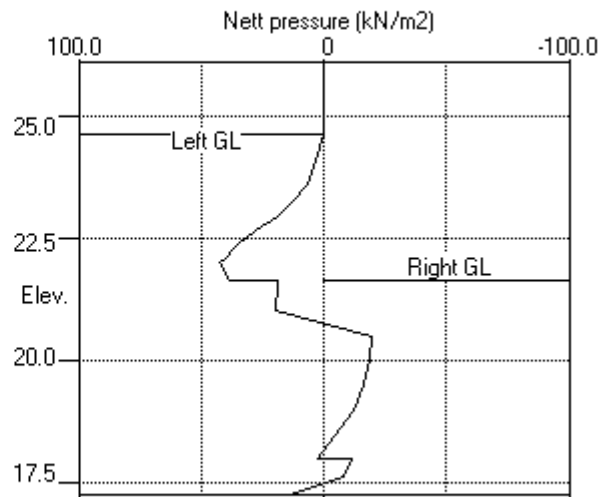
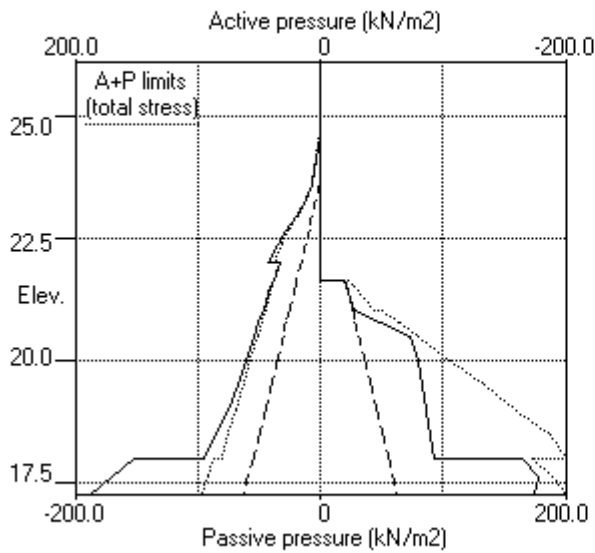
Note: 26.72a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)



Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

 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.		Strut Elev.	FoS for toe elev. = 17.25		Toe elev. for FoS = 1.500		Direction of failure
	Act.	Pass.		Factor of Safety	Moment at elev.	Toe elev.	Wall Penetration	
1	24.60	24.60	Cant.	Conditions not suitable for FoS calc.				
2	24.60	24.60	Cant.	Conditions not suitable for FoS calc.				
3	24.60	24.60		No analysis at this stage				
4	24.60	24.60	25.75	Conditions not suitable for FoS calc.				
5	24.60	21.04	25.75	2.262	n/a	17.88	3.16	L to R
6	24.60	21.64	25.75	2.701	n/a	18.96	2.68	L to R
7	24.60	21.64		No analysis at this stage				

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

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 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-SLS, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 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				Shear force			
		max. m	min. m	Calculated kN.m/m		Factored kN.m/m		Calculated kN/m		Factored kN/m	
1	26.10	0.002	0.000	0	-0	0	-0	0	-27	0	-36
2	25.75	0.002	0.000	0	-9	0	-13	0	-30	0	-41
3	25.46	0.002	0.000	0	-17	0	-23	0	-30	0	-41
4	25.18	0.003	0.000	0	-25	0	-33	0	-30	0	-41
5	24.89	0.003	0.000	0	-32	0	-44	0	-30	0	-41
6	24.60	0.004	0.000	0	-40	0	-54	0	-30	0	-41
7	24.10	0.004	0.000	0	-53	0	-72	0	-30	0	-40
8	23.60	0.005	0.000	0	-65	0	-88	0	-27	0	-36
9	23.25	0.005	0.000	0	-73	0	-98	0	-24	0	-32
10	22.95	0.005	0.000	0	-79	0	-107	0	-20	0	-27
11	22.65	0.006	0.000	0	-85	0	-114	0	-15	0	-20
12	22.36	0.006	0.000	0	-88	0	-119	4	-7	5	-10
13	22.06	0.006	0.000	0	-89	0	-120	15	-6	21	-8
14	22.00	0.006	0.000	0	-89	0	-120	7	-4	9	-5
15	21.64	0.006	0.000	0	-86	0	-116	20	-0	27	-1
16	21.50	0.006	0.000	0	-84	0	-114	23	-1	31	-1
17	21.04	0.006	0.000	0	-75	0	-101	32	-2	43	-3
18	20.77	0.005	0.000	0	-66	0	-89	35	-2	47	-3
19	20.50	0.005	0.000	0	-57	0	-77	33	-2	45	-3
20	20.00	0.005	0.000	0	-41	0	-55	27	-1	37	-1
21	19.50	0.004	0.000	0	-29	0	-39	22	-0	29	-0
22	19.00	0.004	0.000	0	-19	0	-26	17	-0	23	-0
23	18.50	0.003	0.000	0	-11	0	-15	16	0	21	0
24	18.00	0.003	0.000	1	-3	1	-5	17	0	23	0
25	17.63	0.002	0.000	1	-0	1	-1	5	-1	6	-1
26	17.25	0.002	0.000	0	0	0	0	0	-0	0	-0

Summary of results (continued)

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

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force							
	Calculated		Factored		Calculated		Factored					
min.	max. elev.	min. elev.	max. elev.	max. elev.	min. elev.	max. elev.	min. elev.	max. elev.				
	kN.m/m		kN.m/m		kN/m		kN/m					
1	0	21.04	-1	19.00	0	-1	1	22.00	-0	23.60	1	
-1	2	0	17.63	-3	22.36	0	-5	2	22.00	-3	22.95	3
-4	3	No calculation at this stage										
4	0	25.75	-8	20.00	0	-11	8	18.00	-4	22.95	10	
-5	5	0	17.25	-89	22.06	0	-120	33	20.77	-30	25.75	45
-41	6	0	17.63	-87	22.06	0	-118	33	20.77	-30	25.75	45
-41	7	No calculation at this stage										
8	No calculation at this stage											
9	0	17.63	-85	22.36	0	-114	32	20.77	-27	26.10	44	
-36	10	0	17.63	-66	22.36	0	-89	26	20.77	-20	26.10	35
-27	11	No calculation at this stage										
12	No calculation at this stage											
13	1	17.63	-78	22.36	1	-105	35	20.77	-24	26.10	47	
-32												

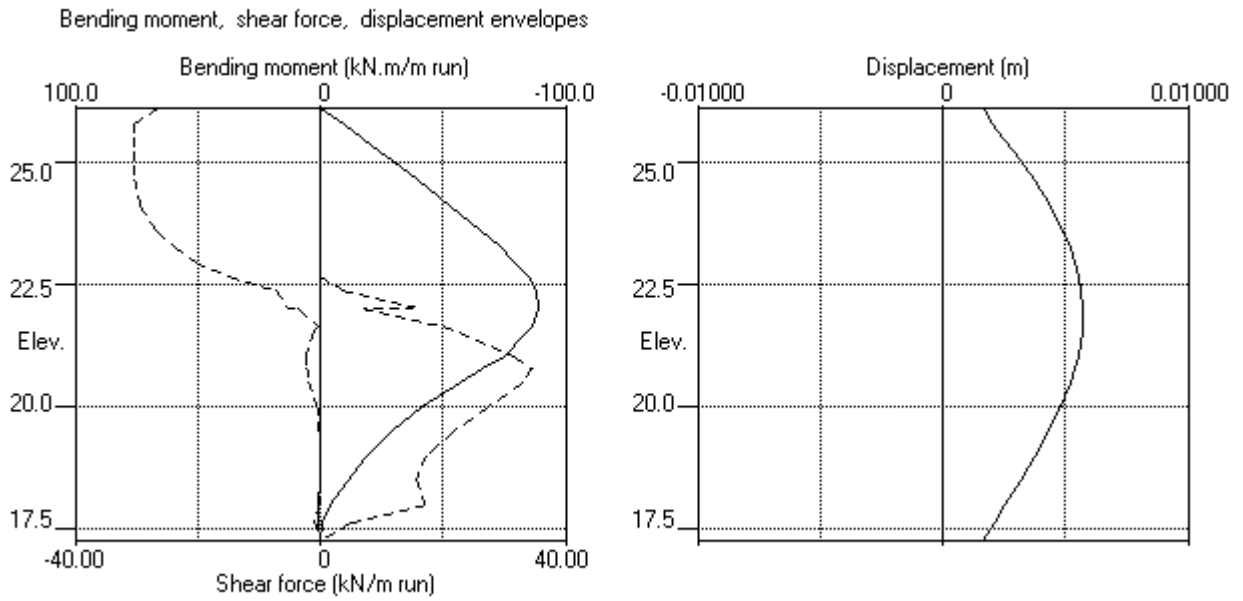
Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.001	26.10	0.000	26.10	Apply surcharge no.1 at elev. 24.60
2	0.002	26.10	0.000	26.10	Apply surcharge no.2 at elev. 23.25
3	No calculation at this stage				Install strut no.1 at elev. 25.75
4	0.002	26.10	0.000	26.10	Apply water pressure profile no.1
5	0.006	22.00	0.000	26.10	Excav. to elev. 21.04 on RIGHT side
6	0.005	22.00	0.000	26.10	Fill to elev. 21.64 on RIGHT side
7	No calculation at this stage				Install strut no.2 at elev. 22.06
8	No calculation at this stage				Install strut no.3 at elev. 26.10
9	0.006	22.00	0.000	26.10	Remove strut no.1 at elev. 25.75
10	0.006	22.00	0.000	26.10	Change EI of wall to 98960kN.m ² /m run
11	No calculation at this stage				Change soil type 3 to soil type 4
12	No calculation at this stage				Apply surcharge no.3 at elev. 21.64
13	0.006	22.36	0.000	26.10	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1			Strut no. 2			Strut no. 3		
	at elev. 25.75			at elev. 22.06			at elev. 26.10		
	--Calculated--	Factored		--Calculated--	Factored		--Calculated--	Factored	
	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut
4	0	2	2	---	---	---	---	---	---
5	30	152	205	---	---	---	---	---	---
6	30	150	203	---	---	---	---	---	---
9	---	---	---	4	4	6	27	27	36
10	---	---	---	17	17	23	20	20	27
13	---	---	---	11	11	15	24	24	32

Units: kN,m



WALLAP

4-ULS1

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	24.60	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES (Unfactored SLS soil strengths)

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

	Left side	Right side
Initial water table elevation	21.50	21.50

Automatic water pressure balancing at toe of wall : No

Water press. profile	Left side				Right side				
Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2		
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0	MC+WC
2	1	23.60	23.60	0.0	1	21.64	21.64	0.0	MC+WC
					2	21.64	23.60	19.2	

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 17.25
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m ² ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	24.60	1.20(L)	20.00	20.00	15.00	=	N/A	1.10 Var
2	23.25	0.40(L)	20.00	0.80	57.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	20.00	=	N/A	1.00 P/F

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 24.60
2	Apply surcharge no.2 at elevation 23.25
3	Install strut or anchor no.1 at elevation 25.75
4	Apply water pressure profile no.1 (Mod. Conserv.)
5	Excavate to elevation 20.68 on RIGHT side
6	Fill to elevation 21.64 on RIGHT side with soil type 1
7	Install strut or anchor no.2 at elevation 22.06
8	Install strut or anchor no.3 at elevation 26.10
9	Remove strut or anchor no.1 at elevation 25.75
10	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
11	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
12	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
13	Apply water pressure profile no.2 (Mod. Conserv.)

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 1

Water pressures : Moderately Conservative

Partial factor on C' = 1.000

Partial factor on Phi' = 1.000

Partial factor on Cu = 1.000

Partial factor on Soil Modulus = 1.000

Partial factor on Permanent Unfavourable loads = 1.000

Partial factor on Permanent Favourable loads = 1.000

Partial factor on Variable Unfavourable loads = 1.100

Design factor on calculated Bending Moments = 1.350

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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m

Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m

Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options		
		Displacement	Active,	Graph.
		Bending mom.	Passive	output
		Shear force	pressures	
1	Apply surcharge no.1 at elev. 24.60	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 23.25	No	No	No
3	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
4	Apply water pressure profile no.1	Yes	Yes	Yes
5	Excav. to elev. 20.68 on RIGHT side	Yes	Yes	Yes
6	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
7	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
8	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
9	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
10	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
11	Change soil type 3 to soil type 4	Yes	Yes	Yes
12	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
13	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
7	24.10	0.00	9.42	3.31	30.63	4.85	4.85	896
8	23.60	0.00	20.13	7.07	65.46	10.63	10.63	896
9	23.25	0.00	27.94	9.81	90.87	14.78	14.78	896
10	22.95	0.00	34.52	12.12	112.27	18.28	18.28	896
11	22.65	0.00	40.96	14.39	133.25	21.75	21.75	896
12	22.36	0.00	47.27	16.60	153.74	25.16	25.16	896
13	22.06	0.00	53.43	18.77	173.79	28.53	28.53	896
14	22.00	0.00	54.66	19.20	177.78	29.20	29.20	896
		0.00	54.66	15.49	238.81	23.93	23.93	4482
15	21.64	0.00	62.65	17.75	273.72	27.85	27.85	4482
16	21.50	0.00	65.71	18.62	287.12	29.36	29.36	4482
17	21.09	4.02	70.56	19.99	308.29	31.74	35.77	4482
18	20.68	8.04	75.26	21.33	328.86	34.08	42.12	4482
19	20.50	9.81	77.29	21.90	337.73	35.09	44.90	4482
20	20.00	14.71	82.83	23.47	361.93	37.87	52.58	4482
21	19.50	19.62	88.25	25.00	385.60	40.61	60.23	4482
22	19.00	24.52	93.57	26.51	408.84	43.32	67.85	4482
23	18.50	29.43	98.81	28.00	431.75	46.01	75.44	4482
24	18.00	34.34	103.99	29.46	454.37	48.69	83.02	4482
		Total>	138.32	33.00m	377.34	159.38	159.38	20140
25	17.63	Total>	145.85	34.88m	392.04	168.21	168.21	20745
26	17.25	Total>	153.35	36.75m	406.71	177.03	177.03	21349

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	896
7	24.10	0.00	9.00	3.16	29.27	5.68	5.68	896
8	23.60	0.00	18.00	6.32	58.55	10.85	10.85	896
9	23.25	0.00	24.30	8.54	79.04	14.48	14.48	896
10	22.95	0.00	29.65	10.42	96.46	17.56	17.56	896
11	22.65	0.00	35.01	12.30	113.88	20.64	20.64	896
12	22.36	0.00	40.36	14.18	131.30	23.72	23.72	896
13	22.06	0.00	45.72	16.06	148.72	26.80	26.80	896
14	22.00	0.00	46.80	16.44	152.23	27.42	27.42	896
		0.00	46.80	13.26	204.49	25.49	25.49	4482
15	21.64	0.00	54.00	15.30	235.95	29.03	29.03	4482
16	21.50	0.00	56.80	16.09	248.18	30.41	30.41	4482
17	21.09	4.02	60.98	17.28	266.44	32.43	36.45	4482
18	20.68	8.04	65.16	18.46	284.69	34.45	42.49	4482
19	20.50	9.81	66.99	18.98	292.70	35.33	45.14	4482
20	20.00	14.71	72.09	20.42	314.97	37.80	52.51	4482
21	19.50	19.62	77.18	21.87	337.23	40.26	59.88	4482
22	19.00	24.52	82.28	23.31	359.49	42.72	67.24	4482
23	18.50	29.43	87.37	24.76	381.75	45.17	74.60	4482
24	18.00	34.34	92.47	26.20	404.01	47.62	81.96	4482
		Total>	126.80	33.00m	365.82	160.78	160.78	20140

Run ID. Fitzrovia_Wall_4_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS1, 600 dia @ 900 - run 03

| Sheet No.
 | Date:12-06-2020
 | Checked :

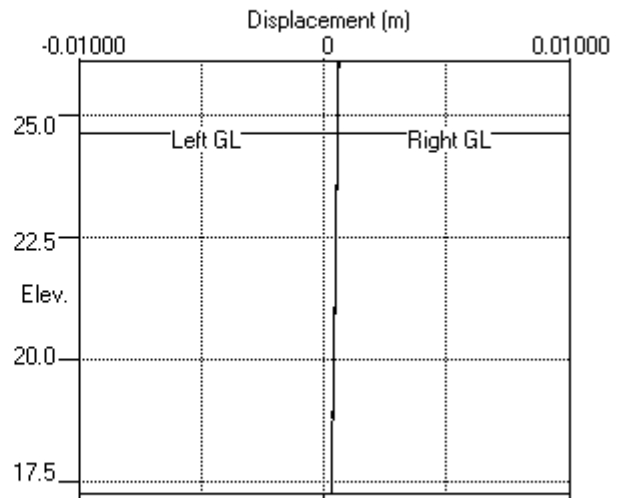
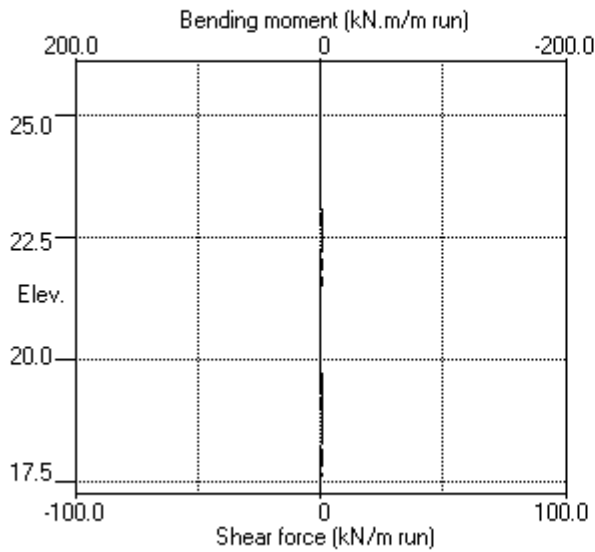
(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

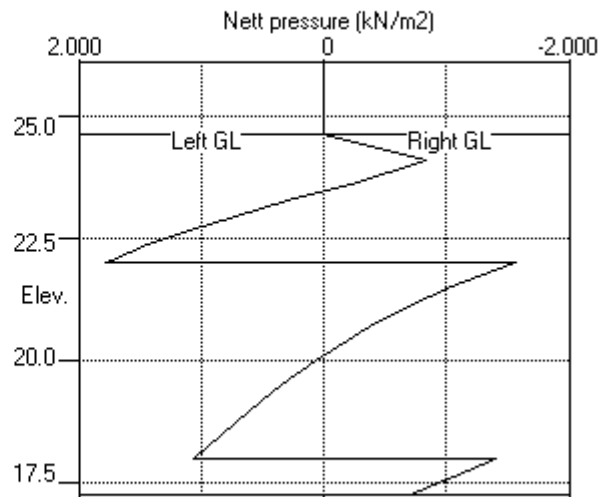
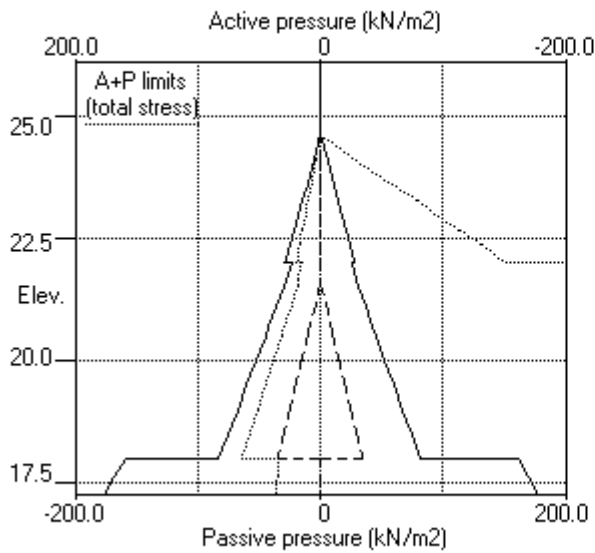
Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
25	17.63	Total>	134.30	34.88m	380.49	169.26	169.26	20745
26	17.25	Total>	141.80	36.75m	395.16	177.73	177.73	21349

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 24.60



Stage No.1 Apply surcharge no.1 at elev. 24.60



(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
7	24.10	0.00	9.42	3.31	30.63	3.79	1090	
8	23.60	0.00	20.13	7.07	65.46	9.62	1090	
9	23.25	0.00	27.94	9.81	90.87	13.80	1090	
10	22.95	0.00	40.00	14.05	130.11	19.16	1090	
11	22.65	0.00	57.42	20.17	186.78	26.31	1090	
12	22.36	0.00	69.60	24.45	226.40	31.72	1090	
13	22.06	0.00	77.49	27.22	252.07	35.70	1090	
14	22.00	0.00	78.77	27.67	256.21	36.40	1090	
		0.00	78.77	22.32	344.17	27.74	5450	
15	21.64	0.00	85.94	24.35	375.50	31.61	5450	
16	21.50	0.00	88.40	25.05	386.25	33.01	5450	
17	21.09	4.02	91.20	25.84	398.50	34.98	5450	
18	20.68	8.04	93.88	26.60	410.18	36.92	5450	
19	20.50	9.81	95.08	26.94	415.42	37.78	5450	
20	20.00	14.71	98.55	27.92	430.61	40.23	5450	
21	19.50	19.62	102.25	28.97	446.76	42.76	5450	
22	19.00	24.52	106.13	30.07	463.72	45.36	5450	
23	18.50	29.43	110.16	31.21	481.34	48.02	5450	
24	18.00	34.34	114.31	32.39	499.46	50.72	5450	
		Total>	148.64	33.00m	387.67	163.18	23719	
25	17.63	Total>	155.49	34.88m	401.69	172.44	24430	
26	17.25	Total>	162.39	36.75m	415.75	181.82	25142	

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.75	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.46	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.18	0.00	0.00	0.00	0.00	0.00	0.0	
5	24.89	0.00	0.00	0.00	0.00	0.00	0.0	
6	24.60	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	1090	
7	24.10	0.00	9.00	3.16	29.27	6.73	1090	
8	23.60	0.00	18.00	6.32	58.55	11.86	1090	
9	23.25	0.00	24.30	8.54	79.04	15.46	1090	
10	22.95	0.00	29.65	10.42	96.46	18.51	1090	
11	22.65	0.00	35.01	12.30	113.88	21.56	1090	
12	22.36	0.00	40.36	14.18	131.30	24.61	1090	
13	22.06	0.00	45.72	16.06	148.72	27.65	1090	
14	22.00	0.00	46.80	16.44	152.23	28.27	1090	
		0.00	46.80	13.26	204.49	29.72	5450	
15	21.64	0.00	54.00	15.30	235.95	33.04	5450	
16	21.50	0.00	56.80	16.09	248.18	34.33	5450	
17	21.09	4.02	60.98	17.28	266.44	36.08	5450	
18	20.68	8.04	65.16	18.46	284.69	37.81	5450	
19	20.50	9.81	66.99	18.98	292.70	38.57	5450	
20	20.00	14.71	72.09	20.42	314.97	40.68	5450	
21	19.50	19.62	77.18	21.87	337.23	42.78	5450	
22	19.00	24.52	82.28	23.31	359.49	44.87	5450	
23	18.50	29.43	87.37	24.76	381.75	46.95	5450	
24	18.00	34.34	92.47	26.20	404.01	49.02	5450	
		Total>	126.80	33.00m	365.82	166.88	23719	

Run ID. Fitzrovia_Wall_4_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS1, 600 dia @ 900 - run 03

| Sheet No.
 | Date:12-06-2020
 | Checked :

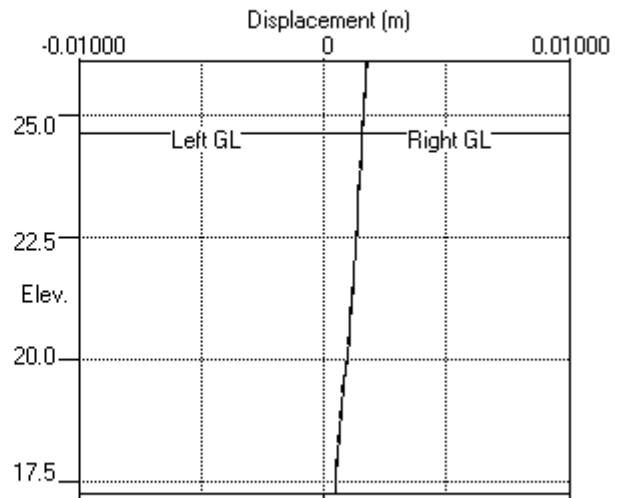
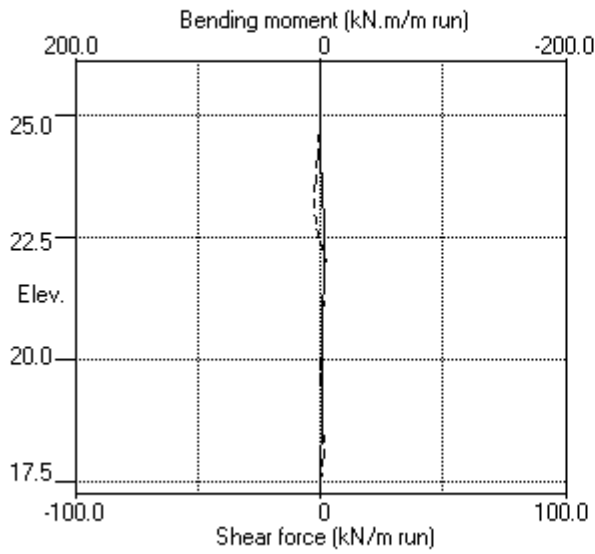
(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

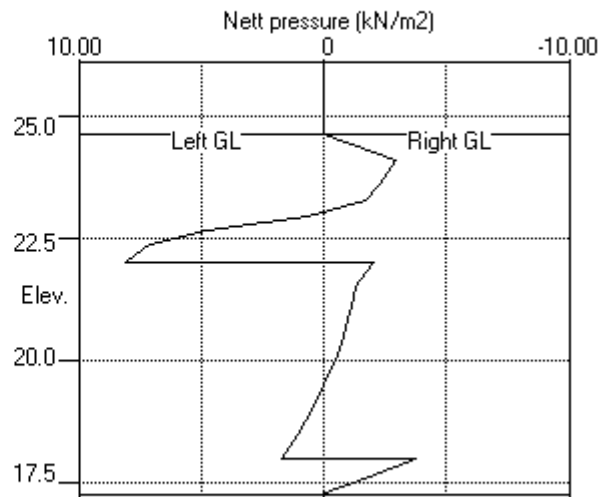
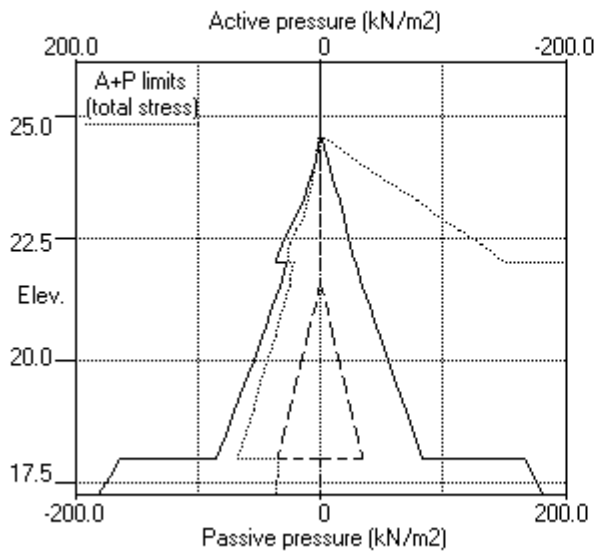
Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
25	17.63	Total>	134.30	34.88m	380.49	174.30	24430	
26	17.25	Total>	141.80	36.75m	395.16	181.62	25142	

Units: kN,m

Stage No.2 Apply surcharge no.2 at elev. 23.25



Stage No.2 Apply surcharge no.2 at elev. 23.25



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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Apply water pressure profile no.1 (Mod. Conserv.)

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.002	3.51E-05	0.0	0.0		138544
2	25.75	0.00	0.002	3.51E-05	0.0	-0.0	0.3	138544
		0.00	0.002	3.51E-05	-0.3	-0.0		
3	25.46	0.00	0.002	3.52E-05	-0.3	-0.1		138544
4	25.18	0.00	0.002	3.55E-05	-0.3	-0.2		138544
5	24.89	0.00	0.002	3.60E-05	-0.3	-0.3		138544
6	24.60	0.00	0.002	3.67E-05	-0.3	-0.4		138544
7	24.10	-3.19	0.002	3.83E-05	-1.1	-0.5		138544
8	23.60	-2.58	0.002	4.20E-05	-2.6	-1.5		138544
9	23.25	-2.04	0.002	4.70E-05	-3.4	-2.5		138544
10	22.95	0.23	0.002	5.36E-05	-3.6	-3.6		138544
11	22.65	4.29	0.002	6.24E-05	-3.0	-4.6		138544
12	22.36	6.61	0.002	7.30E-05	-1.4	-5.3		138544
13	22.06	7.51	0.002	8.44E-05	0.8	-5.4		138544
14	22.00	7.59	0.002	8.67E-05	1.2	-5.3		138544
		-4.69	0.002	8.67E-05	1.2	-5.3		
15	21.64	-4.33	0.001	1.00E-04	-0.4	-5.2		138544
16	21.50	-4.29	0.001	1.05E-04	-1.0	-5.3		138544
17	21.09	-1.56	0.001	1.22E-04	-2.2	-6.0		138544
18	20.68	1.19	0.001	1.41E-04	-2.3	-7.0		138544
19	20.50	2.44	0.001	1.50E-04	-2.0	-7.4		138544
20	20.00	2.76	0.001	1.78E-04	-0.7	-8.1		138544
21	19.50	3.29	0.001	2.07E-04	0.8	-8.1		138544
22	19.00	4.03	0.001	2.35E-04	2.7	-7.3		138544
23	18.50	4.94	0.001	2.58E-04	4.9	-5.4		138544
24	18.00	5.98	0.001	2.72E-04	7.6	-2.4		138544
		-13.35	0.001	2.72E-04	7.6	-2.4		
25	17.63	-10.28	0.001	2.76E-04	3.2	-0.5		138544
26	17.25	-6.85	0.001	2.76E-04	0.0	-0.0		---

At elev. 25.75 Strut force = 1.6 kN/strut = 0.3 kN/m run

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical limit kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.75	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.46	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.18	0.00	0.00	0.00	0.00	0.00	0.0	
5	24.89	0.00	0.00	0.00	0.00	0.00	0.0	

(continued)

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	961
8	23.60	0.00	9.42	3.31	30.63	3.67	3.67	961
9	23.25	0.00	20.13	7.07	65.46	9.45	9.45	961
10	22.95	0.00	27.94	9.81	90.87	13.61	13.61	961
11	22.65	0.00	40.00	14.05	130.11	18.95	18.95	961
12	22.36	0.00	57.42	20.17	186.78	26.08	26.08	961
13	22.06	0.00	69.60	24.45	226.40	31.47	31.47	961
14	22.00	0.00	77.49	27.22	252.07	35.43	35.43	961
		0.00	78.77	27.67	256.21	36.13	36.13	961
		0.00	78.77	22.32	344.17	26.38	26.38	4803
15	21.64	0.00	85.94	24.35	375.50	30.16	30.16	4803
16	21.50	0.00	88.40	25.05	386.25	31.52	31.52	4803
17	21.09	4.02	91.20	25.84	398.50	33.40	37.43	4803
18	20.68	8.04	93.88	26.60	410.18	35.28	43.32	4803
19	20.50	9.81	95.08	26.94	415.42	36.12	45.93	4803
20	20.00	14.71	98.55	27.92	430.61	38.56	53.28	4803
21	19.50	19.62	102.25	28.97	446.76	41.15	60.77	4803
22	19.00	24.52	106.13	30.07	463.72	43.86	68.38	4803
23	18.50	29.43	110.16	31.21	481.34	46.68	76.11	4803
24	18.00	34.34	114.31	32.39	499.46	49.59	83.93	4803
		Total>	148.64	33.00m	387.67	158.17	158.17	21305
25	17.63	Total>	155.49	34.88m	401.69	168.04	168.04	21944
26	17.25	Total>	162.39	36.75m	415.75	178.10	178.10	22583

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	961
7	24.10	0.00	9.00	3.16	29.27	6.86	6.86	961
8	23.60	0.00	18.00	6.32	58.55	12.03	12.03	961
9	23.25	0.00	24.30	8.54	79.04	15.65	15.65	961
10	22.95	0.00	29.65	10.42	96.46	18.72	18.72	961
11	22.65	0.00	35.01	12.30	113.88	21.79	21.79	961
12	22.36	0.00	40.36	14.18	131.30	24.86	24.86	961
13	22.06	0.00	45.72	16.06	148.72	27.92	27.92	961
14	22.00	0.00	46.80	16.44	152.23	28.54	28.54	961
		0.00	46.80	13.26	204.49	31.07	31.07	4803
15	21.64	0.00	54.00	15.30	235.95	34.49	34.49	4803
16	21.50	0.00	56.80	16.09	248.18	35.81	35.81	4803
17	21.09	0.00	65.00	18.42	284.01	38.99	38.99	4803
18	20.68	0.00	73.20	20.74	319.84	42.13	42.13	4803
19	20.50	0.00	76.80	21.76	335.57	43.50	43.50	4803
20	20.00	4.90	81.90	23.20	357.83	45.61	50.52	4803
21	19.50	9.81	86.99	24.65	380.09	47.66	57.47	4803
22	19.00	14.71	92.09	26.09	402.35	49.64	64.35	4803

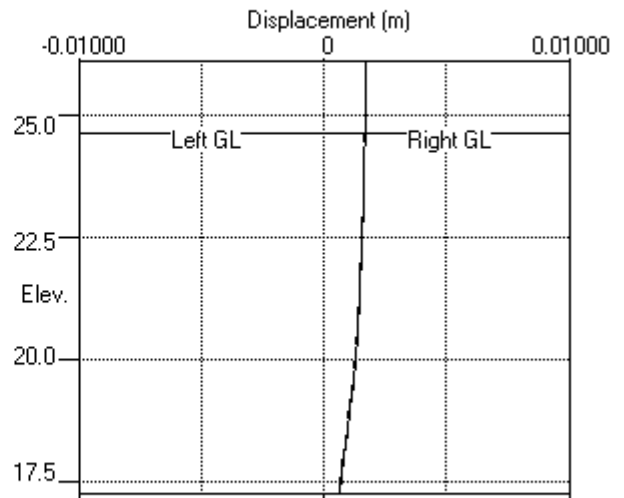
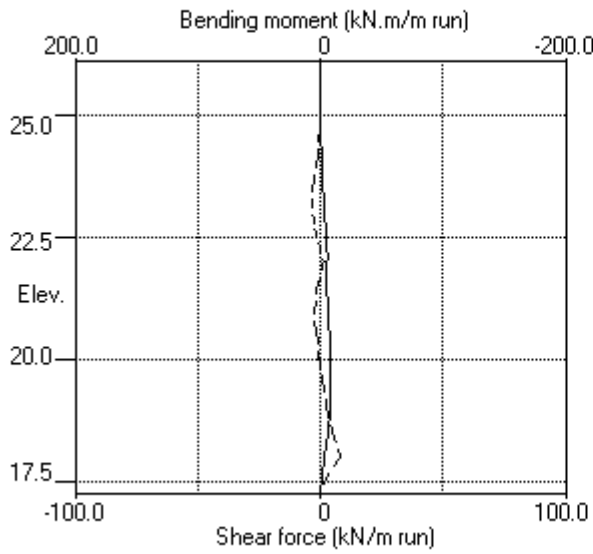
(continued)

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)

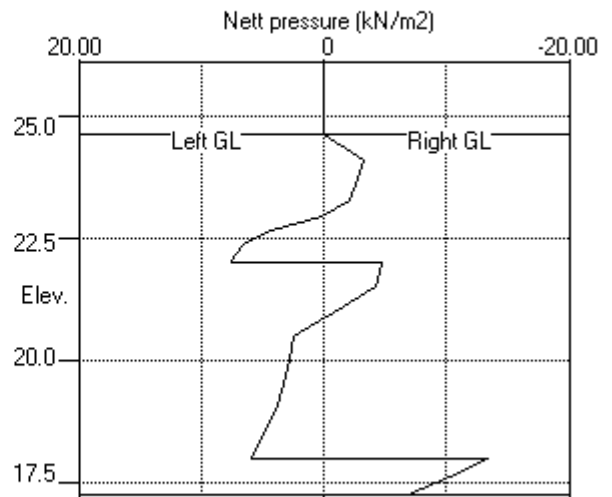
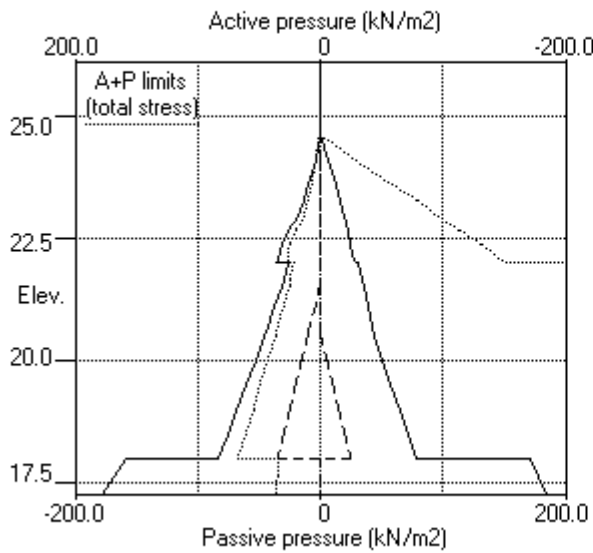
Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2			
23	18.50	19.62	97.18	27.53	424.62	51.55	71.17	4803	
24	18.00	24.52	102.28	28.98	446.88	53.42	77.95	4803	
		Total>	126.80	33.00m	365.82	171.52	171.52	21305	
25	17.63	Total>	134.30	34.88m	380.49	178.31	178.31	21944	
26	17.25	Total>	141.80	36.75m	395.16	184.96	184.96	22583	

Units: kN,m

Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)



Stage No.4 Apply water pressure profile no.1 (Mod. Conserv.)



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 5 Excavate to elevation 20.68 on RIGHT side

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.001	-1.95E-03	0.0	0.0		138544
2	25.75	0.00	0.002	-1.95E-03	0.0	-0.0	36.3	138544
		0.00	0.002	-1.95E-03	-36.3	0.0		
3	25.46	0.00	0.003	-1.94E-03	-36.3	-10.4		138544
4	25.18	0.00	0.003	-1.90E-03	-36.3	-20.9		138544
5	24.89	0.00	0.004	-1.85E-03	-36.3	-31.3		138544
6	24.60	0.00	0.004	-1.77E-03	-36.3	-41.8		138544
7	24.10	3.31	0.005	-1.59E-03	-35.5	-59.7		138544
8	23.60	7.07	0.006	-1.34E-03	-32.9	-76.8		138544
9	23.25	9.81	0.006	-1.14E-03	-30.0	-87.9		138544
10	22.95	14.13	0.007	-9.42E-04	-26.4	-96.2		138544
11	22.65	21.00	0.007	-7.28E-04	-21.2	-103.3		138544
12	22.36	26.19	0.007	-5.00E-04	-14.1	-108.6		138544
13	22.06	30.01	0.007	-2.64E-04	-5.8	-111.6		138544
14	22.00	30.69	0.007	-2.15E-04	-4.0	-111.9		138544
		22.32	0.007	-2.15E-04	-4.0	-111.9		
15	21.64	24.35	0.007	7.47E-05	4.4	-111.9		138544
16	21.50	25.05	0.007	1.87E-04	7.9	-111.0		138544
17	21.09	29.86	0.007	5.07E-04	19.1	-105.5		138544
18	20.68	34.64	0.007	8.04E-04	32.4	-95.1		138544
19	20.50	21.02	0.006	9.23E-04	37.4	-88.7		138544
20	20.00	-0.26	0.006	1.20E-03	42.6	-68.3		138544
21	19.50	-18.01	0.005	1.41E-03	38.0	-46.5		138544
22	19.00	-13.75	0.005	1.55E-03	30.1	-29.8		138544
23	18.50	-7.45	0.004	1.63E-03	24.8	-15.9		138544
24	18.00	2.64	0.003	1.67E-03	23.6	-4.5		138544
		-61.56	0.003	1.67E-03	23.6	-4.5		
25	17.63	-31.95	0.002	1.67E-03	6.0	-0.0		138544
26	17.25	-0.23	0.002	1.67E-03	0.0	-0.0		---

At elev. 25.75 Strut force = 181.6 kN/strut = 36.3 kN/m run

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertical limit kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.75	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.46	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.18	0.00	0.00	0.00	0.00	0.00	0.0	
5	24.89	0.00	0.00	0.00	0.00	0.00	0.0	

(continued)

Stage No.5 Excavate to elevation 20.68 on RIGHT side

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	982
8	23.60	0.00	9.42	3.31	30.63	3.31	3.31a	982
9	23.25	0.00	20.13	7.07	65.46	7.07	7.07a	982
10	22.95	0.00	27.94	9.81	90.87	9.81	9.81a	982
11	22.65	0.00	40.00	14.05	130.11	14.13	14.13	982
12	22.36	0.00	57.42	20.17	186.78	21.00	21.00	982
13	22.06	0.00	69.60	24.45	226.40	26.19	26.19	982
14	22.00	0.00	77.49	27.22	252.07	30.01	30.01	982
15	21.64	0.00	78.77	27.67	256.21	30.69	30.69	982
16	21.50	0.00	78.77	22.32	344.17	22.32	22.32a	4908
17	21.09	0.00	85.94	24.35	375.50	24.35	24.35a	4908
18	20.68	0.00	88.40	25.05	386.25	25.05	25.05a	4908
19	20.50	4.02	91.20	25.84	398.50	25.84	29.86a	4908
20	20.00	8.04	93.88	26.60	410.18	26.60	34.64a	4908
21	19.50	9.81	95.08	26.94	415.42	26.94	36.75a	4908
22	19.00	14.71	98.55	27.92	430.61	27.92	42.64a	4908
23	18.50	19.62	102.25	28.97	446.76	28.97	48.59a	4908
24	18.00	24.52	106.13	30.07	463.72	30.07	54.60a	4908
25	17.63	29.43	110.16	31.21	481.34	32.81	62.24	4908
26	17.25	34.34	114.31	32.39	499.46	39.13	73.47	4908
		Total>	148.64	33.00m	387.67	111.94	111.94	21694
		Total>	155.49	34.88m	401.69	132.16	132.16	22345
		Total>	162.39	36.75m	415.75	153.26	153.26	22996

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	21.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	21.09	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	20.68	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	20.50	0.00	0.00	0.00	0.00	0.00	0.00	8108
20	20.00	0.00	3.60	1.02	15.73	15.73	15.73p	8108
21	19.50	4.90	8.70	2.46	37.99	37.99	42.90p	8108
22	19.00	9.81	13.79	3.91	60.26	56.79	66.60	8108
23	18.50	14.71	18.89	5.35	82.52	53.63	68.34	8108
		19.62	23.98	6.80	104.79	50.07	69.69	8108

(continued)

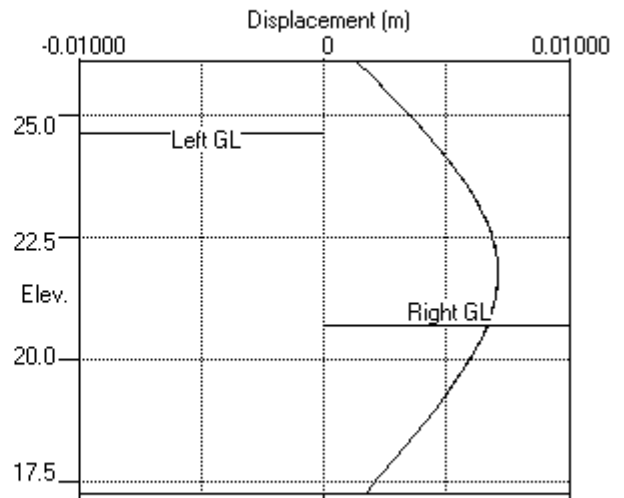
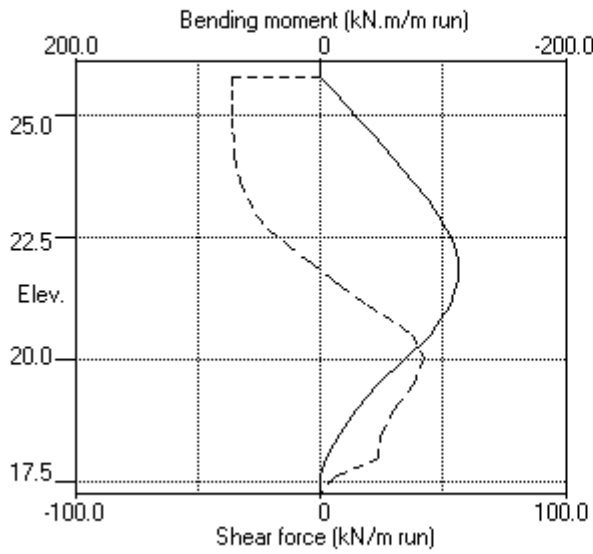
Stage No.5 Excavate to elevation 20.68 on RIGHT side

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
24	18.00	24.52	29.08	8.24	127.06	46.31	70.83	8108
		Total>	53.60	13.40m	292.61	173.50	173.50	33931
25	17.63	Total>	61.11	15.27m	307.28	164.11	164.11	34949
26	17.25	Total>	68.61	17.15m	321.95	153.49	153.49	35967

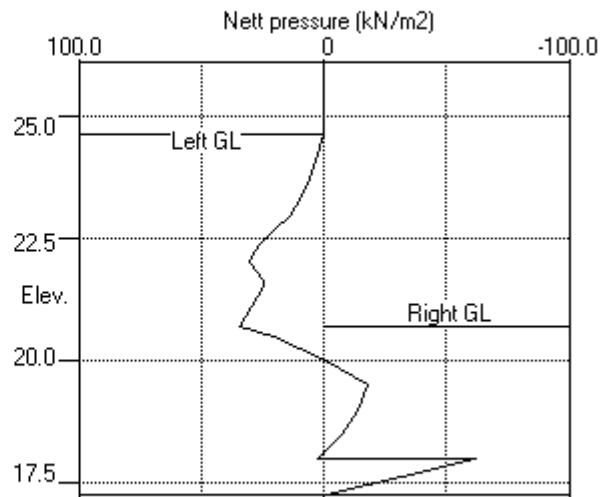
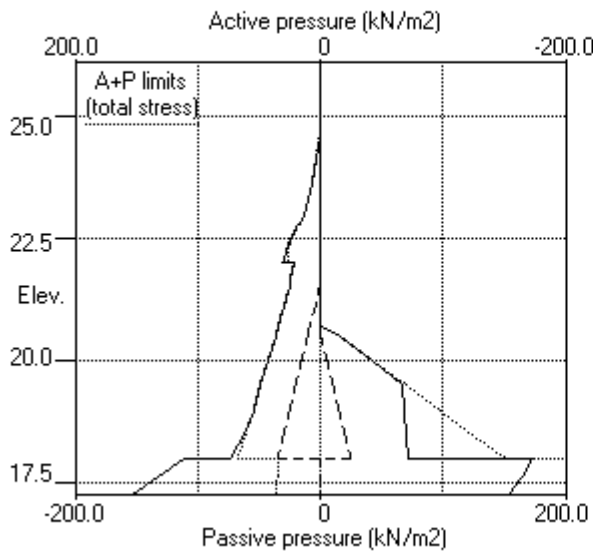
Note: 54.60a Soil pressure at active limit
 42.90p Soil pressure at passive limit

Units: kN,m

Stage No.5 Excav. to elev. 20.68 on RIGHT side



Stage No.5 Excav. to elev. 20.68 on RIGHT side



(continued)

Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	9.42	3.31	30.63	3.46	3.46	965
8	23.60	0.00	20.13	7.07	65.46	7.27	7.27	965
9	23.25	0.00	27.94	9.81	90.87	10.04	10.04	965
10	22.95	0.00	40.00	14.05	130.11	14.39	14.39	965
11	22.65	0.00	57.42	20.17	186.78	21.28	21.28	965
12	22.36	0.00	69.60	24.45	226.40	26.49	26.49	965
13	22.06	0.00	77.49	27.22	252.07	30.34	30.34	965
14	22.00	0.00	78.77	27.67	256.21	31.02	31.02	965
		0.00	78.77	22.32	344.17	23.96	23.96	4827
15	21.64	0.00	85.94	24.35	375.50	26.11	26.11	4827
16	21.50	0.00	88.40	25.05	386.25	26.86	26.86	4827
17	21.09	4.02	91.20	25.84	398.50	27.77	31.79	4827
18	20.68	8.04	93.88	26.60	410.18	28.62	36.66	4827
19	20.50	9.81	95.08	26.94	415.42	28.99	38.80	4827
20	20.00	14.71	98.55	27.92	430.61	30.05	44.76	4827
21	19.50	19.62	102.25	28.97	446.76	31.13	50.75	4827
22	19.00	24.52	106.13	30.07	463.72	32.23	56.76	4827
23	18.50	29.43	110.16	31.21	481.34	34.95	64.38	4827
24	18.00	34.34	114.31	32.39	499.46	41.22	75.56	4827
		Total>	148.64	33.00m	387.67	121.21	121.21	21393
25	17.63	Total>	155.49	34.88m	401.69	141.53	141.53	22035
26	17.25	Total>	162.39	36.75m	415.75	162.72	162.72	22677

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1137
16	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1137
17	21.09	0.00	9.90	3.48	32.20	3.48	3.48a	1137
18	20.68	0.00	17.28	6.07	56.21	6.07	6.07a	1137
		0.00	17.28	4.90	75.50	4.90	4.90a	5686
19	20.50	0.00	20.88	5.92	91.23	19.07	19.07	5686
20	20.00	4.90	25.98	7.36	113.50	41.25	46.16	5686
21	19.50	9.81	31.07	8.80	135.76	60.01	69.82	5686

(continued)

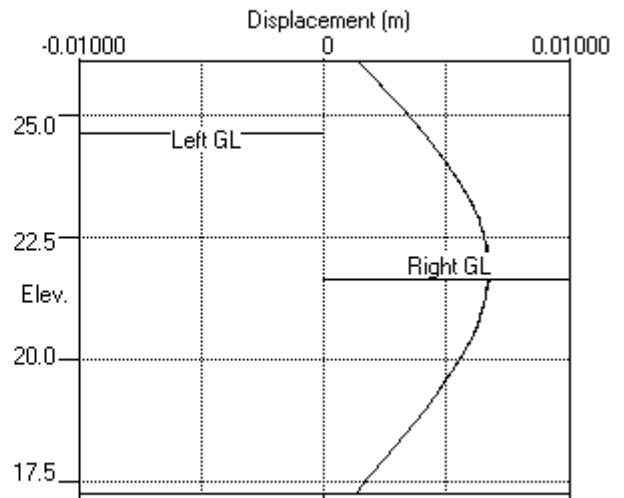
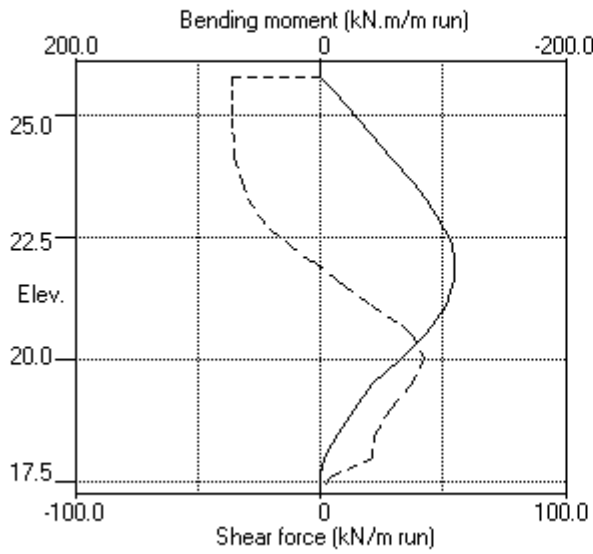
Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
22	19.00	14.71	36.17	10.25	158.03	56.85	71.56	5686	
23	18.50	19.62	41.27	11.69	180.30	53.32	72.94	5686	
24	18.00	24.52	46.36	13.14	202.58	49.60	74.13	5686	
		Total>	70.89	18.20m	309.89	179.44	179.44	24611	
25	17.63	Total>	78.39	20.08m	324.57	169.93	169.93	25349	
26	17.25	Total>	85.90	21.95m	339.24	159.22	159.22	26088	

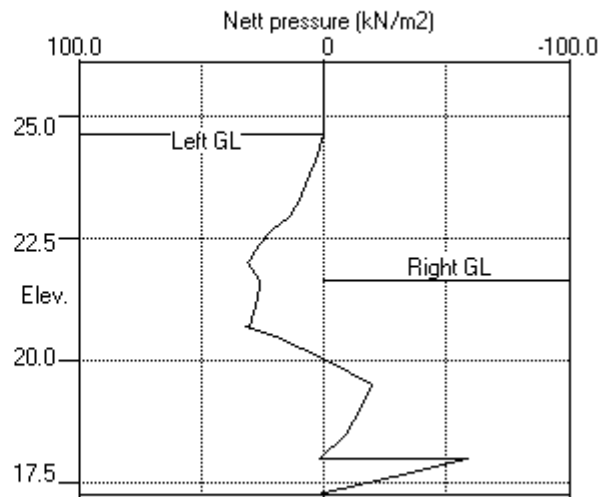
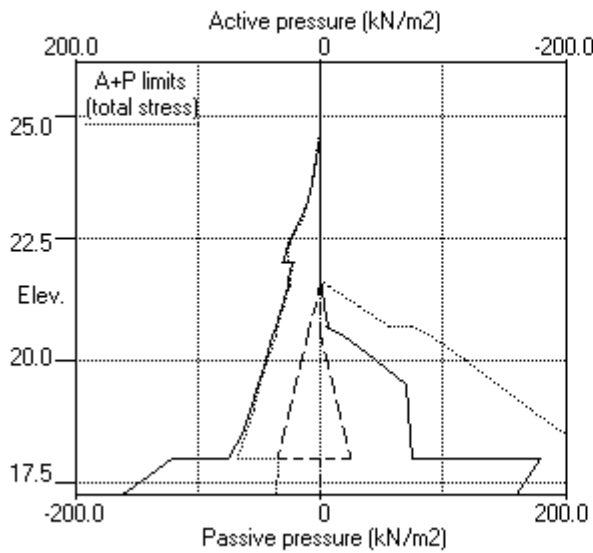
Note: 4.90a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Fill to elev. 21.64 on RIGHT side



Stage No.6 Fill to elev. 21.64 on RIGHT side



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 9 Remove strut or anchor no.1 at elevation 25.75

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.001	-1.93E-03	-31.8	0.0	31.8	138544
2	25.75	0.00	0.002	-1.92E-03	-31.8	-11.1		138544
3	25.46	0.00	0.003	-1.88E-03	-31.8	-20.3		138544
4	25.18	0.00	0.003	-1.83E-03	-31.8	-29.5		138544
5	24.89	0.00	0.004	-1.76E-03	-31.8	-38.6		138544
6	24.60	0.00	0.004	-1.67E-03	-31.8	-47.8		138544
7	24.10	3.31	0.005	-1.47E-03	-31.0	-63.4		138544
8	23.60	7.12	0.006	-1.21E-03	-28.4	-78.4		138544
9	23.25	9.93	0.006	-1.00E-03	-25.4	-87.8		138544
10	22.95	14.30	0.006	-8.13E-04	-21.8	-94.8		138544
11	22.65	21.22	0.006	-6.03E-04	-16.5	-100.6		138544
12	22.36	26.46	0.007	-3.83E-04	-9.5	-104.5		138544
13	22.06	30.33	0.007	-1.57E-04	-1.0	-106.1	4.9	138544
		30.33	0.007	-1.57E-04	-5.9	-106.1		
14	22.00	31.01	0.007	-1.11E-04	-4.1	-106.4		138544
		23.92	0.007	-1.11E-04	-4.1	-106.4		
15	21.64	26.16	0.007	1.65E-04	4.9	-106.2		138544
16	21.50	26.03	0.007	2.71E-04	8.6	-105.3		138544
17	21.09	28.42	0.007	5.75E-04	19.7	-99.5		138544
18	20.68	30.73	0.006	8.54E-04	31.9	-89.0		138544
		31.90	0.006	8.54E-04	31.9	-89.0		
19	20.50	20.02	0.006	9.65E-04	36.5	-82.8		138544
20	20.00	-1.09	0.006	1.22E-03	41.3	-63.0		138544
21	19.50	-18.78	0.005	1.41E-03	36.3	-41.9		138544
22	19.00	-14.55	0.004	1.54E-03	28.0	-26.2		138544
23	18.50	-8.35	0.003	1.61E-03	22.2	-13.4		138544
24	18.00	1.58	0.002	1.64E-03	20.6	-3.4		138544
		-57.58	0.002	1.64E-03	20.6	-3.4		
25	17.63	-27.92	0.002	1.64E-03	4.5	0.3		138544
26	17.25	3.79	0.001	1.64E-03	0.0	-0.0		---
At elev. 26.10 Strut force =				31.8 kN/strut =	31.8 kN/m run			
At elev. 22.06 Strut force =				4.9 kN/strut =	4.9 kN/m run			

(continued)

Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	2096
7	24.10	0.00	9.42	3.31	30.63	3.31	3.31a	2096
8	23.60	0.00	20.13	7.07	65.46	7.12	7.12	2096
9	23.25	0.00	27.94	9.81	90.87	9.93	9.93	2096
10	22.95	0.00	40.00	14.05	130.11	14.30	14.30	2096
11	22.65	0.00	57.42	20.17	186.78	21.22	21.22	2096
12	22.36	0.00	69.60	24.45	226.40	26.46	26.46	2096
13	22.06	0.00	77.49	27.22	252.07	30.33	30.33	2096
14	22.00	0.00	78.77	27.67	256.21	31.01	31.01	2096
		0.00	78.77	22.32	344.17	23.92	23.92	10481
15	21.64	0.00	85.94	24.35	375.50	26.16	26.16	6531
16	21.50	0.00	88.40	25.05	386.25	26.92	26.92	6531
17	21.09	4.02	91.20	25.84	398.50	27.87	31.90	6531
18	20.68	8.04	93.88	26.60	410.18	28.75	36.80	6531
19	20.50	9.81	95.08	26.94	415.42	29.14	38.95	6531
20	20.00	14.71	98.55	27.92	430.61	30.20	44.91	6531
21	19.50	19.62	102.25	28.97	446.76	31.27	50.89	6531
22	19.00	24.52	106.13	30.07	463.72	32.36	56.88	6531
23	18.50	29.43	110.16	31.21	481.34	35.05	64.48	6531
24	18.00	34.34	114.31	32.39	499.46	41.30	75.64	6531
		Total>	148.64	33.00m	387.67	121.53	121.53	27838
25	17.63	Total>	155.49	34.88m	401.69	141.77	141.77	28674
26	17.25	Total>	162.39	36.75m	415.75	162.86	162.86	29509

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1306
16	21.50	0.00	2.52	0.89	8.20	0.89	0.89a	1306
17	21.09	0.00	9.90	3.48	32.20	3.48	3.48a	1306
18	20.68	0.00	17.28	6.07	56.21	6.07	6.07a	1306
		0.00	17.28	4.90	75.50	4.90	4.90a	6531

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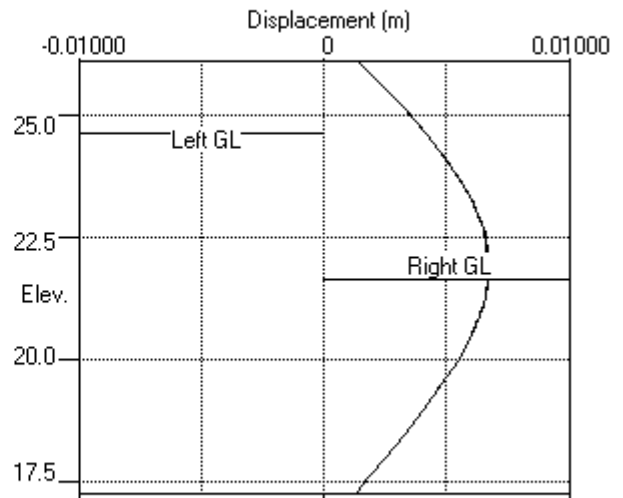
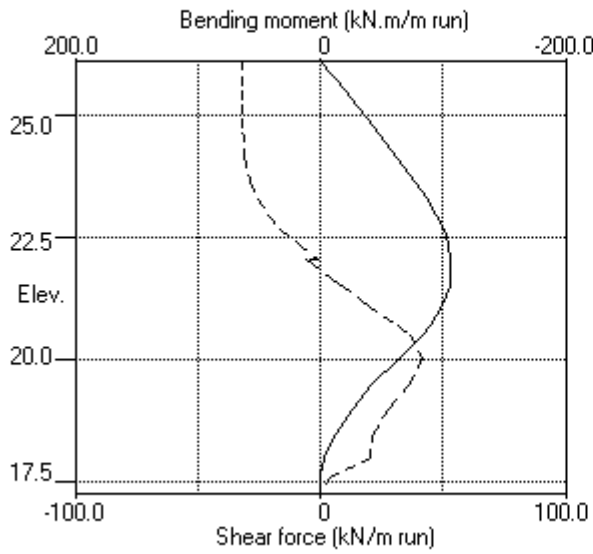
Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2			
19	20.50	0.00	20.88	5.92	91.23	18.93	18.93	6531	
20	20.00	4.90	25.98	7.36	113.50	41.10	46.00	6531	
21	19.50	9.81	31.07	8.80	135.76	59.86	69.67	6531	
22	19.00	14.71	36.17	10.25	158.03	56.72	71.43	6531	
23	18.50	19.62	41.27	11.69	180.30	53.21	72.83	6531	
24	18.00	24.52	46.36	13.14	202.58	49.53	74.05	6531	
		Total>	70.89	18.20m	309.89	179.11	179.11	27838	
25	17.63	Total>	78.39	20.08m	324.57	169.69	169.69	28674	
26	17.25	Total>	85.90	21.95m	339.24	159.07	159.07	29509	

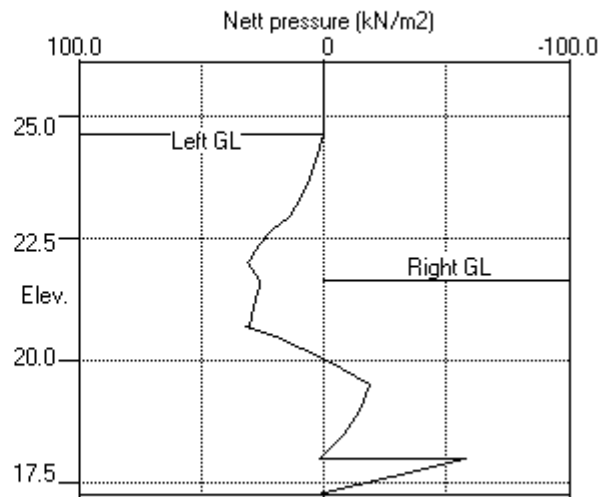
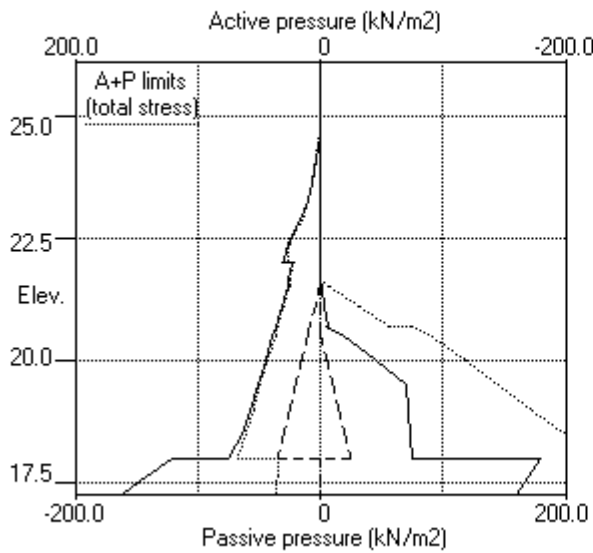
Note: 4.90a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.9 Remove strut no.1 at elev. 25.75



Stage No.9 Remove strut no.1 at elev. 25.75



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.001	-1.96E-03	-23.6	0.0	23.6	98960
2	25.75	0.00	0.002	-1.94E-03	-23.6	-8.9		98960
3	25.46	0.00	0.003	-1.91E-03	-23.6	-16.2		98960
4	25.18	0.00	0.003	-1.85E-03	-23.6	-23.5		98960
5	24.89	0.00	0.004	-1.78E-03	-23.6	-30.9		98960
6	24.60	0.00	0.004	-1.69E-03	-23.6	-38.2		98960
7	24.10	3.31	0.005	-1.48E-03	-22.8	-50.6		98960
8	23.60	7.08	0.006	-1.21E-03	-20.2	-62.4		98960
9	23.25	9.88	0.006	-1.00E-03	-17.2	-69.6		98960
10	22.95	14.26	0.006	-8.02E-04	-13.7	-74.7		98960
11	22.65	21.18	0.007	-5.90E-04	-8.4	-78.6		98960
12	22.36	26.43	0.007	-3.70E-04	-1.3	-80.6		98960
13	22.06	30.30	0.007	-1.49E-04	7.1	-80.3	20.9	98960
		30.30	0.007	-1.49E-04	-13.8	-80.3		
14	22.00	30.98	0.007	-1.05E-04	-12.0	-81.0		98960
		23.79	0.007	-1.05E-04	-12.0	-81.0		
15	21.64	26.04	0.007	1.67E-04	-3.0	-83.1		98960
16	21.50	25.86	0.007	2.75E-04	0.6	-83.0		98960
17	21.09	28.28	0.007	5.88E-04	11.7	-79.8		98960
18	20.68	30.67	0.006	8.80E-04	23.8	-71.8		98960
		31.77	0.006	8.80E-04	23.8	-71.8		
19	20.50	20.00	0.006	9.97E-04	28.5	-66.8		98960
20	20.00	-0.76	0.005	1.27E-03	33.3	-50.0		98960
21	19.50	-18.04	0.005	1.46E-03	28.6	-32.0		98960
22	19.00	-13.44	0.004	1.57E-03	20.7	-19.2		98960
23	18.50	-6.92	0.003	1.64E-03	15.6	-9.2		98960
24	18.00	3.26	0.002	1.66E-03	14.7	-1.6		98960
		-50.61	0.002	1.66E-03	14.7	-1.6		
25	17.63	-20.12	0.002	1.66E-03	1.4	0.8		98960
26	17.25	12.39	0.001	1.66E-03	0.0	-0.0		---
At elev. 26.10		Strut force =		23.6 kN/strut =	23.6 kN/m run			
At elev. 22.06		Strut force =		20.9 kN/strut =	20.9 kN/m run			

(continued)

Stage No.10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	9.42	3.31	30.63	3.31	3.31a	1359
8	23.60	0.00	20.13	7.07	65.46	7.08	7.08	1359
9	23.25	0.00	27.94	9.81	90.87	9.88	9.88	1359
10	22.95	0.00	40.00	14.05	130.11	14.26	14.26	1359
11	22.65	0.00	57.42	20.17	186.78	21.18	21.18	1359
12	22.36	0.00	69.60	24.45	226.40	26.43	26.43	1359
13	22.06	0.00	77.49	27.22	252.07	30.30	30.30	1359
14	22.00	0.00	78.77	27.67	256.21	30.98	30.98	1359
		0.00	78.77	22.32	344.17	23.79	23.79	6795
15	21.64	0.00	85.94	24.35	375.50	26.04	26.04	6795
16	21.50	0.00	88.40	25.05	386.25	26.80	26.80	6795
17	21.09	4.02	91.20	25.84	398.50	27.78	31.80	6795
18	20.68	8.04	93.88	26.60	410.18	28.71	36.76	6795
19	20.50	9.81	95.08	26.94	415.42	29.13	38.94	6795
20	20.00	14.71	98.55	27.92	430.61	30.36	45.08	9055
21	19.50	19.62	102.25	28.97	446.76	31.64	51.26	9055
22	19.00	24.52	106.13	30.07	463.72	32.91	57.44	9055
23	18.50	29.43	110.16	31.21	481.34	35.77	65.20	9055
24	18.00	34.34	114.31	32.39	499.46	42.14	76.47	9055
		Total>	148.64	33.00m	387.67	125.02	125.02	37609
25	17.63	Total>	155.49	34.88m	401.69	145.67	145.67	38737
26	17.25	Total>	162.39	36.75m	415.75	167.16	167.16	39865

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	3211
16	21.50	0.00	2.52	0.89	8.20	0.94	0.94	3211

(continued)

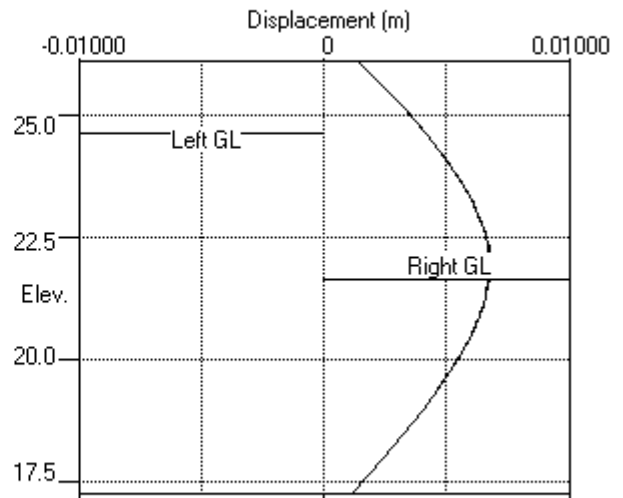
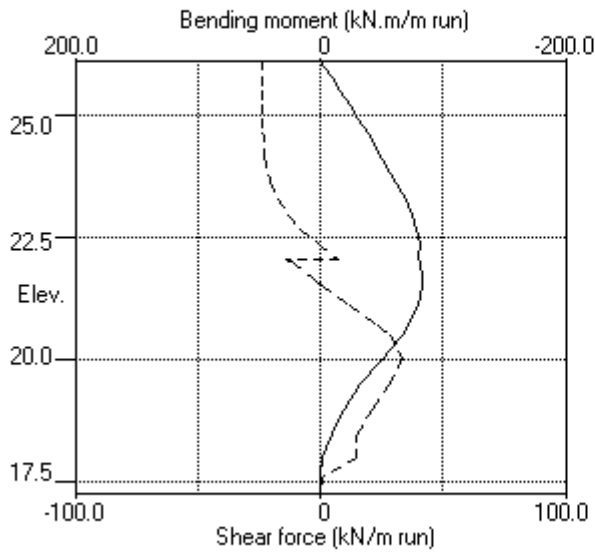
Stage No.10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	RIGHT side						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
17	21.09	0.00	9.90	3.48	32.20	3.52	3.52	3211
18	20.68	0.00	17.28	6.07	56.21	6.09	6.09	3211
		0.00	17.28	4.90	75.50	4.99	4.99	16057
19	20.50	0.00	20.88	5.92	91.23	18.94	18.94	16057
20	20.00	4.90	25.98	7.36	113.50	40.93	45.84	9055
21	19.50	9.81	31.07	8.80	135.76	59.49	69.30	9055
22	19.00	14.71	36.17	10.25	158.03	56.16	70.88	9055
23	18.50	19.62	41.27	11.69	180.30	52.50	72.12	9055
24	18.00	24.52	46.36	13.14	202.58	48.69	73.21	9055
		Total>	70.89	18.20m	309.89	175.63	175.63	37609
25	17.63	Total>	78.39	20.08m	324.57	165.79	165.79	38737
26	17.25	Total>	85.90	21.95m	339.24	154.77	154.77	39865

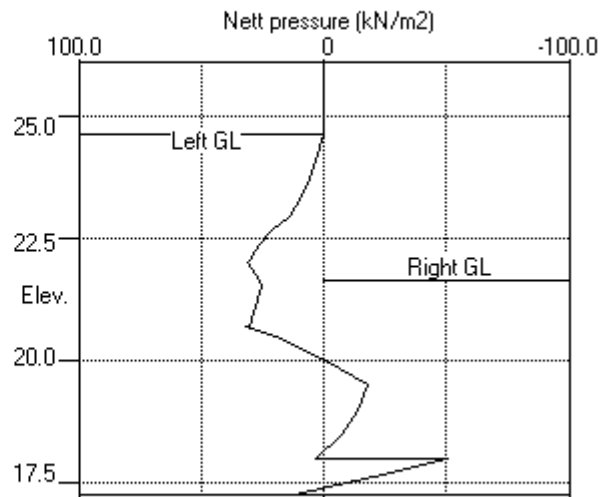
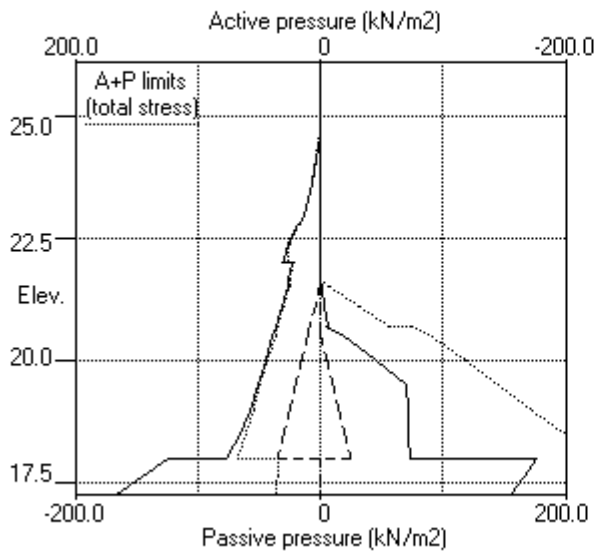
Note: 3.31a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.10 Change EI of wall to 98960kN.m²/m run



Stage No.10 Change EI of wall to 98960kN.m²/m run



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 13 Apply water pressure profile no.2 (Mod. Conserv.)

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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	EI of wall kN.m2/m
1	26.10	0.00	0.001	-2.05E-03	-27.3	0.0	27.3	98960
2	25.75	0.00	0.002	-2.03E-03	-27.3	-10.2		98960
3	25.46	0.00	0.003	-2.00E-03	-27.3	-18.5		98960
4	25.18	0.00	0.003	-1.93E-03	-27.3	-26.9		98960
5	24.89	0.00	0.004	-1.85E-03	-27.3	-35.3		98960
6	24.60	0.00	0.004	-1.74E-03	-27.3	-43.6		98960
7	24.10	3.31	0.005	-1.50E-03	-26.4	-57.9		98960
8	23.60	7.07	0.006	-1.19E-03	-23.8	-71.5		98960
9	23.25	12.04	0.006	-9.49E-04	-20.5	-79.9		98960
10	22.95	18.29	0.006	-7.16E-04	-16.0	-85.9		98960
11	22.65	27.22	0.007	-4.69E-04	-9.2	-90.2		98960
12	22.36	34.48	0.007	-2.15E-04	-0.0	-92.2		98960
13	22.06	40.38	0.007	3.87E-05	11.1	-91.1	13.9	98960
		40.38	0.007	3.87E-05	-2.8	-91.1		
14	22.00	41.47	0.007	8.95E-05	-0.4	-91.1		98960
		34.38	0.007	8.95E-05	-0.4	-91.1		
15	21.64	39.46	0.007	3.90E-04	12.9	-88.3		98960
		19.96	0.007	3.90E-04	12.9	-88.3		
16	21.50	20.06	0.007	5.04E-04	15.7	-86.0		98960
17	21.09	20.46	0.006	8.18E-04	24.0	-77.2		98960
18	20.68	20.79	0.006	1.09E-03	32.5	-64.9		98960
		21.37	0.006	1.09E-03	32.5	-64.9		
19	20.50	11.20	0.006	1.19E-03	35.4	-58.5		98960
20	20.00	-8.46	0.005	1.42E-03	36.1	-39.4		98960
21	19.50	-24.97	0.004	1.55E-03	27.8	-20.9		98960
22	19.00	-19.91	0.004	1.62E-03	16.5	-9.4		98960
23	18.50	-13.25	0.003	1.64E-03	8.2	-2.3		98960
24	18.00	-3.12	0.002	1.64E-03	4.2	0.9		98960
		-15.72	0.002	1.64E-03	4.2	0.9		
25	17.63	-10.67	0.001	1.63E-03	-0.8	1.1		98960
26	17.25	14.89	0.001	1.63E-03	0.0	-0.0		---
At elev. 26.10		Strut force =		27.3 kN/strut =	27.3 kN/m run			
At elev. 22.06		Strut force =		13.9 kN/strut =	13.9 kN/m run			

(continued)

Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1763
7	24.10	0.00	9.42	3.31	30.63	3.31	3.31a	1763
8	23.60	0.00	20.13	7.07	65.46	7.07	7.07a	1763
9	23.25	3.43	24.50	8.61	79.70	8.61	12.04a	1763
10	22.95	6.35	33.65	11.82	109.45	11.94	18.29	1763
11	22.65	9.27	48.15	16.91	156.63	17.95	27.22	1763
12	22.36	12.19	57.41	20.17	186.75	22.29	34.48	1763
13	22.06	15.11	62.39	21.91	202.93	25.28	40.38	1257
14	22.00	15.70	63.07	22.16	205.16	25.78	41.47	1257
		15.70	63.07	17.87	275.59	18.69	34.38	6286
15	21.64	19.23	66.71	18.90	291.48	20.23	39.46	6286
16	21.50	20.60	67.80	19.21	296.24	20.73	41.34	6286
17	21.09	24.62	70.60	20.00	308.48	22.31	46.93	6286
18	20.68	28.65	73.28	20.76	320.17	23.82	52.46	6286
19	20.50	30.41	74.48	21.10	325.41	24.46	54.87	6286
20	20.00	35.32	77.95	22.09	340.60	26.24	61.56	6286
21	19.50	40.22	81.65	23.13	356.74	27.90	68.12	6286
22	19.00	45.13	85.53	24.23	373.71	29.39	74.51	6286
23	18.50	50.03	89.56	25.38	391.32	32.30	82.33	6286
24	18.00	54.94	93.71	26.55	409.45	38.62	93.56	6286
		54.94	93.71	32.92	304.82	92.77	147.70	13570
25	17.63	58.61	96.88	34.03	315.13	109.81	168.43	13977
26	17.25	62.29	100.09	35.16	325.59	127.67	189.97	14384

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		19.23	0.77	0.27	2.51	0.27	19.50a	1257
16	21.50	20.60	1.92	0.67	6.24	0.67	21.27a	1257
17	21.09	24.62	5.27	1.85	17.16	1.85	26.48a	1257
18	20.68	28.65	8.63	3.03	28.06	3.03	31.68a	1257
		28.65	8.63	2.44	37.69	2.44	31.09a	6286

(continued)

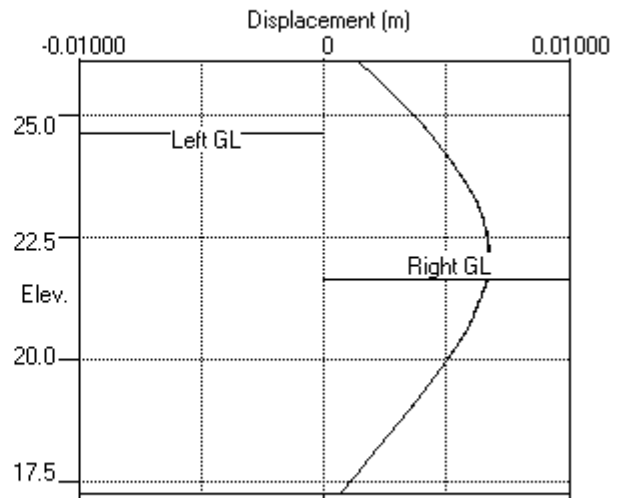
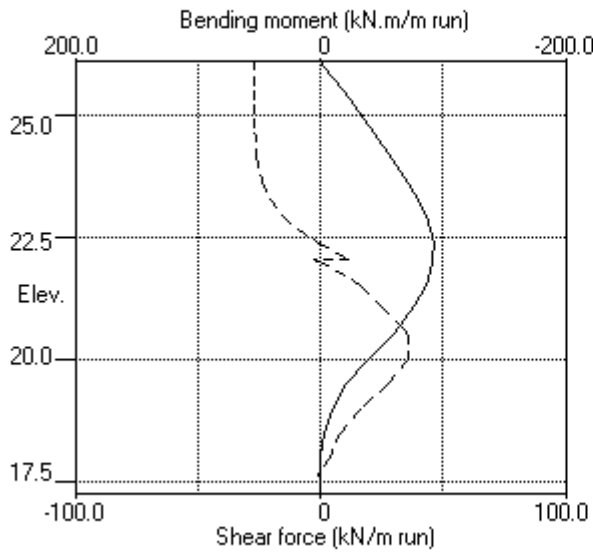
Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
19	20.50	30.41	10.46	2.96	45.69	13.26	43.67	6286
20	20.00	35.32	15.53	4.40	67.84	34.70	70.02	6286
21	19.50	40.22	20.58	5.83	89.91	52.87	93.09	6286
22	19.00	45.13	25.60	7.25	111.87	49.30	94.43	6286
23	18.50	50.03	30.60	8.67	133.72	45.55	95.58	6286
24	18.00	54.94	35.58	10.08	155.44	41.74	96.68	6286
		54.94	35.58	12.50	115.72	108.49	163.42	13570
25	17.63	58.61	39.29	13.80	127.79	120.48	179.10	13977
26	17.25	62.29	42.98	15.10	139.80	112.78	175.07	14384

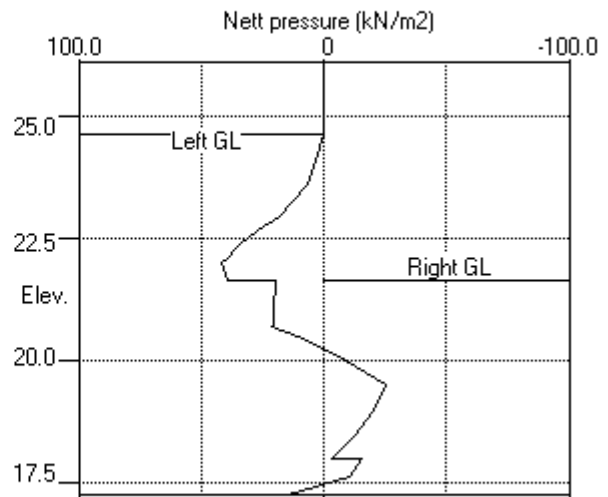
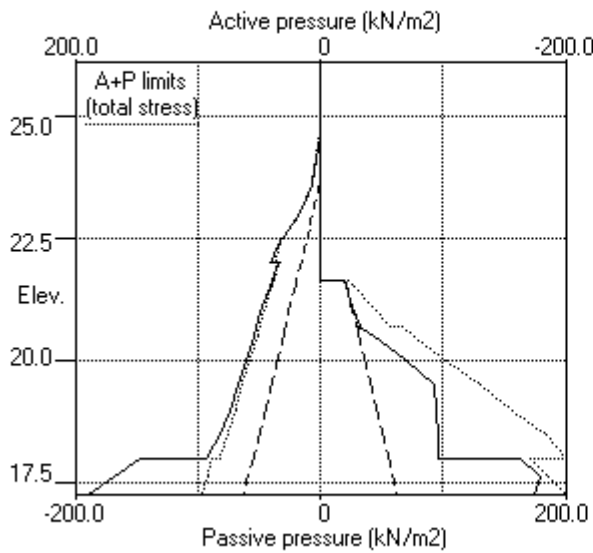
Note: 31.09a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)



Stage No.13 Apply water pressure profile no.2 (Mod. Conserv.)



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 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS1
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS1, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 1

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				Shear force			
		max. m	min. m	Calculated kN.m/m		Factored kN.m/m		Calculated kN/m		Factored kN/m	
1	26.10	0.002	0.000	0	0	0	0	0	-32	0	-43
2	25.75	0.002	0.000	0	-11	0	-15	0	-36	0	-49
3	25.46	0.003	0.000	0	-20	0	-27	0	-36	0	-49
4	25.18	0.003	0.000	0	-29	0	-40	0	-36	0	-49
5	24.89	0.004	0.000	0	-39	0	-52	0	-36	0	-49
6	24.60	0.004	0.000	0	-48	0	-64	0	-36	0	-49
7	24.10	0.005	0.000	0	-63	0	-86	0	-36	0	-48
8	23.60	0.006	0.000	0	-78	0	-106	0	-33	0	-44
9	23.25	0.006	0.000	0	-88	0	-119	0	-30	0	-40
10	22.95	0.007	0.000	0	-96	0	-130	0	-26	0	-36
11	22.65	0.007	0.000	0	-103	0	-140	0	-21	0	-29
12	22.36	0.007	0.000	0	-109	0	-147	0	-14	0	-19
13	22.06	0.007	0.000	0	-112	0	-151	11	-14	15	-19
14	22.00	0.007	0.000	0	-112	0	-151	2	-12	3	-16
15	21.64	0.007	0.000	0	-112	0	-151	13	-3	17	-4
16	21.50	0.007	0.000	0	-111	0	-150	16	-1	21	-1
17	21.09	0.007	0.000	0	-106	0	-142	24	-2	32	-3
18	20.68	0.007	0.000	0	-95	0	-128	33	-2	44	-3
19	20.50	0.006	0.000	0	-89	0	-120	38	-2	51	-3
20	20.00	0.006	0.000	0	-68	0	-92	43	-1	57	-1
21	19.50	0.005	0.000	0	-46	0	-63	38	-0	51	-0
22	19.00	0.005	0.000	0	-30	0	-40	30	-0	41	-0
23	18.50	0.004	0.000	0	-16	0	-22	25	0	33	0
24	18.00	0.003	0.000	1	-4	1	-6	24	0	32	0
25	17.63	0.002	0.000	1	-0	1	-1	6	-1	8	-1
26	17.25	0.002	0.000	0	-0	0	-0	0	-0	0	-0

Summary of results (continued)

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

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	Calculated		Factored		Calculated		Factored	
min.	max. elev.	min. elev.	max. min.	max. min.	max. elev.	min. elev.	max. min.	max. min.
	kN.m/m	kN.m/m	kN.m/m	kN/m	kN/m	kN/m	kN/m	kN/m
1	0 21.09	-1 19.00	0 -1	1 22.00	-0 23.60	1		
-1								
2	0 17.63	-4 22.36	0 -5	2 22.00	-3 22.95	3		
-4								
3	No calculation at this stage							
4	0 26.10	-8 19.50	0 -11	8 18.00	-4 22.95	10		
-5								
5	0 26.10	-112 22.00	0 -151	43 20.00	-36 25.75	57		
-49								
6	0 17.63	-110 22.00	0 -148	42 20.00	-36 25.75	57		
-48								
7	No calculation at this stage							
8	No calculation at this stage							
9	0 17.63	-106 22.00	0 -144	41 20.00	-32 26.10	56		
-43								
10	1 17.63	-83 21.64	1 -112	33 20.00	-24 26.10	45		
-32								
11	No calculation at this stage							
12	No calculation at this stage							
13	1 17.63	-92 22.36	1 -124	36 20.00	-27 26.10	49		
-37								

Maximum and minimum displacement at each stage

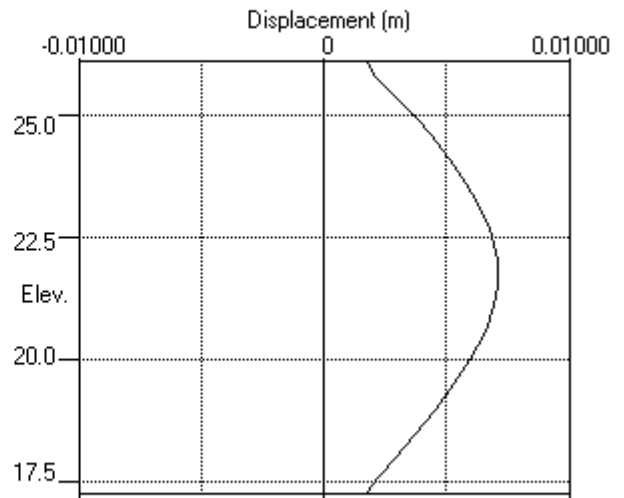
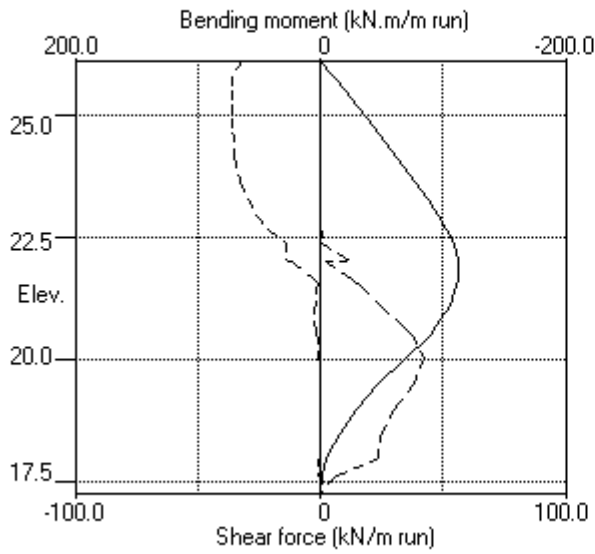
Stage no.	Displacement				Stage description
	maximum	elev.	minimum	elev.	
	m		m		
1	0.001	26.10	0.000	26.10	Apply surcharge no.1 at elev. 24.60
2	0.002	26.10	0.000	26.10	Apply surcharge no.2 at elev. 23.25
3	No calculation at this stage				Install strut no.1 at elev. 25.75
4	0.002	26.10	0.000	26.10	Apply water pressure profile no.1
5	0.007	21.64	0.000	26.10	Excav. to elev. 20.68 on RIGHT side
6	0.007	21.64	0.000	26.10	Fill to elev. 21.64 on RIGHT side
7	No calculation at this stage				Install strut no.2 at elev. 22.06
8	No calculation at this stage				Install strut no.3 at elev. 26.10
9	0.007	22.00	0.000	26.10	Remove strut no.1 at elev. 25.75
10	0.007	22.00	0.000	26.10	Change EI of wall to 98960kN.m2/m run
11	No calculation at this stage				Change soil type 3 to soil type 4
12	No calculation at this stage				Apply surcharge no.3 at elev. 21.64
13	0.007	22.06	0.000	26.10	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1			Strut no. 2			Strut no. 3		
	at elev. 25.75			at elev. 22.06			at elev. 26.10		
	--Calculated--	Factored		--Calculated--	Factored		--Calculated--	Factored	
	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut	kN per m run	kN per strut	kN per strut
4	0	2	2	---	---	---	---	---	---
5	36	182	245	---	---	---	---	---	---
6	36	179	242	---	---	---	---	---	---
9	---	---	---	5	5	7	32	32	43
10	---	---	---	21	21	28	24	24	32
13	---	---	---	14	14	19	27	27	37

Units: kN,m

Bending moment, shear force, displacement envelopes



WALLAP

4-ULS2

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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Left side	Right side
1	24.60	1 Made Ground dr	1 Made Ground dr
2	22.00	2 LHG S&G dr	2 LHG S&G dr
3	18.00	3 London Clay und	3 London Clay und

SOIL PROPERTIES (Unfactored SLS soil strengths)

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description (Datum elev.)	kN/m3	Eh,kN/m2 (dEh/dy)	Ko (dKo/dy)	NC/OC (Nu)	Ka (Kac)	Kp (Kpc)	kN/m2 (dc/dy)
1 Made Ground dr	18.00	5000	0.577	OC (0.250)	0.351 (0.000)	3.253 (0.000)	
2 LHG S&G dr	20.00	25000	0.500	OC (0.250)	0.283 (0.000)	4.369 (0.000)	
3 London Cl.. (18.00)	20.00	75000 (6000)	1.300	OC (0.490)	1.000 (2.476)	1.000 (2.390)	100.0u (8.000)
4 London Cl.. (18.00)	20.00	56250 (4500)	1.300	OC (0.200)	0.351 (1.391)	3.253 (4.831)	0.0d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1 Made Ground dr	25.00	0.670	0.00	25.00	0.500	0.00
2 LHG S&G dr	30.00	0.670	0.00	30.00	0.500	0.00
3 London Clay und	0.00	0.670	0.00	0.00	0.500	0.00
4 London Clay dr	25.00	0.670	0.00	25.00	0.500	0.00

GROUND WATER CONDITIONS

Density of water = 9.810 kN/m3

Initial water table elevation Left side Right side
 21.50 21.50

Automatic water pressure balancing at toe of wall : No

Water profile no.	Point no.	Left side			Right side			
		Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2
1	1	21.50	21.50	0.0	1	20.50	20.50	0.0 MC+WC
	2	1	23.60	23.60	0.0	1	21.64	21.64
2						21.64	23.60	19.2

WALL PROPERTIES

Type of structure = Fully Embedded Wall
 Elevation of toe of wall = 17.25
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 1.9600E+07 kN/m2
 Moment of inertia of wall I = 7.0686E-03 m4/m run
 E.I = 138544 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/m ²	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	25.75	5.00	0.015000	2.050E+08	5.00	0.00	0	No
2	22.06	1.00	0.300000	1.400E+07	5.00	0.00	0	No
3	26.10	1.00	0.300000	1.400E+07	5.00	0.00	0	No

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- Near edge Far edge		----- Equiv. soil type	Partial factor/ Category
1	24.60	1.20(L)	20.00	20.00	15.00	=	N/A	1.30 Var
2	23.25	0.40(L)	20.00	0.80	57.00	=	N/A	1.00 P/U
3	21.64	-0.00(R)	20.00	20.00	20.00	=	N/A	1.00 P/F

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 24.60
2	Apply surcharge no.2 at elevation 23.25
3	Install strut or anchor no.1 at elevation 25.75
4	Apply water pressure profile no.1 (Worst Cred.)
5	Excavate to elevation 20.68 on RIGHT side
6	Fill to elevation 21.64 on RIGHT side with soil type 1
7	Install strut or anchor no.2 at elevation 22.06
8	Install strut or anchor no.3 at elevation 26.10
9	Remove strut or anchor no.1 at elevation 25.75
10	Change EI of wall to 98960 kN.m ² /m run Yield moment not defined Allow wall to relax with new modulus value
11	Change properties of soil type 3 to soil type 4 No analysis at this stage Ko pressures will not be reset
12	Apply surcharge no.3 at elevation 21.64 No analysis at this stage
13	Apply water pressure profile no.2 (Worst Cred.)

FACTORS OF SAFETY and ANALYSIS OPTIONS

Limit State options: ULS DA1 Combination 2

Water pressures : Worst Credible

Partial factor on C' = 1.250

Partial factor on Phi' = 1.250

Partial factor on Cu = 1.400

Partial factor on Soil Modulus = 1.000

Partial factor on Permanent Unfavourable loads = 1.000

Partial factor on Permanent Favourable loads = 1.000

Partial factor on Variable Unfavourable loads = 1.300

Stability analysis:

Method of analysis - Strength Factor method

Overall 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) = 9.500 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 50.00 m

Width of excavation on Left side of wall = 50.00 m

Width of excavation on Right side of wall = 50.00 m

Distance to rigid boundary on Left side = 50.00 m

Distance to rigid boundary on Right side = 50.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 24.60	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 23.25	No	No	No
3	Install strut no.1 at elev. 25.75	Yes	Yes	Yes
4	Apply water pressure profile no.1	Yes	Yes	Yes
5	Excav. to elev. 20.68 on RIGHT side	Yes	Yes	Yes
6	Fill to elev. 21.64 on RIGHT side	Yes	Yes	Yes
7	Install strut no.2 at elev. 22.06	Yes	Yes	Yes
8	Install strut no.3 at elev. 26.10	Yes	Yes	Yes
9	Remove strut no.1 at elev. 25.75	Yes	Yes	Yes
10	Change EI of wall to 98960kN.m ² /m run	Yes	Yes	Yes
11	Change soil type 3 to soil type 4	Yes	Yes	Yes
12	Apply surcharge no.3 at elev. 21.64	Yes	Yes	Yes
13	Apply water pressure profile no.2	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 1 Apply surcharge no.1 at elevation 24.60

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.	Overall FoS for toe elev. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.000	Wall Penetr -ation	Direction of failure
1	24.60 24.60	Cant.					<u>Conditions not suitable for FoS calc.</u>

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.001	3.80E-05	0.0	0.0		138544
2	25.75	0.00	0.001	3.80E-05	0.0	-0.0		138544
3	25.46	0.00	0.001	3.80E-05	0.0	0.0		138544
4	25.18	0.00	0.001	3.80E-05	0.0	-0.0		138544
5	24.89	0.00	0.001	3.80E-05	0.0	-0.0		138544
6	24.60	0.00	0.001	3.80E-05	0.0	0.0		138544
7	24.10	-0.98	0.001	3.80E-05	-0.2	0.0		138544
8	23.60	-0.27	0.001	3.83E-05	-0.6	-0.2		138544
9	23.25	0.35	0.001	3.91E-05	-0.5	-0.4		138544
10	22.95	0.85	0.001	4.01E-05	-0.4	-0.5		138544
11	22.65	1.31	0.001	4.14E-05	-0.0	-0.6		138544
12	22.36	1.70	0.001	4.26E-05	0.4	-0.6		138544
13	22.06	2.04	0.001	4.36E-05	1.0	-0.4		138544
14	22.00	2.11	0.001	4.37E-05	1.1	-0.3		138544
		-1.85	0.001	4.37E-05	1.1	-0.3		
15	21.64	-1.39	0.001	4.41E-05	0.5	-0.0		138544
16	21.50	-1.23	0.001	4.41E-05	0.3	0.0		138544
17	21.09	-0.81	0.001	4.40E-05	-0.1	0.1		138544
18	20.68	-0.44	0.000	4.39E-05	-0.4	-0.0		138544
19	20.50	-0.29	0.000	4.39E-05	-0.4	-0.1		138544
20	20.00	0.08	0.000	4.47E-05	-0.5	-0.3		138544
21	19.50	0.41	0.000	4.63E-05	-0.3	-0.5		138544
22	19.00	0.72	0.000	4.85E-05	-0.1	-0.7		138544
23	18.50	1.00	0.000	5.07E-05	0.4	-0.6		138544
24	18.00	1.26	0.000	5.24E-05	0.9	-0.3		138544
		-1.65	0.000	5.24E-05	0.9	-0.3		
25	17.63	-1.25	0.000	5.28E-05	0.4	-0.1		138544
26	17.25	-0.82	0.000	5.29E-05	-0.0	0.0		---

(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	896
7	24.10	0.00	9.49	4.04	24.18	4.79	4.79	896
8	23.60	0.00	20.51	8.72	52.25	10.67	10.67	896
9	23.25	0.00	28.60	12.16	72.85	14.91	14.91	896
10	22.95	0.00	35.40	15.05	90.18	18.50	18.50	896
11	22.65	0.00	42.05	17.87	107.11	22.03	22.03	896
12	22.36	0.00	48.52	20.63	123.60	25.50	25.50	896
13	22.06	0.00	54.83	23.31	139.67	28.92	28.92	896
14	22.00	0.00	56.08	23.84	142.87	29.60	29.60	896
		0.00	56.08	19.88	180.31	24.02	24.02	4482
15	21.64	0.00	64.22	22.76	206.46	28.01	28.01	4482
16	21.50	0.00	67.33	23.86	216.47	29.54	29.54	4482
17	21.09	4.02	72.30	25.62	232.44	31.97	35.99	4482
18	20.68	8.04	77.10	27.32	247.89	34.35	42.39	4482
19	20.50	9.81	79.17	28.06	254.52	35.38	45.19	4482
20	20.00	14.71	84.79	30.05	272.59	38.20	52.92	4482
21	19.50	19.62	90.26	31.99	290.20	40.98	60.60	4482
22	19.00	24.52	95.62	33.89	307.43	43.72	68.25	4482
23	18.50	29.43	100.89	35.76	324.37	46.44	75.87	4482
24	18.00	34.34	106.08	37.59	341.06	49.13	83.47	4482
		Total>	140.42	33.00m	311.15	160.25	160.25	20140
25	17.63	Total>	147.95	34.88m	323.81	169.12	169.12	20745
26	17.25	Total>	155.45	36.75m	336.43	177.98	177.98	21349

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	896
7	24.10	0.00	9.00	3.83	22.93	5.76	5.76	896
8	23.60	0.00	18.00	7.65	45.85	10.94	10.94	896
9	23.25	0.00	24.30	10.33	61.90	14.56	14.56	896
10	22.95	0.00	29.65	12.61	75.54	17.64	17.64	896
11	22.65	0.00	35.01	14.88	89.18	20.72	20.72	896
12	22.36	0.00	40.36	17.16	102.83	23.80	23.80	896
13	22.06	0.00	45.72	19.44	116.47	26.88	26.88	896
14	22.00	0.00	46.80	19.90	119.22	27.50	27.50	896
		0.00	46.80	16.59	150.46	25.87	25.87	4482
15	21.64	0.00	54.00	19.14	173.61	29.40	29.40	4482
16	21.50	0.00	56.80	20.13	182.61	30.77	30.77	4482
17	21.09	4.02	60.98	21.61	196.04	32.78	36.80	4482

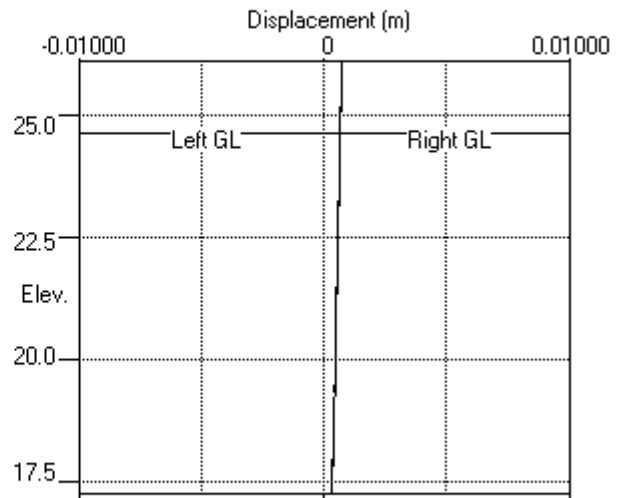
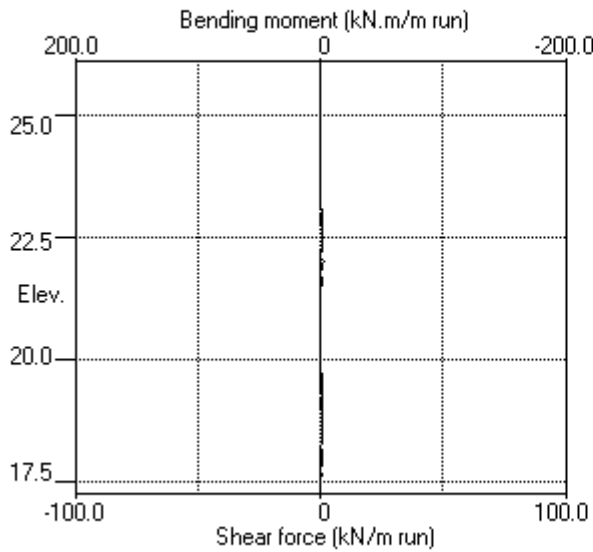
(continued)

Stage No.1 Apply surcharge no.1 at elevation 24.60

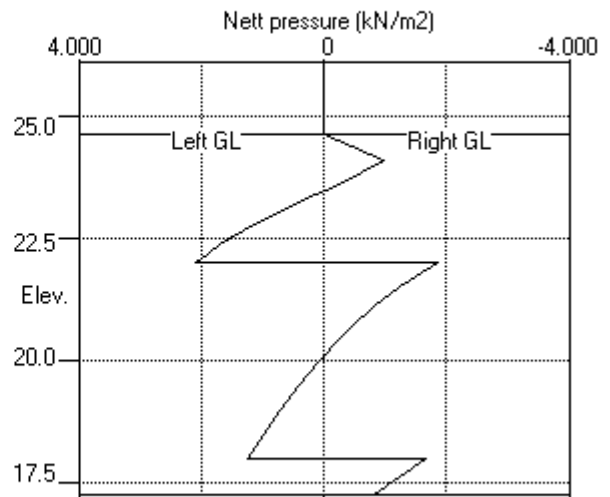
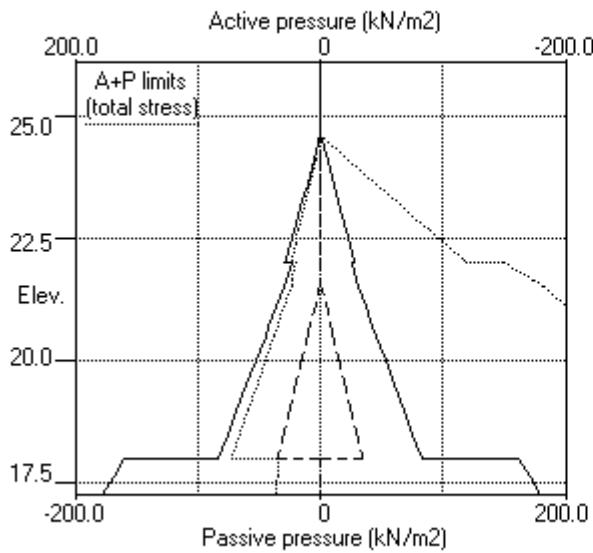
Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
18	20.68	8.04	65.16	23.09	209.48	34.79	42.83	4482
19	20.50	9.81	66.99	23.74	215.37	35.67	45.48	4482
20	20.00	14.71	72.09	25.55	231.75	38.12	52.83	4482
21	19.50	19.62	77.18	27.35	248.13	40.56	60.18	4482
22	19.00	24.52	82.28	29.16	264.51	43.00	67.53	4482
23	18.50	29.43	87.37	30.96	280.89	45.44	74.87	4482
24	18.00	34.34	92.47	32.77	297.28	47.87	82.21	4482
		Total>	126.80	33.00m	297.53	161.91	161.91	20140
25	17.63	Total>	134.30	34.88m	310.15	170.37	170.37	20745
26	17.25	Total>	141.80	36.75m	322.78	178.80	178.80	21349

Units: kN,m

Stage No.1 Apply surcharge no.1 at elev. 24.60



Stage No.1 Apply surcharge no.1 at elev. 24.60



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 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 2 Apply surcharge no.2 at elevation 23.25

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.	Overall FoS for toe elev. = 17.25	Moment of equil. at elev.	Toe elev. for FoS = 1.000	Wall Penetr-ation	Direction of failure
2	24.60 24.60	Cant.					<u>Conditions not suitable for FoS calc.</u>

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.002	1.30E-04	0.0	-0.0		138544
2	25.75	0.00	0.002	1.30E-04	0.0	0.0		138544
3	25.46	0.00	0.002	1.30E-04	0.0	0.0		138544
4	25.18	0.00	0.002	1.30E-04	0.0	-0.0		138544
5	24.89	0.00	0.002	1.30E-04	0.0	0.0		138544
6	24.60	0.00	0.002	1.30E-04	0.0	0.0		138544
7	24.10	-2.82	0.002	1.30E-04	-0.7	-0.0		138544
8	23.60	-2.36	0.002	1.31E-04	-2.0	-0.7		138544
9	23.25	-1.67	0.002	1.34E-04	-2.7	-1.5		138544
10	22.95	0.73	0.001	1.38E-04	-2.8	-2.3		138544
11	22.65	4.90	0.001	1.44E-04	-2.0	-3.1		138544
12	22.36	7.33	0.001	1.51E-04	-0.2	-3.4		138544
13	22.06	8.32	0.001	1.58E-04	2.1	-3.2		138544
14	22.00	8.41	0.001	1.59E-04	2.6	-3.0		138544
		-1.78	0.001	1.59E-04	2.6	-3.0		
15	21.64	-1.81	0.001	1.66E-04	2.0	-2.1		138544
16	21.50	-1.66	0.001	1.68E-04	1.8	-1.8		138544
17	21.09	-1.34	0.001	1.72E-04	1.1	-1.3		138544
18	20.68	-1.06	0.001	1.76E-04	0.6	-0.9		138544
19	20.50	-0.92	0.001	1.77E-04	0.5	-0.8		138544
20	20.00	-0.49	0.001	1.80E-04	0.1	-0.7		138544
21	19.50	0.02	0.001	1.83E-04	-0.0	-0.8		138544
22	19.00	0.59	0.001	1.85E-04	0.1	-0.8		138544
23	18.50	1.23	0.001	1.88E-04	0.6	-0.6		138544
24	18.00	1.91	0.001	1.89E-04	1.4	-0.2		138544
		-3.85	0.001	1.89E-04	1.4	-0.2		
25	17.63	-1.91	0.001	1.90E-04	0.3	0.0		138544
26	17.25	0.26	0.000	1.90E-04	0.0	0.0		---

(continued)

Stage No.2 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1104
7	24.10	0.00	9.49	4.04	24.18	4.04	4.04a	1104
8	23.60	0.00	20.51	8.72	52.25	9.63	9.63	1104
9	23.25	0.00	28.60	12.16	72.85	13.90	13.90	1104
10	22.95	0.00	40.88	17.38	104.15	19.35	19.35	1104
11	22.65	0.00	58.51	24.87	149.04	26.57	26.57	1104
12	22.36	0.00	70.86	30.12	180.50	32.04	32.04	1104
13	22.06	0.00	78.90	33.54	200.98	36.07	36.07	1104
14	22.00	0.00	80.20	34.09	204.29	36.78	36.78	1104
		0.00	80.20	28.42	257.83	28.42	28.42a	5522
15	21.64	0.00	87.51	31.01	281.34	31.68	31.68	5522
16	21.50	0.00	90.02	31.90	289.41	33.11	33.11	5522
17	21.09	4.02	92.94	32.94	298.81	35.15	39.17	5522
18	20.68	8.04	95.72	33.92	307.72	37.14	45.19	5522
19	20.50	9.81	96.95	34.36	311.69	38.03	47.84	5522
20	20.00	14.71	100.51	35.62	323.13	40.53	55.25	5522
21	19.50	19.62	104.26	36.95	335.20	43.11	62.73	5522
22	19.00	24.52	108.18	38.34	347.81	45.75	70.28	5522
23	18.50	29.43	112.24	39.78	360.86	48.45	77.88	5522
24	18.00	34.34	116.40	41.25	374.24	51.18	85.51	5522
		Total>	150.74	33.00m	321.48	164.11	164.11	23989
25	17.63	Total>	157.59	34.88m	333.46	173.42	173.42	24709
26	17.25	Total>	164.49	36.75m	345.47	182.86	182.86	25429

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1104
7	24.10	0.00	9.00	3.83	22.93	6.86	6.86	1104
8	23.60	0.00	18.00	7.65	45.85	11.98	11.98	1104
9	23.25	0.00	24.30	10.33	61.90	15.57	15.57	1104
10	22.95	0.00	29.65	12.61	75.54	18.62	18.62	1104
11	22.65	0.00	35.01	14.88	89.18	21.66	21.66	1104
12	22.36	0.00	40.36	17.16	102.83	24.71	24.71	1104
13	22.06	0.00	45.72	19.44	116.47	27.75	27.75	1104
14	22.00	0.00	46.80	19.90	119.22	28.36	28.36	1104
		0.00	46.80	16.59	150.46	30.20	30.20	5522
15	21.64	0.00	54.00	19.14	173.61	33.49	33.49	5522
16	21.50	0.00	56.80	20.13	182.61	34.77	34.77	5522
17	21.09	4.02	60.98	21.61	196.04	36.49	40.51	5522

(continued)

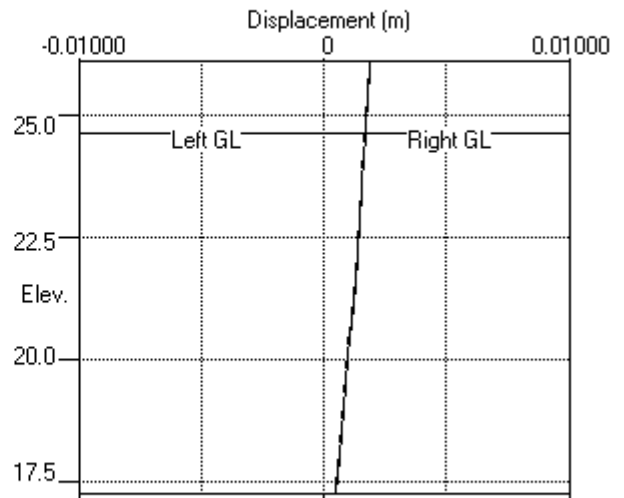
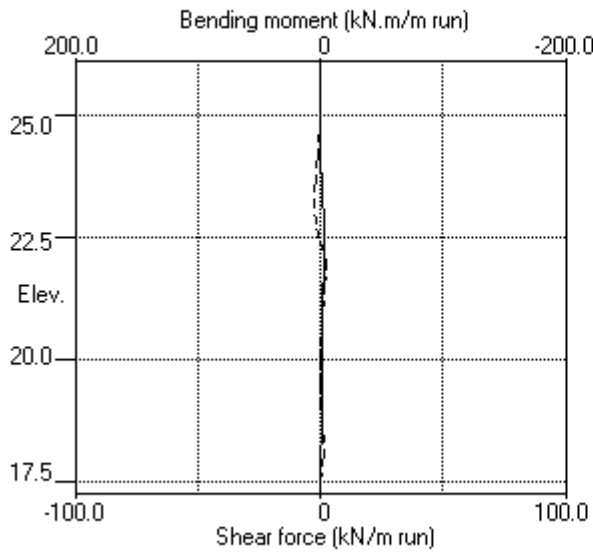
Stage No.2 Apply surcharge no.2 at elevation 23.25

Node no.	Y coord	RIGHT side					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
18	20.68	8.04	65.16	23.09	209.48	38.20	46.24	5522
19	20.50	9.81	66.99	23.74	215.37	38.95	48.76	5522
20	20.00	14.71	72.09	25.55	231.75	41.03	55.74	5522
21	19.50	19.62	77.18	27.35	248.13	43.10	62.72	5522
22	19.00	24.52	82.28	29.16	264.51	45.16	69.68	5522
23	18.50	29.43	87.37	30.96	280.89	47.22	76.65	5522
24	18.00	34.34	92.47	32.77	297.28	49.27	83.60	5522
		Total>	126.80	33.00m	297.53	167.97	167.97	23989
25	17.63	Total>	134.30	34.88m	310.15	175.33	175.33	24709
26	17.25	Total>	141.80	36.75m	322.78	182.60	182.60	25429

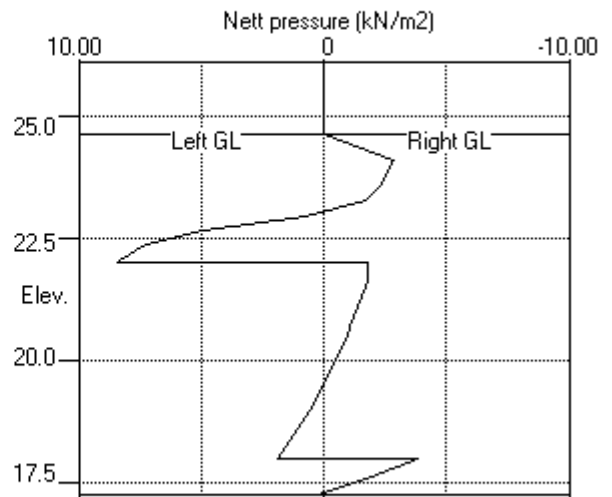
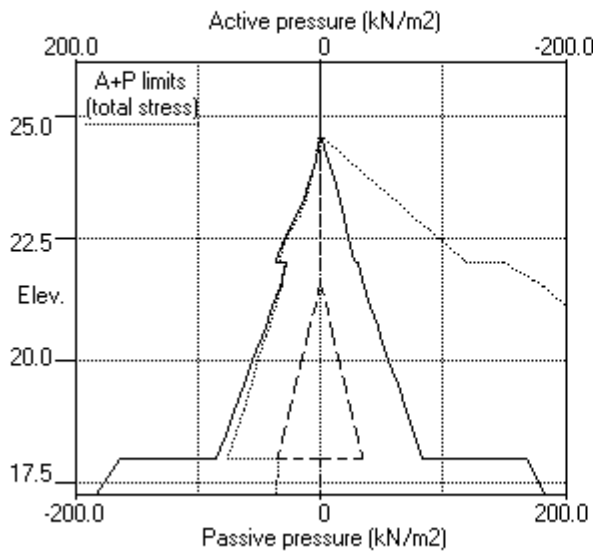
Note: 28.42a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.2 Apply surcharge no.2 at elev. 23.25



Stage No.2 Apply surcharge no.2 at elev. 23.25



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 4 Apply water pressure profile no.1 (Worst Cred.)

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

			Overall						
			FoS for toe	Toe elev. for					
			elev. = 17.25	FoS = 1.000					

Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure	
4	24.60	24.60	25.75	<u>Conditions not suitable for FoS calc.</u>					

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.002	4.24E-05	0.0	-0.0		138544
2	25.75	0.00	0.002	4.24E-05	0.0	0.0	0.5	138544
		0.00	0.002	4.24E-05	-0.5	-0.0		
3	25.46	0.00	0.002	4.26E-05	-0.5	-0.1		138544
4	25.18	0.00	0.002	4.30E-05	-0.5	-0.3		138544
5	24.89	0.00	0.002	4.37E-05	-0.5	-0.4		138544
6	24.60	0.00	0.002	4.47E-05	-0.5	-0.6		138544
7	24.10	-2.96	0.002	4.72E-05	-1.2	-0.8		138544
8	23.60	-2.72	0.002	5.19E-05	-2.6	-1.7		138544
9	23.25	-2.08	0.002	5.76E-05	-3.5	-2.8		138544
10	22.95	0.28	0.002	6.49E-05	-3.8	-3.9		138544
11	22.65	4.41	0.002	7.44E-05	-3.1	-5.0		138544
12	22.36	6.80	0.002	8.58E-05	-1.4	-5.6		138544
13	22.06	7.75	0.002	9.81E-05	0.8	-5.7		138544
14	22.00	7.84	0.002	1.00E-04	1.2	-5.7		138544
		-3.21	0.002	1.00E-04	1.2	-5.7		
15	21.64	-4.01	0.002	1.14E-04	-0.1	-5.4		138544
16	21.50	-4.43	0.002	1.20E-04	-0.6	-5.4		138544
17	21.09	-1.96	0.002	1.37E-04	-2.0	-6.0		138544
18	20.68	0.90	0.001	1.56E-04	-2.2	-6.9		138544
19	20.50	2.18	0.001	1.65E-04	-1.9	-7.2		138544
20	20.00	2.61	0.001	1.92E-04	-0.7	-7.9		138544
21	19.50	3.24	0.001	2.21E-04	0.8	-8.0		138544
22	19.00	4.07	0.001	2.49E-04	2.6	-7.2		138544
23	18.50	5.06	0.001	2.71E-04	4.9	-5.4		138544
24	18.00	6.17	0.001	2.85E-04	7.7	-2.4		138544
		-13.58	0.001	2.85E-04	7.7	-2.4		
25	17.63	-10.33	0.001	2.89E-04	3.2	-0.5		138544
26	17.25	-6.72	0.001	2.90E-04	0.0	0.0		---
At elev. 25.75			Strut force =	2.4 kN/strut =	0.5 kN/m run			

(continued)

Stage No.4 Apply water pressure profile no.1 (Worst Cred.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	958
7	24.10	0.00	9.49	4.04	24.18	4.04	4.04a	958
8	23.60	0.00	20.51	8.72	52.25	9.45	9.45	958
9	23.25	0.00	28.60	12.16	72.85	13.70	13.70	958
10	22.95	0.00	40.88	17.38	104.15	19.12	19.12	958
11	22.65	0.00	58.51	24.87	149.04	26.32	26.32	958
12	22.36	0.00	70.86	30.12	180.50	31.77	31.77	958
13	22.06	0.00	78.90	33.54	200.98	35.79	35.79	958
14	22.00	0.00	80.20	34.09	204.29	36.49	36.49	958
		0.00	80.20	28.42	257.83	28.42	28.42a	4791
15	21.64	0.00	87.51	31.01	281.34	31.01	31.01a	4791
16	21.50	0.00	90.02	31.90	289.41	31.90	31.90a	4791
17	21.09	4.02	92.94	32.94	298.81	33.50	37.52	4791
18	20.68	8.04	95.72	33.92	307.72	35.44	43.48	4791
19	20.50	9.81	96.95	34.36	311.69	36.31	46.12	4791
20	20.00	14.71	100.51	35.62	323.13	38.82	53.53	4791
21	19.50	19.62	104.26	36.95	335.20	41.46	61.08	4791
22	19.00	24.52	108.18	38.34	347.81	44.22	68.74	4791
23	18.50	29.43	112.24	39.78	360.86	47.09	76.52	4791
24	18.00	34.34	116.40	41.25	374.24	50.04	84.37	4791
		Total>	150.74	33.00m	321.48	159.06	159.06	21262
25	17.63	Total>	157.59	34.88m	333.46	169.02	169.02	21900
26	17.25	Total>	164.49	36.75m	345.47	179.18	179.18	22538

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	958
7	24.10	0.00	9.00	3.83	22.93	7.00	7.00	958
8	23.60	0.00	18.00	7.65	45.85	12.16	12.16	958
9	23.25	0.00	24.30	10.33	61.90	15.78	15.78	958
10	22.95	0.00	29.65	12.61	75.54	18.84	18.84	958
11	22.65	0.00	35.01	14.88	89.18	21.91	21.91	958
12	22.36	0.00	40.36	17.16	102.83	24.97	24.97	958
13	22.06	0.00	45.72	19.44	116.47	28.03	28.03	958
14	22.00	0.00	46.80	19.90	119.22	28.65	28.65	958
		0.00	46.80	16.59	150.46	31.63	31.63	4791
15	21.64	0.00	54.00	19.14	173.61	35.02	35.02	4791
16	21.50	0.00	56.80	20.13	182.61	36.33	36.33	4791
17	21.09	0.00	65.00	23.04	208.98	39.48	39.48	4791

(continued)

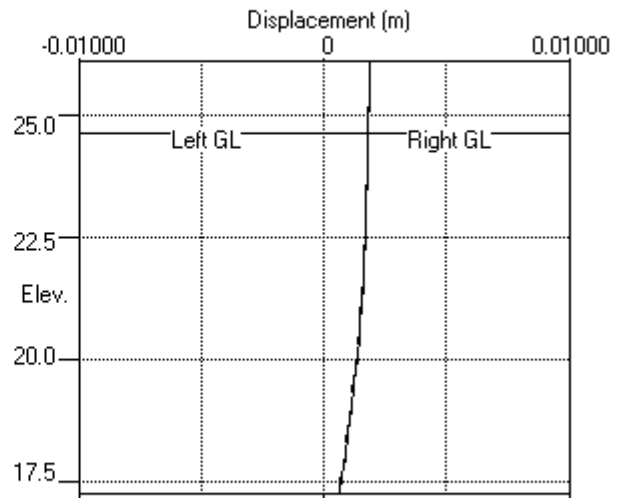
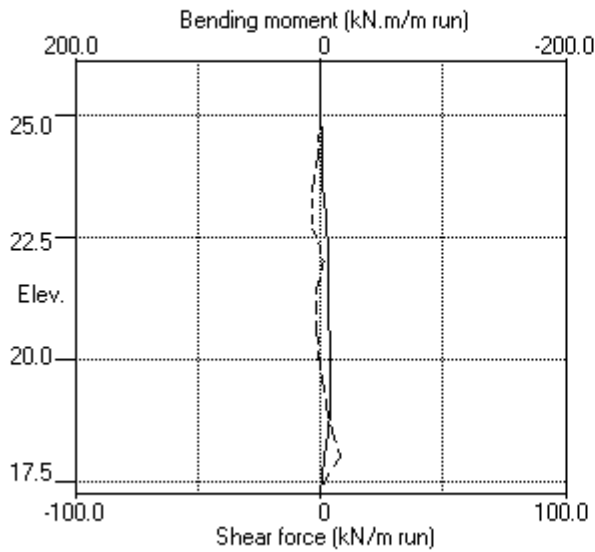
Stage No.4 Apply water pressure profile no.1 (Worst Cred.)

Node no.	Y coord	----- RIGHT side -----						Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
18	20.68	0.00	73.20	25.94	235.34	42.59	42.59	4791	
19	20.50	0.00	76.80	27.22	246.91	43.94	43.94	4791	
20	20.00	4.90	81.90	29.02	263.29	46.01	50.92	4791	
21	19.50	9.81	86.99	30.83	279.67	48.02	57.83	4791	
22	19.00	14.71	92.09	32.63	296.05	49.96	64.68	4791	
23	18.50	19.62	97.18	34.44	312.43	51.84	71.46	4791	
24	18.00	24.52	102.28	36.25	328.81	53.68	78.20	4791	
		Total>	126.80	33.00m	297.53	172.64	172.64	21262	
25	17.63	Total>	134.30	34.88m	310.16	179.35	179.35	21900	
26	17.25	Total>	141.80	36.75m	322.78	185.90	185.90	22538	

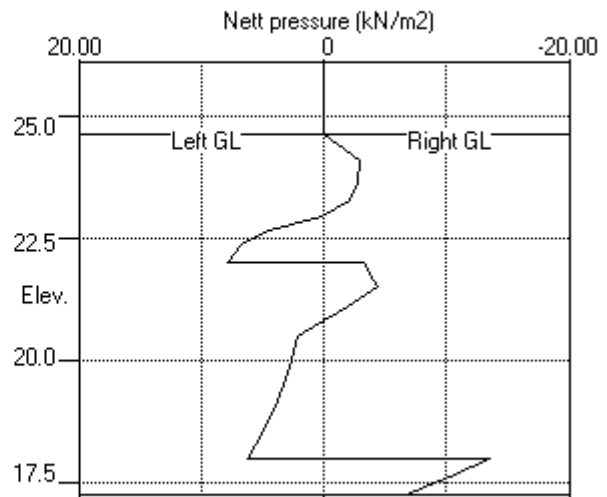
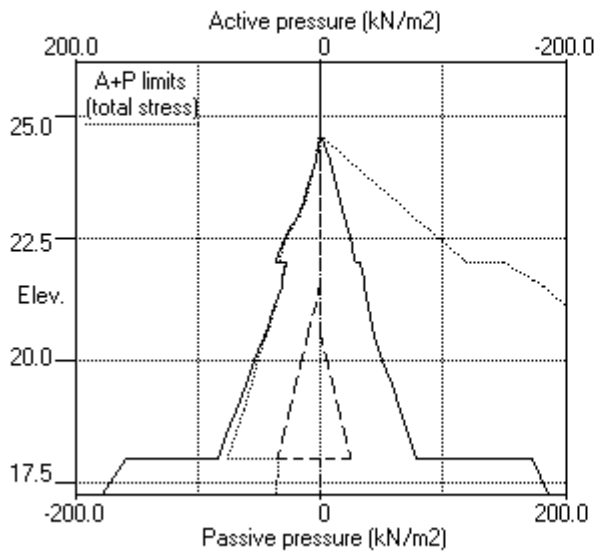
Note: 31.90a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Apply water pressure profile no.1 (Worst Cred.)



Stage No.4 Apply water pressure profile no.1 (Worst Cred.)



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 5 Excavate to elevation 20.68 on RIGHT side

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

			Overall		Toe elev. for			
			FoS for toe		FoS = 1.000			
			elev. = 17.25					
Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment at elev.	Toe elev.	Wall Penetr-ation	Direction of failure
5	24.60	20.68	25.75	1.492	n/a	17.85	2.83	L to R

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.001	-2.84E-03	0.0	0.0		138544
2	25.75	0.00	0.002	-2.84E-03	0.0	0.0	50.2	138544
		0.00	0.002	-2.84E-03	-50.2	0.0		
3	25.46	0.00	0.003	-2.82E-03	-50.2	-14.4		138544
4	25.18	0.00	0.004	-2.78E-03	-50.2	-28.9		138544
5	24.89	0.00	0.005	-2.70E-03	-50.2	-43.3		138544
6	24.60	0.00	0.005	-2.60E-03	-50.2	-57.7		138544
7	24.10	4.04	0.007	-2.35E-03	-49.2	-82.5		138544
8	23.60	8.72	0.008	-2.01E-03	-46.0	-106.4		138544
9	23.25	12.16	0.008	-1.72E-03	-42.3	-121.9		138544
10	22.95	17.38	0.009	-1.44E-03	-37.9	-133.8		138544
11	22.65	24.87	0.009	-1.14E-03	-31.7	-144.2		138544
12	22.36	30.12	0.010	-8.30E-04	-23.5	-152.5		138544
13	22.06	33.54	0.010	-4.96E-04	-14.0	-158.1		138544
14	22.00	34.09	0.010	-4.28E-04	-12.0	-158.9		138544
		28.42	0.010	-4.28E-04	-12.0	-158.9		
15	21.64	31.01	0.010	-1.23E-05	-1.3	-161.2		138544
16	21.50	31.90	0.010	1.50E-04	3.1	-161.1		138544
17	21.09	36.96	0.010	6.20E-04	17.2	-156.9		138544
18	20.68	41.96	0.009	1.07E-03	33.4	-146.6		138544
19	20.50	32.59	0.009	1.25E-03	40.1	-140.0		138544
20	20.00	17.47	0.008	1.71E-03	52.7	-116.5		138544
21	19.50	2.42	0.007	2.08E-03	57.6	-88.7		138544
22	19.00	-12.57	0.006	2.35E-03	55.1	-60.2		138544
23	18.50	-11.75	0.005	2.52E-03	49.0	-32.9		138544
24	18.00	-2.67	0.004	2.60E-03	45.4	-9.9		138544
		-110.12	0.004	2.60E-03	45.4	-9.9		
25	17.63	-61.38	0.003	2.61E-03	13.2	-0.6		138544
26	17.25	-9.26	0.002	2.61E-03	-0.0	0.0		---
At elev. 25.75 Strut force =			250.9 kN/strut =			50.2 kN/m run		

(continued)

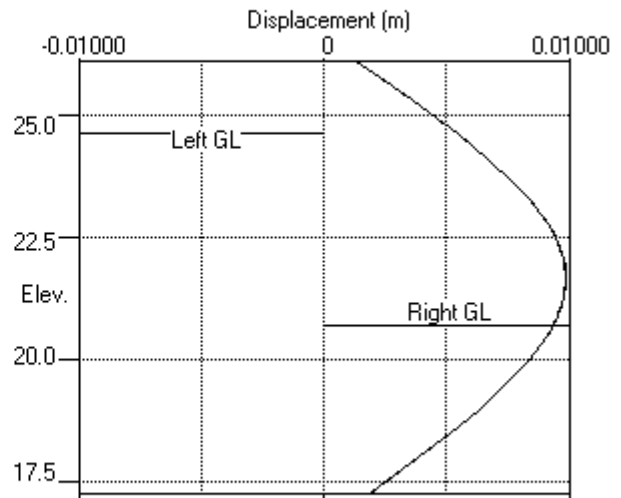
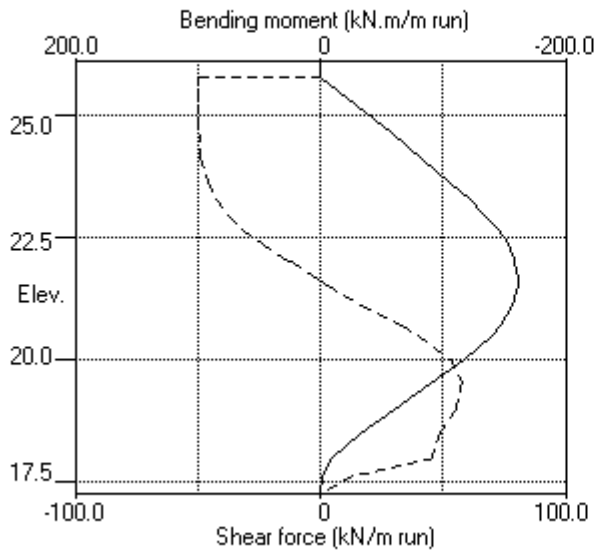
Stage No.5 Excavate to elevation 20.68 on RIGHT side

Node no.	Y coord	Effective stresses					Total earth pressure	Coeff. of subgrade reaction
		Water press.	Vertical	Active limit	Passive limit	Earth pressure		
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
19	20.50	0.00	3.60	1.28	11.57	11.57	11.57p	8243
20	20.00	4.90	8.70	3.08	27.95	27.95	32.86p	8243
21	19.50	9.81	13.79	4.89	44.34	44.34	54.15p	8243
22	19.00	14.71	18.89	6.69	60.72	60.72	75.43p	8243
23	18.50	19.62	23.98	8.50	77.10	61.34	80.96	8243
24	18.00	24.52	29.08	10.31	93.49	53.73	78.26	8243
		Total>	53.60	13.40m	224.32	204.52	204.52	34452
25	17.63	Total>	61.11	15.27m	236.95	183.37	183.37	35486
26	17.25	Total>	68.61	17.15m	249.57	160.21	160.21	36520

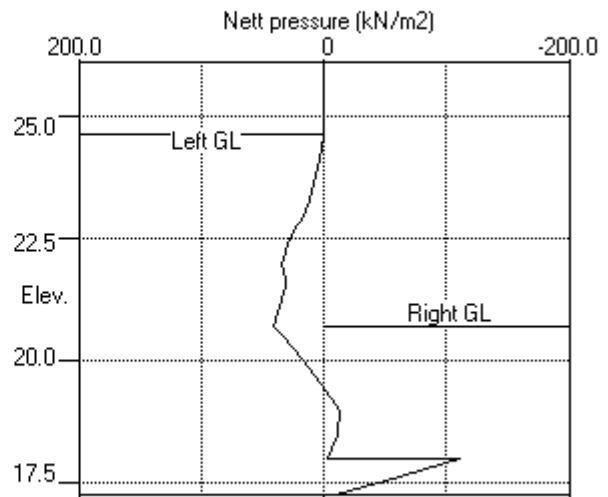
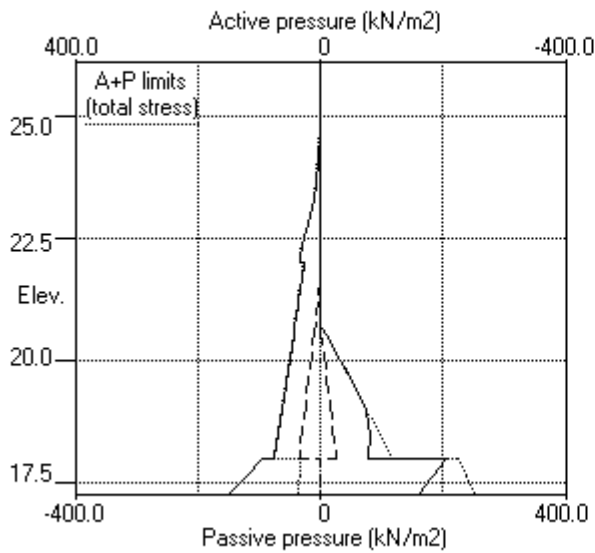
Note: 75.59a Soil pressure at active limit
 75.43p Soil pressure at passive limit

Units: kN,m

Stage No.5 Excav. to elev. 20.68 on RIGHT side



Stage No.5 Excav. to elev. 20.68 on RIGHT side



Units: kN,m

Stage No. 6 Fill to elevation 21.64 on RIGHT side with soil type 1

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

				Overall				
				FoS for toe		Toe elev. for		
				elev. = 17.25		FoS = 1.000		
				-----		-----		
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.	Elev.	Elev.	of	equilib.	elev.	Penetr	of
				Safety	at elev.		-ation	failure
6	24.60 21.64	25.75	1.977	n/a	19.58	2.06	L to R	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.001	-2.73E-03	0.0	0.0		138544
2	25.75	0.00	0.002	-2.73E-03	0.0	0.0	49.6	138544
		0.00	0.002	-2.73E-03	-49.6	0.0		
3	25.46	0.00	0.003	-2.72E-03	-49.6	-14.3		138544
4	25.18	0.00	0.004	-2.67E-03	-49.6	-28.5		138544
5	24.89	0.00	0.005	-2.60E-03	-49.6	-42.8		138544
6	24.60	0.00	0.005	-2.50E-03	-49.6	-57.1		138544
7	24.10	4.20	0.006	-2.25E-03	-48.6	-81.6		138544
8	23.60	8.94	0.008	-1.91E-03	-45.3	-105.1		138544
9	23.25	12.40	0.008	-1.62E-03	-41.6	-120.4		138544
10	22.95	17.65	0.009	-1.35E-03	-37.1	-132.1		138544
11	22.65	25.17	0.009	-1.06E-03	-30.7	-142.2		138544
12	22.36	30.44	0.009	-7.49E-04	-22.4	-150.2		138544
13	22.06	33.88	0.009	-4.21E-04	-12.9	-155.5		138544
14	22.00	34.44	0.009	-3.53E-04	-10.8	-156.2		138544
		30.17	0.009	-3.53E-04	-10.8	-156.2		
15	21.64	32.88	0.009	5.43E-05	0.5	-158.0		138544
16	21.50	32.74	0.009	2.13E-04	5.1	-157.6		138544
17	21.09	34.78	0.009	6.72E-04	19.0	-152.6		138544
18	20.68	36.73	0.009	1.10E-03	33.6	-141.9		138544
		37.95	0.009	1.10E-03	33.6	-141.9		
19	20.50	31.52	0.009	1.28E-03	39.9	-135.3		138544
20	20.00	16.53	0.008	1.73E-03	51.9	-112.1		138544
21	19.50	1.52	0.007	2.09E-03	56.4	-84.7		138544
22	19.00	-13.50	0.006	2.34E-03	53.4	-57.0		138544
23	18.50	-12.78	0.005	2.50E-03	46.8	-30.6		138544
24	18.00	-3.83	0.003	2.57E-03	42.7	-8.9		138544
		-106.57	0.003	2.57E-03	42.7	-8.9		
25	17.63	-57.74	0.002	2.58E-03	11.9	-0.4		138544
26	17.25	-5.58	0.001	2.58E-03	-0.0	0.0		---

At elev. 25.75 Strut force = 248.1 kN/strut = 49.6 kN/m run

(continued)

Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	958
7	24.10	0.00	9.49	4.04	24.18	4.20	4.20	958
8	23.60	0.00	20.51	8.72	52.25	8.94	8.94	958
9	23.25	0.00	28.60	12.16	72.85	12.40	12.40	958
10	22.95	0.00	40.88	17.38	104.15	17.65	17.65	958
11	22.65	0.00	58.51	24.87	149.04	25.17	25.17	958
12	22.36	0.00	70.86	30.12	180.50	30.44	30.44	958
13	22.06	0.00	78.90	33.54	200.98	33.88	33.88	958
14	22.00	0.00	80.20	34.09	204.29	34.44	34.44	958
		0.00	80.20	28.42	257.83	30.17	30.17	4791
15	21.64	0.00	87.51	31.01	281.34	32.88	32.88	4791
16	21.50	0.00	90.02	31.90	289.41	33.81	33.81	4791
17	21.09	4.02	92.94	32.94	298.81	34.96	38.98	4791
18	20.68	8.04	95.72	33.92	307.72	36.03	44.08	4791
19	20.50	9.81	96.95	34.36	311.69	36.50	46.31	4791
20	20.00	14.71	100.51	35.62	323.13	37.82	52.53	4791
21	19.50	19.62	104.26	36.95	335.20	39.17	58.79	4791
22	19.00	24.52	108.18	38.34	347.81	40.55	65.07	4791
23	18.50	29.43	112.24	39.78	360.86	41.94	71.37	4791
24	18.00	34.34	116.40	41.25	374.24	43.36	77.69	4791
		Total>	150.74	33.00m	321.48	103.74	103.74	21262
25	17.63	Total>	157.59	34.88m	333.46	131.37	131.37	21900
26	17.25	Total>	164.49	36.75m	345.47	160.35	160.35	22538

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1137
16	21.50	0.00	2.52	1.07	6.42	1.07	1.07a	1137
17	21.09	0.00	9.90	4.21	25.22	4.21	4.21a	1137
18	20.68	0.00	17.28	7.35	44.02	7.35	7.35a	1137
		0.00	17.28	6.12	55.56	6.12	6.12a	5686

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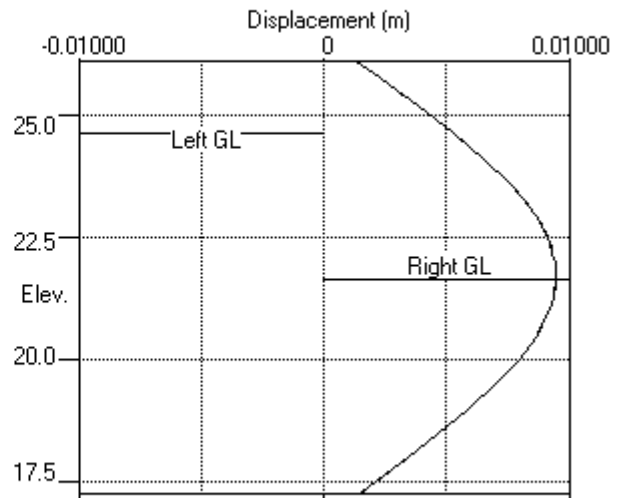
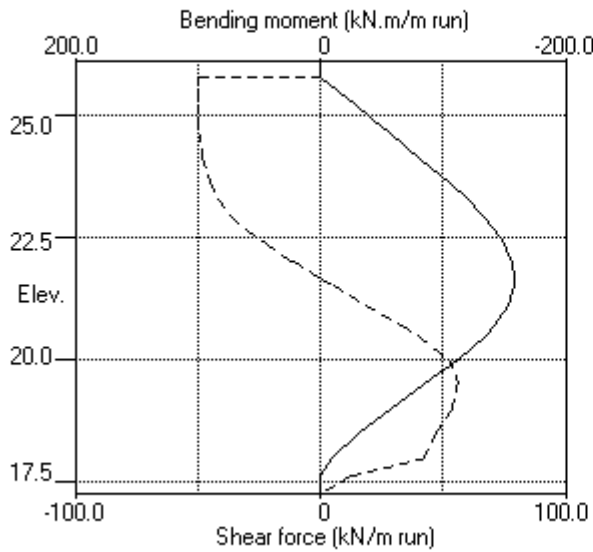
Stage No.6 Fill to elevation 21.64 on RIGHT side with soil type 1

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
19	20.50	0.00	20.88	7.40	67.13	14.79	14.79	5686
20	20.00	4.90	25.98	9.21	83.51	31.10	36.01	5686
21	19.50	9.81	31.07	11.01	99.90	47.46	57.27	5686
22	19.00	14.71	36.17	12.82	116.28	63.86	78.58	5686
23	18.50	19.62	41.27	14.62	132.67	64.53	84.15	5686
24	18.00	24.52	46.36	16.43	149.06	56.99	81.52	5686
		Total>	70.89	18.20m	241.61	210.31	210.31	24611
25	17.63	Total>	78.39	20.08m	254.24	189.12	189.12	25349
26	17.25	Total>	85.90	21.95m	266.86	165.93	165.93	26088

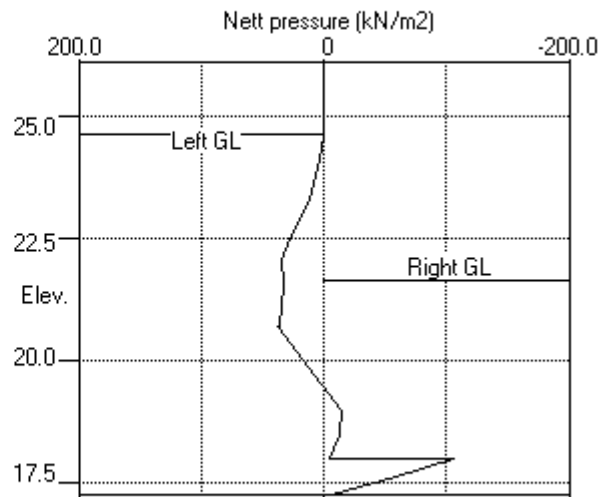
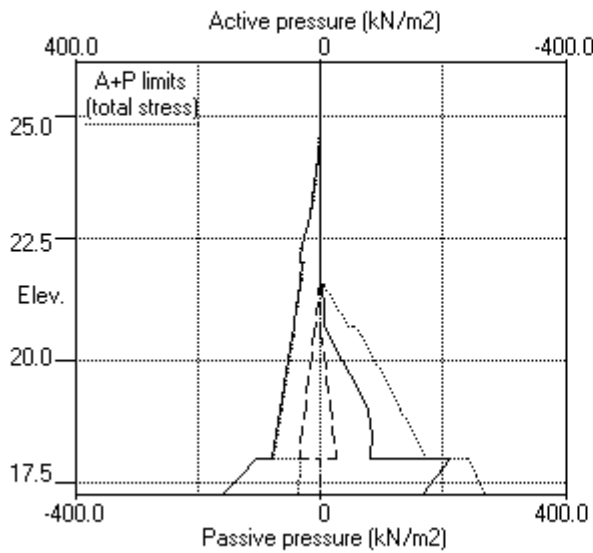
Note: 6.12a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Fill to elev. 21.64 on RIGHT side



Stage No.6 Fill to elev. 21.64 on RIGHT side



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 9 Remove strut or anchor no.1 at elevation 25.75

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

			Overall						
			FoS for toe	Toe elev. for					
			elev. = 17.25	FoS = 1.000					
Stage No.	--- G.L. Act.	--- Pass.	Strut Elev.	Factor of Safety	Moment of equil. at elev.	Toe elev.	Wall Penetr-ation	Direction of failure	
9	24.60	21.64		More than one strut.		No FoS calc.			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.001	-2.84E-03	-44.1	0.0	44.1	138544
2	25.75	0.00	0.002	-2.83E-03	-44.1	-15.4		138544
3	25.46	0.00	0.003	-2.78E-03	-44.1	-28.1		138544
4	25.18	0.00	0.004	-2.71E-03	-44.1	-40.7		138544
5	24.89	0.00	0.005	-2.61E-03	-44.1	-53.4		138544
6	24.60	0.00	0.005	-2.49E-03	-44.1	-66.1		138544
7	24.10	4.04	0.007	-2.21E-03	-43.0	-87.8		138544
8	23.60	8.73	0.008	-1.85E-03	-39.8	-108.6		138544
9	23.25	12.24	0.008	-1.56E-03	-36.2	-121.9		138544
10	22.95	17.53	0.009	-1.29E-03	-31.8	-132.1		138544
11	22.65	25.08	0.009	-1.00E-03	-25.4	-140.7		138544
12	22.36	30.40	0.009	-6.94E-04	-17.2	-147.0		138544
13	22.06	33.87	0.009	-3.74E-04	-7.6	-150.7	6.8	138544
		33.87	0.009	-3.74E-04	-14.4	-150.7		
14	22.00	34.43	0.009	-3.08E-04	-12.4	-151.5		138544
		30.11	0.009	-3.08E-04	-12.4	-151.5		
15	21.64	32.94	0.009	8.78E-05	-1.0	-153.9		138544
16	21.50	32.83	0.009	2.43E-04	3.6	-153.7		138544
17	21.09	34.93	0.009	6.91E-04	17.5	-149.4		138544
18	20.68	36.92	0.009	1.11E-03	32.2	-139.3		138544
		38.14	0.009	1.11E-03	32.2	-139.3		
19	20.50	31.92	0.009	1.29E-03	38.5	-132.9		138544
20	20.00	16.95	0.008	1.73E-03	50.7	-110.4		138544
21	19.50	1.92	0.007	2.08E-03	55.4	-83.5		138544
22	19.00	-13.15	0.006	2.33E-03	52.6	-56.3		138544
23	18.50	-12.49	0.005	2.49E-03	46.2	-30.2		138544
24	18.00	-3.62	0.003	2.56E-03	42.2	-8.7		138544
		-105.68	0.003	2.56E-03	42.2	-8.7		
25	17.63	-57.09	0.002	2.57E-03	11.7	-0.4		138544
26	17.25	-5.18	0.001	2.57E-03	-0.0	0.0		---
At elev. 26.10 Strut force =				44.1 kN/strut =	44.1 kN/m run			
At elev. 22.06 Strut force =				6.8 kN/strut =	6.8 kN/m run			

(continued)

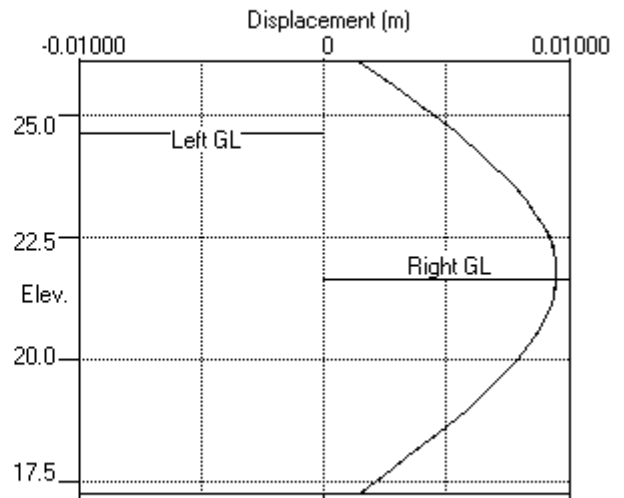
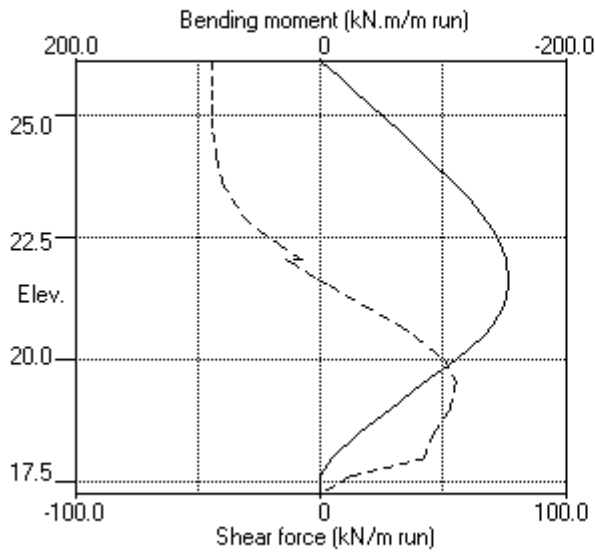
Stage No.9 Remove strut or anchor no.1 at elevation 25.75

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	2096
7	24.10	0.00	9.49	4.04	24.18	4.04	4.04a	2096
8	23.60	0.00	20.51	8.72	52.25	8.73	8.73	2096
9	23.25	0.00	28.60	12.16	72.85	12.24	12.24	2096
10	22.95	0.00	40.88	17.38	104.15	17.53	17.53	2096
11	22.65	0.00	58.51	24.87	149.04	25.08	25.08	2096
12	22.36	0.00	70.86	30.12	180.50	30.40	30.40	2096
13	22.06	0.00	78.90	33.54	200.98	33.87	33.87	2096
14	22.00	0.00	80.20	34.09	204.29	34.43	34.43	2096
		0.00	80.20	28.42	257.83	30.11	30.11	10479
15	21.64	0.00	87.51	31.01	281.34	32.94	32.94	6531
16	21.50	0.00	90.02	31.90	289.41	33.90	33.90	6531
17	21.09	4.02	92.94	32.94	298.81	35.11	39.14	6531
18	20.68	8.04	95.72	33.92	307.72	36.22	44.27	6531
19	20.50	9.81	96.95	34.36	311.69	36.70	46.51	6531
20	20.00	14.71	100.51	35.62	323.13	38.03	52.75	6531
21	19.50	19.62	104.26	36.95	335.20	39.37	58.99	6531
22	19.00	24.52	108.18	38.34	347.81	40.72	65.25	6531
23	18.50	29.43	112.24	39.78	360.86	42.09	71.52	6531
24	18.00	34.34	116.40	41.25	374.24	43.46	77.80	6531
		Total>	150.74	33.00m	321.48	104.19	104.19	27839
25	17.63	Total>	157.59	34.88m	333.46	131.70	131.70	28674
26	17.25	Total>	164.49	36.75m	345.47	160.55	160.55	29509

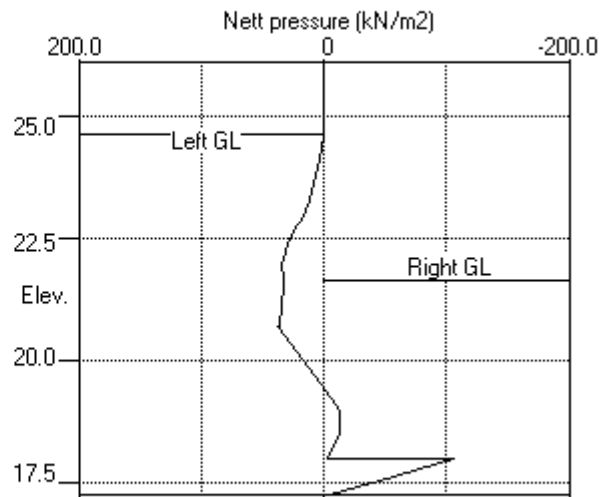
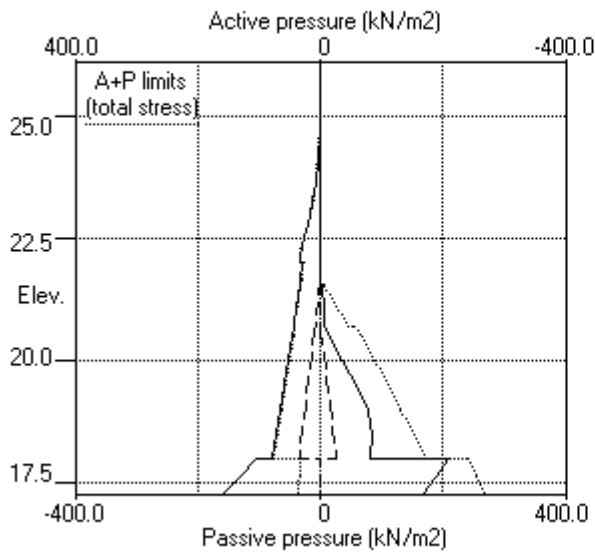
Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1306
16	21.50	0.00	2.52	1.07	6.42	1.07	1.07a	1306
17	21.09	0.00	9.90	4.21	25.22	4.21	4.21a	1306
18	20.68	0.00	17.28	7.35	44.02	7.35	7.35a	1306
		0.00	17.28	6.12	55.56	6.12	6.12a	6531

Units: kN,m

Stage No.9 Remove strut no.1 at elev. 25.75



Stage No.9 Remove strut no.1 at elev. 25.75



PILEDESIGNS LTD	Sheet No.
Program: WALLAP Version 6.06 Revision A51.B69.R54	Job No. 23198
Licensed from GEOSOLVE	Made by : DBS
Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2	Date:12-06-2020
Fitzrovia - Middlesex Hospital Annexe	Checked :
Wall 4, Secant-ULS2, 600 dia @ 900 - run 03	

Units: kN,m

Stage No. 10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

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

			Overall				
			FoS for toe		Toe elev. for		
			elev. = 17.25		FoS = 1.000		
			-----		-----		
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction
No.	Act. Pass.	Elev.	of	of	elev.	Penetr	of
			Safety	at elev.		-ation	failure
10	24.60 21.64		More than one strut.		No	FoS calc.	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.001	-2.87E-03	-32.1	0.0	32.1	98960
2	25.75	0.00	0.002	-2.85E-03	-32.1	-12.2		98960
3	25.46	0.00	0.003	-2.80E-03	-32.1	-22.1		98960
4	25.18	0.00	0.004	-2.73E-03	-32.1	-32.1		98960
5	24.89	0.00	0.005	-2.63E-03	-32.1	-42.1		98960
6	24.60	0.00	0.005	-2.50E-03	-32.1	-52.1		98960
7	24.10	4.04	0.007	-2.22E-03	-31.1	-69.2		98960
8	23.60	8.72	0.008	-1.86E-03	-27.9	-85.3		98960
9	23.25	12.21	0.008	-1.56E-03	-24.2	-95.4		98960
10	22.95	17.49	0.009	-1.29E-03	-19.8	-102.8		98960
11	22.65	25.05	0.009	-1.00E-03	-13.5	-108.6		98960
12	22.36	30.36	0.009	-7.00E-04	-5.2	-112.2		98960
13	22.06	33.82	0.009	-3.92E-04	4.3	-113.1	28.9	98960
		33.82	0.009	-3.92E-04	-24.6	-113.1		
14	22.00	34.38	0.009	-3.30E-04	-22.5	-114.4		98960
		29.88	0.009	-3.30E-04	-22.5	-114.4		
15	21.64	32.63	0.010	5.81E-05	-11.3	-119.6		98960
16	21.50	32.41	0.009	2.14E-04	-6.7	-120.6		98960
17	21.09	34.41	0.009	6.74E-04	7.0	-119.6		98960
18	20.68	36.37	0.009	1.12E-03	21.5	-112.8		98960
		37.19	0.009	1.12E-03	21.5	-112.8		
19	20.50	31.00	0.009	1.31E-03	27.6	-108.0		98960
20	20.00	16.28	0.008	1.77E-03	39.4	-89.7		98960
21	19.50	1.71	0.007	2.14E-03	43.9	-67.4		98960
22	19.00	-12.56	0.006	2.40E-03	41.2	-44.6		98960
23	18.50	-10.93	0.005	2.56E-03	35.3	-22.9		98960
24	18.00	-1.12	0.003	2.63E-03	32.3	-5.5		98960
		-95.51	0.003	2.63E-03	32.3	-5.5		
25	17.63	-43.93	0.002	2.63E-03	6.2	0.5		98960

(continued)

Stage No.10 Change EI of wall to 98960 kN.m²/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	Nett pressure kN/m ²	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m	EI of wall kN.m ² /m
26	17.25	10.97	0.001	2.63E-03	-0.0	0.0		---
At elev. 26.10		Strut force =		32.1 kN/strut =		32.1 kN/m run		
At elev. 22.06		Strut force =		28.9 kN/strut =		28.9 kN/m run		

Node no.	Y coord	LEFT side					Total earth pressure kN/m ²	Coeff. of subgrade reaction kN/m ³
		Effective stresses						
		Water press. kN/m ²	Vertic -al kN/m ²	Active limit kN/m ²	Passive limit kN/m ²	Earth pressure kN/m ²		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.75	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.46	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.18	0.00	0.00	0.00	0.00	0.00	0.0	
5	24.89	0.00	0.00	0.00	0.00	0.00	0.0	
6	24.60	0.00	0.00	0.00	0.00	0.00	0.0	
7	24.10	0.00	9.49	4.04	24.18	4.04	1657	
8	23.60	0.00	20.51	8.72	52.25	8.72	1657	
9	23.25	0.00	28.60	12.16	72.85	12.21	1657	
10	22.95	0.00	40.88	17.38	104.15	17.49	1657	
11	22.65	0.00	58.51	24.87	149.04	25.05	1657	
12	22.36	0.00	70.86	30.12	180.50	30.36	1657	
13	22.06	0.00	78.90	33.54	200.98	33.82	1657	
14	22.00	0.00	80.20	34.09	204.29	34.38	1657	
		0.00	80.20	28.42	257.83	29.88	8286	
15	21.64	0.00	87.51	31.01	281.34	32.63	8286	
16	21.50	0.00	90.02	31.90	289.41	33.56	8286	
17	21.09	4.02	92.94	32.94	298.81	34.69	8286	
18	20.68	8.04	95.72	33.92	307.72	35.77	8286	
19	20.50	9.81	96.95	34.36	311.69	36.27	8286	
20	20.00	14.71	100.51	35.62	323.13	37.71	8286	
21	19.50	19.62	104.26	36.95	335.20	39.27	8286	
22	19.00	24.52	108.18	38.34	347.81	41.02	13134	
23	18.50	29.43	112.24	39.78	360.86	42.87	13134	
24	18.00	34.34	116.40	41.25	374.24	44.71	13134	
		Total>	150.74	33.00m	321.48	109.27	53492	
25	17.63	Total>	157.59	34.88m	333.46	138.28	55097	
26	17.25	Total>	164.49	36.75m	345.47	168.63	56702	

Node no.	Y coord	RIGHT side					Total earth pressure kN/m ²	Coeff. of subgrade reaction kN/m ³
		Effective stresses						
		Water press. kN/m ²	Vertic -al kN/m ²	Active limit kN/m ²	Passive limit kN/m ²	Earth pressure kN/m ²		
1	26.10	0.00	0.00	0.00	0.00	0.00	0.0	
2	25.75	0.00	0.00	0.00	0.00	0.00	0.0	
3	25.46	0.00	0.00	0.00	0.00	0.00	0.0	
4	25.18	0.00	0.00	0.00	0.00	0.00	0.0	
5	24.89	0.00	0.00	0.00	0.00	0.00	0.0	
6	24.60	0.00	0.00	0.00	0.00	0.00	0.0	
7	24.10	0.00	0.00	0.00	0.00	0.00	0.0	
8	23.60	0.00	0.00	0.00	0.00	0.00	0.0	
9	23.25	0.00	0.00	0.00	0.00	0.00	0.0	
10	22.95	0.00	0.00	0.00	0.00	0.00	0.0	

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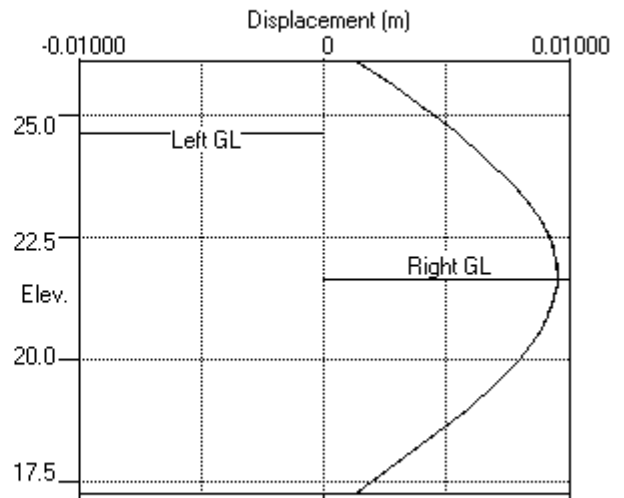
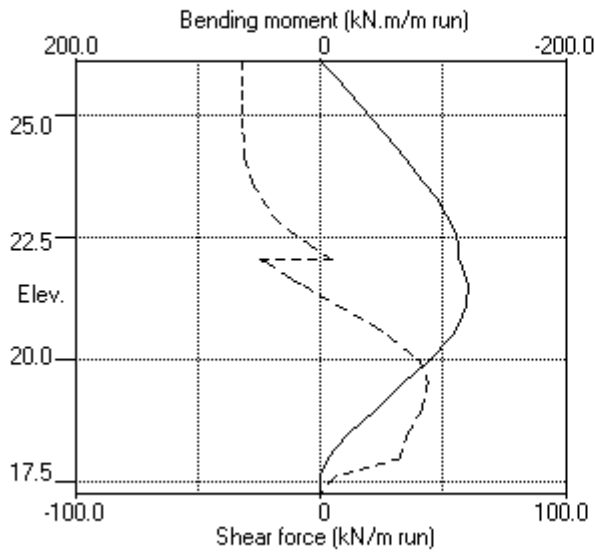
Stage No.10 Change EI of wall to 98960 kN.m2/m run
 Yield moment not defined
 Allow wall to relax with new modulus value

Node no.	Y coord	----- RIGHT side -----						Total earth pressure kN/m2	Coeff. of subgrade reaction kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	-----		
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
		0.00	0.00	0.00	0.00	0.00	0.00	1862	
16	21.50	0.00	2.52	1.07	6.42	1.15	1.15	1862	
17	21.09	0.00	9.90	4.21	25.22	4.30	4.30	1862	
18	20.68	0.00	17.28	7.35	44.02	7.45	7.45	1862	
		0.00	17.28	6.12	55.56	6.63	6.63	9312	
19	20.50	0.00	20.88	7.40	67.13	15.08	15.08	9312	
20	20.00	4.90	25.98	9.21	83.51	31.25	36.15	9312	
21	19.50	9.81	31.07	11.01	99.90	47.37	57.18	9312	
22	19.00	14.71	36.17	12.82	116.28	63.39	78.10	13134	
23	18.50	19.62	41.27	14.62	132.67	63.61	83.23	13134	
24	18.00	24.52	46.36	16.43	149.06	55.64	80.17	13134	
		Total>	70.89	18.20m	241.61	204.78	204.78	53492	
25	17.63	Total>	78.39	20.08m	254.24	182.21	182.21	55097	
26	17.25	Total>	85.90	21.95m	266.86	157.65	157.65	56702	

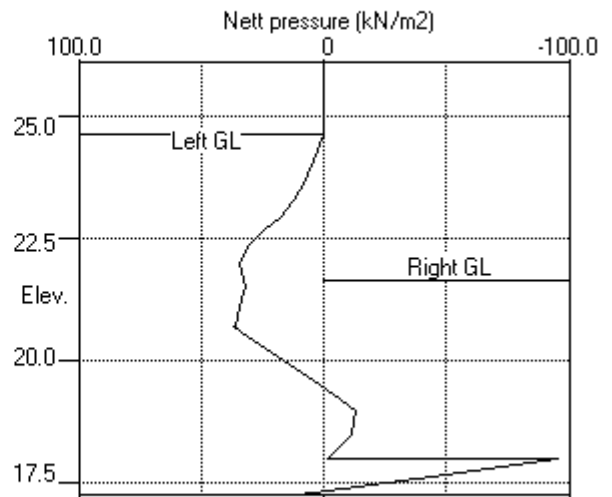
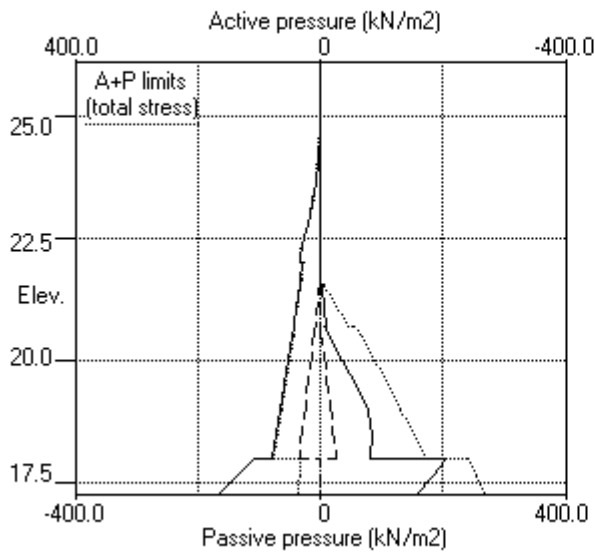
Note: 8.72a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.10 Change EI of wall to 98960kN.m²/m run



Stage No.10 Change EI of wall to 98960kN.m²/m run



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
 Licensed from GEOSOLVE
 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Stage No. 13 Apply water pressure profile no.2 (Worst Cred.)

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

			Overall					
			FoS for toe	Toe elev. for				
			elev. = 17.25	FoS = 1.000				
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	Direction	
No.	Act. Pass.	Elev.	of	equilib.	elev.	Penetr	of	
			Safety	at elev.		-ation	failure	
13	24.60 21.64		More than one strut. No FoS calc.					

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m

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 50.00 from wall

Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.00	0.001	-2.94E-03	-34.8	0.0	34.8	98960
2	25.75	0.00	0.002	-2.91E-03	-34.8	-13.1		98960
3	25.46	0.00	0.003	-2.86E-03	-34.8	-23.9		98960
4	25.18	0.00	0.004	-2.79E-03	-34.8	-34.6		98960
5	24.89	0.00	0.005	-2.68E-03	-34.8	-45.4		98960
6	24.60	0.00	0.006	-2.54E-03	-34.8	-56.1		98960
7	24.10	4.04	0.007	-2.23E-03	-33.8	-74.6		98960
8	23.60	8.72	0.008	-1.84E-03	-30.6	-92.1		98960
9	23.25	14.32	0.008	-1.52E-03	-26.5	-103.0		98960
10	22.95	21.58	0.009	-1.23E-03	-21.2	-111.0		98960
11	22.65	31.12	0.009	-9.13E-04	-13.4	-117.0		98960
12	22.36	38.43	0.009	-5.85E-04	-3.0	-120.3		98960
13	22.06	43.91	0.009	-2.55E-04	9.2	-120.2	21.2	98960
		43.91	0.009	-2.55E-04	-12.0	-120.2		
14	22.00	44.88	0.009	-1.89E-04	-9.3	-120.7		98960
		40.49	0.009	-1.89E-04	-9.3	-120.7		
15	21.64	46.01	0.009	2.12E-04	6.2	-120.4		98960
		26.46	0.009	2.12E-04	6.2	-120.4		
16	21.50	26.61	0.009	3.68E-04	10.0	-119.0		98960
17	21.09	26.52	0.009	8.08E-04	20.8	-111.7		98960
18	20.68	26.25	0.009	1.21E-03	31.7	-100.0		98960
		27.43	0.009	1.21E-03	31.7	-100.0		
19	20.50	21.19	0.009	1.37E-03	36.0	-93.5		98960
20	20.00	6.69	0.008	1.76E-03	43.0	-72.2		98960
21	19.50	-8.33	0.007	2.04E-03	42.6	-49.3		98960
22	19.00	-23.76	0.006	2.21E-03	34.6	-28.4		98960
23	18.50	-23.90	0.005	2.30E-03	22.7	-11.5		98960
24	18.00	-19.50	0.003	2.33E-03	11.8	-2.0		98960
		-26.61	0.003	2.33E-03	11.8	-2.0		
25	17.63	-16.01	0.003	2.33E-03	3.8	0.3		98960
26	17.25	-4.36	0.002	2.33E-03	-0.0	0.0		---

At elev. 26.10 Strut force = 34.8 kN/strut = 34.8 kN/m run

At elev. 22.06 Strut force = 21.2 kN/strut = 21.2 kN/m run

(continued)

Stage No.13 Apply water pressure profile no.2 (Worst Cred.)

Node no.	Y coord	LEFT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	0.00	0.00	0.00	1774
7	24.10	0.00	9.49	4.04	24.18	4.04	4.04a	1774
8	23.60	0.00	20.51	8.72	52.25	8.72	8.72a	1774
9	23.25	3.43	25.16	10.70	64.10	10.89	14.32	1774
10	22.95	6.35	34.53	14.68	87.97	15.23	21.58	1774
11	22.65	9.27	49.24	20.93	125.42	21.85	31.12	1774
12	22.36	12.19	58.67	24.94	149.45	26.24	38.43	1774
13	22.06	15.11	63.79	27.12	162.49	28.80	43.91	1588
14	22.00	15.70	64.50	27.42	164.31	29.18	44.88	1588
		15.70	64.50	22.86	207.37	24.79	40.49	7939
15	21.64	19.23	68.28	24.20	219.53	26.79	46.01	7939
16	21.50	20.60	69.42	24.60	223.18	27.43	48.03	7939
17	21.09	24.62	72.34	25.64	232.58	29.03	53.66	7939
18	20.68	28.65	75.11	26.62	241.49	30.49	59.14	7939
19	20.50	30.41	76.35	27.06	245.46	31.10	61.51	7939
20	20.00	35.32	79.91	28.32	256.90	32.65	67.97	7939
21	19.50	40.22	83.66	29.65	268.96	33.97	74.20	7939
22	19.00	45.13	87.58	31.04	281.58	35.13	80.26	7939
23	18.50	50.03	91.64	32.48	294.63	36.08	86.11	7939
24	18.00	54.94	95.80	33.95	308.01	35.19	90.13	20082
		54.94	95.80	40.73	244.05	64.02	118.96	43678
25	17.63	58.61	98.98	42.08	252.15	84.07	142.68	44989
26	17.25	62.29	102.19	43.44	260.33	105.13	167.42	46299

Node no.	Y coord	RIGHT side					Total earth pressure kN/m2	Coeff. of subgrade reaction 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	26.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	25.46	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	25.18	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	24.89	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	24.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	24.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	23.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	22.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	22.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	22.36	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	22.06	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	21.64	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		19.23	0.77	0.33	1.97	0.33	19.56a	1588
16	21.50	20.60	1.92	0.81	4.88	0.81	21.42a	1588
17	21.09	24.62	5.27	2.24	13.44	2.52	27.14	1588
18	20.68	28.65	8.63	3.67	21.98	4.25	32.89	1588
		28.65	8.63	3.06	27.73	3.06	31.70a	7939

(continued)

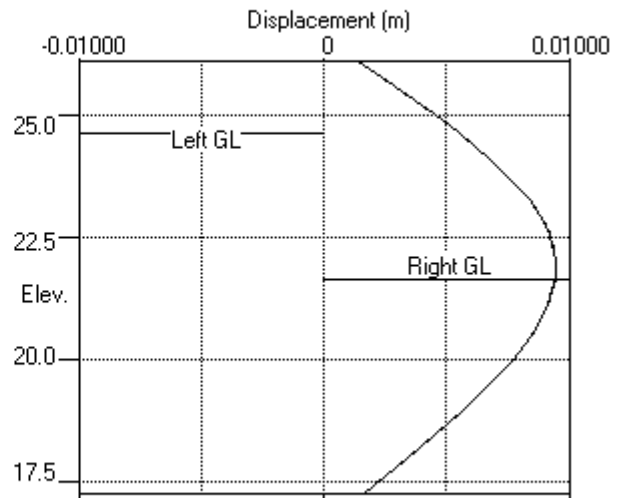
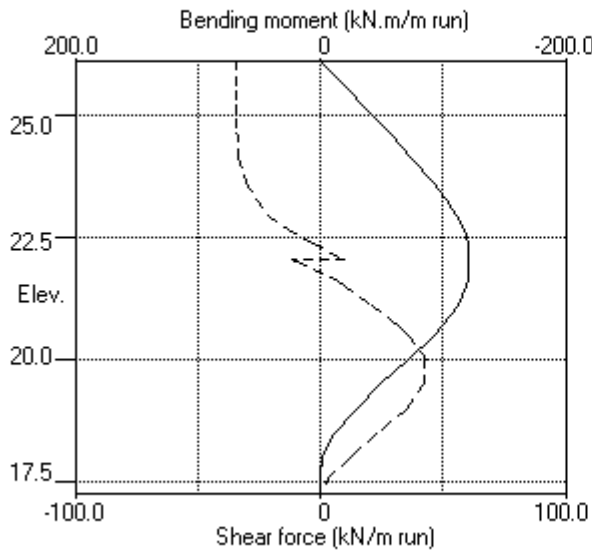
Stage No.13 Apply water pressure profile no.2 (Worst Cred.)

Node no.	Y coord	----- RIGHT side -----					Total earth pressure	Coeff. of subgrade reaction
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
19	20.50	30.41	10.46	3.71	33.62	9.91	40.32	7939
20	20.00	35.32	15.53	5.50	49.92	25.96	61.28	7939
21	19.50	40.22	20.58	7.29	66.15	42.30	82.52	7939
22	19.00	45.13	25.60	9.07	82.32	58.89	104.01	7939
23	18.50	50.03	30.60	10.85	98.39	59.98	110.01	7939
24	18.00	54.94	35.58	12.61	114.38	54.70	109.63	20082
		54.94	35.58	15.12	90.63	90.63	145.56p	43678
25	17.63	58.61	39.29	16.70	100.08	100.08	158.69p	44989
26	17.25	62.29	42.98	18.27	109.49	109.49	171.78p	46299

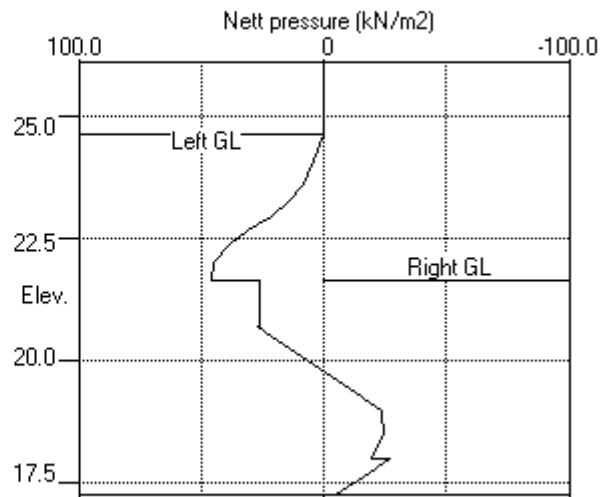
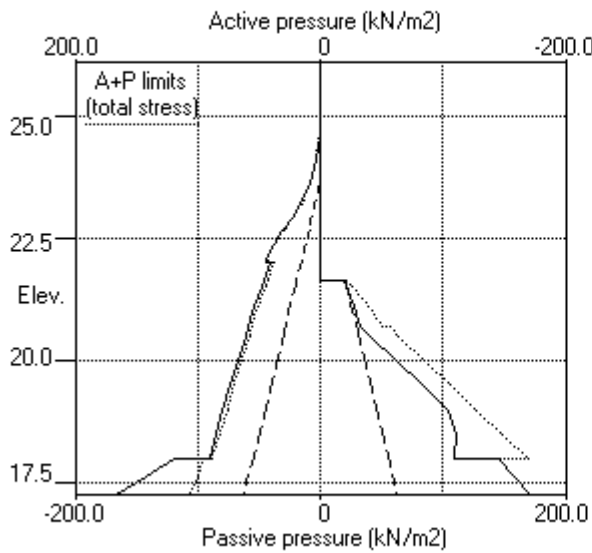
Note: 31.70a Soil pressure at active limit
 171.78p Soil pressure at passive limit

Units: kN,m

Stage No.13 Apply water pressure profile no.2 (Worst Cred.)



Stage No.13 Apply water pressure profile no.2 (Worst Cred.)



PILEDESIGNS LTD
 Program: WALLAP Version 6.06 Revision A51.B69.R54
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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

LIMIT STATE PARAMETERS

Limit State: ULS DA1 Combination 2
 Water pressures : Worst Credible
 Partial factor on C' = 1.250
 Partial factor on Phi' = 1.250
 Partial factor on Cu = 1.400
 Partial factor on Soil Modulus = 1.000
 Partial factor on Permanent Unfavourable loads = 1.000
 Partial factor on Permanent Favourable loads = 1.000
 Partial factor on Variable Unfavourable loads = 1.300

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.	Overall		Toe elev. for FoS = 1.000	Toe elev.	Wall Penetr -ation	Direction of failure
			Factor of Safety	Moment of equilib. at elev.				
1	24.60 24.60	Cant.	Conditions not suitable for FoS calc.					
2	24.60 24.60	Cant.	Conditions not suitable for FoS calc.					
3	24.60 24.60		No analysis at this stage					
4	24.60 24.60	25.75	Conditions not suitable for FoS calc.					
5	24.60 20.68	25.75	1.492	n/a	17.85	2.83		L to R
6	24.60 21.64	25.75	1.977	n/a	19.58	2.06		L to R
7	24.60 21.64		No analysis at this stage					

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

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 Data filename/Run ID: Fitzrovia_Wall_4_600mm_rev_03_ULS2
 Fitzrovia - Middlesex Hospital Annexe
 Wall 4, Secant-ULS2, 600 dia @ 900 - run 03

Sheet No.
 Job No. 23198
 Made by : DBS
 Date:12-06-2020
 Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall

Analysis options

Length of wall perpendicular to section = 50.00m
 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 50.00 from wall
 Right side 50.00 from wall

Limit State: ULS DA1 Combination 2

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	26.10	0.002	0.000	0.0	-0.0	0.0	-44.1
2	25.75	0.002	0.000	0.0	-15.4	0.0	-50.2
3	25.46	0.003	0.000	0.0	-28.1	0.0	-50.2
4	25.18	0.004	0.000	0.0	-40.7	0.0	-50.2
5	24.89	0.005	0.000	0.0	-53.4	0.0	-50.2
6	24.60	0.006	0.000	0.0	-66.1	0.0	-50.2
7	24.10	0.007	0.000	0.0	-87.8	0.0	-49.2
8	23.60	0.008	0.000	0.0	-108.6	0.0	-46.0
9	23.25	0.008	0.000	0.0	-121.9	0.0	-42.3
10	22.95	0.009	0.000	0.0	-133.8	0.0	-37.9
11	22.65	0.009	0.000	0.0	-144.2	0.0	-31.7
12	22.36	0.010	0.000	0.0	-152.5	0.4	-23.5
13	22.06	0.010	0.000	0.0	-158.1	9.2	-24.6
14	22.00	0.010	0.000	0.0	-158.9	2.6	-22.5
15	21.64	0.010	0.000	0.0	-161.2	6.2	-11.3
16	21.50	0.010	0.000	0.0	-161.1	10.0	-6.7
17	21.09	0.010	0.000	0.1	-156.9	20.8	-2.0
18	20.68	0.009	0.000	0.0	-146.6	33.6	-2.2
19	20.50	0.009	0.000	0.0	-140.0	40.1	-1.9
20	20.00	0.008	0.000	0.0	-116.5	52.7	-0.7
21	19.50	0.007	0.000	0.0	-88.7	57.6	-0.3
22	19.00	0.006	0.000	0.0	-60.2	55.1	-0.1
23	18.50	0.005	0.000	0.0	-32.9	49.0	0.0
24	18.00	0.004	0.000	0.0	-9.9	45.4	0.0
25	17.63	0.003	0.000	0.5	-0.6	13.2	0.0
26	17.25	0.002	0.000	0.0	0.0	0.0	-0.0

Summary of results (continued)

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	0.1	21.09	-0.7	19.00	1.1	22.00	-0.6	23.60
2	0.0	17.63	-3.4	22.36	2.6	22.00	-2.8	22.95
3	No calculation at this stage							
4	0.0	25.75	-8.0	19.50	7.7	18.00	-3.8	22.95
5	0.0	25.75	-161.2	21.64	57.6	19.50	-50.2	25.75
6	0.0	25.75	-158.0	21.64	56.4	19.50	-49.6	25.75
7	No calculation at this stage							
8	No calculation at this stage							
9	0.0	17.25	-153.9	21.64	55.4	19.50	-44.1	26.10
10	0.5	17.63	-120.6	21.50	43.9	19.50	-32.1	26.10
11	No calculation at this stage							
12	No calculation at this stage							
13	0.3	17.63	-120.7	22.00	43.0	20.00	-34.8	26.10

Maximum and minimum displacement at each stage

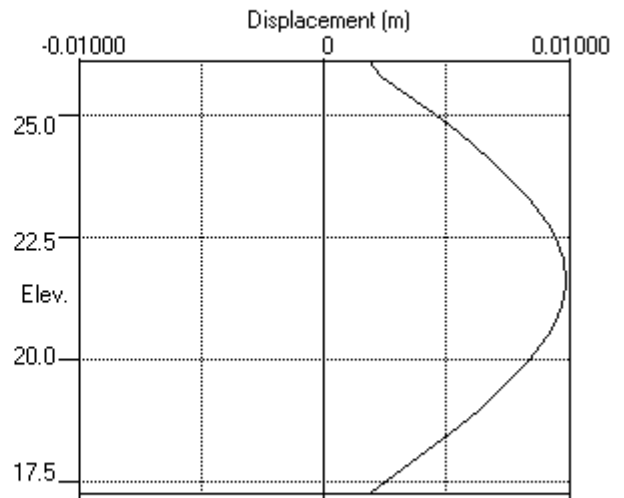
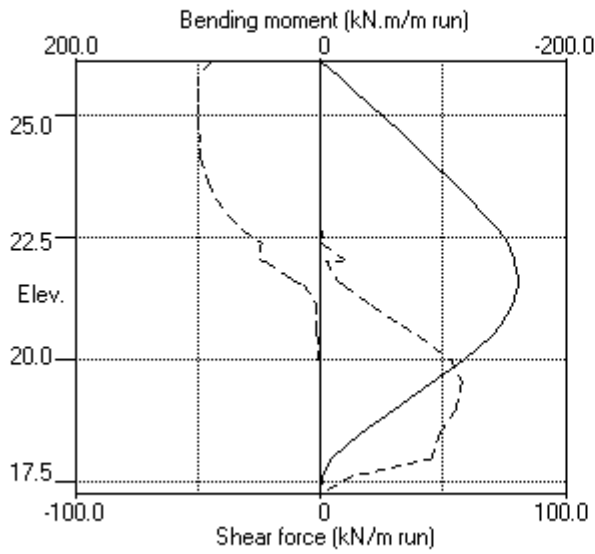
Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.001	26.10	0.000	26.10	Apply surcharge no.1 at elev. 24.60
2	0.002	26.10	0.000	26.10	Apply surcharge no.2 at elev. 23.25
3	No calculation at this stage				Install strut no.1 at elev. 25.75
4	0.002	26.10	0.000	26.10	Apply water pressure profile no.1
5	0.010	21.64	0.000	26.10	Excav. to elev. 20.68 on RIGHT side
6	0.009	21.64	0.000	26.10	Fill to elev. 21.64 on RIGHT side
7	No calculation at this stage				Install strut no.2 at elev. 22.06
8	No calculation at this stage				Install strut no.3 at elev. 26.10
9	0.009	21.64	0.000	26.10	Remove strut no.1 at elev. 25.75
10	0.010	21.64	0.000	26.10	Change EI of wall to 98960kN.m ² /m run
11	No calculation at this stage				Change soil type 3 to soil type 4
12	No calculation at this stage				Apply surcharge no.3 at elev. 21.64
13	0.009	22.00	0.000	26.10	Apply water pressure profile no.2

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1		Strut no. 2		Strut no. 3	
	at elev. 25.75 kN/m run	kN/strut	at elev. 22.06 kN/m run	kN/strut	at elev. 26.10 kN/m run	kN/strut
4	0.48	2.42	---	---	---	---
5	50.18	250.90	---	---	---	---
6	49.62	248.11	---	---	---	---
9	---	---	6.82	6.82	44.05	44.05
10	---	---	28.91	28.91	32.07	32.07
13	---	---	21.23	21.23	34.77	34.77

Units: kN,m

Bending moment, shear force, displacement envelopes



APPENDIX C

Ref No	Description
C1	Results of "ADC" analysis for 600mm diameter wall piles with 6 x B20mm bars, 0kN compression load (Wall 4).
C2	Results of "ADC" analysis for 600mm diameter wall piles with 6 x B25mm bars, 0kN compression load (Walls 1 and 2).
C3	Results of "ADC" analysis for 600mm diameter wall piles with 6 x B32mm bars, 0kN compression load (Wall 3).
C4	Results of Helical Check for 600mm diameter wall piles with 6 x B20mm bars, B8mm helical @ 250mm centres, 75mm cover (Wall 4).
C5	Results of Helical Check for 600mm diameter wall piles with 6 x B25mm bars, B8mm helical @ 250mm centres, 75mm cover (Walls 1 and 2).
C6	Results of Helical Check for 600mm diameter wall piles with 6 x B32mm bars, B10mm helical @ 250mm centres, 75mm cover (Wall 3).

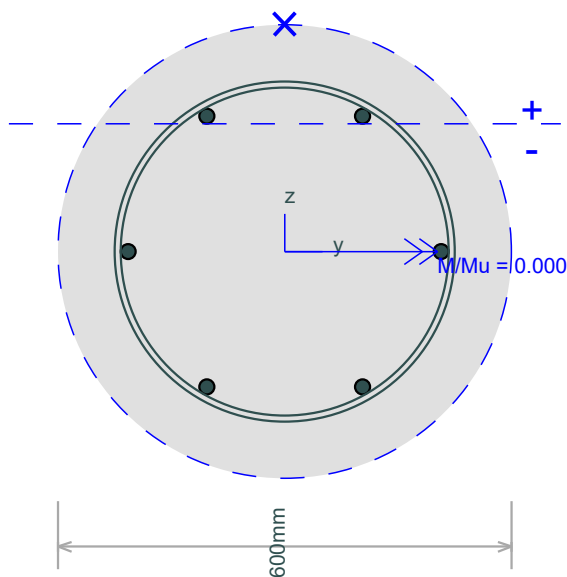
Job No.	Sheet No.	Rev.
23198		
Drg. Ref.		
Made by DBS	Date 12-Jun-2020	Checked

Reinforcement Details

Bar Arrangement	1 ring(s)/6 bars per ring
Diameter of main bars	20mm
Area of reinforcement	1884.96mm ²
Nominal Cover (outer)	75mm

Design Results

Analysis Case Name	Analysis Case 1
Axial Design Force	0kN
Axial Capacity	5094.52kN
Design Moment 'M'	0kNm
Ultimate Moment 'Mu'	177.307kNm
Neutral Axis	— — —
Comp./Tens. Side	+/-
Governing Node/Bar	X


Section 1
 Analysis Case 1

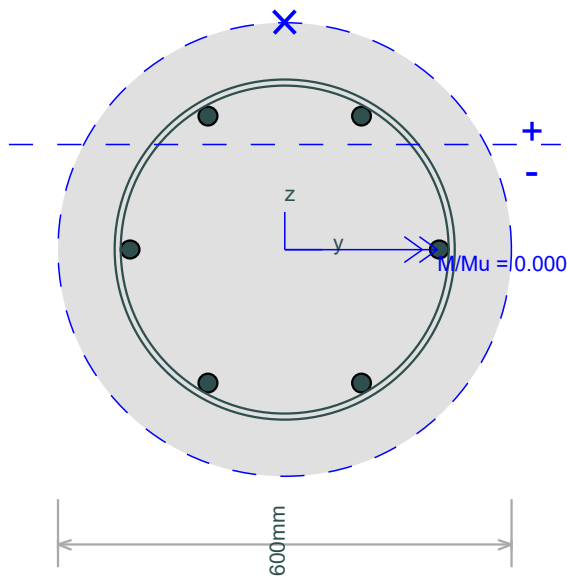
Job No.	Sheet No.	Rev.
23198		
Drg. Ref.		
Made by DBS	Date 12-Jun-2020	Checked

Reinforcement Details

Bar Arrangement	1 ring(s)/6 bars per ring
Diameter of main bars	25mm
Area of reinforcement	2945.24mm ²
Nominal Cover (outer)	75mm

Design Results

Analysis Case Name	Analysis Case 1
Axial Design Force	0kN
Axial Capacity	5502.25kN
Design Moment 'M'	0kNm
Ultimate Moment 'Mu'	258.182kNm
Neutral Axis	— — —
Comp./Tens. Side	+/-
Governing Node/Bar	X



Section 1
 Analysis Case 1

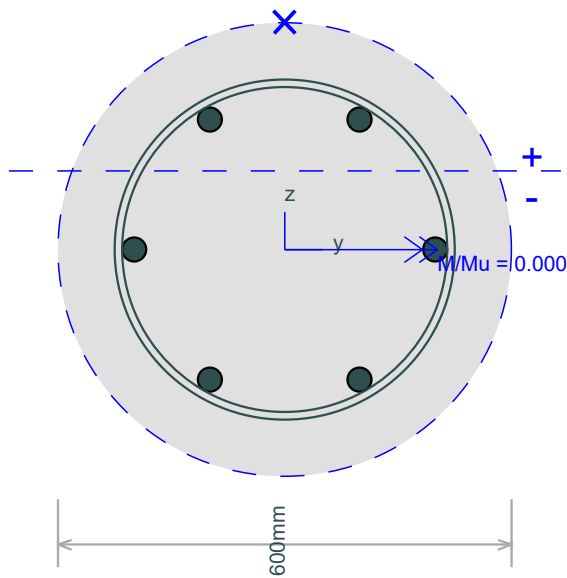
Job No.	Sheet No.	Rev.
23198		
Drg. Ref.		
Made by DBS	Date 12-Jun-2020	Checked

Reinforcement Details

Bar Arrangement	1 ring(s)/6 bars per ring
Diameter of main bars	32mm
Area of reinforcement	4825.49mm ²
Nominal Cover (outer)	75mm

Design Results

Analysis Case Name	Analysis Case 1
Axial Design Force	0kN
Axial Capacity	6225.29kN
Design Moment 'M'	0kNm
Ultimate Moment 'Mu'	373.258kNm
Neutral Axis	— — —
Comp./Tens. Side	+/-
Governing Node/Bar	X



Section 1
Analysis Case 1

Project	FITZROVIA - Middlesex Hospital Annexe	Project No.	23198	Date	12/06/20
Tilte	600mm Pile Shear Check - Wall 4	By	DBS	Check By	Page 1

REFERENCE
EC2
Shear to EN 1992-1-1:2004 (EC2) Circular Sections (Cast In-situ) using helical reinforcement
Pile section

4.4.1.3(4)	pile dia d_{nom} =	600 mm		
	design pile diameter =	600 mm		
	A_c =	282743 mm ²		
	cover c_{nom} =	75 mm	$k_2 =$	75 mm [NA.1 4.4.1.3 (4)]
	main bar dia =	20 mm		
	no. main bars =	6 no.		
	helical dia. =	8 mm		
	d =	425 mm	$\gamma_c =$	1.5 (This is adjusted by $K_f=1.1$ [2.4.2.5 (2)] to give 1.65)
	f_{ck} =	30 MPa	$\gamma_c =$	1.65 $\alpha_{cc} =$
	f_{yk} =	500 MPa	$\gamma_s =$	1.15 [NA.1 3.1.6 (1)]
	Ult V_{Ed} =	52.2 kN	SF factor	1
	Ult V_{Ed} =	52.2 kN		
	factored action: N_{Ed} =	0 kN		

6.2.2

Check requirement for shear reinforcement

$V_{Rd,c}$ =	$[C_{Rd,c}k(100\rho_1f_{ck})^{1/3}+k_1\sigma_{cp}]b_wd$	$CR_{d,c}$ =	$0.18 / \gamma_c$	0.11
with minimum =	$(v_{min}+k_1\sigma_{cp})b_wd$	k =	$1+(200/d)^{1/2}$	1.69 <=2.0
v_{min} =	$0.035k^{3/2}f_{ck}^{1/2}$	ρ_1 =	A_{sl}/b_wd	0 <=0.02
	0.4196	σ_{cp} =	N_{ed}/A_c	0 < 0.2 f_{cd}
		k_1 =	0.15	[NA.1 6.2.2(1)]

$$V_{Rd,c} = 105 \text{ kN}$$

Is $V_{Rd,c} > V_{Ed}$ => **YES** Action: **No shear links needed - provide nominal links as req'd**

6.2.3

Design Shear Reinforcement

 Check concrete strut capacity at $\cot \theta = 2.5$:-

 6.2.3 (3)
exp 6.9

$V_{Rd,max}$ =	$\alpha_{cw} \cdot b_w \cdot z \cdot v_1 \cdot f_{cd} / (\cot \theta + \tan \theta)$	(6.9)	$\cot \theta$ =	2.5
			$\tan \theta$ =	0.4
			α_{cw} =	1 [NA.1 6.2.3(3)]
			z =	0.9d 383 mm
$V_{Rd,max}$ =	646 kN		v_1 =	0.6 (1-($f_{ck}/250$)) 0.53 [6.6N]

Is $V_{Rd,c} > V_{Ed}$ => **NA** Action:

Calculation for strut inclination:-

θ =	$0.5 \cdot \sin^{-1}[(6.54 \cdot V_{Ed}) / (b_w \cdot d \cdot (1 - f_{ck}/250) \cdot f_{ck})]$	
θ =	NA rad	$\cot \theta =$
		2.5 > 1.0

Calculate shear reinforcement spacing after Turmo et al (2008):-

$V_{Rd,s}$ =	$z \cdot \cot \theta \cdot (A_\phi / 0.5s) \cdot f_{ywd} \cdot 0.85$	A_ϕ =	50.3 mm ²
s =	$2 \cdot ([z \cdot \cot \theta \cdot A_\phi \cdot f_{ywd} \cdot 0.85] / V_{Rd,s})$	f_{ywd} =	435 MPa
	NA mm		

Provide 8 mm helical at nominal pitch 300 mm
--

Project	FITZROVIA - Middlesex Hospital Annexe	Project No.	23198	Date	12/06/20
Titile	600mm Pile Shear Check - Walls 1 & 2	By	DBS	Check By	Page 1

REFERENCE
EC2
Shear to EN 1992-1-1:2004 (EC2) Circular Sections (Cast In-situ) using helical reinforcement
Pile section

4.4.1.3(4)	pile dia d_{nom} =	600 mm		
	design pile diameter =	600 mm		
	A_c =	282743 mm ²		
	cover c_{nom} =	75 mm	$k_2 =$	75 mm [NA.1 4.4.1.3 (4)]
	main bar dia =	25 mm		
	no. main bars =	6 no.		
	helical dia. =	8 mm		
	d =	422 mm	$\gamma_c =$	1.5 (This is adjusted by $K_f=1.1$ [2.4.2.5 (2)] to give 1.65)
	f_{ck} =	30 MPa	$\gamma_c =$	1.65 $\alpha_{cc} =$
	f_{yk} =	500 MPa	$\gamma_s =$	1.15 0.85 [NA.1 3.1.6 (1)]
	Ult V_{Ed} =	98.4 kN	SF factor	1
	Ult V_{Ed} =	98.4 kN		
	factored action: N_{Ed} =	0 kN		

6.2.2

Check requirement for shear reinforcement

$V_{Rd,c}$ =	$[C_{Rd,c}k(100\rho_1f_{ck})^{1/3}+k_1\sigma_{cp}]b_wd$	$CR_{d,c}$ =	$0.18 / \gamma_c$	0.11
with minimum	$= (v_{min}+k_1\sigma_{cp})b_wd$	k =	$1+(200/d)^{1/2}$	1.69 ≤ 2.0
v_{min} =	$0.035k^{3/4}f_{ck}^{1/2}$	ρ_1 =	A_{sl}/b_wd	0.01 ≤ 0.02
	0.4205	σ_{cp} =	N_{ed}/A_c	0 $< 0.2f_{cd}$
		k_1 =	0.15	[NA.1 6.2.2(1)]

$$V_{Rd,c} = 107 \text{ kN}$$

 Is $V_{Rd,c} > V_{Ed}$ \Rightarrow **YES** Action: **No shear links needed - provide nominal links as req'd**

6.2.3

Design Shear Reinforcement

 Check concrete strut capacity at $\cot \theta = 2.5$:-

 6.2.3 (3)
exp 6.9

$V_{Rd,max}$ =	$\alpha_{cw} \cdot b_w \cdot z \cdot V_1 \cdot f_{cd} / (\cot \theta + \tan \theta)$	(6.9)	$\cot \theta$ =	2.5
			$\tan \theta$ =	0.4
			α_{cw} =	1 [NA.1 6.2.3(3)]
			z =	0.9d 380 mm
$V_{Rd,max}$ =	642 kN		V_1 =	0.6 (1-($f_{ck}/250$)) 0.53 [6.6N]

 Is $V_{Rd,c} > V_{Ed}$ \Rightarrow **NA** Action:

Calculation for strut inclination:-

θ =	$0.5 \cdot \sin^{-1}[(6.54 \cdot V_{Ed}) / (b_w \cdot d \cdot (1 - f_{ck}/250) \cdot f_{ck})]$	
θ =	NA rad	$\cot \theta =$
		2.5 > 1.0

Calculate shear reinforcement spacing after Turmo et al (2008):-

$V_{Rd,s}$ =	$z \cdot \cot \theta \cdot (A_\phi / 0.5s) \cdot f_{ywd} \cdot 0.85$	A_ϕ =	50.3 mm ²
s =	$2 \cdot ([z \cdot \cot \theta \cdot A_\phi \cdot f_{ywd} \cdot 0.85] / V_{Rd,s})$	f_{ywd} =	435 MPa
	NA mm		

Provide 8 mm helical at nominal pitch 300 mm
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 Turo, J, *et al*. Shear truss analogy for concrete members of solid and hollow circular cross section. **Eng. Struct.** (2008)

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REFERENCE
EC2
Shear to EN 1992-1-1:2004 (EC2) Circular Sections (Cast In-situ) using helical reinforcement
Pile section

4.4.1.3(4)	pile dia d_{nom} =	600 mm		
	design pile diameter =	600 mm		
	A_c =	282743 mm ²		
	cover c_{nom} =	75 mm	$k_2 =$	75 mm [NA.1 4.4.1.3 (4)]
	main bar dia =	32 mm		
	no. main bars =	6 no.		
	helical dia. =	10 mm		
	d =	417 mm	$\gamma_c =$	1.5 (This is adjusted by $K_f=1.1$ [2.4.2.5 (2)] to give 1.65)
	f_{ck} =	30 MPa	$\gamma_c =$	1.65 $\alpha_{cc} =$
	f_{yk} =	500 MPa	$\gamma_s =$	1.15
	Ult V_{Ed} =	151.9 kN	SF factor	1
	Ult V_{Ed} =	151.9 kN		
	factored action: N_{Ed} =	0 kN		

6.2.2

Check requirement for shear reinforcement

$V_{Rd,c}$ =	$[C_{Rd,c}k(100\rho_1f_{ck})^{1/3}+k_1\sigma_{cp}]b_wd$	$CR_{d,c}$ =	$0.18 / \gamma_c$	0.11
with minimum	$= (v_{min}+k_1\sigma_{cp})b_wd$	k =	$1+(200/d)^{1/2}$	1.69 ≤ 2.0
v_{min} =	$0.035k^{3/2}f_{ck}^{1/2}$	ρ_1 =	A_{sl}/b_wd	0.01 ≤ 0.02
	0.4223	σ_{cp} =	N_{ed}/A_c	0 $< 0.2f_{cd}$
		k_1 =	0.15	[NA.1 6.2.2(1)]

$$V_{Rd,c} = 106 \text{ kN}$$

Is $V_{Rd,c} > V_{Ed}$ \Rightarrow **NO** Action: **Design of shear reinforcement required**

6.2.3

Design Shear Reinforcement

 Check concrete strut capacity at $\cot \theta = 2.5$:-

 6.2.3 (3)
exp 6.9

$V_{Rd,max}$ =	$\alpha_{cw} \cdot b_w \cdot z \cdot v_1 \cdot f_{cd} / (\cot \theta + \tan \theta)$	(6.9)	$\cot \theta =$	2.5
			$\tan \theta =$	0.4
$V_{Rd,max}$ =	633 kN		$\alpha_{cw} =$	1 [NA.1 6.2.3(3)]
			$z =$	0.9d 375 mm
			$v_1 =$	0.6 (1-($f_{ck}/250$)) 0.53 [6.6N]

Is $V_{Rd,c} > V_{Ed}$ \Rightarrow **YES** Action: **Calculate link spacing**

Calculation for strut inclination:-

$\theta =$	$0.5 \cdot \sin^{-1} [(6.54 \cdot V_{Ed}) / (b_w \cdot d \cdot (1 - f_{ck}/250) \cdot f_{ck})]$	
$\theta =$	NA rad	$\cot \theta =$
		2.5 > 1.0

Calculate shear reinforcement spacing after Turmo et al (2008):-

$V_{Rd,s}$ =	$z \cdot \cot \theta \cdot (A_\phi / 0.5s) \cdot f_{ywd} \cdot 0.85$	$A_\phi =$	78.5 mm ²
s =	$2 \cdot ([z \cdot \cot \theta \cdot A_\phi \cdot f_{ywd} \cdot 0.85] / V_{Rd,s})$	$f_{ywd} =$	435 MPa
	358 mm		

Provide 10 mm helical at nominal pitch 300 mm