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Structural Assessment Report External Development Adjacent TfNSW Railway Corridor

For Proposed Development:
At 2 Mandala Place, Castle Hill

Prepared For:
Deicorp Pty Ltd
Level 3, 161 Redfern Street
REDFERN NSW 2016

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Structural Assessment Report



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1. Introduction

ABC Consultants has been engaged by Deicorp Pty Ltd to complete the structural engineering design for the proposed multi residential development at 2 Mandala Parade, Castle Hill.

The development site exists directly opposite the Hills Showground Metro station box and tunnels which are located across Mandala Parade.

The purpose of this report is to provide an assessment of the impact of the proposed structure on the proposed Sydney Metro infrastructure and demonstrate compliance with structural design requirements outlined in TfNSW Technical Guidelines – NWRLSRT-PBA-SRT-TU-REP-000008 – Sydney Metro Underground Corridor Protection – Revision 1.



2. Project Description

The proposed development site is located at 2 Mandala Parade, Castle Hill, NSW 2154. The site is bound by De Clambe Drive, Andalusian Way, Mandala Parade and Doran Drive to the North, East, South and West respectively. The Hills Showground Metro station is located to the south across Mandala Parade.

The metro infrastructure adjacent to the development consists of the Hills Showground station box as well as the two metro tunnels running approximately East to West which meet the station box.

The total site area is approximately 7,969m². The site is currently vacant land consisting mostly of grassed area with some trees and shrubbery throughout the site. Refer to the existing site survey prepared by Daw & Walton Pty Ltd project 5042-20 Revision 02 dated 17 August 20120 for survey details.

The proposed development is a mixed retail, commercial and residential development consisting of two residential buildings above and common retail / commercial / open space podium with associated basement parking. The residential towers range up to 20 stories in height with the proposed basement extending six levels below ground. Refer to architectural plans prepared by Turner architects project number 19068 for full development details.



Figure 1 - Locality Map



3. Sydney Metro

The Sydney Metro Norwest is a rail infrastructure project which was completed in mid 2019. The project consists of twin metro tunnels serving stations from Tallawong through to Chatswood.

3.1. Protection Reserves

Protection reserves define the extent of zones that have been established to protect existing metro infrastructure and protect the feasibility of planned metro infrastructure from future adjacent developments.

The technical guideline defines two reserves for the protection of the Sydney Metro tunnels and station boxes. A first reserve is defined for a distance nearer to the tunnel where all works are heavily restricted and stringently reviewed. A second reserve is defined beyond the first reserve where any proposed works are still required to be assessed however less may proceed provided they meet the requirements set out by TfNSW. Table 4.5 of the technical guidelines provides a list of construction restrictions that apply to each reserve.

For the metro tunnels the reserves are defined as follows:

- First reserve extends from the tunnel edge inscribed with a square to a distance the greater of 5m or the extent of the Sydney Metro Substratum.
- Second reserve extends to a greater of 25m or the width of the tunnel from the first reserve.

For the metro station boxes the reserves are defined similarly as follows:

- First reserve extends up to the Sydney Metro Substratum or property boundary.
- Second reserve extends from the first reserve up to 25m.

Figures 4.1 and 4.2 provide a diagrammatic outline of the reserve extents with Figure 4.2 being applicable for this project.

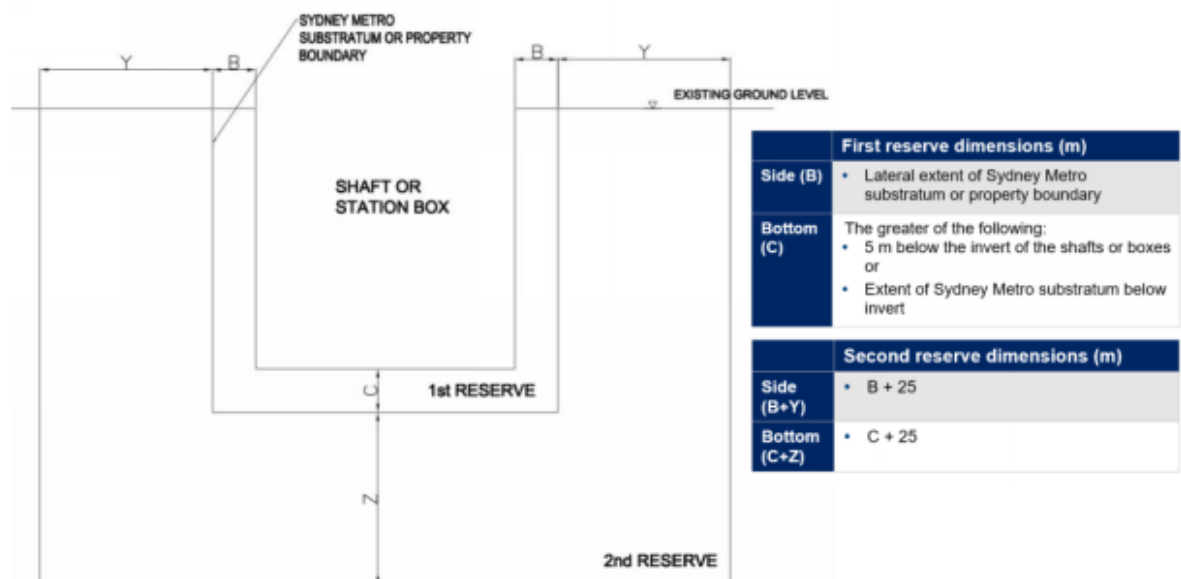


Figure 4.2 Protection reserves for shafts and station boxes

Sydney Metro Underground Corridor Protection Technical Guideline – April 2021

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Figure 2 - Typical Metro Protection Reserves Section



3.2. Infrastructure location

The proposed development is located opposite the Hills Showground station box for the full length of the development site with the metro tunnels commencing beyond the development extent at either side of the station box.

As such the location of the infrastructure and protection reserves are based on the property boundary of the station box as defined in the Daw & Walton survey.

Based on the survey drawings the distance between the Sydney Metro and development site property boundaries range between 25.8m and 26.5m.

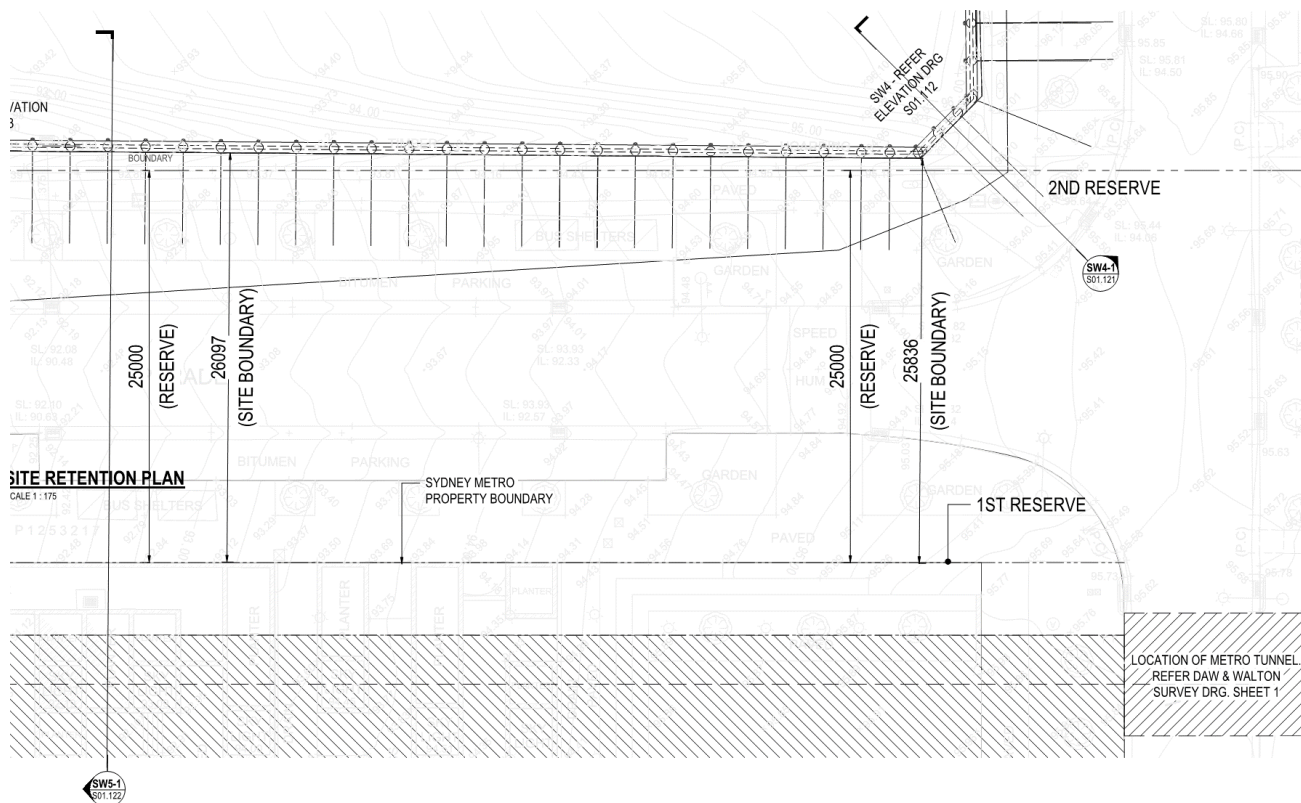


Figure 3 - Extract from structural shoring plan showing measurement to between the site boundaries

Given the second reserve is defined as extending 25m past the metro property boundary it can be seen that the development site exists completely outside of the first and second protection reserves.

Although the development site and the proposed shoring wall and piles are located completely outside of the protection reserves, the current development plan does propose temporary retention of the basement excavation by means of shoring anchors bonded external of the site into the sandstone. These anchors will extend into the second protection reserve and hence require assessment.

A structural shoring plan has been prepared for the subject development which identifies the proximity of the shoring wall to the Sydney Metro property boundary.



4. Geotechnical Investigation

A geotechnical engineering report has been completed for the subject project by EI Australia, Report No. E24724.G03 dated 26 August January 2020. The report details a geotechnical investigation of the site which includes existing site condition, soil stratigraphy, ground water measurements and recommendations for foundation design and basement retention.

Below is a summary of the geotechnical report with relevance to the structural engineering design.

4.1. Stratigraphy

The sub-surface material described in the geotechnical engineering report generally consists of fill, residual soil, Class V/IV sandstone and Class III sandstone.

Six boreholes were completed for the site. The depth to each sub-surface material at each borehole is shown in Table 1 below.

Due to the varying depth of the sub-surface material across the site, various models have been assessed at regular distances along the shoring wall with the worst case between the two nearest boreholes taken as the soil profile.

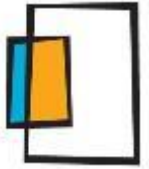
Material	BH1	BH2	BH3	BH4	BH5	BH6
Fill	0.0 (96.50)	0.0 (95.10)	0.0 (91.00)	0.0 (98.00)	0.0 (94.10)	0.0 (90.80)
Residual Soil	0.6 (95.90)	1.4 (93.70)	2.60 (88.40)	4.0 (94.00)	1.8 (92.30)	1.2 (89.60)
Class V/IV Sandstone	2.1 (94.40)	NE	NE	NE	NE	NE
Class II/III Sandstone	3.0 (93.50)	3.3 (91.80)	2.90 (88.10)	5.0 (93.00)	2.0 (92.10)	1.5 (89.30)

Table 1 - Approximate Depth to Sub-surface Material (m).

The geotechnical design parameters, including the earth pressure coefficients, cohesion, friction angle and unit weight adopted in the shoring wall design are shown below.

Material	Earth Pressure Coefficients			c' (kPa)	φ' (deg.)	Youngs Modulus (MPa)	Unit Weight (kN/m³)
	K_a	K_o	K_p				
Fill	0.41	0.58	2.46	0	25	10	18
Residual Soil	0.41	0.58	2.46	5	25	10	20
Class V / IV Sandstone	0.27	0.43	3.69	5	35	30	23
Class II/III Sandstone	0.21	0.35	4.60	30	40	200	24

Table 2 – Geotechnical design parameters for site materials.



4.2. Ground Water

Three ground water monitoring wells were installed on the site at bore holes 3M, 4M and 5M. Ground water was observed in all the monitoring wells at a level well above the bulk excavation level.

Due to the low permeability of the rock, the geotechnical engineer advises that ground water inflows should not have an adverse impact on the proposed development or neighbouring sites. The geotechnical engineer recommends that the drainage should be provided behind the shoring wall and below the basement floor slab to capture any seepage water.

It is recommended that adequate drainage is provided behind the proposed shoring walls to collect and drain any inflow water.

4.3. Excavation Support

The basement excavation is proposed near to the site boundaries and the high level soil material is not suitable for vertical cut. To ensure the stability of the excavation during construction, temporary batters may be provided at a ratio of 1V:1H to the BEL of the basement. Alternatively, where the batters are not feasible, a suitably designed shoring wall will need to be constructed.

The six level basement excavation proposed for the site is not feasible to excavate using a batter slope. To ensure the stability of existing structures and infrastructure during construction the geotechnical engineer recommends an anchored soldier pile wall to support the fill, residual soil and Class V / IV sandstone.

The Class II/III sandstone is considered suitable to be able to be vertically cut without support with some stabilisation measures such as rock bolts and shotcrete or dental treatment to be provided to local defects. The excavation of the unsupported rock must be completed in the presence of a geotechnical engineer.

4.4. Foundation Design

The expected material to be encountered at the site following bulk excavation is expected to be Class II/III sandstone. In order to limit the potential for differential settlement, the footings will be founded in a uniform material.

Basement strip and pad footings will be proportioned to suit a maximum allowable bearing capacity of 3500kPa for the bedrock.



5. Structural Design

The building structure of the proposed development is a typical concrete framed building consisting of concrete footings, walls, columns and slabs. A copy of the structural engineering documentation for the shoring wall is provided in Appendix A.

The structural engineering design for the shoring wall has been completed in accordance with the following Australian Standards:

- AS1170.0:2002 – Structural Design Actions: General Design Principals
- AS1170.1:2002 – Structural Design Actions: Permanent Imposed and Other Actions
- AS1170.2:2011 – Structural Design Actions: Wind Actions
- AS1170.4:2007 – Structural Design Actions: Earthquake Actions in Australia
- AS2159:2009 – Piling Design and Installation
- AS3600:2018 – Concrete Structures
- AS4100:2020 – Steel Structures
- AS4678:2002 – Earth Retaining Structures
- AS5100:2017 – Bridge Design

5.1. Shoring Wall

The proposed development includes six levels of basement excavation with a proposed bulk earth level of 69.45. Detailed excavations for footings, pits and services will be below this level.

The shoring wall has been analysed using WALLAP at critical cross sections along the southern elevation. The WALLAP analysis outputs displacement and force information required for the wall design based on the geotechnical inputs and wall staging provided.

The shoring wall adjacent is generally designed as a 600diameter soldier pile wall with piles spaced at 2.4m centres. The piles are restrained with at least two rock anchors with a toe anchor located 1.5m above the base of the pile where excavation into the Class II/III sandstone is proposed.

A copy of the shoring wall design calculations relevant to the shoring wall along the Southern boundary adjacent to the railway corridor is provided in Appendix B

5.1.1. Loading

The shoring wall along the southern boundary is designed to withstand the dead load applied by the site soil conditions as well as live load surcharges as shown on the structural engineering documentation.

The design live load surcharge is as nominated below;

- General construction zone - 20kPa
- Footpath zone – 5 kPa

Nil surcharge is imposed on the shoring wall from the Sydney Metro station box or tunnels.



5.1.2. Pile design

The pile specification for all piles on the project is a 600diameter pile at 2.4m centres, 40MPa concrete, 75mm cover, 6N28 vertical and N12-200 closed ties. Pile bending capacity (ϕM_u) = 332kN.m. Pile shear capacity (ϕV_u) = 400kN

The pile bending capacity and pile shear capacity have been calculated in accordance with AS3600:2018 using INDUCTA RCC.

A summary of the maximum applied shear and bending moment forces at each section analysed in WALLAP is presented in the table below.

Wall Section	TOW RL (m)	Maximum Applied Force		Factor of Safety		Deflection (mm)
		Moment (kN.m)	Shear (kN)	Moment	Shear	
SW1-1	90.7	33	55	4.2	3.0	4
SW1-2	91.2	45	52	3.1	3.2	6
SW1-3	92.3	49	45	2.8	3.7	6
SW1-4	93.3	80	51	1.7	3.3	15
SW1-5	94.3	47	51	2.9	3.3	6
SW1-6	95.3	83	50	1.6	3.3	15
SW1-7	96.3	71	75	1.9	2.2	19
SW1-8	97.3	66	80	2.1	2.1	16
SW3-1	97.8	66	89	2.1	1.8	19
SW3-2	97	73	55	1.9	3.0	17
SW3-3	96.2	36	59	3.8	2.8	6
SW5-1	91	72	56	1.9	2.6	11
SW5-2	91.3	93	54	1.5	3.1	17
SW5-3	92.3	74	50	1.9	3.4	11
SW5-4	93.2	48	50	2.9	3.3	6
SW5-5	94	48	50	2.9	3.3	6
SW5-6	95	65	61	2.1	2.7	10
SW5-7	95.8	65	58	2.1	2.8	10
SW7-1	89.9	17	32	8.1	5.2	1

Table 3 - Pile design summary



5.1.3. Anchor design

Shoring anchors have been nominated at regular centres to ensure the bending moment, shear force and displacement of the soldier pile walls do not exceed allowable maximums.

A minimum bond length has been determined to ensure the anchor can be fully bonded into the Class II/III sandstone. The bond length is based on a hole diameter bonded into the rock strength as noted in the schedule below.

The final anchor design is the responsibility of the shoring contractor and may need to be varied to suit site soil conditions. Any design variations will need to be reviewed by the project structural engineers and no anchors are to be permitted past the site boundary.

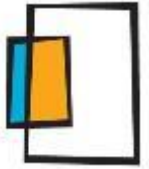
Anchor Mark	Lock off Load	Safe Working Load	Inclination	Minimum hole diameter	Bond Stress	Minimum Bond Length
A1	200kN	300kN	45°	130mm	300kPa	4200mm
A2	300kN	450kN	45°	130mm	300kPa	6200mm
A3	400kN	600kN	45°	130	300kPa	8200mm

Table 4 - Shoring Anchor Design Schedule

5.1.4. Sequence

The proposed basement excavation will proceed in the following sequence:

1. Setout the location of the piles and capping beams as noted on plans, elevation and sections.
2. **Hold point** the geotechnical engineer (who shall be employed by the builder) is required to certify that the soil conditions comply with the design assumptions detailed in the geotechnical investigation report. The geotechnical engineer is to determine the level of supervision required to be able to provide this certificate. Supervision of the material removed as piles are drilled may be required.
3. Drill required bore holes to the diameter specified and depth shown on plans, elevations and sections. Ensure the socket is fully cleaned and all loose material is removed.
4. **Hold point** the structural engineer is to witness the reinforcement cages prior to placement in the bored piles. Placement of the cages within the piles for piles greater than 6m deep is to be witnessed on site
5. Place reinforcement cages in holes ensuring that cages are orientated so drilling through soldier piles for anchors / rock bolts will clear any vertical reinforcement in piles. End caps are to be placed at the base of the reinforcement cage and roller chairs placed at 2m intervals along the length of the pile (a minimum of 3 per section) to ensure minimum cover to the cage is maintained.
6. Using a tremie pipe or similar from the base of the bored hole to ensure no separation of concrete aggregate, place concrete from the base of the pile to underside of capping beam. Vibrate concrete progressively from the base of the pile as the pile is filled.
7. Install capping beam reinforcement in accordance with details on these drawings.
8. **Hold point** the structural engineer is to witness the reinforcement of the capping beam.
9. Place capping beam concrete and allow to cure for a minimum of 7 days.
10. **Hold point** project surveyor is to establish a datum of the capping beam location prior to any excavation past the capping beam. Refer to monitoring notes. Monitoring of the wall is to continue on a regular basis as detailed in the monitoring notes.



11. Excavate against the piles to maximum 500mm below the top level of rock anchors / bolts or to a maximum of 2.0m whichever is the lesser.
12. Drill and epoxy shotcrete dowels into shoring piles as nominated on drawings. Place reinforcement to the shotcrete wall.
13. **Hold point** the structural engineer is to witness the reinforcement of the shotcrete panels and ensure minimum depth is achieved to the panel.
14. Place concrete to shotcrete wall. Shotcrete panels are to be formed and poured or sprayed. If shotcrete walls are sprayed, the panels are to be oversprayed and then screeded back to the design thickness. Shotcrete is to be self-compacting in accordance with as3600
15. If the excavation is at the level of the shoring anchor; scan pile for reinforcement prior to coring anchor hole, a maximum horizontal deviation of 5° to clear any reinforcement is permitted, otherwise contact the structural engineer for further advice. Drill anchor bore holes, install rock anchors / bolts with associated centralisers and grout tubes, place grout within the bore hole. (refer Rock Anchors – Post Tensioned Strand notes).
16. **Hold point** the geotechnical engineer is to witness the wedge lift off and anchor lift off tests as required.
17. Once the grout has achieved design strength and after a minimum 3 days, the rock anchors / bolts may be stressed.
18. Provided the shotcrete panels have reached 25mpa strength and the shoring anchors are fully stressed excavation may continue to the next stage. Repeat steps 10 to 17 the final anchor is installed at the toe of the pile.
19. Continue excavation into the unsupported Class II/III sandstone in accordance with the geotechnical engineering report and advice.
20. Minimum 3 months after ground floor / level 1 slab has been cast, rebates at each slab / pile interface shall be cleaned out and grouted up with an approved non-shrink grout (monolith or equal). When f'c grout is at least 40 MPa. Typical anchors / rock bolts shall be destressed, anchor heads removed and piles made good.

5.1.5. Displacement

A major issue associated with deep excavation is the lateral displacement of the soil mass behind the shoring wall due to the shoring wall deflection.

The shoring wall has been analysed using engineering design software WALLAP. Analysis of the shoring wall predicts a maximum lateral deflection of 20mm at the capping beam. A full deflection plot is provided in the WALLAP results provided in Appendix B.

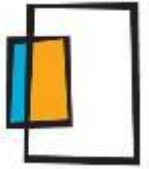
The geotechnical engineer has undertaken FEM analysis to investigate the movement of the shoring wall and the stress relief in the rock during the excavation works and hence the predicted movement of the rock around the Sydney Metro tunnels. Please refer to their report for more details on their assumptions, modelling and predicted results.



5.1.6. Monitoring

To ensure the maximum design displacement of the shoring wall discussed above is not exceeded, the shoring wall will be monitored by means of survey points installed along the wall at regular intervals prior to excavation.

A registered surveyor will monitor the points throughout excavation and construction for any lateral movement. A project specific monitoring report has been undertaken by the project geotechnical engineers EI Australia. Please refer to their report No: E24724.G10 – Monitoring Plan for Sydney Metro for detailed requirements.



5.1.7. Shotcrete

180 thick shotcrete walls are nominated throughout the project to infill the areas between the soldier piles. Based on advice received from the geotechnical engineers, a $4H$ (where H is the height of the shoring wall) working pressure has been applied to the back of the shotcrete wall.

The shotcrete walls are specified as 32MPa concrete with 50mm cover to the front face with RL1018 mesh (main wires horizontal). The shotcrete wall is connected to the shoring piles using N16-350 dowels drilled and epoxied into the piles using HILTI Hit-RE500 chemical epoxy.

5.2. Foundations

The building foundations consist of a combination of strip and pad footings to support the concrete walls and columns above founded below the bulk earth levels at RL 69.45

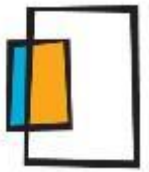
Based on the bulk earth levels above and allowing for a pad footing depth ranging depth of 800mm to 1600mm; the building footings will be founded at a level of RL 67.85.

The footings will be uniformly founded on strong rock material with an Allowable Bearing pressure of 3500 kPa as described in the geotechnical engineer's report and will be constructed using min 40 MPa concrete and 50mm cover.

5.3. Lateral Design

As part of the permanent design of the development, lateral loads due to wind and earthquake will be imposed on the structure throughout its lifetime.

In order to withstand these applied loads, the buildings will utilise concrete core walls to transfer the loads through the structure and down to foundation level. The bearing pressure at the foundation level will not exceed the design Allowable Bearing pressure of 3500kPa.



6. Compliance with TfNSW Sydney Metro Technical Guidelines

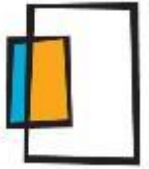
The following sections aims to demonstrate compliance with TfNSW Sydney Metro Underground Corridor Protection Technical Guidelines NWRLSRT-PBA-SRT-TU-REP-000008 which outlines the specific design requirements for external developments near the Sydney Metro tunnel.

In accordance with the standard, the structural engineering design has been completed in accordance with relevant Australian Standards. Refer to the Section 5 of this report for a full list of standards which have been referenced in the design.

6.1. Construction Restrictions Within Tunnel Reserves

Table 4.5 of Section 4.4 of the technical guidelines outline specific construction restrictions within the first and second reserves. The table below summaries compliance with these restrictions.

Type of construction	Designer comment
Excavation for basements and footings	No excavations are proposed within the first or second protection reserves.
Shallow footings or pile foundations	No footings or piles are proposed within the first or second protection reserve.
Tunnels and underground excavations	No tunnels or underground excavations are proposed within the first reserve. Bore holes are proposed within the second reserve to allow installation of temporary ground anchors to restrain the proposed shoring piles. The bore holes are 130mm in diameter and generally spaced in a regular grid. The impact of the bore holes and stress imposed on to the bed rock to the station box is considered negligible. Refer to structural elevations and sections for full details on the extent of the proposed anchors.
Demolition of existing sub-surface structures	No demolition of existing structures is proposed within the first reserve. Demolition of existing sub-surface structures within the second reserve are presented in the referenced documentation for approval.
Penetrative subsurface investigations	No additional sub-surface investigations are proposed.



6.2. Imposed Loading

Section 9.1.1 of the technical guideline *“Any temporary or permanent works adjacent to the metro could be subject to the influence of train loading and as such will need to be assessed in accordance with AS5100 for live load surcharge”*.

The level of the Sydney Metro station box is below the lowest level of the proposed shoring wall within the immediate vicinity of the site. The zone of influence of the excavation does not intersect any part of the Sydney Metro property boundary with the distance between the properties being larger than the excavation depth. As such, no loads are imposed from the Sydney Metro infrastructure on to the development site and no additional surcharge loading needs to be considered.

6.3. Induced Movement

Section 9.1.2 of the technical guideline *“Displacement of metro infrastructure as induced by the development must not affect the operational functionality and durability of the affected infrastructure. The developer must consider the possibility that future metro construction may induce movement on the development.”*

In both the temporary and permanent case, the shoring wall has been designed for a maximum lateral deflection of 20mm at any point along the wall. The deflection limit set by Section 9.1.2 of the technical guideline is 10mm at the tunnel wall.

In the long term, the shoring wall will be restrained by the basement slabs with lateral pressure acting on the back face of the pile towards the inner face of the basement.

“Any development activity, whether beneath or adjacent to contained metro tracks, that has the potential to cause track displacement must comply with the requirements of SPC 207 Track Monitoring Requirements for Undertrack Excavation”

In accordance with the requirements of the technical guideline the track is to be monitored in accordance with the requirements of SPC 207 Track Monitoring Requirements for Undertrack Excavation.

The project geotechnical engineer EI Australia has undertaken finite element analysis using Plaxis to assess the movement of the adjoining station box and train lines as a result of the proposed excavation and reference should be made to their report E24724.G06 for further details.

6.4. Induced Cracking

Section 9.1.3 outlines technical criteria regarding the monitoring and treatment of existing and new cracks to the tunnel lining.

Given that the tunnels are relatively new then we anticipate that no existing cracking to the tunnels has occurred or if it has then Sydney Metro would be aware of its existence. As such we are of the opinion that a dilapidation report of the tunnel lining is not required especially given the large distance from the tunnel to the basement excavation.

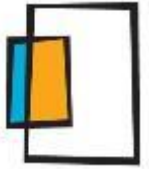


6.5. Temporary Components

Section 5.2 of T HR CI 12080 ST *“Any temporary components of shoring systems that are located such that their stability has the potential to affect the rail corridor shall have a minimum service life of 10 years excluding considerations of any support from permanent structure”.*

Compliance with the above clause has been achieved by the proposed shoring wall. The concrete components of the wall have all been designed for the permanent structure case and as such have a minimum design life of 100 years.

Shoring anchors which will be de-commissioned following completion of the final structure and are designed for a minimum life of 10 years.



6.6. Noise and vibration

Section 6.4 of T HR CI 12080 ST *“The effects of noise and vibration from rail operations shall be considered in the design of the development. The noise from construction and rail operation shall be considered against statutory and project noise vibration limit requirements.”*

Refer to the geotechnical and acoustic engineers report for details regarding excavation and vibration considerations.

6.7. Stray currents and electrolysis from rail operations

Section 6.5 of T HR CI 12080 ST *“The potential effects of stray electrical currents and electrolysis in the electrified area of the rail network shall be the subject of a risk assessment across the full life cycle of the asset. Such effects shall be managed to a safety SFAIRP level across the full life cycle”.*

An independent stray current electrolysis report has been completed by Cathodic Protection Services dated 25 September 2020.

The report recommends the following details be incorporated into the structural design:

- Slab on ground – must be protected by a moisture barrier.
- Footings – must be a minimum 32MPa with a 50mm cover
- Piles – must be a minimum 40MPa with 70mm cover
- Shotcrete walls – must be a minimum 32MPa with 70mm cover on the soil side.

These recommendations have been adopted in the structural engineering design.



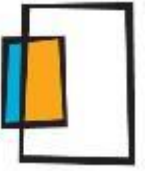
7. Conclusion

The structural assessment report demonstrates that the proposed development at 2 Mandala Parade, Castle Hill can be completed within the requirements set by Transport for New South Wales for building adjacent to the Sydney Metro.

The structural engineering design has been completed to ensure existing rail infrastructure is maintained and unaffected by the proposed development. Nil reliance has been placed on the rail infrastructure or corridor for support of the development in both the temporary and permanent case.

A concrete soldier pile shoring wall is proposed to protect existing structures and infrastructure during the temporary basement excavation. The wall has been designed to limit deflection of the wall thereby limiting the risk of damage external structures.

This structural assessment report is to be read in conjunction with the ABC Consultants structural engineering documentation, project 20025 – Doran Drive Precinct – 2Mandala Parade, Castle Hill.



8. Appendix A – Structural Engineering Drawings

BORED PILES

1. REFER TO THE GEOTECHNICAL REPORT E24724 G03 BY EI AUSTRALIA (DATED 26 AUGUST 2020) FOR A DESCRIPTION OF THE ANTICIPATED SITE CONDITIONS. THE PILING CONTRACTOR IS TO STUDY THE REPORT AND MAKE HIS OWN EVALUATION OF THE SITE CONDITIONS. ANY ADDITIONAL COSTS INCURRED SHALL BE BORNE BY THE PILING CONTRACTOR.
2. THE BORED PILES ARE PROPORTIONED FOR THE SCHEDULED LOADS WITH ALLOWABLE SOCKET SKIN FRICTION AND END BEARING CAPACITY AS INDICATED IN THE REPORT. THE DEPTHS AND LENGTHS NOMINATED IN THE SCHEDULE ARE INDICATIVE ONLY. THEY MAY NEED TO BE VARIED DEPENDING ON THE SITE CONDITIONS ENCOUNTERED. THE PILING CONTRACTOR NEEDS TO INCORPORATE ANY DESIGN CHANGES REQUIRED.
3. ALL WORKMANSHIP AND MATERIAL SHALL BE IN ACCORDANCE WITH AS 2159.
4. THE BORED PILES SHALL BE LOCATED CONCENTRIC WITH THE COLUMNS AND WALLS UNLESS NOTED OTHERWISE.
5. DRILL AND INSTALL THE BORED PILES IN THE LOCATIONS SHOWN ON THE DRAWINGS AND THE ABOVE REQUIREMENTS.
6. THE PILING CONTRACTOR SHALL ALLOW FOR THE COST OF INTEGRITY TESTING OF 10% ALL BORED PILES IN ACCORDANCE WITH AS2159 CLAUSE 8.8. ALL PILE INTEGRITY TESTING IS TO BE WITNESSED BY THE PROJECT GEOTECHNICAL ENGINEER.
7. BEFORE ANY CONCRETE IS POURED, ALL ROCK SOCKETS SHALL BE DEWATERED AND INSPECTED BY A GEOTECHNICAL ENGINEER, WHO SHALL BE EMPLOYED BY THE BUILDER, TO VERIFY THE SOIL PARAMETERS, THE SOCKET BASE AND WALLS MUST BE CLEAN AND FREE FROM CLAY.
8. IF THE CONCRETE NEEDS TO BE TREMIED, SUPER PLASTICIZER MUST BE ADDED TO THE MIX AND THE CONCRETE GRADE INCREASED BY 30% . REFER TO THE SPECIFICATIONS FOR THE INSPECTION OF THE HOLE PRIOR TO CONCRETING.
9. ANY ALTERNATIVE DESIGN SHALL MEET THE ABOVE REQUIREMENTS AND THE SCHEDULED LOADS. THE PILING CONTRACTOR SHALL OBTAIN CERTIFICATION FOR THE CALCULATIONS OF THE ALTERNATIVE SYSTEM. THE DETAILS AND CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE PERFORMANCE OF THE ALTERNATIVE BORED PILES.
10. PILING CONTRACTOR TO ALLOW FOR CASING OF ALL PILES IN LOOSE MATERIAL.
11. SPLICING TO LONGITUDINAL PILE REINFORCEMENT IS TO BE AVOIDED WHERE POSSIBLE I.E. FOR PILE CAGE LENGTHS LESS THAN 12m. SPLICES OF CAGE REINFORCEMENT ARE TO ENSURE MINIMUM SPACING BETWEEN TIES ARE MAINTAINED. LOCATION OF SPLICED CAGES ARE TO BE APPROVED BY THE STRUCTURAL ENGINEER.

BULK EARTHWORKS AND SHORING NOTES

GEOTECHNICAL REPORT
REFER TO GEOTECHNICAL REPORT E24724 G03 BY EI AUSTRALIA (DATED 26 AUGUST 2020) AND THE CONTRACTOR IS TO ENSURE GEOTECH REPORT RECOMMENDATIONS ARE ADHERED TO.

SPECIFICATION
THESE NOTES ARE TO BE READ IN CONJUNCTION WITH THE HEAD SPECIFICATION.

EROSION AND SEDIMENT CONTROL
PROVIDE GRAVEL SHAKEDOWN AREA FOR 10 METRES AT BOUNDARY OF SITE AND OTHER SEDIMENT CONTROL MEASURES GENERALLY CONSISTENT WITH THE REQUIREMENTS OF THE PUBLICATION SOIL AND WATER MANAGEMENT FOR URBAN DEVELOPMENT NSW DEPARTMENT OF HOUSING 1993. (SDN 0 7305 9423 0). FOR THE DURATION OF THE WORKS, NOTE THAT ALL WORKS ON SITE ARE TO COMPLY WITH COUNCIL SOIL AND EROSION CONTROL REQUIREMENTS. ALLOW TO SUBMIT DETAILS TO COUNCIL FOR APPROVAL IF REQUIRED. ENSURE STREETS ARE KEPT CLEAN OF ALL DEBRIS.

DUST CONTROL
THE CONTRACTOR IS TO ENSURE THAT THE DUST PREVENTION METHODS HE ADOPTS ARE SUFFICIENT TO MEET THE REQUIREMENTS OF THE COUNCIL. IT IS THE CONTRACTORS' RESPONSIBILITY TO ACQUAINT HIMSELF WITH THE REQUIREMENTS.

SITE SETOUT
REFER TO THE ARCHITECTS DRAWINGS FOR THE ACCURATE SETOUT OF ALL BUILDINGS, DRIVEWAYS, PARKING AREAS ETC. NOTE BULK EARTHWORKS PLAN IS INDICATIVE ONLY. CALCULATE AND CUT BATTERS FROM ARCHITECTS PLANS AND SURVEY CROSSOVER PROFILES TO COUNCIL REQUIREMENTS.

GENERALLY
PROCEED WITH BULK EARTHWORKS AND SHORING TO PROVIDE A STABLE SUBGRADE AND WORK SPACE FOR THE CONSTRUCTION OF THE PROPOSED DEVELOPMENT. STRIP AND DISPOSE OF TOPSOIL, REDUCE SITE TO LEVELS INDICATED AND DISPOSE OF ALL UNWANTED MATERIAL LEGALLY.

SUPERVISION
A GEOTECHNICAL ENGINEER IS TO PROVIDE SUPERVISION (AS3798) FOR ALL EARTHWORKS DURING THE COURSE OF CONSTRUCTION. AT THE COMPLETION OF THE BULK EXCAVATION CONTRACT, THE GEOTECHNICAL ENGINEER IS TO PROVIDE CERTIFICATION THAT THE WORKS HAVE BEEN CARRIED OUT IN ACCORDANCE WITH BULK EARTHWORKS SPECIFICATION.

DRAINAGE DURING CONSTRUCTION
PROVIDE ADEQUATE DRAINAGE DURING CONSTRUCTION TO ENSURE MINIMUM DISRUPTION FROM RAIN.

SERVICES
DURING EXCAVATION COORDINATE WITH ALL SERVICES INCLUDING SEWER, GAS AND POWER.

BULK EARTHWORKS PROCEDURE AND SPECIFICATION

- THE SITE IS TO BE STRIPPED OF TOPSOIL AND UNCONSOLIDATED EXISTING FILL.
- AT THE COMPLETION OF THE BULK EARTHWORKS, THE CONTRACTOR SHALL PROVIDE TEMPORARY OR PERMANENT DRAINAGE TO ENSURE NO SURFACE WATER IS RETAINED ON THE SITE, OR THAT SURFACE WATER FLOW DETRIMENTALLY SCOURS THE PREPARED BASE.

GEOTECHNICAL ENGINEER NOTES

- EXCAVATION TO BE CARRIED OUT UNDER GEOTECHNICAL ENGINEERS SUPERVISION.
- GEOTECHNICAL ENGINEER (GE) TO COMMENT ON SUITABILITY OF THE SUBCONTRACTORS METHOD OF EXCAVATION AS REMOVAL PROCEEDS.

HYDRAULICS ENGINEER

- DURING EXCAVATION COORDINATE WITH ALL HYDRAULIC ENGINEERS REQUIREMENTS FOR SEWER, GAS AND STORMWATER LINES.

AS-BUILT DRAWING

- PROVIDE AN AS-BUILT DRAWING PREPARED BY A REGISTERED SURVEYOR TO CONFIRM BULK EARTHWORKS IS COMPLETED TO REQUIRED DIMENSIONS AND LEVELS.

DILAPIDATION REPORT

- THE APPROVED SHORING WALL CONTRACTOR SHALL PREPARE A DILAPIDATION REPORT OF STREET, FOOTPATH, ROAD FEATURES AND ALL REQUESTED RAIL/Corp ASSETS PRIOR TO INSTALLATION OF SHORING WALL.

COMPACTION NOTES

- COMPACTION BEHIND INTERNAL FORMED RETAINING WALL BY EXCAVATION CONTRACTOR USING HAND HELD RAMMERS TO ACHIEVE 98% MODIFIED DENSITY.
- COMPACT IN MAXIMUM 300mm THICK LAYERS AT OPTIMUM MOISTURE CONTENT OF ±3%.

CONTRACTOR TO ALLOW FOR 15% INCREASE IN ANCHOR QUANTITIES OR SIZES TO ACCOMMODATE REQUIREMENTS BY GEOTECHNICAL CONSULTANT DURING EXCAVATION WORKS

BOND LENGTH AND DIAMETER OF ANCHOR HOLE TO BE CONFIRMED BY SHORING WALL CONTRACTOR. THE ANCHOR LENGTHS SHOWN ON THE STRUCTURAL DRAWINGS ARE INDICATIVE ONLY

SHORING DESIGN CRITERIA

STRUCTURE IMPORTANCE LEVEL: 3

DESIGN WORKING LIFE: 100 YEARS OR MORE

WIND ANNUAL PROBABILITY OF EXCEEDANCE: 1/1000

EARTHQUAKE ANNUAL PROBABILITY OF EXCEEDANCE: 1/1000

EARTHQUAKE DESIGN CATEGORY: EDC II

CONCRETE EXPOSURE CLASSIFICATION: B1

SURCHARGE: REFER LOADING PLANS

GEOTECHNICAL DESIGN PARAMETERS

ALLOWABLE END BEARING CAPACITY (INC. GEOTECHNICAL REDUCTION FACTOR OF 0.5)
CLASS II / III SANDSTONE 3500 kPa

ALLOWABLE SHAFT ADHESION (INC. GEOTECHNICAL REDUCTION FACTOR OF 0.5)
CLASS II / III SANDSTONE 3500 kPa

PERMANENT SHORING WALLS HAVE BEEN DESIGNED IN ACCORDANCE WITH AS3600, AS1170, AS2159 AND AS5100 WITH A DURABILITY DESIGN LIFE OF 100 YEARS

CONCRETE GRADE

ELEMENT	CONCRETE QUALITY	STRENGTH F _c	MAX SIZE AGG. mm	SUMP mm	CEMENT TYPE	ADMIXTURE
SHORING PILES		50	20	80	GP	-
SHOTCRETE		32	10	150 - 200	GP	-
CAPPING BEAM		50	20	80	GP	-

NOTE: ALL CEMENTITIOUS MATERIAL MUST CONFIRM TO TNSW SPECIFICATION 3211

COVERS			
ELEMENT	TOP	BTM	SIDES
PILES	75mm	75mm	75mm
CAPPING BEAM	50mm	50mm	50mm
SHOTCRETE	50mm	50mm	50mm

TOLERANCE

1. BORES SHALL BE CENTERED WITHIN 50mm OF THE DESIGN CENTRE AS INDICATED ON THE PLANS.
2. MAXIMUM "OUT OF PLUMB" OF BORES SHALL BE 75mm OR 1:500, WHICHEVER IS LESS
3. GROUND ANCHORS

MONITORING

1. MONITORING OF THE ADJACENT BUILDINGS AND TOP AND MIDDLE OF THE SOLDIERS SHALL BE CARRIED OUT IN ACCORDANCE WITH GEOTECHNICAL AND VIBRATION MONITORING PLANS E24724 G10 PREPARED BY EI AUSTRALIA.
2. MONITORING OF SURVEY POINTS SHALL BE BY A LICENSED SURVEYOR AND BE INITIALLY AT MAXIMUM THREE WEEK INTERVALS & FOR EVERY BASEMENT LEVEL EXCAVATED.
3. IF ANY MOVEMENTS ABOVE THE LIMITS NOMINATED BY THE GEOTECHNICAL ENGINEER ARE DETECTED, ALL WORKS SHALL BE CEASED. THE ENGINEER SHALL BE IMMEDIATELY NOTIFIED. THE PROJECT MANAGER SHALL NOTIFY THE ADJOINING PROPERTY OWNERS.
4. RECORDS SHALL BE KEPT OF ALL MONITORING AND BE AVAILABLE FOR INSPECTION AT ANY TIME.

GEOTECHNICAL ENGINEER TO APPROVE ALL PILE SPACINGS ON SITE AND TO CONFIRM RETAINED MATERIALS ABILITY TO ARCH BETWEEN PILES TEMPORARILY.

CONSTRUCTION SEQUENCE FOR EXTERNALLY ANCHORED SOLDIER WALLS:

THE PROPOSED BASEMENT EXCAVATION WILL PROCEED IN THE FOLLOWING SEQUENCE:

1. SETOUT THE LOCATION OF THE PILES AND CAPPING BEAMS AS NOTED ON PLANS, ELEVATION AND SECTIONS.
2. **HOLD POINT** THE GEOTECHNICAL ENGINEER (WHO SHALL BE EMPLOYED BY THE BUILDER) IS REQUIRED TO CERTIFY THAT THE SOIL CONDITIONS COMPLY WITH THE DESIGN ASSUMPTIONS DETAILED IN THE GEOTECHNICAL INVESTIGATION REPORT. THE GEOTECHNICAL ENGINEER IS TO DETERMINE THE LEVEL OF SUPERVISION REQUIRED TO BE ABLE TO PROVIDE THIS CERTIFICATE. SUPERVISION OF THE MATERIAL REMOVED AS PILES ARE DRILLED MAY BE REQUIRED.
3. DRILL REQUIRED BORE HOLES TO THE DIAMETER SPECIFIED AND DEPTH SHOWN ON PLANS, ELEVATIONS AND SECTIONS. ENSURE THE SOCKET IS FULLY CLEANED AND ALL LOOSE MATERIAL IS REMOVED.
4. **HOLD POINT** THE STRUCTURAL ENGINEER IS TO WITNESS THE REINFORCEMENT CAGES PRIOR TO PLACEMENT IN THE BORED PILES. PLACEMENT OF THE CAGES WITHIN THE PILES FOR PILES GREATER THAN 8M DEEP IS TO BE WITNESSED ON SITE.
5. PLACE REINFORCEMENT CAGES IN HOLES ENSURING THAT CAGES ARE ORIENTATED SO DRILLING THROUGH SOLDIER PILES FOR ANCHORS / ROCK BOLTS WILL CLEAR ANY VERTICAL REINFORCEMENT IN PILES. END CARS ARE TO BE PLACED AT THE BASE OF THE REINFORCEMENT CAGE AND ROLLER CHAIRS PLACED AT 2M INTERVALS ALONG THE LENGTH OF THE PILE (A MINIMUM OF 3 PER SECTION TO ENSURE MINIMUM COVER TO THE CAGE IS MAINTAINED).
6. USING A TREMIE PIPE OR SIMILAR FROM THE BASE OF THE BORED HOLE TO ENSURE NO SEPARATION OF CONCRETE AGGREGATE. PLACE CONCRETE FROM THE BASE OF THE PILE TO UNDERSIDE OF CAPPING BEAM. VIBRATE CONCRETE PROGRESSIVELY FROM THE BASE OF THE PILE AS THE PILE IS FILLED.
7. INSTALL CAPPING BEAM REINFORCEMENT IN ACCORDANCE WITH DETAILS ON THESE DRAWINGS.
8. **HOLD POINT** THE STRUCTURAL ENGINEER IS TO WITNESS THE REINFORCEMENT OF THE CAPPING BEAM.
9. PLACE CAPPING BEAM CONCRETE AND ALLOW TO CURE FOR A MINIMUM OF 7 DAYS.
10. **HOLD POINT** PROJECT SURVEYOR IS TO ESTABLISH A DATUM OF THE CAPPING BEAM LOCATION PRIOR TO ANY EXCAVATION PAST THE CAPPING BEAM. REFER TO MONITORING NOTES.
11. MONITORING OF THE WALL IS TO CONTINUE ON A REGULAR BASIS AS DETAILED IN THE MONITORING NOTES.
12. EXCAVATE AGAINST THE PILES TO MAXIMUM 500MM BELOW THE TOP LEVEL OF ROCK ANCHORS / BOLTS OR TO A MAXIMUM OF 2.0M WHICHEVER IS THE LESSER.
13. DRILL AND EPOXY SHOTCRETE DOWELS INTO SHORING PILES AS NOMINATED ON DRAWINGS. PLACE REINFORCEMENT TO THE SHOTCRETE WALL.
14. **HOLD POINT** THE STRUCTURAL ENGINEER IS TO WITNESS THE REINFORCEMENT OF THE SHOTCRETE PANELS AND ENSURE MINIMUM DEPTH IS ACHIEVED TO THE PANEL.
15. PLACE CONCRETE TO SHOTCRETE WALL. SHOTCRETE PANELS ARE TO BE FORMED AND POURED OR SPRAYED. IF SHOTCRETE WALLS ARE SPRAYED, THE PANELS ARE TO BE OVERSPRAYED AND THEN SCORRELED BACK TO THE DESIGN THICKNESS. SHOTCRETE IS TO BE SELF-COMPACTING IN ACCORDANCE WITH AS3600.
16. IF THE EXCAVATION IS AT THE LEVEL OF THE SHORING ANCHOR, SCAN PILE FOR REINFORCEMENT PRIOR TO CORING ANCHOR HOLE. A MAXIMUM HORIZONTAL DEVIATION OF 5° TO CLEAR ANY REINFORCEMENT IS PERMITTED. OTHERWISE CONTACT THE STRUCTURAL ENGINEER FOR FURTHER ADVICE. DRILL ANCHOR BORE HOLES. INSTALL ROCK ANCHORS / BOLTS WITH ASSOCIATED CENTRALISERS AND GROUT TUBES. PLACE GROUT WITHIN THE BORE HOLE. (PREFER ROCK ANCHORS – POST TENSIONED STRAND NOTES).
17. **HOLD POINT** THE GEOTECHNICAL ENGINEER IS TO WITNESS THE WEDGE LIFT OFF AND ADHOR LIFT OFF TESTS AS REQUIRED. ONCE THE GROUT HAS ACHIEVED DESIGN STRENGTH AND AFTER A MINIMUM 3 DAYS, THE ROCK ANCHORS / BOLTS MAY BE STRESSED.
18. PROVIDED THE SHOTCRETE PANELS HAVE REACHED 25MPA STRENGTH AND THE SHORING ANCHORS ARE FULLY STRESSED EXCAVATION MAY CONTINUE TO THE NEXT STAGE. REPEAT STEPS 10 TO 17 THE FINAL ANCHOR IS INSTALLED AT THE TOE OF THE PILE.
19. CONTINUE EXCAVATION INTO THE UNSUPPORTED CLASS II / III SANDSTONE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEERING REPORT AND ADVICE.
20. MINIMUM 3 MONTHS AFTER GROUND FLOOR / LEVEL 1 SLAB HAS BEEN CAST, REBATES AT EACH SLAB / PILE INTERFACE SHALL BE CLEANED OUT AND GROUTED UP WITH AN APPROVED NON-SHRINK GROUT (NOMOLITH OR EQUAL). WHEN PG GROUT IS AT LEAST 40 MPa, TYPICAL ANCHORS / ROCK BOLTS SHALL BE DESTRESSED, ANCHOR HEADS REMOVED AND PILES MADE GOOD.

ROCK ANCHORS - POST-TENSIONED STRAND

1. IN ADDITION TO ANY NOTES PROVIDED BELOW AND DETAILS SHOWN ON THESE DRAWINGS, ALL ROCK ANCHORS ARE TO BE INSTALLED IN ACCORDANCE WITH AS4678 AND TRANSPORT FOR NSW QA SPECIFICATION B114
2. ANCHORS SHALL CONSIST OF LOW RELAXATION STRESS-RELIEVED SUPERGRADE STEEL STRAND TO AS4672.1 AND AS4672.2 AND ANCHORAGES AND WEDGES SHALL CONFORM TO AS1314.
3. ALL STEEL ELEMENTS, INCLUDING BEARING PLATES AND WASHERS, MUST BE FABRICATED FROM GRADE 250 STEEL IN ACCORDANCE WITH AS3678. NUTS FOR THE ROCK BOLTS MUST BE GRADE C COMPLYING WITH AS1112.3 AND PROPERTY CLASS 5 COMPLYING WITH AS4291.2 OR EQUIVALENT TO SUIT THE END THREAD OF THE BOLT.
4. THE USE OF COUPLERS TO THE ANCHOR STRANDS IS NOT PERMITTED.
5. PRIOR TO ANY DRILLING OPERATIONS, THE BUILDER SHALL ACQUAINT THEMSELVES WITH ALL ADJACENT UNDERGROUND SERVICES AND ENSURE THAT NONE OF THESE ARE DISRUPTED BY ROCK ANCHORS. ALL APPROPRIATE APPROVALS, PERMITS AND AGREEMENTS SHALL BE OBTAINED BEFORE COMMENCEMENT OF THE WORK.
6. BORE HOLES FOR THE ROCK BOLTS MUST BE DRILLED USING ROTARY OR ROTARY PERCUSSION DRILLING EQUIPMENT. DRILLING FLUIDS AND CORE DRILLING ARE NOT PERMITTED. BORE HOLES MUST BE INSTALLED WITH A MAXIMUM DEVIATION FROM THE DESIGN INCLINATION IN ANY DIRECTION OF 2° AND A MAXIMUM DEVIATION FROM THE ENTRY POINT OF ±20mm.
7. CENTRALISERS MUST BE PROVIDED ALONG THE LENGTH OF THE STRAND AT 1800mm CENTRES WITHIN THE BOND LENGTH. 2000mm CENTRES WITHIN THE FREE LENGTH AND 300mm FROM EACH END TO ENSURE THE STRAND IS CENTRALISED TO THE CENTRE OF THE BOREHOLE. THE CENTRALISERS MUST BE NON-CORRODIBLE, FIRMLY FIXED TO THE BOLT AND A SHAPE THAT PERMITS THE FREE FLOW OF GROUT TO FULLY ENCAPSULATE THE BOLT.
8. GROUT TUBES MUST EXTEND TO THE BASE OF THE LOWEST PORTION OF THE BORE HOLE AND BE SECURELY FIXED TO THE STRANDS. TUBING MUST BE OF ADEQUATE STRENGTH TO RESIST ANY DAMAGE DURING INSTALLATION AND GROUTING AND BE OF SUFFICIENT SIZE TO ALLOW PUMPING OF GROUT.
9. MATERIAL PROPERTIES OF THE GROUT MUST CONFORM TO TABLE B114.2 OF TNSW QA SPECIFICATION R64. GROUTS MUST GENERALLY HAVE A HIGH BLEED RESISTANCE, LOW SHRINKAGE AND HIGH FLUIDITY. THE GROUT SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 50MPa AT THREE (3) DAYS. GROUT CYLINDERS SHALL BE TAKEN ON THE BASIS OF ONE SAMPLE (TWO CYLINDERS) FOR EVERY TEN ANCHORS AND TESTED ON THE DAY OF STRESSING. THE GROUT SHALL BE MIXED IN A HIGH-SPEED IMPELLER TYPE MACHINE.
10. THE STRANDS SHALL PULLED TAUT AND MARKED AT THE FACE OF THE WEDGE PRIOR TO UNDERTAKING THE TENSIONING PROCEDURE. MEASUREMENTS FROM THE FACE OF THE WEDGE TO THE MARKING SHALL BE TAKEN AT 25%, 50%, 75%, 100% AND 125% AS THE STRAND IS PROGRESSIVELY TENSIONED TO THE PROOF LOAD. RESULTS OF THE MEASUREMENTS SHALL BE PROVIDED TO THE ENGINEER FOR COMPARISON AGAINST THEORETICAL EXTENSIONS.
11. EACH ANCHOR SHALL BE PROOF LOADED (I.E. STRESSED TO 125% OF THE WORKING LOAD, HELD FOR FIVE MINUTES, AND SLOWLY EASED BACK. THE ANCHOR SHALL BE THEN STRESSED TO WORKING LOAD AND LOCKED OFF. ANY ANCHOR WHICH FAILS TO HOLD THE LOAD SHALL BE REMOVED AND REPLACED WITH ANOTHER ANCHOR. SUCH WORK SHALL BE CARRIED OUT IN THE PRESENCE OF AN ENGINEER.
12. STRANDS WHICH EXTEND EXCESSIVELY BEYOND THE FACE OF THE PILE MAY BE CUT TO A MINIMUM LENGTH OF 300mm + THE EXTENSION LENGTH FROM THE PILE FACE.
13. ALL ANCHORS TO BE TESTED USING THE INDUSTRY STANDARD 'WEDGE LIFT-OFF' TEST METHODOLOGY AND IN ADDITION 10% OF ALL ANCHORS TO BE ADDITIONALLY TESTED USING THE 'ANCHOR LIFT-OFF' TESTING METHODOLOGY IMMEDIATELY FOLLOWING LOCK-OFF OF THE ANCHORS.
14. ALL ROCK ANCHORS TO BE INSPECTED BY GEOTECHNICAL ENGINEER DURING INSTALLATION TO CONFIRM CORRECT INSTALLATION AND ANCHOR LOADS ACHIEVED.
15. MINIMUM DESIGN LIFE OF ALL TEMPORARY ROCK ANCHORS TO BE 2 YEARS OR AS NOMINATED BY BUILDER.
16. THE BUILDER SHALL KEEP ON SITE AN ADEQUATE SUPPLY OF ANCHOR CABLES, GROUT ETC. FOR EMERGENCY USE.
17. THE BUILDER SHALL REGULARLY MONITOR THE STRESS IN THE ANCHORS REGULARLY BY MEANS OF A LIFT OFF TEST TO ENSURE NO MAJOR LOSSES ARE OCCURRING. IF STRESS LOSSES ARE DETECTED THEY SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.

ROCK ANCHORS - SOLID BAR

1. IN ADDITION TO ANY NOTES PROVIDED BELOW AND DETAILS SHOWN ON THESE DRAWINGS, ALL ROCK BOLTS ARE TO BE INSTALLED IN ACCORDANCE WITH AS 4678 AND TRANSPORT FOR NSW QA SPECIFICATION R64.
2. ROCKS BOLTS MUST BE STEEL REINFORCEMENT BARS GRADE 500N DEFORMED BAR TO AS4671. THE BOLTS MUST BE THREADED AT ONE END TO SUIT ISO COARSE PITCH THREAD TO AS1075.
3. ALL STEEL COMPONENTS OF THE ROCK BOLT SYSTEM, INCLUDING THE BOLT, BEARING PLATES, WASHERS AND NUTS MUST BE HOT-DIP GALVANISED TO AS/NZS4680 WITH A MINIMUM AVERAGE COATING WEIGHT OF 600 GM/2.
4. ALL STEEL ELEMENTS, INCLUDING BEARING PLATES AND WASHERS, MUST BE FABRICATED FROM GRADE 250 STEEL IN ACCORDANCE WITH AS3678. NUTS FOR THE ROCK BOLTS MUST BE GRADE C COMPLYING WITH AS1112.3 AND PROPERTY CLASS 5 COMPLYING WITH AS4291.2 OR EQUIVALENT TO SUIT THE END THREAD OF THE BOLT.
5. THE USE OF COUPLERS TO THE ROCK BOLTS IS NOT PERMITTED.
6. PRIOR TO ANY DRILLING OPERATIONS, THE BUILDER SHALL ACQUAINT THEMSELVES WITH ALL ADJACENT UNDERGROUND SERVICES AND ENSURE THAT NONE OF THESE ARE DISRUPTED BY ROCK ANCHORS. ALL APPROPRIATE APPROVALS, PERMITS AND AGREEMENTS SHALL BE OBTAINED BEFORE COMMENCEMENT OF THE WORK.
7. BORE HOLES FOR THE ROCK BOLTS MUST BE DRILLED USING ROTARY OR ROTARY PERCUSSION DRILLING EQUIPMENT. DRILLING FLUIDS AND CORE DRILLING ARE NOT PERMITTED. BORE HOLES MUST BE INSTALLED WITH A MAXIMUM DEVIATION FROM THE DESIGN INCLINATION IN ANY DIRECTION OF 2° AND A MAXIMUM DEVIATION FROM THE ENTRY POINT OF ±20mm.
8. CENTRALISERS MUST BE PROVIDED ALONG THE LENGTH OF THE BOLT AT 2000mm CENTRES AND 300mm FROM EACH END TO ENSURE THE BOLT IS CENTRALISED TO THE CENTRE OF THE BOREHOLE. THE CENTRALISERS MUST BE NON-CORRODIBLE, FIRMLY FIXED TO THE BOLT AND A SHAPE THAT PERMITS THE FREE FLOW OF GROUT TO FULLY ENCAPSULATE THE BOLT.
9. GROUT TUBES MUST EXTEND TO THE BASE OF THE LOWEST PORTION OF THE BORE HOLE AND BE SECURELY FIXED TO THE ROCK BOLT. TUBING MUST BE OF ADEQUATE STRENGTH TO RESIST ANY DAMAGE DURING INSTALLATION AND GROUTING AND BE OF SUFFICIENT SIZE TO ALLOW PUMPING OF GROUT.
10. MATERIAL PROPERTIES OF THE GROUT MUST CONFORM TO TABLE R64.1 OF TNSW QA SPECIFICATION R64. GROUTS MUST GENERALLY HAVE A HIGH BLEED RESISTANCE, LOW SHRINKAGE AND HIGH FLUIDITY. THE GROUT SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 50MPa AT THREE (3) DAYS. GROUT CYLINDERS SHALL BE TAKEN ON THE BASIS OF ONE SAMPLE (TWO CYLINDERS) FOR EVERY TEN ANCHORS AND TESTED ON THE DAY OF STRESSING. THE GROUT SHALL BE MIXED IN A HIGH-SPEED IMPELLER TYPE MACHINE.
11. A MINIMUM OF 1% OF THE ROCK BOLTS MUST BE TESTED IN ACCORDANCE WITH THE 'SUITABILITY TEST' AND A MINIMUM OF 3% OF THE ROCK BOLT TO MUST BE TESTED IN ACCORDANCE WITH THE 'ACCEPTANCE TEST' AS DEFINED IN TRANSPORT FOR NSW QA SPECIFICATION R64.
12. RE-BOLTING OF THE ROCK BOLTS AT THE DISCRETION OF THE GEOTECHNICAL AND STRUCTURAL ENGINEERS MAY BE REQUIRED WHERE THE BOLT BECOMES OVERSTRESSED DURING EXCAVATION OR EXCESSIVE DEFORMATION OF ANY INCLUDED ROCK BEDS EXISTS.

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

PS	22.02.22	ISSUED FOR PRELIMINARY INFORMATION	AV
PA	25.05.21	ISSUED FOR PRELIMINARY INFORMATION	AV
PS	12.04.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P2	11.09.20	ISSUED FOR PRELIMINARY INFORMATION	AV
P1	14.07.20	ISSUED FOR PRELIMINARY INFORMATION	AV
REV	DATE	REVISION DESCRIPTION	BY

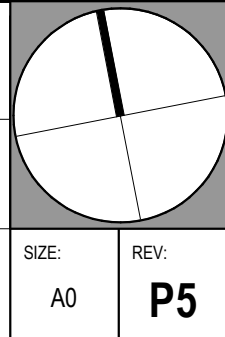
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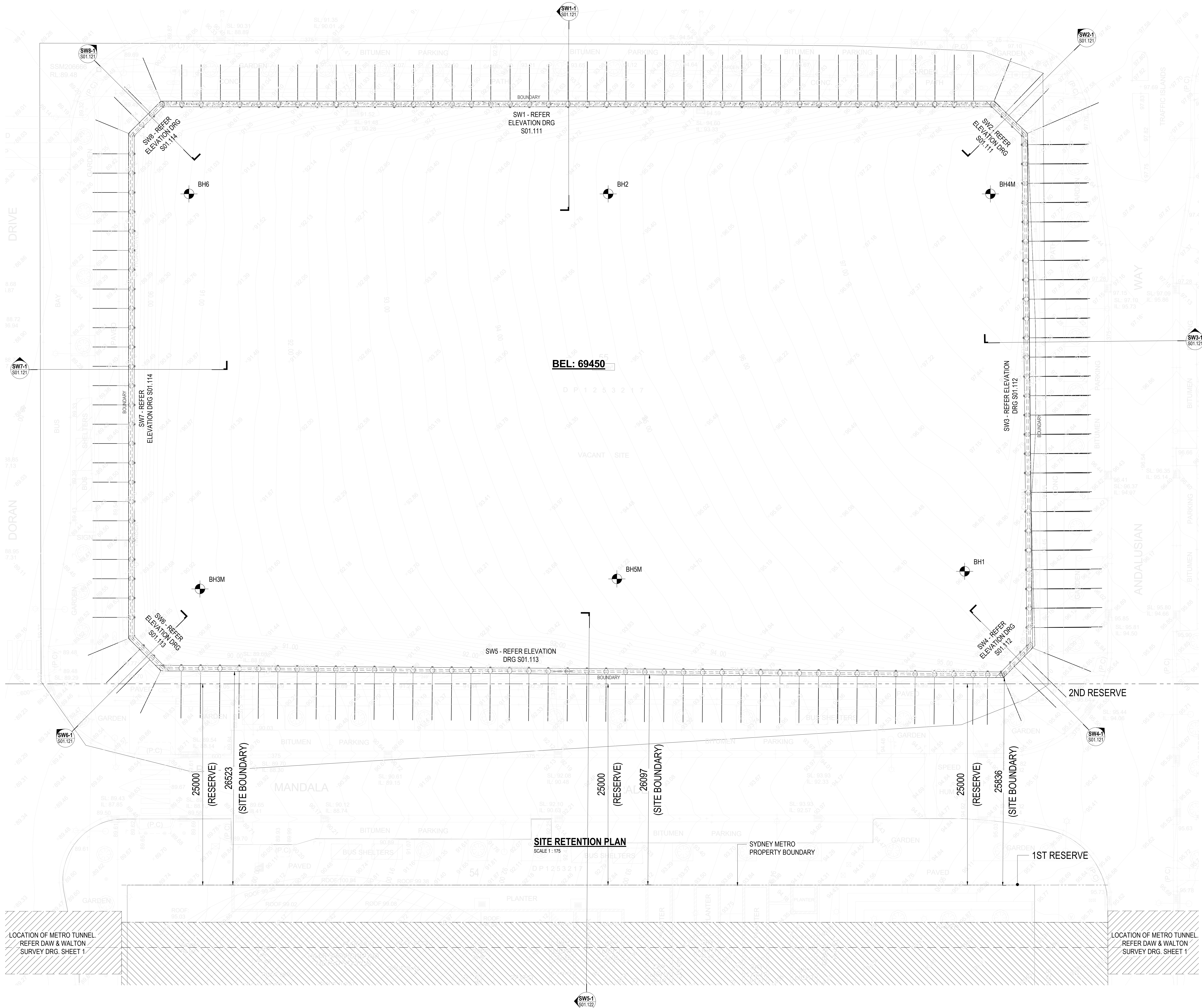


DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

SITE RETENTION NOTES

JOB NUMBER: 20025	ORIG NUMBER: S01.101
DESIGNED BY: RC	DATE:
DRAWN BY: AV	SCALE: 1:1 @ A0





PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

P6	22.02.22	ISSUED FOR PRELIMINARY INFORMATION	AV
P5	11.11.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P4	12.04.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P3	17.09.20	ISSUED FOR PRELIMINARY INFORMATION	AV
P2	11.09.20	ISSUED FOR PRELIMINARY INFORMATION	AV
REV	DATE	REVISION DESCRIPTION	BY

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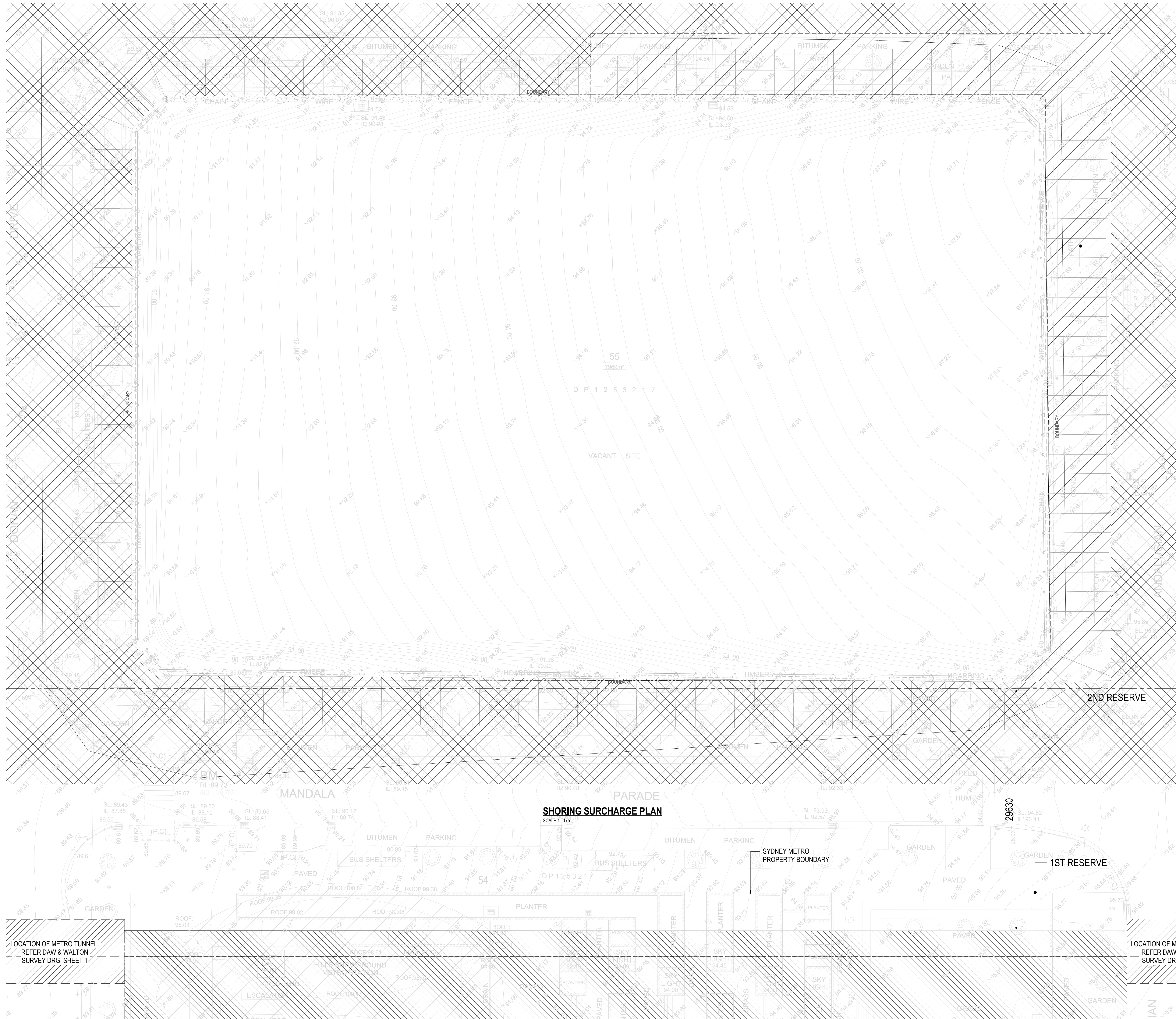
DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

SITE RETENTION PLAN

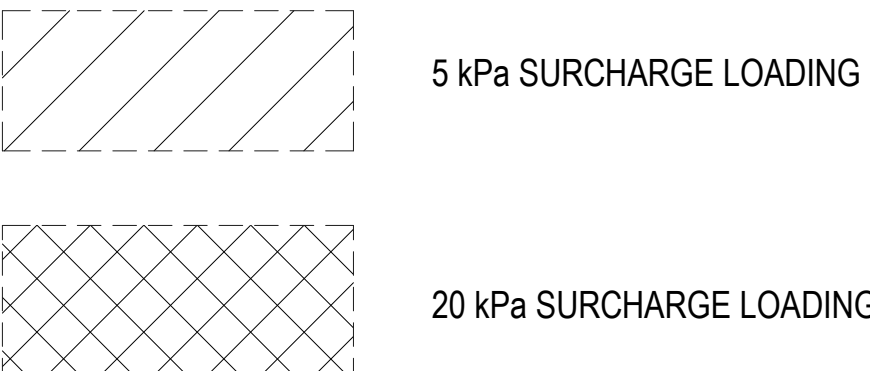
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DESIGNED BY:	RC	DATE:	
DRAWN BY:	AV	SCALE:	1:175 @ A0

SIZE:	A0	REV:	P6

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SHORING SURCHARGE KEY



NOTE:
5 kPa ZONE MAY BE INCREASED TO 20 kPa
AFTER INSTALLATION OF FIRST PROP.

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO
ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P3	22.02.22	ISSUED FOR PRELIMINARY INFORMATION	AV
P2	11.11.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P1	12.04.21	ISSUED FOR PRELIMINARY INFORMATION	AV

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Project: 100-0146-0001
Drawn: 100-0146-0001
Checked: 100-0146-0001
Date: 100-0146-0001
Scale: 1:175 @ A0
North Arrow: 100-0146-0001

DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

SHORING SURCHARGE
LOADING PLAN

JOB NUMBER:
20025

DESIGNED BY:
RC

DRAWN BY:
AV

DWG NUMBER:
S01.106

DATE:

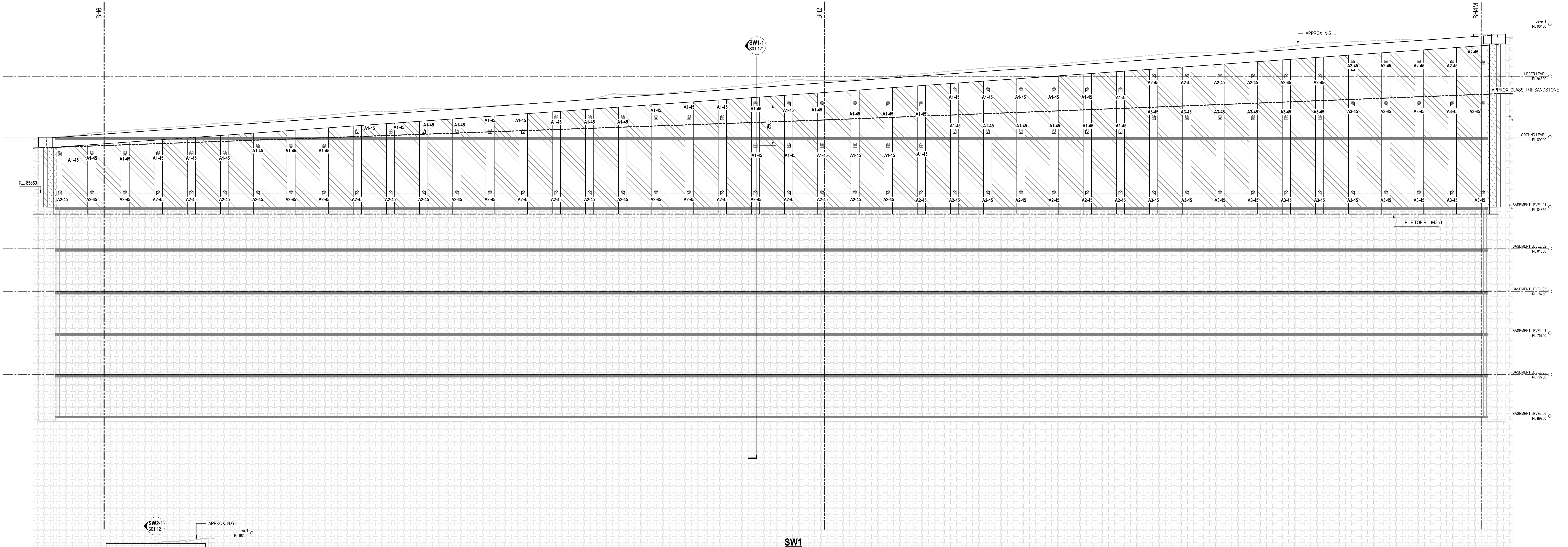
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SHEET:
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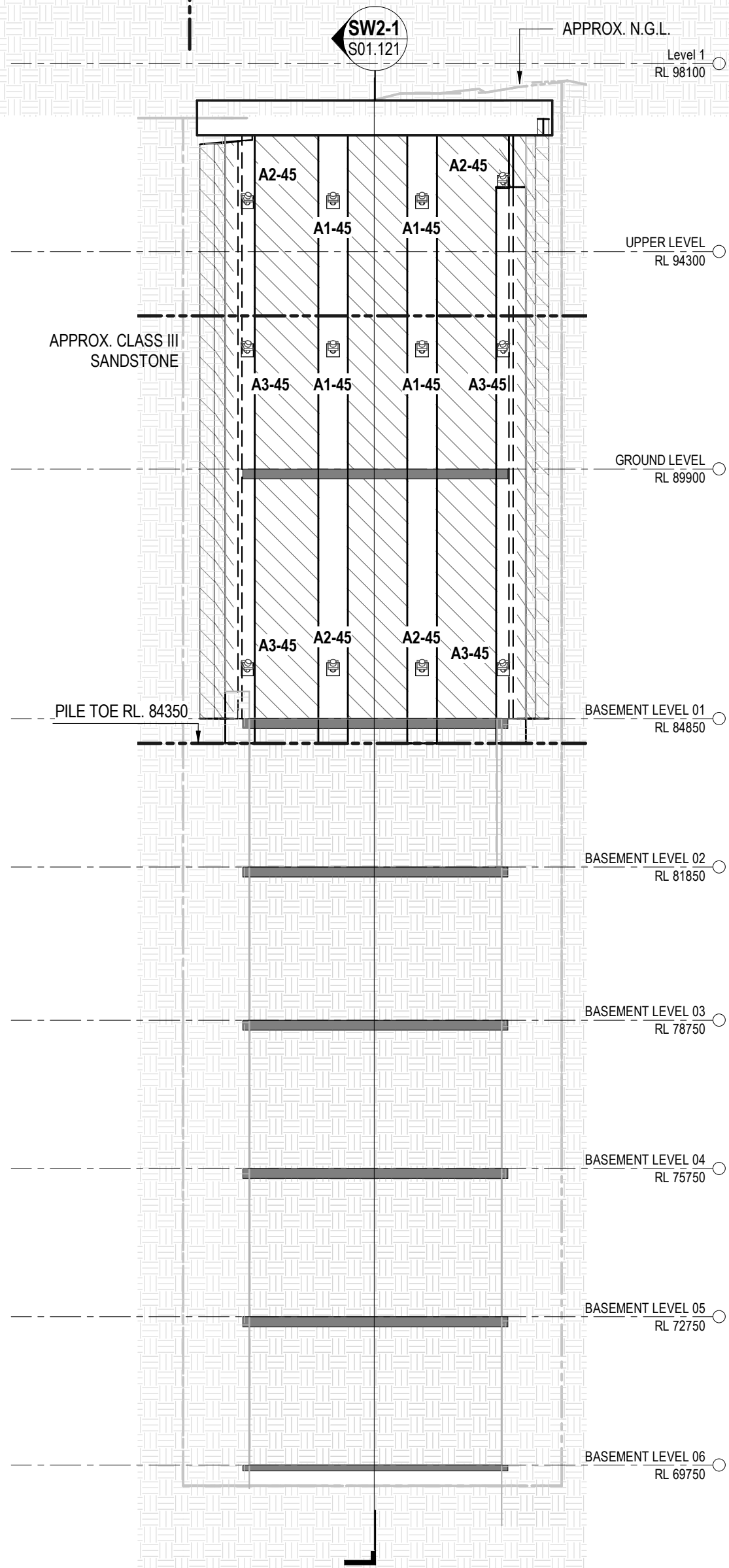
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SW1
SCALE 1:100



SW2
SCALE 1:100

SHORING PILE SCHEDULE					
MARK	DIA.	VERT. BARS	TIES	CONCRETE GRADE	COVER
SP1	600	8N32	N16-150	S0	70

HATCH DENOTES EXTENT OF 150mm THK SHOTCRETE BETWEEN SHORING PILES

HATCH DENOTES EXPOSED ROCK FACE TO BE RETAINED WITH SHOTCRETE AND ROCKBOLTS TO GEOTECHNICAL ENG. DETAILS

GEOTECHNICAL ENGINEER TO INSPECT EXPOSED SHALE FACE REGULARLY DURING EXCAVATION AND NOMINATE APPROPRIATE ROCK BOLTS AND SHOTCRETE AS REQUIRED TO ENSURE STABILITY AT ALL TIMES.

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING S01.101 - SITE RETENTION PLAN FOR SHORING PILE SETOUT DIMENSIONS AND GROUND ANCHOR HORIZONTAL DEFLECTION ANGLES.

ANCHOR SCHEDULE				
MARK	SWL	LO	INCLINATION	MIN. BOND LENGTH
A1-45	300	200	45°	4200
A2-45	450	300	45°	6200
A3-45	450	400	45°	8200

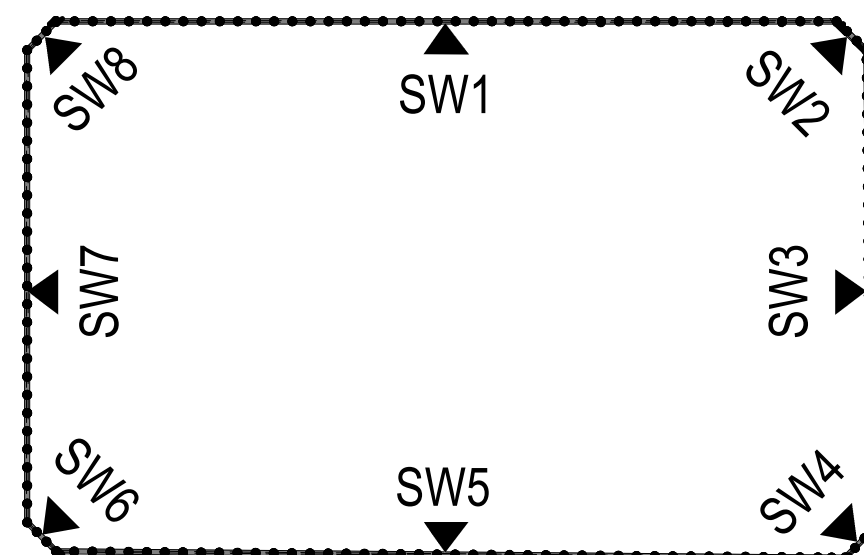
'SWL' DENOTES SAFE WORKING LOAD
'LO' DENOTES LOCK OFF LOAD

SHORING ANCHOR NOTES:
BOND LENGTH NOMINATED IN SHORING ANCHOR SCHEDULE FOR COORDINATION PURPOSES ONLY. SHORING CONTRACTOR IS RESPONSIBLE FOR FINAL ANCHOR DESIGN. BOND LENGTHS MAY NEED TO BE VARIED DEPENDING ON SITE CONDITIONS ENCOUNTERED.
BOND LENGTH BASED ON A 130mm HOLE WITH ALLOWABLE BOND STRESS OF 350 kPa.

NOTE:
GROUND LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE SURVEYOR

NOTE:
ROCK LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE GEOTECHNICAL ENGINEER

NOTE:
MAXIMUM 500mm EXCAVATION BELOW ANCHOR HEIGHT PERMITTED PRIOR TO INSTALLING ANCHOR



KEY PLAN
SCALE 1:1000

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P7	22.02.22	ISSUED FOR PRELIMINARY INFORMATION	AV
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P5	25.05.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P4	12.04.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P3	17.09.20	ISSUED FOR PRELIMINARY INFORMATION	AV

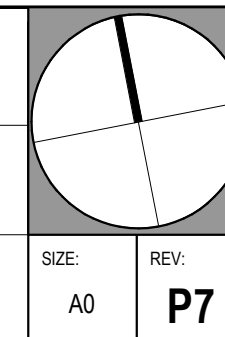
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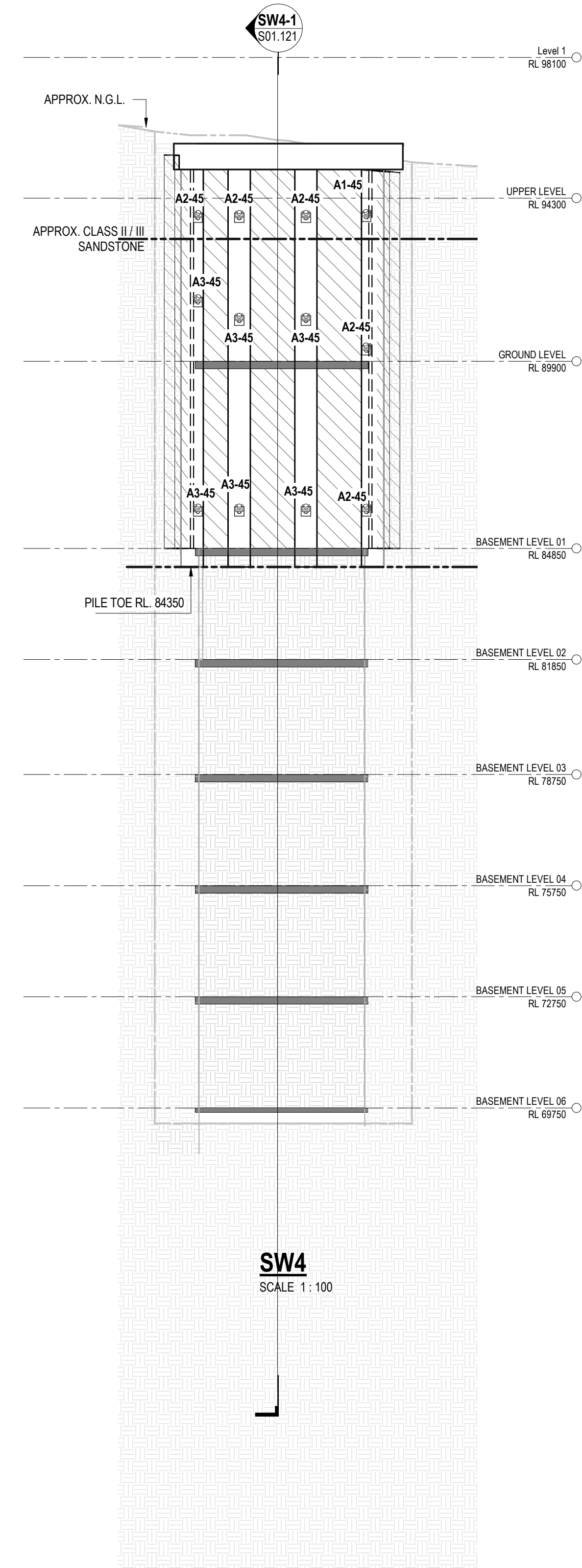
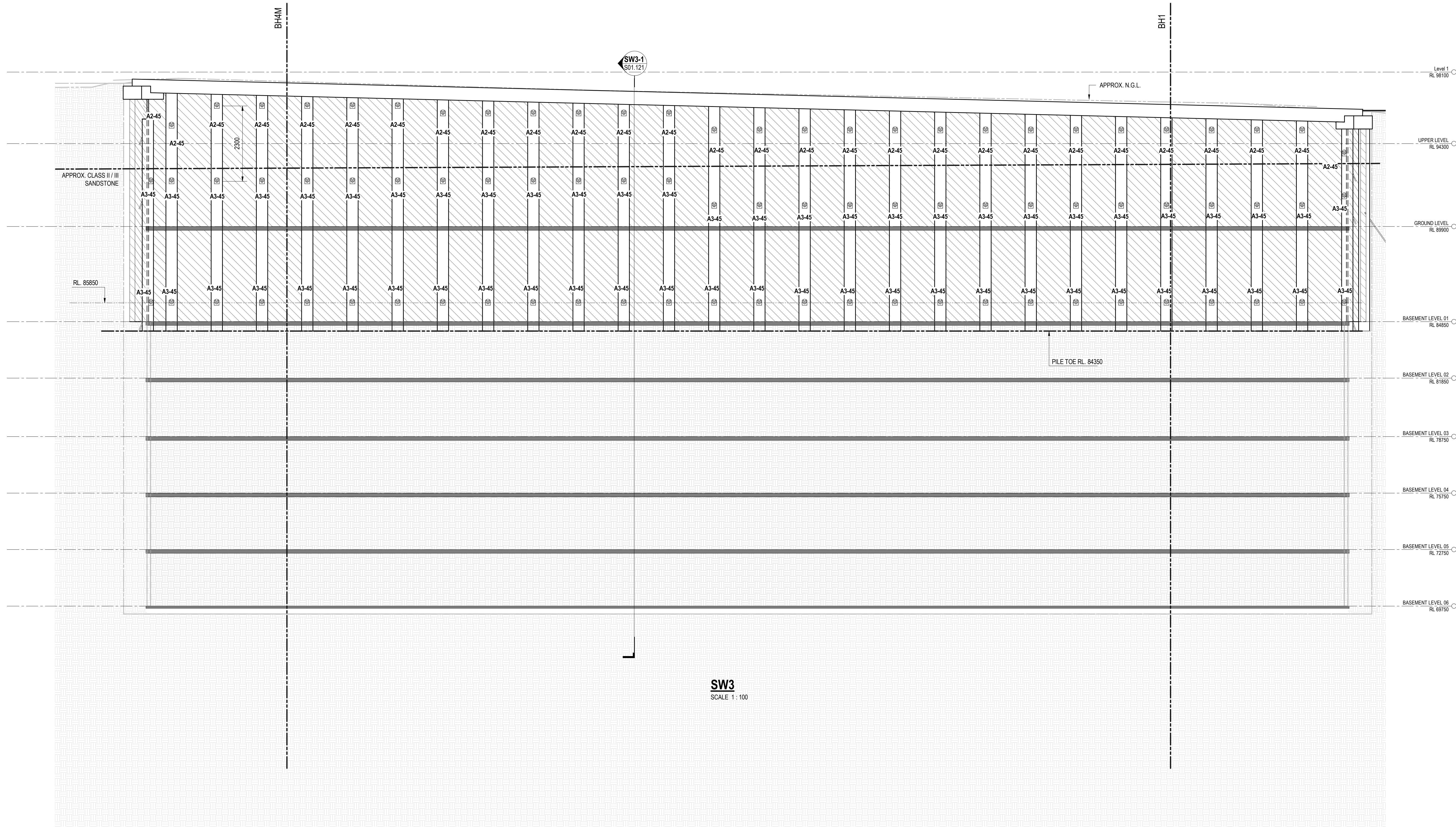
DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

SHORING WALL ELEVATIONS
SW1 & SW2

JOB NUMBER: 20025	DATE: RC	DESIGNED BY: AV	SCALE: 1:100, 1:1000 @ A0	SIZE: A0	REV: P7



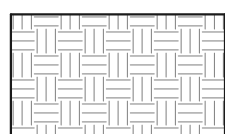
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SHORING PILE SCHEDULE					
MARK	DIA.	VERT. BARS	TIES	CONCRETE GRADE	COVER
SP1	600	8K32	N16-150	50	70



HATCH DENOTES EXTENT OF 150mm THK SHOTCRETE BETWEEN SHORING PILES



HATCH DENOTES EXPOSED ROCK FACE TO BE RETAINED WITH SHOTCRETE AND ROCKBOLTS TO GEOTECHNICAL ENG. DETAILS

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THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING S01.101 - SITE RETENTION PLAN FOR SHORING PILE SETOUT DIMENSIONS AND GROUND ANCHOR HORIZONTAL DEFLECTION ANGLES.

ANCHOR SCHEDULE				
MARK	SWL	LO	INCLINATION	MIN. BOND LENGTH
A1-45	300	200	45°	4200
A2-45	450	300	45°	6200
A3-45	450	400	45°	8200

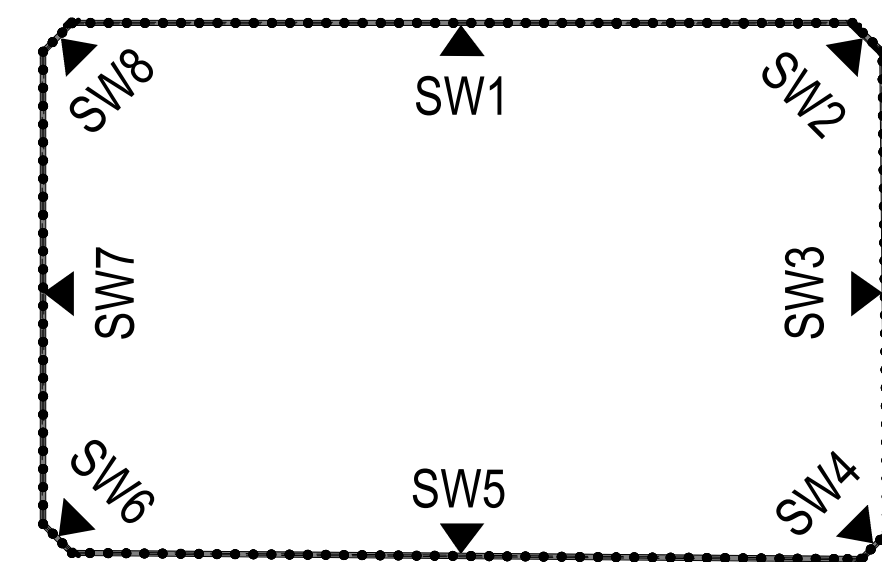
'SWL' DENOTES SAFE WORKING LOAD
'LO' DENOTES LOCK OFF LOAD

SHORING ANCHOR NOTES:
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BOND LENGTH BASED ON A 130mm HOLE WITH ALLOWABLE BOND STRESS OF 350 KPa.

NOTE:
GROUND LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE SURVEYOR

NOTE:
ROCK LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE GEOTECHNICAL ENGINEER

NOTE:
MAXIMUM 500mm EXCAVATION BELOW ANCHOR HEIGHT PERMITTED PRIOR TO INSTALLING ANCHOR



KEY PLAN
SCALE 1:1000

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

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P5	25.05.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P4	12.04.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P3	17.09.20	ISSUED FOR PRELIMINARY INFORMATION	AV

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DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

SHORING WALL ELEVATIONS
SW3 & SW4

JOB NUMBER:
20025

DESIGNED BY:
RC

DRAWN BY:
AV

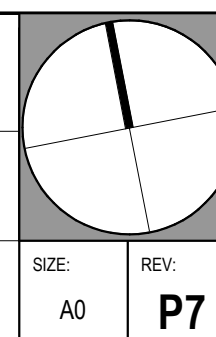
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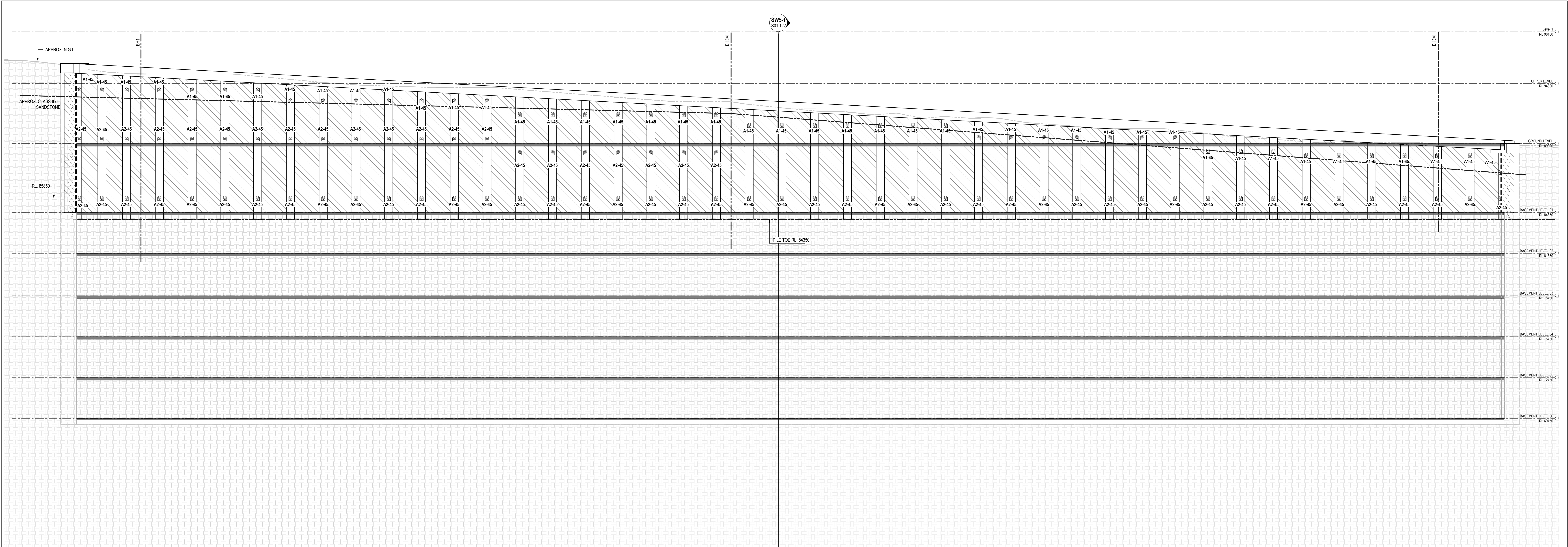
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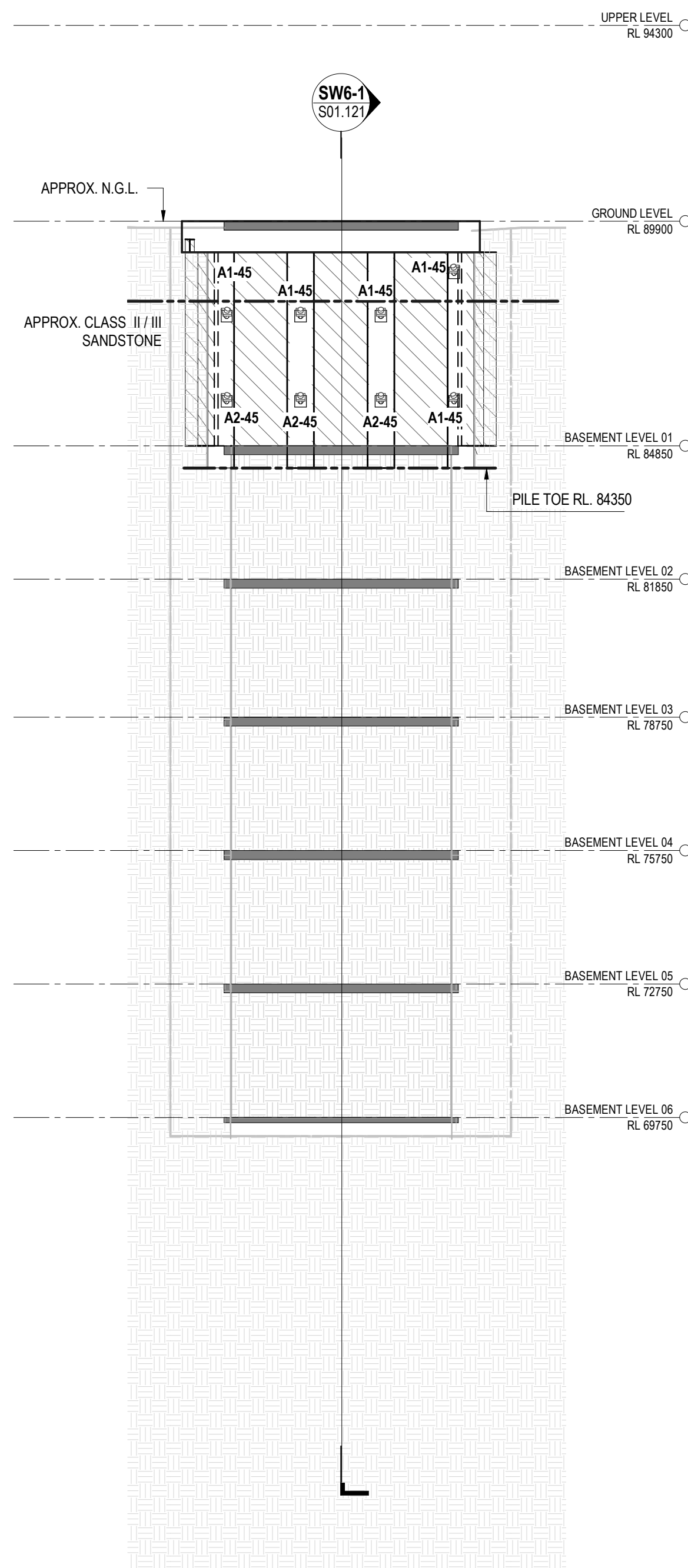
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SW5
SCALE 1: 100



SW6
SCALE 1: 100

SHORING PILE SCHEDULE					
MARK	DIA.	VERT. BARS	TIES	CONCRETE GRADE	COVER
SP1	600	8K12	W16-150	30	70

	HATCH DENOTES EXTENT OF 180mm THK SHOTCRETE BETWEEN SHORING PILES
	HATCH DENOTES EXPOSED ROCK FACE TO BE RETAINED WITH SHOTCRETE AND ROCKBOLTS TO GEOTECHNICAL ENG. DETAILS

GEOTECHNICAL ENGINEER TO INSPECT EXPOSED SHALE FACE REGULARLY DURING EXCAVATION AND NOMINATE APPROPRIATE ROCK BOLTS AND SHOTCRETE AS REQUIRED TO ENSURE STABILITY AT ALL TIMES.

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ANCHOR SCHEDULE				
MARK	SWL	LO	INCLINATION	MIN. BOND LENGTH
A1-45	300	200	45°	4200
A2-45	450	300	45°	6200
A3-45	450	400	45°	8200

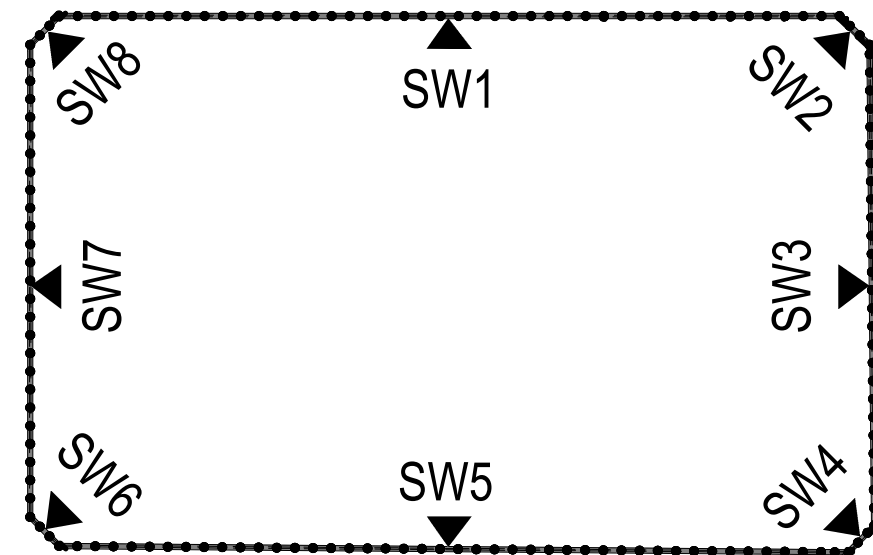
'SWL' DENOTES SAFE WORKING LOAD
'LO' DENOTES LOCK OFF LOAD

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BOND LENGTH BASED ON A 130mm HOLE WITH ALLOWABLE BOND STRESS OF 350 kPa.

NOTE:
GROUND LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE SURVEYOR

NOTE:
ROCK LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE GEOTECHNICAL ENGINEER

NOTE:
MAXIMUM 500mm EXCAVATION BELOW ANCHOR HEIGHT PERMITTED PRIOR TO INSTALLING ANCHOR



KEY PLAN
SCALE 1: 1000

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

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P7	22.02.22	ISSUED FOR PRELIMINARY INFORMATION	AV
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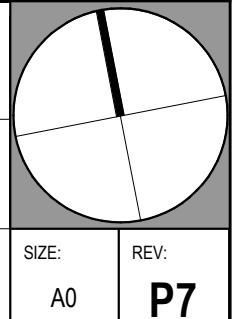


DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

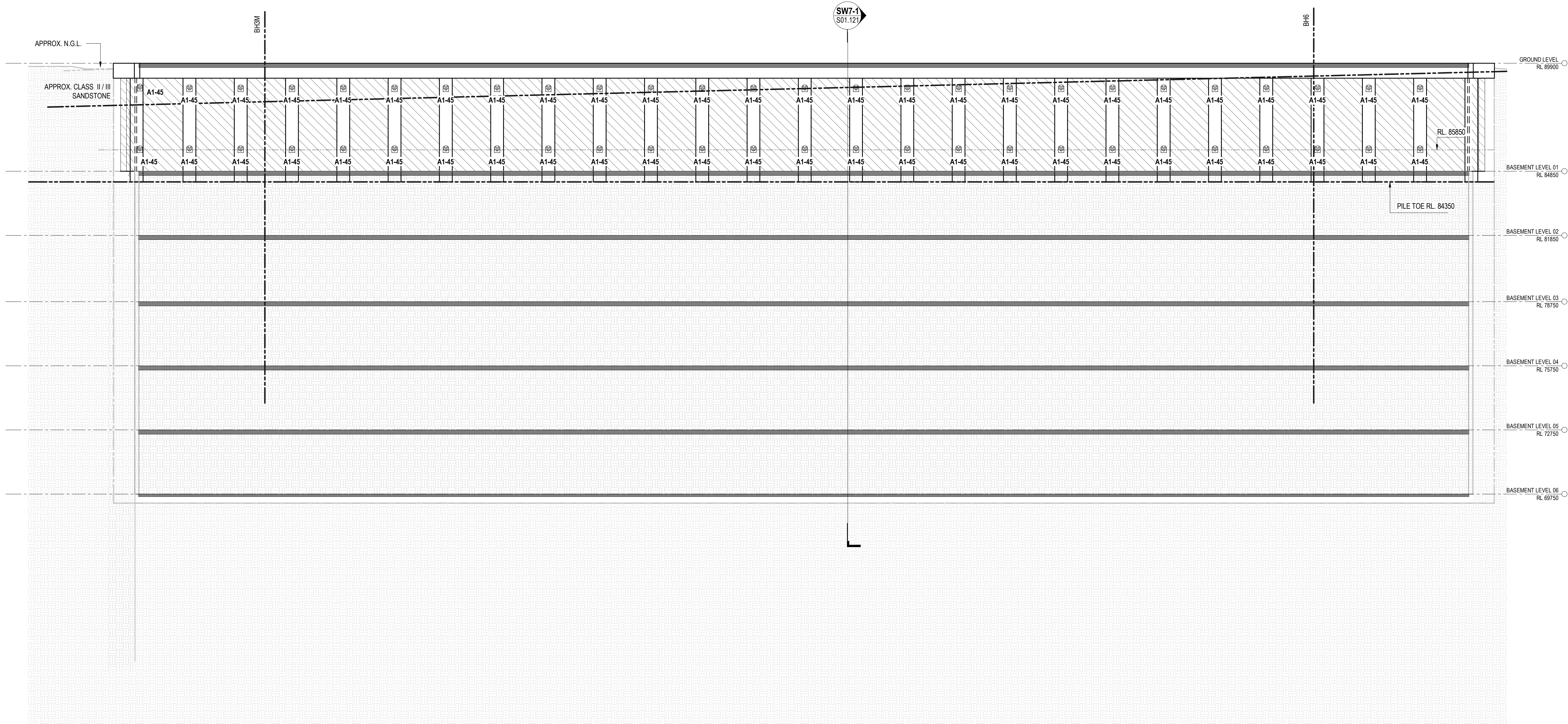
SHORING WALL ELEVATIONS
SW5 & SW6

JOB NUMBER: 20025	DATE: RC
DESIGNED BY: RC	DRAWN BY: AV

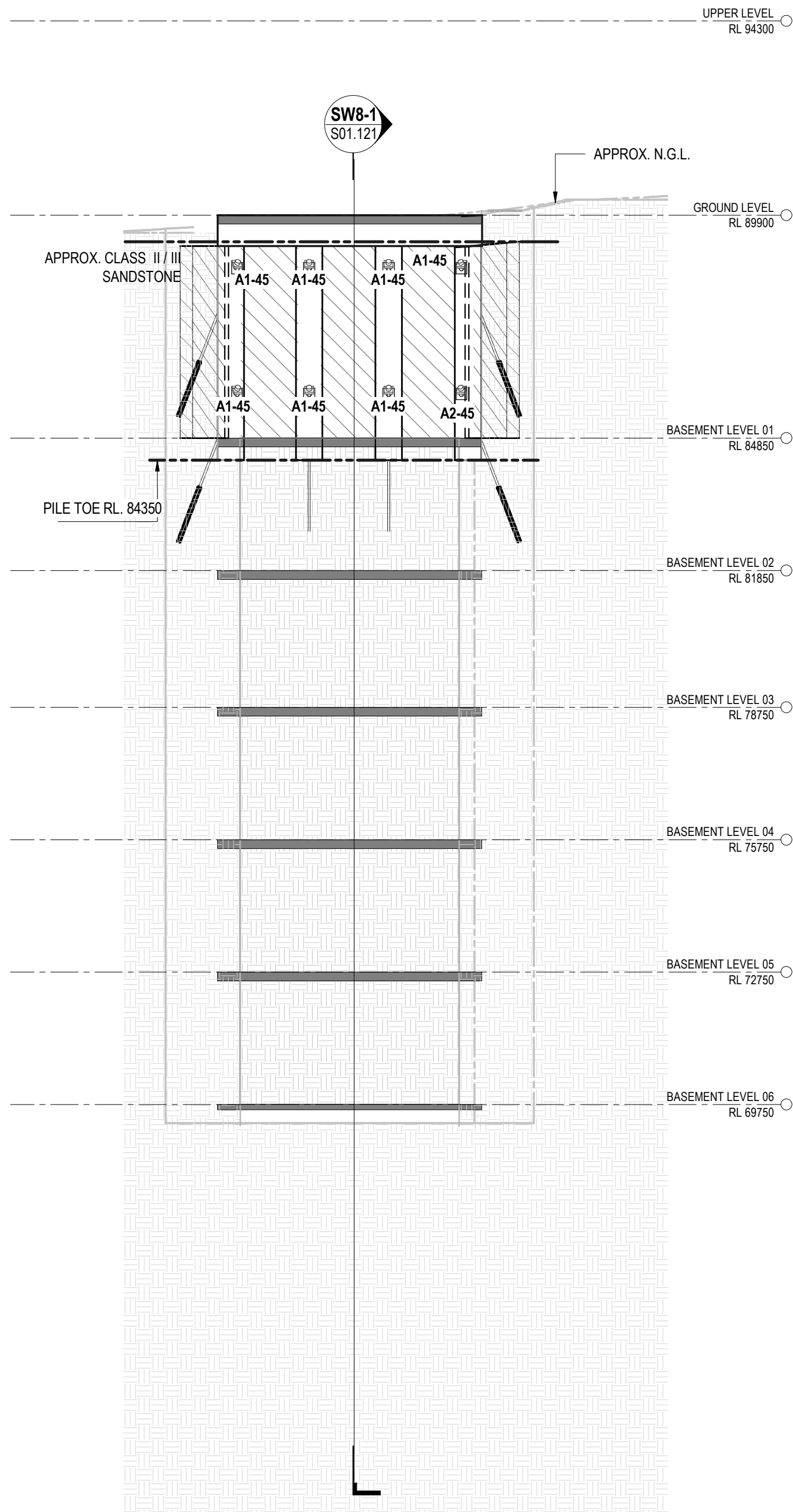
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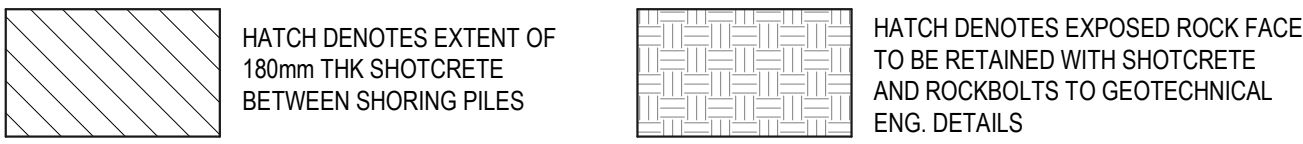
SW7
SCALE 1: 100



SW8
SCALE 1: 100

SHORING PILE SCHEDULE					
MARK	DIA.	VERT. BARS	TIES	CONCRETE GRADE	COVER
SP1	600	8N22	N16-150	50	70

ANCHOR SCHEDULE				
MARK	SWL	LO	INCLINATION	MIN. BOND LENGTH
A1-45	300	200	45°	4200
A2-45	450	300	45°	6200
A3-45	450	400	45°	8200



GEOTECHNICAL ENGINEER TO INSPECT EXPOSED SHALE FACE REGULARLY DURING EXCAVATION AND NOMINATE APPROPRIATE ROCK BOLTS AND SHOTCRETE AS REQUIRED TO ENSURE STABILITY AT ALL TIMES.

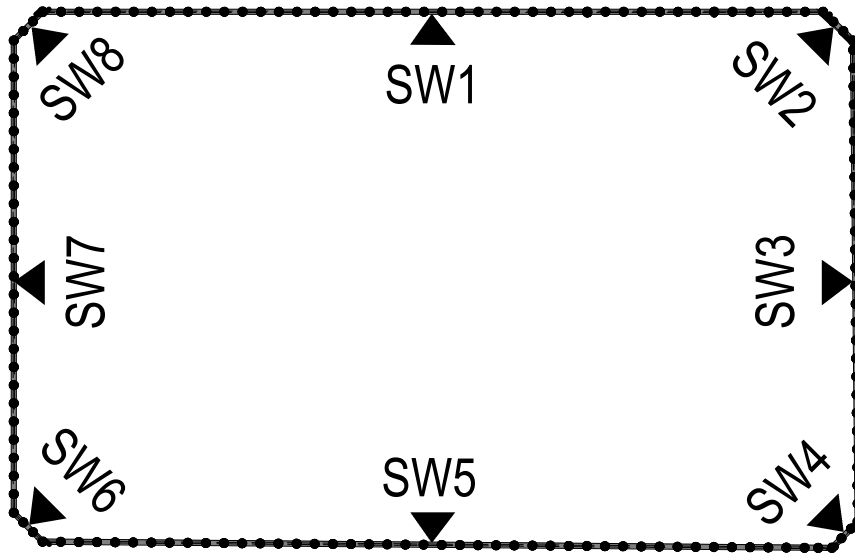
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'LO' DENOTES LOCK OFF LOAD
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NOTE:
MAXIMUM 500mm EXCAVATION BELOW ANCHOR HEIGHT PERMITTED PRIOR TO INSTALLING ANCHOR



KEY PLAN
SCALE 1: 1000

PRELIMINARY ISSUE
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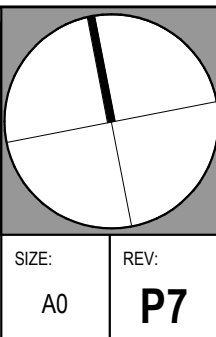


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NSW 1585
Postal Address: PO Box 111
North Sydney NSW 1585

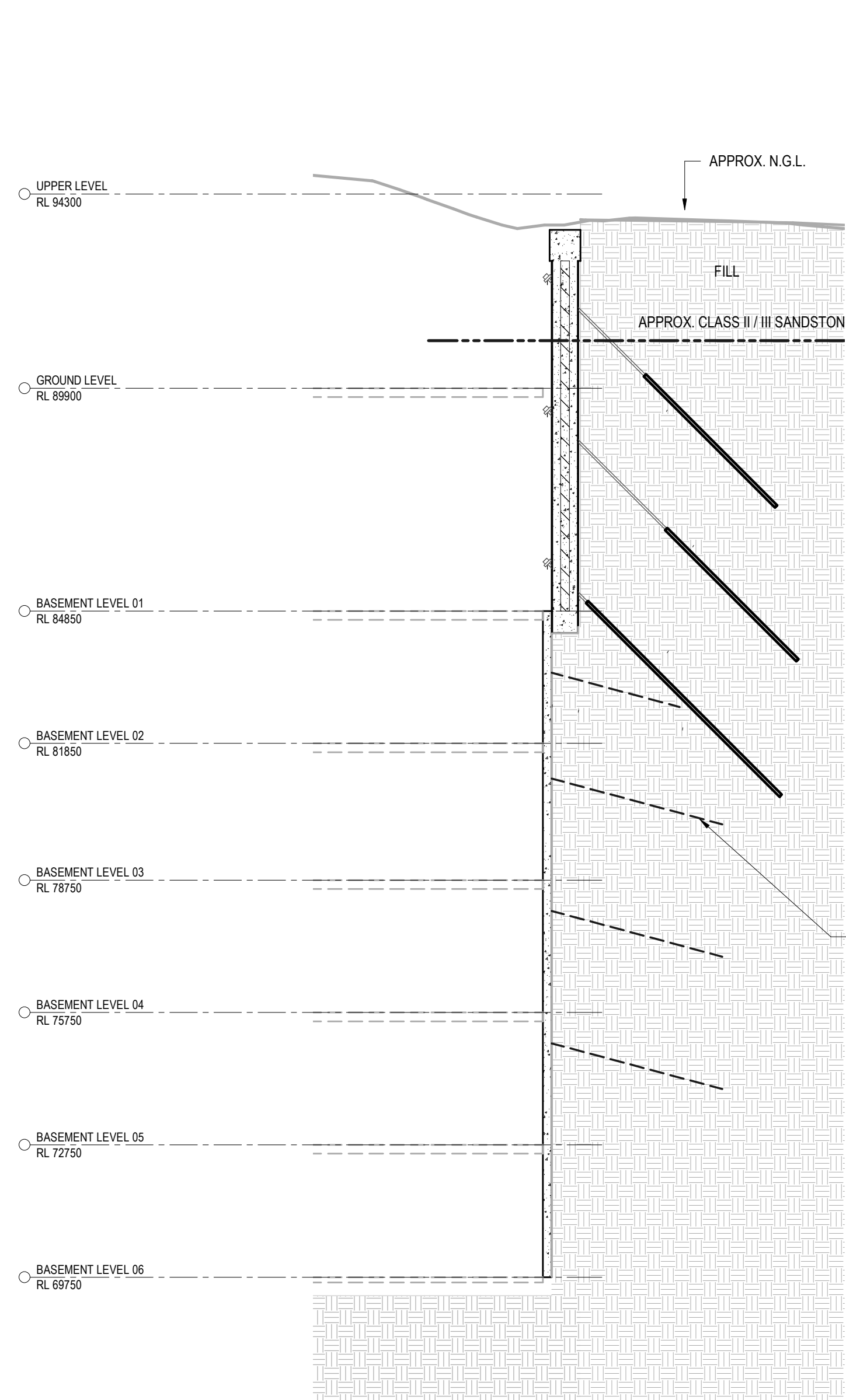
DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

SHORING WALL ELEVATIONS
SW7 & SW8

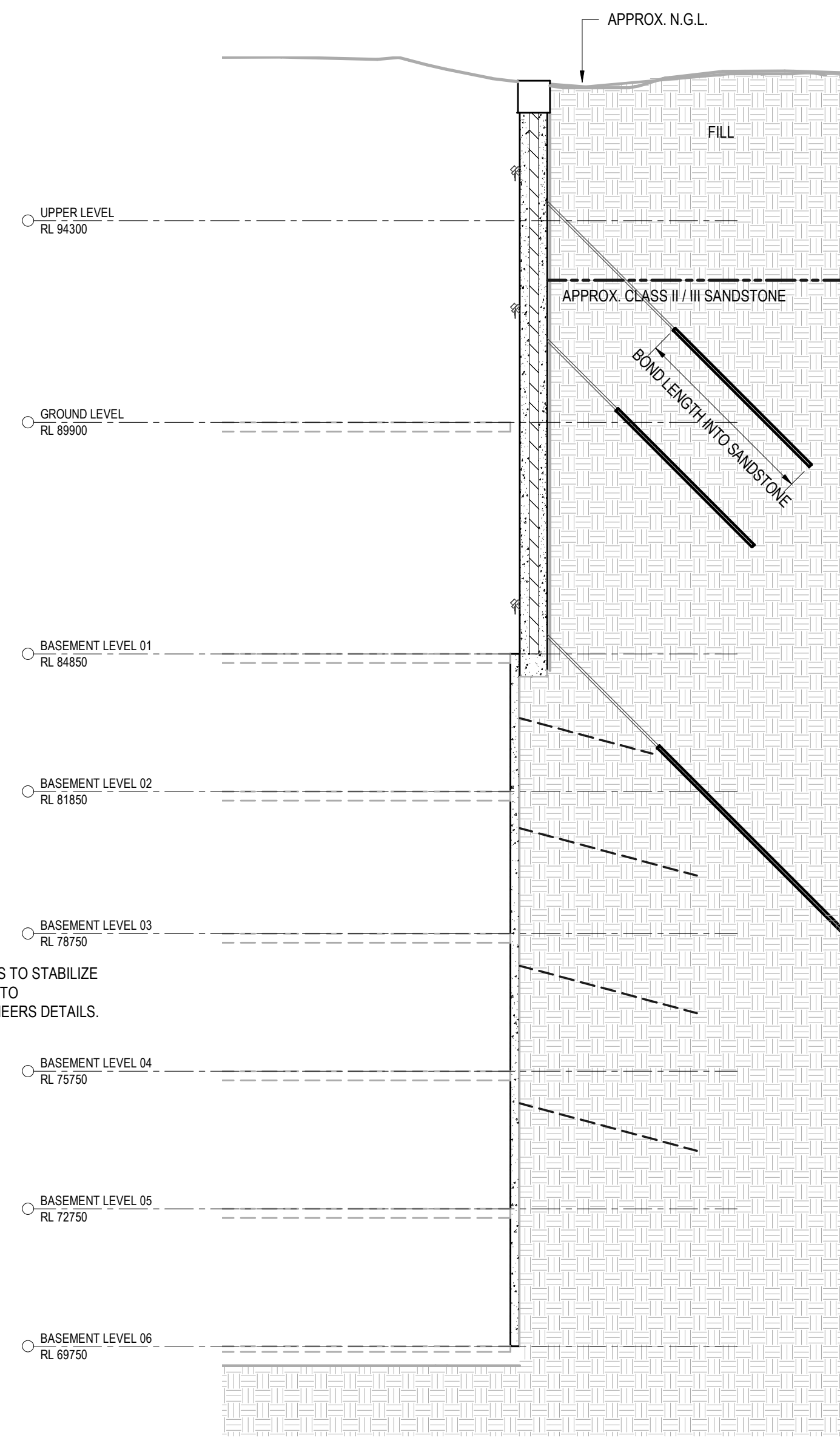
JOB NUMBER: 20025	DATE: 11/01/2022	SCALE: 1:100, 1:1000 @ A0	SIZE: A0	REV: P7
DESIGNED BY: RC	DRAWN BY: AV			



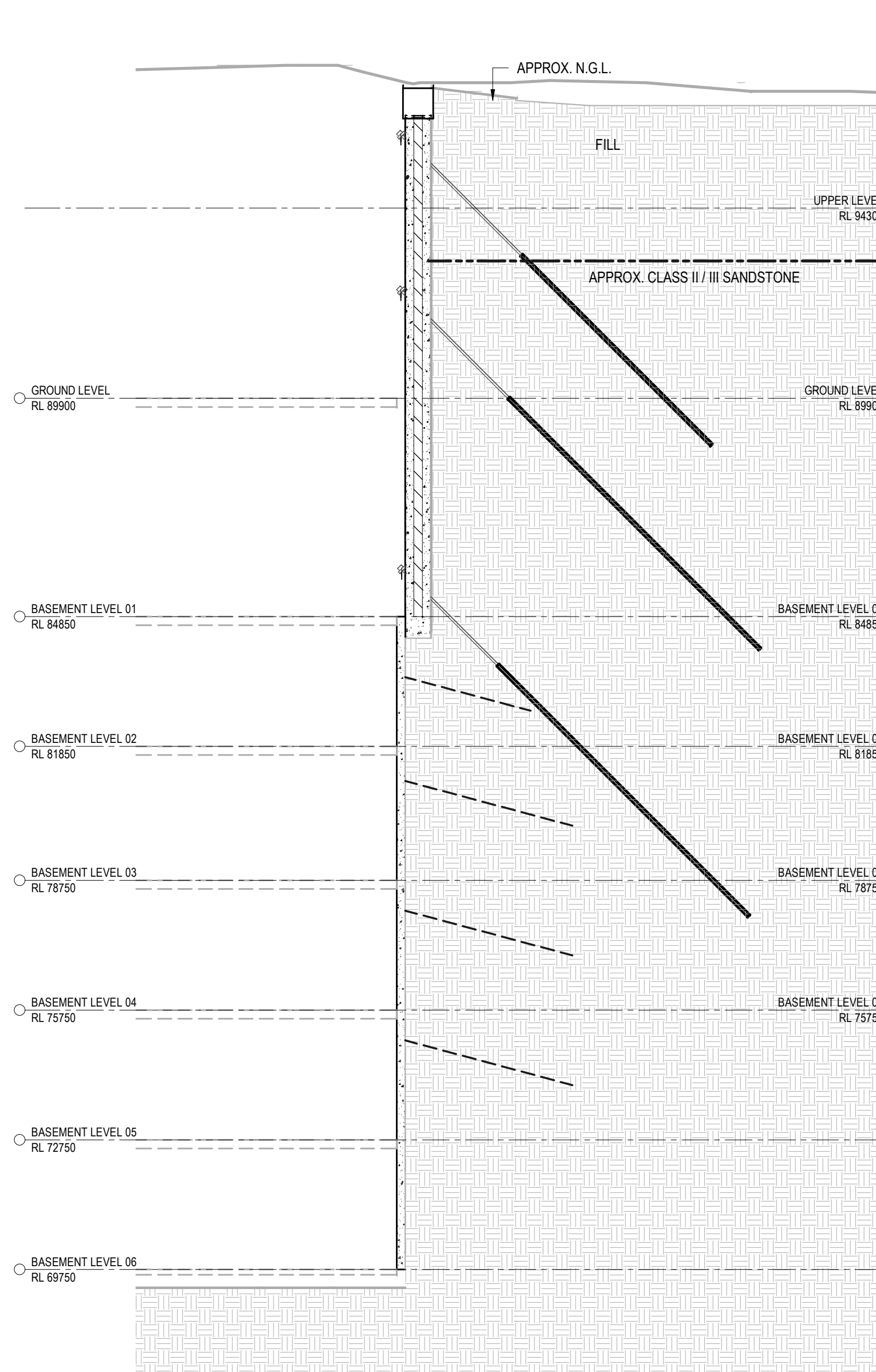
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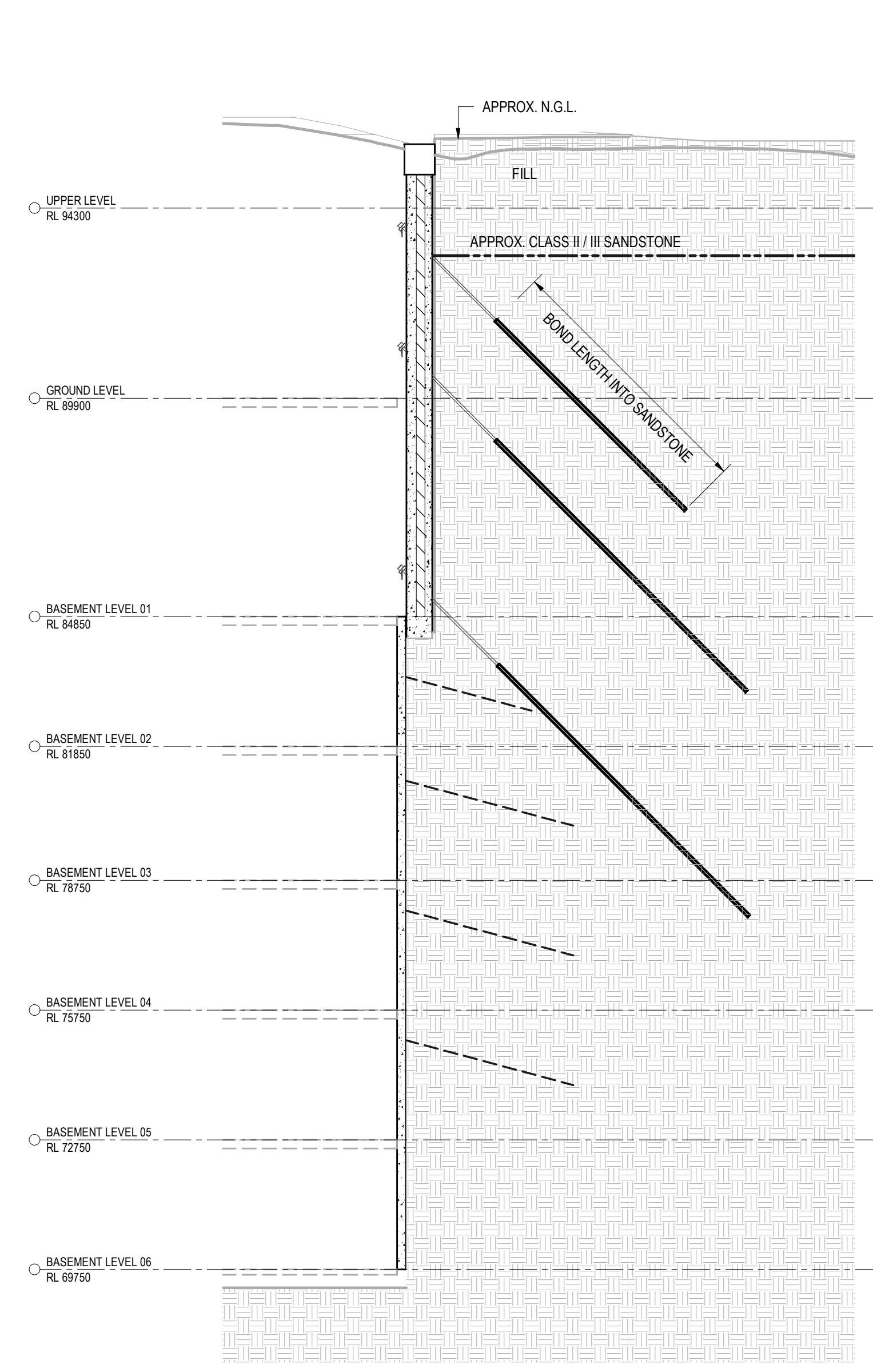
SECTION SW1-1
Scale 1:100 S01.105



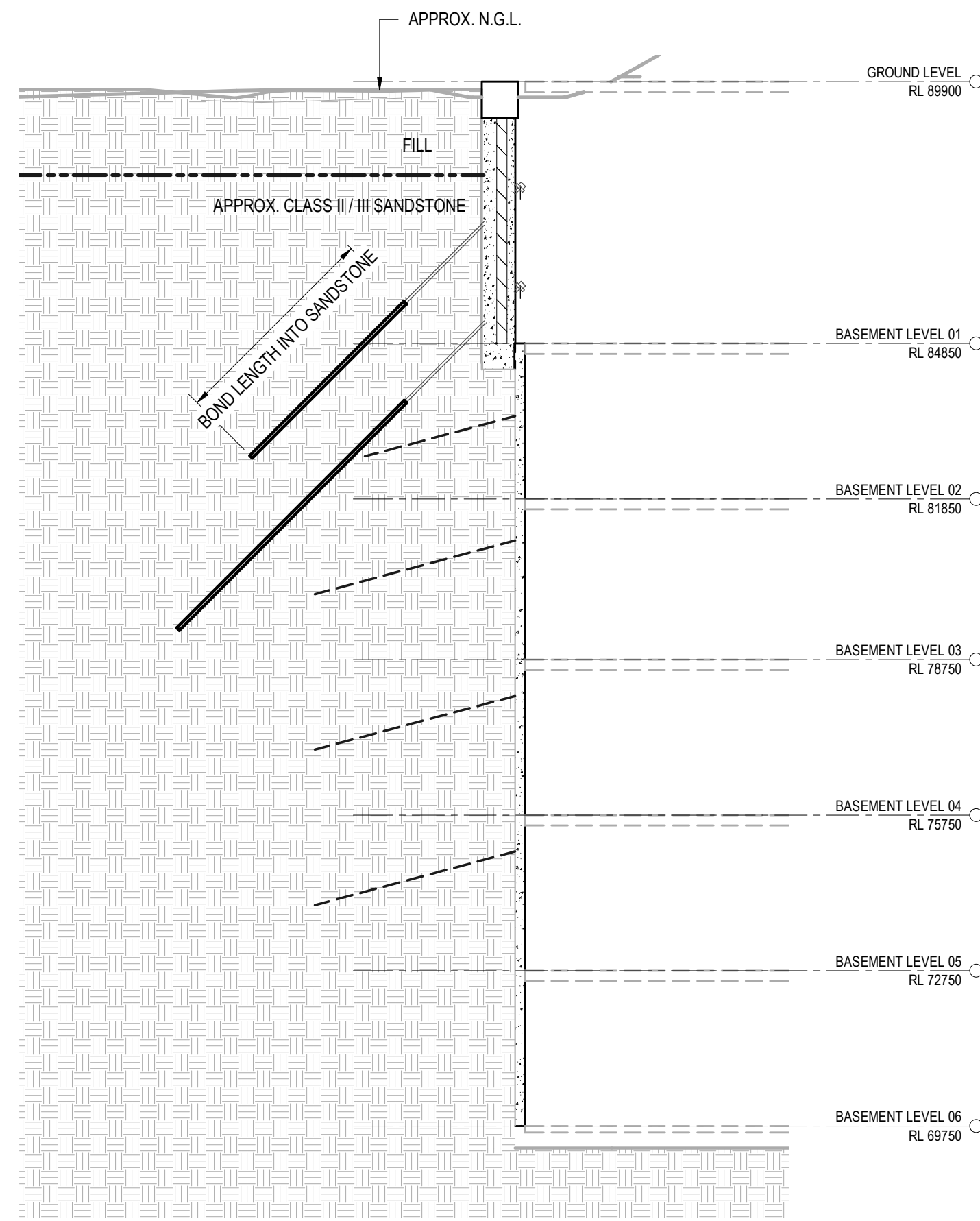
SECTION SW2-1
Scale 1:100 S01.105



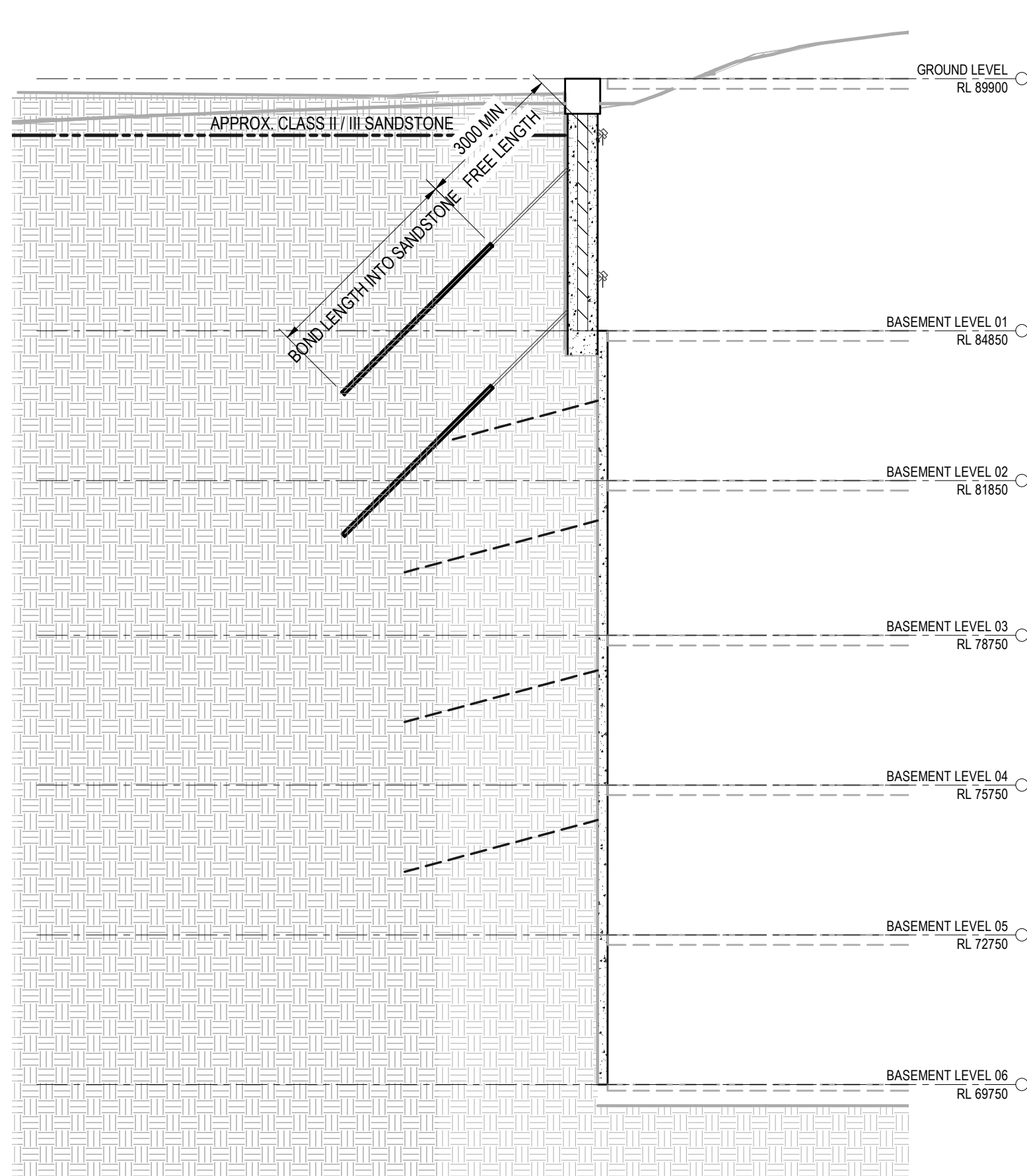
SECTION SW3-1
Scale 1:100 S01.105



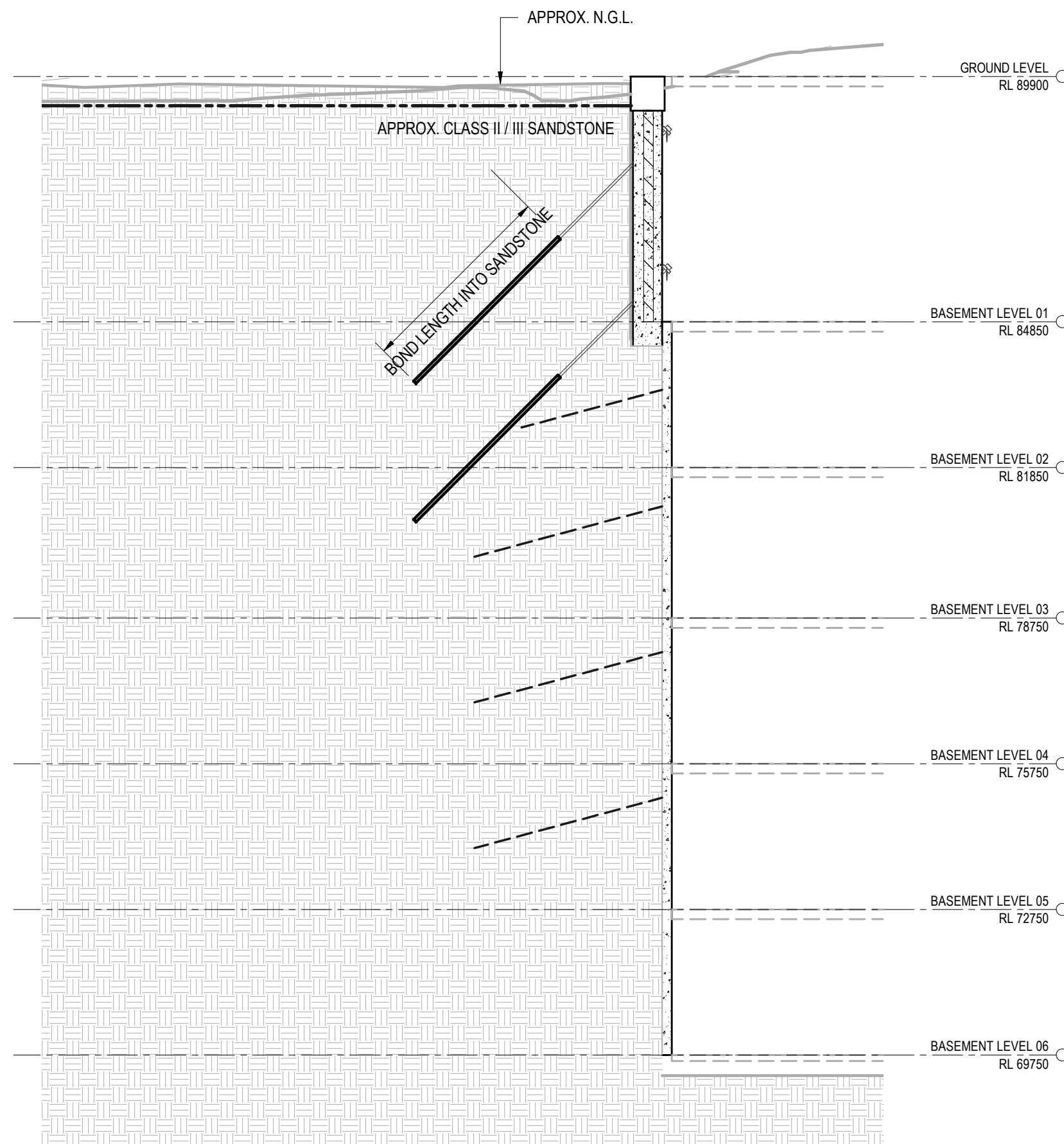
SECTION SW4-1
Scale 1:100 S01.105



SECTION SW6-1
Scale 1:100 S01.105



SECTION SW7-1
Scale 1:100 S01.105



SECTION SW8-1
Scale 1:100 S01.105

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REV	DATE	REVISION DESCRIPTION	BY
P6	22.02.22	ISSUED FOR PRELIMINARY INFORMATION	AV
P5	25.05.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P4	12.04.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P3	17.09.20	ISSUED FOR PRELIMINARY INFORMATION	AV
P2	11.09.20	ISSUED FOR PRELIMINARY INFORMATION	AV

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DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

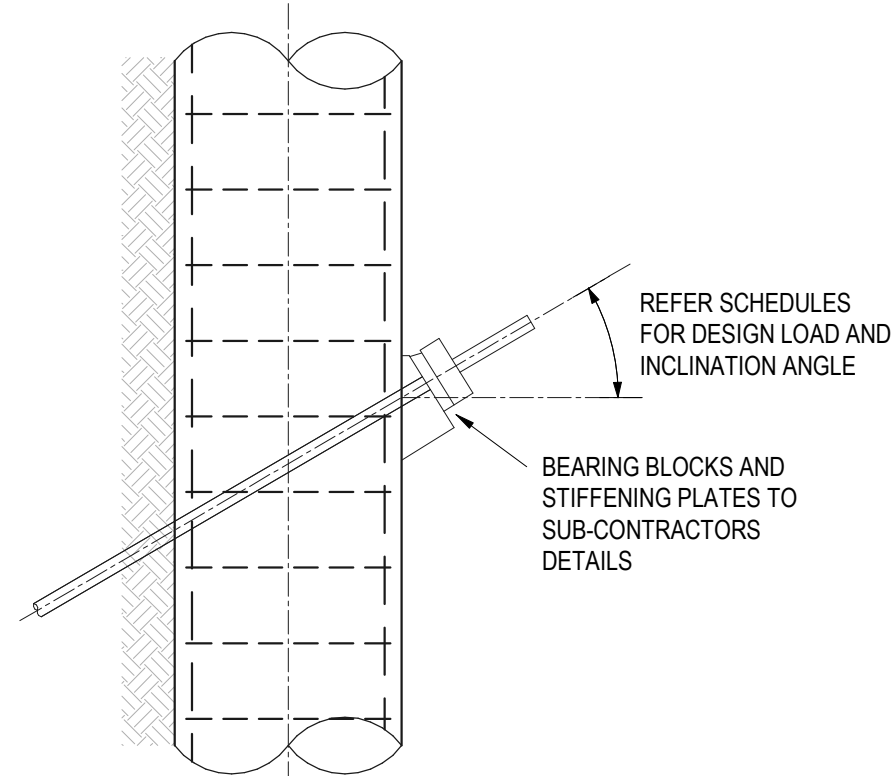
SHORING SECTIONS
SHEET 1

JOB NUMBER:
20025
DESIGNED BY:
RC
DRAWN BY:
AV

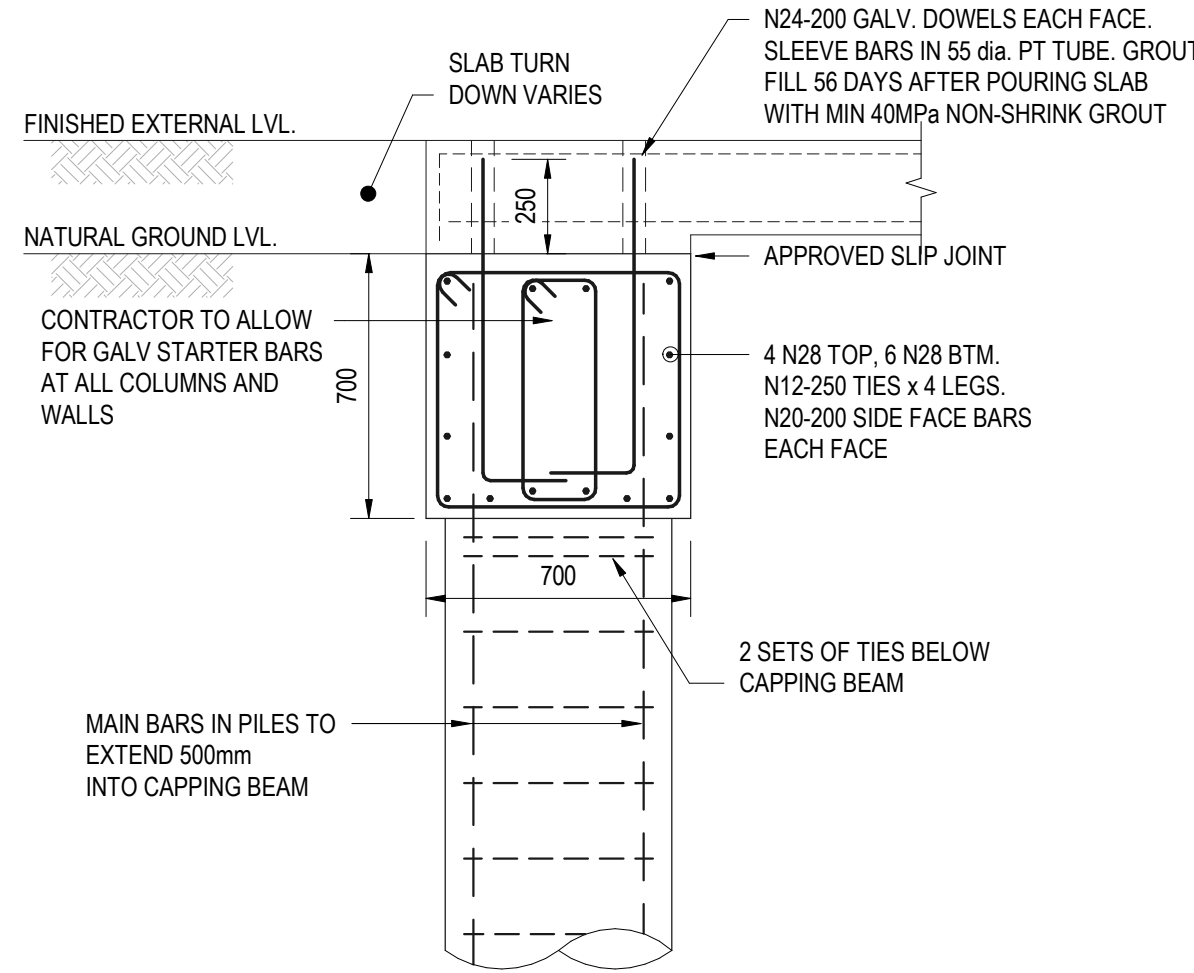
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S01.121
DATE:
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SIZE:
A0
REV:
P6

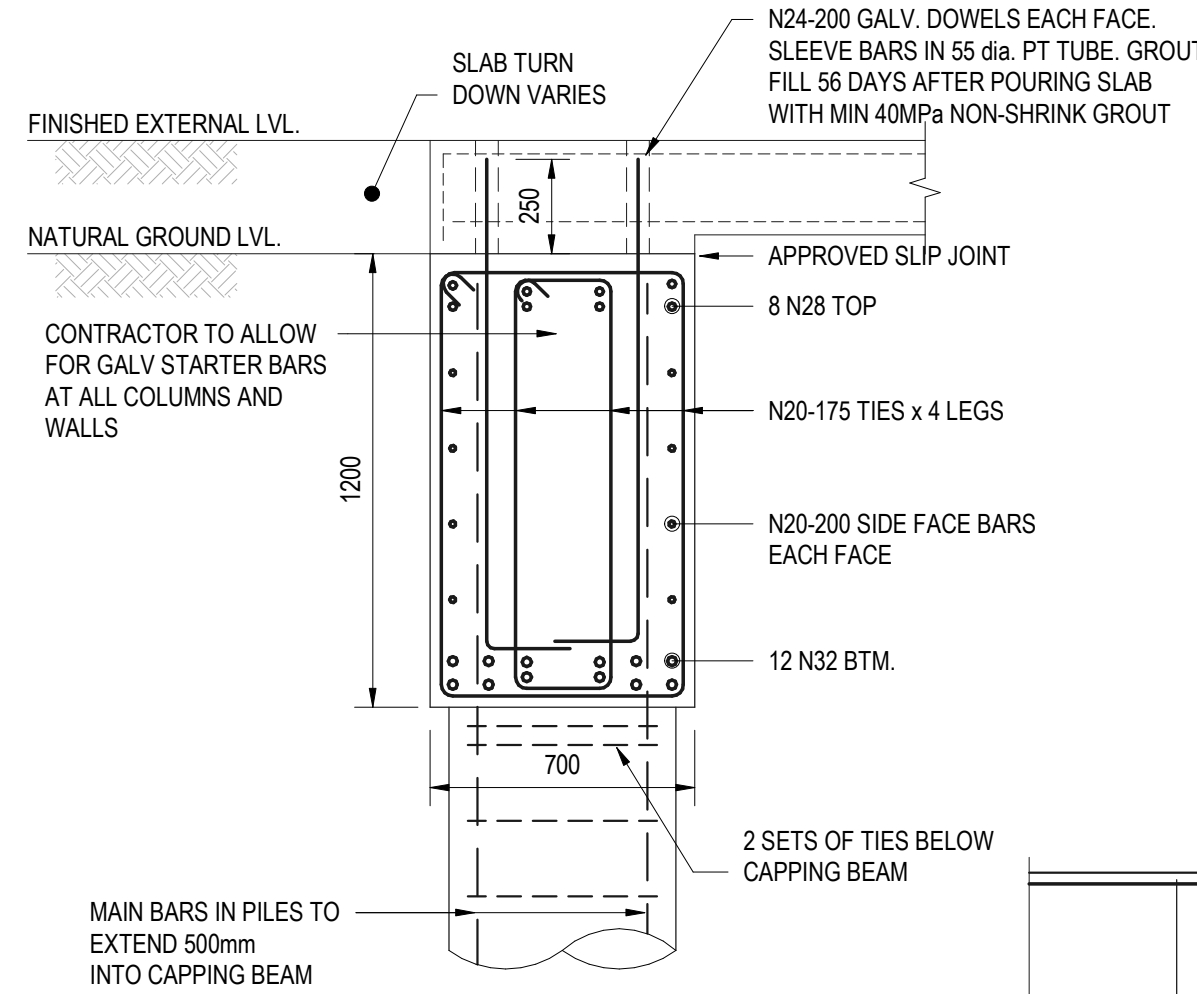
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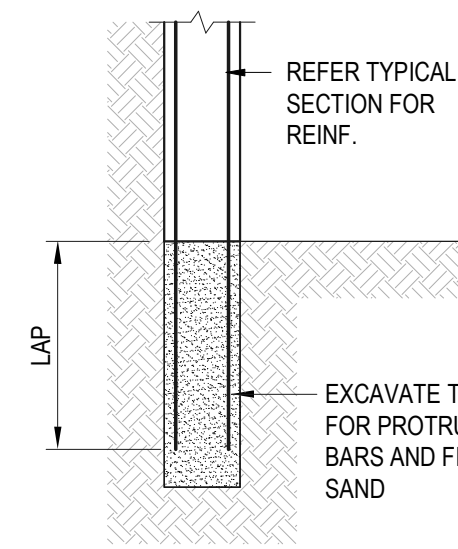
TYPICAL PILE & ANCHOR DETAIL



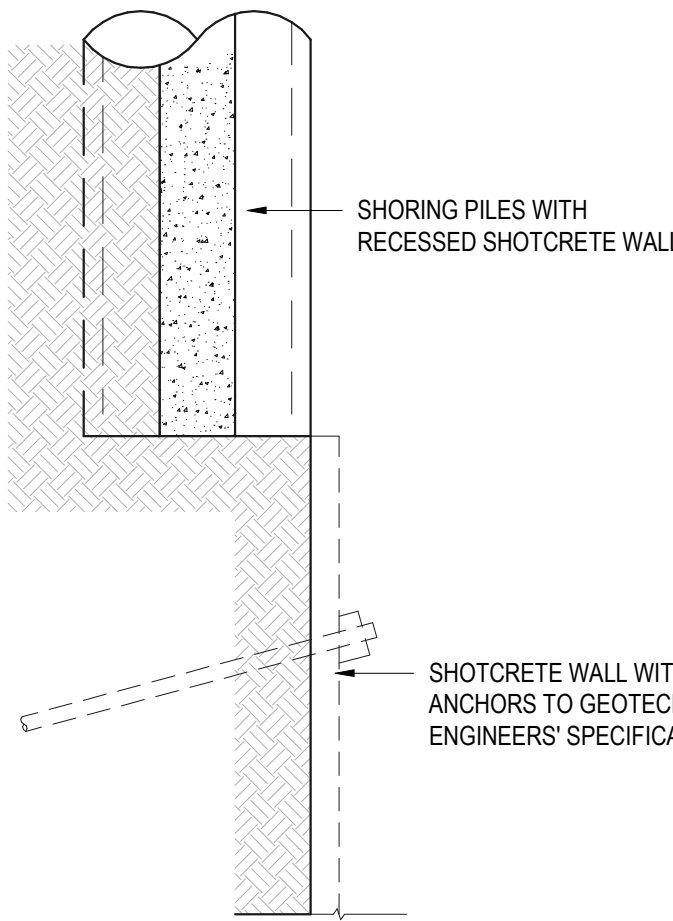
CAPPING BEAM - CB1
NOTE: SHOTCRETE WALL OMITTED FOR CLARITY



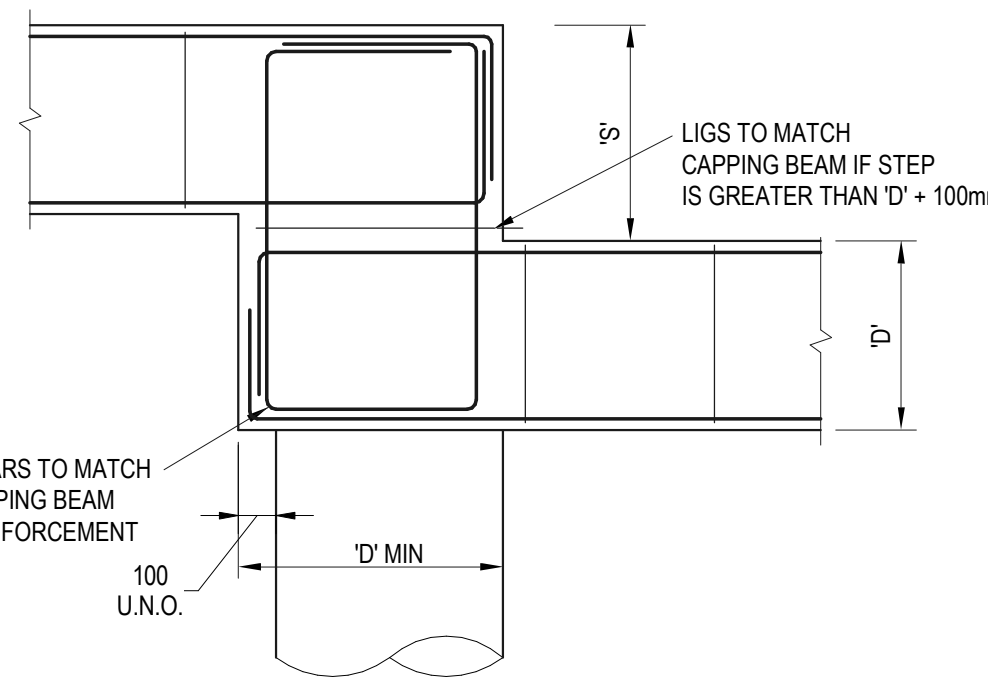
CAPPING BEAM - CB2
NOTE: SHOTCRETE WALL OMITTED FOR CLARITY



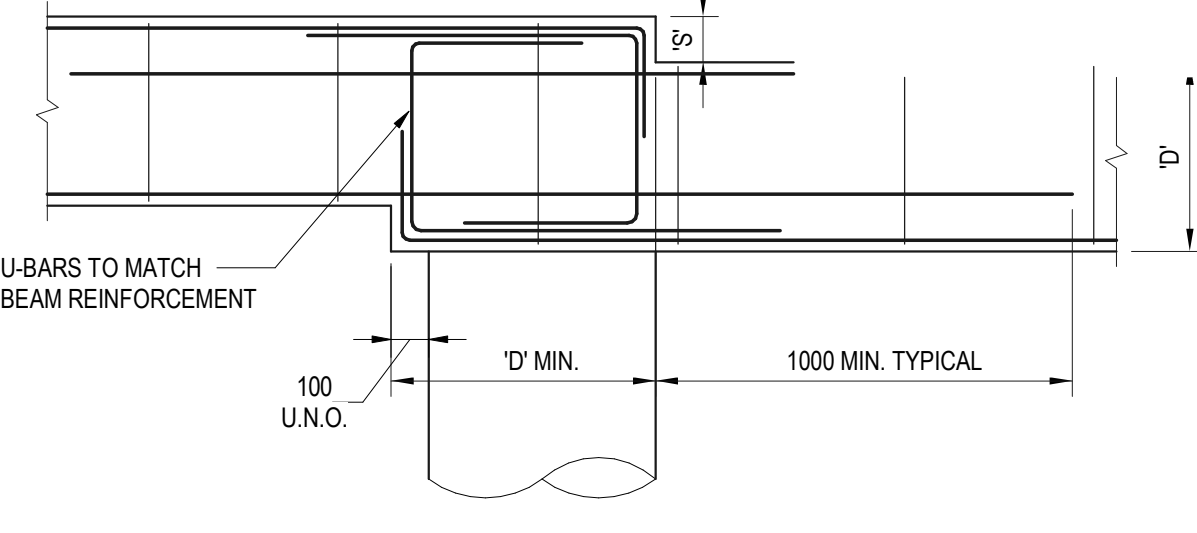
HORIZONTAL SHOTCRETE
CONSTRUCTION JOINT



TYPICAL MID-LEVEL PILE BASE

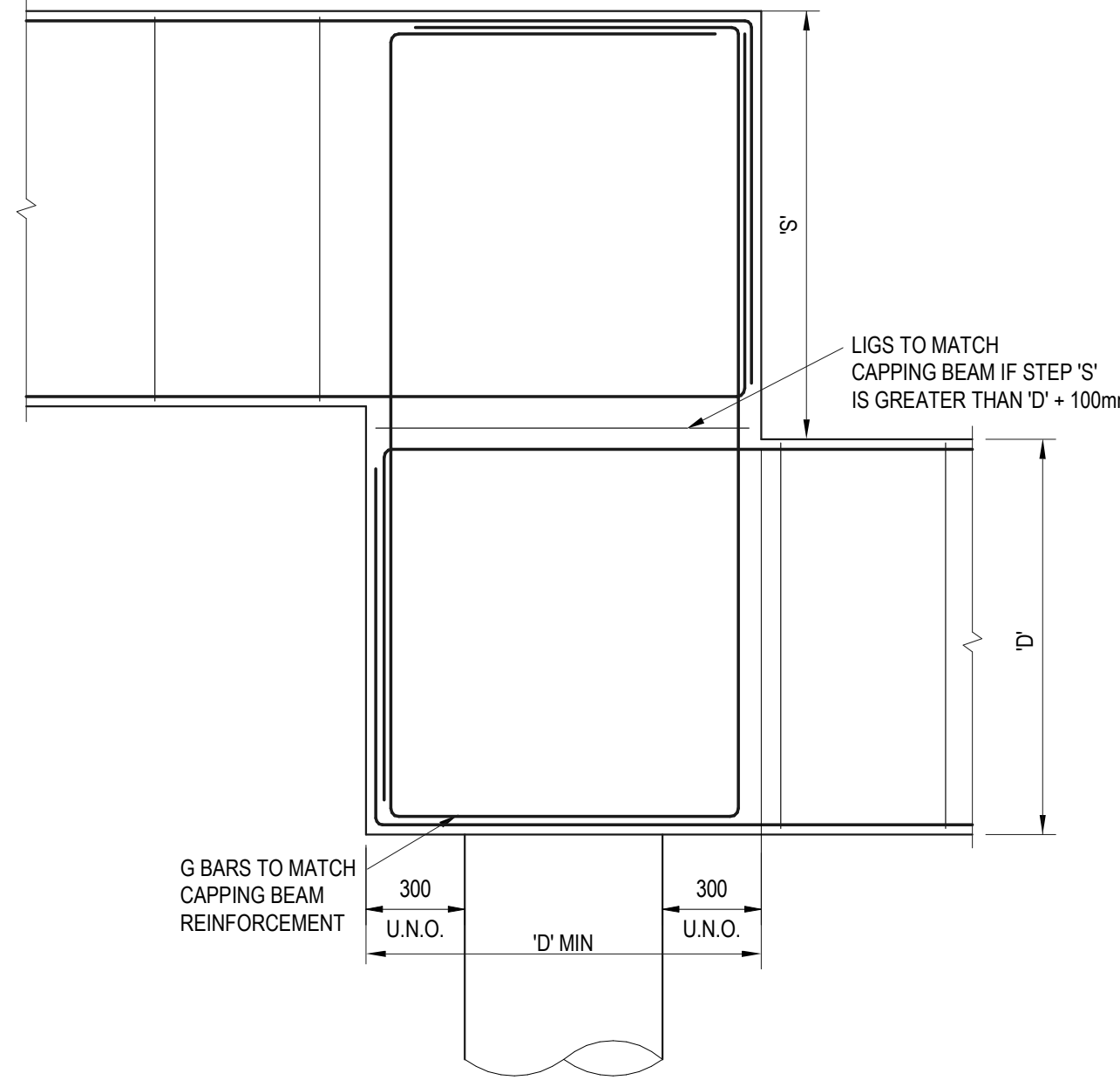


SETDOWN : 'S' = STEP GREATER THAN 'D'-50mm

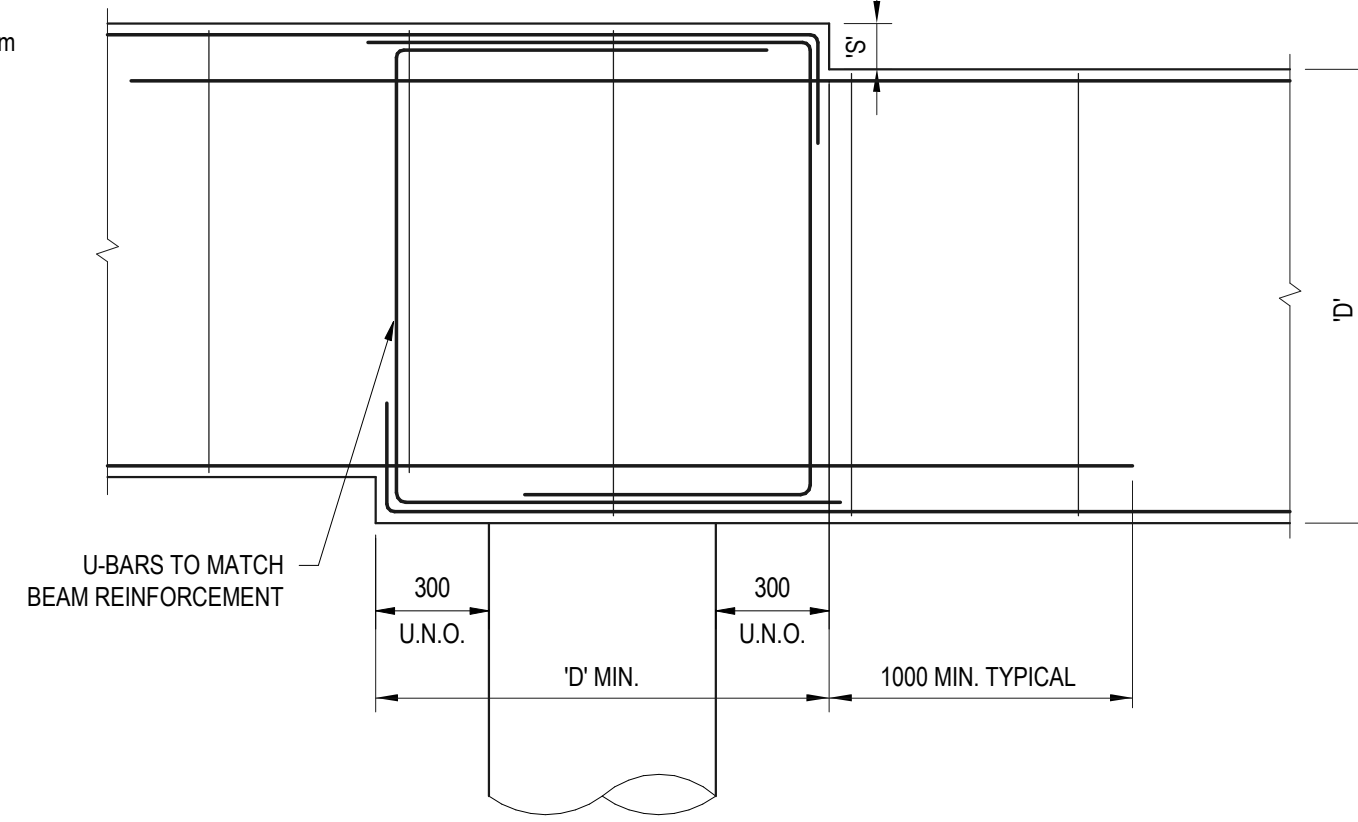


SETDOWN : 'S' = STEP LESS THAN 'D'-50mm

TYPICAL CAPPING BEAM STEP DETAILS - CB1

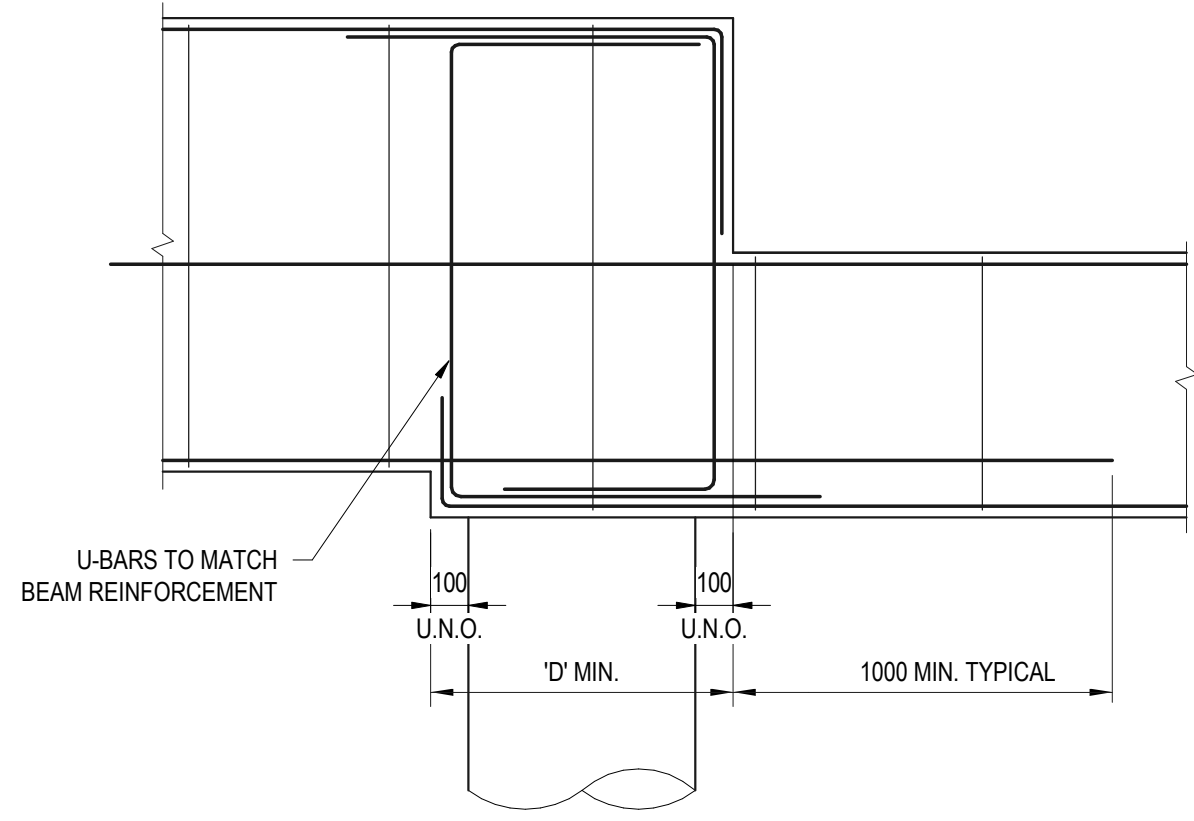


SETDOWN : 'S' = STEP GREATER THAN 'D'-50mm

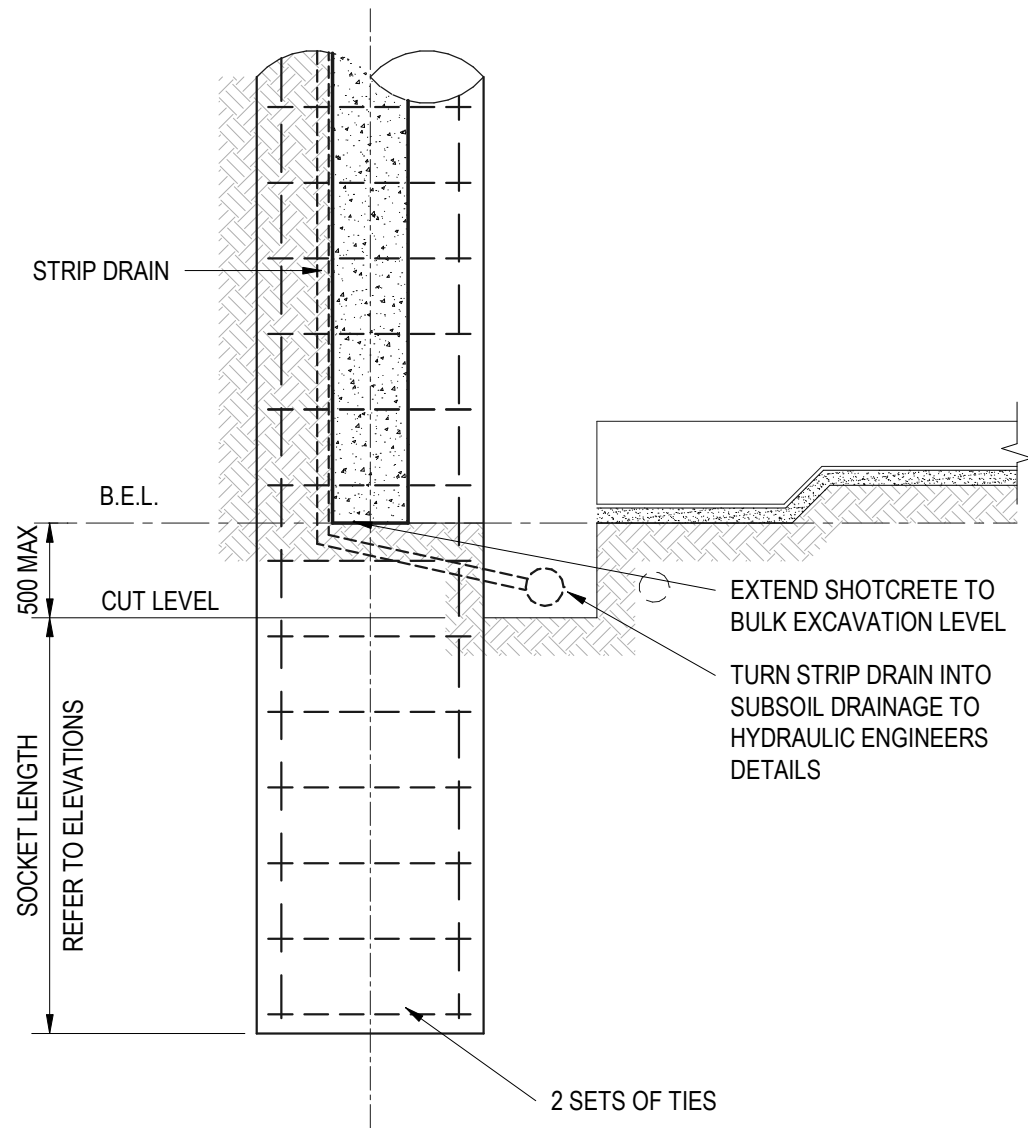


SETDOWN : 'S' = STEP LESS THAN 'D'-50mm

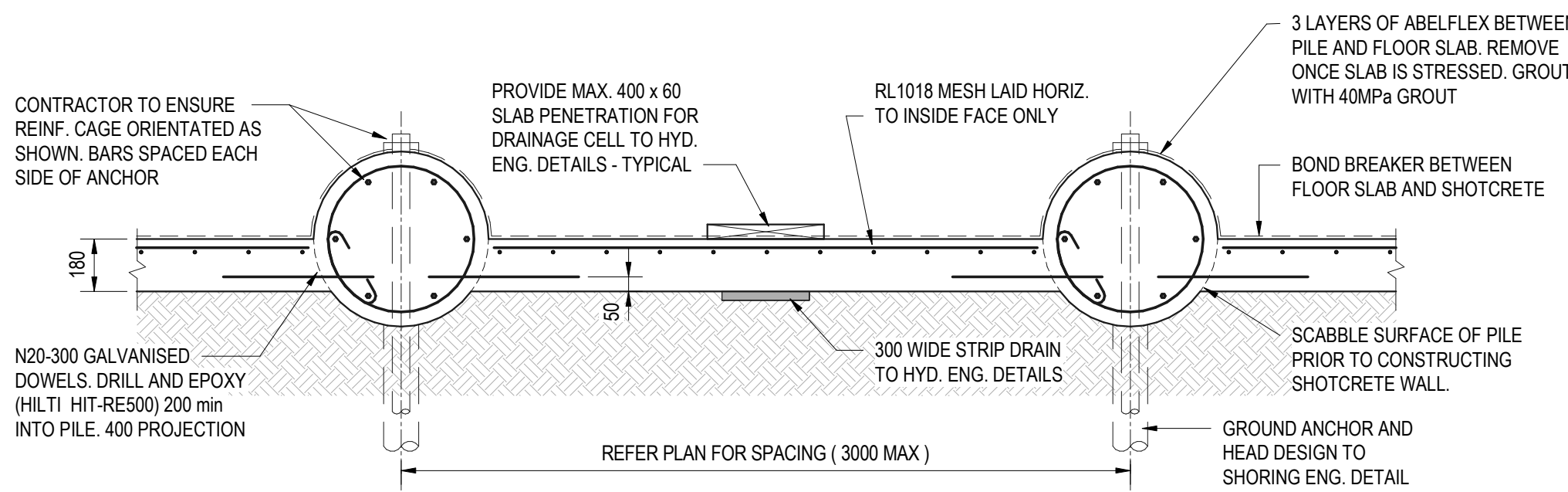
TYPICAL CAPPING BEAM STEP DETAILS - CB2



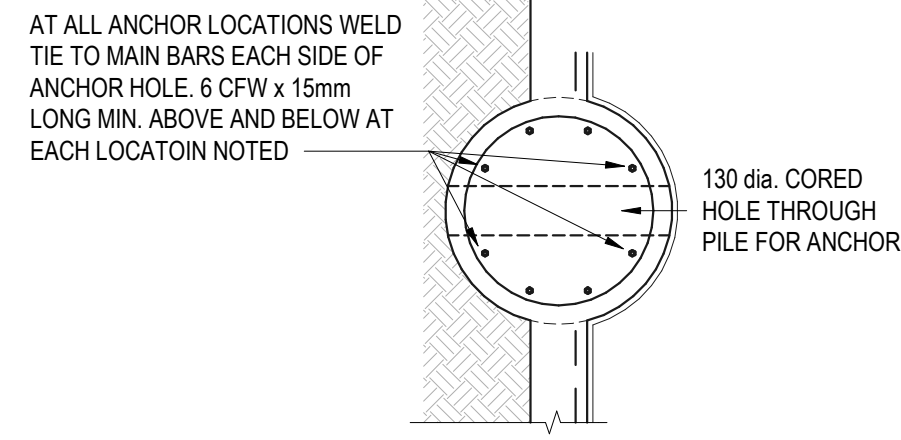
TYPICAL CAPPING BEAM STEP DETAIL - CB1 TO CB2



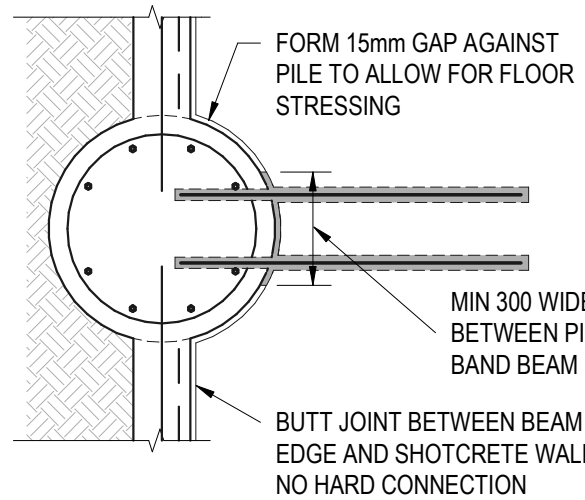
TYPICAL PILE SOCKET



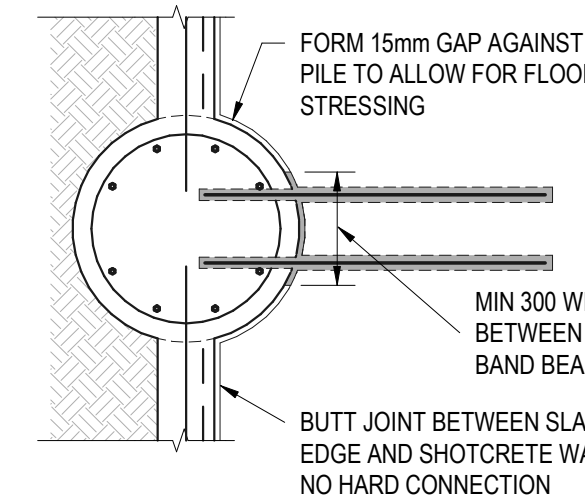
TYPICAL SHORING PILE & 180 THK SHOTCRETE WALL PLAN - 40MPa



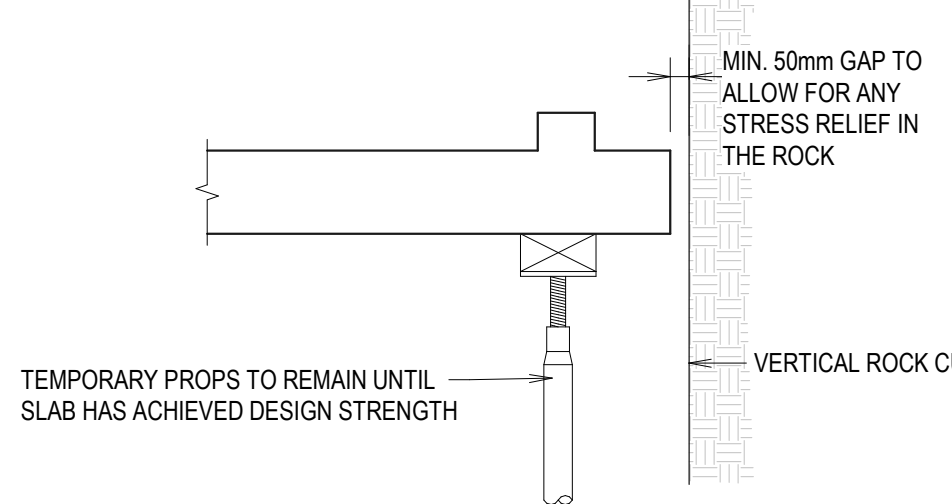
TYPICAL PILE
REINFORCEMENT AT ANCHOR



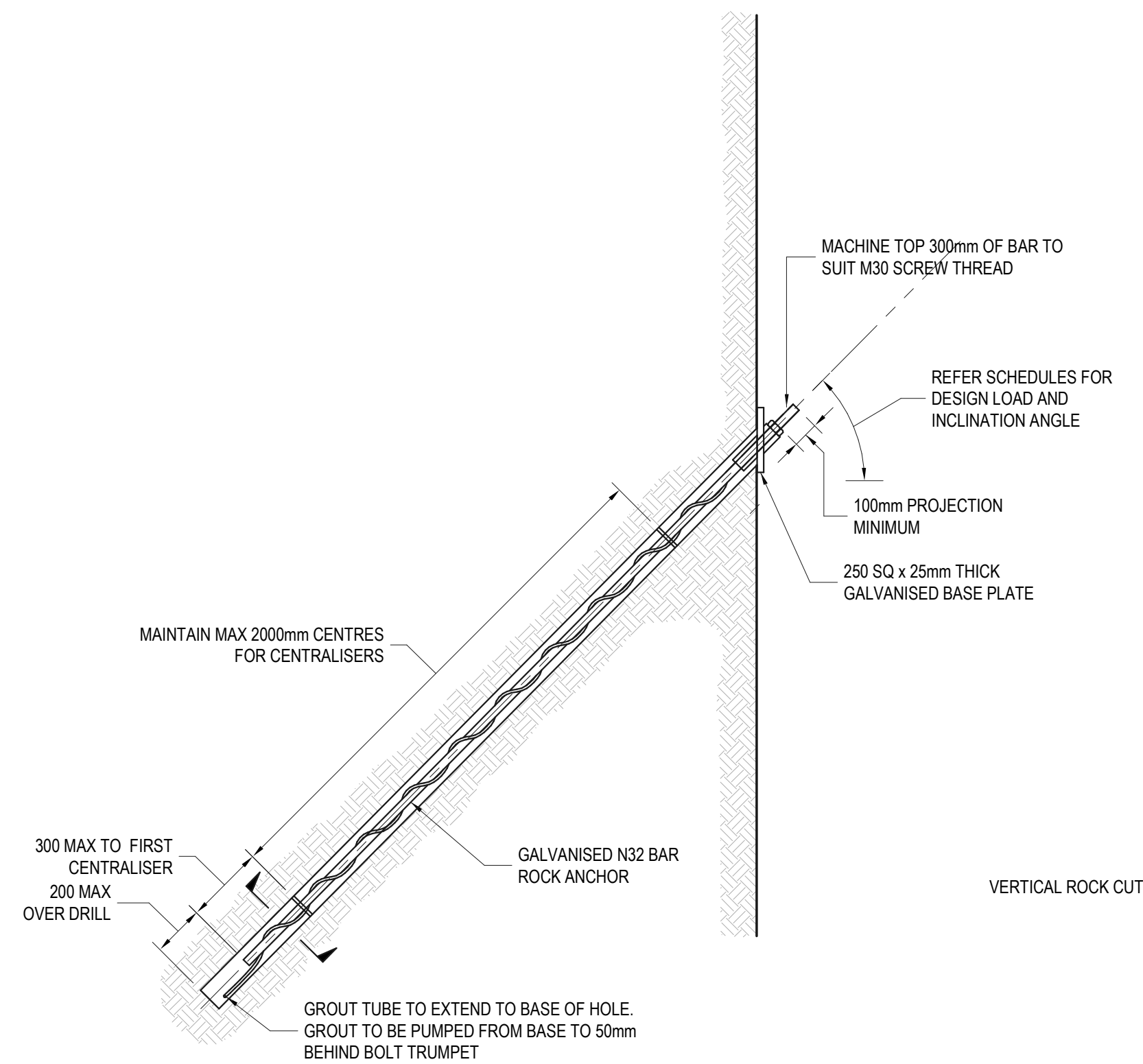
TYPICAL PILE TO BAND BEAM
CONNECTION DETAIL



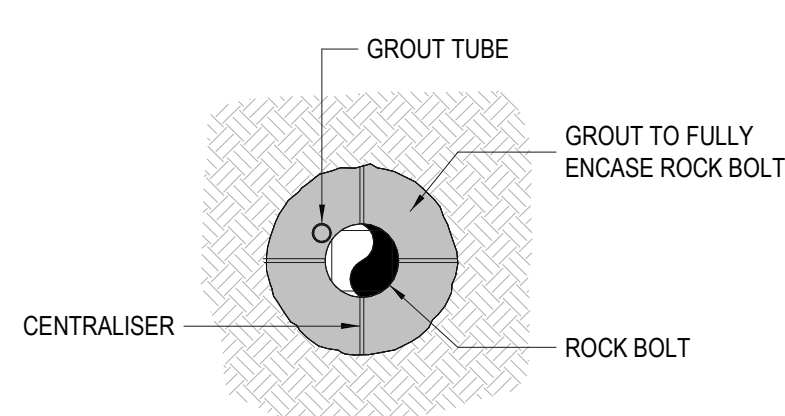
TYPICAL PILE TO SLAB
CONNECTION DETAIL



TYPICAL SLAB TO EXPOSED ROCK FACE



TYPICAL ROCK BOLT DETAIL



SECTION THROUGH ROCK BOLT

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P4	25.05.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P3	12.04.21	ISSUED FOR PRELIMINARY INFORMATION	AV
P2	11.09.20	ISSUED FOR PRELIMINARY INFORMATION	AV
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Company: 120, 121 & 122
Level 12, 121 & 122
121 & 122, 121 & 122
121 & 122, 121 & 122

DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

TYPICAL SITE RETENTION DETAILS
SHEET 1

JOB NUMBER:	20025	ORIG NUMBER:	S01.125
DESIGNED BY:	RC	DATE:	
DRAWN BY:	AV	SCALE:	1:20 @ A0

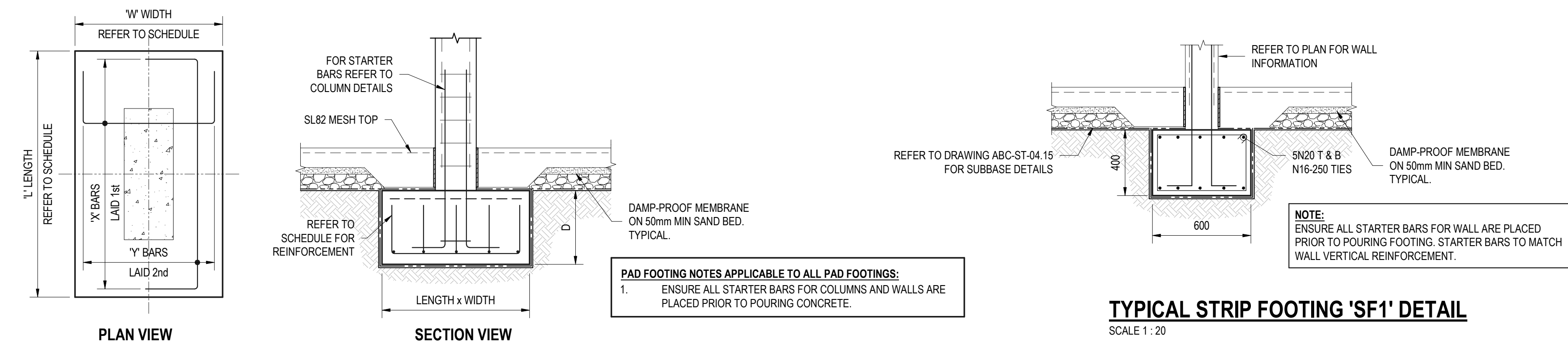
SIZE:	A0	REV:	P5

12/03/2022 4:29:59 PM

MISCELLANEOUS NOTES:

REFER TO DRAWING S00.001 FOR GENERAL NOTES.

REINFORCEMENT COVERS		
FOOTING		INTERIOR
ELEMENT	TOP	50mm
	BTM	15mm
	SIDES	75mm

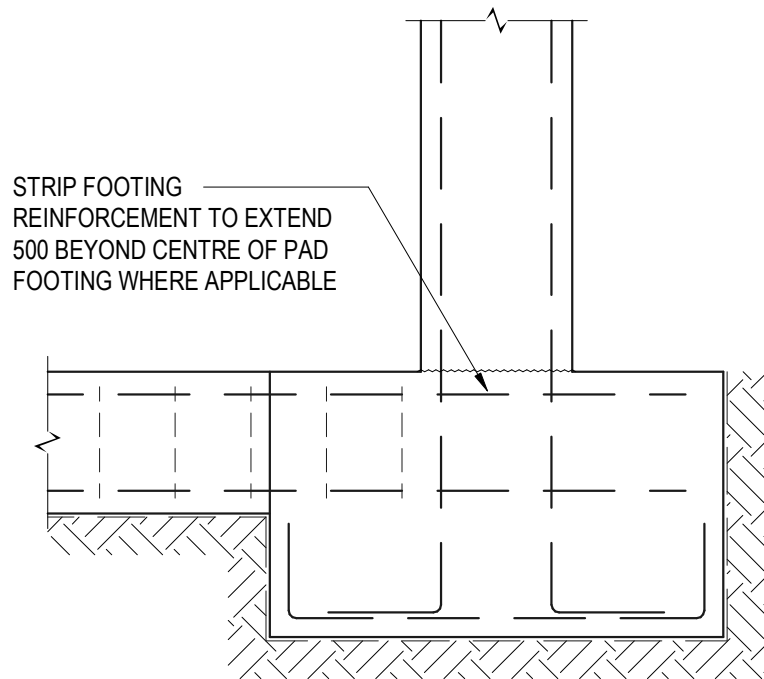
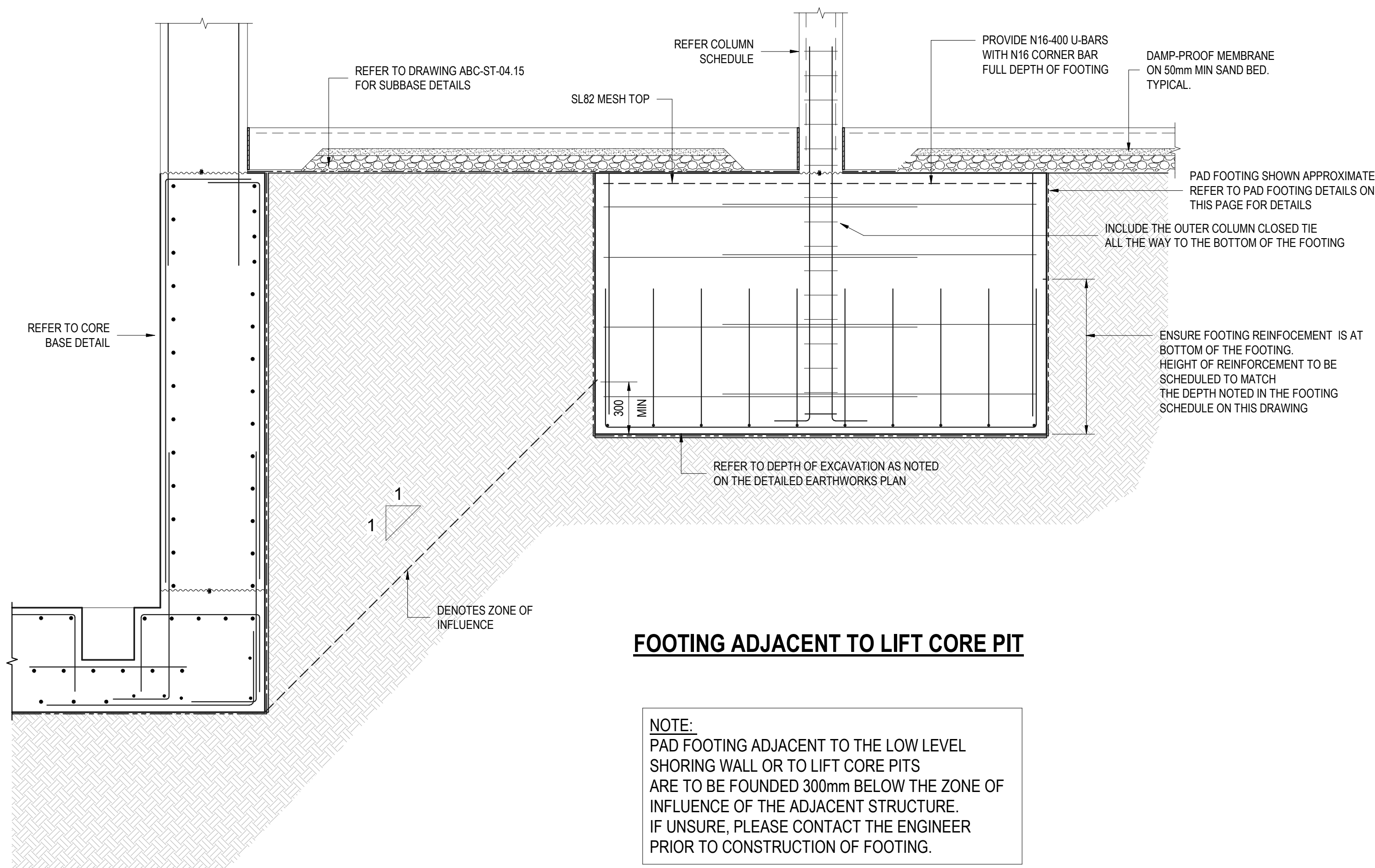


PAD FOOTING SCHEDULE						
PAD	3500 kPa *			REINFORCEMENT		CONCRETE STRENGTH
	L	W	D	X' BARS	Y' BARS	
PF1	1800	1200	700	N24-250	N24-250	40 MPa
PF2	1900	1500	750	N24-150	N24-150	40 MPa
PF3	2000	1600	800	N24-150	N24-150	40 MPa
PF3A	-	-	-	-	-	40 MPa
PF4	2100	1800	850	N24-150	N24-150	40 MPa
PF5	2200	2000	900	N28-150	N28-150	50 MPa
PF6	2400	2400	1100	N28-150	N28-150	50 MPa
PF7	2700	2700	1250	N28-100	N28-100	50 MPa
PF8	2900	2900	1300	N28-100	N28-100	50 MPa
PF9	3100	3100	1350	N28-100	N28-100	50 MPa
PF9A	-	-	-	-	-	50 MPa
PF9B	3100	3100	1350	N28-100	N28-100	50 MPa
PF10	3700	3700	1600	N32-100	N32-100	50 MPa
PF11	3500	1800	1050	N24-100	N24-100	50 MPa
PF12	3400	3400	1500	N28-100	N28-100	50 MPa
PF12A	-	-	-	-	-	50 MPa
PF13	4200	2750	1450	N28-100	N28-100	50 MPa
PF14	4300	2100	1250	N28-100	N28-100	50 MPa
PF15	3400	2000	1150	N28-150	N28-150	50 MPa
PF16	2400	2050	900	N28-150	N28-150	50 MPa

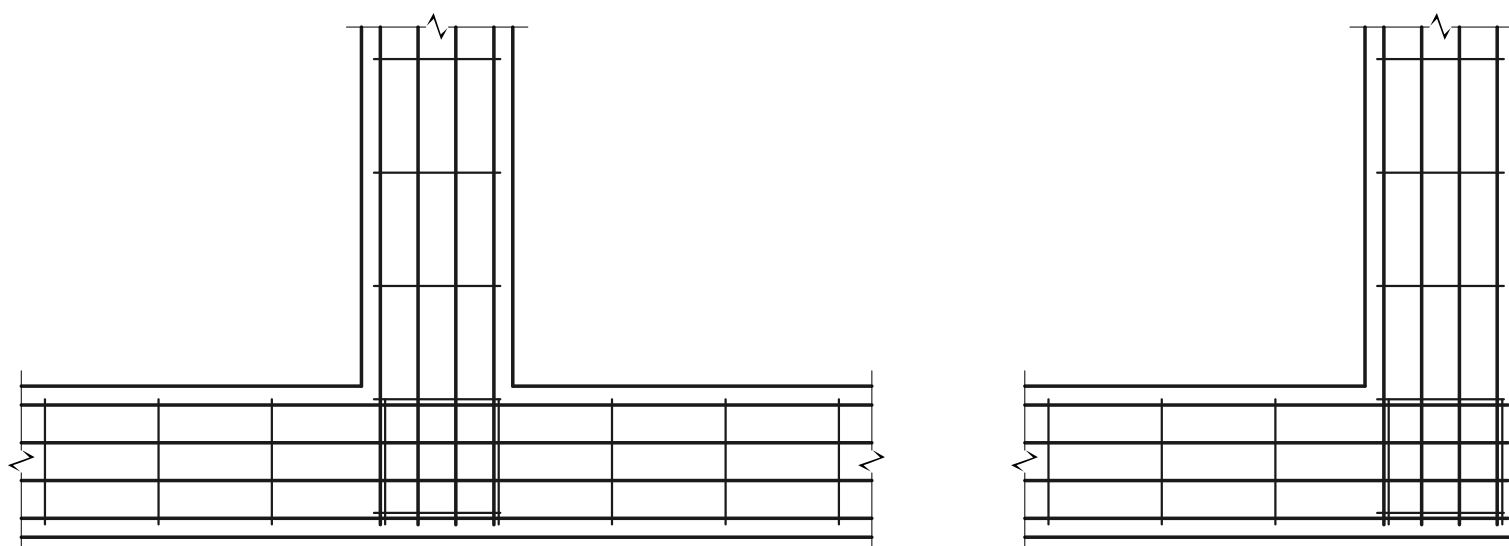
TYPICAL COLUMN PAD FOOTING DETAIL

SCALE 1:20

* PROVIDED SPOON TESTING OF 50% OF FOOTINGS IS UNDERTAKEN AS PER GEOTECHNICAL ENGINEERS REQUIREMENTS



STRIP / PAD FOOTING JUNCTION



T' INTERSECTION

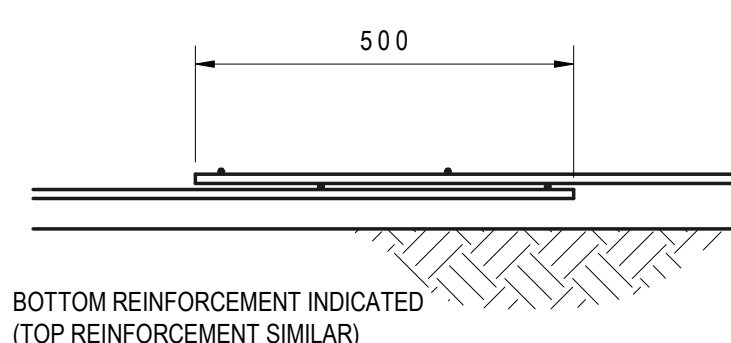
L' CORNER

CROSS INTERSECTION SIMILAR

NOTE: EACH LAYER OF TRENCH MESH IS TO BE MADE 'CONTINUOUS' BY LAPPING WHERE REQUIRED AS FOLLOWS:

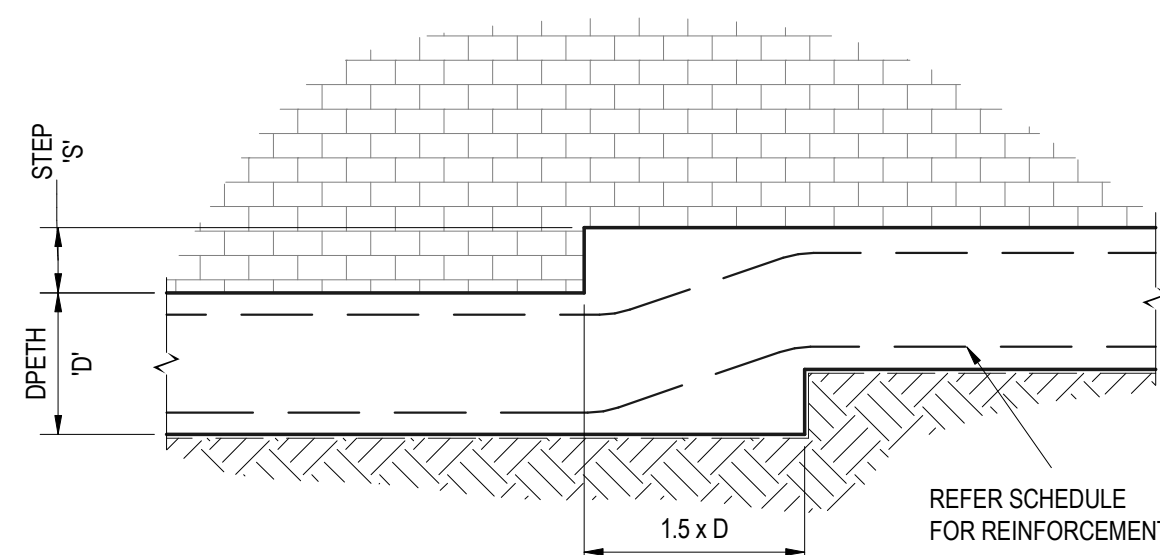
- AT 'T' INTERSECTIONS AND 'L' INTERSECTIONS - FOR THE FULL WIDTH OF THE TRENCH MESH
- AT 'L' CORNERS - FOR FULL WIDTH OF TRENCH MESH
- AT SPLICES WHERE NEEDED - 500mm MINIMUM

PLAN VIEWS - STRIP FOOTINGS

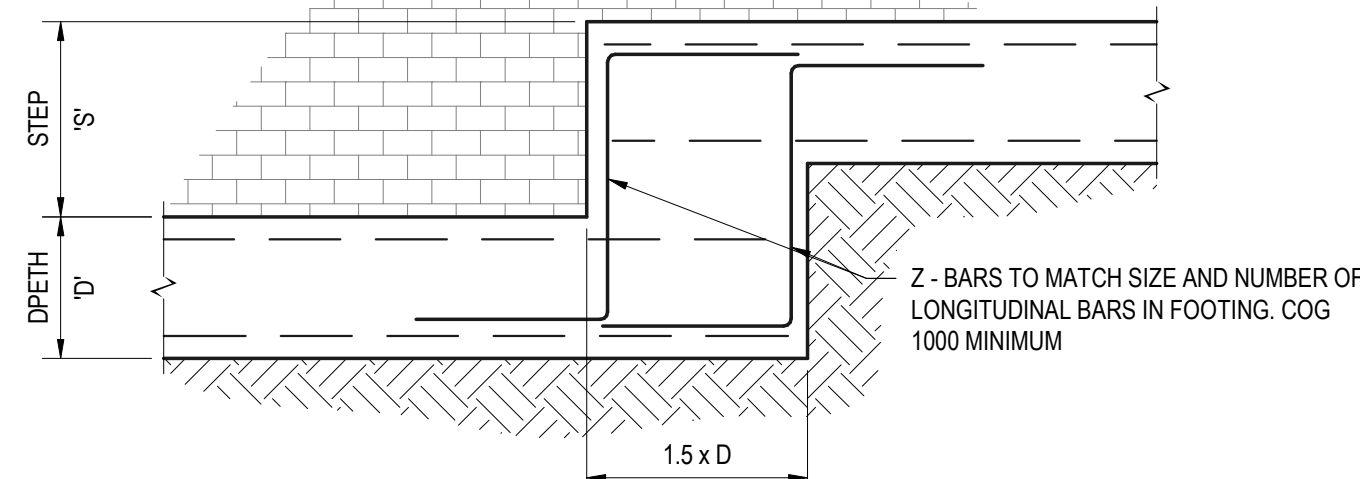


BOTTOM REINFORCEMENT INDICATED (TOP REINFORCEMENT SIMILAR)

REINFORCEMENT SPLICE DETAIL

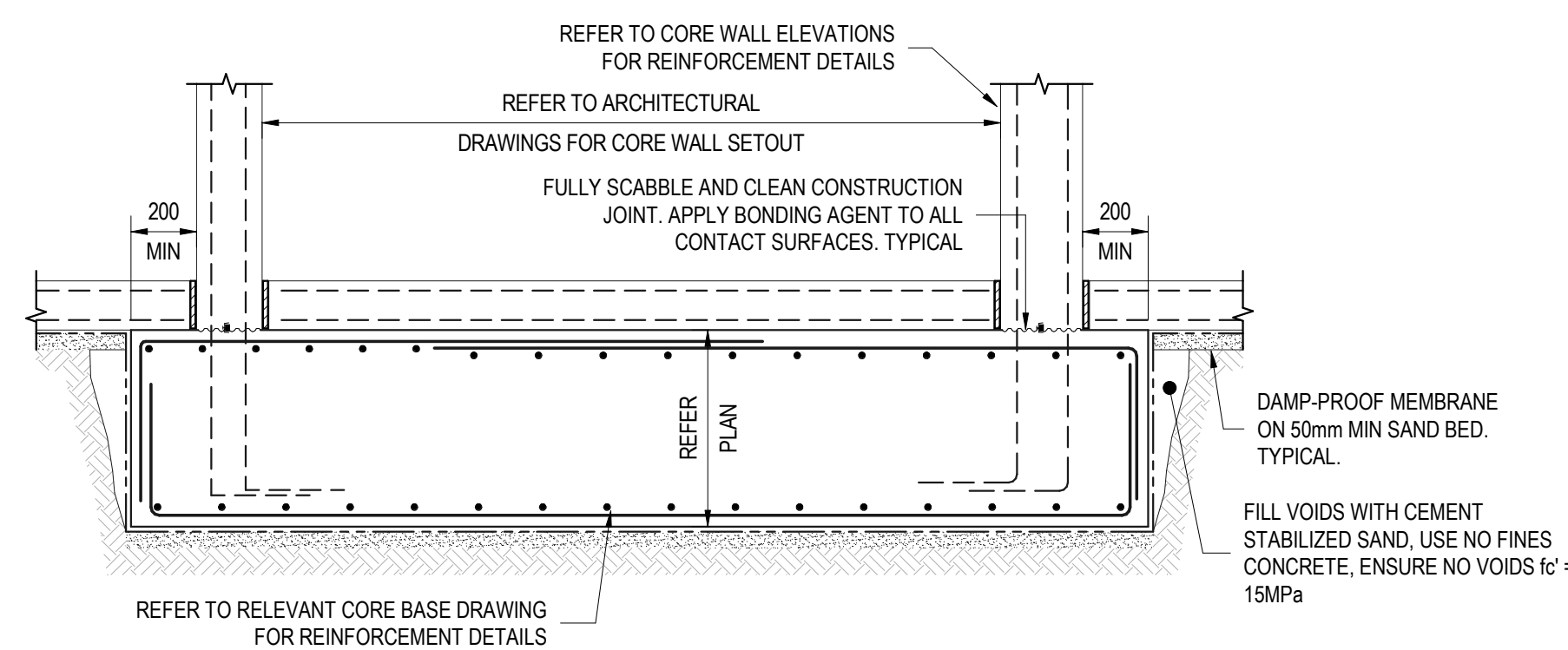


'S' LESS THAN OR EQUAL TO 200mm



'S' GREATER THAN 'D' BUT LESS THAN 1.5 x 'D'

STRIP FOOTING STEPPING DETAILS



TYPICAL STAIR BASE DETAIL

1:20

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REV	DATE	REVISION DESCRIPTION	BY
P1	18.11.21	ISSUED FOR PRELIMINARY INFORMATION	MP

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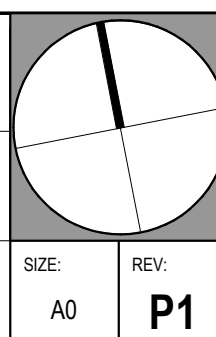


Client: Doran Drive Precinct
Project: 2 Mandala Parade
Drawing: 20025
Scale: 1:1, 1:20 @ A0
Date: November 2021

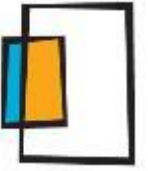
DORAN DRIVE PRECINCT
2 MANDALA PARADE
CASTLE HILL

FOUNDATION DETAILS

JOB NUMBER:	20025	ORG NUMBER:	S01.131
DESIGNED BY:	RC	DATE:	November 2021
DRAWN BY:	MP	SCALE:	1:1, 1:20 @ A0



18/11/2021 2:46:52 PM



9. Appendix B – Shoring Wall Calculations

ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.07 - SW1 Section 1 - TCB 90.7 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 1 | Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	90.70	1 Fill	1 Fill	
2	89.60	2 Res Soil	2 Res Soil	
3	89.30	4 Class III Rock	4 Class III Rock	

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill	Soil friction angle	Wall adhesion coeff.	Back-fill
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	80.00	80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
 Soldier Pile width = 0.60 m
 Soldier Pile spacing = 2.40 m
 Passive mobilisation factor = 3.00 m
 Elevation of toe of wall = 85.40
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 3.2800E+07 kN/m2
 Moment of inertia of wall I = 1.3200E-03 m4/m run
 E.I = 43296 kN.m2/m run
 Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Strut Elev.	X-section area of strut	Youngs modulus	Free length	Inclin -ation (degs)	Pre-stress /strut	Tension allowed
		sq.m	kN/m2	m		kN	
1	88.70	2.40	0.000300	2.000E+08	5.00	45.00	200.0 Yes
2	Not defined						
3	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0 Yes

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	91.20	1 Fill	1 Fill
2	89.60	2 Res Soil	2 Res Soil
3	89.30	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
angle				angle			
adhesion				adhesion			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.50 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Strut Elev.	X-section area of strut	Youngs modulus	Free length	Inclin -ation (degs)	Pre-stress /strut	Tension allowed
		sq.m	kN/m2	m		kN	
1	89.20	2.40	0.000300	2.000E+08	5.00	45.00	200.0 Yes
2	Not defined						
3	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0 Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	91.20	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 91.20
2	Excavate to elevation 88.70 on PASSIVE side
3	Install strut or anchor no.1 at elevation 89.20
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.3 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

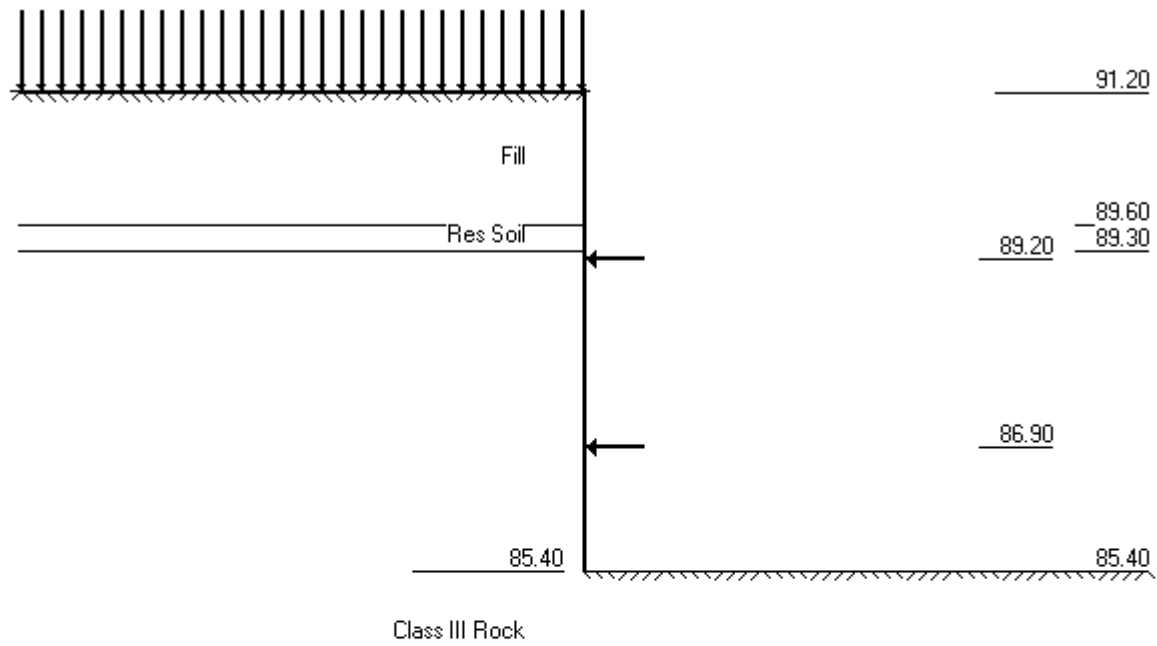
OUTPUT OPTIONS

Stage no.	Stage description	Output options		
		Displacement	Active, Bending mom. Shear force	Graph. Passive output pressures
1	Apply surcharge no.1 at elev. 91.20	Yes	Yes	Yes
2	Excav. to elev. 88.70 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 89.20	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.3 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

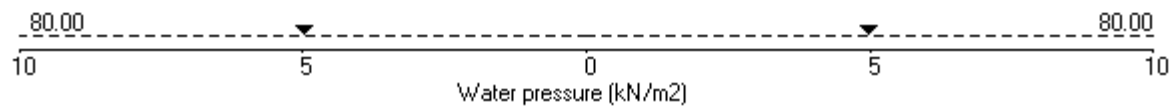
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



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Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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Data filename/Run ID: 2021.04.07 - SW1 Section 2 - TCB 91.2 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW1 - Section 2 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 88.70 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	91.20 88.70	Cant.		2.076	85.93	87.46	1.24

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	91.20	8.12	0.006	2.02E-03	0.0	-0.0	
2	90.85	10.67	0.005	2.02E-03	3.3	0.6	
3	90.50	13.23	0.004	2.00E-03	7.5	2.5	
4	90.05	16.52	0.003	1.95E-03	14.2	7.3	
5	89.60	19.81	0.002	1.83E-03	22.3	15.4	
		17.32	0.002	1.83E-03	22.3	15.4	
6	89.30	22.62	0.002	1.70E-03	28.3	23.0	
		0.00	0.002	1.70E-03	28.3	23.0	
7	89.20	0.00	0.002	1.65E-03	28.3	25.8	
8	88.70	0.00	0.001	1.27E-03	28.3	39.3	
		-96.50	0.001	1.27E-03	28.3	39.3	
9	88.35	-81.11	0.001	9.34E-04	-2.8	44.9	
10	88.00	-32.78	0.000	5.93E-04	-22.7	39.4	
11	87.50	8.58	0.000	2.28E-04	-28.7	23.9	
12	87.20	18.13	-0.000	9.07E-05	-24.7	15.7	
13	86.90	20.68	-0.000	4.80E-06	-18.9	9.1	
14	86.40	17.82	0.000	-6.06E-05	-9.3	2.2	
15	85.90	10.35	0.000	-7.25E-05	-2.2	-0.2	
16	85.40	-1.40	0.000	-7.15E-05	0.0	0.0	

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure	Soil stiffness
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	coeff.	
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3	
1	91.20	0.00	20.00	8.12	49.28	8.12a	3336	
2	90.85	0.00	26.30	10.67	64.80	10.67a	3336	
3	90.50	0.00	32.60	13.23	80.32	13.23a	3336	
4	90.05	0.00	40.70	16.52	100.28	16.52a	3336	
5	89.60	0.00	48.80	19.81	120.24	19.81a	3336	
		0.00	48.80	13.43	135.93	17.32	3336	

(continued)

Stage No.2 Excavate to elevation 88.70 on PASSIVE side

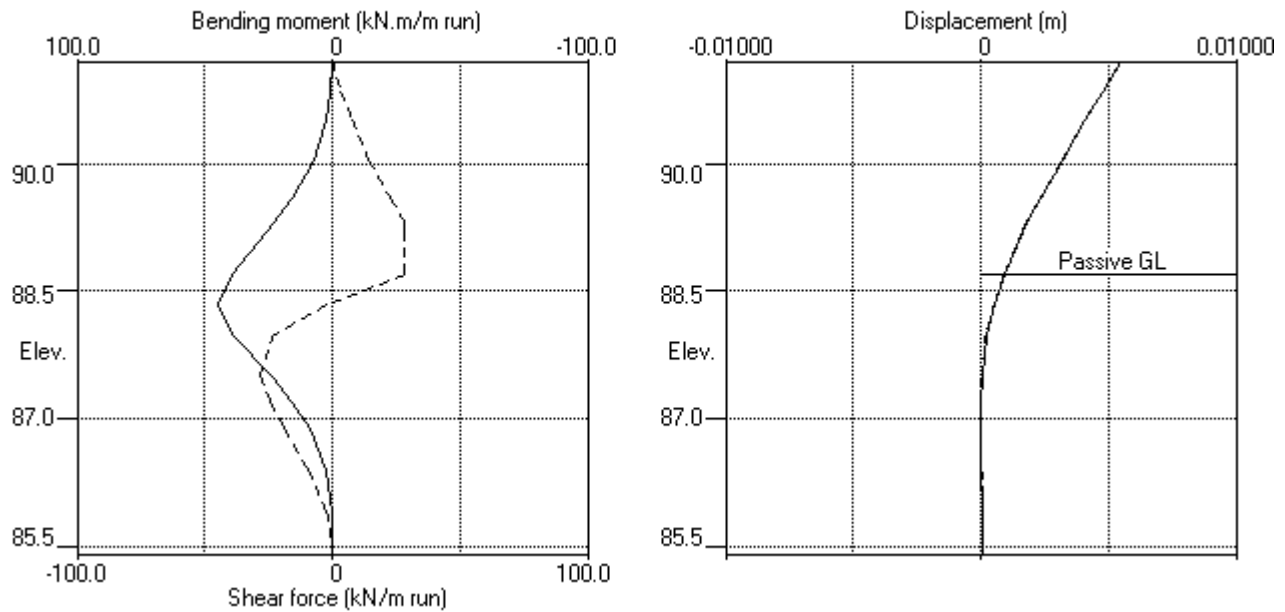
Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
6	89.30	0.00	54.80	15.87	150.72	22.62	22.62	3336
		0.00	54.80	0.00	380.69	0.00	0.00a	61719
7	89.20	0.00	57.20	0.00	391.72	0.00	0.00a	61719
8	88.70	0.00	69.20	0.00	446.91	0.00	0.00a	61719
		0.00	69.20	0.00	335.18	0.00	0.00a	61719
9	88.35	0.00	77.60	0.00	364.15	0.00	0.00a	61719
10	88.00	0.00	86.00	0.00	393.12	12.91	12.91	61719
11	87.50	0.00	98.00	0.00	434.51	29.48	29.48	61719
12	87.20	0.00	105.20	0.00	459.34	35.23	35.23	92563
13	86.90	0.00	112.39	0.00	484.17	39.03	39.03	92563
14	86.40	0.00	124.39	0.00	525.55	41.80	41.80	92563
15	85.90	0.00	136.39	1.68	566.93	42.27	42.27	194785
16	85.40	0.00	148.39	4.29	608.31	40.60	40.60	194785

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	90.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	90.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	96.50	96.50p	153465
9	88.35	0.00	8.40	0.00	125.48	81.11	81.11	153465
10	88.00	0.00	16.80	0.00	154.45	45.69	45.69	153465
11	87.50	0.00	28.80	0.00	195.85	20.90	20.90	153465
12	87.20	0.00	36.01	0.00	220.70	17.11	17.11	92563
13	86.90	0.00	43.22	0.00	245.56	18.35	18.35	92563
14	86.40	0.00	55.23	0.00	287.01	23.98	23.98	92563
15	85.90	0.00	67.26	0.00	328.90	31.92	31.92	194785
16	85.40	0.00	79.29	0.00	371.06	42.00	42.00	194785

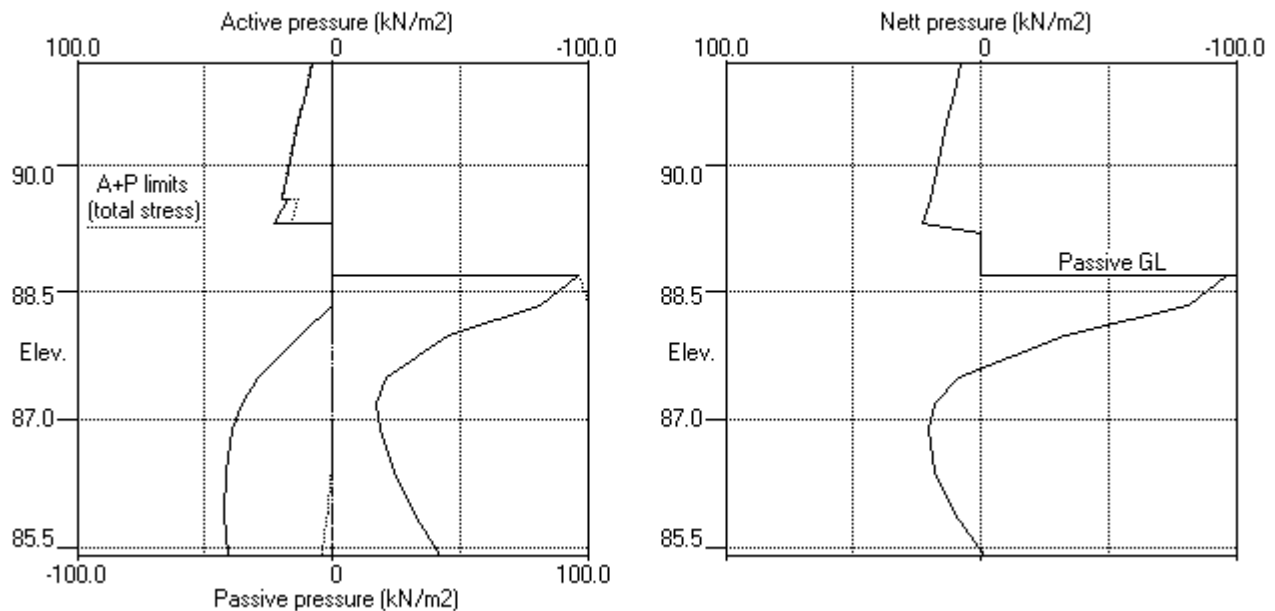
Note: 0.00a Soil pressure at active limit
 96.50p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 88.70 on PASSIVE side



Stage No.2 Excav. to elev. 88.70 on PASSIVE side



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 Data filename/Run ID: 2021.04.07 - SW1 Section 2 - TCB 91.2 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 2 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
4	91.20 86.40	89.20	Conditions not	suitable for	FoS calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	91.20	12.45	0.004	1.43E-03	0.0	-0.0	
2	90.85	14.48	0.004	1.42E-03	4.7	0.9	
3	90.50	16.51	0.003	1.41E-03	10.1	3.5	
4	90.05	19.10	0.003	1.34E-03	18.1	9.8	
5	89.60	21.66	0.002	1.18E-03	27.3	20.0	
		19.17	0.002	1.18E-03	27.3	20.0	
6	89.30	23.95	0.002	1.01E-03	33.8	29.1	
		24.75	0.002	1.01E-03	33.8	29.1	
7	89.20	21.38	0.002	9.44E-04	36.1	32.6	60.5
		21.38	0.002	9.44E-04	-24.4	32.6	
8	88.70	4.25	0.001	6.26E-04	-18.0	22.4	
9	88.35	0.00	0.001	4.62E-04	-17.2	18.0	
10	88.00	0.24	0.001	3.40E-04	-17.2	12.3	
11	87.50	12.37	0.001	2.49E-04	-14.0	3.5	
12	87.20	17.98	0.001	2.38E-04	-9.5	-0.2	
13	86.90	22.96	0.001	2.46E-04	-3.3	-2.2	
14	86.40	29.60	0.000	2.63E-04	9.8	-0.8	
		-27.40	0.000	2.63E-04	9.8	-0.8	
15	85.90	-8.65	0.000	2.64E-04	0.8	0.7	
16	85.40	5.53	0.000	2.60E-04	0.0	0.0	
Strut force at elev. 89.20 =			60.48 kN/m	run =	145.16 kN/strut (horiz.)		
				=	205.29 kN/strut (incl.)		

(continued)

Stage No.4 Excavate to elevation 86.40 on PASSIVE side

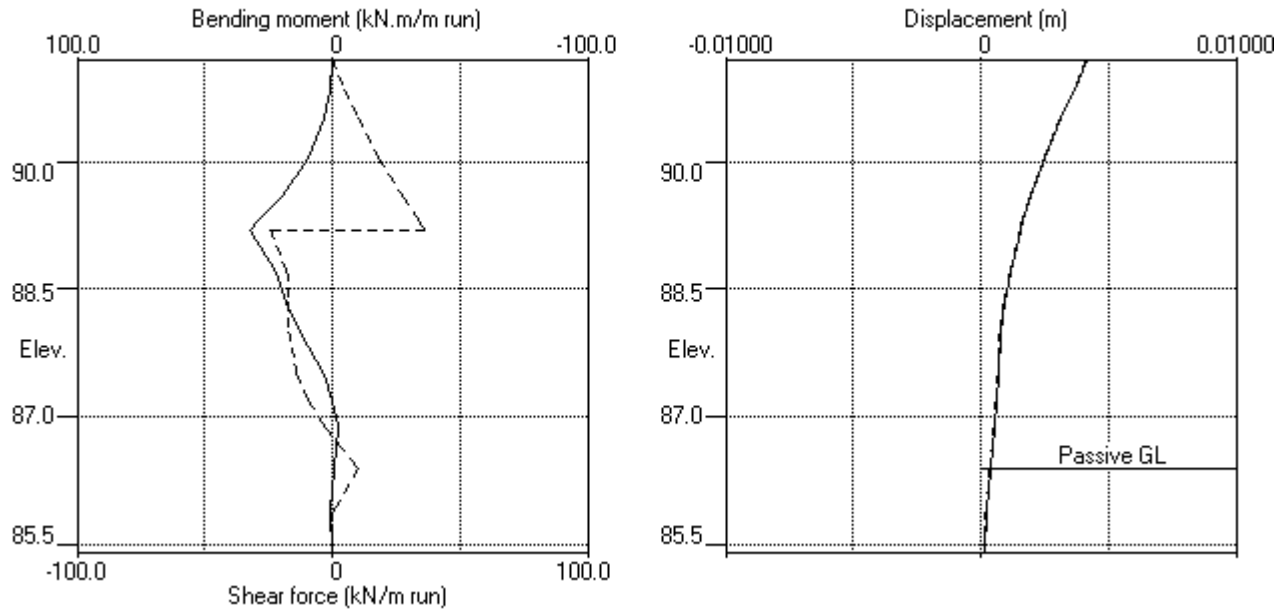
Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	91.20	0.00	20.00	8.12	49.28	12.45	12.45	1501
2	90.85	0.00	26.30	10.67	64.80	14.48	14.48	1501
3	90.50	0.00	32.60	13.23	80.32	16.51	16.51	1501
4	90.05	0.00	40.70	16.52	100.28	19.10	19.10	1501
5	89.60	0.00	48.80	19.81	120.24	21.66	21.66	1501
6	89.30	0.00	48.80	13.43	135.93	19.17	19.17	1501
		0.00	54.80	15.87	150.72	23.95	23.95	1501
7	89.20	0.00	54.80	0.00	380.69	24.75	24.75	27443
		0.00	57.20	0.00	391.72	21.38	21.38	27443
8	88.70	0.00	69.20	0.00	446.91	4.25	4.25	27443
9	88.35	0.00	77.60	0.00	485.54	0.00	0.00a	27443
10	88.00	0.00	86.00	0.00	524.16	0.24	0.24	27443
11	87.50	0.00	98.00	0.00	579.35	12.37	12.37	27443
12	87.20	0.00	105.20	0.00	612.45	17.98	17.98	27443
13	86.90	0.00	112.39	0.00	645.56	22.96	22.96	27443
14	86.40	0.00	124.39	0.00	700.74	29.60	29.60	27443
15	85.90	0.00	124.39	0.00	525.55	29.60	29.60	27443
		0.00	136.39	1.68	566.93	34.88	34.88	27443
16	85.40	0.00	148.39	4.29	608.31	38.11	38.11	27443

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	90.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	90.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	88.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	85.90	0.00	0.00	0.00	96.50	57.00	57.00	132639
		0.00	12.00	0.00	138.31	43.53	43.53	132639
16	85.40	0.00	24.01	0.00	180.37	32.59	32.59	132639

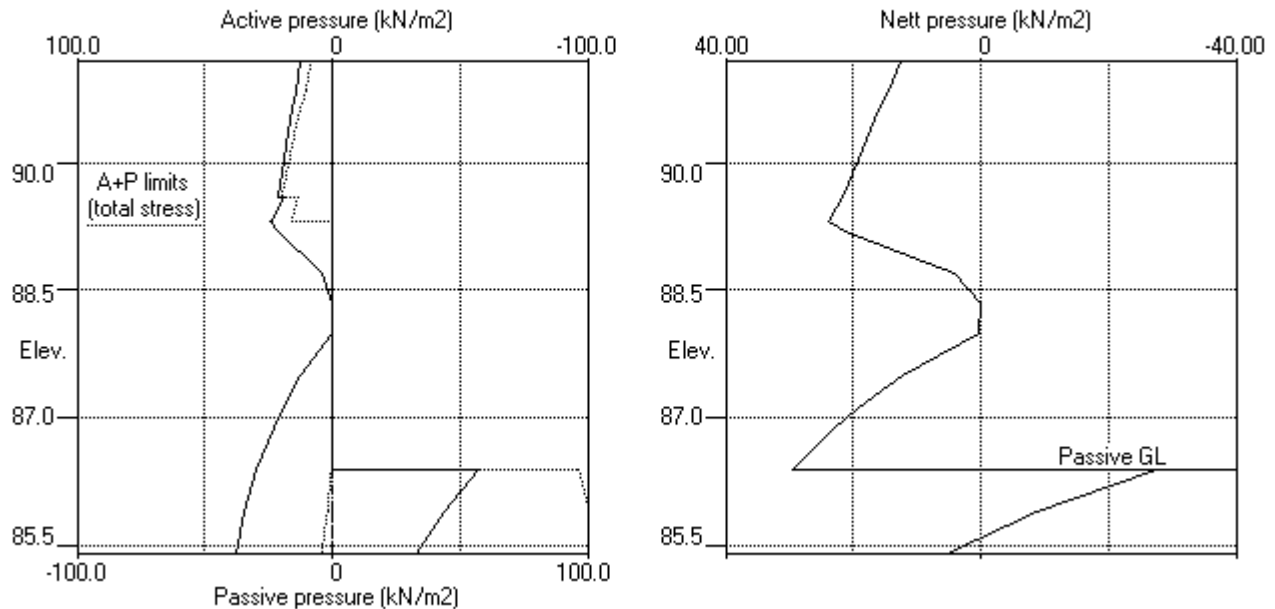
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



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 Data filename/Run ID: 2021.04.07 - SW1 Section 2 - TCB 91.2 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 2 | Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
6	91.20 85.90		More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 4.29kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

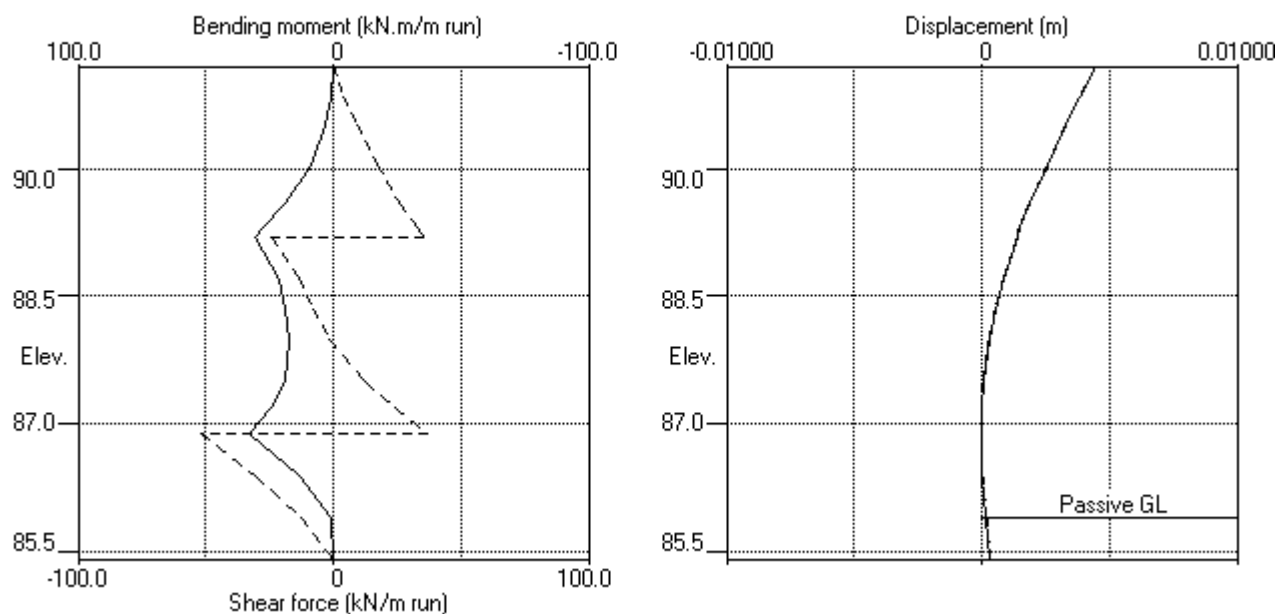
Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	91.20	10.74	0.004	1.64E-03	0.0	-0.0	
2	90.85	13.18	0.004	1.64E-03	4.2	0.8	
3	90.50	15.62	0.003	1.62E-03	9.2	3.1	
4	90.05	18.75	0.003	1.56E-03	17.0	9.0	
5	89.60	21.78	0.002	1.42E-03	26.1	18.6	
		19.29	0.002	1.42E-03	26.1	18.6	
6	89.30	24.24	0.001	1.26E-03	32.6	27.3	
		30.05	0.001	1.26E-03	32.6	27.3	
7	89.20	27.72	0.001	1.19E-03	35.5	30.7	60.1
		27.72	0.001	1.19E-03	-24.6	30.7	
8	88.70	16.08	0.001	8.95E-04	-13.7	21.2	
9	88.35	15.82	0.001	7.33E-04	-8.1	19.0	
10	88.00	19.92	0.000	5.85E-04	-1.8	17.5	
11	87.50	36.22	0.000	3.76E-04	12.2	18.8	
12	87.20	41.87	0.000	2.27E-04	23.9	24.1	
13	86.90	44.48	-0.000	2.92E-05	36.9	33.2	88.5
		44.48	-0.000	2.92E-05	-51.6	33.2	
14	86.40	40.79	0.000	-2.38E-04	-30.3	13.2	
15	85.90	31.32	0.000	-3.21E-04	-12.3	1.3	
16	85.40	17.82	0.000	-3.28E-04	0.0	0.0	
Strut force at elev. 89.20 =			60.10 kN/m	run =	144.23 kN/strut (horiz.)		
				=	203.97 kN/strut (incl.)		
Strut force at elev. 86.90 =			88.51 kN/m	run =	212.43 kN/strut (horiz.)		
				=	300.43 kN/strut (incl.)		

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

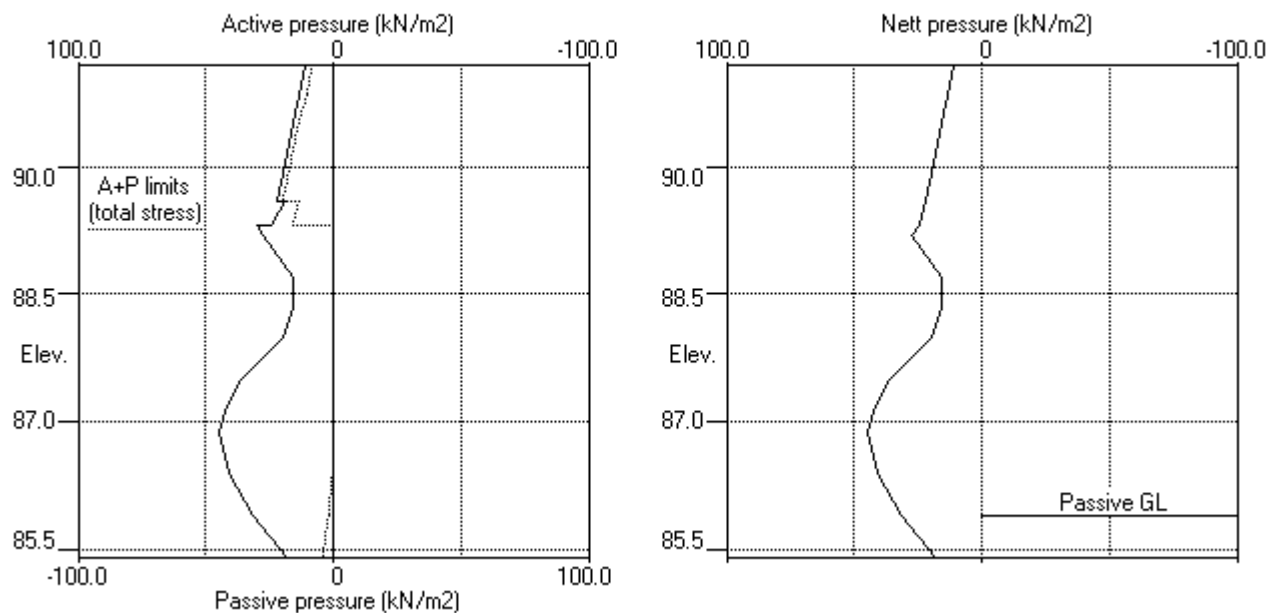
[illegible]

Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
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Data filename/Run ID: 2021.04.07 - SW1 Section 2 - TCB 91.2	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW1 - Section 2	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40	FoS = 1.000	

				Factor	Moment	Toe	Wall
				of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
1	91.20	91.20	Cant.	7.414	86.16	90.44	0.76
2	91.20	88.70	Cant.	2.076	85.93	87.46	1.24
3	91.20	88.70	89.20	Conditions not suitable for FoS calc.			
4	91.20	86.40	89.20	Conditions not suitable for FoS calc.			
5	91.20	86.40		More than one strut			
6	91.20	85.90		More than one strut			

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	91.20	0.006	0.000	0.0	-0.0	0.0	0.0
2	90.85	0.005	0.000	0.9	0.0	4.9	0.0
3	90.50	0.004	0.000	3.6	0.0	10.6	0.0
4	90.05	0.003	0.000	10.2	0.0	18.9	0.0
5	89.60	0.002	0.000	20.8	0.0	28.4	0.0
6	89.30	0.002	0.000	30.3	0.0	35.2	0.0
7	89.20	0.002	0.000	34.1	0.0	39.2	-24.9
8	88.70	0.001	0.000	39.3	0.0	28.3	-18.0
9	88.35	0.001	0.000	44.9	0.0	0.0	-17.2
10	88.00	0.001	0.000	39.4	0.0	0.0	-22.7
11	87.50	0.001	0.000	23.9	0.0	12.2	-28.7
12	87.20	0.001	-0.000	24.1	-0.2	23.9	-24.7
13	86.90	0.001	-0.000	33.2	-2.2	36.9	-52.1
14	86.40	0.000	-0.000	13.2	-0.8	9.8	-30.3
15	85.90	0.000	0.000	1.3	-0.7	0.8	-12.3
16	85.40	0.000	0.000	0.0	0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	9.3	89.20	-0.0	85.90	9.2	89.30	-5.6	88.00
2	44.9	88.35	-0.2	85.90	28.3	89.30	-28.7	87.50
3	34.1	89.20	-0.7	85.90	39.2	89.20	-19.7	89.20
4	32.6	89.20	-2.2	86.90	36.1	89.20	-24.4	89.20
5	30.6	89.20	-0.0	91.20	36.3	86.90	-52.1	86.90
6	33.2	86.90	-0.0	91.20	36.9	86.90	-51.6	86.90

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.001	91.20	0.000	91.20	Apply surcharge no.1 at elev. 91.20
2	0.006	91.20	-0.000	86.90	Excav. to elev. 88.70 on PASSIVE side
3	0.004	91.20	0.000	91.20	Install strut no.1 at elev. 89.20
4	0.004	91.20	0.000	91.20	Excav. to elev. 86.40 on PASSIVE side
5	0.004	91.20	-0.000	86.90	Install strut no.3 at elev. 86.90
6	0.004	91.20	-0.000	86.90	Excav. to elev. 85.40 on PASSIVE side

Run ID. 2021.04.07 - SW1 Section 2 - TCB 91.2
2 Mandala Place, Castle Hill
SW1 - Section 2

| Sheet No.
| Date:12-04-2021
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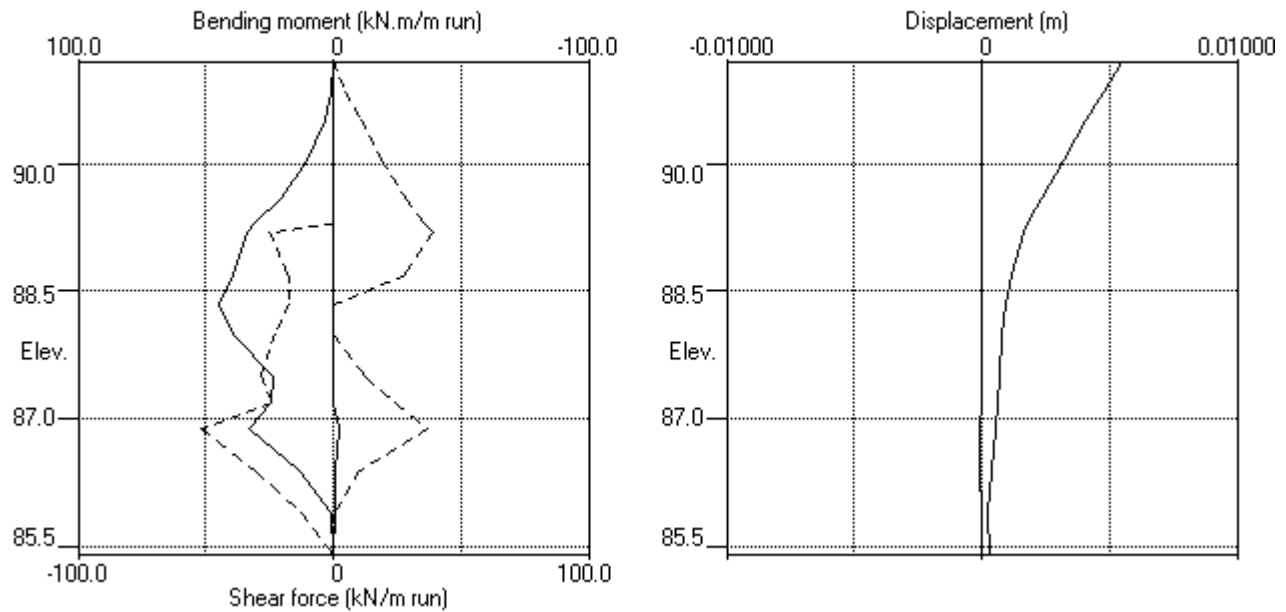
Summary of results (continued)

Strut forces at each stage (horizontal components)

Stage	--- Strut no. 1 ---		--- Strut no. 3 ---	
no.	at elev. 89.20		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut
3	58.93	141.42	---	---
4	60.48	145.16	---	---
5	60.17	144.41	88.39	212.13
6	60.10	144.23	88.51	212.43

Units: kN,m

Bending moment, shear force, displacement envelopes



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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 3 | Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	92.30	1 Fill	1 Fill
2	90.90	2 Res Soil	2 Res Soil
3	90.00	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill	Soil friction angle	Wall adhesion coeff.	Back-fill
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	80.00	80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
 Soldier Pile width = 0.60 m
 Soldier Pile spacing = 2.40 m
 Passive mobilisation factor = 3.00 m
 Elevation of toe of wall = 85.40
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 3.2800E+07 kN/m2
 Moment of inertia of wall I = 1.3200E-03 m4/m run
 E.I = 43296 kN.m2/m run
 Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Strut Elev.	X-section area of strut	Youngs modulus	Free length	Inclin -ation (degs)	Pre-stress /strut	Tension allowed
		sq.m	kN/m2	m		kN	
1	90.30	2.40	0.000300	2.000E+08	5.00	45.00	200.0 Yes
2	Not defined						
3	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0 Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	92.30	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 92.30
2	Excavate to elevation 89.90 on PASSIVE side
3	Install strut or anchor no.1 at elevation 90.30
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.3 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

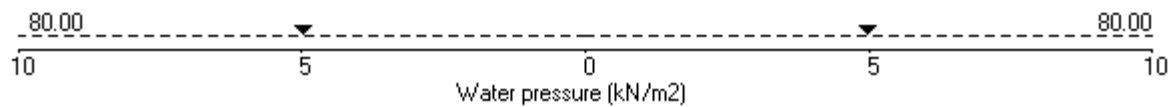
Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	----- Output options -----		
		Displacement	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 92.30	Yes	Yes	Yes
2	Excav. to elev. 89.90 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 90.30	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.3 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 3 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 89.90 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	92.30 89.90	Cant.		2.563	86.09	88.61	1.29

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	92.30	8.12	0.006	2.15E-03	0.0	-0.0	
2	91.90	11.04	0.005	2.14E-03	3.8	0.8	
3	91.50	13.96	0.004	2.12E-03	8.8	3.3	
4	91.20	16.15	0.004	2.09E-03	13.3	6.7	
5	90.90	18.34	0.003	2.03E-03	18.5	11.4	
		13.18	0.003	2.03E-03	18.5	11.4	
6	90.60	18.69	0.002	1.93E-03	23.3	17.6	
7	90.30	24.06	0.002	1.78E-03	29.7	25.5	
8	90.00	29.26	0.001	1.57E-03	37.7	35.5	
		0.00	0.001	1.57E-03	37.7	35.5	
9	89.90	0.00	0.001	1.48E-03	37.7	39.3	
		-96.50	0.001	1.48E-03	37.7	39.3	
10	89.45	-82.23	0.001	1.02E-03	-2.5	48.6	
11	89.00	-23.74	0.000	5.67E-04	-26.3	39.7	
12	88.50	12.30	0.000	2.02E-04	-29.2	23.6	
13	88.00	21.67	-0.000	5.49E-06	-20.7	10.5	
14	87.50	17.42	0.000	-7.17E-05	-10.9	2.9	
15	87.20	13.09	0.000	-8.28E-05	-6.4	0.4	
16	86.90	9.47	0.000	-8.08E-05	-3.0	-1.0	
17	86.40	4.02	0.000	-6.80E-05	0.4	-1.3	
18	85.90	-0.51	0.000	-5.74E-05	1.3	-0.6	
19	85.40	-4.55	0.000	-5.41E-05	0.0	0.0	

(continued)

Stage No.2 Excavate to elevation 89.90 on PASSIVE side

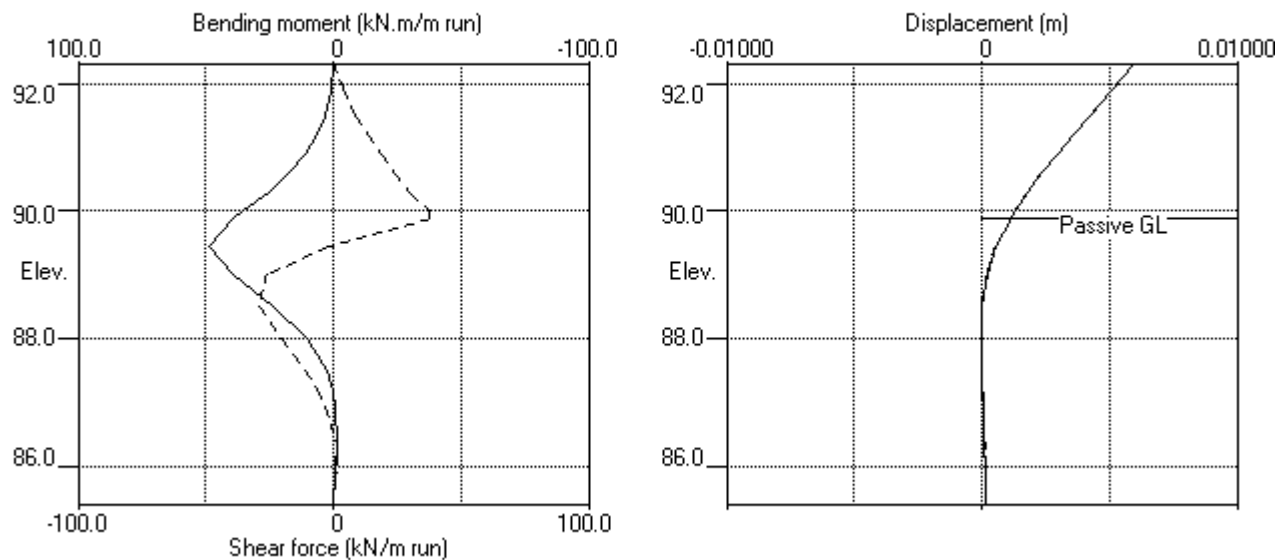
Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	92.30	0.00	20.00	8.12	49.28	8.12	8.12a	3366
2	91.90	0.00	27.20	11.04	67.02	11.04	11.04a	3366
3	91.50	0.00	34.40	13.96	84.76	13.96	13.96a	3366
4	91.20	0.00	39.80	16.15	98.06	16.15	16.15a	3366
5	90.90	0.00	45.20	18.34	111.37	18.34	18.34a	3366
		0.00	45.20	11.97	127.06	13.18	13.18	3366
6	90.60	0.00	51.20	14.41	141.85	18.69	18.69	3366
7	90.30	0.00	57.20	16.84	156.63	24.06	24.06	3366
8	90.00	0.00	63.20	19.28	171.41	29.26	29.26	3366
		0.00	63.20	0.00	419.32	0.00	0.00a	62283
9	89.90	0.00	65.60	0.00	430.35	0.00	0.00a	62283
		0.00	65.60	0.00	322.76	0.00	0.00a	62283
10	89.45	0.00	76.40	0.00	360.01	0.00	0.00a	62283
11	89.00	0.00	87.20	0.00	397.26	15.25	15.25	62283
12	88.50	0.00	99.20	0.00	438.65	31.06	31.06	62283
13	88.00	0.00	111.19	0.00	480.03	39.55	39.55	115796
14	87.50	0.00	123.19	0.00	521.41	41.63	41.63	115796
15	87.20	0.00	130.39	0.37	546.24	41.99	41.99	75456
16	86.90	0.00	137.59	1.94	571.07	42.70	42.70	75456
17	86.40	0.00	149.59	4.55	612.45	44.18	44.18	75456
18	85.90	0.00	161.58	7.16	653.83	46.12	46.12	75456
19	85.40	0.00	173.58	9.76	695.20	48.31	48.31	75456

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	91.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	91.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	90.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	89.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	96.50	96.50p	150844
10	89.45	0.00	10.80	0.00	133.75	82.23	82.23	150844
11	89.00	0.00	21.60	0.00	171.01	38.99	38.99	150844
12	88.50	0.00	33.61	0.00	212.42	18.76	18.76	150844
13	88.00	0.00	45.62	0.00	253.84	17.89	17.89	115796
14	87.50	0.00	57.63	0.00	295.29	24.21	24.21	115796
15	87.20	0.00	64.85	0.00	320.26	28.90	28.90	75456
16	86.90	0.00	72.06	0.00	345.55	33.23	33.23	75456
17	86.40	0.00	84.10	0.00	387.72	40.16	40.16	75456
18	85.90	0.00	96.15	0.00	429.92	46.63	46.63	75456
19	85.40	0.00	108.21	0.00	472.17	52.86	52.86	75456

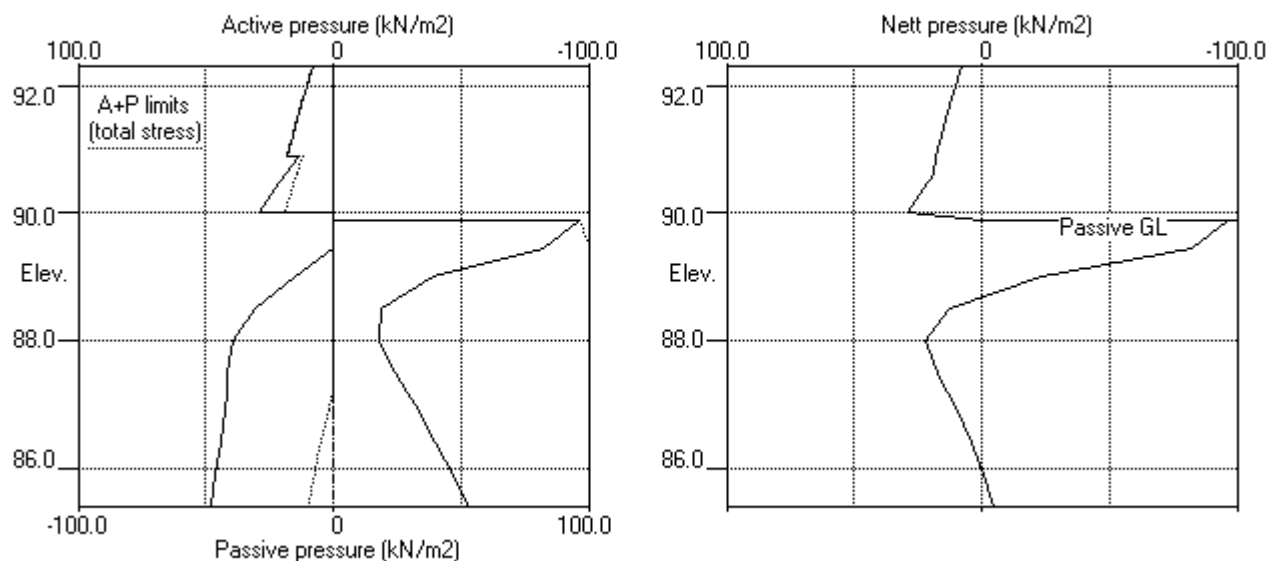
Note: 0.00a Soil pressure at active limit
 96.50p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 89.90 on PASSIVE side



Stage No.2 Excav. to elev. 89.90 on PASSIVE side



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SW1 - Section 3 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe Wall
No.	Act. Pass.	Elev.	of	of equilib.	elev. Penetr
			Safety	at elev.	-ation
4	92.30 86.40	90.30	Conditions not	suitable for	FoS calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	92.30	12.94	0.005	1.42E-03	0.0	-0.0	
2	91.90	15.14	0.004	1.41E-03	5.6	1.2	
3	91.50	17.34	0.003	1.39E-03	12.1	4.7	
4	91.20	18.98	0.003	1.34E-03	17.6	9.2	
5	90.90	20.60	0.003	1.25E-03	23.5	15.4	
		15.44	0.003	1.25E-03	23.5	15.4	
6	90.60	20.34	0.002	1.12E-03	28.9	23.2	
7	90.30	25.08	0.002	9.29E-04	35.7	32.8	61.5
		25.08	0.002	9.29E-04	-25.8	32.8	
8	90.00	29.61	0.002	7.25E-04	-17.6	26.2	
		6.81	0.002	7.25E-04	-17.6	26.2	
9	89.90	2.78	0.002	6.66E-04	-17.2	24.5	
10	89.45	0.00	0.001	4.38E-04	-16.5	19.5	
11	89.00	0.00	0.001	2.74E-04	-16.5	11.9	
12	88.50	2.72	0.001	1.80E-04	-15.8	4.3	
13	88.00	11.02	0.001	1.74E-04	-12.4	-3.2	
14	87.50	16.02	0.001	2.38E-04	-5.7	-7.8	
15	87.20	19.15	0.001	2.95E-04	-0.4	-8.7	
16	86.90	23.17	0.001	3.52E-04	6.0	-7.9	
17	86.40	30.85	0.001	4.08E-04	19.5	-1.8	
		-50.78	0.001	4.08E-04	19.5	-1.8	
18	85.90	-20.07	0.000	4.09E-04	1.8	1.6	
19	85.40	13.01	0.000	4.00E-04	-0.0	0.0	
Strut force at elev. 90.30 =			61.51 kN/m	run =	147.63 kN/strut (horiz.)		
				=	208.79 kN/strut (incl.)		

(continued)

Stage No.4 Excavate to elevation 86.40 on PASSIVE side

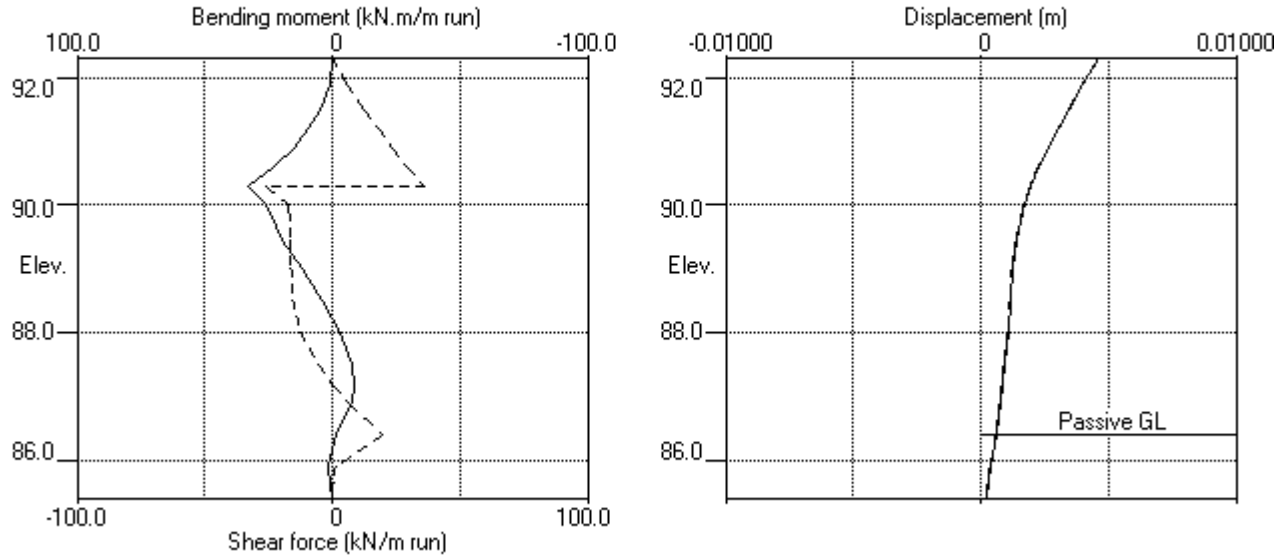
Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	92.30	0.00	20.00	8.12	49.28	12.94	12.94	1351
2	91.90	0.00	27.20	11.04	67.02	15.14	15.14	1351
3	91.50	0.00	34.40	13.96	84.76	17.34	17.34	1351
4	91.20	0.00	39.80	16.15	98.06	18.98	18.98	1351
5	90.90	0.00	45.20	18.34	111.37	20.60	20.60	1351
		0.00	45.20	11.97	127.06	15.44	15.44	1351
6	90.60	0.00	51.20	14.41	141.85	20.34	20.34	1351
7	90.30	0.00	57.20	16.84	156.63	25.08	25.08	1351
8	90.00	0.00	63.20	19.28	171.41	29.61	29.61	1351
		0.00	63.20	0.00	419.32	6.81	6.81	24646
9	89.90	0.00	65.60	0.00	430.35	2.78	2.78	24646
10	89.45	0.00	76.40	0.00	480.02	0.00	0.00a	24646
11	89.00	0.00	87.20	0.00	529.68	0.00	0.00a	24646
12	88.50	0.00	99.20	0.00	584.86	2.72	2.72	24646
13	88.00	0.00	111.19	0.00	640.04	11.02	11.02	24646
14	87.50	0.00	123.19	0.00	695.22	16.02	16.02	24646
15	87.20	0.00	130.39	0.37	728.32	19.15	19.15	24646
16	86.90	0.00	137.59	1.94	761.43	23.17	23.17	24646
17	86.40	0.00	149.59	4.55	816.60	30.85	30.85	24646
		0.00	149.59	4.55	612.45	30.85	30.85	24646
18	85.90	0.00	161.58	7.16	653.83	39.09	39.09	24646
19	85.40	0.00	173.58	9.76	695.20	48.83	48.83	24646

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	91.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	91.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	90.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	89.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	89.45	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	88.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	97.64	81.63	81.63	127216
18	85.90	0.00	12.00	0.00	139.69	59.16	59.16	127216
19	85.40	0.00	24.01	0.00	181.75	35.82	35.82	127216

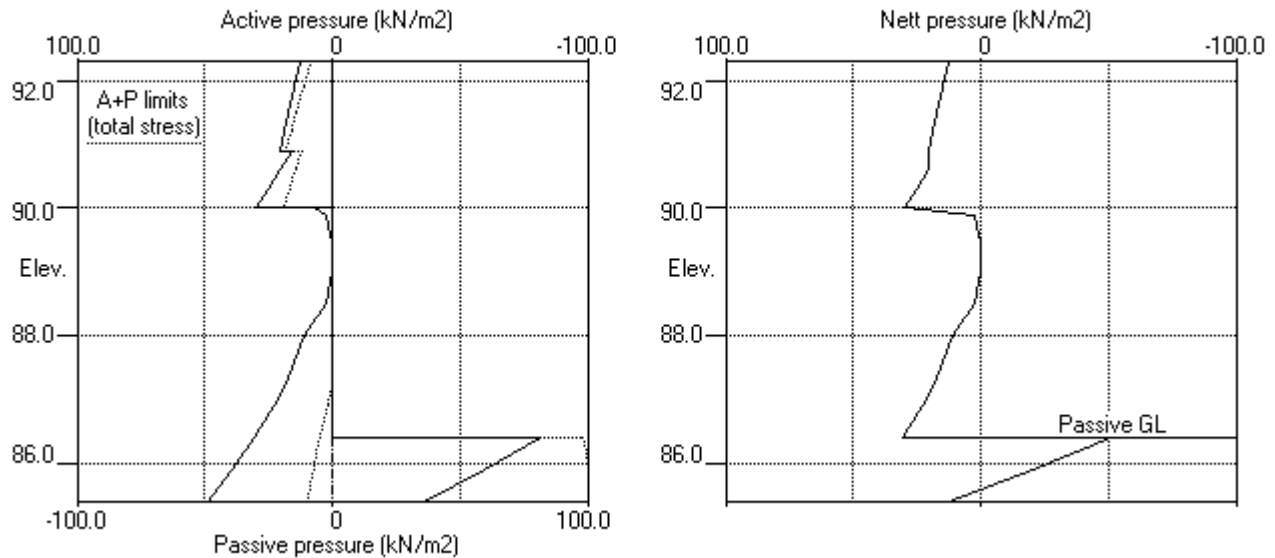
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



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 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.07 - SW1 Section 3 - TCB 92.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 3 | Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
6	92.30 85.90		More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 9.76kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	92.30	11.78	0.005	1.55E-03	0.0	-0.0	
2	91.90	14.16	0.004	1.54E-03	5.2	1.1	
3	91.50	16.55	0.004	1.52E-03	11.3	4.4	
4	91.20	18.33	0.003	1.47E-03	16.6	8.6	
5	90.90	20.10	0.003	1.39E-03	22.3	14.4	
		14.94	0.003	1.39E-03	22.3	14.4	
6	90.60	20.00	0.002	1.27E-03	27.6	21.8	
7	90.30	24.90	0.002	1.08E-03	34.3	31.1	61.6
		24.90	0.002	1.08E-03	-27.3	31.1	
8	90.00	29.60	0.002	8.97E-04	-19.1	24.0	
		6.77	0.002	8.97E-04	-19.1	24.0	
9	89.90	3.91	0.002	8.44E-04	-18.6	22.1	
10	89.45	4.62	0.001	6.42E-04	-16.7	16.7	
11	89.00	8.66	0.001	5.06E-04	-13.7	9.5	
12	88.50	16.38	0.001	4.26E-04	-7.4	4.4	
13	88.00	29.64	0.001	3.85E-04	4.1	2.8	
14	87.50	36.90	0.000	3.18E-04	20.7	8.8	
15	87.20	38.92	0.000	2.30E-04	32.1	16.7	
16	86.90	39.27	0.000	7.49E-05	43.8	28.2	88.7
		39.27	0.000	7.49E-05	-44.9	28.2	
17	86.40	34.49	0.000	-1.50E-04	-26.5	10.9	
18	85.90	26.27	0.000	-2.25E-04	-11.3	2.1	

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

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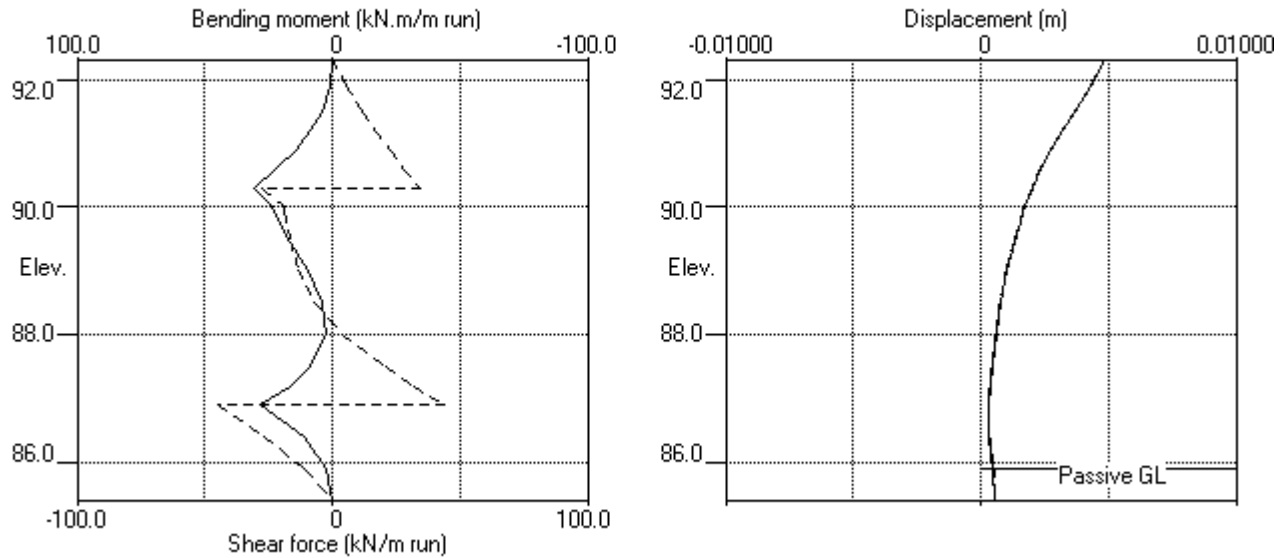
| Sheet No.
| Date:12-04-2021
| Checked :

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

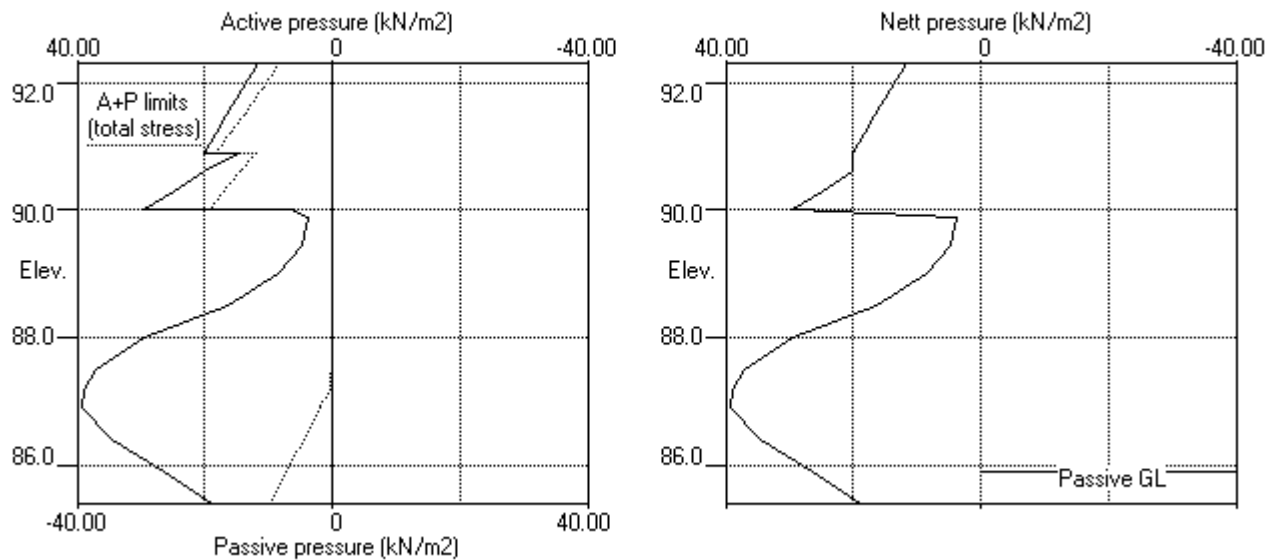
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



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Data filename/Run ID: 2021.04.07 - SW1 Section 3 - TCB 92.3	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW1 - Section 3	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe		Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40		FoS = 1.000	
					-----		-----	
				Factor	Moment		Toe	Wall
				of	equilib.		elev.	Penetr
				Safety	at elev.			-ation
1	92.30	92.30	Cant.	8.344	86.30		91.60	0.70
2	92.30	89.90	Cant.	2.563	86.09		88.61	1.29
3	92.30	89.90	90.30	Conditions not suitable for FoS calc.				
4	92.30	86.40	90.30	Conditions not suitable for FoS calc.				
5	92.30	86.40		More than one strut				
6	92.30	85.90		More than one strut				

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	92.30	0.006	0.000	0.0	-0.0	0.0	0.0
2	91.90	0.005	0.000	1.3	0.0	6.0	0.0
3	91.50	0.004	0.000	5.0	0.0	12.9	0.0
4	91.20	0.004	0.000	9.8	0.0	18.7	0.0
5	90.90	0.003	0.000	16.4	0.0	25.0	0.0
6	90.60	0.002	0.000	24.7	0.0	30.8	0.0
7	90.30	0.002	0.000	34.9	0.0	38.0	-27.5
8	90.00	0.002	0.000	35.5	0.0	37.7	-19.3
9	89.90	0.002	0.000	39.3	0.0	37.7	-18.9
10	89.45	0.001	0.000	48.6	0.0	0.0	-17.5
11	89.00	0.001	0.000	39.7	0.0	0.0	-26.3
12	88.50	0.001	0.000	23.6	0.0	0.0	-29.2
13	88.00	0.001	-0.000	10.5	-3.2	4.1	-20.7
14	87.50	0.001	0.000	8.8	-7.8	20.7	-10.9
15	87.20	0.001	0.000	16.7	-8.7	32.1	-6.4
16	86.90	0.001	0.000	28.2	-7.9	45.0	-44.9
17	86.40	0.001	0.000	10.9	-1.8	19.5	-26.5
18	85.90	0.000	0.000	2.1	-0.6	1.8	-11.3
19	85.40	0.001	0.000	0.0	-0.0	0.0	-0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	10.9	89.90	-0.3	86.40	9.4	90.00	-6.1	89.00
2	48.6	89.45	-1.3	86.40	37.7	90.00	-29.2	88.50
3	34.9	90.30	-1.2	86.90	38.0	90.30	-20.9	90.30
4	32.8	90.30	-8.7	87.20	35.7	90.30	-25.8	90.30
5	31.0	90.30	-0.0	92.30	45.0	86.90	-43.4	86.90
6	31.1	90.30	-0.0	92.30	43.8	86.90	-44.9	86.90

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.001	92.30	0.000	92.30	Apply surcharge no.1 at elev. 92.30
2	0.006	92.30	-0.000	88.00	Excav. to elev. 89.90 on PASSIVE side
3	0.004	92.30	0.000	92.30	Install strut no.1 at elev. 90.30
4	0.005	92.30	0.000	92.30	Excav. to elev. 86.40 on PASSIVE side
5	0.005	92.30	0.000	92.30	Install strut no.3 at elev. 86.90
6	0.005	92.30	0.000	92.30	Excav. to elev. 85.40 on PASSIVE side

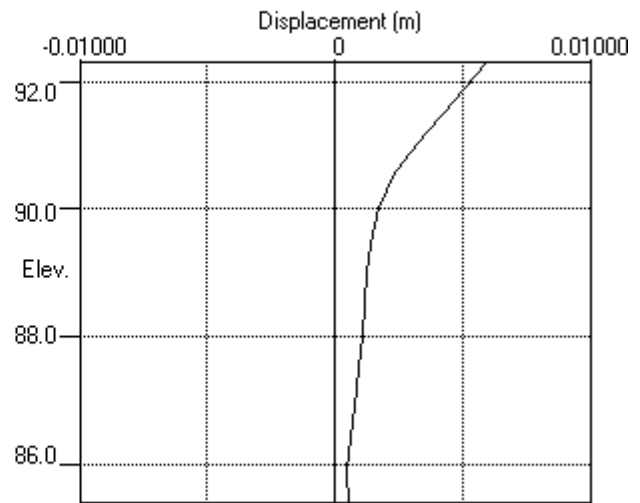
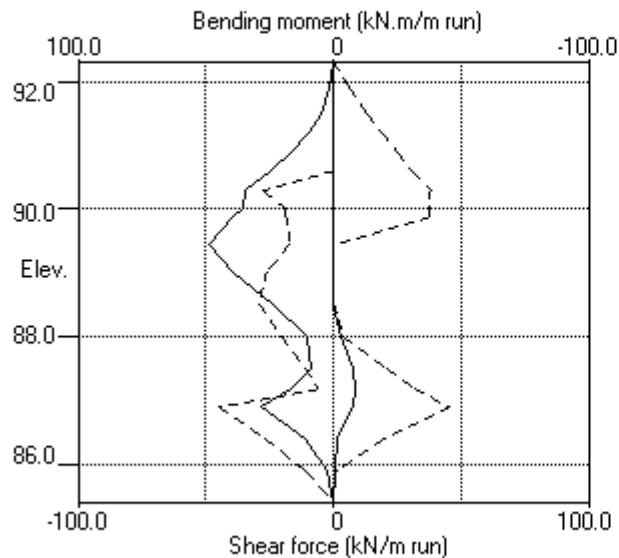
Summary of results (continued)

Strut forces at each stage (horizontal components)

Stage	--- Strut no. 1 ---		--- Strut no. 3 ---	
no.	at elev. 90.30		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut
3	58.93	141.42	---	---
4	61.51	147.63	---	---
5	61.68	148.03	88.39	212.13
6	61.59	147.82	88.73	212.96

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	93.30	1 Fill	1 Fill
2	91.90	2 Res Soil	2 Res Soil
3	90.00	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
adhesion				adhesion			
fill				fill			
angle				angle			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	80.00	80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.50 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Strut Elev.	X-section area	Youngs modulus	Free length	Inclin -ation	Pre-stress /strut	Tension allowed
		sq.m	kN/m2	m	(degs)	kN	
1	91.30	2.40	0.000300	2.000E+08	5.00	45.00	200.0 Yes
2	Not defined						
3	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0 Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	93.30	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 93.30
2	Excavate to elevation 90.80 on PASSIVE side
3	Install strut or anchor no.1 at elevation 91.30
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.3 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

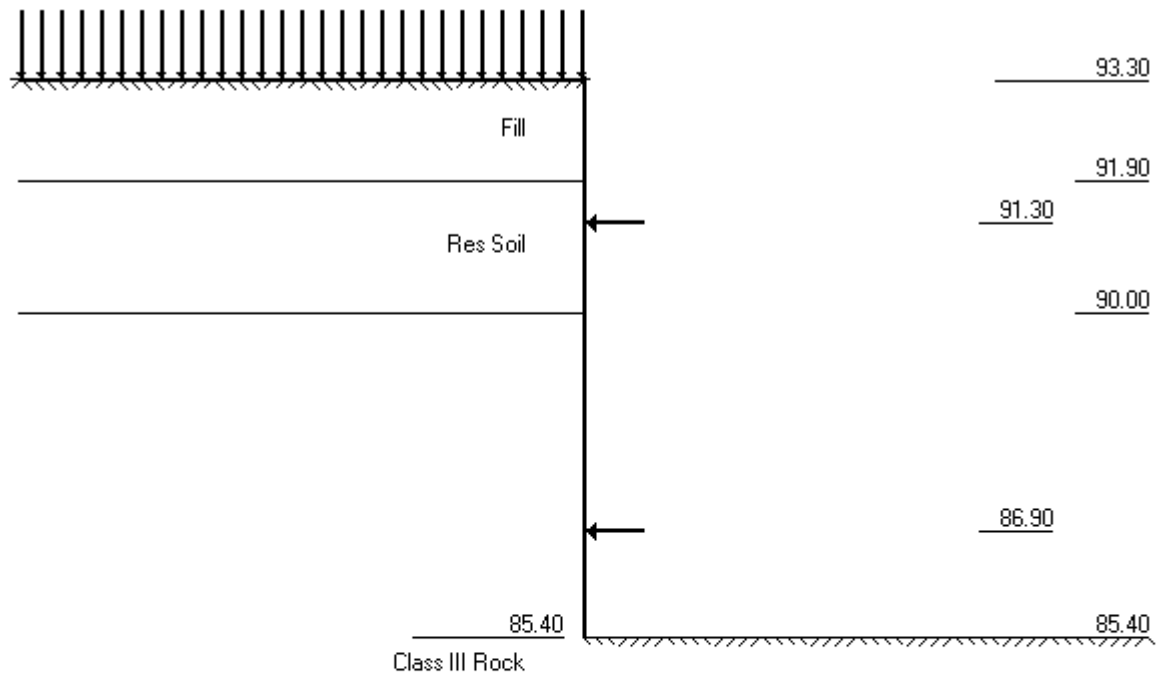
OUTPUT OPTIONS

Stage no.	Stage description	Output options		
		Displacement	Active, Bending mom. Shear force	Graph. Passive output pressures
1	Apply surcharge no.1 at elev. 93.30	Yes	Yes	Yes
2	Excav. to elev. 90.80 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 91.30	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.3 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

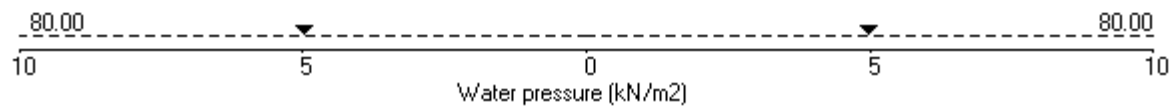
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



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 Data filename/Run ID: 2021.04.07 - SW1 Section 4 - TCB 93.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 4 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 90.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	93.30 90.80	Cant.		2.350	86.24	88.60	2.20

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	93.30	8.12	0.015	4.33E-03	0.0	0.0	
2	92.90	11.04	0.013	4.32E-03	3.8	0.9	
3	92.50	13.96	0.011	4.30E-03	8.8	3.4	
4	92.20	16.15	0.010	4.27E-03	13.3	6.7	
5	91.90	18.34	0.009	4.21E-03	18.5	11.5	
		11.97	0.009	4.21E-03	18.5	11.5	
6	91.60	14.41	0.007	4.11E-03	22.5	17.6	
7	91.30	16.84	0.006	3.96E-03	27.2	25.0	
8	90.80	23.22	0.004	3.58E-03	37.2	41.3	
		7.53	0.004	3.58E-03	37.2	41.3	
9	90.40	4.05	0.003	3.12E-03	39.5	57.0	
10	90.00	13.42	0.002	2.52E-03	43.0	73.1	
		-151.69	0.002	2.52E-03	43.0	73.1	
11	89.50	-94.88	0.001	1.63E-03	-18.6	80.2	
12	89.00	-15.84	0.000	8.30E-04	-46.3	60.0	
13	88.50	23.11	-0.000	2.82E-04	-44.5	34.8	
14	88.00	30.94	-0.000	-7.22E-06	-31.0	15.4	
15	87.50	25.87	-0.000	-1.18E-04	-16.8	3.8	
16	87.20	20.72	-0.000	-1.31E-04	-9.8	-0.1	
17	86.90	15.53	0.000	-1.24E-04	-4.4	-2.1	
18	86.40	6.26	0.000	-9.88E-05	1.1	-2.3	
19	85.90	-1.36	0.000	-7.98E-05	2.3	-1.0	
20	85.40	-7.88	0.000	-7.41E-05	0.0	-0.0	

(continued)

Stage No.2 Excavate to elevation 90.80 on PASSIVE side

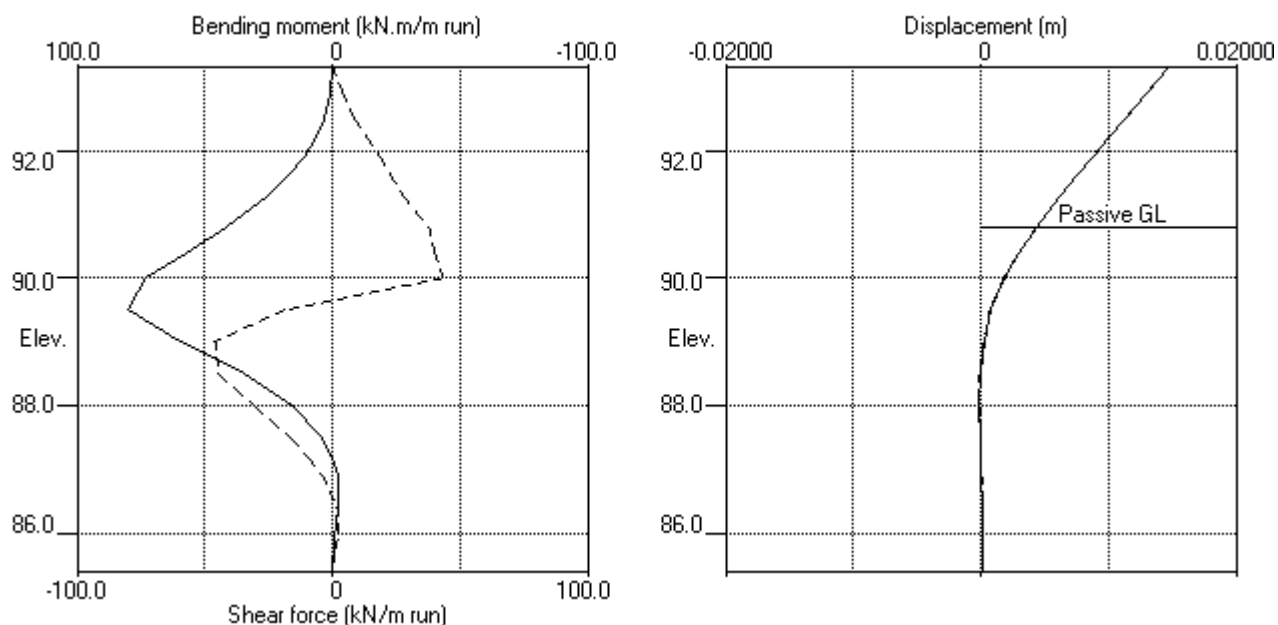
Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	93.30	0.00	20.00	8.12	49.28	8.12	8.12a	2923
2	92.90	0.00	27.20	11.04	67.02	11.04	11.04a	2923
3	92.50	0.00	34.40	13.96	84.76	13.96	13.96a	2923
4	92.20	0.00	39.80	16.15	98.06	16.15	16.15a	2923
5	91.90	0.00	45.20	18.34	111.37	18.34	18.34a	2923
		0.00	45.20	11.97	127.06	11.97	11.97a	2923
6	91.60	0.00	51.20	14.41	141.85	14.41	14.41a	2923
7	91.30	0.00	57.20	16.84	156.63	16.84	16.84a	2923
8	90.80	0.00	67.20	20.90	181.27	23.22	23.22	2923
		0.00	67.20	20.90	135.95	23.22	23.22	2923
9	90.40	0.00	75.20	24.15	150.73	31.79	31.79	2923
10	90.00	0.00	83.20	27.40	165.55	39.74	39.74	2923
		0.00	83.20	0.00	383.47	0.00	0.00a	54007
11	89.50	0.00	95.20	0.00	424.85	0.00	0.00a	54007
12	89.00	0.00	107.19	0.00	466.23	23.32	23.32	54007
13	88.50	0.00	119.19	0.00	507.62	42.88	42.88	69754
14	88.00	0.00	131.19	0.55	549.00	51.00	51.00	69754
15	87.50	0.00	143.19	3.16	590.38	52.66	52.66	69754
16	87.20	0.00	150.38	4.72	615.20	52.61	52.61	69754
17	86.90	0.00	157.58	6.29	640.03	52.54	52.54	69754
18	86.40	0.00	169.58	8.89	681.40	52.11	52.11	96003
19	85.90	0.00	181.57	11.50	722.78	52.51	52.51	96003
20	85.40	0.00	193.57	14.11	764.14	53.46	53.46	96003

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	93.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	92.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	92.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	92.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	91.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	91.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	91.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	90.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	15.70	15.70	15.70p	5794
9	90.40	0.00	8.00	0.00	32.59	27.74	27.74	5794
10	90.00	0.00	16.00	0.12	48.19	26.32	26.32	5794
		0.00	16.00	0.00	151.69	151.69	151.69p	107643
11	89.50	0.00	28.01	0.00	193.10	94.88	94.88	107643
12	89.00	0.00	40.01	0.00	234.52	39.16	39.16	107643
13	88.50	0.00	52.03	0.00	275.96	19.77	19.77	69754
14	88.00	0.00	64.05	0.00	317.57	20.05	20.05	69754
15	87.50	0.00	76.09	0.00	359.73	26.79	26.79	69754
16	87.20	0.00	83.31	0.00	385.04	31.89	31.89	69754
17	86.90	0.00	90.54	0.00	410.37	37.01	37.01	69754
18	86.40	0.00	102.60	0.00	452.62	45.85	45.85	96003
19	85.90	0.00	114.67	0.00	494.91	53.87	53.87	96003
20	85.40	0.00	126.76	0.00	537.26	61.34	61.34	96003

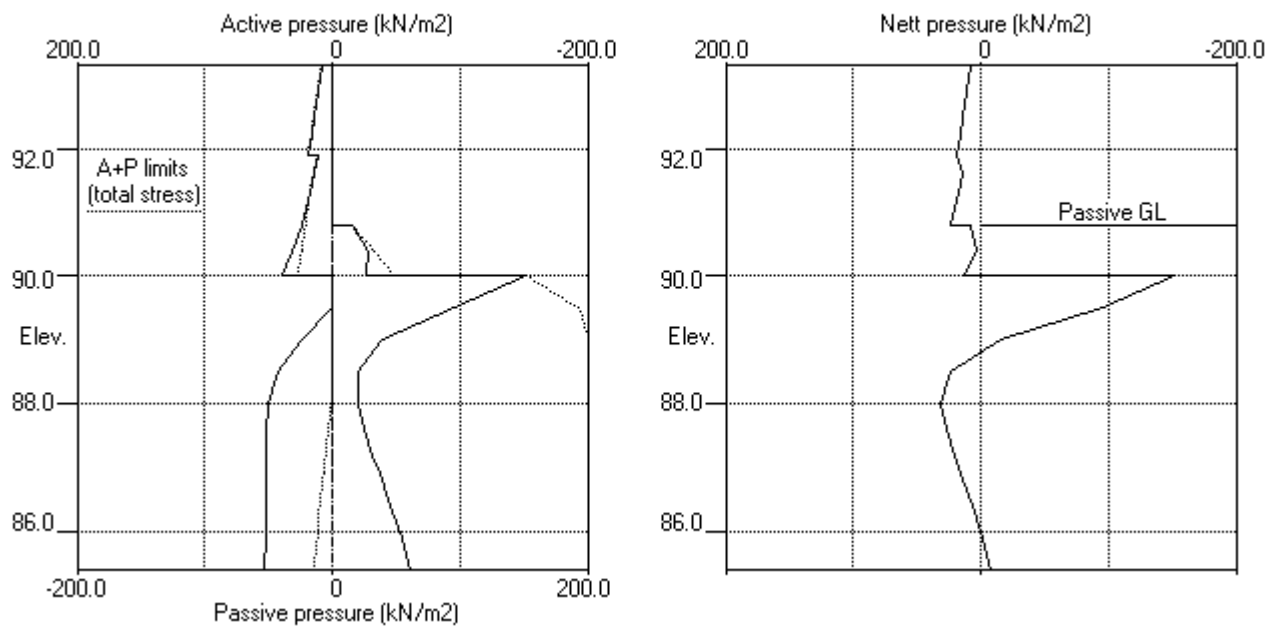
Note: 0.00a Soil pressure at active limit
 151.69p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 90.80 on PASSIVE side



Stage No.2 Excav. to elev. 90.80 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.07 - SW1 Section 4 - TCB 93.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 4 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe		Toe elev. for		
				elev. = 85.40		FoS = 1.000		

Stage	---	G.L.	---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.		of	equilib.	elev.	Penetr
					Safety	at elev.		-ation
4	93.30	86.40	91.30	1.512		n/a	86.35	0.05

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	93.30	14.98	0.013	2.76E-03	0.0	0.0	
2	92.90	16.63	0.012	2.75E-03	6.3	1.4	
3	92.50	18.27	0.011	2.72E-03	13.3	5.4	
4	92.20	19.48	0.010	2.67E-03	19.0	10.2	
5	91.90	20.67	0.010	2.57E-03	25.0	16.8	
		14.30	0.010	2.57E-03	25.0	16.8	
6	91.60	15.69	0.009	2.43E-03	29.5	25.0	
7	91.30	17.03	0.008	2.22E-03	34.4	34.6	69.4
		17.03	0.008	2.22E-03	-35.0	34.6	
8	90.80	21.49	0.007	1.91E-03	-25.4	19.8	
9	90.40	28.63	0.006	1.76E-03	-15.3	12.0	
10	90.00	35.45	0.006	1.67E-03	-2.5	8.2	
		0.00	0.006	1.67E-03	-2.5	8.2	
11	89.50	0.00	0.005	1.55E-03	-2.5	11.9	
12	89.00	0.00	0.004	1.43E-03	-2.5	9.8	
13	88.50	0.00	0.003	1.33E-03	-2.5	7.5	
14	88.00	0.55	0.003	1.25E-03	-2.4	6.0	
15	87.50	3.16	0.002	1.18E-03	-1.4	5.2	
16	87.20	5.07	0.002	1.15E-03	-0.2	5.6	
17	86.90	14.78	0.001	1.11E-03	2.8	5.8	
18	86.40	29.62	0.001	1.02E-03	13.9	9.4	
		-69.10	0.001	1.02E-03	13.9	9.4	
19	85.90	-42.17	0.000	9.07E-04	-14.0	10.9	
20	85.40	97.99	0.000	8.44E-04	0.0	-0.0	
Strut force at elev. 91.30 =			69.37 kN/m run =				166.49 kN/strut (horiz.)
							= 235.46 kN/strut (incl.)

(continued)

Stage No.4 Excavate to elevation 86.40 on PASSIVE side

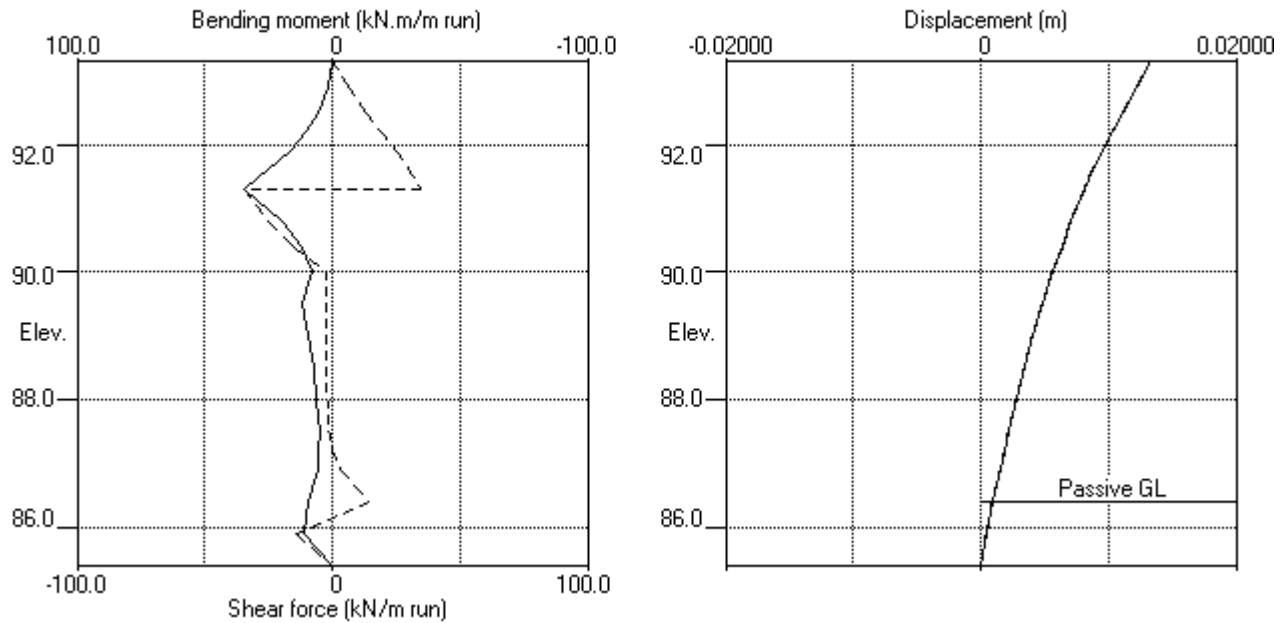
Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	93.30	0.00	20.00	8.12	49.28	14.98	14.98	1347
2	92.90	0.00	27.20	11.04	67.02	16.63	16.63	1347
3	92.50	0.00	34.40	13.96	84.76	18.27	18.27	1347
4	92.20	0.00	39.80	16.15	98.06	19.48	19.48	1347
5	91.90	0.00	45.20	18.34	111.37	20.67	20.67	1347
		0.00	45.20	11.97	127.06	14.30	14.30	1347
6	91.60	0.00	51.20	14.41	141.85	15.69	15.69	1347
7	91.30	0.00	57.20	16.84	156.63	17.03	17.03	1347
8	90.80	0.00	67.20	20.90	181.27	21.49	21.49	1347
9	90.40	0.00	75.20	24.15	200.98	28.63	28.63	1347
10	90.00	0.00	83.20	27.40	220.69	35.45	35.45	1347
		0.00	83.20	0.00	511.29	0.00	0.00a	24567
11	89.50	0.00	95.20	0.00	566.47	0.00	0.00a	24567
12	89.00	0.00	107.19	0.00	621.65	0.00	0.00a	24567
13	88.50	0.00	119.19	0.00	676.82	0.00	0.00a	24567
14	88.00	0.00	131.19	0.55	732.00	0.55	0.55a	24567
15	87.50	0.00	143.19	3.16	787.17	3.16	3.16a	24567
16	87.20	0.00	150.38	4.72	820.27	5.07	5.07	24567
17	86.90	0.00	157.58	6.29	853.37	14.78	14.78	24567
18	86.40	0.00	169.58	8.89	908.54	29.62	29.62	24567
		0.00	169.58	8.89	681.40	29.62	29.62	24567
19	85.90	0.00	181.57	11.50	722.78	43.57	43.57	24567
20	85.40	0.00	193.57	14.11	764.14	97.99	97.99	379339

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	93.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	92.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	92.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	92.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	91.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	91.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	91.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	90.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	90.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	89.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	88.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	98.73	98.73	98.73p	166279
19	85.90	0.00	12.00	0.00	140.77	85.74	85.74	166279
20	85.40	0.00	24.01	0.00	182.84	0.00	0.00a	553491

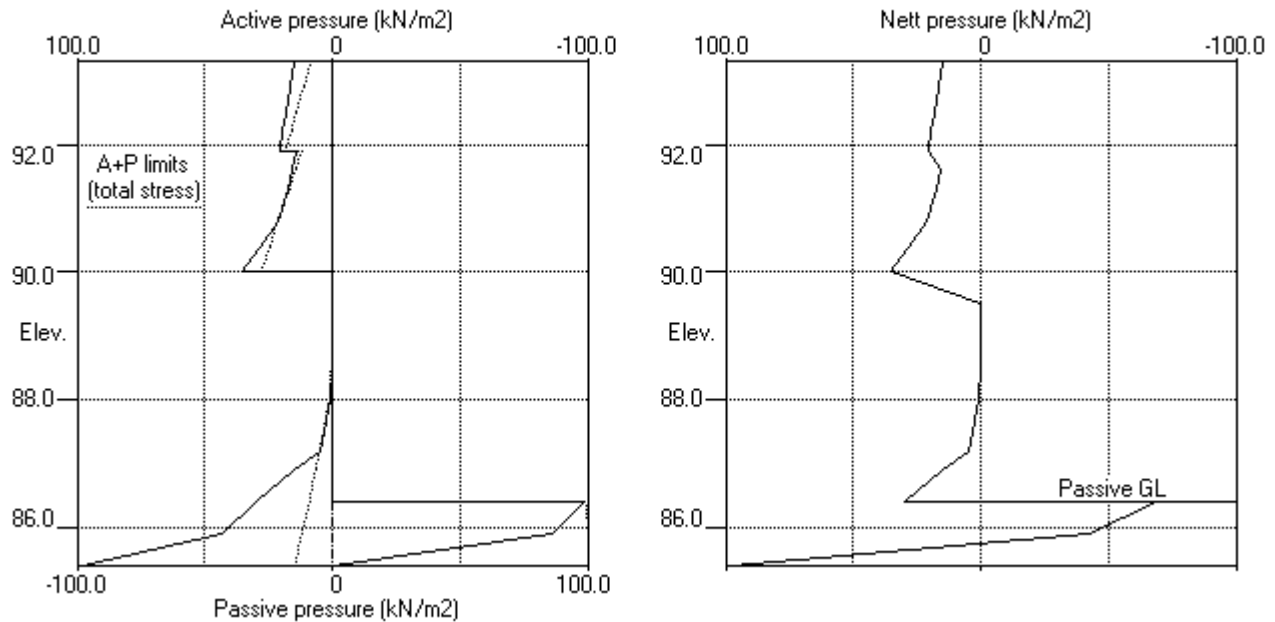
Note: 0.00a Soil pressure at active limit
 98.73p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
			More than one strut		-ation
6	93.30 85.90				

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
14.11kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	93.30	14.34	0.014	2.83E-03	0.0	0.0	
2	92.90	16.05	0.012	2.82E-03	6.1	1.4	
3	92.50	17.75	0.011	2.79E-03	12.8	5.2	
4	92.20	19.02	0.011	2.74E-03	18.4	9.8	
5	91.90	20.26	0.010	2.65E-03	24.2	16.3	
		13.89	0.010	2.65E-03	24.2	16.3	
6	91.60	15.34	0.009	2.51E-03	28.6	24.2	
7	91.30	16.91	0.008	2.31E-03	33.5	33.5	69.6
		16.91	0.008	2.31E-03	-36.1	33.5	
8	90.80	21.32	0.007	2.01E-03	-26.6	18.2	
9	90.40	28.57	0.006	1.88E-03	-16.6	9.8	
10	90.00	35.52	0.006	1.81E-03	-3.8	5.5	
		1.39	0.006	1.81E-03	-3.8	5.5	
11	89.50	4.58	0.005	1.73E-03	-2.3	8.7	
12	89.00	8.64	0.004	1.63E-03	1.0	7.3	
13	88.50	13.32	0.003	1.55E-03	6.5	7.9	
14	88.00	18.20	0.002	1.43E-03	14.4	12.6	
15	87.50	21.64	0.002	1.23E-03	24.3	22.3	
16	87.20	21.83	0.001	1.04E-03	30.9	31.3	
17	86.90	27.28	0.001	7.92E-04	38.2	41.6	89.0
		27.28	0.001	7.92E-04	-50.7	41.6	
18	86.40	28.93	0.001	4.37E-04	-36.7	20.0	

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	93.30	0.00	20.00	8.12	49.28	14.34	14.34	1500
2	92.90	0.00	27.20	11.04	67.02	16.05	16.05	1500
3	92.50	0.00	34.40	13.96	84.76	17.75	17.75	1500
4	92.20	0.00	39.80	16.15	98.06	19.02	19.02	1500
5	91.90	0.00	45.20	18.34	111.37	20.26	20.26	1500
		0.00	45.20	11.97	127.06	13.89	13.89	1500
6	91.60	0.00	51.20	14.41	141.85	15.34	15.34	1500
7	91.30	0.00	57.20	16.84	156.63	16.91	16.91	1500
8	90.80	0.00	67.20	20.90	181.27	21.32	21.32	1500
9	90.40	0.00	75.20	24.15	200.98	28.57	28.57	1500
10	90.00	0.00	83.20	27.40	220.69	35.52	35.52	1500
		0.00	83.20	0.00	511.29	1.39	1.39	27432
11	89.50	0.00	95.20	0.00	566.47	4.58	4.58	27432
12	89.00	0.00	107.19	0.00	621.65	8.64	8.64	27432
13	88.50	0.00	119.19	0.00	676.82	13.32	13.32	27432
14	88.00	0.00	131.19	0.55	732.00	18.20	18.20	73886
15	87.50	0.00	143.19	3.16	787.17	21.64	21.64	73886
16	87.20	0.00	150.38	4.72	820.27	21.83	21.83	73886
17	86.90	0.00	157.58	6.29	853.37	27.28	27.28	73886
18	86.40	0.00	169.58	8.89	908.54	28.93	28.93	73886
19	85.90	0.00	181.57	11.50	963.70	26.54	26.54	73886
		0.00	181.57	11.50	722.78	26.54	26.54	73886
20	85.40	0.00	193.57	14.11	764.14	64.71	64.71	73886

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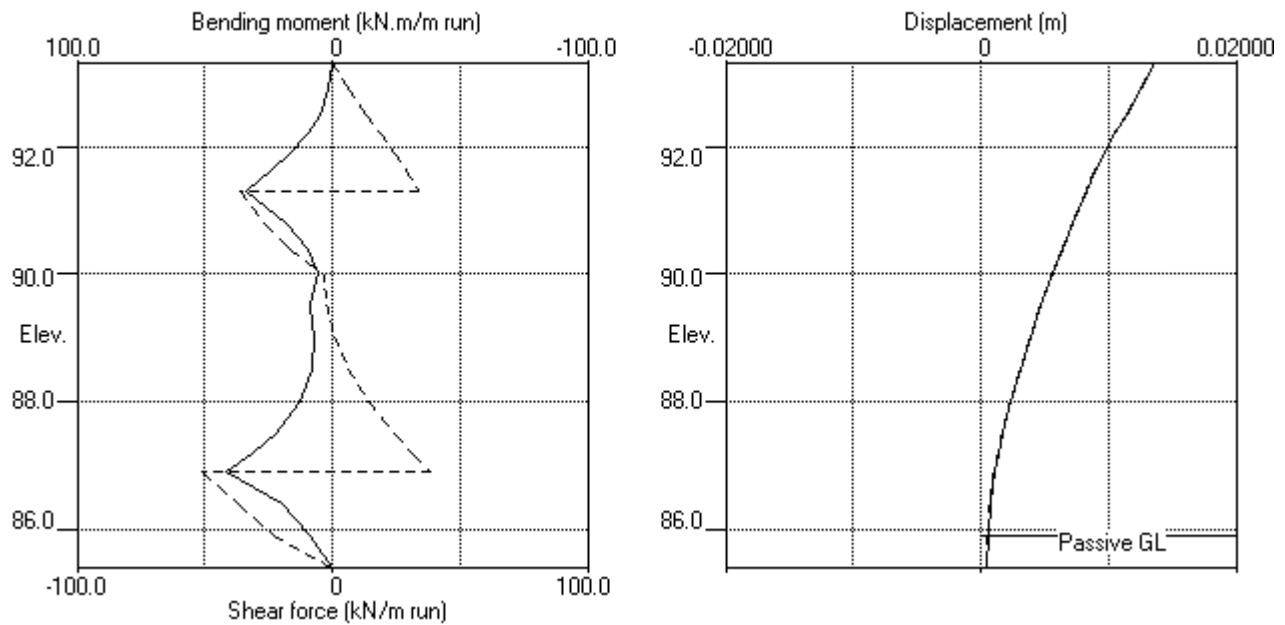
| Sheet No.
| Date:12-04-2021
| Checked :

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

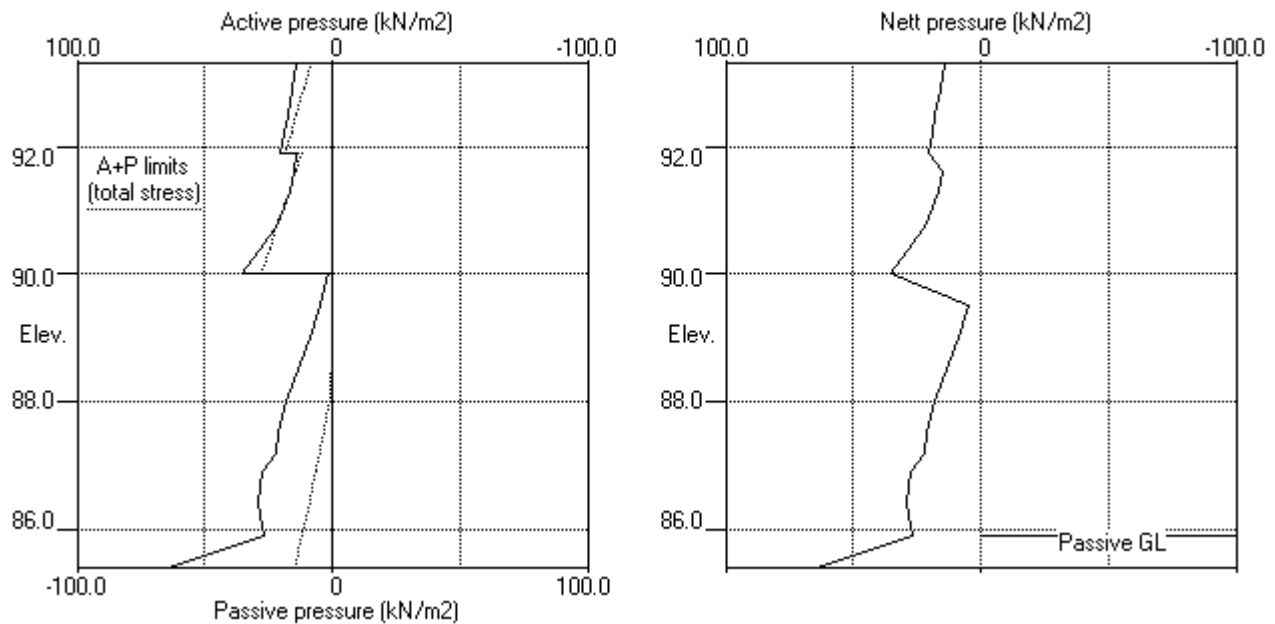
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



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 Data filename/Run ID: 2021.04.07 - SW1 Section 4 - TCB 93.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 4 | Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe		Toe elev. for	
				elev. = 85.40		FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
1	93.30	93.30	Cant.	8.070	86.45	92.60	0.70
2	93.30	90.80	Cant.	2.350	86.24	88.60	2.20
3	93.30	90.80	91.30	Conditions not suitable for FoS calc.			
4	93.30	86.40	91.30	1.512	n/a	86.35	0.05
5	93.30	86.40		More than one strut			
6	93.30	85.90		More than one strut			

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	93.30	0.015	0.000	0.0	0.0	0.0	0.0
2	92.90	0.013	0.000	1.8	0.0	8.0	0.0
3	92.50	0.011	0.000	6.7	0.0	16.7	0.0
4	92.20	0.011	0.000	12.8	0.0	23.8	0.0
5	91.90	0.010	0.000	21.1	0.0	31.4	0.0
6	91.60	0.009	0.000	31.4	0.0	37.5	0.0
7	91.30	0.008	0.000	43.6	0.0	44.0	-36.4
8	90.80	0.007	0.000	41.3	0.0	37.2	-26.8
9	90.40	0.006	0.000	57.0	0.0	39.5	-16.9
10	90.00	0.006	0.000	73.1	0.0	43.0	-4.1
11	89.50	0.005	0.000	80.2	0.0	0.0	-18.6
12	89.00	0.004	0.000	60.0	0.0	1.0	-46.3
13	88.50	0.003	-0.000	34.8	0.0	6.5	-44.5
14	88.00	0.003	-0.000	15.4	0.0	14.4	-31.0
15	87.50	0.002	-0.000	22.3	0.0	24.3	-16.8
16	87.20	0.002	-0.000	31.3	-0.4	31.7	-9.8
17	86.90	0.001	0.000	41.6	-2.1	41.9	-50.7
18	86.40	0.001	0.000	20.0	-2.3	13.9	-36.7
19	85.90	0.001	0.000	11.0	-1.0	2.3	-24.1
20	85.40	0.000	0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	12.0	89.50	-0.2	86.40	9.2	90.00	-6.3	88.50
2	80.2	89.50	-2.3	86.40	43.0	90.00	-46.3	89.00
3	48.2	89.50	-1.4	86.90	44.0	91.30	-28.5	89.00
4	34.6	91.30	-0.0	85.40	34.4	91.30	-35.0	91.30
5	37.6	86.90	-0.0	85.40	41.9	86.90	-46.5	86.90
6	41.6	86.90	0.0	93.30	38.2	86.90	-50.7	86.90

Summary of results (continued)

Maximum and minimum displacement at each stage

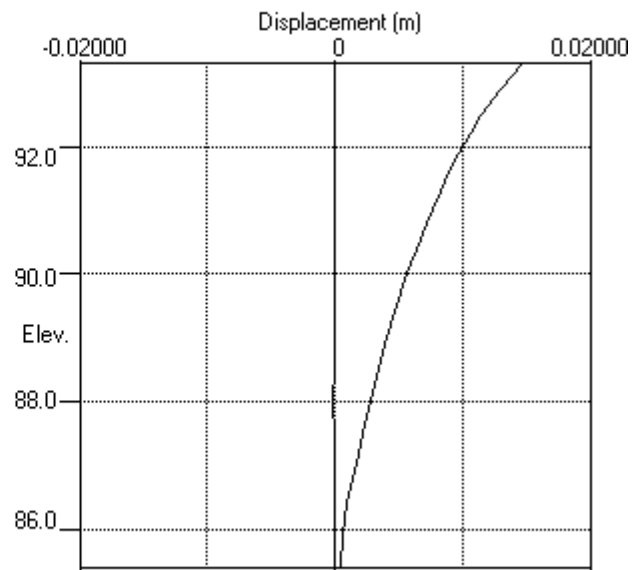
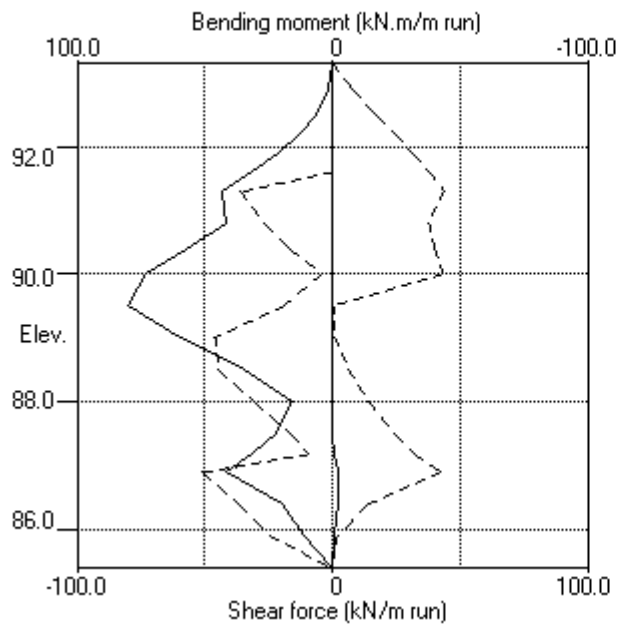
Stage no.	-----	Displacement	-----	Stage description
no.	maximum	elev.	minimum	elev.
	m		m	
1	0.002	93.30	0.000	93.30
2	0.015	93.30	-0.000	88.00
3	0.010	93.30	0.000	93.30
4	0.013	93.30	0.000	93.30
5	0.014	93.30	0.000	93.30
6	0.014	93.30	0.000	93.30

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---	--- Strut no. 3 ---
	at elev. 91.30	at elev. 86.90
	kN/m run	kN/strut
3	58.93	141.42
4	69.37	166.49
5	69.72	167.33
6	69.60	167.05

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	94.30	1 Fill	1 Fill
2	93.70	2 Res Soil	2 Res Soil
3	91.80	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
angle				angle			
adhesion				adhesion			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.50 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	92.30	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes
2	89.30	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes
3	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge	Equiv. Partial soil factor/ type Category
1	94.30	0.00 (A)	100.00	100.00	20.00 =	N/A N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 94.30
2	Excavate to elevation 91.80 on PASSIVE side
3	Install strut or anchor no.1 at elevation 92.30
4	Excavate to elevation 88.80 on PASSIVE side
5	Install strut or anchor no.2 at elevation 89.30
6	Excavate to elevation 86.40 on PASSIVE side
7	Install strut or anchor no.3 at elevation 86.90
8	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

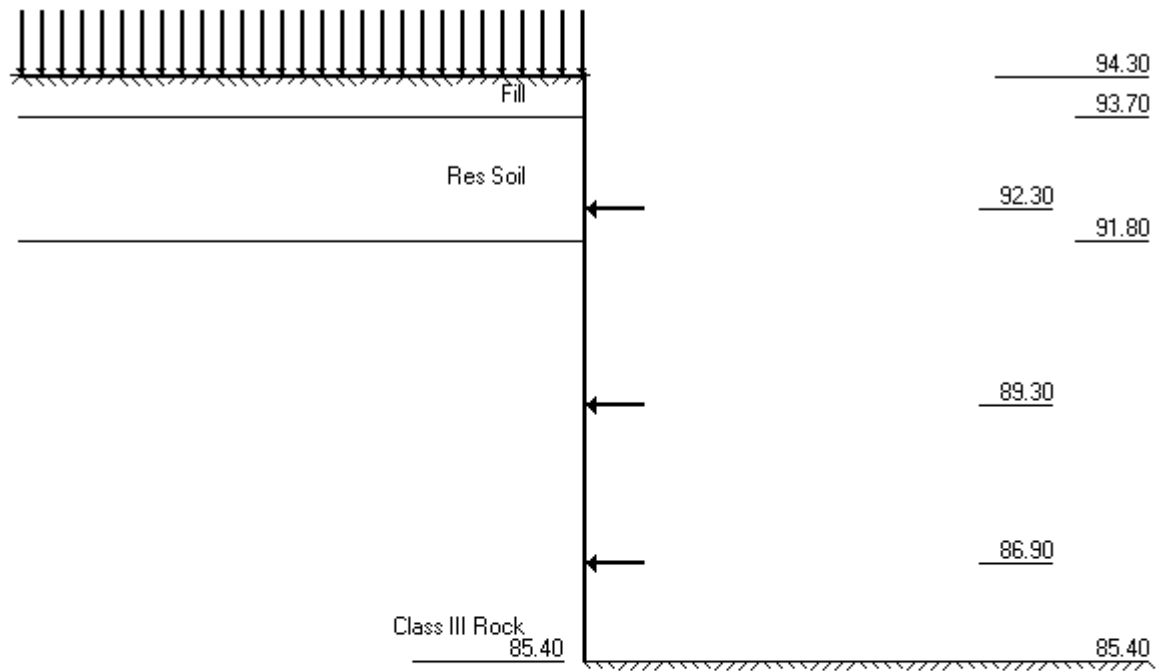
OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Output options Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 94.30	Yes	Yes	Yes
2	Excav. to elev. 91.80 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 92.30	No	No	No
4	Excav. to elev. 88.80 on PASSIVE side	No	No	No
5	Install strut no.2 at elev. 89.30	No	No	No
6	Excav. to elev. 86.40 on PASSIVE side	No	No	No
7	Install strut no.3 at elev. 86.90	No	No	No
8	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

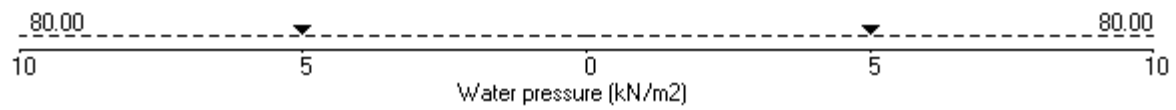
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Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



ABC Consultants Pty Ltd | Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
Licensed from GEOSOLVE | Made by : VR
Data filename/Run ID: 2021.04.07 - SW1 Section 5 - TCB 94.3 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW1 - Section 5 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 91.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	94.30	91.80	Cant.	3.240	86.29	90.56	1.24

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	94.30	8.12	0.006	2.08E-03	0.0	-0.0	
2	94.00	10.31	0.005	2.08E-03	2.8	0.5	
3	93.70	12.50	0.005	2.07E-03	6.2	1.8	
		6.13	0.005	2.07E-03	6.2	1.8	
4	93.35	8.97	0.004	2.05E-03	8.8	4.4	
5	93.00	12.13	0.003	2.00E-03	12.5	8.2	
6	92.65	18.46	0.003	1.91E-03	17.9	13.4	
7	92.30	24.66	0.002	1.77E-03	25.4	20.9	
8	91.80	33.14	0.001	1.44E-03	39.9	36.9	
		-96.50	0.001	1.44E-03	39.9	36.9	
9	91.40	-85.94	0.001	1.05E-03	3.4	46.7	
10	91.00	-35.09	0.000	6.49E-04	-20.8	41.6	
11	90.50	5.66	0.000	2.54E-04	-28.2	26.8	
12	90.00	19.85	0.000	2.19E-05	-21.8	13.4	
13	89.65	15.67	0.000	-6.06E-05	-15.6	7.0	
14	89.30	13.42	0.000	-9.90E-05	-10.5	2.5	
15	88.80	9.18	0.000	-1.07E-04	-4.9	-1.1	
16	88.40	5.96	0.000	-9.19E-05	-1.8	-2.3	
17	88.00	3.38	0.000	-6.97E-05	0.0	-2.5	
18	87.50	1.15	0.000	-4.30E-05	1.2	-2.1	
19	87.20	0.28	0.000	-3.00E-05	1.4	-1.7	
20	86.90	-0.30	0.000	-1.98E-05	1.4	-1.3	
21	86.40	-0.85	0.000	-9.17E-06	1.1	-0.6	
22	85.90	-1.12	0.000	-4.78E-06	0.6	-0.2	
23	85.40	-1.29	0.000	-3.85E-06	0.0	0.0	

(continued)

Stage No.2 Excavate to elevation 91.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	94.30	0.00	20.00	8.12	49.28	8.12	8.12a	3295
2	94.00	0.00	25.40	10.31	62.58	10.31	10.31a	3295
3	93.70	0.00	30.80	12.50	75.89	12.50	12.50a	3295
		0.00	30.80	6.13	91.58	6.13	6.13a	3295
4	93.35	0.00	37.80	8.97	108.83	8.97	8.97a	3295
5	93.00	0.00	44.80	11.81	126.08	12.13	12.13	3295
6	92.65	0.00	51.80	14.65	143.33	18.46	18.46	3295
7	92.30	0.00	58.80	17.49	160.57	24.66	24.66	3295
8	91.80	0.00	68.80	21.55	185.21	33.14	33.14	3295
		0.00	68.80	0.00	333.80	0.00	0.00a	60952
9	91.40	0.00	78.40	0.00	366.91	0.00	0.00a	60952
10	91.00	0.00	88.00	0.00	400.02	11.23	11.23	60952
11	90.50	0.00	100.00	0.00	441.41	28.80	28.80	60952
12	90.00	0.00	111.99	0.00	482.79	38.53	38.53	363739
13	89.65	0.00	120.39	0.00	511.76	39.37	39.37	35388
14	89.30	0.00	128.79	0.03	540.73	41.19	41.19	35388
15	88.80	0.00	140.79	2.63	582.11	43.28	43.28	35388
16	88.40	0.00	150.39	4.72	615.21	45.03	45.03	35388
17	88.00	0.00	159.98	6.81	648.31	47.10	47.10	35388
18	87.50	0.00	171.98	9.42	689.69	50.20	50.20	35388
19	87.20	0.00	179.17	10.98	714.51	52.29	52.29	35388
20	86.90	0.00	186.37	12.55	739.33	54.52	54.52	35388
21	86.40	0.00	198.37	15.15	780.77	58.46	58.46	35388
22	85.90	0.00	210.36	17.76	822.80	62.54	62.54	35388
23	85.40	0.00	222.35	20.37	864.82	66.66	66.66	35388

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	94.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	93.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	92.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	96.50	96.50p	148147
9	91.40	0.00	9.60	0.00	129.62	85.94	85.94	148147
10	91.00	0.00	19.20	0.00	162.73	46.32	46.32	148147
11	90.50	0.00	31.21	0.00	204.14	23.14	23.14	148147
12	90.00	0.00	43.21	0.00	245.56	18.67	18.67	363739
13	89.65	0.00	51.63	0.00	274.57	23.71	23.71	35388
14	89.30	0.00	60.04	0.00	303.60	27.78	27.78	35388
15	88.80	0.00	72.07	0.00	345.74	34.10	34.10	35388
16	88.40	0.00	81.70	0.00	379.48	39.07	39.07	35388
17	88.00	0.00	91.34	0.00	413.24	43.73	43.73	35388
18	87.50	0.00	103.39	0.00	455.49	49.05	49.05	35388
19	87.20	0.00	110.64	0.00	480.85	52.01	52.01	35388
20	86.90	0.00	117.88	0.00	506.24	54.82	54.82	35388
21	86.40	0.00	129.97	0.28	548.60	59.31	59.31	35388
22	85.90	0.00	142.08	2.92	591.01	63.65	63.65	35388

Run ID. 2021.04.07 - SW1 Section 5 - TCB 94.3
 2 Mandala Place, Castle Hill
 SW1 - Section 5

| Sheet No.
 | Date:12-04-2021
 | Checked :

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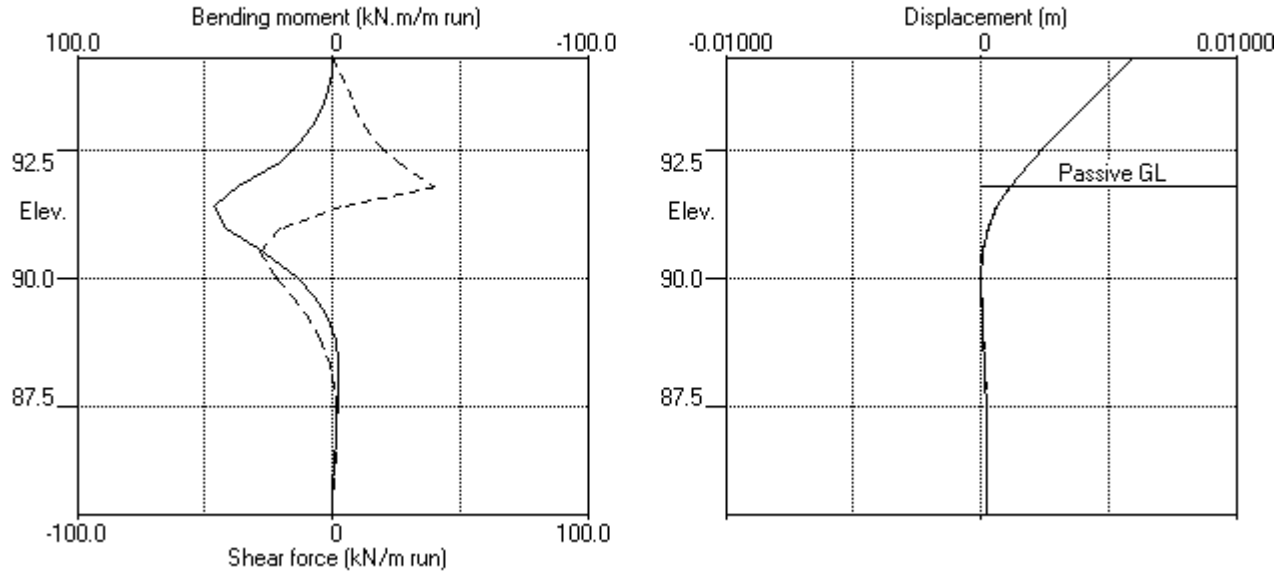
Stage No.2 Excavate to elevation 91.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
23	85.40	0.00	154.20	5.55	633.47	67.96	67.96	35388

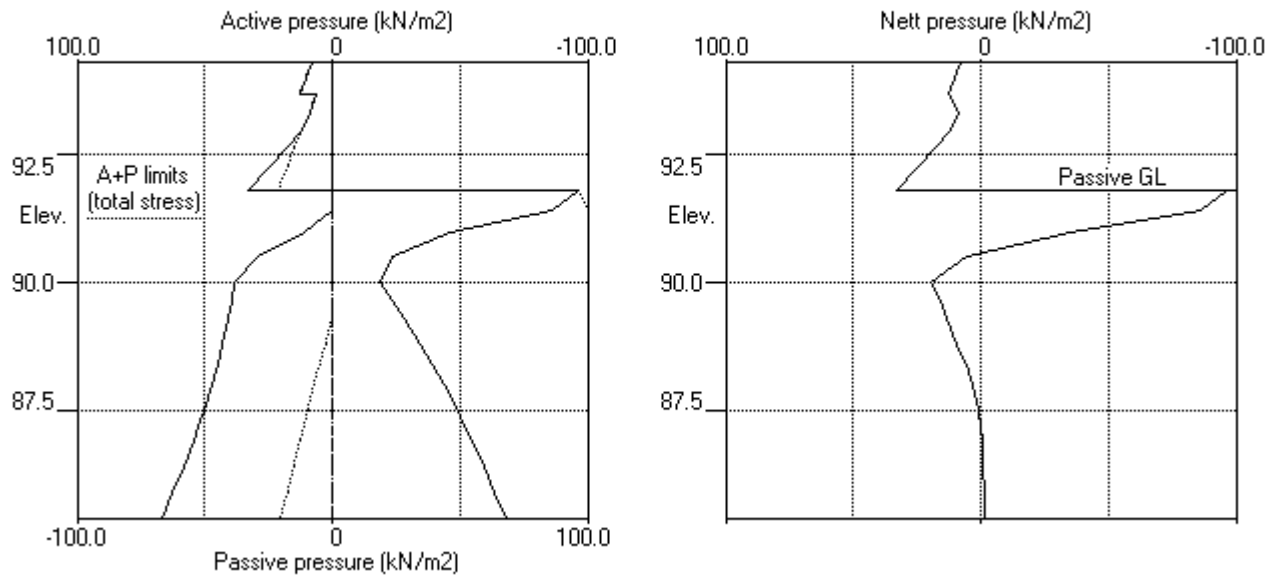
Note: 0.00a Soil pressure at active limit
 96.50p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 91.80 on PASSIVE side



Stage No.2 Excav. to elev. 91.80 on PASSIVE side



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 Data filename/Run ID: 2021.04.07 - SW1 Section 5 - TCB 94.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 5 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 88.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000	
				-----	-----	
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of	elev.	Penetr
				equilib.		-ation
				Safety at elev.		
4	94.30	88.80	92.30	Conditions not suitable for FoS calc.		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	94.30	13.69	0.004	1.33E-03	0.0	-0.0	
2	94.00	15.30	0.004	1.33E-03	4.3	0.7	
3	93.70	16.92	0.004	1.32E-03	9.2	2.7	
		10.54	0.004	1.32E-03	9.2	2.7	
4	93.35	12.70	0.003	1.28E-03	13.2	6.6	
5	93.00	15.16	0.003	1.20E-03	18.1	12.2	
6	92.65	20.74	0.002	1.07E-03	24.4	19.6	
7	92.30	26.15	0.002	8.79E-04	32.6	29.5	61.4
		26.15	0.002	8.79E-04	-28.8	29.5	
8	91.80	33.43	0.002	6.02E-04	-13.9	18.6	
		5.66	0.002	6.02E-04	-13.9	18.6	
9	91.40	0.00	0.001	4.45E-04	-12.8	15.5	
10	91.00	0.00	0.001	3.25E-04	-12.8	10.5	
11	90.50	3.49	0.001	2.38E-04	-11.9	4.7	
12	90.00	12.88	0.001	2.16E-04	-7.8	-0.9	
13	89.65	15.69	0.001	2.30E-04	-2.8	-2.7	
14	89.30	20.56	0.001	2.52E-04	3.5	-2.7	
15	88.80	27.80	0.001	2.57E-04	15.6	1.9	
		-29.63	0.001	2.57E-04	15.6	1.9	
16	88.40	-18.89	0.001	2.21E-04	5.9	5.8	
17	88.00	-10.29	0.000	1.64E-04	0.1	6.6	
18	87.50	-3.11	0.000	9.52E-05	-3.3	5.4	
19	87.20	-0.48	0.000	6.18E-05	-3.8	4.3	
20	86.90	1.19	0.000	3.62E-05	-3.7	3.1	
21	86.40	2.53	0.000	1.01E-05	-2.8	1.4	
22	85.90	2.84	0.000	-1.05E-07	-1.4	0.4	
23	85.40	2.82	0.000	-2.14E-06	0.0	0.0	
Strut force at elev. 92.30 =			61.41 kN/m	run =	147.38 kN/strut (horiz.)		
				=	208.42 kN/strut (incl.)		

(continued)

Stage No.4 Excavate to elevation 88.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	94.30	0.00	20.00	8.12	49.28	13.69	13.69	1379
2	94.00	0.00	25.40	10.31	62.58	15.30	15.30	1379
3	93.70	0.00	30.80	12.50	75.89	16.92	16.92	1379
		0.00	30.80	6.13	91.58	10.54	10.54	1379
4	93.35	0.00	37.80	8.97	108.83	12.70	12.70	1379
5	93.00	0.00	44.80	11.81	126.08	15.16	15.16	1379
6	92.65	0.00	51.80	14.65	143.33	20.74	20.74	1379
7	92.30	0.00	58.80	17.49	160.57	26.15	26.15	1379
8	91.80	0.00	68.80	21.55	185.21	33.43	33.43	1379
		0.00	68.80	0.00	445.07	5.66	5.66	25168
9	91.40	0.00	78.40	0.00	489.22	0.00	0.00a	25168
10	91.00	0.00	88.00	0.00	533.36	0.00	0.00a	25168
11	90.50	0.00	100.00	0.00	588.54	3.49	3.49	25168
12	90.00	0.00	111.99	0.00	643.72	12.88	12.88	25168
13	89.65	0.00	120.39	0.00	682.35	15.69	15.69	25168
14	89.30	0.00	128.79	0.03	720.97	20.56	20.56	25168
15	88.80	0.00	140.79	2.63	776.14	27.80	27.80	25168
		0.00	140.79	2.63	582.11	27.80	27.80	25168
16	88.40	0.00	150.39	4.72	615.21	33.47	33.47	25168
17	88.00	0.00	159.98	6.81	648.31	38.70	38.70	25168
18	87.50	0.00	171.98	9.42	689.69	44.45	44.45	25168
19	87.20	0.00	179.17	10.98	714.51	47.54	47.54	25168
20	86.90	0.00	186.37	12.55	739.33	50.41	50.41	25168
21	86.40	0.00	198.37	15.15	780.70	54.90	54.90	25168
22	85.90	0.00	210.36	17.76	822.07	59.15	59.15	25168
23	85.40	0.00	222.35	20.37	863.43	63.32	63.32	25168

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	94.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	93.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	92.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	89.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	97.16	57.43	57.43	75772
16	88.40	0.00	9.60	0.00	130.80	52.36	52.36	75772
17	88.00	0.00	19.20	0.00	164.44	48.99	48.99	75772
18	87.50	0.00	31.21	0.00	206.52	47.56	47.56	75772
19	87.20	0.00	38.43	0.00	231.79	48.02	48.02	75772
20	86.90	0.00	45.64	0.00	257.07	49.22	49.22	75772
21	86.40	0.00	57.69	0.00	299.26	52.37	52.37	75772

Run ID. 2021.04.07 - SW1 Section 5 - TCB 94.3
 2 Mandala Place, Castle Hill
 SW1 - Section 5

| Sheet No.
 | Date:12-04-2021
 | Checked :

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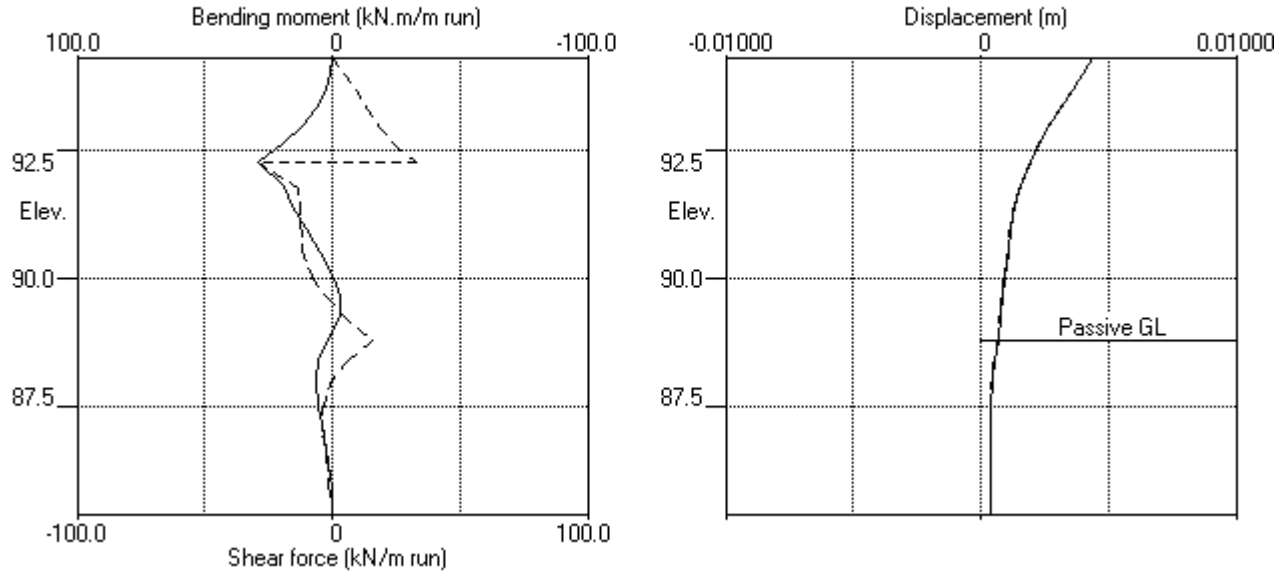
Stage No.4 Excavate to elevation 88.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
22	85.90	0.00	69.75	0.00	341.53	56.31	56.31	75772
23	85.40	0.00	81.84	0.00	383.89	60.50	60.50	75772

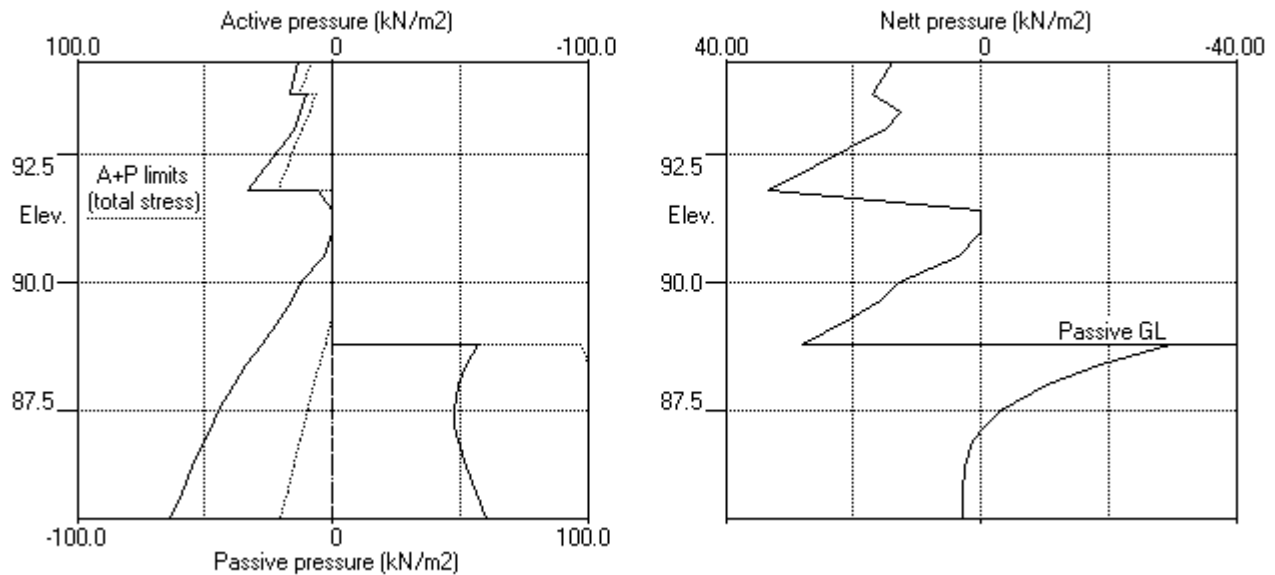
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 88.80 on PASSIVE side



Stage No.4 Excav. to elev. 88.80 on PASSIVE side



Units: kN,m

Stage No. 6 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
			More than one strut		-ation
6	94.30	86.40			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	94.30	13.34	0.004	1.38E-03	0.0	-0.0	
2	94.00	15.05	0.004	1.38E-03	4.3	0.7	
3	93.70	16.75	0.004	1.37E-03	9.0	2.7	
		10.38	0.004	1.37E-03	9.0	2.7	
4	93.35	12.65	0.003	1.33E-03	13.1	6.5	
5	93.00	15.22	0.003	1.25E-03	17.9	12.1	
6	92.65	20.92	0.002	1.13E-03	24.3	19.3	
7	92.30	26.44	0.002	9.35E-04	32.5	29.2	61.1
		26.44	0.002	9.35E-04	-28.6	29.2	
8	91.80	33.76	0.001	6.60E-04	-13.5	18.4	
		11.80	0.001	6.60E-04	-13.5	18.4	
9	91.40	6.67	0.001	5.01E-04	-9.8	16.0	
10	91.00	7.16	0.001	3.69E-04	-7.1	12.7	
11	90.50	11.38	0.001	2.34E-04	-2.4	10.6	
12	90.00	20.18	0.001	1.11E-04	5.5	10.8	
13	89.65	21.13	0.001	1.07E-05	12.7	14.0	
14	89.30	22.32	0.001	-1.26E-04	20.3	19.8	59.9
		22.32	0.001	-1.26E-04	-39.6	19.8	
15	88.80	21.00	0.001	-2.58E-04	-28.7	3.1	
16	88.40	19.27	0.001	-2.42E-04	-20.7	-6.6	
17	88.00	18.61	0.001	-1.50E-04	-13.1	-13.2	
18	87.50	20.65	0.001	2.49E-05	-3.3	-17.2	
19	87.20	23.69	0.001	1.43E-04	3.4	-17.2	
20	86.90	28.12	0.001	2.55E-04	11.1	-15.0	
21	86.40	37.23	0.001	3.75E-04	27.5	-5.8	
		-59.13	0.001	3.75E-04	27.5	-5.8	
22	85.90	-27.63	0.001	4.05E-04	5.8	0.6	
23	85.40	4.51	0.000	4.02E-04	0.0	0.0	
Strut force at elev. 92.30 =			61.13 kN/m	run =	146.71 kN/strut (horiz.)		
				=	207.48 kN/strut (incl.)		
Strut force at elev. 89.30 =			59.86 kN/m	run =	143.66 kN/strut (horiz.)		
				=	203.17 kN/strut (incl.)		

(continued)

Stage No.6 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	94.30	0.00	20.00	8.12	49.28	13.34	13.34	2658
2	94.00	0.00	25.40	10.31	62.58	15.05	15.05	2658
3	93.70	0.00	30.80	12.50	75.89	16.75	16.75	2658
		0.00	30.80	6.13	91.58	10.38	10.38	2658
4	93.35	0.00	37.80	8.97	108.83	12.65	12.65	2658
5	93.00	0.00	44.80	11.81	126.08	15.22	15.22	2658
6	92.65	0.00	51.80	14.65	143.33	20.92	20.92	2658
7	92.30	0.00	58.80	17.49	160.57	26.44	26.44	2658
8	91.80	0.00	68.80	21.55	185.21	33.76	33.76	2658
		0.00	68.80	0.00	445.07	11.80	11.80	49064
9	91.40	0.00	78.40	0.00	489.22	6.67	6.67	49064
10	91.00	0.00	88.00	0.00	533.36	7.16	7.16	35335
11	90.50	0.00	100.00	0.00	588.54	11.38	11.38	35335
12	90.00	0.00	111.99	0.00	643.72	20.18	20.18	35335
13	89.65	0.00	120.39	0.00	682.35	21.13	21.13	35335
14	89.30	0.00	128.79	0.03	720.97	22.32	22.32	35335
15	88.80	0.00	140.79	2.63	776.14	21.00	21.00	35335
16	88.40	0.00	150.39	4.72	820.28	19.27	19.27	35335
17	88.00	0.00	159.98	6.81	864.41	18.61	18.61	35335
18	87.50	0.00	171.98	9.42	919.58	20.65	20.65	35335
19	87.20	0.00	179.17	10.98	952.68	23.69	23.69	35335
20	86.90	0.00	186.37	12.55	985.78	28.12	28.12	35335
21	86.40	0.00	198.37	15.15	1040.93	37.23	37.23	35335
		0.00	198.37	15.15	780.70	37.23	37.23	35335
22	85.90	0.00	210.36	17.76	822.07	48.20	48.20	35335
23	85.40	0.00	222.35	20.37	863.43	59.46	59.46	35335

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	94.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	93.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	92.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	89.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	88.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	100.29	96.36	96.36	123389

Run ID. 2021.04.07 - SW1 Section 5 - TCB 94.3
2 Mandala Place, Castle Hill
SW1 - Section 5

| Sheet No.
| Date:12-04-2021
| Checked :

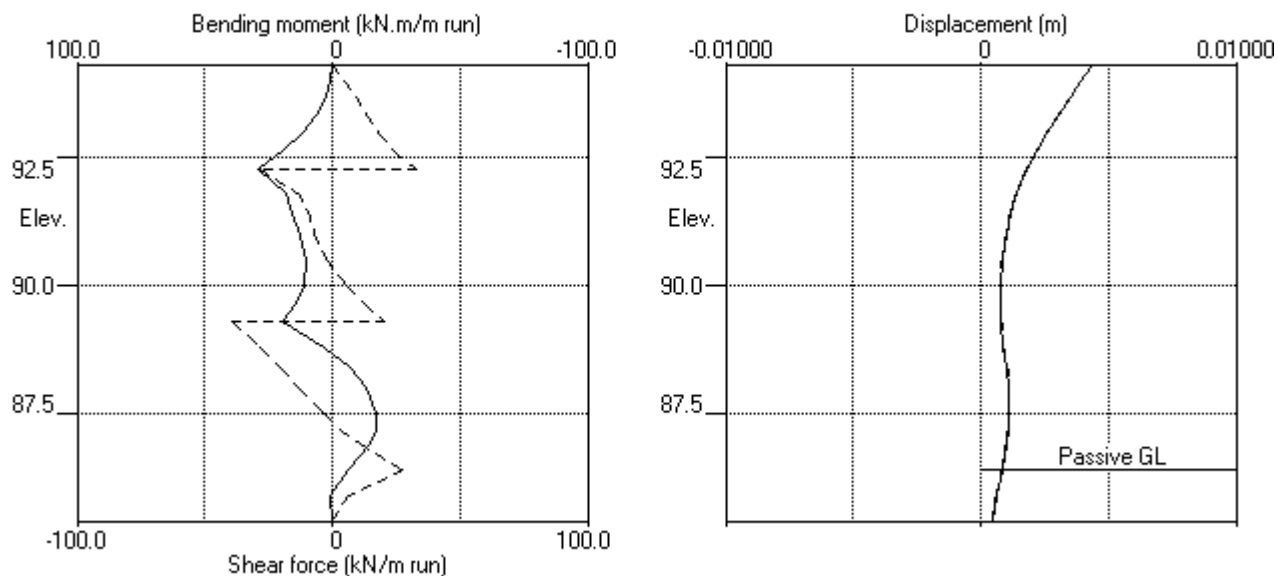
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Stage No.6 Excavate to elevation 86.40 on PASSIVE side

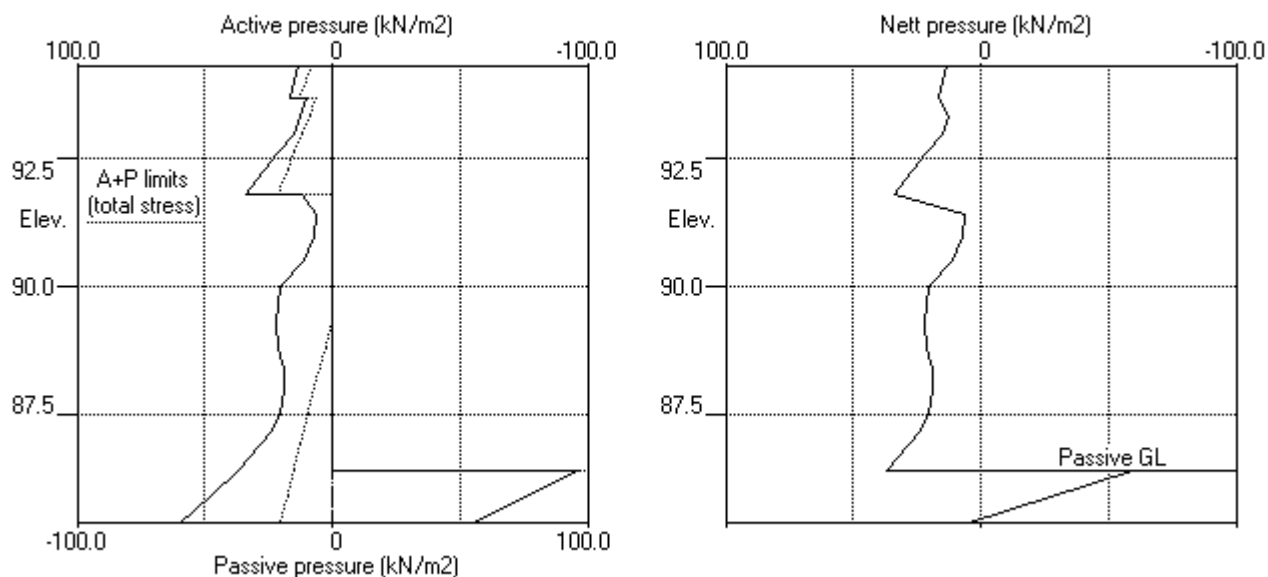
Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
22	85.90	0.00	12.00	0.00	142.34	75.83	75.83	123389
23	85.40	0.00	24.01	0.00	184.41	54.95	54.95	123389

Units: kN,m

Stage No.6 Excav. to elev. 86.40 on PASSIVE side



Stage No.6 Excav. to elev. 86.40 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.07 - SW1 Section 5 - TCB 94.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 5 | Checked :

Units: kN,m

Stage No. 8 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
8	94.30	85.90	More than one	strut	

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 20.37kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

*** Convergence failure - Out of balance shear force at elevation 85.40 is 0.028% of the maximum shear force. see Note.

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	94.30	13.09	0.004	1.40E-03	0.0	-0.0	
2	94.00	14.81	0.004	1.39E-03	4.2	0.7	
3	93.70	16.53	0.004	1.38E-03	8.9	2.6	
		10.16	0.004	1.38E-03	8.9	2.6	
4	93.35	12.44	0.003	1.35E-03	12.8	6.4	
5	93.00	15.02	0.003	1.27E-03	17.6	11.9	
6	92.65	20.74	0.002	1.15E-03	23.9	19.0	
7	92.30	26.28	0.002	9.59E-04	32.1	28.7	61.3
		26.28	0.002	9.59E-04	-29.2	28.7	
8	91.80	33.64	0.001	6.91E-04	-14.2	17.6	
		9.51	0.001	6.91E-04	-14.2	17.6	
9	91.40	4.97	0.001	5.41E-04	-11.3	14.7	
10	91.00	6.20	0.001	4.24E-04	-9.1	10.7	
11	90.50	11.75	0.001	3.18E-04	-4.6	7.6	
12	90.00	22.66	0.001	2.36E-04	4.0	6.7	
13	89.65	25.67	0.001	1.70E-04	12.5	9.6	
14	89.30	29.41	0.001	6.87E-05	22.1	15.6	59.4
		29.41	0.001	6.87E-05	-37.3	15.6	
15	88.80	32.49	0.001	-2.61E-05	-21.8	0.8	

(continued)

Stage No.8 Excavate to elevation 85.40 on PASSIVE side

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
16	88.40	34.60	0.001	-6.19E-06	-8.4	-5.2	
17	88.00	37.44	0.001	4.36E-05	6.0	-5.6	
18	87.50	40.62	0.001	6.27E-05	25.5	2.3	
19	87.20	40.95	0.001	1.37E-05	37.7	11.8	
20	86.90	39.43	0.001	-1.14E-04	49.8	25.1	88.9
		39.43	0.001	-1.14E-04	-39.1	25.1	
21	86.40	30.60	0.001	-3.20E-04	-21.6	10.6	
22	85.90	17.76	0.001	-4.03E-04	-9.5	3.9	
23	85.40	20.37	0.001	-4.26E-04	0.0	0.0	
Strut force at elev.			92.30 =	61.32 kN/m	run =	147.16 kN/strut (horiz.)	
					=	208.11 kN/strut (incl.)	
Strut force at elev.			89.30 =	59.43 kN/m	run =	142.64 kN/strut (horiz.)	
					=	201.72 kN/strut (incl.)	
Strut force at elev.			86.90 =	88.91 kN/m	run =	213.38 kN/strut (horiz.)	
					=	301.76 kN/strut (incl.)	

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	94.30	0.00	20.00	8.12	49.28	13.09	13.09	3235
2	94.00	0.00	25.40	10.31	62.58	14.81	14.81	3235
3	93.70	0.00	30.80	12.50	75.89	16.53	16.53	3235
		0.00	30.80	6.13	91.58	10.16	10.16	3235
4	93.35	0.00	37.80	8.97	108.83	12.44	12.44	3235
5	93.00	0.00	44.80	11.81	126.08	15.02	15.02	3235
6	92.65	0.00	51.80	14.65	143.33	20.74	20.74	3235
7	92.30	0.00	58.80	17.49	160.57	26.28	26.28	3235
8	91.80	0.00	68.80	21.55	185.21	33.64	33.64	3235
		0.00	68.80	0.00	445.07	9.51	9.51	59834
9	91.40	0.00	78.40	0.00	489.22	4.97	4.97	45025
10	91.00	0.00	88.00	0.00	533.36	6.20	6.20	45025
11	90.50	0.00	100.00	0.00	588.54	11.75	11.75	45025
12	90.00	0.00	111.99	0.00	643.72	22.66	22.66	45025
13	89.65	0.00	120.39	0.00	682.35	25.67	25.67	45025
14	89.30	0.00	128.79	0.03	720.97	29.41	29.41	45025
15	88.80	0.00	140.79	2.63	776.14	32.49	32.49	45025
16	88.40	0.00	150.39	4.72	820.28	34.60	34.60	45025
17	88.00	0.00	159.98	6.81	864.41	37.44	37.44	45025
18	87.50	0.00	171.98	9.42	919.58	40.62	40.62	88066
19	87.20	0.00	179.17	10.98	952.68	40.95	40.95	88066
20	86.90	0.00	186.37	12.55	985.78	39.43	39.43	88066
21	86.40	0.00	198.37	15.15	1040.93	30.60	30.60	88066
22	85.90	0.00	210.36	17.76	1096.09	17.76	17.76a	88066
		0.00	210.36	17.76	822.07	17.76	17.76a	88066
23	85.40	0.00	222.35	20.37	863.43	20.37	20.37a	88066

(continued)

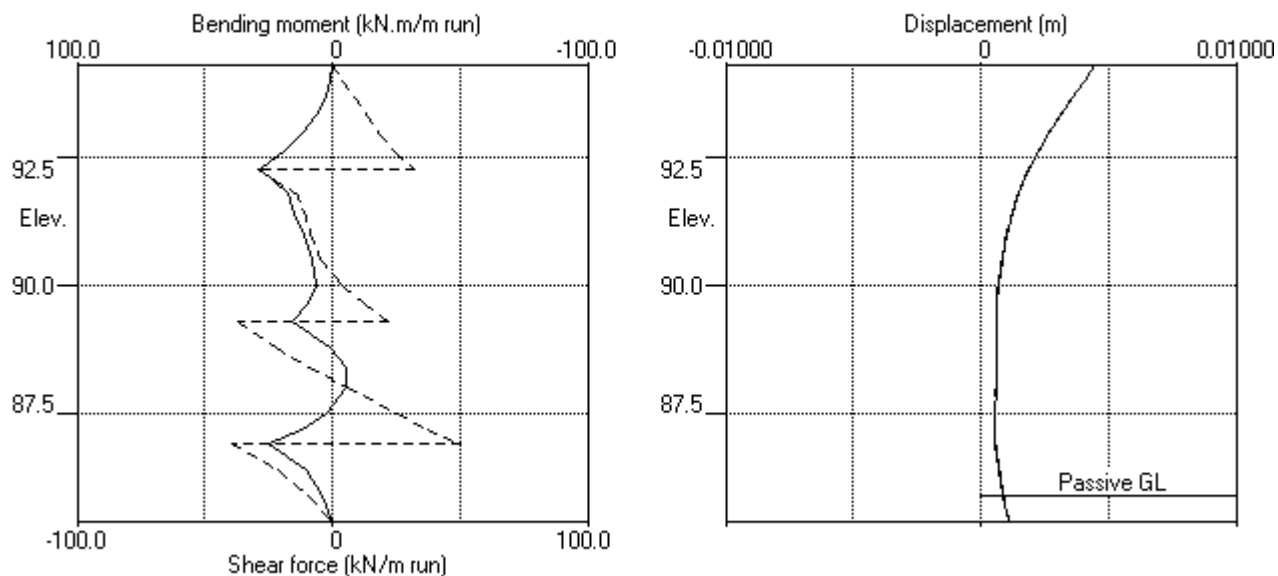
Stage No.8 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	94.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	93.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	92.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	89.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	88.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

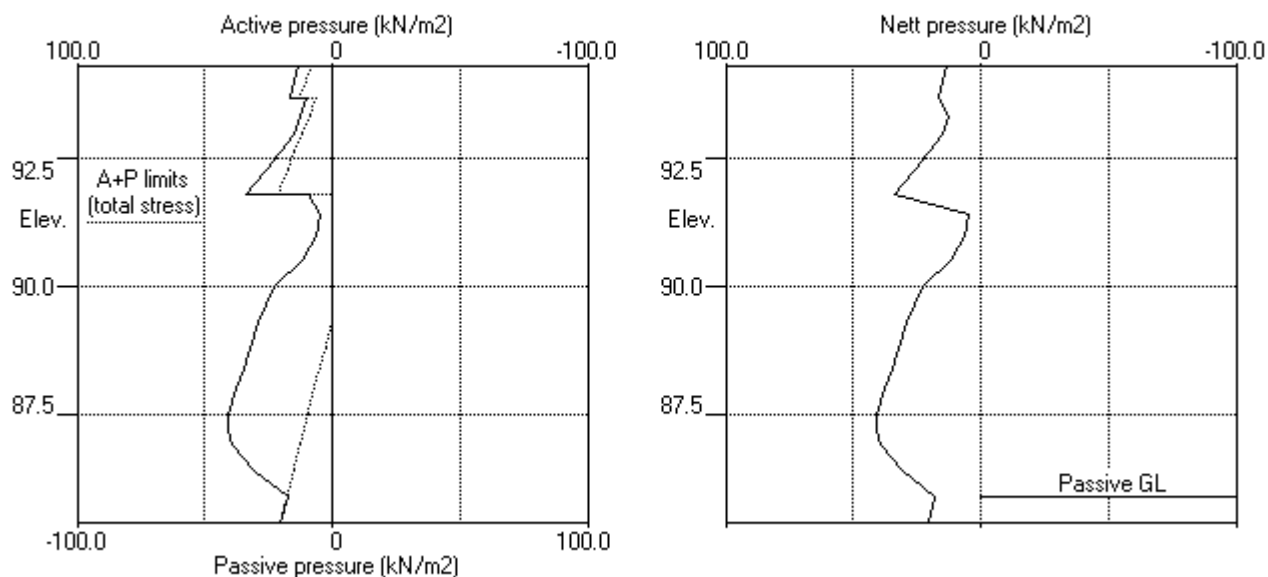
Note: 20.37a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Stage No.8 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
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Data filename/Run ID: 2021.04.07 - SW1 Section 5 - TCB 94.3	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW1 - Section 5	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe		Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40		FoS = 1.000	
					-----		-----	
				Factor	Moment		Toe	Wall
				of	equilib.		elev.	Penetr
				Safety	at elev.			-ation
1	94.30	94.30	Cant.	11.234	86.51		93.63	0.67
2	94.30	91.80	Cant.	3.240	86.29		90.56	1.24
3	94.30	91.80	92.30	Conditions not suitable for FoS calc.				
4	94.30	88.80	92.30	Conditions not suitable for FoS calc.				
5	94.30	88.80		More than one strut				
All remaining stages have more than one strut - FoS calculation n/a								

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	94.30	0.006	0.000	0.0	-0.0	0.0	0.0
2	94.00	0.005	0.000	0.8	0.0	4.7	0.0
3	93.70	0.005	0.000	2.9	0.0	9.8	0.0
4	93.35	0.004	0.000	7.1	0.0	14.3	0.0
5	93.00	0.003	0.000	13.2	0.0	19.6	0.0
6	92.65	0.003	0.000	21.1	0.0	26.3	0.0
7	92.30	0.002	0.000	31.7	0.0	35.0	-29.7
8	91.80	0.002	0.000	36.9	0.0	39.9	-14.8
9	91.40	0.001	0.000	46.7	0.0	3.4	-12.8
10	91.00	0.001	0.000	41.6	0.0	0.0	-20.8
11	90.50	0.001	0.000	26.8	0.0	0.0	-28.2
12	90.00	0.001	0.000	13.4	-0.9	6.2	-21.8
13	89.65	0.001	0.000	14.0	-2.7	16.3	-15.6
14	89.30	0.001	0.000	19.8	-2.7	27.9	-39.6
15	88.80	0.001	0.000	6.4	-1.1	15.6	-28.7
16	88.40	0.001	0.000	5.8	-8.4	5.9	-20.7
17	88.00	0.001	0.000	6.6	-13.2	6.0	-13.1
18	87.50	0.001	0.000	5.4	-17.2	25.5	-3.3
19	87.20	0.001	0.000	11.8	-17.2	37.7	-3.8
20	86.90	0.001	0.000	25.1	-15.0	50.4	-39.1
21	86.40	0.001	0.000	10.6	-5.8	27.5	-21.6
22	85.90	0.001	0.000	3.9	-0.2	5.8	-9.5
23	85.40	0.001	0.000	0.0	0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	11.1	91.40	-0.5	88.00	9.3	91.80	-6.2	90.50
2	46.7	91.40	-2.5	88.00	39.9	91.80	-28.2	90.50
3	31.7	92.30	-1.4	88.00	35.0	92.30	-23.9	92.30
4	29.5	92.30	-2.7	89.65	32.6	92.30	-28.8	92.30
5	28.2	92.30	-0.7	87.20	31.7	92.30	-31.0	89.30
6	29.2	92.30	-17.2	87.20	32.5	92.30	-39.6	89.30
7	28.9	92.30	-10.4	88.00	50.4	86.90	-39.2	89.30
8	28.7	92.30	-5.6	88.00	49.8	86.90	-39.1	86.90

Summary of results (continued)

Maximum and minimum displacement at each stage

Stage no.	Displacement maximum m	Displacement elev.	Displacement minimum m	Displacement elev.	Stage description
1	0.002	94.30	0.000	94.30	Apply surcharge no.1 at elev. 94.30
2	0.006	94.30	0.000	94.30	Excav. to elev. 91.80 on PASSIVE side
3	0.004	94.30	0.000	94.30	Install strut no.1 at elev. 92.30
4	0.004	94.30	0.000	94.30	Excav. to elev. 88.80 on PASSIVE side
5	0.005	94.30	0.000	94.30	Install strut no.2 at elev. 89.30
6	0.004	94.30	0.000	94.30	Excav. to elev. 86.40 on PASSIVE side
7	0.004	94.30	0.000	94.30	Install strut no.3 at elev. 86.90
8	0.004	94.30	0.000	94.30	Excav. to elev. 85.40 on PASSIVE side

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 --- at elev. 92.30		--- Strut no. 2 --- at elev. 89.30		--- Strut no. 3 --- at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
3	58.93	141.42	---	---	---	---
4	61.41	147.38	---	---	---	---
5	61.40	147.35	58.93	141.42	---	---
6	61.13	146.71	59.86	143.66	---	---
7	61.30	147.11	59.53	142.87	88.39	212.13
8	61.32	147.16	59.43	142.64	88.91	213.38

*** Convergence errors have occurred in at least one Construction Stage.
 The errors are cumulative, and the results of all stages must be inspected for significant out of balance moment or shear at the toe of the wall.

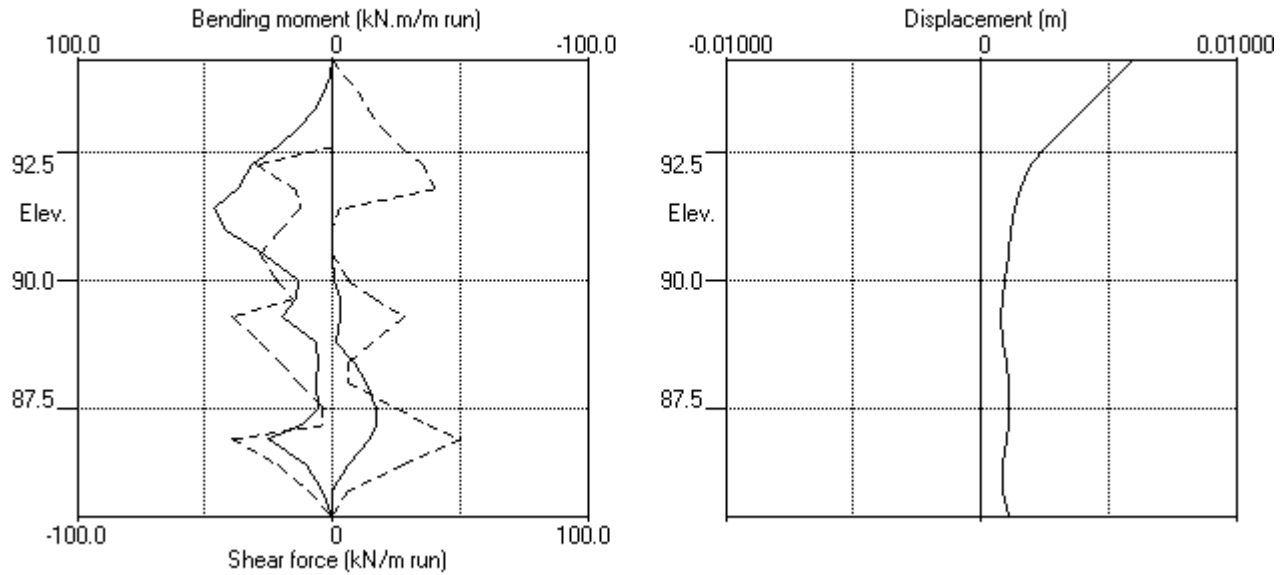
Failure of the iterative procedure to converge to an equilibrium solution may be due to a very high ratio of soil stiffness to wall stiffness. The data should be reviewed to see if realistic values have been specified

Out of balance shear forces.

Percentage Error	Interpretation
-----	-----
< 2%	Generally acceptable
2% to 4%	Use with caution
> 4%	Should not be used

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	97.30	1 Fill	1 Fill
2	94.00	2 Res Soil	2 Res Soil
3	93.00	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
angle				angle			
adhesion				adhesion			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	95.80	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes
2	92.30	2.40	0.000600	2.000E+08	5.00	45.00	400.0	Yes
3	86.90	2.40	0.000600	2.000E+08	5.00	45.00	400.0	Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	97.30	0.00 (A)	100.00	6.00	5.00	=	N/A	N/A
2	97.30	6.00 (A)	100.00	100.00	20.00	=	N/A	N/A
3	97.30	0.00 (A)	1000.00	6.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 97.30
2	Apply surcharge no.2 at elevation 97.30
3	Excavate to elevation 95.30 on PASSIVE side
4	Install strut or anchor no.1 at elevation 95.80
5	Remove surcharge no.1 at elevation 97.30
6	Apply surcharge no.3 at elevation 97.30
7	Excavate to elevation 91.80 on PASSIVE side
8	Install strut or anchor no.2 at elevation 92.30
9	Excavate to elevation 86.40 on PASSIVE side
10	Install strut or anchor no.3 at elevation 86.90
11	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

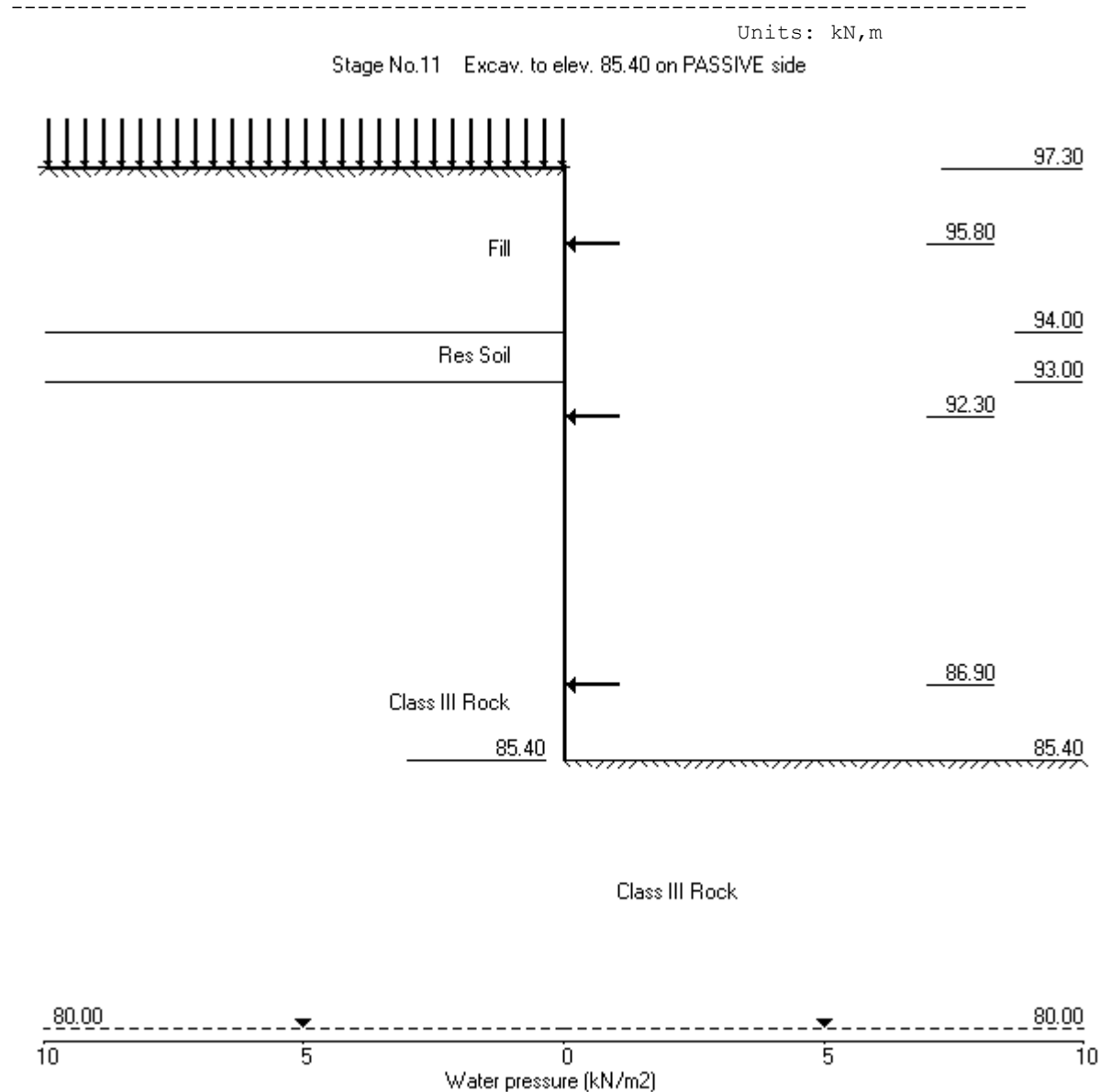
Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 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. 97.30	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 97.30	No	No	No
3	Excav. to elev. 95.30 on PASSIVE side	No	No	No
4	Install strut no.1 at elev. 95.80	No	No	No
5	Remove surcharge no.1 at elev. 97.30	No	No	No
6	Apply surcharge no.3 at elev. 97.30	No	No	No
7	Excav. to elev. 91.80 on PASSIVE side	No	No	No
8	Install strut no.2 at elev. 92.30	No	No	No
9	Excav. to elev. 86.40 on PASSIVE side	No	No	No
10	Install strut no.3 at elev. 86.90	No	No	No
11	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes



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 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.07 - SW1 Section 8 - TCB 97.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 8 | Checked :

Units: kN,m

Stage No. 3 Excavate to elevation 95.30 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
3	97.30 95.30	Cant.		5.105	86.77	92.40	2.90

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.30	2.03	0.016	3.92E-03	0.0	0.0	
2	96.95	4.59	0.014	3.92E-03	1.2	0.2	
3	96.60	7.15	0.013	3.91E-03	3.2	1.0	
4	96.20	10.08	0.012	3.89E-03	6.7	2.9	
5	95.80	13.02	0.010	3.85E-03	11.3	6.4	
6	95.30	16.72	0.008	3.73E-03	18.7	13.8	
7	94.98	4.73	0.007	3.61E-03	22.2	20.6	
8	94.65	-5.45	0.006	3.42E-03	22.1	27.9	
9	94.33	-9.15	0.005	3.19E-03	19.7	35.0	
10	94.00	-5.20	0.004	2.90E-03	17.4	41.1	
11	93.50	3.44	0.002	2.38E-03	16.9	49.1	
12	93.00	10.25	0.001	1.76E-03	20.4	58.0	
		-105.71	0.001	1.76E-03	20.4	58.0	
13	92.65	-70.98	0.001	1.29E-03	-10.6	58.6	
14	92.30	-28.40	0.000	8.52E-04	-28.0	51.1	
15	91.80	6.33	0.000	3.62E-04	-33.5	33.6	
16	91.20	22.25	-0.000	2.80E-05	-24.9	14.7	
17	90.60	17.46	-0.000	-9.98E-05	-13.0	3.8	
18	90.00	8.43	0.000	-1.19E-04	-5.2	-0.9	
19	89.40	4.54	0.000	-9.68E-05	-1.3	-2.5	
20	88.80	1.77	0.000	-6.28E-05	0.6	-2.4	
21	88.20	0.20	0.000	-3.37E-05	1.2	-1.8	
22	87.60	-0.48	0.000	-1.42E-05	1.1	-1.0	
23	87.25	-0.61	0.000	-7.34E-06	0.9	-0.7	
24	86.90	-0.63	0.000	-2.90E-06	0.7	-0.4	
25	86.40	-0.53	0.000	3.60E-07	0.4	-0.2	
26	85.90	-0.38	0.000	1.41E-06	0.2	-0.0	
27	85.40	-0.23	0.000	1.58E-06	0.0	-0.0	

(continued)

Stage No.3 Excavate to elevation 95.30 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.30	0.00	5.00	2.03	12.32	2.03	2.03a	2612
2	96.95	0.00	11.30	4.59	27.84	4.59	4.59a	2612
3	96.60	0.00	17.61	7.15	43.39	7.15	7.15a	2612
4	96.20	0.00	24.84	10.08	61.20	10.08	10.08a	2612
5	95.80	0.00	32.09	13.02	79.07	13.02	13.02a	2612
6	95.30	0.00	41.21	16.72	101.53	16.72	16.72a	2612
		0.00	41.21	16.72	76.15	16.72	16.72a	2612
7	94.98	0.00	47.16	19.14	87.75	19.14	19.14a	2612
8	94.65	0.00	53.14	21.57	99.39	21.57	21.57a	2612
9	94.33	0.00	59.14	24.00	111.07	24.00	24.00a	2612
10	94.00	0.00	65.17	26.45	122.80	27.56	27.56	2612
		0.00	65.17	20.08	132.98	27.56	27.56	2612
11	93.50	0.00	75.47	24.26	153.04	36.93	36.93	2612
12	93.00	0.00	85.81	28.46	173.16	45.57	45.57	2612
		0.00	85.81	0.00	392.48	0.00	0.00a	48205
13	92.65	0.00	94.47	0.00	422.33	0.00	0.00a	48205
14	92.30	0.00	103.13	0.00	452.22	19.32	19.32	48205
15	91.80	0.00	115.52	0.00	494.94	37.67	37.67	48205
16	91.20	0.00	130.39	0.37	546.24	50.53	50.53	84827
17	90.60	0.00	145.26	3.61	597.53	53.24	53.24	84827
18	90.00	0.00	160.12	6.84	648.79	53.83	53.83	30498
19	89.40	0.00	174.97	10.07	700.08	56.99	56.99	30498
20	88.80	0.00	189.79	13.29	752.00	60.71	60.71	30498
21	88.20	0.00	204.60	16.51	803.86	65.03	65.03	30498
22	87.60	0.00	219.38	19.72	855.64	69.80	69.80	30498
23	87.25	0.00	227.99	21.60	885.81	72.71	72.71	30498
24	86.90	0.00	236.60	23.47	915.95	75.68	75.68	30498
25	86.40	0.00	248.88	26.14	958.97	79.99	79.99	30498
26	85.90	0.00	261.15	28.81	1001.94	84.31	84.31	30498
27	85.40	0.00	273.40	31.47	1044.86	88.64	88.64	30498

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	96.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	96.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	96.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	95.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	95.30	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	3901
7	94.98	0.00	5.85	2.37	14.41	14.41	14.41p	3901
8	94.65	0.00	11.70	4.75	27.01	27.01	27.01p	3901
9	94.33	0.00	17.55	7.12	38.44	33.16	33.16	3901
10	94.00	0.00	23.40	9.50	49.86	32.75	32.75	3901
		0.00	23.40	3.13	60.04	32.75	32.75	3901
11	93.50	0.00	33.41	7.19	79.58	33.49	33.49	3901
12	93.00	0.00	43.42	11.25	99.13	35.33	35.33	3901
		0.00	43.42	0.00	246.28	105.71	105.71	72269
13	92.65	0.00	51.83	0.00	275.29	70.98	70.98	72269
14	92.30	0.00	60.25	0.00	304.32	47.72	47.72	72269
15	91.80	0.00	72.28	0.00	345.81	31.33	31.33	72269

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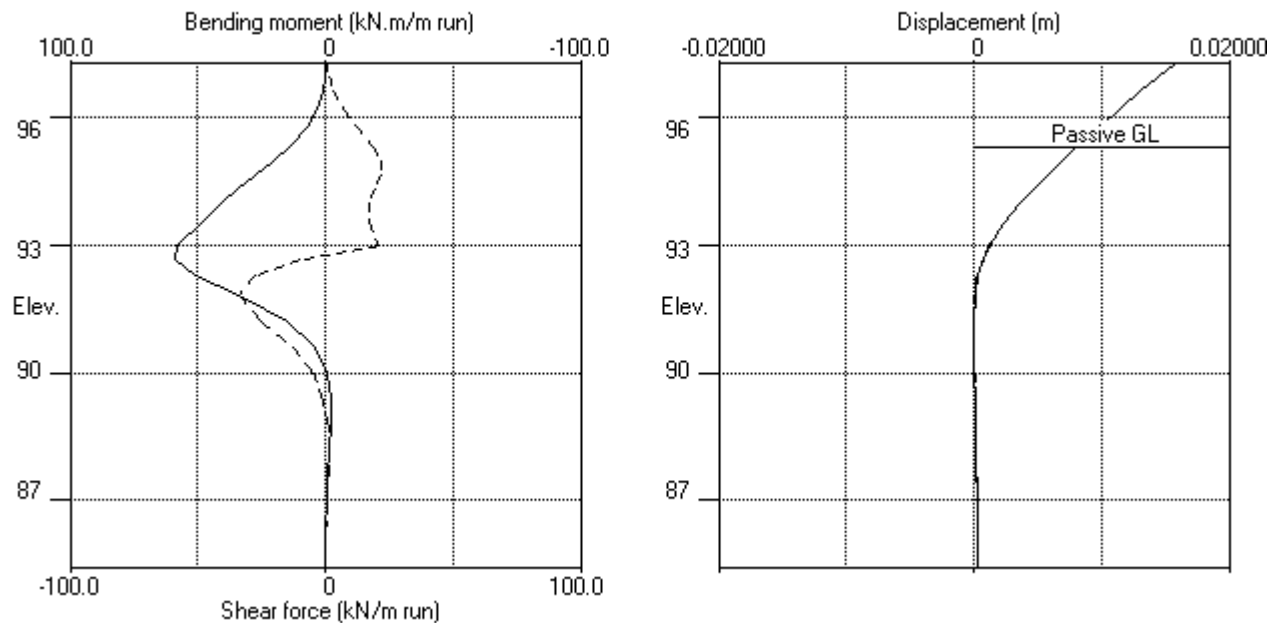
Stage No.3 Excavate to elevation 95.30 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
16	91.20	0.00	86.73	0.00	395.73	28.27	28.27	84827
17	90.60	0.00	101.19	0.00	446.41	35.78	35.78	84827
18	90.00	0.00	115.66	0.00	497.15	45.40	45.40	30498
19	89.40	0.00	130.15	0.32	547.95	52.45	52.45	30498
20	88.80	0.00	144.66	3.48	598.80	58.94	58.94	30498
21	88.20	0.00	159.19	6.64	649.71	64.84	64.84	30498
22	87.60	0.00	173.74	9.80	700.69	70.28	70.28	30498
23	87.25	0.00	182.23	11.65	730.45	73.32	73.32	30498
24	86.90	0.00	190.73	13.49	760.23	76.31	76.31	30498
25	86.40	0.00	202.88	16.14	802.82	80.52	80.52	30498
26	85.90	0.00	215.05	18.78	845.44	84.70	84.70	30498
27	85.40	0.00	227.22	21.43	888.10	88.87	88.87	30498

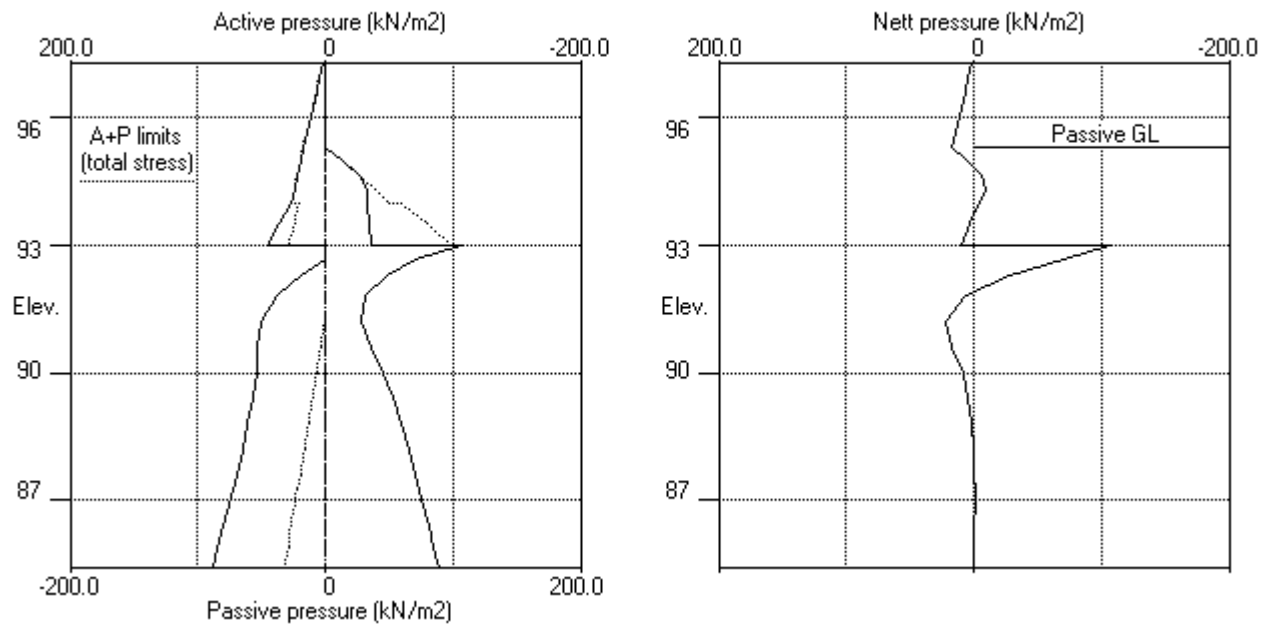
Note: 0.00a Soil pressure at active limit
 27.01p Soil pressure at passive limit

Units: kN,m

Stage No.3 Excav. to elev. 95.30 on PASSIVE side



Stage No.3 Excav. to elev. 95.30 on PASSIVE side



Units: kN,m

Stage No. 7 Excavate to elevation 91.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
7	97.30 91.80	95.80		4.152	n/a	91.60	0.20

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.30	8.12	0.006	5.77E-04	0.0	0.0	
2	96.95	13.96	0.006	5.73E-04	3.9	0.9	
3	96.60	29.92	0.006	5.58E-04	11.5	2.9	
4	96.20	35.22	0.006	4.99E-04	24.6	10.0	
5	95.80	34.68	0.005	3.48E-04	38.5	22.7	101.2
		34.68	0.005	3.48E-04	-62.7	22.7	
6	95.30	33.89	0.005	2.42E-04	-45.5	-4.2	
7	94.98	33.47	0.005	3.21E-04	-34.6	-17.1	
8	94.65	33.24	0.005	4.87E-04	-23.7	-26.9	
9	94.33	33.29	0.005	7.09E-04	-12.9	-32.5	
10	94.00	34.81	0.005	9.61E-04	-1.9	-34.7	
11	93.50	41.81	0.004	1.34E-03	17.3	-31.1	
12	93.00	49.06	0.003	1.61E-03	40.0	-17.0	
		0.00	0.003	1.61E-03	40.0	-17.0	
13	92.65	0.00	0.003	1.69E-03	40.0	-2.9	
14	92.30	0.00	0.002	1.66E-03	40.0	11.3	
15	91.80	2.28	0.001	1.41E-03	40.6	32.0	
		-94.22	0.001	1.41E-03	40.6	32.0	
16	91.20	-58.31	0.001	8.90E-04	-5.2	43.8	
17	90.60	-4.55	0.000	3.77E-04	-24.0	30.2	
18	90.00	12.67	0.000	6.43E-05	-21.6	15.0	
19	89.40	15.17	0.000	-6.91E-05	-13.3	4.3	
20	88.80	10.44	0.000	-9.23E-05	-5.6	-0.9	
21	88.20	5.08	0.000	-6.92E-05	-0.9	-2.4	
22	87.60	1.45	0.000	-3.85E-05	1.0	-2.0	
23	87.25	0.23	0.000	-2.39E-05	1.3	-1.6	
24	86.90	-0.48	0.000	-1.31E-05	1.3	-1.1	
25	86.40	-0.88	0.000	-3.87E-06	1.0	-0.5	
26	85.90	-0.91	0.000	-1.28E-07	0.5	-0.1	
27	85.40	-1.15	0.000	6.81E-07	0.0	-0.0	
Strut force at elev. 95.80 =			101.22 kN/m run =	242.93 kN/strut (horiz.)			
				= 343.56 kN/strut (incl.)			

(continued)

Stage No.7 Excavate to elevation 91.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.30	0.00	20.00	8.12	49.28	8.12	8.12a	1434
2	96.95	0.00	26.30	10.67	64.80	13.96	13.96	1434
3	96.60	0.00	32.60	13.23	80.32	29.92	29.92	1434
4	96.20	0.00	39.80	16.15	98.06	35.22	35.22	1434
5	95.80	0.00	47.00	19.08	115.80	34.68	34.68	1434
6	95.30	0.00	56.00	22.73	137.98	33.89	33.89	1434
7	94.98	0.00	61.85	25.10	152.39	33.47	33.47	1434
8	94.65	0.00	67.70	27.48	166.80	33.24	33.24	1434
9	94.33	0.00	73.55	29.85	181.22	33.29	33.29	1434
10	94.00	0.00	79.40	32.22	195.63	34.81	34.81	1434
		0.00	79.40	25.85	211.33	34.81	34.81	1434
11	93.50	0.00	89.40	29.91	235.96	41.81	41.81	1434
12	93.00	0.00	99.39	33.97	260.60	49.06	49.06	1434
		0.00	99.39	0.00	585.78	0.00	0.00a	26193
13	92.65	0.00	107.79	0.00	624.40	0.00	0.00a	26193
14	92.30	0.00	116.19	0.00	663.03	0.00	0.00a	26193
15	91.80	0.00	128.19	0.00	718.20	2.28	2.28	26193
		0.00	128.19	0.00	538.65	2.28	2.28	26193
16	91.20	0.00	142.59	3.03	588.31	29.80	29.80	26193
17	90.60	0.00	156.98	6.16	637.96	44.09	44.09	26193
18	90.00	0.00	171.38	9.29	687.61	50.99	50.99	26193
19	89.40	0.00	185.77	12.42	737.26	56.49	56.49	26193
20	88.80	0.00	200.16	15.55	786.90	60.54	60.54	26193
21	88.20	0.00	214.55	18.67	836.54	64.43	64.43	26193
22	87.60	0.00	228.95	21.80	886.18	68.68	68.68	26193
23	87.25	0.00	237.34	23.63	915.13	71.35	71.35	26193
24	86.90	0.00	245.73	25.45	944.08	74.13	74.13	26193
25	86.40	0.00	257.72	28.06	985.53	78.24	78.24	26193
26	85.90	0.00	269.71	30.67	1027.55	82.44	82.44	26193
27	85.40	0.00	281.70	33.28	1069.57	86.52	86.52	26193

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	96.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	96.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	96.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	95.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	94.98	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	94.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	94.33	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	92.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	96.50	96.50p	124623
16	91.20	0.00	14.40	0.00	146.93	88.11	88.11	124623
17	90.60	0.00	28.81	0.00	197.41	48.65	48.65	124623

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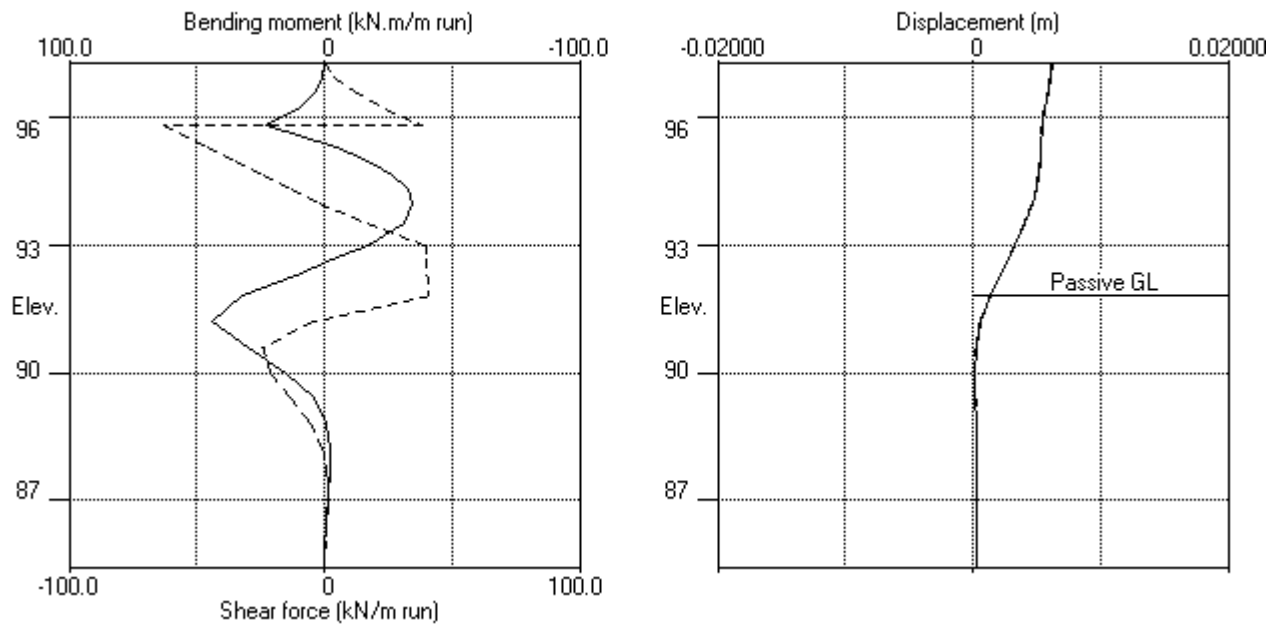
Stage No.7 Excavate to elevation 91.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
18	90.00	0.00	43.23	0.00	247.94	38.32	38.32	124623
19	89.40	0.00	57.68	0.00	298.55	41.31	41.31	124623
20	88.80	0.00	72.15	0.00	349.25	50.09	50.09	124623
21	88.20	0.00	86.66	0.00	400.07	59.35	59.35	124623
22	87.60	0.00	101.20	0.00	451.02	67.23	67.23	124623
23	87.25	0.00	109.71	0.00	480.82	71.12	71.12	124623
24	86.90	0.00	118.23	0.00	510.66	74.60	74.60	124623
25	86.40	0.00	130.43	0.38	553.40	79.12	79.12	124623
26	85.90	0.00	142.67	3.04	596.25	83.35	83.35	124623
27	85.40	0.00	154.94	5.71	639.23	87.66	87.66	124623

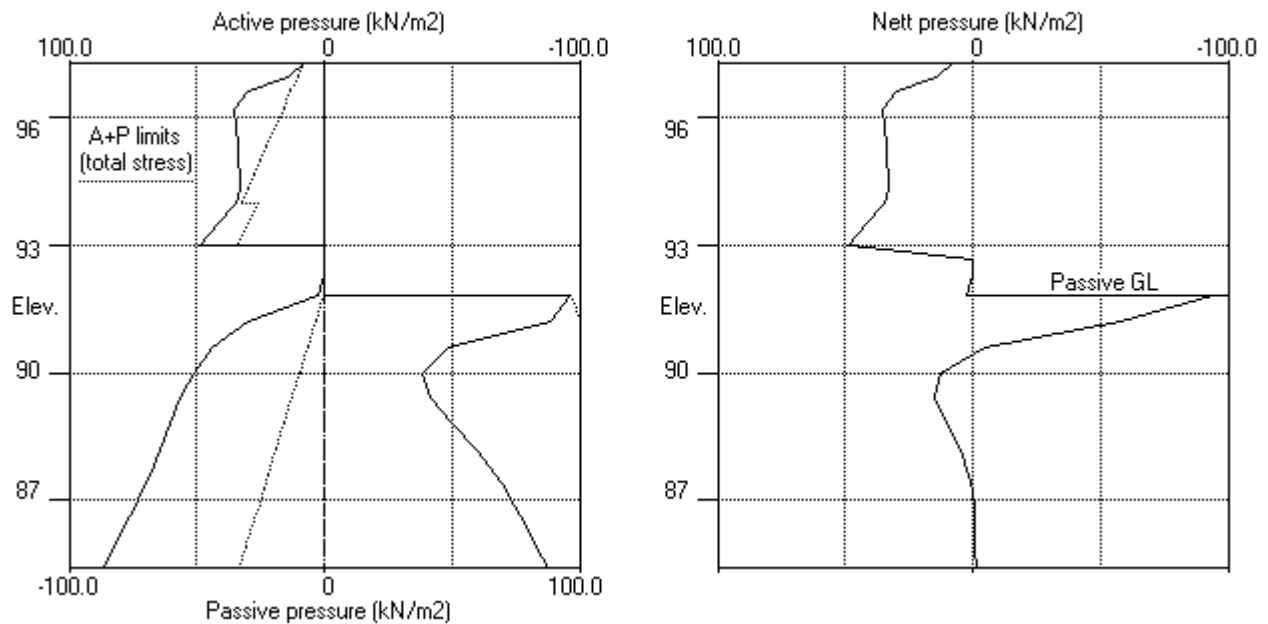
Note: 0.00a Soil pressure at active limit
 96.50p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. 91.80 on PASSIVE side



Stage No.7 Excav. to elev. 91.80 on PASSIVE side



Units: kN,m

Stage No. 9 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
			More than one strut		-ation
9	97.30	86.40			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.30	9.42	0.006	9.77E-04	0.0	0.0	
2	96.95	15.49	0.005	9.73E-04	4.4	0.9	
3	96.60	31.67	0.005	9.56E-04	12.6	3.2	
4	96.20	37.21	0.004	8.91E-04	26.4	10.9	
5	95.80	36.92	0.004	7.28E-04	41.2	24.5	96.2
		36.92	0.004	7.28E-04	-55.0	24.5	
6	95.30	36.41	0.004	5.76E-04	-36.7	1.7	
7	94.98	36.14	0.004	6.01E-04	-24.9	-8.1	
8	94.65	36.03	0.003	6.86E-04	-13.1	-14.7	
9	94.33	36.16	0.003	8.03E-04	-1.4	-16.6	
10	94.00	37.68	0.003	9.22E-04	10.6	-15.0	
11	93.50	44.52	0.002	1.03E-03	31.1	-4.8	
12	93.00	51.34	0.002	9.68E-04	55.1	16.6	
		41.88	0.002	9.68E-04	55.1	16.6	
13	92.65	33.84	0.002	7.45E-04	68.4	38.5	
14	92.30	22.36	0.001	3.28E-04	78.2	64.8	120.0
		22.36	0.001	3.28E-04	-41.8	64.8	
15	91.80	1.95	0.001	-3.18E-04	-35.8	47.3	
16	91.20	3.03	0.002	-8.18E-04	-34.3	25.0	
17	90.60	6.16	0.002	-1.02E-03	-31.5	4.6	
18	90.00	9.29	0.003	-9.66E-04	-26.9	-12.9	
19	89.40	12.42	0.003	-6.89E-04	-20.4	-27.1	
20	88.80	15.55	0.004	-2.46E-04	-12.0	-36.7	
21	88.20	18.67	0.004	2.90E-04	-1.7	-40.8	
22	87.60	21.80	0.003	8.37E-04	10.4	-38.2	
23	87.25	23.63	0.003	1.12E-03	18.4	-33.1	
24	86.90	25.45	0.003	1.36E-03	27.0	-25.2	
25	86.40	34.97	0.002	1.54E-03	42.1	-6.3	
		-68.55	0.002	1.54E-03	42.1	-6.3	
26	85.90	-83.91	0.001	1.55E-03	4.0	4.5	
27	85.40	68.06	0.000	1.52E-03	0.0	-0.0	
Strut force at elev. 95.80 =			96.21 kN/m	run =	230.90 kN/strut (horiz.)		
				=	326.54 kN/strut (incl.)		
Strut force at elev. 92.30 =			120.03 kN/m	run =	288.06 kN/strut (horiz.)		
				=	407.38 kN/strut (incl.)		

Stage No.9 Excavate to elevation 86.40 on PASSIVE side

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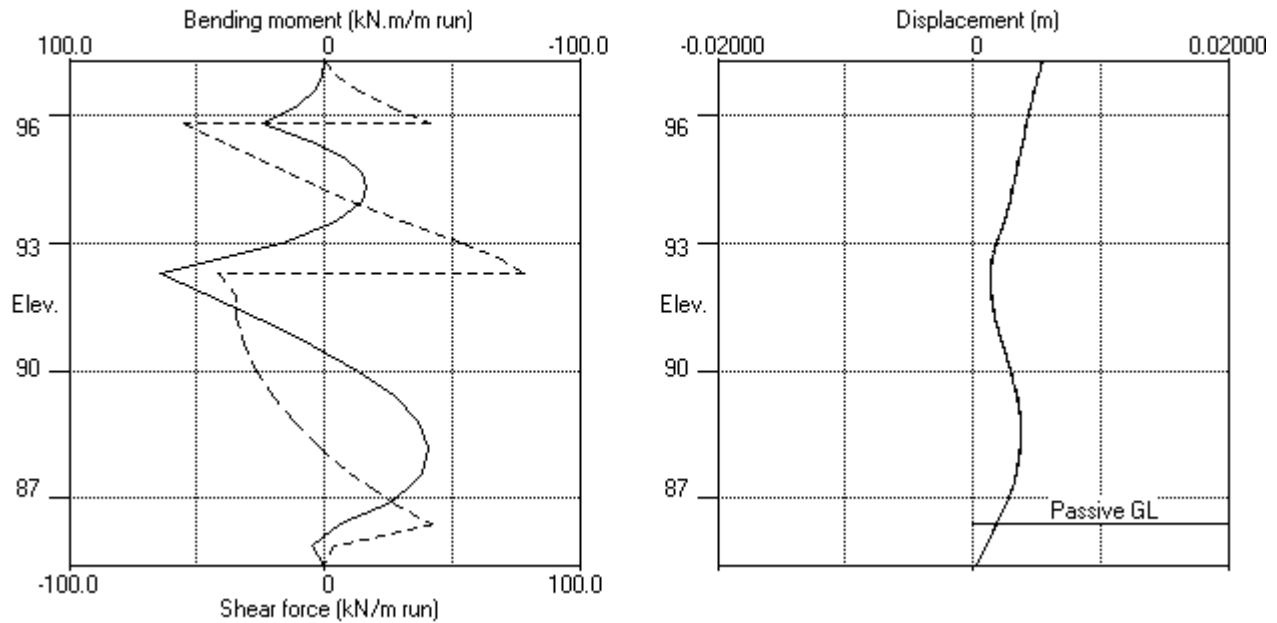
Stage No.9 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
19	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
25	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	103.52	103.52	103.52p	142278
26	85.90	0.00	12.00	0.00	145.57	145.57	145.57p	142278
27	85.40	0.00	24.01	0.00	187.65	25.19	25.19	1012459

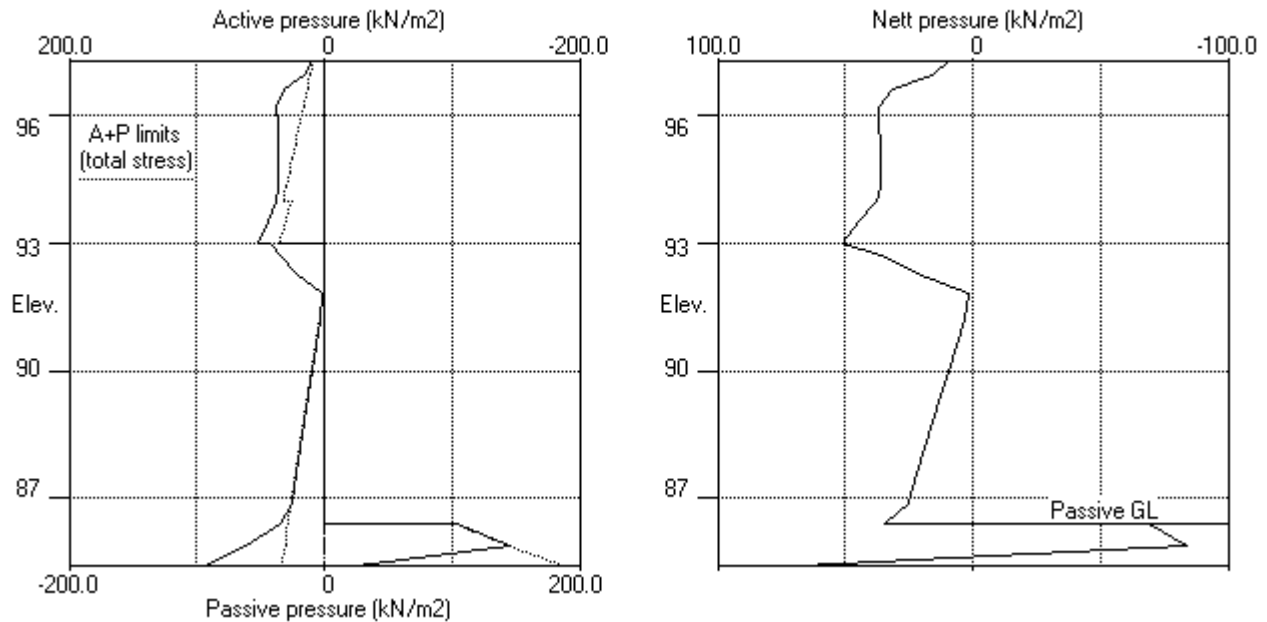
Note: 25.45a Soil pressure at active limit
 145.57p Soil pressure at passive limit

Units: kN,m

Stage No.9 Excav. to elev. 86.40 on PASSIVE side



Stage No.9 Excav. to elev. 86.40 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.07 - SW1 Section 8 - TCB 97.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 8 | Checked :

Units: kN,m

Stage No. 11 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
11	97.30 85.90		More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 33.28kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.30	9.47	0.006	9.66E-04	0.0	0.0	
2	96.95	15.52	0.005	9.62E-04	4.4	0.9	
3	96.60	31.69	0.005	9.45E-04	12.6	3.2	
4	96.20	37.21	0.004	8.80E-04	26.4	10.9	
5	95.80	36.90	0.004	7.17E-04	41.2	24.5	96.3
		36.90	0.004	7.17E-04	-55.0	24.5	
6	95.30	36.38	0.004	5.65E-04	-36.7	1.7	
7	94.98	36.11	0.004	5.89E-04	-24.9	-8.1	
8	94.65	35.99	0.003	6.75E-04	-13.2	-14.7	
9	94.33	36.11	0.003	7.92E-04	-1.5	-16.6	
10	94.00	37.62	0.003	9.11E-04	10.5	-15.0	
11	93.50	44.45	0.002	1.02E-03	31.0	-4.9	
12	93.00	51.26	0.002	9.59E-04	54.9	16.4	
		40.39	0.002	9.59E-04	54.9	16.4	
13	92.65	32.23	0.002	7.39E-04	67.7	38.2	
14	92.30	20.65	0.001	3.25E-04	76.9	64.1	120.3
		20.65	0.001	3.25E-04	-43.4	64.1	
15	91.80	0.29	0.001	-3.07E-04	-38.1	45.6	
16	91.20	3.77	0.002	-7.73E-04	-36.9	21.6	
17	90.60	7.73	0.002	-9.21E-04	-33.4	-0.2	
18	90.00	13.44	0.003	-7.91E-04	-27.1	-18.6	
19	89.40	21.90	0.003	-4.40E-04	-16.5	-32.2	

(continued)

Stage No.11 Excavate to elevation 85.40 on PASSIVE side

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
20	88.80	31.85	0.003	4.46E-05	-0.4	-37.8	
21	88.20	41.70	0.003	5.27E-04	21.7	-31.9	
22	87.60	45.21	0.003	8.25E-04	47.8	-11.1	
23	87.25	40.21	0.002	8.35E-04	62.7	8.4	
24	86.90	28.50	0.002	6.68E-04	74.7	32.9	119.6
		28.50	0.002	6.68E-04	-44.8	32.9	
25	86.40	28.06	0.002	3.92E-04	-30.7	15.0	
26	85.90	30.67	0.002	2.80E-04	-16.0	4.3	
27	85.40	33.28	0.002	2.55E-04	0.0	0.0	
Strut force at elev. 95.80 =			96.25 kN/m run =		231.01 kN/strut (horiz.)		
					= 326.69 kN/strut (incl.)		
Strut force at elev. 92.30 =			120.26 kN/m run =		288.62 kN/strut (horiz.)		
					= 408.17 kN/strut (incl.)		
Strut force at elev. 86.90 =			119.55 kN/m run =		286.93 kN/strut (horiz.)		
					= 405.78 kN/strut (incl.)		

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	97.30	0.00	20.00	8.12	49.28	9.47	9.47	1512
2	96.95	0.00	26.30	10.67	64.80	15.52	15.52	1512
3	96.60	0.00	32.60	13.23	80.32	31.69	31.69	1512
4	96.20	0.00	39.80	16.15	98.06	37.21	37.21	1512
5	95.80	0.00	47.00	19.08	115.80	36.90	36.90	1512
6	95.30	0.00	56.00	22.73	137.98	36.38	36.38	1512
7	94.98	0.00	61.85	25.10	152.39	36.11	36.11	1512
8	94.65	0.00	67.70	27.48	166.80	35.99	35.99	1512
9	94.33	0.00	73.55	29.85	181.22	36.11	36.11	1512
10	94.00	0.00	79.40	32.22	195.63	37.62	37.62	1512
		0.00	79.40	25.85	211.33	37.62	37.62	1512
11	93.50	0.00	89.40	29.91	235.96	44.45	44.45	1512
12	93.00	0.00	99.39	33.97	260.60	51.26	51.26	1512
		0.00	99.39	0.00	585.78	40.39	40.39	27657
13	92.65	0.00	107.79	0.00	624.40	32.23	32.23	27657
14	92.30	0.00	116.19	0.00	663.03	20.65	20.65	27657
15	91.80	0.00	128.19	0.00	718.20	0.29	0.29	44274
16	91.20	0.00	142.59	3.03	784.41	3.77	3.77	44274
17	90.60	0.00	156.98	6.16	850.61	7.73	7.73	44274
18	90.00	0.00	171.38	9.29	916.81	13.44	13.44	44274
19	89.40	0.00	185.77	12.42	983.01	21.90	21.90	44274
20	88.80	0.00	200.16	15.55	1049.20	31.85	31.85	44274
21	88.20	0.00	214.55	18.67	1115.39	41.70	41.70	44274
22	87.60	0.00	228.95	21.80	1181.57	45.21	45.21	82890
23	87.25	0.00	237.34	23.63	1220.17	40.21	40.21	82890
24	86.90	0.00	245.73	25.45	1258.77	28.50	28.50	82890
25	86.40	0.00	257.72	28.06	1313.92	28.06	28.06a	82890
26	85.90	0.00	269.71	30.67	1369.05	30.67	30.67a	82890
		0.00	269.71	30.67	1026.79	30.67	30.67a	82890
27	85.40	0.00	281.70	33.28	1068.14	33.28	33.28a	82890

(continued)

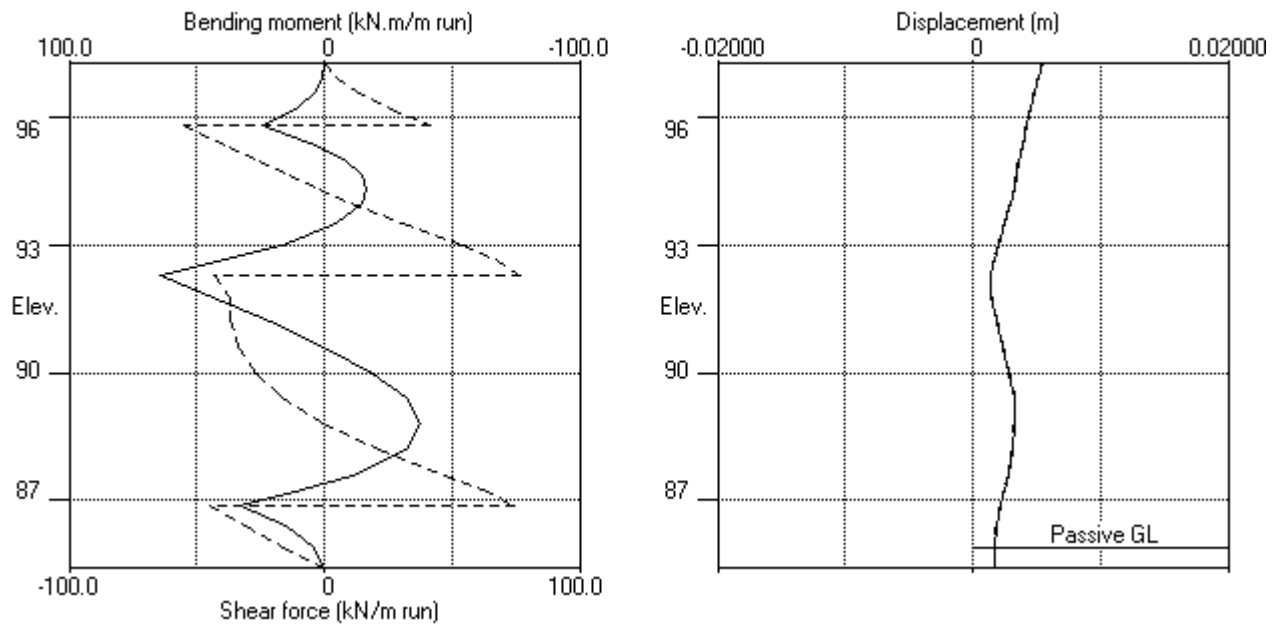
Stage No.11 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective stresses Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
1	97.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	96.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	96.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	96.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	95.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	94.98	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	94.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	94.33	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	92.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
25	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
26	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
27	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

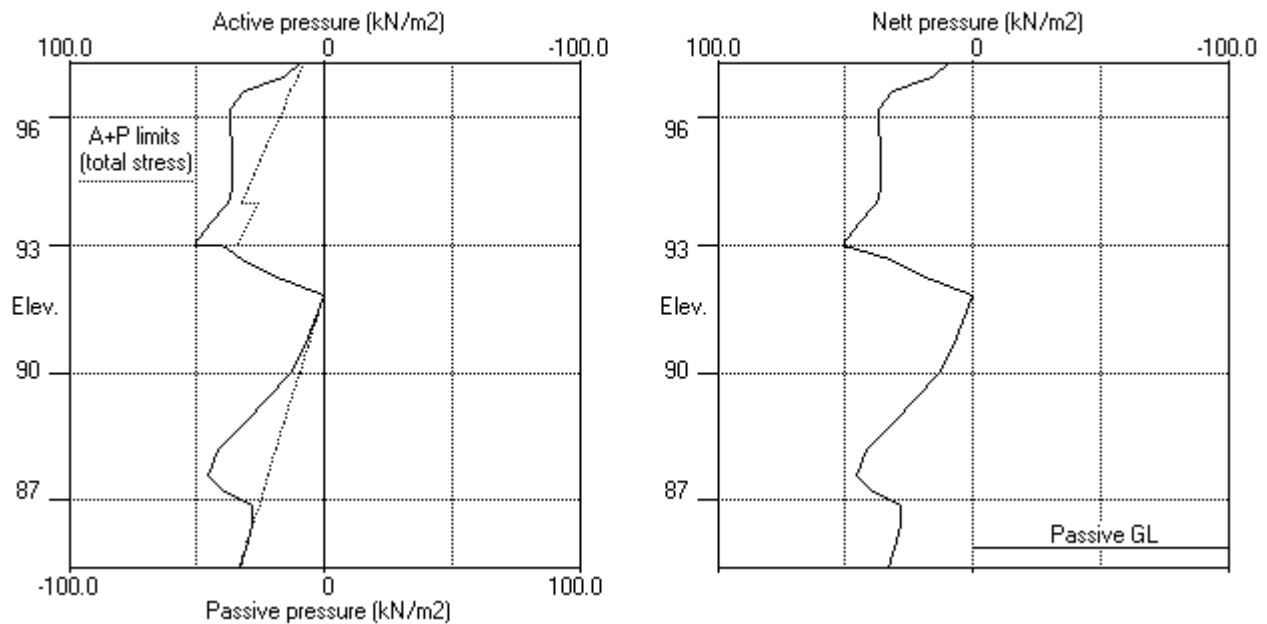
Note: 33.28a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.11 Excav. to elev. 85.40 on PASSIVE side



Stage No.11 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
Licensed from GEOSOLVE	Made by : VR
Data filename/Run ID: 2021.04.07 - SW1 Section 8 - TCB 97.3	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW1 - Section 8	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	FoS for toe elev. = 85.40	Moment of equilib. at elev.	Toe elev. for FoS = 1.000	Wall Penetr -ation
1	97.30 97.30	Cant.	Conditions not suitable for FoS calc.			
2	97.30 97.30	Cant.	Conditions not suitable for FoS calc.			
3	97.30 95.30	Cant.	5.105	86.77	92.40	2.90
4	97.30 95.30	95.80	Conditions not suitable for FoS calc.			
5	97.30 95.30	95.80	Conditions not suitable for FoS calc.			
6	97.30 95.30	95.80	Conditions not suitable for FoS calc.			
7	97.30 91.80	95.80	4.152	n/a	91.60	0.20
8	97.30 91.80	More than one strut				
All remaining stages have more than one strut - FoS calculation n/a						

ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
Licensed from GEOSOLVE	Made by : VR
Data filename/Run ID: 2021.04.07 - SW1 Section 8 - TCB 97.3	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW1 - Section 8	Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	97.30	0.016	0.000	0.0	-0.0	0.0	0.0
2	96.95	0.014	0.000	1.1	0.0	7.0	0.0
3	96.60	0.013	0.000	4.9	0.0	17.7	0.0
4	96.20	0.012	0.000	14.7	0.0	31.0	-0.1
5	95.80	0.010	0.000	29.8	0.0	44.3	-62.7
6	95.30	0.008	0.000	13.8	-4.2	18.7	-45.5
7	94.98	0.007	0.000	20.6	-17.1	22.2	-34.6
8	94.65	0.006	0.000	27.9	-26.9	22.1	-23.7
9	94.33	0.005	0.000	35.0	-32.5	19.7	-12.9
10	94.00	0.005	0.000	41.1	-34.7	17.4	-1.9
11	93.50	0.004	0.000	49.1	-31.1	31.1	0.0
12	93.00	0.003	0.000	58.0	-17.0	55.1	0.0
13	92.65	0.003	0.000	58.6	-2.9	68.4	-10.6
14	92.30	0.002	0.000	64.8	0.0	78.2	-43.4
15	91.80	0.001	0.000	47.3	0.0	40.6	-38.1
16	91.20	0.002	-0.000	43.8	0.0	0.0	-36.9
17	90.60	0.002	-0.000	30.2	-0.2	0.0	-34.2
18	90.00	0.003	0.000	15.0	-18.7	0.0	-29.0
19	89.40	0.003	0.000	4.3	-34.0	0.0	-20.4
20	88.80	0.004	0.000	0.0	-42.4	0.6	-12.0
21	88.20	0.004	0.000	0.0	-40.8	21.7	-1.7
22	87.60	0.003	0.000	0.0	-38.2	47.8	0.0
23	87.25	0.003	0.000	8.4	-33.1	62.7	0.0
24	86.90	0.003	0.000	32.9	-25.2	79.4	-44.8
25	86.40	0.002	0.000	15.0	-6.3	42.1	-30.7
26	85.90	0.002	0.000	4.8	-0.1	4.0	-16.0
27	85.40	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	2.6	92.65	-0.1	88.80	2.3	93.00	-1.3	91.80
2	2.9	92.65	-0.1	88.80	2.9	93.00	-1.4	91.20
3	58.6	92.65	-2.5	89.40	22.2	94.98	-33.5	91.80
4	29.8	95.80	-0.9	94.33	44.3	95.80	-44.1	95.80
5	21.6	95.80	-9.4	94.33	38.5	95.80	-45.2	95.80
6	25.6	95.80	-5.0	94.33	43.3	95.80	-47.2	95.80
7	43.8	91.20	-34.7	94.00	40.6	91.80	-62.7	95.80
8	47.7	92.30	-23.9	94.33	77.0	92.30	-58.5	95.80
9	64.8	92.30	-40.8	88.20	78.2	92.30	-55.0	95.80
10	64.5	92.30	-42.4	88.80	79.4	86.90	-54.9	95.80
11	64.1	92.30	-37.8	88.80	76.9	92.30	-55.0	95.80

Maximum and minimum displacement at each stage

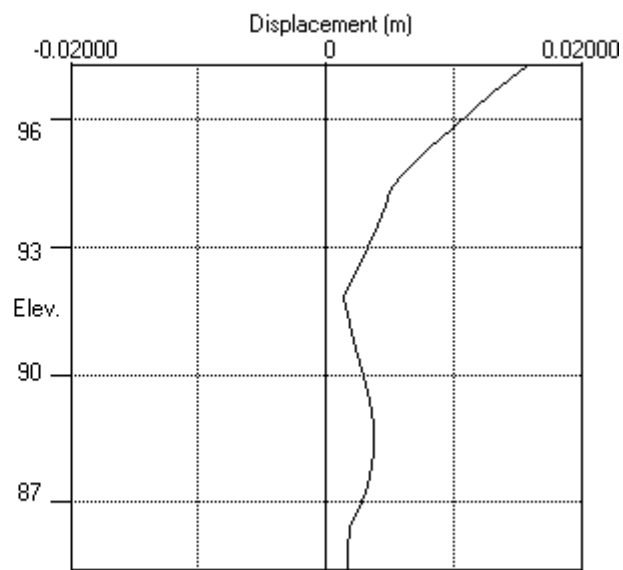
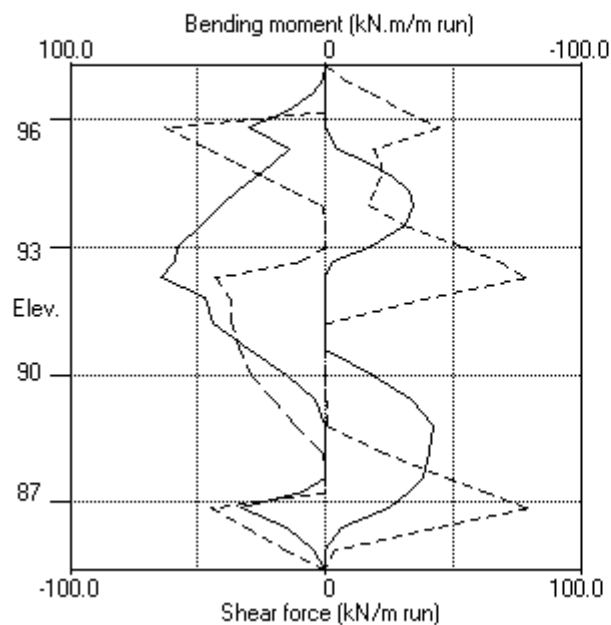
Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.001	97.30	0.000	97.30	Apply surcharge no.1 at elev. 97.30
2	0.001	97.30	0.000	97.30	Apply surcharge no.2 at elev. 97.30
3	0.016	97.30	-0.000	91.20	Excav. to elev. 95.30 on PASSIVE side
4	0.004	97.30	0.000	97.30	Install strut no.1 at elev. 95.80
5	0.001	97.30	0.000	97.30	Remove surcharge no.1 at elev. 97.30
6	0.004	97.30	0.000	97.30	Apply surcharge no.3 at elev. 97.30
7	0.006	97.30	0.000	97.30	Excav. to elev. 91.80 on PASSIVE side
8	0.006	97.30	0.000	97.30	Install strut no.2 at elev. 92.30
9	0.006	97.30	0.000	97.30	Excav. to elev. 86.40 on PASSIVE side
10	0.006	97.30	0.000	97.30	Install strut no.3 at elev. 86.90
11	0.006	97.30	0.000	97.30	Excav. to elev. 85.40 on PASSIVE side

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1		Strut no. 2		Strut no. 3	
	at elev. 95.80		at elev. 92.30		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
4	88.39	212.13	---	---	---	---
5	83.67	200.81	---	---	---	---
6	90.57	217.37	---	---	---	---
7	101.22	242.93	---	---	---	---
8	98.20	235.68	117.85	282.84	---	---
9	96.21	230.90	120.03	288.06	---	---
10	96.21	230.90	120.24	288.58	117.85	282.84
11	96.25	231.01	120.26	288.62	119.55	286.93

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	95.30	1 Fill	1 Fill
2	93.70	2 Res Soil	2 Res Soil
3	92.00	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
angle				angle			
adhesion				adhesion			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	93.30	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes
2	90.30	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes
3	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	95.30	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 95.30
2	Excavate to elevation 92.80 on PASSIVE side
3	Install strut or anchor no.1 at elevation 93.30
4	Excavate to elevation 89.80 on PASSIVE side
5	Install strut or anchor no.2 at elevation 90.30
6	Excavate to elevation 86.40 on PASSIVE side
7	Install strut or anchor no.3 at elevation 86.90
8	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

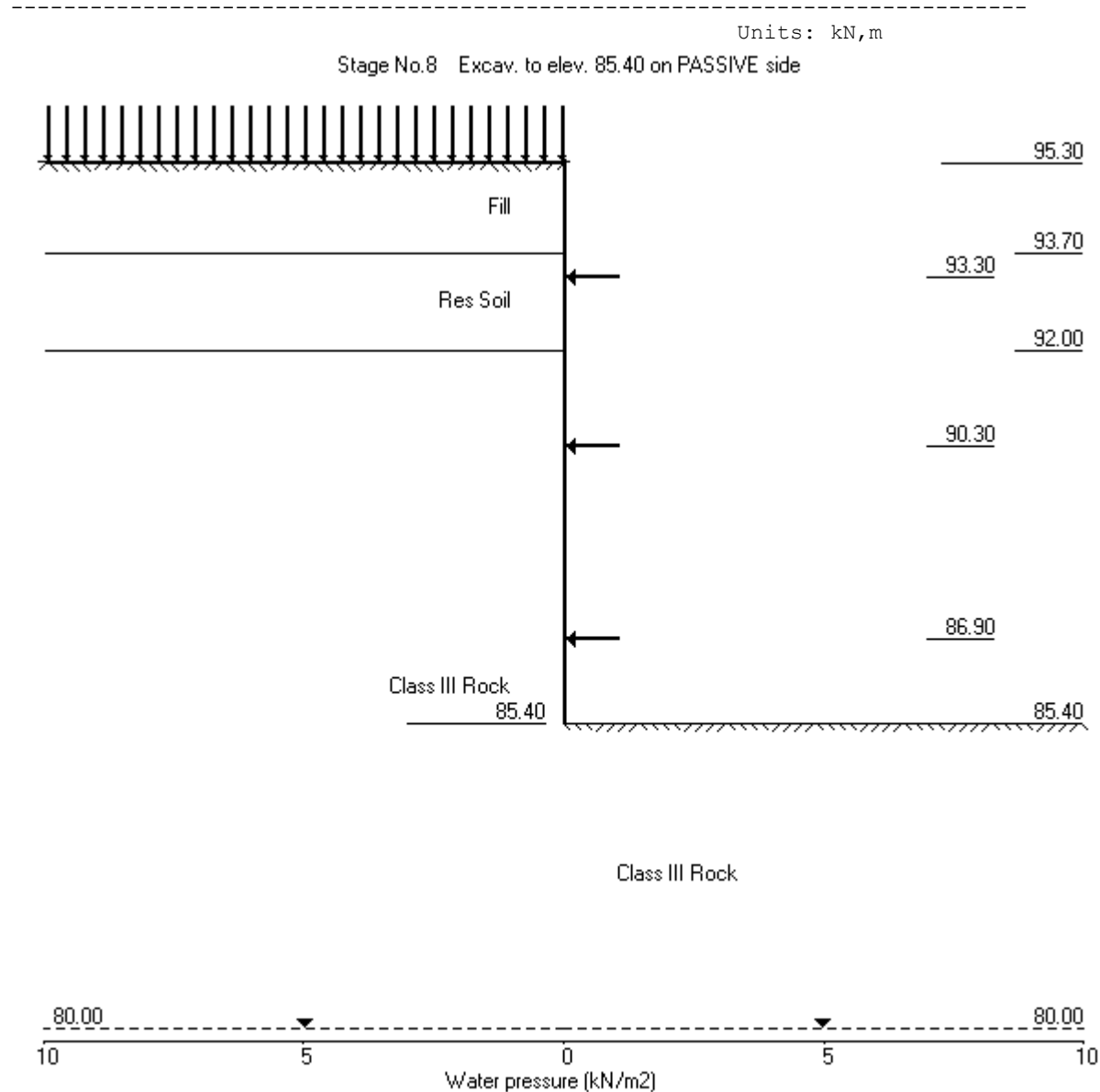
Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Output options Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 95.30	Yes	Yes	Yes
2	Excav. to elev. 92.80 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 93.30	No	No	No
4	Excav. to elev. 89.80 on PASSIVE side	No	No	No
5	Install strut no.2 at elev. 90.30	No	No	No
6	Excav. to elev. 86.40 on PASSIVE side	No	No	No
7	Install strut no.3 at elev. 86.90	No	No	No
8	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

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Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
Licensed from GEOSOLVE | Made by : VR
Data filename/Run ID: 2021.04.08 - SW1 Section 6 - TCB 95.3 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW1 - Section 6 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 92.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	95.30 92.80	Cant.		3.168	86.48	90.61	2.19

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.30	8.12	0.015	4.43E-03	0.0	0.0	
2	94.90	11.04	0.013	4.43E-03	3.8	0.9	
3	94.50	13.96	0.012	4.41E-03	8.8	3.4	
4	94.10	16.88	0.010	4.35E-03	15.0	8.1	
5	93.70	19.81	0.008	4.24E-03	22.3	15.6	
		13.43	0.008	4.24E-03	22.3	15.6	
6	93.30	16.68	0.006	4.05E-03	28.4	25.6	
7	92.80	22.74	0.004	3.66E-03	38.2	42.5	
		7.04	0.004	3.66E-03	38.2	42.5	
8	92.40	3.38	0.003	3.19E-03	40.3	58.6	
9	92.00	12.99	0.002	2.58E-03	43.6	74.9	
		-151.69	0.002	2.58E-03	43.6	74.9	
10	91.60	-112.33	0.001	1.85E-03	-9.2	83.2	
11	91.20	-45.87	0.000	1.13E-03	-40.9	71.1	
12	90.75	9.63	0.000	5.19E-04	-49.0	48.0	
13	90.30	29.35	-0.000	1.30E-04	-40.3	26.9	
14	89.80	29.55	-0.000	-8.60E-05	-25.5	10.5	
15	89.30	20.11	-0.000	-1.54E-04	-13.1	1.4	
16	88.80	11.32	0.000	-1.47E-04	-5.3	-2.6	
17	88.20	5.24	0.000	-1.03E-04	-0.3	-3.7	
18	87.60	1.41	0.000	-5.74E-05	1.7	-3.0	
19	87.25	0.11	0.000	-3.62E-05	2.0	-2.3	
20	86.90	-0.68	0.000	-2.06E-05	1.9	-1.6	
21	86.40	-1.23	0.000	-7.30E-06	1.4	-0.7	
22	85.90	-1.42	0.000	-2.01E-06	0.7	-0.2	
23	85.40	-1.51	0.000	-9.33E-07	0.0	-0.0	

(continued)

Stage No.2 Excavate to elevation 92.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	95.30	0.00	20.00	8.12	49.28	8.12	8.12a	2925
2	94.90	0.00	27.20	11.04	67.02	11.04	11.04a	2925
3	94.50	0.00	34.40	13.96	84.76	13.96	13.96a	2925
4	94.10	0.00	41.60	16.88	102.50	16.88	16.88a	2925
5	93.70	0.00	48.80	19.81	120.24	19.81	19.81a	2925
		0.00	48.80	13.43	135.93	13.43	13.43a	2925
6	93.30	0.00	56.80	16.68	155.65	16.68	16.68a	2925
7	92.80	0.00	66.80	20.74	180.28	22.74	22.74	2925
		0.00	66.80	20.74	135.21	22.74	22.74	2925
8	92.40	0.00	74.80	23.99	149.99	31.40	31.40	2925
9	92.00	0.00	82.80	27.23	164.81	39.43	39.43	2925
		0.00	82.80	0.00	382.09	0.00	0.00a	54044
10	91.60	0.00	92.40	0.00	415.19	0.00	0.00a	54044
11	91.20	0.00	101.99	0.00	448.30	10.93	10.93	54044
12	90.75	0.00	112.79	0.00	485.55	34.34	34.34	54044
13	90.30	0.00	123.59	0.00	522.79	47.59	47.59	75333
14	89.80	0.00	135.59	1.50	564.17	51.89	51.89	75333
15	89.30	0.00	147.58	4.11	605.55	51.38	51.38	75333
16	88.80	0.00	159.58	6.72	646.92	51.19	51.19	37491
17	88.20	0.00	173.97	9.85	696.57	53.19	53.19	37491
18	87.60	0.00	188.37	12.98	746.22	56.33	56.33	37491
19	87.25	0.00	196.76	14.81	775.27	58.63	58.63	37491
20	86.90	0.00	205.16	16.63	804.69	61.18	61.18	37491
21	86.40	0.00	217.15	19.24	846.71	65.12	65.12	37491
22	85.90	0.00	229.14	21.85	888.73	69.24	69.24	37491
23	85.40	0.00	241.13	24.45	930.75	73.41	73.41	37491

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	15.70	15.70	15.70p	5818
8	92.40	0.00	8.00	0.00	32.55	28.03	28.03	5818
9	92.00	0.00	16.00	0.12	48.15	26.44	26.44	5818
		0.00	16.00	0.00	151.69	151.69	151.69p	108080
10	91.60	0.00	25.60	0.00	184.82	112.33	112.33	108080
11	91.20	0.00	35.21	0.00	217.95	56.80	56.80	108080
12	90.75	0.00	46.02	0.00	255.24	24.71	24.71	108080
13	90.30	0.00	56.84	0.00	292.55	18.24	18.24	75333
14	89.80	0.00	68.87	0.00	334.41	22.34	22.34	75333
15	89.30	0.00	80.90	0.00	376.58	31.27	31.27	75333
16	88.80	0.00	92.95	0.00	418.79	39.87	39.87	37491
17	88.20	0.00	107.43	0.00	469.50	47.96	47.96	37491
18	87.60	0.00	121.92	0.00	520.28	54.92	54.92	37491
19	87.25	0.00	130.39	0.37	549.94	58.52	58.52	37491
20	86.90	0.00	138.86	2.22	579.62	61.86	61.86	37491

(continued)

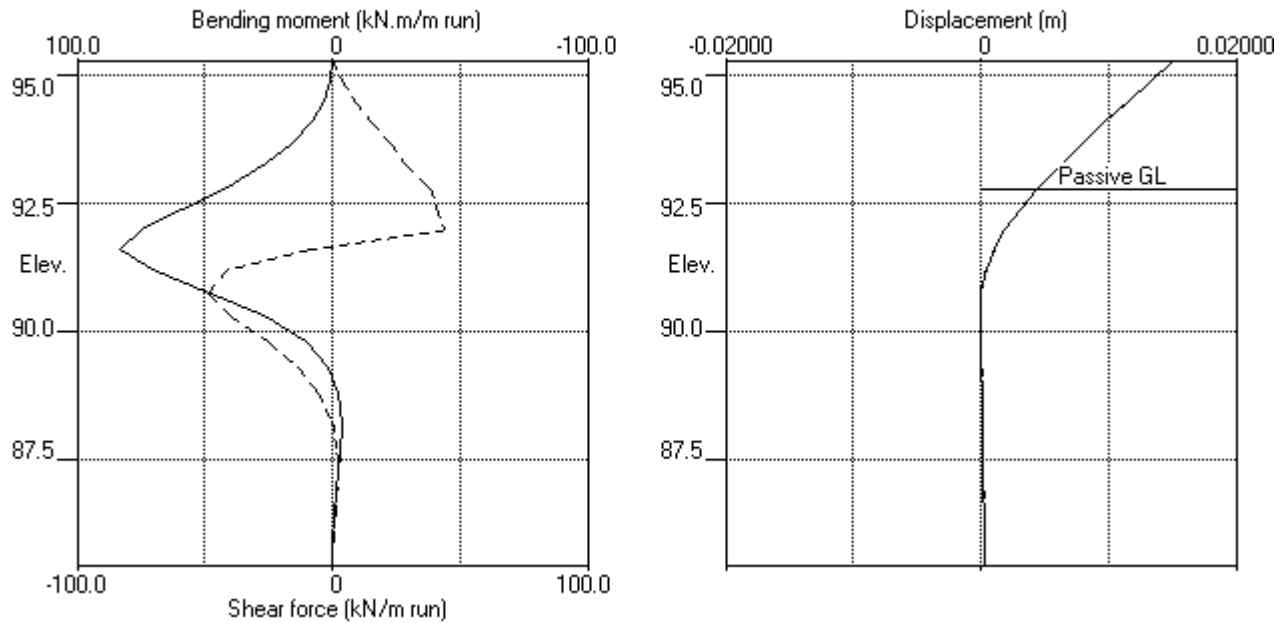
Stage No.2 Excavate to elevation 92.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
21	86.40	0.00	150.98	4.85	622.07	66.35	66.35	37491
22	85.90	0.00	163.11	7.49	664.57	70.66	70.66	37491
23	85.40	0.00	175.26	10.13	707.13	74.92	74.92	37491

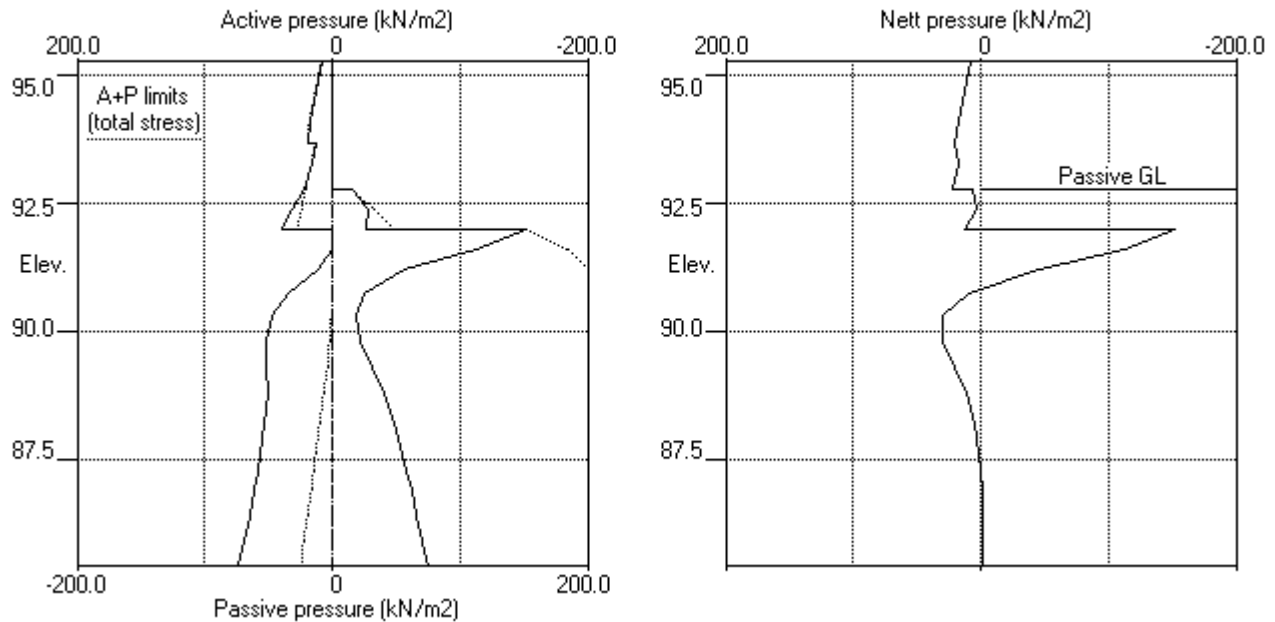
Note: 0.00a Soil pressure at active limit
 151.69p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 92.80 on PASSIVE side



Stage No.2 Excav. to elev. 92.80 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
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 Data filename/Run ID: 2021.04.08 - SW1 Section 6 - TCB 95.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 6 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 89.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
4	95.30 89.80	93.30	Conditions not suitable for FoS calc.		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.30	14.91	0.013	3.30E-03	0.0	0.0	
2	94.90	16.78	0.012	3.29E-03	6.3	1.4	
3	94.50	18.64	0.011	3.26E-03	13.4	5.4	
4	94.10	20.48	0.010	3.18E-03	21.2	12.3	
5	93.70	22.26	0.008	3.02E-03	29.8	22.6	
		15.89	0.008	3.02E-03	29.8	22.6	
6	93.30	17.91	0.007	2.75E-03	36.6	35.8	66.7
		17.91	0.007	2.75E-03	-30.1	35.8	
7	92.80	22.33	0.006	2.40E-03	-20.1	23.6	
8	92.40	29.79	0.005	2.21E-03	-9.6	18.0	
9	92.00	36.89	0.004	2.05E-03	3.7	16.5	
		0.00	0.004	2.05E-03	3.7	16.5	
10	91.60	0.00	0.003	1.88E-03	3.7	21.4	
11	91.20	0.00	0.003	1.67E-03	3.7	22.6	
12	90.75	0.00	0.002	1.44E-03	3.7	23.1	
13	90.30	7.63	0.001	1.18E-03	5.4	25.8	
14	89.80	25.82	0.001	8.66E-04	13.8	29.6	
		-71.05	0.001	8.66E-04	13.8	29.6	
15	89.30	-32.40	0.000	5.14E-04	-12.1	31.2	
16	88.80	-0.50	0.000	2.12E-04	-20.3	21.1	
17	88.20	13.86	0.000	4.64E-06	-16.3	8.9	
18	87.60	12.99	0.000	-6.75E-05	-8.2	1.6	
19	87.25	9.92	0.000	-7.17E-05	-4.2	-0.5	
20	86.90	6.61	0.000	-6.39E-05	-1.3	-1.4	
21	86.40	2.40	0.000	-4.86E-05	0.9	-1.3	
22	85.90	-1.01	0.000	-3.85E-05	1.3	-0.5	
23	85.40	-4.01	0.000	-3.56E-05	0.0	-0.0	
Strut force at elev. 93.30 =			66.68 kN/m run =				160.02 kN/strut (horiz.)
							= 226.31 kN/strut (incl.)

(continued)

Stage No.4 Excavate to elevation 89.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	95.30	0.00	20.00	8.12	49.28	14.91	14.91	1499
2	94.90	0.00	27.20	11.04	67.02	16.78	16.78	1499
3	94.50	0.00	34.40	13.96	84.76	18.64	18.64	1499
4	94.10	0.00	41.60	16.88	102.50	20.48	20.48	1499
5	93.70	0.00	48.80	19.81	120.24	22.26	22.26	1499
		0.00	48.80	13.43	135.93	15.89	15.89	1499
6	93.30	0.00	56.80	16.68	155.65	17.91	17.91	1499
7	92.80	0.00	66.80	20.74	180.28	22.33	22.33	1499
8	92.40	0.00	74.80	23.99	199.99	29.79	29.79	1499
9	92.00	0.00	82.80	27.23	219.70	36.89	36.89	1499
		0.00	82.80	0.00	509.45	0.00	0.00a	27415
10	91.60	0.00	92.40	0.00	553.59	0.00	0.00a	27415
11	91.20	0.00	101.99	0.00	597.74	0.00	0.00a	27415
12	90.75	0.00	112.79	0.00	647.40	0.00	0.00a	27415
13	90.30	0.00	123.59	0.00	697.05	7.63	7.63	27415
14	89.80	0.00	135.59	1.50	752.23	25.82	25.82	27415
		0.00	135.59	1.50	564.17	25.82	25.82	27415
15	89.30	0.00	147.58	4.11	605.55	37.15	37.15	27415
16	88.80	0.00	159.58	6.72	646.92	44.67	44.67	27415
17	88.20	0.00	173.97	9.85	696.57	51.03	51.03	27415
18	87.60	0.00	188.37	12.98	746.22	55.24	55.24	27415
19	87.25	0.00	196.76	14.81	775.18	57.43	57.43	27415
20	86.90	0.00	205.16	16.63	804.13	59.68	59.68	27415
21	86.40	0.00	217.15	19.24	845.50	63.07	63.07	27415
22	85.90	0.00	229.14	21.85	886.86	66.65	66.65	27415
23	85.40	0.00	241.13	24.45	928.21	70.32	70.32	27415

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	90.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.88	96.88	96.88p	139711
15	89.30	0.00	12.00	0.00	138.92	69.55	69.55	139711
16	88.80	0.00	24.01	0.00	180.98	45.16	45.16	139711
17	88.20	0.00	38.42	0.00	231.50	37.17	37.17	139711
18	87.60	0.00	52.86	0.00	282.09	42.25	42.25	139711
19	87.25	0.00	61.30	0.00	311.64	47.51	47.51	139711
20	86.90	0.00	69.75	0.00	341.23	53.07	53.07	139711
21	86.40	0.00	81.83	0.00	383.57	60.66	60.66	139711

Run ID. 2021.04.08 - SW1 Section 6 - TCB 95.3
2 Mandala Place, Castle Hill
SW1 - Section 6

| Sheet No.
| Date:12-04-2021
| Checked :

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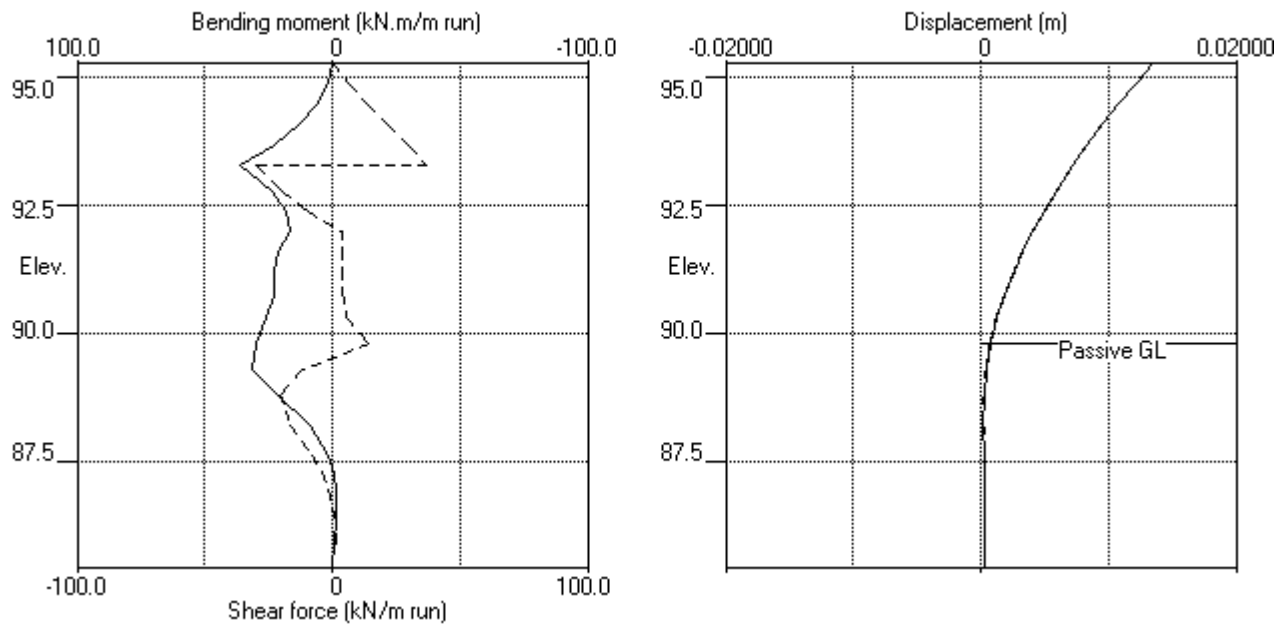
Stage No.4 Excavate to elevation 89.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
22	85.90	0.00	93.95	0.00	426.01	67.66	67.66	139711
23	85.40	0.00	106.09	0.00	468.55	74.33	74.33	139711

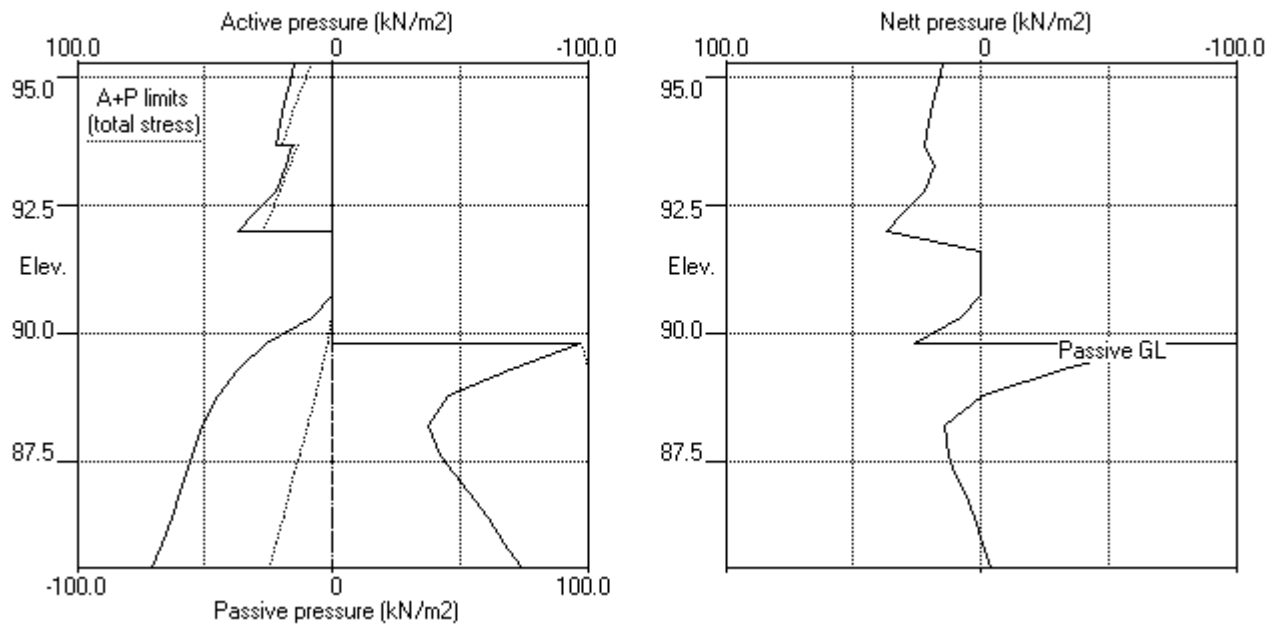
Note: 0.00a Soil pressure at active limit
 96.88p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 89.80 on PASSIVE side



Stage No.4 Excav. to elev. 89.80 on PASSIVE side



Units: kN,m

Stage No. 6 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
			More than one strut		-ation
6	95.30	86.40			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.30	15.09	0.013	3.32E-03	0.0	0.0	
2	94.90	17.29	0.012	3.31E-03	6.5	1.4	
3	94.50	19.50	0.010	3.28E-03	13.8	5.5	
4	94.10	21.33	0.009	3.20E-03	22.0	12.6	
5	93.70	23.10	0.008	3.03E-03	30.9	23.3	
		16.73	0.008	3.03E-03	30.9	23.3	
6	93.30	18.73	0.007	2.75E-03	38.0	37.0	65.8
		18.73	0.007	2.75E-03	-27.8	37.0	
7	92.80	23.10	0.006	2.39E-03	-17.3	26.1	
8	92.40	30.49	0.005	2.17E-03	-6.6	21.6	
9	92.00	37.49	0.004	1.97E-03	7.0	21.4	
		11.08	0.004	1.97E-03	7.0	21.4	
10	91.60	9.66	0.003	1.74E-03	11.1	28.5	
11	91.20	7.59	0.002	1.45E-03	14.6	33.4	
12	90.75	3.65	0.002	1.07E-03	17.1	39.6	
13	90.30	4.77	0.001	6.17E-04	19.0	48.7	60.3
		4.77	0.001	6.17E-04	-41.3	48.7	
14	89.80	12.45	0.001	1.70E-04	-37.0	28.8	
15	89.30	13.09	0.001	-8.15E-05	-30.6	14.8	
16	88.80	12.60	0.001	-1.70E-04	-24.2	0.6	
17	88.20	14.22	0.001	-9.43E-05	-16.2	-11.7	
18	87.60	18.77	0.001	1.13E-04	-6.3	-18.3	
19	87.25	23.67	0.001	2.65E-04	1.2	-19.3	
20	86.90	30.39	0.001	4.13E-04	10.6	-17.3	
21	86.40	42.51	0.001	5.59E-04	28.8	-7.9	
		-58.80	0.001	5.59E-04	28.8	-7.9	
22	85.90	-34.96	0.001	5.95E-04	5.4	1.7	
23	85.40	13.37	0.000	5.85E-04	0.0	0.0	
Strut force at elev. 93.30 =			65.78 kN/m	run =	157.87 kN/strut (horiz.)		
				=	223.27 kN/strut (incl.)		
Strut force at elev. 90.30 =			60.32 kN/m	run =	144.76 kN/strut (horiz.)		
				=	204.73 kN/strut (incl.)		

(continued)

Stage No.6 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	95.30	0.00	20.00	8.12	49.28	15.09	15.09	2533
2	94.90	0.00	27.20	11.04	67.02	17.29	17.29	2533
3	94.50	0.00	34.40	13.96	84.76	19.50	19.50	2533
4	94.10	0.00	41.60	16.88	102.50	21.33	21.33	2533
5	93.70	0.00	48.80	19.81	120.24	23.10	23.10	2533
		0.00	48.80	13.43	135.93	16.73	16.73	2533
6	93.30	0.00	56.80	16.68	155.65	18.73	18.73	2533
7	92.80	0.00	66.80	20.74	180.28	23.10	23.10	2533
8	92.40	0.00	74.80	23.99	199.99	30.49	30.49	2533
9	92.00	0.00	82.80	27.23	219.70	37.49	37.49	2533
		0.00	82.80	0.00	509.45	11.08	11.08	46723
10	91.60	0.00	92.40	0.00	553.59	9.66	9.66	31174
11	91.20	0.00	101.99	0.00	597.74	7.59	7.59	31174
12	90.75	0.00	112.79	0.00	647.40	3.65	3.65	31174
13	90.30	0.00	123.59	0.00	697.05	4.77	4.77	31174
14	89.80	0.00	135.59	1.50	752.23	12.45	12.45	31174
15	89.30	0.00	147.58	4.11	807.40	13.09	13.09	31174
16	88.80	0.00	159.58	6.72	862.57	12.60	12.60	31174
17	88.20	0.00	173.97	9.85	928.76	14.22	14.22	31174
18	87.60	0.00	188.37	12.98	994.96	18.77	18.77	31174
19	87.25	0.00	196.76	14.81	1033.57	23.67	23.67	31174
20	86.90	0.00	205.16	16.63	1072.18	30.39	30.39	31174
21	86.40	0.00	217.15	19.24	1127.33	42.51	42.51	31174
		0.00	217.15	19.24	845.50	42.51	42.51	31174
22	85.90	0.00	229.14	21.85	886.86	56.08	56.08	31174
23	85.40	0.00	241.13	24.45	928.21	69.68	69.68	31174

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	90.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	101.31	101.31	101.31p	134149

Run ID. 2021.04.08 - SW1 Section 6 - TCB 95.3
 2 Mandala Place, Castle Hill
 SW1 - Section 6

| Sheet No.
 | Date:12-04-2021
 | Checked :

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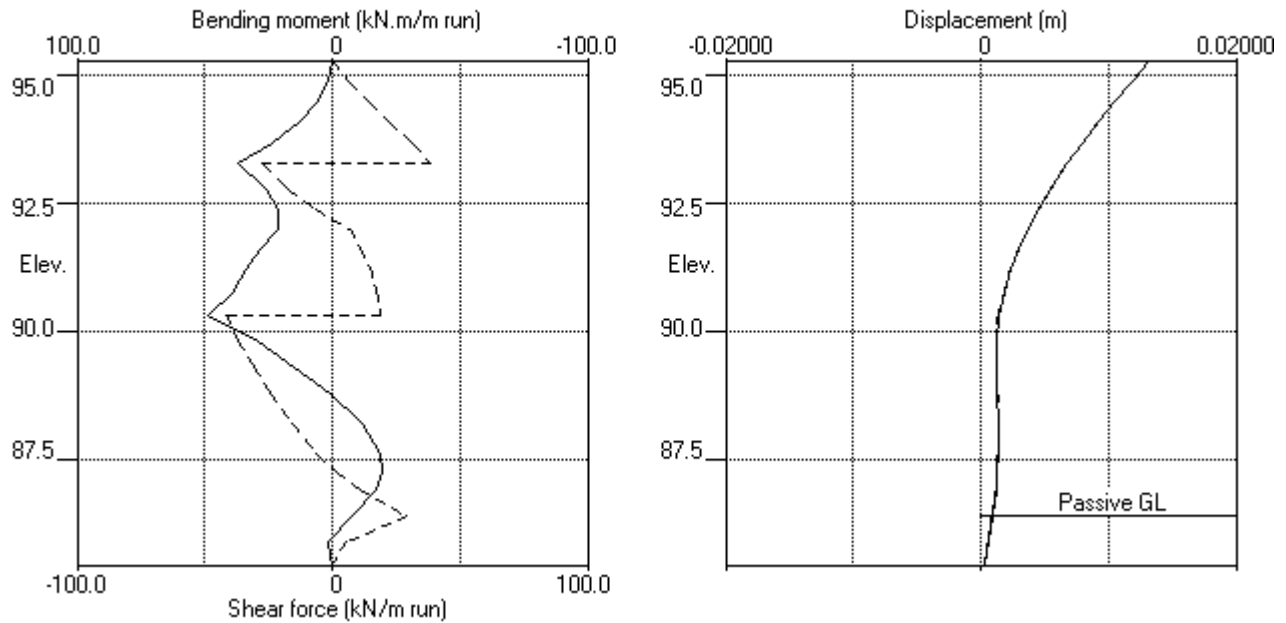
Stage No.6 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
22	85.90	0.00	12.00	0.00	143.36	91.04	91.04	134149
23	85.40	0.00	24.01	0.00	185.43	56.32	56.32	134149

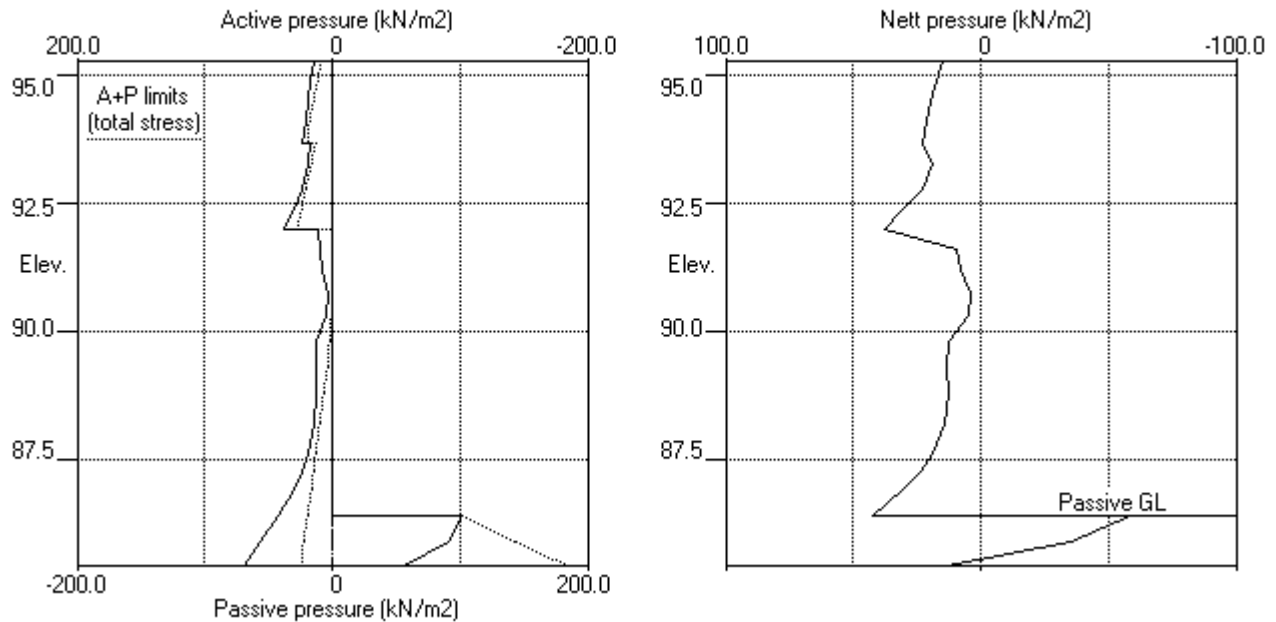
Note: 12.34a Soil pressure at active limit
 101.31p Soil pressure at passive limit

Units: kN,m

Stage No.6 Excav. to elev. 86.40 on PASSIVE side



Stage No.6 Excav. to elev. 86.40 on PASSIVE side



Units: kN,m

Stage No. 8 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
			Factor Moment of equilib. Safety at elev.	Toe Wall elev. Penetr -ation
Stage	--- G.L. ---	Strut		
No.	Act. Pass.	Elev.		
8	95.30 85.90		More than one strut	

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
24.45kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.30	14.96	0.013	3.32E-03	0.0	0.0	
2	94.90	17.16	0.012	3.31E-03	6.4	1.4	
3	94.50	19.37	0.011	3.28E-03	13.7	5.4	
4	94.10	21.19	0.009	3.20E-03	21.8	12.5	
5	93.70	22.96	0.008	3.03E-03	30.7	23.1	
		16.59	0.008	3.03E-03	30.7	23.1	
6	93.30	18.60	0.007	2.75E-03	37.7	36.8	66.0
		18.60	0.007	2.75E-03	-28.3	36.8	
7	92.80	22.98	0.006	2.39E-03	-17.9	25.6	
8	92.40	30.37	0.005	2.18E-03	-7.2	20.9	
9	92.00	37.39	0.004	1.99E-03	6.4	20.4	
		9.22	0.004	1.99E-03	6.4	20.4	
10	91.60	8.18	0.003	1.77E-03	9.8	27.1	
11	91.20	6.68	0.002	1.50E-03	12.8	31.4	
12	90.75	3.68	0.002	1.14E-03	15.1	36.7	
13	90.30	6.22	0.001	7.25E-04	17.4	44.9	60.2
		6.22	0.001	7.25E-04	-42.9	44.9	
14	89.80	16.62	0.001	3.24E-04	-37.2	24.4	
15	89.30	20.93	0.001	1.20E-04	-27.8	10.9	
16	88.80	24.91	0.001	6.25E-05	-16.3	-0.9	
17	88.20	31.97	0.001	1.11E-04	0.7	-6.2	
18	87.60	38.57	0.001	1.51E-04	21.9	0.5	

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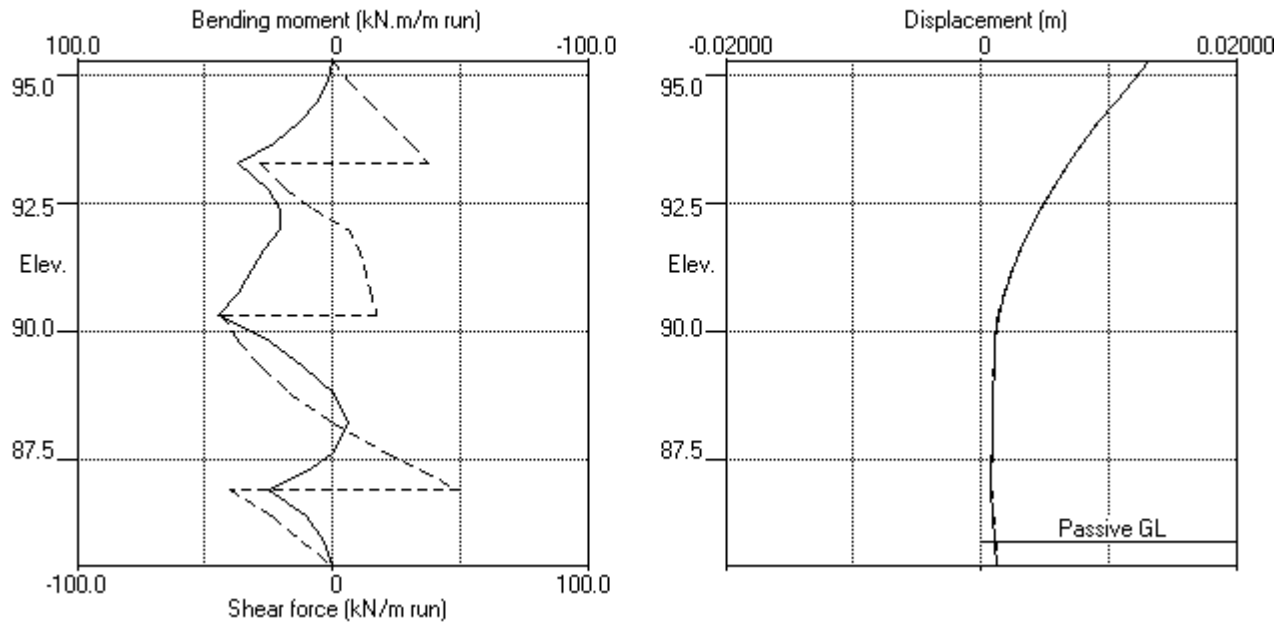
Stage No.8 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
7	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	90.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

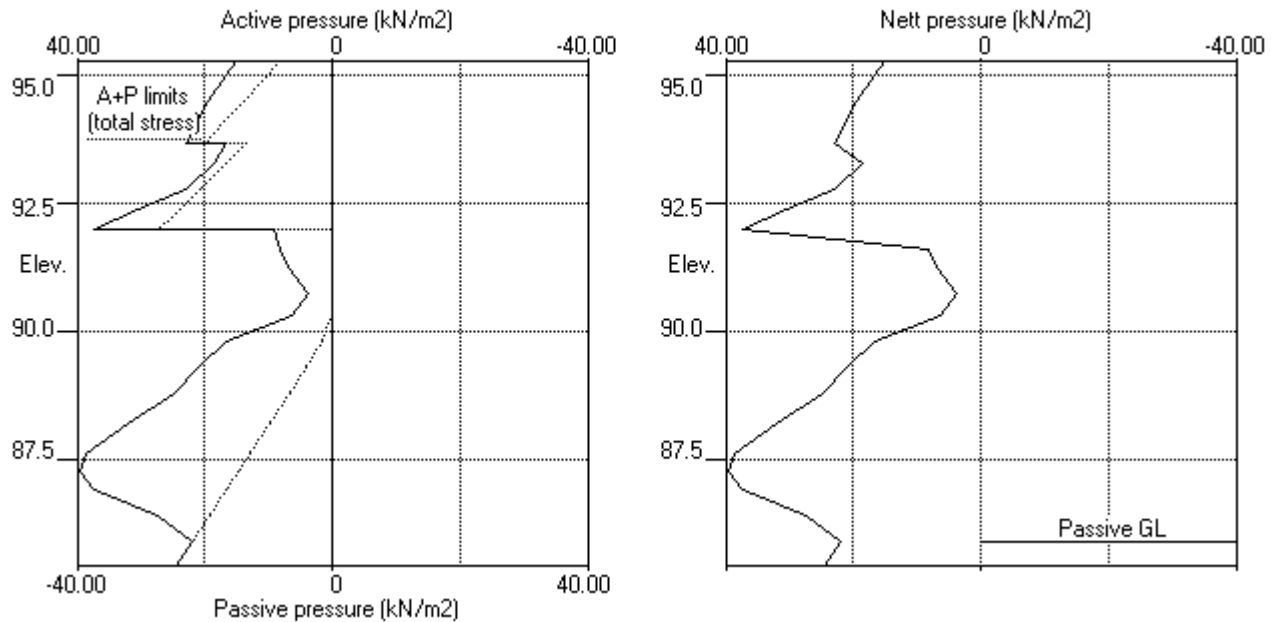
Note: 24.45a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Stage No.8 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
Licensed from GEOSOLVE	Made by : VR
Data filename/Run ID: 2021.04.08 - SW1 Section 6 - TCB 95.3	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW1 - Section 6	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40	FoS = 1.000	
					-----	-----	
				Factor	Moment	Toe	Wall
				of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
1	95.30	95.30	Cant.	10.719	86.69	94.60	0.70
2	95.30	92.80	Cant.	3.168	86.48	90.61	2.19
3	95.30	92.80	93.30	Conditions not suitable for FoS calc.			
4	95.30	89.80	93.30	Conditions not suitable for FoS calc.			
5	95.30	89.80		More than one strut			
All remaining stages have more than one strut - FoS calculation n/a							

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	95.30	0.015	0.000	0.0	0.0	0.0	0.0
2	94.90	0.013	0.000	1.8	0.0	8.0	0.0
3	94.50	0.012	0.000	6.7	0.0	16.8	0.0
4	94.10	0.010	0.000	15.3	0.0	26.4	0.0
5	93.70	0.008	0.000	28.0	0.0	36.8	0.0
6	93.30	0.007	0.000	44.4	0.0	45.4	-30.1
7	92.80	0.006	0.000	42.5	0.0	38.2	-20.1
8	92.40	0.005	0.000	58.6	0.0	40.3	-9.6
9	92.00	0.004	0.000	74.9	0.0	43.6	0.0
10	91.60	0.003	0.000	83.2	0.0	11.1	-9.2
11	91.20	0.003	0.000	71.1	0.0	14.6	-40.9
12	90.75	0.002	0.000	48.0	0.0	20.7	-49.0
13	90.30	0.001	-0.000	48.7	0.0	29.1	-43.5
14	89.80	0.001	-0.000	33.2	0.0	13.8	-38.6
15	89.30	0.001	-0.000	31.2	0.0	0.0	-30.6
16	88.80	0.001	0.000	21.1	-3.5	0.0	-24.2
17	88.20	0.001	0.000	8.9	-11.7	0.7	-16.3
18	87.60	0.001	0.000	1.6	-18.3	21.9	-8.2
19	87.25	0.001	0.000	10.6	-19.3	35.6	-4.2
20	86.90	0.001	0.000	25.6	-17.3	50.0	-40.1
21	86.40	0.001	0.000	10.5	-7.9	28.8	-23.9
22	85.90	0.001	0.000	3.4	-0.5	5.4	-11.6
23	85.40	0.001	0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	12.3	91.60	-0.5	88.20	9.1	92.00	-6.7	90.75
2	83.2	91.60	-3.7	88.20	43.6	92.00	-49.0	90.75
3	50.2	91.60	-2.2	88.20	45.4	93.30	-30.2	90.75
4	35.8	93.30	-1.4	86.90	36.6	93.30	-30.1	93.30
5	45.1	90.30	-2.4	86.90	36.4	93.30	-30.0	93.30
6	48.7	90.30	-19.3	87.25	38.0	93.30	-41.3	90.30
7	45.2	90.30	-11.5	88.20	50.0	86.90	-43.5	90.30
8	44.9	90.30	-6.2	88.20	49.0	86.90	-42.9	90.30

Summary of results (continued)

Maximum and minimum displacement at each stage

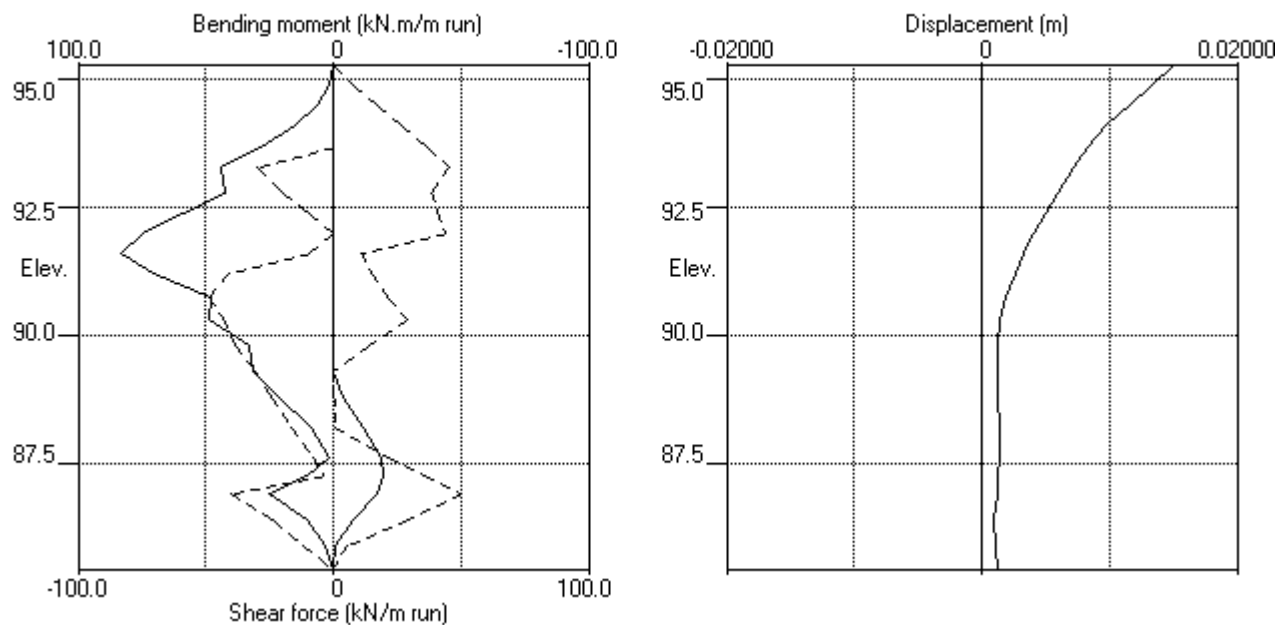
Stage	Displacement				Stage description
no.	maximum	elev.	minimum	elev.	
	m		m		
1	0.002	95.30	0.000	95.30	Apply surcharge no.1 at elev. 95.30
2	0.015	95.30	-0.000	89.80	Excav. to elev. 92.80 on PASSIVE side
3	0.011	95.30	0.000	95.30	Install strut no.1 at elev. 93.30
4	0.013	95.30	0.000	95.30	Excav. to elev. 89.80 on PASSIVE side
5	0.014	95.30	0.000	95.30	Install strut no.2 at elev. 90.30
6	0.013	95.30	0.000	95.30	Excav. to elev. 86.40 on PASSIVE side
7	0.013	95.30	0.000	95.30	Install strut no.3 at elev. 86.90
8	0.013	95.30	0.000	95.30	Excav. to elev. 85.40 on PASSIVE side

Strut forces at each stage (horizontal components)

Stage	--- Strut no. 1 ---		--- Strut no. 2 ---		--- Strut no. 3 ---	
no.	at elev. 93.30		at elev. 90.30		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
3	58.93	141.42	---	---	---	---
4	66.68	160.02	---	---	---	---
5	66.33	159.20	58.93	141.42	---	---
6	65.78	157.87	60.32	144.76	---	---
7	65.93	158.24	60.30	144.73	88.39	212.13
8	65.97	158.33	60.24	144.57	89.09	213.81

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	96.30	1 Fill	1 Fill
2	93.70	2 Res Soil	2 Res Soil
3	92.00	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
adhesion				adhesion			
fill				fill			
angle				angle			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	94.30	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes
2	91.30	2.40	0.000600	2.000E+08	5.00	45.00	450.0	Yes
3	86.90	2.40	0.000600	2.000E+08	5.00	45.00	450.0	Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	96.30	0.00 (A)	100.00	6.00	5.00	=	N/A	N/A
2	96.30	6.00 (A)	100.00	100.00	20.00	=	N/A	N/A
3	96.30	0.00 (A)	100.00	6.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 96.30
2	Apply surcharge no.2 at elevation 96.30
3	Excavate to elevation 93.80 on PASSIVE side
4	Install strut or anchor no.1 at elevation 94.30
5	Remove surcharge no.1 at elevation 96.30
6	Apply surcharge no.3 at elevation 96.30
7	Excavate to elevation 90.80 on PASSIVE side
8	Install strut or anchor no.2 at elevation 91.30
9	Excavate to elevation 86.40 on PASSIVE side
10	Install strut or anchor no.3 at elevation 86.90
11	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

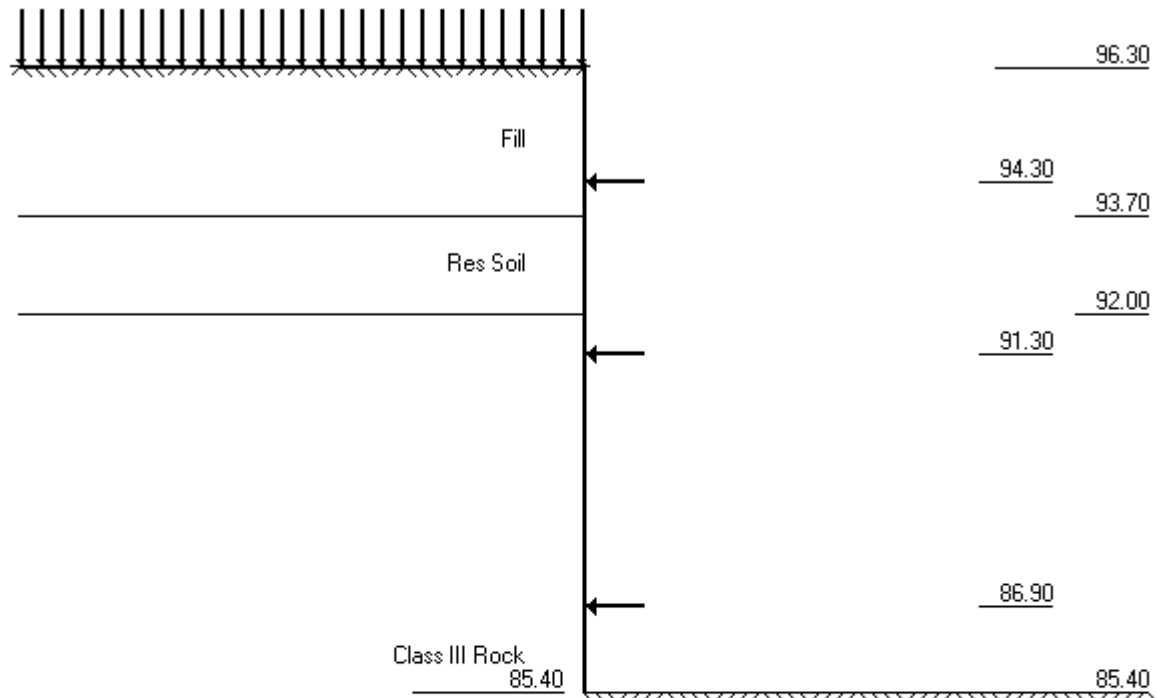
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

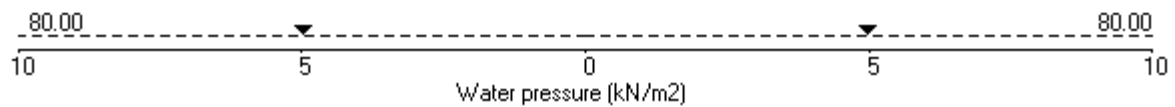
Stage no.	Stage description	Displacement	Active, Bending mom.	Graph. Passive output pressures
1	Apply surcharge no.1 at elev. 96.30	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 96.30	No	No	No
3	Excav. to elev. 93.80 on PASSIVE side	No	No	No
4	Install strut no.1 at elev. 94.30	No	No	No
5	Remove surcharge no.1 at elev. 96.30	No	No	No
6	Apply surcharge no.3 at elev. 96.30	No	No	No
7	Excav. to elev. 90.80 on PASSIVE side	No	No	No
8	Install strut no.2 at elev. 91.30	No	No	No
9	Excav. to elev. 86.40 on PASSIVE side	No	No	No
10	Install strut no.3 at elev. 86.90	No	No	No
11	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

Units: kN,m

Stage No.11 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.08 - SW1 Section 7 - TCB 96.3 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 7 | Checked :

Units: kN,m

Stage No. 3 Excavate to elevation 93.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
3	96.30 93.80	Cant.		3.865	86.61	91.15	2.65

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	96.30	2.03	0.019	4.56E-03	0.0	-0.0	
2	95.85	5.32	0.017	4.55E-03	1.7	0.4	
3	95.40	8.61	0.014	4.54E-03	4.8	1.8	
4	94.85	12.66	0.012	4.49E-03	10.6	5.9	
5	94.30	16.72	0.010	4.37E-03	18.7	13.9	
6	93.80	20.45	0.007	4.14E-03	28.0	25.5	
7	93.70	16.76	0.007	4.08E-03	29.9	28.4	
		-3.98	0.007	4.08E-03	29.9	28.4	
8	93.35	-13.26	0.006	3.81E-03	26.9	38.7	
9	93.00	-7.80	0.004	3.46E-03	23.2	47.6	
10	92.50	3.23	0.003	2.85E-03	22.0	58.3	
11	92.00	11.93	0.002	2.11E-03	25.8	69.7	
		-133.62	0.002	2.11E-03	25.8	69.7	
12	91.65	-85.76	0.001	1.54E-03	-12.6	70.4	
13	91.30	-36.36	0.000	1.01E-03	-33.9	61.4	
14	90.80	7.85	0.000	4.28E-04	-41.1	39.9	
15	90.40	23.58	-0.000	1.32E-04	-34.8	24.1	
16	90.00	25.95	-0.000	-3.41E-05	-24.9	12.1	
17	89.40	17.36	-0.000	-1.30E-04	-11.9	1.8	
18	88.80	8.77	0.000	-1.27E-04	-4.0	-2.2	
19	88.20	4.09	0.000	-9.12E-05	-0.2	-3.0	
20	87.60	1.13	0.000	-5.34E-05	1.4	-2.4	
21	87.25	0.11	0.000	-3.61E-05	1.6	-1.9	
22	86.90	-0.52	0.000	-2.32E-05	1.5	-1.3	
23	86.40	-0.98	0.000	-1.22E-05	1.1	-0.6	
24	85.90	-1.16	0.000	-7.77E-06	0.6	-0.2	
25	85.40	-1.27	0.000	-6.85E-06	0.0	0.0	

(continued)

Stage No.3 Excavate to elevation 93.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.30	0.00	5.00	2.03	12.32	2.03	2.03a	2590
2	95.85	0.00	13.10	5.32	32.28	5.32	5.32a	2590
3	95.40	0.00	21.22	8.61	52.29	8.61	8.61a	2590
4	94.85	0.00	31.18	12.66	76.83	12.66	12.66a	2590
5	94.30	0.00	41.21	16.72	101.53	16.72	16.72a	2590
6	93.80	0.00	50.38	20.45	124.13	20.45	20.45a	2590
7	93.70	0.00	50.38	20.45	93.10	20.45	20.45a	2590
		0.00	52.22	21.19	96.68	21.19	21.19a	2590
8	93.35	0.00	52.22	14.82	108.27	14.82	14.82a	2590
		0.00	59.38	17.73	121.50	19.21	19.21	2590
9	93.00	0.00	66.57	20.65	134.79	26.64	26.64	2590
10	92.50	0.00	76.87	24.83	154.85	36.65	36.65	2590
11	92.00	0.00	87.21	29.02	174.97	45.80	45.80	2590
12	91.65	0.00	87.21	0.00	397.31	0.00	0.00a	47794
		0.00	95.87	0.00	427.16	0.00	0.00a	47794
13	91.30	0.00	104.53	0.00	457.05	17.09	17.09	47794
14	90.80	0.00	116.92	0.00	499.77	37.95	37.95	47794
15	90.40	0.00	126.83	0.00	533.97	48.85	48.85	79095
16	90.00	0.00	136.75	1.76	568.17	53.44	53.44	79095
17	89.40	0.00	151.62	4.99	619.45	54.25	54.25	79095
18	88.80	0.00	166.47	8.22	670.69	55.06	55.06	36940
19	88.20	0.00	181.31	11.45	721.88	57.83	57.83	36940
20	87.60	0.00	196.13	14.67	773.71	61.46	61.46	36940
21	87.25	0.00	204.77	16.55	803.96	63.93	63.93	36940
22	86.90	0.00	213.39	18.42	834.18	66.59	66.59	36940
23	86.40	0.00	225.70	21.10	877.30	70.62	70.62	36940
24	85.90	0.00	238.00	23.77	920.37	74.79	74.79	36940
25	85.40	0.00	250.28	26.44	963.39	78.99	78.99	36940

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	95.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	94.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.70	0.00	0.00	0.00	0.00	0.00	0.00	4392
		0.00	1.80	0.73	4.44	4.44	4.44p	4392
8	93.35	0.00	1.80	0.00	18.80	18.80	18.80p	4392
		0.00	8.80	0.00	32.47	32.47	32.47p	4392
9	93.00	0.00	15.80	0.04	46.13	34.43	34.43	4392
10	92.50	0.00	25.81	4.10	65.67	33.42	33.42	4392
11	92.00	0.00	35.81	8.16	85.21	33.87	33.87	4392
12	91.65	0.00	35.81	0.00	220.03	133.62	133.62	81451
		0.00	44.22	0.00	249.04	85.76	85.76	81451
13	91.30	0.00	52.64	0.00	278.06	53.44	53.44	81451
14	90.80	0.00	64.66	0.00	319.54	30.09	30.09	81451
15	90.40	0.00	74.29	0.00	352.74	25.27	25.27	79095
16	90.00	0.00	83.93	0.00	386.42	27.49	27.49	79095
17	89.40	0.00	98.39	0.00	437.12	36.89	36.89	79095

(continued)

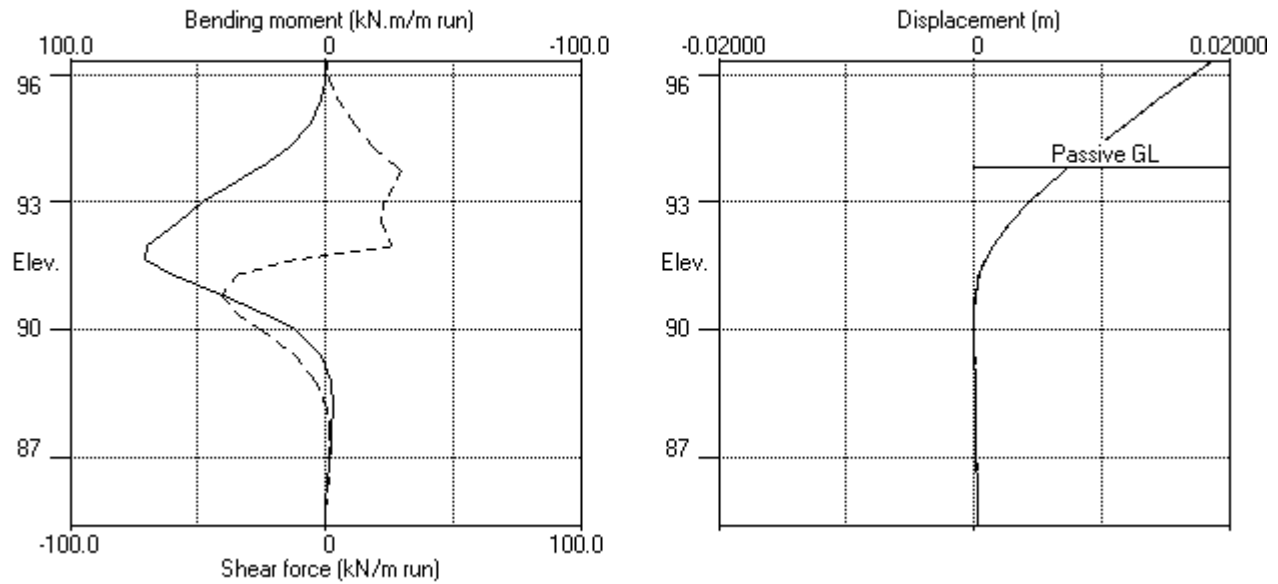
Stage No.3 Excavate to elevation 93.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
18	88.80	0.00	112.88	0.00	487.89	46.30	46.30	36940
19	88.20	0.00	127.38	0.00	538.73	53.74	53.74	36940
20	87.60	0.00	141.91	2.88	589.64	60.33	60.33	36940
21	87.25	0.00	150.39	4.72	619.37	63.82	63.82	36940
22	86.90	0.00	158.88	6.57	649.13	67.11	67.11	36940
23	86.40	0.00	171.03	9.21	691.69	71.60	71.60	36940
24	85.90	0.00	183.19	11.85	734.30	75.95	75.95	36940
25	85.40	0.00	195.36	14.50	776.96	80.26	80.26	36940

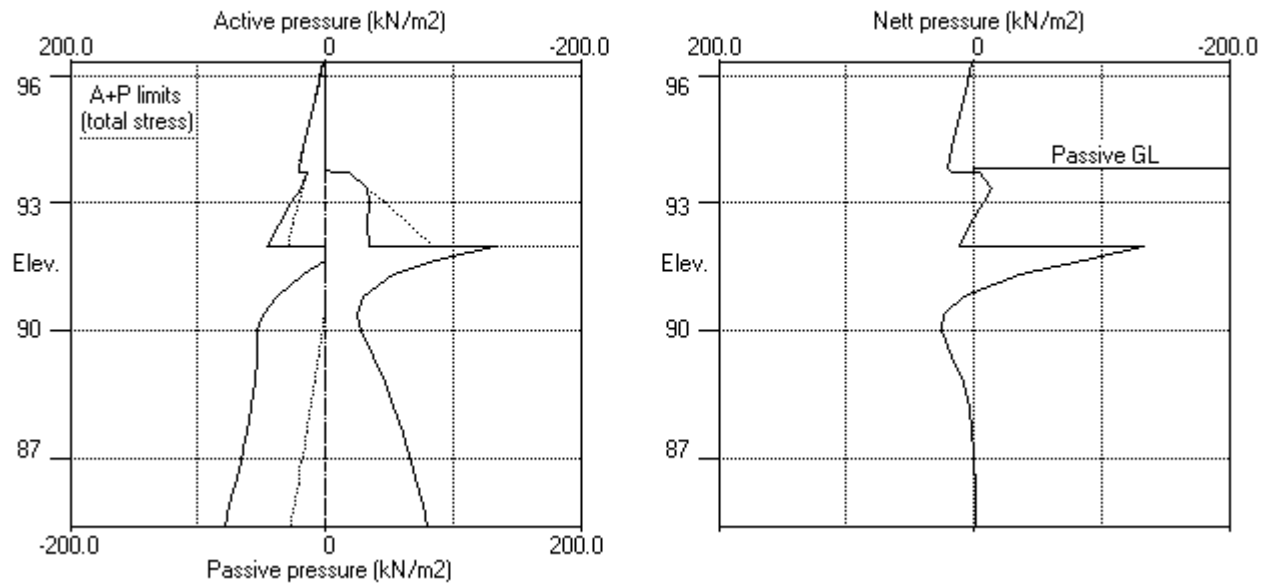
Note: 0.00a Soil pressure at active limit
 32.47p Soil pressure at passive limit

Units: kN,m

Stage No.3 Excav. to elev. 93.80 on PASSIVE side



Stage No.3 Excav. to elev. 93.80 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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Data filename/Run ID: 2021.04.08 - SW1 Section 7 - TCB 96.3 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW1 - Section 7 | Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 90.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
7	96.30 90.80	94.30	3.805	n/a	90.68 0.12

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	96.30	8.12	0.012	2.69E-03	0.0	-0.0	
2	95.85	17.33	0.011	2.68E-03	5.7	0.9	
3	95.40	27.67	0.010	2.65E-03	15.9	5.5	
4	94.85	29.33	0.008	2.50E-03	31.5	18.6	
5	94.30	30.78	0.007	2.12E-03	48.1	40.5	101.8
		30.78	0.007	2.12E-03	-53.7	40.5	
6	93.80	31.83	0.006	1.79E-03	-38.1	17.6	
7	93.70	32.03	0.006	1.75E-03	-34.9	14.0	
		25.66	0.006	1.75E-03	-34.9	14.0	
8	93.35	28.19	0.005	1.68E-03	-25.5	3.3	
9	93.00	33.94	0.005	1.68E-03	-14.6	-3.3	
10	92.50	42.00	0.004	1.74E-03	4.4	-6.3	
11	92.00	49.89	0.003	1.76E-03	27.4	1.3	
		0.00	0.003	1.76E-03	27.4	1.3	
12	91.65	0.00	0.002	1.71E-03	27.4	10.8	
13	91.30	0.00	0.002	1.59E-03	27.4	20.6	
14	90.80	9.55	0.001	1.27E-03	29.8	34.8	
		-87.00	0.001	1.27E-03	29.8	34.8	
15	90.40	-67.32	0.001	9.18E-04	-1.1	41.8	
16	90.00	-22.39	0.000	5.59E-04	-19.1	36.0	
17	89.40	8.05	0.000	1.67E-04	-23.4	20.5	
18	88.80	14.87	0.000	-3.00E-05	-16.5	8.0	
19	88.20	12.70	0.000	-9.06E-05	-8.2	0.8	
20	87.60	7.36	0.000	-8.29E-05	-2.2	-1.9	
21	87.25	4.50	0.000	-6.64E-05	-0.1	-2.2	
22	86.90	2.21	0.000	-4.97E-05	1.1	-2.0	
23	86.40	-0.10	0.000	-3.18E-05	1.6	-1.1	
24	85.90	-1.66	0.000	-2.30E-05	1.2	-0.4	
25	85.40	-2.94	0.000	-2.09E-05	0.0	-0.0	
Strut force at elev. 94.30 =			101.79 kN/m run =	244.29 kN/strut (horiz.)			
				= 345.48 kN/strut (incl.)			

(continued)

Stage No.7 Excavate to elevation 90.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.30	0.00	20.00	8.12	49.28	8.12	8.12a	1436
2	95.85	0.00	28.10	11.40	69.23	17.33	17.33	1436
3	95.40	0.00	36.20	14.69	89.19	27.67	27.67	1436
4	94.85	0.00	46.10	18.71	113.59	29.33	29.33	1436
5	94.30	0.00	56.00	22.73	137.98	30.78	30.78	1436
6	93.80	0.00	65.00	26.38	160.15	31.83	31.83	1436
7	93.70	0.00	66.80	27.11	164.59	32.03	32.03	1436
		0.00	66.80	20.74	180.28	25.66	25.66	1436
8	93.35	0.00	73.80	23.58	197.53	28.19	28.19	1436
9	93.00	0.00	80.80	26.42	214.77	33.94	33.94	1436
10	92.50	0.00	90.80	30.48	239.41	42.00	42.00	1436
11	92.00	0.00	100.79	34.54	264.04	49.89	49.89	1436
		0.00	100.79	0.00	592.21	0.00	0.00a	26229
12	91.65	0.00	109.19	0.00	630.84	0.00	0.00a	26229
13	91.30	0.00	117.59	0.00	669.46	0.00	0.00a	26229
14	90.80	0.00	129.59	0.20	724.63	9.55	9.55	26229
		0.00	129.59	0.20	543.48	9.55	9.55	26229
15	90.40	0.00	139.19	2.29	576.58	27.54	27.54	26229
16	90.00	0.00	148.78	4.37	609.68	39.19	39.19	26229
17	89.40	0.00	163.18	7.50	659.33	47.96	47.96	26229
18	88.80	0.00	177.57	10.63	708.98	52.90	52.90	26229
19	88.20	0.00	191.96	13.76	758.62	57.16	57.16	26229
20	87.60	0.00	206.35	16.89	808.26	60.94	60.94	26229
21	87.25	0.00	214.75	18.72	837.21	63.24	63.24	26229
22	86.90	0.00	223.14	20.54	866.16	65.67	65.67	26229
23	86.40	0.00	235.13	23.15	907.52	69.35	69.35	26229
24	85.90	0.00	247.12	25.76	948.88	73.20	73.20	26229
25	85.40	0.00	259.11	28.36	990.32	77.11	77.11	26229

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	95.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	94.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	93.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	92.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	91.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	90.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.55	96.55	96.55p	125372
15	90.40	0.00	9.60	0.00	130.19	94.86	94.86	125372
16	90.00	0.00	19.20	0.00	163.83	61.58	61.58	125372
17	89.40	0.00	33.62	0.00	214.33	39.91	39.91	125372
18	88.80	0.00	48.05	0.00	264.88	38.03	38.03	125372
19	88.20	0.00	62.50	0.00	315.52	44.46	44.46	125372

(continued)

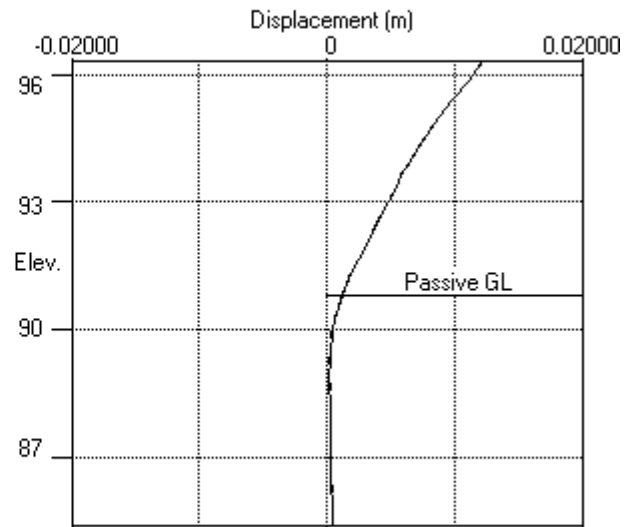
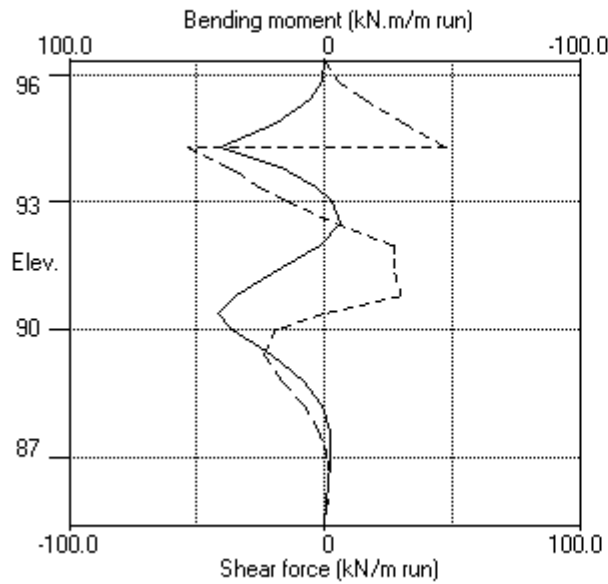
Stage No.7 Excavate to elevation 90.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
20	87.60	0.00	76.98	0.00	366.26	53.58	53.58	125372
21	87.25	0.00	85.45	0.00	395.92	58.74	58.74	125372
22	86.90	0.00	93.93	0.00	425.62	63.46	63.46	125372
23	86.40	0.00	106.07	0.00	468.14	69.45	69.45	125372
24	85.90	0.00	118.24	0.00	510.77	74.86	74.86	125372
25	85.40	0.00	130.44	0.39	553.51	80.05	80.05	125372

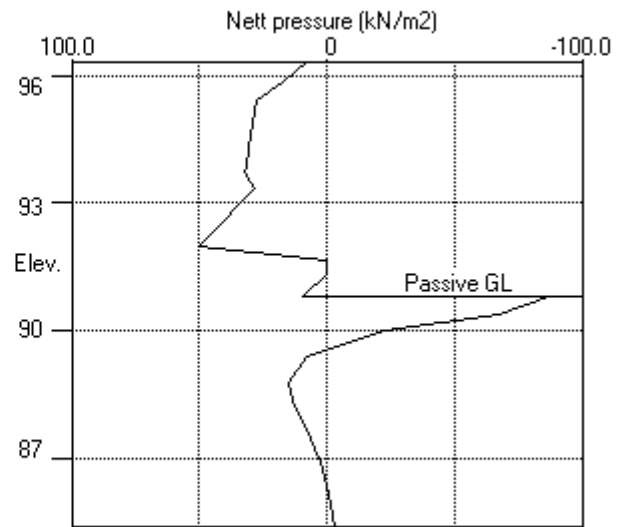
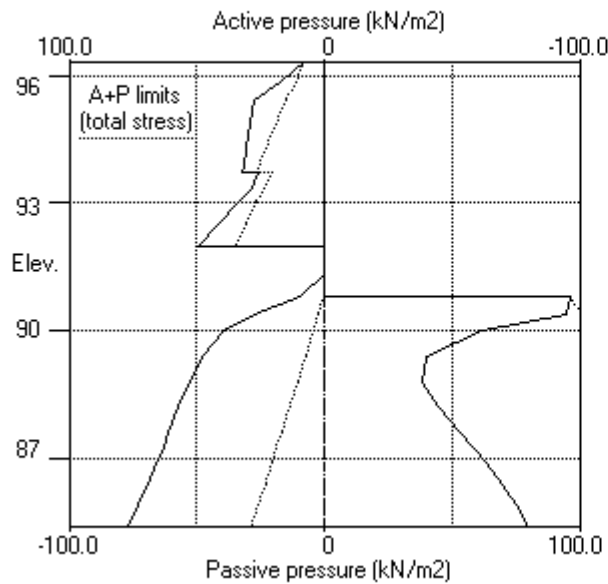
Note: 0.00a Soil pressure at active limit
 96.55p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. 90.80 on PASSIVE side



Stage No.7 Excav. to elev. 90.80 on PASSIVE side



Units: kN,m

Stage No. 9 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
			-----	-----
Stage	--- G.L. ---	Strut	Factor Moment	Toe Wall
No.	Act. Pass.	Elev.	of equilib.	elev. Penetr
			Safety at elev.	-ation
9	96.30	86.40	More than one strut	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	96.30	9.13	0.012	3.10E-03	0.0	-0.0	
2	95.85	18.64	0.010	3.09E-03	6.2	1.0	
3	95.40	29.26	0.009	3.06E-03	17.0	5.9	
4	94.85	31.27	0.007	2.89E-03	33.7	19.9	
5	94.30	33.05	0.006	2.49E-03	51.4	43.3	96.6
		33.05	0.006	2.49E-03	-45.3	43.3	
6	93.80	34.36	0.005	2.10E-03	-28.4	25.0	
7	93.70	34.61	0.004	2.04E-03	-25.0	22.3	
		28.24	0.004	2.04E-03	-25.0	22.3	
8	93.35	30.90	0.004	1.89E-03	-14.6	15.3	
9	93.00	36.72	0.003	1.78E-03	-2.8	12.6	
10	92.50	44.76	0.002	1.61E-03	17.6	15.9	
11	92.00	52.41	0.001	1.35E-03	41.9	30.5	
		46.15	0.001	1.35E-03	41.9	30.5	
12	91.65	40.39	0.001	1.03E-03	57.0	47.8	
13	91.30	31.48	0.001	5.56E-04	69.6	70.5	133.8
		31.48	0.001	5.56E-04	-64.2	70.5	
14	90.80	22.53	0.001	-9.79E-05	-50.7	42.9	
15	90.40	24.20	0.001	-4.08E-04	-41.3	24.4	
16	90.00	21.09	0.001	-5.67E-04	-32.3	9.9	
17	89.40	12.69	0.001	-6.01E-04	-22.2	-5.0	
18	88.80	10.63	0.002	-4.42E-04	-15.2	-17.9	
19	88.20	13.76	0.002	-1.47E-04	-7.8	-24.7	
20	87.60	16.89	0.002	2.08E-04	1.4	-26.6	
21	87.25	18.72	0.002	4.16E-04	7.6	-25.0	
22	86.90	27.09	0.002	5.99E-04	15.6	-20.2	
23	86.40	42.58	0.001	7.67E-04	33.0	-8.8	
		-59.71	0.001	7.67E-04	33.0	-8.8	
24	85.90	-46.81	0.001	8.02E-04	6.4	2.7	
25	85.40	21.25	0.000	7.87E-04	0.0	0.0	
Strut force at elev. 94.30 =			96.61 kN/m	run =	231.86 kN/strut (horiz.)		
				=	327.90 kN/strut (incl.)		
Strut force at elev. 91.30 =			133.80 kN/m	run =	321.13 kN/strut (horiz.)		
				=	454.15 kN/strut (incl.)		

Stage No.9 Excavate to elevation 86.40 on PASSIVE side

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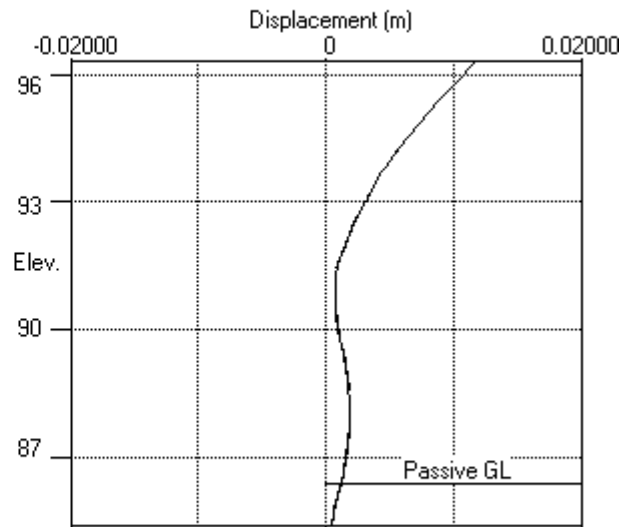
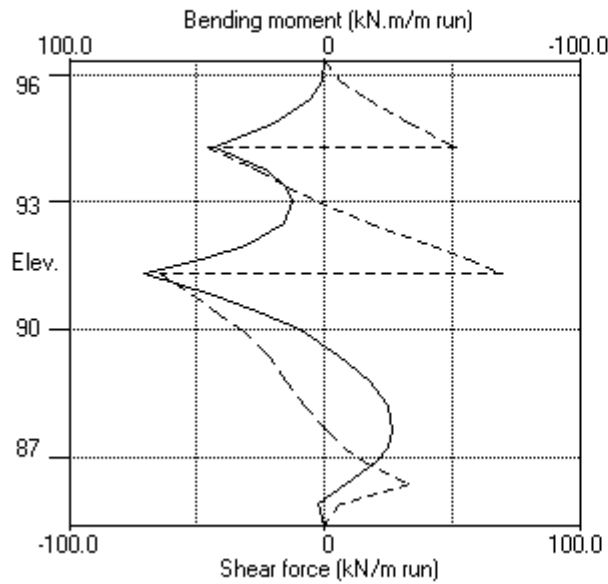
Stage No.9 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
21	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	102.29	102.29	102.29p	132830
24	85.90	0.00	12.00	0.00	144.34	106.29	106.29	132830
25	85.40	0.00	24.01	0.00	186.41	56.56	56.56	132830

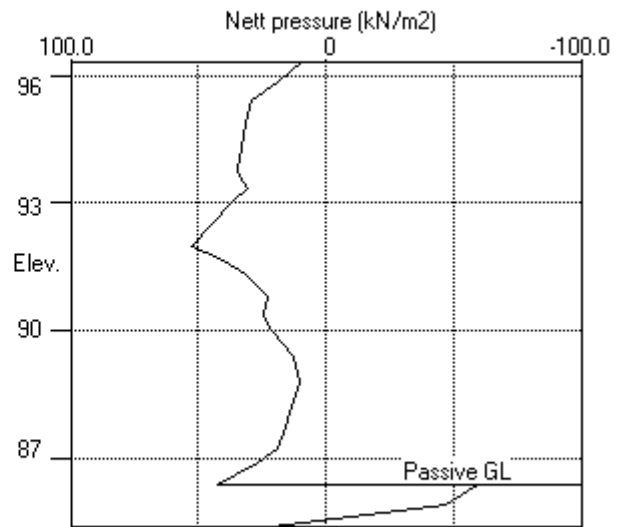
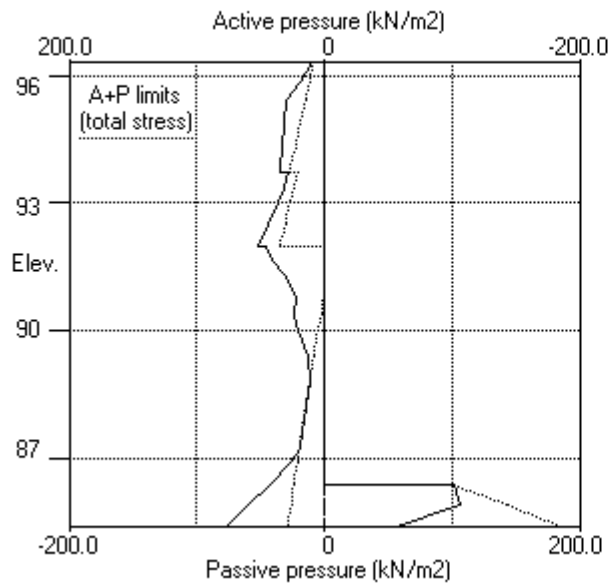
Note: 18.72a Soil pressure at active limit
 102.29p Soil pressure at passive limit

Units: kN,m

Stage No.9 Excav. to elev. 86.40 on PASSIVE side



Stage No.9 Excav. to elev. 86.40 on PASSIVE side



Units: kN,m

Stage No. 11 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
11	96.30	85.90	More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
28.36kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	96.30	9.09	0.012	3.08E-03	0.0	-0.0	
2	95.85	18.58	0.010	3.07E-03	6.2	1.0	
3	95.40	29.18	0.009	3.04E-03	17.0	5.9	
4	94.85	31.18	0.007	2.87E-03	33.6	19.9	
5	94.30	32.94	0.006	2.47E-03	51.2	43.2	96.9
		32.94	0.006	2.47E-03	-45.7	43.2	
6	93.80	34.24	0.005	2.08E-03	-28.9	24.6	
7	93.70	34.48	0.005	2.03E-03	-25.4	21.9	
		28.11	0.005	2.03E-03	-25.4	21.9	
8	93.35	30.77	0.004	1.88E-03	-15.1	14.7	
9	93.00	36.58	0.003	1.77E-03	-3.3	11.8	
10	92.50	44.62	0.002	1.62E-03	17.0	14.9	
11	92.00	52.28	0.002	1.36E-03	41.2	29.1	
		43.79	0.002	1.36E-03	41.2	29.1	
12	91.65	38.28	0.001	1.06E-03	55.5	46.0	
13	91.30	29.82	0.001	6.04E-04	67.5	68.0	134.1
		29.82	0.001	6.04E-04	-66.6	68.0	
14	90.80	21.93	0.001	-1.38E-05	-53.7	39.0	
15	90.40	24.94	0.001	-2.83E-04	-44.3	19.3	
16	90.00	24.32	0.001	-3.89E-04	-34.5	3.7	
17	89.40	21.49	0.001	-3.32E-04	-20.7	-11.9	
18	88.80	27.16	0.001	-9.42E-05	-6.1	-22.4	

(continued)

Stage No.11 Excavate to elevation 85.40 on PASSIVE side

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
19	88.20	39.15	0.001	2.05E-04	13.8	-20.8	
20	87.60	48.74	0.001	3.85E-04	40.1	-5.1	
21	87.25	49.16	0.001	3.57E-04	57.3	12.0	
22	86.90	50.64	0.001	1.64E-04	74.7	36.0	133.2
		50.64	0.001	1.64E-04	-58.5	36.0	
23	86.40	44.82	0.001	-1.19E-04	-34.6	13.3	
24	85.90	32.65	0.001	-2.30E-04	-15.3	5.9	
25	85.40	28.36	0.001	-2.64E-04	0.0	0.0	
Strut force at elev.			94.30 =	96.86 kN/m	run =	232.46 kN/strut (horiz.)	
					=	328.75 kN/strut (incl.)	
Strut force at elev.			91.30 =	134.10 kN/m	run =	321.83 kN/strut (horiz.)	
					=	455.14 kN/strut (incl.)	
Strut force at elev.			86.90 =	133.22 kN/m	run =	319.73 kN/strut (horiz.)	
					=	452.16 kN/strut (incl.)	

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al limit kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	96.30	0.00	20.00	8.12	49.28	9.09	9.09	1663
2	95.85	0.00	28.10	11.40	69.23	18.58	18.58	1663
3	95.40	0.00	36.20	14.69	89.19	29.18	29.18	1663
4	94.85	0.00	46.10	18.71	113.59	31.18	31.18	1663
5	94.30	0.00	56.00	22.73	137.98	32.94	32.94	1663
6	93.80	0.00	65.00	26.38	160.15	34.24	34.24	1663
7	93.70	0.00	66.80	27.11	164.59	34.48	34.48	1663
		0.00	66.80	20.74	180.28	28.11	28.11	1663
8	93.35	0.00	73.80	23.58	197.53	30.77	30.77	1663
9	93.00	0.00	80.80	26.42	214.77	36.58	36.58	1663
10	92.50	0.00	90.80	30.48	239.41	44.62	44.62	1663
11	92.00	0.00	100.79	34.54	264.04	52.28	52.28	1663
		0.00	100.79	0.00	592.21	43.79	43.79	30491
12	91.65	0.00	109.19	0.00	630.84	38.28	38.28	30491
13	91.30	0.00	117.59	0.00	669.46	29.82	29.82	46124
14	90.80	0.00	129.59	0.20	724.63	21.93	21.93	46124
15	90.40	0.00	139.19	2.29	768.77	24.94	24.94	46124
16	90.00	0.00	148.78	4.37	812.91	24.32	24.32	46124
17	89.40	0.00	163.18	7.50	879.11	21.49	21.49	46124
18	88.80	0.00	177.57	10.63	945.30	27.16	27.16	46124
19	88.20	0.00	191.96	13.76	1011.49	39.15	39.15	46124
20	87.60	0.00	206.35	16.89	1077.68	48.74	48.74	91033
21	87.25	0.00	214.75	18.72	1116.28	49.16	49.16	91033
22	86.90	0.00	223.14	20.54	1154.88	50.64	50.64	91033
23	86.40	0.00	235.13	23.15	1210.03	44.82	44.82	91033
24	85.90	0.00	247.12	25.76	1265.17	32.65	32.65	91033
		0.00	247.12	25.76	948.88	32.65	32.65	91033
25	85.40	0.00	259.11	28.36	990.23	28.36	28.36a	91033

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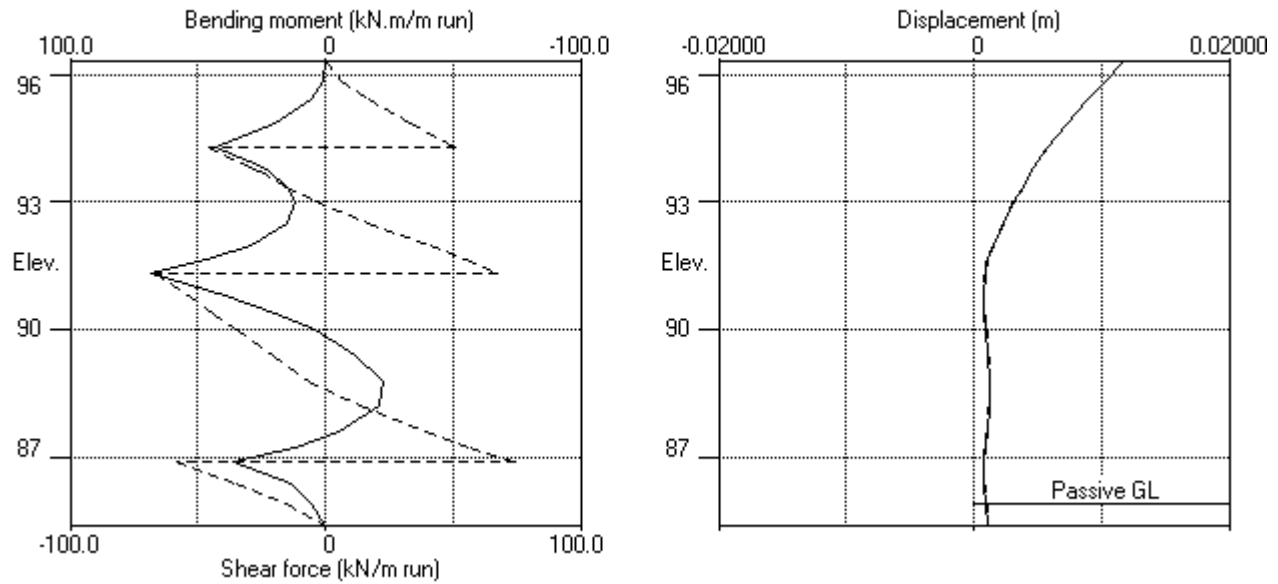
Stage No.11 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						
		Water press. kN/m2	----- Vertic -al kN/m2	Effective Active limit kN/m2	Effective stresses Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
1	96.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	95.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	94.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	93.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	92.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	91.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	90.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	90.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
25	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

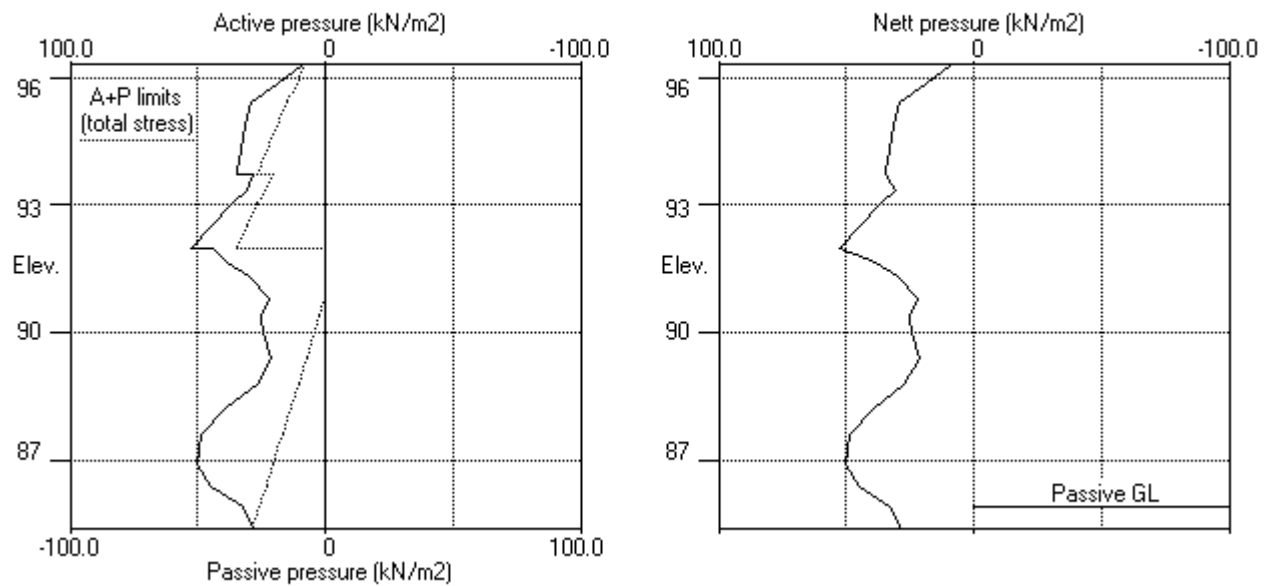
Note: 28.36a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.11 Excav. to elev. 85.40 on PASSIVE side



Stage No.11 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
Licensed from GEOSOLVE	Made by : VR
Data filename/Run ID: 2021.04.08 - SW1 Section 7 - TCB 96.3	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW1 - Section 7	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for
No.	Act.	Pass.	Elev.	Factor	elev. = 85.40	FoS = 1.000
				Moment		
				of		
				equilib.		
				Safety	at elev.	
						Penetr
						-ation
1	96.30	96.30	Cant.	Conditions not suitable for FoS calc.		
2	96.30	96.30	Cant.	Conditions not suitable for FoS calc.		
3	96.30	93.80	Cant.	3.865 86.61 91.15 2.65		
4	96.30	93.80	94.30	Conditions not suitable for FoS calc.		
5	96.30	93.80	94.30	Conditions not suitable for FoS calc.		
6	96.30	93.80	94.30	Conditions not suitable for FoS calc.		
7	96.30	90.80	94.30	3.805 n/a 90.68 0.12		
8	96.30	90.80		More than one strut		
All remaining stages have more than one strut - FoS calculation n/a						

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	96.30	0.019	0.000	0.0	-0.0	0.0	0.0
2	95.85	0.017	0.000	1.1	0.0	8.5	0.0
3	95.40	0.014	0.000	7.6	0.0	20.3	-0.0
4	94.85	0.012	0.000	23.1	0.0	35.7	-0.2
5	94.30	0.010	0.000	47.2	0.0	54.3	-53.7
6	93.80	0.007	0.000	32.9	0.0	28.0	-38.1
7	93.70	0.007	0.000	31.0	0.0	29.9	-34.9
8	93.35	0.006	0.000	38.7	0.0	26.9	-25.5
9	93.00	0.005	0.000	47.6	-3.3	23.2	-14.6
10	92.50	0.004	0.000	58.3	-6.3	22.0	-1.5
11	92.00	0.003	0.000	69.7	0.0	41.9	0.0
12	91.65	0.002	0.000	70.4	0.0	57.0	-12.6
13	91.30	0.002	0.000	70.5	0.0	69.7	-66.6
14	90.80	0.001	0.000	42.9	0.0	29.8	-53.8
15	90.40	0.001	-0.000	41.8	0.0	0.0	-44.7
16	90.00	0.001	-0.000	36.0	0.0	0.0	-35.2
17	89.40	0.001	-0.000	20.5	-12.5	0.0	-23.4
18	88.80	0.002	0.000	8.0	-24.3	0.0	-16.5
19	88.20	0.002	0.000	0.8	-24.7	13.8	-8.2
20	87.60	0.002	0.000	0.0	-26.6	40.1	-2.2
21	87.25	0.002	0.000	12.0	-25.0	57.3	-0.1
22	86.90	0.002	0.000	36.0	-20.2	74.7	-58.5
23	86.40	0.001	0.000	13.3	-8.8	33.0	-34.6
24	85.90	0.001	0.000	5.9	-0.4	6.4	-15.3
25	85.40	0.001	0.000	0.0	-0.0	0.0	-0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	2.6	91.65	-0.1	88.20	2.2	92.00	-1.3	90.80
2	2.9	91.65	-0.1	87.60	2.9	92.00	-1.5	90.40
3	70.4	91.65	-3.0	88.20	29.9	93.70	-41.1	90.80
4	47.2	94.30	-0.8	88.20	51.9	94.30	-36.5	94.30
5	39.9	94.30	-0.6	87.60	48.8	94.30	-36.4	94.30
6	45.8	94.30	-1.3	88.20	54.3	94.30	-37.2	94.30
7	41.8	90.40	-6.3	92.50	48.1	94.30	-53.7	94.30
8	62.2	91.30	-3.1	88.20	69.7	91.30	-62.9	91.30
9	70.5	91.30	-26.6	87.60	69.6	91.30	-64.2	91.30
10	68.4	91.30	-24.7	88.20	74.6	86.90	-66.5	91.30
11	68.0	91.30	-22.4	88.80	74.7	86.90	-66.6	91.30

Summary of results (continued)

Maximum and minimum displacement at each stage

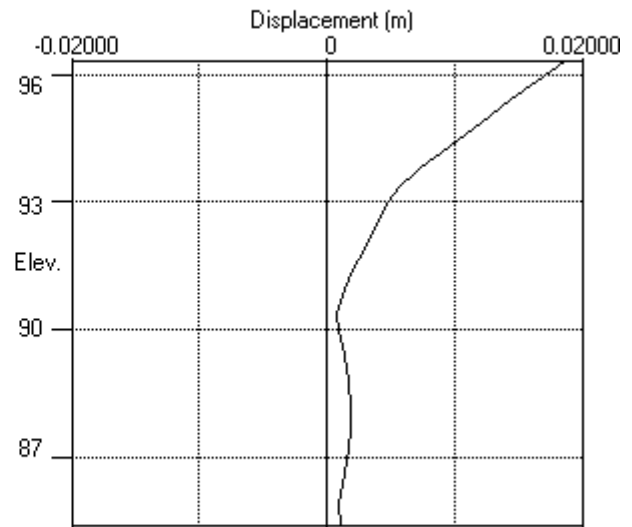
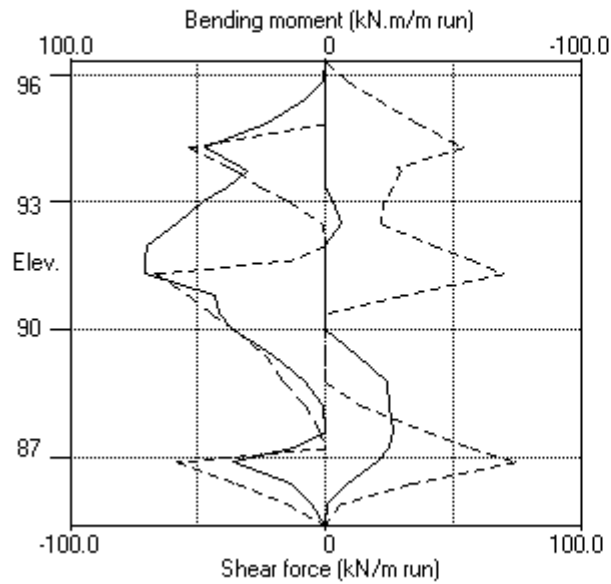
Stage no.	----- maximum m	Displacement elev.	----- minimum m	elev.	Stage description -----
1	0.001	96.30	0.000	96.30	Apply surcharge no.1 at elev. 96.30
2	0.001	96.30	0.000	96.30	Apply surcharge no.2 at elev. 96.30
3	0.019	96.30	-0.000	90.00	Excav. to elev. 93.80 on PASSIVE side
4	0.009	96.30	0.000	96.30	Install strut no.1 at elev. 94.30
5	0.007	96.30	0.000	96.30	Remove surcharge no.1 at elev. 96.30
6	0.010	96.30	0.000	96.30	Apply surcharge no.3 at elev. 96.30
7	0.012	96.30	0.000	96.30	Excav. to elev. 90.80 on PASSIVE side
8	0.012	96.30	0.000	96.30	Install strut no.2 at elev. 91.30
9	0.012	96.30	0.000	96.30	Excav. to elev. 86.40 on PASSIVE side
10	0.012	96.30	0.000	96.30	Install strut no.3 at elev. 86.90
11	0.012	96.30	0.000	96.30	Excav. to elev. 85.40 on PASSIVE side

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---		--- Strut no. 2 ---		--- Strut no. 3 ---	
	at elev. 94.30		at elev. 91.30		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
4	88.39	212.13	---	---	---	---
5	85.21	204.50	---	---	---	---
6	91.52	219.66	---	---	---	---
7	101.79	244.29	---	---	---	---
8	97.58	234.19	132.58	318.20	---	---
9	96.61	231.86	133.80	321.13	---	---
10	96.82	232.37	134.11	321.87	132.58	318.20
11	96.86	232.46	134.10	321.83	133.22	319.73

Units: kN,m

Bending moment, shear force, displacement envelopes



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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW3 - Section 1 | Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	97.80	1 Fill	1 Fill	
2	94.00	2 Res Soil	2 Res Soil	
3	93.00	4 Class III Rock	4 Class III Rock	

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill	Soil friction angle	Wall adhesion coeff.	Back-fill
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	80.00	80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
 Soldier Pile width = 0.60 m
 Soldier Pile spacing = 2.40 m
 Passive mobilisation factor = 3.00 m
 Elevation of toe of wall = 85.40
 Maximum finite element length = 0.60 m
 Youngs modulus of wall E = 3.2800E+07 kN/m2
 Moment of inertia of wall I = 1.3200E-03 m4/m run
 E.I = 43296 kN.m2/m run
 Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	96.30	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes
2	92.30	2.40	0.000600	2.000E+08	5.00	45.00	400.0	Yes
3	86.90	2.40	0.000600	2.000E+08	5.00	45.00	400.0	Yes

SURCHARGE LOADS

Surch	Distance	Length	Width	Surcharge		Equiv.	Partial
-arge	from	parallel	perpend.	-----	kN/m2	-----	soil factor/
no.	Elev.	wall	to wall	to wall	Near edge	Far edge	type Category
1	97.80	0.00 (A)	100.00	6.00	5.00	=	N/A N/A
2	97.80	6.00 (A)	100.00	100.00	20.00	=	N/A N/A
3	97.80	0.00 (A)	100.00	6.00	20.00	=	N/A N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction	Stage description
stage no.	-----
1	Apply surcharge no.1 at elevation 97.80
2	Apply surcharge no.2 at elevation 97.80
3	Excavate to elevation 95.80 on PASSIVE side
4	Install strut or anchor no.1 at elevation 96.30
5	Remove surcharge no.1 at elevation 97.80
6	Apply surcharge no.3 at elevation 97.80
7	Excavate to elevation 91.80 on PASSIVE side
8	Install strut or anchor no.2 at elevation 92.30
9	Excavate to elevation 86.40 on PASSIVE side
10	Install strut or anchor no.3 at elevation 86.90
11	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

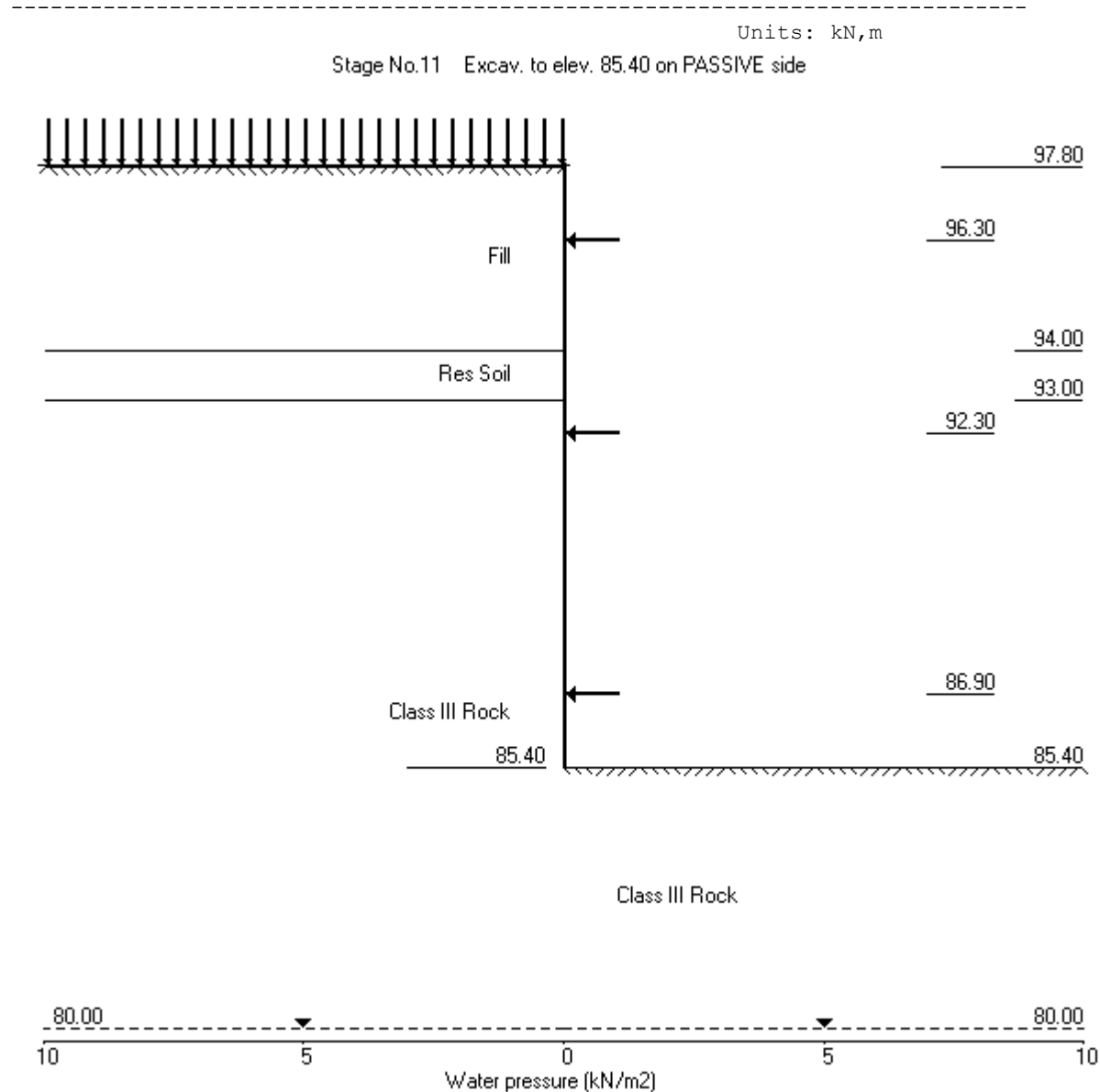
Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage	-----	Stage description	-----	Output options		
no.				Displacement	Active,	Graph.
				Bending mom.	Passive	output
				Shear force	pressures	
1	Apply surcharge no.1 at elev.	97.80	Yes	Yes	Yes	Yes
2	Apply surcharge no.2 at elev.	97.80	No	No	No	No
3	Excav. to elev.	95.80 on PASSIVE side	No	No	No	No
4	Install strut no.1 at elev.	96.30	No	No	No	No
5	Remove surcharge no.1 at elev.	97.80	No	No	No	No
6	Apply surcharge no.3 at elev.	97.80	No	No	No	No
7	Excav. to elev.	91.80 on PASSIVE side	No	No	No	No
8	Install strut no.2 at elev.	92.30	No	No	No	No
9	Excav. to elev.	86.40 on PASSIVE side	No	No	No	No
10	Install strut no.3 at elev.	86.90	No	No	No	No
11	Excav. to elev.	85.40 on PASSIVE side	No	No	No	No
*	Summary output		Yes	-	-	Yes



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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW3 - Section 1 | Checked :

Units: kN,m

Stage No. 3 Excavate to elevation 95.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
3	97.80 95.80	Cant.		4.980	86.85	92.73	3.07

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.80	2.03	0.019	4.52E-03	0.0	-0.0	
2	97.20	6.42	0.017	4.51E-03	2.5	0.8	
3	96.75	9.71	0.015	4.50E-03	6.2	2.7	
4	96.30	13.02	0.013	4.45E-03	11.3	6.6	
5	95.80	16.72	0.010	4.33E-03	18.7	14.0	
6	95.30	-1.30	0.008	4.11E-03	22.6	24.7	
7	94.80	-13.88	0.006	3.75E-03	18.8	36.1	
8	94.40	-9.98	0.005	3.39E-03	14.0	42.5	
9	94.00	-3.52	0.004	2.98E-03	11.3	47.6	
10	93.50	4.70	0.002	2.40E-03	11.6	52.8	
11	93.00	11.07	0.001	1.75E-03	15.6	59.2	
		-100.13	0.001	1.75E-03	15.6	59.2	
12	92.65	-64.73	0.001	1.27E-03	-13.3	59.1	
13	92.30	-24.43	0.000	8.33E-04	-28.9	50.5	
14	91.80	7.03	0.000	3.51E-04	-33.3	33.0	
15	91.20	22.28	-0.000	2.42E-05	-24.5	14.3	
16	90.60	17.06	-0.000	-9.97E-05	-12.7	3.6	
17	90.00	8.25	0.000	-1.18E-04	-5.1	-0.9	
18	89.40	4.43	0.000	-9.54E-05	-1.3	-2.4	
19	88.80	1.72	0.000	-6.17E-05	0.6	-2.4	
20	88.20	0.18	0.000	-3.30E-05	1.2	-1.7	
21	87.60	-0.48	0.000	-1.38E-05	1.1	-1.0	
22	87.25	-0.60	0.000	-7.04E-06	0.9	-0.7	
23	86.90	-0.62	0.000	-2.67E-06	0.7	-0.4	
24	86.40	-0.52	0.000	5.35E-07	0.4	-0.2	
25	85.90	-0.38	0.000	1.57E-06	0.2	-0.0	
26	85.40	-0.22	0.000	1.73E-06	0.0	0.0	

(continued)

Stage No.3 Excavate to elevation 95.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.80	0.00	5.00	2.03	12.32	2.03	2.03a	2499
2	97.20	0.00	15.81	6.42	38.94	6.42	6.42a	2499
3	96.75	0.00	23.93	9.71	58.97	9.71	9.71a	2499
4	96.30	0.00	32.09	13.02	79.07	13.02	13.02a	2499
5	95.80	0.00	41.21	16.72	101.53	16.72	16.72a	2499
		0.00	41.21	16.72	76.15	16.72	16.72a	2499
6	95.30	0.00	50.38	20.45	94.01	20.45	20.45a	2499
7	94.80	0.00	59.61	24.19	111.97	24.19	24.19a	2499
8	94.40	0.00	67.02	27.20	126.41	27.20	27.20a	2499
9	94.00	0.00	74.47	30.22	140.91	33.34	33.34	2499
		0.00	74.47	23.85	151.09	33.34	33.34	2499
10	93.50	0.00	84.81	28.05	171.21	42.63	42.63	2499
11	93.00	0.00	95.18	32.26	191.38	51.16	51.16	2499
		0.00	95.18	0.00	424.79	0.00	0.00a	46090
12	92.65	0.00	103.85	0.00	454.68	4.14	4.14	46090
13	92.30	0.00	112.52	0.00	484.60	23.81	23.81	46090
14	91.80	0.00	124.91	0.00	527.35	41.13	41.13	46090
15	91.20	0.00	139.78	2.42	578.64	53.74	53.74	86112
16	90.60	0.00	154.65	5.65	629.90	56.24	56.24	86112
17	90.00	0.00	169.49	8.88	681.12	56.95	56.95	30349
18	89.40	0.00	184.32	12.10	732.84	60.14	60.14	30349
19	88.80	0.00	199.13	15.32	784.71	63.89	63.89	30349
20	88.20	0.00	213.92	18.54	836.50	68.23	68.23	30349
21	87.60	0.00	228.68	21.75	888.22	73.01	73.01	30349
22	87.25	0.00	237.29	23.62	918.36	75.92	75.92	30349
23	86.90	0.00	245.88	25.49	948.46	78.89	78.89	30349
24	86.40	0.00	258.15	28.15	991.43	83.19	83.19	30349
25	85.90	0.00	270.40	30.82	1034.35	87.52	87.52	30349
26	85.40	0.00	282.64	33.48	1077.23	91.85	91.85	30349

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	97.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	96.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	96.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	95.80	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	3591
6	95.30	0.00	9.00	3.65	21.74	21.74	21.74p	3591
7	94.80	0.00	18.00	7.31	39.31	38.07	38.07	3591
8	94.40	0.00	25.21	10.23	53.38	37.18	37.18	3591
9	94.00	0.00	32.41	13.15	67.45	36.86	36.86	3591
		0.00	32.41	6.78	77.63	36.86	36.86	3591
10	93.50	0.00	42.42	10.85	97.18	37.92	37.92	3591
11	93.00	0.00	52.44	14.91	116.74	40.09	40.09	3591
		0.00	52.44	0.00	277.38	100.13	100.13	66483
12	92.65	0.00	60.86	0.00	306.41	68.87	68.87	66483
13	92.30	0.00	69.28	0.00	335.46	48.24	48.24	66483
14	91.80	0.00	81.32	0.00	376.98	34.10	34.10	66483
15	91.20	0.00	95.77	0.00	427.45	31.47	31.47	86112
16	90.60	0.00	110.25	0.00	478.18	39.18	39.18	86112

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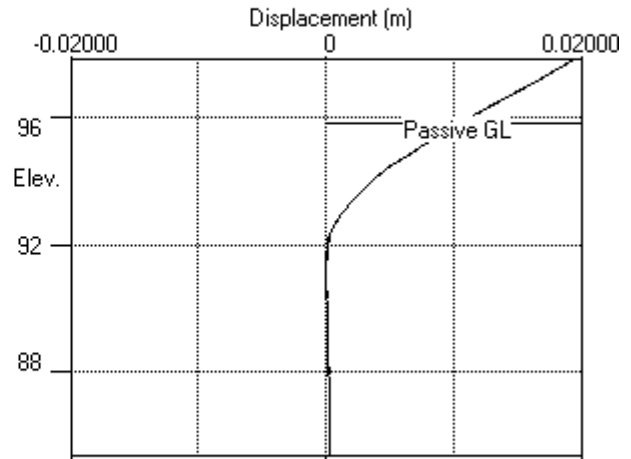
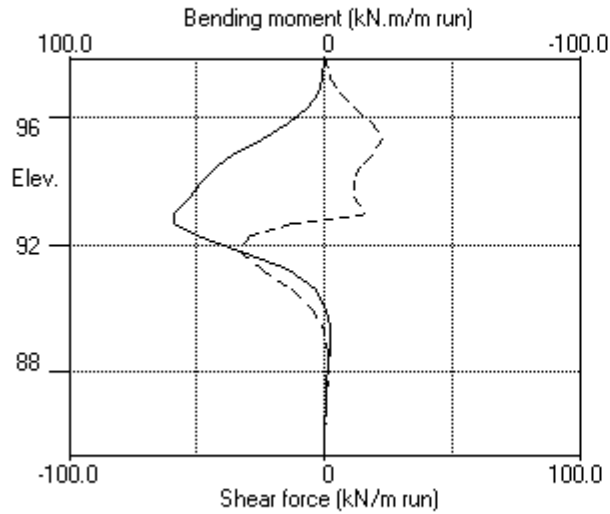
Stage No.3 Excavate to elevation 95.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
17	90.00	0.00	124.74	0.00	528.97	48.69	48.69	30349
18	89.40	0.00	139.25	2.30	579.81	55.71	55.71	30349
19	88.80	0.00	153.77	5.46	630.71	62.17	62.17	30349
20	88.20	0.00	168.31	8.62	681.68	68.05	68.05	30349
21	87.60	0.00	182.87	11.79	732.70	73.48	73.48	30349
22	87.25	0.00	191.37	13.63	762.49	76.52	76.52	30349
23	86.90	0.00	199.88	15.48	792.31	79.51	79.51	30349
24	86.40	0.00	212.05	18.13	834.93	83.72	83.72	30349
25	85.90	0.00	224.22	20.78	877.59	87.90	87.90	30349
26	85.40	0.00	236.41	23.43	920.29	92.07	92.07	30349

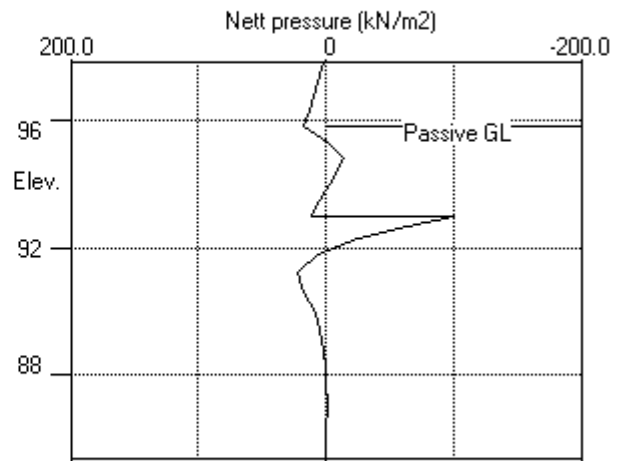
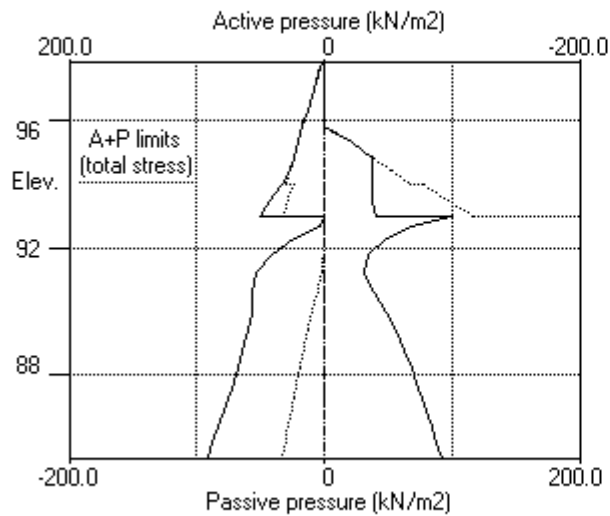
Note: 0.00a Soil pressure at active limit
 21.74p Soil pressure at passive limit

Units: kN,m

Stage No.3 Excav. to elev. 95.80 on PASSIVE side



Stage No.3 Excav. to elev. 95.80 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
Licensed from GEOSOLVE | Made by : VR
Data filename/Run ID: 2021.04.07 - SW3 Section 1 - TCB 97.8 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW3 - Section 1 | Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 91.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
7	97.80	91.80	96.30	3.873	n/a	91.51	0.29

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	97.80	8.12	0.010	6.17E-04	0.0	-0.0	
2	97.20	23.99	0.009	6.06E-04	9.6	1.6	
3	96.75	34.95	0.009	5.52E-04	22.9	8.6	
4	96.30	34.07	0.009	3.90E-04	38.4	22.6	106.3
		34.07	0.009	3.90E-04	-67.9	22.6	
5	95.80	32.98	0.009	3.00E-04	-51.1	-7.0	
6	95.30	32.10	0.009	5.02E-04	-34.9	-28.1	
7	94.80	31.82	0.008	9.02E-04	-18.9	-41.2	
8	94.40	32.95	0.008	1.30E-03	-5.9	-46.3	
9	94.00	36.37	0.007	1.73E-03	7.9	-45.6	
10	93.50	44.10	0.006	2.20E-03	28.1	-36.9	
11	93.00	52.07	0.005	2.51E-03	52.1	-17.1	
		0.00	0.005	2.51E-03	52.1	-17.1	
12	92.65	0.00	0.004	2.58E-03	52.1	1.5	
13	92.30	0.00	0.003	2.49E-03	52.1	19.3	
14	91.80	1.85	0.002	2.13E-03	52.6	44.5	
		-95.11	0.002	2.13E-03	52.6	44.5	
15	91.20	-94.03	0.001	1.36E-03	-4.2	65.5	
16	90.60	-10.05	0.000	5.95E-04	-35.4	46.0	
17	90.00	19.02	0.000	1.17E-04	-32.7	23.0	
18	89.40	22.95	0.000	-8.91E-05	-20.1	6.8	
19	88.80	15.78	0.000	-1.28E-04	-8.5	-1.1	
20	88.20	7.66	0.000	-9.69E-05	-1.5	-3.4	
21	87.60	2.18	0.000	-5.32E-05	1.5	-2.9	
22	87.25	0.35	0.000	-3.24E-05	1.9	-2.2	
23	86.90	-0.71	0.000	-1.71E-05	1.9	-1.5	
24	86.40	-1.30	0.000	-4.16E-06	1.4	-0.7	
25	85.90	-1.34	0.000	9.61E-07	0.7	-0.2	
26	85.40	-1.50	0.000	2.02E-06	0.0	-0.0	
Strut force at elev. 96.30 =			106.31 kN/m run =	255.15 kN/strut (horiz.)			
				= 360.83 kN/strut (incl.)			

(continued)

Stage No.7 Excavate to elevation 91.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.80	0.00	20.00	8.12	49.28	8.12	8.12a	1379
2	97.20	0.00	30.80	12.50	75.89	23.99	23.99	1379
3	96.75	0.00	38.90	15.79	95.85	34.95	34.95	1379
4	96.30	0.00	47.00	19.08	115.80	34.07	34.07	1379
5	95.80	0.00	56.00	22.73	137.98	32.98	32.98	1379
6	95.30	0.00	65.00	26.38	160.15	32.10	32.10	1379
7	94.80	0.00	74.00	30.03	182.32	31.82	31.82	1379
8	94.40	0.00	81.20	32.95	200.06	32.95	32.95a	1379
9	94.00	0.00	88.40	35.88	217.80	36.37	36.37	1379
		0.00	88.40	29.51	233.50	36.37	36.37	1379
10	93.50	0.00	98.39	33.56	258.13	44.10	44.10	1379
11	93.00	0.00	108.39	37.62	282.77	52.07	52.07	1379
		0.00	108.39	0.00	627.16	0.00	0.00a	25173
12	92.65	0.00	116.79	0.00	665.78	0.00	0.00a	25173
13	92.30	0.00	125.19	0.00	704.40	0.00	0.00a	25173
14	91.80	0.00	137.18	1.85	759.57	1.85	1.85a	25173
		0.00	137.18	1.85	569.68	1.85	1.85a	25173
15	91.20	0.00	151.58	4.98	619.33	28.12	28.12	25173
16	90.60	0.00	165.97	8.11	668.98	47.02	47.02	25173
17	90.00	0.00	180.37	11.24	718.62	55.46	55.46	25173
18	89.40	0.00	194.76	14.37	768.26	60.86	60.86	25173
19	88.80	0.00	209.15	17.50	817.90	64.31	64.31	25173
20	88.20	0.00	223.54	20.63	867.53	67.67	67.67	25173
21	87.60	0.00	237.93	23.76	917.16	71.59	71.59	25173
22	87.25	0.00	246.32	25.58	946.11	74.16	74.16	25173
23	86.90	0.00	254.71	27.41	975.05	76.89	76.89	25173
24	86.40	0.00	266.70	30.01	1016.50	80.99	80.99	25173
25	85.90	0.00	278.69	32.62	1058.51	85.20	85.20	25173
26	85.40	0.00	290.67	35.23	1100.52	89.32	89.32	25173

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	97.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	96.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	96.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	95.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	94.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	94.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	92.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.97	96.97	96.97p	124886
15	91.20	0.00	14.40	0.00	147.42	122.14	122.14	124886
16	90.60	0.00	28.81	0.00	197.90	57.06	57.06	124886
17	90.00	0.00	43.24	0.00	248.44	36.44	36.44	124886
18	89.40	0.00	57.68	0.00	299.06	37.91	37.91	124886

(continued)

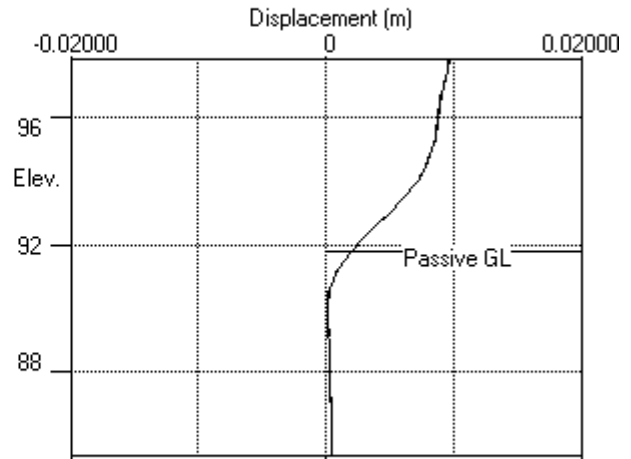
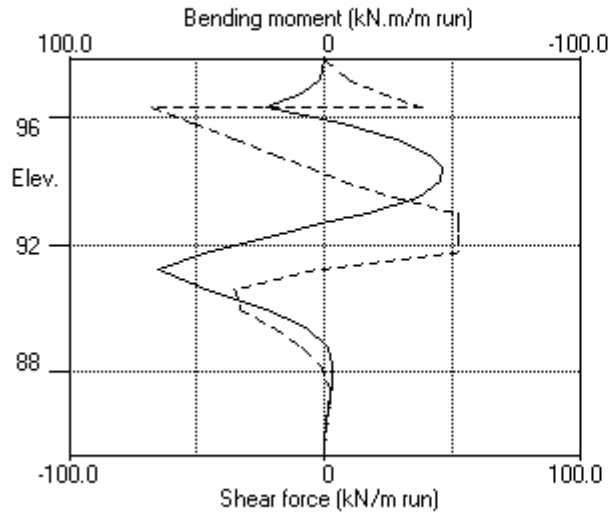
Stage No.7 Excavate to elevation 91.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
19	88.80	0.00	72.16	0.00	349.78	48.53	48.53	124886
20	88.20	0.00	86.68	0.00	400.63	60.01	60.01	124886
21	87.60	0.00	101.24	0.00	451.63	69.40	69.40	124886
22	87.25	0.00	109.75	0.00	481.45	73.81	73.81	124886
23	86.90	0.00	118.28	0.00	511.33	77.60	77.60	124886
24	86.40	0.00	130.50	0.40	554.12	82.28	82.28	124886
25	85.90	0.00	142.76	3.06	597.05	86.55	86.55	124886
26	85.40	0.00	155.05	5.74	640.10	90.82	90.82	124886

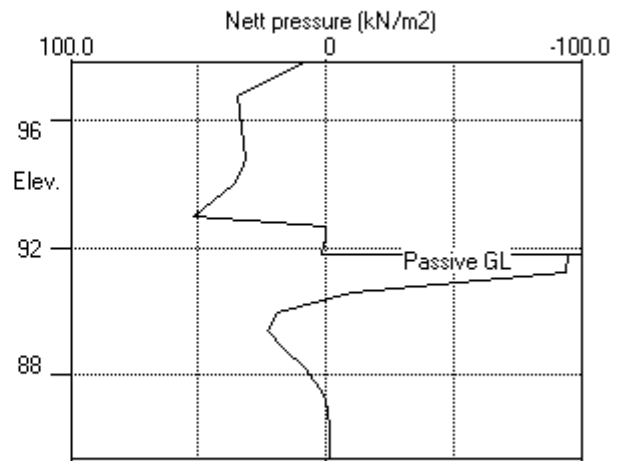
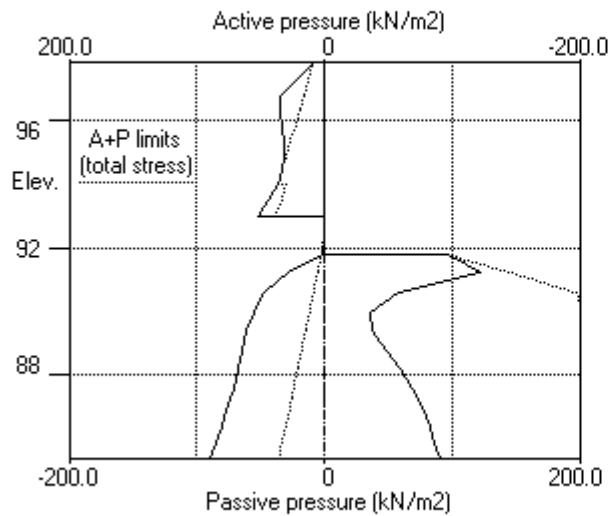
Note: 1.85a Soil pressure at active limit
 96.97p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. 91.80 on PASSIVE side



Stage No.7 Excav. to elev. 91.80 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.07 - SW3 Section 1 - TCB 97.8 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW3 - Section 1 | Checked :

Units: kN,m

Stage No. 9 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
9	97.80	86.40	More than one strut		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.80	9.43	0.009	1.02E-03	0.0	-0.0	
2	97.20	25.61	0.008	1.00E-03	10.5	1.8	
3	96.75	36.85	0.008	9.50E-04	24.6	9.4	
4	96.30	36.25	0.008	7.75E-04	41.0	24.3	101.6
		36.25	0.008	7.75E-04	-60.6	24.3	
5	95.80	35.43	0.007	6.42E-04	-42.7	-1.3	
6	95.30	34.78	0.007	7.52E-04	-25.1	-17.9	
7	94.80	34.62	0.007	1.00E-03	-7.8	-25.8	
8	94.40	35.73	0.006	1.24E-03	6.3	-26.3	
9	94.00	39.00	0.006	1.46E-03	21.3	-20.4	
10	93.50	46.35	0.005	1.60E-03	42.6	-4.7	
11	93.00	53.72	0.004	1.50E-03	67.6	22.6	
		30.22	0.004	1.50E-03	67.6	22.6	
12	92.65	18.78	0.003	1.21E-03	76.2	48.5	
13	92.30	3.56	0.003	7.11E-04	80.1	75.9	123.7
		3.56	0.003	7.11E-04	-43.6	75.9	
14	91.80	1.85	0.003	-3.01E-05	-42.2	52.7	
15	91.20	4.98	0.003	-6.18E-04	-40.2	32.2	
16	90.60	8.11	0.004	-8.90E-04	-36.2	6.9	
17	90.00	11.24	0.004	-8.42E-04	-30.4	-13.8	
18	89.40	14.37	0.005	-5.40E-04	-22.7	-29.9	
19	88.80	17.50	0.005	-5.30E-05	-13.2	-40.4	
20	88.20	20.63	0.005	5.36E-04	-1.7	-44.6	
21	87.60	23.76	0.004	1.13E-03	11.6	-41.6	
22	87.25	25.58	0.004	1.44E-03	20.2	-36.0	
23	86.90	27.41	0.003	1.70E-03	29.5	-27.3	
24	86.40	30.98	0.002	1.90E-03	44.1	-6.9	
		-73.02	0.002	1.90E-03	44.1	-6.9	
25	85.90	-84.69	0.001	1.91E-03	4.7	4.4	
26	85.40	66.07	0.000	1.89E-03	0.0	-0.0	
Strut force at elev. 96.30 =			101.59 kN/m	run =	243.82 kN/strut (horiz.)		
				=	344.81 kN/strut (incl.)		
Strut force at elev. 92.30 =			123.65 kN/m	run =	296.77 kN/strut (horiz.)		
				=	419.70 kN/strut (incl.)		

Stage No.9 Excavate to elevation 86.40 on PASSIVE side

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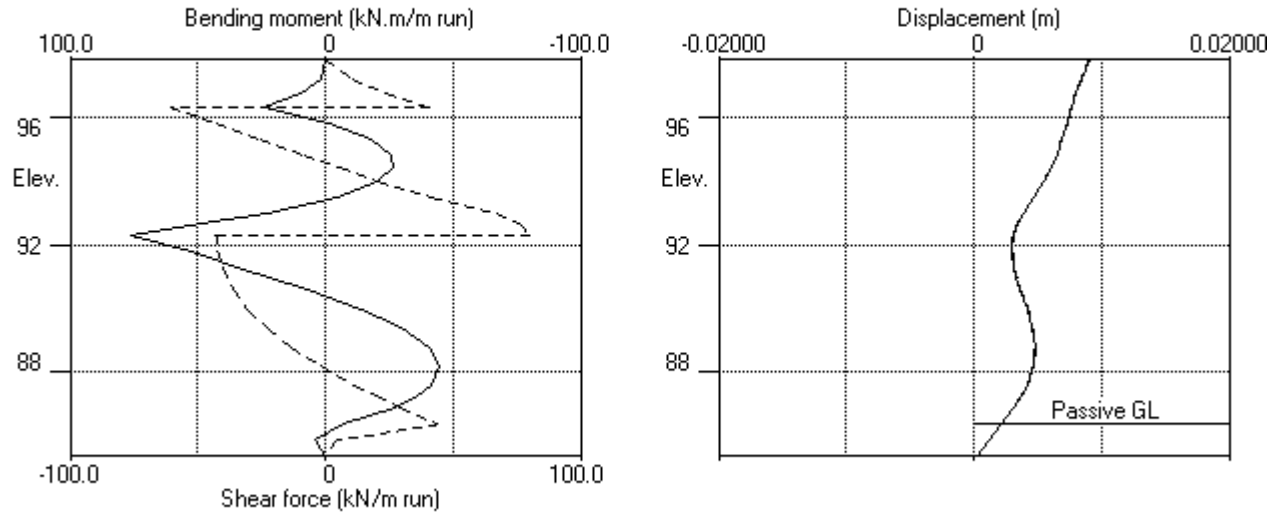
Stage No.9 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	104.01	104.01	104.01p	144148
25	85.90	0.00	12.00	0.00	146.05	146.05	146.05p	144148
26	85.40	0.00	24.01	0.00	188.13	29.46	29.46	510417

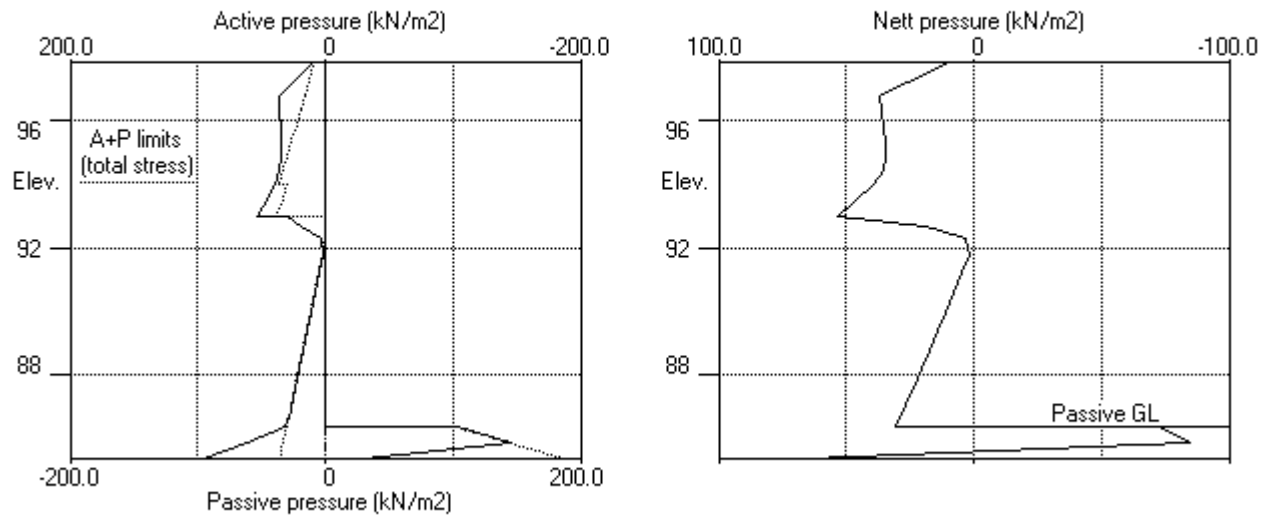
Note: 27.41a Soil pressure at active limit
 146.05p Soil pressure at passive limit

Units: kN,m

Stage No.9 Excav. to elev. 86.40 on PASSIVE side



Stage No.9 Excav. to elev. 86.40 on PASSIVE side



Units: kN,m

Stage No. 11 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
			Factor Moment	Toe Wall
			of equilib.	elev. Penetr
			Safety at elev.	-ation
Stage	--- G.L. ---	Strut	More than one strut	
No.	Act. Pass.	Elev.		
11	97.80	85.90		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
35.23kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.80	9.50	0.009	1.00E-03	0.0	-0.0	101.6
2	97.20	25.64	0.008	9.95E-04	10.5	1.8	
3	96.75	36.86	0.008	9.36E-04	24.6	9.5	
4	96.30	36.22	0.008	7.60E-04	41.0	24.4	
		36.22	0.008	7.60E-04	-60.6	24.4	124.0
5	95.80	35.40	0.007	6.26E-04	-42.7	-1.3	
6	95.30	34.73	0.007	7.37E-04	-25.2	-17.8	
7	94.80	34.55	0.007	9.89E-04	-7.8	-25.8	
8	94.40	35.66	0.006	1.22E-03	6.2	-26.3	
9	94.00	38.92	0.006	1.44E-03	21.1	-20.5	
10	93.50	46.25	0.005	1.59E-03	42.4	-4.9	
11	93.00	53.61	0.004	1.49E-03	67.4	22.3	
		28.16	0.004	1.49E-03	67.4	22.3	
12	92.65	16.58	0.004	1.20E-03	75.2	48.0	
13	92.30	1.27	0.003	7.10E-04	78.3	74.9	
		1.27	0.003	7.10E-04	-45.7	74.9	
14	91.80	2.16	0.003	-1.23E-05	-44.8	50.3	
15	91.20	6.10	0.003	-5.58E-04	-42.3	28.4	
16	90.60	10.34	0.004	-7.69E-04	-37.4	2.0	
17	90.00	15.93	0.004	-6.51E-04	-29.5	-19.0	
18	89.40	24.70	0.004	-2.86E-04	-17.3	-33.7	
19	88.80	34.49	0.004	2.18E-04	0.4	-39.1	

(continued)

Stage No.11 Excavate to elevation 85.40 on PASSIVE side

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
20	88.20	43.29	0.004	7.11E-04	23.8	-32.1	
21	87.60	42.32	0.004	1.00E-03	49.5	-9.7	
22	87.25	33.66	0.003	9.99E-04	62.8	10.3	
23	86.90	27.41	0.003	8.21E-04	73.4	33.7	120.4
		27.41	0.003	8.21E-04	-47.0	33.7	
24	86.40	30.01	0.003	5.33E-04	-32.6	16.2	
25	85.90	32.62	0.002	4.13E-04	-17.0	4.6	
26	85.40	35.23	0.002	3.86E-04	0.0	-0.0	
Strut force at elev.			96.30 =	101.64 kN/m	run =	243.94 kN/strut (horiz.)	
					=	344.99 kN/strut (incl.)	
Strut force at elev.			92.30 =	123.98 kN/m	run =	297.56 kN/strut (horiz.)	
					=	420.81 kN/strut (incl.)	
Strut force at elev.			86.90 =	120.41 kN/m	run =	289.00 kN/strut (horiz.)	
					=	408.70 kN/strut (incl.)	

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al limit kN/m2	Effective Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	97.80	0.00	20.00	8.12	49.28	9.50	9.50	1550
2	97.20	0.00	30.80	12.50	75.89	25.64	25.64	1550
3	96.75	0.00	38.90	15.79	95.85	36.86	36.86	1550
4	96.30	0.00	47.00	19.08	115.80	36.22	36.22	1550
5	95.80	0.00	56.00	22.73	137.98	35.40	35.40	1550
6	95.30	0.00	65.00	26.38	160.15	34.73	34.73	1550
7	94.80	0.00	74.00	30.03	182.32	34.55	34.55	1550
8	94.40	0.00	81.20	32.95	200.06	35.66	35.66	1550
9	94.00	0.00	88.40	35.88	217.80	38.92	38.92	1550
		0.00	88.40	29.51	233.50	38.92	38.92	1550
10	93.50	0.00	98.39	33.56	258.13	46.25	46.25	1550
11	93.00	0.00	108.39	37.62	282.77	53.61	53.61	1550
		0.00	108.39	0.00	627.16	28.16	28.16	28371
12	92.65	0.00	116.79	0.00	665.78	16.58	16.58	28371
13	92.30	0.00	125.19	0.00	704.40	1.27	1.27	28371
14	91.80	0.00	137.18	1.85	759.57	2.16	2.16	44748
15	91.20	0.00	151.58	4.98	825.77	6.10	6.10	44748
16	90.60	0.00	165.97	8.11	891.97	10.34	10.34	44748
17	90.00	0.00	180.37	11.24	958.16	15.93	15.93	44748
18	89.40	0.00	194.76	14.37	1024.35	24.70	24.70	44748
19	88.80	0.00	209.15	17.50	1090.53	34.49	34.49	44748
20	88.20	0.00	223.54	20.63	1156.71	43.29	43.29	44748
21	87.60	0.00	237.93	23.76	1222.88	42.32	42.32	80678
22	87.25	0.00	246.32	25.58	1261.48	33.66	33.66	80678
23	86.90	0.00	254.71	27.41	1300.07	27.41	27.41a	80678
24	86.40	0.00	266.70	30.01	1355.20	30.01	30.01a	80678
25	85.90	0.00	278.69	32.62	1410.33	32.62	32.62a	80678
		0.00	278.69	32.62	1057.75	32.62	32.62a	80678
26	85.40	0.00	290.67	35.23	1099.09	35.23	35.23a	80678

(continued)

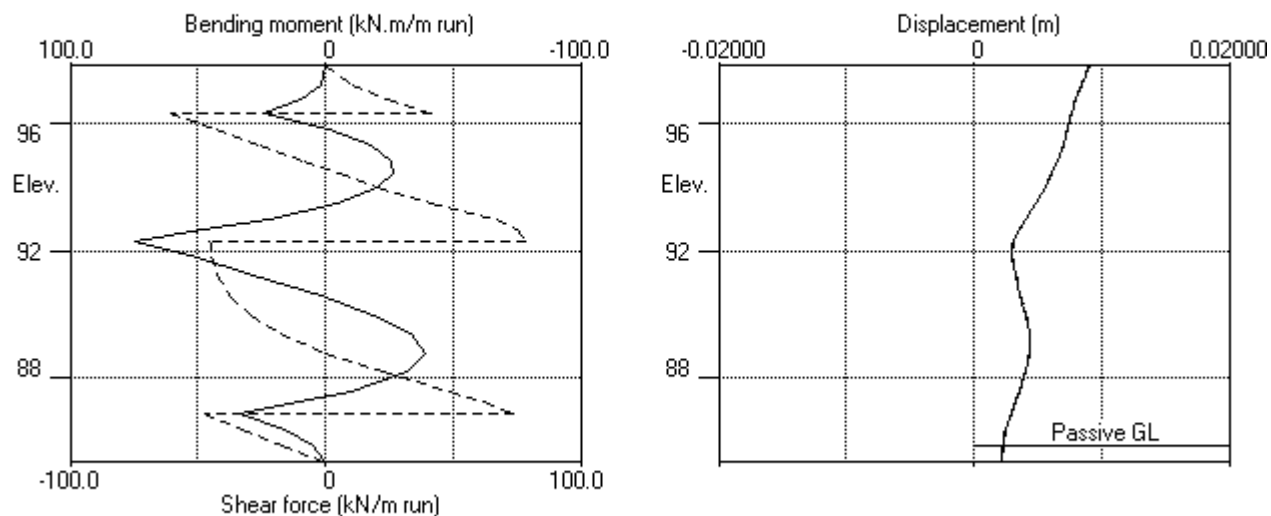
Stage No.11 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	97.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	97.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	96.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	96.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	95.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	94.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	94.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	92.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
25	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
26	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

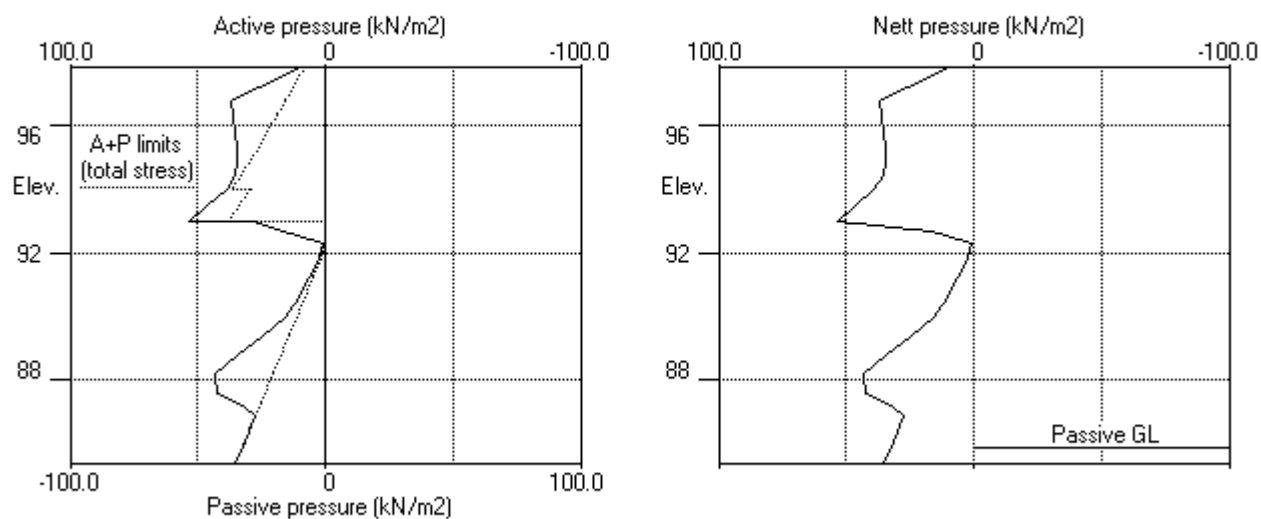
Note: 35.23a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.11 Excav. to elev. 85.40 on PASSIVE side



Stage No.11 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
Licensed from GEOSOLVE	Made by : VR
Data filename/Run ID: 2021.04.07 - SW3 Section 1 - TCB 97.8	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW3 - Section 1	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for
No.	Act.	Pass.	Elev.	Factor	elev. = 85.40	FoS = 1.000
				Moment		
				of		
				equilib.		
				Safety	at elev.	
						Penetr
						-ation
1	97.80	97.80	Cant.	Conditions not suitable for FoS calc.		
2	97.80	97.80	Cant.	Conditions not suitable for FoS calc.		
3	97.80	95.80	Cant.	4.980 86.85 92.73 3.07		
4	97.80	95.80	96.30	Conditions not suitable for FoS calc.		
5	97.80	95.80	96.30	Conditions not suitable for FoS calc.		
6	97.80	95.80	96.30	Conditions not suitable for FoS calc.		
7	97.80	91.80	96.30	3.873 n/a 91.51 0.29		
8	97.80	91.80		More than one strut		
All remaining stages have more than one strut - FoS calculation n/a						

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	97.80	0.019	0.000	0.0	-0.0	0.0	0.0
2	97.20	0.017	0.000	2.1	0.0	14.0	0.0
3	96.75	0.015	0.000	11.9	0.0	29.5	-0.1
4	96.30	0.013	0.000	28.8	0.0	45.0	-67.9
5	95.80	0.010	0.000	14.0	-7.0	18.7	-51.1
6	95.30	0.009	0.000	24.7	-28.1	22.6	-34.9
7	94.80	0.008	0.000	36.1	-41.2	18.8	-18.9
8	94.40	0.008	0.000	42.5	-46.3	14.0	-5.9
9	94.00	0.007	0.000	47.6	-45.6	21.3	0.0
10	93.50	0.006	0.000	52.8	-36.9	42.6	0.0
11	93.00	0.005	0.000	59.2	-17.1	67.6	0.0
12	92.65	0.004	0.000	59.1	0.0	76.2	-13.3
13	92.30	0.003	0.000	75.9	0.0	89.0	-45.7
14	91.80	0.003	0.000	52.7	0.0	52.6	-44.8
15	91.20	0.003	-0.000	65.5	0.0	0.0	-42.5
16	90.60	0.004	-0.000	46.0	0.0	0.0	-38.5
17	90.00	0.004	0.000	23.0	-19.5	0.0	-32.7
18	89.40	0.005	0.000	6.8	-36.5	0.0	-22.7
19	88.80	0.005	0.000	0.0	-45.9	0.6	-13.2
20	88.20	0.005	0.000	0.0	-44.6	23.8	-1.7
21	87.60	0.004	0.000	0.0	-41.6	49.5	0.0
22	87.25	0.004	0.000	10.3	-36.0	62.8	0.0
23	86.90	0.003	0.000	33.7	-27.3	81.9	-47.0
24	86.40	0.003	0.000	16.2	-6.9	44.1	-32.6
25	85.90	0.002	0.000	4.6	-0.2	4.7	-17.0
26	85.40	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	2.6	92.65	-0.1	88.80	2.2	93.00	-1.3	91.80
2	2.9	92.30	-0.1	88.20	3.0	93.00	-1.4	91.20
3	59.2	93.00	-2.4	89.40	22.6	95.30	-33.3	91.80
4	28.8	96.30	-1.1	88.80	45.0	96.30	-43.4	96.30
5	20.7	96.30	-7.2	94.80	39.0	96.30	-44.2	96.30
6	27.2	92.65	-3.3	94.80	44.1	96.30	-47.1	96.30
7	65.5	91.20	-46.3	94.40	52.6	91.80	-67.9	96.30
8	55.3	92.30	-37.7	94.40	89.0	92.30	-64.8	96.30
9	75.9	92.30	-44.6	88.20	80.1	92.30	-60.6	96.30
10	75.5	92.30	-45.9	88.80	81.9	86.90	-60.5	96.30
11	74.9	92.30	-39.1	88.80	78.3	92.30	-60.6	96.30

Maximum and minimum displacement at each stage

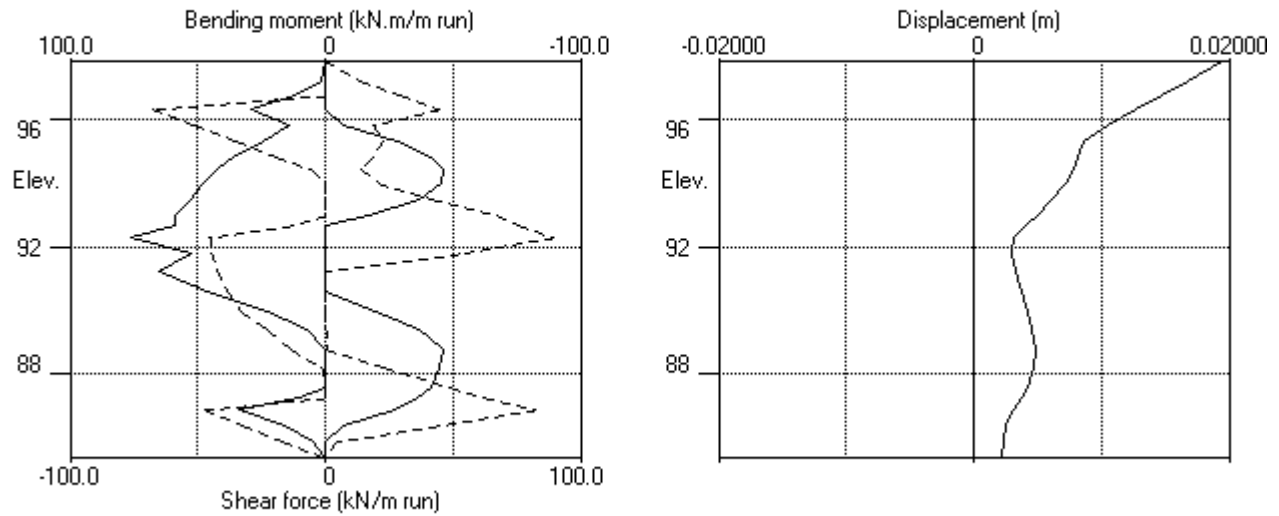
Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.001	97.80	0.000	97.80	Apply surcharge no.1 at elev. 97.80
2	0.001	97.80	0.000	97.80	Apply surcharge no.2 at elev. 97.80
3	0.019	97.80	-0.000	91.20	Excav. to elev. 95.80 on PASSIVE side
4	0.006	97.80	0.000	97.80	Install strut no.1 at elev. 96.30
5	0.004	97.80	0.000	97.80	Remove surcharge no.1 at elev. 97.80
6	0.007	97.80	0.000	97.80	Apply surcharge no.3 at elev. 97.80
7	0.010	97.80	0.000	97.80	Excav. to elev. 91.80 on PASSIVE side
8	0.010	97.80	0.000	97.80	Install strut no.2 at elev. 92.30
9	0.009	97.80	0.000	97.80	Excav. to elev. 86.40 on PASSIVE side
10	0.009	97.80	0.000	97.80	Install strut no.3 at elev. 86.90
11	0.009	97.80	0.000	97.80	Excav. to elev. 85.40 on PASSIVE side

Strut forces at each stage (horizontal components)

Stage no.	Strut no. 1		Strut no. 2		Strut no. 3	
	at elev. 96.30		at elev. 92.30		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
4	88.39	212.13	---	---	---	---
5	83.23	199.75	---	---	---	---
6	91.26	219.04	---	---	---	---
7	106.31	255.15	---	---	---	---
8	103.97	249.52	117.85	282.84	---	---
9	101.59	243.82	123.65	296.77	---	---
10	101.59	243.82	123.97	297.52	117.85	282.84
11	101.64	243.94	123.98	297.56	120.41	289.00

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	97.00	1 Fill	1 Fill
2	94.00	2 Res Soil	2 Res Soil
3	93.00	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
angle				angle			
adhesion				adhesion			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	95.00	2.40	0.000300	2.000E+08	5.00	45.00	200.0	No
2	91.00	2.40	0.000450	2.000E+08	5.00	45.00	300.0	No
3	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	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	97.00	0.00 (A)	100.00	6.00	5.00	=	N/A	N/A
2	97.00	6.00 (A)	100.00	100.00	20.00	=	N/A	N/A
3	97.00	0.00 (A)	100.00	6.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 97.00
2	Apply surcharge no.2 at elevation 97.00
3	Excavate to elevation 94.50 on PASSIVE side
4	Install strut or anchor no.1 at elevation 95.00
5	Remove surcharge no.1 at elevation 97.00
6	Apply surcharge no.3 at elevation 97.00
7	Excavate to elevation 90.50 on PASSIVE side
8	Install strut or anchor no.2 at elevation 91.00
9	Excavate to elevation 86.40 on PASSIVE side
10	Install strut or anchor no.3 at elevation 86.90
11	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

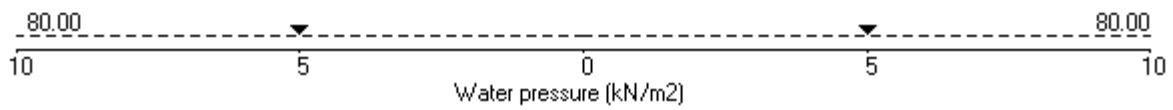
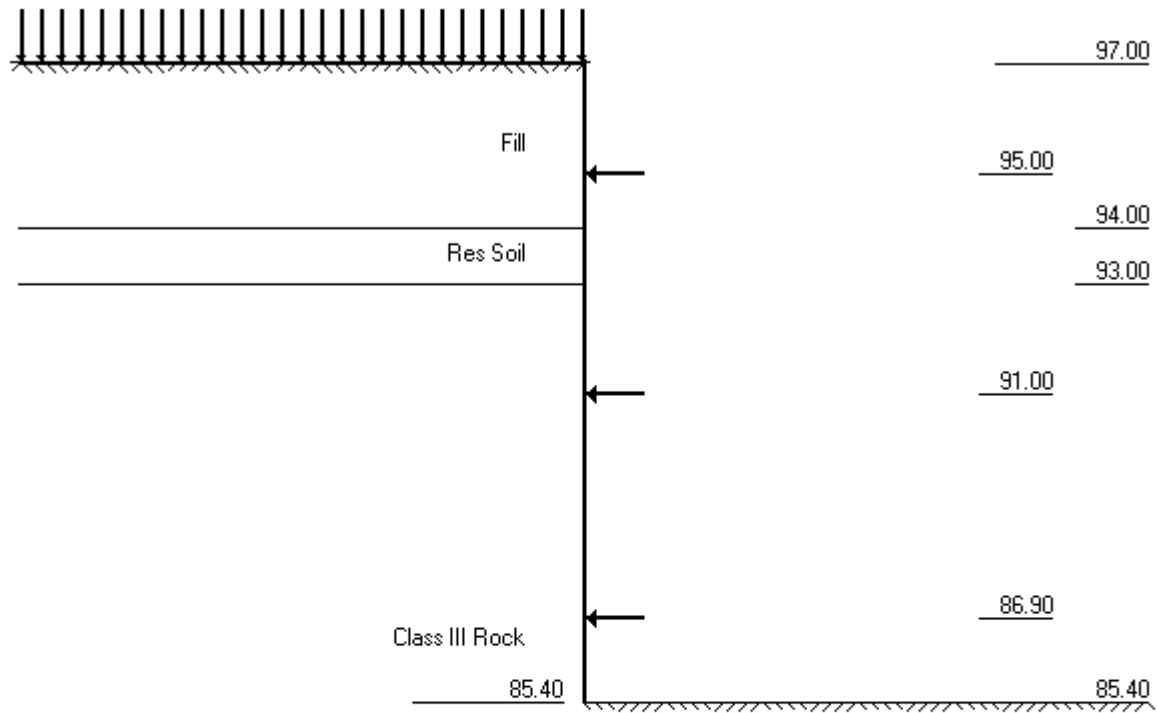
Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement	Active, Bending mom.	Graph. Passive output pressures
1	Apply surcharge no.1 at elev. 97.00	Yes	Yes	Yes
2	Apply surcharge no.2 at elev. 97.00	No	No	No
3	Excav. to elev. 94.50 on PASSIVE side	No	No	No
4	Install strut no.1 at elev. 95.00	No	No	No
5	Remove surcharge no.1 at elev. 97.00	No	No	No
6	Apply surcharge no.3 at elev. 97.00	No	No	No
7	Excav. to elev. 90.50 on PASSIVE side	No	No	No
8	Install strut no.2 at elev. 91.00	No	No	No
9	Excav. to elev. 86.40 on PASSIVE side	No	No	No
10	Install strut no.3 at elev. 86.90	No	No	No
11	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

Units: kN,m

Stage No.11 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.07 - SW3 Section 2 - TCB 97.0 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW3 - Section 2 | Checked :

Units: kN,m

Stage No. 3 Excavate to elevation 94.50 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
3	97.00 94.50	Cant.		4.352	86.67	91.92	2.58

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.00	2.03	0.017	4.30E-03	0.0	0.0	
2	96.50	5.68	0.015	4.29E-03	1.9	0.5	
3	96.00	9.35	0.013	4.28E-03	5.7	2.3	
4	95.50	13.02	0.010	4.23E-03	11.3	6.5	
5	95.00	16.72	0.008	4.11E-03	18.7	13.9	
6	94.50	20.45	0.006	3.88E-03	28.0	25.5	
7	94.00	2.02	0.004	3.50E-03	33.6	41.3	
		-10.64	0.004	3.50E-03	33.6	41.3	
8	93.50	1.25	0.003	2.93E-03	31.3	56.7	
9	93.00	10.75	0.002	2.18E-03	34.3	72.5	
		-146.18	0.002	2.18E-03	34.3	72.5	
10	92.40	-57.55	0.001	1.21E-03	-26.8	68.2	
11	91.80	7.05	0.000	4.51E-04	-42.0	41.7	
12	91.40	23.92	-0.000	1.41E-04	-35.8	25.5	
13	91.00	26.57	-0.000	-3.68E-05	-25.7	13.1	
14	90.50	19.50	-0.000	-1.33E-04	-14.2	3.6	
15	89.95	10.14	0.000	-1.47E-04	-6.0	-1.3	
16	89.40	5.70	0.000	-1.19E-04	-1.7	-3.1	
17	88.80	2.23	0.000	-7.75E-05	0.7	-3.0	
18	88.20	0.26	0.000	-4.11E-05	1.5	-2.2	
19	87.60	-0.60	0.000	-1.68E-05	1.3	-1.3	
20	87.25	-0.76	0.000	-8.18E-06	1.1	-0.9	
21	86.90	-0.78	0.000	-2.64E-06	0.8	-0.5	
22	86.40	-0.66	0.000	1.43E-06	0.5	-0.2	
23	85.90	-0.48	0.000	2.74E-06	0.2	-0.0	
24	85.40	-0.28	0.000	2.95E-06	0.0	-0.0	

(continued)

Stage No.3 Excavate to elevation 94.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.00	0.00	5.00	2.03	12.32	2.03	2.03a	2659
2	96.50	0.00	14.00	5.68	34.50	5.68	5.68a	2659
3	96.00	0.00	23.03	9.35	56.74	9.35	9.35a	2659
4	95.50	0.00	32.09	13.02	79.07	13.02	13.02a	2659
5	95.00	0.00	41.21	16.72	101.53	16.72	16.72a	2659
6	94.50	0.00	50.38	20.45	124.13	20.45	20.45a	2659
7	94.00	0.00	50.38	20.45	93.10	20.45	20.45a	2659
		0.00	59.61	24.19	111.06	24.19	24.19a	2659
8	93.50	0.00	59.61	17.82	121.92	21.93	21.93	2659
		0.00	69.88	21.99	141.25	32.13	32.13	2659
9	93.00	0.00	80.20	26.18	161.33	41.48	41.48	2659
10	92.40	0.00	80.20	0.00	373.14	0.00	0.00a	49085
		0.00	95.03	0.00	424.27	6.65	6.65	49085
11	91.80	0.00	109.88	0.00	475.51	35.30	35.30	49085
12	91.40	0.00	119.80	0.00	509.70	46.61	46.61	78571
13	91.00	0.00	129.71	0.23	543.90	51.33	51.33	78571
14	90.50	0.00	142.10	2.92	586.65	52.06	52.06	78571
15	89.95	0.00	155.73	5.88	633.65	52.06	52.06	30571
16	89.40	0.00	169.35	8.84	680.61	54.52	54.52	30571
17	88.80	0.00	184.18	12.07	731.86	57.89	57.89	30571
18	88.20	0.00	199.00	15.29	783.76	62.01	62.01	30571
19	87.60	0.00	213.79	18.51	835.58	66.69	66.69	30571
20	87.25	0.00	222.41	20.38	865.77	69.59	69.59	30571
21	86.90	0.00	231.02	22.26	895.94	72.56	72.56	30571
22	86.40	0.00	243.31	24.93	938.99	76.88	76.88	30571
23	85.90	0.00	255.59	27.60	981.99	81.23	81.23	30571
24	85.40	0.00	267.85	30.26	1024.94	85.58	85.58	30571

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	97.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	96.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	96.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	95.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	94.00	0.00	0.00	0.00	0.00	0.00	0.00	4722
		0.00	9.00	3.65	22.18	22.18	22.18p	4722
8	93.50	0.00	9.00	0.00	32.86	32.57	32.57	4722
		0.00	19.00	1.34	52.39	30.88	30.88	4722
9	93.00	0.00	29.01	5.40	71.92	30.73	30.73	4722
10	92.40	0.00	29.01	0.00	196.56	146.18	146.18	87615
		0.00	43.42	0.00	246.27	64.20	64.20	87615
11	91.80	0.00	57.85	0.00	296.02	28.24	28.24	87615
12	91.40	0.00	67.47	0.00	329.22	22.69	22.69	78571
13	91.00	0.00	77.10	0.00	362.49	24.77	24.77	78571
14	90.50	0.00	89.15	0.00	404.71	32.55	32.55	78571
15	89.95	0.00	102.41	0.00	451.21	41.92	41.92	30571
16	89.40	0.00	115.69	0.00	497.76	48.82	48.82	30571
17	88.80	0.00	130.20	0.33	548.61	55.66	55.66	30571
18	88.20	0.00	144.73	3.49	599.54	61.76	61.76	30571

(continued)

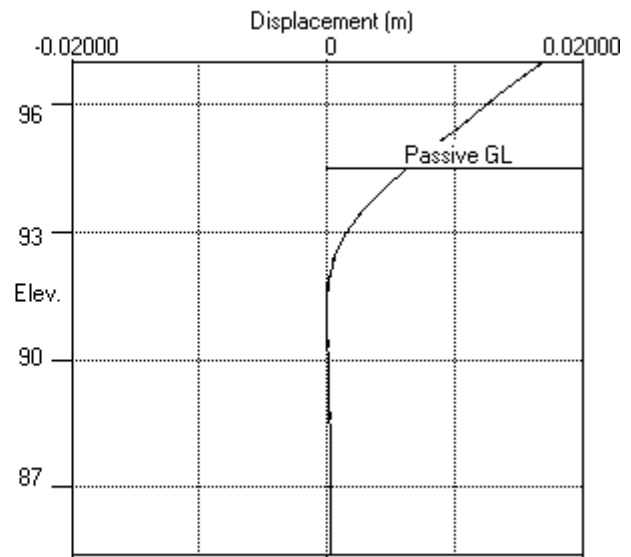
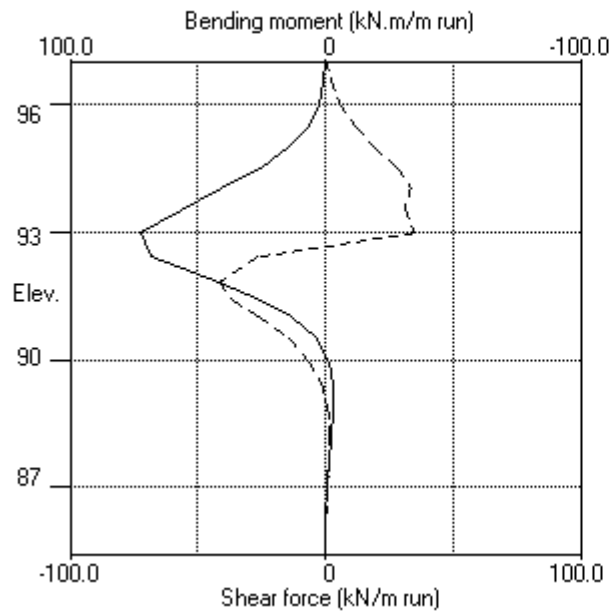
Stage No.3 Excavate to elevation 94.50 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
19	87.60	0.00	159.28	6.66	650.53	67.29	67.29	30571
20	87.25	0.00	167.78	8.50	680.32	70.36	70.36	30571
21	86.90	0.00	176.29	10.35	710.13	73.35	73.35	30571
22	86.40	0.00	188.46	13.00	752.76	77.54	77.54	30571
23	85.90	0.00	200.64	15.65	795.44	81.71	81.71	30571
24	85.40	0.00	212.83	18.30	838.17	85.87	85.87	30571

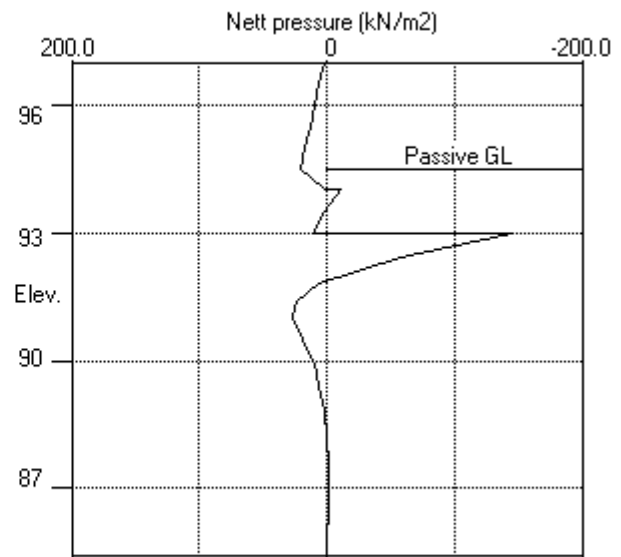
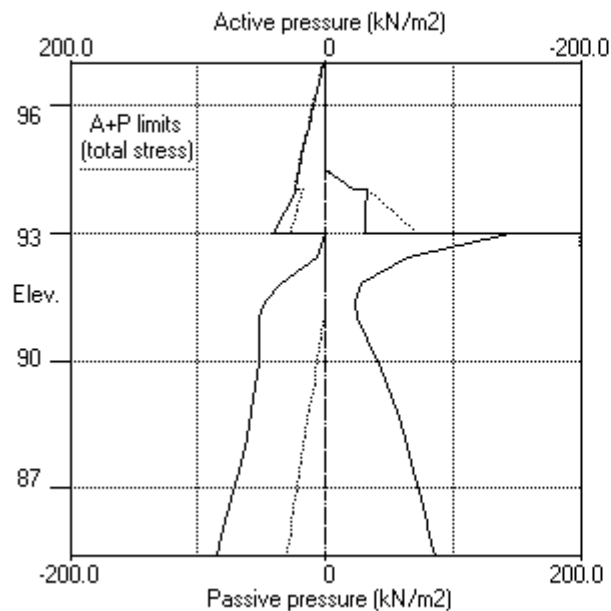
Note: 0.00a Soil pressure at active limit
 22.18p Soil pressure at passive limit

Units: kN,m

Stage No.3 Excav. to elev. 94.50 on PASSIVE side



Stage No.3 Excav. to elev. 94.50 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.07 - SW3 Section 2 - TCB 97.0 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW3 - Section 2 | Checked :

Units: kN,m

Stage No. 7 Excavate to elevation 90.50 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
7	97.00 90.50	95.00		3.170	n/a	90.42	0.08

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.00	8.12	0.017	2.97E-03	0.0	0.0	
2	96.50	14.31	0.015	2.96E-03	5.6	1.3	
3	96.00	16.79	0.014	2.92E-03	13.4	6.0	
4	95.50	19.22	0.012	2.80E-03	22.4	15.0	
5	95.00	22.73	0.011	2.55E-03	32.9	28.4	74.5
		22.73	0.011	2.55E-03	-41.6	28.4	
6	94.50	26.38	0.010	2.32E-03	-29.4	10.7	
7	94.00	30.03	0.009	2.26E-03	-15.3	-0.8	
		23.66	0.009	2.26E-03	-15.3	-0.8	
8	93.50	32.52	0.008	2.30E-03	-1.2	-5.1	
9	93.00	41.20	0.006	2.34E-03	17.2	-1.6	
		0.00	0.006	2.34E-03	17.2	-1.6	
10	92.40	0.00	0.005	2.30E-03	17.2	7.4	
11	91.80	0.00	0.004	2.14E-03	17.2	15.0	
12	91.40	0.81	0.003	1.97E-03	17.4	21.6	
13	91.00	2.90	0.002	1.74E-03	18.1	28.6	
14	90.50	20.83	0.001	1.34E-03	24.1	40.2	
		-77.05	0.001	1.34E-03	24.1	40.2	
15	89.95	-57.02	0.001	8.00E-04	-12.8	46.0	
16	89.40	-1.13	0.000	3.16E-04	-28.8	30.3	
17	88.80	19.08	0.000	1.74E-05	-23.4	12.8	
18	88.20	18.03	0.000	-8.66E-05	-12.3	2.2	
19	87.60	10.70	0.000	-8.87E-05	-3.7	-1.9	
20	87.25	6.56	0.000	-7.06E-05	-0.6	-2.5	
21	86.90	3.27	0.000	-5.08E-05	1.1	-2.4	
22	86.40	0.05	0.000	-2.89E-05	1.9	-1.4	
23	85.90	-1.99	0.000	-1.81E-05	1.4	-0.5	
24	85.40	-3.72	0.000	-1.54E-05	0.0	0.0	
Strut force at elev. 95.00 =			74.50 kN/m	run =	178.80 kN/strut (horiz.)		
				=	252.87 kN/strut (incl.)		

(continued)

Stage No.7 Excavate to elevation 90.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	97.00	0.00	20.00	8.12	49.28	8.12	8.12a	1368
2	96.50	0.00	29.00	11.77	71.45	14.31	14.31	1368
3	96.00	0.00	38.00	15.42	93.63	16.79	16.79	1368
4	95.50	0.00	47.00	19.08	115.80	19.22	19.22	1368
5	95.00	0.00	56.00	22.73	137.98	22.73	22.73a	1368
6	94.50	0.00	65.00	26.38	160.15	26.38	26.38a	1368
7	94.00	0.00	74.00	30.03	182.32	30.03	30.03a	1368
		0.00	74.00	23.66	198.02	23.66	23.66a	1368
8	93.50	0.00	84.00	27.72	222.66	32.52	32.52	1368
9	93.00	0.00	94.00	31.78	247.29	41.20	41.20	1368
		0.00	94.00	0.00	560.95	0.00	0.00a	24954
10	92.40	0.00	108.39	0.00	627.16	0.00	0.00a	24954
11	91.80	0.00	122.79	0.00	693.37	0.00	0.00a	24954
12	91.40	0.00	132.39	0.81	737.51	0.81	0.81a	24954
13	91.00	0.00	141.98	2.90	781.65	2.90	2.90a	24954
14	90.50	0.00	153.98	5.50	836.81	20.83	20.83	24954
		0.00	153.98	5.50	627.61	20.83	20.83	24954
15	89.95	0.00	167.18	8.37	673.12	38.42	38.42	24954
16	89.40	0.00	180.37	11.24	718.63	50.81	50.81	24954
17	88.80	0.00	194.76	14.37	768.27	58.25	58.25	24954
18	88.20	0.00	209.15	17.50	817.91	62.67	62.67	24954
19	87.60	0.00	223.54	20.63	867.54	66.35	66.35	24954
20	87.25	0.00	231.94	22.45	896.49	68.60	68.60	24954
21	86.90	0.00	240.33	24.28	925.44	71.02	71.02	24954
22	86.40	0.00	252.32	26.89	966.80	74.74	74.74	24954
23	85.90	0.00	264.31	29.49	1008.15	78.68	78.68	24954
24	85.40	0.00	276.30	32.10	1049.50	82.62	82.62	24954

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	97.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	96.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	96.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	95.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	97.88	97.88	97.88p	138452
15	89.95	0.00	13.20	0.00	144.13	95.43	95.43	138452
16	89.40	0.00	26.41	0.00	190.40	51.93	51.93	138452
17	88.80	0.00	40.83	0.00	240.94	39.17	39.17	138452
18	88.20	0.00	55.29	0.00	291.57	44.64	44.64	138452
19	87.60	0.00	69.77	0.00	342.31	55.65	55.65	138452
20	87.25	0.00	78.24	0.00	371.97	62.04	62.04	138452

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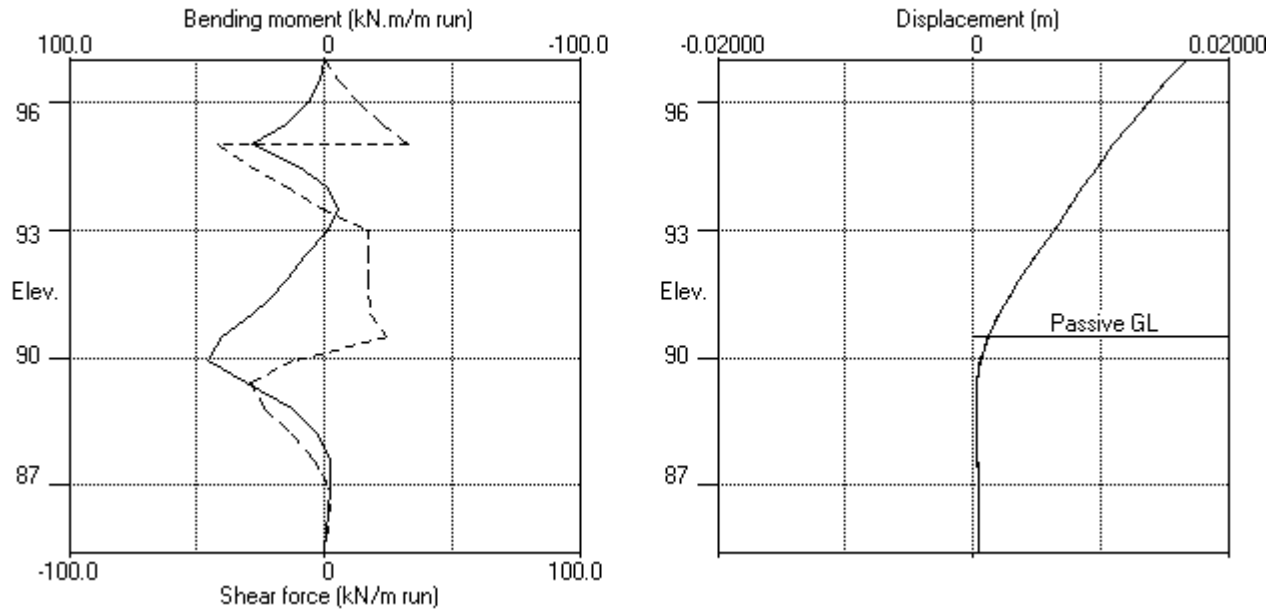
Stage No.7 Excavate to elevation 90.50 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
21	86.90	0.00	86.72	0.00	401.68	67.75	67.75	138452
22	86.40	0.00	98.87	0.00	444.23	74.69	74.69	138452
23	85.90	0.00	111.05	0.00	486.91	80.67	80.67	138452
24	85.40	0.00	123.27	0.00	529.72	86.34	86.34	138452

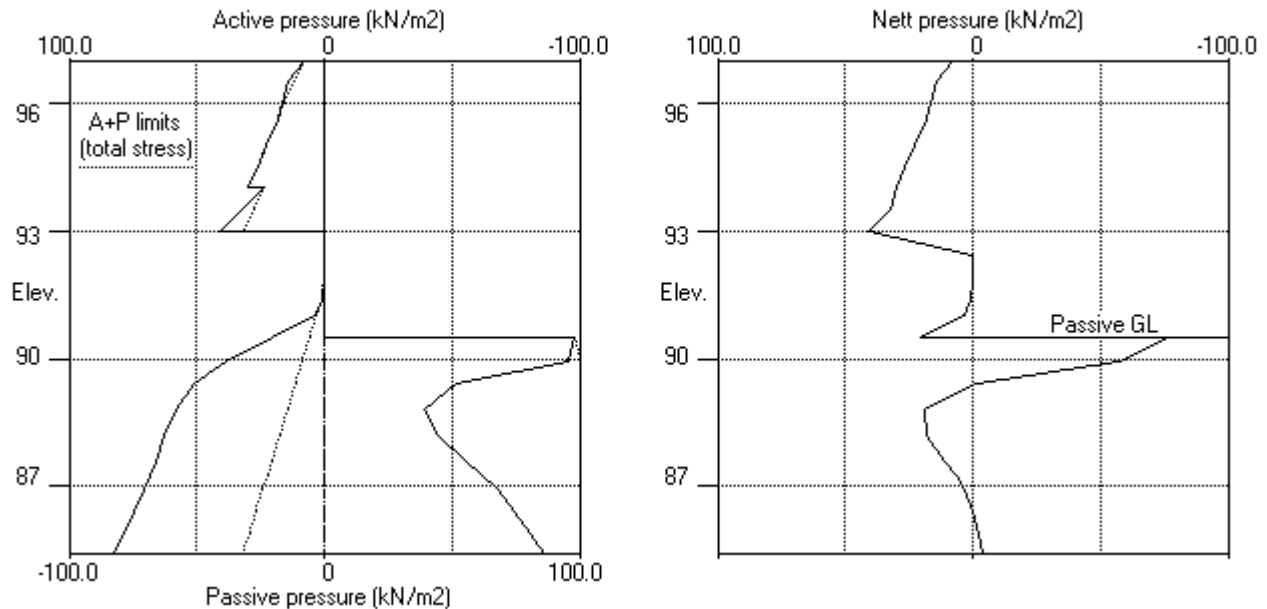
Note: 2.90a Soil pressure at active limit
 97.88p Soil pressure at passive limit

Units: kN,m

Stage No.7 Excav. to elev. 90.50 on PASSIVE side



Stage No.7 Excav. to elev. 90.50 on PASSIVE side



Units: kN,m

Stage No. 9 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
9	97.00	86.40	More than one strut		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.00	8.72	0.017	3.06E-03	0.0	0.0	
2	96.50	14.11	0.015	3.06E-03	5.7	1.4	
3	96.00	16.81	0.014	3.01E-03	13.4	6.1	
4	95.50	19.63	0.012	2.89E-03	22.5	15.1	
5	95.00	23.26	0.011	2.64E-03	33.3	28.7	73.8
		23.26	0.011	2.64E-03	-40.5	28.7	
6	94.50	26.97	0.009	2.41E-03	-28.0	11.5	
7	94.00	30.71	0.008	2.33E-03	-13.6	0.8	
		24.34	0.008	2.33E-03	-13.6	0.8	
8	93.50	33.27	0.007	2.34E-03	0.8	-2.6	
9	93.00	41.99	0.006	2.35E-03	19.7	2.1	
		14.65	0.006	2.35E-03	19.7	2.1	
10	92.40	14.86	0.005	2.23E-03	28.5	15.2	
11	91.80	13.22	0.003	1.90E-03	36.9	32.2	
12	91.40	10.43	0.003	1.53E-03	41.7	47.7	
13	91.00	5.55	0.002	1.01E-03	44.9	65.2	90.8
		5.55	0.002	1.01E-03	-46.0	65.2	
14	90.50	9.38	0.002	3.75E-04	-42.2	45.2	
15	89.95	9.90	0.002	-9.20E-05	-36.9	28.5	
16	89.40	11.24	0.002	-3.11E-04	-31.1	6.1	
17	88.80	14.37	0.002	-2.80E-04	-23.4	-10.7	
18	88.20	17.50	0.002	-5.61E-05	-13.9	-21.7	
19	87.60	20.63	0.002	2.75E-04	-2.4	-26.2	
20	87.25	22.69	0.002	4.81E-04	5.2	-24.7	
21	86.90	31.84	0.002	6.67E-04	14.7	-21.4	
22	86.40	47.73	0.001	8.48E-04	34.6	-9.8	
		-55.49	0.001	8.48E-04	34.6	-9.8	
23	85.90	-52.27	0.001	8.89E-04	7.7	2.7	
24	85.40	21.66	0.000	8.74E-04	0.0	0.0	
Strut force at elev. 95.00 =			73.80 kN/m	run =	177.13 kN/strut (horiz.)		
				=	250.50 kN/strut (incl.)		
Strut force at elev. 91.00 =			90.81 kN/m	run =	217.94 kN/strut (horiz.)		
				=	308.22 kN/strut (incl.)		

Stage No.9 Excavate to elevation 86.40 on PASSIVE side

[illegible]

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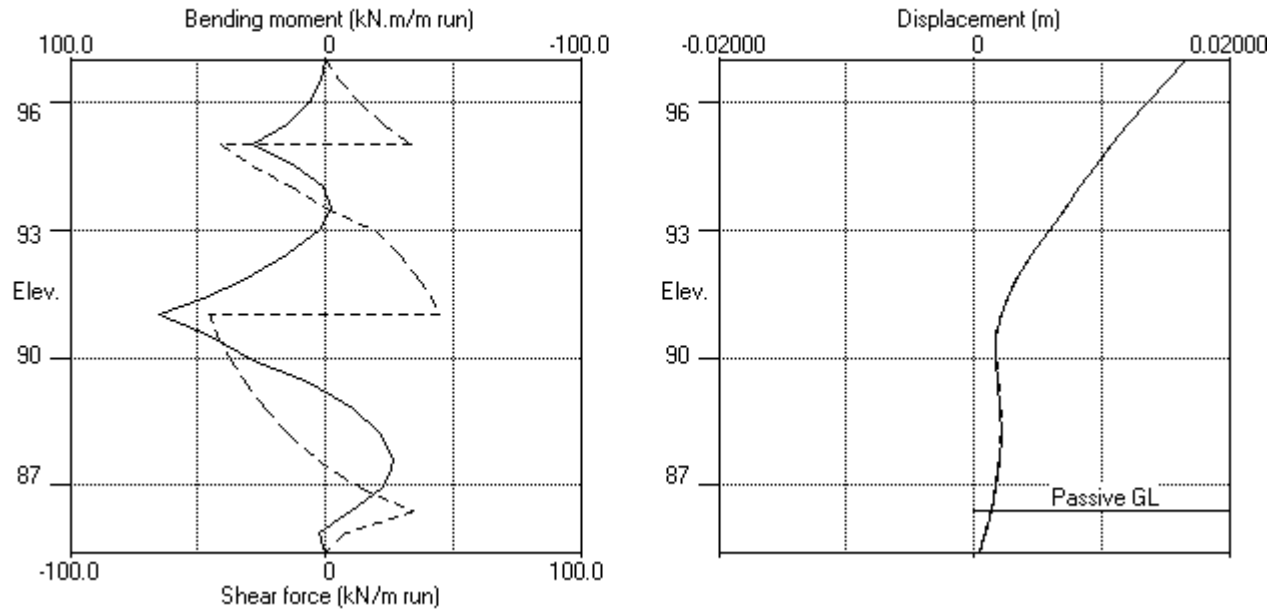
Stage No.9 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
22	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	103.22	103.22	103.22p	137253
23	85.90	0.00	12.00	0.00	145.27	117.49	117.49	137253
24	85.40	0.00	24.01	0.00	187.35	61.54	61.54	137253

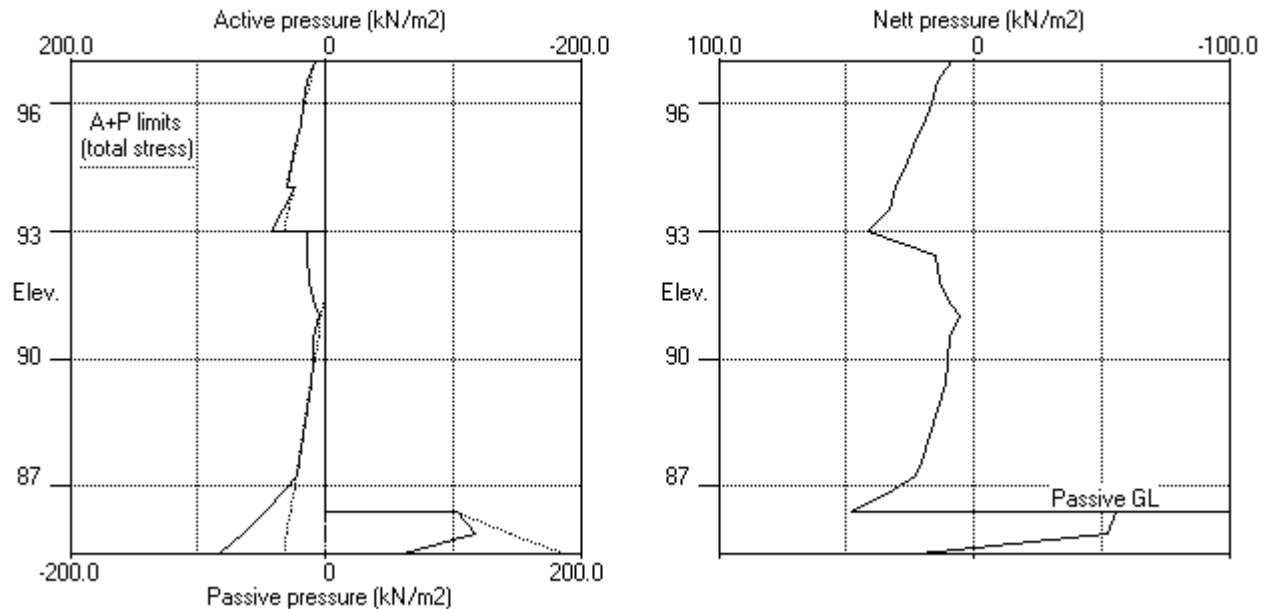
Note: 20.63a Soil pressure at active limit
 103.22p Soil pressure at passive limit

Units: kN,m

Stage No.9 Excav. to elev. 86.40 on PASSIVE side



Stage No.9 Excav. to elev. 86.40 on PASSIVE side



Units: kN,m

Stage No. 11 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
11	97.00	85.90	More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
32.10kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	97.00	8.71	0.017	3.05E-03	0.0	0.0	
2	96.50	14.09	0.015	3.05E-03	5.7	1.4	
3	96.00	16.78	0.014	3.00E-03	13.4	6.1	
4	95.50	19.59	0.012	2.88E-03	22.5	15.1	
5	95.00	23.21	0.011	2.63E-03	33.2	28.7	73.9
		23.21	0.011	2.63E-03	-40.7	28.7	
6	94.50	26.91	0.010	2.40E-03	-28.1	11.4	
7	94.00	30.64	0.008	2.33E-03	-13.8	0.6	
		24.27	0.008	2.33E-03	-13.8	0.6	
8	93.50	33.20	0.007	2.34E-03	0.6	-2.9	
9	93.00	41.92	0.006	2.35E-03	19.4	1.7	
		13.38	0.006	2.35E-03	19.4	1.7	
10	92.40	13.66	0.005	2.24E-03	27.5	14.4	
11	91.80	12.38	0.003	1.93E-03	35.3	30.6	
12	91.40	10.18	0.003	1.57E-03	39.8	45.4	
13	91.00	6.21	0.002	1.08E-03	43.1	62.1	90.8
		6.21	0.002	1.08E-03	-47.7	62.1	
14	90.50	11.73	0.002	4.85E-04	-43.2	41.3	
15	89.95	15.35	0.002	6.74E-05	-35.7	24.5	
16	89.40	20.83	0.002	-1.10E-04	-25.8	3.6	
17	88.80	28.99	0.002	-7.84E-05	-10.8	-8.3	
18	88.20	35.83	0.002	4.20E-05	8.6	-9.1	

Stage No.11 Excavate to elevation 85.40 on PASSIVE side

[illegible]

(continued)

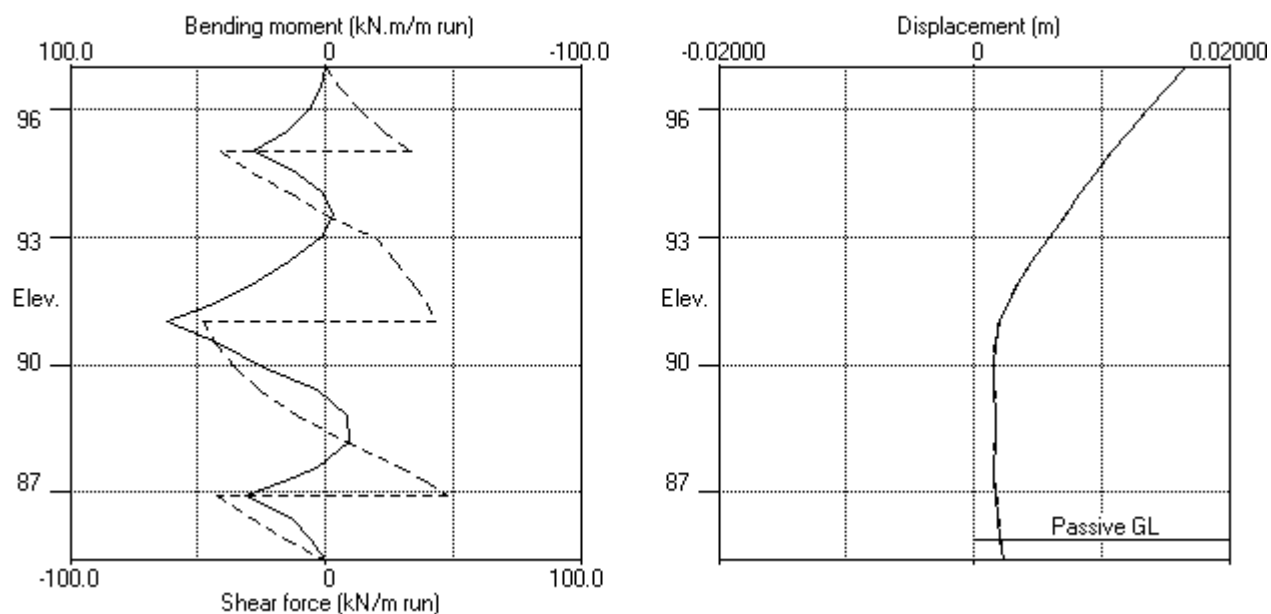
Stage No.11 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
5	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	89.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

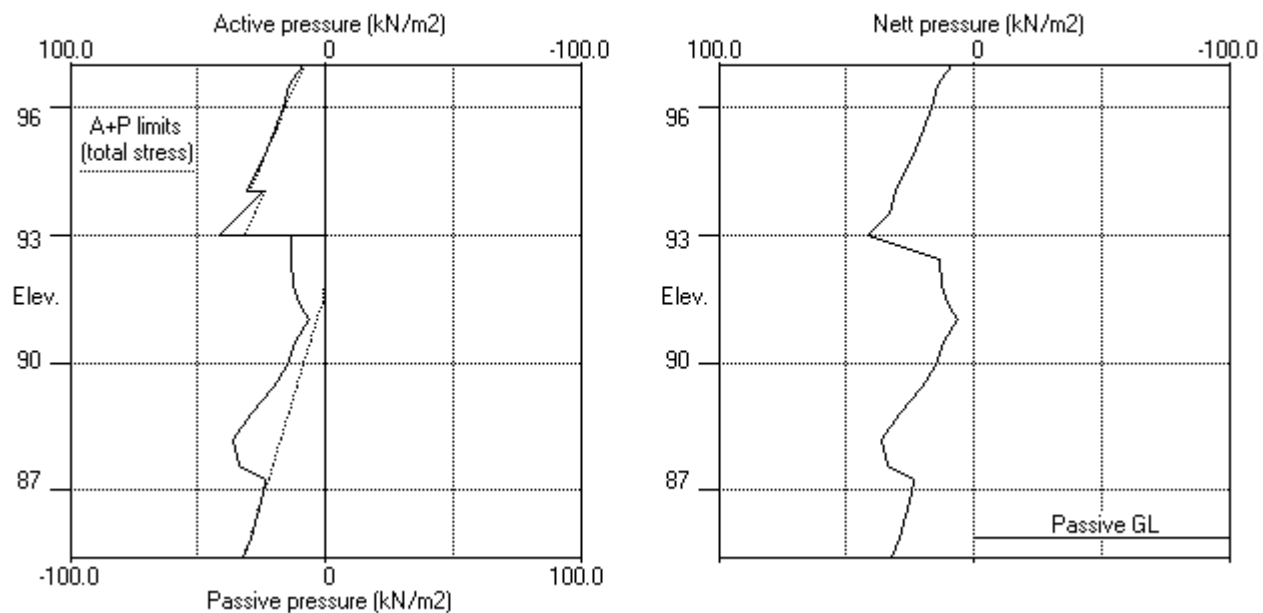
Note: 32.10a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.11 Excav. to elev. 85.40 on PASSIVE side



Stage No.11 Excav. to elev. 85.40 on PASSIVE side



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Data filename/Run ID: 2021.04.07 - SW3 Section 2 - TCB 97.0	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW3 - Section 2	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	FoS for toe elev. = 85.40	Moment of equilib. at elev.	Toe elev. for FoS = 1.000	Wall Penetr -ation
1	97.00 97.00	Cant.	Conditions not suitable for FoS calc.			
2	97.00 97.00	Cant.	Conditions not suitable for FoS calc.			
3	97.00 94.50	Cant.	4.352	86.67	91.92	2.58
4	97.00 94.50	95.00	Conditions not suitable for FoS calc.			
5	97.00 94.50	95.00	Conditions not suitable for FoS calc.			
6	97.00 94.50	95.00	Conditions not suitable for FoS calc.			
7	97.00 90.50	95.00	3.170	n/a	90.42	0.08
8	97.00 90.50	More than one strut				
All remaining stages have more than one strut - FoS calculation n/a						

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	97.00	0.017	0.000	0.0	0.0	0.0	0.0
2	96.50	0.015	0.000	1.4	0.0	7.6	0.0
3	96.00	0.014	0.000	7.6	0.0	17.7	0.0
4	95.50	0.012	0.000	19.3	0.0	29.9	-0.0
5	95.00	0.011	0.000	37.6	0.0	43.5	-42.4
6	94.50	0.010	0.000	32.3	0.0	28.0	-30.1
7	94.00	0.009	0.000	41.3	-2.5	33.6	-15.9
8	93.50	0.008	0.000	56.7	-7.1	31.3	-1.7
9	93.00	0.006	0.000	72.5	-3.8	34.3	0.0
10	92.40	0.005	0.000	68.2	0.0	28.5	-26.8
11	91.80	0.004	0.000	41.7	0.0	36.9	-42.0
12	91.40	0.003	-0.000	47.7	0.0	44.6	-35.8
13	91.00	0.002	-0.000	65.2	0.0	54.2	-48.0
14	90.50	0.002	-0.000	45.8	0.0	24.1	-44.5
15	89.95	0.002	0.000	46.0	-1.3	0.0	-38.7
16	89.40	0.002	0.000	30.3	-3.1	0.0	-31.1
17	88.80	0.002	0.000	12.8	-15.0	0.7	-23.4
18	88.20	0.002	0.000	2.2	-21.7	8.6	-13.9
19	87.60	0.002	0.000	3.2	-26.2	29.4	-3.7
20	87.25	0.002	0.000	16.6	-24.7	39.5	-0.6
21	86.90	0.002	0.000	31.3	-21.4	54.1	-42.3
22	86.40	0.002	0.000	13.2	-9.8	34.6	-29.5
23	85.90	0.002	0.000	5.4	-0.5	7.7	-15.4
24	85.40	0.002	0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	2.6	92.40	-0.1	88.80	2.3	93.00	-1.4	91.80
2	2.8	92.40	-0.1	88.80	2.7	93.00	-1.4	91.40
3	72.5	93.00	-3.1	89.40	34.3	93.00	-42.0	91.80
4	38.0	93.00	-1.7	88.80	40.2	95.00	-23.1	91.80
5	32.6	92.40	-1.5	88.80	38.3	95.00	-20.1	91.80
6	47.4	93.00	-2.3	88.80	43.5	95.00	-28.4	91.80
7	46.0	89.95	-5.1	93.50	32.9	95.00	-41.6	95.00
8	57.6	91.00	-7.1	93.50	54.2	91.00	-42.4	95.00
9	65.2	91.00	-26.2	87.60	44.9	91.00	-46.0	91.00
10	63.1	91.00	-21.6	88.20	54.1	86.90	-48.0	91.00
11	62.1	91.00	-9.1	88.20	47.9	86.90	-47.7	91.00

Summary of results (continued)

Maximum and minimum displacement at each stage

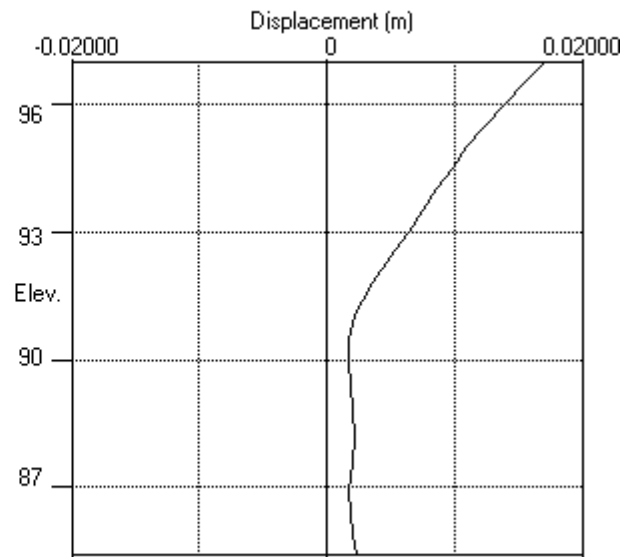
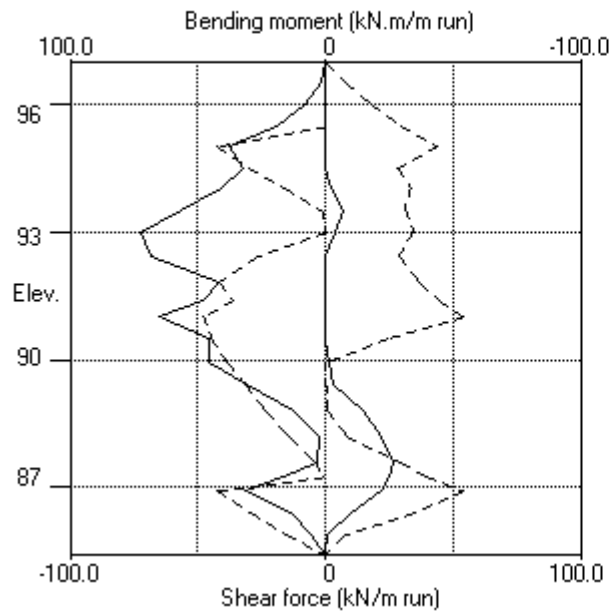
Stage no.	----- maximum m	Displacement elev.	----- minimum m	elev.	Stage description -----
1	0.001	97.00	0.000	97.00	Apply surcharge no.1 at elev. 97.00
2	0.001	97.00	0.000	97.00	Apply surcharge no.2 at elev. 97.00
3	0.017	97.00	-0.000	91.00	Excav. to elev. 94.50 on PASSIVE side
4	0.011	97.00	0.000	97.00	Install strut no.1 at elev. 95.00
5	0.009	97.00	0.000	97.00	Remove surcharge no.1 at elev. 97.00
6	0.013	97.00	0.000	97.00	Apply surcharge no.3 at elev. 97.00
7	0.017	97.00	0.000	97.00	Excav. to elev. 90.50 on PASSIVE side
8	0.017	97.00	0.000	97.00	Install strut no.2 at elev. 91.00
9	0.017	97.00	0.000	97.00	Excav. to elev. 86.40 on PASSIVE side
10	0.017	97.00	0.000	97.00	Install strut no.3 at elev. 86.90
11	0.017	97.00	0.000	97.00	Excav. to elev. 85.40 on PASSIVE side

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---		--- Strut no. 2 ---		--- Strut no. 3 ---	
	at elev. 95.00		at elev. 91.00		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
4	58.93	141.42	---	---	---	---
5	57.44	137.85	---	---	---	---
6	61.61	147.86	---	---	---	---
7	74.50	178.80	---	---	---	---
8	74.55	178.92	88.39	212.13	---	---
9	73.80	177.13	90.81	217.94	---	---
10	73.82	177.18	90.89	218.14	88.39	212.13
11	73.88	177.31	90.78	217.86	90.23	216.56

Units: kN,m

Bending moment, shear force, displacement envelopes



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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW3 - Section 3 | Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Active side	Passive side
1	96.20	1 Fill	1 Fill
2	95.60	2 Res Soil	2 Res Soil
3	94.10	3 Class V/IV Rock	3 Class V/IV Rock
4	93.20	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

----- Soil type -----	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction	Wall adhesion	Back-fill	Soil friction	Wall adhesion	Back-fill
No. Description	angle	coeff.	angle	angle	coeff.	angle
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	80.00	80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
 Soldier Pile width = 0.60 m
 Soldier Pile spacing = 2.40 m
 Passive mobilisation factor = 3.00 m
 Elevation of toe of wall = 85.40
 Maximum finite element length = 0.60 m
 Youngs modulus of wall E = 3.2800E+07 kN/m2
 Moment of inertia of wall I = 1.3200E-03 m4/m run
 E.I = 43296 kN.m2/m run
 Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	95.00	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes
2	91.00	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes
3	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	96.20	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 96.20
2	Excavate to elevation 94.50 on PASSIVE side
3	Install strut or anchor no.1 at elevation 95.00
4	Excavate to elevation 90.50 on PASSIVE side
5	Install strut or anchor no.2 at elevation 91.00
6	Excavate to elevation 86.40 on PASSIVE side
7	Install strut or anchor no.3 at elevation 86.90
8	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

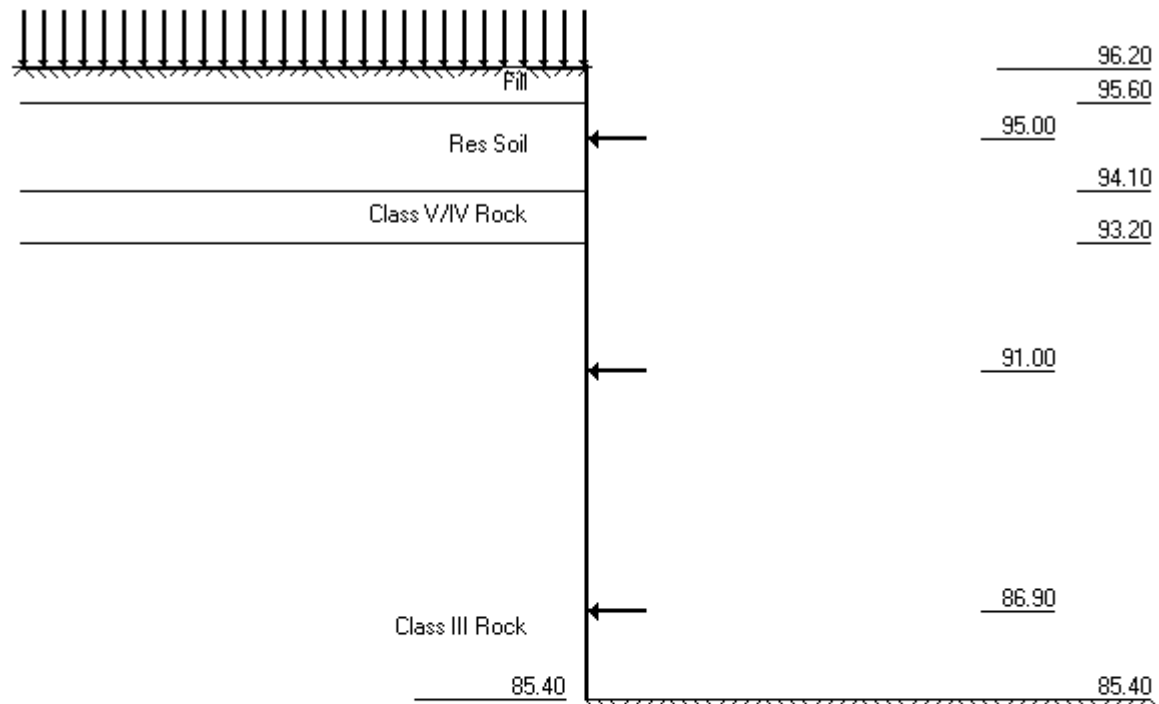
OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 96.20	Yes	Yes	Yes
2	Excav. to elev. 94.50 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 95.00	No	No	No
4	Excav. to elev. 90.50 on PASSIVE side	No	No	No
5	Install strut no.2 at elev. 91.00	No	No	No
6	Excav. to elev. 86.40 on PASSIVE side	No	No	No
7	Install strut no.3 at elev. 86.90	No	No	No
8	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

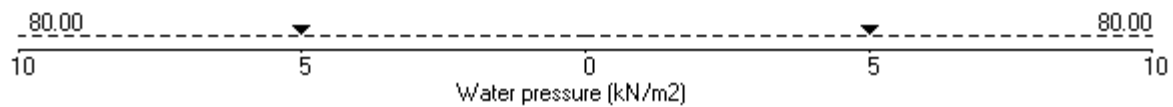
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Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW3 - Section 3 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 94.50 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	96.20 94.50	Cant.		4.963	86.62	92.79	1.71

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

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
1	96.20	8.12	0.006	2.00E-03	0.0	-0.0	
2	95.60	12.50	0.005	1.98E-03	6.2	2.0	
		6.13	0.005	1.98E-03	6.2	2.0	
3	95.00	11.00	0.004	1.92E-03	11.3	7.0	
4	94.50	19.24	0.003	1.80E-03	18.9	14.5	
		3.70	0.003	1.80E-03	18.9	14.5	
5	94.10	7.79	0.002	1.62E-03	21.2	22.6	
		-20.33	0.002	1.62E-03	21.2	22.6	
6	93.65	-10.01	0.001	1.35E-03	14.4	30.3	
7	93.20	1.91	0.001	1.01E-03	12.5	35.7	
		-72.25	0.001	1.01E-03	12.5	35.7	
8	92.80	-39.22	0.000	6.83E-04	-9.8	35.3	
9	92.40	-8.82	0.000	3.90E-04	-19.4	28.2	
10	91.80	10.22	0.000	9.05E-05	-19.0	15.0	
11	91.40	12.33	0.000	-1.71E-05	-14.4	8.3	
12	91.00	10.68	0.000	-7.14E-05	-9.8	3.5	
13	90.50	7.86	0.000	-9.09E-05	-5.2	-0.1	
14	89.95	4.63	0.000	-7.89E-05	-1.8	-1.8	
15	89.40	2.13	0.000	-5.46E-05	0.1	-2.1	
16	88.80	0.47	0.000	-2.92E-05	0.9	-1.6	
17	88.20	-0.30	0.000	-1.11E-05	0.9	-1.0	
18	87.60	-0.52	0.000	-6.82E-07	0.7	-0.5	
19	87.25	-0.50	0.000	2.56E-06	0.5	-0.3	
20	86.90	-0.43	0.000	4.38E-06	0.3	-0.2	
21	86.40	-0.30	0.000	5.49E-06	0.2	-0.0	
22	85.90	-0.16	0.000	5.72E-06	0.0	-0.0	
23	85.40	-0.01	0.000	5.72E-06	0.0	-0.0	

(continued)

Stage No.2 Excavate to elevation 94.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.20	0.00	20.00	8.12	49.28	8.12	8.12a	3217
2	95.60	0.00	30.80	12.50	75.89	12.50	12.50a	3217
		0.00	30.80	6.13	91.58	6.13	6.13a	3217
3	95.00	0.00	42.80	11.00	121.15	11.00	11.00a	3217
4	94.50	0.00	52.80	15.06	145.79	19.24	19.24	3217
		0.00	52.80	15.06	109.34	19.24	19.24	3217
5	94.10	0.00	60.80	18.31	124.13	26.08	26.08	3217
		0.00	60.80	11.27	182.68	11.27	11.27a	9243
6	93.65	0.00	71.15	14.07	211.32	17.20	17.20	9243
7	93.20	0.00	81.50	16.88	240.61	26.57	26.57	9243
		0.00	81.50	0.00	377.60	0.00	0.00a	59493
8	92.80	0.00	91.10	0.00	410.71	7.88	7.88	59493
9	92.40	0.00	100.70	0.00	443.82	23.84	23.84	59493
10	91.80	0.00	115.09	0.00	493.48	36.81	36.81	85739
11	91.40	0.00	124.69	0.00	526.59	41.21	41.21	342958
12	91.00	0.00	134.29	1.22	559.69	43.76	43.76	27518
13	90.50	0.00	146.29	3.83	601.07	46.55	46.55	27518
14	89.95	0.00	159.48	6.70	646.59	49.56	49.56	27518
15	89.40	0.00	172.68	9.57	692.10	52.94	52.94	27518
16	88.80	0.00	187.07	12.70	742.07	57.15	57.15	27518
17	88.20	0.00	201.46	15.83	792.50	61.82	61.82	27518
18	87.60	0.00	215.86	18.96	842.93	66.76	66.76	27518
19	87.25	0.00	224.25	20.78	872.34	69.72	69.72	27518
20	86.90	0.00	232.64	22.61	901.75	72.70	72.70	27518
21	86.40	0.00	244.63	25.22	943.77	76.98	76.98	27518
22	85.90	0.00	256.62	27.82	985.79	81.27	81.27	27518
23	85.40	0.00	268.61	30.43	1027.80	85.56	85.56	27518

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	15.54	15.54	15.54p	5173
5	94.10	0.00	8.00	0.00	31.13	18.29	18.29	5173
		0.00	8.00	0.00	39.37	31.61	31.61	14895
6	93.65	0.00	18.35	0.00	68.72	27.20	27.20	14895
7	93.20	0.00	28.70	2.57	98.07	24.66	24.66	14895
		0.00	28.70	0.00	195.51	72.25	72.25	96032
8	92.80	0.00	38.31	0.00	228.64	47.10	47.10	96032
9	92.40	0.00	47.92	0.00	261.77	32.67	32.67	96032
10	91.80	0.00	62.33	0.00	311.50	26.59	26.59	96032
11	91.40	0.00	71.95	0.00	344.67	28.89	28.89	342958
12	91.00	0.00	81.57	0.00	378.16	33.07	33.07	27518
13	90.50	0.00	93.61	0.00	420.33	38.68	38.68	27518
14	89.95	0.00	106.85	0.00	466.74	44.93	44.93	27518
15	89.40	0.00	120.11	0.00	513.19	50.80	50.80	27518
16	88.80	0.00	134.59	1.29	563.91	56.68	56.68	27518
17	88.20	0.00	149.09	4.44	614.69	62.12	62.12	27518
18	87.60	0.00	163.60	7.60	665.53	67.28	67.28	27518

(continued)

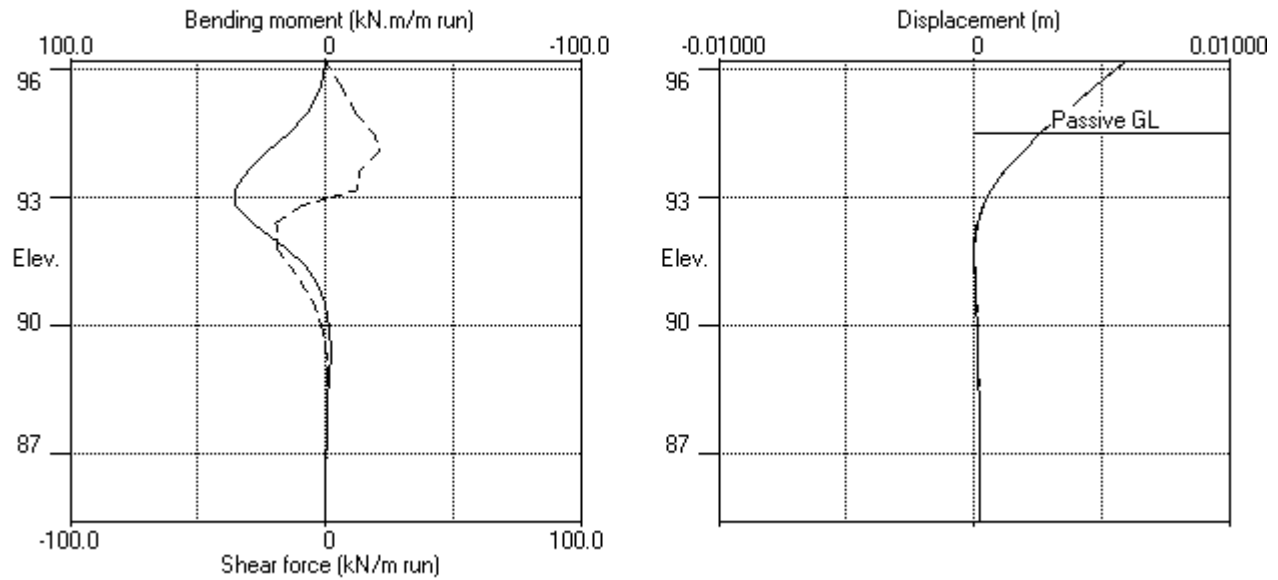
Stage No.2 Excavate to elevation 94.50 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
19	87.25	0.00	172.07	9.44	695.20	70.22	70.22	27518
20	86.90	0.00	180.55	11.28	724.90	73.14	73.14	27518
21	86.40	0.00	192.67	13.92	767.36	77.28	77.28	27518
22	85.90	0.00	204.80	16.55	809.86	81.43	81.43	27518
23	85.40	0.00	216.94	19.19	852.39	85.57	85.57	27518

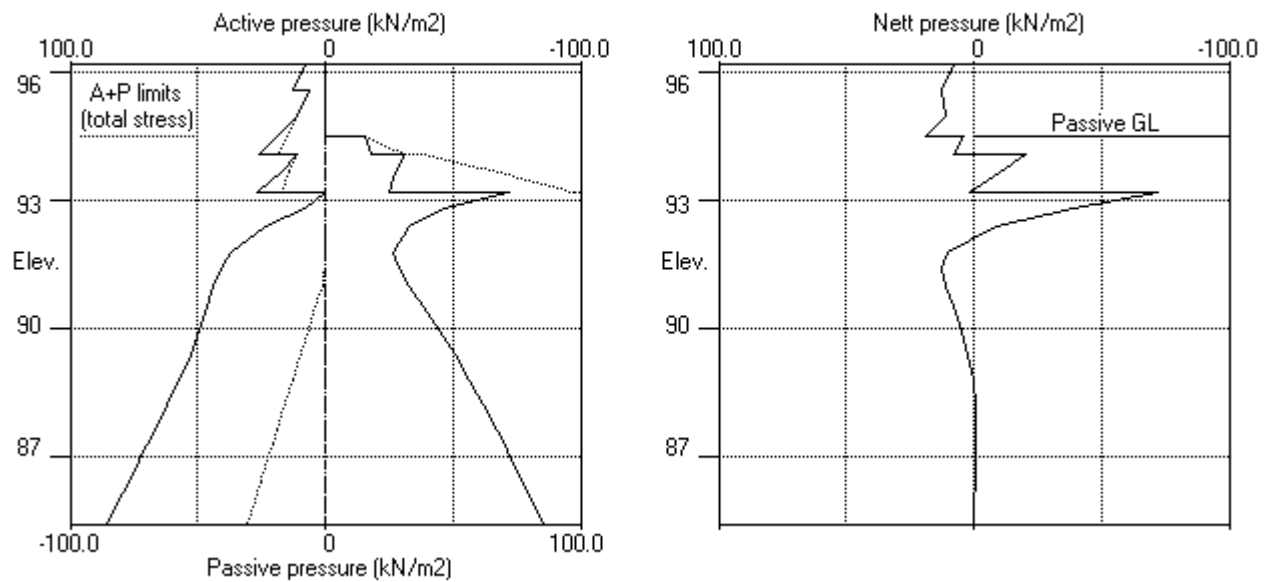
Note: 0.00a Soil pressure at active limit
 15.54p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 94.50 on PASSIVE side



Stage No.2 Excav. to elev. 94.50 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
Licensed from GEOSOLVE	Made by : VR
Data filename/Run ID: 2021.04.07 - SW3 Section 3 - TCB 96.2	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW3 - Section 3	Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 90.50 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000
				-----		-----
Stage	--- G.L. ---	Strut		Factor	Moment	Toe Wall
No.	Act. Pass.	Elev.		of	equilib.	elev. Penetr
				Safety	at elev.	-ation
4	96.20 90.50	95.00		3.277	n/a	90.46 0.04

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	96.20	23.09	0.002	1.57E-04	0.0	-0.0	
2	95.60	24.19	0.002	1.24E-04	14.2	4.7	
		17.82	0.002	1.24E-04	14.2	4.7	
3	95.00	19.32	0.002	-2.29E-05	25.3	16.6	62.4
		19.32	0.002	-2.29E-05	-37.1	16.6	
4	94.50	24.64	0.002	-1.24E-04	-26.1	1.0	
5	94.10	29.27	0.002	-9.56E-05	-15.3	-7.1	
		20.48	0.002	-9.56E-05	-15.3	-7.1	
6	93.65	20.27	0.002	1.06E-06	-6.1	-11.5	
7	93.20	25.03	0.002	1.23E-04	4.1	-12.0	
		0.00	0.002	1.23E-04	4.1	-12.0	
8	92.80	0.00	0.002	2.23E-04	4.1	-9.6	
9	92.40	0.00	0.002	3.04E-04	4.1	-8.0	
10	91.80	0.00	0.001	4.01E-04	4.1	-5.9	
11	91.40	7.77	0.001	4.44E-04	5.6	-3.4	
12	91.00	15.85	0.001	4.62E-04	10.3	-0.5	
13	90.50	26.32	0.001	4.25E-04	20.9	6.9	
		-44.45	0.001	4.25E-04	20.9	6.9	
14	89.95	-21.31	0.001	3.07E-04	2.8	11.6	
15	89.40	-6.26	0.000	1.71E-04	-4.8	9.9	
16	88.80	1.70	0.000	6.12E-05	-6.2	5.9	
17	88.20	3.90	0.000	2.59E-06	-4.5	2.5	
18	87.60	3.38	0.000	-1.88E-05	-2.3	0.6	
19	87.25	2.62	0.000	-2.09E-05	-1.2	-0.0	
20	86.90	1.81	0.000	-1.94E-05	-0.5	-0.3	
21	86.40	0.76	0.000	-1.57E-05	0.2	-0.3	
22	85.90	-0.13	0.000	-1.29E-05	0.3	-0.1	
23	85.40	-1.19	0.000	-1.21E-05	0.0	-0.0	
Strut force at elev. 95.00 =			62.41 kN/m	run =		149.77 kN/strut (horiz.)	
				=		211.81 kN/strut (incl.)	

(continued)

Stage No.4 Excavate to elevation 90.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.20	0.00	20.00	8.12	49.28	23.09	23.09	1380
2	95.60	0.00	30.80	12.50	75.89	24.19	24.19	1380
		0.00	30.80	6.13	91.58	17.82	17.82	1380
3	95.00	0.00	42.80	11.00	121.15	19.32	19.32	1380
4	94.50	0.00	52.80	15.06	145.79	24.64	24.64	1380
5	94.10	0.00	60.80	18.31	165.50	29.27	29.27	1380
		0.00	60.80	11.27	243.57	20.48	20.48	3936
6	93.65	0.00	71.15	14.07	281.76	20.27	20.27	3936
7	93.20	0.00	81.50	16.88	319.95	25.03	25.03	3936
		0.00	81.50	0.00	503.47	0.00	0.00a	25179
8	92.80	0.00	91.10	0.00	547.62	0.00	0.00a	25179
9	92.40	0.00	100.70	0.00	591.76	0.00	0.00a	25179
10	91.80	0.00	115.09	0.00	657.98	0.00	0.00a	25179
11	91.40	0.00	124.69	0.00	702.12	7.77	7.77	25179
12	91.00	0.00	134.29	1.22	746.26	15.85	15.85	25179
13	90.50	0.00	146.29	3.83	801.43	26.32	26.32	25179
		0.00	146.29	3.83	601.07	26.32	26.32	25179
14	89.95	0.00	159.48	6.70	646.59	36.63	36.63	25179
15	89.40	0.00	172.68	9.57	692.10	44.90	44.90	25179
16	88.80	0.00	187.07	12.70	741.75	51.80	51.80	25179
17	88.20	0.00	201.46	15.83	791.39	57.30	57.30	25179
18	87.60	0.00	215.86	18.96	841.03	62.16	62.16	25179
19	87.25	0.00	224.25	20.78	869.98	64.91	64.91	25179
20	86.90	0.00	232.64	22.61	898.93	67.65	67.65	25179
21	86.40	0.00	244.63	25.22	940.29	71.61	71.61	25179
22	85.90	0.00	256.62	27.82	981.65	75.62	75.62	25179
23	85.40	0.00	268.61	30.43	1023.00	79.54	79.54	25179

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	94.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	97.46	70.77	70.77	78920
14	89.95	0.00	13.20	0.00	143.71	57.95	57.95	78920
15	89.40	0.00	26.41	0.00	189.98	51.15	51.15	78920
16	88.80	0.00	40.83	0.00	240.52	50.10	50.10	78920
17	88.20	0.00	55.28	0.00	291.13	53.40	53.40	78920
18	87.60	0.00	69.76	0.00	341.86	58.79	58.79	78920
19	87.25	0.00	78.22	0.00	371.50	62.29	62.29	78920
20	86.90	0.00	86.70	0.00	401.20	65.84	65.84	78920

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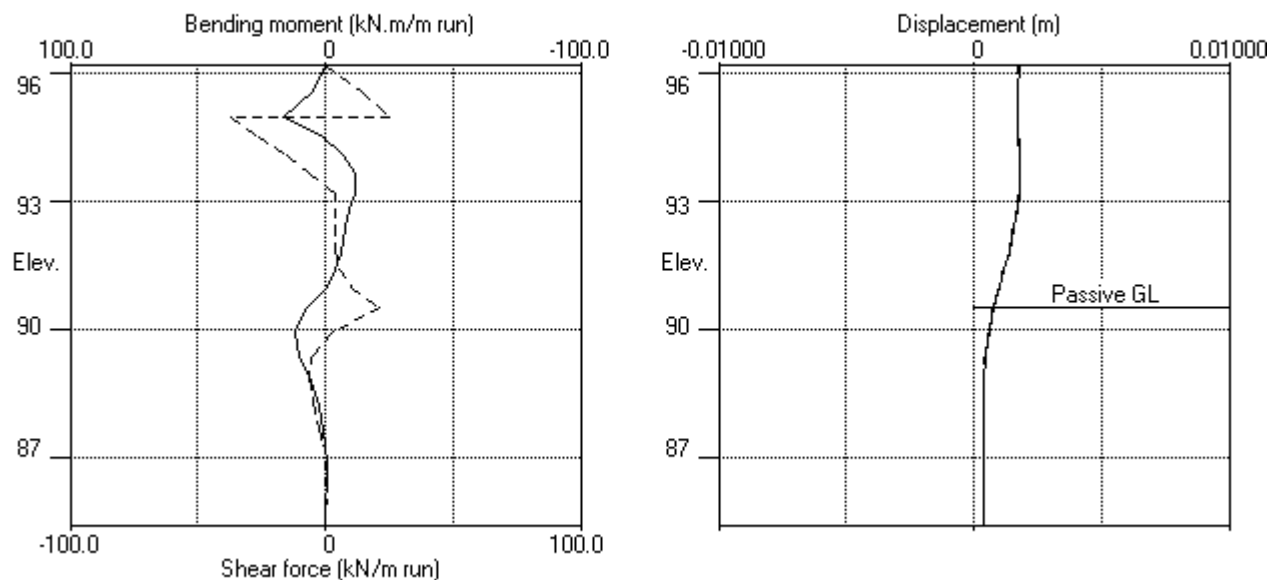
Stage No.4 Excavate to elevation 90.50 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
21	86.40	0.00	98.84	0.00	443.72	70.85	70.85	78920
22	85.90	0.00	111.01	0.00	486.36	75.76	75.76	78920
23	85.40	0.00	123.22	0.00	529.13	80.73	80.73	78920

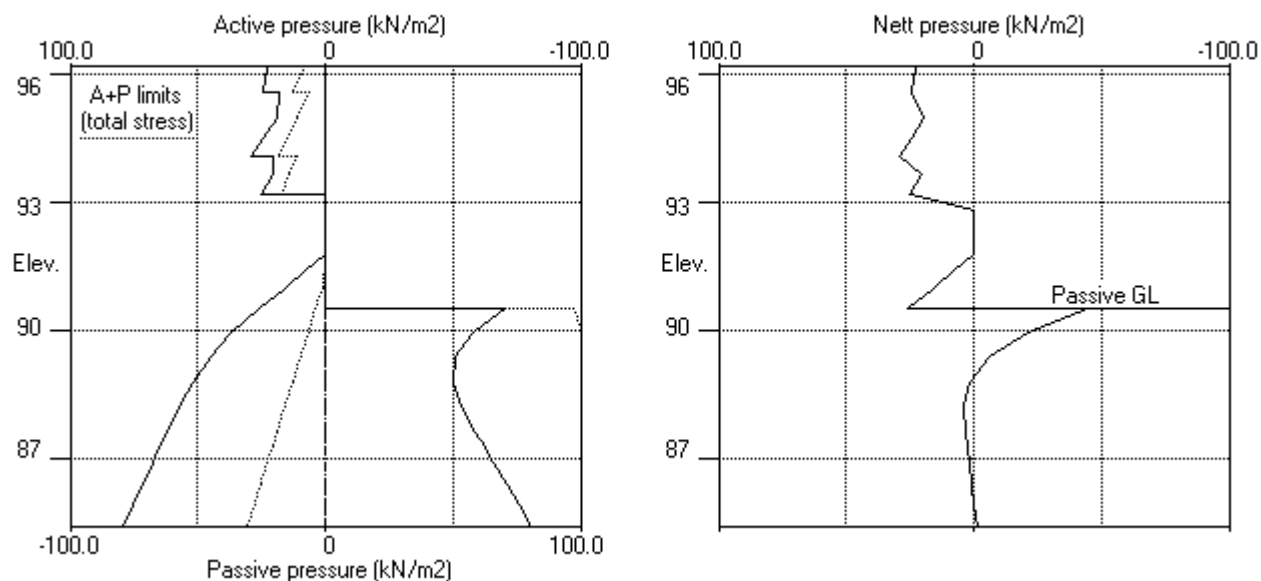
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 90.50 on PASSIVE side



Stage No.4 Excav. to elev. 90.50 on PASSIVE side



Units: kN,m

Stage No. 6 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
			More than one strut		-ation
6	96.20	86.40			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	96.20	22.54	0.002	2.55E-04	0.0	-0.0	
2	95.60	23.95	0.002	2.23E-04	13.9	4.6	
		17.58	0.002	2.23E-04	13.9	4.6	
3	95.00	19.39	0.002	7.87E-05	25.0	16.3	62.0
		19.39	0.002	7.87E-05	-37.0	16.3	
4	94.50	24.98	0.002	-1.94E-05	-25.9	0.7	
5	94.10	29.76	0.002	1.06E-05	-14.9	-7.3	
		21.88	0.002	1.06E-05	-14.9	-7.3	
6	93.65	21.97	0.002	1.07E-04	-5.1	-11.3	
7	93.20	27.03	0.001	2.24E-04	5.9	-11.2	
		12.85	0.001	2.24E-04	5.9	-11.2	
8	92.80	14.44	0.001	3.08E-04	11.4	-7.0	
9	92.40	15.66	0.001	3.46E-04	17.4	-1.3	
10	91.80	16.02	0.001	2.75E-04	26.9	11.6	
11	91.40	21.42	0.001	1.08E-04	34.4	24.5	
12	91.00	23.37	0.001	-1.89E-04	43.4	40.1	90.1
		23.37	0.001	-1.89E-04	-46.8	40.1	
13	90.50	19.78	0.001	-5.35E-04	-36.0	19.8	
14	89.95	11.40	0.001	-6.83E-04	-27.4	3.4	
15	89.40	9.57	0.002	-6.32E-04	-21.6	-11.4	
16	88.80	12.70	0.002	-4.00E-04	-14.9	-22.1	
17	88.20	15.83	0.002	-4.92E-05	-6.4	-28.5	
18	87.60	18.96	0.002	3.50E-04	4.1	-29.2	
19	87.25	20.78	0.002	5.76E-04	11.0	-26.6	
20	86.90	23.40	0.002	7.67E-04	18.7	-20.6	
21	86.40	41.37	0.001	9.32E-04	34.9	-8.1	
		-61.43	0.001	9.32E-04	34.9	-8.1	
22	85.90	-55.32	0.001	9.56E-04	5.7	4.0	
23	85.40	32.34	0.000	9.32E-04	0.0	0.0	
Strut force at elev. 95.00 =			62.03 kN/m	run =	148.88 kN/strut (horiz.)		
				=	210.54 kN/strut (incl.)		
Strut force at elev. 91.00 =			90.12 kN/m	run =	216.30 kN/strut (horiz.)		
				=	305.89 kN/strut (incl.)		

(continued)

Stage No.6 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.20	0.00	20.00	8.12	49.28	22.54	22.54	1988
2	95.60	0.00	30.80	12.50	75.89	23.95	23.95	1988
		0.00	30.80	6.13	91.58	17.58	17.58	1988
3	95.00	0.00	42.80	11.00	121.15	19.39	19.39	1988
4	94.50	0.00	52.80	15.06	145.79	24.98	24.98	1988
5	94.10	0.00	60.80	18.31	165.50	29.76	29.76	1988
		0.00	60.80	11.27	243.57	21.88	21.88	5695
6	93.65	0.00	71.15	14.07	281.76	21.97	21.97	5695
7	93.20	0.00	81.50	16.88	319.95	27.03	27.03	5695
		0.00	81.50	0.00	503.47	12.85	12.85	36557
8	92.80	0.00	91.10	0.00	547.62	14.44	14.44	36557
9	92.40	0.00	100.70	0.00	591.76	15.66	15.66	36557
10	91.80	0.00	115.09	0.00	657.98	16.02	16.02	31433
11	91.40	0.00	124.69	0.00	702.12	21.42	21.42	31433
12	91.00	0.00	134.29	1.22	746.26	23.37	23.37	31433
13	90.50	0.00	146.29	3.83	801.43	19.78	19.78	31433
14	89.95	0.00	159.48	6.70	862.12	11.40	11.40	31433
15	89.40	0.00	172.68	9.57	922.80	9.57	9.57a	31433
16	88.80	0.00	187.07	12.70	988.99	12.70	12.70a	31433
17	88.20	0.00	201.46	15.83	1055.19	15.83	15.83a	31433
18	87.60	0.00	215.86	18.96	1121.37	18.96	18.96a	31433
19	87.25	0.00	224.25	20.78	1159.98	20.78	20.78a	31433
20	86.90	0.00	232.64	22.61	1198.58	23.40	23.40	31433
21	86.40	0.00	244.63	25.22	1253.72	41.37	41.37	31433
		0.00	244.63	25.22	940.29	41.37	41.37	31433
22	85.90	0.00	256.62	27.82	981.65	60.79	60.79	31433
23	85.40	0.00	268.61	30.43	1023.00	81.65	81.65	238483

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	96.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	94.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	102.81	102.81	102.81p	139665

(continued)

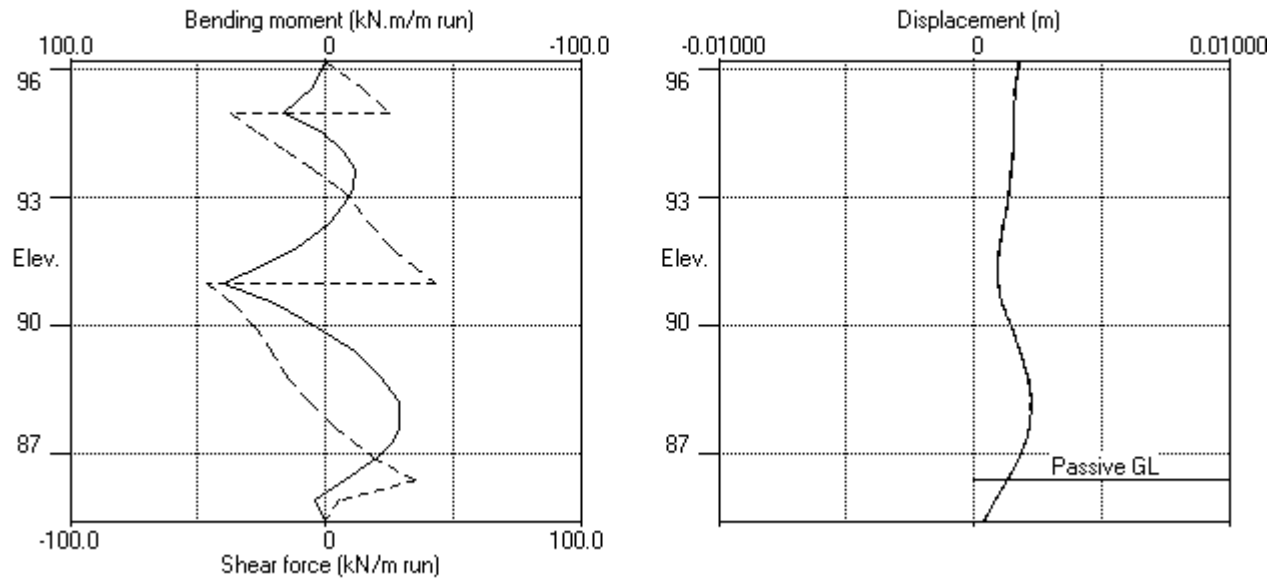
Stage No.6 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
22	85.90	0.00	12.00	0.00	144.85	116.11	116.11	139665
23	85.40	0.00	24.01	0.00	186.93	49.31	49.31	1011082

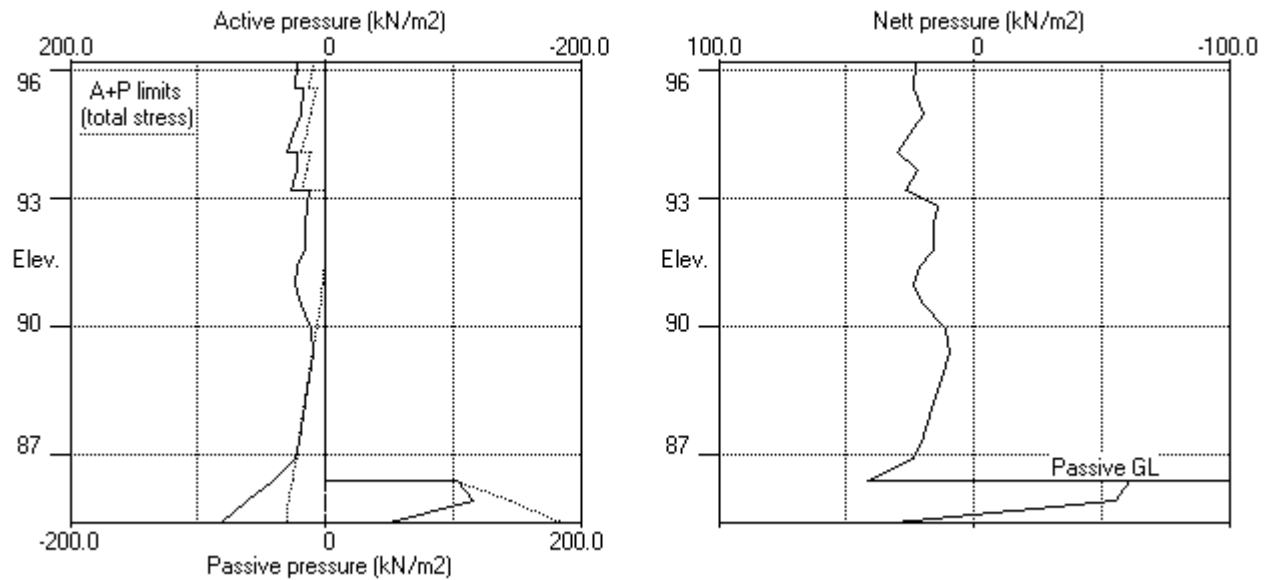
Note: 20.78a Soil pressure at active limit
 102.81p Soil pressure at passive limit

Units: kN,m

Stage No.6 Excav. to elev. 86.40 on PASSIVE side



Stage No.6 Excav. to elev. 86.40 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.07 - SW3 Section 3 - TCB 96.2 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW3 - Section 3 | Checked :

Units: kN,m

Stage No. 8 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
8	96.20 85.90		More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 30.43kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	96.20	22.53	0.002	2.48E-04	0.0	-0.0	
2	95.60	23.93	0.002	2.16E-04	13.9	4.6	
		17.56	0.002	2.16E-04	13.9	4.6	
3	95.00	19.36	0.002	7.15E-05	25.0	16.3	62.1
		19.36	0.002	7.15E-05	-37.1	16.3	
4	94.50	24.94	0.002	-2.63E-05	-26.0	0.7	
5	94.10	29.71	0.002	4.45E-06	-15.1	-7.3	
		21.75	0.002	4.45E-06	-15.1	-7.3	
6	93.65	21.82	0.002	1.02E-04	-5.3	-11.5	
7	93.20	26.87	0.001	2.21E-04	5.7	-11.4	
		11.81	0.001	2.21E-04	5.7	-11.4	
8	92.80	13.38	0.001	3.08E-04	10.7	-7.4	
9	92.40	14.62	0.001	3.52E-04	16.3	-2.1	
10	91.80	15.32	0.001	2.97E-04	25.3	10.0	
11	91.40	21.27	0.001	1.49E-04	32.6	22.2	
12	91.00	24.10	0.001	-1.24E-04	41.7	37.1	90.1
		24.10	0.001	-1.24E-04	-48.4	37.1	
13	90.50	22.22	0.001	-4.31E-04	-36.8	16.1	
14	89.95	16.81	0.001	-5.31E-04	-26.0	-0.4	
15	89.40	18.91	0.002	-4.42E-04	-16.2	-13.7	
16	88.80	26.75	0.002	-2.12E-04	-2.5	-19.5	
17	88.20	33.12	0.002	3.23E-05	15.4	-15.9	

(continued)

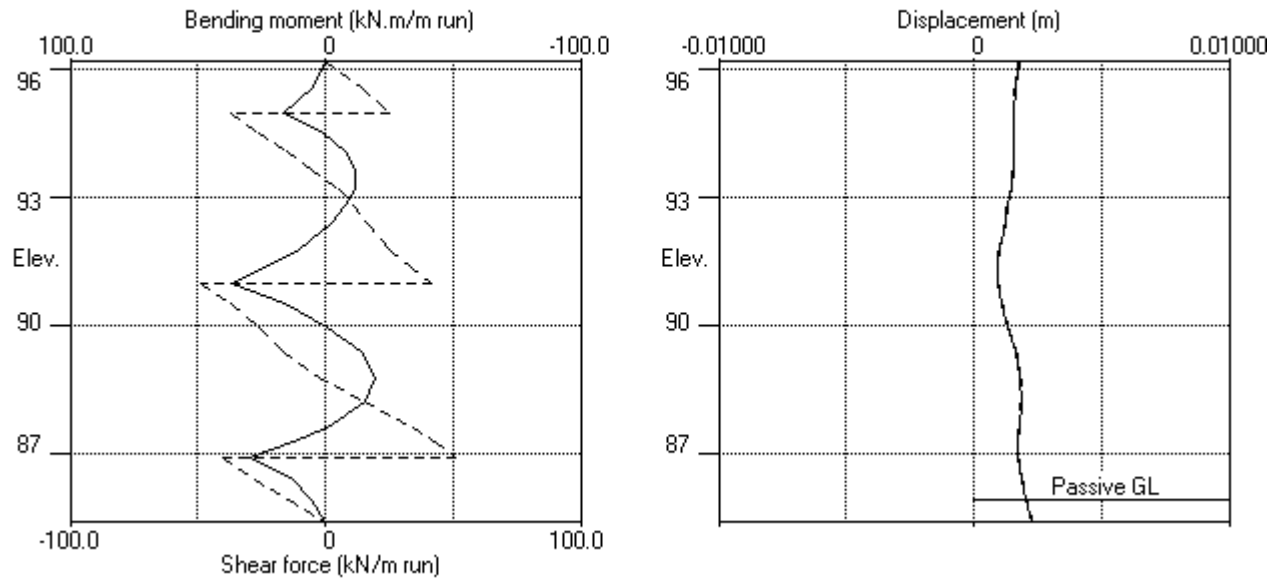
Stage No.8 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
5	94.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

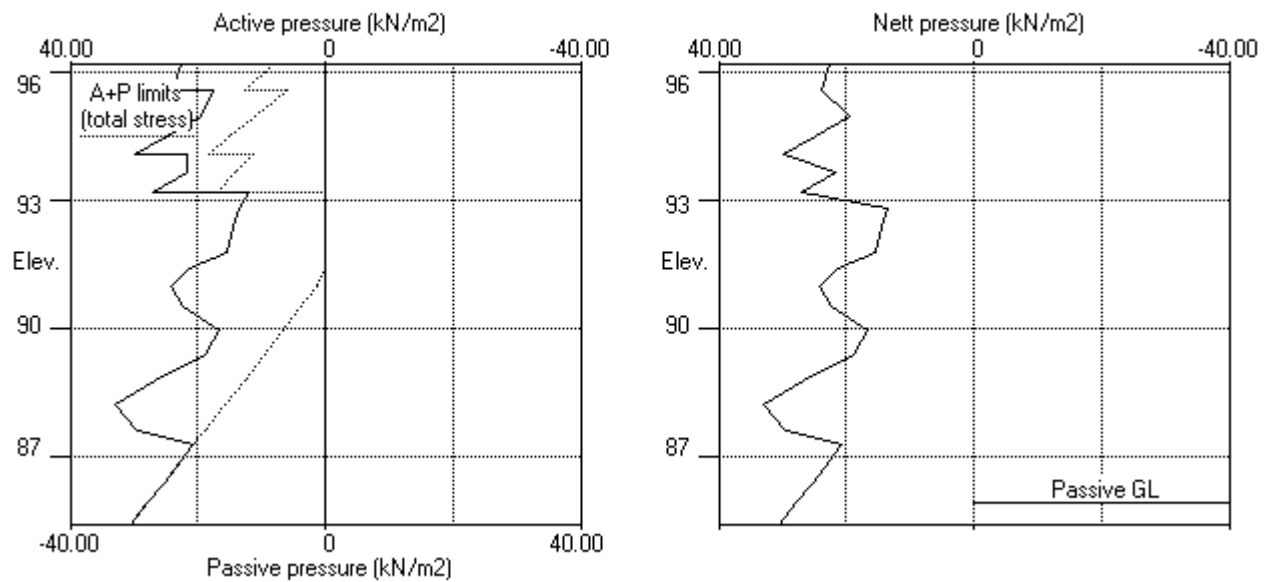
Note: 30.43a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Stage No.8 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
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Data filename/Run ID: 2021.04.07 - SW3 Section 3 - TCB 96.2	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW3 - Section 3	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe		Toe elev. for	
				elev. = 85.40		FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
1	96.20 96.20	Cant.	13.582	86.72	95.54	0.66	
2	96.20 94.50	Cant.	4.963	86.62	92.79	1.71	
3	96.20 94.50	95.00	Conditions not suitable for FoS calc.				
4	96.20 90.50	95.00	3.277	n/a	90.46	0.04	
5	96.20 90.50		More than one strut				
All remaining stages have more than one strut - FoS calculation n/a							

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	96.20	0.006	0.000	0.0	-0.0	0.0	0.0
2	95.60	0.005	0.000	5.0	0.0	15.2	0.0
3	95.00	0.004	0.000	17.8	0.0	27.4	-38.2
4	94.50	0.003	0.000	14.5	-0.3	18.9	-27.3
5	94.10	0.002	0.000	22.6	-8.9	21.2	-16.6
6	93.65	0.002	0.000	30.3	-13.8	14.4	-7.2
7	93.20	0.002	0.000	35.7	-14.8	12.5	0.0
8	92.80	0.002	0.000	35.3	-12.0	11.4	-9.8
9	92.40	0.002	0.000	28.2	-8.2	17.4	-19.4
10	91.80	0.001	0.000	15.0	-5.9	26.9	-19.0
11	91.40	0.001	0.000	24.5	-3.4	34.4	-14.4
12	91.00	0.001	0.000	40.1	-0.5	46.5	-48.8
13	90.50	0.001	0.000	19.8	-0.1	20.9	-38.2
14	89.95	0.001	0.000	11.6	-1.8	2.8	-29.2
15	89.40	0.002	0.000	9.9	-16.6	0.1	-21.6
16	88.80	0.002	0.000	5.9	-26.5	0.9	-14.9
17	88.20	0.002	0.000	2.5	-28.5	15.4	-6.4
18	87.60	0.002	0.000	0.6	-29.2	34.2	-2.3
19	87.25	0.002	0.000	12.9	-26.6	43.0	-1.2
20	86.90	0.002	0.000	30.2	-20.6	58.1	-39.8
21	86.40	0.002	0.000	12.9	-8.1	34.9	-27.8
22	85.90	0.002	0.000	5.8	-0.1	5.7	-14.6
23	85.40	0.002	0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	10.6	93.20	-0.5	89.40	5.8	94.10	-5.7	91.80
2	35.7	93.20	-2.1	89.40	21.2	94.10	-19.4	92.40
3	17.8	95.00	-2.7	93.65	27.4	95.00	-31.5	95.00
4	16.6	95.00	-12.0	93.20	25.3	95.00	-37.1	95.00
5	28.8	91.00	-14.8	93.20	46.5	91.00	-41.9	91.00
6	40.1	91.00	-29.2	87.60	43.4	91.00	-46.8	91.00
7	38.0	91.00	-28.5	88.20	58.1	86.90	-48.8	91.00
8	37.1	91.00	-19.5	88.80	50.6	86.90	-48.4	91.00

Summary of results (continued)

Maximum and minimum displacement at each stage

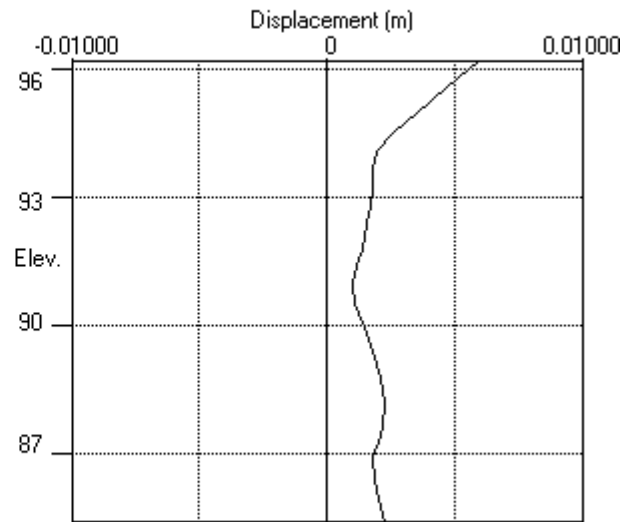
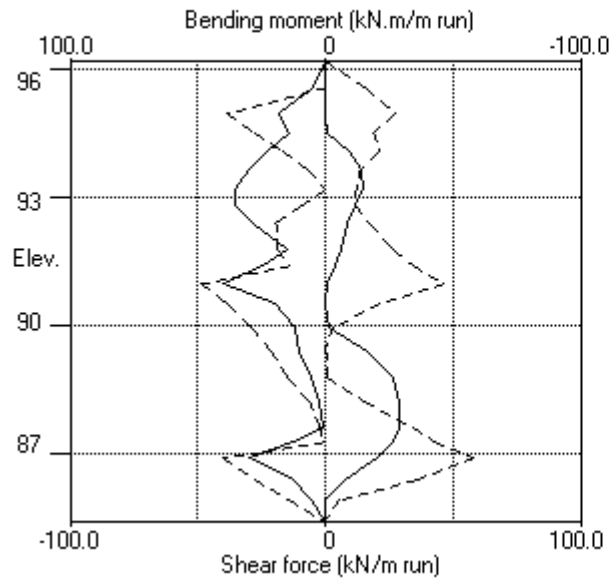
Stage no.	-----	Displacement	-----	Stage description
no.	maximum	elev.	minimum	elev.
	m		m	
1	0.002	96.20	0.000	96.20
2	0.006	96.20	0.000	96.20
3	0.001	96.20	0.000	96.20
4	0.002	96.20	0.000	96.20
5	0.002	96.20	0.000	96.20
6	0.002	88.20	0.000	96.20
7	0.002	88.80	0.000	96.20
8	0.002	85.40	0.000	96.20

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---	--- Strut no. 2 ---	--- Strut no. 3 ---
	at elev. 95.00	at elev. 91.00	at elev. 86.90
	kN/m run	kN/strut	kN/m run
3	58.93	141.42	---
4	62.41	149.77	---
5	62.63	150.32	88.39
6	62.03	148.88	90.12
7	62.03	148.88	90.20
8	62.08	148.99	90.08

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	91.00	1 Fill	1 Fill
2	88.40	2 Res Soil	2 Res Soil
3	88.10	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
----- Soil type -----	friction	Wall adhesion	Back-fill	friction	Wall adhesion	Back-fill	
No. Description	angle	coeff.	angle	angle	coeff.	angle	
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.30 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	89.00	2.40	0.000300	2.000E+08	5.00	45.00	200.0	No
2	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	No

SURCHARGE LOADS

Surch- arge no.	Distance from Elev. wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- Near edge	Surcharge kN/m2 Far edge	Equiv. soil type	Partial factor/ Category
1	91.00	0.00 (A)	100.00	100.00	20.00 =	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 91.00
2	Excavate to elevation 88.50 on PASSIVE side
3	Install strut or anchor no.1 at elevation 89.00
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.2 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

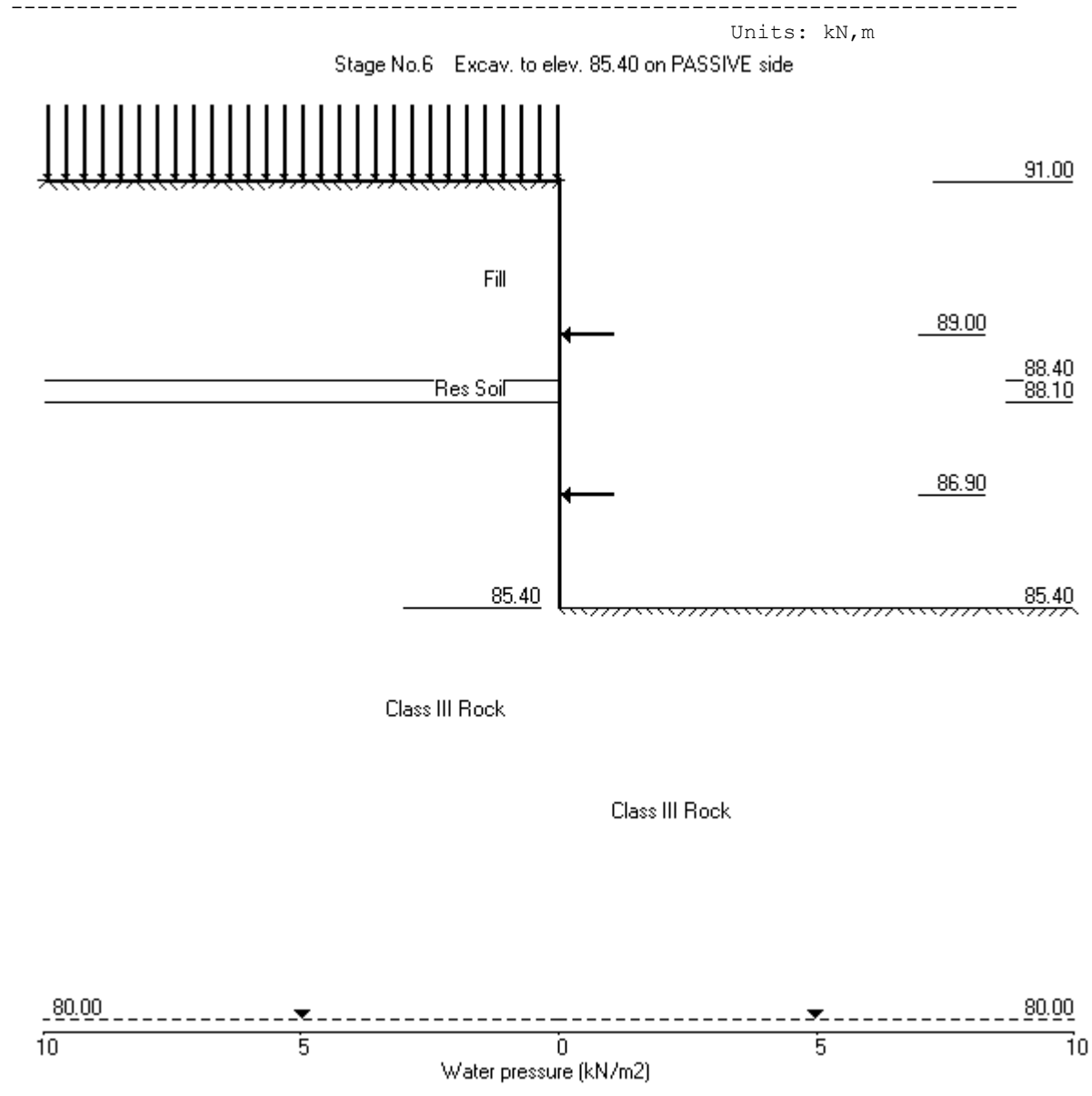
Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 91.00	Yes	Yes	Yes
2	Excav. to elev. 88.50 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 89.00	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.2 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

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ABC Consultants Pty Ltd | Sheet No.
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 Data filename/Run ID: 2021.04.06 - SW5 Section 1 - TCB 91.00 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 1 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 88.50 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	91.00 88.50	Cant.		1.525	85.95	86.53	1.97

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	91.00	8.12	0.011	3.60E-03	0.0	-0.0	
2	90.80	9.58	0.011	3.60E-03	1.8	0.2	
3	90.60	11.04	0.010	3.60E-03	3.8	0.8	
4	90.30	13.23	0.009	3.59E-03	7.5	2.4	
5	90.00	15.42	0.008	3.56E-03	11.8	5.3	
6	89.70	17.61	0.007	3.51E-03	16.7	9.6	
7	89.40	19.81	0.006	3.42E-03	22.3	15.4	
8	89.20	21.27	0.005	3.34E-03	26.4	20.3	
9	89.00	22.73	0.004	3.23E-03	30.8	26.0	
10	88.75	24.55	0.004	3.06E-03	36.8	34.4	
11	88.50	26.38	0.003	2.83E-03	43.1	44.4	
12	88.40	23.42	0.003	2.72E-03	45.6	48.9	
		7.72	0.003	2.72E-03	45.6	48.9	
13	88.10	11.54	0.002	2.34E-03	48.5	63.1	
		-123.41	0.002	2.34E-03	48.5	63.1	
14	87.85	-144.10	0.001	1.95E-03	15.1	71.0	
15	87.60	-101.57	0.001	1.54E-03	-15.6	71.5	
16	87.30	-53.61	0.000	1.07E-03	-38.9	62.5	
17	87.10	-21.64	0.000	8.09E-04	-46.4	53.6	
18	86.90	1.89	0.000	5.84E-04	-48.4	43.9	
19	86.65	20.31	-0.000	3.66E-04	-45.6	31.8	
20	86.40	30.51	-0.000	2.13E-04	-39.3	21.1	
21	86.10	37.02	-0.000	1.03E-04	-29.2	10.6	
22	85.80	41.48	-0.000	5.44E-05	-17.4	3.6	
23	85.60	43.53	-0.000	4.41E-05	-8.9	0.9	
24	85.40	45.38	-0.000	4.20E-05	0.0	0.0	

(continued)

Stage No.2 Excavate to elevation 88.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	91.00	0.00	20.00	8.12	49.28	8.12	8.12a	3084
2	90.80	0.00	23.60	9.58	58.14	9.58	9.58a	3084
3	90.60	0.00	27.20	11.04	67.02	11.04	11.04a	3084
4	90.30	0.00	32.60	13.23	80.32	13.23	13.23a	3084
5	90.00	0.00	38.00	15.42	93.63	15.42	15.42a	3084
6	89.70	0.00	43.40	17.61	106.93	17.61	17.61a	3084
7	89.40	0.00	48.80	19.81	120.24	19.81	19.81a	3084
8	89.20	0.00	52.40	21.27	129.11	21.27	21.27a	3084
9	89.00	0.00	56.00	22.73	137.98	22.73	22.73a	3084
10	88.75	0.00	60.50	24.55	149.06	24.55	24.55a	3084
11	88.50	0.00	65.00	26.38	160.15	26.38	26.38a	3084
		0.00	65.00	26.38	120.11	26.38	26.38a	3084
12	88.40	0.00	66.80	27.11	123.62	27.86	27.86	3084
		0.00	66.80	20.74	135.21	27.86	27.86	3084
13	88.10	0.00	72.80	23.18	146.30	33.68	33.68	3084
		0.00	72.80	0.00	347.60	0.00	0.00a	57023
14	87.85	0.00	78.80	0.00	368.29	0.00	0.00a	57023
15	87.60	0.00	84.80	0.00	388.98	0.00	0.00a	57023
16	87.30	0.00	92.00	0.00	413.81	6.09	6.09	57023
17	87.10	0.00	96.80	0.00	430.37	18.48	18.48	57023
18	86.90	0.00	101.59	0.00	446.92	28.05	28.05	57023
19	86.65	0.00	107.59	0.00	467.61	37.69	37.69	75645
20	86.40	0.00	113.59	0.00	488.31	44.89	44.89	75645
21	86.10	0.00	120.79	0.00	513.13	50.67	50.67	75645
22	85.80	0.00	127.99	0.00	537.96	55.42	55.42	75645
23	85.60	0.00	132.79	0.90	554.52	58.13	58.13	75645
24	85.40	0.00	137.59	1.94	571.07	60.73	60.73	75645

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	90.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	89.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	88.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	88.50	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	6735
12	88.40	0.00	1.80	0.73	4.44	4.44	4.44p	6735
		0.00	1.80	0.00	20.13	20.13	20.13p	6735
13	88.10	0.00	7.80	0.00	31.98	22.15	22.15	6735
		0.00	7.80	0.00	123.41	123.41	123.41p	125226
14	87.85	0.00	13.80	0.00	144.10	144.10	144.10p	125226
15	87.60	0.00	19.80	0.00	164.80	101.57	101.57	125226
16	87.30	0.00	27.00	0.00	189.64	59.70	59.70	125226
17	87.10	0.00	31.81	0.00	206.21	40.11	40.11	125226
18	86.90	0.00	36.61	0.00	222.78	26.16	26.16	125226

(continued)

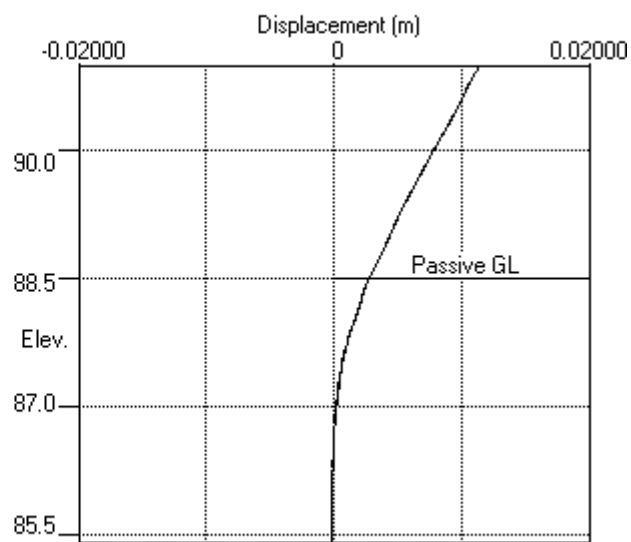
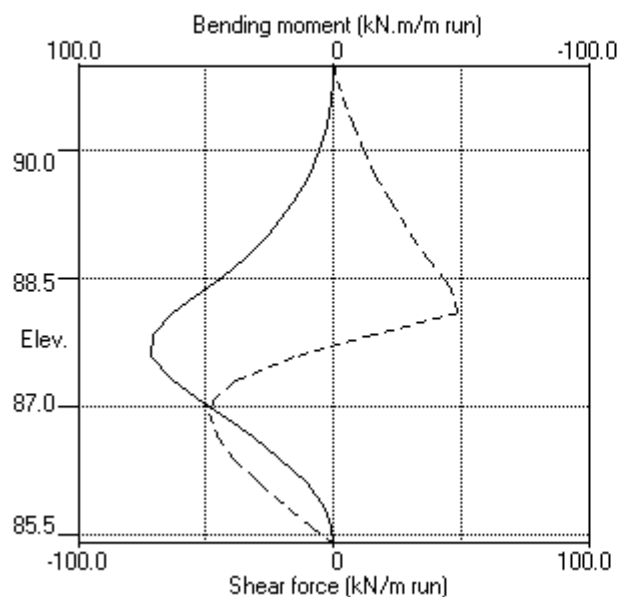
Stage No.2 Excavate to elevation 88.50 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
19	86.65	0.00	42.61	0.00	243.49	17.38	17.38	75645
20	86.40	0.00	48.62	0.00	264.21	14.38	14.38	75645
21	86.10	0.00	55.83	0.00	289.08	13.65	13.65	75645
22	85.80	0.00	63.05	0.00	313.96	13.94	13.94	75645
23	85.60	0.00	67.86	0.00	330.78	14.59	14.59	75645
24	85.40	0.00	72.67	0.00	347.64	15.35	15.35	75645

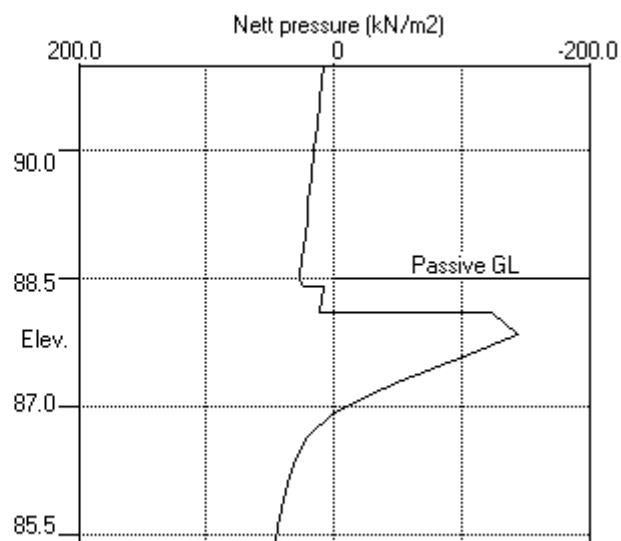
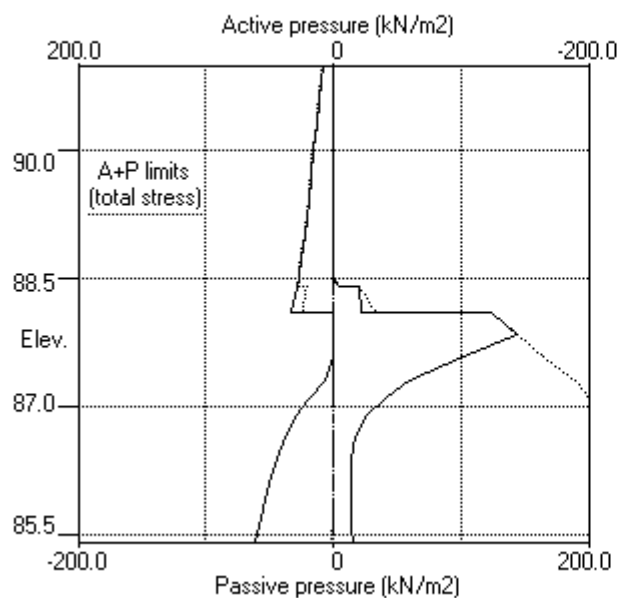
Note: 0.00a Soil pressure at active limit
 144.10p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 88.50 on PASSIVE side



Stage No.2 Excav. to elev. 88.50 on PASSIVE side



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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 1 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
4	91.00 86.40	89.00	Conditions not suitable for FoS calc.		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	91.00	13.56	0.010	2.80E-03	0.0	-0.0	
2	90.80	14.59	0.010	2.80E-03	2.8	0.3	
3	90.60	15.63	0.009	2.80E-03	5.8	1.2	
4	90.30	17.17	0.008	2.78E-03	10.8	3.7	
5	90.00	18.71	0.007	2.74E-03	16.1	7.7	
6	89.70	20.23	0.007	2.67E-03	22.0	13.4	
7	89.40	21.72	0.006	2.55E-03	28.3	21.0	
8	89.20	22.69	0.005	2.44E-03	32.7	27.1	
9	89.00	23.64	0.005	2.30E-03	37.3	34.1	64.4
		23.64	0.005	2.30E-03	-27.1	34.1	
10	88.75	24.80	0.004	2.12E-03	-21.0	28.0	
11	88.50	26.38	0.004	1.97E-03	-14.6	23.5	
12	88.40	27.20	0.004	1.92E-03	-11.9	22.2	
13	88.10	32.37	0.003	1.77E-03	-3.0	20.1	
		0.00	0.003	1.77E-03	-3.0	20.1	
14	87.85	0.00	0.003	1.65E-03	-3.0	19.7	
15	87.60	0.00	0.002	1.54E-03	-3.0	20.0	
16	87.30	0.00	0.002	1.40E-03	-3.0	19.1	
17	87.10	0.00	0.001	1.32E-03	-3.0	18.4	
18	86.90	0.00	0.001	1.23E-03	-3.0	17.7	
19	86.65	6.52	0.001	1.13E-03	-2.2	17.2	
20	86.40	18.40	0.001	1.04E-03	0.9	16.8	
		-78.11	0.001	1.04E-03	0.9	16.8	
21	86.10	-48.07	0.000	9.31E-04	-18.0	14.9	
22	85.80	6.88	0.000	8.54E-04	-24.2	7.3	
23	85.60	49.77	-0.000	8.31E-04	-18.5	2.6	
24	85.40	135.40	-0.000	8.25E-04	0.0	-0.0	
Strut force at elev. 89.00 =			64.43 kN/m	run =	154.62 kN/strut (horiz.)		
				=	218.67 kN/strut (incl.)		

(continued)

Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	91.00	0.00	20.00	8.12	49.28	13.56	13.56	1642
2	90.80	0.00	23.60	9.58	58.14	14.59	14.59	1642
3	90.60	0.00	27.20	11.04	67.02	15.63	15.63	1642
4	90.30	0.00	32.60	13.23	80.32	17.17	17.17	1642
5	90.00	0.00	38.00	15.42	93.63	18.71	18.71	1642
6	89.70	0.00	43.40	17.61	106.93	20.23	20.23	1642
7	89.40	0.00	48.80	19.81	120.24	21.72	21.72	1642
8	89.20	0.00	52.40	21.27	129.11	22.69	22.69	1642
9	89.00	0.00	56.00	22.73	137.98	23.64	23.64	1642
10	88.75	0.00	60.50	24.55	149.06	24.80	24.80	1642
11	88.50	0.00	65.00	26.38	160.15	26.38	26.38a	1642
12	88.40	0.00	66.80	27.11	164.59	27.20	27.20	1642
		0.00	66.80	20.74	180.28	27.20	27.20	1642
13	88.10	0.00	72.80	23.18	195.06	32.37	32.37	1642
		0.00	72.80	0.00	463.46	0.00	0.00a	30081
14	87.85	0.00	78.80	0.00	491.05	0.00	0.00a	30081
15	87.60	0.00	84.80	0.00	518.64	0.00	0.00a	30081
16	87.30	0.00	92.00	0.00	551.75	0.00	0.00a	30081
17	87.10	0.00	96.80	0.00	573.82	0.00	0.00a	30081
18	86.90	0.00	101.59	0.00	595.90	0.00	0.00a	30081
19	86.65	0.00	107.59	0.00	623.49	6.52	6.52	30081
20	86.40	0.00	113.59	0.00	651.07	18.40	18.40	30081
		0.00	113.59	0.00	488.31	18.40	18.40	30081
21	86.10	0.00	120.79	0.00	513.13	30.74	30.74	30081
22	85.80	0.00	127.99	0.00	537.96	42.30	42.30	30081
23	85.60	0.00	132.79	0.90	554.52	51.49	51.49	120002
24	85.40	0.00	137.59	1.94	571.07	135.40	135.40	457288

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	90.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	89.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	88.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	88.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	88.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	88.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	87.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	87.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	87.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	86.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	96.50	96.50p	173708

Run ID. 2021.04.06 - SW5 Section 1 - TCB 91.00
 2 Mandala Place, Castle Hill
 SW5 - Section 1

| Sheet No.
 | Date:12-04-2021
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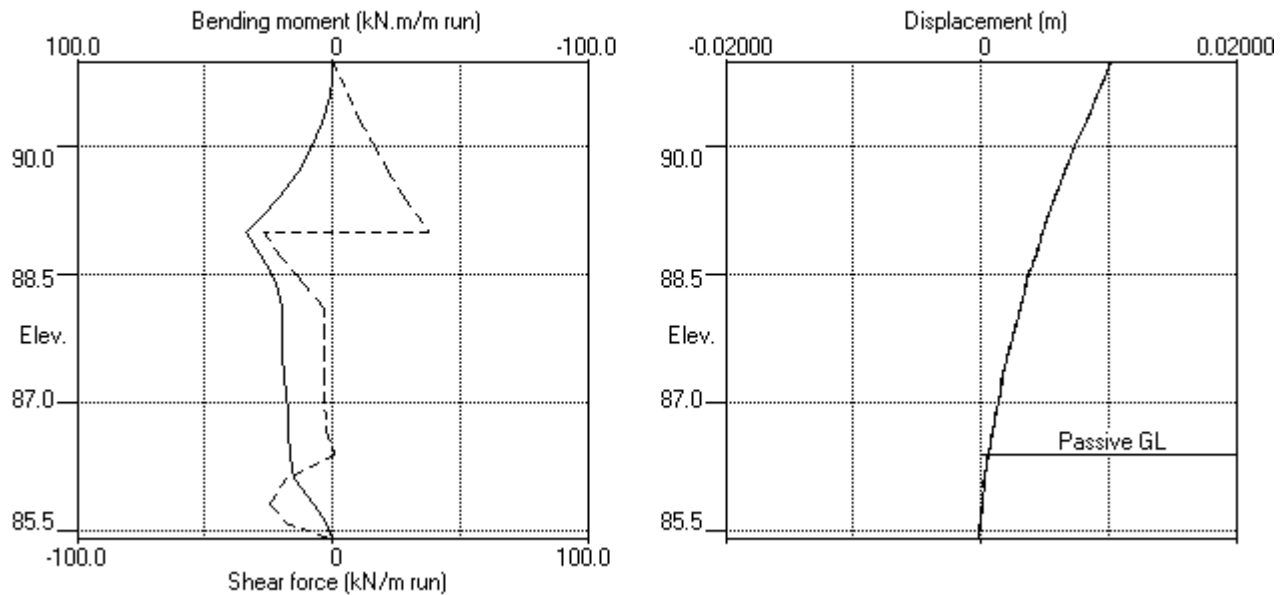
Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
21	86.10	0.00	7.20	0.00	121.34	78.81	78.81	173708
22	85.80	0.00	14.40	0.00	146.17	35.42	35.42	173708
23	85.60	0.00	19.20	0.00	162.96	1.71	1.71	457288
24	85.40	0.00	24.00	0.00	179.78	0.00	0.00a	457288

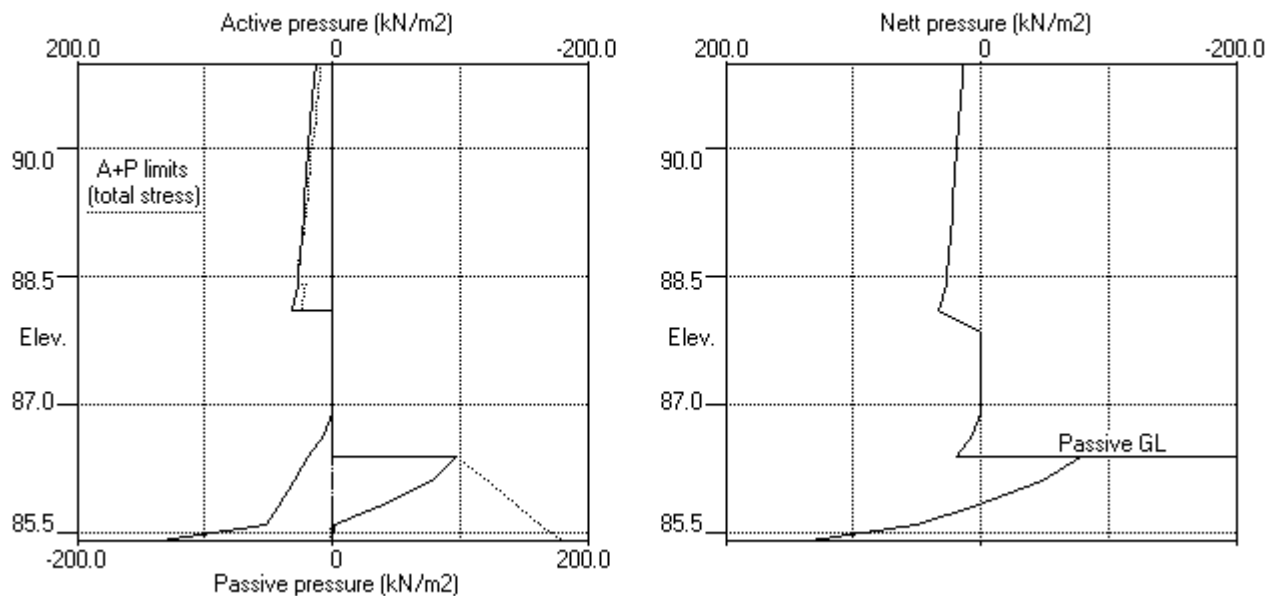
Note: 0.00a Soil pressure at active limit
 96.50p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



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 Data filename/Run ID: 2021.04.06 - SW5 Section 1 - TCB 91.00 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 1 | Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut		Factor Moment	Toe Wall
No.	Act. Pass.	Elev.		of equilib.	elev. Penetr
				Safety at elev.	-ation
6	91.00 85.60			More than one strut	

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 1.94kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	91.00	14.52	0.010	2.96E-03	0.0	-0.0	
2	90.80	15.59	0.009	2.96E-03	3.0	0.3	
3	90.60	16.67	0.008	2.96E-03	6.2	1.3	
4	90.30	18.29	0.008	2.94E-03	11.5	3.9	
5	90.00	19.89	0.007	2.90E-03	17.2	8.2	
6	89.70	21.47	0.006	2.82E-03	23.4	14.3	
7	89.40	23.03	0.005	2.69E-03	30.1	22.3	
8	89.20	24.04	0.004	2.58E-03	34.8	28.8	
9	89.00	25.02	0.004	2.43E-03	39.7	36.3	62.2
		25.02	0.004	2.43E-03	-22.5	36.3	
10	88.75	26.22	0.003	2.23E-03	-16.1	31.4	
11	88.50	27.83	0.003	2.06E-03	-9.3	28.2	
12	88.40	28.66	0.003	1.99E-03	-6.5	27.4	
13	88.10	33.84	0.002	1.81E-03	2.9	27.0	
		26.97	0.002	1.81E-03	2.9	27.0	
14	87.85	26.90	0.002	1.64E-03	9.6	28.9	
15	87.60	26.37	0.001	1.46E-03	16.3	33.2	
16	87.30	24.55	0.001	1.21E-03	23.9	39.2	
17	87.10	22.64	0.001	1.02E-03	28.6	44.4	
18	86.90	20.00	0.000	8.06E-04	32.9	50.5	88.5
		20.00	0.000	8.06E-04	-55.7	50.5	
19	86.65	22.09	0.000	5.52E-04	-50.4	37.4	

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

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
20	86.40	28.64	0.000	3.71E-04	-44.1	25.5	
21	86.10	34.08	0.000	2.30E-04	-34.6	15.0	
22	85.80	38.65	0.000	1.58E-04	-23.7	5.9	
23	85.60	43.18	-0.000	1.39E-04	-15.6	1.9	
24	85.40	112.37	-0.000	1.35E-04	0.0	0.0	
Strut force at elev.			89.00 =	62.20 kN/m	run =	149.28 kN/strut	(horiz.)
					=	211.11 kN/strut	(incl.)
Strut force at elev.			86.90 =	88.53 kN/m	run =	212.48 kN/strut	(horiz.)
					=	300.49 kN/strut	(incl.)

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total earth pressure	Soil stiffness coeff.
		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	91.00	0.00	20.00	8.12	49.28	14.52	14.52	2523
2	90.80	0.00	23.60	9.58	58.14	15.59	15.59	2523
3	90.60	0.00	27.20	11.04	67.02	16.67	16.67	2523
4	90.30	0.00	32.60	13.23	80.32	18.29	18.29	2523
5	90.00	0.00	38.00	15.42	93.63	19.89	19.89	2523
6	89.70	0.00	43.40	17.61	106.93	21.47	21.47	2523
7	89.40	0.00	48.80	19.81	120.24	23.03	23.03	2523
8	89.20	0.00	52.40	21.27	129.11	24.04	24.04	2523
9	89.00	0.00	56.00	22.73	137.98	25.02	25.02	2523
10	88.75	0.00	60.50	24.55	149.06	26.22	26.22	2523
11	88.50	0.00	65.00	26.38	160.15	27.83	27.83	2523
12	88.40	0.00	66.80	27.11	164.59	28.66	28.66	2523
		0.00	66.80	20.74	180.28	28.66	28.66	2523
13	88.10	0.00	72.80	23.18	195.06	33.84	33.84	2523
		0.00	72.80	0.00	463.46	26.97	26.97	46541
14	87.85	0.00	78.80	0.00	491.05	26.90	26.90	46541
15	87.60	0.00	84.80	0.00	518.64	26.37	26.37	81409
16	87.30	0.00	92.00	0.00	551.75	24.55	24.55	81409
17	87.10	0.00	96.80	0.00	573.82	22.64	22.64	81409
18	86.90	0.00	101.59	0.00	595.90	20.00	20.00	81409
19	86.65	0.00	107.59	0.00	623.49	22.09	22.09	81409
20	86.40	0.00	113.59	0.00	651.07	28.64	28.64	81409
21	86.10	0.00	120.79	0.00	684.18	34.08	34.08	81409
22	85.80	0.00	127.99	0.00	717.28	38.65	38.65	81409
23	85.60	0.00	132.79	0.90	739.35	43.18	43.18	81409
		0.00	132.79	0.90	554.52	43.18	43.18	81409
24	85.40	0.00	137.59	1.94	571.07	112.37	112.37	81409

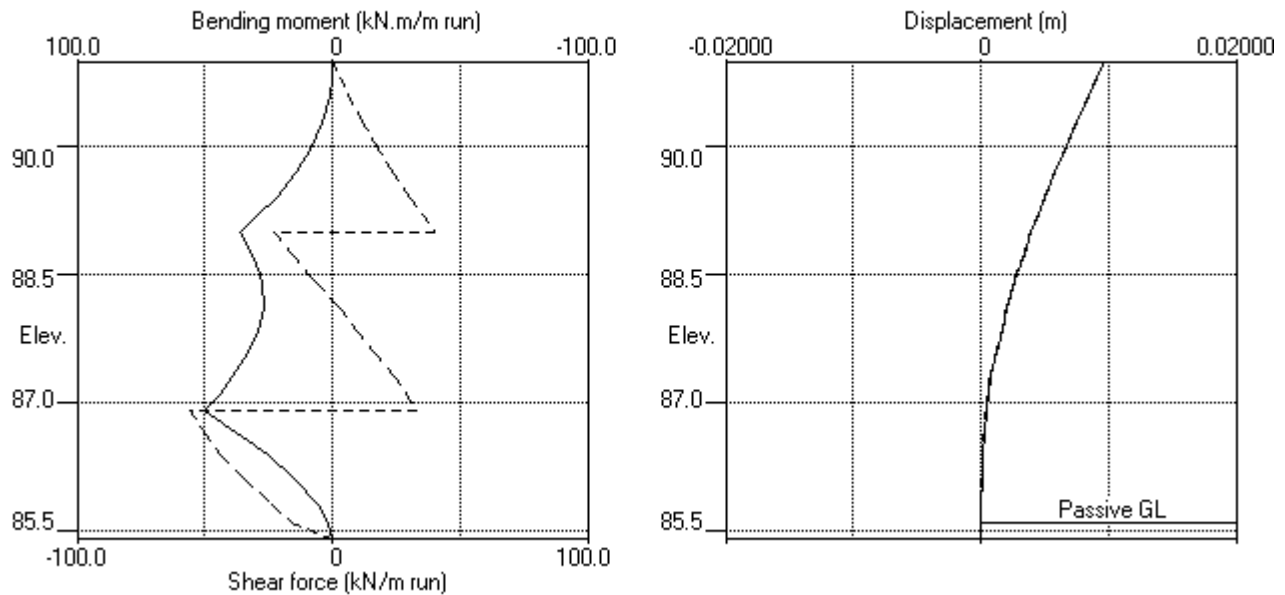
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Stage No.6 Excavate to elevation 85.40 on PASSIVE side

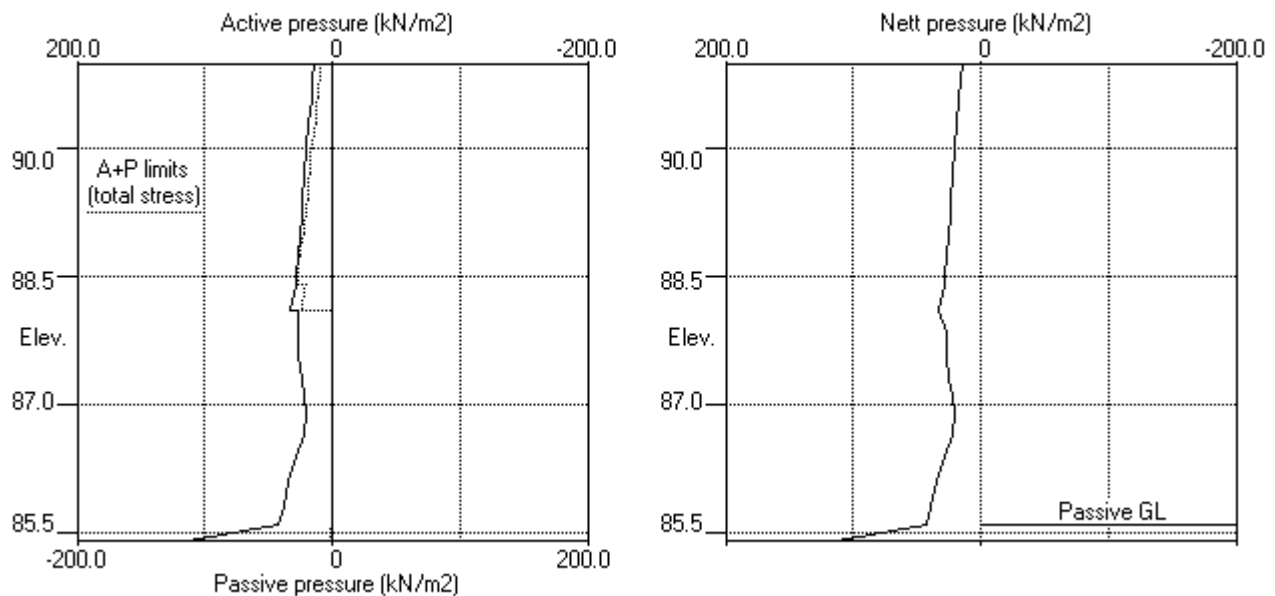
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
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Data filename/Run ID: 2021.04.06 - SW5 Section 1 - TCB 91.00	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW5 - Section 1	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40	FoS = 1.000	
					-----	-----	
				Factor	Moment	Toe	Wall
				of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
1	91.00	91.00	Cant.	5.039	86.15	90.25	0.75
2	91.00	88.50	Cant.	1.525	85.95	86.53	1.97
3	91.00	88.50	89.00	Conditions not suitable for FoS calc.			
4	91.00	86.40	89.00	Conditions not suitable for FoS calc.			
5	91.00	86.40		More than one strut			
6	91.00	85.60		More than one strut			

ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.06 - SW5 Section 1 - TCB 91.00 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 1 | Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	91.00	0.011	0.000	0.0	-0.0	0.0	0.0
2	90.80	0.011	0.000	0.4	0.0	3.6	0.0
3	90.60	0.010	0.000	1.5	0.0	7.3	0.0
4	90.30	0.009	0.000	4.6	0.0	13.4	0.0
5	90.00	0.008	0.000	9.6	0.0	19.9	0.0
6	89.70	0.007	0.000	16.6	0.0	26.8	0.0
7	89.40	0.006	0.000	25.8	0.0	34.2	0.0
8	89.20	0.005	0.000	33.1	0.0	39.4	0.0
9	89.00	0.005	0.000	41.5	0.0	44.8	-27.1
10	88.75	0.004	0.000	38.9	0.0	36.8	-21.0
11	88.50	0.004	0.000	44.4	0.0	43.1	-14.6
12	88.40	0.004	0.000	48.9	0.0	45.6	-11.9
13	88.10	0.003	0.000	63.1	0.0	48.5	-3.0
14	87.85	0.003	0.000	71.0	0.0	15.1	-3.0
15	87.60	0.002	0.000	71.5	0.0	16.3	-15.6
16	87.30	0.002	0.000	62.5	0.0	23.9	-38.9
17	87.10	0.001	0.000	53.6	0.0	28.6	-46.4
18	86.90	0.001	0.000	50.5	0.0	33.3	-55.7
19	86.65	0.001	-0.000	37.4	0.0	0.0	-50.4
20	86.40	0.001	-0.000	25.5	0.0	0.9	-44.1
21	86.10	0.000	-0.000	15.0	0.0	0.0	-34.6
22	85.80	0.000	-0.000	7.3	0.0	0.0	-24.3
23	85.60	0.000	-0.000	2.6	0.0	0.0	-18.5
24	85.40	0.000	-0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	11.6	87.85	-0.0	91.00	9.1	88.10	-7.2	86.90
2	71.5	87.60	-0.0	91.00	48.5	88.10	-48.4	86.90
3	41.8	87.85	-0.0	85.40	44.8	89.00	-28.2	86.90
4	34.1	89.00	-0.0	91.00	37.3	89.00	-27.1	89.00
5	49.2	86.90	-0.0	91.00	39.4	89.00	-55.1	86.90
6	50.5	86.90	-0.0	91.00	39.7	89.00	-55.7	86.90

Summary of results (continued)

Maximum and minimum displacement at each stage

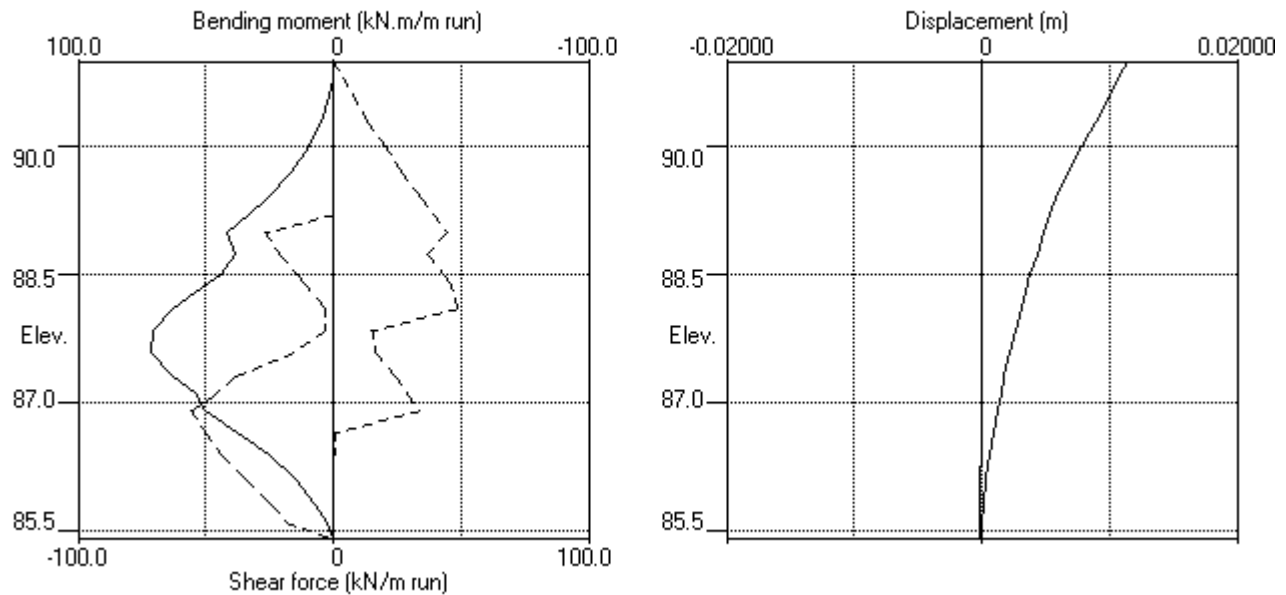
Stage no.	-----	Displacement	-----	Stage description
no.	maximum	elev.	minimum	elev.
	m		m	
1	0.002	91.00	-0.000	85.40
2	0.011	91.00	-0.000	85.40
3	0.008	91.00	-0.000	85.40
4	0.010	91.00	-0.000	85.40
5	0.010	91.00	-0.000	85.40
6	0.010	91.00	-0.000	85.40

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---	--- Strut no. 2 ---
	at elev. 89.00	at elev. 86.90
	kN/m run	kN/strut
3	58.93	141.42
4	64.43	154.62
5	62.30	149.53
6	62.20	149.28

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	91.30	1 Fill	1 Fill
2	88.40	2 Res Soil	2 Res Soil
3	88.10	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
angle				angle			
adhesion				adhesion			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.30 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	89.00	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes
2	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- Near edge	Surcharge kN/m2 Far edge	----- soil type	Partial factor/ Category
1	91.30	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 91.30
2	Excavate to elevation 88.50 on PASSIVE side
3	Install strut or anchor no.1 at elevation 89.00
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.2 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

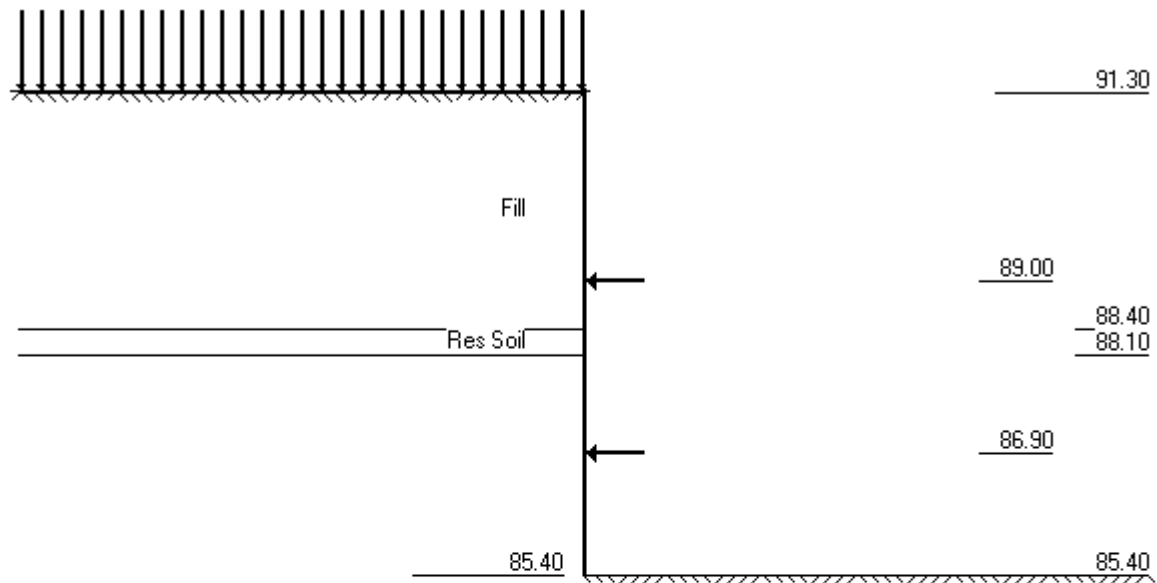
OUTPUT OPTIONS

Stage no.	Stage description	----- Displacement Bending mom. Shear force	----- Output options Active, Passive pressures	----- Graph. output
1	Apply surcharge no.1 at elev. 91.30	Yes	Yes	Yes
2	Excav. to elev. 88.50 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 89.00	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.2 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

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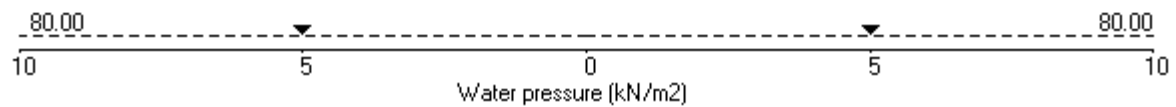
Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Class III Rock

Class III Rock



Units: kN,m

Stage No. 2 Excavate to elevation 88.50 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe		Toe elev. for		
				elev. = 85.40		FoS = 1.000		

Stage	---	G.L.	---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.		of	equilib.	elev.	Penetr
					Safety	at elev.		-ation
2	91.30	88.50	Cant.	1.391	85.95	86.34	2.16	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	91.30	8.12	0.017	4.90E-03	0.0	-0.0	
2	91.10	9.58	0.016	4.90E-03	1.8	0.2	
3	90.90	11.04	0.015	4.90E-03	3.8	0.8	
4	90.60	13.23	0.013	4.89E-03	7.5	2.4	
5	90.30	15.42	0.012	4.86E-03	11.8	5.3	
6	90.00	17.61	0.011	4.81E-03	16.7	9.6	
7	89.70	19.81	0.009	4.72E-03	22.3	15.4	
8	89.40	22.00	0.008	4.59E-03	28.6	23.0	
9	89.20	23.46	0.007	4.47E-03	33.2	29.2	
10	89.00	24.92	0.006	4.32E-03	38.0	36.3	
11	88.75	26.75	0.005	4.08E-03	44.4	46.6	
12	88.50	28.57	0.004	3.77E-03	51.4	58.6	
13	88.40	24.87	0.003	3.63E-03	54.0	63.8	
		8.58	0.003	3.63E-03	54.0	63.8	
14	88.10	7.99	0.002	3.13E-03	56.5	80.6	
		-123.41	0.002	3.13E-03	56.5	80.6	
15	87.85	-144.10	0.002	2.64E-03	23.1	90.5	
16	87.60	-141.09	0.001	2.11E-03	-12.6	93.0	
17	87.30	-82.27	0.001	1.50E-03	-46.1	82.8	
18	87.10	-39.24	0.000	1.14E-03	-58.2	72.1	
19	86.90	-6.26	0.000	8.42E-04	-62.8	59.7	
20	86.65	21.54	-0.000	5.44E-04	-60.9	43.8	
21	86.40	37.97	-0.000	3.33E-04	-53.4	29.2	
22	86.10	49.26	-0.000	1.80E-04	-40.3	14.9	
23	85.80	57.03	-0.000	1.11E-04	-24.4	5.0	
24	85.60	61.06	-0.000	9.65E-05	-12.6	1.3	
25	85.40	64.80	-0.000	9.35E-05	0.0	0.0	

(continued)

Stage No.2 Excavate to elevation 88.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	91.30	0.00	20.00	8.12	49.28	8.12	8.12a	2901
2	91.10	0.00	23.60	9.58	58.14	9.58	9.58a	2901
3	90.90	0.00	27.20	11.04	67.02	11.04	11.04a	2901
4	90.60	0.00	32.60	13.23	80.32	13.23	13.23a	2901
5	90.30	0.00	38.00	15.42	93.63	15.42	15.42a	2901
6	90.00	0.00	43.40	17.61	106.93	17.61	17.61a	2901
7	89.70	0.00	48.80	19.81	120.24	19.81	19.81a	2901
8	89.40	0.00	54.20	22.00	133.54	22.00	22.00a	2901
9	89.20	0.00	57.80	23.46	142.41	23.46	23.46a	2901
10	89.00	0.00	61.40	24.92	151.28	24.92	24.92a	2901
11	88.75	0.00	65.90	26.75	162.37	26.75	26.75a	2901
12	88.50	0.00	70.40	28.57	173.46	28.57	28.57a	2901
		0.00	70.40	28.57	130.09	28.57	28.57a	2901
13	88.40	0.00	72.20	29.30	133.60	29.30	29.30a	2901
		0.00	72.20	22.93	145.19	28.71	28.71	2901
14	88.10	0.00	78.20	25.37	156.28	35.14	35.14	2901
		0.00	78.20	0.00	366.22	0.00	0.00a	53598
15	87.85	0.00	84.20	0.00	386.91	0.00	0.00a	53598
16	87.60	0.00	90.20	0.00	407.61	0.00	0.00a	53598
17	87.30	0.00	97.40	0.00	432.44	0.00	0.00a	53598
18	87.10	0.00	102.19	0.00	448.99	14.79	14.79	53598
19	86.90	0.00	106.99	0.00	465.54	27.08	27.08	53598
20	86.65	0.00	112.99	0.00	486.24	39.52	39.52	80006
21	86.40	0.00	118.99	0.00	506.93	49.83	49.83	80006
22	86.10	0.00	126.19	0.00	531.75	58.01	58.01	80006
23	85.80	0.00	133.39	1.03	556.58	64.41	64.41	80006
24	85.60	0.00	138.19	2.07	573.13	68.11	68.11	80006
25	85.40	0.00	142.99	3.11	589.69	71.66	71.66	80006

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	91.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	91.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	90.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	89.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	88.75	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	88.50	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	6575
13	88.40	0.00	1.80	0.73	4.44	4.44	4.44p	6575
		0.00	1.80	0.00	20.13	20.13	20.13p	6575
14	88.10	0.00	7.80	0.00	32.53	27.15	27.15	6575
		0.00	7.80	0.00	123.41	123.41	123.41p	122235
15	87.85	0.00	13.80	0.00	144.10	144.10	144.10p	122235
16	87.60	0.00	19.80	0.00	164.80	141.09	141.09	122235
17	87.30	0.00	27.00	0.00	189.65	82.27	82.27	122235

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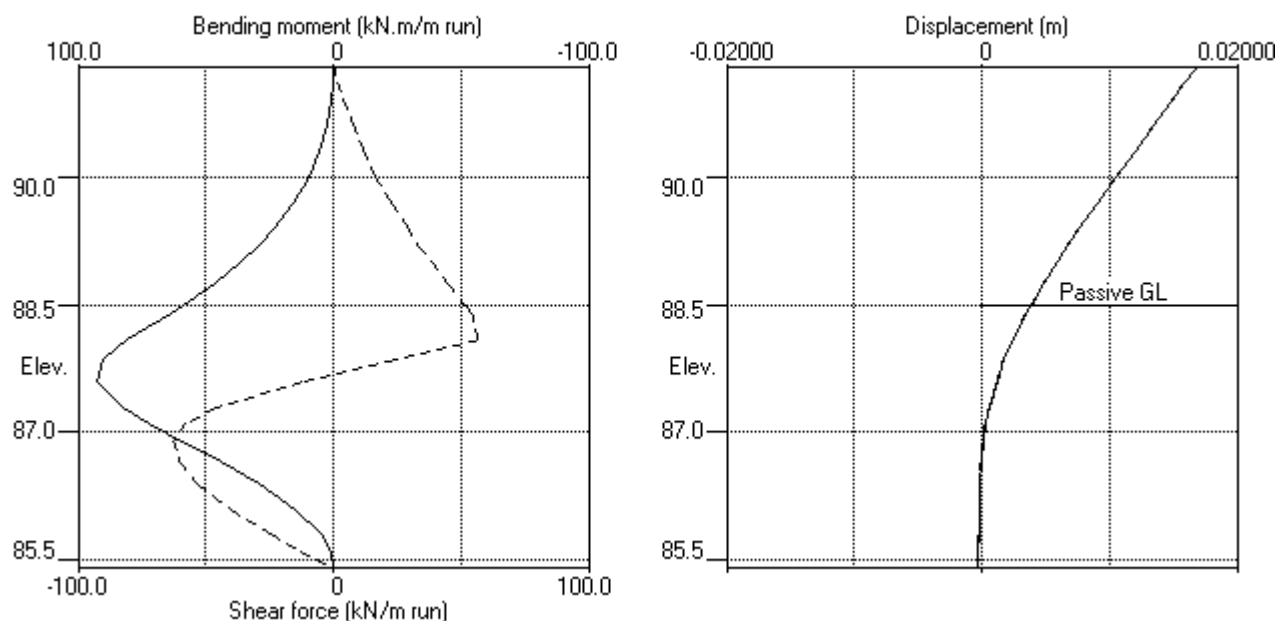
Stage No.2 Excavate to elevation 88.50 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
18	87.10	0.00	31.81	0.00	206.21	54.03	54.03	122235
19	86.90	0.00	36.61	0.00	222.78	33.33	33.33	122235
20	86.65	0.00	42.62	0.00	243.50	17.98	17.98	80006
21	86.40	0.00	48.62	0.00	264.22	11.87	11.87	80006
22	86.10	0.00	55.84	0.00	289.09	8.74	8.74	80006
23	85.80	0.00	63.05	0.00	314.24	7.38	7.38	80006
24	85.60	0.00	67.86	0.00	331.09	7.05	7.05	80006
25	85.40	0.00	72.68	0.00	347.96	6.86	6.86	80006

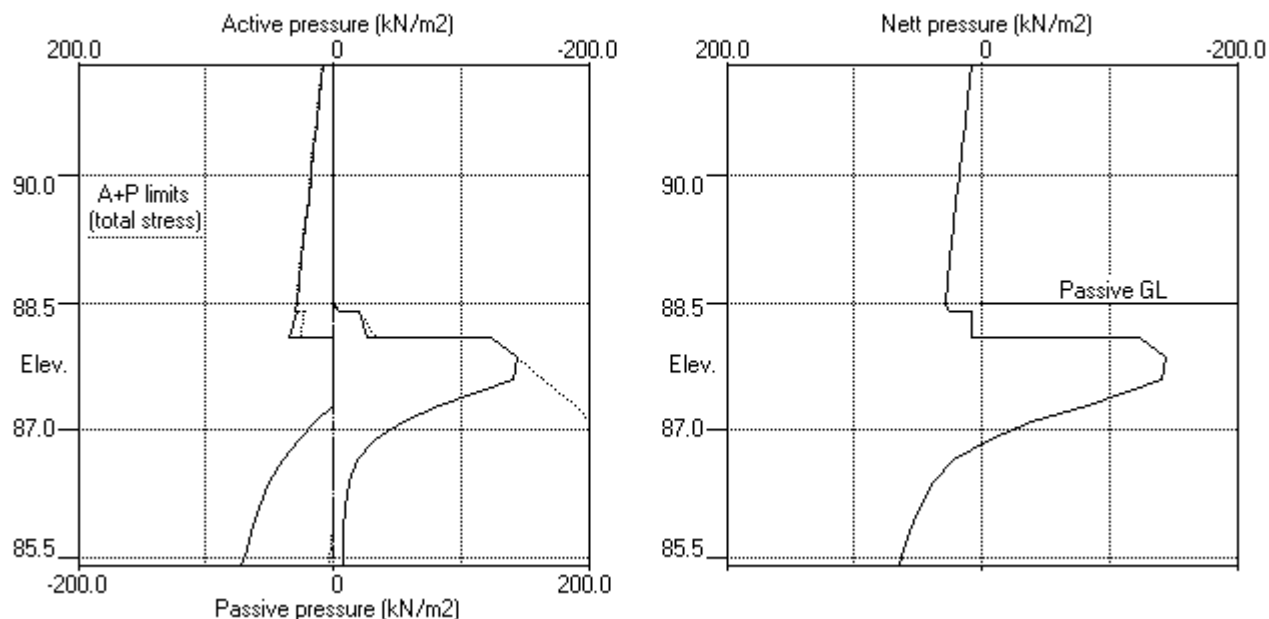
Note: 0.00a Soil pressure at active limit
 144.10p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 88.50 on PASSIVE side



Stage No.2 Excav. to elev. 88.50 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.06 - SW5 Section 2 - TCB 91.30 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 2 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe Wall
No.	Act. Pass.	Elev.	of	of equilib.	elev. Penetr
			Safety	at elev.	-ation
4	91.30 86.40	89.00	Conditions not	suitable for	FoS calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	91.30	11.05	0.017	4.13E-03	0.0	-0.0	
2	91.10	12.16	0.016	4.13E-03	2.3	0.3	
3	90.90	13.27	0.015	4.13E-03	4.9	1.0	
4	90.60	14.94	0.014	4.11E-03	9.1	3.1	
5	90.30	16.60	0.013	4.08E-03	13.8	6.5	
6	90.00	18.25	0.011	4.02E-03	19.1	11.5	
7	89.70	19.88	0.010	3.91E-03	24.8	18.0	
8	89.40	22.00	0.009	3.76E-03	31.1	26.3	
9	89.20	23.46	0.008	3.62E-03	35.6	33.0	
10	89.00	24.92	0.008	3.45E-03	40.4	40.6	67.4
		24.92	0.008	3.45E-03	-27.0	40.6	
11	88.75	26.75	0.007	3.24E-03	-20.5	34.6	
12	88.50	28.57	0.006	3.05E-03	-13.6	30.3	
13	88.40	29.30	0.006	2.98E-03	-10.7	29.1	
		26.09	0.006	2.98E-03	-10.7	29.1	
14	88.10	32.03	0.005	2.79E-03	-2.0	27.3	
		0.00	0.005	2.79E-03	-2.0	27.3	
15	87.85	0.00	0.004	2.63E-03	-2.0	27.1	
16	87.60	0.00	0.004	2.47E-03	-2.0	28.1	
17	87.30	0.00	0.003	2.28E-03	-2.0	26.9	
18	87.10	0.00	0.002	2.16E-03	-2.0	26.5	
19	86.90	0.00	0.002	2.03E-03	-2.0	25.9	
20	86.65	0.00	0.001	1.89E-03	-2.0	25.2	
21	86.40	13.37	0.001	1.74E-03	-0.3	25.1	
		-83.13	0.001	1.74E-03	-0.3	25.1	
22	86.10	-83.94	0.001	1.58E-03	-25.4	22.6	
23	85.80	9.83	0.000	1.46E-03	-36.5	11.2	
24	85.60	75.12	-0.000	1.42E-03	-28.0	4.1	
25	85.40	205.18	-0.000	1.41E-03	0.0	-0.0	
Strut force at elev. 89.00 =			67.44 kN/m	run =	161.86 kN/strut (horiz.)		
				=	228.90 kN/strut (incl.)		

Stage No.4 Excavate to elevation 86.40 on PASSIVE side

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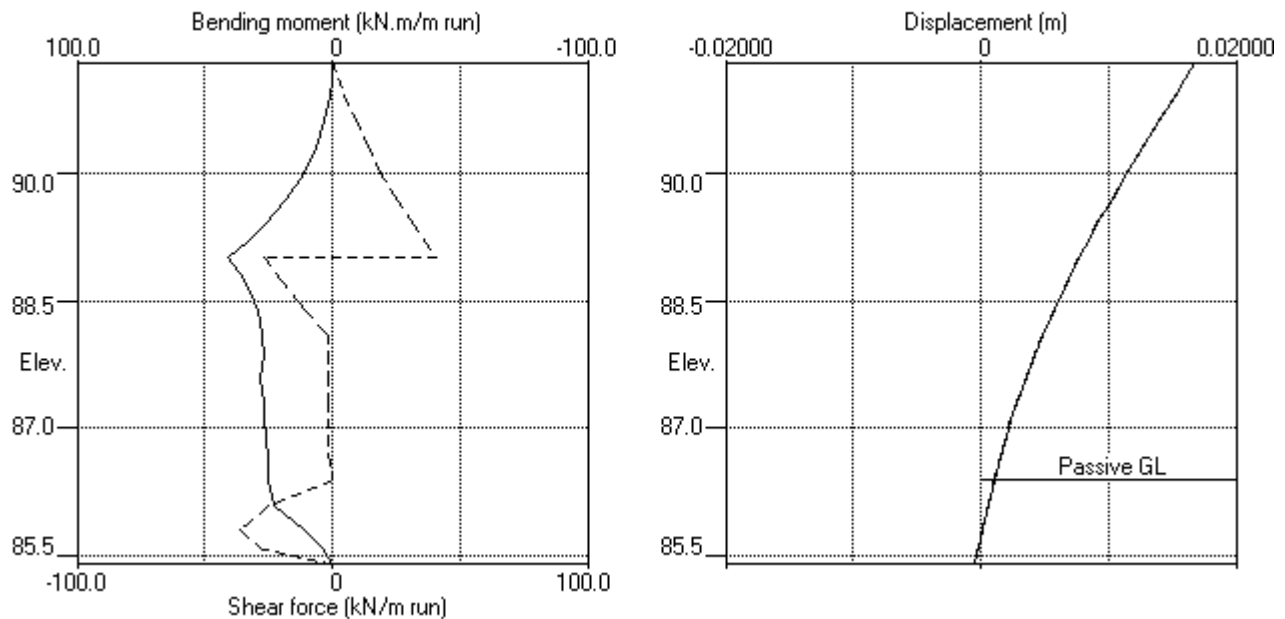
Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	96.50	96.50p	177915
22	86.10	0.00	7.20	0.00	121.34	116.41	116.41	177915
23	85.80	0.00	14.40	0.00	146.43	40.12	40.12	177915
24	85.60	0.00	19.20	0.00	163.25	0.00	0.00a	416020
25	85.40	0.00	24.01	0.00	180.08	0.00	0.00a	416020

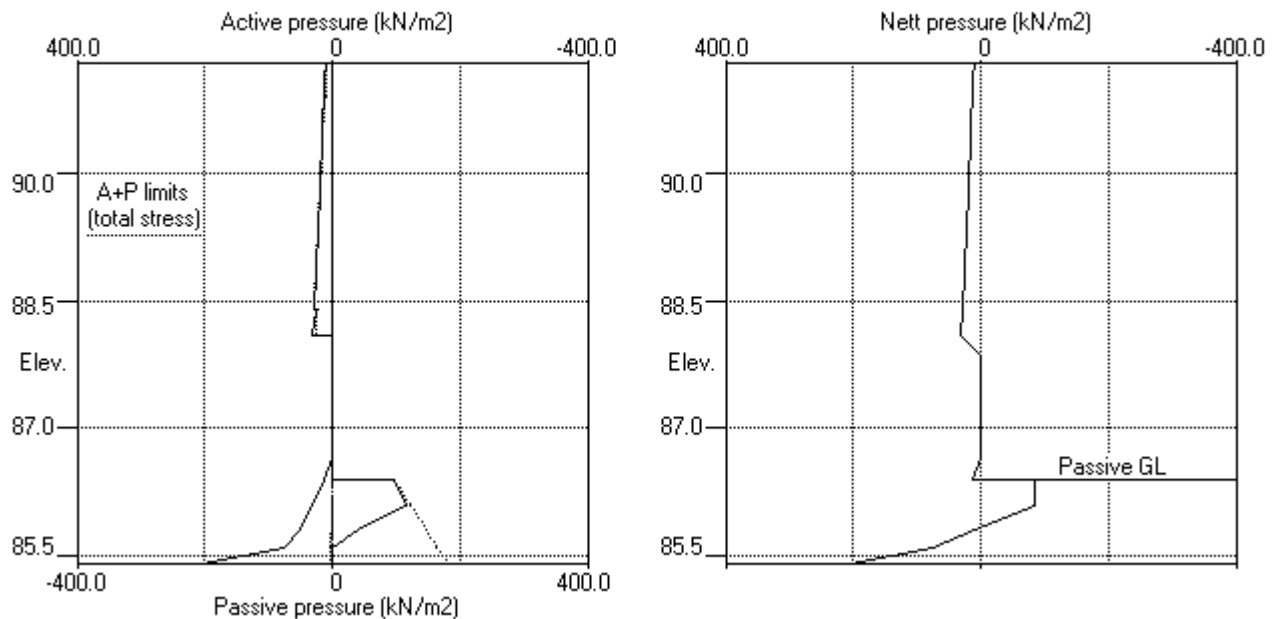
Note: 0.00a Soil pressure at active limit
 96.50p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe		Toe elev. for	
			elev. = 85.40		FoS = 1.000	

Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of	elev.	Penetr
				equilib.		-ation
				Safety at elev.		
6	91.30	85.60		More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
3.11kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	91.30	11.97	0.016	4.30E-03	0.0	-0.0	
2	91.10	13.13	0.015	4.30E-03	2.5	0.3	
3	90.90	14.29	0.015	4.30E-03	5.3	1.1	
4	90.60	16.03	0.013	4.28E-03	9.8	3.3	
5	90.30	17.76	0.012	4.25E-03	14.9	7.0	
6	90.00	19.48	0.011	4.18E-03	20.5	12.3	
7	89.70	21.17	0.009	4.07E-03	26.6	19.4	
8	89.40	23.35	0.008	3.91E-03	33.2	28.2	
9	89.20	24.84	0.008	3.76E-03	38.0	35.4	
10	89.00	26.34	0.007	3.58E-03	43.2	43.5	65.2
		26.34	0.007	3.58E-03	-22.1	43.5	
11	88.75	28.20	0.006	3.34E-03	-15.2	38.8	
12	88.50	30.04	0.005	3.12E-03	-8.0	35.9	
13	88.40	30.78	0.005	3.04E-03	-4.9	35.2	
		27.57	0.005	3.04E-03	-4.9	35.2	
14	88.10	33.51	0.004	2.80E-03	4.2	35.3	
		27.04	0.004	2.80E-03	4.2	35.3	
15	87.85	26.64	0.003	2.59E-03	11.0	37.5	
16	87.60	25.23	0.003	2.36E-03	17.4	42.5	
17	87.30	22.40	0.002	2.04E-03	24.6	48.3	
18	87.10	19.72	0.002	1.81E-03	28.8	53.7	
19	86.90	16.24	0.001	1.55E-03	32.4	59.7	88.7
		16.24	0.001	1.55E-03	-56.4	59.7	

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

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
20	86.65	10.66	0.001	1.24E-03	-53.0	45.9	
21	86.40	17.53	0.001	1.01E-03	-49.5	33.3	
22	86.10	28.40	0.000	8.27E-04	-42.6	21.3	
23	85.80	37.74	0.000	7.22E-04	-32.7	9.1	
24	85.60	57.58	-0.000	6.93E-04	-23.1	3.3	
25	85.40	173.71	-0.000	6.86E-04	0.0	-0.0	
Strut force at elev.			89.00 =	65.23 kN/m	run =	156.54 kN/strut	(horiz.)
					=	221.38 kN/strut	(incl.)
Strut force at elev.			86.90 =	88.74 kN/m	run =	212.99 kN/strut	(horiz.)
					=	301.21 kN/strut	(incl.)

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total	Soil
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	earth pressure kN/m2	stiffness coeff. kN/m3
1	91.30	0.00	20.00	8.12	49.28	11.97	11.97	2420
2	91.10	0.00	23.60	9.58	58.14	13.13	13.13	2420
3	90.90	0.00	27.20	11.04	67.02	14.29	14.29	2420
4	90.60	0.00	32.60	13.23	80.32	16.03	16.03	2420
5	90.30	0.00	38.00	15.42	93.63	17.76	17.76	2420
6	90.00	0.00	43.40	17.61	106.93	19.48	19.48	2420
7	89.70	0.00	48.80	19.81	120.24	21.17	21.17	2420
8	89.40	0.00	54.20	22.00	133.54	23.35	23.35	2420
9	89.20	0.00	57.80	23.46	142.41	24.84	24.84	2420
10	89.00	0.00	61.40	24.92	151.28	26.34	26.34	2420
11	88.75	0.00	65.90	26.75	162.37	28.20	28.20	2420
12	88.50	0.00	70.40	28.57	173.46	30.04	30.04	2420
13	88.40	0.00	72.20	29.30	177.89	30.78	30.78	2420
		0.00	72.20	22.93	193.59	27.57	27.57	2420
14	88.10	0.00	78.20	25.37	208.37	33.51	33.51	2420
		0.00	78.20	0.00	488.29	27.04	27.04	44628
15	87.85	0.00	84.20	0.00	515.88	26.64	26.64	44628
16	87.60	0.00	90.20	0.00	543.47	25.23	25.23	74626
17	87.30	0.00	97.40	0.00	576.58	22.40	22.40	74626
18	87.10	0.00	102.19	0.00	598.65	19.72	19.72	74626
19	86.90	0.00	106.99	0.00	620.72	16.24	16.24	74626
20	86.65	0.00	112.99	0.00	648.31	10.66	10.66	74626
21	86.40	0.00	118.99	0.00	675.90	17.53	17.53	74626
22	86.10	0.00	126.19	0.00	709.01	28.40	28.40	74626
23	85.80	0.00	133.39	1.03	742.11	37.74	37.74	74626
24	85.60	0.00	138.19	2.07	764.18	57.58	57.58	74626
		0.00	138.19	2.07	573.13	57.58	57.58	74626
25	85.40	0.00	142.99	3.11	589.69	173.71	173.71	74626

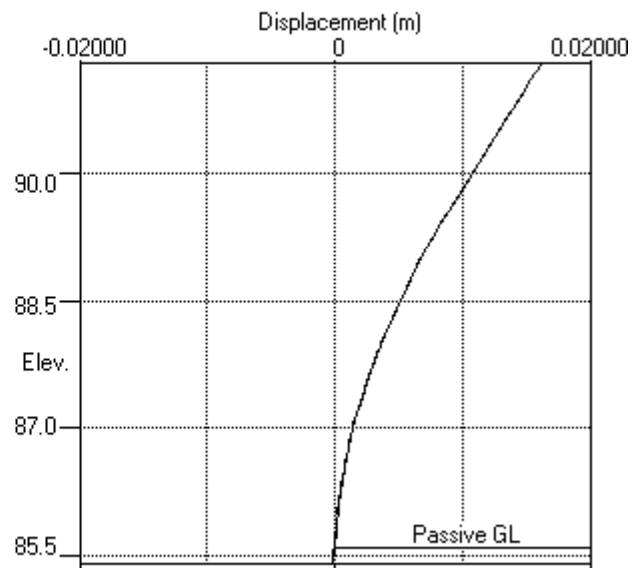
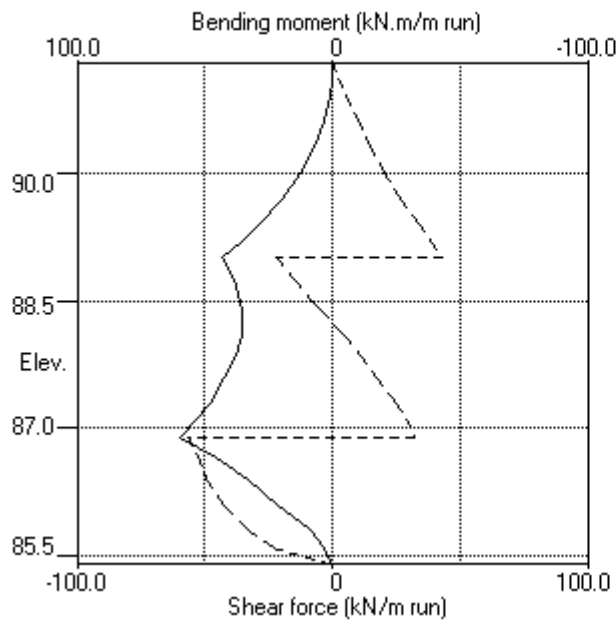
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Stage No.6 Excavate to elevation 85.40 on PASSIVE side

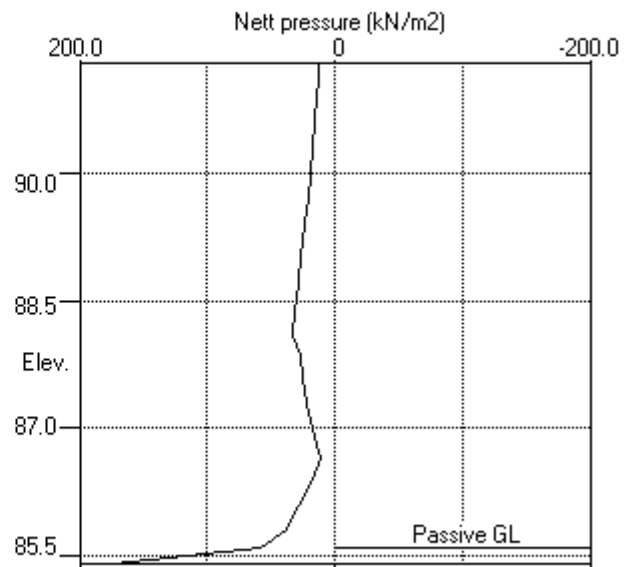
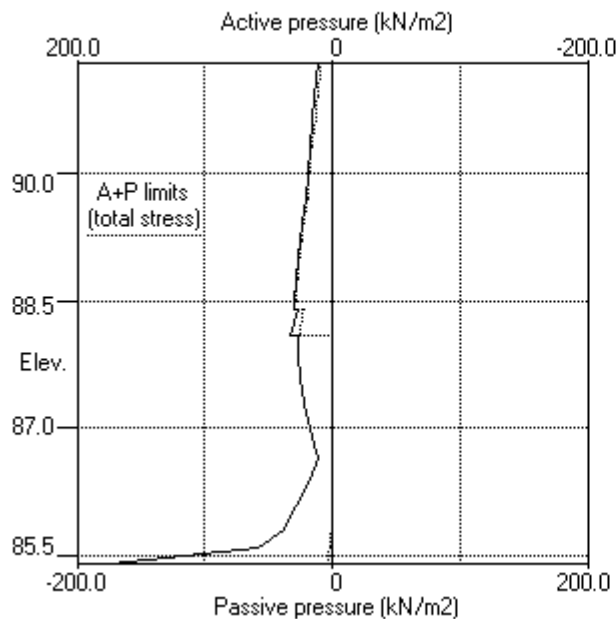
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
Licensed from GEOSOLVE	Made by : VR
Data filename/Run ID: 2021.04.06 - SW5 Section 2 - TCB 91.30	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW5 - Section 2	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40	FoS = 1.000	

				Factor	Moment	Toe	Wall
				of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
1	91.30	91.30	Cant.	5.008	86.18	90.55	0.75
2	91.30	88.50	Cant.	1.391	85.95	86.34	2.16
3	91.30	88.50	89.00	Conditions not suitable for FoS calc.			
4	91.30	86.40	89.00	Conditions not suitable for FoS calc.			
5	91.30	86.40		More than one strut			
6	91.30	85.60		More than one strut			

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	91.30	0.017	0.000	0.0	-0.0	0.0	0.0
2	91.10	0.016	0.000	0.4	0.0	3.3	0.0
3	90.90	0.015	0.000	1.4	0.0	6.9	0.0
4	90.60	0.014	0.000	4.3	0.0	12.7	0.0
5	90.30	0.013	0.000	9.1	0.0	19.0	0.0
6	90.00	0.011	0.000	15.8	0.0	25.8	0.0
7	89.70	0.010	0.000	24.6	0.0	33.1	0.0
8	89.40	0.009	0.000	35.7	0.0	40.9	0.0
9	89.20	0.008	0.000	44.4	0.0	46.4	0.0
10	89.00	0.008	0.000	54.3	0.0	52.0	-27.0
11	88.75	0.007	0.000	53.5	0.0	44.4	-20.5
12	88.50	0.006	0.000	58.6	0.0	51.4	-13.6
13	88.40	0.006	0.000	63.8	0.0	54.0	-10.7
14	88.10	0.005	0.000	80.6	0.0	56.5	-2.0
15	87.85	0.004	0.000	90.5	0.0	23.1	-2.0
16	87.60	0.004	0.000	93.0	0.0	17.4	-12.6
17	87.30	0.003	0.000	82.8	0.0	24.6	-46.1
18	87.10	0.002	0.000	72.1	0.0	29.5	-58.2
19	86.90	0.002	0.000	59.7	0.0	34.3	-62.8
20	86.65	0.001	-0.000	45.9	0.0	0.0	-60.9
21	86.40	0.001	-0.000	33.4	0.0	0.0	-53.4
22	86.10	0.001	-0.000	22.8	0.0	0.0	-42.6
23	85.80	0.000	-0.000	11.2	0.0	0.0	-36.7
24	85.60	0.000	-0.000	4.1	0.0	0.0	-28.0
25	85.40	0.000	-0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	11.7	87.85	-0.0	85.40	9.1	88.10	-7.2	86.90
2	93.0	87.60	-0.0	91.30	56.5	88.10	-62.8	86.90
3	64.8	87.60	-0.0	91.30	52.0	89.00	-43.7	86.90
4	40.6	89.00	-0.0	91.30	40.4	89.00	-36.5	85.80
5	57.5	86.90	-0.0	91.30	42.5	89.00	-54.1	86.90
6	59.7	86.90	-0.0	91.30	43.2	89.00	-56.4	86.90

Summary of results (continued)

Maximum and minimum displacement at each stage

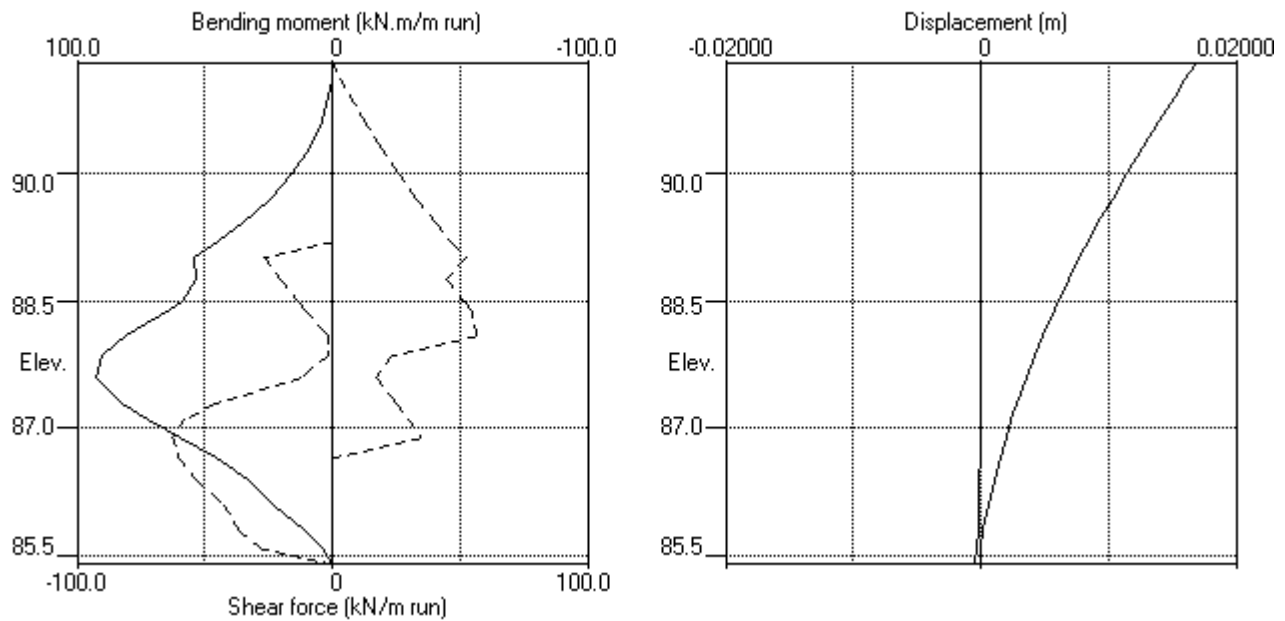
Stage no.	-----	Displacement	-----	Stage description
no.	maximum	elev.	minimum	elev.
	m		m	
1	0.002	91.30	-0.000	85.40
2	0.017	91.30	-0.000	85.40
3	0.014	91.30	-0.000	85.40
4	0.017	91.30	-0.000	85.40
5	0.016	91.30	-0.000	85.40
6	0.016	91.30	-0.000	85.40

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---	--- Strut no. 2 ---
	at elev. 89.00	at elev. 86.90
	kN/m run	kN/strut
3	58.93	141.42
4	67.44	161.86
5	65.41	156.98
6	65.23	156.54

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	92.30	1 Fill	1 Fill
2	89.70	2 Res Soil	2 Res Soil
3	89.40	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

		--- parameters for Ka ---			--- parameters for Kp ---		
		Soil	Wall	Back-	Soil	Wall	Back-
----- Soil type -----		friction	adhesion	fill	friction	adhesion	fill
No.	Description	angle	coeff.	angle	angle	coeff.	angle
1	Fill	25.00	0.000	0.00	25.00	0.000	0.00
2	Res Soil	25.00	0.000	0.00	25.00	0.000	0.00
3	Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00
4	Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00

SURCHARGE LOADS

Surch- arge no.	Distance from Elev. wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- Near edge	Surcharge kN/m2 Far edge	Equiv. soil type	Partial factor/ Category
1	92.30	0.00 (A)	100.00	100.00	20.00 =	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 92.30
2	Excavate to elevation 89.80 on PASSIVE side
3	Install strut or anchor no.1 at elevation 90.30
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.2 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

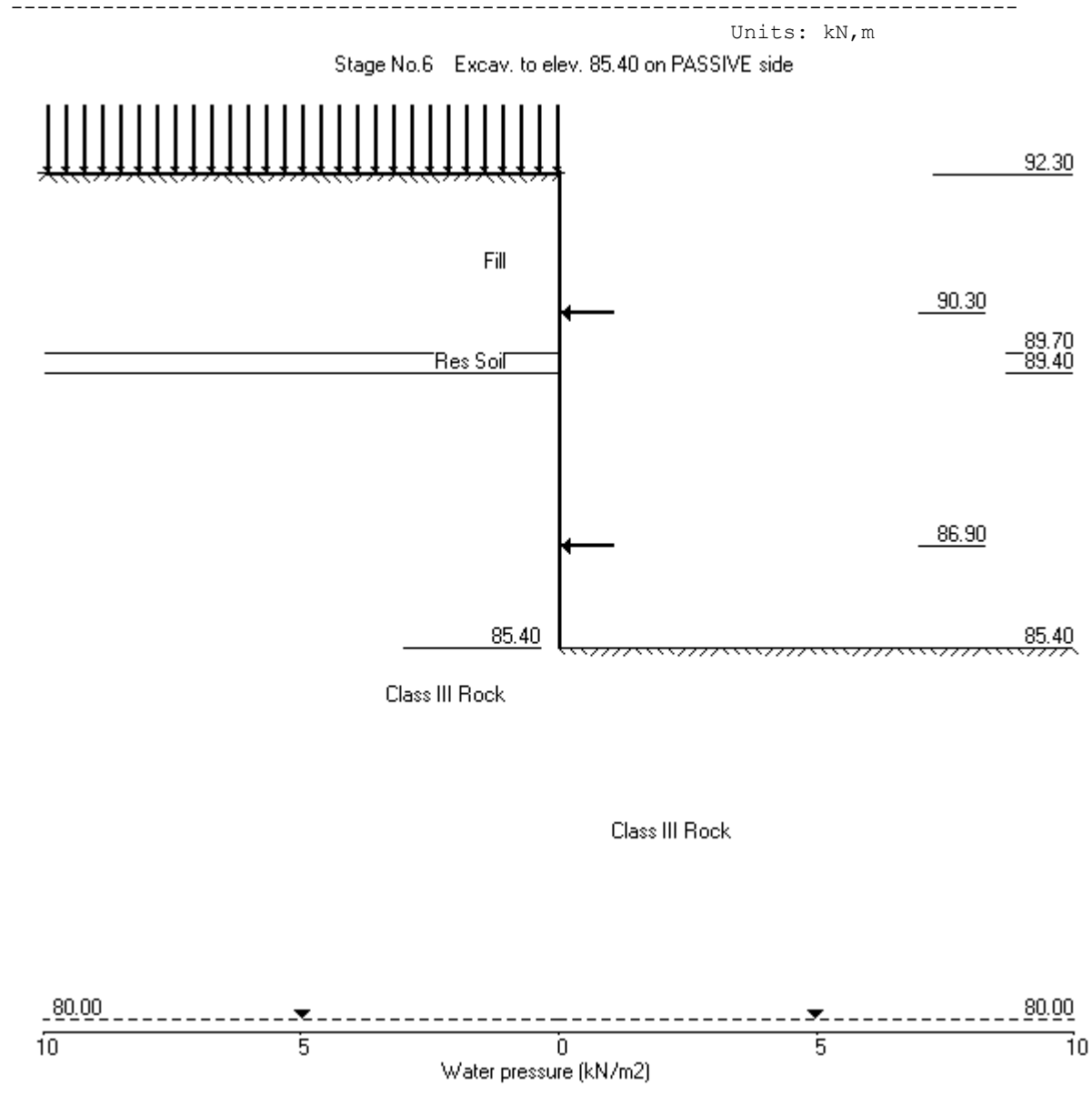
Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 92.30	Yes	Yes	Yes
2	Excav. to elev. 89.80 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 90.30	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.2 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

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 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.06 - SW5 Section 3 - TCB 92.30 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 3 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 89.80 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	92.30	89.80	Cant.	2.104	86.12	87.86	1.94

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	92.30	8.12	0.011	3.59E-03	0.0	0.0	
2	91.95	10.67	0.010	3.59E-03	3.3	0.7	
3	91.60	13.23	0.009	3.58E-03	7.5	2.5	
4	91.20	16.15	0.007	3.53E-03	13.3	6.6	
5	90.80	19.08	0.006	3.44E-03	20.4	13.4	
6	90.55	20.90	0.005	3.35E-03	25.4	19.1	
7	90.30	22.73	0.004	3.22E-03	30.8	26.1	
8	90.05	24.55	0.004	3.04E-03	36.8	34.5	
9	89.80	26.38	0.003	2.81E-03	43.1	44.5	
10	89.70	23.57	0.002	2.71E-03	45.6	48.9	
		7.87	0.002	2.71E-03	45.6	48.9	
11	89.40	11.91	0.002	2.32E-03	48.6	63.2	
		-123.41	0.002	2.32E-03	48.6	63.2	
12	89.10	-134.53	0.001	1.84E-03	9.9	73.5	
13	88.80	-82.38	0.001	1.35E-03	-22.6	70.3	
14	88.40	-18.39	0.000	7.70E-04	-42.8	55.2	
15	88.00	17.29	-0.000	3.46E-04	-43.0	36.6	
16	87.60	27.98	-0.000	8.11E-05	-34.0	20.8	
17	87.25	28.44	-0.000	-4.58E-05	-24.1	10.6	
18	86.90	24.69	-0.000	-1.04E-04	-14.8	3.9	
19	86.65	20.91	-0.000	-1.18E-04	-9.1	1.0	
20	86.40	16.91	-0.000	-1.19E-04	-4.4	-0.6	
21	86.00	8.13	0.000	-1.12E-04	0.6	-1.0	
22	85.70	-1.15	0.000	-1.07E-04	1.7	-0.5	
23	85.40	-10.11	0.000	-1.05E-04	0.0	0.0	

(continued)

Stage No.2 Excavate to elevation 89.80 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	92.30	0.00	20.00	8.12	49.28	8.12	8.12a	3088
2	91.95	0.00	26.30	10.67	64.80	10.67	10.67a	3088
3	91.60	0.00	32.60	13.23	80.32	13.23	13.23a	3088
4	91.20	0.00	39.80	16.15	98.06	16.15	16.15a	3088
5	90.80	0.00	47.00	19.08	115.80	19.08	19.08a	3088
6	90.55	0.00	51.50	20.90	126.89	20.90	20.90a	3088
7	90.30	0.00	56.00	22.73	137.98	22.73	22.73a	3088
8	90.05	0.00	60.50	24.55	149.06	24.55	24.55a	3088
9	89.80	0.00	65.00	26.38	160.15	26.38	26.38a	3088
		0.00	65.00	26.38	120.11	26.38	26.38a	3088
10	89.70	0.00	66.80	27.11	123.62	28.00	28.00	3088
		0.00	66.80	20.74	135.21	28.00	28.00	3088
11	89.40	0.00	72.80	23.18	146.30	33.82	33.82	3088
		0.00	72.80	0.00	347.60	0.00	0.00a	57097
12	89.10	0.00	80.00	0.00	372.43	0.00	0.00a	57097
13	88.80	0.00	87.20	0.00	397.26	0.00	0.00a	57097
14	88.40	0.00	96.80	0.00	430.37	19.63	19.63	57097
15	88.00	0.00	106.39	0.00	463.48	35.76	35.76	68785
16	87.60	0.00	115.99	0.00	496.58	44.47	44.47	68785
17	87.25	0.00	124.39	0.00	525.55	47.64	47.64	68785
18	86.90	0.00	132.79	0.90	554.52	48.70	48.70	68785
19	86.65	0.00	138.79	2.20	575.20	48.92	48.92	68785
20	86.40	0.00	144.79	3.50	595.89	49.02	49.02	68785
21	86.00	0.00	154.38	5.59	628.99	47.99	47.99	166647
22	85.70	0.00	161.58	7.16	653.82	45.88	45.88	166647
23	85.40	0.00	168.78	8.72	678.64	43.92	43.92	166647

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	91.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	91.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	90.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	90.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	90.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	89.80	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	6777
10	89.70	0.00	1.80	0.73	4.44	4.44	4.44p	6777
		0.00	1.80	0.00	20.13	20.13	20.13p	6777
11	89.40	0.00	7.80	0.00	31.98	21.91	21.91	6777
		0.00	7.80	0.00	123.41	123.41	123.41p	126019
12	89.10	0.00	15.00	0.00	148.24	134.53	134.53	126019
13	88.80	0.00	22.20	0.00	173.08	82.38	82.38	126019
14	88.40	0.00	31.81	0.00	206.21	38.02	38.02	126019
15	88.00	0.00	41.41	0.00	239.35	18.47	18.47	68785
16	87.60	0.00	51.03	0.00	272.50	16.49	16.49	68785
17	87.25	0.00	59.44	0.00	301.52	19.20	19.20	68785
18	86.90	0.00	67.86	0.00	330.78	24.02	24.02	68785
19	86.65	0.00	73.87	0.00	351.85	28.01	28.01	68785

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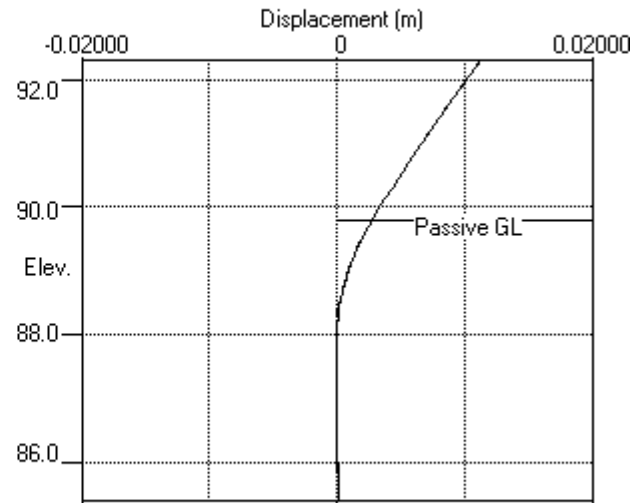
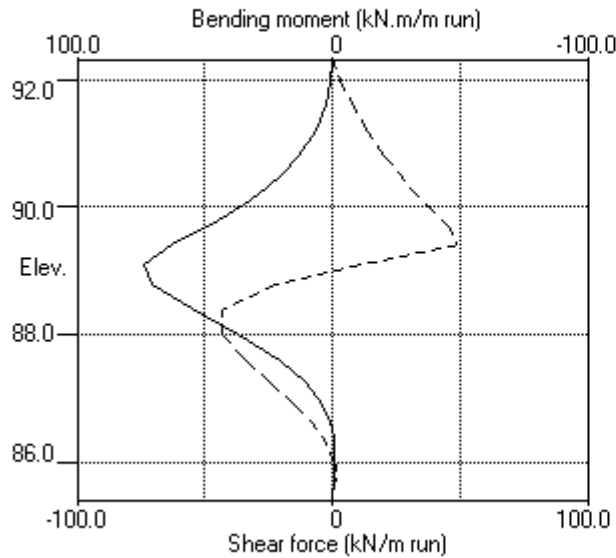
Stage No.2 Excavate to elevation 89.80 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
20	86.40	0.00	79.89	0.00	372.94	32.11	32.11	68785
21	86.00	0.00	89.53	0.00	406.69	39.87	39.87	166647
22	85.70	0.00	96.76	0.00	432.02	47.03	47.03	166647
23	85.40	0.00	103.99	0.00	457.37	54.03	54.03	166647

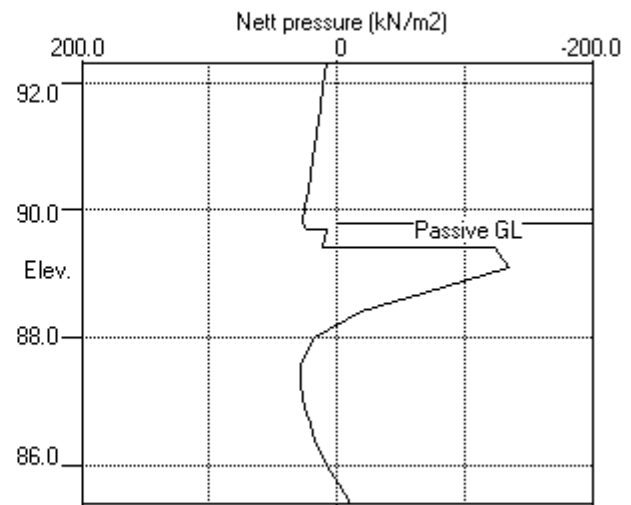
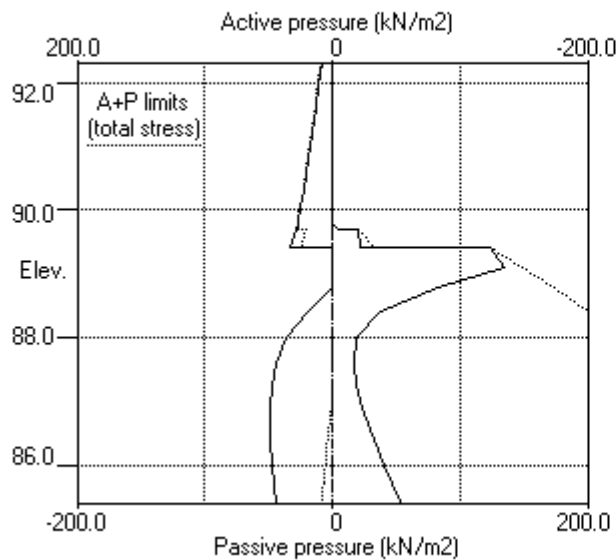
Note: 0.00a Soil pressure at active limit
 123.41p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 89.80 on PASSIVE side



Stage No.2 Excav. to elev. 89.80 on PASSIVE side



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 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.06 - SW5 Section 3 - TCB 92.30 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 3 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
4	92.30 86.40	90.30	Conditions not	suitable for	FoS calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	92.30	13.60	0.010	2.55E-03	0.0	0.0	
2	91.95	15.28	0.009	2.54E-03	5.1	1.0	
3	91.60	16.96	0.009	2.52E-03	10.7	3.7	
4	91.20	18.86	0.008	2.46E-03	17.9	9.4	
5	90.80	20.72	0.007	2.33E-03	25.8	18.2	
6	90.55	21.85	0.006	2.21E-03	31.1	25.3	
7	90.30	22.94	0.006	2.04E-03	36.7	33.8	66.2
		22.94	0.006	2.04E-03	-29.5	33.8	
8	90.05	24.55	0.005	1.86E-03	-23.6	27.1	
9	89.80	26.38	0.005	1.72E-03	-17.2	22.0	
10	89.70	27.11	0.004	1.67E-03	-14.6	20.4	
		26.41	0.004	1.67E-03	-14.6	20.4	
11	89.40	31.45	0.004	1.54E-03	-5.9	17.4	
		0.00	0.004	1.54E-03	-5.9	17.4	
12	89.10	0.00	0.003	1.42E-03	-5.9	17.9	
13	88.80	0.00	0.003	1.30E-03	-5.9	15.8	
14	88.40	0.00	0.003	1.17E-03	-5.9	13.1	
15	88.00	0.00	0.002	1.06E-03	-5.9	10.2	
16	87.60	0.00	0.002	9.82E-04	-5.9	7.7	
17	87.25	5.15	0.001	9.25E-04	-5.0	6.5	
18	86.90	15.70	0.001	8.78E-04	-1.3	5.1	
19	86.65	22.79	0.001	8.48E-04	3.5	5.3	
20	86.40	29.66	0.001	8.13E-04	10.0	6.9	
		-67.72	0.001	8.13E-04	10.0	6.9	
21	86.00	-32.70	0.000	7.45E-04	-10.0	7.7	
22	85.70	8.50	0.000	7.07E-04	-13.7	3.2	
23	85.40	82.69	-0.000	6.96E-04	0.0	-0.0	
Strut force at elev. 90.30 =			66.23 kN/m run =				158.94 kN/strut (horiz.)
							= 224.78 kN/strut (incl.)

(continued)

Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	92.30	0.00	20.00	8.12	49.28	13.60	13.60	1462
2	91.95	0.00	26.30	10.67	64.80	15.28	15.28	1462
3	91.60	0.00	32.60	13.23	80.32	16.96	16.96	1462
4	91.20	0.00	39.80	16.15	98.06	18.86	18.86	1462
5	90.80	0.00	47.00	19.08	115.80	20.72	20.72	1462
6	90.55	0.00	51.50	20.90	126.89	21.85	21.85	1462
7	90.30	0.00	56.00	22.73	137.98	22.94	22.94	1462
8	90.05	0.00	60.50	24.55	149.06	24.55	24.55a	1462
9	89.80	0.00	65.00	26.38	160.15	26.38	26.38a	1462
10	89.70	0.00	66.80	27.11	164.59	27.11	27.11a	1462
		0.00	66.80	20.74	180.28	26.41	26.41	1462
11	89.40	0.00	72.80	23.18	195.06	31.45	31.45	1462
		0.00	72.80	0.00	463.46	0.00	0.00a	26716
12	89.10	0.00	80.00	0.00	496.57	0.00	0.00a	26716
13	88.80	0.00	87.20	0.00	529.68	0.00	0.00a	26716
14	88.40	0.00	96.80	0.00	573.82	0.00	0.00a	26716
15	88.00	0.00	106.39	0.00	617.97	0.00	0.00a	26716
16	87.60	0.00	115.99	0.00	662.11	0.00	0.00a	26716
17	87.25	0.00	124.39	0.00	700.73	5.15	5.15	26716
18	86.90	0.00	132.79	0.90	739.35	15.70	15.70	26716
19	86.65	0.00	138.79	2.20	766.94	22.79	22.79	26716
20	86.40	0.00	144.79	3.50	794.52	29.66	29.66	26716
		0.00	144.79	3.50	595.89	29.66	29.66	26716
21	86.00	0.00	154.38	5.59	628.99	38.89	38.89	26716
22	85.70	0.00	161.58	7.16	653.82	43.96	43.96	26716
23	85.40	0.00	168.78	8.72	678.64	82.69	82.69	205373

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	91.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	91.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	90.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	90.55	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	90.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	90.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	89.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	89.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	89.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	89.10	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	88.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	86.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	97.38	97.38	97.38p	183162
21	86.00	0.00	9.60	0.00	131.01	71.58	71.58	183162

Run ID. 2021.04.06 - SW5 Section 3 - TCB 92.30
 2 Mandala Place, Castle Hill
 SW5 - Section 3

| Sheet No.
 | Date:12-04-2021
 | Checked :

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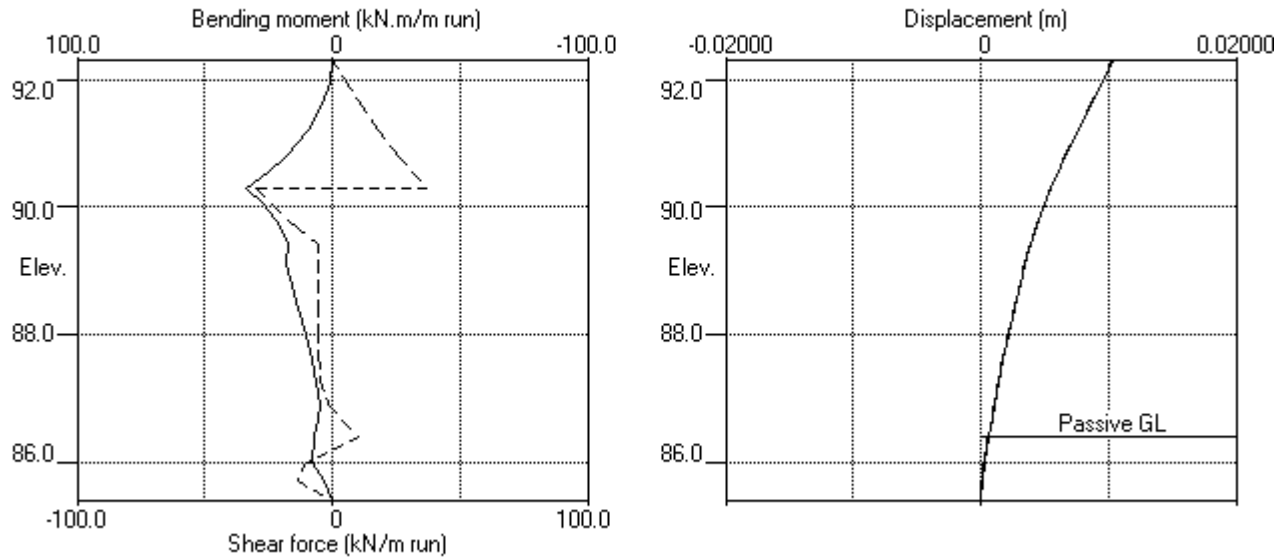
Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
22	85.70	0.00	16.80	0.00	156.25	35.46	35.46	183162
23	85.40	0.00	24.01	0.00	181.49	0.00	0.00a	387497

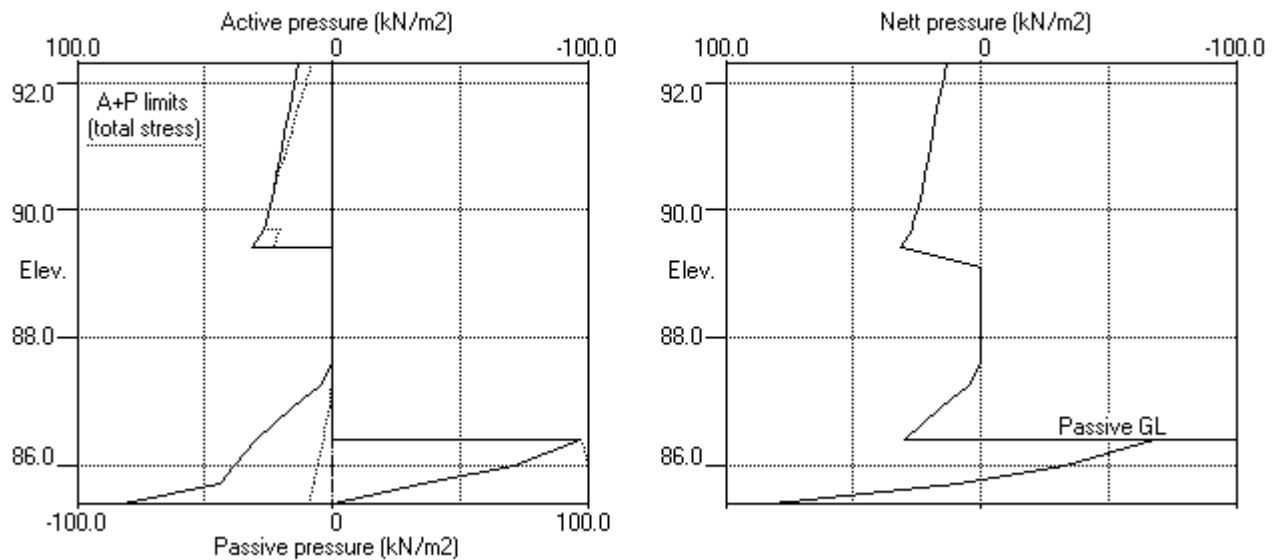
Note: 0.00a Soil pressure at active limit
 97.38p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
Licensed from GEOSOLVE | Made by : VR
Data filename/Run ID: 2021.04.06 - SW5 Section 3 - TCB 92.30 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW5 - Section 3 | Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
6	92.30	85.70	More than one	strut	

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
8.72kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	92.30	12.55	0.011	2.67E-03	0.0	0.0	
2	91.95	14.39	0.010	2.66E-03	4.7	0.9	
3	91.60	16.23	0.009	2.64E-03	10.1	3.5	
4	91.20	18.31	0.008	2.59E-03	17.0	8.9	
5	90.80	20.37	0.007	2.47E-03	24.7	17.3	
6	90.55	21.63	0.006	2.35E-03	30.0	24.1	
7	90.30	22.86	0.006	2.18E-03	35.5	32.3	66.2
		22.86	0.006	2.18E-03	-30.7	32.3	
8	90.05	24.65	0.005	2.02E-03	-24.7	25.3	
9	89.80	26.55	0.005	1.89E-03	-18.3	19.9	
10	89.70	27.31	0.004	1.84E-03	-15.7	18.2	
		26.61	0.004	1.84E-03	-15.7	18.2	
11	89.40	31.77	0.004	1.73E-03	-6.9	14.9	
		5.99	0.004	1.73E-03	-6.9	14.9	
12	89.10	8.45	0.003	1.62E-03	-4.7	15.3	
13	88.80	11.13	0.003	1.52E-03	-1.8	14.0	
14	88.40	14.91	0.002	1.39E-03	3.4	13.8	
15	88.00	18.36	0.002	1.26E-03	10.1	15.8	
16	87.60	20.09	0.001	1.09E-03	17.8	21.1	
17	87.25	24.79	0.001	8.85E-04	25.6	29.4	
18	86.90	31.93	0.001	6.05E-04	35.5	40.0	88.8
		31.93	0.001	6.05E-04	-53.2	40.0	

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

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
19	86.65	34.25	0.000	4.09E-04	-45.0	27.7	
20	86.40	34.93	0.000	2.78E-04	-36.3	17.6	
21	86.00	33.05	0.000	1.60E-04	-22.7	8.0	
22	85.70	29.67	0.000	1.24E-04	-13.3	2.4	
23	85.40	59.16	0.000	1.16E-04	0.0	-0.0	
Strut force at elev.			90.30 =	66.22 kN/m	run =	158.92 kN/strut	(horiz.)
					=	224.74 kN/strut	(incl.)
Strut force at elev.			86.90 =	88.79 kN/m	run =	213.09 kN/strut	(horiz.)
					=	301.35 kN/strut	(incl.)

Node no.	Y coord	----- ACTIVE side -----						
		----- Effective stresses -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	92.30	0.00	20.00	8.12	49.28	12.55	12.55	1871
2	91.95	0.00	26.30	10.67	64.80	14.39	14.39	1871
3	91.60	0.00	32.60	13.23	80.32	16.23	16.23	1871
4	91.20	0.00	39.80	16.15	98.06	18.31	18.31	1871
5	90.80	0.00	47.00	19.08	115.80	20.37	20.37	1871
6	90.55	0.00	51.50	20.90	126.89	21.63	21.63	1871
7	90.30	0.00	56.00	22.73	137.98	22.86	22.86	1871
8	90.05	0.00	60.50	24.55	149.06	24.65	24.65	1871
9	89.80	0.00	65.00	26.38	160.15	26.55	26.55	1871
10	89.70	0.00	66.80	27.11	164.59	27.31	27.31	1871
11	89.40	0.00	66.80	20.74	180.28	26.61	26.61	1871
		0.00	72.80	23.18	195.06	31.77	31.77	1871
12	89.10	0.00	72.80	0.00	463.46	5.99	5.99	34378
		0.00	80.00	0.00	496.57	8.45	8.45	34378
13	88.80	0.00	87.20	0.00	529.68	11.13	11.13	34378
14	88.40	0.00	96.80	0.00	573.82	14.91	14.91	34378
15	88.00	0.00	106.39	0.00	617.97	18.36	18.36	72719
16	87.60	0.00	115.99	0.00	662.11	20.09	20.09	72719
17	87.25	0.00	124.39	0.00	700.73	24.79	24.79	72719
18	86.90	0.00	132.79	0.90	739.35	31.93	31.93	72719
19	86.65	0.00	138.79	2.20	766.94	34.25	34.25	72719
20	86.40	0.00	144.79	3.50	794.52	34.93	34.93	72719
21	86.00	0.00	154.38	5.59	838.66	33.05	33.05	72719
22	85.70	0.00	161.58	7.16	871.76	29.67	29.67	72719
23	85.40	0.00	161.58	7.16	653.82	29.67	29.67	72719
		0.00	168.78	8.72	678.64	59.16	59.16	72719

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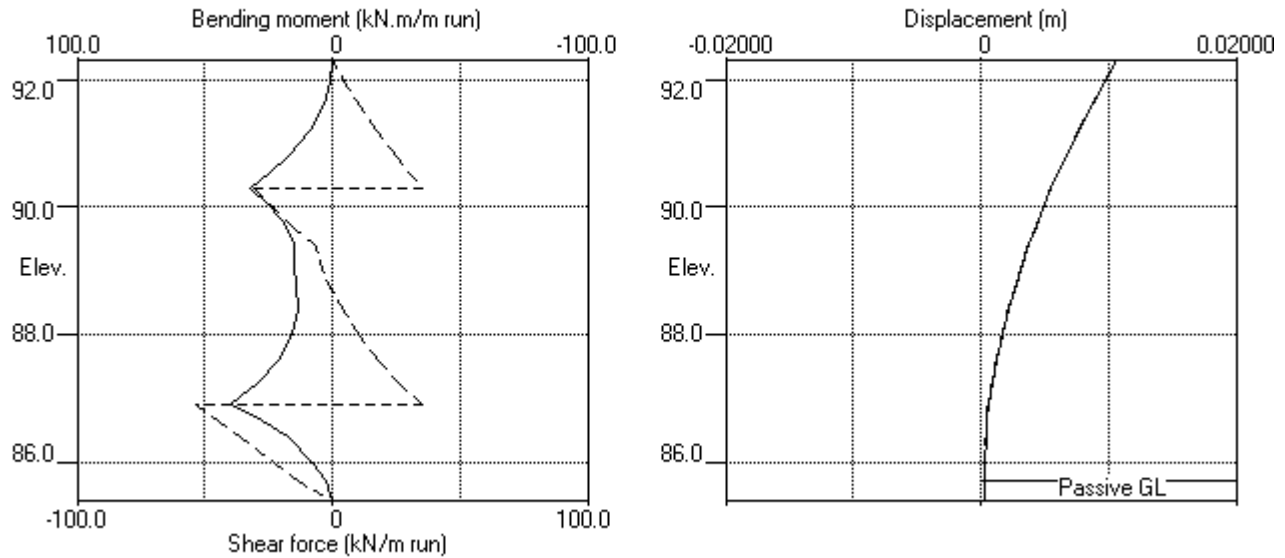
| Sheet No.
| Date:12-04-2021
| Checked :

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

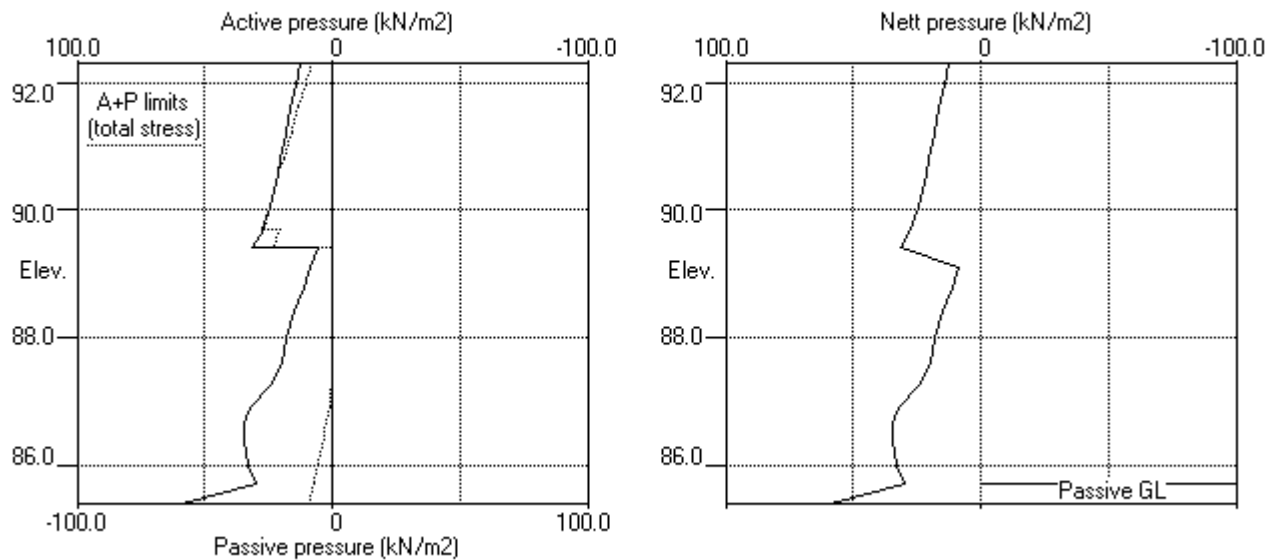
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
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Data filename/Run ID: 2021.04.06 - SW5 Section 3 - TCB 92.30	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW5 - Section 3	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40	FoS = 1.000	
					Factor	Moment	Toe
					of	equilib.	Wall
					Safety	at elev.	Penetr
							-ation
1	92.30	92.30	Cant.	6.848	86.33	91.54	0.76
2	92.30	89.80	Cant.	2.104	86.12	87.86	1.94
3	92.30	89.80	90.30	Conditions not suitable for FoS calc.			
4	92.30	86.40	90.30	Conditions not suitable for FoS calc.			
5	92.30	86.40		More than one strut			
6	92.30	85.70		More than one strut			

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	92.30	0.011	0.000	0.0	0.0	0.0	0.0
2	91.95	0.010	0.000	1.2	0.0	6.4	0.0
3	91.60	0.009	0.000	4.7	0.0	13.4	0.0
4	91.20	0.008	0.000	11.7	0.0	22.1	0.0
5	90.80	0.007	0.000	22.5	0.0	31.7	0.0
6	90.55	0.006	0.000	31.2	0.0	38.0	0.0
7	90.30	0.006	0.000	41.6	0.0	44.7	-31.0
8	90.05	0.005	0.000	38.9	0.0	36.8	-25.1
9	89.80	0.005	0.000	44.5	0.0	43.1	-18.7
10	89.70	0.004	0.000	48.9	0.0	45.6	-16.1
11	89.40	0.004	0.000	63.2	0.0	48.6	-7.3
12	89.10	0.003	0.000	73.5	0.0	9.9	-5.9
13	88.80	0.003	0.000	70.3	0.0	0.0	-22.6
14	88.40	0.003	0.000	55.2	0.0	3.4	-42.8
15	88.00	0.002	-0.000	36.6	0.0	10.1	-43.0
16	87.60	0.002	-0.000	21.1	0.0	17.8	-34.0
17	87.25	0.001	-0.000	29.4	0.0	26.0	-24.1
18	86.90	0.001	-0.000	40.0	0.0	38.1	-53.2
19	86.65	0.001	-0.000	27.7	-0.2	3.5	-45.0
20	86.40	0.001	-0.000	17.7	-1.0	10.0	-36.3
21	86.00	0.000	0.000	9.4	-1.0	1.2	-23.3
22	85.70	0.000	0.000	3.2	-0.5	1.7	-16.4
23	85.40	0.000	-0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	12.2	89.10	-0.0	85.70	9.2	89.40	-6.6	88.00
2	73.5	89.10	-1.0	86.00	48.6	89.40	-43.0	88.00
3	43.7	89.10	-1.0	86.40	44.7	90.30	-26.0	88.40
4	33.8	90.30	-0.0	85.40	36.7	90.30	-29.5	90.30
5	37.5	86.90	-0.0	85.40	38.1	86.90	-50.3	86.90
6	40.0	86.90	-0.0	85.40	35.5	86.90	-53.2	86.90

Summary of results (continued)

Maximum and minimum displacement at each stage

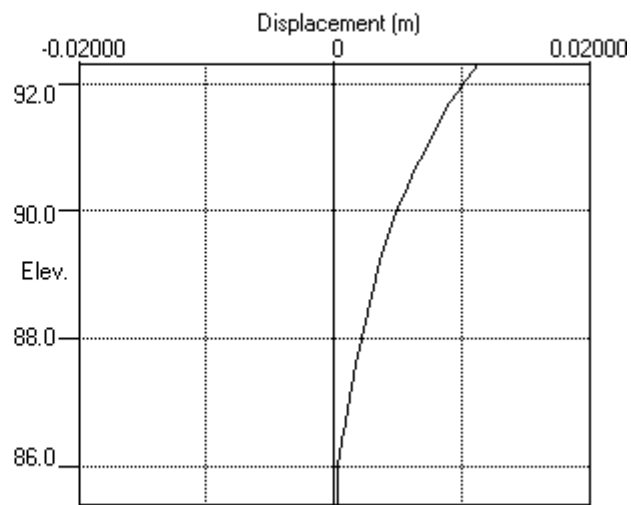
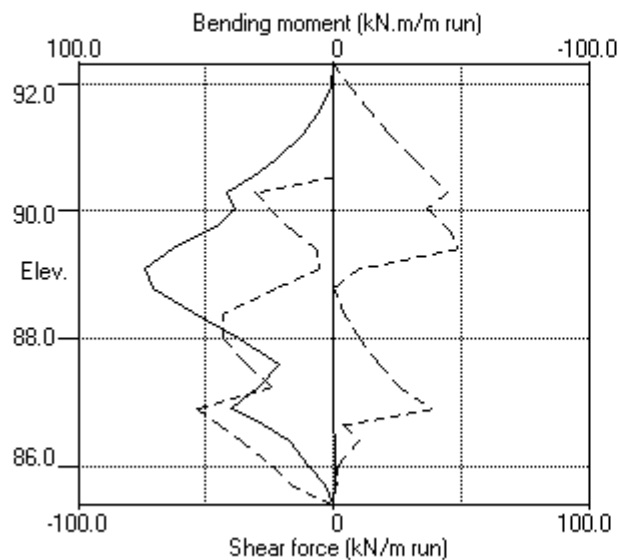
Stage no.	-----	Displacement	-----	Stage description
no.	maximum	elev.	minimum	elev.
	m		m	
1	0.002	92.30	0.000	92.30
2	0.011	92.30	-0.000	87.25
3	0.008	92.30	0.000	92.30
4	0.010	92.30	-0.000	85.40
5	0.011	92.30	-0.000	85.40
6	0.011	92.30	0.000	92.30
				Apply surcharge no.1 at elev. 92.30
				Excav. to elev. 89.80 on PASSIVE side
				Install strut no.1 at elev. 90.30
				Excav. to elev. 86.40 on PASSIVE side
				Install strut no.2 at elev. 86.90
				Excav. to elev. 85.40 on PASSIVE side

Strut forces at each stage (horizontal components)

Stage no.	---	Strut no. 1	---	Strut no. 2	---
		at elev. 90.30		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut	
3	58.93	141.42	---	---	
4	66.23	158.94	---	---	
5	66.35	159.23	88.39	212.13	
6	66.22	158.92	88.79	213.09	

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	-----	Soil types -----
		Active side	Passive side
1	93.20	1 Fill	1 Fill
2	91.40	2 Res Soil	2 Res Soil
3	91.20	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

--- parameters for Ka ---				--- parameters for Kp ---			
Soil				Soil			
friction				friction			
angle				angle			
adhesion				adhesion			
coeff.				coeff.			
fill				fill			
angle				angle			
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00	
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00	
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00	
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00	

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.40 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	91.20	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes
2	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	93.20	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 93.20
2	Excavate to elevation 90.70 on PASSIVE side
3	Install strut or anchor no.1 at elevation 91.20
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.2 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

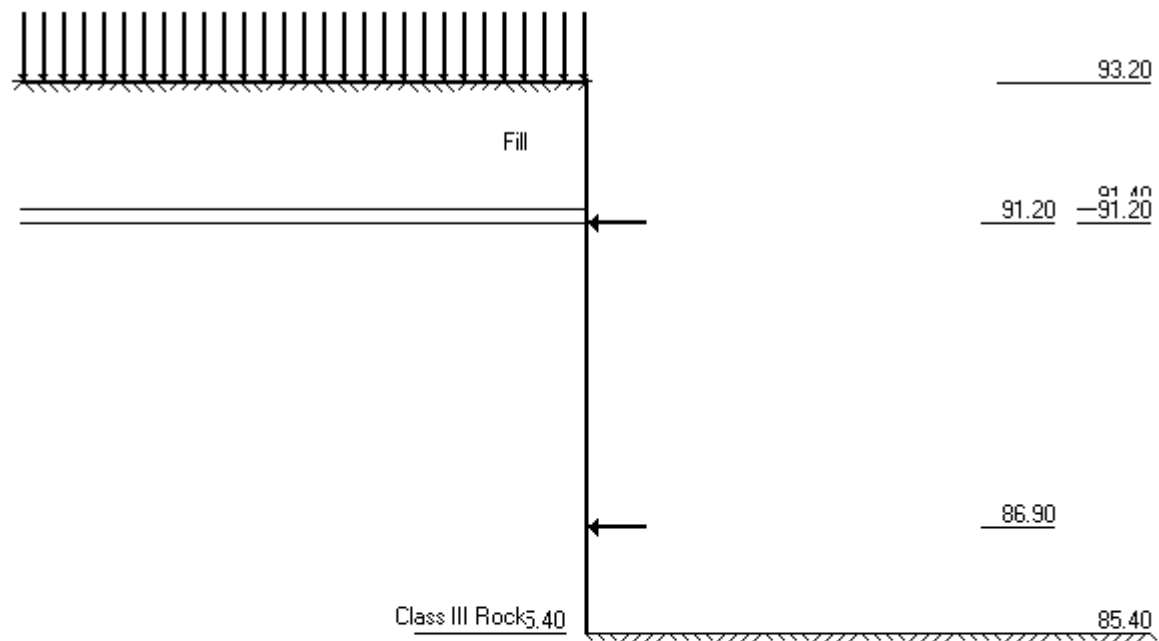
OUTPUT OPTIONS

Stage no.	Stage description	Output options		
		Displacement	Active, Bending mom. Shear force	Graph. Passive output pressures
1	Apply surcharge no.1 at elev. 93.20	Yes	Yes	Yes
2	Excav. to elev. 90.70 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 91.20	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.2 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

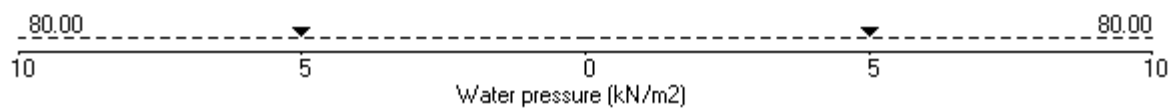
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



ABC Consultants Pty Ltd | Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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Data filename/Run ID: 2021.04.06 - SW5 Section 4 - TCB 93.20 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW5 - Section 4 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 90.70 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	93.20 90.70	Cant.		2.918	86.16	89.36	1.34

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	93.20	8.12	0.006	2.14E-03	0.0	0.0	
2	92.80	11.04	0.005	2.14E-03	3.8	0.8	
3	92.40	13.96	0.004	2.12E-03	8.8	3.4	
4	92.00	16.88	0.003	2.06E-03	15.0	8.1	
5	91.70	19.08	0.003	1.99E-03	20.4	13.3	
6	91.40	21.27	0.002	1.87E-03	26.4	20.3	
		20.10	0.002	1.87E-03	26.4	20.3	
7	91.20	23.66	0.002	1.77E-03	30.8	26.0	
		0.00	0.002	1.77E-03	30.8	26.0	
8	90.95	0.00	0.001	1.59E-03	30.8	33.8	
9	90.70	0.00	0.001	1.38E-03	30.8	41.5	
		-96.50	0.001	1.38E-03	30.8	41.5	
10	90.35	-87.11	0.001	1.01E-03	-1.3	47.9	
11	90.00	-37.92	0.000	6.54E-04	-23.2	42.5	
12	89.60	1.26	0.000	3.19E-04	-30.5	30.2	
13	89.20	18.10	-0.000	9.64E-05	-26.6	18.1	
14	88.80	21.13	-0.000	-2.78E-05	-18.8	8.8	
15	88.40	15.86	0.000	-8.26E-05	-11.4	3.0	
16	88.00	11.28	0.000	-9.52E-05	-6.0	-0.3	
17	87.60	7.42	0.000	-8.58E-05	-2.2	-1.8	
18	87.25	4.56	0.000	-7.02E-05	-0.1	-2.1	
19	86.90	2.30	0.000	-5.43E-05	1.1	-1.9	
20	86.65	1.03	0.000	-4.45E-05	1.5	-1.5	
21	86.40	-0.01	0.000	-3.69E-05	1.6	-1.1	
22	86.00	-1.36	0.000	-2.95E-05	1.3	-0.5	
23	85.70	-2.23	0.000	-2.74E-05	0.8	-0.1	
24	85.40	-3.07	0.000	-2.69E-05	-0.0	-0.0	

(continued)

Stage No.2 Excavate to elevation 90.70 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	93.20	0.00	20.00	8.12	49.28	8.12	8.12a	3324
2	92.80	0.00	27.20	11.04	67.02	11.04	11.04a	3324
3	92.40	0.00	34.40	13.96	84.76	13.96	13.96a	3324
4	92.00	0.00	41.60	16.88	102.50	16.88	16.88a	3324
5	91.70	0.00	47.00	19.08	115.80	19.08	19.08a	3324
6	91.40	0.00	52.40	21.27	129.11	21.27	21.27a	3324
7	91.20	0.00	52.40	14.90	144.80	20.10	20.10	3324
		0.00	56.40	16.52	154.66	23.66	23.66	3324
8	90.95	0.00	56.40	0.00	388.05	0.00	0.00a	61498
		0.00	62.40	0.00	415.64	0.00	0.00a	61498
9	90.70	0.00	68.40	0.00	443.23	0.00	0.00a	61498
		0.00	68.40	0.00	332.42	0.00	0.00a	61498
10	90.35	0.00	76.80	0.00	361.39	0.00	0.00a	61498
11	90.00	0.00	85.20	0.00	390.36	10.95	10.95	61498
12	89.60	0.00	94.80	0.00	423.47	26.21	26.21	61498
13	89.20	0.00	104.40	0.00	456.58	35.04	35.04	124834
14	88.80	0.00	113.99	0.00	489.69	39.92	39.92	124834
15	88.40	0.00	123.59	0.00	522.79	40.64	40.64	124834
16	88.00	0.00	133.19	0.98	555.90	41.71	41.71	49556
17	87.60	0.00	142.79	3.07	589.00	43.15	43.15	49556
18	87.25	0.00	151.18	4.90	617.97	44.66	44.66	49556
19	86.90	0.00	159.58	6.72	646.93	46.48	46.48	49556
20	86.65	0.00	165.58	8.03	667.62	47.94	47.94	49556
21	86.40	0.00	171.58	9.33	688.31	49.52	49.52	49556
22	86.00	0.00	181.17	11.42	721.40	52.22	52.22	49556
23	85.70	0.00	188.37	12.98	746.23	54.31	54.31	49556
24	85.40	0.00	195.57	14.55	771.05	56.42	56.42	49556

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	93.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	91.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	90.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	90.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	96.50	96.50p	151988
10	90.35	0.00	8.40	0.00	125.48	87.11	87.11	151988
11	90.00	0.00	16.80	0.00	154.45	48.87	48.87	151988
12	89.60	0.00	26.40	0.00	187.57	24.95	24.95	151988
13	89.20	0.00	36.01	0.00	220.70	16.94	16.94	124834
14	88.80	0.00	45.62	0.00	253.85	18.78	18.78	124834
15	88.40	0.00	55.23	0.00	287.00	24.78	24.78	124834
16	88.00	0.00	64.85	0.00	320.43	30.44	30.44	49556
17	87.60	0.00	74.47	0.00	354.15	35.73	35.73	49556
18	87.25	0.00	82.90	0.00	383.67	40.10	40.10	49556
19	86.90	0.00	91.34	0.00	413.21	44.17	44.17	49556
20	86.65	0.00	97.36	0.00	434.33	46.91	46.91	49556

(continued)

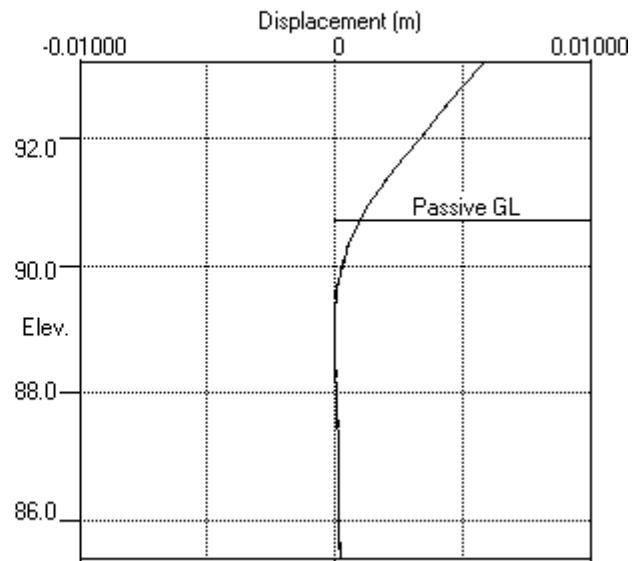
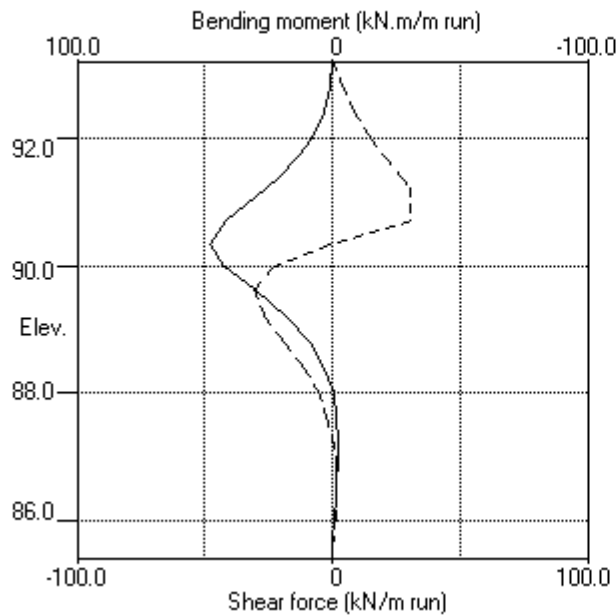
Stage No.2 Excavate to elevation 90.70 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
21	86.40	0.00	103.39	0.00	455.46	49.54	49.54	49556
22	86.00	0.00	113.05	0.00	489.29	53.58	53.58	49556
23	85.70	0.00	120.30	0.00	514.68	56.54	56.54	49556
24	85.40	0.00	127.55	0.00	540.09	59.48	59.48	49556

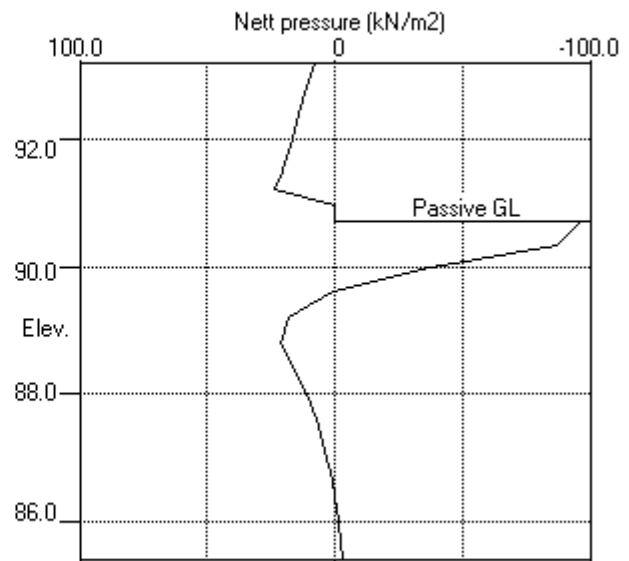
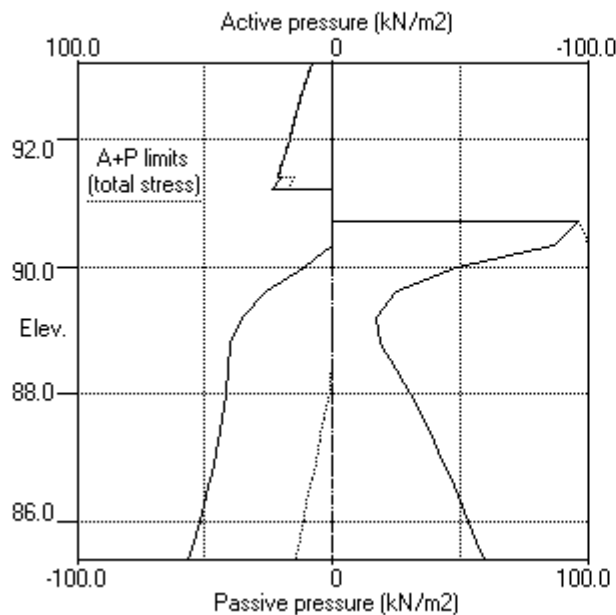
Note: 0.00a Soil pressure at active limit
 96.50p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 90.70 on PASSIVE side



Stage No.2 Excav. to elev. 90.70 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.06 - SW5 Section 4 - TCB 93.20 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 4 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
4	93.20 86.40	91.20		1.533	n/a	86.38	0.02

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	93.20	14.35	0.004	1.30E-03	0.0	0.0	
2	92.80	15.60	0.004	1.30E-03	6.0	1.3	
3	92.40	17.75	0.003	1.27E-03	12.7	5.1	
4	92.00	19.88	0.002	1.19E-03	20.2	11.6	
5	91.70	21.45	0.002	1.08E-03	26.4	18.6	
6	91.40	23.00	0.002	9.30E-04	33.1	27.5	
		21.83	0.002	9.30E-04	33.1	27.5	
7	91.20	24.94	0.002	7.86E-04	37.7	34.6	60.6
		23.76	0.002	7.86E-04	-22.9	34.6	
8	90.95	12.84	0.001	6.01E-04	-18.3	29.7	
9	90.70	2.18	0.001	4.42E-04	-16.4	25.4	
10	90.35	0.00	0.001	2.53E-04	-16.1	21.4	
11	90.00	0.00	0.001	1.02E-04	-16.1	15.8	
12	89.60	0.00	0.001	-1.16E-05	-16.1	8.9	
13	89.20	2.75	0.001	-6.74E-05	-15.5	3.1	
14	88.80	6.07	0.001	-6.90E-05	-13.7	-2.8	
15	88.40	6.92	0.001	-2.10E-05	-11.1	-7.6	
16	88.00	9.43	0.001	6.68E-05	-7.9	-11.4	
17	87.60	13.47	0.001	1.82E-04	-3.3	-13.7	
18	87.25	18.19	0.001	2.94E-04	2.2	-13.9	
19	86.90	24.02	0.001	3.98E-04	9.6	-11.9	
20	86.65	28.78	0.001	4.58E-04	16.2	-8.8	
21	86.40	33.90	0.001	4.94E-04	24.1	-3.8	
		-63.76	0.001	4.94E-04	24.1	-3.8	
22	86.00	-32.44	0.001	5.08E-04	4.8	0.7	
23	85.70	-8.02	0.000	5.03E-04	-1.2	0.7	
24	85.40	16.30	0.000	5.01E-04	-0.0	-0.0	
Strut force at elev. 91.20 =			60.62 kN/m run =				145.49 kN/strut (horiz.)
							= 205.76 kN/strut (incl.)

(continued)

Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	93.20	0.00	20.00	8.12	49.28	14.35	14.35	245467
2	92.80	0.00	27.20	11.04	67.02	15.60	15.60	1442
3	92.40	0.00	34.40	13.96	84.76	17.75	17.75	1442
4	92.00	0.00	41.60	16.88	102.50	19.88	19.88	1442
5	91.70	0.00	47.00	19.08	115.80	21.45	21.45	1442
6	91.40	0.00	52.40	21.27	129.11	23.00	23.00	1442
7	91.20	0.00	52.40	14.90	144.80	21.83	21.83	1442
		0.00	56.40	16.52	154.66	24.94	24.94	1442
8	90.95	0.00	56.40	0.00	388.05	23.76	23.76	26346
		0.00	62.40	0.00	415.64	12.84	12.84	26346
9	90.70	0.00	68.40	0.00	443.23	2.18	2.18	26346
10	90.35	0.00	76.80	0.00	481.86	0.00	0.00a	26346
11	90.00	0.00	85.20	0.00	520.49	0.00	0.00a	26346
12	89.60	0.00	94.80	0.00	564.63	0.00	0.00a	26346
13	89.20	0.00	104.40	0.00	608.77	2.75	2.75	26346
14	88.80	0.00	113.99	0.00	652.92	6.07	6.07	26346
15	88.40	0.00	123.59	0.00	697.06	6.92	6.92	26346
16	88.00	0.00	133.19	0.98	741.20	9.43	9.43	26346
17	87.60	0.00	142.79	3.07	785.34	13.47	13.47	26346
18	87.25	0.00	151.18	4.90	823.96	18.19	18.19	26346
19	86.90	0.00	159.58	6.72	862.57	24.02	24.02	26346
20	86.65	0.00	165.58	8.03	890.16	28.78	28.78	26346
21	86.40	0.00	171.58	9.33	917.74	33.90	33.90	26346
		0.00	171.58	9.33	688.31	33.90	33.90	26346
22	86.00	0.00	181.17	11.42	721.40	42.39	42.39	26346
23	85.70	0.00	188.37	12.98	746.23	49.25	49.25	26346
24	85.40	0.00	195.57	14.55	771.05	56.12	56.12	26346

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	93.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	92.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	91.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	91.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	90.95	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	90.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	90.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	88.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	98.84	97.65	97.65	126668

Run ID. 2021.04.06 - SW5 Section 4 - TCB 93.20
 2 Mandala Place, Castle Hill
 SW5 - Section 4

| Sheet No.
 | Date:12-04-2021
 | Checked :

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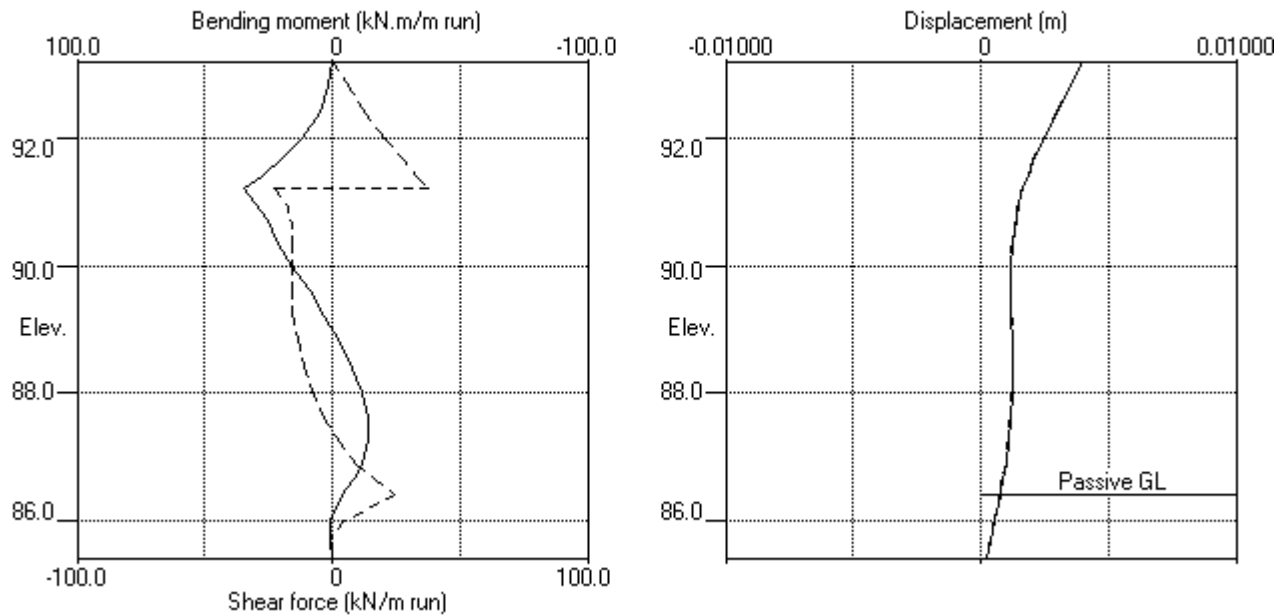
Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
22	86.00	0.00	9.60	0.00	132.47	74.84	74.84	126668
23	85.70	0.00	16.80	0.00	157.70	57.27	57.27	126668
24	85.40	0.00	24.01	0.00	182.95	39.81	39.81	126668

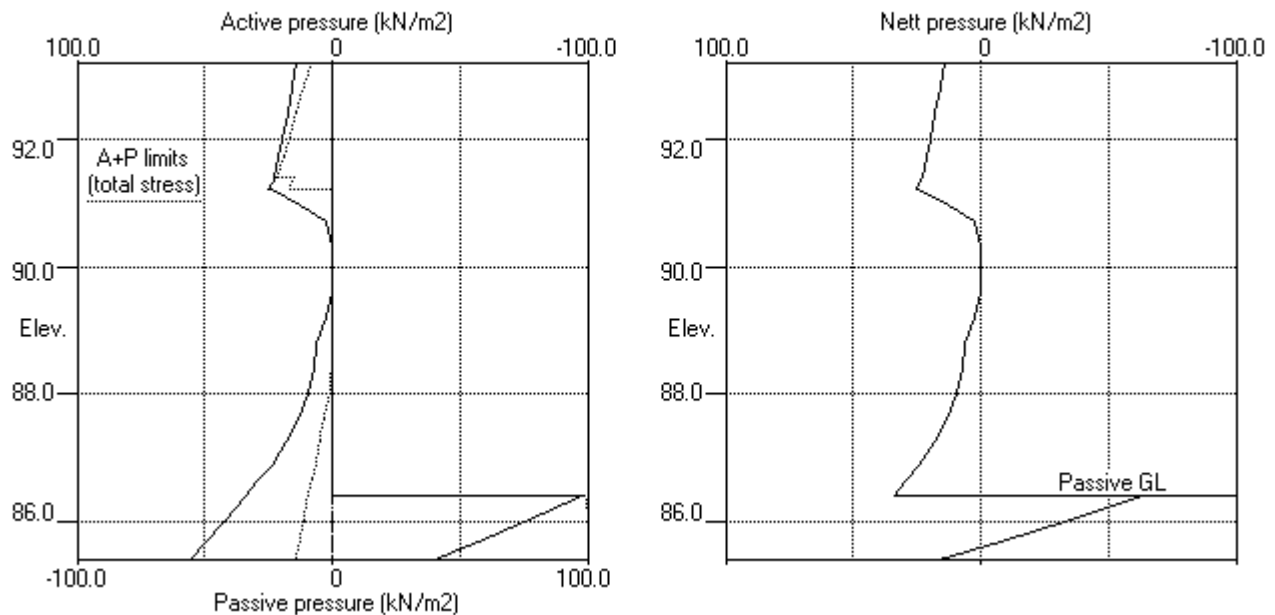
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



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 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.06 - SW5 Section 4 - TCB 93.20 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 4 | Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
6	93.20 85.70		More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 14.55kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	93.20	13.75	0.004	1.36E-03	0.0	0.0	
2	92.80	15.08	0.004	1.36E-03	5.8	1.3	
3	92.40	17.31	0.003	1.33E-03	12.2	4.9	
4	92.00	19.52	0.003	1.25E-03	19.6	11.2	
5	91.70	21.16	0.002	1.15E-03	25.7	18.0	
6	91.40	22.77	0.002	1.00E-03	32.3	26.7	
		21.60	0.002	1.00E-03	32.3	26.7	
7	91.20	24.75	0.002	8.61E-04	36.9	33.6	60.8
		20.24	0.002	8.61E-04	-23.8	33.6	
8	90.95	10.35	0.002	6.82E-04	-20.0	28.4	
9	90.70	0.80	0.001	5.31E-04	-18.6	23.6	
10	90.35	0.73	0.001	3.60E-04	-18.4	18.8	
11	90.00	2.24	0.001	2.34E-04	-17.8	12.4	
12	89.60	4.70	0.001	1.53E-04	-16.5	5.0	
13	89.20	10.49	0.001	1.33E-04	-13.4	-0.6	
14	88.80	17.37	0.001	1.59E-04	-7.8	-5.0	
15	88.40	22.06	0.001	2.12E-04	0.0	-6.6	
16	88.00	28.15	0.001	2.64E-04	10.1	-4.7	
17	87.60	33.72	0.001	2.78E-04	22.5	1.7	
18	87.25	36.93	0.001	2.24E-04	34.8	11.7	
19	86.90	37.52	0.001	7.10E-05	47.8	26.2	88.8
		37.52	0.001	7.10E-05	-41.0	26.2	

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

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(continued)

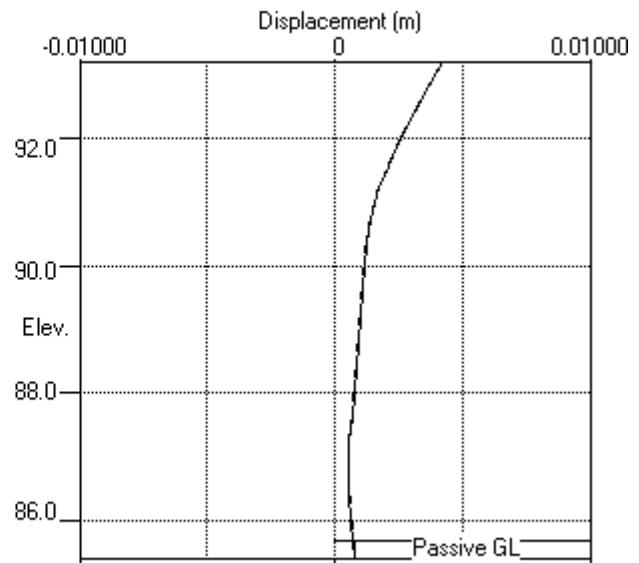
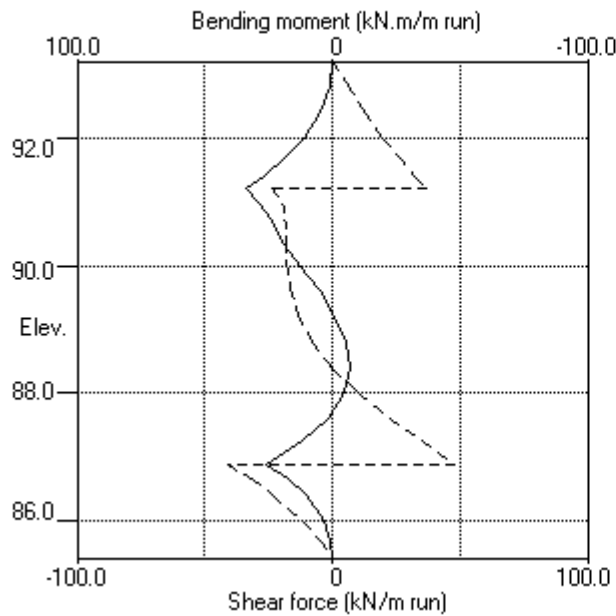
Stage No.6 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
9	90.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	90.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	88.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	86.65	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	86.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	85.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

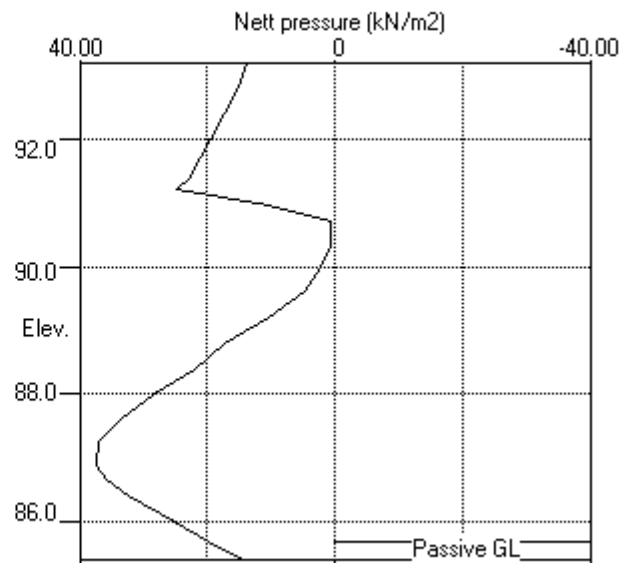
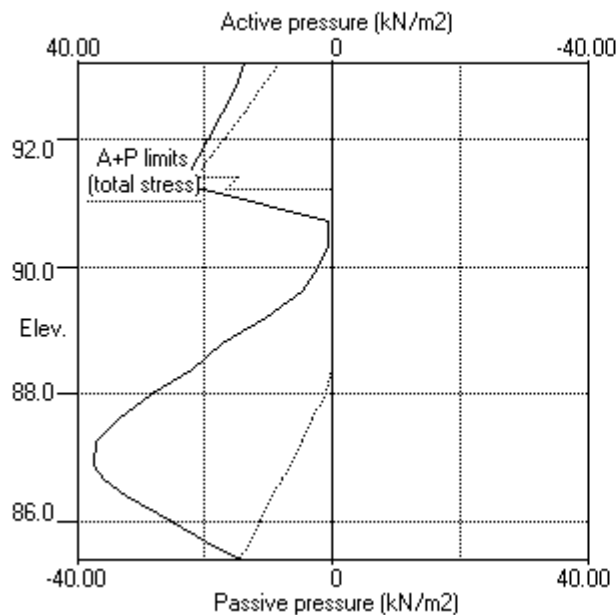
Note: 14.55a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



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Data filename/Run ID: 2021.04.06 - SW5 Section 4 - TCB 93.20	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW5 - Section 4	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe		Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40		FoS = 1.000	
					-----		-----	
				Factor	Moment		Toe	Wall
				of	equilib.		elev.	Penetr
				Safety	at elev.			-ation
1	93.20	93.20	Cant.	10.117	86.38		92.50	0.70
2	93.20	90.70	Cant.	2.918	86.16		89.36	1.34
3	93.20	90.70	91.20	Conditions not suitable for FoS calc.				
4	93.20	86.40	91.20	1.533	n/a		86.38	0.02
5	93.20	86.40		More than one strut				
6	93.20	85.70		More than one strut				

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	93.20	0.006	0.000	0.0	0.0	0.0	0.0
2	92.80	0.005	0.000	1.3	0.0	6.0	0.0
3	92.40	0.004	0.000	5.1	0.0	12.7	0.0
4	92.00	0.003	0.000	11.6	0.0	20.3	0.0
5	91.70	0.003	0.000	18.6	0.0	26.7	0.0
6	91.40	0.002	0.000	27.6	0.0	33.7	0.0
7	91.20	0.002	0.000	34.8	0.0	38.5	-23.8
8	90.95	0.002	0.000	33.8	0.0	30.8	-20.0
9	90.70	0.001	0.000	41.5	0.0	30.8	-18.7
10	90.35	0.001	0.000	47.9	0.0	0.0	-18.7
11	90.00	0.001	0.000	42.5	0.0	0.0	-23.2
12	89.60	0.001	0.000	30.2	0.0	0.0	-30.5
13	89.20	0.001	-0.000	18.1	-1.5	0.0	-26.6
14	88.80	0.001	-0.000	8.8	-6.7	0.0	-18.8
15	88.40	0.001	0.000	3.0	-9.3	0.0	-11.4
16	88.00	0.001	0.000	0.0	-11.4	10.1	-7.9
17	87.60	0.001	0.000	1.7	-13.7	22.5	-3.3
18	87.25	0.001	0.000	11.7	-13.9	34.8	-0.1
19	86.90	0.001	0.000	26.2	-11.9	49.3	-41.0
20	86.65	0.001	0.000	17.2	-8.8	16.2	-31.8
21	86.40	0.001	0.000	10.4	-3.8	24.1	-23.4
22	86.00	0.001	0.000	3.6	-0.5	4.8	-11.9
23	85.70	0.001	0.000	1.2	-0.1	0.8	-5.1
24	85.40	0.001	0.000	0.0	-0.0	0.0	-0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	10.4	90.95	-0.4	87.60	9.2	91.20	-6.2	90.00
2	47.9	90.35	-2.1	87.25	30.8	91.20	-30.5	89.60
3	34.8	91.20	-1.5	87.60	38.5	91.20	-20.4	91.20
4	34.6	91.20	-13.9	87.25	37.7	91.20	-22.9	91.20
5	33.7	91.20	-9.3	88.40	49.3	86.90	-39.1	86.90
6	33.6	91.20	-6.6	88.40	47.8	86.90	-41.0	86.90

Summary of results (continued)

Maximum and minimum displacement at each stage

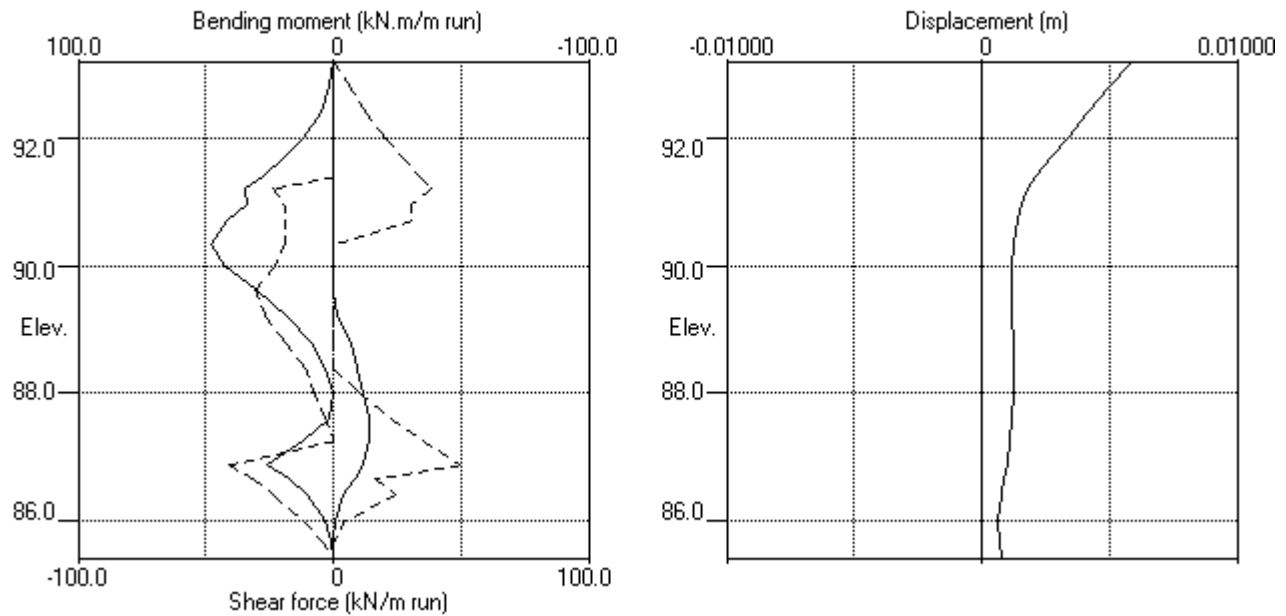
Stage no.	-----	Displacement	-----	Stage description
no.	maximum	elev.	minimum	elev.
	m		m	
1	0.001	93.20	0.000	93.20
2	0.006	93.20	-0.000	88.80
3	0.004	93.20	0.000	93.20
4	0.004	93.20	0.000	93.20
5	0.004	93.20	0.000	93.20
6	0.004	93.20	0.000	93.20

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---	--- Strut no. 2 ---
	at elev. 91.20	at elev. 86.90
	kN/m run	kN/strut
3	58.93	141.42
4	60.62	145.49
5	60.79	145.90
6	60.78	145.88

Units: kN,m

Bending moment, shear force, displacement envelopes



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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 5 | Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	94.00	1 Fill	1 Fill	
2	92.20	2 Res Soil	2 Res Soil	
3	92.00	4 Class III Rock	4 Class III Rock	

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

No. Description	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction angle	Wall adhesion coeff.	Back-fill	Soil friction angle	Wall adhesion coeff.	Back-fill
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	80.00	80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
 Soldier Pile width = 0.60 m
 Soldier Pile spacing = 2.40 m
 Passive mobilisation factor = 3.00 m
 Elevation of toe of wall = 85.40
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 3.2800E+07 kN/m2
 Moment of inertia of wall I = 1.3200E-03 m4/m run
 E.I = 43296 kN.m2/m run
 Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	89.20	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes
2	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes
3	92.00	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes

SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge	Equiv. Partial soil factor/ type Category
1	94.00	0.00 (A)	100.00	100.00	20.00 =	N/A N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 94.00
2	Excavate to elevation 91.50 on PASSIVE side
3	Install strut or anchor no.3 at elevation 92.00
4	Excavate to elevation 88.70 on PASSIVE side
5	Install strut or anchor no.1 at elevation 89.20
6	Excavate to elevation 86.40 on PASSIVE side
7	Install strut or anchor no.2 at elevation 86.90
8	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

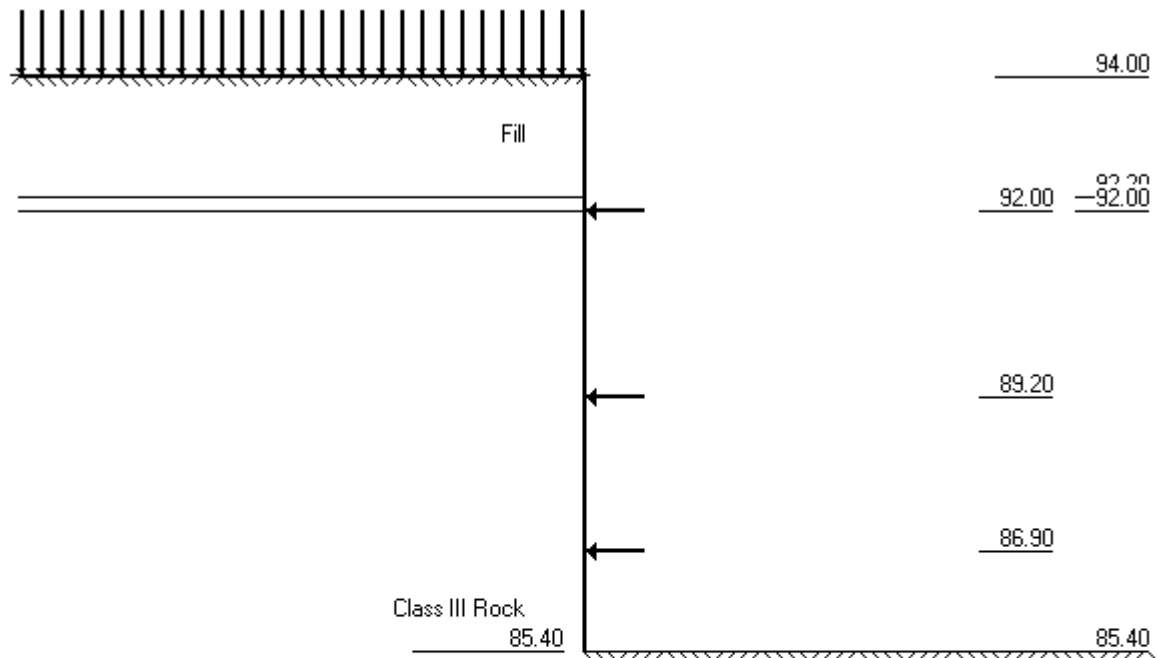
OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Output options Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 94.00	Yes	Yes	Yes
2	Excav. to elev. 91.50 on PASSIVE side	No	No	No
3	Install strut no.3 at elev. 92.00	No	No	No
4	Excav. to elev. 88.70 on PASSIVE side	No	No	No
5	Install strut no.1 at elev. 89.20	No	No	No
6	Excav. to elev. 86.40 on PASSIVE side	No	No	No
7	Install strut no.2 at elev. 86.90	No	No	No
8	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

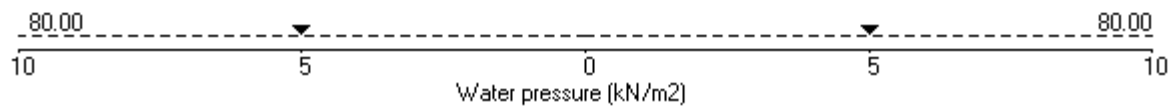
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Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



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 SW5 - Section 5 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 91.50 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
2	94.00 91.50	Cant.	3.250	86.24	90.18 1.32

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	94.00	8.12	0.006	2.16E-03	0.0	0.0	
2	93.50	11.77	0.005	2.16E-03	5.0	1.3	
3	93.00	15.42	0.004	2.12E-03	11.8	5.5	
4	92.60	18.34	0.003	2.04E-03	18.5	11.5	
5	92.20	21.27	0.002	1.89E-03	26.4	20.4	
		20.01	0.002	1.89E-03	26.4	20.4	
6	92.00	23.58	0.002	1.78E-03	30.8	26.1	
		0.00	0.002	1.78E-03	30.8	26.1	
7	91.50	0.00	0.001	1.39E-03	30.8	41.5	
		-96.50	0.001	1.39E-03	30.8	41.5	
8	91.00	-69.84	0.000	8.83E-04	-10.8	47.8	
9	90.50	-6.70	0.000	4.07E-04	-29.9	34.7	
10	90.00	18.02	-0.000	9.81E-05	-27.1	18.9	
11	89.60	21.29	-0.000	-3.26E-05	-19.2	9.5	
12	89.20	14.92	0.000	-9.24E-05	-12.0	3.5	
13	88.70	10.25	0.000	-1.08E-04	-5.7	-0.7	
14	88.35	7.14	0.000	-9.79E-05	-2.6	-2.0	
15	88.00	4.53	0.000	-7.96E-05	-0.6	-2.5	
16	87.50	1.81	0.000	-5.21E-05	1.0	-2.2	
17	87.20	0.72	0.000	-3.79E-05	1.4	-1.9	
18	86.90	-0.05	0.000	-2.64E-05	1.5	-1.4	
19	86.40	-0.83	0.000	-1.41E-05	1.2	-0.7	
20	85.90	-1.26	0.000	-8.90E-06	0.7	-0.2	
21	85.40	-1.58	0.000	-7.77E-06	0.0	0.0	

(continued)

Stage No.2 Excavate to elevation 91.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	94.00	0.00	20.00	8.12	49.28	8.12	8.12a	3302
2	93.50	0.00	29.00	11.77	71.45	11.77	11.77a	3302
3	93.00	0.00	38.00	15.42	93.63	15.42	15.42a	3302
4	92.60	0.00	45.20	18.34	111.37	18.34	18.34a	3302
5	92.20	0.00	52.40	21.27	129.11	21.27	21.27a	3302
		0.00	52.40	14.90	144.80	20.01	20.01	3302
6	92.00	0.00	56.40	16.52	154.66	23.58	23.58	3302
		0.00	56.40	0.00	388.05	0.00	0.00a	61089
7	91.50	0.00	68.40	0.00	443.23	0.00	0.00a	61089
		0.00	68.40	0.00	332.42	0.00	0.00a	61089
8	91.00	0.00	80.40	0.00	373.81	0.00	0.00a	61089
9	90.50	0.00	92.40	0.00	415.20	22.98	22.98	61089
10	90.00	0.00	104.40	0.00	456.58	34.95	34.95	119870
11	89.60	0.00	113.99	0.00	489.69	40.00	40.00	134176
12	89.20	0.00	123.59	0.00	522.79	40.18	40.18	134176
13	88.70	0.00	135.59	1.50	564.17	42.04	42.04	38528
14	88.35	0.00	143.99	3.33	593.14	43.43	43.43	38528
15	88.00	0.00	152.38	5.16	622.10	45.06	45.06	38528
16	87.50	0.00	164.38	7.76	663.48	47.91	47.91	38528
17	87.20	0.00	171.58	9.33	688.31	49.89	49.89	38528
18	86.90	0.00	178.77	10.89	713.13	52.03	52.03	38528
19	86.40	0.00	190.77	13.50	754.50	55.85	55.85	38528
20	85.90	0.00	202.76	16.11	796.20	59.84	59.84	38528
21	85.40	0.00	214.76	18.72	838.23	63.90	63.90	38528

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	92.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	92.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	91.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	96.50	96.50p	149641
8	91.00	0.00	12.00	0.00	137.89	69.84	69.84	149641
9	90.50	0.00	24.00	0.00	179.29	29.68	29.68	149641
10	90.00	0.00	36.01	0.00	220.70	16.93	16.93	134176
11	89.60	0.00	45.62	0.00	253.85	18.71	18.71	134176
12	89.20	0.00	55.23	0.00	287.00	25.25	25.25	134176
13	88.70	0.00	67.26	0.00	328.85	31.79	31.79	38528
14	88.35	0.00	75.68	0.00	358.36	36.29	36.29	38528
15	88.00	0.00	84.11	0.00	387.89	40.54	40.54	38528
16	87.50	0.00	96.16	0.00	430.11	46.10	46.10	38528
17	87.20	0.00	103.39	0.00	455.46	49.17	49.17	38528
18	86.90	0.00	110.63	0.00	480.83	52.08	52.08	38528
19	86.40	0.00	122.72	0.00	523.15	56.68	56.68	38528
20	85.90	0.00	134.81	1.34	565.52	61.11	61.11	38528
21	85.40	0.00	146.92	3.97	607.95	65.48	65.48	38528

Run ID. 2021.04.06 - SW5 Section 5 - TCB 94.00
2 Mandala Place, Castle Hill
SW5 - Section 5

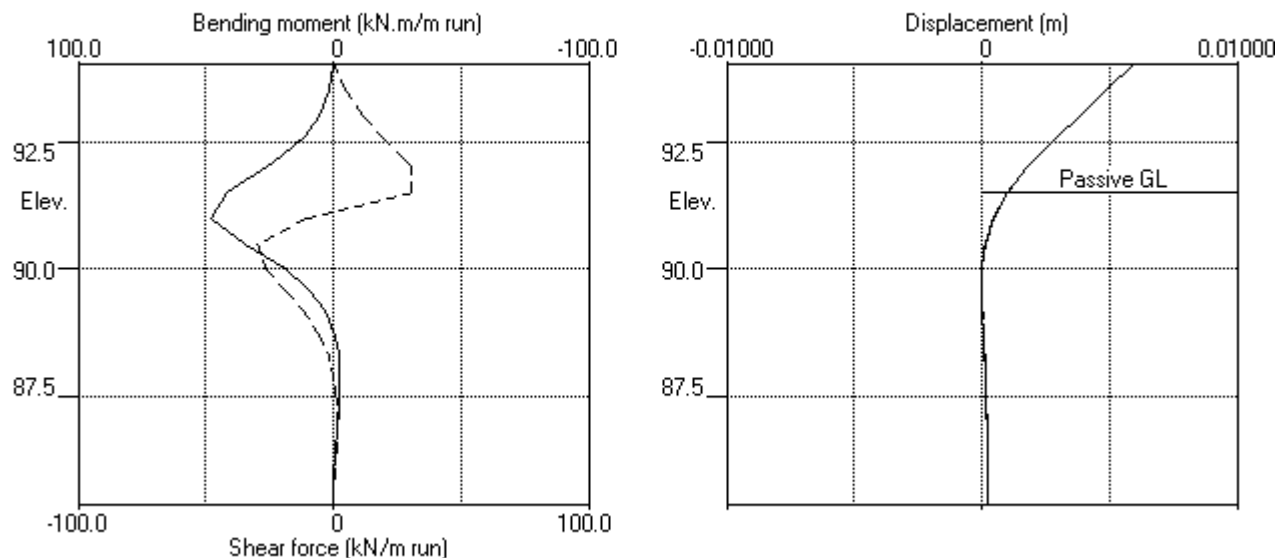
| Sheet No.
| Date:12-04-2021
| Checked :

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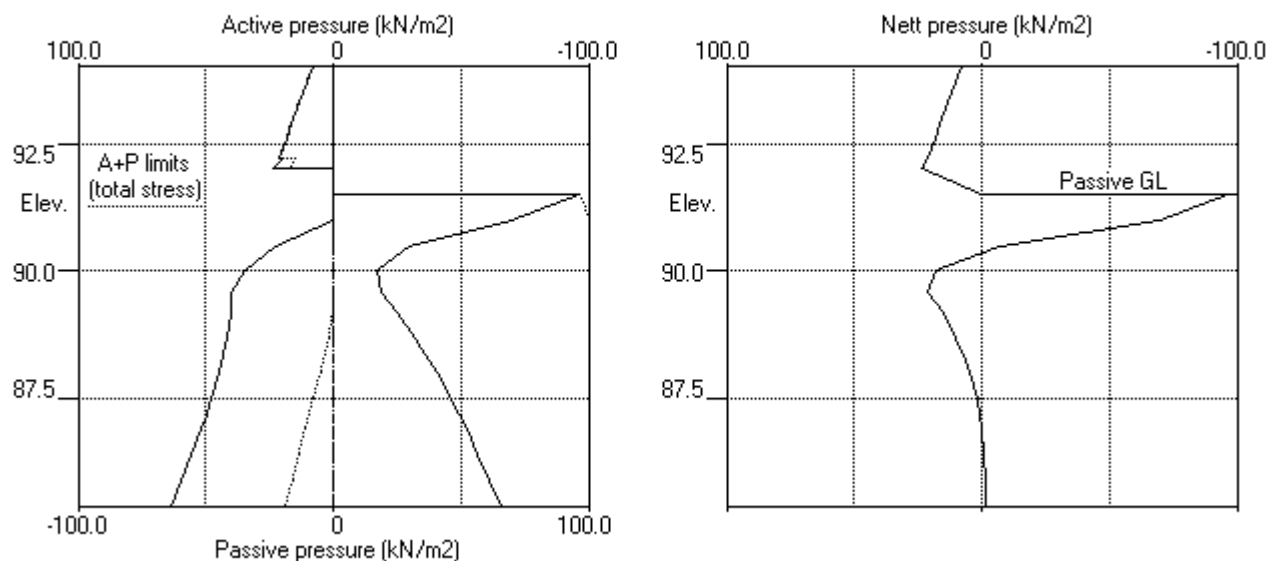
Stage No.2 Excavate to elevation 91.50 on PASSIVE side
Note: 0.00a Soil pressure at active limit
 96.50p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 91.50 on PASSIVE side



Stage No.2 Excav. to elev. 91.50 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.06 - SW5 Section 5 - TCB 94.00 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 5 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 88.70 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000	
				-----	-----	
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of	elev.	Penetr
				equilib.		-ation
				Safety at elev.		
4	94.00	88.70	92.00	Conditions not suitable for FoS calc.		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	94.00	17.33	0.003	1.23E-03	0.0	-0.0	
2	93.50	18.70	0.002	1.22E-03	9.0	2.5	
3	93.00	21.12	0.002	1.15E-03	19.0	9.5	
4	92.60	23.01	0.001	1.02E-03	27.8	18.8	
5	92.20	24.82	0.001	7.88E-04	37.4	31.8	
		23.56	0.001	7.88E-04	37.4	31.8	
6	92.00	26.53	0.001	6.22E-04	42.4	39.8	89.5
		54.68	0.001	6.22E-04	-47.1	39.8	
7	91.50	25.89	0.001	2.59E-04	-27.0	23.1	
8	91.00	1.72	0.001	5.30E-05	-20.1	12.8	
9	90.50	9.50	0.001	-4.26E-05	-17.3	3.8	
10	90.00	14.55	0.001	-4.33E-05	-11.3	-3.7	
11	89.60	18.36	0.001	5.82E-06	-4.7	-7.0	
12	89.20	19.82	0.001	7.10E-05	3.0	-7.2	
13	88.70	25.26	0.001	1.29E-04	14.2	-3.0	
		-19.63	0.001	1.29E-04	14.2	-3.0	
14	88.35	-14.97	0.001	1.38E-04	8.2	0.8	
15	88.00	-10.44	0.000	1.24E-04	3.7	2.7	
16	87.50	-5.18	0.000	9.02E-05	-0.2	3.3	
17	87.20	-2.87	0.000	6.85E-05	-1.4	3.0	
18	86.90	-1.14	0.000	4.97E-05	-2.0	2.4	
19	86.40	0.89	0.000	2.81E-05	-2.1	1.3	
20	85.90	2.14	0.000	1.84E-05	-1.3	0.4	
21	85.40	3.05	0.000	1.62E-05	0.0	0.0	
Strut force at elev. 92.00 =			89.49 kN/m run =				214.77 kN/strut (horiz.)
							= 303.74 kN/strut (incl.)

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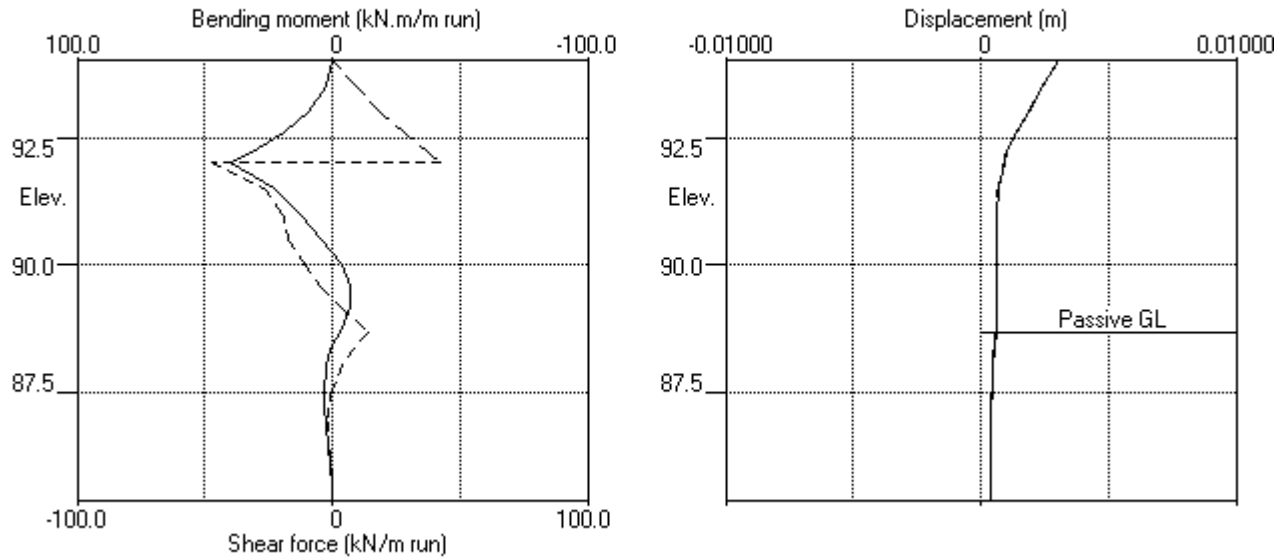
Stage No.4 Excavate to elevation 88.70 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	94.00	0.00	20.00	8.12	49.28	17.33	17.33	12931
2	93.50	0.00	29.00	11.77	71.45	18.70	18.70	3015
3	93.00	0.00	38.00	15.42	93.63	21.12	21.12	1601
4	92.60	0.00	45.20	18.34	111.37	23.01	23.01	1601
5	92.20	0.00	52.40	21.27	129.11	24.82	24.82	1601
		0.00	52.40	14.90	144.80	23.56	23.56	1601
6	92.00	0.00	56.40	16.52	154.66	26.53	26.53	1601
		0.00	56.40	0.00	388.05	54.68	54.68	29324
7	91.50	0.00	68.40	0.00	443.23	25.89	25.89	29324
8	91.00	0.00	80.40	0.00	498.41	1.72	1.72	29324
9	90.50	0.00	92.40	0.00	553.59	9.50	9.50	29324
10	90.00	0.00	104.40	0.00	608.77	14.55	14.55	29324
11	89.60	0.00	113.99	0.00	652.92	18.36	18.36	29324
12	89.20	0.00	123.59	0.00	697.06	19.82	19.82	29324
13	88.70	0.00	135.59	1.50	752.23	25.26	25.26	29324
		0.00	135.59	1.50	564.17	25.26	25.26	29324
14	88.35	0.00	143.99	3.33	593.14	29.57	29.57	29324
15	88.00	0.00	152.38	5.16	622.10	33.88	33.88	29324
16	87.50	0.00	164.38	7.76	663.48	39.71	39.71	29324
17	87.20	0.00	171.58	9.33	688.31	42.96	42.96	29324
18	86.90	0.00	178.77	10.89	713.13	46.02	46.02	29324
19	86.40	0.00	190.77	13.50	754.50	50.89	50.89	29324
20	85.90	0.00	202.76	16.11	795.87	55.51	55.51	29324
21	85.40	0.00	214.76	18.72	837.23	60.01	60.01	29324

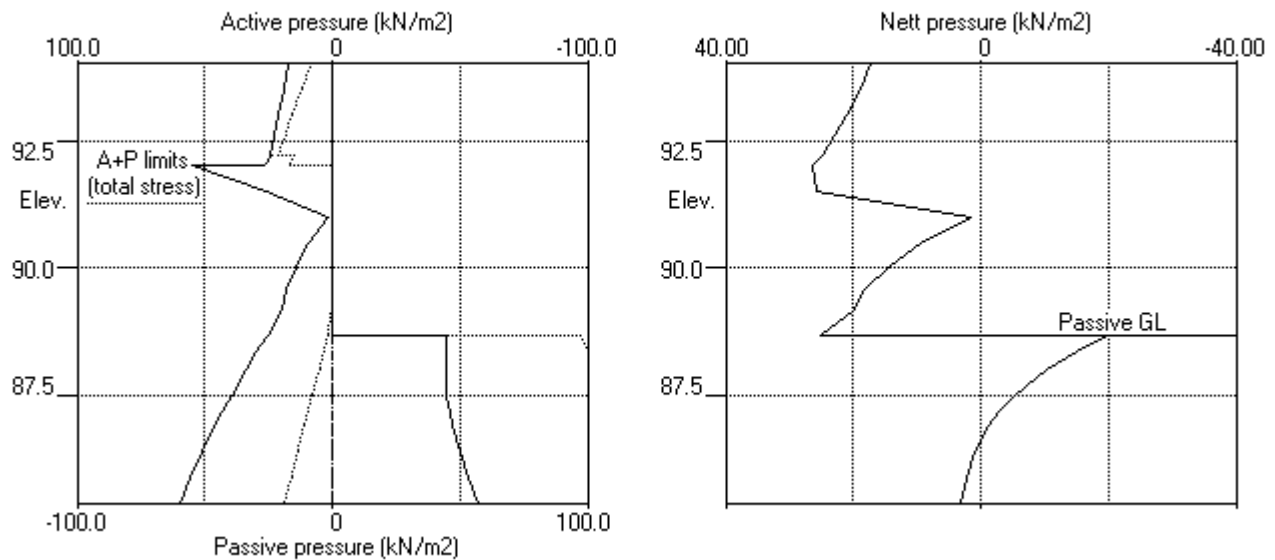
Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	92.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	92.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	91.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.88	44.89	44.89	58923
14	88.35	0.00	8.40	0.00	126.31	44.54	44.54	58923
15	88.00	0.00	16.80	0.00	155.75	44.33	44.33	58923
16	87.50	0.00	28.81	0.00	197.82	44.90	44.90	58923
17	87.20	0.00	36.02	0.00	223.08	45.83	45.83	58923
18	86.90	0.00	43.24	0.00	248.35	47.17	47.17	58923
19	86.40	0.00	55.27	0.00	290.53	50.01	50.01	58923
20	85.90	0.00	67.33	0.00	332.77	53.37	53.37	58923
21	85.40	0.00	79.41	0.00	375.09	56.96	56.96	58923

Units: kN,m

Stage No.4 Excav. to elev. 88.70 on PASSIVE side



Stage No.4 Excav. to elev. 88.70 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.06 - SW5 Section 5 - TCB 94.00 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 5 | Checked :

Units: kN,m

Stage No. 6 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe Wall
No.	Act. Pass.	Elev.	of	equilib.	elev. Penetr
			Safety	at elev.	-ation
6	94.00 86.40		More than one strut		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	94.00	16.75	0.003	1.31E-03	0.0	-0.0	
2	93.50	18.31	0.002	1.29E-03	8.8	2.4	
3	93.00	20.92	0.002	1.22E-03	18.6	9.3	
4	92.60	22.97	0.001	1.10E-03	27.4	18.4	
5	92.20	24.95	0.001	8.72E-04	36.9	31.3	
		23.69	0.001	8.72E-04	36.9	31.3	
6	92.00	26.72	0.001	7.09E-04	42.0	39.1	89.2
		58.23	0.001	7.09E-04	-47.3	39.1	
7	91.50	30.90	0.001	3.52E-04	-25.0	22.8	
8	91.00	8.16	0.000	1.39E-04	-15.2	14.1	
9	90.50	17.62	0.000	9.44E-06	-8.8	8.4	
10	90.00	23.31	0.000	-7.45E-05	1.5	6.2	
11	89.60	26.07	0.000	-1.43E-04	11.3	8.7	
12	89.20	24.19	0.001	-2.55E-04	21.4	15.5	59.7
		24.19	0.001	-2.55E-04	-38.3	15.5	
13	88.70	21.76	0.001	-3.42E-04	-26.8	-0.4	
14	88.35	19.85	0.001	-3.07E-04	-19.5	-8.3	
15	88.00	18.81	0.001	-2.18E-04	-12.7	-13.7	
16	87.50	19.98	0.001	-3.95E-05	-3.0	-17.3	
17	87.20	22.45	0.001	8.02E-05	3.3	-17.3	
18	86.90	26.27	0.001	1.92E-04	10.6	-15.2	
19	86.40	34.52	0.001	3.17E-04	25.8	-6.4	
		-51.58	0.001	3.17E-04	25.8	-6.4	
20	85.90	-26.08	0.001	3.54E-04	6.4	0.1	
21	85.40	0.40	0.000	3.54E-04	0.0	-0.0	
Strut force at elev. 92.00 =			89.23 kN/m	run =	214.15 kN/strut (horiz.)		
				=	302.85 kN/strut (incl.)		
Strut force at elev. 89.20 =			59.67 kN/m	run =	143.21 kN/strut (horiz.)		
				=	202.52 kN/strut (incl.)		

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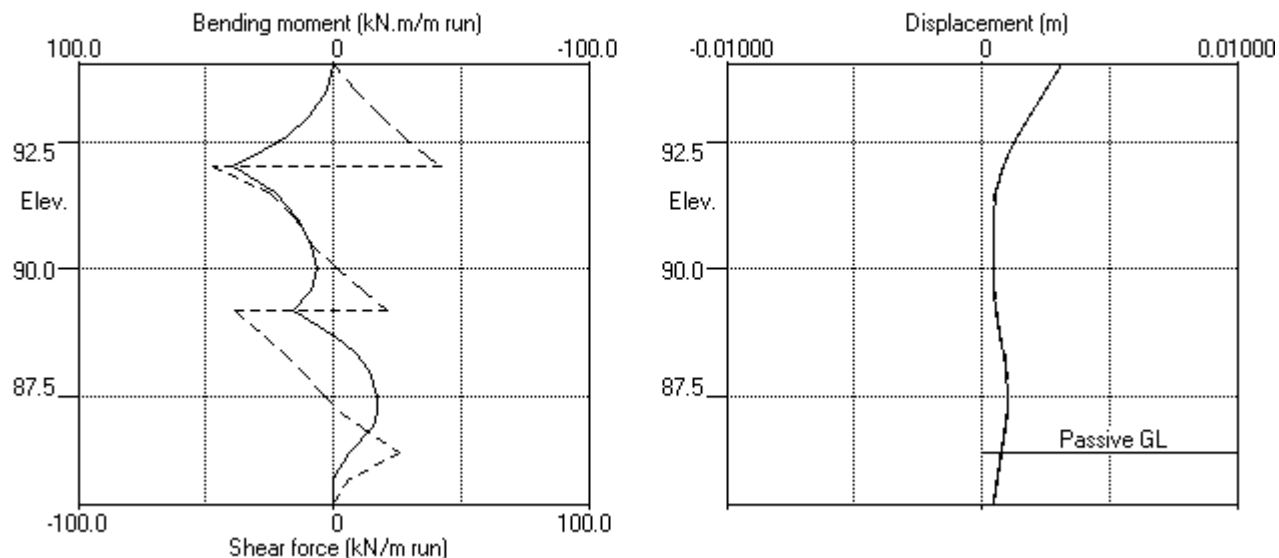
Stage No.6 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	94.00	0.00	20.00	8.12	49.28	16.75	16.75	2875
2	93.50	0.00	29.00	11.77	71.45	18.31	18.31	2875
3	93.00	0.00	38.00	15.42	93.63	20.92	20.92	2875
4	92.60	0.00	45.20	18.34	111.37	22.97	22.97	2875
5	92.20	0.00	52.40	21.27	129.11	24.95	24.95	2875
6	92.00	0.00	52.40	14.90	144.80	23.69	23.69	2875
		0.00	56.40	16.52	154.66	26.72	26.72	2875
7	91.50	0.00	56.40	0.00	388.05	58.23	58.23	53113
		0.00	68.40	0.00	443.23	30.90	30.90	53113
8	91.00	0.00	80.40	0.00	498.41	8.16	8.16	35899
9	90.50	0.00	92.40	0.00	553.59	17.62	17.62	35899
10	90.00	0.00	104.40	0.00	608.77	23.31	23.31	35899
11	89.60	0.00	113.99	0.00	652.92	26.07	26.07	35899
12	89.20	0.00	123.59	0.00	697.06	24.19	24.19	35899
13	88.70	0.00	135.59	1.50	752.23	21.76	21.76	35899
14	88.35	0.00	143.99	3.33	790.85	19.85	19.85	35899
15	88.00	0.00	152.38	5.16	829.47	18.81	18.81	35899
16	87.50	0.00	164.38	7.76	884.64	19.98	19.98	35899
17	87.20	0.00	171.58	9.33	917.74	22.45	22.45	35899
18	86.90	0.00	178.77	10.89	950.84	26.27	26.27	35899
19	86.40	0.00	190.77	13.50	1006.00	34.52	34.52	35899
20	85.90	0.00	190.77	13.50	754.50	34.52	34.52	35899
		0.00	202.76	16.11	795.87	44.61	44.61	35899
21	85.40	0.00	214.76	18.72	837.23	55.03	55.03	35899

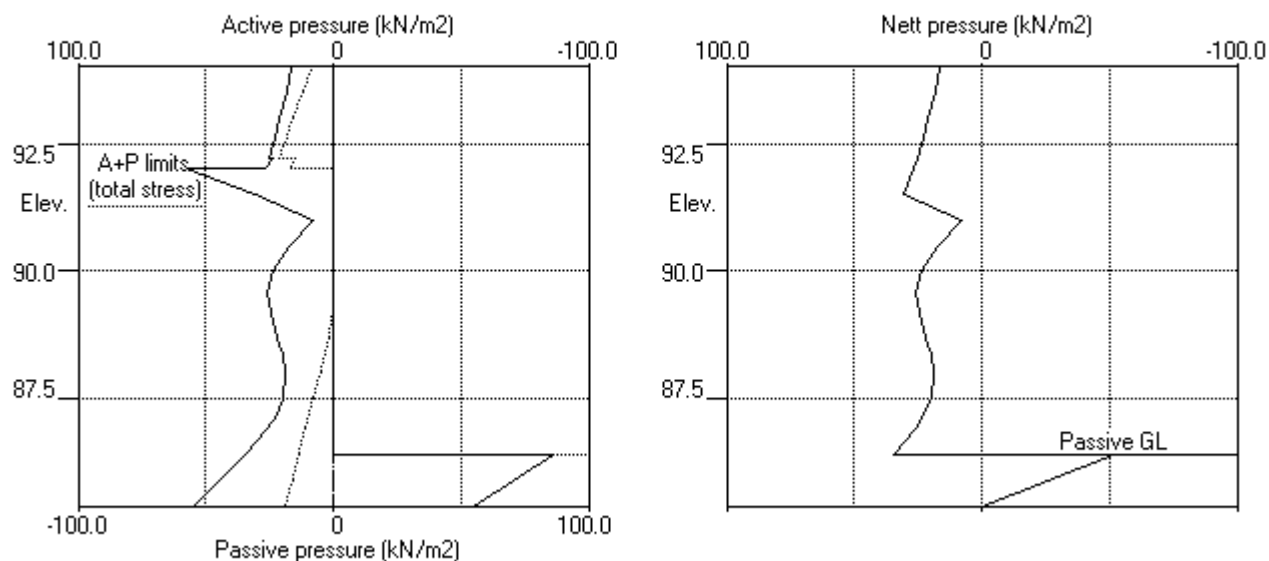
Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	----- Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	93.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	92.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	92.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	91.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	90.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	90.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	88.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	85.90	0.00	0.00	0.00	99.88	86.10	86.10	115656
		0.00	12.00	0.00	141.92	70.69	70.69	115656
21	85.40	0.00	24.01	0.00	183.99	54.63	54.63	115656

Units: kN,m

Stage No.6 Excav. to elev. 86.40 on PASSIVE side



Stage No.6 Excav. to elev. 86.40 on PASSIVE side



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 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 5 | Checked :

Units: kN,m

Stage No. 8 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	equilib.	Wall
			Safety	at elev.	Penetr
					-ation
8	94.00	85.90	More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 18.72kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	94.00	16.52	0.003	1.32E-03	0.0	-0.0	
2	93.50	18.11	0.003	1.31E-03	8.7	2.4	
3	93.00	20.74	0.002	1.24E-03	18.4	9.2	
4	92.60	22.81	0.001	1.12E-03	27.1	18.2	
5	92.20	24.81	0.001	8.93E-04	36.6	30.9	
		23.55	0.001	8.93E-04	36.6	30.9	
6	92.00	26.60	0.001	7.32E-04	41.6	38.7	89.4
		55.94	0.001	7.32E-04	-47.8	38.7	
7	91.50	29.26	0.001	3.83E-04	-26.5	21.8	
8	91.00	7.32	0.000	1.87E-04	-17.4	12.2	
9	90.50	18.04	0.000	8.66E-05	-11.0	5.3	
10	90.00	25.74	0.000	4.49E-05	-0.1	1.9	
11	89.60	30.81	0.000	1.72E-05	11.2	4.1	
12	89.20	31.90	0.000	-5.31E-05	23.8	11.2	59.2
		31.90	0.000	-5.31E-05	-35.4	11.2	
13	88.70	34.01	0.000	-1.04E-04	-19.0	-2.3	
14	88.35	35.52	0.000	-6.77E-05	-6.8	-6.7	
15	88.00	37.66	0.000	-1.33E-05	6.0	-6.7	
16	87.50	40.65	0.000	1.77E-05	25.6	1.4	
17	87.20	40.89	0.000	-2.48E-05	37.8	10.9	
18	86.90	39.33	0.000	-1.46E-04	49.8	24.2	88.8
		39.33	0.000	-1.46E-04	-39.0	24.2	

Stage No.8 Excavate to elevation 85.40 on PASSIVE side

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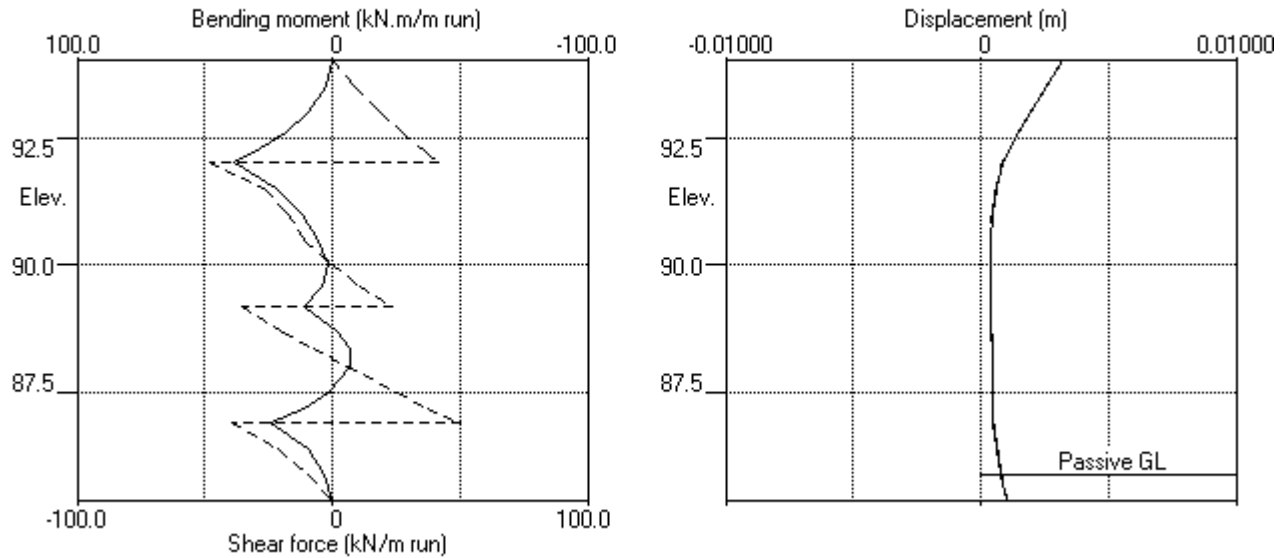
Stage No.8 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
12	89.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	88.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

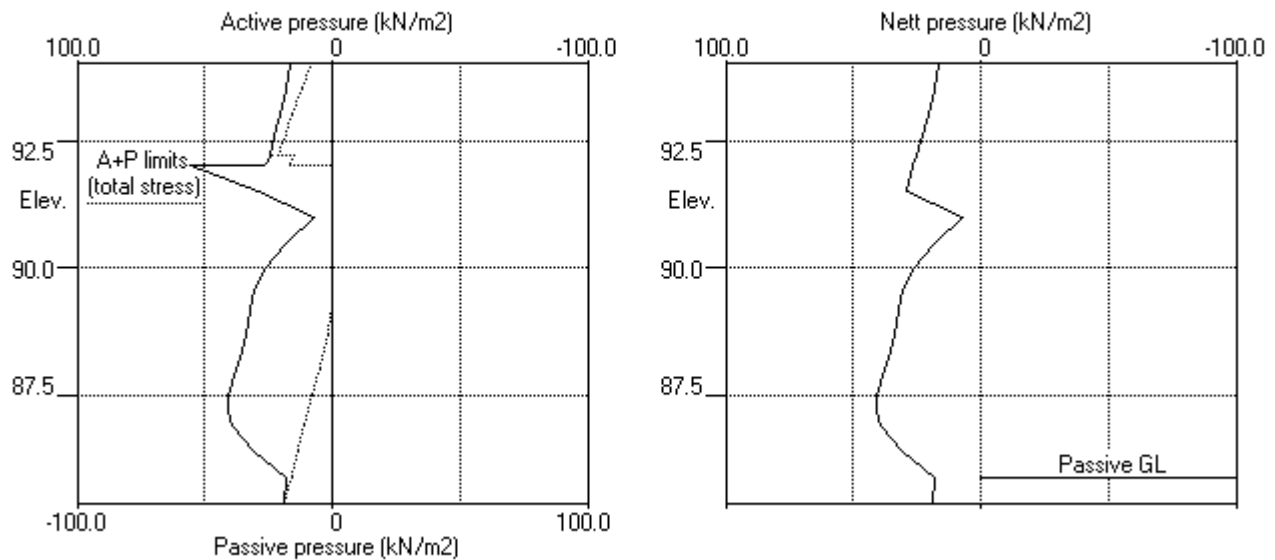
Note: 18.72a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Stage No.8 Excav. to elev. 85.40 on PASSIVE side



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Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage No.	--- G.L. --- Act. Pass.	Strut Elev.	FoS for toe elev. = 85.40 ----- Factor of Safety	Moment of equilib. at elev.	Toe elev. for FoS = 1.000 ----- Toe elev.	Wall Penetr- ation
1	94.00 94.00	Cant.	11.289	86.46	93.36	0.64
2	94.00 91.50	Cant.	3.250	86.24	90.18	1.32
3	94.00 91.50	92.00	Conditions not suitable for FoS calc.			
4	94.00 88.70	92.00	Conditions not suitable for FoS calc.			
5	94.00 88.70		More than one strut			
All remaining stages have more than one strut - FoS calculation n/a						

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	94.00	0.006	0.000	0.0	-0.0	0.0	0.0
2	93.50	0.005	0.000	2.5	0.0	9.0	0.0
3	93.00	0.004	0.000	9.5	0.0	19.0	0.0
4	92.60	0.003	0.000	18.8	0.0	27.8	0.0
5	92.20	0.002	0.000	31.8	0.0	37.4	0.0
6	92.00	0.002	0.000	39.8	0.0	42.4	-48.1
7	91.50	0.001	0.000	41.5	0.0	30.8	-27.0
8	91.00	0.001	0.000	47.8	0.0	0.0	-20.1
9	90.50	0.001	0.000	34.7	0.0	0.0	-29.9
10	90.00	0.001	-0.000	18.9	-3.7	1.5	-27.1
11	89.60	0.001	-0.000	9.5	-7.0	13.5	-19.2
12	89.20	0.001	0.000	15.5	-7.2	27.2	-38.3
13	88.70	0.001	0.000	1.4	-4.3	14.2	-26.8
14	88.35	0.001	0.000	0.8	-9.7	8.2	-19.5
15	88.00	0.001	0.000	2.7	-13.7	6.0	-12.7
16	87.50	0.001	0.000	3.3	-17.3	25.6	-3.0
17	87.20	0.001	0.000	10.9	-17.3	37.8	-1.4
18	86.90	0.001	0.000	24.2	-15.2	50.0	-39.0
19	86.40	0.001	0.000	9.8	-6.4	25.8	-21.5
20	85.90	0.001	0.000	3.4	-0.2	6.4	-9.2
21	85.40	0.001	0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	10.8	91.50	-0.5	88.35	9.4	92.00	-6.0	91.00
2	47.8	91.00	-2.5	88.00	30.8	92.00	-29.9	90.50
3	39.4	92.00	-1.3	88.35	42.4	92.00	-46.0	92.00
4	39.8	92.00	-7.2	89.20	42.4	92.00	-47.1	92.00
5	38.5	92.00	-3.1	88.00	41.4	92.00	-48.1	92.00
6	39.1	92.00	-17.3	87.50	42.0	92.00	-47.3	92.00
7	38.8	92.00	-10.9	88.00	50.0	86.90	-47.7	92.00
8	38.7	92.00	-6.7	88.00	49.8	86.90	-47.8	92.00

Summary of results (continued)

Maximum and minimum displacement at each stage

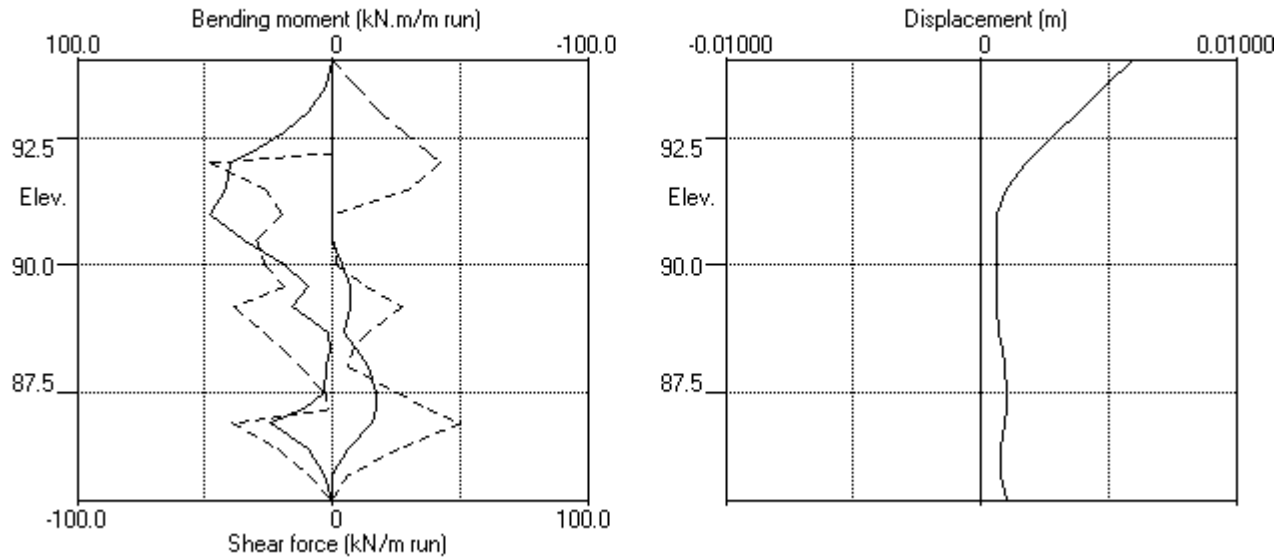
Stage no.	-----	Displacement	-----	Stage description
no.	maximum	elev.	minimum	elev.
	m		m	
1	0.001	94.00	0.000	94.00
2	0.006	94.00	-0.000	89.60
3	0.003	94.00	0.000	94.00
4	0.003	94.00	0.000	94.00
5	0.003	94.00	0.000	94.00
6	0.003	94.00	0.000	94.00
7	0.003	94.00	0.000	94.00
8	0.003	94.00	0.000	94.00

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---	--- Strut no. 2 ---	--- Strut no. 3 ---
	at elev. 89.20	at elev. 86.90	at elev. 92.00
	kN/m run	kN/strut	kN/m run
3	---	---	88.39
4	---	---	89.49
5	58.93	141.42	89.45
6	59.67	143.21	89.23
7	59.29	142.31	89.42
8	59.20	142.09	89.43

Units: kN,m

Bending moment, shear force, displacement envelopes



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 SW5 - Section 6 | Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types	
		Active side	Passive side
1	95.00	1 Fill	1 Fill
2	93.20	2 Res Soil	2 Res Soil
3	92.90	3 Class V/IV Rock	3 Class V/IV Rock
4	92.00	4 Class III Rock	4 Class III Rock

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

----- Soil type -----	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction	Wall adhesion	Back-fill	Soil friction	Wall adhesion	Back-fill
No. Description	angle	coeff.	angle	angle	coeff.	angle
1 Fill	25.00	0.000	0.00	25.00	0.000	0.00
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	80.00	80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
 Soldier Pile width = 0.60 m
 Soldier Pile spacing = 2.40 m
 Passive mobilisation factor = 3.00 m
 Elevation of toe of wall = 85.40
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 3.2800E+07 kN/m2
 Moment of inertia of wall I = 1.3200E-03 m4/m run
 E.I = 43296 kN.m2/m run
 Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	90.20	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes
2	86.90	2.40	0.000450	2.000E+08	5.00	45.00	300.0	Yes
3	93.00	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	95.00	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 95.00
2	Excavate to elevation 92.50 on PASSIVE side
3	Install strut or anchor no.3 at elevation 93.00
4	Excavate to elevation 89.70 on PASSIVE side
5	Install strut or anchor no.1 at elevation 90.20
6	Excavate to elevation 86.40 on PASSIVE side
7	Install strut or anchor no.2 at elevation 86.90
8	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

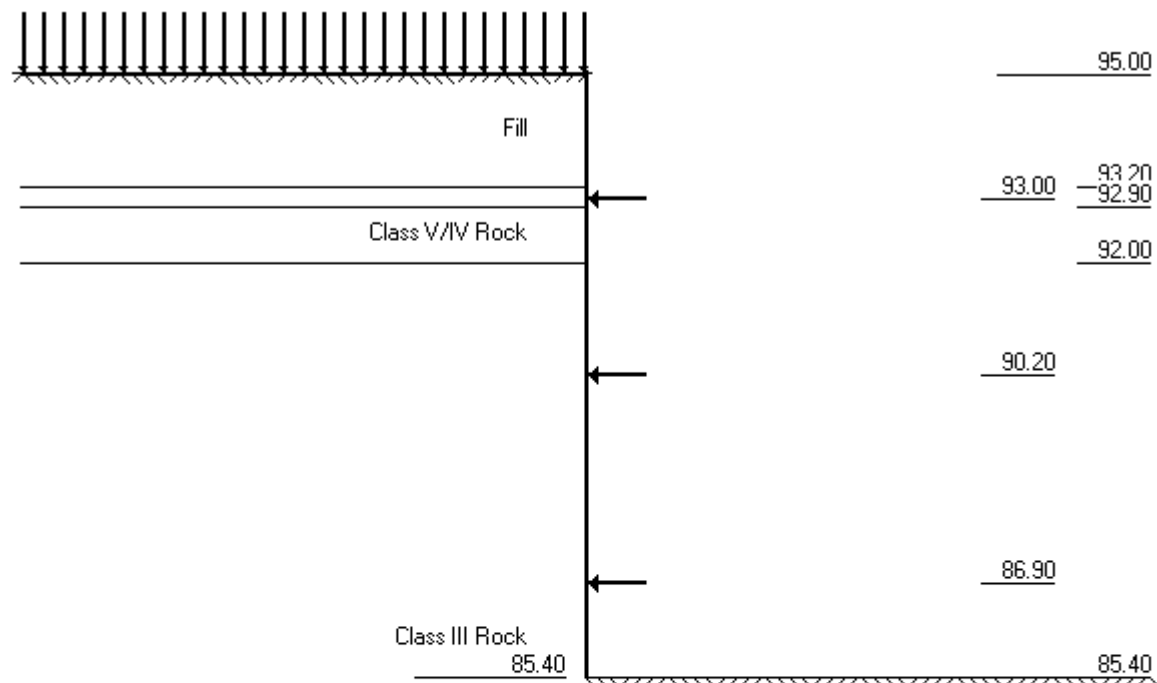
OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 95.00	Yes	Yes	Yes
2	Excav. to elev. 92.50 on PASSIVE side	No	No	No
3	Install strut no.3 at elev. 93.00	No	No	No
4	Excav. to elev. 89.70 on PASSIVE side	No	No	No
5	Install strut no.1 at elev. 90.20	No	No	No
6	Excav. to elev. 86.40 on PASSIVE side	No	No	No
7	Install strut no.2 at elev. 86.90	No	No	No
8	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

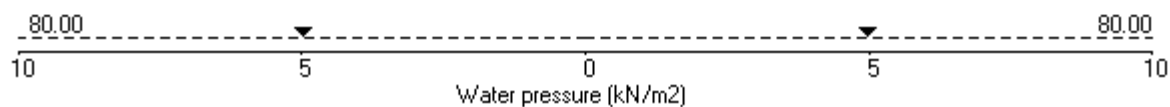
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Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



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Units: kN,m

Stage No. 2 Excavate to elevation 92.50 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	95.00 92.50	Cant.		3.318	86.41	90.65	1.85

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.00	8.12	0.010	3.28E-03	0.0	0.0	
2	94.50	11.77	0.009	3.27E-03	5.0	1.4	
3	94.00	15.42	0.007	3.23E-03	11.8	5.4	
4	93.60	18.34	0.006	3.15E-03	18.5	11.5	
5	93.20	21.27	0.004	3.01E-03	26.4	20.4	
		14.90	0.004	3.01E-03	26.4	20.4	
6	93.00	17.83	0.004	2.90E-03	29.7	26.1	
7	92.90	19.89	0.004	2.83E-03	31.6	29.2	
		10.62	0.004	2.83E-03	31.6	29.2	
8	92.50	13.11	0.002	2.50E-03	36.4	42.6	
		-4.57	0.002	2.50E-03	36.4	42.6	
9	92.00	-12.74	0.001	1.90E-03	32.0	61.0	
		-136.17	0.001	1.90E-03	32.0	61.0	
10	91.50	-74.96	0.001	1.18E-03	-20.8	64.2	
11	91.00	-4.17	0.000	5.53E-04	-40.5	45.4	
12	90.60	20.52	-0.000	2.09E-04	-37.3	28.9	
13	90.20	26.60	-0.000	4.52E-06	-27.8	15.6	
14	89.70	21.22	-0.000	-1.14E-04	-15.9	5.0	
15	89.35	14.23	0.000	-1.37E-04	-9.7	0.7	
16	89.00	10.57	0.000	-1.33E-04	-5.4	-1.8	
17	88.50	5.91	0.000	-1.05E-04	-1.2	-3.1	
18	88.00	2.55	0.000	-6.94E-05	0.9	-3.0	
19	87.50	0.50	0.000	-3.90E-05	1.6	-2.3	
20	87.20	-0.24	0.000	-2.51E-05	1.7	-1.7	
21	86.90	-0.69	0.000	-1.47E-05	1.5	-1.2	
22	86.40	-1.04	0.000	-4.32E-06	1.1	-0.6	
23	85.90	-1.13	0.000	-2.49E-07	0.6	-0.1	
24	85.40	-1.14	0.000	5.63E-07	-0.0	-0.0	

(continued)

Stage No.2 Excavate to elevation 92.50 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	95.00	0.00	20.00	8.12	49.28	8.12	8.12a	3095
2	94.50	0.00	29.00	11.77	71.45	11.77	11.77a	3095
3	94.00	0.00	38.00	15.42	93.63	15.42	15.42a	3095
4	93.60	0.00	45.20	18.34	111.37	18.34	18.34a	3095
5	93.20	0.00	52.40	21.27	129.11	21.27	21.27a	3095
		0.00	52.40	14.90	144.80	14.90	14.90a	3095
6	93.00	0.00	56.40	16.52	154.66	17.83	17.83	3095
7	92.90	0.00	58.40	17.33	159.59	19.89	19.89	3095
		0.00	58.40	10.62	234.71	10.62	10.62a	8894
8	92.50	0.00	67.60	13.11	268.66	13.11	13.11a	8894
		0.00	67.60	13.11	201.50	13.11	13.11a	8894
9	92.00	0.00	79.10	16.23	233.32	20.15	20.15	8894
		0.00	79.10	0.00	369.33	0.00	0.00a	57232
10	91.50	0.00	91.10	0.00	410.71	0.00	0.00a	57232
11	91.00	0.00	103.10	0.00	452.10	26.43	26.43	57232
12	90.60	0.00	112.69	0.00	485.20	39.25	39.25	84428
13	90.20	0.00	122.29	0.00	518.31	45.66	45.66	84428
14	89.70	0.00	134.29	1.22	559.69	47.17	47.17	84428
15	89.35	0.00	142.69	3.05	588.66	46.62	46.62	41216
16	89.00	0.00	151.08	4.87	617.62	47.73	47.73	35442
17	88.50	0.00	163.08	7.48	659.00	49.61	49.61	35442
18	88.00	0.00	175.08	10.09	700.37	52.14	52.14	35442
19	87.50	0.00	187.07	12.70	741.74	55.32	55.32	35442
20	87.20	0.00	194.27	14.26	766.56	57.48	57.48	35442
21	86.90	0.00	201.46	15.83	791.69	59.77	59.77	35442
22	86.40	0.00	213.46	18.44	833.71	63.81	63.81	35442
23	85.90	0.00	225.45	21.04	875.74	67.98	67.98	35442
24	85.40	0.00	237.44	23.65	917.76	72.20	72.20	35442

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	93.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	17.69	17.69	17.69p	19448
9	92.00	0.00	11.50	0.00	50.29	32.89	32.89	19448
		0.00	11.50	0.00	136.17	136.17	136.17p	125480
10	91.50	0.00	23.50	0.00	177.57	74.96	74.96	125480
11	91.00	0.00	35.51	0.00	218.98	30.60	30.60	125480
12	90.60	0.00	45.12	0.00	252.12	18.74	18.74	84428
13	90.20	0.00	54.73	0.00	285.28	19.06	19.06	84428
14	89.70	0.00	66.75	0.00	327.06	25.95	25.95	84428
15	89.35	0.00	75.18	0.00	356.56	32.39	32.39	41216
16	89.00	0.00	83.60	0.00	386.09	37.16	37.16	35442
17	88.50	0.00	95.65	0.00	428.30	43.70	43.70	35442
18	88.00	0.00	107.72	0.00	470.56	49.58	49.58	35442

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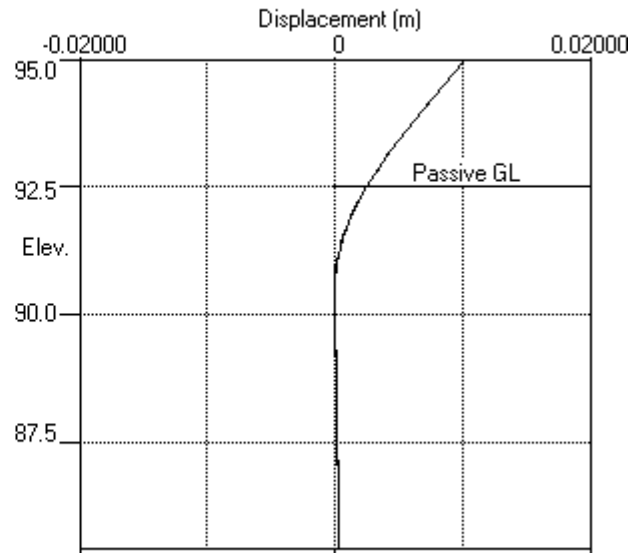
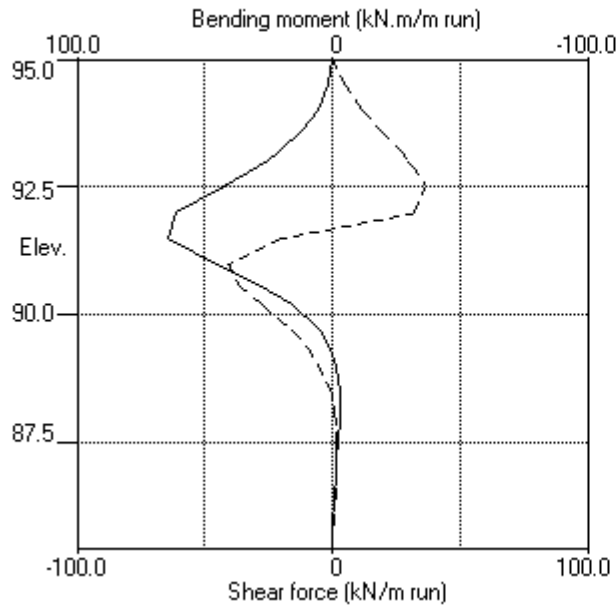
Stage No.2 Excavate to elevation 92.50 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
19	87.50	0.00	119.79	0.00	512.87	54.82	54.82	35442
20	87.20	0.00	127.05	0.00	538.28	57.71	57.71	35442
21	86.90	0.00	134.30	1.23	563.70	60.47	60.47	35442
22	86.40	0.00	146.42	3.86	606.12	64.85	64.85	35442
23	85.90	0.00	158.54	6.50	648.60	69.11	69.11	35442
24	85.40	0.00	170.68	9.14	691.13	73.33	73.33	35442

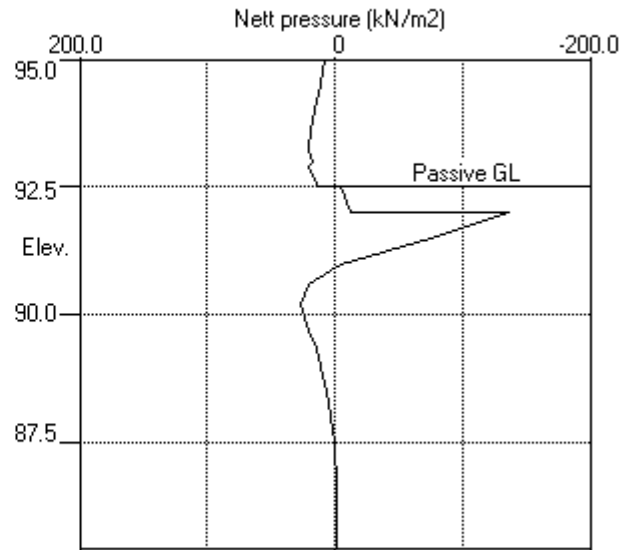
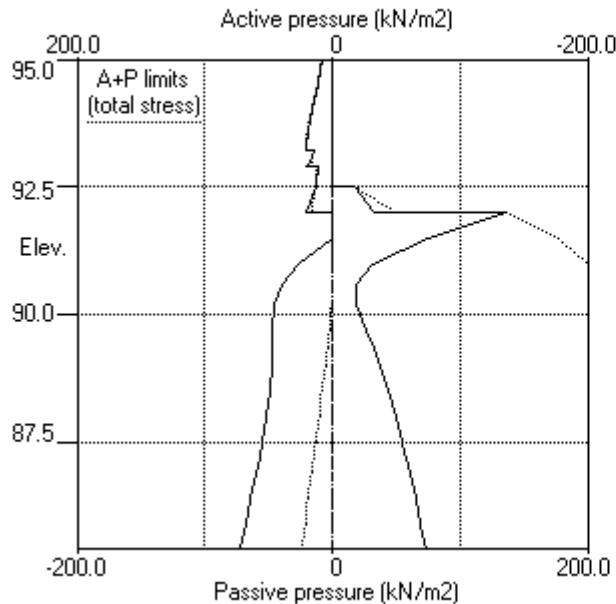
Note: 0.00a Soil pressure at active limit
 136.17p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 92.50 on PASSIVE side



Stage No.2 Excav. to elev. 92.50 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.06 - SW5 Section 6 - TCB 95.00 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 6 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 89.70 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
4	95.00	89.70	93.00	Conditions not suitable for FoS calc.	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.00	14.66	0.008	2.40E-03	0.0	0.0	
2	94.50	17.21	0.007	2.39E-03	8.0	2.2	
3	94.00	19.74	0.006	2.32E-03	17.2	8.4	
4	93.60	21.72	0.005	2.21E-03	25.5	17.0	
5	93.20	23.64	0.004	1.99E-03	34.6	29.0	
		17.27	0.004	1.99E-03	34.6	29.0	
6	93.00	19.67	0.004	1.84E-03	38.3	36.4	63.0
		19.67	0.004	1.84E-03	-24.7	36.4	
7	92.90	21.45	0.004	1.76E-03	-22.7	34.0	
		15.13	0.004	1.76E-03	-22.7	34.0	
8	92.50	14.38	0.003	1.48E-03	-16.8	26.1	
9	92.00	17.90	0.002	1.22E-03	-8.7	20.5	
		0.00	0.002	1.22E-03	-8.7	20.5	
10	91.50	0.00	0.002	9.84E-04	-8.7	20.3	
11	91.00	0.00	0.001	7.78E-04	-8.7	15.5	
12	90.60	8.71	0.001	6.48E-04	-7.0	12.6	
13	90.20	19.82	0.001	5.41E-04	-1.3	10.5	
14	89.70	28.84	0.001	4.07E-04	10.9	12.7	
		-39.39	0.001	4.07E-04	10.9	12.7	
15	89.35	-24.04	0.000	2.99E-04	-0.2	14.1	
16	89.00	-10.25	0.000	1.92E-04	-6.2	12.5	
17	88.50	1.12	0.000	7.28E-05	-8.5	8.1	
18	88.00	5.38	0.000	2.49E-06	-6.9	4.0	
19	87.50	5.57	0.000	-2.82E-05	-4.1	1.3	
20	87.20	4.75	0.000	-3.37E-05	-2.6	0.3	
21	86.90	3.67	0.000	-3.38E-05	-1.3	-0.3	
22	86.40	1.74	0.000	-2.97E-05	0.0	-0.5	
23	85.90	-0.07	0.000	-2.58E-05	0.5	-0.2	
24	85.40	-1.77	0.000	-2.45E-05	-0.0	0.0	
Strut force at elev. 93.00 =			63.01 kN/m	run =	151.21 kN/strut (horiz.)		
				=	213.85 kN/strut (incl.)		

(continued)

Stage No.4 Excavate to elevation 89.70 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	95.00	0.00	20.00	8.12	49.28	14.66	14.66	1498
2	94.50	0.00	29.00	11.77	71.45	17.21	17.21	1498
3	94.00	0.00	38.00	15.42	93.63	19.74	19.74	1498
4	93.60	0.00	45.20	18.34	111.37	21.72	21.72	1498
5	93.20	0.00	52.40	21.27	129.11	23.64	23.64	1498
		0.00	52.40	14.90	144.80	17.27	17.27	1498
6	93.00	0.00	56.40	16.52	154.66	19.67	19.67	1498
7	92.90	0.00	58.40	17.33	159.59	21.45	21.45	1498
		0.00	58.40	10.62	234.71	15.13	15.13	4279
8	92.50	0.00	67.60	13.11	268.66	14.38	14.38	4279
9	92.00	0.00	79.10	16.23	311.09	17.90	17.90	4279
		0.00	79.10	0.00	492.43	0.00	0.00a	27399
10	91.50	0.00	91.10	0.00	547.62	0.00	0.00a	27399
11	91.00	0.00	103.10	0.00	602.80	0.00	0.00a	27399
12	90.60	0.00	112.69	0.00	646.94	8.71	8.71	27399
13	90.20	0.00	122.29	0.00	691.08	19.82	19.82	27399
14	89.70	0.00	134.29	1.22	746.25	28.84	28.84	27399
		0.00	134.29	1.22	559.69	28.84	28.84	27399
15	89.35	0.00	142.69	3.05	588.66	33.30	33.30	27399
16	89.00	0.00	151.08	4.87	617.62	38.50	38.50	27399
17	88.50	0.00	163.08	7.48	659.00	44.35	44.35	27399
18	88.00	0.00	175.08	10.09	700.37	48.94	48.94	27399
19	87.50	0.00	187.07	12.70	741.74	52.88	52.88	27399
20	87.20	0.00	194.27	14.26	766.56	55.13	55.13	27399
21	86.90	0.00	201.46	15.83	791.38	57.36	57.36	27399
22	86.40	0.00	213.46	18.44	832.75	61.11	61.11	27399
23	85.90	0.00	225.45	21.04	874.11	64.93	64.93	27399
24	85.40	0.00	237.44	23.65	915.47	68.78	68.78	27399

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	93.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.81	68.23	68.23	107397
15	89.35	0.00	8.40	0.00	126.24	57.34	57.34	107397
16	89.00	0.00	16.80	0.00	155.67	48.75	48.75	107397
17	88.50	0.00	28.81	0.00	197.75	43.23	43.23	107397
18	88.00	0.00	40.83	0.00	239.85	43.56	43.56	107397
19	87.50	0.00	52.86	0.00	282.01	47.31	47.31	107397

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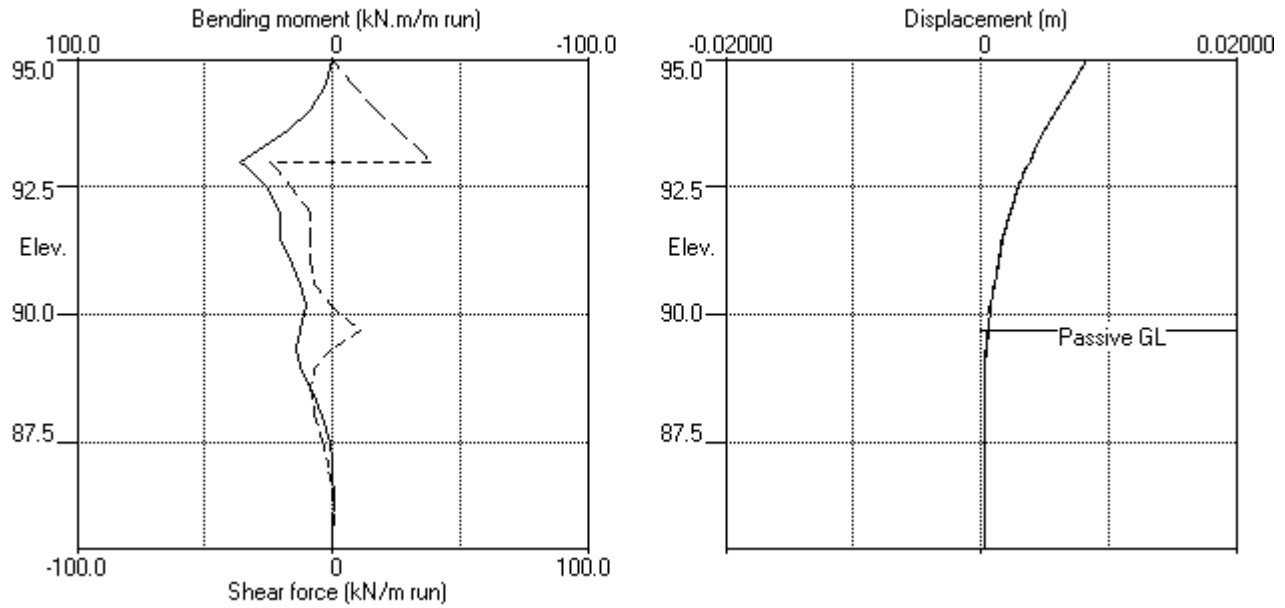
Stage No.4 Excavate to elevation 89.70 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	87.20	0.00	60.09	0.00	307.34	50.38	50.38	107397
21	86.90	0.00	67.33	0.00	332.69	53.69	53.69	107397
22	86.40	0.00	79.41	0.00	375.01	59.37	59.37	107397
23	85.90	0.00	91.52	0.00	417.43	65.00	65.00	107397
24	85.40	0.00	103.66	0.00	459.95	70.55	70.55	107397

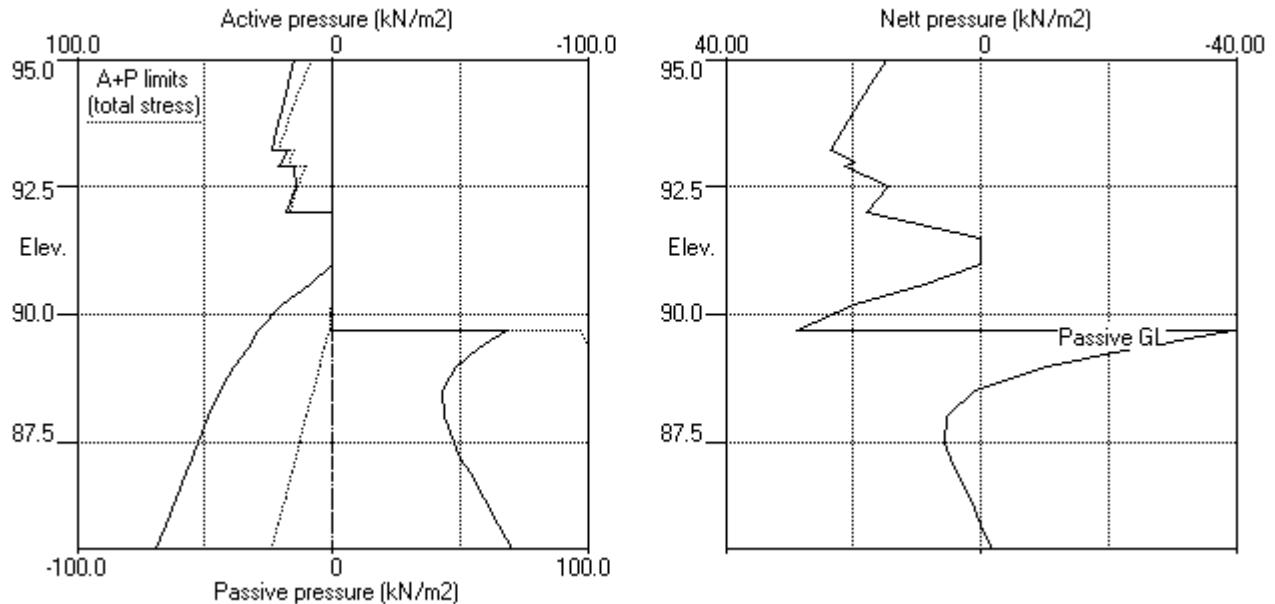
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 89.70 on PASSIVE side



Stage No.4 Excav. to elev. 89.70 on PASSIVE side



Units: kN,m

Stage No. 6 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe		Toe elev. for	
			elev. = 85.40		FoS = 1.000	
			-----		-----	
Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	of	of equilib.	elev.	Penetr
			Safety	at elev.		-ation
6	95.00	86.40	More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	95.00	14.05	0.008	2.51E-03	0.0	0.0	
2	94.50	17.06	0.007	2.50E-03	7.8	2.1	
3	94.00	20.07	0.006	2.44E-03	17.1	8.2	
4	93.60	22.28	0.005	2.32E-03	25.5	16.8	
5	93.20	24.28	0.004	2.11E-03	34.8	28.9	
		17.91	0.004	2.11E-03	34.8	28.9	
6	93.00	20.35	0.004	1.96E-03	38.7	36.3	62.2
		20.35	0.004	1.96E-03	-23.6	36.3	
7	92.90	22.15	0.003	1.88E-03	-21.5	34.0	
		17.14	0.003	1.88E-03	-21.5	34.0	
8	92.50	16.63	0.003	1.60E-03	-14.7	26.8	
9	92.00	20.40	0.002	1.31E-03	-5.4	22.5	
		16.03	0.002	1.31E-03	-5.4	22.5	
10	91.50	17.07	0.001	1.03E-03	2.8	26.0	
11	91.00	17.59	0.001	7.21E-04	11.5	29.0	
12	90.60	24.71	0.001	4.22E-04	20.0	35.6	
13	90.20	31.09	0.001	4.73E-05	31.1	45.6	89.6
		31.09	0.001	4.73E-05	-58.5	45.6	
14	89.70	28.81	0.001	-3.34E-04	-43.5	20.6	
15	89.35	23.95	0.001	-4.46E-04	-34.3	7.2	
16	89.00	20.45	0.001	-4.62E-04	-26.5	-3.3	
17	88.50	16.59	0.001	-3.65E-04	-17.3	-13.6	
18	88.00	15.76	0.001	-1.72E-04	-9.2	-19.8	
19	87.50	18.48	0.001	6.95E-05	-0.6	-22.2	
20	87.20	22.37	0.001	2.20E-04	5.5	-21.5	
21	86.90	27.85	0.001	3.59E-04	13.1	-18.7	
22	86.40	39.74	0.001	5.17E-04	29.9	-8.5	
		-61.37	0.001	5.17E-04	29.9	-8.5	
23	85.90	-34.38	0.001	5.59E-04	6.0	1.3	
24	85.40	10.33	0.000	5.51E-04	-0.0	-0.0	
Strut force at elev. 93.00 =			62.24 kN/m	run = 149.39 kN/strut (horiz.)			
				= 211.26 kN/strut (incl.)			
Strut force at elev. 90.20 =			89.61 kN/m	run = 215.07 kN/strut (horiz.)			
				= 304.15 kN/strut (incl.)			

Stage No.6 Excavate to elevation 86.40 on PASSIVE side

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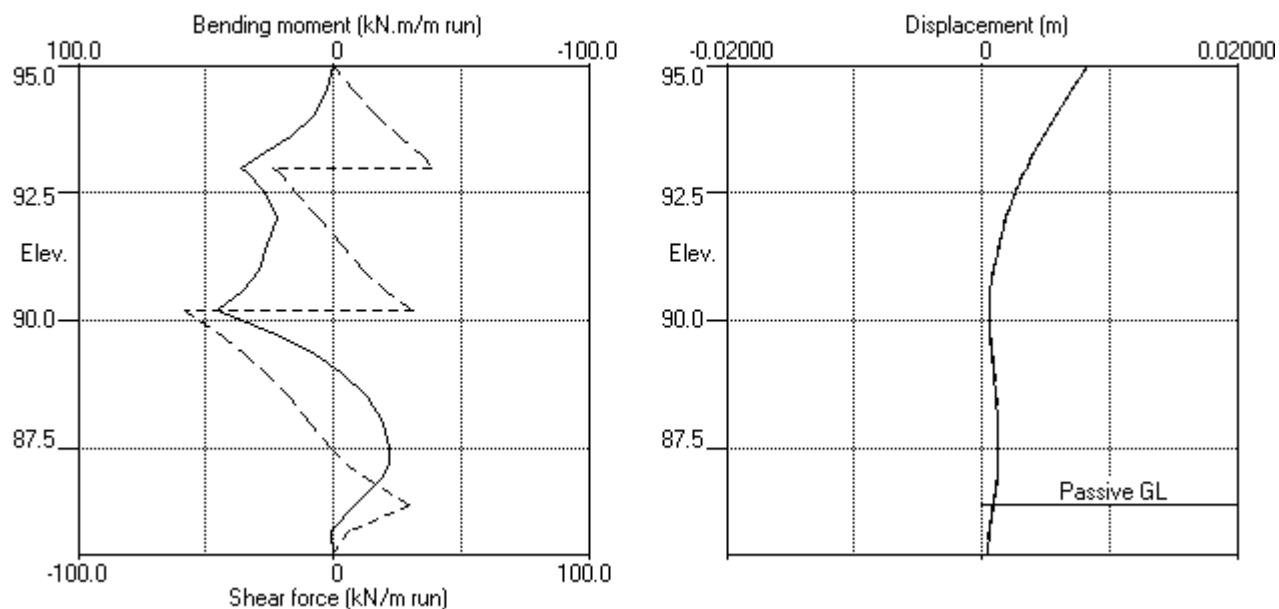
Stage No.6 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
21	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	101.11	101.11	101.11p	128891
23	85.90	0.00	12.00	0.00	143.16	87.72	87.72	128891
24	85.40	0.00	24.01	0.00	185.23	56.73	56.73	128891

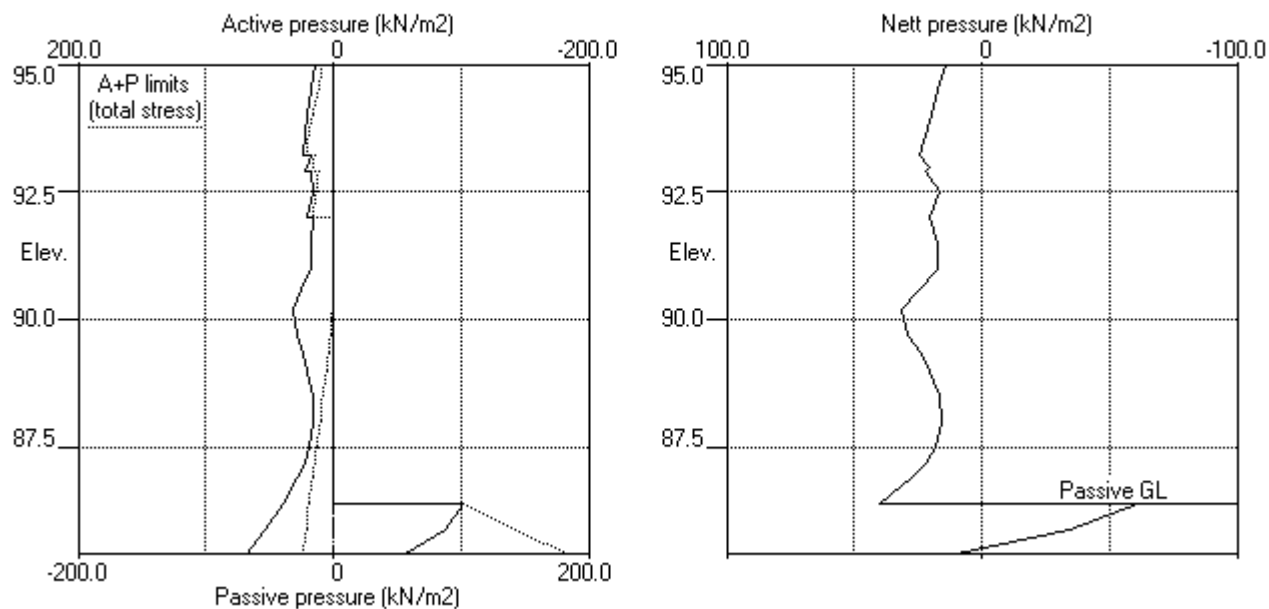
Note: 12.34a Soil pressure at active limit
 101.11p Soil pressure at passive limit

Units: kN,m

Stage No.6 Excav. to elev. 86.40 on PASSIVE side



Stage No.6 Excav. to elev. 86.40 on PASSIVE side



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 Data filename/Run ID: 2021.04.06 - SW5 Section 6 - TCB 95.00 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 6 | Checked :

Units: kN,m

Stage No. 8 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
8	95.00	85.90	More than one	strut	

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 23.65kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.00	13.90	0.008	2.51E-03	0.0	0.0	
2	94.50	16.92	0.007	2.50E-03	7.7	2.1	
3	94.00	19.93	0.006	2.44E-03	16.9	8.2	
4	93.60	22.14	0.005	2.33E-03	25.3	16.7	
5	93.20	24.15	0.004	2.12E-03	34.6	28.6	
		17.78	0.004	2.12E-03	34.6	28.6	
6	93.00	20.23	0.004	1.97E-03	38.4	36.0	62.4
		20.23	0.004	1.97E-03	-24.0	36.0	
7	92.90	22.02	0.003	1.89E-03	-21.9	33.7	
		16.79	0.003	1.89E-03	-21.9	33.7	
8	92.50	16.30	0.003	1.61E-03	-15.3	26.2	
9	92.00	20.12	0.002	1.33E-03	-6.2	21.6	
		14.25	0.002	1.33E-03	-6.2	21.6	
10	91.50	15.78	0.001	1.07E-03	1.3	24.5	
11	91.00	17.07	0.001	7.76E-04	9.5	26.7	
12	90.60	25.14	0.001	5.03E-04	18.0	32.4	
13	90.20	32.99	0.001	1.61E-04	29.6	41.7	89.4
		32.99	0.001	1.61E-04	-59.8	41.7	
14	89.70	33.58	0.001	-1.72E-04	-43.2	16.1	
15	89.35	31.31	0.001	-2.50E-04	-31.8	3.2	
16	89.00	30.83	0.001	-2.38E-04	-21.0	-6.0	
17	88.50	31.67	0.001	-1.33E-04	-5.3	-12.2	

(continued)

Stage No.8 Excavate to elevation 85.40 on PASSIVE side

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
18	88.00	34.95	0.001	-1.74E-06	11.3	-10.6	
19	87.50	37.67	0.001	6.13E-05	29.5	-0.3	
20	87.20	37.40	0.001	2.69E-05	40.7	10.3	
21	86.90	35.00	0.001	-9.24E-05	51.6	24.2	89.1
		35.00	0.001	-9.24E-05	-37.5	24.2	
22	86.40	24.63	0.001	-2.90E-04	-22.6	10.0	
23	85.90	21.04	0.001	-3.66E-04	-11.2	3.2	
24	85.40	23.65	0.001	-3.84E-04	-0.0	-0.0	
Strut force at elev.			93.00 =	62.42 kN/m	run =	149.80 kN/strut (horiz.)	
					=	211.84 kN/strut (incl.)	
Strut force at elev.			90.20 =	89.45 kN/m	run =	214.68 kN/strut (horiz.)	
					=	303.60 kN/strut (incl.)	
Strut force at elev.			86.90 =	89.08 kN/m	run =	213.79 kN/strut (horiz.)	
					=	302.35 kN/strut (incl.)	

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertical limit kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
1	95.00	0.00	20.00	8.12	49.28	13.90	13.90	2575
2	94.50	0.00	29.00	11.77	71.45	16.92	16.92	2575
3	94.00	0.00	38.00	15.42	93.63	19.93	19.93	2575
4	93.60	0.00	45.20	18.34	111.37	22.14	22.14	2575
5	93.20	0.00	52.40	21.27	129.11	24.15	24.15	2575
		0.00	52.40	14.90	144.80	17.78	17.78	2575
6	93.00	0.00	56.40	16.52	154.66	20.23	20.23	2575
7	92.90	0.00	58.40	17.33	159.59	22.02	22.02	2575
		0.00	58.40	10.62	234.71	16.79	16.79	7390
8	92.50	0.00	67.60	13.11	268.66	16.30	16.30	7390
9	92.00	0.00	79.10	16.23	311.09	20.12	20.12	7390
		0.00	79.10	0.00	492.43	14.25	14.25	47513
10	91.50	0.00	91.10	0.00	547.62	15.78	15.78	45012
11	91.00	0.00	103.10	0.00	602.80	17.07	17.07	45012
12	90.60	0.00	112.69	0.00	646.94	25.14	25.14	45012
13	90.20	0.00	122.29	0.00	691.08	32.99	32.99	45012
14	89.70	0.00	134.29	1.22	746.25	33.58	33.58	45012
15	89.35	0.00	142.69	3.05	784.88	31.31	31.31	45012
16	89.00	0.00	151.08	4.87	823.49	30.83	30.83	45012
17	88.50	0.00	163.08	7.48	878.66	31.67	31.67	45012
18	88.00	0.00	175.08	10.09	933.83	34.95	34.95	45012
19	87.50	0.00	187.07	12.70	988.99	37.67	37.67	88271
20	87.20	0.00	194.27	14.26	1022.08	37.40	37.40	88271
21	86.90	0.00	201.46	15.83	1055.18	35.00	35.00	88271
22	86.40	0.00	213.46	18.44	1110.33	24.63	24.63	88271
23	85.90	0.00	225.45	21.04	1165.48	21.04	21.04a	88271
		0.00	225.45	21.04	874.11	21.04	21.04a	88271
24	85.40	0.00	237.44	23.65	915.47	23.65	23.65a	88271

(continued)

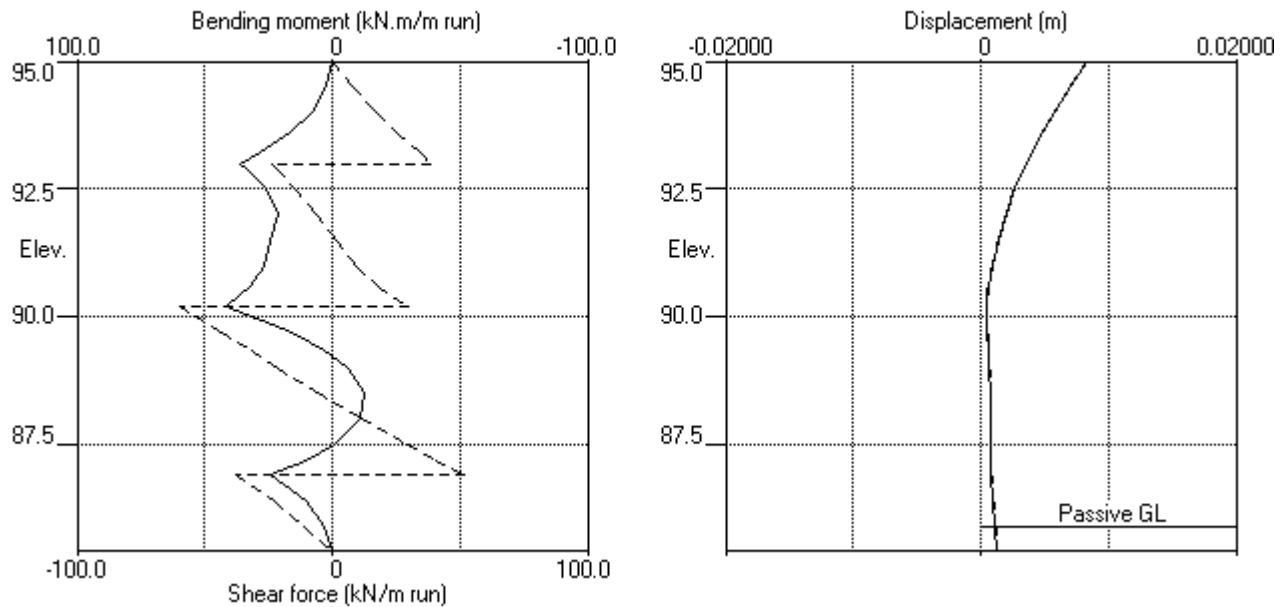
Stage No.8 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE 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	Soil stiffness coeff. kN/m3
1	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	94.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	93.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	93.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	92.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	92.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	91.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	90.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	89.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	89.35	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	88.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

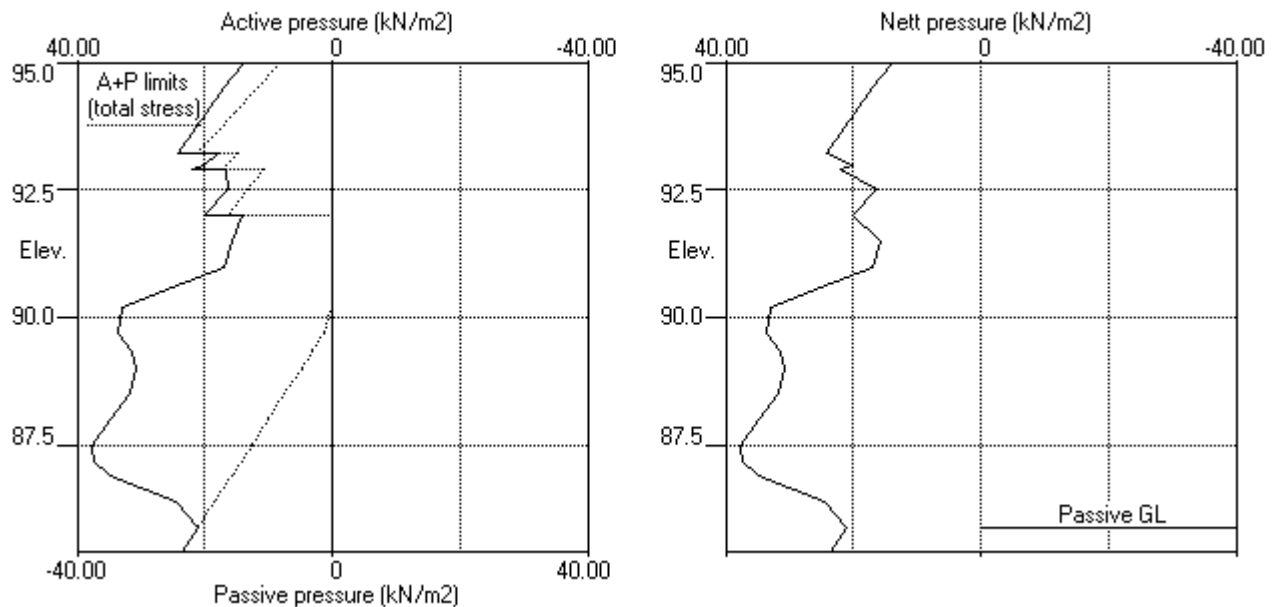
Note: 23.65a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Stage No.8 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
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Data filename/Run ID: 2021.04.06 - SW5 Section 6 - TCB 95.00	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW5 - Section 6	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe		Toe elev. for
No.	Act.	Pass.	Elev.		elev. = 85.40		FoS = 1.000
					-----		-----
				Factor	Moment	Toe	Wall
				of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
1	95.00	95.00	Cant.	11.398	86.62	94.36	0.64
2	95.00	92.50	Cant.	3.318	86.41	90.65	1.85
3	95.00	92.50	93.00	Conditions not suitable for FoS calc.			
4	95.00	89.70	93.00	Conditions not suitable for FoS calc.			
5	95.00	89.70		More than one strut			
All remaining stages have more than one strut - FoS calculation n/a							

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	95.00	0.010	0.000	0.0	0.0	0.0	0.0
2	94.50	0.009	0.000	2.5	0.0	9.1	0.0
3	94.00	0.007	0.000	9.5	0.0	19.5	0.0
4	93.60	0.006	0.000	19.2	0.0	28.7	0.0
5	93.20	0.004	0.000	32.7	0.0	38.7	0.0
6	93.00	0.004	0.000	40.9	0.0	42.9	-25.0
7	92.90	0.004	0.000	39.4	0.0	31.6	-22.9
8	92.50	0.003	0.000	42.6	0.0	36.4	-16.8
9	92.00	0.002	0.000	61.0	0.0	32.0	-8.7
10	91.50	0.002	0.000	64.2	0.0	2.8	-20.8
11	91.00	0.001	0.000	45.4	0.0	11.5	-40.5
12	90.60	0.001	-0.000	35.6	0.0	20.1	-37.3
13	90.20	0.001	-0.000	45.6	0.0	34.7	-60.7
14	89.70	0.001	-0.000	20.6	0.0	10.9	-44.8
15	89.35	0.001	0.000	14.1	-0.1	0.0	-34.3
16	89.00	0.001	0.000	12.5	-8.0	0.0	-26.5
17	88.50	0.001	0.000	8.1	-16.1	0.0	-17.3
18	88.00	0.001	0.000	4.0	-19.8	11.3	-9.2
19	87.50	0.001	0.000	1.3	-22.2	29.5	-4.1
20	87.20	0.001	0.000	10.3	-21.5	40.7	-2.6
21	86.90	0.001	0.000	24.2	-18.7	52.4	-37.5
22	86.40	0.001	0.000	10.0	-8.5	29.9	-22.6
23	85.90	0.001	0.000	3.2	-0.3	6.0	-11.2
24	85.40	0.001	0.000	0.0	-0.0	0.0	-0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	11.0	92.00	-0.5	88.50	5.9	92.90	-6.1	91.00
2	64.2	91.50	-3.1	88.50	36.4	92.50	-40.5	91.00
3	40.9	93.00	-1.9	88.50	42.9	93.00	-24.7	91.00
4	36.4	93.00	-0.5	86.40	38.3	93.00	-24.7	93.00
5	39.8	90.20	-3.0	88.00	37.6	93.00	-53.7	90.20
6	45.6	90.20	-22.2	87.50	38.7	93.00	-58.5	90.20
7	41.9	90.20	-17.0	88.00	52.4	86.90	-60.7	90.20
8	41.7	90.20	-12.2	88.50	51.6	86.90	-59.8	90.20

Summary of results (continued)

Maximum and minimum displacement at each stage

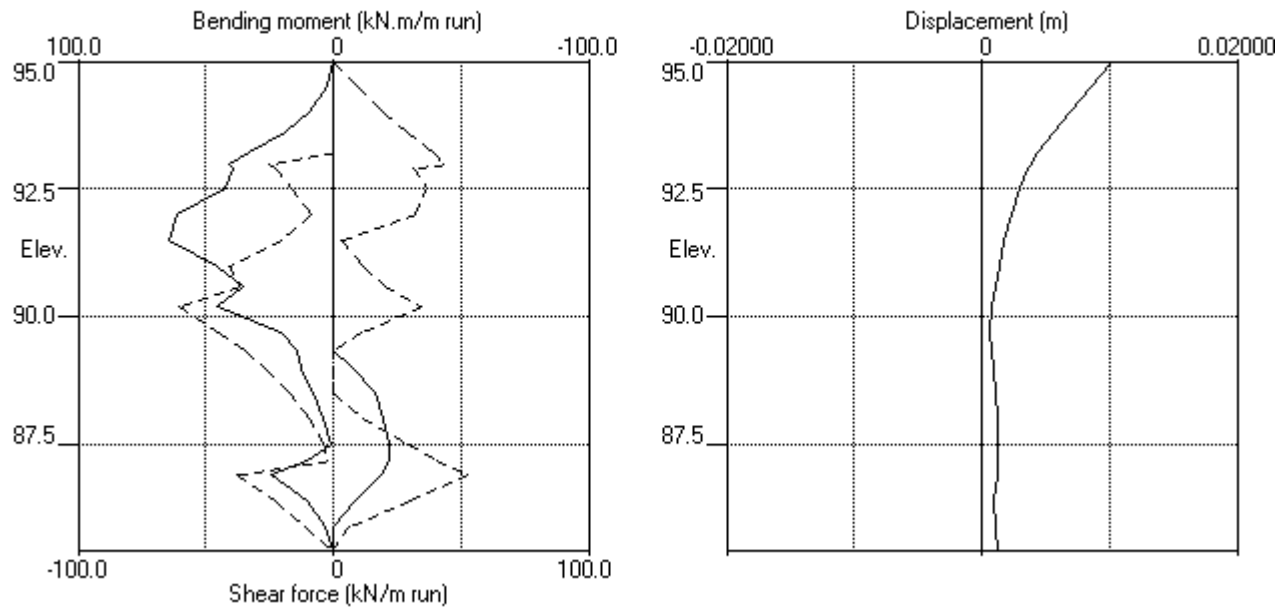
Stage no.	-----	Displacement	-----	Stage description
no.	maximum	elev.	minimum	elev.
	m		m	
1	0.002	95.00	0.000	95.00
2	0.010	95.00	-0.000	90.20
3	0.007	95.00	0.000	95.00
4	0.008	95.00	0.000	95.00
5	0.009	95.00	0.000	95.00
6	0.008	95.00	0.000	95.00
7	0.008	95.00	0.000	95.00
8	0.008	95.00	0.000	95.00

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 ---	--- Strut no. 2 ---	--- Strut no. 3 ---
	at elev. 90.20	at elev. 86.90	at elev. 93.00
	kN/m run	kN/strut	kN/m run
3	---	---	58.93
4	---	---	63.01
5	88.39	212.13	62.64
6	89.61	215.07	62.24
7	89.56	214.94	62.38
8	89.45	214.68	62.42

Units: kN,m

Bending moment, shear force, displacement envelopes



Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	----- Soil types -----	Active side	Passive side
1	95.80	1 Fill	1 Fill	
2	94.00	2 Res Soil	2 Res Soil	
3	93.70	3 Class V/IV Rock	3 Class V/IV Rock	
4	92.80	4 Class III Rock	4 Class III Rock	

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

Additional soil parameters associated with Ka and Kp

		--- parameters for Ka ---			--- parameters for Kp ---		
		Soil friction	Wall adhesion	Back-fill	Soil friction	Wall adhesion	Back-fill
----- Soil type -----		angle	coeff.	angle	angle	coeff.	angle
No. Description							
1 Fill		25.00	0.000	0.00	25.00	0.000	0.00
2 Res Soil		25.00	0.000	0.00	25.00	0.000	0.00
3 Class V/IV Rock		35.00	0.000	0.00	35.00	0.000	0.00
4 Class III Rock		40.00	0.000	0.00	40.00	0.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

Initial water table elevation Active side Passive side
80.00 80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
Soldier Pile width = 0.60 m
Soldier Pile spacing = 2.40 m
Passive mobilisation factor = 3.00 m
Elevation of toe of wall = 85.40
Maximum finite element length = 0.60 m
Youngs modulus of wall E = 3.2800E+07 kN/m2
Moment of inertia of wall I = 1.3200E-03 m4/m run
E.I = 43296 kN.m2/m run
Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre- stress /strut kN	Tension allowed
1	90.20	2.40	0.000450	2.000E+08	8.00	45.00	300.0	Yes
2	86.90	2.40	0.000450	2.000E+08	12.00	45.00	300.0	Yes
3	93.80	2.40	0.000300	2.000E+08	5.00	45.00	200.0	Yes

SURCHARGE LOADS

Surch -arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	95.80	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 95.80
2	Excavate to elevation 93.30 on PASSIVE side
3	Install strut or anchor no.3 at elevation 93.80
4	Excavate to elevation 89.70 on PASSIVE side
5	Install strut or anchor no.1 at elevation 90.20
6	Excavate to elevation 86.40 on PASSIVE side
7	Install strut or anchor no.2 at elevation 86.90
8	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

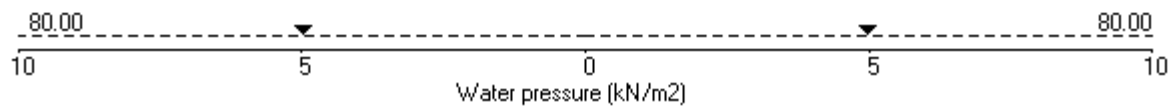
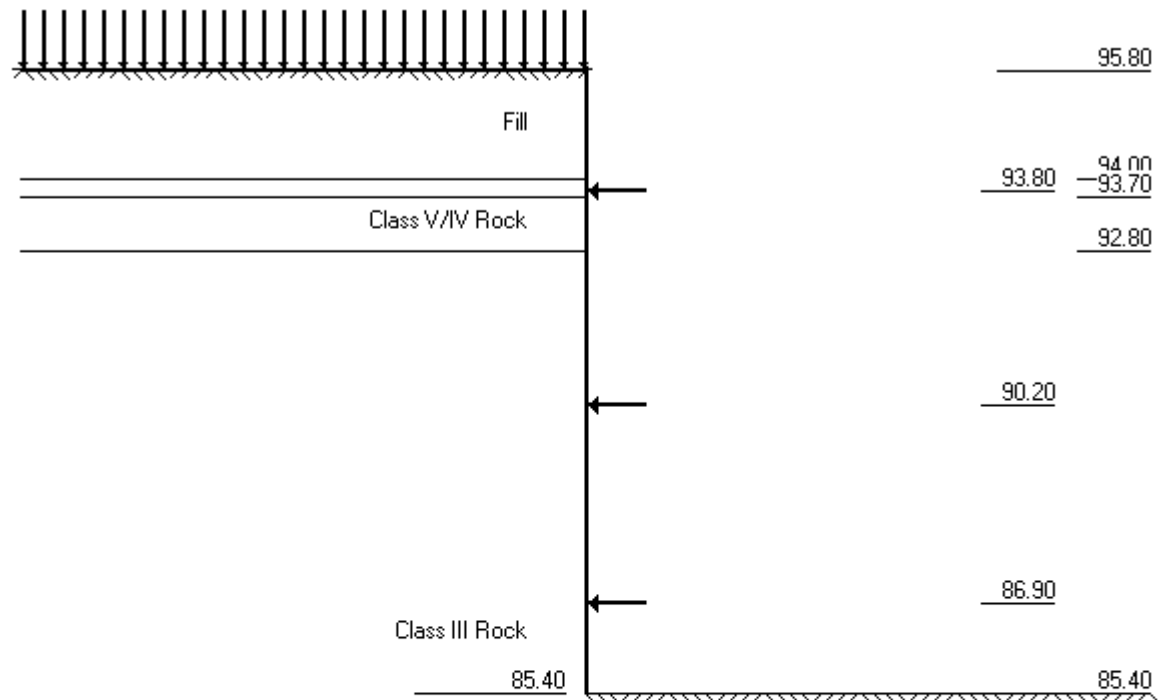
OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 95.80	Yes	Yes	Yes
2	Excav. to elev. 93.30 on PASSIVE side	No	No	No
3	Install strut no.3 at elev. 93.80	No	No	No
4	Excav. to elev. 89.70 on PASSIVE side	No	No	No
5	Install strut no.1 at elev. 90.20	No	No	No
6	Excav. to elev. 86.40 on PASSIVE side	No	No	No
7	Install strut no.2 at elev. 86.90	No	No	No
8	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

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Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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Data filename/Run ID: 2021.04.06 - SW5 Section 7 - TCB 95.80 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW5 - Section 7 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 93.30 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000		
				-----	-----		
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	95.80 93.30	Cant.		3.650	86.49	91.46	1.84

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.80	8.12	0.010	3.27E-03	0.0	0.0	
2	95.30	11.77	0.009	3.27E-03	5.0	1.4	
3	94.80	15.42	0.007	3.23E-03	11.8	5.4	
4	94.40	18.34	0.006	3.15E-03	18.5	11.5	
5	94.00	21.27	0.004	3.00E-03	26.4	20.4	
		14.90	0.004	3.00E-03	26.4	20.4	
6	93.80	17.88	0.004	2.89E-03	29.7	26.1	
7	93.70	19.93	0.004	2.83E-03	31.6	29.2	
		10.62	0.004	2.83E-03	31.6	29.2	
8	93.30	13.11	0.002	2.50E-03	36.4	42.6	
		-4.57	0.002	2.50E-03	36.4	42.6	
9	92.80	-12.50	0.001	1.90E-03	32.1	61.0	
		-136.17	0.001	1.90E-03	32.1	61.0	
10	92.30	-74.06	0.001	1.18E-03	-20.5	64.3	
11	91.80	-3.10	0.000	5.45E-04	-39.8	45.7	
12	91.20	26.34	-0.000	8.10E-05	-32.8	21.3	
13	90.70	24.60	-0.000	-8.93E-05	-20.1	8.2	
14	90.20	14.12	0.000	-1.44E-04	-10.4	1.3	
15	89.70	9.35	0.000	-1.38E-04	-4.5	-2.2	
16	89.25	5.49	0.000	-1.10E-04	-1.2	-3.2	
17	88.80	2.62	0.000	-7.70E-05	0.7	-3.2	
18	88.20	0.33	0.000	-3.84E-05	1.5	-2.4	
19	87.60	-0.65	0.000	-1.26E-05	1.5	-1.4	
20	87.25	-0.83	0.000	-3.49E-06	1.2	-0.9	
21	86.90	-0.85	0.000	2.29E-06	0.9	-0.5	
22	86.40	-0.72	0.000	6.49E-06	0.5	-0.2	
23	85.90	-0.51	0.000	7.80E-06	0.2	-0.0	
24	85.40	-0.28	0.000	8.00E-06	0.0	-0.0	

(continued)

Stage No.2 Excavate to elevation 93.30 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	95.80	0.00	20.00	8.12	49.28	8.12	8.12a	3098
2	95.30	0.00	29.00	11.77	71.45	11.77	11.77a	3098
3	94.80	0.00	38.00	15.42	93.63	15.42	15.42a	3098
4	94.40	0.00	45.20	18.34	111.37	18.34	18.34a	3098
5	94.00	0.00	52.40	21.27	129.11	21.27	21.27a	3098
		0.00	52.40	14.90	144.80	14.90	14.90a	3098
6	93.80	0.00	56.40	16.52	154.66	17.88	17.88	3098
7	93.70	0.00	58.40	17.33	159.59	19.93	19.93	3098
		0.00	58.40	10.62	234.71	10.62	10.62a	8902
8	93.30	0.00	67.60	13.11	268.66	13.11	13.11a	8902
		0.00	67.60	13.11	201.50	13.11	13.11a	8902
9	92.80	0.00	79.10	16.23	233.32	20.25	20.25	8902
		0.00	79.10	0.00	369.33	0.00	0.00a	57288
10	92.30	0.00	91.10	0.00	410.71	0.00	0.00a	57288
11	91.80	0.00	103.10	0.00	452.10	26.79	26.79	57288
12	91.20	0.00	117.49	0.00	501.76	43.85	43.85	93949
13	90.70	0.00	129.49	0.18	543.14	47.18	47.18	93949
14	90.20	0.00	141.49	2.79	584.52	46.14	46.14	44395
15	89.70	0.00	153.48	5.40	625.90	47.96	47.96	30551
16	89.25	0.00	164.28	7.74	663.13	49.82	49.82	30551
17	88.80	0.00	175.08	10.09	700.37	52.17	52.17	30551
18	88.20	0.00	189.47	13.22	750.02	56.08	56.08	30551
19	87.60	0.00	203.86	16.35	800.10	60.64	60.64	30551
20	87.25	0.00	212.26	18.18	829.51	63.50	63.50	30551
21	86.90	0.00	220.65	20.00	858.93	66.44	66.44	30551
22	86.40	0.00	232.64	22.61	900.95	70.72	70.72	30551
23	85.90	0.00	244.63	25.22	942.97	75.04	75.04	30551
24	85.40	0.00	256.62	27.82	984.98	79.38	79.38	30551

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	95.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	93.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	17.69	17.69	17.69p	19539
9	92.80	0.00	11.50	0.00	50.29	32.76	32.76	19539
		0.00	11.50	0.00	136.17	136.17	136.17p	126065
10	92.30	0.00	23.50	0.00	177.57	74.06	74.06	126065
11	91.80	0.00	35.51	0.00	218.98	29.90	29.90	126065
12	91.20	0.00	49.92	0.00	268.70	17.51	17.51	93949
13	90.70	0.00	61.94	0.00	310.20	22.58	22.58	93949
14	90.20	0.00	73.97	0.00	352.35	32.02	32.02	44395
15	89.70	0.00	86.01	0.00	394.53	38.61	38.61	30551
16	89.25	0.00	96.86	0.00	432.53	44.33	44.33	30551
17	88.80	0.00	107.72	0.00	470.56	49.55	49.55	30551
18	88.20	0.00	122.21	0.00	521.33	55.74	55.74	30551

(continued)

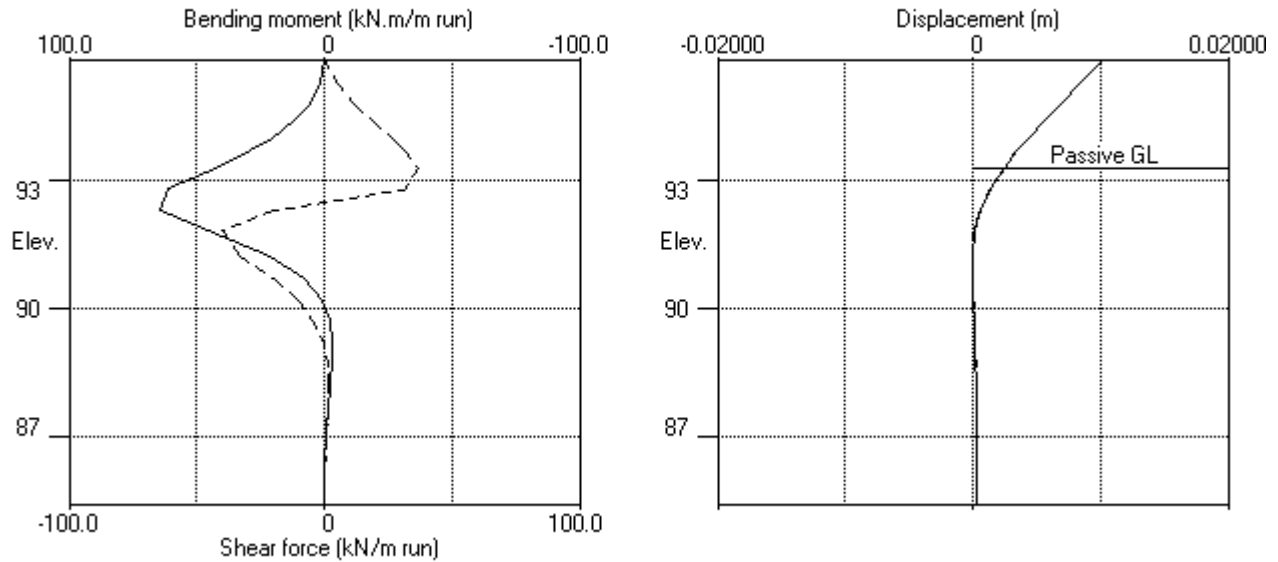
Stage No.2 Excavate to elevation 93.30 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
19	87.60	0.00	136.73	1.75	572.18	61.29	61.29	30551
20	87.25	0.00	145.20	3.59	601.88	64.33	64.33	30551
21	86.90	0.00	153.69	5.44	631.60	67.29	67.29	30551
22	86.40	0.00	165.82	8.08	674.11	71.44	71.44	30551
23	85.90	0.00	177.98	10.72	716.68	75.55	75.55	30551
24	85.40	0.00	190.15	13.37	759.30	79.66	79.66	30551

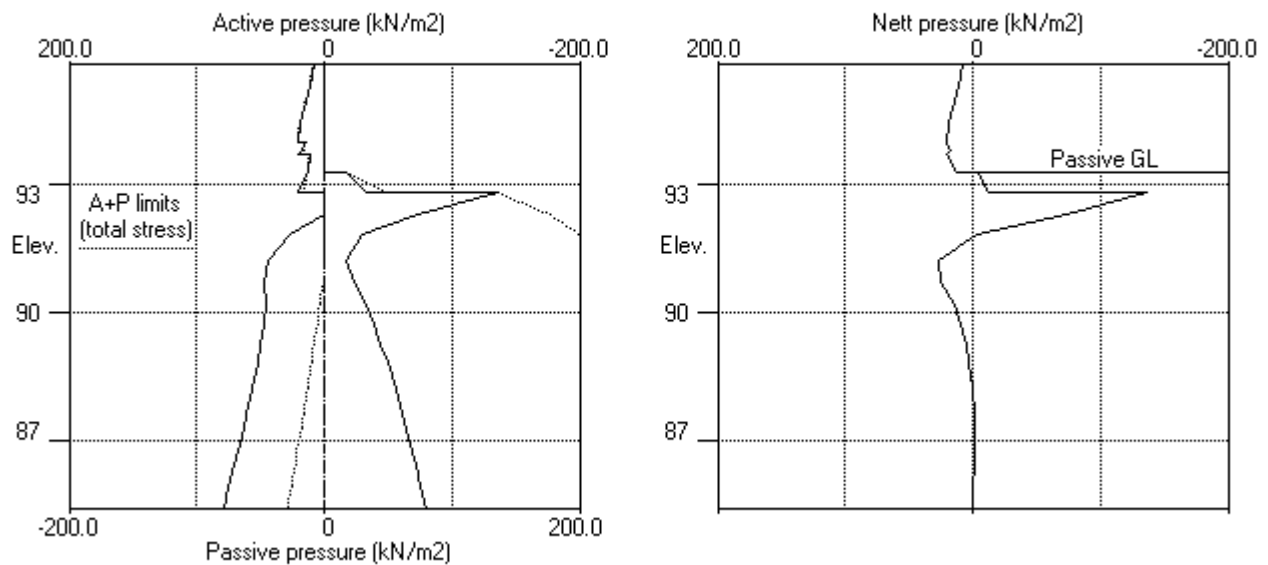
Note: 0.00a Soil pressure at active limit
 136.17p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 93.30 on PASSIVE side



Stage No.2 Excav. to elev. 93.30 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
 Licensed from GEOSOLVE | Made by : VR
 Data filename/Run ID: 2021.04.06 - SW5 Section 7 - TCB 95.80 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 7 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 89.70 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe
No.	Act. Pass.	Elev.	of	of equilib.	Wall
			Safety	at elev.	Penetr
					-ation
4	95.80 89.70	93.80	Conditions not	suitable for	FoS calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.80	14.76	0.008	2.27E-03	0.0	0.0	
2	95.30	17.23	0.007	2.26E-03	8.0	2.2	
3	94.80	19.67	0.006	2.20E-03	17.2	8.5	
4	94.40	21.59	0.005	2.08E-03	25.5	17.1	
5	94.00	23.44	0.004	1.87E-03	34.5	29.0	
		17.07	0.004	1.87E-03	34.5	29.0	
6	93.80	19.48	0.004	1.71E-03	38.1	36.3	63.7
		19.48	0.004	1.71E-03	-25.6	36.3	
7	93.70	21.24	0.004	1.63E-03	-23.5	33.9	
		14.43	0.004	1.63E-03	-23.5	33.9	
8	93.30	13.48	0.003	1.36E-03	-17.9	25.6	
9	92.80	16.86	0.003	1.10E-03	-10.3	19.3	
		0.00	0.003	1.10E-03	-10.3	19.3	
10	92.30	0.00	0.002	8.87E-04	-10.3	18.3	
11	91.80	0.00	0.002	7.08E-04	-10.3	12.6	
12	91.20	3.81	0.001	5.67E-04	-9.2	7.8	
13	90.70	13.85	0.001	4.99E-04	-4.8	3.9	
14	90.20	21.03	0.001	4.56E-04	3.9	3.6	
15	89.70	30.88	0.001	3.87E-04	16.9	8.4	
		-43.61	0.001	3.87E-04	16.9	8.4	
16	89.25	-22.30	0.001	2.84E-04	2.1	11.6	
17	88.80	-7.83	0.000	1.70E-04	-4.7	10.3	
18	88.20	1.87	0.000	5.78E-05	-6.5	6.0	
19	87.60	4.43	0.000	-9.39E-07	-4.6	2.5	
20	87.25	4.19	0.000	-1.54E-05	-3.1	1.1	
21	86.90	3.40	0.000	-2.11E-05	-1.8	0.3	
22	86.40	1.93	0.000	-2.19E-05	-0.4	-0.2	
23	85.90	0.43	0.000	-2.03E-05	0.2	-0.1	
24	85.40	-1.07	0.000	-1.95E-05	-0.0	0.0	
Strut force at elev. 93.80 =			63.69 kN/m	run =	152.85 kN/strut (horiz.)		
				=	216.16 kN/strut (incl.)		

(continued)

Stage No.4 Excavate to elevation 89.70 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	95.80	0.00	20.00	8.12	49.28	14.76	14.76	1403
2	95.30	0.00	29.00	11.77	71.45	17.23	17.23	1403
3	94.80	0.00	38.00	15.42	93.63	19.67	19.67	1403
4	94.40	0.00	45.20	18.34	111.37	21.59	21.59	1403
5	94.00	0.00	52.40	21.27	129.11	23.44	23.44	1403
		0.00	52.40	14.90	144.80	17.07	17.07	1403
6	93.80	0.00	56.40	16.52	154.66	19.48	19.48	1403
7	93.70	0.00	58.40	17.33	159.59	21.24	21.24	1403
		0.00	58.40	10.62	234.71	14.43	14.43	4003
8	93.30	0.00	67.60	13.11	268.66	13.48	13.48	4003
9	92.80	0.00	79.10	16.23	311.09	16.86	16.86	4003
		0.00	79.10	0.00	492.43	0.00	0.00a	25612
10	92.30	0.00	91.10	0.00	547.62	0.00	0.00a	25612
11	91.80	0.00	103.10	0.00	602.80	0.00	0.00a	25612
12	91.20	0.00	117.49	0.00	669.01	3.81	3.81	25612
13	90.70	0.00	129.49	0.18	724.18	13.85	13.85	25612
14	90.20	0.00	141.49	2.79	779.36	21.03	21.03	25612
15	89.70	0.00	153.48	5.40	834.53	30.88	30.88	25612
		0.00	153.48	5.40	625.90	30.88	30.88	25612
16	89.25	0.00	164.28	7.74	663.13	38.66	38.66	25612
17	88.80	0.00	175.08	10.09	700.37	45.11	45.11	25612
18	88.20	0.00	189.47	13.22	750.02	51.86	51.86	25612
19	87.60	0.00	203.86	16.35	799.66	57.29	57.29	25612
20	87.25	0.00	212.26	18.18	828.61	60.14	60.14	25612
21	86.90	0.00	220.65	20.00	857.57	62.90	62.90	25612
22	86.40	0.00	232.64	22.61	898.93	66.81	66.81	25612
23	85.90	0.00	244.63	25.22	940.29	70.73	70.73	25612
24	85.40	0.00	256.62	27.82	981.64	74.65	74.65	25612

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	95.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	93.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	90.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	89.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	97.85	74.49	74.49	96094
16	89.25	0.00	10.80	0.00	135.69	60.96	60.96	96094
17	88.80	0.00	21.61	0.00	173.55	52.94	52.94	96094
18	88.20	0.00	36.02	0.00	224.06	49.99	49.99	96094
19	87.60	0.00	50.46	0.00	274.65	52.86	52.86	96094

Run ID. 2021.04.06 - SW5 Section 7 - TCB 95.80
 2 Mandala Place, Castle Hill
 SW5 - Section 7

| Sheet No.
 | Date:12-04-2021
 | Checked :

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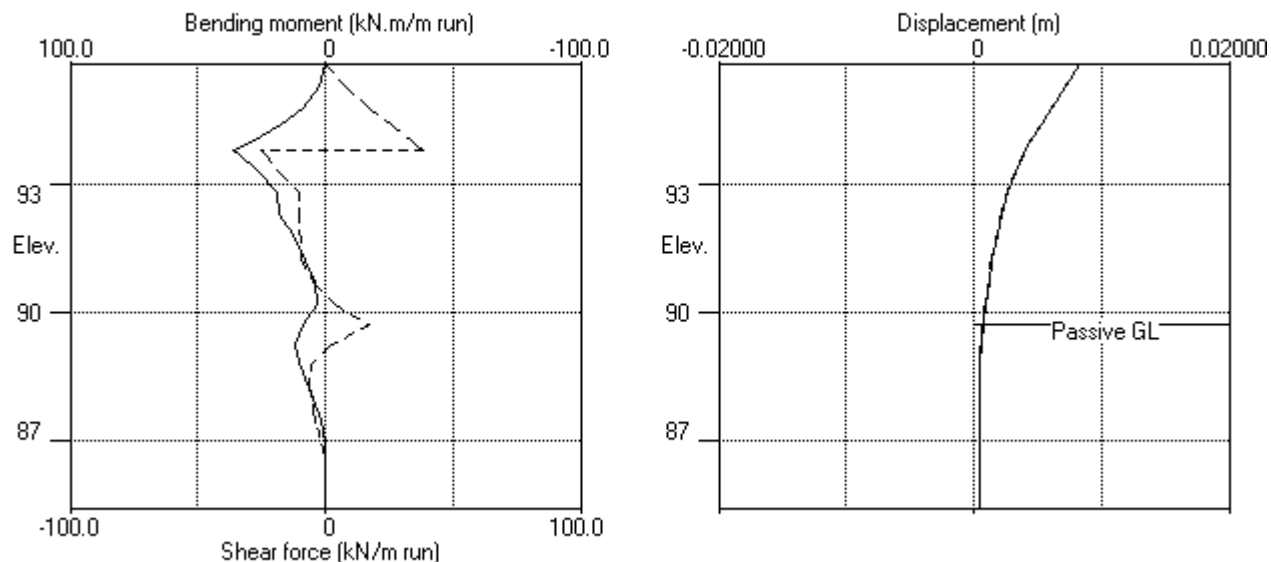
Stage No.4 Excavate to elevation 89.70 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
20	87.25	0.00	58.90	0.00	304.21	55.95	55.95	96094
21	86.90	0.00	67.35	0.00	333.81	59.50	59.50	96094
22	86.40	0.00	79.45	0.00	376.18	64.88	64.88	96094
23	85.90	0.00	91.57	0.00	418.66	70.30	70.30	96094
24	85.40	0.00	103.73	0.00	461.25	75.72	75.72	96094

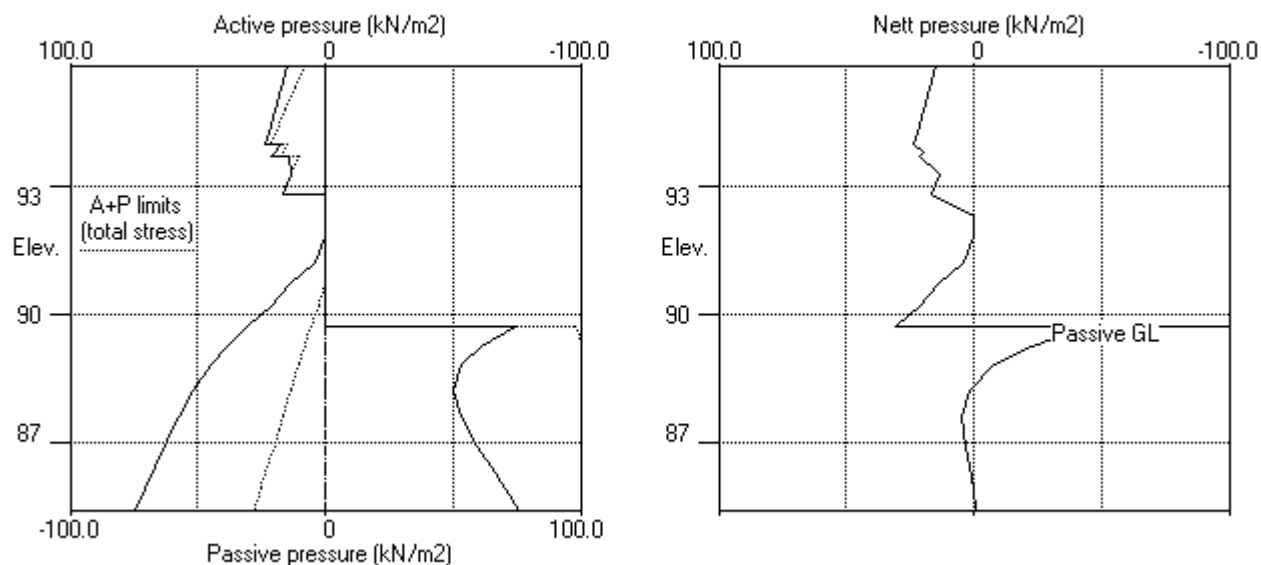
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.4 Excav. to elev. 89.70 on PASSIVE side



Stage No.4 Excav. to elev. 89.70 on PASSIVE side



Units: kN,m

Stage No. 6 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe		Toe elev. for		
				elev. = 85.40		FoS = 1.000		

Stage	---	G.L.	---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.		of	equilib.	elev.	Penetr
					Safety	at elev.		-ation
6	95.80	86.40			More than one strut			

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	95.80	14.14	0.008	2.35E-03	0.0	0.0	
2	95.30	16.76	0.007	2.34E-03	7.7	2.1	
3	94.80	19.37	0.006	2.28E-03	16.8	8.2	
4	94.40	21.42	0.005	2.17E-03	24.9	16.6	
5	94.00	23.42	0.004	1.96E-03	33.9	28.3	
		17.05	0.004	1.96E-03	33.9	28.3	
6	93.80	19.54	0.004	1.81E-03	37.5	35.5	63.5
		19.54	0.004	1.81E-03	-26.0	35.5	
7	93.70	21.33	0.004	1.73E-03	-23.9	33.0	
		14.69	0.004	1.73E-03	-23.9	33.0	
8	93.30	14.21	0.003	1.47E-03	-18.1	24.6	
9	92.80	17.95	0.003	1.22E-03	-10.1	18.3	
		7.00	0.003	1.22E-03	-10.1	18.3	
10	92.30	9.57	0.002	1.01E-03	-5.9	18.3	
11	91.80	12.12	0.002	8.14E-04	-0.5	16.0	
12	91.20	18.24	0.001	5.69E-04	8.6	19.2	
13	90.70	27.57	0.001	3.08E-04	20.0	26.0	
14	90.20	29.14	0.001	-7.18E-05	34.2	39.8	89.4
		29.14	0.001	-7.18E-05	-55.2	39.8	
15	89.70	26.93	0.001	-3.94E-04	-41.2	16.1	
16	89.25	21.98	0.001	-4.80E-04	-30.2	0.4	
17	88.80	17.32	0.001	-4.27E-04	-21.3	-10.7	
18	88.20	14.60	0.002	-2.16E-04	-11.7	-19.8	
19	87.60	17.55	0.002	8.54E-05	-2.1	-23.8	
20	87.25	22.37	0.002	2.75E-04	4.9	-23.4	
21	86.90	29.52	0.001	4.52E-04	14.0	-20.2	
22	86.40	42.87	0.001	6.22E-04	32.1	-9.3	
		-59.28	0.001	6.22E-04	32.1	-9.3	
23	85.90	-40.96	0.001	6.67E-04	7.0	1.6	
24	85.40	12.96	0.000	6.57E-04	-0.0	-0.0	
Strut force at elev. 93.80 =			63.50 kN/m run =				152.40 kN/strut (horiz.)
							215.52 kN/strut (incl.)
Strut force at elev. 90.20 =			89.40 kN/m run =				214.56 kN/strut (horiz.)
							303.44 kN/strut (incl.)

Stage No.6 Excavate to elevation 86.40 on PASSIVE side

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(continued)

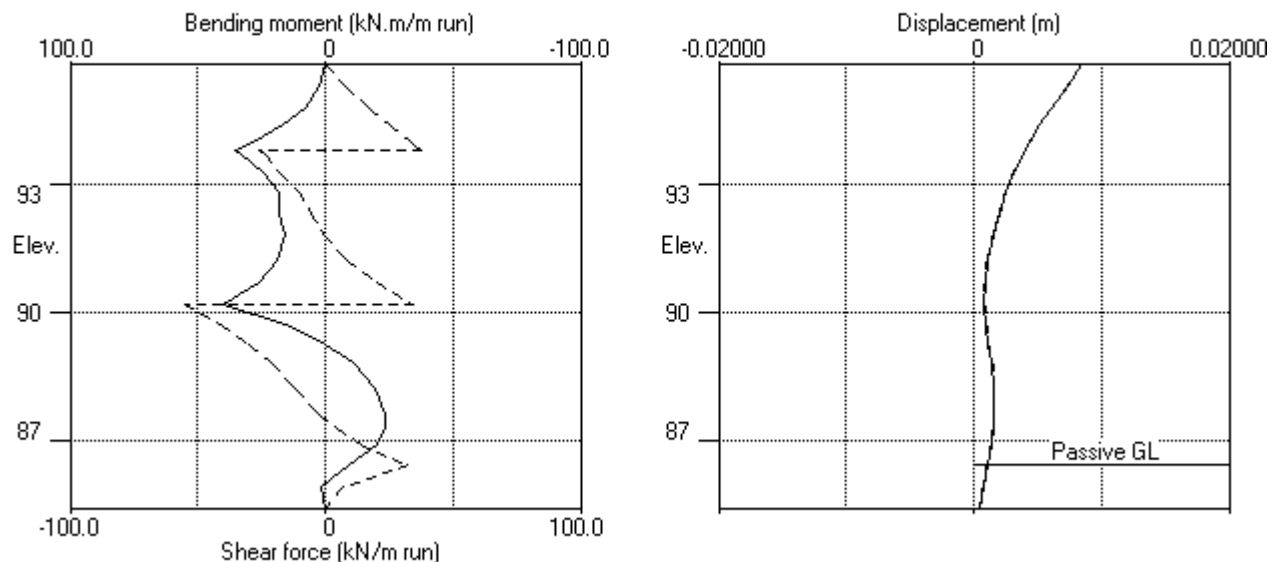
Stage No.6 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----					Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2		
21	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	102.15	102.15	102.15p	131751
23	85.90	0.00	12.00	0.00	144.20	99.02	99.02	131751
24	85.40	0.00	24.01	0.00	186.28	60.37	60.37	131751

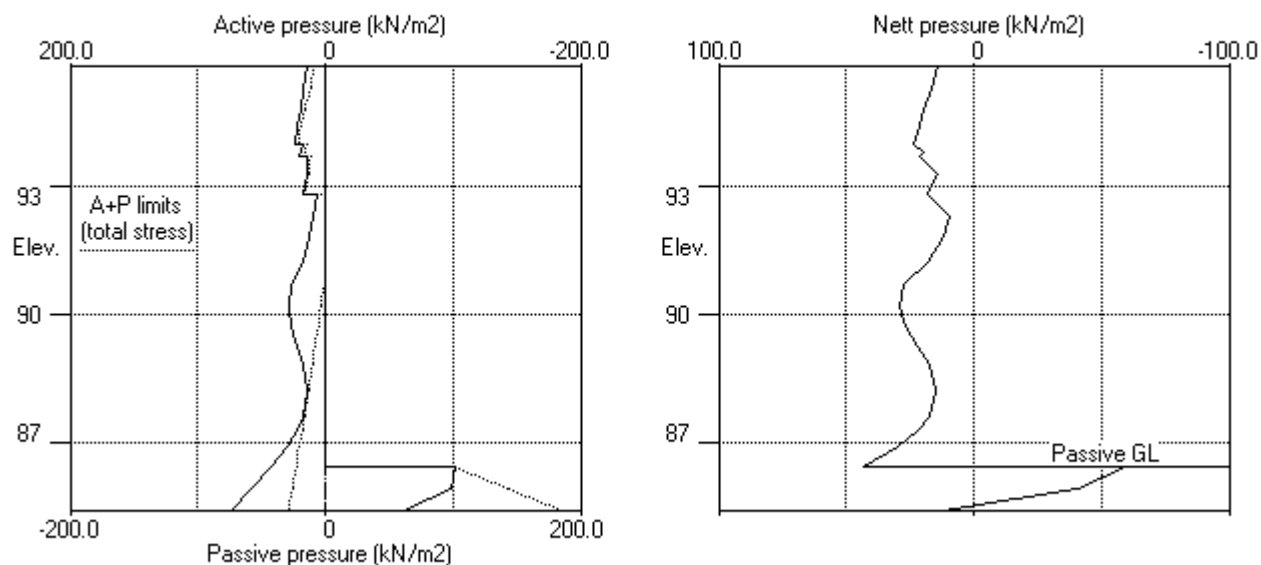
Note: 12.34a Soil pressure at active limit
 102.15p Soil pressure at passive limit

Units: kN,m

Stage No.6 Excav. to elev. 86.40 on PASSIVE side



Stage No.6 Excav. to elev. 86.40 on PASSIVE side



ABC Consultants Pty Ltd | Sheet No.
 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.06 - SW5 Section 7 - TCB 95.80 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW5 - Section 7 | Checked :

Units: kN,m

Stage No. 8 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut		Factor Moment	Toe Wall
No.	Act. Pass.	Elev.		of equilib.	elev. Penetr
				Safety at elev.	-ation
8	95.80 85.90			More than one strut	

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
 27.82kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
 It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	95.80	14.11	0.008	2.34E-03	0.0	0.0	
2	95.30	16.72	0.007	2.33E-03	7.7	2.1	
3	94.80	19.32	0.006	2.27E-03	16.7	8.2	
4	94.40	21.37	0.005	2.16E-03	24.9	16.6	
5	94.00	23.36	0.004	1.95E-03	33.8	28.2	
		16.99	0.004	1.95E-03	33.8	28.2	
6	93.80	19.47	0.004	1.80E-03	37.5	35.4	63.6
		19.47	0.004	1.80E-03	-26.1	35.4	
7	93.70	21.27	0.004	1.73E-03	-24.1	32.9	
		14.51	0.004	1.73E-03	-24.1	32.9	
8	93.30	14.02	0.003	1.46E-03	-18.4	24.4	
9	92.80	17.75	0.003	1.22E-03	-10.4	17.9	
		5.73	0.003	1.22E-03	-10.4	17.9	
10	92.30	8.33	0.002	1.01E-03	-6.9	17.6	
11	91.80	11.07	0.002	8.29E-04	-2.1	14.7	
12	91.20	17.88	0.001	6.11E-04	6.6	16.8	
13	90.70	28.35	0.001	3.83E-04	18.2	22.6	
14	90.20	31.88	0.001	4.84E-05	33.2	35.5	89.3
		31.88	0.001	4.84E-05	-56.0	35.5	
15	89.70	32.71	0.001	-2.24E-04	-39.9	11.7	
16	89.25	31.30	0.001	-2.71E-04	-25.5	-2.8	
17	88.80	30.69	0.001	-2.00E-04	-11.5	-10.8	

(continued)

Stage No.8 Excavate to elevation 85.40 on PASSIVE side

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
18	88.20	32.90	0.001	-4.43E-05	7.5	-11.7	
19	87.60	35.62	0.001	4.18E-05	28.1	-0.8	
20	87.25	33.59	0.001	-6.81E-07	40.2	11.3	
21	86.90	27.96	0.001	-1.57E-04	51.0	27.5	88.8
		27.96	0.001	-1.57E-04	-37.9	27.5	
22	86.40	22.61	0.001	-3.78E-04	-25.2	10.7	
23	85.90	25.22	0.001	-4.63E-04	-13.3	4.1	
24	85.40	27.82	0.002	-4.87E-04	-0.0	-0.0	
Strut force at elev.			93.80 =	63.58 kN/m	run =	152.58 kN/strut (horiz.)	
					=	215.79 kN/strut (incl.)	
Strut force at elev.			90.20 =	89.26 kN/m	run =	214.21 kN/strut (horiz.)	
					=	302.94 kN/strut (incl.)	
Strut force at elev.			86.90 =	88.84 kN/m	run =	213.22 kN/strut (horiz.)	
					=	301.53 kN/strut (incl.)	

Node no.	Y coord	----- ACTIVE side -----						Total earth pressure kN/m2	Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertical kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2			
1	95.80	0.00	20.00	8.12	49.28	14.11	14.11	2084	
2	95.30	0.00	29.00	11.77	71.45	16.72	16.72	2084	
3	94.80	0.00	38.00	15.42	93.63	19.32	19.32	2084	
4	94.40	0.00	45.20	18.34	111.37	21.37	21.37	2084	
5	94.00	0.00	52.40	21.27	129.11	23.36	23.36	2084	
		0.00	52.40	14.90	144.80	16.99	16.99	2084	
6	93.80	0.00	56.40	16.52	154.66	19.47	19.47	2084	
7	93.70	0.00	58.40	17.33	159.59	21.27	21.27	2084	
		0.00	58.40	10.62	234.71	14.51	14.51	5972	
8	93.30	0.00	67.60	13.11	268.66	14.02	14.02	5972	
9	92.80	0.00	79.10	16.23	311.09	17.75	17.75	5972	
		0.00	79.10	0.00	492.43	5.73	5.73	38350	
10	92.30	0.00	91.10	0.00	547.62	8.33	8.33	38350	
11	91.80	0.00	103.10	0.00	602.80	11.07	11.07	45545	
12	91.20	0.00	117.49	0.00	669.01	17.88	17.88	45545	
13	90.70	0.00	129.49	0.18	724.18	28.35	28.35	45545	
14	90.20	0.00	141.49	2.79	779.36	31.88	31.88	45545	
15	89.70	0.00	153.48	5.40	834.53	32.71	32.71	45545	
16	89.25	0.00	164.28	7.74	884.18	31.30	31.30	45545	
17	88.80	0.00	175.08	10.09	933.83	30.69	30.69	45545	
18	88.20	0.00	189.47	13.22	1000.02	32.90	32.90	45545	
19	87.60	0.00	203.86	16.35	1066.21	35.62	35.62	86319	
20	87.25	0.00	212.26	18.18	1104.82	33.59	33.59	86319	
21	86.90	0.00	220.65	20.00	1143.42	27.96	27.96	86319	
22	86.40	0.00	232.64	22.61	1198.57	22.61	22.61a	86319	
23	85.90	0.00	244.63	25.22	1253.72	25.22	25.22a	86319	
		0.00	244.63	25.22	940.29	25.22	25.22a	86319	
24	85.40	0.00	256.62	27.82	981.64	27.82	27.82a	86319	

(continued)

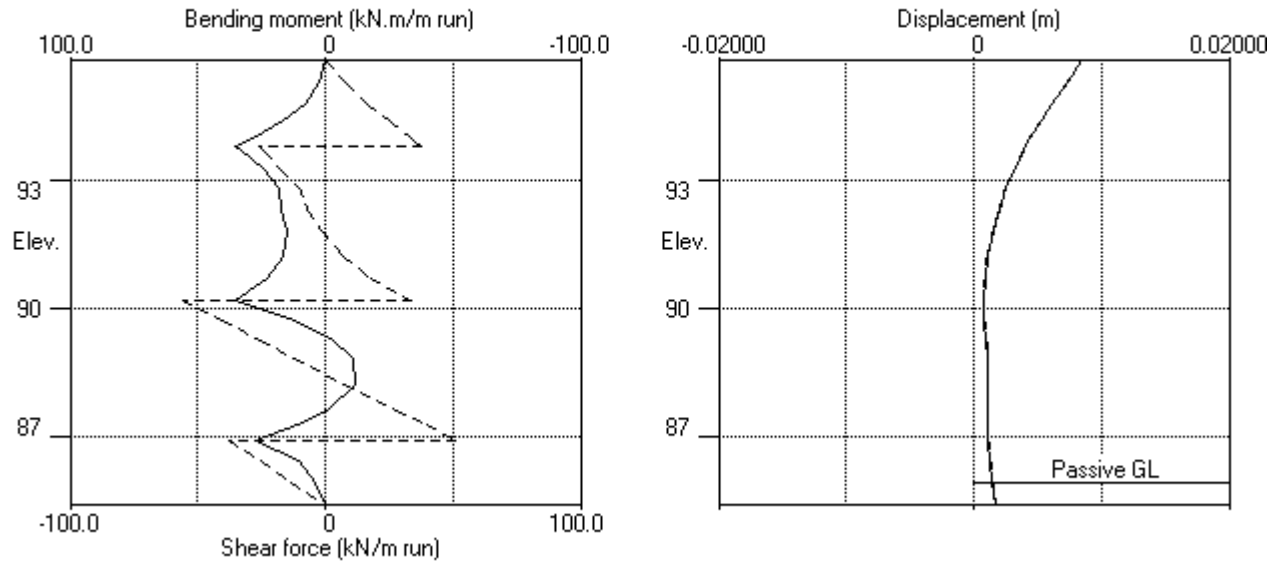
Stage No.8 Excavate to elevation 85.40 on PASSIVE side

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	95.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	95.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	94.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	94.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	94.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	93.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	93.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	93.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	92.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	92.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	91.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	91.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	90.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	90.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	89.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	89.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
17	88.80	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
19	87.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20	87.25	0.00	0.00	0.00	0.00	0.00	0.00	0.0
21	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
22	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
23	85.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24	85.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0

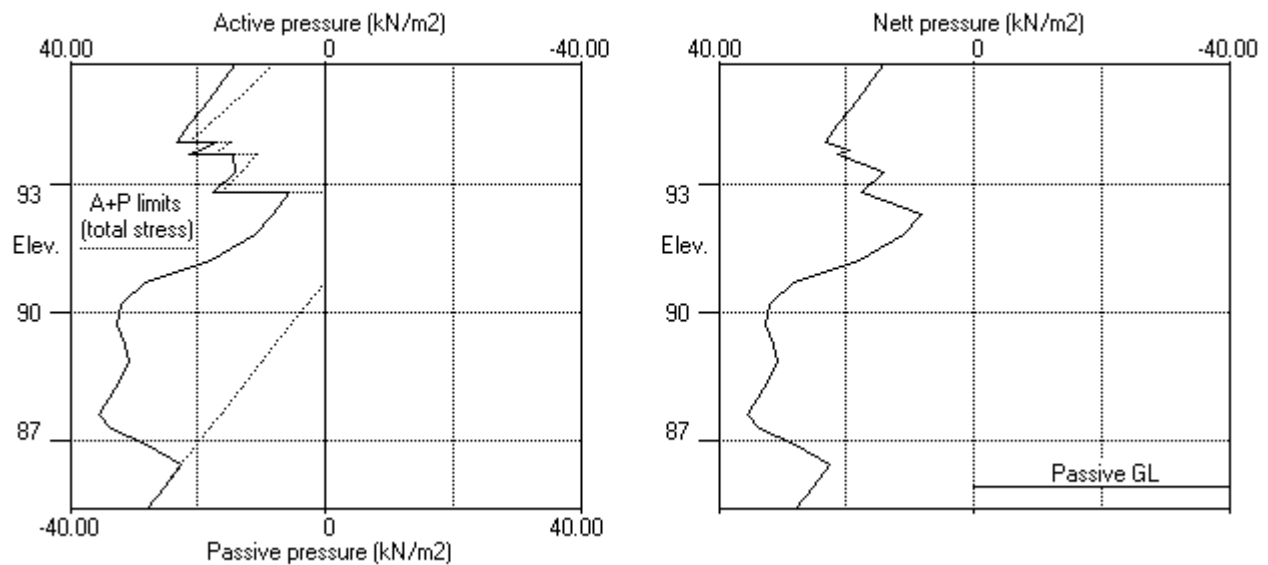
Note: 27.82a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.8 Excav. to elev. 85.40 on PASSIVE side



Stage No.8 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
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Data filename/Run ID: 2021.04.06 - SW5 Section 7 - TCB 95.80	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW5 - Section 7	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe		Toe elev. for		
			elev. = 85.40		FoS = 1.000		

Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall	
No.	Act.	Pass.	Elev.	of	equilib.	elev. Penetr	
				Safety	at elev.	-ation	
1	95.80	95.80	Cant.	12.500	86.70	95.16 0.64	
2	95.80	93.30	Cant.	3.650	86.49	91.46 1.84	
3	95.80	93.30	93.80	Conditions not suitable for FoS calc.			
4	95.80	89.70	93.80	Conditions not suitable for FoS calc.			
5	95.80	89.70		More than one strut			
All remaining stages have more than one strut - FoS calculation n/a							

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	95.80	0.010	0.000	0.0	0.0	0.0	0.0
2	95.30	0.009	0.000	2.5	0.0	9.1	0.0
3	94.80	0.007	0.000	9.5	0.0	19.4	0.0
4	94.40	0.006	0.000	19.2	0.0	28.7	0.0
5	94.00	0.005	0.000	32.7	0.0	38.7	0.0
6	93.80	0.004	0.000	40.9	0.0	42.9	-27.0
7	93.70	0.004	0.000	39.4	0.0	31.6	-25.0
8	93.30	0.003	0.000	42.6	0.0	36.4	-19.5
9	92.80	0.003	0.000	61.0	0.0	32.1	-11.8
10	92.30	0.002	0.000	64.3	0.0	0.0	-20.5
11	91.80	0.002	0.000	45.7	0.0	0.0	-39.8
12	91.20	0.001	-0.000	21.3	0.0	8.6	-32.8
13	90.70	0.001	-0.000	26.0	0.0	20.6	-20.1
14	90.20	0.001	0.000	39.8	0.0	40.4	-57.3
15	89.70	0.001	0.000	16.1	-2.2	16.9	-42.4
16	89.25	0.001	0.000	11.6	-4.7	2.1	-30.2
17	88.80	0.001	0.000	10.3	-14.9	0.7	-21.3
18	88.20	0.002	0.000	6.0	-19.8	7.5	-11.7
19	87.60	0.002	0.000	2.5	-23.8	28.1	-4.6
20	87.25	0.002	0.000	11.3	-23.4	40.2	-3.1
21	86.90	0.001	0.000	27.5	-20.2	53.3	-37.9
22	86.40	0.001	0.000	10.7	-9.3	32.1	-25.2
23	85.90	0.001	0.000	4.1	-0.2	7.0	-13.3
24	85.40	0.002	0.000	0.0	-0.0	0.0	-0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	11.0	92.80	-0.5	89.25	5.9	93.70	-6.0	91.80
2	64.3	92.30	-3.2	89.25	36.4	93.30	-39.8	91.80
3	40.9	93.80	-2.0	88.80	42.9	93.80	-24.2	91.80
4	36.3	93.80	-0.2	86.40	38.1	93.80	-25.6	93.80
5	34.8	93.80	-2.1	87.60	40.4	90.20	-48.0	90.20
6	39.8	90.20	-23.8	87.60	37.5	93.80	-55.2	90.20
7	35.9	90.20	-19.7	88.20	53.3	86.90	-57.3	90.20
8	35.5	90.20	-11.7	88.20	51.0	86.90	-56.0	90.20

Summary of results (continued)

Maximum and minimum displacement at each stage

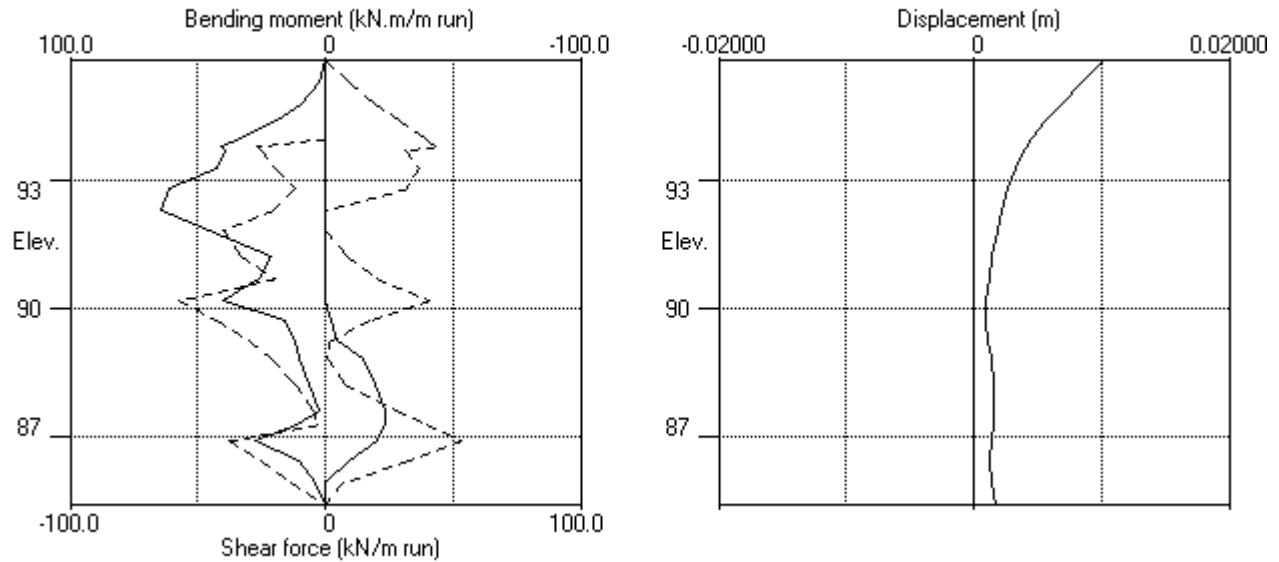
Stage no.	----- maximum m	Displacement elev.	----- minimum m	elev.	Stage description -----
1	0.002	95.80	0.000	95.80	Apply surcharge no.1 at elev. 95.80
2	0.010	95.80	-0.000	91.20	Excav. to elev. 93.30 on PASSIVE side
3	0.007	95.80	0.000	95.80	Install strut no.3 at elev. 93.80
4	0.008	95.80	0.000	95.80	Excav. to elev. 89.70 on PASSIVE side
5	0.009	95.80	0.000	95.80	Install strut no.1 at elev. 90.20
6	0.008	95.80	0.000	95.80	Excav. to elev. 86.40 on PASSIVE side
7	0.008	95.80	0.000	95.80	Install strut no.2 at elev. 86.90
8	0.008	95.80	0.000	95.80	Excav. to elev. 85.40 on PASSIVE side

Strut forces at each stage (horizontal components)

Stage no.	--- Strut no. 1 --- at elev. 90.20		--- Strut no. 2 --- at elev. 86.90		--- Strut no. 3 --- at elev. 93.80	
	kN/m run	kN/strut	kN/m run	kN/strut	kN/m run	kN/strut
3	---	---	---	---	58.93	141.42
4	---	---	---	---	63.69	152.85
5	88.39	212.13	---	---	63.85	153.25
6	89.40	214.56	---	---	63.50	152.40
7	89.36	214.46	88.39	212.13	63.54	152.50
8	89.26	214.21	88.84	213.22	63.58	152.58

Units: kN,m

Bending moment, shear force, displacement envelopes



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 Data filename/Run ID: 2021.04.07 - SW7 Section 1 - TCB 89.9 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW7 - Section 1 | Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	89.90	1 Fill	1 Fill	
2	89.60	2 Res Soil	2 Res Soil	
3	89.30	4 Class III Rock	4 Class III Rock	

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 Fill	18.00	10000	0.580	OC (0.300)	0.406 (0.000)	2.464 (0.000)	
2 Res Soil	20.00	10000	0.580	OC (0.300)	0.406 (1.274)	2.464 (3.139)	5.000d
3 Class V/IV Rock	23.00	30000	0.430	OC (0.250)	0.271 (1.041)	3.690 (3.842)	5.000d
4 Class III Rock	24.00	200000	0.350	OC (0.200)	0.217 (0.933)	4.599 (4.289)	30.00d

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 Fill	25.00	0.000	0.00	25.00	0.000	0.00
2 Res Soil	25.00	0.000	0.00	25.00	0.000	0.00
3 Class V/IV Rock	35.00	0.000	0.00	35.00	0.000	0.00
4 Class III Rock	40.00	0.000	0.00	40.00	0.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	80.00	80.00

Automatic water pressure balancing at toe of wall : No

WALL PROPERTIES

Type of structure = Soldier Pile Wall
 Soldier Pile width = 0.60 m
 Soldier Pile spacing = 2.40 m
 Passive mobilisation factor = 3.00 m
 Elevation of toe of wall = 85.40
 Maximum finite element length = 0.50 m
 Youngs modulus of wall E = 3.2800E+07 kN/m2
 Moment of inertia of wall I = 1.3200E-03 m4/m run
 E.I = 43296 kN.m2/m run
 Yield Moment of wall = Not defined

STRUTS and ANCHORS

Strut/ anchor no.	Elev.	Strut spacing m	X-section area of strut sq.m	Youngs modulus kN/m2	Free length m	Inclin -ation (degs)	Pre-stress /strut kN	Tension allowed
1	88.70	2.40	0.000300	2.000E+08	5.00	45.00	200.0	No
2	86.90	2.40	0.000300	2.000E+08	5.00	45.00	200.0	No

SURCHARGE LOADS

Surch- arge no.	Distance from Elev. wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 Near edge	Surcharge ----- kN/m2 Far edge	Equiv. soil type	Partial factor/ Category
1	89.90	0.00 (A)	100.00	100.00	20.00	=	N/A N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 89.90
2	Excavate to elevation 88.20 on PASSIVE side
3	Install strut or anchor no.1 at elevation 88.70
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.2 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

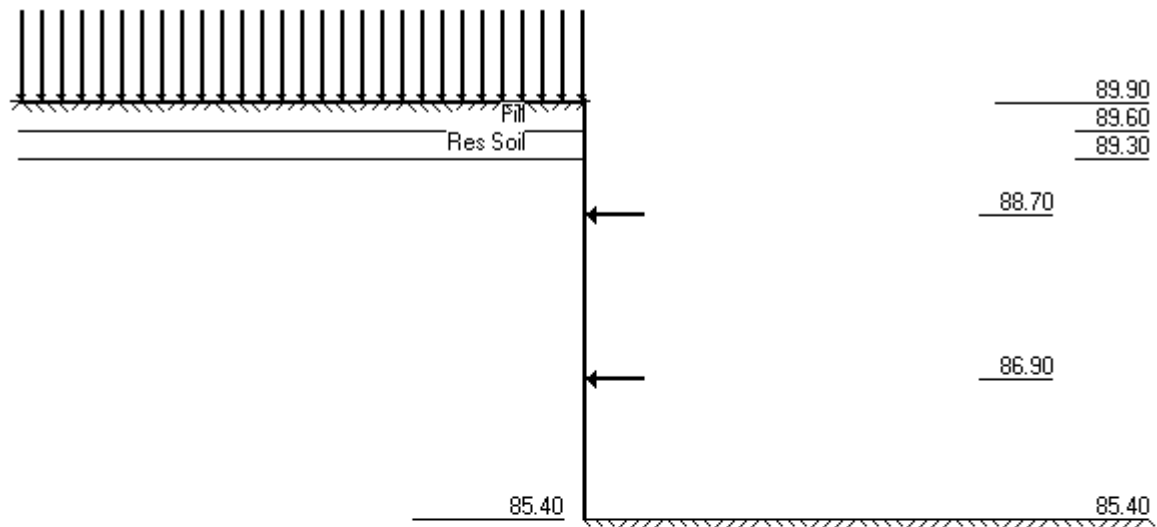
OUTPUT OPTIONS

Stage no.	Stage description	Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply surcharge no.1 at elev. 89.90	Yes	Yes	Yes
2	Excav. to elev. 88.20 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 88.70	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.2 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

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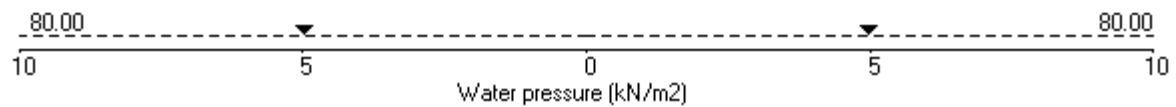
Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Class III Rock

Class III Rock



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 2 Mandala Place, Castle Hill | Date:12-04-2021
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Units: kN,m

Stage No. 2 Excavate to elevation 88.20 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe		Toe elev. for		
				elev. = 85.40		FoS = 1.000		

Stage	---	G.L.	---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.		of	equilib.	elev.	Penetr
					Safety	at elev.		-ation
2	89.90	88.20	Cant.	2.980	85.76	87.72	0.48	

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

Rigid boundaries: Active side 20.00 from wall

Passive side 20.00 from wall

Node	Y	Nett	Wall	Wall	Shear	Bending	Strut
no.	coord	pressure	disp.	rotation	force	moment	forces
		kN/m2	m	rad.	kN/m	kN.m/m	kN/m
1	89.90	8.12	0.001	3.88E-04	0.0	0.0	
2	89.60	10.31	0.001	3.86E-04	2.8	0.4	
		8.83	0.001	3.86E-04	2.8	0.4	
3	89.30	12.78	0.001	3.79E-04	6.0	1.7	
		0.00	0.001	3.79E-04	6.0	1.7	
4	89.00	0.00	0.000	3.61E-04	6.0	3.4	
5	88.70	0.00	0.000	3.31E-04	6.0	5.2	
6	88.20	1.11	0.000	2.51E-04	6.3	8.7	
		-29.93	0.000	2.51E-04	6.3	8.7	
7	87.85	-15.16	0.000	1.80E-04	-1.6	9.0	
8	87.50	-5.19	0.000	1.12E-04	-5.2	7.6	
9	87.20	0.04	0.000	6.67E-05	-5.9	5.8	
10	86.90	2.94	0.000	3.29E-05	-5.5	4.0	
11	86.40	4.39	0.000	5.31E-07	-3.7	1.6	
12	85.90	3.80	0.000	-1.07E-05	-1.6	0.3	
13	85.40	2.66	0.000	-1.26E-05	0.0	0.0	

Node	Y	----- ACTIVE side -----					
no.	coord	Water	Vertic	Effective	Earth	Total	Soil
		press.	-al	Active	Passive	earth	stiffness
		kN/m2	kN/m2	limit	limit	pressure	coeff.
1	89.90	0.00	20.00	8.12	49.28	8.12	3914
2	89.60	0.00	25.40	10.31	62.58	10.31	3914
		0.00	25.40	3.94	78.28	8.83	3914
3	89.30	0.00	31.40	6.37	93.06	12.78	3914
		0.00	31.40	0.00	273.07	0.00	72524
4	89.00	0.00	38.60	0.00	306.19	0.00	72524
5	88.70	0.00	45.80	0.00	339.30	0.00	72524
6	88.20	0.00	57.80	0.00	394.48	1.11	72524
		0.00	57.80	0.00	295.86	1.11	72524

(continued)

Stage No.2 Excavate to elevation 88.20 on PASSIVE side

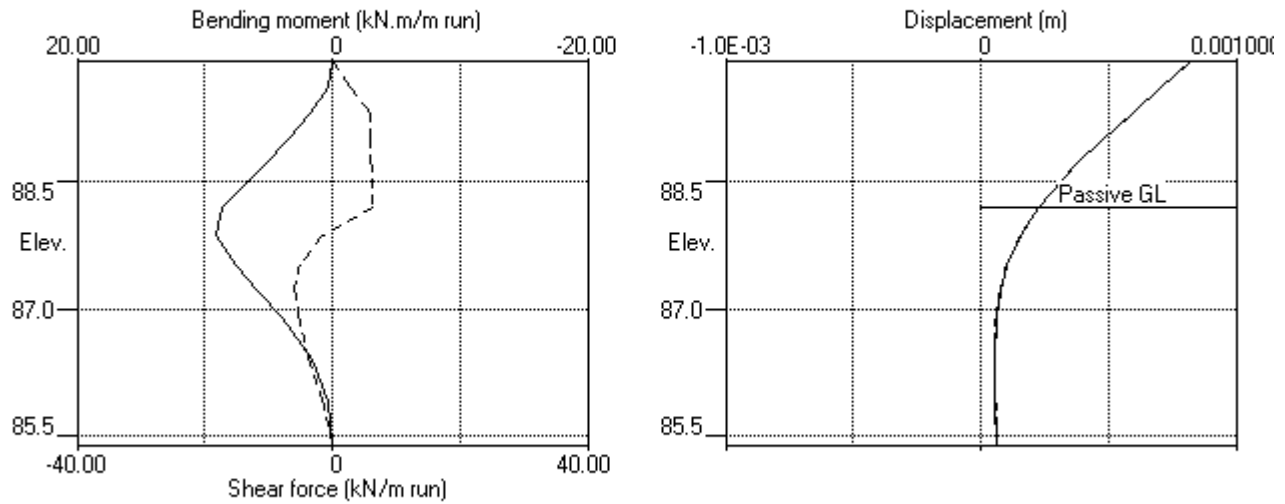
Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff. kN/m3
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
7	87.85	0.00	66.20	0.00	324.84	9.65	9.65	72524
8	87.50	0.00	74.60	0.00	353.81	16.34	16.34	72524
9	87.20	0.00	81.80	0.00	378.64	20.80	20.80	72524
10	86.90	0.00	89.00	0.00	403.47	24.38	24.38	72524
11	86.40	0.00	101.00	0.00	444.86	29.07	29.07	72524
12	85.90	0.00	113.00	0.00	486.24	33.01	33.01	72524
13	85.40	0.00	124.99	0.00	527.63	36.74	36.74	72524

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff. kN/m3
		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	
1	89.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	87.85	0.00	8.40	0.00	125.48	24.81	24.81	124418
8	87.50	0.00	16.80	0.00	154.45	21.53	21.53	124418
9	87.20	0.00	24.00	0.00	179.29	20.76	20.76	124418
10	86.90	0.00	31.20	0.00	204.13	21.44	21.44	124418
11	86.40	0.00	43.21	0.00	245.55	24.68	24.68	124418
12	85.90	0.00	55.22	0.00	286.98	29.21	29.21	124418
13	85.40	0.00	67.24	0.00	328.44	34.08	34.08	124418

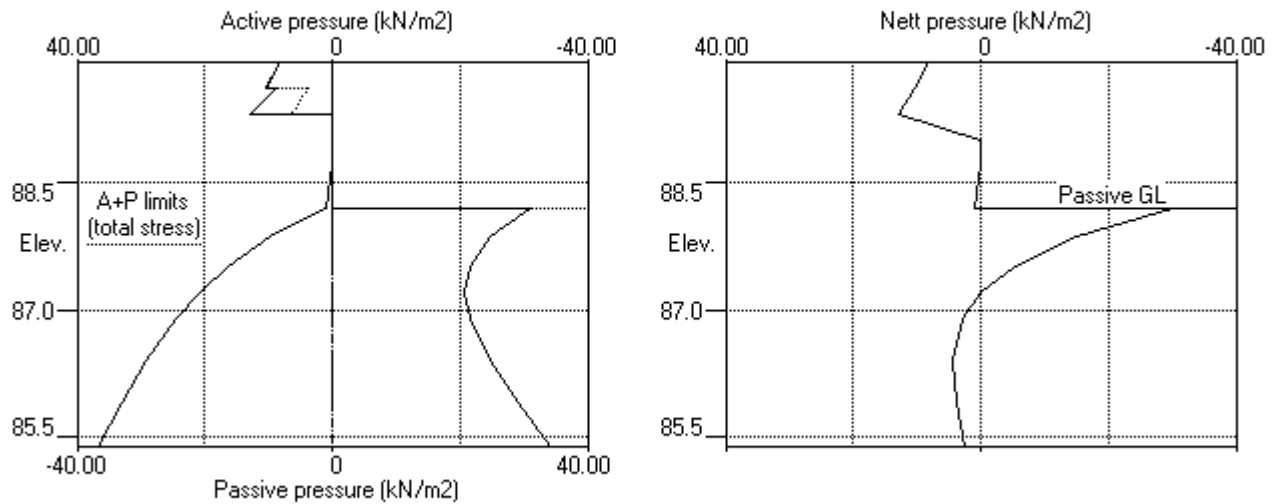
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 88.20 on PASSIVE side



Stage No.2 Excav. to elev. 88.20 on PASSIVE side



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Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe Wall
No.	Act. Pass.	Elev.	of	of equilib.	elev. Penetr
			Safety	at elev.	-ation
4	89.90 86.40	88.70	Conditions not	suitable for	FoS calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	89.90	11.72	-0.000	-3.89E-06	0.0	-0.0	
2	89.60	13.24	-0.000	-5.89E-06	3.7	0.6	
		11.76	-0.000	-5.89E-06	3.7	0.6	
3	89.30	15.09	-0.000	-1.57E-05	7.8	2.3	
		42.68	-0.000	-1.57E-05	7.8	2.3	
4	89.00	35.85	-0.000	-4.61E-05	19.6	6.5	
5	88.70	28.55	-0.000	-1.16E-04	29.2	13.9	59.1
		28.55	-0.000	-1.16E-04	-29.9	13.9	
6	88.20	16.02	0.000	-2.14E-04	-18.7	3.0	
7	87.85	15.75	0.000	-2.15E-04	-13.2	-2.7	
8	87.50	15.50	0.000	-1.78E-04	-7.7	-6.7	
9	87.20	15.78	0.000	-1.26E-04	-3.0	-8.2	
10	86.90	16.73	0.000	-6.95E-05	1.9	-8.3	
11	86.40	19.52	0.000	7.31E-06	10.9	-5.0	
		-12.35	0.000	7.31E-06	10.9	-5.0	
12	85.90	-11.17	0.000	4.28E-05	5.0	-1.1	
13	85.40	-8.96	0.000	4.93E-05	0.0	0.0	
Strut force at elev. 88.70 =			59.09 kN/m run =				141.82 kN/strut (horiz.)
							= 200.57 kN/strut (incl.)

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure	Soil stiffness
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure		coeff.
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	89.90	0.00	20.00	8.12	49.28	11.72	11.72	12424
2	89.60	0.00	25.40	10.31	62.58	13.24	13.24	12424
		0.00	25.40	3.94	78.28	11.76	11.76	12424
3	89.30	0.00	31.40	6.37	93.06	15.09	15.09	2012
		0.00	31.40	0.00	273.07	42.68	42.68	36995
4	89.00	0.00	38.60	0.00	306.19	35.85	35.85	36995

(continued)

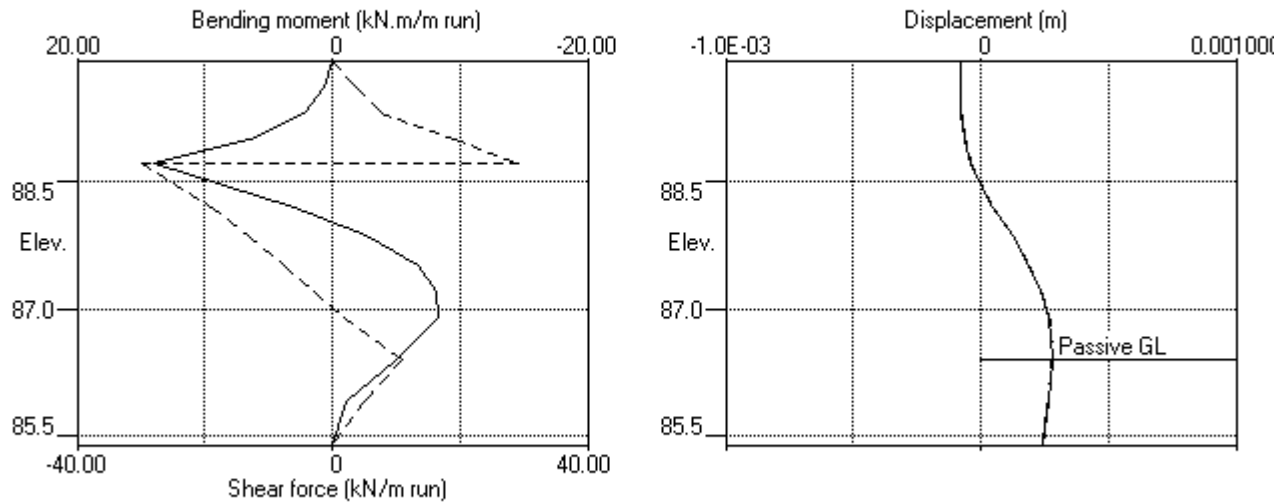
Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
5	88.70	0.00	45.80	0.00	339.30	28.55	28.55	36995
6	88.20	0.00	57.80	0.00	394.48	16.02	16.02	36995
7	87.85	0.00	66.20	0.00	433.11	15.75	15.75	36995
8	87.50	0.00	74.60	0.00	471.74	15.50	15.50	36995
9	87.20	0.00	81.80	0.00	504.85	15.78	15.78	36995
10	86.90	0.00	89.00	0.00	537.96	16.73	16.73	36995
11	86.40	0.00	101.00	0.00	593.15	19.52	19.52	36995
		0.00	101.00	0.00	444.86	19.52	19.52	36995
12	85.90	0.00	113.00	0.00	486.24	23.71	23.71	36995
13	85.40	0.00	124.99	0.00	527.63	28.38	28.38	36995

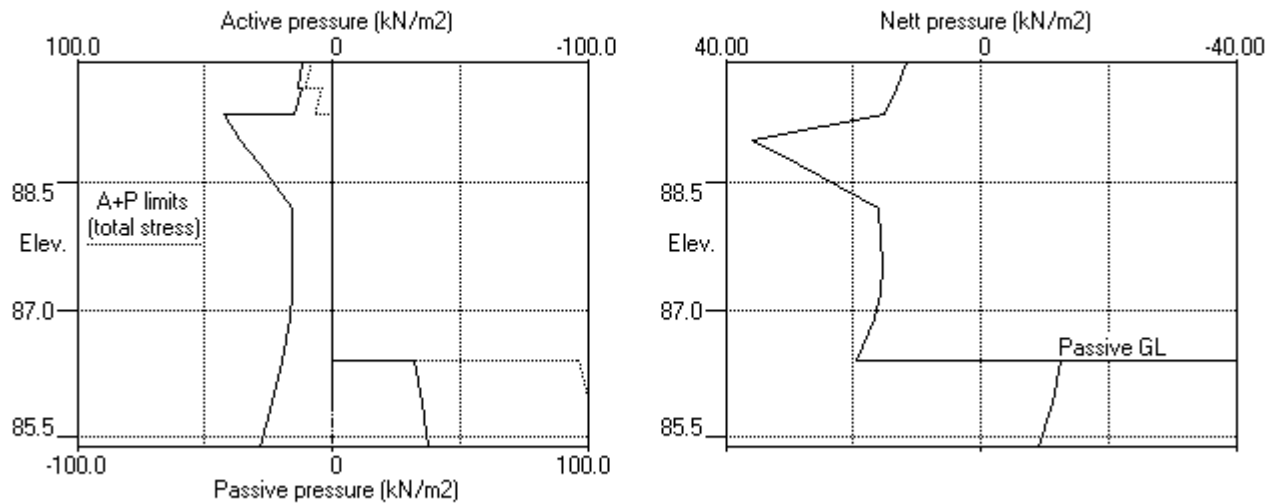
Node no.	Y coord	----- PASSIVE side -----					Total earth pressure	Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Active limit kN/m2	Passive limit kN/m2	Earth pressure kN/m2		
1	89.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	87.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	31.87	31.87	80520
12	85.90	0.00	12.00	0.00	137.89	34.89	34.89	80520
13	85.40	0.00	24.00	0.00	179.30	37.34	37.34	80520

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



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2 Mandala Place, Castle Hill | Date:12-04-2021
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Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe Wall
No.	Act. Pass.	Elev.	of	equilib.	elev. Penetr
			Safety	at elev.	-ation
6	89.90 85.90		More than one strut		

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	89.90	10.41	0.000	2.05E-04	0.0	-0.0	
2	89.60	12.90	-0.000	2.03E-04	3.5	0.5	
		11.43	-0.000	2.03E-04	3.5	0.5	
3	89.30	15.21	-0.000	1.94E-04	7.5	2.1	
		44.92	-0.000	1.94E-04	7.5	2.1	
4	89.00	40.77	-0.000	1.65E-04	20.3	6.3	
5	88.70	36.15	-0.000	9.40E-05	31.9	14.2	58.7
		36.15	-0.000	9.40E-05	-26.8	14.2	
6	88.20	27.91	-0.000	-2.19E-05	-10.8	5.9	
7	87.85	30.20	-0.000	-6.04E-05	-0.6	3.7	
8	87.50	31.50	-0.000	-9.53E-05	10.2	5.0	
9	87.20	31.49	-0.000	-1.45E-04	19.6	9.6	
10	86.90	30.26	-0.000	-2.37E-04	28.9	17.0	59.0
		30.26	-0.000	-2.37E-04	-30.1	17.0	
11	86.40	24.52	0.000	-3.69E-04	-16.4	5.9	
12	85.90	16.55	0.000	-4.03E-04	-6.1	0.0	
13	85.40	8.05	0.000	-4.03E-04	0.0	0.0	
Strut force at elev. 88.70 =			58.67 kN/m run =			140.80 kN/strut (horiz.)	
						= 199.12 kN/strut (incl.)	
Strut force at elev. 86.90 =			59.02 kN/m run =			141.65 kN/strut (horiz.)	
						= 200.33 kN/strut (incl.)	

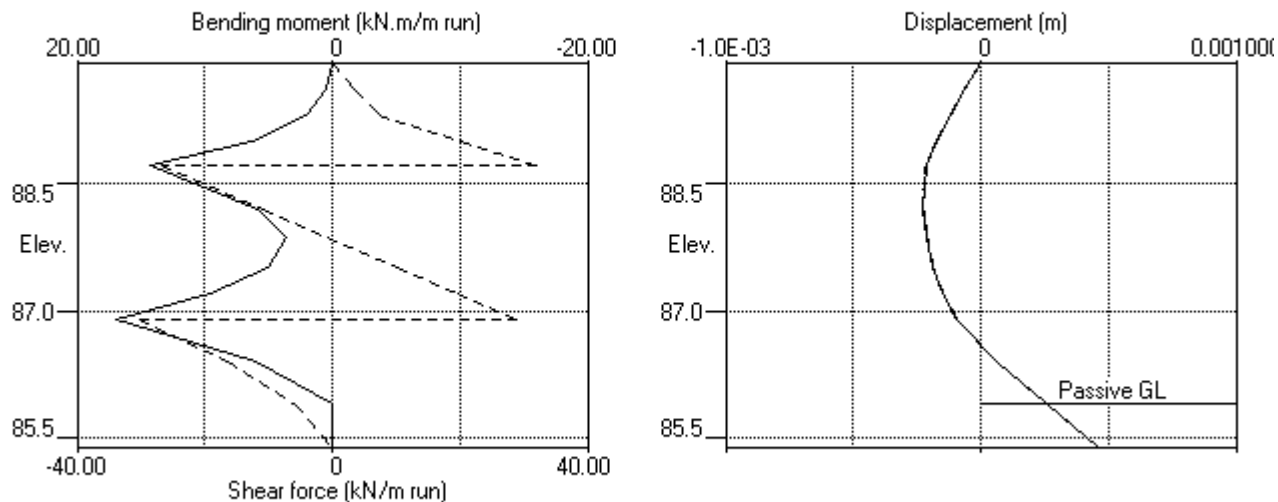
Node no.	Y coord	----- ACTIVE side -----					Total earth pressure	Soil stiffness
		Water press.	Effective stress	Active limit	Passive limit	Earth pressure		coeff.
		kN/m2	Vertical	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3
1	89.90	0.00	20.00	8.12	49.28	10.41	10.41	2978
2	89.60	0.00	25.40	10.31	62.58	12.90	12.90	2978
		0.00	25.40	3.94	78.28	11.43	11.43	2978
3	89.30	0.00	31.40	6.37	93.06	15.21	15.21	2978
		0.00	31.40	0.00	273.07	44.92	44.92	55036

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

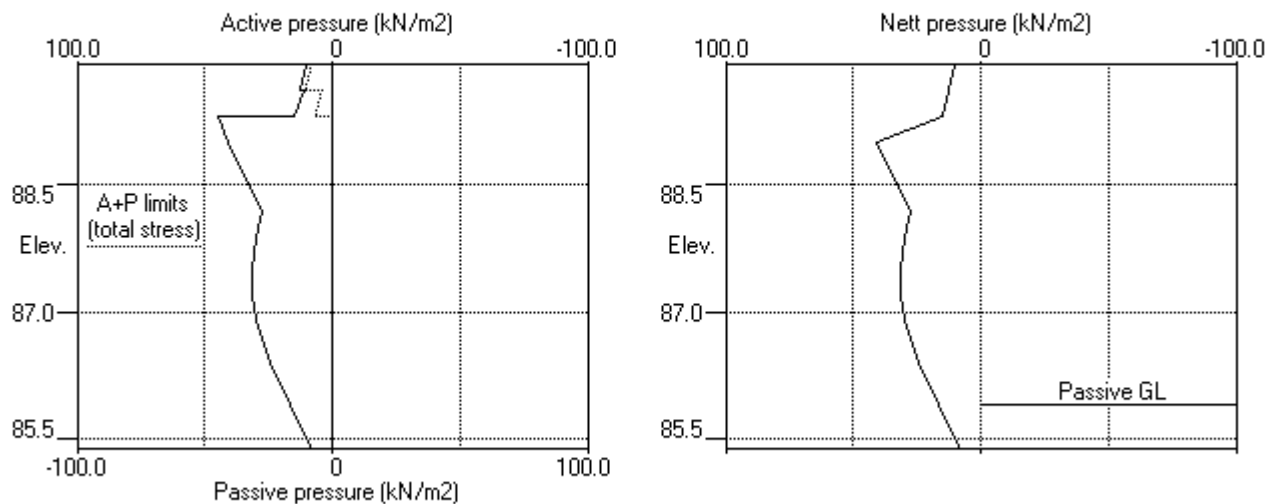
[illegible]

Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
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Data filename/Run ID: 2021.04.07 - SW7 Section 1 - TCB 89.9	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW7 - Section 1	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40	FoS = 1.000	

				Factor	Moment	Toe	Wall
				of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
1	89.90	89.90	Cant.	10.023	85.85	89.49	0.41
2	89.90	88.20	Cant.	2.980	85.76	87.72	0.48
3	89.90	88.20	88.70	Conditions not suitable for FoS calc.			
4	89.90	86.40	88.70	Conditions not suitable for FoS calc.			
5	89.90	86.40		More than one strut			
6	89.90	85.90		More than one strut			

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	89.90	0.001	-0.000	0.0	-0.0	0.0	0.0
2	89.60	0.001	-0.000	0.6	0.0	3.7	0.0
3	89.30	0.001	-0.000	2.3	0.0	7.8	0.0
4	89.00	0.000	-0.000	6.5	0.0	20.3	0.0
5	88.70	0.000	-0.000	14.2	0.0	31.9	-29.9
6	88.20	0.000	-0.000	8.7	0.0	6.3	-18.7
7	87.85	0.000	-0.000	9.0	-2.7	0.0	-13.2
8	87.50	0.000	-0.000	7.6	-6.7	10.2	-7.7
9	87.20	0.000	-0.000	9.6	-8.2	19.6	-5.9
10	86.90	0.000	-0.000	17.0	-8.3	28.9	-30.6
11	86.40	0.000	-0.000	5.9	-5.0	10.9	-16.4
12	85.90	0.000	0.000	0.3	-1.1	5.0	-6.1
13	85.40	0.000	0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	2.4	88.70	-0.0	85.90	4.6	89.30	-1.5	87.85
2	9.0	87.85	0.0	89.90	6.3	88.20	-5.9	87.20
3	13.8	88.70	-3.5	87.20	29.8	88.70	-29.1	88.70
4	13.9	88.70	-8.3	86.90	29.2	88.70	-29.9	88.70
5	14.0	86.90	-1.1	85.90	31.0	88.70	-30.6	86.90
6	17.0	86.90	-0.0	89.90	31.9	88.70	-30.1	86.90

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.000	89.90	0.000	89.90	Apply surcharge no.1 at elev. 89.90
2	0.001	89.90	0.000	89.90	Excav. to elev. 88.20 on PASSIVE side
3	0.000	85.40	-0.000	88.70	Install strut no.1 at elev. 88.70
4	0.000	86.40	-0.000	89.90	Excav. to elev. 86.40 on PASSIVE side
5	0.000	85.40	-0.000	88.20	Install strut no.2 at elev. 86.90
6	0.000	85.40	-0.000	88.20	Excav. to elev. 85.40 on PASSIVE side

Run ID. 2021.04.07 - SW7 Section 1 - TCB 89.9
2 Mandala Place, Castle Hill
SW7 - Section 1

| Sheet No.
| Date:12-04-2021
| Checked :

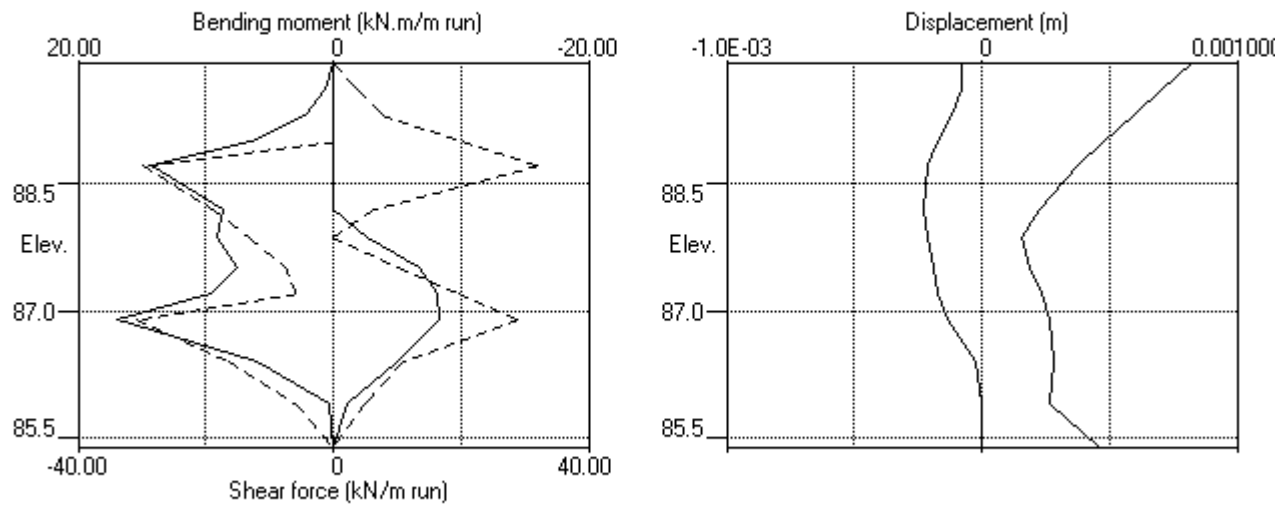
Summary of results (continued)

Strut forces at each stage (horizontal components)

Stage	--- Strut no. 1 ---		--- Strut no. 2 ---	
no.	at elev. 88.70		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut
3	58.93	141.42	---	---
4	59.09	141.82	---	---
5	58.72	140.93	58.93	141.42
6	58.67	140.80	59.02	141.65

Units: kN,m

Bending moment, shear force, displacement envelopes



SURCHARGE LOADS

Surch- arge no.	Elev.	Distance from wall	Length parallel to wall	Width perpend. to wall	Surcharge ----- kN/m2 ----- Near edge Far edge		Equiv. soil type	Partial factor/ Category
1	90.70	0.00 (A)	100.00	100.00	20.00	=	N/A	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply surcharge no.1 at elevation 90.70
2	Excavate to elevation 88.20 on PASSIVE side
3	Install strut or anchor no.1 at elevation 88.70
4	Excavate to elevation 86.40 on PASSIVE side
5	Install strut or anchor no.3 at elevation 86.90
6	Excavate to elevation 85.40 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

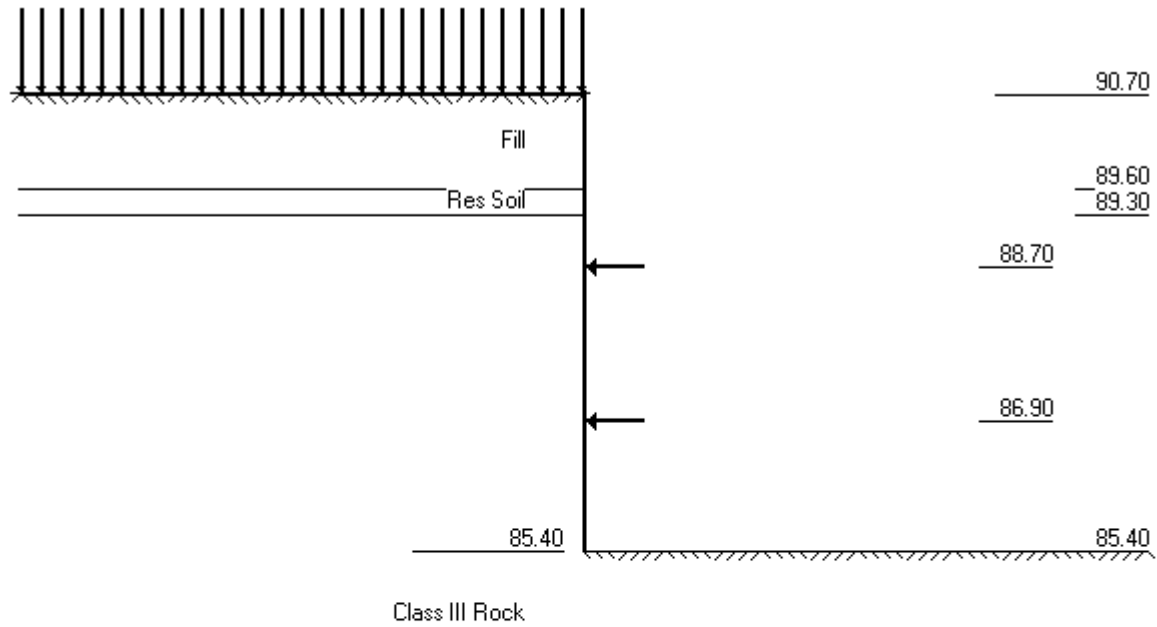
OUTPUT OPTIONS

Stage no.	Stage description	Output options		
		Displacement	Active, Bending mom. Shear force	Graph. Passive output pressures
1	Apply surcharge no.1 at elev. 90.70	Yes	Yes	Yes
2	Excav. to elev. 88.20 on PASSIVE side	No	No	No
3	Install strut no.1 at elev. 88.70	No	No	No
4	Excav. to elev. 86.40 on PASSIVE side	No	No	No
5	Install strut no.3 at elev. 86.90	No	No	No
6	Excav. to elev. 85.40 on PASSIVE side	No	No	No
*	Summary output	Yes	-	Yes

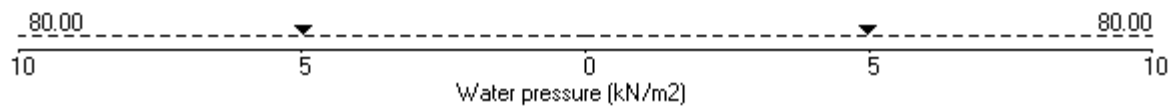
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Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Class III Rock



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 Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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 Data filename/Run ID: 2021.04.07 - SW1 Section 1 - TCB 90.7 |
 2 Mandala Place, Castle Hill | Date:12-04-2021
 SW1 - Section 1 | Checked :

Units: kN,m

Stage No. 2 Excavate to elevation 88.20 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40		Toe elev. for FoS = 1.000	
				-----		-----	
Stage	--- G.L. ---	Strut		Factor	Moment	Toe	Wall
No.	Act. Pass.	Elev.		of	equilib.	elev.	Penetr
				Safety	at elev.		-ation
2	90.70	88.20	Cant.	2.053	85.84	87.15	1.05

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	90.70	8.12	0.004	1.48E-03	0.0	0.0	
2	90.43	10.13	0.003	1.48E-03	2.5	0.4	
3	90.15	12.13	0.003	1.47E-03	5.6	1.5	
4	89.88	14.14	0.003	1.46E-03	9.2	3.5	
5	89.60	16.15	0.002	1.42E-03	13.3	6.6	
		12.16	0.002	1.42E-03	13.3	6.6	
6	89.30	17.13	0.002	1.36E-03	17.7	11.2	
		0.00	0.002	1.36E-03	17.7	11.2	
7	89.00	0.00	0.001	1.27E-03	17.7	16.6	
8	88.70	0.00	0.001	1.13E-03	17.7	21.8	
9	88.20	0.00	0.001	8.37E-04	17.7	30.3	
		-91.68	0.001	8.37E-04	17.7	30.3	
10	87.85	-51.62	0.000	5.88E-04	-7.3	31.3	
11	87.50	-16.13	0.000	3.58E-04	-19.2	25.6	
12	87.20	1.99	0.000	2.03E-04	-21.3	19.1	
13	86.90	11.59	0.000	9.31E-05	-19.3	12.8	
14	86.40	17.13	0.000	-7.47E-06	-12.1	4.6	
15	85.90	12.78	0.000	-3.82E-05	-4.6	0.7	
16	85.40	5.69	0.000	-4.23E-05	0.0	-0.0	

Node no.	Y coord	----- ACTIVE side -----					Total earth pressure	Soil stiffness
		Water press.	Vertic -al	Effective Active limit	Effective Passive limit	Earth pressure	coeff.	
		kN/m2	kN/m2	kN/m2	kN/m2	kN/m2	kN/m3	
1	90.70	0.00	20.00	8.12	49.28	8.12a	3399	
2	90.43	0.00	24.95	10.13	61.47	10.13a	3399	
3	90.15	0.00	29.90	12.13	73.67	12.13a	3399	
4	89.88	0.00	34.85	14.14	85.87	14.14a	3399	
5	89.60	0.00	39.80	16.15	98.06	16.15a	3399	
		0.00	39.80	9.78	113.76	12.16	3399	

(continued)

Stage No.2 Excavate to elevation 88.20 on PASSIVE side

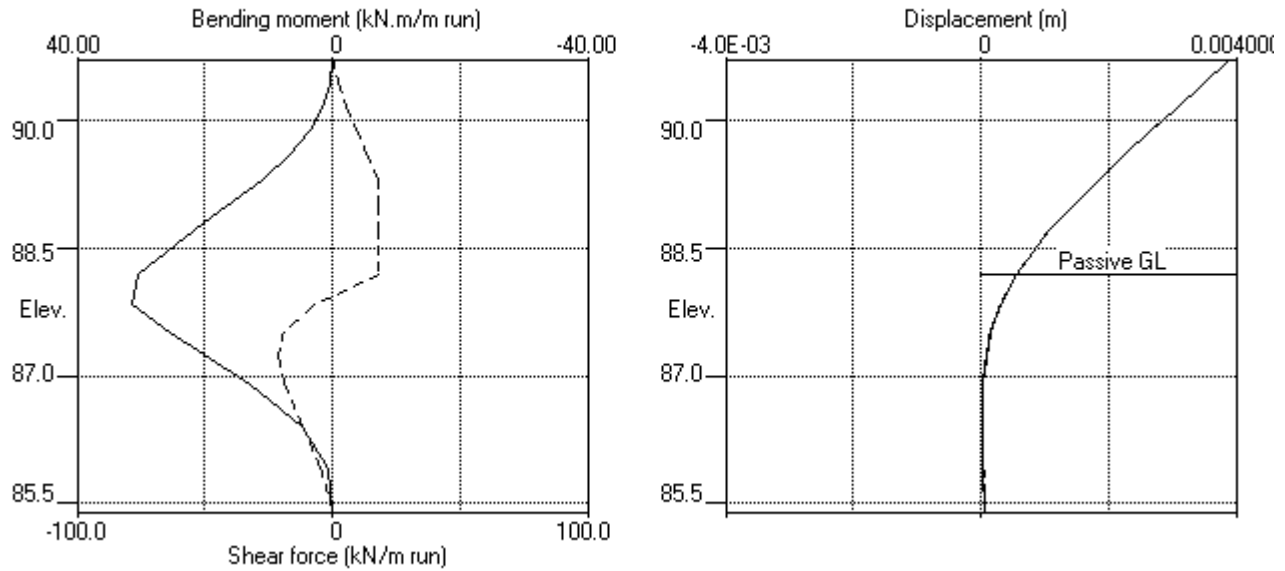
Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
6	89.30	0.00	45.80	12.22	128.54	17.13	17.13	3399
		0.00	45.80	0.00	339.30	0.00	0.00a	62893
7	89.00	0.00	53.00	0.00	372.41	0.00	0.00a	62893
8	88.70	0.00	60.20	0.00	405.52	0.00	0.00a	62893
9	88.20	0.00	72.20	0.00	460.71	0.00	0.00a	62893
		0.00	72.20	0.00	345.53	0.00	0.00a	62893
10	87.85	0.00	80.60	0.00	374.50	5.44	5.44	62893
11	87.50	0.00	89.00	0.00	403.47	18.83	18.83	62893
12	87.20	0.00	96.20	0.00	428.30	26.60	26.60	62893
13	86.90	0.00	103.40	0.00	453.13	31.82	31.82	62893
14	86.40	0.00	115.39	0.00	494.52	37.93	37.93	258850
15	85.90	0.00	127.39	0.00	535.90	39.96	39.96	215798
16	85.40	0.00	139.39	2.33	577.28	40.62	40.62	215798

Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		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	
1	90.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	90.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	90.15	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	89.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
		0.00	0.00	0.00	96.50	91.68	91.68	155460
10	87.85	0.00	8.40	0.00	125.48	57.06	57.06	155460
11	87.50	0.00	16.80	0.00	154.45	34.96	34.96	155460
12	87.20	0.00	24.00	0.00	179.29	24.61	24.61	155460
13	86.90	0.00	31.21	0.00	204.14	20.23	20.23	155460
14	86.40	0.00	43.22	0.00	245.56	20.80	20.80	258850
15	85.90	0.00	55.23	0.00	287.01	27.18	27.18	215798
16	85.40	0.00	67.26	0.00	329.08	34.92	34.92	215798

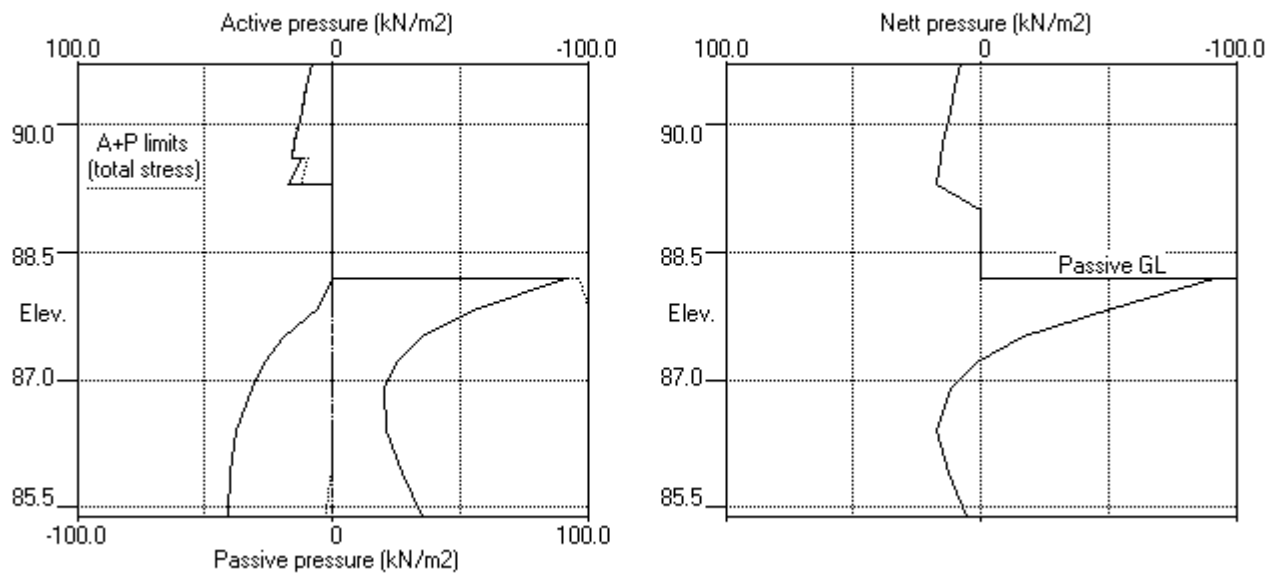
Note: 0.00a Soil pressure at active limit
 123.45p Soil pressure at passive limit

Units: kN,m

Stage No.2 Excav. to elev. 88.20 on PASSIVE side



Stage No.2 Excav. to elev. 88.20 on PASSIVE side



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Program: WALLAP Version 6.05 Revision A40.B55.R44 | Job No. 20025
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Data filename/Run ID: 2021.04.07 - SW1 Section 1 - TCB 90.7 |
2 Mandala Place, Castle Hill | Date:12-04-2021
SW1 - Section 1 | Checked :

Units: kN,m

Stage No. 4 Excavate to elevation 86.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

				FoS for toe elev. = 85.40	Toe elev. for FoS = 1.000
				-----	-----
Stage	--- G.L. ---	Strut	Factor	Moment	Toe Wall
No.	Act. Pass.	Elev.	of	of equilib.	elev. Penetr
			Safety	at elev.	-ation
4	90.70 86.40	88.70	Conditions not	suitable for	FoS calc.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
Passive mobilisation factor = 3.000
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached

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

Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	90.70	10.99	0.003	1.08E-03	0.0	0.0	
2	90.43	12.74	0.002	1.08E-03	3.3	0.5	
3	90.15	14.49	0.002	1.07E-03	7.0	1.9	
4	89.88	16.24	0.002	1.05E-03	11.2	4.4	
5	89.60	17.98	0.002	1.01E-03	15.9	8.1	
		13.99	0.002	1.01E-03	15.9	8.1	
6	89.30	18.66	0.001	9.42E-04	20.8	13.6	
		28.26	0.001	9.42E-04	20.8	13.6	
7	89.00	22.50	0.001	8.21E-04	28.4	21.2	
8	88.70	16.22	0.001	6.42E-04	34.3	30.6	59.6
		16.22	0.001	6.42E-04	-25.4	30.6	
9	88.20	4.63	0.001	3.52E-04	-20.2	19.6	
10	87.85	3.02	0.000	2.21E-04	-18.8	12.9	
11	87.50	11.45	0.000	1.43E-04	-16.3	6.3	
12	87.20	16.76	0.000	1.15E-04	-12.1	1.9	
13	86.90	21.03	0.000	1.11E-04	-6.4	-0.9	
14	86.40	27.16	0.000	1.24E-04	5.6	-1.3	
		-11.91	0.000	1.24E-04	5.6	-1.3	
15	85.90	-5.28	0.000	1.32E-04	1.3	-0.0	
16	85.40	-0.10	0.000	1.32E-04	0.0	-0.0	
Strut force at elev. 88.70 =			59.64 kN/m run =			143.13 kN/strut (horiz.)	
						= 202.41 kN/strut (incl.)	

(continued)

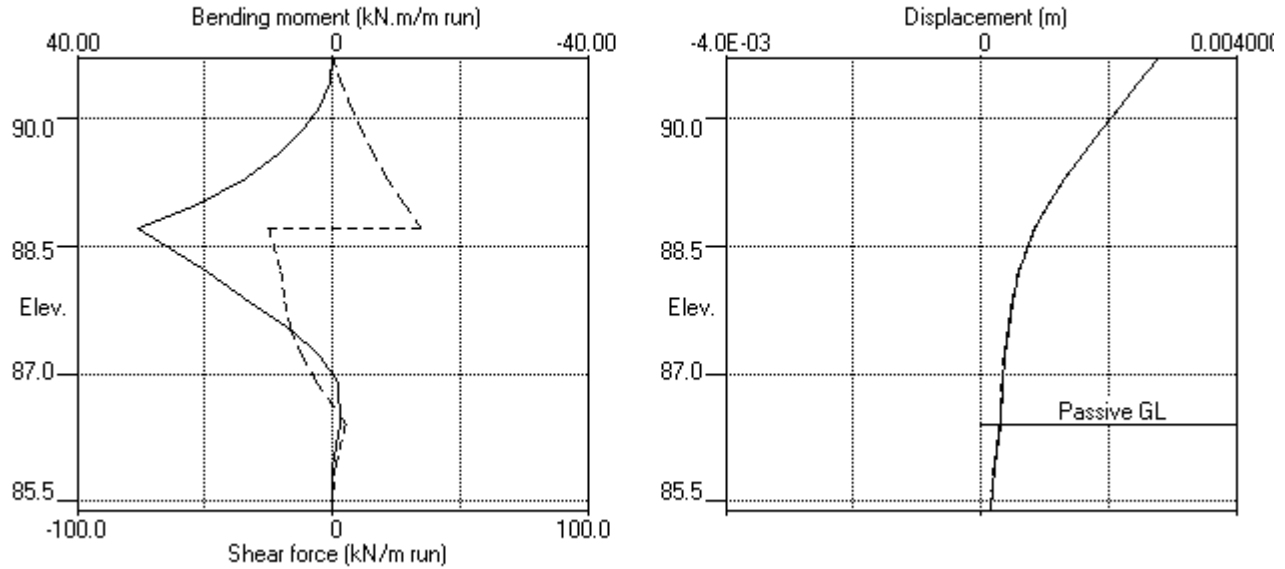
Stage No.4 Excavate to elevation 86.40 on PASSIVE side

Node no.	Y coord	----- ACTIVE side -----						Soil stiffness coeff.
		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	
1	90.70	0.00	20.00	8.12	49.28	10.99	10.99	1854
2	90.43	0.00	24.95	10.13	61.47	12.74	12.74	1854
3	90.15	0.00	29.90	12.13	73.67	14.49	14.49	1854
4	89.88	0.00	34.85	14.14	85.87	16.24	16.24	1854
5	89.60	0.00	39.80	16.15	98.06	17.98	17.98	1854
6	89.30	0.00	39.80	9.78	113.76	13.99	13.99	1854
		0.00	45.80	12.22	128.54	18.66	18.66	1854
7	89.00	0.00	45.80	0.00	339.30	28.26	28.26	34046
		0.00	53.00	0.00	372.41	22.50	22.50	34046
8	88.70	0.00	60.20	0.00	405.52	16.22	16.22	34046
9	88.20	0.00	72.20	0.00	460.71	4.63	4.63	34046
10	87.85	0.00	80.60	0.00	499.33	3.02	3.02	34046
11	87.50	0.00	89.00	0.00	537.96	11.45	11.45	34046
12	87.20	0.00	96.20	0.00	571.07	16.76	16.76	34046
13	86.90	0.00	103.40	0.00	604.18	21.03	21.03	34046
14	86.40	0.00	115.39	0.00	659.36	27.16	27.16	34046
15	85.90	0.00	115.39	0.00	494.52	27.16	27.16	34046
		0.00	127.39	0.00	535.90	31.26	31.26	34046
16	85.40	0.00	139.39	2.33	577.28	34.60	34.60	34046

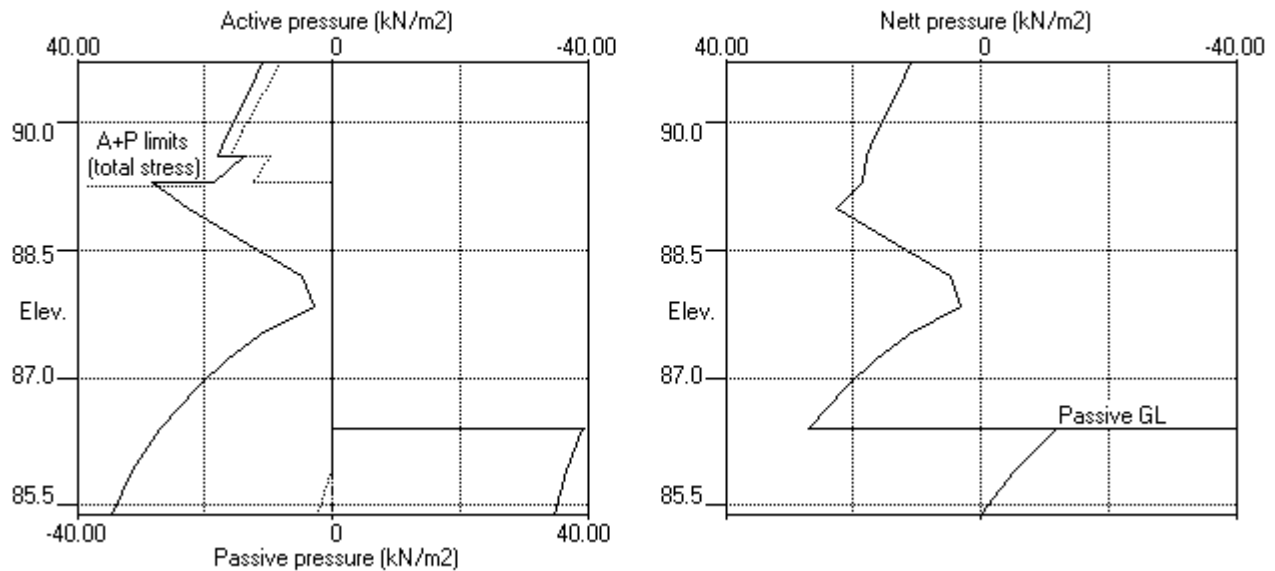
Node no.	Y coord	----- PASSIVE side -----						Soil stiffness coeff.
		Water press. kN/m2	Vertic -al kN/m2	Effective Active limit kN/m2	Effective Passive limit kN/m2	Earth pressure kN/m2	Total earth pressure kN/m2	
1	90.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	90.43	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	90.15	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	89.88	0.00	0.00	0.00	0.00	0.00	0.00	0.0
5	89.60	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	89.30	0.00	0.00	0.00	0.00	0.00	0.00	0.0
7	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	88.70	0.00	0.00	0.00	0.00	0.00	0.00	0.0
9	88.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	87.85	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11	87.50	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	87.20	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13	86.90	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	86.40	0.00	0.00	0.00	0.00	0.00	0.00	0.0
15	85.90	0.00	0.00	0.00	96.50	39.08	39.08	108080
		0.00	12.00	0.00	137.90	36.55	36.55	108080
16	85.40	0.00	24.01	0.00	179.88	34.70	34.70	108080

Units: kN,m

Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Stage No.4 Excav. to elev. 86.40 on PASSIVE side



Units: kN,m

Stage No. 6 Excavate to elevation 85.40 on PASSIVE side

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

			FoS for toe		Toe elev. for	
			elev. = 85.40		FoS = 1.000	

Stage	--- G.L. ---	Strut	Factor	Moment	Toe	Wall
No.	Act.	Pass.	Elev.	of	elev.	Penetr
				equilib.		-ation
				Safety at elev.		
6	90.70	85.90		More than one strut		

*** Warning - Weak strata at or below toe of wall:

Active limit (active side) > Passive limit (passive side)
2.33kN/m2 > 0.00kN/m2 at elev. 85.40

The above pressures include water pressure.

*** Warning - Failure and flow of soil BELOW the toe of the wall may occur if the wall is not toed in to a firm stratum.
It may occur even when acceptable factors of safety and displacements have been calculated.

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m

Passive mobilisation factor = 3.000

Length of wall perpendicular to section = 1000.00m

Subgrade reaction model - Boussinesq Influence coefficients

Soil deformations are elastic until the active or passive limit is reached

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

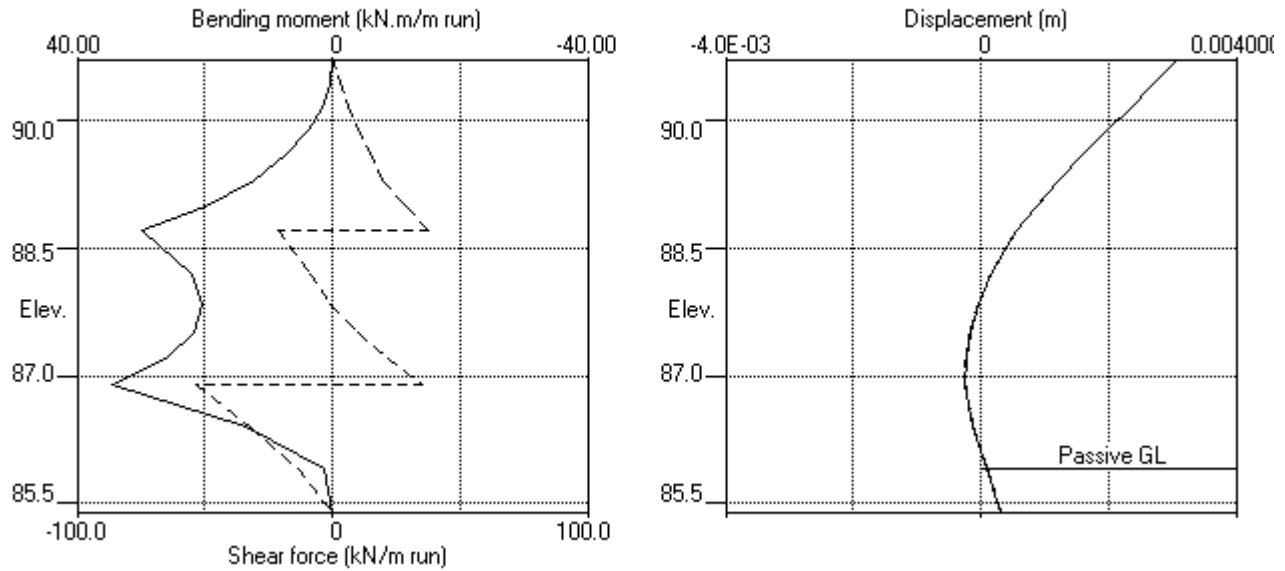
Node no.	Y coord	Nett pressure kN/m2	Wall disp. m	Wall rotation rad.	Shear force kN/m	Bending moment kN.m/m	Strut forces kN/m
1	90.70	8.95	0.003	1.35E-03	0.0	0.0	
2	90.43	11.20	0.003	1.35E-03	2.8	0.4	
3	90.15	13.44	0.002	1.34E-03	6.2	1.6	
4	89.88	15.68	0.002	1.33E-03	10.2	3.8	
5	89.60	17.93	0.002	1.29E-03	14.8	7.2	
		13.94	0.002	1.29E-03	14.8	7.2	
6	89.30	18.87	0.001	1.22E-03	19.7	12.4	
		32.05	0.001	1.22E-03	19.7	12.4	
7	89.00	29.96	0.001	1.11E-03	29.0	19.8	
8	88.70	27.45	0.001	9.44E-04	37.6	29.7	59.0
		27.45	0.001	9.44E-04	-21.4	29.7	
9	88.20	22.20	0.000	6.44E-04	-8.9	22.2	
10	87.85	24.66	-0.000	4.72E-04	-0.7	20.5	
11	87.50	36.21	-0.000	3.02E-04	9.9	21.5	
12	87.20	42.42	-0.000	1.37E-04	21.7	26.1	
13	86.90	45.00	-0.000	-7.24E-05	34.8	34.6	88.5
		45.00	-0.000	-7.24E-05	-53.6	34.6	
14	86.40	41.99	-0.000	-3.49E-04	-31.9	13.5	
15	85.90	32.38	0.000	-4.35E-04	-13.3	1.4	
16	85.40	20.79	0.000	-4.43E-04	0.0	-0.0	
Strut force at elev. 88.70 =			58.97 kN/m run =	141.52 kN/strut (horiz.)			
				= 200.14 kN/strut (incl.)			
Strut force at elev. 86.90 =			88.46 kN/m run =	212.30 kN/strut (horiz.)			
				= 300.24 kN/strut (incl.)			

Stage No.6 Excavate to elevation 85.40 on PASSIVE side

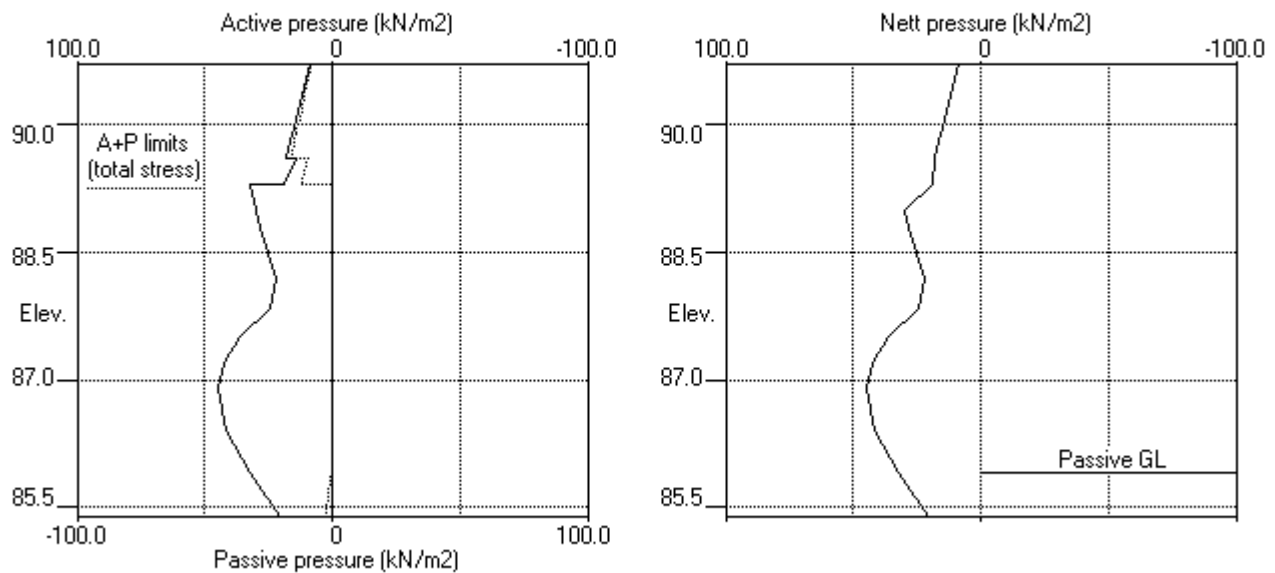
[illegible]

Units: kN,m

Stage No.6 Excav. to elev. 85.40 on PASSIVE side



Stage No.6 Excav. to elev. 85.40 on PASSIVE side



ABC Consultants Pty Ltd	Sheet No.
Program: WALLAP Version 6.05 Revision A40.B55.R44	Job No. 20025
Licensed from GEOSOLVE	Made by : VR
Data filename/Run ID: 2021.04.07 - SW1 Section 1 - TCB 90.7	
2 Mandala Place, Castle Hill	Date:12-04-2021
SW1 - Section 1	Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS of Soldier Pile Wall according to Strength Factor method

Factor of safety on soil strength

Stage	---	G.L.	---	Strut	FoS for toe	Toe elev. for	
No.	Act.	Pass.	Elev.		elev. = 85.40	FoS = 1.000	
					Factor	Moment	Toe
					of	equilib.	Wall
					Safety	at elev.	Penetr
							-ation
1	90.70	90.70	Cant.	8.086	86.06	89.98	0.72
2	90.70	88.20	Cant.	2.053	85.84	87.15	1.05
3	90.70	88.20	88.70	Conditions not suitable for FoS calc.			
4	90.70	86.40	88.70	Conditions not suitable for FoS calc.			
5	90.70	86.40		More than one strut			
6	90.70	85.90		More than one strut			

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT ANALYSIS of Soldier Pile Wall

Analysis options

Soldier Pile width = 0.60m; spacing = 2.40m
 Passive mobilisation factor = 3.000
 Length of wall perpendicular to section = 1000.00m
 Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached

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

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	90.70	0.004	0.000	0.0	-0.0	0.0	0.0
2	90.43	0.003	0.000	0.5	0.0	3.3	0.0
3	90.15	0.003	0.000	1.9	0.0	7.0	0.0
4	89.88	0.003	0.000	4.4	0.0	11.3	0.0
5	89.60	0.002	0.000	8.1	0.0	16.1	0.0
6	89.30	0.002	0.000	13.7	0.0	21.1	0.0
7	89.00	0.001	0.000	21.6	0.0	30.9	0.0
8	88.70	0.001	0.000	32.2	0.0	39.4	-25.4
9	88.20	0.001	0.000	30.3	0.0	17.7	-20.2
10	87.85	0.000	-0.000	31.3	0.0	0.0	-18.8
11	87.50	0.000	-0.000	25.6	0.0	9.9	-19.2
12	87.20	0.000	-0.000	26.1	0.0	21.7	-21.3
13	86.90	0.000	-0.000	34.6	-0.9	34.8	-54.3
14	86.40	0.000	-0.000	13.5	-1.3	5.6	-31.9
15	85.90	0.000	-0.000	1.4	-0.3	1.3	-13.3
16	85.40	0.000	0.000	0.0	-0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	7.3	89.00	-0.0	85.90	8.2	89.30	-4.3	88.20
2	31.3	87.85	-0.0	85.40	17.7	89.30	-21.3	87.20
3	32.2	88.70	-0.3	85.90	39.4	88.70	-19.5	88.70
4	30.6	88.70	-1.3	86.40	34.3	88.70	-25.4	88.70
5	32.5	86.90	-0.0	85.40	37.1	88.70	-54.3	86.90
6	34.6	86.90	-0.0	85.40	37.6	88.70	-53.6	86.90

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.001	90.70	0.000	90.70	Apply surcharge no.1 at elev. 90.70
2	0.004	90.70	0.000	90.70	Excav. to elev. 88.20 on PASSIVE side
3	0.003	90.70	0.000	90.70	Install strut no.1 at elev. 88.70
4	0.003	90.70	0.000	90.70	Excav. to elev. 86.40 on PASSIVE side
5	0.003	90.70	-0.000	86.90	Install strut no.3 at elev. 86.90
6	0.003	90.70	-0.000	86.90	Excav. to elev. 85.40 on PASSIVE side

Run ID. 2021.04.07 - SW1 Section 1 - TCB 90.7
2 Mandala Place, Castle Hill
SW1 - Section 1

| Sheet No.
| Date:12-04-2021
| Checked :

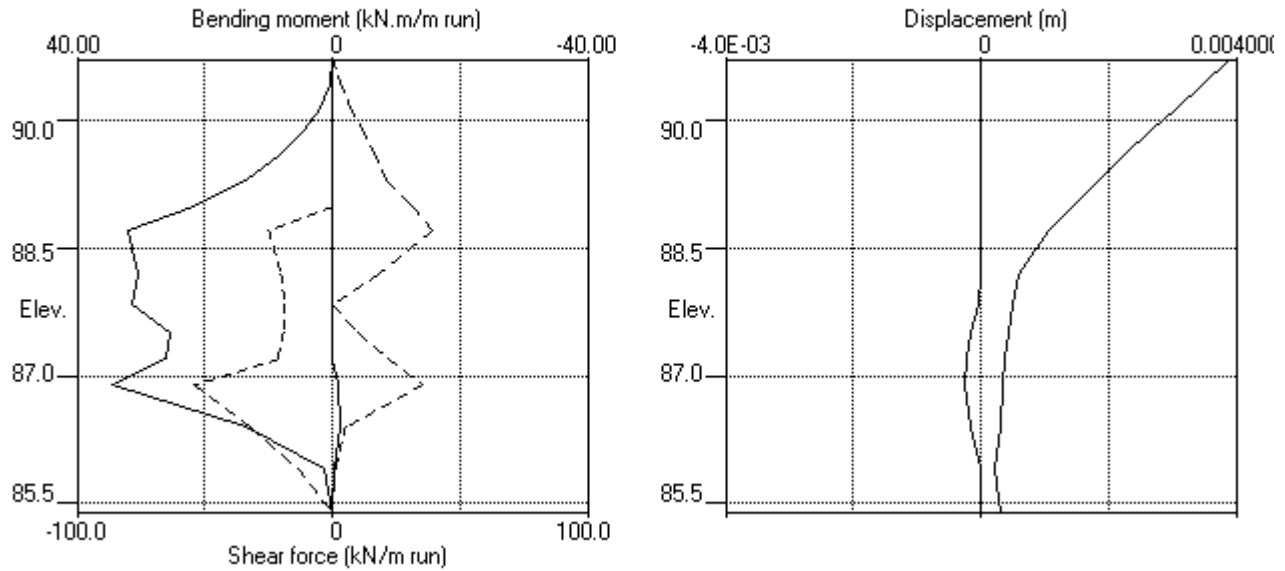
Summary of results (continued)

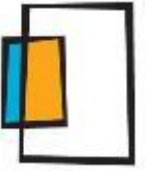
Strut forces at each stage (horizontal components)

Stage	--- Strut no. 1 ---		--- Strut no. 3 ---	
no.	at elev. 88.70		at elev. 86.90	
	kN/m run	kN/strut	kN/m run	kN/strut
3	58.93	141.42	---	---
4	59.64	143.13	---	---
5	59.01	141.63	88.39	212.13
6	58.97	141.52	88.46	212.30

Units: kN,m

Bending moment, shear force, displacement envelopes

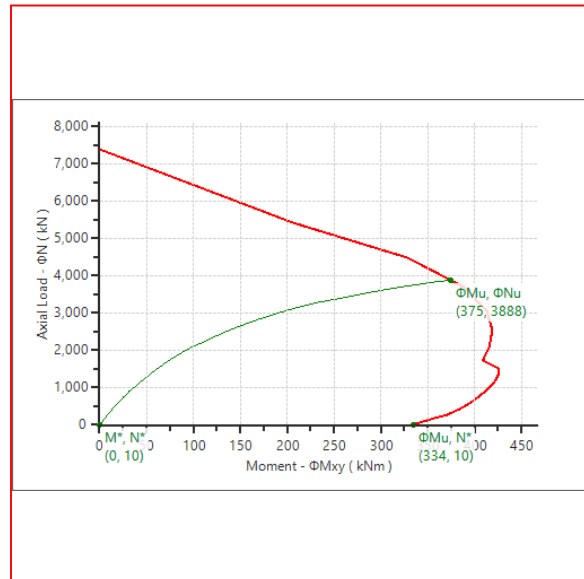
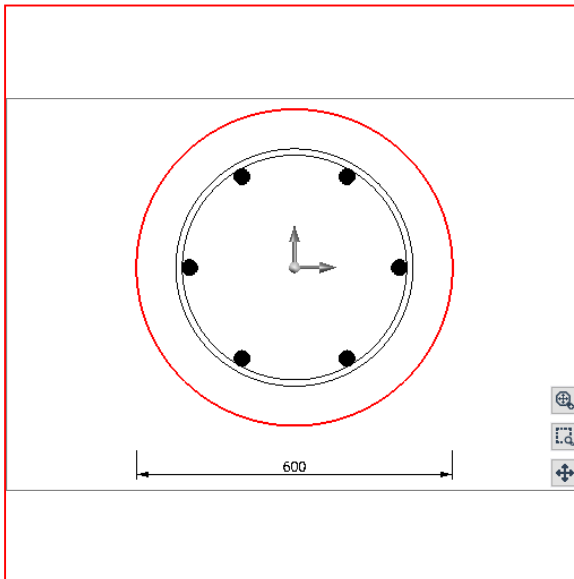




10. Appendix C – Pile Calculations

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File Name:



Dimensions, mm, D: 600

Bracing: Braced in X Braced in Y

Eff. Le(m), X: 6 Y: 6 (H: 6m)

 f'_c , MPa: 40

Cover, mm: 75

Long. Bar D, mm: 28

Steel Strength, MPa: 500

Cover, mm: 75

Bars Total: 6

Design Load: Ultimate

 N^* , kN: 10 (Top) 10 (Btm) M^*_x , kNm: 0 (Top) 0 (Btm) M^*_y , kNm: 0 (Top) 0 (Btm) V^*_x , kN: 400 (Top) 0 (Btm) V^*_y , kNm: 0 (Top) 0 (Btm) β_3 : 1 (Top) 1 (Btm) β_d : 0.8

Apply Min M: Yes

Design Load: Fire

 N^*_f , kN: 0 (Top) 0 (Btm) $M^*_f_x$, kNm: 0 (Top) 0 (Btm) $M^*_f_y$, kNm: 0 (Top) 0 (Btm) β_d : 0

FRP, min: 90

Exposed on more than one side

 $l_{o.fi} = 0.5 \cdot L_u$: No

Mmin with single curvature: No

See next page for Design Log

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COLUMN DESIGN - AS 3600 - 2018 incl. AMDT No. 1

STRENGTH

=====

Design Code: AS 3600 - 2018 incl. AMDT No. 1

RADIUS OF GYRATION

r_{xy} = 150.0 mm

APPLIED AXIAL LOAD:

N = 10.0 kN

MINIMUM MOMENT:

M_{xy_top} = 0.3 kNmM_{xy_btm} = -0.3 kNm

APPLIED MOMENT:

M_{xy_top} = 0.0 kNmM_{xy_btm} = 0.0 kNm

DESIGN MOMENT:

M_{xy_top} = 0.3 kNmM_{xy_btm} = -0.3 kNmRATIO OF SMALLER END BENDING MOMENT TO LARGER END BENDING MOMENT:
(forced bending in single curvature)xy: M₁*/M₂* = -1

Single Curv. in XY

SLENDERNESS:

L_{xy} / r_{xy} = 40.0 > 25.0

Slender Column in xy

MOMENT MAGNIFICATION FACTORS:

δ_{xy_top} = 1.002Magnified M_{xy_top} : 0.3 kNmδ_{xy_btm} = 1.002Magnified M_{xy_btm} : -0.3 kNm

BUCKLING LOAD:

N_{cxy_top} = 5,652 kNN_{cxy_btm} = 5,652 kN

M-N POINTS:

XY-XY

Squash Load Point	: N _{uo} = 11,347 kN	ΦN _{uo} = 7,375 kN	(Φ = 0.65)
Decompression Point	: N _{udxy} = 7,467 kN	ΦN _{udxy} = 4,480 kN	(Φ = 0.60)
	M _{udxy} = 548 kNm	ΦM _{udxy} = 328.5 kNm	(Φ = 0.60)
Balance Point	: N _{ubxy} = 2,855 kN	ΦN _{ubxy} = 1,713 kN	(Φ = 0.60)
	M _{ubxy} = 681 kNm	ΦM _{ubxy} = 408.6 kNm	(Φ = 0.60)
Pure Bending Point	: M _{uoxy} = 392 kNm	ΦM _{uoxy} = 332.9 kNm	(Φ = 0.85)

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Pure Tension Point : Nuot = -1,860 kN Φ Nuot = -1,581 kN (Φ = 0.85)

MOMENT CAPACITY AT DESIGN LOAD, N*: 10.00 kN

TOP

XY-XY Muxy = 393.8 kNm Φ Muxy = 334.3 kNm Ductile in XY.

BTM

XY-XY Muxy = 393.8 kNm Φ Muxy = 334.3 kNm Ductile in XY.

TOP Φ xy: 0.85

$(M^*_{xy} / (\Phi_{xy} \cdot M_{uxy})) = 0.001$

Safety Factor for Bending (resultant): 1112.35 OK

BTM Φ xy: 0.85

$(M^*_{xy} / (\Phi_{xy} \cdot M_{uxy})) = 0.001$

Safety Factor for Bending (resultant): 1112.35 OK

MOMENT & AXIAL CAPACITY (Φ Mu, Φ Nu)

Loading Line Intersection with M-N Curve

TOP

Φ Muxy = 374.6 kNm Φ Nuxy = 3,888.2 kN

Safety Factor for Bending in xy: 1245.76 OK

Load as % of Capacity in xy: 0.08% OK

BTM

Φ Muxy = 374.6 kNm Φ Nuxy = 3,888.2 kN

Safety Factor for Bending in xy: 1245.76 OK

Load as % of Capacity in xy: 0.08% OK

FIRE

=====

Design Code: AS 3600 - 2018 incl. AMDT No. 1

AXIS DISTANCE

as = 101.00 mm

MINIMUM MOMENT - FIRE:

Mxy_top = 0.0 kNm

Mxy_btm = 0.0 kNm

APPLIED MOMENT - FIRE:

Mxy_top = 0.0 kNm

Mxy_btm = 0.0 kNm

DESIGN MOMENT - FIRE:

Mxy_top = 0.0 kNm

Mxy_btm = 0.0 kNm

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No Fire Load - Fire check will not be performed

CONFINEMENT OF THE CORE

=====

Design Code: AS 3600 - 2018 incl. AMDT No. 1 Cl. 10.7.3

Tie Diameter: 12mm

$f'_c \leq 50 \text{ MPa}$

Cl. 10.7.3.1(a) Confinement deemed to be provided if:

Cl. 10.7.4.3(b) - $S_c = \min(D_c, 15d_b)$

$S_c = S_{\max\_core} = 420 \text{ mm}$

SHEAR

=====

Design Code: AS 3600 - 2018 incl. AMDT No. 1 Section 8

SHEAR FORCE:

$V_{xy\_top} = 400.0 \text{ kN}$

$V_{xy\_btm} = 400.0 \text{ kN}$

Note: $V^* < 0.001 \text{ kN}$ taken as $V^* = 0 \text{ kN}$

Top

Shear combined in XY

$b_v = 476 \text{ mm}$

$d_v = 449.10 \text{ mm}$

$\theta_v = 36.45^\circ$

$k_v = 0.154$

2 Legs - N12

$\phi V_{u,max} = 1,573.7 \text{ kN}$ - Eqn. 8.2.3.3(1)

$V^*_x = 400.0 \text{ kN}$

ZONE WHERE: $V_{x,Top} < \phi V_{uc}$

$S_{\max\_col} = 420 \text{ mm}$

$S_{\max\_beam} = (\text{none needed for shear})$

$S_{\max} = 420 \text{ mm}$ where $V_{x,Top} < \phi V_{uc}$ - Cl. 10.7.4.3

$A_{sv} = 220 \text{ mm}^2$

$A_{sv,min} = 202 \text{ mm}^2$ - Cl. 8.2.1.7

$A_{sv} \geq A_{sv,min}$

$\phi V_{uc} = 156.3 \text{ kN}$ - Eqn. 8.2.4.1

$\phi V_{us} = 119.5 \text{ kN}$ - Eqn. 8.2.5.2(1)

$\phi V_u = \phi V_{uc} + \phi V_{us} = 275.8 \text{ kN}$ - Cl. 8.2.3

$\phi V_u = V^*_{x,Top}$

Safety Factor = 2

$S_s = 420 \text{ mm}$

Additional long. tensile forces caused by shear - Cl. 8.2.7

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$$\Delta F_{td} = -460.8 \text{ kN}$$

ZONE WHERE: $\phi V_{uc} \leq V_{x,Top} \leq \phi V_{u,max}$

$$S_{max\_col} = 420 \text{ mm}$$

$$S_{max\_beam} = 300 \text{ mm}$$

$$S_{max} = 300 \text{ mm where } \phi V_{uc} \leq V_{x,Top} \leq \phi V_{u,max} - \text{Cl. 8.3.2.2}$$

$$A_{sv} = 220 \text{ mm}^2$$

$$A_{sv,min} = 145 \text{ mm}^2 - \text{Cl. 8.2.1.7}$$

$$A_{sv} \geq A_{sv,min}$$

Tie spacing decreased below maximum

$$\phi V_{uc} = 156.3 \text{ kN} - \text{Eqn. 8.2.4.1}$$

$$\phi V_{us} = 244.7 \text{ kN} - \text{Eqn. 8.2.5.2(1)}$$

$$\phi V_u = \phi V_{uc} + \phi V_{us} = 401.1 \text{ kN} - \text{Cl. 8.2.3}$$

$$\phi V_u = V_{x,Top}$$

$$\text{Safety Factor} = 1$$

$$S_s = 205 \text{ mm}$$

Additional long. tensile forces caused by shear - Cl. 8.2.7

$$\Delta F_{td} = -375.9 \text{ kN}$$

Shear combined in XY

Btm

Shear combined in XY

$$b_v = 476 \text{ mm}$$

$$d_v = 449.10 \text{ mm}$$

$$\theta_v = 29.00^\circ$$

$$k_v = 0.400$$

2 Legs - N12

$$\phi V_{u,max} = 1,396.3 \text{ kN} - \text{Eqn. 8.2.3.3(1)}$$

No Shear Load

Shear combined in XY

Max Tie Spacing

$$S = \min(S_s, S_c) = 205 \text{ mm}$$

SUMMARY

=====

File Name :

Date : 12/04/2021 03:30

Design Code: AS 3600 - 2018 incl. AMDT No. 1

GEOMETRY

12/04/2021 03:31

Bracing : Braced in X Braced in Y
Unsupported Length, L_u : 6 m
Effective Length, L_e : X: 6 m Y: 6 m
Dimensions : A: 600 mm

STEEL

f'_{sy} (long) : 500 MPa
 f'_{sy} (ties) : 500 MPa
NOTE: f'_{sy} is capped at 600 MPa to Cl. 1.1.2(d)

CONCRETE

f'_c : 40 MPa
Cover : 75 mm
Spalling Factor : 1
Area Gross : 282,743 mm²
Area Concrete : 279,023 mm²
Area Long. Steel : 3,720 mm² (1.32 %)

COLUMN DESIGN SUMMARY

Area Gross : 282,743 mm²
Vol. Gross : 1.70 m³
Area Concrete : 279,023 mm²
Area Long. Steel : 3,720 mm² (1.32 %)
Volume Tie : 0.0045 m³
Volume Long. Steel : 0.0223 m³
Volume Steel : 0.027 m³
Steel Weight : 206 kg
Steel Dosage : 122 kg/m³

DESIGN CHECKS SUMMARY

Strength : Performed, OK
 Safety Factors: top
 XY: 1245.76
 Safety Factors: btm
 XY: 1245.76
Fire : Not Performed
Core Confinement: : Satisfied
Shear : Performed, OK