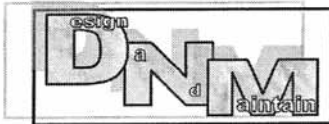


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DESIGN CRITERIA	Project Title	Job No	By	Date
	51 FROGNAL	10/598	DNM	FEB 2010
		Checked	Date	Page of
			FEB 2010	1
References	Element of Works			Results
	DESIGN OF TEMPORARY WORKS EMBEDDED RETAINING WALL.			
	Intended Use	Loading		
	TEMPORARY WORKS	SURCHARGE - 5 KN/m2		
	Standards Adopted	Materials		
	BS 8002 / CIRIA 104 BS 8110	PILED WALL CONCRETE		
	Design Assumptions / Limitations	Computer Analysis Reference		
BASED ON ENGINEER'S SECTION & CLIENT ADVICE	CADS PILED WALL SUITE			
Design Check Level	Checked By :-			
☒ ☐ 2 ☐ 3	 Date :- FEBRUARY 2010			
Comments				
SOIL PROFILE BASED ON ADVICE FROM SELECT PILE. COMMENCEMENT PRIOR TO ENGINEER'S APPROVAL AT CLIENT'S RISK				



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CALCULATIONS	Project Title 51 FROGNAL	Job No 10/598	By DNM	Date FEB 2010
		Checked <i>[Signature]</i>	Date FEB 2010	Page 2 of

References

Results

LAYOUT

TEMPORARY WORKS

FOS = 1.5

SOILS

ADVICE FROM SITE IS THAT SOIL IS GOOD QUALITY LONDON CLAY.

CASE : $\phi' = 25^\circ$
 $\gamma = 20 \text{ kN/m}^3$

Use program CADS PIVOT WITH SUITE P. INTERSE.

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Pile geometry

Pile top Level 100 m
 Pile Length 7 m
 Pile toe level 93 m
 Active ground slope 0 Degrees (To horizontal)

Soils and ground water initial data (Soils data given for active and passive sides)

Initial Ground Water level -100

Top Level m	Description	Bulk Dens kN/m3	Sat' Dens kN/m3	Young Mod kN/m2	Young Inc. kN/m3	Cu C' kN/m2	C Inc. kN/m3	Phi Deg	Wall Shear Ratio	Ka Kp	Kac Kpc
100.00	London Clay	20.00	20.00	75000	0			25 25	.67 .50	.35 3.38	

Construction sequence

Stage Ref	Stage Type	Level or Angle m/deg.	Load kN(/m)	Offset m	Width m	Length m
3 A	Active surcharge	100.00	5.0	.0		
3 A	Passive side excavation	97.20				

Code of practice

Code of practice or reference document	CIRIA 104 (Burland and Potts)
Class of work being undertaken	Temporary works
Application of pressures for stability	CIRIA 104 (FOS on available passive)
FOS on moments (stability check)	1.5
Factor on Tan(Phi) values (all calcs)	1.0
Factor on Cohesion values (all calcs)	1.0
FOS on embedment (stability check)	1.0
Correction factor on cantilever embedment	1.2

Wall analysis detail options

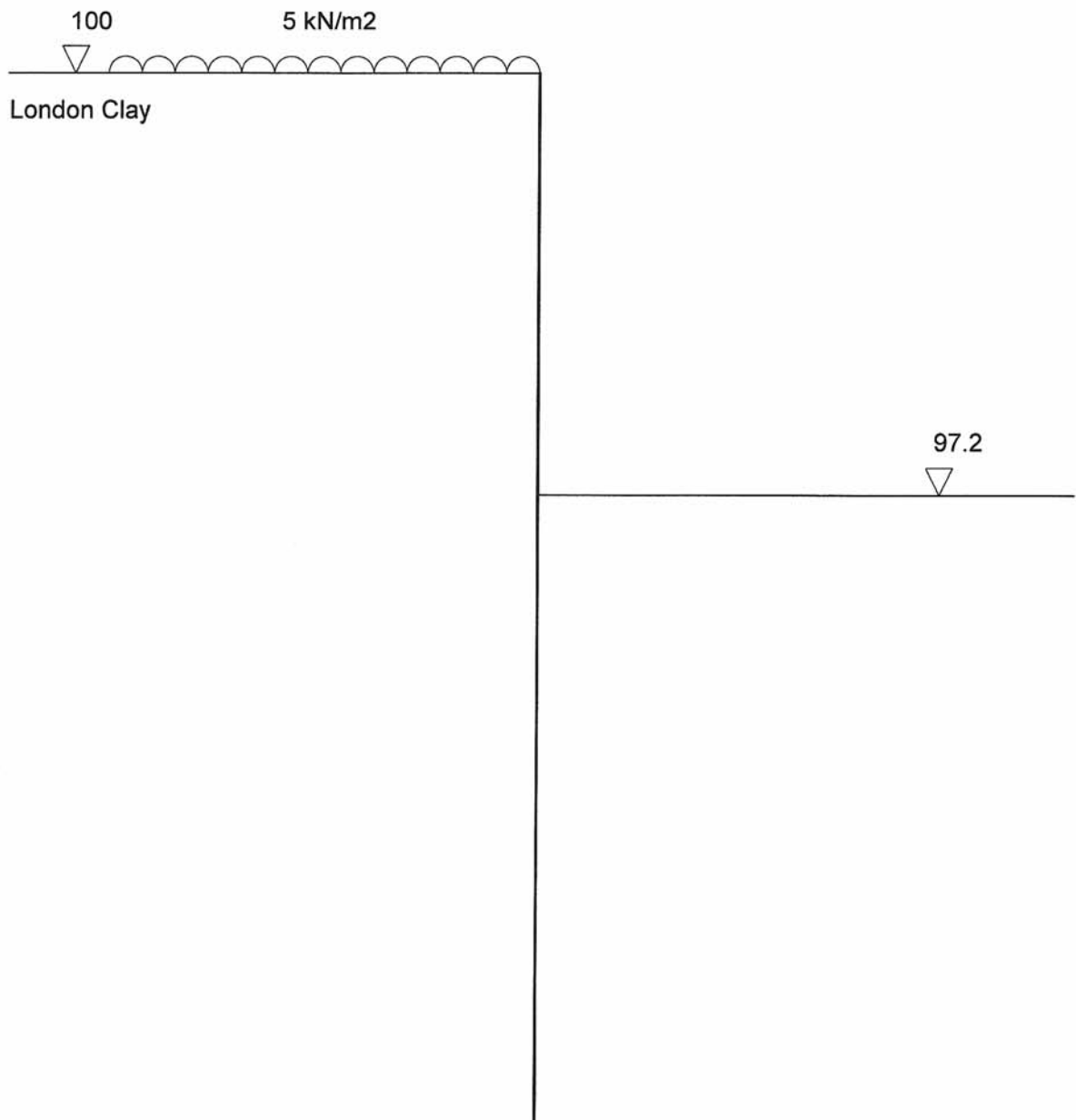
Nominal Phi for load distribution	30.0 Degrees
Depth of water filled tension cracks	.0 m
Density of water	10.0 kN/m3
Minimum equivalent fluid density	5.0 kN/m3
Depth of passive softened soil	1.0 m
Continuity model for wall analysis	Pins at second and lower props

Deflection parameters

Wall moment of inertia	128680 cm4/m
Wall Youngs modulus	27000000 kN/m2

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Stage ref. 2
Stage type Passive side excavation



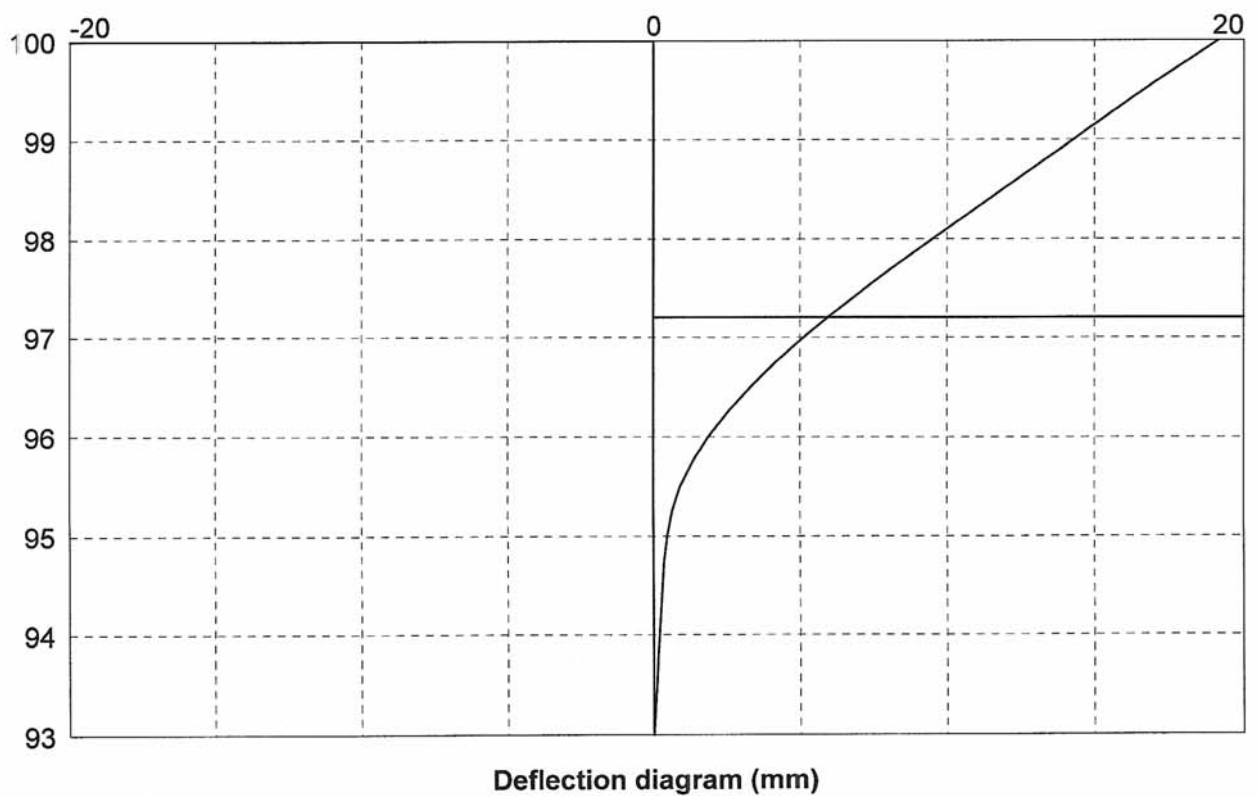
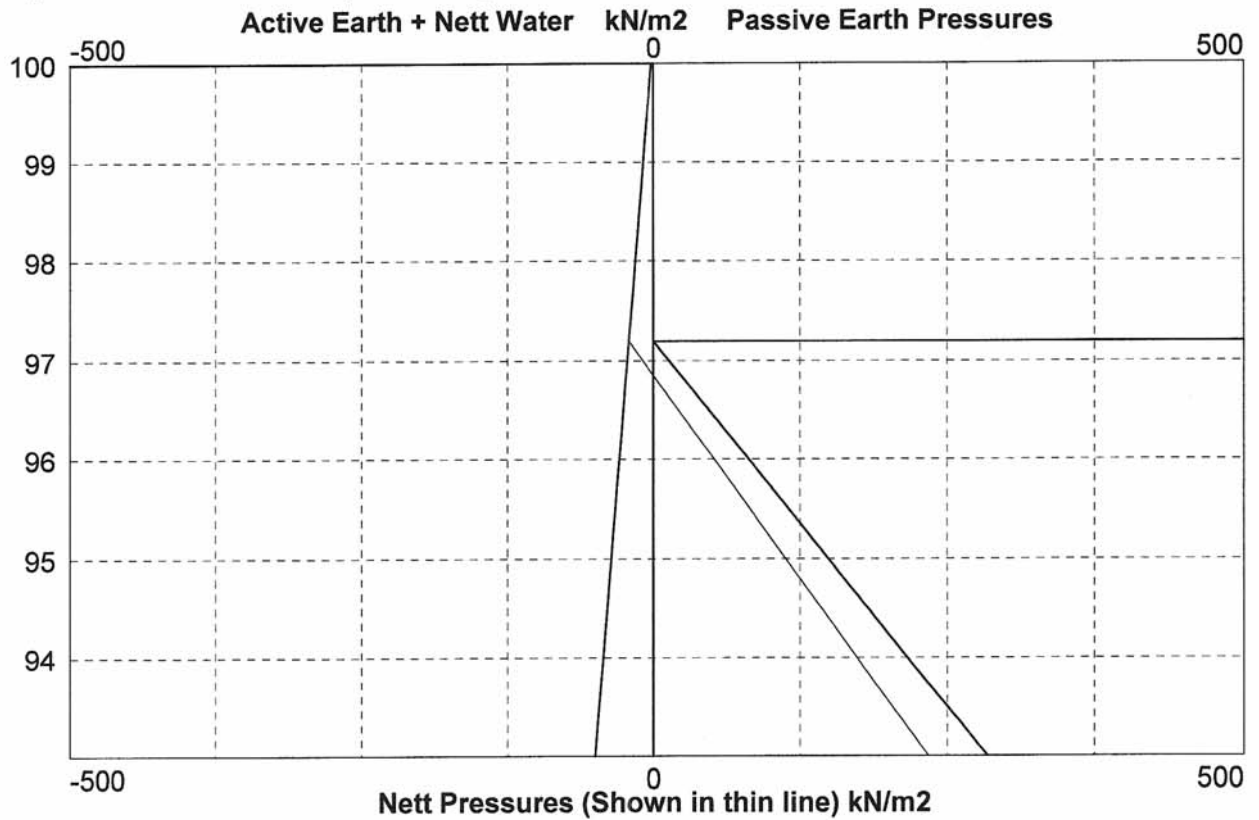
	Page No 5 Analysis TW
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Tabular results from analysis of stage ref 2

Calc Level m	Active Vert kN/m2	Active Earth kN/m2	Active Water kN/m2	Pas' Vert kN/m2	Pas' Earth kN/m2	Pas' Water kN/m2	Total Nett kN/m2	Bend. Moment kNm/m	Shear Force kN/m	Defl't mm	Prop Force kN/m	FOS
100.00	.0	.0	.0	.0	.0	.0	0	0	0	19.2		.00
100.00	5.0	1.7	.0	.0	.0	.0	1.7	0	0	19.1		.00
99.92	6.6	2.3	.0	.0	.0	.0	2.3	0	-.2	18.8		.00
99.00	25.0	8.6	.0	.0	.0	.0	8.6	2.0	-5.2	14.3		.00
98.00	45.0	15.5	.0	.0	.0	.0	15.5	12.7	-17.3	9.5		.00
97.20	61.0	21.1	.0	.0	.0	.0	21.1	32.0	-31.9	6.0		.00
97.20	61.0	21.1	.0	.0	.0	.0	21.1	32.0	-31.9	5.9		.00
97.00	65.0	22.5	.0	4.0	13.5	.0	8.9	38.8	-34.9	5.1		.00
96.00	85.0	29.4	.0	24.0	81.2	.0	-51.9	68.0	-13.4	1.9		.14
95.00	105.0	36.3	.0	44.0	148.9	.0	-112.6	45.4	68.8	.5		.50
94.54	114.2	39.4	.0	53.2	179.9	.0	-140.5	0	126.8	.3		.71
94.00	125.0	43.2	.0	64.0	216.6	.0	-173.4	0	0	.2		1.00
93.00	145.0	50.1	.0	84.0	284.3	.0	-234.2	0	0	0		1.59

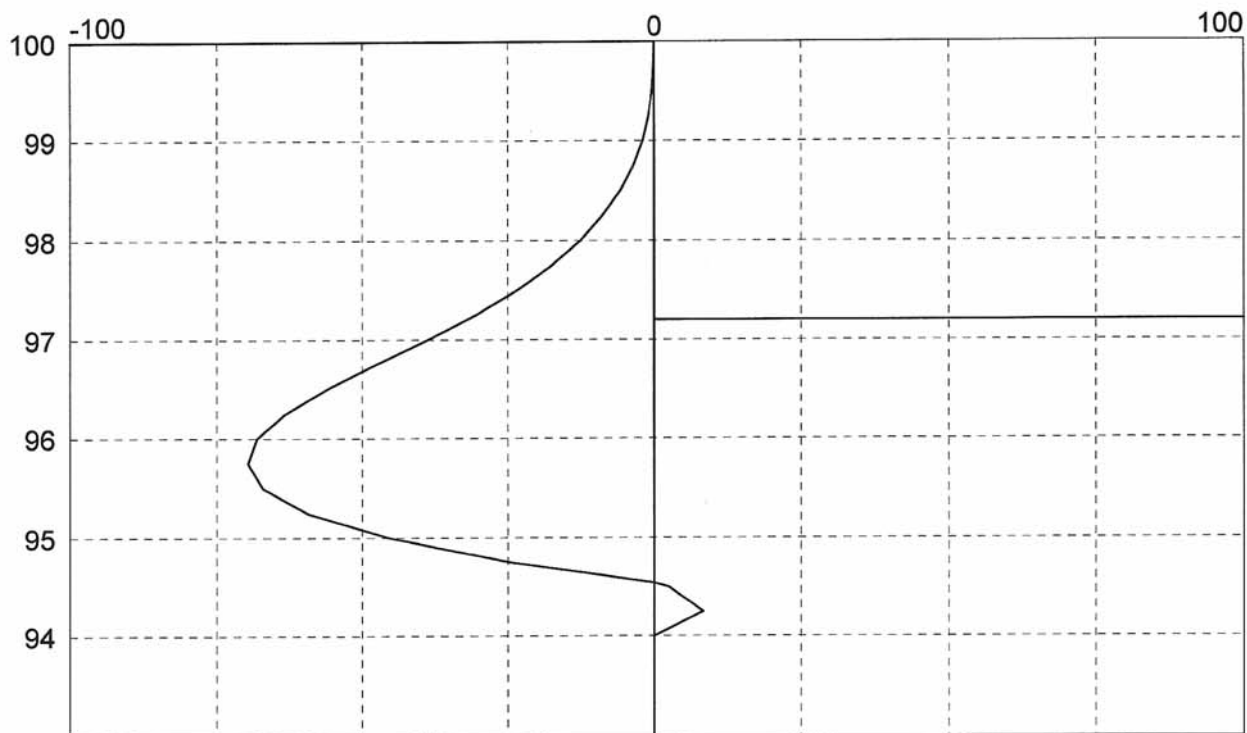
	Page No 6 Analysis TW
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Graphical results from analysis of stage ref 2

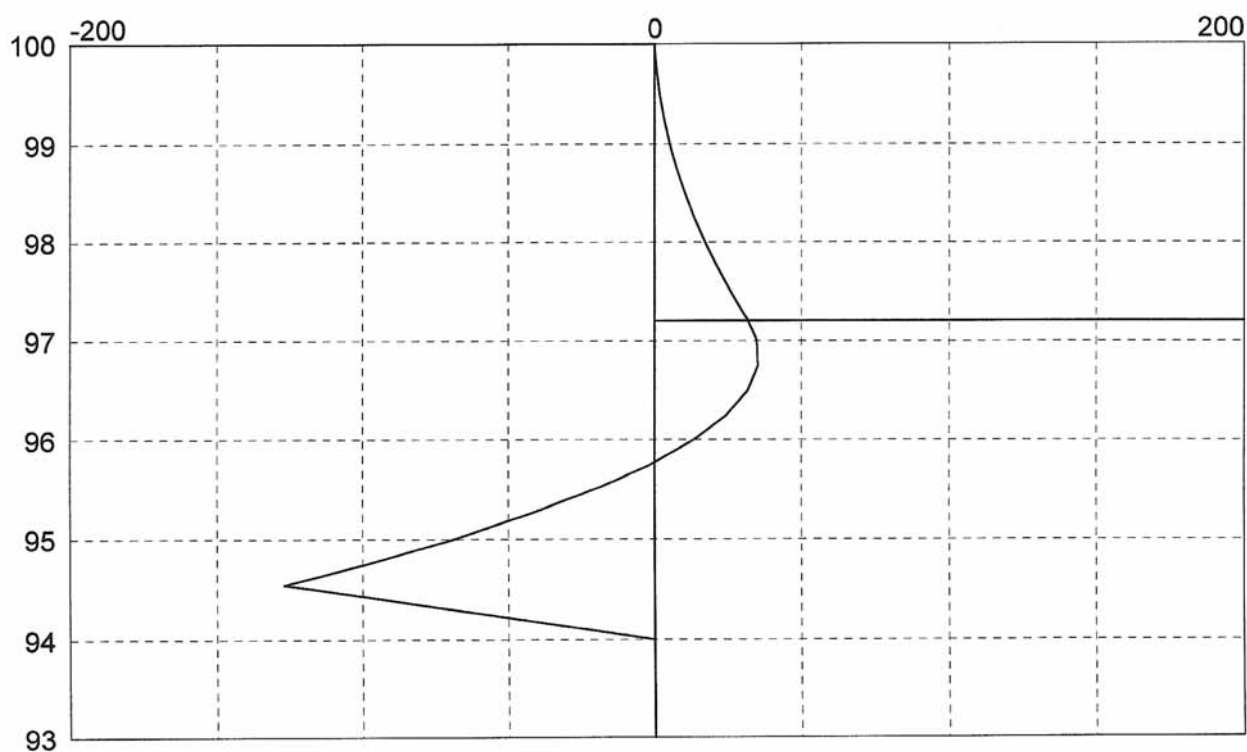


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Graphical results from analysis of stage ref 2 continued



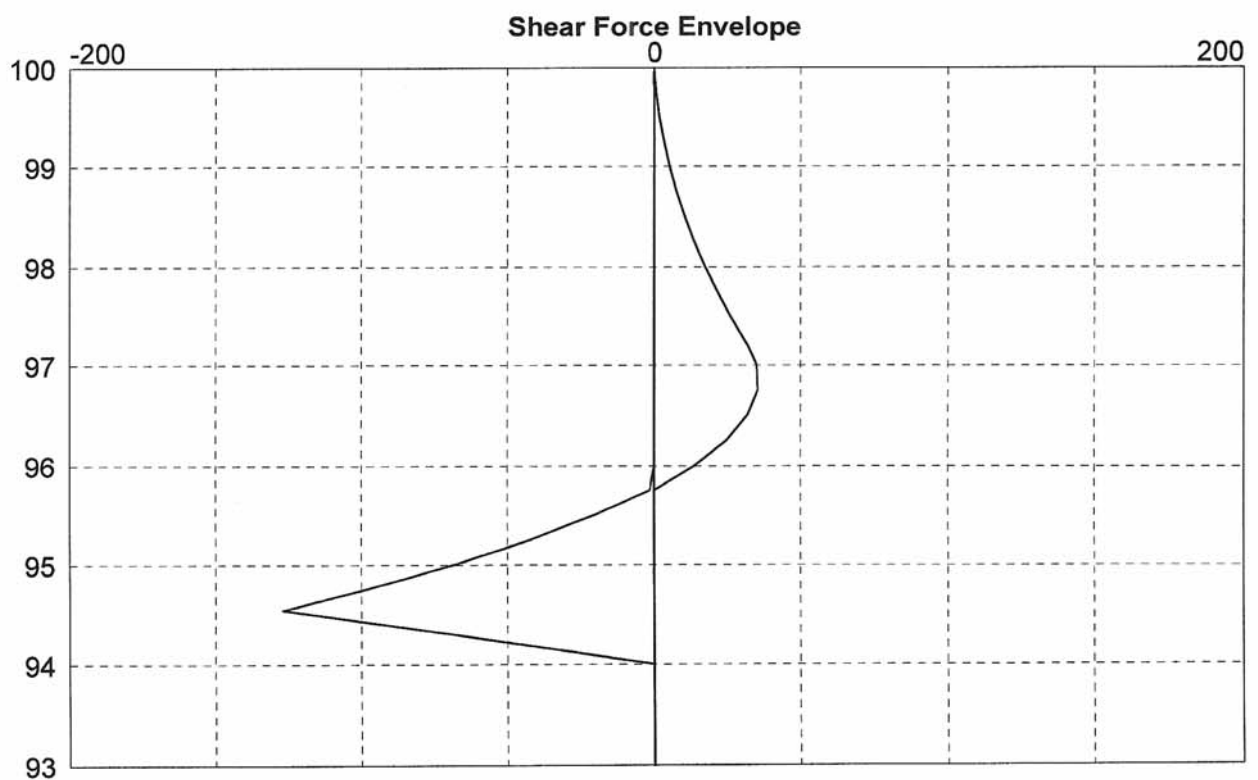
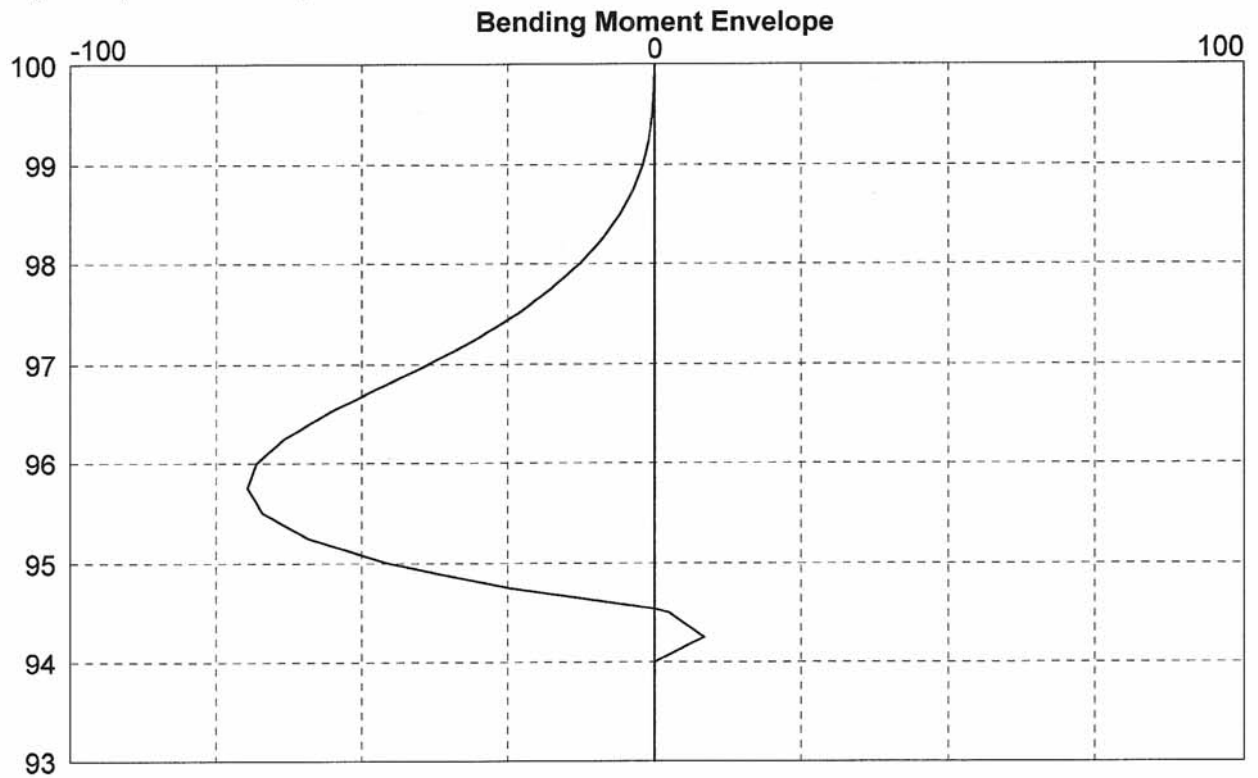
Bending Moment Diagram (kNm/m)



Shear Force Diagram (kN/m)

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Graphical plot of envelope from selected construction stages



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Table of envelope for wall forces

Calc Level m	Bending Minimum kNm/m	Bending Maximum kNm/m	Shear Minimum kN/m	Shear Maximum kN/m	Prop Force kN/m
100.00	.0	.0	.0	.0	
100.00	.0	.0	.0	.0	
99.92	.0	.0	-.2	.1	
99.00	.0	2.0	-5.2	.0	
98.00	.0	12.7	-17.3	.0	
97.20	.0	32.0	-31.9	.0	
97.20	.0	32.0	-31.9	.0	
97.00	.0	38.8	-34.9	.0	
96.00	.0	68.0	-13.4	.0	
95.00	.0	45.4	.0	68.8	
94.54	.0	.0	.0	126.8	
94.00	.0	.0	.0	.0	
93.00	.0	.0	.0	.0	

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Structural design of wall

Wall section properties

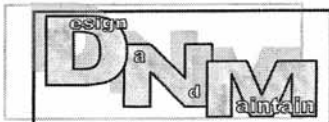
Primary pile diameter	320 mm
Primary pile spacing	400 mm
Infill pile diameter	mm
Main rebar bar diameter	16 mm
Main rebar number of bars	6
Links/Helix bar diameter	8 mm
Links/Helix spacing/pitch	125 mm

Wall material properties

Concrete cube strength	35 N/mm2
Concrete cover	35 mm
Main rebar steel grade	460 N/mm2
Link rebar steel grade	460 N/mm2
Ultimate load factor	1.50

Wall structural design checks

Check description	Required or Limit	Provided or Actual	Units
Max. ultimate moment BS8110, Ultimate resistance	41	47	kNm
Maximum longitudinal steel BS8110, Max 6% by area	4825	1206	mm2
Minimum longitudinal steel BS8110, Min 0.4% by area	321	1206	mm2
Maximum ultimate shear BS8110 Ultimate resistance	76	101	kN
Minimum link diameter BS8110, 6mm or 0.25x bar dia	6	8	mm
Max. link spacing/pitch BS8110, 12x main bar dia or 0.75d	136	125	mm
Minimum shear link area BS8110, Clause 3.4.5	450	804	mm2/m



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References

Results

Summary

Piles $\boxed{320 \phi @ 400 \phi c}$

O/A LENGTH = $\boxed{7.0m}$ (2.8 excavation)

CONCRETE - $\boxed{RC35}$ COVER = $\boxed{35mm}$

REINFORCEMENT

MAW - $\boxed{6 H16's}$

LINKS - $\boxed{H8 @ 125}$