Pile geometry

Pile top Level	0	m
Pile Length	9	m
Pile toe level	-9	m

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

Initial Ground Water level 0

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
.00	New Soil	18.00	20.00	30000	0	50				1.00 1.00	2.00

Water pressure profiles

	Active Actual Level	Active Water Level	Passive Actual Level	Passive Water Level
Water pressure profile 1	0.00	0.00	-4.00	-4.00

Construction sequence

Stage Ref		Stage Type	Level or Angle m/deg.	Load kN(/m)	Offset m	Width m	Length m
1	A	Passive side excavation	-2.00				
2		Insert prop	-0.50				
3	A	Passive side excavation	-4.00				
4	A	Water profile 1					
5	A	Active surcharge	0.00	15.0	.0		

Code of practice

Code of practice or reference document	Eurocode 7 ULS Design Approach 1 Combination 2
Application of pressures for stability	Not applicable for FOS=1 on moments
FOS on moments (stability check)	1.00
ULS factor on Tan(Phi) values	1.25
ULS fFactor on drained cohesion values	1.25
ULS factor on undrained cohesion values	1.40
ULS factor on active soil pressures	1.00
ULS factor on passive soil pressures	1.00
ULS factor on active water pressures	1.00
ULS factor on passive water pressures	1.00
ULS factor on loads applied to the soil	1.30
ULS factor on loads applied to the wall	1.30
FOS on embedment (stability check)	1.00
Correction factor on cantilever embedment	1.20

Wall analysis detail options

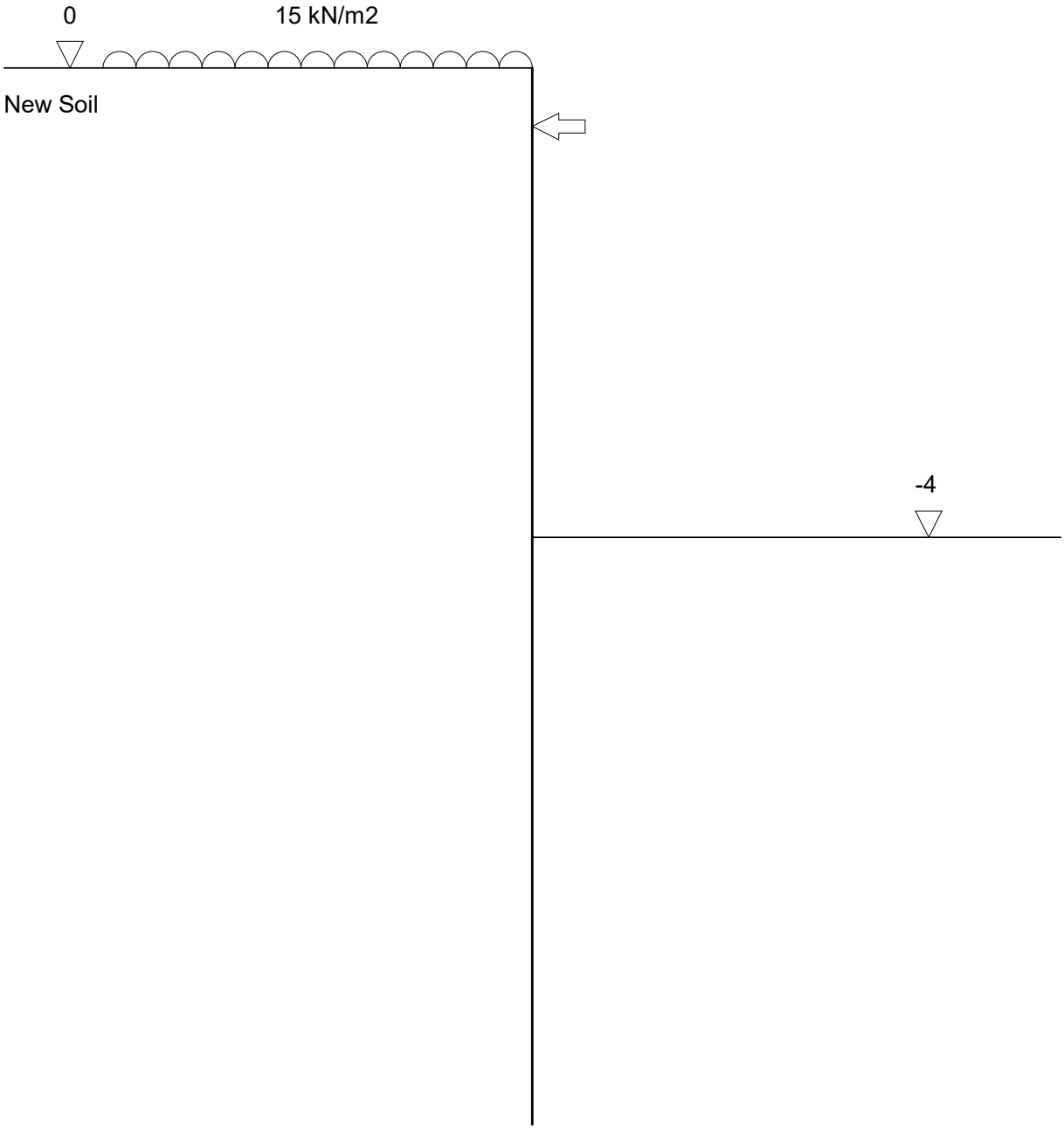
Nominal Phi for load distribution	30.0	Degrees
Depth of water filled tension cracks	.0	m
Density of water	10.0	kN/m3
Minimum equivalent fluid density	5.0	kN/m3
Depth of passive softened soil	1.0	m
Continuity model for wall analysis	Pins at second and lower props	

Deflection parameters

Wall moment of inertia	210462	cm4/m
Wall Youngs modulus	27000000	kN/m2

Properties for prop at -0.5		
Prop/Tie cross sectional area	200	cm2 each
Prop/Tie Youngs modulus	210000000	kN/m2
Prop/Tie length	10.0	m
Prop/Tie spacing	6.0	m
Waling moment of inertia	Waling deflection not included	
Waling Youngs modulus	Waling deflection not included	
Prop/Tie preload	0	kN
Initial lack of fit	0.0	mm

Stage ref. **5**
Stage type **Active surcharge**

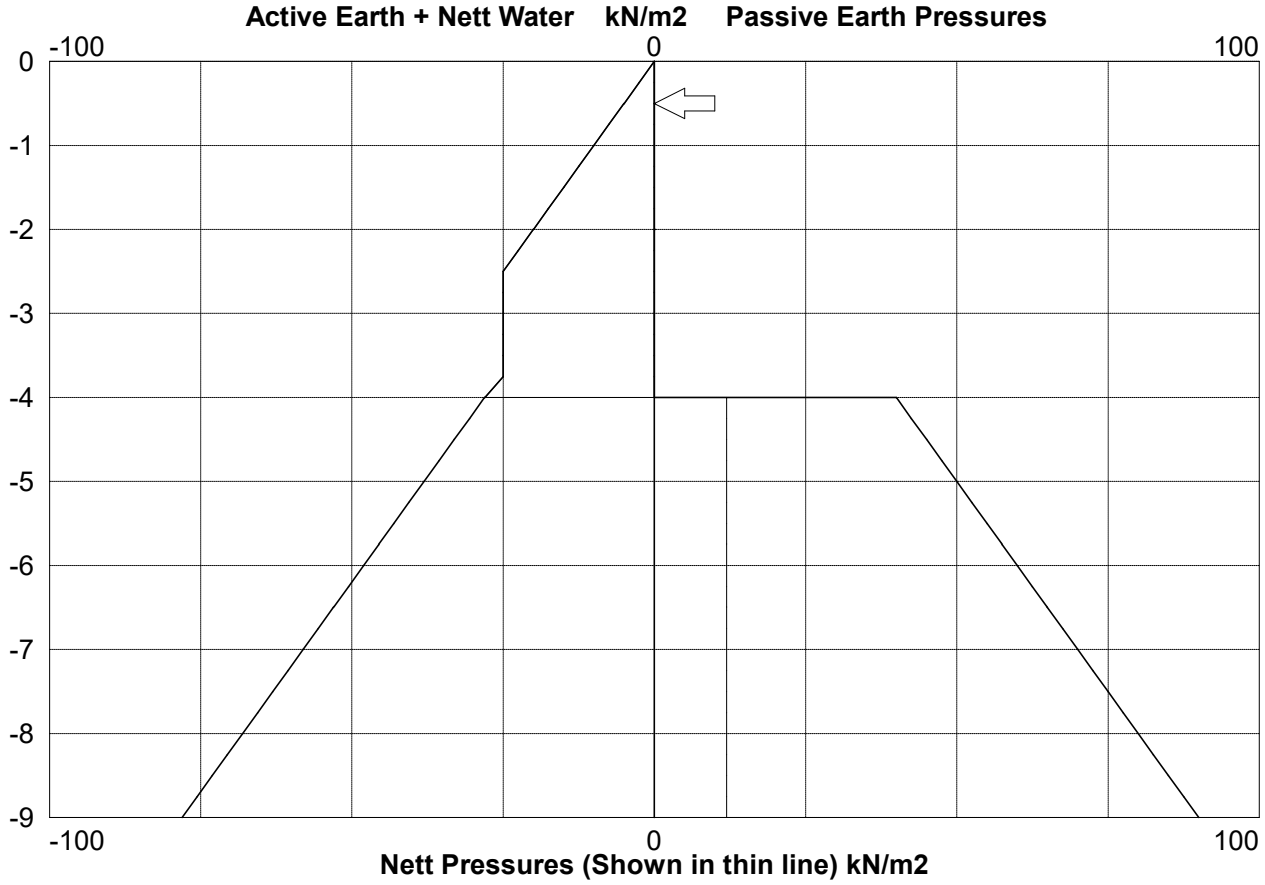


Tabular results from analysis of stage ref 5

strength.
analysis.

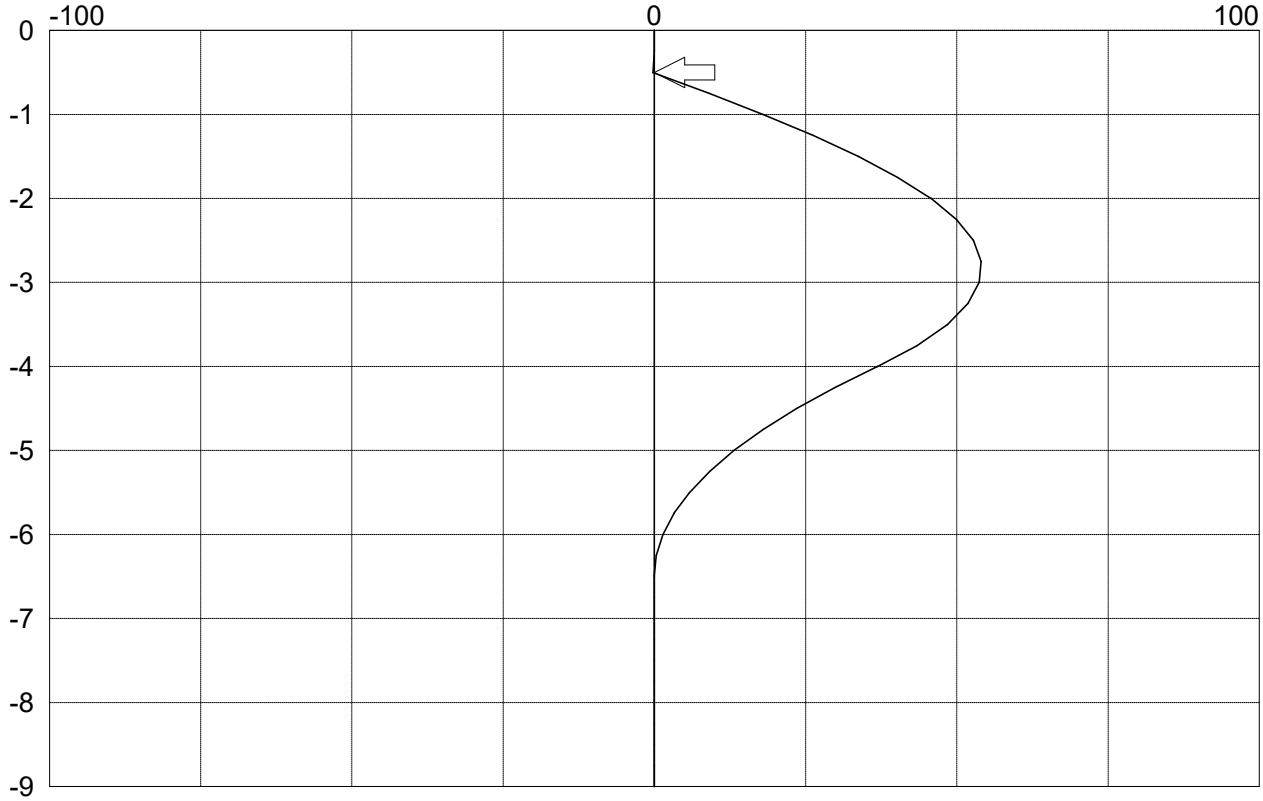
Calc Level m	Active Vert kN/m2	Active Earth kN/m2	Active Water kN/m2	Pas' Vert kN/m2	Pas' Earth kN/m2	Pas' Water kN/m2	Total Nett kN/m2	Bend. Moment kNm/m	Shear Force kN/m	Defl't mm	Prop Force kN/m	FOS
.00	19.5	.0	.0	.0	.0	.0	0	0	0			.00
t -.50	29.5	.0	5.0	.0	.0	.0	5.0	.2	-1.3		39.4	.00
t -.50	29.5	.0	5.0	.0	.0	.0	5.0	.2	38.2			.00
t -1.00	39.5	.0	10.0	.0	.0	.0	10.0	-18.0	34.4			.00
t -2.00	59.5	.0	20.0	.0	.0	.0	20.0	-45.7	19.5			.00
t -2.00	59.5	.0	20.0	.0	.0	.0	20.0	-45.7	19.4			.00
t -3.00	79.5	.0	25.0	.0	.0	.0	25.0	-53.7	-4.3			.00
-4.00	99.5	28.0	.0	.0	.0	.0	28.0	-36.9	-29.6			.00
-4.00	99.5	28.1	.0	40.0	40.0	.0	-11.9	-36.9	-29.7			.00
-4.01	99.7	28.2	.0	40.1	40.1	.1	-11.9	-36.6	-29.6			.01
-5.00	119.5	48.1	.0	50.0	50.0	10.0	-11.9	-13.2	-17.7			.66
-5.74	134.3	62.8	.0	57.4	57.4	17.4	-11.9	-3.3	-8.9			.88
-6.00	139.5	68.1	.0	60.0	60.0	20.0	-11.9	-1.4	-5.8			.93
-6.49	149.3	77.8	.0	64.9	64.9	24.9	-11.9	0	0			1.00
-7.00	159.5	88.1	.0	70.0	70.0	30.0	-11.9	0	0			1.05
-8.00	179.5	108.1	.0	80.0	80.0	40.0	-11.9	0	0			1.10
-9.00	199.5	128.1	.0	90.0	90.0	50.0	-11.9	0	0			1.12

Graphical results from analysis of stage ref 5

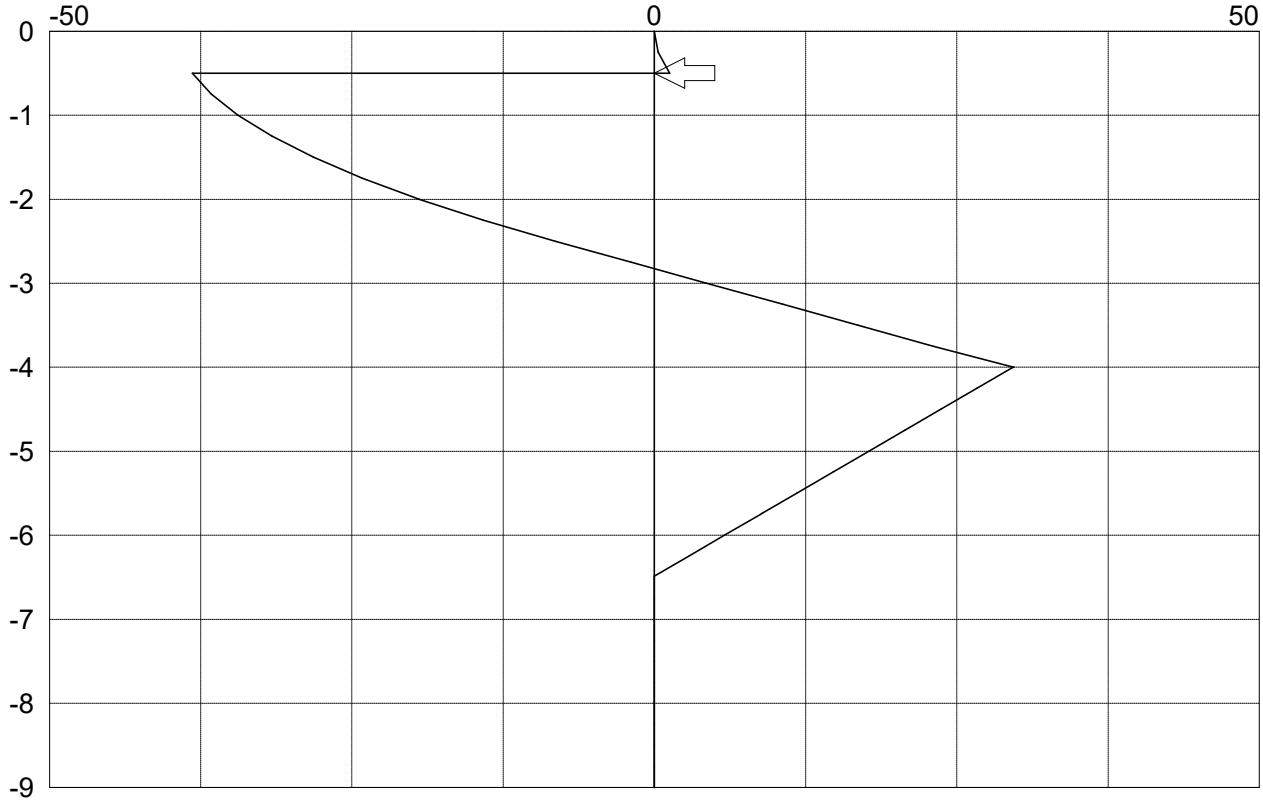


Deflection diagram not shown for analysis with partial factors applied

Graphical results from analysis of stage ref 5 continued

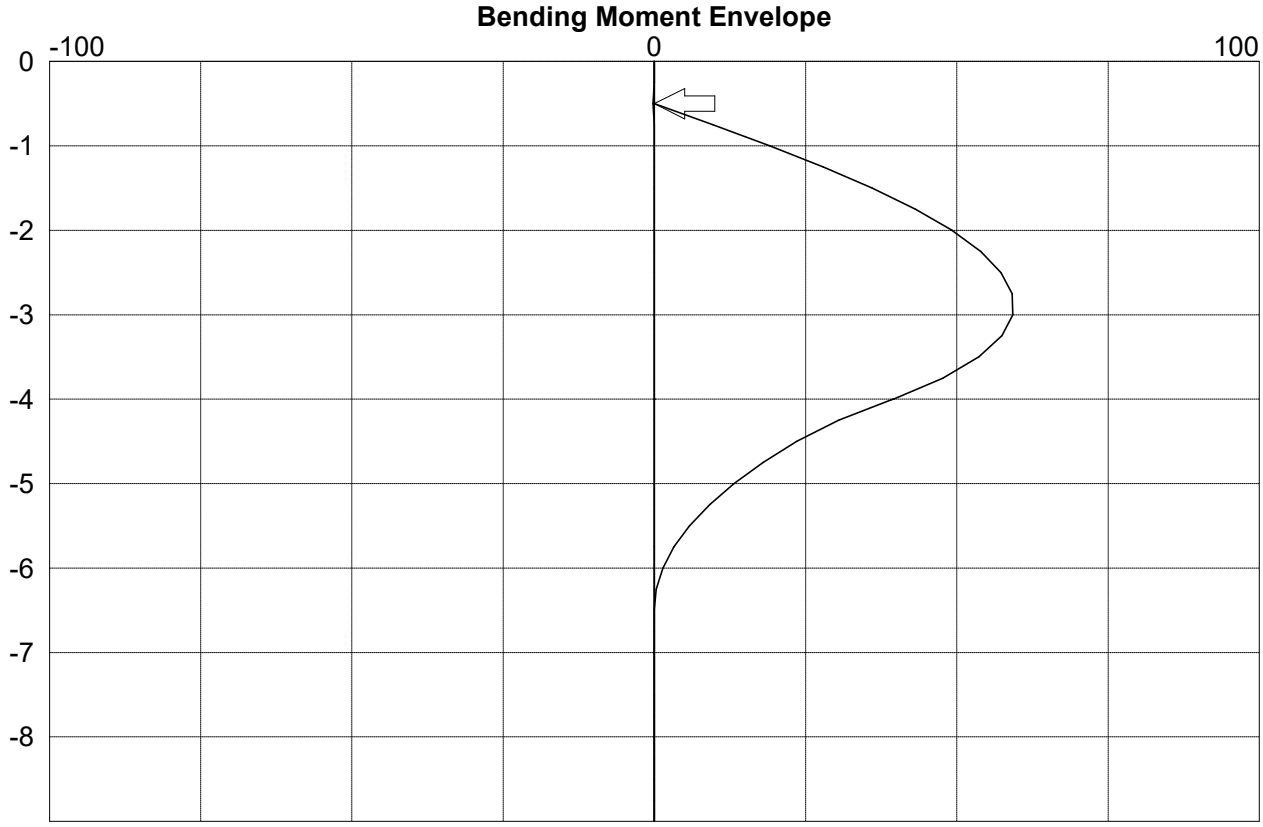


Bending Moment Diagram (kNm/m)



Shear Force Diagram (kN/m)

Graphical plot of envelope from selected construction stages



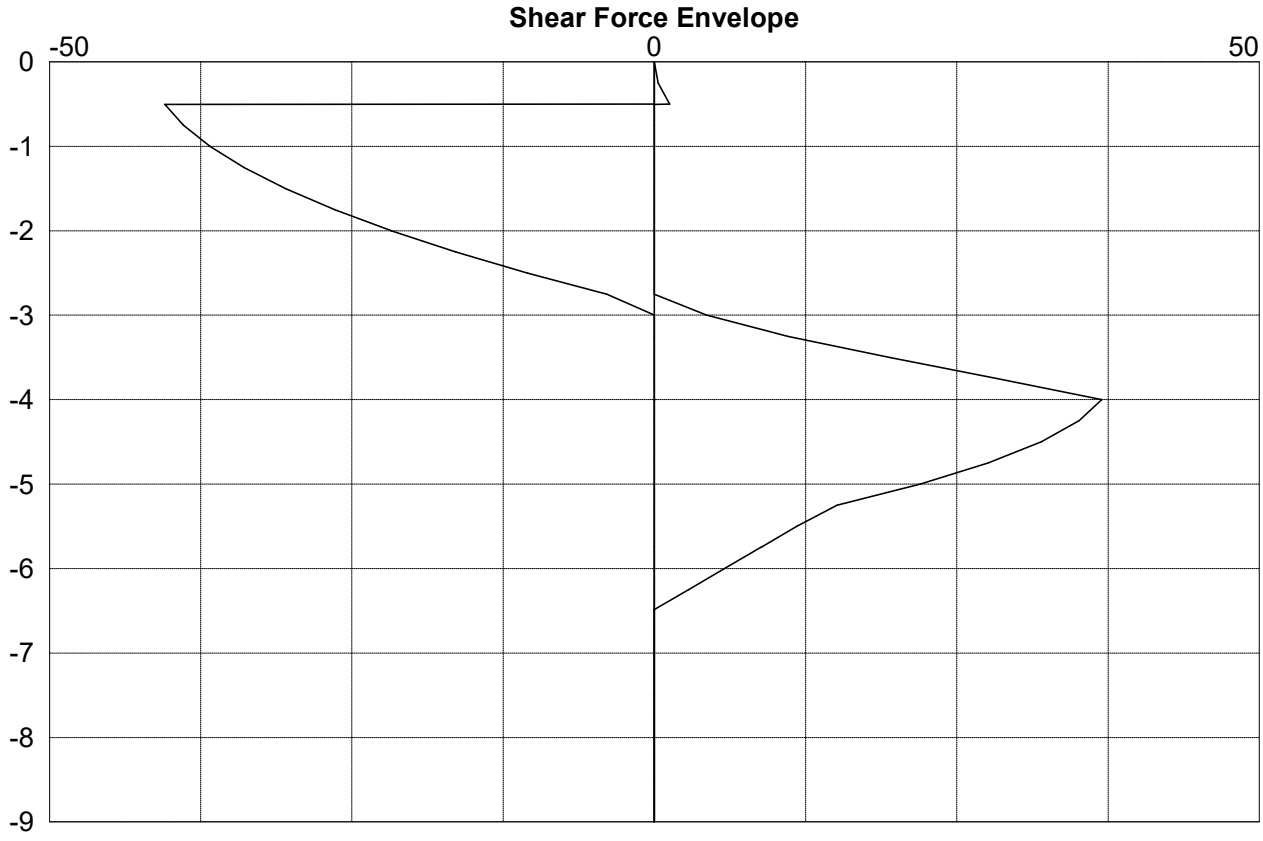


Table of envelope for wall forces

Calc Level m	Bending Minimum kNm/m	Bending Maximum kNm/m	Shear Minimum kN/m	Shear Maximum kN/m	Prop Force kN/m
.00	.0	.0	.0	.0	
-.50	.0	.2	-1.3	.0	41.7
-.50	.0	.2	.0	40.5	
-1.00	-19.1	.0	.0	36.7	
-2.00	-49.1	.0	.0	21.8	
-2.00	-49.2	.0	.0	21.7	
-3.00	-59.2	.0	-4.3	.0	
-4.00	-39.6	.0	-37.0	.0	
-4.00	-39.5	.0	-37.0	.0	
-4.01	-39.2	.0	-36.9	.0	
-5.00	-13.2	.0	-22.0	.0	
-5.74	-3.3	.0	-8.9	.0	
-6.00	-1.4	.0	-5.8	.0	
-6.49	.0	.0	.0	.0	
-7.00	.0	.0	.0	.0	
-8.00	.0	.0	.0	.0	
-9.00	.0	.0	.0	.0	

Structural design of wall

Wall section properties

Primary pile diameter	350	mm
Primary pile spacing	350	mm
Infill pile diameter		mm
Main rebar bar diameter	16	mm
Main rebar number of bars	6	
Links/Helix bar diameter	12	mm
Links/Helix spacing/pitch	150	mm

Wall material properties

Concrete cube strength	25	N/mm2
Concrete cover	25	mm
Main rebar steel grade	500	N/mm2
Link rebar steel grade	500	N/mm2
Ultimate load factor	1.00	

Wall structural design checks

Check description	Required or Limit	Provided or Actual	Units
Bending resistance, EC2 plane strain model	21	56	kNm
Max main steel, EC2 9.5.2(3), 4%	3848	1206	mm2
Min main steel, EC2 9.8.5(3)	481	1206	mm2
Shear resistance, EC2 variable angle truss model	14	429	kN
Max main steel spc, BS EN 1536+A1:2015	400	114	mm
Min main steel spc, BS EN 1536+A1:2015	100	114	mm
Min link diameter, EC2 9.5.3(1), 0.25x long. bar dia.	6	12	mm
Max link spc, EC2 9.5.3(2) + 9.2.2(6), 400mm/20xbar/0.75d	185	150	mm
Min link spc, BS EN 1536:2010+A1:2015	100	150	mm
Min. shear link area, EC2 9.2.2(5) equation 9.4	277	1508	mm2/m