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CADS Piled Wall Suite Version 6.09 Design of embedded retaining walls and cofferdams	Project 9715 File Name ...t 1.5m long term.pws
Contiguous Piled Wall Long Term	Engineer TP Date 03/08/2022

Pile geometry

Pile top Level 0 m
Pile Length 8 m
Pile toe level -8 m

Soils and ground water initial data

(Soils data given for active and passive sides)

Initial Ground Water level -5

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	Hardcore	18.00	18.00	25000	0			25 25	.50 .50	.36 3.22	
-1.00	CLAY	19.50	20.00	30000	0			27 27	.50 .50	.33 3.60	

Construction sequence

Stage Ref	Stage Type	Level or Angle m/deg.	Load kN/(m)	Offset m	Width m	Length m
1	Active surcharge	0.00	20.0	.0		
2 A	Passive side excavation	-1.50				
3 A	Active water level	-1.00				
4 A	Passive water level	-1.50				

Code of practice

Code of practice or reference document	Eurocode 7 ULS Design Approach 1 Combination 1
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	1.00
ULS fFactor on drained cohesion values	1.00
ULS factor on undrained cohesion values	1.00
ULS factor on active soil pressures	1.35
ULS factor on passive soil pressures	1.35
ULS factor on active water pressures	1.35
ULS factor on passive water pressures	1.35
ULS factor on loads applied to the soil	1.11
ULS factor on loads applied to the wall	1.50
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

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Deflection parameters

Wall moment of inertia 147324 cm⁴/m
Wall Youngs modulus 27000000 kN/m²

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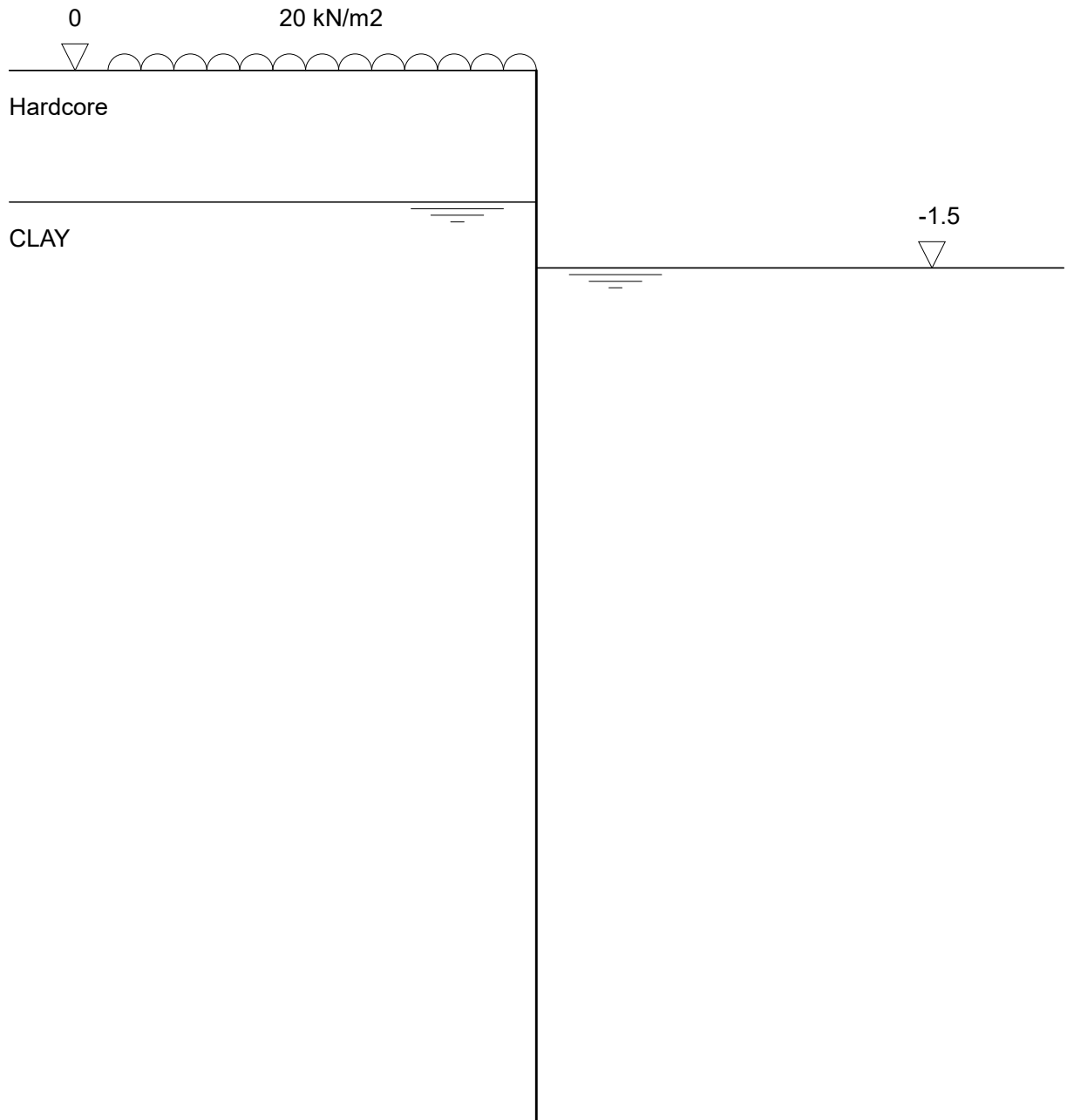
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Stage ref. 4
Stage type Passive water level



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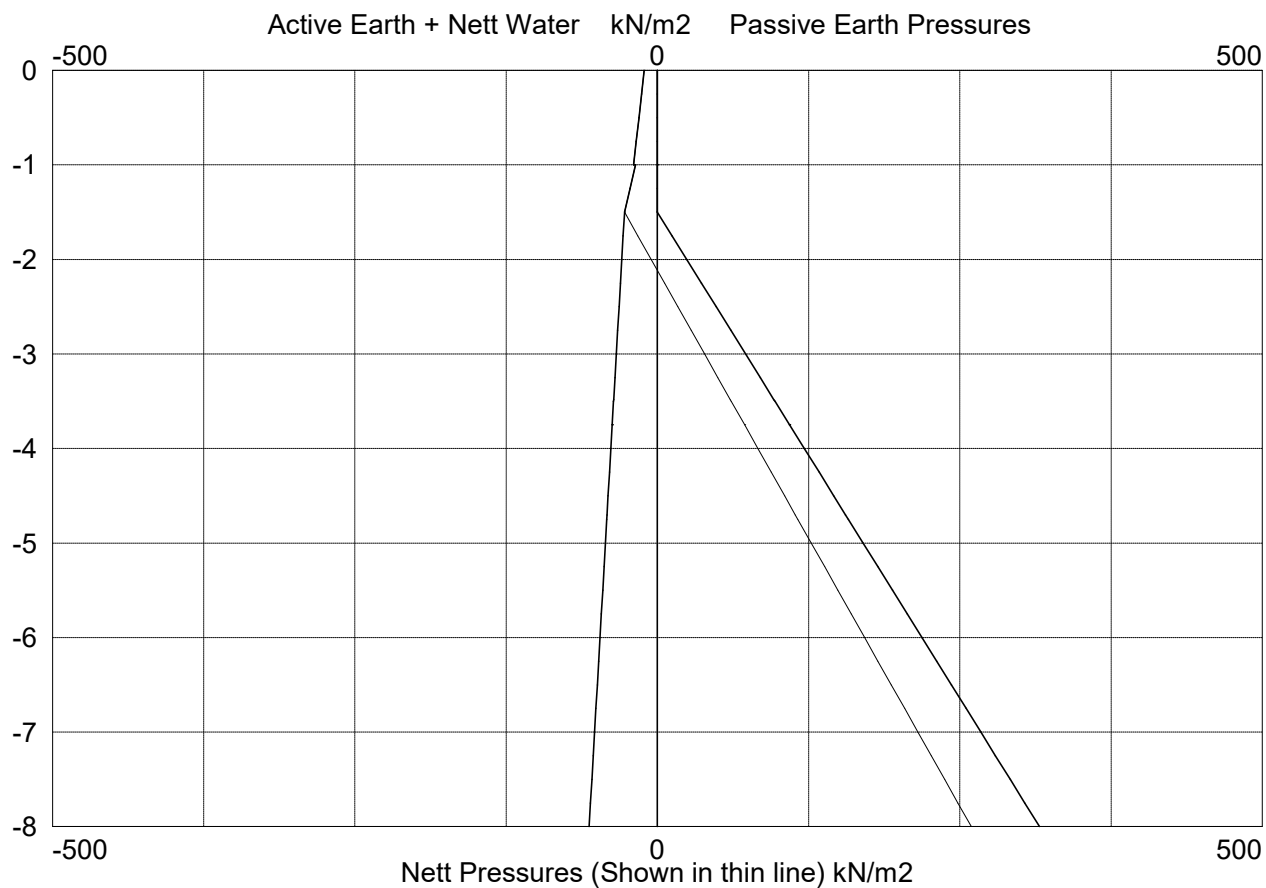
Tabular results from analysis of stage ref 4

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	22.2	10.9	.0	.0	.0	.0	10.9	0	0			.00
-1.00	40.2	19.7	.0	.0	.0	.0	19.7	6.9	-15.3			.00
-1.00	40.2	18.1	.0	.0	.0	.0	18.1	6.9	-15.3			.00
-1.50	45.2	20.4	6.7	.0	.0	.0	27.1	17.1	-26.5			.00
-1.50	45.2	20.4	6.8	.0	.0	.0	27.1	17.2	-26.6			.00
-2.00	50.2	22.6	13.5	5.0	24.3	6.8	5.1	32.9	-34.6			.02
-3.00	60.2	27.1	27.0	15.0	72.9	20.3	-39.0	62.8	-17.7			.22
-3.48	65.0	29.3	33.5	19.8	96.4	26.8	-60.3	65.9	6.3			.36
-3.75	67.7	30.5	37.1	22.5	109.3	30.4	-72.1	61.9	24.0			.45
-4.00	70.2	31.6	40.5	25.0	121.5	33.8	-83.1	53.5	43.4			.53
-4.70	77.2	34.8	50.0	32.0	155.7	43.2	-114.1	0	112.8			.77
-5.00	80.2	36.1	54.0	35.0	170.1	47.3	-127.2	-9.0	60.5			.88
-6.00	90.2	40.7	67.5	45.0	218.7	60.8	-171.3	0	0			1.23
-7.00	100.2	45.2	81.0	55.0	267.3	74.3	-215.4	0	0			1.57
-8.00	110.2	49.7	94.5	65.0	316.0	87.8	-259.5	0	0			1.90

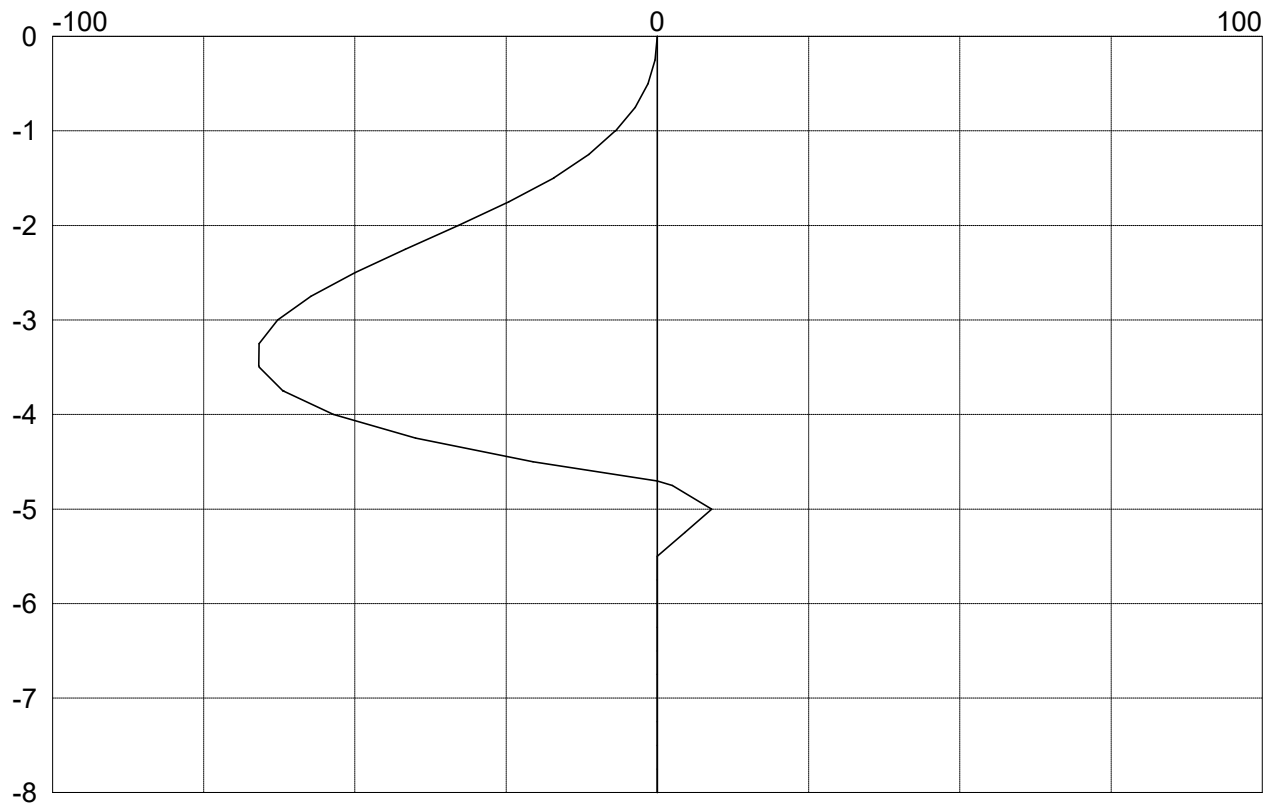
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Graphical results from analysis of stage ref 4

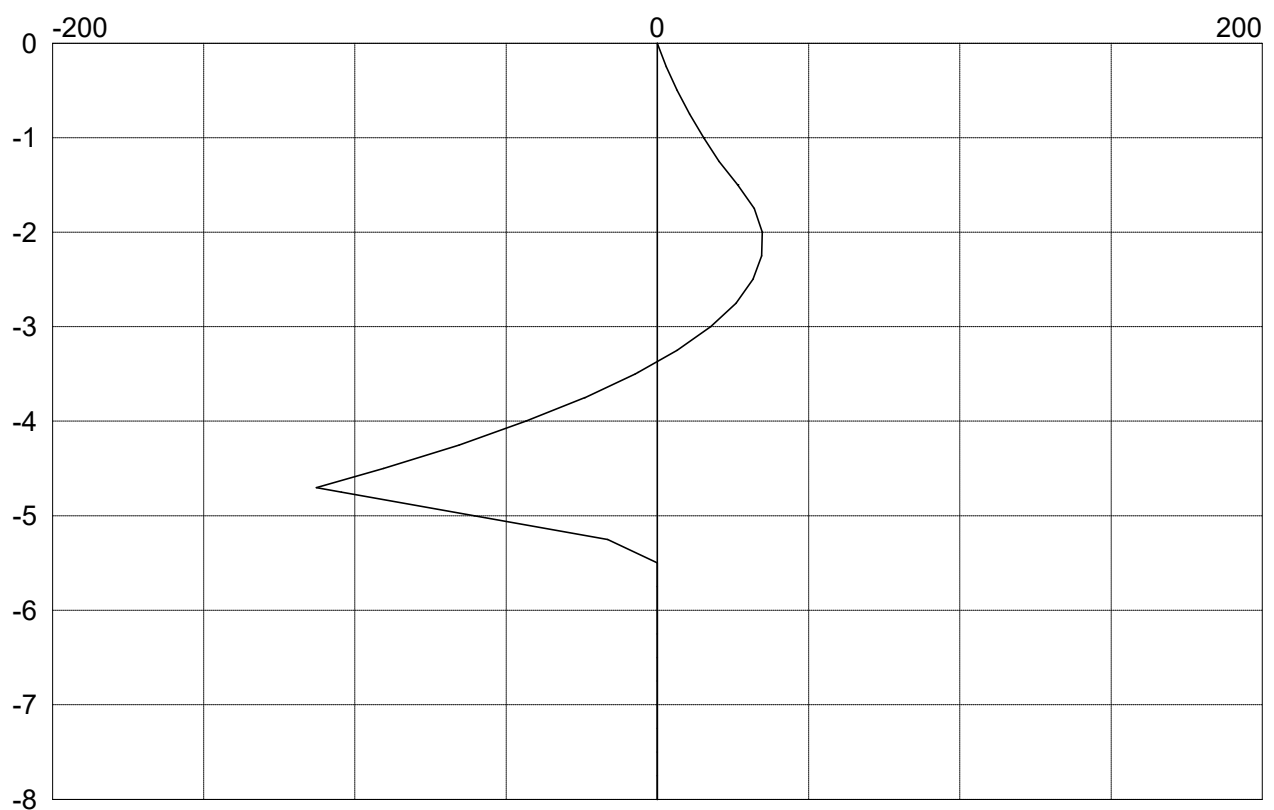


Deflection diagram not shown for analysis with partial factors applied

Graphical results from analysis of stage ref 4 continued

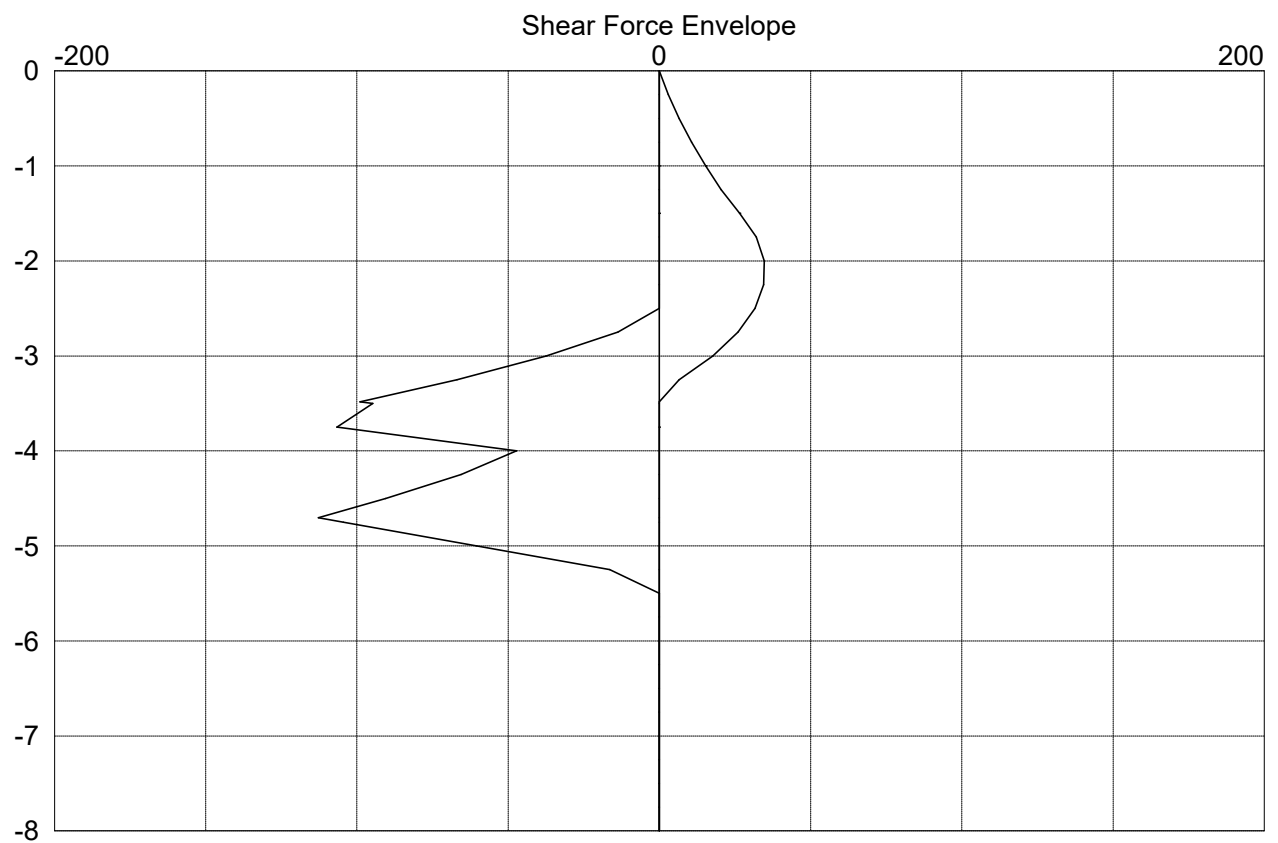
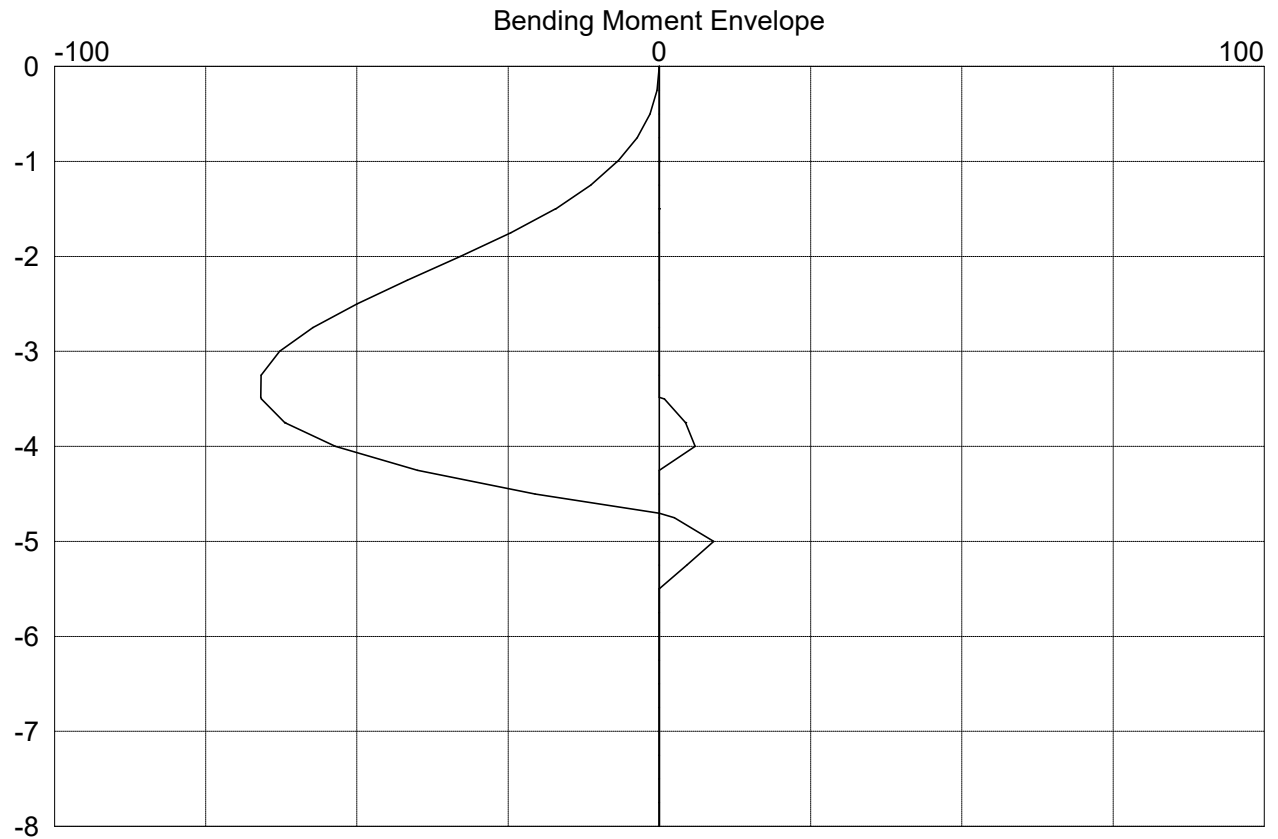


Bending Moment Diagram (kNm/m)



Shear Force Diagram (kN/m)

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
.00	.0	.0	.0	.0	
-1.00	.0	6.9	-15.3	.0	
-1.00	.0	6.9	-15.3	.0	
-1.50	.0	17.1	-26.5	.0	
-1.50	.0	17.2	-26.6	.0	
-2.00	.0	32.9	-34.6	.0	
-3.00	.0	62.8	-17.7	37.5	
-3.48	.0	65.9	.0	99.0	
-3.75	-4.3	61.9	.0	106.6	
-4.00	-5.9	53.5	.0	47.2	
-4.70	.0	.0	.0	112.8	
-5.00	-9.0	.0	.0	60.5	
-6.00	.0	.0	.0	.0	
-7.00	.0	.0	.0	.0	
-8.00	.0	.0	.0	.0	

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Structural design of wall

Wall section properties

Primary pile diameter	350 mm
Primary pile spacing	500 mm
Infill pile diameter	mm
Main rebar bar diameter	16 mm
Main rebar number of bars	4
Links/Helix bar diameter	10 mm
Links/Helix spacing/pitch	150 mm

Wall material properties

Concrete cube strength	35 N/mm ²
Concrete cover	50 mm
Main rebar steel grade	500 N/mm ²
Link rebar steel grade	500 N/mm ²
Ultimate load factor	1.00

Wall structural design checks

Check description	Required or Limit	Provided or Actual	Units
Bending resistance, EC2 plane strain model	33	37	kNm
Max main steel, EC2 9.5.2(3), 4%	3848	804	mm ²
Min main steel, EC2 9.8.5(3)	481	804	mm ²
Shear resistance, EC2 variable angle truss model	56	186	kN
Max main steel spc, BS EN 1536+A1:2015	400	135	mm
Min main steel spc, BS EN 1536+A1:2015	100	135	mm
Min link diameter, EC2 9.5.3(1), 0.25x long. bar dia.	6	10	mm
Max link spc, EC2 9.5.3(2) + 9.2.2(6), 400mm/20xbar/0.75d	150	150	mm
Min link spc, BS EN 1536:2010+A1:2015	100	150	mm