

Aan
Projectteam N236

Van
E. Van Liefland

MEMO

Beschouwing grondkeringen

Datum
05-09-2017

Kenmerk
N236-MEM-016

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Op verschillende locaties naast de N236 is het door verlegging van de watergang of verhoging van het grondlichaam noodzakelijk een grondkering toe te passen bij de kant van de watergang. De onderliggende memo behandelt deze grondkeringen.

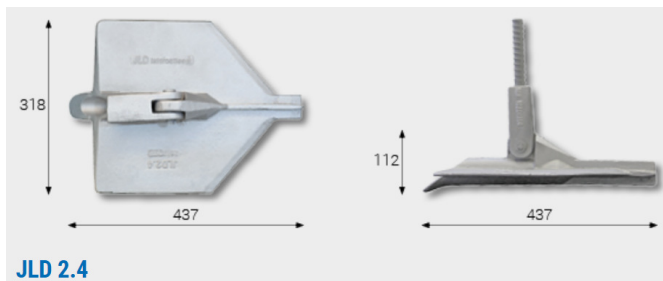
Uitgangspunten:

- Grondkeringen worden gemaakt van houten damwandplanken 60x4500mm, 60x4000mm (Okan) en gordingen 100x150mm, 50x150mm (Angelim vermelho).
- Verankering dmv. klpankers JLD 2.4 met thermisch verzinkt stalen ankerstaaf (M16), h.o.h. circa 2m en lengte 3m.



Gegevens klapanker JLD 2.4:

PRODUCTGEGEVENS		
Type	JLD 2.4	[-]
Breedte	318	[mm]
Lengte	437	[mm]
Hoogte	112	[mm]
Oppervlakte	93.820	[mm ²]
Breuksterkte	220	[kN]
Vloeisterkte	165	[kN]
Afwerking	Thermisch verzinkt	



Grondslag:

- Grondkering bij km 10.1 ligt nabij sondering DKM28 (rapportage geotechnisch veldwerk betreffende reconstructie N236 en Vechtbrug te Weesp, opdrachtnummer: 9015-0662-000, dd. 6-11-2015, Fugro Geoservices B.V.).
- Grondkering bij km 10.4 ligt nabij sondering DKM31 (rapportage geotechnisch veldwerk betreffende reconstructie N236 en Vechtbrug te Weesp, opdrachtnummer: 9015-0662-000, dd. 6-11-2015, Fugro Geoservices B.V.).
- Grondkering bij km 10.8 ligt nabij sondering DKM33 (rapportage geotechnisch veldwerk betreffende reconstructie N236 en Vechtbrug te Weesp, opdrachtnummer: 9015-0662-000, dd. 6-11-2015, Fugro Geoservices B.V.).

Voor het berekenen van de grondkeringen word gebruik gemaakt van sondering DKM31 omdat deze de maatgevende resultaten geeft. Grondwaarden zoals ingevoerd in D-sheet (gehanteerde rekenprogramatuur) worden bepaald door deze uit een .gef bestand van nabijgelegen sonderingen te importeren. Hierdoor worden grondwaarden gehanteerd welke representatief zijn voor het projectgebied.

Voorbelasting:

Maatgevende situatie van de grondkerende constructie is wanneer de volle voorbelasting direct naast de grondkering aangebracht is. Hierbij wordt als uitgangspunt gehanteerd dat er geen zwaar materieel over de voorbelasting heen rijdt. Maatgevende hoogte voorbelasting is conform tekening "Profielen OVH N236 Km 11.100" in D-sheet gemodeleerd op +1,85m NAP

Invoer damwand D-sheet:

Om een houten damwand in D-sheet te kunnen invoeren is er een omrekeningslag nodig. Hiervoor zijn de onderstaande waarden gehanteerd:

Elasticiteitsmodulus	E	16800	N/mm ²	
Buigspanning	$\sigma_{yd;buig}$	70	N/mm ²	
Drsn oppervlak	A	b * h =	600	cm ² /m ¹
Traagheidsmoment	I _y	$\frac{1}{12} * b * h^3 =$	18000000	mm ⁴
Stijfheid	EI	E * I _y =	302,4	kNm ² /m ¹
Weerstandsmoment	W _{y,el}	$\frac{1}{6} * b * h^2 =$	600	cm ³ /m ¹
Karakteristiek Moment	M _{max}	$\sigma_{yd;buig} * W_y =$	42	kNm/m ¹

De verankering wordt in D-sheet ingevoerd als zijnde veer. Hiervoor wordt de veerwaarde als volgt bepaald:

$$K_v = E * A_{drsn} * 1m = 4.221 * 10^4 \text{ N/mm}^2$$

Resultaten:

In bijgevoegd berekeningsrapport van D-sheet is de hierboven omschreven houten damwand, inclusief ankers en ontgravingsniveau's, ingevoerd en getoetst. Hieruit blijkt dat de momentcapaciteit van de houten damwand ruim voldoende is, vervorming is maatgevend. Deze vervorming is bepaald op 7,5mm ontgraven zijde van de houten damwand. Een dergelijke uitbuiging wordt als toelaatbaar beschouwd $(3,2m - 1,6m) / 100 = 16mm > 7,5$.

Report for D-Sheet Piling 14.1

Design of Sheet Piling
Developed by Deltares

Company:	Royal Boskalis Westminster nv
Date of report:	05-Sep-17
Time of report:	1:57:13 PM
Date of calculation:	05-Sep-17
Time of calculation:	1:56:59 PM
Filename:	D:\..\2114498 N236 Reconstructie Vechtbrug\Grondkeringen\grondkering

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2 Summary

2.1 Maxima per Stage

Stage no.	Stage name	Displacement [mm]	Moment [kNm]	Shear force [kN]	Mob. perc. moment [%]	Mob. perc. resistance [%]	Vertical balance
1	Plaatsen damw...	1.8	-0.5	-2.4	22.5	23.3	---
2	Ontgraven sloot	4.7	1.5	2.8	41.8	44.0	---
3	Waterstandsver...	7.5	2.7	4.2	47.8	50.6	---

Max		7.5	2.7	4.2	47.8	50.6	---
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2.2 Supports

Stage name	Support Klapanker	
	Force [kN]	Moment [kNm/m']
Plaatsen damw...	-1.20	-
Ontgraven sloot	-2.77	-
Waterstandsver...	-4.21	-

3 Input Data for all Stages

3.1 General Input Data

Model	Sheet piling
Check vertical balance	Yes
Number of construction stages	3
Unit weight of water	9.81 kN/m ³
Number of curves on spring characteristic	3
Unloading curve on spring characteristic	No

3.2 Sheet Piling Properties

Length	4.50 m
Level top side	-1.60 m
Number of sections	1
Pr;max;point	0.00 MPa
Xi factor	0.72

Section name	From [m]	To [m]	Stiffness EI [kNm ² /m']	Acting width [m]
Houten damwand	-6.10	-1.60	3.0240E+02	1.00

Section name	From [m]	To [m]	Max. char. moment [kNm/m']	Max. rep. moment [kNm/m']	Modification factor [-]	Material factor [-]	Design moment [kNm/m']
Houten damwand	-6.10	-1.60	42.00	42.00	1.00	1.00	42.00

Section name	From [m]	To [m]	Red. factor EI [-]	Red. factor max. moment [-]	Note to reduction factor
Houten damwand	-6.10	-1.60	1.00	1.00	

Section name	From [m]	To [m]	Corrected stiffness EI [kNm ²]	Corrected max. moment [kNm]
Houten damwand	-6.10	-1.60	3.0240E+02	42.00

Section name	From [m]	To [m]	Height [mm]	Coating area [m ² /m ² wall]	Section area [cm ² /m']
Houten damwand	-6.10	-1.60	60.00	1.00	600.00

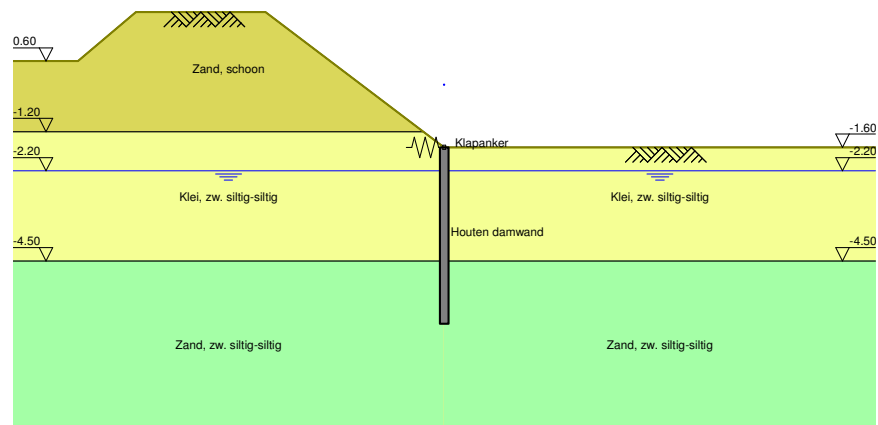
3.3 Calculation Options

First stage represents initial situation	No
Calculation refinement	Coarse
Lambda recalculation	Automatic
Reduce delta(s) according to CUR	Yes

4 Construction Stage 1: Plaatsen damwand

4.1 Outline

Outline - Stage 1: Plaatsen damwand



4.2 General Input Data

4.2.1 Spring Supports

Name	Level [m]	Rotation [kNm/rad/m']	Translation [kN/m/m']
Klapanker	-1.60	0.00000E+00	4.22100E+04

4.3 Input Data Left

4.3.1 Calculation Method

Calculation method: C, phi, delta

4.3.2 Water Level

Water level: -2.20 [m]

4.3.3 Surface

X [m]	Y [m]
0.00	-1.60
6.90	1.85
11.90	1.85
14.15	0.60

4.3.4 Soil Material Properties in Profile: DKM31

Layer name	Level [m]	Unit weight		Cohesion [kN/m²]	Friction angle phi [deg]	Delta friction angle [deg]
		Unsat [kN/m³]	Sat [kN/m³]			
Zand, schoon	2.00	18.00	20.00	0.00	32.50	16.60
Klei, zw. siltig-s...	-1.20	18.00	18.00	5.00	22.50	15.00
Zand, zw. siltig-...	-4.50	18.00	20.00	0.00	27.00	18.00

Layer name	Level [m]	Shell factor [-]	OCR [-]	Grain type
Zand, schoon	2.00	1.00	1.00	Fine
Klei, zw. siltig-s...	-1.20	1.00	1.00	Fine
Zand, zw. siltig-...	-4.50	1.00	1.00	Fine

Layer name	Level [m]	Earth pressure coefficients			Additional pore pressure	
		Active [-]	Neutral [-]	Passive [-]	Top [kN/m²]	Bottom [kN/m²]
Zand, schoon	2.00	n.a.	n.a.	n.a.	0.00	0.00
Klei, zw. siltig-s...	-1.20	n.a.	n.a.	n.a.	0.00	0.00
Zand, zw. siltig-...	-4.50	n.a.	n.a.	n.a.	0.00	0.00

4.3.5 Modulus of Subgrade Reaction (Secant)

Layer name	Level [m]	Branch 1		Branch 2	
		Top [kN/m³]	Bottom [kN/m³]	Top [kN/m³]	Bottom [kN/m³]
Zand, schoon	2.00	20000.00	20000.00	10000.00	10000.00
Klei, zw. siltig-s...	-1.20	5000.00	5000.00	2500.00	2500.00
Zand, zw. siltig-...	-4.50	16000.00	16000.00	8000.00	8000.00

Layer name	Level [m]	Branch 3	
		Top [kN/m³]	Bottom [kN/m³]
Zand, schoon	2.00	5000.00	5000.00
Klei, zw. siltig-s...	-1.20	1250.00	1250.00
Zand, zw. siltig-...	-4.50	4000.00	4000.00

4.4 Calculated Earth Pressure Coefficients Left

Segment number	Level [m]	Horizontal pressure		Fictive earth pressure coefficients		
		Active [kN/m²]	Passive [kN/m²]	Ka [-]	Ko [-]	Kp [-]
1	-1.70	0.0	100.3	0.00	2.07	41.92
2	-1.90	0.0	129.6	0.00	1.58	18.19
3	-2.10	0.0	231.9	0.00	1.36	19.55
4	-2.30	0.0	332.1	0.00	1.26	21.27
5	-2.50	0.0	427.2	0.00	1.20	23.24
6	-2.70	0.0	522.1	0.00	1.15	24.70
7	-2.90	0.0	616.8	0.00	1.09	25.83
8	-3.10	8.1	698.2	0.31	1.05	26.23
9	-3.31	11.0	497.9	0.37	1.00	16.91
10	-3.52	13.0	414.0	0.40	0.96	12.79

Segment number	Level [m]	Horizontal pressure		Fictive earth pressure coefficients		
		Active [kN/m ²]	Passive [kN/m ²]	Ka [-]	Ko [-]	Kp [-]
11	-3.74	15.0	243.5	0.42	0.92	6.90
12	-3.96	16.9	203.6	0.44	0.89	5.34
13	-4.17	18.7	208.1	0.46	0.86	5.08
14	-4.39	20.1	212.7	0.46	0.83	4.85
15	-4.60	25.4	229.6	0.54	0.76	4.91
16	-4.80	26.4	246.2	0.53	0.73	4.96
17	-5.00	27.3	265.6	0.52	0.71	5.05
18	-5.20	28.2	284.7	0.51	0.70	5.13
19	-5.40	29.1	303.7	0.50	0.68	5.20
20	-5.60	30.0	322.7	0.49	0.67	5.27
21	-5.80	30.9	341.8	0.48	0.65	5.33
22	-6.00	31.7	361.0	0.47	0.64	5.39

4.5 Calculated Force from a layer Left

Name	Force
Zand, schoon	0.00
Klei, zw. siltig-siltig	0.00
Zand, zw. siltig-siltig	47.62

4.6 Input Data Right

4.6.1 Calculation Method

Calculation method: Ka, Ko, Kp

4.6.2 Water Level

Water level: -2.20 [m]

4.6.3 Surface

X [m]	Y [m]
0.00	-1.60

4.6.4 Soil Material Properties in Profile: DKM31

Layer name	Level [m]	Unit weight		Cohesion [kN/m ²]	Friction angle phi [deg]	Delta friction angle [deg]
		Unsat [kN/m ³]	Sat [kN/m ³]			
Zand, schoon	2.00	18.00	20.00	0.00	32.50	16.60
Klei, zw. siltig-s...	-1.20	18.00	18.00	5.00	22.50	15.00
Zand, zw. siltig-...	-4.50	18.00	20.00	0.00	27.00	18.00

Layer name	Level [m]	Shell factor [-]	OCR [-]	Grain type
Zand, schoon	2.00	1.00	1.00	Fine
Klei, zw. siltig-s...	-1.20	1.00	1.00	Fine
Zand, zw. siltig-...	-4.50	1.00	1.00	Fine

Layer name	Level [m]	Earth pressure coefficients			Additional pore pressure	
		Active [-]	Neutral [-]	Passive [-]	Top [kN/m ²]	Bottom [kN/m ²]
Zand, schoon	2.00	0.26	0.46	5.46	0.00	0.00
Klei, zw. siltig-s...	-1.20	0.39	0.62	2.96	0.00	0.00
Zand, zw. siltig-...	-4.50	0.32	0.55	3.84	0.00	0.00

4.6.5 Modulus of Subgrade Reaction (Secant)

Layer name	Level [m]	Branch 1		Branch 2	
		Top [kN/m ³]	Bottom [kN/m ³]	Top [kN/m ³]	Bottom [kN/m ³]
Zand, schoon	2.00	20000.00	20000.00	10000.00	10000.00
Klei, zw. siltig-s...	-1.20	5000.00	5000.00	2500.00	2500.00
Zand, zw. siltig-...	-4.50	16000.00	16000.00	8000.00	8000.00

Layer name	Level [m]	Branch 3	
		Top [kN/m ³]	Bottom [kN/m ³]
Zand, schoon	2.00	5000.00	5000.00
Klei, zw. siltig-s...	-1.20	1250.00	1250.00
Zand, zw. siltig-...	-4.50	4000.00	4000.00

4.7 Calculated Force from a layer Right

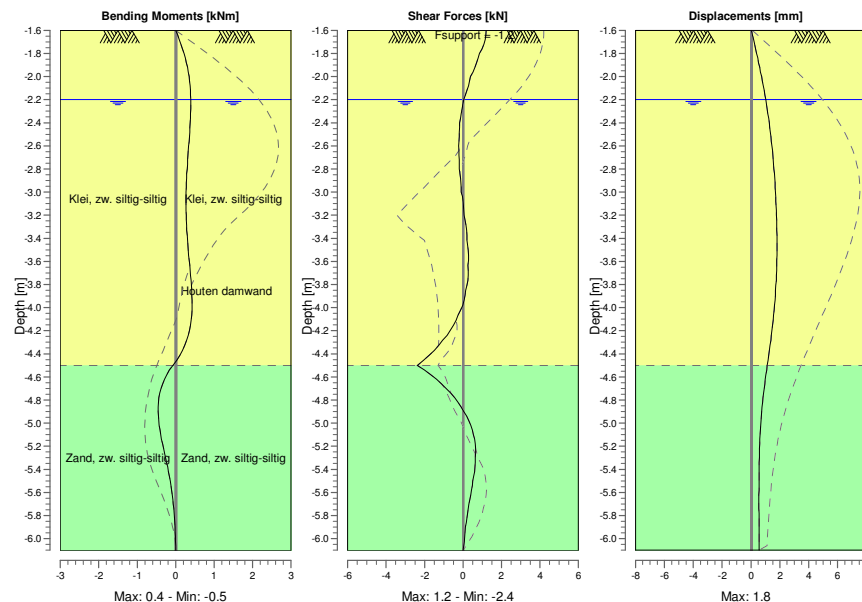
Name	Force
Zand, schoon	0.00
Klei, zw. siltig-siltig	0.00
Zand, zw. siltig-siltig	50.00

4.8 Calculation Results

Number of iterations: 3

4.8.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: Plaatsen damwand



4.8.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	-1.60	0.0	1.2	0.0
1	-1.80	0.2	0.8	0.4
2	-1.80	0.2	0.8	0.4
2	-2.00	0.3	0.4	0.7
3	-2.00	0.3	0.4	0.7
3	-2.20	0.4	0.0	1.0
4	-2.20	0.4	0.0	1.0
4	-2.40	0.4	-0.2	1.3
5	-2.40	0.4	-0.2	1.3
5	-2.60	0.3	-0.2	1.4
6	-2.60	0.3	-0.2	1.4
6	-2.80	0.3	-0.2	1.6
7	-2.80	0.3	-0.2	1.6
7	-3.00	0.3	-0.1	1.7
8	-3.00	0.3	-0.1	1.7
8	-3.20	0.3	0.1	1.8
9	-3.20	0.3	0.1	1.8
9	-3.42	0.3	0.2	1.8
10	-3.42	0.3	0.2	1.8
10	-3.63	0.4	0.3	1.8
11	-3.63	0.4	0.3	1.8
11	-3.85	0.4	0.1	1.7
12	-3.85	0.4	0.1	1.7
12	-4.07	0.4	-0.3	1.6
13	-4.07	0.4	-0.3	1.6
13	-4.28	0.3	-1.1	1.4
14	-4.28	0.3	-1.1	1.4
14	-4.50	-0.1	-2.4	1.1
15	-4.50	-0.1	-2.4	1.1
15	-4.70	-0.4	-0.9	0.9
16	-4.70	-0.4	-0.9	0.9
16	-4.90	-0.5	0.0	0.7
17	-4.90	-0.5	0.0	0.7
17	-5.10	-0.4	0.5	0.6
18	-5.10	-0.4	0.5	0.6
18	-5.30	-0.3	0.6	0.6
19	-5.30	-0.3	0.6	0.6
19	-5.50	-0.1	0.5	0.5
20	-5.50	-0.1	0.5	0.5
20	-5.70	-0.1	0.3	0.5
21	-5.70	-0.1	0.3	0.5
21	-5.90	0.0	0.1	0.5
22	-5.90	0.0	0.1	0.5
22	-6.10	0.0	0.0	0.6
Max		-0.5	-2.4	1.8
Max, minor nodes incl.		-0.5	-2.4	1.8

4.8.3 Stresses

Node number	Level [m]	Left				Right			
		Effective stress [kN/m ²]	Water stress [kN/m ²]	Stat* [%]	Mob* [%]	Effective stress [kN/m ²]	Water stress [kN/m ²]	Stat* [%]	Mob* [%]
1	-1.60	0.00	0.00	A		0.14	0.00	1	1
1	-1.80	7.88	0.00	1		4.18	0.00	1	15
2	-1.80	5.55	0.00	1		4.18	0.00	1	15
2	-2.00	11.36	0.00	1		8.08	0.00	1	21
3	-2.00	9.26	0.00	1		8.08	0.00	1	21

Node number	Level [m]	Left				Right			
		Effective stress [kN/m ²]	Water stress [kN/m ²]	Stat*	Mob*	Effective stress [kN/m ²]	Water stress [kN/m ²]	Stat*	Mob*
3	-2.20	14.24	0.00	1		11.76	0.00	1	24
4	-2.20	12.80	0.00	1		11.76	0.00	1	24
4	-2.40	15.09	1.96	1		13.97	1.96	1	26
5	-2.40	14.14	1.96	1		13.97	1.96	1	26
5	-2.60	16.51	3.92	1		15.93	3.92	1	27
6	-2.60	15.40	3.92	1		15.93	3.92	1	27
6	-2.80	17.84	5.89	1		17.66	5.89	1	28
7	-2.80	16.65	5.89	1		17.66	5.89	1	28
7	-3.00	19.13	7.85	1		19.19	7.85	1	28
8	-3.00	17.92	7.85	1		19.19	7.85	1	28
8	-3.20	20.42	9.81	1		20.54	9.81	1	28
9	-3.20	19.16	9.81	1		20.54	9.81	1	28
9	-3.42	21.93	11.94	1		21.79	11.94	1	28
10	-3.42	20.63	11.94	1		21.79	11.94	1	28
10	-3.63	23.50	14.06	1		22.81	14.06	1	27
11	-3.63	22.23	14.06	1		22.81	14.06	1	27
11	-3.85	25.25	16.19	1		23.53	16.19	1	26
12	-3.85	24.01	16.19	1		23.53	16.19	1	26
12	-4.07	27.24	18.31	1		23.94	18.31	1	25
13	-4.07	26.04	18.31	1		23.94	18.31	1	25
13	-4.28	29.47	20.44	1		24.03	20.44	1	24
14	-4.28	28.31	20.44	1		24.03	20.44	1	24
14	-4.50	31.86	22.56	1		23.92	22.56	1	23
15	-4.50	24.63	22.56	A		34.17	22.56	1	30
15	-4.70	26.25	24.52	A		31.83	24.52	1	26
16	-4.70	25.60	24.52	A		31.83	24.52	1	26
16	-4.90	27.16	26.49	A		30.25	26.49	1	23
17	-4.90	26.55	26.49	A		30.25	26.49	1	23
17	-5.10	28.56	28.45	1		29.61	28.45	1	22
18	-5.10	27.58	28.45	1		29.61	28.45	1	22
18	-5.30	30.54	30.41	1		29.79	30.41	1	21
19	-5.30	29.60	30.41	1		29.79	30.41	1	21
19	-5.50	31.93	32.37	1		30.52	32.37	1	20
20	-5.50	31.03	32.37	1		30.52	32.37	1	20
20	-5.70	33.00	34.34	1		31.56	34.34	1	20
21	-5.70	32.13	34.34	1		31.56	34.34	1	20
21	-5.90	33.92	36.30	1		32.72	36.30	1	19
22	-5.90	33.09	36.30	1		32.72	36.30	1	19
22	-6.10	34.78	38.26	1		33.93	38.26	1	19

*

Stat Status (A=active, P=passive, Number is branche, 0 is unloading)
 Mob Percentage passive mobilized

4.8.4 Soil Collapse

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	101.5	100.3
Water	74.6	74.6
Total	176.1	174.9

Considered as passive side

Maximum passive effective resistance

Mobilized passive effective resistance

Percentage mobilized resistance

Position single support

Maximum passive moment

Mobilized passive moment

Right

429.47 kN

100.25 kN

23.3 %

-1.60 m

1214.65 kNm

273.66 kNm

Percentage mobilized moment 22.5 %

4.8.5 Vertical Force Balance

Xi factor 0.72
 Partial material factor 1.20
 Maximum point resistance 0.00 [MPa]
 A maximum point resistance of zero results in a vertical toe capacity of zero

Vertical force balance unplugged	Force [kN]
Vertical force active	-29.90
Vertical force passive	29.71
Resulting vertical force (no dead weight)	-0.19
Vertical toe capacity $F_{toe;d}$	0.00
Vertical toe capacity is sufficient ($0 \leq 0$)	

Vertical force balance plugged	Force [kN]
Vertical force active	-29.90
Vertical force passive	29.71
Resulting vertical force (no dead weight)	-0.19
Vertical toe capacity $F_{toe;d}$	0.00
Vertical toe capacity is sufficient ($0 \leq 0$)	

4.8.6 Vertical Force Balance Contribution per Layer

Left			Right		
Level [m]	Layer name	Contribution [kN]	Level [m]	Layer name	Contribution [kN]
-1.60	Klei, zw. siltig-s...	-14.42	-1.60	Klei, zw. siltig-s...	13.46
-4.50	Zand, zw. siltig-...	-15.47	-4.50	Zand, zw. siltig-...	16.25

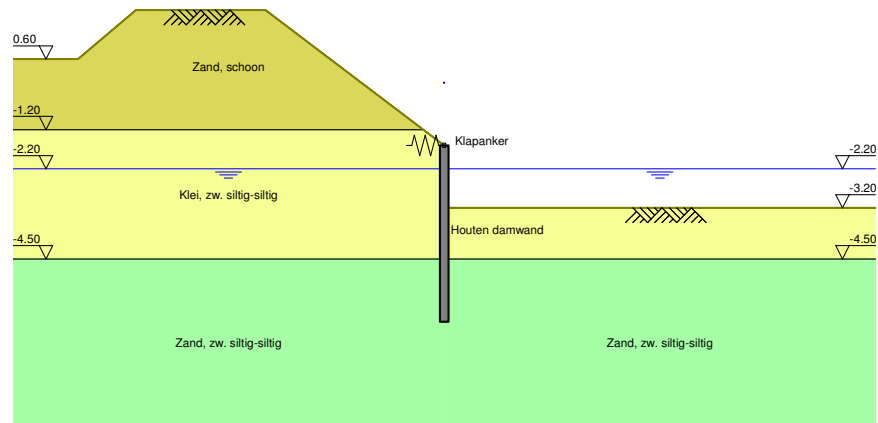
4.8.7 Rigid and Spring Supports

Node number	Level [m]	Force [kN]	Moment [kNm]
1	-1.60	-1.20	0.00

5 Construction Stage 2: Ontgraven sloot

5.1 Outline

Outline - Stage 2: Ontgraven sloot



5.2 General Input Data

5.2.1 Spring Supports

Name	Level [m]	Rotation [kNm/rad/m']	Translation [kN/m/m']
Klapanker	-1.60	0.00000E+00	4.22100E+04

5.3 Input Data Left

5.3.1 Calculation Method

Calculation method: C, phi, delta

5.3.2 Water Level

Water level: -2.20 [m]

5.3.3 Surface

X [m]	Y [m]
0.00	-1.60
6.90	1.85
11.90	1.85
14.15	0.60

5.3.4 Soil Material Properties in Profile: DKM31

Layer name	Level [m]	Unit weight		Cohesion [kN/m²]	Friction angle phi [deg]	Delta friction angle [deg]
		Unsat [kN/m³]	Sat [kN/m³]			
Zand, schoon	2.00	18.00	20.00	0.00	32.50	16.60
Klei, zw. siltig-s...	-1.20	18.00	18.00	5.00	22.50	15.00
Zand, zw. siltig-...	-4.50	18.00	20.00	0.00	27.00	18.00

Layer name	Level [m]	Shell factor [-]	OCR [-]	Grain type
Zand, schoon	2.00	1.00	1.00	Fine
Klei, zw. siltig-s...	-1.20	1.00	1.00	Fine
Zand, zw. siltig-...	-4.50	1.00	1.00	Fine

Layer name	Level [m]	Earth pressure coefficients			Additional pore pressure	
		Active [-]	Neutral [-]	Passive [-]	Top [kN/m²]	Bottom [kN/m²]
Zand, schoon	2.00	n.a.	n.a.	n.a.	0.00	0.00
Klei, zw. siltig-s...	-1.20	n.a.	n.a.	n.a.	0.00	0.00
Zand, zw. siltig-...	-4.50	n.a.	n.a.	n.a.	0.00	0.00

5.3.5 Modulus of Subgrade Reaction (Secant)

Layer name	Level [m]	Branch 1		Branch 2	
		Top [kN/m³]	Bottom [kN/m³]	Top [kN/m³]	Bottom [kN/m³]
Zand, schoon	2.00	20000.00	20000.00	10000.00	10000.00
Klei, zw. siltig-s...	-1.20	5000.00	5000.00	2500.00	2500.00
Zand, zw. siltig-...	-4.50	16000.00	16000.00	8000.00	8000.00

Layer name	Level [m]	Branch 3	
		Top [kN/m³]	Bottom [kN/m³]
Zand, schoon	2.00	5000.00	5000.00
Klei, zw. siltig-s...	-1.20	1250.00	1250.00
Zand, zw. siltig-...	-4.50	4000.00	4000.00

5.4 Calculated Earth Pressure Coefficients Left

Segment number	Level [m]	Horizontal pressure		Fictive earth pressure coefficients		
		Active [kN/m²]	Passive [kN/m²]	Ka [-]	Ko [-]	Kp [-]
1	-1.70	0.0	100.3	0.00	2.07	41.92
2	-1.90	0.0	129.6	0.00	1.58	18.19
3	-2.10	0.0	231.9	0.00	1.36	19.55
4	-2.30	0.0	332.1	0.00	1.26	21.27
5	-2.50	0.0	427.2	0.00	1.20	23.24
6	-2.70	0.0	522.1	0.00	1.15	24.70
7	-2.90	0.0	616.8	0.00	1.09	25.83
8	-3.10	8.1	698.2	0.31	1.05	26.23
9	-3.31	11.0	497.9	0.37	1.00	16.91
10	-3.52	13.0	414.0	0.40	0.96	12.79

Segment number	Level [m]	Horizontal pressure		Fictive earth pressure coefficients		
		Active [kN/m ²]	Passive [kN/m ²]	Ka [-]	Ko [-]	Kp [-]
11	-3.74	15.0	243.5	0.42	0.92	6.90
12	-3.96	16.9	203.6	0.44	0.89	5.34
13	-4.17	18.7	208.1	0.46	0.86	5.08
14	-4.39	20.1	212.7	0.46	0.83	4.85
15	-4.60	25.4	229.6	0.54	0.76	4.91
16	-4.80	26.4	246.2	0.53	0.73	4.96
17	-5.00	27.3	265.6	0.52	0.71	5.05
18	-5.20	28.2	284.7	0.51	0.70	5.13
19	-5.40	29.1	303.7	0.50	0.68	5.20
20	-5.60	30.0	322.7	0.49	0.67	5.27
21	-5.80	30.9	341.8	0.48	0.65	5.33
22	-6.00	31.7	361.0	0.47	0.64	5.39

5.5 Calculated Force from a layer Left

Name	Force
Zand, schoon	0.00
Klei, zw. siltig-siltig	0.00
Zand, zw. siltig-siltig	45.81

5.6 Input Data Right

5.6.1 Calculation Method

Calculation method: Ka, Ko, Kp

5.6.2 Water Level

Water level: -2.20 [m]

5.6.3 Surface

X [m]	Y [m]
0.00	-3.20

5.6.4 Soil Material Properties in Profile: DKM31

Layer name	Level [m]	Unit weight		Cohesion [kN/m ²]	Friction angle phi [deg]	Delta friction angle [deg]
		Unsat [kN/m ³]	Sat [kN/m ³]			
Zand, schoon	2.00	18.00	20.00	0.00	32.50	16.60
Klei, zw. siltig-s...	-1.20	18.00	18.00	5.00	22.50	15.00
Zand, zw. siltig-...	-4.50	18.00	20.00	0.00	27.00	18.00

Layer name	Level [m]	Shell factor [-]	OCR [-]	Grain type
Zand, schoon	2.00	1.00	1.00	Fine
Klei, zw. siltig-s...	-1.20	1.00	1.00	Fine
Zand, zw. siltig-...	-4.50	1.00	1.00	Fine

Layer name	Level [m]	Earth pressure coefficients			Additional pore pressure	
		Active [-]	Neutral [-]	Passive [-]	Top [kN/m ²]	Bottom [kN/m ²]
Zand, schoon	2.00	0.26	0.46	5.46	0.00	0.00
Klei, zw. siltig-s...	-1.20	0.39	0.62	2.96	0.00	0.00
Zand, zw. siltig-...	-4.50	0.32	0.55	3.84	0.00	0.00

5.6.5 Modulus of Subgrade Reaction (Secant)

Layer name	Level [m]	Branch 1		Branch 2	
		Top [kN/m ³]	Bottom [kN/m ³]	Top [kN/m ³]	Bottom [kN/m ³]
Zand, schoon	2.00	20000.00	20000.00	10000.00	10000.00
Klei, zw. siltig-s...	-1.20	5000.00	5000.00	2500.00	2500.00
Zand, zw. siltig-...	-4.50	16000.00	16000.00	8000.00	8000.00

Layer name	Level [m]	Branch 3	
		Top [kN/m ³]	Bottom [kN/m ³]
Zand, schoon	2.00	5000.00	5000.00
Klei, zw. siltig-s...	-1.20	1250.00	1250.00
Zand, zw. siltig-...	-4.50	4000.00	4000.00

5.7 Calculated Force from a layer Right

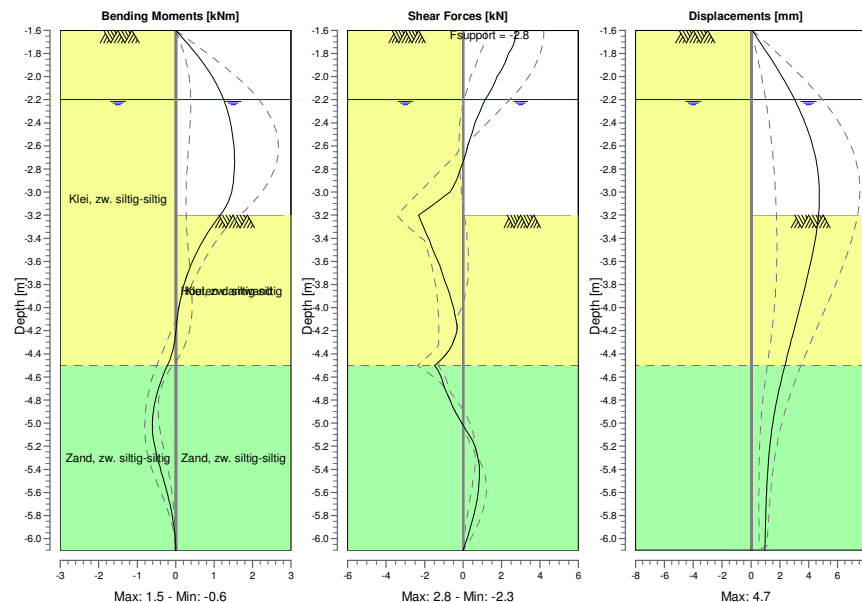
Name	Force
Zand, schoon	0.00
Klei, zw. siltig-siltig	0.00
Zand, zw. siltig-siltig	47.29

5.8 Calculation Results

Number of iterations: 5

5.8.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: Ontgraven sloot



5.8.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	-1.60	0.0	2.8	0.1
1	-1.80	0.5	2.4	1.1
2	-1.80	0.5	2.4	1.1
2	-2.00	1.0	1.8	2.1
3	-2.00	1.0	1.8	2.1
3	-2.20	1.2	1.2	3.0
4	-2.20	1.2	1.2	3.0
4	-2.40	1.4	0.6	3.7
5	-2.40	1.4	0.6	3.7
5	-2.60	1.5	0.2	4.3
6	-2.60	1.5	0.2	4.3
6	-2.80	1.5	-0.1	4.6
7	-2.80	1.5	-0.1	4.6
7	-3.00	1.5	-0.7	4.7
8	-3.00	1.5	-0.7	4.7
8	-3.20	1.2	-2.3	4.7
9	-3.20	1.2	-2.3	4.7
9	-3.42	0.7	-1.7	4.4
10	-3.42	0.7	-1.7	4.4
10	-3.63	0.4	-1.2	4.1
11	-3.63	0.4	-1.2	4.1
11	-3.85	0.2	-0.8	3.7
12	-3.85	0.2	-0.8	3.7
12	-4.07	0.1	-0.4	3.2
13	-4.07	0.1	-0.4	3.2
13	-4.28	0.0	-0.5	2.8
14	-4.28	0.0	-0.5	2.8
14	-4.50	-0.2	-1.5	2.3
15	-4.50	-0.2	-1.5	2.3
15	-4.70	-0.4	-0.9	2.0
16	-4.70	-0.4	-0.9	2.0
16	-4.90	-0.6	-0.4	1.6
17	-4.90	-0.6	-0.4	1.6
17	-5.10	-0.6	0.3	1.4
18	-5.10	-0.6	0.3	1.4
18	-5.30	-0.5	0.8	1.2
19	-5.30	-0.5	0.8	1.2
19	-5.50	-0.3	0.8	1.1
20	-5.50	-0.3	0.8	1.1
20	-5.70	-0.2	0.7	1.0
21	-5.70	-0.2	0.7	1.0
21	-5.90	0.0	0.4	1.0
22	-5.90	0.0	0.4	1.0
22	-6.10	0.0	0.0	1.0
Max		1.5	2.8	4.7
Max, minor nodes incl.		1.5	2.8	4.7

5.8.3 Stresses

Node number	Level [m]	Left				Right			
		Effective stress [kN/m²]	Water stress [kN/m²]	Stat* [%]	Mob* [%]	Effective stress [kN/m²]	Water stress [kN/m²]	Stat* [%]	Mob* [%]
1	-1.60	0.00	0.00	A		0.00	0.00	-	
1	-1.80	4.14	0.00	1		0.00	0.00	-	
2	-1.80	1.81	0.00	1		0.00	0.00	-	
2	-2.00	4.27	0.00	1		0.00	0.00	-	
3	-2.00	2.16	0.00	1		0.00	0.00	-	

Node number	Level [m]	Left				Right			
		Effective stress [kN/m²]	Water stress [kN/m²]	Stat*	Mob*	Effective stress [kN/m²]	Water stress [kN/m²]	Stat*	Mob*
3	-2.20	4.19	0.00	1		0.00	0.00	-	
4	-2.20	2.75	0.00	1		0.00	0.00	-	
4	-2.40	2.64	1.96	1		0.00	1.96	-	
5	-2.40	1.69	1.96	1		0.00	1.96	-	
5	-2.60	2.36	3.92	1		0.00	3.92	-	
6	-2.60	1.25	3.92	1		0.00	3.92	-	
6	-2.80	2.75	5.89	1		0.00	5.89	-	
7	-2.80	1.57	5.89	1		0.00	5.89	-	
7	-3.00	3.92	7.85	1		0.00	7.85	-	
8	-3.00	7.71	7.85	A		0.00	7.85	-	
8	-3.20	8.54	9.81	A		0.00	9.81	-	
9	-3.20	10.47	9.81	A		12.79	9.81	2	74
9	-3.42	11.57	11.94	A		14.52	11.94	2	65
10	-3.42	12.40	11.94	A		14.52	11.94	2	65
10	-3.63	13.57	14.06	A		16.25	14.06	2	59
11	-3.63	14.34	14.06	A		16.25	14.06	2	59
11	-3.85	15.56	16.19	A		17.90	16.19	2	54
12	-3.85	16.27	16.19	A		17.90	16.19	2	54
12	-4.07	18.88	18.31	1		19.51	18.31	2	51
13	-4.07	18.09	18.31	A		19.51	18.31	2	51
13	-4.28	22.35	20.44	1		19.43	20.44	1	45
14	-4.28	21.19	20.44	1		19.43	20.44	1	45
14	-4.50	25.74	22.56	1		18.31	22.56	1	38
15	-4.50	24.63	22.56	A		29.14	22.56	2	71
15	-4.70	26.25	24.52	A		28.19	24.52	2	58
16	-4.70	25.60	24.52	A		28.19	24.52	2	58
16	-4.90	27.16	26.49	A		29.93	26.49	2	53
17	-4.90	26.55	26.49	A		29.93	26.49	2	53
17	-5.10	28.06	28.45	A		31.46	28.45	1	49
18	-5.10	27.48	28.45	A		31.46	28.45	1	49
18	-5.30	28.95	30.41	A		29.84	30.41	1	41
19	-5.30	28.40	30.41	A		29.84	30.41	1	41
19	-5.50	29.83	32.37	A		29.21	32.37	1	36
20	-5.50	29.30	32.37	A		29.21	32.37	1	36
20	-5.70	30.70	34.34	A		29.24	34.34	1	33
21	-5.70	30.20	34.34	A		29.24	34.34	1	33
21	-5.90	31.56	36.30	A		29.60	36.30	1	31
22	-5.90	31.08	36.30	A		29.60	36.30	1	31
22	-6.10	32.41	38.26	A		30.06	38.26	1	29

*

Stat Status (A=active, P=passive, Number is branche, 0 is unloading)
 Mob Percentage passive mobilized

5.8.4 Soil Collapse

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	72.5	69.7
Water	74.6	74.6
Total	147.1	144.3

Considered as passive side

Maximum passive effective resistance

Mobilized passive effective resistance

Percentage mobilized resistance

Position single support

Maximum passive moment

Mobilized passive moment

Right

158.43 kN

69.70 kN

44.0 %

-1.60 m

541.86 kNm

226.55 kNm

Percentage mobilized moment 41.8 %

5.8.5 Vertical Force Balance

Xi factor 0.72
 Partial material factor 1.20
 Maximum point resistance 0.00 [MPa]
 A maximum point resistance of zero results in a vertical toe capacity of zero

Vertical force balance unplugged	Force [kN]
Vertical force active	-22.03
Vertical force passive	21.37
Resulting vertical force (no dead weight)	-0.66
Vertical toe capacity $F_{toe;d}$	0.00
Vertical toe capacity is not sufficient ($1 > 0$)	

Vertical force balance plugged	Force [kN]
Vertical force active	-22.03
Vertical force passive	21.37
Resulting vertical force (no dead weight)	-0.66
Vertical toe capacity $F_{toe;d}$	0.00
Vertical toe capacity is not sufficient ($1 > 0$)	

5.8.6 Vertical Force Balance Contribution per Layer

Left			Right		
Level [m]	Layer name	Contribution [kN]	Level [m]	Layer name	Contribution [kN]
-1.60	Klei, zw. siltig-s...	-7.14	-3.20	Klei, zw. siltig-s...	6.01
-4.50	Zand, zw. siltig-...	-14.89	-4.50	Zand, zw. siltig-...	15.36

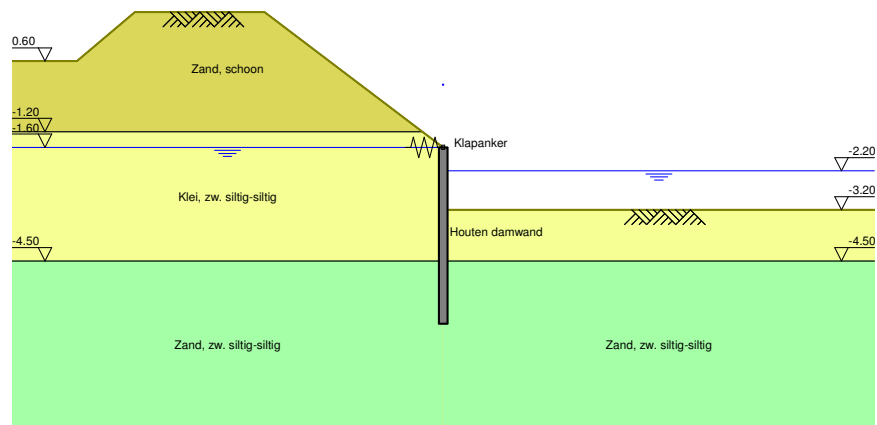
5.8.7 Rigid and Spring Supports

Node number	Level [m]	Force [kN]	Moment [kNm]
1	-1.60	-2.77	0.00

6 Construction Stage 3: Waterstandsverschil

6.1 Outline

Outline - Stage 3: Waterstandsverschil



6.2 General Input Data

6.2.1 Spring Supports

Name	Level [m]	Rotation [kNm/rad/m']	Translation [kN/m/m']
Klapanker	-1.60	0.00000E+00	4.22100E+04

6.3 Input Data Left

6.3.1 Calculation Method

Calculation method: C, phi, delta

6.3.2 Water Level

Water level: -1.60 [m]

6.3.3 Surface

X [m]	Y [m]
0.00	-1.60
6.90	1.85
11.90	1.85
14.15	0.60

6.3.4 Soil Material Properties in Profile: DKM31

Layer name	Level [m]	Unit weight		Cohesion [kN/m²]	Friction angle phi [deg]	Delta friction angle [deg]
		Unsat [kN/m³]	Sat [kN/m³]			
Zand, schoon	2.00	18.00	20.00	0.00	32.50	16.60
Klei, zw. siltig-s...	-1.20	18.00	18.00	5.00	22.50	15.00
Zand, zw. siltig-...	-4.50	18.00	20.00	0.00	27.00	18.00

Layer name	Level [m]	Shell factor [-]	OCR [-]	Grain type
Zand, schoon	2.00	1.00	1.00	Fine
Klei, zw. siltig-s...	-1.20	1.00	1.00	Fine
Zand, zw. siltig-...	-4.50	1.00	1.00	Fine

Layer name	Level [m]	Earth pressure coefficients			Additional pore pressure	
		Active [-]	Neutral [-]	Passive [-]	Top [kN/m²]	Bottom [kN/m²]
Zand, schoon	2.00	n.a.	n.a.	n.a.	0.00	0.00
Klei, zw. siltig-s...	-1.20	n.a.	n.a.	n.a.	0.00	0.00
Zand, zw. siltig-...	-4.50	n.a.	n.a.	n.a.	0.00	0.00

6.3.5 Modulus of Subgrade Reaction (Secant)

Layer name	Level [m]	Branch 1		Branch 2	
		Top [kN/m³]	Bottom [kN/m³]	Top [kN/m³]	Bottom [kN/m³]
Zand, schoon	2.00	20000.00	20000.00	10000.00	10000.00
Klei, zw. siltig-s...	-1.20	5000.00	5000.00	2500.00	2500.00
Zand, zw. siltig-...	-4.50	16000.00	16000.00	8000.00	8000.00

Layer name	Level [m]	Branch 3	
		Top [kN/m³]	Bottom [kN/m³]
Zand, schoon	2.00	5000.00	5000.00
Klei, zw. siltig-s...	-1.20	1250.00	1250.00
Zand, zw. siltig-...	-4.50	4000.00	4000.00

6.4 Calculated Earth Pressure Coefficients Left

Segment number	Level [m]	Horizontal pressure		Fictive earth pressure coefficients		
		Active [kN/m²]	Passive [kN/m²]	Ka [-]	Ko [-]	Kp [-]
1	-1.70	0.0	95.7	0.00	3.08	67.82
2	-1.90	0.0	117.7	0.00	2.26	28.14
3	-2.10	0.0	212.0	0.00	1.88	30.48
4	-2.30	0.0	308.6	0.00	1.64	31.72
5	-2.50	0.0	403.9	0.00	1.48	32.32
6	-2.70	0.0	498.8	0.00	1.35	32.70
7	-2.90	0.0	593.6	0.00	1.25	32.98
8	-3.10	0.0	681.1	0.00	1.17	32.85
9	-3.31	3.8	489.2	0.16	1.10	20.77
10	-3.52	11.0	398.0	0.42	1.03	15.03

Segment number	Level [m]	Horizontal pressure		Fictive earth pressure coefficients		
		Active [kN/m ²]	Passive [kN/m ²]	Ka [-]	Ko [-]	Kp [-]
11	-3.74	13.0	214.2	0.44	0.98	7.29
12	-3.96	14.9	183.9	0.46	0.94	5.70
13	-4.17	16.5	188.6	0.47	0.90	5.37
14	-4.39	17.9	193.3	0.47	0.86	5.10
15	-4.60	23.7	203.5	0.58	0.79	4.98
16	-4.80	24.6	221.7	0.56	0.76	5.06
17	-5.00	25.5	241.2	0.55	0.74	5.16
18	-5.20	26.4	260.2	0.53	0.71	5.24
19	-5.40	27.3	279.0	0.52	0.70	5.31
20	-5.60	28.2	297.8	0.51	0.68	5.38
21	-5.80	29.0	316.6	0.50	0.66	5.44
22	-6.00	29.9	335.5	0.49	0.65	5.50

6.5 Calculated Force from a layer Left

Name	Force
Zand, schoon	0.00
Klei, zw. siltig-siltig	0.00
Zand, zw. siltig-siltig	42.93

6.6 Input Data Right

6.6.1 Calculation Method

Calculation method: Ka, Ko, Kp

6.6.2 Water Level

Water level: -2.20 [m]

6.6.3 Surface

X [m]	Y [m]
0.00	-3.20

6.6.4 Soil Material Properties in Profile: DKM31

Layer name	Level [m]	Unit weight		Cohesion [kN/m ²]	Friction angle phi [deg]	Delta friction angle [deg]
		Unsat [kN/m ³]	Sat [kN/m ³]			
Zand, schoon	2.00	18.00	20.00	0.00	32.50	16.60
Klei, zw. siltig-s...	-1.20	18.00	18.00	5.00	22.50	15.00
Zand, zw. siltig-...	-4.50	18.00	20.00	0.00	27.00	18.00

Layer name	Level [m]	Shell factor [-]	OCR [-]	Grain type
Zand, schoon	2.00	1.00	1.00	Fine
Klei, zw. siltig-s...	-1.20	1.00	1.00	Fine
Zand, zw. siltig-...	-4.50	1.00	1.00	Fine

Layer name	Level [m]	Earth pressure coefficients			Additional pore pressure	
		Active [-]	Neutral [-]	Passive [-]	Top [kN/m ²]	Bottom [kN/m ²]
Zand, schoon	2.00	0.26	0.46	5.46	0.00	0.00
Klei, zw. siltig-s...	-1.20	0.39	0.62	2.96	0.00	0.00
Zand, zw. siltig-...	-4.50	0.32	0.55	3.84	0.00	0.00

6.6.5 Modulus of Subgrade Reaction (Secant)

Layer name	Level [m]	Branch 1		Branch 2	
		Top [kN/m ³]	Bottom [kN/m ³]	Top [kN/m ³]	Bottom [kN/m ³]
Zand, schoon	2.00	20000.00	20000.00	10000.00	10000.00
Klei, zw. siltig-s...	-1.20	5000.00	5000.00	2500.00	2500.00
Zand, zw. siltig-...	-4.50	16000.00	16000.00	8000.00	8000.00

Layer name	Level [m]	Branch 3	
		Top [kN/m ³]	Bottom [kN/m ³]
Zand, schoon	2.00	5000.00	5000.00
Klei, zw. siltig-s...	-1.20	1250.00	1250.00
Zand, zw. siltig-...	-4.50	4000.00	4000.00

6.7 Calculated Force from a layer Right

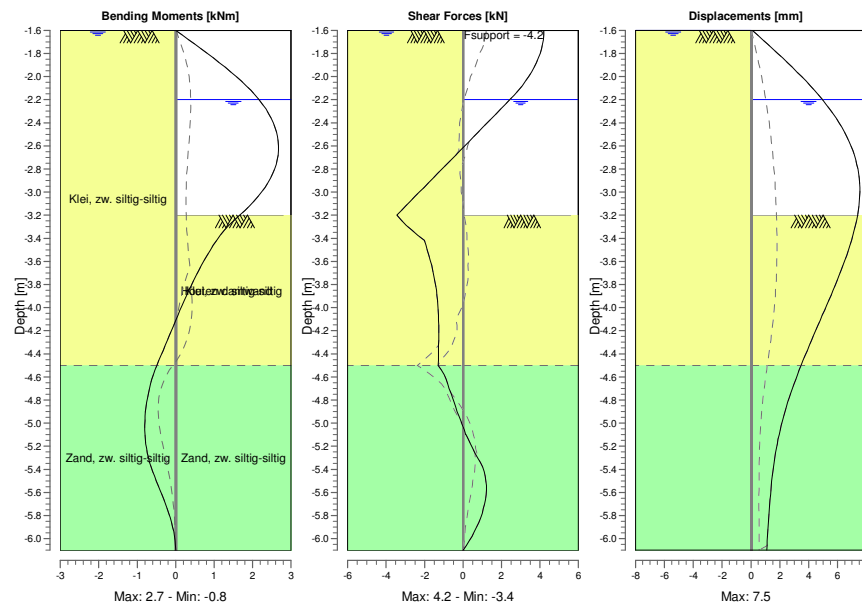
Name	Force
Zand, schoon	0.00
Klei, zw. siltig-siltig	0.00
Zand, zw. siltig-siltig	53.64

6.8 Calculation Results

Number of iterations: 4

6.8.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: Waterstandsverschil



6.8.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	-1.60	0.0	4.2	0.1
1	-1.80	0.8	4.0	1.9
2	-1.80	0.8	4.0	1.9
2	-2.00	1.6	3.4	3.5
3	-2.00	1.6	3.4	3.5
3	-2.20	2.2	2.4	4.9
4	-2.20	2.2	2.4	4.9
4	-2.40	2.5	1.3	6.1
5	-2.40	2.5	1.3	6.1
5	-2.60	2.7	0.1	6.9
6	-2.60	2.7	0.1	6.9
6	-2.80	2.6	-1.1	7.4
7	-2.80	2.6	-1.1	7.4
7	-3.00	2.2	-2.3	7.5
8	-3.00	2.2	-2.3	7.5
8	-3.20	1.7	-3.4	7.4
9	-3.20	1.7	-3.4	7.4
9	-3.42	1.1	-2.0	7.0
10	-3.42	1.1	-2.0	7.0
10	-3.63	0.7	-1.6	6.4
11	-3.63	0.7	-1.6	6.4
11	-3.85	0.3	-1.4	5.7
12	-3.85	0.3	-1.4	5.7
12	-4.07	0.1	-1.3	4.9
13	-4.07	0.1	-1.3	4.9
13	-4.28	-0.2	-1.3	4.2
14	-4.28	-0.2	-1.3	4.2
14	-4.50	-0.5	-1.3	3.5
15	-4.50	-0.5	-1.3	3.5
15	-4.70	-0.7	-0.7	2.9
16	-4.70	-0.7	-0.7	2.9
16	-4.90	-0.8	-0.3	2.4
17	-4.90	-0.8	-0.3	2.4
17	-5.10	-0.8	0.1	2.0
18	-5.10	-0.8	0.2	2.0
18	-5.30	-0.7	0.8	1.6
19	-5.30	-0.7	0.8	1.6
19	-5.50	-0.5	1.2	1.4
20	-5.50	-0.5	1.2	1.4
20	-5.70	-0.3	1.1	1.3
21	-5.70	-0.3	1.1	1.3
21	-5.90	-0.1	0.7	1.2
22	-5.90	-0.1	0.7	1.2
22	-6.10	0.0	0.0	1.1
Max		2.7	4.2	7.5
Max, minor nodes incl.		2.7	4.2	7.5

6.8.3 Stresses

Node number	Level [m]	Left				Right			
		Effective stress [kN/m ²]	Water stress [kN/m ²]	Stat* [%]	Mob* [%]	Effective stress [kN/m ²]	Water stress [kN/m ²]	Stat* [%]	Mob* [%]
1	-1.60	0.00	0.00	A		0.00	0.00	-	
1	-1.80	0.00	1.96	A		0.00	0.00	-	
2	-1.80	0.00	1.96	A		0.00	0.00	-	
2	-2.00	0.00	3.92	A		0.00	0.00	-	
3	-2.00	0.00	3.92	A		0.00	0.00	-	

Node number	Level [m]	Left				Right			
		Effective stress [kN/m²]	Water stress [kN/m²]	Stat*	Mob*	Effective stress [kN/m²]	Water stress [kN/m²]	Stat*	Mob*
3	-2.20	0.00	5.89	A		0.00	0.00	-	
4	-2.20	0.00	5.89	A		0.00	0.00	-	
4	-2.40	0.00	7.85	A		0.00	1.96	-	
5	-2.40	0.00	7.85	A		0.00	1.96	-	
5	-2.60	0.00	9.81	A		0.00	3.92	-	
6	-2.60	0.00	9.81	A		0.00	3.92	-	
6	-2.80	0.00	11.77	A		0.00	5.89	-	
7	-2.80	0.00	11.77	A		0.00	5.89	-	
7	-3.00	0.00	13.73	A		0.00	7.85	-	
8	-3.00	0.00	13.73	A		0.00	7.85	-	
8	-3.20	0.00	15.70	A		0.00	9.81	-	
9	-3.20	3.54	15.70	A		14.59	9.81	3	85
9	-3.42	4.01	17.82	A		17.96	11.94	2	80
10	-3.42	10.40	17.82	A		17.96	11.94	2	80
10	-3.63	11.61	19.95	A		19.37	14.06	2	70
11	-3.63	12.33	19.95	A		19.37	14.06	2	70
11	-3.85	13.61	22.07	A		20.64	16.19	2	63
12	-3.85	14.26	22.07	A		20.64	16.19	2	63
12	-4.07	15.58	24.20	A		21.83	18.31	2	57
13	-4.07	15.84	24.20	A		21.83	18.31	2	57
13	-4.28	17.17	26.32	A		23.01	20.44	2	53
14	-4.28	17.19	26.32	A		23.01	20.44	2	53
14	-4.50	18.52	28.45	A		23.92	22.56	1	49
15	-4.50	22.82	28.45	A		33.13	22.56	3	81
15	-4.70	24.54	30.41	A		32.14	24.52	2	66
16	-4.70	23.77	30.41	A		32.14	24.52	2	66
16	-4.90	25.43	32.37	A		33.06	26.49	2	58
17	-4.90	24.71	32.37	A		33.06	26.49	2	58
17	-5.10	26.31	34.34	A		34.43	28.45	2	53
18	-5.10	25.64	34.34	A		34.43	28.45	2	53
18	-5.30	27.18	36.30	A		36.26	30.41	2	50
19	-5.30	26.55	36.30	A		36.26	30.41	2	50
19	-5.50	28.05	38.26	A		34.37	32.37	1	43
20	-5.50	27.45	38.26	A		34.37	32.37	1	43
20	-5.70	28.90	40.22	A		33.17	34.34	1	38
21	-5.70	28.34	40.22	A		33.17	34.34	1	38
21	-5.90	29.75	42.18	A		32.54	36.30	1	34
22	-5.90	29.22	42.18	A		32.54	36.30	1	34
22	-6.10	30.59	44.15	A		32.09	38.26	1	31

*

Stat Status (A=active, P=passive, Number is branche, 0 is unloading)
 Mob Percentage passive mobilized

6.8.4 Soil Collapse

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	59.6	80.1
Water	99.3	74.6
Total	158.9	154.7

Considered as passive side

Maximum passive effective resistance

Mobilized passive effective resistance

Percentage mobilized resistance

Position single support

Maximum passive moment

Mobilized passive moment

Right

158.43 kN

80.12 kN

50.6 %

-1.60 m

541.86 kNm

259.25 kNm

Percentage mobilized moment 47.8 %

6.8.5 Vertical Force Balance

Xi factor 0.72
 Partial material factor 1.20
 Maximum point resistance 0.00 [MPa]
 A maximum point resistance of zero results in a vertical toe capacity of zero

Vertical force balance unplugged	Force [kN]
Vertical force active	-18.42
Vertical force passive	24.52
Resulting vertical force (no dead weight)	6.10
Vertical toe capacity $F_{toe;d}$	0.00
Resultant goes up	

Vertical force balance plugged	Force [kN]
Vertical force active	-18.42
Vertical force passive	24.52
Resulting vertical force (no dead weight)	6.10
Vertical toe capacity $F_{toe;d}$	0.00
Resultant goes up	

6.8.6 Vertical Force Balance Contribution per Layer

Left			Right		
Level [m]	Layer name	Contribution [kN]	Level [m]	Layer name	Contribution [kN]
-1.60	Klei, zw. siltig-s...	-4.47	-3.20	Klei, zw. siltig-s...	7.10
-4.50	Zand, zw. siltig-...	-13.95	-4.50	Zand, zw. siltig-...	17.43

6.8.7 Rigid and Spring Supports

Node number	Level [m]	Force [kN]	Moment [kNm]
1	-1.60	-4.21	0.00

End of Report