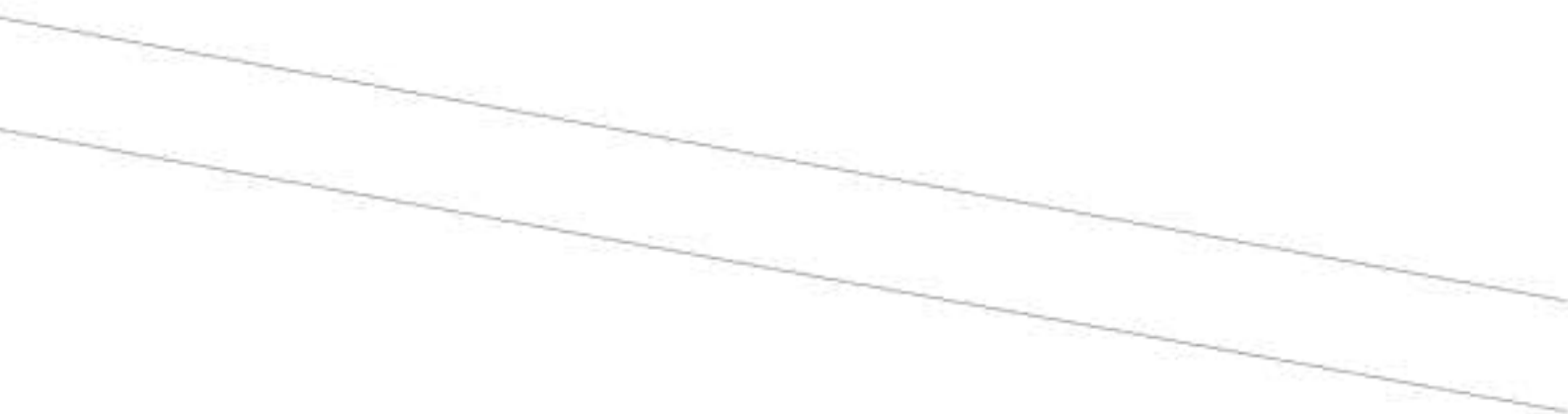




is d.m.v. flens verbinding

P +0.10 m
P -11.00 m



Notitie / Memo

HaskoningDHV Nederland B.V.
Mobility & Infrastructure

Aan: Waterschap Hollandse Delta
Van: [REDACTED] [REDACTED]
Datum: 23 augustus 2024
Kopie: -
Ons kenmerk: BG8369-RHD-XX-XX-ME-C-0003
Classificatie: Projectgerelateerd
Gecontroleerd door [REDACTED]
Vrijgegeven door [REDACTED]

Onderwerp: Onderbouwing damwand t.b.v. duikerkruising Strijenseweg te 's-Gravendeel

1 Aanleiding

De gemeente Hoeksche Waard is voornemens om een duikerkruising aan te leggen waardoor de wateroverlast in de kern 's-Gravendeel wordt verminderd. Deze duikerkruising kruist de Strijenseweg welke onderdeel is van een waterkering in beheer bij het Waterschap Hollandse Delta.

Gedurende de werkvoorbereiding hebben er diverse overlegmomenten plaatsgevonden met [REDACTED], vergunningverlener vanuit het Waterschap Hollandse Delta. Gedurende deze gesprekken is gesproken over de mogelijke wijze van uitvoering en een toelichting op het project. De uitkomst van deze afstemming is dat de kruising van de Strijenseweg wordt gemaakt door middel van een gesloten frontboring.

2 Toelichting

Voor het uitvoeren van de duikerkruising middels een gesloten frontboring (GFT) dienen er een tweetal bouwkuipen in de vorm van ontvangst- en een perskuip gerealiseerd te worden. Voor de engineering van de boring en de bijbehorende bouwkuipen is er een aanvullend geotechnisch advies opgesteld.

Gedurende gesprekken met de vergunningverlener [REDACTED] van het Waterschap Hollandse Delta is er gesproken over damwanden die moeten worden toegepast binnen de beschermingszone van de waterkering.

Het traditioneel aanleggen van de duiker middels een open ontgraving heeft constructieve schade tot gevolg aan belendende constructies, zoals de gemetselde garage en houten schuur bij de huisnummers 43 en 102. Er wordt dan ook geadviseerd in het geotechnisch advies om te werken met een damwandkuip en de damwanden grenzend aan de belendende constructie na afloop van de werkzaamheden niet te trekken. De verstoring van de ondergrond is te groot als gevolg van het trekken van de damwanden en staat dit niet toe.

Het geotechnisch advies schrijft ook een onderwaterbetonvloer voor in de bouwkuipen. Dit is het gevolg van de keuze om te werken met een waterdichte kuip en om opbarsten in de kuip ten opzichte van de aanwezige waterdruk te voorkomen. Uit de constructieve berekening is gebleken dat deze onderwaterbetonvloer bevestigd dient te worden aan de damwanden. Dit heeft tot gevolg dat de damwanden van de constructie niet getrokken kunnen worden en dus na afloop van de werkzaamheden blijven staan. Afwerking van het geheel vindt plaats door de damwanden af te branden tot het maaiveld

min 1 meter en vervolgens afdekken met gebiedseigen grond welke is vrijgekomen uit de ontgraving. Na afronding van de werkzaamheden dient de waterkering weer te worden hersteld maar met het achterlaten van de damwanden. De functionaliteit van de waterkering zal hierdoor niet verstoord zijn gezien het feit dat het een waterdichte constructie betreft.

Vergunningen

Ten aanzien van de aan te vragen vergunningen dienen de volgende activiteiten te worden aangevraagd:

- Technische bouwactiviteit (Artikel 5.1 lid 2 onder a Omgevingswet), voorts geldt ook Afdeling 3.2 Veiligheid, waaronder Bbl, Art. 3.8 t/m 3.34 Constructieve gegevens van de bouwwerken. Hierin dient de weerstand tegen opbarsten en verdere constructieve veiligheid van de betonnen dekvloer te worden aangetoond.
- Dergelijke activiteit moet worden aangemeld bij [REDACTED] en tevens worden ingediend bij Waterschap Hollandse Delta.
- Aanlegactiviteit Omgevingswet (Artikel 5.1, lid 2 Omgevingswet, voorts artikel 2.49, lid 4 Waterschapsverordening Hollandse Delta).
- Wateractiviteit ten behoeve van dempen en graven (artikel 2.74. lid 5 waterschapsverordening)
- Ook geldt de specifieke zorgplicht (Artikel 3.4 Waterschapsverordening) om ongewenste lozingen, ten gevolge van de werkzaamheden, in het oppervlaktewater te voorkomen
- Milieubelastende activiteit (zie ook: Artikel 22.42 lid c Omgevingsplan [REDACTED]), aangaande het afbranden van de damwanden tot het maaiveld.

Voor het gehele project geldt dat de stikstofemissie moet worden bepaald in de verdere werkvoorbereiding, om te bepalen of er een Natura 2000-activiteit moet worden vergund.

3 Resultaten

Ter onderbouwing verwijzen we u graag naar de volgende documenten welke tevens zijn toegevoegd aan de vergunningaanvraag:

- Bijlage 1: Geotechnisch advies
Bijlage 2: Constructieve berekening
Bijlage 3: Definitief Ontwerp

Toelichting grondslagen

In dit document kunt u secties vinden die onleesbaar zijn gemaakt. Deze informatie is achterwege gelaten op basis van de Wet open overheid (Woo). De letter die hierbij is vermeld correspondeert met de bijbehorende grondslag in onderstaand overzicht.

J Art. 5.1 lid 2 sub e

Het belang van de openbaarmaking van deze informatie weegt niet op tegen het belang van de eerbiediging van de persoonlijke levenssfeer van betrokkenen

RAPPORT

Ontwerp pers- en ontvangstuip duikerkruising Strijenseweg 's Gravendeel

Definitief Ontwerp

Klant: Gemeente Hoeksche Waard

Referentie: BG8369-RHD-XX-ZZ-RP-GE-0001

Status: Definitief/1

Datum: 27 juni 2024

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Titel document: Ontwerp pers- en ontvangstuip duikerkruising Strijenseweg 's Gravendeel

Sub titel: Definitief Ontwerp
Referentie: BG8369-RHD-XX-ZZ-RP-GE-0001
Status: 1/Definitief
Datum: 27 juni 2024
Projectnaam: Duikerkruising Strijenseweg
Projectnummer: BG8369
Auteur(s): [Redacted] J
Opgesteld door: [Redacted] J [Redacted] J
Gecontroleerd door: [Redacted] J [Redacted] J
Datum: 27-06-2024
Goedgekeurd door: [Redacted] J
Datum: 27-6-2024

Classificatie

Projectgerelateerd

Behoudens andersluidende afspraken met de Opdrachtgever, mag niets uit dit document worden verveelvoudigd of openbaar gemaakt of worden gebruikt voor een ander doel dan waarvoor het document is vervaardigd. HaskoningDHV Nederland B.V. aanvaardt geen enkele verantwoordelijkheid of aansprakelijkheid voor dit document, anders dan jegens de Opdrachtgever.

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Appendix B Dsheetpiling berekening
Appendix C verticaal evenwichtsberekening
Appendix D schade indicatie berekening

1 Inleiding

1.1 Algemene projectinformatie

In het kader van het project Duikerkruising te Strijenseweg, 's Gravendeel wordt in opdracht van Gemeente Hoeksche Waard door Royal HaskoningDHV (RHDHV) de engineering uitgevoerd voor een duikerkruising om twee peilgebieden te verbinden. Deze kruising is door middel van een horizontale boring en voor deze boring zijn een pers- en ontvangstuip noodzakelijk.

In deze reportage zijn de uitgangspunten, berekeningen en vervolgstappen van het ontwerp van beide bouwkuipen behandeld. De horizontale boring zelf wordt buiten beschouwing gehouden.

1.2 Doel van het document

In voorliggend rapport is ten behoeve van het Definitief Ontwerp (DO) van de bouwkuipen. Het bouwkuipadvies bestaat uit de volgende onderdelen:

- Referenties en uitgangspunten;
- Raakvlakken en risico's;
- Grondonderzoeken en grondwaterstanden;
- Bepalen bouwkuipfasering;
- Bepalen verticaal evenwicht met onderwaterbetonvloer;
- Bepalen stabiliteit en benodigde damwanden;
- Bepalen schadeverwachting belendende constructies;
- Uitvoeringseisen en aanbevelingen.

2 Referenties

2.1 Projectspecifieke documenten

- [1] [REDACTED], 'Rapport geotechnisch bodemonderzoek', documentnr. 220625 0, d.d 21-09-2022
- [2] RSK, 'Bemalingsadvies Strijenseweg te 's Gravendeel (rioleringswerkzaamheden'. Documentnr. 516374.002(00), d.d [REDACTED];
- [3] RSK, 'Aanvullend (water)bodemonderzoek Strijenseweg te 's Gravendeel'. Documentnr. 519736.001(01), d.d 21-12-2023;
- [4] RHDHV, 'Aanbrengen duikerverbinding Duikerkruising Strijenseweg', documentnr. BG8369-RHD-WR-XX-DR-C2101 3.0, 25-04-2024;
- [5] RHDHV, 'Profielen boorkuip Duikerkruising Strijenseweg', documentnr. BG8369-RHD-WR-XX-DR-C-002 0.1, 25-04-2024;
- [6] [REDACTED] GWW-services BV, 'Meting bestaande situatie omgeving en dwarsprofiel;
- [7] Datum meting 07-04-2022 Strijenseweg 's Gravendeel', documentnr. 50.2204.220411.03, 11-04-2024;
- [8] RHDHV, 'Prognose Benodigde Perskracht, 06-05-24.

2.2 Normen en Richtlijnen

Eurocodes zijn inclusief Nederlandse nationale bijlagen.

- [9] NEN-EN 9997-1+C1, 'Geotechnisch ontwerp van constructies – Deel 1: Algemene regels', d.d. november 2017;
- [10] CUR 166, 'Damwandconstructies 6^e druk'.

3 Uitgangspunten

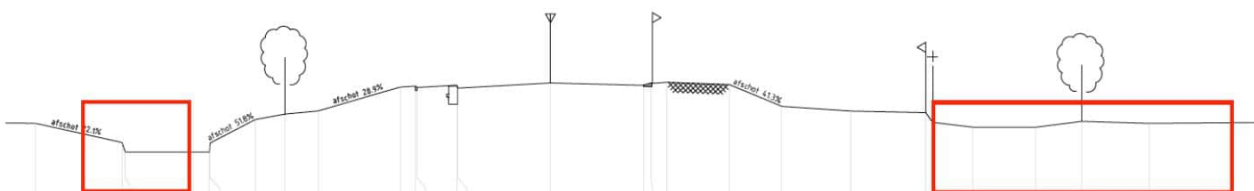
3.1 Beschrijving bestaande situatie

3.1.1 Projectlocatie

In de bestaande situatie ligt er een regionale waterkering ter plaatste van de Strijenseweg, deze dijk scheidt twee peilgebieden, om wateroverlast in de kern 's-Gravendeel te verminderen, worden door middel van een duikerkruising de twee peilgebieden aan elkaar gekoppeld. Daardoor is er meer buffercapaciteit en de afwatering wordt gegarandeerd. De duikerkruising wordt gerealiseerd door middel van een gesloten front boringen, hiervoor is een pers- en ontvangstuip ontworpen.



Figuur 1 locatie van de duikerkruising aan de Strijenseweg, 's-Gravendeel, locatie van de boorkuip, duiker en ontvangstuip zijn indicatief weergegeven in de afbeelding



Figuur 2 schematische dwarsdoorsnede met indicatieve locatie van ontvangstuip (links) en boorkuip (rechts) in rood

3.1.2 Beschikbare ruimte, watergangen, waterkeringen, belendingen, werkhoogte

De beschikbare werkruimte is beperkt, de Strijenseweg heeft een breedte van ongeveer 10 meter en is aangrenst door woningen. Tijdens de uitvoering zal hier rekening gehouden moeten worden, om de mogelijke overlast tot een minimum te houden. Naast de ontvangstuip is een watergang aanwezig, deze zal tijdens de uitvoering (gedeeltelijk) gedempt worden. Voor zowel de persuip als de ontvangstuip zijn er bestaande objecten binnen twee meter van de kuip.

3.2 Projectspecifieke eisen

Ten behoeve van het geotechnisch ontwerp van de grondkerende constructie zijn onderstaande betrouwbaarheidsklassen gehanteerd:

- Bouwkuip: CC2/ RC2

3.3 Beschrijving ontwerp

Bij het ontwerp van de bouwkuipen gelden de volgende uitgangspunten.

- De bouwkuipen worden met onverankerde stalen damwanden gemaakt. De damwanden worden na afloop van de werkzaamheden (deels) getrokken;
- De afmetingen van de kuipen zijn als volgt:
 - Perskuip: 15,0 m lang bij 5 m breed;
 - Ontvangstkuip: 5,0 m lang bij 5 m breed.
- Voor de perskuip en de ontvangstkuip is de bovenkant damwand op NAP +0,1 m;
- Het minimaal benodigd ontgravingsniveau bedraagt NAP -3,2 m waarbij rekening is gehouden met de benodigde afstand onderkant leiding tot bovenkant werkvloer in de kuip van 1,0 m;
- De maximaal toelaatbare doorbuiging van de damwanden is op 1/100 keer de kerende hoogte gesteld [10];
- De verticale stabiliteit van de damwanden (draagvermogen) is niet getoetst, gezien de damwanden niet verticaal belast worden;
- Voor de pers- en ontvangstkuip zal gebruikt worden gemaakt van een ringgording, in de berekening is de ringgording als stempel meegenomen met een aangrijpingsniveau op bovenkant damwandplank; Het kniklimiet van de ringgording en andere constructieve faalmechanismes zijn in deze fase niet bekeken. De exacte afmetingen en strekte van de ringgording dienen door een constructeur te worden bepaald;
- Bij het verticale evenwicht van de bouwkuipen en de dikte van de onderwaterbetonvloer wordt alleen rekening gehouden met het eigengewicht van het beton, de horizontale stempeldruk en opwaartse zwelbelasting zijn niet meegenomen;
- Na voltooiing van de bouwkuip wordt een deel van de wanden getrokken en een deel blijft achter. De wanden die achterblijven behouden hun kerende functie na voltooiing. Daarom worden er alleen bouwphase berekeningen uitgevoerd en wordt er dus niet gerekend met corrosie.

Voor de hele perskuip voldoet een AZ20-700 (S240) voor het ontwerp. De gehanteerde parameters van de damwand voor de perskuip zijn te zien in Tabel 3-1.

Tabel 3-1 Resultaten doorsnedes perskuip

Algemene eigenschappen	Waarde
Damwandtype [-]	AZ 20-700
Staalkwaliteit [-]	S240
Elasticiteitsmodulus [kN/m ²]	2,1 x 10 ⁸
Weerstandsmoment, W_{el} [cm ³ /m]*	1945
Traagheidsmoment, I [cm ⁴ /m]*	40960
Momentcapaciteit [kNm/m']*	467
Bovenkant damwand [m NAP]	NAP +0,10 m
Onderkant damwand [m NAP]	NAP-11,0 m

*: Er is geen rekening met corrosie (tijdelijke constructie)

Voor de hele ontvangstuip voldoet een AZ14-700 (S240) voor het ontwerp. De gehanteerde parameters van de damwand voor de ontvangstuip zijn te zien in Tabel 3-2.

Tabel 3-2 Resultaten doorsnedes ontvangstuip

Algemene eigenschappen	Waarde
Damwandtype [-]	AZ14-700
Staalkwaliteit [-]	S240
Elasticiteitsmodulus [kN/m ²]	2,1 x 10 ⁸
Weerstandsmoment, W_{el} [cm ³ /m]	1405
Traagheidsmoment, I [cm ⁴ /m]	22190
Momentcapaciteit [kNm/m']	337
Bovenkant damwand [m NAP]	NAP +0,10 m
Onderkant damwand [m NAP]	NAP -8,0 m

*: Er is geen rekening met corrosie (tijdelijke constructie)

3.4 Belastingen

De benodigde perskracht bedraagt ca. 1101 kN [7]. Aangenomen is dat de belasting door het vijzelframe verdeeld wordt over een strook van één meter hoog en de gehele 5 meter breedte van de kuip. Dit resulteert in een verdeelde karakteristieke belasting van 220 kN/m² tussen ca. NAP-1,7m. De perskracht is als variabele belasting aangenomen.

De stenen garage naastgelegen de ontvangstuip is aangenomen als een maaiveldbelasting van 20 kN/m² strekkende 6,5 meter; Voor de houten schuur bij de perskuip is een belasting van 5 kN/m² strekkende 5 meter aanhouden.

3.5 Fasering

Voor de fasering van de bouwkuipen is de volgende volgorde aangehouden:

- Damwanden bouwkuipen aanbrengen;
- Ontgraven, onderwaterbetonvloer en bemaling in bouwkuip;
- Perskracht op achterkant perskuip damwand;
- Trekken van een deel van de damwanden (zie aanbevelingen).

4 Raakvlakken

4.1 Interne raakvlakken

De ringgording en onderwaterbeton vloeren dienen constructief ontworpen te worden door de constructeur.

4.2 Externe raakvlakken

- Binnen enkele meters van de pers- en ontvangstuip liggen meerdere belendende constructies waaronder huizen, schuren en garages, deze objecten dienen niet beschadigd te worden door de werkzaamheden. Het is aan te bevelen om deze objecten in te meten en op foto's vast te leggen voor de start van de werkzaamheden en volgens te monitoren.
- De Strijenseweg te 's Gravendeel moeten waarschijnlijk worden afgezet, hinder voor de bewoners dient te worden geminimaliseerd.
- De damwanden worden aangebracht in en bij de waterkering. Bij het trekken van de damwanden zal de waterkering moeten worden hersteld om de waterkerende functie te behouden. Op basis het grondonderzoek is de waterkering een zanddijk met een kleibescherming, in dit geval dient de kleibescherming na het trekken van de damwanden te worden hersteld.

5 Bodemopbouw

Er is grondonderzoek uitgevoerd op de projectlocatie. De resultaten zijn gegeven in het document.

5.1 Uitgevoerd grondonderzoek

Er is een grondonderzoeksplan opgesteld in overeenstemming met de norm [9].

De volgende onderzoeken zijn uitgevoerd:

- 4 sonderingen (waarvan 4 met waterspanningsmeting);
- 27+24 (hand)boringen uit het bemalingsadvies en aanvullend bodemonderzoek.

5.2 Beschrijving ondergrond

Het grondonderzoek (sonderingen) is uitgevoerd tot een diepte van maximaal maaiveld -20 m. Het algemene beeld van de bodemopbouw kan als volgt worden omschreven: tot NAP -3 bestaat de bodemopbouw uit verschillende klei-, veen- en zandlagen. Het maaiveldniveau van de projectlocatie verschilt tussen de NAP +0,5 m en NAP -0,75 m. De variatie tussen de sonderingen en de (oppervlakkige) boringen is groot, vaak is de opbouw gekenmerkt door een toplaag van zand en klei met daaronder enkele meters veen. Vanaf een diepte van NAP -3 m tot NAP -12 m is de variatie tussen de sonderingen het grootst. CPT 1 en CPT 2 zijn genomen in de flank van de waterkering; beide sondering geven een zandpakket vanaf NAP -5 m weer. In CPT 1 stopt het zandige pakket bij NAP -9,9 m en wordt gevolgd door een klei/veen pakket tot en met NAP -13,9 m, daaronder is het uitsluitend zandig. Het zand pakket in CPT 2 stopt bij NAP -12,2 m en wordt gevolgd door een leem/klei laag van 1 meter, daarna vervolgt het zandpakket zich. CPT 3 en CPT 4 bevinden zich naast de dijk ter plekke van de nieuwe watergang. In deze sonderingen ontbreekt het eerste zandpakket en is het profiel tot en met NAP -12,1 m volledig kleiige daarna begint pas de zandlaag.

5.3 Laagindeling en grondparameters

Op basis van de sonderingen is de grondopbouw bepaald. De laagindelingen voor de berekeningen van de doorsnede is bepaald op basis van de bijgelegen sonderingen en zijn gegeven in Tabel 5-2, Tabel 5-3 en Tabel 5-4. De parameters die daarbij horen zijn gegeven in Tabel 5-5.

Gezien de variatie in sonderingen en de relatieve ligging ten opzichte van de bouwkuipen, is voor elke doorsnede een apart gekozen welke sondering gebruikt is voor de damwandberekening. De sonderingen die gebruikt zijn voor elke berekening zijn in Tabel 5-1 aangegeven.

Tabel 5-1 Sonderingen gebruikt voor berekeningen

Doorsnede	Sondering gebruikt voor berekening
Perskuip achterwand	CPT 2, CPT 3
Perskuip voor- en zijwanden	CPT 2, CPT 3
Ontvangstkuip voor- en achterwand	CPT 1
Ontvangstkuip en zijwanden	CPT 1

Tabel 5-2 Grondopbouw op basis van sondering CPT 1

Grondlaag [-]	Bovenkant laag [m] t.o.v. NAP
Zand, sterk siltig, los gepakt	0,5
Leem, sterk zandig, vast	-1,1
Klei, sterk zandig matig	-2,7
Leem, sterk zandig, vast	-4,7
Zand, sterk siltig, los gepakt	-5,2
Zand, zwak siltig, matig gepakt	-5,8
Leem, sterk zandig, vast	-9,9
Klei, sterk zandig matig	-10,4
Klei schoon slap	-10,9
Veen, matig voorbelast	-11,9
Klei schoon slap	-13,4
Zand, zwak siltig, matig gepakt	-13,9

Tabel 5-3 Grondopbouw op basis van sondering CPT 2

Grondlaag [-]	Bovenkant laag [m] t.o.v. NAP
Leem, sterk zandig, vast	0,2
Klei, sterk zandig matig	-0,3
Leem, sterk zandig, vast	-0,8
Klei, sterk zandig matig	-1,4
Klei schoon slap	-1,9
Klei, sterk zandig matig	-3,4
Leem, sterk zandig, vast	-4,5
Zand, zwk/stk siltig, los/vastgepakt	-5,0
Leem, sterk zandig, vast	-12,2
Zand, zwk/stk siltig, los/vastgepakt	-13,2

Tabel 5-4 Grondopbouw op basis van sondering CPT 3

Grondlaag [-]	Bovenkant laag [m] t.o.v. NAP
Leem, sterk zandig, vast	-0,3
Klei, sterk zandig matig	-2,3
Klei schoon slap	-3,9
Klei, sterk zandig matig	-8,5
Leem, sterk zandig, vast	-9,0
Klei, sterk zandig matig	-10,1
Leem, sterk zandig, vast	-11,6
Zand, sterk siltig, los gepakt	-12,1
Zand, zwak siltig, matig gepakt	-13,1

De grondparameters (volumieke gewichten en sterkte) zijn op basis van NEN-EN 9997-1+C2 2017 (tabel 2b) bepaald, de beddingconstanten zijn op basis van de CUR 166 (6^e druk, tabel 3.3) afgeleid.

Tabel 5-5: Representatieve grondparameters

Grond- beschrijving	Grondparameters							
	Volumiek gewicht		Sterkte			Beddingsconstanten		
	Vochtig [kN/m ³]	Verzadigd [kN/m ³]	c' [kPa]	φ' [°]	δ' [°]	k _{h1} [kN/m ³]	k _{h2} [kN/m ³]	k _{h3} [kN/m ³]
Veen, matig voorbelast	12	12	0	15	0	2,0e+3	1,0e+3	5,0e+3
Klei schoon slap	14	14	0	17,5	11,67	2,0e+3	1,0e+3	5,0e+3
Klei, sterk zandig matig	18	18	5	22,5	15	5,0e+3	2,5e+3	1,25e+3
Leem, sterk zandig, vast	19	19	0	27,5	18,33	6,0e+3	3,0e+3	1,5e+3
Zand, sterk siltig, los gepakt	18	20	0	25	16,67	1,4e+4	7,0e+3	3,5e+3
Zand, zwak siltig, matig gepakt	18	20	0	27	18	1,6e+4	8,0e+3	4,0e+3

Met hierin:

γ_d:vochtig / verzadigd:

c':

φ':

δ':

k_{h,1}; k_{h,2}; k_{h,3} :

tabel 3.3).

Vochtige en verzadigd volumieke gewicht (in kN/m³);

Effectieve cohesie (in kPa);

Effectieve hoek van inwendige wrijving (in graden);

Wandwrijvingshoek (in graden);

Horizontale beddingconstanten (kN/m³) – conform CUR166 –

Bij alle grondlagen is een OCR-waarde van 1,0 gehanteerd.

5.4 Grondwater

Bij het grondonderzoek is in verschillende boringen een peilbuis geplaatst in de draagkrachtige zandlaag (1^{ste} watervoerend pakket). Hieruit is een bemalingsadvies geschreven [2]. De waterstanden uit dit advies zijn overgenomen voor de geotechnische berekening. Gezien in alle fases de Gemiddeld Hoogste Grondwaterstand (GHG) maatgevend is, is alleen met GHG gerekend. In de bouwkuipen zelf, is een grondwaterstand na bemaling 0,5 meter onder de onderkant bouwkuip vloer aangehouden, dus NAP -3,7 m. De grondwaterstanden aangehouden in de berekening zijn te zien in Tabel 5-6.

Tabel 5-6 grondwaterstanden aangehouden in geotechnisch ontwerp

Situatie	Grondwaterstand [m] t.o.v. NAP
Gemiddeld hoogste grondwaterstand (freatisch)	-0,8
Gemiddeld hoogste grondwaterstand (stijghoogte)	-0,4
Gemiddelde grondwaterstand (freatisch)	-1,2
Gemiddelde grondwaterstand (stijghoogte)	-0,6
Gemiddeld laagste grondwaterstand (freatisch)	-1,6
Gemiddeld laagste grondwaterstand (stijghoogte)	-0,8
Bouwkuip gebruiksfase, 0,5 meter onder onderkantvloer	-3,7

6 Risico's

6.1 Projectspecifieke risico's

Voor de realisatie van de bouwkuipen zijn de relevante geotechnische risico's in beeld gebracht. In Tabel 6-1. Een overzicht gegeven van de ondergrond gerelateerde risico's (GeoRM) voor de constructie van de bouwkuipen. Op basis van de ondergrond, het ontwerp en de omgeving is een inventarisatie gemaakt van de risico's/ gebeurtenissen, oorzaak en gevolg. Dit overzicht is niet limitatief.

Tabel 6-1 ondergrond gerelateerde risico's

#	Risico / Gebeurtenis	Oorzaak	Gevolg	Opmerkingen
Bouwkuip				
1	Verlies stabiliteit damwanden	1. Fouten in het ontwerp. 2. Niet uitgevoerd zoals advies.	Grond uitspoeling in bouwkuip tot bezwijk van de bouwkuip – zettingen in de omgeving	Klein risico, want goed ontwerp (intern kwaliteitssysteem, externe review en kundige aannemer).
2	Niet op diepte krijgen damwanden	1. Weerstand te groot voor inbrengmethode. 2. Obstakels (funderingsresten).	Instabiliteit damwand	Risico aanwezig. Op basis van Grafiek 18 en 19 van CUR 166 moet het net mogelijk zijn de damwanden in te brengen, in de uitvoering kan gekozen

#	Risico / Gebeurtenis	Oorzaak	Gevolg	Opmerkingen
				worden voor een zwaarder profiel om dit risico in te perken.
3	Opbarsten bouwkuip	1. Onvoldoende labonderzoek naar volumiek gewicht. 2. Verkeerde grondschematisatie.	Onderwater lopen bouwkuip -Schade aan boormachine	Klein risico, want goed ontwerp (intern kwaliteitssysteem, externe review en kundige aannemer).
4	Uitspoeling zand door damwand	1. Keuze voor risicovol wandsysteem que waterdichtheid. 2. Uit het slot lopen damwand door obstakels. 3. Niet goed uitgevoerd.	Instabiliteit van de damwand, zetting in de omgeving. Overlast in bouwkuip.	Droge bouwkuip, dus lekkages makkelijker op te sporen.

7 Berekening en advies

7.1 Algemeen

Voor de bouwkuipen zijn de volgende aspecten berekend: verticaal evenwicht van de bouwkuip, benodigde damwand types en lengte, ringgording, stabiliteit en schade indicatie van belendende constructies.

Het verticale evenwicht is per sondering uitgerekend en niet per damwandkuip gezien de variatie in grondslag.

Voor de damwandberekeningen worden er in totaal vier doorsnedes doorgerekend, twee voor de perskuip en twee voor de ontvangstuip, te weten:

- In de perskuip wordt de achterwand horizontaal belast door het vizelframe. Om genoeg steun te krijgen voor de damwanden, moet een ringgording worden toegepast. De krachten op damwand kunnen op deze manier worden overgedragen op de overige damwanden. Voor de perskuip is zowel CPT 2 als CPT 3 aangehouden gezien de achterwand van de perskuip in/bij de watergang ligt, hierdoor valt niet uit te sluiten dat het grondprofiel ter hoogte van de perskuip vergelijkbaar is met CPT 3. De voorwand doorgerekend gezien het talud aan de voorwand ongunstiger is dan aan de zijwanden. De damwand die voor de voorwand wordt gerekend is ook toepasbaar voor de zijwanden.
- Voor de ontvangstuip is zowel de maatgevende lengtedoorsnede als één dwarsdoorsnede doorgerekend, beide met CPT 1.

De ringgording is in D-Sheet Piling van Deltares gemodelleerd als stempel. Voor het oppervlak van de ringgording is uitgegaan van 14 cm²/m over 7,5 meter strekkende damwand. Dit is vergelijkbaar met een stempeloppervlak van 105 cm² voor de lange zijde. Voor de korte zijn is hetzelfde oppervlak met strekkende meter aanhouden, dit is een conservatieve aanname. Het oppervlak van de stempel is vergelijkbaar als dat van een HEA300. De stempel lengte voor de lange zijde is 7,5 m, de helft van de bouwkuip lengte.

De ringgording is als stempel gemodelleerd met de volgende parameters te zien in Tabel 7-1.

Tabel 7-1 stempel parameters in D-Sheet Piling voor de ringgording

Stempel parameters als ringgording	Waarde
Oppervlak [m ² /m]	0,0014
Elasticiteitsmodulus [kN/m ²]	2,1 x 10 ⁸
Lengte [m]	7,5
Aanhechtingsniveau bovenkant damwand [m NAP]	NAP +0,10 m*

*dit is een conservatieve aanname.

Gezien de gebruiksfase van de bouwkuip maatgevend is, worden deze resultaten gepresenteerd in het rapport, de andere fases zijn terug te vinden in de Bijlage B.

7.2 Verticaal evenwicht en piping

Het verticale evenwicht voor beide bouwkuipen is berekend op basis van 3 sonderingen (zie tabel 5-1). In deze berekening is alleen het eigenwicht van de grond en de betonvloer meegenomen.

De beschikbare handboringen in de bouwkuipen zijn niet dieper dan 3 meter, dit is oppervlakkiger dan de ontgravingsdiepte en zijn daardoor niet bruikbaar voor de opbarstingsberekening. Het risico is aanwezig dat de grondslag in de bouwkuipen afwijkt van de sonderingen. In Tabel 7-2 zijn de resultaten van de opbarstingsberekening te zien. In Bijlage C staat de gedetailleerde berekening

Tabel 7-2 Resultaten opbarstingsberekening voor de bouwkuipen en de benodigde onderwaterbeton vloer

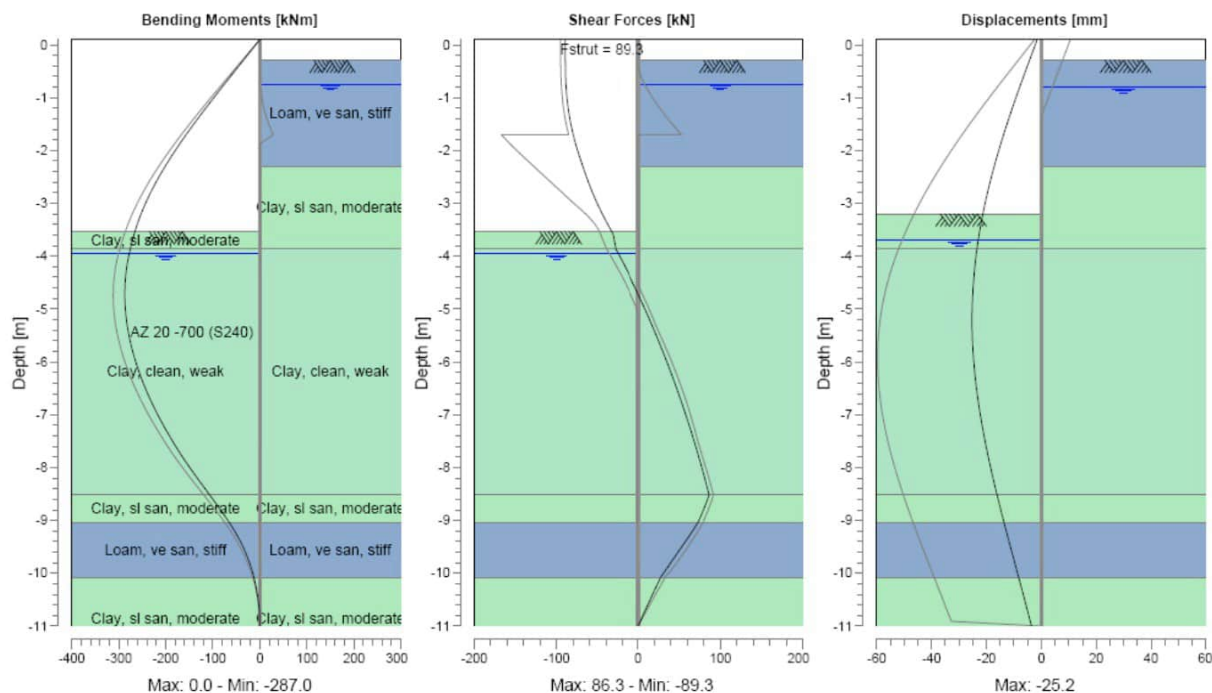
Bouwkuip	Sondering	Totaalgewicht grond [kN/m ³]	Opwaartse druk [kN/m ³]	U.C zonder OWB [-]	Benodigde dikte OWB [m]	U.C. met OWB [-]
Ontvangstkuip	CPT 1	24,5	42,3	0,58	0,86	1,0
Perskuip	CPT 2	19,5	39,7	0,49	0,98	1,0
Perskuip	CPT 3	77,8	84,8	0,92	0,33	1,0

Gezien er geen verticaal evenwicht is zonder onderwaterbeton, hoeft er ook geen rekening gehouden te worden met piping.

7.3 Damwand berekening: Perskuip achterwand

De achterwand van de perskuip zal gebruikt worden om het vijzelframe van de boring op te bevestigen, de maximale perskracht voor de horizontale boring is 1101 kN, deze kracht zal horizontaal worden uitoefent op de achterkant van de perskuip. In de perskuip dient er een ringgording te worden toegepast. De krachten op damwand kunnen op deze manier worden overgedragen op de overige damwanden.

De achterwand van de perskuip is de belangrijkste doorsnede om door te rekenen gezien hier de meeste krachten op komen te staan. Voor de doorsnede is gerekend met CPT 2 en CPT 3. De maatgevende resultaten met CPT3 t.a.v. het buigende moment, dwarskrachten en vervormingen zijn grafisch in Figuur 3 weergegeven. Het buigende moment en dwarskrachten gelden voor stap 6.3; de vervormingen gelden voor stap 6.5 (zie stappenplan CUR166).



Figuur 3: D-Sheet Piling resultaten – Gebruiksfase perskuip achterwand met CPT 3 (Stap 6.3: Buigend moment; stap 6.5: Vervormingen)

Voor deze fase zijn de maximale verplaatsing, het maximale buigend moment en stabiliteit getoetst:

Tabel 7-3 resultaten Gebruiksfase perskuip achterwand met CPT 3

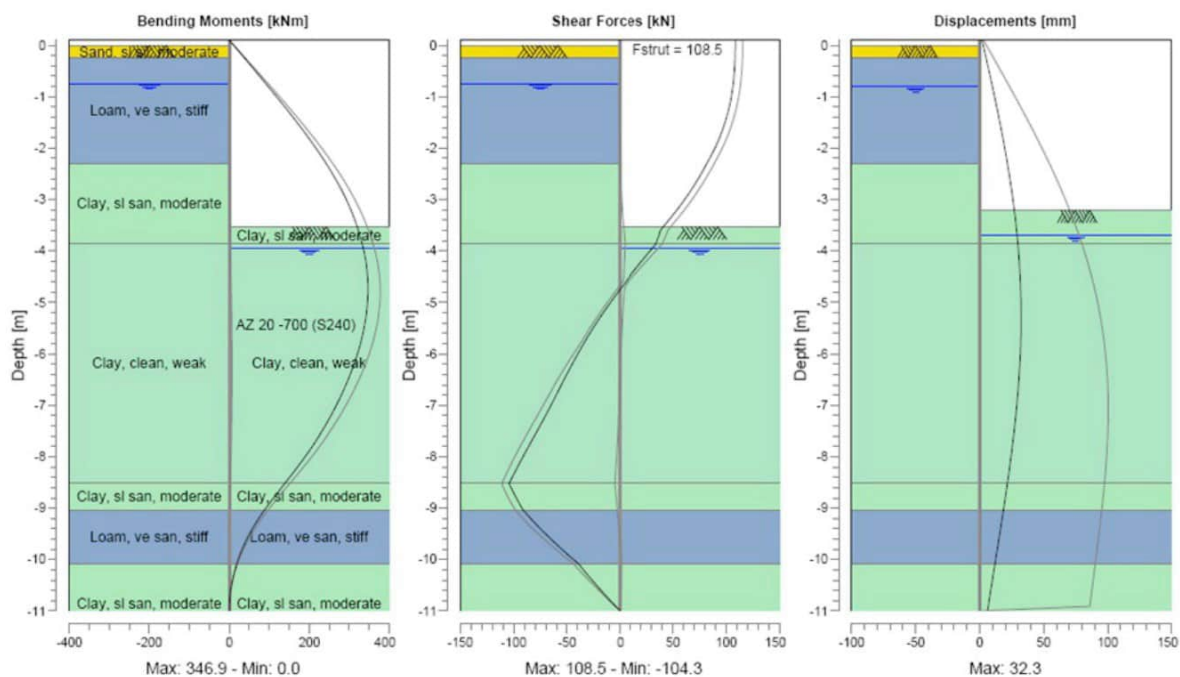
Toets	Waarde	Voldoet ?
Maximale verplaatsingen van de damwand (<1/100 kerende hoogte) [mm]	-25,2	Voldoet
Max. buigend moment [kNm/m ¹]	287 kNm/m ² (U.C. =0,56)	Voldoet
Hor. Stabiliteit [-]	1,52	Voldoet

In deze fase voldoet het ontwerp.

7.4 Damwand berekening: Perskuip voorwand en zijwanden

Voor de voor- en zijwanden van de perskuip is gekozen om de voorwand te berekenen gezien deze maatgevend is. De voorwand heeft een grotere grondkerende werking en heeft te maken met maaiveld belasting vanuit de houten schuur, gelegen op ongeveer 1,8 meter afstand van de voorwand. Gezien de zijwanden een lager grondkerende hoogte hebben en geen houten schuur, kan het profiel van de voorwand worden gebruikt voor de zijwanden. Het damwandprofiel voor de voor- en zijwanden is identiek aan die voor de achterwand; een AZ20-700 (S240).

Voor de doorsnede is gerekend met CPT 2 en CPT 3. De maatgevende resultaten met CPT 3 t.a.v. het buigende moment, dwarskrachten en vervormingen zijn grafisch in Figuur 3 weergegeven. Het buigende moment en dwarskrachten gelden voor stap 6.3; de vervormingen gelden voor stap 6.5 (zie stappenplan CUR166).



Figuur 4: D-Sheet Piling resultaten – Gebruiksfase perskuip voorwand met CPT 3 (Stap 6.3: Buigend moment; stap 6.5: Vervormingen)

Voor deze fase zijn de maximale verplaatsing, het maximale buigend moment en stabiliteit getoetst:

Tabel 7-4 resultaten Gebruiksfase perskuip voorwand met CPT 3

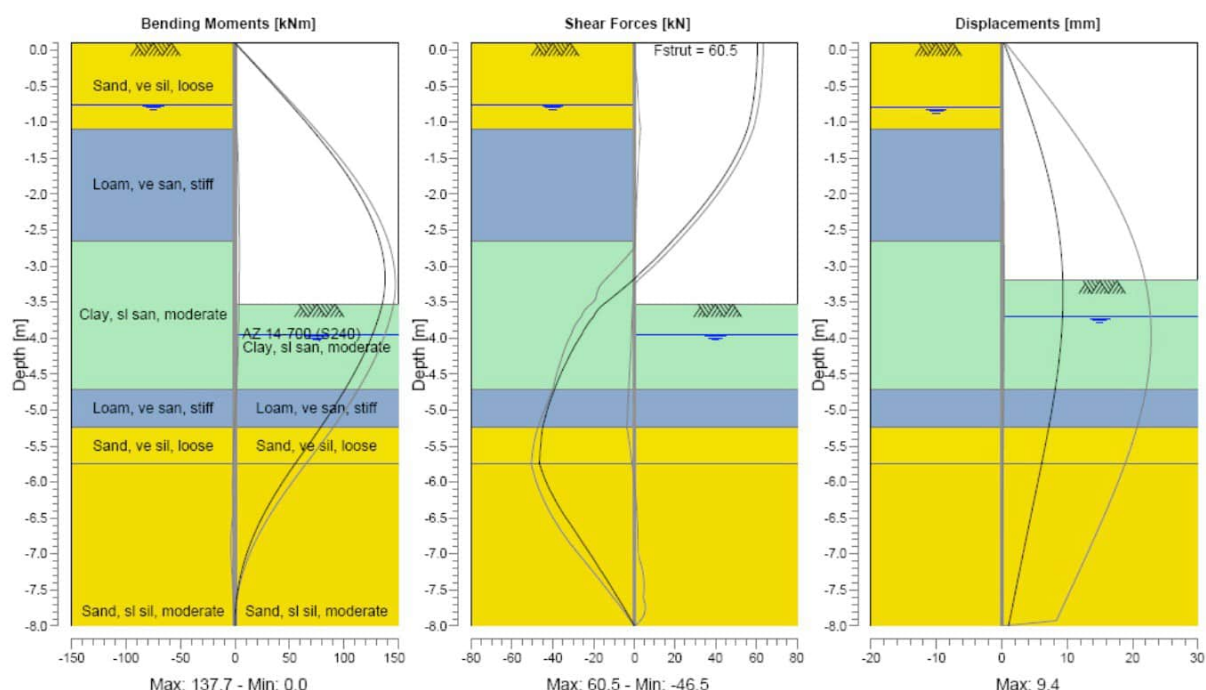
Toets	Waarde	Voldoet ?
Maximale verplaatsingen van de damwand (<1/100 kerende hoogte) [mm]	32,3	Voldoet
Max. buigend moment [kNm/m ¹]	347 (U.C. =0,56)	Voldoet
Hor. Stabiliteit [-]	1,52	Voldoet

In deze fase voldoet het ontwerp.

7.5 Damwand berekening: Ontvangstkuip lengte doorsnede

Voor de ontvangstkuip is een lengtedoorsnede op basis van CPT 1 berekend. De damwand waar de frontboring op uitkomt is gekozen om te bereken gezien deze maatgevend is, de voorwand heeft een grotere grondkerende werking en heeft te maken met maaiveldbelasting vanuit de metselwerk schuur, gelegen op ongeveer 1,1 meter afstand van de voorwand. Gezien de achterwand een lager grondkerende hoogte heeft en geen naast gelegen belastingen, kan het profiel van de voorwand ook worden gebruikt voor de achterwand.

De maatgevende resultaten t.a.v. het buigende moment, dwarskrachten en vervormingen zijn grafisch in Figuur 5 weergegeven. Het buigende moment en dwarskrachten gelden voor stap 6.3; de vervormingen gelden voor stap 6.5 (zie stappenplan CUR166).



Figuur 5: D-Sheet Piling resultaten – Gebruiksfase ontvangstkuip voorwand met CPT 1 (Stap 6.3: Buigend moment; stap 6.5: Vervormingen)

Voor deze fase zijn de maximale verplaatsing, het maximale buigend moment en stabiliteit getoetst:

Tabel 7-5 resultaten Gebruiksfase ontvangstkuip voorwand met CPT 1

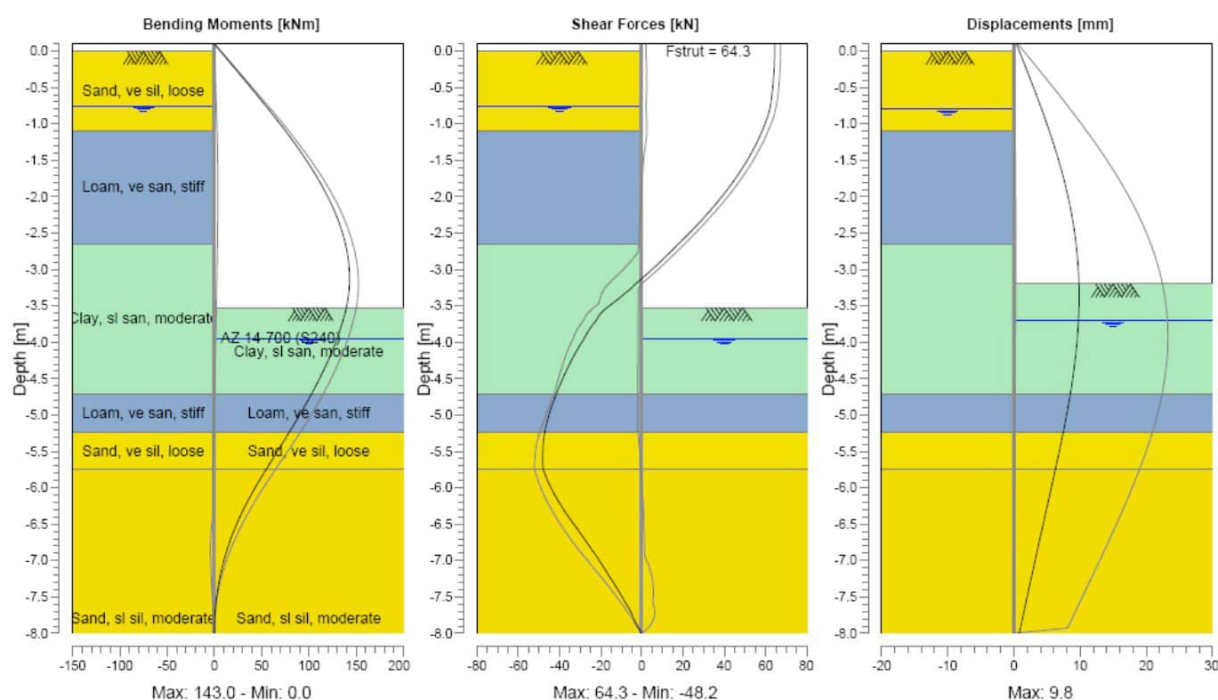
Toets	Waarde	Voldoet ?
Maximale verplaatsingen van de damwand (<1/100 kerende hoogte) [mm]	9,4	Voldoet
Max. buigend moment [kNm/m ¹]	138 (U.C. =0,41)	Voldoet
Hor. Stabiliteit [-]	1,43	Voldoet

In deze fase voldoet het ontwerp.

7.6 Damwand berekening: Ontvangstkuip breedte doorsnede (zijwand)

Voor de ontvangstkuip is een dwarsdoorsnede op basis van CPT 1 berekend. De dwarsdoorsnede is symmetrisch, maar heeft aan één zijde te maken met maaiveldbelasting vanuit de metselwerk schuur, gelegen op ongeveer 1,1 meter afstand van de voorwand.

De maatgevende resultaten t.a.v. het buigende moment, dwarskrachten en vervormingen zijn grafisch in Figuur 6 weergegeven. Het buigende moment en dwarskrachten gelden voor stap 6.3; de vervormingen gelden voor stap 6.5 (zie stappenplan CUR166).



Figuur 6: D-Sheet Piling resultaten – Gebruiksfase ontvangstkuip zijwand met CPT 1 (Stap 6.3: Buigend moment; stap 6.5: Vervormingen)

Voor deze fase zijn de maximale verplaatsing, het maximale buigend moment en stabiliteit getoetst:

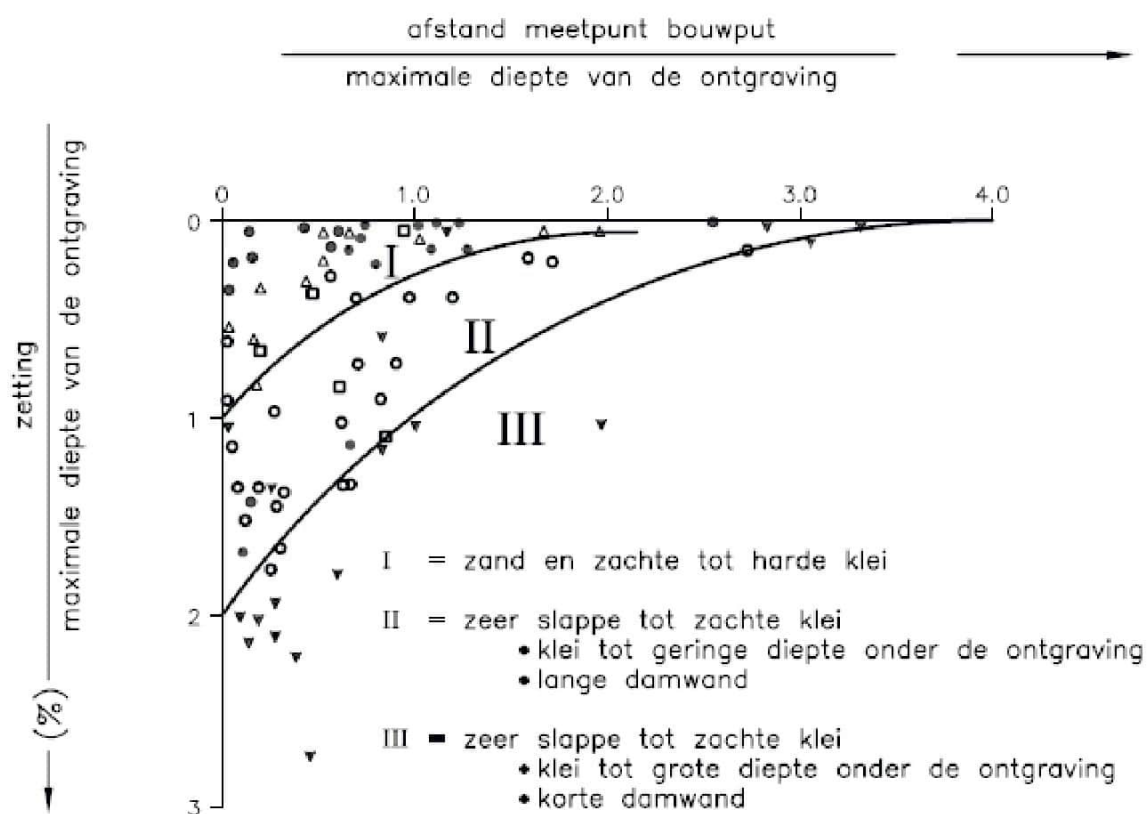
Tabel 7-6 resultaten Gebruiksfase ontvangstkuip zijwand met CPT 1

Toets	Waarde	Voldoet ?
Maximale verplaatsingen van de damwand (<1/100 kerende hoogte) [mm]	9,8	Voldoet
Max. buigend moment [kNm/m ¹]	143 (U.C. =0,412)	Voldoet
Stabiliteit [-]	1,45	Voldoet

In deze fase voldoet het ontwerp.

7.7 Schade aan bestaande objecten

Vervormingen van de damwand kan leiden tot bezwijken van belendende constructies, door verplaatsing van de damwand ontstaat er een zettingstrog achter de damwand met als gevolg mogelijke verzakking van naast gelegen belendende constructies. Een aantal bestaande objecten staan op enkele meters van de bouwkuipen, voor deze objecten moet worden inschat of tijdens uitvoering er schade kan ontstaan. Het gaat om de objecten: gemetselde garage van huisnummer 43 en houten schuur achter huisnummer 102. De zettingen zijn berekend conform CUR166 op basis van Figuur 7. Om deze inschatting van de mogelijke zetting ter hoogte van de constructies te maken, is gebruik gemaakt van onderstaande grafiek uit de CUR 166.



Figuur 7 Maaiveldzakking op bepaalde afstand achter de wand als functie van de kerende hoogte uit CUR-166

De resultaten van deze berekening zijn te vinden in Tabel 7-7.

Tabel 7-7 Beoogde zetting van belendende constructie en rotatie door de ontgraving.

Object	Afstand belendende constructie gevel tot bouwkuip [m]	Zetting object op minimale afstand bouwkuip [cm]	Rotatie [-]	Acceptabel ?
Metselwerk garage nummer 43	1,1	2,2	1:246	Nee
Houten schuur nummer 102	1,8	1,7	1:230	Nee

De berekende rotatie van de belendende constructies is hoger dan toegaan om constructieve schade uit te sluiten. Het advies is om de belendende constructies in te meten en te monitoren voordat er wordt ontgraven, daarnaast zouden er schade preventieve maatregelen genomen moeten worden zoals het trillingsvrij aanbrengen van de damwanden en de damwanden langs de garage/schuur niet te trekken na afloop van de werkzaamheden.

Projectgerelateerd

gDHV
omenvatting Damwandberekening resultaten

aten damwandberekening Perskuip

ede, fase en	Type damwand [-]	Max. optreden buigend moment (stap 6.3) [kNm/m ¹]	Max. capaciteit buigend moment [kNm/m ¹]	U.C. buigend moment [-]	FoS Stabiliteit [-]	Max. verplaatsing damwand (stap 6.5) [mm]	Max verp dam
wand; ontgraven met	AZ 20-700 (S240)	100	467	0,21	2,74	-4,6	33
wand; gebruiksfase CPT 2		100	467	0,21	3,29	29,6	33
wand; ontgraven met		287	467	0,61	1,52	-25,2	33
wand; gebruiksfase CPT 3		287	467	0,61	1,78	-21,9	33
and: ontgraven en et CPT 2		124	467	0,27	1,99	5,9	33
and: ontgraven en et CPT 3		347	467	0,74	1,21	32,3	33

Projectgerelateerd

gDHV

aten damwandberekening Ontvangstkuip

mede	Type damwand [-]	Max. optreden buigend moment (stap 6.3) [kNm/m ¹]	Max. capaciteit buigend moment [kNm/m ¹]	U.C. buigend moment [-]	FoS Stabiliteit [-]	Max. verplaatsing damwand (stap 6.5) [mm]	Max. toeges damwand [r
engte graven en et CPT 1	AZ14-700 (S240)	138	337	0,41	1,43	9,4	33
breedte graven en et CPT 1		143	337	0,42	1,45	9,8	33

8 Conclusies en aanbevelingen

8.1 Advies

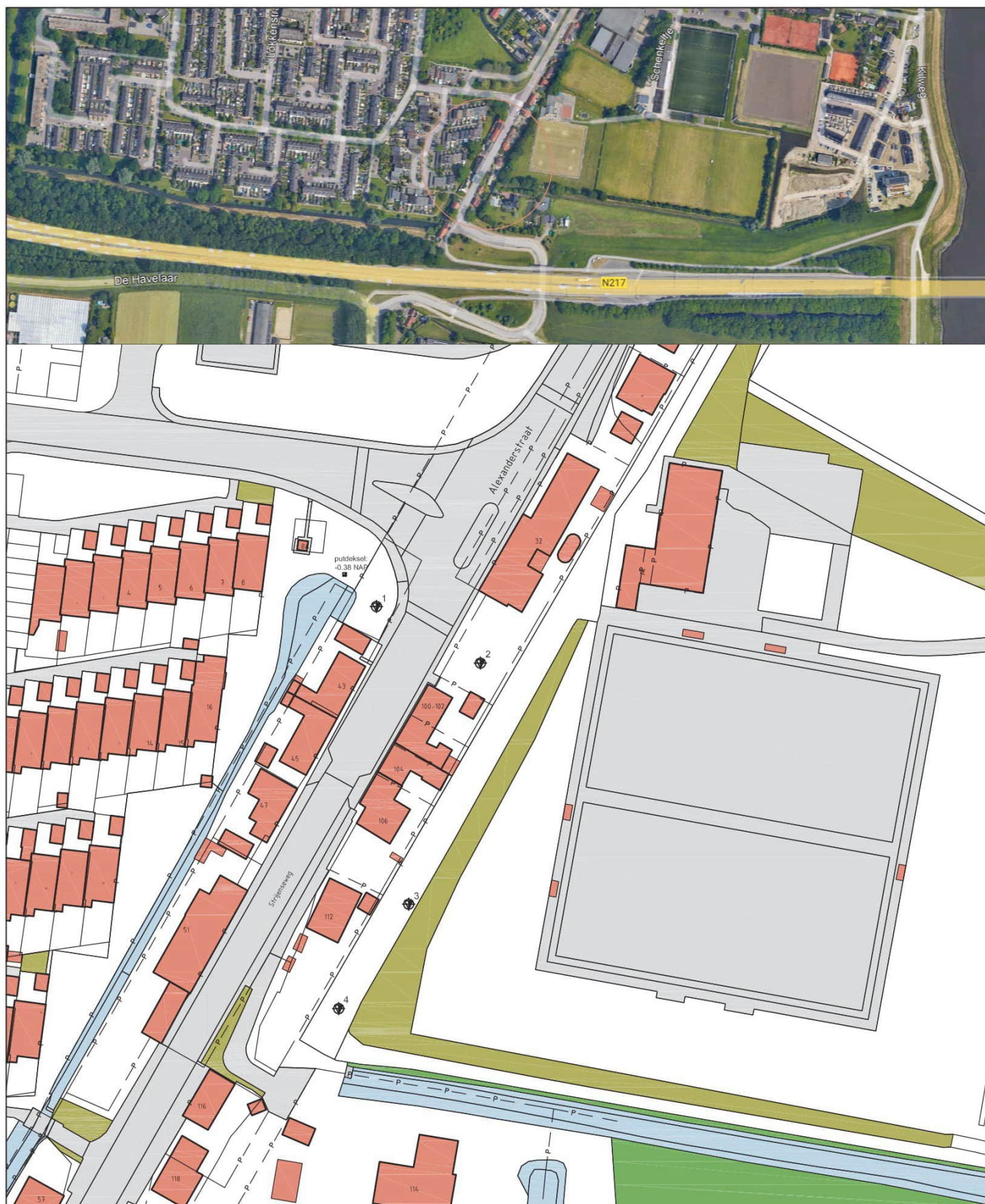
Voor de realisatie van de bouwkuipen voor de gesloten front boring volstaat een AZ20-700 (S240) tot NAP -11 m diep voor de hele perskuip. Voor de ontvangstuip volstaat een AZ14-700 (S240) tot NAP -8 meter diep. Voor beide bouwkuipen dient een ringgording en een ontwaterbetonvloer te worden aangebracht van minimaal 1,0 meter dik.

8.2 Aandachtspunten uitvoering

- De variantie in grondslag van CPT 2 en CPT3 is groot; CPT 2 is genomen in de bestaande dijk en heeft een zandig profiel, CPT 3 is geplaatst naast de dijk en bevat een dik pakket cohesieve lagen. Er valt niet uit te sluiten dat het grondprofiel van de perskuip en voornamelijk de achterwand van de perskuip, vergelijkbaar is met CPT 3.
- Het advies is om de damwanden trillingsvrij aan te brengen doormiddel van persen. In het UO moet gekeken worden naar de mogelijkheid om de damwand planken te persen, dit is niet meegenomen in het DO.
- Op basis van grafiek 18 en 19 van de CUR166 is het mogelijk om een AZ14-700 in te breng tot NAP -8m dit is indicatief, indien de qc-waarde lokaal hoger is, kan de damwand niet op diepte gebracht worden. Het kan verstandig zijn op een zwaarder profiel dan een AZ14-700 te kiezen voor de ontvangstuip.
- De ringgording is niet constructief getoetst in deze rapportage dit zijn in het UO gedaan moeten worden.
- Door het maken van de bouwkuipen zou constructieve schade aan belendende constructies (gemetselde garage en houten schuur bij de huisnummers 43 en 102 respectievelijk) kunnen ontstaan. Deze risico's dienen nader te worden onderzocht in het UO. De damwanden grenzend aan de belendende constructie zouden na afloop van de werkzaamheden moeten blijven staan en kunnen worden afgebrand tot het maaiveld. Na het trekken van de overige damwanden dient de waterkering weer te worden hersteld zodat deze niet zijn functie verliest.
- Het risico op piping is bij deze constructie gering, gezien er gebruikt gemaakt wordt van onderwaterbeton. Het verticale evenwicht met het onderwaterbeton is alleen op eigengewicht getoetst, de OWB-vloer zelf dient nog constructief te worden getoetst.
- De Strijenseweg te 's Gravendeel wordt tijdens de bouwwerkzaamheden mogelijk afgezet, de hinder voor de bewoners dient te worden geminimaliseerd.

Bijlage A

Grondonderzoek



Opdrachtgever: RSK Netherlands

Plaats: 's-Gravendeel

Locatie: Strijenseweg

Projectnr.: 220625

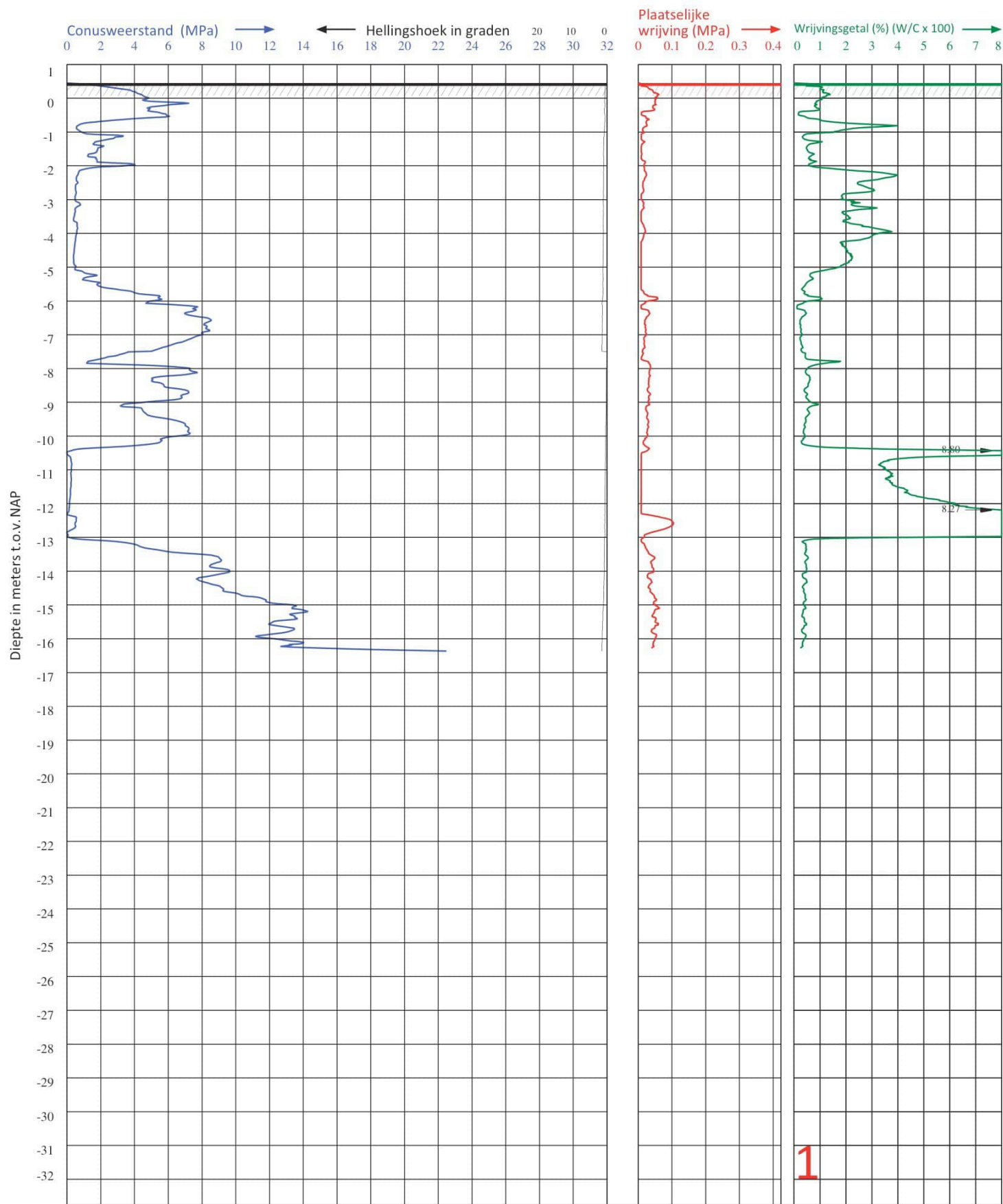
Getekend: md

Schaal: 1:1000

Datum: 15 september 2022

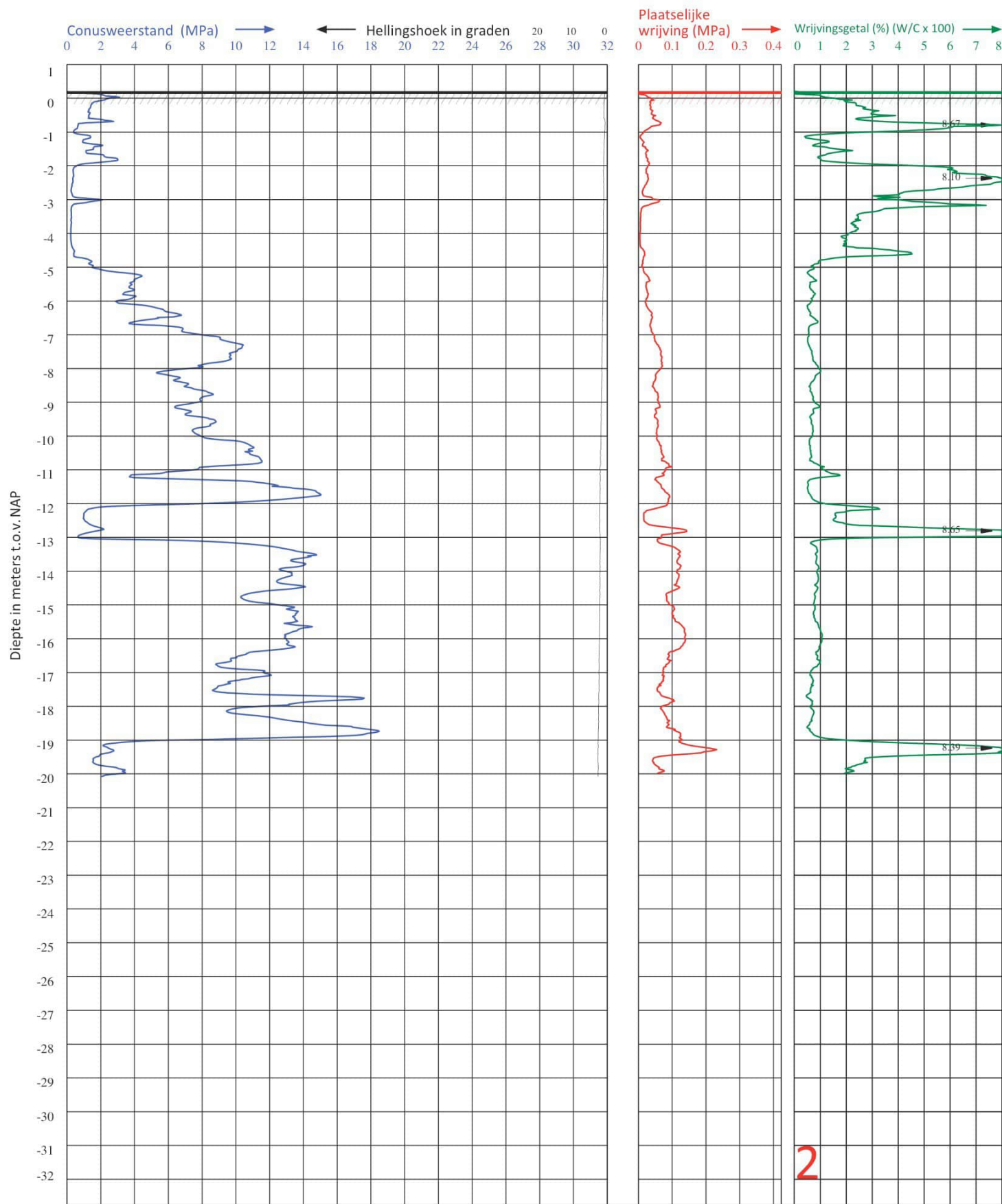


VAN DER STRAATEN
GEOTECHNIEK B.V.



Van der Straaten Geotechniek B.V.		Telefoon (0031) 113-382510		E-mail : geotechniek@vd-straaten.nl	
PLAATS	: 'S-GRAVENDEEL	HOOGTE MAAVELD	: 0.45 m1 t.o.v. NAP	CONUS TYPE	: I-CFY-15
LOCATIE	: STRIJSEWEG	GRONDWATERSTAND	: m1- MAAVELD	ID CONUS	: 220627
OPDRACHTGEVER	: RSK NETHERLANDS	DATUM	: 15-9-2022	SONDERING	: - NEN-EN-ISO 22476-1
PROJECTNUMMER	: 220625	TIJD	: 9:46	VOLGENS	: - TOEPASSINGSKLASSE 3
ID SONDERING	: 1	X-COÖRDINAAT (RD)	: 101845.10	Y-COÖRDINAAT(RD)	: 420923.71

Diepteschaal: 65 mm = 1 m1



Diepteschaal: 65 mm = 1 m

Van der Straaten Geotechniek B.V.

Telefoon (0031) 113-382510

E-mail : geotechniek@vd-straaten.nl

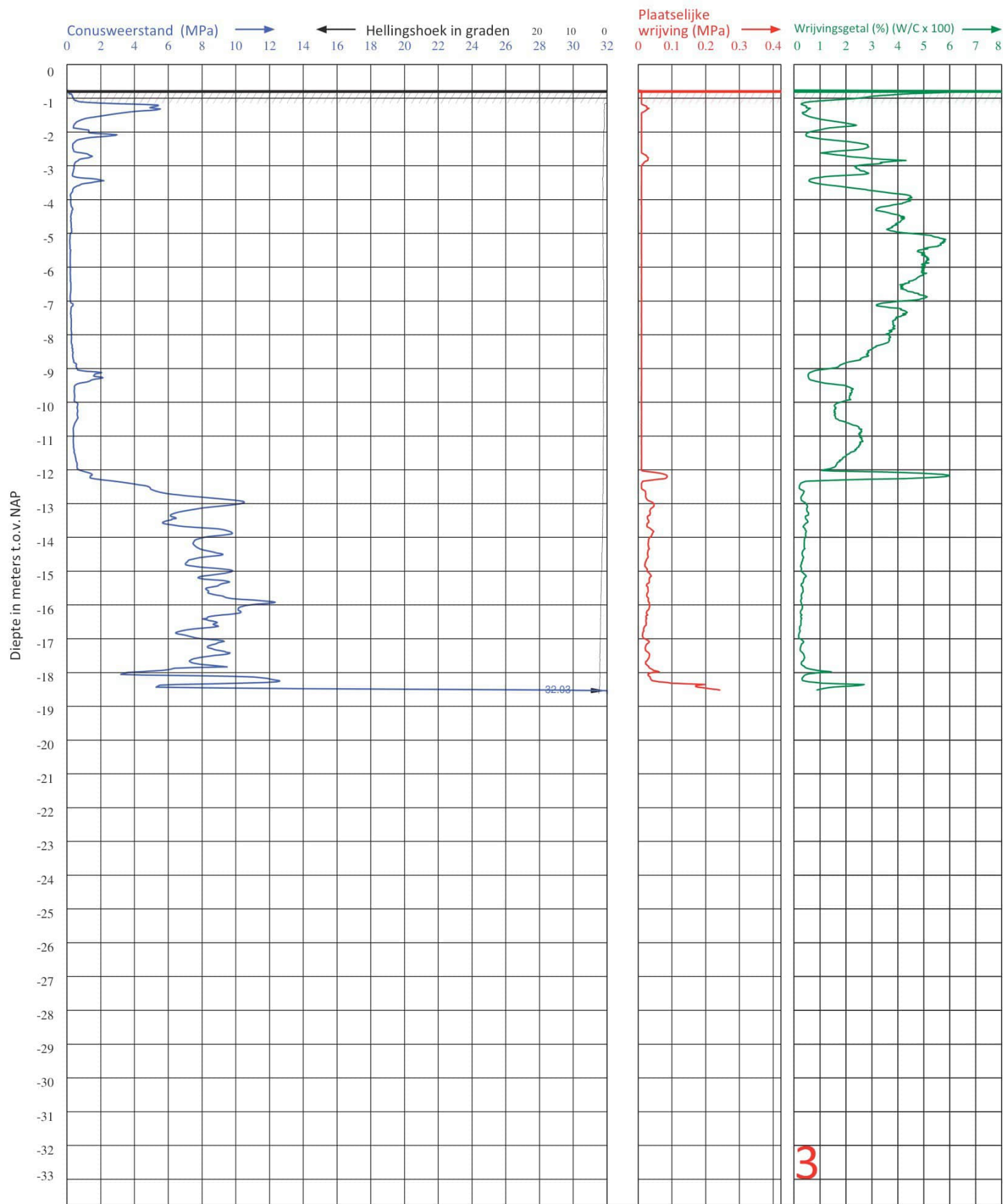
PLAATS : 'S-GRAVENDEEL
 LOCATIE : STRIJSEWEG
 OPDRACHTGEVER : RSK NETHERLANDS
 PROJECTNUMMER : 220625
 ID SONDERING : 2

HOOGTE MAAVELD : 0.21 m1 t.o.v. NAP
 GRONDWATERSTAND : m1- MAAVELD
 DATUM : 16-9-2022
 TIJD : 13:57

X-COÖRDINAAT (RD) : 101839.76

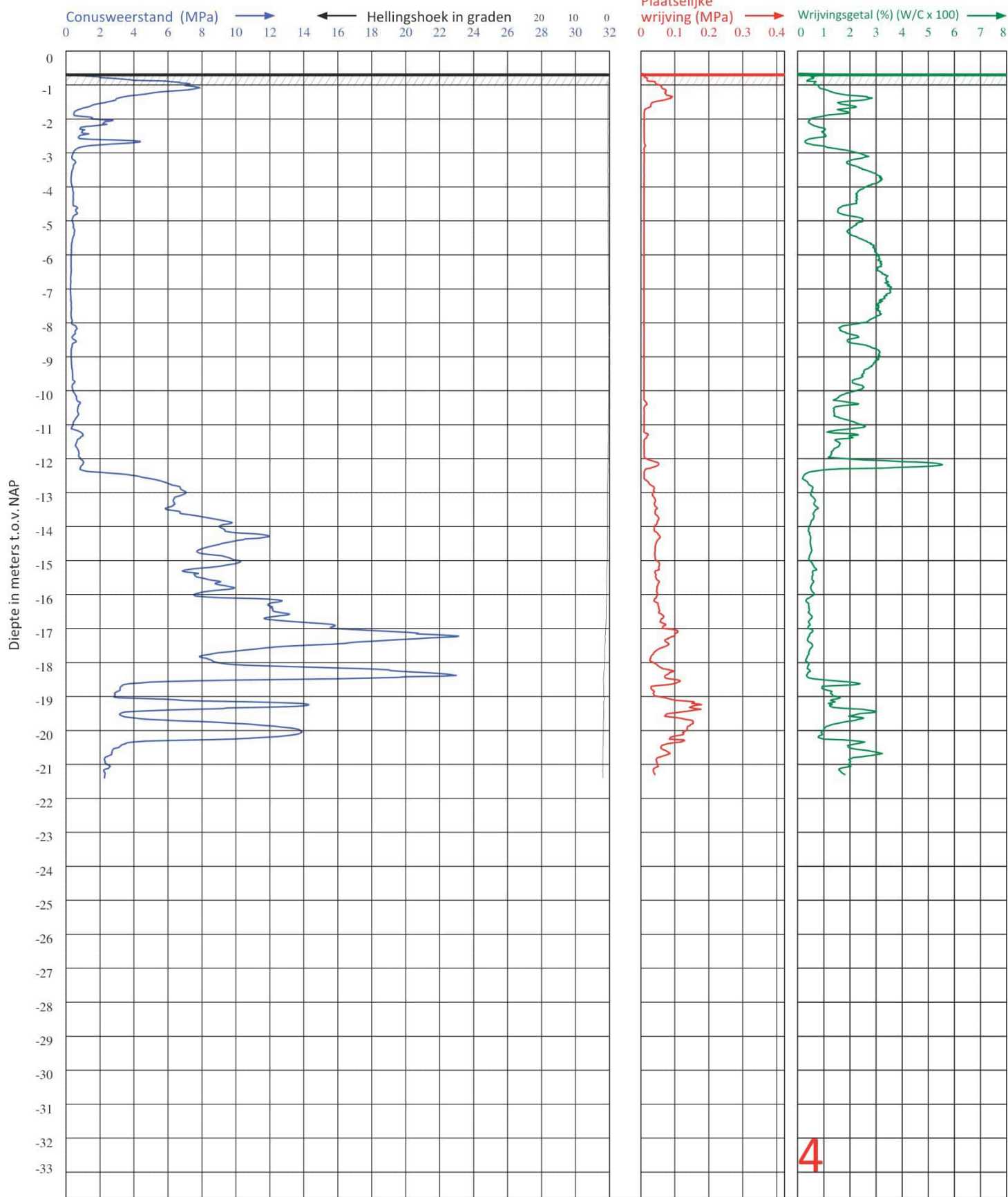
CONUS TYPE : I-CFY-15
 ID CONUS : 220626
 SONDERING VOLGENS : - NEN-EN-ISO 22476-1
 - TOEPASSINGSKLASSE 3

Y-COÖRDINAAT (RD) : 420931.44



Van der Straaten Geotechniek B.V.		Telefoon (0031) 113-382510		E-mail : geotechniek@vd-straaten.nl	
PLAATS	: 'S-GRAVENDEEL	HOOGTE MAAVELD	: -0.76 m1 t.o.v. NAP	CONUS TYPE	: I-CFY-15
LOCATIE	: STRIJSEWEG	GRONDWATERSTAND	: m1- MAAVELD	ID CONUS	: 220627
OPDRACHTGEVER	: RSK NETHERLANDS	DATUM	: 15-9-2022	SONDERING	: - NEN-EN-ISO 22476-1
PROJECTNUMMER	: 220625	TIJD	: 11:40	VOLGENS	: - TOEPASSINGSKLASSE 3
ID SONDERING	: 3	X-COÖRDINAAT (RD)	: 101825.94	Y-COÖRDINAAT(RD)	: 420884.94

Diepteschaal: 65 mm = 1 m1



4

Van der Straaten Geotechniek B.V.		Telefoon (0031) 113-382510		E-mail : geotechniek@vd-straaten.nl	
PLAATS	: 'S-GRAVENDEEL	HOOGTE MAAVELD	: -0.66 m1 t.o.v. NAP	CONUS TYPE	: I-CFY-15
LOCATIE	: STRIJSEWEG	GRONDWATERSTAND	: m1- MAAVELD	ID CONUS	: 220627
OPDRACHTGEVER	: RSK NETHERLANDS	DATUM	: 15-9-2022	SONDERING	: - NEN-EN-ISO 22476-1
PROJECTNUMMER	: 220625	TIJD	: 13:43	VOLGENS	: - TOEPASSINGSKLASSE 3
ID SONDERING	: 4	X-COÖRDINAAT (RD)	: 101812.41	Y-COÖRDINAAT (RD)	: 420864.80

Diepteschaal: 65 mm = 1 m1

Waterpasstaat

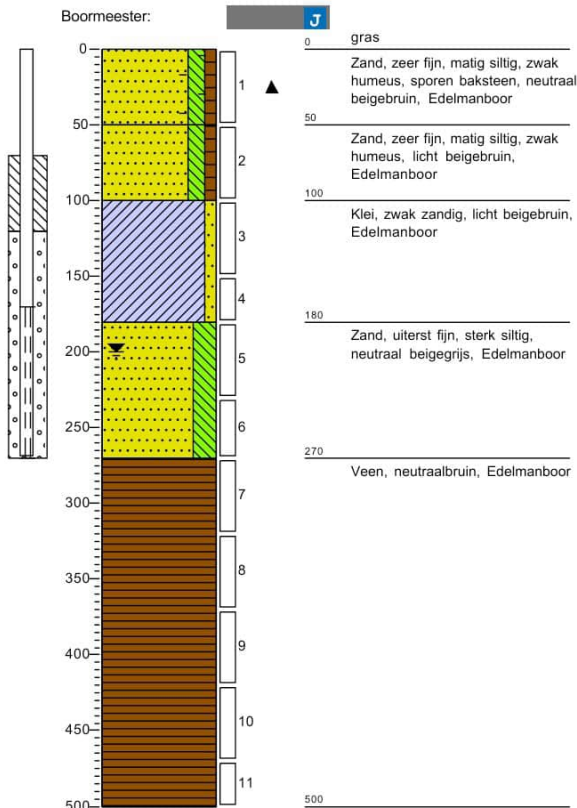
Projectnummer:

220625

Omschrijving meetpunt	X-coördinaat	Y-coördinaat	Hoogte t.o.v. maaiveld (in m' NAP)
1	101819.7011	420942.3698	0.45
2	101839.7614	420931.4433	0.21
3	101825.9434	420884.9410	-0.76
4	101812.4079	420864.7962	-0.66
putdeksel	101813.5625	420948.5460	-0.38

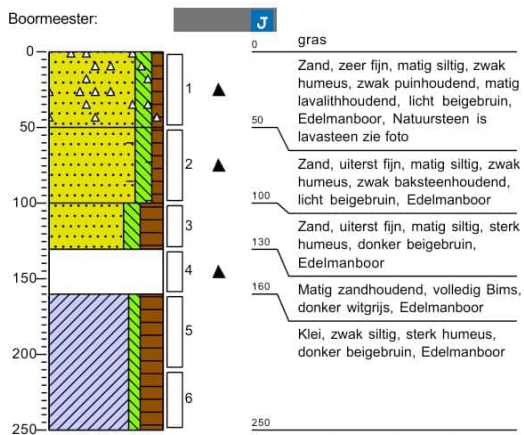
Boring: Pb01

Datum: 16-9-2022



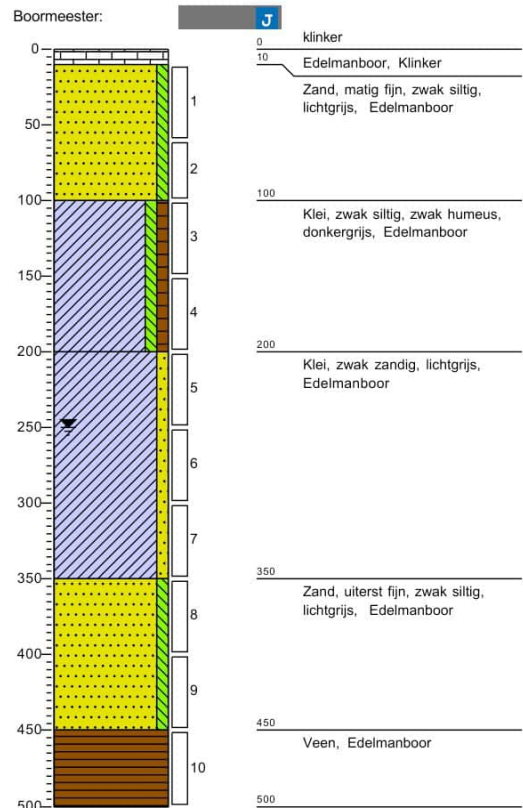
Boring: 03

Datum: 15-9-2022



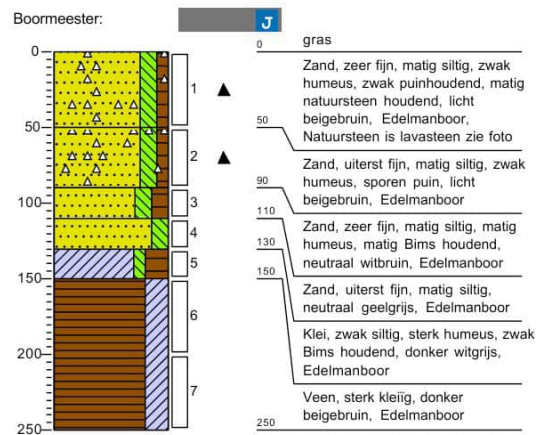
Boring: 02

Datum: 16-9-2022



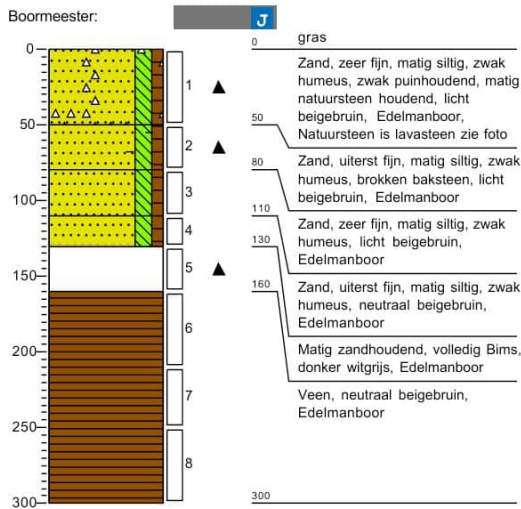
Boring: 04

Datum: 15-9-2022



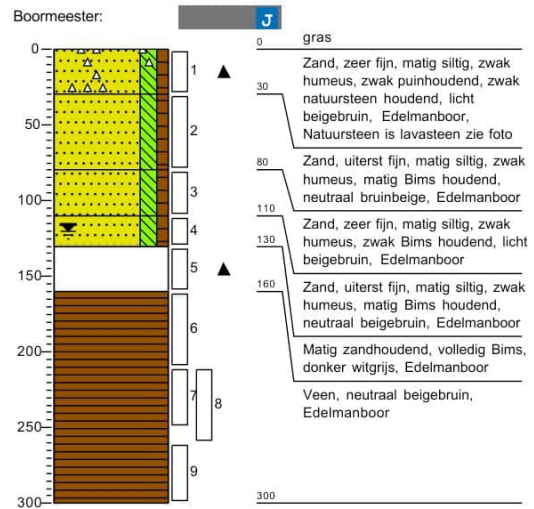
Boring: 05

Datum: 15-9-2022



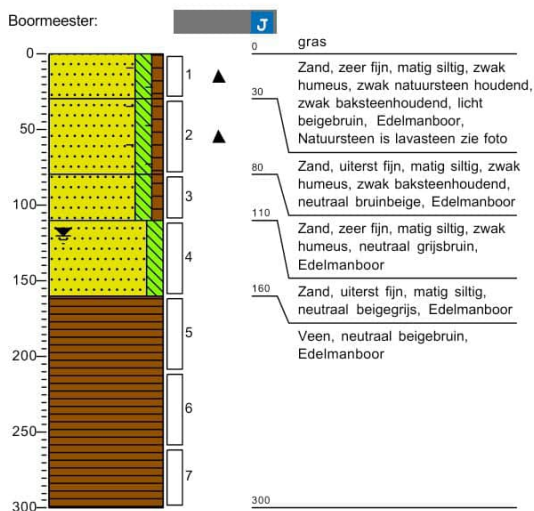
Boring: 06

Datum: 15-9-2022



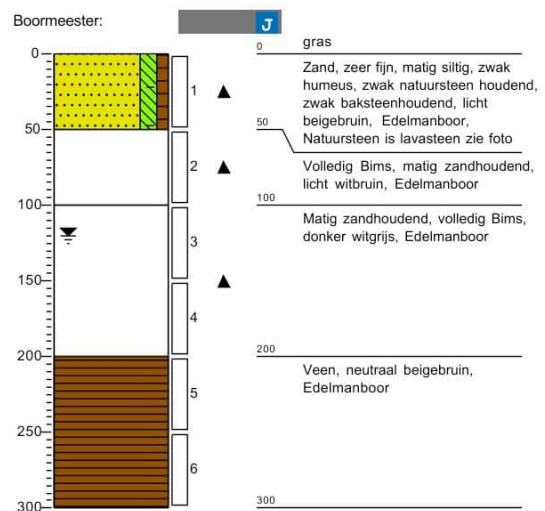
Boring: Pb07

Datum: 15-9-2022



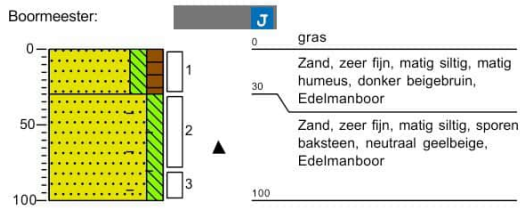
Boring: 08

Datum: 15-9-2022



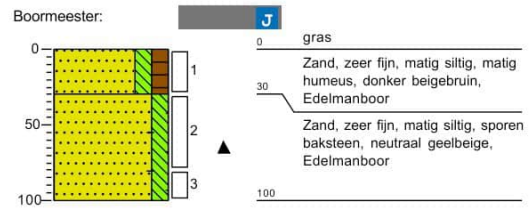
Boring: 09

Datum: 15-9-2022



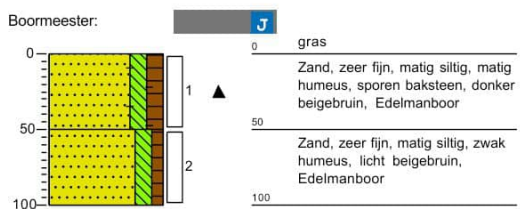
Boring: 10

Datum: 15-9-2022



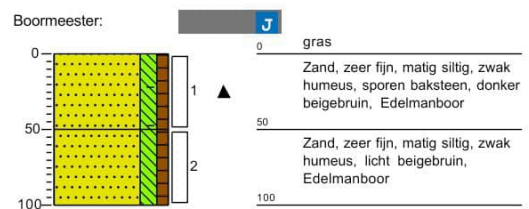
Boring: 11

Datum: 15-9-2022



Boring: 12

Datum: 15-9-2022

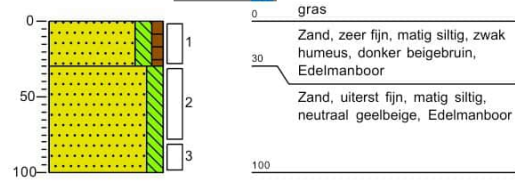


Boring: 13

Datum: 15-9-2022

Boormeester:

J

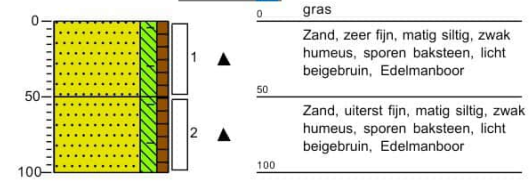


Boring: 14

Datum: 15-9-2022

Boormeester:

J

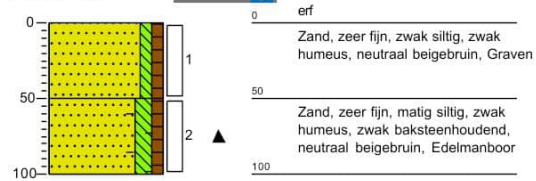


Boring: 15

Datum: 16-9-2022

Boormeester:

J

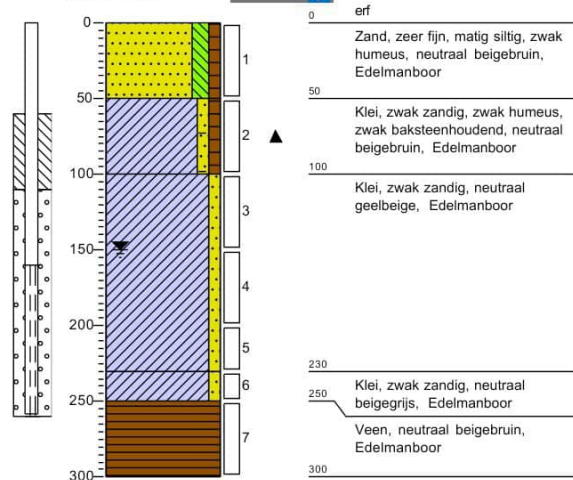


Boring: Pb16

Datum: 16-9-2022

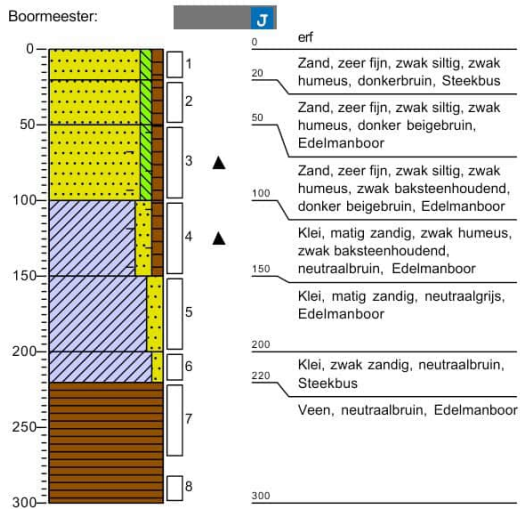
Boormeester:

J



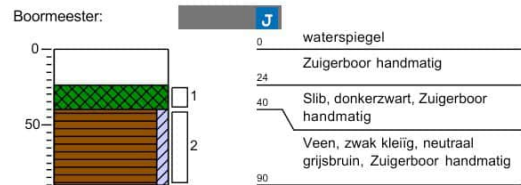
Boring: 17

Datum: 16-9-2022



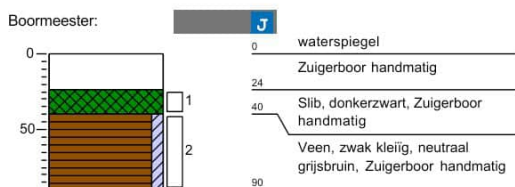
Boring: Wb01

Datum: 16-9-2022



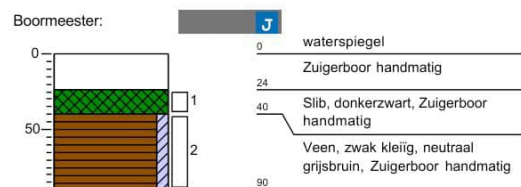
Boring: Wb02

Datum: 16-9-2022



Boring: Wb03

Datum: 16-9-2022

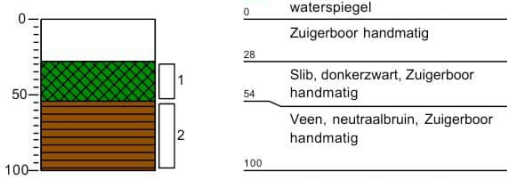


Boring: Wb04

Datum: 16-9-2022

Boormeester:

J

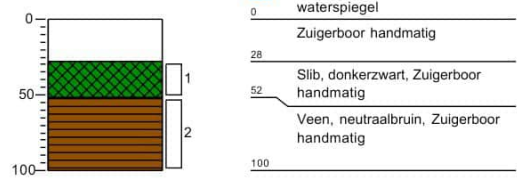


Boring: Wb05

Datum: 16-9-2022

Boormeester:

J



Boring: Wb06

Datum: 16-9-2022

Boormeester:

J

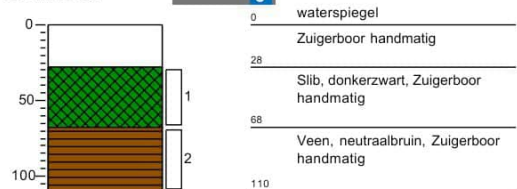


Boring: Wb07

Datum: 16-9-2022

Boormeester:

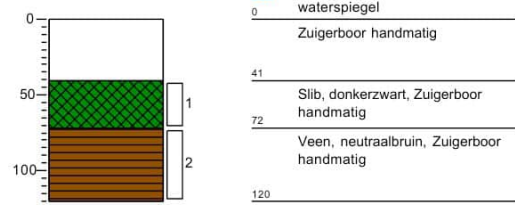
J



Boring: Wb08

Datum: 16-9-2022

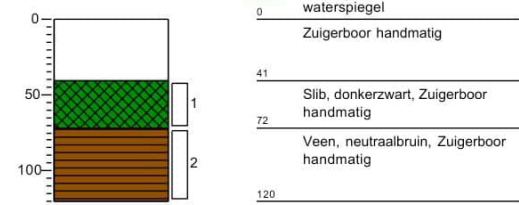
Boormeester:



Boring: Wb09

Datum: 16-9-2022

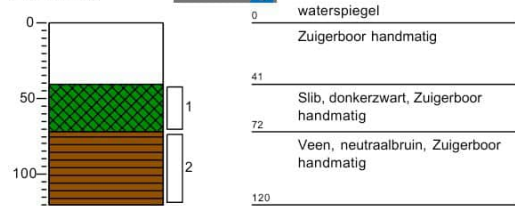
Boormeester:



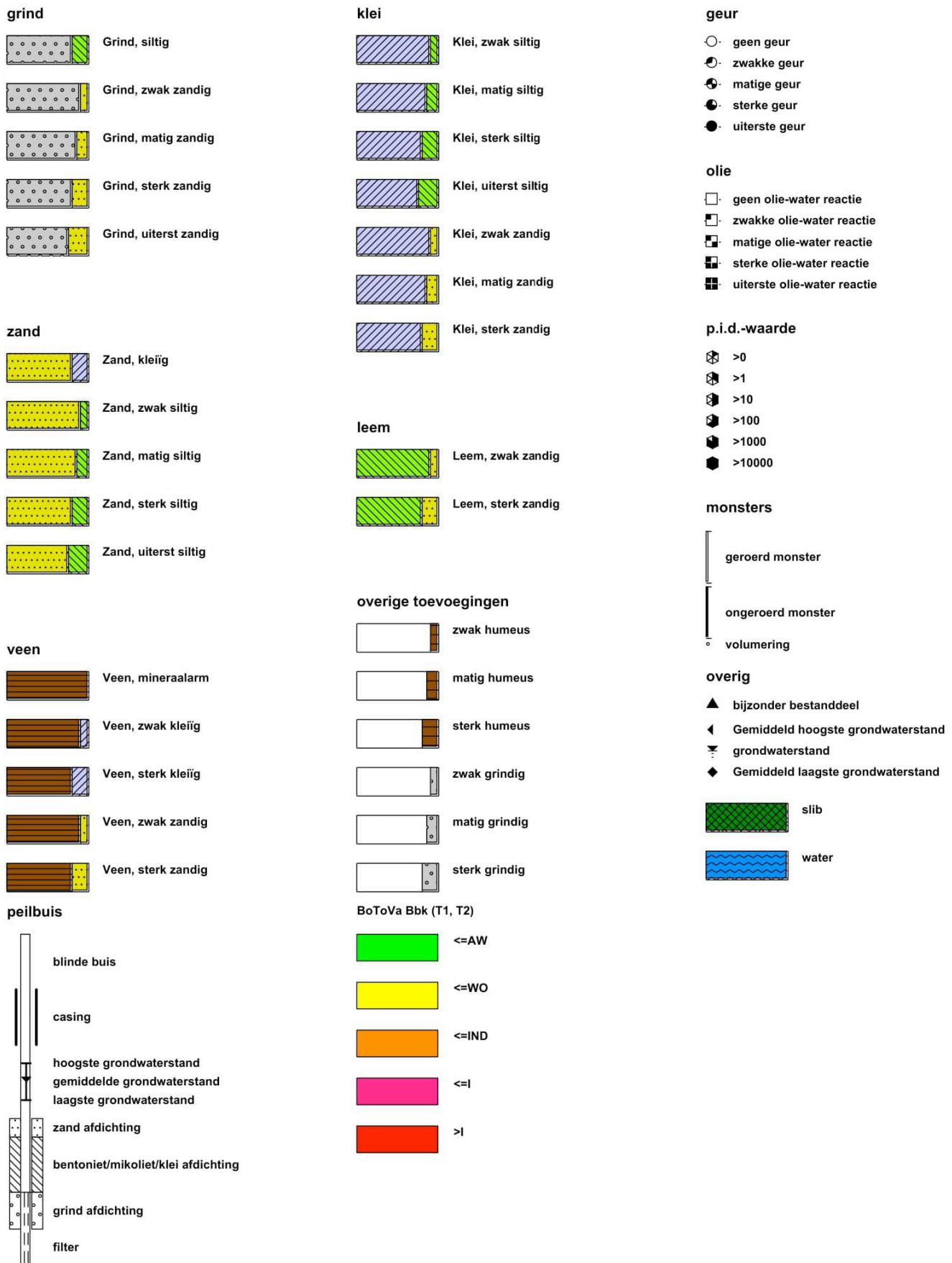
Boring: Wb10

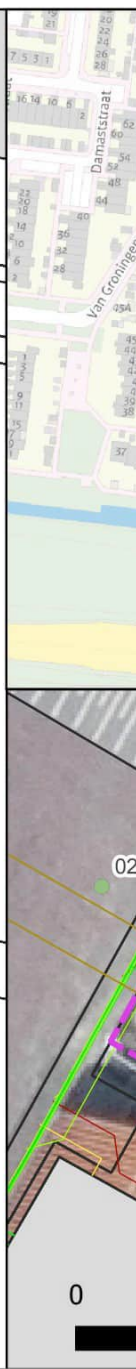
Datum: 16-9-2022

Boormeester:



Legenda (conform NEN 5104)

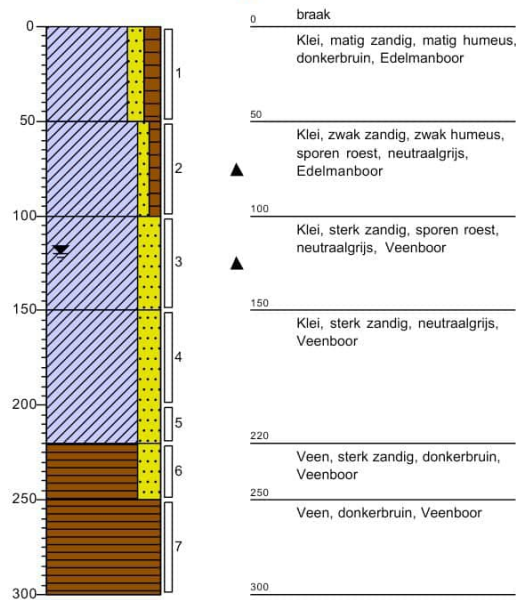




Boring: 201

Datum: 10-11-2023
X: 101839,50
Y: 420852,98

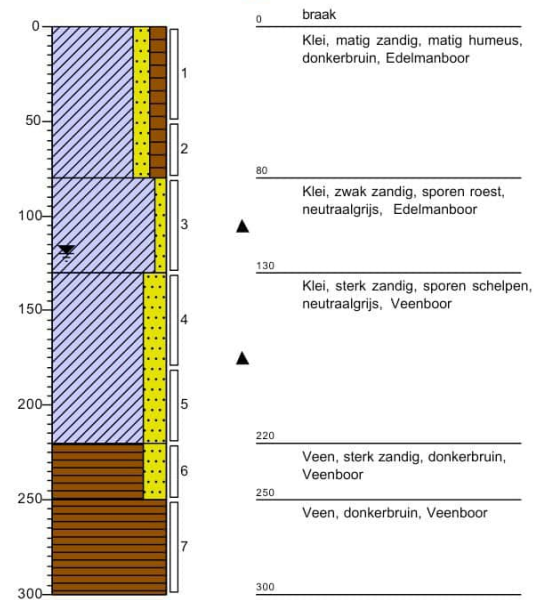
Boormeester:



Boring: 202

Datum: 10-11-2023
X: 101841,38
Y: 420863,95

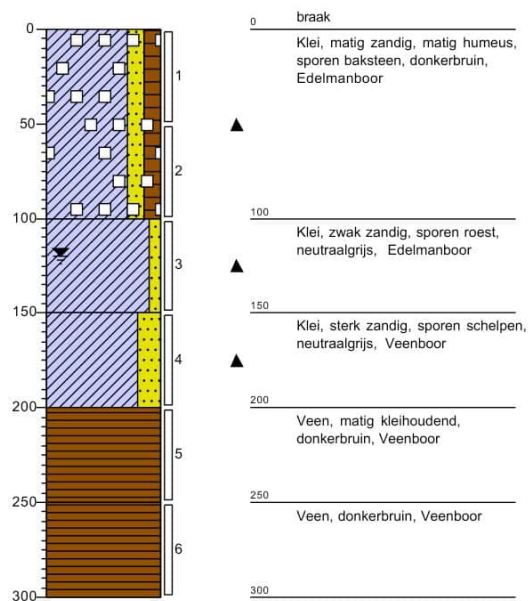
Boormeester:



Boring: 203

Datum: 10-11-2023
X: 101843,63
Y: 420875,46

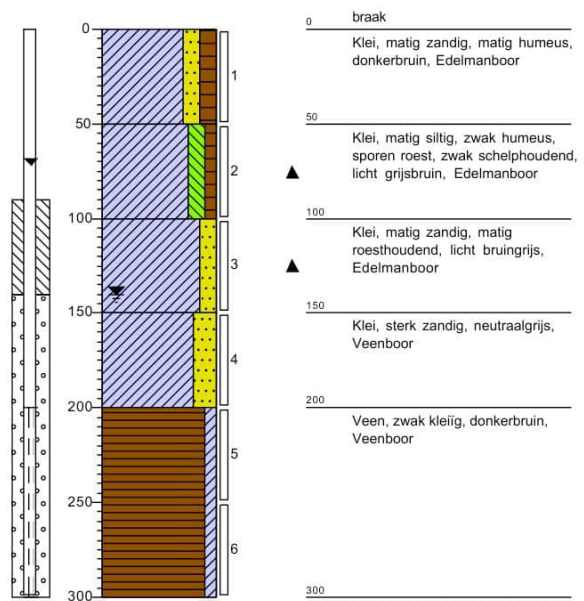
Boormeester:



Boring: 204

Datum: 10-11-2023
X: 101847,85
Y: 420890,19

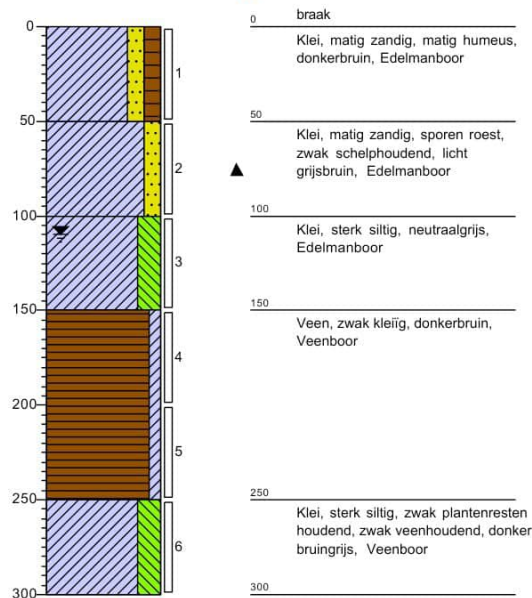
Boormeester:



Boring: 205

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X: 101850,60
Y: 420904,57

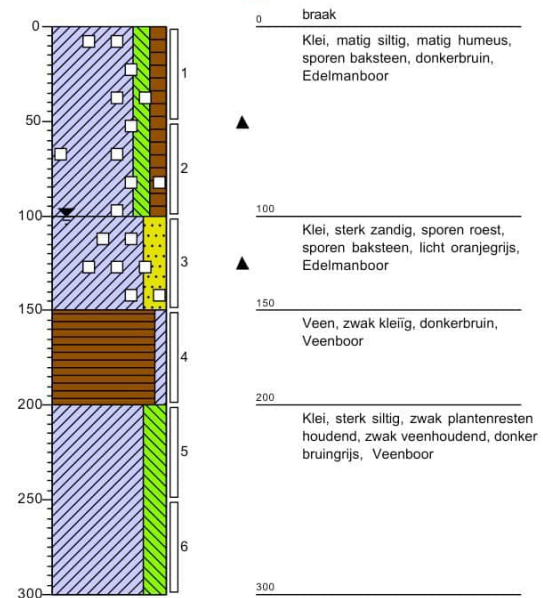
Boormeester:



Boring: 206

Datum: 10-11-2023
X: 101852,80
Y: 420915,66

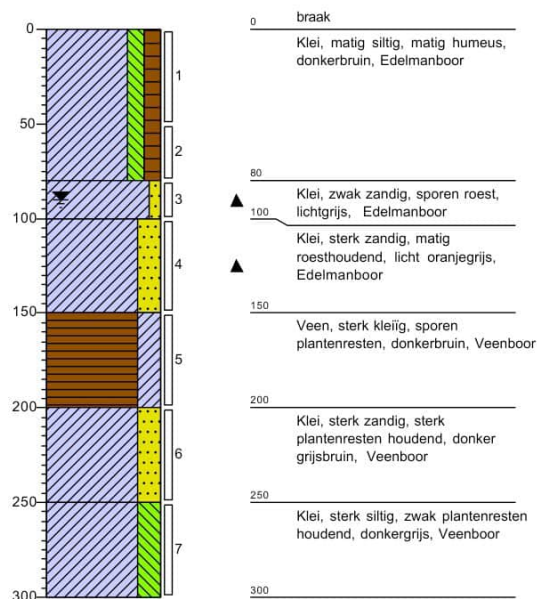
Boormeester:



Boring: 207

Datum: 10-11-2023
X: 101853,41
Y: 420924,85

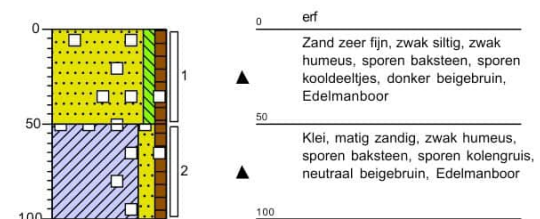
Boormeester:



Boring: 208

Datum: 10-11-2023
X: 101838,69
Y: 420928,84

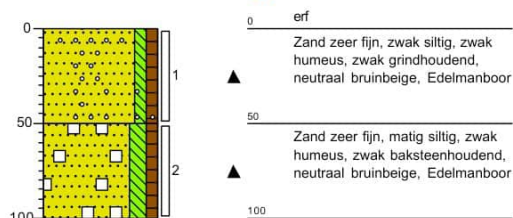
Boormeester:



Boring: 209

Datum: 10-11-2023
X: 101834,78
Y: 420931,89

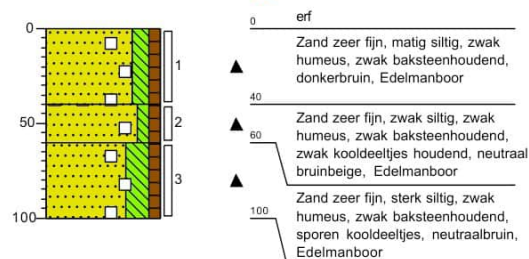
Boormeester:



Boring: 210

Datum: 10-11-2023
X: 101840,48
Y: 420928,74

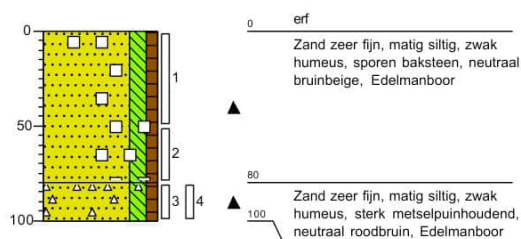
Boormeester:



Boring: 211

Datum: 10-11-2023
X: 101833,48
Y: 420931,07

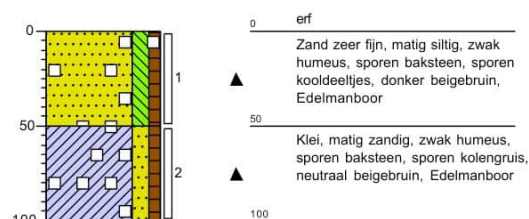
Boormeester:



Boring: 212

Datum: 10-11-2023
X: 101837,76
Y: 420929,74

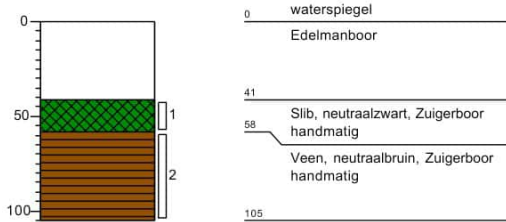
Boormeester:



Boring: 220

Datum: 10-11-2023

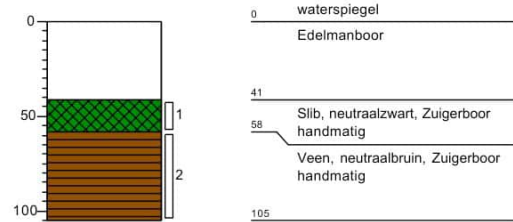
Boormeester:



Boring: 221

Datum: 10-11-2023

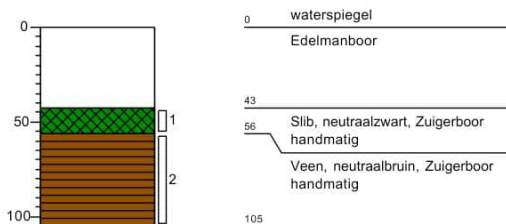
Boormeester:



Boring: 222

Datum: 10-11-2023

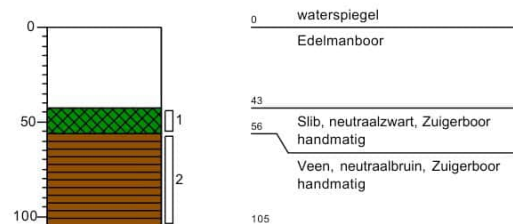
Boormeester:



Boring: 223

Datum: 10-11-2023

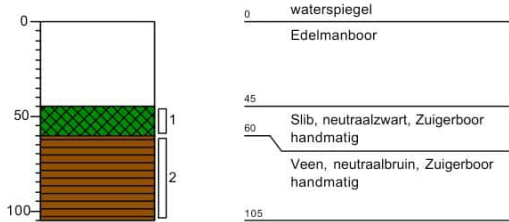
Boormeester:



Boring: 224

Datum: 10-11-2023

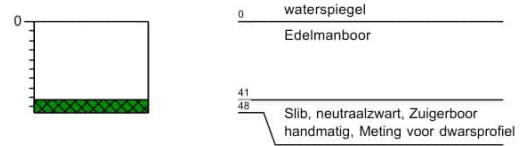
Boormeester:



Boring: 225a

Datum: 10-11-2023

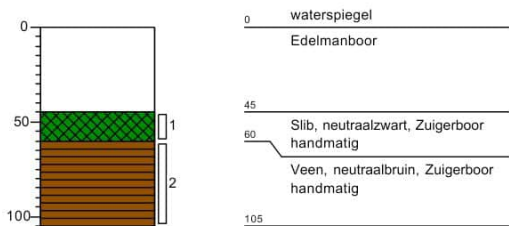
Boormeester:



Boring: 225b

Datum: 10-11-2023

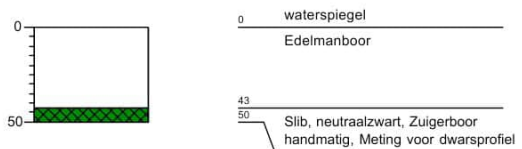
Boormeester:



Boring: 225c

Datum: 10-11-2023

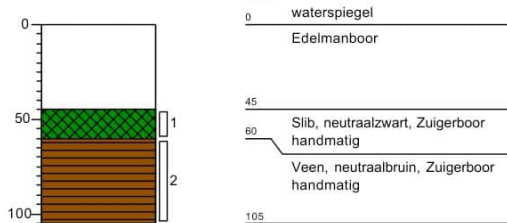
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Boring: 226

Datum: 10-11-2023

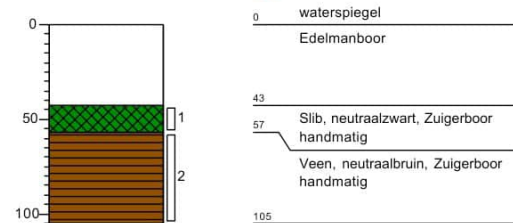
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Boring: 227

Datum: 10-11-2023

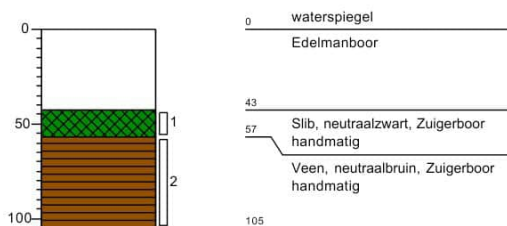
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Boring: 228

Datum: 10-11-2023

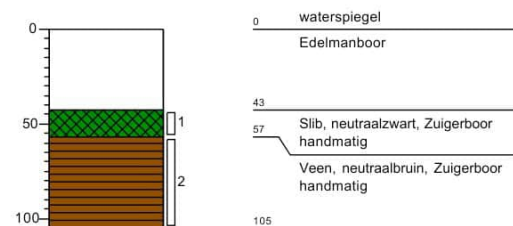
Boormeester:



Boring: 229

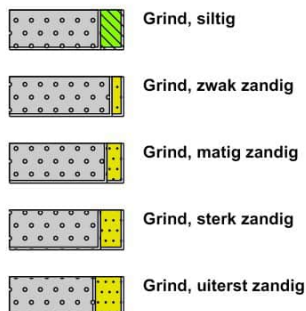
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Boormeester:

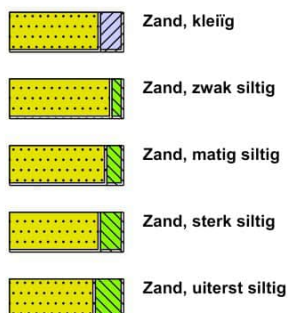


Legenda (conform NEN 5104)

grind



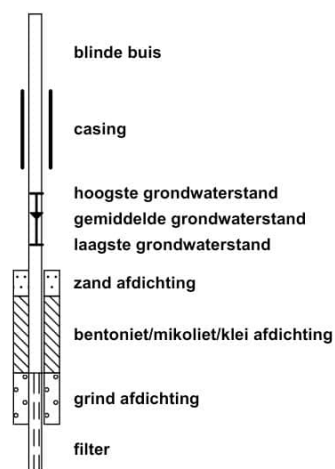
zand



veen



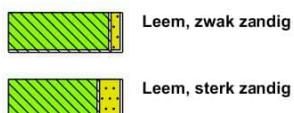
peilbuis



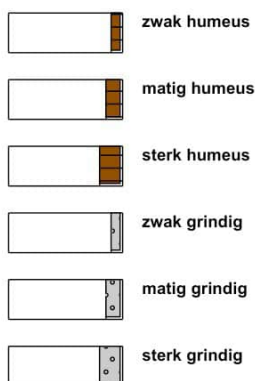
klei



leem



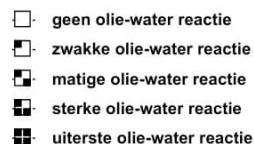
overige toevoegingen



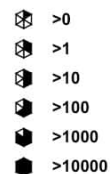
geur



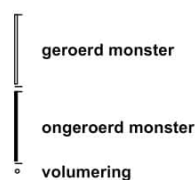
olie



p.i.d.-waarde



monsters



overig



Bijlage B

Dsheetpiling berekening

Report for D-Sheet Piling 20.2

Design of Diaphragm and Sheet Pile Walls
Developed by Deltares



Company: Royal HaskoningDHV

Date of report: 04-Jun-24

Time of report: 8:23:13

Report with version: 20.2.1.30962

Date of calculation: 03-Jun-24

Time of calculation: 15:04:51

Calculated with version: 20.2.1.30962

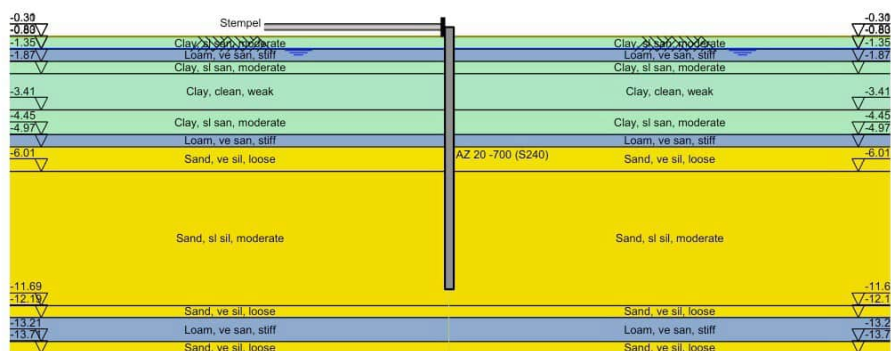
File name: CPT 2 boorkuip achterwand

Project identification: Duikerkruising Strijenseweg 'S Gravendeel
Boorkuip achterwand
CPT 3

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

1 Outline Stage 1: CPT 2 aanbrengen damwanden en ringgording

Outline - Stage 1: CPT 2 aanbrengen damwanden en ringgording

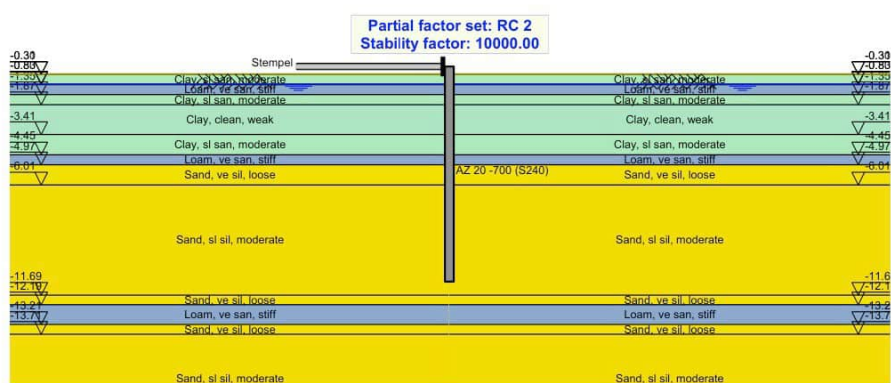


2 Overall Stability Stage 1: CPT 2 aanbrengen damwanden en ringgording

Stability factor : 10000.00

2.1 Overall Stability

Overall Stability - Stage 1: CPT 2 aanbrengen damwanden en ringgording



3 Step 6.1 Stage 1: CPT 2 aanbrengen damwanden en ringgording

3.1 General Input Data

Passive side:

D-Sheet Piling determined

3.2 Input Data Left

3.2.1 Calculation Method

Calculation method: C, phi, delta

3.2.2 Water Level

Water level: -0.75 [m]

3.2.3 Surface

X [m]	Y [m]
0.00	-0.30

3.3 Input Data Right

3.3.1 Calculation Method

Calculation method: C, phi, delta

3.3.2 Water Level

Water level: -0.55 [m]

3.3.3 Surface

X [m]	Y [m]
0.00	-0.34

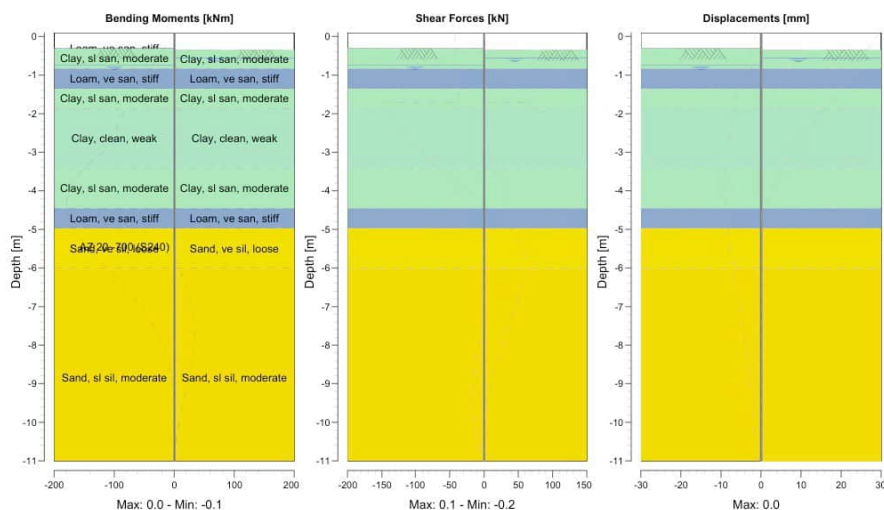
3.4 Calculation Results

Number of iterations: 2

3.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.1 - Partial factor set: RC 2



3.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-0.02	0.0
1	-0.30	-0.01	-0.02	0.0
2	-0.30	-0.01	-0.02	0.0
2	-0.31	-0.01	-0.02	0.0
3	-0.31	-0.01	-0.02	0.0
3	-0.34	-0.01	-0.03	0.0
4	-0.34	-0.01	-0.03	0.0
4	-0.75	-0.06	-0.17	0.0
5	-0.75	-0.06	-0.17	0.0
5	-0.80	-0.06	-0.16	0.0
6	-0.80	-0.06	-0.16	0.0
6	-0.83	-0.07	-0.16	0.0
7	-0.83	-0.07	-0.16	0.0
7	-1.05	-0.10	-0.09	0.0
8	-1.05	-0.10	-0.09	0.0
8	-1.35	-0.11	0.00	0.0
9	-1.35	-0.11	0.00	0.0
9	-1.70	-0.10	0.04	0.0
10	-1.70	-0.10	0.04	0.0
10	-1.87	-0.10	0.05	0.0
11	-1.87	-0.10	0.05	0.0
11	-2.31	-0.08	0.02	0.0
12	-2.31	-0.08	0.02	0.0
12	-2.76	-0.08	-0.01	0.0
13	-2.76	-0.08	-0.01	0.0
13	-3.20	-0.09	-0.04	0.0
14	-3.20	-0.09	-0.04	0.0
14	-3.41	-0.10	-0.05	0.0
15	-3.41	-0.10	-0.05	0.0
15	-3.53	-0.10	-0.05	0.0
16	-3.53	-0.10	-0.05	0.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-0.11	-0.04	0.0
17	-3.70	-0.11	-0.04	0.0
17	-3.95	-0.12	-0.02	0.0
18	-3.95	-0.12	-0.02	0.0
18	-4.45	-0.12	0.00	0.0
19	-4.45	-0.12	0.00	0.0
19	-4.97	-0.09	0.11	0.0
20	-4.97	-0.09	0.11	0.0
20	-5.49	-0.05	0.08	0.0
21	-5.49	-0.05	0.08	0.0
21	-6.01	-0.02	0.04	0.0
22	-6.01	-0.02	0.04	0.0
22	-6.56	0.00	0.02	0.0
23	-6.56	0.00	0.02	0.0
23	-7.12	0.01	0.01	0.0
24	-7.12	0.01	0.01	0.0
24	-7.67	0.01	0.00	0.0
25	-7.67	0.01	0.00	0.0
25	-8.23	0.01	0.00	0.0
26	-8.23	0.01	0.00	0.0
26	-8.78	0.01	-0.01	0.0
27	-8.78	0.01	-0.01	0.0
27	-9.34	0.01	-0.01	0.0
28	-9.34	0.01	-0.01	0.0
28	-9.89	0.00	-0.01	0.0
29	-9.89	0.00	-0.01	0.0
29	-10.45	0.00	0.00	0.0
30	-10.45	0.00	0.00	0.0
30	-11.00	0.00	0.00	0.0
Max		-0.12	-0.17	0.0
Max, minor nodes incl.		-0.12	-0.17	0.0

3.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	315.6	295.3
Water	515.3	535.6
Total	831.0	831.0

No passive side found of the sheet piling.

Left effect. resistance / max. passive resistance 18.3 %

Right effect. resistance / max. passive resistance 18.0 %

3.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.02	Elastic	Left	Strut

4 Step 6.2 Stage 1: CPT 2 aanbrengen damwanden en ringgording

4.1 General Input Data

Passive side:

D-Sheet Piling determined

4.2 Input Data Left

4.2.1 Calculation Method

Calculation method: C, phi, delta

4.2.2 Water Level

Water level: -0.75 [m]

4.2.3 Surface

X [m]	Y [m]
0.00	-0.30

4.3 Input Data Right

4.3.1 Calculation Method

Calculation method: C, phi, delta

4.3.2 Water Level

Water level: -0.55 [m]

4.3.3 Surface

X [m]	Y [m]
0.00	-0.34

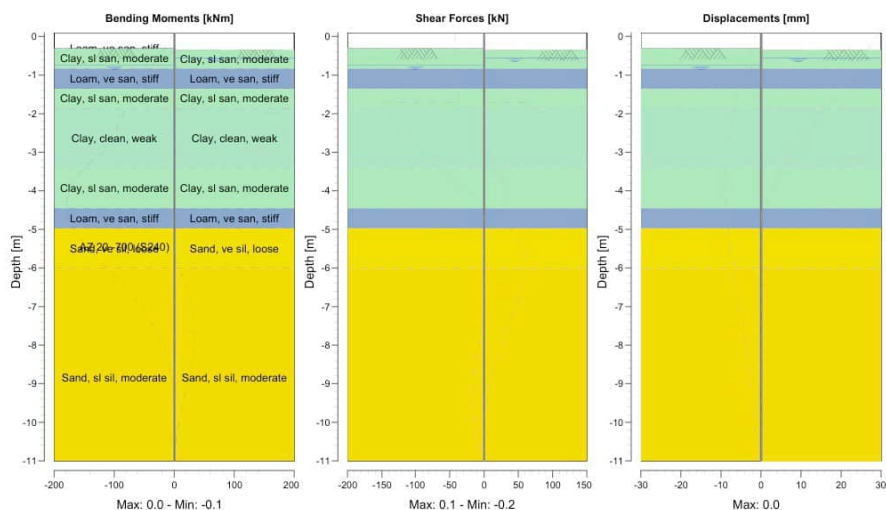
4.4 Calculation Results

Number of iterations: 3

4.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.2 - Partial factor set: RC 2



4.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.0
1	-0.30	0.00	0.00	0.0
2	-0.30	0.00	0.00	0.0
2	-0.31	0.00	0.00	0.0
3	-0.31	0.00	0.00	0.0
3	-0.34	0.00	-0.01	0.0
4	-0.34	0.00	-0.01	0.0
4	-0.75	-0.04	-0.15	0.0
5	-0.75	-0.04	-0.15	0.0
5	-0.80	-0.05	-0.14	0.0
6	-0.80	-0.05	-0.14	0.0
6	-0.83	-0.05	-0.14	0.0
7	-0.83	-0.05	-0.14	0.0
7	-1.05	-0.08	-0.07	0.0
8	-1.05	-0.08	-0.07	0.0
8	-1.35	-0.08	0.02	0.0
9	-1.35	-0.08	0.02	0.0
9	-1.70	-0.07	0.05	0.0
10	-1.70	-0.07	0.05	0.0
10	-1.87	-0.06	0.07	0.0
11	-1.87	-0.06	0.07	0.0
11	-2.31	-0.04	0.04	0.0
12	-2.31	-0.04	0.04	0.0
12	-2.76	-0.03	0.00	0.0
13	-2.76	-0.03	0.00	0.0
13	-3.20	-0.04	-0.03	0.0
14	-3.20	-0.04	-0.03	0.0
14	-3.41	-0.04	-0.05	0.0
15	-3.41	-0.04	-0.05	0.0
15	-3.53	-0.05	-0.04	0.0
16	-3.53	-0.05	-0.04	0.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-0.06	-0.03	0.0
17	-3.70	-0.06	-0.03	0.0
17	-3.95	-0.06	-0.02	0.0
18	-3.95	-0.06	-0.02	0.0
18	-4.45	-0.07	-0.01	0.0
19	-4.45	-0.07	-0.01	0.0
19	-4.97	-0.05	0.10	0.0
20	-4.97	-0.05	0.10	0.0
20	-5.49	-0.01	0.06	0.0
21	-5.49	-0.01	0.06	0.0
21	-6.01	0.01	0.02	0.0
22	-6.01	0.01	0.02	0.0
22	-6.56	0.02	0.00	0.0
23	-6.56	0.02	0.00	0.0
23	-7.12	0.02	-0.01	0.0
24	-7.12	0.02	-0.01	0.0
24	-7.67	0.01	-0.01	0.0
25	-7.67	0.01	-0.01	0.0
25	-8.23	0.01	-0.01	0.0
26	-8.23	0.01	-0.01	0.0
26	-8.78	0.01	-0.01	0.0
27	-8.78	0.01	-0.01	0.0
27	-9.34	0.00	0.00	0.0
28	-9.34	0.00	0.00	0.0
28	-9.89	0.00	0.00	0.0
29	-9.89	0.00	0.00	0.0
29	-10.45	0.00	0.00	0.0
30	-10.45	0.00	0.00	0.0
30	-11.00	0.00	0.00	0.0
Max		-0.08	-0.15	0.0
Max, minor nodes incl.		-0.08	-0.15	0.0

4.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	315.6	295.3
Water	515.3	535.6
Total	831.0	831.0

No passive side found of the sheet piling.

Left effect. resistance / max. passive resistance 18.3 %

Right effect. resistance / max. passive resistance 18.0 %

4.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

5 Step 6.3 Stage 1: CPT 2 aanbrengen damwanden en ringgording

5.1 General Input Data

Passive side:

D-Sheet Piling determined

5.2 Input Data Left

5.2.1 Calculation Method

Calculation method: C, phi, delta

5.2.2 Water Level

Water level: -0.75 [m]

5.2.3 Surface

X [m]	Y [m]
0.00	-0.30

5.3 Input Data Right

5.3.1 Calculation Method

Calculation method: C, phi, delta

5.3.2 Water Level

Water level: -1.05 [m]

5.3.3 Surface

X [m]	Y [m]
0.00	-0.34

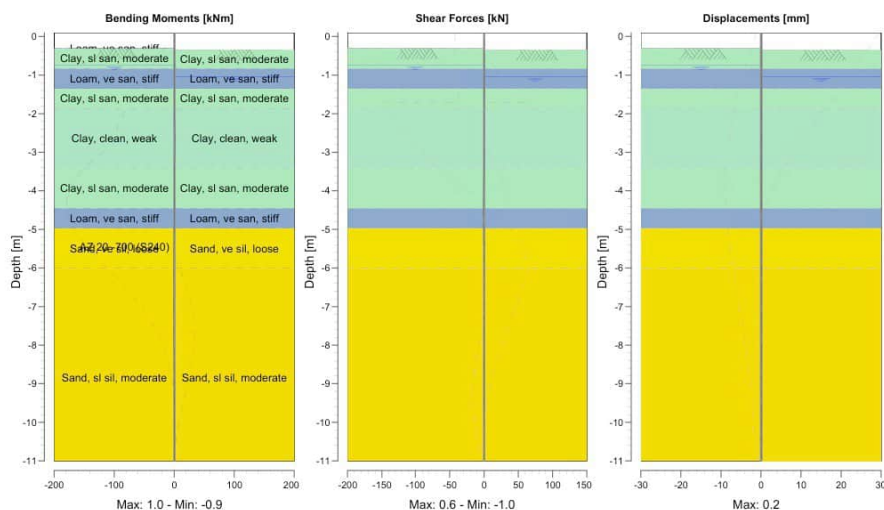
5.4 Calculation Results

Number of iterations: 4

5.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.3 - Partial factor set: RC 2



5.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.2
1	-0.30	0.00	0.00	0.2
2	-0.30	0.00	0.00	0.2
2	-0.31	0.00	0.00	0.2
3	-0.31	0.00	0.00	0.2
3	-0.34	0.00	0.00	0.2
4	-0.34	0.00	0.00	0.2
4	-0.75	0.07	0.38	0.2
5	-0.75	0.07	0.38	0.2
5	-0.80	0.09	0.42	0.2
6	-0.80	0.09	0.42	0.2
6	-0.83	0.10	0.45	0.2
7	-0.83	0.10	0.45	0.2
7	-1.05	0.22	0.58	0.2
8	-1.05	0.22	0.58	0.2
8	-1.35	0.40	0.64	0.2
9	-1.35	0.40	0.64	0.2
9	-1.70	0.63	0.65	0.2
10	-1.70	0.63	0.65	0.2
10	-1.87	0.74	0.65	0.2
11	-1.87	0.74	0.65	0.2
11	-2.31	0.95	0.33	0.2
12	-2.31	0.95	0.33	0.2
12	-2.76	1.03	0.00	0.2
13	-2.76	1.03	0.00	0.2
13	-3.20	0.96	-0.33	0.2
14	-3.20	0.96	-0.33	0.2
14	-3.41	0.87	-0.50	0.2
15	-3.41	0.87	-0.50	0.2
15	-3.53	0.81	-0.52	0.2
16	-3.53	0.81	-0.52	0.2

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	0.72	-0.56	0.2
17	-3.70	0.72	-0.56	0.2
17	-3.95	0.57	-0.62	0.2
18	-3.95	0.57	-0.62	0.2
18	-4.45	0.22	-0.79	0.1
19	-4.45	0.22	-0.79	0.1
19	-4.97	-0.25	-1.01	0.1
20	-4.97	-0.25	-1.01	0.1
20	-5.49	-0.64	-0.53	0.1
21	-5.49	-0.64	-0.53	0.1
21	-6.01	-0.83	-0.22	0.1
22	-6.01	-0.83	-0.22	0.1
22	-6.56	-0.86	0.08	0.1
23	-6.56	-0.86	0.08	0.1
23	-7.12	-0.77	0.24	0.1
24	-7.12	-0.77	0.24	0.1
24	-7.67	-0.62	0.30	0.1
25	-7.67	-0.62	0.30	0.1
25	-8.23	-0.45	0.30	0.1
26	-8.23	-0.45	0.30	0.1
26	-8.78	-0.30	0.26	0.1
27	-8.78	-0.30	0.26	0.1
27	-9.34	-0.17	0.20	0.1
28	-9.34	-0.17	0.20	0.1
28	-9.89	-0.07	0.14	0.1
29	-9.89	-0.07	0.14	0.1
29	-10.45	-0.02	0.07	0.1
30	-10.45	-0.02	0.07	0.1
30	-11.00	0.00	0.00	0.1
Max		1.03	-1.01	0.2
Max, minor nodes incl.		1.03	-1.01	0.2

5.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	306.5	336.2
Water	515.3	485.6
Total	821.8	821.9

Considered as passive side	Right
Maximum passive effective resistance	1797.22 kN
Mobilized passive effective resistance	336.24 kN
Percentage mobilized resistance	18.7 %
Position single support	0.10 m
Maximum passive moment	13693.91 kNm
Mobilized passive moment	2469.47 kNm
Percentage mobilized moment	18.0 %

5.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

6 Step 6.4 Stage 1: CPT 2 aanbrengen damwanden en ringgording

6.1 General Input Data

Passive side:

D-Sheet Piling determined

6.2 Input Data Left

6.2.1 Calculation Method

Calculation method: C, phi, delta

6.2.2 Water Level

Water level: -0.75 [m]

6.2.3 Surface

X [m]	Y [m]
0.00	-0.30

6.3 Input Data Right

6.3.1 Calculation Method

Calculation method: C, phi, delta

6.3.2 Water Level

Water level: -1.05 [m]

6.3.3 Surface

X [m]	Y [m]
0.00	-0.34

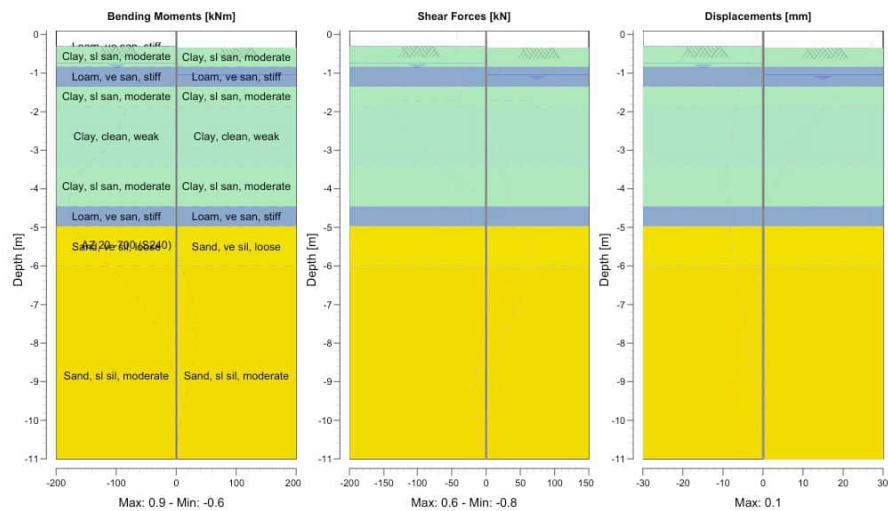
6.4 Calculation Results

Number of iterations: 4

6.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.4 - Partial factor set: RC 2



6.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.1
1	-0.30	0.00	0.00	0.1
2	-0.30	0.00	0.00	0.1
2	-0.31	0.00	0.00	0.1
3	-0.31	0.00	0.00	0.1
3	-0.34	0.00	0.00	0.1
4	-0.34	0.00	0.00	0.1
4	-0.75	0.06	0.32	0.1
5	-0.75	0.06	0.32	0.1
5	-0.80	0.08	0.36	0.1
6	-0.80	0.08	0.36	0.1
6	-0.83	0.09	0.38	0.1
7	-0.83	0.09	0.38	0.1
7	-1.05	0.19	0.49	0.1
8	-1.05	0.19	0.49	0.1
8	-1.35	0.34	0.54	0.1
9	-1.35	0.34	0.54	0.1
9	-1.70	0.53	0.56	0.1
10	-1.70	0.53	0.56	0.1
10	-1.87	0.63	0.57	0.1
11	-1.87	0.63	0.57	0.1
11	-2.31	0.81	0.27	0.1
12	-2.31	0.81	0.27	0.1
12	-2.76	0.87	-0.02	0.1
13	-2.76	0.87	-0.02	0.1
13	-3.20	0.79	-0.33	0.1
14	-3.20	0.79	-0.33	0.1
14	-3.41	0.71	-0.48	0.1
15	-3.41	0.71	-0.48	0.1
15	-3.53	0.65	-0.48	0.1
16	-3.53	0.65	-0.48	0.1

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	0.57	-0.48	0.1
17	-3.70	0.57	-0.48	0.1
17	-3.95	0.44	-0.51	0.1
18	-3.95	0.44	-0.51	0.1
18	-4.45	0.16	-0.62	0.1
19	-4.45	0.16	-0.62	0.1
19	-4.97	-0.20	-0.80	0.0
20	-4.97	-0.20	-0.80	0.0
20	-5.49	-0.48	-0.30	0.0
21	-5.49	-0.48	-0.30	0.0
21	-6.01	-0.56	-0.03	0.0
22	-6.01	-0.56	-0.03	0.0
22	-6.56	-0.51	0.18	0.0
23	-6.56	-0.51	0.18	0.0
23	-7.12	-0.39	0.24	0.0
24	-7.12	-0.39	0.24	0.0
24	-7.67	-0.26	0.22	0.0
25	-7.67	-0.26	0.22	0.0
25	-8.23	-0.15	0.17	0.0
26	-8.23	-0.15	0.17	0.0
26	-8.78	-0.07	0.11	0.0
27	-8.78	-0.07	0.11	0.0
27	-9.34	-0.02	0.06	0.0
28	-9.34	-0.02	0.06	0.0
28	-9.89	0.00	0.02	0.0
29	-9.89	0.00	0.02	0.0
29	-10.45	0.00	0.00	0.0
30	-10.45	0.00	0.00	0.0
30	-11.00	0.00	0.00	0.0
Max		0.87	-0.80	0.1
Max, minor nodes incl.		0.87	-0.80	0.1

6.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	306.5	336.2
Water	515.3	485.6
Total	821.8	821.9

Considered as passive side	Right
Maximum passive effective resistance	1797.22 kN
Mobilized passive effective resistance	336.24 kN
Percentage mobilized resistance	18.7 %
Position single support	0.10 m
Maximum passive moment	13693.91 kNm
Mobilized passive moment	2469.47 kNm
Percentage mobilized moment	18.0 %

6.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

7 Step 6.5 Stage 1: CPT 2 aanbrengen damwanden en ringgording

7.1 General Input Data

Passive side:

D-Sheet Piling determined

7.2 Input Data Left

7.2.1 Calculation Method

Calculation method: C, phi, delta

7.2.2 Water Level

Water level: -0.80 [m]

7.2.3 Surface

X [m]	Y [m]
0.00	-0.30

7.3 Input Data Right

7.3.1 Calculation Method

Calculation method: C, phi, delta

7.3.2 Water Level

Water level: -0.80 [m]

7.3.3 Surface

X [m]	Y [m]
0.00	-0.30

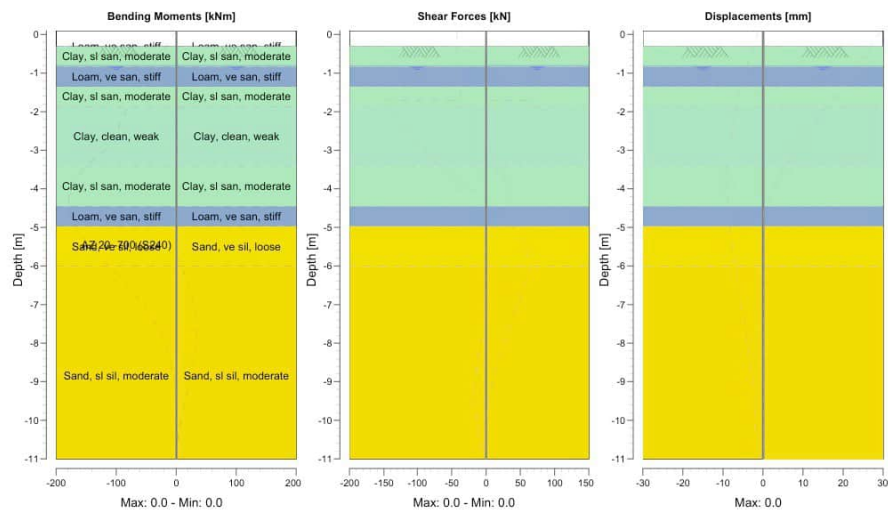
7.4 Calculation Results

Number of iterations: 3

7.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.5 - Partial factor set: RC 2



7.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.0
1	-0.30	0.00	0.00	0.0
2	-0.30	0.00	0.00	0.0
2	-0.31	0.00	0.00	0.0
3	-0.31	0.00	0.00	0.0
3	-0.80	0.00	0.00	0.0
4	-0.80	0.00	0.00	0.0
4	-0.83	0.00	0.00	0.0
5	-0.83	0.00	0.00	0.0
5	-1.35	0.00	0.00	0.0
6	-1.35	0.00	0.00	0.0
6	-1.70	0.00	0.00	0.0
7	-1.70	0.00	0.00	0.0
7	-1.87	0.00	0.00	0.0
8	-1.87	0.00	0.00	0.0
8	-2.31	0.00	0.00	0.0
9	-2.31	0.00	0.00	0.0
9	-2.76	0.00	0.00	0.0
10	-2.76	0.00	0.00	0.0
10	-3.20	0.00	0.00	0.0
11	-3.20	0.00	0.00	0.0
11	-3.41	0.00	0.00	0.0
12	-3.41	0.00	0.00	0.0
12	-3.70	0.00	0.00	0.0
13	-3.70	0.00	0.00	0.0
13	-4.08	0.00	0.00	0.0
14	-4.08	0.00	0.00	0.0
14	-4.45	0.00	0.00	0.0
15	-4.45	0.00	0.00	0.0
15	-4.97	0.00	0.00	0.0
16	-4.97	0.00	0.00	0.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-5.49	0.00	0.00	0.0
17	-5.49	0.00	0.00	0.0
17	-6.01	0.00	0.00	0.0
18	-6.01	0.00	0.00	0.0
18	-6.56	0.00	0.00	0.0
19	-6.56	0.00	0.00	0.0
19	-7.12	0.00	0.00	0.0
20	-7.12	0.00	0.00	0.0
20	-7.67	0.00	0.00	0.0
21	-7.67	0.00	0.00	0.0
21	-8.23	0.00	0.00	0.0
22	-8.23	0.00	0.00	0.0
22	-8.78	0.00	0.00	0.0
23	-8.78	0.00	0.00	0.0
23	-9.34	0.00	0.00	0.0
24	-9.34	0.00	0.00	0.0
24	-9.89	0.00	0.00	0.0
25	-9.89	0.00	0.00	0.0
25	-10.45	0.00	0.00	0.0
26	-10.45	0.00	0.00	0.0
26	-11.00	0.00	0.00	0.0
Max		0.00	0.00	0.0
Max, minor nodes incl.		0.00	0.00	0.0

7.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	289.6	289.6
Water	510.3	510.3
Total	799.9	799.9

No passive side found of the sheet piling.

Left effect. resistance / max. passive resistance 13.0 %

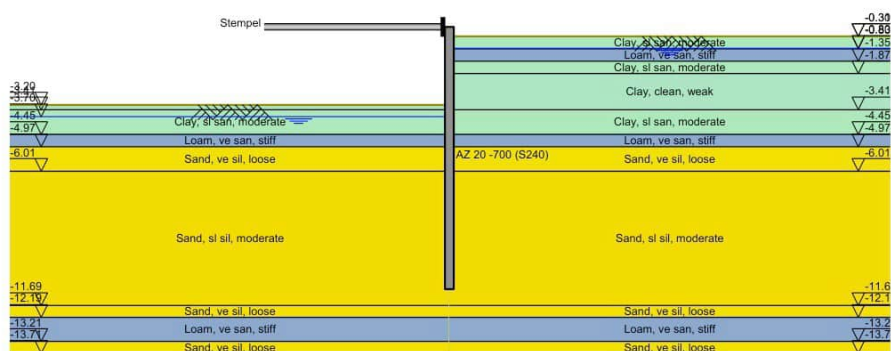
Right effect. resistance / max. passive resistance 13.0 %

7.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

8 Outline Stage 2: CPT 2 ontgraven

Outline - Stage 2: CPT 2 ontgraven

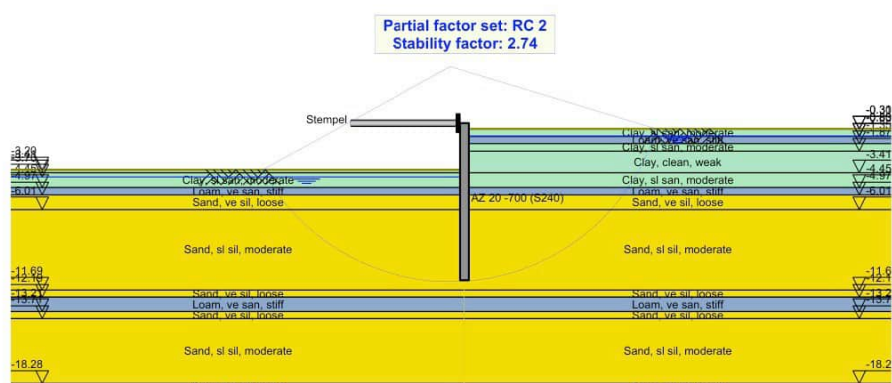


9 Overall Stability Stage 2: CPT 2 ontgraven

Stability factor : 2.74

9.1 Overall Stability

Overall Stability - Stage 2: CPT 2 ontgraven



10 Step 6.1 Stage 2: CPT 2 ontgraven

10.1 General Input Data

Passive side:

D-Sheet Piling determined

10.2 Input Data Left

10.2.1 Calculation Method

Calculation method: C, phi, delta

10.2.2 Water Level

Water level: -3.53 [m]

10.2.3 Surface

X [m]	Y [m]
0.00	-3.53

10.3 Input Data Right

10.3.1 Calculation Method

Calculation method: C, phi, delta

10.3.2 Water Level

Water level: -0.75 [m]

10.3.3 Surface

X [m]	Y [m]
0.00	-0.30

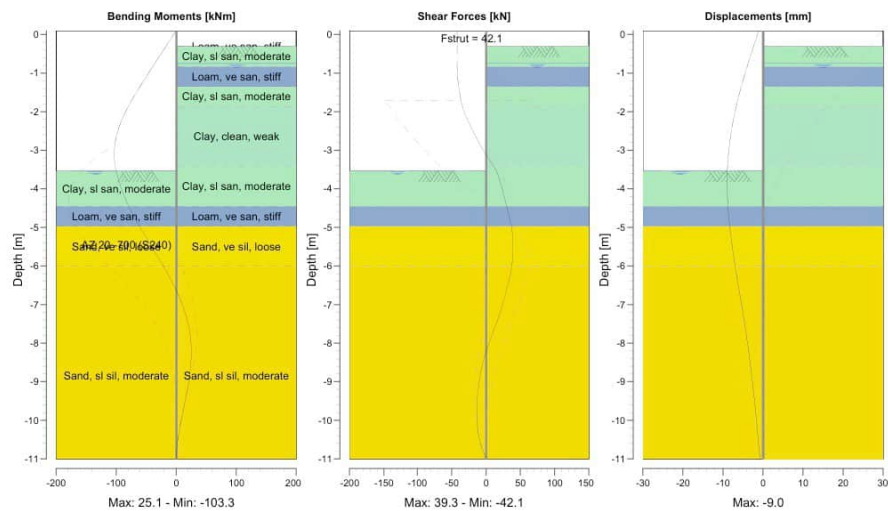
10.4 Calculation Results

Number of iterations: 4

10.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven

Step 6.1 - Partial factor set: RC 2



10.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-42.14	-1.1
1	-0.30	-16.85	-42.14	-2.3
2	-0.30	-16.85	-42.14	-2.3
2	-0.31	-17.28	-42.14	-2.4
3	-0.31	-17.28	-42.14	-2.4
3	-0.34	-18.54	-42.14	-2.5
4	-0.34	-18.54	-42.14	-2.5
4	-0.75	-35.82	-42.14	-3.7
5	-0.75	-35.82	-42.14	-3.7
5	-0.80	-37.92	-42.12	-3.9
6	-0.80	-37.92	-42.12	-3.9
6	-0.83	-39.19	-42.10	-4.0
7	-0.83	-39.19	-42.10	-4.0
7	-1.05	-48.41	-41.69	-4.6
8	-1.05	-48.41	-41.69	-4.6
8	-1.35	-60.65	-39.73	-5.4
9	-1.35	-60.65	-39.73	-5.4
9	-1.70	-74.03	-36.52	-6.3
10	-1.70	-74.03	-36.52	-6.3
10	-1.87	-80.06	-34.37	-6.7
11	-1.87	-80.06	-34.37	-6.7
11	-2.31	-93.14	-24.25	-7.6
12	-2.31	-93.14	-24.25	-7.6
12	-2.76	-101.21	-11.75	-8.3
13	-2.76	-101.21	-11.75	-8.3
13	-3.20	-103.21	3.13	-8.7
14	-3.20	-103.21	3.13	-8.7
14	-3.41	-101.73	11.00	-8.8
15	-3.41	-101.73	11.00	-8.8
15	-3.53	-100.18	14.90	-8.9
16	-3.53	-100.18	14.90	-8.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-97.31	18.30	-8.9
17	-3.70	-97.31	18.30	-8.9
17	-3.95	-92.15	22.58	-8.9
18	-3.95	-92.15	22.57	-8.9
18	-4.45	-78.90	29.72	-8.8
19	-4.45	-78.90	29.72	-8.8
19	-4.97	-61.40	37.15	-8.3
20	-4.97	-61.40	37.15	-8.3
20	-5.49	-41.33	39.29	-7.7
21	-5.49	-41.33	39.29	-7.7
21	-6.01	-21.17	37.99	-6.9
22	-6.01	-21.17	37.99	-6.9
22	-6.56	-2.01	30.82	-6.1
23	-6.56	-2.01	30.82	-6.1
23	-7.12	12.70	21.98	-5.2
24	-7.12	12.70	21.98	-5.2
24	-7.67	22.05	11.42	-4.3
25	-7.67	22.05	11.41	-4.3
25	-8.23	25.13	-0.01	-3.6
26	-8.23	25.13	-0.02	-3.6
26	-8.78	22.75	-7.90	-2.9
27	-8.78	22.75	-7.90	-2.9
27	-9.34	17.03	-12.16	-2.3
28	-9.34	17.03	-12.16	-2.3
28	-9.89	9.85	-13.28	-1.7
29	-9.89	9.85	-13.30	-1.7
29	-10.45	3.08	-10.01	-1.2
30	-10.45	3.08	-10.01	-1.2
30	-11.00	0.00	0.00	-0.7
Max		-103.21	-42.14	-8.9
Max, minor nodes incl.		-103.34	-42.14	-9.0

10.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	392.7	193.2
Water	273.7	515.3
Total	666.4	708.6

Considered as passive side	Left
Maximum passive effective resistance	947.16 kN
Mobilized passive effective resistance	392.69 kN
Percentage mobilized resistance	41.5 %
Position single support	0.10 m
Maximum passive moment	8171.94 kNm
Mobilized passive moment	3097.31 kNm
Percentage mobilized moment	37.9 %

10.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	42.14	Elastic	Left	Strut

11 Step 6.2 Stage 2: CPT 2 ontgraven

11.1 General Input Data

Passive side:

D-Sheet Piling determined

11.2 Input Data Left

11.2.1 Calculation Method

Calculation method: C, phi, delta

11.2.2 Water Level

Water level: -3.53 [m]

11.2.3 Surface

X [m]	Y [m]
0.00	-3.53

11.3 Input Data Right

11.3.1 Calculation Method

Calculation method: C, phi, delta

11.3.2 Water Level

Water level: -0.75 [m]

11.3.3 Surface

X [m]	Y [m]
0.00	-0.30

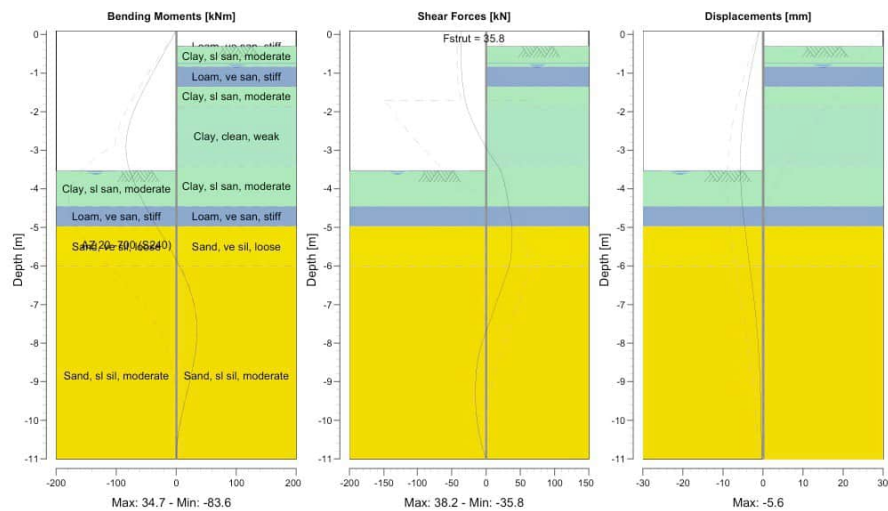
11.4 Calculation Results

Number of iterations: 4

11.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven

Step 6.2 - Partial factor set: RC 2



11.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-35.82	-0.9
1	-0.30	-14.33	-35.82	-1.8
2	-0.30	-14.33	-35.82	-1.8
2	-0.31	-14.69	-35.82	-1.8
3	-0.31	-14.69	-35.82	-1.8
3	-0.34	-15.76	-35.82	-1.9
4	-0.34	-15.76	-35.82	-1.9
4	-0.75	-30.45	-35.82	-2.7
5	-0.75	-30.45	-35.82	-2.7
5	-0.80	-32.24	-35.81	-2.8
6	-0.80	-32.24	-35.81	-2.8
6	-0.83	-33.32	-35.79	-2.9
7	-0.83	-33.32	-35.79	-2.9
7	-1.05	-41.15	-35.38	-3.3
8	-1.05	-41.15	-35.38	-3.3
8	-1.35	-51.50	-33.42	-3.8
9	-1.35	-51.50	-33.42	-3.8
9	-1.70	-62.67	-30.21	-4.4
10	-1.70	-62.67	-30.21	-4.4
10	-1.87	-67.63	-28.05	-4.6
11	-1.87	-67.63	-28.05	-4.6
11	-2.31	-77.91	-17.94	-5.1
12	-2.31	-77.91	-17.94	-5.1
12	-2.76	-83.18	-5.43	-5.5
13	-2.76	-83.18	-5.43	-5.5
13	-3.20	-82.38	9.44	-5.6
14	-3.20	-82.38	9.44	-5.6
14	-3.41	-79.58	17.31	-5.6
15	-3.41	-79.58	17.31	-5.6
15	-3.53	-77.27	21.21	-5.6
16	-3.53	-77.27	21.21	-5.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-73.34	24.21	-5.6
17	-3.70	-73.34	24.21	-5.6
17	-3.95	-66.78	27.75	-5.5
18	-3.95	-66.78	27.75	-5.5
18	-4.45	-51.37	32.73	-5.1
19	-4.45	-51.37	32.72	-5.1
19	-4.97	-32.84	37.74	-4.6
20	-4.97	-32.84	37.73	-4.6
20	-5.49	-13.04	37.76	-4.0
21	-5.49	-13.04	37.76	-4.0
21	-6.01	5.76	33.92	-3.3
22	-6.01	5.76	33.90	-3.3
22	-6.56	21.47	22.81	-2.6
23	-6.56	21.47	22.81	-2.6
23	-7.12	31.11	11.94	-2.0
24	-7.12	31.11	11.95	-2.0
24	-7.67	34.67	0.82	-1.5
25	-7.67	34.68	0.79	-1.5
25	-8.23	32.08	-9.38	-1.1
26	-8.23	32.08	-9.38	-1.1
26	-8.78	25.32	-14.21	-0.8
27	-8.78	25.32	-14.21	-0.8
27	-9.34	17.02	-15.23	-0.6
28	-9.34	17.02	-15.24	-0.6
28	-9.89	8.87	-13.71	-0.5
29	-9.89	8.87	-13.72	-0.5
29	-10.45	2.52	-8.56	-0.4
30	-10.45	2.52	-8.56	-0.4
30	-11.00	0.00	0.00	-0.3
Max		-83.18	37.76	-5.6
Max, minor nodes incl.		-83.64	38.22	-5.6

11.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	399.4	193.7
Water	273.7	515.3
Total	673.1	709.0

Considered as passive side	Left
Maximum passive effective resistance	947.16 kN
Mobilized passive effective resistance	399.43 kN
Percentage mobilized resistance	42.2 %
Position single support	0.10 m
Maximum passive moment	8171.94 kNm
Mobilized passive moment	3101.14 kNm
Percentage mobilized moment	37.9 %

11.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	35.82	Elastic	Left	Strut

12 Step 6.3 Stage 2: CPT 2 ontgraven

12.1 General Input Data

Passive side:

D-Sheet Piling determined

12.2 Input Data Left

12.2.1 Calculation Method

Calculation method: C, phi, delta

12.2.2 Water Level

Water level: -3.95 [m]

12.2.3 Surface

X [m]	Y [m]
0.00	-3.53

12.3 Input Data Right

12.3.1 Calculation Method

Calculation method: C, phi, delta

12.3.2 Water Level

Water level: -0.75 [m]

12.3.3 Surface

X [m]	Y [m]
0.00	-0.30

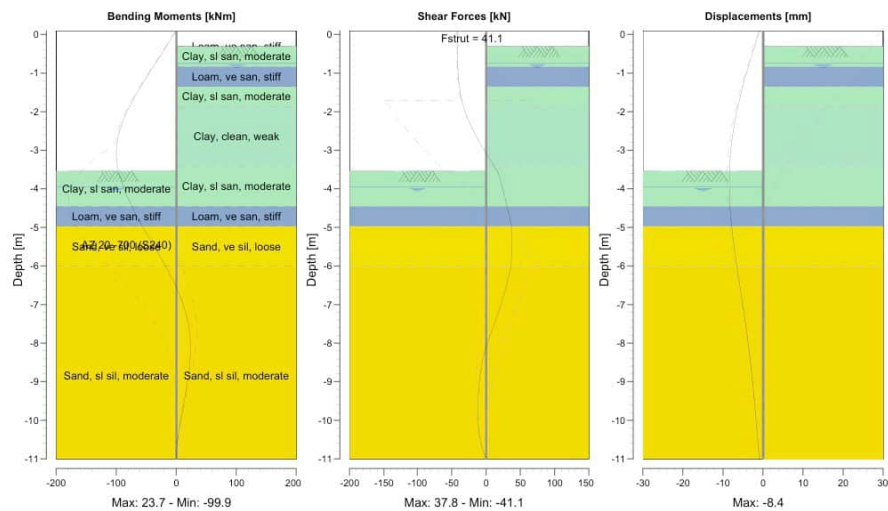
12.4 Calculation Results

Number of iterations: 5

12.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven

Step 6.3 - Partial factor set: RC 2



12.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-41.06	-0.8
1	-0.30	-16.42	-41.06	-2.1
2	-0.30	-16.42	-41.06	-2.1
2	-0.31	-16.84	-41.06	-2.1
3	-0.31	-16.84	-41.06	-2.1
3	-0.34	-18.07	-41.06	-2.2
4	-0.34	-18.07	-41.06	-2.2
4	-0.75	-34.90	-41.06	-3.4
5	-0.75	-34.90	-41.06	-3.4
5	-0.80	-36.96	-41.05	-3.5
6	-0.80	-36.96	-41.05	-3.5
6	-0.83	-38.19	-41.03	-3.6
7	-0.83	-38.19	-41.03	-3.6
7	-1.05	-47.18	-40.62	-4.3
8	-1.05	-47.18	-40.62	-4.3
8	-1.35	-59.10	-38.66	-5.0
9	-1.35	-59.10	-38.66	-5.0
9	-1.70	-72.10	-35.44	-5.9
10	-1.70	-72.10	-35.44	-5.9
10	-1.87	-77.95	-33.29	-6.3
11	-1.87	-77.95	-33.29	-6.3
11	-2.31	-90.55	-23.17	-7.1
12	-2.31	-90.55	-23.17	-7.1
12	-2.76	-98.14	-10.67	-7.8
13	-2.76	-98.14	-10.67	-7.8
13	-3.20	-99.66	4.20	-8.2
14	-3.20	-99.66	4.20	-8.2
14	-3.41	-97.96	12.07	-8.3
15	-3.41	-97.96	12.07	-8.3
15	-3.53	-96.28	15.97	-8.4
16	-3.53	-96.28	15.97	-8.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-93.23	19.37	-8.4
17	-3.70	-93.23	19.37	-8.4
17	-3.95	-87.83	23.49	-8.4
18	-3.95	-87.83	23.49	-8.4
18	-4.45	-74.21	30.50	-8.2
19	-4.45	-74.21	30.50	-8.2
19	-4.97	-56.49	37.22	-7.8
20	-4.97	-56.49	37.22	-7.8
20	-5.49	-36.91	37.65	-7.2
21	-5.49	-36.91	37.64	-7.2
21	-6.01	-17.62	36.29	-6.5
22	-6.01	-17.62	36.29	-6.5
22	-6.56	0.52	28.84	-5.7
23	-6.56	0.52	28.84	-5.7
23	-7.12	14.02	19.57	-4.9
24	-7.12	14.02	19.57	-4.9
24	-7.67	21.88	8.44	-4.1
25	-7.67	21.88	8.42	-4.1
25	-8.23	23.57	-1.67	-3.4
26	-8.23	23.57	-1.67	-3.4
26	-8.78	20.71	-8.06	-2.8
27	-8.78	20.71	-8.06	-2.8
27	-9.34	15.22	-11.28	-2.3
28	-9.34	15.22	-11.28	-2.3
28	-9.89	8.70	-11.79	-1.8
29	-9.89	8.70	-11.80	-1.8
29	-10.45	2.73	-8.84	-1.4
30	-10.45	2.73	-8.85	-1.4
30	-11.00	0.00	0.00	-0.9
Max		-99.66	-41.06	-8.4
Max, minor nodes incl.		-99.89	-41.06	-8.4

12.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	422.1	191.6
Water	243.8	515.3
Total	665.9	707.0

Considered as passive side	Left
Maximum passive effective resistance	1048.43 kN
Mobilized passive effective resistance	422.07 kN
Percentage mobilized resistance	40.3 %
Position single support	0.10 m
Maximum passive moment	8938.27 kNm
Mobilized passive moment	3303.67 kNm
Percentage mobilized moment	37.0 %

12.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	41.06	Elastic	Left	Strut

13 Step 6.4 Stage 2: CPT 2 ontgraven

13.1 General Input Data

Passive side:

D-Sheet Piling determined

13.2 Input Data Left

13.2.1 Calculation Method

Calculation method: C, phi, delta

13.2.2 Water Level

Water level: -3.95 [m]

13.2.3 Surface

X [m]	Y [m]
0.00	-3.53

13.3 Input Data Right

13.3.1 Calculation Method

Calculation method: C, phi, delta

13.3.2 Water Level

Water level: -0.75 [m]

13.3.3 Surface

X [m]	Y [m]
0.00	-0.30

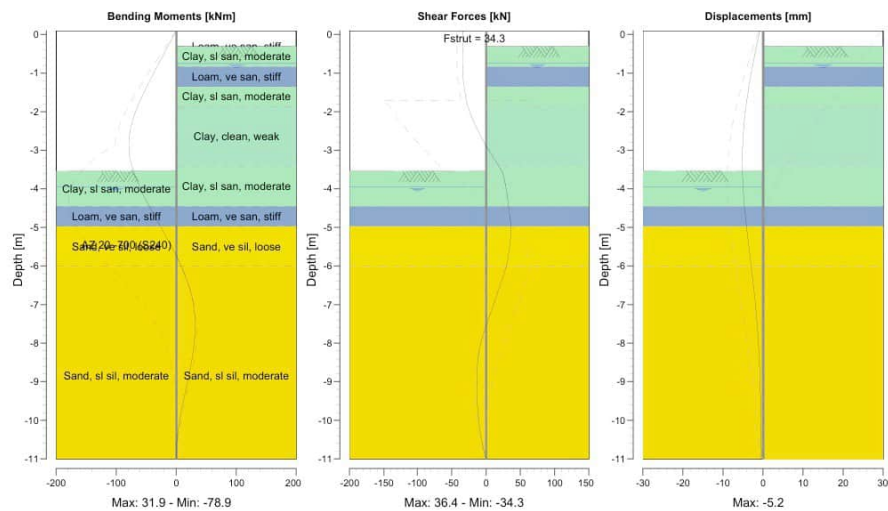
13.4 Calculation Results

Number of iterations: 5

13.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven

Step 6.4 - Partial factor set: RC 2



13.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-34.26	-0.8
1	-0.30	-13.70	-34.26	-1.6
2	-0.30	-13.70	-34.26	-1.6
2	-0.31	-14.05	-34.26	-1.6
3	-0.31	-14.05	-34.26	-1.6
3	-0.34	-15.07	-34.26	-1.7
4	-0.34	-15.07	-34.26	-1.7
4	-0.75	-29.12	-34.26	-2.5
5	-0.75	-29.12	-34.26	-2.5
5	-0.80	-30.83	-34.25	-2.6
6	-0.80	-30.83	-34.25	-2.6
6	-0.83	-31.86	-34.23	-2.6
7	-0.83	-31.86	-34.23	-2.6
7	-1.05	-39.35	-33.82	-3.0
8	-1.05	-39.35	-33.82	-3.0
8	-1.35	-49.23	-31.85	-3.5
9	-1.35	-49.23	-31.85	-3.5
9	-1.70	-59.85	-28.64	-4.0
10	-1.70	-59.85	-28.64	-4.0
10	-1.87	-64.54	-26.49	-4.3
11	-1.87	-64.54	-26.49	-4.3
11	-2.31	-74.13	-16.37	-4.7
12	-2.31	-74.13	-16.37	-4.7
12	-2.76	-78.70	-3.87	-5.0
13	-2.76	-78.70	-3.87	-5.0
13	-3.20	-77.21	11.00	-5.2
14	-3.20	-77.21	11.00	-5.2
14	-3.41	-74.08	18.88	-5.2
15	-3.41	-74.08	18.88	-5.2
15	-3.53	-71.58	22.77	-5.1
16	-3.53	-71.58	22.77	-5.1

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-67.39	25.70	-5.1
17	-3.70	-67.39	25.70	-5.1
17	-3.95	-60.52	28.74	-5.0
18	-3.95	-60.52	28.73	-5.0
18	-4.45	-44.99	32.85	-4.6
19	-4.45	-44.99	32.85	-4.6
19	-4.97	-26.90	36.44	-4.1
20	-4.97	-26.90	36.44	-4.1
20	-5.49	-8.24	34.66	-3.6
21	-5.49	-8.24	34.66	-3.6
21	-6.01	8.55	29.67	-2.9
22	-6.01	8.54	29.67	-2.9
22	-6.56	22.12	19.29	-2.3
23	-6.56	22.12	19.30	-2.3
23	-7.12	29.92	8.77	-1.8
24	-7.12	29.92	8.77	-1.8
24	-7.67	31.72	-2.33	-1.3
25	-7.67	31.72	-2.36	-1.3
25	-8.23	28.00	-10.09	-1.0
26	-8.23	28.00	-10.08	-1.0
26	-8.78	21.42	-13.06	-0.8
27	-8.78	21.42	-13.05	-0.8
27	-9.34	14.07	-13.05	-0.6
28	-9.34	14.07	-13.05	-0.6
28	-9.89	7.26	-11.28	-0.5
29	-9.89	7.26	-11.29	-0.5
29	-10.45	2.06	-6.99	-0.5
30	-10.45	2.06	-6.99	-0.5
30	-11.00	0.00	0.00	-0.4
Max		-78.70	36.44	-5.2
Max, minor nodes incl.		-78.92	36.44	-5.2

13.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	428.6	191.3
Water	243.8	515.3
Total	672.4	706.7

Considered as passive side	Left
Maximum passive effective resistance	1048.43 kN
Mobilized passive effective resistance	428.59 kN
Percentage mobilized resistance	40.9 %
Position single support	0.10 m
Maximum passive moment	8938.27 kNm
Mobilized passive moment	3300.16 kNm
Percentage mobilized moment	36.9 %

13.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	34.26	Elastic	Left	Strut

14 Step 6.5 Stage 2: CPT 2 ontgraven

14.1 General Input Data

Passive side:

D-Sheet Piling determined

14.2 Input Data Left

14.2.1 Calculation Method

Calculation method: C, phi, delta

14.2.2 Water Level

Water level: -3.70 [m]

14.2.3 Surface

X [m]	Y [m]
0.00	-3.20

14.3 Input Data Right

14.3.1 Calculation Method

Calculation method: C, phi, delta

14.3.2 Water Level

Water level: -0.80 [m]

14.3.3 Surface

X [m]	Y [m]
0.00	-0.30

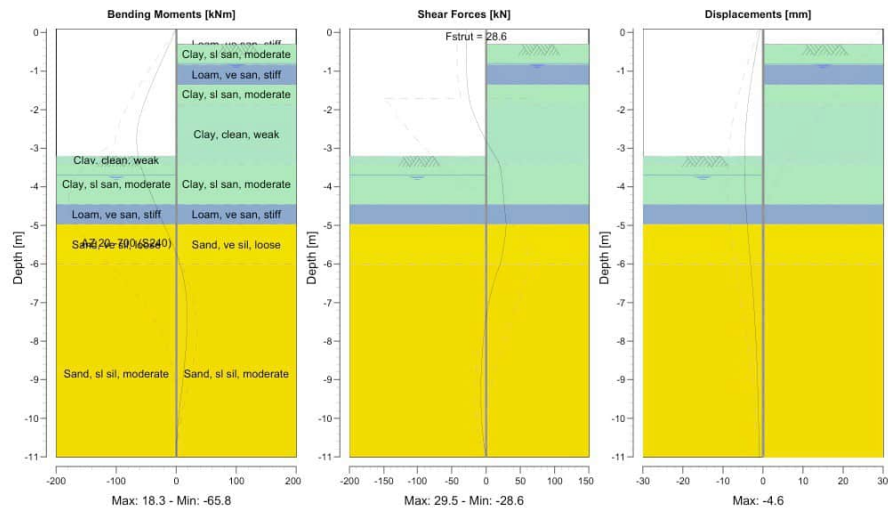
14.4 Calculation Results

Number of iterations: 4

14.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven

Step 6.5 - Partial factor set: RC 2



14.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-28.61	-0.7
1	-0.30	-11.44	-28.61	-1.4
2	-0.30	-11.44	-28.61	-1.4
2	-0.31	-11.73	-28.61	-1.4
3	-0.31	-11.73	-28.61	-1.4
3	-0.80	-25.75	-28.61	-2.3
4	-0.80	-25.75	-28.61	-2.3
4	-0.83	-26.61	-28.60	-2.3
5	-0.83	-26.61	-28.60	-2.3
5	-1.35	-41.21	-27.12	-3.1
6	-1.35	-41.21	-27.12	-3.1
6	-1.70	-50.30	-24.64	-3.6
7	-1.70	-50.30	-24.64	-3.6
7	-1.87	-54.35	-22.87	-3.8
8	-1.87	-54.35	-22.87	-3.8
8	-2.31	-62.45	-13.31	-4.2
9	-2.31	-62.45	-13.31	-4.2
9	-2.76	-65.80	-1.41	-4.5
10	-2.76	-65.80	-1.41	-4.5
10	-3.20	-63.36	12.82	-4.6
11	-3.20	-63.36	12.82	-4.6
11	-3.41	-59.93	19.73	-4.6
12	-3.41	-59.93	19.73	-4.6
12	-3.70	-53.75	22.36	-4.6
13	-3.70	-53.75	22.36	-4.6
13	-4.08	-44.88	24.66	-4.5
14	-4.08	-44.88	24.65	-4.5
14	-4.45	-35.27	26.52	-4.3
15	-4.45	-35.27	26.52	-4.3
15	-4.97	-20.73	29.49	-4.0
16	-4.97	-20.73	29.49	-4.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-5.49	-6.11	26.31	-3.5
17	-5.49	-6.11	26.31	-3.5
17	-6.01	6.19	20.59	-3.1
18	-6.01	6.19	20.59	-3.1
18	-6.56	14.56	10.13	-2.6
19	-6.56	14.56	10.13	-2.6
19	-7.12	17.98	2.70	-2.3
20	-7.12	17.98	2.70	-2.3
20	-7.67	18.02	-2.20	-1.9
21	-7.67	18.02	-2.20	-1.9
21	-8.23	15.90	-5.16	-1.7
22	-8.23	15.90	-5.16	-1.7
22	-8.78	12.56	-6.71	-1.4
23	-8.78	12.56	-6.71	-1.4
23	-9.34	8.64	-7.30	-1.3
24	-9.34	8.64	-7.30	-1.3
24	-9.89	4.62	-6.94	-1.1
25	-9.89	4.62	-6.94	-1.1
25	-10.45	1.34	-4.51	-1.0
26	-10.45	1.34	-4.51	-1.0
26	-11.00	0.00	0.00	-0.9
Max		-65.80	29.49	-4.6
Max, minor nodes incl.		-65.81	29.49	-4.6

14.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	386.2	165.8
Water	261.4	510.3
Total	647.6	676.2

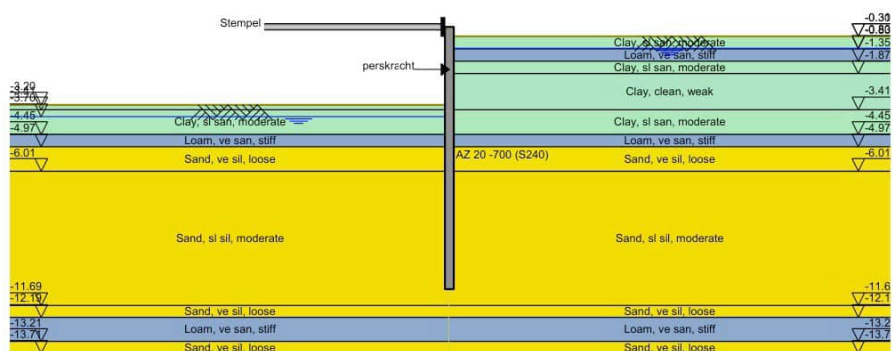
Considered as passive side	Left
Maximum passive effective resistance	1442.66 kN
Mobilized passive effective resistance	386.17 kN
Percentage mobilized resistance	26.8 %
Position single support	0.10 m
Maximum passive moment	12176.07 kNm
Mobilized passive moment	2952.62 kNm
Percentage mobilized moment	24.2 %

14.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	28.61	Elastic	Left	Strut

15 Outline Stage 3: CPT 2 gebruiksfase met perskracht

Outline - Stage 3: CPT 2 gebruiksfase met perskracht

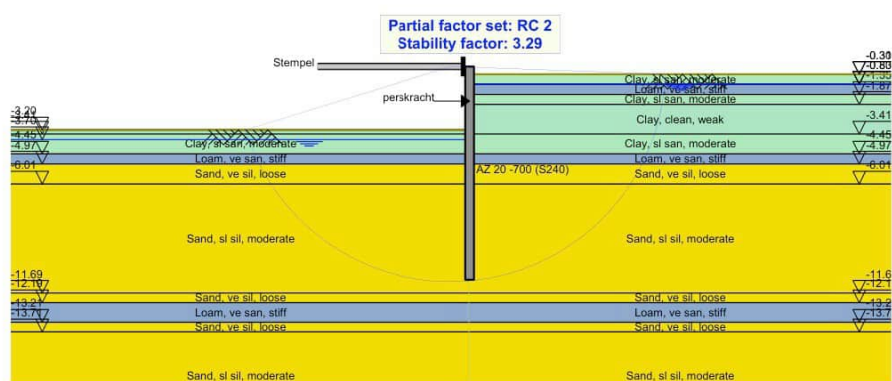


16 Overall Stability Stage 3: CPT 2 gebruiksfase met perskracht

Stability factor : 3.29

16.1 Overall Stability

Overall Stability - Stage 3: CPT 2 gebruiksfase met perskracht



17 Step 6.1 Stage 3: CPT 2 gebruiksfase met perskracht

17.1 General Input Data

Passive side:

D-Sheet Piling determined

17.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	0.00	Favourable (D-Sheet Pi...	Variable

17.2 Input Data Left

17.2.1 Calculation Method

Calculation method: C, phi, delta

17.2.2 Water Level

Water level: -3.53 [m]

17.2.3 Surface

X [m]	Y [m]
0.00	-3.53

17.3 Input Data Right

17.3.1 Calculation Method

Calculation method: C, phi, delta

17.3.2 Water Level

Water level: -0.75 [m]

17.3.3 Surface

X [m]	Y [m]
0.00	-0.30

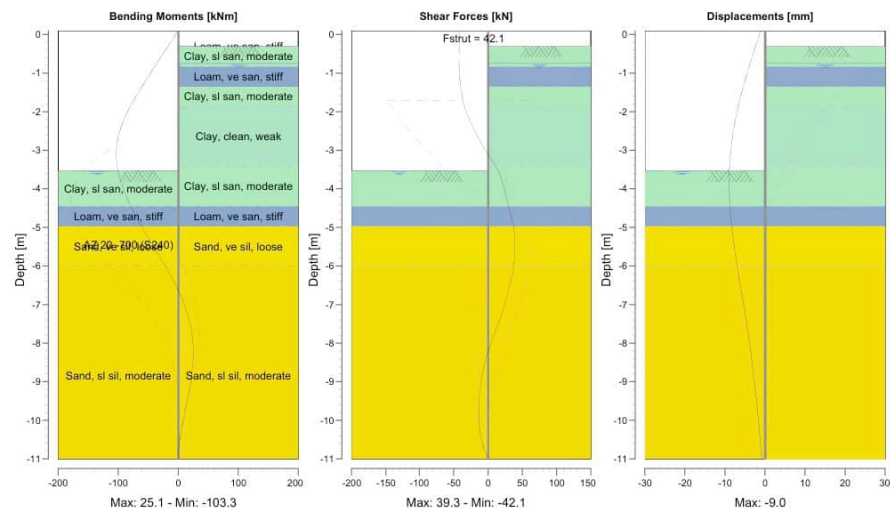
17.4 Calculation Results

Number of iterations: 2

17.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 2 gebruiksfase met perskracht

Step 6.1 - Partial factor set: RC 2



17.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-42.14	-1.1
1	-0.30	-16.85	-42.14	-2.3
2	-0.30	-16.85	-42.14	-2.3
2	-0.31	-17.28	-42.14	-2.4
3	-0.31	-17.28	-42.14	-2.4
3	-0.34	-18.54	-42.14	-2.5
4	-0.34	-18.54	-42.14	-2.5
4	-0.75	-35.82	-42.14	-3.7
5	-0.75	-35.82	-42.14	-3.7
5	-0.80	-37.92	-42.12	-3.9
6	-0.80	-37.92	-42.12	-3.9
6	-0.83	-39.19	-42.10	-4.0
7	-0.83	-39.19	-42.10	-4.0
7	-1.05	-48.41	-41.69	-4.6
8	-1.05	-48.41	-41.69	-4.6
8	-1.35	-60.65	-39.73	-5.4
9	-1.35	-60.65	-39.73	-5.4
9	-1.70	-74.03	-36.52	-6.3
10	-1.70	-74.03	-36.52	-6.3
10	-1.87	-80.06	-34.37	-6.7
11	-1.87	-80.06	-34.37	-6.7
11	-2.31	-93.14	-24.25	-7.6
12	-2.31	-93.14	-24.25	-7.6
12	-2.76	-101.21	-11.75	-8.3
13	-2.76	-101.21	-11.75	-8.3
13	-3.20	-103.21	3.13	-8.7
14	-3.20	-103.21	3.13	-8.7
14	-3.41	-101.73	11.00	-8.8
15	-3.41	-101.73	11.00	-8.8
15	-3.53	-100.18	14.90	-8.9
16	-3.53	-100.18	14.90	-8.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-97.31	18.30	-8.9
17	-3.70	-97.31	18.30	-8.9
17	-3.95	-92.15	22.58	-8.9
18	-3.95	-92.15	22.57	-8.9
18	-4.45	-78.90	29.72	-8.8
19	-4.45	-78.90	29.72	-8.8
19	-4.97	-61.40	37.15	-8.3
20	-4.97	-61.40	37.15	-8.3
20	-5.49	-41.33	39.29	-7.7
21	-5.49	-41.33	39.29	-7.7
21	-6.01	-21.17	37.99	-6.9
22	-6.01	-21.17	37.99	-6.9
22	-6.56	-2.01	30.82	-6.1
23	-6.56	-2.01	30.82	-6.1
23	-7.12	12.70	21.98	-5.2
24	-7.12	12.70	21.98	-5.2
24	-7.67	22.05	11.42	-4.3
25	-7.67	22.05	11.41	-4.3
25	-8.23	25.13	-0.01	-3.6
26	-8.23	25.13	-0.02	-3.6
26	-8.78	22.75	-7.90	-2.9
27	-8.78	22.75	-7.90	-2.9
27	-9.34	17.03	-12.16	-2.3
28	-9.34	17.03	-12.16	-2.3
28	-9.89	9.85	-13.28	-1.7
29	-9.89	9.85	-13.30	-1.7
29	-10.45	3.08	-10.01	-1.2
30	-10.45	3.08	-10.01	-1.2
30	-11.00	0.00	0.00	-0.7
Max		-103.21	-42.14	-8.9
Max, minor nodes incl.		-103.34	-42.14	-9.0

17.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	392.7	193.2
Water	273.7	515.3
Total	666.4	708.6

Considered as passive side	Left
Maximum passive effective resistance	947.16 kN
Mobilized passive effective resistance	392.69 kN
Percentage mobilized resistance	41.5 %
Position single support	0.10 m
Maximum passive moment	8171.94 kNm
Mobilized passive moment	3097.31 kNm
Percentage mobilized moment	37.9 %

17.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	42.14	Elastic	Left	Strut

18 Step 6.2 Stage 3: CPT 2 gebruiksfase met perskracht

18.1 General Input Data

Passive side:

D-Sheet Piling determined

18.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	0.00	Favourable (D-Sheet Pi...	Variable

18.2 Input Data Left

18.2.1 Calculation Method

Calculation method: C, phi, delta

18.2.2 Water Level

Water level: -3.53 [m]

18.2.3 Surface

X [m]	Y [m]
0.00	-3.53

18.3 Input Data Right

18.3.1 Calculation Method

Calculation method: C, phi, delta

18.3.2 Water Level

Water level: -0.75 [m]

18.3.3 Surface

X [m]	Y [m]
0.00	-0.30

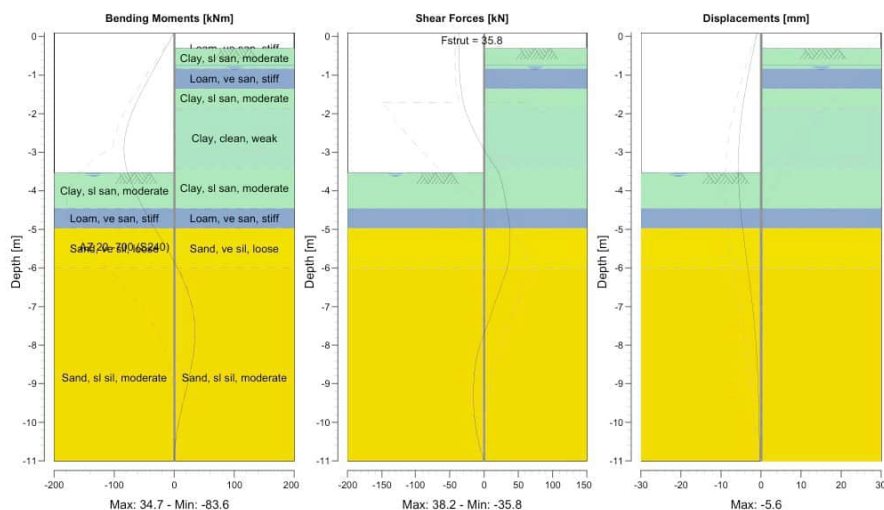
18.4 Calculation Results

Number of iterations: 6

18.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 2 gebruiksfase met perskracht

Step 6.2 - Partial factor set: RC 2



18.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-35.82	-0.9
1	-0.30	-14.33	-35.82	-1.8
2	-0.30	-14.33	-35.82	-1.8
2	-0.31	-14.69	-35.82	-1.8
3	-0.31	-14.69	-35.82	-1.8
3	-0.34	-15.76	-35.82	-1.9
4	-0.34	-15.76	-35.82	-1.9
4	-0.75	-30.45	-35.82	-2.7
5	-0.75	-30.45	-35.82	-2.7
5	-0.80	-32.24	-35.81	-2.8
6	-0.80	-32.24	-35.81	-2.8
6	-0.83	-33.32	-35.79	-2.9
7	-0.83	-33.32	-35.79	-2.9
7	-1.05	-41.15	-35.38	-3.3
8	-1.05	-41.15	-35.38	-3.3
8	-1.35	-51.50	-33.42	-3.8
9	-1.35	-51.50	-33.42	-3.8
9	-1.70	-62.67	-30.21	-4.4
10	-1.70	-62.67	-30.21	-4.4
10	-1.87	-67.63	-28.05	-4.6
11	-1.87	-67.63	-28.05	-4.6
11	-2.31	-77.91	-17.94	-5.1
12	-2.31	-77.91	-17.94	-5.1
12	-2.76	-83.18	-5.43	-5.5
13	-2.76	-83.18	-5.43	-5.5
13	-3.20	-82.38	9.44	-5.6
14	-3.20	-82.38	9.44	-5.6
14	-3.41	-79.58	17.31	-5.6
15	-3.41	-79.58	17.31	-5.6
15	-3.53	-77.27	21.21	-5.6
16	-3.53	-77.27	21.21	-5.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-73.34	24.21	-5.6
17	-3.70	-73.34	24.21	-5.6
17	-3.95	-66.78	27.75	-5.5
18	-3.95	-66.78	27.75	-5.5
18	-4.45	-51.37	32.73	-5.1
19	-4.45	-51.37	32.72	-5.1
19	-4.97	-32.84	37.74	-4.6
20	-4.97	-32.84	37.73	-4.6
20	-5.49	-13.04	37.76	-4.0
21	-5.49	-13.04	37.76	-4.0
21	-6.01	5.76	33.92	-3.3
22	-6.01	5.76	33.90	-3.3
22	-6.56	21.47	22.81	-2.6
23	-6.56	21.47	22.81	-2.6
23	-7.12	31.11	11.94	-2.0
24	-7.12	31.11	11.95	-2.0
24	-7.67	34.67	0.82	-1.5
25	-7.67	34.68	0.79	-1.5
25	-8.23	32.08	-9.38	-1.1
26	-8.23	32.08	-9.38	-1.1
26	-8.78	25.32	-14.21	-0.8
27	-8.78	25.32	-14.21	-0.8
27	-9.34	17.02	-15.23	-0.6
28	-9.34	17.02	-15.24	-0.6
28	-9.89	8.87	-13.71	-0.5
29	-9.89	8.87	-13.72	-0.5
29	-10.45	2.52	-8.56	-0.4
30	-10.45	2.52	-8.56	-0.4
30	-11.00	0.00	0.00	-0.3
Max		-83.18	37.76	-5.6
Max, minor nodes incl.		-83.64	38.22	-5.6

18.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	399.4	193.7
Water	273.7	515.3
Total	673.1	709.0

Considered as passive side	Left
Maximum passive effective resistance	947.16 kN
Mobilized passive effective resistance	399.43 kN
Percentage mobilized resistance	42.2 %
Position single support	0.10 m
Maximum passive moment	8171.94 kNm
Mobilized passive moment	3101.14 kNm
Percentage mobilized moment	37.9 %

18.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	35.82	Elastic	Left	Strut

19 Step 6.3 Stage 3: CPT 2 gebruiksfase met perskracht

19.1 General Input Data

Passive side:

D-Sheet Piling determined

19.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	0.00	Favourable (D-Sheet Pi...	Variable

19.2 Input Data Left

19.2.1 Calculation Method

Calculation method: C, phi, delta

19.2.2 Water Level

Water level: -3.95 [m]

19.2.3 Surface

X [m]	Y [m]
0.00	-3.53

19.3 Input Data Right

19.3.1 Calculation Method

Calculation method: C, phi, delta

19.3.2 Water Level

Water level: -0.75 [m]

19.3.3 Surface

X [m]	Y [m]
0.00	-0.30

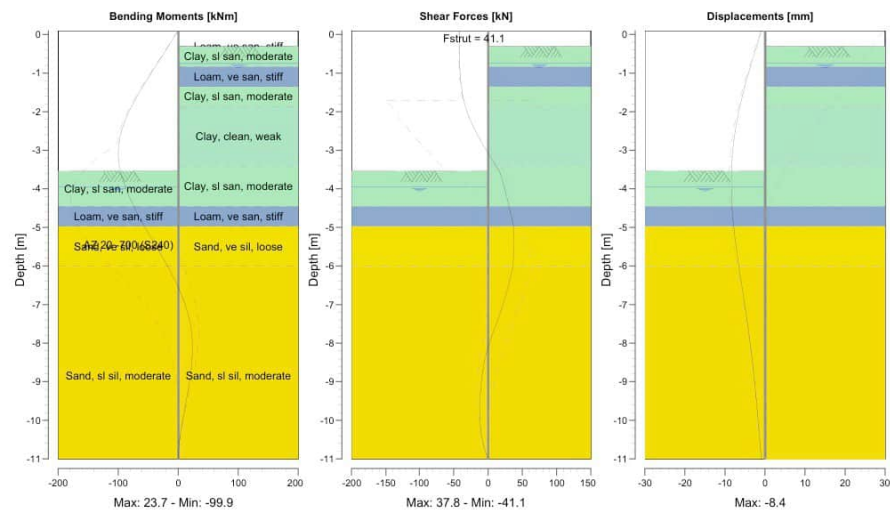
19.4 Calculation Results

Number of iterations: 2

19.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 2 gebruiksfase met perskracht

Step 6.3 - Partial factor set: RC 2



19.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-41.06	-0.8
1	-0.30	-16.42	-41.06	-2.1
2	-0.30	-16.42	-41.06	-2.1
2	-0.31	-16.84	-41.06	-2.1
3	-0.31	-16.84	-41.06	-2.1
3	-0.34	-18.07	-41.06	-2.2
4	-0.34	-18.07	-41.06	-2.2
4	-0.75	-34.90	-41.06	-3.4
5	-0.75	-34.90	-41.06	-3.4
5	-0.80	-36.96	-41.05	-3.5
6	-0.80	-36.96	-41.05	-3.5
6	-0.83	-38.19	-41.03	-3.6
7	-0.83	-38.19	-41.03	-3.6
7	-1.05	-47.18	-40.62	-4.3
8	-1.05	-47.18	-40.62	-4.3
8	-1.35	-59.10	-38.66	-5.0
9	-1.35	-59.10	-38.66	-5.0
9	-1.70	-72.10	-35.44	-5.9
10	-1.70	-72.10	-35.44	-5.9
10	-1.87	-77.95	-33.29	-6.3
11	-1.87	-77.95	-33.29	-6.3
11	-2.31	-90.55	-23.17	-7.1
12	-2.31	-90.55	-23.17	-7.1
12	-2.76	-98.14	-10.67	-7.8
13	-2.76	-98.14	-10.67	-7.8
13	-3.20	-99.66	4.20	-8.2
14	-3.20	-99.66	4.20	-8.2
14	-3.41	-97.96	12.07	-8.3
15	-3.41	-97.96	12.07	-8.3
15	-3.53	-96.28	15.97	-8.4
16	-3.53	-96.28	15.97	-8.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-93.23	19.37	-8.4
17	-3.70	-93.23	19.37	-8.4
17	-3.95	-87.83	23.49	-8.4
18	-3.95	-87.83	23.49	-8.4
18	-4.45	-74.21	30.50	-8.2
19	-4.45	-74.21	30.50	-8.2
19	-4.97	-56.49	37.22	-7.8
20	-4.97	-56.49	37.22	-7.8
20	-5.49	-36.91	37.65	-7.2
21	-5.49	-36.91	37.64	-7.2
21	-6.01	-17.62	36.29	-6.5
22	-6.01	-17.62	36.29	-6.5
22	-6.56	0.52	28.84	-5.7
23	-6.56	0.52	28.84	-5.7
23	-7.12	14.02	19.57	-4.9
24	-7.12	14.02	19.57	-4.9
24	-7.67	21.88	8.44	-4.1
25	-7.67	21.88	8.42	-4.1
25	-8.23	23.57	-1.67	-3.4
26	-8.23	23.57	-1.67	-3.4
26	-8.78	20.71	-8.06	-2.8
27	-8.78	20.71	-8.06	-2.8
27	-9.34	15.22	-11.28	-2.3
28	-9.34	15.22	-11.28	-2.3
28	-9.89	8.70	-11.79	-1.8
29	-9.89	8.70	-11.80	-1.8
29	-10.45	2.73	-8.84	-1.4
30	-10.45	2.73	-8.85	-1.4
30	-11.00	0.00	0.00	-0.9
Max		-99.66	-41.06	-8.4
Max, minor nodes incl.		-99.89	-41.06	-8.4

19.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	422.1	191.6
Water	243.8	515.3
Total	665.9	707.0

Considered as passive side	Left
Maximum passive effective resistance	1048.43 kN
Mobilized passive effective resistance	422.07 kN
Percentage mobilized resistance	40.3 %
Position single support	0.10 m
Maximum passive moment	8938.27 kNm
Mobilized passive moment	3303.67 kNm
Percentage mobilized moment	37.0 %

19.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	41.06	Elastic	Left	Strut

20 Step 6.4 Stage 3: CPT 2 gebruiksfase met perskracht

20.1 General Input Data

Passive side:

D-Sheet Piling determined

20.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	0.00	Favourable (D-Sheet Pi...	Variable

20.2 Input Data Left

20.2.1 Calculation Method

Calculation method: C, phi, delta

20.2.2 Water Level

Water level: -3.95 [m]

20.2.3 Surface

X [m]	Y [m]
0.00	-3.53

20.3 Input Data Right

20.3.1 Calculation Method

Calculation method: C, phi, delta

20.3.2 Water Level

Water level: -0.75 [m]

20.3.3 Surface

X [m]	Y [m]
0.00	-0.30

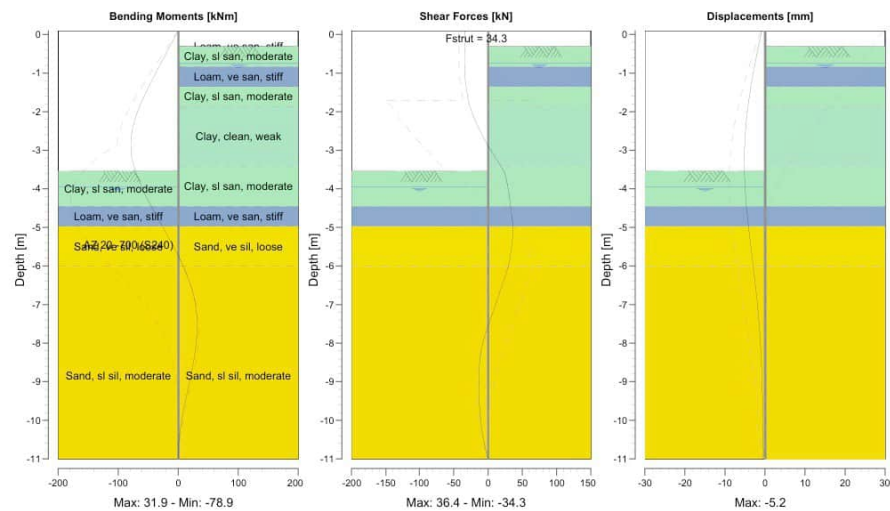
20.4 Calculation Results

Number of iterations: 6

20.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 2 gebruiksfase met perskracht

Step 6.4 - Partial factor set: RC 2



20.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-34.26	-0.8
1	-0.30	-13.70	-34.26	-1.6
2	-0.30	-13.70	-34.26	-1.6
2	-0.31	-14.05	-34.26	-1.6
3	-0.31	-14.05	-34.26	-1.6
3	-0.34	-15.07	-34.26	-1.7
4	-0.34	-15.07	-34.26	-1.7
4	-0.75	-29.12	-34.26	-2.5
5	-0.75	-29.12	-34.26	-2.5
5	-0.80	-30.83	-34.25	-2.6
6	-0.80	-30.83	-34.25	-2.6
6	-0.83	-31.86	-34.23	-2.6
7	-0.83	-31.86	-34.23	-2.6
7	-1.05	-39.35	-33.82	-3.0
8	-1.05	-39.35	-33.82	-3.0
8	-1.35	-49.23	-31.85	-3.5
9	-1.35	-49.23	-31.85	-3.5
9	-1.70	-59.85	-28.64	-4.0
10	-1.70	-59.85	-28.64	-4.0
10	-1.87	-64.54	-26.49	-4.3
11	-1.87	-64.54	-26.49	-4.3
11	-2.31	-74.13	-16.37	-4.7
12	-2.31	-74.13	-16.37	-4.7
12	-2.76	-78.70	-3.87	-5.0
13	-2.76	-78.70	-3.87	-5.0
13	-3.20	-77.21	11.00	-5.2
14	-3.20	-77.21	11.00	-5.2
14	-3.41	-74.08	18.88	-5.2
15	-3.41	-74.08	18.88	-5.2
15	-3.53	-71.58	22.77	-5.1
16	-3.53	-71.58	22.77	-5.1

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.70	-67.39	25.70	-5.1
17	-3.70	-67.39	25.70	-5.1
17	-3.95	-60.52	28.74	-5.0
18	-3.95	-60.52	28.73	-5.0
18	-4.45	-44.99	32.85	-4.6
19	-4.45	-44.99	32.85	-4.6
19	-4.97	-26.90	36.44	-4.1
20	-4.97	-26.90	36.44	-4.1
20	-5.49	-8.24	34.66	-3.6
21	-5.49	-8.24	34.66	-3.6
21	-6.01	8.55	29.67	-2.9
22	-6.01	8.54	29.67	-2.9
22	-6.56	22.12	19.29	-2.3
23	-6.56	22.12	19.30	-2.3
23	-7.12	29.92	8.77	-1.8
24	-7.12	29.92	8.77	-1.8
24	-7.67	31.72	-2.33	-1.3
25	-7.67	31.72	-2.36	-1.3
25	-8.23	28.00	-10.09	-1.0
26	-8.23	28.00	-10.08	-1.0
26	-8.78	21.42	-13.06	-0.8
27	-8.78	21.42	-13.05	-0.8
27	-9.34	14.07	-13.05	-0.6
28	-9.34	14.07	-13.05	-0.6
28	-9.89	7.26	-11.28	-0.5
29	-9.89	7.26	-11.29	-0.5
29	-10.45	2.06	-6.99	-0.5
30	-10.45	2.06	-6.99	-0.5
30	-11.00	0.00	0.00	-0.4
Max		-78.70	36.44	-5.2
Max, minor nodes incl.		-78.92	36.44	-5.2

20.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	428.6	191.3
Water	243.8	515.3
Total	672.4	706.7

Considered as passive side	Left
Maximum passive effective resistance	1048.43 kN
Mobilized passive effective resistance	428.59 kN
Percentage mobilized resistance	40.9 %
Position single support	0.10 m
Maximum passive moment	8938.27 kNm
Mobilized passive moment	3300.16 kNm
Percentage mobilized moment	36.9 %

20.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	34.26	Elastic	Left	Strut

21 Step 6.5 Stage 3: CPT 2 gebruiksfase met perskracht

21.1 General Input Data

Passive side:

D-Sheet Piling determined

21.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	220.00	Favourable (D-Sheet Pi...	Variable

21.2 Input Data Left

21.2.1 Calculation Method

Calculation method: C, phi, delta

21.2.2 Water Level

Water level: -3.70 [m]

21.2.3 Surface

X [m]	Y [m]
0.00	-3.20

21.3 Input Data Right

21.3.1 Calculation Method

Calculation method: C, phi, delta

21.3.2 Water Level

Water level: -0.80 [m]

21.3.3 Surface

X [m]	Y [m]
0.00	-0.30

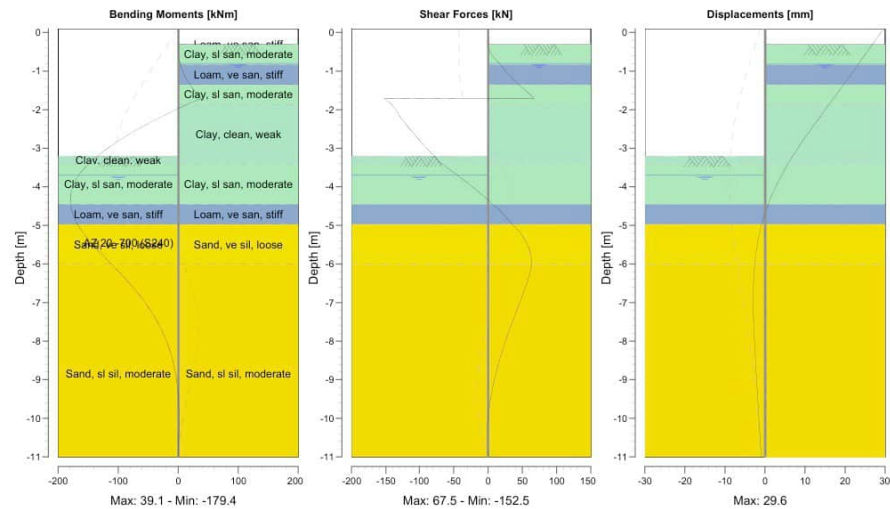
21.4 Calculation Results

Number of iterations: 6

21.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 2 gebruiksfase met perskracht

Step 6.5 - Partial factor set: RC 2



21.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	29.6
1	-0.30	0.00	0.00	26.9
2	-0.30	0.00	0.00	26.9
2	-0.31	0.00	0.00	26.8
3	-0.31	0.00	0.01	26.8
3	-0.80	2.93	16.69	23.4
4	-0.80	2.93	16.69	23.4
4	-0.83	3.45	18.08	23.2
5	-0.83	3.45	18.08	23.2
5	-1.35	19.46	45.15	19.6
6	-1.35	19.46	45.15	19.6
6	-1.70	39.11	67.47	17.2
7	-1.70	39.11	-152.53	17.2
7	-1.87	14.14	-141.14	16.0
8	-1.87	14.14	-141.14	16.0
8	-2.31	-44.36	-122.42	12.8
9	-2.31	-44.36	-122.42	12.8
9	-2.76	-94.10	-101.62	9.8
10	-2.76	-94.10	-101.62	9.8
10	-3.20	-134.16	-78.72	7.0
11	-3.20	-134.16	-78.72	7.0
11	-3.41	-149.49	-67.28	5.7
12	-3.41	-149.49	-67.27	5.7
12	-3.70	-165.68	-44.53	4.1
13	-3.70	-165.68	-44.53	4.1
13	-4.08	-177.18	-17.33	2.3
14	-4.08	-177.18	-17.33	2.3
14	-4.45	-179.07	6.42	0.8
15	-4.45	-179.07	6.42	0.8
15	-4.97	-167.80	34.97	-0.8
16	-4.97	-167.80	34.95	-0.8

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-5.49	-142.92	57.44	-1.9
17	-5.49	-142.92	57.42	-1.9
17	-6.01	-110.92	63.45	-2.6
18	-6.01	-110.91	63.42	-2.6
18	-6.56	-77.57	55.47	-2.9
19	-6.56	-77.57	55.42	-2.9
19	-7.12	-50.01	43.81	-2.9
20	-7.12	-50.01	43.80	-2.9
20	-7.67	-29.02	32.01	-2.8
21	-7.67	-29.02	32.00	-2.8
21	-8.23	-14.32	21.27	-2.5
22	-8.23	-14.32	21.27	-2.5
22	-8.78	-5.11	12.30	-2.2
23	-8.78	-5.11	12.30	-2.2
23	-9.34	-0.30	5.39	-1.9
24	-9.34	-0.30	5.39	-1.9
24	-9.89	1.27	0.63	-1.6
25	-9.89	1.27	0.63	-1.6
25	-10.45	0.80	-1.92	-1.3
26	-10.45	0.80	-1.93	-1.3
26	-11.00	0.00	0.00	-0.9
Max		-179.07	-152.53	29.6
Max, minor nodes incl.		-179.39	-152.53	29.6

21.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	373.4	344.6
Water	261.4	510.3
Total	634.8	854.9

Considered as passive side	Left
Maximum passive effective resistance	1442.66 kN
Mobilized passive effective resistance	373.41 kN
Percentage mobilized resistance	25.9 %
Position single support	0.10 m
Maximum passive moment	12176.07 kNm
Mobilized passive moment	3059.18 kNm
Percentage mobilized moment	25.1 %

21.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

End of Report

Report for D-Sheet Piling 20.2

Design of Diaphragm and Sheet Pile Walls
Developed by Deltares



Company: Royal HaskoningDHV

Date of report: 03-Jun-24

Time of report: 17:12:34

Report with version: 20.2.1.30962

Date of calculation: 03-Jun-24

Time of calculation: 16:40:52

Calculated with version: 20.2.1.30962

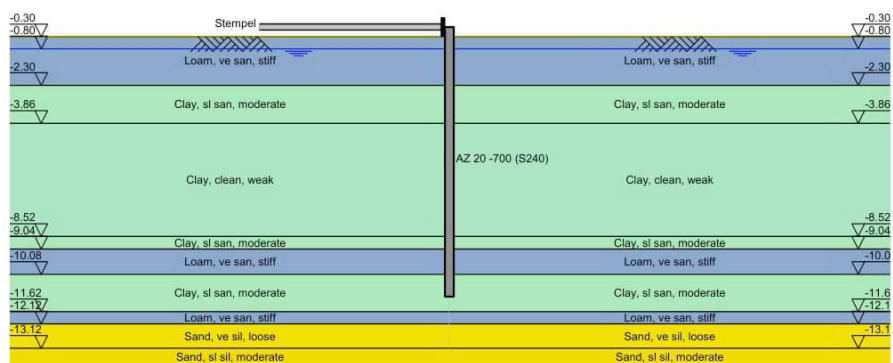
File name: CPT 3 boorkuip achterwand

Project identification: Duikerkruising Strijenseweg 'S Gravendeel
Boorkuip achterwand
CPT 3

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

1 Outline Stage 1: CPT 3 aanbrengen damwanden en ringgording

Outline - Stage 1: CPT 3 aanbrengen damwanden en ringgording

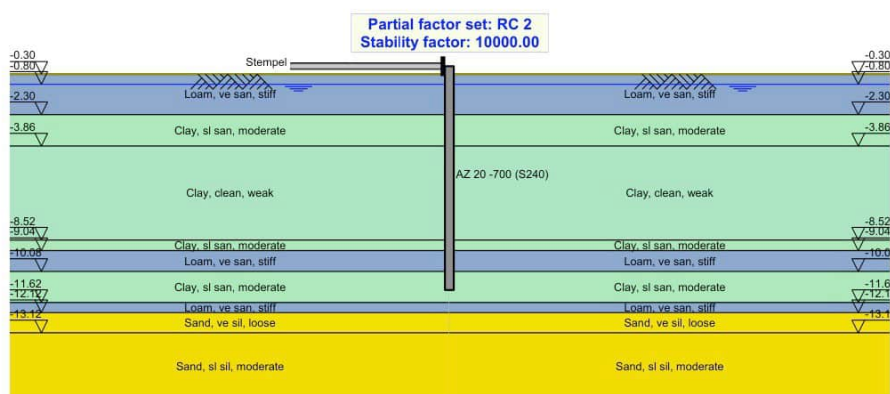


2 Overall Stability Stage 1: CPT 3 aanbrengen damwanden en ringgording

Stability factor : 10000.00

2.1 Overall Stability

Overall Stability - Stage 1: CPT 3 aanbrengen damwanden en ringgording



3 Step 6.1 Stage 1: CPT 3 aanbrengen damwanden en ringgording

3.1 General Input Data

Passive side:

D-Sheet Piling determined

3.2 Input Data Left

3.2.1 Calculation Method

Calculation method: C, phi, delta

3.2.2 Water Level

Water level: -0.75 [m]

3.2.3 Surface

X [m]	Y [m]
0.00	-0.30

3.3 Input Data Right

3.3.1 Calculation Method

Calculation method: C, phi, delta

3.3.2 Water Level

Water level: -0.55 [m]

3.3.3 Surface

X [m]	Y [m]
0.00	-0.34

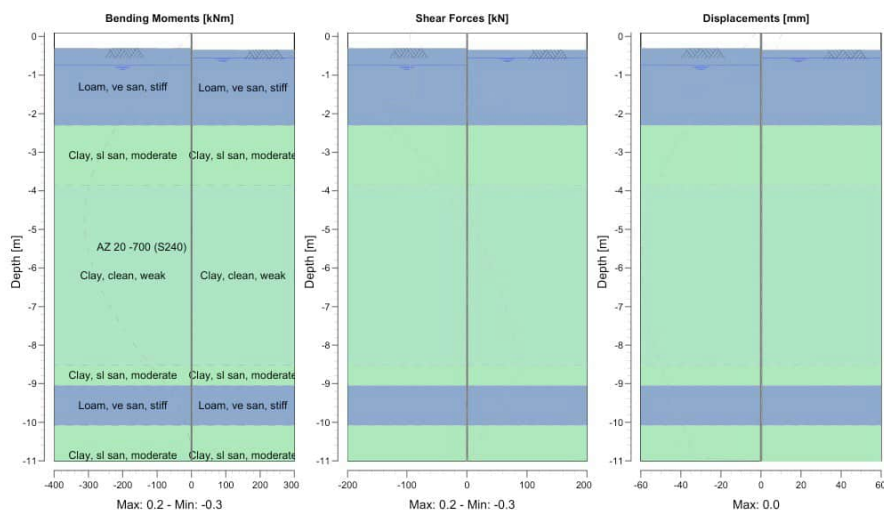
3.4 Calculation Results

Number of iterations: 2

3.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.1 - Partial factor set: RC 2



3.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-0.13	0.0
1	-0.25	-0.05	-0.13	0.0
2	-0.25	-0.05	-0.13	0.0
2	-0.30	-0.05	-0.13	0.0
3	-0.30	-0.05	-0.13	0.0
3	-0.34	-0.06	-0.14	0.0
4	-0.34	-0.06	-0.14	0.0
4	-0.75	-0.16	-0.27	0.0
5	-0.75	-0.16	-0.27	0.0
5	-0.80	-0.17	-0.26	0.0
6	-0.80	-0.17	-0.26	0.0
6	-1.05	-0.22	-0.19	0.0
7	-1.05	-0.22	-0.19	0.0
7	-1.38	-0.27	-0.11	0.0
8	-1.38	-0.27	-0.11	0.0
8	-1.70	-0.30	-0.03	0.0
9	-1.70	-0.30	-0.03	0.0
9	-2.00	-0.30	0.04	0.0
10	-2.00	-0.30	0.04	0.0
10	-2.30	-0.28	0.11	0.0
11	-2.30	-0.28	0.11	0.0
11	-2.75	-0.22	0.13	0.0
12	-2.75	-0.22	0.13	0.0
12	-3.20	-0.16	0.16	0.0
13	-3.20	-0.16	0.16	0.0
13	-3.53	-0.10	0.18	0.0
14	-3.53	-0.10	0.18	0.0
14	-3.70	-0.07	0.19	0.0
15	-3.70	-0.07	0.19	0.0
15	-3.86	-0.04	0.20	0.0
16	-3.86	-0.04	0.20	0.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-0.02	0.19	0.0
17	-3.95	-0.02	0.19	0.0
17	-4.46	0.07	0.15	0.0
18	-4.46	0.07	0.15	0.0
18	-4.97	0.14	0.12	0.0
19	-4.97	0.14	0.12	0.0
19	-5.47	0.19	0.08	0.0
20	-5.47	0.19	0.08	0.0
20	-5.98	0.22	0.04	0.0
21	-5.98	0.22	0.04	0.0
21	-6.49	0.23	0.01	0.0
22	-6.49	0.23	0.01	0.0
22	-7.00	0.23	-0.03	0.0
23	-7.00	0.23	-0.03	0.0
23	-7.50	0.20	-0.07	0.0
24	-7.50	0.20	-0.07	0.0
24	-8.01	0.16	-0.11	0.0
25	-8.01	0.16	-0.11	0.0
25	-8.52	0.09	-0.15	0.0
26	-8.52	0.09	-0.15	0.0
26	-9.04	0.02	-0.13	0.0
27	-9.04	0.02	-0.13	0.0
27	-9.56	-0.02	-0.04	0.0
28	-9.56	-0.02	-0.04	0.0
28	-10.08	-0.02	0.04	0.0
29	-10.08	-0.02	0.04	0.0
29	-10.54	-0.01	0.03	0.0
30	-10.54	-0.01	0.03	0.0
30	-11.00	0.00	0.00	0.0
Max		-0.30	-0.27	0.0
Max, minor nodes incl.		-0.30	-0.28	0.0

3.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	307.1	286.9
Water	515.3	535.6
Total	822.4	822.5

No passive side found of the sheet piling.

Left effect. resistance / max. passive resistance 25.2 %

Right effect. resistance / max. passive resistance 25.1 %

3.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.13	Elastic	Left	Strut

4 Step 6.2 Stage 1: CPT 3 aanbrengen damwanden en ringgording

4.1 General Input Data

Passive side:

D-Sheet Piling determined

4.2 Input Data Left

4.2.1 Calculation Method

Calculation method: C, phi, delta

4.2.2 Water Level

Water level: -0.75 [m]

4.2.3 Surface

X [m]	Y [m]
0.00	-0.30

4.3 Input Data Right

4.3.1 Calculation Method

Calculation method: C, phi, delta

4.3.2 Water Level

Water level: -0.55 [m]

4.3.3 Surface

X [m]	Y [m]
0.00	-0.34

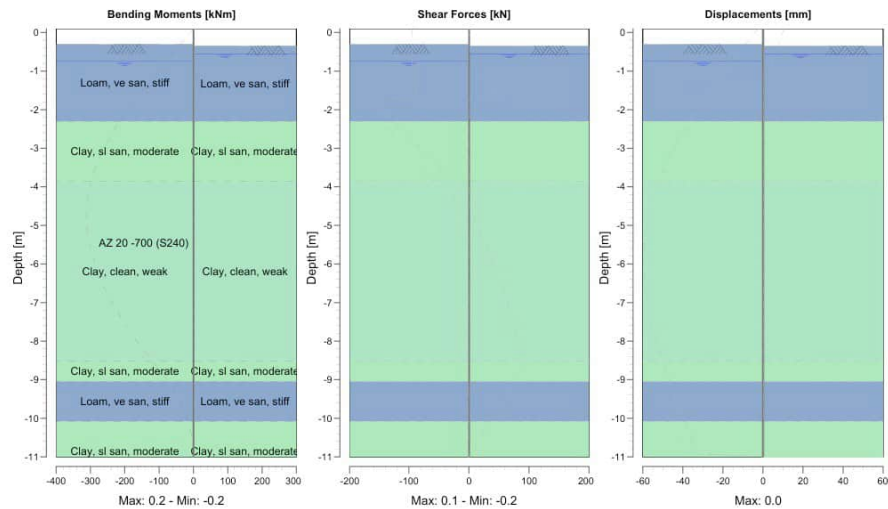
4.4 Calculation Results

Number of iterations: 2

4.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.2 - Partial factor set: RC 2



4.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-0.06	0.0
1	-0.25	-0.02	-0.06	0.0
2	-0.25	-0.02	-0.06	0.0
2	-0.30	-0.03	-0.06	0.0
3	-0.30	-0.03	-0.06	0.0
3	-0.34	-0.03	-0.08	0.0
4	-0.34	-0.03	-0.08	0.0
4	-0.75	-0.10	-0.22	0.0
5	-0.75	-0.10	-0.22	0.0
5	-0.80	-0.11	-0.20	0.0
6	-0.80	-0.11	-0.20	0.0
6	-1.05	-0.15	-0.15	0.0
7	-1.05	-0.15	-0.15	0.0
7	-1.38	-0.19	-0.08	0.0
8	-1.38	-0.19	-0.08	0.0
8	-1.70	-0.21	-0.02	0.0
9	-1.70	-0.21	-0.02	0.0
9	-2.00	-0.21	0.03	0.0
10	-2.00	-0.21	0.03	0.0
10	-2.30	-0.19	0.09	0.0
11	-2.30	-0.19	0.09	0.0
11	-2.75	-0.15	0.10	0.0
12	-2.75	-0.15	0.10	0.0
12	-3.20	-0.10	0.11	0.0
13	-3.20	-0.10	0.11	0.0
13	-3.53	-0.06	0.13	0.0
14	-3.53	-0.06	0.13	0.0
14	-3.70	-0.04	0.14	0.0
15	-3.70	-0.04	0.14	0.0
15	-3.86	-0.02	0.15	0.0
16	-3.86	-0.02	0.15	0.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	0.00	0.14	0.0
17	-3.95	0.00	0.14	0.0
17	-4.46	0.06	0.10	0.0
18	-4.46	0.06	0.10	0.0
18	-4.97	0.10	0.07	0.0
19	-4.97	0.10	0.07	0.0
19	-5.47	0.13	0.05	0.0
20	-5.47	0.13	0.05	0.0
20	-5.98	0.15	0.02	0.0
21	-5.98	0.15	0.02	0.0
21	-6.49	0.15	0.00	0.0
22	-6.49	0.15	0.00	0.0
22	-7.00	0.15	-0.03	0.0
23	-7.00	0.15	-0.03	0.0
23	-7.50	0.13	-0.05	0.0
24	-7.50	0.13	-0.05	0.0
24	-8.01	0.09	-0.09	0.0
25	-8.01	0.09	-0.09	0.0
25	-8.52	0.04	-0.13	0.0
26	-8.52	0.04	-0.13	0.0
26	-9.04	-0.02	-0.10	0.0
27	-9.04	-0.02	-0.10	0.0
27	-9.56	-0.05	-0.01	0.0
28	-9.56	-0.05	-0.01	0.0
28	-10.08	-0.03	0.06	0.0
29	-10.08	-0.03	0.06	0.0
29	-10.54	-0.01	0.04	0.0
30	-10.54	-0.01	0.04	0.0
30	-11.00	0.00	0.00	0.0
Max		-0.21	-0.22	0.0
Max, minor nodes incl.		-0.21	-0.22	0.0

4.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	307.1	286.9
Water	515.3	535.6
Total	822.5	822.5

No passive side found of the sheet piling.

Left effect. resistance / max. passive resistance 25.2 %

Right effect. resistance / max. passive resistance 25.1 %

4.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.06	Elastic	Left	Strut

5 Step 6.3 Stage 1: CPT 3 aanbrengen damwanden en ringgording

5.1 General Input Data

Passive side:

D-Sheet Piling determined

5.2 Input Data Left

5.2.1 Calculation Method

Calculation method: C, phi, delta

5.2.2 Water Level

Water level: -0.75 [m]

5.2.3 Surface

X [m]	Y [m]
0.00	-0.30

5.3 Input Data Right

5.3.1 Calculation Method

Calculation method: C, phi, delta

5.3.2 Water Level

Water level: -1.05 [m]

5.3.3 Surface

X [m]	Y [m]
0.00	-0.34

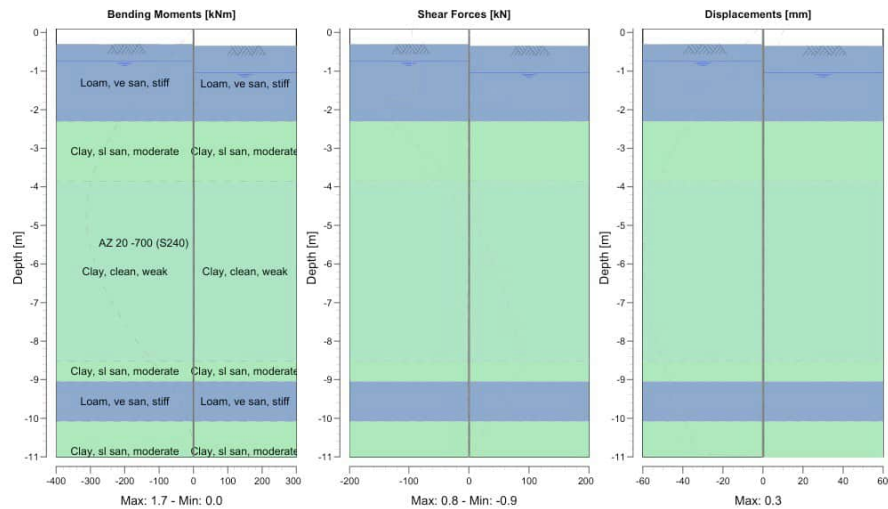
5.4 Calculation Results

Number of iterations: 3

5.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.3 - Partial factor set: RC 2



5.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.1
1	-0.25	0.00	0.00	0.1
2	-0.25	0.00	0.00	0.1
2	-0.30	0.00	0.00	0.1
3	-0.30	0.00	0.00	0.1
3	-0.34	0.00	-0.01	0.1
4	-0.34	0.00	-0.01	0.1
4	-0.75	0.03	0.20	0.1
5	-0.75	0.03	0.20	0.1
5	-0.80	0.04	0.23	0.1
6	-0.80	0.04	0.23	0.1
6	-1.05	0.11	0.25	0.1
7	-1.05	0.11	0.25	0.1
7	-1.38	0.17	0.16	0.2
8	-1.38	0.17	0.16	0.2
8	-1.70	0.22	0.13	0.2
9	-1.70	0.22	0.13	0.2
9	-2.00	0.26	0.14	0.2
10	-2.00	0.26	0.14	0.2
10	-2.30	0.31	0.19	0.2
11	-2.30	0.31	0.19	0.2
11	-2.75	0.41	0.27	0.2
12	-2.75	0.41	0.27	0.2
12	-3.20	0.57	0.43	0.2
13	-3.20	0.57	0.43	0.2
13	-3.53	0.73	0.59	0.3
14	-3.53	0.73	0.59	0.3
14	-3.70	0.84	0.69	0.3
15	-3.70	0.84	0.69	0.3
15	-3.86	0.96	0.79	0.3
16	-3.86	0.96	0.79	0.3

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	1.03	0.75	0.3
17	-3.95	1.03	0.75	0.3
17	-4.46	1.36	0.53	0.3
18	-4.46	1.36	0.53	0.3
18	-4.97	1.58	0.34	0.3
19	-4.97	1.58	0.34	0.3
19	-5.47	1.70	0.17	0.3
20	-5.47	1.70	0.17	0.3
20	-5.98	1.75	0.01	0.3
21	-5.98	1.75	0.01	0.3
21	-6.49	1.71	-0.15	0.3
22	-6.49	1.71	-0.15	0.3
22	-7.00	1.59	-0.32	0.3
23	-7.00	1.59	-0.32	0.3
23	-7.50	1.39	-0.49	0.3
24	-7.50	1.39	-0.49	0.3
24	-8.01	1.09	-0.69	0.3
25	-8.01	1.09	-0.69	0.3
25	-8.52	0.68	-0.91	0.3
26	-8.52	0.68	-0.91	0.3
26	-9.04	0.29	-0.61	0.3
27	-9.04	0.29	-0.61	0.3
27	-9.56	0.07	-0.27	0.2
28	-9.56	0.07	-0.27	0.2
28	-10.08	-0.01	-0.03	0.2
29	-10.08	-0.01	-0.03	0.2
29	-10.54	-0.01	0.02	0.2
30	-10.54	-0.01	0.02	0.2
30	-11.00	0.00	0.00	0.2
Max		1.75	-0.91	0.3
Max, minor nodes incl.		1.75	-0.91	0.3

5.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	299.2	328.9
Water	515.3	485.6
Total	814.5	814.5

Considered as passive side	Right
Maximum passive effective resistance	1277.12 kN
Mobilized passive effective resistance	328.93 kN
Percentage mobilized resistance	25.8 %
Position single support	0.10 m
Maximum passive moment	9111.79 kNm
Mobilized passive moment	2306.16 kNm
Percentage mobilized moment	25.3 %

5.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

6 Step 6.4 Stage 1: CPT 3 aanbrengen damwanden en ringgording

6.1 General Input Data

Passive side:

D-Sheet Piling determined

6.2 Input Data Left

6.2.1 Calculation Method

Calculation method: C, phi, delta

6.2.2 Water Level

Water level: -0.75 [m]

6.2.3 Surface

X [m]	Y [m]
0.00	-0.30

6.3 Input Data Right

6.3.1 Calculation Method

Calculation method: C, phi, delta

6.3.2 Water Level

Water level: -1.05 [m]

6.3.3 Surface

X [m]	Y [m]
0.00	-0.34

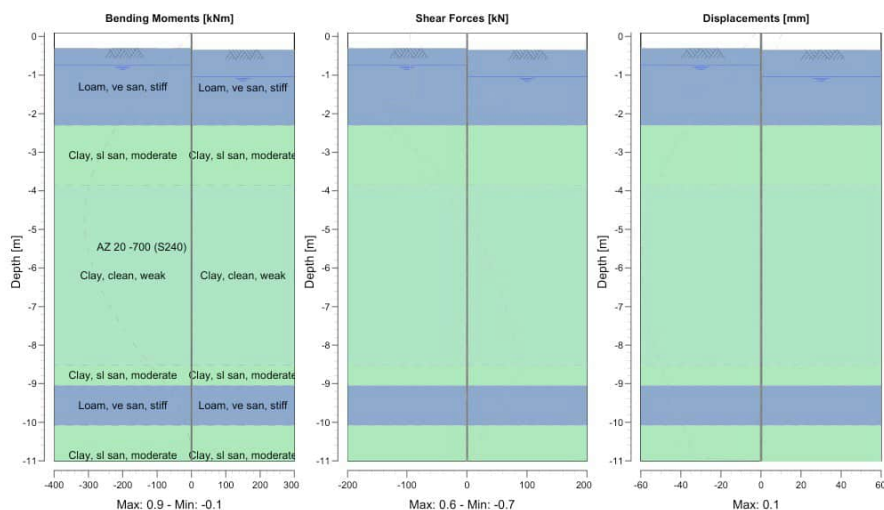
6.4 Calculation Results

Number of iterations: 3

6.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.4 - Partial factor set: RC 2



6.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.0
1	-0.25	0.00	0.00	0.0
2	-0.25	0.00	0.00	0.0
2	-0.30	0.00	0.00	0.0
3	-0.30	0.00	0.00	0.0
3	-0.34	0.00	-0.01	0.0
4	-0.34	0.00	-0.01	0.0
4	-0.75	0.02	0.13	0.0
5	-0.75	0.02	0.13	0.0
5	-0.80	0.03	0.15	0.0
6	-0.80	0.03	0.15	0.0
6	-1.05	0.06	0.13	0.0
7	-1.05	0.06	0.13	0.0
7	-1.38	0.08	0.00	0.0
8	-1.38	0.08	0.00	0.0
8	-1.70	0.07	-0.07	0.1
9	-1.70	0.07	-0.07	0.1
9	-2.00	0.04	-0.09	0.1
10	-2.00	0.04	-0.09	0.1
10	-2.30	0.02	-0.05	0.1
11	-2.30	0.02	-0.05	0.1
11	-2.75	0.02	0.03	0.1
12	-2.75	0.02	0.03	0.1
12	-3.20	0.06	0.20	0.1
13	-3.20	0.06	0.20	0.1
13	-3.53	0.16	0.38	0.1
14	-3.53	0.16	0.38	0.1
14	-3.70	0.23	0.50	0.1
15	-3.70	0.23	0.50	0.1
15	-3.86	0.32	0.62	0.1
16	-3.86	0.32	0.62	0.1

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	0.37	0.58	0.1
17	-3.95	0.37	0.58	0.1
17	-4.46	0.62	0.40	0.1
18	-4.46	0.62	0.40	0.1
18	-4.97	0.78	0.25	0.1
19	-4.97	0.78	0.25	0.1
19	-5.47	0.88	0.13	0.1
20	-5.47	0.88	0.13	0.1
20	-5.98	0.92	0.03	0.1
21	-5.98	0.92	0.03	0.1
21	-6.49	0.90	-0.07	0.1
22	-6.49	0.90	-0.07	0.1
22	-7.00	0.84	-0.18	0.1
23	-7.00	0.84	-0.18	0.1
23	-7.50	0.72	-0.31	0.1
24	-7.50	0.72	-0.31	0.1
24	-8.01	0.52	-0.47	0.1
25	-8.01	0.52	-0.47	0.1
25	-8.52	0.23	-0.67	0.1
26	-8.52	0.23	-0.67	0.1
26	-9.04	-0.03	-0.35	0.1
27	-9.04	-0.03	-0.35	0.1
27	-9.56	-0.12	-0.04	0.1
28	-9.56	-0.12	-0.04	0.1
28	-10.08	-0.09	0.14	0.1
29	-10.08	-0.09	0.14	0.1
29	-10.54	-0.03	0.11	0.1
30	-10.54	-0.03	0.11	0.1
30	-11.00	0.00	0.00	0.1
Max		0.92	-0.67	0.1
Max, minor nodes incl.		0.92	-0.67	0.1

6.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	299.2	328.9
Water	515.3	485.6
Total	814.5	814.5

Considered as passive side	Right
Maximum passive effective resistance	1277.12 kN
Mobilized passive effective resistance	328.93 kN
Percentage mobilized resistance	25.8 %
Position single support	0.10 m
Maximum passive moment	9111.79 kNm
Mobilized passive moment	2306.16 kNm
Percentage mobilized moment	25.3 %

6.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

7 Step 6.5 Stage 1: CPT 3 aanbrengen damwanden en ringgording

7.1 General Input Data

Passive side:

D-Sheet Piling determined

7.2 Input Data Left

7.2.1 Calculation Method

Calculation method: C, phi, delta

7.2.2 Water Level

Water level: -0.80 [m]

7.2.3 Surface

X [m]	Y [m]
0.00	-0.30

7.3 Input Data Right

7.3.1 Calculation Method

Calculation method: C, phi, delta

7.3.2 Water Level

Water level: -0.80 [m]

7.3.3 Surface

X [m]	Y [m]
0.00	-0.30

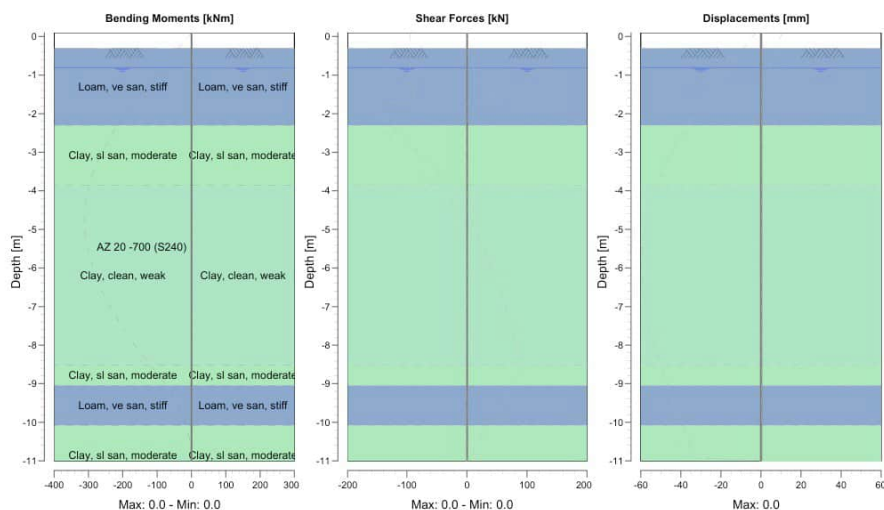
7.4 Calculation Results

Number of iterations: 3

7.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.5 - Partial factor set: RC 2



7.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.0
1	-0.25	0.00	0.00	0.0
2	-0.25	0.00	0.00	0.0
2	-0.30	0.00	0.00	0.0
3	-0.30	0.00	0.00	0.0
3	-0.80	0.00	0.00	0.0
4	-0.80	0.00	0.00	0.0
4	-1.25	0.00	0.00	0.0
5	-1.25	0.00	0.00	0.0
5	-1.70	0.00	0.00	0.0
6	-1.70	0.00	0.00	0.0
6	-2.00	0.00	0.00	0.0
7	-2.00	0.00	0.00	0.0
7	-2.30	0.00	0.00	0.0
8	-2.30	0.00	0.00	0.0
8	-2.75	0.00	0.00	0.0
9	-2.75	0.00	0.00	0.0
9	-3.20	0.00	0.00	0.0
10	-3.20	0.00	0.00	0.0
10	-3.70	0.00	0.00	0.0
11	-3.70	0.00	0.00	0.0
11	-3.86	0.00	0.00	0.0
12	-3.86	0.00	0.00	0.0
12	-4.38	0.00	0.00	0.0
13	-4.38	0.00	0.00	0.0
13	-4.90	0.00	0.00	0.0
14	-4.90	0.00	0.00	0.0
14	-5.41	0.00	0.00	0.0
15	-5.41	0.00	0.00	0.0
15	-5.93	0.00	0.00	0.0
16	-5.93	0.00	0.00	0.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-6.45	0.00	0.00	0.0
17	-6.45	0.00	0.00	0.0
17	-6.97	0.00	0.00	0.0
18	-6.97	0.00	0.00	0.0
18	-7.48	0.00	0.00	0.0
19	-7.48	0.00	0.00	0.0
19	-8.00	0.00	0.00	0.0
20	-8.00	0.00	0.00	0.0
20	-8.52	0.00	0.00	0.0
21	-8.52	0.00	0.00	0.0
21	-9.04	0.00	0.00	0.0
22	-9.04	0.00	0.00	0.0
22	-9.56	0.00	0.00	0.0
23	-9.56	0.00	0.00	0.0
23	-10.08	0.00	0.00	0.0
24	-10.08	0.00	0.00	0.0
24	-10.54	0.00	0.00	0.0
25	-10.54	0.00	0.00	0.0
25	-11.00	0.00	0.00	0.0
Max		0.00	0.00	0.0
Max, minor nodes incl.		0.00	0.00	0.0

7.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	288.7	288.7
Water	510.3	510.3
Total	799.0	799.0

No passive side found of the sheet piling.

Left effect. resistance / max. passive resistance 19.1 %

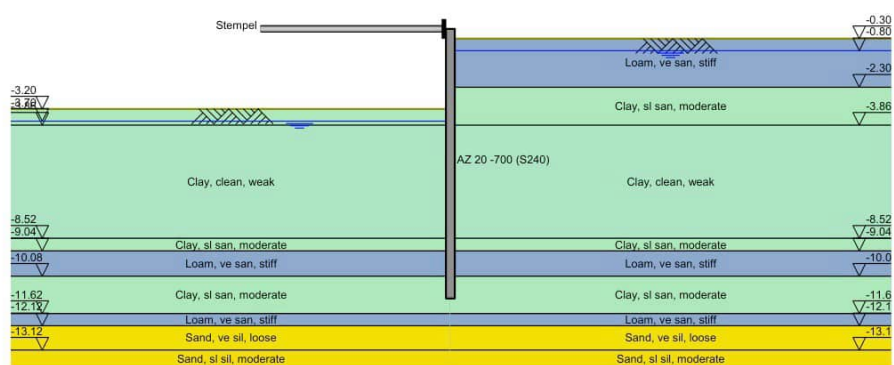
Right effect. resistance / max. passive resistance 19.1 %

7.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

8 Outline Stage 2: CPT 3 ontgraven

Outline - Stage 2: CPT 3 ontgraven

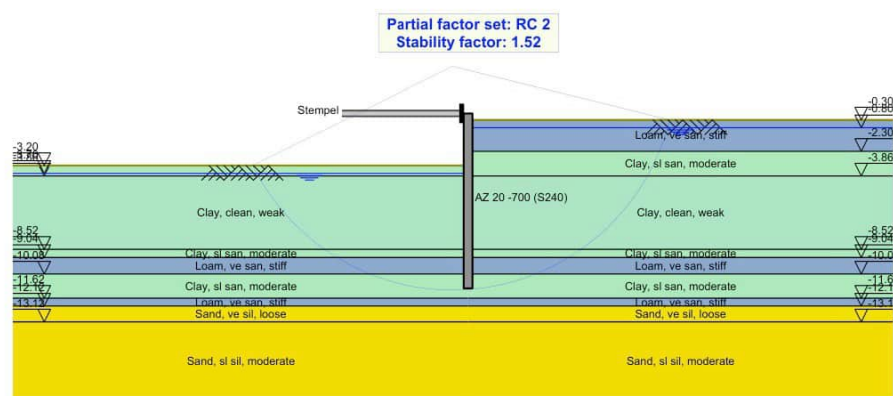


9 Overall Stability Stage 2: CPT 3 ontgraven

Stability factor : 1.52

9.1 Overall Stability

Overall Stability - Stage 2: CPT 3 ontgraven



10 Step 6.1 Stage 2: CPT 3 ontgraven

10.1 General Input Data

Passive side:

D-Sheet Piling determined

10.2 Input Data Left

10.2.1 Calculation Method

Calculation method: C, phi, delta

10.2.2 Water Level

Water level: -3.53 [m]

10.2.3 Surface

X [m]	Y [m]
0.00	-3.53

10.3 Input Data Right

10.3.1 Calculation Method

Calculation method: C, phi, delta

10.3.2 Water Level

Water level: -0.75 [m]

10.3.3 Surface

X [m]	Y [m]
0.00	-0.30

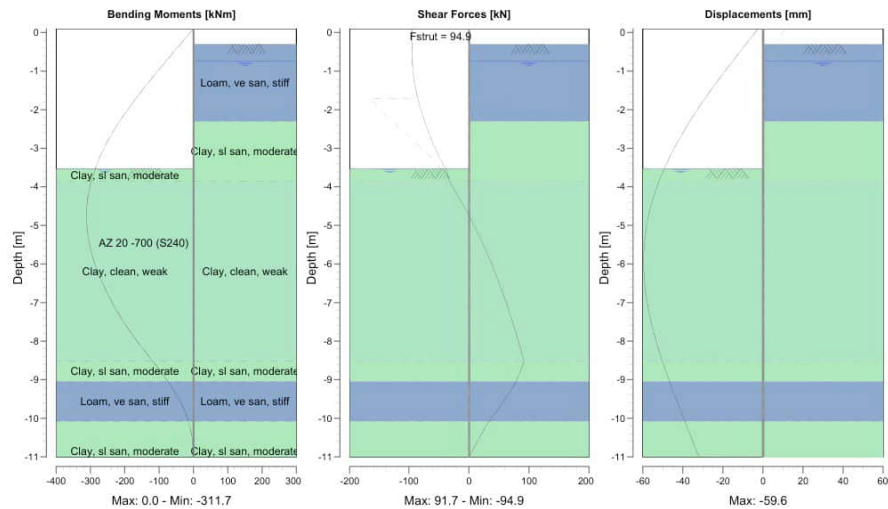
10.4 Calculation Results

Number of iterations: 5

10.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven

Step 6.1 - Partial factor set: RC 2



10.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-94.91	-2.4
1	-0.25	-33.22	-94.91	-7.8
2	-0.25	-33.22	-94.91	-7.8
2	-0.30	-37.96	-94.91	-8.5
3	-0.30	-37.96	-94.91	-8.5
3	-0.34	-41.76	-94.91	-9.1
4	-0.34	-41.76	-94.91	-9.1
4	-0.75	-80.57	-94.21	-15.3
5	-0.75	-80.57	-94.21	-15.3
5	-0.80	-85.28	-94.04	-16.0
6	-0.80	-85.28	-94.04	-16.0
6	-1.05	-108.64	-92.69	-19.7
7	-1.05	-108.64	-92.69	-19.7
7	-1.38	-138.31	-89.71	-24.3
8	-1.38	-138.31	-89.71	-24.3
8	-1.70	-166.80	-85.34	-28.8
9	-1.70	-166.80	-85.34	-28.8
9	-2.00	-191.64	-80.08	-32.8
10	-2.00	-191.64	-80.08	-32.8
10	-2.30	-214.73	-73.63	-36.5
11	-2.30	-214.73	-73.63	-36.5
11	-2.75	-245.61	-63.20	-41.7
12	-2.75	-245.61	-63.20	-41.7
12	-3.20	-271.18	-50.06	-46.3
13	-3.20	-271.18	-50.06	-46.3
13	-3.53	-285.86	-38.70	-49.3
14	-3.53	-285.86	-38.70	-49.3
14	-3.70	-292.08	-35.44	-50.7
15	-3.70	-292.08	-35.44	-50.7
15	-3.86	-297.51	-32.86	-51.9
16	-3.86	-297.51	-32.86	-51.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-300.31	-29.28	-52.6
17	-3.95	-300.31	-29.28	-52.6
17	-4.46	-310.23	-10.09	-55.7
18	-4.46	-310.23	-10.09	-55.7
18	-4.97	-310.84	7.42	-58.0
19	-4.97	-310.84	7.42	-58.0
19	-5.47	-302.98	23.24	-59.2
20	-5.47	-302.98	23.24	-59.2
20	-5.98	-287.52	37.37	-59.6
21	-5.98	-287.52	37.37	-59.6
21	-6.49	-265.28	50.05	-59.1
22	-6.49	-265.28	50.05	-59.1
22	-7.00	-236.85	61.76	-57.9
23	-7.00	-236.85	61.76	-57.9
23	-7.50	-202.71	72.58	-55.9
24	-7.50	-202.71	72.58	-55.9
24	-8.01	-163.29	82.53	-53.3
25	-8.01	-163.29	82.53	-53.3
25	-8.52	-119.03	91.66	-50.2
26	-8.52	-119.03	91.66	-50.2
26	-9.04	-74.53	78.88	-46.7
27	-9.04	-74.53	78.88	-46.7
27	-9.56	-38.78	57.86	-42.9
28	-9.56	-38.78	57.85	-42.9
28	-10.08	-15.02	32.87	-39.0
29	-10.08	-15.02	32.86	-39.0
29	-10.54	-3.73	16.22	-35.5
30	-10.54	-3.73	16.22	-35.5
30	-11.00	0.00	0.00	-32.1
Max		-310.84	-94.91	-59.6
Max, minor nodes incl.		-311.66	-94.91	-59.6

10.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	337.6	190.8
Water	273.7	515.3
Total	611.3	706.2

Considered as passive side	Left
Maximum passive effective resistance	405.05 kN
Mobilized passive effective resistance	337.56 kN
Percentage mobilized resistance	83.3 %
Position single support	0.10 m
Maximum passive moment	3621.30 kNm
Mobilized passive moment	2956.55 kNm
Percentage mobilized moment	81.6 %

10.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	94.91	Elastic	Left	Strut

11 Step 6.2 Stage 2: CPT 3 ontgraven

11.1 General Input Data

Passive side:

D-Sheet Piling determined

11.2 Input Data Left

11.2.1 Calculation Method

Calculation method: C, phi, delta

11.2.2 Water Level

Water level: -3.53 [m]

11.2.3 Surface

X [m]	Y [m]
0.00	-3.53

11.3 Input Data Right

11.3.1 Calculation Method

Calculation method: C, phi, delta

11.3.2 Water Level

Water level: -0.75 [m]

11.3.3 Surface

X [m]	Y [m]
0.00	-0.30

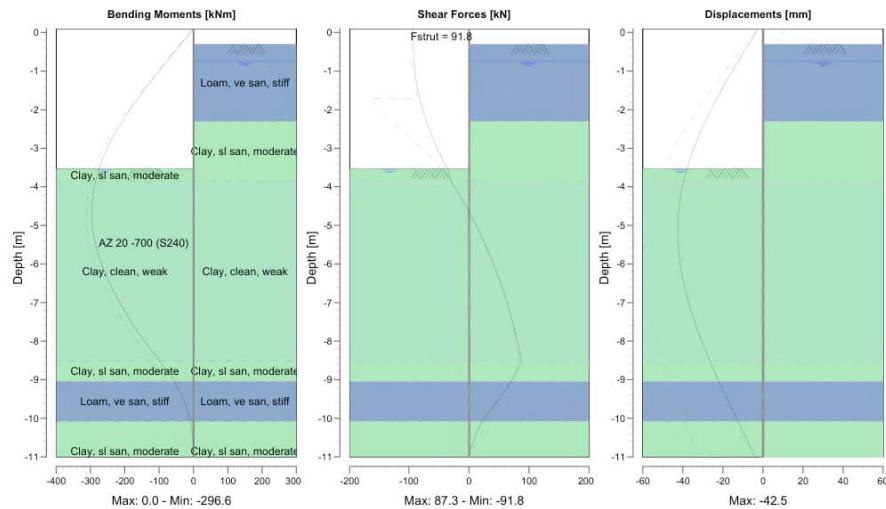
11.4 Calculation Results

Number of iterations: 6

11.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven

Step 6.2 - Partial factor set: RC 2



11.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-91.77	-2.3
1	-0.25	-32.12	-91.77	-6.6
2	-0.25	-32.12	-91.77	-6.6
2	-0.30	-36.71	-91.77	-7.2
3	-0.30	-36.71	-91.77	-7.2
3	-0.34	-40.38	-91.76	-7.6
4	-0.34	-40.38	-91.76	-7.6
4	-0.75	-77.90	-91.07	-12.5
5	-0.75	-77.90	-91.07	-12.5
5	-0.80	-82.45	-90.90	-13.1
6	-0.80	-82.45	-90.90	-13.1
6	-1.05	-105.02	-89.55	-15.9
7	-1.05	-105.02	-89.55	-15.9
7	-1.38	-133.68	-86.57	-19.5
8	-1.38	-133.68	-86.57	-19.5
8	-1.70	-161.14	-82.20	-23.0
9	-1.70	-161.14	-82.20	-23.0
9	-2.00	-185.04	-76.94	-26.0
10	-2.00	-185.04	-76.94	-26.0
10	-2.30	-207.19	-70.49	-28.8
11	-2.30	-207.19	-70.49	-28.8
11	-2.75	-236.65	-60.06	-32.6
12	-2.75	-236.65	-60.06	-32.6
12	-3.20	-260.81	-46.91	-35.9
13	-3.20	-260.81	-46.91	-35.9
13	-3.53	-274.45	-35.56	-37.9
14	-3.53	-274.45	-35.56	-37.9
14	-3.70	-280.14	-32.29	-38.8
15	-3.70	-280.14	-32.29	-38.8
15	-3.86	-285.07	-29.72	-39.6
16	-3.86	-285.07	-29.72	-39.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-287.58	-26.14	-40.0
17	-3.95	-287.58	-26.14	-40.0
17	-4.46	-295.91	-6.95	-41.6
18	-4.46	-295.91	-6.95	-41.6
18	-4.97	-294.92	10.56	-42.5
19	-4.97	-294.92	10.56	-42.5
19	-5.47	-285.47	26.39	-42.4
20	-5.47	-285.47	26.39	-42.4
20	-5.98	-268.41	40.51	-41.4
21	-5.98	-268.41	40.51	-41.4
21	-6.49	-244.61	52.94	-39.7
22	-6.49	-244.61	52.94	-39.7
22	-7.00	-214.93	63.68	-37.2
23	-7.00	-214.93	63.68	-37.2
23	-7.50	-180.23	72.71	-34.1
24	-7.50	-180.23	72.71	-34.1
24	-8.01	-141.35	80.23	-30.5
25	-8.01	-141.35	80.23	-30.5
25	-8.52	-98.81	87.31	-26.4
26	-8.52	-98.81	87.29	-26.4
26	-9.04	-57.59	70.85	-21.9
27	-9.04	-57.59	70.85	-21.9
27	-9.56	-26.74	47.33	-17.3
28	-9.56	-26.74	47.32	-17.3
28	-10.08	-8.67	21.97	-12.5
29	-10.08	-8.68	21.94	-12.5
29	-10.54	-1.81	8.61	-8.3
30	-10.54	-1.81	8.61	-8.3
30	-11.00	0.00	0.00	-4.1
Max		-295.91	-91.77	-42.5
Max, minor nodes incl.		-296.58	-91.77	-42.5

11.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	340.6	190.8
Water	273.7	515.3
Total	614.3	706.2

Considered as passive side	Left
Maximum passive effective resistance	405.05 kN
Mobilized passive effective resistance	340.65 kN
Percentage mobilized resistance	84.1 %
Position single support	0.10 m
Maximum passive moment	3621.30 kNm
Mobilized passive moment	2956.11 kNm
Percentage mobilized moment	81.6 %

11.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	91.77	Elastic	Left	Strut

12 Step 6.3 Stage 2: CPT 3 ontgraven

12.1 General Input Data

Passive side:

D-Sheet Piling determined

12.2 Input Data Left

12.2.1 Calculation Method

Calculation method: C, phi, delta

12.2.2 Water Level

Water level: -3.95 [m]

12.2.3 Surface

X [m]	Y [m]
0.00	-3.53

12.3 Input Data Right

12.3.1 Calculation Method

Calculation method: C, phi, delta

12.3.2 Water Level

Water level: -0.75 [m]

12.3.3 Surface

X [m]	Y [m]
0.00	-0.30

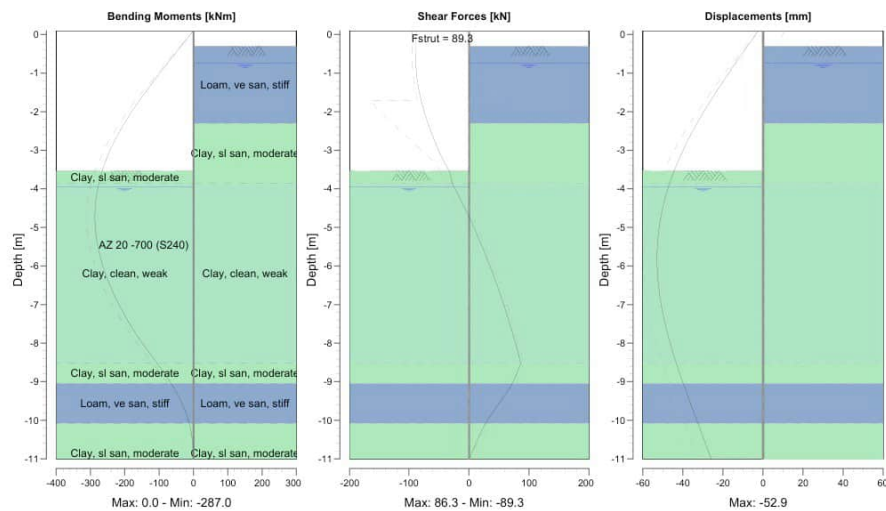
12.4 Calculation Results

Number of iterations: 5

12.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven

Step 6.3 - Partial factor set: RC 2



12.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-89.27	-2.2
1	-0.25	-31.24	-89.27	-7.0
2	-0.25	-31.24	-89.27	-7.0
2	-0.30	-35.71	-89.27	-7.7
3	-0.30	-35.71	-89.27	-7.7
3	-0.34	-39.28	-89.26	-8.2
4	-0.34	-39.28	-89.26	-8.2
4	-0.75	-75.77	-88.57	-13.8
5	-0.75	-75.77	-88.57	-13.8
5	-0.80	-80.20	-88.40	-14.5
6	-0.80	-80.20	-88.40	-14.5
6	-1.05	-102.15	-87.05	-17.8
7	-1.05	-102.15	-87.05	-17.8
7	-1.38	-129.99	-84.07	-22.0
8	-1.38	-129.99	-84.07	-22.0
8	-1.70	-156.64	-79.70	-26.0
9	-1.70	-156.64	-79.70	-26.0
9	-2.00	-179.79	-74.44	-29.6
10	-2.00	-179.79	-74.44	-29.6
10	-2.30	-201.19	-67.99	-32.9
11	-2.30	-201.19	-67.99	-32.9
11	-2.75	-229.53	-57.56	-37.6
12	-2.75	-229.53	-57.56	-37.6
12	-3.20	-252.56	-44.42	-41.7
13	-3.20	-252.56	-44.42	-41.7
13	-3.53	-265.38	-33.06	-44.3
14	-3.53	-265.38	-33.06	-44.3
14	-3.70	-270.65	-30.04	-45.5
15	-3.70	-270.65	-30.04	-45.5
15	-3.86	-275.27	-28.14	-46.6
16	-3.86	-275.27	-28.14	-46.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-277.66	-24.93	-47.2
17	-3.95	-277.66	-24.93	-47.2
17	-4.46	-285.96	-8.04	-49.9
18	-4.46	-285.96	-8.04	-49.9
18	-4.97	-286.10	7.27	-51.7
19	-4.97	-286.10	7.27	-51.7
19	-5.47	-278.76	21.45	-52.7
20	-5.47	-278.76	21.45	-52.7
20	-5.98	-264.49	34.58	-52.8
21	-5.98	-264.49	34.58	-52.8
21	-6.49	-243.81	46.72	-52.2
22	-6.49	-243.81	46.72	-52.2
22	-7.00	-217.20	57.92	-50.9
23	-7.00	-217.20	57.92	-50.9
23	-7.50	-185.14	68.23	-48.8
24	-7.50	-185.14	68.23	-48.8
24	-8.01	-148.06	77.67	-46.3
25	-8.01	-148.06	77.67	-46.3
25	-8.52	-106.40	86.31	-43.3
26	-8.52	-106.40	86.31	-43.3
26	-9.04	-64.87	72.81	-39.8
27	-9.04	-64.87	72.80	-39.8
27	-9.56	-32.73	50.40	-36.2
28	-9.56	-32.73	50.40	-36.2
28	-10.08	-12.50	27.35	-32.5
29	-10.08	-12.50	27.35	-32.5
29	-10.54	-3.10	13.50	-29.2
30	-10.54	-3.10	13.50	-29.2
30	-11.00	0.00	0.00	-25.8
Max		-286.10	-89.27	-52.8
Max, minor nodes incl.		-286.97	-89.27	-52.9

12.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	373.1	190.8
Water	243.8	515.3
Total	616.9	706.2

Considered as passive side	Left
Maximum passive effective resistance	478.75 kN
Mobilized passive effective resistance	373.11 kN
Percentage mobilized resistance	77.9 %
Position single support	0.10 m
Maximum passive moment	4194.74 kNm
Mobilized passive moment	3179.97 kNm
Percentage mobilized moment	75.8 %

12.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	89.27	Elastic	Left	Strut

13 Step 6.4 Stage 2: CPT 3 ontgraven

13.1 General Input Data

Passive side:

D-Sheet Piling determined

13.2 Input Data Left

13.2.1 Calculation Method

Calculation method: C, phi, delta

13.2.2 Water Level

Water level: -3.95 [m]

13.2.3 Surface

X [m]	Y [m]
0.00	-3.53

13.3 Input Data Right

13.3.1 Calculation Method

Calculation method: C, phi, delta

13.3.2 Water Level

Water level: -0.75 [m]

13.3.3 Surface

X [m]	Y [m]
0.00	-0.30

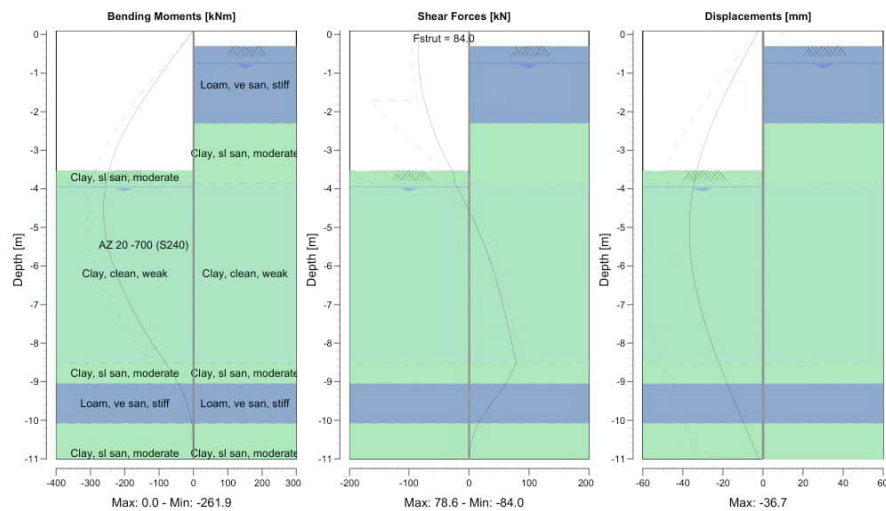
13.4 Calculation Results

Number of iterations: 6

13.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven

Step 6.4 - Partial factor set: RC 2



13.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-83.97	-2.1
1	-0.25	-29.39	-83.97	-5.8
2	-0.25	-29.39	-83.97	-5.8
2	-0.30	-33.59	-83.97	-6.3
3	-0.30	-33.59	-83.97	-6.3
3	-0.34	-36.95	-83.96	-6.8
4	-0.34	-36.95	-83.96	-6.8
4	-0.75	-71.27	-83.27	-11.0
5	-0.75	-71.27	-83.27	-11.0
5	-0.80	-75.43	-83.10	-11.5
6	-0.80	-75.43	-83.10	-11.5
6	-1.05	-96.05	-81.75	-14.0
7	-1.05	-96.05	-81.75	-14.0
7	-1.38	-122.17	-78.77	-17.2
8	-1.38	-122.17	-78.77	-17.2
8	-1.70	-147.10	-74.40	-20.2
9	-1.70	-147.10	-74.40	-20.2
9	-2.00	-168.66	-69.14	-22.8
10	-2.00	-168.66	-69.14	-22.8
10	-2.30	-188.47	-62.69	-25.3
11	-2.30	-188.47	-62.69	-25.3
11	-2.75	-214.42	-52.26	-28.6
12	-2.75	-214.42	-52.26	-28.6
12	-3.20	-235.07	-39.11	-31.4
13	-3.20	-235.07	-39.11	-31.4
13	-3.53	-246.14	-27.76	-33.1
14	-3.53	-246.14	-27.76	-33.1
14	-3.70	-250.51	-24.74	-33.8
15	-3.70	-250.51	-24.74	-33.8
15	-3.86	-254.28	-22.84	-34.4
16	-3.86	-254.28	-22.84	-34.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-256.19	-19.63	-34.8
17	-3.95	-256.19	-19.63	-34.8
17	-4.46	-261.80	-2.74	-36.1
18	-4.46	-261.80	-2.74	-36.1
18	-4.97	-259.26	12.47	-36.7
19	-4.97	-259.26	12.47	-36.7
19	-5.47	-249.42	25.98	-36.5
20	-5.47	-249.42	25.98	-36.5
20	-5.98	-233.15	37.81	-35.6
21	-5.98	-233.15	37.81	-35.6
21	-6.49	-211.31	47.93	-33.9
22	-6.49	-211.31	47.93	-33.9
22	-7.00	-184.76	56.45	-31.6
23	-7.00	-184.76	56.45	-31.6
23	-7.50	-154.10	64.23	-28.8
24	-7.50	-154.10	64.23	-28.8
24	-8.01	-119.60	71.59	-25.5
25	-8.01	-119.60	71.59	-25.5
25	-8.52	-81.45	78.60	-21.9
26	-8.52	-81.45	78.60	-21.9
26	-9.04	-44.71	62.31	-17.9
27	-9.04	-44.71	62.31	-17.9
27	-9.56	-18.58	37.72	-13.8
28	-9.56	-18.58	37.69	-13.8
28	-10.08	-5.18	14.75	-9.6
29	-10.08	-5.18	14.75	-9.6
29	-10.54	-0.80	4.87	-5.9
30	-10.54	-0.80	4.85	-5.9
30	-11.00	0.01	0.07	-2.1
Max		-261.80	-83.97	-36.7
Max, minor nodes incl.		-261.91	-83.97	-36.7

13.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	378.3	190.8
Water	243.8	515.3
Total	622.1	706.2

Considered as passive side	Left
Maximum passive effective resistance	478.75 kN
Mobilized passive effective resistance	378.29 kN
Percentage mobilized resistance	79.0 %
Position single support	0.10 m
Maximum passive moment	4194.74 kNm
Mobilized passive moment	3178.72 kNm
Percentage mobilized moment	75.8 %

13.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	83.97	Elastic	Left	Strut

14 Step 6.5 Stage 2: CPT 3 ontgraven

14.1 General Input Data

Passive side:

D-Sheet Piling determined

14.2 Input Data Left

14.2.1 Calculation Method

Calculation method: C, phi, delta

14.2.2 Water Level

Water level: -3.70 [m]

14.2.3 Surface

X [m]	Y [m]
0.00	-3.20

14.3 Input Data Right

14.3.1 Calculation Method

Calculation method: C, phi, delta

14.3.2 Water Level

Water level: -0.80 [m]

14.3.3 Surface

X [m]	Y [m]
0.00	-0.30

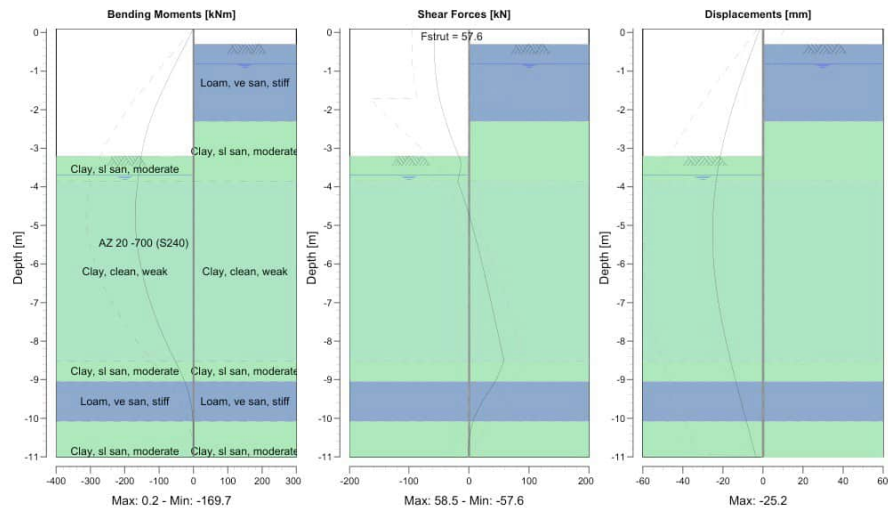
14.4 Calculation Results

Number of iterations: 4

14.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven

Step 6.5 - Partial factor set: RC 2



14.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-57.56	-1.5
1	-0.25	-20.15	-57.56	-4.0
2	-0.25	-20.15	-57.56	-4.0
2	-0.30	-23.02	-57.56	-4.3
3	-0.30	-23.02	-57.56	-4.3
3	-0.80	-51.68	-56.82	-7.8
4	-0.80	-51.68	-56.82	-7.8
4	-1.25	-76.76	-54.21	-10.9
5	-1.25	-76.76	-54.21	-10.9
5	-1.70	-100.08	-49.03	-13.7
6	-1.70	-100.08	-49.03	-13.7
6	-2.00	-114.09	-44.16	-15.5
7	-2.00	-114.09	-44.16	-15.5
7	-2.30	-126.46	-38.14	-17.1
8	-2.30	-126.46	-38.14	-17.1
8	-2.75	-141.60	-28.79	-19.4
9	-2.75	-141.60	-28.79	-19.4
9	-3.20	-151.95	-16.81	-21.3
10	-3.20	-151.95	-16.81	-21.3
10	-3.70	-159.27	-16.89	-23.0
11	-3.70	-159.27	-16.89	-23.0
11	-3.86	-162.09	-18.56	-23.4
12	-3.86	-162.09	-18.56	-23.4
12	-4.38	-168.60	-6.81	-24.5
13	-4.38	-168.60	-6.81	-24.5
13	-4.90	-169.38	3.57	-25.1
14	-4.90	-169.38	3.57	-25.1
14	-5.41	-165.13	12.65	-25.1
15	-5.41	-165.13	12.65	-25.1
15	-5.93	-156.38	21.04	-24.7
16	-5.93	-156.38	21.04	-24.7

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-6.45	-143.42	28.96	-23.7
17	-6.45	-143.42	28.96	-23.7
17	-6.97	-126.45	36.56	-22.3
18	-6.97	-126.45	36.56	-22.3
18	-7.48	-105.60	43.94	-20.6
19	-7.48	-105.60	43.94	-20.6
19	-8.00	-80.96	51.21	-18.4
20	-8.00	-80.96	51.21	-18.4
20	-8.52	-52.58	58.44	-16.1
21	-8.52	-52.58	58.47	-16.1
21	-9.04	-25.89	44.00	-13.5
22	-9.04	-25.88	44.06	-13.5
22	-9.56	-8.60	22.56	-10.9
23	-9.56	-8.60	22.61	-10.9
23	-10.08	-1.31	6.71	-8.2
24	-10.08	-1.31	6.75	-8.2
24	-10.54	0.18	0.52	-5.9
25	-10.54	0.18	0.50	-5.9
25	-11.00	0.00	0.02	-3.5
Max		-169.38	58.47	-25.1
Max, minor nodes incl.		-169.71	58.47	-25.2

14.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	359.4	167.9
Water	261.4	510.3
Total	620.8	678.2

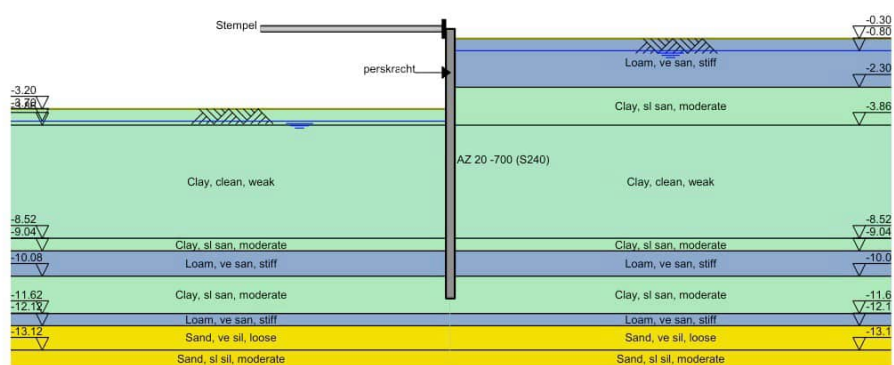
Considered as passive side	Left
Maximum passive effective resistance	681.48 kN
Mobilized passive effective resistance	359.38 kN
Percentage mobilized resistance	52.7 %
Position single support	0.10 m
Maximum passive moment	5856.45 kNm
Mobilized passive moment	2857.72 kNm
Percentage mobilized moment	48.8 %

14.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	57.56	Elastic	Left	Strut

15 Outline Stage 3: CPT 3 gebruiksfase met perskracht

Outline - Stage 3: CPT 3 gebruiksfase met perskracht

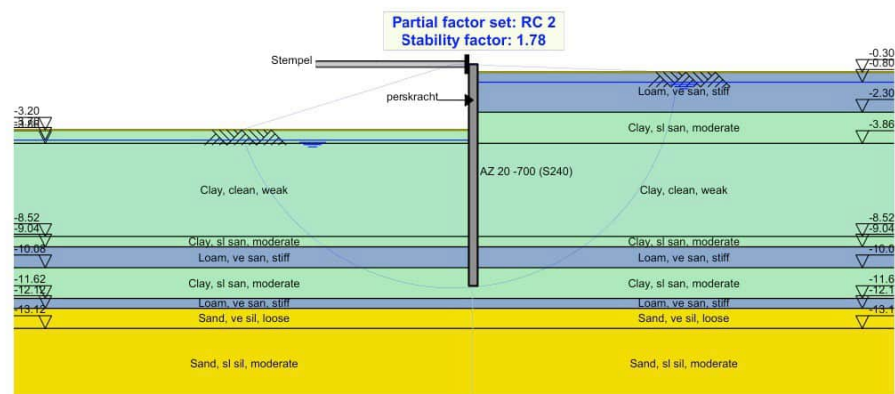


16 Overall Stability Stage 3: CPT 3 gebruiksfase met perskracht

Stability factor : 1.78

16.1 Overall Stability

Overall Stability - Stage 3: CPT 3 gebruiksfase met perskracht



17 Step 6.1 Stage 3: CPT 3 gebruiksfase met perskracht

17.1 General Input Data

Passive side:

D-Sheet Piling determined

17.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	0.00	Favourable (D-Sheet Pi...	Variable

17.2 Input Data Left

17.2.1 Calculation Method

Calculation method: C, phi, delta

17.2.2 Water Level

Water level: -3.53 [m]

17.2.3 Surface

X [m]	Y [m]
0.00	-3.53

17.3 Input Data Right

17.3.1 Calculation Method

Calculation method: C, phi, delta

17.3.2 Water Level

Water level: -0.75 [m]

17.3.3 Surface

X [m]	Y [m]
0.00	-0.30

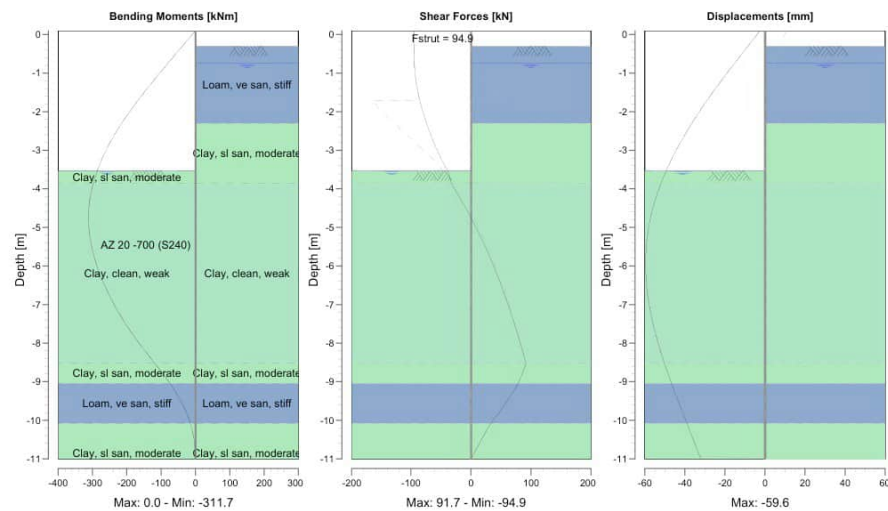
17.4 Calculation Results

Number of iterations: 2

17.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 3 gebruiksfase met perskracht

Step 6.1 - Partial factor set: RC 2



17.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-94.91	-2.4
1	-0.25	-33.22	-94.91	-7.8
2	-0.25	-33.22	-94.91	-7.8
2	-0.30	-37.96	-94.91	-8.5
3	-0.30	-37.96	-94.91	-8.5
3	-0.34	-41.76	-94.91	-9.1
4	-0.34	-41.76	-94.91	-9.1
4	-0.75	-80.57	-94.21	-15.3
5	-0.75	-80.57	-94.21	-15.3
5	-0.80	-85.28	-94.04	-16.0
6	-0.80	-85.28	-94.04	-16.0
6	-1.05	-108.64	-92.69	-19.7
7	-1.05	-108.64	-92.69	-19.7
7	-1.38	-138.31	-89.71	-24.3
8	-1.38	-138.31	-89.71	-24.3
8	-1.70	-166.80	-85.34	-28.8
9	-1.70	-166.80	-85.34	-28.8
9	-2.00	-191.64	-80.08	-32.8
10	-2.00	-191.64	-80.08	-32.8
10	-2.30	-214.73	-73.63	-36.5
11	-2.30	-214.73	-73.63	-36.5
11	-2.75	-245.61	-63.20	-41.7
12	-2.75	-245.61	-63.20	-41.7
12	-3.20	-271.18	-50.06	-46.3
13	-3.20	-271.18	-50.06	-46.3
13	-3.53	-285.86	-38.70	-49.3
14	-3.53	-285.86	-38.70	-49.3
14	-3.70	-292.08	-35.44	-50.7
15	-3.70	-292.08	-35.44	-50.7
15	-3.86	-297.51	-32.86	-51.9
16	-3.86	-297.51	-32.86	-51.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-300.31	-29.28	-52.6
17	-3.95	-300.31	-29.28	-52.6
17	-4.46	-310.23	-10.09	-55.7
18	-4.46	-310.23	-10.09	-55.7
18	-4.97	-310.84	7.42	-58.0
19	-4.97	-310.84	7.42	-58.0
19	-5.47	-302.98	23.24	-59.2
20	-5.47	-302.98	23.24	-59.2
20	-5.98	-287.52	37.37	-59.6
21	-5.98	-287.52	37.37	-59.6
21	-6.49	-265.28	50.05	-59.1
22	-6.49	-265.28	50.05	-59.1
22	-7.00	-236.85	61.76	-57.9
23	-7.00	-236.85	61.76	-57.9
23	-7.50	-202.71	72.58	-55.9
24	-7.50	-202.71	72.58	-55.9
24	-8.01	-163.29	82.53	-53.3
25	-8.01	-163.29	82.53	-53.3
25	-8.52	-119.03	91.66	-50.2
26	-8.52	-119.03	91.66	-50.2
26	-9.04	-74.53	78.88	-46.7
27	-9.04	-74.53	78.88	-46.7
27	-9.56	-38.78	57.86	-42.9
28	-9.56	-38.78	57.85	-42.9
28	-10.08	-15.02	32.87	-39.0
29	-10.08	-15.02	32.86	-39.0
29	-10.54	-3.73	16.22	-35.5
30	-10.54	-3.73	16.22	-35.5
30	-11.00	0.00	0.00	-32.1
Max		-310.84	-94.91	-59.6
Max, minor nodes incl.		-311.66	-94.91	-59.6

17.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	337.6	190.8
Water	273.7	515.3
Total	611.3	706.2

Considered as passive side	Left
Maximum passive effective resistance	405.05 kN
Mobilized passive effective resistance	337.56 kN
Percentage mobilized resistance	83.3 %
Position single support	0.10 m
Maximum passive moment	3621.30 kNm
Mobilized passive moment	2956.55 kNm
Percentage mobilized moment	81.6 %

17.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	94.91	Elastic	Left	Strut

18 Step 6.2 Stage 3: CPT 3 gebruiksfase met perskracht

18.1 General Input Data

Passive side:

D-Sheet Piling determined

18.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	0.00	Favourable (D-Sheet Pi...	Variable

18.2 Input Data Left

18.2.1 Calculation Method

Calculation method: C, phi, delta

18.2.2 Water Level

Water level: -3.53 [m]

18.2.3 Surface

X [m]	Y [m]
0.00	-3.53

18.3 Input Data Right

18.3.1 Calculation Method

Calculation method: C, phi, delta

18.3.2 Water Level

Water level: -0.75 [m]

18.3.3 Surface

X [m]	Y [m]
0.00	-0.30

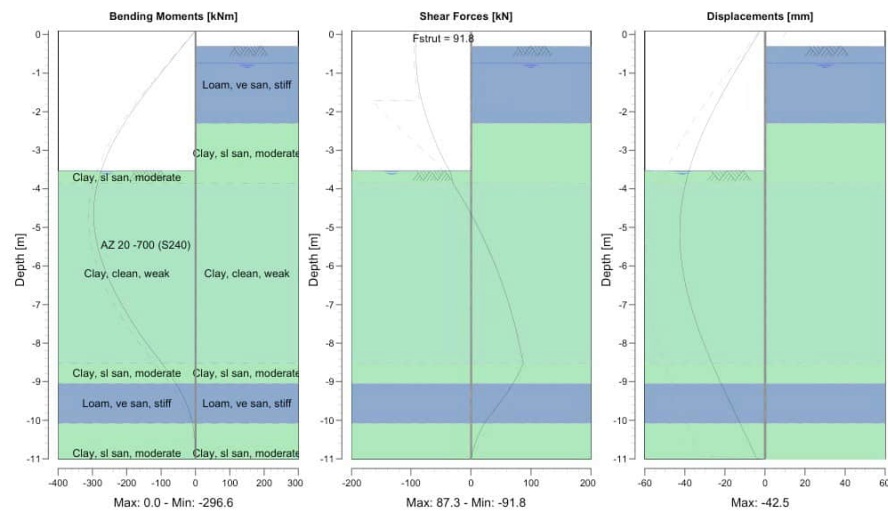
18.4 Calculation Results

Number of iterations: 2

18.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 3 gebruiksfase met perskracht

Step 6.2 - Partial factor set: RC 2



18.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-91.77	-2.3
1	-0.25	-32.12	-91.77	-6.6
2	-0.25	-32.12	-91.77	-6.6
2	-0.30	-36.71	-91.77	-7.2
3	-0.30	-36.71	-91.77	-7.2
3	-0.34	-40.38	-91.76	-7.6
4	-0.34	-40.38	-91.76	-7.6
4	-0.75	-77.90	-91.07	-12.5
5	-0.75	-77.90	-91.07	-12.5
5	-0.80	-82.45	-90.90	-13.1
6	-0.80	-82.45	-90.90	-13.1
6	-1.05	-105.02	-89.55	-15.9
7	-1.05	-105.02	-89.55	-15.9
7	-1.38	-133.68	-86.57	-19.5
8	-1.38	-133.68	-86.57	-19.5
8	-1.70	-161.14	-82.20	-23.0
9	-1.70	-161.14	-82.20	-23.0
9	-2.00	-185.04	-76.94	-26.0
10	-2.00	-185.04	-76.94	-26.0
10	-2.30	-207.19	-70.49	-28.8
11	-2.30	-207.19	-70.49	-28.8
11	-2.75	-236.65	-60.06	-32.6
12	-2.75	-236.65	-60.06	-32.6
12	-3.20	-260.81	-46.91	-35.9
13	-3.20	-260.81	-46.91	-35.9
13	-3.53	-274.45	-35.56	-37.9
14	-3.53	-274.45	-35.56	-37.9
14	-3.70	-280.14	-32.29	-38.8
15	-3.70	-280.14	-32.29	-38.8
15	-3.86	-285.07	-29.72	-39.6
16	-3.86	-285.07	-29.72	-39.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-287.58	-26.14	-40.0
17	-3.95	-287.58	-26.14	-40.0
17	-4.46	-295.91	-6.95	-41.6
18	-4.46	-295.91	-6.95	-41.6
18	-4.97	-294.92	10.56	-42.5
19	-4.97	-294.92	10.56	-42.5
19	-5.47	-285.47	26.39	-42.4
20	-5.47	-285.47	26.39	-42.4
20	-5.98	-268.41	40.51	-41.4
21	-5.98	-268.41	40.51	-41.4
21	-6.49	-244.61	52.94	-39.7
22	-6.49	-244.61	52.94	-39.7
22	-7.00	-214.93	63.68	-37.2
23	-7.00	-214.93	63.68	-37.2
23	-7.50	-180.23	72.71	-34.1
24	-7.50	-180.23	72.71	-34.1
24	-8.01	-141.35	80.23	-30.5
25	-8.01	-141.35	80.23	-30.5
25	-8.52	-98.81	87.31	-26.4
26	-8.52	-98.81	87.29	-26.4
26	-9.04	-57.59	70.85	-21.9
27	-9.04	-57.59	70.85	-21.9
27	-9.56	-26.74	47.33	-17.3
28	-9.56	-26.74	47.32	-17.3
28	-10.08	-8.67	21.97	-12.5
29	-10.08	-8.68	21.94	-12.5
29	-10.54	-1.81	8.61	-8.3
30	-10.54	-1.81	8.61	-8.3
30	-11.00	0.00	0.00	-4.1
Max		-295.91	-91.77	-42.5
Max, minor nodes incl.		-296.58	-91.77	-42.5

18.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	340.6	190.8
Water	273.7	515.3
Total	614.3	706.2

Considered as passive side	Left
Maximum passive effective resistance	405.05 kN
Mobilized passive effective resistance	340.65 kN
Percentage mobilized resistance	84.1 %
Position single support	0.10 m
Maximum passive moment	3621.30 kNm
Mobilized passive moment	2956.11 kNm
Percentage mobilized moment	81.6 %

18.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	91.77	Elastic	Left	Strut

19 Step 6.3 Stage 3: CPT 3 gebruiksfase met perskracht

19.1 General Input Data

Passive side:

D-Sheet Piling determined

19.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	0.00	Favourable (D-Sheet Pi...	Variable

19.2 Input Data Left

19.2.1 Calculation Method

Calculation method: C, phi, delta

19.2.2 Water Level

Water level: -3.95 [m]

19.2.3 Surface

X [m]	Y [m]
0.00	-3.53

19.3 Input Data Right

19.3.1 Calculation Method

Calculation method: C, phi, delta

19.3.2 Water Level

Water level: -0.75 [m]

19.3.3 Surface

X [m]	Y [m]
0.00	-0.30

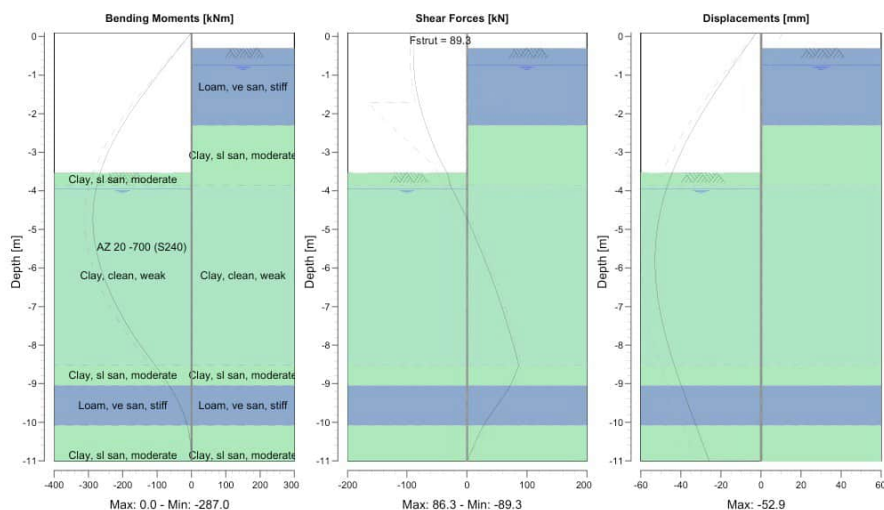
19.4 Calculation Results

Number of iterations: 2

19.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 3 gebruiksfase met perskracht

Step 6.3 - Partial factor set: RC 2



19.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-89.27	-2.2
1	-0.25	-31.24	-89.27	-7.0
2	-0.25	-31.24	-89.27	-7.0
2	-0.30	-35.71	-89.27	-7.7
3	-0.30	-35.71	-89.27	-7.7
3	-0.34	-39.28	-89.26	-8.2
4	-0.34	-39.28	-89.26	-8.2
4	-0.75	-75.77	-88.57	-13.8
5	-0.75	-75.77	-88.57	-13.8
5	-0.80	-80.20	-88.40	-14.5
6	-0.80	-80.20	-88.40	-14.5
6	-1.05	-102.15	-87.05	-17.8
7	-1.05	-102.15	-87.05	-17.8
7	-1.38	-129.99	-84.07	-22.0
8	-1.38	-129.99	-84.07	-22.0
8	-1.70	-156.64	-79.70	-26.0
9	-1.70	-156.64	-79.70	-26.0
9	-2.00	-179.79	-74.44	-29.6
10	-2.00	-179.79	-74.44	-29.6
10	-2.30	-201.19	-67.99	-32.9
11	-2.30	-201.19	-67.99	-32.9
11	-2.75	-229.53	-57.56	-37.6
12	-2.75	-229.53	-57.56	-37.6
12	-3.20	-252.56	-44.42	-41.7
13	-3.20	-252.56	-44.42	-41.7
13	-3.53	-265.38	-33.06	-44.3
14	-3.53	-265.38	-33.06	-44.3
14	-3.70	-270.65	-30.04	-45.5
15	-3.70	-270.65	-30.04	-45.5
15	-3.86	-275.27	-28.14	-46.6
16	-3.86	-275.27	-28.14	-46.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-277.66	-24.93	-47.2
17	-3.95	-277.66	-24.93	-47.2
17	-4.46	-285.96	-8.04	-49.9
18	-4.46	-285.96	-8.04	-49.9
18	-4.97	-286.10	7.27	-51.7
19	-4.97	-286.10	7.27	-51.7
19	-5.47	-278.76	21.45	-52.7
20	-5.47	-278.76	21.45	-52.7
20	-5.98	-264.49	34.58	-52.8
21	-5.98	-264.49	34.58	-52.8
21	-6.49	-243.81	46.72	-52.2
22	-6.49	-243.81	46.72	-52.2
22	-7.00	-217.20	57.92	-50.9
23	-7.00	-217.20	57.92	-50.9
23	-7.50	-185.14	68.23	-48.8
24	-7.50	-185.14	68.23	-48.8
24	-8.01	-148.06	77.67	-46.3
25	-8.01	-148.06	77.67	-46.3
25	-8.52	-106.40	86.31	-43.3
26	-8.52	-106.40	86.31	-43.3
26	-9.04	-64.87	72.81	-39.8
27	-9.04	-64.87	72.80	-39.8
27	-9.56	-32.73	50.40	-36.2
28	-9.56	-32.73	50.40	-36.2
28	-10.08	-12.50	27.35	-32.5
29	-10.08	-12.50	27.35	-32.5
29	-10.54	-3.10	13.50	-29.2
30	-10.54	-3.10	13.50	-29.2
30	-11.00	0.00	0.00	-25.8
Max		-286.10	-89.27	-52.8
Max, minor nodes incl.		-286.97	-89.27	-52.9

19.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	373.1	190.8
Water	243.8	515.3
Total	616.9	706.2

Considered as passive side	Left
Maximum passive effective resistance	478.75 kN
Mobilized passive effective resistance	373.11 kN
Percentage mobilized resistance	77.9 %
Position single support	0.10 m
Maximum passive moment	4194.74 kNm
Mobilized passive moment	3179.97 kNm
Percentage mobilized moment	75.8 %

19.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	89.27	Elastic	Left	Strut

20 Step 6.4 Stage 3: CPT 3 gebruiksfase met perskracht

20.1 General Input Data

Passive side:

D-Sheet Piling determined

20.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	0.00	Favourable (D-Sheet Pi...	Variable

20.2 Input Data Left

20.2.1 Calculation Method

Calculation method: C, phi, delta

20.2.2 Water Level

Water level: -3.95 [m]

20.2.3 Surface

X [m]	Y [m]
0.00	-3.53

20.3 Input Data Right

20.3.1 Calculation Method

Calculation method: C, phi, delta

20.3.2 Water Level

Water level: -0.75 [m]

20.3.3 Surface

X [m]	Y [m]
0.00	-0.30

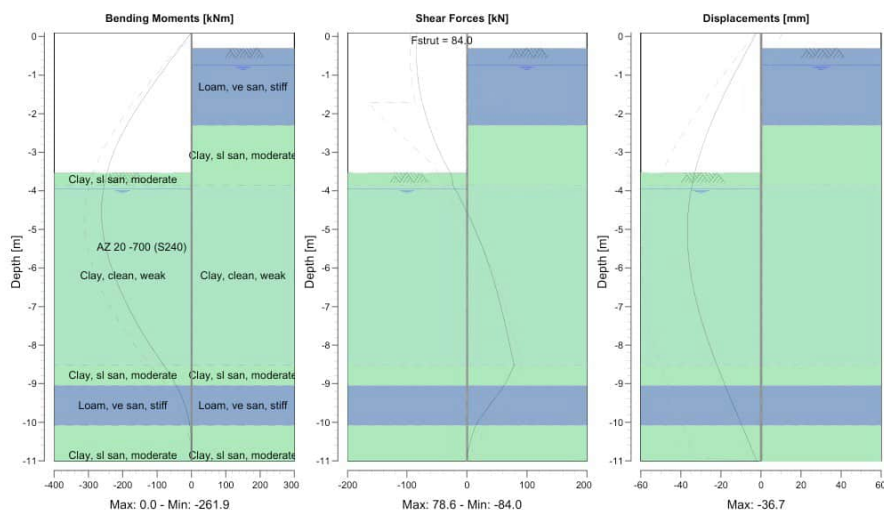
20.4 Calculation Results

Number of iterations: 2

20.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 3 gebruiksfase met perskracht

Step 6.4 - Partial factor set: RC 2



20.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	-83.97	-2.1
1	-0.25	-29.39	-83.97	-5.8
2	-0.25	-29.39	-83.97	-5.8
2	-0.30	-33.59	-83.97	-6.3
3	-0.30	-33.59	-83.97	-6.3
3	-0.34	-36.95	-83.96	-6.8
4	-0.34	-36.95	-83.96	-6.8
4	-0.75	-71.27	-83.27	-11.0
5	-0.75	-71.27	-83.27	-11.0
5	-0.80	-75.43	-83.10	-11.5
6	-0.80	-75.43	-83.10	-11.5
6	-1.05	-96.05	-81.75	-14.0
7	-1.05	-96.05	-81.75	-14.0
7	-1.38	-122.17	-78.77	-17.2
8	-1.38	-122.17	-78.77	-17.2
8	-1.70	-147.10	-74.40	-20.2
9	-1.70	-147.10	-74.40	-20.2
9	-2.00	-168.66	-69.14	-22.8
10	-2.00	-168.66	-69.14	-22.8
10	-2.30	-188.47	-62.69	-25.3
11	-2.30	-188.47	-62.69	-25.3
11	-2.75	-214.42	-52.26	-28.6
12	-2.75	-214.42	-52.26	-28.6
12	-3.20	-235.07	-39.11	-31.4
13	-3.20	-235.07	-39.11	-31.4
13	-3.53	-246.14	-27.76	-33.1
14	-3.53	-246.14	-27.76	-33.1
14	-3.70	-250.51	-24.74	-33.8
15	-3.70	-250.51	-24.74	-33.8
15	-3.86	-254.28	-22.84	-34.4
16	-3.86	-254.28	-22.84	-34.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	-256.19	-19.63	-34.8
17	-3.95	-256.19	-19.63	-34.8
17	-4.46	-261.80	-2.74	-36.1
18	-4.46	-261.80	-2.74	-36.1
18	-4.97	-259.26	12.47	-36.7
19	-4.97	-259.26	12.47	-36.7
19	-5.47	-249.42	25.98	-36.5
20	-5.47	-249.42	25.98	-36.5
20	-5.98	-233.15	37.81	-35.6
21	-5.98	-233.15	37.81	-35.6
21	-6.49	-211.31	47.93	-33.9
22	-6.49	-211.31	47.93	-33.9
22	-7.00	-184.76	56.45	-31.6
23	-7.00	-184.76	56.45	-31.6
23	-7.50	-154.10	64.23	-28.8
24	-7.50	-154.10	64.23	-28.8
24	-8.01	-119.60	71.59	-25.5
25	-8.01	-119.60	71.59	-25.5
25	-8.52	-81.45	78.60	-21.9
26	-8.52	-81.45	78.60	-21.9
26	-9.04	-44.71	62.31	-17.9
27	-9.04	-44.71	62.31	-17.9
27	-9.56	-18.58	37.72	-13.8
28	-9.56	-18.58	37.69	-13.8
28	-10.08	-5.18	14.75	-9.6
29	-10.08	-5.18	14.75	-9.6
29	-10.54	-0.80	4.87	-5.9
30	-10.54	-0.80	4.85	-5.9
30	-11.00	0.01	0.07	-2.1
Max		-261.80	-83.97	-36.7
Max, minor nodes incl.		-261.91	-83.97	-36.7

20.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	378.3	190.8
Water	243.8	515.3
Total	622.1	706.2

Considered as passive side	Left
Maximum passive effective resistance	478.75 kN
Mobilized passive effective resistance	378.29 kN
Percentage mobilized resistance	79.0 %
Position single support	0.10 m
Maximum passive moment	4194.74 kNm
Mobilized passive moment	3178.72 kNm
Percentage mobilized moment	75.8 %

20.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	83.97	Elastic	Left	Strut

21 Step 6.5 Stage 3: CPT 3 gebruiksfase met perskracht

21.1 General Input Data

Passive side:

D-Sheet Piling determined

21.1.1 Horizontal Loads

Name	Level [m]	Characteristic load [kN/m']	Favourable / Unfavourable	Permanent / Variable
perskracht	-1.70	220.00	Favourable (D-Sheet Pi...	Variable

21.2 Input Data Left

21.2.1 Calculation Method

Calculation method: C, phi, delta

21.2.2 Water Level

Water level: -3.70 [m]

21.2.3 Surface

X [m]	Y [m]
0.00	-3.20

21.3 Input Data Right

21.3.1 Calculation Method

Calculation method: C, phi, delta

21.3.2 Water Level

Water level: -0.80 [m]

21.3.3 Surface

X [m]	Y [m]
0.00	-0.30

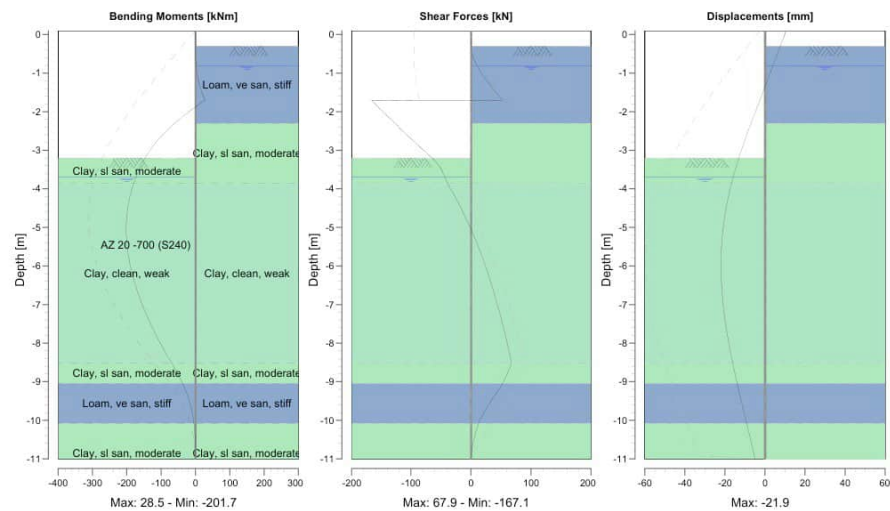
21.4 Calculation Results

Number of iterations: 6

21.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 3: CPT 3 gebruiksfase met perskracht

Step 6.5 - Partial factor set: RC 2



21.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	10.6
1	-0.25	0.00	0.00	8.1
2	-0.25	0.00	0.00	8.1
2	-0.30	0.00	0.00	7.7
3	-0.30	0.00	0.00	7.7
3	-0.80	1.73	9.87	4.1
4	-0.80	1.73	9.87	4.1
4	-1.25	10.24	28.84	0.8
5	-1.25	10.24	28.84	0.8
5	-1.70	28.45	52.91	-2.5
6	-1.70	28.45	-167.09	-2.5
6	-2.00	-18.91	-148.31	-4.7
7	-2.00	-18.91	-148.31	-4.7
7	-2.30	-60.32	-127.41	-7.0
8	-2.30	-60.32	-127.40	-7.0
8	-2.75	-110.74	-96.45	-10.1
9	-2.75	-110.74	-96.45	-10.1
9	-3.20	-147.03	-64.81	-13.1
10	-3.20	-147.03	-64.81	-13.1
10	-3.70	-173.05	-43.65	-15.9
11	-3.70	-173.05	-43.64	-15.9
11	-3.86	-179.67	-39.31	-16.7
12	-3.86	-179.67	-39.31	-16.7
12	-4.38	-195.07	-20.60	-18.9
13	-4.38	-195.07	-20.60	-18.9
13	-4.90	-201.40	-4.22	-20.6
14	-4.90	-201.40	-4.22	-20.6
14	-5.41	-199.79	10.10	-21.6
15	-5.41	-199.79	10.10	-21.6
15	-5.93	-191.24	22.65	-21.9
16	-5.93	-191.24	22.65	-21.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-6.45	-176.59	33.69	-21.7
17	-6.45	-176.59	33.69	-21.7
17	-6.97	-156.56	43.51	-21.0
18	-6.97	-156.56	43.51	-21.0
18	-7.48	-131.70	52.34	-19.7
19	-7.48	-131.70	52.34	-19.7
19	-8.00	-102.48	60.41	-18.1
20	-8.00	-102.48	60.41	-18.1
20	-8.52	-69.25	67.89	-16.1
21	-8.52	-69.25	67.92	-16.1
21	-9.04	-37.66	53.32	-13.9
22	-9.04	-37.66	53.39	-13.9
22	-9.56	-15.65	31.06	-11.5
23	-9.56	-15.66	31.12	-11.5
23	-10.08	-4.54	12.77	-9.2
24	-10.08	-4.54	12.81	-9.2
24	-10.54	-0.80	4.19	-7.1
25	-10.54	-0.80	4.17	-7.1
25	-11.00	0.00	0.02	-4.9
Max		-201.40	-167.09	-21.9
Max, minor nodes incl.		-201.68	-167.09	-21.9

21.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	360.5	331.4
Water	261.4	510.3
Total	621.9	841.7

Considered as passive side	Left
Maximum passive effective resistance	681.48 kN
Mobilized passive effective resistance	360.54 kN
Percentage mobilized resistance	52.9 %
Position single support	0.10 m
Maximum passive moment	5856.45 kNm
Mobilized passive moment	2910.18 kNm
Percentage mobilized moment	49.7 %

21.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Left	Strut

End of Report

Report for D-Sheet Piling 20.2

Design of Diaphragm and Sheet Pile Walls
Developed by Deltares



Company: Royal HaskoningDHV

Date of report: 03-Jun-24

Time of report: 17:16:43

Report with version: 20.2.1.30962

Date of calculation: 30-May-24

Time of calculation: 15:28:30

Calculated with version: 20.2.1.30962

File name: CPT 2 boorkuip voorwand

Project identification: Duikerkruising Strijenseweg 's Gravendeel
Boorkuip voorwand
CPT 2

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

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2 Summary

2.1 Overview per Stage and Test

Stage nr.	Verification type	Displacement [mm]	Moment [kNm]	Shear force [kN]	Mob. perc. moment [%]	Mob. perc. resistance [%]	Status
1	EC7(NL)-Step 6.1		10.64	-6.54	19.5	20.4	
1	EC7(NL)-Step 6.2		6.34	-4.64	19.5	20.5	
1	EC7(NL)-Step 6.3		12.91	-7.97	19.8	20.8	
1	EC7(NL)-Step 6.4		7.65	-5.66	19.8	20.9	
1	EC7(NL)-Step 6.5	0.7	10.09	-6.53	14.0	14.8	
1	EC7(NL)-Step 6.5 x 1.200		12.10	-7.84			
2	EC7(NL)-Step 6.1		130.18	54.57	43.2	47.0	
2	EC7(NL)-Step 6.2		107.24	-48.39	43.2	47.8	
2	EC7(NL)-Step 6.3		124.30	52.74	41.8	45.4	
2	EC7(NL)-Step 6.4		99.75	44.80	41.8	46.1	
2	EC7(NL)-Step 6.5	5.9	82.32	37.32	26.9	29.7	
2	EC7(NL)-Step 6.5 x 1.200		98.78	44.78			
Max		5.9	130.18	54.57	43.2	47.8	

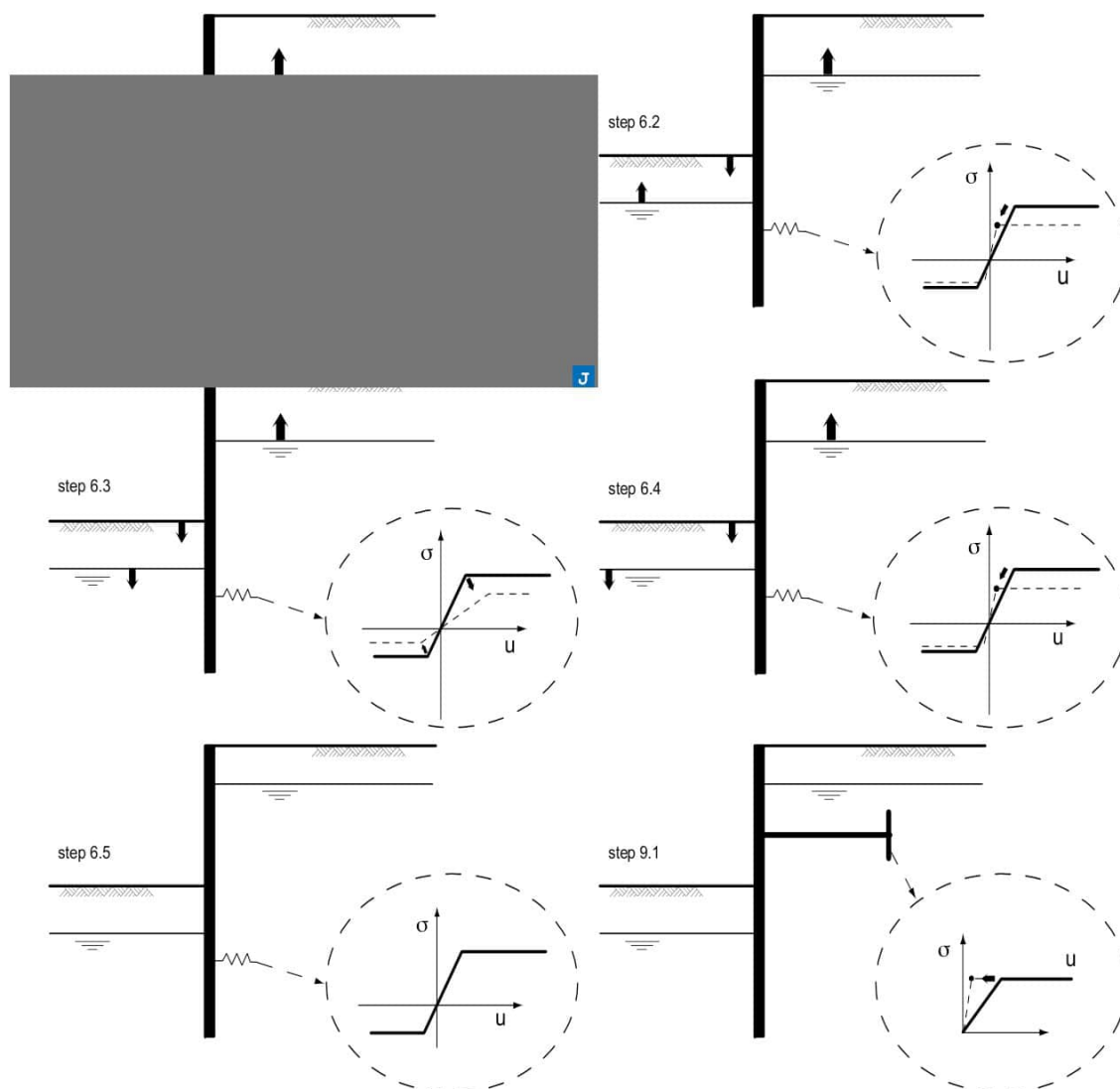
2.2 Anchors and Struts

Stage nr.	Verification type	Anchor/strut Stempel		
		Force [kN]	State	Status
1	EC7(NL)-Step 6.1	4.84	Elastic	
1	EC7(NL)-Step 6.2	2.08	Elastic	
1	EC7(NL)-Step 6.3	5.93	Elastic	
1	EC7(NL)-Step 6.4	2.54	Elastic	
1	EC7(NL)-Step 6.5 x 1.200	5.26	Elastic	
2	EC7(NL)-Step 6.1	54.57	Elastic	
2	EC7(NL)-Step 6.2	47.27	Elastic	
2	EC7(NL)-Step 6.3	52.74	Elastic	
2	EC7(NL)-Step 6.4	44.80	Elastic	
2	EC7(NL)-Step 6.5 x 1.200	44.78	Elastic	
Max		54.57		

2.3 Overall Stability per Stage

Stage name	Stability factor [-]
CPT 2 aanbrengen damwanden en ringgording	6.93
CPT 2 ontgraven en gebruiksfase	1.99

2.4 CUR Verification Steps



3 Input Data for all Stages

3.1 General Input Data

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

Model	Sheet piling
Check vertical balance	No
Number of construction stages	2
Unit weight of water	9.81 kN/m ³
Number of curves for spring characteristics	3
Unloading curve on spring characteristic	No
Elastic calculation	Yes

3.2 Sheet Piling Properties

Length	11.10 m
Level top side	0.10 m
Number of sections	1

3.2.1 General Properties

Section name	From [m]	To [m]	Material type	Acting width [m]
AZ 20 -700 (S24...	-11.00	0.10	Steel	1.00

3.2.2 Stiffness EI (elastic behaviour)

Section name	Elastic stiffness EI [kNm ² /m']	Red. factor on EI [-]	Corrected elas. stiffness EI [kNm ²]	Note to reduction factor
AZ 20 -700 (S24...	8.6016E+04	1.00	8.6016E+04	

3.2.3 Maximum Allowable Moments

Section name	 [kNm/m']	Modification factor [-]	Material factor [-]	Red. factor allow. moment [-]	 [kNm]
AZ 20 -700 (S24...	467.00	1.00	1.00	1.00	467.00

3.3 Calculation Options

First stage represents initial situation	No
Calculation refinement	Coarse
Reduce delta(s) according to CUR	Yes
Verification	EC7 NA NL - method A: Partial factors (design values) in all stages. Eurocode 7 using the factors as described in the National Annex of the Netherlands. It is basically design approach III.
Multiplication factor for anchor stiffness	1.000
Used partial factor set	RC 2
Factors on loads - Geotechnical loads	
- Permanent load, unfavourable	1.000
- Permanent load, favourable	1.000
- Variable load, unfavourable	1.100
- Variable load, favourable	0.000
Factors on loads - Constructive loads	
- Permanent load, unfavourable	1.350
- Permanent load, favourable	0.900

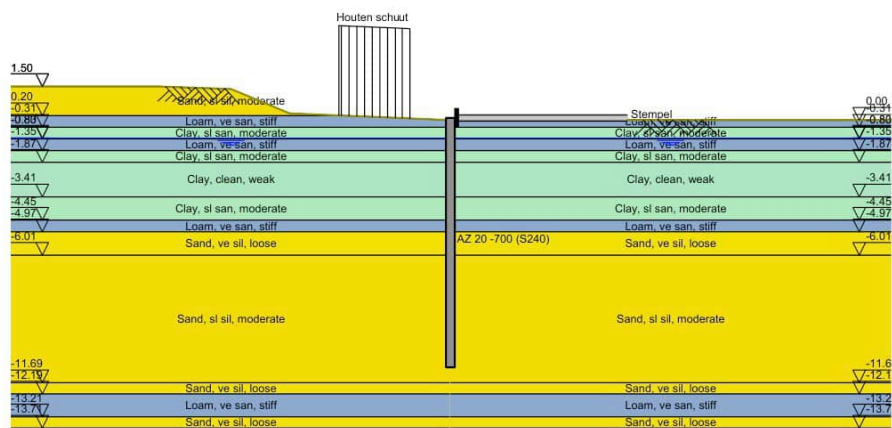
- Variable load, unfavourable	1.500
- Variable load, favourable	0.000
Material factors	
- Cohesion	1.250
- Tangent phi	1.175
- Delta (wall friction angle)*	1.175
- Modulus of low representative subgrade reaction	1.300
Geometry modification	
- Increase retaining height	10.00 %
- Maximum increase retaining height	0.50 m
- Reduction in phreatic line on passive side **	0.25 m
- Raise in phreatic line on passive side **	0.25 m
- Raise in phreatic line on active side	0.05 m
Factors on representative values	
- Partial factor on M, D and Pmax	1.200
Overall stability factors	
- Cohesion	1.450
- Tangent phi	1.250
- Factor on unit weight soil	1.000

* For delta (wall friction angle), the input value of tangent phi is used

** This modification of the phreatic level does not apply when the sheet piling is completely submerged.

4 Outline Stage 1: CPT 2 aanbrengen damwanden en ringgording

Outline - Stage 1: CPT 2 aanbrengen damwanden en ringgording

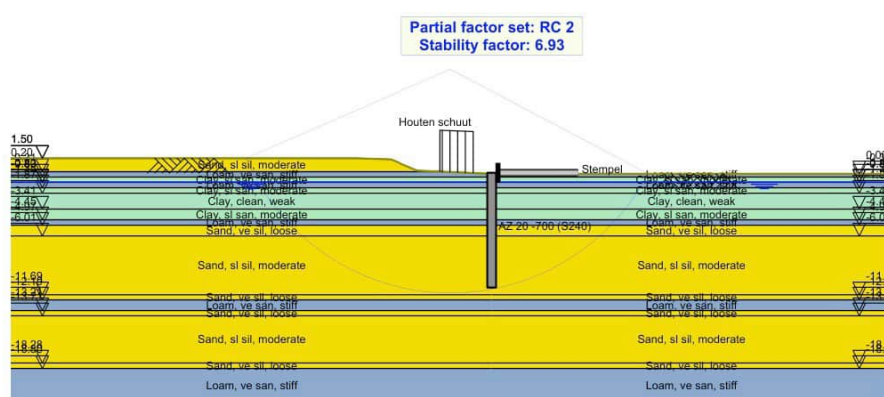


5 Overall Stability Stage 1: CPT 2 aanbrengen damwanden en ringgording

Stability factor : 6.93

5.1 Overall Stability

Overall Stability - Stage 1: CPT 2 aanbrengen damwanden en ringgording



6 Step 6.1 Stage 1: CPT 2 aanbrengen damwanden en ringgording

6.1 General Input Data

Passive side:

D-Sheet Piling determined

6.2 Input Data Left

6.2.1 Calculation Method

Calculation method: C, phi, delta

6.2.2 Water Level

Water level: -0.75 [m]

6.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

6.3 Input Data Right

6.3.1 Calculation Method

Calculation method: C, phi, delta

6.3.2 Water Level

Water level: -0.55 [m]

6.3.3 Surface

X [m]	Y [m]
0.00	-0.01

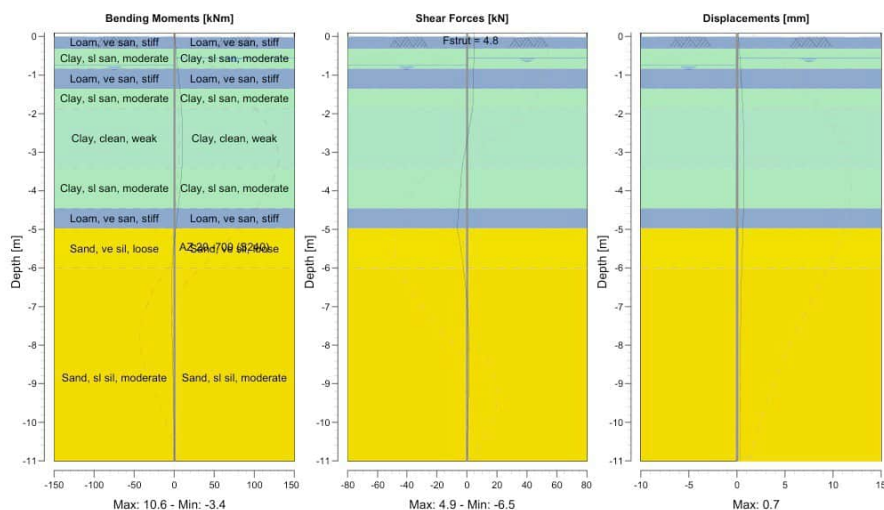
6.4 Calculation Results

Number of iterations: 3

6.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.1 - Partial factor set: RC 2



6.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	4.84	0.1
1	0.00	0.48	4.84	0.2
2	0.00	0.48	4.84	0.2
2	-0.01	0.53	4.84	0.2
3	-0.01	0.53	4.84	0.2
3	-0.31	2.00	4.91	0.2
4	-0.31	2.00	4.91	0.2
4	-0.75	4.11	4.57	0.4
5	-0.75	4.11	4.57	0.4
5	-0.80	4.33	4.53	0.4
6	-0.80	4.33	4.53	0.4
6	-0.83	4.47	4.51	0.4
7	-0.83	4.47	4.51	0.4
7	-1.05	5.46	4.49	0.4
8	-1.05	5.46	4.49	0.4
8	-1.35	6.80	4.43	0.5
9	-1.35	6.80	4.44	0.5
9	-1.87	8.96	3.81	0.6
10	-1.87	8.96	3.82	0.6
10	-2.31	10.24	1.90	0.7
11	-2.31	10.24	1.91	0.7
11	-2.76	10.64	-0.15	0.7
12	-2.76	10.64	-0.13	0.7
12	-3.20	10.11	-2.32	0.7
13	-3.20	10.11	-2.31	0.7
13	-3.41	9.51	-3.39	0.7
14	-3.41	9.51	-3.39	0.7
14	-3.53	9.10	-3.59	0.7
15	-3.53	9.10	-3.59	0.7
15	-3.70	8.46	-3.90	0.7
16	-3.70	8.46	-3.90	0.7

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	7.43	-4.40	0.7
17	-3.95	7.43	-4.40	0.7
17	-4.45	4.96	-5.59	0.7
18	-4.45	4.96	-5.59	0.7
18	-4.97	1.84	-6.54	0.6
19	-4.97	1.84	-6.54	0.6
19	-5.49	-0.88	-4.11	0.6
20	-5.49	-0.88	-4.11	0.6
20	-6.01	-2.54	-2.46	0.5
21	-6.01	-2.54	-2.46	0.5
21	-6.56	-3.34	-0.61	0.5
22	-6.56	-3.34	-0.61	0.5
22	-7.12	-3.33	0.50	0.4
23	-7.12	-3.33	0.50	0.4
23	-7.67	-2.85	1.07	0.4
24	-7.67	-2.85	1.07	0.4
24	-8.23	-2.18	1.25	0.4
25	-8.23	-2.18	1.25	0.4
25	-8.78	-1.49	1.18	0.3
26	-8.78	-1.49	1.18	0.3
26	-9.34	-0.87	0.97	0.3
27	-9.34	-0.88	0.97	0.3
27	-9.89	-0.40	0.67	0.3
28	-9.89	-0.40	0.67	0.3
28	-10.45	-0.11	0.35	0.3
29	-10.45	-0.11	0.35	0.3
29	-11.00	0.00	0.00	0.3
Max		10.64	-6.54	0.7
Max, minor nodes incl.		10.64	-6.54	0.7

6.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	403.0	377.8
Water	515.3	535.6
Total	918.3	913.4

Considered as passive side	Right
Maximum passive effective resistance	1851.39 kN
Mobilized passive effective resistance	377.76 kN
Percentage mobilized resistance	20.4 %
Position single support	0.10 m
Maximum passive moment	13971.39 kNm
Mobilized passive moment	2727.78 kNm
Percentage mobilized moment	19.5 %

6.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	4.84	Elastic	Right	Strut

7 Step 6.2 Stage 1: CPT 2 aanbrengen damwanden en ringgording

7.1 General Input Data

Passive side:

D-Sheet Piling determined

7.2 Input Data Left

7.2.1 Calculation Method

Calculation method: C, phi, delta

7.2.2 Water Level

Water level: -0.75 [m]

7.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

7.3 Input Data Right

7.3.1 Calculation Method

Calculation method: C, phi, delta

7.3.2 Water Level

Water level: -0.55 [m]

7.3.3 Surface

X [m]	Y [m]
0.00	-0.01

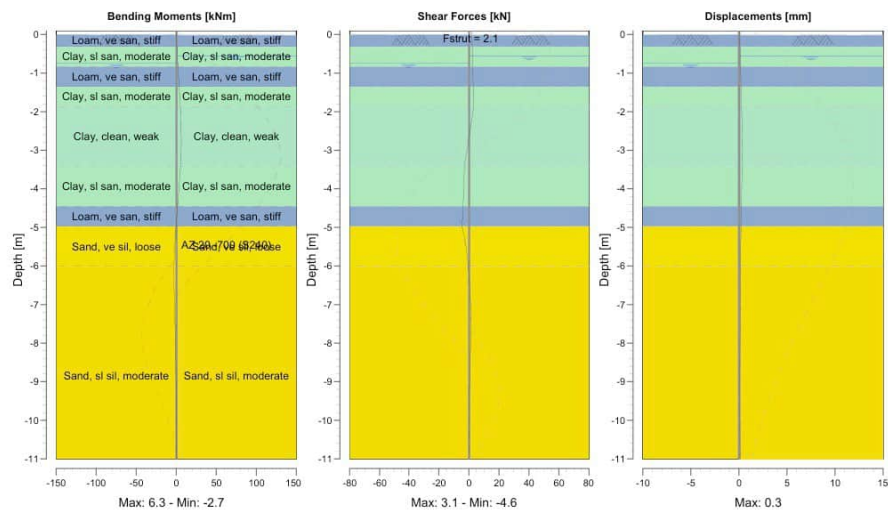
7.4 Calculation Results

Number of iterations: 2

7.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.2 - Partial factor set: RC 2



7.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	2.08	0.1
1	0.00	0.21	2.08	0.1
2	0.00	0.21	2.08	0.1
2	-0.01	0.23	2.07	0.1
3	-0.01	0.23	2.07	0.1
3	-0.31	0.89	2.29	0.1
4	-0.31	0.89	2.29	0.1
4	-0.75	1.90	2.27	0.2
5	-0.75	1.90	2.27	0.2
5	-0.80	2.01	2.28	0.2
6	-0.80	2.01	2.28	0.2
6	-0.83	2.08	2.29	0.2
7	-0.83	2.08	2.29	0.2
7	-1.05	2.61	2.55	0.2
8	-1.05	2.61	2.55	0.2
8	-1.35	3.44	2.94	0.2
9	-1.35	3.44	2.94	0.2
9	-1.87	5.02	3.10	0.3
10	-1.87	5.02	3.10	0.3
10	-2.31	6.04	1.48	0.3
11	-2.31	6.04	1.49	0.3
11	-2.76	6.33	-0.25	0.3
12	-2.76	6.33	-0.24	0.3
12	-3.20	5.82	-2.12	0.3
13	-3.20	5.82	-2.11	0.3
13	-3.41	5.28	-3.06	0.3
14	-3.41	5.28	-3.06	0.3
14	-3.53	4.91	-3.08	0.3
15	-3.53	4.91	-3.08	0.3
15	-3.70	4.38	-3.14	0.3
16	-3.70	4.38	-3.14	0.3

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	3.58	-3.32	0.3
17	-3.95	3.58	-3.32	0.3
17	-4.45	1.78	-4.03	0.3
18	-4.45	1.78	-4.03	0.3
18	-4.97	-0.43	-4.64	0.2
19	-4.97	-0.43	-4.64	0.2
19	-5.49	-2.08	-1.99	0.2
20	-5.49	-2.08	-1.99	0.2
20	-6.01	-2.68	-0.56	0.2
21	-6.01	-2.68	-0.56	0.2
21	-6.56	-2.58	0.71	0.1
22	-6.56	-2.58	0.71	0.1
22	-7.12	-2.01	1.16	0.1
23	-7.12	-2.01	1.16	0.1
23	-7.67	-1.35	1.12	0.1
24	-7.67	-1.35	1.12	0.1
24	-8.23	-0.78	0.87	0.1
25	-8.23	-0.78	0.87	0.1
25	-8.78	-0.37	0.55	0.1
26	-8.78	-0.37	0.55	0.1
26	-9.34	-0.13	0.27	0.1
27	-9.34	-0.13	0.27	0.1
27	-9.89	-0.03	0.08	0.1
28	-9.89	-0.03	0.08	0.1
28	-10.45	0.00	-0.02	0.1
29	-10.45	0.00	-0.02	0.1
29	-11.00	0.00	0.00	0.1
Max		6.33	-4.64	0.3
Max, minor nodes incl.		6.34	-4.64	0.3

7.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	401.6	379.1
Water	515.3	535.6
Total	916.9	914.8

Considered as passive side	Right
Maximum passive effective resistance	1851.39 kN
Mobilized passive effective resistance	379.15 kN
Percentage mobilized resistance	20.5 %
Position single support	0.10 m
Maximum passive moment	13971.39 kNm
Mobilized passive moment	2727.79 kNm
Percentage mobilized moment	19.5 %

7.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	2.08	Elastic	Right	Strut

8 Step 6.3 Stage 1: CPT 2 aanbrengen damwanden en ringgording

8.1 General Input Data

Passive side:

D-Sheet Piling determined

8.2 Input Data Left

8.2.1 Calculation Method

Calculation method: C, phi, delta

8.2.2 Water Level

Water level: -0.75 [m]

8.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

8.3 Input Data Right

8.3.1 Calculation Method

Calculation method: C, phi, delta

8.3.2 Water Level

Water level: -1.05 [m]

8.3.3 Surface

X [m]	Y [m]
0.00	-0.01

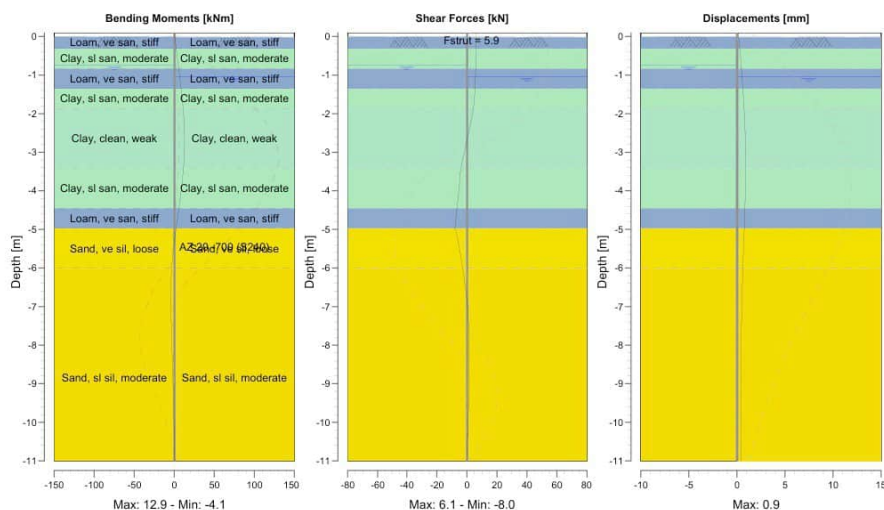
8.4 Calculation Results

Number of iterations: 2

8.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.3 - Partial factor set: RC 2



8.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	5.93	0.2
1	0.00	0.59	5.93	0.2
2	0.00	0.59	5.93	0.2
2	-0.01	0.65	5.93	0.2
3	-0.01	0.65	5.93	0.2
3	-0.31	2.46	6.11	0.3
4	-0.31	2.46	6.11	0.3
4	-0.75	5.13	5.93	0.4
5	-0.75	5.13	5.93	0.4
5	-0.80	5.43	5.89	0.5
6	-0.80	5.43	5.89	0.5
6	-0.83	5.61	5.86	0.5
7	-0.83	5.61	5.86	0.5
7	-1.05	6.88	5.68	0.5
8	-1.05	6.88	5.68	0.5
8	-1.35	8.53	5.32	0.6
9	-1.35	8.53	5.32	0.6
9	-1.87	11.06	4.36	0.7
10	-1.87	11.06	4.37	0.7
10	-2.31	12.50	2.07	0.8
11	-2.31	12.50	2.09	0.8
11	-2.76	12.90	-0.32	0.9
12	-2.76	12.90	-0.30	0.9
12	-3.20	12.22	-2.83	0.9
13	-3.20	12.22	-2.82	0.9
13	-3.41	11.49	-4.06	0.9
14	-3.41	11.49	-4.06	0.9
14	-3.53	10.99	-4.31	0.9
15	-3.53	10.99	-4.31	0.9
15	-3.70	10.23	-4.68	0.9
16	-3.70	10.23	-4.68	0.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	8.99	-5.28	0.9
17	-3.95	8.99	-5.28	0.9
17	-4.45	6.02	-6.69	0.8
18	-4.45	6.02	-6.68	0.8
18	-4.97	2.25	-7.97	0.8
19	-4.97	2.25	-7.97	0.8
19	-5.49	-1.07	-5.00	0.7
20	-5.49	-1.07	-5.01	0.7
20	-6.01	-3.09	-2.96	0.6
21	-6.01	-3.09	-2.96	0.6
21	-6.56	-4.05	-0.74	0.6
22	-6.56	-4.05	-0.74	0.6
22	-7.12	-4.03	0.61	0.5
23	-7.12	-4.03	0.61	0.5
23	-7.67	-3.47	1.29	0.5
24	-7.67	-3.47	1.29	0.5
24	-8.23	-2.66	1.51	0.4
25	-8.23	-2.66	1.51	0.4
25	-8.78	-1.81	1.44	0.4
26	-8.78	-1.81	1.44	0.4
26	-9.34	-1.07	1.18	0.4
27	-9.34	-1.07	1.18	0.4
27	-9.89	-0.49	0.83	0.4
28	-9.89	-0.49	0.83	0.4
28	-10.45	-0.13	0.43	0.4
29	-10.45	-0.13	0.43	0.4
29	-11.00	0.00	0.00	0.4
Max		12.90	-7.97	0.9
Max, minor nodes incl.		12.91	-7.97	0.9

8.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	394.4	418.1
Water	515.3	485.6
Total	909.7	903.8

Considered as passive side	Right
Maximum passive effective resistance	2009.74 kN
Mobilized passive effective resistance	418.14 kN
Percentage mobilized resistance	20.8 %
Position single support	0.10 m
Maximum passive moment	14968.45 kNm
Mobilized passive moment	2970.82 kNm
Percentage mobilized moment	19.8 %

8.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	5.93	Elastic	Right	Strut

9 Step 6.4 Stage 1: CPT 2 aanbrengen damwanden en ringgording

9.1 General Input Data

Passive side:

D-Sheet Piling determined

9.2 Input Data Left

9.2.1 Calculation Method

Calculation method: C, phi, delta

9.2.2 Water Level

Water level: -0.75 [m]

9.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

9.3 Input Data Right

9.3.1 Calculation Method

Calculation method: C, phi, delta

9.3.2 Water Level

Water level: -1.05 [m]

9.3.3 Surface

X [m]	Y [m]
0.00	-0.01

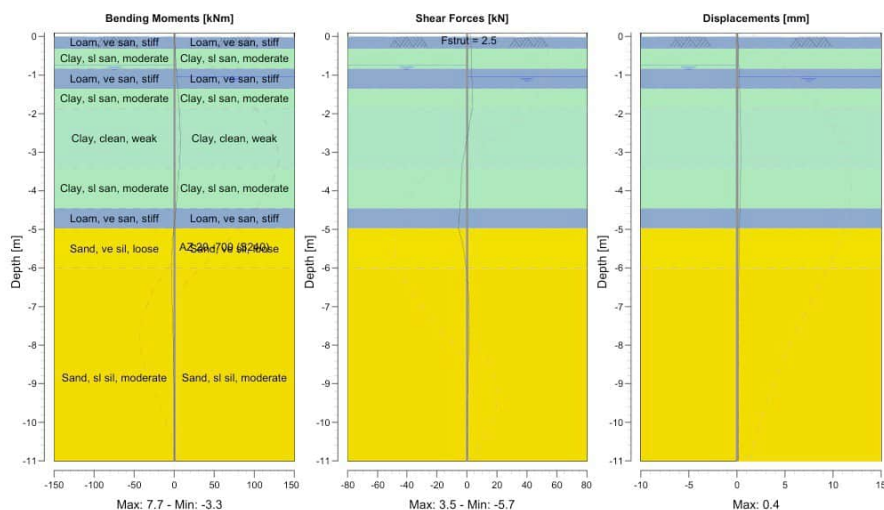
9.4 Calculation Results

Number of iterations: 2

9.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.4 - Partial factor set: RC 2



9.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	2.54	0.1
1	0.00	0.25	2.54	0.1
2	0.00	0.25	2.54	0.1
2	-0.01	0.28	2.54	0.1
3	-0.01	0.28	2.54	0.1
3	-0.31	1.09	2.89	0.1
4	-0.31	1.09	2.89	0.1
4	-0.75	2.43	3.11	0.2
5	-0.75	2.43	3.11	0.2
5	-0.80	2.58	3.13	0.2
6	-0.80	2.58	3.13	0.2
6	-0.83	2.68	3.14	0.2
7	-0.83	2.68	3.14	0.2
7	-1.05	3.39	3.31	0.2
8	-1.05	3.39	3.31	0.2
8	-1.35	4.41	3.50	0.3
9	-1.35	4.41	3.50	0.3
9	-1.87	6.23	3.49	0.3
10	-1.87	6.23	3.50	0.3
10	-2.31	7.37	1.58	0.4
11	-2.31	7.37	1.59	0.4
11	-2.76	7.63	-0.44	0.4
12	-2.76	7.63	-0.42	0.4
12	-3.20	6.98	-2.58	0.4
13	-3.20	6.98	-2.57	0.4
13	-3.41	6.33	-3.65	0.4
14	-3.41	6.33	-3.65	0.4
14	-3.53	5.89	-3.67	0.4
15	-3.53	5.89	-3.67	0.4
15	-3.70	5.26	-3.75	0.4
16	-3.70	5.26	-3.75	0.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	4.30	-3.96	0.4
17	-3.95	4.30	-3.96	0.4
17	-4.45	2.15	-4.78	0.3
18	-4.45	2.15	-4.78	0.3
18	-4.97	-0.51	-5.66	0.3
19	-4.97	-0.51	-5.66	0.3
19	-5.49	-2.53	-2.43	0.2
20	-5.49	-2.53	-2.43	0.2
20	-6.01	-3.26	-0.65	0.2
21	-6.01	-3.26	-0.65	0.2
21	-6.56	-3.12	0.87	0.2
22	-6.56	-3.12	0.87	0.2
22	-7.12	-2.44	1.40	0.2
23	-7.12	-2.44	1.40	0.2
23	-7.67	-1.64	1.36	0.1
24	-7.67	-1.64	1.36	0.1
24	-8.23	-0.95	1.05	0.1
25	-8.23	-0.95	1.05	0.1
25	-8.78	-0.45	0.67	0.1
26	-8.78	-0.45	0.67	0.1
26	-9.34	-0.16	0.34	0.1
27	-9.34	-0.16	0.34	0.1
27	-9.89	-0.03	0.10	0.1
28	-9.89	-0.03	0.10	0.1
28	-10.45	0.00	-0.01	0.1
29	-10.45	0.00	-0.01	0.1
29	-11.00	0.00	0.00	0.1
Max		7.63	-5.66	0.4
Max, minor nodes incl.		7.65	-5.66	0.4

9.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	392.7	419.9
Water	515.3	485.6
Total	908.0	905.5

Considered as passive side	Right
Maximum passive effective resistance	2009.74 kN
Mobilized passive effective resistance	419.85 kN
Percentage mobilized resistance	20.9 %
Position single support	0.10 m
Maximum passive moment	14968.45 kNm
Mobilized passive moment	2970.84 kNm
Percentage mobilized moment	19.8 %

9.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	2.54	Elastic	Right	Strut

10 Step 6.5 Stage 1: CPT 2 aanbrengen damwanden en ringgording

10.1 General Input Data

Passive side:

D-Sheet Piling determined

10.2 Input Data Left

10.2.1 Calculation Method

Calculation method: C, phi, delta

10.2.2 Water Level

Water level: -0.80 [m]

10.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

10.3 Input Data Right

10.3.1 Calculation Method

Calculation method: C, phi, delta

10.3.2 Water Level

Water level: -0.80 [m]

10.3.3 Surface

X [m]	Y [m]
0.00	0.00

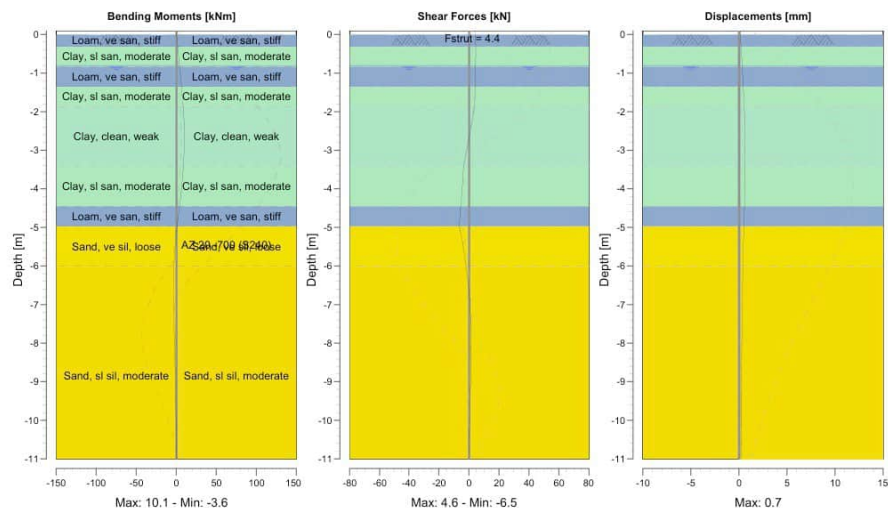
10.4 Calculation Results

Number of iterations: 2

10.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 2 aanbrengen damwanden en ringgording

Step 6.5 - Partial factor set: RC 2



10.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	4.38	0.1
1	0.00	0.44	4.38	0.1
2	0.00	0.44	4.38	0.1
2	-0.31	1.83	4.58	0.2
3	-0.31	1.83	4.58	0.2
3	-0.80	4.05	4.35	0.3
4	-0.80	4.05	4.35	0.3
4	-0.83	4.18	4.33	0.3
5	-0.83	4.18	4.33	0.3
5	-1.35	6.42	4.25	0.5
6	-1.35	6.42	4.25	0.5
6	-1.87	8.50	3.73	0.5
7	-1.87	8.50	3.73	0.5
7	-2.31	9.74	1.78	0.6
8	-2.31	9.74	1.78	0.6
8	-2.76	10.08	-0.29	0.6
9	-2.76	10.08	-0.29	0.6
9	-3.20	9.48	-2.48	0.7
10	-3.20	9.48	-2.48	0.7
10	-3.41	8.84	-3.57	0.7
11	-3.41	8.84	-3.57	0.7
11	-3.70	7.75	-4.00	0.6
12	-3.70	7.75	-4.00	0.6
12	-4.08	6.13	-4.69	0.6
13	-4.08	6.13	-4.69	0.6
13	-4.45	4.22	-5.56	0.6
14	-4.45	4.22	-5.56	0.6
14	-4.97	1.12	-6.53	0.5
15	-4.97	1.12	-6.53	0.5
15	-5.49	-1.52	-3.82	0.5
16	-5.49	-1.52	-3.82	0.5

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-6.01	-2.99	-2.05	0.4
17	-6.01	-2.99	-2.05	0.4
17	-6.56	-3.55	-0.20	0.4
18	-6.56	-3.55	-0.20	0.4
18	-7.12	-3.33	0.82	0.3
19	-7.12	-3.33	0.82	0.3
19	-7.67	-2.72	1.25	0.3
20	-7.67	-2.72	1.25	0.3
20	-8.23	-1.98	1.30	0.3
21	-8.23	-1.98	1.30	0.3
21	-8.78	-1.29	1.13	0.3
22	-8.78	-1.29	1.13	0.3
22	-9.34	-0.72	0.86	0.3
23	-9.34	-0.72	0.85	0.3
23	-9.89	-0.32	0.55	0.3
24	-9.89	-0.32	0.55	0.3
24	-10.45	-0.08	0.26	0.3
25	-10.45	-0.08	0.26	0.3
25	-11.00	0.00	0.00	0.3
Max		10.08	-6.53	0.7
Max, minor nodes incl.		10.09	-6.53	0.7

10.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	371.6	367.2
Water	510.3	510.3
Total	881.9	877.6

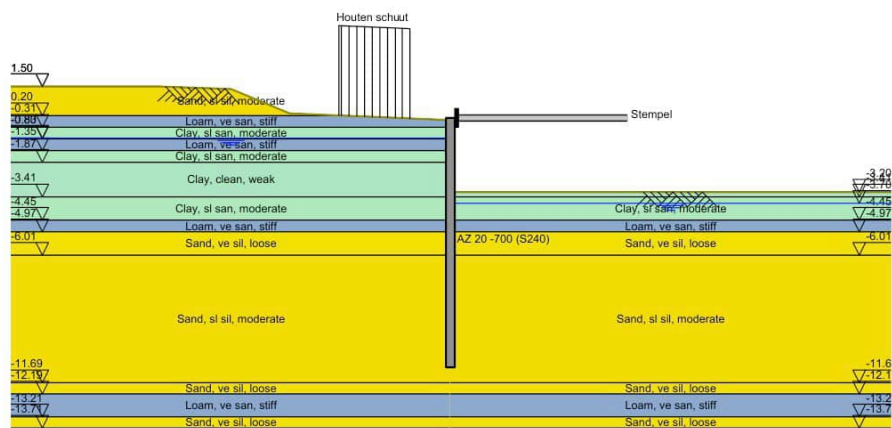
Considered as passive side	Right
Maximum passive effective resistance	2477.81 kN
Mobilized passive effective resistance	367.23 kN
Percentage mobilized resistance	14.8 %
Position single support	0.10 m
Maximum passive moment	18624.81 kNm
Mobilized passive moment	2614.08 kNm
Percentage mobilized moment	14.0 %

10.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	4.38	Elastic	Right	Strut

11 Outline Stage 2: CPT 2 ontgraven en gebruiksfase

Outline - Stage 2: CPT 2 ontgraven en gebruiksfase

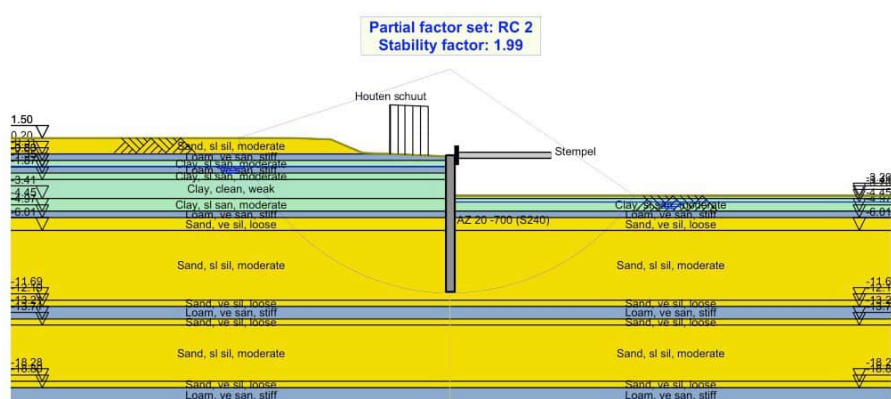


12 Overall Stability Stage 2: CPT 2 ontgraven en gebruiksfase

Stability factor : 1.99

12.1 Overall Stability

Overall Stability - Stage 2: CPT 2 ontgraven en gebruiksfase



13 Step 6.1 Stage 2: CPT 2 ontgraven en gebruiksfase

13.1 General Input Data

Passive side:

D-Sheet Piling determined

13.2 Input Data Left

13.2.1 Calculation Method

Calculation method: C, phi, delta

13.2.2 Water Level

Water level: -0.75 [m]

13.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

13.3 Input Data Right

13.3.1 Calculation Method

Calculation method: C, phi, delta

13.3.2 Water Level

Water level: -3.53 [m]

13.3.3 Surface

X [m]	Y [m]
0.00	-3.53

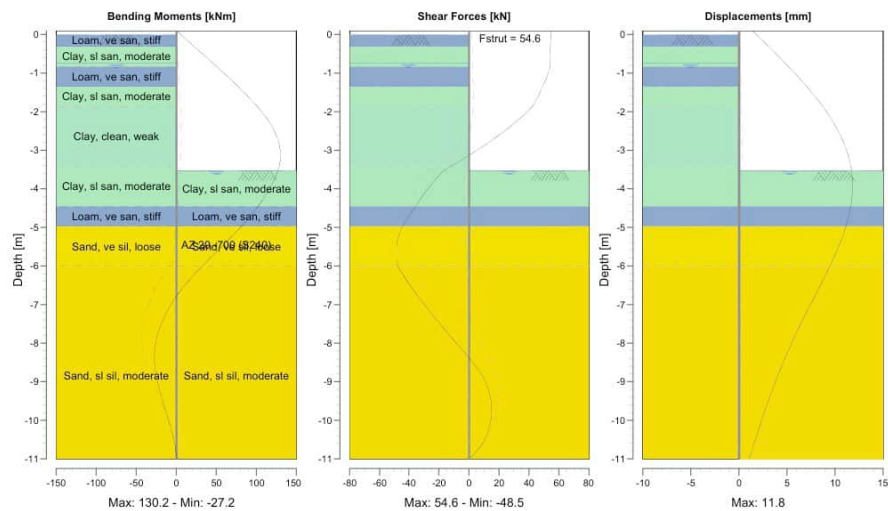
13.4 Calculation Results

Number of iterations: 5

13.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven en gebruiksfase

Step 6.1 - Partial factor set: RC 2



13.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	54.57	1.4
1	0.00	5.46	54.57	1.8
2	0.00	5.46	54.57	1.8
2	-0.01	6.00	54.57	1.8
3	-0.01	6.00	54.57	1.8
3	-0.31	22.34	54.22	3.1
4	-0.31	22.34	54.22	3.1
4	-0.75	46.20	54.22	4.8
5	-0.75	46.20	54.22	4.8
5	-0.80	48.90	54.14	5.0
6	-0.80	48.90	54.14	5.0
6	-0.83	50.53	54.08	5.2
7	-0.83	50.53	54.08	5.2
7	-1.05	62.25	52.39	6.0
8	-1.05	62.25	52.39	6.0
8	-1.35	77.50	49.04	7.1
9	-1.35	77.50	49.04	7.1
9	-1.87	101.35	42.18	8.7
10	-1.87	101.35	42.22	8.7
10	-2.31	117.39	29.74	9.9
11	-2.31	117.39	29.84	9.9
11	-2.76	127.34	14.63	10.8
12	-2.76	127.34	14.75	10.8
12	-3.20	130.10	-2.76	11.4
13	-3.20	130.10	-2.69	11.4
13	-3.41	128.57	-11.93	11.6
14	-3.41	128.57	-11.93	11.6
14	-3.53	126.87	-16.49	11.7
15	-3.53	126.87	-16.49	11.7
15	-3.70	123.65	-20.65	11.8
16	-3.70	123.65	-20.65	11.8

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	117.75	-26.06	11.8
17	-3.95	117.75	-26.06	11.8
17	-4.45	102.22	-35.20	11.6
18	-4.45	102.22	-35.20	11.6
18	-4.97	81.41	-44.24	11.1
19	-4.97	81.41	-44.24	11.1
19	-5.49	57.15	-48.32	10.4
20	-5.49	57.15	-48.32	10.4
20	-6.01	32.09	-47.37	9.5
21	-6.01	32.09	-47.36	9.5
21	-6.56	8.34	-38.09	8.3
22	-6.56	8.34	-38.09	8.3
22	-7.12	-9.84	-27.30	7.2
23	-7.12	-9.84	-27.30	7.2
23	-7.67	-21.77	-15.52	6.1
24	-7.67	-21.77	-15.52	6.1
24	-8.23	-26.98	-3.06	5.1
25	-8.23	-26.99	-3.05	5.1
25	-8.78	-25.58	7.82	4.1
26	-8.78	-25.58	7.84	4.1
26	-9.34	-19.28	14.00	3.3
27	-9.34	-19.28	14.00	3.3
27	-9.89	-11.03	14.93	2.5
28	-9.89	-11.03	14.93	2.5
28	-10.45	-3.57	11.18	1.8
29	-10.45	-3.57	11.21	1.8
29	-11.00	0.00	0.00	1.1
Max		130.10	54.57	11.8
Max, minor nodes incl.		130.18	54.57	11.8

13.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	258.5	445.2
Water	515.3	273.7
Total	773.9	718.9

Considered as passive side	Right
Maximum passive effective resistance	947.16 kN
Mobilized passive effective resistance	445.18 kN
Percentage mobilized resistance	47.0 %
Position single support	0.10 m
Maximum passive moment	8171.94 kNm
Mobilized passive moment	3527.50 kNm
Percentage mobilized moment	43.2 %

13.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	54.57	Elastic	Right	Strut

14 Step 6.2 Stage 2: CPT 2 ontgraven en gebruiksfase

14.1 General Input Data

Passive side:

D-Sheet Piling determined

14.2 Input Data Left

14.2.1 Calculation Method

Calculation method: C, phi, delta

14.2.2 Water Level

Water level: -0.75 [m]

14.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

14.3 Input Data Right

14.3.1 Calculation Method

Calculation method: C, phi, delta

14.3.2 Water Level

Water level: -3.53 [m]

14.3.3 Surface

X [m]	Y [m]
0.00	-3.53

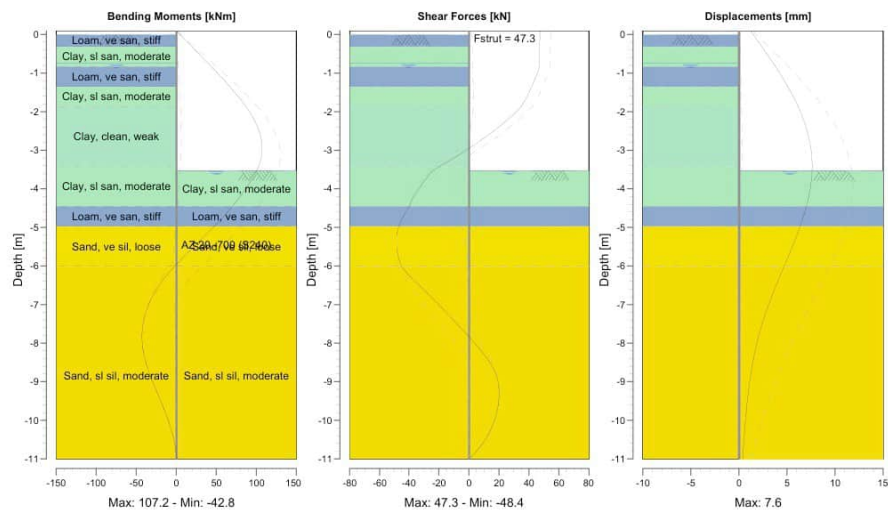
14.4 Calculation Results

Number of iterations: 5

14.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven en gebruiksfase

Step 6.2 - Partial factor set: RC 2



14.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	47.27	1.2
1	0.00	4.73	47.27	1.5
2	0.00	4.73	47.27	1.5
2	-0.01	5.20	47.27	1.5
3	-0.01	5.20	47.27	1.5
3	-0.31	19.35	46.93	2.4
4	-0.31	19.35	46.93	2.4
4	-0.75	39.99	46.93	3.6
5	-0.75	39.99	46.93	3.6
5	-0.80	42.34	46.85	3.7
6	-0.80	42.34	46.85	3.7
6	-0.83	43.74	46.78	3.8
7	-0.83	43.74	46.78	3.8
7	-1.05	53.86	45.09	4.4
8	-1.05	53.86	45.09	4.4
8	-1.35	66.92	41.74	5.1
9	-1.35	66.92	41.74	5.1
9	-1.87	86.98	34.88	6.2
10	-1.87	86.98	34.93	6.2
10	-2.31	99.79	22.44	6.9
11	-2.31	99.79	22.55	6.9
11	-2.76	106.51	7.33	7.3
12	-2.76	106.51	7.46	7.3
12	-3.20	106.02	-10.05	7.6
13	-3.20	106.02	-9.99	7.6
13	-3.41	102.97	-19.22	7.6
14	-3.41	102.97	-19.22	7.6
14	-3.53	100.39	-23.79	7.6
15	-3.53	100.39	-23.79	7.6
15	-3.70	95.95	-27.60	7.6
16	-3.70	95.95	-27.60	7.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	88.38	-32.35	7.4
17	-3.95	88.38	-32.35	7.4
17	-4.45	70.11	-39.56	7.0
18	-4.45	70.11	-39.56	7.0
18	-4.97	47.50	-46.60	6.4
19	-4.97	47.50	-46.60	6.4
19	-5.49	22.57	-48.30	5.6
20	-5.49	22.57	-48.30	5.6
20	-6.01	-1.83	-44.96	4.7
21	-6.01	-1.83	-44.96	4.7
21	-6.56	-23.28	-31.69	3.8
22	-6.56	-23.28	-31.67	3.8
22	-7.12	-36.75	-17.13	2.9
23	-7.12	-36.75	-17.13	2.9
23	-7.67	-42.51	-3.75	2.2
24	-7.67	-42.51	-3.75	2.2
24	-8.23	-41.12	8.82	1.7
25	-8.23	-41.12	8.85	1.7
25	-8.78	-33.50	17.70	1.2
26	-8.78	-33.50	17.70	1.2
26	-9.34	-22.74	20.18	0.9
27	-9.34	-22.74	20.18	0.9
27	-9.89	-12.02	17.84	0.7
28	-9.89	-12.02	17.85	0.7
28	-10.45	-3.59	11.83	0.6
29	-10.45	-3.59	11.84	0.6
29	-11.00	0.00	0.00	0.4
Max		106.51	-48.30	7.6
Max, minor nodes incl.		107.24	-48.39	7.6

14.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	259.1	453.1
Water	515.3	273.7
Total	774.5	726.8

Considered as passive side	Right
Maximum passive effective resistance	947.16 kN
Mobilized passive effective resistance	453.07 kN
Percentage mobilized resistance	47.8 %
Position single support	0.10 m
Maximum passive moment	8171.94 kNm
Mobilized passive moment	3533.88 kNm
Percentage mobilized moment	43.2 %

14.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	47.27	Elastic	Right	Strut

15 Step 6.3 Stage 2: CPT 2 ontgraven en gebruiksfase

15.1 General Input Data

Passive side:

D-Sheet Piling determined

15.2 Input Data Left

15.2.1 Calculation Method

Calculation method: C, phi, delta

15.2.2 Water Level

Water level: -0.75 [m]

15.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

15.3 Input Data Right

15.3.1 Calculation Method

Calculation method: C, phi, delta

15.3.2 Water Level

Water level: -3.95 [m]

15.3.3 Surface

X [m]	Y [m]
0.00	-3.53

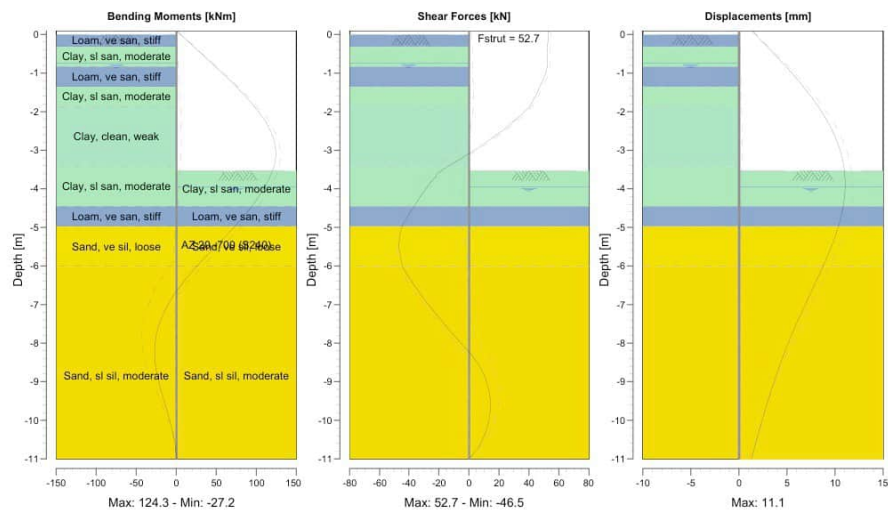
15.4 Calculation Results

Number of iterations: 4

15.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven en gebruiksfase

Step 6.3 - Partial factor set: RC 2



15.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	52.74	1.3
1	0.00	5.27	52.74	1.7
2	0.00	5.27	52.74	1.7
2	-0.01	5.80	52.74	1.8
3	-0.01	5.80	52.74	1.8
3	-0.31	21.59	52.40	2.9
4	-0.31	21.59	52.39	2.9
4	-0.75	44.64	52.39	4.6
5	-0.75	44.64	52.39	4.6
5	-0.80	47.26	52.31	4.8
6	-0.80	47.26	52.31	4.8
6	-0.83	48.83	52.25	4.9
7	-0.83	48.83	52.25	4.9
7	-1.05	60.15	50.56	5.7
8	-1.05	60.15	50.56	5.7
8	-1.35	74.84	47.21	6.7
9	-1.35	74.84	47.21	6.7
9	-1.87	97.75	40.35	8.2
10	-1.87	97.75	40.39	8.2
10	-2.31	112.98	27.91	9.3
11	-2.31	112.98	28.01	9.3
11	-2.76	122.12	12.80	10.2
12	-2.76	122.12	12.92	10.2
12	-3.20	124.06	-4.59	10.7
13	-3.20	124.06	-4.52	10.7
13	-3.41	122.15	-13.75	10.9
14	-3.41	122.15	-13.75	10.9
14	-3.53	120.23	-18.32	11.0
15	-3.53	120.23	-18.32	11.0
15	-3.70	116.70	-22.45	11.0
16	-3.70	116.70	-22.45	11.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	110.40	-27.57	11.1
17	-3.95	110.40	-27.57	11.1
17	-4.45	94.31	-36.35	10.9
18	-4.45	94.31	-36.35	10.9
18	-4.97	73.18	-44.52	10.4
19	-4.97	73.18	-44.52	10.4
19	-5.49	49.32	-46.55	9.6
20	-5.49	49.32	-46.54	9.6
20	-6.01	25.61	-44.37	8.7
21	-6.01	25.61	-44.36	8.7
21	-6.56	3.46	-35.31	7.7
22	-6.56	3.46	-35.31	7.7
22	-7.12	-13.21	-24.59	6.7
23	-7.12	-13.21	-24.59	6.7
23	-7.67	-23.61	-12.68	5.7
24	-7.67	-23.61	-12.68	5.7
24	-8.23	-27.16	0.11	4.8
25	-8.23	-27.16	0.14	4.8
25	-8.78	-24.27	9.49	4.0
26	-8.78	-24.27	9.49	4.0
26	-9.34	-17.58	13.86	3.2
27	-9.34	-17.58	13.86	3.2
27	-9.89	-9.74	13.74	2.5
28	-9.89	-9.74	13.74	2.5
28	-10.45	-3.07	9.67	1.9
29	-10.45	-3.08	9.70	1.9
29	-11.00	0.00	0.00	1.3
Max		124.06	52.74	11.1
Max, minor nodes incl.		124.30	52.74	11.1

15.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	257.3	475.7
Water	515.3	243.8
Total	772.6	719.5

Considered as passive side	Right
Maximum passive effective resistance	1048.43 kN
Mobilized passive effective resistance	475.72 kN
Percentage mobilized resistance	45.4 %
Position single support	0.10 m
Maximum passive moment	8938.27 kNm
Mobilized passive moment	3737.86 kNm
Percentage mobilized moment	41.8 %

15.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	52.74	Elastic	Right	Strut

16 Step 6.4 Stage 2: CPT 2 ontgraven en gebruiksfase

16.1 General Input Data

Passive side:

D-Sheet Piling determined

16.2 Input Data Left

16.2.1 Calculation Method

Calculation method: C, phi, delta

16.2.2 Water Level

Water level: -0.75 [m]

16.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

16.3 Input Data Right

16.3.1 Calculation Method

Calculation method: C, phi, delta

16.3.2 Water Level

Water level: -3.95 [m]

16.3.3 Surface

X [m]	Y [m]
0.00	-3.53

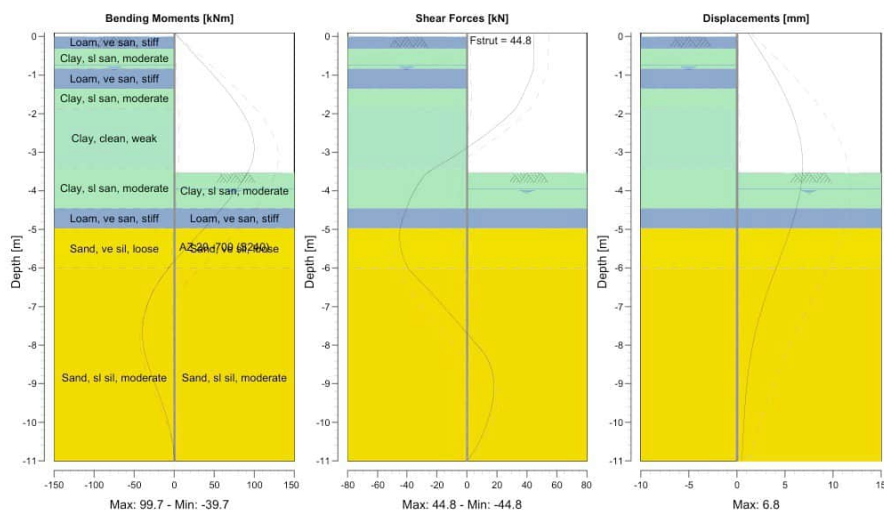
16.4 Calculation Results

Number of iterations: 5

16.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven en gebruiksfase

Step 6.4 - Partial factor set: RC 2



16.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	44.80	1.1
1	0.00	4.48	44.80	1.4
2	0.00	4.48	44.80	1.4
2	-0.01	4.93	44.80	1.4
3	-0.01	4.93	44.80	1.4
3	-0.31	18.33	44.46	2.2
4	-0.31	18.33	44.46	2.2
4	-0.75	37.90	44.46	3.3
5	-0.75	37.90	44.46	3.3
5	-0.80	40.12	44.38	3.4
6	-0.80	40.12	44.38	3.4
6	-0.83	41.45	44.32	3.5
7	-0.83	41.45	44.32	3.5
7	-1.05	51.02	42.62	4.0
8	-1.05	51.02	42.62	4.0
8	-1.35	63.34	39.27	4.7
9	-1.35	63.34	39.27	4.7
9	-1.87	82.11	32.41	5.6
10	-1.87	82.11	32.46	5.6
10	-2.31	93.83	19.97	6.2
11	-2.31	93.83	20.08	6.2
11	-2.76	99.45	4.86	6.6
12	-2.76	99.45	4.99	6.6
12	-3.20	97.87	-12.52	6.8
13	-3.20	97.87	-12.46	6.8
13	-3.41	94.30	-21.69	6.8
14	-3.41	94.30	-21.69	6.8
14	-3.53	91.42	-26.25	6.8
15	-3.53	91.42	-26.25	6.8
15	-3.70	86.57	-29.97	6.8
16	-3.70	86.57	-29.97	6.8

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	78.48	-34.14	6.6
17	-3.95	78.48	-34.14	6.6
17	-4.45	59.76	-39.94	6.2
18	-4.45	59.76	-39.93	6.2
18	-4.97	37.64	-44.50	5.6
19	-4.97	37.64	-44.49	5.6
19	-5.49	14.46	-44.07	4.8
20	-5.49	14.46	-44.07	4.8
20	-6.01	-7.36	-39.26	4.1
21	-6.01	-7.36	-39.24	4.1
21	-6.56	-25.36	-25.78	3.2
22	-6.56	-25.36	-25.78	3.2
22	-7.12	-36.03	-12.81	2.5
23	-7.12	-36.03	-12.81	2.5
23	-7.67	-39.68	-0.35	1.9
24	-7.67	-39.68	-0.35	1.9
24	-8.23	-36.52	11.73	1.5
25	-8.23	-36.51	11.75	1.5
25	-8.78	-28.17	17.34	1.1
26	-8.78	-28.17	17.33	1.1
26	-9.34	-18.28	17.66	0.9
27	-9.34	-18.28	17.66	0.9
27	-9.89	-9.25	14.44	0.8
28	-9.89	-9.25	14.44	0.8
28	-10.45	-2.69	8.87	0.6
29	-10.45	-2.69	8.90	0.6
29	-11.00	0.00	0.00	0.5
Max		99.45	44.80	6.8
Max, minor nodes incl.		99.75	44.80	6.8

16.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	256.9	483.2
Water	515.3	243.8
Total	772.2	727.0

Considered as passive side	Right
Maximum passive effective resistance	1048.43 kN
Mobilized passive effective resistance	483.22 kN
Percentage mobilized resistance	46.1 %
Position single support	0.10 m
Maximum passive moment	8938.27 kNm
Mobilized passive moment	3733.19 kNm
Percentage mobilized moment	41.8 %

16.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	44.80	Elastic	Right	Strut

17 Step 6.5 Stage 2: CPT 2 ontgraven en gebruiksfase

17.1 General Input Data

Passive side:

D-Sheet Piling determined

17.2 Input Data Left

17.2.1 Calculation Method

Calculation method: C, phi, delta

17.2.2 Water Level

Water level: -0.80 [m]

17.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

17.3 Input Data Right

17.3.1 Calculation Method

Calculation method: C, phi, delta

17.3.2 Water Level

Water level: -3.70 [m]

17.3.3 Surface

X [m]	Y [m]
0.00	-3.20

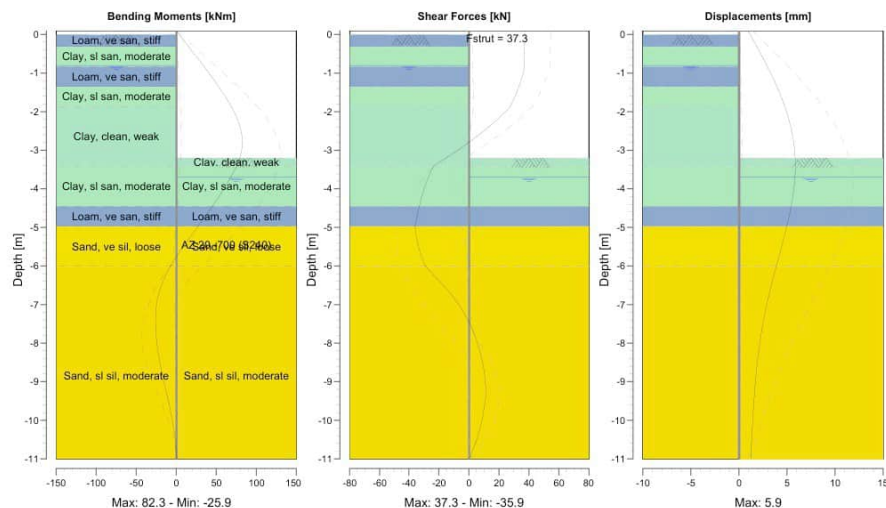
17.4 Calculation Results

Number of iterations: 4

17.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 2 ontgraven en gebruiksfase

Step 6.5 - Partial factor set: RC 2



17.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	37.32	1.0
1	0.00	3.73	37.32	1.2
2	0.00	3.73	37.31	1.2
2	-0.31	15.27	37.02	1.9
3	-0.31	15.27	37.02	1.9
3	-0.80	33.41	37.02	2.9
4	-0.80	33.41	37.02	2.9
4	-0.83	34.52	37.02	3.0
5	-0.83	34.52	37.02	3.0
5	-1.35	52.91	33.15	3.9
6	-1.35	52.91	33.15	3.9
6	-1.87	68.80	27.49	4.8
7	-1.87	68.80	27.49	4.8
7	-2.31	78.46	15.66	5.3
8	-2.31	78.46	15.66	5.3
8	-2.76	82.32	1.33	5.7
9	-2.76	82.32	1.33	5.7
9	-3.20	79.32	-15.28	5.8
10	-3.20	79.32	-15.28	5.8
10	-3.41	75.26	-23.34	5.9
11	-3.41	75.26	-23.34	5.9
11	-3.70	67.90	-26.85	5.8
12	-3.70	67.90	-26.85	5.8
12	-4.08	57.11	-30.35	5.7
13	-4.08	57.11	-30.35	5.7
13	-4.45	45.18	-32.95	5.4
14	-4.45	45.18	-32.95	5.4
14	-4.97	27.24	-35.86	5.0
15	-4.97	27.24	-35.86	5.0
15	-5.49	9.06	-33.68	4.4
16	-5.49	9.06	-33.68	4.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-6.01	-7.31	-28.96	3.9
17	-6.01	-7.32	-28.95	3.9
17	-6.56	-19.68	-15.61	3.3
18	-6.56	-19.67	-15.60	3.3
18	-7.12	-25.16	-4.83	2.8
19	-7.12	-25.16	-4.83	2.8
19	-7.67	-25.61	2.68	2.4
20	-7.67	-25.61	2.68	2.4
20	-8.23	-22.73	7.36	2.0
21	-8.23	-22.73	7.36	2.0
21	-8.78	-17.74	10.36	1.8
22	-8.78	-17.75	10.36	1.8
22	-9.34	-11.68	11.27	1.6
23	-9.34	-11.68	11.28	1.6
23	-9.89	-5.94	9.28	1.5
24	-9.89	-5.94	9.29	1.5
24	-10.45	-1.68	5.68	1.3
25	-10.45	-1.68	5.68	1.3
25	-11.00	0.00	0.00	1.2
Max		82.32	37.32	5.9
Max, minor nodes incl.		82.32	37.32	5.9

17.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	217.1	428.6
Water	510.3	261.4
Total	727.4	690.0

Considered as passive side	Right
Maximum passive effective resistance	1442.66 kN
Mobilized passive effective resistance	428.64 kN
Percentage mobilized resistance	29.7 %
Position single support	0.10 m
Maximum passive moment	12176.07 kNm
Mobilized passive moment	3274.00 kNm
Percentage mobilized moment	26.9 %

17.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	37.32	Elastic	Right	Strut

End of Report

Report for D-Sheet Piling 20.2

Design of Diaphragm and Sheet Pile Walls
Developed by Deltares



Company: Royal HaskoningDHV

Date of report: 03-Jun-24

Time of report: 17:05:12

Report with version: 20.2.1.30962

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Time of calculation: 16:49:06

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File name: CPT 3 boorkuip voorwand

Project identification: Duikerkruising Strijenseweg 's Gravendeel
Boorkuip voorwand
CPT 3

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

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2 Summary

2.1 Overview per Stage and Test

Stage nr.	Verification type	Displacement [mm]	Moment [kNm]	Shear force [kN]	Mob. perc. moment [%]	Mob. perc. resistance [%]	Status
1	EC7(NL)-Step 6.1		13.01	-6.94	27.6	28.2	
1	EC7(NL)-Step 6.2		6.94	-5.16	27.6	28.2	
1	EC7(NL)-Step 6.3		14.68	-7.73	28.0	28.4	
1	EC7(NL)-Step 6.4		7.71	-5.70	28.0	28.5	
1	EC7(NL)-Step 6.5	1.7	11.60	-6.62	21.1	21.5	
1	EC7(NL)-Step 6.5 x 1.200		13.92	-7.94			
2	EC7(NL)-Step 6.1		377.47	115.40	96.3	96.8	
2	EC7(NL)-Step 6.2		376.22	115.14	96.3	96.9	
2	EC7(NL)-Step 6.3		346.86	108.54	88.5	89.6	
2	EC7(NL)-Step 6.4		332.52	105.55	88.4	90.2	
2	EC7(NL)-Step 6.5	32.3	210.45	71.36	55.9	59.5	
2	EC7(NL)-Step 6.5 x 1.200		252.55	85.64			
Max		32.3	377.47	115.40	96.3	96.9	

2.2 Anchors and Struts

Stage nr.	Verification type	Anchor/strut Stempel		
		Force [kN]	State	Status
1	EC7(NL)-Step 6.1	0.18	Elastic	
1	EC7(NL)-Step 6.2	-		
1	EC7(NL)-Step 6.3	0.66	Elastic	
1	EC7(NL)-Step 6.4	-		
1	EC7(NL)-Step 6.5 x 1.200	0.03	Elastic	
2	EC7(NL)-Step 6.1	115.40	Elastic	
2	EC7(NL)-Step 6.2	115.14	Elastic	
2	EC7(NL)-Step 6.3	108.54	Elastic	
2	EC7(NL)-Step 6.4	105.55	Elastic	
2	EC7(NL)-Step 6.5 x 1.200	85.64	Elastic	
Max		115.40		

2.3 Overall Stability per Stage

Stage name	Stability factor [-]
CPT 3 aanbrengen damwanden en ringgording	5.15
CPT 3 ontgraven en gebruiksfase	1.21

3 Input Data for all Stages

3.1 General Input Data

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

Model	Sheet piling
Check vertical balance	No
Number of construction stages	2
Unit weight of water	9.81 kN/m ³
Number of curves for spring characteristics	3
Unloading curve on spring characteristic	No
Elastic calculation	Yes

3.2 Sheet Piling Properties

Length	11.10 m
Level top side	0.10 m
Number of sections	1

3.2.1 General Properties

Section name	From [m]	To [m]	Material type	Acting width [m]
AZ 20 -700 (S24...	-11.00	0.10	Steel	1.00

3.2.2 Stiffness EI (elastic behaviour)

Section name	Elastic stiffness EI [kNm ² /m']	Red. factor on EI [-]	Corrected elas. stiffness EI [kNm ²]	Note to reduction factor
AZ 20 -700 (S24...	8.6016E+04	1.00	8.6016E+04	

3.2.3 Maximum Allowable Moments

Section name	 [kNm/m']	Modification factor [-]	Material factor [-]	Red. factor allow. moment [-]	 [kNm]
AZ 20 -700 (S24...	467.00	1.00	1.00	1.00	467.00

3.3 Calculation Options

First stage represents initial situation	No
Calculation refinement	Coarse
Reduce delta(s) according to CUR	Yes
Verification	EC7 NA NL - method A: Partial factors (design values) in all stages. Eurocode 7 using the factors as described in the National Annex of the Netherlands. It is basically design approach III.
Multiplication factor for anchor stiffness	1.000
Used partial factor set	RC 2
Factors on loads - Geotechnical loads	
- Permanent load, unfavourable	1.000
- Permanent load, favourable	1.000
- Variable load, unfavourable	1.100
- Variable load, favourable	0.000
Factors on loads - Constructive loads	
- Permanent load, unfavourable	1.350
- Permanent load, favourable	0.900

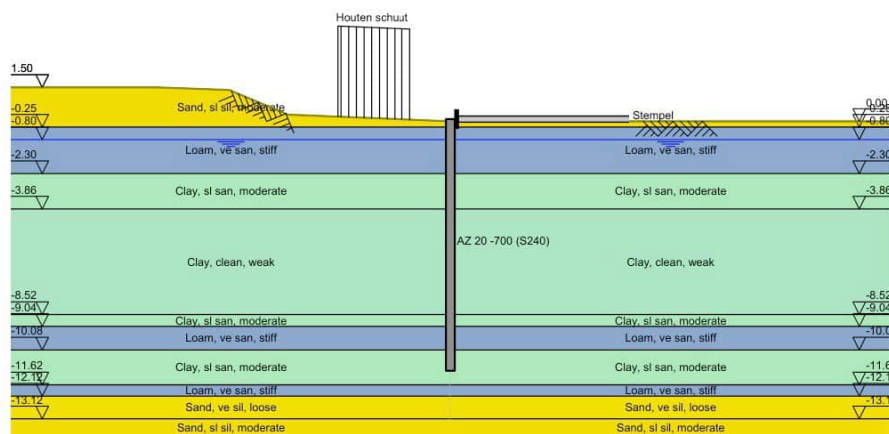
- Variable load, unfavourable	1.500
- Variable load, favourable	0.000
Material factors	
- Cohesion	1.250
- Tangent phi	1.175
- Delta (wall friction angle)*	1.175
- Modulus of low representative subgrade reaction	1.300
Geometry modification	
- Increase retaining height	10.00 %
- Maximum increase retaining height	0.50 m
- Reduction in phreatic line on passive side **	0.25 m
- Raise in phreatic line on passive side **	0.25 m
- Raise in phreatic line on active side	0.05 m
Factors on representative values	
- Partial factor on M, D and Pmax	1.200
Overall stability factors	
- Cohesion	1.450
- Tangent phi	1.250
- Factor on unit weight soil	1.000

* For delta (wall friction angle), the input value of tangent phi is used

** This modification of the phreatic level does not apply when the sheet piling is completely submerged.

4 Outline Stage 1: CPT 3 aanbrengen damwanden en ringgording

Outline - Stage 1: CPT 3 aanbrengen damwanden en ringgording

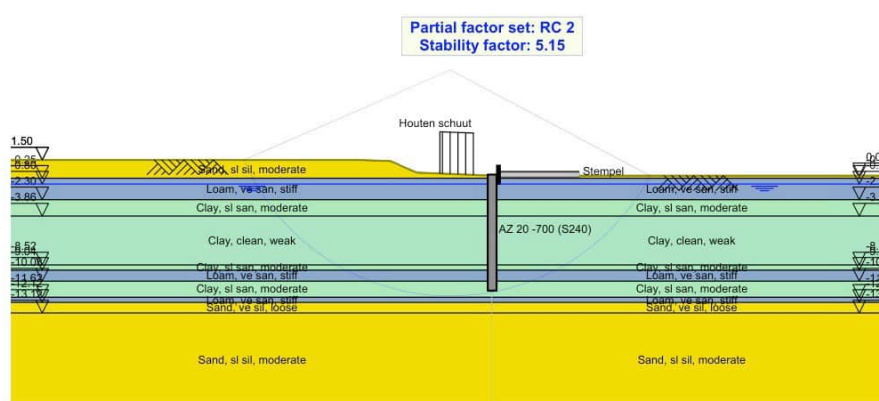


5 Overall Stability Stage 1: CPT 3 aanbrengen damwanden en ringgording

Stability factor : 5.15

5.1 Overall Stability

Overall Stability - Stage 1: CPT 3 aanbrengen damwanden en ringgording



6 Step 6.1 Stage 1: CPT 3 aanbrengen damwanden en ringgording

6.1 General Input Data

Passive side:

D-Sheet Piling determined

6.2 Input Data Left

6.2.1 Calculation Method

Calculation method: C, phi, delta

6.2.2 Water Level

Water level: -0.75 [m]

6.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

6.3 Input Data Right

6.3.1 Calculation Method

Calculation method: C, phi, delta

6.3.2 Water Level

Water level: -0.55 [m]

6.3.3 Surface

X [m]	Y [m]
0.00	-0.01

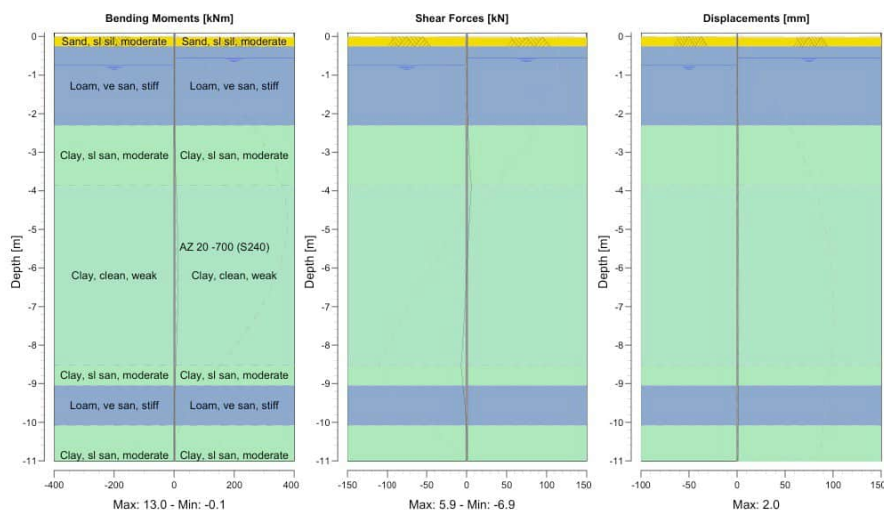
6.4 Calculation Results

Number of iterations: 2

6.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.1 - Partial factor set: RC 2



6.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.18	0.0
1	0.00	0.02	0.18	0.0
2	0.00	0.02	0.18	0.0
2	-0.01	0.02	0.17	0.0
3	-0.01	0.02	0.17	0.0
3	-0.25	0.09	0.42	0.1
4	-0.25	0.09	0.42	0.1
4	-0.75	0.23	0.10	0.3
5	-0.75	0.23	0.10	0.3
5	-0.80	0.23	0.10	0.4
6	-0.80	0.23	0.10	0.4
6	-1.05	0.26	0.13	0.5
7	-1.05	0.26	0.13	0.5
7	-1.47	0.35	0.33	0.6
8	-1.47	0.35	0.33	0.6
8	-1.88	0.59	0.84	0.8
9	-1.88	0.59	0.84	0.8
9	-2.30	1.13	1.75	1.0
10	-2.30	1.13	1.75	1.0
10	-2.75	2.06	2.43	1.1
11	-2.75	2.06	2.43	1.1
11	-3.20	3.40	3.53	1.3
12	-3.20	3.40	3.53	1.3
12	-3.53	4.74	4.61	1.4
13	-3.53	4.74	4.61	1.4
13	-3.70	5.57	5.25	1.5
14	-3.70	5.57	5.25	1.5
14	-3.86	6.47	5.91	1.5
15	-3.86	6.47	5.91	1.5
15	-3.95	6.99	5.64	1.6
16	-3.95	6.99	5.64	1.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.46	9.49	4.22	1.7
17	-4.46	9.49	4.22	1.7
17	-4.97	11.30	2.89	1.8
18	-4.97	11.30	2.89	1.8
18	-5.47	12.46	1.63	1.9
19	-5.47	12.46	1.63	1.9
19	-5.98	12.98	0.39	2.0
20	-5.98	12.98	0.39	2.0
20	-6.49	12.87	-0.87	2.0
21	-6.49	12.87	-0.87	2.0
21	-7.00	12.10	-2.19	2.0
22	-7.00	12.10	-2.19	2.0
22	-7.50	10.65	-3.61	1.9
23	-7.50	10.65	-3.61	1.9
23	-8.01	8.43	-5.18	1.8
24	-8.01	8.43	-5.18	1.8
24	-8.52	5.37	-6.94	1.7
25	-8.52	5.37	-6.94	1.7
25	-9.04	2.32	-4.93	1.6
26	-9.04	2.32	-4.93	1.6
26	-9.56	0.50	-2.21	1.4
27	-9.56	0.50	-2.21	1.4
27	-10.08	-0.07	-0.17	1.3
28	-10.08	-0.07	-0.17	1.3
28	-10.54	-0.05	0.14	1.2
29	-10.54	-0.05	0.14	1.2
29	-11.00	0.00	0.00	1.0
Max		12.98	-6.94	2.0
Max, minor nodes incl.		13.01	-6.94	2.0

6.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	392.6	372.1
Water	515.3	535.6
Total	907.9	907.8

Considered as passive side	Right
Maximum passive effective resistance	1320.78 kN
Mobilized passive effective resistance	372.12 kN
Percentage mobilized resistance	28.2 %
Position single support	0.10 m
Maximum passive moment	9299.90 kNm
Mobilized passive moment	2566.50 kNm
Percentage mobilized moment	27.6 %

6.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.18	Elastic	Right	Strut

7 Step 6.2 Stage 1: CPT 3 aanbrengen damwanden en ringgording

7.1 General Input Data

Passive side:

D-Sheet Piling determined

7.2 Input Data Left

7.2.1 Calculation Method

Calculation method: C, phi, delta

7.2.2 Water Level

Water level: -0.75 [m]

7.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

7.3 Input Data Right

7.3.1 Calculation Method

Calculation method: C, phi, delta

7.3.2 Water Level

Water level: -0.55 [m]

7.3.3 Surface

X [m]	Y [m]
0.00	-0.01

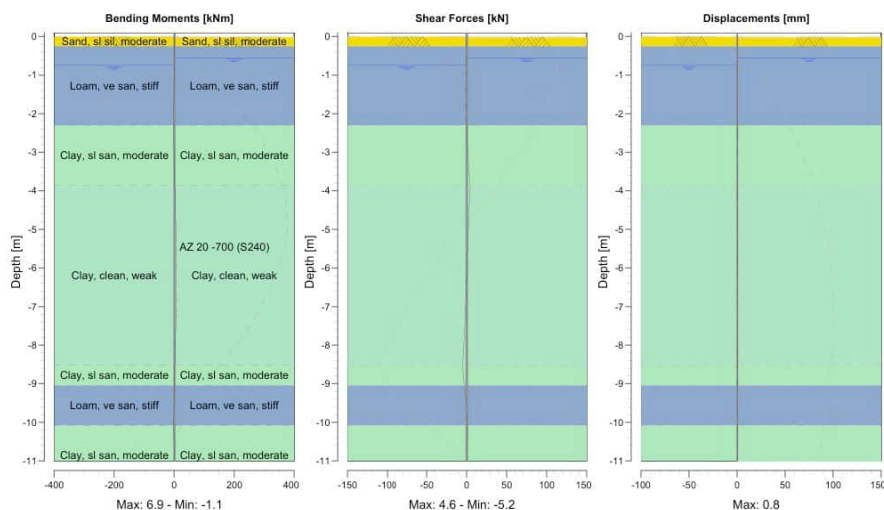
7.4 Calculation Results

Number of iterations: 4

7.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.2 - Partial factor set: RC 2



7.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.0
1	0.00	0.00	0.00	0.0
2	0.00	0.00	0.00	0.0
2	-0.01	0.00	0.00	0.0
3	-0.01	0.00	-0.01	0.0
3	-0.25	-0.01	-0.08	0.0
4	-0.25	-0.01	-0.08	0.0
4	-0.75	-0.19	-0.67	0.1
5	-0.75	-0.19	-0.67	0.1
5	-0.80	-0.22	-0.70	0.1
6	-0.80	-0.22	-0.70	0.1
6	-1.05	-0.41	-0.81	0.1
7	-1.05	-0.41	-0.81	0.1
7	-1.47	-0.76	-0.84	0.2
8	-1.47	-0.76	-0.84	0.2
8	-1.88	-1.05	-0.54	0.3
9	-1.88	-1.05	-0.54	0.3
9	-2.30	-1.13	0.20	0.3
10	-2.30	-1.13	0.20	0.3
10	-2.75	-0.91	0.80	0.4
11	-2.75	-0.91	0.80	0.4
11	-3.20	-0.30	1.94	0.5
12	-3.20	-0.30	1.94	0.5
12	-3.53	0.53	3.13	0.5
13	-3.53	0.53	3.13	0.5
13	-3.70	1.12	3.87	0.5
14	-3.70	1.12	3.87	0.5
14	-3.86	1.80	4.64	0.6
15	-3.86	1.80	4.64	0.6
15	-3.95	2.21	4.41	0.6
16	-3.95	2.21	4.41	0.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.46	4.14	3.21	0.6
17	-4.46	4.14	3.21	0.6
17	-4.97	5.51	2.19	0.7
18	-4.97	5.51	2.19	0.7
18	-5.47	6.40	1.30	0.7
19	-5.47	6.40	1.30	0.7
19	-5.98	6.86	0.49	0.8
20	-5.98	6.86	0.49	0.8
20	-6.49	6.91	-0.33	0.8
21	-6.49	6.91	-0.33	0.8
21	-7.00	6.53	-1.23	0.8
22	-7.00	6.53	-1.23	0.8
22	-7.50	5.66	-2.28	0.7
23	-7.50	5.66	-2.28	0.7
23	-8.01	4.19	-3.58	0.7
24	-8.01	4.19	-3.58	0.7
24	-8.52	2.00	-5.16	0.6
25	-8.52	2.00	-5.15	0.6
25	-9.04	-0.07	-3.00	0.5
26	-9.04	-0.07	-3.00	0.5
26	-9.56	-0.92	-0.46	0.5
27	-9.56	-0.92	-0.46	0.5
27	-10.08	-0.70	1.09	0.4
28	-10.08	-0.70	1.09	0.4
28	-10.54	-0.22	0.85	0.3
29	-10.54	-0.22	0.85	0.3
29	-11.00	0.00	0.00	0.3
Max		6.91	-5.16	0.8
Max, minor nodes incl.		6.94	-5.16	0.8

7.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	392.5	372.2
Water	515.3	535.6
Total	907.9	907.8

Considered as passive side	Right
Maximum passive effective resistance	1320.78 kN
Mobilized passive effective resistance	372.21 kN
Percentage mobilized resistance	28.2 %
Position single support	0.10 m
Maximum passive moment	9299.90 kNm
Mobilized passive moment	2566.50 kNm
Percentage mobilized moment	27.6 %

7.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Right	Strut

8 Step 6.3 Stage 1: CPT 3 aanbrengen damwanden en ringgording

8.1 General Input Data

Passive side:

D-Sheet Piling determined

8.2 Input Data Left

8.2.1 Calculation Method

Calculation method: C, phi, delta

8.2.2 Water Level

Water level: -0.75 [m]

8.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

8.3 Input Data Right

8.3.1 Calculation Method

Calculation method: C, phi, delta

8.3.2 Water Level

Water level: -1.05 [m]

8.3.3 Surface

X [m]	Y [m]
0.00	-0.01

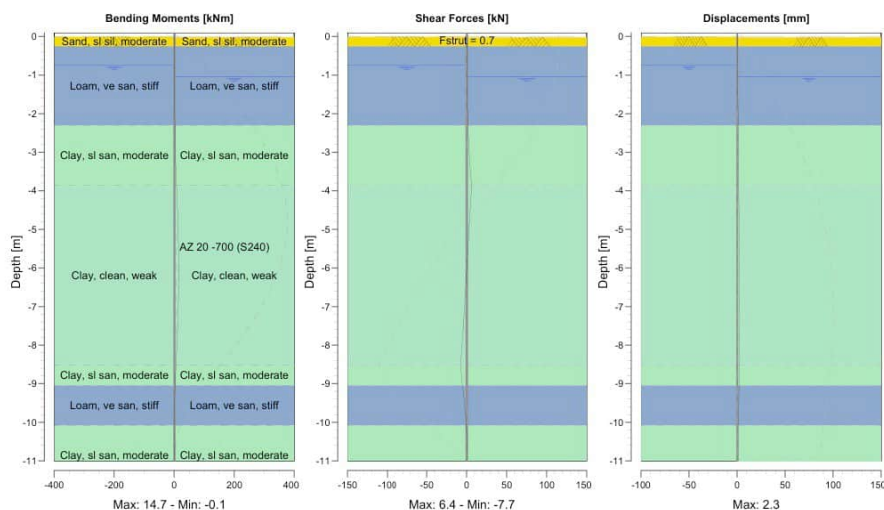
8.4 Calculation Results

Number of iterations: 2

8.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.3 - Partial factor set: RC 2



8.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.66	0.0
1	0.00	0.07	0.66	0.1
2	0.00	0.07	0.66	0.1
2	-0.01	0.07	0.65	0.1
3	-0.01	0.07	0.65	0.1
3	-0.25	0.27	1.05	0.2
4	-0.25	0.27	1.05	0.2
4	-0.75	0.78	0.95	0.4
5	-0.75	0.78	0.95	0.4
5	-0.80	0.83	0.94	0.5
6	-0.80	0.83	0.94	0.5
6	-1.05	1.05	0.83	0.6
7	-1.05	1.05	0.83	0.6
7	-1.47	1.36	0.68	0.8
8	-1.47	1.36	0.68	0.8
8	-1.88	1.70	0.98	1.0
9	-1.88	1.70	0.98	1.0
9	-2.30	2.26	1.78	1.2
10	-2.30	2.26	1.78	1.2
10	-2.75	3.21	2.47	1.4
11	-2.75	3.21	2.47	1.4
11	-3.20	4.59	3.68	1.6
12	-3.20	4.59	3.68	1.6
12	-3.53	6.00	4.90	1.7
13	-3.53	6.00	4.90	1.7
13	-3.70	6.89	5.63	1.8
14	-3.70	6.89	5.63	1.8
14	-3.86	7.85	6.38	1.8
15	-3.86	7.85	6.38	1.8
15	-3.95	8.41	6.08	1.9
16	-3.95	8.41	6.08	1.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.46	11.10	4.48	2.0
17	-4.46	11.10	4.48	2.0
17	-4.97	13.00	3.01	2.2
18	-4.97	13.00	3.01	2.2
18	-5.47	14.18	1.62	2.3
19	-5.47	14.18	1.62	2.3
19	-5.98	14.67	0.26	2.3
20	-5.98	14.67	0.26	2.3
20	-6.49	14.47	-1.10	2.3
21	-6.49	14.47	-1.10	2.3
21	-7.00	13.55	-2.54	2.3
22	-7.00	13.55	-2.54	2.3
22	-7.50	11.89	-4.09	2.2
23	-7.50	11.89	-4.09	2.2
23	-8.01	9.39	-5.81	2.1
24	-8.01	9.39	-5.81	2.1
24	-8.52	5.97	-7.73	2.0
25	-8.52	5.97	-7.73	2.0
25	-9.04	2.59	-5.42	1.8
26	-9.04	2.59	-5.42	1.8
26	-9.56	0.59	-2.44	1.7
27	-9.56	0.59	-2.44	1.7
27	-10.08	-0.06	-0.24	1.5
28	-10.08	-0.06	-0.24	1.5
28	-10.54	-0.06	0.13	1.4
29	-10.54	-0.06	0.13	1.4
29	-11.00	0.00	0.00	1.2
Max		14.67	-7.73	2.3
Max, minor nodes incl.		14.68	-7.73	2.3

8.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	384.9	414.0
Water	515.3	485.6
Total	900.3	899.6

Considered as passive side	Right
Maximum passive effective resistance	1455.21 kN
Mobilized passive effective resistance	413.99 kN
Percentage mobilized resistance	28.4 %
Position single support	0.10 m
Maximum passive moment	10086.44 kNm
Mobilized passive moment	2819.78 kNm
Percentage mobilized moment	28.0 %

8.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.66	Elastic	Right	Strut

9 Step 6.4 Stage 1: CPT 3 aanbrengen damwanden en ringgording

9.1 General Input Data

Passive side:

D-Sheet Piling determined

9.2 Input Data Left

9.2.1 Calculation Method

Calculation method: C, phi, delta

9.2.2 Water Level

Water level: -0.75 [m]

9.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

9.3 Input Data Right

9.3.1 Calculation Method

Calculation method: C, phi, delta

9.3.2 Water Level

Water level: -1.05 [m]

9.3.3 Surface

X [m]	Y [m]
0.00	-0.01

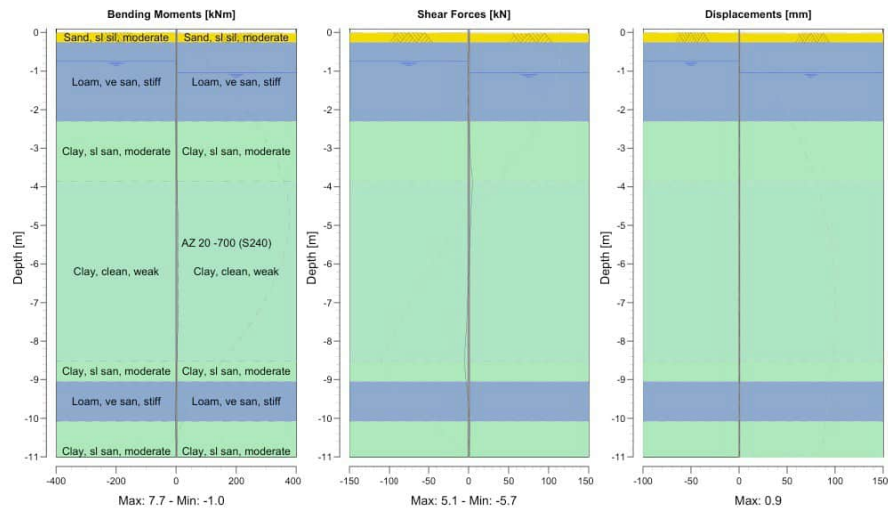
9.4 Calculation Results

Number of iterations: 4

9.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.4 - Partial factor set: RC 2



9.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.0
1	0.00	0.00	0.00	0.0
2	0.00	0.00	0.00	0.0
2	-0.01	0.00	0.00	0.0
3	-0.01	0.00	-0.01	0.0
3	-0.25	0.01	0.15	0.0
4	-0.25	0.01	0.15	0.0
4	-0.75	0.02	-0.19	0.1
5	-0.75	0.02	-0.19	0.1
5	-0.80	0.01	-0.21	0.1
6	-0.80	0.01	-0.21	0.1
6	-1.05	-0.07	-0.45	0.2
7	-1.05	-0.07	-0.45	0.2
7	-1.47	-0.33	-0.78	0.2
8	-1.47	-0.33	-0.78	0.2
8	-1.88	-0.64	-0.65	0.3
9	-1.88	-0.64	-0.65	0.3
9	-2.30	-0.78	0.03	0.4
10	-2.30	-0.78	0.03	0.4
10	-2.75	-0.63	0.69	0.5
11	-2.75	-0.63	0.69	0.5
11	-3.20	-0.04	1.98	0.5
12	-3.20	-0.04	1.98	0.5
12	-3.53	0.83	3.34	0.6
13	-3.53	0.83	3.34	0.6
13	-3.70	1.47	4.19	0.6
14	-3.70	1.47	4.19	0.6
14	-3.86	2.21	5.07	0.7
15	-3.86	2.21	5.07	0.7
15	-3.95	2.65	4.81	0.7
16	-3.95	2.65	4.81	0.7

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.46	4.75	3.46	0.8
17	-4.46	4.75	3.46	0.8
17	-4.97	6.22	2.34	0.8
18	-4.97	6.22	2.34	0.8
18	-5.47	7.17	1.36	0.9
19	-5.47	7.17	1.36	0.9
19	-5.98	7.64	0.48	0.9
20	-5.98	7.64	0.48	0.9
20	-6.49	7.67	-0.41	0.9
21	-6.49	7.67	-0.41	0.9
21	-7.00	7.23	-1.39	0.9
22	-7.00	7.23	-1.39	0.9
22	-7.50	6.25	-2.55	0.8
23	-7.50	6.25	-2.54	0.8
23	-8.01	4.62	-3.96	0.8
24	-8.01	4.62	-3.96	0.8
24	-8.52	2.19	-5.70	0.7
25	-8.52	2.19	-5.70	0.7
25	-9.04	-0.09	-3.25	0.6
26	-9.04	-0.09	-3.25	0.6
26	-9.56	-0.99	-0.48	0.5
27	-9.56	-0.99	-0.48	0.5
27	-10.08	-0.76	1.17	0.5
28	-10.08	-0.76	1.17	0.5
28	-10.54	-0.24	0.92	0.4
29	-10.54	-0.24	0.92	0.4
29	-11.00	0.00	0.00	0.3
Max		7.67	-5.70	0.9
Max, minor nodes incl.		7.71	-5.70	0.9

9.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	384.6	414.3
Water	515.3	485.6
Total	899.9	899.9

Considered as passive side	Right
Maximum passive effective resistance	1455.21 kN
Mobilized passive effective resistance	414.31 kN
Percentage mobilized resistance	28.5 %
Position single support	0.10 m
Maximum passive moment	10086.44 kNm
Mobilized passive moment	2819.78 kNm
Percentage mobilized moment	28.0 %

9.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Right	Strut

10 Step 6.5 Stage 1: CPT 3 aanbrengen damwanden en ringgording

10.1 General Input Data

Passive side:

D-Sheet Piling determined

10.2 Input Data Left

10.2.1 Calculation Method

Calculation method: C, phi, delta

10.2.2 Water Level

Water level: -0.80 [m]

10.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

10.3 Input Data Right

10.3.1 Calculation Method

Calculation method: C, phi, delta

10.3.2 Water Level

Water level: -0.80 [m]

10.3.3 Surface

X [m]	Y [m]
0.00	0.00

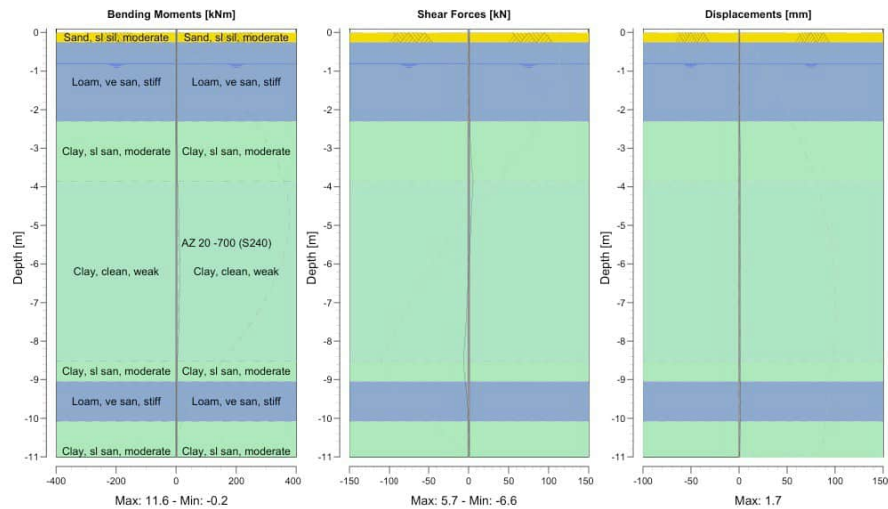
10.4 Calculation Results

Number of iterations: 2

10.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 3 aanbrengen damwanden en ringgording

Step 6.5 - Partial factor set: RC 2



10.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.03	0.0
1	0.00	0.00	0.03	0.0
2	0.00	0.00	0.02	0.0
2	-0.25	0.04	0.31	0.1
3	-0.25	0.04	0.31	0.1
3	-0.80	0.16	0.01	0.3
4	-0.80	0.16	0.01	0.3
4	-1.30	0.13	-0.09	0.5
5	-1.30	0.13	-0.09	0.5
5	-1.80	0.16	0.26	0.6
6	-1.80	0.16	0.26	0.6
6	-2.30	0.52	1.24	0.8
7	-2.30	0.52	1.24	0.8
7	-2.75	1.23	1.94	0.9
8	-2.75	1.23	1.94	0.9
8	-3.20	2.36	3.12	1.1
9	-3.20	2.36	3.12	1.1
9	-3.70	4.38	5.00	1.2
10	-3.70	4.38	5.00	1.2
10	-3.86	5.24	5.73	1.3
11	-3.86	5.24	5.73	1.3
11	-4.38	7.83	4.28	1.4
12	-4.38	7.83	4.28	1.4
12	-4.90	9.71	2.96	1.5
13	-4.90	9.71	2.96	1.5
13	-5.41	10.93	1.74	1.6
14	-5.41	10.93	1.74	1.6
14	-5.93	11.53	0.56	1.7
15	-5.93	11.53	0.56	1.7
15	-6.45	11.52	-0.63	1.7
16	-6.45	11.52	-0.63	1.7

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-6.97	10.88	-1.89	1.6
17	-6.97	10.88	-1.89	1.6
17	-7.48	9.56	-3.27	1.6
18	-7.48	9.56	-3.27	1.6
18	-8.00	7.48	-4.83	1.5
19	-8.00	7.48	-4.83	1.5
19	-8.52	4.54	-6.61	1.4
20	-8.52	4.54	-6.62	1.4
20	-9.04	1.70	-4.48	1.3
21	-9.04	1.70	-4.49	1.3
21	-9.56	0.12	-1.75	1.1
22	-9.56	0.12	-1.76	1.1
22	-10.08	-0.25	0.17	1.0
23	-10.08	-0.25	0.17	1.0
23	-10.54	-0.10	0.34	0.9
24	-10.54	-0.10	0.34	0.9
24	-11.00	0.00	0.00	0.8
Max		11.53	-6.62	1.7
Max, minor nodes incl.		11.60	-6.62	1.7

10.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	369.1	369.1
Water	510.3	510.3
Total	879.4	879.4

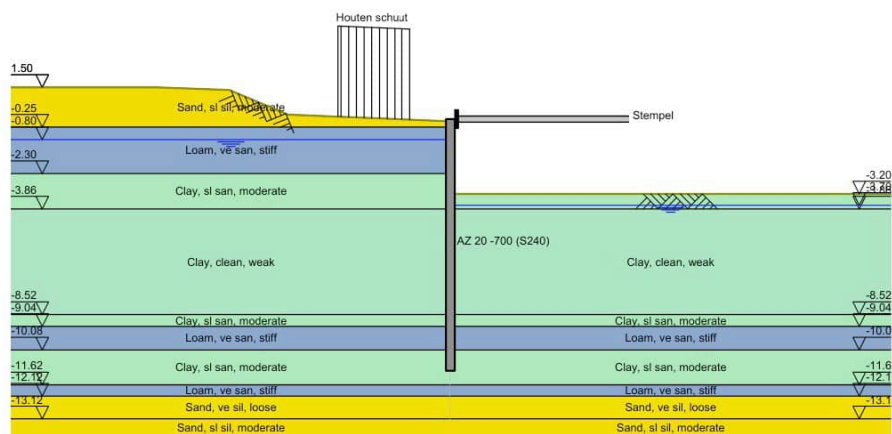
Considered as passive side	Right
Maximum passive effective resistance	1713.22 kN
Mobilized passive effective resistance	369.11 kN
Percentage mobilized resistance	21.6 %
Position single support	0.10 m
Maximum passive moment	11951.53 kNm
Mobilized passive moment	2523.16 kNm
Percentage mobilized moment	21.1 %

10.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.03	Elastic	Right	Strut

11 Outline Stage 2: CPT 3 ontgraven en gebruiksfase

Outline - Stage 2: CPT 3 ontgraven en gebruiksfase

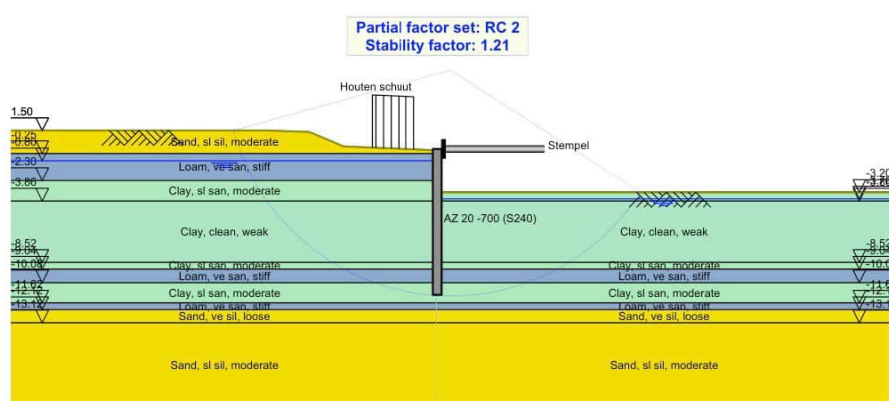


12 Overall Stability Stage 2: CPT 3 ontgraven en gebruiksfase

Stability factor : 1.21

12.1 Overall Stability

Overall Stability - Stage 2: CPT 3 ontgraven en gebruiksfase



13 Step 6.1 Stage 2: CPT 3 ontgraven en gebruiksfase

13.1 General Input Data

Passive side:

D-Sheet Piling determined

13.2 Input Data Left

13.2.1 Calculation Method

Calculation method: C, phi, delta

13.2.2 Water Level

Water level: -0.75 [m]

13.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

13.3 Input Data Right

13.3.1 Calculation Method

Calculation method: C, phi, delta

13.3.2 Water Level

Water level: -3.53 [m]

13.3.3 Surface

X [m]	Y [m]
0.00	-3.53

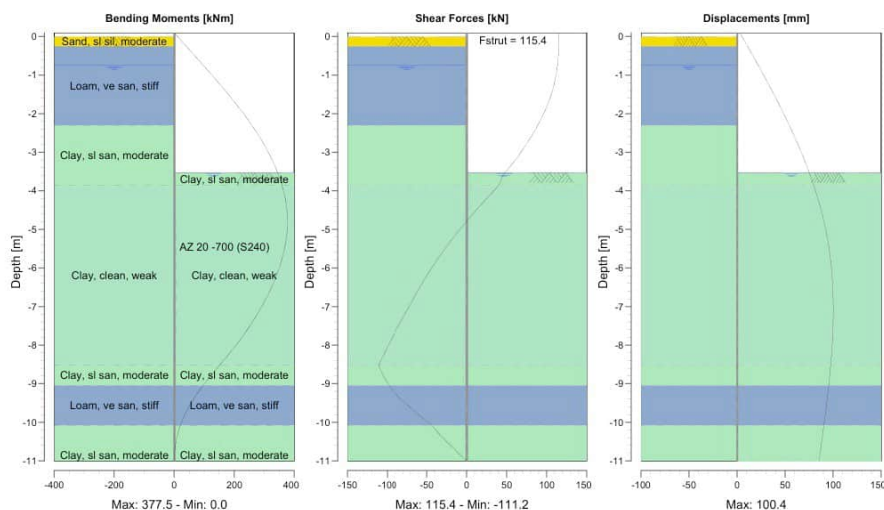
13.4 Calculation Results

Number of iterations: 7

13.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven en gebruiksfase

Step 6.1 - Partial factor set: RC 2



13.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	115.40	2.9
1	0.00	11.54	115.40	5.2
2	0.00	11.54	115.40	5.2
2	-0.01	12.69	115.40	5.4
3	-0.01	12.69	115.39	5.4
3	-0.25	40.37	115.18	10.9
4	-0.25	40.37	115.18	10.9
4	-0.75	97.60	113.45	22.1
5	-0.75	97.60	113.45	22.1
5	-0.80	103.27	113.17	23.2
6	-0.80	103.27	113.17	23.2
6	-1.05	131.34	111.27	28.7
7	-1.05	131.34	111.27	28.7
7	-1.47	176.74	106.26	37.7
8	-1.47	176.74	106.26	37.7
8	-1.88	219.57	98.93	46.3
9	-1.88	219.57	98.93	46.3
9	-2.30	258.73	88.62	54.4
10	-2.30	258.73	88.62	54.4
10	-2.75	295.89	76.11	62.7
11	-2.75	295.89	76.11	62.7
11	-3.20	326.80	60.80	70.2
12	-3.20	326.80	60.80	70.2
12	-3.53	344.75	47.80	75.2
13	-3.53	344.75	47.80	75.2
13	-3.70	352.44	43.67	77.6
14	-3.70	352.44	43.67	77.6
14	-3.86	359.13	40.28	79.8
15	-3.86	359.13	40.28	79.8
15	-3.95	362.57	36.16	81.0
16	-3.95	362.57	36.16	81.0

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.46	375.20	13.84	87.0
17	-4.46	375.20	13.84	87.0
17	-4.97	376.87	-7.03	91.8
18	-4.97	376.87	-7.03	91.8
18	-5.47	368.37	-26.19	95.6
19	-5.47	368.37	-26.19	95.6
19	-5.98	350.73	-43.02	98.2
20	-5.98	350.73	-43.02	98.2
20	-6.49	324.97	-58.18	99.8
21	-6.49	324.97	-58.18	99.8
21	-7.00	291.89	-71.81	100.4
22	-7.00	291.89	-71.81	100.4
22	-7.50	251.84	-85.70	100.1
23	-7.50	251.84	-85.70	100.1
23	-8.01	204.87	-99.08	99.1
24	-8.01	204.87	-99.08	99.1
24	-8.52	151.45	-111.18	97.5
25	-8.52	151.45	-111.18	97.5
25	-9.04	96.72	-98.27	95.3
26	-9.04	96.72	-98.27	95.3
26	-9.56	51.66	-73.72	92.9
27	-9.56	51.66	-73.72	92.9
27	-10.08	20.87	-43.95	90.3
28	-10.08	20.87	-43.95	90.3
28	-10.54	5.38	-22.99	87.9
29	-10.54	5.38	-22.99	87.9
29	-11.00	0.00	0.00	85.5
Max		376.87	115.40	100.4
Max, minor nodes incl.		377.47	115.40	100.4

13.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	266.0	392.3
Water	515.3	273.7
Total	781.4	666.0

Considered as passive side	Right
Maximum passive effective resistance	405.05 kN
Mobilized passive effective resistance	392.26 kN
Percentage mobilized resistance	96.8 %
Position single support	0.10 m
Maximum passive moment	3621.30 kNm
Mobilized passive moment	3487.16 kNm
Percentage mobilized moment	96.3 %

13.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	115.40	Elastic	Right	Strut

14 Step 6.2 Stage 2: CPT 3 ontgraven en gebruiksfase

14.1 General Input Data

Passive side:

D-Sheet Piling determined

14.2 Input Data Left

14.2.1 Calculation Method

Calculation method: C, phi, delta

14.2.2 Water Level

Water level: -0.75 [m]

14.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

14.3 Input Data Right

14.3.1 Calculation Method

Calculation method: C, phi, delta

14.3.2 Water Level

Water level: -3.53 [m]

14.3.3 Surface

X [m]	Y [m]
0.00	-3.53

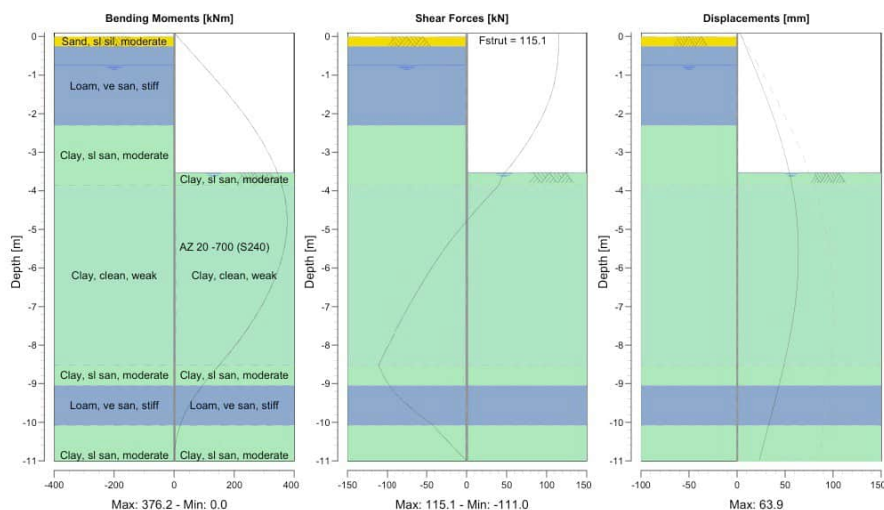
14.4 Calculation Results

Number of iterations: 6

14.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven en gebruiksfase

Step 6.2 - Partial factor set: RC 2



14.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	115.14	2.9
1	0.00	11.51	115.14	4.6
2	0.00	11.51	115.14	4.6
2	-0.01	12.67	115.14	4.8
3	-0.01	12.67	115.14	4.8
3	-0.25	40.28	114.92	8.9
4	-0.25	40.28	114.92	8.9
4	-0.75	97.38	113.19	17.3
5	-0.75	97.38	113.19	17.3
5	-0.80	103.04	112.91	18.1
6	-0.80	103.04	112.91	18.1
6	-1.05	131.05	111.02	22.2
7	-1.05	131.05	111.02	22.2
7	-1.47	176.34	106.01	28.8
8	-1.47	176.34	106.01	28.8
8	-1.88	219.07	98.68	35.0
9	-1.88	219.07	98.68	35.0
9	-2.30	258.12	88.36	40.8
10	-2.30	258.12	88.36	40.8
10	-2.75	295.16	75.86	46.4
11	-2.75	295.16	75.86	46.4
11	-3.20	325.95	60.54	51.4
12	-3.20	325.95	60.54	51.4
12	-3.53	343.82	47.54	54.6
13	-3.53	343.82	47.54	54.6
13	-3.70	351.47	43.41	56.0
14	-3.70	351.47	43.41	56.0
14	-3.86	358.12	40.02	57.3
15	-3.86	358.12	40.02	57.3
15	-3.95	361.53	35.91	57.9
16	-3.95	361.53	35.91	57.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.46	374.03	13.59	61.0
17	-4.46	374.03	13.59	61.0
17	-4.97	375.57	-7.28	63.0
18	-4.97	375.57	-7.28	63.0
18	-5.47	366.94	-26.45	63.9
19	-5.47	366.94	-26.45	63.9
19	-5.98	349.17	-43.27	63.7
20	-5.98	349.17	-43.27	63.7
20	-6.49	323.28	-58.44	62.4
21	-6.49	323.28	-58.44	62.4
21	-7.00	290.08	-72.06	60.2
22	-7.00	290.08	-72.06	60.2
22	-7.50	249.89	-85.96	57.0
23	-7.50	249.89	-85.96	57.0
23	-8.01	202.79	-99.33	53.2
24	-8.01	202.79	-99.33	53.2
24	-8.52	149.34	-110.97	48.7
25	-8.52	149.34	-110.97	48.7
25	-9.04	94.71	-98.06	43.7
26	-9.04	94.71	-98.06	43.7
26	-9.56	49.77	-73.44	38.3
27	-9.56	49.77	-73.43	38.3
27	-10.08	19.49	-42.13	32.9
28	-10.08	19.49	-42.12	32.9
28	-10.54	4.90	-21.18	27.9
29	-10.54	4.90	-21.18	27.9
29	-11.00	0.00	0.00	23.0
Max		375.57	115.14	63.9
Max, minor nodes incl.		376.22	115.14	63.9

14.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	266.0	392.5
Water	515.3	273.7
Total	781.4	666.2

Considered as passive side	Right
Maximum passive effective resistance	405.05 kN
Mobilized passive effective resistance	392.50 kN
Percentage mobilized resistance	96.9 %
Position single support	0.10 m
Maximum passive moment	3621.30 kNm
Mobilized passive moment	3486.98 kNm
Percentage mobilized moment	96.3 %

14.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	115.14	Elastic	Right	Strut

15 Step 6.3 Stage 2: CPT 3 ontgraven en gebruiksfase

15.1 General Input Data

Passive side:

D-Sheet Piling determined

15.2 Input Data Left

15.2.1 Calculation Method

Calculation method: C, phi, delta

15.2.2 Water Level

Water level: -0.75 [m]

15.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

15.3 Input Data Right

15.3.1 Calculation Method

Calculation method: C, phi, delta

15.3.2 Water Level

Water level: -3.95 [m]

15.3.3 Surface

X [m]	Y [m]
0.00	-3.53

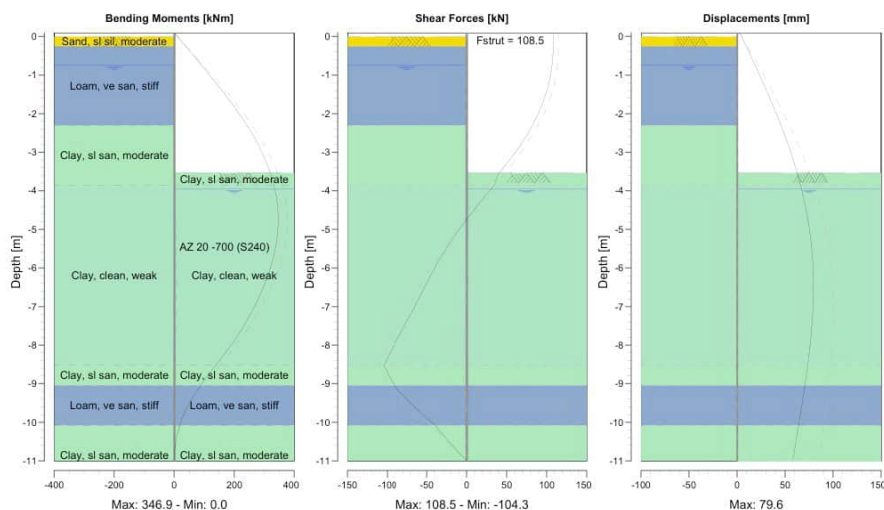
15.4 Calculation Results

Number of iterations: 6

15.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven en gebruiksfase

Step 6.3 - Partial factor set: RC 2



15.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	108.54	2.8
1	0.00	10.85	108.54	4.7
2	0.00	10.85	108.54	4.7
2	-0.01	11.94	108.54	4.9
3	-0.01	11.94	108.54	4.9
3	-0.25	37.97	108.32	9.5
4	-0.25	37.97	108.32	9.5
4	-0.75	91.77	106.59	18.9
5	-0.75	91.77	106.59	18.9
5	-0.80	97.09	106.31	19.8
6	-0.80	97.09	106.31	19.8
6	-1.05	123.45	104.41	24.4
7	-1.05	123.45	104.41	24.4
7	-1.47	165.99	99.40	31.9
8	-1.47	165.99	99.40	31.9
8	-1.88	205.97	92.07	39.1
9	-1.88	205.97	92.07	39.1
9	-2.30	242.27	81.76	45.8
10	-2.30	242.27	81.76	45.8
10	-2.75	276.34	69.25	52.5
11	-2.75	276.34	69.25	52.5
11	-3.20	304.16	53.94	58.6
12	-3.20	304.16	53.94	58.6
12	-3.53	319.85	40.94	62.6
13	-3.53	319.85	40.94	62.6
13	-3.70	326.39	37.06	64.5
14	-3.70	326.39	37.06	64.5
14	-3.86	332.07	34.34	66.2
15	-3.86	332.07	34.34	66.2
15	-3.95	334.99	30.59	67.1
16	-3.95	334.99	30.59	67.1

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.46	345.37	10.58	71.6
17	-4.46	345.37	10.58	71.6
17	-4.97	345.97	-7.99	75.1
18	-4.97	345.97	-7.99	75.1
18	-5.47	337.56	-24.85	77.6
19	-5.47	337.56	-24.85	77.6
19	-5.98	321.19	-39.37	79.1
20	-5.98	321.19	-39.37	79.1
20	-6.49	297.82	-52.51	79.6
21	-6.49	297.82	-52.51	79.6
21	-7.00	268.01	-64.79	79.2
22	-7.00	268.01	-64.79	79.2
22	-7.50	231.70	-78.08	78.0
23	-7.50	231.70	-78.08	78.0
23	-8.01	188.58	-91.64	76.1
24	-8.01	188.58	-91.64	76.1
24	-8.52	138.81	-104.30	73.6
25	-8.52	138.81	-104.30	73.6
25	-9.04	87.86	-91.05	70.7
26	-9.04	87.86	-91.05	70.7
26	-9.56	46.55	-67.12	67.4
27	-9.56	46.55	-67.12	67.4
27	-10.08	18.70	-39.28	64.1
28	-10.08	18.70	-39.28	64.1
28	-10.54	4.83	-20.60	61.0
29	-10.54	4.83	-20.60	61.0
29	-11.00	0.00	0.00	58.0
Max		345.97	108.54	79.6
Max, minor nodes incl.		346.86	108.54	79.6

15.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	266.0	429.0
Water	515.3	243.8
Total	781.4	672.8

Considered as passive side	Right
Maximum passive effective resistance	478.75 kN
Mobilized passive effective resistance	429.04 kN
Percentage mobilized resistance	89.6 %
Position single support	0.10 m
Maximum passive moment	4194.74 kNm
Mobilized passive moment	3710.62 kNm
Percentage mobilized moment	88.5 %

15.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	108.54	Elastic	Right	Strut

16 Step 6.4 Stage 2: CPT 3 ontgraven en gebruiksfase

16.1 General Input Data

Passive side:

D-Sheet Piling determined

16.2 Input Data Left

16.2.1 Calculation Method

Calculation method: C, phi, delta

16.2.2 Water Level

Water level: -0.75 [m]

16.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

16.3 Input Data Right

16.3.1 Calculation Method

Calculation method: C, phi, delta

16.3.2 Water Level

Water level: -3.95 [m]

16.3.3 Surface

X [m]	Y [m]
0.00	-3.53

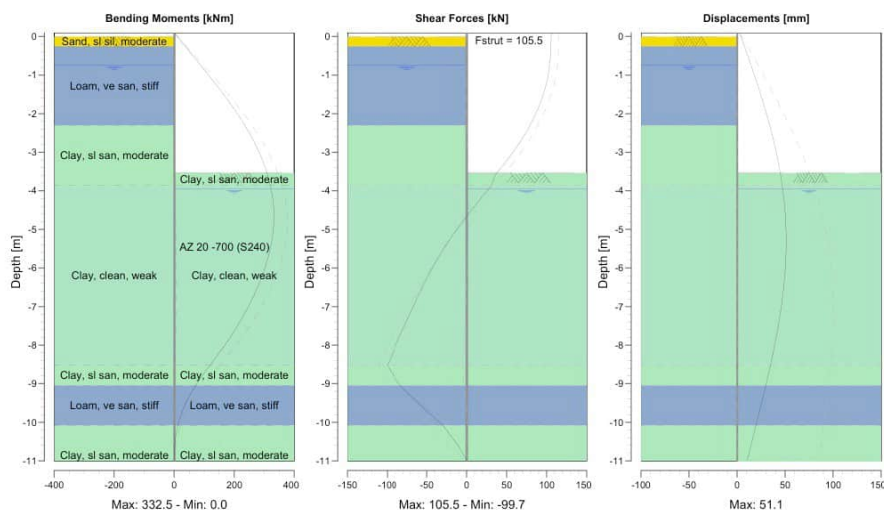
16.4 Calculation Results

Number of iterations: 6

16.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven en gebruiksfase

Step 6.4 - Partial factor set: RC 2



16.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	105.55	2.7
1	0.00	10.55	105.55	4.1
2	0.00	10.55	105.55	4.1
2	-0.01	11.61	105.55	4.2
3	-0.01	11.61	105.55	4.2
3	-0.25	36.92	105.33	7.6
4	-0.25	36.92	105.33	7.6
4	-0.75	89.23	103.60	14.6
5	-0.75	89.23	103.60	14.6
5	-0.80	94.40	103.32	15.3
6	-0.80	94.40	103.32	15.3
6	-1.05	120.01	101.43	18.7
7	-1.05	120.01	101.43	18.7
7	-1.47	161.31	96.41	24.1
8	-1.47	161.31	96.41	24.1
8	-1.88	200.04	89.08	29.3
9	-1.88	200.04	89.08	29.3
9	-2.30	235.09	78.77	34.0
10	-2.30	235.09	78.77	34.0
10	-2.75	267.82	66.26	38.5
11	-2.75	267.82	66.26	38.5
11	-3.20	294.29	50.95	42.5
12	-3.20	294.29	50.95	42.5
12	-3.53	309.00	37.95	44.9
13	-3.53	309.00	37.95	44.9
13	-3.70	315.03	34.07	46.0
14	-3.70	315.03	34.07	46.0
14	-3.86	320.23	31.35	47.0
15	-3.86	320.23	31.35	47.0
15	-3.95	322.88	27.60	47.5
16	-3.95	322.88	27.60	47.5

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.46	331.75	7.59	49.7
17	-4.46	331.75	7.59	49.7
17	-4.97	330.83	-10.98	50.9
18	-4.97	330.83	-10.98	50.9
18	-5.47	320.90	-27.84	51.1
19	-5.47	320.90	-27.84	51.1
19	-5.98	303.01	-42.36	50.3
20	-5.98	303.01	-42.36	50.3
20	-6.49	278.17	-55.22	48.7
21	-6.49	278.17	-55.22	48.7
21	-7.00	247.19	-66.54	46.2
22	-7.00	247.19	-66.54	46.2
22	-7.50	210.40	-78.13	43.0
23	-7.50	210.40	-78.13	43.0
23	-8.01	167.85	-89.26	39.1
24	-8.01	167.85	-89.26	39.1
24	-8.52	119.86	-99.75	34.8
25	-8.52	119.86	-99.74	34.8
25	-9.04	72.01	-83.54	29.9
26	-9.04	72.02	-83.54	29.9
26	-9.56	35.28	-57.38	24.9
27	-9.56	35.28	-57.38	24.9
27	-10.08	12.57	-29.66	19.7
28	-10.08	12.57	-29.65	19.7
28	-10.54	2.78	-12.96	15.1
29	-10.54	2.78	-12.94	15.1
29	-11.00	0.00	0.00	10.4
Max		331.75	105.55	51.1
Max, minor nodes incl.		332.52	105.55	51.1

16.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	266.0	432.0
Water	515.3	243.8
Total	781.4	675.8

Considered as passive side	Right
Maximum passive effective resistance	478.75 kN
Mobilized passive effective resistance	431.97 kN
Percentage mobilized resistance	90.2 %
Position single support	0.10 m
Maximum passive moment	4194.74 kNm
Mobilized passive moment	3710.14 kNm
Percentage mobilized moment	88.4 %

16.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	105.55	Elastic	Right	Strut

17 Step 6.5 Stage 2: CPT 3 ontgraven en gebruiksfase

17.1 General Input Data

Passive side:

D-Sheet Piling determined

17.2 Input Data Left

17.2.1 Calculation Method

Calculation method: C, phi, delta

17.2.2 Water Level

Water level: -0.80 [m]

17.2.3 Surface

X [m]	Y [m]
0.00	0.00
7.20	0.30
9.80	1.39
13.00	1.50

17.3 Input Data Right

17.3.1 Calculation Method

Calculation method: C, phi, delta

17.3.2 Water Level

Water level: -3.70 [m]

17.3.3 Surface

X [m]	Y [m]
0.00	-3.20

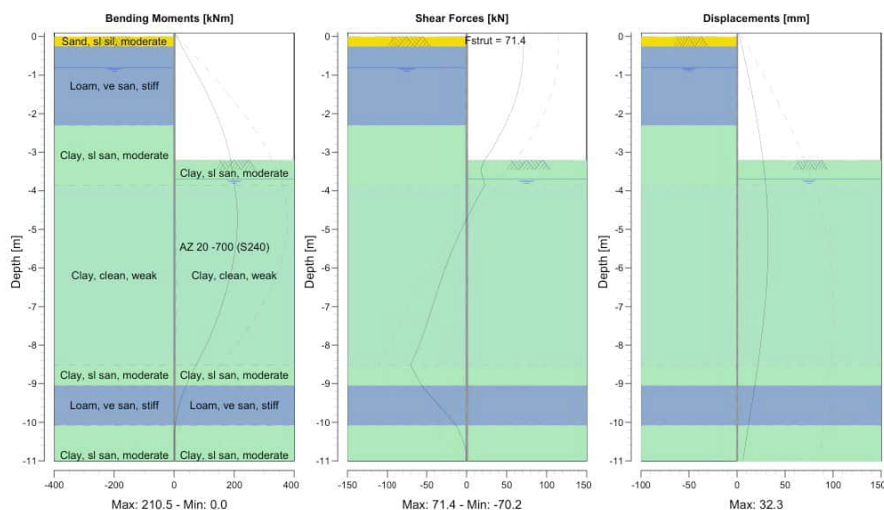
17.4 Calculation Results

Number of iterations: 4

17.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 3 ontgraven en gebruiksfase

Step 6.5 - Partial factor set: RC 2



17.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	71.36	1.8
1	0.00	7.14	71.36	2.7
2	0.00	7.14	71.36	2.7
2	-0.25	24.96	71.18	5.0
3	-0.25	24.96	71.17	5.0
3	-0.80	63.72	69.46	9.9
4	-0.80	63.72	69.46	9.9
4	-1.30	97.58	65.46	14.1
5	-1.30	97.58	65.46	14.1
5	-1.80	128.65	58.25	18.1
6	-1.80	128.65	58.25	18.1
6	-2.30	155.24	47.56	21.7
7	-2.30	155.24	47.56	21.7
7	-2.75	174.23	36.44	24.6
8	-2.75	174.23	36.44	24.6
8	-3.20	187.61	22.61	27.0
9	-3.20	187.61	22.60	27.0
9	-3.70	197.39	21.25	29.2
10	-3.70	197.39	21.25	29.2
10	-3.86	200.89	22.65	29.8
11	-3.86	200.89	22.65	29.8
11	-4.38	208.96	8.74	31.3
12	-4.38	208.96	8.74	31.3
12	-4.90	210.14	-3.99	32.1
13	-4.90	210.14	-3.99	32.1
13	-5.41	205.05	-15.46	32.3
14	-5.41	205.05	-15.46	32.3
14	-5.93	194.37	-25.57	31.8
15	-5.93	194.37	-25.57	31.8
15	-6.45	178.91	-34.07	30.8
16	-6.45	178.91	-34.07	30.8

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-6.97	159.13	-42.30	29.1
17	-6.97	159.13	-42.30	29.1
17	-7.48	135.10	-50.52	27.0
18	-7.48	135.10	-50.52	27.0
18	-8.00	106.73	-59.10	24.5
19	-8.00	106.73	-59.10	24.5
19	-8.52	73.29	-70.15	21.6
20	-8.52	73.29	-70.18	21.6
20	-9.04	40.34	-56.46	18.5
21	-9.04	40.34	-56.54	18.5
21	-9.56	16.57	-34.69	15.3
22	-9.56	16.57	-34.77	15.3
22	-10.08	4.17	-13.21	12.0
23	-10.08	4.17	-13.18	12.0
23	-10.54	0.56	-3.49	9.1
24	-10.54	0.56	-3.48	9.1
24	-11.00	0.00	0.00	6.1
Max		210.14	71.36	32.3
Max, minor nodes incl.		210.45	71.36	32.3

17.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	227.8	405.6
Water	510.3	261.4
Total	738.2	667.0

Considered as passive side	Right
Maximum passive effective resistance	681.48 kN
Mobilized passive effective resistance	405.57 kN
Percentage mobilized resistance	59.5 %
Position single support	0.10 m
Maximum passive moment	5856.45 kNm
Mobilized passive moment	3273.91 kNm
Percentage mobilized moment	55.9 %

17.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	71.36	Elastic	Right	Strut

End of Report

Report for D-Sheet Piling 20.2

Design of Diaphragm and Sheet Pile Walls
Developed by Deltares



Company: Royal HaskoningDHV

Date of report: 03-Jun-24

Time of report: 17:22:39

Report with version: 20.2.1.30962

Date of calculation: 30-May-24

Time of calculation: 16:37:21

Calculated with version: 20.2.1.30962

File name: Ontvangstkuip lengtedoorsnede

Project identification: Duikerkruising Strijenseweg 's Gravendeel
Ontvangstkuip lengtedoorsnede
CPT 1

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

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2 Summary

2.1 Overview per Stage and Test

Stage nr.	Verification type	Displacement [mm]	Moment [kNm]	Shear force [kN]	Mob. perc. moment [%]	Mob. perc. resistance [%]	Status
1	EC7(NL)-Step 6.1		8.24	-5.53	20.2	20.9	
1	EC7(NL)-Step 6.2		3.96	-3.84	20.2	21.0	
1	EC7(NL)-Step 6.3		10.03	-6.79	20.7	21.4	
1	EC7(NL)-Step 6.4		4.79	-4.73	20.7	21.5	
1	EC7(NL)-Step 6.5	0.8	7.40	-5.44	14.7	15.2	
1	EC7(NL)-Step 6.5 x 1.200		8.88	-6.52			
2	EC7(NL)-Step 6.1		147.10	63.34	78.6	80.4	
2	EC7(NL)-Step 6.2		133.65	59.25	78.7	81.6	
2	EC7(NL)-Step 6.3		137.70	60.50	71.9	73.7	
2	EC7(NL)-Step 6.4		117.69	54.22	72.2	75.6	
2	EC7(NL)-Step 6.5	9.4	80.65	40.05	43.9	46.3	
2	EC7(NL)-Step 6.5 x 1.200		96.78	48.06			
Max		9.4	147.10	63.34	78.7	81.6	

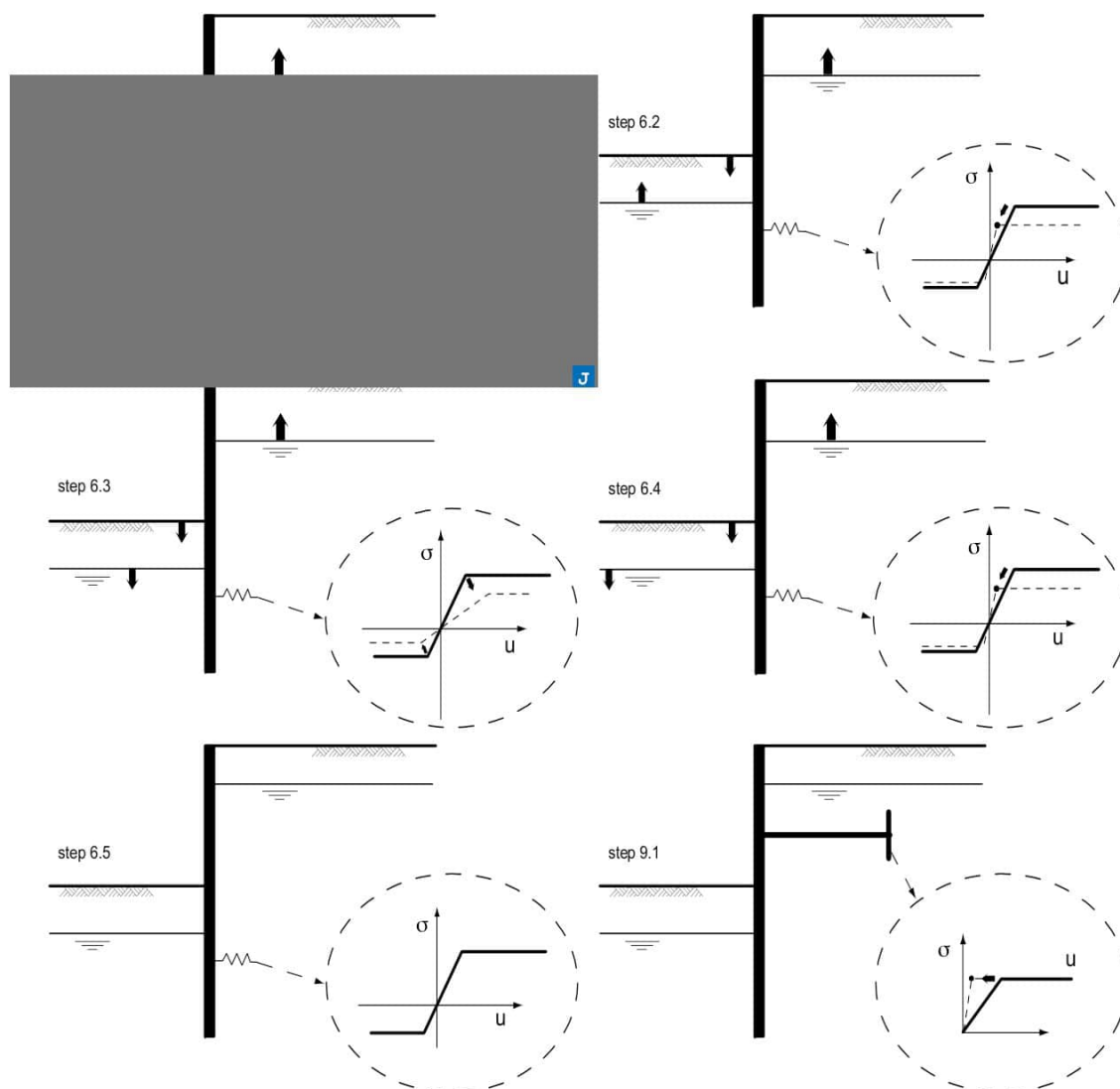
2.2 Anchors and Struts

Stage nr.	Verification type	Anchor/strut Stempel		
		Force [kN]	State	Status
1	EC7(NL)-Step 6.1	1.94	Elastic	
1	EC7(NL)-Step 6.2	-		
1	EC7(NL)-Step 6.3	2.44	Elastic	
1	EC7(NL)-Step 6.4	-		
1	EC7(NL)-Step 6.5 x 1.200	1.66	Elastic	
2	EC7(NL)-Step 6.1	63.34	Elastic	
2	EC7(NL)-Step 6.2	59.25	Elastic	
2	EC7(NL)-Step 6.3	60.50	Elastic	
2	EC7(NL)-Step 6.4	54.23	Elastic	
2	EC7(NL)-Step 6.5 x 1.200	48.07	Elastic	
Max		63.34		

2.3 Overall Stability per Stage

Stage name	Stability factor [-]
CPT 1 aanbrengen damwanden en ringgordin	6.89
CPT 1 ontgraven en gebruiksfase	1.43

2.4 CUR Verification Steps



3 Input Data for all Stages

3.1 General Input Data

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

Model	Sheet piling
Check vertical balance	No
Number of construction stages	2
Unit weight of water	9.81 kN/m ³
Number of curves for spring characteristics	3
Unloading curve on spring characteristic	No
Elastic calculation	Yes

3.2 Sheet Piling Properties

Length	8.10 m
Level top side	0.10 m
Number of sections	1

3.2.1 General Properties

Section name	From [m]	To [m]	Material type	Acting width [m]
AZ 14-700 (S240)	-8.00	0.10	Steel	1.00

3.2.2 Stiffness EI (elastic behaviour)

Section name	Elastic stiffness EI [kNm ² /m']	Red. factor on EI [-]	Corrected elastic stiffness EI [kNm ²]	Note to reduction factor
AZ 14-700 (S240)	4.6599E+04	1.00	4.6599E+04	

3.2.3 Maximum Allowable Moments

Section name	 [kNm/m']	Modification factor [-]	Material factor [-]	Red. factor allow. moment [-]	 [kNm]
AZ 14-700 (S240)	337.00	1.00	1.00	1.00	337.00

3.3 Calculation Options

First stage represents initial situation	No
Calculation refinement	Coarse
Reduce delta(s) according to CUR	Yes
Verification	EC7 NA NL - method A: Partial factors (design values) in all stages. Eurocode 7 using the factors as described in the National Annex of the Netherlands. It is basically design approach III.
Multiplication factor for anchor stiffness	1.000
Used partial factor set	RC 2
Factors on loads - Geotechnical loads	
- Permanent load, unfavourable	1.000
- Permanent load, favourable	1.000
- Variable load, unfavourable	1.100
- Variable load, favourable	0.000
Factors on loads - Constructive loads	
- Permanent load, unfavourable	1.350
- Permanent load, favourable	0.900

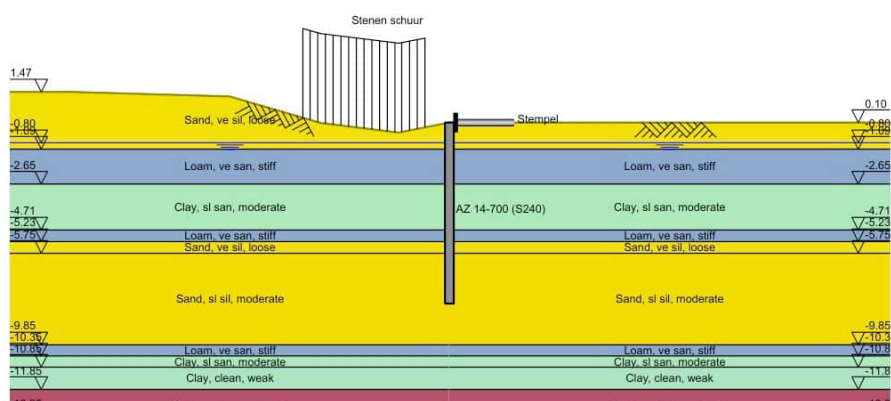
- Variable load, unfavourable	1.500
- Variable load, favourable	0.000
Material factors	
- Cohesion	1.250
- Tangent phi	1.175
- Delta (wall friction angle)*	1.175
- Modulus of low representative subgrade reaction	1.300
Geometry modification	
- Increase retaining height	10.00 %
- Maximum increase retaining height	0.50 m
- Reduction in phreatic line on passive side **	0.25 m
- Raise in phreatic line on passive side **	0.25 m
- Raise in phreatic line on active side	0.05 m
Factors on representative values	
- Partial factor on M, D and Pmax	1.200
Overall stability factors	
- Cohesion	1.450
- Tangent phi	1.250
- Factor on unit weight soil	1.000

* For delta (wall friction angle), the input value of tangent phi is used

** This modification of the phreatic level does not apply when the sheet piling is completely submerged.

4 Outline Stage 1: CPT 1 aanbrengen damwanden en ringgordin

Outline - Stage 1: CPT 1 aanbrengen damwanden en ringgordin

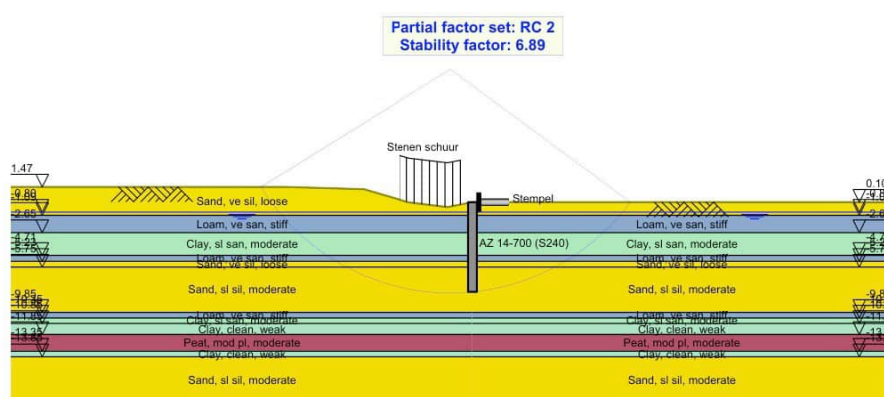


5 Overall Stability Stage 1: CPT 1 aanbrengen damwanden en ringgordin

Stability factor : 6.89

5.1 Overall Stability

Overall Stability - Stage 1: CPT 1 aanbrengen damwanden en ringgordin



6 Step 6.1 Stage 1: CPT 1 aanbrengen damwanden en ringgordin

6.1 General Input Data

Passive side:

D-Sheet Piling determined

6.2 Input Data Left

6.2.1 Calculation Method

Calculation method: C, phi, delta

6.2.2 Water Level

Water level: -0.75 [m]

6.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

6.3 Input Data Right

6.3.1 Calculation Method

Calculation method: C, phi, delta

6.3.2 Water Level

Water level: -0.55 [m]

6.3.3 Surface

X [m]	Y [m]
0.00	0.10

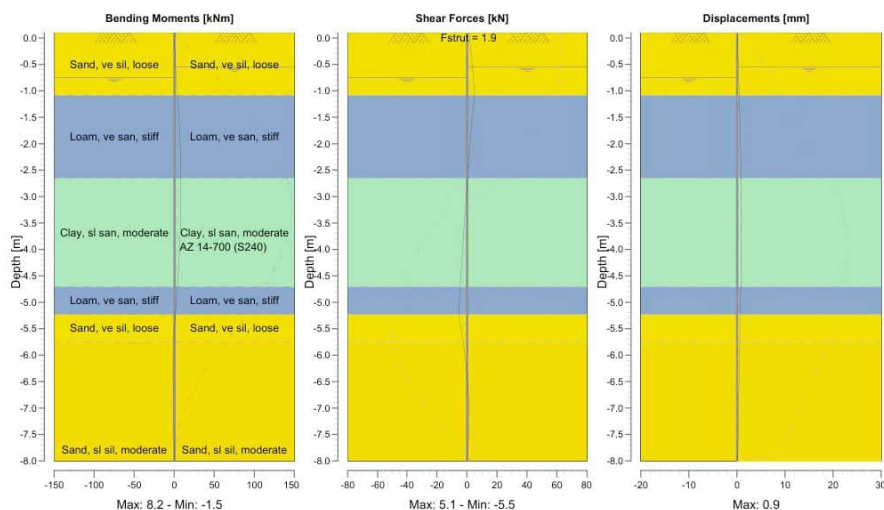
6.4 Calculation Results

Number of iterations: 2

6.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgordin

Step 6.1 - Partial factor set: RC 2



6.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	1.94	0.0
1	-0.18	0.59	2.36	0.1
2	-0.18	0.59	2.36	0.1
2	-0.47	1.40	3.49	0.2
3	-0.47	1.40	3.49	0.2
3	-0.75	2.49	4.23	0.3
4	-0.75	2.49	4.23	0.3
4	-0.80	2.71	4.36	0.4
5	-0.80	2.71	4.36	0.4
5	-1.05	3.87	4.96	0.5
6	-1.05	3.87	4.96	0.5
6	-1.09	4.07	5.07	0.5
7	-1.09	4.07	5.07	0.5
7	-1.48	5.81	3.71	0.6
8	-1.48	5.81	3.71	0.6
8	-1.87	7.03	2.42	0.7
9	-1.87	7.03	2.42	0.7
9	-2.26	7.78	1.37	0.8
10	-2.26	7.78	1.37	0.8
10	-2.65	8.18	0.59	0.9
11	-2.65	8.18	0.59	0.9
11	-2.92	8.24	-0.22	0.9
12	-2.92	8.24	-0.22	0.9
12	-3.20	8.08	-0.96	0.9
13	-3.20	8.08	-0.96	0.9
13	-3.53	7.63	-1.77	0.9
14	-3.53	7.63	-1.77	0.9
14	-3.70	7.30	-2.16	0.9
15	-3.70	7.30	-2.16	0.9
15	-3.95	6.69	-2.74	0.9
16	-3.95	6.69	-2.74	0.9

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.33	5.49	-3.64	0.9
17	-4.33	5.49	-3.64	0.9
17	-4.71	3.93	-4.63	0.8
18	-4.71	3.93	-4.63	0.8
18	-4.97	2.68	-5.03	0.7
19	-4.97	2.68	-5.03	0.7
19	-5.23	1.31	-5.53	0.7
20	-5.23	1.31	-5.53	0.7
20	-5.49	0.08	-4.02	0.6
21	-5.49	0.08	-4.02	0.6
21	-5.75	-0.80	-2.79	0.6
22	-5.75	-0.80	-2.77	0.6
22	-6.13	-1.45	-0.84	0.5
23	-6.13	-1.45	-0.82	0.5
23	-6.50	-1.49	0.49	0.4
24	-6.50	-1.49	0.50	0.4
24	-6.88	-1.15	1.20	0.4
25	-6.88	-1.15	1.21	0.4
25	-7.25	-0.65	1.35	0.3
26	-7.25	-0.65	1.35	0.3
26	-7.63	-0.20	0.95	0.2
27	-7.63	-0.20	0.94	0.2
27	-8.00	0.00	0.01	0.2
Max		8.24	-5.53	0.9
Max, minor nodes incl.		8.24	-5.53	0.9

6.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	259.2	242.8
Water	257.8	272.2
Total	517.0	515.0

Considered as passive side	Right
Maximum passive effective resistance	1161.00 kN
Mobilized passive effective resistance	242.79 kN
Percentage mobilized resistance	20.9 %
Position single support	0.10 m
Maximum passive moment	6139.80 kNm
Mobilized passive moment	1242.53 kNm
Percentage mobilized moment	20.2 %

6.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	1.94	Elastic	Right	Strut

7 Step 6.2 Stage 1: CPT 1 aanbrengen damwanden en ringgordin

7.1 General Input Data

Passive side:

D-Sheet Piling determined

7.2 Input Data Left

7.2.1 Calculation Method

Calculation method: C, phi, delta

7.2.2 Water Level

Water level: -0.75 [m]

7.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

7.3 Input Data Right

7.3.1 Calculation Method

Calculation method: C, phi, delta

7.3.2 Water Level

Water level: -0.55 [m]

7.3.3 Surface

X [m]	Y [m]
0.00	0.10

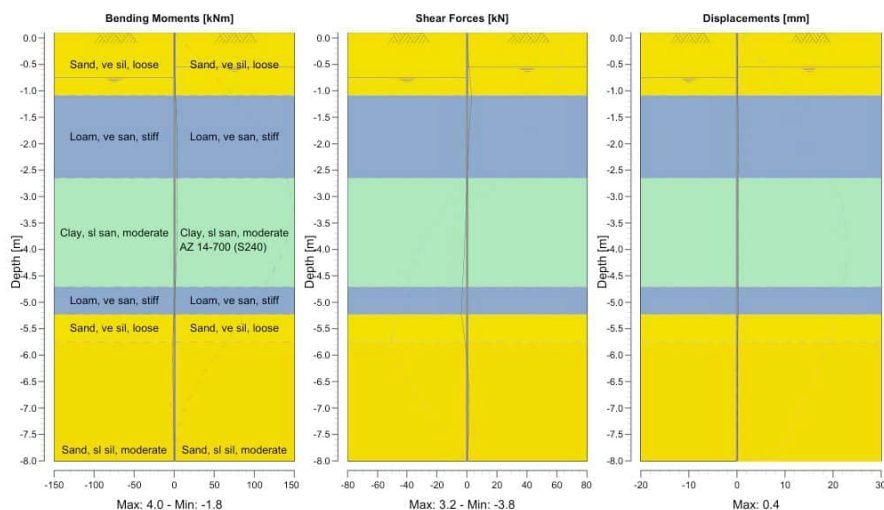
7.4 Calculation Results

Number of iterations: 4

7.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgordin

Step 6.2 - Partial factor set: RC 2



7.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.0
1	-0.18	0.02	0.30	0.0
2	-0.18	0.02	0.30	0.0
2	-0.47	0.23	1.31	0.1
3	-0.47	0.23	1.31	0.1
3	-0.75	0.71	2.10	0.1
4	-0.75	0.71	2.10	0.1
4	-0.80	0.82	2.26	0.1
5	-0.80	0.82	2.26	0.1
5	-1.05	1.48	3.07	0.2
6	-1.05	1.48	3.07	0.2
6	-1.09	1.60	3.22	0.2
7	-1.09	1.60	3.22	0.2
7	-1.48	2.67	2.13	0.2
8	-1.48	2.67	2.13	0.2
8	-1.87	3.34	1.21	0.3
9	-1.87	3.34	1.21	0.3
9	-2.26	3.71	0.62	0.3
10	-2.26	3.71	0.62	0.3
10	-2.65	3.91	0.37	0.3
11	-2.65	3.91	0.37	0.3
11	-2.92	3.95	-0.13	0.4
12	-2.92	3.95	-0.13	0.4
12	-3.20	3.86	-0.55	0.4
13	-3.20	3.86	-0.55	0.4
13	-3.53	3.61	-1.01	0.4
14	-3.53	3.61	-1.01	0.4
14	-3.70	3.42	-1.24	0.4
15	-3.70	3.42	-1.24	0.4
15	-3.95	3.07	-1.59	0.3
16	-3.95	3.07	-1.59	0.3

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.33	2.36	-2.22	0.3
17	-4.33	2.36	-2.22	0.3
17	-4.71	1.38	-3.03	0.3
18	-4.71	1.38	-3.03	0.3
18	-4.97	0.56	-3.36	0.3
19	-4.97	0.56	-3.36	0.3
19	-5.23	-0.38	-3.84	0.2
20	-5.23	-0.38	-3.84	0.2
20	-5.49	-1.18	-2.41	0.2
21	-5.49	-1.18	-2.41	0.2
21	-5.75	-1.66	-1.35	0.2
22	-5.75	-1.66	-1.34	0.2
22	-6.13	-1.84	0.19	0.2
23	-6.13	-1.84	0.21	0.2
23	-6.50	-1.58	1.07	0.1
24	-6.50	-1.58	1.08	0.1
24	-6.88	-1.10	1.40	0.1
25	-6.88	-1.10	1.40	0.1
25	-7.25	-0.58	1.29	0.1
26	-7.25	-0.58	1.29	0.1
26	-7.63	-0.17	0.82	0.1
27	-7.63	-0.17	0.81	0.1
27	-8.00	0.00	0.01	0.1
Max		3.95	-3.84	0.4
Max, minor nodes incl.		3.96	-3.84	0.4

7.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	258.1	243.7
Water	257.8	272.2
Total	516.0	516.0

Considered as passive side	Right
Maximum passive effective resistance	1161.00 kN
Mobilized passive effective resistance	243.71 kN
Percentage mobilized resistance	21.0 %
Position single support	0.10 m
Maximum passive moment	6139.80 kNm
Mobilized passive moment	1242.58 kNm
Percentage mobilized moment	20.2 %

7.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Right	Strut

8 Step 6.3 Stage 1: CPT 1 aanbrengen damwanden en ringgordin

8.1 General Input Data

Passive side:

D-Sheet Piling determined

8.2 Input Data Left

8.2.1 Calculation Method

Calculation method: C, phi, delta

8.2.2 Water Level

Water level: -0.75 [m]

8.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

8.3 Input Data Right

8.3.1 Calculation Method

Calculation method: C, phi, delta

8.3.2 Water Level

Water level: -1.05 [m]

8.3.3 Surface

X [m]	Y [m]
0.00	0.10

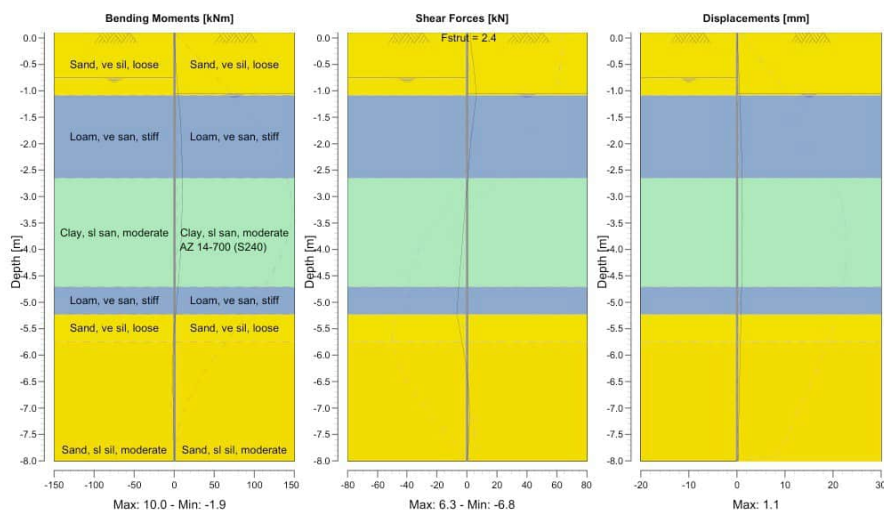
8.4 Calculation Results

Number of iterations: 2

8.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgordin

Step 6.3 - Partial factor set: RC 2



8.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	2.44	0.0
1	-0.18	0.74	2.91	0.2
2	-0.18	0.74	2.91	0.2
2	-0.47	1.73	4.23	0.3
3	-0.47	1.73	4.23	0.3
3	-0.75	3.08	5.31	0.4
4	-0.75	3.08	5.31	0.4
4	-0.80	3.35	5.49	0.5
5	-0.80	3.35	5.49	0.5
5	-1.05	4.82	6.23	0.6
6	-1.05	4.82	6.23	0.6
6	-1.09	5.07	6.34	0.6
7	-1.09	5.07	6.34	0.6
7	-1.48	7.21	4.53	0.7
8	-1.48	7.21	4.53	0.7
8	-1.87	8.67	2.88	0.9
9	-1.87	8.67	2.88	0.9
9	-2.26	9.55	1.56	1.0
10	-2.26	9.55	1.56	1.0
10	-2.65	9.98	0.57	1.1
11	-2.65	9.98	0.57	1.1
11	-2.92	10.01	-0.37	1.1
12	-2.92	10.01	-0.37	1.1
12	-3.20	9.80	-1.22	1.1
13	-3.20	9.80	-1.22	1.1
13	-3.53	9.25	-2.15	1.1
14	-3.53	9.25	-2.15	1.1
14	-3.70	8.85	-2.61	1.1
15	-3.70	8.85	-2.61	1.1
15	-3.95	8.11	-3.29	1.1
16	-3.95	8.11	-3.29	1.1

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.33	6.67	-4.36	1.1
17	-4.33	6.67	-4.36	1.1
17	-4.71	4.80	-5.54	1.0
18	-4.71	4.80	-5.54	1.0
18	-4.97	3.30	-6.10	0.9
19	-4.97	3.30	-6.10	0.9
19	-5.23	1.62	-6.79	0.9
20	-5.23	1.62	-6.79	0.9
20	-5.49	0.11	-4.93	0.8
21	-5.49	0.11	-4.93	0.8
21	-5.75	-0.96	-3.40	0.7
22	-5.75	-0.96	-3.39	0.7
22	-6.13	-1.76	-1.02	0.6
23	-6.13	-1.76	-1.00	0.6
23	-6.50	-1.81	0.59	0.6
24	-6.50	-1.81	0.61	0.6
24	-6.88	-1.39	1.46	0.5
25	-6.88	-1.39	1.47	0.5
25	-7.25	-0.79	1.64	0.4
26	-7.25	-0.79	1.64	0.4
26	-7.63	-0.24	1.15	0.3
27	-7.63	-0.24	1.14	0.3
27	-8.00	0.00	0.01	0.2
Max		10.01	-6.79	1.1
Max, minor nodes incl.		10.03	-6.79	1.1

8.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	251.5	269.9
Water	257.8	236.9
Total	509.3	506.8

Considered as passive side	Right
Maximum passive effective resistance	1263.10 kN
Mobilized passive effective resistance	269.92 kN
Percentage mobilized resistance	21.4 %
Position single support	0.10 m
Maximum passive moment	6601.78 kNm
Mobilized passive moment	1365.17 kNm
Percentage mobilized moment	20.7 %

8.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	2.44	Elastic	Right	Strut

9 Step 6.4 Stage 1: CPT 1 aanbrengen damwanden en ringgordin

9.1 General Input Data

Passive side:

D-Sheet Piling determined

9.2 Input Data Left

9.2.1 Calculation Method

Calculation method: C, phi, delta

9.2.2 Water Level

Water level: -0.75 [m]

9.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

9.3 Input Data Right

9.3.1 Calculation Method

Calculation method: C, phi, delta

9.3.2 Water Level

Water level: -1.05 [m]

9.3.3 Surface

X [m]	Y [m]
0.00	0.10

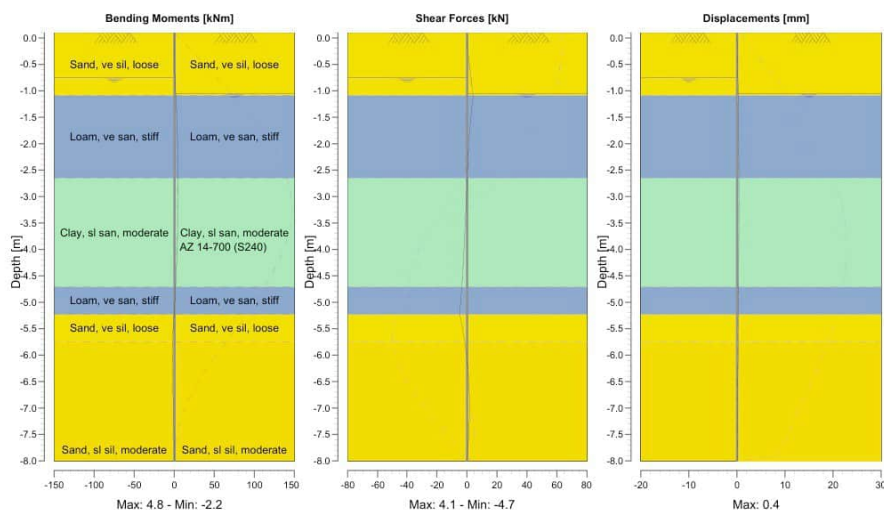
9.4 Calculation Results

Number of iterations: 4

9.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgordin

Step 6.4 - Partial factor set: RC 2



9.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	0.00	0.0
1	-0.18	0.02	0.32	0.0
2	-0.18	0.02	0.33	0.0
2	-0.47	0.27	1.57	0.1
3	-0.47	0.27	1.57	0.1
3	-0.75	0.87	2.72	0.2
4	-0.75	0.87	2.72	0.2
4	-0.80	1.01	2.93	0.2
5	-0.80	1.01	2.93	0.2
5	-1.05	1.87	3.92	0.2
6	-1.05	1.87	3.92	0.2
6	-1.09	2.03	4.09	0.2
7	-1.09	2.03	4.09	0.2
7	-1.48	3.35	2.60	0.3
8	-1.48	3.35	2.60	0.3
8	-1.87	4.15	1.42	0.4
9	-1.87	4.15	1.42	0.4
9	-2.26	4.56	0.66	0.4
10	-2.26	4.56	0.66	0.4
10	-2.65	4.76	0.31	0.4
11	-2.65	4.76	0.31	0.4
11	-2.92	4.78	-0.24	0.4
12	-2.92	4.78	-0.24	0.4
12	-3.20	4.65	-0.71	0.4
13	-3.20	4.65	-0.71	0.4
13	-3.53	4.34	-1.21	0.4
14	-3.53	4.34	-1.21	0.4
14	-3.70	4.12	-1.47	0.4
15	-3.70	4.12	-1.47	0.4
15	-3.95	3.70	-1.88	0.4
16	-3.95	3.70	-1.88	0.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.33	2.86	-2.62	0.4
17	-4.33	2.86	-2.62	0.4
17	-4.71	1.70	-3.59	0.4
18	-4.71	1.70	-3.59	0.4
18	-4.97	0.71	-4.07	0.3
19	-4.97	0.71	-4.07	0.3
19	-5.23	-0.43	-4.73	0.3
20	-5.23	-0.43	-4.73	0.3
20	-5.49	-1.42	-2.97	0.3
21	-5.49	-1.42	-2.97	0.3
21	-5.75	-2.01	-1.66	0.2
22	-5.75	-2.01	-1.64	0.2
22	-6.13	-2.24	0.23	0.2
23	-6.13	-2.24	0.25	0.2
23	-6.50	-1.92	1.30	0.2
24	-6.50	-1.92	1.31	0.2
24	-6.88	-1.33	1.70	0.1
25	-6.88	-1.33	1.71	0.1
25	-7.25	-0.70	1.58	0.1
26	-7.25	-0.70	1.57	0.1
26	-7.63	-0.20	1.00	0.1
27	-7.63	-0.20	0.99	0.1
27	-8.00	0.00	0.01	0.1
Max		4.78	-4.73	0.4
Max, minor nodes incl.		4.79	-4.73	0.4

9.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	250.2	271.1
Water	257.8	236.9
Total	508.0	508.0

Considered as passive side	Right
Maximum passive effective resistance	1263.10 kN
Mobilized passive effective resistance	271.05 kN
Percentage mobilized resistance	21.5 %
Position single support	0.10 m
Maximum passive moment	6601.78 kNm
Mobilized passive moment	1365.22 kNm
Percentage mobilized moment	20.7 %

9.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	0.00	Tension	Right	Strut

10 Step 6.5 Stage 1: CPT 1 aanbrengen damwanden en ringgordin

10.1 General Input Data

Passive side:

D-Sheet Piling determined

10.2 Input Data Left

10.2.1 Calculation Method

Calculation method: C, phi, delta

10.2.2 Water Level

Water level: -0.80 [m]

10.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

10.3 Input Data Right

10.3.1 Calculation Method

Calculation method: C, phi, delta

10.3.2 Water Level

Water level: -0.80 [m]

10.3.3 Surface

X [m]	Y [m]
0.00	0.10

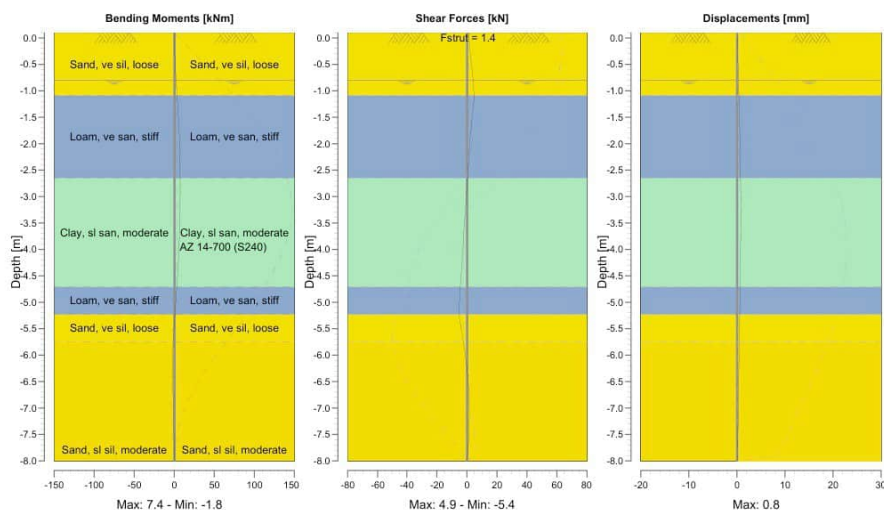
10.4 Calculation Results

Number of iterations: 2

10.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgordin

Step 6.5 - Partial factor set: RC 2



10.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	1.38	0.0
1	-0.20	0.46	1.87	0.1
2	-0.20	0.46	1.87	0.1
2	-0.50	1.20	3.16	0.2
3	-0.50	1.20	3.16	0.2
3	-0.80	2.28	4.06	0.3
4	-0.80	2.28	4.06	0.3
4	-1.09	3.57	4.89	0.4
5	-1.09	3.57	4.89	0.4
5	-1.48	5.23	3.48	0.5
6	-1.48	5.23	3.48	0.5
6	-1.87	6.35	2.19	0.6
7	-1.87	6.35	2.19	0.6
7	-2.26	7.02	1.18	0.7
8	-2.26	7.02	1.18	0.7
8	-2.65	7.36	0.48	0.8
9	-2.65	7.36	0.48	0.8
9	-2.92	7.39	-0.28	0.8
10	-2.92	7.39	-0.28	0.8
10	-3.20	7.22	-0.95	0.8
11	-3.20	7.22	-0.95	0.8
11	-3.45	6.92	-1.52	0.8
12	-3.45	6.92	-1.52	0.8
12	-3.70	6.48	-2.06	0.8
13	-3.70	6.48	-2.06	0.8
13	-4.04	5.67	-2.79	0.8
14	-4.04	5.67	-2.79	0.8
14	-4.37	4.60	-3.58	0.7
15	-4.37	4.60	-3.58	0.7
15	-4.71	3.26	-4.46	0.7
16	-4.71	3.26	-4.46	0.7

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.97	2.05	-4.89	0.6
17	-4.97	2.05	-4.89	0.6
17	-5.23	0.71	-5.44	0.6
18	-5.23	0.71	-5.44	0.6
18	-5.49	-0.48	-3.81	0.5
19	-5.49	-0.48	-3.81	0.5
19	-5.75	-1.29	-2.50	0.5
20	-5.75	-1.29	-2.50	0.5
20	-6.13	-1.82	-0.50	0.4
21	-6.13	-1.82	-0.50	0.4
21	-6.50	-1.74	0.80	0.4
22	-6.50	-1.74	0.80	0.4
22	-6.88	-1.29	1.46	0.3
23	-6.88	-1.29	1.46	0.3
23	-7.25	-0.71	1.52	0.3
24	-7.25	-0.71	1.52	0.3
24	-7.63	-0.21	1.03	0.2
25	-7.63	-0.21	1.03	0.2
25	-8.00	0.00	0.00	0.2
Max		7.39	-5.44	0.8
Max, minor nodes incl.		7.40	-5.44	0.8

10.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	238.4	237.0
Water	254.3	254.3
Total	492.7	491.3

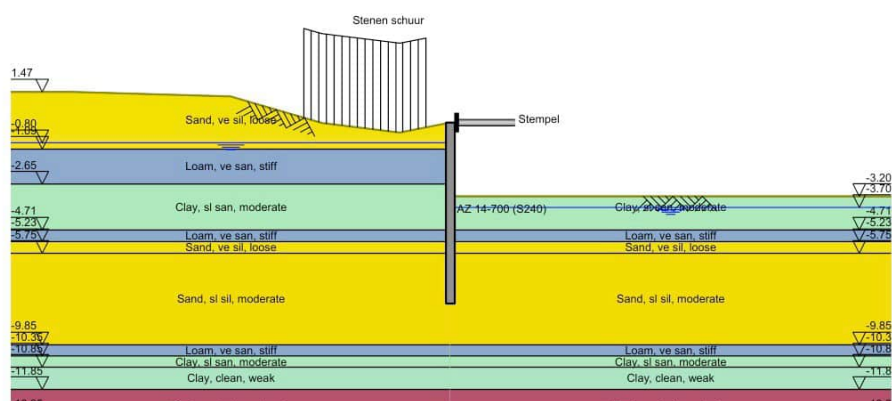
Considered as passive side	Right
Maximum passive effective resistance	1556.20 kN
Mobilized passive effective resistance	236.99 kN
Percentage mobilized resistance	15.2 %
Position single support	0.10 m
Maximum passive moment	8185.53 kNm
Mobilized passive moment	1199.36 kNm
Percentage mobilized moment	14.7 %

10.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	1.38	Elastic	Right	Strut

11 Outline Stage 2: CPT 1 ontgraven en gebruiksfase

Outline - Stage 2: CPT 1 ontgraven en gebruiksfase

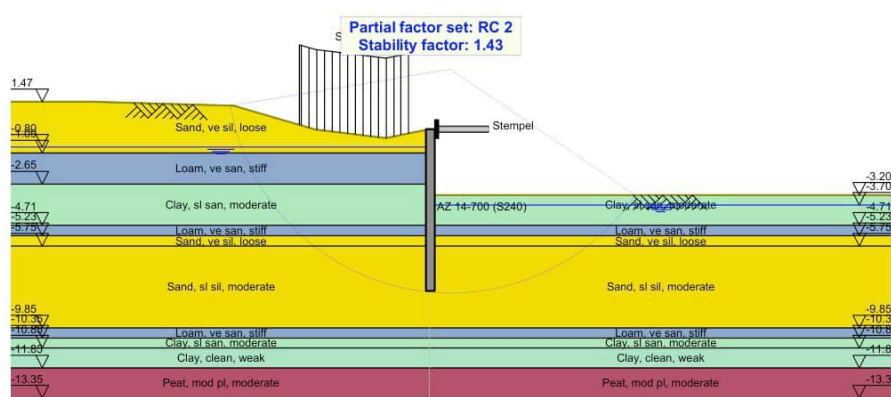


12 Overall Stability Stage 2: CPT 1 ontgraven en gebruiksfase

Stability factor : 1.43

12.1 Overall Stability

Overall Stability - Stage 2: CPT 1 ontgraven en gebruiksfase



13 Step 6.1 Stage 2: CPT 1 ontgraven en gebruiksfase

13.1 General Input Data

Passive side:

D-Sheet Piling determined

13.2 Input Data Left

13.2.1 Calculation Method

Calculation method: C, phi, delta

13.2.2 Water Level

Water level: -0.75 [m]

13.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

13.3 Input Data Right

13.3.1 Calculation Method

Calculation method: C, phi, delta

13.3.2 Water Level

Water level: -3.53 [m]

13.3.3 Surface

X [m]	Y [m]
0.00	-3.53

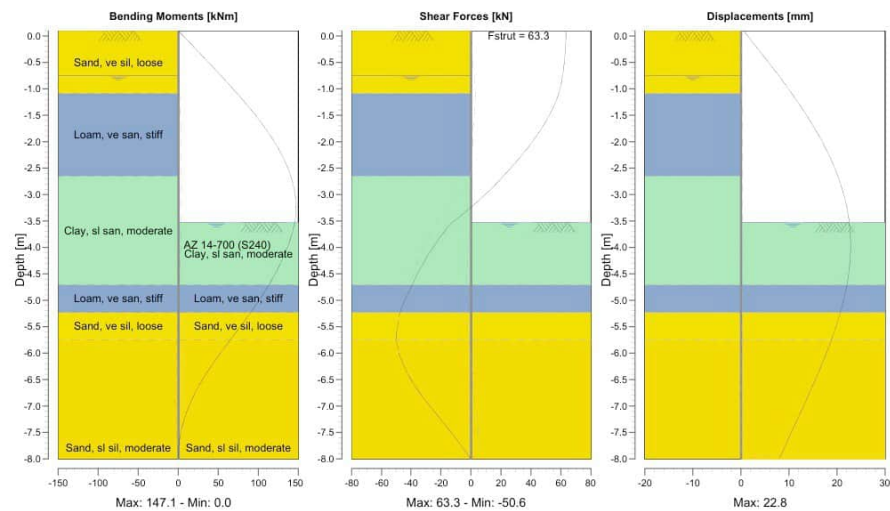
13.4 Calculation Results

Number of iterations: 5

13.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.1 - Partial factor set: RC 2



13.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	63.34	0.5
1	-0.18	17.92	63.09	3.0
2	-0.18	17.92	63.09	3.0
2	-0.47	35.70	62.33	5.5
3	-0.47	35.70	62.33	5.5
3	-0.75	53.20	61.08	7.9
4	-0.75	53.20	61.08	7.9
4	-0.80	56.25	60.80	8.3
5	-0.80	56.25	60.80	8.3
5	-1.05	71.23	58.91	10.3
6	-1.05	71.23	58.91	10.3
6	-1.09	73.58	58.53	10.6
7	-1.09	73.58	58.53	10.6
7	-1.48	95.32	52.56	13.5
8	-1.48	95.32	52.56	13.5
8	-1.87	114.26	44.20	16.1
9	-1.87	114.26	44.20	16.1
9	-2.26	129.55	33.78	18.3
10	-2.26	129.55	33.78	18.3
10	-2.65	140.41	21.58	20.2
11	-2.65	140.41	21.58	20.2
11	-2.92	145.11	12.37	21.2
12	-2.92	145.11	12.37	21.2
12	-3.20	147.07	1.75	21.9
13	-3.20	147.07	1.75	21.9
13	-3.53	145.35	-12.41	22.5
14	-3.53	145.35	-12.41	22.5
14	-3.70	142.75	-17.30	22.7
15	-3.70	142.75	-17.30	22.7
15	-3.95	137.54	-23.79	22.8
16	-3.95	137.54	-23.79	22.8

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.33	126.76	-32.23	22.6
17	-4.33	126.76	-32.23	22.6
17	-4.71	113.11	-39.09	22.1
18	-4.71	113.11	-39.09	22.1
18	-4.97	102.33	-43.67	21.5
19	-4.97	102.33	-43.67	21.5
19	-5.23	90.50	-47.14	20.7
20	-5.23	90.50	-47.14	20.7
20	-5.49	77.90	-49.41	19.8
21	-5.49	77.90	-49.41	19.8
21	-5.75	64.88	-50.60	18.8
22	-5.75	64.88	-50.57	18.8
22	-6.13	46.62	-46.47	17.2
23	-6.13	46.62	-46.40	17.2
23	-6.50	30.37	-39.94	15.5
24	-6.50	30.37	-39.84	15.5
24	-6.88	17.01	-31.04	13.7
25	-6.88	17.01	-30.90	13.7
25	-7.25	7.42	-20.29	11.8
26	-7.25	7.42	-20.15	11.8
26	-7.63	1.82	-9.91	9.9
27	-7.63	1.82	-9.78	9.9
27	-8.00	0.00	-0.06	8.0
Max		147.07	63.34	22.8
Max, minor nodes incl.		147.10	63.34	22.8

13.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	171.0	266.8
Water	257.8	98.0
Total	428.8	364.8

Considered as passive side	Right
Maximum passive effective resistance	331.97 kN
Mobilized passive effective resistance	266.79 kN
Percentage mobilized resistance	80.4 %
Position single support	0.10 m
Maximum passive moment	2176.50 kNm
Mobilized passive moment	1711.59 kNm
Percentage mobilized moment	78.6 %

13.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	63.34	Elastic	Right	Strut

14 Step 6.2 Stage 2: CPT 1 ontgraven en gebruiksfase

14.1 General Input Data

Passive side:

D-Sheet Piling determined

14.2 Input Data Left

14.2.1 Calculation Method

Calculation method: C, phi, delta

14.2.2 Water Level

Water level: -0.75 [m]

14.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

14.3 Input Data Right

14.3.1 Calculation Method

Calculation method: C, phi, delta

14.3.2 Water Level

Water level: -3.53 [m]

14.3.3 Surface

X [m]	Y [m]
0.00	-3.53

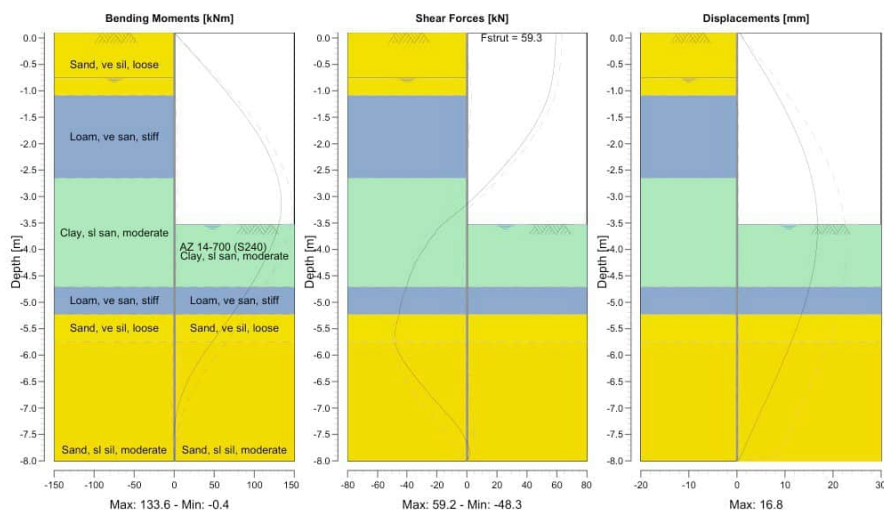
14.4 Calculation Results

Number of iterations: 6

14.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.2 - Partial factor set: RC 2



14.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	59.25	0.5
1	-0.18	16.76	59.00	2.5
2	-0.18	16.76	59.00	2.5
2	-0.47	33.39	58.25	4.4
3	-0.47	33.39	58.25	4.4
3	-0.75	49.72	56.99	6.3
4	-0.75	49.72	56.99	6.3
4	-0.80	52.57	56.71	6.6
5	-0.80	52.57	56.71	6.6
5	-1.05	66.53	54.82	8.2
6	-1.05	66.53	54.82	8.2
6	-1.09	68.71	54.44	8.5
7	-1.09	68.71	54.44	8.5
7	-1.48	88.86	48.47	10.7
8	-1.48	88.86	48.47	10.7
8	-1.87	106.21	40.12	12.7
9	-1.87	106.21	40.12	12.7
9	-2.26	119.90	29.69	14.3
10	-2.26	119.90	29.69	14.3
10	-2.65	129.17	17.49	15.5
11	-2.65	129.17	17.49	15.5
11	-2.92	132.74	8.29	16.2
12	-2.92	132.74	8.29	16.2
12	-3.20	133.58	-2.34	16.6
13	-3.20	133.58	-2.34	16.6
13	-3.53	130.52	-16.50	16.8
14	-3.53	130.52	-16.50	16.8
14	-3.70	127.22	-21.24	16.7
15	-3.70	127.22	-21.24	16.7
15	-3.95	121.03	-27.52	16.6
16	-3.95	121.03	-27.52	16.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.33	108.94	-35.08	16.0
17	-4.33	108.94	-35.08	16.0
17	-4.71	94.51	-40.04	15.1
18	-4.71	94.51	-40.04	15.1
18	-4.97	83.61	-43.45	14.3
19	-4.97	83.61	-43.44	14.3
19	-5.23	72.07	-45.10	13.4
20	-5.23	72.07	-45.10	13.4
20	-5.49	60.01	-47.36	12.4
21	-5.49	60.01	-47.36	12.4
21	-5.75	47.54	-48.29	11.3
22	-5.75	47.54	-48.26	11.3
22	-6.13	30.49	-41.96	9.6
23	-6.13	30.48	-41.84	9.6
23	-6.50	16.60	-31.99	7.8
24	-6.50	16.60	-31.85	7.8
24	-6.88	6.68	-20.92	6.0
25	-6.88	6.68	-20.76	6.0
25	-7.25	1.14	-8.93	4.1
26	-7.25	1.15	-8.77	4.1
26	-7.63	-0.43	-0.54	2.2
27	-7.63	-0.44	-0.41	2.2
27	-8.00	-0.01	-0.21	0.3
Max		133.58	59.25	16.8
Max, minor nodes incl.		133.65	59.25	16.8

14.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	171.4	270.9
Water	257.8	98.0
Total	429.2	369.0

Considered as passive side	Right
Maximum passive effective resistance	331.97 kN
Mobilized passive effective resistance	270.95 kN
Percentage mobilized resistance	81.6 %
Position single support	0.10 m
Maximum passive moment	2176.50 kNm
Mobilized passive moment	1712.38 kNm
Percentage mobilized moment	78.7 %

14.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	59.25	Elastic	Right	Strut

15 Step 6.3 Stage 2: CPT 1 ontgraven en gebruiksfase

15.1 General Input Data

Passive side:

D-Sheet Piling determined

15.2 Input Data Left

15.2.1 Calculation Method

Calculation method: C, phi, delta

15.2.2 Water Level

Water level: -0.75 [m]

15.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

15.3 Input Data Right

15.3.1 Calculation Method

Calculation method: C, phi, delta

15.3.2 Water Level

Water level: -3.95 [m]

15.3.3 Surface

X [m]	Y [m]
0.00	-3.53

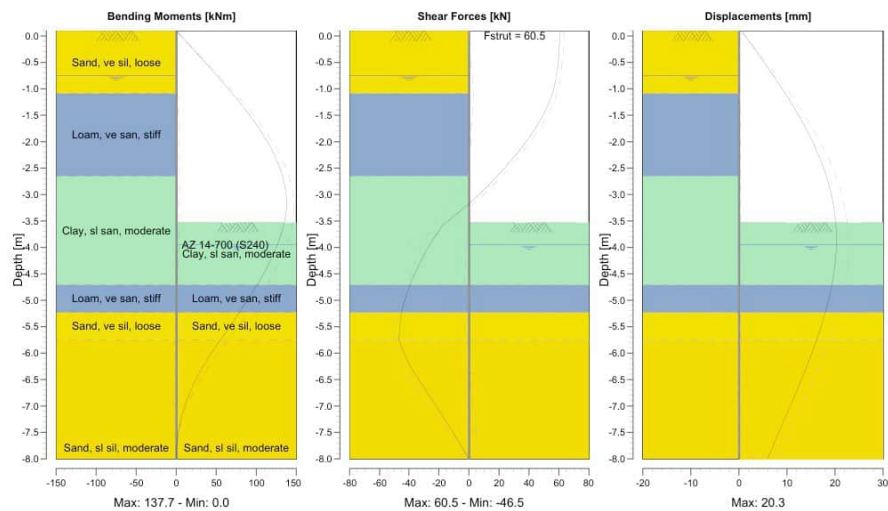
15.4 Calculation Results

Number of iterations: 5

15.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.3 - Partial factor set: RC 2



15.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	60.50	0.5
1	-0.18	17.12	60.25	2.8
2	-0.18	17.12	60.25	2.8
2	-0.47	34.09	59.49	5.0
3	-0.47	34.09	59.49	5.0
3	-0.75	50.79	58.24	7.2
4	-0.75	50.79	58.24	7.2
4	-0.80	53.69	57.96	7.5
5	-0.80	53.69	57.96	7.5
5	-1.05	67.96	56.07	9.4
6	-1.05	67.96	56.07	9.4
6	-1.09	70.20	55.69	9.6
7	-1.09	70.20	55.69	9.6
7	-1.48	90.83	49.72	12.3
8	-1.48	90.83	49.72	12.3
8	-1.87	108.67	41.36	14.6
9	-1.87	108.67	41.36	14.6
9	-2.26	122.85	30.94	16.6
10	-2.26	122.85	30.94	16.6
10	-2.65	132.61	18.74	18.2
11	-2.65	132.61	18.74	18.2
11	-2.92	136.52	9.53	19.0
12	-2.92	136.52	9.53	19.0
12	-3.20	137.70	-1.09	19.7
13	-3.20	137.70	-1.09	19.7
13	-3.53	135.05	-15.25	20.1
14	-3.53	135.05	-15.25	20.1
14	-3.70	131.97	-20.04	20.2
15	-3.70	131.97	-20.04	20.2
15	-3.95	126.15	-25.92	20.3
16	-3.95	126.15	-25.92	20.3

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.33	114.80	-33.30	20.0
17	-4.33	114.80	-33.30	20.0
17	-4.71	100.96	-39.17	19.3
18	-4.71	100.96	-39.17	19.3
18	-4.97	90.32	-42.44	18.7
19	-4.97	90.32	-42.44	18.7
19	-5.23	78.96	-44.94	18.0
20	-5.23	78.96	-44.94	18.0
20	-5.49	67.12	-45.97	17.1
21	-5.49	67.12	-45.97	17.1
21	-5.75	55.07	-46.54	16.1
22	-5.75	55.07	-46.50	16.1
22	-6.13	38.55	-41.27	14.6
23	-6.13	38.55	-41.19	14.6
23	-6.50	24.46	-33.57	13.0
24	-6.50	24.46	-33.45	13.0
24	-6.88	13.57	-24.78	11.3
25	-6.88	13.57	-24.66	11.3
25	-7.25	5.93	-16.18	9.5
26	-7.25	5.93	-16.07	9.5
26	-7.63	1.45	-7.93	7.7
27	-7.63	1.45	-7.83	7.7
27	-8.00	0.00	-0.05	5.9
Max		137.70	60.50	20.3
Max, minor nodes incl.		137.70	60.50	20.3

15.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	171.0	287.2
Water	257.8	80.5
Total	428.8	367.7

Considered as passive side	Right
Maximum passive effective resistance	389.85 kN
Mobilized passive effective resistance	287.24 kN
Percentage mobilized resistance	73.7 %
Position single support	0.10 m
Maximum passive moment	2527.12 kNm
Mobilized passive moment	1816.80 kNm
Percentage mobilized moment	71.9 %

15.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	60.50	Elastic	Right	Strut

16 Step 6.4 Stage 2: CPT 1 ontgraven en gebruiksfase

16.1 General Input Data

Passive side:

D-Sheet Piling determined

16.2 Input Data Left

16.2.1 Calculation Method

Calculation method: C, phi, delta

16.2.2 Water Level

Water level: -0.75 [m]

16.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

16.3 Input Data Right

16.3.1 Calculation Method

Calculation method: C, phi, delta

16.3.2 Water Level

Water level: -3.95 [m]

16.3.3 Surface

X [m]	Y [m]
0.00	-3.53

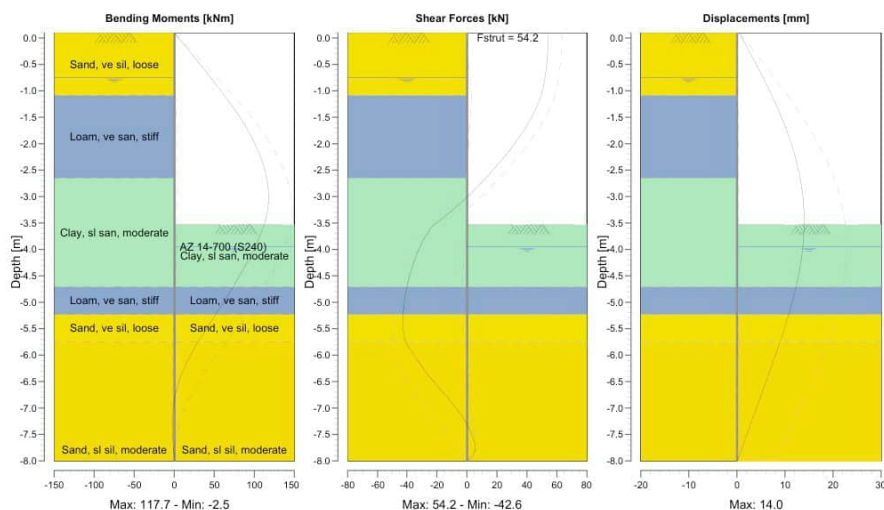
16.4 Calculation Results

Number of iterations: 5

16.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.4 - Partial factor set: RC 2



16.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	54.22	0.4
1	-0.18	15.34	53.97	2.1
2	-0.18	15.34	53.98	2.1
2	-0.47	30.54	53.23	3.8
3	-0.47	30.54	53.23	3.8
3	-0.75	45.46	51.97	5.4
4	-0.75	45.46	51.97	5.4
4	-0.80	48.05	51.69	5.7
5	-0.80	48.05	51.69	5.7
5	-1.05	60.75	49.80	7.1
6	-1.05	60.75	49.80	7.1
6	-1.09	62.74	49.42	7.3
7	-1.09	62.74	49.42	7.3
7	-1.48	80.93	43.45	9.2
8	-1.48	80.93	43.45	9.2
8	-1.87	96.32	35.10	10.8
9	-1.87	96.32	35.10	10.8
9	-2.26	108.05	24.67	12.2
10	-2.26	108.05	24.67	12.2
10	-2.65	115.37	12.47	13.1
11	-2.65	115.37	12.47	13.1
11	-2.92	117.55	3.27	13.6
12	-2.92	117.55	3.27	13.6
12	-3.20	117.02	-7.36	13.9
13	-3.20	117.02	-7.36	13.9
13	-3.53	112.29	-21.52	14.0
14	-3.53	112.29	-21.52	14.0
14	-3.70	108.16	-26.01	13.9
15	-3.70	108.16	-26.01	13.9
15	-3.95	100.91	-31.07	13.7
16	-3.95	100.91	-31.07	13.7

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.33	88.01	-36.27	13.1
17	-4.33	88.01	-36.27	13.1
17	-4.71	73.45	-39.95	12.3
18	-4.71	73.45	-39.95	12.3
18	-4.97	62.82	-41.63	11.6
19	-4.97	62.82	-41.63	11.6
19	-5.23	51.88	-42.36	10.8
20	-5.23	51.88	-42.36	10.8
20	-5.49	40.82	-42.37	9.9
21	-5.49	40.82	-42.37	9.9
21	-5.75	29.94	-41.04	9.0
22	-5.75	29.94	-40.97	9.0
22	-6.13	16.15	-32.37	7.5
23	-6.13	16.15	-32.25	7.5
23	-6.50	5.89	-22.29	6.1
24	-6.50	5.89	-22.14	6.1
24	-6.88	-0.32	-10.92	4.6
25	-6.88	-0.32	-10.75	4.6
25	-7.25	-2.45	-1.26	3.1
26	-7.25	-2.45	-1.16	3.1
26	-7.63	-1.66	4.72	1.6
27	-7.63	-1.66	4.87	1.6
27	-8.00	-0.01	-0.05	0.1
Max		117.55	54.22	14.0
Max, minor nodes incl.		117.69	54.22	14.0

16.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	172.2	294.6
Water	257.8	80.5
Total	430.0	375.0

Considered as passive side	Right
Maximum passive effective resistance	389.85 kN
Mobilized passive effective resistance	294.56 kN
Percentage mobilized resistance	75.6 %
Position single support	0.10 m
Maximum passive moment	2527.12 kNm
Mobilized passive moment	1825.54 kNm
Percentage mobilized moment	72.2 %

16.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	54.23	Elastic	Right	Strut

17 Step 6.5 Stage 2: CPT 1 ontgraven en gebruiksfase

17.1 General Input Data

Passive side:

D-Sheet Piling determined

17.2 Input Data Left

17.2.1 Calculation Method

Calculation method: C, phi, delta

17.2.2 Water Level

Water level: -0.80 [m]

17.2.3 Surface

X [m]	Y [m]
0.00	0.10
2.28	-0.35
5.79	0.08
9.89	1.27
16.94	1.47

17.3 Input Data Right

17.3.1 Calculation Method

Calculation method: C, phi, delta

17.3.2 Water Level

Water level: -3.70 [m]

17.3.3 Surface

X [m]	Y [m]
0.00	-3.20

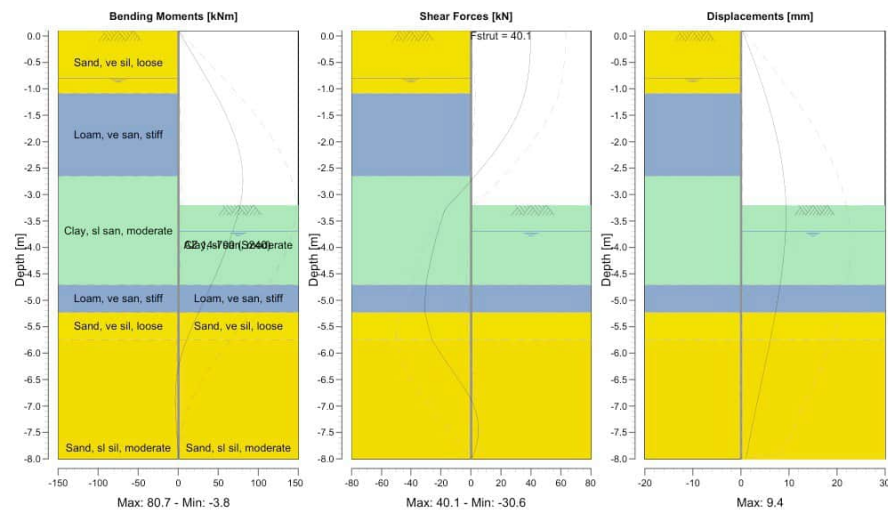
17.4 Calculation Results

Number of iterations: 4

17.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.5 - Partial factor set: RC 2



17.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	40.05	0.3
1	-0.20	11.99	39.81	1.6
2	-0.20	11.99	39.81	1.6
2	-0.50	23.84	39.07	2.8
3	-0.50	23.84	39.07	2.8
3	-0.80	35.39	37.84	3.9
4	-0.80	35.39	37.84	3.9
4	-1.09	46.10	35.88	5.0
5	-1.09	46.10	35.88	5.0
5	-1.48	59.22	31.01	6.3
6	-1.48	59.22	31.02	6.3
6	-1.87	69.92	23.46	7.4
7	-1.87	69.92	23.46	7.4
7	-2.26	77.27	13.88	8.3
8	-2.26	77.27	13.88	8.3
8	-2.65	80.54	2.54	8.9
9	-2.65	80.54	2.54	8.9
9	-2.92	80.14	-5.65	9.2
10	-2.92	80.14	-5.65	9.2
10	-3.20	77.34	-14.88	9.3
11	-3.20	77.34	-14.88	9.3
11	-3.45	72.94	-19.04	9.4
12	-3.45	72.94	-19.04	9.4
12	-3.70	67.78	-21.86	9.3
13	-3.70	67.78	-21.86	9.3
13	-4.04	59.85	-25.00	9.1
14	-4.04	59.85	-25.00	9.1
14	-4.37	50.94	-27.74	8.7
15	-4.37	50.94	-27.74	8.7
15	-4.71	41.21	-29.83	8.2
16	-4.71	41.21	-29.83	8.2

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.97	33.35	-30.52	7.7
17	-4.97	33.35	-30.52	7.7
17	-5.23	25.39	-30.58	7.2
18	-5.23	25.39	-30.58	7.2
18	-5.49	17.72	-28.36	6.7
19	-5.49	17.72	-28.36	6.7
19	-5.75	10.66	-25.91	6.1
20	-5.75	10.66	-25.91	6.1
20	-6.13	2.51	-17.46	5.2
21	-6.13	2.51	-17.46	5.2
21	-6.50	-2.32	-8.20	4.4
22	-6.50	-2.32	-8.18	4.4
22	-6.88	-3.80	-0.08	3.5
23	-6.88	-3.80	-0.06	3.5
23	-7.25	-2.84	4.38	2.7
24	-7.25	-2.84	4.38	2.7
24	-7.63	-1.03	4.48	1.9
25	-7.63	-1.03	4.49	1.9
25	-8.00	0.00	-0.02	1.0
Max		80.54	40.05	9.4
Max, minor nodes incl.		80.65	40.05	9.4

17.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	145.8	269.3
Water	254.3	90.7
Total	400.1	359.9

Considered as passive side	Right
Maximum passive effective resistance	581.07 kN
Mobilized passive effective resistance	269.26 kN
Percentage mobilized resistance	46.3 %
Position single support	0.10 m
Maximum passive moment	3693.94 kNm
Mobilized passive moment	1621.18 kNm
Percentage mobilized moment	43.9 %

17.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
Stempel	0.10	2.100E+08	40.06	Elastic	Right	Strut

End of Report

Report for D-Sheet Piling 20.2

Design of Diaphragm and Sheet Pile Walls
Developed by Deltares



Company: Royal HaskoningDHV

Date of report: 03-Jun-24

Time of report: 17:21:23

Report with version: 20.2.1.30962

Date of calculation: 30-May-24

Time of calculation: 16:43:21

Calculated with version: 20.2.1.30962

File name: Ontvangstkuip Dwarsdoorsnede

Project identification: Duikerkruising Strijenseweg 's Gravendeel
Dwarsdoorsnede
CPT 1

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

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2 Summary

2.1 Overview per Stage and Test

Stage nr.	Verification type	Displacement [mm]	Moment [kNm]	Shear force [kN]	Mob. perc. moment [%]	Mob. perc. resistance [%]	Status
1	EC7(NL)-Step 6.1		7.52	5.35	19.0	19.8	
1	EC7(NL)-Step 6.2		3.71	2.57	19.0	19.9	
1	EC7(NL)-Step 6.3		9.24	5.87	19.5	20.3	
1	EC7(NL)-Step 6.4		4.50	3.45	19.5	20.5	
1	EC7(NL)-Step 6.5	0.6	6.82	4.65	13.7	14.3	
1	EC7(NL)-Step 6.5 x 1.200		8.18	5.58			
2	EC7(NL)-Step 6.1		152.36	67.19	78.5	80.3	
2	EC7(NL)-Step 6.2		139.13	63.12	78.4	81.4	
2	EC7(NL)-Step 6.3		142.97	64.32	71.8	73.6	
2	EC7(NL)-Step 6.4		122.96	57.96	71.9	75.4	
2	EC7(NL)-Step 6.5	9.8	86.22	43.31	43.6	46.3	
2	EC7(NL)-Step 6.5 x 1.200		103.47	51.97			
Max		9.8	152.36	67.19	78.5	81.4	

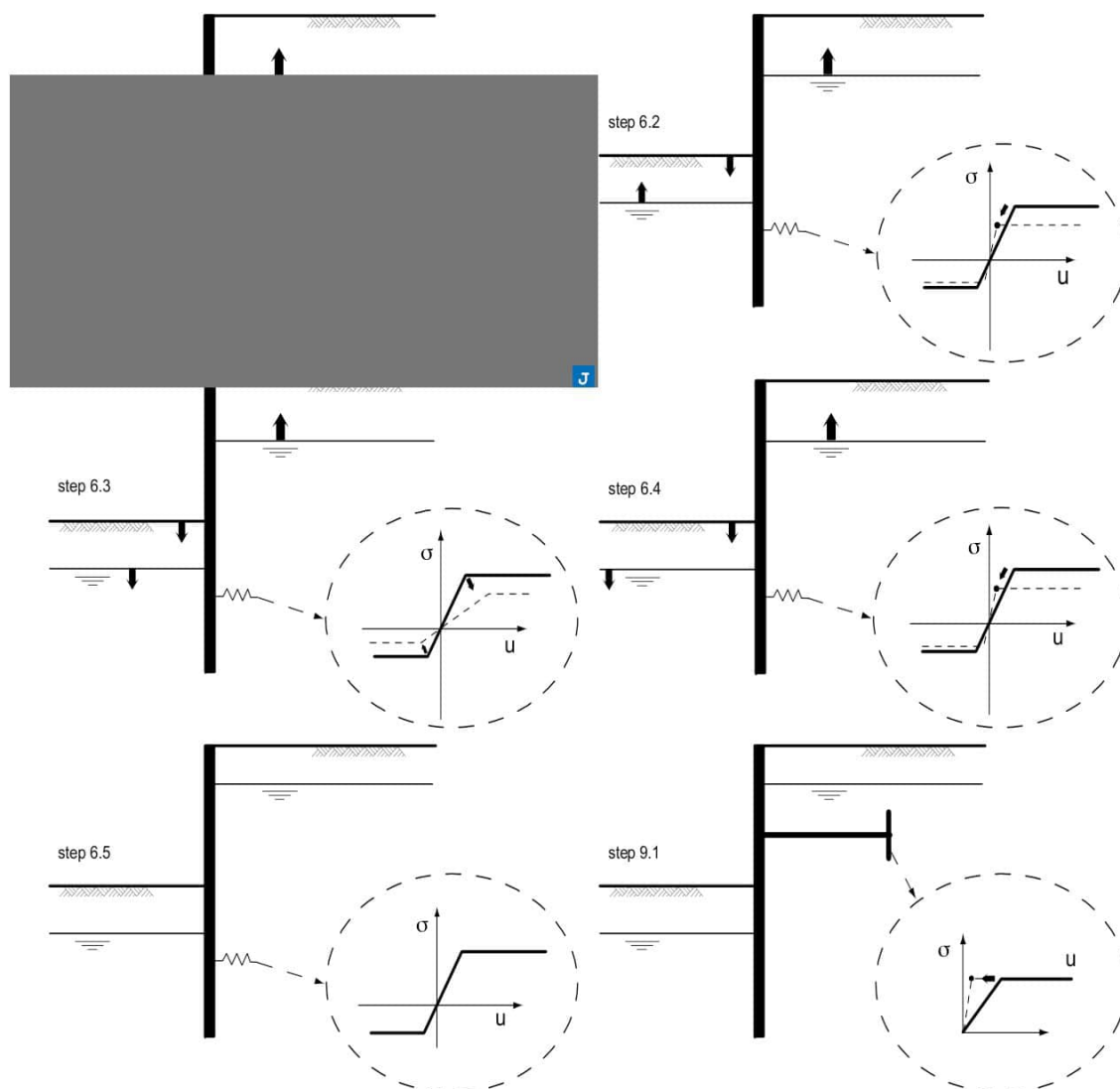
2.2 Anchors and Struts

Stage nr.	Verification type	Anchor/strut		
		Force [kN]	State	Status
1	EC7(NL)-Step 6.1	5.28	Elastic	
1	EC7(NL)-Step 6.2	2.26	Elastic	
1	EC7(NL)-Step 6.3	5.72	Elastic	
1	EC7(NL)-Step 6.4	2.18	Elastic	
1	EC7(NL)-Step 6.5 x 1.200	5.40	Elastic	
2	EC7(NL)-Step 6.1	67.19	Elastic	
2	EC7(NL)-Step 6.2	63.12	Elastic	
2	EC7(NL)-Step 6.3	64.32	Elastic	
2	EC7(NL)-Step 6.4	57.96	Elastic	
2	EC7(NL)-Step 6.5 x 1.200	51.97	Elastic	
Max		67.19		

2.3 Overall Stability per Stage

Stage name	Stability factor [-]
CPT 1 aanbrengen damwanden en ringgording	9.09
CPT 1 ontgraven en gebruiksfase	1.45

2.4 CUR Verification Steps



3 Input Data for all Stages

3.1 General Input Data

Verification according to National Annex of Eurocode 7 in the Netherlands (NEN 9997-1:2016)

Model	Sheet piling
Check vertical balance	No
Number of construction stages	2
Unit weight of water	9.81 kN/m ³
Number of curves for spring characteristics	3
Unloading curve on spring characteristic	No
Elastic calculation	Yes

3.2 Sheet Piling Properties

Length	8.10 m
Level top side	0.10 m
Number of sections	1

3.2.1 General Properties

Section name	From [m]	To [m]	Material type	Acting width [m]
AZ 14-700 (S240)	-8.00	0.10	Steel	1.00

3.2.2 Stiffness EI (elastic behaviour)

Section name	Elastic stiffness EI [kNm ² /m']	Red. factor on EI [-]	Corrected elas. stiffness EI [kNm ²]	Note to reduction factor
AZ 14-700 (S240)	4.6599E+04	1.00	4.6599E+04	

3.2.3 Maximum Allowable Moments

Section name	 [kNm/m']	Modification factor [-]	Material factor [-]	Red. factor allow. moment [-]	 [kNm]
AZ 14-700 (S240)	337.00	1.00	1.00	1.00	337.00

3.3 Calculation Options

First stage represents initial situation	No
Calculation refinement	Coarse
Reduce delta(s) according to CUR	Yes
Verification	EC7 NA NL - method A: Partial factors (design values) in all stages. Eurocode 7 using the factors as described in the National Annex of the Netherlands. It is basically design approach III.
Multiplication factor for anchor stiffness	1.000
Used partial factor set	RC 2
Factors on loads - Geotechnical loads	
- Permanent load, unfavourable	1.000
- Permanent load, favourable	1.000
- Variable load, unfavourable	1.100
- Variable load, favourable	0.000
Factors on loads - Constructive loads	
- Permanent load, unfavourable	1.350
- Permanent load, favourable	0.900

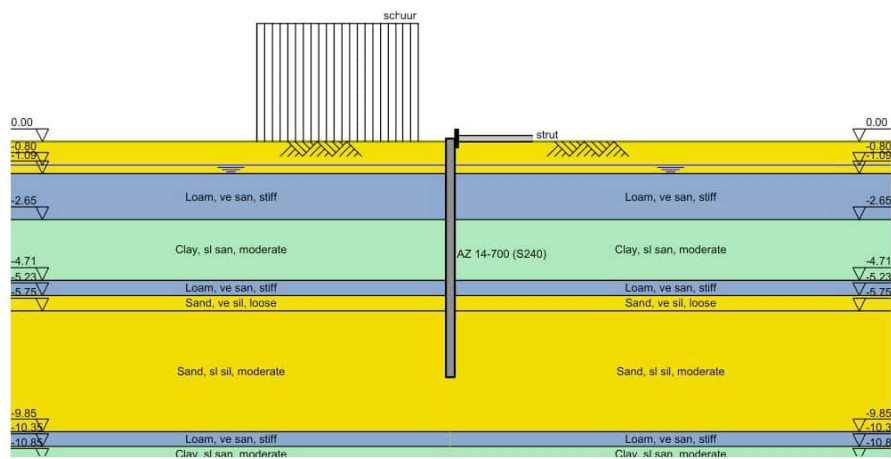
- Variable load, unfavourable	1.500
- Variable load, favourable	0.000
Material factors	
- Cohesion	1.250
- Tangent phi	1.175
- Delta (wall friction angle)*	1.175
- Modulus of low representative subgrade reaction	1.300
Geometry modification	
- Increase retaining height	10.00 %
- Maximum increase retaining height	0.50 m
- Reduction in phreatic line on passive side **	0.25 m
- Raise in phreatic line on passive side **	0.25 m
- Raise in phreatic line on active side	0.05 m
Factors on representative values	
- Partial factor on M, D and Pmax	1.200
Overall stability factors	
- Cohesion	1.450
- Tangent phi	1.250
- Factor on unit weight soil	1.000

* For delta (wall friction angle), the input value of tangent phi is used

** This modification of the phreatic level does not apply when the sheet piling is completely submerged.

4 Outline Stage 1: CPT 1 aanbrengen damwanden en ringgording

Outline - Stage 1: CPT 1 aanbrengen damwanden en ringgording

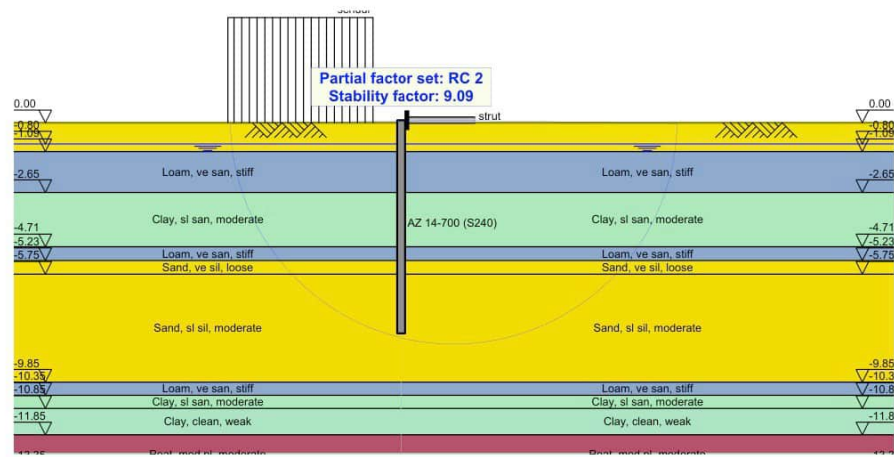


5 Overall Stability Stage 1: CPT 1 aanbrengen damwanden en ringgording

Stability factor : 9.09

5.1 Overall Stability

Overall Stability - Stage 1: CPT 1 aanbrengen damwanden en ringgording



6 Step 6.1 Stage 1: CPT 1 aanbrengen damwanden en ringgording

6.1 General Input Data

Passive side:

D-Sheet Piling determined

6.2 Input Data Left

6.2.1 Calculation Method

Calculation method: C, phi, delta

6.2.2 Water Level

Water level: -0.75 [m]

6.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

6.3 Input Data Right

6.3.1 Calculation Method

Calculation method: C, phi, delta

6.3.2 Water Level

Water level: -0.55 [m]

6.3.3 Surface

X [m]	Y [m]
0.00	-0.01
1.09	-0.01
8.00	-0.01

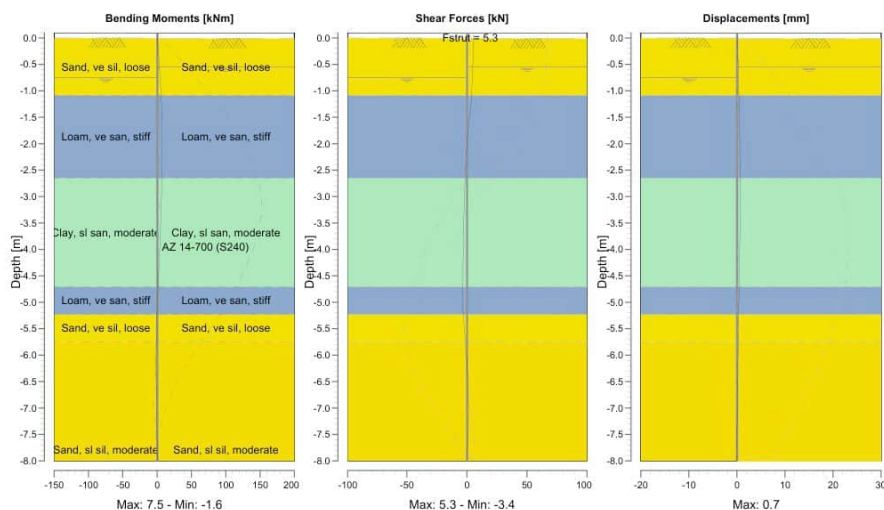
6.4 Calculation Results

Number of iterations: 2

6.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgording

Step 6.1 - Partial factor set: RC 2



6.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	5.28	0.0
1	0.00	0.53	5.28	0.1
2	0.00	0.53	5.28	0.1
2	-0.01	0.58	5.28	0.1
3	-0.01	0.58	5.28	0.1
3	-0.38	2.54	5.14	0.2
4	-0.38	2.54	5.14	0.2
4	-0.75	4.34	4.41	0.3
5	-0.75	4.34	4.41	0.3
5	-0.80	4.56	4.34	0.3
6	-0.80	4.56	4.34	0.3
6	-1.05	5.62	4.07	0.4
7	-1.05	5.62	4.07	0.4
7	-1.09	5.78	4.05	0.4
8	-1.09	5.78	4.05	0.4
8	-1.48	6.99	2.02	0.5
9	-1.48	6.99	2.02	0.5
9	-1.87	7.48	0.42	0.6
10	-1.87	7.48	0.42	0.6
10	-2.26	7.44	-0.70	0.6
11	-2.26	7.44	-0.70	0.6
11	-2.65	7.05	-1.38	0.7
12	-2.65	7.05	-1.37	0.7
12	-2.92	6.59	-1.95	0.7
13	-2.92	6.59	-1.95	0.7
13	-3.20	6.00	-2.38	0.6
14	-3.20	6.00	-2.38	0.6
14	-3.53	5.15	-2.75	0.6
15	-3.53	5.15	-2.75	0.6
15	-3.70	4.67	-2.89	0.6
16	-3.70	4.67	-2.89	0.6

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	3.93	-3.06	0.6
17	-3.95	3.93	-3.06	0.6
17	-4.33	2.74	-3.24	0.5
18	-4.33	2.74	-3.24	0.5
18	-4.71	1.49	-3.39	0.5
19	-4.71	1.49	-3.39	0.5
19	-4.97	0.62	-3.29	0.4
20	-4.97	0.62	-3.29	0.4
20	-5.23	-0.22	-3.22	0.4
21	-5.23	-0.22	-3.22	0.4
21	-5.49	-0.91	-2.13	0.3
22	-5.49	-0.91	-2.13	0.3
22	-5.75	-1.35	-1.24	0.3
23	-5.75	-1.35	-1.24	0.3
23	-6.13	-1.56	0.01	0.2
24	-6.13	-1.56	0.02	0.2
24	-6.50	-1.39	0.82	0.1
25	-6.50	-1.39	0.82	0.1
25	-6.88	-1.00	1.20	0.1
26	-6.88	-1.00	1.21	0.1
26	-7.25	-0.54	1.19	0.0
27	-7.25	-0.54	1.19	0.0
27	-7.63	-0.16	0.79	0.0
28	-7.63	-0.16	0.78	0.0
28	-8.00	0.00	0.01	-0.1
Max		7.48	5.28	0.7
Max, minor nodes incl.		7.52	5.35	0.7

6.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	238.8	219.0
Water	257.8	272.3
Total	496.6	491.3

Considered as passive side	Right
Maximum passive effective resistance	1108.84 kN
Mobilized passive effective resistance	219.04 kN
Percentage mobilized resistance	19.8 %
Position single support	0.10 m
Maximum passive moment	5925.22 kNm
Mobilized passive moment	1123.70 kNm
Percentage mobilized moment	19.0 %

6.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	5.28	Elastic	Right	Strut

7 Step 6.2 Stage 1: CPT 1 aanbrengen damwanden en ringgording

7.1 General Input Data

Passive side:

D-Sheet Piling determined

7.2 Input Data Left

7.2.1 Calculation Method

Calculation method: C, phi, delta

7.2.2 Water Level

Water level: -0.75 [m]

7.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

7.3 Input Data Right

7.3.1 Calculation Method

Calculation method: C, phi, delta

7.3.2 Water Level

Water level: -0.55 [m]

7.3.3 Surface

X [m]	Y [m]
0.00	-0.01
1.09	-0.01
8.00	-0.01

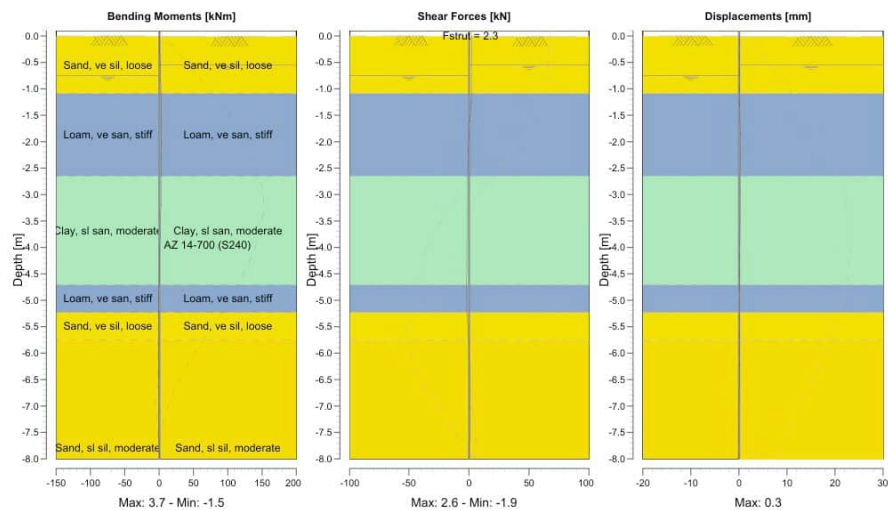
7.4 Calculation Results

Number of iterations: 2

7.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgording

Step 6.2 - Partial factor set: RC 2



7.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	2.26	0.0
1	0.00	0.23	2.26	0.0
2	0.00	0.23	2.26	0.0
2	-0.01	0.25	2.26	0.0
3	-0.01	0.25	2.25	0.0
3	-0.38	1.13	2.38	0.1
4	-0.38	1.13	2.38	0.1
4	-0.75	2.00	2.22	0.1
5	-0.75	2.00	2.22	0.1
5	-0.80	2.11	2.24	0.1
6	-0.80	2.11	2.24	0.1
6	-1.05	2.71	2.50	0.2
7	-1.05	2.71	2.50	0.2
7	-1.09	2.81	2.57	0.2
8	-1.09	2.81	2.57	0.2
8	-1.48	3.53	0.97	0.2
9	-1.48	3.53	0.97	0.2
9	-1.87	3.71	-0.14	0.2
10	-1.87	3.71	-0.14	0.2
10	-2.26	3.55	-0.75	0.3
11	-2.26	3.55	-0.75	0.3
11	-2.65	3.23	-0.94	0.3
12	-2.65	3.23	-0.94	0.3
12	-2.92	2.93	-1.26	0.3
13	-2.92	2.93	-1.26	0.3
13	-3.20	2.56	-1.46	0.3
14	-3.20	2.56	-1.46	0.3
14	-3.53	2.06	-1.60	0.2
15	-3.53	2.06	-1.60	0.2
15	-3.70	1.78	-1.65	0.2
16	-3.70	1.78	-1.65	0.2

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	1.37	-1.70	0.2
17	-3.95	1.37	-1.70	0.2
17	-4.33	0.71	-1.78	0.2
18	-4.33	0.71	-1.78	0.2
18	-4.71	0.02	-1.91	0.2
19	-4.71	0.02	-1.91	0.2
19	-4.97	-0.47	-1.84	0.1
20	-4.97	-0.47	-1.84	0.1
20	-5.23	-0.94	-1.83	0.1
21	-5.23	-0.94	-1.83	0.1
21	-5.49	-1.30	-0.96	0.1
22	-5.49	-1.30	-0.96	0.1
22	-5.75	-1.46	-0.32	0.1
23	-5.75	-1.46	-0.31	0.1
23	-6.13	-1.41	0.50	0.1
24	-6.13	-1.41	0.51	0.1
24	-6.50	-1.13	0.93	0.0
25	-6.50	-1.13	0.93	0.0
25	-6.88	-0.75	1.04	0.0
26	-6.88	-0.75	1.04	0.0
26	-7.25	-0.38	0.90	0.0
27	-7.25	-0.38	0.90	0.0
27	-7.63	-0.11	0.55	0.0
28	-7.63	-0.11	0.55	0.0
28	-8.00	0.00	0.00	0.0
Max		3.71	2.57	0.3
Max, minor nodes incl.		3.71	2.57	0.3

7.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	237.2	220.6
Water	257.8	272.3
Total	495.0	492.8

Considered as passive side	Right
Maximum passive effective resistance	1108.84 kN
Mobilized passive effective resistance	220.55 kN
Percentage mobilized resistance	19.9 %
Position single support	0.10 m
Maximum passive moment	5925.22 kNm
Mobilized passive moment	1123.73 kNm
Percentage mobilized moment	19.0 %

7.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	2.26	Elastic	Right	Strut

8 Step 6.3 Stage 1: CPT 1 aanbrengen damwanden en ringgording

8.1 General Input Data

Passive side:

D-Sheet Piling determined

8.2 Input Data Left

8.2.1 Calculation Method

Calculation method: C, phi, delta

8.2.2 Water Level

Water level: -0.75 [m]

8.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

8.3 Input Data Right

8.3.1 Calculation Method

Calculation method: C, phi, delta

8.3.2 Water Level

Water level: -1.05 [m]

8.3.3 Surface

X [m]	Y [m]
0.00	-0.01
1.09	-0.01
8.00	-0.01

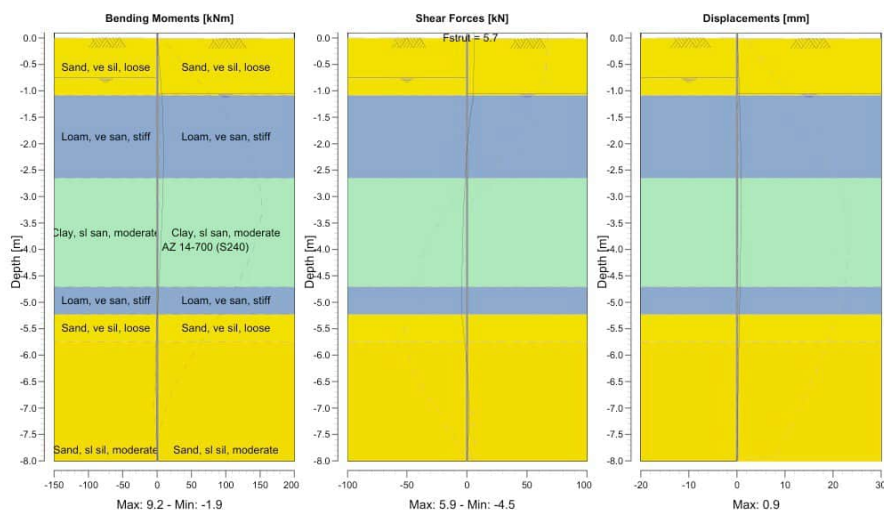
8.4 Calculation Results

Number of iterations: 2

8.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgording

Step 6.3 - Partial factor set: RC 2



8.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	5.72	0.0
1	0.00	0.57	5.72	0.1
2	0.00	0.57	5.72	0.1
2	-0.01	0.63	5.72	0.1
3	-0.01	0.63	5.71	0.1
3	-0.38	2.78	5.80	0.3
4	-0.38	2.78	5.80	0.3
4	-0.75	4.91	5.52	0.4
5	-0.75	4.91	5.52	0.4
5	-0.80	5.18	5.50	0.4
6	-0.80	5.18	5.50	0.4
6	-1.05	6.55	5.35	0.5
7	-1.05	6.55	5.35	0.5
7	-1.09	6.76	5.34	0.5
8	-1.09	6.76	5.34	0.5
8	-1.48	8.38	2.84	0.7
9	-1.48	8.38	2.84	0.7
9	-1.87	9.13	0.88	0.8
10	-1.87	9.13	0.88	0.8
10	-2.26	9.21	-0.51	0.8
11	-2.26	9.21	-0.51	0.8
11	-2.65	8.85	-1.39	0.9
12	-2.65	8.85	-1.39	0.9
12	-2.92	8.37	-2.09	0.9
13	-2.92	8.37	-2.09	0.9
13	-3.20	7.72	-2.64	0.9
14	-3.20	7.72	-2.64	0.9
14	-3.53	6.77	-3.13	0.8
15	-3.53	6.77	-3.13	0.8
15	-3.70	6.22	-3.34	0.8
16	-3.70	6.22	-3.34	0.8

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	5.36	-3.60	0.8
17	-3.95	5.36	-3.60	0.8
17	-4.33	3.93	-3.95	0.7
18	-4.33	3.93	-3.95	0.7
18	-4.71	2.36	-4.30	0.6
19	-4.71	2.36	-4.30	0.6
19	-4.97	1.24	-4.36	0.6
20	-4.97	1.24	-4.36	0.6
20	-5.23	0.09	-4.48	0.5
21	-5.23	0.09	-4.48	0.5
21	-5.49	-0.88	-3.04	0.5
22	-5.49	-0.88	-3.04	0.5
22	-5.75	-1.51	-1.86	0.4
23	-5.75	-1.51	-1.85	0.4
23	-6.13	-1.87	-0.18	0.3
24	-6.13	-1.87	-0.17	0.3
24	-6.50	-1.71	0.92	0.3
25	-6.50	-1.71	0.93	0.3
25	-6.88	-1.25	1.46	0.2
26	-6.88	-1.25	1.47	0.2
26	-7.25	-0.68	1.49	0.1
27	-7.25	-0.68	1.48	0.1
27	-7.63	-0.20	1.00	0.1
28	-7.63	-0.20	0.99	0.1
28	-8.00	0.00	0.01	0.0
Max		9.21	5.80	0.9
Max, minor nodes incl.		9.24	5.87	0.9

8.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	231.0	246.1
Water	257.8	236.9
Total	488.8	483.0

Considered as passive side	Right
Maximum passive effective resistance	1211.22 kN
Mobilized passive effective resistance	246.13 kN
Percentage mobilized resistance	20.3 %
Position single support	0.10 m
Maximum passive moment	6387.44 kNm
Mobilized passive moment	1246.32 kNm
Percentage mobilized moment	19.5 %

8.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	5.72	Elastic	Right	Strut

9 Step 6.4 Stage 1: CPT 1 aanbrengen damwanden en ringgording

9.1 General Input Data

Passive side:

D-Sheet Piling determined

9.2 Input Data Left

9.2.1 Calculation Method

Calculation method: C, phi, delta

9.2.2 Water Level

Water level: -0.75 [m]

9.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

9.3 Input Data Right

9.3.1 Calculation Method

Calculation method: C, phi, delta

9.3.2 Water Level

Water level: -1.05 [m]

9.3.3 Surface

X [m]	Y [m]
0.00	-0.01
1.09	-0.01
8.00	-0.01

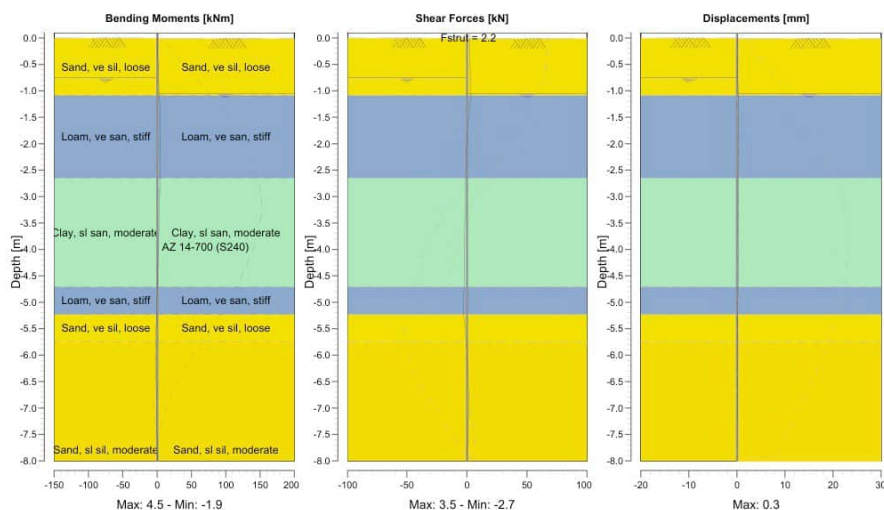
9.4 Calculation Results

Number of iterations: 2

9.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgording

Step 6.4 - Partial factor set: RC 2



9.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	2.18	0.0
1	0.00	0.22	2.18	0.0
2	0.00	0.22	2.18	0.0
2	-0.01	0.24	2.18	0.0
3	-0.01	0.24	2.17	0.0
3	-0.38	1.11	2.52	0.1
4	-0.38	1.11	2.52	0.1
4	-0.75	2.13	2.83	0.2
5	-0.75	2.13	2.83	0.2
5	-0.80	2.27	2.92	0.2
6	-0.80	2.27	2.92	0.2
6	-1.05	3.06	3.36	0.2
7	-1.05	3.06	3.36	0.2
7	-1.09	3.20	3.45	0.2
8	-1.09	3.20	3.45	0.2
8	-1.48	4.18	1.46	0.3
9	-1.48	4.18	1.46	0.3
9	-1.87	4.50	0.08	0.3
10	-1.87	4.50	0.08	0.3
10	-2.26	4.39	-0.70	0.3
11	-2.26	4.39	-0.70	0.3
11	-2.65	4.07	-0.99	0.3
12	-2.65	4.07	-0.99	0.3
12	-2.92	3.75	-1.36	0.3
13	-2.92	3.75	-1.36	0.3
13	-3.20	3.34	-1.61	0.3
14	-3.20	3.34	-1.61	0.3
14	-3.53	2.79	-1.80	0.3
15	-3.53	2.79	-1.80	0.3
15	-3.70	2.47	-1.88	0.3
16	-3.70	2.47	-1.88	0.3

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	1.99	-1.98	0.3
17	-3.95	1.99	-1.98	0.3
17	-4.33	1.21	-2.18	0.3
18	-4.33	1.21	-2.18	0.3
18	-4.71	0.34	-2.47	0.2
19	-4.71	0.34	-2.47	0.2
19	-4.97	-0.31	-2.55	0.2
20	-4.97	-0.31	-2.55	0.2
20	-5.23	-1.00	-2.73	0.2
21	-5.23	-1.00	-2.73	0.2
21	-5.49	-1.54	-1.52	0.1
22	-5.49	-1.54	-1.52	0.1
22	-5.75	-1.81	-0.62	0.1
23	-5.75	-1.81	-0.62	0.1
23	-6.13	-1.81	0.54	0.1
24	-6.13	-1.81	0.55	0.1
24	-6.50	-1.47	1.16	0.1
25	-6.50	-1.47	1.16	0.1
25	-6.88	-0.99	1.34	0.1
26	-6.88	-0.99	1.34	0.1
26	-7.25	-0.51	1.18	0.0
27	-7.25	-0.51	1.18	0.0
27	-7.63	-0.14	0.73	0.0
28	-7.63	-0.14	0.72	0.0
28	-8.00	0.00	0.00	0.0
Max		4.50	3.45	0.3
Max, minor nodes incl.		4.50	3.45	0.3

9.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	229.2	247.9
Water	257.8	236.9
Total	487.0	484.8

Considered as passive side	Right
Maximum passive effective resistance	1211.22 kN
Mobilized passive effective resistance	247.91 kN
Percentage mobilized resistance	20.5 %
Position single support	0.10 m
Maximum passive moment	6387.44 kNm
Mobilized passive moment	1246.37 kNm
Percentage mobilized moment	19.5 %

9.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	2.18	Elastic	Right	Strut

10 Step 6.5 Stage 1: CPT 1 aanbrengen damwanden en ringgording

10.1 General Input Data

Passive side:

D-Sheet Piling determined

10.2 Input Data Left

10.2.1 Calculation Method

Calculation method: C, phi, delta

10.2.2 Water Level

Water level: -0.80 [m]

10.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

10.3 Input Data Right

10.3.1 Calculation Method

Calculation method: C, phi, delta

10.3.2 Water Level

Water level: -0.80 [m]

10.3.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

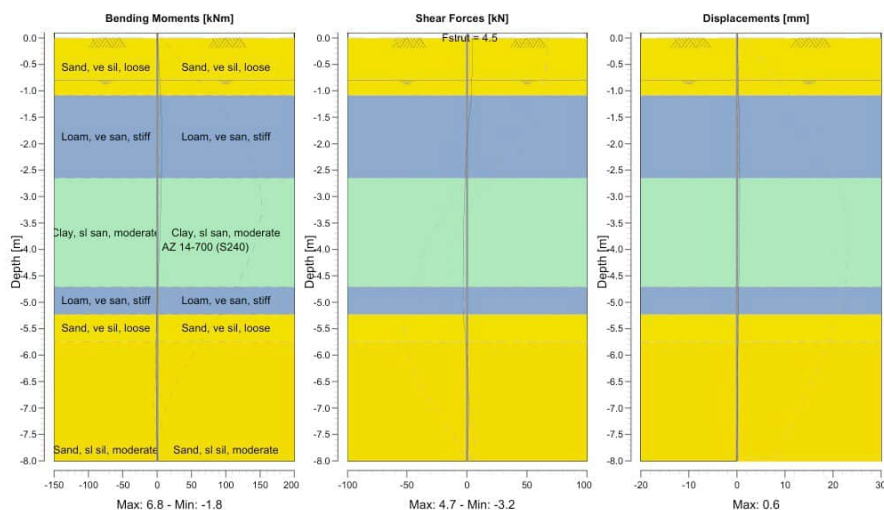
10.4 Calculation Results

Number of iterations: 2

10.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 1: CPT 1 aanbrengen damwanden en ringgording

Step 6.5 - Partial factor set: RC 2



10.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	4.50	0.0
1	0.00	0.45	4.50	0.1
2	0.00	0.45	4.49	0.1
2	-0.40	2.29	4.53	0.2
3	-0.40	2.29	4.53	0.2
3	-0.80	4.04	4.04	0.3
4	-0.80	4.04	4.04	0.3
4	-1.09	5.20	3.92	0.4
5	-1.09	5.20	3.92	0.4
5	-1.48	6.36	1.87	0.5
6	-1.48	6.36	1.87	0.5
6	-1.87	6.80	0.30	0.5
7	-1.87	6.80	0.30	0.5
7	-2.26	6.72	-0.76	0.6
8	-2.26	6.72	-0.76	0.6
8	-2.65	6.32	-1.36	0.6
9	-2.65	6.32	-1.36	0.6
9	-2.92	5.87	-1.88	0.6
10	-2.92	5.87	-1.88	0.6
10	-3.20	5.31	-2.26	0.6
11	-3.20	5.31	-2.26	0.6
11	-3.45	4.71	-2.52	0.6
12	-3.45	4.71	-2.52	0.6
12	-3.70	4.06	-2.70	0.5
13	-3.70	4.06	-2.70	0.5
13	-4.04	3.12	-2.89	0.5
14	-4.04	3.12	-2.89	0.5
14	-4.37	2.13	-3.04	0.4
15	-4.37	2.13	-3.04	0.4
15	-4.71	1.09	-3.19	0.4
16	-4.71	1.09	-3.19	0.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.97	0.27	-3.14	0.4
17	-4.97	0.27	-3.14	0.4
17	-5.23	-0.55	-3.14	0.3
18	-5.23	-0.55	-3.14	0.3
18	-5.49	-1.21	-1.99	0.3
19	-5.49	-1.21	-1.99	0.3
19	-5.75	-1.60	-1.06	0.2
20	-5.75	-1.60	-1.06	0.2
20	-6.13	-1.74	0.20	0.2
21	-6.13	-1.74	0.20	0.2
21	-6.50	-1.51	0.98	0.1
22	-6.50	-1.51	0.98	0.1
22	-6.88	-1.06	1.32	0.1
23	-6.88	-1.06	1.32	0.1
23	-7.25	-0.57	1.26	0.0
24	-7.25	-0.57	1.26	0.0
24	-7.63	-0.16	0.82	0.0
25	-7.63	-0.16	0.82	0.0
25	-8.00	0.00	0.00	0.0
Max		6.80	4.53	0.6
Max, minor nodes incl.		6.82	4.65	0.6

10.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	219.1	214.6
Water	254.3	254.3
Total	473.3	468.8

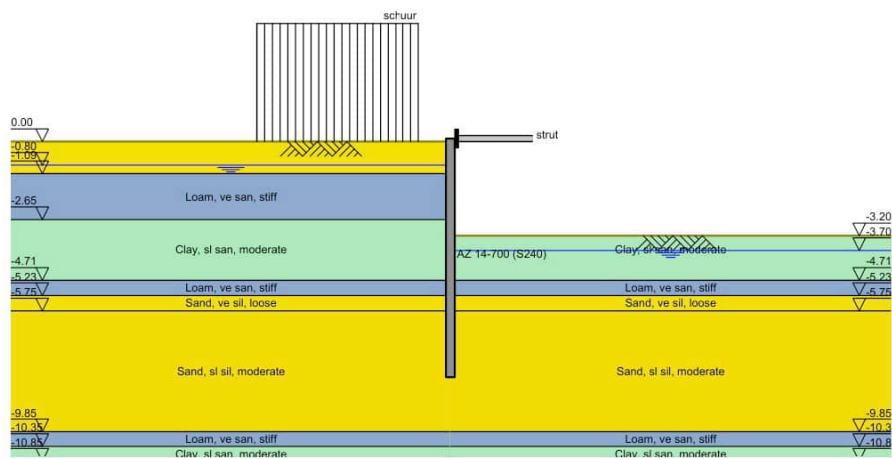
Considered as passive side	Right
Maximum passive effective resistance	1496.27 kN
Mobilized passive effective resistance	214.56 kN
Percentage mobilized resistance	14.3 %
Position single support	0.10 m
Maximum passive moment	7937.43 kNm
Mobilized passive moment	1085.53 kNm
Percentage mobilized moment	13.7 %

10.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	4.50	Elastic	Right	Strut

11 Outline Stage 2: CPT 1 ontgraven en gebruiksfase

Outline - Stage 2: CPT 1 ontgraven en gebruiksfase

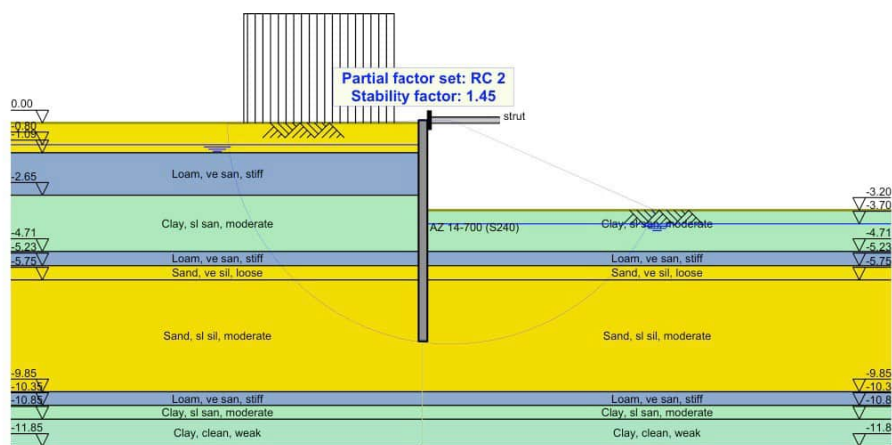


12 Overall Stability Stage 2: CPT 1 ontgraven en gebruiksfase

Stability factor : 1.45

12.1 Overall Stability

Overall Stability - Stage 2: CPT 1 ontgraven en gebruiksfase



13 Step 6.1 Stage 2: CPT 1 ontgraven en gebruiksfase

13.1 General Input Data

Passive side:

D-Sheet Piling determined

13.2 Input Data Left

13.2.1 Calculation Method

Calculation method: C, phi, delta

13.2.2 Water Level

Water level: -0.75 [m]

13.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

13.3 Input Data Right

13.3.1 Calculation Method

Calculation method: C, phi, delta

13.3.2 Water Level

Water level: -3.53 [m]

13.3.3 Surface

X [m]	Y [m]
0.00	-3.53

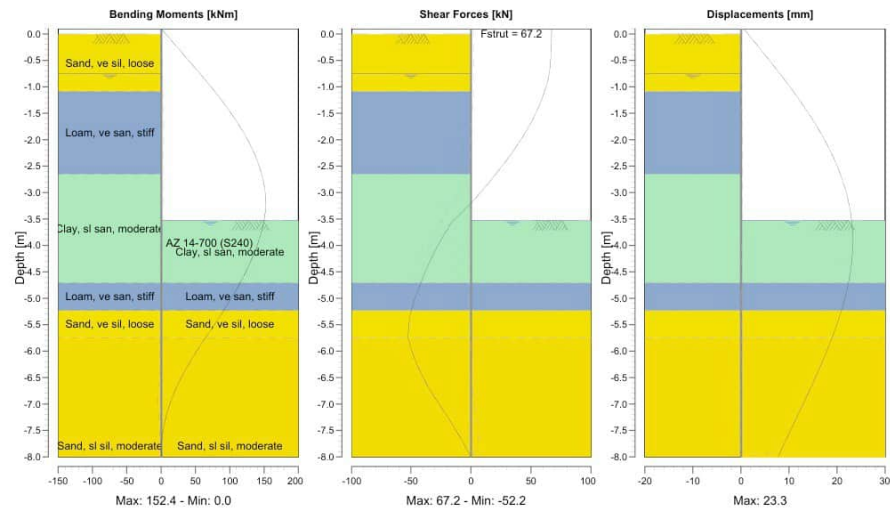
13.4 Calculation Results

Number of iterations: 5

13.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.1 - Partial factor set: RC 2



13.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	67.19	0.6
1	0.00	6.72	67.19	1.5
2	0.00	6.72	67.19	1.5
2	-0.01	7.39	67.19	1.6
3	-0.01	7.39	67.19	1.6
3	-0.38	32.18	66.66	4.9
4	-0.38	32.18	66.66	4.9
4	-0.75	56.60	65.16	8.1
5	-0.75	56.60	65.16	8.1
5	-0.80	59.86	64.87	8.5
6	-0.80	59.86	64.87	8.5
6	-1.05	75.72	61.84	10.6
7	-1.05	75.72	61.84	10.6
7	-1.09	78.18	61.24	10.9
8	-1.09	78.18	61.24	10.9
8	-1.48	100.81	54.37	13.9
9	-1.48	100.81	54.37	13.9
9	-1.87	120.31	45.16	16.6
10	-1.87	120.31	45.17	16.6
10	-2.26	135.80	33.88	18.8
11	-2.26	135.80	33.88	18.8
11	-2.65	146.51	20.66	20.7
12	-2.65	146.51	20.66	20.7
12	-2.92	150.86	10.82	21.7
13	-2.92	150.86	10.82	21.7
13	-3.20	152.36	-0.07	22.4
14	-3.20	152.36	-0.07	22.4
14	-3.53	150.00	-14.51	23.0
15	-3.53	150.00	-14.51	23.0
15	-3.70	147.03	-19.51	23.2
16	-3.70	147.03	-19.51	23.2

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	141.26	-26.02	23.3
17	-3.95	141.26	-26.02	23.3
17	-4.33	129.61	-34.58	23.0
18	-4.33	129.61	-34.58	23.0
18	-4.71	115.06	-41.47	22.4
19	-4.71	115.06	-41.47	22.4
19	-4.97	103.65	-46.09	21.7
20	-4.97	103.65	-46.09	21.7
20	-5.23	91.19	-49.53	20.9
21	-5.23	91.19	-49.53	20.9
21	-5.49	77.99	-51.68	20.0
22	-5.49	77.99	-51.68	20.0
22	-5.75	64.47	-52.19	19.0
23	-5.75	64.47	-52.16	19.0
23	-6.13	45.76	-47.23	17.3
24	-6.13	45.76	-47.15	17.3
24	-6.50	29.41	-39.69	15.5
25	-6.50	29.41	-39.58	15.5
25	-6.88	16.25	-30.23	13.6
26	-6.88	16.25	-30.09	13.6
26	-7.25	6.99	-19.36	11.6
27	-7.25	6.99	-19.22	11.6
27	-7.63	1.69	-9.23	9.7
28	-7.63	1.69	-9.10	9.7
28	-8.00	0.00	-0.06	7.7
Max		152.36	67.19	23.3
Max, minor nodes incl.		152.36	67.19	23.3

13.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	174.5	266.4
Water	257.8	98.0
Total	432.3	364.4

Considered as passive side	Right
Maximum passive effective resistance	331.97 kN
Mobilized passive effective resistance	266.43 kN
Percentage mobilized resistance	80.3 %
Position single support	0.10 m
Maximum passive moment	2176.50 kNm
Mobilized passive moment	1708.19 kNm
Percentage mobilized moment	78.5 %

13.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	67.19	Elastic	Right	Strut

14 Step 6.2 Stage 2: CPT 1 ontgraven en gebruiksfase

14.1 General Input Data

Passive side:

D-Sheet Piling determined

14.2 Input Data Left

14.2.1 Calculation Method

Calculation method: C, phi, delta

14.2.2 Water Level

Water level: -0.75 [m]

14.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

14.3 Input Data Right

14.3.1 Calculation Method

Calculation method: C, phi, delta

14.3.2 Water Level

Water level: -3.53 [m]

14.3.3 Surface

X [m]	Y [m]
0.00	-3.53

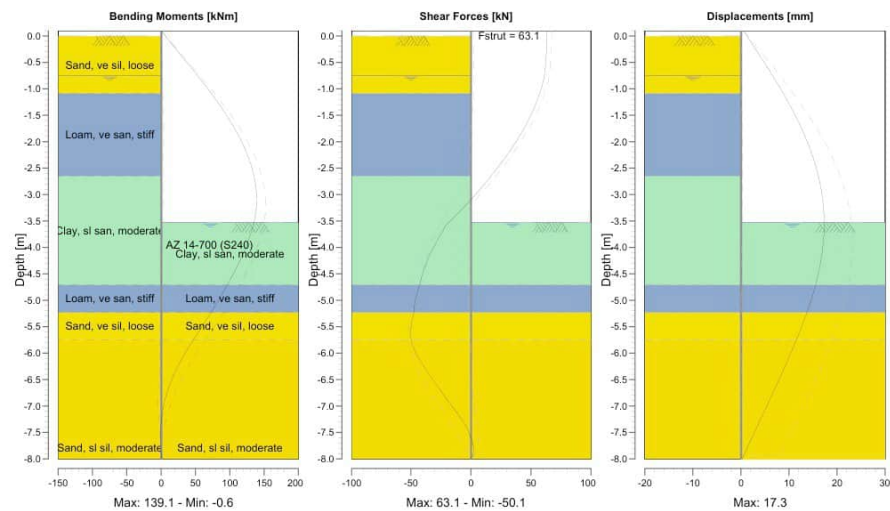
14.4 Calculation Results

Number of iterations: 6

14.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.2 - Partial factor set: RC 2



14.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	63.12	0.5
1	0.00	6.31	63.12	1.3
2	0.00	6.31	63.12	1.3
2	-0.01	6.94	63.12	1.3
3	-0.01	6.94	63.11	1.3
3	-0.38	30.23	62.59	4.0
4	-0.38	30.23	62.59	4.0
4	-0.75	53.14	61.09	6.6
5	-0.75	53.14	61.09	6.6
5	-0.80	56.19	60.80	6.9
6	-0.80	56.19	60.80	6.9
6	-1.05	71.04	57.77	8.6
7	-1.05	71.04	57.77	8.6
7	-1.09	73.33	57.17	8.8
8	-1.09	73.33	57.17	8.8
8	-1.48	94.38	50.30	11.2
9	-1.48	94.38	50.30	11.2
9	-1.87	112.28	41.09	13.2
10	-1.87	112.28	41.09	13.2
10	-2.26	126.18	29.81	14.9
11	-2.26	126.18	29.81	14.9
11	-2.65	135.31	16.59	16.1
12	-2.65	135.31	16.59	16.1
12	-2.92	138.54	6.75	16.7
13	-2.92	138.54	6.75	16.7
13	-3.20	138.92	-4.14	17.1
14	-3.20	138.92	-4.14	17.1
14	-3.53	135.21	-18.58	17.3
15	-3.53	135.21	-18.58	17.3
15	-3.70	131.55	-23.44	17.3
16	-3.70	131.55	-23.44	17.3

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	124.81	-29.77	17.1
17	-3.95	124.81	-29.77	17.1
17	-4.33	111.83	-37.49	16.5
18	-4.33	111.83	-37.48	16.5
18	-4.71	96.47	-42.51	15.5
19	-4.71	96.47	-42.51	15.5
19	-4.97	84.92	-45.98	14.7
20	-4.97	84.92	-45.98	14.7
20	-5.23	72.72	-47.58	13.7
21	-5.23	72.72	-47.58	13.7
21	-5.49	60.03	-49.73	12.7
22	-5.49	60.03	-49.73	12.7
22	-5.75	47.02	-50.01	11.5
23	-5.75	47.02	-49.96	11.5
23	-6.13	29.48	-42.88	9.8
24	-6.13	29.48	-42.74	9.8
24	-6.50	15.45	-31.82	7.9
25	-6.50	15.45	-31.66	7.9
25	-6.88	5.73	-20.07	6.0
26	-6.88	5.72	-19.90	6.0
26	-7.25	0.55	-7.83	4.1
27	-7.25	0.56	-7.66	4.1
27	-7.63	-0.63	0.42	2.2
28	-7.63	-0.64	0.55	2.2
28	-8.00	-0.01	-0.21	0.2
Max		138.92	63.12	17.3
Max, minor nodes incl.		139.13	63.12	17.3

14.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	174.7	270.4
Water	257.8	98.0
Total	432.5	368.4

Considered as passive side	Right
Maximum passive effective resistance	331.97 kN
Mobilized passive effective resistance	270.38 kN
Percentage mobilized resistance	81.5 %
Position single support	0.10 m
Maximum passive moment	2176.50 kNm
Mobilized passive moment	1707.38 kNm
Percentage mobilized moment	78.4 %

14.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	63.12	Elastic	Right	Strut

15 Step 6.3 Stage 2: CPT 1 ontgraven en gebruiksfase

15.1 General Input Data

Passive side:

D-Sheet Piling determined

15.2 Input Data Left

15.2.1 Calculation Method

Calculation method: C, phi, delta

15.2.2 Water Level

Water level: -0.75 [m]

15.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

15.3 Input Data Right

15.3.1 Calculation Method

Calculation method: C, phi, delta

15.3.2 Water Level

Water level: -3.95 [m]

15.3.3 Surface

X [m]	Y [m]
0.00	-3.53

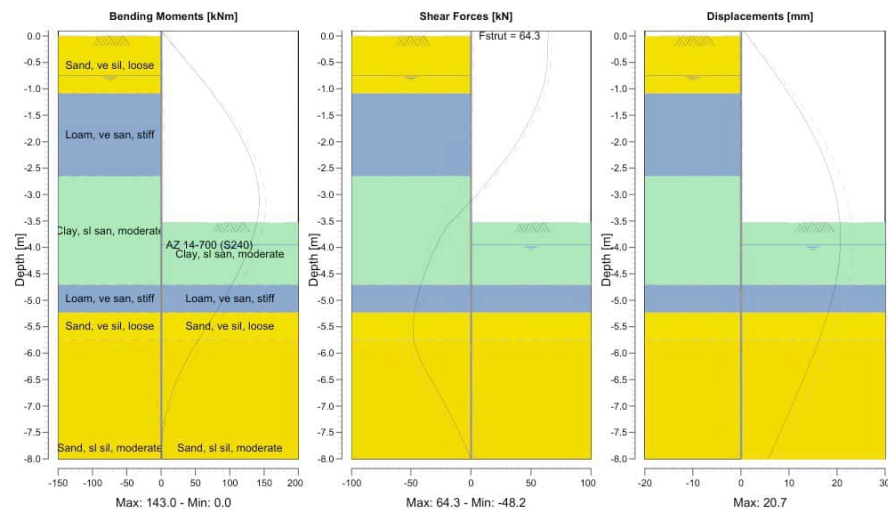
15.4 Calculation Results

Number of iterations: 5

15.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.3 - Partial factor set: RC 2



15.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	64.32	0.5
1	0.00	6.43	64.32	1.4
2	0.00	6.43	64.32	1.4
2	-0.01	7.07	64.32	1.5
3	-0.01	7.08	64.31	1.5
3	-0.38	30.80	63.79	4.5
4	-0.38	30.80	63.79	4.5
4	-0.75	54.16	62.28	7.4
5	-0.75	54.16	62.28	7.4
5	-0.80	57.27	62.00	7.8
6	-0.80	57.27	62.00	7.8
6	-1.05	72.41	58.96	9.7
7	-1.05	72.41	58.96	9.7
7	-1.09	74.76	58.37	10.0
8	-1.09	74.76	58.37	10.0
8	-1.48	96.27	51.50	12.7
9	-1.48	96.27	51.50	12.7
9	-1.87	114.64	42.29	15.1
10	-1.87	114.64	42.29	15.1
10	-2.26	129.01	31.01	17.1
11	-2.26	129.01	31.01	17.1
11	-2.65	138.60	17.78	18.7
12	-2.65	138.60	17.79	18.7
12	-2.92	142.16	7.94	19.5
13	-2.92	142.16	7.94	19.5
13	-3.20	142.87	-2.95	20.1
14	-3.20	142.87	-2.95	20.1
14	-3.53	139.56	-17.39	20.6
15	-3.53	139.56	-17.39	20.6
15	-3.70	136.11	-22.29	20.7
16	-3.70	136.11	-22.29	20.7

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	129.72	-28.18	20.7
17	-3.95	129.72	-28.18	20.7
17	-4.33	117.50	-35.66	20.3
18	-4.33	117.50	-35.66	20.3
18	-4.71	102.75	-41.56	19.6
19	-4.71	102.75	-41.55	19.6
19	-4.97	91.49	-44.85	19.0
20	-4.97	91.49	-44.85	19.0
20	-5.23	79.50	-47.29	18.2
21	-5.23	79.50	-47.29	18.2
21	-5.49	67.07	-48.14	17.3
22	-5.49	67.07	-48.14	17.3
22	-5.75	54.55	-48.03	16.3
23	-5.75	54.55	-47.99	16.3
23	-6.13	37.62	-41.94	14.7
24	-6.13	37.62	-41.85	14.7
24	-6.50	23.47	-33.24	13.0
25	-6.50	23.47	-33.11	13.0
25	-6.88	12.80	-23.93	11.2
26	-6.88	12.80	-23.81	11.2
26	-7.25	5.50	-15.25	9.4
27	-7.25	5.50	-15.14	9.4
27	-7.63	1.33	-7.25	7.5
28	-7.63	1.33	-7.15	7.5
28	-8.00	0.00	-0.05	5.7
Max		142.87	64.32	20.7
Max, minor nodes incl.		142.97	64.32	20.7

15.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	174.5	286.9
Water	257.8	80.5
Total	432.3	367.4

Considered as passive side	Right
Maximum passive effective resistance	389.85 kN
Mobilized passive effective resistance	286.92 kN
Percentage mobilized resistance	73.6 %
Position single support	0.10 m
Maximum passive moment	2527.12 kNm
Mobilized passive moment	1813.41 kNm
Percentage mobilized moment	71.8 %

15.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	64.32	Elastic	Right	Strut

16 Step 6.4 Stage 2: CPT 1 ontgraven en gebruiksfase

16.1 General Input Data

Passive side:

D-Sheet Piling determined

16.2 Input Data Left

16.2.1 Calculation Method

Calculation method: C, phi, delta

16.2.2 Water Level

Water level: -0.75 [m]

16.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

16.3 Input Data Right

16.3.1 Calculation Method

Calculation method: C, phi, delta

16.3.2 Water Level

Water level: -3.95 [m]

16.3.3 Surface

X [m]	Y [m]
0.00	-3.53

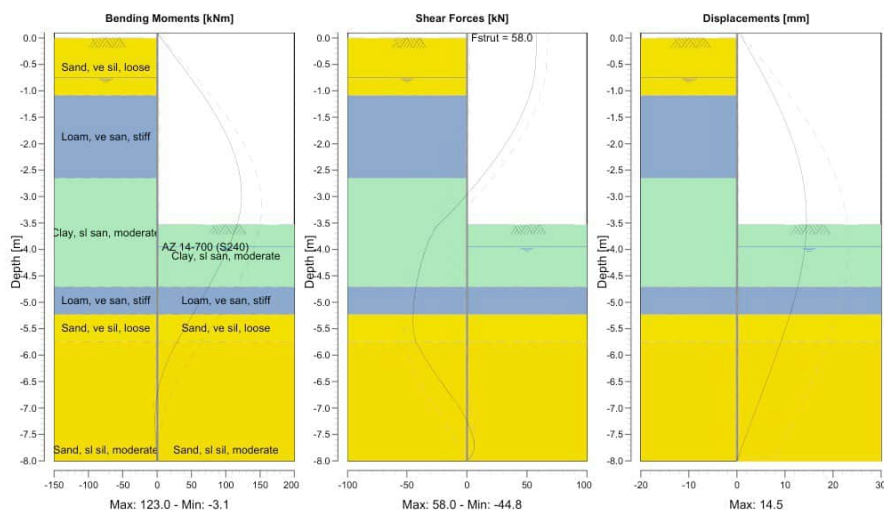
16.4 Calculation Results

Number of iterations: 5

16.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.4 - Partial factor set: RC 2



16.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	57.96	0.5
1	0.00	5.80	57.96	1.1
2	0.00	5.80	57.96	1.1
2	-0.01	6.38	57.96	1.2
3	-0.01	6.38	57.95	1.2
3	-0.38	27.75	57.43	3.5
4	-0.38	27.75	57.43	3.5
4	-0.75	48.76	55.92	5.7
5	-0.75	48.76	55.92	5.7
5	-0.80	51.55	55.64	6.0
6	-0.80	51.55	55.64	6.0
6	-1.05	65.10	52.61	7.4
7	-1.05	65.10	52.61	7.4
7	-1.09	67.19	52.01	7.6
8	-1.09	67.19	52.01	7.6
8	-1.48	86.22	45.14	9.6
9	-1.48	86.22	45.14	9.6
9	-1.87	102.11	35.93	11.3
10	-1.87	102.11	35.93	11.3
10	-2.26	114.00	24.65	12.7
11	-2.26	114.00	24.65	12.7
11	-2.65	121.11	11.43	13.7
12	-2.65	121.11	11.43	13.7
12	-2.92	122.93	1.58	14.1
13	-2.92	122.93	1.58	14.1
13	-3.20	121.89	-9.31	14.4
14	-3.20	121.89	-9.31	14.4
14	-3.53	116.48	-23.74	14.5
15	-3.53	116.48	-23.74	14.5
15	-3.70	111.96	-28.36	14.4
16	-3.70	111.96	-28.36	14.4

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-3.95	104.11	-33.45	14.1
17	-3.95	104.11	-33.45	14.1
17	-4.33	90.28	-38.73	13.5
18	-4.33	90.28	-38.73	13.5
18	-4.71	74.80	-42.37	12.6
19	-4.71	74.80	-42.37	12.6
19	-4.97	63.54	-44.02	11.9
20	-4.97	63.54	-44.01	11.9
20	-5.23	51.99	-44.67	11.0
21	-5.23	51.99	-44.67	11.0
21	-5.49	40.35	-44.55	10.1
22	-5.49	40.35	-44.55	10.1
22	-5.75	28.99	-42.57	9.1
23	-5.75	28.99	-42.49	9.1
23	-6.13	14.80	-32.97	7.7
24	-6.13	14.80	-32.83	7.7
24	-6.50	4.52	-21.79	6.1
25	-6.50	4.52	-21.64	6.1
25	-6.88	-1.39	-9.80	4.6
26	-6.88	-1.39	-9.62	4.6
26	-7.25	-3.06	0.05	3.0
27	-7.25	-3.06	0.15	3.0
27	-7.63	-1.82	5.79	1.5
28	-7.63	-1.82	5.93	1.5
28	-8.00	-0.01	-0.05	0.0
Max		122.93	57.96	14.5
Max, minor nodes incl.		122.96	57.96	14.5

16.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	175.2	293.8
Water	257.8	80.5
Total	433.0	374.2

Considered as passive side	Right
Maximum passive effective resistance	389.85 kN
Mobilized passive effective resistance	293.78 kN
Percentage mobilized resistance	75.4 %
Position single support	0.10 m
Maximum passive moment	2527.12 kNm
Mobilized passive moment	1817.76 kNm
Percentage mobilized moment	71.9 %

16.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	57.96	Elastic	Right	Strut

17 Step 6.5 Stage 2: CPT 1 ontgraven en gebruiksfase

17.1 General Input Data

Passive side:

D-Sheet Piling determined

17.2 Input Data Left

17.2.1 Calculation Method

Calculation method: C, phi, delta

17.2.2 Water Level

Water level: -0.80 [m]

17.2.3 Surface

X [m]	Y [m]
0.00	0.00
1.09	0.00
8.00	0.00

17.3 Input Data Right

17.3.1 Calculation Method

Calculation method: C, phi, delta

17.3.2 Water Level

Water level: -3.70 [m]

17.3.3 Surface

X [m]	Y [m]
0.00	-3.20

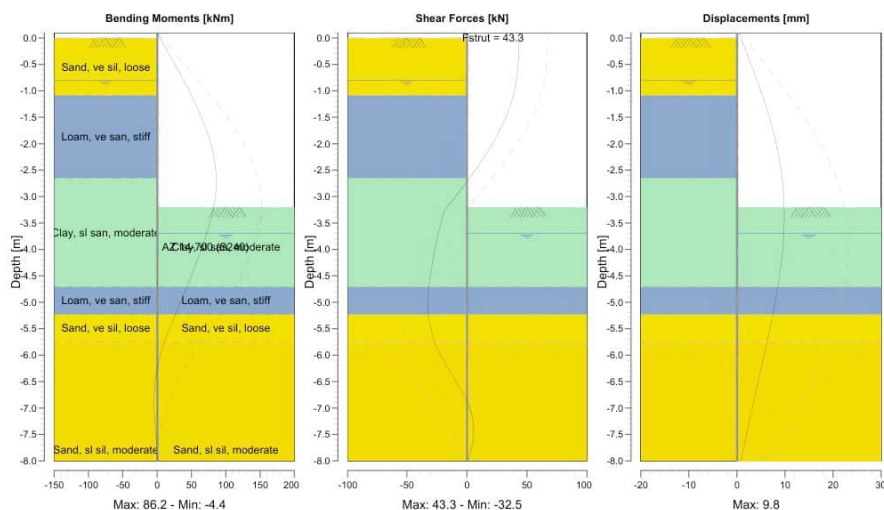
17.4 Calculation Results

Number of iterations: 4

17.4.1 Charts of Moments, Forces and Displacements

Moments/Forces/Displacements - Stage 2: CPT 1 ontgraven en gebruiksfase

Step 6.5 - Partial factor set: RC 2



17.4.2 Moments, Forces and Displacements

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
1	0.10	0.00	43.31	0.4
1	0.00	4.33	43.31	0.8
2	0.00	4.33	43.30	0.8
2	-0.40	21.59	42.80	2.5
3	-0.40	21.59	42.80	2.5
3	-0.80	38.44	41.30	4.2
4	-0.80	38.44	41.30	4.2
4	-1.09	50.08	38.69	5.3
5	-1.09	50.08	38.69	5.3
5	-1.48	64.08	32.72	6.7
6	-1.48	64.08	32.72	6.7
6	-1.87	75.31	24.48	7.8
7	-1.87	75.31	24.48	7.8
7	-2.26	82.92	14.16	8.8
8	-2.26	82.92	14.16	8.8
8	-2.65	86.16	2.05	9.4
9	-2.65	86.16	2.05	9.4
9	-2.92	85.54	-6.73	9.7
10	-2.92	85.54	-6.73	9.7
10	-3.20	82.36	-16.53	9.8
11	-3.20	82.36	-16.53	9.8
11	-3.45	77.52	-20.85	9.8
12	-3.45	77.52	-20.85	9.8
12	-3.70	71.90	-23.74	9.8
13	-3.70	71.90	-23.74	9.8
13	-4.04	63.34	-26.86	9.5
14	-4.04	63.34	-26.86	9.5
14	-4.37	53.80	-29.62	9.1
15	-4.37	53.80	-29.62	9.1
15	-4.71	43.44	-31.71	8.5
16	-4.71	43.44	-31.71	8.5

Segment number	Level [m]	Moment [kNm]	Shear force [kN]	Displacement [mm]
16	-4.97	35.09	-32.40	8.0
17	-4.97	35.09	-32.40	8.0
17	-5.23	26.64	-32.45	7.5
18	-5.23	26.64	-32.45	7.5
18	-5.49	18.52	-30.02	6.9
19	-5.49	18.52	-30.02	6.9
19	-5.75	11.06	-27.34	6.3
20	-5.75	11.06	-27.34	6.3
20	-6.13	2.41	-18.71	5.3
21	-6.13	2.41	-18.71	5.3
21	-6.50	-2.81	-9.03	4.4
22	-6.50	-2.81	-9.02	4.4
22	-6.88	-4.38	0.28	3.5
23	-6.88	-4.38	0.30	3.5
23	-7.25	-3.19	5.15	2.6
24	-7.25	-3.19	5.15	2.6
24	-7.63	-1.11	5.10	1.7
25	-7.63	-1.11	5.10	1.7
25	-8.00	0.00	-0.03	0.8
Max		86.16	43.31	9.8
Max, minor nodes incl.		86.22	43.31	9.8

17.4.3 Percentage Mobilized Resistance

Horizontal soil pressure	Left [kN]	Right [kN]
Effective	148.5	268.8
Water	254.3	90.7
Total	402.8	359.4

Considered as passive side	Right
Maximum passive effective resistance	581.07 kN
Mobilized passive effective resistance	268.76 kN
Percentage mobilized resistance	46.3 %
Position single support	0.10 m
Maximum passive moment	3693.94 kNm
Mobilized passive moment	1612.29 kNm
Percentage mobilized moment	43.6 %

17.4.4 Anchors/Struts

Anchor/strut	Level [m]	E-Modulus [kN/m ²]	Force [kN]	State	Side	Type
strut	0.10	2.100E+08	43.31	Elastic	Right	Strut

End of Report

Bijlage C

Verticaal evenwichts berekening

Bijlage D

Schade indicatie berekening

Toelichting grondslagen

In dit document kunt u secties vinden die onleesbaar zijn gemaakt. Deze informatie is achterwege gelaten op basis van de Wet open overheid (Woo). De letter die hierbij is vermeld correspondeert met de bijbehorende grondslag in onderstaand overzicht.

J Art. 5.1 lid 2 sub e

Het belang van de openbaarmaking van deze informatie weegt niet op tegen het belang van de eerbiediging van de persoonlijke levenssfeer van betrokkenen

Notitie / Memo

HaskoningDHV Nederland B.V.
Mobility & Infrastructure

Aan: [REDACTED]
Van: [REDACTED]
Datum: 22 augustus 2024
Kopie: [REDACTED] & [REDACTED]
Ons kenmerk: BG8369-MI-ME-240730-1313
Classificatie: Project gerelateerd
Gecontroleerd door [REDACTED]

**Onderwerp: Ontwerp Ringgording en OWB-vloer duikerkruising Strijenseweg 's
Gravendeel**

1 Inleiding

Voor het project Duikerkruising te Strijenseweg, 's Gravendeel wordt in opdracht van Gemeente Hoeksche Waard door Royal HaskoningDHV (RHDHV) de engineering uitgevoerd voor een duikerkruising om twee peilgebieden te verbinden. Deze kruising is door middel van een horizontale boring. Voor deze boring zijn een pers- en ontvangstuip noodzakelijk. In deze memo zijn de uitgangspunten en constructieve toetsingen van het ontwerp van de ringgordingen en OWB-vloeren voor de bouwkuipen behandeld.

2 Referenties

De gebruikte referenties voor het geotechnisch ontwerp zijn hieronder uitgezet.

2.1 Normen en richtlijnen

- [N1] NEN 9997-1+C2, Geotechnisch ontwerp van constructies
- [N2] CUR 77, Regels voor ongewapende onderwaterbetonvloeren
- [N3] CUR 166, Damwandconstructies
- [N4] NEN-EN 1990+A1+A1/C2:2011 Grondslagen van het constructief ontwerp
- [N5] NEN-EN 1991-1-1+C1:2011 Belastingen op constructies - Deel 1-1: Algemene belastingen - Volumieke gewichten, eigen gewicht en opgelegde belastingen voor gebouwen
- [N6] NEN-EN 1993-1-1+C2 Ontwerp en berekening van staalconstructies - Deel 1-1: Algemene regels en regels voor gebouwen
- [N7] NEN-EN 1993-1-6 Ontwerp en berekening van staalconstructies - Deel 1-6: Algemene regels - Sterkte en Stabiliteit van Staalconstructies
- [N8] NEN-EN 1993-5 Ontwerp en berekening van staalconstructies - Deel 5: Palen en damwanden
- [N9] NEN-EN 1991-1-5 Belastingen op constructies - Deel 1-5: Thermische belasting

2.2 Documenten

- [D1] 'BG8369-RHD-XX-ZZ-RP-GE-0001 Geotechnisch advies duikerkruising, RHDHV, rapportage, d.d. 27 juni 2024;
[D2] 'BG8369-RHD-WR-XX-DR-C-2201-BO_duikerkruising, RHDHV, tekening, d.d. 09 juli 2024

3 Uitgangspunten

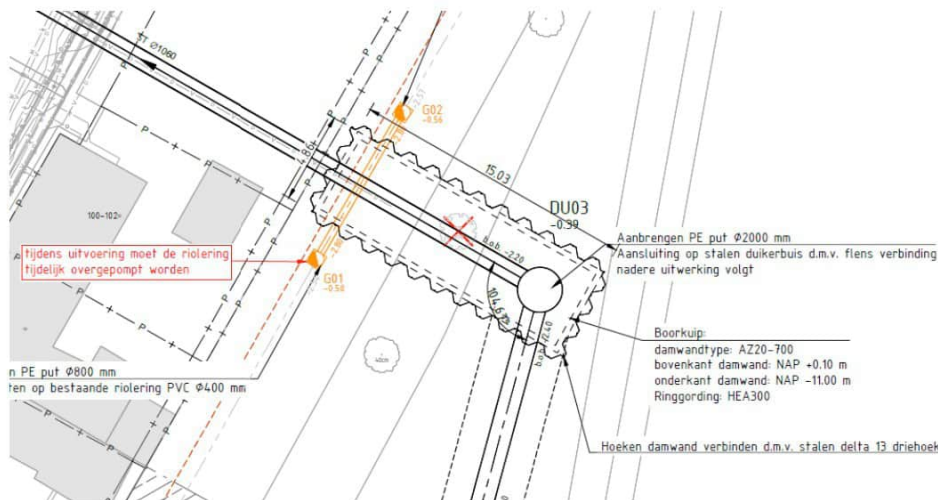
3.1 Beschrijving ontwerp

In de bestaande situatie ligt er een regionale waterkering ter plaatste van de Strijenseweg. Deze dijk scheidt twee peilgebieden. Om wateroverlast in 's-Gravendeel te verminderen worden door middel van een duikerkruising de twee peilgebieden aan elkaar gekoppeld. Daardoor wordt er meer buffercapaciteit gecreëerd en wordt de afwatering gegarandeerd. De duikerkruising wordt gerealiseerd door middel van een gesloten front boringen. Hiervoor is een pers- en ontvangstuip ontworpen.

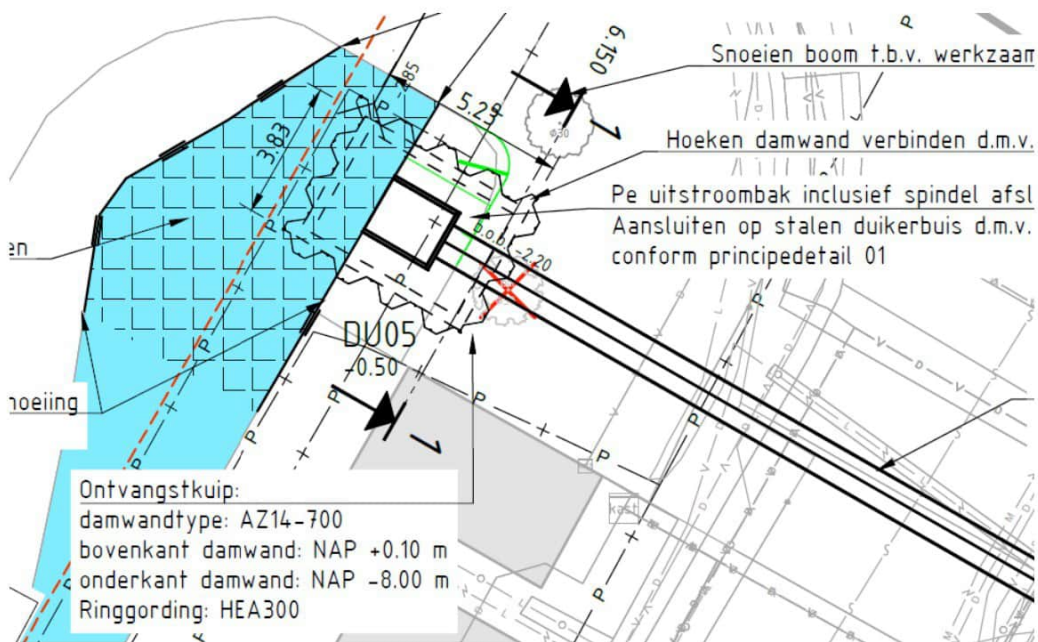


Figuur 3-1 Locatie van duikerkruising aan de Strijenseweg, 's-Gravendeel, locatie van de persuip, duiker en ontvangstuip zijn indicatief weergegeven

Voor de pers- en ontvangstuip zijn in [D1] ontwerpen gemaakt voor de damwanden en is een inschatting gemaakt voor de ringgordingen en de OWB-vloeren.



Figuur 3-2 Ontwerp perskuip volgens



Figuur 3-3 Ontwerp ontvangstuik

3.2 Gevolgklasse

Volgens de CUR77 [N2] wordt de OWB-vloer ingedeeld in gevolgklasse 2. Voor de gording wordt ook uitgegaan van gevolgklasse 2. Volgens de CUR 166 [N3] moet er ook met stempeluitval gerekend worden.

3.3 Materialen

3.3.1 Beton

Het OWB wordt uitgevoerd met betonsterkteklasse C20/25.

De eigenschappen van deze betonklasse volgens de CUR 77 [N2] zijn hieronder weergegeven.

Tabel 3-1 Betonklasse OWB-vloer

Betonklasse	f_{ck} [N/mm ²]	$f_{cd,p}$ [N/mm ²]	$f_{ctd,pl}$ [N/mm ²]	E_{cm} [N/mm ²]
C20/25	20	10,7	0,80	27500

3.3.2 Staal

Voor de gording wordt staalkwaliteit S355 toegepast. De eigenschappen zijn gepresenteerd in Tabel 3-2.

Tabel 3-2; Materiaaleigenschappen gebruikte staalsoort

Sterkteklasse	f_{yk} [MPa]	f_{yd} [MPa]	f_u [MPa]	E_{cm} [MPa]
S355	355	355	510	210000

3.4 Bouwfasering

Voor beide bouwkuipen geldt de (globale) volgende bouwfasering:

1. Aanbrengen damwanden;
2. Ontgraven t.b.v. aanbrengen stempels en gording;
3. Aanbrengen gording en stempels;
4. Ontgraven bouwkuip;
5. Aanbrengen OWB-vloer;
6. Leegpompen bouwkuip;
7. Bouwkuip in gebruik nemen.

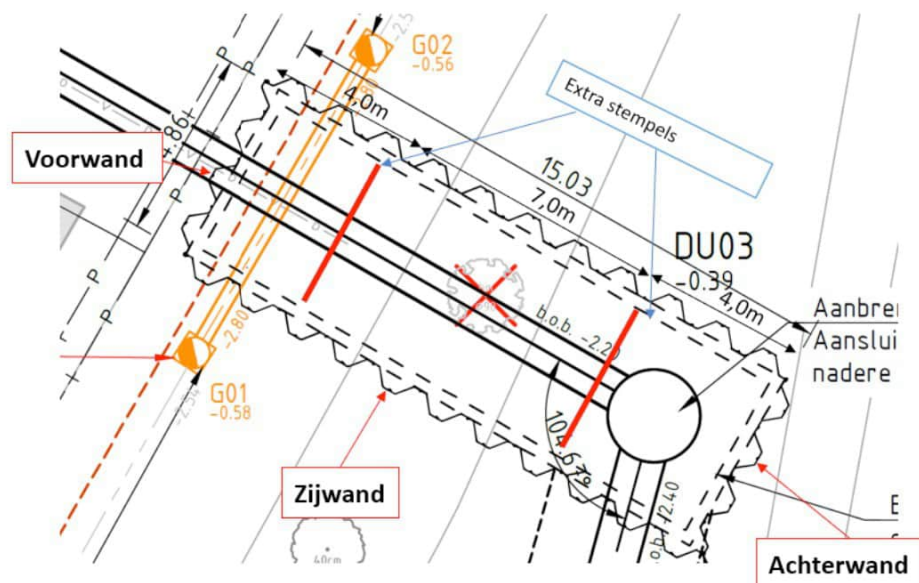
4 Ringgording

Ten behoeve van de stabiliteit van de bouwkuip en om de vervormingen te beperken dient een ringgording toegepast te worden. In paragraaf 3.1 zijn de ringgordingen van beide bouwkuipen gepresenteerd.

De ringgording is in D-Sheet in [D1] gemodelleerd als stempel. Voor het oppervlak van de ringgording is uitgegaan van $14 \text{ cm}^2/\text{m}$ over 7,5 meter strekkende damwand. Dit is vergelijkbaar met een stempeloppervlak van 105 cm^2 voor de lange zijde. Het oppervlak van de stempel is vergelijkbaar als dat van een HEA300. Voor beide bouwkuipen is de stempel op deze manier in D-sheet gemodelleerd.

4.1 Ringgording perskuip

De ringgording wordt aan de binnenzijde van de bouwkuip aangebracht en dient op druk aan de damwand gekoppeld te worden. De afmeting van de bouwkuip bedraagt $15,03 \times 4,86 \text{ m}^1$. Uit een eerste beschouwing is gebleken dat de gordingen tegen de zijwanden niet voldoen, zie Figuur 4-1. Vervolgens is ervoor gekozen om twee extra stempels tussen deze gording te zetten. Omwille van het kunnen aanbrengen van de boor is ervoor gekozen om de afstand tussen de twee stempels 7,0m te maken. Deze stempels hebben een buitendiameter van 273mm en wanddikte van 10mm (CHS273,0x10). De ringgordingen en stempels zitten op een hoogte van NAP +0,10m.

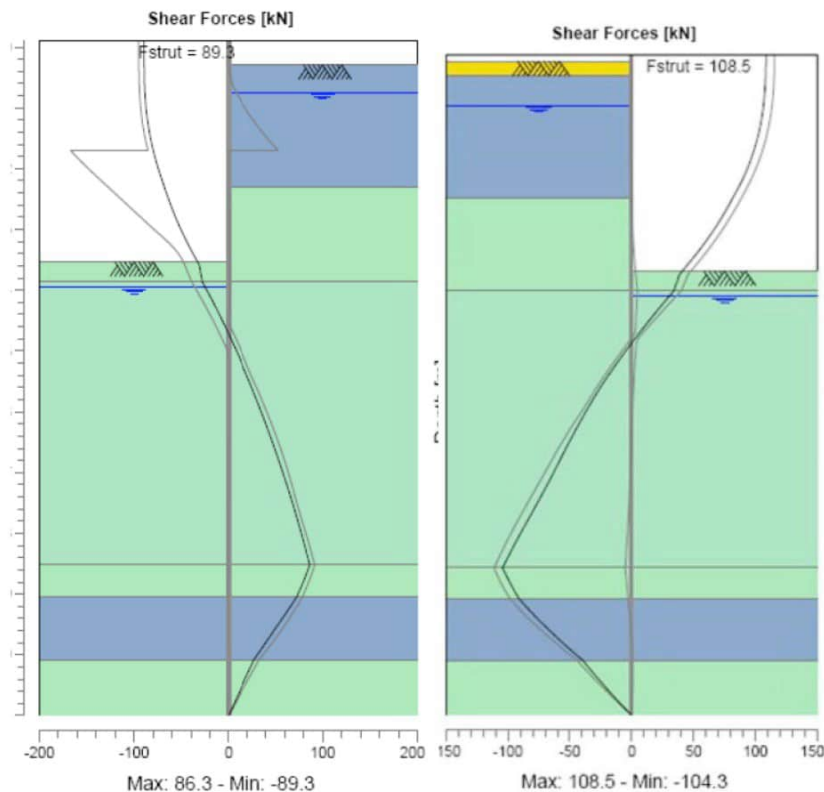


Figuur 4-1 Bovenaanzicht perskuip met extra stempels

In [D1] zijn voor de perskuip twee D-sheet berekening uitgevoerd:

- Damwand berekening: perskuip achterwand;
- Damwand berekening: perskuip voorwand en zijwanden.

Het verschil tussen deze twee berekeningen is dat op de achterwand de grote vijzelkracht van de boor werkt en voor de voorwand en zijwanden is gekozen om de voorwand te berekenen aangezien deze maatgevend is vanwege een schuur en een grotere kerende hoogte. In Figuur 4-2 zijn de maatgevende krachten voor de achterwand en de voorwand gepresenteerd.



Figuur 4-2 Maatgevende UGT D-sheet piling resultaten volgens [D1], links de achterwand en rechts de voorwand en de zijwanden

De gordingen aan de korte zijde (achter- en voorwand) is geschematiseerd als een ligger op twee steunpunten en de gordingen aan de lange zijde als een ligger op 4 steunpunten. Voor zowel de korte gording als de lange gording wordt een belasting van 108,5 kN/m aangehouden.

Belastingen korte gording HEB300 (achterwand en voorwand)

De belastingen die werken op de korte ringgording zijn:

$$q_{\text{gording}} = 108,5 \text{ kN/m (UGT)}$$

$$N = \frac{1}{2} * q * L = \frac{1}{2} * 108,5 * 4,0 = 217 \text{ kN (UGT)}$$

Als één van de stempels uitvalt van de lange zijde ontstaat er een grotere drukkracht in de gording van de korte zijde. Deze normaalkracht is dan:

$$N = \frac{1}{2} * q * L = \frac{1}{2} * 108,5 * (4,0 + 7,0) = 597 \text{ kN (CAL)}$$

Conservatief wordt deze normaalkracht in rekening gebracht op de korte gording.

Daarnaast wordt de uitzetting t.g.v. temperatuur door de gording meegenomen. De temperatuurbelasting resulteert in een verlenging van de gording en verhoging van de normaalkracht. Een deel van deze vervorming resulteert in een verplaatsing van de damwand tegen de gronddruk in. Het overige deel resulteert in verhinderde vervorming van de gording. Volgens de D-sheet bijlage van [D1] is de optredende verplaatsing bij de stempelkracht van 108,5 kN 2,8mm. Dit resulteert in een beddingsconstante van de grond van $108,5 // 2,8 // 10^3 = 38750 \text{ kN/m}$. Er wordt een bovengrens van $38750 * \sqrt{2} = 55000 \text{ kN/m}$ (stijvere grond resulteert in hogere normaalkracht).

De stempelkracht t.g.v. temperatuur kan berekend worden aan de onderstaande formules uit de CUR166 paragraaf 4.9.12.

Veerconstante damwand	$K_{dw} = \beta_g \ell_g =$
Veerconstante stempel	$K_s = \frac{2 A E_s}{\ell_s} =$
Temperatuurrange	$\Delta T_{rep} = \psi_t (T_{out} - T_m) =$
Stempelkracht	$N_{\Delta T, rep} = \Delta T_{rep} A_s E_s \alpha_T K_{dw} / (K_{dw} + K_s)$

Uitgangspunten voor deze berekening zijn:

- $T_m = 10$ graden (volgen NEN-EN 1991-1-5 NB5.3 T_6 t/m T_9)
- $T_{out} = T_{max} + T_5 = 30 + 45 = 75$ graden (volgens NEN-EN 1991-1-5 NB5.3 [N9])
- $t = 1$ jaar (conservatief aangenomen)
- $\psi_t = 0,565$ (op basis van 1 jaar volgens CUR 166 en NEN  A1.1)

$$K_{dw} = 55000 \cdot 4,86 = 267300 \text{ kN/m}$$

$$K_s = 2 \cdot 14908 \cdot \frac{210000}{4860} = 1288345 \text{ kN/m}$$

$$\Delta T_{rep} = 0,565 \cdot (75 - 10) = 36,7$$

$$N_{\Delta T, rep} = 36,7 \cdot 14908 \cdot 210 \cdot 12 \cdot 10^{-6} \cdot \frac{267300}{267300 + 1288345} = 236 \text{ kN}$$

$$\text{UGT: } N_{tot} = 597 + 1,5 \cdot 236 = 951 \text{ kN}$$

Belastingen lange gording HEB500 en stempels CHS 273x10 (zijwanden)

De belastingen die werken op de lange ringgording zijn:

$$\text{UGT: } q_{gording} = 108,5 \text{ kN/m}$$

$$N = \frac{1}{2} \cdot q \cdot L = \frac{1}{2} \cdot 108,5 \cdot 4,86 = 262 \text{ kN}$$

$$\text{CAL}_{\text{stempeluitval: } q_{gording} = 108,5 / 1,2 = 90,4 \text{ kN/m}}$$

$$N = \frac{1}{2} \cdot q \cdot L = \frac{1}{2} \cdot 90,4 \cdot 4,86 = 220 \text{ kN}$$

Ook voor de lange ringgording wordt temperatuur meegenomen.

$$K_{dw} = 55000 \cdot 15,0 = 825000 \text{ kN/m}$$

$$K_s = 2 \cdot 23864 \cdot \frac{210000}{15000} = 668192 \text{ kN/m}$$

$$\Delta T_{rep} = 0,565 \cdot (75 - 10) = 36,7$$

$$N_{\Delta T, rep} = 36,7 \cdot 23864 \cdot 210 \cdot 12 \cdot 10^{-6} \cdot \frac{825000}{825000 + 668192} = 1219 \text{ kN}$$

$$\text{UGT: } N_{tot} = 262 + 1,5 \cdot 1219 = 2091 \text{ kN}$$

$$\text{CAL: } N_{tot} = 220 + 1219 = 1439 \text{ kN}$$

De toetsing voor de korte en de lange gording is uitgevoerd in bijlage A1.

In de toetsing van de lange gording zijn ook de stempels getoetst.

Merk op dat voor de korte gording in de standaardsheet ook een stempel getoetst wordt, echter deze toetsing dient te worden genegeerd. Een overzicht van de toetsing is hieronder gepresenteerd. De ringgordingen voldoen.

De toetsing van de korte zijde voldoet. Zie onderstaande samenvatting van de toetsing:

Stempeluitval	UC _{zonder}	UC _{met uitval}
Stempel: Stabiliteit	#DIV/0!	#DIV/0!
Gording: Stabiliteit	0,68	0,00
Doorsnede:	0,54	0,00

Figuur 4-3 Toetsing korte gording

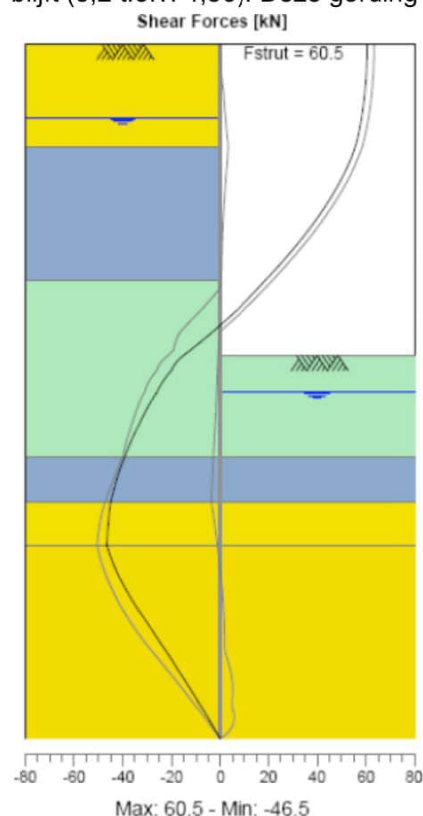
Voor de lange zijde is te zien dat de toetsing voor stempeluitval niet voldoet (linker toetsing hieronder). Hierbij is voor de h.o.h. afstand tussen de stempels 7,0m ingevoerd (er kan maar één h.o.h. afstand ingevoerd worden). Bij stempeluitval wordt de afstand tussen de ondersteuning dan 14,0m. In werkelijkheid is deze afstand 7,0m + 4,0m = 11,0m. Er wordt voor de situatie voor met ankeruitval gerekend met een h.o.h. afstand van 5,5m. Hiermee wordt de afstand tussen de ondersteuning met stempeluitval 11,0m. De toetsing met stempeluitval voldoet nu wel.

Stempeluitval		UC _{zonder}	UC _{met uitval}	Stempeluitval		UC _{zonder}	UC _{met uitval}
Stempel:	Stabiliteit	0,85	0,93	Stempel:	Stabiliteit	0,70	0,76
Gording:	Stabiliteit	0,74	1,41	Gording:	Stabiliteit	0,57	0,93
	Doorsnede:	0,67	1,31		Doorsnede:	0,42	0,82

Figuur 4-4 Toetsing lange gording en stempels met h.o.h. afstand 7,0m (links) en h.o.h. afstand 5,5m (rechts)

4.2 Ringgording ontvangstuip

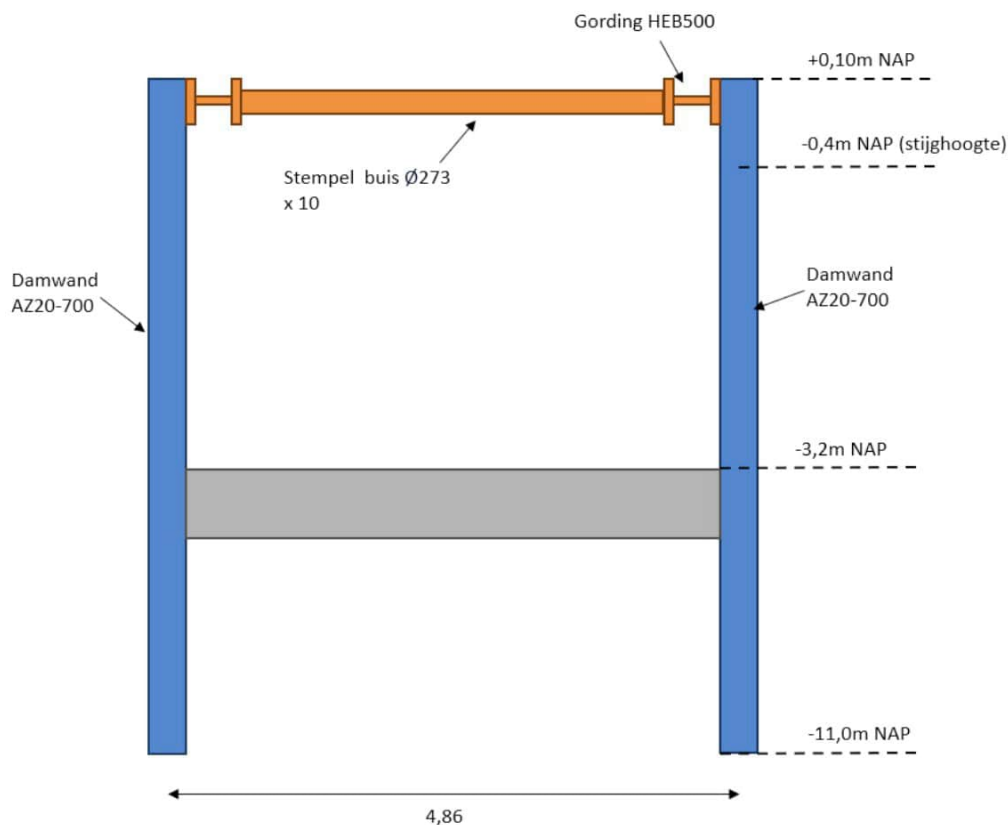
Voor de ringgording van de ontvangstuip wordt net als voor de korte zijde een HEB300 toegepast. Deze ringgording zal niet maatgevend zijn t.o.v. de HEB300 die toegepast wordt voor de perskuip. De belasting is aanzienlijk minder (zie Figuur 4-5) terwijl de maximale lengte van de gording nagenoeg gelijk blijft (5,2 t.o.v. 4,86). Deze gording wordt verder niet uitgewerkt.



Figuur 4-5 Maatgevende UGT D-sheet piling resultaten volgens [D1] voor de ontvangstuip

5 OWB-vloeren

Omdat het verticaal evenwicht niet voldoet voor de bouwkuip, is er gekozen voor onderwaterbeton (OWB). Voor de dikte van het OWB is voor zowel de pers- als ontvangstuip uitgegaan van 1000mm. Voor de pers- en ontvangstuip worden respectievelijke damwanden AZ20-700 en AZ14-700 gebruikt. Hieronder is een dwarsdoorsnede van de perskuip gepresenteerd.



Figuur 5-1 Bouwkuip perskuip met damwanden en OWB

5.1 Belastingen

De belasting voor beide OWB-vloeren is gelijk. Beide vloeren hebben dezelfde waterdruk (gelijke grondwaterstand en niveau OWB) aangezien en dezelfde dikte.

Eigen gewicht (BG1)

De OWB-vloer is 1000mm dik. Het soortelijk gewicht van OWB is 23 kN/m³ volgens CUR 77 [N2].

$$q_{g,k} = 1,0 \cdot 23 = 23 \text{ kN/m}^2$$

Waterdruk (BG2)

De bovenkant van de vloer ligt op -3,20m NAP en er wordt gerekend met een stijghoogte van -0,4m NAP (zie [D1]). Voor het soortelijk gewicht van water wordt 10 kN/m³ aangehouden.

$$q_{w,k} = (-0,4 - -3,2 + 1,0) \cdot 10 = 38 \text{ kN/m}^2$$

Stempelkracht (BG3)

Er wordt geen stempelkracht in rekening gebracht. Deze stempelkracht werkt gunstig voor de krachtswerking, dus dit is een conservatieve aanname.

Zwelbelasting (BG4)

Voor de evenwichtsberekening in [D1] wordt geen zwelbelasting meegenomen. Voor de constructieve toetsing is er ook als uitgangspunt voor gekozen dat er geen zwel optreedt.

5.2 Belastingcombinaties

De belastingcombinatie die beschouwd is:

$$BC1 = 0,9 \times BG1 + 1,2 \times BG2 + 0,9 \times BG3$$

De opwaartse druk tegen de onderkant van de vloer is:

$$0,9 \times 23 - 1,2 \times 38 = -24,9 \text{ kN/m}^2$$

5.3 Toetsing OWB

De OWB-vloer wordt gezien als ligger op twee steunpunten. Het maximale moment in het midden van de vloer en de toetsing hiervan wordt hieronder gedaan. Voor de toleranties wordt uitgegaan dat er een uitvullaag toegepast wordt en dat de vloer wordt uitgevoerd volgens de Hop-dobber-methode.

$$h_{min} = h_{gem} - \sqrt{(tol_{onder})^2 + (tol_{boven})^2} = 1000 - \sqrt{150^2 + 75^2} = 832 \text{ mm}$$

$$M_{Ed} = \frac{1}{8} \cdot q \cdot l^2 = \frac{1}{8} \cdot 24,9 \cdot 4,86^2 = 73,5 \text{ kNm/m}$$

$$\sigma_{ed} = \frac{6 \cdot M_{Ed}}{b \cdot h_{min}^2} = \frac{6 \cdot 73,5 \cdot 10^6}{1000 \cdot 832^2} = 0,64 \text{ MPa}$$

$$f_{ctd,pl} = 0,80 \text{ (volgens CUR 77)}$$

$$U.C. = \frac{0,64}{0,80} = 0,80 \rightarrow \text{voldoet}$$

De optredende dwarskracht is:

$$V_{ed} = \frac{1}{2} \cdot 24,9 \cdot 4,86 = 60,5 \text{ kN/m}$$

$$V_{rd,c} = v_{min} \cdot h_{min} = 0,28 \cdot 1000 \cdot 832 = 233 \text{ kN/m}$$

$$v_{min} = 0,035 \cdot k^{\frac{3}{2}} \cdot f_{ck}^{\frac{1}{2}} = 0,035 \cdot 1,49^{\frac{3}{2}} \cdot 20^{\frac{1}{2}} = 0,28 \text{ MPa}$$

$$k = 1 + \sqrt{\frac{200}{h_{min}}} = 1,49$$

$$k_1 = 0,15$$

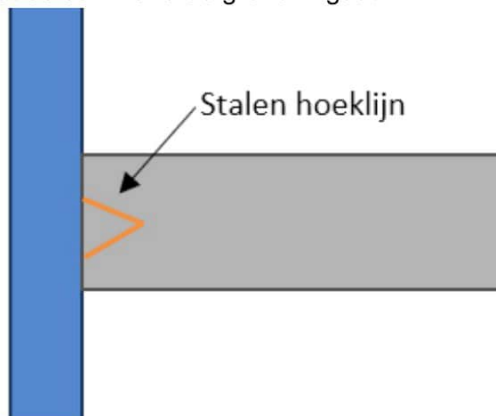
$$U.C. = \frac{60,5}{233} = 0,26 \rightarrow \text{voldoet}$$

5.4 Verbinding OWB en damwand

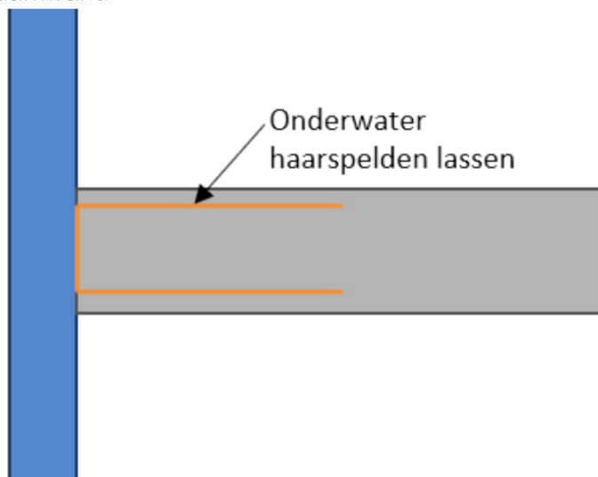
De belastingafdracht van de onderwaterbetonvloer naar de damwanden wordt verzorgd doormiddel van wrijving. Er wordt vanuit gegaan dat de stempelkracht in de onderwaterbetonvloer niet voldoende is om dit doormiddel van wrijving af te dragen aan de damwanden.

De vloer zal dus gaan schuiven en er is een speciale voorziening nodig om dit te verhinderen. De volgende twee opties zijn hiervoor mogelijk:

- Stalen hoekprofiel lassen aan de damwand. Dit profiel kan aangebracht worden op de damwand voordat de damwand de grond in gaat.

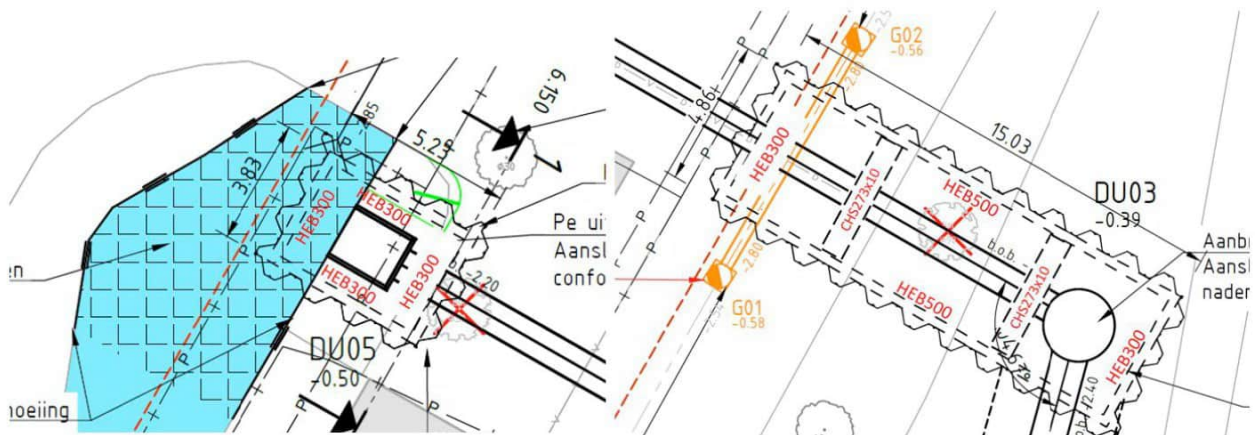


- Wapeningstaven lassen aan de damwand. Deze staven moeten onderwater gelast worden aan de damwand



6 Conclusie en aanbevelingen

Voor de ringgordingen wordt geadviseerd voor ontvangstuip een HEB300 rondom toe te passen. Voor de perskuip voldoet een HEB500 in lengte richting en een HEB300 in korte richting. Daarnaast is het nodig om in de lange richting twee extra stempels toe te passen. Deze stempels bestaan uit stalen buisprofielen en hebben een diameter van 273mm en een wanddikte van 10mm (CHS273,0x10).



Figuur 6-1 Boven-aanzicht ontvangstuip (links) en perskuip (rechts) met in het rood de gekozen staalprofielen

Beide OWB-vloeren dienen uitgevoerd te worden met een vloerdikte van 1000mm. De OWB-vloeren kunnen ongewapend uitgevoerd worden. Om het opdrijven van de vloeren tegen te gaan is het belangrijk dat er voor beide bouwkuipen speciale voorzieningen getroffen worden om het opdrijven tegen te gaan.

De volgende maatregelen bieden uitkomst:

- Stalen hoekprofiel lassen aan de damwand en verankeren in de OWB-vloeren;
- Wapeningstaven lassen aan de damwand en verankeren in de OWB-vloeren.

Door de verbinding tussen de damwand en de OWB-vloer gaat de bouwkuip als één systeem werken. De reactiekracht vanuit de OWB-vloer werkt in de damwand. De trekcapaciteit van de damwand moet voldoende zijn om deze kracht op te nemen. Dit dient getoetst te worden in het geotechnische advies [D1].

De volgende onderdelen moeten nog uitgewerkt worden in de vervolgfase (UO):

- Verbinding stempels met gording;
- Verbinding gording met gording (hoek);
- Eén van de bovenstaande verbindingen tussen de damwand en de OWB-vloer. Als er gekozen wordt voor de stalen hoeklijn moet deze ook getoetst worden op de belasting die optreedt tijdens het aanbrengen van de damwanden;

Voor de toleranties van de OWB-vloer wordt uitgegaan van een uitvullaag en de stortmethode Hop-dobber-methode. Dit moet nog afgestemd worden met de aannemer. Als deze uitgangspunten wijzigen zal de berekening aangepast moeten worden.

A1 Toetsing ringgording

Stempel en Gordingberekening NEN-EN 1993-1-1+C2+NB				Ver.2.0 27-11-'15	 Royal HaskoningDHV Enhancing Society Together																																
Projectnr	BG8369		J J J			Versie 2.0																															
Project	Strijenseweg 's Gravendeel		J J																																		
Subject	Ringgording korte zijde		J																																		
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Stempel en Gordingberekening NEN-EN 1993-1-1+C2+NB				Ver.2.0 27-11-15		 Royal HaskoningDHV Enhancing Society Together	
Projectnr	BG8369			J		Versie 2.0	
Project	Strijenseweg 's Gravendeel			J		J	
Subject	Ringgording korte zijde			J		J	
Doorsnede eigenschappen							
Stempel Φ 0,0-0,0				HE300B			
$d = 0 \text{ mm}$ $t = 0 \text{ mm}$ $A = 0 \text{ mm}^2$ $I = 0 \times 10^4 \text{ mm}^4$ $W_{pl} = 0,0 \times 10^3 \text{ mm}^3$ $W_{el} = \#DIV/0! \times 10^3 \text{ mm}^3$				$h = 300 \text{ mm}$ $b = 300 \text{ mm}$ $t_w = 11 \text{ mm}$ $t_f = 19 \text{ mm}$ $r = 27,0 \text{ mm}$ $d = 208 \text{ mm}$ $S_{y,max} = 1868,7 \times 1/2 \times 10^3 = 934,3 \times 10^3 \text{ mm}^3$ $S_{y,fl} = 934 \times 1000 - 1/8 \times 11,0 \times 208^2 = 874,8 \times 10^3 \text{ mm}^3$			
				$A_{tot} = 14908 \text{ mm}^2$ $A_v = 4743 \text{ mm}^2$ $I_y = 25166 \times 10^4 \text{ mm}^4$ $I_z = 8563 \times 10^4 \text{ mm}^4$ $W_{y,pl} = 1868,7 \times 10^3 \text{ mm}^3$ $W_{y,el} = 1677,7 \times 10^3 \text{ mm}^3$			
Krachtenwerking							
Hulpfactoren	elastisch	Steunpunt	Veldmidden	Equival. moment	Reactiekr.	Dwarskr.	
1. Scharnierend (enkelvelds)	plastisch	$k_{M,s}$	$k_{M,mid}$	C_{my}	k_R	k_V	$E_s = 210 \text{ kN/mm}^2$
		$k_{M,s} \cdot q \ell^2$	$k_{M,mid} \cdot q \ell^2$		$k_R \cdot q \ell$	$k_V \cdot q \ell$	$\rho_s = 7850 \text{ kg/m}^3$
Zonder stempeluitval	e	0,0000	0,1250	0,9500	1,0000	0,5000	$\alpha_T = 12 \times 10^{-6}/K$
Veerconstante damwand $K_{dw} = \beta_g \ell_g = 55000 \times 4,86 = 267300 \text{ kN/m}$ Veerconstante stempel $K_s = 2 A E_s / \ell_s = 2 \times 0 \times 210000 / 4860 = 0 \text{ kN/m}$ Temperatuurrange $\Delta T_{rep} = \psi_t (T_{out} - T_m) = 0,565 \times (75 - 10) = 36,7 \text{ }^\circ\text{C}$ Stempelkracht $N_{\Delta T,rep} = \Delta T_{rep} A_s E_s \alpha_T K_{dw} / (K_{dw} + K_s) = 36,7 \times 0 \times 210 \times 12 / (1e6 \times 267300 / (267300 + 0)) = 0,0 \text{ kN}$ Gordingtemperatuurbelasting $q_{\Delta T,rep} = N_{\Delta T,rep} / \ell_g = 0,0 / 4,86 = 0,0 \text{ kN/m}$							
Stempel zonder stempel uitval							
$M_{Ed} = 1,20 \times 0,0 + 1,50 \times 3,0 + 1,50 \times 12,2 = 23 \text{ kNm}$							
$q_N = 1,25 \times 108,5 + 1,50 \times 0,0 = 136 \text{ kN/m}$							
$N_{Ed} = 1,0000 \times 135,6 \times 4,86 = 659 \text{ kN}$							
Gording zonder stempel uitval							
$q_d = 1,10 \times 108,5 + 1,50 \times 0,0 = 119 \text{ kN/m}$							
$M_{s,y,Ed} = 0,0000 \times 119,4 \times 4,86^2 = 0 \text{ kNm}$							
$M_{mid,y,Ed} = 0,1250 \times 119,4 \times 4,86^2 = 352 \text{ kNm}$							
$V_{z,Ed} = 0,5000 \times 119,4 \times 4,86 = 290 \text{ kN}$							
$N_{Ed} = 1,25 \times 572,0 = 715 \text{ kN}$							
Stabiliteitscontrole stempel NEN-EN 1993-1-1+C2							
Stempel 0,0-0,0 $\rightarrow$ S355				$f_y = 355 \text{ N/mm}^2$		$\sigma_{ploo} = \#DIV/0! \text{ N/mm}^2$	
Knikkromme: c				$\epsilon = 0,81$			
Zonder stempeluitval	$M_{Ed} = 23 \text{ kNm}$						
	$N_{Ed} = 659 \text{ kN}$						
Doorsnedeklasse NEN-EN 1993-1-1+C2 5.6							
$d / t = \#DIV/0!$		Klasse: 1	33,10	#DIV/0!	Stabiliteitstoets is maatgevende stempeloetsing #DIV/0!		
		Klasse: 2	46,34	#DIV/0!			
		Klasse: 3	59,58	#DIV/0!			
		Klasse: #DIV/0!	controle met W #DIV/0!				
$M_{y,Rd} = \#DIV/0! \times 10^{-3} = \#DIV/0! \text{ kNm}$							
$N_{Rd} = \#DIV/0! \times 10^{-3} = \#DIV/0! \text{ kN}$							
Stabiliteit zonder stempeluitval NEN-EN 1993-1-1+C2 6.3.3							
$L_{cr,y} = \ell_s = 4,86 \text{ m}$							
$N_{cr,y} = \pi^2 E I_y / L_{cr,y}^2 = 0 \text{ kN}$							
$\lambda_{rel,y} = \sqrt{N_{Rd} / N_{cr,y}} = \#DIV/0!$							
$\chi_y = (\Phi + \sqrt{\Phi^2 - \lambda_{rel,y}^2})^{-1} = \#DIV/0!$							
$C_{my} = 0,95 + 0,05 \times \alpha_h = 0,950$							
$k_{yy} \#DIV/0! \lambda_{rel,y} N_{Ed} / (\chi_y N_{Rd}) C_{my} = \#DIV/0!$							
#DIV/0!							
659 #DIV/0! 23 #DIV/0!							
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- De verticale belasting op de gording (bijv. grond) is niet meegenomen - De gording dient voldoende vertikaal gesteund te worden tbv stabiliteit en sterkte																																															

Stempel en Gordingberekening NEN-EN 1993-1-1+C2+NB						Ver.2.0 27-11-15		 Royal HaskoningDHV Enhancing Society Together	
Projectnr		BG8369		J		Versie 2.0			
Project		Strijenseweg 's Gravendeel		J		J			
Subject		Berekening Gording lange zijde		J		J			
Doorsnede eigenschappen									
Stempel Φ 273,0-10,0				HE500B					
$d = 273 \text{ mm}$ $t = 10 \text{ mm}$ $A = 8262 \text{ mm}^2$ $I = 7154 \times 10^4 \text{ mm}^4$ $W_{pl} = 692,0 \times 10^3 \text{ mm}^3$ $W_{el} = 524,1 \times 10^3 \text{ mm}^3$				$h = 500 \text{ mm}$ $b = 300 \text{ mm}$ $t_w = 14,5 \text{ mm}$ $t_f = 28 \text{ mm}$ $r = 27,0 \text{ mm}$ $d = 390 \text{ mm}$ $A_{tot} = 23864 \text{ mm}^2$ $A_v = 8982 \text{ mm}^2$ $I_y = 107176 \times 10^4 \text{ mm}^4$ $I_z = 12624 \times 10^4 \text{ mm}^4$ $W_{y,pl} = 4814,6 \times 10^3 \text{ mm}^3$ $W_{y,el} = 4287,0 \times 10^3 \text{ mm}^3$ $S_{y,max} = 4814,6 \times 1/2 \times 10^3 = 2407,3 \times 10^3 \text{ mm}^3$ $S_{y,fl} = 2407 \times 1000 - 1/8 \times 14,5 \times 390^2 = 2131,6 \times 10^3 \text{ mm}^3$					
Krachtenwerking									
Hulpfactoren	elastisch	Steunpunt	Veldmidden	Equival. moment	Reactiekr.	Dwarskr.			
3. Randveld (meervelds)	plastisch	$k_{M,s}$	$k_{M,mid}$	C_{my}	k_R	k_V			
Zonder stempeluitval	e	-0,1071	0,0750	0,7000	1,1429	0,6071			
Bij stempeluitval	p	-0,0858	0,0821	0,8657	1,0074	0,5858			
							$E_s =$	210 kN/mm ²	
							$\rho_s =$	7850 kg/m ³	
							$\alpha_T =$	$12 \times 10^{-6}/K$	
Veerconstante damwand		$K_{dw} =$	$\beta_g \ell_g =$			55000 x 5,50 =	302500 kN/m		
Veerconstante stempel		$K_s =$	$2 A E_s / \ell_s =$			2x 8262 x 210000 / 4860 =	714034 kN/m		
Temperatuurrange		$\Delta T_{rep} =$	$\psi_t(T_{out}-T_m) =$			0,565 x (75 - 10) =	36,7 °C		
Stempelkracht		$N_{\Delta T,rep} =$	$\Delta T_{rep} A_s E_s \alpha_T K_{dw} / (K_{dw} + K_s) =$			36,7 x 8262 x 210 x 12 / 1e6 x 302500 / (302500 + 714034) =	227,7 kN		
Gordingtemperatuurbelasting		$q_{\Delta T,rep} =$	$N_{\Delta T,rep} / \ell_g =$			227,7 / 5,50 =	41,4 kN/m		
Stempel zonder stempel uitval					Stempel bij stempel uitval				
$M_{Ed} = 1,20 \times 1,9 + 1,50 \times 3,0 + 1,50 \times 12,2 = 25 \text{ kNm}$					$M_{Ed} = 1,00 \times 1,9 + 1,00 \times 3,0 + 1,00 \times 12,2 = 17 \text{ kNm}$				
$q_N = 1,25 \times 108,5 + 1,50 \times 41,4 = 198 \text{ kN/m}$					$q_N = 1,00 \times 90,4 + 1,00 \times 41,4 = 132 \text{ kN/m}$				
$N_{Ed} = 1,1429 \times 197,7 \times 5,50 = 1243 \text{ kN}$					$N_{Ed} = 1,0074 \times 131,8 \times 11,00 = 1460 \text{ kN}$				
Gording zonder stempel uitval					Gording bij stempel uitval				
$q_d = 1,10 \times 108,5 + 1,50 \times 41,4 = 181 \text{ kN/m}$					$q_d = 1,00 \times 90,4 + 1,00 \times 41,4 = 132 \text{ kN/m}$				
$M_{s,y,Ed} = -0,1071 \times 181,4 \times 5,50^2 = -588 \text{ kNm}$					$M_{s,y,Ed} = -0,0858 \times 131,8 \times 11,00^2 = -1368 \text{ kNm}$				
$M_{mid,y,Ed} = 0,0750 \times 181,4 \times 5,50^2 = 412 \text{ kNm}$					$M_{mid,y,Ed} = 0,0821 \times 131,8 \times 11,00^2 = 1309 \text{ kNm}$				
$V_{z,Ed} = 0,6071 \times 181,4 \times 5,50 = 606 \text{ kN}$					$V_{z,Ed} = 0,5858 \times 131,8 \times 11,00 = 849 \text{ kN}$				
$N_{Ed} = 1,25 \times 2091,0 = 2614 \text{ kN}$					$N_{Ed} = 1,00 \times 1439,0 = 1439 \text{ kN}$				
Stabiliteitscontrole stempel NEN-EN 1993-1-1+C2									
Stempel 273,0-10,0 → S355				$f_y = 355 \text{ N/mm}^2$		$\sigma_{ploo} = 355 \text{ N/mm}^2$			
Knikkromme: c				$\epsilon = 0,81$					
Zonder stempeluitval		$M_{Ed} = 25 \text{ kNm}$		Met stempeluitval		$M_{Ed} = 17 \text{ kNm}$			
		$N_{Ed} = 1243 \text{ kN}$				$N_{Ed} = 1460 \text{ kN}$			
Doorsnedeklasse NEN-EN 1993-1-1+C2 5.6									
d / t = 27,30		Klasse: 1	33,10	voldoet					
		Klasse: 2	46,34						
		Klasse: 3	59,58						
Klasse: 1		controle met W_{pl}			Stabiliteitstoets is maatgevende stempeloetsing				
$M_{y,Rd} = 692,0 \times 355 \times 10^{-3} = 246 \text{ kNm}$									
$N_{Rd} = 8262 \times 355 \times 10^{-3} = 2933 \text{ kN}$									
Stabiliteit zonder stempeluitval NEN-EN 1993-1-1+C2 6.3.3					Stabiliteit bij stempeluitval NEN-EN 1993-1-1+C2 6.3.3				
$L_{cr,y} = \ell_s = 4,86 \text{ m}$									
$N_{cr,y} = \pi^2 E I_y / L_{cr,y}^2 = 6278 \text{ kN}$									
$\lambda_{rel,y} = \sqrt{N_{Rd} / N_{cr,y}} = 0,684$									
$\chi_y = (\Phi + \sqrt{\Phi^2 - \lambda_{rel,y}^2})^{-1} = 0,735$									
$C_{my} = 0,95 + 0,05 \times \alpha_h = 0,950$									
$k_{yy} = (1 + (-0,2 + \lambda_{rel,y}) N_{Ed} / (\chi_y N_{Rd})) C_{my} = 1,215$									
$\frac{1243}{0,73 \times 2933} + 1,215 \times \frac{25}{246} = 0,577 + 0,123 = 0,70$					$\frac{1460}{0,73 \times 2933} + 1,261 \times \frac{17}{246} = 0,678 + 0,087 = 0,76$				
voldoet!					voldoet!				
0,577 + 0,123 = 0,70					0,678 + 0,087 = 0,76				

Stempel en Gordingberekening NEN-EN 1993-1-1+C2+NB				Ver.2.0 27-11-15	
Projectnr: BG8369		Project: Strijenseweg 's Gravendeel		Versie 2.0	
Subject: Berekening Gording lange zijde					
Stabiliteitscontrole gording NEN-EN 1993-1-1+C2					
Gording: 1 x HE500B → S355				$f_y = 355 \text{ N/mm}^2$ $\epsilon = 0,81$	
Zonder stempeluitval		$M_{y,Ed} = 588 \text{ kNm}$ $N_{Ed} = 2614 \text{ kN}$		Met stempeluitval	
				$M_{y,Ed} = 1368 \text{ kNm}$ $N_{Ed} = 1439 \text{ kN}$	
Doorsnede klasse zonder stempeluitval NEN-EN 1993-1-1+C2 5.6			Doorsnede klasse bij stempeluitval NEN-EN 1993-1-1+C2 5.6		
$h_{w,ben} = 507,8 \text{ mm}$ $\alpha = 1,000$ $f_N = 109,5 \text{ N/mm}^2$ $f_M = 245,5 \text{ N/mm}^2$ $\psi = -0,383$			$h_{w,ben} = 279,6 \text{ mm}$ $\alpha = 0,858$ $f_N = 60,3 \text{ N/mm}^2$ $f_M = 294,7 \text{ N/mm}^2$ $\psi = -0,660$		
Lijf: $d / t_w = 26,90$ Klasse: 1: 26,85 Klasse: 2: 30,92 <i>voldoet!</i> Klasse: 3: 62,86			Lijf: $d / t_w = 26,90$ Klasse: 1: 31,71 <i>voldoet!</i> Klasse: 2: 36,52 Klasse: 3: 75,58		
Flens: $c / t_f = 4,13$ Klasse: 1: 7,32 <i>voldoet!</i> Klasse: 2: 8,14 Klasse: 3: 11,39			Flens: $c / t_f = 4,13$ Klasse: 1: 7,32 <i>voldoet!</i> Klasse: 2: 8,14 Klasse: 3: 11,39		
Klasse: 2 controle met $W_{y,pl}$			Klasse: 1 controle met $W_{y,pl}$		
$M_{y,Rd} = 1 \times 4814,6 \times 355 \times 10^{-3} = 1709 \text{ kNm}$ $N_{Rd} = 1 \times 23864 \times 355 \times 10^{-3} = 8472 \text{ kN}$ $V_{z,Rd} = 1 \times 8982 \times 355 / \sqrt{3} \times 10^{-3} = 1841 \text{ kN}$			$M_{y,Rd} = 1 \times 4814,6 \times 355 \times 10^{-3} = 1709 \text{ kNm}$ $N_{Rd} = 1 \times 23864 \times 355 \times 10^{-3} = 8472 \text{ kN}$ $V_{z,Rd} = 1 \times 8982 \times 355 / \sqrt{3} \times 10^{-3} = 1841 \text{ kN}$		
Stabiliteit zonder stempeluitval NEN-EN 1993-1-1+C2 6.3.3			Stabiliteit bij stempeluitval NEN-EN 1993-1-1+C2 6.3.3		
$L_{cr,y} = l_g = 5,50 \text{ m}$ $N_{cr,y} = \pi^2 E I_y / L_{cr,y}^2 = 73433 \text{ kN}$ $\lambda_{rel,y} = \sqrt{N_{Rd} / N_{cr,y}} = 0,340$ $\chi_y = (\Phi + \sqrt{\Phi^2 - \lambda_{rel,y}^2})^{-1} = 0,968$ $C_{my} = 0,1 - 0,8 \times \alpha_s = 0,700$ $k_{yy} = (1 + (-0,2 + \lambda_{rel,y} N_{Ed} / (X_y \cdot N_{Rd}))) C_{my} = 0,731$ $\frac{2614}{0,968 \times 8472} + 0,731 \times \frac{588}{1709} = 0,319 + 0,252 = 0,57$			$L_{cr,y} = 1,650 \times 5,500 = 9,08 \text{ m}$ $N_{cr,y} = \pi^2 E I_y / L_{cr,y}^2 = 26973 \text{ kN}$ $\lambda_{rel,y} = \sqrt{N_{Rd} / N_{cr,y}} = 0,560$ $\chi_y = (\Phi + \sqrt{\Phi^2 - \lambda_{rel,y}^2})^{-1} = 0,904$ $C_{my} = 0,1 - 0,8 \times \alpha_s = 0,866$ $k_{yy} = (1 + (-0,2 + \lambda_{rel,y} N_{Ed} / (X_y \cdot N_{Rd}))) C_{my} = 0,924$ $\frac{1439}{0,904 \times 8472} + 0,924 \times \frac{1368}{1709} = 0,188 + 0,740 = 0,93$		
Doorsnedecontrole gording NEN-EN 1993-1-1+C2+NB					
Zonder stempeluitval		$M_{y,Ed} = 588 \text{ kNm}$ $V_{z,Ed} = 606 \text{ kN}$ $N_{Ed} = 2614 \text{ kN}$		Met stempeluitval	
Klasse: 2 <i>plastische doorsnedecontrole</i>				Klasse: 1 <i>plastische doorsnedecontrole</i>	
				$M_{y,Ed} = 1368 \text{ kNm}$ $V_{z,Ed} = 849 \text{ kN}$ $N_{Ed} = 1439 \text{ kN}$	
Plastische doorsnedecontrole NEN-EN 1993-1-1+C2+NB 6.2.10			Plastische doorsnedecontrole NEN-EN 1993-1-1+C2+NB 6.2.10		
$V_{z,Ed} / V_{z,pl,Rd} = 0,329$ $\rho = 0,00$ $a_1 = 0,30$ $a_2 = 0,30$ $N_{Ed} / N_{Vz,Rd} = 0,309$ $M_{y,Ed} / M_{VN,y,Rd} = 0,42$			$V_{z,Ed} / V_{z,pl,Rd} = 0,461$ $\rho = 0,00$ $a_1 = 0,30$ $a_2 = 0,30$ $N_{Ed} / N_{Vz,Rd} = 0,170$ $M_{y,Ed} / M_{VN,y,Rd} = 0,82$		
$M_{y,V,Rd} = 1709 \text{ kNm}$ $N_{Vz,Rd} = 8472 \text{ kN}$ $M_{VN,y,Rd} = 1387 \text{ kNm}$			$M_{y,V,Rd} = 1709 \text{ kNm}$ $N_{Vz,Rd} = 8472 \text{ kN}$ $M_{VN,y,Rd} = 1665 \text{ kNm}$		
<i>voldoet!</i>			<i>voldoet!</i>		

Stempel en Gordingberekening NEN-EN 1993-1-1+C2+NB Ver.2.0 27-11-'15				 Royal HaskoningDHV Enhancing Society Together																																	
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Belastingen																																					
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Opmerkingen																																					
- De verticale belasting op de gording (bijv. grond) is niet meegenomen - De gording dient voldoende vertikaal gesteund te worden tbv stabiliteit en sterkte																																					

Stempel en Gordingberekening NEN-EN 1993-1-1+C2+NB						Ver.2.0 27-11-15		 Royal HaskoningDHV Enhancing Society Together	
Projectnr		BG8369		J		Versie 2.0		J	
Project		Strijenseweg 's Gravendeel		J		J		J	
Subject		Berekening Gording lange zijde		J		J		J	
Doorsnede eigenschappen									
Stempel Φ 273,0-10,0				HE500B					
$d = 273 \text{ mm}$ $t = 10 \text{ mm}$ $A = 8262 \text{ mm}^2$ $I = 7154 \times 10^4 \text{ mm}^4$ $W_{pl} = 692,0 \times 10^3 \text{ mm}^3$ $W_{el} = 524,1 \times 10^3 \text{ mm}^3$				$h = 500 \text{ mm}$ $b = 300 \text{ mm}$ $t_w = 14,5 \text{ mm}$ $t_f = 28 \text{ mm}$ $r = 27,0 \text{ mm}$ $d = 390 \text{ mm}$ $A_{tot} = 23864 \text{ mm}^2$ $A_v = 8982 \text{ mm}^2$ $I_y = 107176 \times 10^4 \text{ mm}^4$ $I_z = 12624 \times 10^4 \text{ mm}^4$ $W_{y,pl} = 4814,6 \times 10^3 \text{ mm}^3$ $W_{y,el} = 4287,0 \times 10^3 \text{ mm}^3$ $S_{y,max} = 4814,6 \times 1/2 \times 10^3 = 2407,3 \times 10^3 \text{ mm}^3$ $S_{y,fl} = 2407 \times 1000 - 1/8 \times 14,5 \times 390^2 = 2131,6 \times 10^3 \text{ mm}^3$					
Krachtenwerking									
Hulpfactoren	elastisch	Steunpunt	Veldmidden	Equival. moment	Reactiekr.	Dwarskr.			
3. Randveld (meervelds)		$k_{M,s}$	$k_{M,mid}$	C_{my}	k_R	k_V			
Zonder stempeluitval	e	-0,1071	0,0750	0,7000	1,1429	0,6071			
Bij stempeluitval	p	-0,0858	0,0821	0,8657	1,0074	0,5858			
							$E_s = 210 \text{ kN/mm}^2$		
							$\rho_s = 7850 \text{ kg/m}^3$		
							$\alpha_T = 12 \times 10^{-6}/K$		
Veerconstante damwand		$K_{dw} = \beta_g \ell_g =$			$55000 \times 7,00 =$		385000 kN/m		
Veerconstante stempel		$K_s = 2 A E_s / \ell_s =$			$2 \times 8262 \times 210000 / 4860 =$		714034 kN/m		
Temperatuurrange		$\Delta T_{rep} = \psi_t(T_{out} - T_m) =$			$0,565 \times (75 - 10) =$		36,7 °C		
Stempelkracht		$N_{\Delta T,rep} = \Delta T_{rep} A_s E_s \alpha_T K_{dw} / (K_{dw} + K_s) =$			$36,7 \times 8262 \times 210 \times 12 / 1e6 \times 385000 / (385000 + 714034) =$		268,0 kN		
Gordingtemperatuurbelasting		$q_{\Delta T,rep} = N_{\Delta T,rep} / \ell_g =$			$268,0 / 7,00 =$		38,3 kN/m		
Stempel zonder stempel uitval					Stempel bij stempel uitval				
$M_{Ed} = 1,20 \times 1,9 + 1,50 \times 3,0 + 1,50 \times 12,2 =$					$M_{Ed} = 1,00 \times 1,9 + 1,00 \times 3,0 + 1,00 \times 12,2 =$				
25 kNm					17 kNm				
$q_N = 1,25 \times 108,5 + 1,50 \times 38,3 =$					$q_N = 1,00 \times 90,4 + 1,00 \times 38,3 =$				
193 kN/m					129 kN/m				
$N_{Ed} = 1,1429 \times 193,1 \times 7,00 =$					$N_{Ed} = 1,0074 \times 128,7 \times 14,00 =$				
1544 kN					1815 kN				
Gording zonder stempel uitval					Gording bij stempel uitval				
$q_d = 1,10 \times 108,5 + 1,50 \times 38,3 =$					$q_d = 1,00 \times 90,4 + 1,00 \times 38,3 =$				
177 kN/m					129 kN/m				
$M_{s,y,Ed} = -0,1071 \times 176,8 \times 7,00^2 =$					$M_{s,y,Ed} = -0,0858 \times 128,7 \times 14,00^2 =$				
-928 kNm					-2164 kNm				
$M_{mid,y,Ed} = 0,0750 \times 176,8 \times 7,00^2 =$					$M_{mid,y,Ed} = 0,0821 \times 128,7 \times 14,00^2 =$				
650 kNm					2071 kNm				
$V_{z,Ed} = 0,6071 \times 176,8 \times 7,00 =$					$V_{z,Ed} = 0,5858 \times 128,7 \times 14,00 =$				
751 kN					1055 kN				
$N_{Ed} = 1,25 \times 2091,0 =$					$N_{Ed} = 1,00 \times 1439,0 =$				
2614 kN					1439 kN				
Stabiliteitscontrole stempel NEN-EN 1993-1-1+C2									
Stempel 273,0-10,0 → S355				$f_y = 355 \text{ N/mm}^2$		$\sigma_{ploo} = 355 \text{ N/mm}^2$			
Knikkromme: c				$\epsilon = 0,81$					
Zonder stempeluitval		$M_{Ed} = 25 \text{ kNm}$		Met stempeluitval		$M_{Ed} = 17 \text{ kNm}$			
		$N_{Ed} = 1544 \text{ kN}$				$N_{Ed} = 1815 \text{ kN}$			
Doorsnedeklasse NEN-EN 1993-1-1+C2 5.6									
d / t = 27,30		Klasse: 1	33,10	voldoet					
		Klasse: 2	46,34						
		Klasse: 3	59,58						
Klasse: 1		controle met W_{pl}			Stabiliteitstoets is maatgevende stempeloetsing				
$M_{y,Rd} = 692,0 \times 355 \times 10^{-3} =$		246 kNm							
$N_{Rd} = 8262 \times 355 \times 10^{-3} =$		2933 kN							
Stabiliteit zonder stempeluitval NEN-EN 1993-1-1+C2 6.3.3					Stabiliteit bij stempeluitval NEN-EN 1993-1-1+C2 6.3.3				
$L_{cr,y} = \ell_s =$					$k_{yy} = (1 + (-0,2 + \lambda_{re,y}) N_{Ed} / (x_y \cdot N_{Rd})) C_{my} =$				
4,86 m					1,337				
$N_{cr,y} = \pi^2 E I_y / L_{cr,y}^2 =$					1815				
6278 kN					$0,73 \times 2933$				
$\lambda_{rel,y} = \sqrt{N_{Rd} / N_{cr,y}} =$					$+ 1,337 \times \frac{17}{246}$				
0,684									
$\chi_y = (\Phi + \sqrt{\Phi^2 - \lambda_{rel,y}^2})^{-1} =$					voldoet!				
0,735									
$C_{my} = 0,95 + 0,05 \times \alpha_h =$					0,85				
0,950									
$k_{yy} = (1 + (-0,2 + \lambda_{re,y}) N_{Ed} / (x_y \cdot N_{Rd})) C_{my} =$					0,85				
1,279									
$\frac{1544}{0,73 \times 2933} + 1,279 \times \frac{25}{246}$					$\frac{1815}{0,73 \times 2933} + 1,337 \times \frac{17}{246}$				
0,717 + 0,130 =					0,842 + 0,093 =				
0,85					0,93				
voldoet!					voldoet!				

Stempel en Gordingberekening NEN-EN 1993-1-1+C2+NB				Ver.2.0 27-11-15	
Projectnr	BG8369			Versie 2.0	
Project	Strijenseweg 's Gravendeel				
Subject	Berekening Gording lange zijde				
					
Stabiliteitscontrole gording NEN-EN 1993-1-1+C2					
Gording: 1 x HE500B → S355				f _y = 355 N/mm ²	
Knikkromme: a				ε = 0,81	
Zonder stempeluitval		M _{y,Ed} = 928 kNm N _{Ed} = 2614 kN		Met stempeluitval	
				M _{y,Ed} = 2164 kNm N _{Ed} = 1439 kN	
Doorsnede klasse zonder stempeluitval NEN-EN 1993-1-1+C2 5.6			Doorsnede klasse bij stempeluitval NEN-EN 1993-1-1+C2 5.6		
h _{w,ben} = 507,8 mm f _N = 109,5 N/mm ² α = 1,000 f _M = 245,5 N/mm ² ψ = -0,383			h _{w,ben} = 279,6 mm f _N = 60,3 N/mm ² α = 0,858 f _M = 294,7 N/mm ² ψ = -0,660		
Lijf: d / t _w = 26,90 Klasse: 1 26,85 Klasse: 2 30,92 voldoet Klasse: 3 62,86			Lijf: d / t _w = 26,90 Klasse: 1 31,71 voldoet Klasse: 2 36,52 Klasse: 3 75,58		
Flens: c / t _f = 4,13 Klasse: 1 7,32 voldoet Klasse: 2 8,14 Klasse: 3 11,39			Flens: c / t _f = 4,13 Klasse: 1 7,32 voldoet Klasse: 2 8,14 Klasse: 3 11,39		
Klasse: 2 controle met W _{y, pl}			Klasse: 1 controle met W _{y, pl}		
M _{y,Rd} = 1 x 4814,6 x 355 x 10 ⁻³ = 1709 kNm			M _{y,Rd} = 1 x 4814,6 x 355 x 10 ⁻³ = 1709 kNm		
N _{Rd} = 1 x 23864 x 355 x 10 ⁻³ = 8472 kN			N _{Rd} = 1 x 23864 x 355 x 10 ⁻³ = 8472 kN		
V _{z,Rd} = 1 x 8982 x 355 / √3 x 10 ⁻³ = 1841 kN			V _{z,Rd} = 1 x 8982 x 355 / √3 x 10 ⁻³ = 1841 kN		
Stabiliteit zonder stempeluitval NEN-EN 1993-1-1+C2 6.3.3			Stabiliteit bij stempeluitval NEN-EN 1993-1-1+C2 6.3.3		
L _{cr,y} = l _g = 7,00 m N _{cr,y} = π ² E I _y / L _{cr,y} ² = 45334 kN λ _{rel,y} = √(N _{Rd} / N _{cr,y}) = 0,432 χ _y = (Φ + √(Φ ² - λ _{rel,y} ²)) ⁻¹ = 0,944 C _{my} = 0,1 - 0,8 x α s = 0,700 k _{yy} = (1 + (-0,2 + λ _{rel,y} N _{Ed} / (χ _y N _{Rd}))) C _{my} = 0,753 2614 / (0,944 x 8472) + 0,753 x 928 / 1709 = 0,327 + 0,409 = 0,74 voldoet!			L _{cr,y} = 1,650 x 7,000 = 11,55 m N _{cr,y} = π ² E I _y / L _{cr,y} ² = 16651 kN λ _{rel,y} = √(N _{Rd} / N _{cr,y}) = 0,713 χ _y = (Φ + √(Φ ² - λ _{rel,y} ²)) ⁻¹ = 0,841 C _{my} = 0,1 - 0,8 x α s = 0,866 k _{yy} = (1 + (-0,2 + λ _{rel,y} N _{Ed} / (χ _y N _{Rd}))) C _{my} = 0,955 1439 / (0,841 x 8472) + 0,955 x 2164 / 1709 = 0,202 + 1,209 = 1,41 voldoet niet!		
Doorsnedecontrole gording NEN-EN 1993-1-1+C2+NB					
Zonder stempeluitval		M _{y,Ed} = 928 kNm V _{z,Ed} = 751 kN N _{Ed} = 2614 kN plastische doorsnedecontrole		Met stempeluitval	
Klasse: 2				Klasse: 1	
				plastische doorsnedecontrole	
Plastische doorsnedecontrole NEN-EN 1993-1-1+C2+NB 6.2.10			Plastische doorsnedecontrole NEN-EN 1993-1-1+C2+NB 6.2.10		
V _{z,Ed} / V _{z,pl,Rd} = 0,408 ρ = 0,00 a ₁ = 0,30 a ₂ = 0,30 N _{Ed} / N _{Vz,Rd} = 0,309 M _{y,Ed} / M _{VN,y,Rd} = 0,67 voldoet!			V _{z,Ed} / V _{z,pl,Rd} = 0,573 ρ = 0,02 a ₁ = 0,30 a ₂ = 0,29 N _{Ed} / N _{Vz,Rd} = 0,171 M _{y,Ed} / M _{VN,y,Rd} = 1,31 voldoet niet!		

Toelichting grondslagen

In dit document kunt u secties vinden die onleesbaar zijn gemaakt. Deze informatie is achterwege gelaten op basis van de Wet open overheid (Woo). De letter die hierbij is vermeld correspondeert met de bijbehorende grondslag in onderstaand overzicht.

J Art. 5.1 lid 2 sub e

Het belang van de openbaarmaking van deze informatie weegt niet op tegen het belang van de eerbiediging van de persoonlijke levenssfeer van betrokkenen