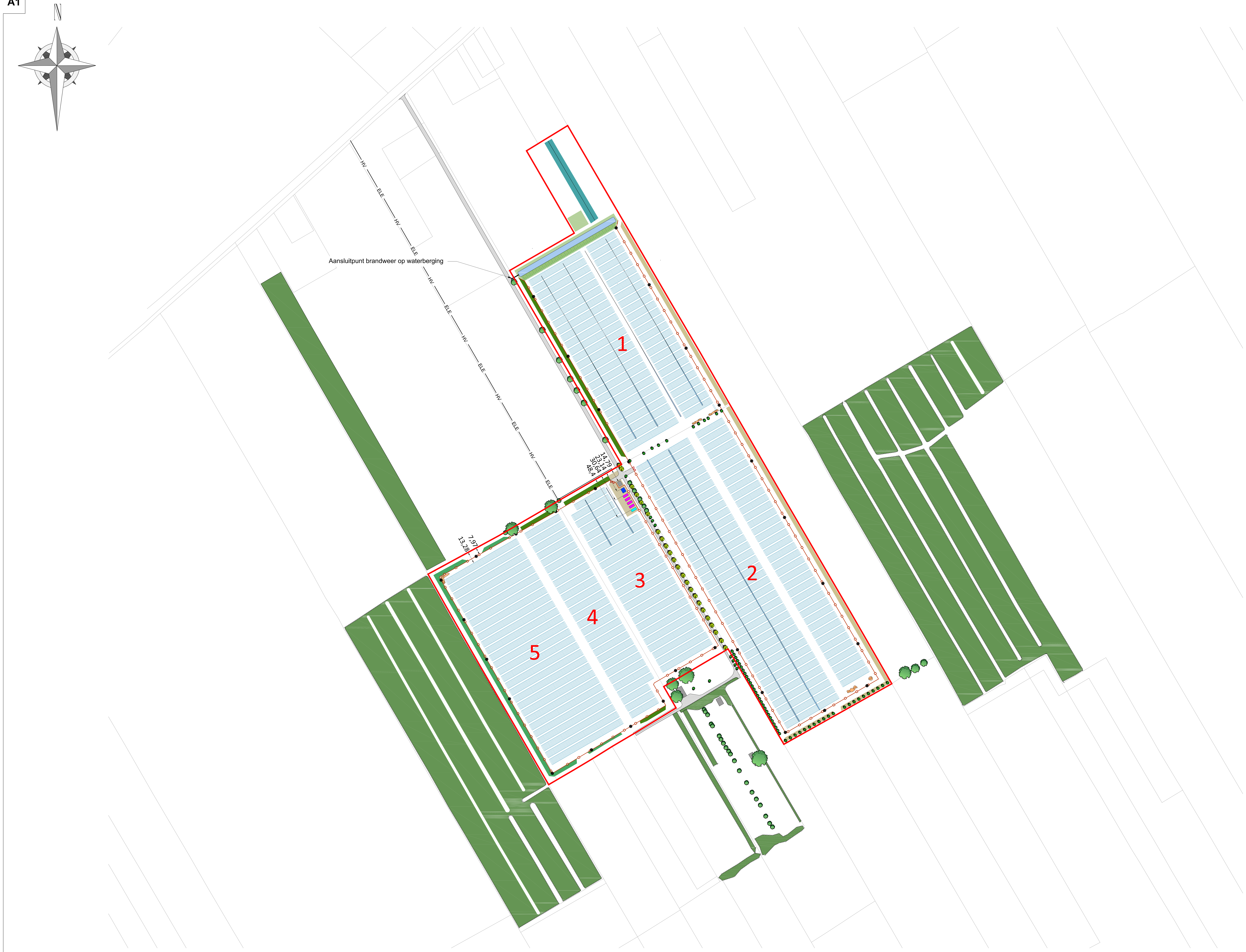
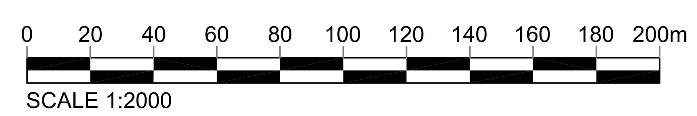
A1



1 ALGEMEEN PLAATS OPMAAK
Schaal : 1:2000@A1



Revisies

Revisie	Datum	Revisie toelichting	Auteur	Gecontroleerd door
01	11.05.22	Eerste Versie	JF	LF
02	18.05.22	Herzien	JM	LF
03	24.05.22	Herzien	JF	LF
04	30.05.22	Herzien	JF	LF
05	17.06.22	Herzien	JM	LF
06	22.07.22	Herzien	JF	LF
07	28.07.22	Herzien	JF	LF
08	03.08.22	Herzien	MC	LF
09	14.10.22	Herzien	MC	LF
10	09.02.23	Herzien	JF	LF
11	14.02.23	Herzien	JF	LF

LEGENDA:

Erfgrens
Onderhoudspad
Kabelroute
Hekwerk
Aansluitpunt Brandweer Op Waterberging
Herstel Fruitbomenrij
Nieuwe Knotbomen
Groen gazon nieuw
Blauw struweel nieuw
Rietkraag
Onderstation (Stedin)
Inverter/ Transformatorstation
Materiaalcontainer
Onderstation Klant
Beveiligingscamera
Zonnepanelen

Status:
VERGUNNING

Project:
Zonneveld Amerongerwetering

LC ENERGY

LC Energy - Bronland 12
6708 WH Wageningen
Tel: +31(0) 85-0499604
www.lcenergy.nl

Tekening:
Technische overzichtstekening

Auteur:	Gecontroleerd door:	Datum:
JF	IL	11.05.2022

Project Code:	Tekeningnummer:
LCE025	MA-01

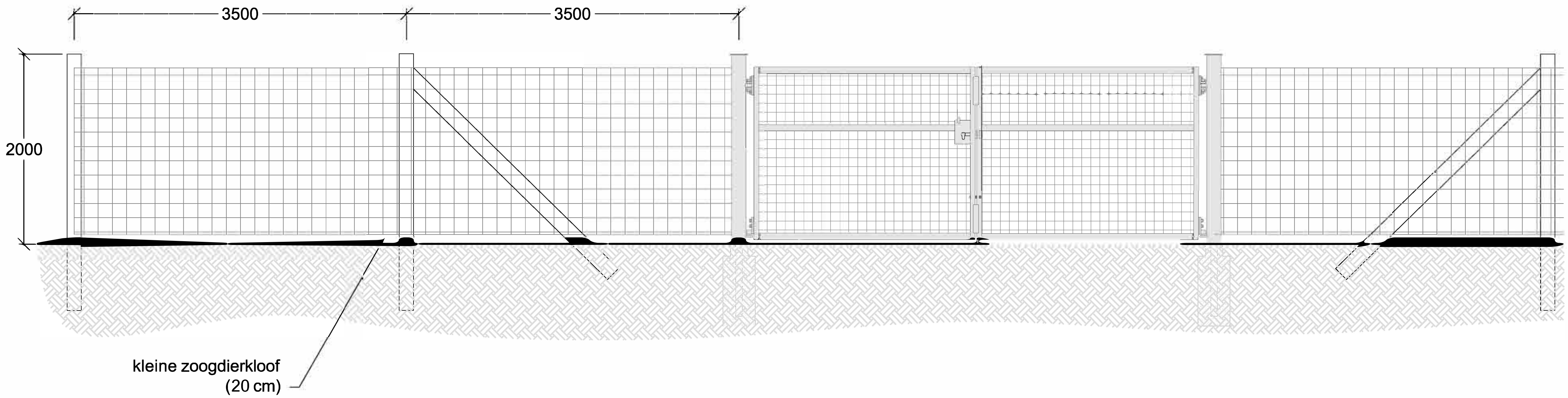
Formaat:	Schaal:	Revisie:
A1	1:2000	11

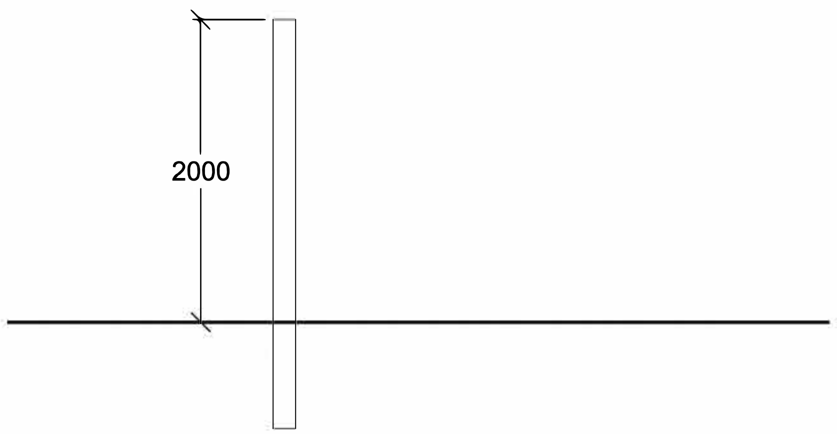
A3

Revisies

Revisie	Datum	Revisie toelichting	Auteur	Gecontroleerd door
01	09.02.23	Eerste Versie	JF	GH
02	14.02.23	Herzien	JF	GH

LEGENDA:





Status:

VERGUNNING

Project:

Zonneveld Amerongerwetering

LC ENERGY

LC Energy - Bronland 12
6708 WH Wageningen
Tel: +31(0) 85-0499604
www.lcenergy.nl

Tekening:

Hek en Poort

Auteur:	Gecontroleerd door:	Datum:
JF	GH	09.03.2023
Project Code: **LCE025**	Tekeningnummer: **PL-11**	
Formaat: **A3**	Schaal: **1:50**	Revisie: **02**

Technische tekeningen, apparatuur, onderhoud en opruimen

In Zonneveld Amerongerwetering zullen verschillende soorten van apparatuur en materialen geplaatst worden. In dit document vindt u nader specificaties hiervan, vindt u de technische tekeningen en leest u hoe in het onderhoud van de apparatuur voorzien is.

1. Technische tekeningen en apparatuur

In de bijlagen van dit document vindt u de technische tekeningen van:

- Technische overzichtstekening (boven-aanzicht)
- Dwarsdoorsnede zonnepanelen (zij-aanzicht)
- Inkoopstation netbeheerder
- Klantstation zonneveld
- Transformatoren
- Hekwerk en toegangspoort
- Reserve onderdelen container
- Tabel met kleuren en materialen
- Referentiebeeld zonnepaneel

2. Onderhoudsplan technische installatie

Voor het onderhoud aan en beheer van de landschappelijke inpassing verwijzen wij graag naar ons Landschappelijk inrichtings- en beheerplan. Het onderhoud van de technische apparatuur beperkt zich ertoe dat de netwerkbeheerder hooguit enkele keren keer per jaar de apparatuur komt controleren waarbij na circa 12 à 15 jaar de omvormers zullen worden vervangen. De panelen bestaan uit een zodanige legering dat deze niet schoongemaakt hoeven te worden en er verder geen onderhoud aan de apparatuur nodig is.

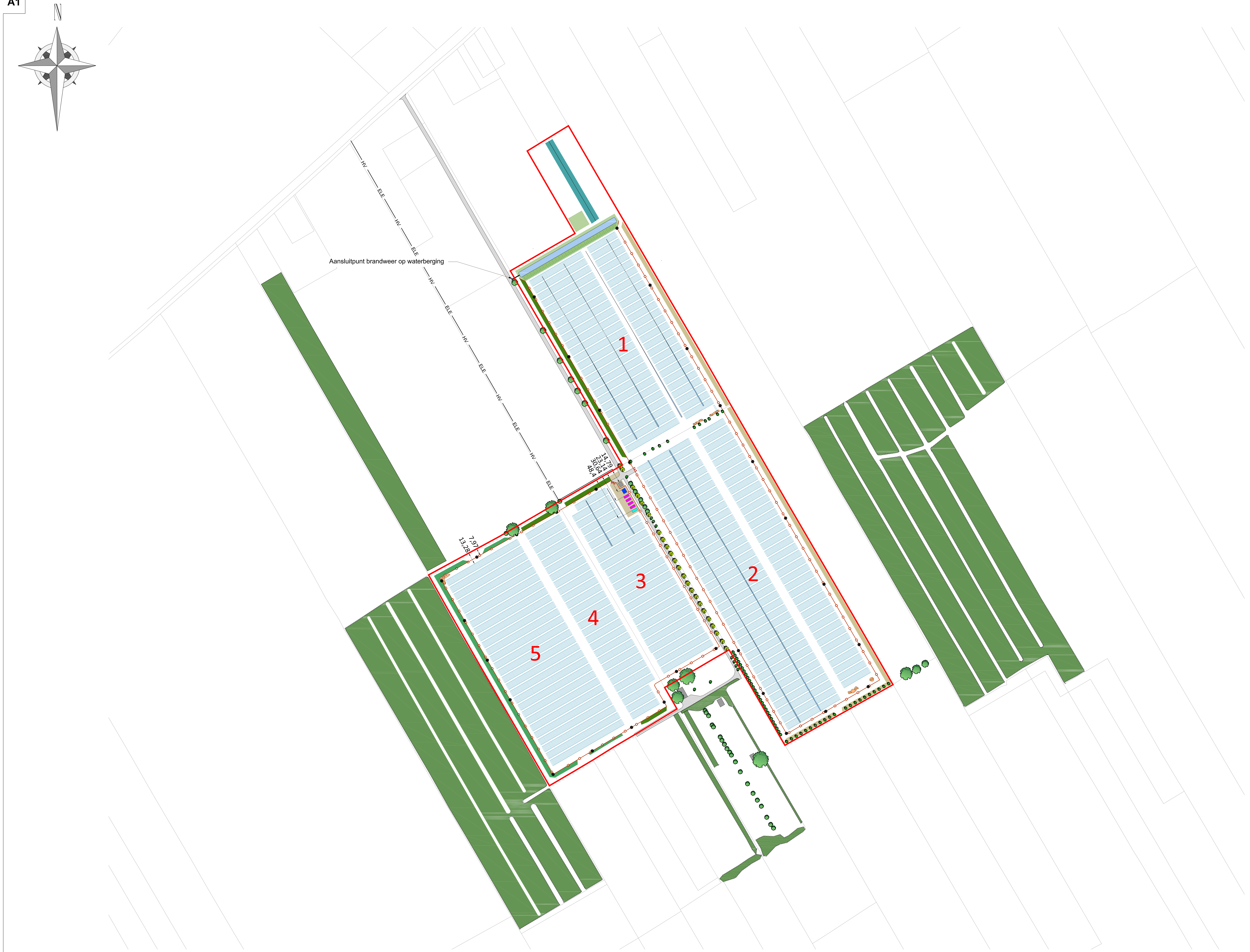
3. Bodemonderzoek, opruimplicht en apparatuur afvoer einde vergunningsduur

LC Energy verplicht zich jegens de gemeente om voor de bouw van het zonnepark een beperkt fysiek bodemonderzoek te laten verrichten en nulmeting op te laten nemen in een proces-verbaal. LC Energy zal in overleg met gemeente de opdracht verstrekken aan een gerenommeerde deskundige. Deze nulmeting zal tevens worden gebruikt als uitgangspunt bij de opruimingsplicht. Na de looptijd van het zonnepark en de beëindiging van de activiteiten, wordt een eindsituatie bodemonderzoek uitgevoerd ter controle of er sprake is van bodemverontreiniging. Indien dit het geval is zal LC Energy de situatie van de bodem dienen te herstellen tenminste tot op het kwaliteitsniveau dat bij de 0-meting aan de orde was.

De verplichting voor het opruimen van het zonnepark na einde vergunningsduur zijn door LC Energy opgenomen in de realisatieovereenkomst met de gemeente. Ter meerdere zekerheid dat aan deze verplichtingen wordt voldaan, benadrukken wij dat de vergunning een beperkte houdbaarheid heeft van 30 jaar en LC Energy na afloop van deze termijn in strijd zou handelen met de regels als het zonnepark er na die tijd nog zou staan.

LC Energy borgt in de uitvraag dat leveranciers van de zonnepanelen en constructies aangesloten zijn bij PV Cycle (http://www.pvcycle.org/netherlands/), aangesloten bij Stichting Open (https://stichting-open.org/) en voldoen we aan de AEEA-richtlijn (https://europa.eu/youreurope/business/product-requirements/recycling-waste-management/weee-responsibilities/index_nl.htm). Tevens dat de leveranciers van de zonnepanelen lid zijn van de Stichting ZRN en daarmee zorgen voor het opruimen en recyclen van de panelen na afloop van het zonnepark.

A1



1 ALGEMEEN PLAATS OPMAAK

Schaal : 1:2000@A1

0 20 40 60 80 100 120 140 160 180 200m

SCALE 1:2000

Revisies

Revisie	Datum	Revisie toelichting	Auteur	Gecontroleerd door
01	11.05.22	Eerste Versie	JF	LF
02	18.05.22	Herzien	JM	LF
03	24.05.22	Herzien	JF	LF
04	30.05.22	Herzien	JF	LF
05	17.06.22	Herzien	JM	LF
06	22.07.22	Herzien	JF	LF
07	28.07.22	Herzien	JF	LF
08	03.08.22	Herzien	MC	LF
09	14.10.22	Herzien	MC	LF
10	09.02.23	Herzien	JF	LF
11	14.02.23	Herzien	JF	LF

LEGENDA:

- Erfgrens
- Onderhoudspad
- Kabelroute (ELE — HV — ELE — HV — ELE)
- Hekwerk
- Aansluitpunt Brandweer Op Waterberging
- Herstel Fruitbomenrij
- Nieuwe Knotbomen
- Groen gazon nieuw
- Blauw struweel nieuw
- Rietkraag
- Onderstation (Stedin)
- Inverter/ Transformatorstation
- Materiaalcontainer
- Onderstation Klant
- Beveiligingscamera
- Zonnepanelen

Status:

VERGUNNING

Project:

Zonneveld Amerongerwetering

LC ENERGY

LC Energy - Bronland 12
6708 WH Wageningen
Tel: +31(0) 85-0499604
www.lcenergy.nl

Tekening:

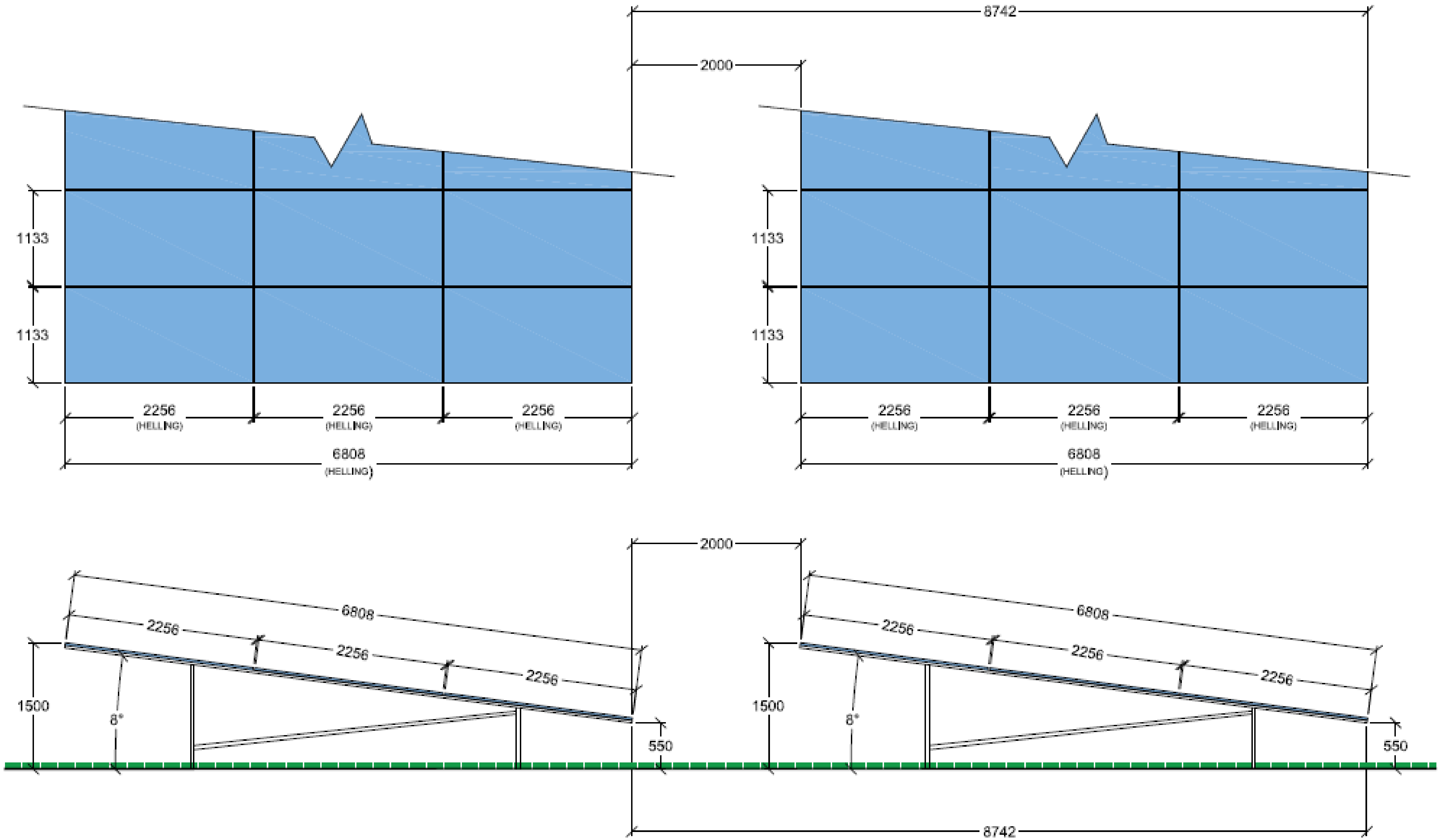
Technische overzichtstekening

Auteur:	Gecontroleerd door:	Datum:
JF	IL	11.05.2022

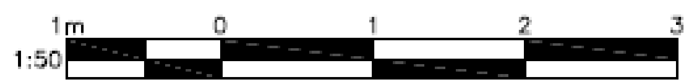
Project Code:	Tekeningnummer:
LCE025	MA-01

Formaat:	Schaal:	Revisie:
A1	1:2000	11

A3



De hoogte van de paneelconstructie bedraagt maximaal 1,5 meter op de hoogste delen van het plangebied.
Er zit namelijk een bolling in de percelen.De bovenkant van de panelen wordt vlak gelegd, zodat een rustig beeld ontstaat.
Aan de onderzijde bedraagt de hoogte (van maaiveld tot aan onderkant paneel) minimaal 0,55 meter.



VERGUNNING

Zonneveld
Amerongerwetering

LC ENERGY

Opstelling Panelen;
3 Portret 8°

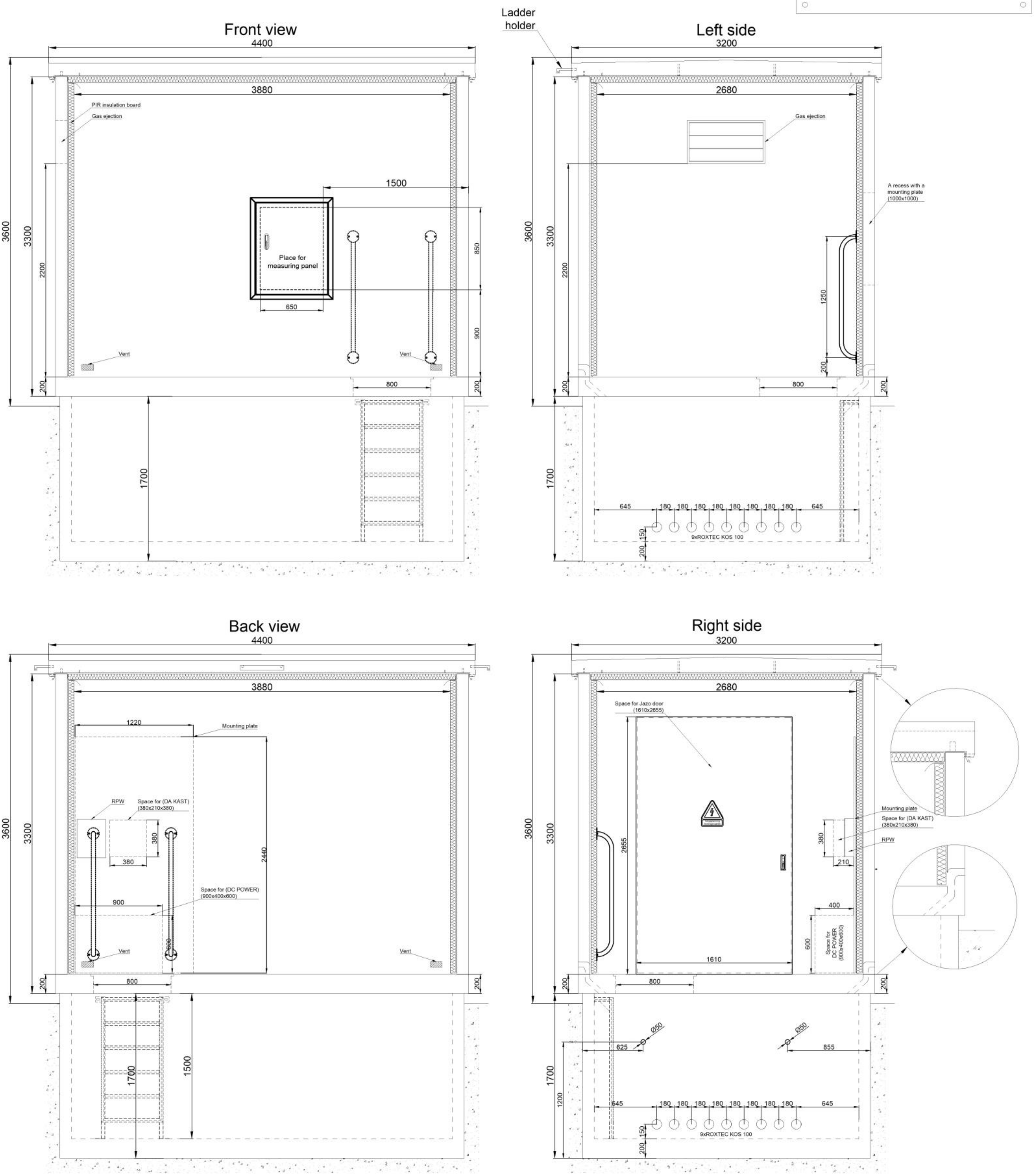
JM	GH	18.05.2022

Project Code: LCE025
Tekeningnummer: PL-10

A3	1:50	03

ZPUE S.A.
29-100 Włoszczowa, ul. Jędrzejowska 79c
tel. +48 41 38 81 000
Serwis 24h +48 506 005 142
www.zpue.pl

CONTAINER TRANSFORMER STATION	
Type:	MRw-b
Year of manufacture: 2020	Serial number: 7-2020-03348/0001
IEC 62271-202	



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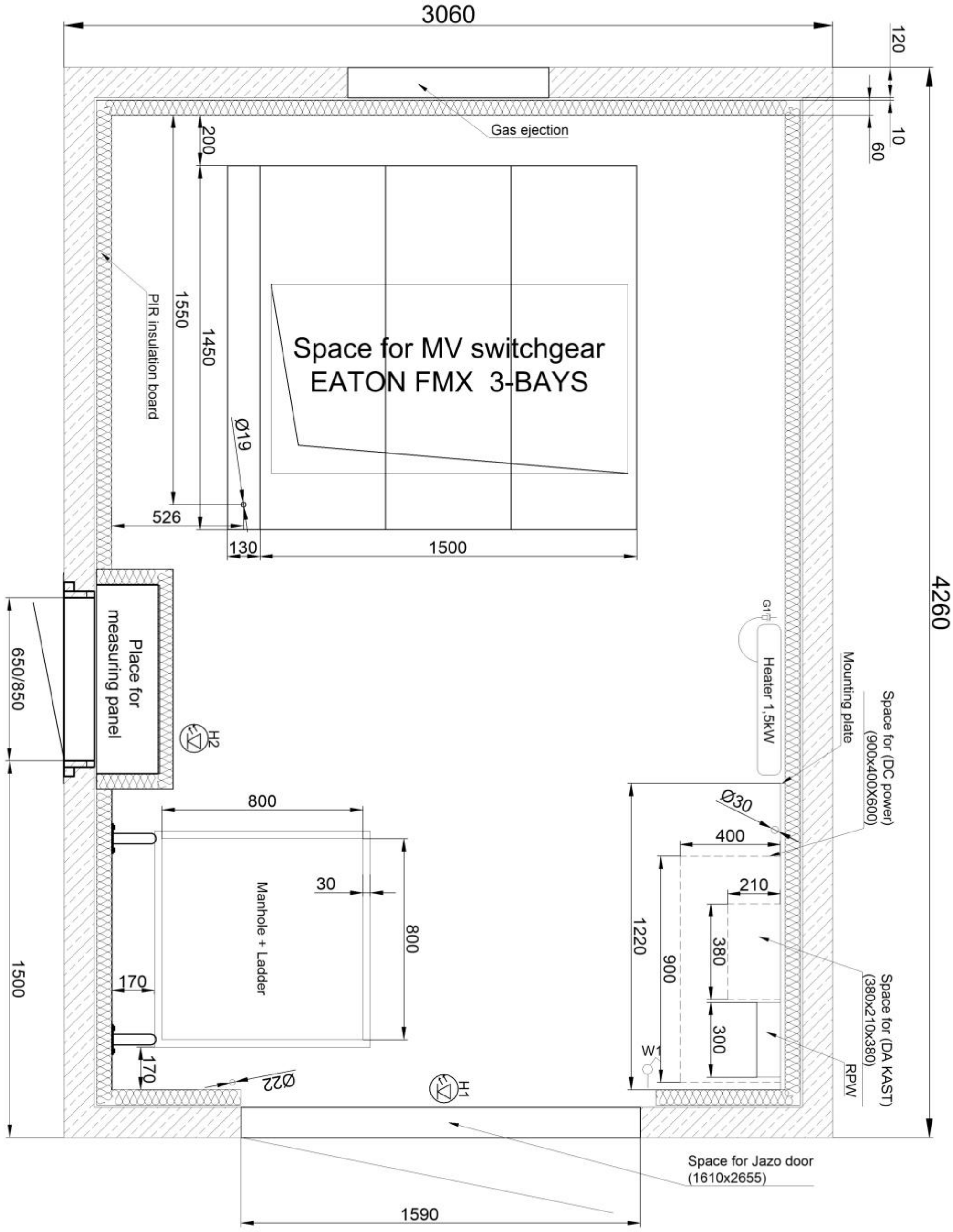
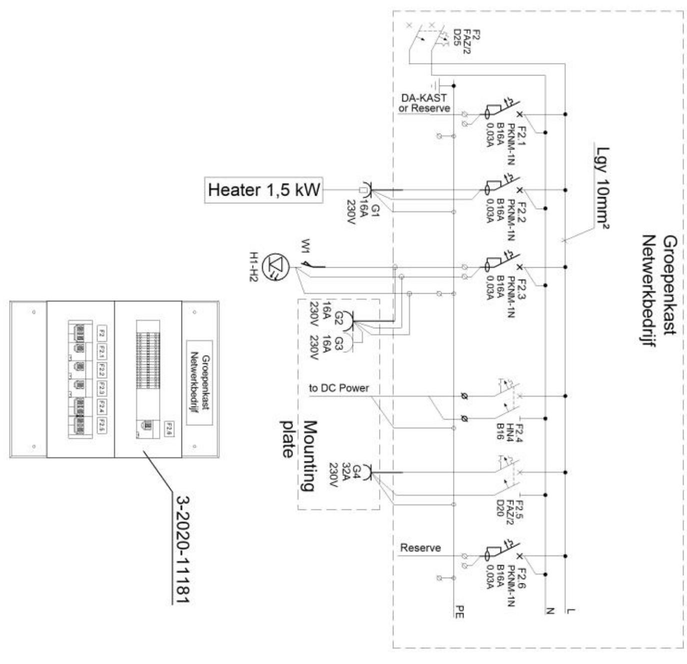
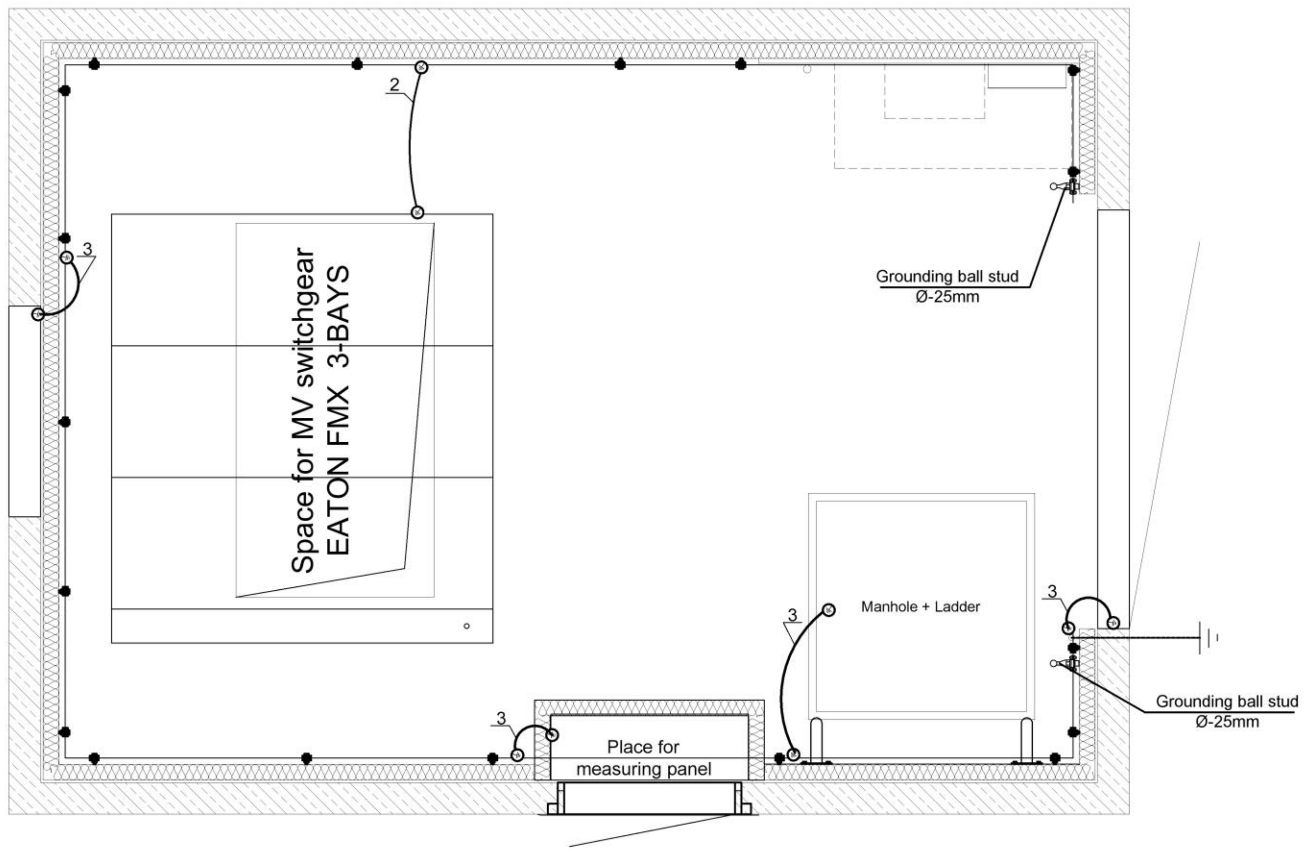
Commission	7-2020-02248		Designed	Andrzej Klapa	Scale: 1:55
Code number	WA2-90-000-0999	Name: MRw-b	Checked	Przemysław Kubik	
			Date	10.10.2020	Page: 1/3





Order	Z-2020-09847	Customer:	Batenburg Energietechniek B.V.
Commission	7-2020-02248		
Code number	WA2-90-000-0999	Name:	MRw-b
Modification		Quantity:	1
Designed	Andrzej Klapa	Scale:	1:30
Checked	Przemysław Kubik	Page:	2/3
Date	10.10.2020		

ZPUE Koronea group

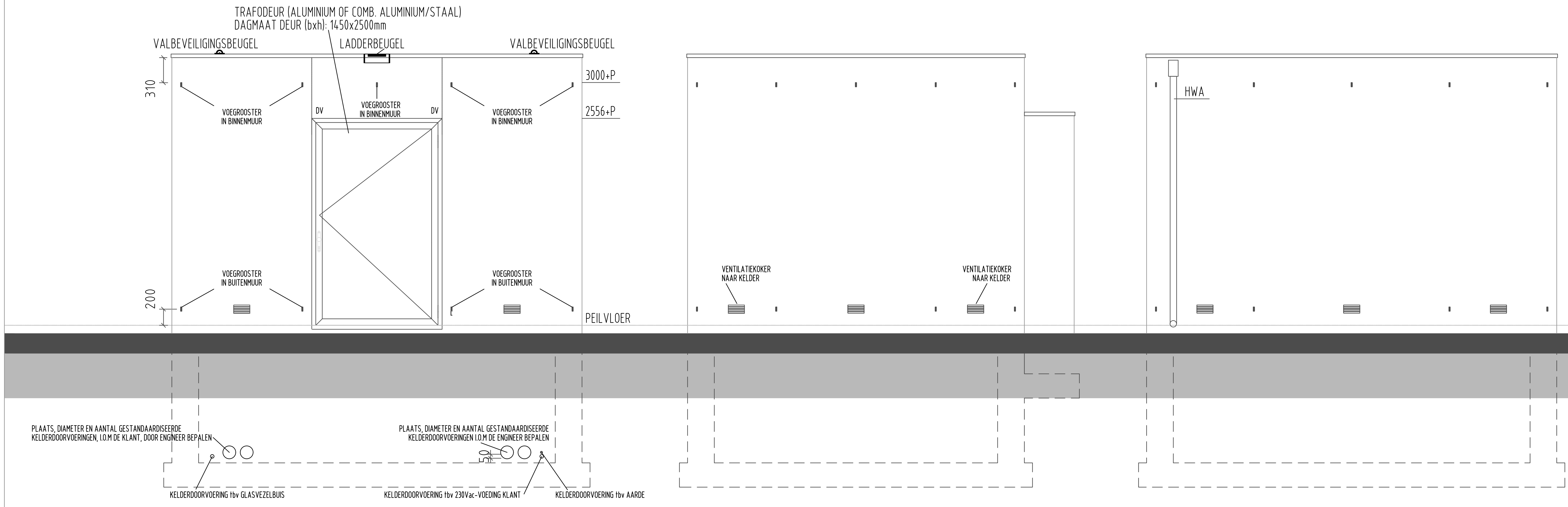


Roof without earthing.

1) Busbar Cu 30x5
2) Wire LgY 70 mm²
3) Wire LgY 35 mm²

Earthing rail at a height of 40 cm above the platform

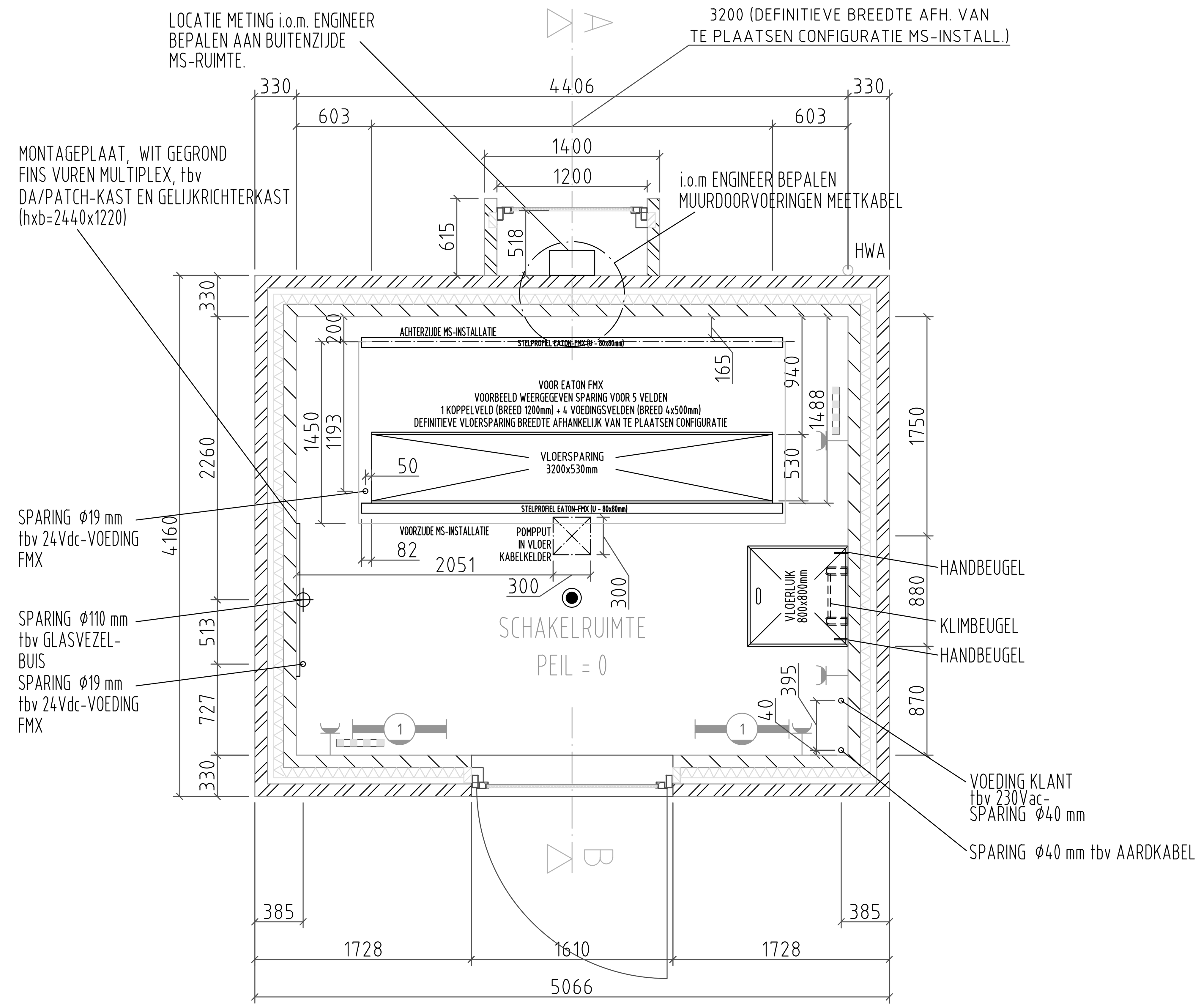
ZPUE Koronea group	Order	Z-2020-09847	Customer:	Batenburg Energietechniek B.V.	Modification		Quantity: 1
	Commission	7-2020-02248			Designed	Andrzej Klapa	Scale: 1:30
	Code number	WA2-90-000-0999	Name:	MRw-b	Checked	Przemysław Kubik	Page: 3/3
					Date	10.10.2020	



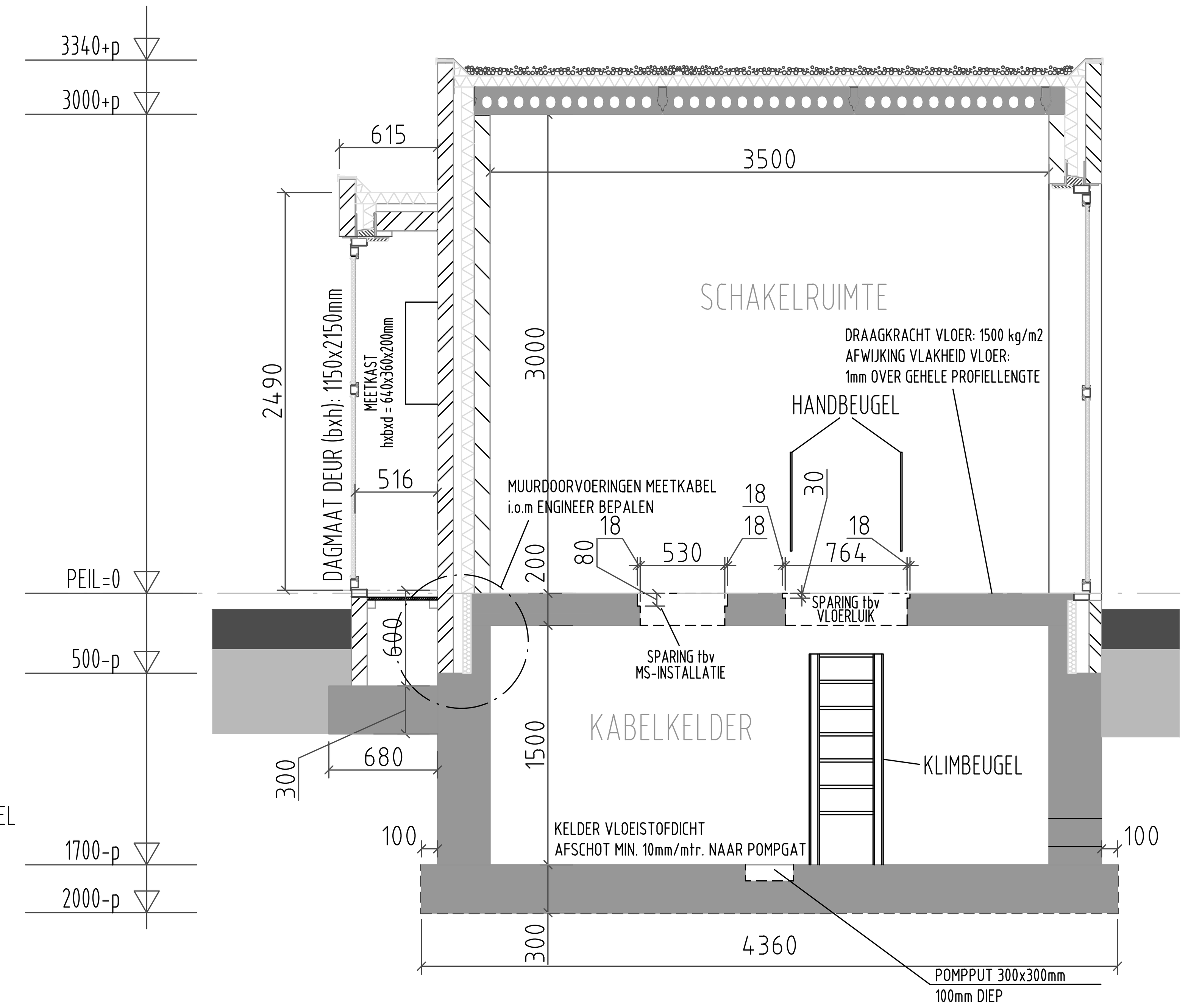
VOORAANZICHT
DV= DILATATIEVOEG

ZIJ-AANZICHT

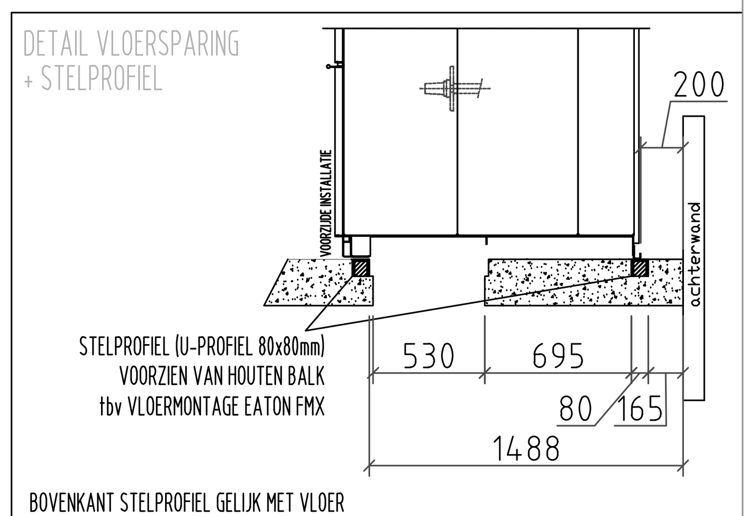
ACHTERAANZICHT



PLATTEGROND



DOORSNEDE A-B



OPMERKINGEN:

DE GEHELE CONSTRUCTIE UITVOEREN VOLGENS TEKENINGEN EN BEREKENINGEN VAN DE CONSTRUCTEUR. ALLE MATEN IN HET WERK BEPALEN	R_c -WAARDE ISOLATIE: - MINIMALE R_c-WAARDE (ISOLATIEWAARDE) VAN HET GEBOUW IS 0,9m² K/W
ALLE DOORVOERINGEN IN VLOER EN KELDERWAND DIENEN VLOEISTOF- EN DAMPDICHT AFGEWERKT TE WORDEN.	VLOERSPARING: - 910mm tbv MS-INSTALLATIE ABB SAFEPLUS CCVm 1235mm tbv MS-INSTALLATIE ABB SAFEPLUS CCCVm
LEVERING KLANT: - 230Vac-VOEDING 25A tbv VOEDING VERLICHTING/-WCD etc.	LET OP: - DE KEUZE VAN DE DEURENLEVERANCIER KAN BETEKENEN DAT DE DEURSPARINGEN GROTER OF KLEINER ZIJN.
BEUGEL VALBEVEILIGING (DAK): - PER 2,5m² DAKOPPERVLAKTE 1 STUK BEUGEL PLAATSEN.	AANTAL ELECTR.KACHELS TE BEPALEN i.o.m. CIVIEL UITVOERDER ENEXIS
TEKENING TRAFOBOX: ZIE TYPE 6.	GLASVEZELVERBINDING: - GLASVEZELBUIS LEGGEN EN AANSLUITEN OP DE DA/PATCHKAST (ALLEEN NODIG BIJ DIFFERENTIAALBEVEILIGING)
MS-INSTALLATIE: GEWICHT MS-INSTALLATIE: ± 1500Kg/m²	

RENVOOI ELEKTRA

- = TL-ARMATUUR 2x36W/33
- = ELECTRISCHE KACHEL 500W MET INGEBOUWDE (NIET INSTELBARE) THERMOSTAAT (VAST INGESTELD OP 5°C). (AANTAL KACHELS AFHANKELIJK VAN DE GROOTTE VAN DE RUIMTE).
- = BEWEGINGSMELDER
- = WANDCONTACTDOOS MET R.A.

Project :
TYPE 4A, SCHAKELRUIMTE KLANTSTATION
MS-T EN HS/MS

Installatie :
MS-INSTALLATIE
EATON TYPE FMX

Status :
DEFINTIEF

Nr.	Gewijzigd	Datum
D	R.BECKERS	04-2014
C	R.BECKERS	03-2013
F	R.BECKERS	09-2019
E	R.BECKERS	11-2015

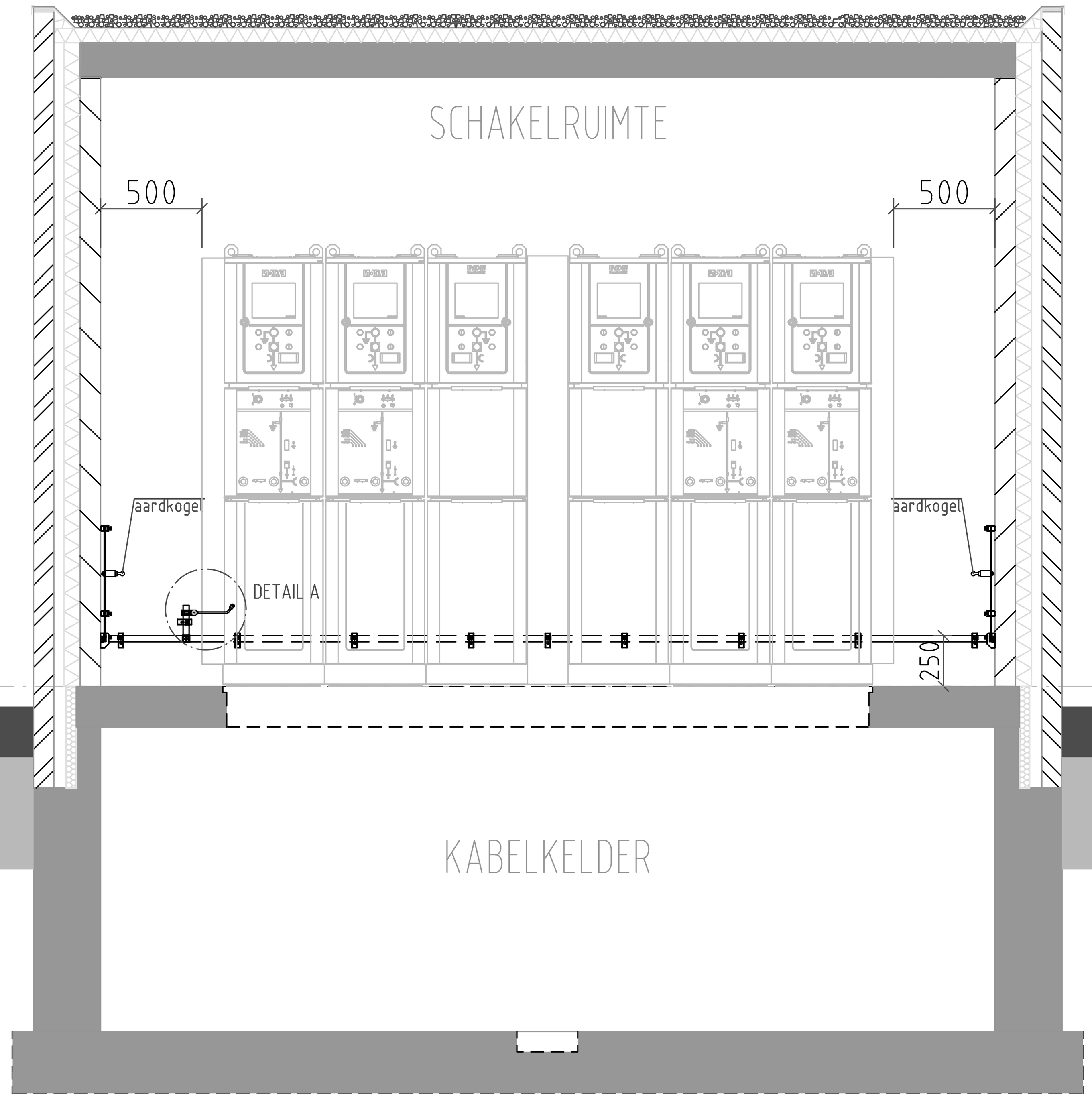
Datum: 10-2011 | Schaal: 1:30 | Get.: R.BECKERS | Gec.:

ENEXIS NETBEHEER

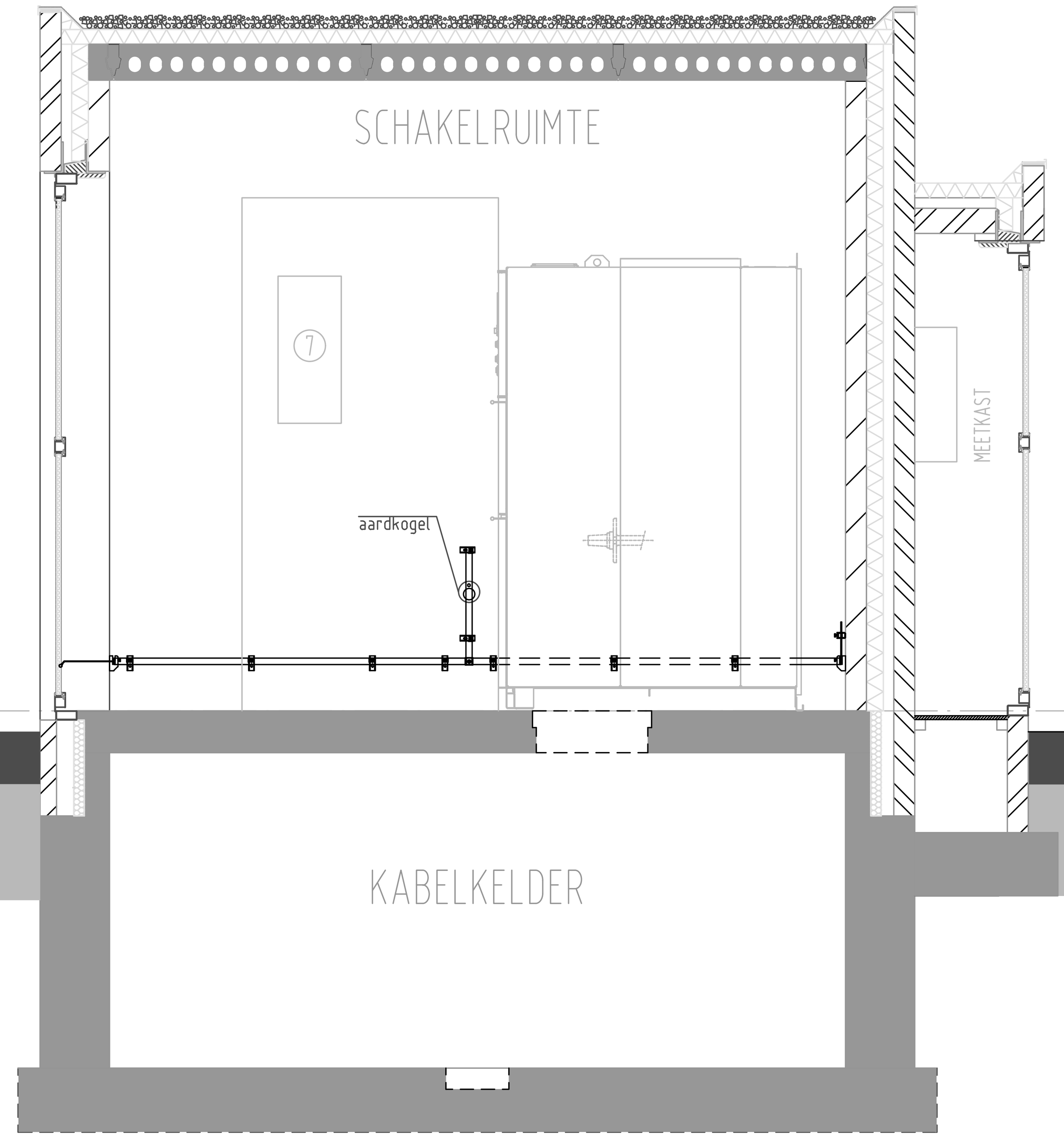
A1

Projectnummer : -

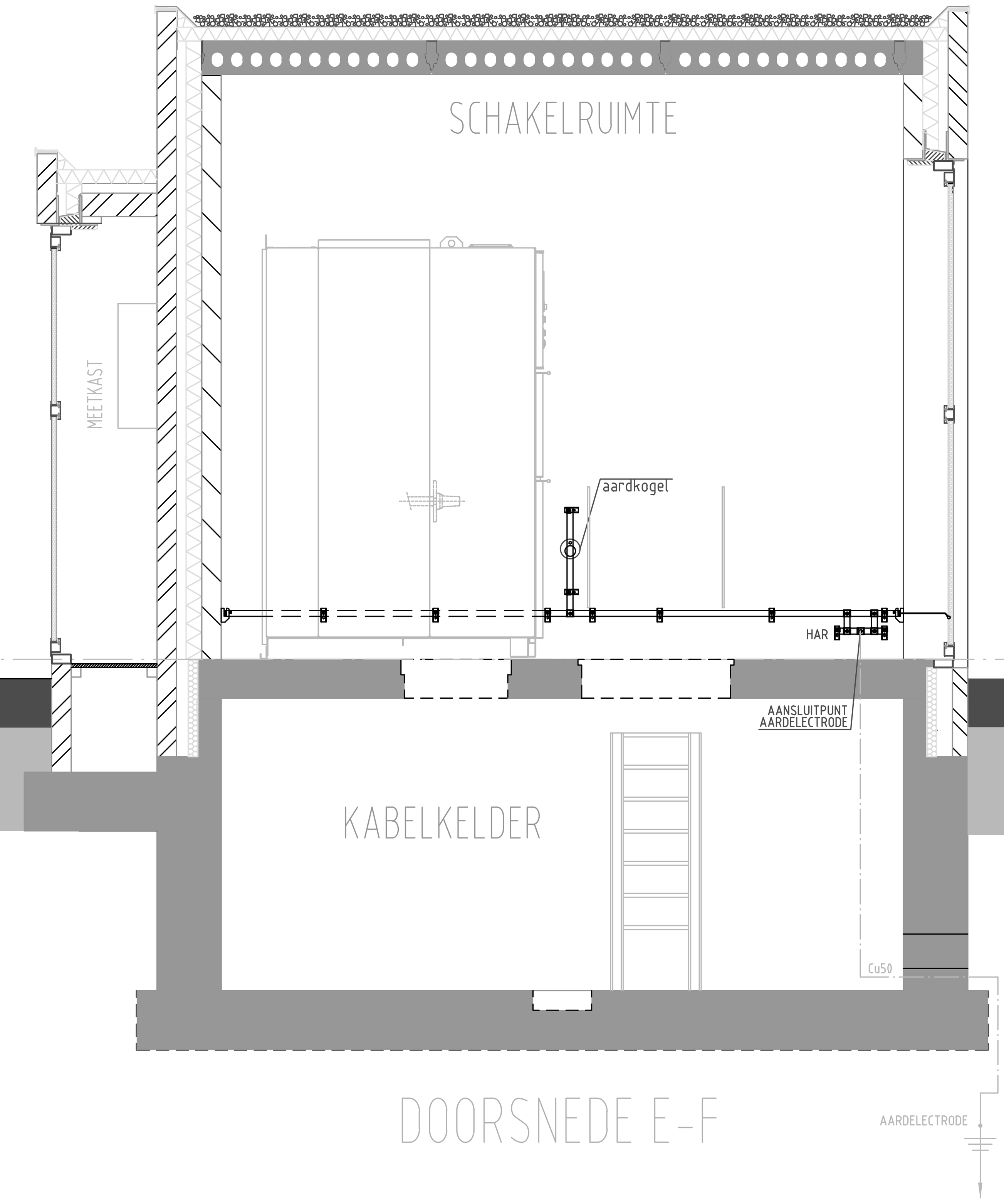
Tekeningnummer :
TYPE 4A



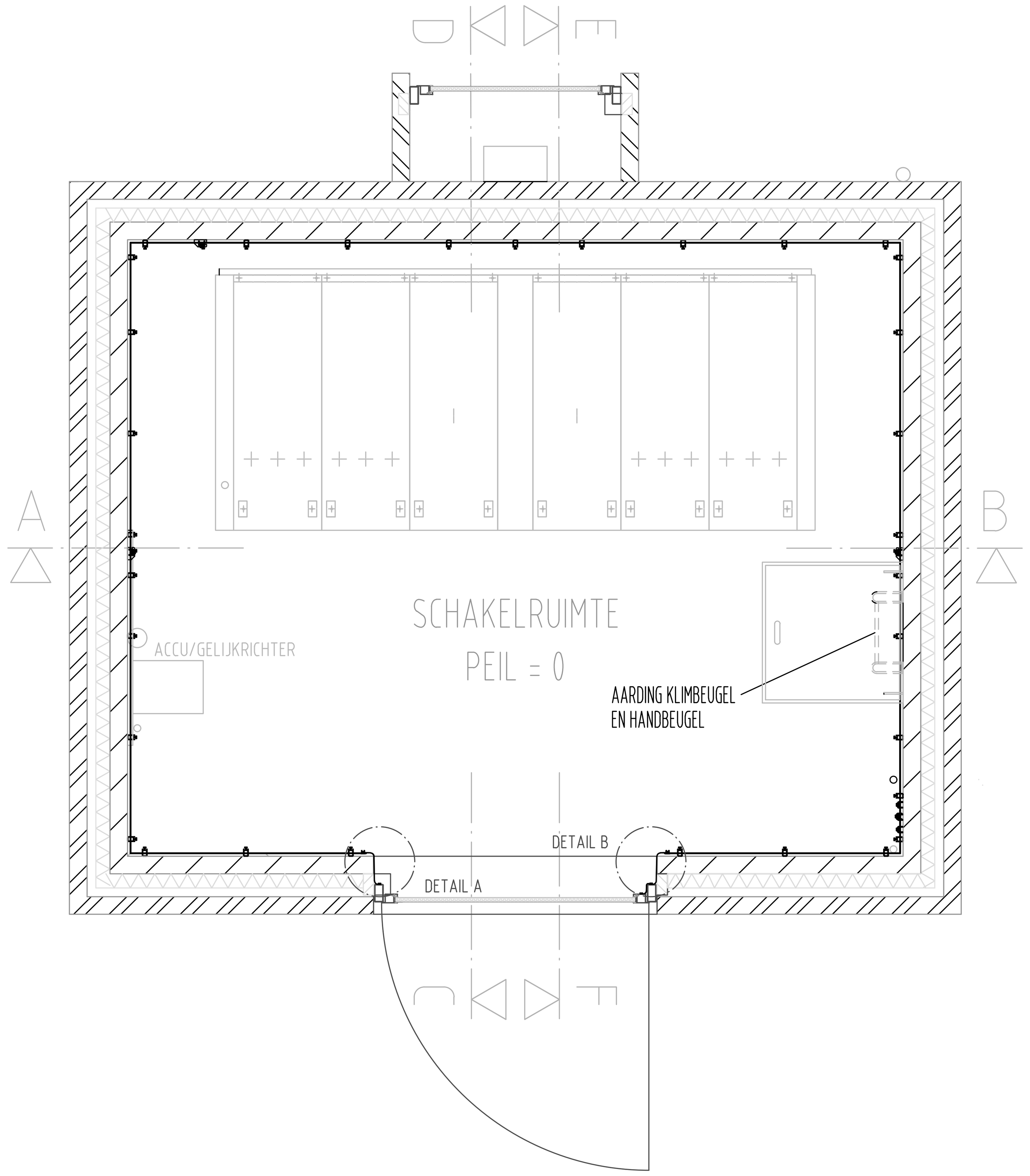
DOORSNEDE A-B



DOORSNEDE C-D

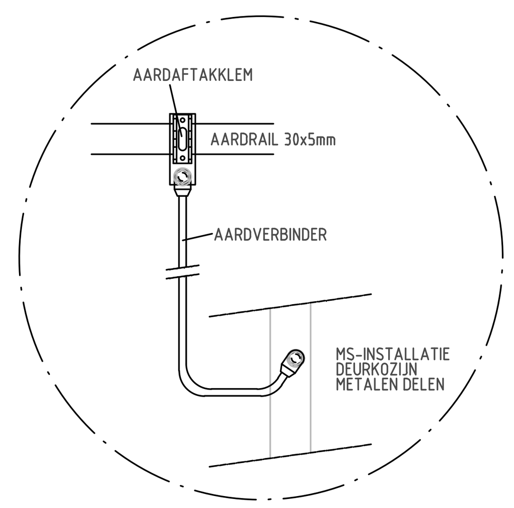


DOORSNEDE E-F

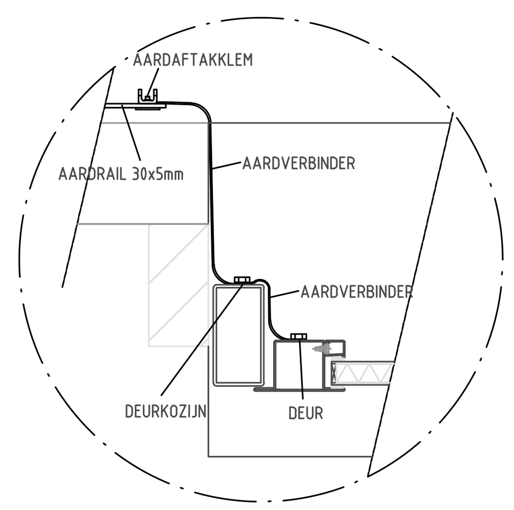


BEGANE GRONDVLOER

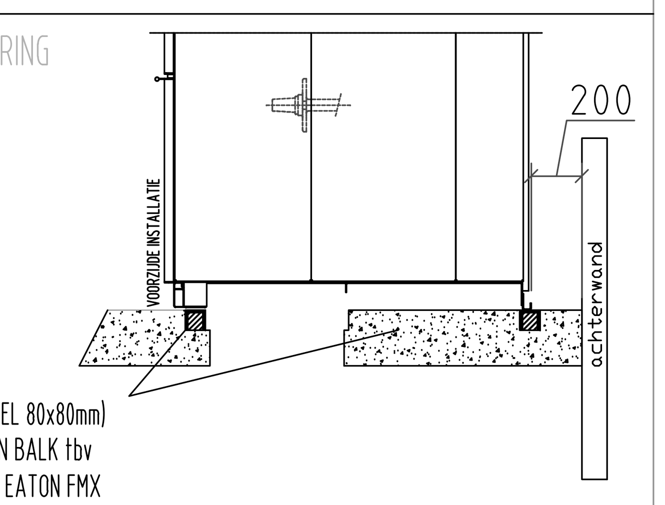
DETAIL A



DETAIL B



DETAIL VLOERSPARING
+ STELPROFIEL



STELPROFIEL (U-PROFIEL 80x80mm)
VOORZIEN VAN HOUTEN BALK tbv
tbv VLOERMONTAGE EATON FMX

BOVENKANT STELPROFIEL GELIJK MET VLOER

OPMERKINGEN:

AARDING:
- ALLE METALEN DELEN AARDEN.
- DE AARDLEIDING MOET GEÏSOLEERD DOOR DE KELDERWAND WORDEN INGEVOERD. MUURDOORVOER TEVENS VLOEISTOFDICHT AFWERKEN.

RENVOOI

= AARDRAIL/PEN-RAIL (30x5mm)
= AFSTANDHOUDER AARDRAIL
= AFTAK AARDRAIL
= AARDINGSKOGEL
= HAR (HOOFDAARDRAIL)

Project :
TYPE 4A, SCHAKELRUIMTE KLANTSTATION
MS-T EN HS/MS; EATON- FMX

Installatie :
DETAIL AARDING-INSTALLATIE

Status :
DEFINTIEF

Nr.	Gewijzigd	Datum
E	R.BECKERS	04-2014
D	R.BECKERS	03-2013
G	R.BECKERS	01-2020
F	R.BECKERS	09-2019

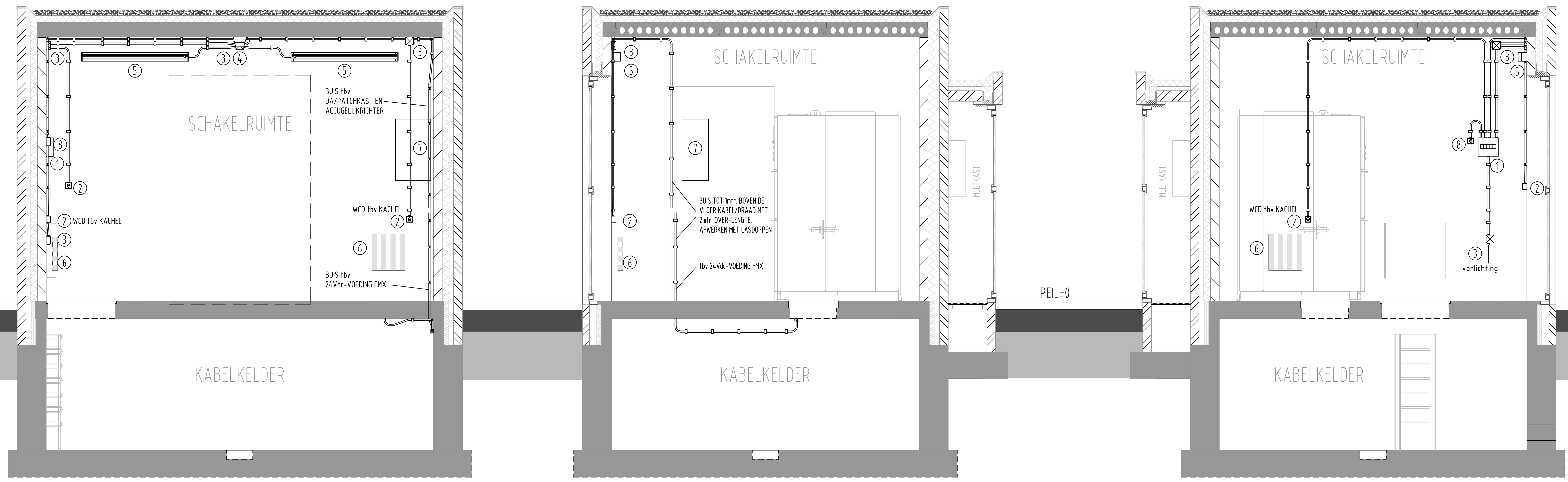
Datum: 02-2012 | Schaal: 1:25 | Get.: R.BECKERS | Gec.:

ENEXIS NETBEHEER

A1

Projectnummer : –

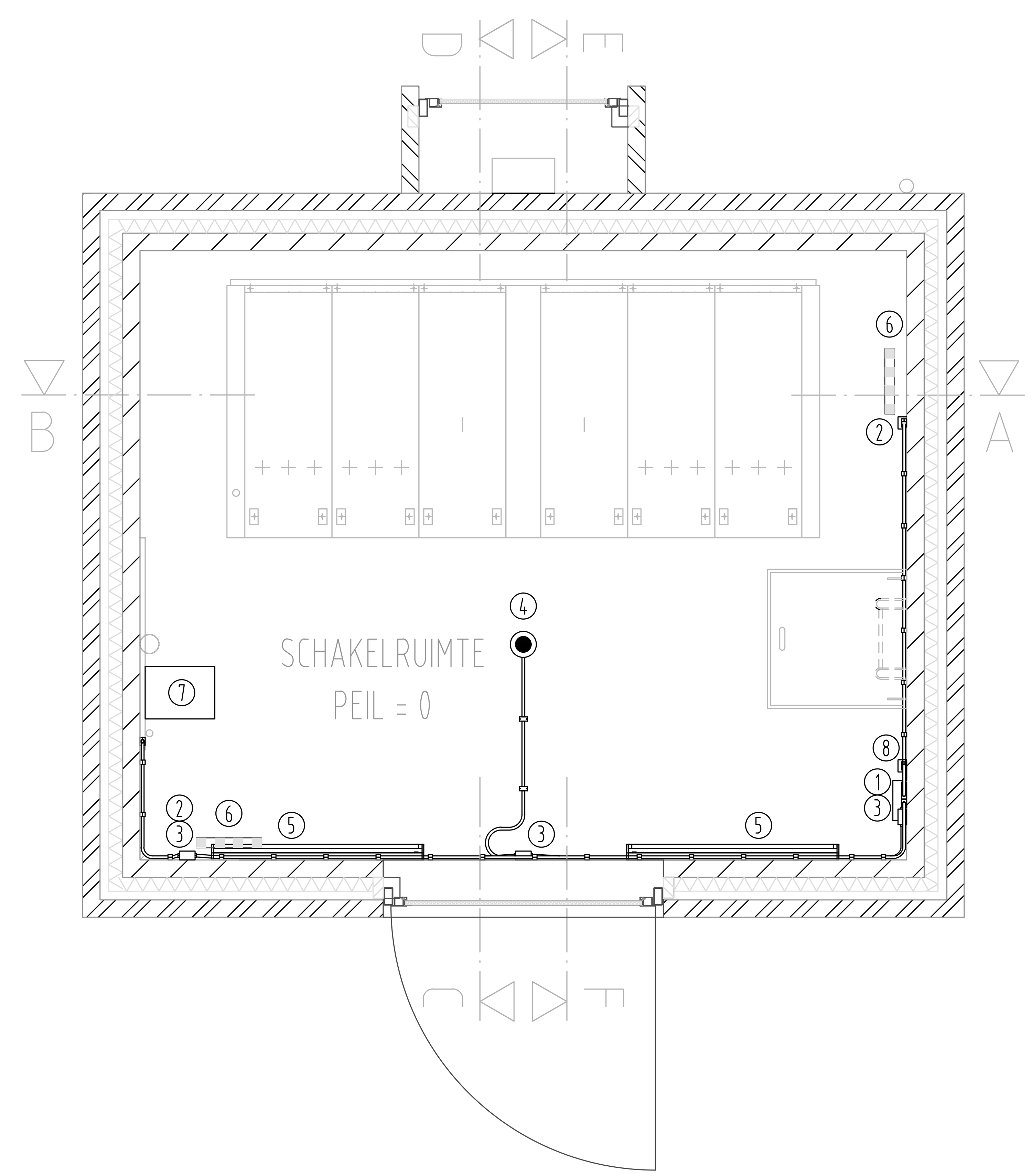
Tekeningnummer : 4-1



DOORSNEDE A-B

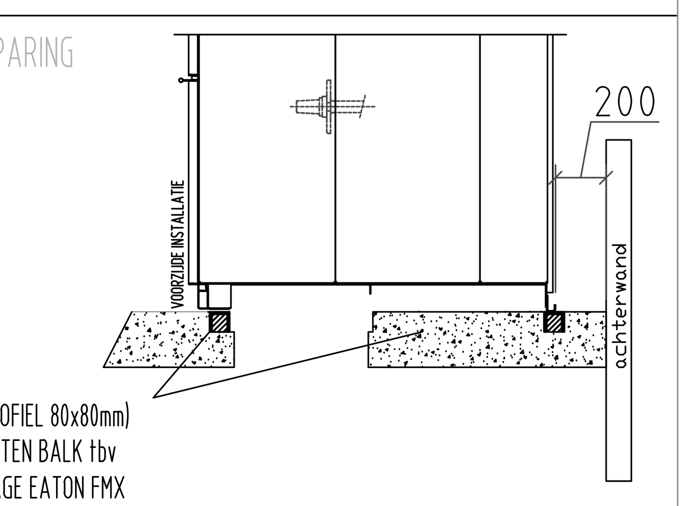
DOORSNEDE C-D

DOORSNEDE E-F



BEGANE GRONDVLOER

DETAIL VLOERSPARING
+ STELPROFIEL



STELPROFIEL (U-PROFIEL 80x80mm)
VOORZIEN VAN HOUTEN BALK tbv
tbv VLOERMONTAGE EATON FMX

BOVENKANT STELPROFIEL GELIJK MET VLOER

OPMERKINGEN:

GROEPENKAST (1) OPGEBOUWD UIT:
- 1 AARDLEKSCHAKELAAR 40A/30mA (1F+N)
- 2 AFGAANDE GROEPEN VOOR AARDLEKSCHAKELAAR:
  # GR.1 (16A): VOEDING DA/PATCHKAST EN ACCU/GELIJKRICHTER.
  # GR.2 (20A): WCD tbv MEETWAGEN
- 2 AFGAANDE GROEPEN ACHTER AARDLEKSCHAKELAAR:
  # GR.3 (16A): STATIONSVERLICHTING + WCD
  # GR.4 (16A): WCD tbv VERWARMING

RENVOOI

1 = GROEPENKAST
2 = WANDCONTACTDOOS MET R.A.
3 = LASDOOS
4 = BEWEGINGSSENSOR
5 = TL-ARMATUUR (2x38W/33)(MINIMAAL)
6 = ELEKTRISCHE KACHEL 230Vac/500W
7 = ACCU/GELIJKRICHTER
8 = WANDCONTACTDOOS MET R.A. tbv MEETWAGEN

Project :
TYPE 4A, SCHAKELRUIMTE KLANTSTATION
MS-T EN HS/MS; EATON- FMX

Installatie :
DETAIL VERLICHTINGINSTALLATIE

Status :
DEFINTIEF

Nr.	Gewijzigd	Datum
D	R.BECKERS	11-2015
C	R.BECKERS	04-2014
F	R.BECKERS	01-2020
E	R.BECKERS	09-2019

Datum: 02-2012 | Schaal: 1:25 | Get.: R.BECKERS | Gec.:

ENEXIS NETBEHEER

A 1

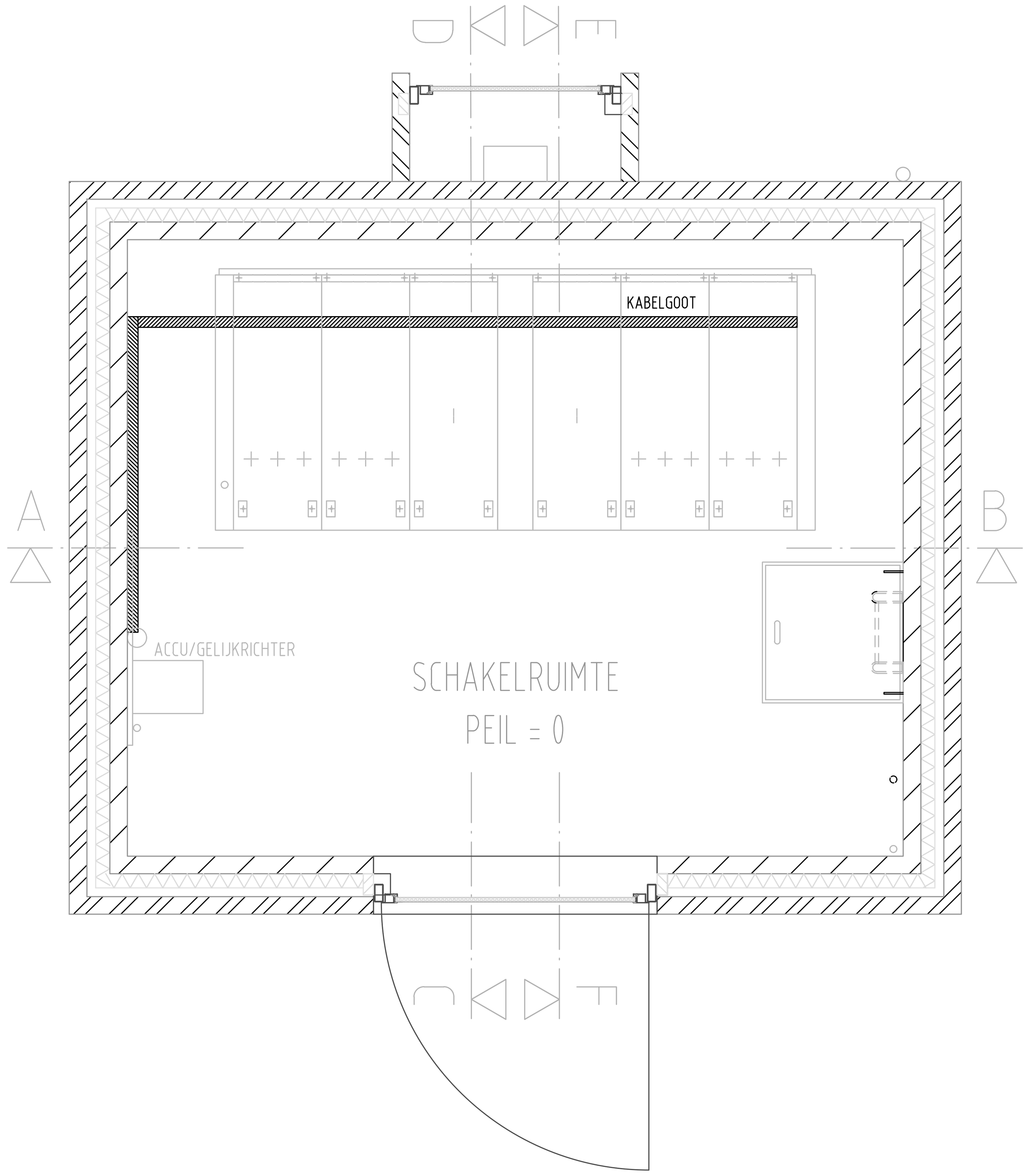
Projectnummer :
-

Tekeningnummer :
4-2

DOORSNEDE A-B

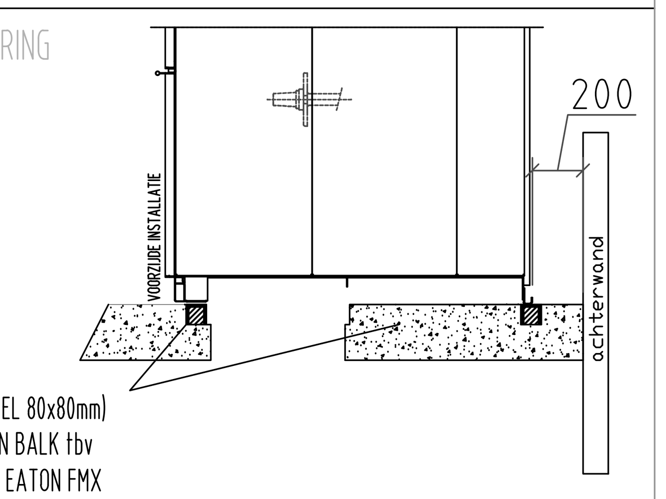
DOORSNEDE C-D

DOORSNEDE E-F



BEGANE GRONDVLOER

DETAIL VLOERSPARING
+ STELPROFIEL



STELPROFIEL (U-PROFIEL 80x80mm)
VOORZIEN VAN HOUTEN BALK tbv
tbv VLOERMONTAGE EATON FMX

BOVENKANT STELPROFIEL GELIJK MET VLOER

OPMERKINGEN:

RENVOOI

= KABELGOOT tbV DIFFERENTIAALBEVEIL.

Project :
TYPE 4A, SCHAKELRUIMTE KLANTSTATION
MS-T EN HS/MS; EATON- FMX

Installatie :
DETAIL KABELGOTEN
tbv DIFFERENTIAALBEVEILIGING

Status :
DEFINTIEF

Nr.	Gewijzigd	Datum
E	R.BECKERS	09-2019
D	R.BECKERS	04-2014
C	R.BECKERS	03-2013
F	R.BECKERS	01-2020

Datum: 02-2012 | Schaal: 1:25 | Get.: R.BECKERS | Gec.:

A 1

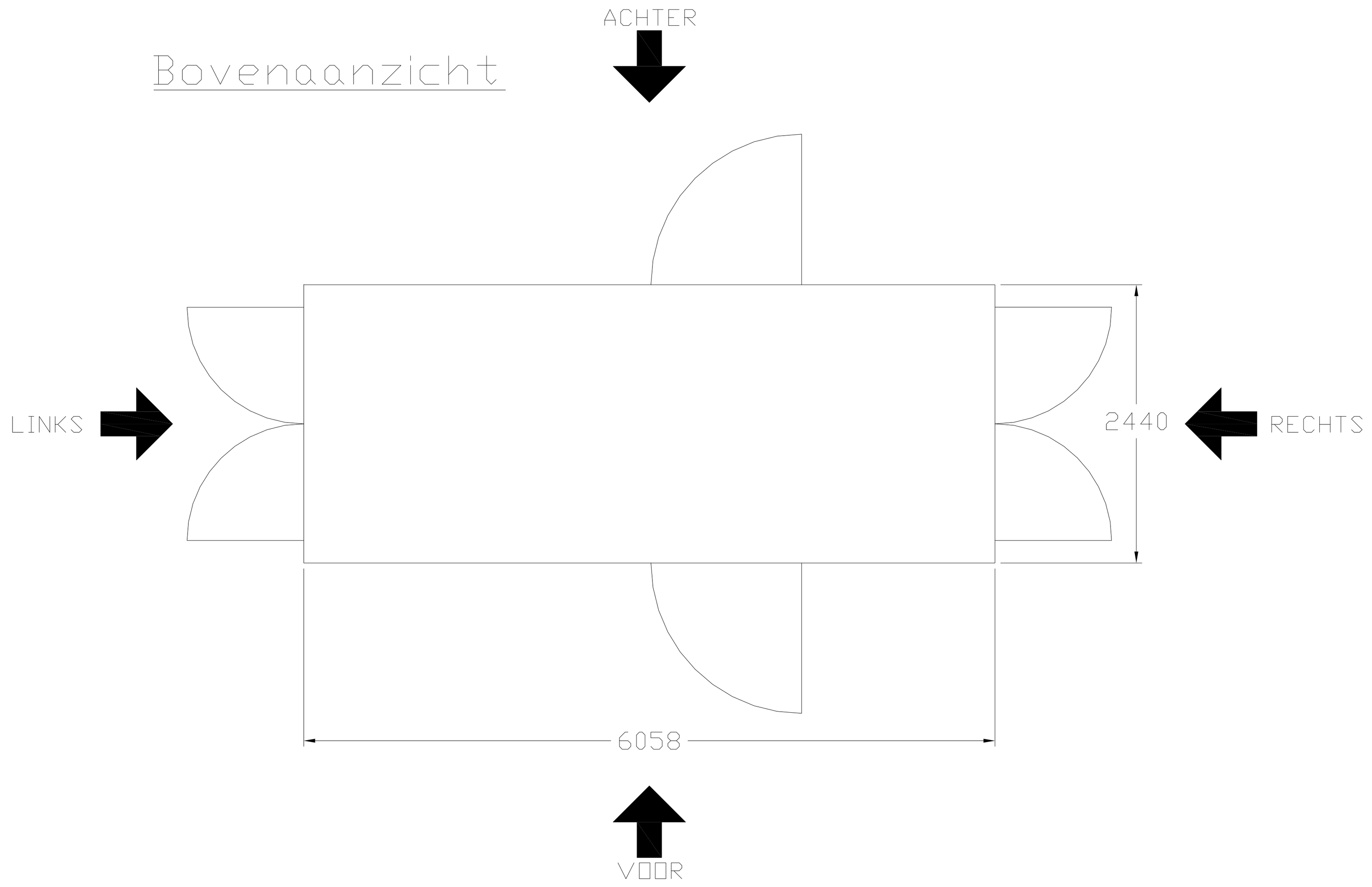
Projectnummer :
-

ENEXIS NETBEHEER

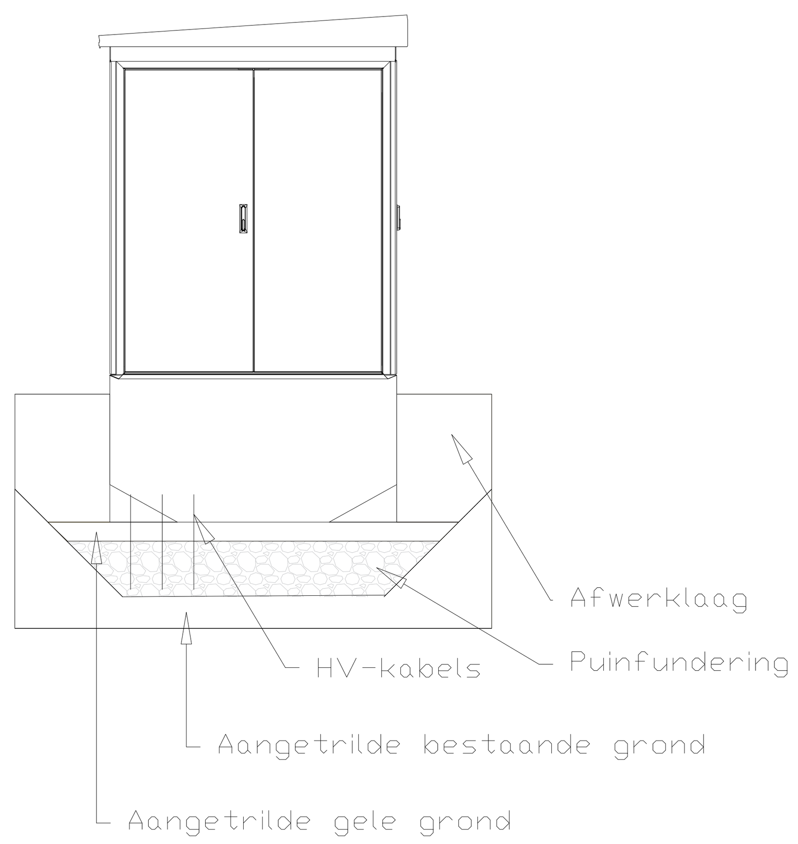
Tekeningnummer :
4-3

A1

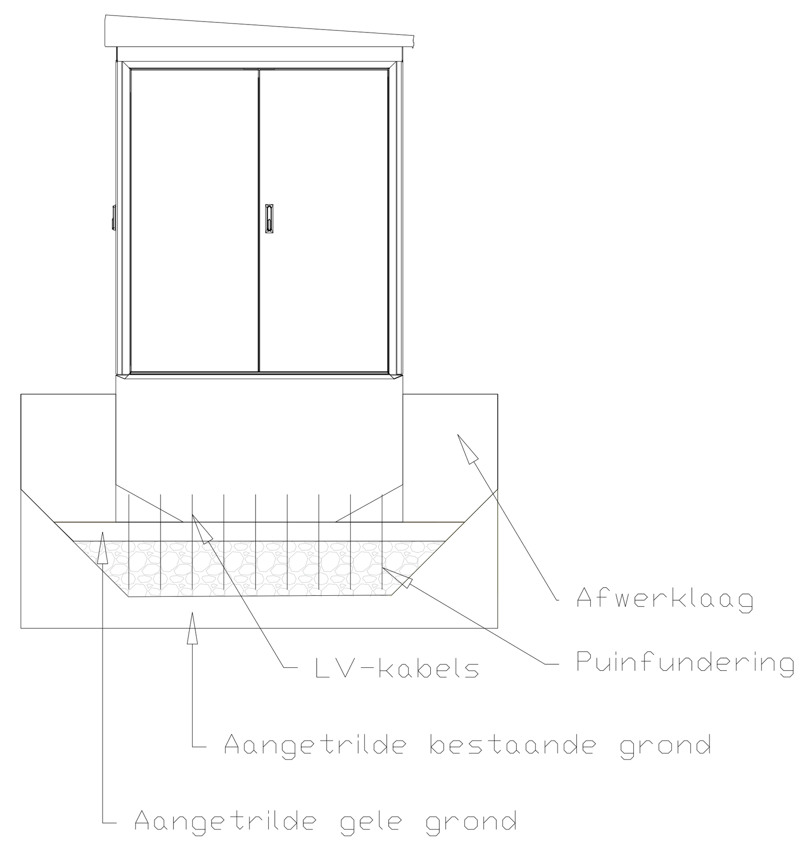
Bovenaanzicht



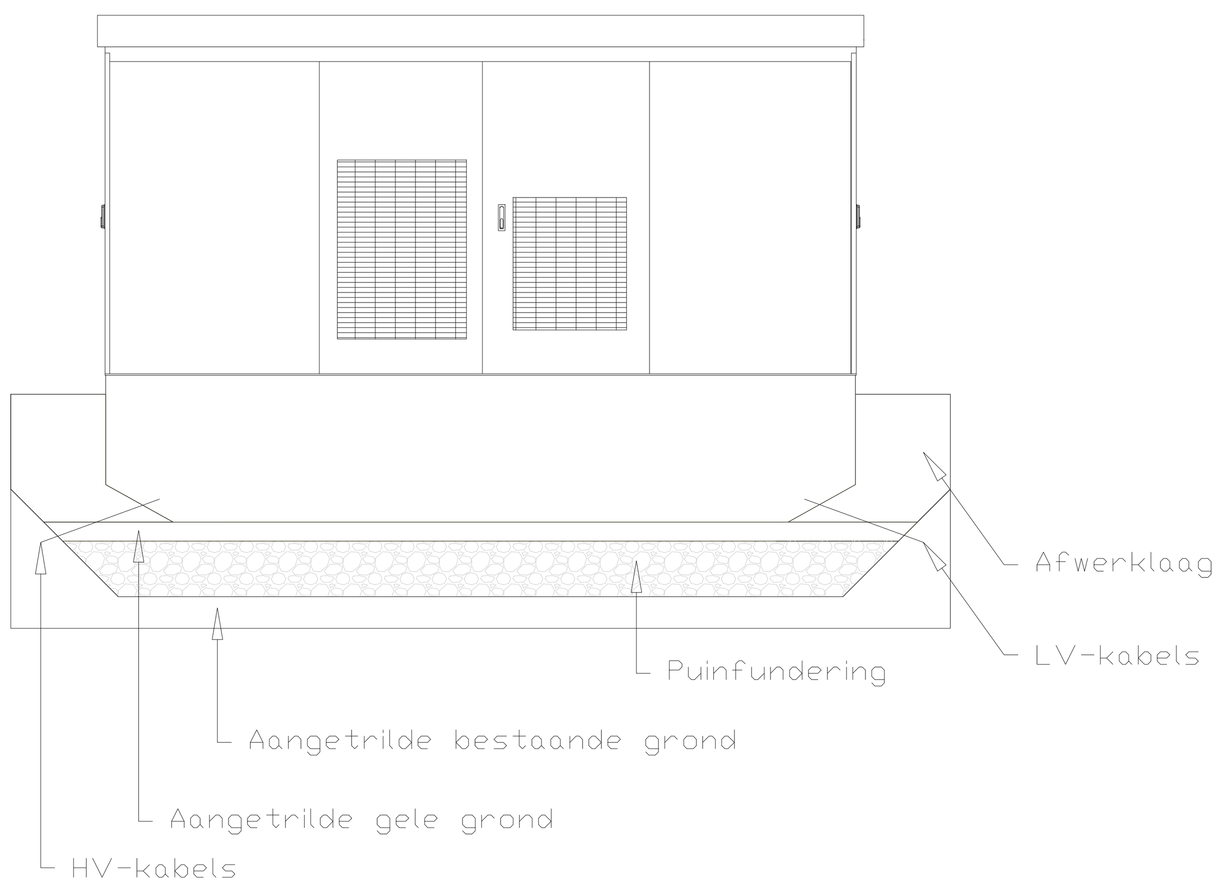
Zijaanzicht links



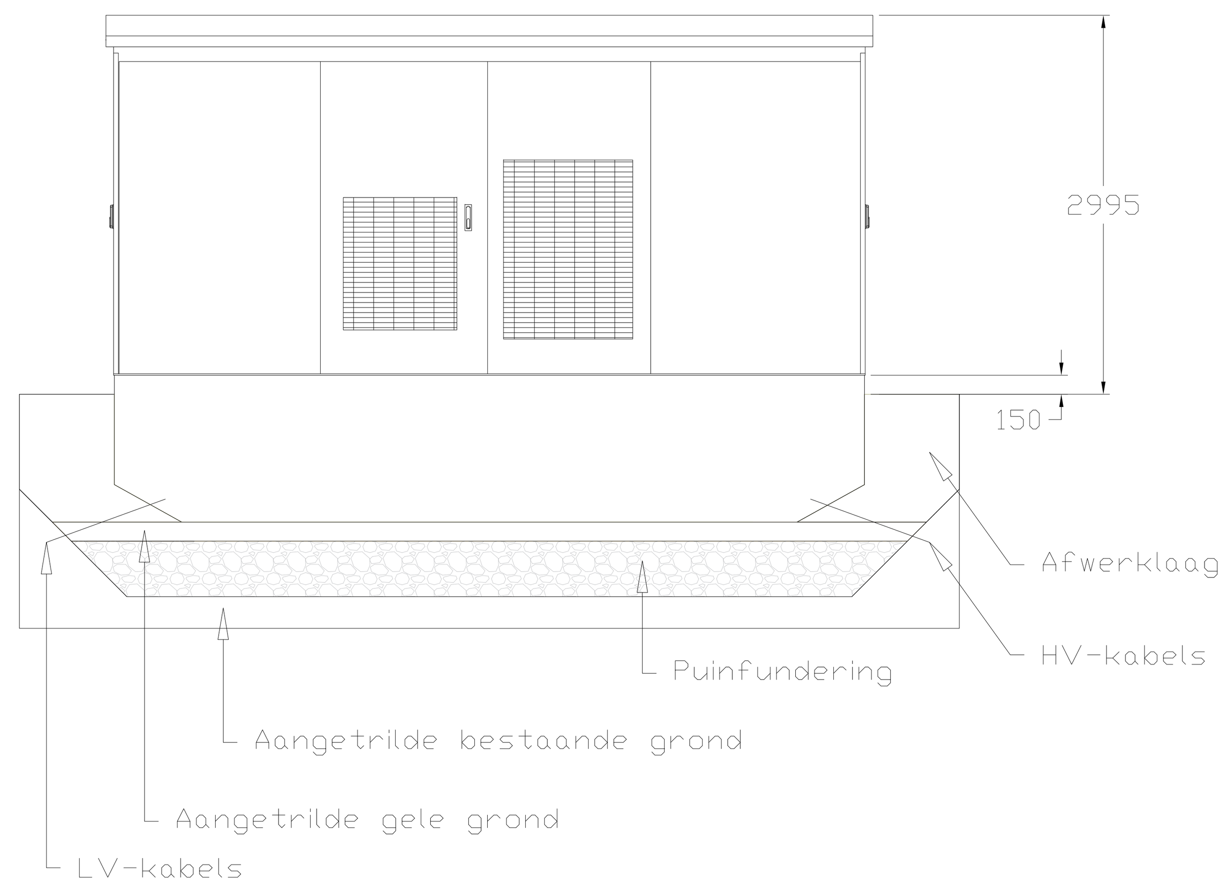
Zijaanzicht rechts



Vooraanzicht



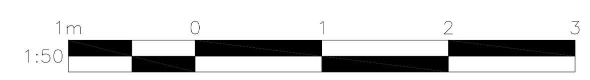
Achteraanzicht



Revisies

Revisie	Datum	Revisie toelichting	Auteur	Gecontroleerd door
01	28.09.18	Eerste Versie	KH	IL
02	01.10.18	Herzien	KH	IL
03	27.05.20	Herzien	GP	IL
04	25.03.21	Herzien	HN	IL

1. Deze tekening is ter oriëntatie, alle maten en indelingen zijn indicatief. Definitief ontwerp zal de aangegeven maten niet overschrijden.



Status:

VERGUNNING

Project:

Standaard Tekening
LC Energy

LC ENERGY

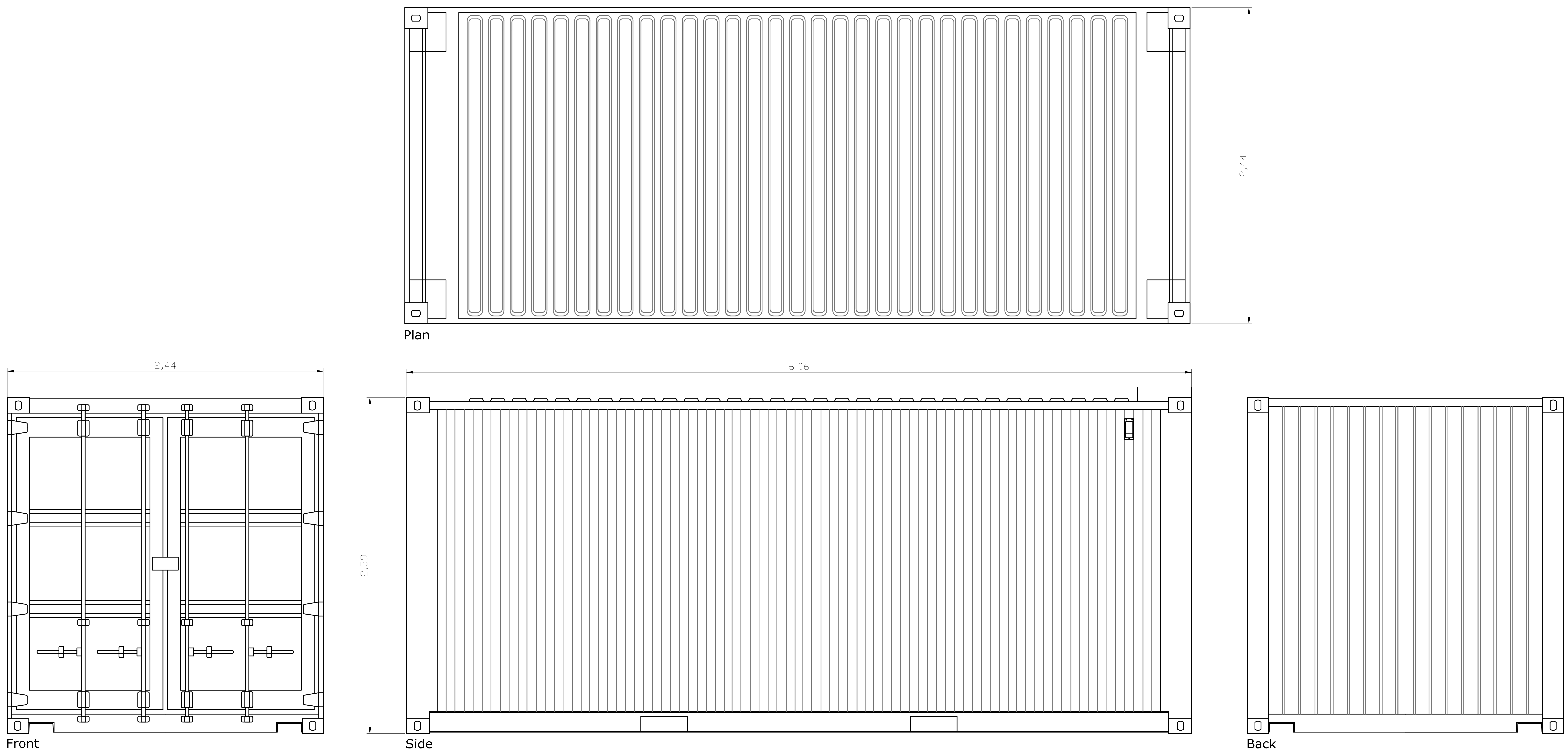
LC Energy - Bronland 12
6708 WH Wageningen
Tel: +31(0) 85-0499604
www.lcenergy.nl

Tekening:

Transformatorstation

Drawn:	Checked:	First Issued:
KH	IL	28.09.2018
Project Code: **LCE-**	Drawing Number: **SD-02**	
Sheet Size: **A1**	Scale: **1:50**	Revision: **04**

Standard ISO 20'



0	21 feb 2018				Originele tekening
Rev.	Date	Ontw.	Contr.	OK	Omschrijving revisie

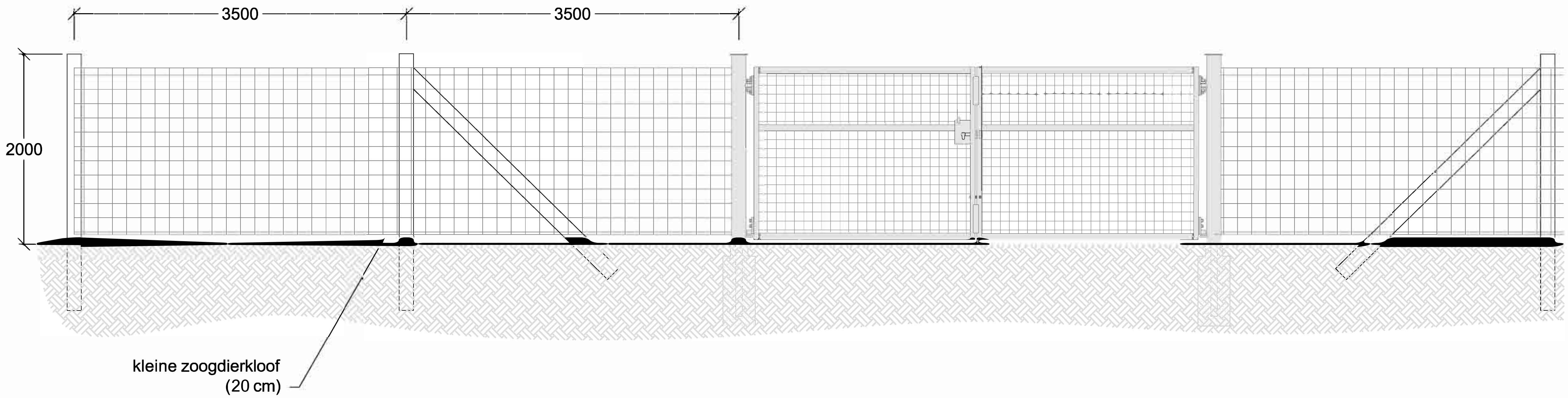
Project management:	Klant: Algemeen		Naam:	Datum:
		Ontwerp:		
		Tekening:	B. van Melis	21 feb 2018
		Controle:	x. xx	xx xxx xxxx
LC Energy Bronland 12 6708 WH Wageningen Tel.: +31 (0)85-0499604 www.lcenergy.nl	Project: Sparepart container 20ft LC Energy	Amerikaanse Projectie 3e Kwadrant	Schaal: 1:25	Formaat: A2
LC ENERGY	Planning-fase:	Datum:		
	Tekeningnummer:	Eenheid: m	Blad: 1/1	Revisie: 0

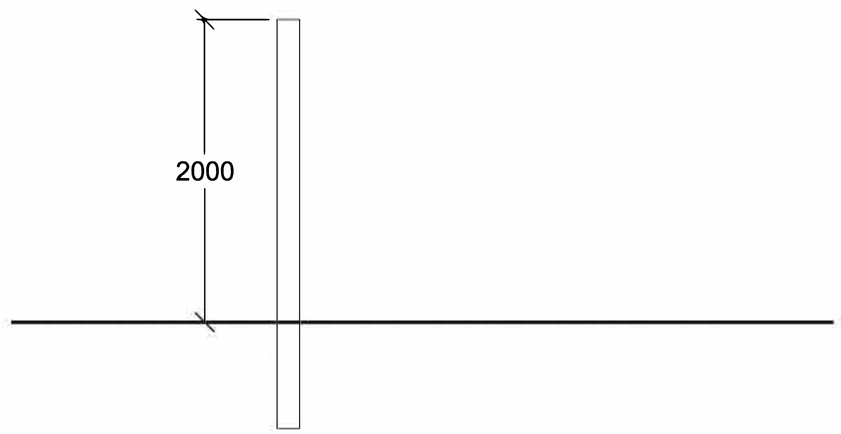
A3

Revisies

Revisie	Datum	Revisie toelichting	Auteur	Gecontroleerd door
01	09.02.23	Eerste Versie	JF	GH
02	14.02.23	Herzien	JF	GH

LEGENDA:





Status:

VERGUNNING

Project:

Zonneveld Amerongerwetering

LC ENERGY

LC Energy - Bronland 12
6708 WH Wageningen
Tel: +31(0) 85-0499604
www.lcenergy.nl

Tekening:

Hek en Poort

Auteur:	Gecontroleerd door:	Datum:
JF	GH	09.03.2023
Project Code: **LCE025**	Tekeningnummer: **PL-11**	
Formaat: **A3**	Schaal: **1:50**	Revisie: **02**

TORNADO®

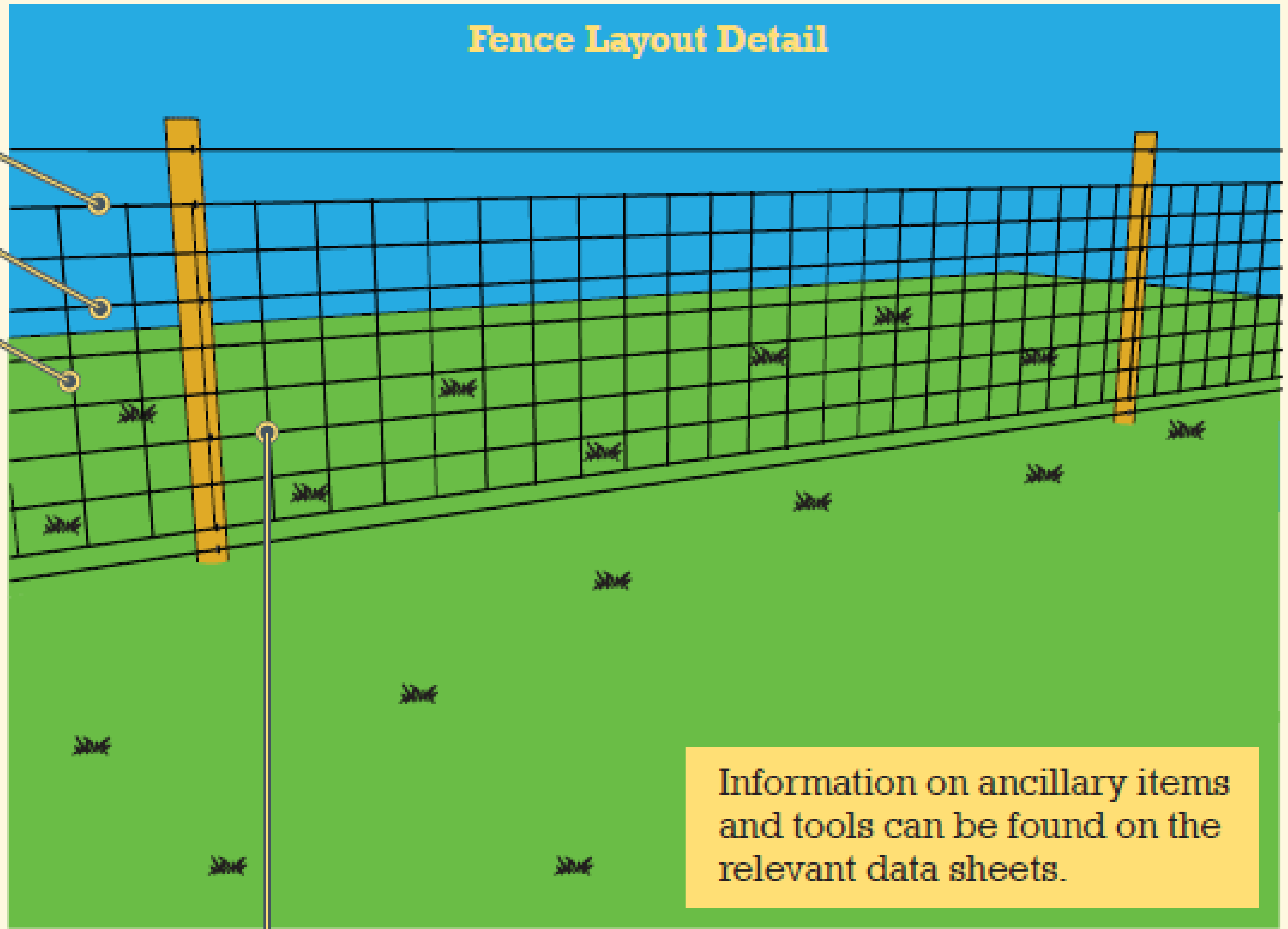
R13/192/15 SOLAR FARM FENCE

Fence Layout Detail

Top wire 2.5mm high tensile

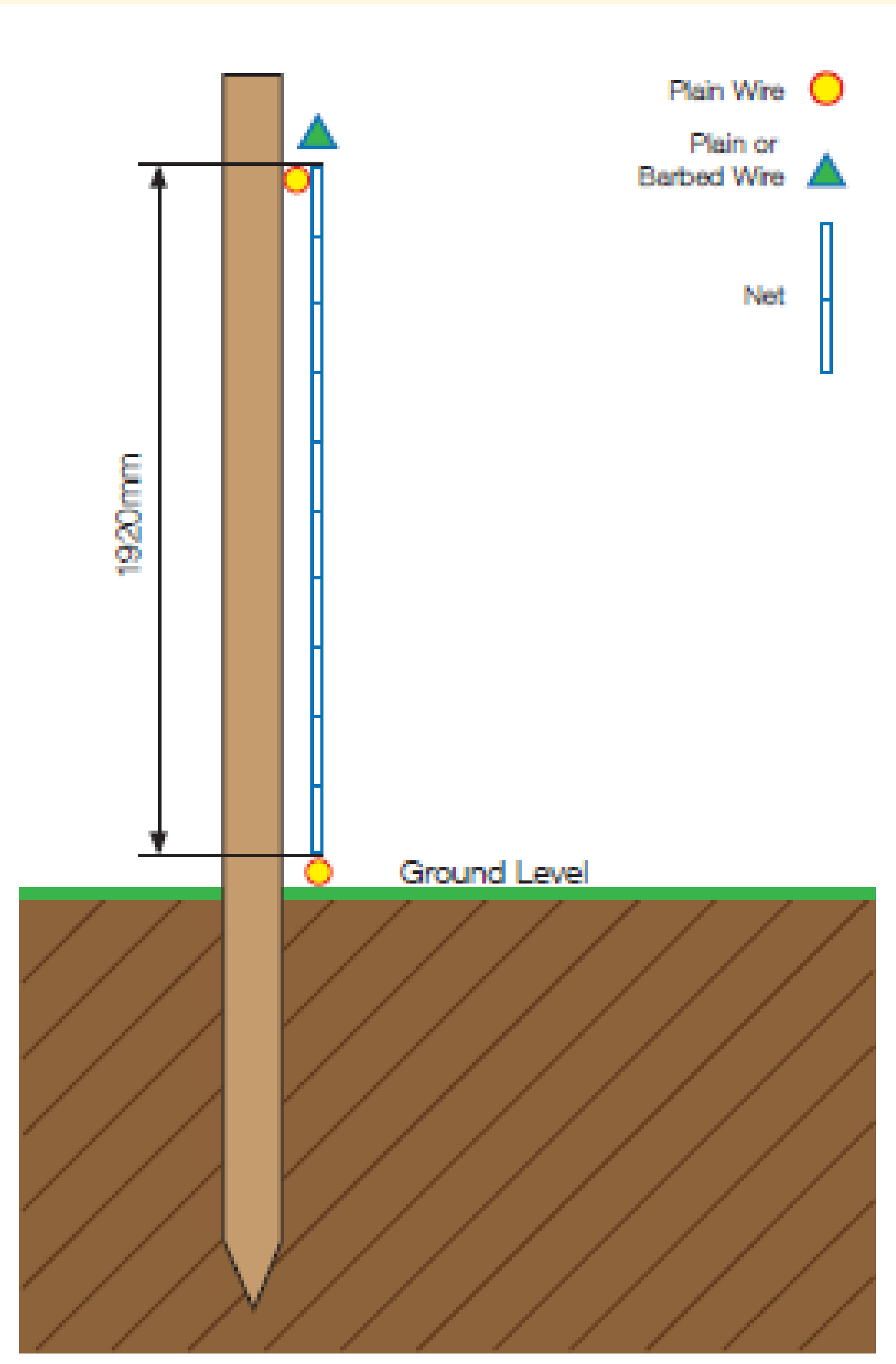
Intermediate line wire 2.5mm high tensile

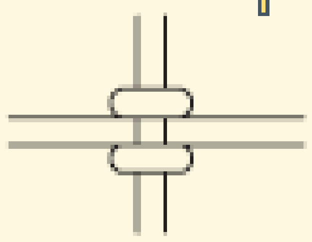
Vertical stay wire 2.5mm



Information on ancillary items and tools can be found on the relevant data sheets.

Fence Configuration Detail





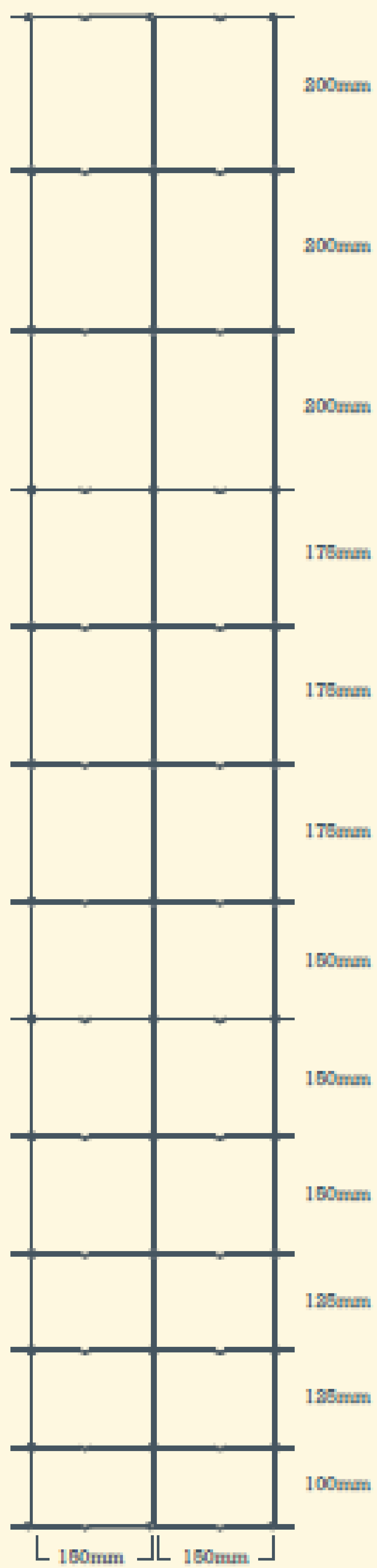
Torus Knot

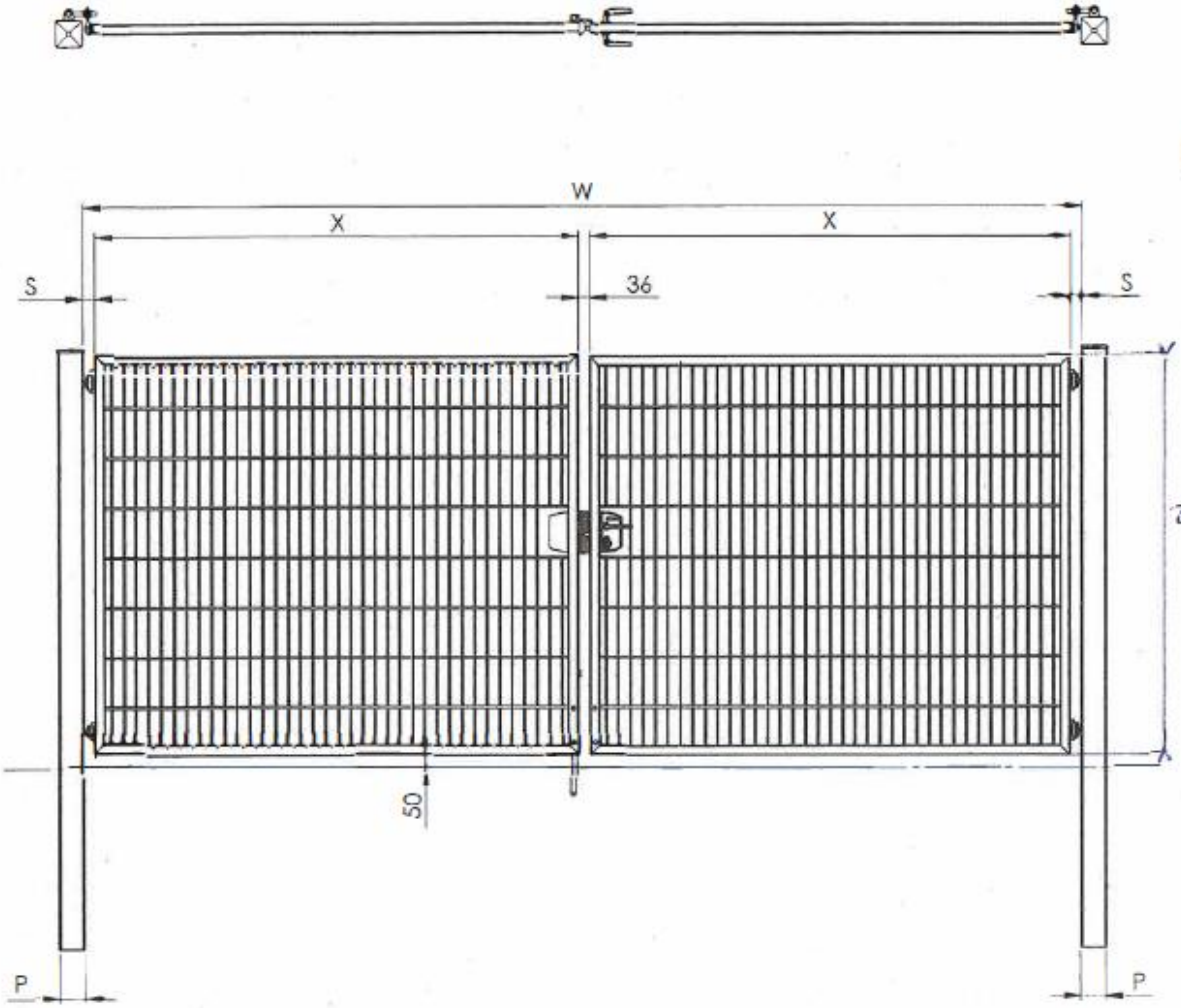
Manufactured with a high pressure bonded, smooth knot and a continuous vertical stay wire. The Tornado Torus offers optimal strength even in the most extreme environments.

Related Products

- Plain wire
- Deer gates
- Badger gates
- Staples
- Stock-ade staple gun
- Range of fence installation tools

Line Wire Detail





Mila DP
Optimale maatvoering

Breedte	P	W	X	S
2000	60	2000	920	62
	80	2000	920	62
	100	1980	920	52
2500	60	2500	1170	62
	80	2500	1170	62
	100	2480	1170	52
3000	60	x	x	x
	80	3000	1420	62
	100	2980	1420	52
4000	60	x	x	x
	80	x	x	x
	100	4000	1932	50
5000	60	x	x	x
	80	x	x	x
	100	5000	2432	50

Details:

1. Dubbele poort DSM Mila, 500 cm breed, 200 cm hoog, type Mila, palen 100 x 100 mm verzinkt. Prijs incl. montage en beton.

2. Enkele poort DSM Mila, 100 cm breed, 200 cm hoog, type Mila, palen 60 x 60 mm verzinkt. Prijs incl. montage en beton.

Project name: -			QTY: 1x
Description: Mou nt ng sembl y			Color: -
PRIVACON	Material:		Scale: 1:20
	Weight: kg	Drawn by: BS	Date: 09-11-20
	Units: MM	Checked by:	Date:
Houtzagerijstraat 22 5451 HZ Mill Telefoon: 0485 44 23 98 E-mail: info@privacon.nl www.privacon.nl	Project number & client name: - - -		
	Drawing number: 00144006		Revision 0-00 A3 SHEET 1 OF 1

Kleuren en materialen bouwwerken

Onderdeel	**Kleur**	**Materiaal**
Draagconstructie panelen	Grijs	Gegalvaniseerd staal, aluminium
Zonnepaneel	Donkerblauw/zwart	Aluminium frame, anti-reflectie glas, silicium zonnecellen (mono kristallijn)
Hekwerk en camera	Kwartsgrijs: RAL 7039	Gaashekwerk (metaaldraad) met houten bebeitste palen
Toegangspoort	Staal of gespoten in kwartsgrijs: RAL 7039	Staal
Transformatorstation	Kwartsgrijs: RAL 7039	Beton (vloer) staal (wanden en dak en aluminium deuren
Inkoopstation	Kwartsgrijs: RAL 7039	Beton (vloer), staal (wanden en dak) en aluminium deuren
Reserveonderdelencontainer	Kwartsgrijs: RAL 7039	Staal

Conceptuele onderbouwing waarborging constructieve veiligheid Zonneveld Amerongerwetering

Bij de bouw van een zonnepark dient rekening te worden gehouden met de verschillende krachten die op de panelen en hun rekken kunnen worden uitgeoefend. Dit betreft het gewicht van de panelen die erop gemonteerd worden, maar ook de invloed van weersomstandigheden zoals wind en sneeuw. Het is van het grootste belang dat de rekken op een veilige manier zijn geconstrueerd.

Voor het bepalen van de constructieve veiligheid zijn voor alle constructieve onderdelen gegevens benodigd over draagkracht en belasting. Op het moment van schrijven zijn deze gegevens nog niet bekend. Deze zijn afhankelijk van metingen op locatie, welke in dit stadium van de projectontwikkeling nog niet aan de orde zijn. Daarom volgt hier een uitleg van de manier waarop we de constructieve veiligheid bij de bouw van het zonnepark zullen waarborgen.

De rekken en profielen die wij standaard gebruiken zijn geschikt voor de meeste situaties die men redelijkerwijs in Nederland mag verwachten tegen te komen. Daarnaast maken we gebruik van veelzijdige rekken die breed compatibel zijn met de vele beschikbare profielen. Dit betekent dat ongeacht de situatie die we tegenkomen, het rek hierop zal kunnen worden aangepast om te zorgen voor een veilige constructie.

Bouwkundige berekeningen worden gemaakt op basis van hei- en uittrektests. Bij deze tests worden palen van verschillende diktes en met verschillende profielen in de bodem geslagen. Vervolgens word gemeten hoeveel kracht er nodig is om de palen weer uit de grond te trekken. Dit gebeurt op diverse plekken op de locatie om te bepalen of de ondergrond heterogeen is. Om veiligheidsredenen zal de “zwakste” meting worden aangehouden. Vervolgens worden deze gegevens gecombineerd met de publiekelijk beschikbare gegevens over wind en sneeuwval voor de locatie, waarna een bouwkundig ingenieur berekent welk profiel wordt gekozen, hoeveel palen er nodig zijn per rek, en hoe diep er geheid moet worden. Wanneer bijvoorbeeld de heidiepte door omstandigheden beperkt is, kunnen meer palen worden toegevoegd om dezelfde mate van veiligheid te waarborgen.

Afbeelding 1: Uittrektests

Hi-MO 5

LR5-72HBD
520~545M

- Based on M10-182mm wafer, best choice for ultra-large power plants
- Advanced module technology delivers superior module efficiency
  - M10 Gallium-doped Wafer • Smart Soldering • 9-busbar Half-cut Cell
- Globally validated bifacial energy yield
- High module quality ensures long-term reliability

12 — 12-year Warranty for Materials and Processing

30 — 30-year Warranty for Extra Linear Power Output

Complete System and Product Certifications

IEC 61215, IEC 61730, UL 61730

ISO 9001:2008: ISO Quality Management System

ISO 14001: 2004: ISO Environment Management System

TS62941: Guideline for module design qualification and type approval

OHSAS 18001: 2007 Occupational Health and Safety

LONGi

TÜV SÜD · C US · CE

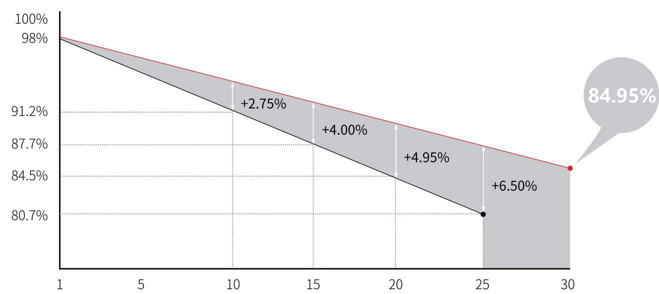
Hi-MO 5

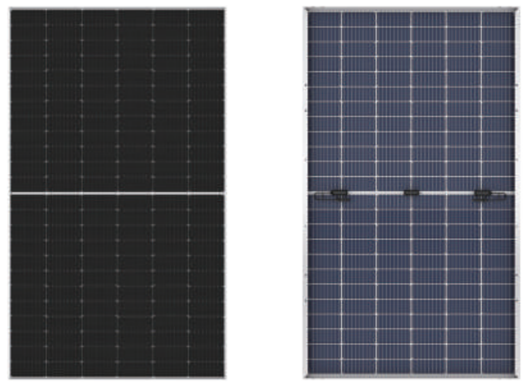
LR5-72HBD 520~545M

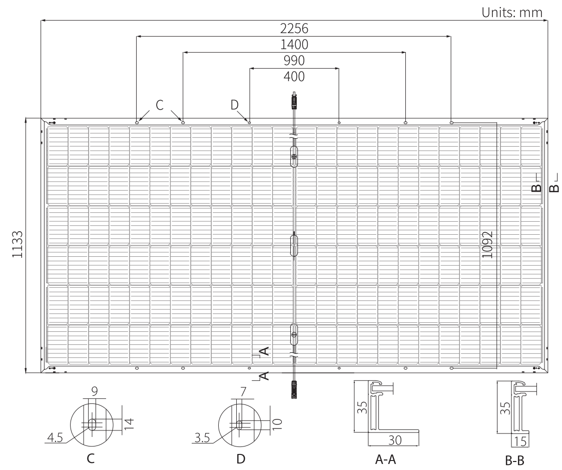
21.3%	0~+5W	<2%	0.45%	HALF-CELL
MAX MODULE EFFICIENCY	POWER TOLERANCE	FIRST YEAR POWER DEGRADATION	YEAR 2-30 POWER DEGRADATION	Lower operating temperature

Additional Value

30-Year Power Warranty







Mechanical Parameters

Cell Orientation	144 (6×24)
Junction Box	IP68, three diodes
Output Cable	$4mm^2$, positive 400 / negative 200mm length can be customized
Glass	Dual glass, 2.0mm coated tempered glass
Frame	Anodized aluminum alloy frame
Weight	32.3kg
Dimension	2256×1133×35mm
Packaging	31pcs per pallet / 155pcs per 20' GP / 620pcs per 40' HC

Electrical Characteristics STC : AM1.5 1000W/m² 25°C

Test uncertainty for Pmax: ±3%

Power Class	520	525	530	535	540	545
Maximum Power (Pmax/W)	520	525	530	535	540	545
Open Circuit Voltage (Voc/V)	48.90	49.05	49.20	49.35	49.50	49.65
Short Circuit Current (Isc/A)	13.57	13.65	13.71	13.78	13.85	13.92
Voltage at Maximum Power (Vmp/V)	41.05	41.20	41.35	41.50	41.65	41.80
Current at Maximum Power (Imp/A)	12.67	12.75	12.82	12.90	12.97	13.04
Module Efficiency(%)	20.3	20.5	20.7	20.9	21.1	21.3

Operating Parameters

Operational Temperature	-40°C ~ +85°C
Power Output Tolerance	0 ~ +5 W
Voc and Isc Tolerance	±3%
Maximum System Voltage	DC1500V (IEC/UL)
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	UL type 29
Bifaciality	70±5%

Mechanical Loading

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

Temperature Ratings (STC)

Temperature Coefficient of Isc	+0.050%/°C
Temperature Coefficient of Voc	-0.284%/°C
Temperature Coefficient of Pmax	-0.350%/°C

LONGi

Floor 19, Lujiazui Financial Plaza, Century Avenue
826, Pudong Shanghai, China
Tel: +86-21-80162606
Web: en.longi-solar.com

Technische beschrijving Hoofdconstructie Zonnepark Amerongerwetering

Algemene omschrijving

Zonnepanelen, die op een tafelstructuur in het land staan opgesteld, zetten zonlicht om in gelijkstroom. Door middel van laagspanningskabels wordt deze gelijkstroom naar omvormers gebracht, waar er een wisselstroom van gemaakt wordt. Van de omvormers lopen er laagspanningskabels naar de transformatorstation. Hier wordt de laagspanning getransformeerd naar middenspanning. Vanuit de transformatorstations lopen middenspanningskabel naar het inkoopstation, waar de stroom gebundeld wordt en geleverd wordt aan het elektriciteitsnet. In de monitoringscontainer wordt alle data van de installaties opgeslagen. Naast de elektrische componenten kent de zonneweide:

- Een hekwerk inclusief toegangspoort die de zonneweide afschermt
- Een toegang/onderhoudspad
- Een camera opstelling ter beveiliging

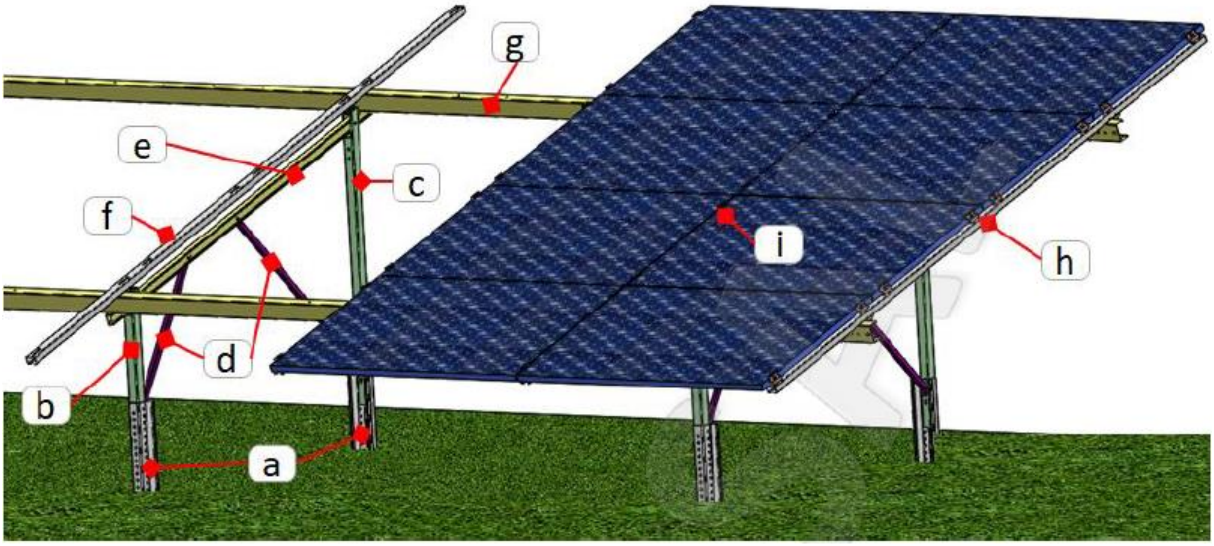
Hieronder volgt een nadere toelichting van hoe een tafel van zonnepanelen wordt opgebouwd. Voor de andere bouwwerken zijn in de vergunningsaanvraag technische tekeningen meegeleverd die het constructieprincipe duiden.

Opbouw van een tafel met zonnepanelen

Hieronder volgt een beschrijving van de opbouw van een tafelconstructie voor zonnepanelen. Het gaat om een principe beschrijving, exacte maatvoering is afhankelijk van de project specifieke eigenschappen (geotechnische studies, windstudie, etc)

Er worden c profiel funderingspalen in de grond geheid (a in de afbeelding hieronder). De exacte diepte is afhankelijk van o.a. het sonderingsonderzoek en de definitieve opstelling, typische diepte is tussen de 1 en 2,5 meter. Aan de deze funderingspalen wordt een v profiel buis (b en c) vast gezet met schroeven en bouten. Aan de buizen b en c worden verstevingsbuizen (d) vastgezet met schroeven en bouten. Deze buizen worden samen middels schroeven en bouten vastgezet aan een schuine buis (e). Middels een mal en een klem wordt de horizontale c rails (g) vastgezet op de buizen. Meerdere rails worden aan elkaar verbonden met schroeven en bouten. Op de horizontale rails wordt een verticale rails (f) gemaakt middels klemmen. In deze rails worden de zonnepanelen geschoven en vastgezet met klemmen (zie clamp configurations overview). Als blijkt uit de windstudie dat extra verbindingen nodig zijn kunnen die op de daarvoor aangebrachte punten worden toegevoegd.

Zie voor een nadere duiding (ter voorbeeld) de assemblage instructie ‘Photovoltaic mounting system: ZM2V-4L-VS2-20-60-C’.



Figuur 1: Schets van een tafelopstelling voor zonnepanelen

a. C post driven foundation
b. Main tube short
c. Main tube long
d. Brace
e. Inclined tube
f. Vertical clamp rail
g. C – rail
h. End clamp
i. Middle clamp

Conceptuele onderbouwing waarborging constructieve veiligheid Zonneveld Amerongerwetering

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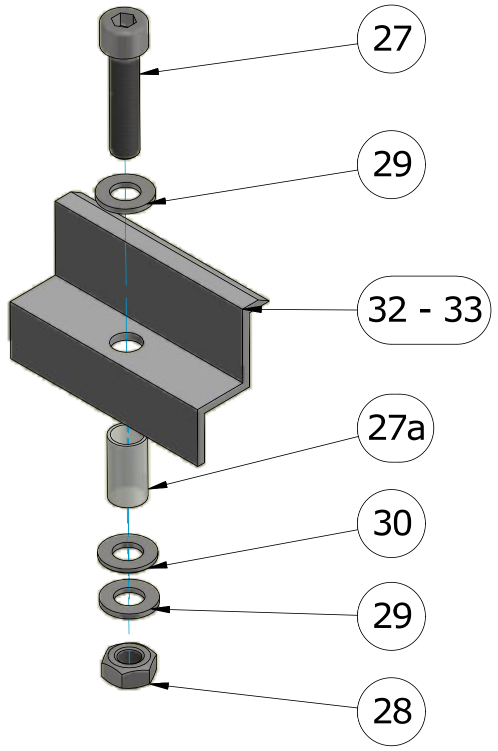
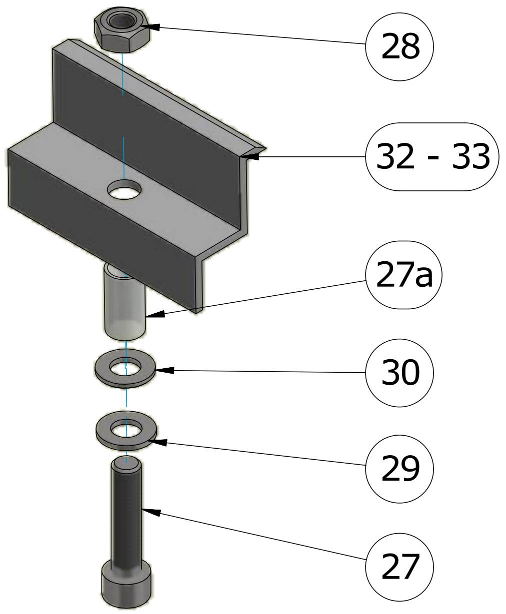
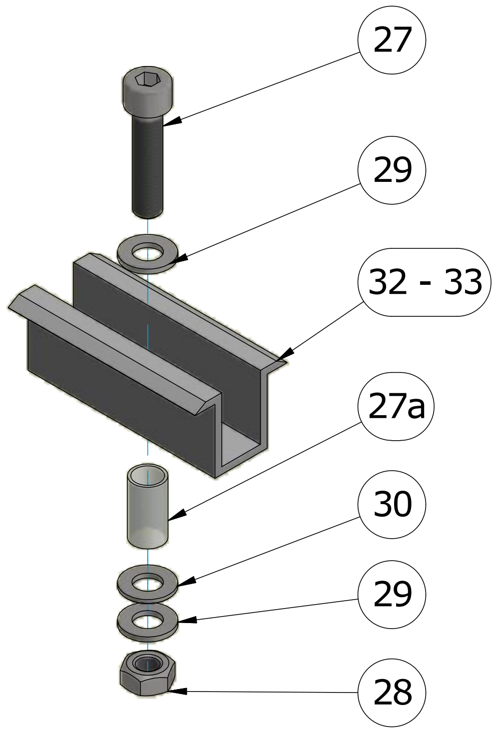
Afbeelding 1: Uittrektests



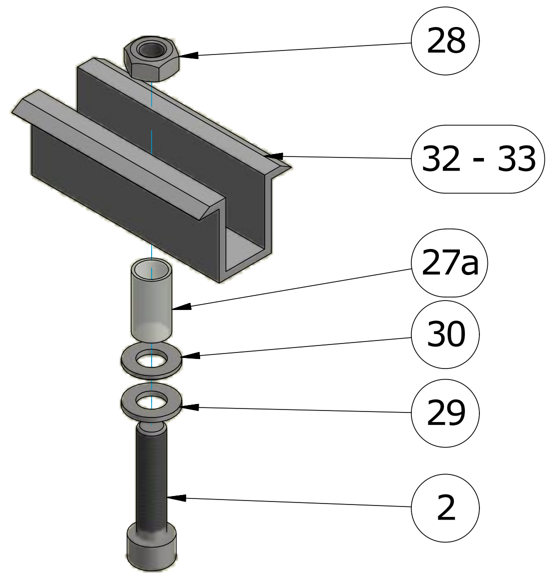
Endclamp Screw from the Top



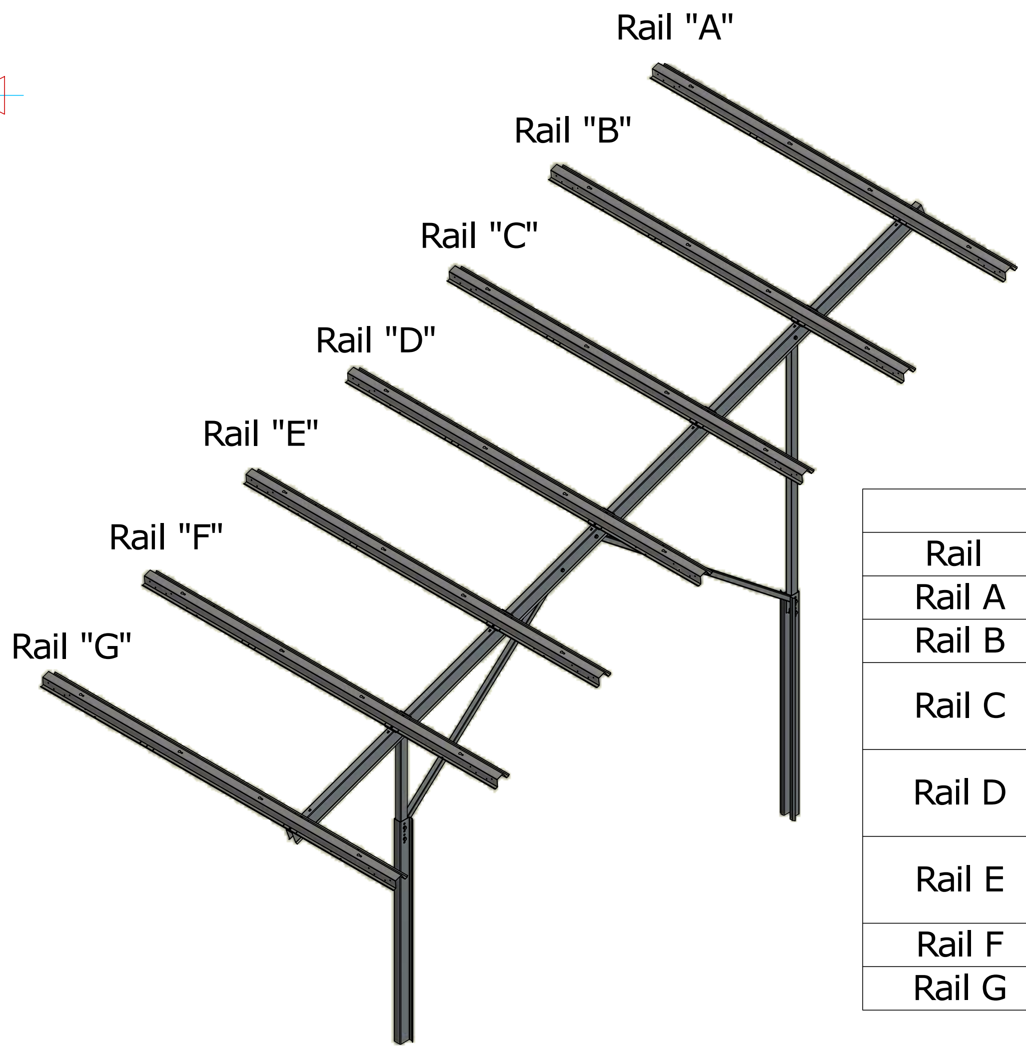
Endclamp Screw from underneath



Midelclamp Screw from the Top



Middelclamp Screw from underneath



Partlist	
Number	Part
27	Screw A2 DIN 912 - M8 x 35
27a	Distance Sleeve PVC
28	Nut A2 DIN 934 - M8
30	Washer DIN 125-1 - B 8,4
29	Lock Washer 8,4
32 - 33	Clamp

Overview Clamp Types	
Rail	Clamp Type
Rail A	Endclamp Screw from Top
Rail B	Mittelclamp Screw from Top
Rail C	Mittelclamp Screw from Underneath
Rail D	Mittelclamp Screw from Underneath
Rail E	Mittelclamp Screw from Underneath
Rail F	Mittelclamp Screw from Top
Rail G	Endclamp Screw from Top

Module Clamps Configuration / Mouting

Builder: Enerparc

	Date:	Name:
Editor	12-10-16	Neumann
Check		
Allowed		
Norm		

General contractor:

ENERPARC

Address: Zirkusweg 2 / Astra Tower
20359 Hamburg (Germany)
Telephon: +49 40 756 644 9-0
Fax: +40 40 756 644 965

Project: Solar - Structure

Scale: ...

Drawing-No. MSD 05

Index	Modification	Date	Name

Path:

Solar plant

Jutterszon

Province of North Holland

Netherlands

Short report

for the determination of the necessary ramming depth based on the static calculation from IB Michl (system Zimmermann) handed over by the client on 29/06/2020 and expertise GEOBEST of 06/12/2019 [1]

Client

Enerparc AG

Zirkusweg 2 / Astra Tower

D-20359 Hamburg

Boden und Wasser

Büro für Hydrogeologie,

angewandte Geologie und Wasserwirtschaft

St.-Martin-Straße 11

D-86551 Aichach

Inh. Dipl.-Geol. R. Hurler

Tel. +49 (0)8251 / 7224 u. 819890

Fax +49 (0)8251 / 51104

e-mail: bodenundwasser@t-online.de

Persons in charge:

Robert Hurler, Claudia Neubert

Content

1 Proceeding

On 22/06/2020, the Büro Boden und Wasser has been tasked to determine the necessary foundation depth for the solar plant 'Jutterszon' based on the Geotechnical Report of GEOBEST of 06/12/2019 (see below) and the static calculation of IB Michl (system Zimmermann), handed over by the client via e-mail on 29/06/2020.

For this purpose, the following report handed over on 13/05/2020 by the client has been evaluated synoptically without realizing any investigations on site.

[1] GEOBEST: "Jutterszon Solar Park in Den Helder Foundation advice" (English Translation);– 06/12/2019.

2 Location and soil composition

The survey area covers an area of approximately 3.75 ha and is located at the Burgemeester Ritmeesterweg in Den Helder. It is undeveloped land which is part of the business park De Dogger. The area has meadow vegetation.

The entire area is nearly flat and level. An inclination of 0° was set for the ramming depth calculation.

Within the depth of investigation, the following soil structure can be assumed from the information given in the expertise of GEOBEST [1]:

Layer **S1**: Humic TOPSOIL, clayey as well as sandy (from 0.0 m – 0.2 m below ground surface)

Layer **S2**: Slightly silty SAND, loose – medium dense (from 0.2 m – > 1.45 m below ground surface), below groundwater level

Layer **S3**: CLAY, very soft (from 1.45 m - >> 2.0 m below ground surface), below groundwater level

Layer **S4**: PEAT (in alternating strata with layer **S3**), below groundwater level. This layer generally occurs in the Jutterszon field at a depth of 2.45 m below ground level at the earliest.

Groundwater is expected at a shallow depth below ground level.

The soil characteristics used for the calculations of the foundation depth are listed in the following tables.

All the values were determined thanks to our experience and in accordance with the information given in the expert report [1].

Layer **S1**
Humic TOPSOIL, clayey as well as sandy
from 0.0 – 0.2 m below ground surface,
very loose.
Only the thickness of this layer is important for determining the ramming depth. For this reason, the soil properties are not shown.

Layer **S2**
Slightly silty SAND
from 0.2 – 1.45 m below ground surface,
loose – medium dense.

Specific gravity γ' cal. below groundwater level	Angle of friction φ cal.	Cohesion c' cal	Skin friction (Breaking value)
kN/m³	°	kN/m²	MN/m²
9.0	30.0	0.5	0.020 – 0.025

Layer **S3**
CLAY
from 1.45 - > 2.0 m below ground surface,
consistency very soft.

Specific gravity γ' cal. below groundwater level	Angle of friction φ cal.	Cohesion c' cal	Skin friction (Breaking value)
kN/m³	°	kN/m²	MN/m²
8.0	20.0	0.0	0.010

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Layer **S4**

PEAT

in alternating strata with layer **S3**,

at the earliest from 2.45 m below ground level,

Liquid to very soft.

Specific gravity γ' cal. below groundwater level	Angle of friction φ cal.	Cohesion c' cal	Skin friction (Breaking value)
kN/m³	°	kN/m²	MN/m²
1.0	15.0	1.0	0.005

Since this layer is below the founding level, it can be neglected in the calculations.

3 Determination of the necessary ramming depth for the project Jutterszon

Step 1 (Determination of the ramming depths using the calculation program acc. to ZTV-Lsw 88 and ZTV-Lsw 06):

In this first step, the ramming depth for every soil layer important for the foundation (in this case layer **S2** of loose – medium dense slightly silty SAND and layer **S3** of very soft CLAY according to chapter 2 is determined for each different profile type (here yellow, blue, red and white tables, as well as high side and low side for each) using the calculation program acc. ZTV-Lsw 88 and ZTV-Lsw 06 as well as the soil characteristics of chapter 2. At this point, the max. horizontal load and tilting moment of the static calculation are important for the calculation. The max. vertical load (pressure and traction) are not taken into account. For calculations acc. to ZTV-Lsw 88 and ZTV-Lsw 06, a safety factor of 1.4 for the ground characteristics has to be used if design values for the max. horizontal load and tilting moment are taken from the static calculation.

The calculations are based on the profile V 93x67x2.75 (Zimmermann). This profile has a surface of approximately 0.615 m^2 per meter of length.

The determinations of the necessary ramming depths are based on the present soil layers. The following thicknesses are assumed for the calculation.

Inclination:	0 degrees
Layer **S2**:	SAND (from 0.2 m - 1.45 m below ground surface), loose – medium dense
Layer **S3**:	CLAY (from 1.45 m - > 2.0 m below ground surface), very soft

Since Layer **S4** of PEAT is below the founding level, it can be neglected in the calculations.

The above mentioned soil structure is 'the worst case' assumed by us within the founding level.

For the calculations, the bonding depth of the profile starts 0.2 m below ground level, since the soil above that depth (non-bearing layer **S1**) is considered not to be consolidated enough.

The calculations of the necessary ramming depths were based on the forces and moments acting on the steel profile from Zimmermann of IB Michl, 26/06/2020. The designation of the different profile types used here was taken from this information. The initial values are summarized in the following table A.

Table A: List of the loads important for the determination of the foundation depths Bearing capacity

Table	Side	min $V_{d\ (traction)}$ [kN]	max $V_{d\ (pressure)}$ [kN]	max H_d [kN]	max M_d [kNm]
Yellow	high	11.260	9.015	0.823	0.522
	low	5.530	13.544	5.571	5.855
Blue	high	11.932	7.583	0.384	1.309
	low	4.087	12.546	4.825	5.061
Red	high	9.706	8.279	1.278	0.831
	low	3.262	9.025	3.869	3.940
White	high	5.486	8.279	1.278	0.831
	low	2.122	9.025	2.511	2.562

Determination of the necessary ramming depth necessary for the yellow tables, high side in layer **S2** (SAND) to bear the ***max. horizontal forces and moments*** using the calculation program acc. to ZTV-Lsw 88 and ZTV-Lsw 06 as well as the soil characteristics listed in chapter 2 with a safety factor of 1.4:

Program: Gründung
Project: Jutterszon_20200630
Short : Jutterszon_S2_Yellow_high

Input data

Angle of slope beta	0.00	degrees
Angle of friction	30.00	degrees
Cohesion c	0.50	kN/m²
reduced to	0.25	kN/m²
Specific gravity gamma	9.00	kN/m³
Skin friction angle delta	15.00	degrees
Breadth of pole b	0.14	m
Safety eta	1.40	(-)
Affecting H-load H	0.82	kN
Affecting moment M	0.52	kNm
Initial depth	0.20	m

Results of the calculations

H * Eta	1.15	kN
M * Eta	0.73	kNm
Depth of the centre of motion t	0.856	m
Sliding surface angle theta	22.97	degrees
Guiding line a	2.020	m
Gap length L	2.194	m
Surface F	0.86	m²
Soil resistance Ephl	6.24	kN
Soil resistance stress eph	104.04	kN/m²
Equilibrium force Eph2	5.08	kN
delta t for SumH=0 dt	0.17	m

Necessary pole length l	**1.03**	**m**
Maximal pole moment Mpf	0.72	kNm
Mpf * eta	1.01	kNm
In a depth X0 =	0.37	m

The foundation depths in layers S2 and S3 for all kind of posts are calculated using the same method.

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Step 2 (Determination of the ramming depths to bear the max. vertical loads):

In a second step, the ramming depths those are necessary for the profile to be able to bear the max. vertical loads (pressure and traction forces) are determined.

When the foundation is carried out in loose soils, the max. vertical loads are transmitted to the ground almost exclusively over the skin friction. Multiplying the pile length (ramming depth) with the skin friction of the soil and the surface per meter of length of the used profile, the max. vertical load the pile is able to bear - when applied exclusively over the skin friction - can be determined.

In the following table, the results from steps 1 and 2 are summarized.

Table B: Summary of the ramming depths [in m from the surface of the area] necessary for the posts to bear the maximum horizontal forces and tilting moments, and the ramming depths necessary for the posts to bear the maximum vertical forces

Table	Side	Layer	Calculated ramming depth [m] necessary for the horizontal load and tilting moment, if the foundation only reaches 1 soil layer Safety = 1.4	Calculated ramming depth [m] necessary to take on the vertical loads, if the foundation only reaches 1 soil layer Safety pressure ≥ 1.2 Safety traction ≥ 1.3
Yellow	high	S2	1.03	1.06
		S3	1.42	2.38
	low	S2	2.09	1.17
		S3	2.80	2.64
Blue	high	S2	1.15	1.12
		S3	1.54	2.52
	low	S2	2.00	1.09
		S3	2.67	2.45
Red	high	S2	1.20	0.91
		S3	1.64	2.05
	low	S2	1.85	0.78
		S3	2.48	1.76
White	high	S2	1.20	0.72
		S3	1.64	1.62
	low	S2	1.61	0.78
		S3	2.17	1.76

Step 3 (Correlation between the necessary ramming depths and the thicknesses of the layers, determining of the total depths):

Now, the ramming depths determined for each layer are correlated in order to get the combined ramming depth for the soil.

This correlation is carried out - separately - for the ramming depth in column 4 in table B, determined using the max. horizontal forces and moments, and the one in column 5 in table B, determined using the max. vertical loads.

The combined max. ramming depth that results from this correlation is decisive for the recommendation given on the final ramming depth.

The following table C shows the exemplary correlation of the ramming depth determined for the max. horizontal forces and moments (see table B, column 4) with the thickness of the different layers and the resulting total ramming depth for the yellow tables, high side.

Table C: Correlation between the necessary ramming depths to bear the maximum *horizontal* forces and tilting moments and the thicknesses of the different layers, determining of the total depth, yellow tables, high side

Horizontal forces and tilting moments, yellow tables, high side	Determined ramming depth [m]	Proportional thickness of cover layer to determined ramming depth cover layer [%]	Proportional ramming depth cover layer [m]	Remainder of cover layer transfer to underlying layer [%]	Remainder of cover layer transfer to underlying layer [m]	Share of total ramming depth [m]
Layer S2 thickness [m] 1.45	1.03	100.00	**1.03**	0.00		**1.03**
Layer S3 thickness [m] > 0.55	1.42			0.00	0.00	**0.00**
Total ramming depth to bear the maximum horizontal forces an tilting moments [m]						**1.03**

Step 4 (determination of the recommended ramming depth):

After steps 1 - 3 the recommended ramming depths are determined. In this recommendation, the highest final ramming depth is taken into account. The recommended ramming depths can additionally include a safety factor freely chosen by the geologist. This safety factor is determined using the experience of "Boden und Wasser" as well as the assessment of the long term stability of the sounded soil layers.

For the project Jutterszon (statics of IB Michl, 26/06/2020 (system Zimmermann)), the following ramming depths are recommended (table D):

Table D: Summary of the calculated and recommended final ramming depths [in m starting from the surface of the area] necessary for the posts to bear the max. *horizontal* forces and tilting moments, and the max. *vertical* forces

Table	Side	Calculated ramming depths nec. for the horizontal forces and moments [m from surface]	Calculated ramming depths nec. for the vertical loads [m from surface]	Recommended final ramming depth [m from surface]	Safety factor on the recommended final ramming depth for bearing the vertical pressure and traction forces [-]	
					pressure	traction
Yellow	high	1.03	1.06	**1.20**	> 1.8	> 1.4
	low	2.31	1.17	**2.31**	> 1.8	> 4.5
Blue	high	1.15	1.12	**1.20**	> 2.1	> 1.3
	low	2.18	1.09	**2.18**	> 1.9	> 6.0
Red	high	1.20	0.91	**1.20**	> 2.0	> 1.7
	low	1.99	0.78	**1.99**	> 2.5	> 7.1
White	high	1.20	0.72	**1.20**	> 2.0	> 3.0
	low	1.67	0.78	**1.67**	> 2.3	> 10

The recommended ramming depths in table D are sufficient for the steel profiles to bear the maximum ***horizontal*** loads and moments (see also calculation results above). These depths are also sufficient to bear the ***vertical loads*** from the static calculation (see safety factors indicated in table D, column 6). One very important factor for this is a sufficient time difference between the ramming process and the application of this load on the profile. It can be assumed that the time span between the ramming of the steel profiles and the installation of the solar modules is in any case sufficient in order for the profile to be able to bear the entire load.

For the recommendation of this ramming depth, influences like ground frost, fluctuating groundwater levels,… have been taken into account.

4 Additional Information

The existing dense grass cover should be left intact as far as possible. At places where this will not be possible, it should be taken care that a coherent grass cover can grow on the field after finishing the construction work. The root horizon of this vegetation is very positive for the stability of the foundation as the soil can take on more horizontal forces. This increases the safety margin. Such vegetation also represents a suitable protection against erosion that might be caused by out flowing rainwater.

5 Conditions and limitation

Büro Boden und Wasser takes the full responsibility for the calculation of the required foundation depth in soil as described in the expert report [1]. Other or further responsibilities are not agreed by Boden und Wasser, especially not for the correct and complete description of the geological conditions on site, the soil conditions and parameters in detail. Further geological and geotechnical consulting is not scope of work from Boden und Wasser.

Person in charge: C. Neubert, Dipl.-Geol.

Aichach, 30/06/2020

R. Hurler, Dipl.-Geol.

Enclosure 1 Excerpt from the geotechnical report of GEOBEST of 06/12/2019 [1]

GEOBEST

Jutterszon Solar Park in Den Helder

Foundation advice

Client	Adamant Solar
Report number	37848-R001-HEN
Status	Final
Report date	6 December 2019

Authorisation	Name	Initials	Date
Author	H.W.H. Engelen		06-12-2019
Inspection	R. Steenbrink		06-12-2019

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1 INTRODUCTION

Adamant Solar B.V. is preparing the construction of a solar park at the Burgemeester Ritmeesterweg in Den Helder. This site has a surface area of approximately 150 by 250 metres. The presently undeveloped land is part of business park De Dogger. The site has not been built upon in recent times. The capacity of the solar park amounts to approximately 3.1 MW. Geobest B.V. has been commissioned to provide geotechnical advice for the realisation of this solar park.

The location aforementioned has been subject to cone penetration testing to determine the load-bearing capacity of the foundation piles.

The solar panels in this meadow are subjected to both pressure and tension as a result of wind loads. The solar panels are built on piles in order to absorb the wind loads. The purpose of this report is to be able to determine whether the pile dimensions are sufficient to provide the necessary compressive and tensile strength.

Figure 1.1: Overview of the site of the Jutterszon solar park in Den Helder (Source: Google Earth Pro)

No choice has yet been made for the type of foundation piles to be used.

Two roads run through the project site, namely the Van der Sterrweg and the Professor Meijersweg. The Van der Sterrweg is maintained, but nothing is known about the Professor Meijersweg. The basic principle is that when this is removed, no additional load-bearing capacity is assigned to the substrate here.

2 STARTING POINTS

2.1 Standards and guidelines

The following standards and guidelines have been used:

[1] NEN 9997-1+C2:2017 "Geotechnisch ontwerp van constructies – Samenstelling van NEN-EN 1997-1, NEN-EN 1997-1/NB Nationale bijlage en NEN 9097-1 Aanvullingsnorm bij NEN-EN 1997-1" (*Geotechnical design of structures - Composition of NEN-EN 1997-1, NEN-EN 1997-1/NB National annex and NEN 9097-1 Addendum standard to NEN-EN 1997-1*), November 2017

[2] CUR 2003-7 "Bepaling geotechnische parameters" (*Determining geotechnical parameters*); first edition, October 2003.

2.2 Information provided

The following documents have been provided by Adamant Solar:

[3] 18024-D01, "Overzichtstekening Zonnepark De Dogger 2 Den Helder" (*Overview drawing Solar Park De Dogger 2 Den Helder*), dated 12 July 2018, shareNRG BV.

In addition, the following additional investigations have been carried out:

[4] AA18888-1, "Veldrapport betreffende grondonderzoek Burgemeester Ritmeester te Den Helder" (*Field report concerning geotechnical investigation Burgemeester Ritmeester in Den Helder*), dated 20 November 2019, Geosonda B.V.;

[5] GP19-25787, "Analyserapport Zonnepark Burgemeester Ritmeesterweg te Den Helder" (*Analysis report solar park Burgemeester Ritmeesterweg in Den Helder*), dated xx December 2019, SGS Belgium NV.

Various databases with relevant information about the geotechnical conditions and the history of the site can be consulted via the internet. The following public sources have been used for the investigation carried out to date:

[6] Overview of the Actueel Hoogtebestand Nederland (AHN) (www.ahn.nl);

[7] Geotechnical investigation from the DINOloket of NITG-TNO (www.dinoloket.nl);

[8] Hoogheemraadschap Holland Noorderkwartier (www.hhnk.nl);

[9] Historical topographical maps - land use (www.topotijdreis.nl).

2.3 Geotechnical conditions

2.3.1 Geotechnical investigation

For the realisation of the solar park, Geosonda carried out thirty cone penetration tests at the project site to a depth of at least 5.0 metres below ground level (maximum depth explored approximately NAP[1] -7.5m). In addition, six soil borings were carried out.

The locations of the cone penetration tests are shown in Figure 2.1

[1] Translator's note: This is a standard unit in the Netherlands called the "Normaal Amsterdams Peil", the standard Amsterdam water level. Heights are measured relative to this level. A NAP level of 0 is approximately equal to the average sea level of the North Sea (source: Rijkswaterstaat, 2020, https://www.rijkswaterstaat.nl/zakelijk/open-data/normaal-amsterdams-peil).

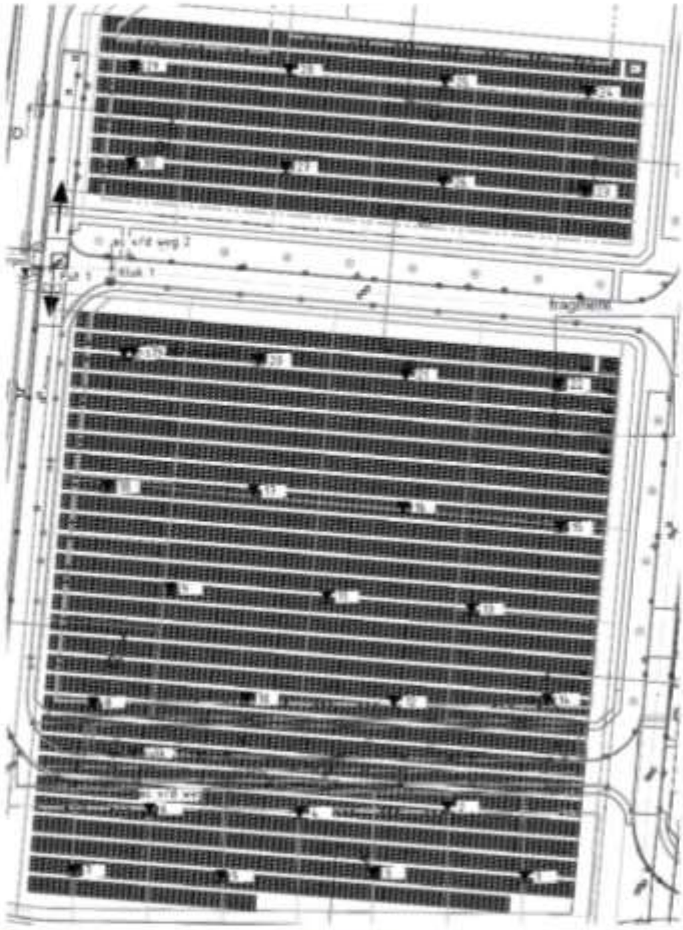

Figure 2.1: Overview of cone penetration test locations

The full geotechnical investigation is set out in Annex 1.

2.3.2 Ground level

The ground level at the location of the cone penetrations tests as found at the time of the geotechnical investigation varies from NAP +0.63 m (CPT 9) to NAP +0.76 m (CPT 18).

From information of the Actueel Hoogtebestand Nederland (www.AHN.nl) it can be concluded that the ground level varies between approximately NAP +0.5 m and NAP +0.8 m, see Figure 2.1.

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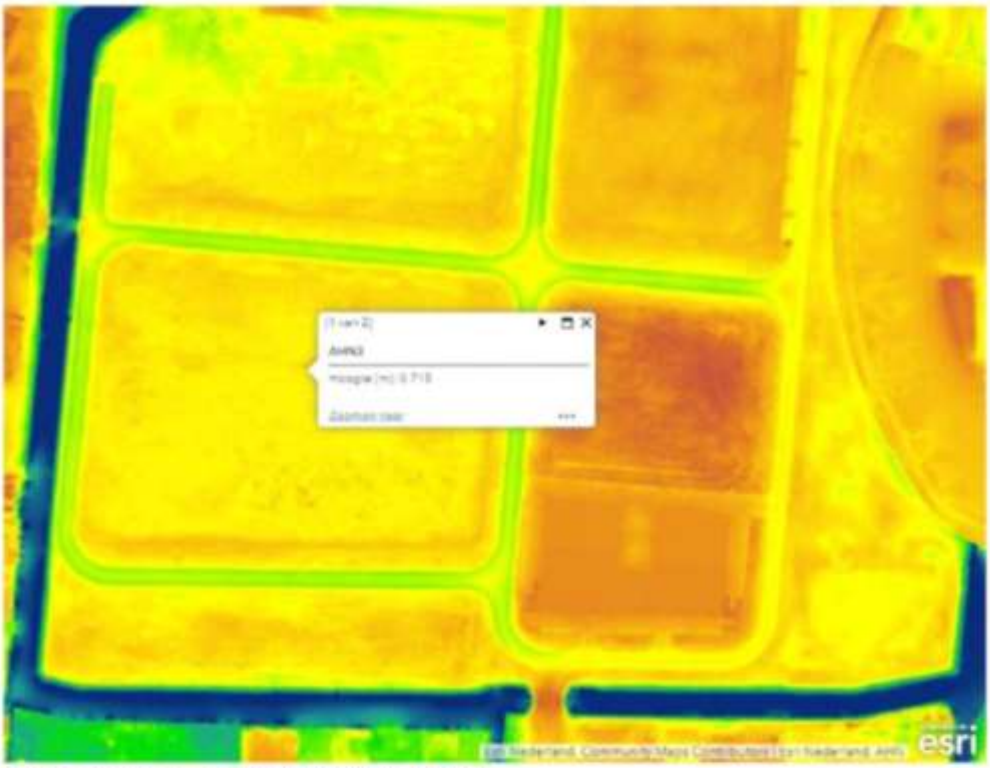

Figure 2.2: Project site ground level layout (source: AHN3)

2.3.3 Soil composition and parameters

From ground level, a moderately sandy clay layer is found over the upper 0.2 to 0.3. Below this is a silty sand layer up to approximately NAP -0.8 m to NAP -1.2 m. This sand layer is followed by a compressible package of alternating clay and peat layers up to approximately NAP -4.5 m to NAP -6.5 m. Figure 2.2 shows two representative cores.

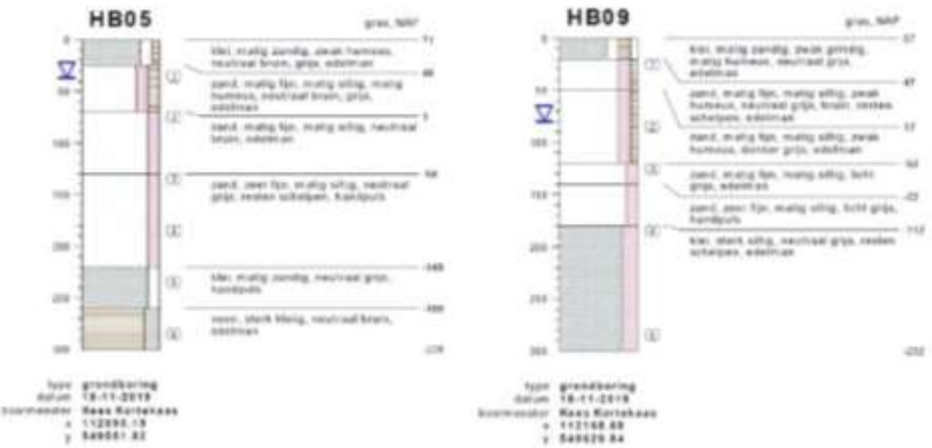

Figure 2.3: Example project site cores

The full geotechnical investigation is set out in Annex 1.

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2.3.4 Groundwater level

The project area forms part of the Koegras water level area (code 2060-01). Dynamic water level management with a target level of NAP -0.50 m forms the basis here. Seepage applies to this polder and brackish groundwater is found.

Table 2-1: Target project site water level (source: Hoogheemraadschap Hollands Noorderkwartier)

Code	Toelichting op het peilgebied	Soort peilbeheer	Vast peil [NAP +m]	Zomerpeil [NAP +m]	Winterpeil [NAP +m]	Ondergrens zomer [NAP +m]	Bovengrens zomer [NAP +m]	Ondergrens winter [NAP +m]	Bovengrens winter [NAP +m]
2010-01	Huisduinen aanvoer	dynamisch	-0.03			-0.10	-0.01	-0.10	-0.01
2010-02	Huisduinen	seizoen dynamisch		-0.05	-0.40	-0.10	-0.01	-0.40	-0.30
2010-03	Huisduinen	seizoen dynamisch		-0.05	-0.30	-0.10	-0.01	-0.35	-0.25
2010-04	Huisduinen begraafplaats	vast	0.30						
2010-05	Huisduinen	seizoen dynamisch		-0.30	-0.50	-0.35	-0.25	-0.55	-0.45
2010-06	Huisduinen sportvelden	dynamisch	-0.50			-0.55	-0.45	-0.55	-0.45
2060-01	Koegras	dynamisch	-0.50			-0.55	-0.45	-0.55	-0.45
2060-02	Kanonsduin, Julianadorp, Nieuw Den Helder, De Schooten	flexibel				-0.60	-0.45	-0.60	-0.45
2060-03	Sportv. Hagendoornstraat	seizoen		0.20	0.01				

During the soil boring, the groundwater was found at approximately 0.5 - 1.0 metres below ground level.

2.4 Land use

For the determination of the history, different topographical bases were used as found on www.topotijdreis.nl as well as the information already collected during the different design stages of this project.

The terrain forms part of the Doggershoek business park and has been undeveloped since its realisation (approx. 20 years ago). Prior to this, the site was likely used as agricultural land for bulb cultivation. It is not clear whether the Professor Meijersweg, which crosses the area, will (partly) be removed for the purpose of the realisation of the solar park. The load-bearing capacity calculations do not take the presence of the (foundation of the) road into account.

Commonly, a distinction is made between subsidence, which occurs as a result of the application of loads on the ground level (heightening), and depression, which is the result of soil processes that lead to subsidence (settling, oxidation, creep). The autonomous soil subsidence in this area is estimated at <0.01 mm/yr (source: Bodemdalingskaart).

For subsidence, the theoretical final subsidence is reached after 30 years. The creep then contributes to the autonomous soil subsidence. This means that all work (terrain elevations) prior to 1989 fall under the heading of autonomous depression, and all work thereafter qualifies as subsidence. From this it can be concluded that all the heightening performed after 1989 can still contribute to the subsidence of the current site. Of course, all heightening applied after the issue of this note also contributes to this subsidence.

2.5 Dimensioning

No loads have been communicated. On the basis of the geotechnical investigation carried out, the optimum driving depth was determined and the corresponding calculation values of the load-bearing capacity have been calculated on the basis of a pile type commonly used for solar park foundations. As no load has been communicated, no testing of the UGT in accordance with section 7.6 of NEN9997-1 can be carried out.

For the calculation of the maximum load-bearing capacity and the determination of the optimum driving depth, the following starting points have been used:

- the project has been placed in reliability class (RC1);
- the foundation is taken to be a non-rigid foundation element;
- the calculations have been carried out with a ξ_3-value of 1.39 in accordance with table A.10a (non-rigid construction work, 1 cone penetration test present);
- the following pile class factors have been used:
    - steel profile:
        - $\alpha_s = 0.006$
        - $\alpha_t = 0.004$
- conservatively, no load-bearing capacity is assigned to the pile tip;
- the partial material factor for the load-bearing capacity of a pile, calculated on the basis of cone penetration tests, amounts to:
    - for piles subject to compressive force $\gamma_t = 1,2$
    - for piles subject to tensile force $\gamma_{s;t} = 1,35$
- a Sigma-shaped profile with an effective circumference of 0.44 m has been assumed.

3 FOUNDATION ADVICE

3.1 General

In view of the soil conditions, only a foundation on piles is eligible for this project. No preconditions have been set with regard to the installation method and type of foundation. Therefore, the application of a sigma-shaped steel profile with dimensions of 150/70/17x3 mm has been assumed. A cross-section is shown in Figure 3.1.

Figure 3.1: Sigma-shaped profile 150/70/17x3

No pile loads have been communicated. It is therefore not possible to recommend a definitive pile type and minimum pile tip level.
An analysis was carried out on the basis of the geotechnical investigation carried out with the aim of determining the optimum driving depth in the base present at the project site. The load-bearing capacities have been determined at this driving depth for a pile type considered to be representative.

3.2 Vertical pile load-bearing capacity

The vertical load-bearing capacity is determined on the basis of the shaft friction. Due to the low thickness of the steel profiles (3 mm), no tip load-bearing capacity is conservatively assigned.

The shaft friction has been calculated based on the local friction measured during cone penetrations testing, the circumference of the pile and the pile class, and material factors mentioned in section 2.5. Based on the classification of the project location (Figure 2.1), the site has been divided into three parts in order to be able to make a statement as to whether it is economically more advantageous to use different driving depths. The classification adopted is:

- Part 1: CPT 1 to 7;
- Part 2: CPT 8 to 22;
- Part 3: CPT 23 to 30.

The resulting cumulative tensile load-bearing capacity is then plotted against the depth. These graphs are set out in Annex 2. The graphs show that both CPT 2 and CPT 7 differ from the other core penetration tests. CPT 2 appears to have been executed in the shoulder of the road of the Professor Meijersweg and is not representative. CPT 7 is located in the southwest corner of the site and stands out due to a lower local friction in the upper 2 meters. The other cone penetration tests are reasonably homogeneous and, with the exception of CPT 7, comparable minimum load-bearing capacities are found for each sub-area.

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The graph also shows that, beyond a depth of approximately 1.75 m below ground level, local friction with the subsurface decreases, thereby also reducing the increase in tensile load-bearing capacity. On this basis, it is concluded that the optimum driving depth for the pile foundation is 1.75 metres below ground level.

On the basis of the representative sigma-shaped profile, the load-bearing capacity has been calculated at a pile point level of 1.75 metres below ground level. A distinction has been made between the deviating CPT 7 and the other cone penetration tests. The results are summarised in Table 3-1.

Table 3-1: Compressive load-bearing capacity

Core penetration testing	Sigma-shaped steel profile 160x71 mm		
	Driving depth [m relative to -	$R_{c;d}$ [kN]	$R_{t;d}$ [kN]
7	1.75	5.7	3.8
Other	1.75	6.6	4.5

$R_{c;d}$ = Calculation value compressive load-bearing capacity [kN]
$R_{t;d}$ = Calculated value tensile load-bearing capacity [kN]

On the basis of the load-bearing capacities above, a structural engineer can determine the optimum table configuration. If other piles are desired, the load-bearing capacity of a comparable pile type can be converted on the basis of the effective pile circumference.

In most cases, the load-bearing capacity on tensile strength is decisive. If the tensile load-bearing capacity that can be generated is insufficient, a possible solution would be to add a concrete slab around the pile. The own weight of the concrete slab must then be sufficient to compensate for the lack of tensile load-bearing capacity.

3.3 Subsidence

The location does not have a recent past with different bank heights. Given the low earth movement and the fact that the top layer consists mainly of sandy material, no significant subsidence is expected. The possible occurrence of subsidence mainly depends on the water management in the immediate vicinity of the location. There may be slight local differences.

3.4 Determination of corrosion

The environmental investigation consists of several analyses on six mixed samples. Each mixed sample consists of a composition of samples from all boring, per 0.5 m soil profile. As it is advised not to erect the table construction deeper than 1.75 metres below ground level, only the four mixed samples representative of the upper 2.0 metres are included in the corrosion determination.

On the basis of the environmental investigation carried out, it can be concluded, in accordance with DIN50929 part 3, that hot-dip galvanising of the profiles with a minimum thickness of 80 µm provides sufficient protection against corrosion for a service life of 25 years and is classified as good. The analysis in question, as well as the laboratory tests, are set out in Annex 3.

4 CONCLUSION

On the basis of the geotechnical investigation carried out and the analyses carried out, it can be concluded that when applying a foundation on piles, a driving depth of 1.75 m offers the most economical solution for the soil structure found for this project. For a Sigma-shaped profile with dimensions of 150/71/17x3, a common pile type for foundations of solar parks, the load-bearing capacities for compression and tensile strength have been determined for a driving depth of 1.75 m. A structural engineer can determine the optimum table configuration based on these values.

If another (similar) pile type is preferred, the load-bearing capacities can be corrected based on the effective circumference of the pile.

On the basis of the laboratory research carried out, it can be established that, if not deeper than 2.0 metres below ground level, the standard corrosion protection consisting of hot-dip galvanisation of the profiles with a minimum thickness of 80 μm is classified as 'good' for this project site.

GEOSONDA

Field report concerning geotechnical investigation
Burgermeester Ritmeesterweg
in Den Helder

Assignment number	AA18888-1
Report date	20 November 2019

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Field report concerning geotechnical investigation
Burgermeester Ritmeesterweg
in Den Helder

Assignment no.	AA18888-1
Report date	20 November 2019
Client	Geobest BV P.O. Box 106 4130 EC Vianen

Annexes

- CPT charts with adhesion measurement	01 to 30
- core schematic	HB01 to HB09
- coordinate table	1 page
- block plan	T01

report check: A.F. van der Burg dd. drawn up by: R.F.M. Lansbergen

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0 1 7 2 4 4 9 8 2 2

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DESCRIPTION OF THE WORK

On 4 November 2019, Geosonda received the assignment of Geobest to carry out geotechnical investigation concerning the construction of the Zonnepark (Solar Park) at the Burgermeester Ritmeesterweg in Den Helder. The results of the geotechnical investigation are included in this field report.

Cone penetration testing

Thirty deep cone penetration tests were carried out including measurement of local sleeve friction. The results of the tests are presented on CPT graphs 01 to 30. The depth is given in meters compared to NAP on the CPT graphs. The test locations have been plotted and measured using dGPS-RTK and are shown on the enclosed block plan T01.

The cone penetration tests were performed with an electrical cone with inclinometer in accordance with NEN-EN-ISO 22476-1. The electrical cone is used for direct and continuous measurement of both the resistance at the cone tip and the friction along the friction sleeve. The continuous recording of the soil resistance experienced ensures a detailed picture of the soil composition. This applies not only to the strength of the soil, but also to the nature of the soil layers present.

This is as the ratio between frictional resistance and cone resistance, the so-called friction number, has a different value for each type of soil. As an indication, the following ratios apply to the smooth electrical cone in normally consolidated soils below ground water level:

friction number in %	soil type
0.3 - 1.2	sand, coarse to fine
1.5 – 2.0	silt
2.5 – 5.0	clay
> 5.0	peat

Transitional forms occur between the different soil types so that the indicated boundaries cannot be viewed as hard boundaries.

There is an inclinometer present in the cone which makes it possible to check for any deviation from the vertical. The measured deviations are presented on the CPT graphs. In general, no special deviations have been recorded.

0 1 7 2 4 4 9 8 2 2

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Manual boring

In connection with the classification of the top layers, 6 manual bores were carried out.

The manual bores were carried out using a hand (soil) auger. The sensory observations of the samples are shown in core schematic HB01 to HB09. A total of 54 mixed samples were taken and presented to the SGS laboratory for analysis. The locations of the manual bores in relation to the surroundings are indicated on the enclosed block plan T01.

Alphen aan den Rijn, 4 November 2019

GEOSONDA B.V.

A.F. van der Burg,
ing., Director

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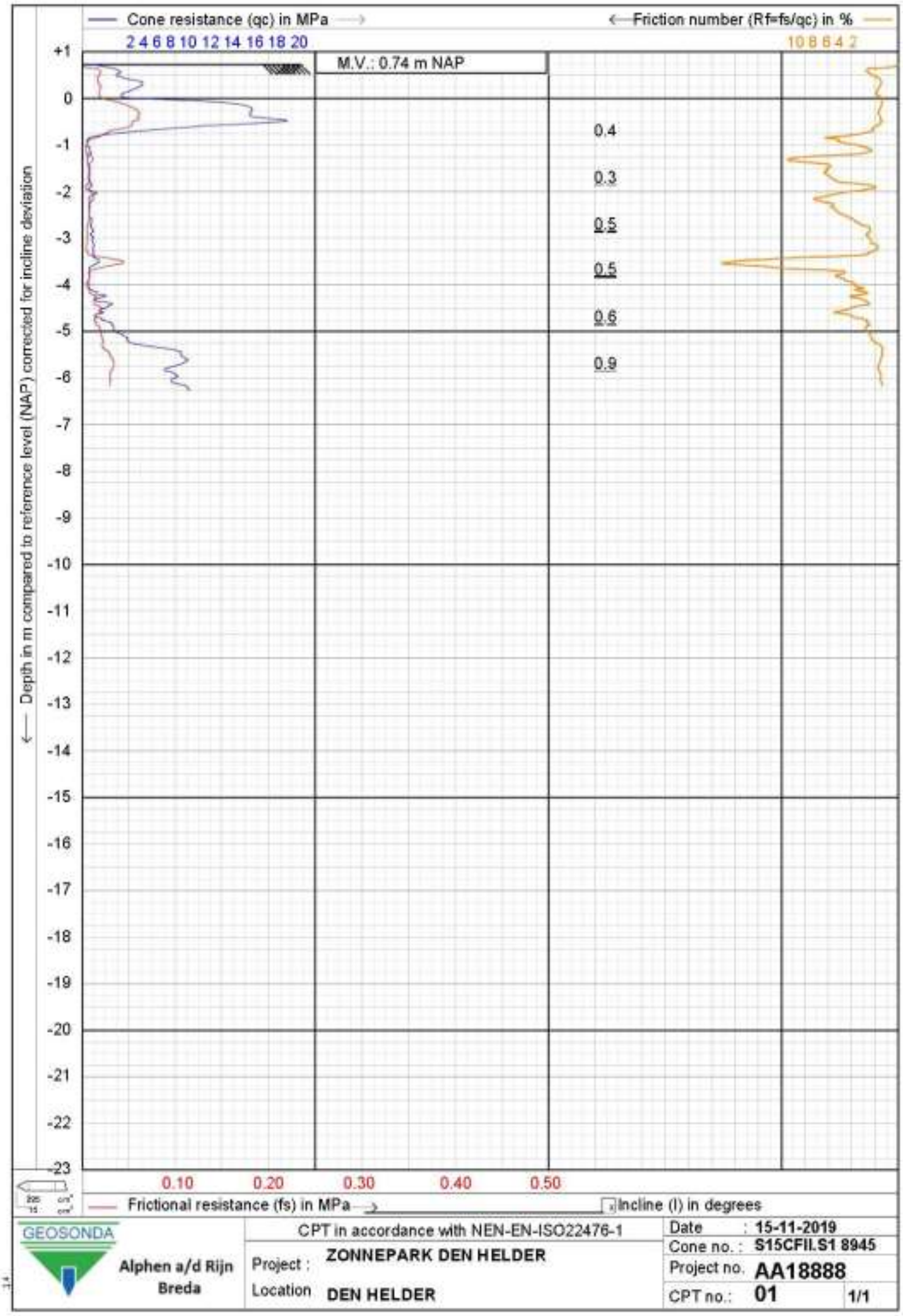
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.74 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.4
0.3
0.5
0.5
0.6
0.9
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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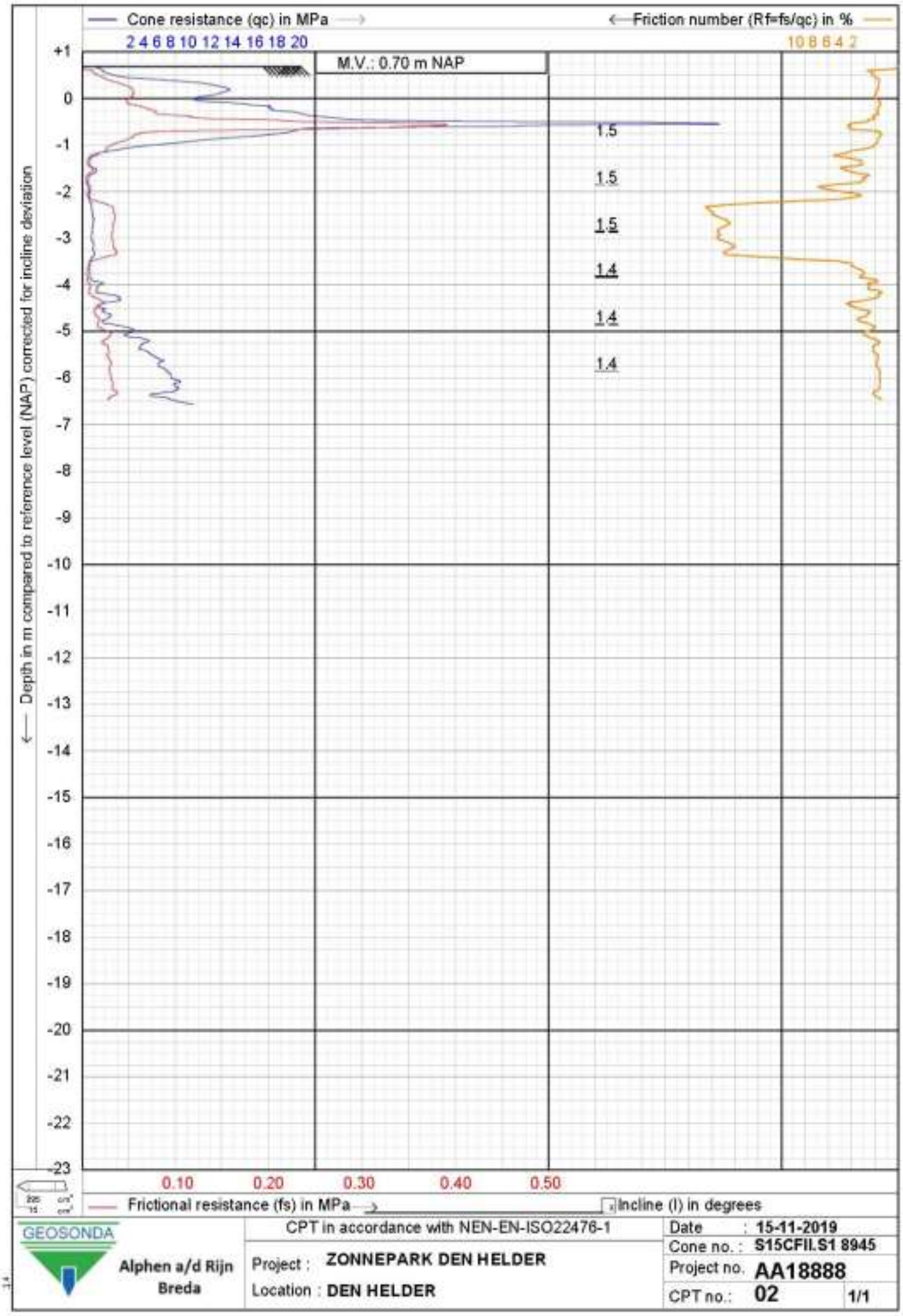
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.70 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
1.5
1.5
1.5
1.4
1.4
1.4
0.10
0.20
0.30
0.40
0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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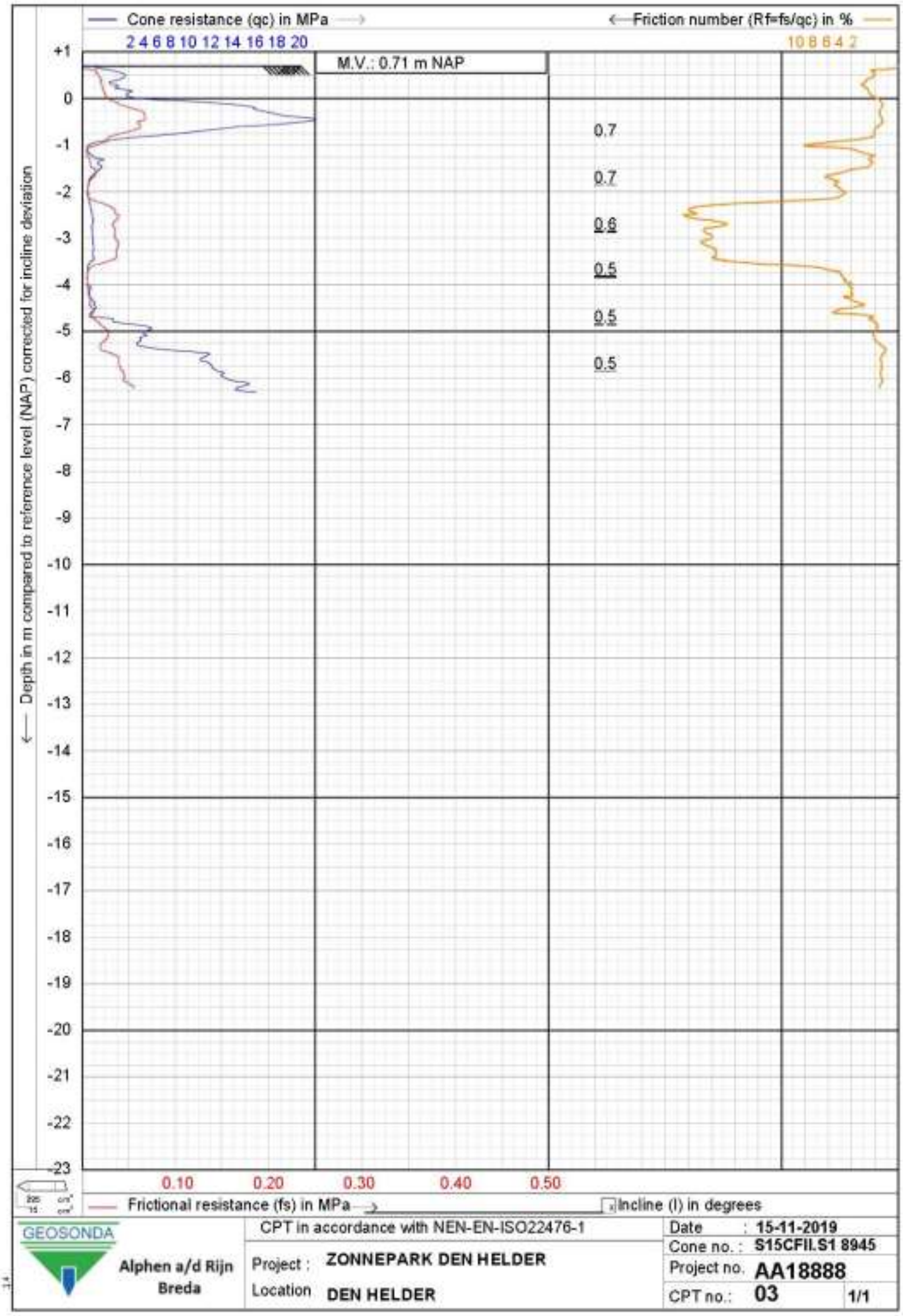
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.71 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.7
0.7
0.6
0.5
0.5
0.5
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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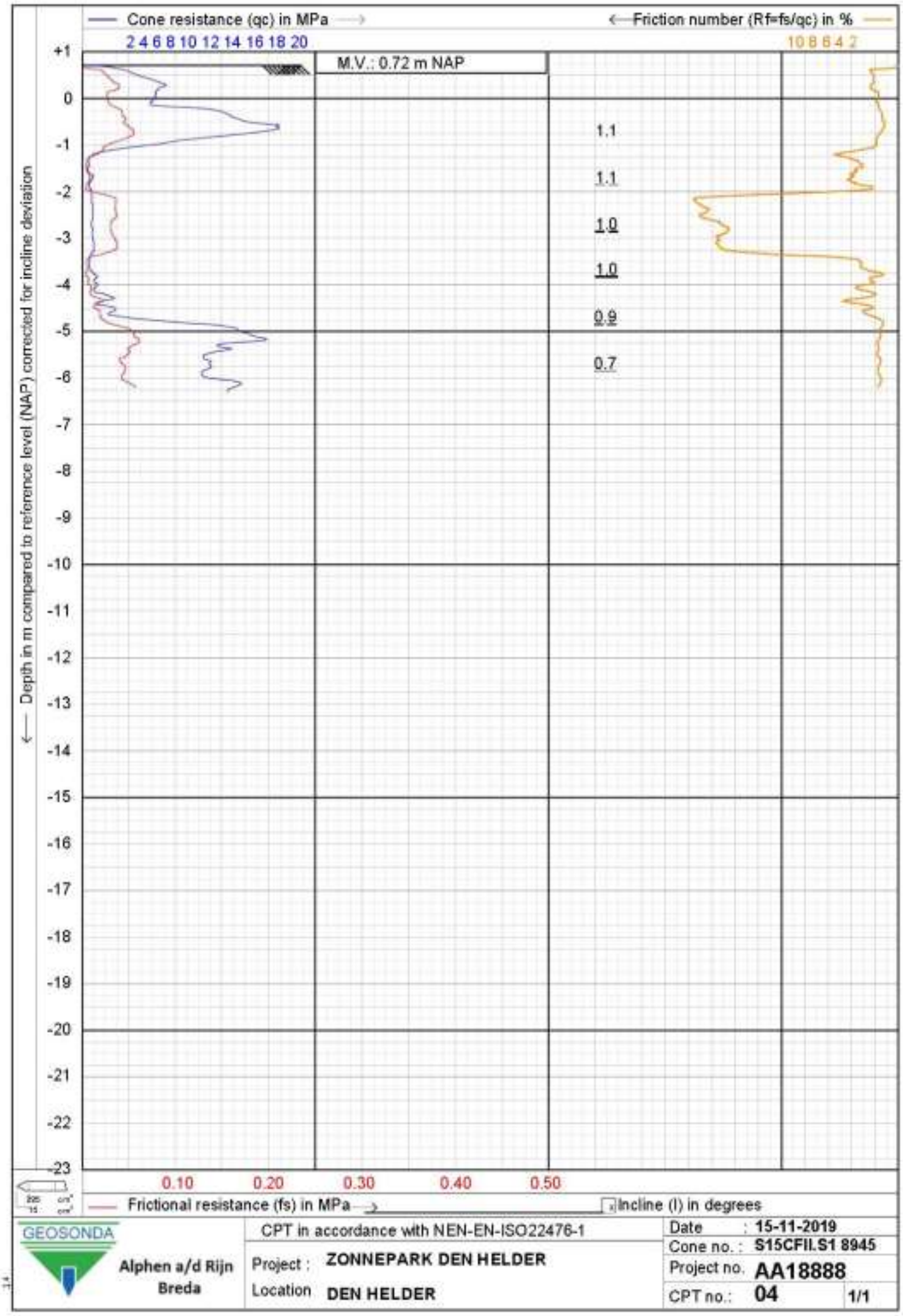

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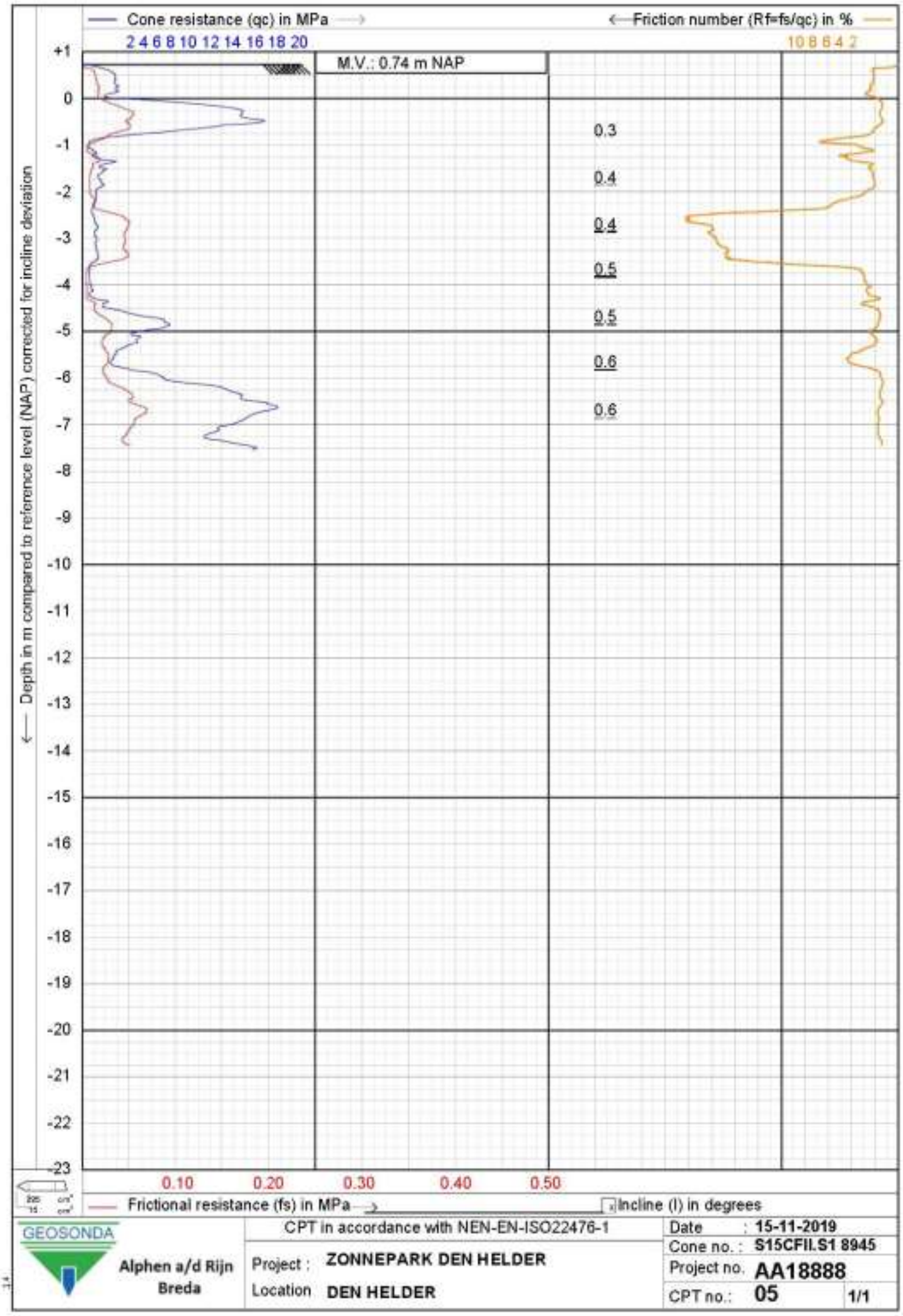

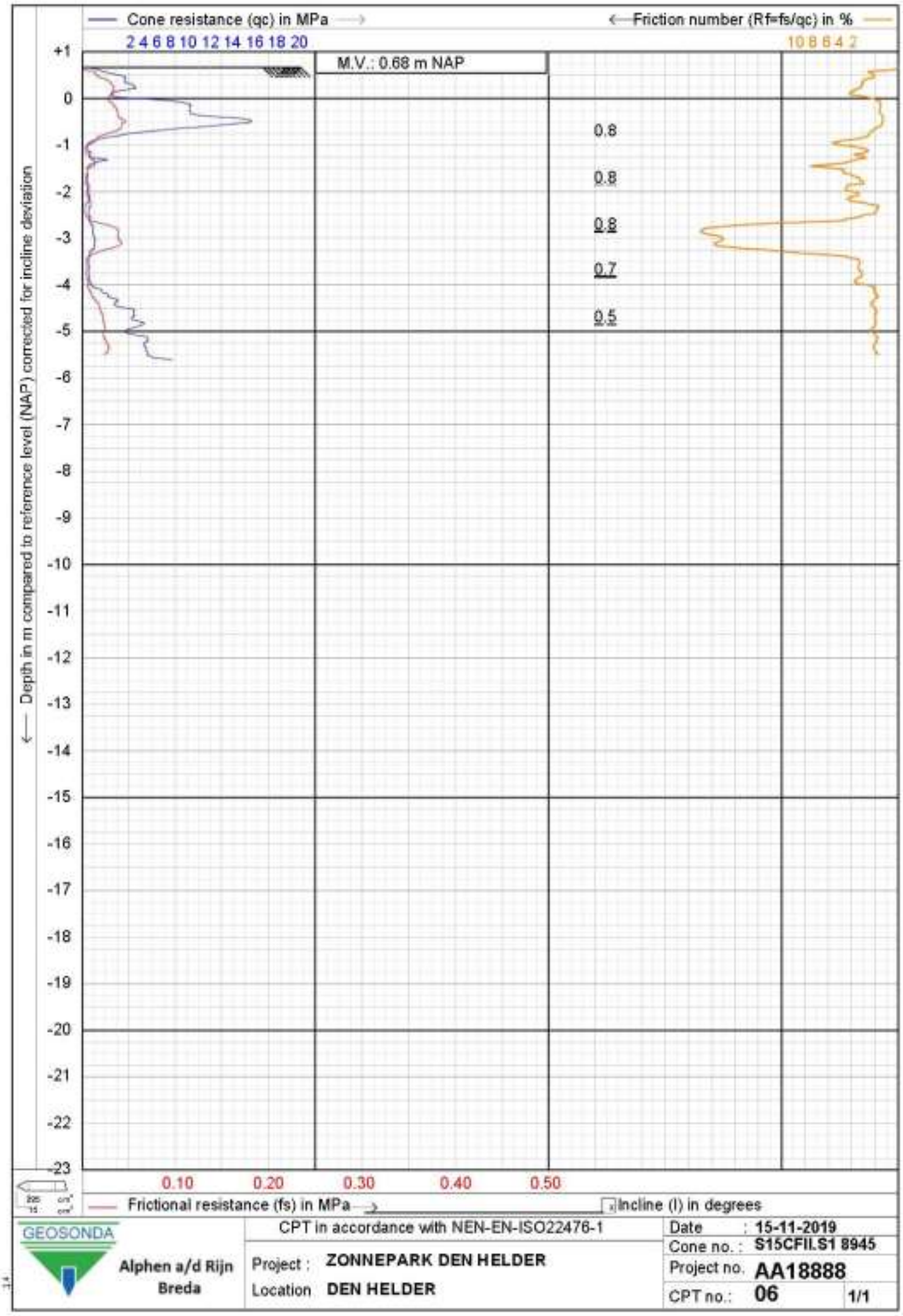
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.68 m NAP
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.8
0.8
0.8
0.7
0.5
Depth in m compared to reference level (NAP) corrected for incline deviation
0.10
0.20
0.30
0.40
0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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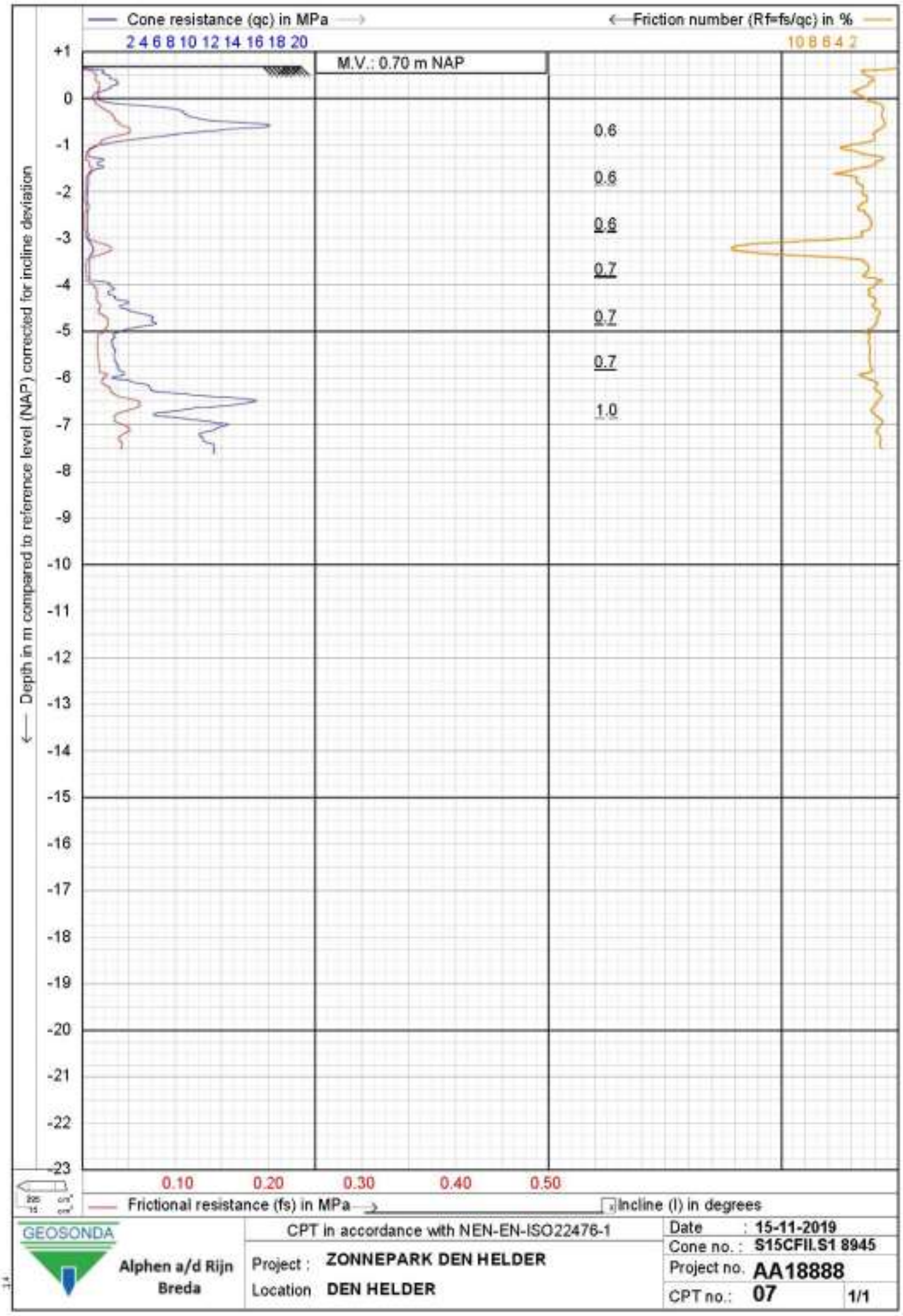
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.70 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
0.6
0.6
0.6
0.7
0.7
0.7
1.0
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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Breda
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Project : ZONNEPARK DEN HELDER
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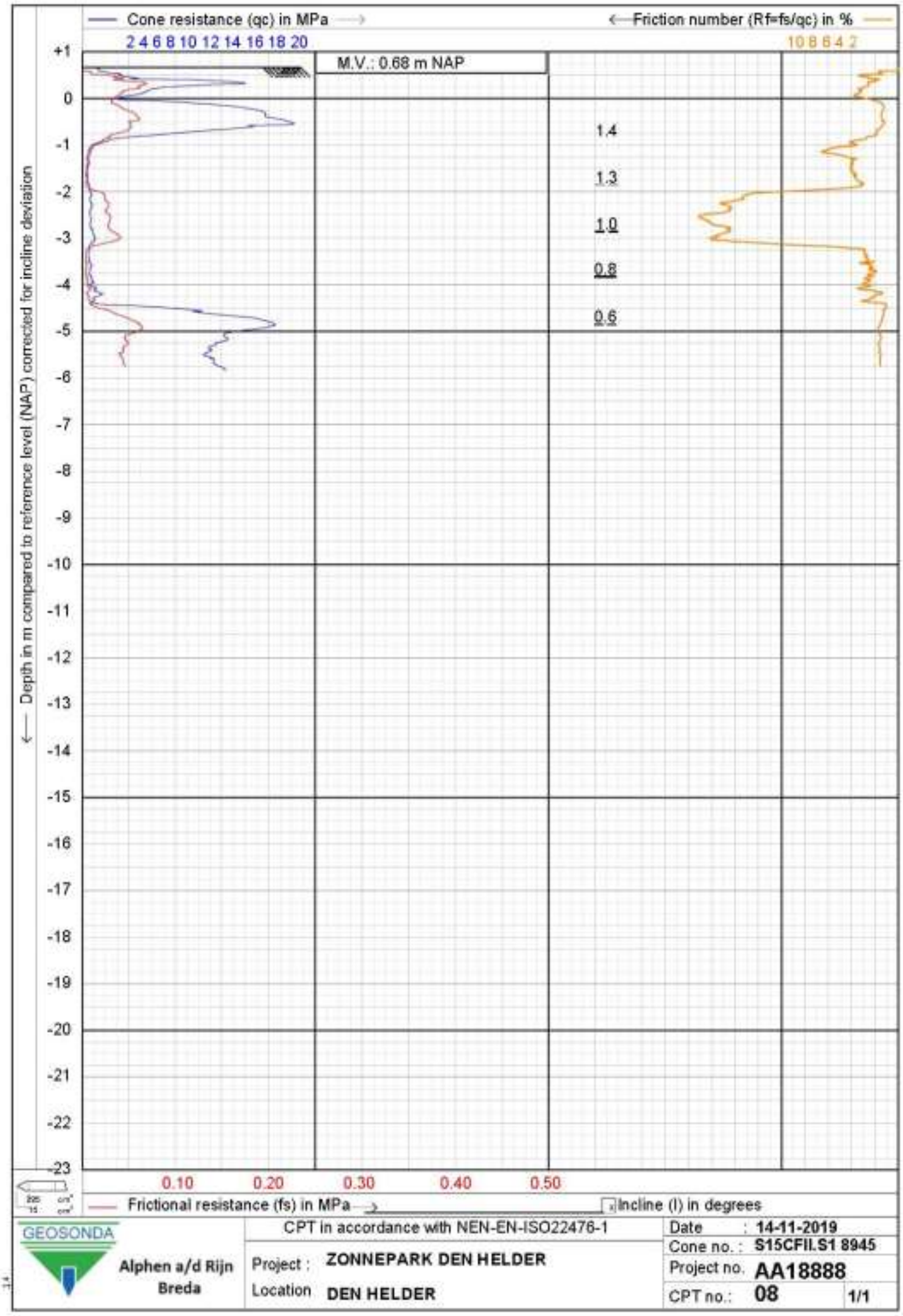
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.68 m NAP
1.4
1.3
1.0
0.8
0.6
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
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Project : ZONNEPARK DEN HELDER
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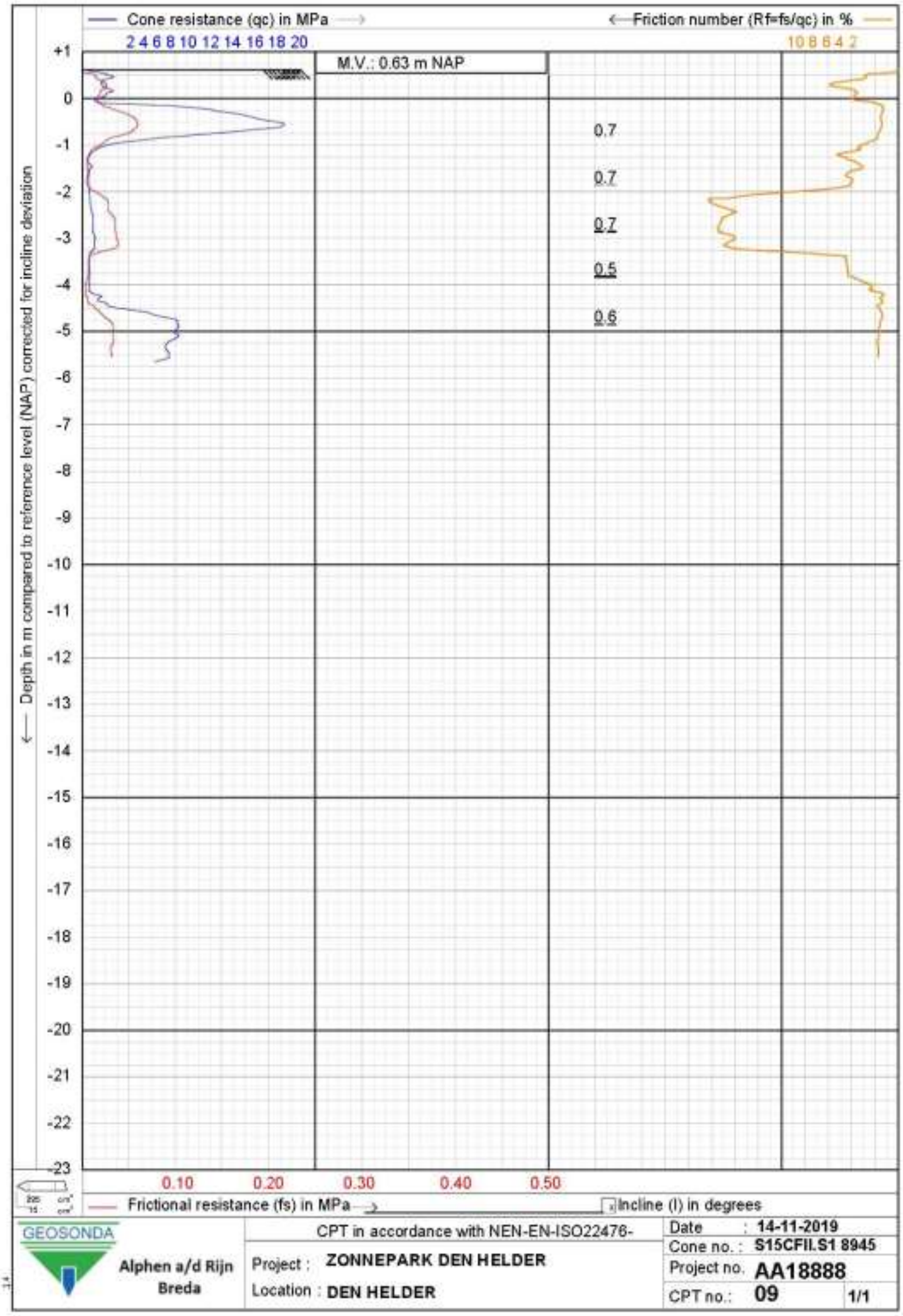

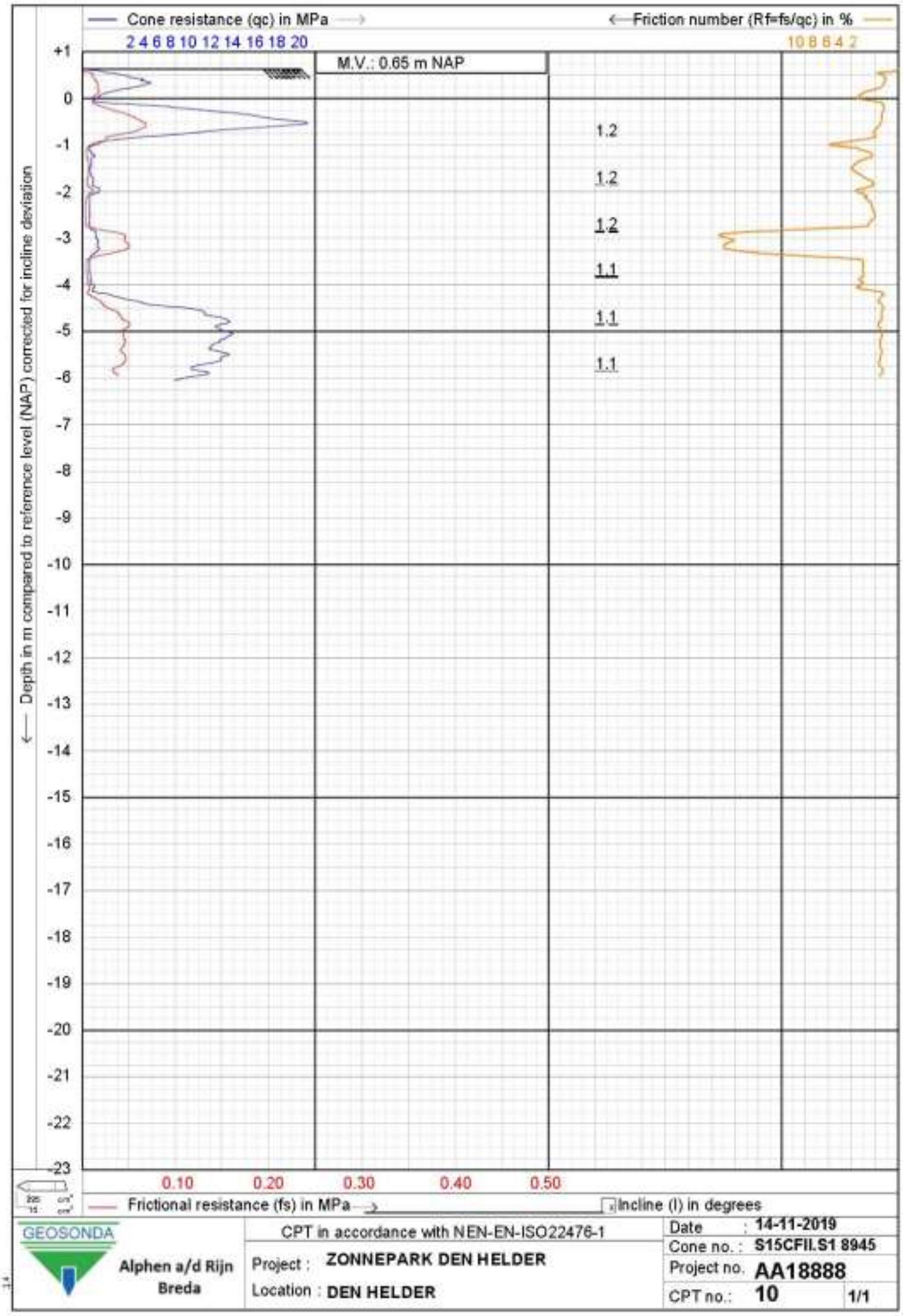
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.65 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
1.2
1.2
1.2
1.1
1.1
1.1
0.10
0.20
0.30
0.40
0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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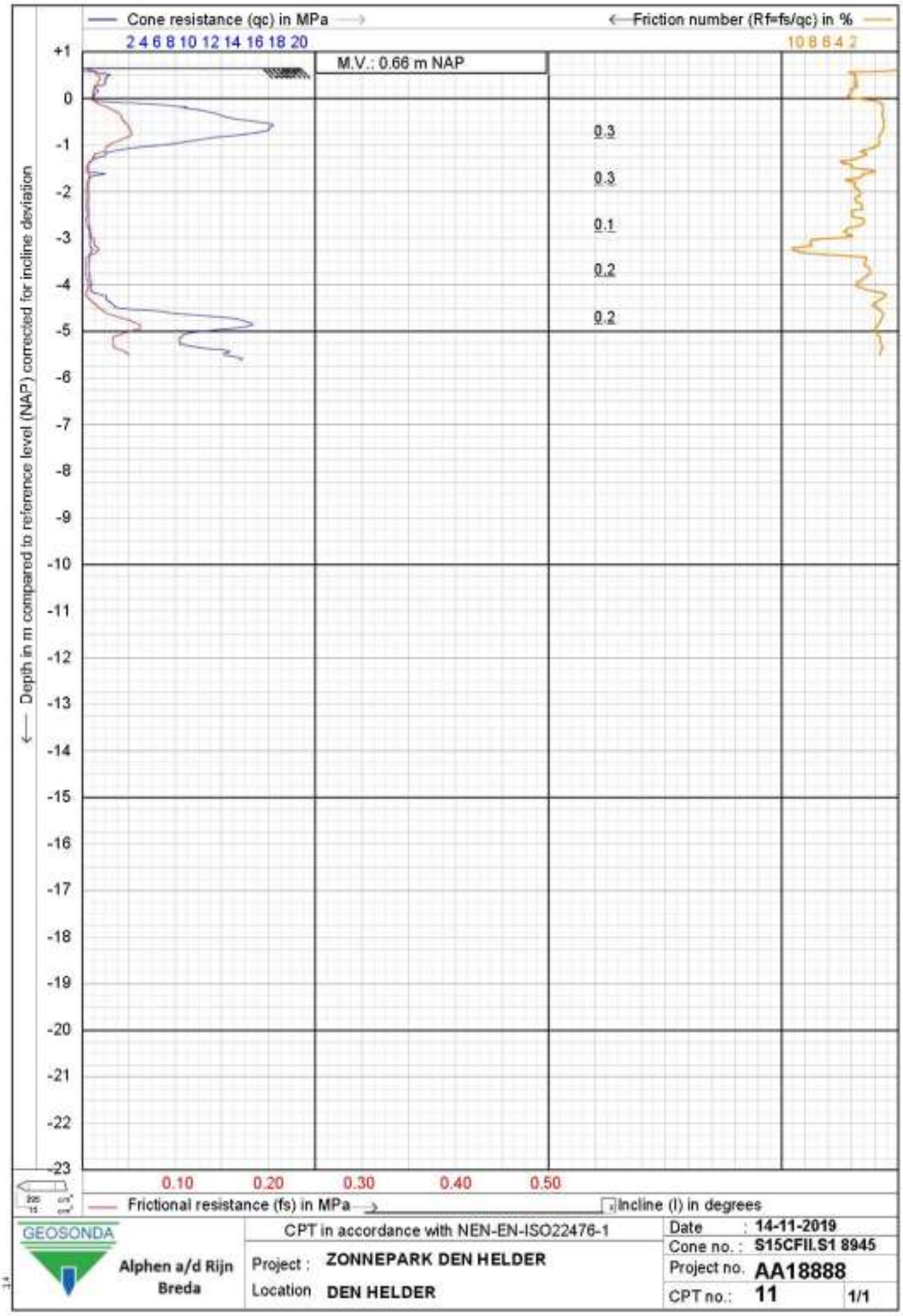

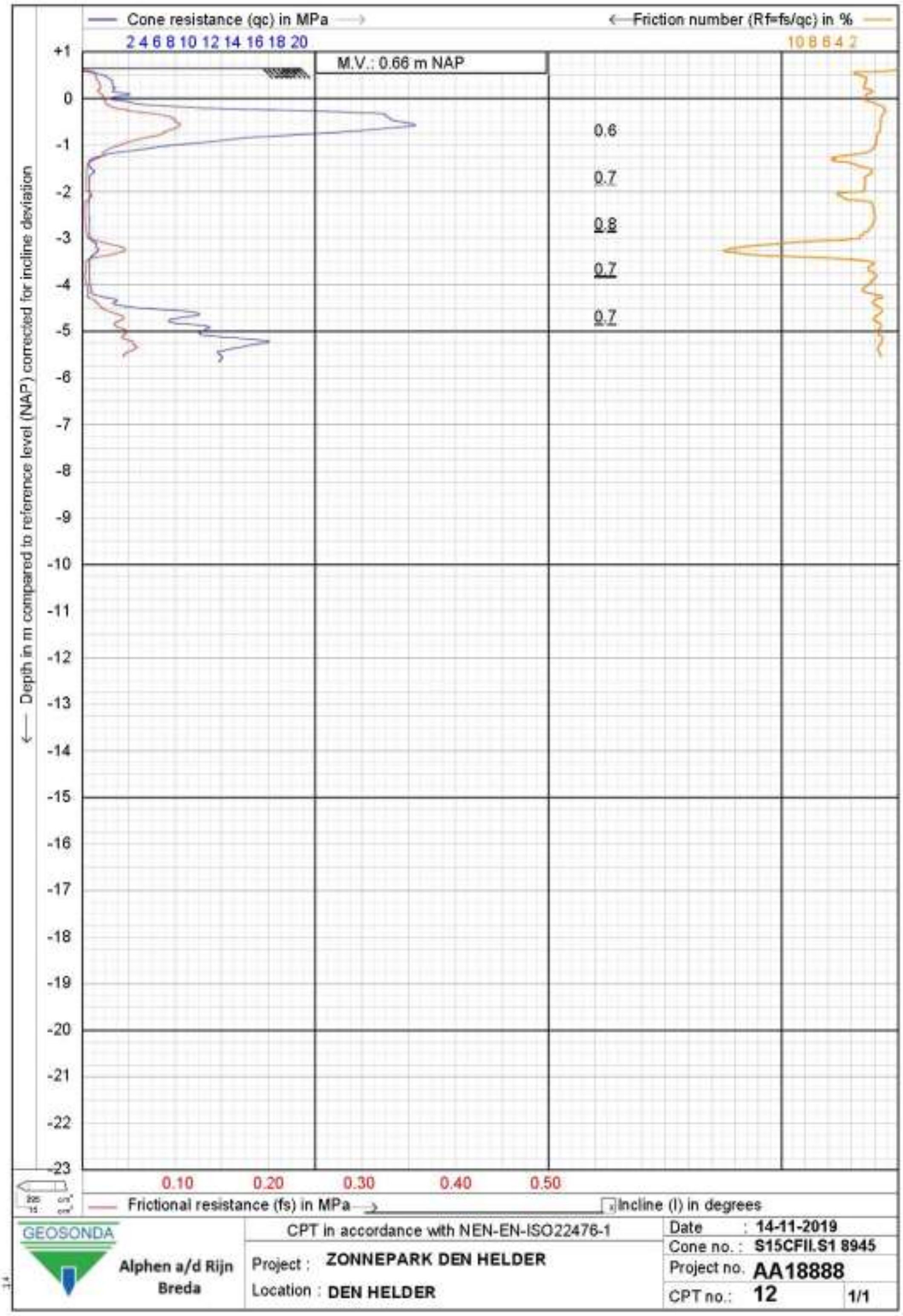
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.66 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.6
0.7
0.8
0.7
0.7
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
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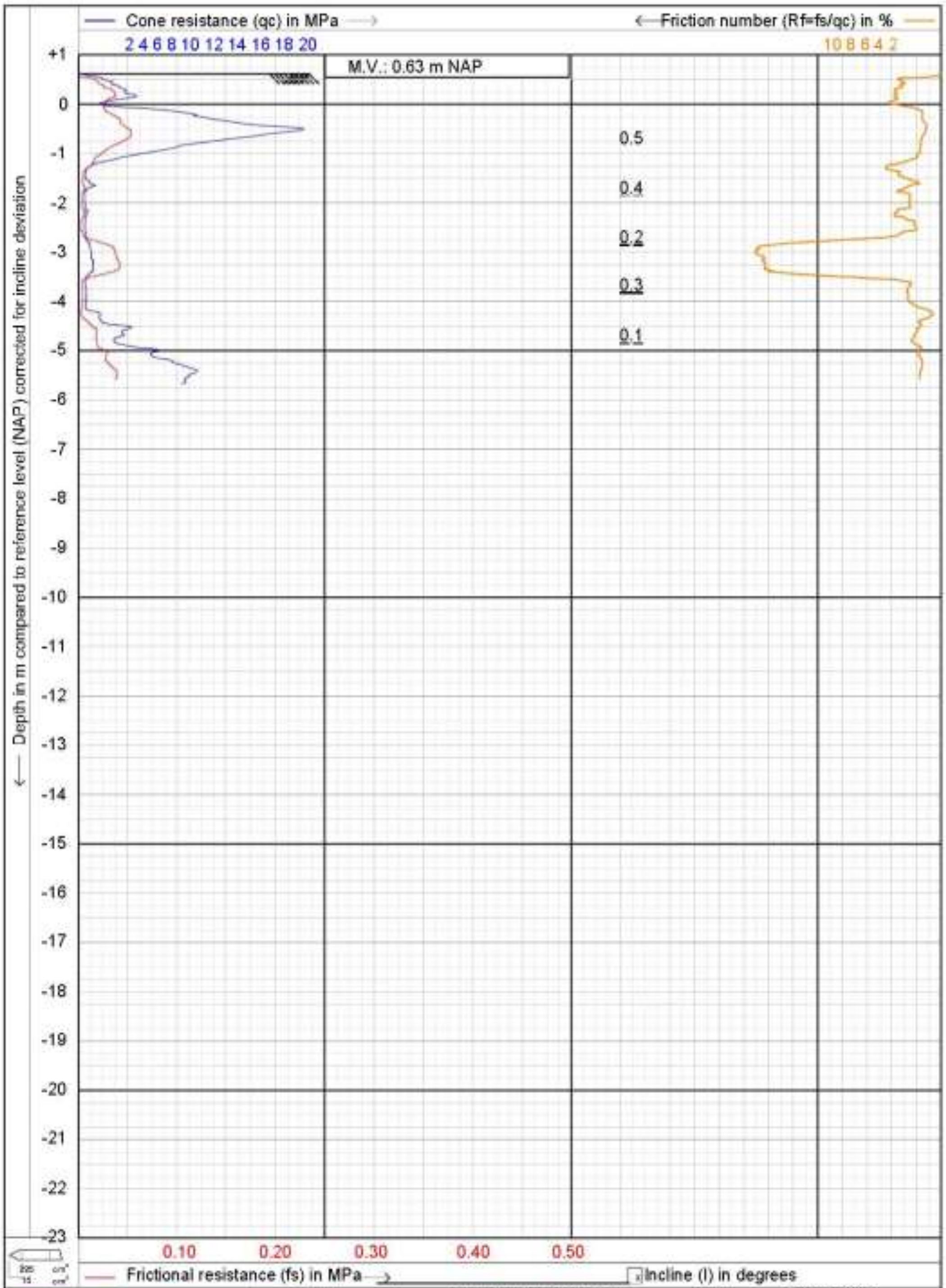

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		Project no. AA18888	
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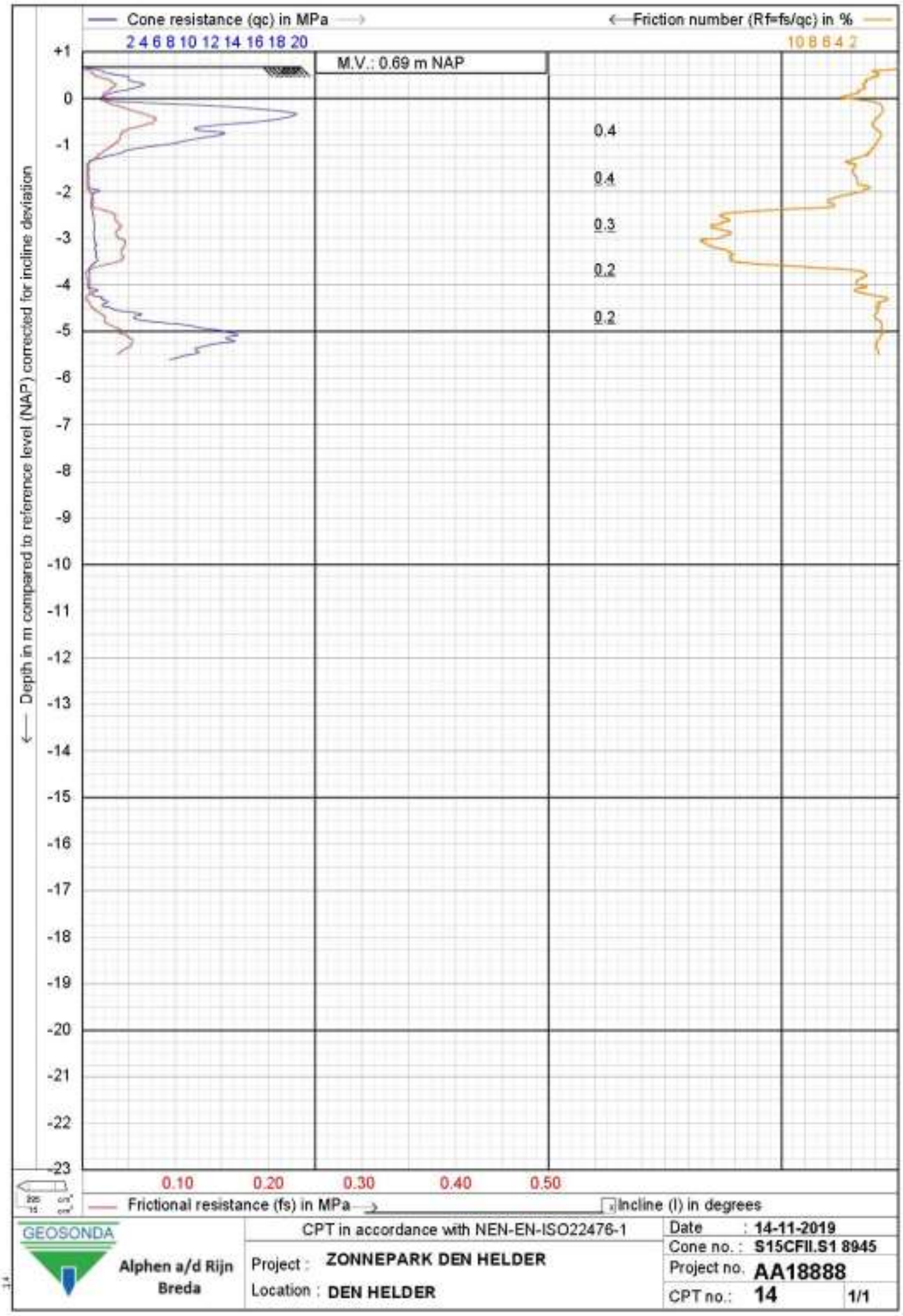
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.69 m NAP
0.4
0.4
0.3
0.2
0.2
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.10
0.20
0.30
0.40
0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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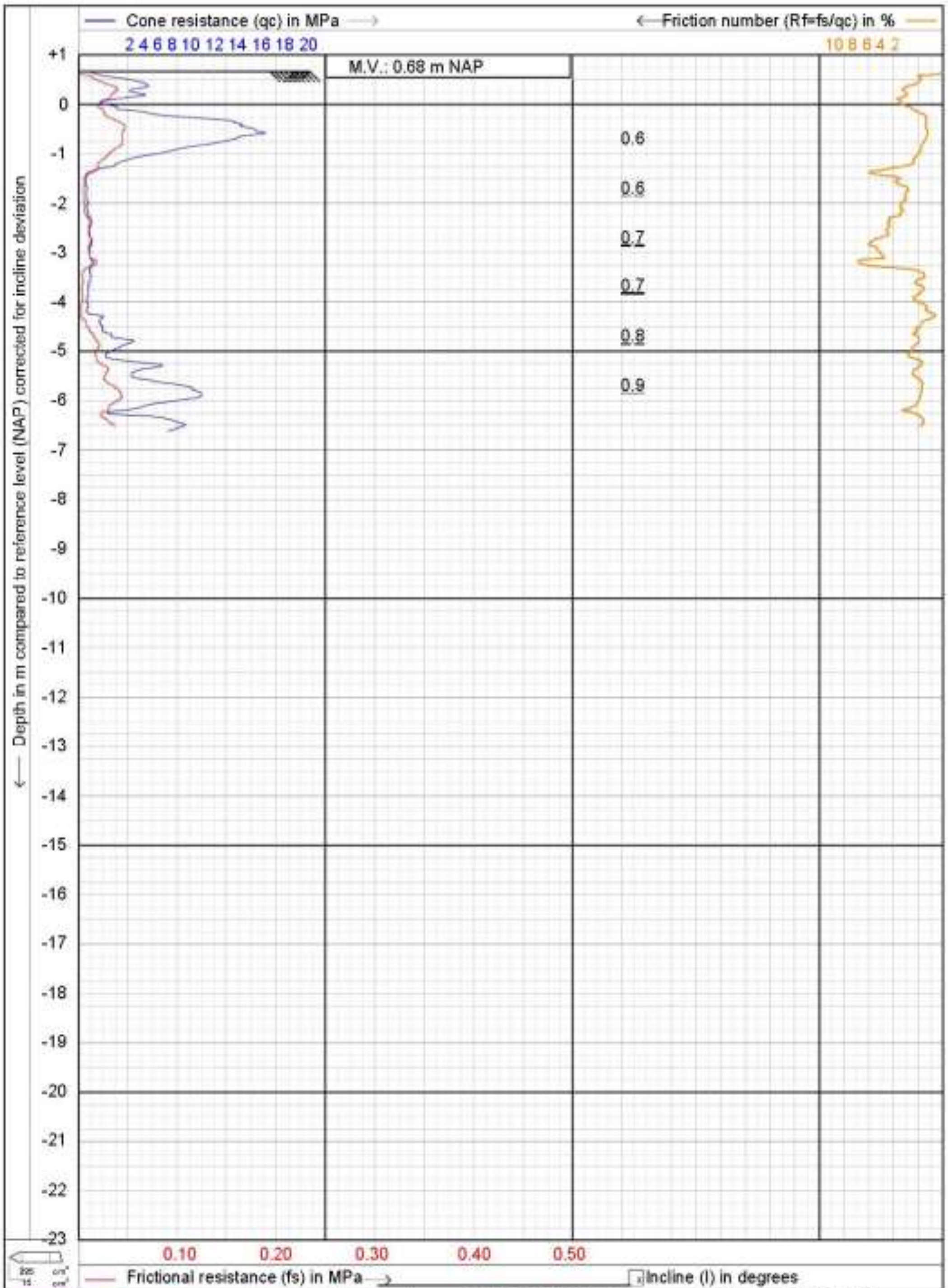

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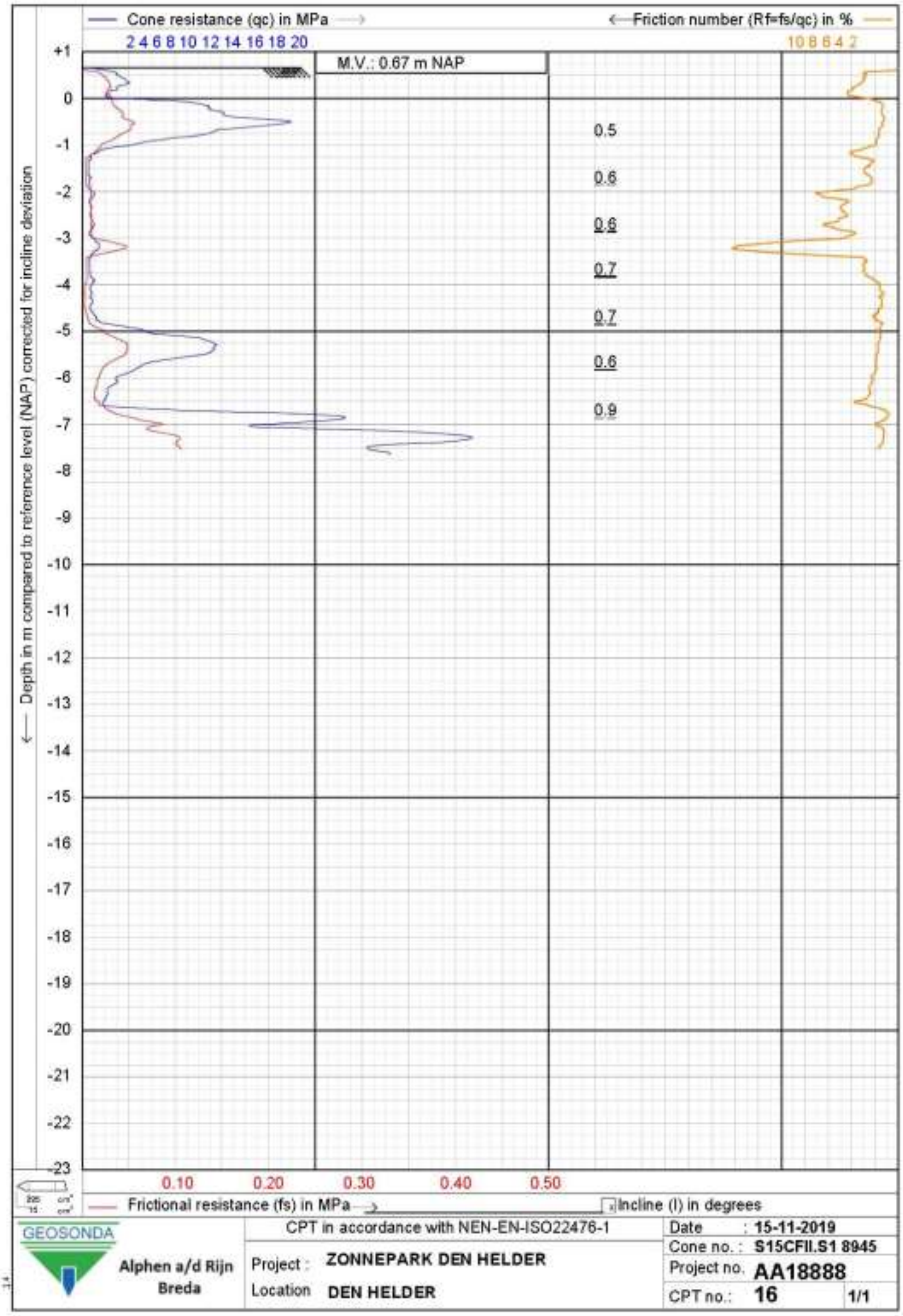
		Project no. AA18888
	Location : DEN HELDER	CPT no.: 15 1/1


Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.67 m NAP
0.5
0.6
0.6
0.7
0.7
0.6
0.9
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.10
0.20
0.30
0.40
0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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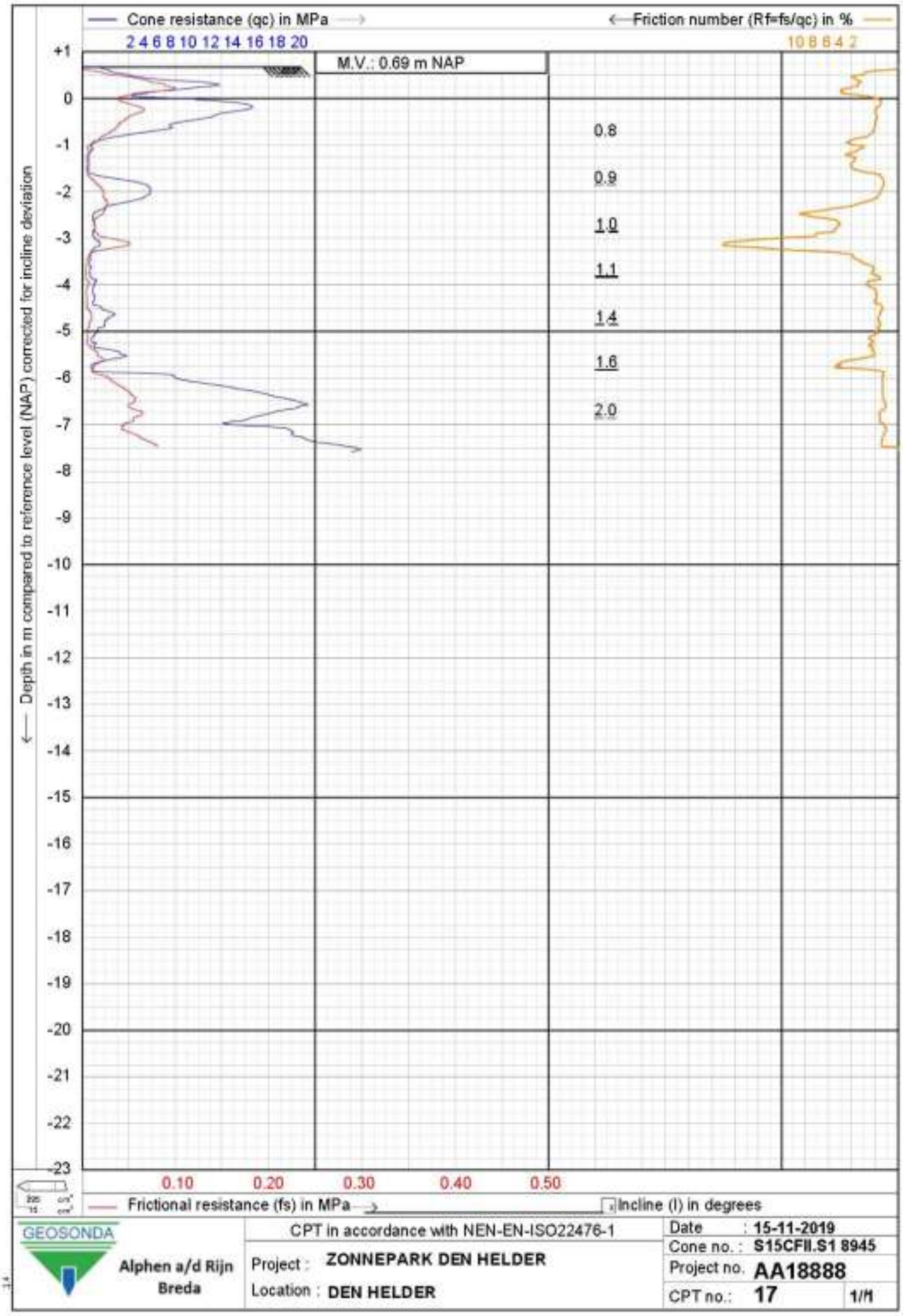
Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.69 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.8
0.9
1.0
1.1
1.4
1.6
2.0
0.10
0.20
0.30
0.40
0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
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Project no. AA18888
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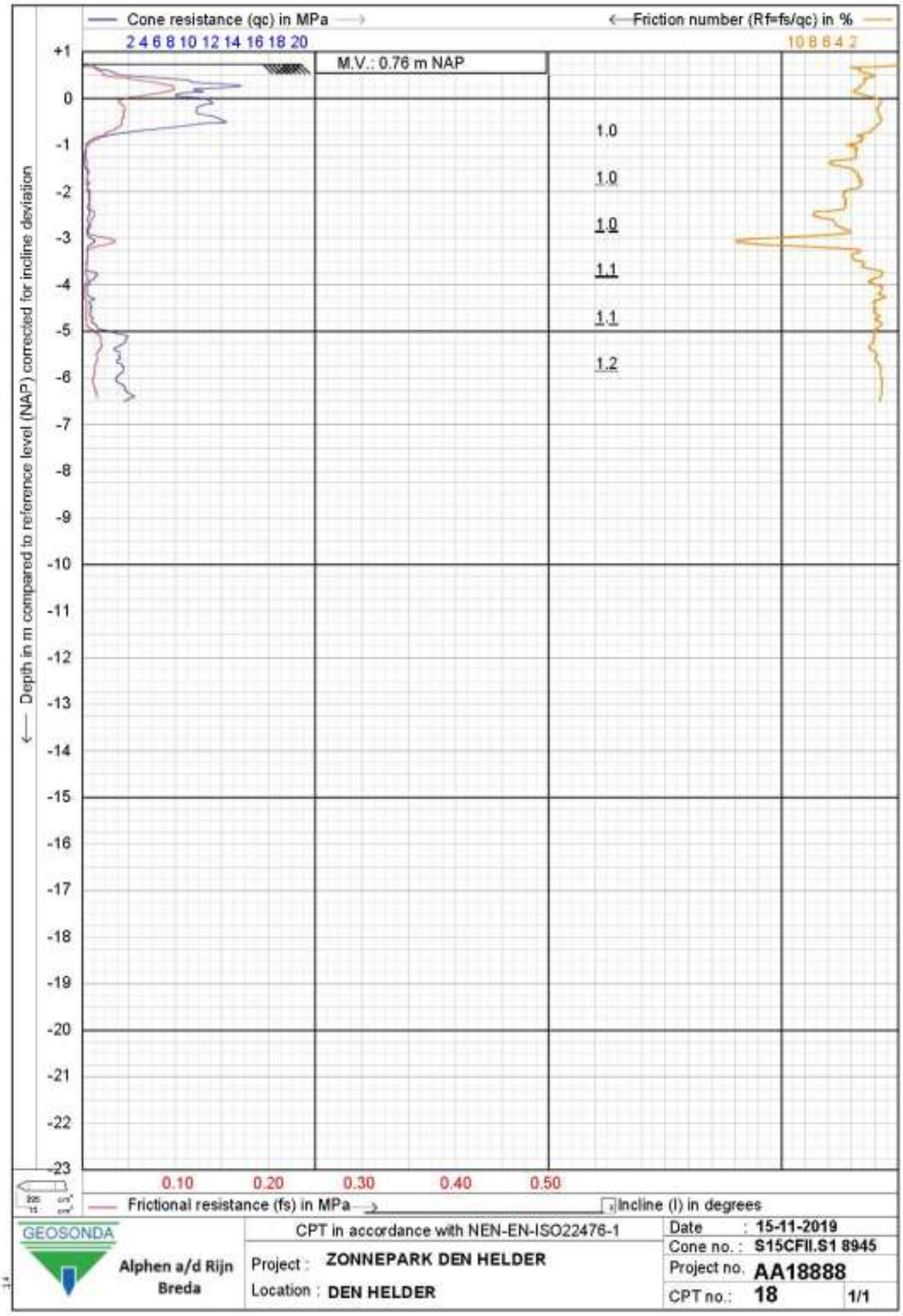
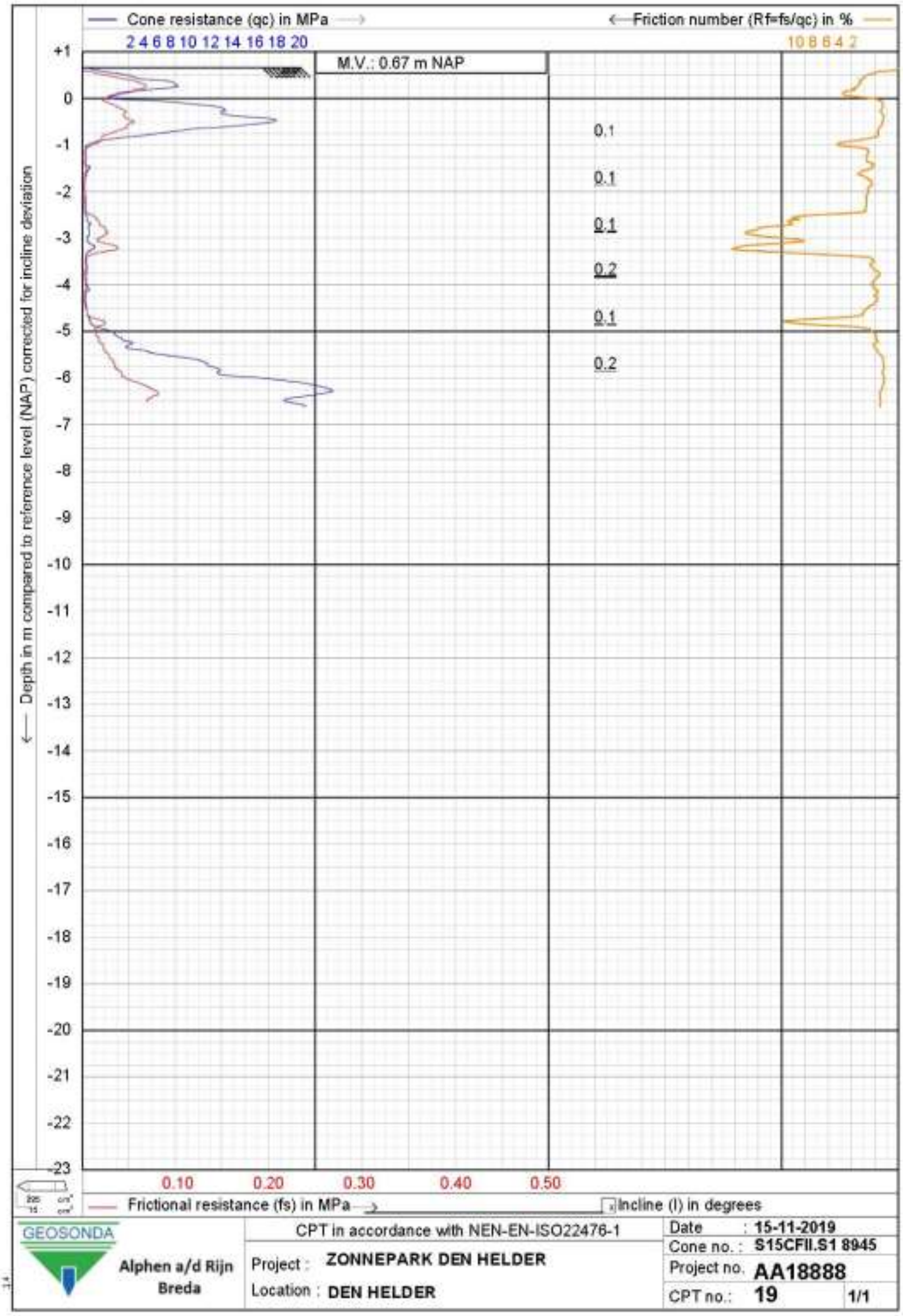
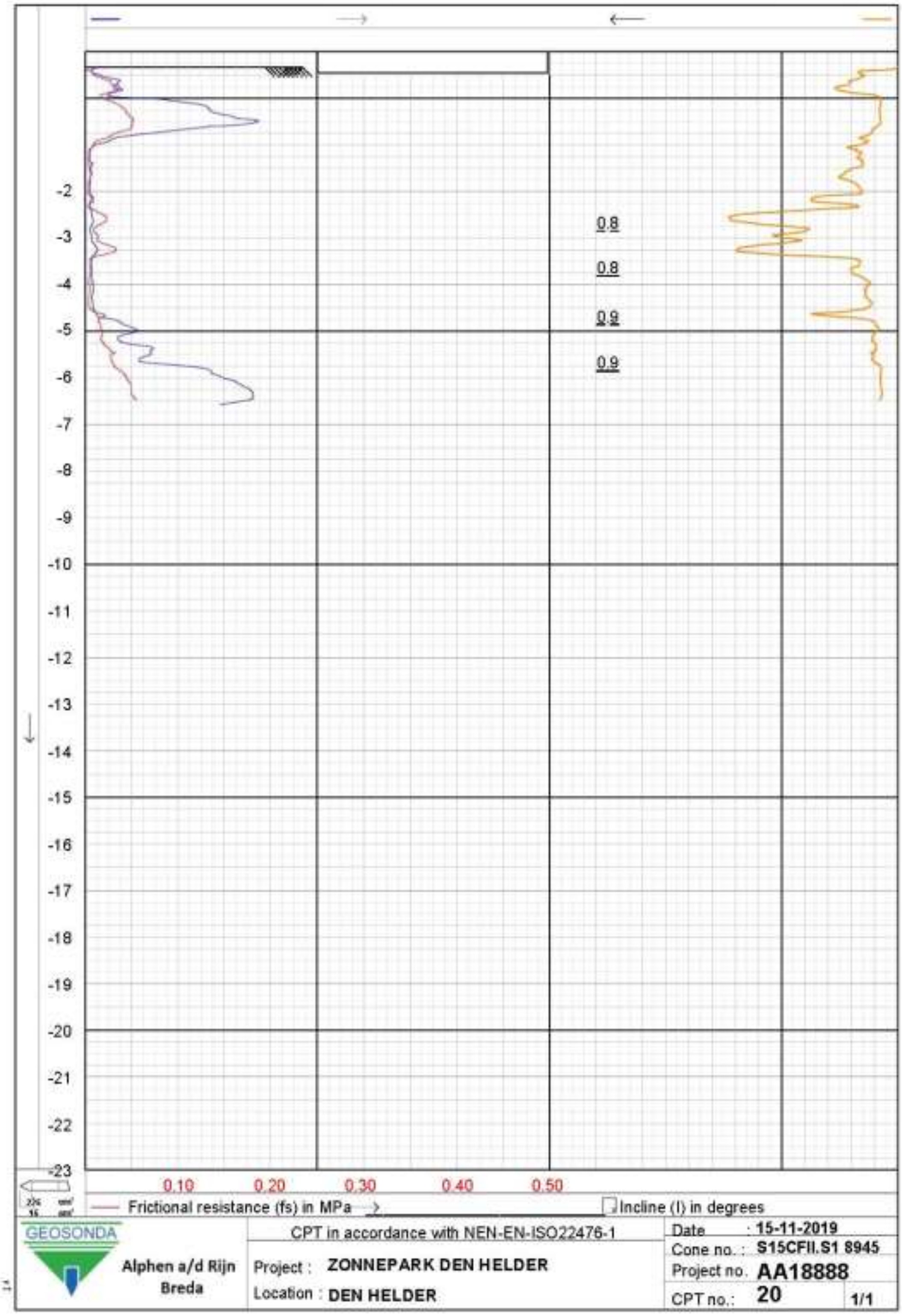

Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.76 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
1.0
1.0
1.0
1.1
1.1
1.2
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
CPT in accordance with NEN-EN-ISO22476-1
Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
Date : 15-11-2019
Cone no. : S15CFII.S1 8945
Project no. AA18888
CPT no.: 18
1/1

Boden und Wasser Büro für Hydrogeologie, angewandte Geologie und Wasserwirtschaft

St.-Martin-Straße 11 **D-86551 Aichach** Tel +49 8251 / 7224 Fax + 49 8251 / 51104 e-mail bodenundwasser@t-online.de

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-3
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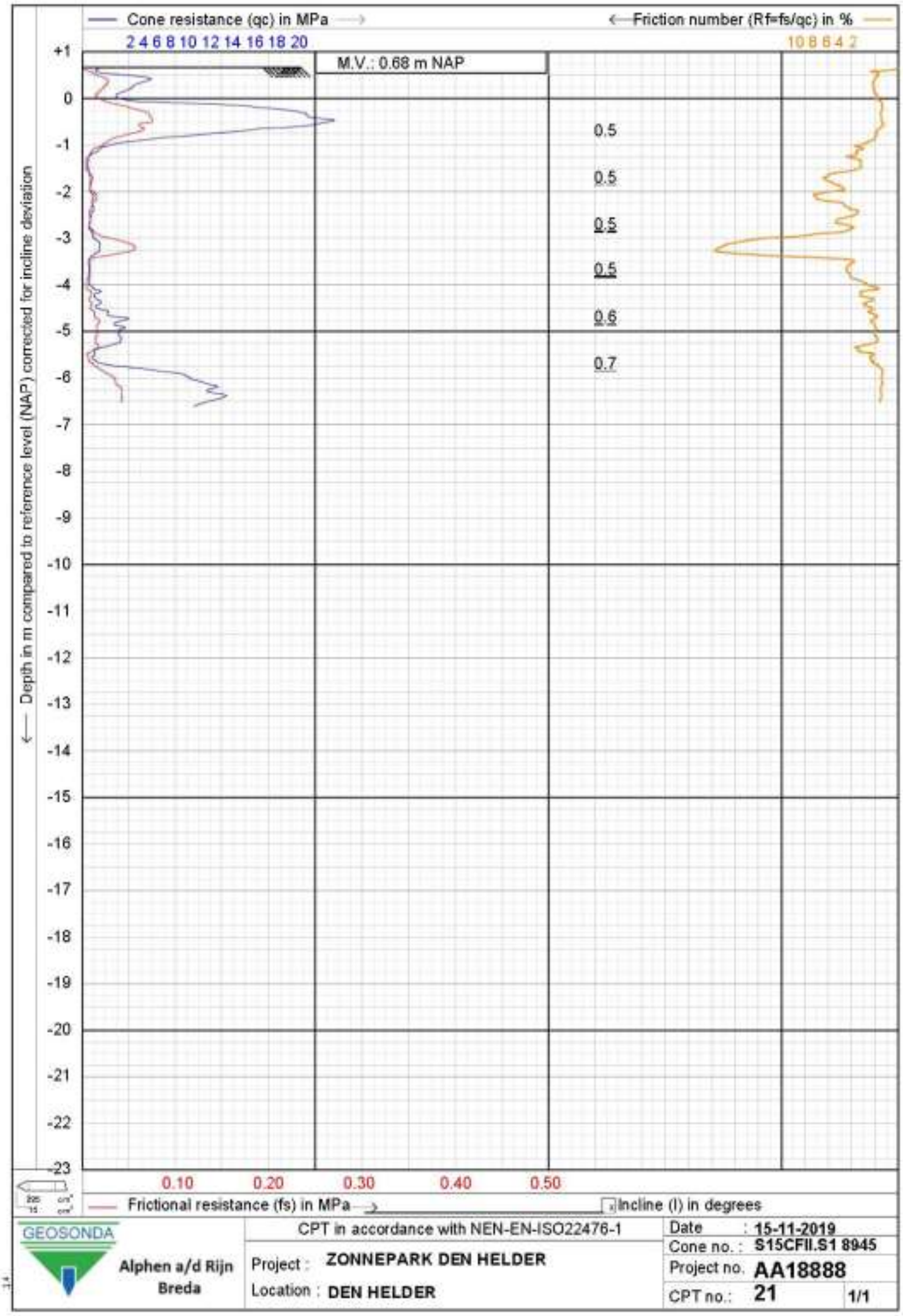
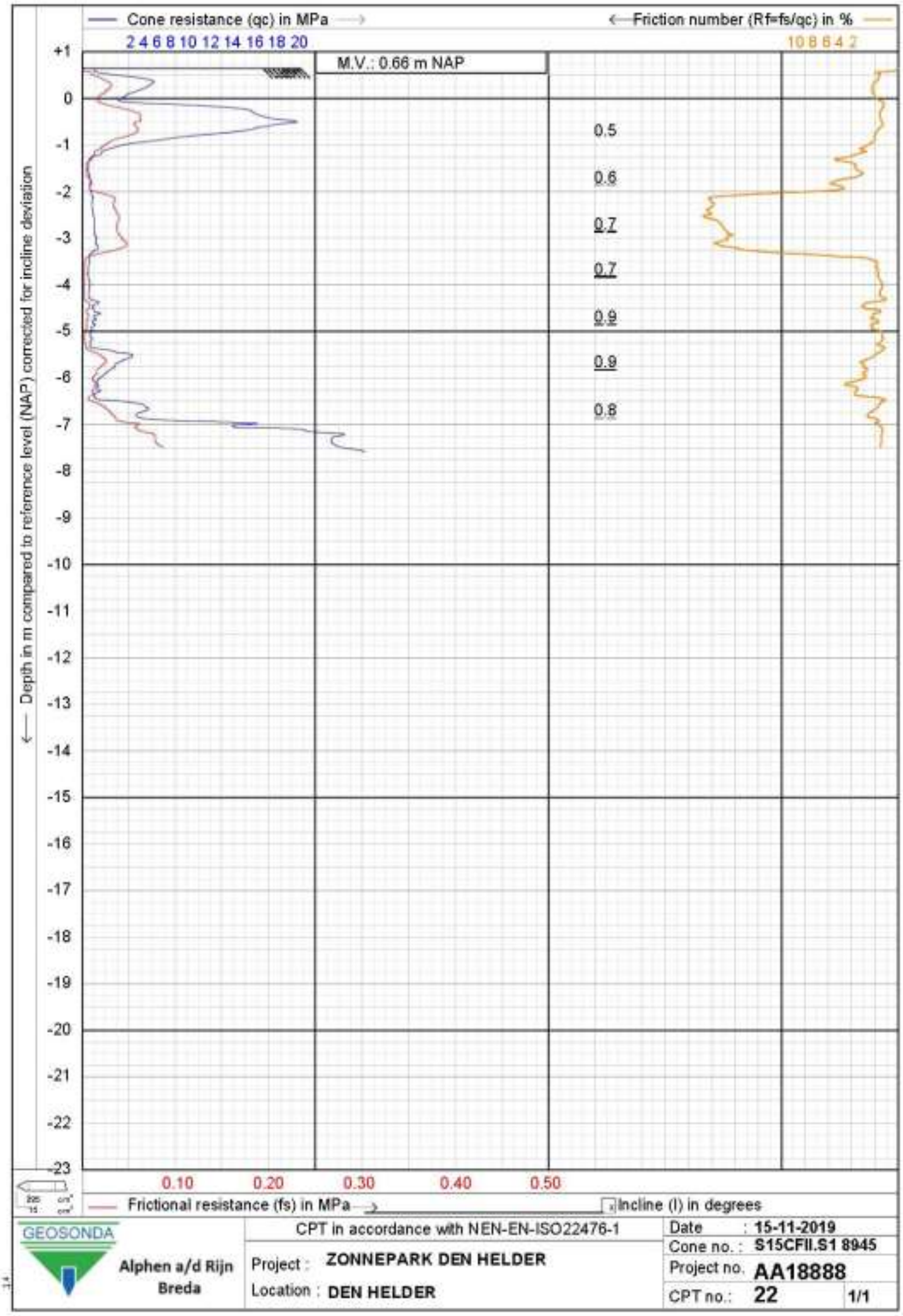
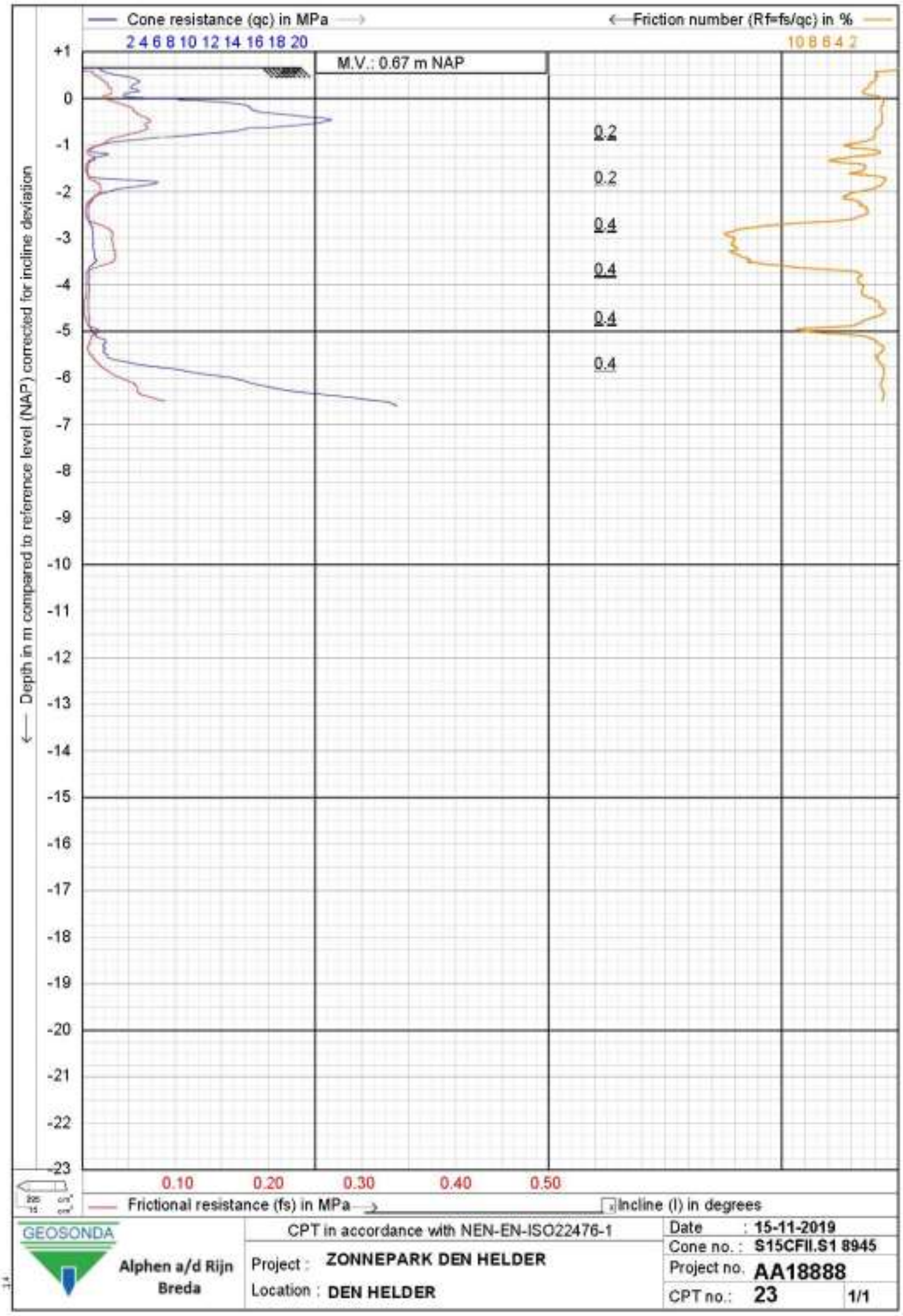
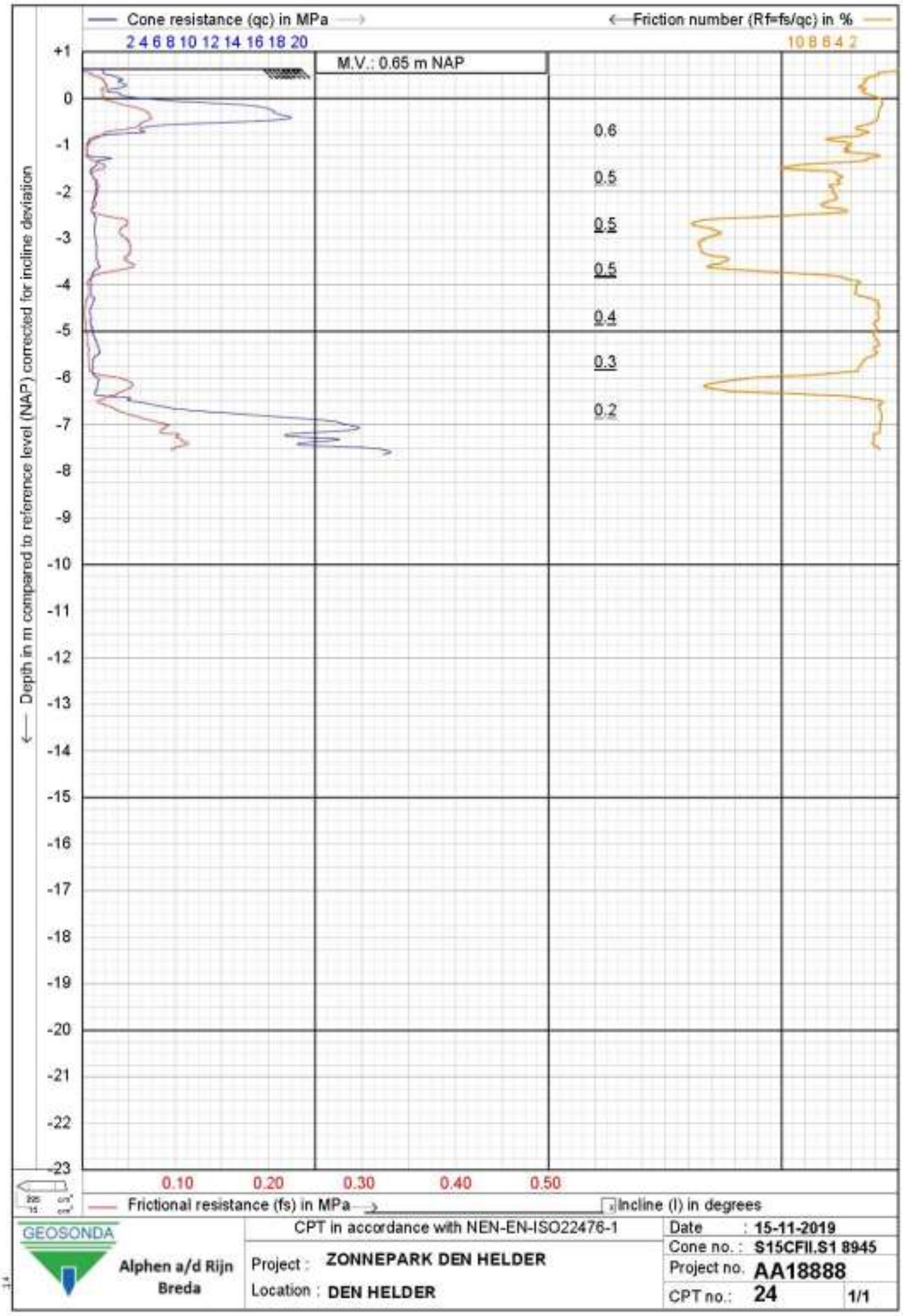
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.8
0.8
0.9
0.9
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
CPT in accordance with NEN-EN-ISO22476-1
Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
Date : 15-11-2019
Cone no. : S15CFII.S1 8945
Project no. AA18888
CPT no.: 20
1/1

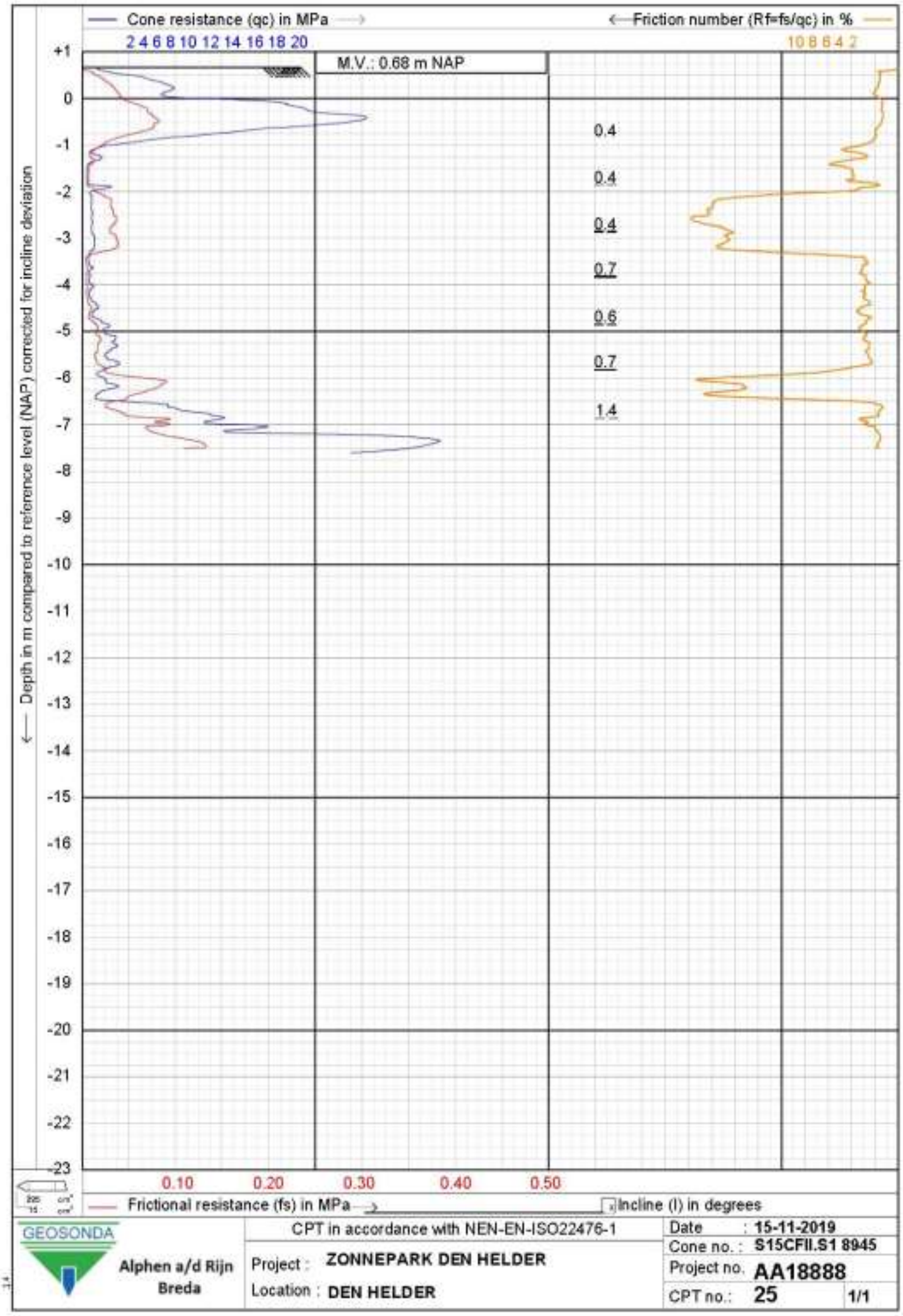

Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.68 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.5
0.5
0.5
0.5
0.6
0.7
0.10
0.20
0.30
0.40
0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
CPT in accordance with NEN-EN-ISO22476-1
Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
Date : 15-11-2019
Cone no. : S15CFII.S1 8945
Project no. AA18888
CPT no.: 21
1/1


Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.66 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.5
0.6
0.7
0.7
0.9
0.9
0.8
0.10
0.20
0.30
0.40
0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
CPT in accordance with NEN-EN-ISO22476-1
Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
Date : 15-11-2019
Cone no. : S15CFII.S1 8945
Project no. AA18888
CPT no.: 22
1/1

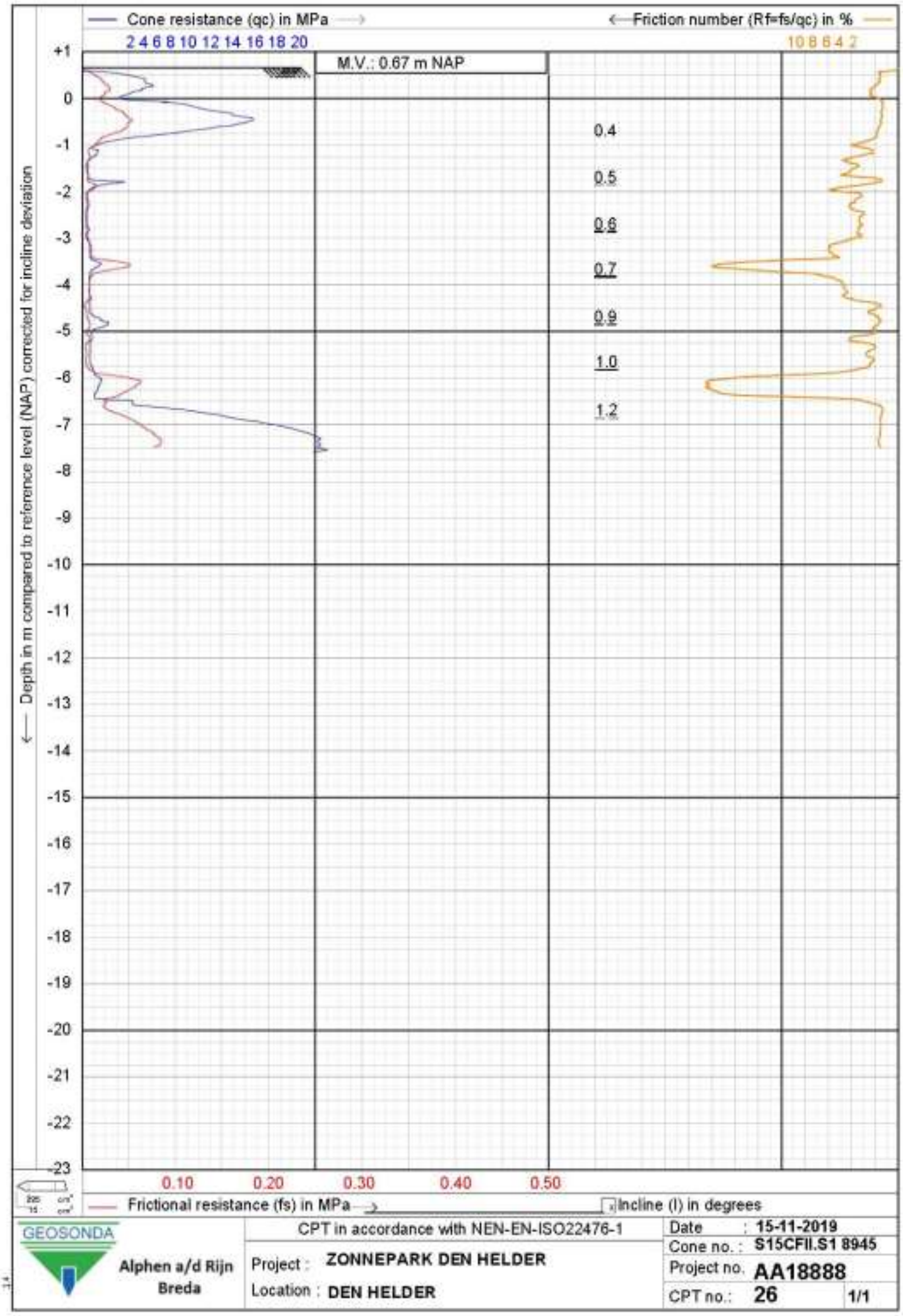
St.-Martin-Straße 11 **D-86551 Aichach** Tel +49 8251 / 7224 Fax + 49 8251 / 51104 e-mail bodenundwasser@t-online.de



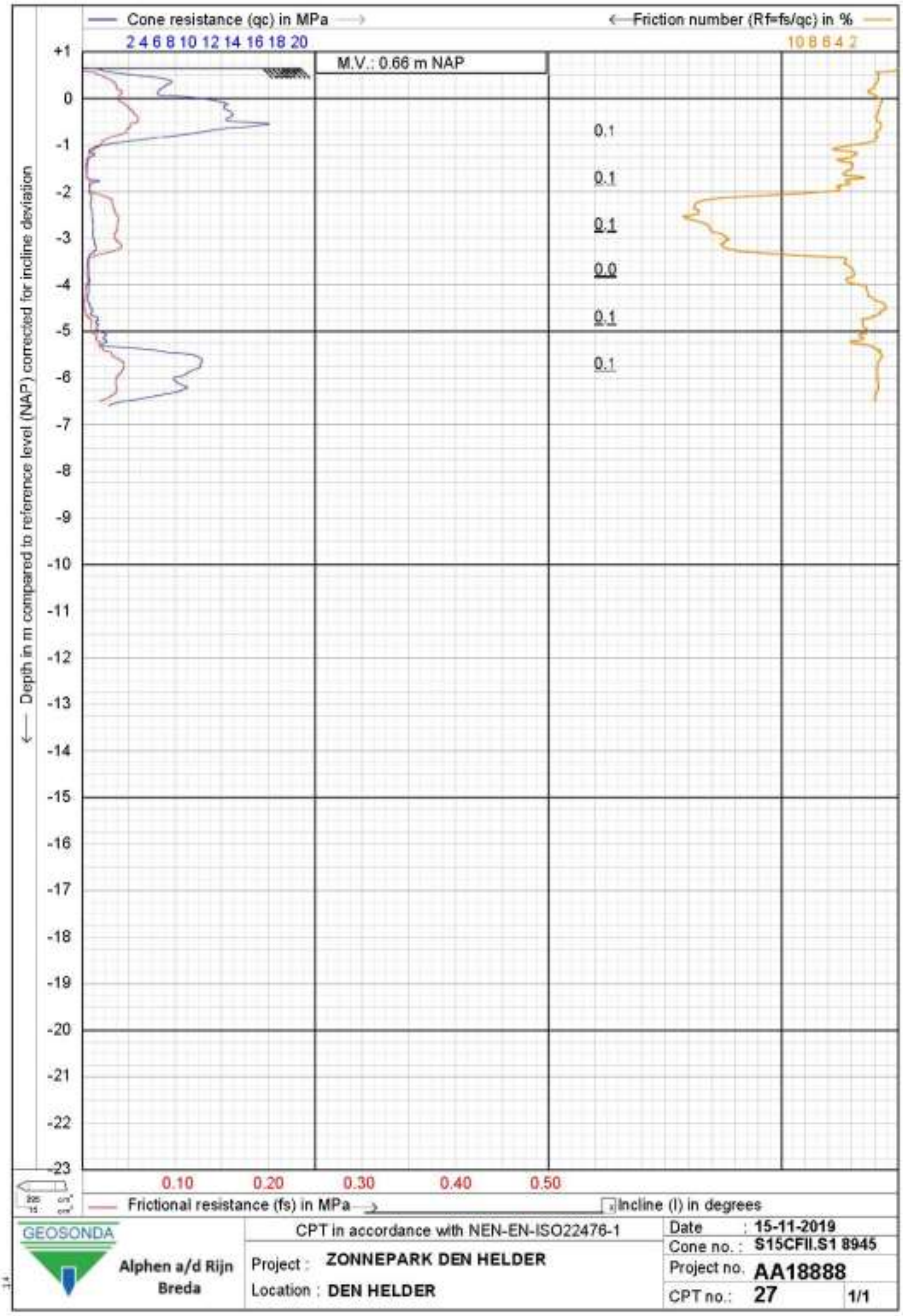

Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.65 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.6
0.5
0.5
0.5
0.4
0.3
0.2
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
CPT in accordance with NEN-EN-ISO22476-1
Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
Date : 15-11-2019
Cone no. : S15CFII.S1 8945
Project no. AA18888
CPT no.: 24
1/1

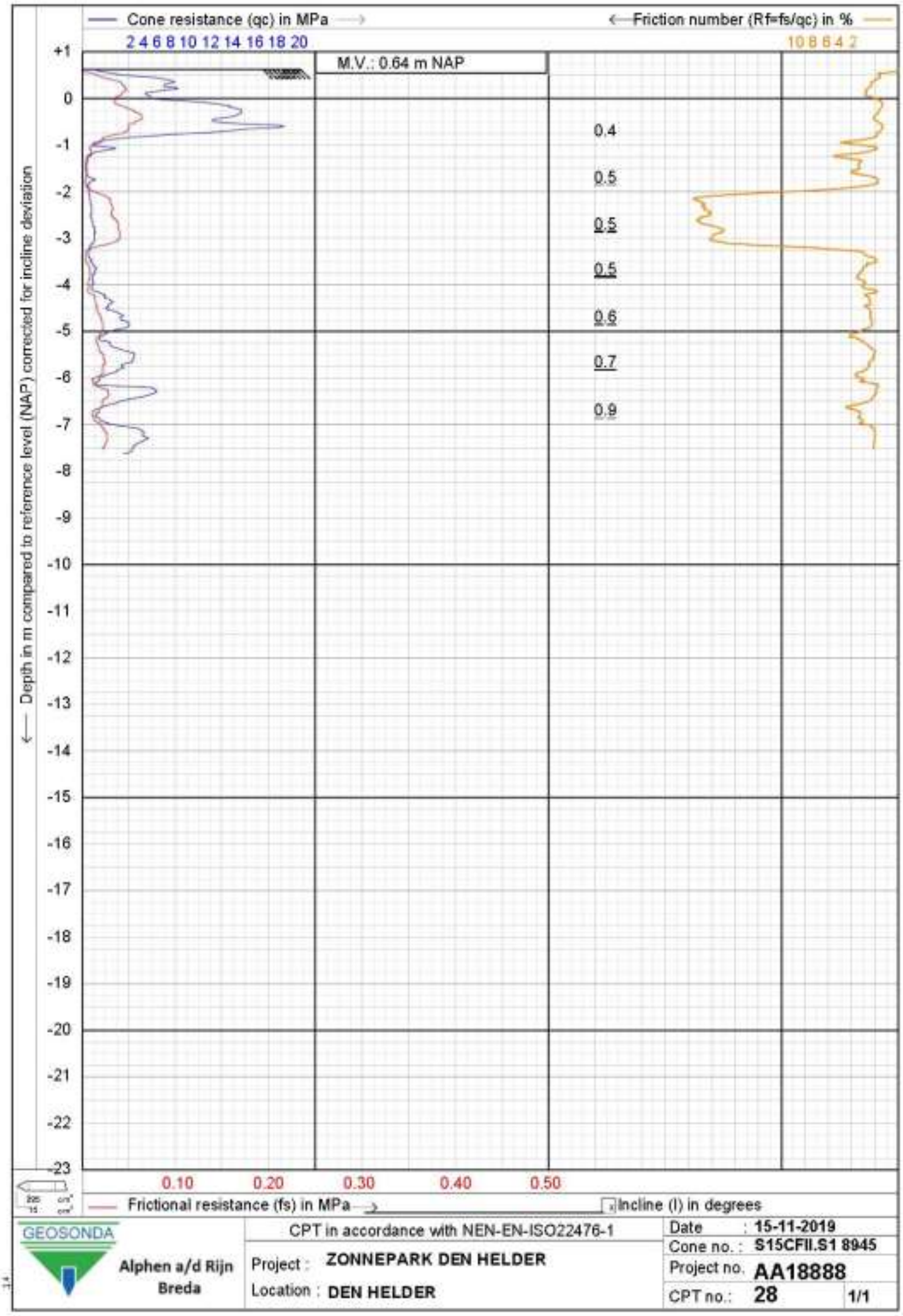

Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.68 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.4
0.4
0.4
0.7
0.6
0.7
1.4
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
CPT in accordance with NEN-EN-ISO22476-1
Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
Date : 15-11-2019
Cone no. : S15CFII.S1 8945
Project no. AA18888
CPT no.: 25
1/1

Boden und Wasser Büro für Hydrogeologie, angewandte Geologie und Wasserwirtschaft
St.-Martin-Straße 11 **D-86551 Aichach** Tel +49 8251 / 7224 Fax + 49 8251 / 51104 e-mail bodenundwasser@t-online.de

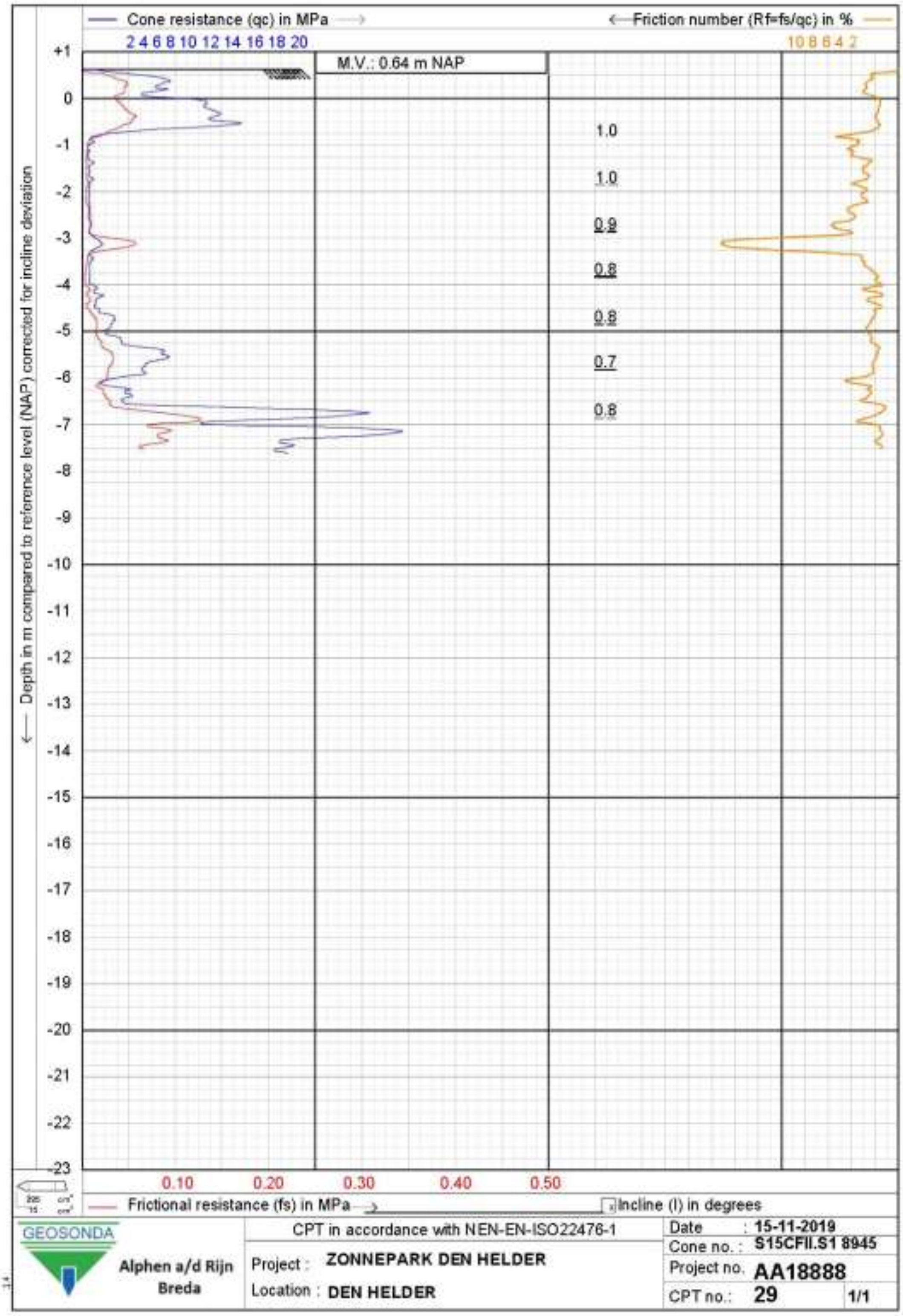


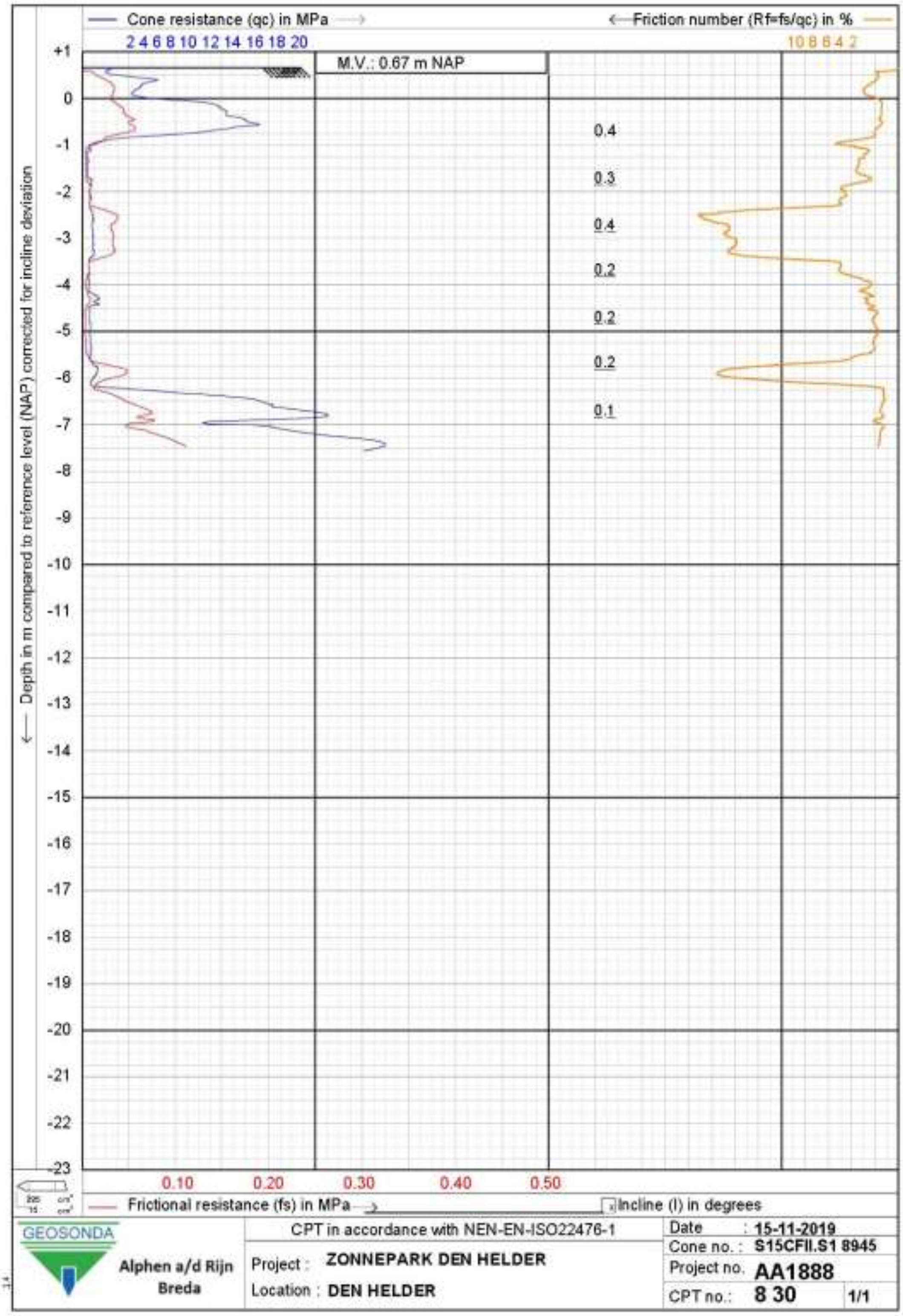
St.-Martin-Straße 11 **D-86551 Aichach** Tel +49 8251 / 7224 Fax + 49 8251 / 51104 e-mail bodenundwasser@t-online.de

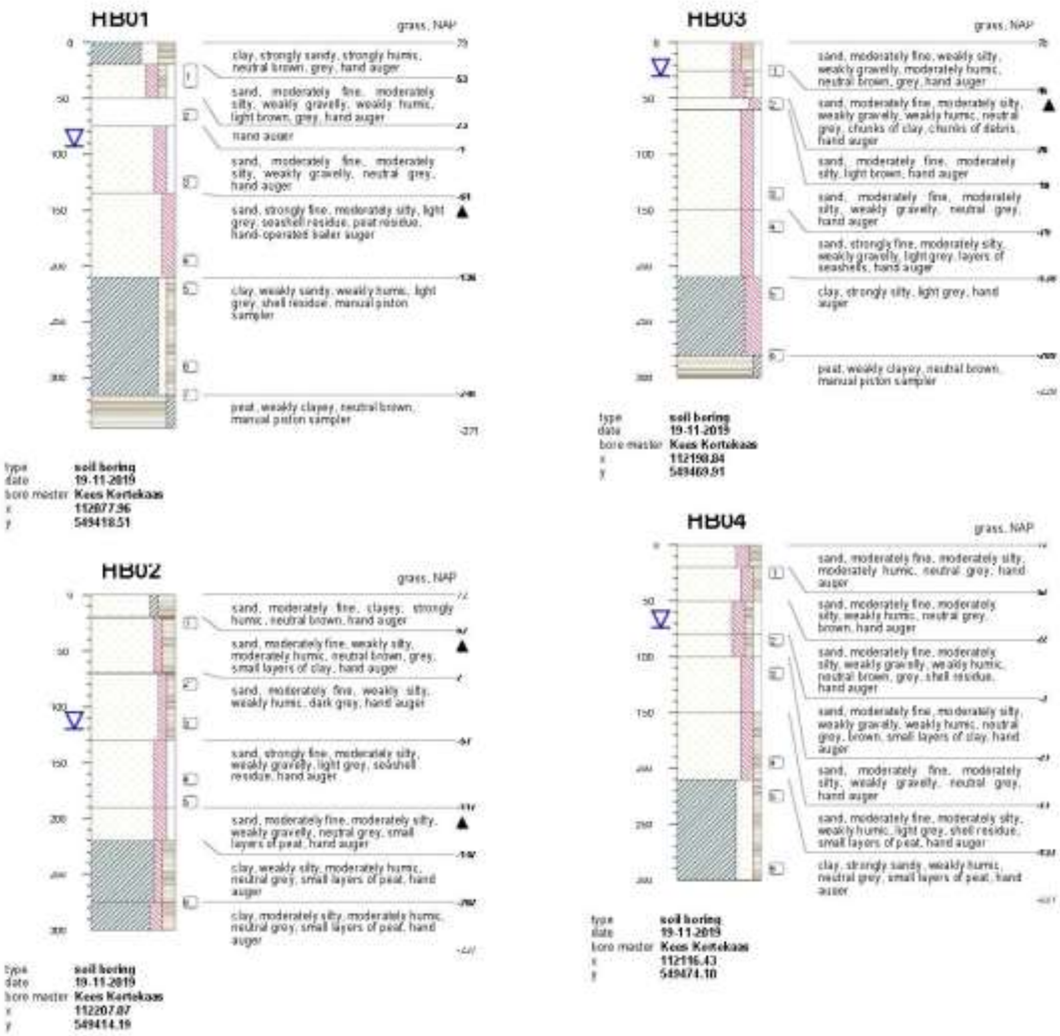



Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.64 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.4
0.5
0.5
0.5
0.6
0.7
0.9
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
CPT in accordance with NEN-EN-ISO22476-1
Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
Date : 15-11-2019
Cone no. : S15CFII.S1 8945
Project no. AA18888
CPT no.: 28 1/1

Boden und Wasser Büro für Hydrogeologie, angewandte Geologie und Wasserwirtschaft
St.-Martin-Straße 11 **D-86551 Aichach** Tel +49 8251 / 7224 Fax + 49 8251 / 51104 e-mail bodenundwasser@t-online.de




Cone resistance (qc) in MPa
2 4 6 8 10 12 14 16 18 20
Friction number (Rf=fs/qc) in %
10 8 6 4 2
M.V.: 0.67 m NAP
Depth in m compared to reference level (NAP) corrected for incline deviation
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
0.4
0.3
0.4
0.2
0.2
0.2
0.1
0.10 0.20 0.30 0.40 0.50
Frictional resistance (fs) in MPa
Incline (I) in degrees
GEOSONDA
Alphen a/d Rijn
Breda
CPT in accordance with NEN-EN-ISO22476-1
Project : ZONNEPARK DEN HELDER
Location : DEN HELDER
Date : 15-11-2019
Cone no. : S15CFII.S1 8945
Project no. AA1888
CPT no.: 8 30
1/1

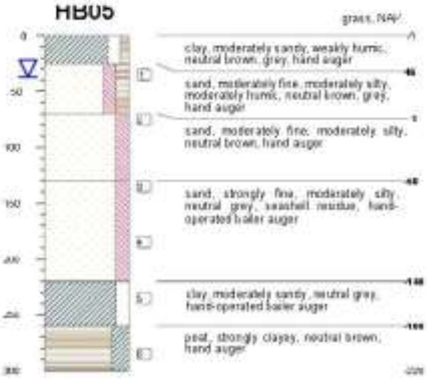


soil profiles

investigation **ZONNEPARK DEN HELDER**
project code **AA18888**
date **21-11-2019**
signed in accordance with **NEN 5104**
page **1 of 3**

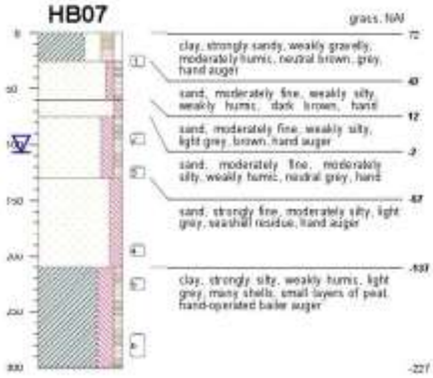
GEOSONDA

HB05



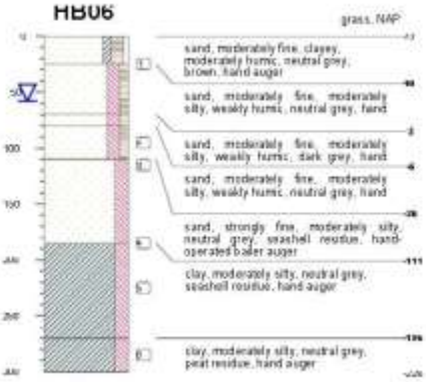
type soil boring
date 18-11-2019
bore master Kees Kortekaas
x 112890.15
y 549551.82

HB07



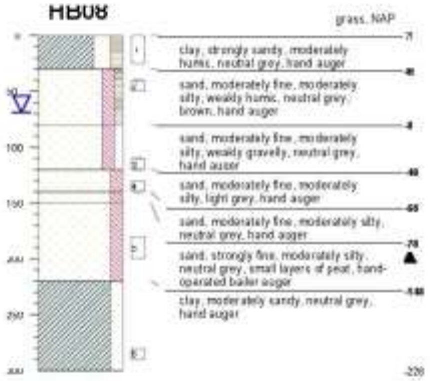
type soil boring
date 19-11-2019
bore master Kees Kortekaas
x 112222.37
y 549593.72

HB06



type soil boring
date 19-11-2019
bore master Kees Kortekaas
x 112223.21
y 549540.47

HB08

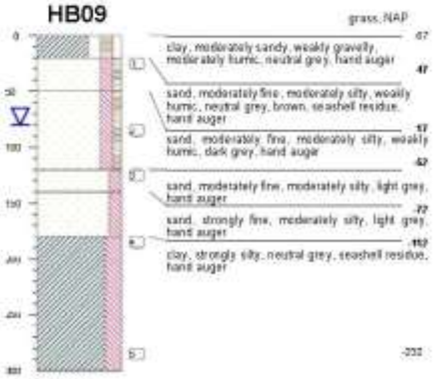


type soil horing
date 18-11-2019
bore master Kees Kortekaas
x 112093.68
y 549604.52

soil profiles

investigation **ZONNEPARK DEN HELDER**
project code **AA18888**
date **21-11-2019**
signed in accordance with **NEN 5104**
page **2 of 3**

GEOSONDA



type	**soil boring**
date	**19-11-2019**
bore master	**Kees Kortekaas**
x	**112168.69**
y	**549629.84**

soil profiles

investigation **ZONNEPARK DEN HELDER**
project code **AA18888**
date **21-11-2019**
signed in accordance with **NEN 5104**
page **3** of **3**

GEOSONDA

GEOSONDA
Alphen a/d Rijn
Breda

Project : SOLAR PARK AT THE BURG. RITMEESTERWEG
Location : DEN HELDER
Project no. : AA18888-1

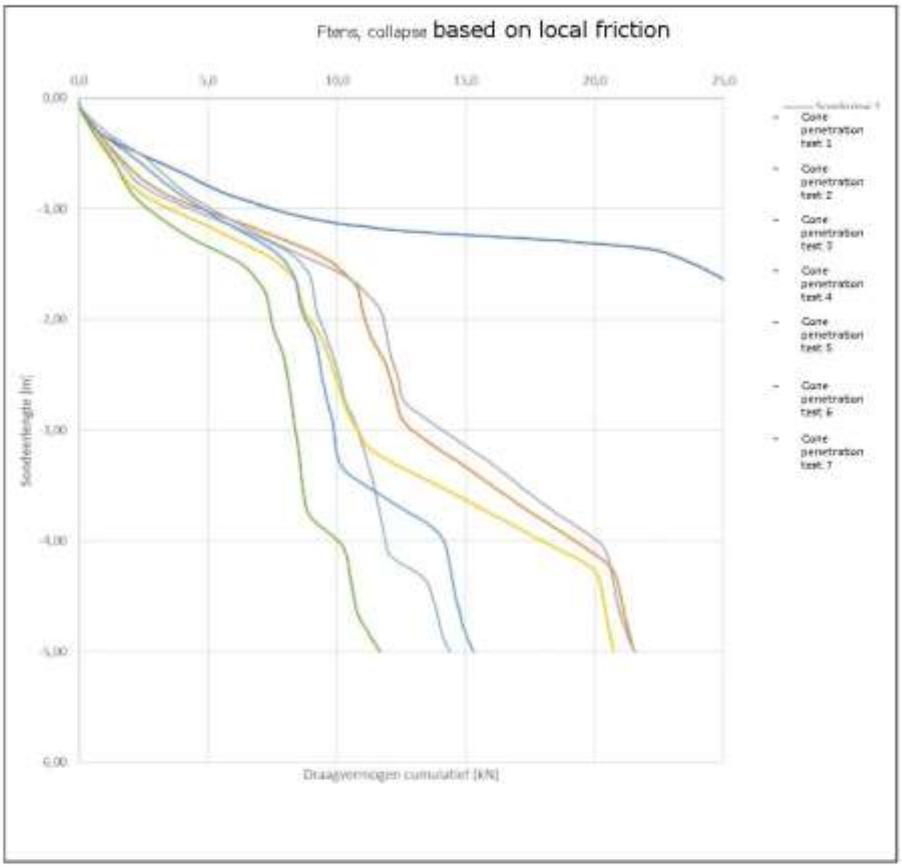
COORDINATE TABLE

Number	X-RD	Y-RD	Z-NAP
manhole 1	112078.94	549582.24	0.64
water level 1	112070.39	549577.59	-0.44
road axis 1	112100.68	549446.84	0.61
road axis 2	112092.83	549579.87	0.62
drainage 1	112092.54	549576.10	0.67
drainage 2	112098.83	549450.47	0.64
1	112203.17	549417.75	0.74
2	112182.50	549436.52	0.70
3	112162.80	549418.82	0.71
4	112143.07	549434.81	0.72
5	112122.03	549418.09	0.74
6	112102.97	549435.87	0.68
7	112082.78	549419.43	0.70
8	112088.03	549464.31	0.68
9	112108.50	549494.84	0.63
10	112128.94	549465.32	0.65
11	112150.26	549492.68	0.66
12	112168.33	549464.51	0.66
13	112188.99	549489.23	0.63
14	112209.09	549465.15	0.69
15	112212.65	549511.19	0.68
16	112170.77	549516.49	0.67
17	112130.71	549520.84	0.69
18	112091.88	549521.98	0.76
19	112098.78	549557.88	0.67
20	112132.00	549555.82	0.68
21	112171.42	549551.76	0.68
22	112212.24	549549.25	0.66
23	112219.23	549600.75	0.67
24	112220.04	549627.23	0.65
25	112181.84	549630.12	0.68
26	112181.35	549603.21	0.67
27	112139.29	549607.28	0.66
28	112140.29	549633.24	0.64
29	112098.92	549634.34	0.64
30	112098.06	549608.37	0.67


excerpt
DEEP CPT WITH
LOCAL FRICTION
INSPECTION
BORING
WATER
SOLAR PARK AT THE BURGEMEESTER
DEN HELDER
Date
Scale
Signed
Format
Project
Drawing no.

Bijlage 2

Tensile load-bearing capacity based on local CPT friction



33613-R001-HEN

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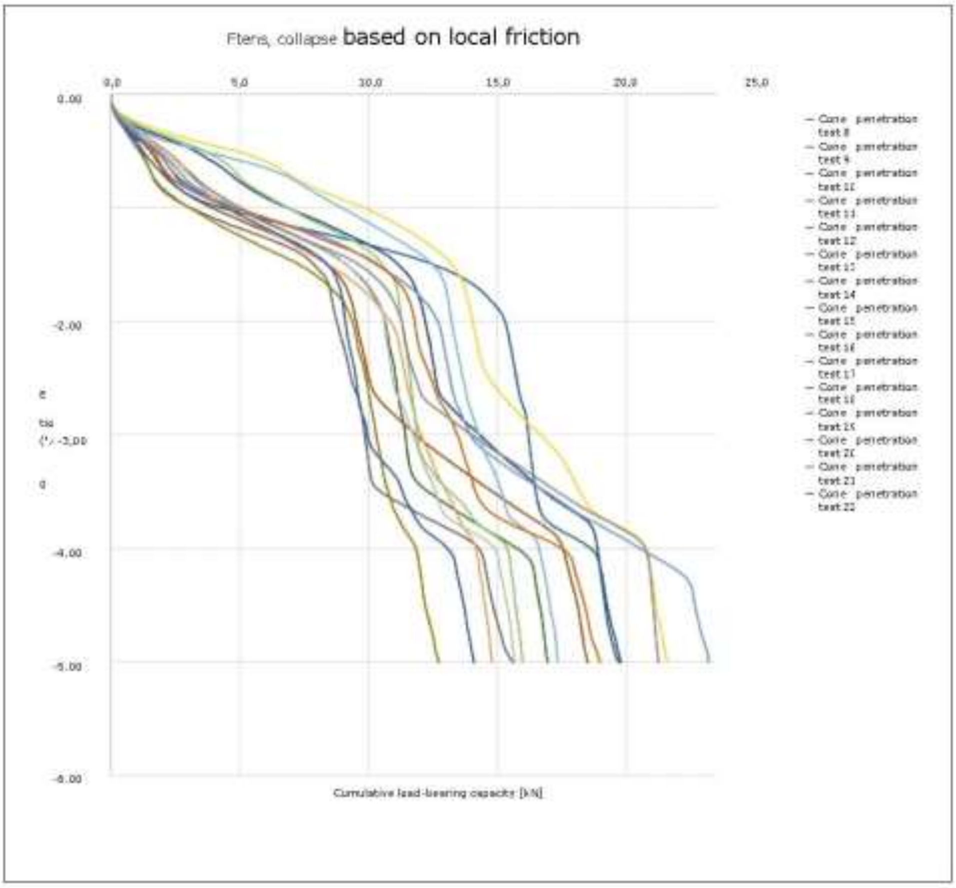
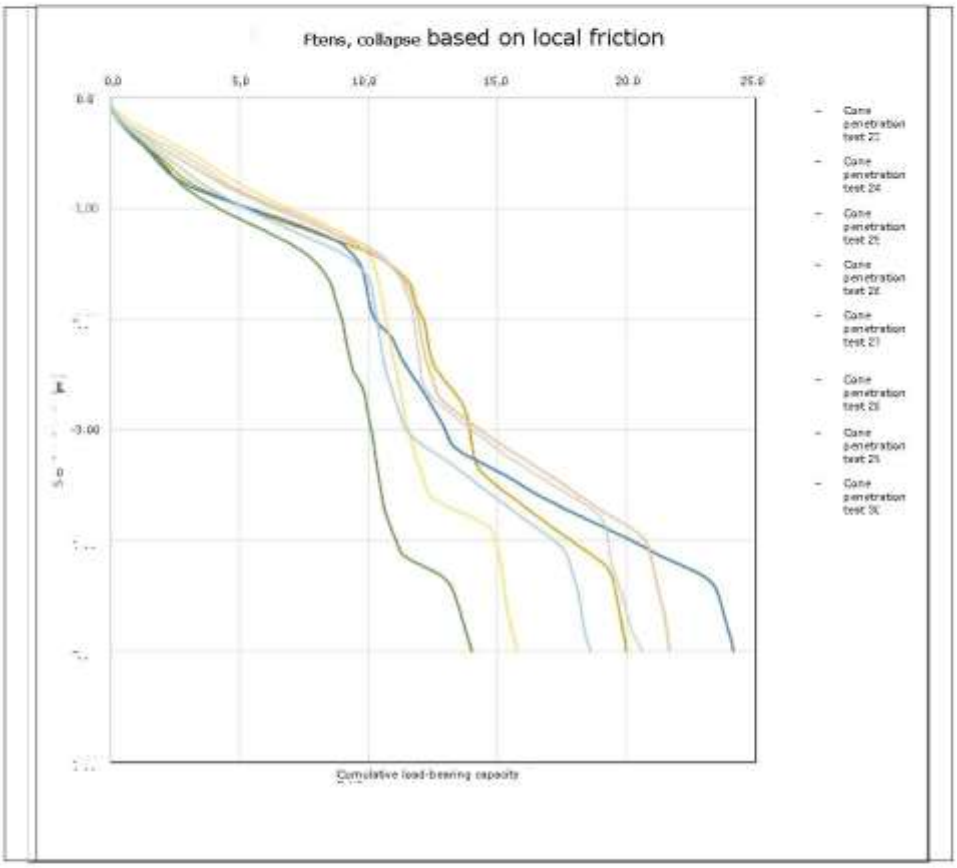


33513-R001-HEN



33513-R001-HEN

Foto Clamp