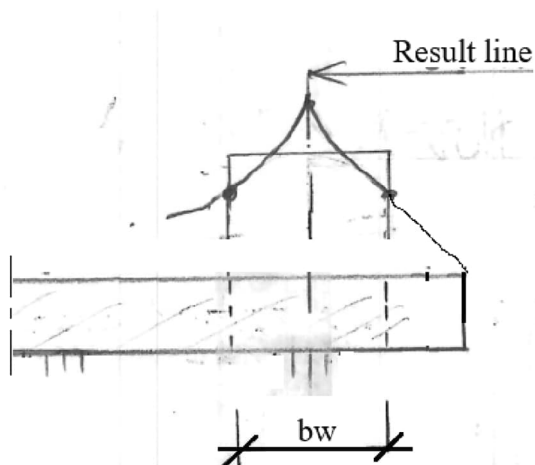


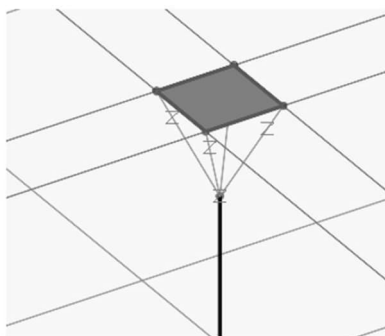
Pile deck

Reduction of stress in deck:

- Use averaging of forces along resultline with width (b_w)



- Attach pile (bar element) to minimum of 4 nodes deck modell.



CONTENTS

Part	Pages	Date	Rev. Date	Rev.
A. CALCULATION ASSUMPTIONS				
1. GENERAL & MEASUREMENTS	1: 1 - 1: 8			
2. STATIC SYSTEM	2: 1 - 2: 29			
3. LOADS	3: 1 - 3: 11			

Appendix	Program	Date	Rev. Date	Rev.
1. Input receipt	3D software			
2. Pile forces	3D software			
3. RC deck	3D software			

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A1:1
		Date :	Created :

1. GENERAL / MEASUREMENT

1.1	CONSTRUCTION TYPE	page 1:2
1.2	MEASUREMENTS	page 1:3-4
1.3	SUBSOIL	page 1:5
1.4	CODE OCH TENDER DOCUMENTS	page 1:6
1.5	TECHNICAL SERVICE LIFE	page 1:7
1.6	MATERIAL	page 1:7
1.7	GEOTECHNICAL CLASS	page 1:7
1.8	SAFETY CLASS	page 1:7
1.9	CONCRETE COVER AND CRACK CRITERIA	page 1:8

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A1:2
		Date :	Created :

1.1 CONSTRUCTION TYPE

Bankpile using orthogonally constructed using reinforced concrete.

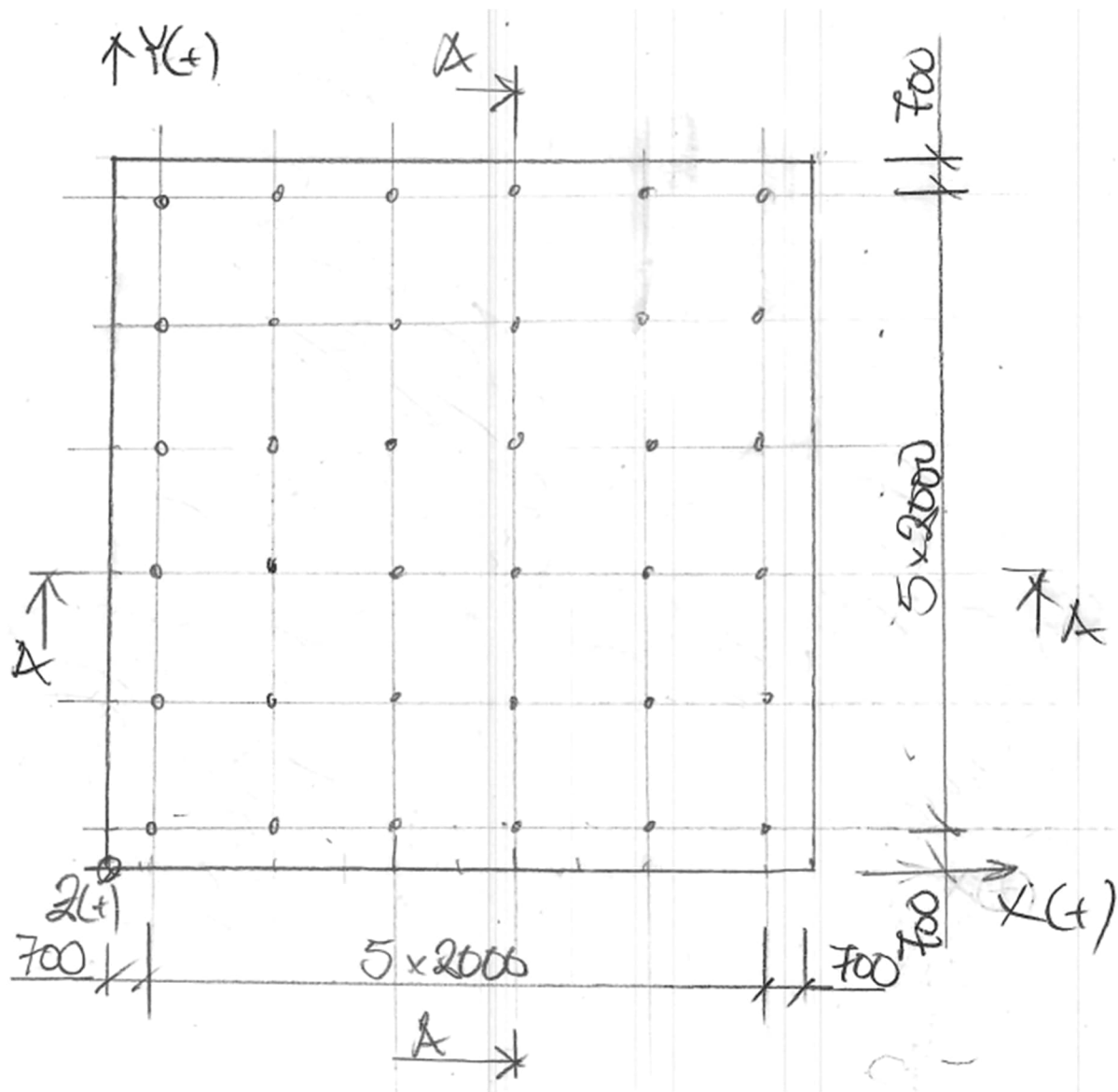
Sub soil consists of clay and gravel.

Piles consist of drilled steel piles with point bearing.

.

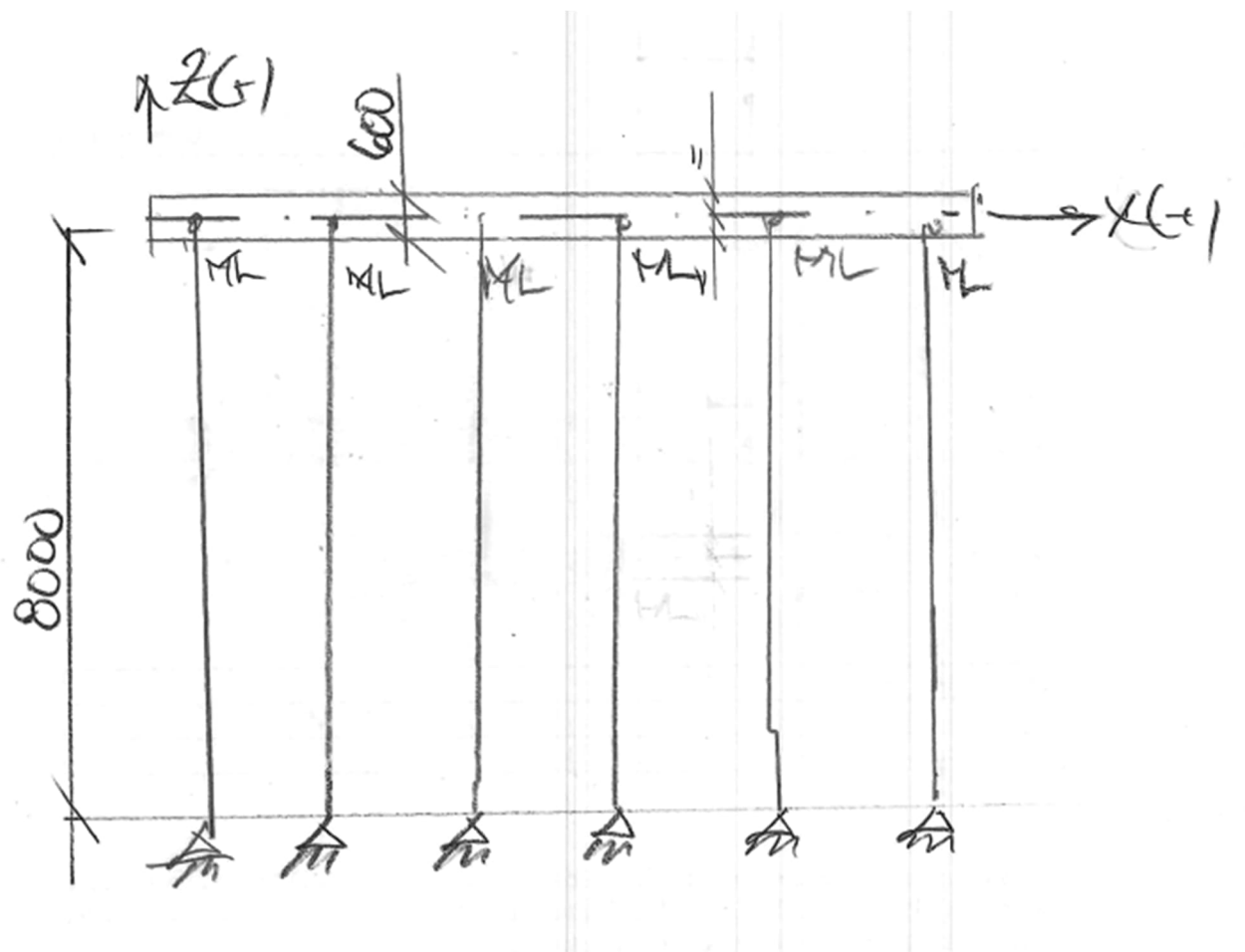
	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A1:3
		Date :	Created :

1.2 MEASUREMENTS



PLAN
Overview

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A1:4
		Date :	Created :



SECTION A-A

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A1:5
		Date :	Created :

1.3 SUBSOIL

Subsoil is either clay or gravel as seen below. Subsoil only provides side support to steel piles when determining secondary load effects due to deformation in plan.'

Clay:

Thickness 4 m.

Gravel:

Thickness 4 m.

Rock:

Located 8 m beneath bottom of RC slab.

Design waterlevel:

Highest level is located at bottom of RC slab.

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A1:6
	Pile deck	Date :	Created :

1.4 CODE OCH TENDER DOCUMENTS

Documents	Version	Name
SS-EN 1990-1997	-	Svensk Standard Eurokod 1-7
TRVINFRA-00226	2.0	KRAV, Bro och broliknande konstruktion, Allmänna krav
TRVINFRA-00227	2.0	KRAV, Bro och broliknande konstruktion, Byggande
TRVINFRA-00228	2.0	KRAV, Bro och broliknande konstruktion, Brounderhåll
TRVINFRA-00331	2.0	KRAV, Bro och broliknande konstruktion, Bärighetsberäkning
TSFS 2018:57		Transportstyrelsens föreskrifter och allmänna råd om tillämpning av eurokoder
TDOK 2013:0667	2.0	Trafikverkets tekniska krav för geokonstruktioner. TK Geo 13
TDOK 2013:0668	2.0	Trafikverkets tekniska råd för geokonstruktioner. TR Geo 13
AMA Anläggning 23		AMA, Svensk Byggtjänst
TDOK 2023:0125	2.0	TRVAMA Anläggning 23
SS 137006:2015	-	Betongkonstruktioner – Utförande – Tillämpning av SS-EN 13670:2009 i Sverige

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A1:7
		Date :	Created :

1.5 TECHNICAL SERVICE LIFE

Technical life span 120 years (L100).

1.6 MATERIAL

Concrete (see SS-EN 1992-1-1, Table 3.1):
C30/37 ($f_{ck} = 30 \text{ MPa}$)

Reinforcement (SS-EN 10080 och SS 212540.):
K500CT ($f_{yk} = 500 \text{ MPa}$)

Drilled steel pile:
RD 320/12.

1.7 GEOTECHNICAL CLASS

Geotechnical class GK2.

1.8 SAFETY CLASS

Geotechnical resistance: SK 2

Other: SK 2

Safety class 2 according to TSFS chapter 2 table 2.1.

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A1:8
		Date :	Created :

1.9 CONCRETE COVER AND CRACK CRITERIA

Class identification bridge components :

Construction part	Exposure class ^{1.)}	Life spann	max vct _{ekv} ^{2.)}	ζ ^{3.)}
RC slab:				
▫ Bottom of slab	XD1/XF4	L100	0.40	1.5
▫ Top of slab	XD1/XF4	L100	0.40	1.5

Footnotes:

- 1.) TRVINRA-00227 section 5.3.2.3
2.) TSFS table 12.1
3.) TSFS table 12.3

Design parameters low corrosion sensitive reinforcement (rebars):

$c_{min,dur}$	: minimum cover with regard to environmental impact
$c_{min,b}$	: minimum cover with regard to adhesion requirements
Δc_{dev}	: execution tolerance
$c_{min} = \max(c_{min,b}; c_{min,dur}; 10mm)$	: SS-EN 1992-1-1 eq. 4.2
$c_{nom} = c_{min} + \Delta c_{dev}$	: SS-EN 1992-1-1 eq. 4.1, noted as BM on the drawing

Construction part	$c_{min,dur}$ ^{1.)}	$c_{min,b}$ ^{2.)}	c_{min}	Δc_{dev} ^{3.)}	c_{nom} ^{6.)}	$w_{k,till}$ ^{4.)}
RC slab:						
▫ Bottom of slab	25	20	25	10	40	0.20
▫ Top of slab	25	20	25	10	40	0.20
	mm	mm	mm	mm	mm	mm

Fotnotes:

- 1.) TSFS table 12.1
2.) SS-EN 1992-1-1 section 4.4.1.2 table 4.2
3.) SS-EN 1992-1-1 section 4.4.1.3
4.) TSFS table 12.2
5.) TSFS chapter 12 section 2§ $k_1 = c_{min} + 15$ mm when casting against building foil.
6.) General Swedish practice min. $c_{nom} = 40$ mm ($\therefore \phi 32 + 5$ mm)

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:1
		Date :	Created :

2. SYSTEM ANALYSIS

2.1	GENERAL	page 2:2
2.2	SKETCH SYSTEM ANALYSIS	page 2:3-8
2.3	CROSS SECTION PROPERTIES	page 2:9-12
2.4	MATERIAL	page 2:13
2.5	BOUNDARY CONDITIONS	page 2:14-15
2.6	MESH	page 2:16-29

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A2:2
	Pile deck	Date :	Created :

2.1 GENERAL

The structure is built using reinforced concrete slab and drilled steel piles.

The concrete slab is modelled using high-node shell elements (QTS8). These shell elements are modelled with isotropic material properties corresponding to uncracked concrete.

The piles are modelled as 3D beams elements (BMI21). These are considered “pinned” against rock and concrete slab.

To avoid “spikes” in RC slab node at top of pile is connected to 4 nodes in RC slab by using rigid joints with no rotational stiffness (JNT4).

Subsoil provides sides support to piles. This is modelled using joints with no rotational stiffness.

However, the material properties of springs are modelled as nonlinear springs corresponding to soil properties.

When retrieving results in deck the use of average forces over width $3h$ is used.

Since springs pile/soil are none linear a nonlinear analysis need to be performed.

Attachments:

Attachment	Name
1	Input receipt
2	Results piles
3	Results RC slab

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:3
		Date :	Created :

2.2 SKETCH SYSTEM ANALYSIS

To describe geometry first POINTS are defined.

Beam elements are defined by applying attributes to LINES.

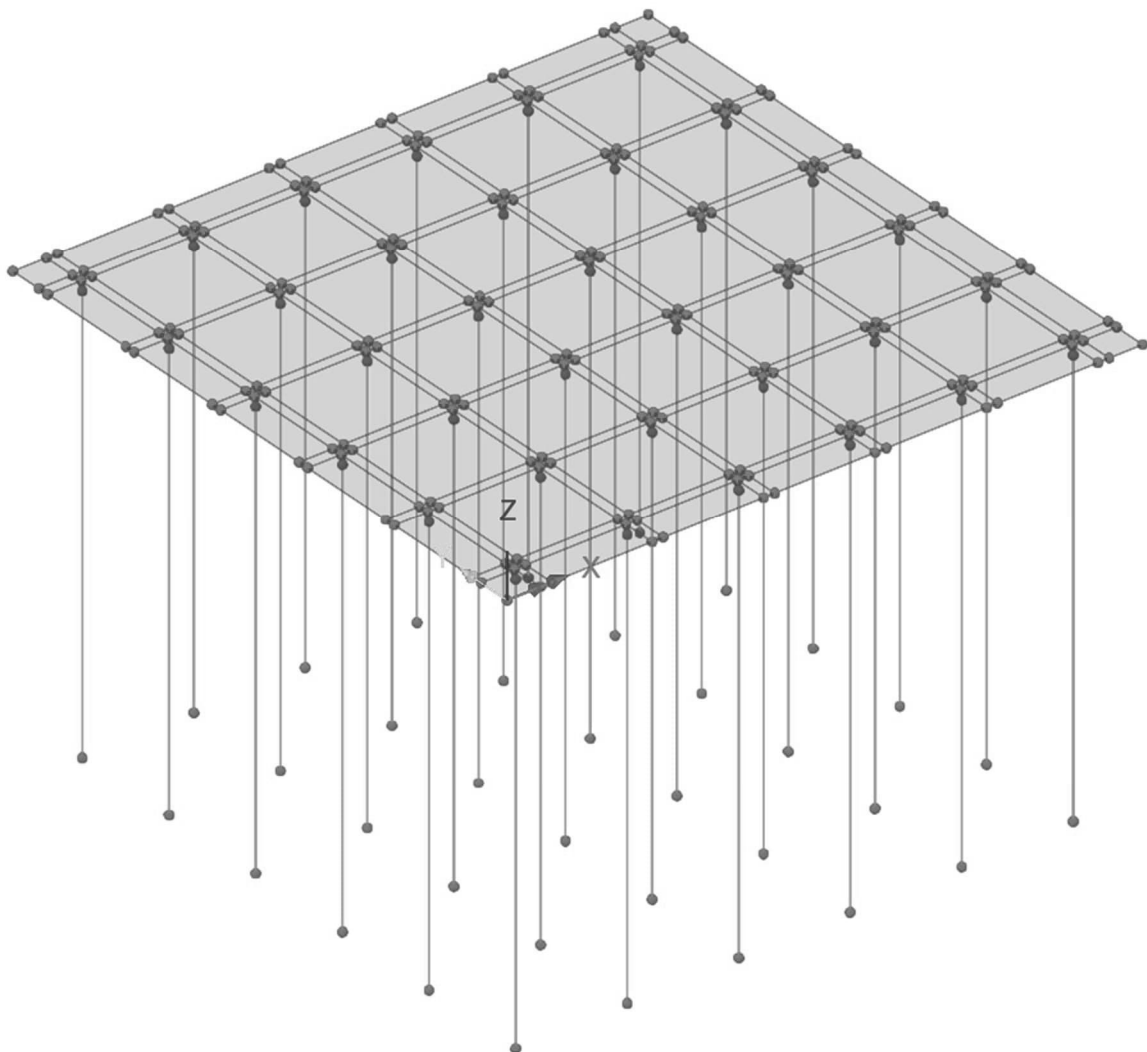
Shell elements are defined by applying attributes to SURFACES.

Attached pictures are retrieved from graphical sketches generated by LUSAS of POINTS, LINES and SURFACES.

All coordinates needed to describe POINTS are found in attachment 1.

All POINTS needed to describe LINES are found in attachment 1.

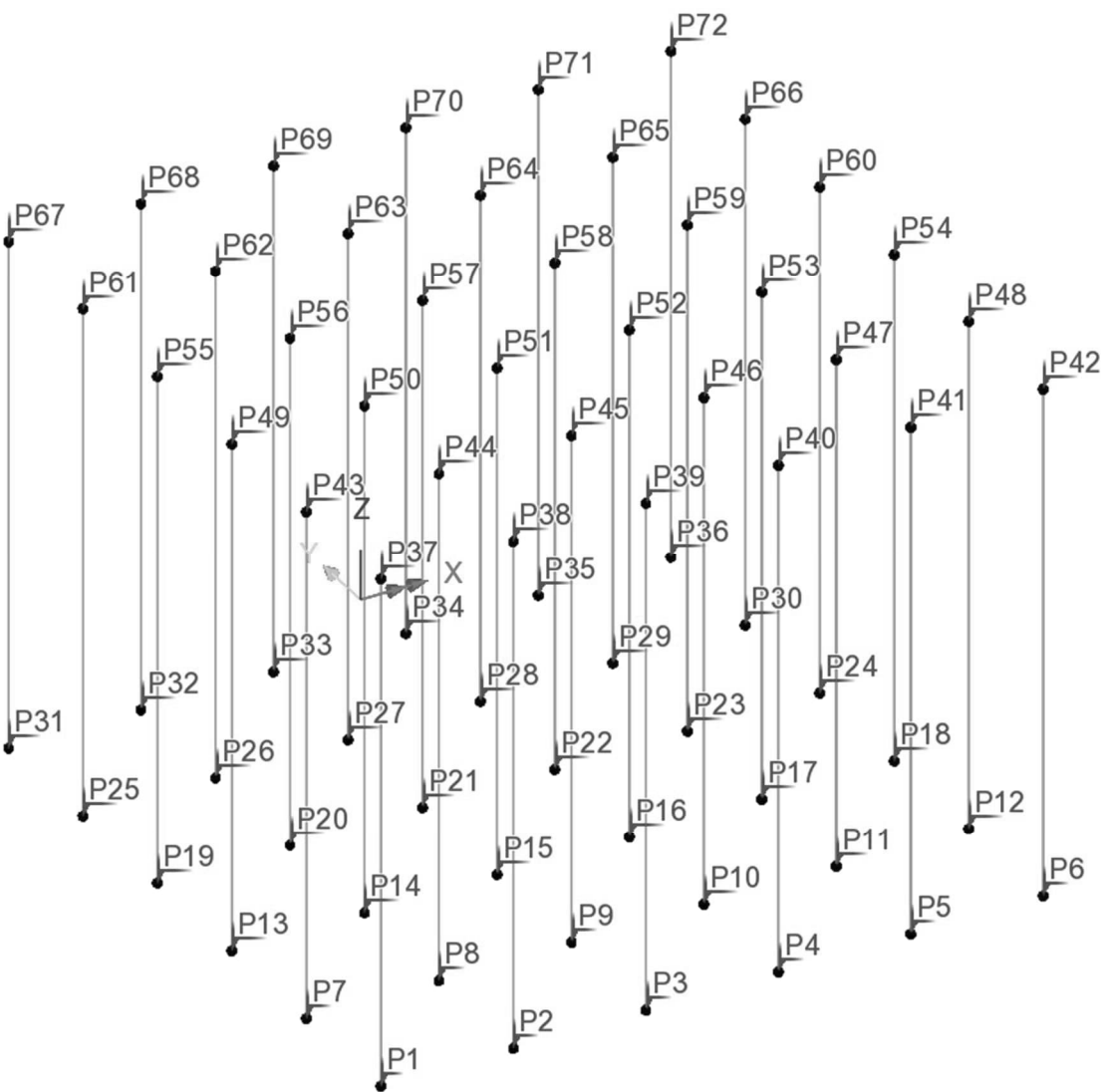
All LINES need to describe SURFACE are found in attachment 1.



Overview 3D Geometry

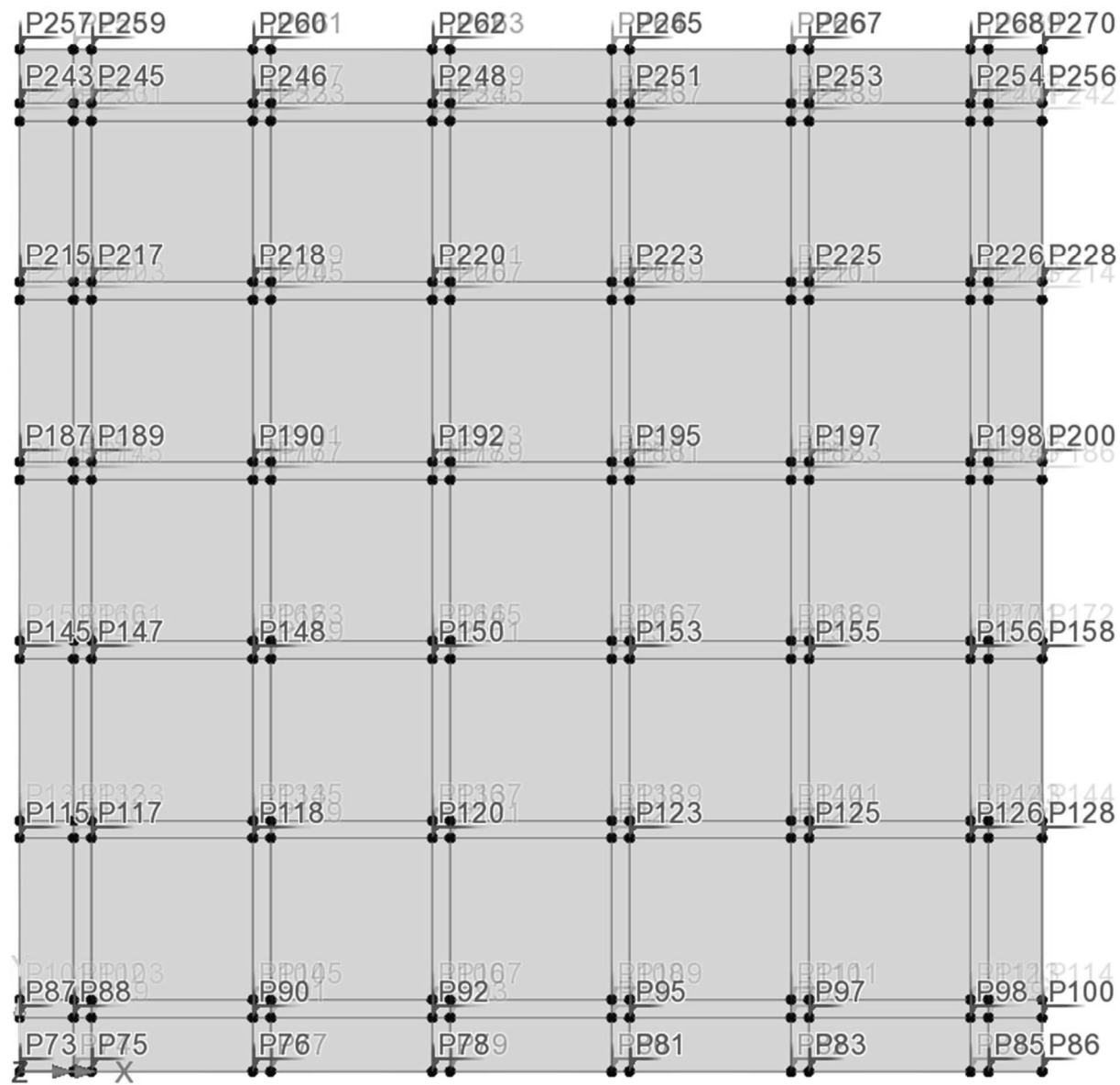
	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:4
		Date :	Created :

2.2.1
Geometry : POINTS



Piles

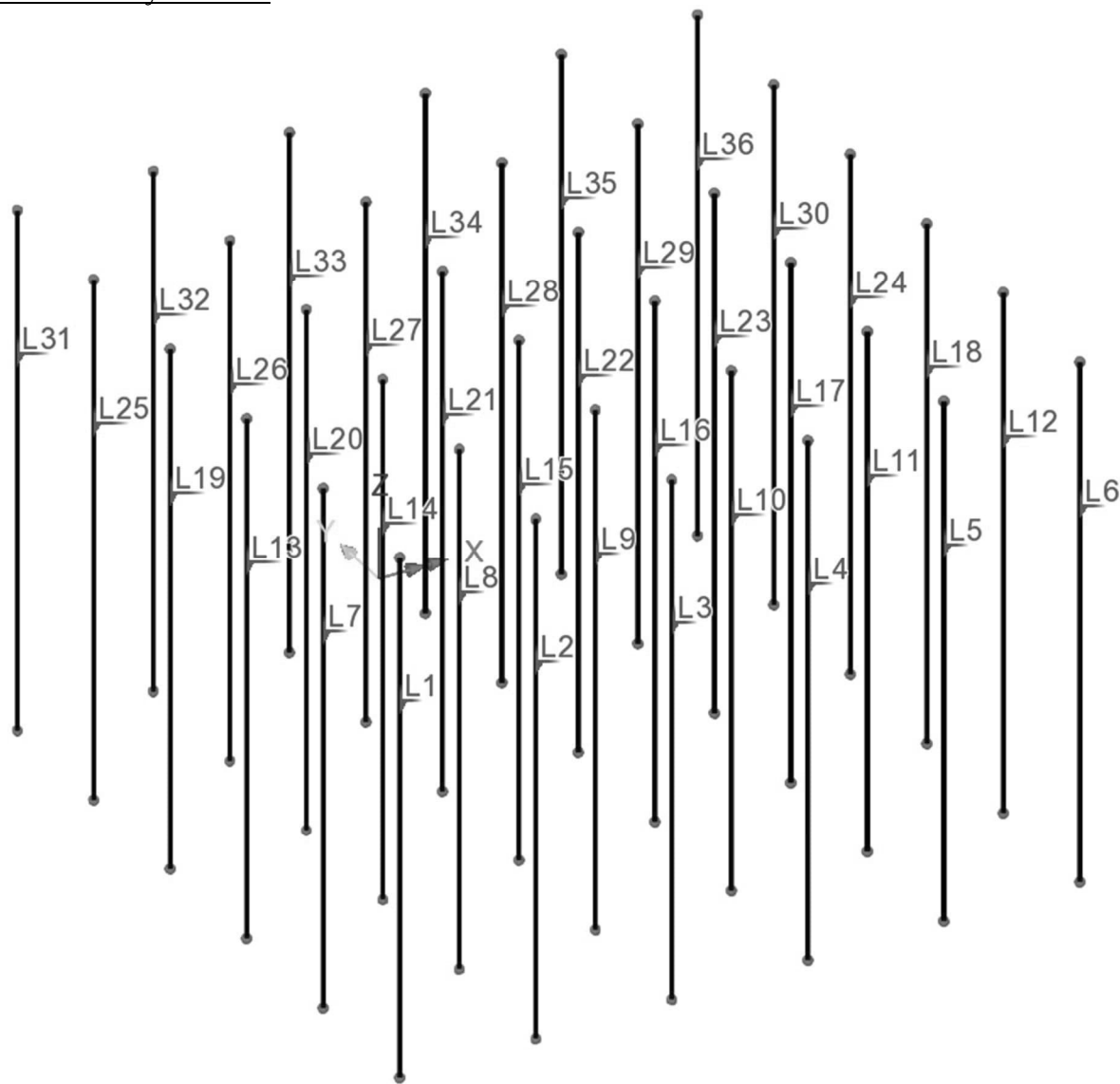
	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:5
		Date :	Created :



RC slab

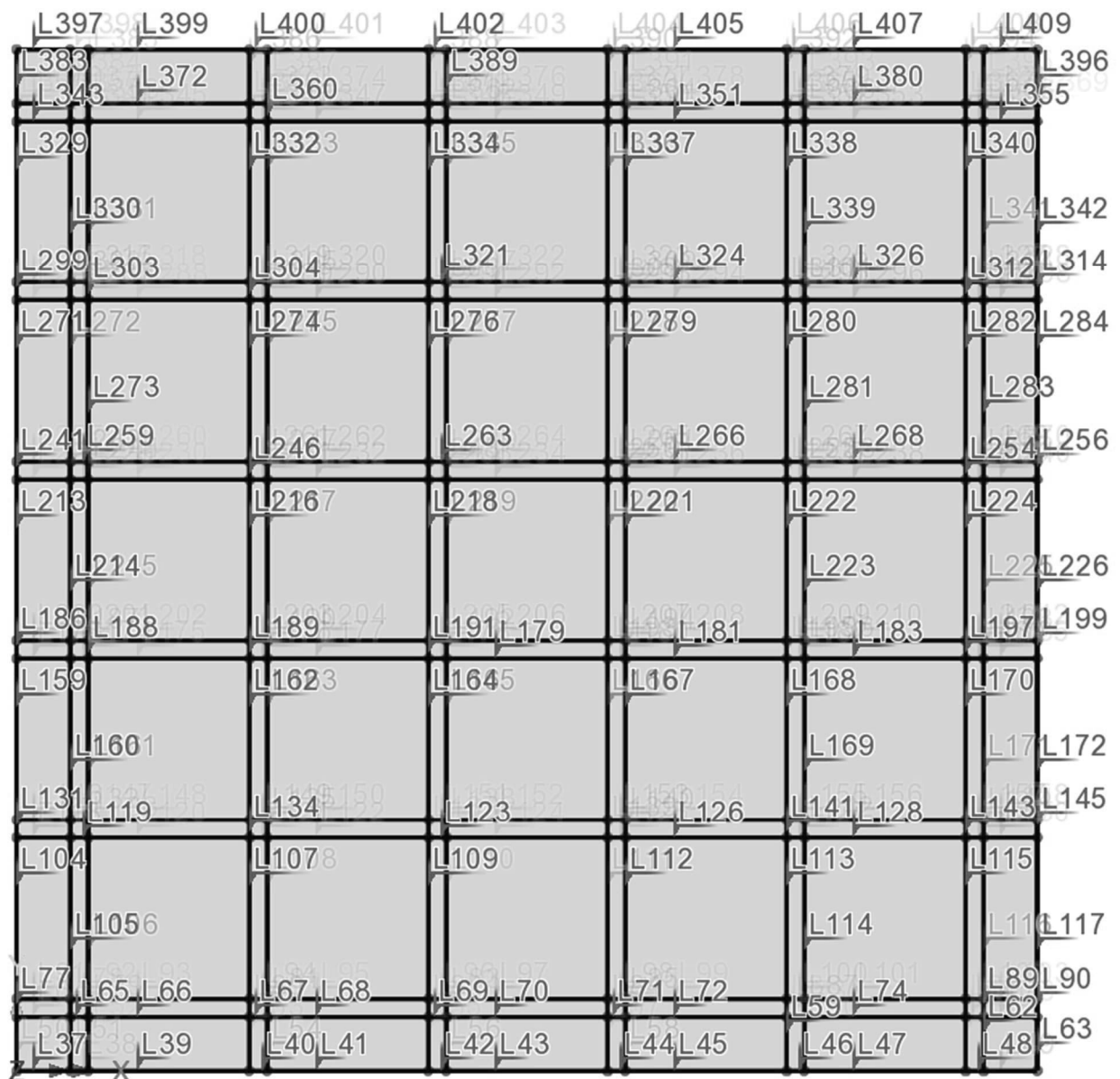
	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:6
		Date :	Created :

2.2.2 Geometry : LINES



Piles

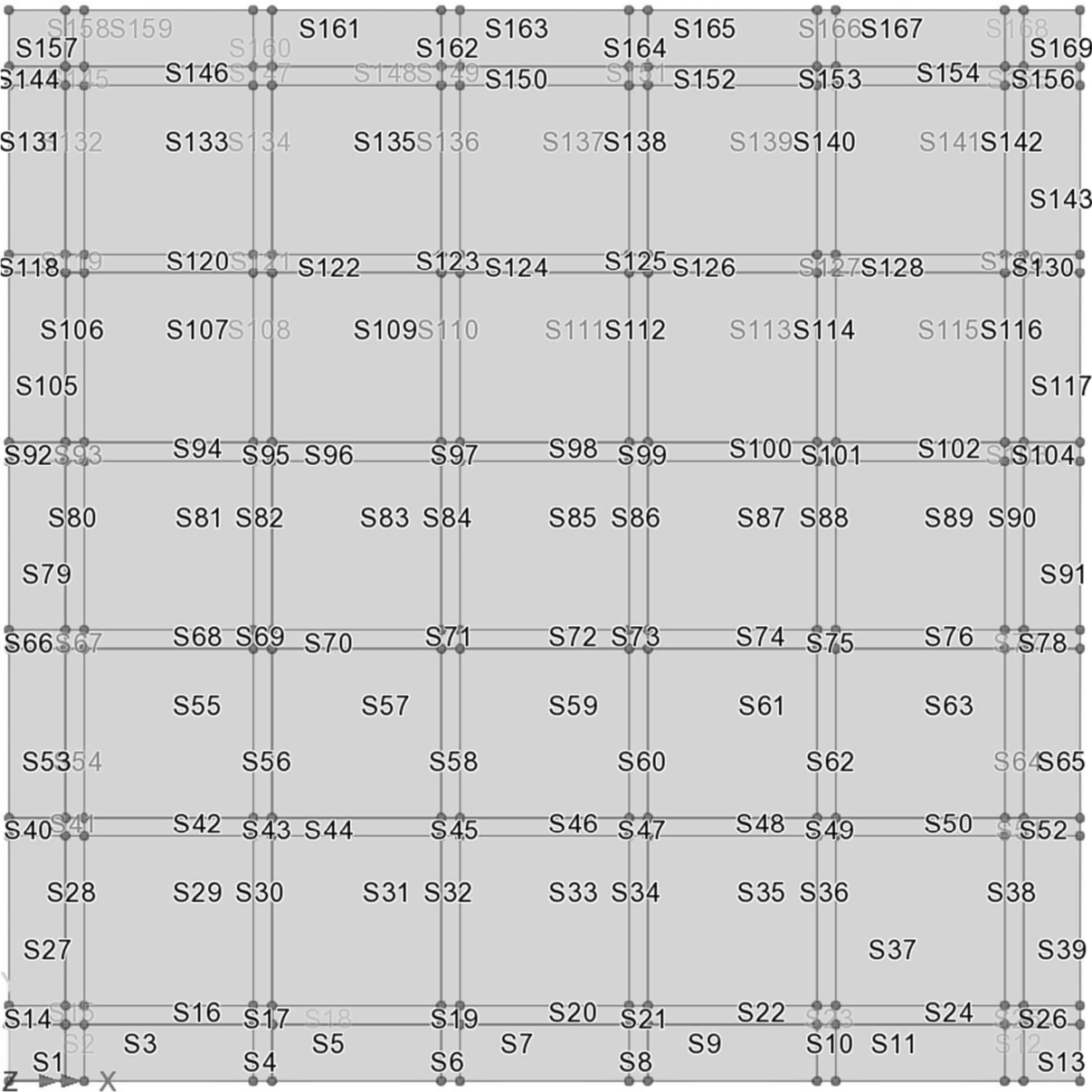
	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:7
		Date :	Created :



RC slab

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:8
		Date :	Created :

2.2.3 Geometri : SURFACES



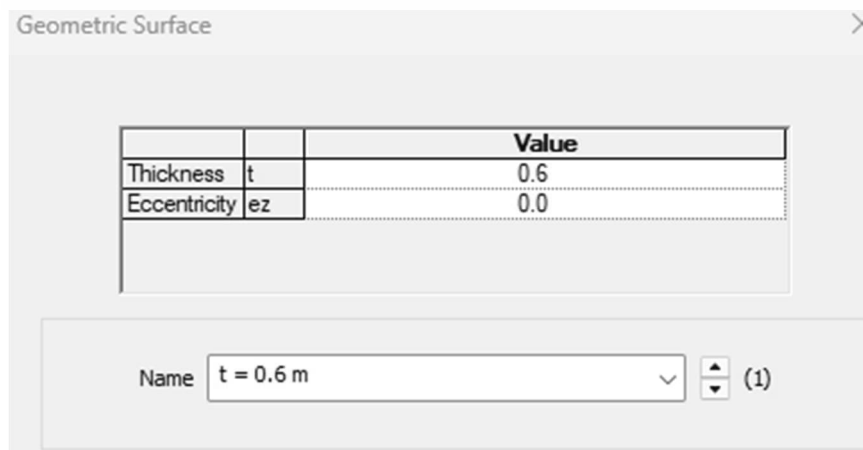
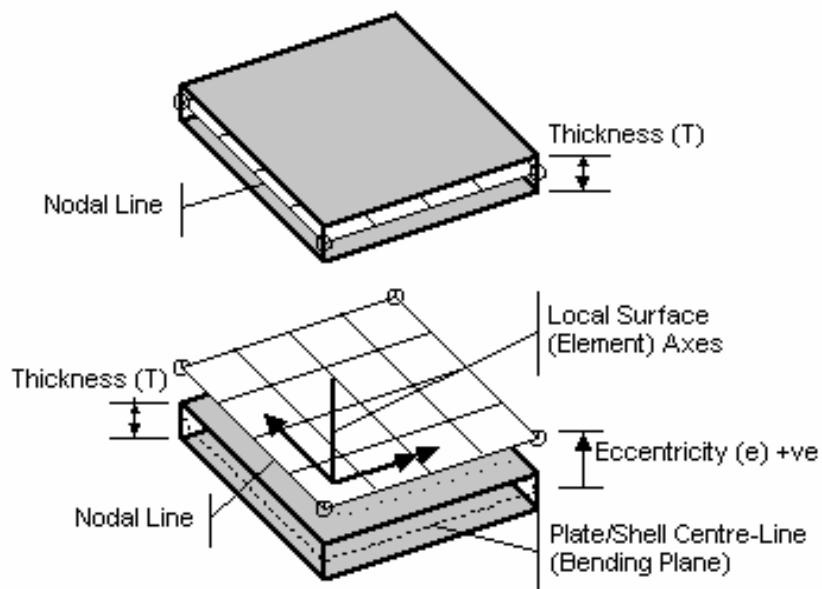
RC slab

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:9
		Date :	Created :

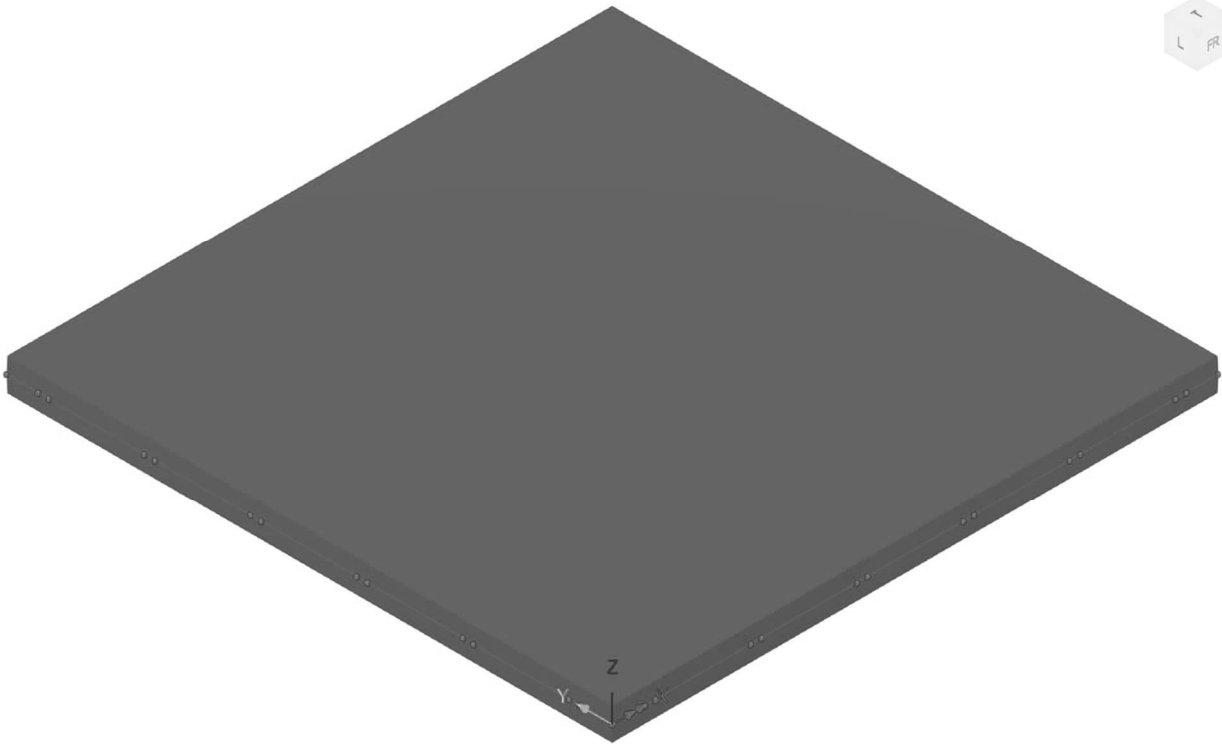
2.3 CROSS SECTION PROPERTIES

2.3.1 Shell element

Principle figures of geometry associated to shell elements ("Thick shell" / QTS4) are seen below.



	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:10
		Date :	Created :

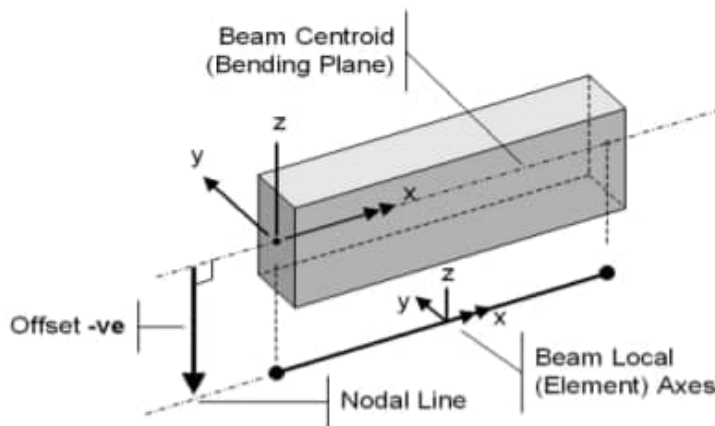


RC slab

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:11
		Date :	Created :

2.3.2 3D-beams ("Thick beam" / BMS3)

Principal sketch of geometry associated to 3D beam elements are seen below.



Geometric Line

Analysis category
3D

Definition

☒ From library / calculator

☐ Enter properties

Rotation about centroid
0
Mirrored about axis
None

Parametric Sections
Circular Sections
1:RD 320 x 12 (CHS D=0.32 t=0.012)

Reinforcement (only used for RC design checks)
None

ez origin
Centroid
ey origin
Same as ez

	Value
Cross sectional area (A)	0.0116113
Second moment of area about y axis (Iyy)	0.137896E-3
Second moment of area about z axis (Izz)	0.137896E-3
Product moment of area (Iyz)	0.0
Torsional constant (J)	0.275733E-3
Effective shear area in y direction (Asy)	5.81973E-3
Effective shear area in z direction (Asz)	5.81973E-3
Eccentricity in y direction (ey)	0.0
Eccentricity in z direction (ez)	0.0

Visualise...
Section details...

Name
Pile
(2)

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:12
		Date :	Created :



Piles

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:13
		Date :	Created :

2.4 MATERIAL

Concrete (RC slab):

Material Library

Material type Concrete

Country Europe

Standard EN1992-1-1:2004/2014

Grade C30/37

Properties

Young's modulus33.0E6

Poisson's ratio0.2

Density2.54842

Thermal expansion10.0E-6

NameConcrete

(2)

Steel pile (RC 320/12):

Material Library

Material type Steel - Structural

Country Europe

Standard EN1993-1-1:2005

Grade Ungraded

Properties

Young's modulus210.0E6

Poisson's ratio0.3

Density7.84913

Thermal expansion12.0E-6

NameSteel

(3)

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A2:14
	Pile deck	Date :	Created :

2.5 BOUNDARY CONDITIONS

Bottom of pile is “pinned” as seen in assignment below which is applied to all piles.

Structural Supports

Analysis category
3D

		Free	Fixed	Spring	Spring stiffness
Translation in	X	☐	☒	☐	
	Y	☐	☒	☐	
	Z	☐	☒	☐	
Rotation about	X	☒	☐	☐	
	Y	☒	☐	☐	
	Z	☒	☐	☐	
Hinge rotation		☒	☐	☐	
Torsional warping		☒	☐	☐	
Pore pressure		Closed	Seepage	Drainage	Open
		☒	☐	☐	☐
Pressure					

Spring stiffness distribution

- ☒ Stiffness
- ☐ Stiffness/unit length
- ☐ Stiffness/unit area

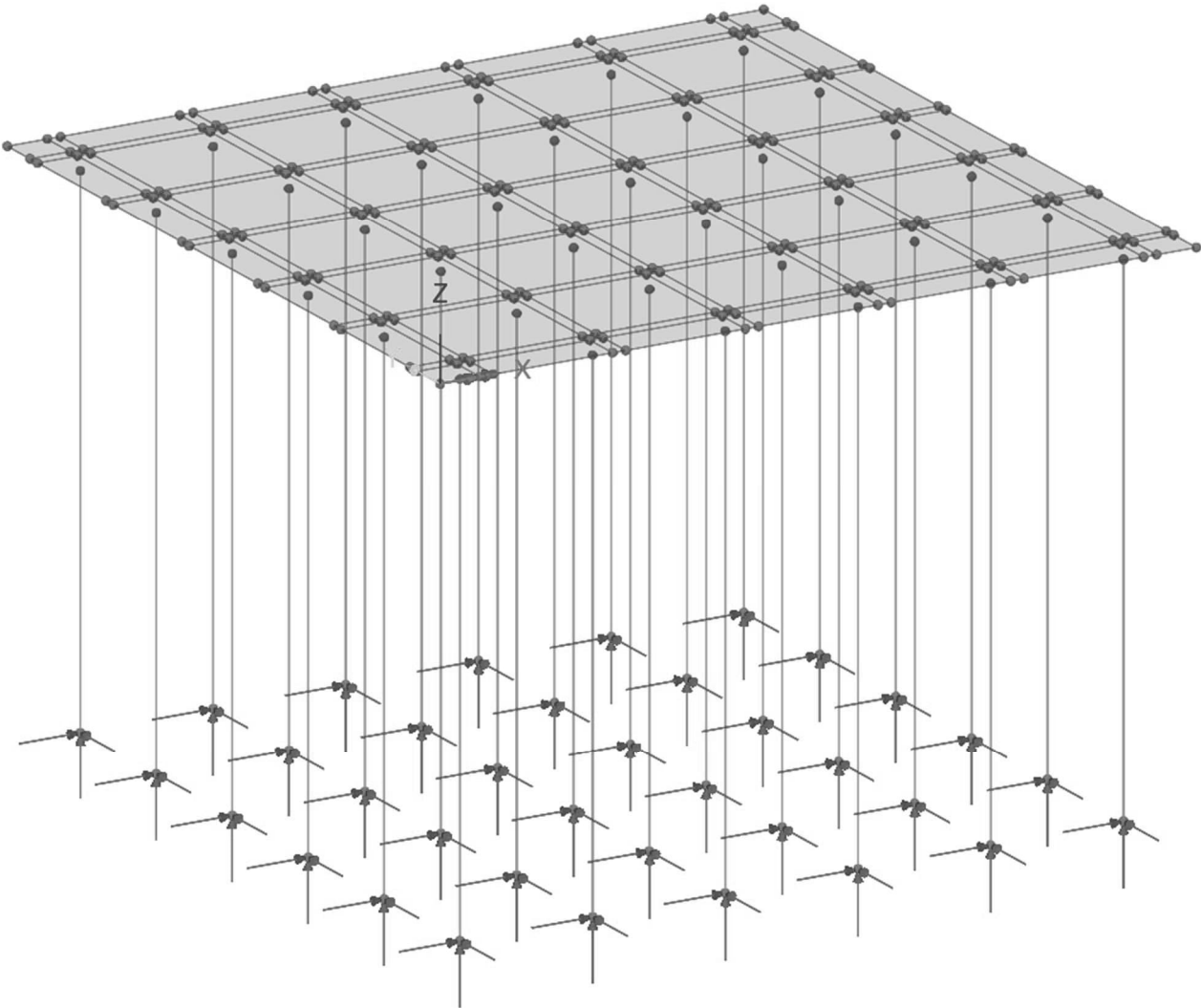
Lift-off >>

Contact >>

Non-reflective >>

Name
Pinned
(1)

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:15
		Date :	Created :



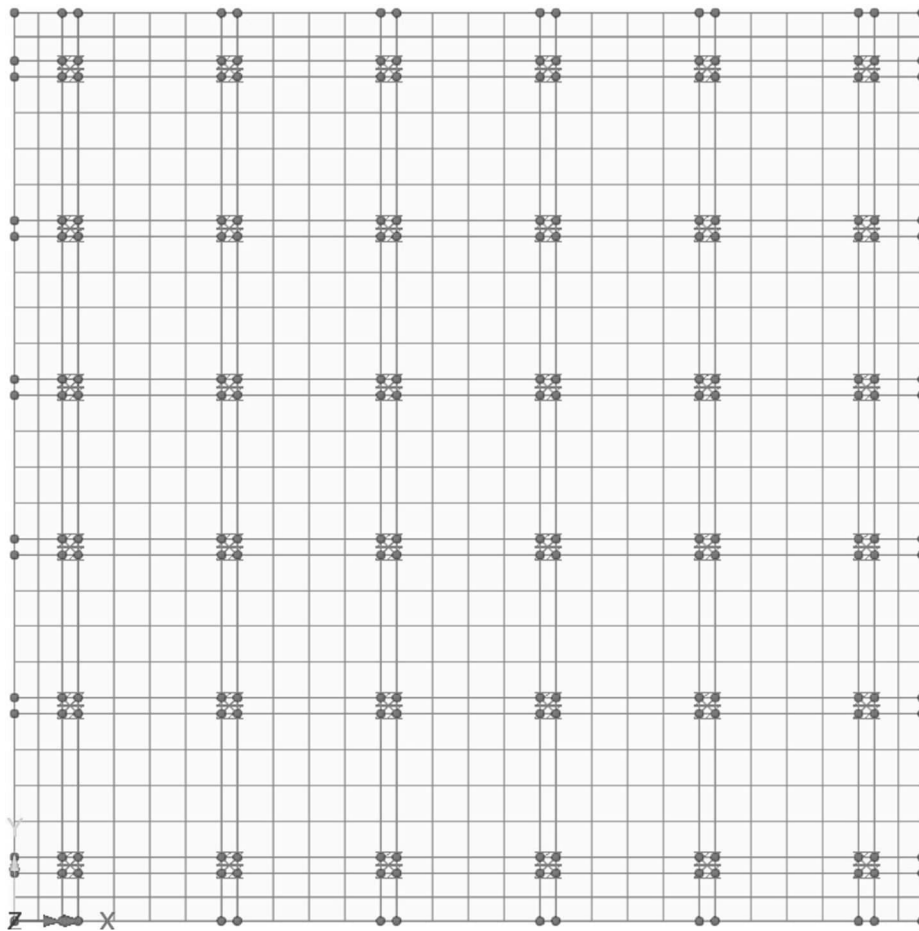
	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:16
		Date :	Created :

2.6 MESH

2.6.1 Shell element (QTS8): quadratic

High node elements are chosen (”Thick shell” / QTS8) to limit the number of elements while maintaining accuracy.

Type	x-divisions	y-divisions
Element 4 x 4	4	4
Element 4 x 2	4	2
Element 2 x 1	2	1
Element 2 x 2	2	2
Element 4 x 1	4	1
Element 1 x 1	1	1
Element 1 x 2	1	2
Element 1 x 4	1	4



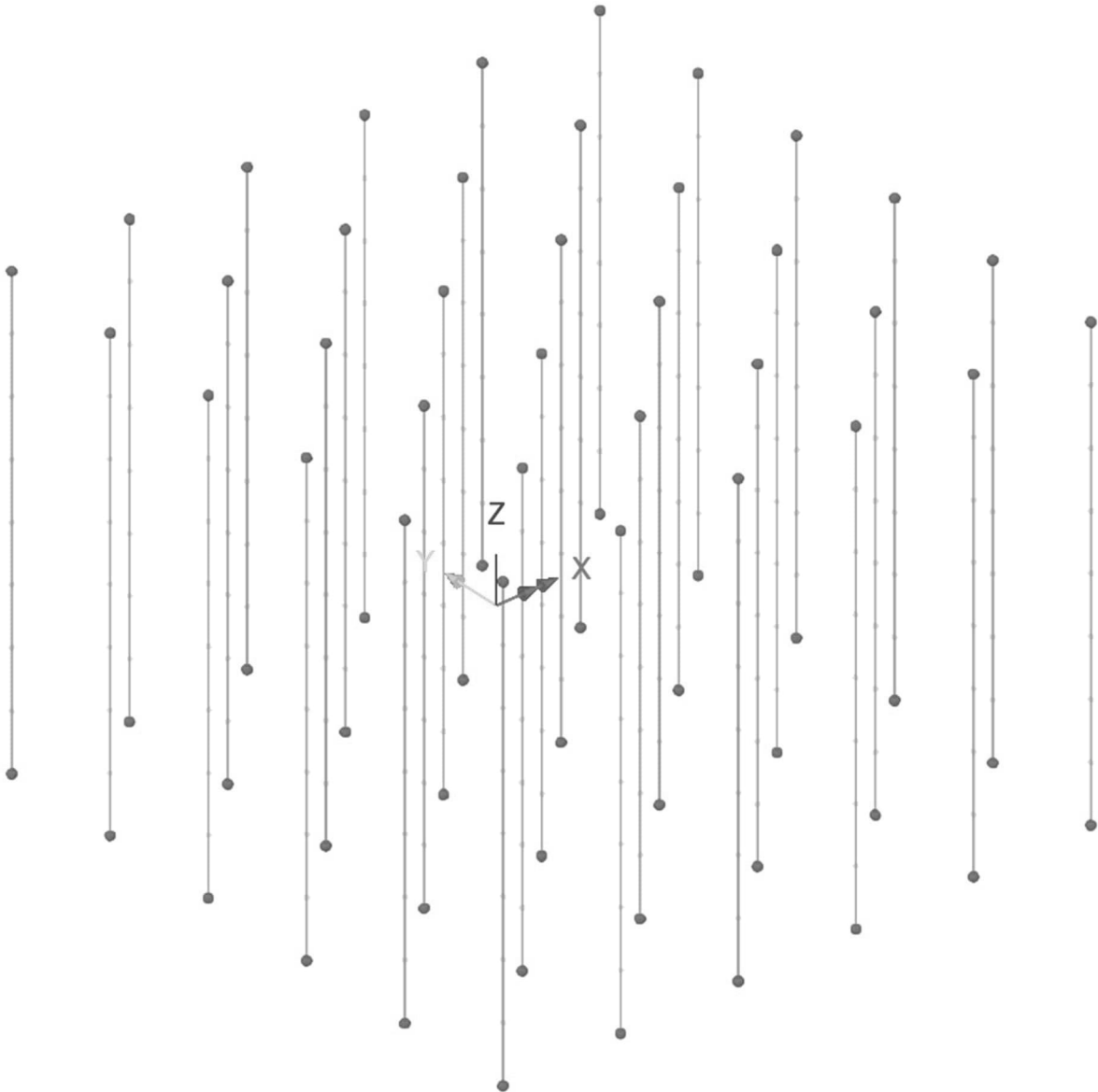
PLAN

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:17
		Date :	Created :

2.6.2 Beam element (BMI21) : linear

Studied bridge uses beam elements (” Beam element” / BMI21) for support beam.

Type	Length	End release: Start	End release: End	Structure
Element: 1 m	1 m	None	None	Rigid support beam

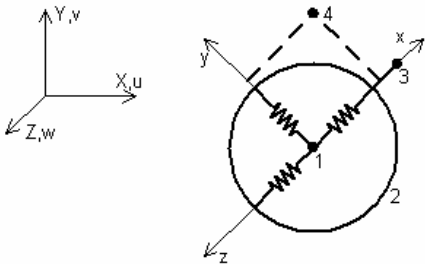


View 3D

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:18
		Date :	Created :

2.6.3 Point joint element at top of every pile: No rotational stiffness (JNT4)

Connection between link slab & superstructure is of type joint element, see presentation below.
The joint uses no rotational stiffness in order achieve a hinge.

Element Name	JNT4
	
Element Group	Joints
Element Subgroup	3D Joints
Element Description	A 3D joint element which connects two nodes by three springs in the local x, y and z-directions.
Number Of Nodes	4. The 3rd and 4th nodes are used to define the local x-axis and local xy-plane.
Freedom	U, V, W: at nodes 1 and 2 (active nodes).
Node Coordinates	X, Y, Z: at each node.

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:19
		Date :	Created :

Joint point element at top of every pile:

Point Mass or Joint

Analysis category

3D

Structural

● Element description

Element type

Joint no rotational stiffness

Assignment type

Between two features (manual)

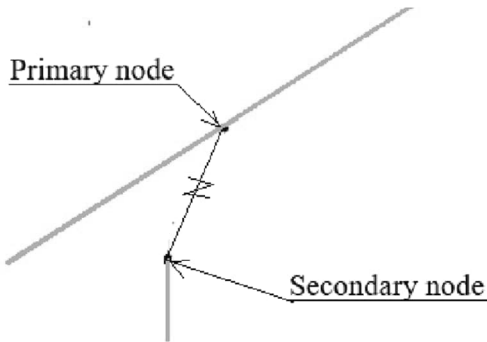
☐ Element name

JNT4

Name

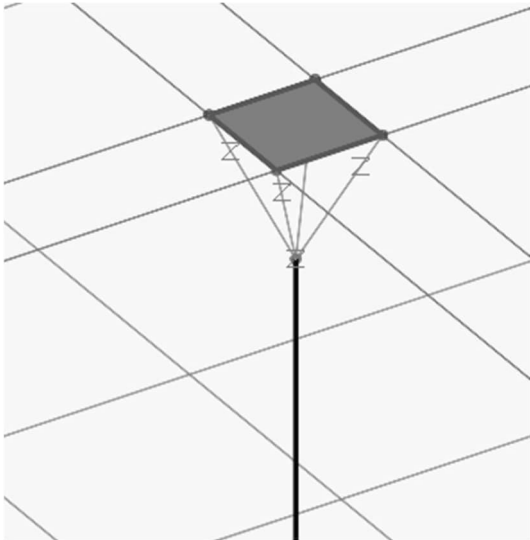
Pile connection

(1)

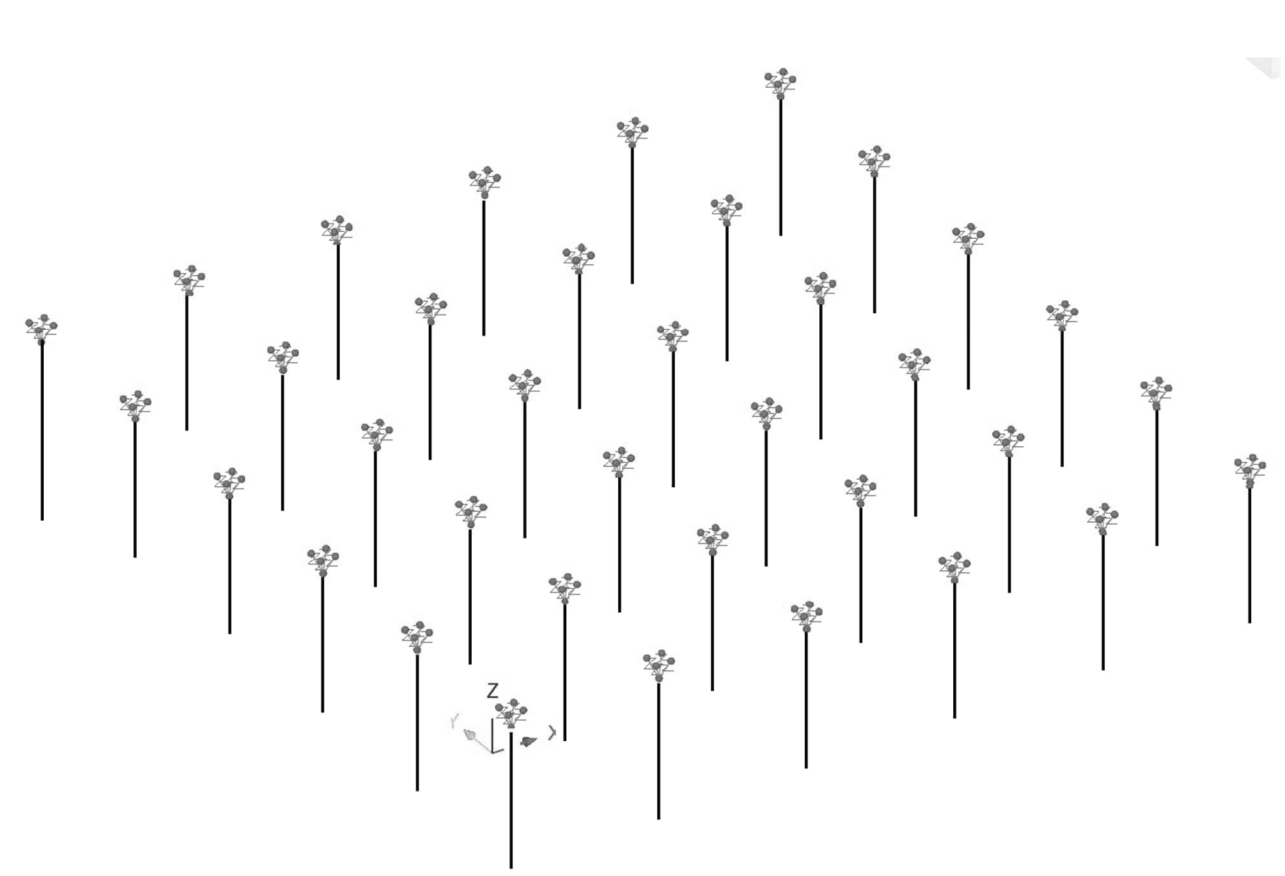


Principal

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:20
		Date :	Created :



Detail
Top of every pile.



View 3D

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:21
		Date :	Created :

Joint material properties:

High stiffness is applied. Corresponds to rigid stiffness.

Spring Stiffness Only ✕

Analysis category

3D

Assignment to

Points and line ends

Joint type

Joint no rotational stiffness

Properties specified for each freedom

	u	v	w
Elastic spring stiffness	1.0E6	1.0E6	1.0E6

Name

Pile connection

⬆️⬆️

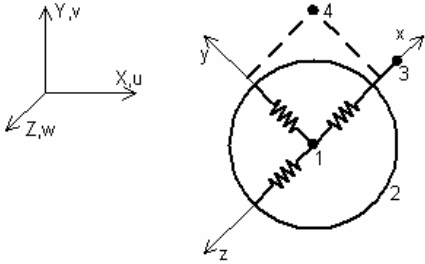
⬆️⬆️

(1)

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:22
		Date :	Created :

2.6.4 Line joint along every pile: No rotational stiffness (JNT4)

Connection between link slab & superstructure is of type joint element, see presentation below.
The joint uses no rotational stiffness in order achieve a hinge.

Element Name	JNT4
	
Element Group	Joints
Element Subgroup	3D Joints
Element Description	A 3D joint element which connects two nodes by three springs in the local x, y and z-directions.
Number Of Nodes	4. The 3rd and 4th nodes are used to define the local x-axis and local xy-plane.
Freedom	U, V, W: at nodes 1 and 2 (active nodes).
Node Coordinates	X, Y, Z: at each node.

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A2:23
	Pile deck	Date :	Created :

Joint line element along every pile:

Line Mesh

Analysis category
3D

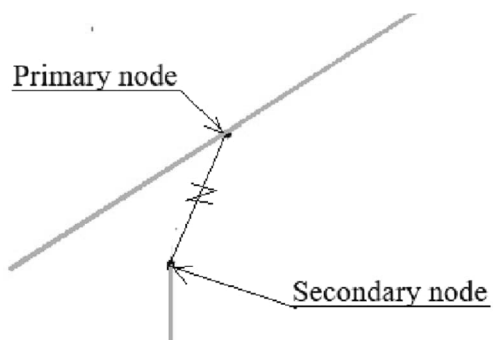
Structural

☒ Element description
Element type
Joint no rotational stiffness
Assignment type
On single feature (automatic)

☐ Use default spacing
☐ Number of divisions
4
Spacing...
☐ Element length
0.0
End conditions...

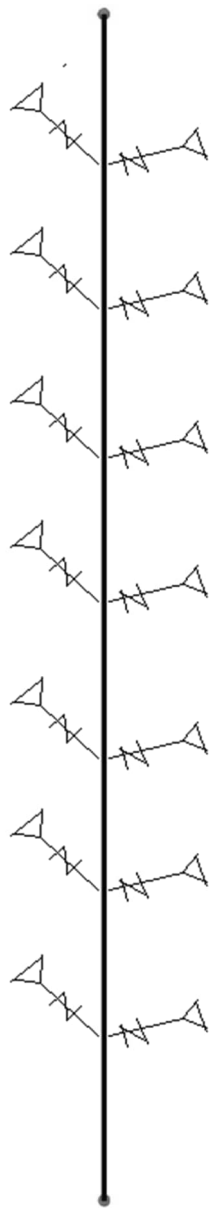
☐ Element name JNT4

Name Soil/pile (13)



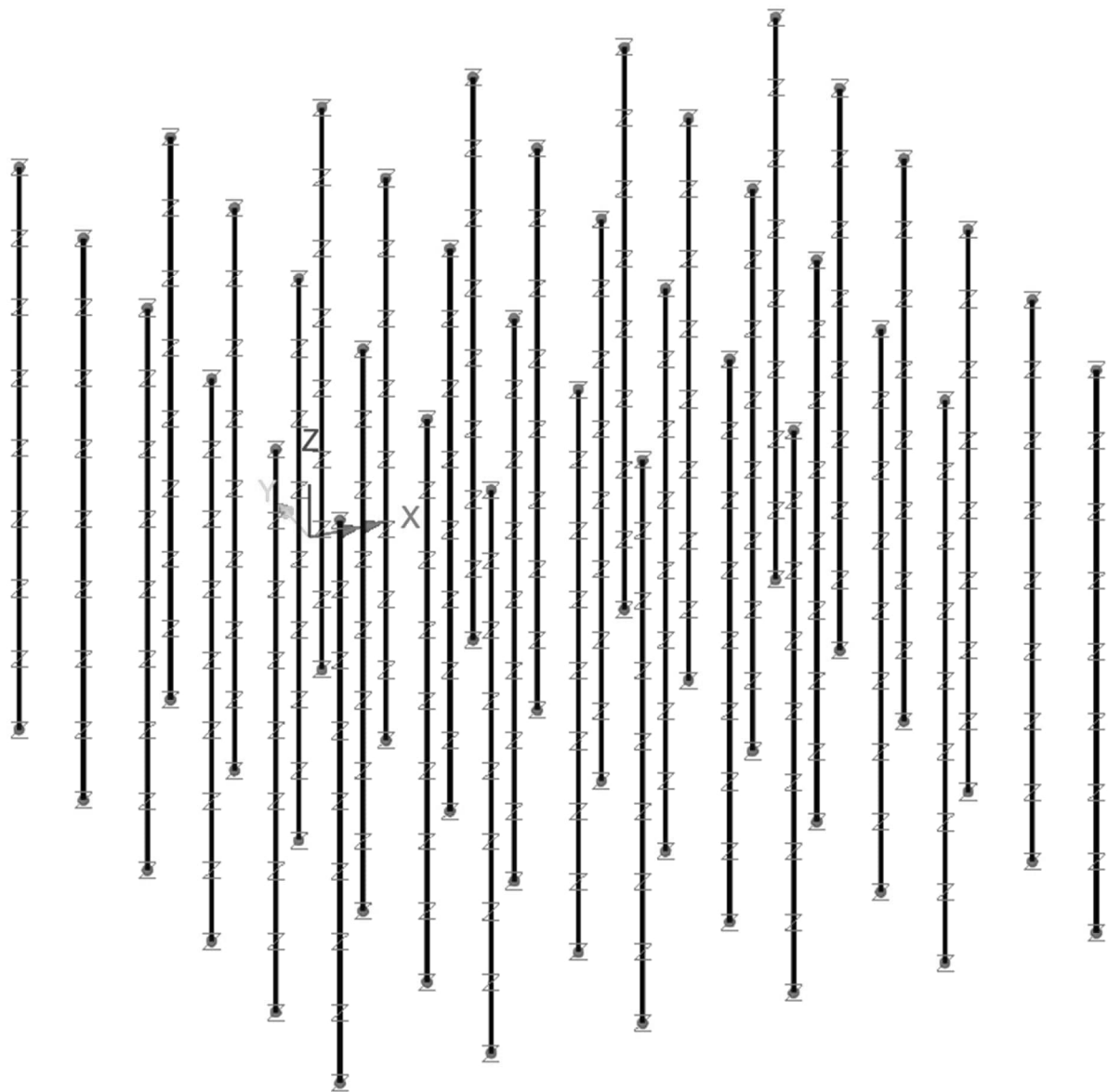
Principal

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:24
		Date :	Created :



Detail
Joint line element along every pile.

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A2:25
	Pile deck	Date :	Created :



[View 3D](#)

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:26
		Date :	Created :

Joint material properties:

Connection between soil and pile is of type joint element, see presentation below. The joint has no rotational stiffness in order achieve a hinge.

The joint uses nonlinear material termed *Elasto-Plastic (Tension and Compression Equal)*. They vary along pile. This is handled using *Line Variation*.

The joint are introduced as same location as nodes along beam element.

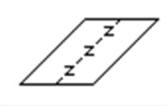
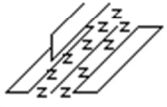
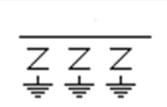
Joint Line Assignment

Type of joint to create

☐ Joints between surfaces (e.g hinge)

☐ Joints to isolate meshed line

☒ Support line via joints

☒ By specified local coordinates

1:Joint coordinate system

☐ Follow axes of each volume

☐ Ignore assigned local coords

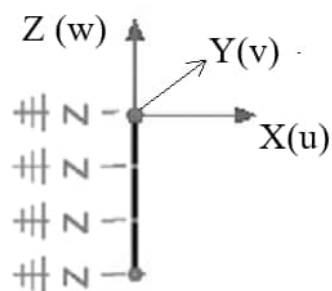
☐ Follow axes of surface

☐ Ignore assigned local coords

☐ Follow axes of line

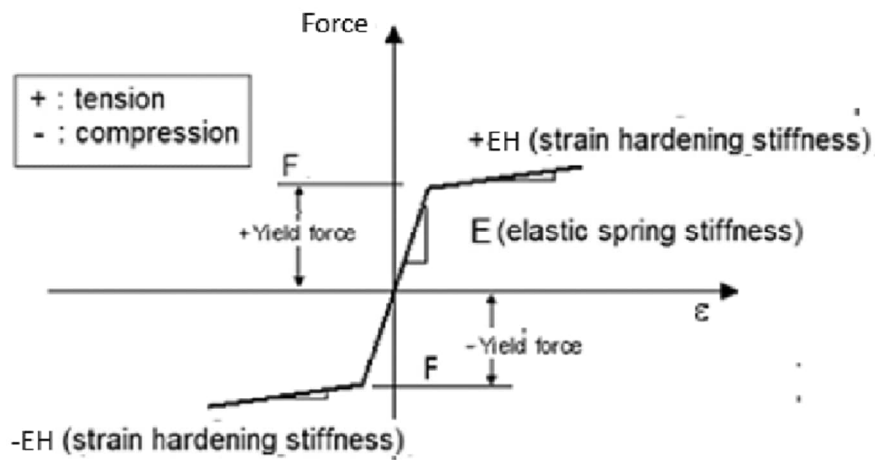
☐ Ignore assigned local coords

☐ By point in selection memory



Principle sketch

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:27
		Date :	Created :



The properties “E” and “F” are vary over distance. This is handled by introducing a line variation.

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:28
		Date :	Created :

Elastic spring stiffness (∴ E)

Line Variation

Type Interpolation

☒ Specify order

Order Linear

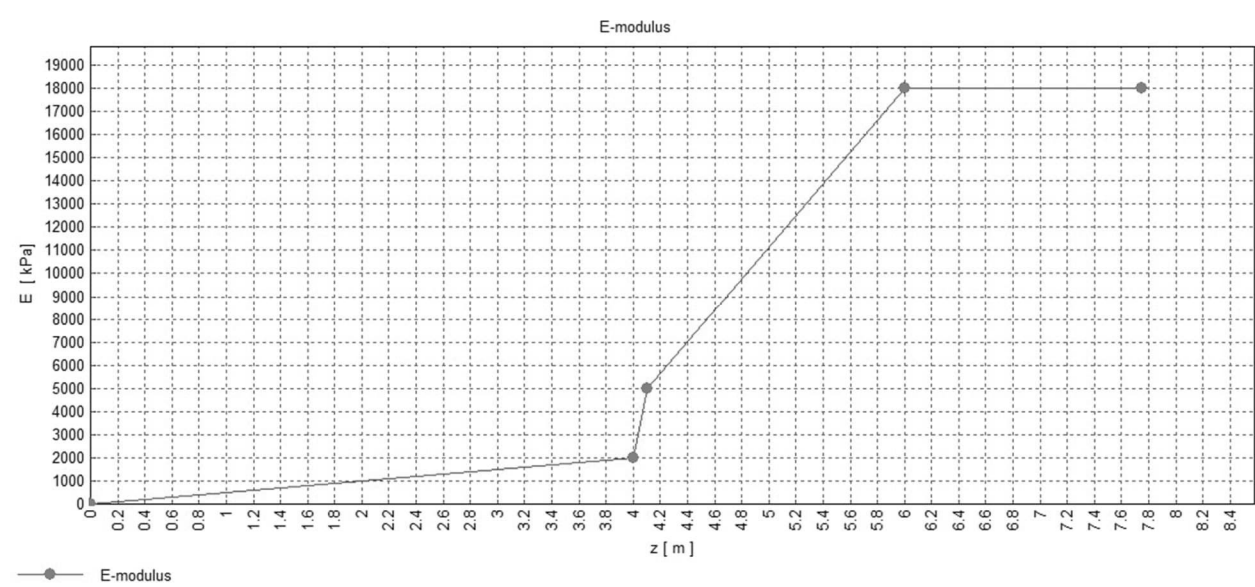
☐ Equal spacing assumed

Distance type Actual

	Distance (x)	Value (y)
1	0	0.0
2	4	2.0E3
3	4.1	5.0E3
4	6	18.0E3
5	8	18.0E3

Name E

(1)



	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A2:29
		Date :	Created :

Maximum soil pressure (Yield force $\therefore$ F)

Line Variation

Type Interpolation ▼

☒ Specify order

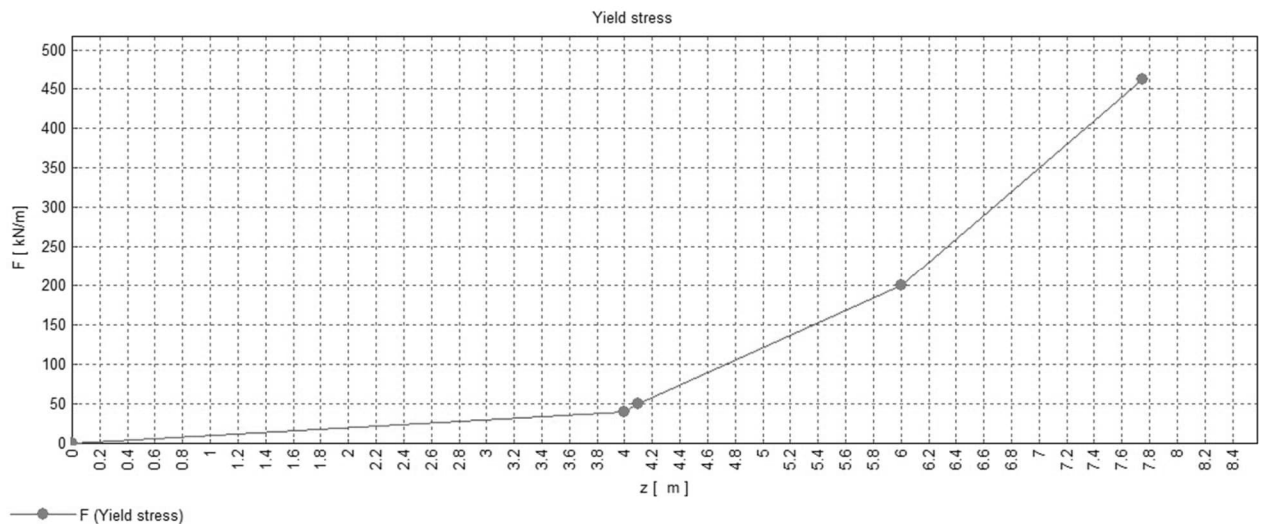
Order Linear ▼

☐ Equal spacing assumed

Distance type Actual ▼

	Distance (x)	Value (y)
1	0	0.0
2	4	40.0
3	4.1	50.0
4	6	200.0
5	8	500.0

Name F ▼ ▲ ▼ (2)



	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A3:1
		Date :	Created :

3. LASTER

3.1	DEAD WEIGHT	page 3:2
3.2	BANKFILLING	page 3:3-4
3.3	SURFACE LOAD	page 3:5-6
3.4	LOAD COMBINATIONS	page 3:7-11

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A3:2
	Pile deck	Date :	Created :

3.1 DEAD WEIGHT

$$\gamma_c = 25 \cdot \frac{kN}{m^3} \quad : \text{concrete}$$

$$\gamma_s = 77 \cdot \frac{kN}{m^3} \quad : \text{steel}$$

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A3:3
	Pile deck	Date :	Created :

3.2 BANKFILLING

Thickness bankfilling 6 m

$$\gamma = 20 \frac{kN}{m^3} \quad : \text{bankfilling}$$

$$\rightarrow q_{bankfyllning} = 20 \frac{kN}{m^3} \cdot 6.0 \text{ m} = 120 kPa$$

Global Distributed ✕

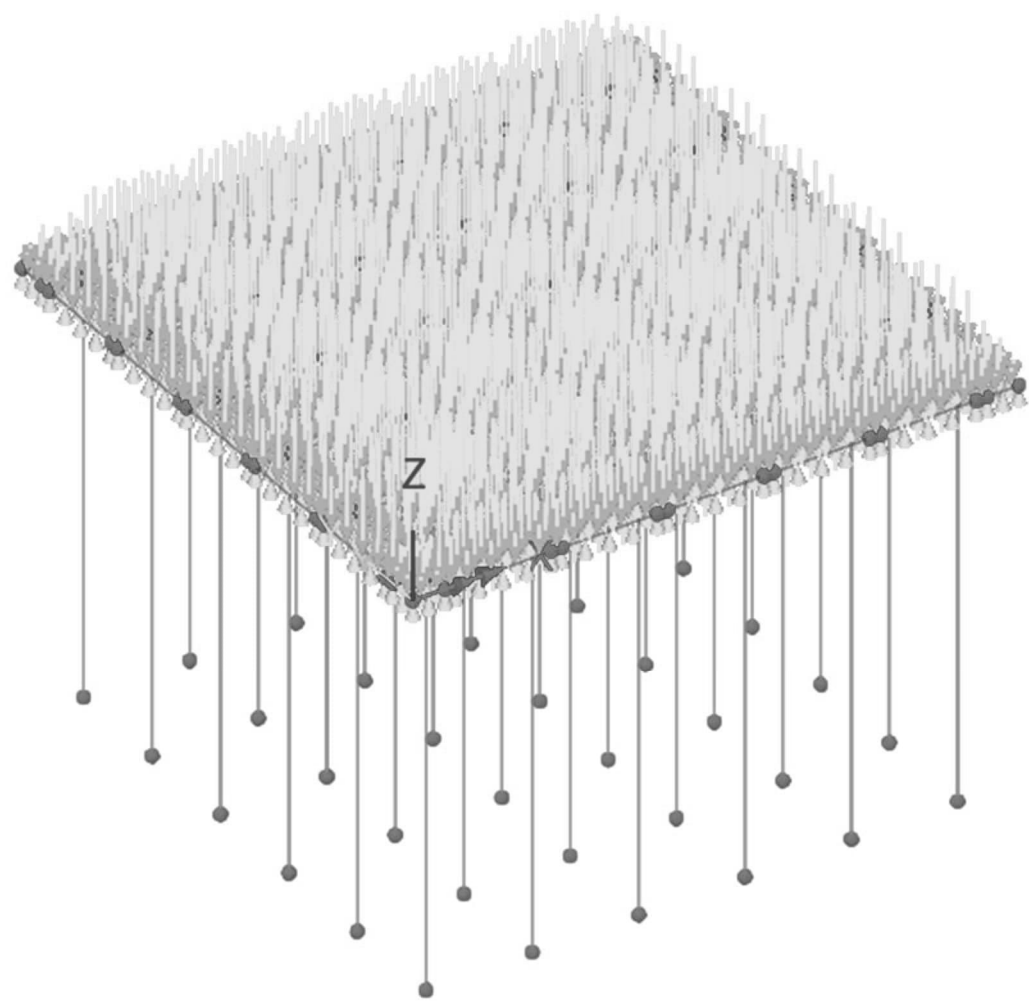
Analysis category

☐ Total
 ☐ Per unit length
 ☒ Per unit area

Component	Value
X Direction	0.0
Y Direction	0.0
Z Direction	-120.0

Name ▼ ⬆️ ⬇️ ⬆️ (1)

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A3:4
		Date :	Created :



Overview 3D

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A3:5
		Date :	Created :

3.3 SURFACE LOAD

Live surface load is applied over entire pile deck.

Global Distributed

Analysis category

3D

Total

Per unit length

Per unit area

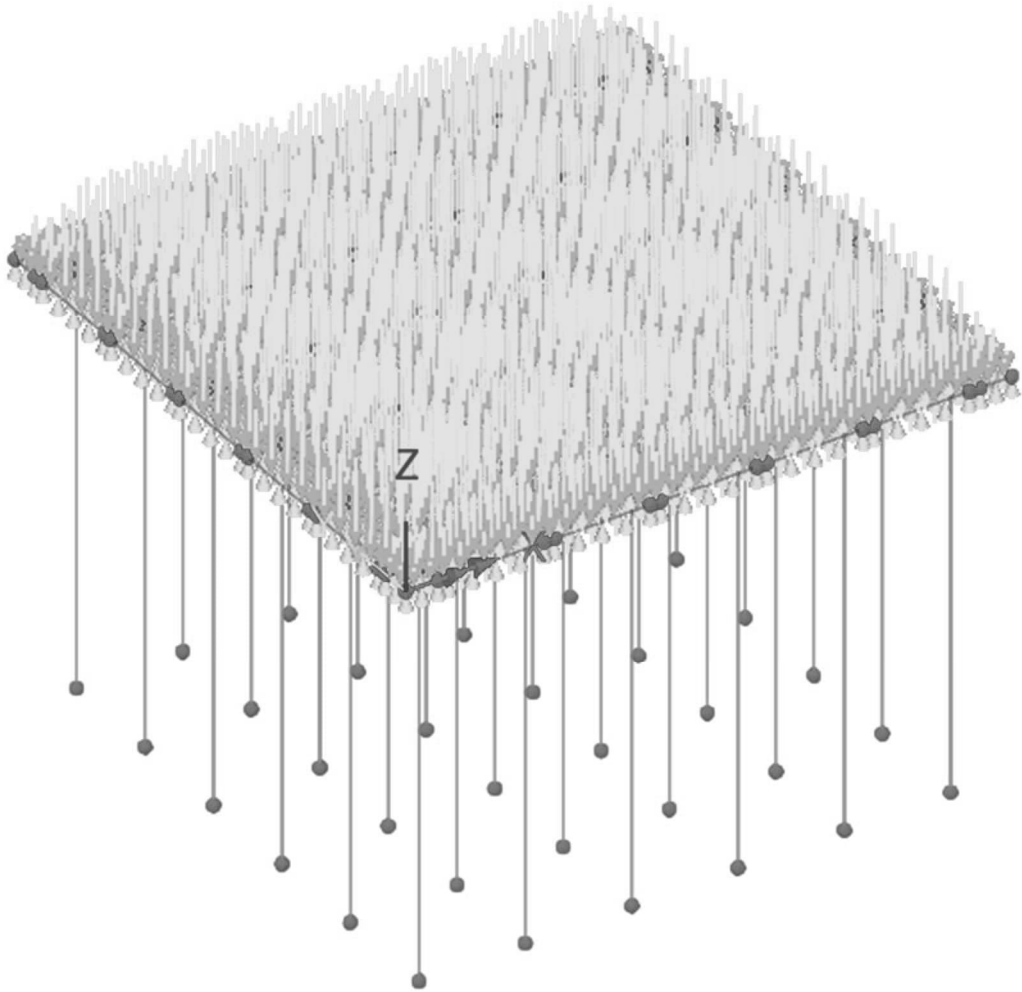
Component	Value
X Direction	0.0
Y Direction	0.0
Z Direction	-20.0

Name

Surface load

(2)

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A3:6
		Date :	Created :



Overview 3D

3.

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A3:7
		Date :	Created :

3.3 LOAD COMBINATIONS

Verification of load capacity shall be carried out for several limit states as detailed in this section.

Fatigue Limit State:

The risk of fatigue according to the partial factor method is checked using equation 6.69 provided in document SS-EN 1992-1-1.

Other Limit States:

For other limit states, section 6.4.3 of EN-1990 is applied.

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A3:8
	Pile deck	Date :	Created :

3.3.1 Ultimate Limit States (ULS)

When checking the ultimate limit state, the load factors vary depending on the type of failure as detailed below:

STR: Verification of structural bearing capacity

GEO: Verification of geotechnical bearing capacity

For checking the ultimate limit state, TRVNFRA-00227 section 7.1.6.3 specifies requirements for load combinations as follows.

Design Method D2 (Set B):

Design Method D2 (Set B) according to TSFS 2018:57 Table 4.4 shall be applied for the structural bearing capacity of the construction (STR; SK 3).

Design Method is defined according to EN-1990 equations 6.10a and 6.10b as detailed below.

$$E_{Sd}^{10a} = \sum_{j \geq 1} \gamma_{G,j} \cdot G_{k,j} + \gamma_{Q,1} \cdot \psi_{0,1} \cdot Q_{k,1} + \sum_{i > 1} \gamma_{Q,i} \cdot \psi_{0,i} \cdot Q_{k,i} = \psi \gamma_{ULS-A} \cdot \left(\sum_{j > 1} G_{k,j} + \sum_{i > 1} Q_{k,i} \right)$$

$$E_{Sd}^{10b} = \sum_{j \geq 1} \xi_j \cdot \gamma_{G,j} \cdot G_{k,j} + \gamma_{Q,1} \cdot Q_{k,1} + \sum_{i > 1} \gamma_{Q,i} \cdot \psi_{0,i} \cdot Q_{k,i} = \psi \gamma_{ULS-B} \cdot \left(\sum_{j > 1} G_{k,j} + \sum_{i > 1} Q_{k,i} \right)$$

Equation 6.10a refers to the (ULS-A) case where the permanent loads are dominant, usually during the construction phase.

Equation 6.10b refers to the (ULS-B) case where the variable loads are dominant.

Design method 2 (set B) according to TSFS 2018:57 table 4.4 shall be applied for the structural capacity (STR; SK3).

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A3:9
	Pile deck	Date :	Created :

Design method D3 (set C):

Design method D3 (set C) according to TSFS 2018:57 table 4.5 shall be applied for determining geotechnical bearing capacity (GEO; SK 2).

The design method is defined according to EN-1990 equation 6.10a and 6.10b as presented below.

$$E_{Sd}^{10a} = \sum_{j \geq 1} \gamma_{G,j} \cdot G_{k,j} + \gamma_{Q,1} \cdot \psi_{0,1} \cdot Q_{k,1} + \sum_{i > 1} \gamma_{Q,i} \cdot \psi_{0,i} \cdot Q_{k,i} = \psi \gamma_{ULS-GA} \cdot \left(\sum_{j > 1} G_{k,j} + \sum_{i > 1} Q_{k,i} \right)$$

$$E_{Sd}^{10b} = \sum_{j \geq 1} \xi_j \cdot \gamma_{G,j} \cdot G_{k,j} + \gamma_{Q,1} \cdot Q_{k,1} + \sum_{i > 1} \gamma_{Q,i} \cdot \psi_{0,i} \cdot Q_{k,i} = \psi \gamma_{ULS-GB} \cdot \left(\sum_{j > 1} G_{k,j} + \sum_{i > 1} Q_{k,i} \right)$$

Equation 6.10a refers to the (ULS-A) case where the permanent loads are dominant, usually during the construction phase.

Equation 6.10b (ULS-B) refers to the case where the variable loads are dominant.

Design method 3 (set C) according to TSFS 2018:57 table 4.5 shall be applied for determining geotechnical bearing capacity (GEO).

A1 (construction loads)

All load factors are less than set B.

A2 (geotechnical loads)

- Load coefficient earth pressure: $\psi \gamma_{jord} = \gamma_d \cdot 1.1 \cdot \eta_{sup.G} = 0.91 \cdot 1.1 \cdot 1.1 = 1.10$
- Load coefficient surcharge: $\psi \gamma_{över} = \gamma_d \cdot 1.40 = 0.91 \cdot 1.40 = 1.27$

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A3:10
		Date :	Created :

Permanent loads:

Nr	Load		$\Psi\gamma_{ULS-A}$	$\Psi\gamma_{ULS-B}$		$\Psi\gamma_{ULS}$
1	Dead weight	max	1,25	1,10	$\Rightarrow$	1.10
		min	1,00	1,00		1.00
2	Bankfilling	max	1.25	1,20		1.20
		min	0,90	0.90		0.90
3	Surface load	max	1.00	1.50		1,50

Remark
Equation ULS-B is considered dominant; thus ULS-A is not considered.

	Part A – CALCULATION ASSUMPTIONS Pile deck	Status :	Page: A3:11
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3.3.2 Service limit state (SLS)

Not considered in this analysis.

Appendix 1: Input receipt (system 001)

Pile deck

	Appendix 1: Input receipt SYSTEM 001	Status :	Page: 1
	Pile deck	Date :	Created:

Title: Input receipt

Model Units: kN,m,t,s,C
Report Units: kN,m,t,s,C

Model Title: System 001
Model File: System 001

Clarification of definitions.

In the report, the letter “T” is used to describe a range. The letter is an abbreviation of “to”.

See example of assignment below.

Assignment to Lines:
105T110;114T119

This expression means that the assignment occurs to the lines L105 → L110 and L114 → L119.

Assignment to Surfaces:
3T17;19T24

This expression means that the assignment occurs to the surfaces S3 → S17 and S19 → S24.

	Appendix 1: Input receipt SYSTEM 001	Status :	Page: 2
	Pile deck	Date :	Created:

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	Appendix 1: Input receipt SYSTEM 001 Pile deck	Status :	Page: 3
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1. Points

Point	X coordinate	Y coordinate	Z coordinate
1	0.7	0.7	-8.0
2	2.7	0.7	-8.0
3	4.7	0.7	-8.0
4	6.7	0.7	-8.0
5	8.7	0.7	-8.0
6	10.7	0.7	-8.0
7	0.7	2.7	-8.0
8	2.7	2.7	-8.0
9	4.7	2.7	-8.0
10	6.7	2.7	-8.0
11	8.7	2.7	-8.0
12	10.7	2.7	-8.0
13	0.7	4.7	-8.0
14	2.7	4.7	-8.0
15	4.7	4.7	-8.0
16	6.7	4.7	-8.0
17	8.7	4.7	-8.0
18	10.7	4.7	-8.0
19	0.7	6.7	-8.0
20	2.7	6.7	-8.0
21	4.7	6.7	-8.0
22	6.7	6.7	-8.0
23	8.7	6.7	-8.0
24	10.7	6.7	-8.0
25	0.7	8.7	-8.0
26	2.7	8.7	-8.0
27	4.7	8.7	-8.0
28	6.7	8.7	-8.0
29	8.7	8.7	-8.0
30	10.7	8.7	-8.0
31	0.7	10.7	-8.0
32	2.7	10.7	-8.0
33	4.7	10.7	-8.0
34	6.7	10.7	-8.0
35	8.7	10.7	-8.0
36	10.7	10.7	-8.0
37	0.7	0.7	-0.3
38	2.7	0.7	-0.3
39	4.7	0.7	-0.3
40	6.7	0.7	-0.3
41	8.7	0.7	-0.3
42	10.7	0.7	-0.3
43	0.7	2.7	-0.3
44	2.7	2.7	-0.3
45	4.7	2.7	-0.3
46	6.7	2.7	-0.3
47	8.7	2.7	-0.3
48	10.7	2.7	-0.3
49	0.7	4.7	-0.3
50	2.7	4.7	-0.3
51	4.7	4.7	-0.3
52	6.7	4.7	-0.3
53	8.7	4.7	-0.3
54	10.7	4.7	-0.3
55	0.7	6.7	-0.3
56	2.7	6.7	-0.3
57	4.7	6.7	-0.3
58	6.7	6.7	-0.3
59	8.7	6.7	-0.3
60	10.7	6.7	-0.3
61	0.7	8.7	-0.3
62	2.7	8.7	-0.3
63	4.7	8.7	-0.3
64	6.7	8.7	-0.3
65	8.7	8.7	-0.3
66	10.7	8.7	-0.3
67	0.7	10.7	-0.3
68	2.7	10.7	-0.3
69	4.7	10.7	-0.3
70	6.7	10.7	-0.3

	Appendix 1: Input receipt SYSTEM 001 Pile deck	Status :	Page: 4
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Point	X coordinate	Y coordinate	Z coordinate
71	8.7	10.7	-0.3
72	10.7	10.7	-0.3
73	0.0	0.0	0.0
74	0.6	0.0	0.0
75	0.8	0.0	0.0
76	2.6	0.0	0.0
77	2.8	0.0	0.0
78	4.6	0.0	0.0
79	4.8	0.0	0.0
80	6.6	0.0	0.0
81	6.8	0.0	0.0
82	8.6	0.0	0.0
83	8.8	0.0	0.0
84	10.6	0.0	0.0
85	10.8	0.0	0.0
86	11.4	0.0	0.0
87	0.0	0.6	0.0
88	0.6	0.6	0.0
89	0.8	0.6	0.0
90	2.6	0.6	0.0
91	2.8	0.6	0.0
92	4.6	0.6	0.0
93	4.8	0.6	0.0
94	6.6	0.6	0.0
95	6.8	0.6	0.0
96	8.6	0.6	0.0
97	8.8	0.6	0.0
98	10.6	0.6	0.0
99	10.8	0.6	0.0
100	11.4	0.6	0.0
101	0.0	0.8	0.0
102	0.6	0.8	0.0
103	0.8	0.8	0.0
104	2.6	0.8	0.0
105	2.8	0.8	0.0
106	4.6	0.8	0.0
107	4.8	0.8	0.0
108	6.6	0.8	0.0
109	6.8	0.8	0.0
110	8.6	0.8	0.0
111	8.8	0.8	0.0
112	10.6	0.8	0.0
113	10.8	0.8	0.0
114	11.4	0.8	0.0
115	0.0	2.6	0.0
116	0.6	2.6	0.0
117	0.8	2.6	0.0
118	2.6	2.6	0.0
119	2.8	2.6	0.0
120	4.6	2.6	0.0
121	4.8	2.6	0.0
122	6.6	2.6	0.0
123	6.8	2.6	0.0
124	8.6	2.6	0.0
125	8.8	2.6	0.0
126	10.6	2.6	0.0
127	10.8	2.6	0.0
128	11.4	2.6	0.0
131	0.0	2.8	0.0
132	0.6	2.8	0.0
133	0.8	2.8	0.0
134	2.6	2.8	0.0
135	2.8	2.8	0.0
136	4.6	2.8	0.0
137	4.8	2.8	0.0
138	6.6	2.8	0.0
139	6.8	2.8	0.0
140	8.6	2.8	0.0
141	8.8	2.8	0.0
142	10.6	2.8	0.0
143	10.8	2.8	0.0
144	11.4	2.8	0.0
145	0.0	4.6	0.0
146	0.6	4.6	0.0

	Appendix 1: Input receipt SYSTEM 001 Pile deck	Status :	Page: 5
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Point	X coordinate	Y coordinate	Z coordinate
147	0.8	4.6	0.0
148	2.6	4.6	0.0
149	2.8	4.6	0.0
150	4.6	4.6	0.0
151	4.8	4.6	0.0
152	6.6	4.6	0.0
153	6.8	4.6	0.0
154	8.6	4.6	0.0
155	8.8	4.6	0.0
156	10.6	4.6	0.0
157	10.8	4.6	0.0
158	11.4	4.6	0.0
159	0.0	4.8	0.0
160	0.6	4.8	0.0
161	0.8	4.8	0.0
162	2.6	4.8	0.0
163	2.8	4.8	0.0
164	4.6	4.8	0.0
165	4.8	4.8	0.0
166	6.6	4.8	0.0
167	6.8	4.8	0.0
168	8.6	4.8	0.0
169	8.8	4.8	0.0
170	10.6	4.8	0.0
171	10.8	4.8	0.0
172	11.4	4.8	0.0
173	0.0	6.6	0.0
174	0.6	6.6	0.0
175	0.8	6.6	0.0
176	2.6	6.6	0.0
177	2.8	6.6	0.0
178	4.6	6.6	0.0
179	4.8	6.6	0.0
180	6.6	6.6	0.0
181	6.8	6.6	0.0
182	8.6	6.6	0.0
183	8.8	6.6	0.0
184	10.6	6.6	0.0
185	10.8	6.6	0.0
186	11.4	6.6	0.0
187	0.0	6.8	0.0
188	0.6	6.8	0.0
189	0.8	6.8	0.0
190	2.6	6.8	0.0
191	2.8	6.8	0.0
192	4.6	6.8	0.0
193	4.8	6.8	0.0
194	6.6	6.8	0.0
195	6.8	6.8	0.0
196	8.6	6.8	0.0
197	8.8	6.8	0.0
198	10.6	6.8	0.0
199	10.8	6.8	0.0
200	11.4	6.8	0.0
201	0.0	8.6	0.0
202	0.6	8.6	0.0
203	0.8	8.6	0.0
204	2.6	8.6	0.0
205	2.8	8.6	0.0
206	4.6	8.6	0.0
207	4.8	8.6	0.0
208	6.6	8.6	0.0
209	6.8	8.6	0.0
210	8.6	8.6	0.0
211	8.8	8.6	0.0
212	10.6	8.6	0.0
213	10.8	8.6	0.0
214	11.4	8.6	0.0
215	0.0	8.8	0.0
216	0.6	8.8	0.0
217	0.8	8.8	0.0
218	2.6	8.8	0.0
219	2.8	8.8	0.0
220	4.6	8.8	0.0

	Appendix 1: Input receipt SYSTEM 001 Pile deck	Status :	Page: 6
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Point	X coordinate	Y coordinate	Z coordinate
221	4.8	8.8	0.0
222	6.6	8.8	0.0
223	6.8	8.8	0.0
224	8.6	8.8	0.0
225	8.8	8.8	0.0
226	10.6	8.8	0.0
227	10.8	8.8	0.0
228	11.4	8.8	0.0
229	0.0	10.6	0.0
230	0.6	10.6	0.0
231	0.8	10.6	0.0
232	2.6	10.6	0.0
233	2.8	10.6	0.0
234	4.6	10.6	0.0
235	4.8	10.6	0.0
236	6.6	10.6	0.0
237	6.8	10.6	0.0
238	8.6	10.6	0.0
239	8.8	10.6	0.0
240	10.6	10.6	0.0
241	10.8	10.6	0.0
242	11.4	10.6	0.0
243	0.0	10.8	0.0
244	0.6	10.8	0.0
245	0.8	10.8	0.0
246	2.6	10.8	0.0
247	2.8	10.8	0.0
248	4.6	10.8	0.0
249	4.8	10.8	0.0
250	6.6	10.8	0.0
251	6.8	10.8	0.0
252	8.6	10.8	0.0
253	8.8	10.8	0.0
254	10.6	10.8	0.0
255	10.8	10.8	0.0
256	11.4	10.8	0.0
257	0.0	11.4	0.0
258	0.6	11.4	0.0
259	0.8	11.4	0.0
260	2.6	11.4	0.0
261	2.8	11.4	0.0
262	4.6	11.4	0.0
263	4.8	11.4	0.0
264	6.6	11.4	0.0
265	6.8	11.4	0.0
266	8.6	11.4	0.0
267	8.8	11.4	0.0
268	10.6	11.4	0.0
269	10.8	11.4	0.0
270	11.4	11.4	0.0

	Appendix 1: Input receipt SYSTEM 001 Pile deck	Status :	Page: 7
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2. Lines

Line	Points	Line	Points
1	1,37	2	2,38
3	3,39	4	4,40
5	5,41	6	6,42
7	7,43	8	8,44
9	9,45	10	10,46
11	11,47	12	12,48
13	13,49	14	14,50
15	15,51	16	16,52
17	17,53	18	18,54
19	19,55	20	20,56
21	21,57	22	22,58
23	23,59	24	24,60
25	25,61	26	26,62
27	27,63	28	28,64
29	29,65	30	30,66
31	31,67	32	32,68
33	33,69	34	34,70
35	35,71	36	36,72
37	74,73	38	74,75
39	76,75	40	76,77
41	78,77	42	78,79
43	80,79	44	80,81
45	82,81	46	82,83
47	84,83	48	84,85
49	86,85	50	87,73
51	88,74	52	75,89
53	76,90	54	91,77
55	78,92	56	93,79
57	80,94	58	95,81
59	82,96	60	83,97
61	84,98	62	85,99
63	100,86	64	88,87
65	89,88	66	90,89
67	91,90	68	92,91
69	93,92	70	94,93
71	95,94	72	96,95
73	97,96	74	98,97
75	99,98	76	100,99
77	87,101	78	88,102
79	103,89	80	104,90
81	91,105	82	106,92
83	93,107	84	108,94
85	95,109	86	110,96
87	111,97	88	112,98
89	99,113	90	100,114
91	102,101	92	102,103
93	104,103	94	104,105
95	106,105	96	106,107
97	108,107	98	108,109
99	110,109	100	110,111
101	112,111	102	112,113
103	114,113	104	101,115
105	116,102	106	117,103
107	104,118	108	105,119
109	106,120	110	107,121
111	108,122	112	109,123
113	110,124	114	125,111
115	112,126	116	127,113
117	128,114	118	116,115
119	116,117	120	118,117
121	118,119	122	120,119
123	120,121	124	122,121
125	122,123	126	124,123
127	124,125	128	126,125
129	126,127	130	128,127
131	115,131	132	116,132
133	133,117	134	134,118
135	119,135	137	136,120
138	121,137	139	138,122
140	123,139	141	140,124

	Appendix 1: Input receipt SYSTEM 001 Pile deck	Status :	Page: 8
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Line	Points	Line	Points
142	141,125	143	142,126
144	127,143	145	128,144
146	132,131	147	132,133
148	134,133	149	134,135
150	136,135	151	136,137
152	138,137	153	138,139
154	140,139	155	140,141
156	142,141	157	142,143
158	144,143	159	131,145
160	146,132	161	147,133
162	134,148	163	135,149
164	136,150	165	137,151
166	138,152	167	139,153
168	140,154	169	155,141
170	142,156	171	157,143
172	158,144	173	146,145
174	146,147	175	148,147
176	148,149	177	150,149
178	150,151	179	152,151
180	152,153	181	154,153
182	154,155	183	156,155
184	156,157	185	158,157
186	145,159	187	146,160
188	161,147	189	162,148
190	149,163	191	164,150
192	151,165	193	166,152
194	153,167	195	168,154
196	169,155	197	170,156
198	157,171	199	158,172
200	160,159	201	160,161
202	162,161	203	162,163
204	164,163	205	164,165
206	166,165	207	166,167
208	168,167	209	168,169
210	170,169	211	170,171
212	172,171	213	159,173
214	174,160	215	175,161
216	162,176	217	163,177
218	164,178	219	165,179
220	166,180	221	167,181
222	168,182	223	183,169
224	170,184	225	185,171
226	186,172	227	174,173
228	174,175	229	174,175
230	176,175	231	176,177
232	178,177	233	178,179
234	180,179	235	180,181
236	182,181	237	182,183
238	184,183	239	184,185
240	186,185	241	173,187
242	174,188	243	174,188
244	189,175	245	189,175
246	190,176	247	177,191
248	192,178	249	179,193
250	194,180	251	181,195
252	196,182	253	197,183
254	198,184	255	185,199
256	186,200	257	188,187
258	188,189	259	188,189
260	190,189	261	190,191
262	192,191	263	192,193
264	194,193	265	194,195
266	196,195	267	196,197
268	198,197	269	198,199
270	200,199	271	187,201
272	188,202	273	203,189
274	190,204	275	191,205
276	192,206	277	193,207
278	194,208	279	195,209
280	196,210	281	211,197
282	198,212	283	213,199
284	200,214	285	202,201
286	202,203	287	202,203
288	204,203	289	204,205

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Line	Points	Line	Points
290	206,205	291	206,207
292	208,207	293	208,209
294	210,209	295	210,211
296	212,211	297	212,213
298	214,213	299	201,215
300	202,216	301	202,216
302	217,203	303	217,203
304	218,204	305	205,219
306	220,206	307	207,221
308	222,208	309	209,223
310	224,210	311	225,211
312	226,212	313	213,227
314	214,228	315	216,215
316	216,217	317	216,217
318	218,217	319	218,219
320	220,219	321	220,221
322	222,221	323	222,223
324	224,223	325	224,225
326	226,225	327	226,227
328	228,227	329	215,229
330	230,216	331	231,217
332	218,232	333	219,233
334	220,234	335	221,235
336	222,236	337	223,237
338	224,238	339	239,225
340	226,240	341	241,227
342	242,228	343	230,229
344	230,231	345	232,231
346	232,233	347	234,233
348	234,235	349	236,235
350	236,237	351	238,237
352	238,239	353	240,239
354	240,241	355	242,241
356	229,243	357	230,244
358	245,231	359	232,246
360	247,233	361	234,248
362	249,235	363	236,250
364	251,237	365	238,252
366	253,239	367	240,254
368	255,241	369	242,256
370	244,243	371	244,245
372	246,245	373	246,247
374	248,247	375	248,249
376	250,249	377	250,251
378	252,251	379	252,253
380	254,253	381	254,255
382	256,255	383	257,243
384	258,244	385	245,259
386	246,260	387	261,247
388	248,262	389	263,249
390	250,264	391	265,251
392	252,266	393	267,253
394	254,268	395	269,255
396	270,256	397	258,257
398	259,258	399	260,259
400	261,260	401	262,261
402	263,262	403	264,263
404	265,264	405	266,265
406	267,266	407	268,267
408	269,268	409	270,269

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3. Surfaces

Surface	Lines	Surface	Lines
2	37,51,64,50	6	64,78,91,77
7	65,79,92,78	8	38,52,65,51
9	91,105,118,104	10	92,106,119,105
11	39,53,66,52	13	93,107,120,106
14	66,80,93,79	18	41,55,68,54
19	95,109,122,108	20	68,82,95,81
24	43,57,70,56	25	97,111,124,110
26	70,84,97,83	30	45,59,72,58
31	99,113,126,112	32	72,86,99,85
39	118,132,146,131	41	146,160,173,159
42	147,161,174,160	43	148,162,175,161
44	120,134,148,133	47	150,164,177,163
48	122,137,150,135	51	152,166,179,165
52	124,139,152,138	55	154,168,181,167
56	126,141,154,140	61	173,187,200,186
63	200,214,227,213	64	201,215,228,214
65	202,216,230,215	66	175,189,202,188
69	204,218,232,217	70	177,191,204,190
73	206,220,234,219	74	179,193,206,192
77	208,222,236,221	78	181,195,208,194
83	227,243,257,241	85	257,272,285,271
86	258,273,287,272	87	260,274,288,273
88	230,246,260,244	91	262,276,290,275
92	232,248,262,247	95	264,278,292,277
96	234,250,264,249	99	266,280,294,279
100	236,252,266,251	105	285,301,315,299
107	315,330,343,329	108	316,331,344,330
109	318,332,345,331	110	288,304,318,303
113	320,334,347,333	114	290,306,320,305
117	322,336,349,335	118	292,308,322,307
121	324,338,351,337	122	294,310,324,309
162	370,384,397,383	163	371,385,398,384
164	372,386,399,385	166	374,388,401,387
168	376,390,403,389	170	378,392,405,391
180	40,54,67,53	181	94,108,121,107
182	149,163,176,162	183	203,217,231,216
184	261,275,289,274	185	319,333,346,332
186	373,387,400,386	192	42,56,69,55
193	96,110,123,109	194	151,165,178,164
195	205,219,233,218	196	263,277,291,276
197	321,335,348,334	198	375,389,402,388
217	44,58,71,57	218	98,112,125,111
219	153,167,180,166	220	207,221,235,220
221	265,279,293,278	222	323,337,350,336
223	377,391,404,390	228	47,61,74,60
229	101,115,128,114	230	74,88,101,87
231	156,170,183,169	232	128,143,156,142
233	210,224,238,223	234	183,197,210,196
235	268,282,296,281	236	238,254,268,253
237	326,340,353,339	238	296,312,326,311
240	380,394,407,393	242	46,60,73,59
243	100,114,127,113	244	155,169,182,168
245	209,223,237,222	246	267,281,295,280
247	325,339,352,338	248	379,393,406,392
254	48,62,75,61	255	102,116,129,115
256	157,171,184,170	257	211,225,239,224
258	269,283,297,282	259	327,341,354,340
260	381,395,408,394	265	49,63,76,62
266	76,90,103,89	267	103,117,130,116
268	130,145,158,144	269	158,172,185,171
270	185,199,212,198	271	212,226,240,225
272	240,256,270,255	273	270,284,298,283
274	298,314,328,313	275	328,342,355,341
276	382,396,409,395	277	343,357,370,356
278	345,359,372,358	279	347,361,374,360
280	349,363,376,362	281	351,365,378,364
286	353,367,380,366	289	355,369,382,368
325	119,133,147,132	334	67,81,94,80
335	69,83,96,82	336	71,85,98,84
337	73,87,100,86	338	75,89,102,88

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Surface	Lines	Surface	Lines
339	121,135,149,134	340	123,138,151,137
341	125,140,153,139	342	127,142,155,141
343	129,144,157,143	344	176,190,203,189
345	178,192,205,191	346	180,194,207,193
347	182,196,209,195	348	184,198,211,197
349	231,247,261,246	350	233,249,263,248
351	235,251,265,250	352	237,253,267,252
353	239,255,269,254	354	289,305,319,304
355	291,307,321,306	356	293,309,323,308
357	295,311,325,310	358	297,313,327,312
359	346,360,373,359	360	348,362,375,361
361	350,364,377,363	362	352,366,379,365
363	354,368,381,367	364	174,188,201,187
365	229,245,259,242	366	286,302,317,300
367	344,358,371,357		

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4. MESH:Line

Attribute: 9 Title: Element: 1 m
Sub Type = Line Mesh Element Type = BMI21
Mesh spacing Element size
Irregular 1.0

Start node end releases: End node end releases:
None None

Assignment to Lines: Beta angle = 0.0
1T36

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5. MESH:Surface

Attribute: 2 Title: Element 4 x 4

Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	4
Number of divisions in y	yDivisions	4
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:

13T31I6;43T55I4;65T77I4;87T99I4;109T121I4;229T237I2

Attribute: 3 Title: Element 4 x 2

Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	4
Number of divisions in y	yDivisions	2
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:

11;18;24;30;164T170I2;228;240

Attribute: 4 Title: Element 2 x 4

Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	2
Number of divisions in y	yDivisions	4
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:

9;41;63T107I22;267T275I2

Attribute: 5 Title: Element 2 x 1

Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	2
Number of divisions in y	yDivisions	1
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:

6;39;61T105I22;266T274I2;277;289

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Attribute: 6 Title: Element 2 x 2

Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	2
Number of divisions in y	yDivisions	2
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:

2;162;265;276

Attribute: 7 Title: Element 4 x 1

Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	4
Number of divisions in y	yDivisions	1
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:

14T32I6;44T56I4;66T78I4;88T100I4;110T122I4;230T238I2;278T281;286

Attribute: 8 Title: Element 1 x 1

Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	1
Number of divisions in y	yDivisions	1
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:

7;325;334T367

Attribute: 10 Title: Element 1 x 2

Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	1
Number of divisions in y	yDivisions	2
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:

8;163;180T198I6;217;223;242T260I6

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Attribute: 11 Title: Element 1 x 4
Sub Type = Surface Mesh Element Type = QTS8

Property	Symbol	Value
Element size	size	0.0
Number of divisions in x	xDivisions	1
Number of divisions in y	yDivisions	4
Transition mesh	transition	true
Allow irregular mesh	allowIrregular	true
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Surfaces:
10;42;64T108I22;181T185;193T197;218T222;243T247;255T259

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6. MESH:Joint

Attribute: 1 Title: Pile connection

Sub Type = Point Mesh Element Type = JNT4

Property	Symbol	Value
Element defined by name	DefinedByName	false
Single feature joint	isSingleFtrJnt	false

Assignment to Points: Beta angle = 0.0, Interface secondary Point 37, Mesh from primary to secondary
88T99;102T113;116T127;132T143;146T157;160T171;174T185;188T199;202T213;216T227;230T241;244T255

Attribute: 13 Title: Soil/pile

Sub Type = Line Mesh Element Type = JNT4

Mesh spacing	Start node end releases:	End node end releases:
Uniform	None	None

Assignment to Lines: Single feature insertion type : grounded
1T36

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7. Geometric : Line

Attribute: 2 Title: Pile (RD 320 x 12 (CHS D=0.32 t=0.012))

Sub Type = Line Geometric

Assigned in: Analysis 1

Property	Symbol	Value
Cross sectional area	A	0.0
Second moment of area about y axis	Iyy	0.0
Second moment of area about z axis	Izz	0.0
Product moment of area	Iyz	0.0
Torsional constant	J	0.0
Eccentricity in local z direction, relative to specified origin	ez0	0.0
Eccentricity in local y direction, relative to specified origin	ey0	0.0
Eccentricity in local z direction, relative to beam centroid	ez	0.0
Eccentricity in local y direction, relative to beam centroid	ey	0.0
Wagner constant 1st moment of square radius about y (Iyr)	Iyr	0.0
Wagner constant 1st moment of square radius about z (Izr)	Izr	0.0
Wagner constant 4th moment of area about origin (Irr)	Irr	0.0
Wagner constant 2nd moment of warping about origin (Iwr)	Iwr	0.0
Effective shear area in local z direction	Asz	0.0
Effective shear area in local y direction	Asy	0.0
Plastic area	Ap	0.0
Plastic modulus for bending about y	Zpy	0.0
Plastic modulus for bending about z	Zpz	0.0
Plastic neutral axis, distance from centroid along y axis	yp	0.0
Plastic neutral axis, distance from centroid along z axis	zp	0.0
Plastic torsional section modulus	Zpt	0.0
Warping torsional constant about shear centre	Cw	0.0
Shear centre about y axis	yo	0.0
Shear centre about z axis	zo	0.0
Monosymmetry constant about y	betay	0.0
Monosymmetry constant about z	betaz	0.0
Radius of gyration about y axis	ky	0.1
Radius of gyration about z axis	kz	0.1
y axis extreme fibre, top	yt	0.2
y axis extreme fibre, bottom	yb	-0.2
z axis extreme fibre, top	zt	0.2
z axis extreme fibre, bottom	zb	-0.2
Shape code identifier	Type	4
Outer diameter of this section	D	0.3
Thickness of this section	t	0.0
Element type	elementType	"3D Thick Beam"
Reinforcement	reinforcement	None

Assignment to Lines:

1T36

8. Geometric: Surface

Attribute: 1 Title: t = 0.6 m

Sub Type = Surface Geometric

Assigned in: Analysis 1

Property	Symbol	Value
Thickness	t	0.6
Eccentricity in local z direction, relative to beam centroid	ez	0.0

Assignment to Surfaces:

2;6;7T11;13;14;18T20;24T26;30T32;39;41;42T44;47;48;51;52;55;56;61;63;64T66;69;70;73;74;77;78;83;85;86T88;91;92;95;96;99;100;105;107;108T110;113;114;117;118;121;122;162T164;166T170I2;180T186;192T198;217T223;228T238;240;242;243T248;254T260;265T281;286;289;325;334;335T367

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9. Isotropic material

Attribute: 2 Title: Concrete (C30/37 | Concrete | EN1992-1-1:2004/2014)

Sub Type = Isotropic Material

Assigned in: Analysis 1

Property	Symbol	Value
Young's modulus	E	33000000.0
Poisson's ratio	nu	0.2
Density	rho	2.5
Coefficient of thermal expansion	alpha	0.0
Characteristic compressive cylinder strength of concrete at 28 days	fck	30000.0
Mean value of axial tensile strength of concrete	fctm	2900.0
Ultimate compressive strain limit 3	ecu3	0.0
Design compressive strength 3	fcd3	20000.0
Compressive strain limit 3	ec3	0.0
Modulus of elasticity 3	E3	11428571.4

Loadcase ID: 1 Title: ULS

Assignment to Surfaces:

2;6;7T11;13;14;18T20;24T26;30T32;39;41;42T44;47;48;51;52;55;56;61;63;64T66;69;70;73;74;77;78;83;85;86T88;91;92;95;96;99;100;105;107;108T110;113;114;117;118;121;122;162T164;166T170I2;180T186;192T198;217T223;228T238;240;242;243T248;254T260;265T281;286;289;325;334;335T367

Attribute: 3 Title: Steel (Ungraded | Steel - Structural | EN1993-1-1:2005)

Sub Type = Isotropic Material

Assigned in: Analysis 1

Property	Symbol	Value
Young's modulus	E	210000000.0
Poisson's ratio	nu	0.3
Density	rho	7.8
Coefficient of thermal expansion	alpha	0.0

Loadcase ID: 1 Title: ULS

Assignment to Lines:

1T36

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10. Joint material

Attribute: 1 Title: Pile connection

Sub Type = Joint Material, Spring Stiffness Only

Assigned in: Analysis 1

	u	v	w
Number of degrees of freedom	nDOF	3	3
Joint type	JointType	"Solids / 3D space membranes"	"Solids / 3D space membranes"
Assignment type	Assignment	"Point"	"Point"
Elastic spring stiffness	K[0]	1000000.0	1000000.0
Elastic spring stiffness	K[1]	1000000.0	1000000.0
Elastic spring stiffness	K[2]	1000000.0	1000000.0

Loadcase ID: 1 Title: ULS

Assignment to Points:

88T99;102T113;116T127;132T143;146T157;160T171;174T185;188T199;202T213;216T227;230T241;244T255

Assignment to Lines:

121;134;135;149;228;243;244;258;287;301;303;316

Attribute: 4 Title: Soil/pile

Sub Type = Joint Material, Elasto-Plastic (Tension and Compression Equal)

Assigned in: Analysis 1

	u	v	w
Number of degrees of freedom	nDOF	3	3
Joint type	JointType	"Solids / 3D space membranes"	"Solids / 3D space membranes"
Assignment type	Assignment	"Line"	"Line"
Yield force	F[0]	0.0	0.0
Yield force	F[1]	1000.0	1000.0
Yield force	F[2]	1000.0	1000.0
Hardening stiffness	H[0]	0.0	0.0
Hardening stiffness	H[1]	10.0	10.0
Hardening stiffness	H[2]	10.0	10.0
Elastic spring stiffness	K[0]	0.0	0.0
Elastic spring stiffness	K[1]	1000.0	1000.0
Elastic spring stiffness	K[2]	1000.0	1000.0
Mass	M[0]	0.0	0.0
Mass	M[1]	0.0	0.0
Mass	M[2]	0.0	0.0
Mass position	MassPosition	"Between nodes"	"Between nodes"

Loadcase ID: 1 Title: ULS

Assignment to Lines:

1T36

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11. Support

Attribute: 1 Title: Pinned

Sub Type = Structural Support

Assigned in: Analysis 1

Property	Symbol	Value
Translation in X	U	"R"
Translation in Y	V	"R"
Translation in Z	W	"R"
Rotation about X	THX	"S"
Rotation about Y	THY	"S"
Rotation about Z	THZ	"F"
Torsional warping	Torsion	"F"
Moment about hinge	L1	"F"
Pore pressure	pore	"C"
Spring stiffness distribution	springType	"Total"
Stiffness in rotation about X	THXstiff	100.0
Stiffness in rotation about Y	THYstiff	100.0

Assignment to Points:

1T36

12. Body load

Attribute: 3 Title: Dead weight

Sub Type = Body Force Load

Property	Symbol	Value
Linear acceleration in X	AccX	0.0
Linear acceleration in Y	AccY	0.0
Linear acceleration in Z	AccZ	-10.0
Angular velocity about X axis	AngVelX	0.0
Angular velocity about Y axis	AngVelY	0.0
Angular velocity about Z axis	AngVelZ	0.0
Angular acceleration about X axis	AngAccX	0.0
Angular acceleration about Y axis	AngAccY	0.0
Angular acceleration about Z axis	AngAccZ	0.0
Linear acceleration In X fluid phase	lnFlAccX	0.0
Linear acceleration In Y fluid phase	lnFlAccY	0.0
Linear acceleration In Z fluid phase	lnFlAccZ	-10.0

Assignment to Surfaces:

2;6;7T11;13;14;18T20;24T26;30T32;39;41;42T44;47;48;51;52;55;56;61;63;64T66;69;70;73;74;77;78;83;85;86T88;91;92;95;96;99;100;105;107;108T110;113;114;117;118;121;122;162T164;166T170I2;180T186;192T198;217T223;228T238;240;242;243T248;254T260;265T281;286;289;325;334;335T367

	Appendix 1: Input receipt SYSTEM 001 Pile deck	Status :	Page: 21
		Date :	Created:

13. Global distributed

Attribute: 1 Title: Bankfilling

Sub Type = Global Distributed Load

Property	Symbol	Value
Attribute type	type	"Area"
X Direction	WX	0.0
Y Direction	WY	0.0
Z Direction	WZ	-120.0
Pore pressure flux	pwp	0.0
Keep global	keepGlobal	false

Assignment to Surfaces:

2;6;7T11;13;14;18T20;24T26;30T32;39;41;42T44;47;48;51;52;55;56;61;63;64T66;69;70;73;74;77;78;83;85;86T88;91;92;95;96;99;100;105;107;108T110;113;114;117;118;121;122;162T164;166T170I2;180T186;192T198;217T223;228T238;240;242;243T248;254T260;265T281;286;289;325;334;335T367

Attribute: 2 Title: Surface load

Sub Type = Global Distributed Load

Property	Symbol	Value
Attribute type	type	"Area"
X Direction	WX	0.0
Y Direction	WY	0.0
Z Direction	WZ	-20.0
Pore pressure flux	pwp	0.0
Keep global	keepGlobal	false

Assignment to Surfaces:

2;6;7T11;13;14;18T20;24T26;30T32;39;41;42T44;47;48;51;52;55;56;61;63;64T66;69;70;73;74;77;78;83;85;86T88;91;92;95;96;99;100;105;107;108T110;113;114;117;118;121;122;162T164;166T170I2;180T186;192T198;217T223;228T238;240;242;243T248;254T260;265T281;286;289;325;334;335T367

14. Wood-Armer

Attribute: 1 Title: Woord armer

Sub Type = Wood-Armer

Property	Symbol	Value
Angle	Angle	90.0
Cover depth of x-top-reinforcements	CoverXTop	0.0
Cover depth of y'/alpha-top-reinforcements	CoverAlphaTop	0.0
Cover depth of x-bottom-reinforcements	CoverXBottom	0.0
Cover depth of y'/alpha-bottom-reinforcements	CoverAlphaBottom	0.0
Wood-Armer: K-factor	WA.KFactor	1.0
Wood-Armer: Resistance of x-top-reinforcements	WA.ResistanceXTop	0.0
Wood-Armer: Resistance of y'/alpha-top-reinforcements	WA.ResistanceAlphaTop	0.0
Wood-Armer: Resistance of x-bottom-reinforcements	WA.ResistanceXBottom	0.0
Wood-Armer: Resistance of y'/alpha-bottom-reinforcements	WA.ResistanceAlphaBottom	0.0
Wood-Armer: Does this calculation use a K-factor?	WA.IsKFactor	false
Wood-Armer: Is this calculation an assessment?	WA.IsAssessment	false
Clark-Nielsen: K-factor	CN.KFactor	1.0
Clark-Nielsen: Resistance of x-top-reinforcements	CN.ResistanceXTop	0.0
Clark-Nielsen: Resistance of y'/alpha-top-reinforcements	CN.ResistanceAlphaTop	0.0
Clark-Nielsen: Resistance of x-bottom-reinforcements	CN.ResistanceXBottom	0.0
Clark-Nielsen: Resistance of y'/alpha-bottom-reinforcements	CN.ResistanceAlphaBottom	0.0
Clark-Nielsen: Does this calculation use a K-factor?	CN.IsKFactor	false
Clark-Nielsen: Is this calculation an assessment?	CN.IsAssessment	false

Assignment to Surfaces:

2;6;7T11;13;14;18T20;24T26;30T32;39;41;42T44;47;48;51;52;55;56;61;63;64T66;69;70;73;74;77;78;83;85;86T88;91;92;95;96;99;100;105;107;108T110;113;114;117;118;121;122;162T164;166T170I2;180T186;192T198;217T223;228T238;240;242;243T248;254T260;265T281;286;289;325;334;335T367

	Appendix 1: Input receipt SYSTEM 001 Pile deck	Status :	Page: 22
		Date :	Created:

15. Basic combination

Loadcase ID: 91 Title: ULS:1

Sub Type: Basic Combination

Loadcase	Results		
File	Factor	Title	Type
7	0	1,1	Dead weight
8	0	1,2	Bankfilling
9	0	1,5	Surface load

Loadcase ID: 92 Title: ULS:2

Sub Type: Basic Combination

Loadcase	Results		
File	Factor	Title	Type
7	0	1,0	Dead weight
8	0	0,9	Bankfilling

16. Envelopes

Loadcase ID: 96 Title: ULS

Sub Type: Envelope

Loadcase	Results	
File	Title	Type
18	0	ULS:1
19	0	ULS:2

	Appendix 2: Results piles Pile deck	Status :	Page: 1
		Date:	Created:

Title: Pile results

Model Units: kN,m,t,s,C
Report Units: kN,m,t,s,C

Model Title: System 001
Model File: System 001

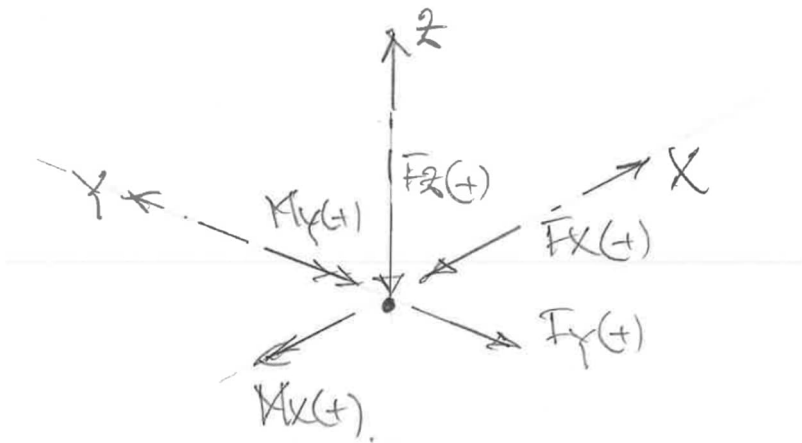
	Appendix 2: Results piles Pile deck	Status :	Page: 2
		Date:	Created:

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2.	Results loadcase	4

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1. SIGN CONENTION



	Appendix 2: Results piles Pile deck	Status :	Page: 4
		Date:	Created:

2. RESULTS ULS

Pile	Node	X	Y	Z	ULS:1 Fz	ULS:2 FZ
1	2817	0.7	0.7	-8.0	565	365
2	2834	2.7	0.7	-8.0	636	411
3	2851	4.7	0.7	-8.0	666	430
4	2868	6.7	0.7	-8.0	666	430
5	2885	8.7	0.7	-8.0	636	411
6	2902	10.7	0.7	-8.0	565	365
7	2919	0.7	2.7	-8.0	636	411
8	2936	2.7	2.7	-8.0	708	457
9	2953	4.7	2.7	-8.0	739	477
10	2970	6.7	2.7	-8.0	739	477
11	2987	8.7	2.7	-8.0	708	457
12	3004	10.7	2.7	-8.0	636	411
13	3021	0.7	4.7	-8.0	666	430
14	3038	2.7	4.7	-8.0	739	477
15	3055	4.7	4.7	-8.0	770	498
16	3072	6.7	4.7	-8.0	770	498
17	3089	8.7	4.7	-8.0	739	477
18	3106	10.7	4.7	-8.0	666	430
19	3123	0.7	6.7	-8.0	665	430
20	3140	2.7	6.7	-8.0	739	477
21	3157	4.7	6.7	-8.0	770	498
22	3174	6.7	6.7	-8.0	770	498
23	3191	8.7	6.7	-8.0	739	477
24	3208	10.7	6.7	-8.0	666	430
25	3225	0.7	8.7	-8.0	636	411
26	3242	2.7	8.7	-8.0	708	457
27	3259	4.7	8.7	-8.0	739	477
28	3276	6.7	8.7	-8.0	739	477
29	3293	8.7	8.7	-8.0	708	457
30	3310	10.7	8.7	-8.0	636	411
31	3327	0.7	10.7	-8.0	566	366
32	3344	2.7	10.7	-8.0	636	411
33	3361	4.7	10.7	-8.0	666	430
34	3378	6.7	10.7	-8.0	666	430
35	3395	8.7	10.7	-8.0	636	411
36	3412	10.7	10.7	-8.0	565	365
-	-	m	m	m	kN	kN

	Appendix 3: Resultat SYSTEM 001 – RC deck Pile deck	Status :	Page: 1
		Date:	Created:

Title: Results RC deck

Model Units: kN,m,t,s,C
Report Units: kN,m,t,s,C

Model Title: System 001
Model File: System 001

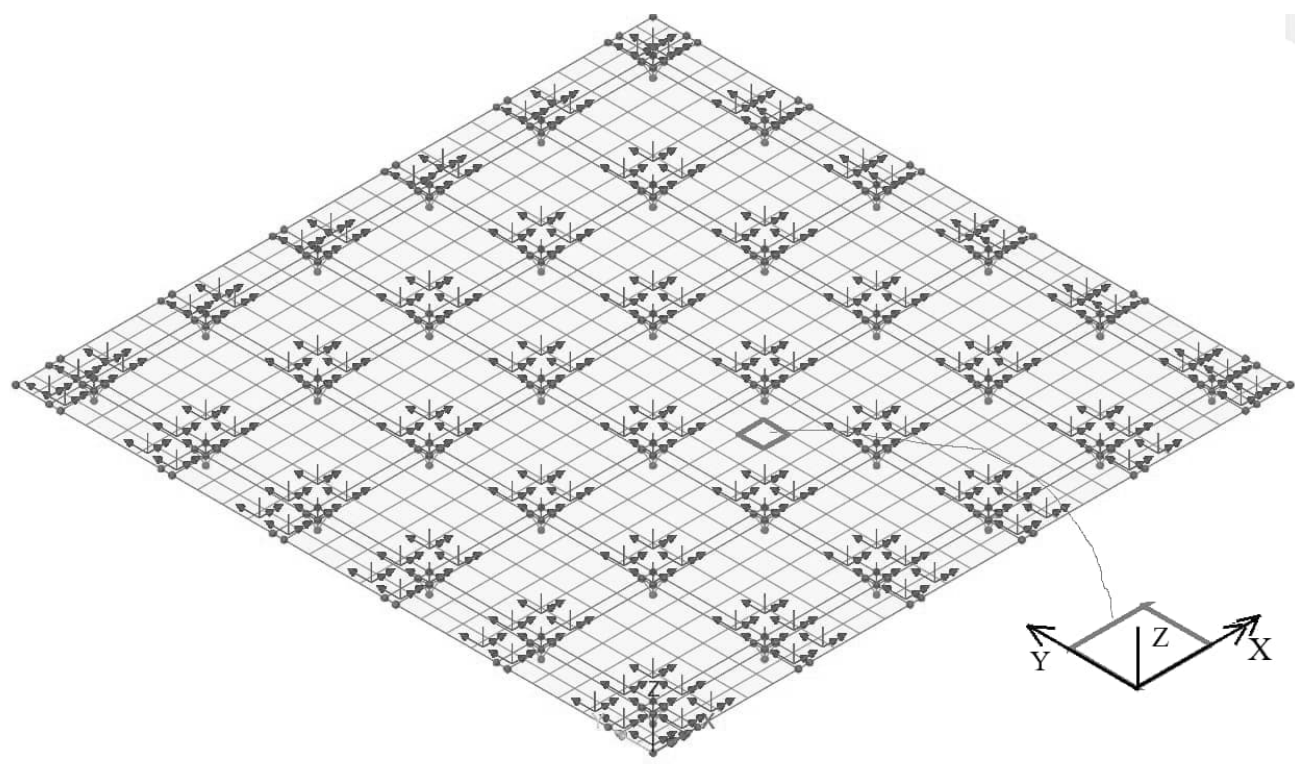
	Appendix 3: Resultat SYSTEM 001 – RC deck	Status :	Page: 2
	Pile deck	Date:	Created:

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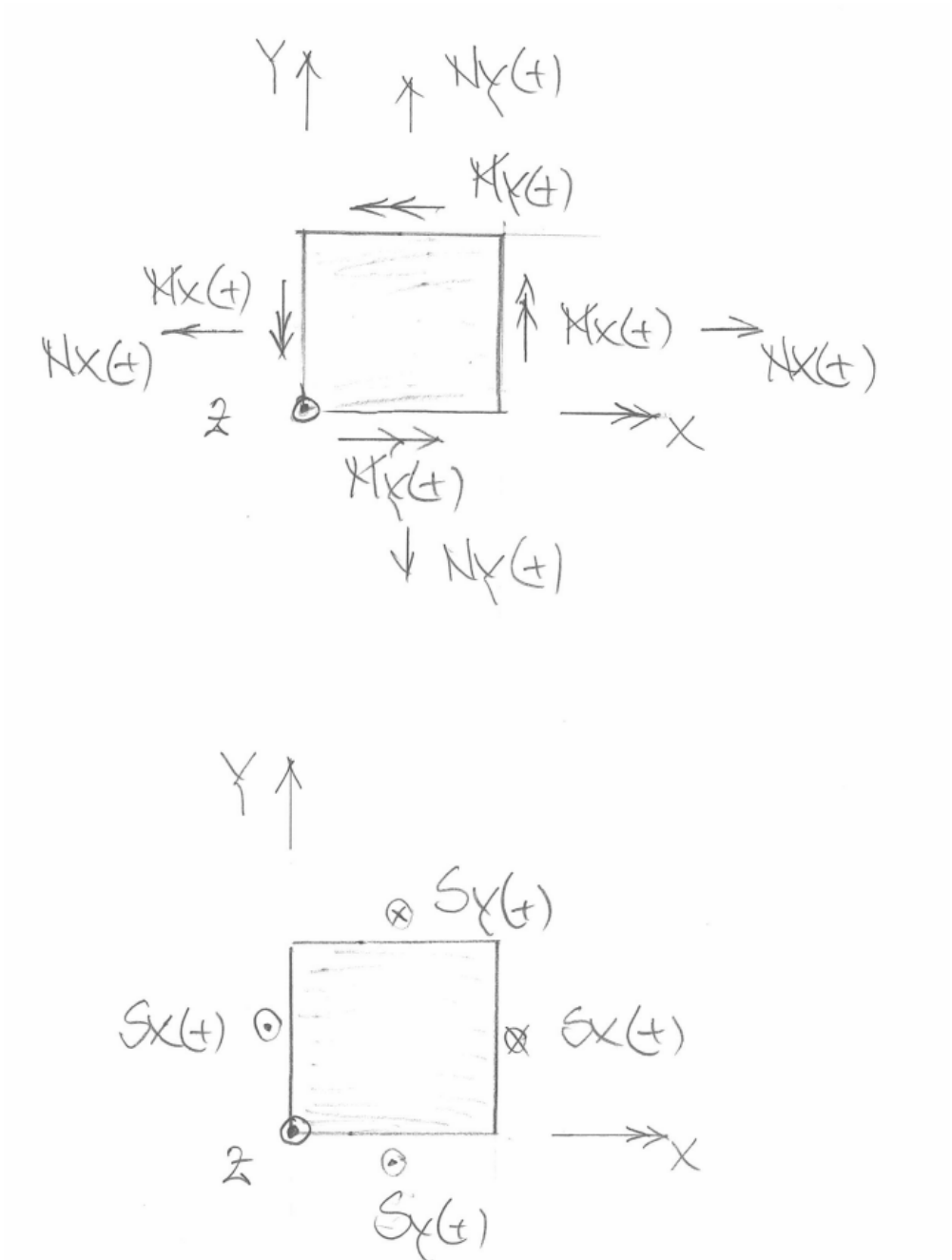
1.	Teckenkonvention	3-4
2.	Wood-Armer	5
3.	Slice Data	6
4.	Definition resultatlinjer	7
5.	ULS - Mx(B)/Mx(T)	8-11

	Appendix 3: Resultat SYSTEM 001 – RC deck Pile deck	Status :	Page: 3
		Date:	Created:

1. Sign convention

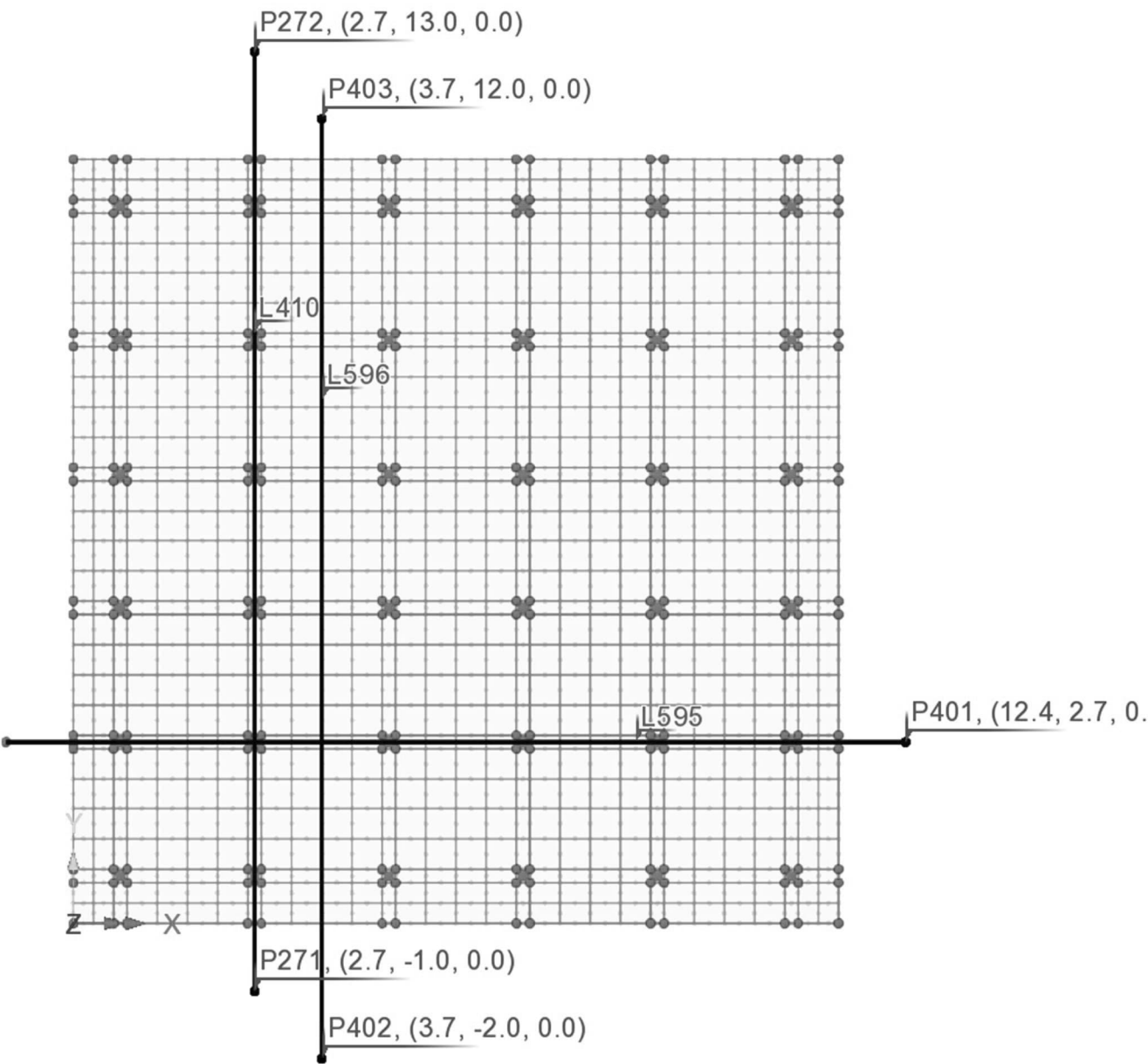


	Appendix 3: Resultat SYSTEM 001 – RC deck Pile deck	Status :	Page: 4
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	Appendix 3: Resultat SYSTEM 001 – RC deck Pile deck	Status :	Page: 7
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4. Definition resultatlinjer

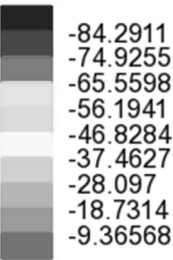


	Appendix 3: Resultat SYSTEM 001 – RC deck Pile deck	Status :	Page: 8
		Date:	Created:

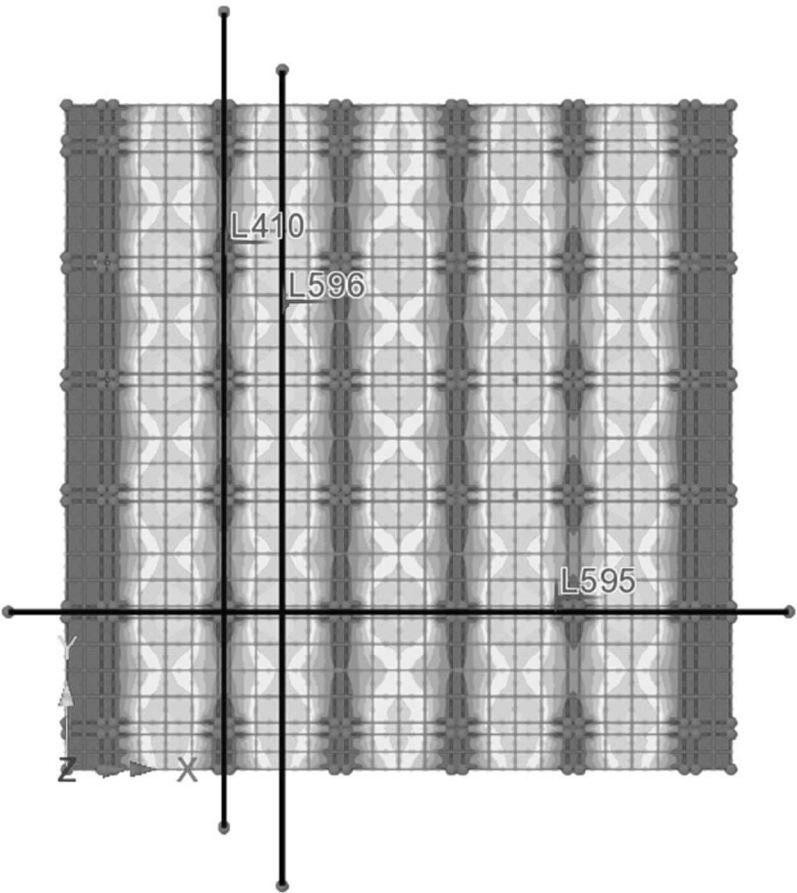
5. ULS - M_x(B)/M_x(T)

5.1. Contour

Envelope: 3:ULS (Min - M_x(B))
Entity: Wood-Armer - Thick Shell
Component (Averaged nodal): M_x(B) (Units: kN.m/m)

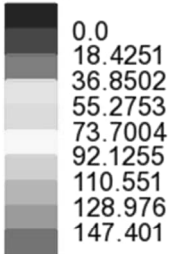


Maximum 0.0 at node 1 of element 2 (1:ULS:1, 1:Increment 1)
Minimum -84.2911 at node 831 of element 898 (1:ULS:1, 1:Increme

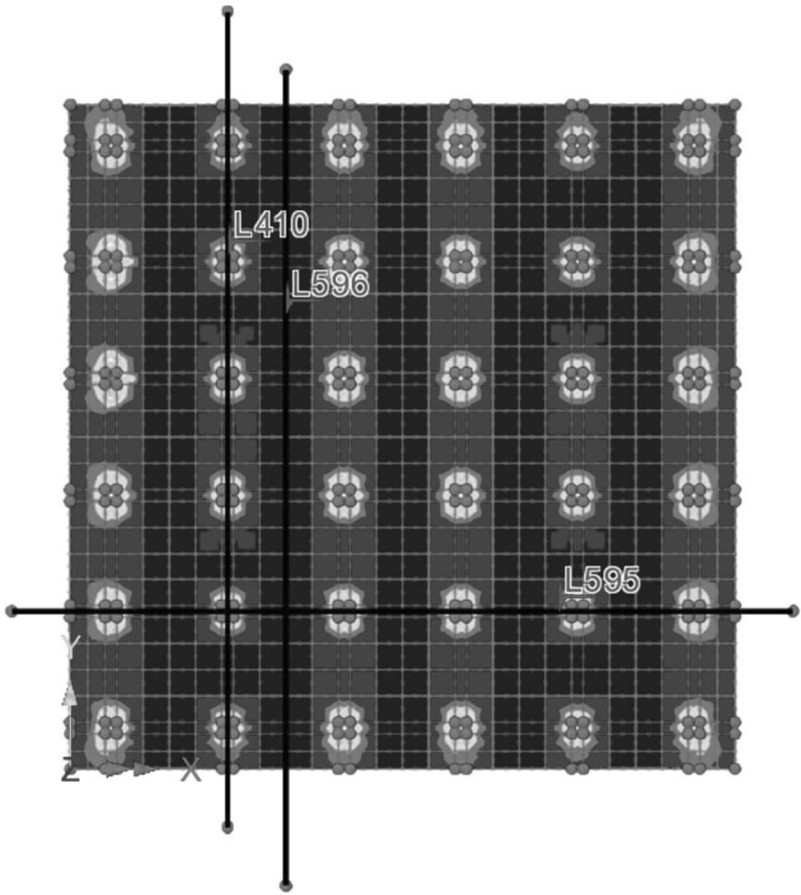


	Appendix 3: Resultat SYSTEM 001 – RC deck	Status :	Page: 9
	Pile deck	Date:	Created:

Envelope: 3:ULS (Max - Mx(T))
Entity: Wood-Armer - Thick Shell
Component (Averaged nodal): Mx(T) (Units: kN.m/m)



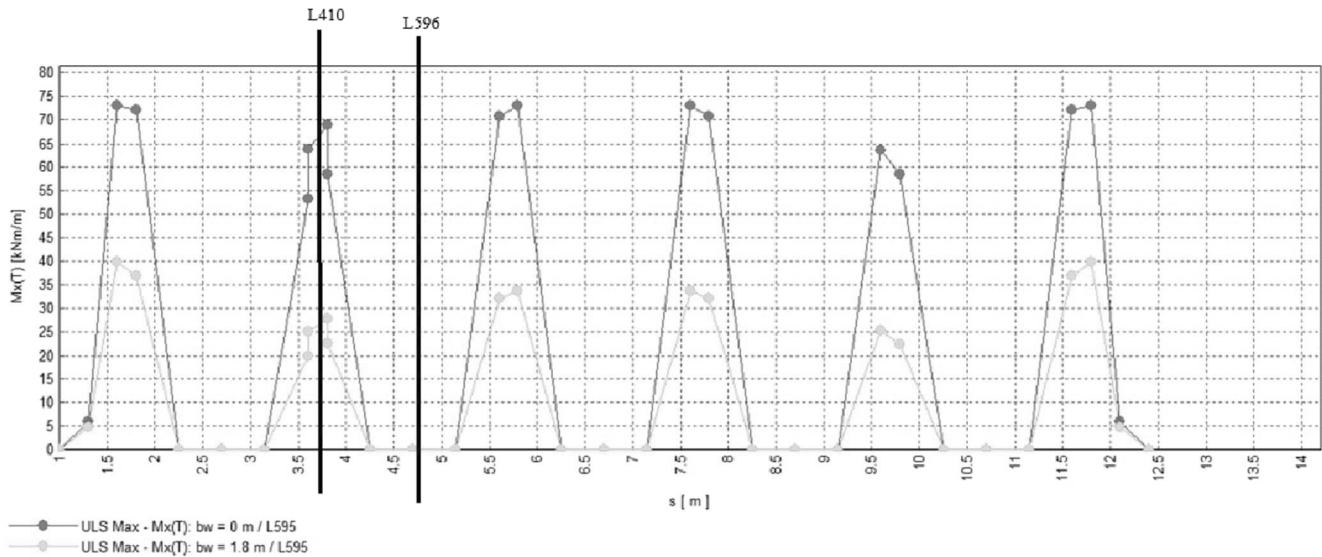
Maximum 165.826 at node 864 of element 898 (1:ULS:1, 1:Increment 1)
Minimum 0.0 at node 12 of element 3 (1:ULS:1, 1:Increment 1)



	Appendix 3: Resultat SYSTEM 001 – RC deck Pile deck	Status :	Page: 10
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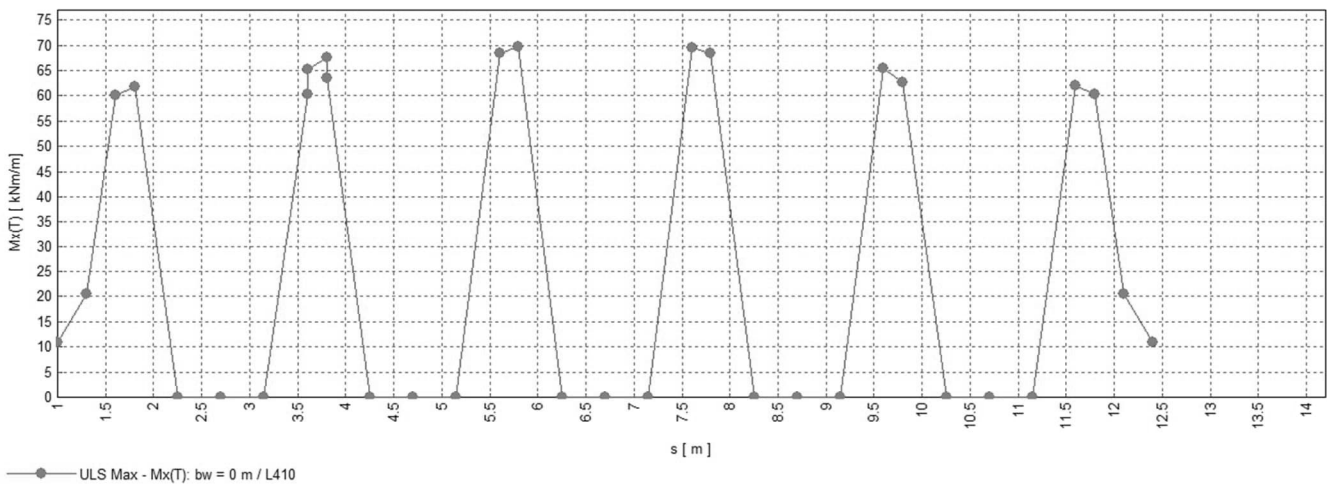
5.1.2 Diagram

Line in longitudinal line (L595):



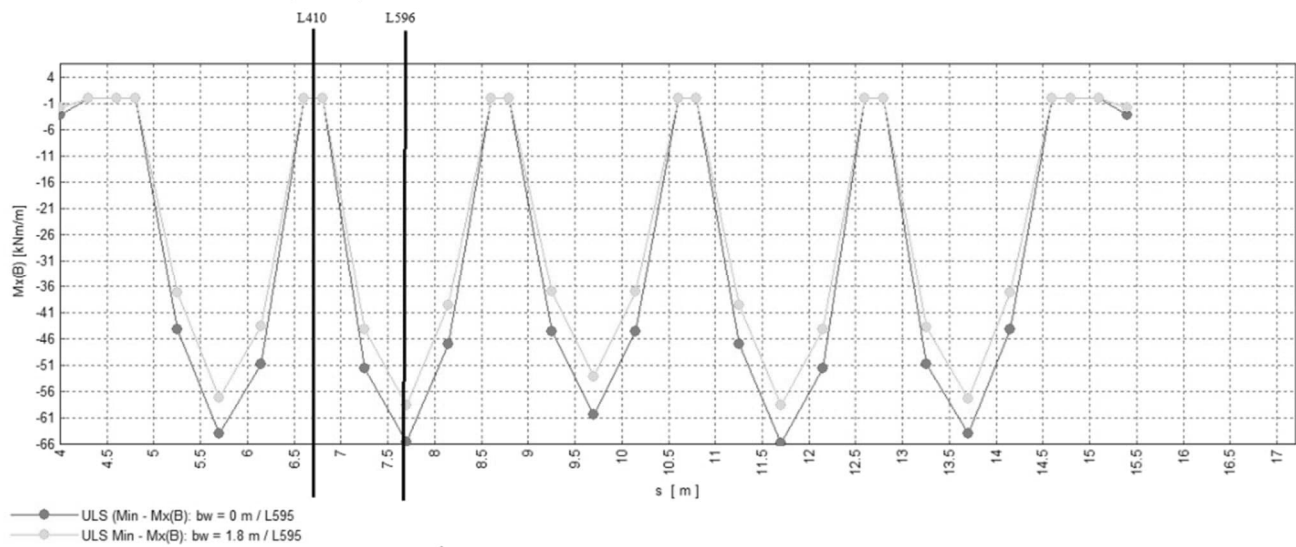
Anm.
Using corridor width $bw = 1.5 \text{ m}$ reduces “hogging” moment by more than 50 %.

Line in transversal direction (L410):



	Appendix 3: Resultat SYSTEM 001 – RC deck Pile deck	Status :	Page: 11
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Line in longitudinal line (L595):



Anm.

Using corridor width $bw = 1.5\text{ m}$ reduces “sagging” moment by less tan 10 %.

Line in transversal direction (L596):

