



Analysis of consolidation

Input data

Project

Date : 28.10.2015

Settings

Standard - limit states

Settlement

Analysis method : Analysis using oedometric modulus
Restriction of influence zone : by percentage of Sigma, Or
Coeff. of restriction of influence zone : 10,0 [%]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-15,00	0,00	15,00	0,00		
2		-15,00	-4,50	15,00	-4,50		

Incompressible subsoil

No.	Location of incompress.subsoil	Coordinates of points of incompress.subsoil [m]					
		x	z	x	z	x	z
1		-15,00	-10,00	15,00	-10,00		

Soil parameters

Clayey soil

Unit weight : $\gamma = 18,50 \text{ kN/m}^3$
Oedometric modulus : $E_{\text{oed}} = 1,00 \text{ MPa}$
Saturated unit weight : $\gamma_{\text{sat}} = 19,00 \text{ kN/m}^3$
Soil : consolidating, input k
Coefficient of permeability : $k = 1,000\text{E-}05 \text{ m/day}$

Embankment

Unit weight : $\gamma = 20,00 \text{ kN/m}^3$
Oedometric modulus : $E_{\text{oed}} = 30,00 \text{ MPa}$
Saturated unit weight : $\gamma_{\text{sat}} = 20,00 \text{ kN/m}^3$
Soil : consolidating, input k
Coefficient of permeability : $k = 1,000\text{E-}02 \text{ m/day}$

Sandy silt

Unit weight : $\gamma = 19,50 \text{ kN/m}^3$
Oedometric modulus : $E_{\text{oed}} = 30,00 \text{ MPa}$
Saturated unit weight : $\gamma_{\text{sat}} = 20,00 \text{ kN/m}^3$
Soil : consolidating, input k



Coefficient of permeability : $k = 1,000E-02$ m/day

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		15,00	-4,50	15,00	0,00	Clayey soil
		-15,00	0,00	-15,00	-4,50	
2		-15,00	-4,50	-15,00	-10,00	Sandy silt
		15,00	-10,00	15,00	-4,50	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-15,00	0,00	15,00	0,00		

Holes layout

Layout and refinement of holes : standard

Horizontal layout

Layout pattern : exact
Add holes : by number of sections
Number of sections : 20

Vertical refinement

No.	From depth [m]	Refinement [m]
1	0,00	0,10
2	2,00	0,30
3	5,00	0,50
4	10,00	2,00
5	30,00	10,00

Consolidation parameters

Top interface of consolidated soil : Interface No. 1
Bottom interface of consolidated soil : Interface No. 2
Water outflow : Both downwards and upwards

Time of stage duration and load action

Stage	Time of stage duration [day]	Load action
2	30,0	load linearly increases during stage duration
3	365,0	load linearly increases during stage duration
4	3650,0	load linearly increases during stage duration

Results (Stage of construction 1)

Results

Analysis of geostatic stress was successfully completed

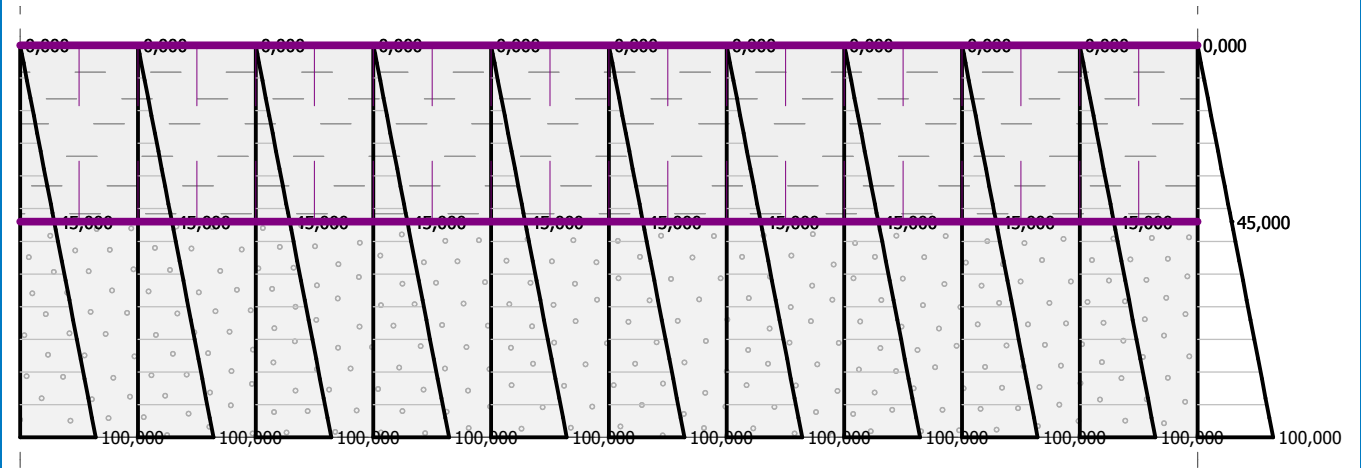


Name : Analysis - Primary geostatic stress

Stage : 1

Description : Stage of construction 1 - Pore pressure u /kPa/

Results : overall; variable : Pore pressure; range : <0,000; 100,000> kPa



Input data (Stage of construction 2)

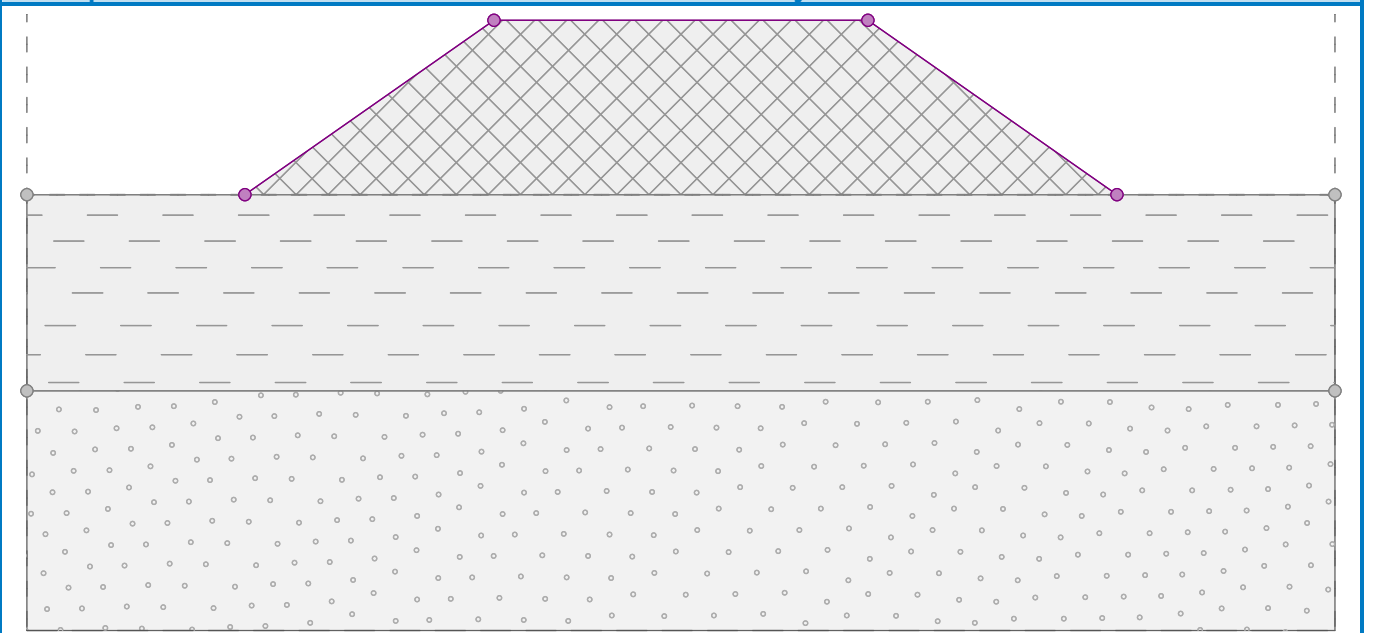
Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		X	Z	X	Z	X	Z
1		-10,00	0,00	-4,29	4,00	4,29	4,00
		10,00	0,00				

Name : 12. Consolidation

Stage : 2

Description : Scheme of the embankment with interface and layers of soils





Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		10,00	0,00	4,29	4,00	Embankment
		-4,29	4,00	-10,00	0,00	
2		15,00	-4,50	15,00	0,00	Clayey soil
		10,00	0,00	-10,00	0,00	
		-15,00	0,00	-15,00	-4,50	
3		-15,00	-4,50	-15,00	-10,00	Sandy silt
		15,00	-10,00	15,00	-4,50	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-15,00	0,00	15,00	0,00		

Results (Stage of construction 2)

Results

Analysis performed, method Analysis using oedometric modulus

Maximum settlement = 33,1 mm

Maximum depth of influence zone = 9,66 m

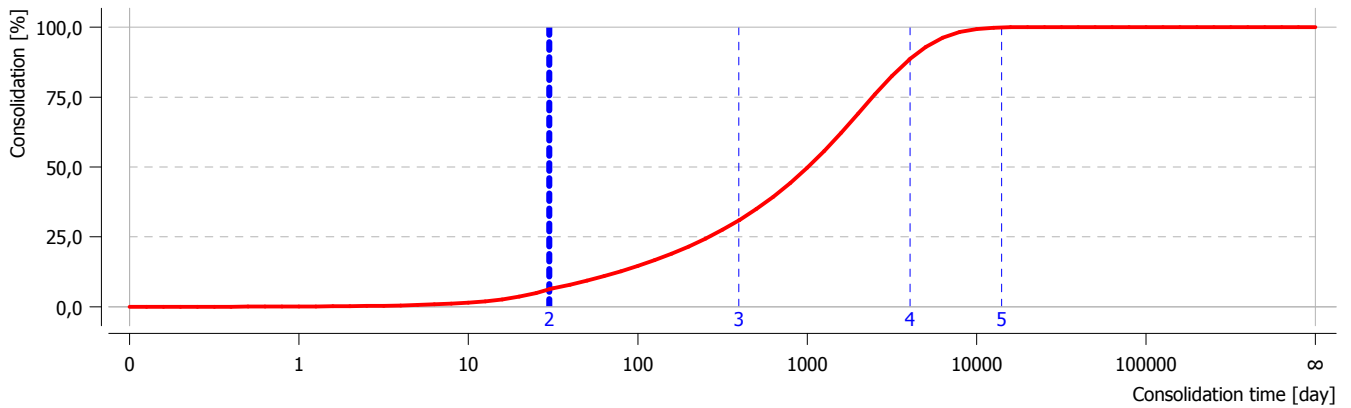
Degree of consolidation

Section	Coordinate X [m]	Degree of consolidation [-]
1	-15,00	0,063
2	-13,75	0,063
3	-12,50	0,063
4	-11,25	0,063
5	-10,00	0,063
6	-8,57	0,063
7	-7,14	0,063
8	-5,72	0,063
9	-4,29	0,063



10	-2,86	0,063
11	-1,43	0,063
12	0,00	0,063
13	1,43	0,063
14	2,86	0,063
15	4,29	0,063
16	5,72	0,063
17	7,14	0,063
18	8,57	0,063
19	10,00	0,063
20	11,25	0,063
21	12,50	0,063
22	13,75	0,063
23	15,00	0,063

Graph of consolidation



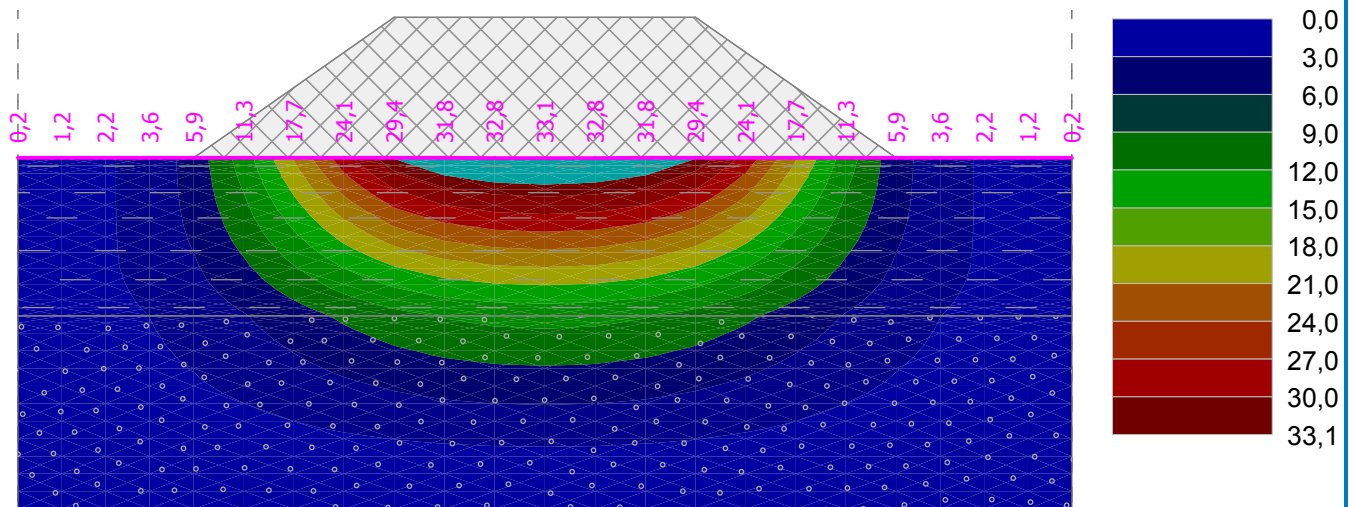
Graph of consolidation in the location of maximum settlement (X = 0,00 m)

Name : Analysis - Consolidation

Stage : 2

Description : Stage of construction 2 - Overall settlement under embankment /mm/

Results : overall; variable : Settlement; range : <0,0; 33,1> mm





Input data (Stage of construction 3)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		10,00	0,00	4,29	4,00	Embankment
		-4,29	4,00	-10,00	0,00	
2		15,00	-4,50	15,00	0,00	Clayey soil
		10,00	0,00	-10,00	0,00	
		-15,00	0,00	-15,00	-4,50	
3		-15,00	-4,50	-15,00	-10,00	Sandy silt
		15,00	-10,00	15,00	-4,50	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-15,00	0,00	15,00	0,00		

Results (Stage of construction 3)

Results

Analysis performed, method Analysis using oedometric modulus

Maximum settlement = 119,8 mm

Maximum depth of influence zone = 9,66 m

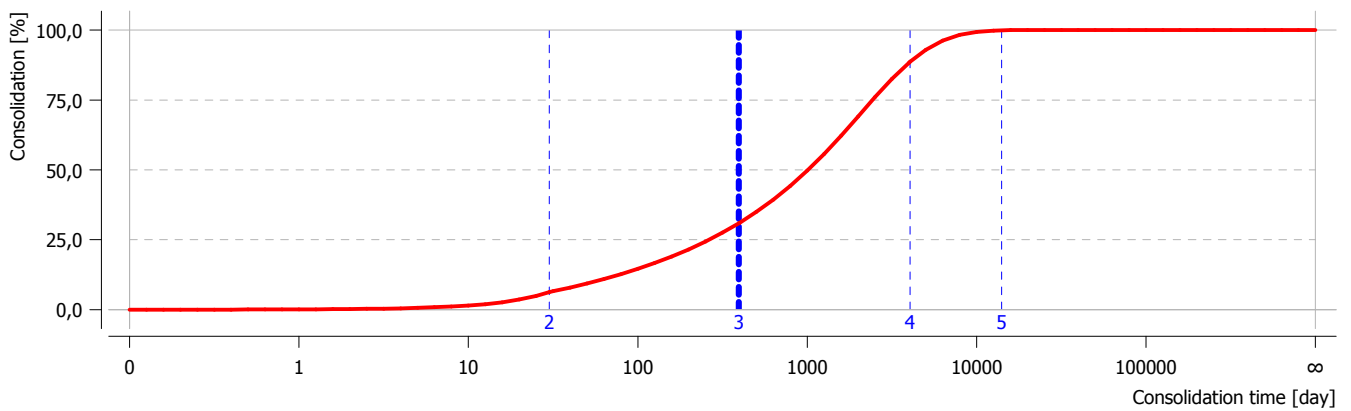
Degree of consolidation

Section	Coordinate X [m]	Degree of consolidation [-]
1	-15,00	0,309
2	-13,75	0,309
3	-12,50	0,309
4	-11,25	0,309
5	-10,00	0,309
6	-8,57	0,309
7	-7,14	0,309

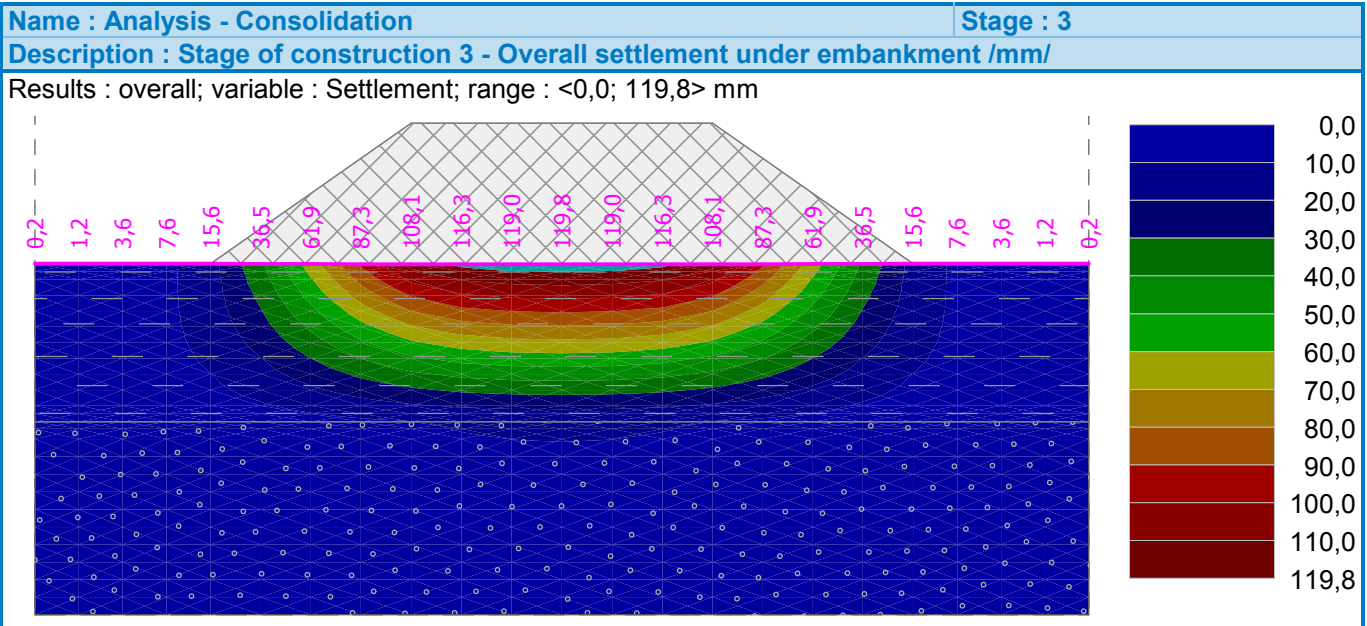


8	-5,72	0,309
9	-4,29	0,309
10	-2,86	0,309
11	-1,43	0,309
12	0,00	0,309
13	1,43	0,309
14	2,86	0,309
15	4,29	0,309
16	5,72	0,309
17	7,14	0,309
18	8,57	0,309
19	10,00	0,309
20	11,25	0,309
21	12,50	0,309
22	13,75	0,309
23	15,00	0,309

Graph of consolidation



Graph of consolidation in the location of maximum settlement (X = 0,00 m)





Input data (Stage of construction 4)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		10,00	0,00	4,29	4,00	Embankment
		-4,29	4,00	-10,00	0,00	
2		15,00	-4,50	15,00	0,00	Clayey soil
		10,00	0,00	-10,00	0,00	
		-15,00	0,00	-15,00	-4,50	
3		-15,00	-4,50	-15,00	-10,00	Sandy silt
		15,00	-10,00	15,00	-4,50	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-15,00	0,00	15,00	0,00		

Results (Stage of construction 4)

Results

Analysis performed, method Analysis using oedometric modulus

Maximum settlement = 323,0 mm

Maximum depth of influence zone = 9,66 m

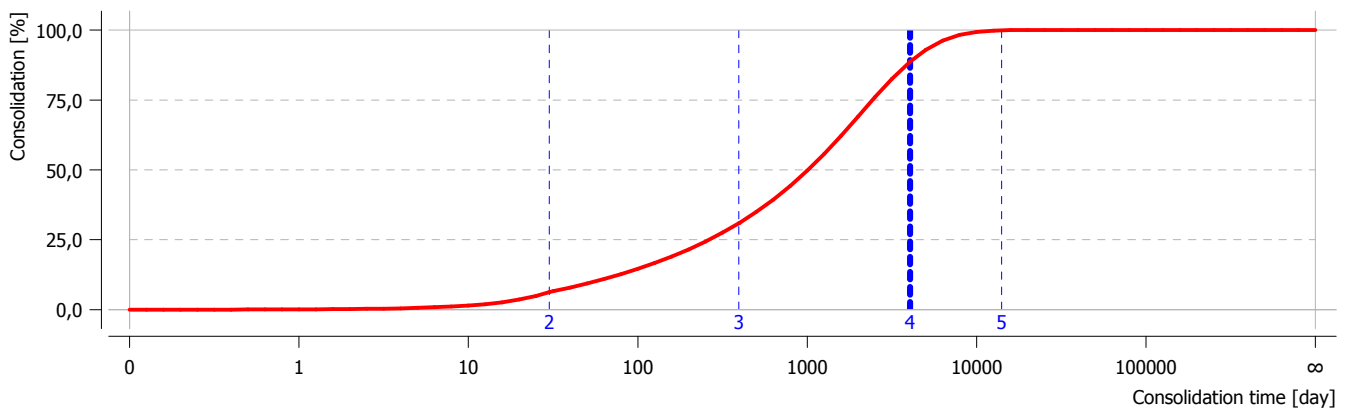
Degree of consolidation

Section	Coordinate X [m]	Degree of consolidation [-]
1	-15,00	0,886
2	-13,75	0,886
3	-12,50	0,886
4	-11,25	0,886
5	-10,00	0,886
6	-8,57	0,886
7	-7,14	0,886

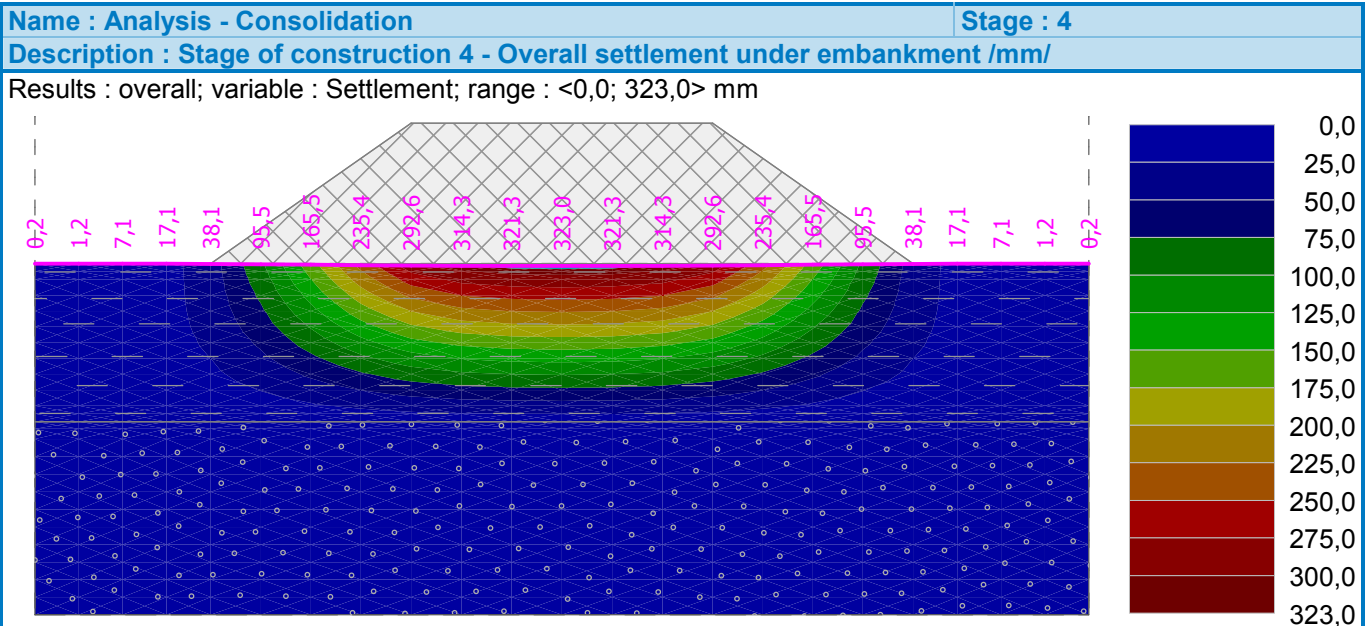


8	-5,72	0,886
9	-4,29	0,886
10	-2,86	0,886
11	-1,43	0,886
12	0,00	0,886
13	1,43	0,886
14	2,86	0,886
15	4,29	0,886
16	5,72	0,886
17	7,14	0,886
18	8,57	0,886
19	10,00	0,886
20	11,25	0,886
21	12,50	0,886
22	13,75	0,886
23	15,00	0,886

Graph of consolidation



Graph of consolidation in the location of maximum settlement (X = 0,00 m)





Input data (Stage of construction 5)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		10,00	0,00	4,29	4,00	Embankment
		-4,29	4,00	-10,00	0,00	
2		15,00	-4,50	15,00	0,00	Clayey soil
		10,00	0,00	-10,00	0,00	
		-15,00	0,00	-15,00	-4,50	
3		-15,00	-4,50	-15,00	-10,00	Sandy silt
		15,00	-10,00	15,00	-4,50	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-15,00	0,00	15,00	0,00		

Results (Stage of construction 5)

Results

Analysis performed, method Analysis using oedometric modulus

Maximum settlement = 364,0 mm

Maximum depth of influence zone = 9,66 m

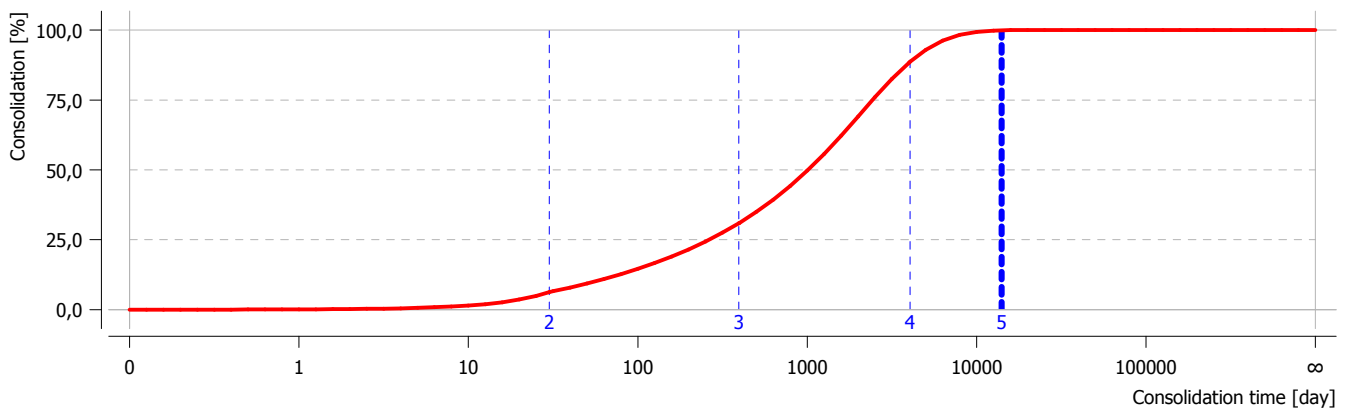
Degree of consolidation

Section	Coordinate X [m]	Degree of consolidation [-]
1	-15,00	1,000
2	-13,75	1,000
3	-12,50	1,000
4	-11,25	1,000
5	-10,00	1,000
6	-8,57	1,000
7	-7,14	1,000



8	-5,72	1,000
9	-4,29	1,000
10	-2,86	1,000
11	-1,43	1,000
12	0,00	1,000
13	1,43	1,000
14	2,86	1,000
15	4,29	1,000
16	5,72	1,000
17	7,14	1,000
18	8,57	1,000
19	10,00	1,000
20	11,25	1,000
21	12,50	1,000
22	13,75	1,000
23	15,00	1,000

Graph of consolidation



Graph of consolidation in the location of maximum settlement (X = 0,00 m)

