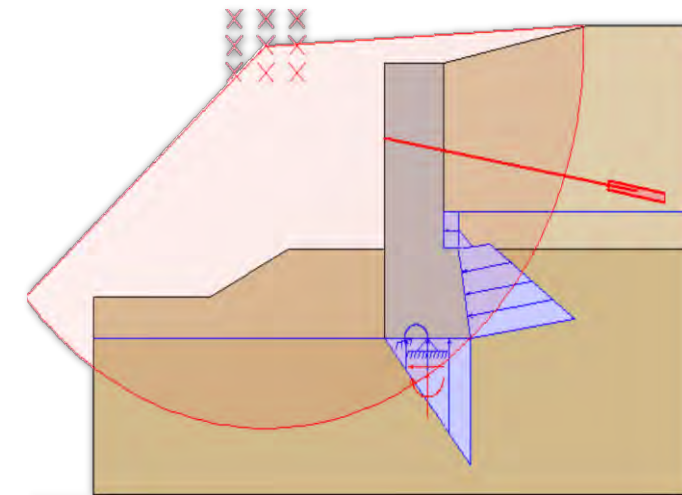
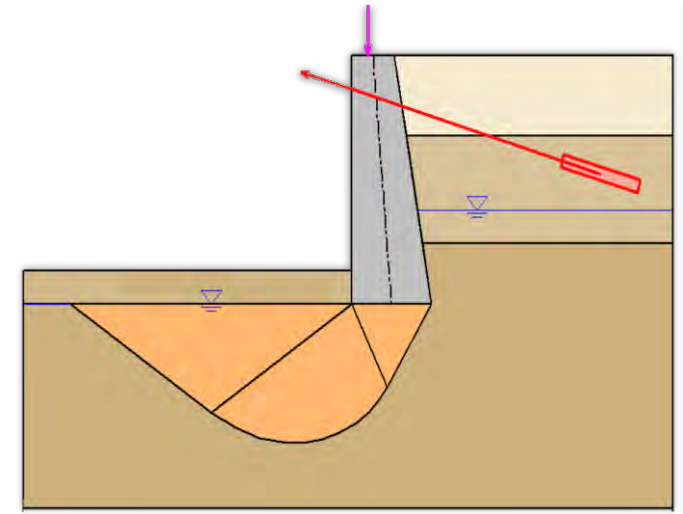
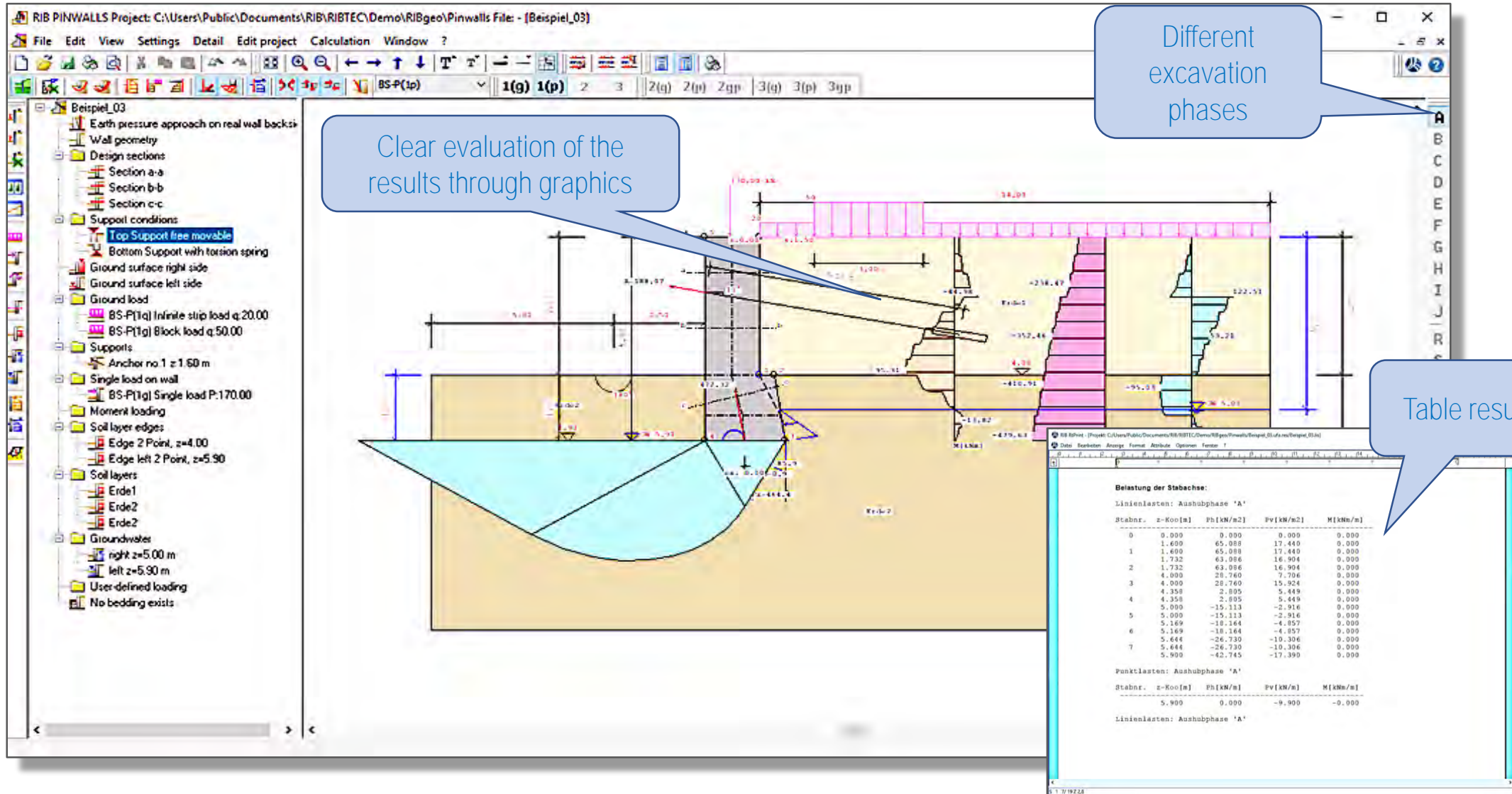


- Consideration of different excavation stages and retreating construction stages with system modifications
- Consideration of different water levels in front of and behind the wall
- clearly arranged and complete result output including graphics and preview functions
- Interface with CAD systems to transfer the wall geometry



Work environment with overview at a glance



The screenshot displays the RIB PINWALLS software interface. The main window shows a cross-section of a retaining wall with various annotations and data. A callout box points to the graphical representation of the excavation phases, stating "Different excavation phases". Another callout box points to the graphical representation of the results, stating "Clear evaluation of the results through graphics". A third callout box points to a table of results, stating "Table results".

Left sidebar menu items:

- Beispiel_03
 - Earth pressure approach on real wall backs
 - Wall geometry
 - Design sections
 - Section a-a
 - Section b-b
 - Section c-c
 - Support conditions
 - Top Support free movable
 - Bottom Support with torsion spring
 - Ground surface right side
 - Ground surface left side
 - Ground load
 - BS-P[1q] Inrate slip load q:20.00
 - BS-P[1q] Block load q:50.00
 - Supports
 - Anchor no 1 z=1.50 m
 - Single load on wall
 - BS-P[1q] Single load P:170.00
 - Moment loading
 - Soil layer edges
 - Edge 2 Point, z=4.00
 - Edge left 2 Point, z=5.90
 - Soil layers
 - Erde1
 - Erde2
 - Erde2
 - Groundwaters
 - right z=5.00 m
 - left z=5.90 m
 - User-defined loading
 - No bedding exists

Different excavation phases

Clear evaluation of the results through graphics

Table results

Belastung der Stabachse:

Linienlasten: Aushubphase 'A'

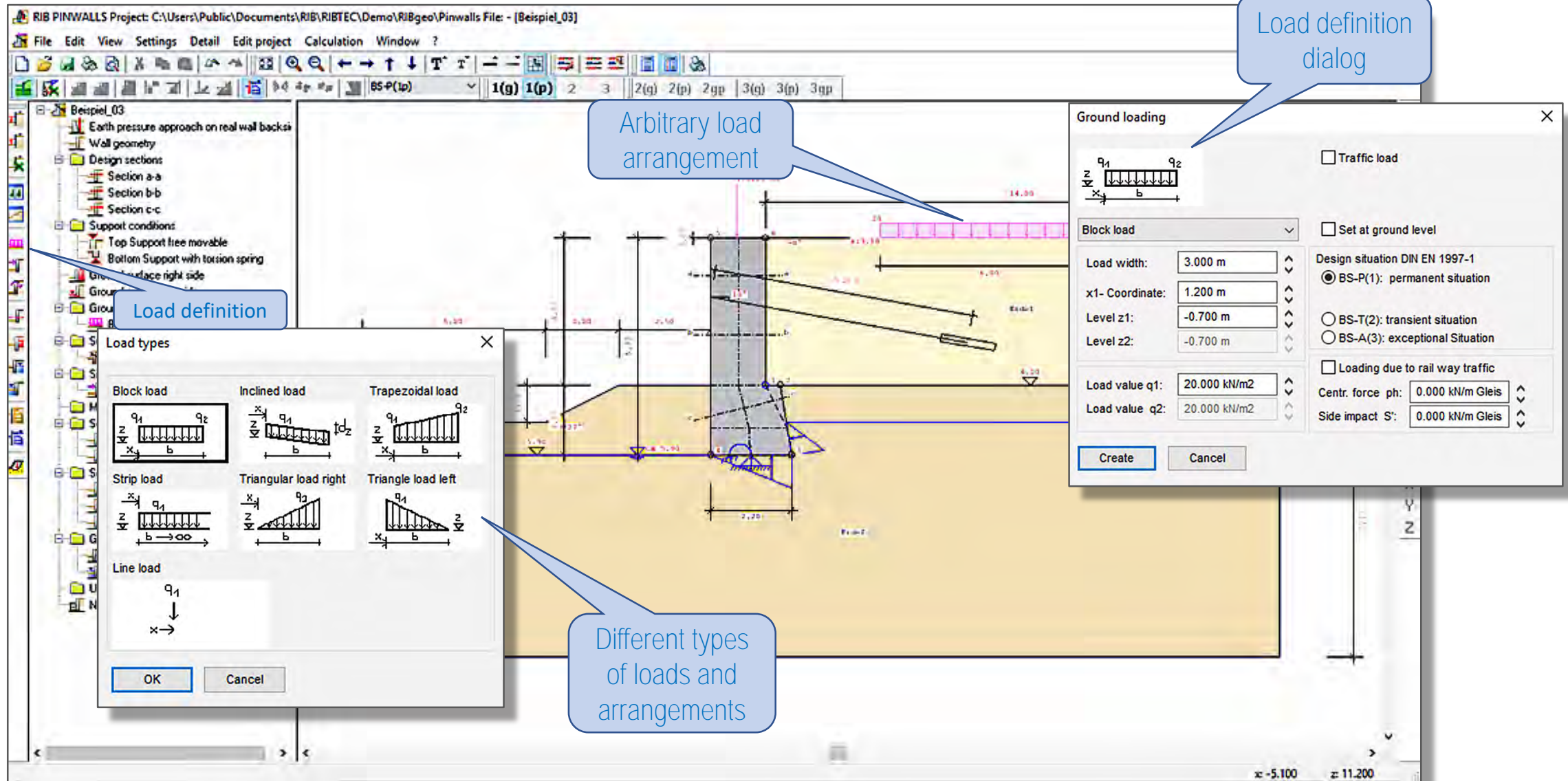
Stabnr.	z-Ko[m]	Ph[kN/m ²]	Pv[kN/m ²]	M[kNm/m]
0	0.000	0.000	0.000	0.000
1	1.600	65.088	17.440	0.000
2	1.732	63.086	16.904	0.000
3	4.000	28.760	7.706	0.000
4	4.358	2.805	5.449	0.000
5	5.000	-15.113	-2.916	0.000
6	5.169	-18.164	-4.857	0.000
7	5.644	-26.730	-10.306	0.000
8	5.900	-42.745	-17.390	0.000

Punktlasten: Aushubphase 'A'

Stabnr.	z-Ko[m]	Ph[kN/m]	Pv[kN/m]	M[kNm/m]
8	5.900	0.000	-9.900	-0.000

Linienlasten: Aushubphase 'A'

Versatile options for system and load input



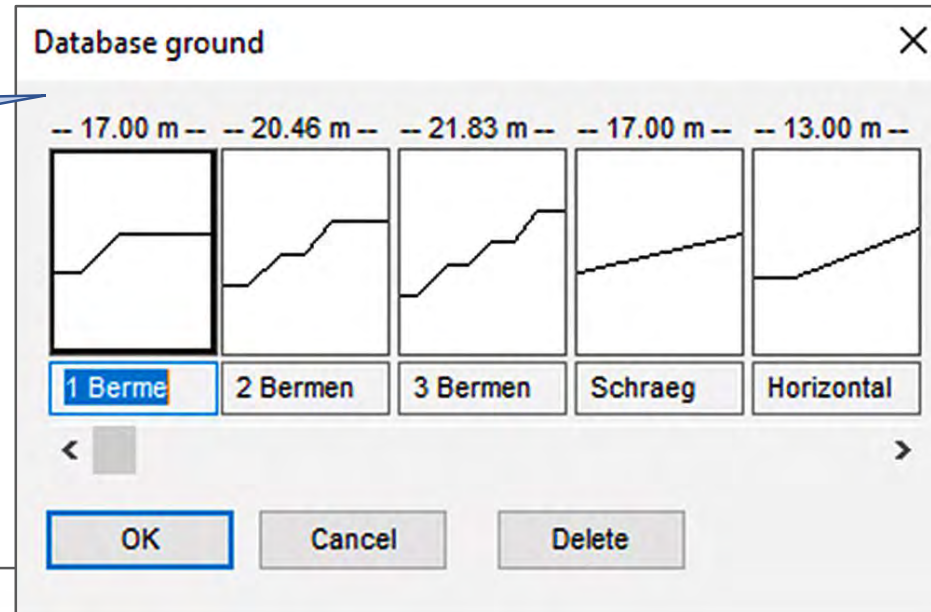
The screenshot displays the RIB PINWALLS software interface. The main window shows a 2D cross-section of a retaining wall with various dimensions and a pink rectangular load area on the ground surface. Two dialog boxes are overlaid on the interface:

- Load definition dialog:** Located in the bottom-left, it lists various load types with corresponding diagrams: Block load, Inclined load, Trapezoidal load, Strip load, Triangular load right, Triangle load left, and Line load. A callout bubble points to this dialog with the text "Load definition".
- Ground loading dialog:** Located in the bottom-right, it provides detailed configuration for a block load. It includes fields for Load width (3.000 m), x1-Coordinate (1.200 m), Level z1 (-0.700 m), and Level z2 (-0.700 m). It also has fields for Load value q1 and q2 (both 20.000 kN/m²). Design situation options include BS-P(1) (permanent situation), BS-T(2) (transient situation), and BS-A(3) (exceptional Situation). Callout bubbles point to this dialog with the text "Load definition dialog" and "Arbitrary load arrangement".

A callout bubble at the bottom of the main window points to the pink load area with the text "Different types of loads and arrangements".

Optimum program functions for underpinning

Different ground surfaces



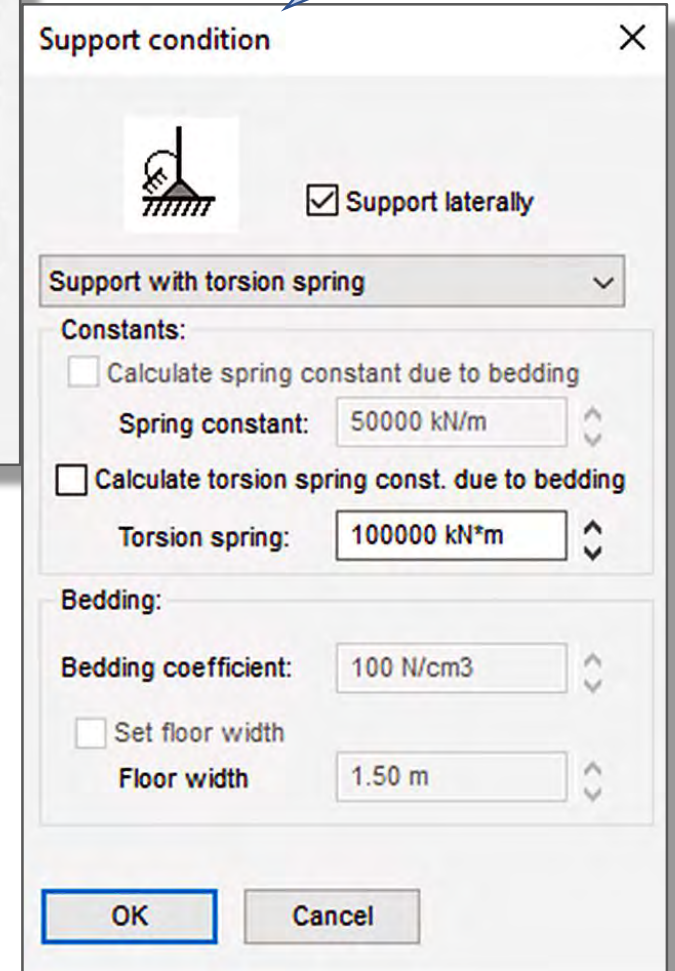
Database ground

-- 17.00 m -- -- 20.46 m -- -- 21.83 m -- -- 17.00 m -- -- 13.00 m --

1 Berme 2 Bermen 3 Bermen Schraeg Horizontal

OK Cancel Delete

Different support types



Support condition

Support laterally

Support with torsion spring

Constants:

Calculate spring constant due to bedding
Spring constant: 50000 kN/m

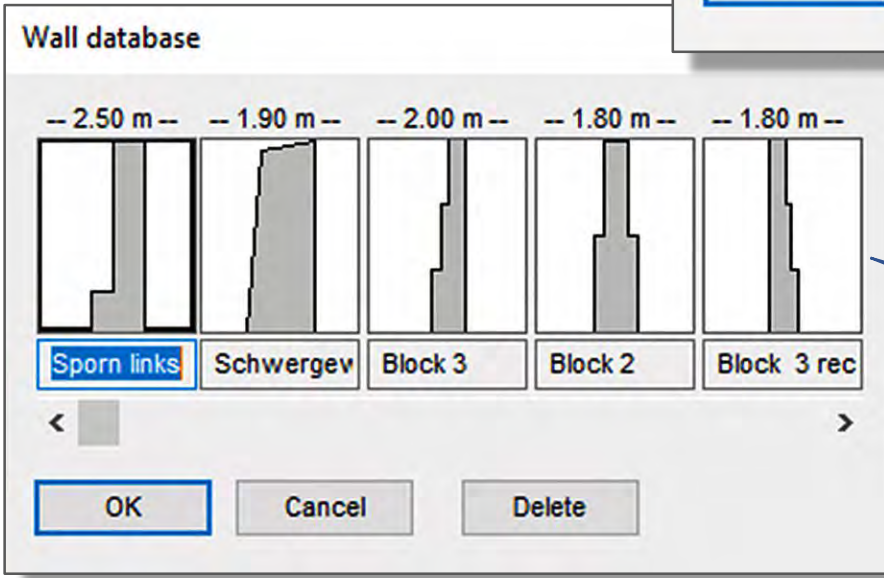
Calculate torsion spring const. due to bedding
Torsion spring: 100000 kN*m

Bedding:

Bedding coefficient: 100 N/cm3

Set floor width
Floor width: 1.50 m

OK Cancel



Wall database

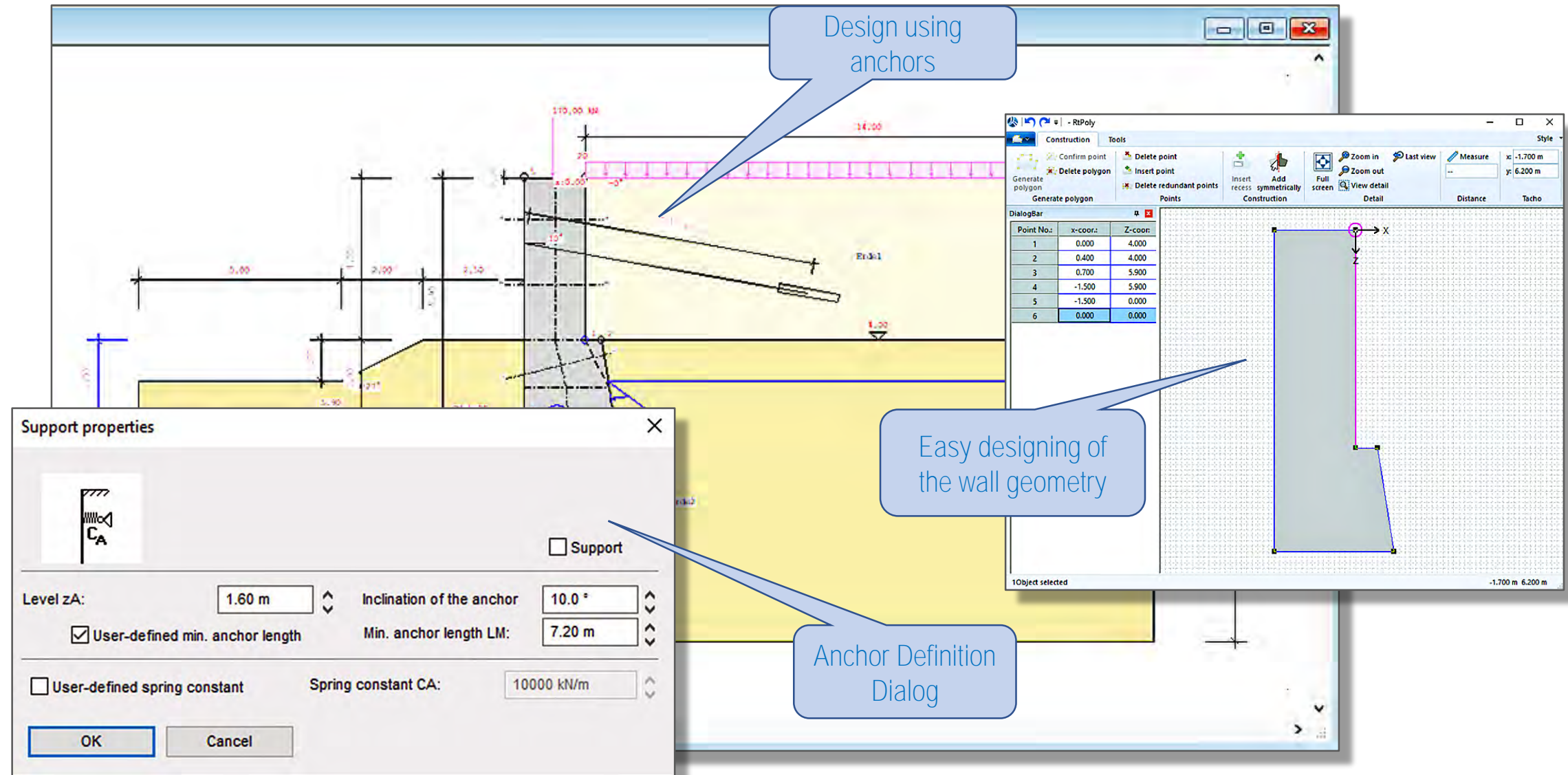
-- 2.50 m -- -- 1.90 m -- -- 2.00 m -- -- 1.80 m -- -- 1.80 m --

Sporn links Schwergev Block 3 Block 2 Block 3 rec

OK Cancel Delete

Different shapes of wall cross sections

Construction of any wall geometry



The screenshot displays the RIB software interface for wall construction. The main window shows a 2D cross-section of a wall with various dimensions and construction lines. A callout bubble points to a horizontal line representing an anchor, with the text "Design using anchors". Another callout bubble points to the wall's profile, with the text "Easy designing of the wall geometry". A third callout bubble points to a dialog box titled "Support properties", which is used for defining anchor characteristics.

Support properties

Support

Level zA: 1.60 m Inclination of the anchor: 10.0 °

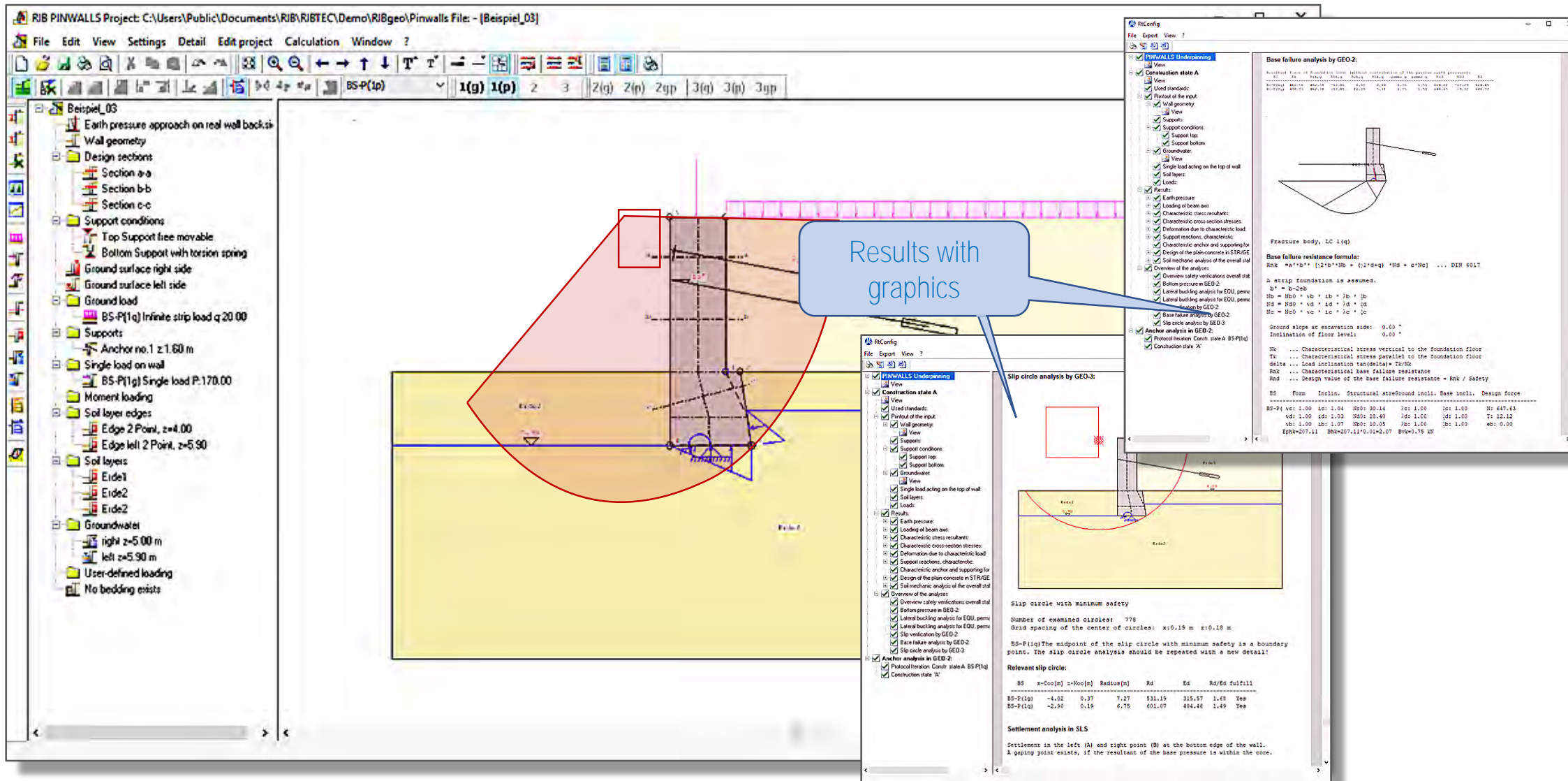
User-defined min. anchor length Min. anchor length LM: 7.20 m

User-defined spring constant Spring constant CA: 10000 kN/m

OK Cancel

Point No.	x-coor.	Z-coor.
1	0.000	4.000
2	0.400	4.000
3	0.700	5.900
4	-1.500	5.900
5	-1.500	0.000
6	0.000	0.000

Configurable and clear result output



Results with graphics

Base failure analysis by GEO-2:

Structural state of foundation limit without consideration of the previous earth pressure:

Rd	Ed	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs
401.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
401.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Fracture body, LC 1(g)

Base failure resistance formula:
 $R_{nk} = a \cdot b \cdot c \cdot d \cdot e \cdot f \cdot g \cdot h \cdot i \cdot j \cdot k \cdot l \cdot m \cdot n \cdot o \cdot p \cdot q \cdot r \cdot s \cdot t \cdot u \cdot v \cdot w \cdot x \cdot y \cdot z$... DIN 4017

A strip foundation is assumed.
 $b^* = b - 2e_b$
 $b_0 = H_{00} + v_d \cdot i_b + i_b \cdot j_b$
 $b_1 = H_{01} + v_d \cdot i_d + i_d \cdot j_d$
 $b_2 = H_{02} + v_d \cdot i_c + i_c \cdot j_c$

Ground slope at excavation side: 0.00 °
 Inclination of floor level: 0.00 °

DE ... Characteristic stress vertical to the foundation floor
 TE ... Characteristic stress parallel to the foundation floor
 de ... Load inclination (horizontal) Tz/DE
 Rnk ... Characteristic base failure resistance
 Rd ... Design value of the base failure resistance = Rnk / Safety

Slip circle analysis by GEO-3:

Slip circle with minimum safety

Number of examined circles: 778
 Grid spacing of the center of circles: x:0.19 m z:0.18 m

BS-P(1q) The midpoint of the slip circle with minimum safety is a boundary point. The slip circle analysis should be repeated with a new detail!

Relevant slip circle:

BS	x-Coo[m]	z-Hoo[m]	Radius[m]	Rd	Ed	Rd/Ed	fulfill
BS-P(1q)	-4.02	0.27	7.27	931.19	316.67	1.68	Yes
BS-P(1q)	-2.90	0.19	6.75	601.07	404.44	1.49	Yes

Settlement analysis in SLS

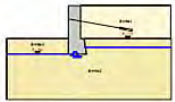
Settlement in the left (A) and right point (B) at the bottom edge of the wall.
 A opening point exists, if the resultant of the base pressure is within the core.

Verifiable result list with graphics

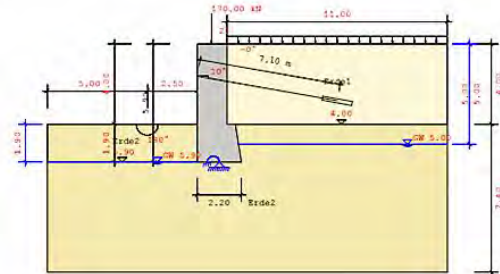
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PINWALLS Underpinning V:16.0 16052018
 File: Beispiel_02
 Project name:
 Baueinfangung



Construction state A



Used standards:

DIN EN 1997-1, Design: DIN EN 1992-1-1

Partial safety factor for actions and loadings:

Design situations:	BS-F(lg)	BS-T(2)	BS-A(3)
STB/GEO-1: Verification for the nominal limit states:			
permanent, general:	1.35	1.20	1.10
unfavorable variable:	1.50	1.50	1.10
permanent, earth pressure at rest:	1.20	1.10	1.00

EQU: Proof of equilibrium			
favorable, permanent:	1.10	1.05	1.00
unfavorable, permanent:	0.00	0.00	0.00
favorable, variable:	1.50	1.25	1.00

GEO-3: Serviceability (Slip circle)			
Dead load:	1.00	1.00	1.00
unfavorable, variable:	1.20	1.20	1.00



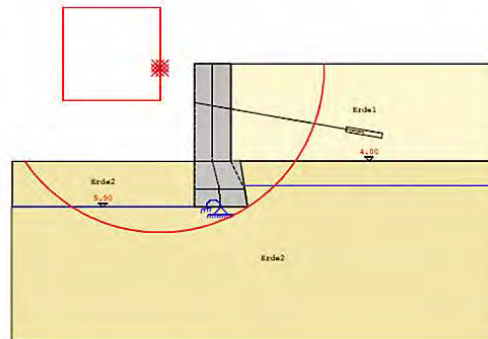
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Clear Output of Results

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Slip circle analysis by GEO-3:



Slip circle with minimum safety

Number of examined circles: 778
 Grid spacing of the center of circles: $x:0.19\text{ m}$ $z:0.18\text{ m}$

BS-P(lg) The midpoint of the slip circle with minimum safety is a boundary point. The slip circle analysis should be repeated with a new detail!

Relevant slip circle:

BS	x-Coo[m]	z-Coo[m]	Radius[m]	Rd	Ed	Rd/Ed fulfill
BS-P(lg)	-4.02	0.37	7.27	531.19	315.57	1.68 Yes
BS-P(lg)	-2.90	0.19	6.76	621.07	404.46	1.55 Yes

Settlement analysis in SLS

Settlement in the left (A) and right point (B) at the bottom edge of the wall. A gaping joint exists, if the resultant of the base pressure is within the core.

User-def. embedment depth: None calculated depth: 1.90 m
 set limiting depth: None calculated depth: 4.40 m

BS	Point A[cm]	Point B[cm]	Gaping joint:
BS-P(lg)	2.47	3.10	not existing

Overview of the analyses

Overview safety verifications overall stability



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Results:

Earth pressure:

Earth pressure options:
 Load calculation iterative: No
 Consider cohesion acc. to classical approach
 $(k_{ach} = 2 \cdot (\sqrt{k_{ah}}) \cdot \cos(\delta))$
 Calculation of active earth pressure
 Considering of earth resistance? with 50%

Earth pressure coefficient:

No.	Name	ϕ [°]	δ [°]	α [°]	β [°]
1	Erde1	30.00	15.00	0.00	0.00
2	Erde1	30.00	20.00	-8.97	0.00
3	Erde2	30.00	20.00	0.00	0.00
4	Erde2	30.00	-20.00	0.00	0.00

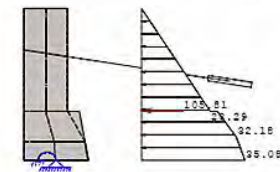
No.	Kah	Kach	K0h	Kph	Kpch
1	0.291	---	---	---	---
2	0.322	---	---	---	---
3	0.279	---	---	5.797	---
4	---	---	---	---	---

Earth pressure redistribution:

Distribution: trapezoidal:
 Consider loads: from q and p
 Levels of z1 and z2 of the redistribution:
 z1 and z2 are moved to the anchor height levels.

Characteristic horizontal rate of the earth pressure (not redistributed):

BS-P(lg):



z-Koo[m]	eh[kN/m²]
0.000	5
4.000	23
4.000	2
5.000	2
5.900	2
5.900	2



Relevant graphics for earth pressures (also with redistributions)