

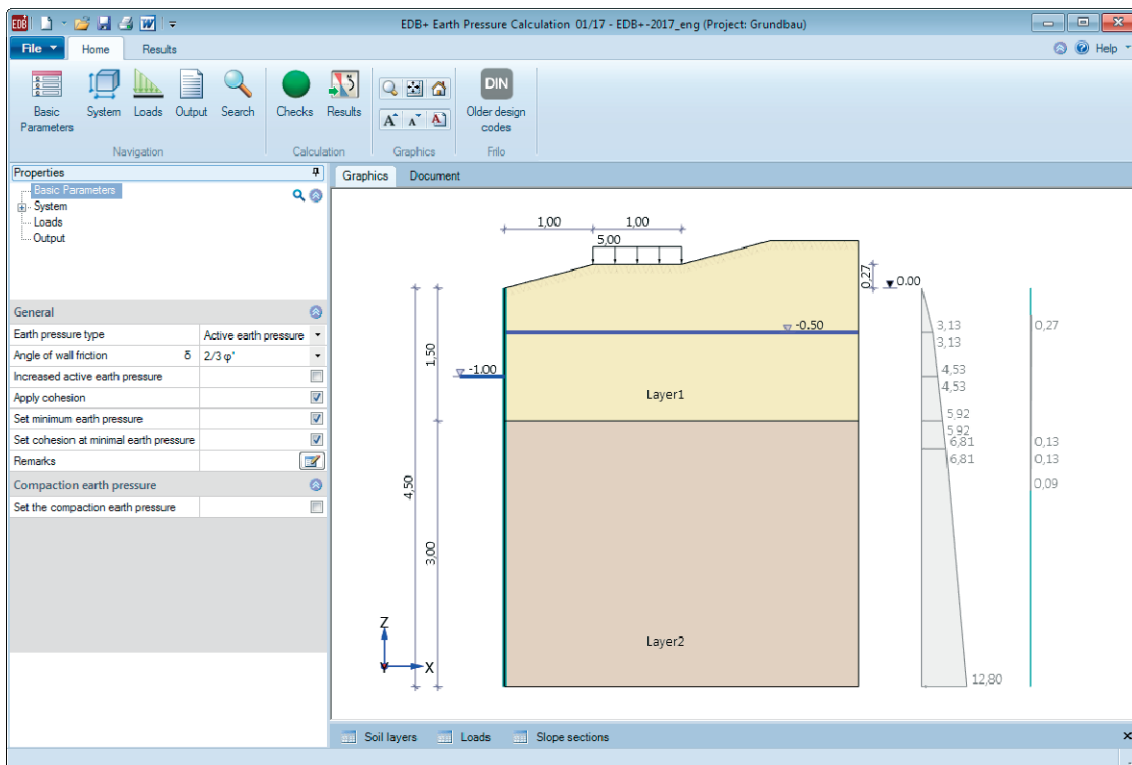
Earth Pressure Calculation EDB+

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Earth Pressure Calculation EDB+

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Application options

The EDB+ application allows you to calculate the earth pressure ordinates from the ground top edge down to a specified depth. The calculated earth pressure ordinates can be put out in detail for a partial area as well as for the entire depth.

At the same time, the software calculates the resulting horizontal and vertical earth pressure forces.

The following calculations are available for selection:

- Active earth pressure
- Earth pressure at rest
- Average of the active earth pressure and the earth pressure at rest (increased active earth pressure)
- Passive earth pressure (earth resistance)

Loading

- You can optionally define limited strip loads, line loads and block loads as well as limited and unlimited area loads on the ground at any depth.

Additional features

- Unlimited number of soil layers
- Discontinuous and continuous slopes
- Consideration of the earth pressure resulting from compaction and from the offset with possibly applying loads as per DIN 4085.
- Variable wall inclination
- Different water levels on the left and the right
- Ground water levels can be selected independently of layer borders
- Automatic consideration of the [water pressure](#) based on the ground water level

Basis of calculation

The earth pressure ordinates are calculated in accordance with the earth-pressure theory of Coulomb.

Reference literature

EAB, 5th edition Empfehlungen des Arbeitskreises "Baugruben"
(Recommendations of the Construction Pits working group)

DIN 4085 [2011-05]

ÖNORM B 4434

Franke, D., Verdichtungserddruck bei leichter Verdichtung, BAUTECHNIK 85 (2008) Booklet 3, pages 197 to 198

Basic parameters

Note: The available data-entry fields depend on the selected options.

Earth pressure type You can calculate the earth pressure for the following states:
 - passive state
 - active state
 - state at rest

Angle of wall friction angle of wall friction δ between the wall and the soil (is determined automatically if earth pressure at rest was selected)

Increased active earth pressure you must check this option if the movement of the wall is insufficient to trigger the limit state of the active earth pressure or to maintain it during the entire service life of the building.

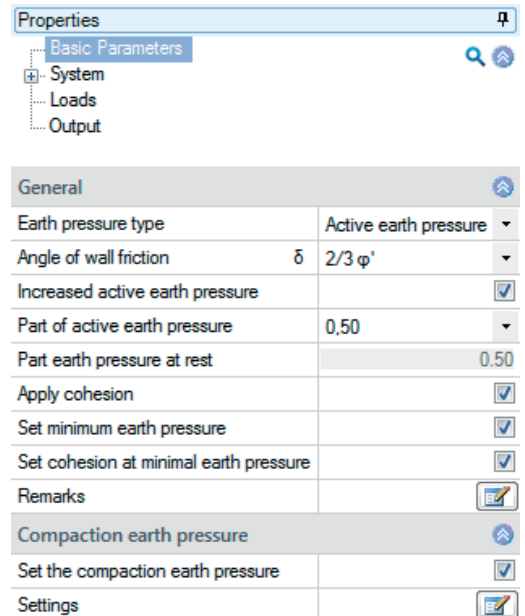
Part of active earth pressure percentage of the active earth pressure in the increased active earth pressure. 0,25 / 0,5 / 0,75 / user input. Example: 0,75 means 75% active earth pressure, 25% earth pressure at rest.

Apply cohesion when this option is checked (default), cohesion is taken into account. This has a favourable effect on the subsequent design. Uncheck this option if the cohesions specified for the individual soil layers should not be considered.
 DIN 4085 5.3.1 does not allow the consideration of cohesion in connection with earth pressure at rest. Therefore, this option is disabled in the calculation of the earth pressure at rest.

Set minimum earth pressure if the minimum earth pressure is considered (option ticked), it is checked for each layer of cohesive soil whether the earth pressure resulting from the self-weight of the soil and a shear strength that corresponds to the angle of inner friction $\varphi = 40^\circ$ becomes decisive at a cohesion $c = 0$. Calculation in accordance with [EAB, 5th edition](#).

Set cohesion at minimum earth pressure Cohesion must not be considered in the verification whether minimum earth pressure is required if the pit walls are unbraced or fitted with yielding bracing (EAB EB4, para. 3). If the construction pit walls are fitted with low-yielding bracing and the redistribution of the earth pressure is expected, you may include cohesion in the verification whether minimum earth pressure is required (EAB EB4 para. 5).

Assume curved sliding surfaces You can calculate the passive earth pressure either with linear or with curved sliding surfaces in accordance with DIN 4085/Sokolovski Pregl. The assumption of linear sliding surfaces for the passive earth pressure is only admissible in the case of $\alpha = \beta = \delta = 0^\circ$ (α : wall inclination, δ : angle of wall friction, β : slope inclination, φ : angle of friction)
 The earth pressure coefficients for curved sliding surfaces are determined in accordance with DIN 4085, Annex C.
Note: The graphical representation is always drawn linear.

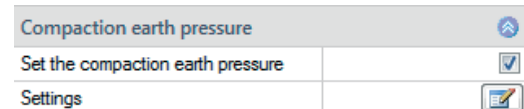



The screenshot shows the 'Properties' dialog box for 'Basic Parameters'. The 'General' tab is active, showing the following settings:

General	
Earth pressure type	Active earth pressure
Angle of wall friction	δ 2/3 φ'
Increased active earth pressure	<input checked="" type="checkbox"/>
Part of active earth pressure	0,50
Part earth pressure at rest	0,50
Apply cohesion	<input checked="" type="checkbox"/>
Set minimum earth pressure	<input checked="" type="checkbox"/>
Set cohesion at minimal earth pressure	<input checked="" type="checkbox"/>
Remarks	<input type="text"/>
Compaction earth pressure	
Set the compaction earth pressure	<input checked="" type="checkbox"/>
Settings	<input type="text"/>

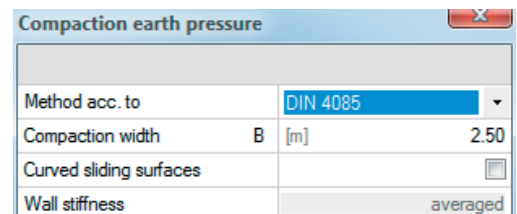
Remarks you can optionally enter comments that are subsequently included in the output.

Compaction earth pressure when soil is backfilled layer by layer and compacted subsequently, the earth pressure exceeds the one resulting from the self-weight of the soil.



When you check the option, the  button is displayed and allows you to access the corresponding data-entry dialog.

Settings the parameters for the compaction earth pressure are displayed.



DIN 4085, Franke or ÖNorm B 4434 are the optionally available methods:

The compaction earth pressure for strong compaction is calculated as per DIN 4085. For light compaction (vibrating plate with an operating mass of up to 250 kg), the method described by Franke (Franke, D., Verdichtungserddruck bei leichter Verdichtung, BAUTECHNIK 85 (2008) Booklet 3, p. 197 to 198) should be selected. Alternatively, you can include the compaction earth pressure as per ÖNorm in addition to the earth pressure at rest.

- Compaction width B:

Width of the space to be filled. B has only an influence in combination with earth pressure at rest and increased earth pressure (with low-yielding walls).

- Curved sliding surfaces:

The depth z_p , from which the full compaction earth pressure is considered, is determined by comparing the compaction earth pressure to the passive earth pressure. The associated passive earth pressure coefficient can be determined in combination with linear and curved sliding surfaces.

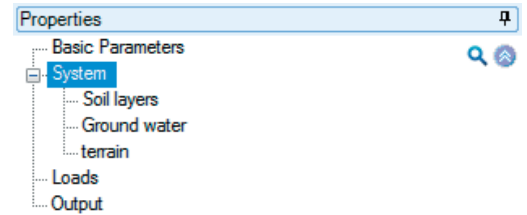
- Yielding of the wall:

Value displayed for information. It is automatically determined and depends on the type of earth pressure.

Structural system

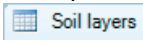
Note: You can change the default units via **File** ▶ **Program options** ▶ **Units**.


Height	height of the area from the ground top level for which the earth pressure should be put out.
Wall inclination α	wall rotation about the upper wall edge. Anti-clockwise is positive (α positive)



System		
Height of the cutout	[m]	6.00
Wall inclination	α [°]	0.0

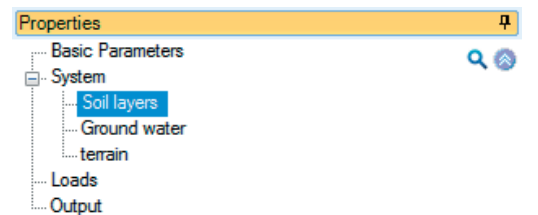
Soil layers

Enter the data of the first soil layer either in the corresponding data-entry mask or directly in the soil layers table, which you can display below the graphic by activating the  button.

To add soil layers, always set up a new soil layer first by activating the  button (a data-entry mask for the new soil layer is displayed each time).

- See also [Data entry via tables](#) in the Basic Operating Instructions PLUS.pdf

Tip: A description is displayed in the status line each time you click into a particular data-entry field.



Soil layers			
Stroke weight	γ	[kN/m ³]	18.0
Buoyant unit weight	γ'	[kN/m ³]	8.0
Effective friction angle	ϕ'	[°]	30.0
Cohesion	c'	[kN/m ²]	0.00
Thickness	d	[m]	3.00
Description			

Stroke weight γ	specific weight of the soil.
Buoyant unit weight γ'	specific weight of the soil layer under buoyancy.
Friction angle ϕ'	friction angle of the soil in this soil layer.
Cohesion c'	cohesion of the soil.
Thickness d	thickness of the soil layer
Name	optional designation of the soil layer.

Ground water

Ground water	displays the definition parameters for the ground water level.
hwb	distance of the ground water table to the ground top level in the construction pit.
hww	distance of the ground water level to the top edge of the wall.


Ground water		
Ground water		<input checked="" type="checkbox"/>
Groundwater levels		
In the pit	hwb [m]	-1.00
Behind the wall	hww [m]	-0.50

Ground topology

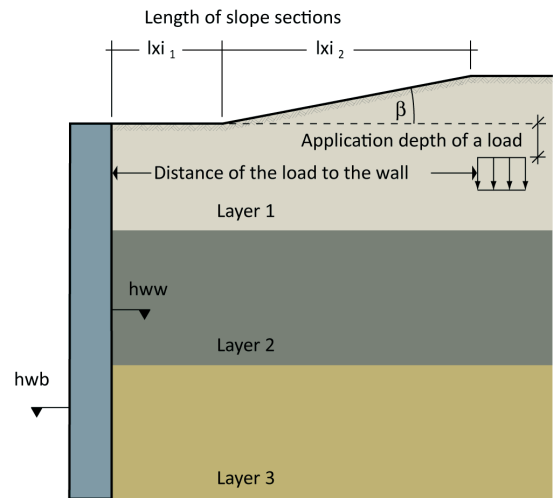
Slope	topology of the ground surface: - horizontal - continuous slope - discontinuous slope
Length	length of the slope section in the x-direction. The length of the last section is automatically increased if required.
Inclination β	inclination of the slope measured against the horizontal level. Anticlockwise is positive. Only positive values are allowed.

Slope sections of discontinuous slopes

You can define slope sections via their length and inclination.

You can access the slope section table by activating the tab  **Slope sections**, see also [Data entry via tables](#) in the Basic Operation Instructions PLUS.pdf

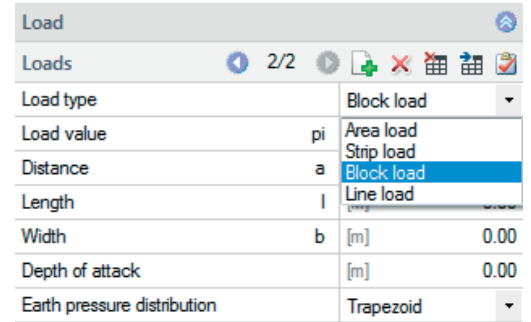
The slope section defined last is automatically adjusted to the maximum relevant length.



terrain		
Slope	broken	
Slope sections 1/4		
Length	bx [m]	1.50
Inclination	β [°]	20.0

Loading

Load type	- Area load - Strip load (not with passive earth pressure) - Block load - Line load (not with passive earth pressure)
Load value pi	load ordinate in kN/m^2 or kN/m
Distance	distance of the load to the wall (in the x-direction)
Length	load length parallel to the wall (block load)
Width	width of the load perpendicular to the wall (with block loads and strip loads)
Depth of attack	depth at which the load applies. Negative values indicate an application below the wall head.



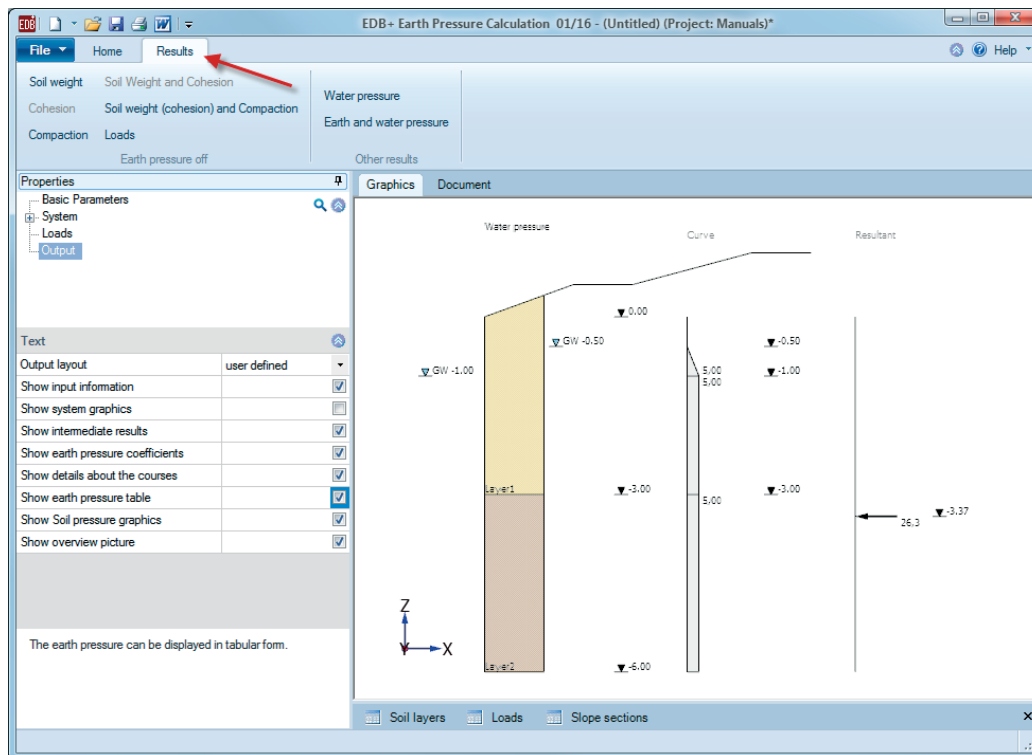
Earth pressure distribution

Rectangular or trapezoidal distribution with block loads and strip loads:

If limited live loads apply, you can distinguish between a rectangular distribution and a trapezoidal distribution of the load. In accordance with [EAB, 5th Edition](#), a rectangular load distribution should be selected for loads that start at the wall. For other loads, a trapezoidal distribution should be selected. Where walls with low-yielding bracing are concerned, the EAB leaves the selection of the earth pressure distribution to the engineer.

Results

The Results tab allows you to display various result graphs.



The individual result buttons are only enabled if a corresponding result is available:

- Weight of soil
- Compaction
- Cohesion
- Cohesion and self-weight
- Water pressure
- Earth pressure and compaction
- Earth pressure and water pressure
- Loads

Output

Output layout and options

By checking the desired options, you can determine the scope of texts to be put out.

Output as a PDF file

On the "Document" tab, a PDF document is displayed.

See also the document [Output and printing](#).

Properties

- Basic Parameters
- System
- Loads
- Output

Text

Output layout	brief	▼
Show input information		<input type="checkbox"/>
Show system graphics		<input type="checkbox"/>
Show intermediate results		<input type="checkbox"/>
Show earth pressure coefficients		<input type="checkbox"/>
Show details about the courses		<input type="checkbox"/>
Show earth pressure table		<input checked="" type="checkbox"/>
Show Soil pressure graphics		<input type="checkbox"/>
Show overview picture		<input checked="" type="checkbox"/>

