

Lateralk

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About



Lateralk

Lateralk is a computer program for calculating lateral earth pressure coefficients in static and earthquake conditions.

Although all efforts have been undertaken to ensure that this software is of the highest possible quality and that the results obtained are correct, the authors do not warrant the functions contained in the program will meet your requirements or that the operation of the program will be uninterrupted or error-free. The authors are not responsible and assume no liability for any results or any use made thereof, nor for any damages or litigation that may result from the use of the software for any purpose. All results to be verified independently by user.

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Vancouver, Canada

License Agreement

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Licensing Help

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References

1- Foundation analysis and design (5th edition)

Joseph E. Bowles

2- Principles of Geotechnical Engineering

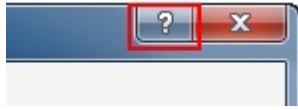
Braja M. Das

Units System

This version of Lateralk supports the following units system :

- Metric (kN, m)
- US Customary (lb, ft)

Getting Help



Help button is placed at the top-right corner of program dialog pages.

In order to open the help content associated with a page, please click on ? button. Otherwise you can open the Help file from Help menu.

» If you prefer the PDF or e-Book format, please refer to Users Manuals folder, located in the program installation folder.

Contents

Input data

As it can be seen in the following screenshot, there are three sets of input parameters in **LateralK** program:

The screenshot displays the Lateral Earth Pressure Software 4.0.2020.410 interface. The main window contains a menu bar (File, View, Tools, Help) and a toolbar with icons for file operations, calculation, and help. The input parameters are organized into three sections:

- Soil Properties:**
 - Select Units System: US Customary (kips, ft)
 - Internal friction angle $\Phi = 36$ (deg)
 - Soil-wall friction angle $\delta = 24$ (deg)
 - Soil unit weight = 120 (lb/ft³)
- Wall Geometry:**
 - Backslope angle $\alpha = 0$ (deg)
 - $\beta = 90$ (deg)
 - Wall height = 9.5 (ft)
 - Wall buried depth = 1.5 (ft)
- Seismic Parameters:**
 - Horizontal ground acceleration = 0.35 (g)
 - Vertical ground acceleration = 0 (g)

A "Calculate" button is located at the bottom of the input fields. The right side of the interface shows a vertical list of options for Static Conditions, Lateral Earth Pressure, Total Lateral Earth Pressure, and Point of Application, with radio buttons for each.

Soil Properties

Φ : Internal friction angle of soil in degrees (between 0 and 55)

δ : Angle of friction between soil and concrete as ratio of F

γ : Unit weight of backfill material

Geometry

α : Back-slope angle in degrees

β : Batter angle of rear face of the retaining wall

Total Height of the wall, and buried portion of the wall

Seismic Parameters

Horizontal and vertical peak ground accelerations

When all parameters are entered, press the **Calculate** button to view the results.

Analysis Results

Lateral earth pressure coefficients and lateral loads are provided in both static and seismic loading conditions

The screenshot shows the Lateral Earth Pressure Software interface. On the left, input fields are filled with: Internal friction angle $\Phi = 36$ (deg), Soil-wall friction angle $\delta = 24$ (deg), Soil unit weight = 120 (lb/ft³), Backslope angle $\alpha = 0$ (deg), Batter angle $\beta = 90$ (deg), Wall height = 9.5 (ft), Wall buried depth = 1.5 (ft), Horizontal ground acceleration = 0.35 (g), and Vertical ground acceleration = 0 (g). The 'Calculate' button is visible at the bottom left.

The main area displays two tables: 'Lateral Earth Pressure Coefficients' and 'Total Lateral Loads lbs/ft (static)'. The 'Static Condition' tab is active.

Condition	Rankine	Coulomb	Jaky
Active (Ka)	0.26	0.235	-
At-rest (Ko)	-	-	0.412
Passive (Kp)	3.852	11.146	-

Condition	Rankine	Coulomb	Jaky
Active (Pa)	1405.8	1271.9	-
At-rest (Po)	-	-	2232.1
Passive (Pp)	520	1504.7	-

Below these tables is the 'Point of Application of Resultant Force' table:

Condition	Distance from the bottom of wall (ft)
Active	3.17
At-rest	3.17
Passive	0.5

On the right, a 'SCHEMATIC RETAINING WALL SECTION' diagram shows a wall of height 9.5 ft and buried depth 1.5 ft. The backfill surface is horizontal ($\alpha = 0^\circ$). The wall face is vertical ($\beta = 90^\circ$). Lateral loads are shown: dP @ 4.75 ft and Pa @ 3.17 ft. The resultant force Pp is shown at 0.5 ft from the bottom. A note at the bottom right states: 'Note: - For magnitude of loads, refer to the tables. - Point of application of loads are shown from the bottom of the wall. - dP is applied at 24 degrees from [Save As Image...](#)'

Click on View > Details menu, in order to view the details of Kae and Kpe coefficients (seismic) for different horizontal and vertical ground accelerations (a_h, a_v):

Static Condition		Earthquake Condition									
		Active Earthquake K _{ae}					Passive Earthquake K _{pe}				
K _h (g)	K _v =0g	K _v =0.05g	K _v =0.1g	K _v =0.15g	K _v =0.2g	K _v =0.25g	K _v =0.3g	K _v =0.35g	K _v =0.4g	K _v =0.45g	K _v =0.5g
0	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
0.1	0.306	0.308	0.31	0.312	0.314	0.317	0.32	0.324	0.329	0.334	0.338
0.2	0.341	0.345	0.349	0.354	0.36	0.366	0.374	0.383	0.394	0.408	0.422

$$K_h = a_h/g$$

$$K_v = a_v/g$$

where g is acceleration due to gravity (9.81 m/s²).

Note: The K_e values marked with * represent a mathematical limitations in Mononobe & Okabe equation.

Reporting

After performing the calculations if a report is needed, we recommend **Exporting** the results to Microsoft Excel or image files and then incorporate them into your reports (use **File→Export** menu). Alternatively you can directly print the tables using the printer button on toolbar or by using File menu.

Equations

Following is the list of all equations used in **LateralK** for calculating the lateral earth pressure coefficients.

Static Conditions - Active K_a

» Rankin Method

$$K_a = \tan^2 \left(45^\circ - \frac{\varphi}{2} \right)$$

» Coulomb Method

$$K_a = \frac{\cos^2(\varphi - \alpha)}{\cos^2 \alpha \cdot \cos(\alpha + \delta) \left[1 + \sqrt{\frac{\sin(\varphi + \delta) \cdot \sin(\varphi - \beta)}{\cos(\alpha + \delta) \cdot \cos(\alpha - \beta)}} \right]^2}$$

Static Conditions - Passive K_p

» Rankin Method

$$K_p = \frac{1 + \sin \varphi}{1 - \sin \varphi} = \tan^2 \left(45^\circ + \frac{\varphi}{2} \right)$$

» Coulomb Method

$$K_p = \frac{\cos^2(\varphi - \alpha)}{\cos^2 \alpha \cdot \cos(\delta - \alpha) \left[1 + \sqrt{\frac{\sin(\varphi - \delta) \cdot \sin(\varphi + \beta)}{\cos(\alpha - \delta) \cdot \cos(\alpha + \beta)}} \right]^2}$$

Static Conditions - At rest K_0

» Jaky Method

$$K_r = 1 - \sin \varphi$$

Earthquake Conditions - Active and Passive K_{ae} , K_{pe}

» Mononobe , Okabe Method

Novo Tech Software Website

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Support

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