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# Smart-Geotechnic V1.00

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Small program package for soil engineering on TI89,  
TI92+, V200

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## 1 Introduction

Smart-Geotechnic V 1.00 is a program package for soil engineering on TI89, TI92+ and V200. It provides numeric input and output.

Smart-Geotechnic contains following file (for TI89, TI92+, V200):

- smartgeo.asm (smartgeo.89z, smartgeo.9xz, smartgeo.v2z)

## 2 Requirements

- TI89, TI92+ or V200 with AMS-Version 2.05 or higher
- 15kB free RAM

## 3 Recommendations

- Program "Auto Alpha-Lock Off" from Kevin Kofler (<http://kevinkofler.cjb.net>) only for TI89
- Program "PreOs" from PpHd (<http://www.timetoteam.fr.st>) as an anti-crash protection

## 4 Notes and warnings

This program is distributed to help students of civil engineering and other technical fields, but WITHOUT ANY WARRANTY. (The authors make no representations or warranties about the suitability of the software, either express or implied. The authors are not liable for any damages suffered as a result of using or distributing this software.) Every kind of commercial use is forbidden without the permission of the authors.

Certainly there are several bugs within the program. For this reason it's useful to make a backup of your calculator before using it.

Wrong operation can lead to a complete crash of the calculator's system which can only be repaired with a reset (on+2nd+hand). The consequence is that all data on your calculator which is not archived will be deleted.

Therefore you should be careful, especially at the start of using this program.

If you have comments, bug reports or anything else, email Christian Urich (csac7688@uibk.ac.at) or Valentini Bernhard (csac7912@uibk.ac.at).

## 5 Features

- active earth pressure coefficients
- passive earth pressure coefficients
- pressure under a corner of a rectangular area with the formula of Steinbrenner

## 6 Installation

Transfer the file "smartgeo.asm" via link cable to your calculator. When you have a TI89 you can install the program "Auto Alpha-Lock Off" from Kevin Kofler (<http://kevinkofler.cjb.net>) to avoid pressing the alpha button every time you make an input.

## 7 Starting the program

Write in the command line of the TI-application "Home" the expression "smartgeo()".

## 8 General Notes

The handling of the program is made as easy as possible, so the input can be done very quickly.

Negative numbers you have to input with the "(-)" sign next to the "." at the bottom of the numeric block. You should never make an input with the sign minus "-".

## 9 Menu structure

File	Programs	Info
Exit	Active Earthpressure Passive Earthpressure Steinbrenner	

## 10 File

### 10.1 Save

### 10.2 Exit

Exits the program.

## 11 Programs

### 11.1 Active Earthpressure

Calculates the active earth pressure coefficients.

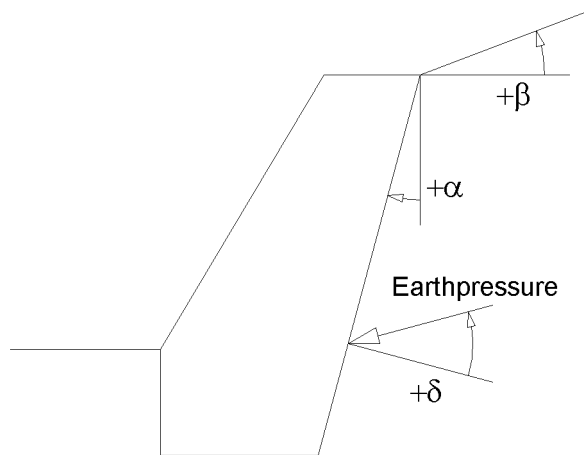


Figure 1: Definition of signs

- $\alpha$  ... angle of the wall
- $\beta$  ... angle of the slope
- $\delta$  ... angle of friction of the wall
- $\varphi$  ... angle of friction

Used formulas:

- $K_{ah}$  ... horizontal active earth pressure coefficient

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

- $K_a$  ... active earth pressure coefficient

$$K_a = K_{ah} \frac{1}{\cos(\alpha - \delta)} \quad (2)$$

- $K_{av}$  ... vertical active earth pressure coefficient

$$K_{av} = K_a \frac{\cos \alpha \cos \beta}{\cos(\beta - \alpha)} \quad (3)$$

- $K_{ac}$  ... active earth pressure coefficient for the cohesion

$$K_{ac} = - \frac{2 \cos(\beta - \alpha) \cos \varphi}{[1 + \cos(\delta + \varphi - \alpha - \beta)] \cos \alpha} \quad (4)$$

## 11.2 Passive Earthpressure

Calculates the passive earth pressure coefficients.

Used formulas:

- $K_{ph}$  ... horizontal passive earth pressure coefficient

$$K_{ph} = \frac{\cos^2(\alpha - \varphi)}{\cos^2 \alpha \left[ 1 + \sqrt{\frac{\sin(\varphi - \delta) \sin(\varphi + \beta)}{\cos(\alpha - \delta) \cos(\alpha + \beta)}} \right]^2} \quad (5)$$

- $K_p$  ... passive earth pressure coefficient

$$K_p = K_{ph} \frac{1}{\cos(\alpha - \delta)} \quad (6)$$

### 11.3 Steinbrenner

Calculates the vertical stress under a corner of a rectangular area with the formula of "Steinbrenner".

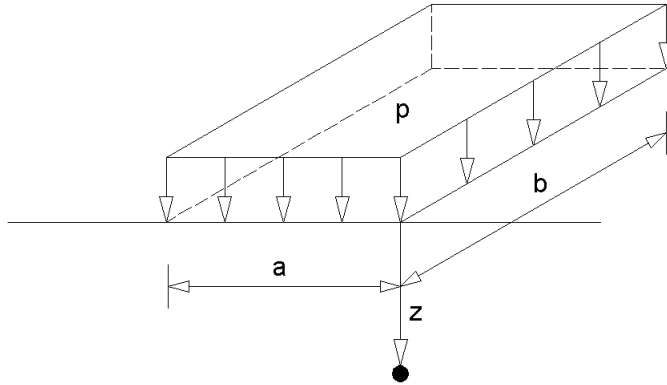


Figure 2: Definition of parameters

- a ... length of the rectangular area
- b ... width of the rectangular area
- z ... depth under the rectangular area    Used formulas:
- p ... loading on the rectangular area

- $\sigma_{zz}$  ... vertical stress in the depth z

$$\sigma_{zz} = -\frac{p}{2\pi} \left[ \arctan \frac{ab}{zR'} + \frac{abz}{R'} \left( \frac{1}{a^2 + z^2} + \frac{1}{b^2 + z^2} \right) \right] \quad (7)$$

(8)

$$R' := \sqrt{a^2 + b^2 + z^2} \quad (9)$$

## 12 Info

Prints some information about the program.

## 13 Developer

- Ulrich Christian [csac7688@uibk.ac.at]
  - calculation
- Valentini Bernhard [csac7912@uibk.ac.at]
  - menus and calculation

Web site: <http://homepage.uibk.ac.at/~csac7688/>

## 14 Thanks

- The TIGCC team for making it possible to program in C (<http://tict.ticalc.org>)

## 15 History

- Smart-Geotechnic V 1.00:
  - 19.06.2004 - final release
    - \* passive earth pressure added
    - \* new layout
- Smart-Geotechnic V 0.01:
  - 21.11.2003 - first release



## References

- [Kolymbas (1998)] Dimitrios Kolymbas, *Geotechnik - Bodenmechanik und Grundbau*, Springer Verlag, Berlin Heidelberg, 1998.
- [ÖNORM B4434 (1993)] *Erddruckberechnung*, Österreichisches Normungsinstitut, Wien, 1993.