Using standards and analysis settings

Program: Gravity wall

File: Demo_manual_01.gtz

This chapter explains the correct use of the Settings administrator, which serves to select the standards, partial factors and verification methodology. It is a basic step needed for all GEO5 programs.

Introduction:

GEO5 software is used in 90 countries worldwide. Engineering tasks are the same everywhere – to prove that the construction is safe and well designed.

The basic characteristics of structures (e.g. dimensions of the wall, terrain, localization of anchors etc.) are the same all over the world, however the ways of proving that the construction is safe and the theories of analysis differ. Large quantities of new theories and mainly partial factors of analysis lead to the need to input large amounts of data and complicate programs. The Settings administrator was created to simplify this process.

In the Settings administrator all input parameters are defined, including standards, methods and coefficients for the current country. The idea is that each user will understand the settings defined in the program (or will define new settings for the analysis) and then use them in their work. The user then goes to the Settings administrator and Settings editor only occasionally.

Assignment:

Perform an analysis of a gravity wall as shown on the picture below for overturning and slip according to these standards and procedures:

1) CSN 73 0037

2) EN 1997 – DA1

3) EN 1997 – DA2

4) EN 1997 – DA3

5) Safety factor on SF=1.6
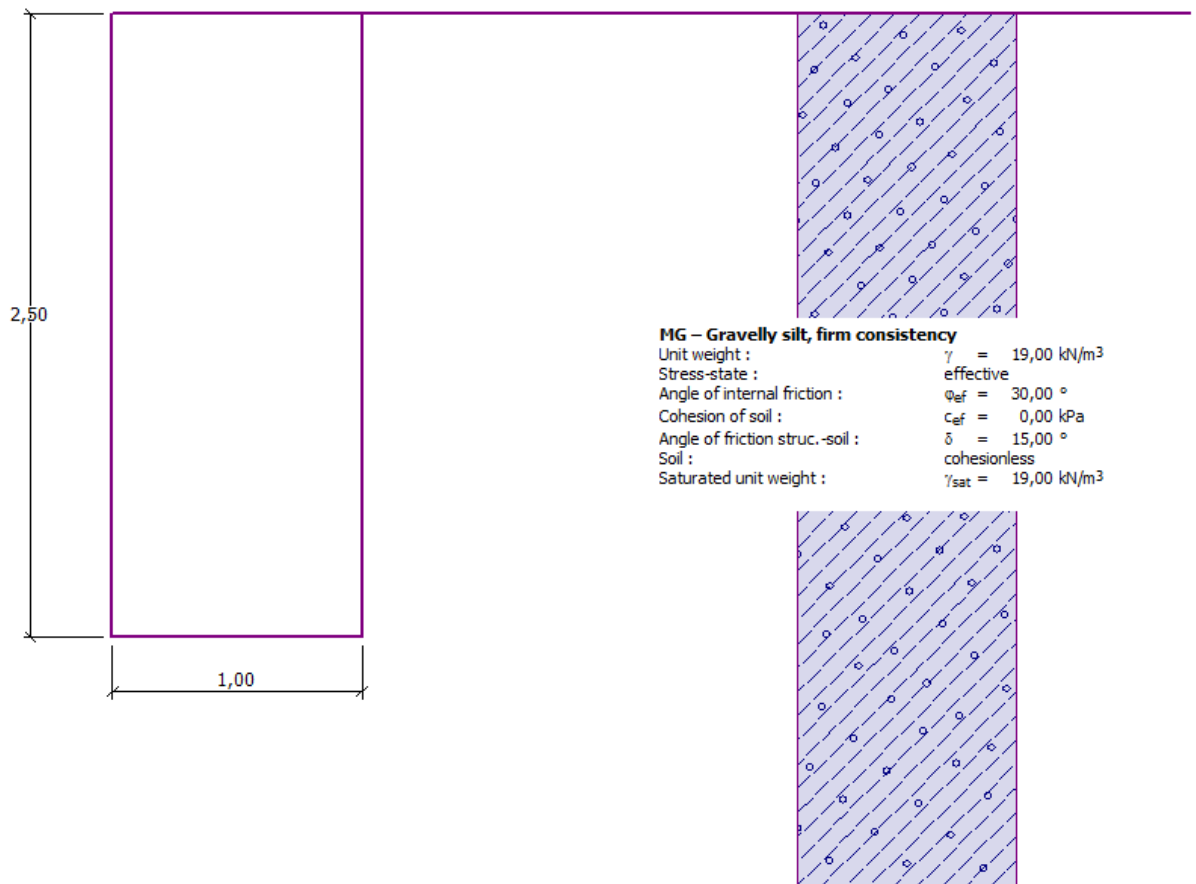
Scheme of the gravity wall for analysis

Solution:

First, input the data about the construction and the geological conditions in the frames: "Geometry", "Assign" and "Soils". Skip the other frames because they are not important for this example.

Table with the soil parameters

| Soil (Soil classification)	Unit weight $\gamma \left[kN/m^3 \right]$	Angle of internal friction $\varphi_{ef} \left[° \right]$	Cohesion of soil $c_{ef} \left[kPa \right]$	Angle of friction structure – soil $\delta = \left[° \right]$
MG – Gravelly silt, firm consistency	19,0	30,0	0	15,0

In the frame "Assign", the first soil will be assigned automatically to the layer or layers. This can be changed if necessary.
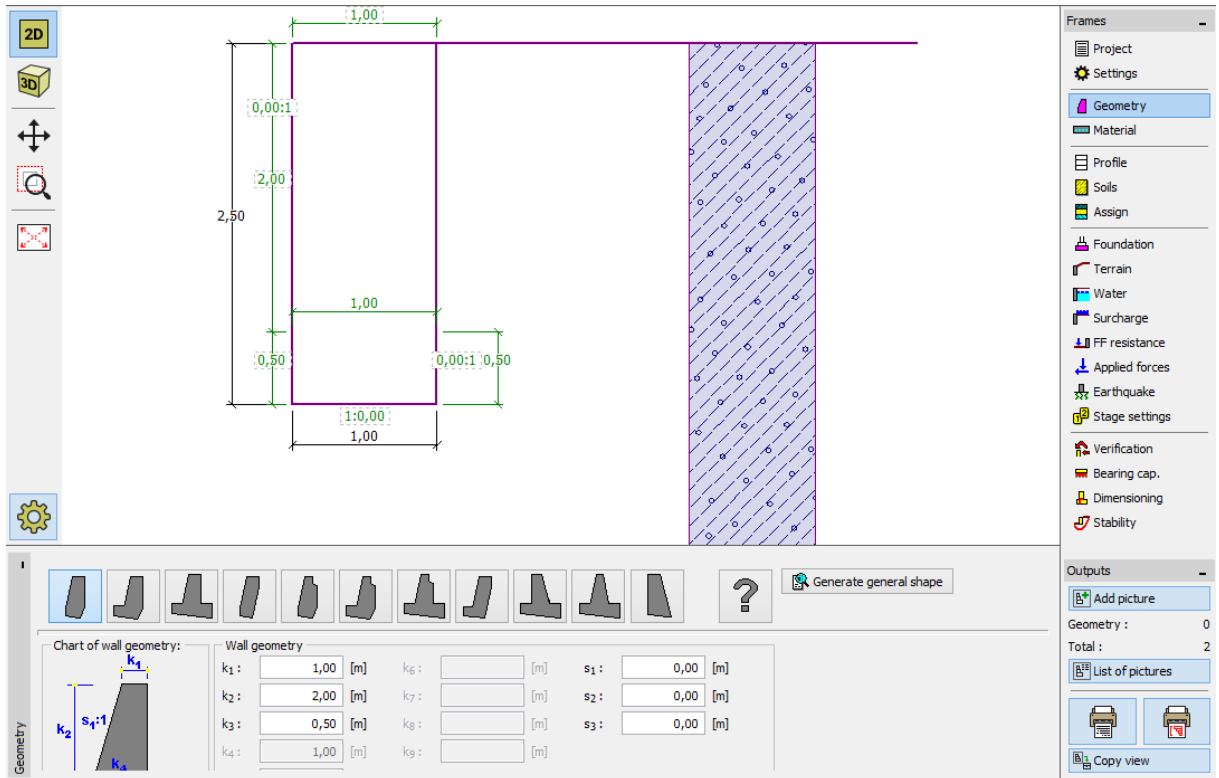
Frame "Geometry" – gravity wall dimensions input

When the basic input of the construction is done, we can choose the standards we want to use, and then finally run the analysis of the gravity wall.

In the frame "Settings" click the button "Select" and choose number 8 – "Czech Republic – old standards CSN (73 1001, 73 1002, 73 0037)".
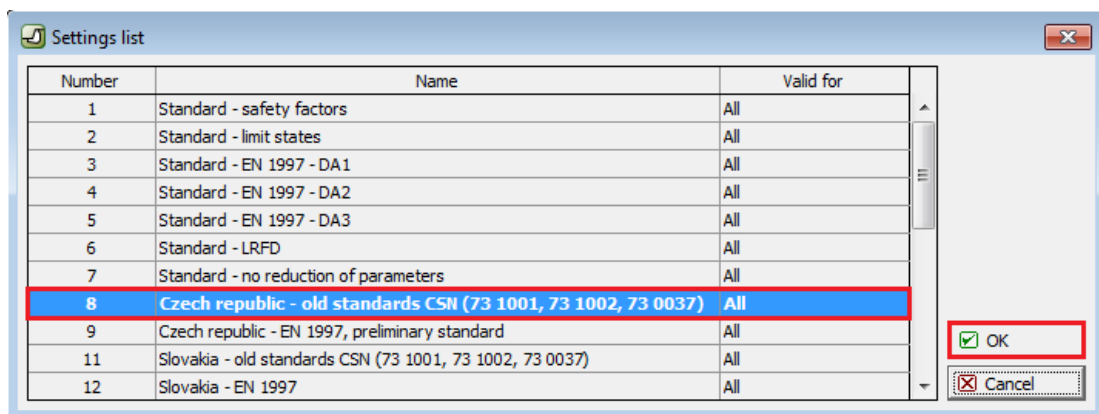
Dialog window "Settings list"

Note: The look of this window depends on what standards are currently active in the Settings administrator – more information in the help of the program (press F1). If the setting you want to use isn't on the list in the dialog window "Settings list", you can activate it in the Settings administrator.

Now, open up the frame "Verification" and after analyzing the example, record the utilization of construction (in the frame "Verification") - 53,1%, or 66,5%.

Frame "Verification" – results of the analysis using CSN 73 0037 standard

Then return to the frame "Settings" and choose number 3 – "Standard – EN 1997 – DA1".

Dialog window "Settings list"

Again, open the frame "Verification" and record the results (55,6% and 74,7%) for EN 1997, DA1.

Frame "Verification" – results of the analysis for EN 1997, DA1

Repeat this procedure for Settings number 4 – "Standard – EN 1997 – DA2" and number 5 – "Standard – EN 1997 – DA3".

The analyzed utilization of the constructions is (77,8% and 69,7%) for EN 1997, DA2 or (53,5% and 74,7%) for EN 1997, DA3.

Option 5 (analysis using Safety factors) is not as simple. In the frame "Settings" click on "Edit". This will show you the current analysis settings. Change the verification methodology to "Safety factors (ASD)" and then set the safety factor for overturning and sliding resistance to 1.6.
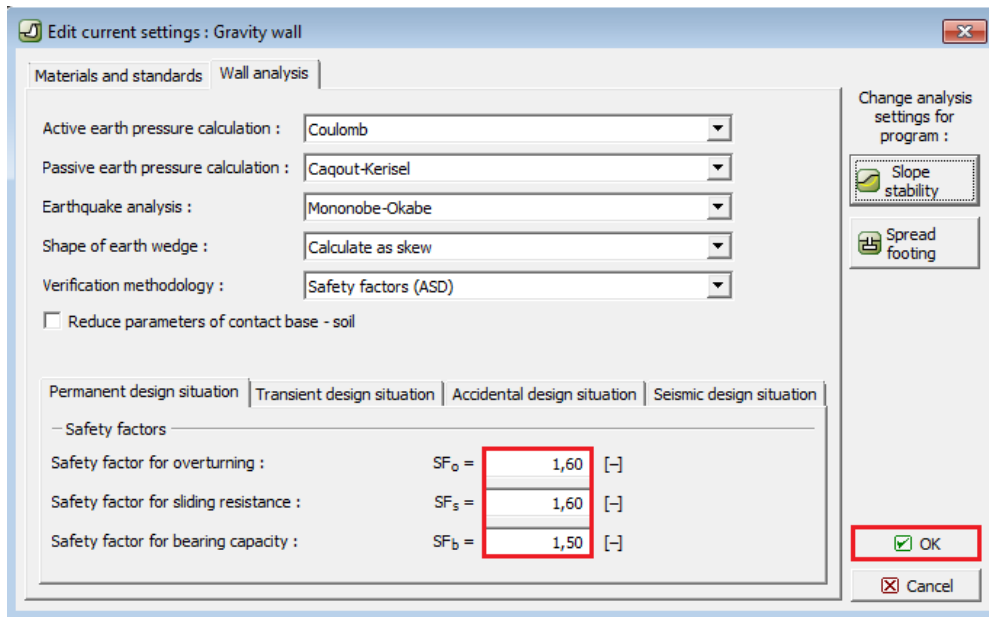
Dialog window "Edit current settings: Gravity wall"

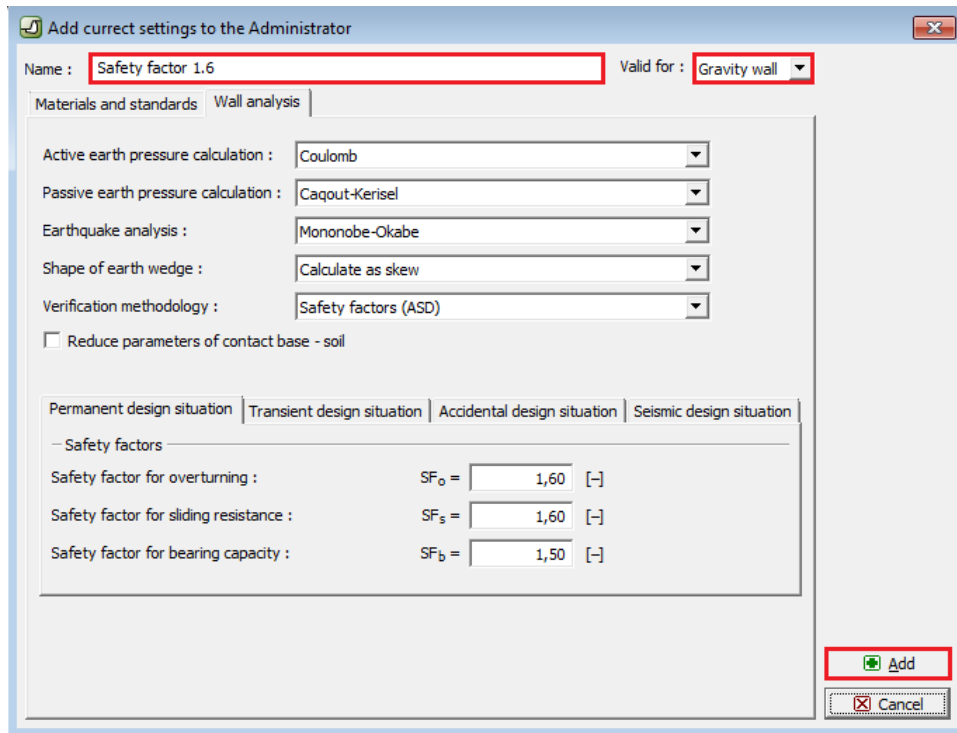Press OK and run the analysis. (Utilization: 69,0% and 77,1%).

Frame "Verification" – analysis results for SF = 1.6

If you would like to use this setting more often, it is useful to save it by clicking on "Add to administrator", rename it as shown below, and next time use it as a standard setting.

Dialog window "Add current settings to the Administrator"

The "Settings list" dialog window then looks like this:
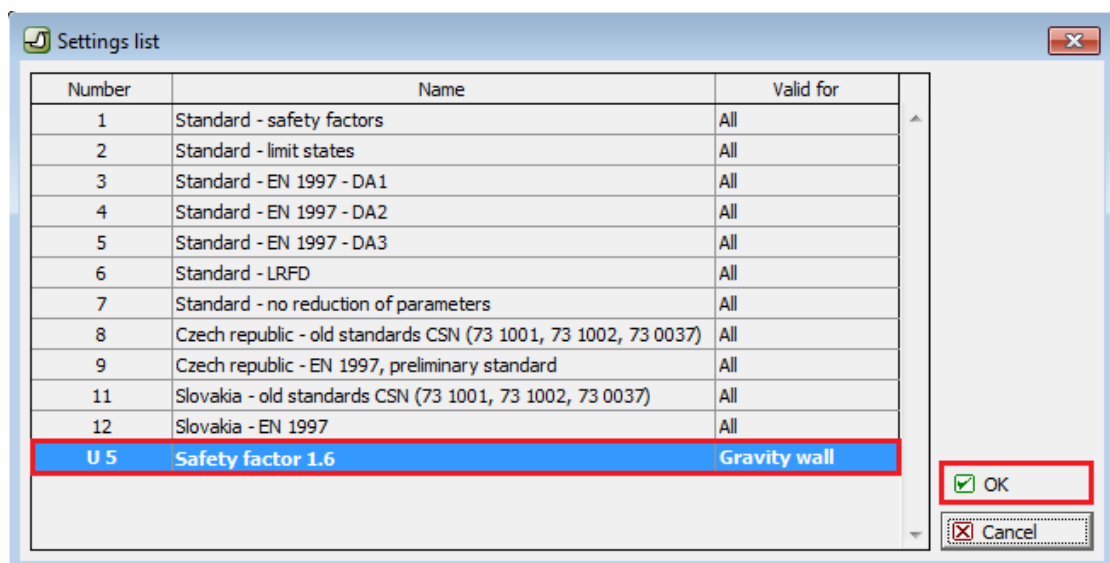
Dialog window "Settings list"

Verification

The utilization percentage using each standard is:

		Overturning	Slip
1)	CSN 73 0037	53,1	66,5
2)	EN 1997 – DA1	55,6	74,7
3)	EN 1997 – DA2	77,8	69,7
4)	EN 1997 – DA3	53,3	74,7
5)	Safety factor on SF=1.6	69,0	77,1

Using the selected analysis standards, the results are satisfactory.

Note: This simple method can be used to compare retaining structures or stability analyses. When analyzing foundations, the load (basic input data) must be computed according to relevant standards. That is the reason why it doesn't make sense, to compare foundation design according to various standards with the same values of load (nominal values).