

Inputting geometry by importing data from a DXF file

Program: GEO5 FEM

GEO5 File: Demo_manual_30.gmk

DXF Files:

- model201.dxf – original file, which cannot be used because it is too complicated
- model202.dxf – partly modified file, which you can use as a template for manual input
- model203.dxf – completely modified file, which you can load to the interfaces of soils

Introduction

Sometimes you have the geometry of a task defined in another program – AutoCad, gINT etc... There is a universal format DXF, which can be used for communication between these programs. This format can be imported to the GEO5 software too. DXF files can contain a large amount of data. It is not possible nor good practice to import all these data.

In this engineering manual we will show you the basic possibilities of working with DXF files. Purposely, we chose an extremely badly created file for import, because we want to show all options including a modification in the CAD software.

If your file is in a better quality, you can skip some chapters, where modifications of the file are made.

Chapters

Exploration and basic modification of the file – describes how to display a DXF file and modify unsuitable data

Variant A. – Interface input by template - describes the import of DXF data to a template and the creation of interfaces of soils using this template

Variant B. – Advanced editing and automatic load - describes the automatic import from a well created DXF file to the interface of soils

Structure input by template – describes possibilities of importing other data to the program – e. g. anchors, beams, reinforcements.

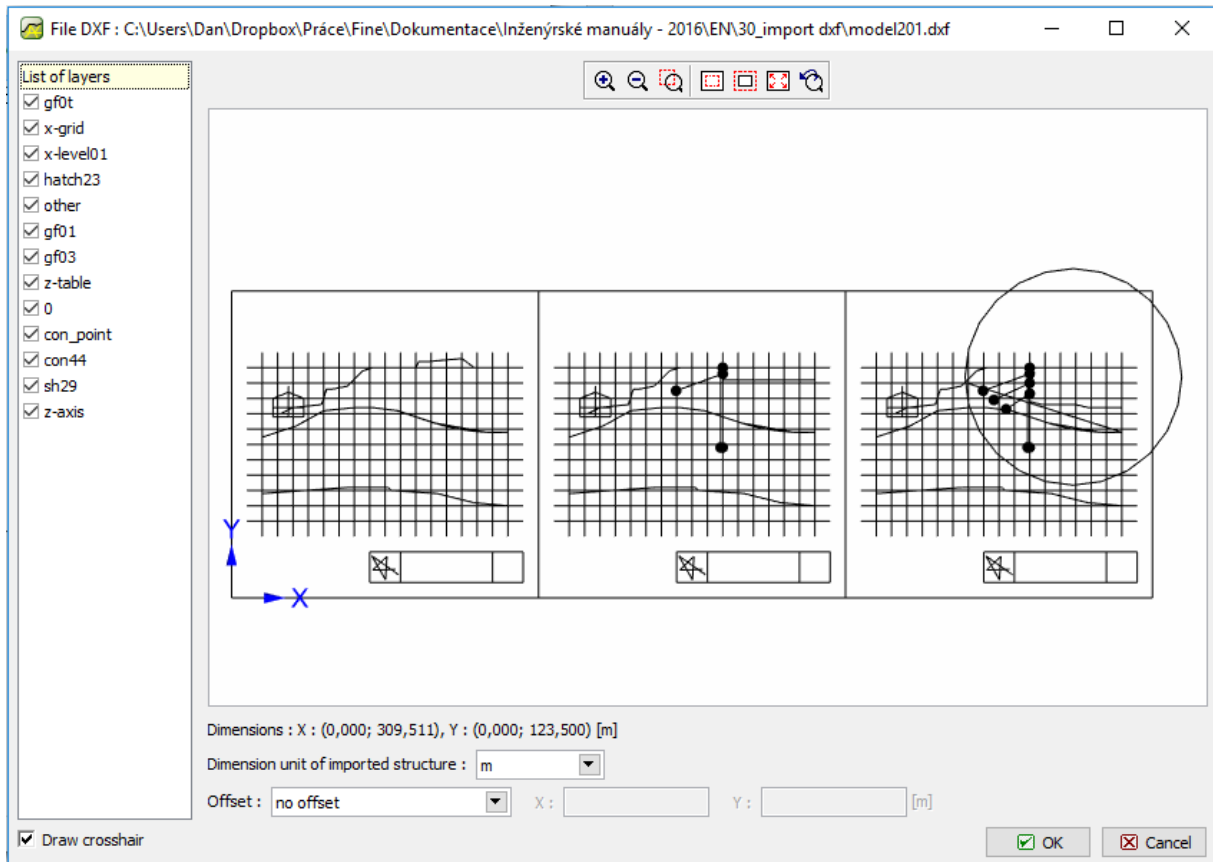
General recommendations and solution of the most common problems – this chapter contains a list of possible problems with importing DXF data and solutions to these problems

Assignment

Use the file **model201.dxf**, which contains a geological scheme of the model, structure of a sheeting wall and the location of the anchors. Model a task in the GEO5 FEM program using data from this file.

Exploration and basic modification of the file

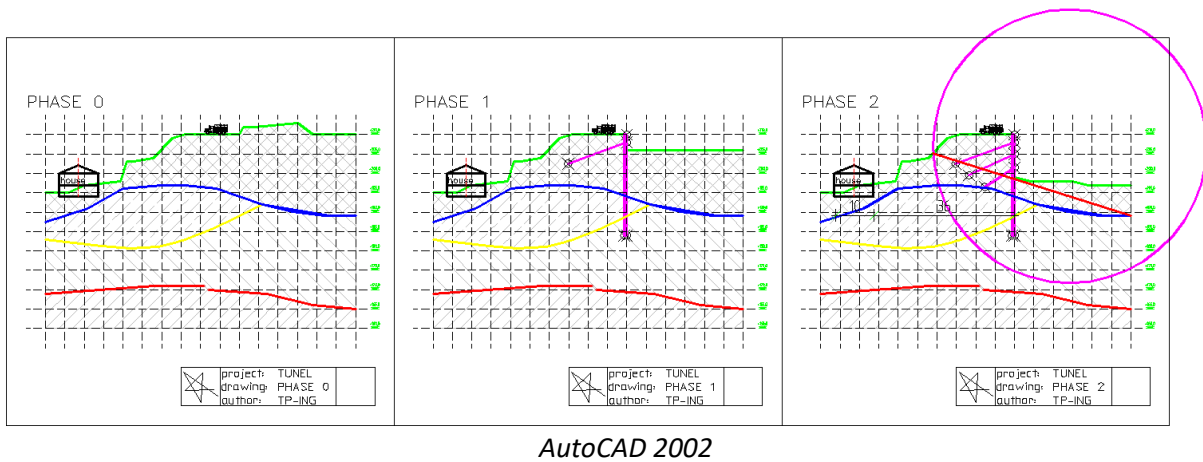
In the **GEO5 FEM** program import a general DXF drawing **model201.dxf**: File -> Import -> Format DXF to template



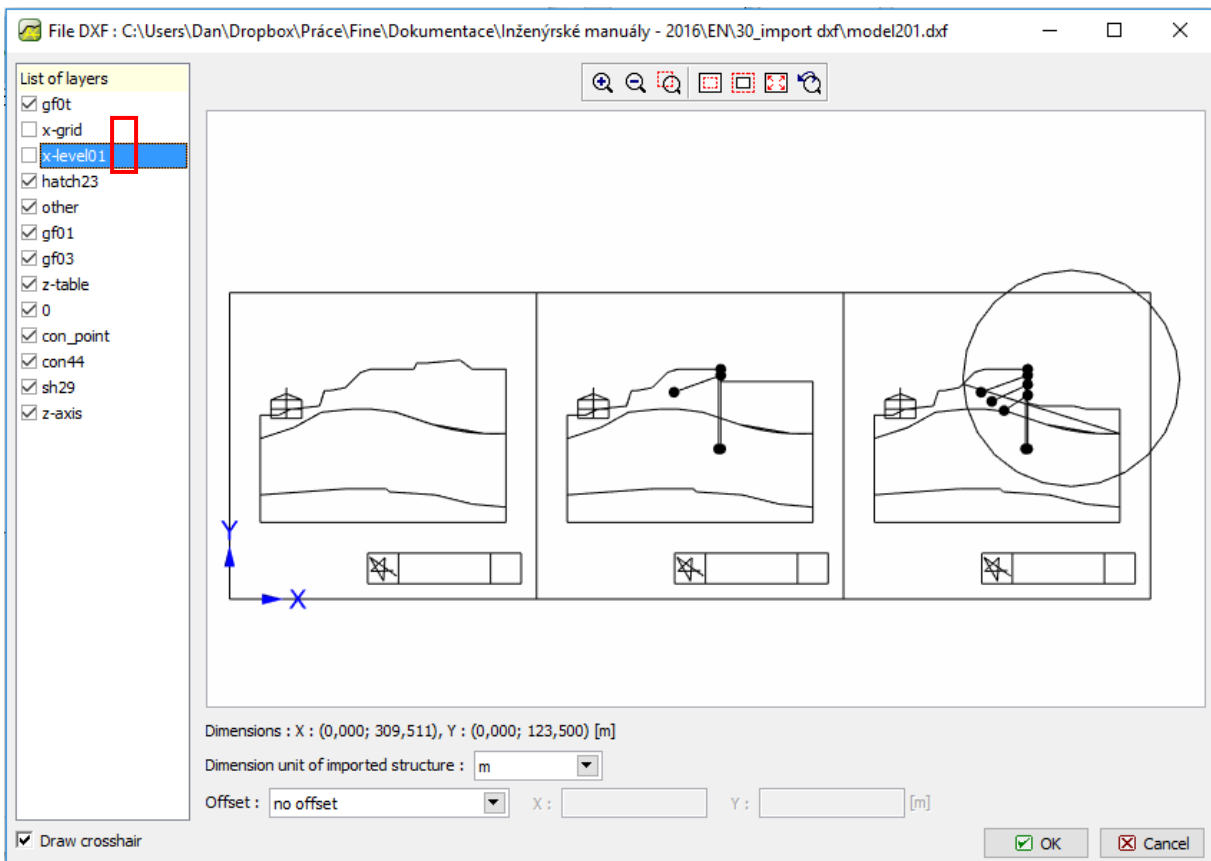
GEO5 FEM – DXF import

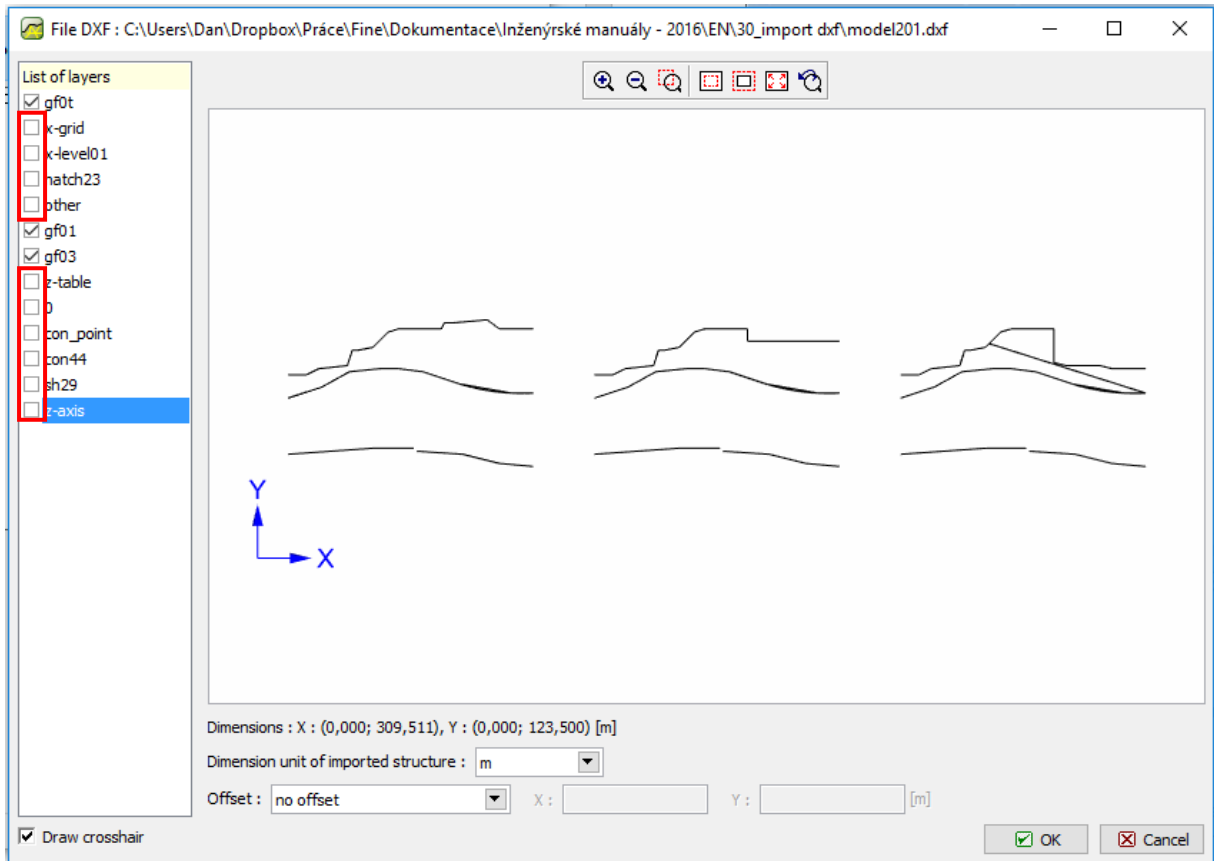
Immediately you see that this drawing contains more than just one model (more construction stages) and some data, which are not useful for our analysis – e. g. tables, grids and other structures. This arrangement is inappropriate for importing geological interfaces. For this reason, we must make some modifications to this file. Then we can use the modified file to successful import the data to the interfaces of soils.

This is the file **model201.dxf** displayed in the AutoCad software.



First we will try to use an original distribution of the objects to the existing layers and turning of these layers in the import settings. We only need the data, which are required to load to the interfaces of soils.

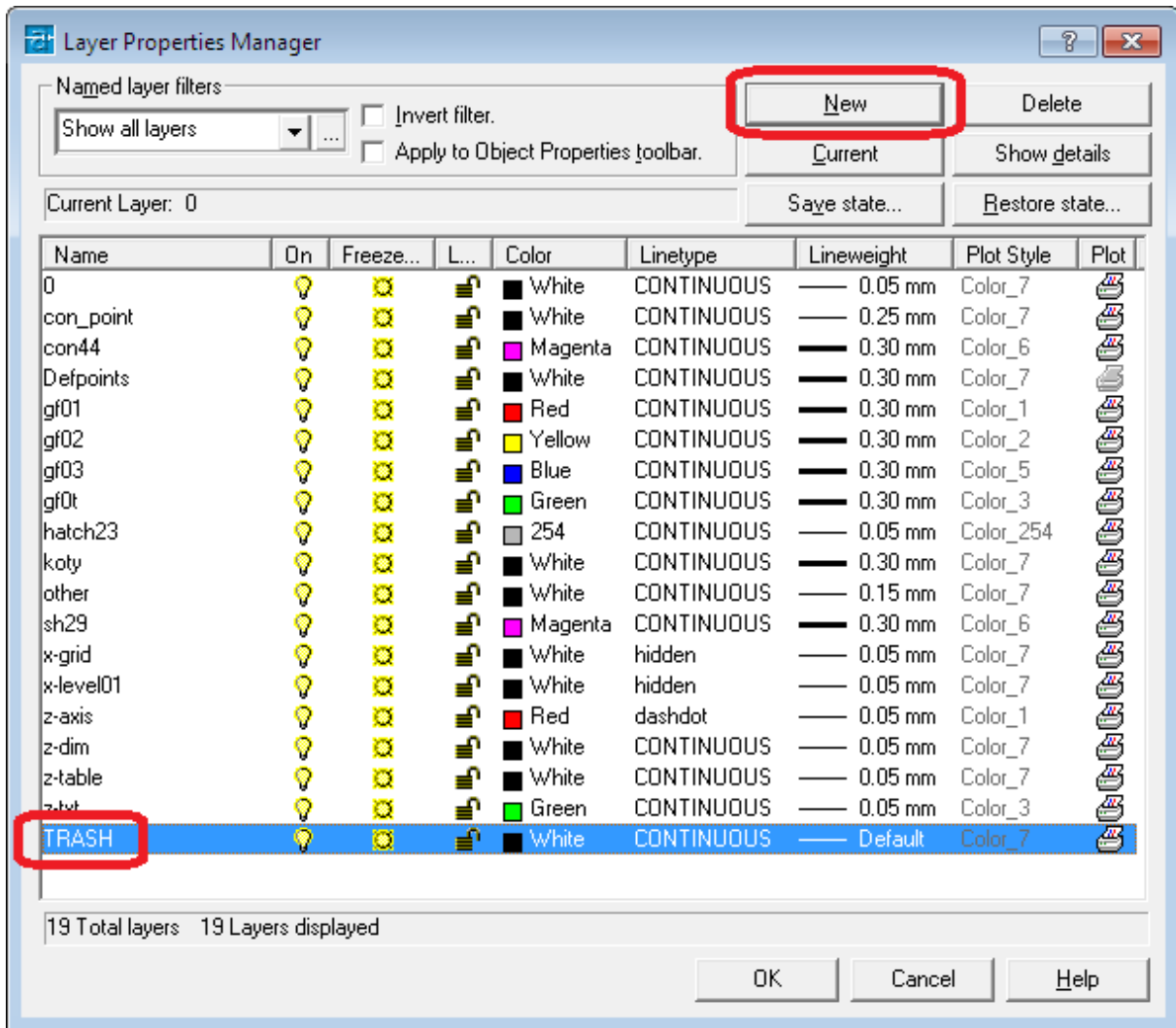




GEO5 FEM – DXF import

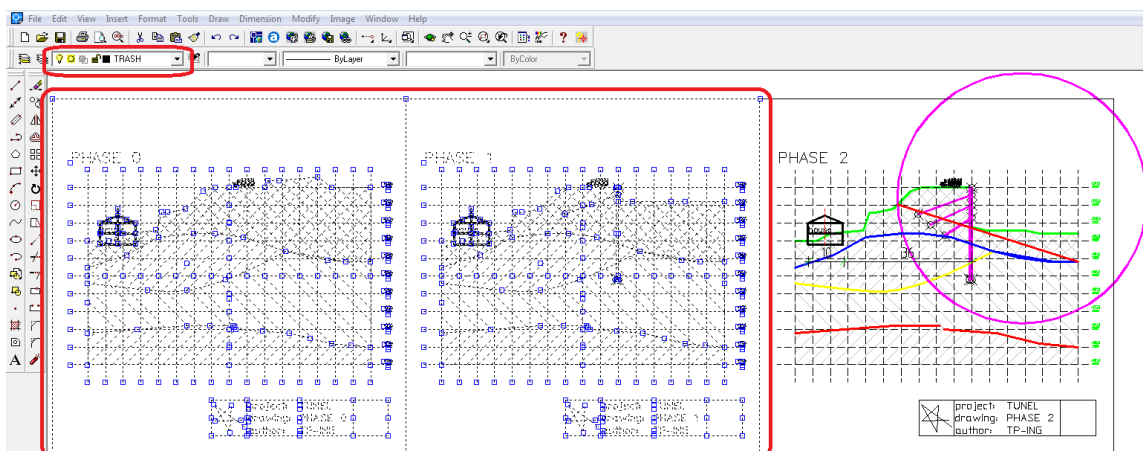
By turning off some existing layers we were able to filter out the majority of useless data. But still there are three models and we only need one for our analysis. For this reason, we have to open this file in the CAD software and delete the useless models or move these models to a layer, which we will not use anymore.

We open the file **model201.dxf** in the CAD software and save it as **model202.dxf** (because we want to keep the original file). We create a new layer (command `_LAYER`). The name of this layer is not important, but it is good to use a simple and easily identifiable name – we use “TRASH”. Other parameters have no influence on the import from a DXF file.



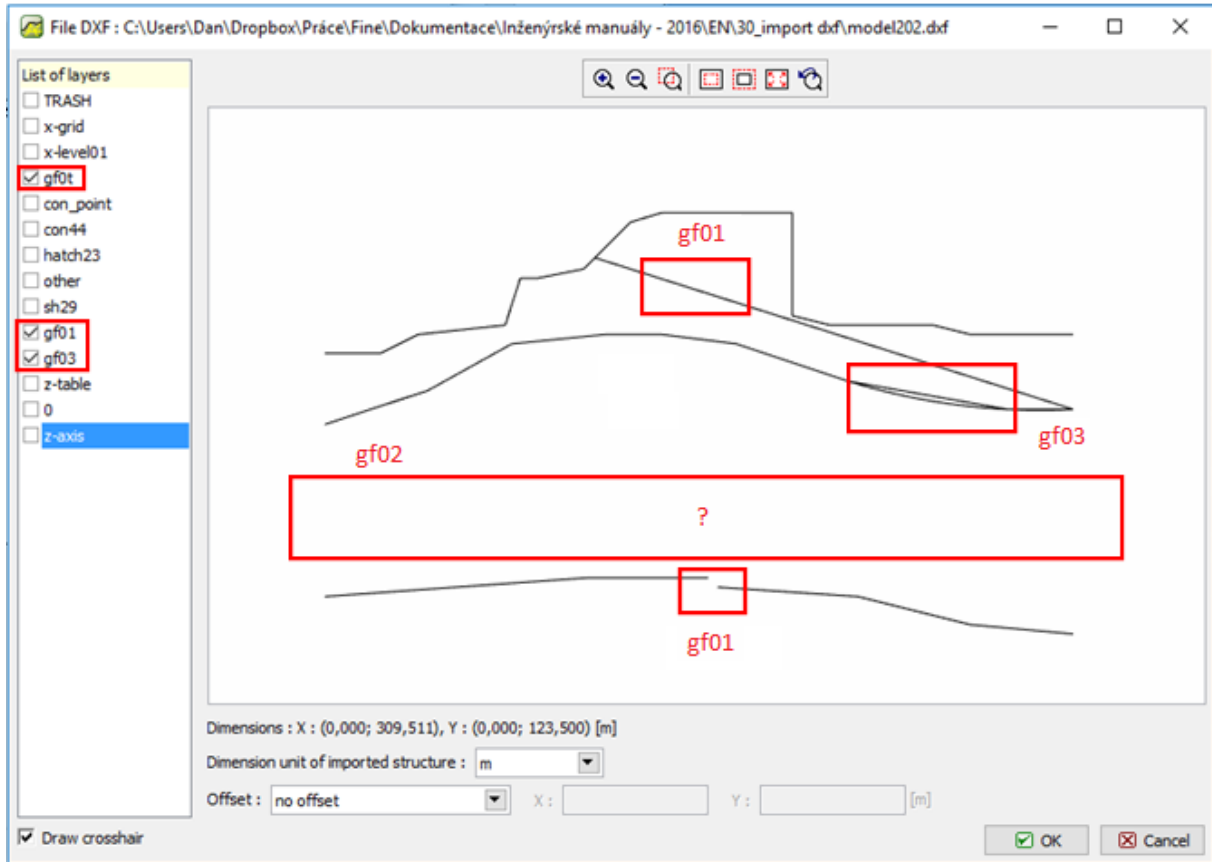
AutoCAD 2002 – Create a new layer

Now we choose all the useless objects in the CAD software and we move them to our new layer “TRASH”.



AutoCAD 2002 – moving useless objects to the new layer

We import a modified DXF file **model202.dxf** in the GEO5 FEM program (File -> Import -> Format DXF to template) and turn off all layers, which are not necessary for our assignment. Now we see the following:



GEO5 MKP – DXF import

The imported data are almost in the state we need, but there are still several fundamental shortcomings.

- A red geological interface in the layer “gf01” is discontinuous.
- A yellow geological interface in the layer “gf02” is completely missing. It has happened because it is modelled using the object SPLINE – GEO5 programs cannot import these objects.
- A blue geological interface in the layer “gf03” is modelled using two objects in one location – the circle (type ARC) and the lines (2D polyline). It is possible to import these objects, but you can use only one type of modelling.
- There is a general sloping line in the red layer “gf01”. This line does not define an interface of soils.

Now we have two ways to follow:

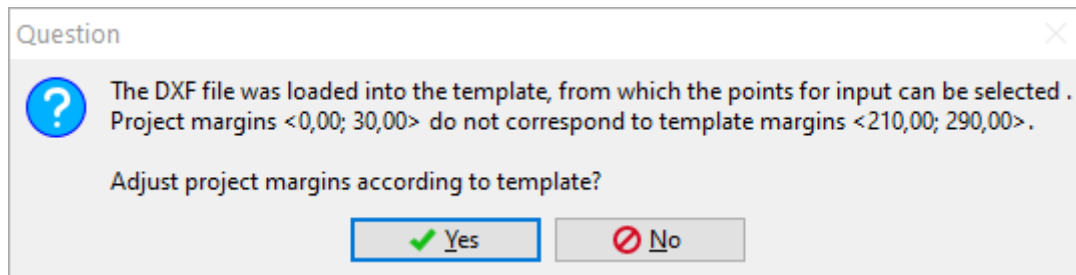
- **Variant A – we import these data to the template**, and we input the geological interfaces by hand. This is a good process, when the data are not large.
- **Variant B – we edit the data in the CAD program** and then we choose the possibility of an automatic load to the GEO5 program.

Variant A. – Interface input by the template

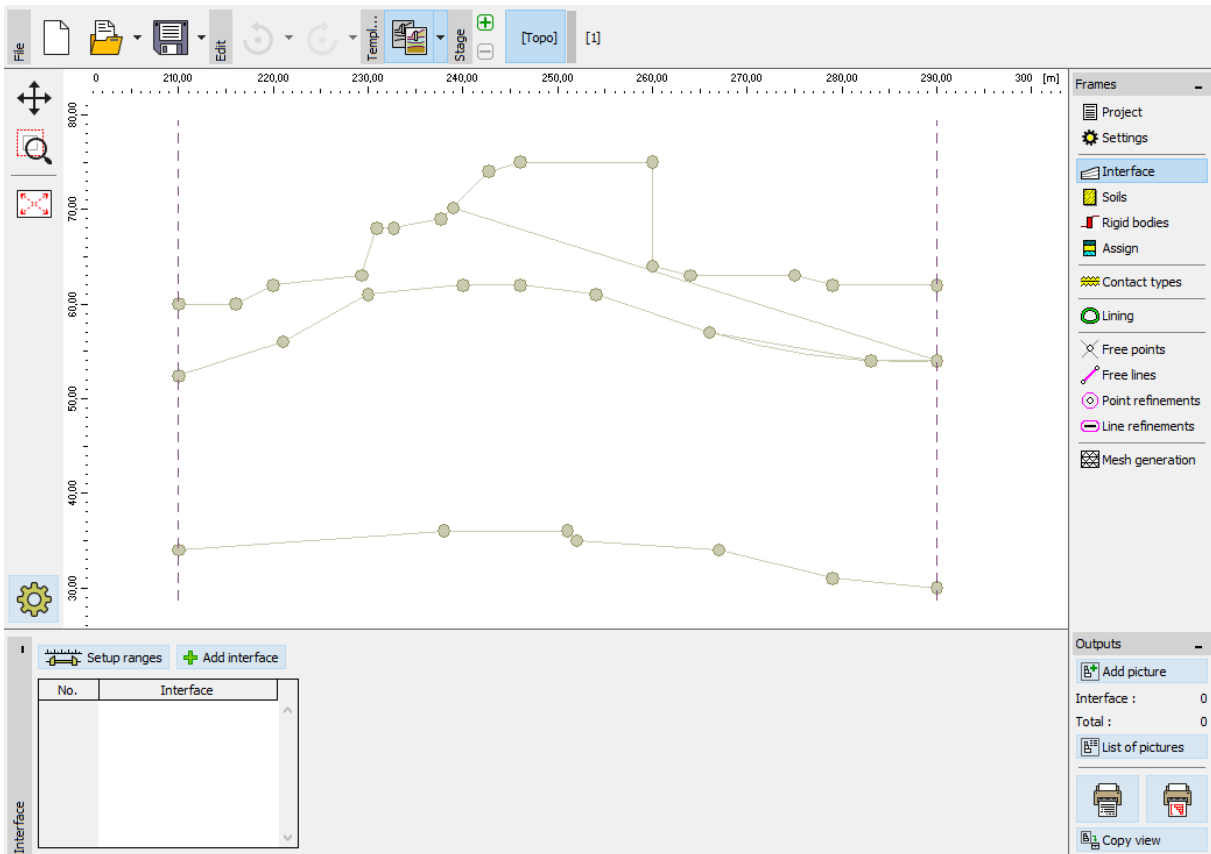
Although the DXF file model202.dxf is not in an optimal state, we can import this file to the template and use this template for inputting the geological interfaces by hand. This is a more laborious process, but we do not have to go back to editing the file in the CAD software.

We will control the dialog window from the previous step, so that only layers which define interfaces (**gf0t**, **gf01** a **gf02**) are visible. We accept this window by clicking the button “OK”.

Now we will see a dialog window with editing project margins according to the template. We accept it by pressing “Yes”.



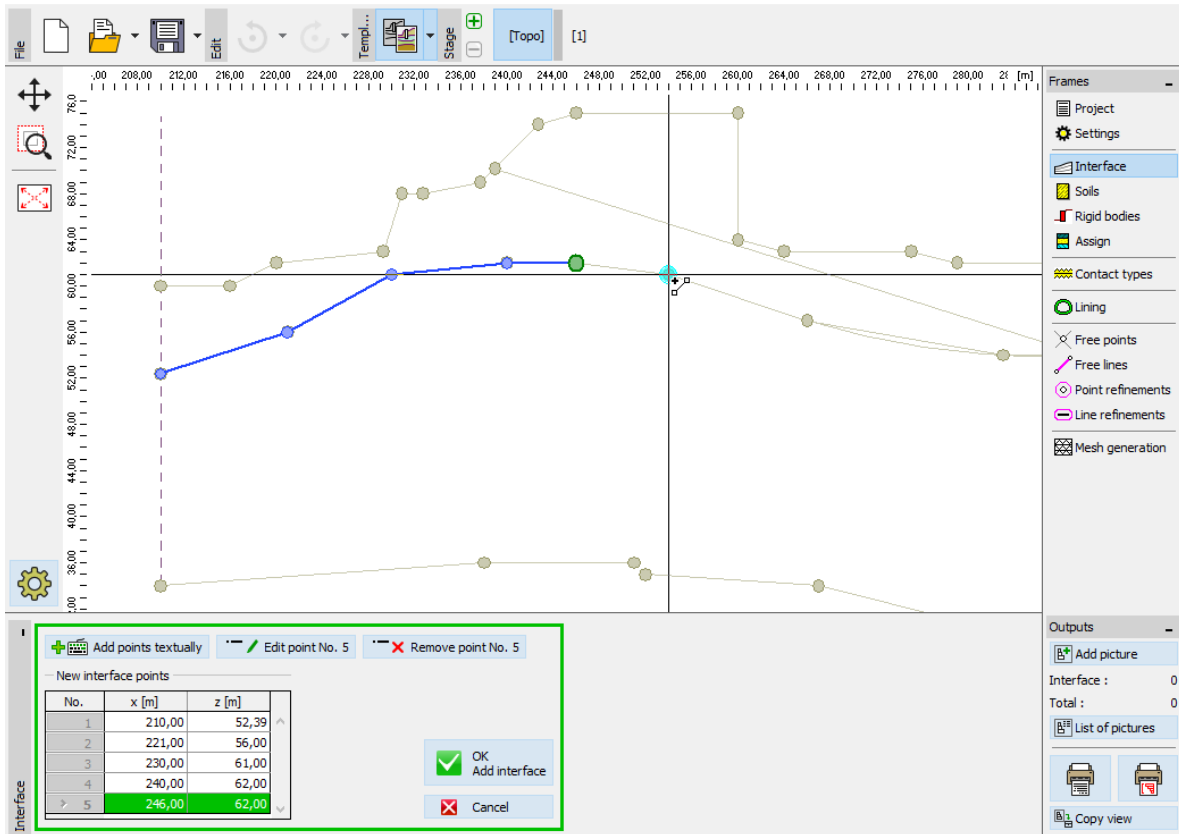
Now we see the main window of the FEM program with the displayed template:



"Interface" frame

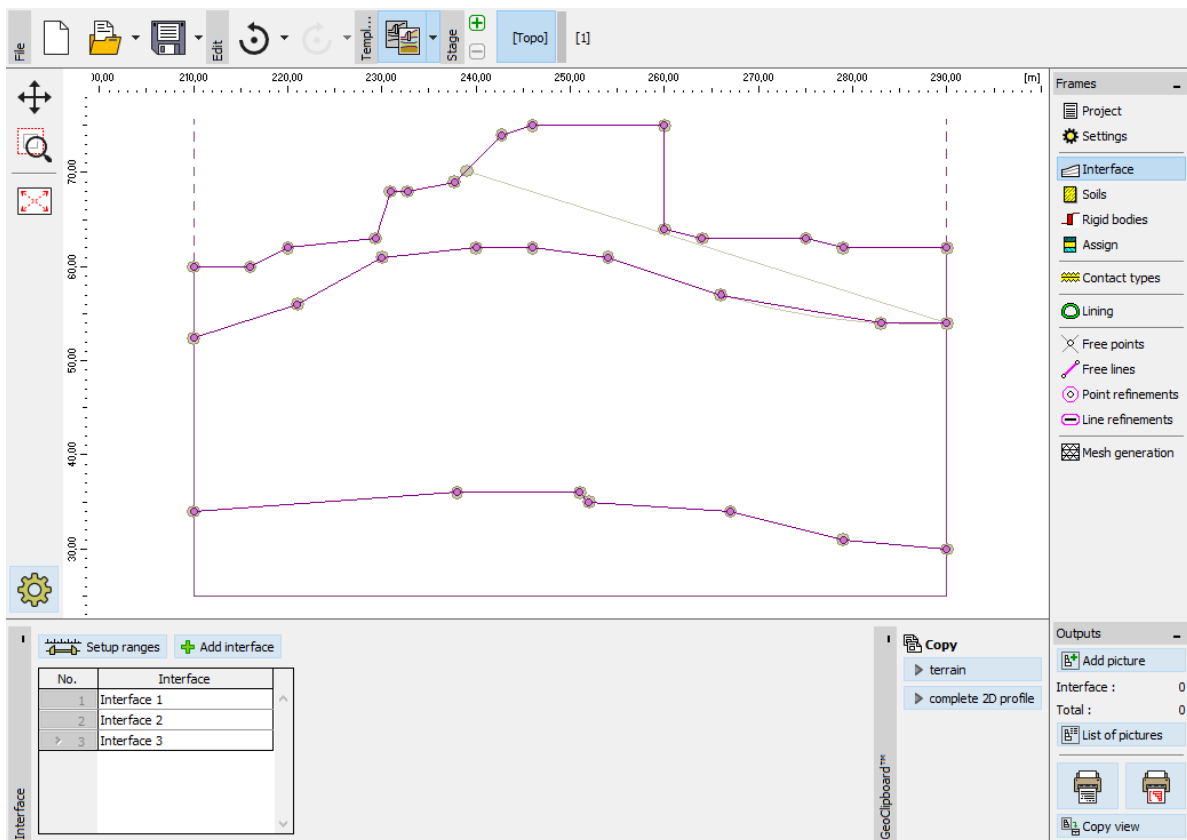
We press the "Add interface" button. We will insert the points graphically according to the points of the imported template.

The process of adding new points is similar to the graphical input of points by mouse. When we are near to the point of the template with the cursor of our mouse, this point changes its color. When we click on this point, a new point of the interface will be created in this location.



"Interface" frame – graphically adding points according to the template

We add all the points of the visible geological interfaces this way.



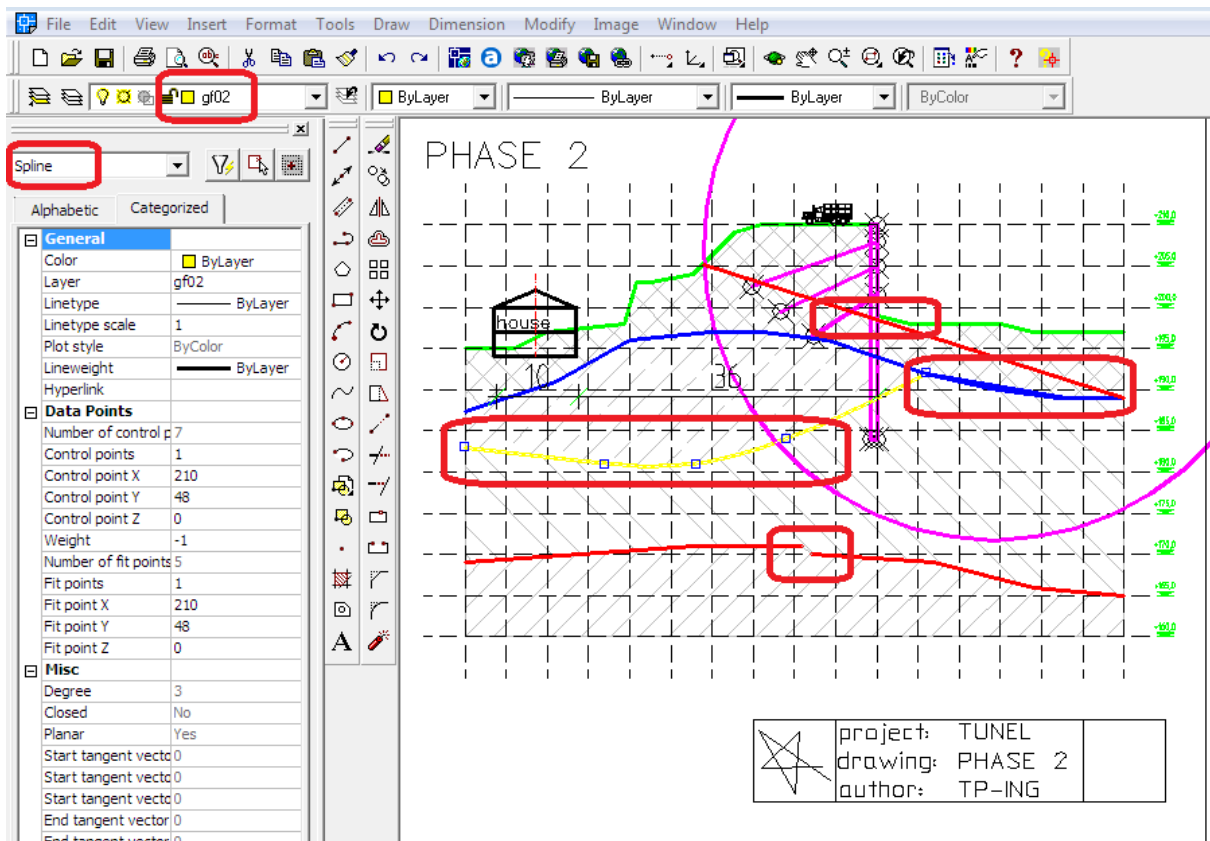
"Interface" frame – successful input of the interfaces

At the end of the previous chapter, we noticed, that the layer **gf02** is missing, because it is modelled by a type of the SPLINE object and GEO5 programs are not able to import this format. We have to insert this interface by hand using the coordinates from the original project.

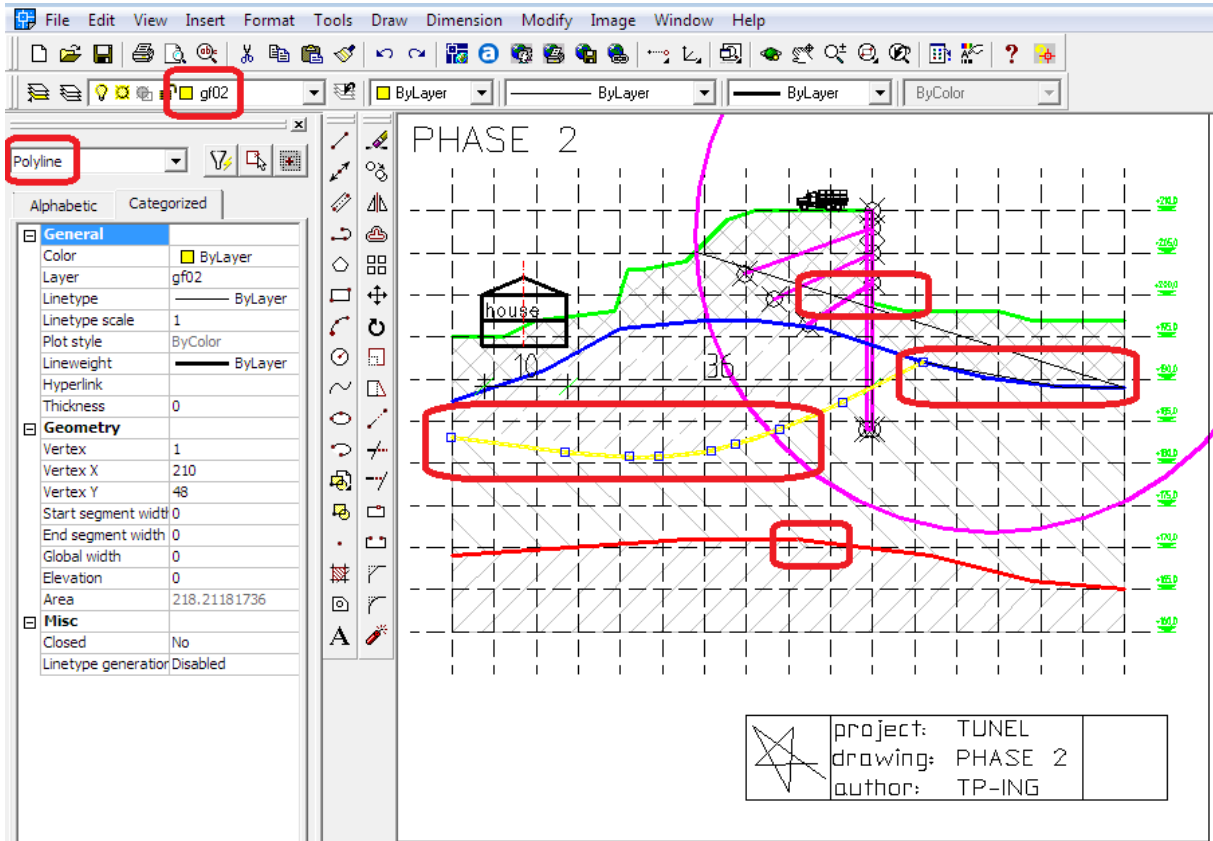
Variat B. – Advanced editing and automatic load

If we want to use an automatic process of loading a DXF file to the geological interfaces, we have to make more modifications to our file. We open the file **model202.dxf** in the CAD software and save it as **model203.dxf**, because we want to keep the original file. Then we modify this drawing according to the list of shortcomings at the end of the chapter **Exploration and basic modification of the file**. This is the list of modification we have to do:

- Layer “gf01”: Unite a lower polyline by adding a new line or by stretching and uniting the existing lines (command `_STRETCH`). Delete the upper sloping line.
- Layer “gf02”: Model a curve (type SPLINE) by approximating objects LINE or 2DPOLYLINE.
- Layer “gf03”: Delete a part of the polyline, which is parallel to the arc – transfer the arc to a 2DPOLYLINE and unite everything to one 2DPOLYLINE.

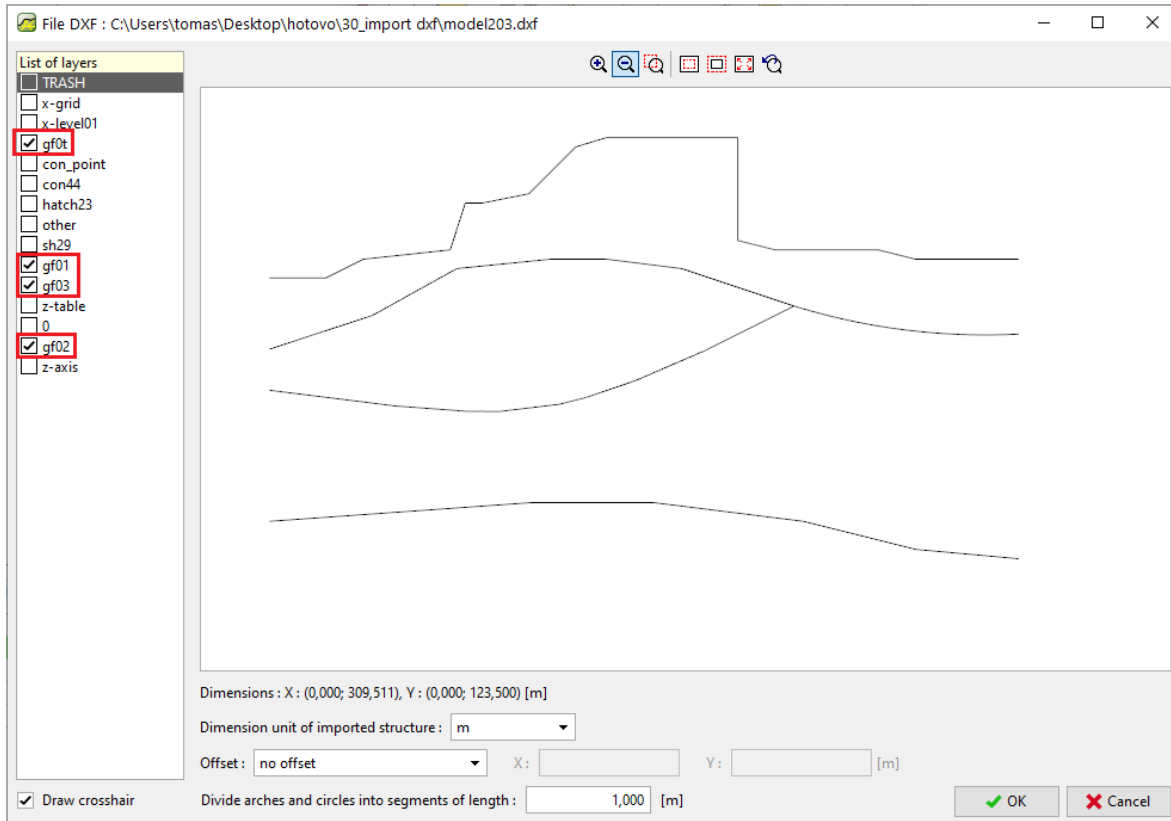


AutoCAD 2002 – modification of a DXF file



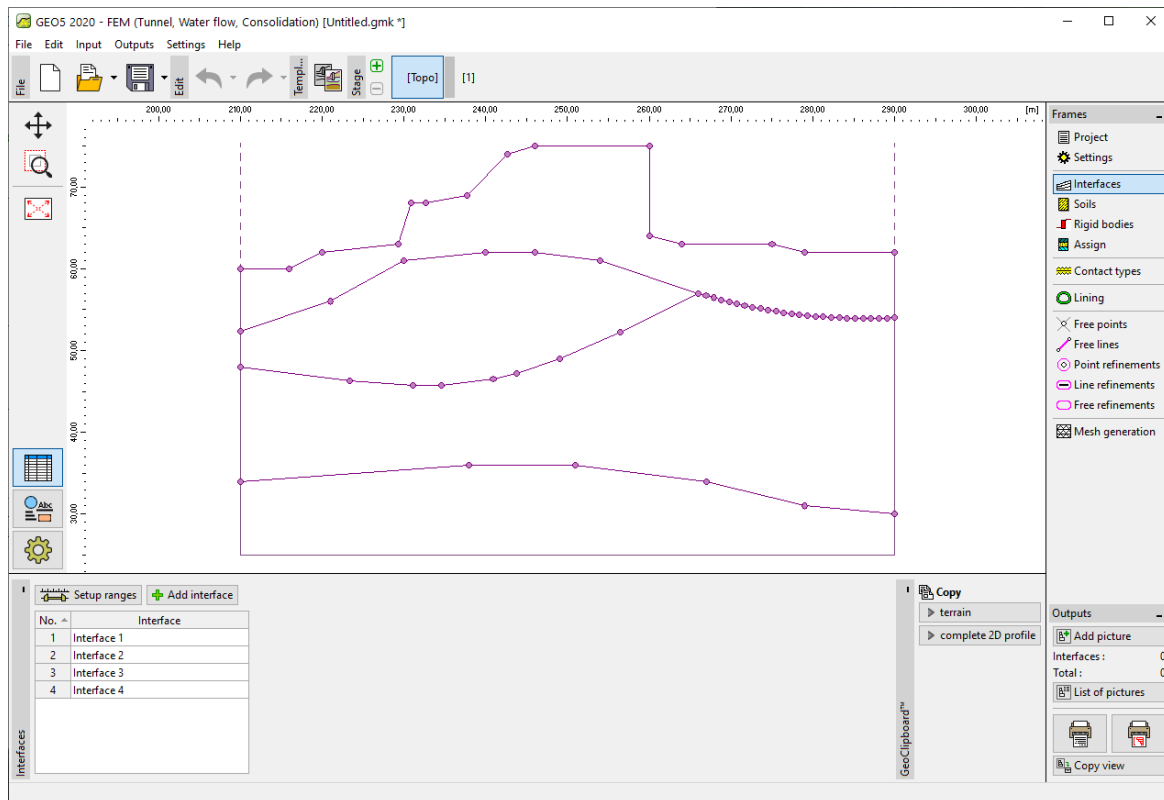
AutoCAD 2002 – modification of a DXF file

We save a new file (**model203.dxf**) and load it to the **GEO5 FEM** program (File -> Import -> format DXF to interfaces). We only turn the layers gf0t, gf01, gf02 a gf03 on and confirm all by pressing OK.



GEO5 MKP – DXF import to the interfaces

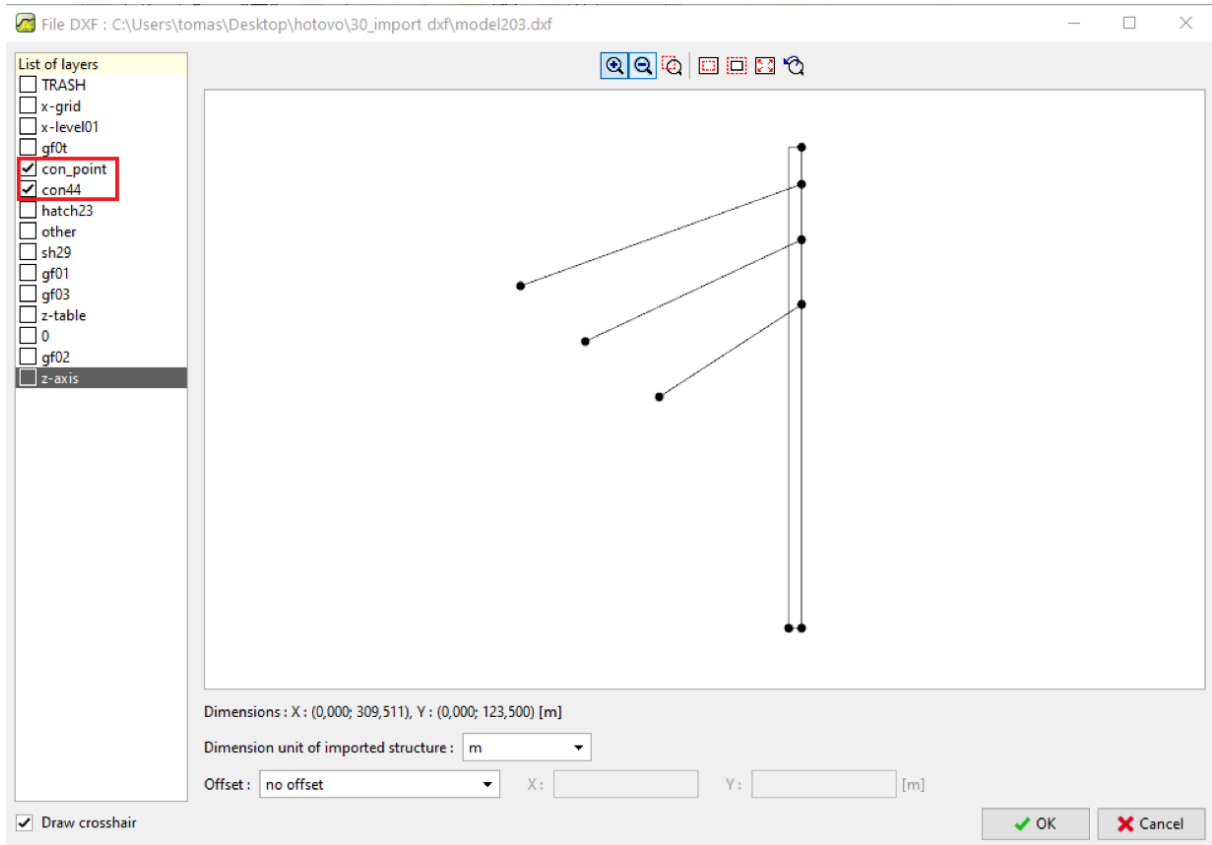
Interfaces of geological layers are successfully automatically imported to the FEM program.



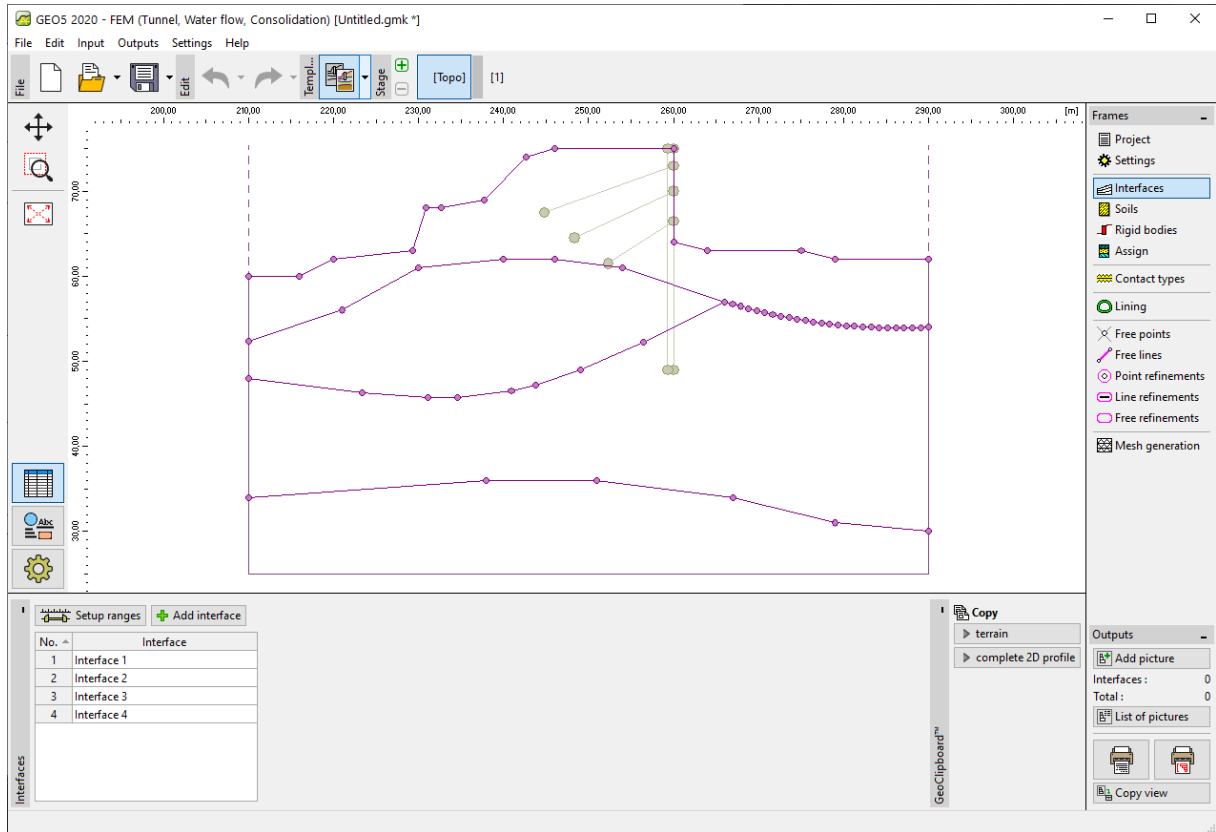
GEO5 FEM – Imported interface

Structure input by template

We can import more data from the DXF file – e. g. a sheeting wall, anchors etc. We load **model203.dxf** to the FEM program (File -> Import -> Format DXF to template). We only turn the layers with a sheeting structure (**con_point**, **con444**) on. We confirm the import by pressing the “OK” button.



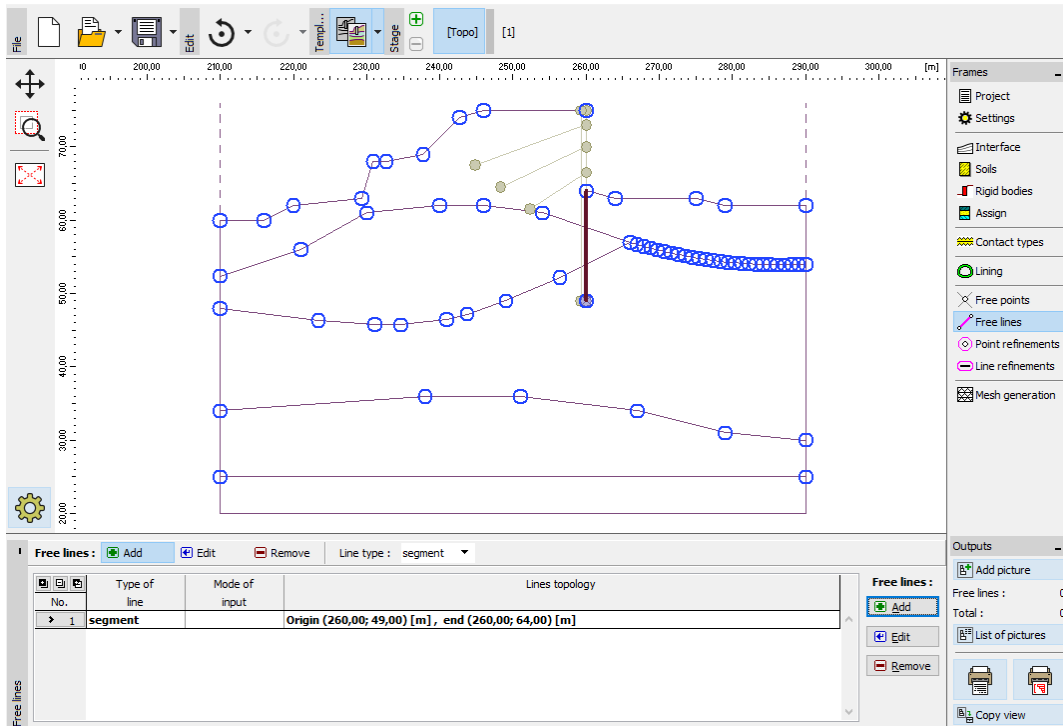
GEO5 FEM – DXF import



GEO5 FEM – Import of a sheeting structure to the template

We will model a sheeting wall using beams (not as a rigid body). For this reason, we need just one line of the structure which is located exactly under the perpendicular part of the terrain.

We press the "Add" button in the "Free points" frame and we add the bottom point of the sheeting wall by selecting a point from the imported template. We add a free line in the "Free lines" frame by connecting relevant points. This way we created an underground part of the sheeting structure.



“Free lines” frame

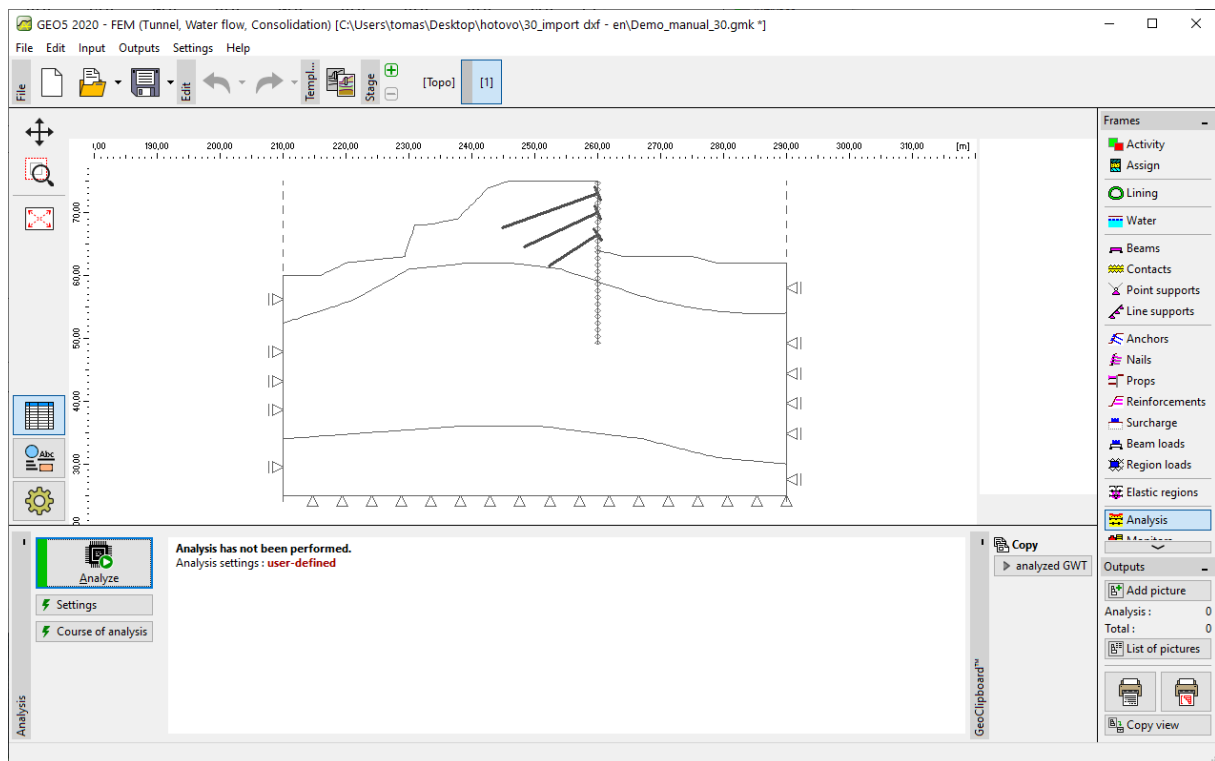
We generate a mesh of finite elements in the frame “Mesh generation” (mesh generating is described in engineering manual No. 24 and it is not included in this manual about the import of DXF files). Now we go to construction stage No. 1.

We press the button “Add graphically” in the frame “Beams” and we add beams on the perpendicular part of the terrain and on the free line, which we created with the template.

We select the choice “Add graphically” in the frame “Anchors” and add a relevant initial and final point for each anchor. We set the parameters for the analysis in a dialog window for each anchor.

This way we imported all the data for our analysis – interface, structure and anchors according to the DXF drawing.

This is the final assignment of our task:



GEO5 FEM – a complete task

General recommendations and solutions of the most common problems

The DXF file contains data, objects and structures, which are useless for the analysis in a GEO5 program (e. g. tables, others buildings, structures etc.).

Solution: Delete these objects or move them to newly created layers.

An original distribution of the objects in the DXF file is unsuitable for import to the GEO5 program (e.g. there is an existing layer which contains both necessary and unnecessary objects).

Solution: Delete these objects or move them to newly created layers.

The DXF file contains more than one model (e. g. more than one construction stage in one DXF).

Solution: Delete these objects or move them to newly created layers.

The DXF file contains a too large model (e. g. the whole area is larger than what we want to solve in the GEO5 program).

Solution: Cut out, delete or move these objects to newly created layers.

The DXF file contains data, which are not suitable for import to the GEO5 program (e. g. the geological interface is modelled by a SPLINE object).

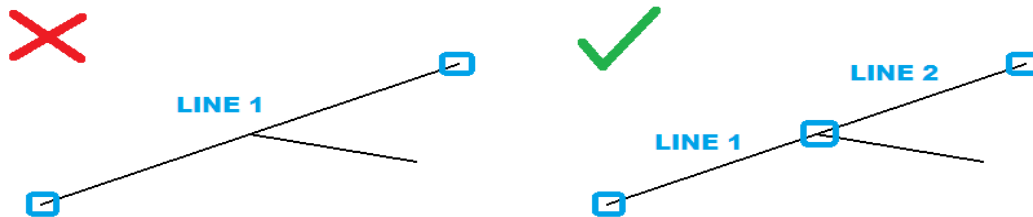
- supported GEO5: POINT, LINE, POLYLINE, CIRCLE, ARC, 3DFACE

- unsupported GEO5: BLOCK, TEXT, SPLINE, DIMENSION etc.

Solution: Model the task using supported CAD objects.

The DXF model contains some geometrical inaccuracies and discontinuity (e. g. unrounded coordinates).

Solution: Edit the model in the CAD software.



The DXF file contains overlapping objects (lines or polylines).

Solution: Delete or filter out these objects in existing or newly created layers; edit the model in the CAD software.

The DXF model has 3 dimensions (it is not a problem in the GEO5 program “Terrain”).

Solution: Change the Z-coordinates in the CAD software to one level (ideally z=0).

The origin of the global coordinate system is not suitable for import to the GEO5 software.

Solution: Generally, it is possible to edit it directly in the dialog window “Import” in the GEO5 program. Sometimes it is necessary to modify the DXF file in the CAD software.

Inappropriate rotation of the model according to the global coordinate system.

Solution: Rotate the model in the CAD software.