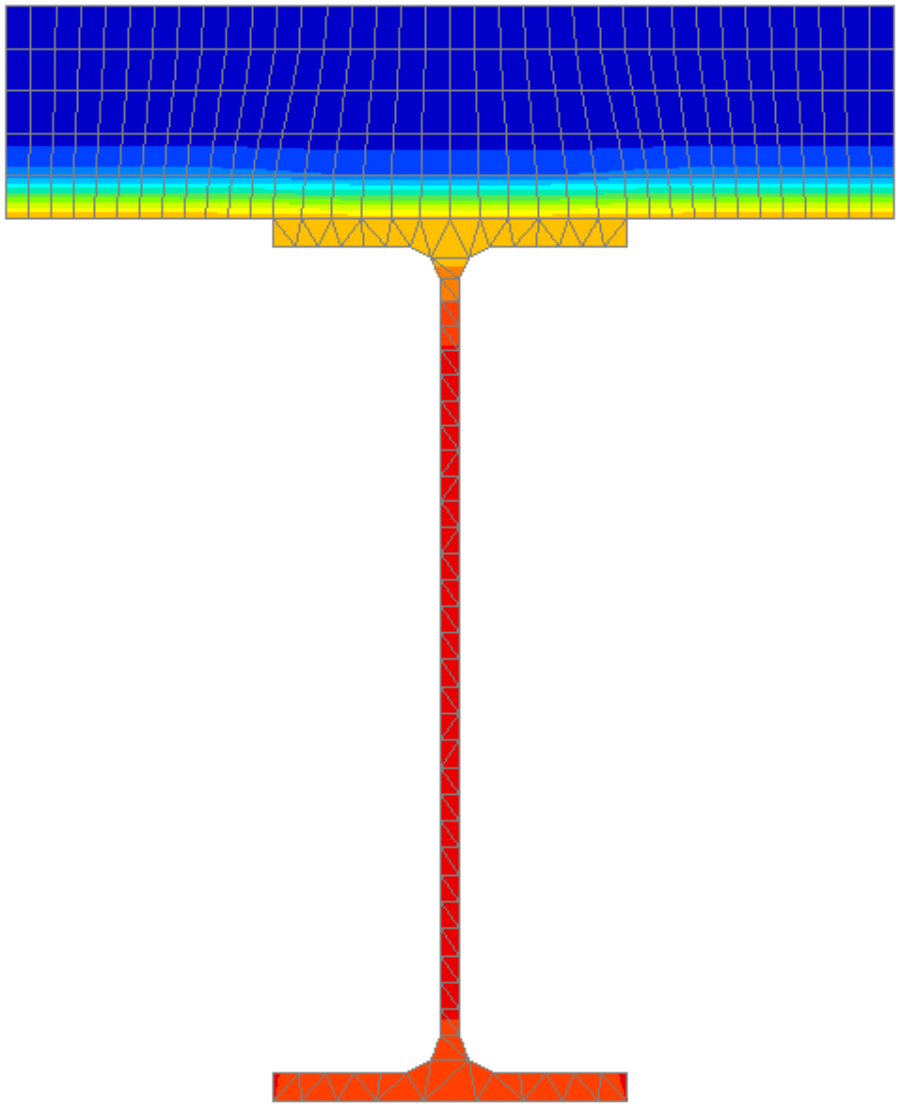
Example for GID-SAFIR 2D and 3DThermal Analysis

Exercise n°3 – IPE550B1 Slab 2D

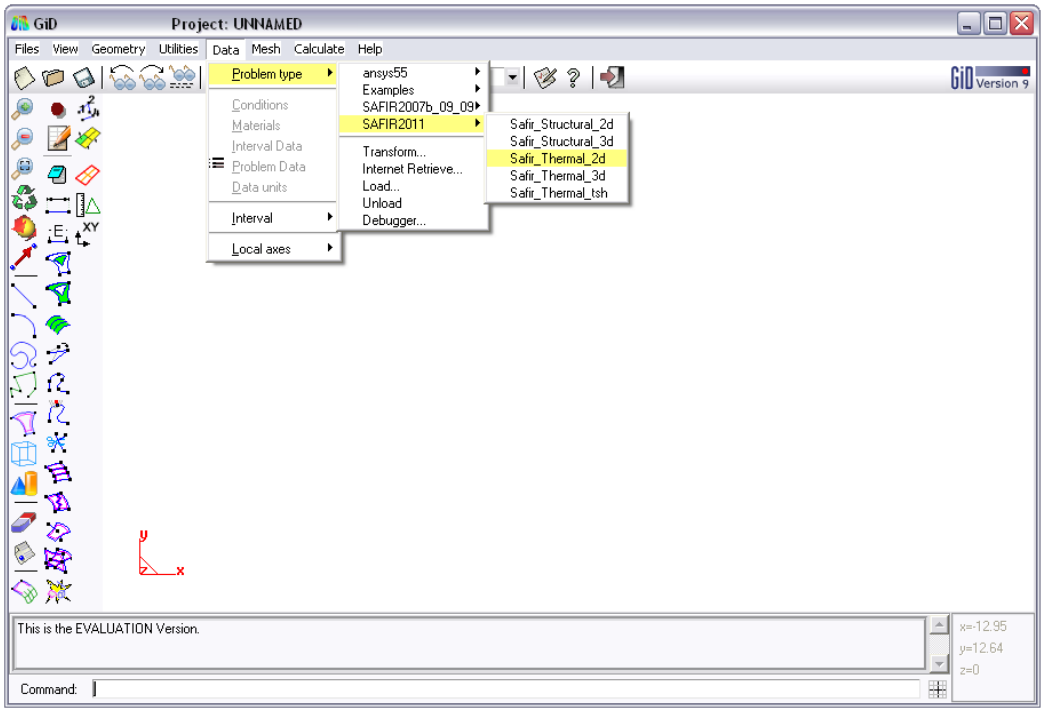


This example creates two IPE550 section with slab exposed to ISO fire, one for a 2D calculation and one for a 3D calculation.

1. Create a project in 2D for Thermal Analysis

From the pull down menu select:

- *Data->Problem type->SAFIR2011->Safir_Thermal_2d*



To save the project select (or use icons on the left):

- *Files->Save* *or*  *or [Ctrl + s]*

⚠ *If Caps lock is active on your keyboard, shortcut don't work*

Enter a file name, eg.: IPE550B1

GiD creates a directory with the name IPE550B1.gid

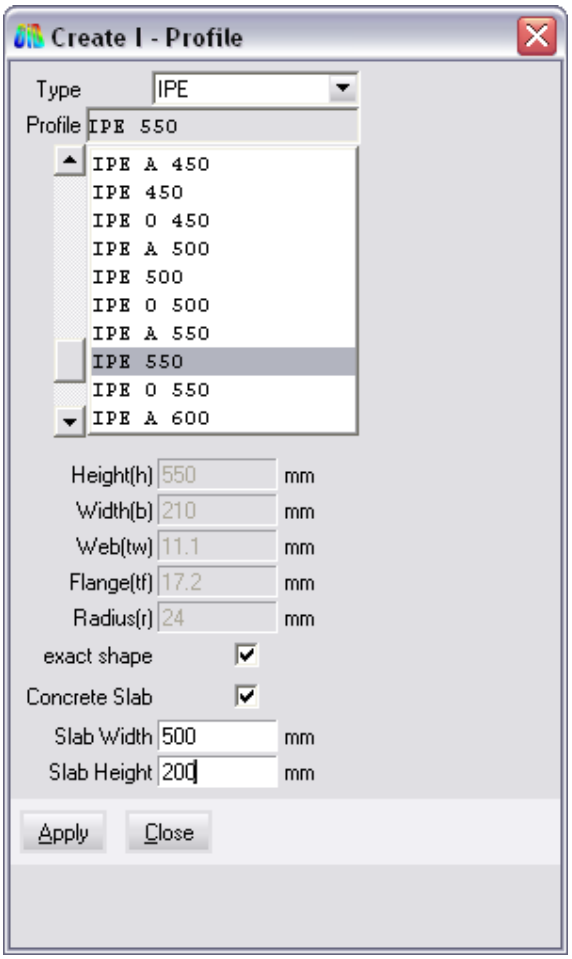
GiD creates a number of system files in this directory.

When you start the SAFIR calculation the Safir . IN, .OUT and .TEM files will be created in this directory.

2. Create the geometry in the xy-plane

From the pull down menu select:

- ***Cross-Section->I-Profile***



Select ***IPE*** as type, ***IPE 550*** as Profile, tick ***exact shape***, put ***1000*** mm as slab width and a slab height of ***200*** mm

Click on ***Apply***

⚠ *GiD-Safir will create an IPE550 profile. The center of this profile will be automatically centered on the 0,0 point of the xy-plan*

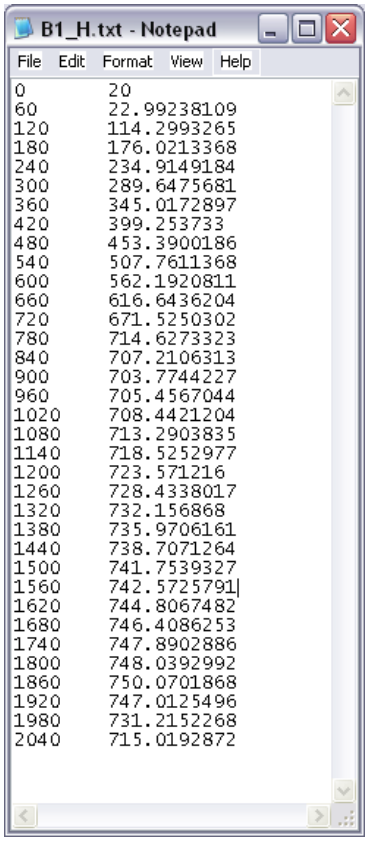
3. Create and Assign a temperature curve

In this exercise, we will suppose that you want to import your own fire curve of temperature.

In order to permit to GiD-Safir to use your data, you have to first create a .txt document.

Open your Notepad and wrote as many line as necessary, each line being, in a free format, a pair of values in the form:

TIME TEMPERATURE



In this case we are going to use the temperature curve: ***B1.txt***

From the pull down menu select:

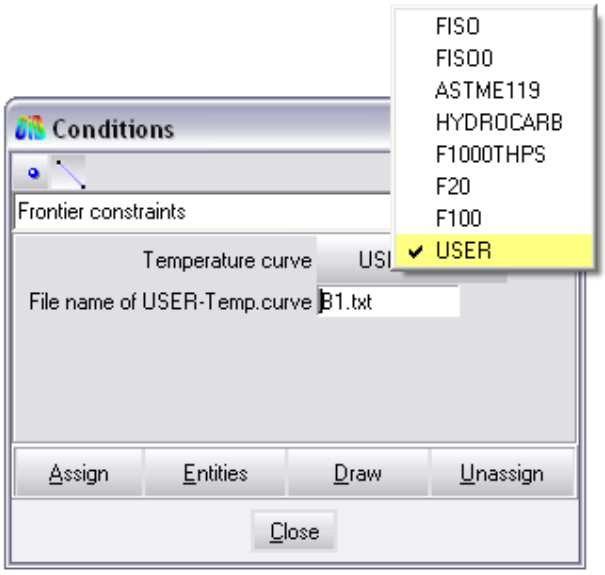
- ***Data->Conditions***

Select:

The  button

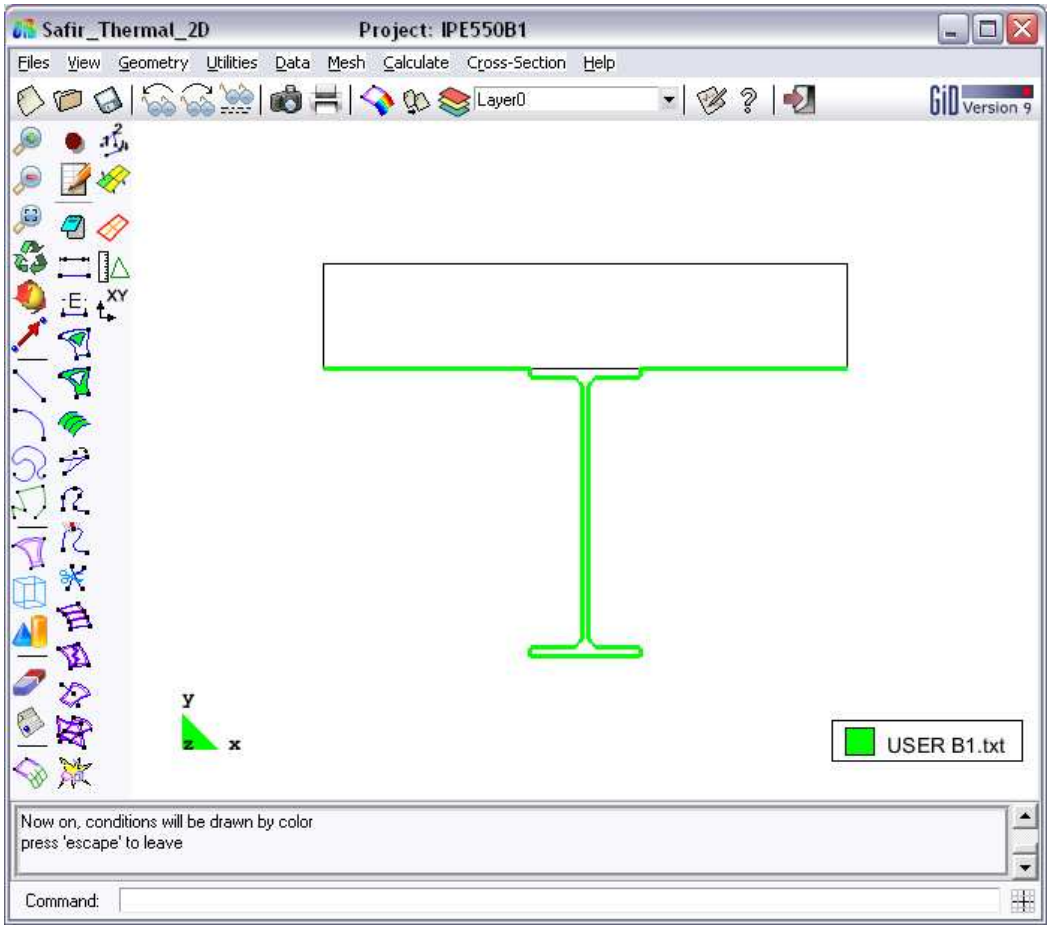
On the first pull down list: ***Frontier constraints***

On the Temperature curve pull down list ***USER***



Write the File name of user temperature curve in the dial box (***B1.txt*** in this example). Then copy the ***B1.txt*** file in the ***IPE550B1.GiD*** file you just created

Click on the ***Assign*** button and assign it to profile and slab lines as shown below:

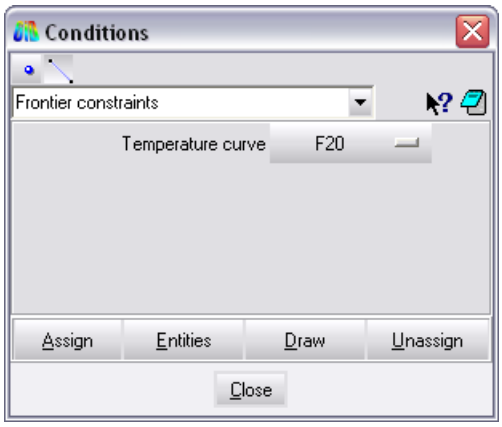


Press *[Esc]* or click on *Finish* to confirm

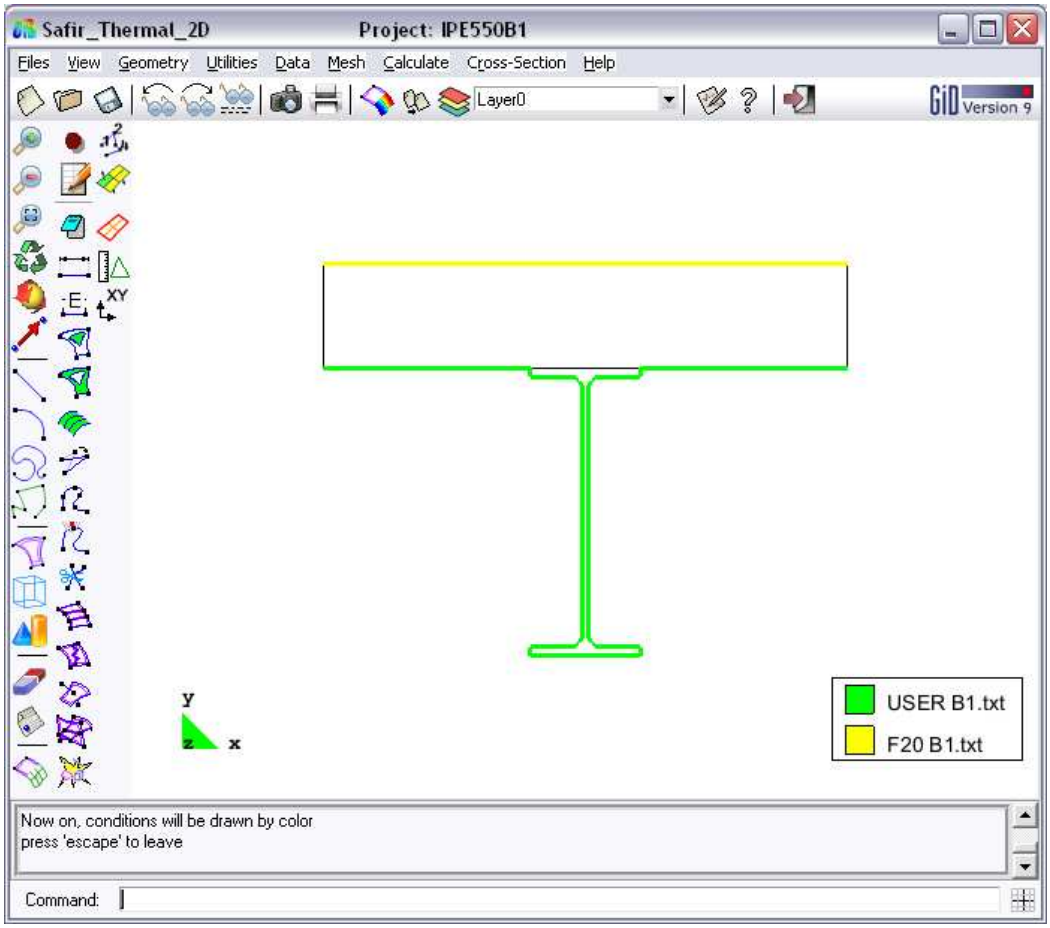
Select *DRAW->Colors* in the Conditions dialog box to display the frontier constraints

Press *[Esc]* or click on *Finish* to leave this view mode

Then select ***F20*** as temperature curve



And assign it to the upper line of the slab, as shown below:



4. Assign Material

From the pull down menu select:

- ***Data->Materials***

Select ***STEEL*** from the dialog box pull down list

Then select:

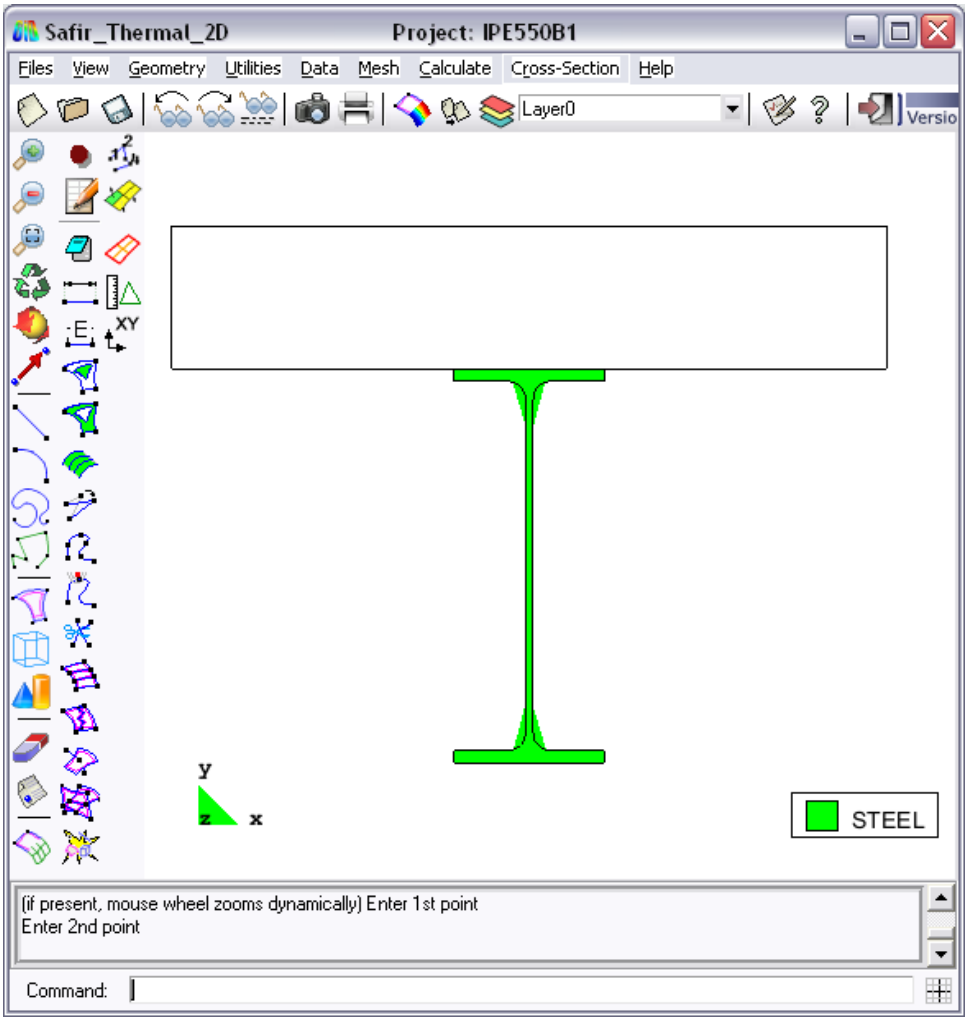
STEELEC3 as Material Type

A Convection Coeff hot of ***25***

A Convection Coeff cold of ***4***

A Relative Emission of ***0.7***

⚠ *In this case, you don't have to change data in the Mechanical tab. They are needed for Torsion calculation only*



Click on ***Assign-> Surfaces*** and assign it to the IPE550 surface

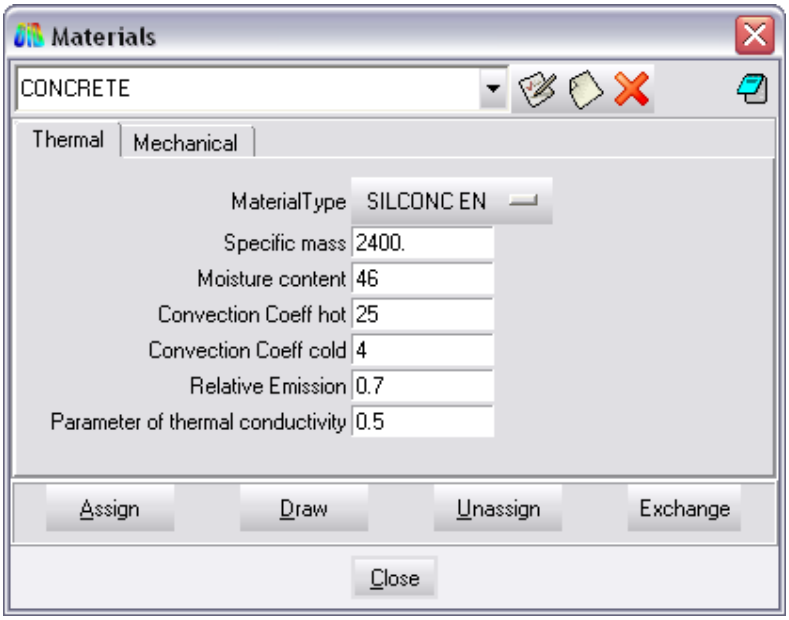
Press ***[Esc]*** or ***Finish*** to confirm

Select ***DRAW->all materials*** in the Material dialog box to display Materials

Press ***[Esc]*** or ***Finish*** to leave

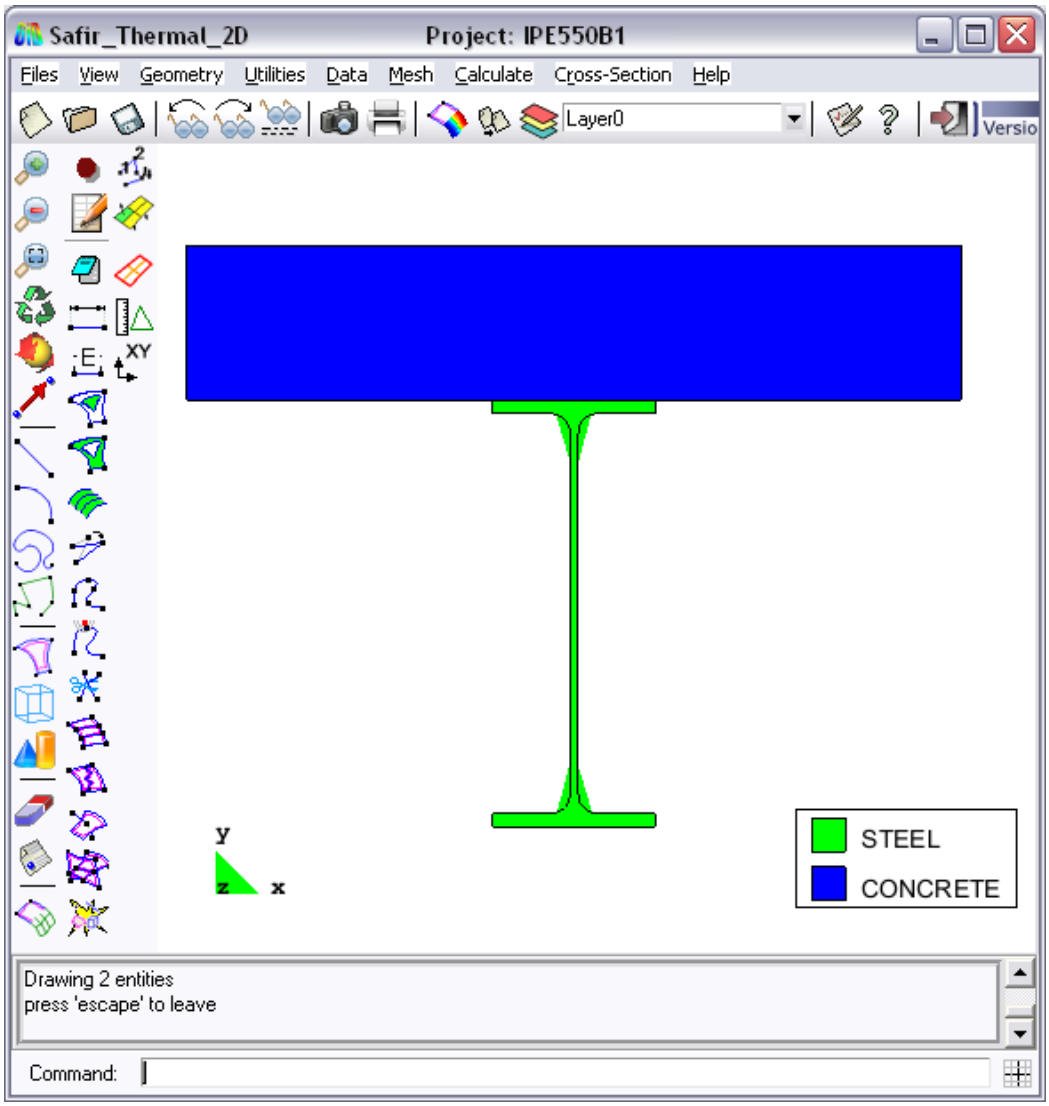
Select ***CONCRETE*** from the dialog box pull down list

Then fill as below:



Click on ***Assign-> Surfaces*** and assign it to the slab surface

Press ***[Esc]*** or ***Finish*** to confirm



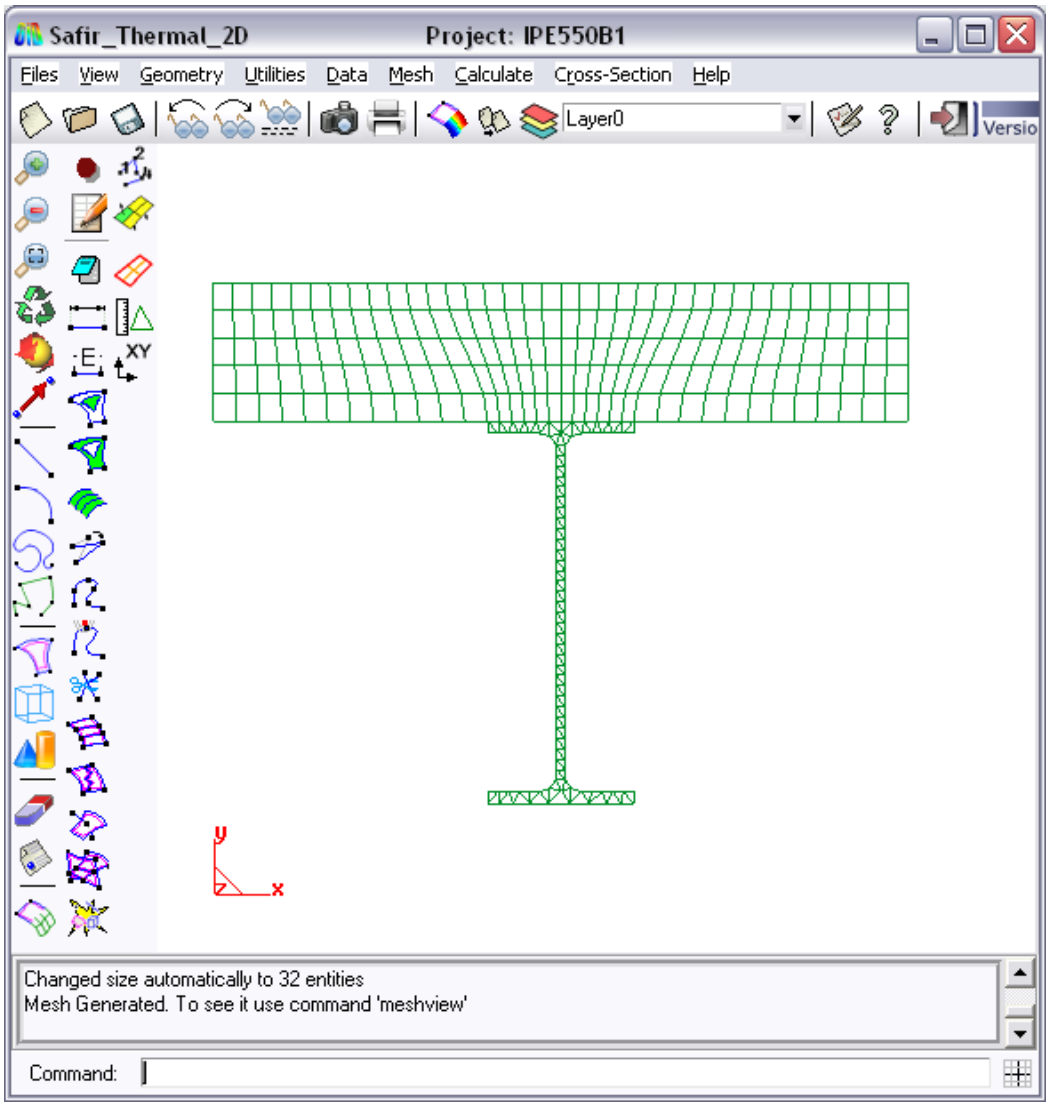
5. Create the mesh

Select the slab surface and press [Esc] to confirm

- ***Mesh->Generate mesh*** ***or use [Ctrl + g]***

Enter 0.03 as size of elements to be generated

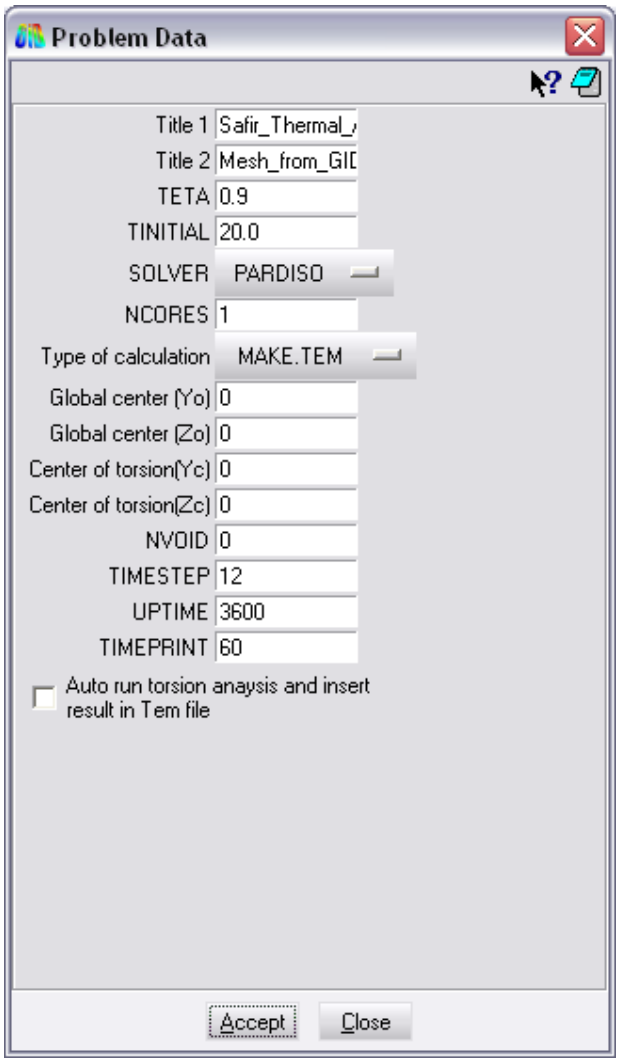
⚠ *A message with the number of nodes and the number of elements will appear. If you are using an evaluation version of GiD, the maximum allowed is 1010 nodes*


Safir_Thermal_2D
Project: IPE550B1
Files View Geometry Utilities Data Mesh Calculate Cross-Section Help
Layer0
Changed size automatically to 32 entities
Mesh Generated. To see it use command 'meshview'
Command:

6. Assign General Data

From the pull down menu select:

- ***Data->Problem Data***



In the Problem Data dialog mask enter:

TIMESTEP, UPTIME, TIMEPRINT as needed

Click on the ***Accept*** data button

⚠ *When you click with the right button on one of the variables, GiD will display an online help message. The variables are also described in more detail in the SAFIR reference manual.*

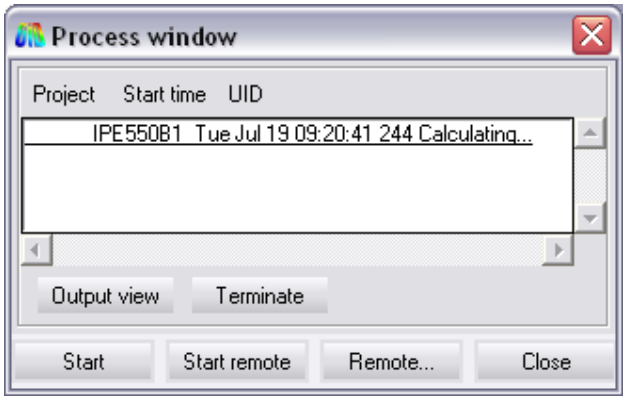
⚠ *In this case we are using a temperature curve with user's values. As you can see in the B1.txt file, the last time step is at 2040s. The UPTIME have to be lower or equal to this value.*

7. Start the calculation

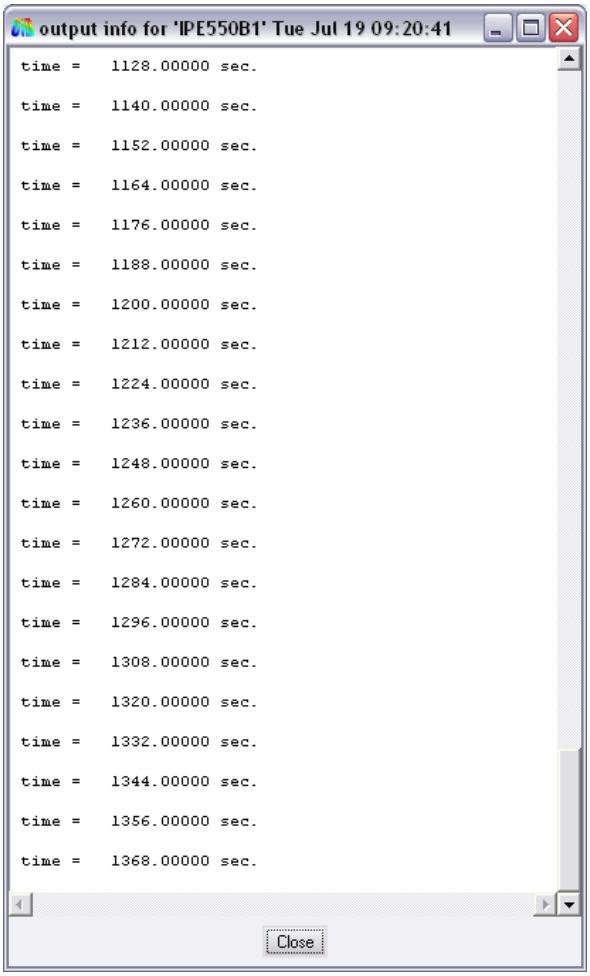
From the pull down menu select:

- ***Calculate->Calculate window***

Click the ***Start*** button



Click the ***Output View*** button



GiD creates a .IN file in the project directory and starts the calculation.

In the output window you can see the calculation progress from SAFIR and the GiD interface program which generates GiD postprocessor files from the .OUT file.

⚠ *If SAFIR found some errors in the .IN file you will see the error message in this window. Don't forget to put the temperature curve fill into the GiD-Safir file.*