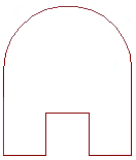
Column - solid section

This example demonstrates how how to design a column with an arbitrary cross-section defined by the user.

The model is a simple one member column, loaded with an axial load and moment; the column has the following cross-section:

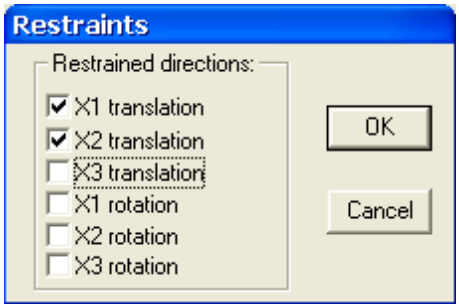


The example shows how to -
- create the section in the *CROSEC* section generator
- copy the section to *STRAP*
- arrange the column reinforcement temple (corner bars and groups) in the concrete design module.

The section will be imported into the program from a DXF file. Please download the file from www.goo.gl/5d**W**nu (note the upper-case "W")

Geometry - general

- click the new model icon
- select **Space Frame** and click user defined
- rotate the model to the X1-X3 plane:
  - click the Dynamic rotate icon
  - click the X1-X3 plane button
  - click End
- click Nodes in the side menu and define the following two nodes:
  - X1=0 ; X2=0 ; X3=0
  - X1=0 ; X2=0 ; X3=5
- click Beams and define a beam connecting the two nodes.
- click Restraints and define the following supports at the two nodes:
  - Bottom node: Fixed
  - Top node: restrain the node against horizontal movement and allow vertical deflection: select Other and -

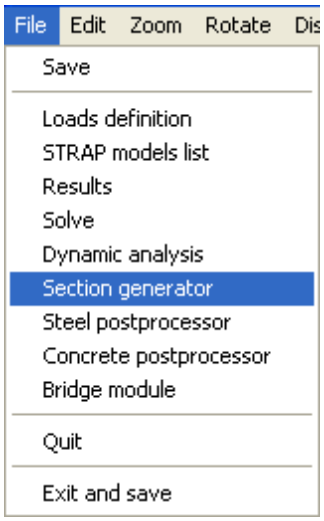


The defined geometry is displayed as:

Geometry - section

The section is defined in the *CROSEC* section generator program:

- select **File** in the menu bar and **"Section generator"** in the menu:



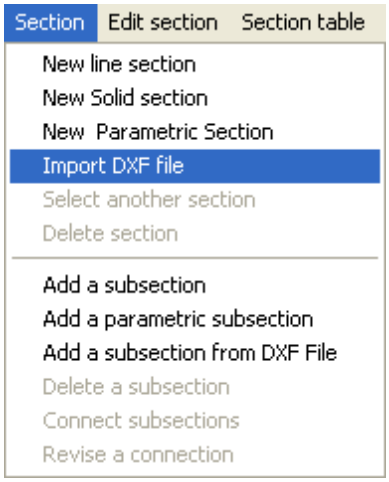
There are three ways to define a section in CROSEC:

- define the lines
- select a standard section from the library
- import a DXF format file

We will use the third option.

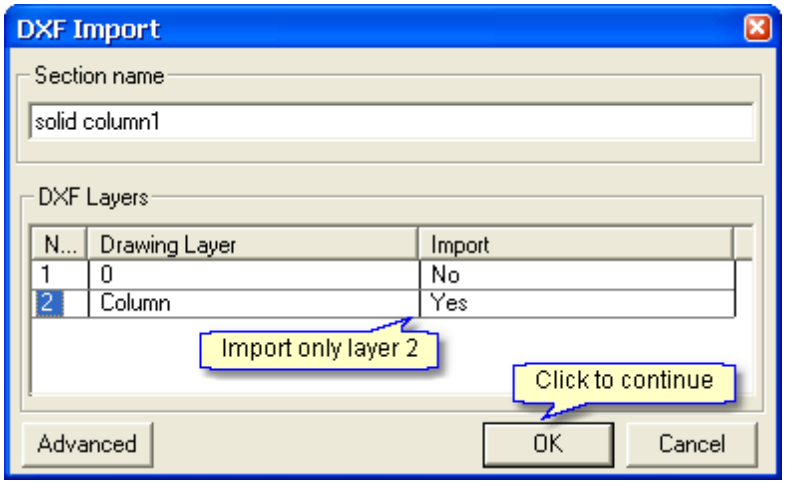
If you have not downloaded the DXF file as explained at the beginning of this example, please do so now.

- select **File** in the menu bar and **"Import DXF file"** in the menu (or click  in the icon bar):

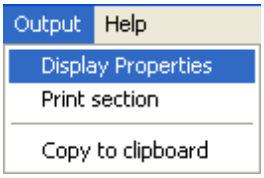


- select the file (in the folder where you saved the file) and click  .

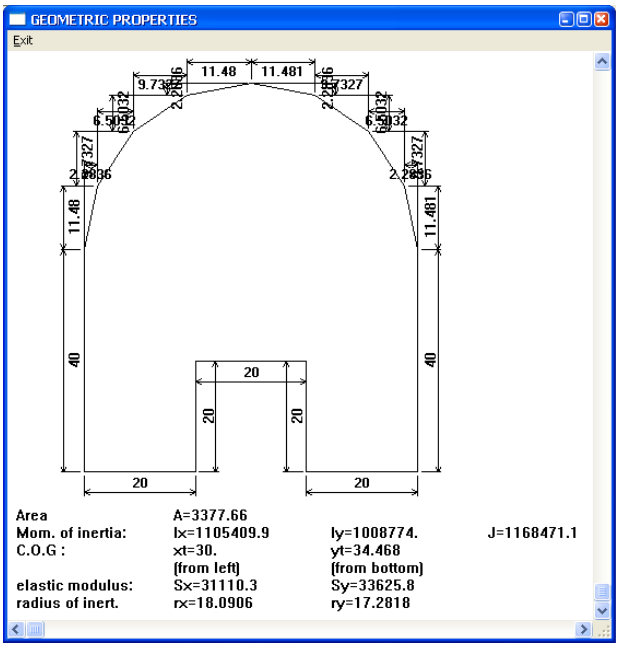
- Select the layers to import:



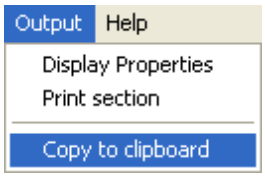
- the program displays the section. Select -



to display the section properties:



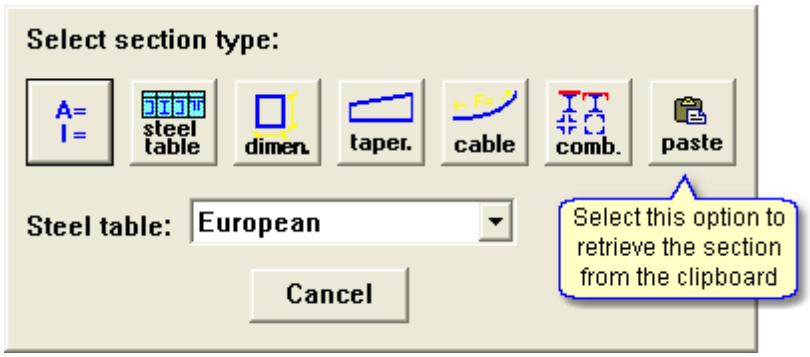
- copy the section to the computer's "clipboard"; select -



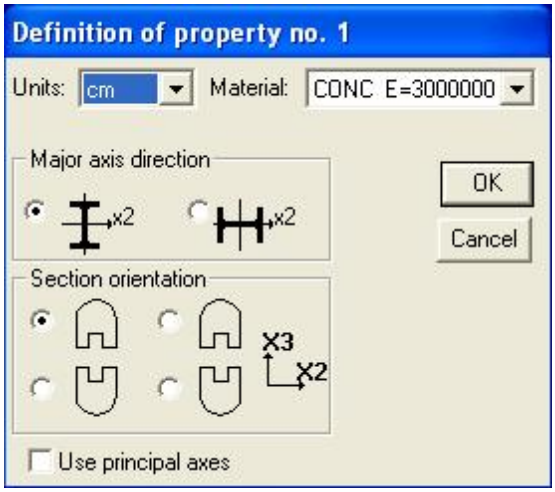
- select **File** in the menu bar and **"Exit"** in the menu

Geometry - continued ...

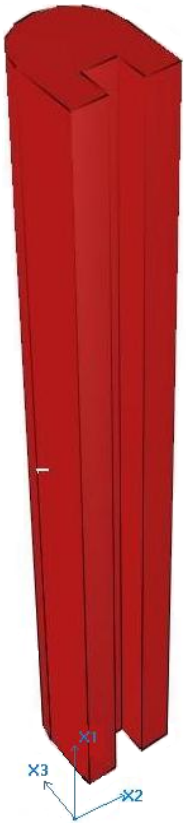
- click Beams and then select Properties in the side menu.
- click and highlight the first row in the table ("- *Not used* -") and click Define/revise.



- check the section orientation and material:



- click to display the rendered drawing:

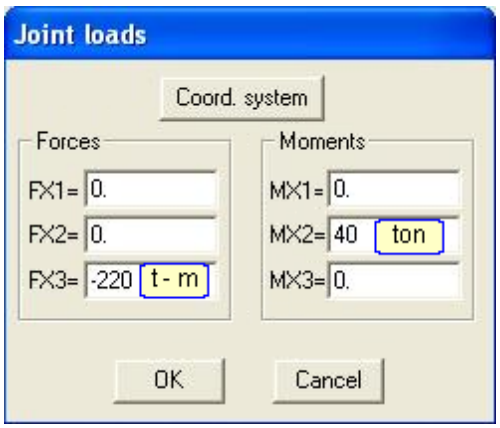


- click Loads in the tab bar.

Loads

Define joint loads at the top of the column:

- click New load in the side menu and enter a title.
- click Joint load in the side menu and define the following axial load and moment:



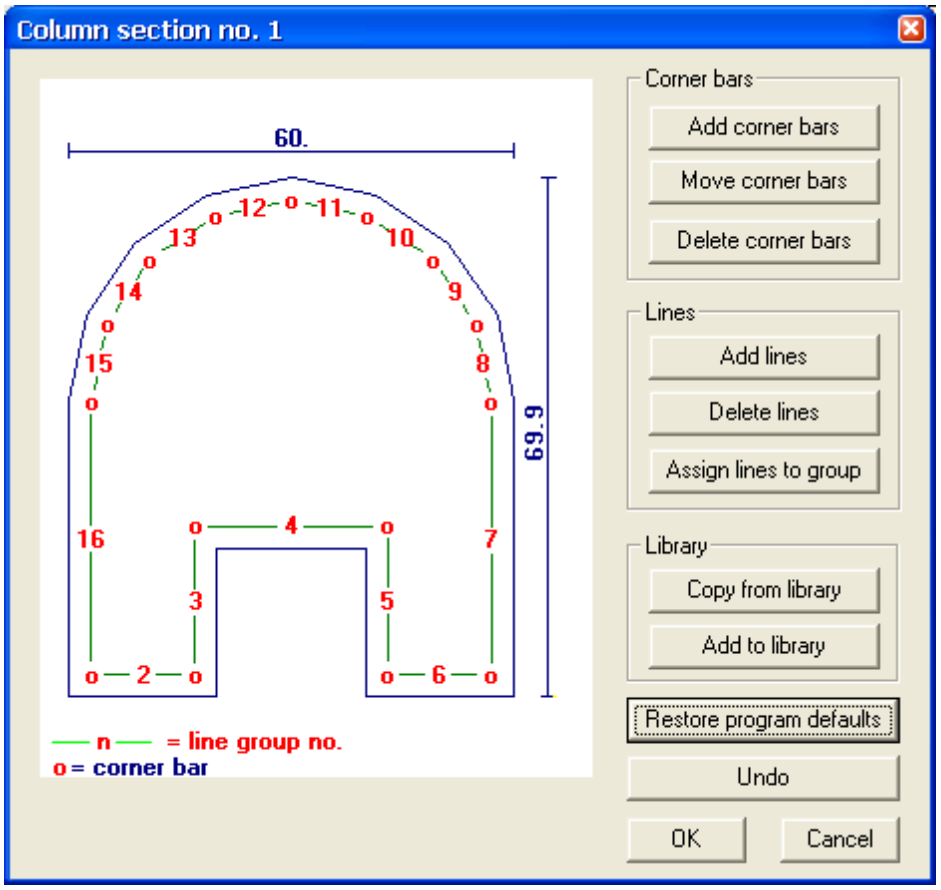
- click End load case and 1+2 Solve
- click the Concrete tab

Concrete design module

- click Columns
- click Define
- click Automatic definition of all columns and click End .
- click Defaults and specify various design parameters - design code, concrete type, reinforcement grade, cover, etc.

To arrange the reinforcement template for the solid section:

- click Properties
- click Edit STRAP solid section
- The program displays the default reinforcement arrangement:
  - a "corner bar" and every perimeter corner
  - a reinforcement line between every pair of adjacent corner bars:

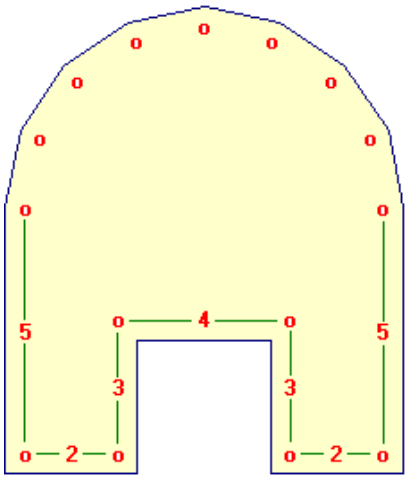


The following changes will be made:

- lines 8 to 15 will be deleted as the corner bars along the arc are sufficient.
- the following symmetric line pairs will be specified as identical: 7-16, 3-5 and 2-6.

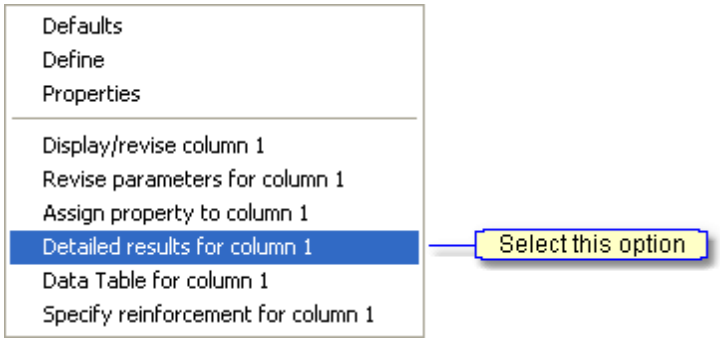
- click Delete lines: highlight line 8 and click the mouse. Repeat for line 9 to 15
- click Assign lines to group :click on line 7 and then on line 16; line 16 is renumbered "7". Repeat for lines 3-5 and 2-6.

When completed the section should appear as:

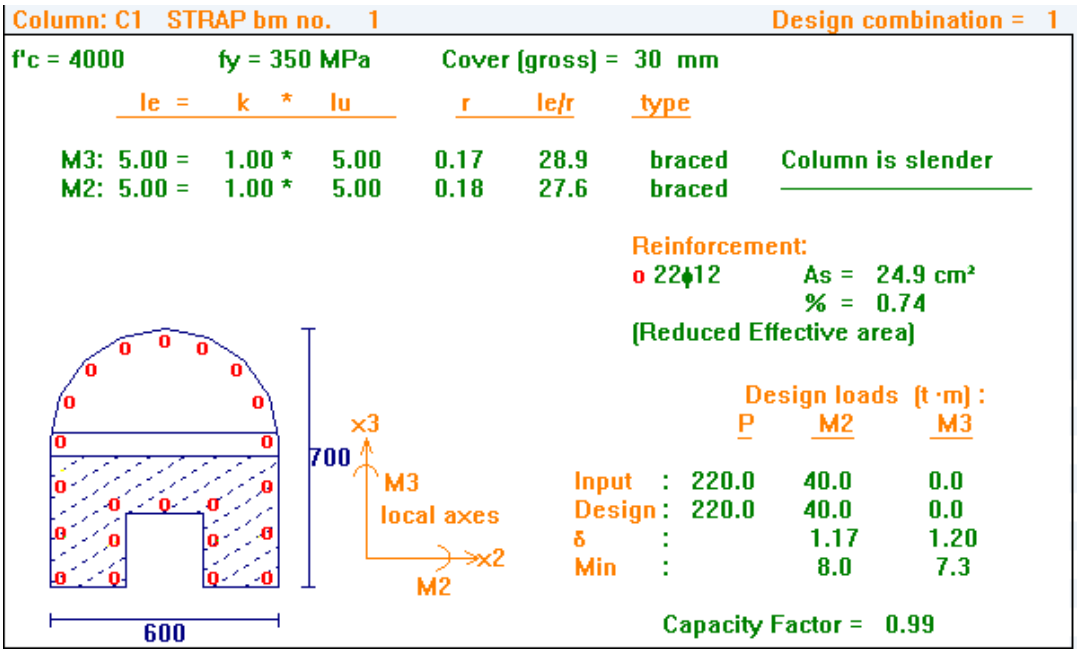


- click OK
- click End
- click Compute in the side menu; the column result summary is displayed.

- to display the detailed results, right-click on the column:

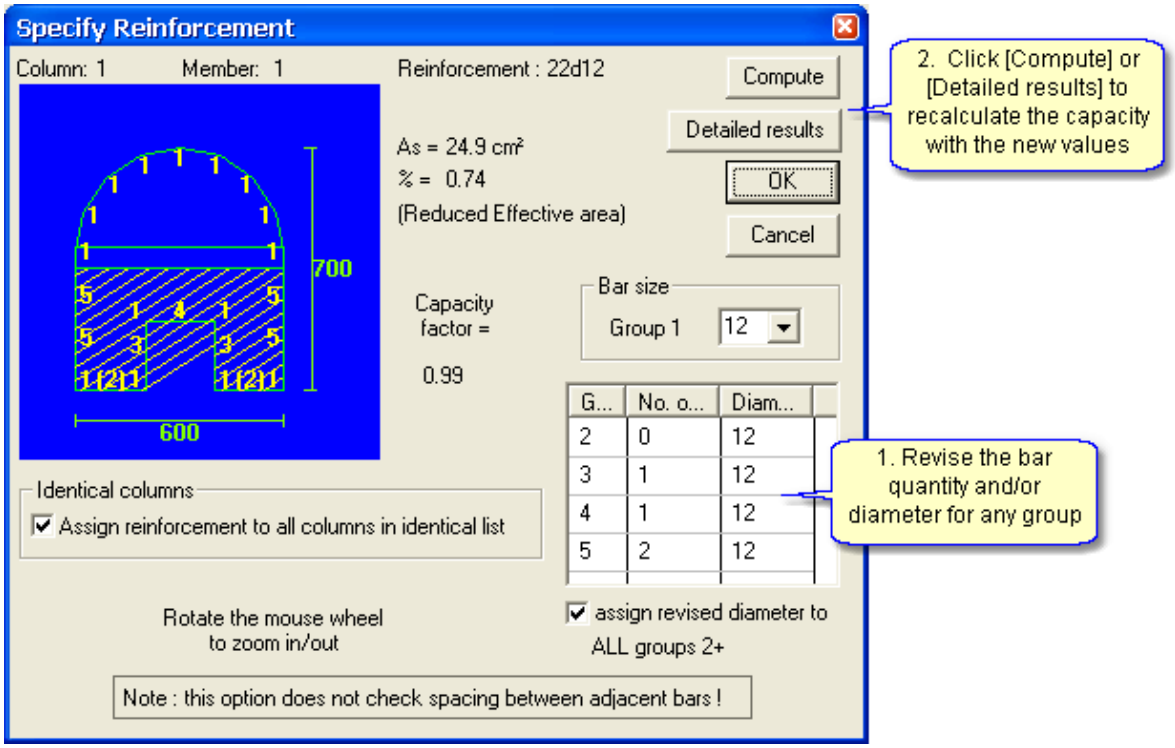


and select ◉ Design combination only



- Finally, you may modify the diameter of quantity of bars in any reinforcement group:

and select the column. The program displays the following screen:



Note:
The "solid section"option can also be used to calculate a beam with any section by defining it as a "column". However it is the user's responsibility to ensure that all Code requirements for beams are satisfied.