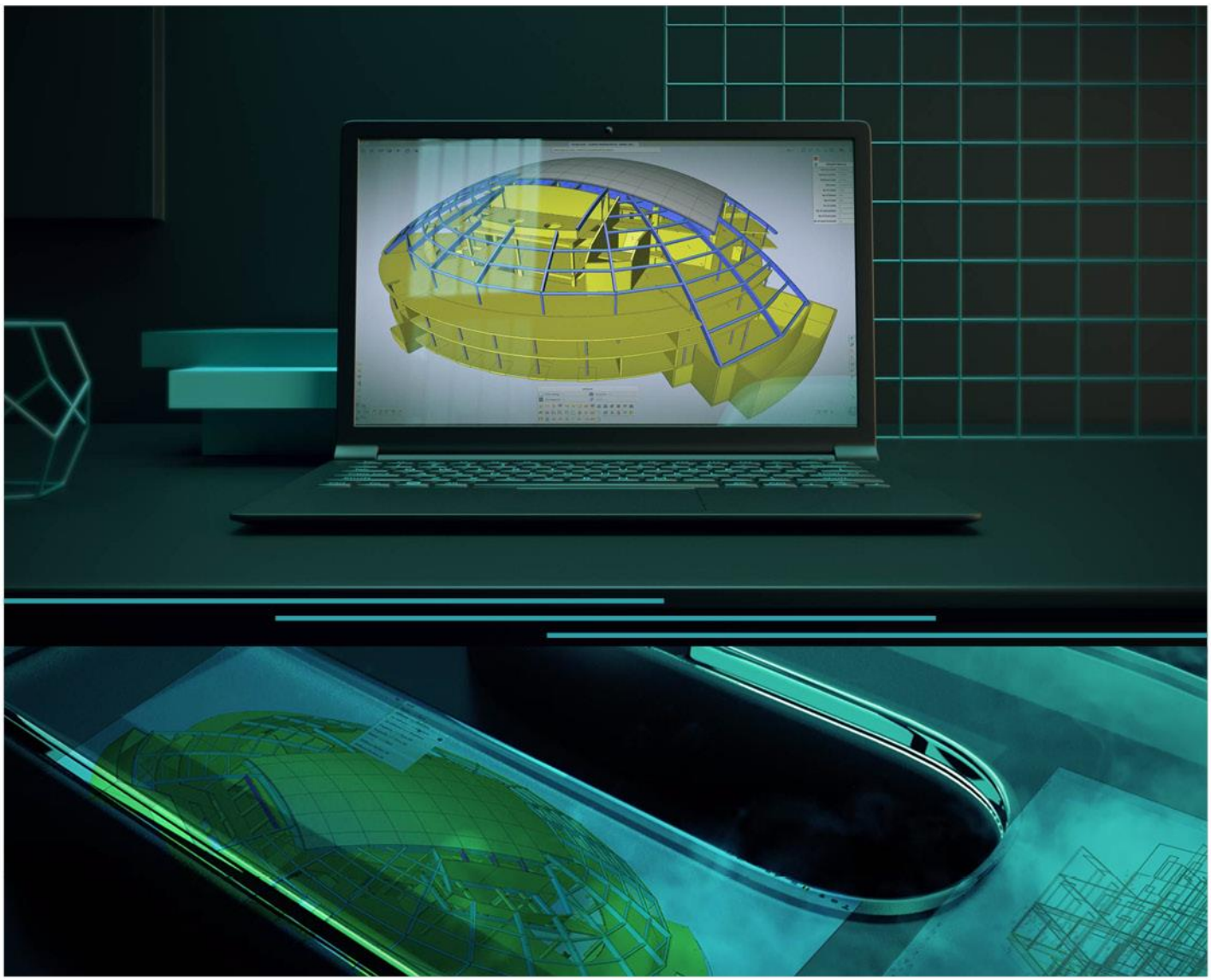
SCIA ENGINEER



TUTORIAL

MODELLING SHELLS

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Introduction

In SCIA Engineer, shells are defined by border lines (i.e., border curves). The shape of the shell can be defined by four, three or two curves/straight lines. Some shapes require certain “mathematical imagination” when they are created. Therefore, basic shapes have been pre-created in the form of templates and can be easily inputted through user blocks.

You can model shells by using:

- Shell command
- Shell – surface of revolution command
- Shell – swept surface command
- Shell template

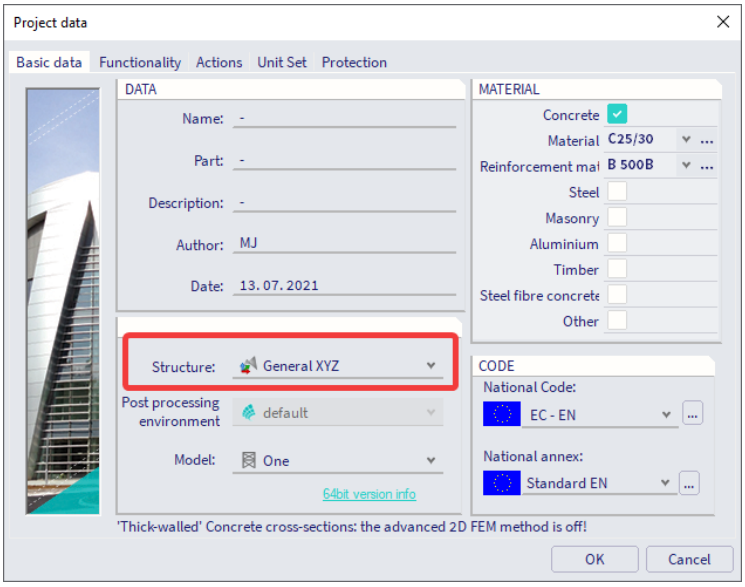
Depending on the shell element, you can choose the optimal way of modelling the shell.

This tutorial will explain the different ways of inputting shells while discussing a simple example.

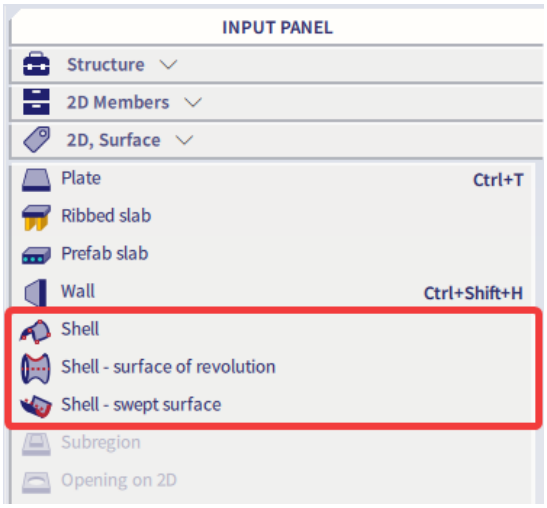
Shell commands

Shells

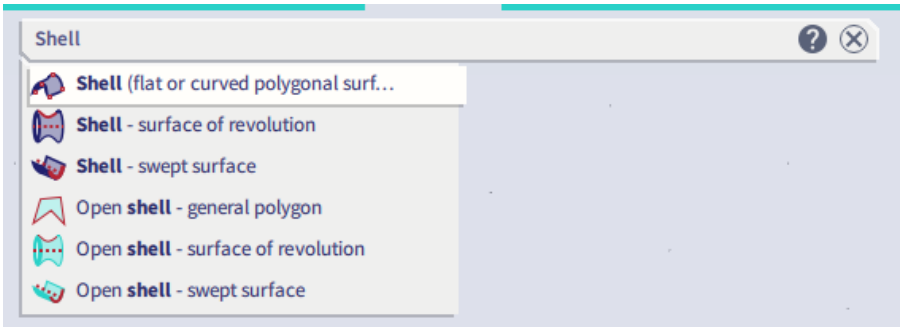
To start modelling shells, make sure the Structure is set to ‘General XYZ’ in the Project data:



In the input panel, you will find the shell commands under Structure > 2D Members:

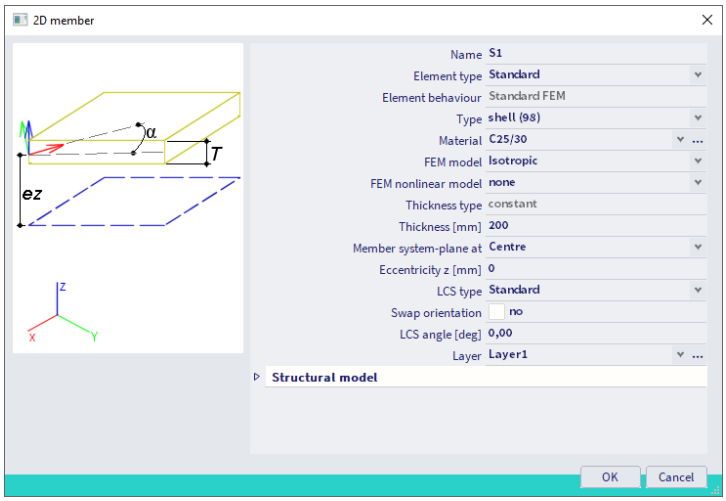


You can also type the command in the SCIA Spotlight:



Shell command

The first way of inputting a shell element is by using the shell command. Once this option is selected, you can set the parameters of the shell element:

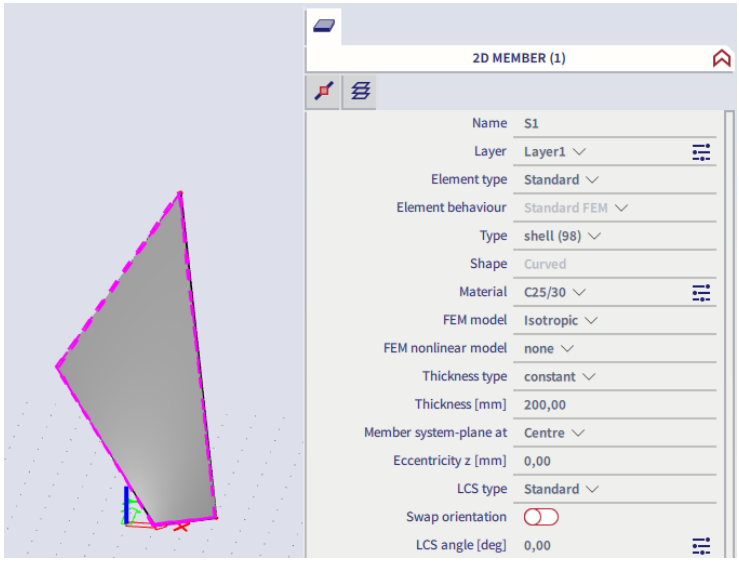


After you confirm with OK, you can input the vertices of the polygon. Keep in mind that you can use the snap points, coordinates, or the shortcuts in the SCIA Spotlight:

If the defined polygon is not closed, the program tries to close it automatically.

Tip: If you want to define a curved 2D member, it may be very useful to input the shape-defining curves in advance as normal lines (service Structure > Modelling/Drawing > Line)

This option can be used to model a general shell:

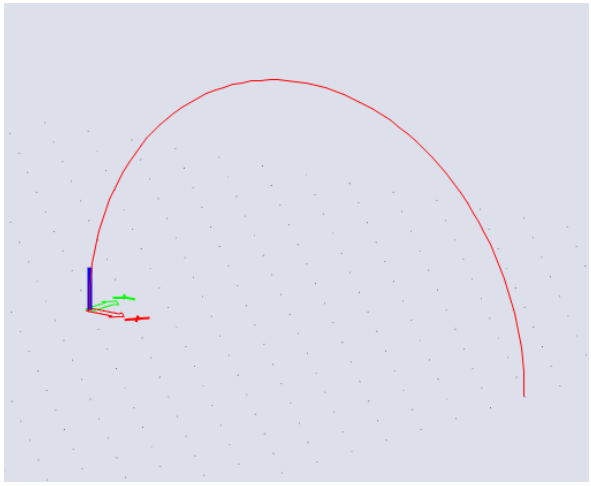


However, it is possible to use special functions for the input of a surface of revolution and swept surface.

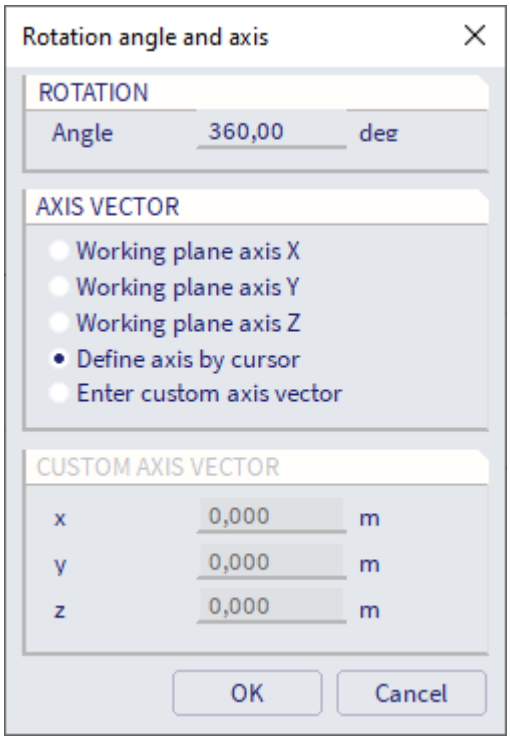
Shell – surface of revolution command

This next option allows you to model a shell where you first need to define a line/curve. The following step is to input a certain angle which then allows you to rotate the line/curve along this angle to create a shell element.

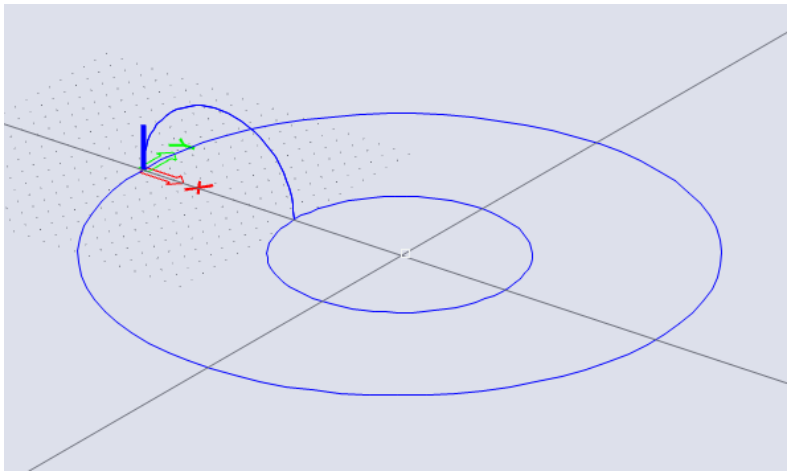
To start, select the option Shell – surface of revolution and set the parameters. Next, input the line/curve. For example, a circular arc. This can be done more easily by using the shortcuts in the command line:

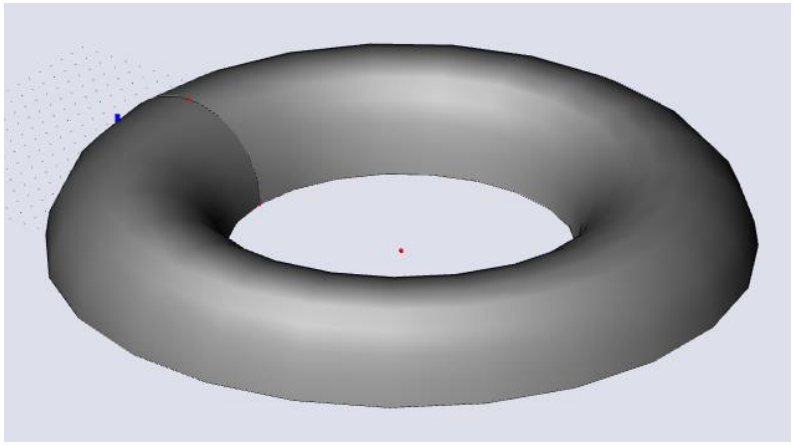


Once the line/curve is modelled, confirm with [Esc]. Next, a dialogue opens where you can input the rotation angle and axis:



Confirm with [OK] and define the centre of rotation to complete the modelling of the shell:



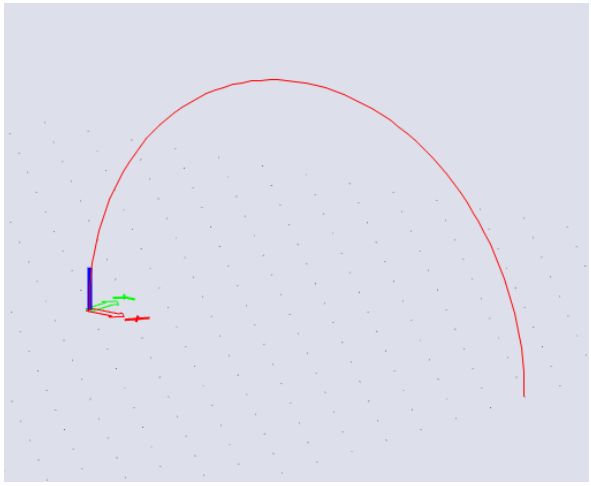


Tip: Set the coordinate system in the correct location to simplify the input of the rotation. For example, when you know a rotation needs to be done around a certain vertical vector, change the coordinate system to that location with the z-axis pointing upwards. This way you can input the rotation around the working plane axis Z in the origin.

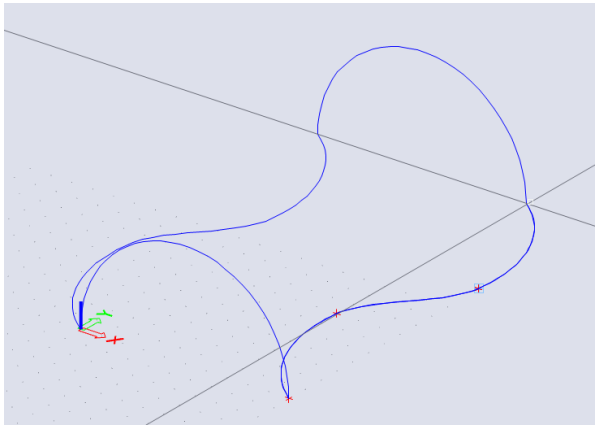
Shell – swept surface

When modelling a shell using swept surface, again you first define a line/curve. The next step is to input another curve along which the master curve will be swept.

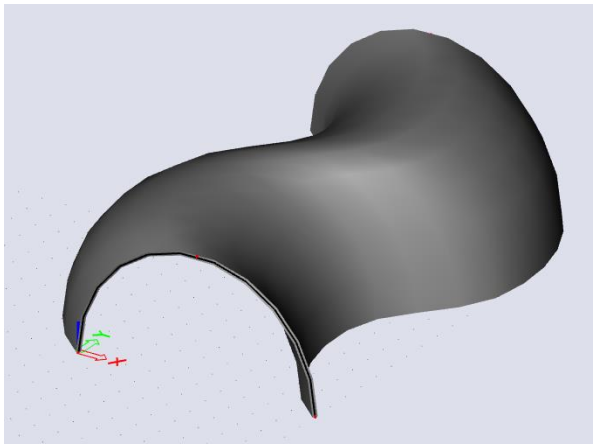
To start, select the option Shell – swept surface and set the parameters. Next, input the master line/curve. For example, a circular arc:



Once the master line/curve is inputted, confirm with [Esc] and start inputting the next curve. This curve will direct the master line/curve along a path to create a shell element:

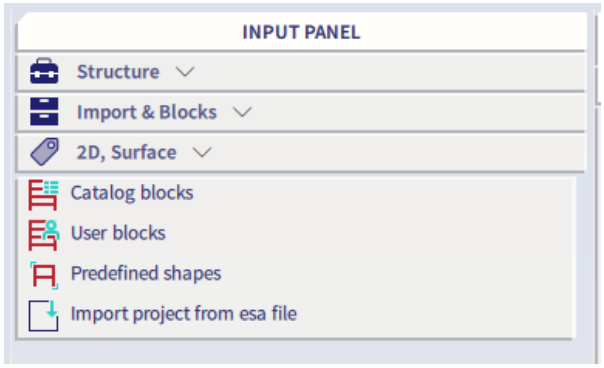


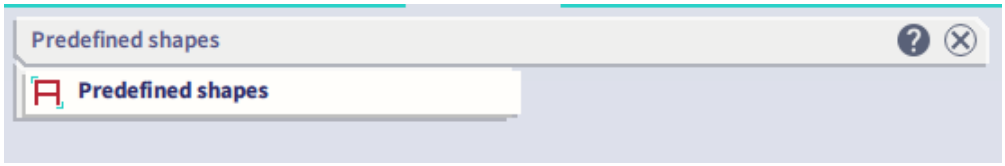
Confirm again with [Esc] to input the shell element:



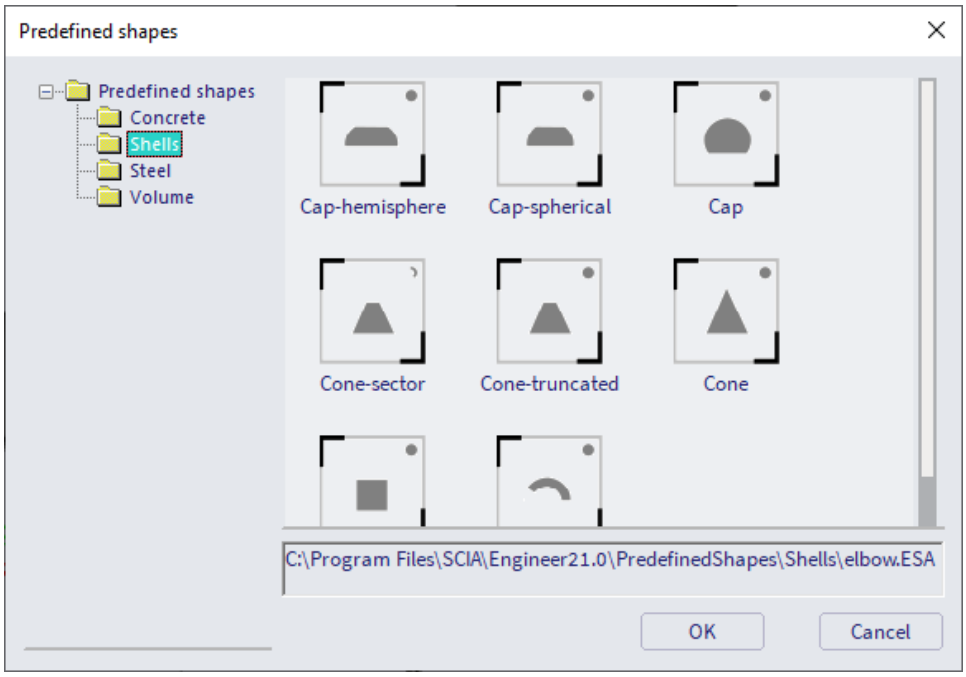
Shell template

The final option of inputting a shell element, is by using predefined shell elements. These can be found in the Input panel under Structure > Import & Blocks or in the SCIA Spotlight by typing ‘Predefined shapes’:

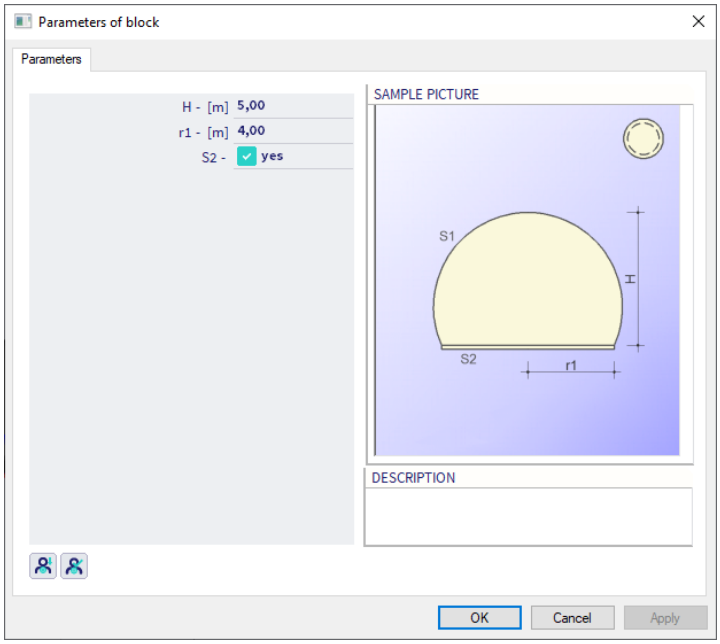




Here, you can select a predefined shape and change some of the parameters:



For example, inputting a cap:



After setting the parameters, confirm with [OK] and select where you want to input the block: