

Truss-maker



Picture WINDOW HOUSE-2002
Arh. Shigeru Ban

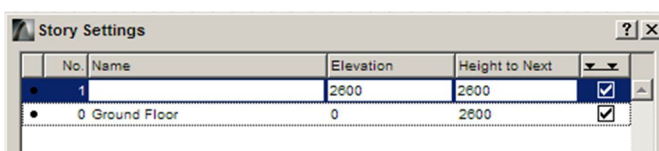
"For me there is no difference between a temporary and a permanent building. It is more easy to build temporary. If people love it, it becomes permanent."

Shigeru Ban

In this tutorial you will study how to:

- **TrussMaker**
 - create and edit a truss
- **ComplexProfiles**
 - create a canopy using complex profiles
 - create a hand rail using complex profiles
- create a custom stair

DEFINING THE PLAN



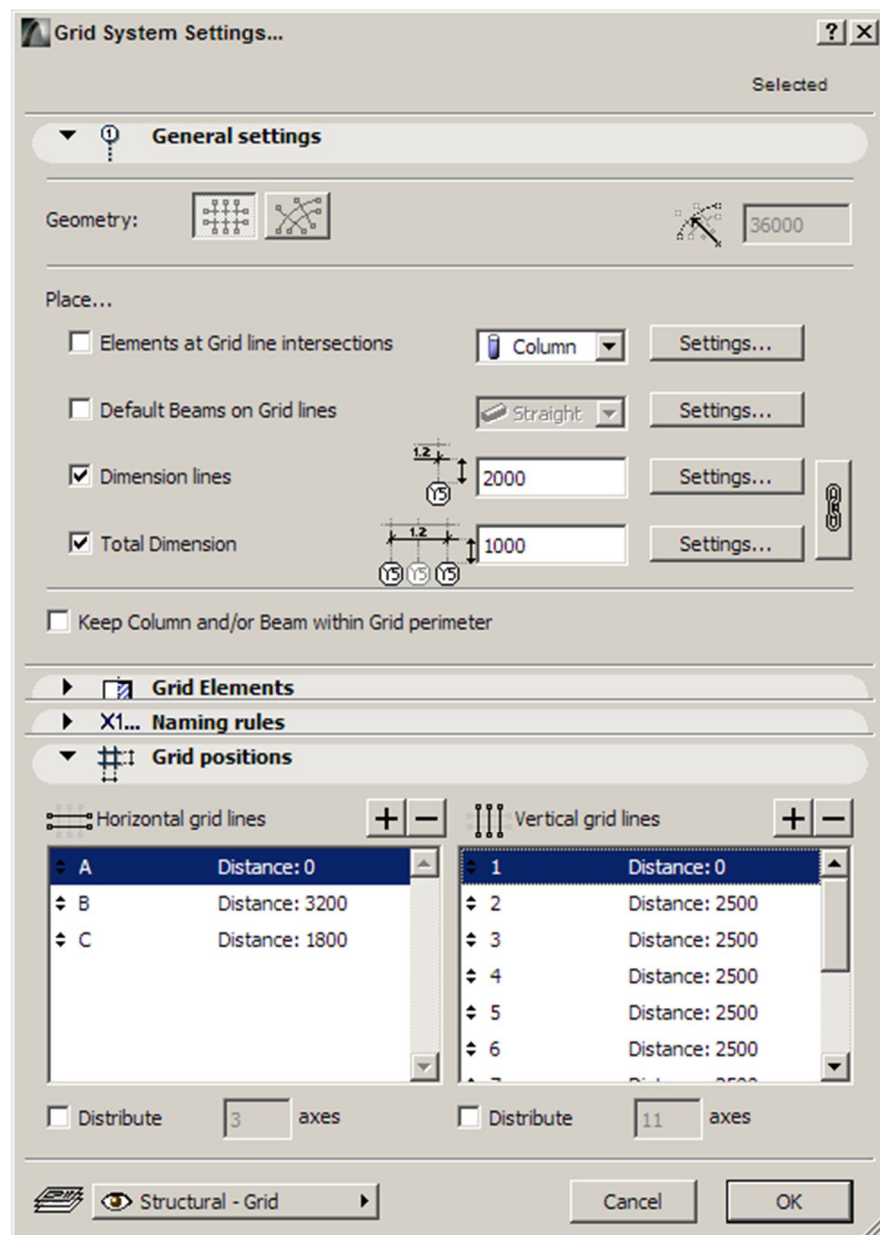
Set the drawing units to millimeters.

In **STORY SETTINGS** (Ctrl+7), set the heights of the stories to 2600.

Define the structural axes in the **DESIGN>GRID SYSTEM** menu.

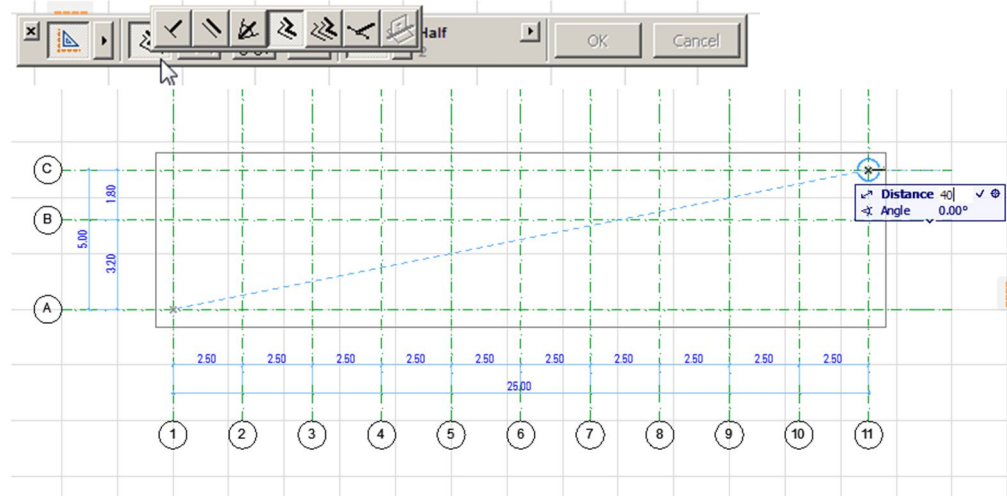
Check the **DIMENSION LINES** and **TOAL DIMENSION** in order to automatically generate dimensions for the grid.

In the **GRID POSITION** section set 3 horizontal axes with the distances of 3200 and 1800, and 11 vertical equally spaced axes (2500). In order to add or remove axes, use the „-“ și „+“ buttons.



Access **WINDOW>PALETTES>CONTROL BOX**.

Using control box, offset a polyline 400 mm outside the overall contour defined by the grid.



DEFINING THE STRUCTURE

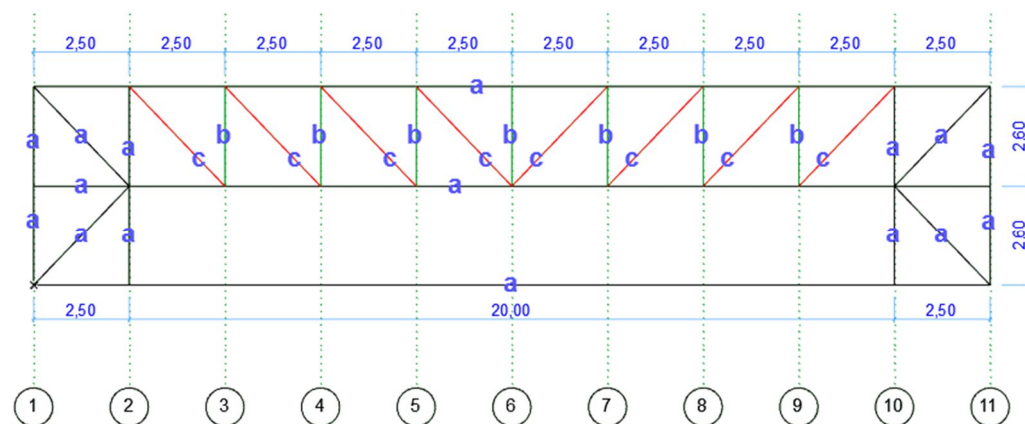
On the floor plan drag a copy of the vertical axes. In order to do this, suspend the groups (**ALT+G**).

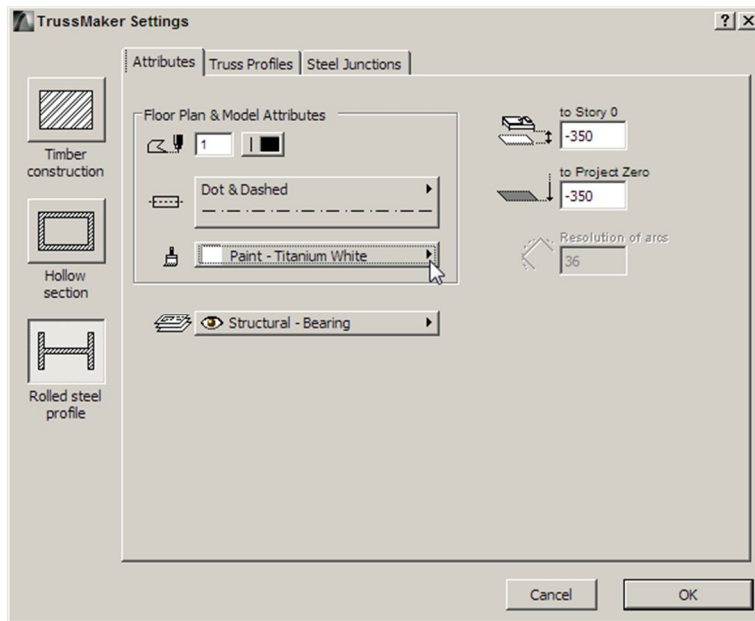
In the plan view, drag a copy of the vertical axes to use them as a guide for the following truss scheme. Follow the image below, using the specified colors:

- Type **a** – color code 1
- Type **b** – color code 4
- Type **c** – color code 20

! The line colors can be manually input in the INFOBOX after selecting them.

Avoid drawing overlapping lines. This would cause errors in truss generation.





Select all the lines and access the **DESIGN>DESIGN EXTRAS>TRUSSMAKER>CREATE TRUSS** menu.

From the left section choose **ROLLED STEEL PROFILE**.

In the **ATTRIBUTES** section, set the level dimension of the truss (-350 mm) and the surface material (Paint-Titanium White).

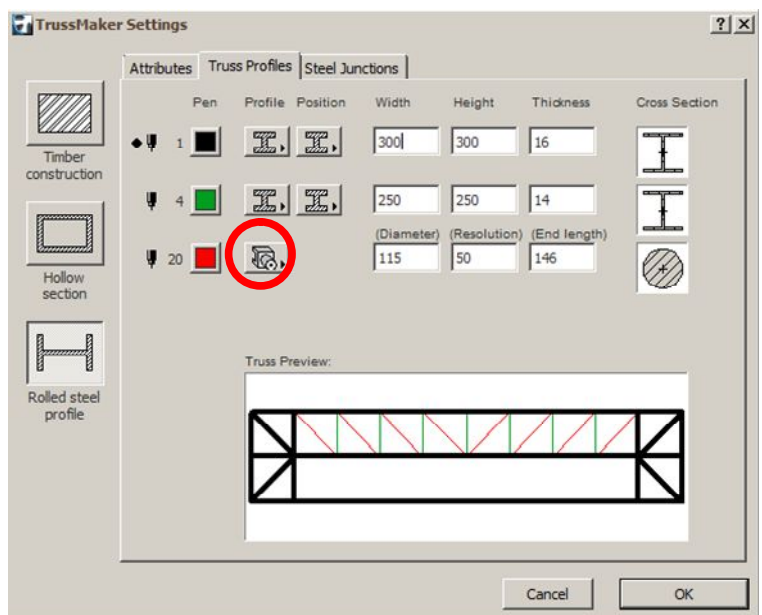
In the **TRUSS PROFILES** section select each color and set the dimensions accordingly:

Profile **a** – de tip H – 300x300x16

Profile **b** – de tip H – 250x250x14

Profile **c** – round tie rod – Diameter 115 mm, Resolution 50, End length 146

In order to set the round section for the diagonal tie rod (color 20) click&hold on the profile next to the color



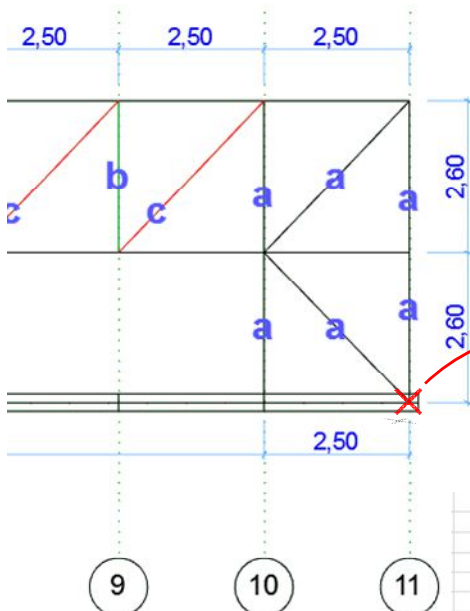
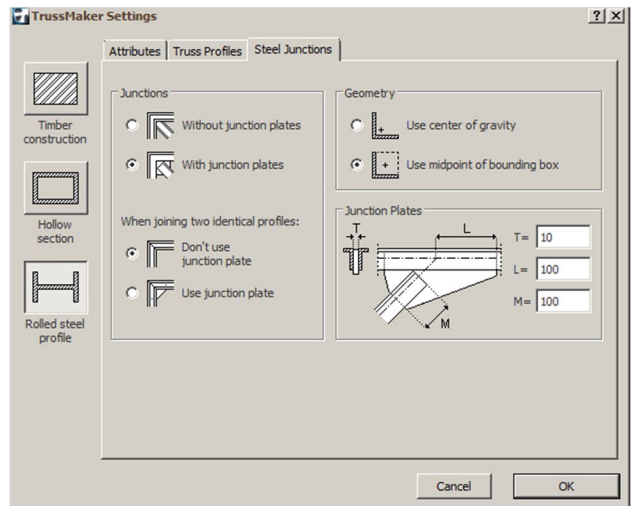
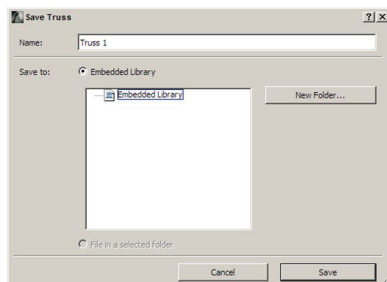
In the **STEEL JOINTIONS** section select the **WITH JUNCTION PLATES** mode using the follow dimensions:

$T=10$

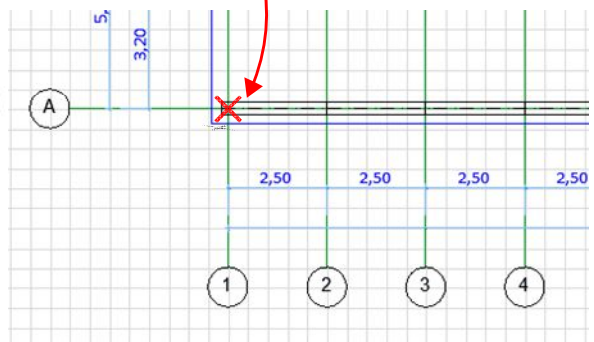
$L=100$

$M=100$

Save the truss as **Truss 1**



The truss will show like a usual beam.
Move it on the **A** axis, using the
intersection of the truss with the axis
11, as an anchor.



In case an error occurs in the generation of the truss, check if the lines of the truss overlap. Truss-Maker cannot generate two identical elements on the same position.

In the plan view, copy and rotate the horizontal axes (A,B,C) to easily draw the truss schemes of the transversal structural elements.

Suspend the groups in order to copy the horizontal axes

Draw the schemes of the 2,3,4,5 trusses, and generate them as previously shown, naming them as such.

In order to achieve clean intersections between truss profiles, stretch the horizontal lines of the schemes on both sides, 150mm towards the exterior. Reuse the drawings to make slight editing and ease your work. Set the level dimension for all trusses to -350.

Copy the trusses and rotate them by 90 degrees, as the schemes are seen from the left side façade (follow the A,B,C axes).

Their position will be as follows:

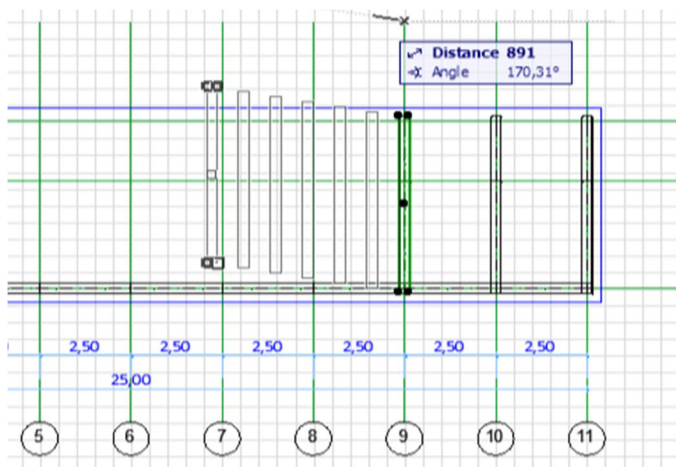
TRUSS2 – 2 pcs – axes 1, 11

TRUSS3 – 2 pcs – axes 2, 10

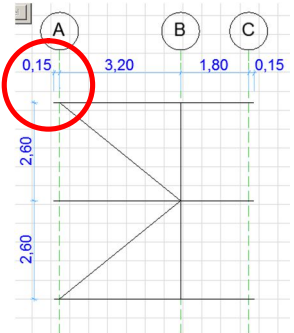
TRUSS4 – 6 pcs – axes 3,4,5,6,8,9

TRUSS5 – 1 pcs – axis 7

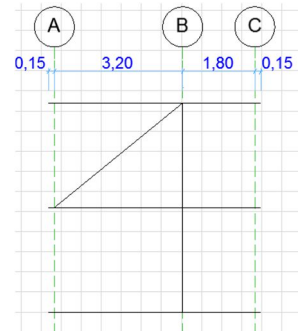
TRUSS6 – 1 pcs – axis C



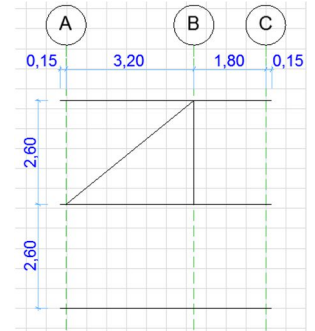
Truss2



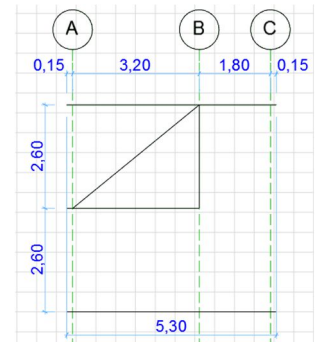
Truss3



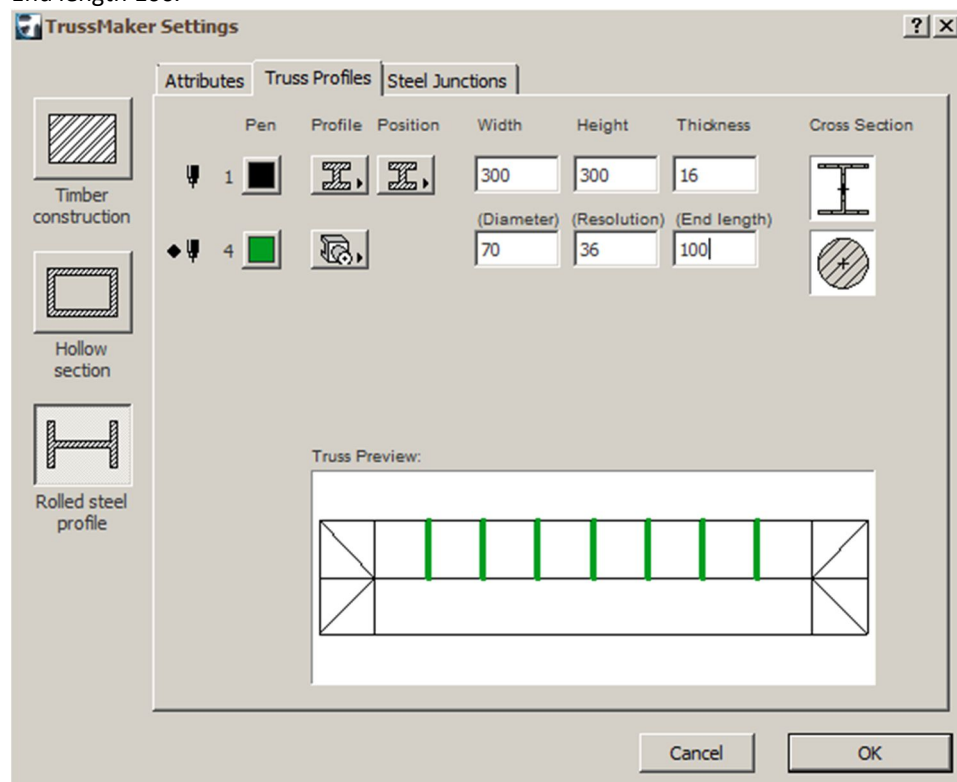
Truss 4



Truss 5



For the main entrance façade (located in the upper part of the plan), copy the scheme used for **Truss 1**, delete the diagonal lines (type **c**), and generate TRUSS 7 modifying the type and dimensions of the profiles used for type **b**: round tie rod – Diameter 70 mm, Resolution 36, End length 100.

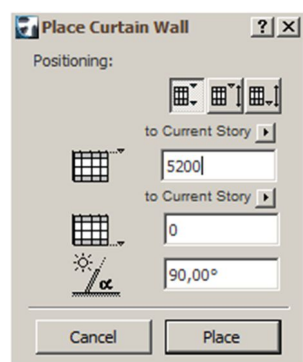


The metal beams situated on axis **B** can be generated using beams from the object library, or as well as the others, using Truss Maker, as they are coplanar. Draw three horizontal axes reusing the schemes of Truss 1 or 7.

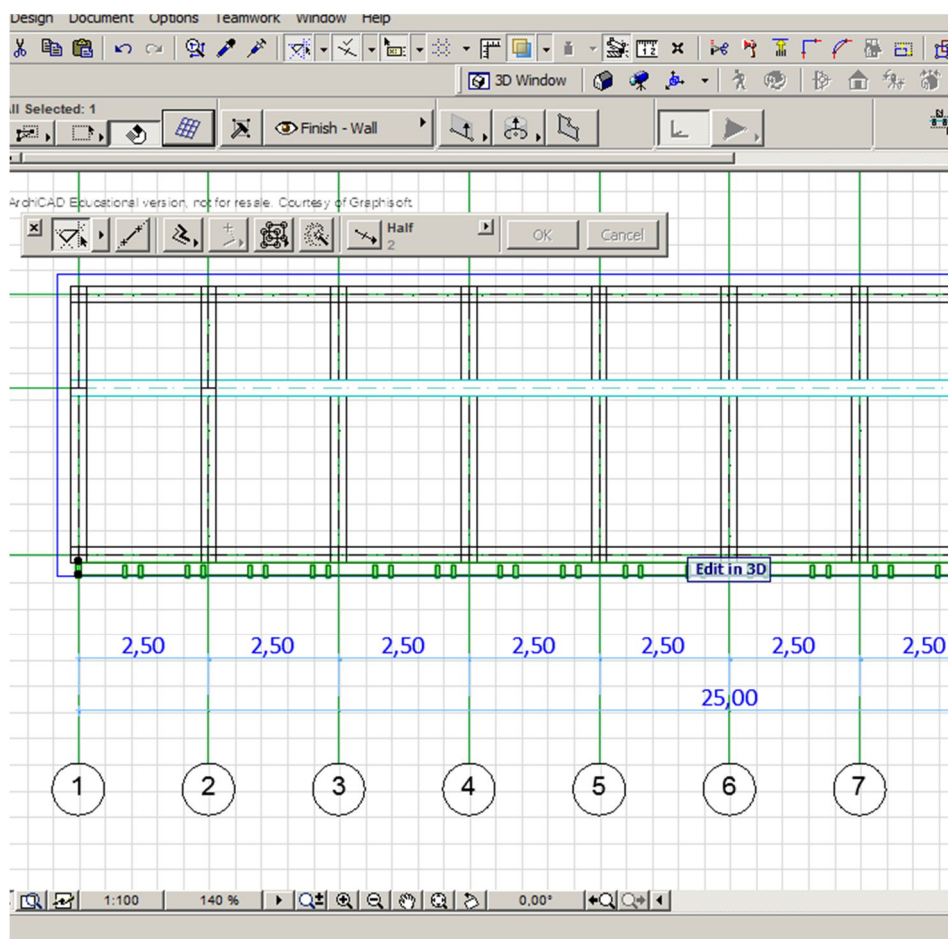


CURTAIN WALLS

Draw the façade with the curtain wall tool on the exterior side of the structure between axes 1 and 11. Click outside the contour in the lower part of the plan to establish the exterior of the curtain wall. Set the top (5200) and base (0) elevation. Set the top (5200) and base (0) elevation.



Enter the curtain wall's settings.

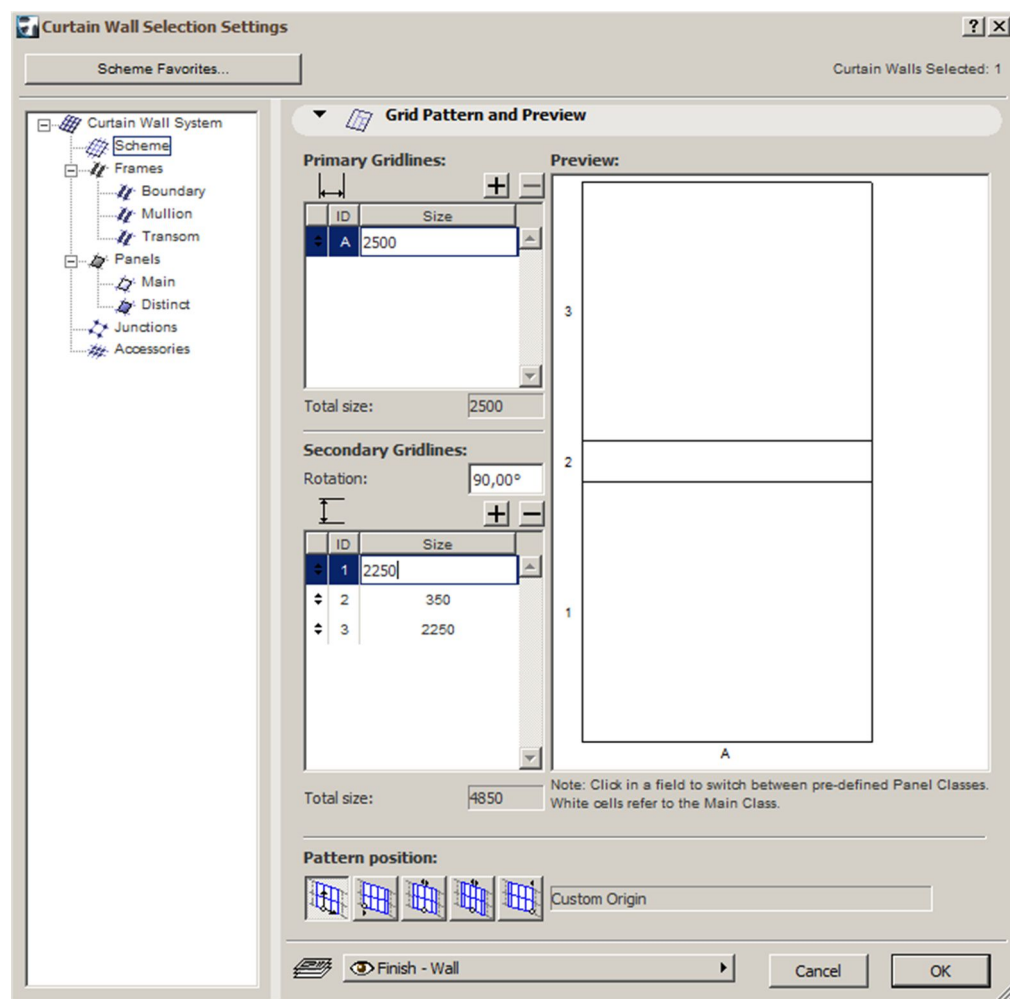


In the SCHEME section remove one of the vertical registers of the grid from Primary Gridlines sector by selecting it and pressing the „-“ button.

Set the width of the remaining register to 2500.

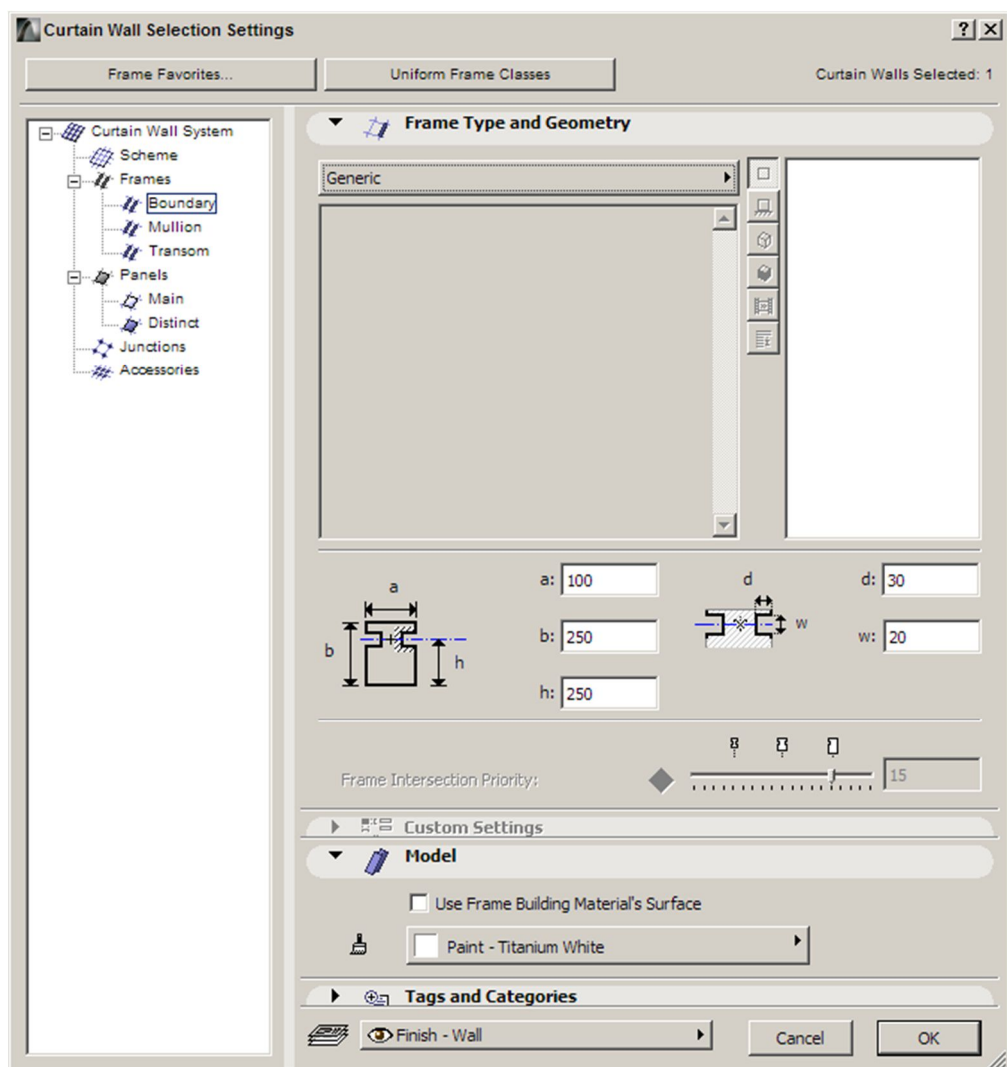
In the Secondary Gridlines sector define the dimensions of the three grid registers (2250, 350, 2250).

Make the wall transparent by clicking in the PREVIEW window on the dark cells of the grid.



Define the dimensions of the structural elements of the curtain wall as follows:

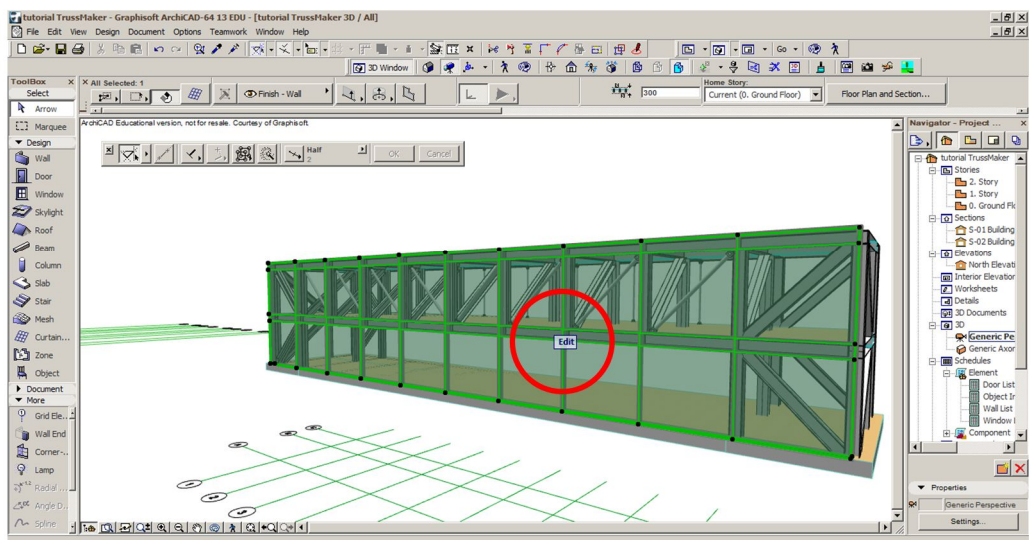
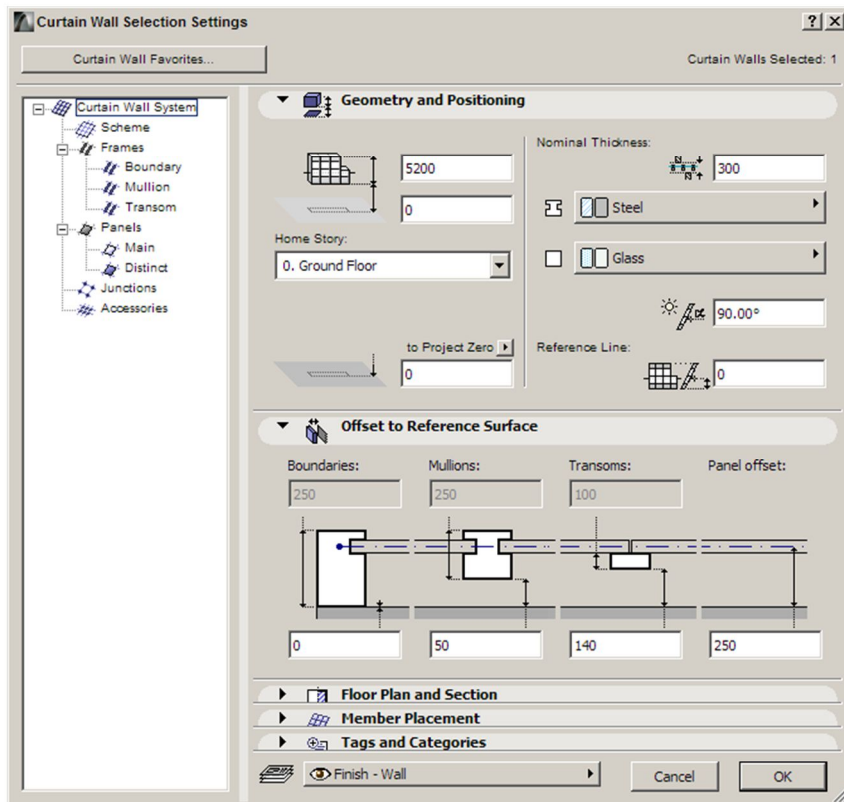
Boundary: a:100, b:250, h:250, d:30, w:20. Material: Paint-Titanium White



Mullion: a:50, b:250, h:200, d:0, w:0. Surface Material: Paint-Titanium White.

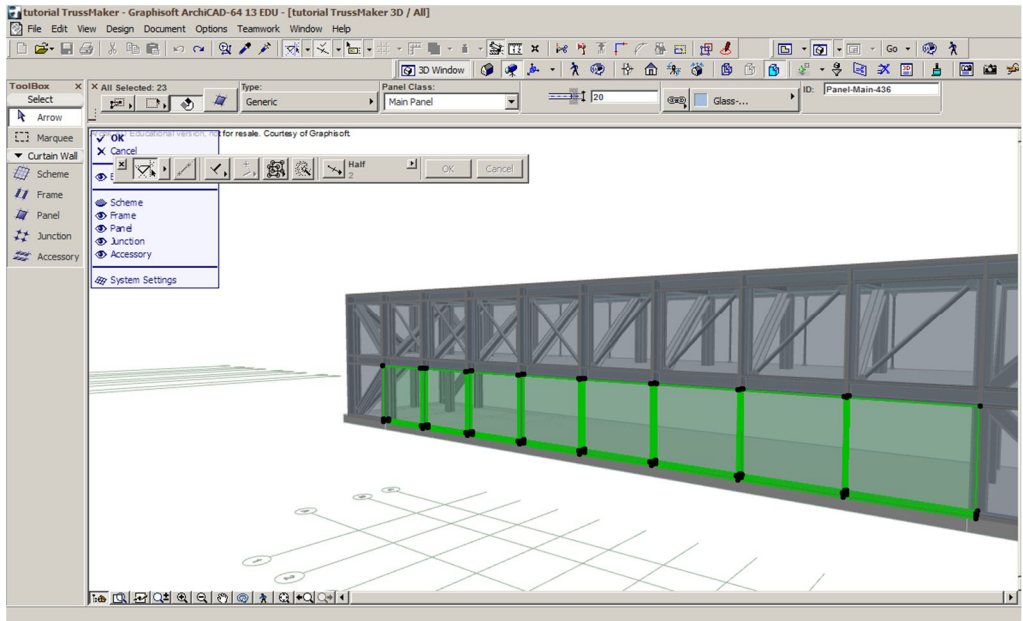
Transom: a:50, b:100, h:110, d:5, w:20. Surface Material: Paint-Titanium White.

Go to curtain Wall system section in the left panel and set the frame material to **Steel**.

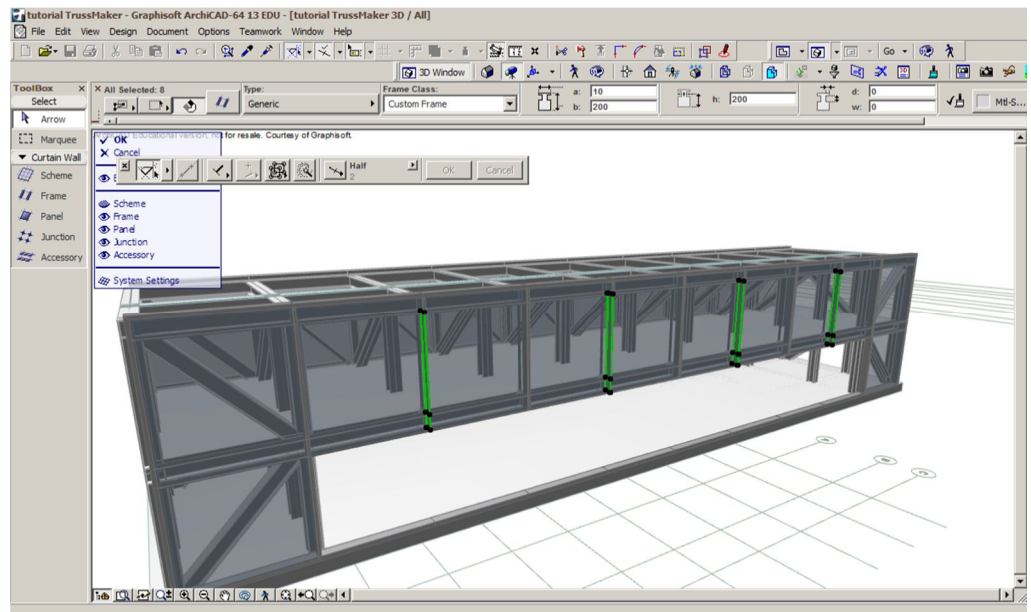


In the 3d window select the curtain wall and press „Edit”.

Select the elements corresponding to the ground level between axes 2-10 and remove them by pressing the DELETE key.



In the plan view select the curtain wall and mirror it to create the other façade. Edit the curtain wall in the 3D window. Select the mullions in the axes 3,5,7,9 and set the dimensions as follows: a:10, b:40, h:40, d:0, w:0. Surface Material: Paint-Titanium White.

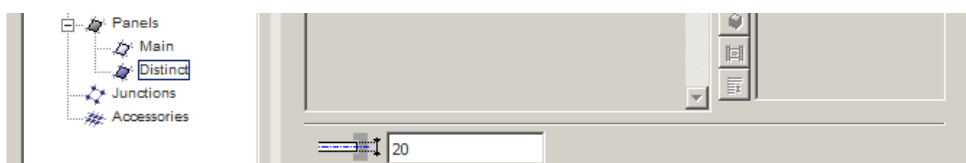
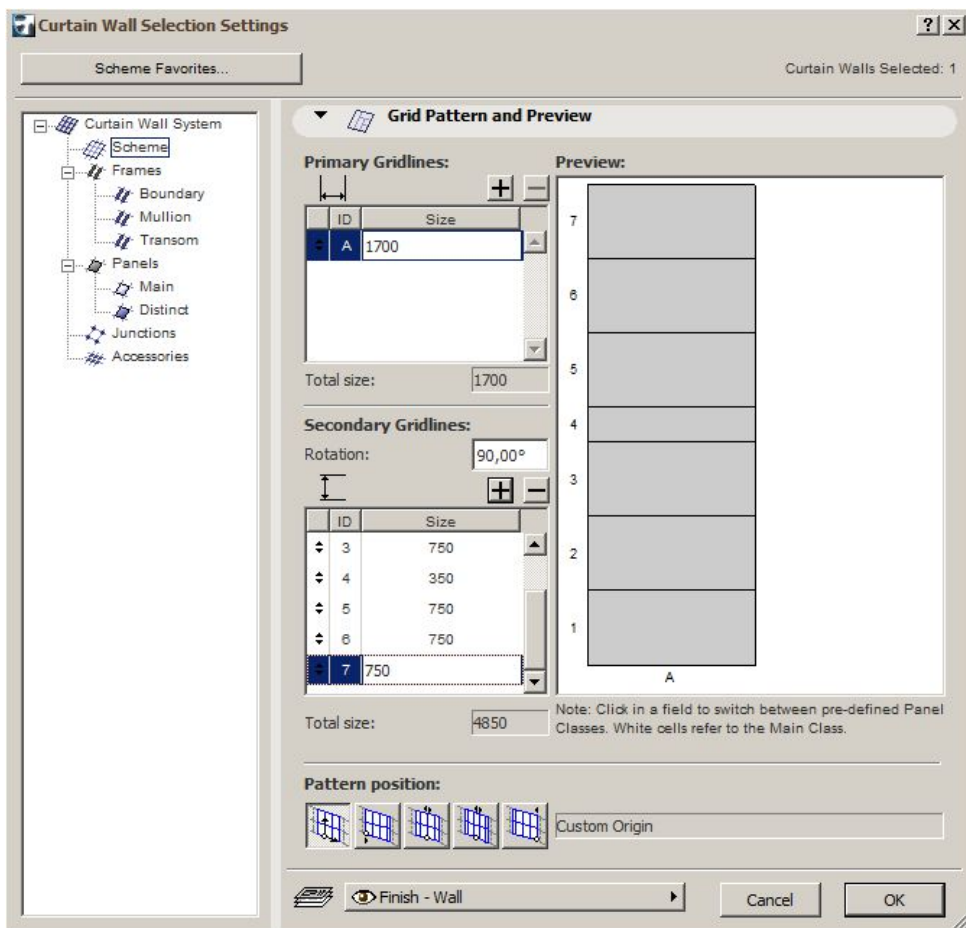


The side facades are opaque, but will be generated as well with the curtain wall tool, with a total width of 5100 mm. The elevation dimensions will be the same as the main facades. Change the material of the grid cells from „Main” to „Distinct” by clicking in the white grid cells in the Preview window.

Use the following dimensions:

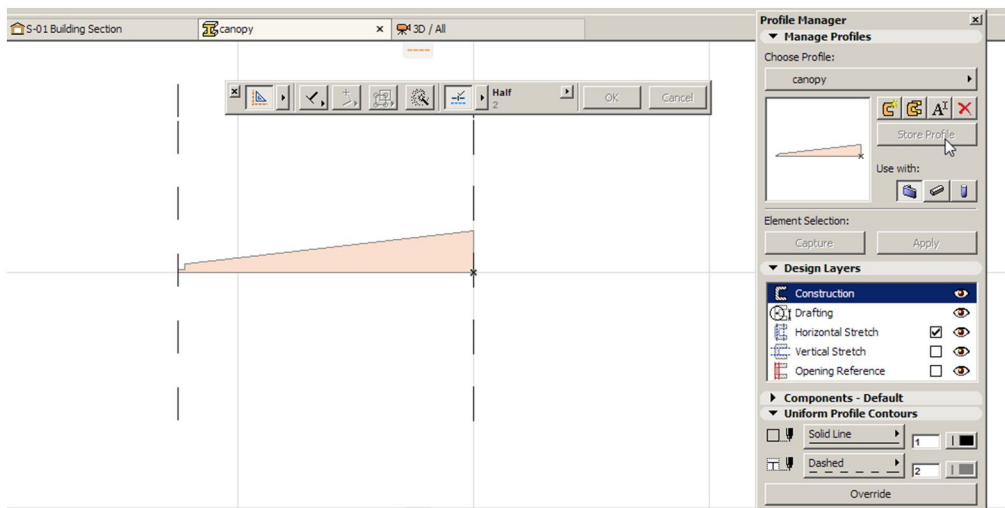
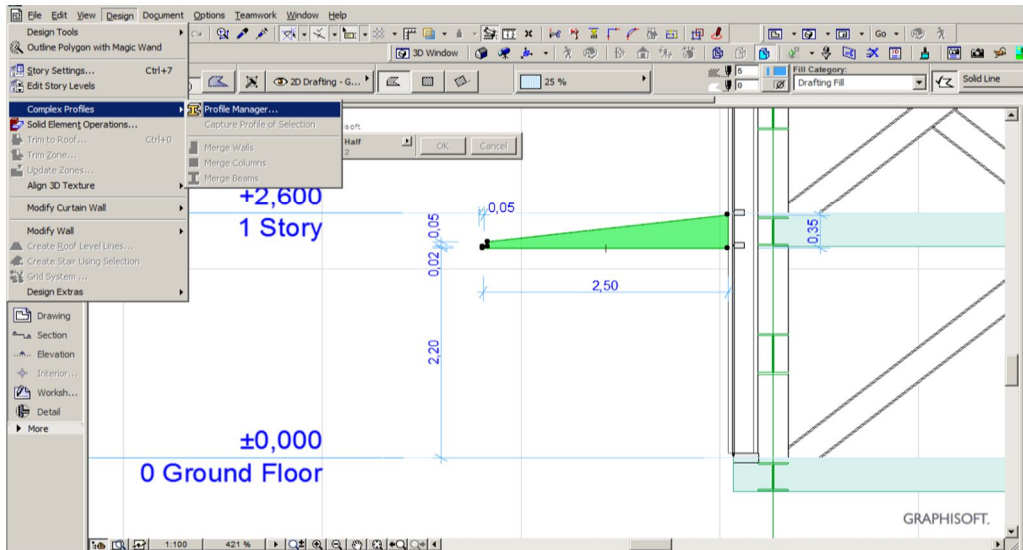
- one vertical register (1700mm wide)
- 6 equal horizontal register: 1,2,3,5,6,7 (750mm)
- one middle horizontal register: 4 (350mm)

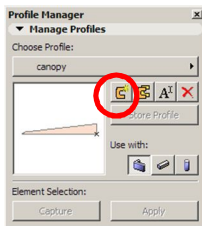
Set the Surface material of the structural elements to Paint-Titanium White.



Draw a transversal section (S-01) and draw a polyline to match the dimensions and position from the image below. Fill the contour using FILL and MAGIC WAND. Select the fill and copy it to the Clipboard (CTRL+V).

Access the **DESIGN>COMPLEX PROFILES>PROFILE MANAGER** menu.

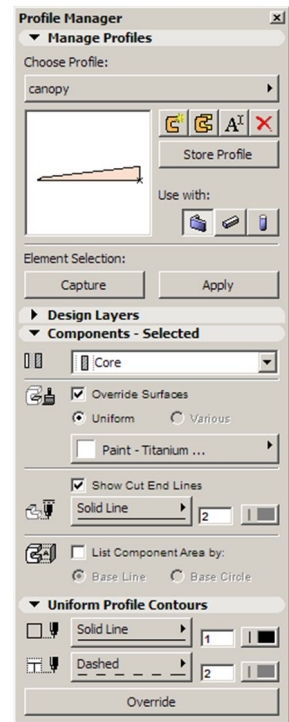
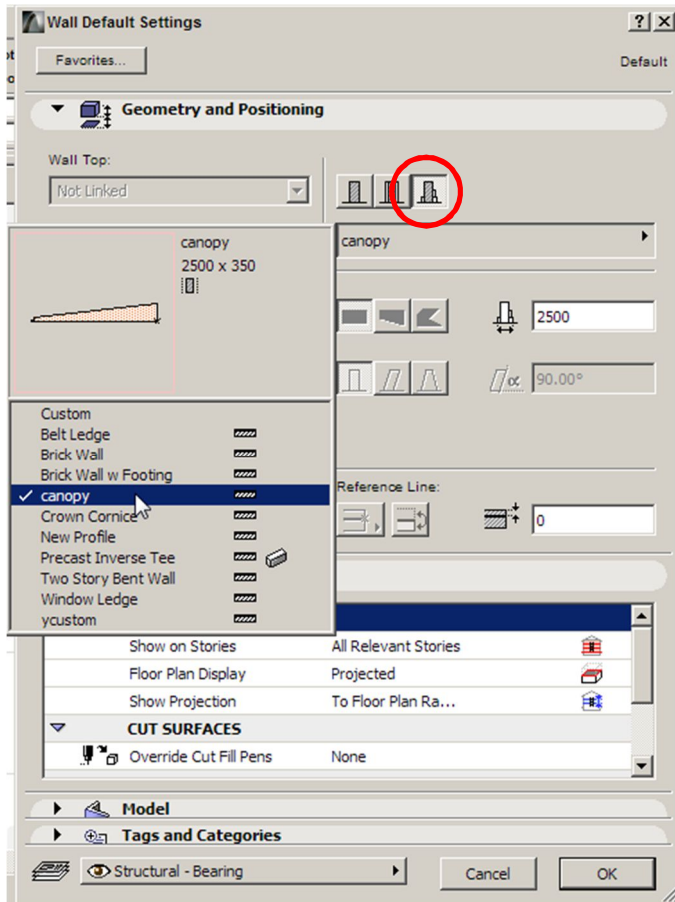




Start a new profile and name it **canopy**. Paste (CTRL+V) the profile and match the origin to be at the base of the profile.

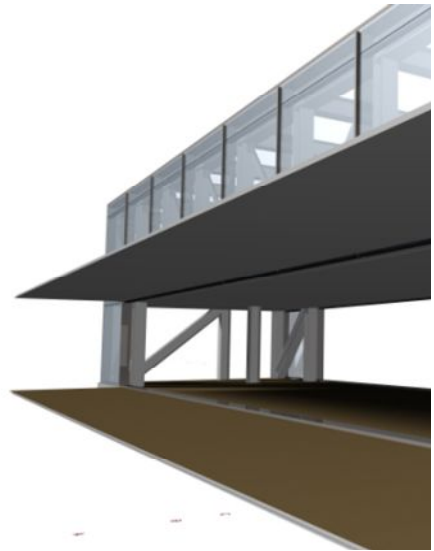
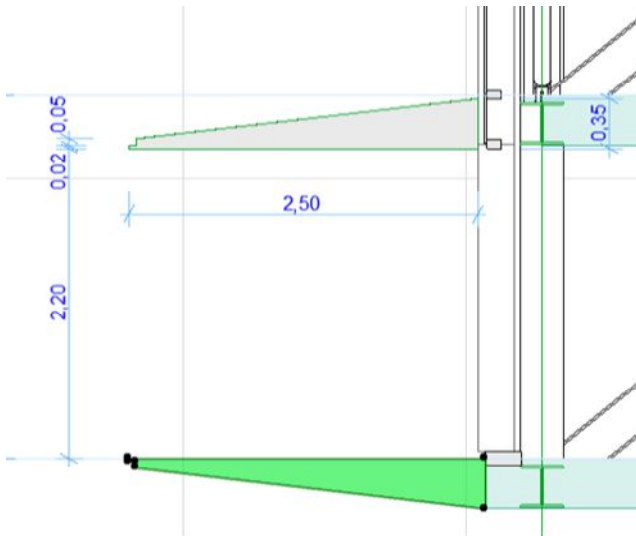
Press on the **STORE PROFILE** button. The profile will show in the preview window. At the base of the window click on **OVERRIDE** button and check the **OVERRIDE SURFACES** box in order to be able to change the Surface Material (Paint-Titanium White). Click apply to save the changes.

Double click on WALL in the toolbox to enter its settings.



Select the complex profile type for the wall and choose the **canopy** profile stored previously. Set the elevation from project 0 to 2200mm. Draw the canopy between axes 2-10.

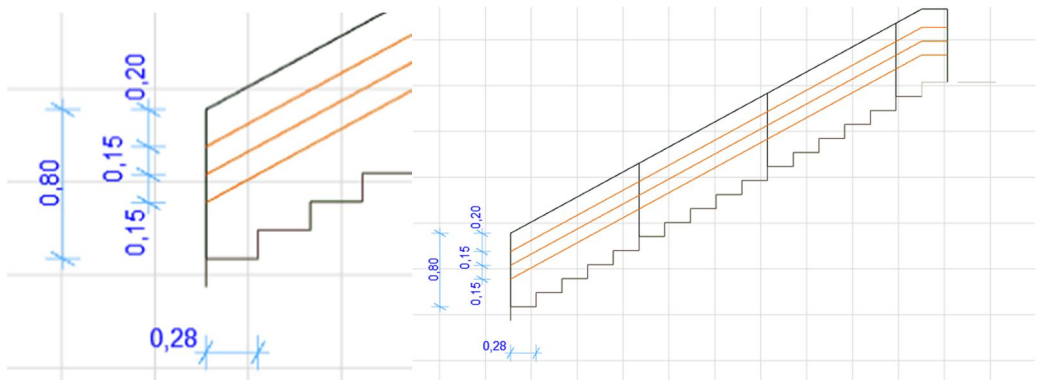
To create the terrace, select the fill of the profile in the section window and mirror it as shown in the image. After storing the new profile which will be named **terrace**, repeat the steps above to define it in the plan as well between axes 2-10, and the elevation project 0 set to 0.



SLABS

Place on the ground story a slab 360mm thick using the polyline drawn in the beginning of the exercise. Draw slabs of the same type and dimensions on the first level and for the roof both between the axes of the structure.

STAIR AND HAND RAIL



You will draw the stair structure and the handrail using TrussMaker as well.

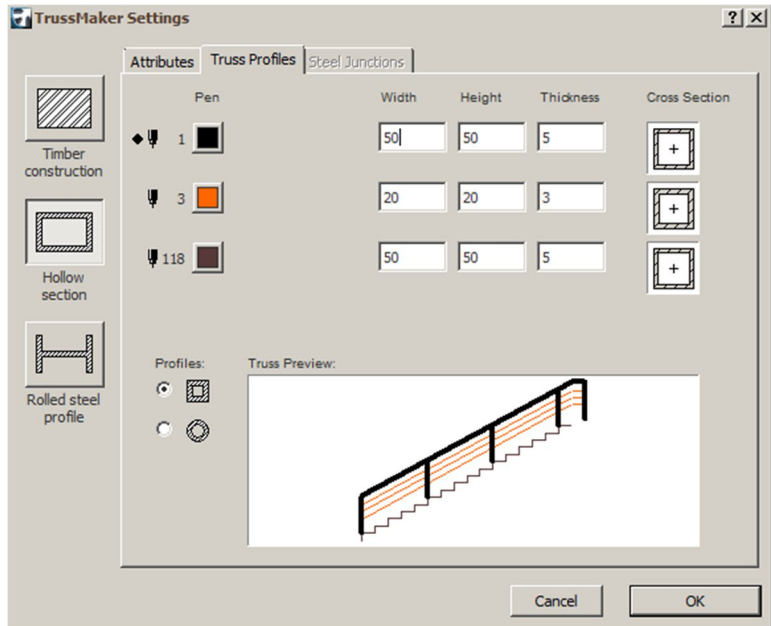
Draw the scheme of the handrail and the stairs having 280mm wide treads and 153mm high risers. The handrail will be coplanar with the stair string, 800mm high. Delete the last tread-riser pair, as it will be defined by the upper slab. Use 3 colors for the scheme, in order to define 3 different types of profiles as in the image below:

In TrussMaker use the Hollow Section profiles and set the dimensions as follows:

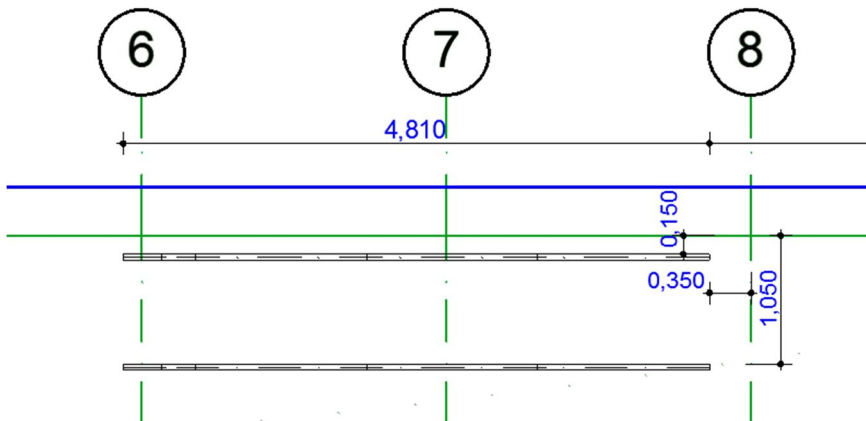
Stairs: 50x50x5

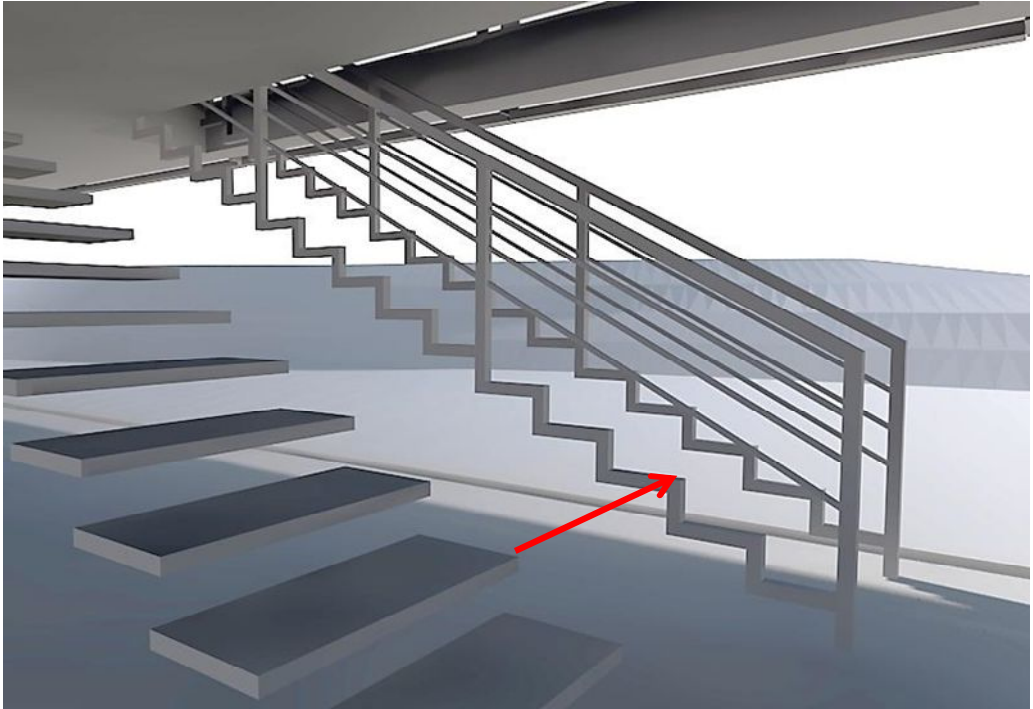
Secondary profiles of the hand rail: 20x20x3

Main profiles of the hand rail: 50x50x3.



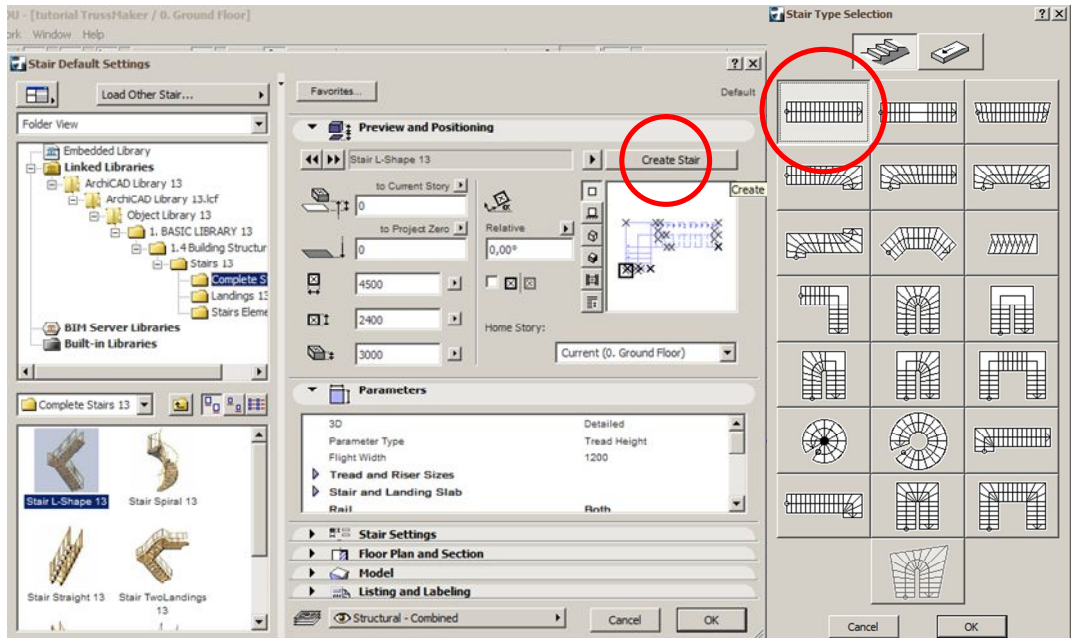
After saving the truss, drag a copy 900 mm from the original object and post them as shown in the drawing below:





Generate the stair with StairMaker.

! Before generating or editing a stair it is highly recommended to save your project.



Launch StairMaker and choose the STRAIGHT RUN Stair.

Input the following dimensions:

Tread Settings:

$$2 * \text{Riser} + \text{Run} > 580^3$$

$$2 * \text{Riser} + \text{Run} < 650$$

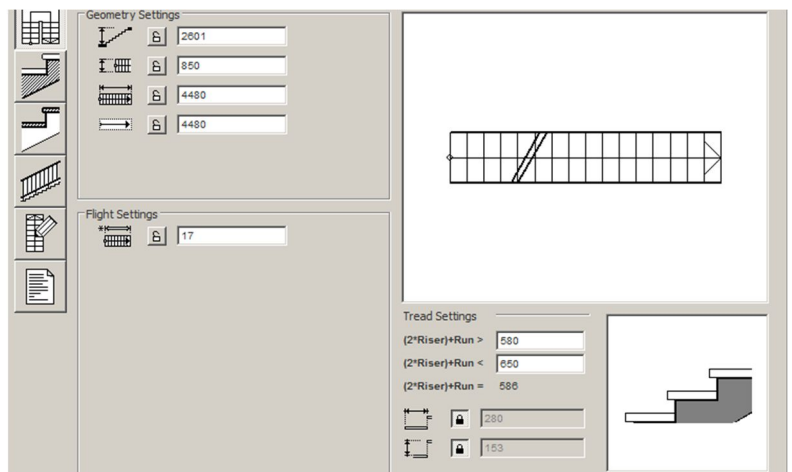
Tread width : 320 mm

Riser: 153 mm

Lock the values for both.

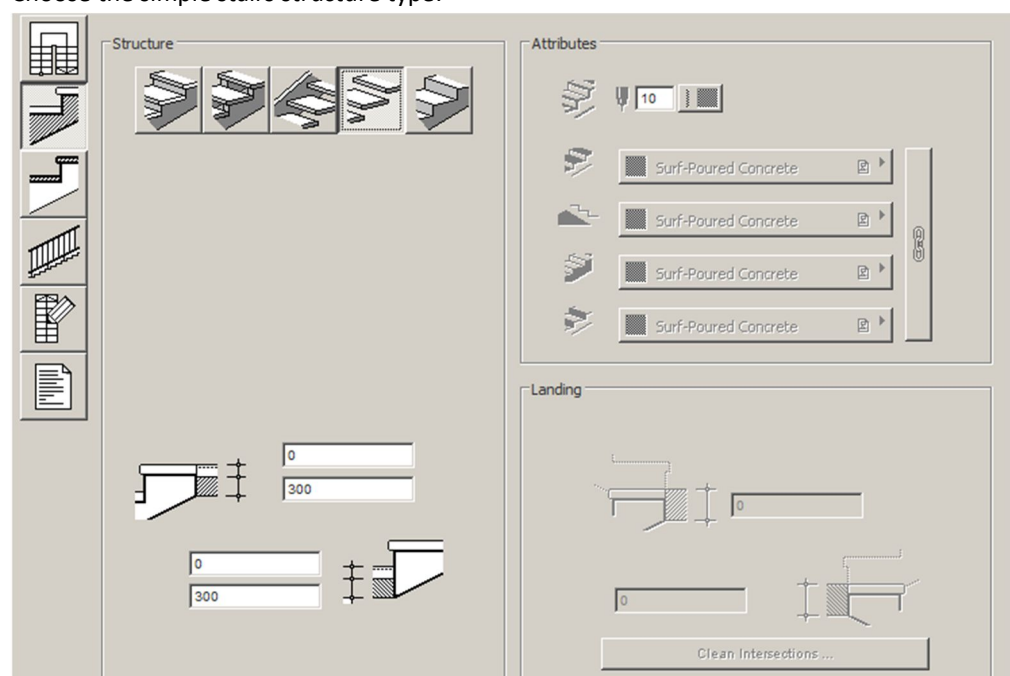
Number of risers: 17

Stair width: 850 mm

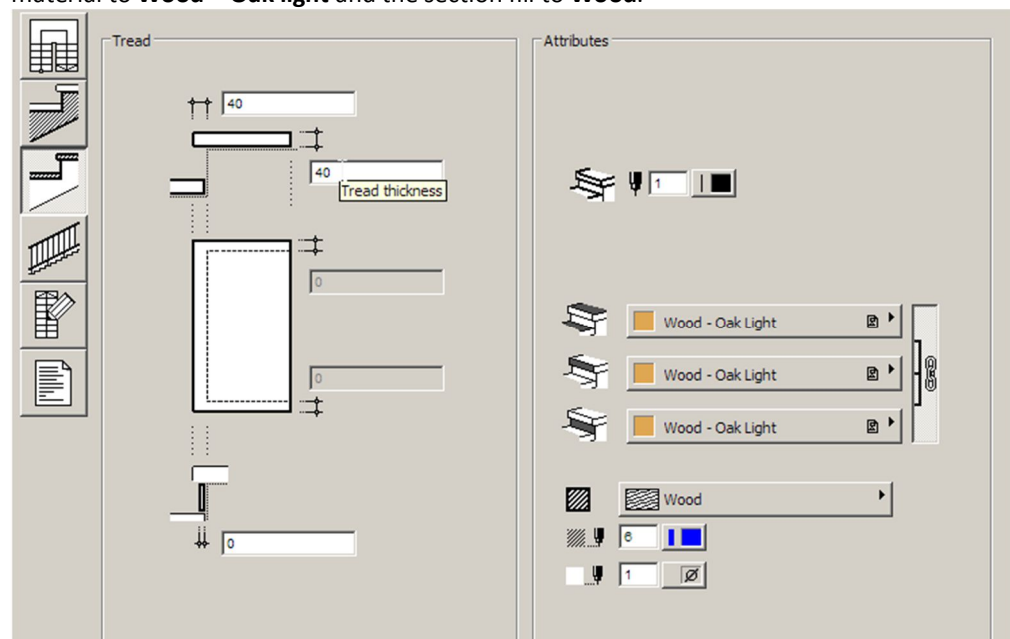


³ The original stair in this project does not follow the usual rule ($2h+L=62\div 64$)

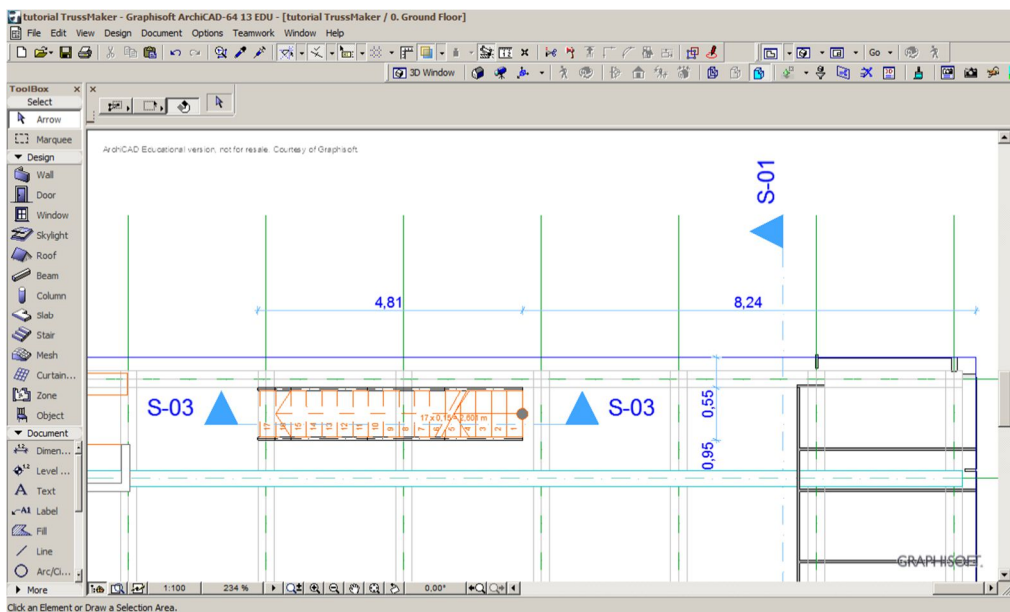
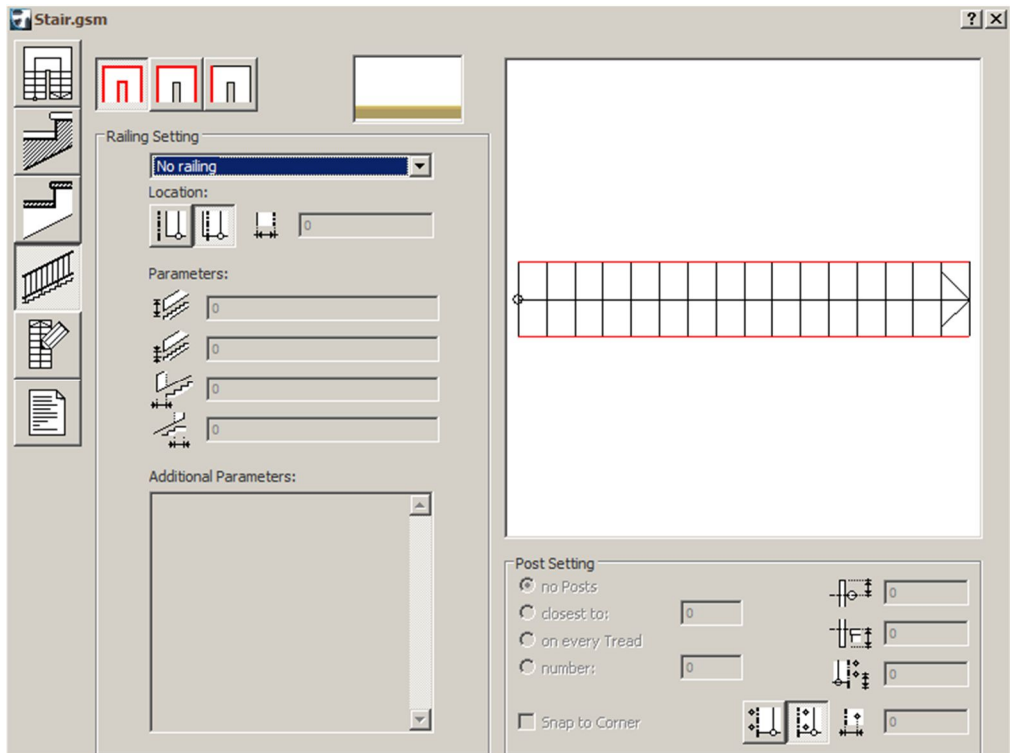
Choose the simple stairs structure type:



In the **Tread Settings** set the **nosing** as well as the **Tread thickness** to 40mm. Set the Surface material to **Wood – Oak light** and the section fill to **Wood**.



Choose **NO RAILING** in the Railing settings section.



Check in a section the position of the stairs relative to the rails previously generated with TrussMaker. The treads should be centered inside the metal profiles (there should be a 5mm offset around the tread – representing the material thickness of the metal profiles).

