TRUSS4

Engineering Manual No. 3

Update 01/2023

Supermarket

Project description

Program: Truss3D

File(s): FineTrial.tr3
available here: https://data.fine.cz/manuals/FineTrial.zip

The target of this manual is a step-by-step input guide for a supermarket as they have been built many times all over Europe. We also focus on the bracing truss group.

It is recommended that you already have worked the examples given in our Engineering Manuals 01 and 04 (a simple hip roof and a formwork truss), which acquaint you with basic functionality in Truss3D and Truss2D.

Theoretical background

Groups of bracing trusses are designed to ensure the spatial rigidity of the roof structure as a whole. It is mainly about ensuring the members of the trusses against deflection out of plane caused by horizontal forces (wind, earthquake, imperfections, etc.) and against the buckling of members in compression. It is generally considered that one bracing field is able to stabilize approx. 8-12 main trusses, depending on the size of the compressive force (span, load) and the layout of the longitudinal reinforcements (purlins, sheathing, etc.).

The design of bracing is performed in a different way compared to ordinary trusses. The procedure used in the program is based on EN 1995-1-1 and procedures recommended for DIN1052:2008.

The load on the bracing trusses is determined according to formula 9.37 of the EN 1995-1-1 standard. The inputs to this formula are mainly the span of the bracing truss (as the total span of the bracing system), the average design compressive force in the braced part and the number of braced trusses. The coefficient kf,3 has a value of 30 with regard to the recommendations of the standard. Design values of the load are always determined with regard to theload duration. The load is applied on the trusses in both possible directions.

The vertical bracing trusses / elements above the supports are loaded by the horizontal reaction from the bracing trusses, which is transmitted by these trusses to the substructure.

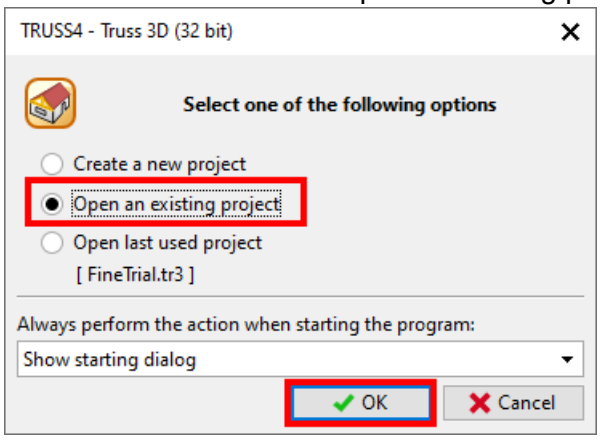
In the calculation the program only considers the forces from the stiffening of the main trusses, the external load (mainly wind load on the shield or friction load) must be added manually in the 2D program to the relevant load case.

This method of calculation assumes a fixed ridge, which can be ensured, e.g. by bracing or steel stripes. To use a different static scheme, it is necessary to change the support method in the Truss 2D program. A different total span can be taken into account by changing the loading width.

Creating a new project

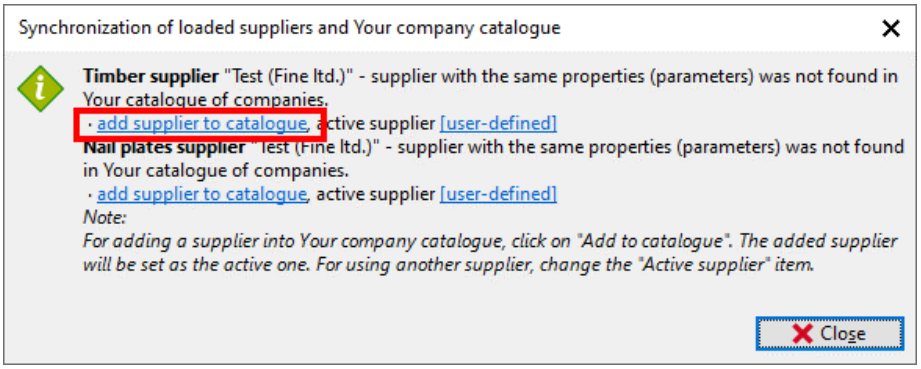
Initially we open an existing project to obtain timber and plates from pre-defined catalogues, then we create the real new project and adjust some more settings.

Run Truss3D and select “Open an existing project” from the wizard.

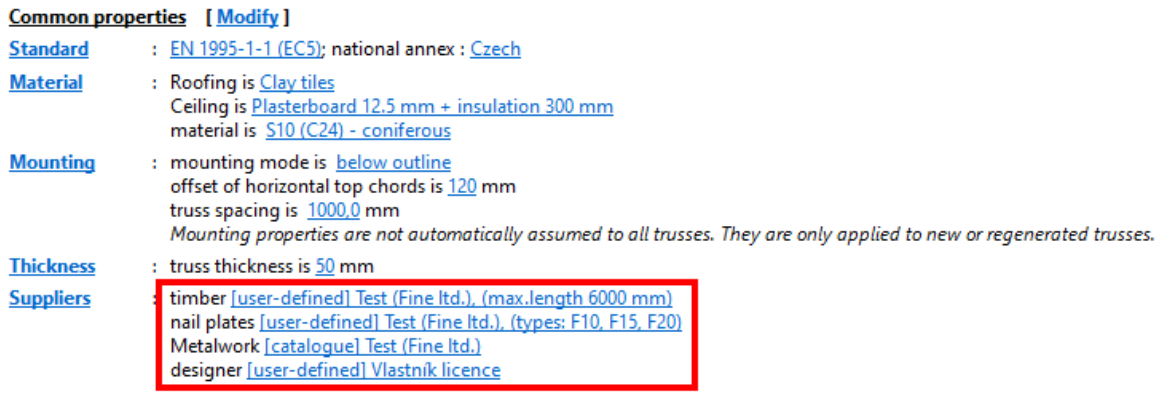


Navigate yourself to the path where you have saved the file “FineTrial.tr3”, select the file and click on “Open”.

Add FineSupplierTrial catalogue to your catalogues and confirm by clicking “OK”

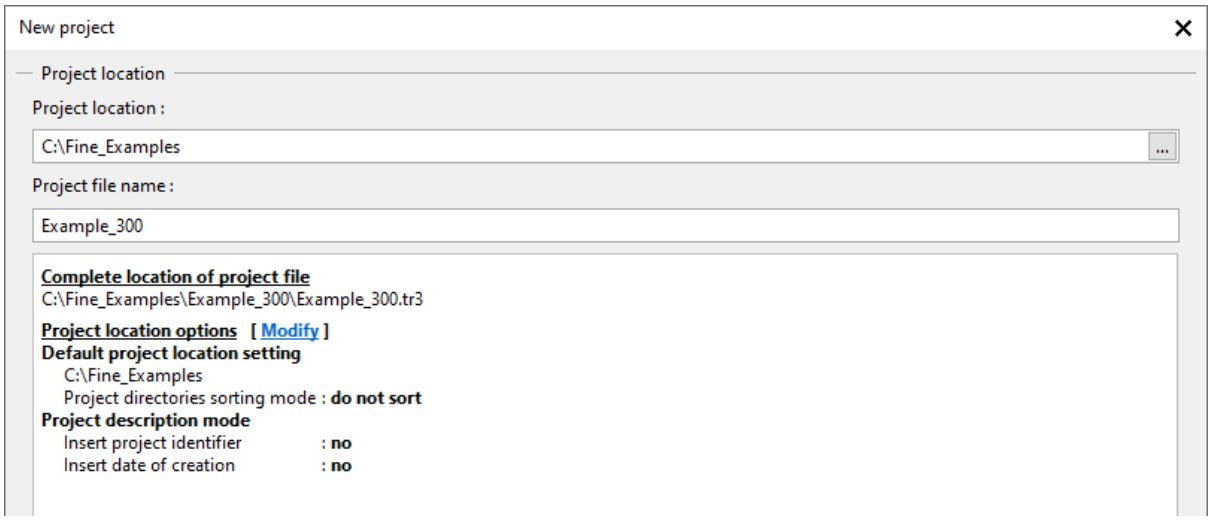


If the window does not appear, it means the catalogue was found, then just check if the timber and nail plates supplier is chosen correctly in “Common properties”. If not click on the appropriate supplier and change it.

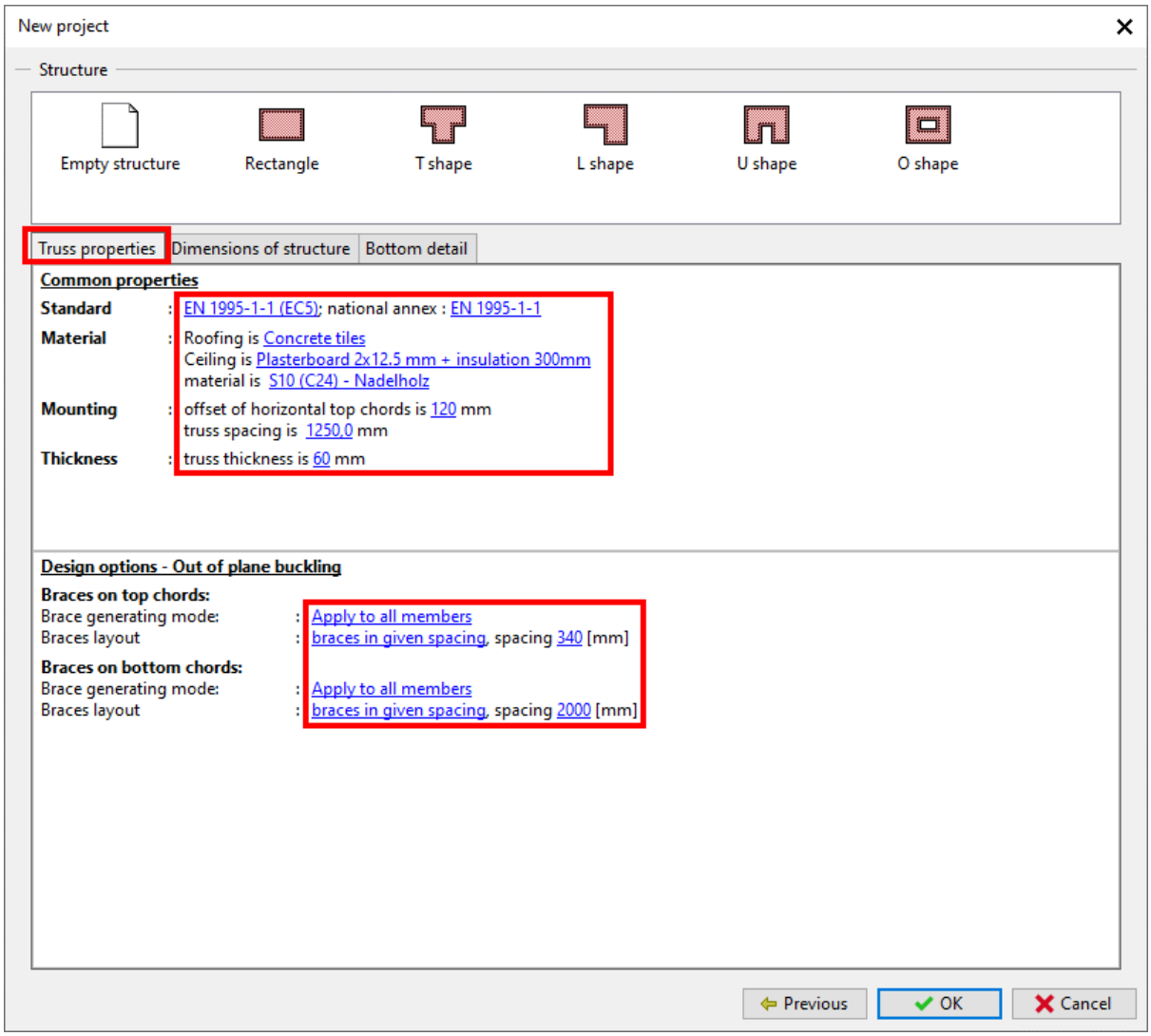


Now create a new project by clicking on  from the ribbon bar, select >File >New… from the menu or <Ctrl+N> on the keyboard. The project wizard will be launched.

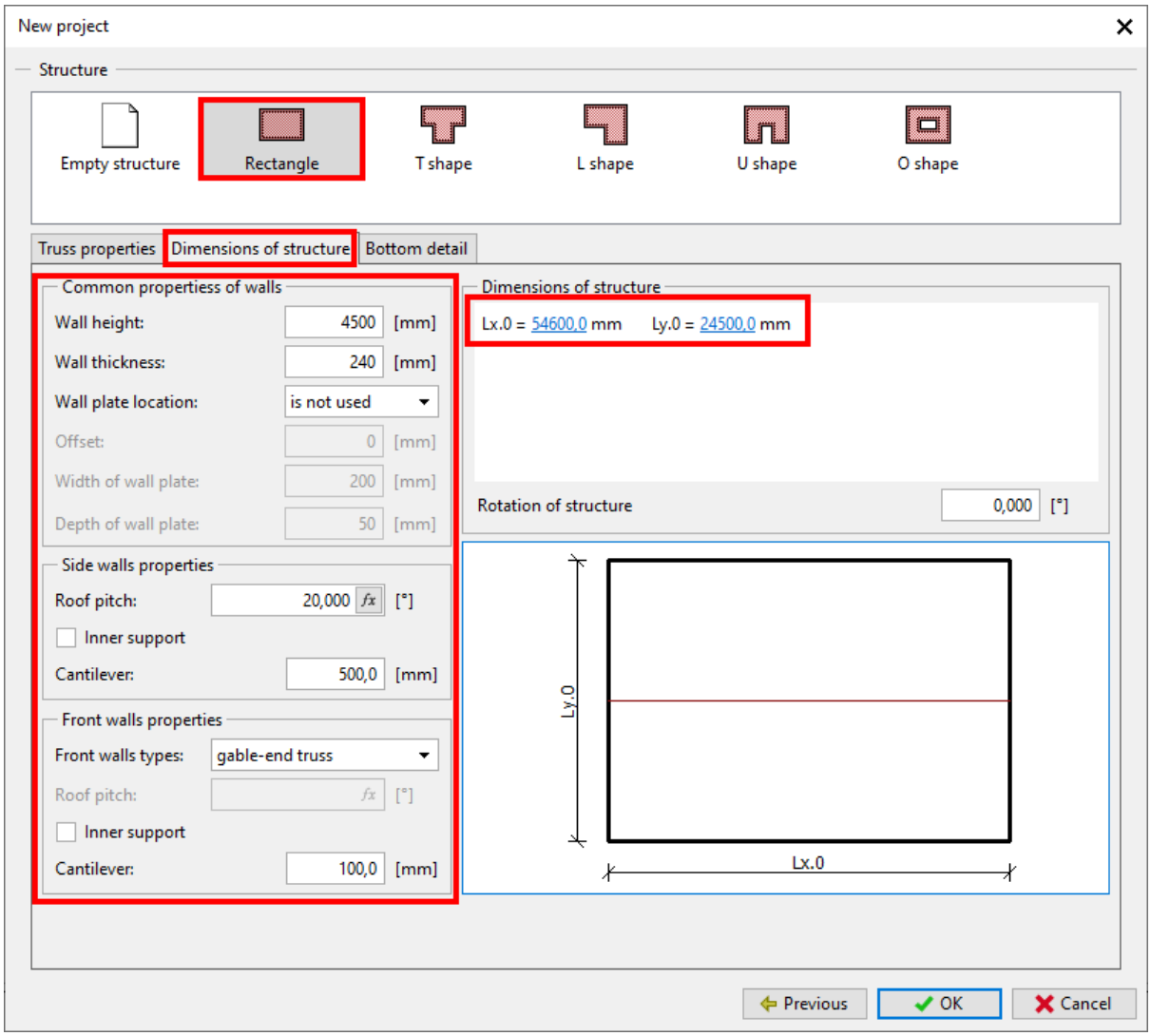
Name the project, e.g. “Example_300”, specify and accept the location where the file should be stored by clicking on “➔ Next”.



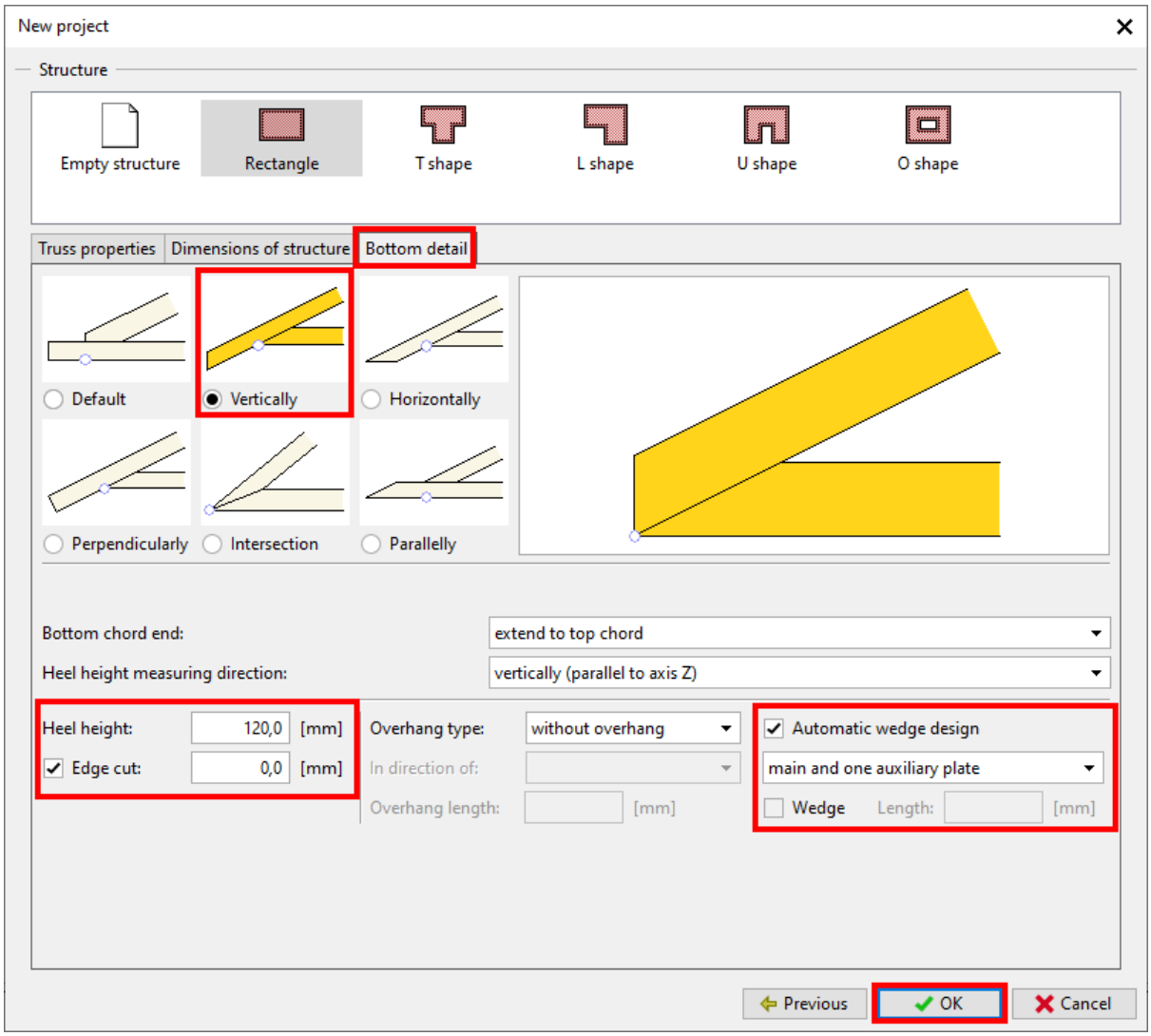
On the tab “Truss properties” set the following values and entries.


New project
Structure
Empty structure
Rectangle
T shape
L shape
U shape
O shape
Truss properties
Dimensions of structure
Bottom detail
Common properties
Standard : EN 1995-1-1 (EC5); national annex : EN 1995-1-1
Material : Roofing is Concrete tiles
Ceiling is Plasterboard 2x12.5 mm + insulation 300mm
material is S10 (C24) - Nadelholz
Mounting : offset of horizontal top chords is 120 mm
truss spacing is 1250,0 mm
Thickness : truss thickness is 60 mm
Design options - Out of plane buckling
Braces on top chords:
Brace generating mode: : Apply to all members
Braces layout : braces in given spacing, spacing 340 [mm]
Braces on bottom chords:
Brace generating mode: : Apply to all members
Braces layout : braces in given spacing, spacing 2000 [mm]
Previous
OK
Cancel

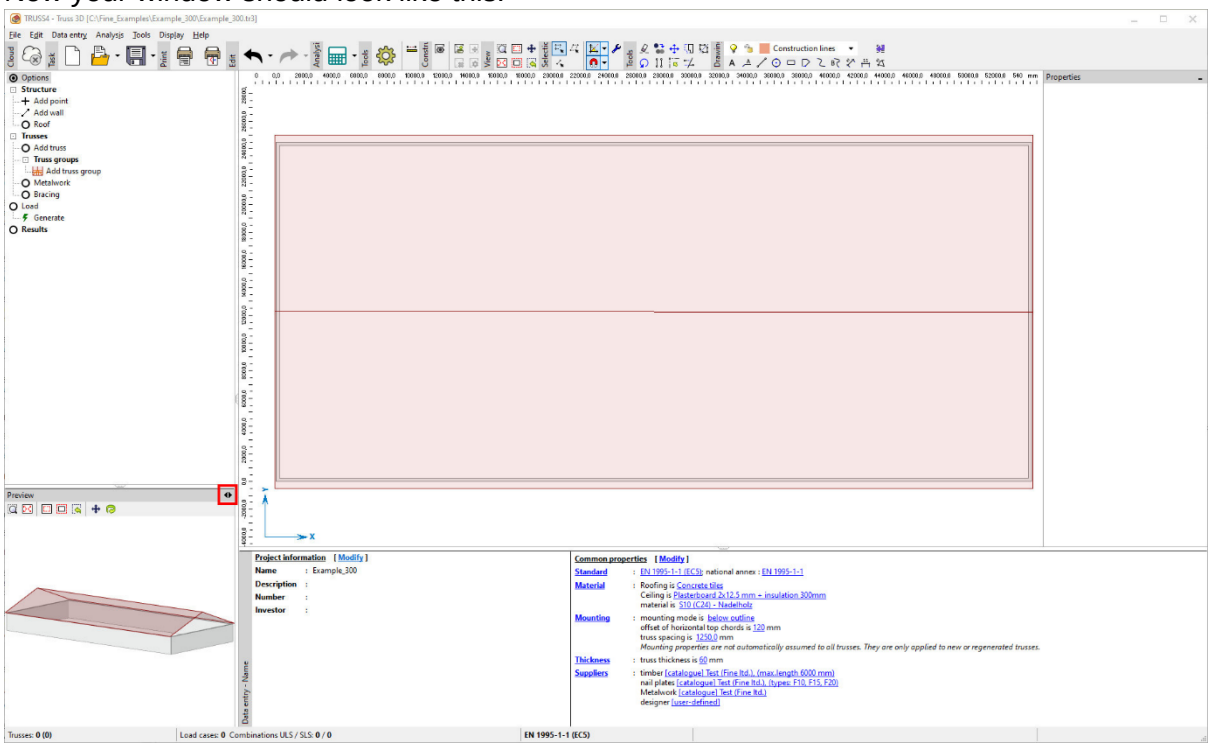
“Dimension of structure”



“Bottom details”



Now your window should look like this:

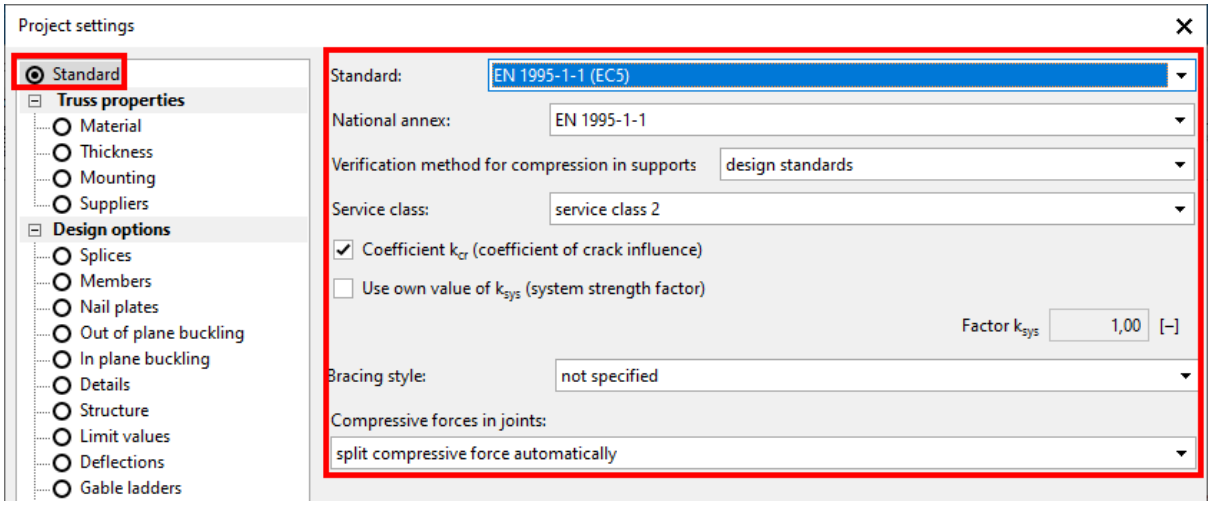


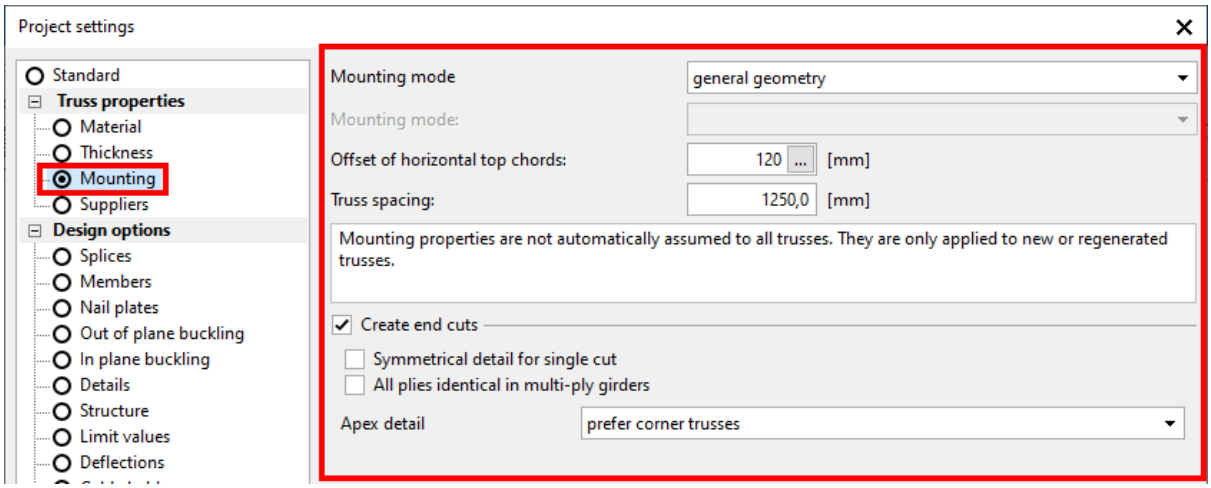
Eventually swap the content of the main workspace window and the auxiliary view window by entering <Ctrl+Tab> or clicking on the <>-arrow in the upper right corner of the auxiliary window.

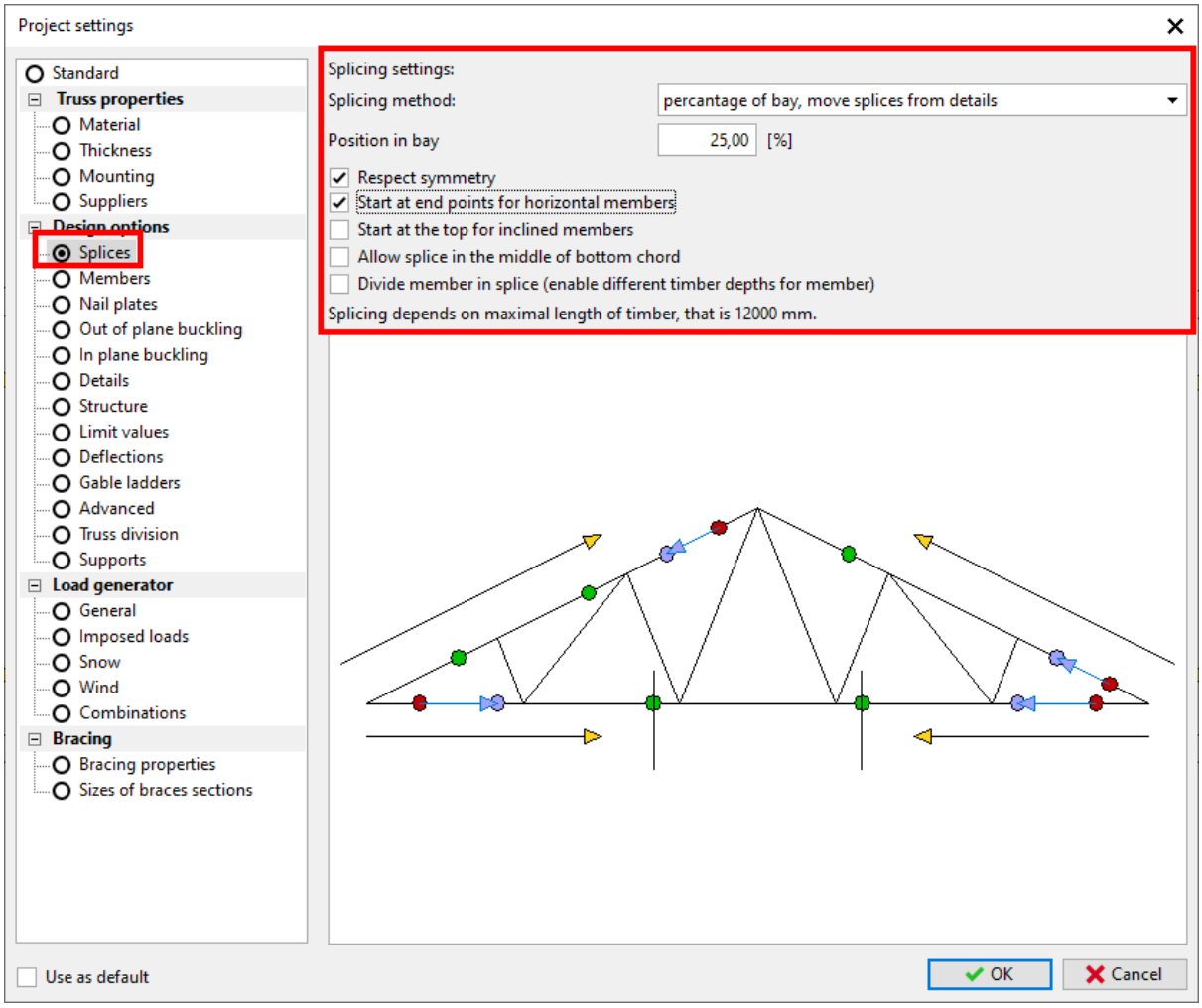
Project settings - prerequisites

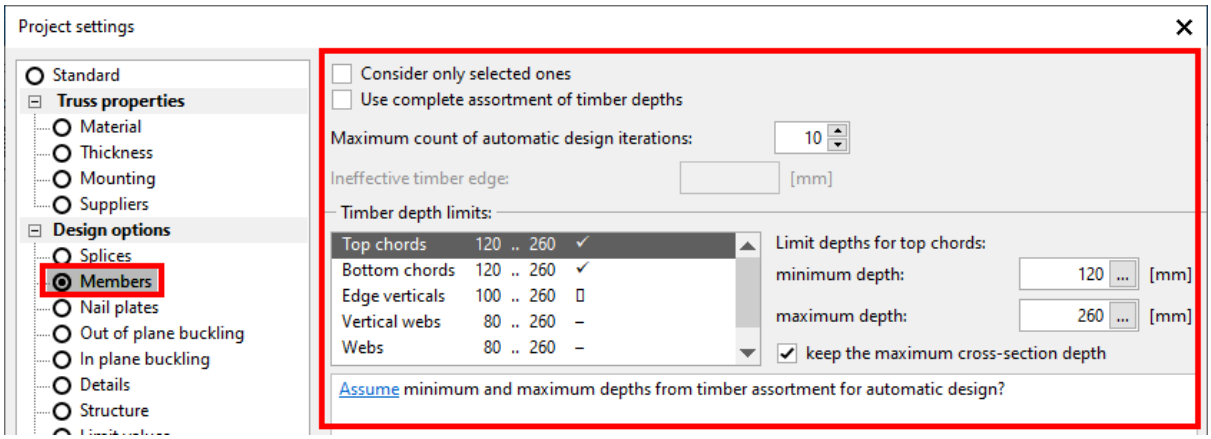
The following steps should ensure that we work with the same settings.

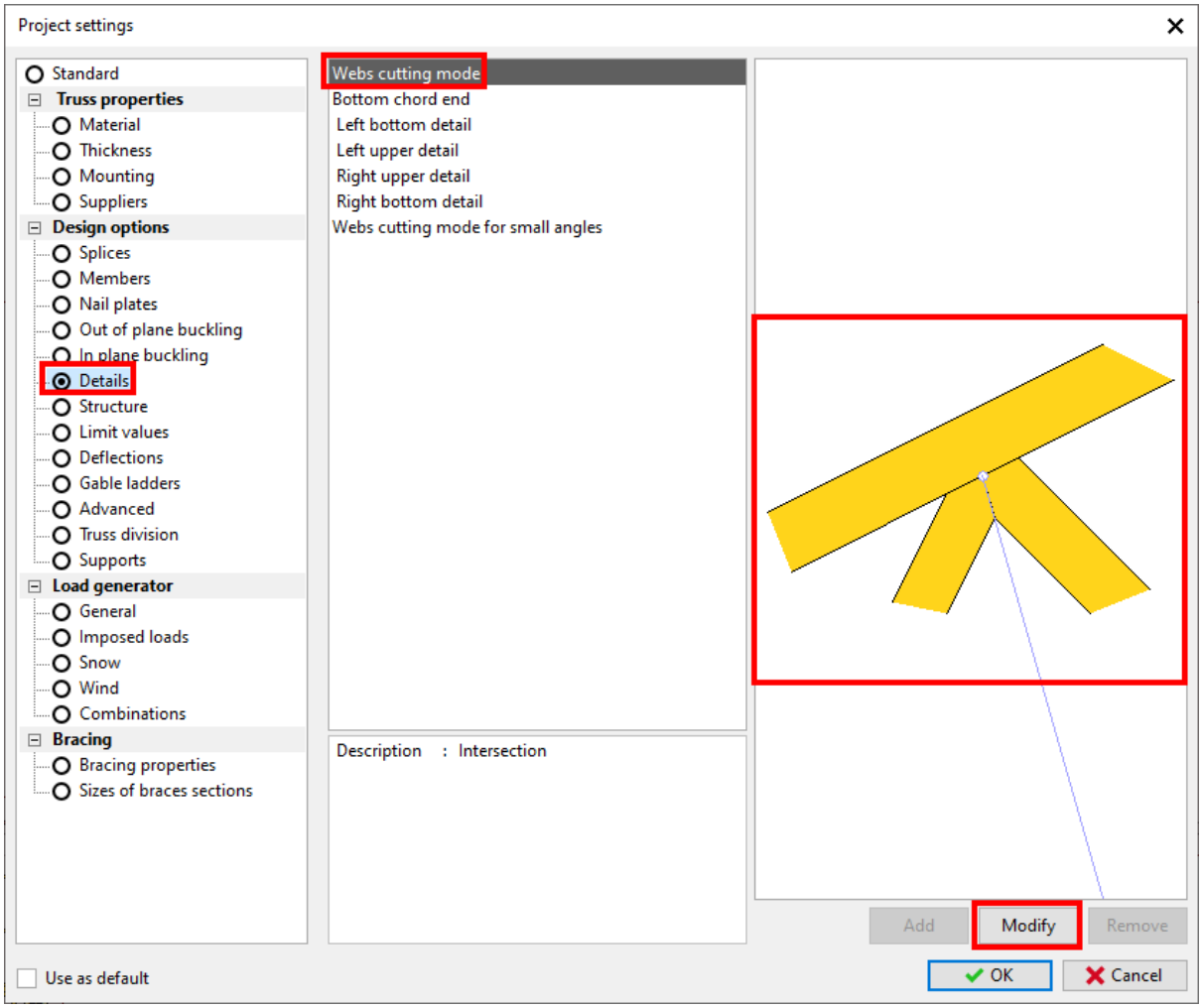
Open Project settings 

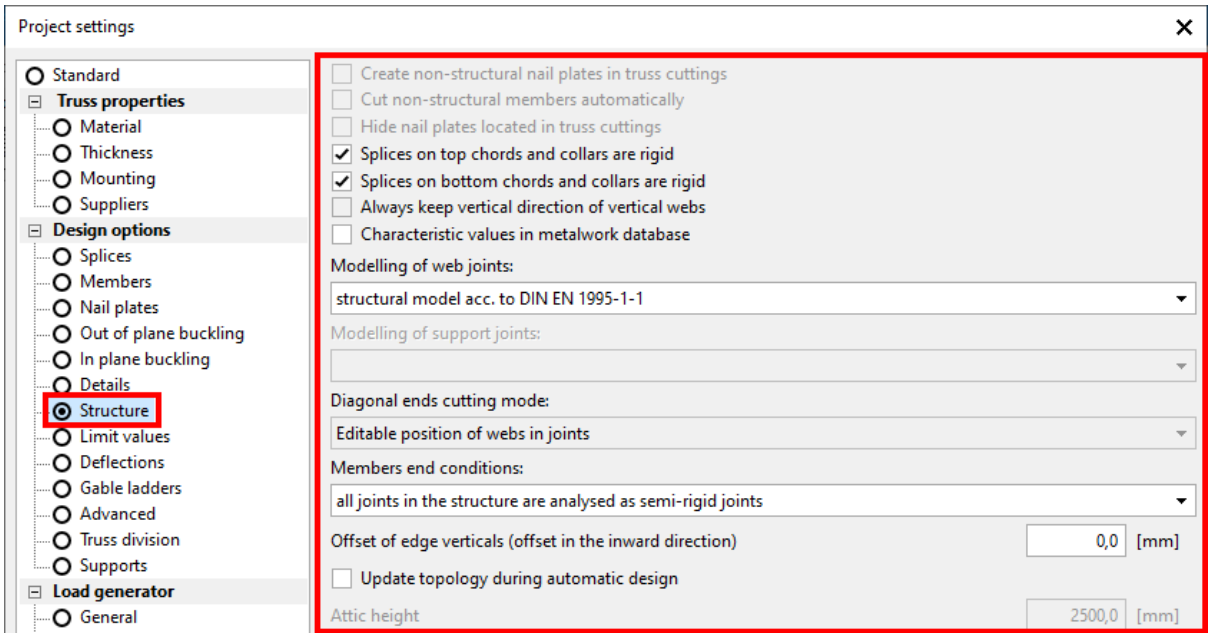


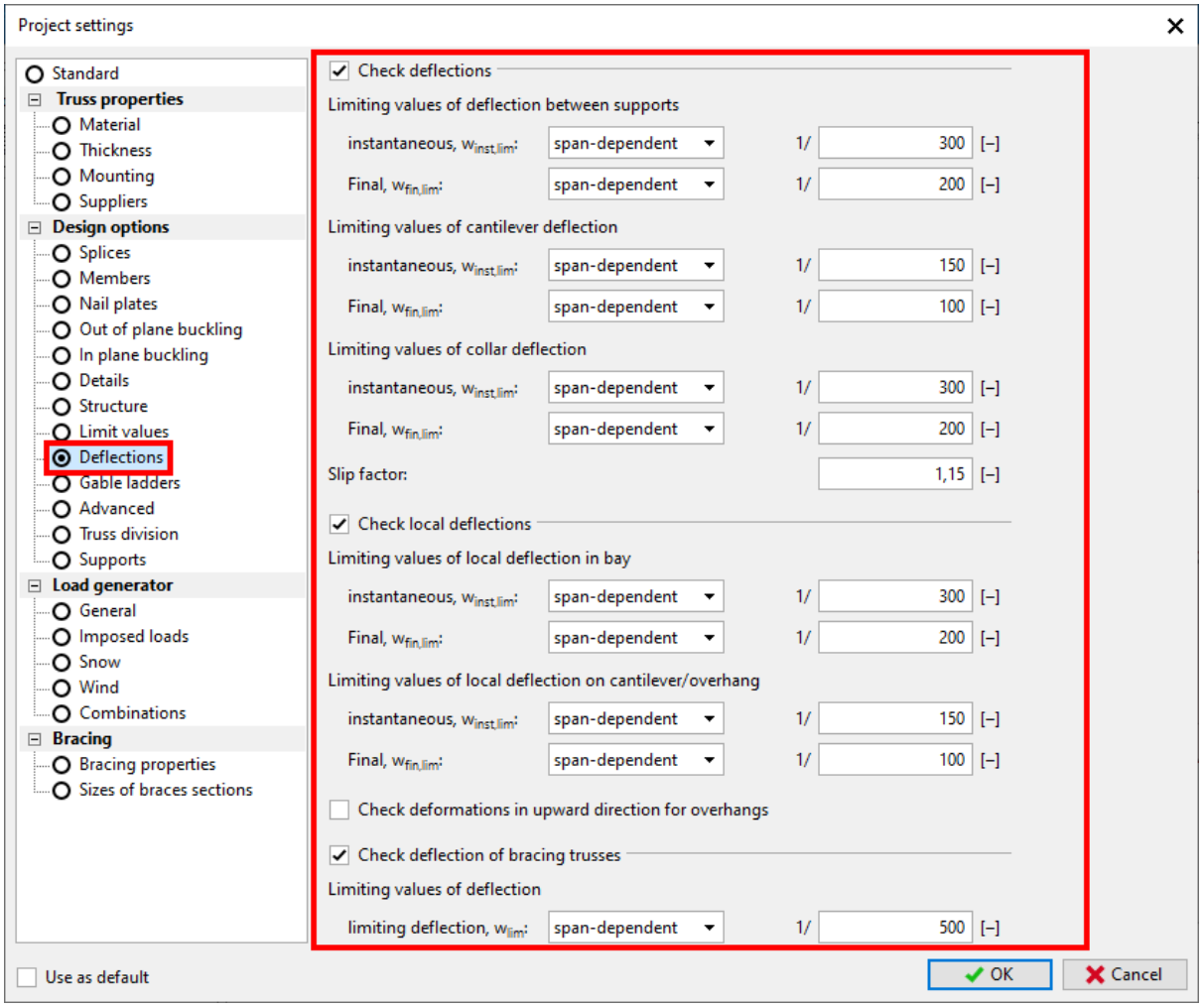

Project settings
Standard
Truss properties
Material
Thickness
Mounting
Suppliers
Design options
Splices
Members
Nail plates
Out of plane buckling
In plane buckling
Details
Structure
Limit values
Deflections
Mounting mode
general geometry
Mounting mode:
Offset of horizontal top chords:
120
[mm]
Truss spacing:
1250,0
[mm]
Mounting properties are not automatically assumed to all trusses. They are only applied to new or regenerated trusses.
Create end cuts
Symmetrical detail for single cut
All plies identical in multi-ply girders
Apex detail
prefer corner trusses

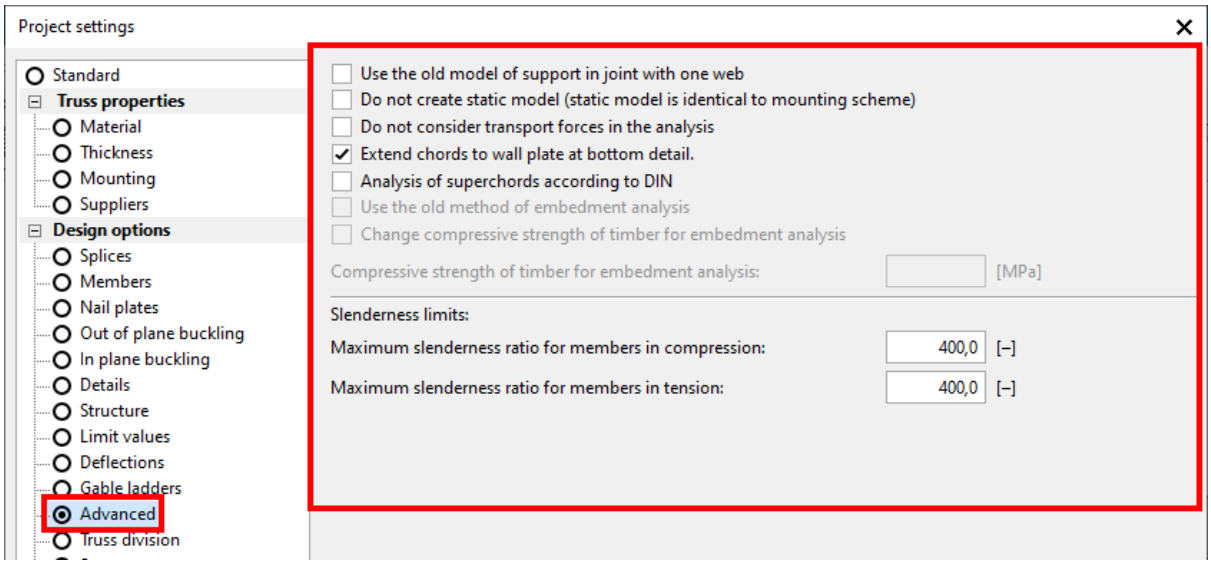

Project settings
Standard
Truss properties
Material
Thickness
Mounting
Suppliers
Design options
Splices
Members
Nail plates
Out of plane buckling
In plane buckling
Details
Structure
Limit values
Deflections
Gable ladders
Advanced
Truss division
Supports
Load generator
General
Imposed loads
Snow
Wind
Combinations
Bracing
Bracing properties
Sizes of braces sections
Splicing settings:
Splicing method:
percantage of bay, move splices from details
Position in bay
25,00
[%]
Respect symmetry
Start at end points for horizontal members
Start at the top for inclined members
Allow splice in the middle of bottom chord
Divide member in splice (enable different timber depths for member)
Splicing depends on maximal length of timber, that is 12000 mm.
Use as default
OK
Cancel


Project settings
Standard
Truss properties
Material
Thickness
Mounting
Suppliers
Design options
Splices
Members
Nail plates
Out of plane buckling
In plane buckling
Details
Structure
Consider only selected ones
Use complete assortment of timber depths
Maximum count of automatic design iterations: 10
Ineffective timber edge: [mm]
Timber depth limits:
Top chords 120 .. 260
Bottom chords 120 .. 260
Edge verticals 100 .. 260
Vertical webs 80 .. 260
Webs 80 .. 260
Limit depths for top chords:
minimum depth: 120 [mm]
maximum depth: 260 [mm]
keep the maximum cross-section depth
Assume minimum and maximum depths from timber assortment for automatic design?


Project settings
Standard
Truss properties
Material
Thickness
Mounting
Suppliers
Design options
Splices
Members
Nail plates
Out of plane buckling
In plane buckling
Details
Structure
Limit values
Deflections
Gable ladders
Advanced
Truss division
Supports
Load generator
General
Imposed loads
Snow
Wind
Combinations
Bracing
Bracing properties
Sizes of braces sections
Webs cutting mode
Bottom chord end
Left bottom detail
Left upper detail
Right upper detail
Right bottom detail
Webs cutting mode for small angles
Description : Intersection
Add
Modify
Remove
Use as default
OK
Cancel


Project settings
Standard
Truss properties
Material
Thickness
Mounting
Suppliers
Design options
Splices
Members
Nail plates
Out of plane buckling
In plane buckling
Details
Structure
Limit values
Deflections
Gable ladders
Advanced
Truss division
Supports
Load generator
General
Create non-structural nail plates in truss cuttings
Cut non-structural members automatically
Hide nail plates located in truss cuttings
Splices on top chords and collars are rigid
Splices on bottom chords and collars are rigid
Always keep vertical direction of vertical webs
Characteristic values in metalwork database
Modelling of web joints:
structural model acc. to DIN EN 1995-1-1
Modelling of support joints:
Diagonal ends cutting mode:
Editable position of webs in joints
Members end conditions:
all joints in the structure are analysed as semi-rigid joints
Offset of edge verticals (offset in the inward direction)
0,0
[mm]
Update topology during automatic design
Attic height
2500,0
[mm]


Project settings
Standard
Truss properties
Material
Thickness
Mounting
Suppliers
Design options
Splices
Members
Nail plates
Out of plane buckling
In plane buckling
Details
Structure
Limit values
Deflections
Gable ladders
Advanced
Truss division
Supports
Load generator
General
Imposed loads
Snow
Wind
Combinations
Bracing
Bracing properties
Sizes of braces sections
Check deflections
Limiting values of deflection between supports
instantaneous, $w_{inst,lim}$:
span-dependent
1/
300
[–]
Final, $w_{fin,lim}$:
span-dependent
1/
200
[–]
Limiting values of cantilever deflection
instantaneous, $w_{inst,lim}$:
span-dependent
1/
150
[–]
Final, $w_{fin,lim}$:
span-dependent
1/
100
[–]
Limiting values of collar deflection
instantaneous, $w_{inst,lim}$:
span-dependent
1/
300
[–]
Final, $w_{fin,lim}$:
span-dependent
1/
200
[–]
Slip factor:
1,15
[–]
Check local deflections
Limiting values of local deflection in bay
instantaneous, $w_{inst,lim}$:
span-dependent
1/
300
[–]
Final, $w_{fin,lim}$:
span-dependent
1/
200
[–]
Limiting values of local deflection on cantilever/overhang
instantaneous, $w_{inst,lim}$:
span-dependent
1/
150
[–]
Final, $w_{fin,lim}$:
span-dependent
1/
100
[–]
Check deformations in upward direction for overhangs
Check deflection of bracing trusses
Limiting values of deflection
limiting deflection, w_{lim}:
span-dependent
1/
500
[–]
Use as default
OK
Cancel



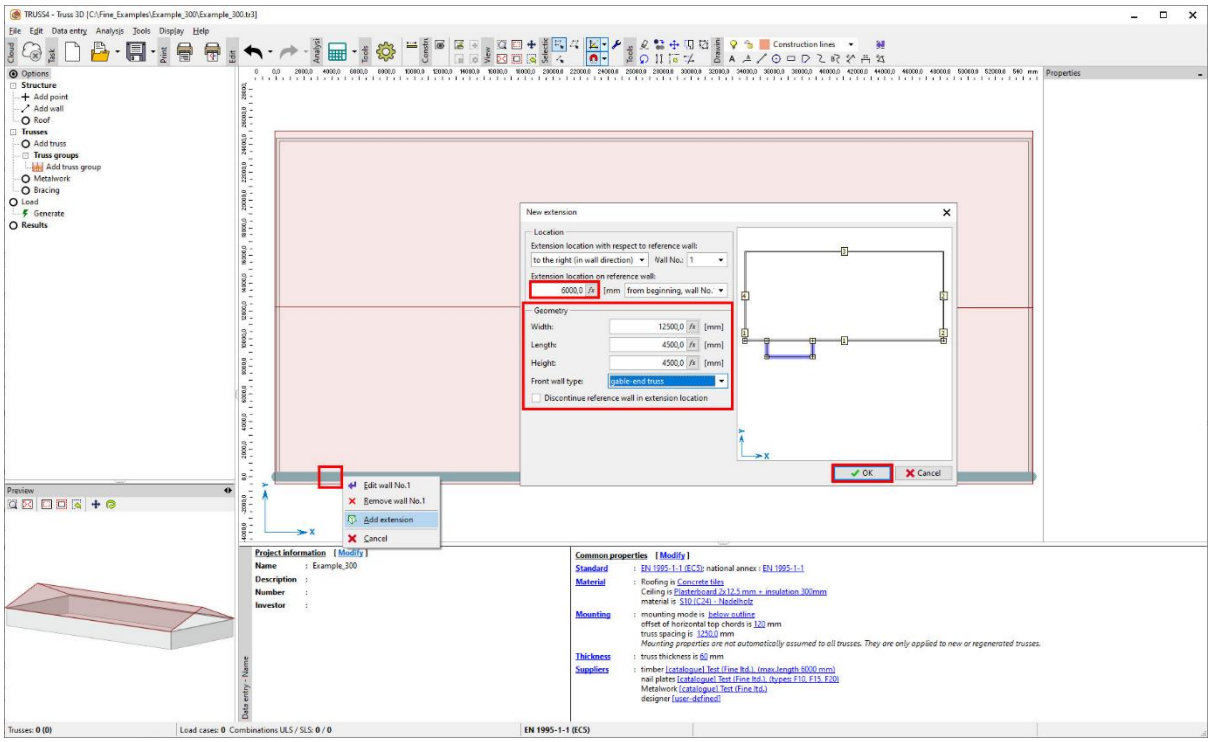
As the other settings are of minor importance or will be dealt with later, we can close the project settings dialog with “OK”.

Project input

In a first step we will add an extension to the existing building in its lower left part – that's where the bakery shop is located. Then we will place the main trusses, the trusses in the building extension and the valley and finally we will add bracing frames at the appropriate locations.

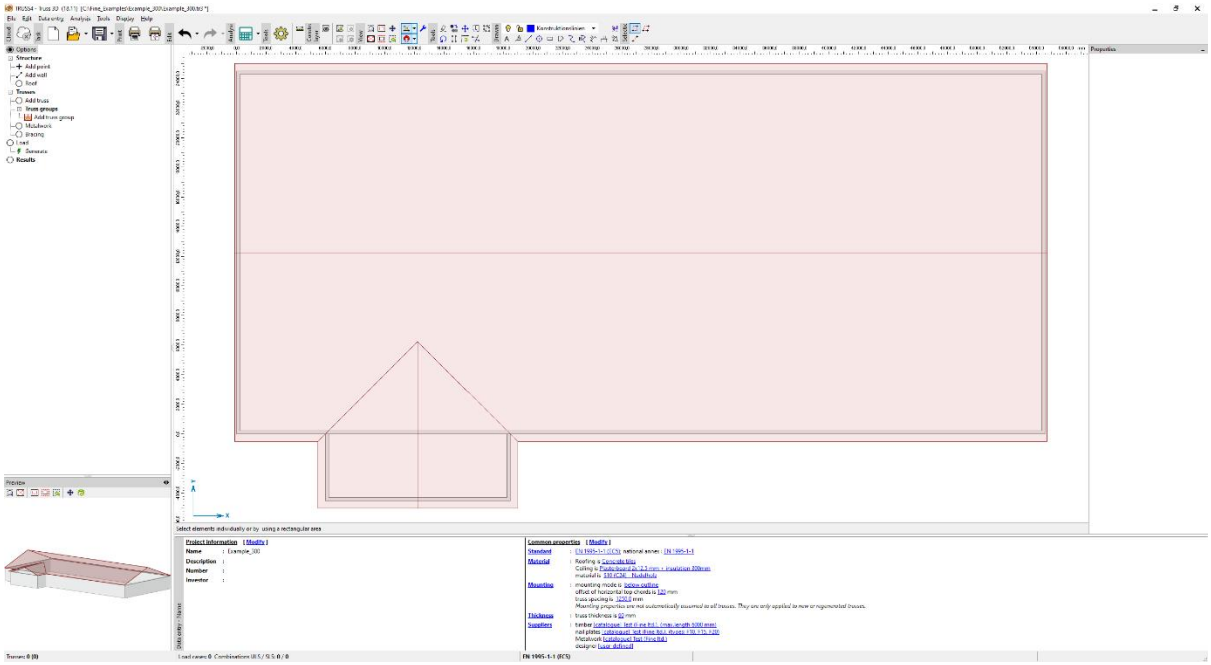
Finalizing the building model

We add an extension to the lower left part of the building.



In the main window right mouse click on the lower horizontal wall and select "Add extension" from the context menu. Fill in the shown values (Extension location: 6000mm, Width: 12500mm, 4500mm and 4500mm) and select gable-end truss as Front wall type in the dialog.

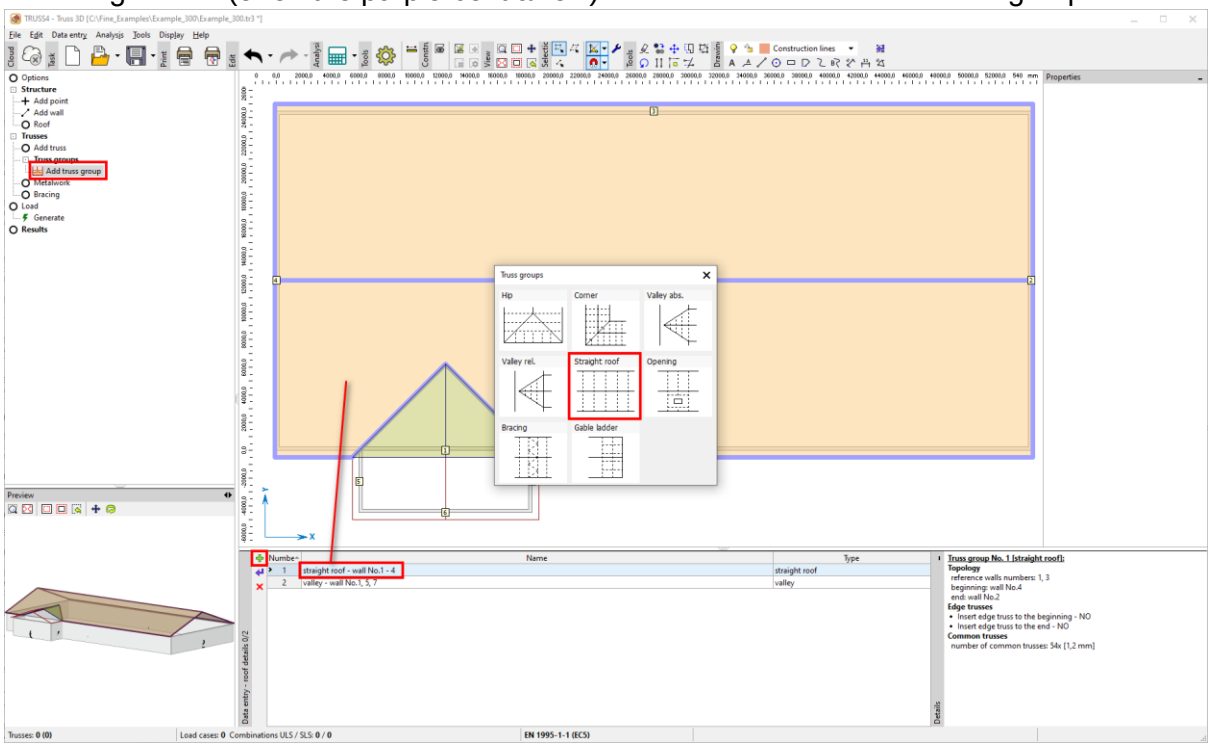
Adjust your view vie the icon  so the entire plan view of the building is well visible in the main window.



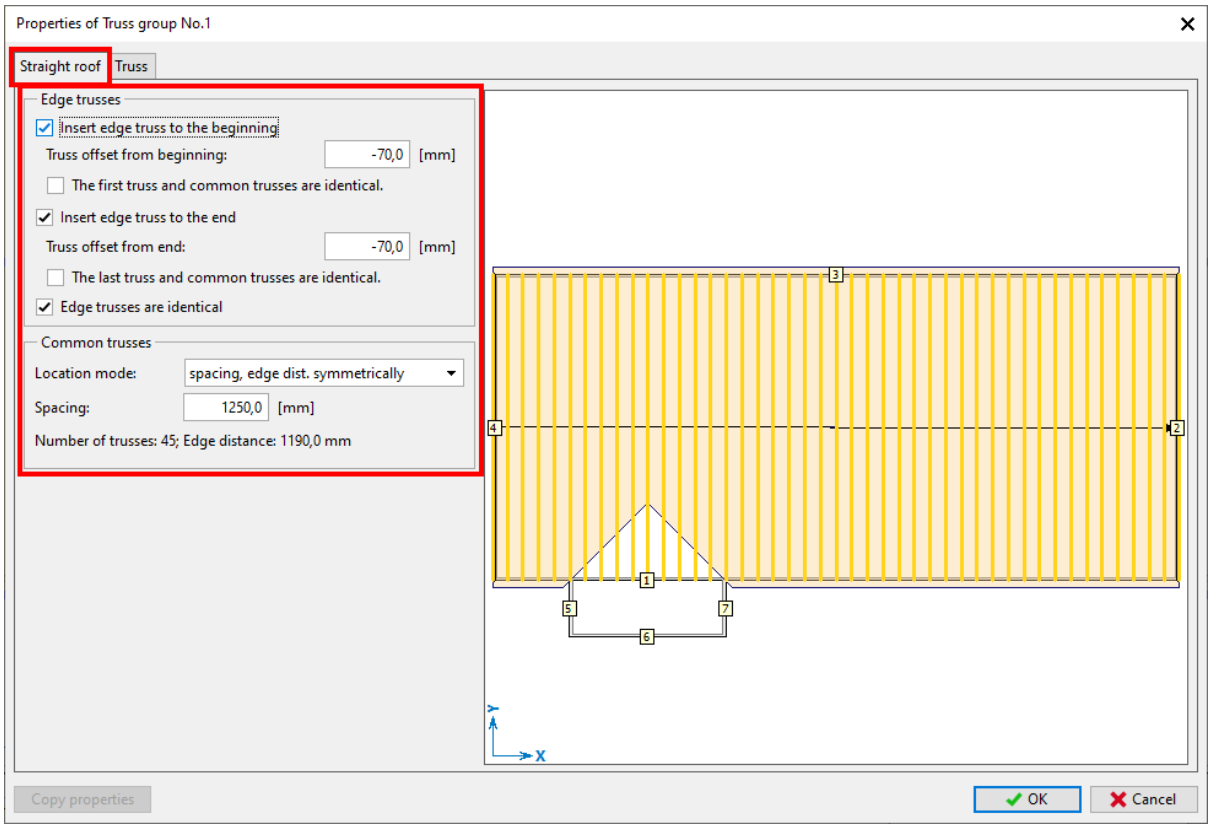
Adding the roof trusses

We will be using the truss group “straight roof” to create all trusses.

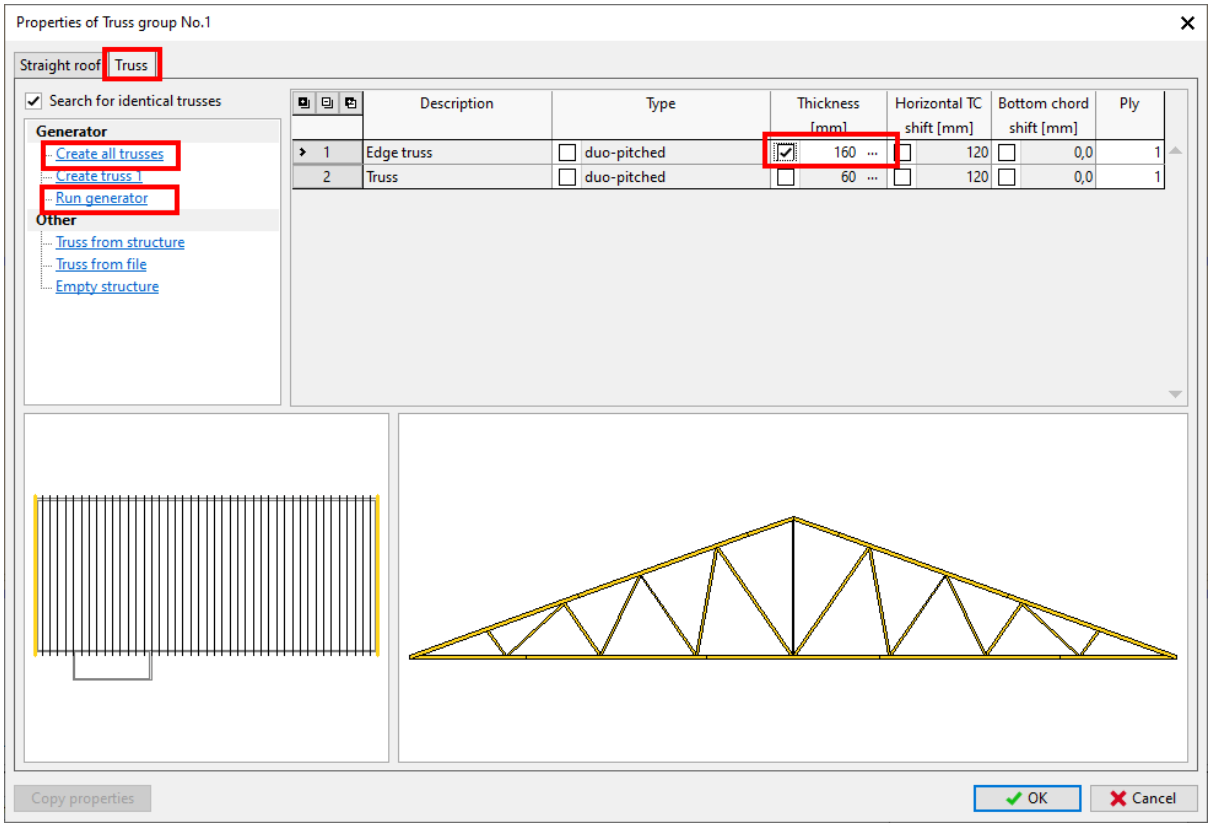
Click on “Add truss group” in the section “Trusses” of the options windows, then double click on “straight roof” (or on the purple bent arrow) in the selection window “Truss groups”.



On the tab “Straight roof” of the appearing dialog make the shown selections and enter the shown values. Insert the edge trusses with a value of -70mm, which will place them with their edges aligned with the roof edges of the gable walls.

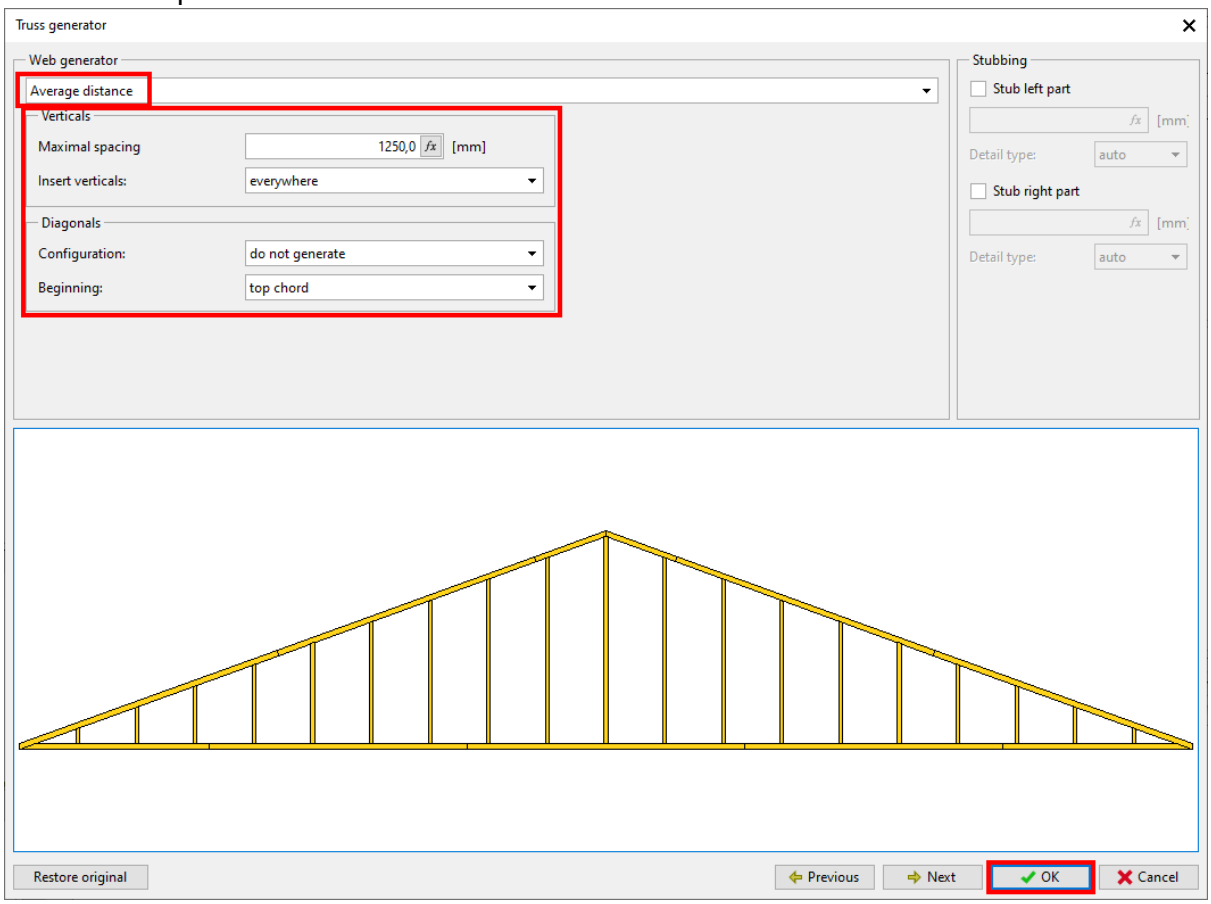


Switch to the tab “Truss” and create the trusses as shown and described.

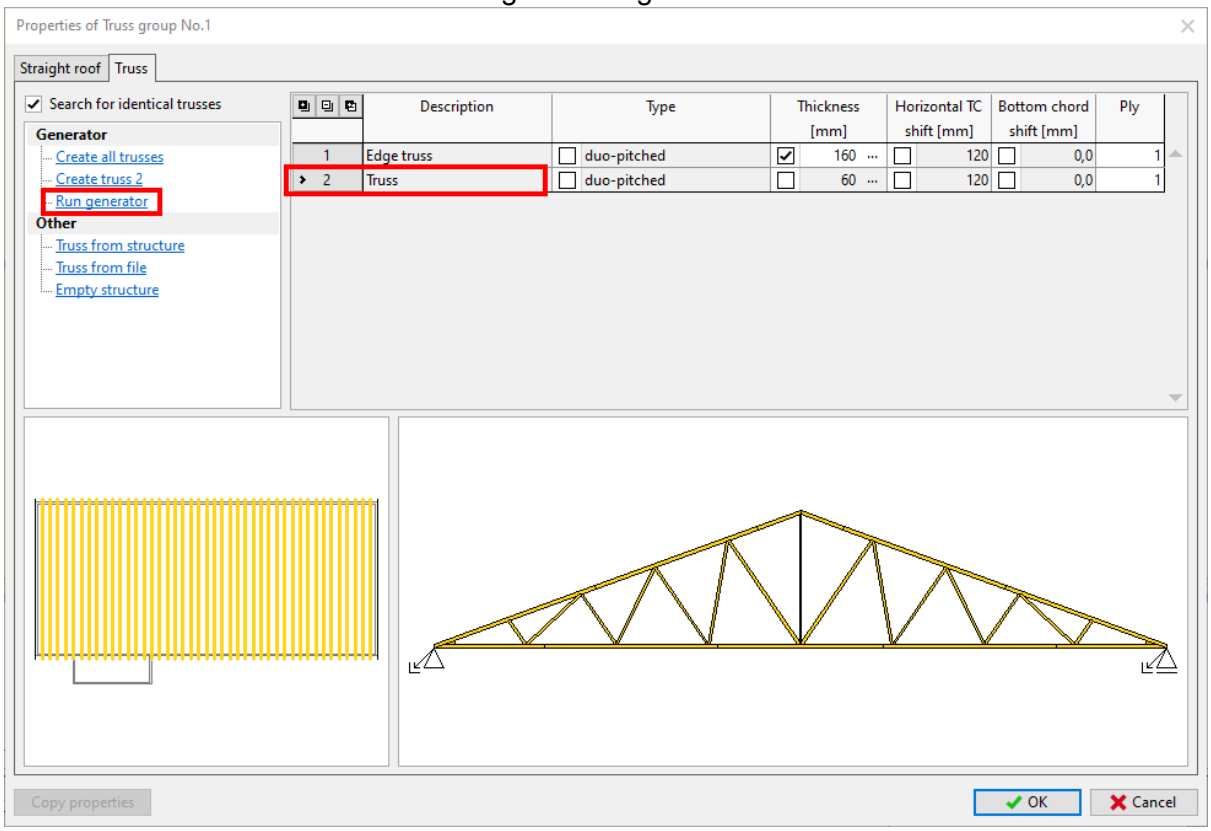


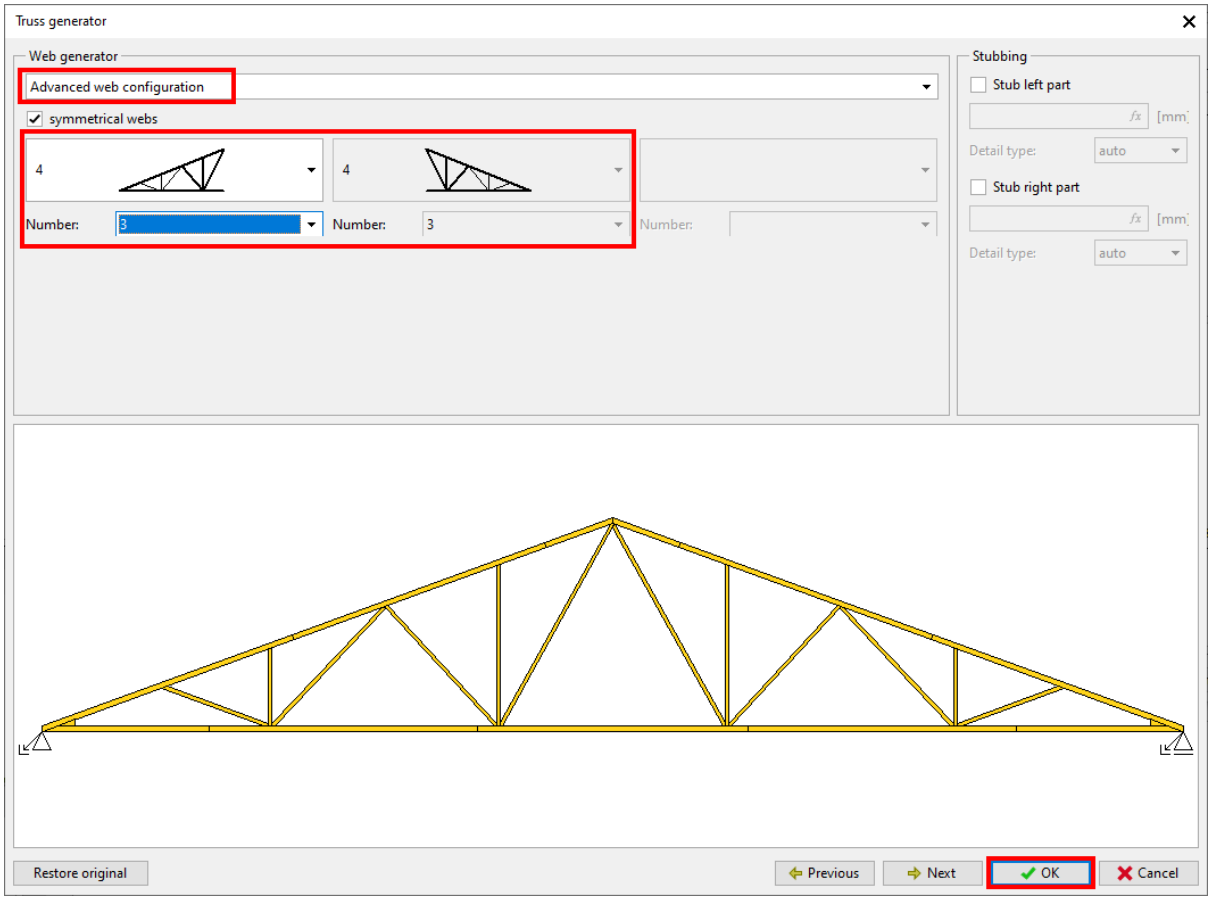
For the edge truss change the timber thickness to 160mm as we will use the timber flatwise. Then “Create all trusses” and “Run generator” in order to adjust the webbing of the gable trusses. We want to have verticals only.

In the Web generator select “Average distance” and further use the settings and values shown in the picture.



Select truss in line 2 of the table and again “Run generator”.

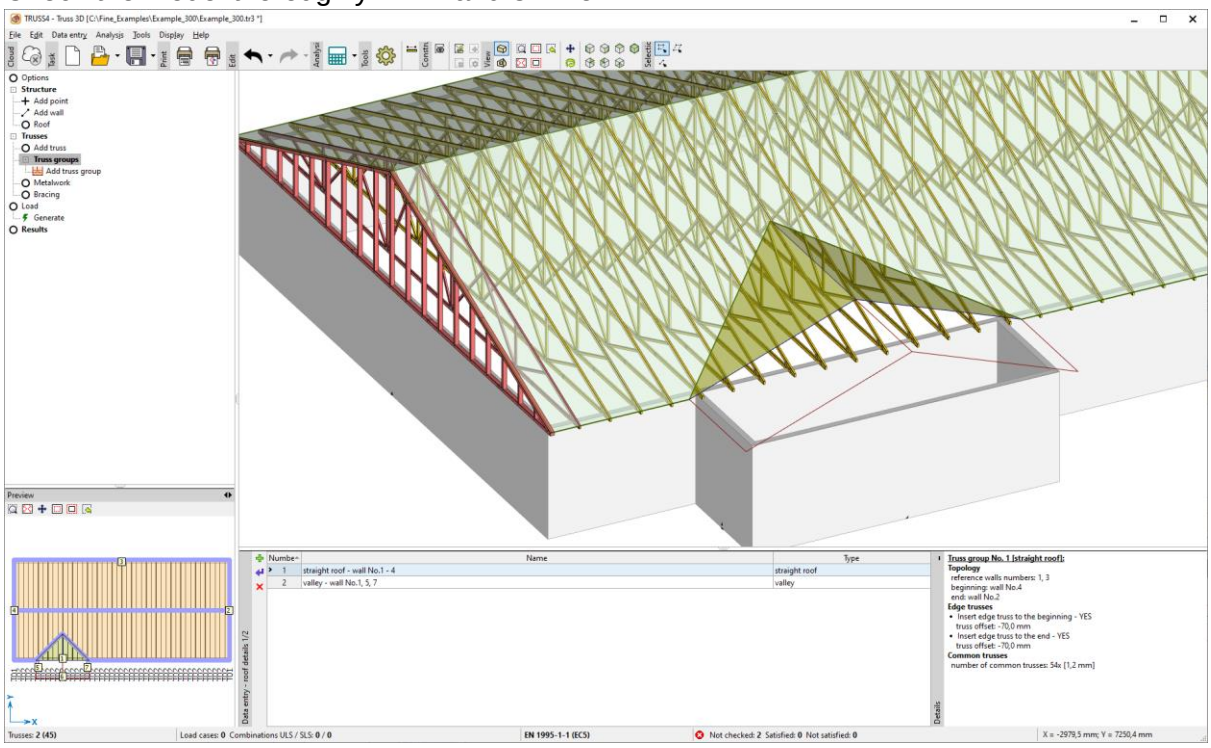




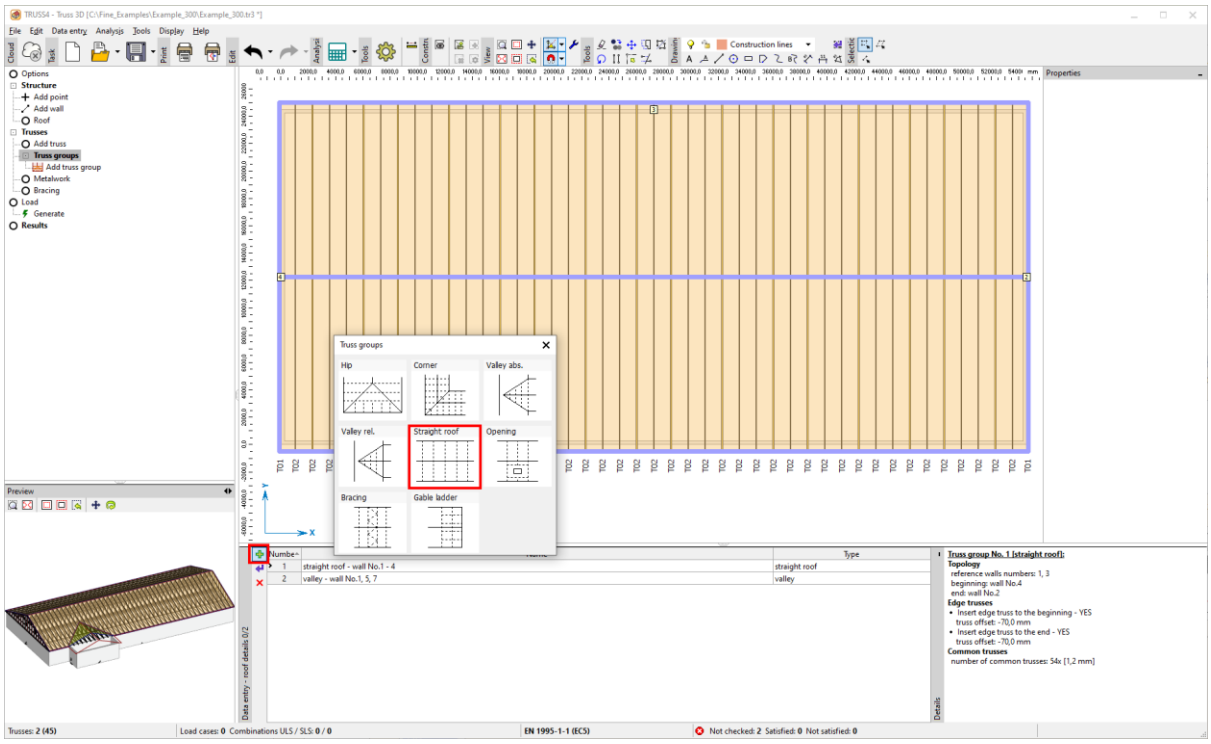
Select the “Advanced web configuration”, type 4 webbing and 3 repetitions.

Close the dialog “Properties of Truss group No.1” with “OK”.

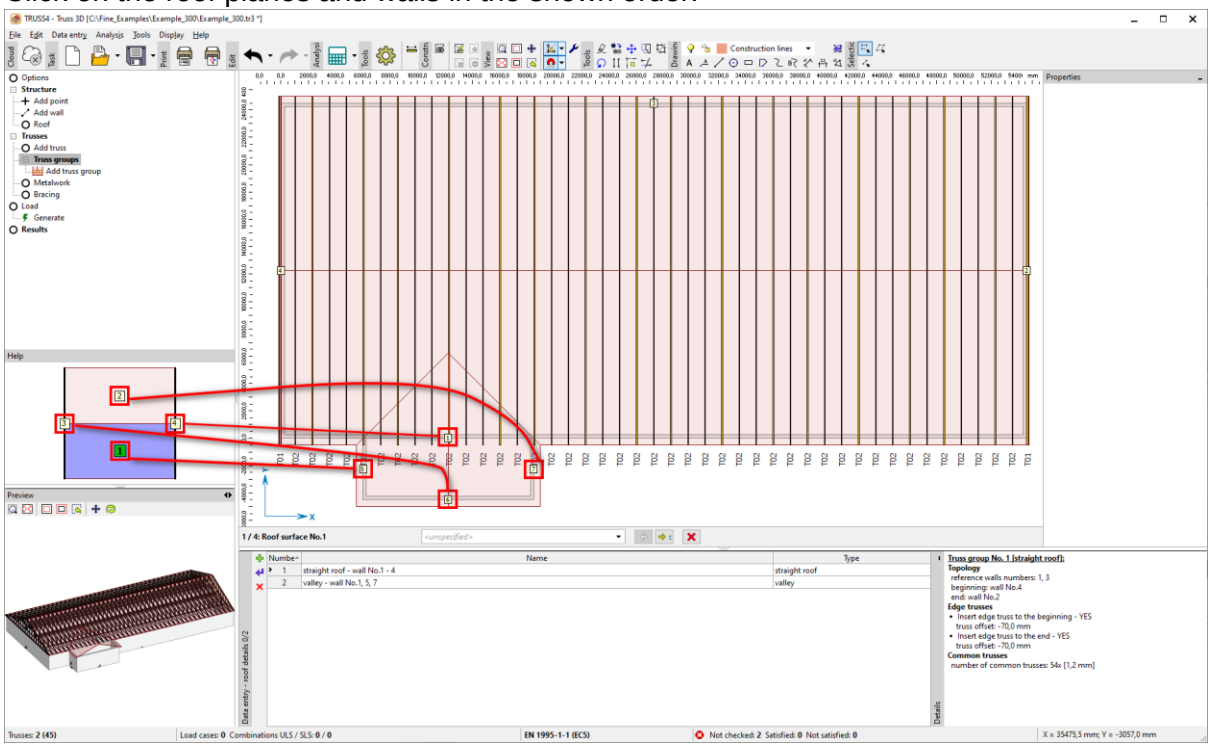
Check the model thoroughly in 2D and 3D view.

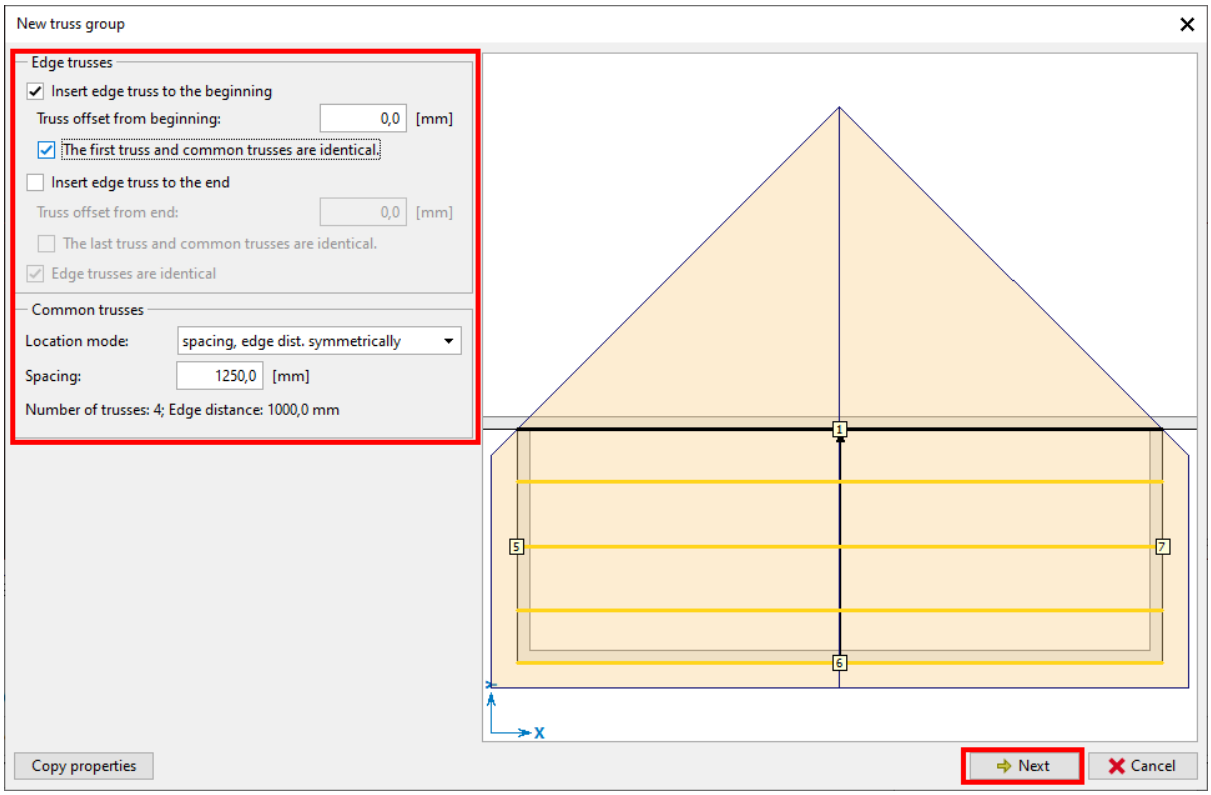


In the next step we will add the trusses at the extension. Click on the “+”-sign in the upper left corner of the truss groups table and select “Straight roof”.

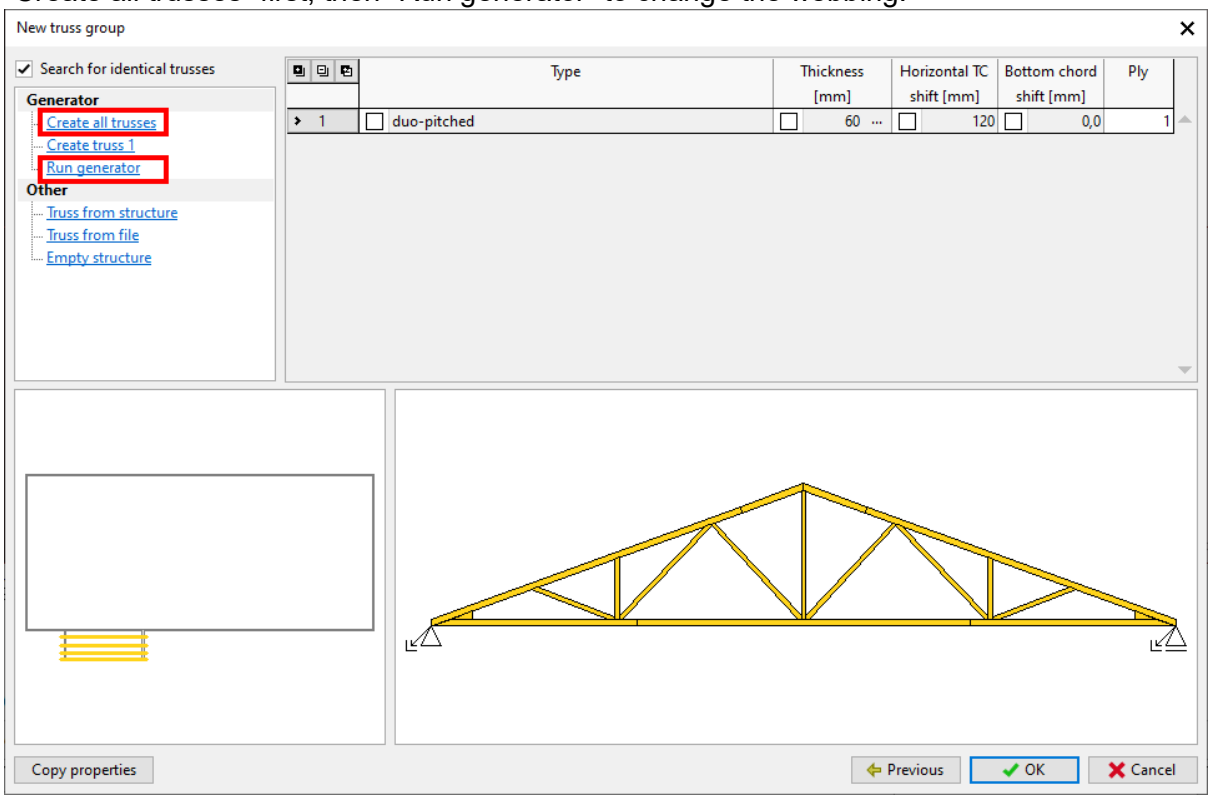


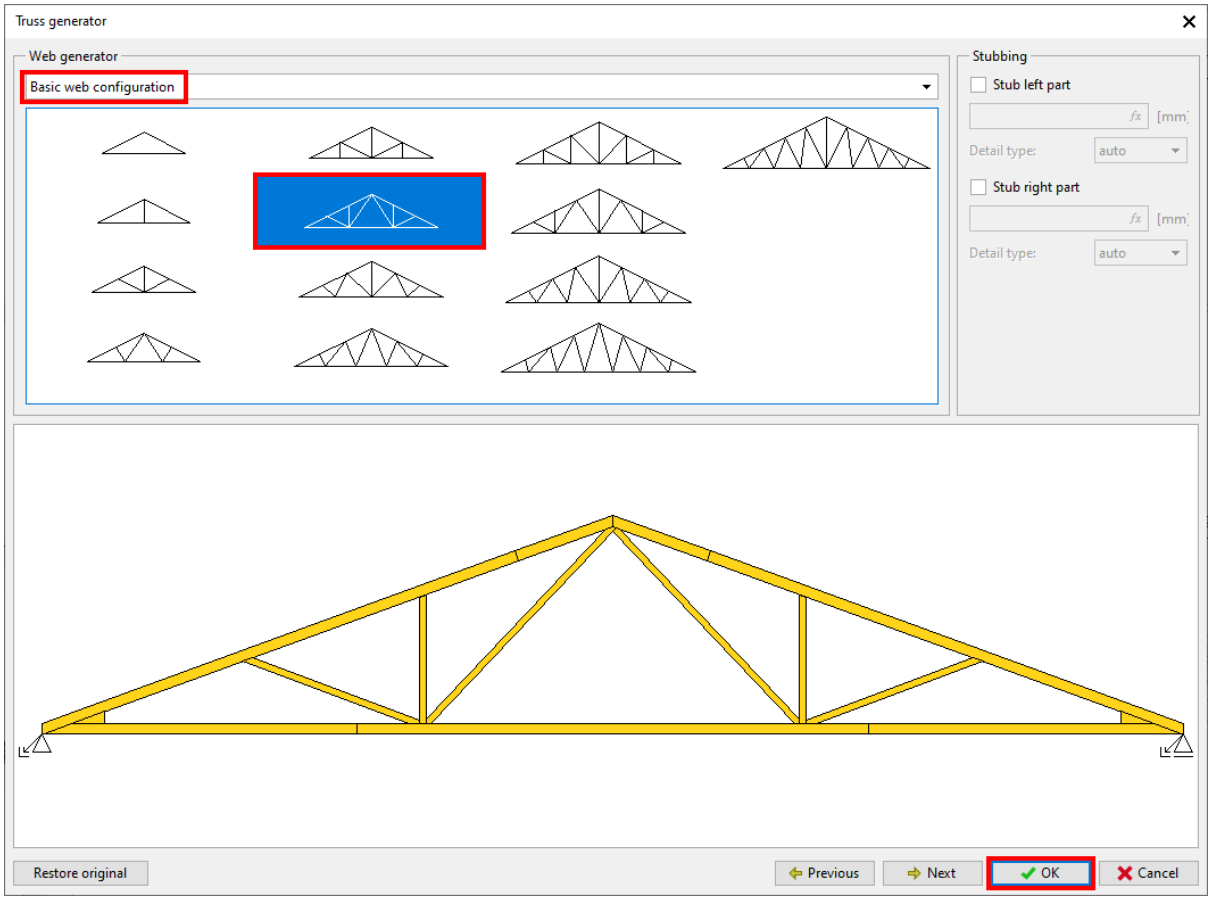
Click on the roof planes and walls in the shown order.



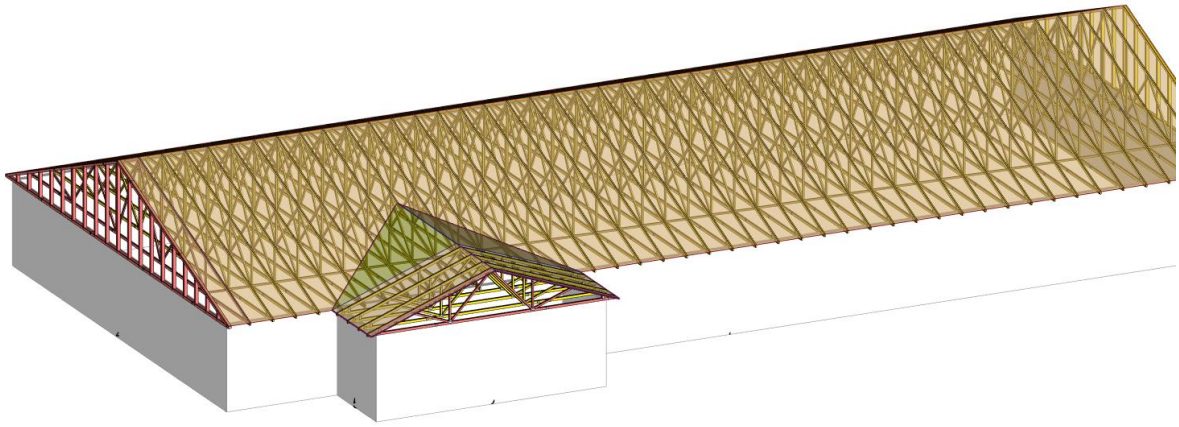


“Create all trusses” first, then “Run generator” to change the webbing.



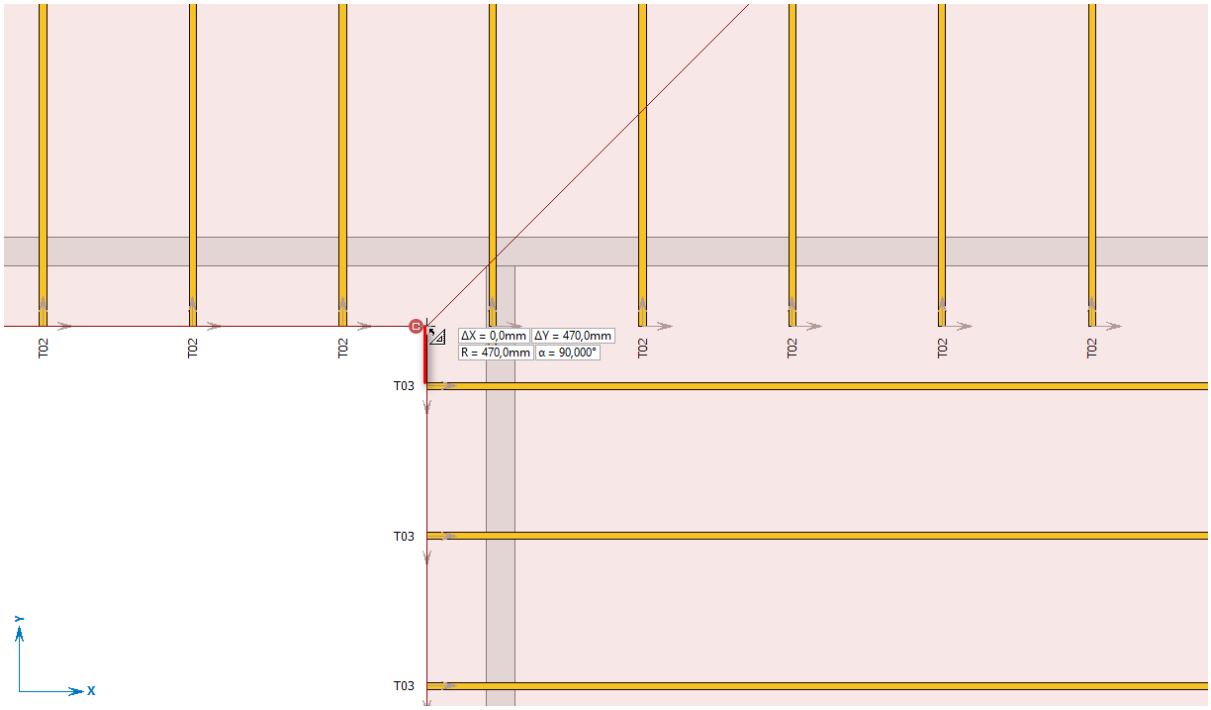


Close also the truss group dialog with “OK”.



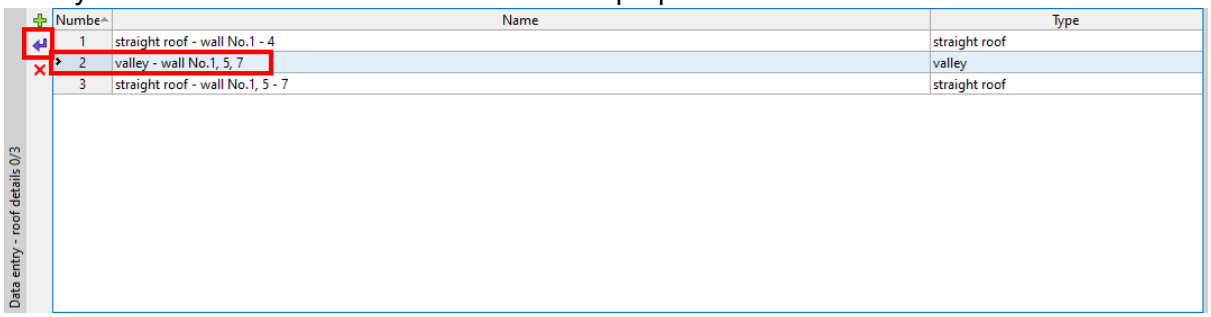
Trusses on the roof after the second truss group has been added.

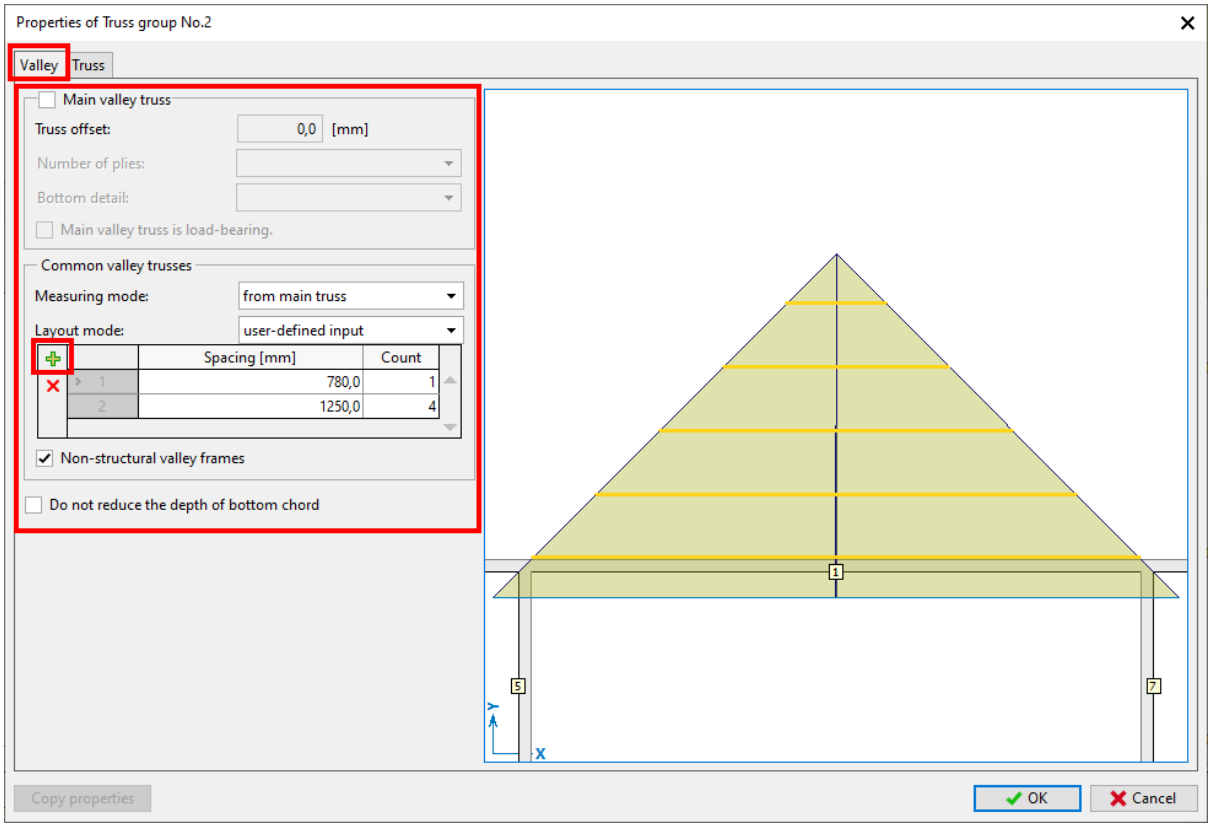
We measure the distance between last truss of the extension and the main roof edge in order to get an equal spacing of the trusses on the extension and the valley trusses.



The measured distance between the roof edge and the upper side of the closest truss T03 is 470mm. This will lead to the position of the first valley truss at 1250 – 470 = 780 mm.

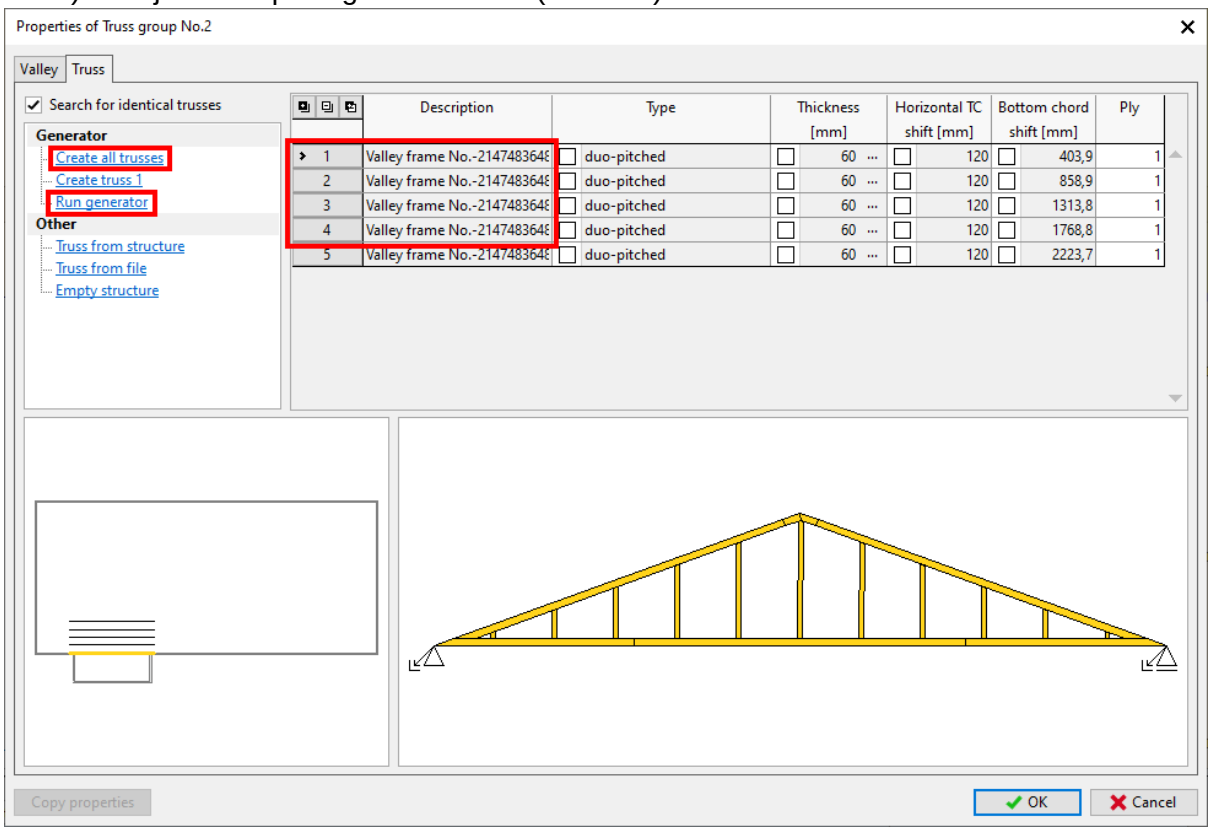
We finalize the roof trusses by filling the valley with a corresponding truss group. Select “valley” in line 2 from the table and click on the purple bent “Edit”-arrow

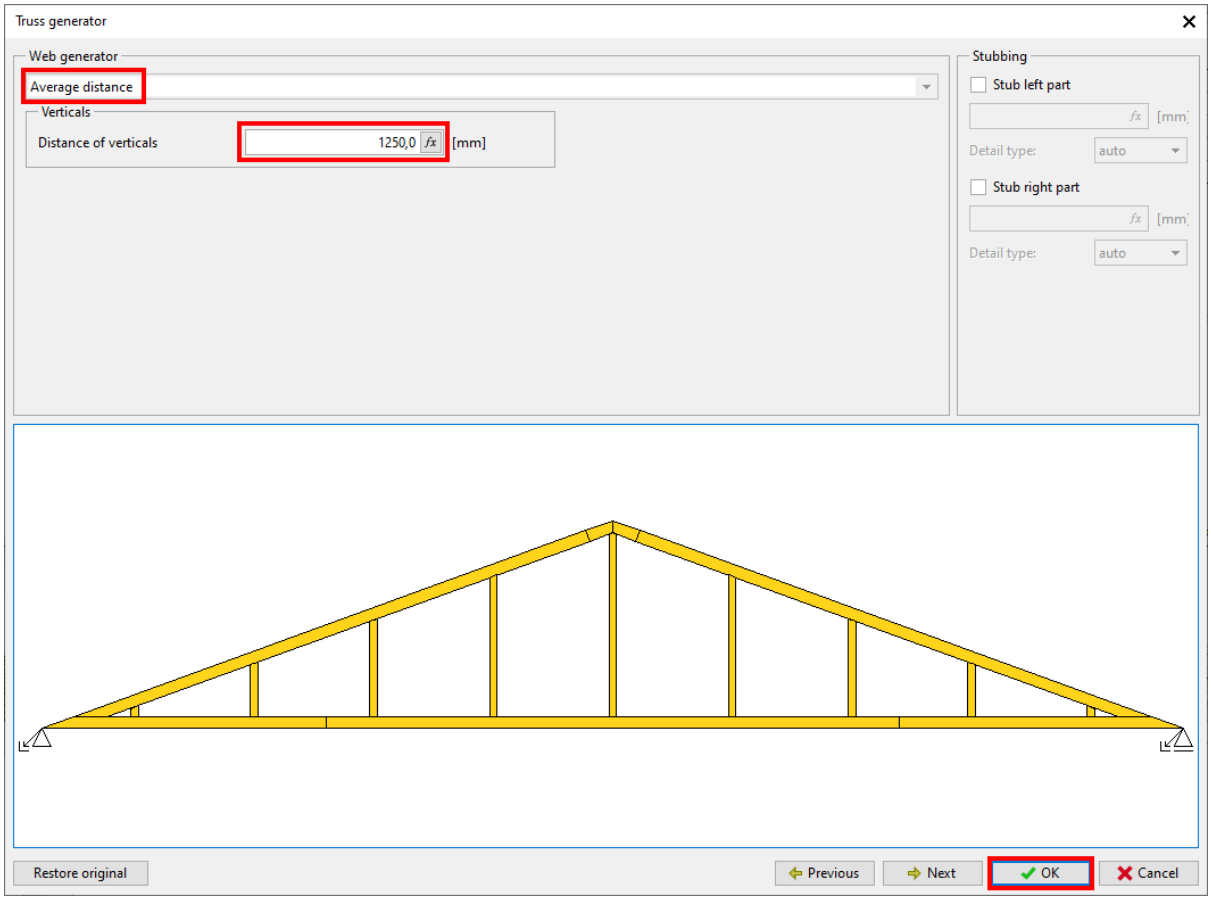




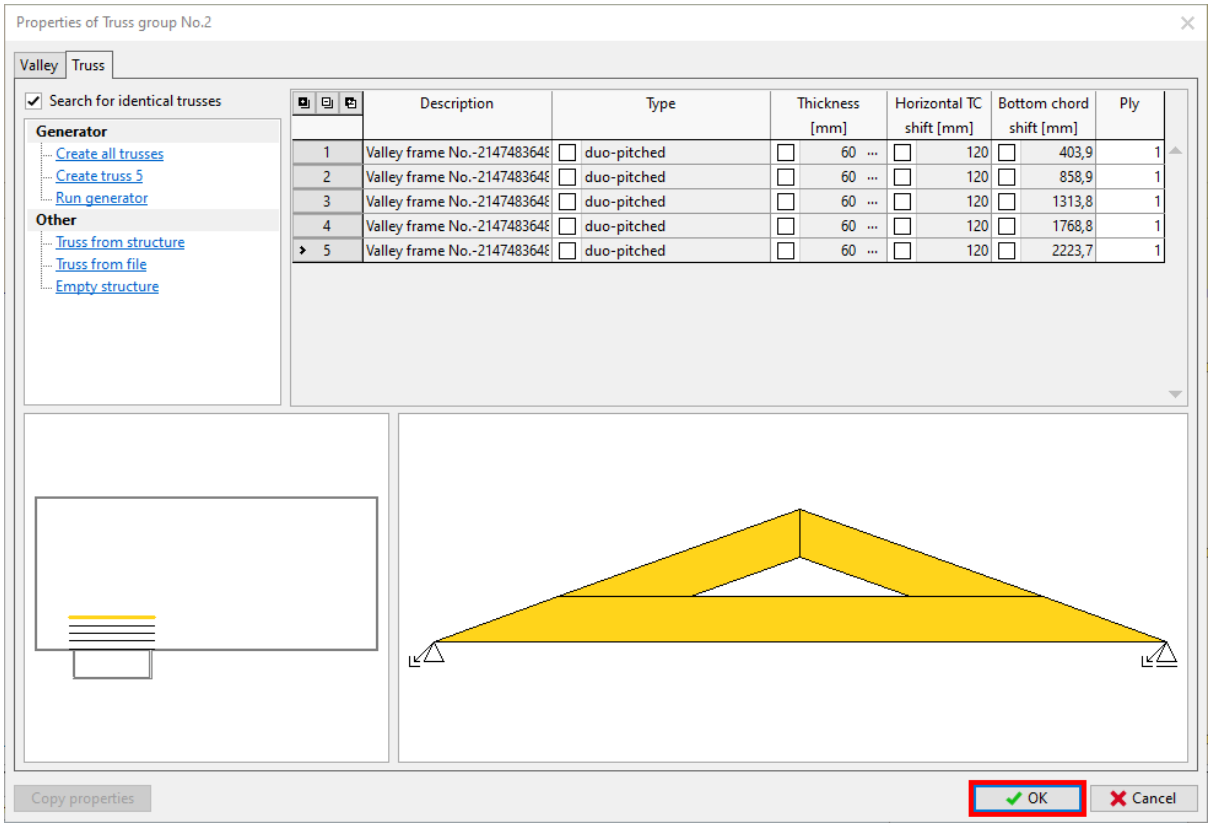
Set values and tick boxes as shown above. “Non-structural valley frames” will provide us with trusses that have vertical webs only, though their spacing still must be adjusted in the generator. In order to change spacing within the truss group, click on the “+”-symbol and enter the spacing and count values (number of trusses) as given.

We create all trusses and then run the generator for the first four valley frames (one after the other) to adjust the spacing for the studs (verticals) at 1250mm.

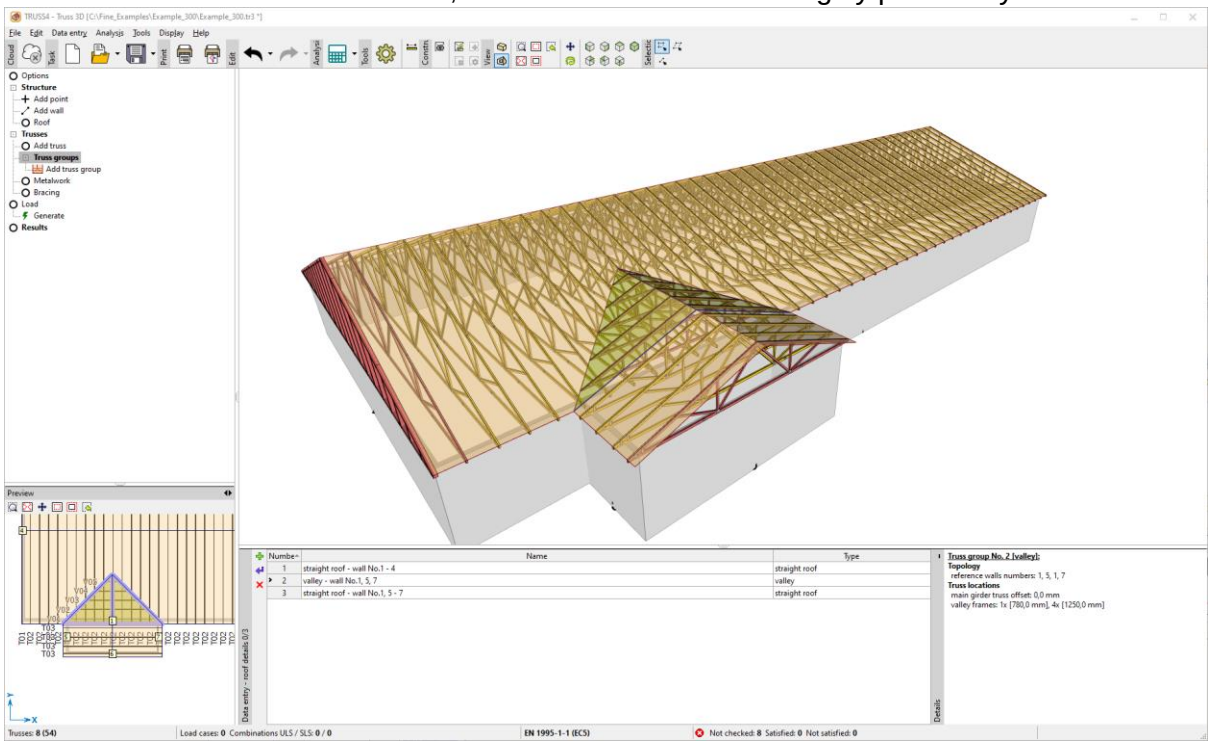




There is no need to perform any changes for the smallest of the valley trusses as it contains no verticals.



All roof trusses have been created, we check the model thoroughly plausibility and collisions.

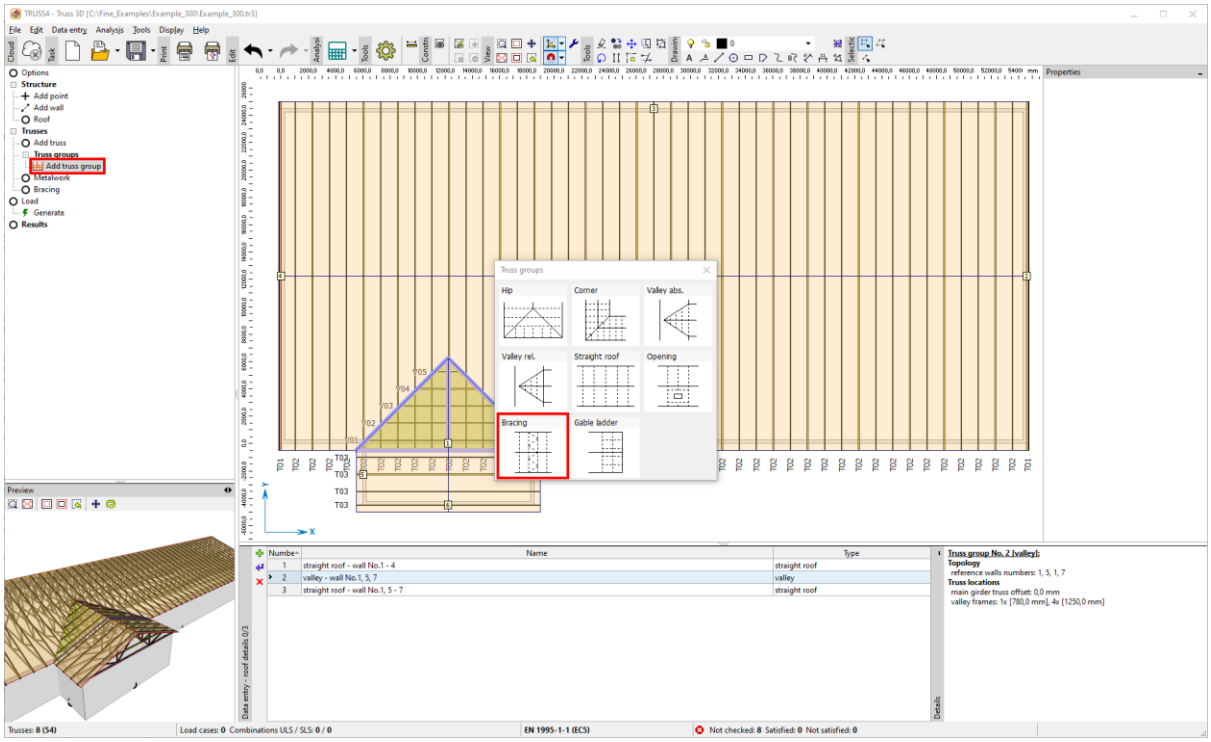


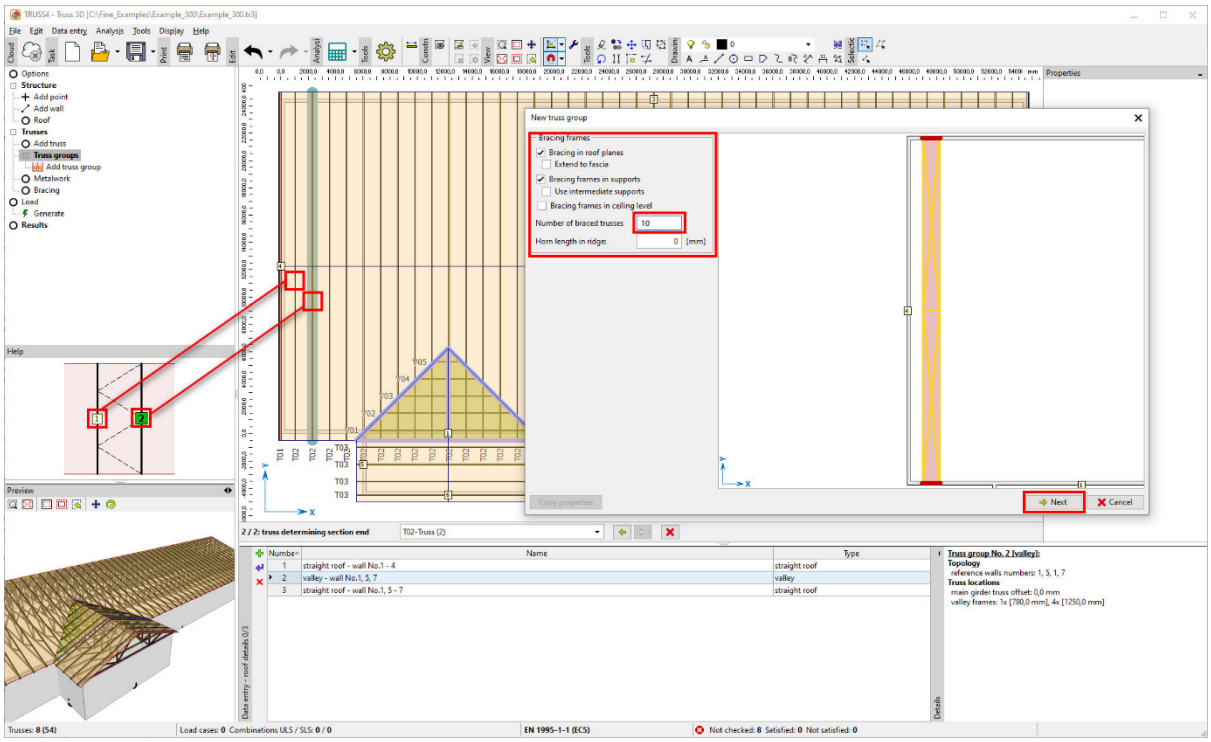
Adding the bracing frames

Generally, one can assume that one bracing frame is capable of supporting 10-12 main trusses, depending on the size of the compressive force in the top chord and the type of lateral bracing.

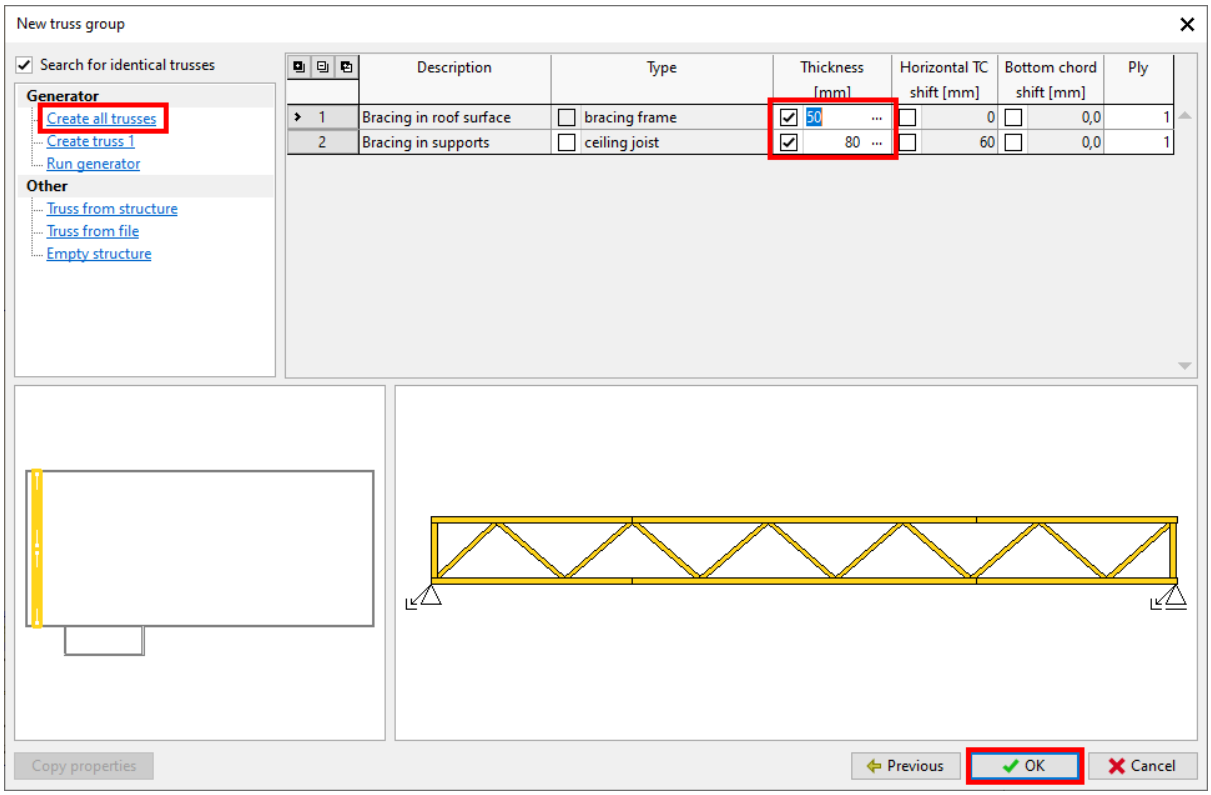
In our case we have 43 main roof trusses (truss T02), which leads to an estimated requirement of 5 bracing elements in the top chord planes on each side of the roof. (The outer bracing frames need to be placed close to the end walls, so we actually need one more than 43/10 = 4). Vertical frames at the eaves ensure that the resulting horizontal forces are transferred into the walls.

Go to “truss groups” in the options window, click on bracing in the Truss groups selection dialog, then click on the two trusses between which the top chord bracing and the vertical frames shall be placed. Enter “10” for the number of braced main trusses. We want to make all the bracing frames identical and the inner bracing frames have to carry the lateral load from 10 connected trusses. The entered value is directly connects with the load acting on the bracing frames (a higher number means a safer design).

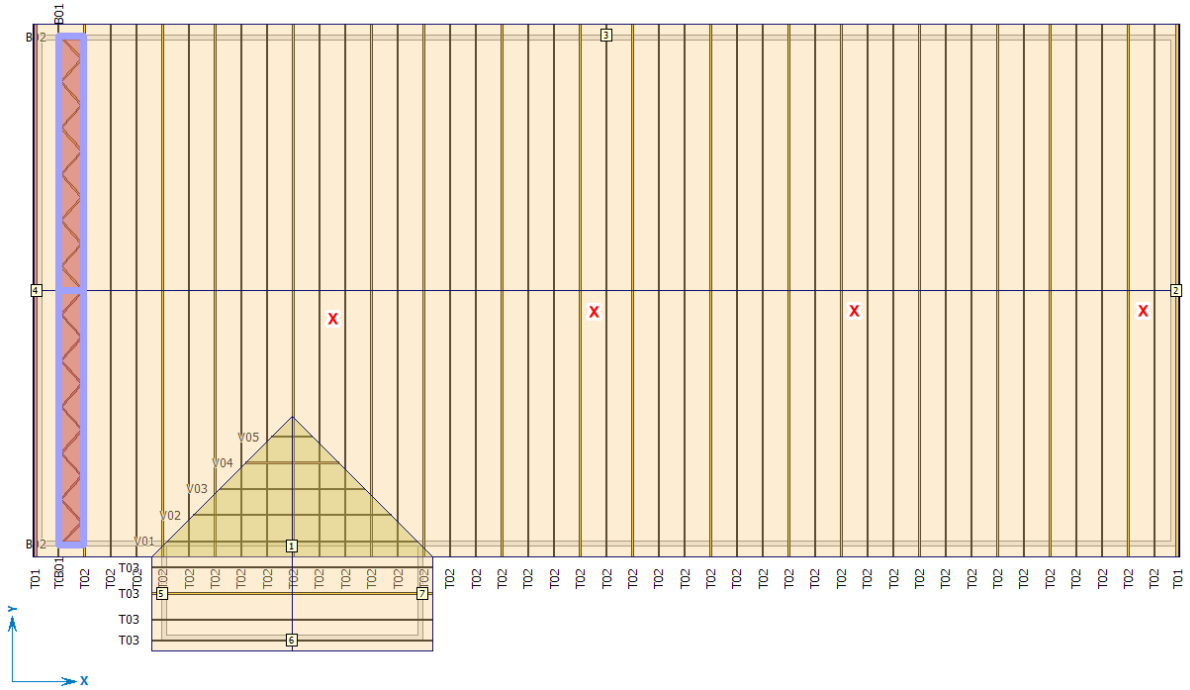




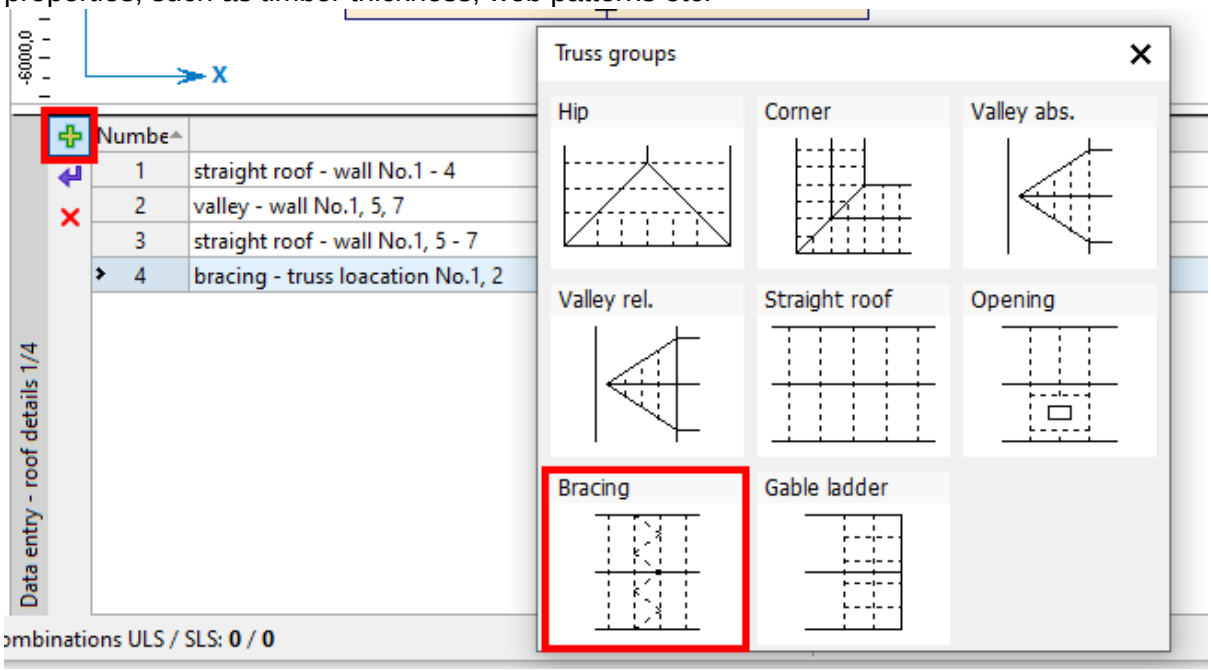
Change the timber thickness to 50mm and 80mm, respectively, create all trusses, confirm with “OK”.

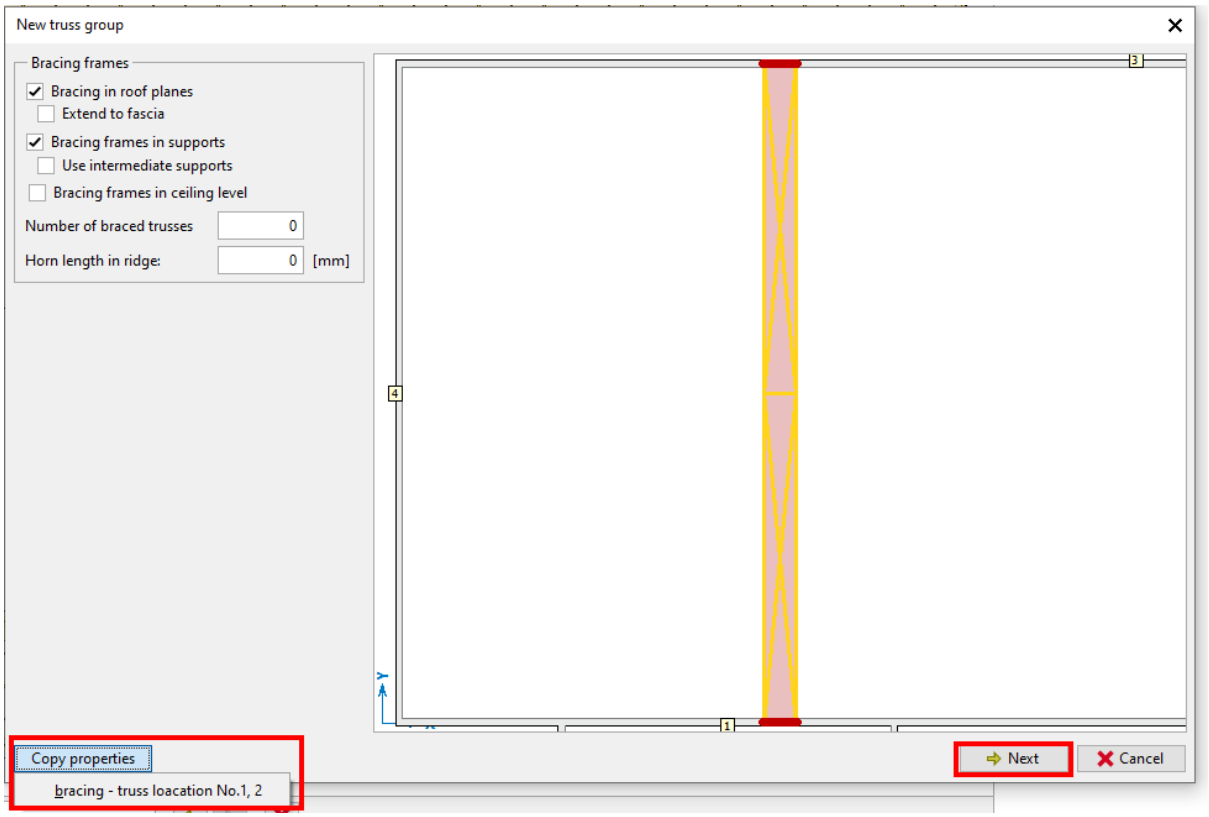


In the same manner we will place the other top chord bracing frames in the positions marked with “X”.



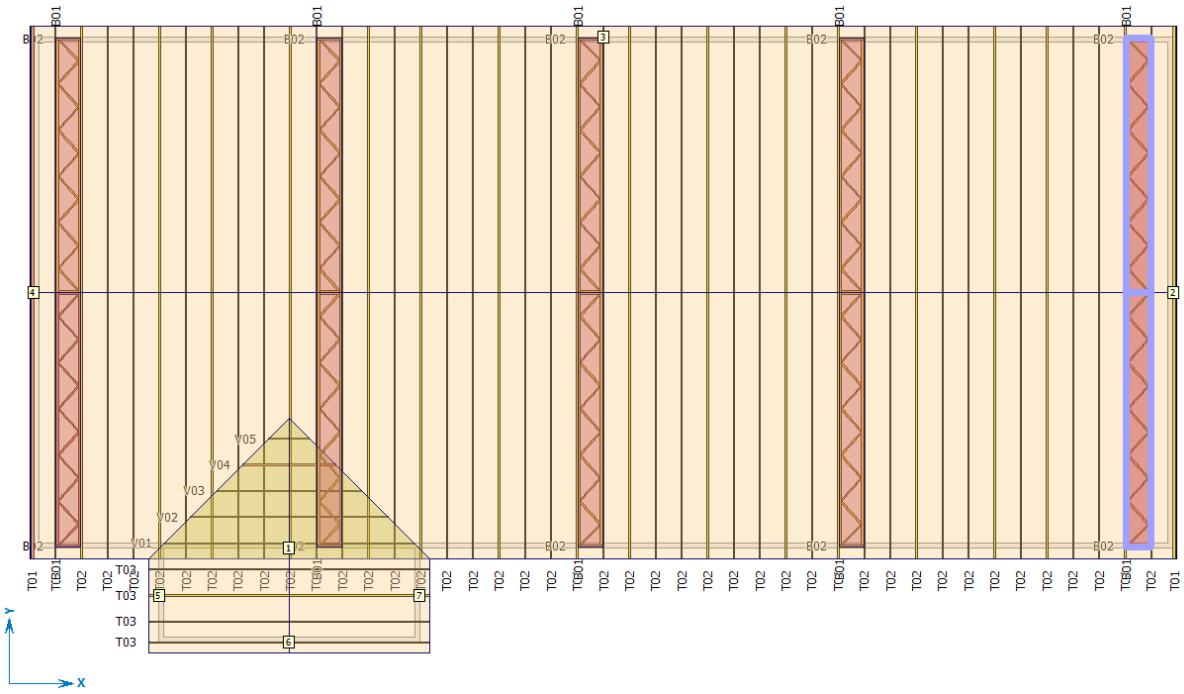
We can save ourselves some work by copying the properties of the previously entered and created bracing truss group. Add a new bracing truss group, then click on the “Copy properties” button in the lower left corner of the dialog and select the group whose properties you want to copy. This not only uses the settings from this dialog page, but also all truss properties, such as timber thickness, web patterns etc.



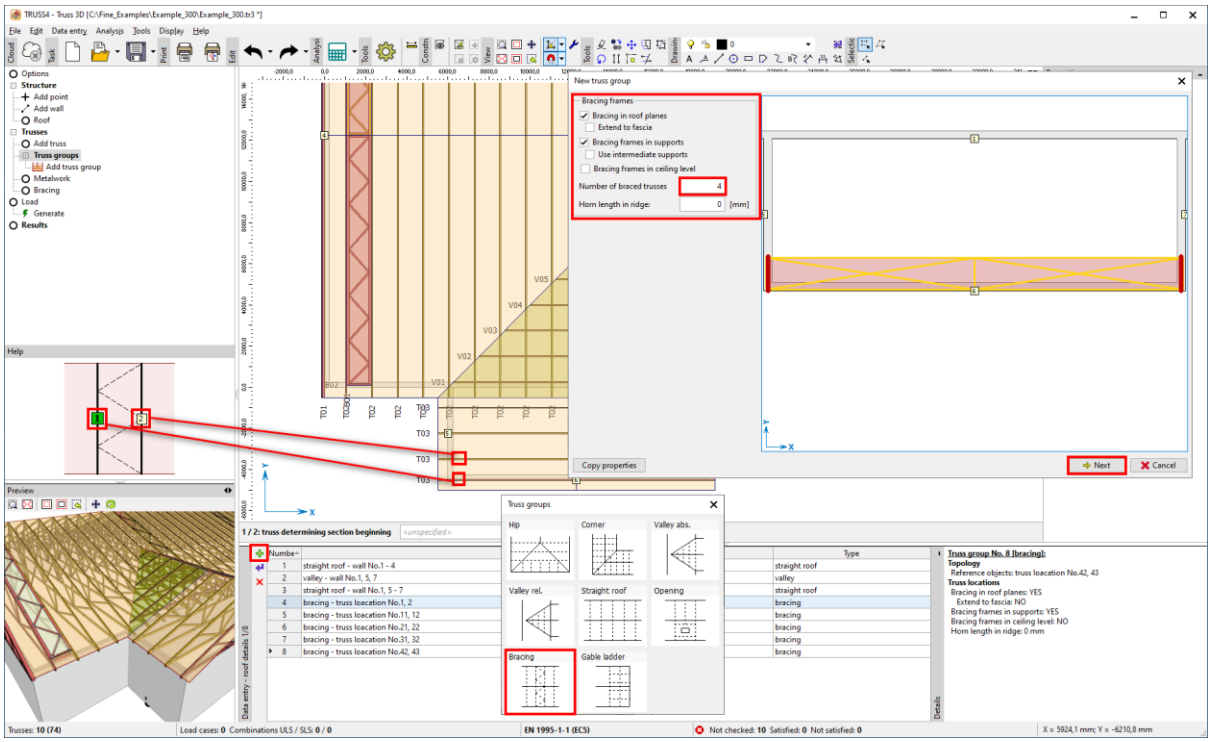


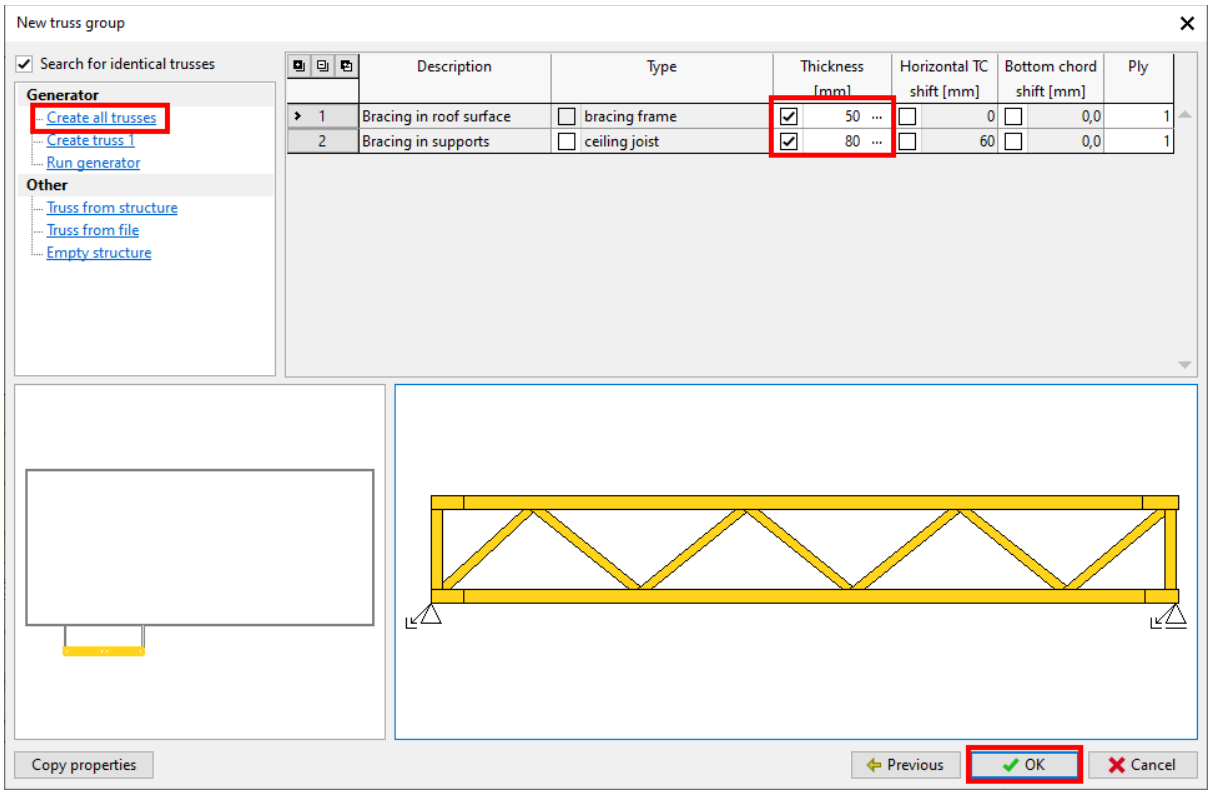
Close the second part of the dialog with “OK”.

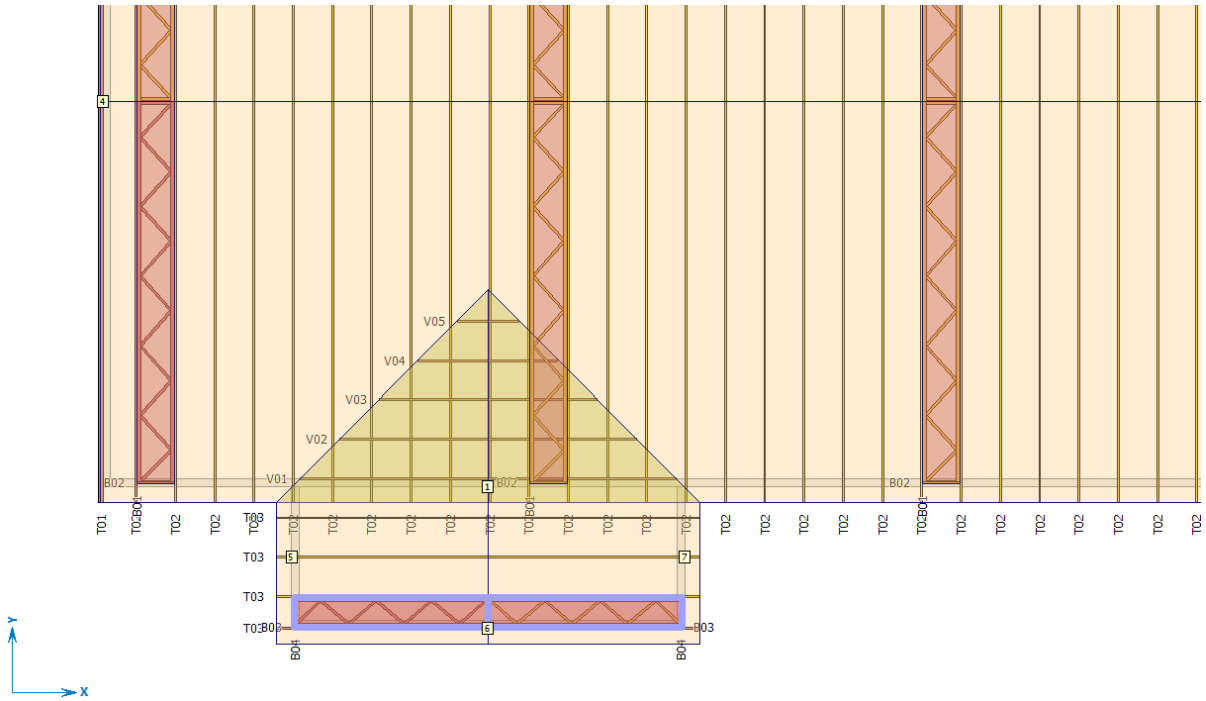
Repeat these steps three more times.



Also, the trusses above the building extension need to be braced in the same way, the number of trusses to be braced is equal to four.



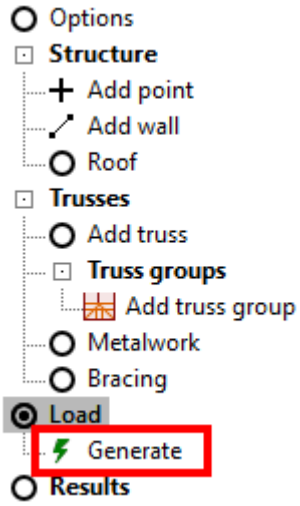

New truss group
Search for identical trusses
Generator
Create all trusses
Create truss 1
Run generator
Other
Truss from structure
Truss from file
Empty structure
Description
Type
Thickness [mm]
Horizontal TC shift [mm]
Bottom chord shift [mm]
Ply
1
Bracing in roof surface
bracing frame
50
0
0,0
1
2
Bracing in supports
ceiling joist
80
60
0,0
1
Copy properties
Previous
OK
Cancel

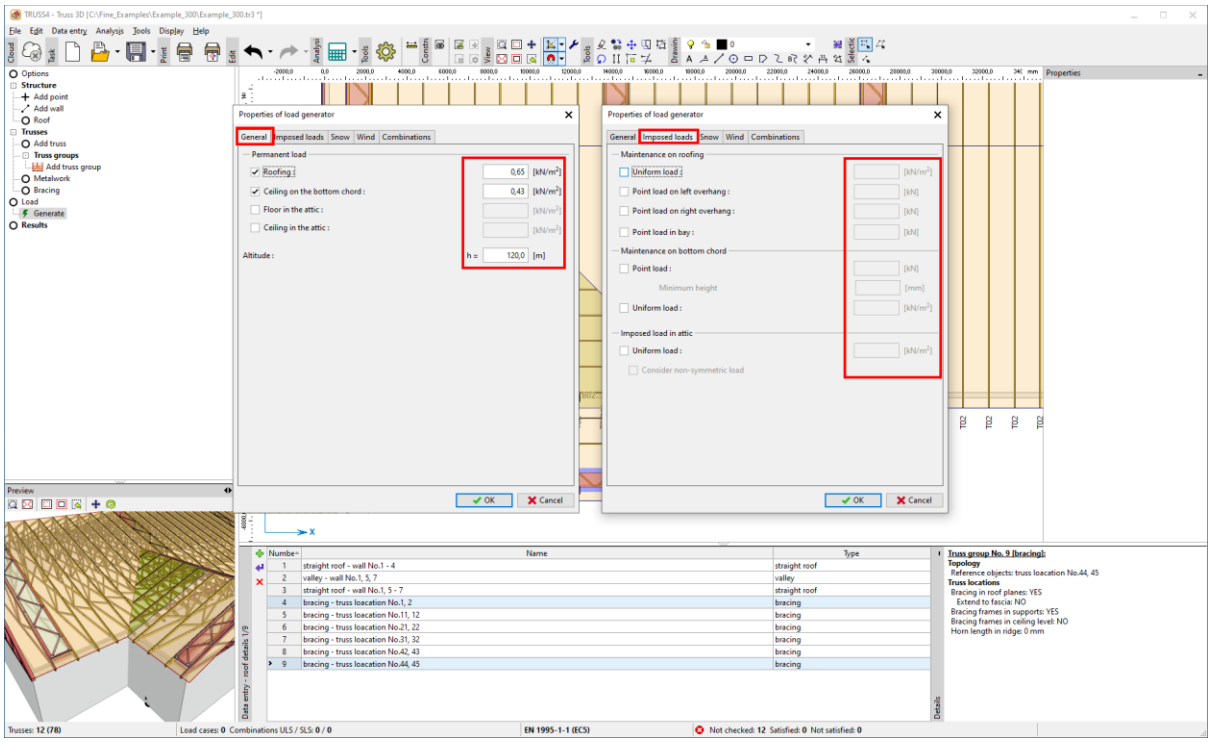


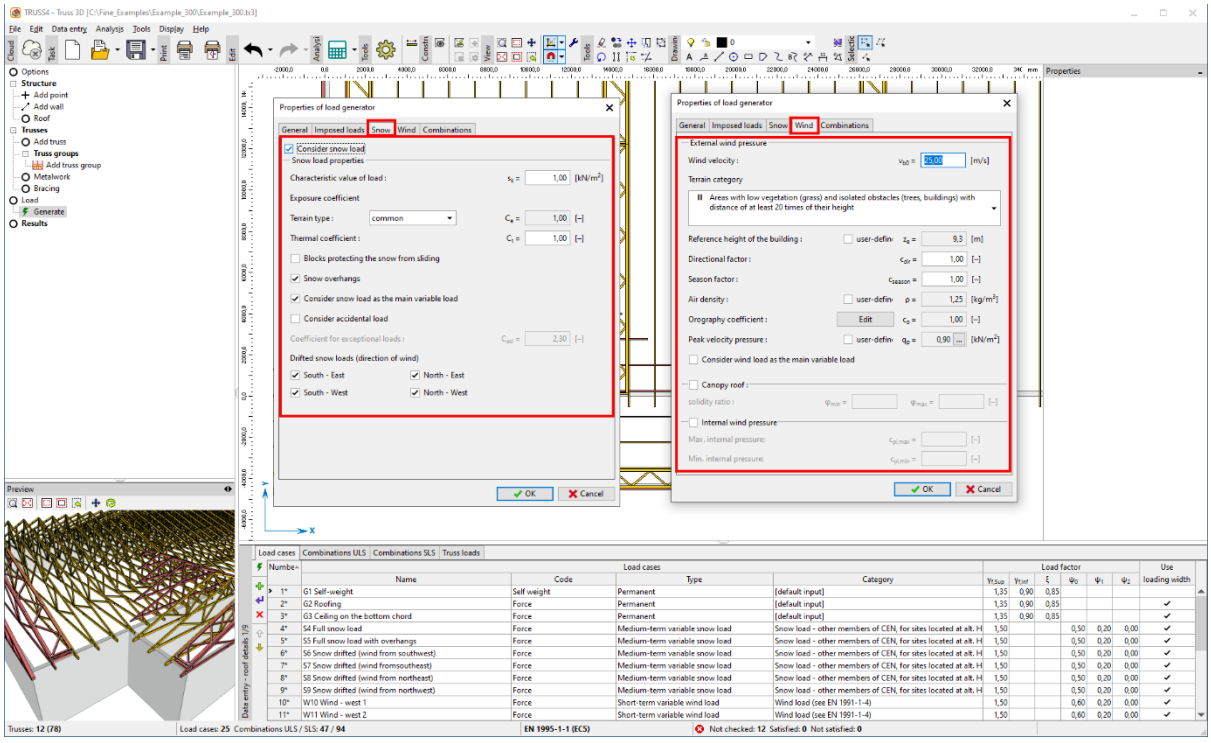
And with that we have placed all trusses and bracing fames on the roof. An actual three-dimensional bracing requires additional elements, e.g. steel straps running diagonally between adjacent top chord bracing frames and the apex and the heels.

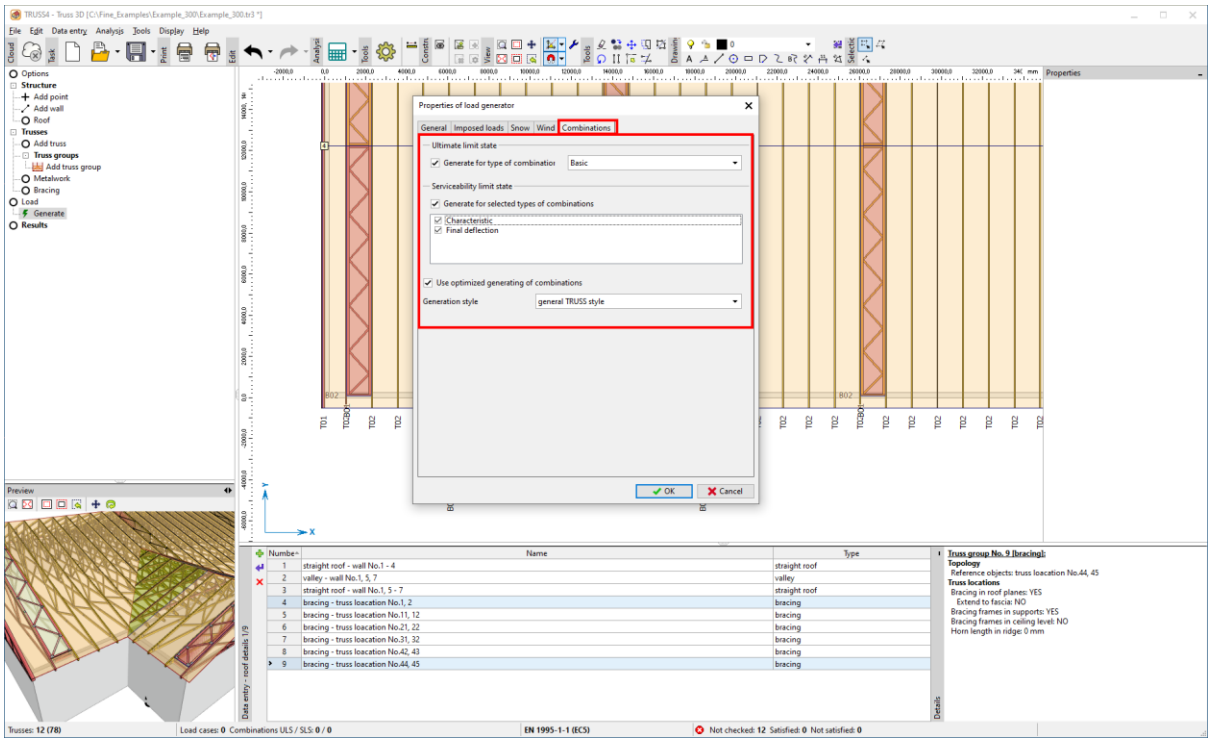
Loading

We add loads to the main trusses by using the load generator. Click on “Load” and “Generate” in the options window.




Properties of load generator
General
Imposed loads
Snow
Wind
Combinations
Permanent load
Roofing :
Ceiling on the bottom chord :
Floor in the attic :
Ceiling in the attic :
Altitude :
Maintenance on roofing
Uniform load :
Point load on left overhang :
Point load on right overhang :
Point load in bay :
Maintenance on bottom chord
Point load :
Minimum height
Uniform load :
Imposed load in attic
Uniform load :
Consider non-symmetric load
OK
Cancel


Properties of load generator
General
Imposed loads
Snow
Wind
Combinations
Consider snow load
Snow load properties
Characteristic value of load :
Exposure coefficient
Terrain type :
common
Thermal coefficient :
Blocks protecting the snow from sliding
Snow overhangs
Consider snow load as the main variable load
Consider accidental load
Coefficient for exceptional loads :
Drifted snow loads (direction of wind)
South - East
North - East
South - West
North - West
External wind pressure
Wind velocity :
Terrain category
Reference height of the building :
Directional factor :
Season factor :
Air density :
Orography coefficient :
Edit
Peak velocity pressure :
Consider wind load as the main variable load
Canopy roof :
Internal wind pressure
OK
Cancel



The loads for the main roof trusses have been created, the loads for the bracing frames and beams will be calculated on the basis of the internal forces of the corresponding roof trusses. Check all load cases thoroughly.

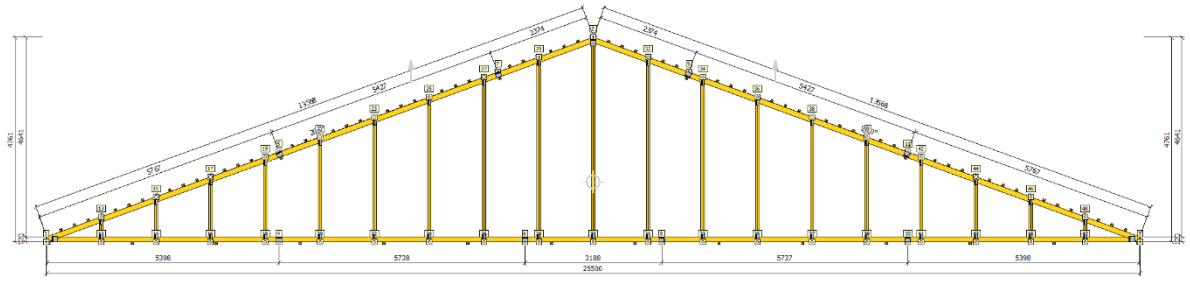
Results - Analysis

First have a look at the valley trusses shown in table window. Unlike the other trusses they don't have a tick in the "Check" column. This is due to our previous selection of non-structural valley frames, which means that they will not be analysed.

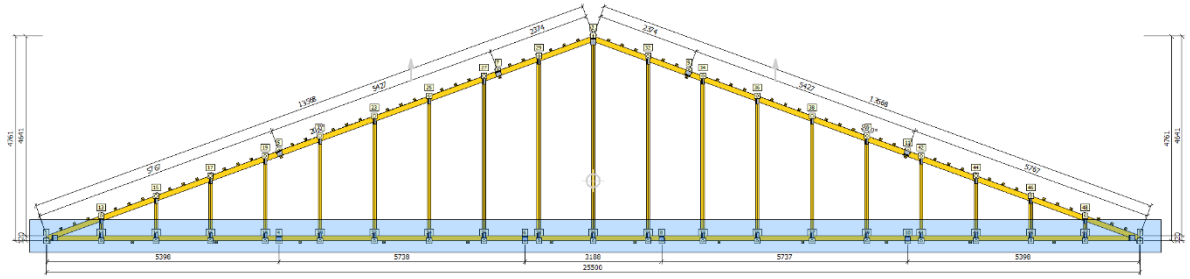
Number	Description	Check		ULS	SLS	Thickness [mm]		Ply	K_{sys} [–]	Transfer of load from Width [mm]	Tran
3	B03	✓	not verified			✓	50 ...	1	1,00	1000,0	do not transfer
4	B04	✓	not verified			✓	80 ...	1	1,00	1000,0	do not transfer
5	T01	✓	not verified ⚠			✓	160 ...	1	1,00	1250,0	full load transfe
6	T02	✓	not verified ⚠				60 ...	1	1,00	1250,0	full load transfe
7	T03	✓	not verified ⚠				60 ...	1	1,00	1250,0	full load transfe
8	V01		- ⚠				60 ...	1			
9	V02		-				60 ...	1			
10	V03		-				60 ...	1			
11	V04		-				60 ...	1			
12	V05		-				60 ...	1			

First have a look at the trusses that we want to have analysed and designed.

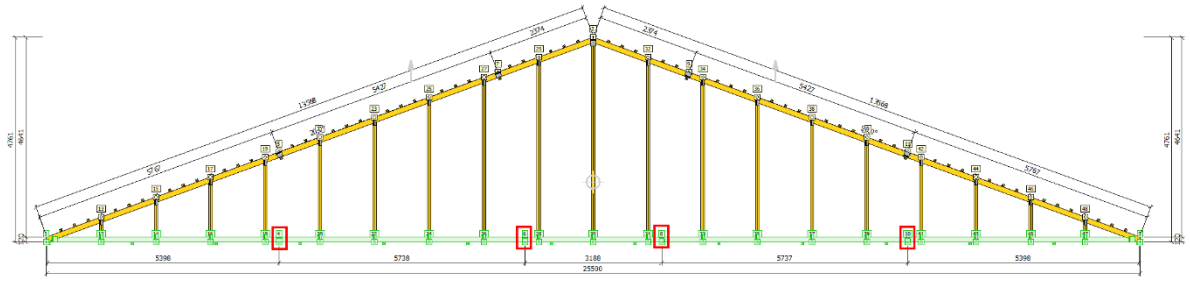
Truss T01 (gable truss on main roof): you may realize that no supports have been created because the generator is not able to determine those for a truss placed totally on a wall.

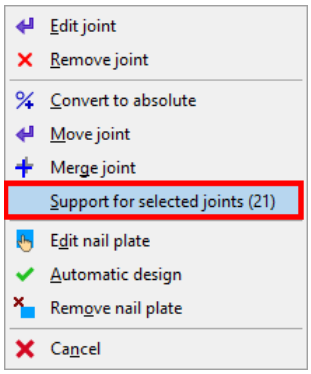


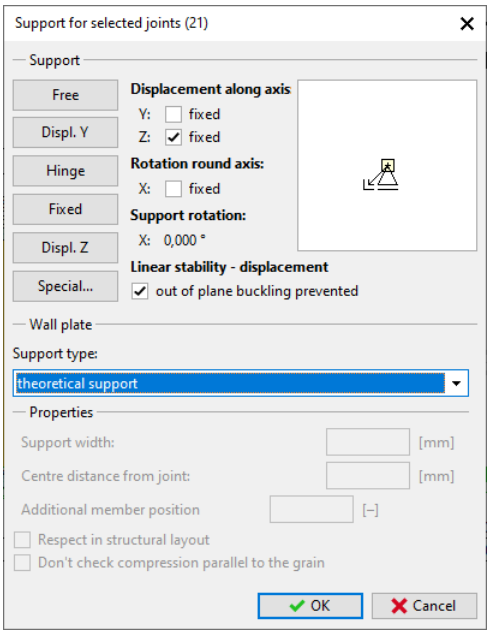
The supports can be added manually via the function “Support for selected joints”. Move your mouse to the left end of the truss, hold down the left mouse key and drag your mouse as shown to create a rectangle which encloses all joints along the bottom chord.



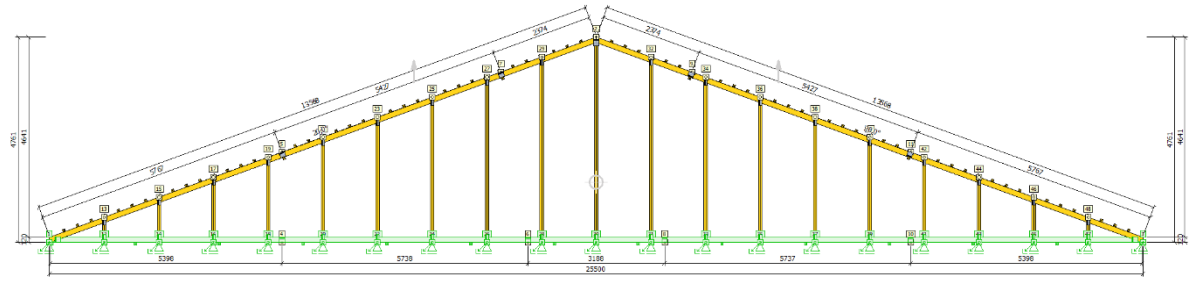
Now hold down the <CTRL>key and click on the four splice joints ([4], [6], [8] and [10]) to deselect them. Eventually repeat this for any selected (highlighted) joints on the top chord. Right mouse click on any of the highlighted bottom chord joints and select “Support for the selected joints (21)” from the context menu and use the shown settings in the appearing dialog.



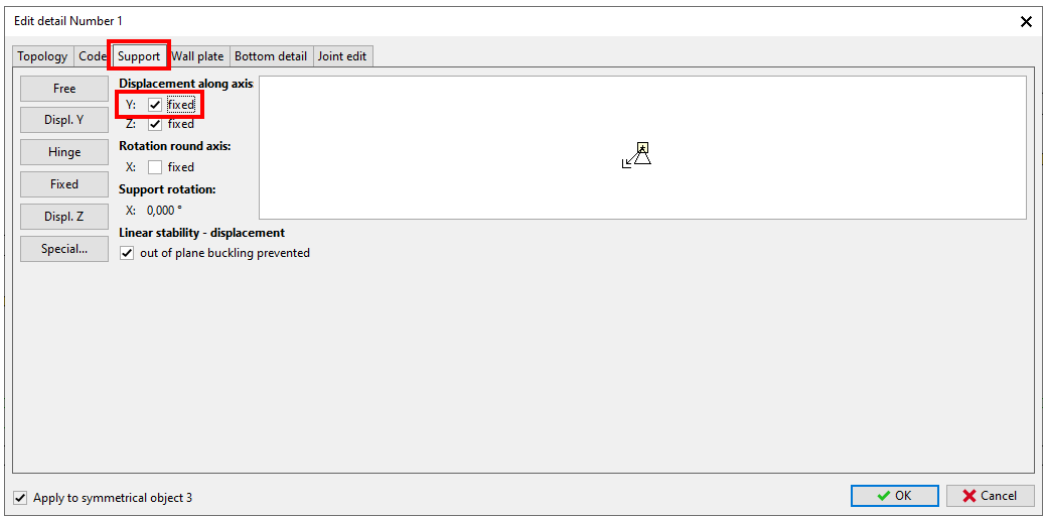




Close the dialog with “OK”.



The gable truss now has a theoretical support under each vertical stud. We still need to cater for any horizontal forces by right mouse clicking on the left most joint [1], selecting “Edit joint” from the context menu and check the Y:-box in the “Support” dialog.



Now we can let the program design the trusses by hitting <CTRL+F8> or clicking the icon  .

Number	Description	Check		ULS	SLS	Thickness [mm]		Ply	K_{sys} [–]	Transfer of load from roof surfaces Width [mm]	Transfer mode
1	B01	✓	not satisfied	✗		✓ 50	...	1	1,00	1000,0	do not transfer
2	B03	✓	satisfied	✓		✓ 50	...	1	1,00	1000,0	do not transfer
3	R01	✓	satisfied	✓		✓ 80	...	1	1,00	1000,0	do not transfer
4	T01	✓	satisfied	✓	✓	✓ 160	...	1	1,00	1250,0	full load transfer
5	T02	✓	not satisfied	✗	✓	60	...	1	1,00	1250,0	full load transfer
6	T03	✓	not satisfied	✗	✓	60	...	1	1,00	1250,0	full load transfer
7	V01		-			60	...	1			
8	V02		-			60	...	1			
9	V03		-			60	...	1			

We will need to look closer at the results for trusses B01, T02 and T03, as they don't match all design criteria, exclusively in ULS (ultimate limit state) checks.

We start with truss T03 and for that we look right of the results table at the "Overall truss check". In case it should not show any information, click on the hyperlink "display.

General truss information display

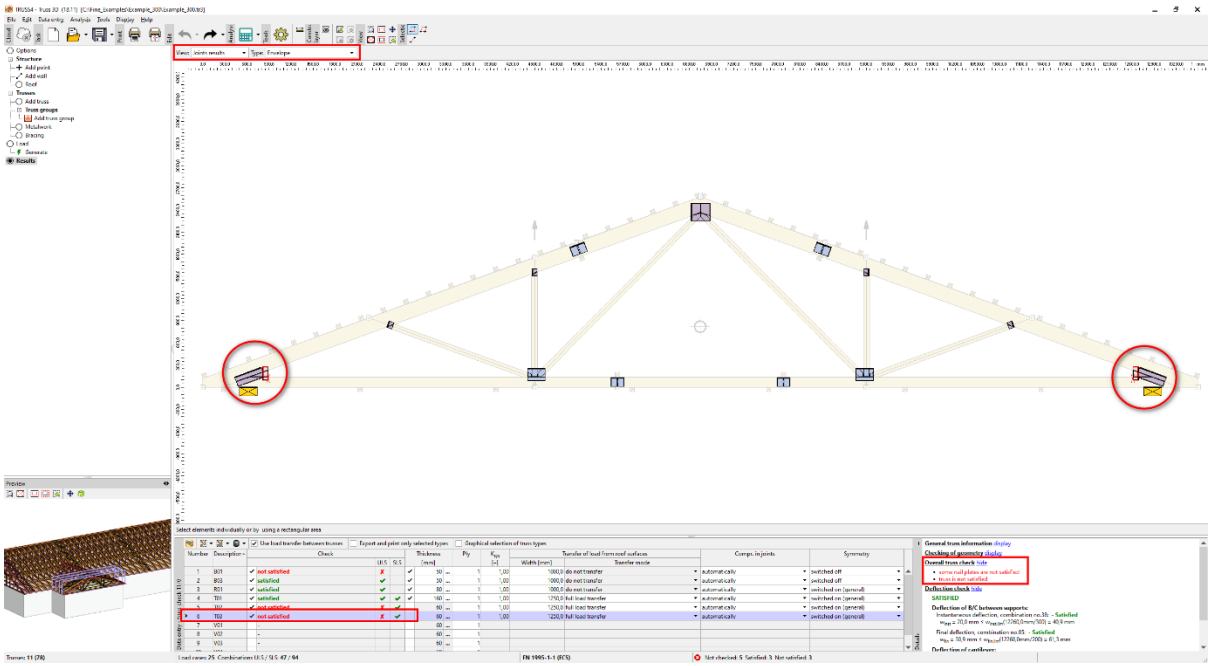
Checking of geometry display

Overall truss check hide

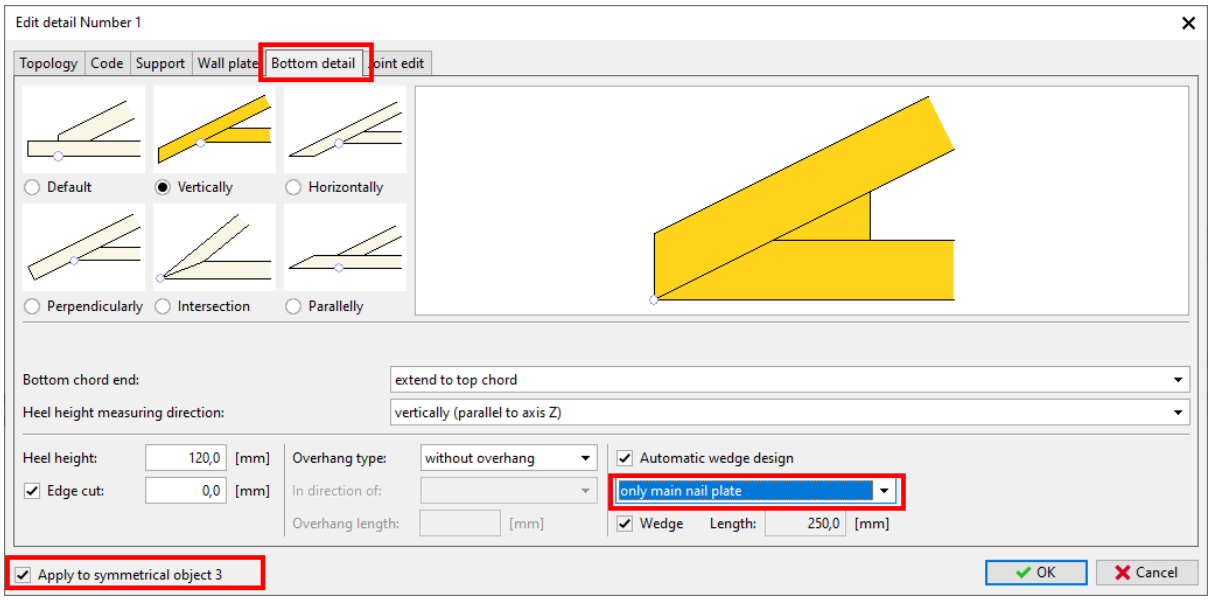
- some nail plates are not satisfied
- truss is not satisfied

Deflection check display

Here we immediately see that some nail plates are not satisfied and therefore can directly display the joints results:

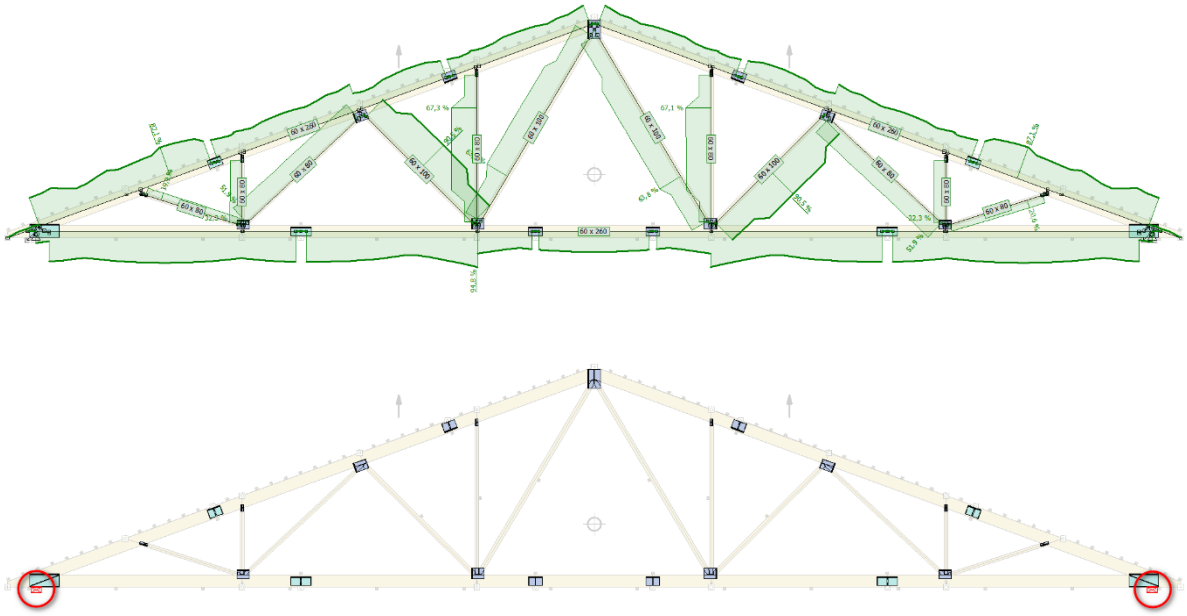


Apparently, the auxiliary plates at the heel joints don't' have a sufficient bite into the chords. Due to the fact that the timber cross sections of the chords are big enough to place the wedge and the main plate above the support, we can omit the usage of an auxiliary plate.

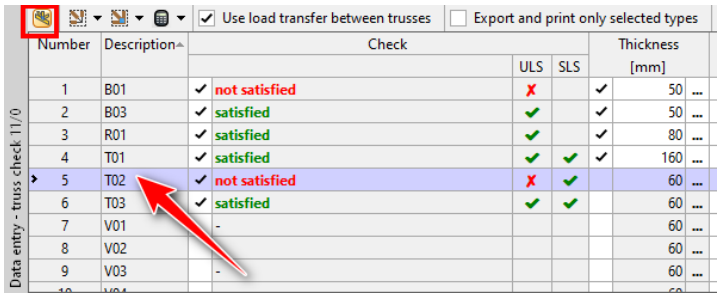


Right mouse click on the left heel joint, select “Edit joint” from the context menu, switch to tab “Bottom detail” and select “only main plate” from the drop down list below “Automatic wedge design”. Close the dialog with “OK” and re-analyse the truss by hitting <F8>. The truss is successfully designed.

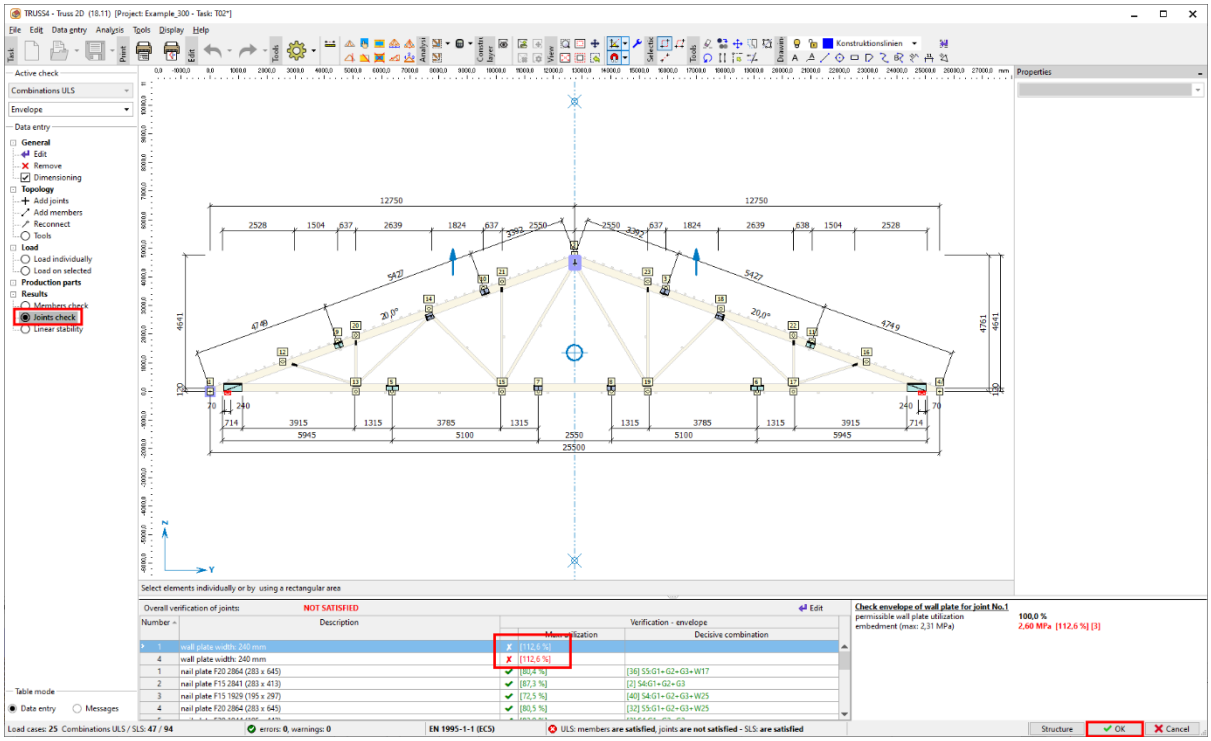
Then we look at truss T02, we check the members result where everything is ok, then we check the joint results and see the truss is overstressed at the two supports.



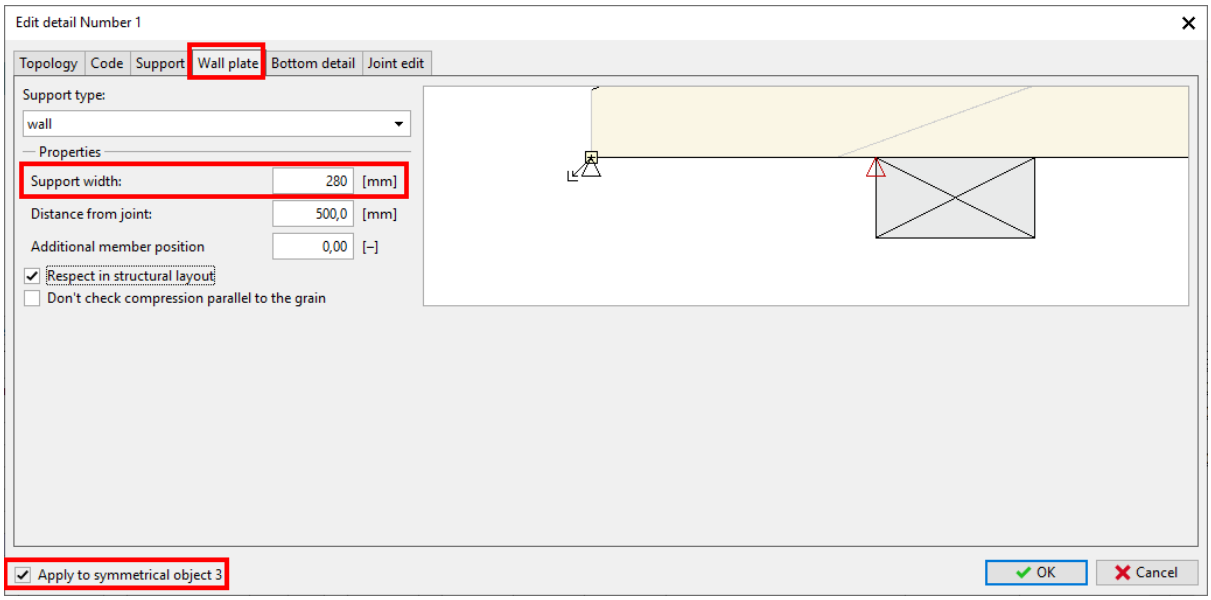
Double click on truss T02 in the results table, so Truss2D gets launched with this truss opened. Alternatively select T02 in the results table and then click on the Truss2D icon in the upper left corner above the table.



In the options window on the left select “Joints check” and look at the results in the table below the truss window. Joints 1 and 3 (heel joints) show an overstress of 112,6%, which means that the current length of the support at 240mm is not sufficient.

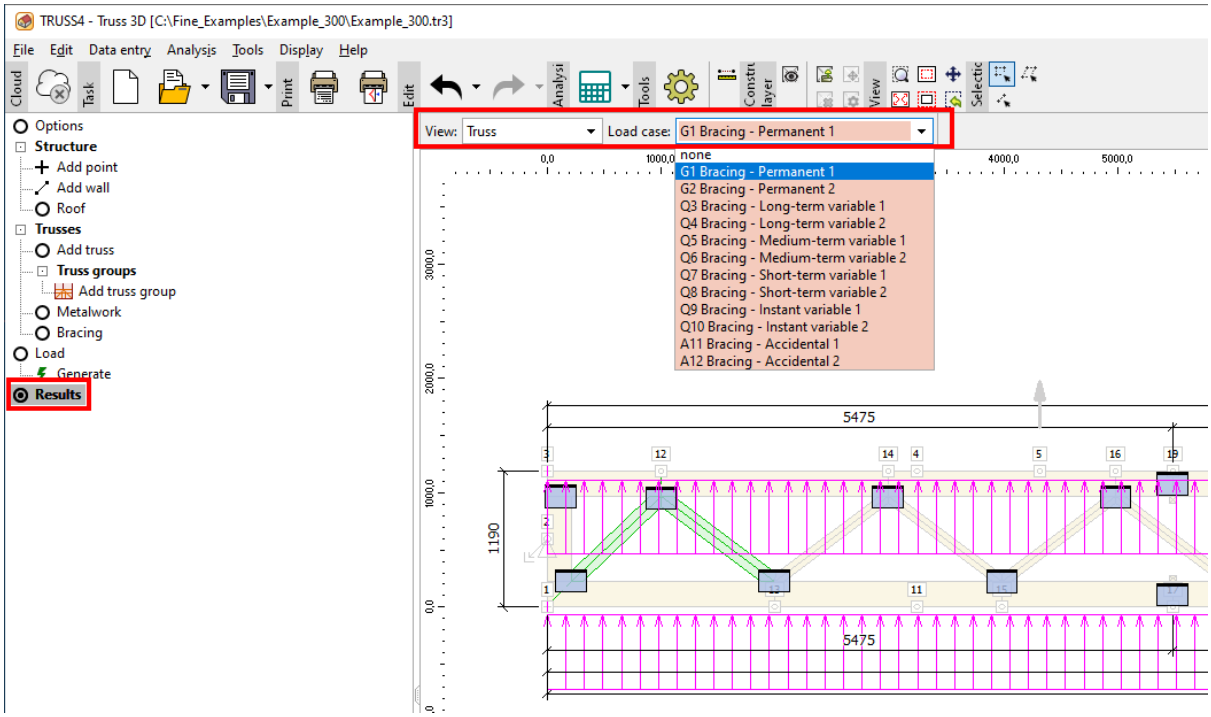


Close the Truss2D by clicking on “OK” in the lower right corner of the program. Back in Truss3D right mouse click on joint 1 (left heel), select “Edit joint” from the context menu and on the “Wall plate” tab change the “Support width” to 280mm.



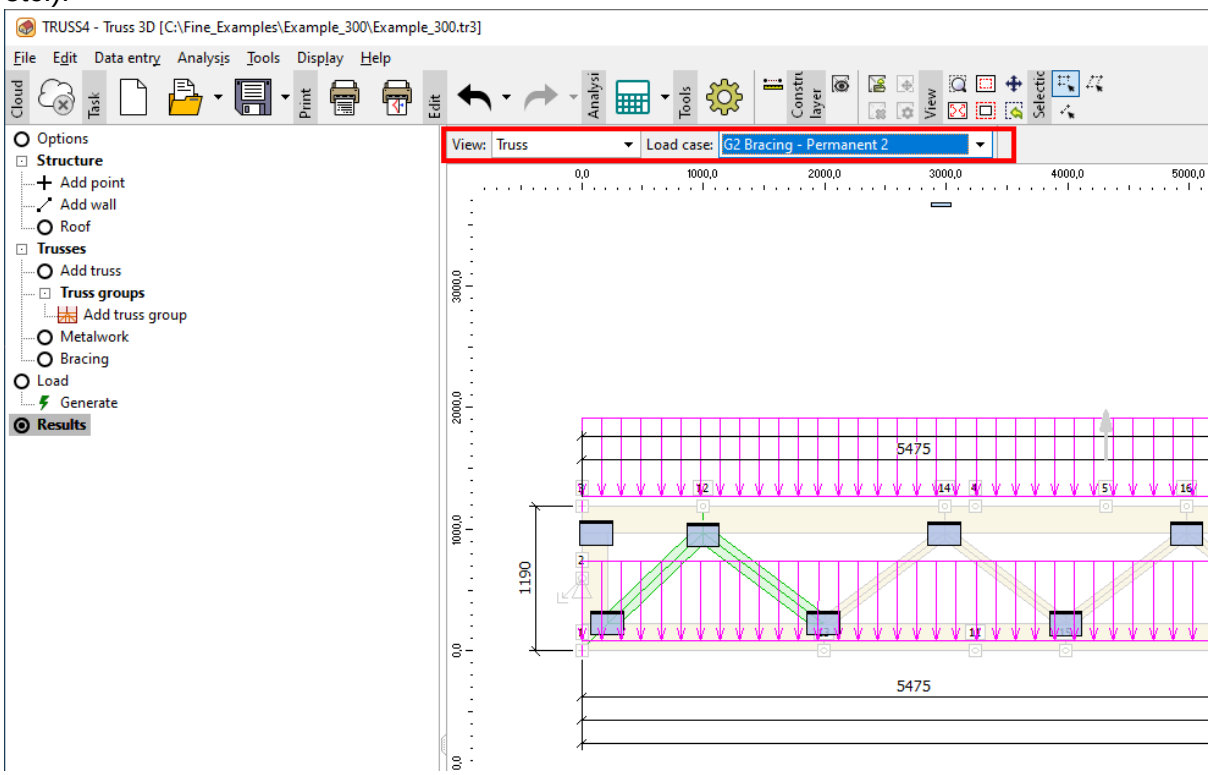
If “Apply to symmetrical object 3” in the lower left corner was ticked, the change should have been applied to the right heel joint, too. Hit <F8> and observe that the truss is now successfully designed. The increase of the support is usually done by using a steel plate of the required length.

We move on to design the bracing frame B01. Before we look at the existing design results we have an eye on the loads and the design criteria of bracing frames.



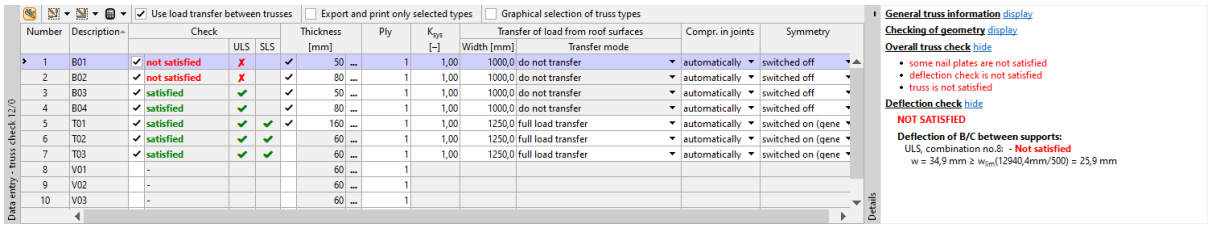
A bracing frame has significantly different load cases from standard trusses. The loads and in alternating directions on the chords, being a result from axial forces in the trusses that are braced and are related to the load duration classes (permanent, long-term, medium-term

etc.).

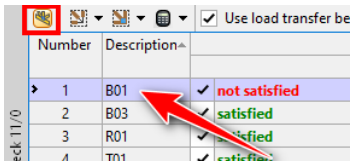


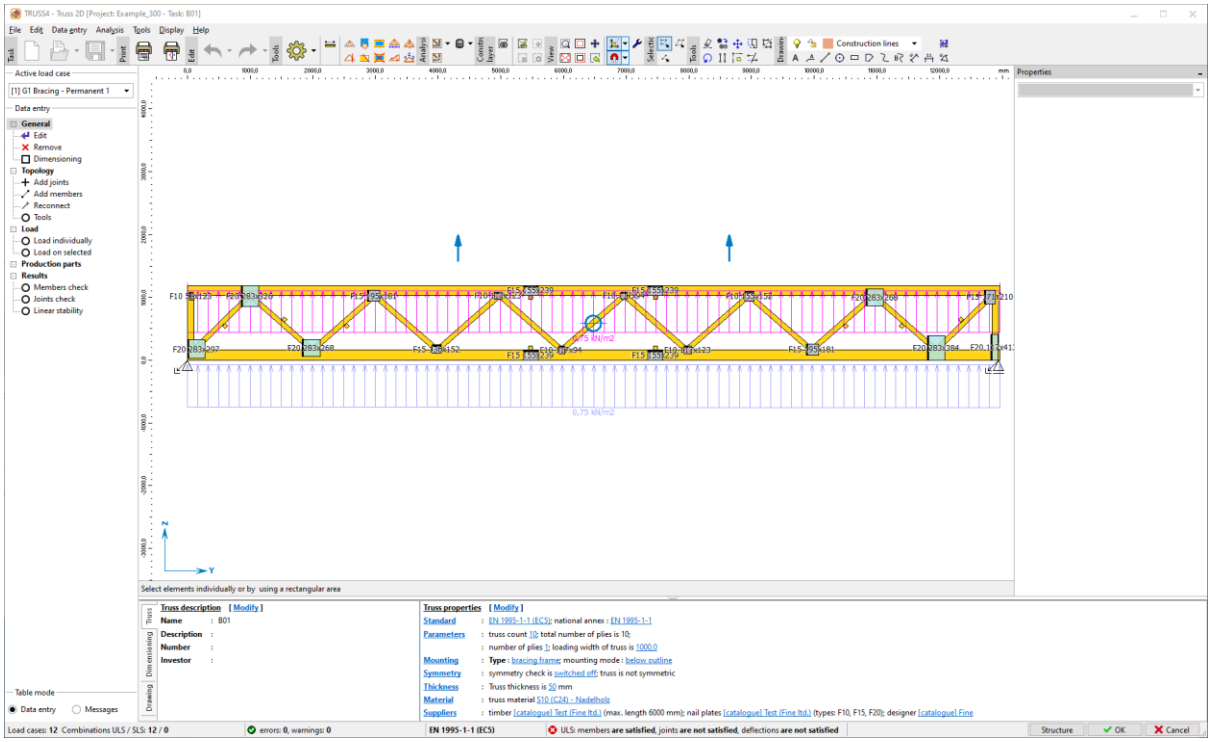
The load values are calculated on the basis of equation (9.37) EN 1995-1-1:2010-12, considering the number of trusses to be braced, the average compressive force in the braced truss member and the length of the bracing itself. These calculated loads only consider the imperfections (bows) of the truss chords, not loads deriving from inclination of the trusses or from external wind loads, e.g. wind on gable.

From the look at the results overview we see that some nail plates are not satisfied and also the deflection check is not fulfilled. As we are using the entire scope of all nail plates in the database, the design becomes a lengthy process. For this reason, it is recommended to use only one type of nail plate, here the F15 (15mm gauge).

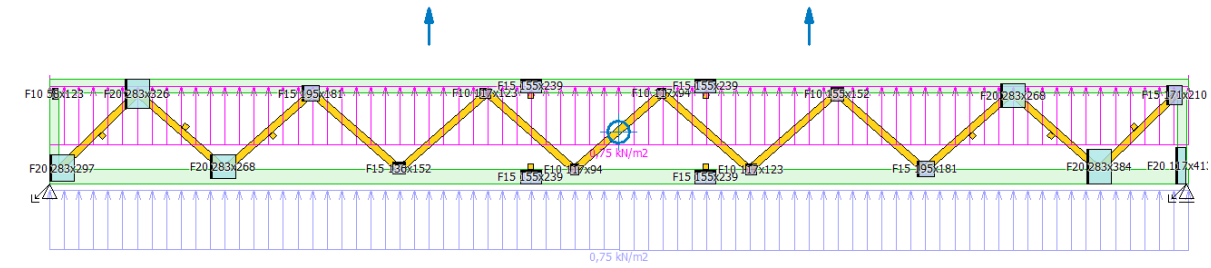


The end verticals of the bracing beam will have to provide enough width for connection with the vertical frame B02, so we increase their width to 220mm. The chords contribute to reducing the deflection of the frame, so we also increase them to 220mm. These changes can be done in an easy way in Truss2D. Double click on truss B01 in the results table or click on the icon Truss2D in order to launch that program.

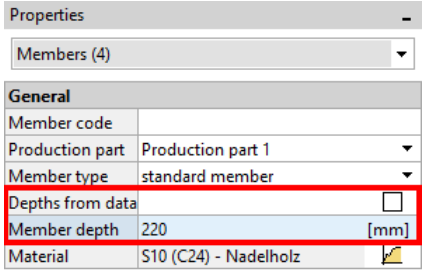




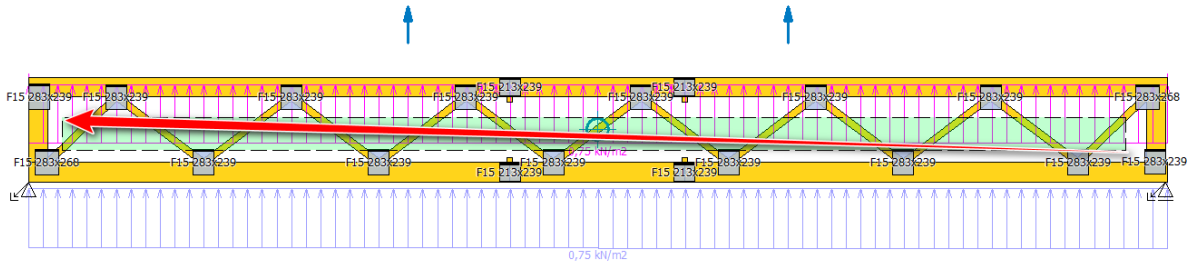
Click left on both end verticals and chords to select them.



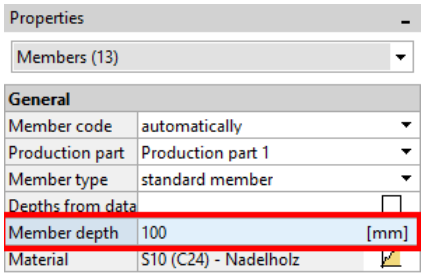
On the right-hand side in the Properties window untick the check box “Depth from data” and enter a value of 220 for “Member depth”.

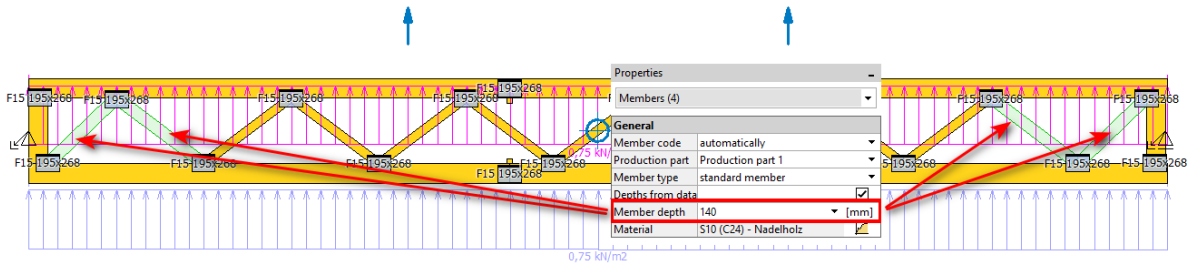


All selected members now have a depth of 220mm. Unselect those members by hitting <ESC>, then open a rectangle from right to left which touches the webs only.

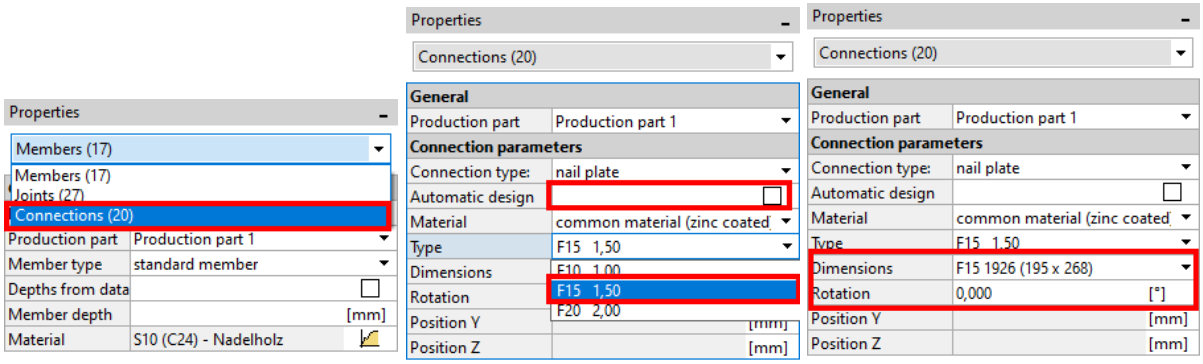


Change the depth of all webs to 100mm. Then select the two left and right most diagonals only and set their depth to 140mm.

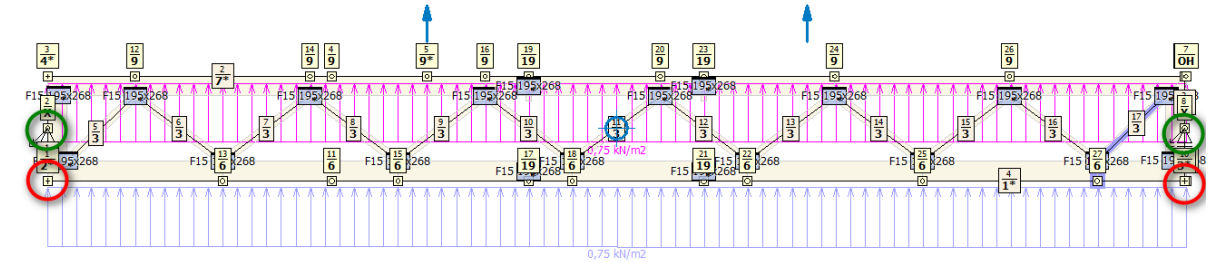




Select the entire truss by hitting the key combination <Ctrl+A>. Below properties select “Connections” from the drop-down list. Untick “Automatic design” and select “F1,50” under “Type”. Set all nail plates to size 195x268 and the orientation (rotation of all plates) to 0°.

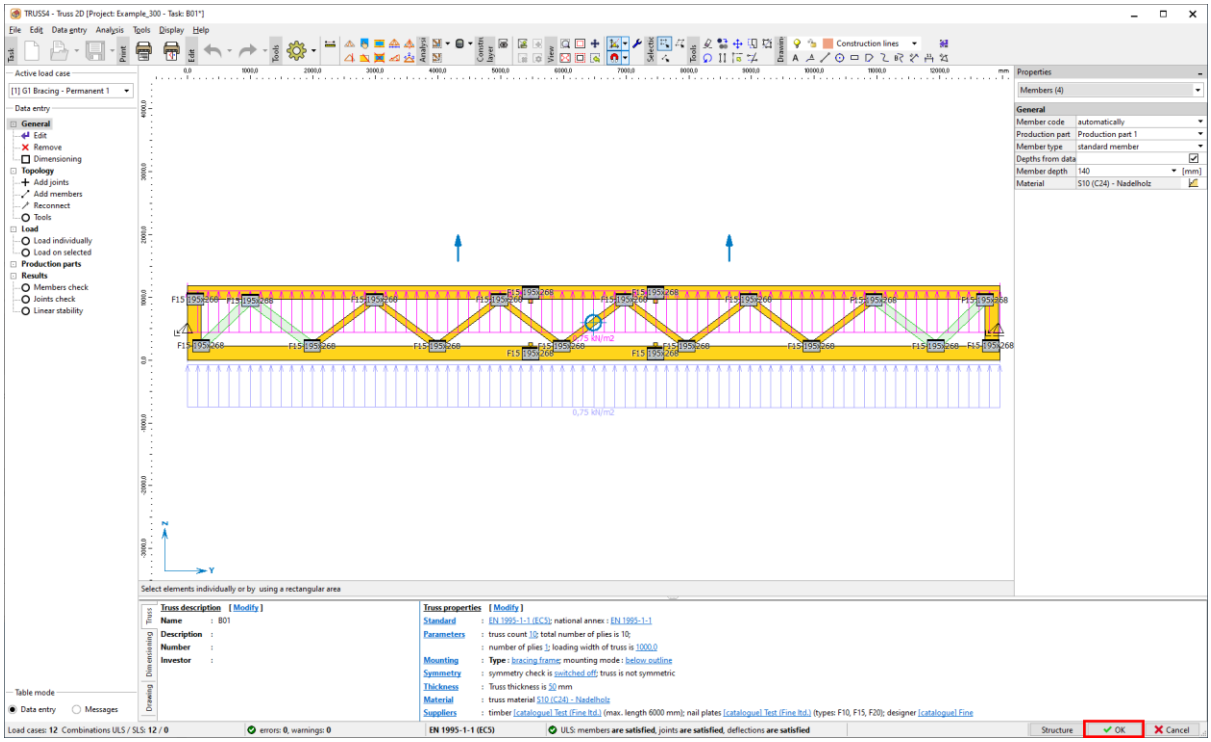


Finally change the current supports location from the heel joints in the lower edges to the existing mid-joints at the end verticals. This is a more realistic modelling of the truss, as in fact it will be connected to B02 all along these members.



Right mouse click on joints 1 and 10 and change the “Support” from “hinge” and “Displ.Y” to free and set joints 2 and 8 to “hinge” and “Displ.Y”.

Click on “OK” in the lower right part of the program window to close Truss2D and return to Truss3D.



Analyse the truss by hitting <F8>, it should satisfy all requirements now.

General truss information display

Checking of geometry display

Overall truss check hide

- truss is satisfied

Deflection check hide

SATISFIED

Deflection of B/C between supports:

ULS, combination no.8: - Satisfied

w = 22,9 mm ≤ w_{lim}(12724,0mm/500) = 25,4 mm

Divergent from roof trusses the deflection check for bracing frames is carried out by using ULS load cases. The deflection here is limited to 1/500 of the distance between supports and must strictly be fulfilled, otherwise the bow of the top chord of the main trusses would

exceed the limits for which formula (9.37) is still valid, resulting in higher loads acting on the bracing frame.

Further steps to finalize this project would be creating documentation and files for driving saws, presses etc. As this is not part of this example, we are done with it and can save the project.

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