HiCAD

UNLIMITED CAD PERFORMANCE **DEVELOPED BY ISD**

Steel Engineering Training

HIC-TR-ENSTB911-2024-0

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THE WORLD OF CAD AND PDM SOLUTIONS

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Steel Engineering Training

Summary

1 Introduction

1.1 Increase your knowledge by training courses

- **Professional Training**

  Fresh ideas and innovative model drawings combined with a professional working method make your staff indispensable. Our extensive and well-structured training program will ensure that this potential will be enhanced even further. Whether as HiCAD beginner or experienced specialist – our sound and solid, industry--specific training courses will provide you with the skills that are required for all of your future projects.

- **Individual learning**

  Every company has its own unique identity – with individual processes, targets, challenges and training requirements. Therefore, our range of training courses comprises a multitude of extensive topics, from basic training and update training to individual training courses tailored to meet your requirements. We will adapt precisely to your demands and, in doing so, add the missing “puzzle piece” that is required for an optimal use of HiCAD.

- **Practice-oriented Use**

  You want to benefit from the full potential of our software, and we want you to use the full potential of your staff! Let our qualified trainers show you in a training course how to further increase your efficiency and productivity at work. Step by step, you can familiarize yourself with the operation of HiCAD and HELiOS, learn about useful Tips & Tricks for our software solutions and deepen your knowledge so that you can apply in practice what you learned in our courses. As a result, you will be enabled to tackle your projects in a flexible manner, while being able to carrying out your tasks at short notice, competently executed and in a timely manner.

1.2 How to use this Training Book

This training book has been conceived in such a way that you can go through the exercises again after completion of the training course, i.e. on your own and without the instructions of the trainer.

Please note the following conventions used in this training book:

Dark red, bold	All elements of the user interface such as the names of the Ribbon tabs, functions, titles of dialogue windows, texts in dialogue windows etc. are displayed in dark red and bold type.
	Exercise steps that need to be executed are indicated by a red arrow symbol.
Black, bold	All inputs entered in the input fields of dialogue windows are shown in black and bold type.
	Tips, notes, alternative procedures or other explanations for the sake of a better understanding are indicated by these symbols.
	This symbol can be found at the end of an Exercise. It indicates that the Exercise has been completed.

We hope to meet your demands with regard to this training course. If this should not be the case, please do not hesitate to let us know, because your opinion and your suggestions matter to us. Simply send an E-mail to info@isdgroup.nl.

We wish you a lot of success with the following training!

2 General

2.1 Short introduction

In this book you will learn the most important functions of the HiCAD profile engineering / steel engineering module. Each chapter describes a topic. At the end of each chapter you will find one or more exercises.

2.2 Purpose of this course book

This book describes the profiles and steel construction of HiCAD and is intended as a training book. The target group is constructors, technical draftsmen and product managers. The course is designed in such a way that you can work through the chapters one after the other.

This training covers the following topics for the Profile engineering module:

- Select profiles from a library
- Installing profiles
- Editing the profiles
- Creating a simple working drawing with parts list and position numbers (without automatic dimensions)
- Drawing your own profiles and placing them in the library

This training covers the following topics for the Steel engineering (module):

- Position numbering of parts with equal and unlike shapes
- Creating a complete production drawing with Bill of material list (with automatic dimensions)

2.3 What is the HiCAD Profile engineering / Steel engineering?

HiCAD is the complete solution for the entire development and construction process. Its modular structure makes it suitable for both beginners and highly automated engineering processes.

The seamless integration of 2D/3D functionality, object-oriented working and an associative data structure make an uncomplicated working method possible. The hybrid data model with surfaces and volume modelling and feature technology delivers high productivity that can be further expanded by special modules such as:

- Steel Engineering (is covered in this course),
- Sheet metal,
- Plant engineering,
- Constraint manager and simulation,

- HELiOS Product data management,
- BOM generation, ERP connections, connections with NC-programs,

HiCAD works in a building part-oriented manner, so the logical structure of your HiCAD construction is identical to the structure of the actual product. This makes editing drawings considerably easier. In addition, HiCAD distinguishes itself with an intuitive user interface, which makes it easy to learn HiCAD and ensures that both the 2D and 3D data structure as well as the integrated industry modules are easily accessible. This accessibility allows you to work combined in 2D and 3D in one file.

3 Starting with the Steel Engineering module

- Start HiCAD via the Windows Start button or via a possibly available shortcut.

  After some time the HiCAD Start Center will appear. Here you can choose what your first action(s) will be in HiCAD. This is not mandatory. You can also disable the HiCAD Start Center and click the first action(s) yourself in HiCAD.

- Change the settings like the image below and press OK. HiCAD will now do the following:
  - Create a “Main Assembly”
  - Activate the Steel Engineering Ribbon
  - Make a processing plane in the “X/Y-plane”
  - Activate the “Top view”
  - Show the parts in I Glass model”

- Use the following settings for exercise 1.

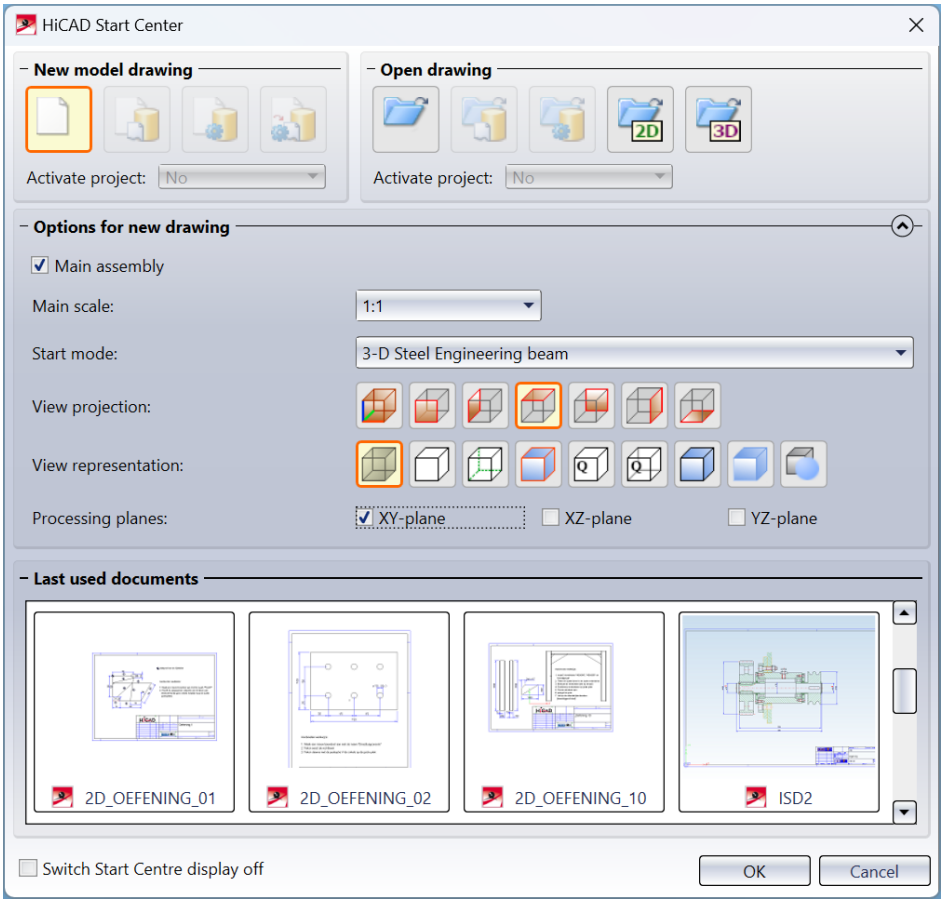


Figure 1 HiCAD Start Center

Make sure that the “Steel Engineering” Ribbon is active. You can check the “Ribbon” on the top of you HiCAD screen:

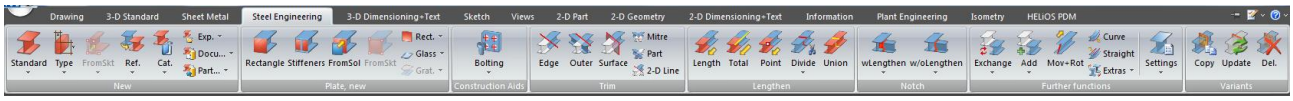


Figure 2 Steel engineering Ribbon

Here are the functions for Steel engineering shown. This module operates from left to right.

Making parts in a drawing:

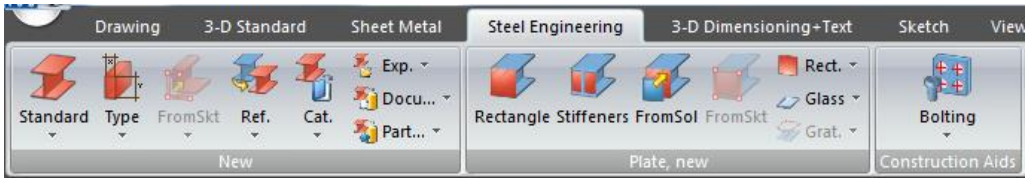


Figure 3 Steel engineering Ribbon – new Parts

Adjusting parts in the drawing:

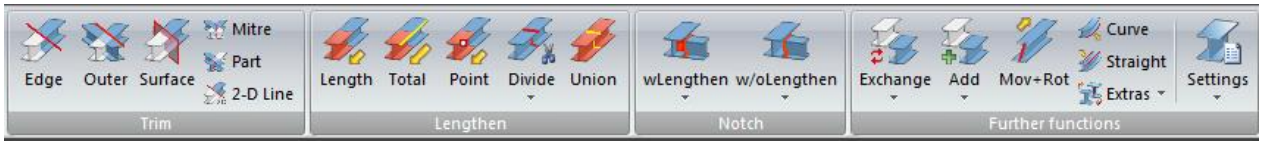


Figure 4 Steel engineering Ribbon – adjust beams

Develop parts into a production drawing and more settings (“drawing” Ribbon):

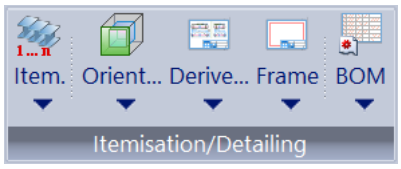


Figure 5 Drawing Ribbon – Itemisation and Detailing

Further more there are also “extra” functions that, for example, allow automatic connections to be made or stairs and handrails to be generated. With a few exceptions (for example “connect pipes”), this function can only be accessed if you have the steel construction module and not just the profiles module. Those functions can be found on the right side of the drawing via Civel Engineering functions.

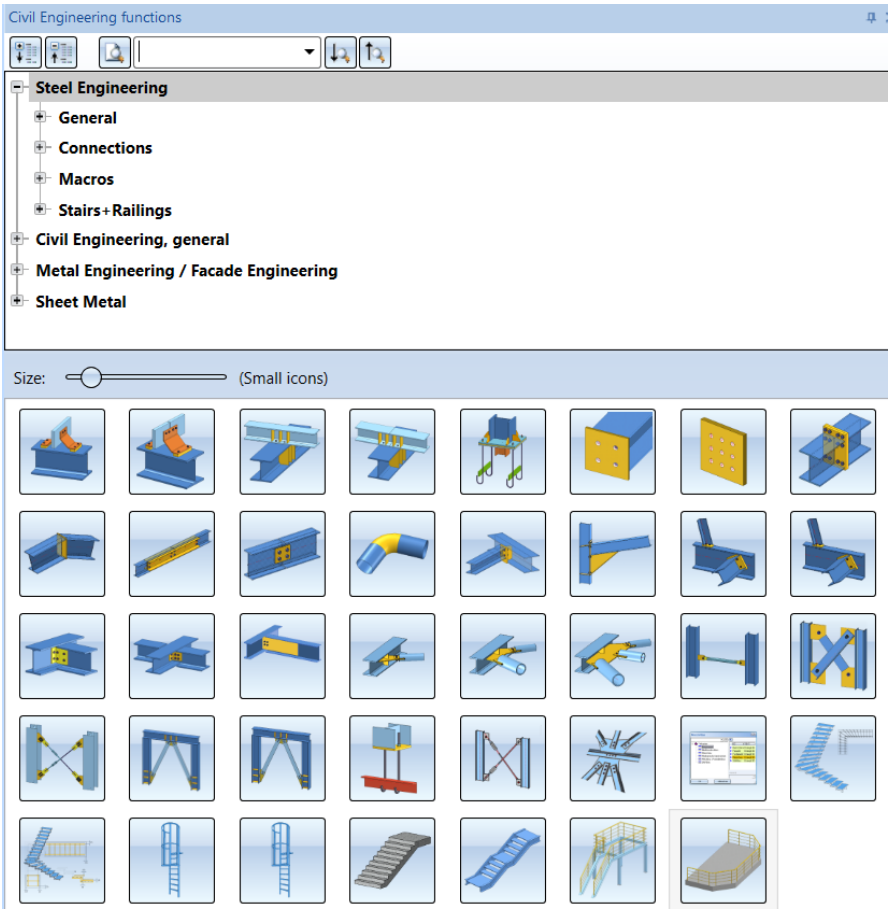


Figure 6 Civil Engineering functions

The last 3 buttons in the Steel Engineering Ribbon are for copying, updating or removing “variants”:

Figure 7 Edit feature variants

If these functions do not work for you, remember that you can always fall back on the 2D/3D functionalities that HiCAD offers.

Also pressing the F1 button while your mouse is on a button will open up the Help website of HiCAD that will give you more info about the functionality.

3.1 Main beam function

The standard beam function is called using Figure 8 Insert new beam.

After some time Figure 9 Function overview of the standard beam. This screen will be further explained from top to bottom.

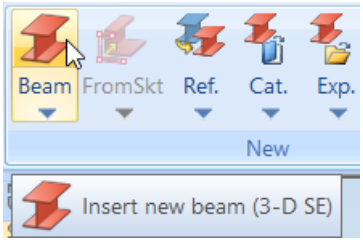


Figure 8 Insert new beam

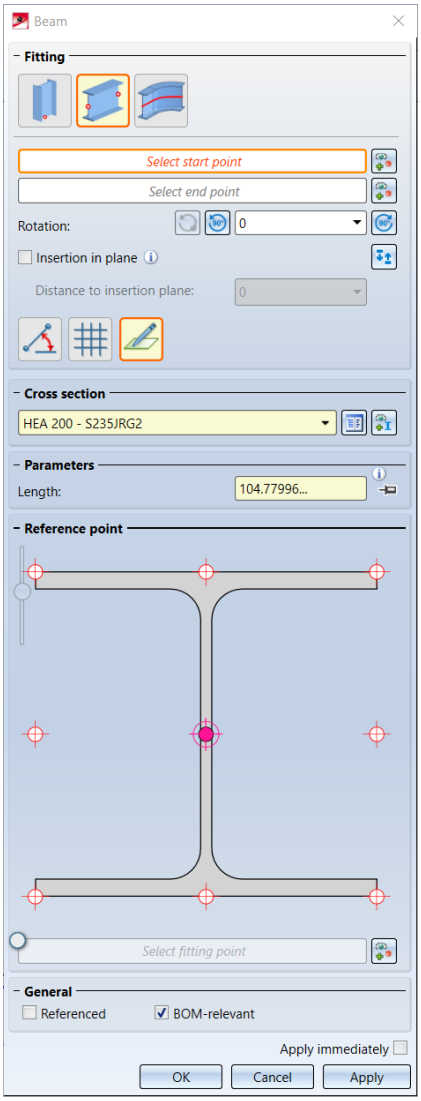


Figure 9 Function overview of the standard beam

3.2 Insert Beam → Fitting options

There are 3 options available:

- Insertion perpendicular to processing plane
- Insertion via 2 points
- Insertion along guideline

For each of those 3 options there are 3 optons on how the fitting point (position in the drawing) should be entered.

By defining a distance and an angle  .

By defining a XY grid 

By defining free 

3.2.1 Fitting option 1: Insertion perpendicular to processing plane

By activating the function showin in Figure 10 Insertion perpendicular to processing plane will the profile be drawin perpendicular (vertical) on the processing plane. Therefore it's only nessesairly to give in 1 point. The end of the beam will be determined by the length wich you will give in further down in the screen.

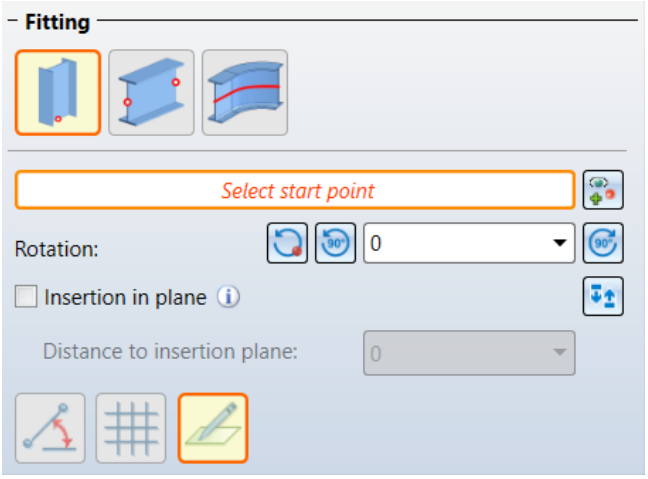


Figure 10 Insertion perpendicular to processing plane

3.2.1.1 Rotation of the beam

Afhter the insertion point the rotation of the beam can be deterimend. This can bedone via 3 options:

- Selecting a point in the drawing. Use image:  .
- A 90 degrees roations via the buttons left and right from the entry field. Use image:  .
- By typing in a value in the entry field. Use image:  .

The behavior of the rotation depends on the insertion point. This gives the part it's internal coordinate system.

3.2.1.2 Insertion in plane

If the beam needs to be placed on the processing plane regardless of the point that is selected, please activate the checkbox before "insertion in plane". Whether the beam would be a given value higher or lower than the plane, this can be given by the entry field next to "distance to insertion plane:". Please see Figure 11 Insertion in plane.

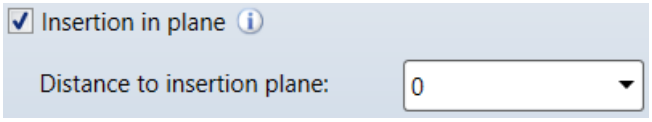


Figure 11 Insertion in plane

Via klicking on the button "switch ends"  the internal coordinate system can be changed.

example:

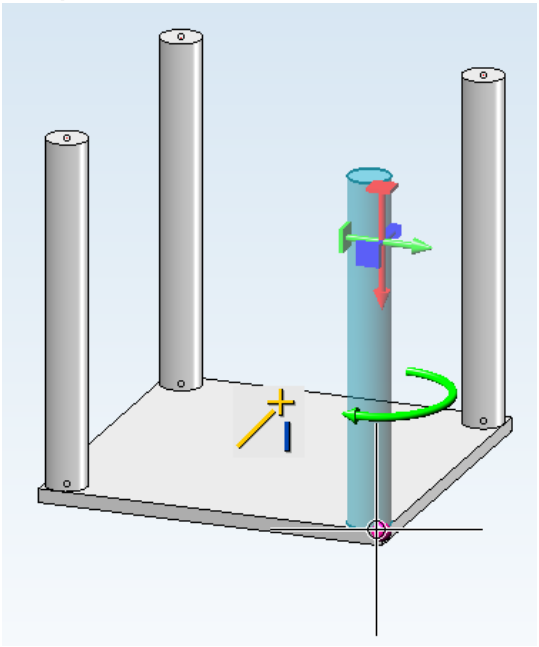


Figure 12 placing perpendicular to processing plane

→

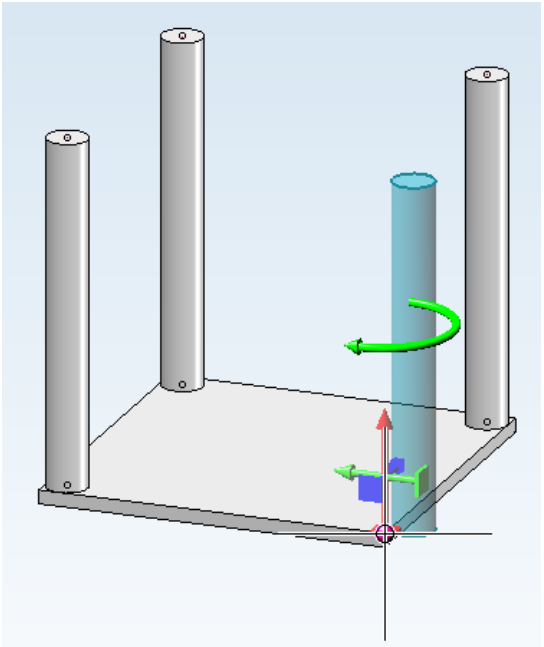


Figure 13 placing after switch ends

3.2.2 Fitting option 2: Insertion via 2 points

When the second option is active, shown in Figure 14 Insertion via 2 points. HiCAD will require two point to be given. The starting point and the end point of the profile. Depending on the checkbox “insertion in plane” the new beam will be drawn in the 3D space or into the processing plane.

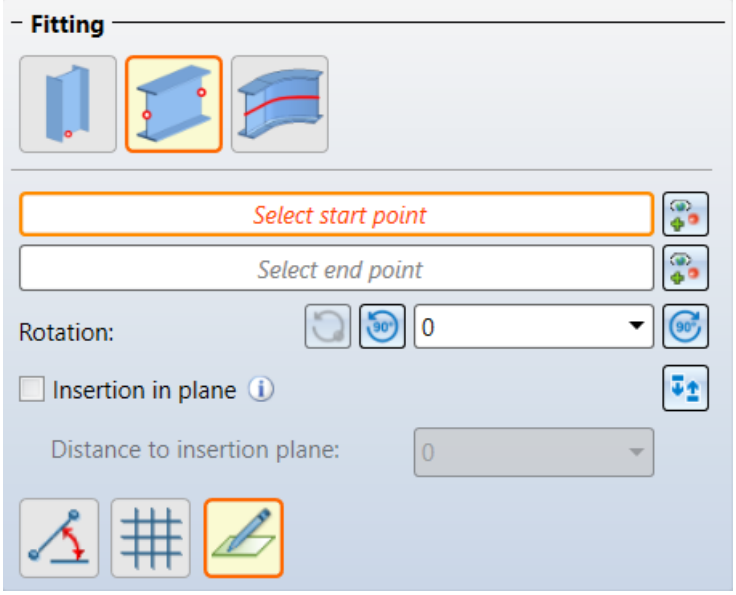


Figure 14 Insertion via 2 points

Example of selecting 2 points:

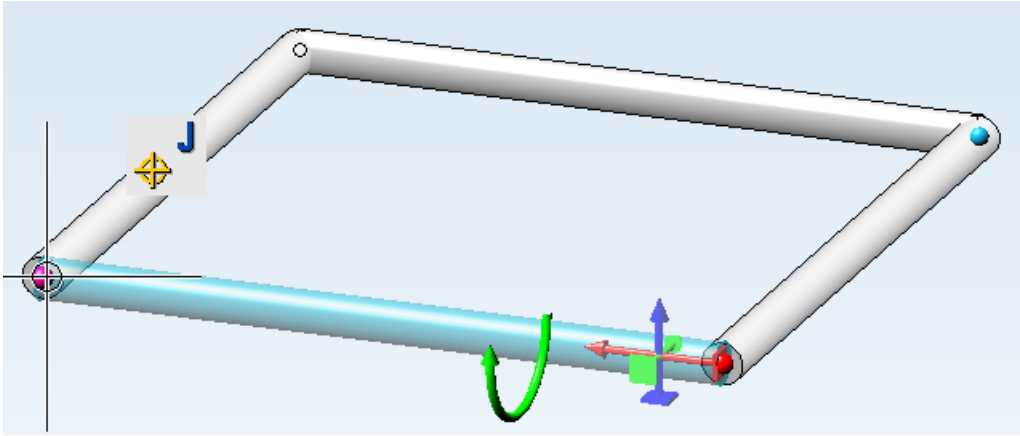


Figure 15 Insertion via 2 points example

3.2.3 Fitting option 3: Insertion along guideline

If you want to run a profile along a line (“3D Sketch”) in the X, Y and Z, use the function from Figure 16 Insertion along guideline to place a profile over it. It’s also possible to use a Sketch (so not 3D sketch).

This sketch can be created before you start the function and than be selected by the following button: 

Also a new sketch can be created while the beam function is used. This can be done by the following button: 

If you want to keep the sketch in the 3D-part structure you can “uncheck” the checkbox before “delete sketch afther creation”. This is not mendetory because the sketch is always stored in the features, where it can be loaded from right back into the 3D part structure. Than edited and ex-changed to update your just created profile.

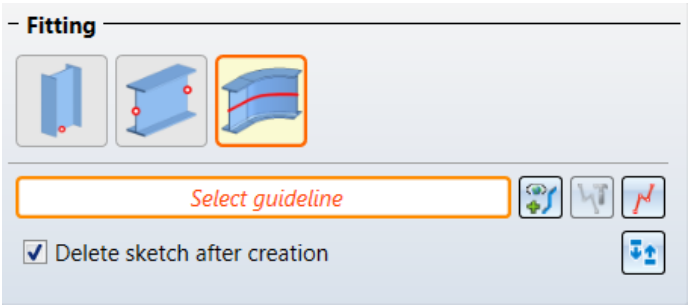


Figure 16 Insertion along guideline

Example Select Guideline:

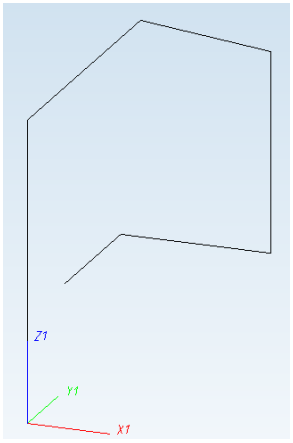


Figure 17 3D-sketch

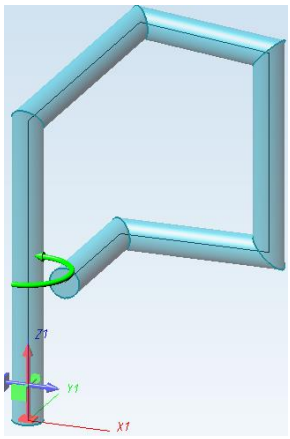


Figure 18 3D-sketch after select guideline

Example of retaining the sketch from the feature by double clicking on “Guideline Load”

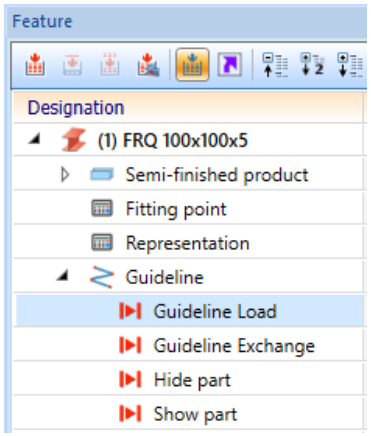


Figure 19 Guideline Load in Feature Parameters

The beam function and prototype beam function are intergraded into 1 function. Therefore you can select from which source you want to select or create your beam/profile.

By selecting the left icon the catalogue will be used.

By selecting the right icon a prototype beam can be created and stored into the catalogue.

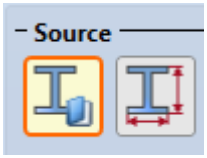


Figure 20 Selecting profile: “Source”

When the left Icon is selected the cross-section of the profile can be slected from the configured catalogue.

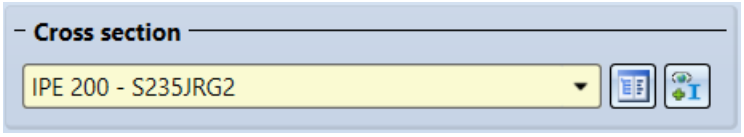


Figure 21 Standard Beam from catalogue

When the function select from catalogue  is selected the standard HiCAD prfile library will be shown:

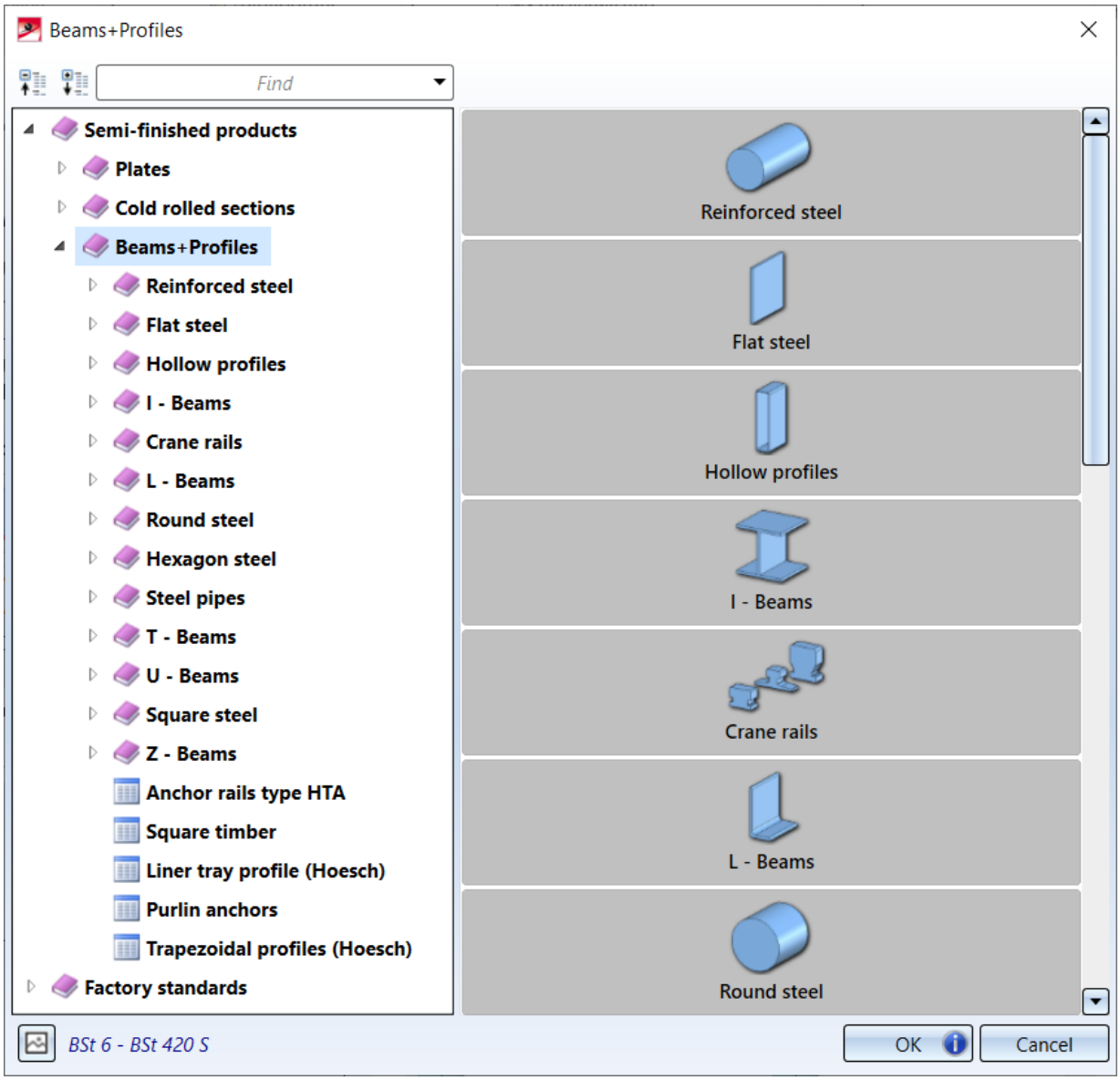


Figure 22 Standard Beam catalogue

On the left top corner there is a search menu where you can type the desired profile or beam.

Figure 23 Find bar in Select beam from Catalogue

This way you can look up your correct table or you can of course manually browse through the library. Then select a size and material. You confirm the selection by double clicking on the size or the “OK” button.

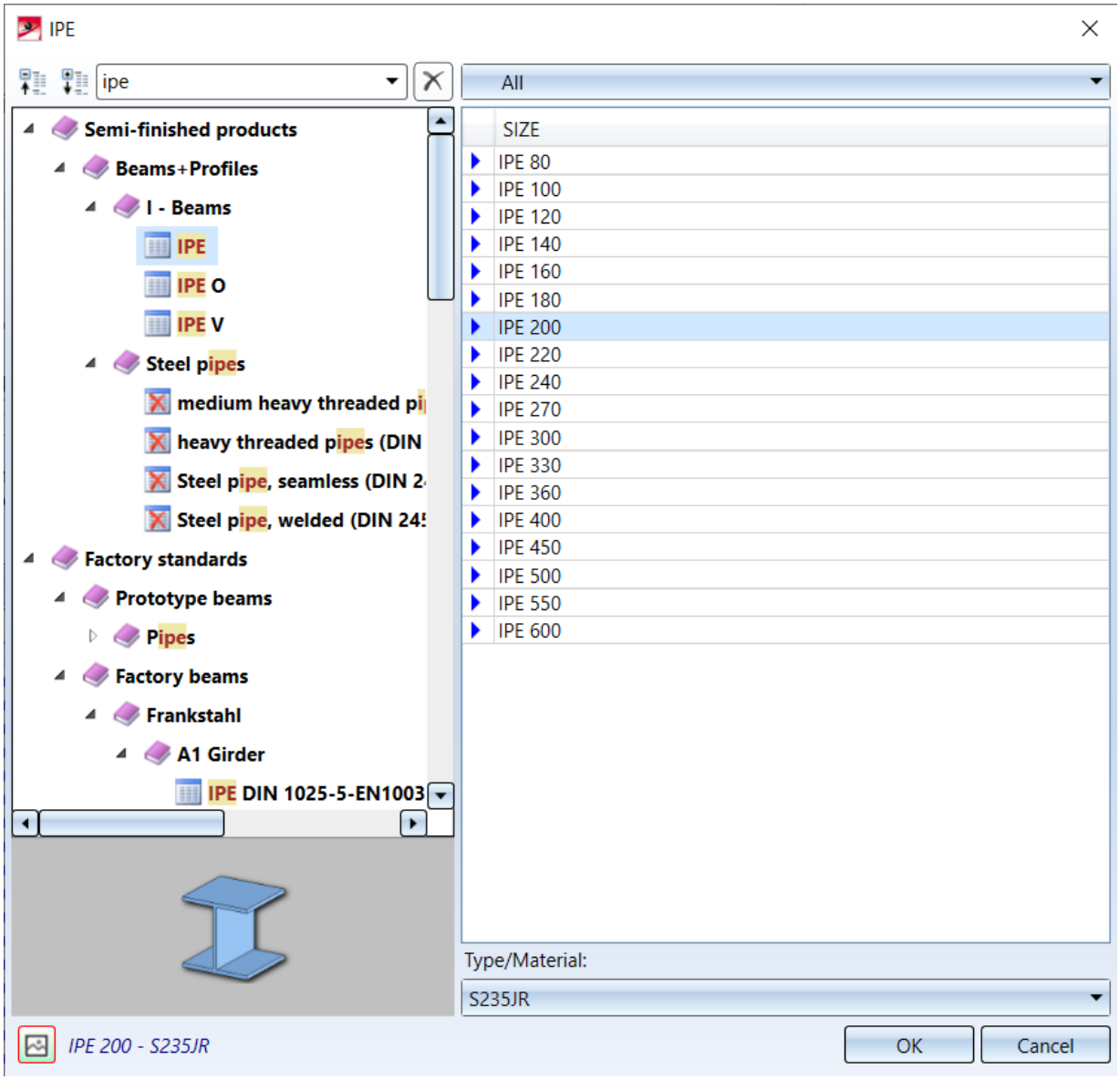


Figure 24 Find IPE example in catalogue

When the function select from catalogue is active it’s also possible to select the following buton:

“adopt cross-section from refence pofile” 

Now you can select a profile in the active HiCAD drawig to use this to contune to design with the same profile.

3.2.3.1 Parameters

When the function “Insertion perpendicular to processing plane” is active the length of the profile can be given by inserting the value in the entry field behind “Length:” and “Fitting depth”.

Length: detriments the distance between the selected point and the end point along the positive of the Z-axis from the processing plane.

Fitting depth: detriments the distance between the selected point and the end point along the negative of the Z-axis from the processing plane

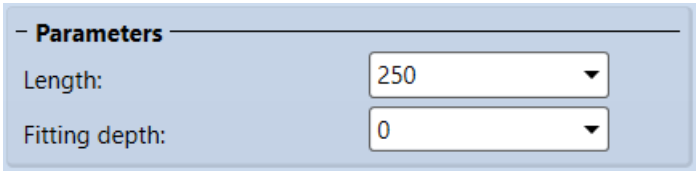


Figure 25 Length parameter when “insertion perpendicular to processing plane” is active

When the function “Insertion via 2 points” is active the length will be calculated automatically. This can be adjusted later by pressing on the following button:

Figure 26 Length parameter when “insertion via 2 points” is active

3.2.3.2 Reference point

This setting determines which installation point will be used. There are 9 installation points visible in Figure 27 Selecting reference point. These installation points are located in the cross-section of the profile. The line (start and end point) that is drawn will lie at this installation point.

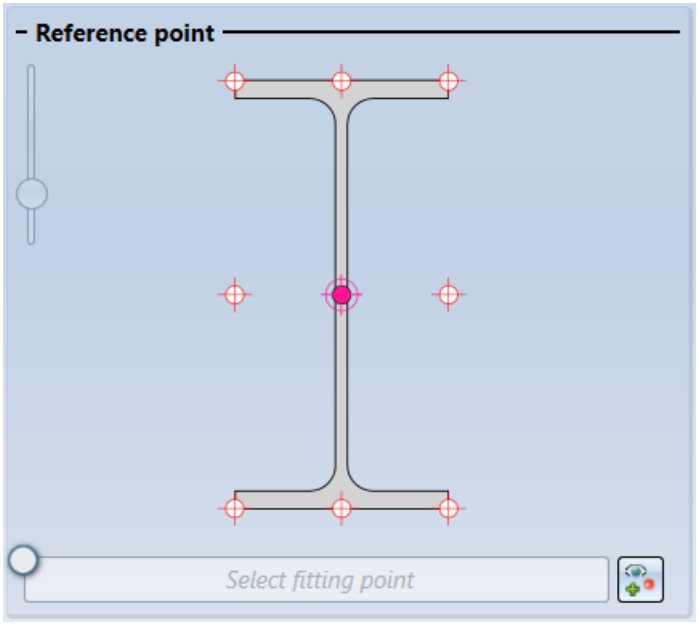
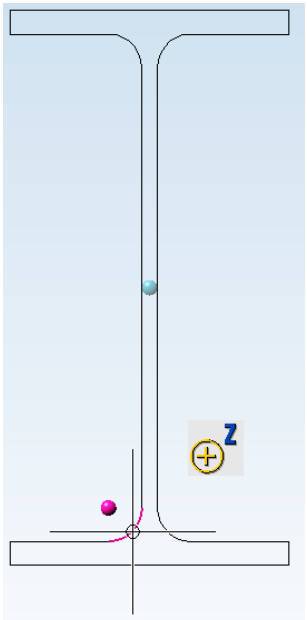


Figure 27 Selecting reference point

It's also possible to define your personal reference point. This can be done by clicking on the following button: 

example:



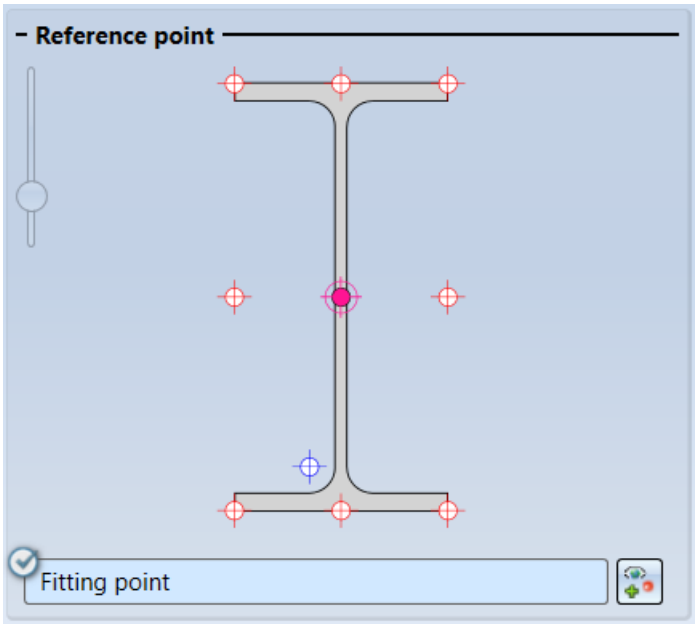


Figure 28 Defining fitting point Figure 29 Visualisation of selected fitting point

3.2.3.3 General

At the very bottom it's possible to reference the part and determine if the part should be Bill of materials (BOM) relevant. Please see Figure 30 general options.

By selecting OK the profile will be placed and the function screen will be closed.

By selecting Cancel the function screen will be closed and no beam will be placed.

By selecting Apply the profil will be placed in the drawing and the function menu will stay active. The apply can also be selected by pressing the middle mouse button. First time is Apply will be used, the second time the cancel option will be used.

By checking the checkbox behind "apply immediately" the part will be placed directly when selecting the insertion point(s).

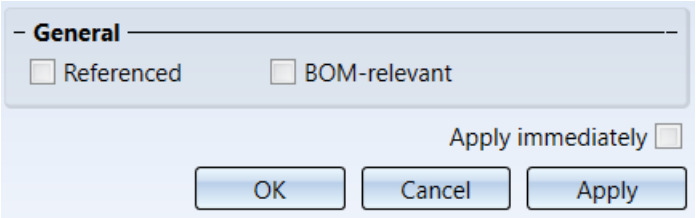


Figure 30 general options

4 More beams

In addition to the Standard Beams in HiCAD, there is also the option to set up your own beams. A whole range of options have been created to give the user as many options as possible.

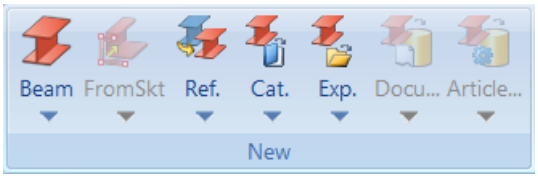


Figure 31 Steel engineering ribbon – insert new beam

4.1 Prototype Beams

Since HiCAD 2024 the Prototype beams is integrated in the “insert new beam” function.

This function makes it possible to quickly make a small variation on a standard profile via a menu and some parameters.

- Select the function by clicking on the second source option.

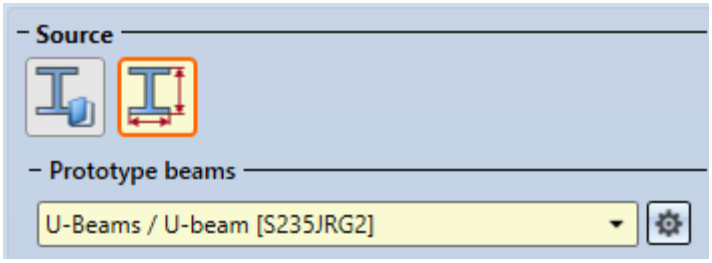


Figure 32 Selecting profile: “Source”

- Define the parameters (Geometric and technicaly) as desired

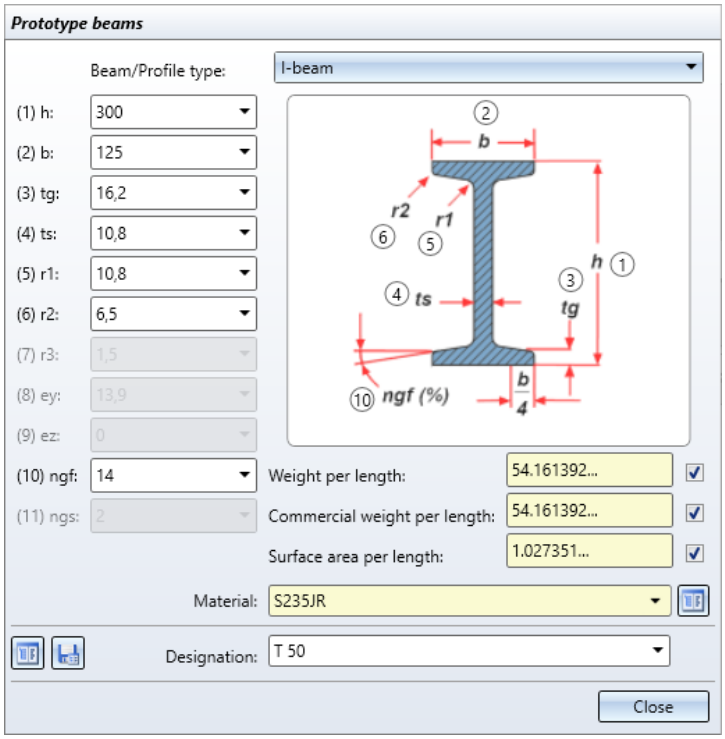


Figure 33 Configuration of Prototype beam

- Select OK to construct with the selected parameters.

  It's also possible to save the parameters in the catalogue so it can be quickly selected the next time.

- Use the save button: 

3.2 Beam from sketch

With the option beam from sketch it's possible to create a beam from a Sketch. By drawing the cross section in a sketch a 3D Profile can be create. To do this follow the following steps:

- Draw the cross section in a Sketch

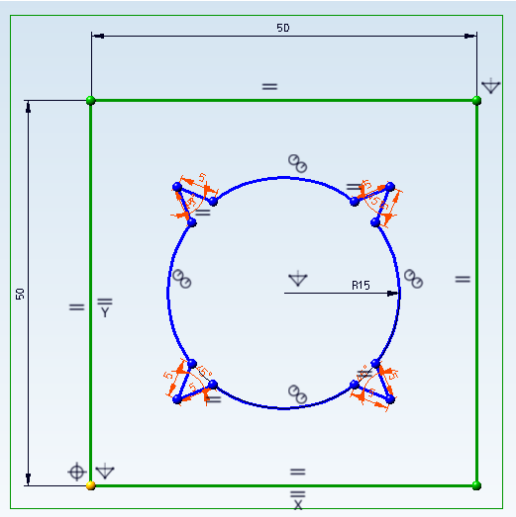


Figure 34 Sketch as cross-section

- Select the function

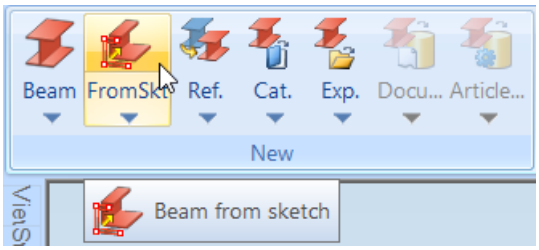


Figure 35 Steel engineering ribbon – Insert beam from Sketch

- Select the sketch
- Select the center of gravity of the beam (mounting point) in te sketch
- Give in the technical parameters of the cross section, like weight per length, article number/name and material type.

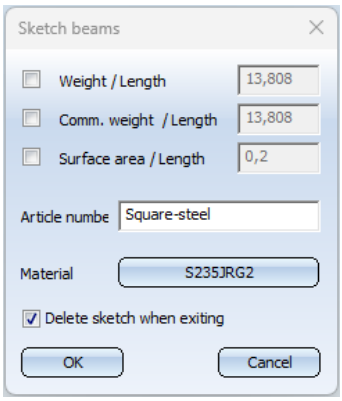


Figure 36 Beam from sketch properties

- Now the cross section can be used to construct

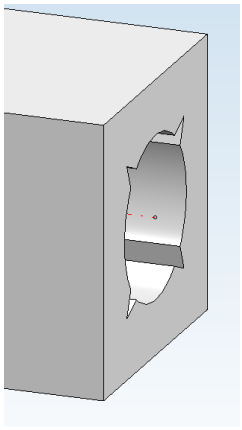


Figure 37 Resulting beam from sketch

4.2 Adopt cross-section

With this function, an already drawn profile can be reused without having to search with which function the profile was drawn, or in which library the profile is located.

- Select the obsolete function in the ribben or select the renewed function in the main beam function:

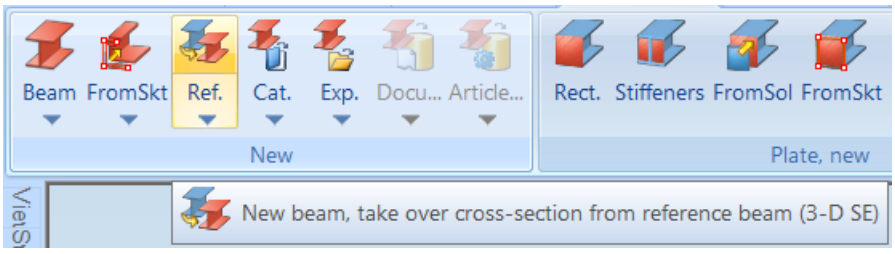


Figure 38 Obsolete function take over cross-section

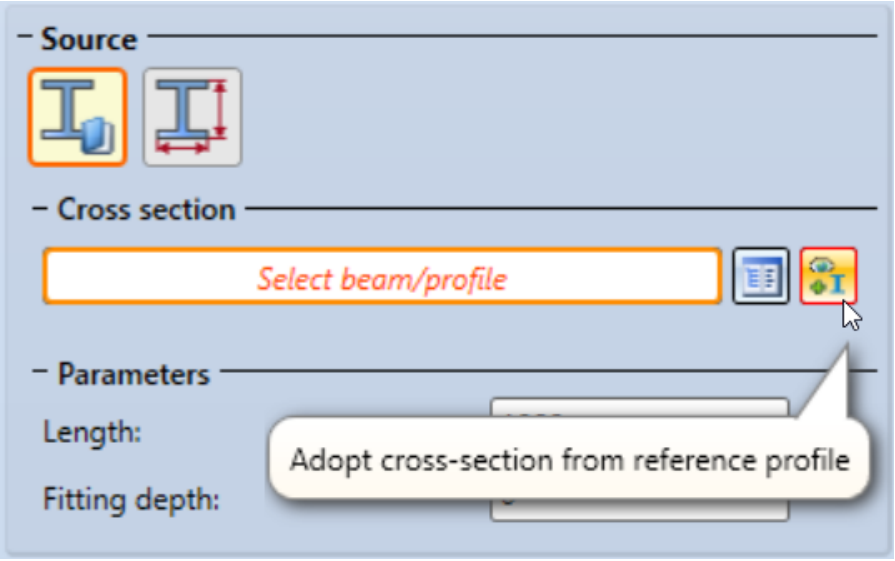


Figure 39 Adopt cross-section in insert beam dialogue

- Select the beam you want to use in the drawing
- Now the selected beam can be used to construct

4.3 Insert series via Explorer

If a 2D cross section (for example from a DXF import) has been saved as a separate part (example FIG file) can the function “insert series via explorer” be used to select this an use it for constructing.

Select the function

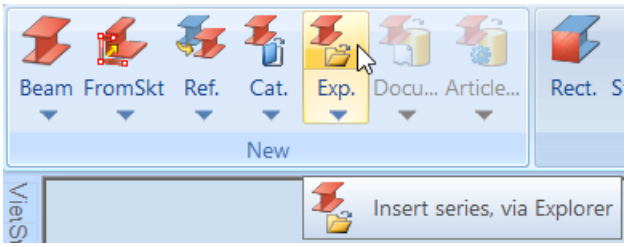


Figure 40 Steel engineering Ribbon – Insert series beam, via Explorer

Browse to the location of the files and select the desired one.

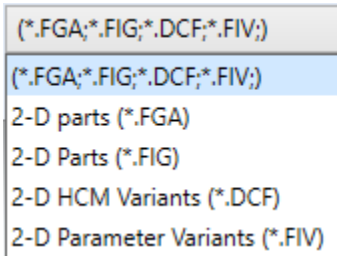


Figure 41 file type selection in HiCAD file explorer

Now the selected beam can be used to construct

Please note:

- There is a separate manual available on how to add your own profiles to this library. Ask your course instructor or the helpdesk about this!

4.4 Bar Elements

With the function Bar elements it's possible to draw only the gravity lines of the profiles / beams. This takes less performance.

- Select the function Bar elements

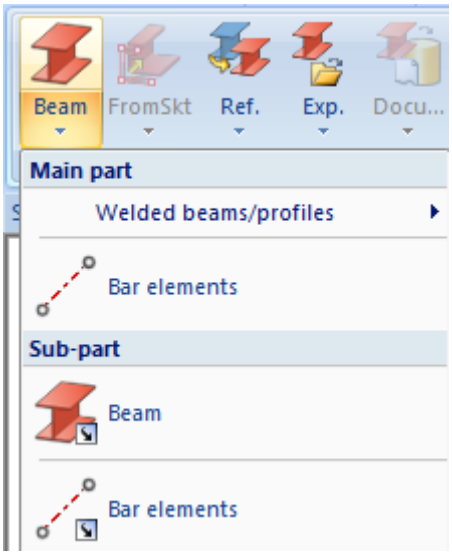


Figure 42 Sub-menu Insert beam – Insert Bar elements

- Draw the profile / beam

Only the "Bar Element" will appear:

Figure 43 Bar element

Those "Bar elements" can be later converted to the desired profile. For example with the Exchange function:

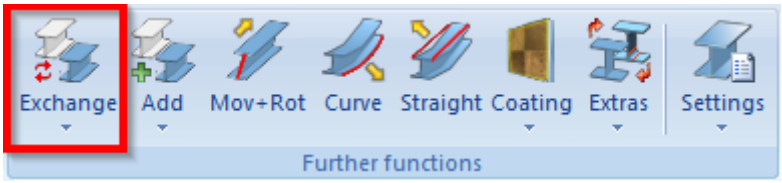


Figure 44 Steel engineering ribbon – Exchange beams

5 Rectangular plate

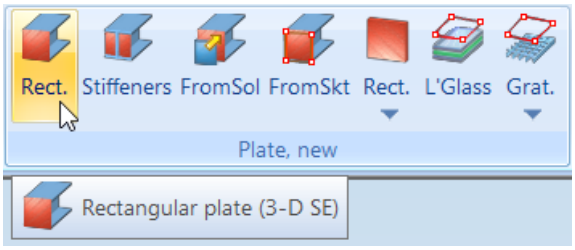


Figure 45 Steel engineering ribbon - Insert Rectangular plate

With the function rectangular plate it's possible to place plates and/or flat strips on the end of a profile / beam. Those can be selected from the catalogue. It's not possible to construct typesetting's with this function. Please use the "Sheet Metal" ribbon for that.

By activating the rectangular plate function the following screen will appear:

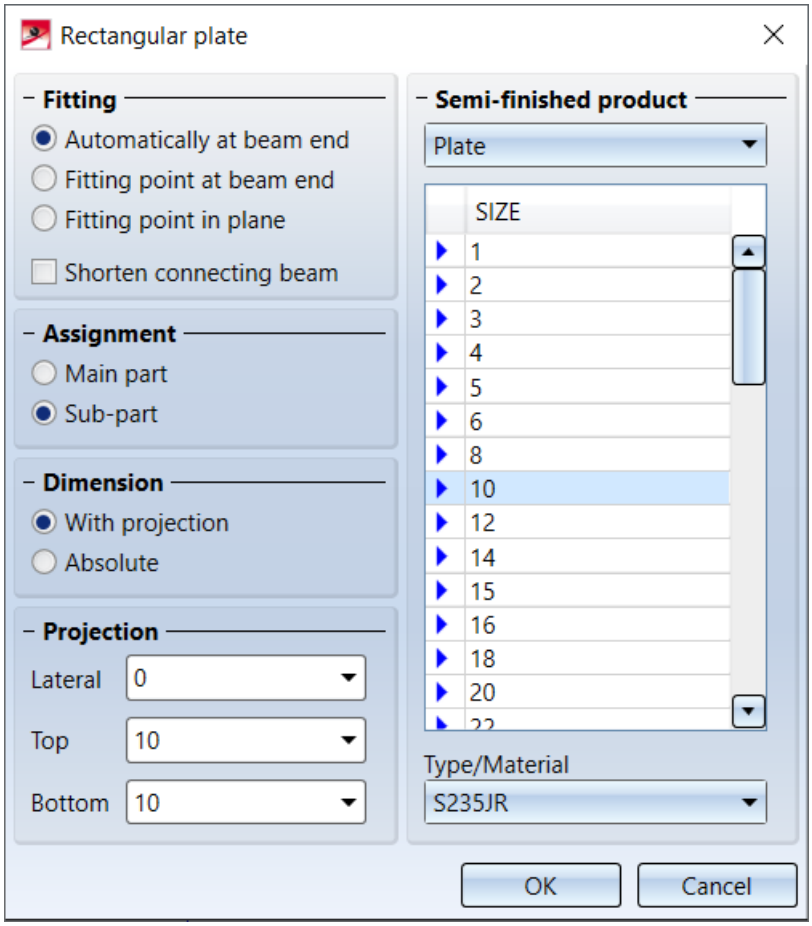


Figure 46 Rectangular plate dialogue

Each setting of this screen will be explained on the following pages.

5.1.1.1 Fitting

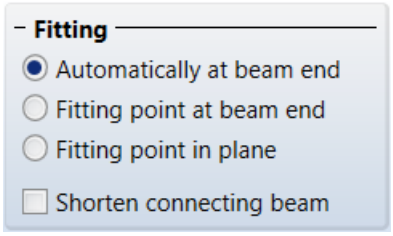


Figure 47 Fitting selection in rectangular plate dialogue

Fitting defines how the strip ore plate should be positioned regarding the selected beam or profile.

Examples

- **Automatically at beam end**; only the top or bottom have of the beam needs to be selected.

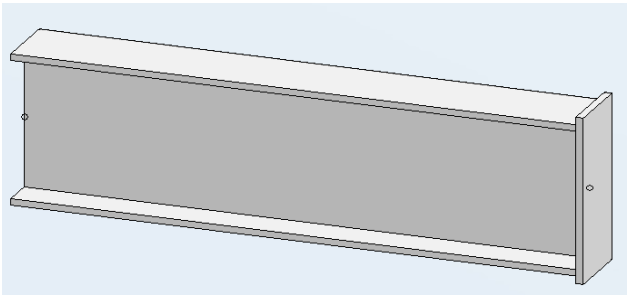


Figure 48 Rectangular plate automatically at beam end

- **Fitting point at beam end**; The plate will be place by selecting an insertion point on the beam

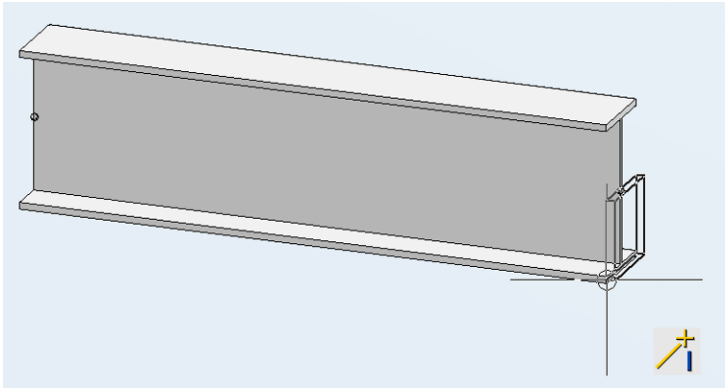


Figure 49 Rectangular plate with fitting point on beam end

- **Fitting point in plane;** First a plane needs to be defined then the plate can be place by a fitting point

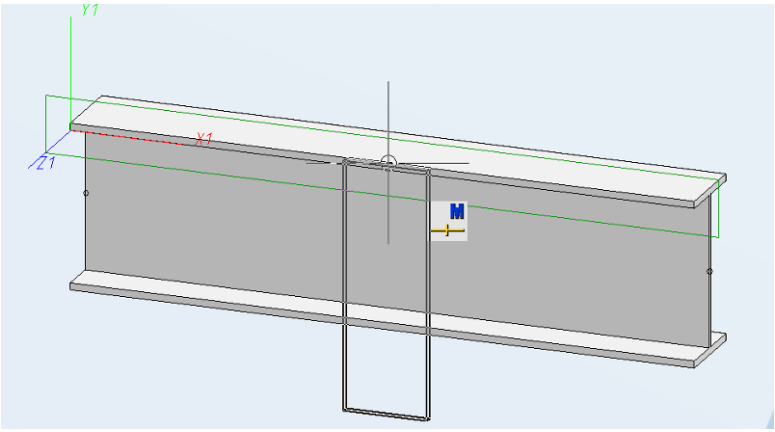


Figure 50 Rectangular plate with fitting point in plane

5.1.1.2 Shorten connecting beam

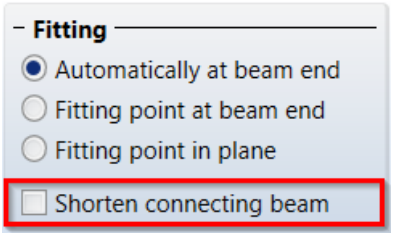


Figure 51 Shorten connecting beam option

When “Shorten connecting beam” is activated the profile or beam that is selected will be shortend by the thickness of the strip/plate. Therefore it will not add to the total length of the construction.

Example

Checkbox Shorten connecting beam **active**:

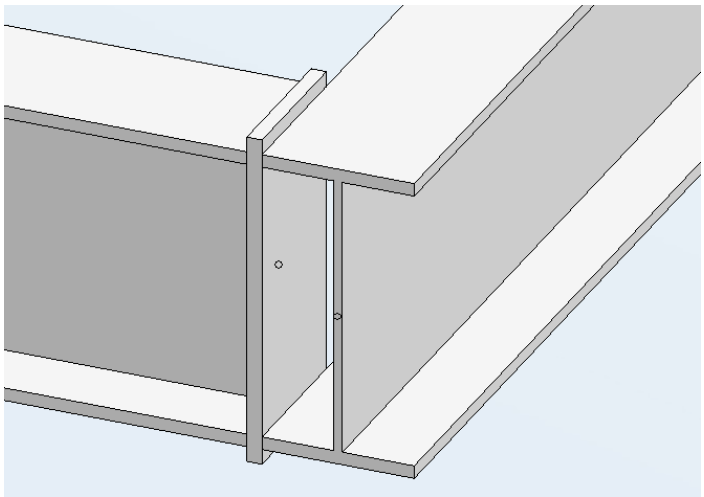


Figure 52 Rectangular plate placed with beam shortening

Checkbox Shorten connecting beam ***not active:***

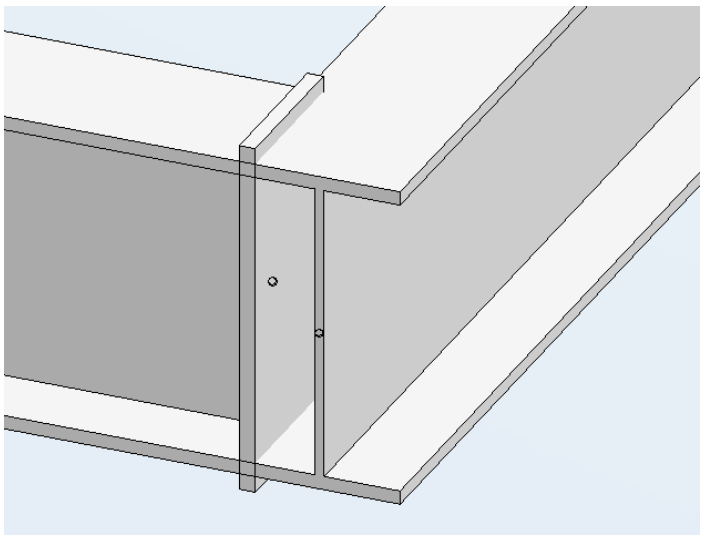


Figure 53 Rectangular plate placed without beam shortening

5.1.1.3 Assignment

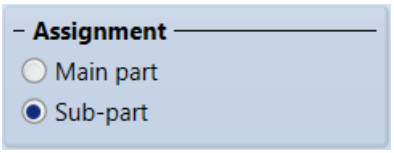


Figure 54 Assignment area of rectangular plate dialogue

The assignment determines whether HiCAD should create an assembly in your 3-D Part Structure.

When **Sub-Part** is selected, HiCAD place the plate/sheet at the same level as the beam/profile and if there is no parent assembly this will be created.

When **Main part** is selected, the plate/sheet will be placed as a main part.

Example:

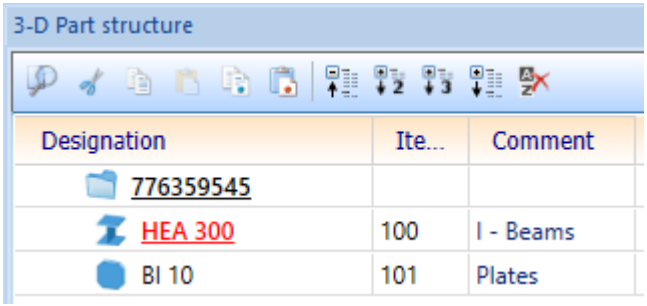


Figure 55 Example of rectangular plate as main part

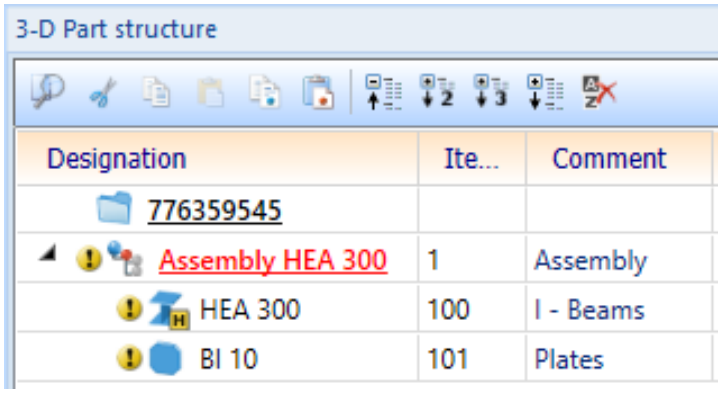


Figure 56 Rectangular plate placed with beam shortening

5.1.1.4 **Dimension**

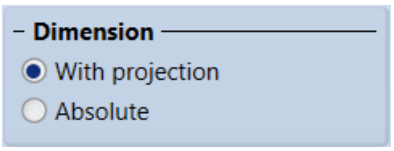


Figure 57 Dimension area of rectangular plate dialogue

With Dimension, you choose how the dimensions are determined. The **'with projection'** option looks at the dimensions of the cross-section of the profile where the plate or strip is placed. Then, a value can be added or subtracted in three directions. If you use '**Absolute**,' the value you enter is the actual dimension of the plate or strip.

Example:

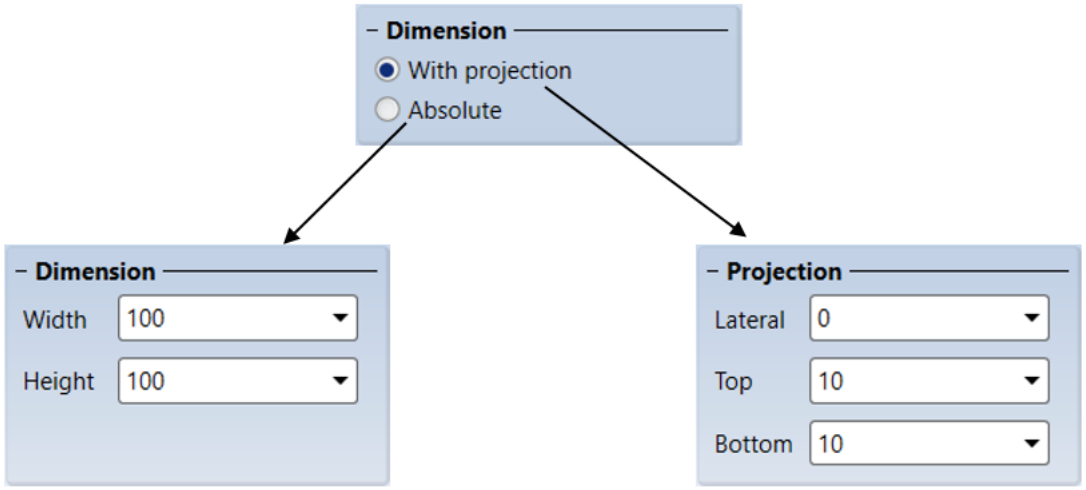


Figure 58 Examples of dimension configurations

5.1.1.5 Semi-finished product

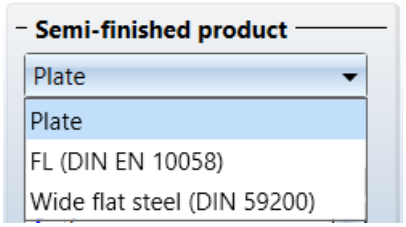


Figure 59 Semi-finished product selection in rectangular plate dialogue

At semi-finished product, one makes a choice between plate, strip (FL), and wide flat steel.

Plate can have variable length and width. The thickness of the plate is selected from a library. However, if strip is chosen, only the length can be entered as a variable. The width and thickness are then selected from the library. There is also an option for wide flat steel, which refers to extra-wide strips.

Example:

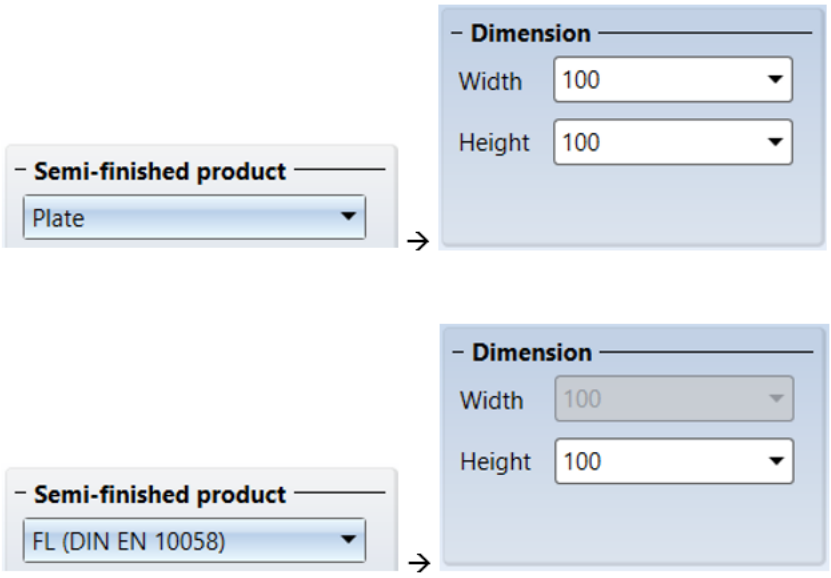


Figure 60 Examples of Semi-finished product configurations

5.1.1.6 Size and Type/Material

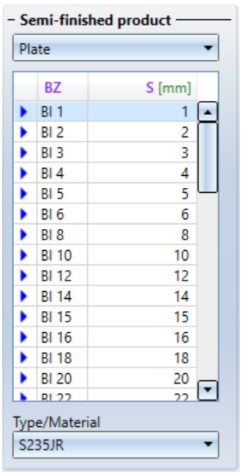


Figure 61 Semi-Finished product selection in rectangular plate dialogue

In this menu, you select the properties of the plate (thickness/material) or strip (thickness x width/material). These values are derived from the standard library

Example:

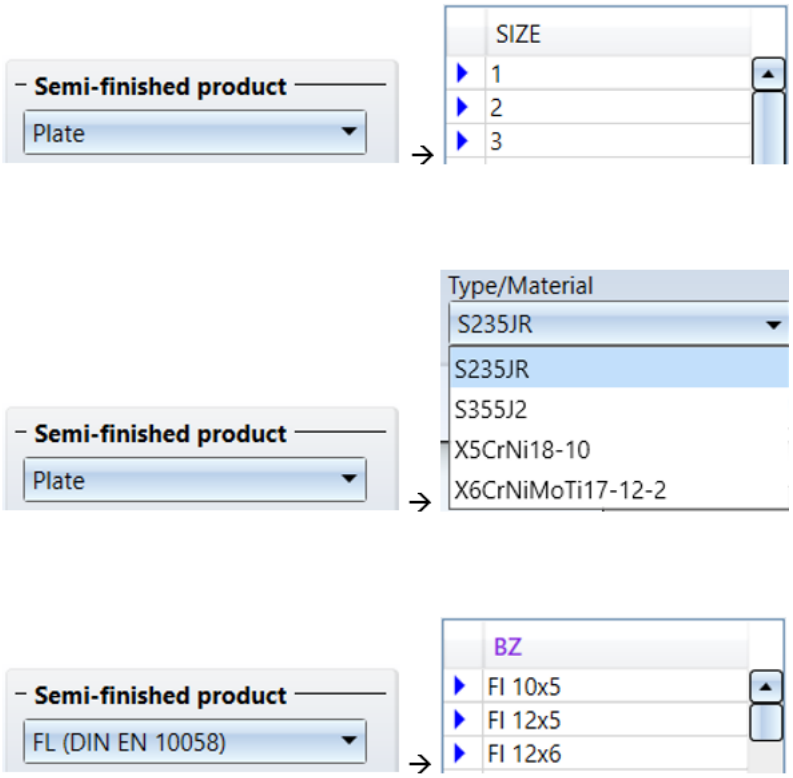


Figure 62 Size, material or type selection for several semi-finished products

6 Profile representation

When a profile is drawn in HiCAD, it does not look like it does in reality.

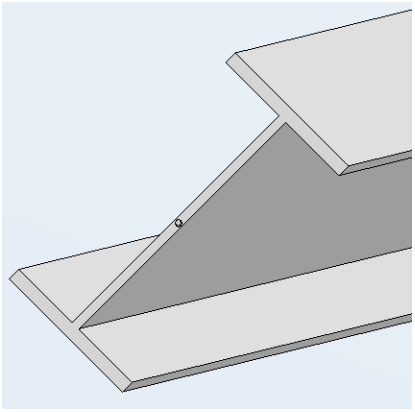


Figure 63 CAD image of IPE profile

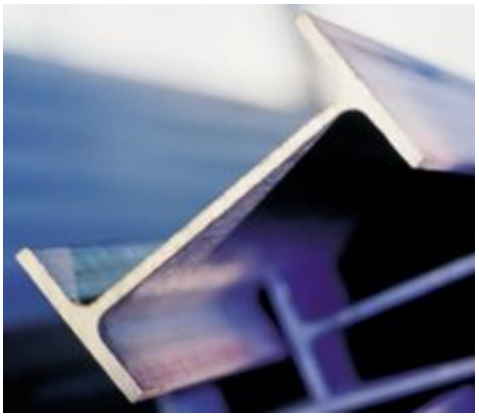


Figure 64 IPE profile

In the image above, several things stand out immediately:

- The radius is missing.
- There is a dashed line running through the center.
- There is an isolated point at the beam ends.

This is indicated in HiCAD as:

- Simple / Exact

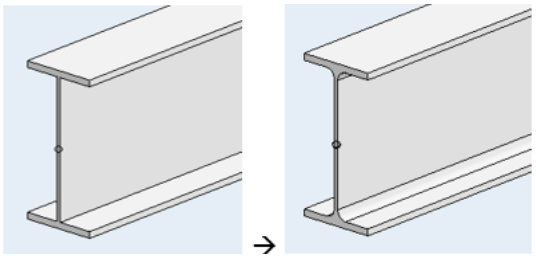


Figure 65 IPE beams in simple and exact representation

- Steel engineering Axes

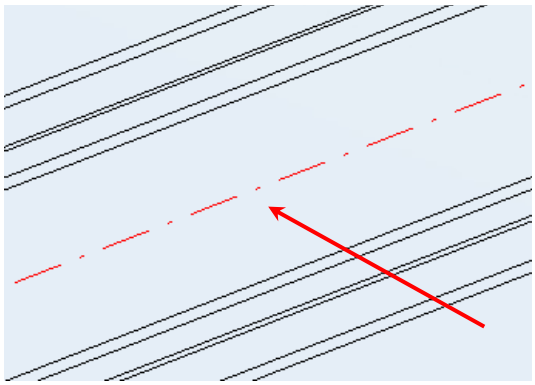


Figure 66 Steel engineering axis

Axis end point

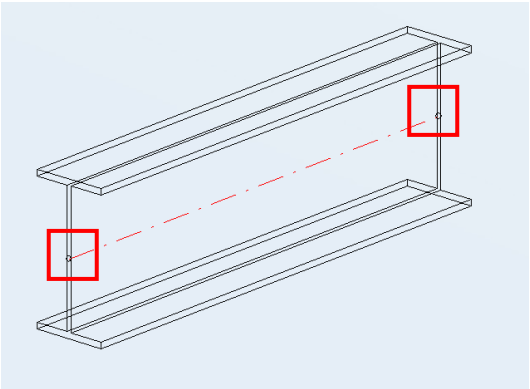


Figure 67 IPE beam with axis end points

Please note:

- This display can be toggled on or off at any time. If you click on the arrow next to "Further functions":

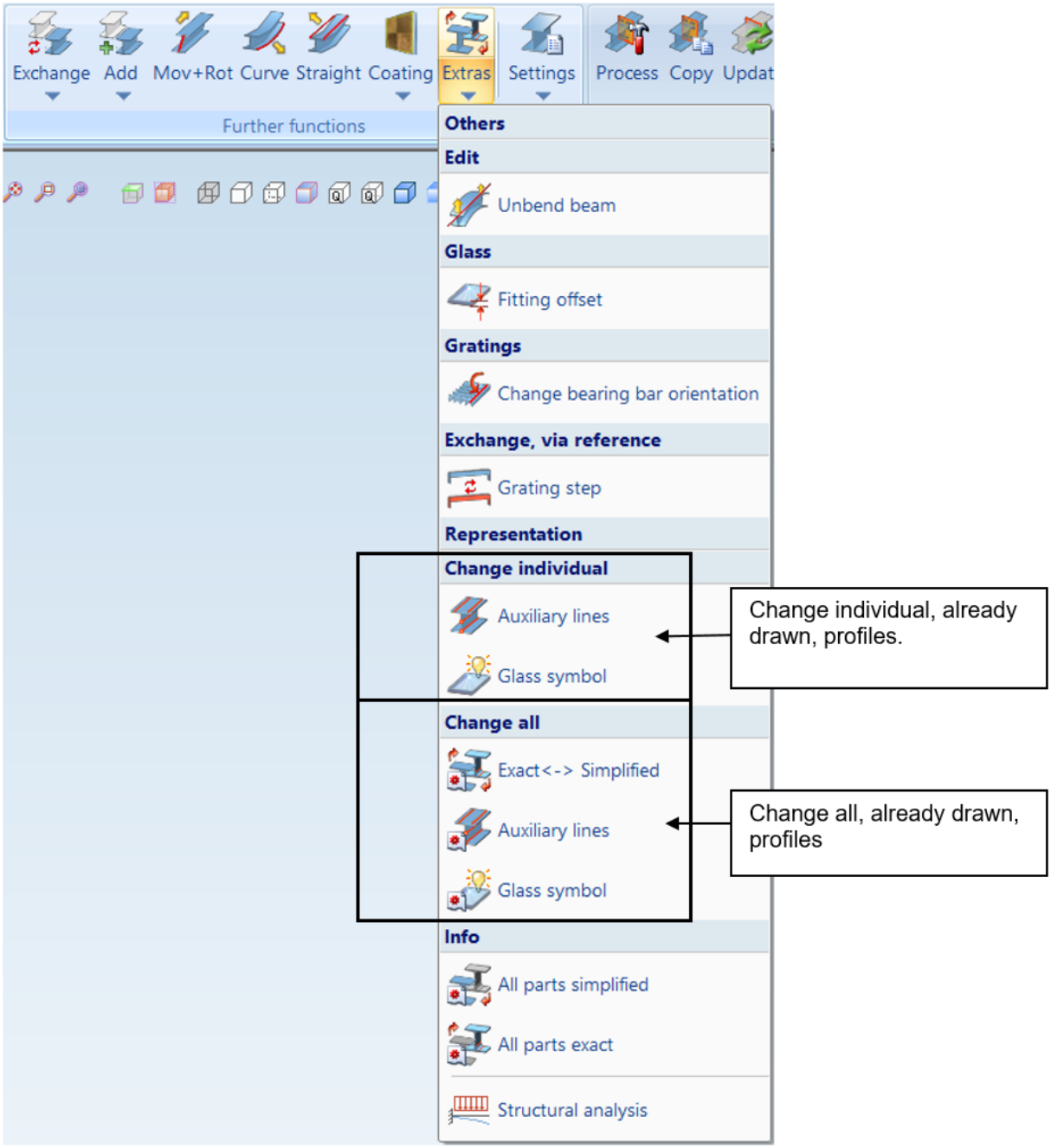


Figure 68 Sub-menu extras – representation settings

- This can be done for all profiles, that still need to be drawn in a new drawing with the setting:

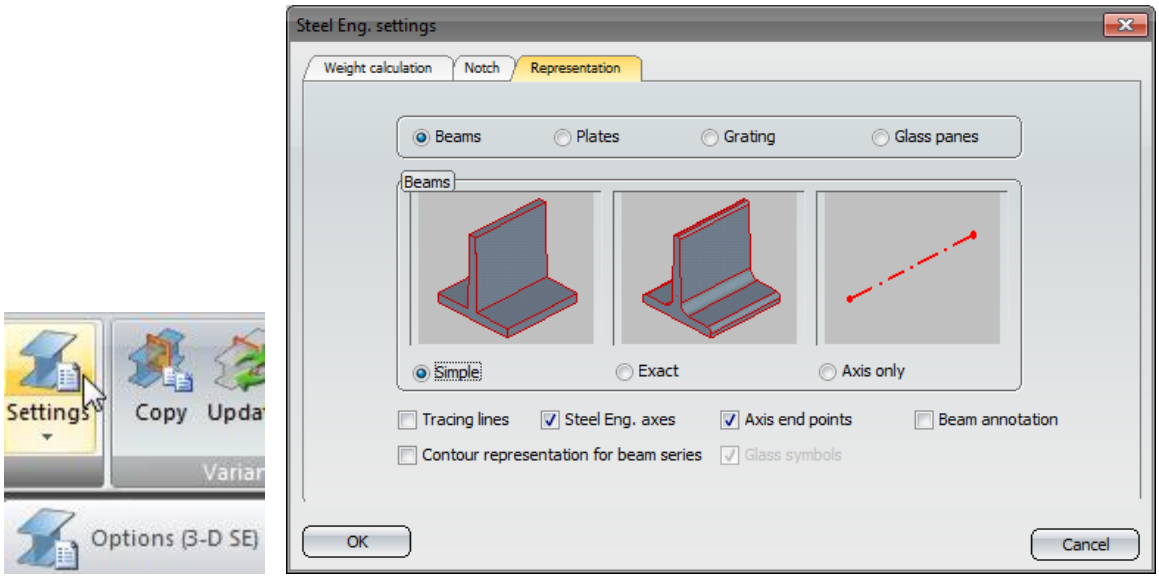


Figure 69 Representation settings for current drawing

The settings in the menu above are temporary and will not be retained after restarting HiCAD!

To change the default settings you need to acces the ConFiGurationDataBase (CFGDB) via:

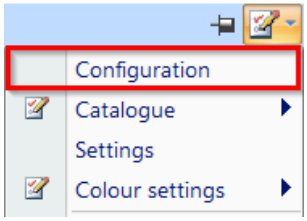


Figure 70 Open Configuration editor

In the 'Steel Engineering' folder you'll find the 'Representation' settings. You can change the settings here accordingly:

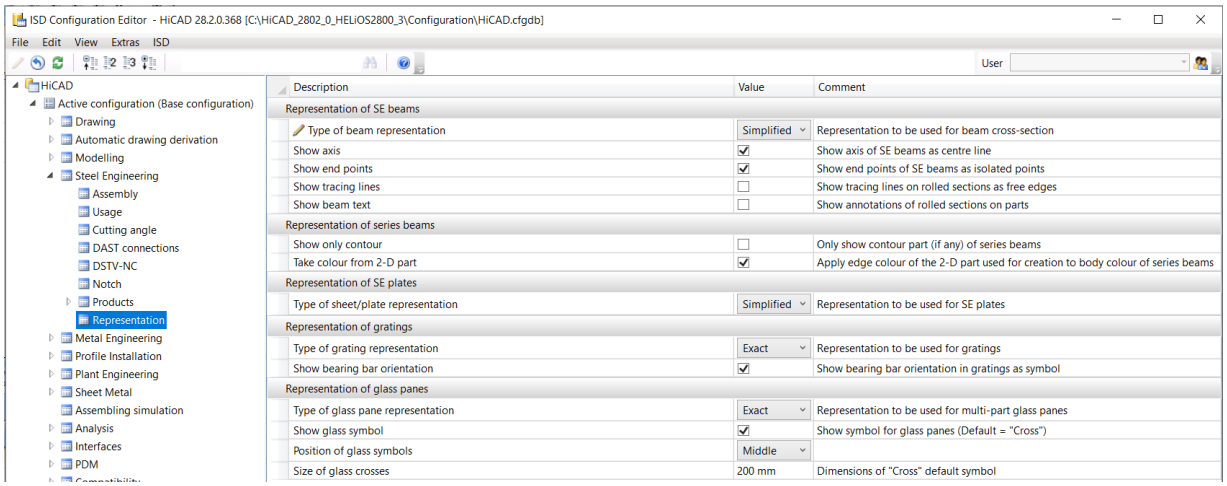


Figure 71 Representation settings in configuration database

7 Edit profiles

Now that profiles have been placed, they can be adjusted to the desired shape. Within the Steel Engineering module, the following standard functions are available for this:

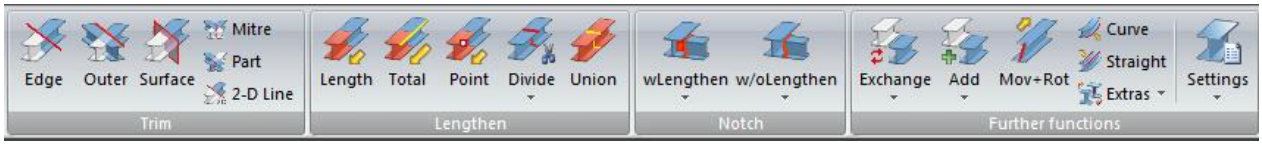
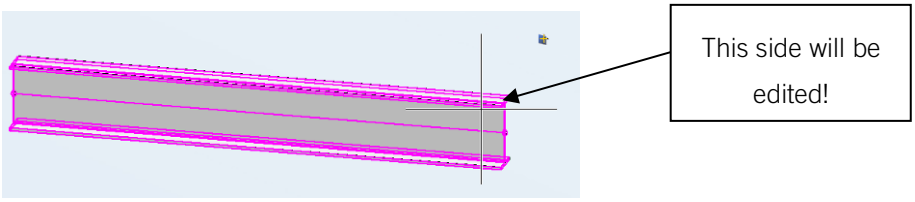


Figure 72 Steel engineering ribbon – adjust beams

Important to know is that the editing functions are always performed based on a selection. This sounds logical, however, a profile can be selected in two ways, considering it has two ends. HiCAD determines the choice between the two ends based on the graphical selection made by the user:

- Selection on the right:



- Selection on the left:

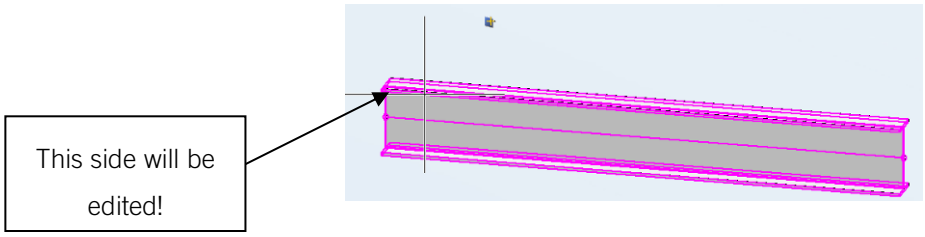
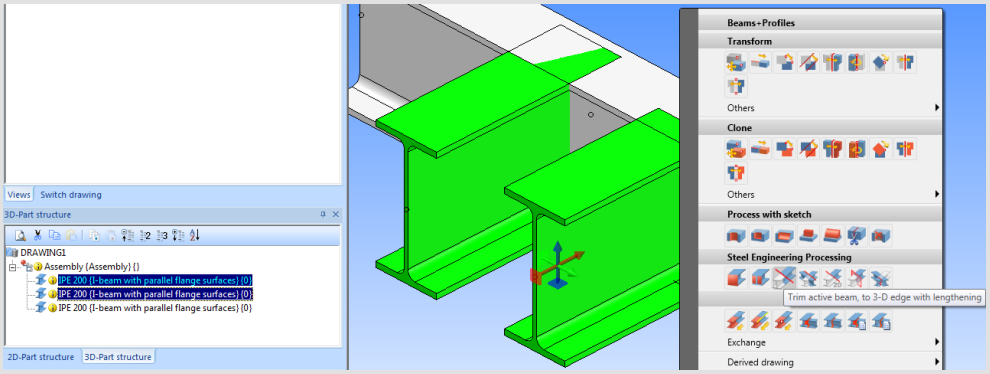


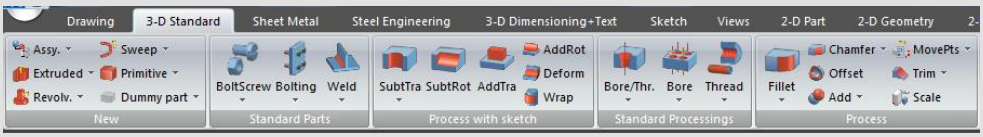
Figure 73 Selection examples for left and right beam end

Please note:

- Some edit functions can also be selected after a multiple selection of profiles! Right-click on the side to be cut of one of the selected profiles



- If the desired result cannot be achieved with the above functions, you can always resort to the normal 3D functions



7.1 Trim settings

Figure 74 Steel engineering ribbon – trim functions

With the 'Trim' commands, one end of a profile can be cut off, but it can also be extended. When a function is selected, the following menu appears:

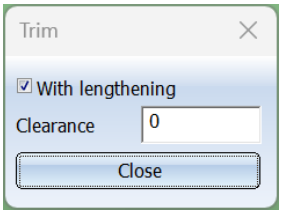


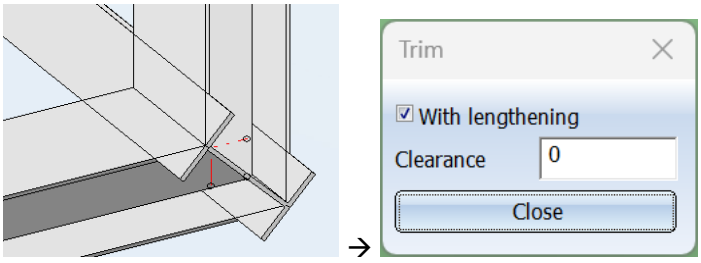
Figure 75 Trim dialogue

- With lengthening

  If 'with lengthening' is checked, the profile gets lengthened to the selected edge.

Example:

Perform the "Trim" function on the construction below:



Result:

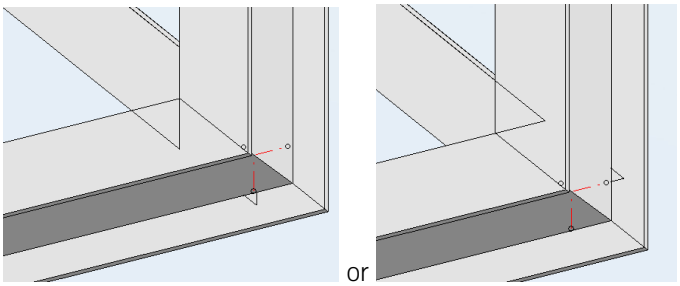
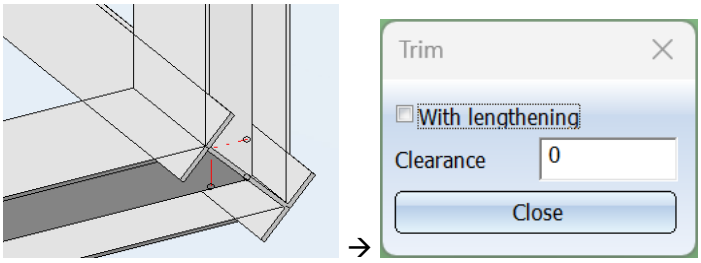


Figure 76 Trim with lengthening of beam

Example:

Perform the “Trim” function on the construction below:



Result:

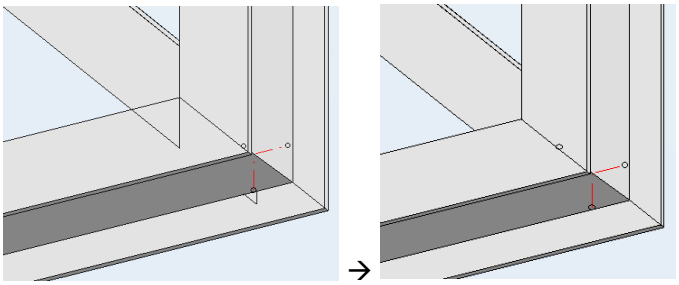
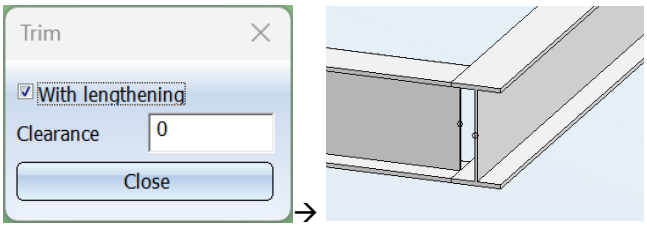


Figure 77 Trim without lengthening of beam

- Clearance

  Clearance can be used to create an opening in the cut.

Example:



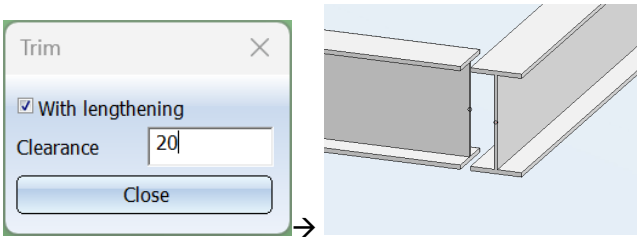


Figure 78 Trim beam with clearance

These functions can all be found in the “Trim” section of the Steel Engineering ribbon

The function will be explained individually in this chapter.

7.2 Trim to edge

Figure 79 Trim to edge

This function can be used to trim one end of a profile along a 3D line.

Selection:

- Side of profile to be edited;
- 3D line (or 2 points) to trim and/or extend to.

Example:

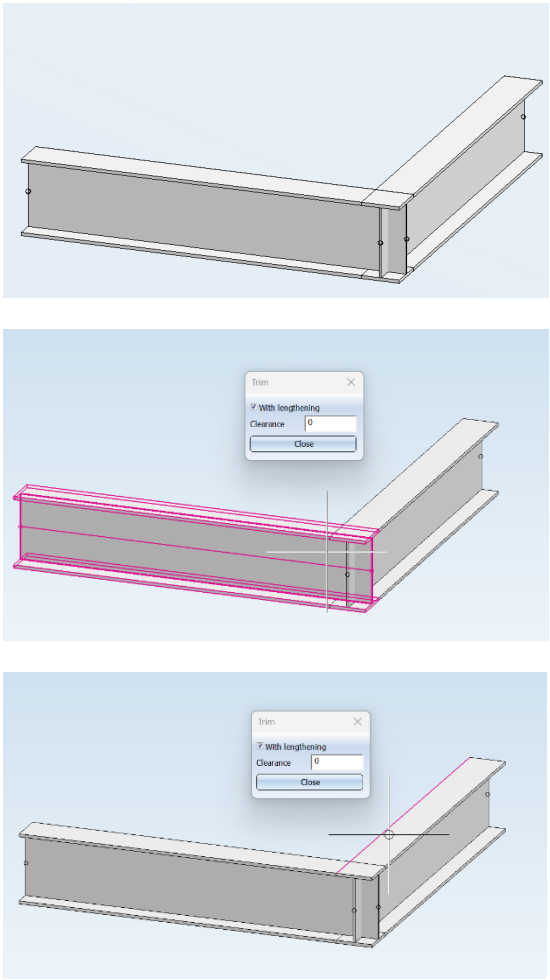


Figure 80 Trim to edge example

Result

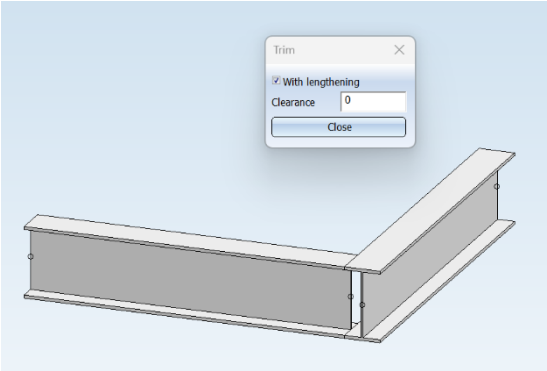


Figure 81 Trim to edge result

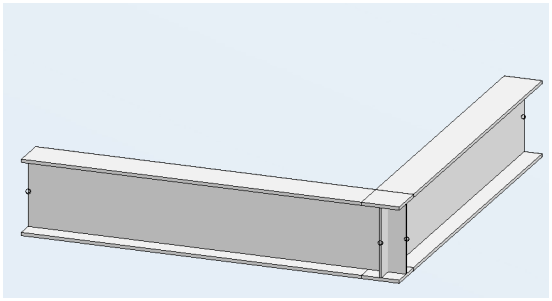
7.3 Trim to outer edge

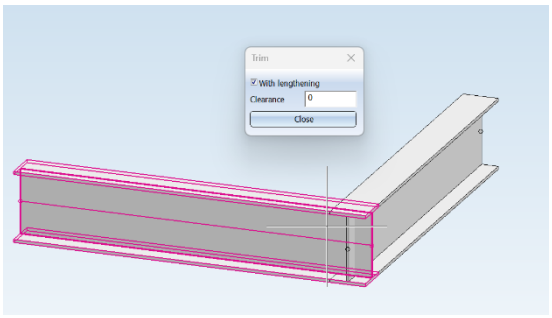
Figure 82 Trim to outer edge

With this function, HiCAD will automatically search for the outer edge of the 2nd selected part. It will then automatically trim the end of the 1st part to align it with the outer edge of the 2nd part.

Selection:

- End to be edited of part 1
- Select part 2





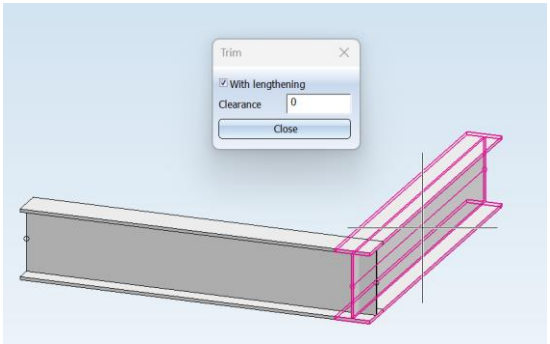


Figure 83 Trim to outer edge example

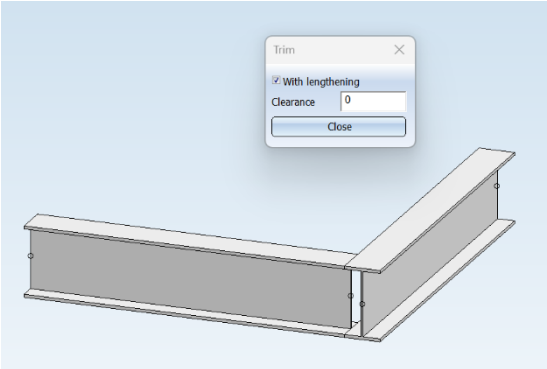


Figure 84 Trim to outer edge example

7.4 Trim to Surface

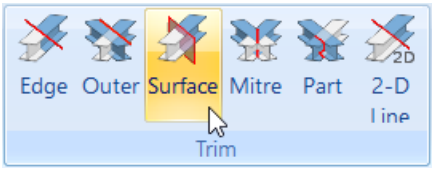


Figure 85 Trim to surface

With this function, one end of a selected profile can be precisely trimmed to a plane.

Selection:

- End to be edited
- 3D plane to trim and/or extend to

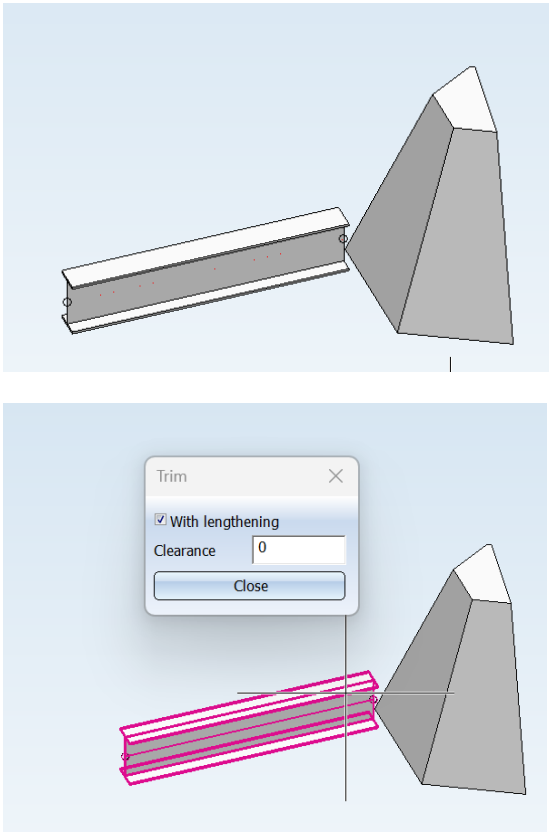


Figure 86 Trim to surface example

Choose the method to specify a plane (in this case: top left = '2 edges')

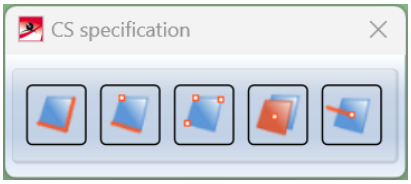
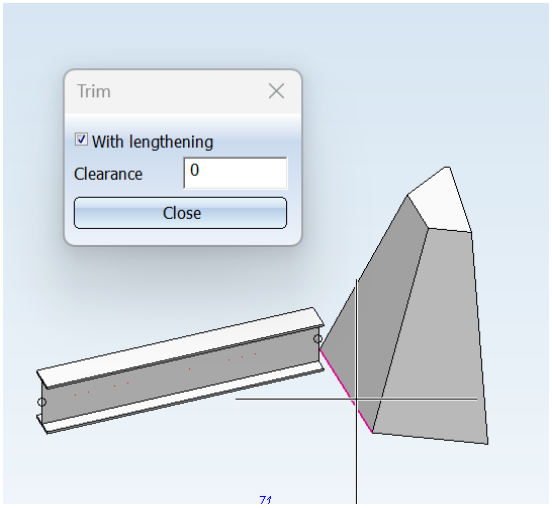


Figure 87 Surface selection dialogue



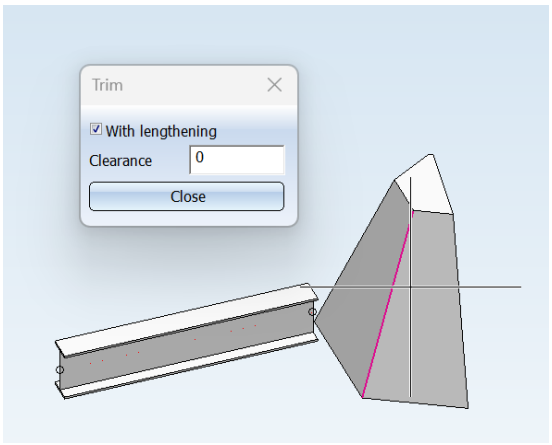


Figure 88 Trim to surface example continuation

Result:

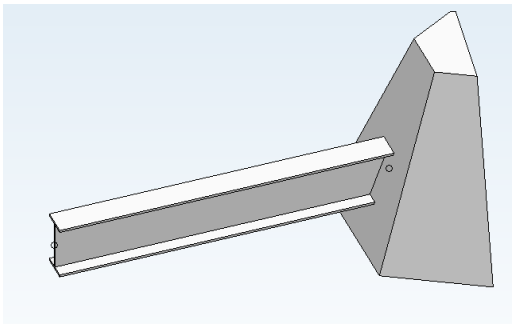


Figure 89 Trim to surface result

7.4.1 Mitre cut

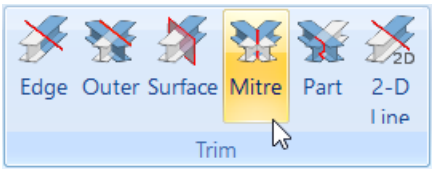


Figure 90 Mitre cut

With this function, a miter cut can be created between two profile ends. The 'Clearance' parameter allows for maintaining an opening in the miter:

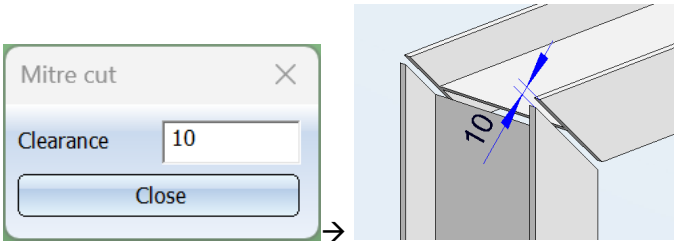
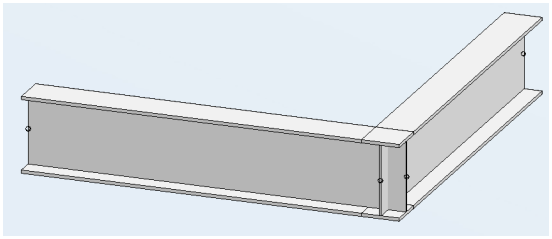
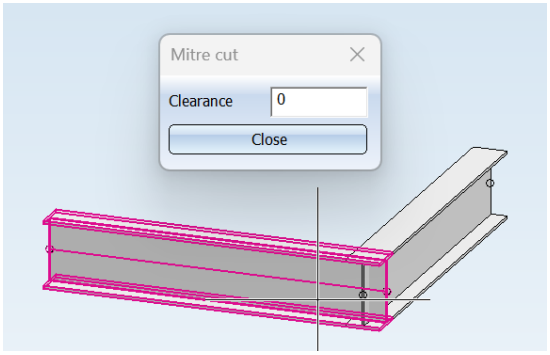


Figure 91 Mitre cut with clearance of 10 mm

Selection:

- To be edited end of the first part
- To be edited end of the second part





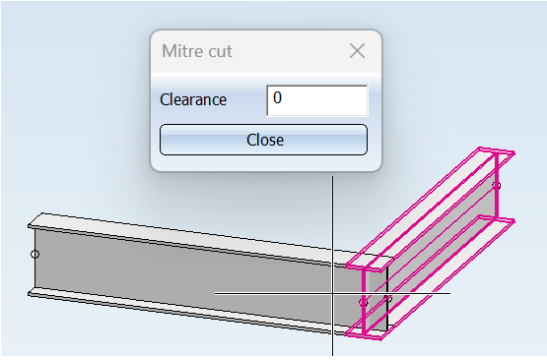


Figure 92 Mitre cut example

Result:

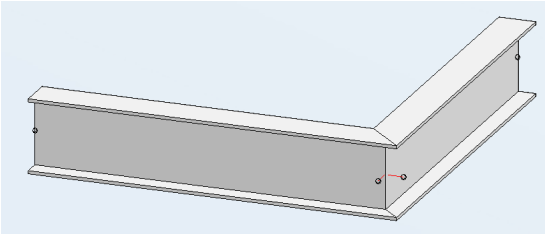


Figure 93 Mitre cut result

7.4.2 Trim to part

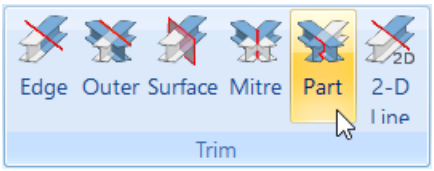


Figure 94 Trim to part

With this function, one end of a selected profile can precisely receive a cutout in the shape of a second profile.

Selection:

- End to be edited of part 1
- Select part 2

Example:

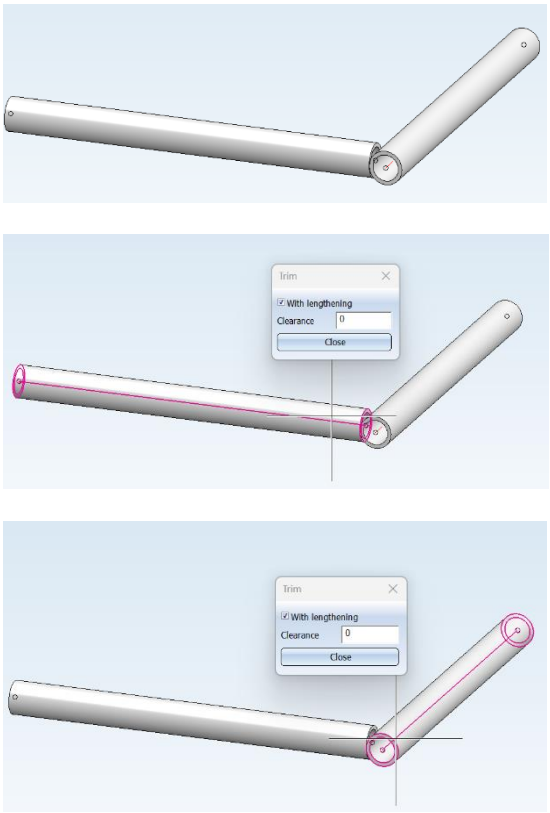


Figure 95 Trim to part example

Result:

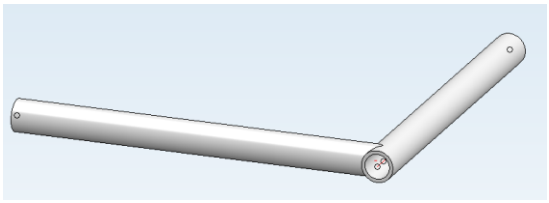


Figure 96 Trim to part result

7.4.3 Trim To 2-D line

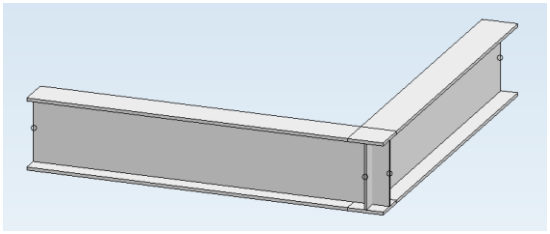
Figure 97 Trim to 2-D Line

With this function, one end of a profile can be trimmed along a 2D line.

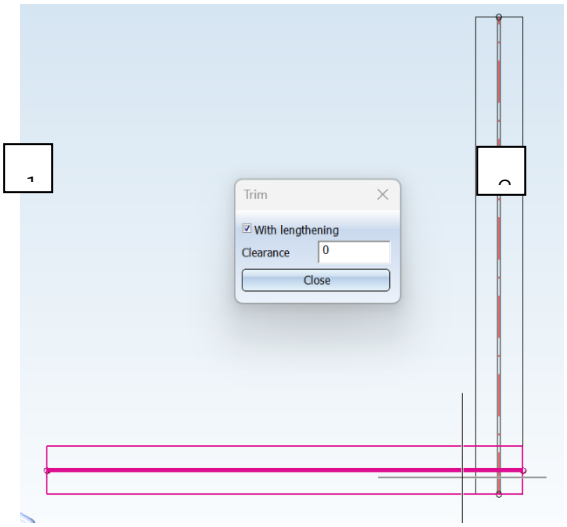
Selection:

- End to be edited
- 2D line (or 2 points) to trim and/or extend to

Example:



Change to the ‘top view’ and ‘glass model’ preview:



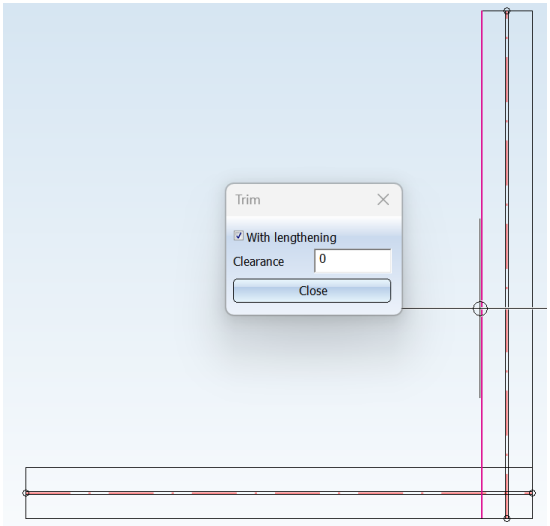


Figure 98 Trim to 2-D Line example

Result:

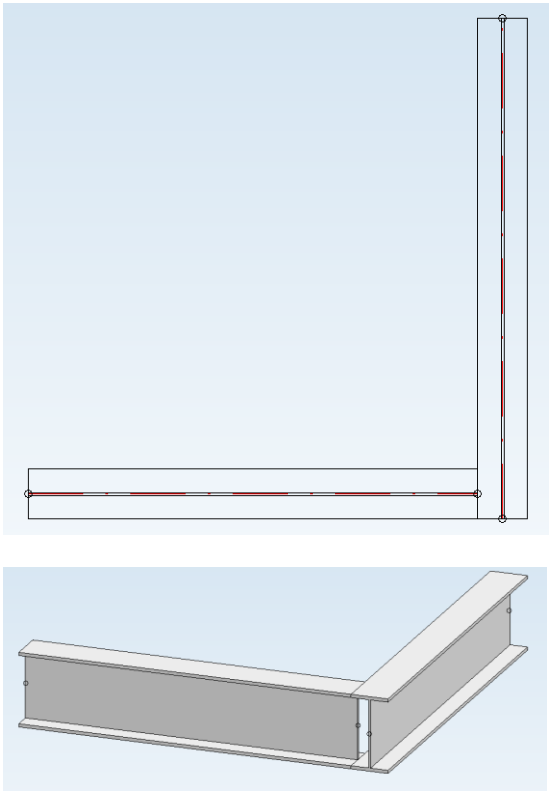


Figure 99 Trim to 2-D Line result

8 Lengthen

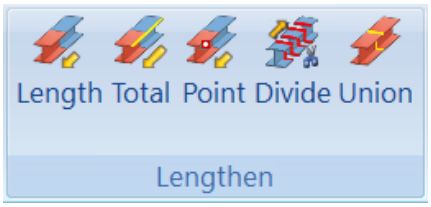


Figure 100 Lengthen beam features

With the 'Change Length' functions, the length of Steel Engineering Profiles can be modified. This can also be done through the feature list.

All functions falling under the 'lengthen' category will be discussed separately in this chapter.

8.1 Change length

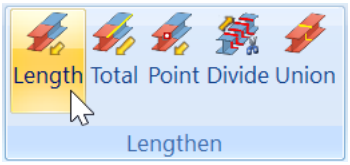


Figure 101 Change Length

With this function, a profile can be lengthened by entering a value. This value is added/subtracted on the selected side.

Selection:

- End of profile to be edited
- Enter the value for addition

Example:

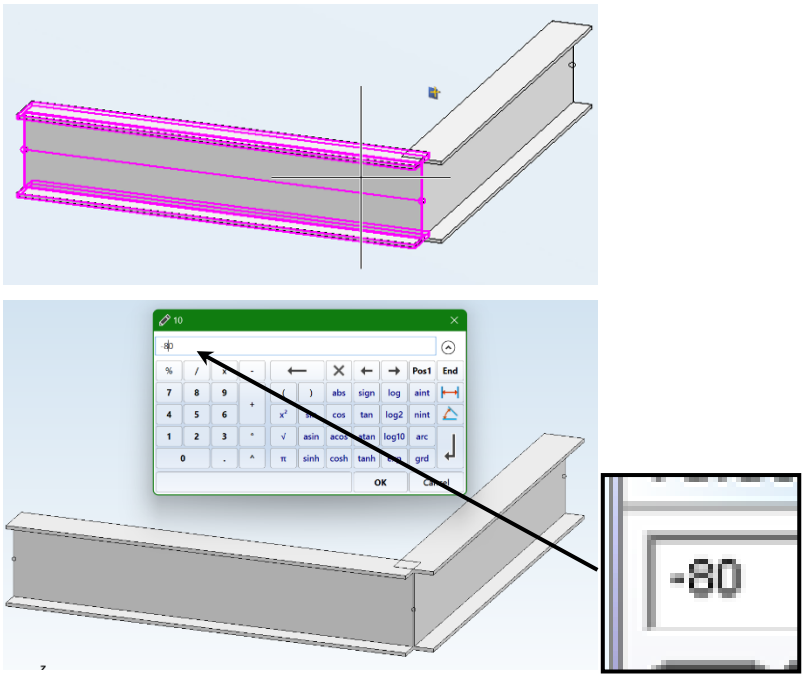


Figure 102 Lengthen example -80 mm

Result:

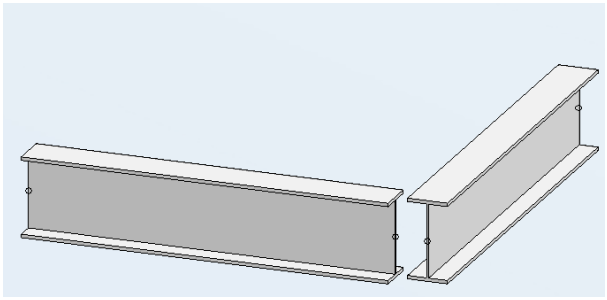


Figure 103 Lengthen -80mm result

8.2 Total length

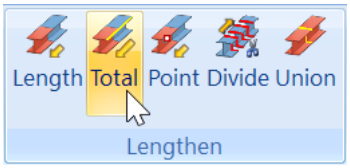


Figure 104 Total length

With this function, a profile can be modified to a total length by entering a value. This value is added/subtracted on the selected side.

Selection:

- End to be edited
- Enter the value for addition

Example:

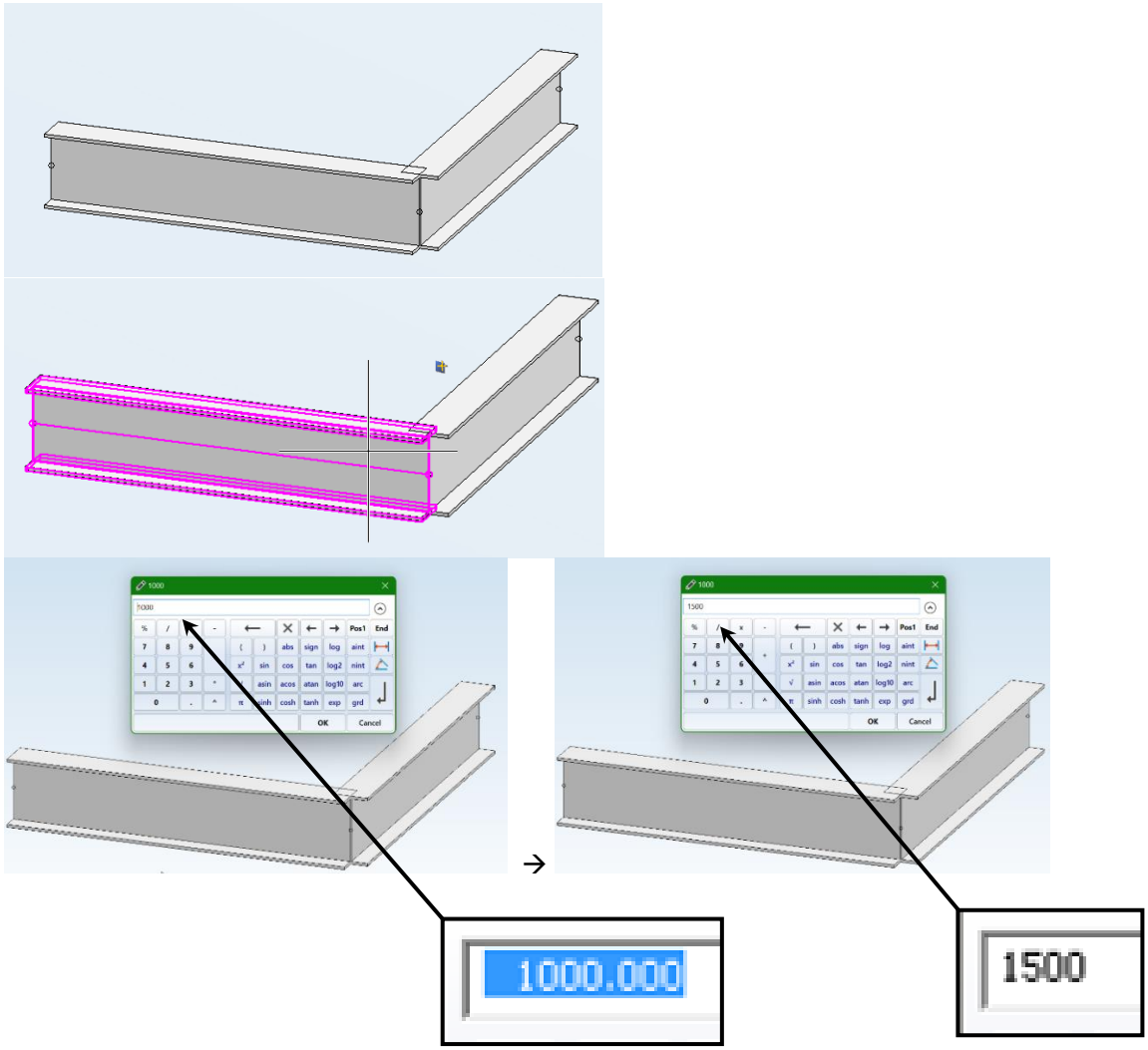


Figure 105 Total length example

Resultaat:

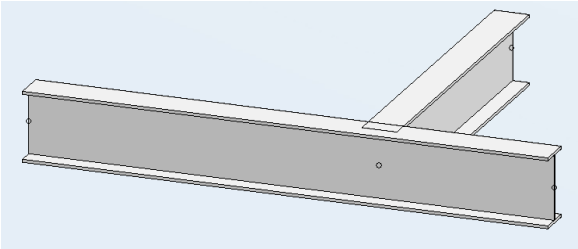


Figure 106 Total length result

8.3 To point

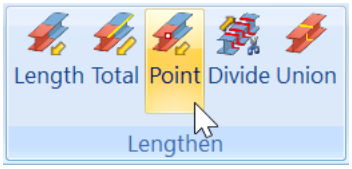


Figure 107 Lengthen to Point

With this function, one end of a profile can be extended or shortened to a selected point. The extension/subtraction occurs on the selected side.

Selection:

- End to be edited
- Point to which it should be extended/shortened

Example:

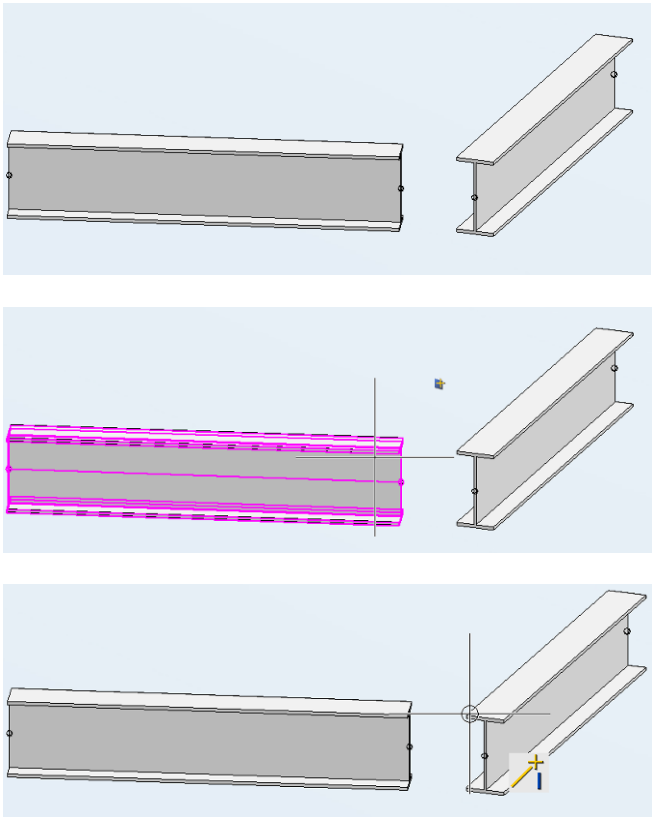


Figure 108 Lengthen to Point example

Result:

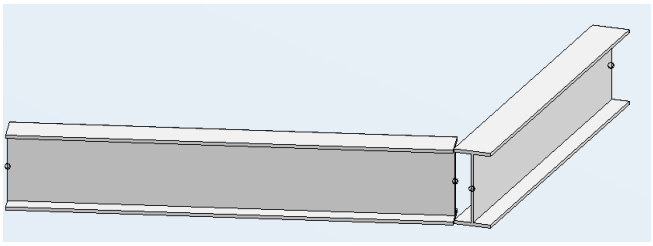


Figure 109 Lengthen to Point result

8.4 Divide

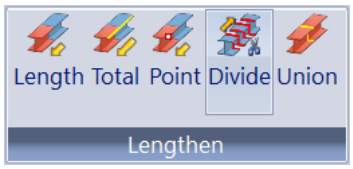


Figure 110 Divide beams

With this function, an already drawn profile can be divided into pieces.

After clicking the function, the beam can be selected. It is also possible to double-click on the function so that the beam can be selected at a later time.

The screen as shown below opens after a double-click on the divide function.

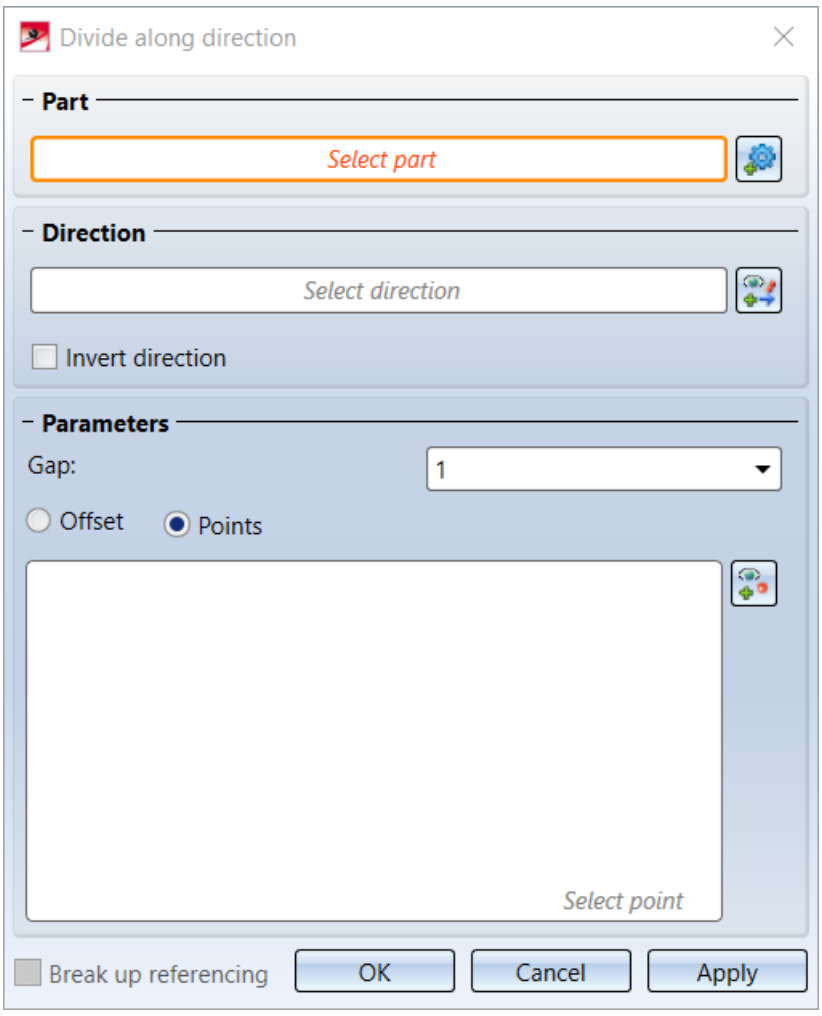


Figure 111 Divide along direction dialogue

Step 1: Select the profile.

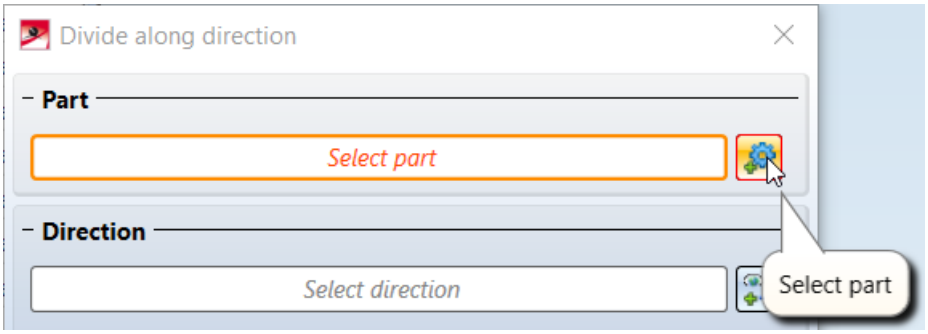


Figure 112 Select part in divide along direction dialogue

Step 2: select the direction

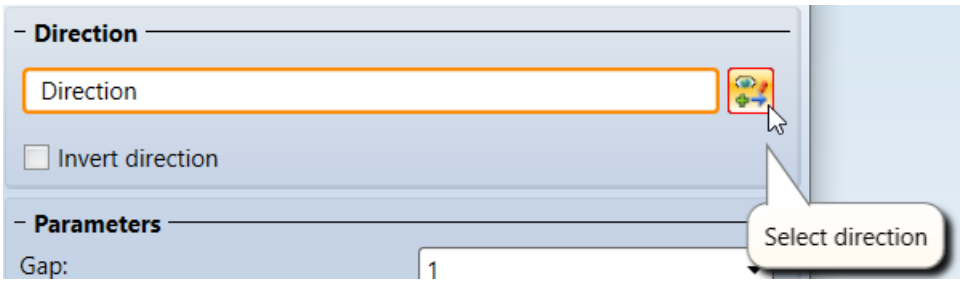


Figure 113 Select direction in divide along direction dialogue

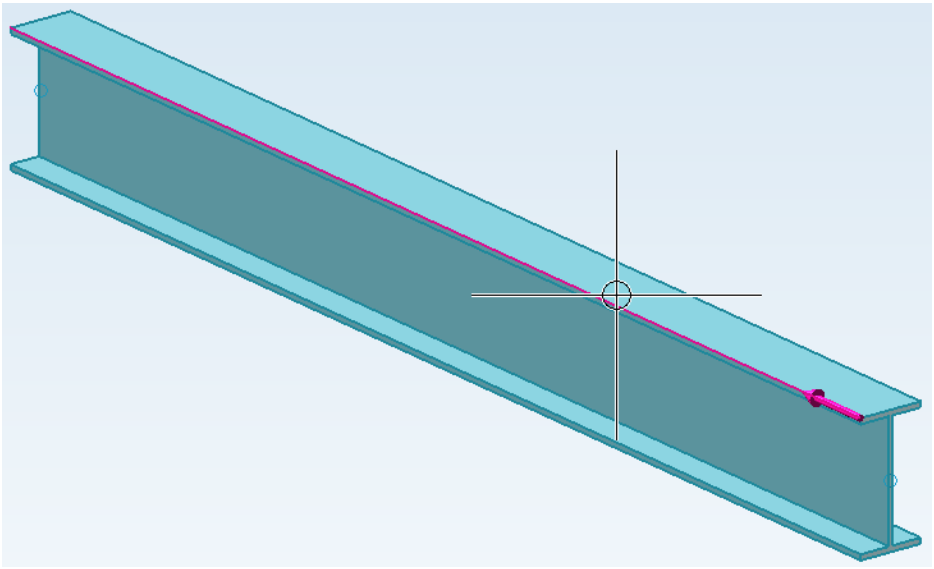


Figure 114 Direction selection in drawing area

By using the **'Invert direction'** checkbox, the direction can be changed.

Step 3: Change parameters

It is possible to perform the division using an offset or specified points.

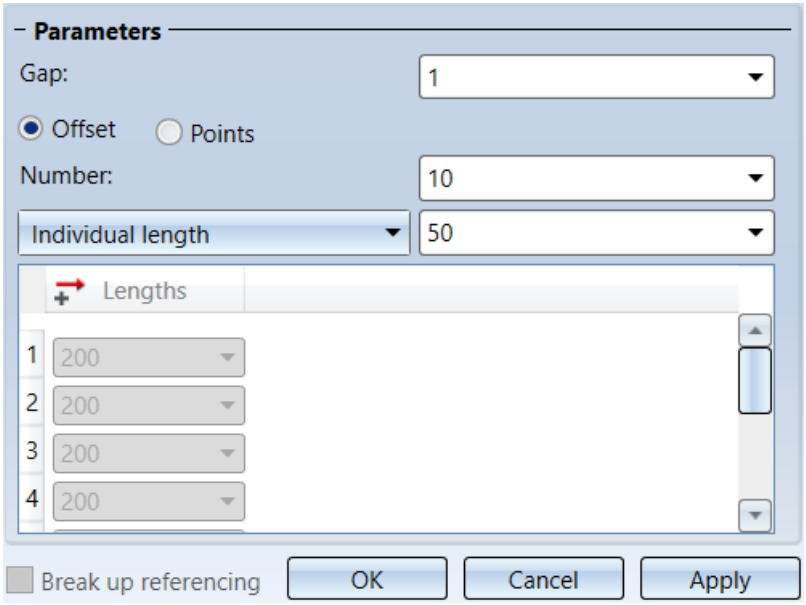


Figure 115 Offset parameters divide dialogue

With Gap, you specify the space between the divisions.

With Number, you indicate the number of divisions.

Then, the dimension can be determined in five different ways.

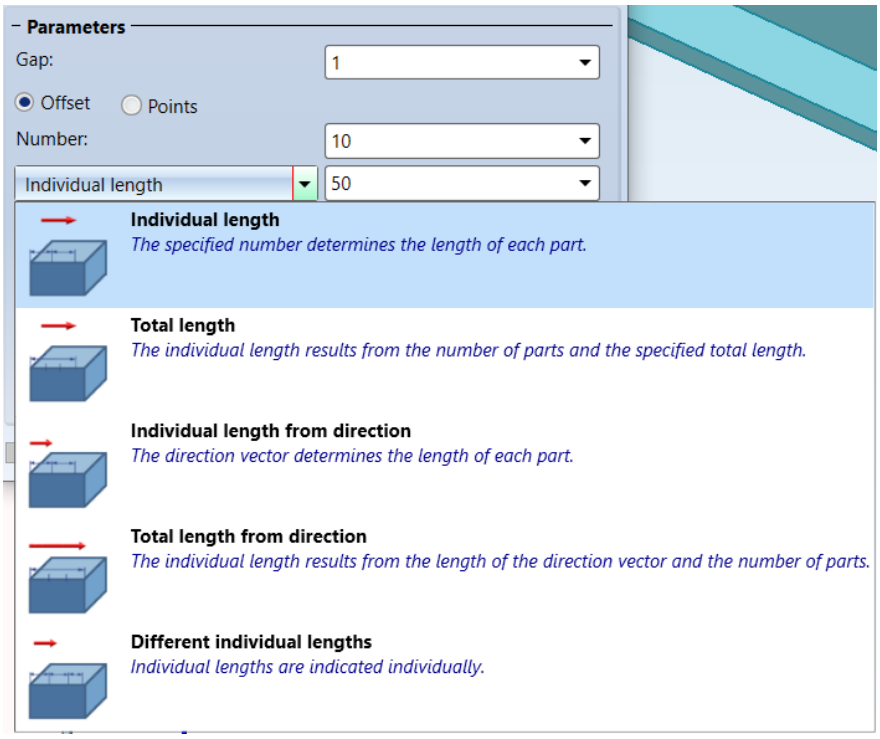


Figure 116 Division options in divide along direction dialogue

Step 4: Click on Apply to apply all of the above and keep the function open. Click on OK to apply it and close the function.

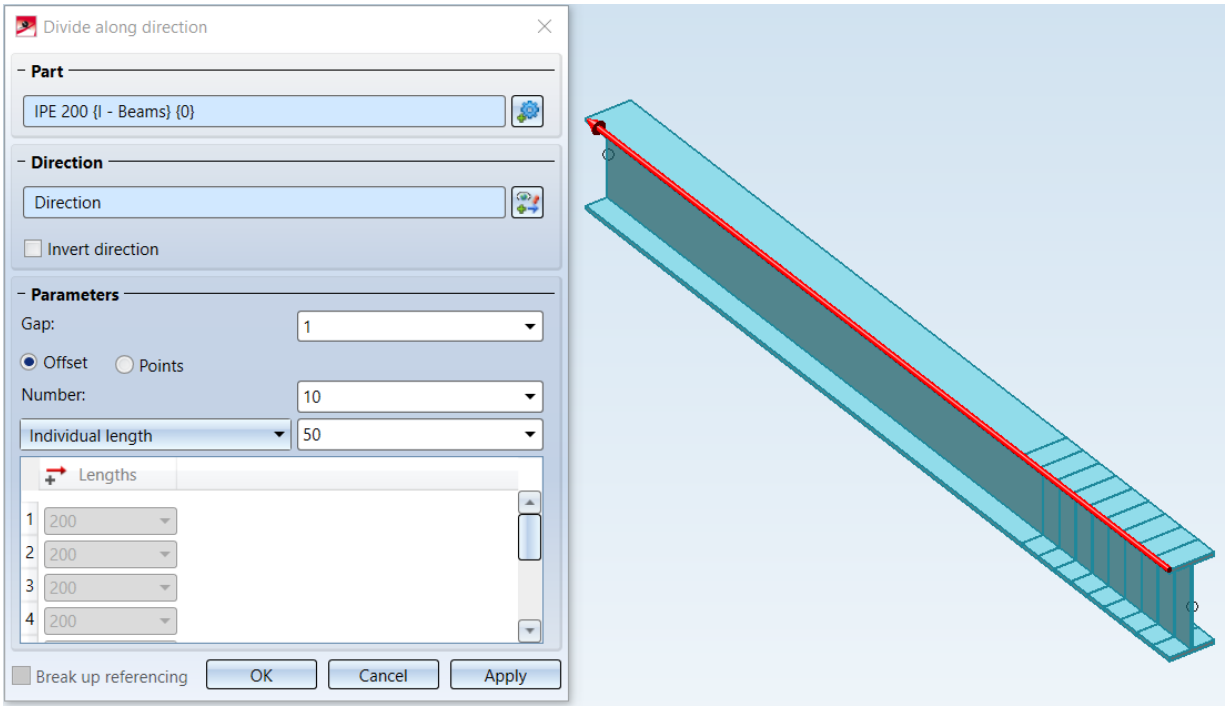


Figure 117 Individual length example

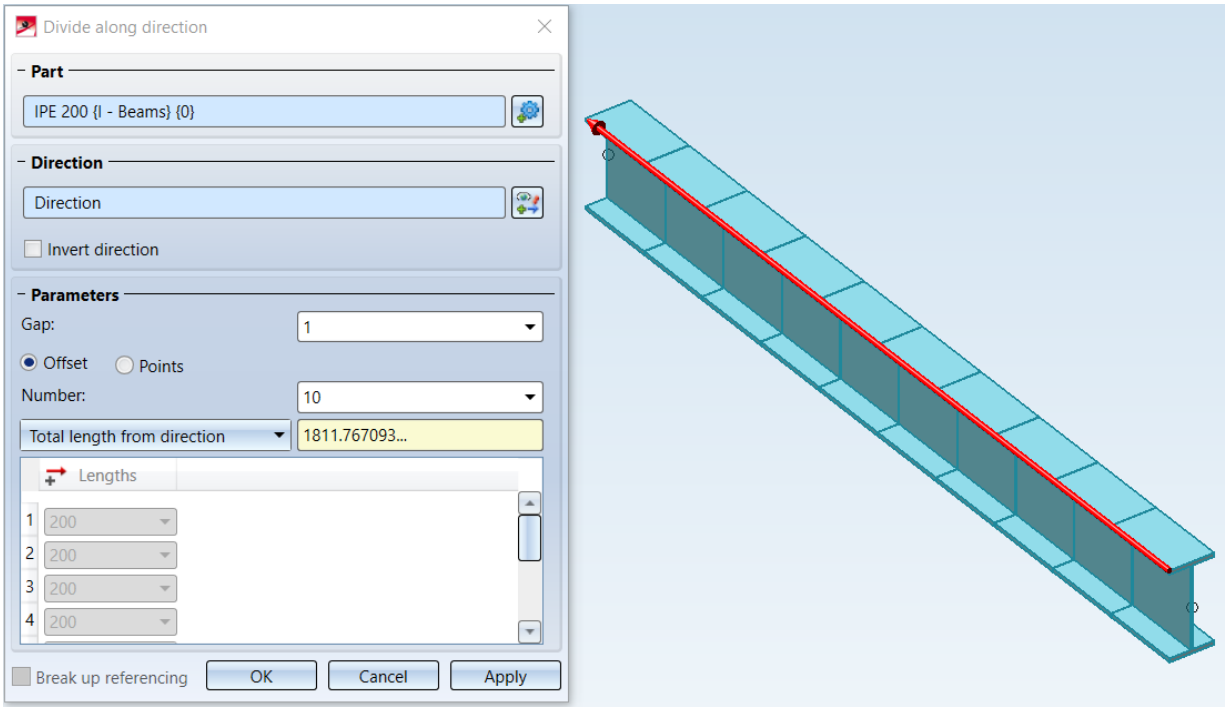


Figure 118 Total length from direction example

8.5 Union

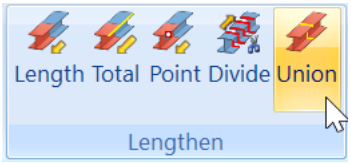
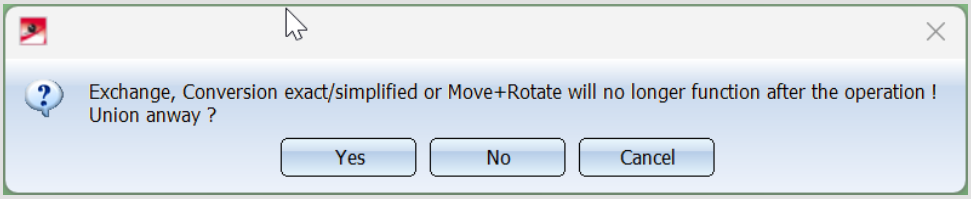


Figure 119 Union feature

With the function Union, devided profiles can be unified again. You can do so by (1) select the first profile and (2) select the profile to be added.

Please note:

- **Be aware** that the functions Exchange, Conversions to exact and simplified and move+rotate can't be performed on this profile anymore.



9 Notch

Figure 120 Notch with and without lengthening

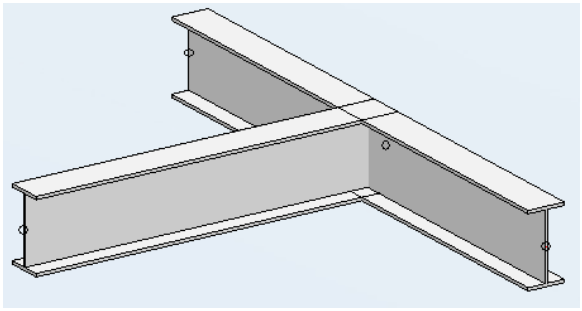
A common operation on profiles is to have the body of the profile continue, and only the flanges of the profile need to be cut off. This can be created with the 'Notch' functions:

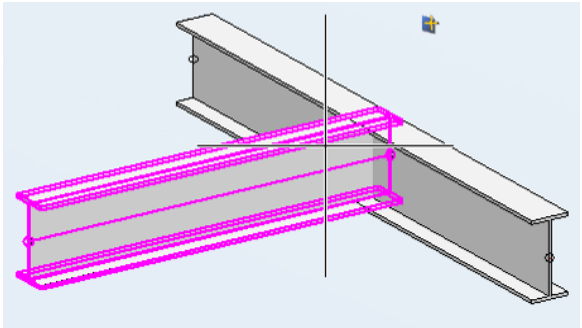
These two functions have the same result; the difference lies in the with/without extension of the profile end.

Selection:

- End to be edited of part 1
- Select part 2"

Example:





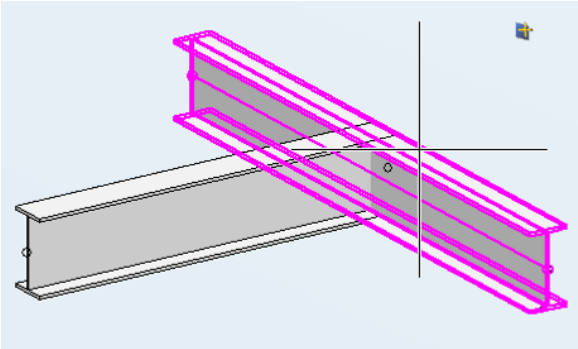


Figure 121 Notch example

Result:

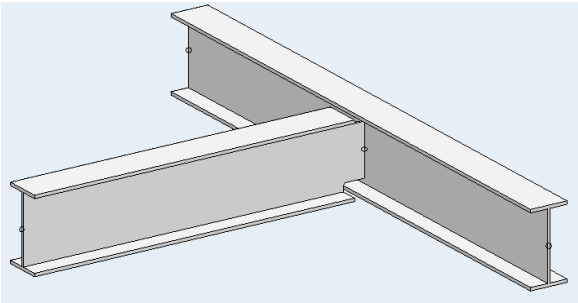


Figure 122 Notch result

9.1 With lengthening / Without lengthening [New Parameters]

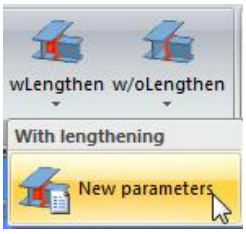


Figure 123 Drop down menu of Notch with lengthening

"With this function, the distances maintained by the 'Notch' function can be set.

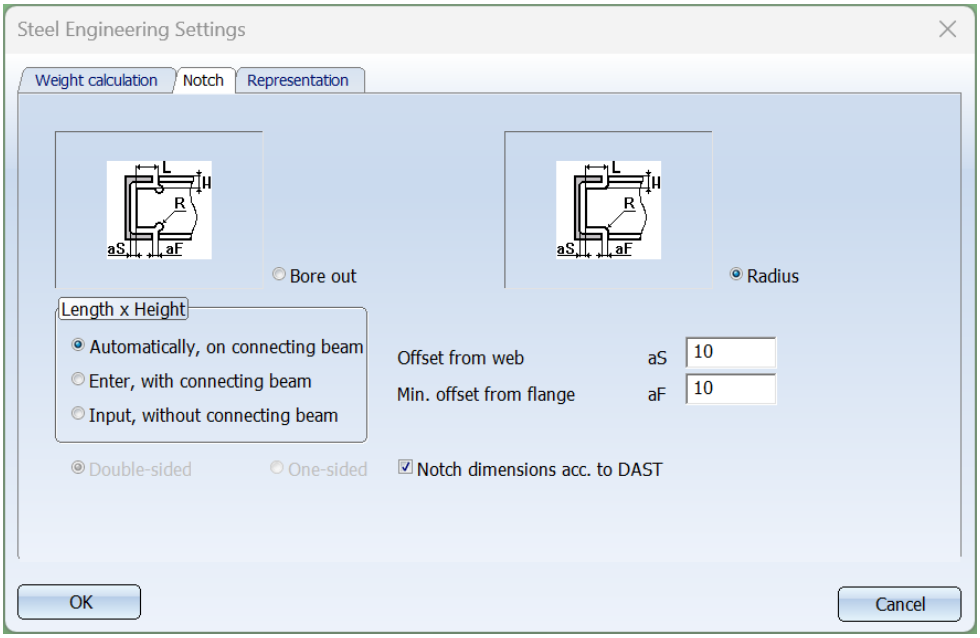


Figure 124 Steel engineering settings – Notch tab

Tip:

- When the option 'Notch length acc. To DAST' is deactivated, an exact offset to the flange can be set.

10Further functions

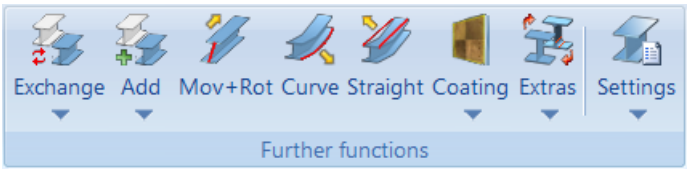


Figure 125 Steel engineering ribbon – Further functions

With these functions, already placed profiles can be modified. This includes:

- Modification of type
- Modification of shape
- Modification of representation (see also 2.4)

If you click on the arrow next to 'Further Functions', the 'sub-functions' of the exchange function can be chosen:"

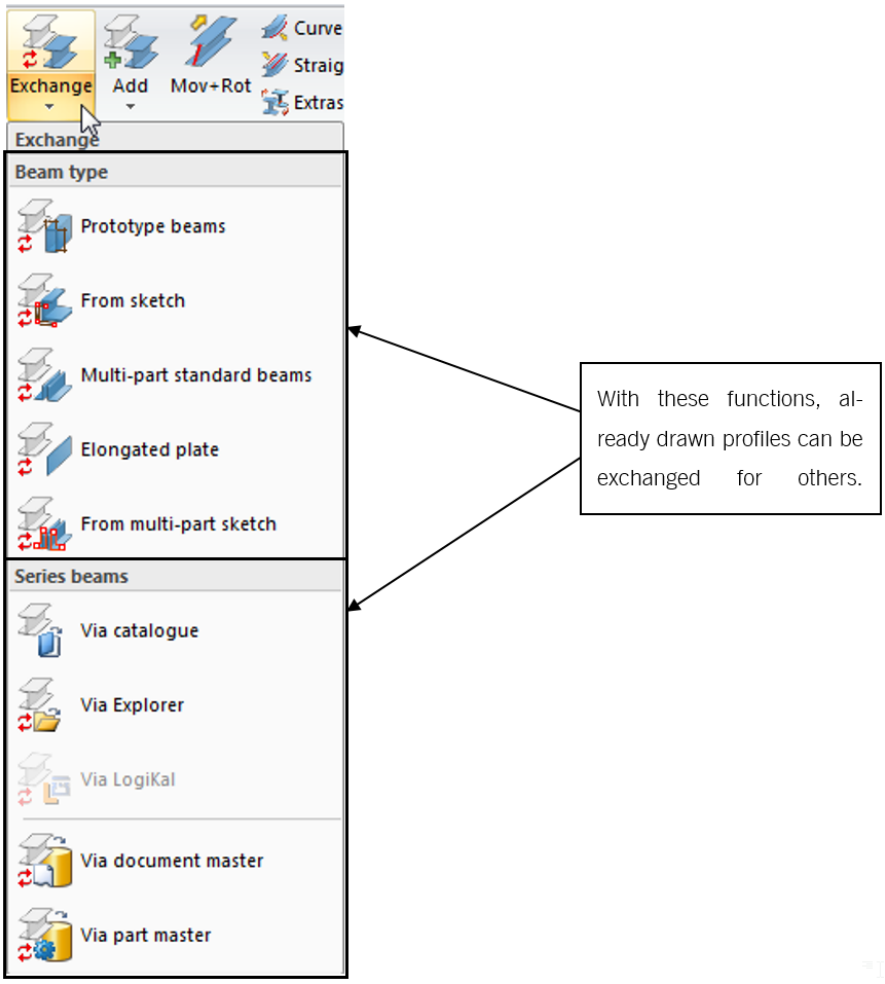


Figure 126 Exchange options in drop-down menu of Exchange feature

10.1 Exchange

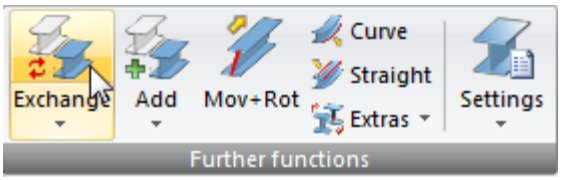


Figure 127 Further functions - Exchange

With this function, an already drawn profile can be exchanged for a different type.

Example:

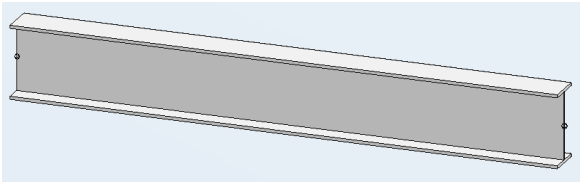


Figure 128 IPE 200 (DIN 1025-5) in HiCAD

- Choose Further Functions → Exchange and select the profile, the library will appear. The current profile is indicated:

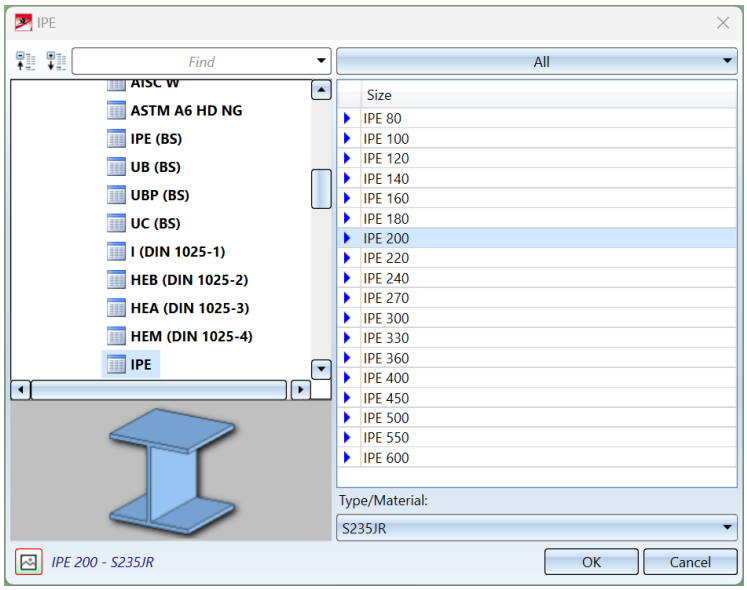


Figure 129 Standard beam catalogue selection

- Select a different dimension, material or type:

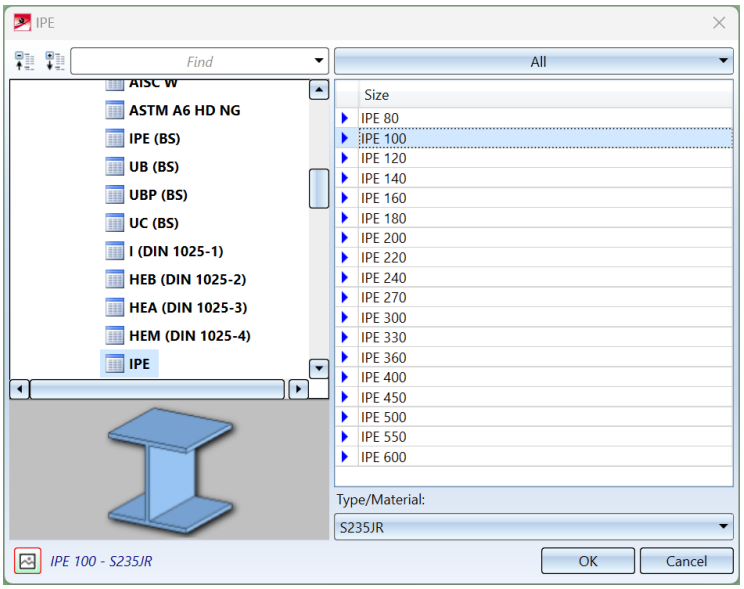


Figure 130 Standard beam catalogue selection (2)

- Choose the new orientation (if the 'retain fitting axis' checkbox is enabled, the component retains its original orientation) and press 'OK':

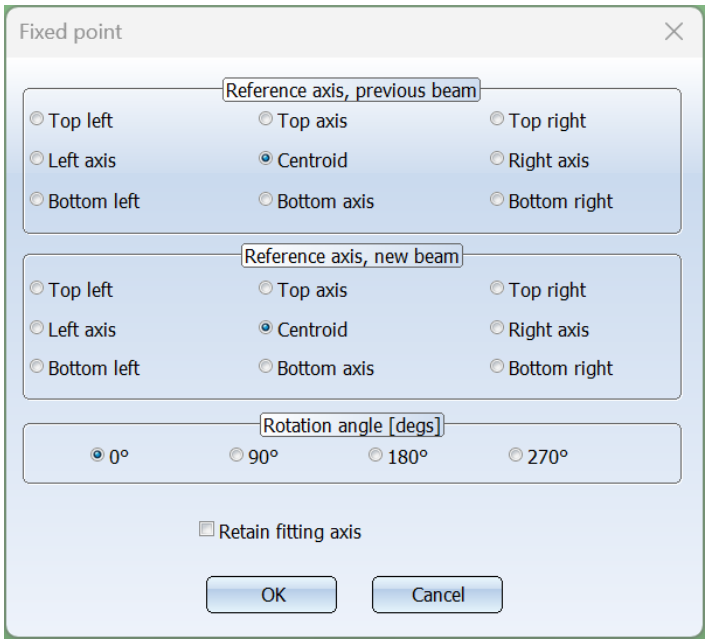


Figure 131 Fixed point selection dialogue

Result:

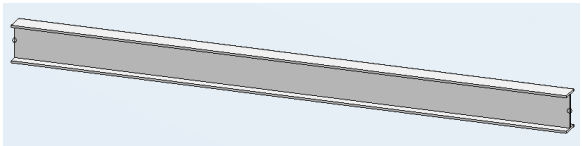


Figure 132 Exchange result

10.2 Add

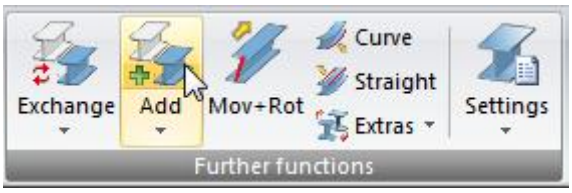


Figure 133 Add standard beam to beam

With this function, an already drawn profile can be exchanged for a different type. However, the original one remains, making it easy to see the difference between the new and old profiles.

Examle

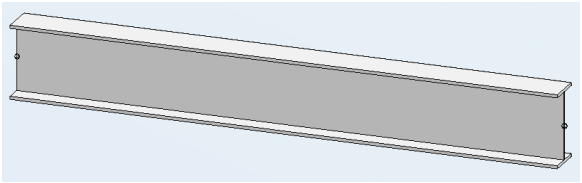


Figure 134 IPE 200 (DIN 1025-5) in HiCAD

- Choose Further Functions→ Add and select the profile, the library will appear. The current profile is indicated:

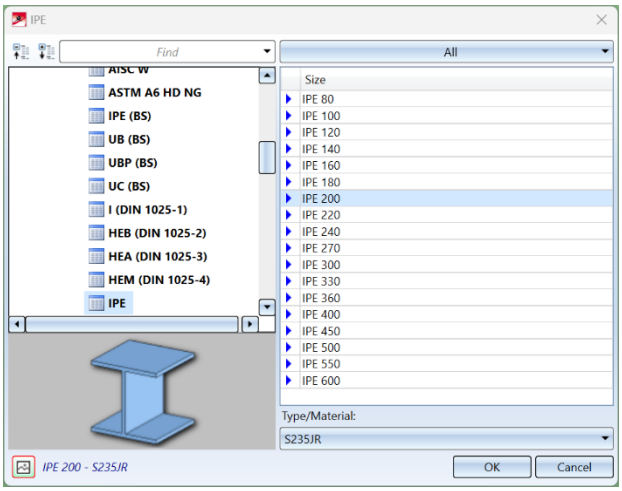


Figure 135 Standard beam catalogue selection

- Select a different dimension, material or type:

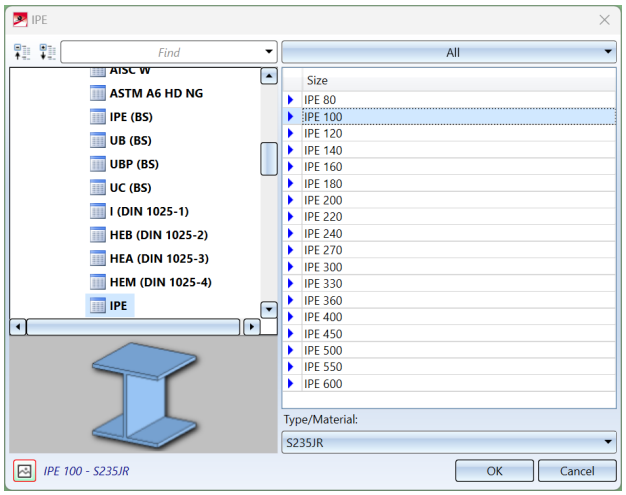


Figure 136 Standard beam catalogue selection (2)

- Choose the new orientation (if the 'retain fitting axis' checkbox is enabled, the component retains its original orientation) and press 'OK':

Result:

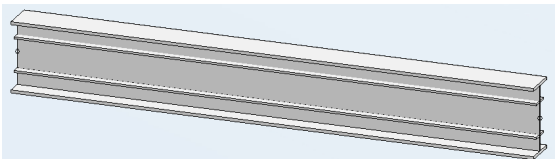


Figure 137 Add beam to standard beam result

10.3 Move + Rotate

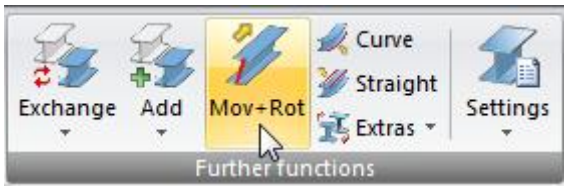


Figure 138 Move + Rotate beam

With this function, a shift and a rotation can be performed on a profile in one operation. A significant difference from other movements and rotations in HiCAD is that no values are requested here, only points. This allows for a complex movement and shift to be easily executed.

Selection:

- Select the rofile to be edited
- Fixation, or rotation point
- Starting point of the movement
- Ending point of the movemen

Example:

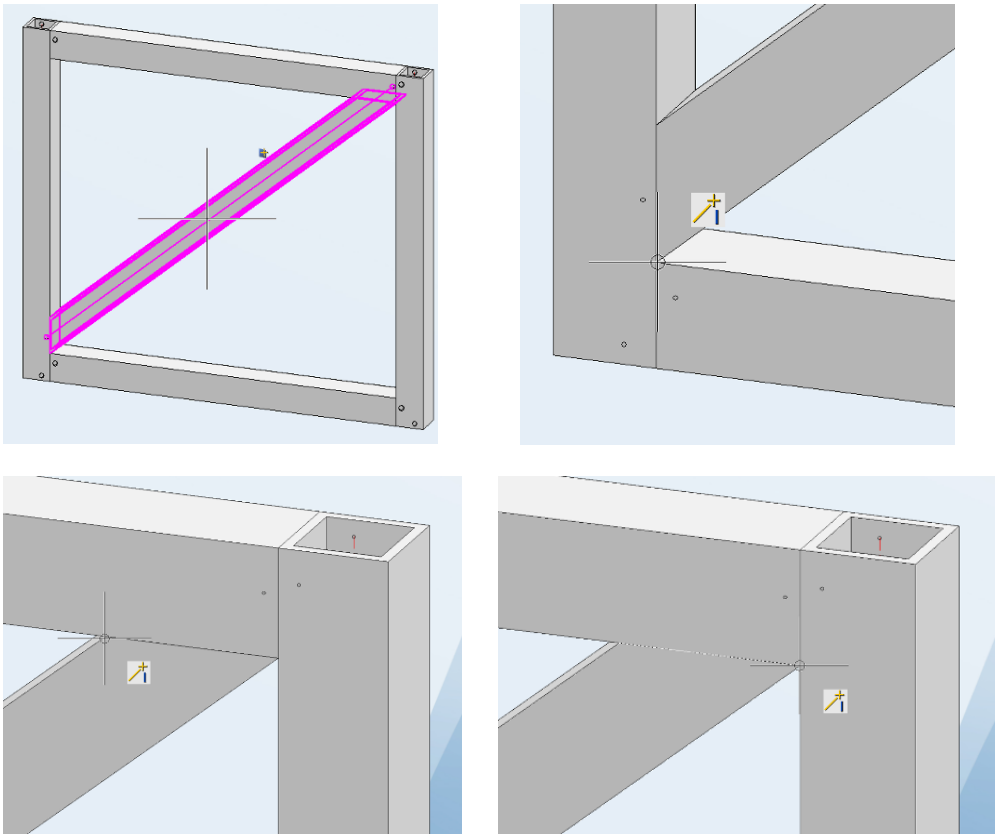


Figure 139 Move + Rotate example

Should external references be activated for the operation? This means that a trim to part is reconsidered after the move + rotate operation.

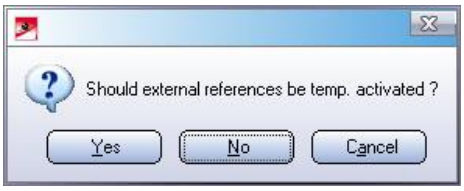


Figure 140 External reference activation message

Result:

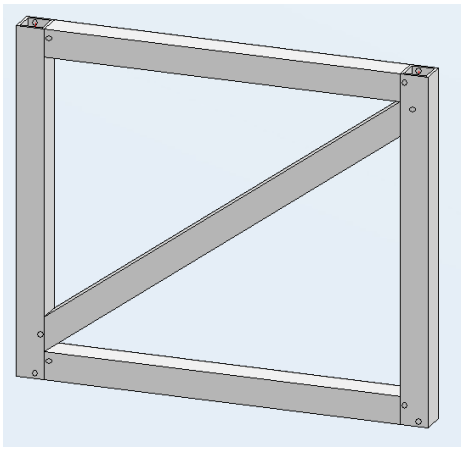


Figure 141 Move + Rotate result

Please note:

- The question 'Should external references be temporarily activated' recalculates the trim operations at the bottom left and top right. However, it should no longer notch on the horizontal beam but on the vertical one. This needs to be manually corrected.

10.4 Curve / Straighten

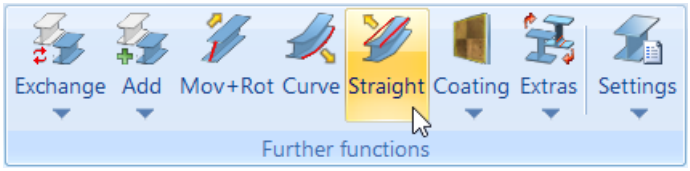


Figure 142 Further functions – Curve/straighten

With this functions it is possible to add a radius to an already drawn profile or to remove the radius.

Example:

- Select the Curve function and choose the radius settings:

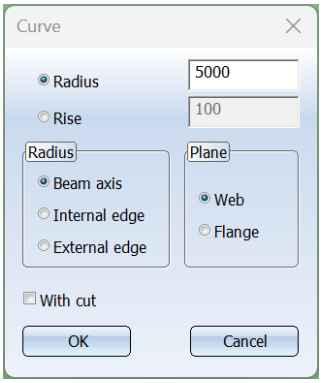


Figure 143 Curve parameters dialogue

Result:

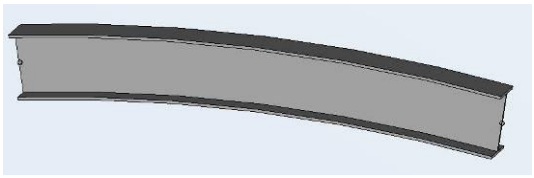


Figure 144 Curved profile

- Unbend: Select the Straight function.

Result:

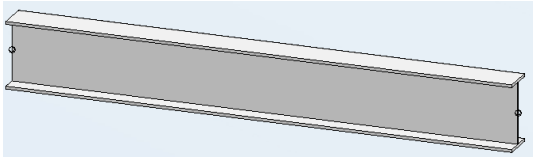


Figure 145 Unbended profile

Please note:

- Profiles may not be displayed with a 'smooth' radius. This is due to the approximated representation of certain representation types.
- Approximation settings can be changed via Right-click in the graphic screen -> Properties -> Surface approximation
- Polygon points for 3-D quadrant' is 6 since HiCAD 2014.

11 Excersises

11.1 Exercise 1

In this exercise, you be drawing your first profiles using the HiCAD profile construction / steel construction module. You will go over the 3 methods that the beam function has to offer. If you haven't started yet, here's a brief recap:

Start HiCAD

After startup, the HiCAD Start Centre will appear. Here, you can choose your initial actions in HiCAD. This step is not mandatory; you can also disable the HiCAD Start Centre and manually select your first actions in HiCAD.

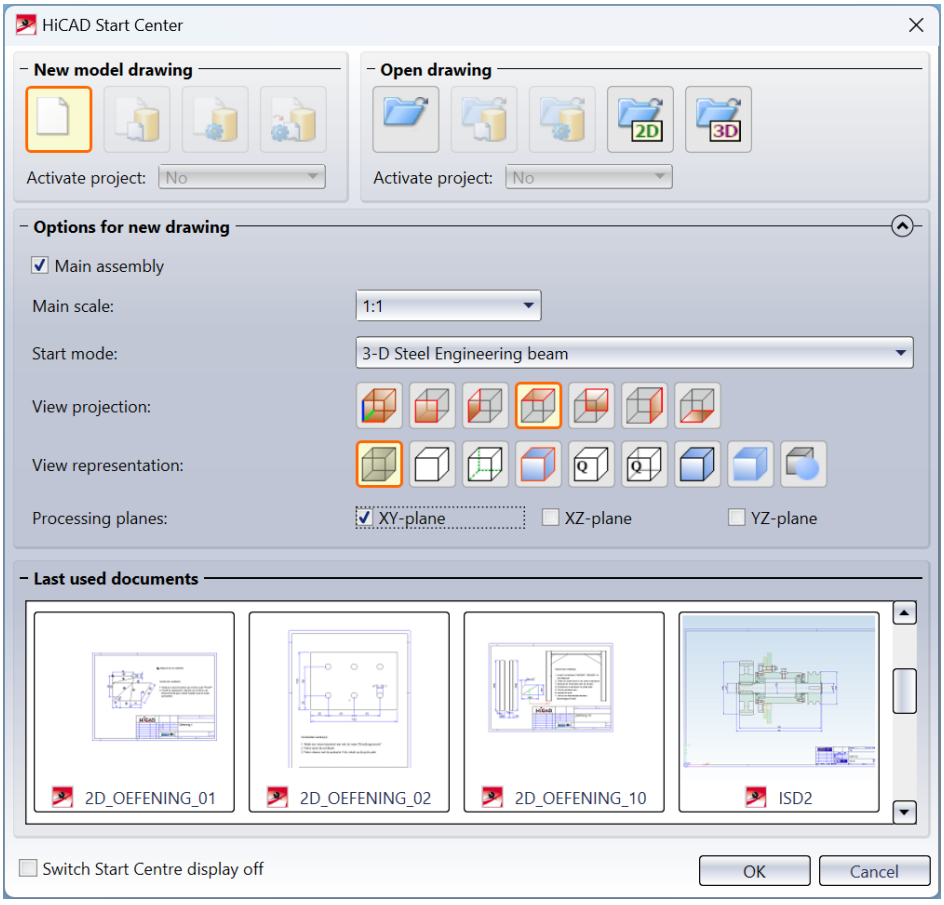


Figure 146 HiCAD Start Center

- Modify the settings in the HiCAD Start Centre and click OK. HiCAD will now perform the following actions for you:
  - Create a Main Assembly
  - Activate the Steel Engineering ribbon
  - Create a processing plane in the X/Y-plane
  - Activate the Top view
  - Set the display to Glass Model

    These settings can be changed aftwards when you're modelling.

11.1.1 Beam via Insertion perpendicular to processing plane

- Place a cuboid Length (x): **1000** **Width** (y): **1000** **Height** (z): **100** using the Primitive function
- **3-D Standard > New > Primitive**
- Start the beam function: **Steel Engineering > New > Beam**
- Select the first insertion method: "insertion perpendicular to processing plane"

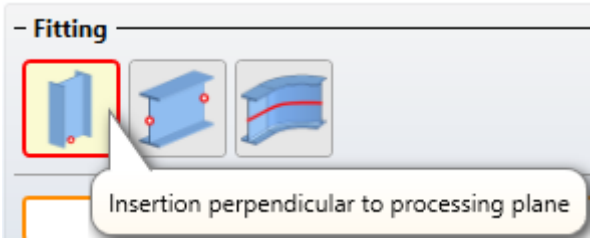


Figure 147 Insertion perpendicular to processing plane

- Select a insertion point by clicking on the top corner of the cuboid
- Select an **IPE 200** from the cataloge using the square book button 
- Set the length to **1000**

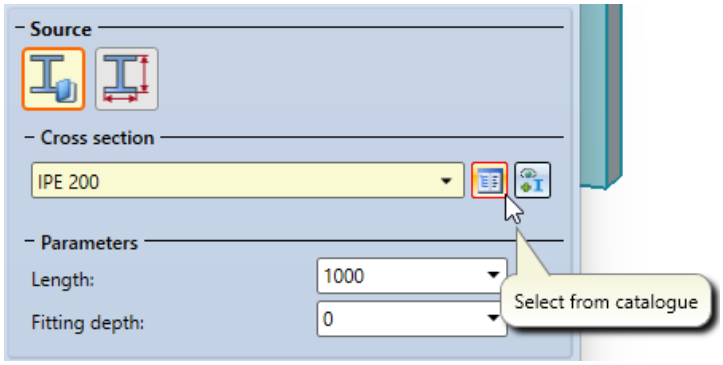


Figure 148 Standard part catalogue selection

- Give in the correct reference point:

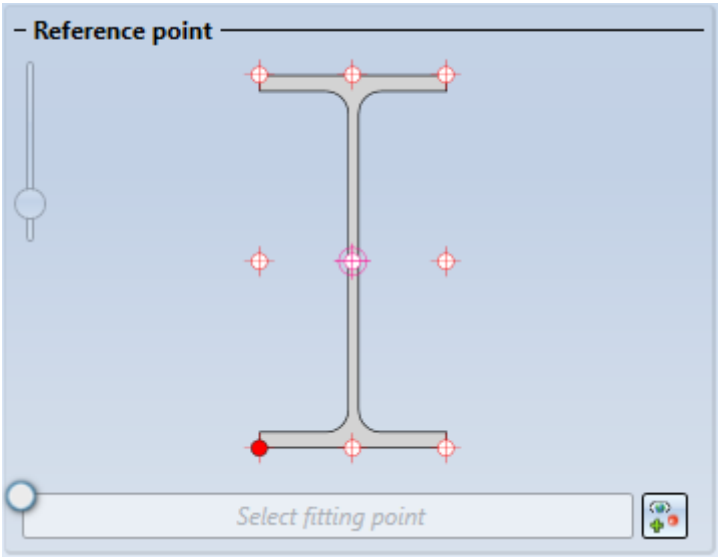


Figure 149 Reference point selection in insert beam dialogue

- And click on Apply or press MMB.
- Do this for all 4 corners resulting in this model:

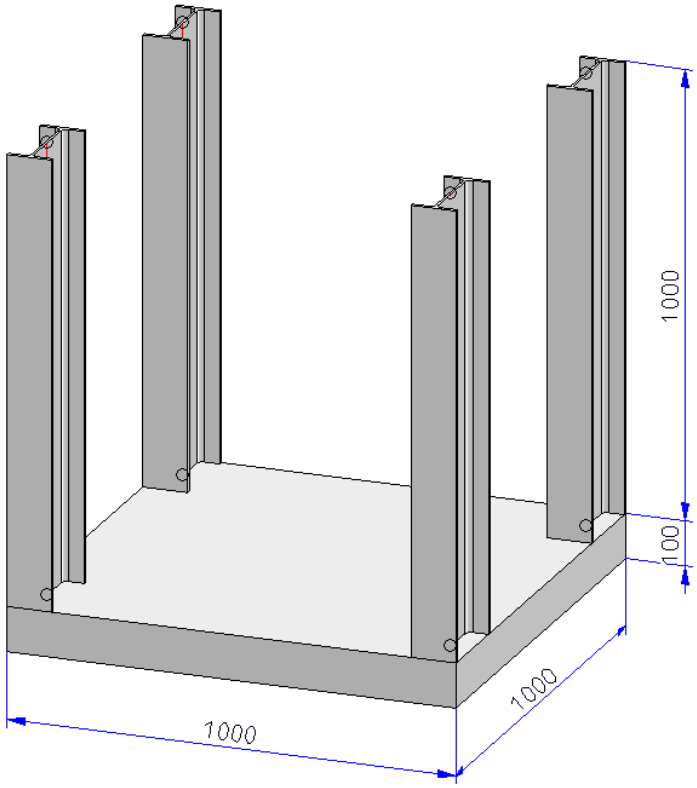


Figure 150 Inserted beams

11.1.2 Beam via Insertion via 2 points

- Continue with the model by selecting the insertion via 2 point in the beam function.

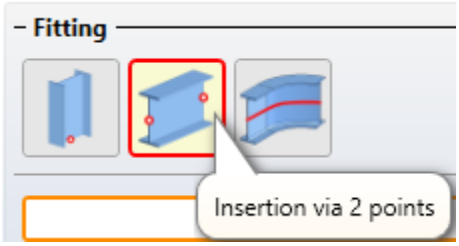


Figure 151 Standard beam insertion via 2 points

- Now we will place 4 beams on top of the 4 pillars using the same IPE 200 profile.
- This can be done by selecting each corner point of the pillars.
- Make sure to select the correct rotation and reference point.

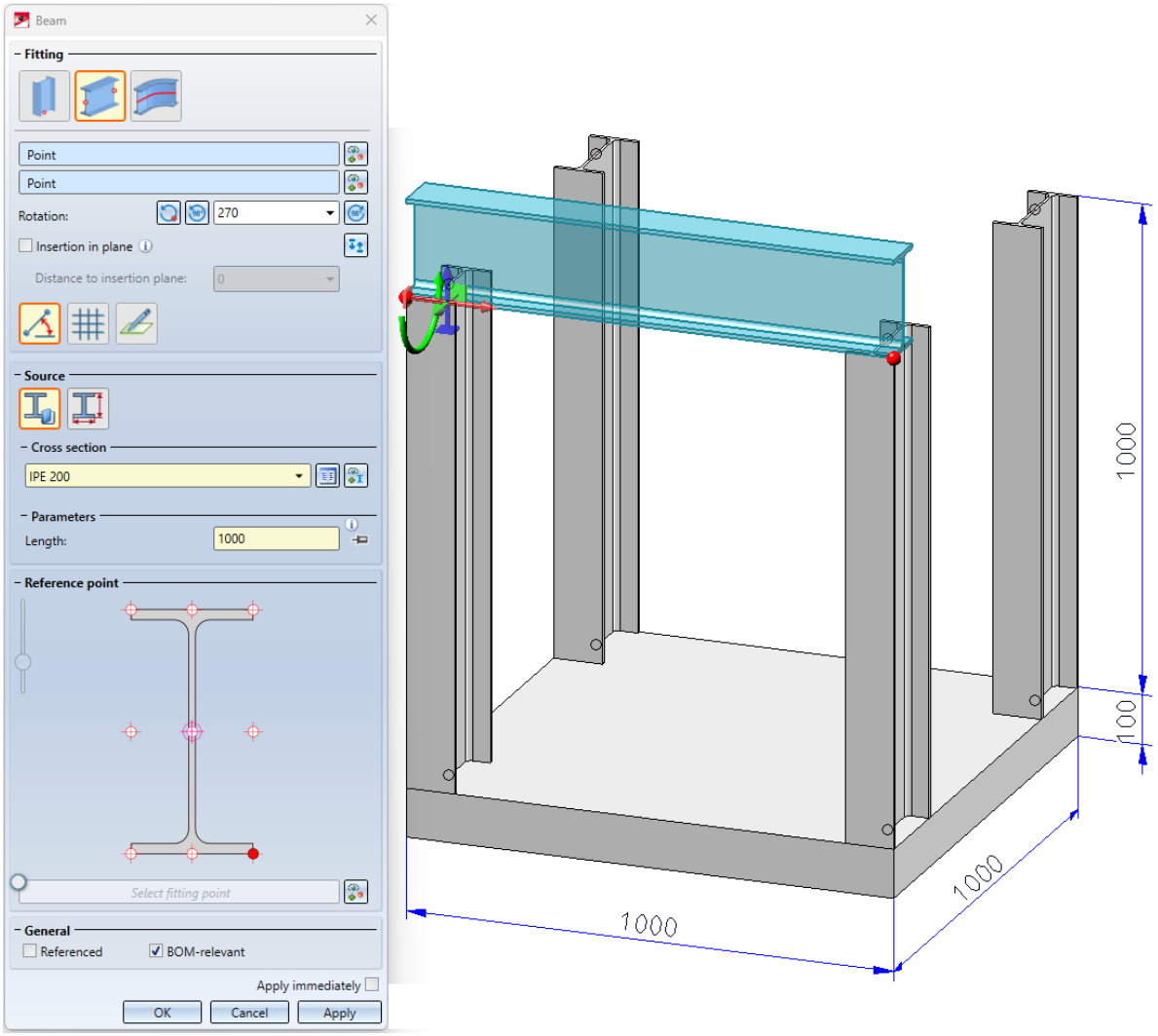


Figure 152 Beam insertion via 2 points

Do this for all 4 corners resulting in this model:

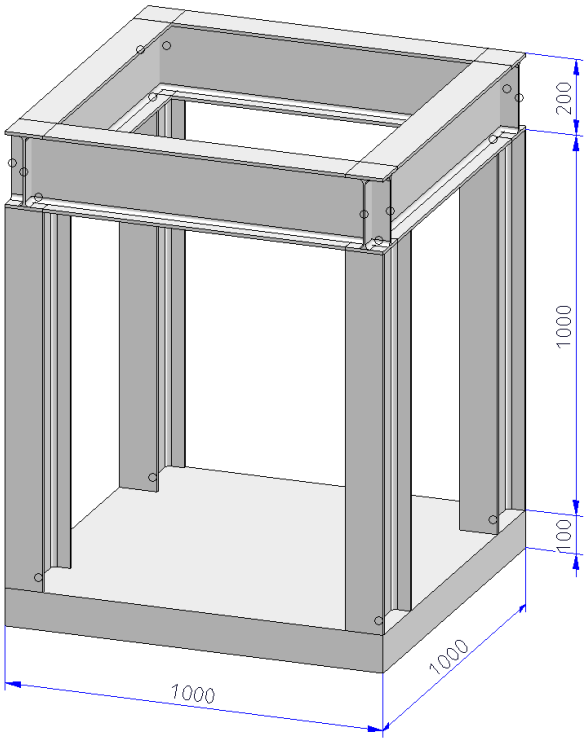


Figure 153 Exercise 1 after beam insertions

11.1.3 Beam via Insertion along guideline

- Continue with the model by selecting the along guideline in the beam function.

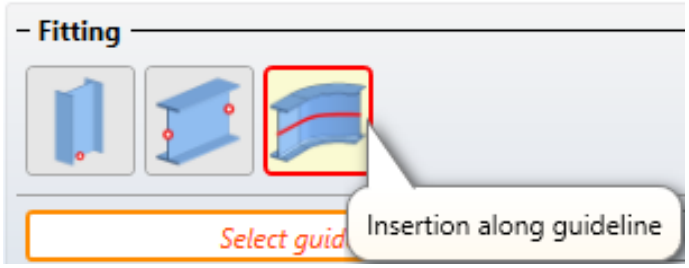


Figure 154 Insert beam along guideline

- Afther this select the New sketch in plane button 

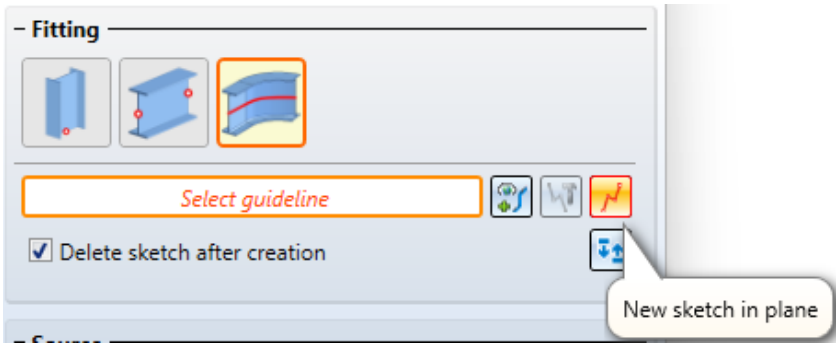


Figure 155 create new sketch for guideline

- Place the processing plain on top op the drawn beams.

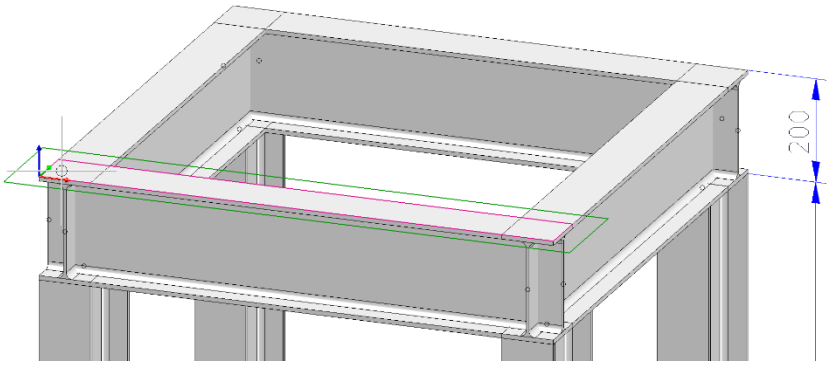
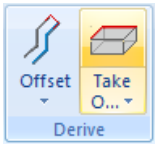


Figure 156 Inserted processing plane for sketch

- Select the take over button edge button 

- **Sketch > Derive > Take Over edges**

- And select the 3 longe edges of the beams,Press MMB to confirm the selection.
- Follow this by clicking on Apply sketch.

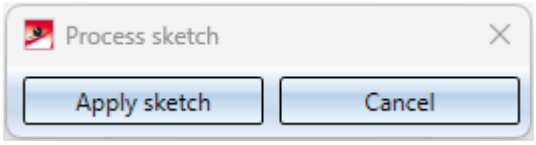


Figure 157 Sketch processing dialogue

- Select the correct reference point and click on apply or MMB to confirm.
- Those steps should result in the following model:

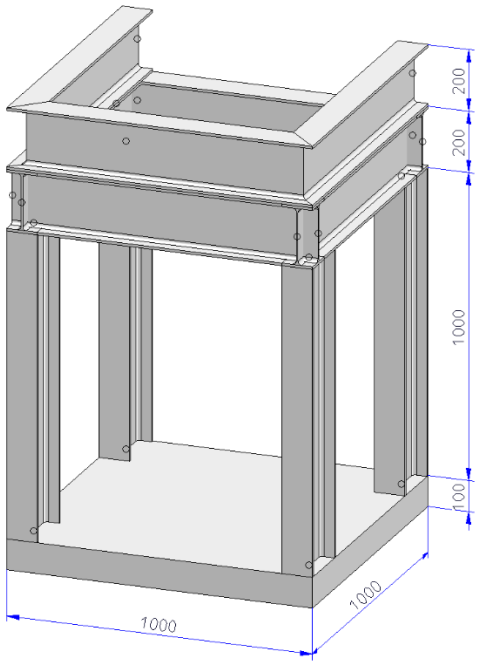


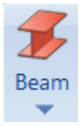
Figure 158 Resulting model exercise

The exercise is finished

11.2 Exercise 2

In this exercise, you will be repeating the functions you have learned in excersise 1. You will be using the HiCAD profile construction / steel construction module.

- Start a new drawing with settings: Main Assembly, Steel Engineering ribbon, Processing plane in the X/Y-plane, Top view, Glass Model.

- Click on 

and search for **IPE 200 – S235JRG2** in the catalogue:

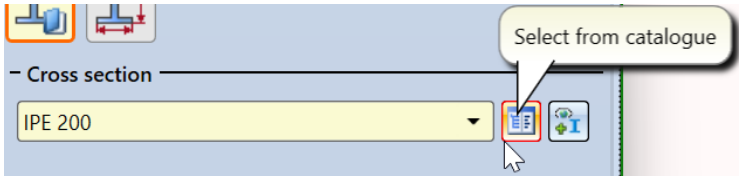


Figure 159 Select standard beam from catalogue

- Next, choose the option "Insertion via 2 points":

Figure 160 Insert beam via 2 points

- Draw the following construction:

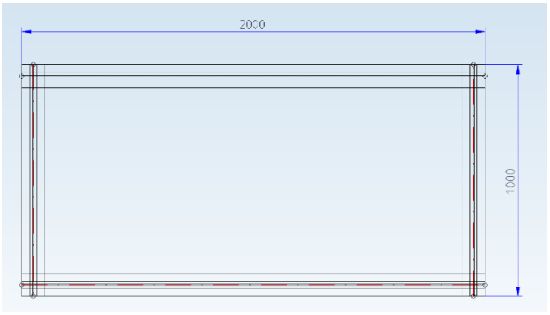


Figure 161 resulting model exercise 2

Tips:

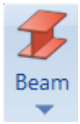
- Draw clockwise.
- Interchange the "Reference point" (Center of Gravity → Axis Left) while placing the profiles to ensure proper alignment of the profiles.

The exercise is finished

11.3 Exercise 3

In this exercise, you will be editing your first profiles using the HiCAD Steel Engineering module.

- Start a new drawing with settings: Main Assembly, Steel Engineering ribbon, Standard Axonometric view, Shaded with edges

- Use the function 

and select the **IPE 200 – S235JRG2** profile via the catalogue.

- Choose for the option ‘insertion via 2 points’:

Figure 162 Insert beam via 2 points

- And create the following construction:

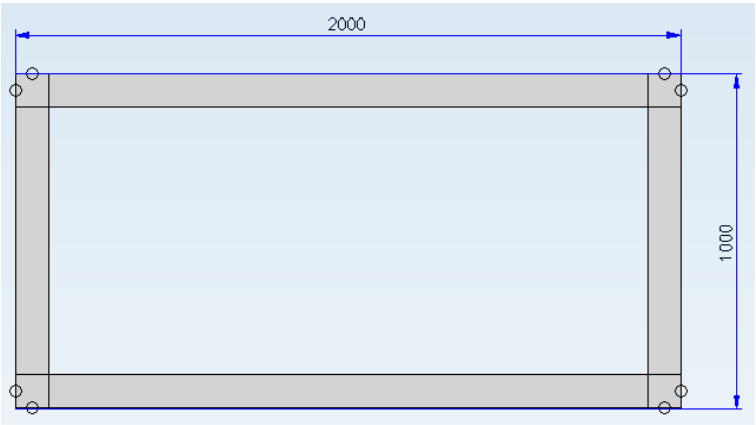


Figure 163 Untrimmed beams

- Then, modify using the 'Trim-Edge' functions:

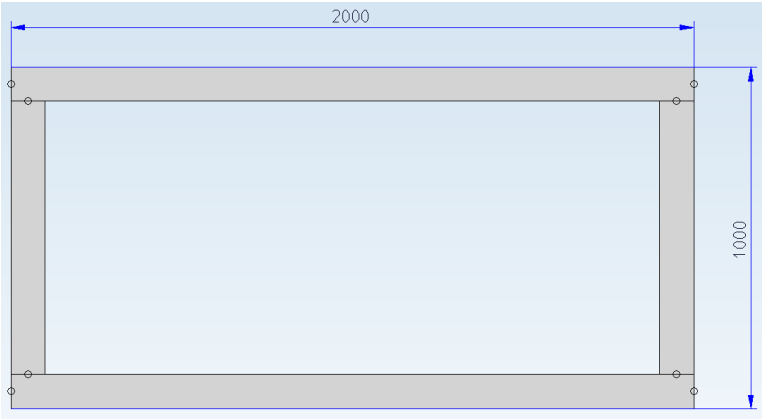


Figure 164 Trimmed beams

And then, modify using the 'Trim-mitre' functions:

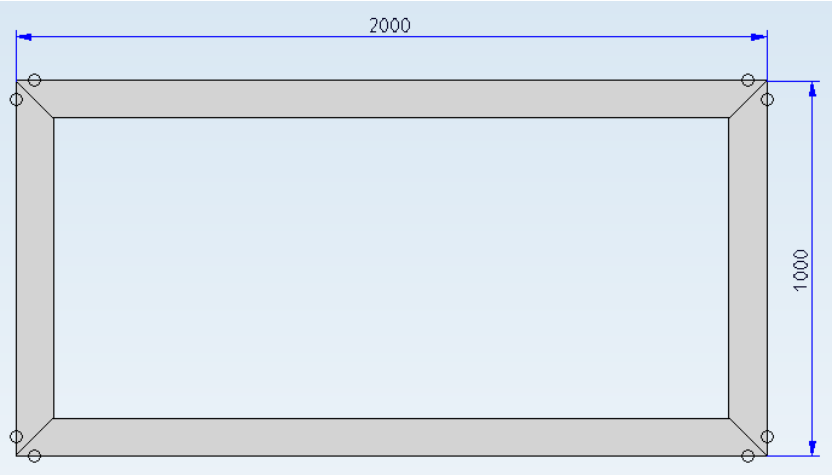
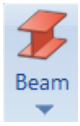


Figure 165 Mitred beams

The exercise is finished

11.4 Exercise 4

In this exercise, you will be swapping the beam axis using the HiCAD Steel Engineering module.

- Start a new drawing with settings: Main Assembly, Steel Engineering ribbon, Processing plane in the X/Y-plane, Top view, Glass Model.
- Use the function 

and select the **IPE 200 – S235JRG2** profile via the cataloge.
- Choose for the option ‘insertion via 2 points’:

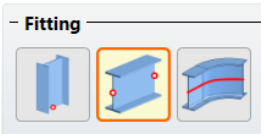


Figure 166 Insert beam via 2 points

- Create the following construction:

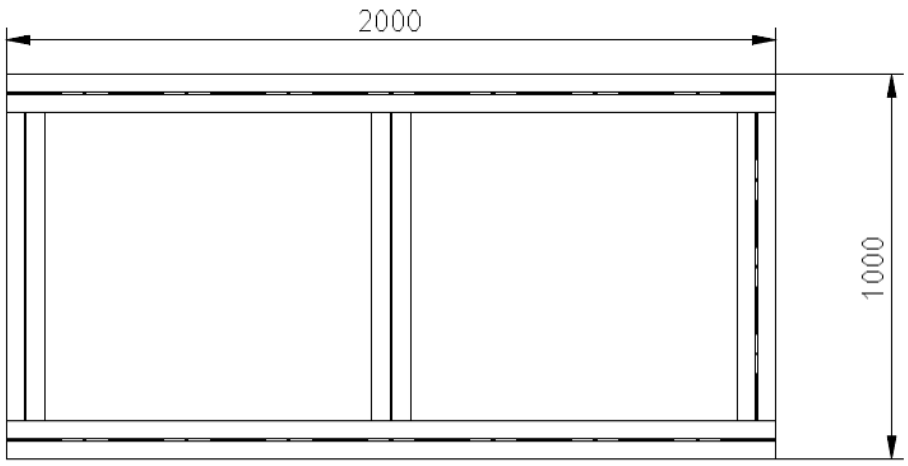


Figure 167 Steel frame

Tips:

- Draw clockwise.
- Interchange the "Reference point" (Center of Gravity → Axis Left) while placing the profiles to ensure proper alignment of the profiles.
- Always change the 'Beam fitting point' only AFTER the profile has been drawn!

The exercise is finished

11.5 Exercise 5

- Start a new drawing with settings: Main Assembly, Steel Engineering ribbon, Processing plane in the X/Y-plane, Top view, Glass Model.
- Create a 3-D sketch with the following function:

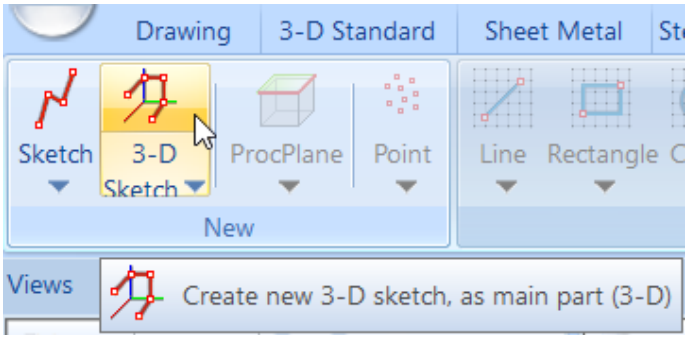
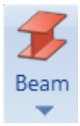


Figure 168 Create new 3-D sketch in Sketch ribbon

- Draw one sketch line of 2000 mm in the positive X direction (axis):
- Use the function 

and select the IPE 200 – S235JRG2 profile via the cataloge.
- Choose for the option 'insertion along guideline':

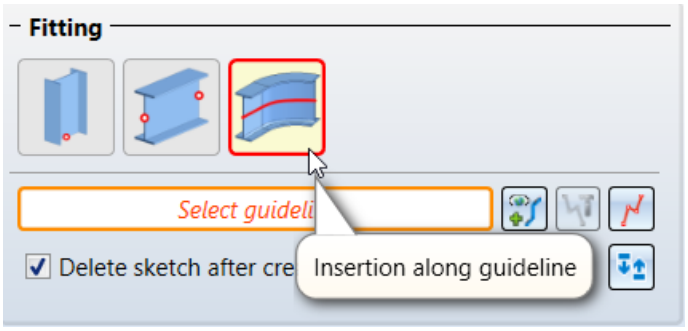


Figure 169 Insert beam along guideline

- Select the sketchline you've drawn (and confirm with MMB of apply):

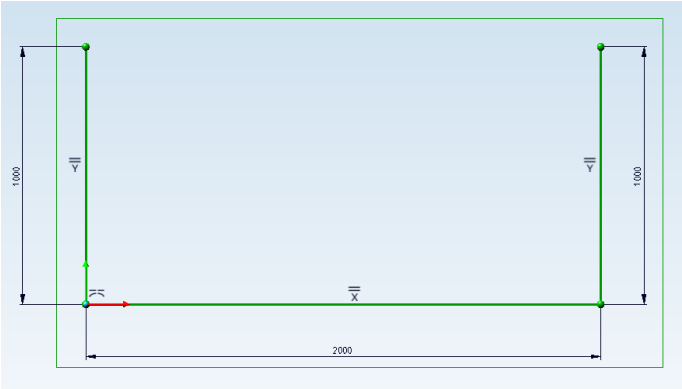


Figure 170 Example sketch

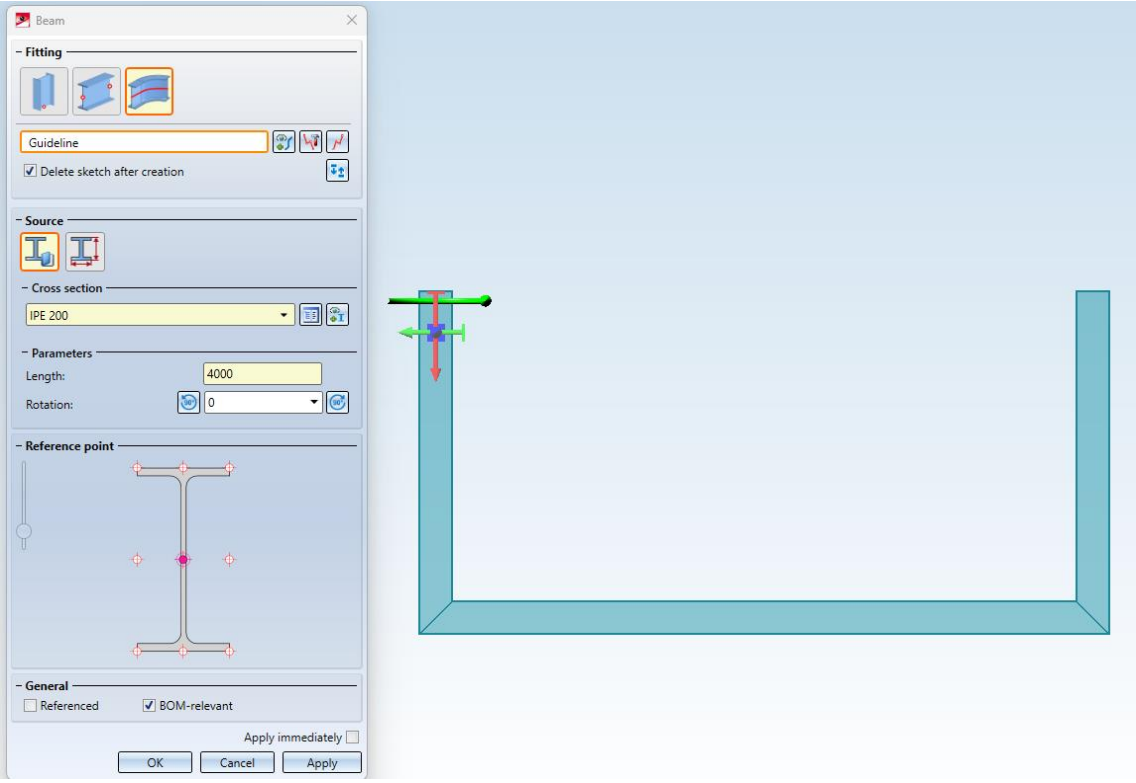


Figure 171 Resulting steel construction

This function allows you to create a profile from a line (this line can have any shape and length in the X, Y, or Z direction).

- Then, choose the option 'Insertion via 2 points:

Figure 172 Insert beam via 2 points

- And finish the construction like this:

Figure 173 Finished steel frame

The exercise is finished

11.6 Exercise 6

In this exercise, you will create profiles into the 3D model using a processing plane.

- Start a new drawing with settings: Main Assembly, Steel Engineering ribbon, No processing, Standard axonometric view, Shaded with edges.
- Draw a "Solid Primitive" (3-D standard) of 2000x1000x1000mm:

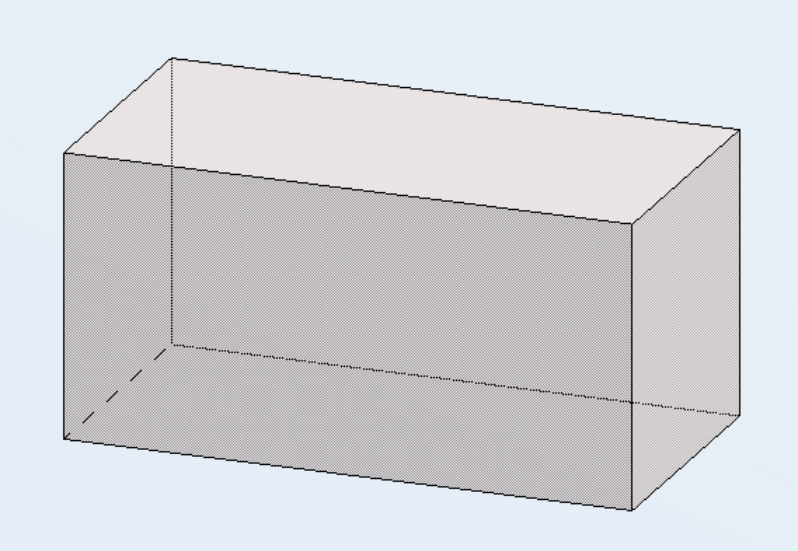


Figure 174 Solid primitive in layer 40

- Create a *"processing plane"* on top of the Solid Primitive

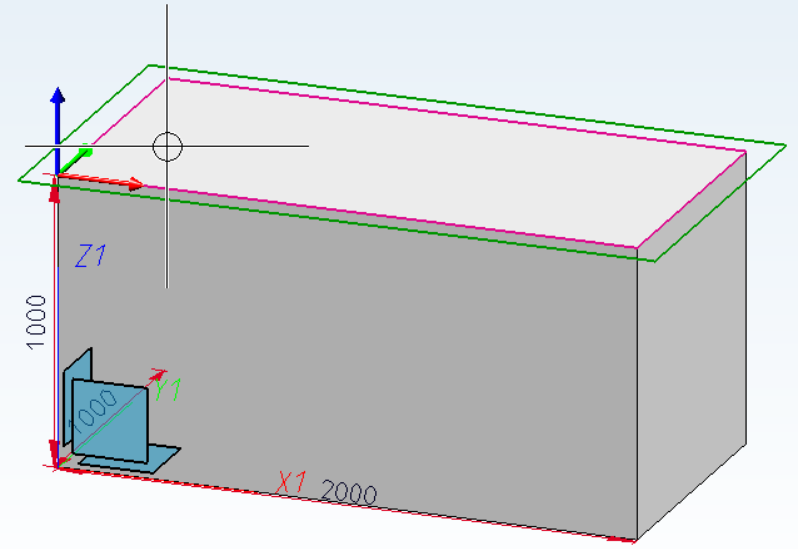
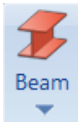


Figure 175 Insert processing plane on solid primitive surface

- Use the function 

and select the **IPE 200 – S235JRG2** profile via the cataloge.
- Choose for the option ‘insertion via 2 points’:

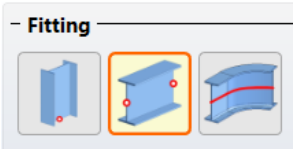


Figure 176 Insert beam via 2 points

- Create the profiles in the processing plane (please pay attention to the position of the profiles):

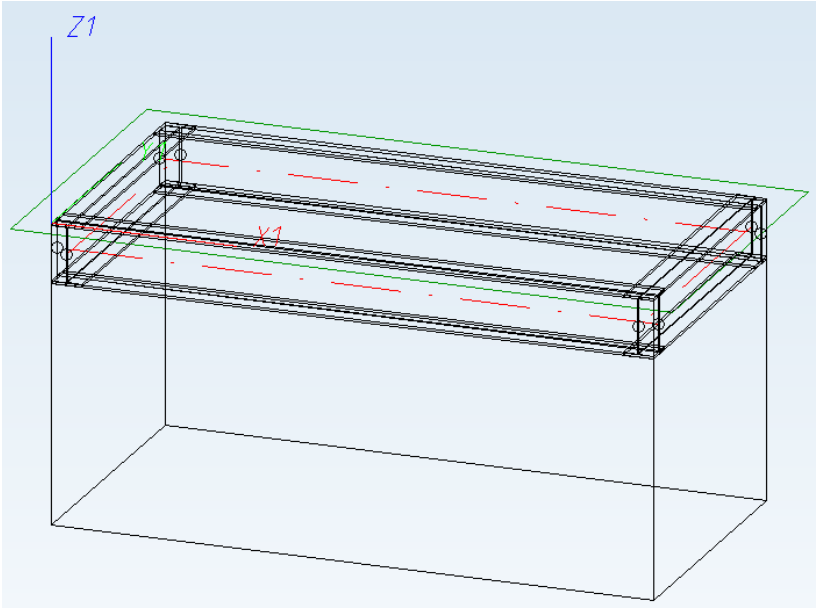


Figure 177 Beams inserted in processing plane

- Ensure that the profiles connect to each other using the mitre:

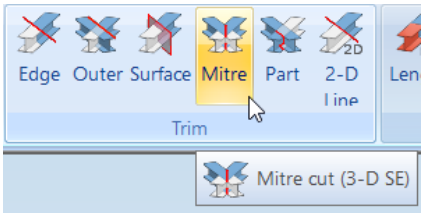


Figure 178 Steel engineering ribbon – Mitre cut

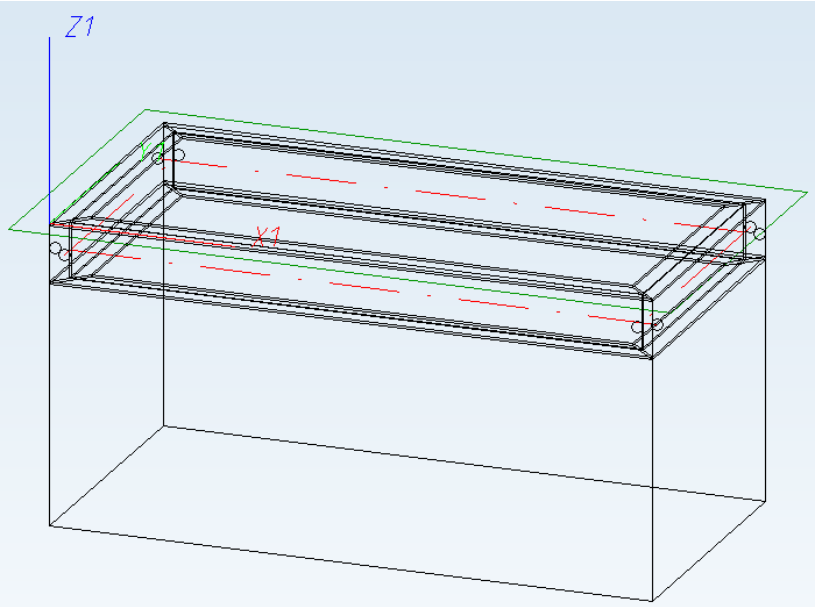


Figure 179 Beams inserted in processing plane mitred

Save this drawing for exercise 7.

Tips:

- draw clockwise and use the reference point Axis left

The exercise is finished

11.7 Exercise 7

In this exercise, you will create profiles into the 3D model using a processing plane.

- Use the drawing of exercise 6.
- Create a new processing plane on the bottom side of the “Solid Primitive” and create (or “Clone”) the profiles:

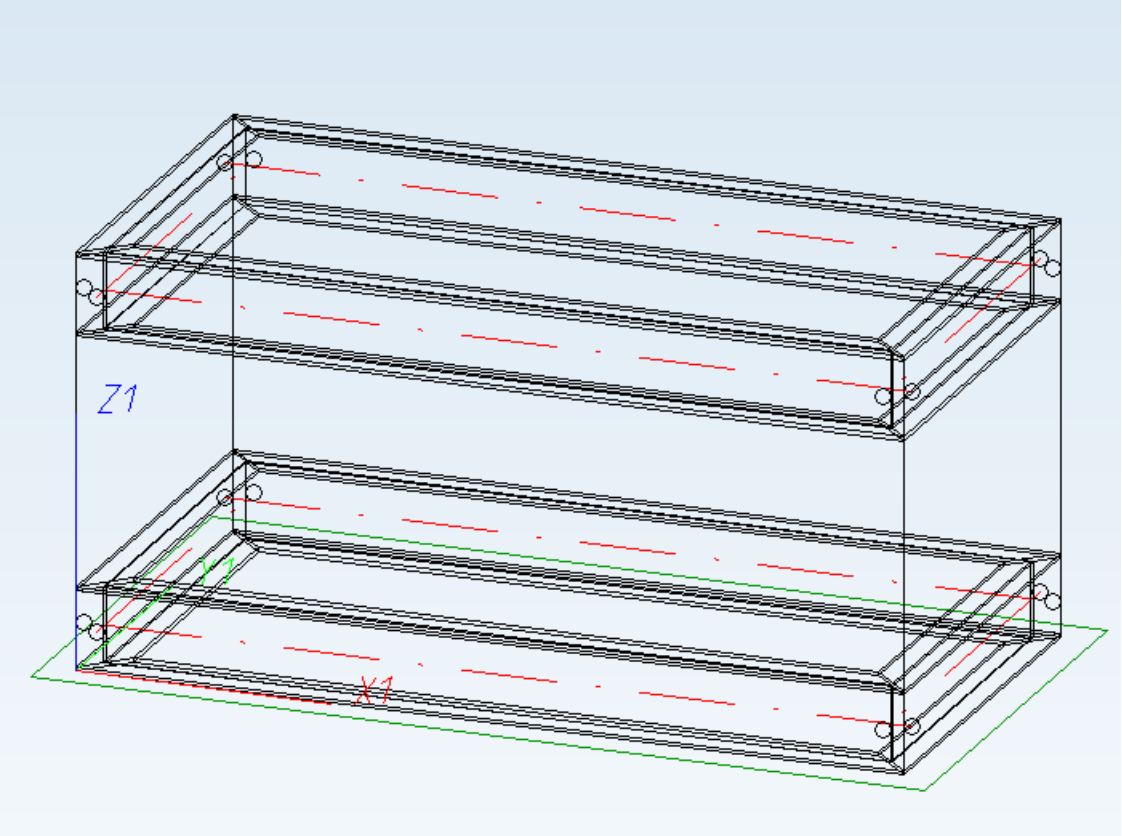


Figure 180 Steel frame cloned over solid primitive

- Save the drawing for exercise 8.

The exercise is finished

11.8 Exercise 8

In this exercise, you will create Steel Engineering profiles into the 3D model using various options.

- Use the drawing of exercise 7.
- Place the vertical profiles in the various ways as shown below:

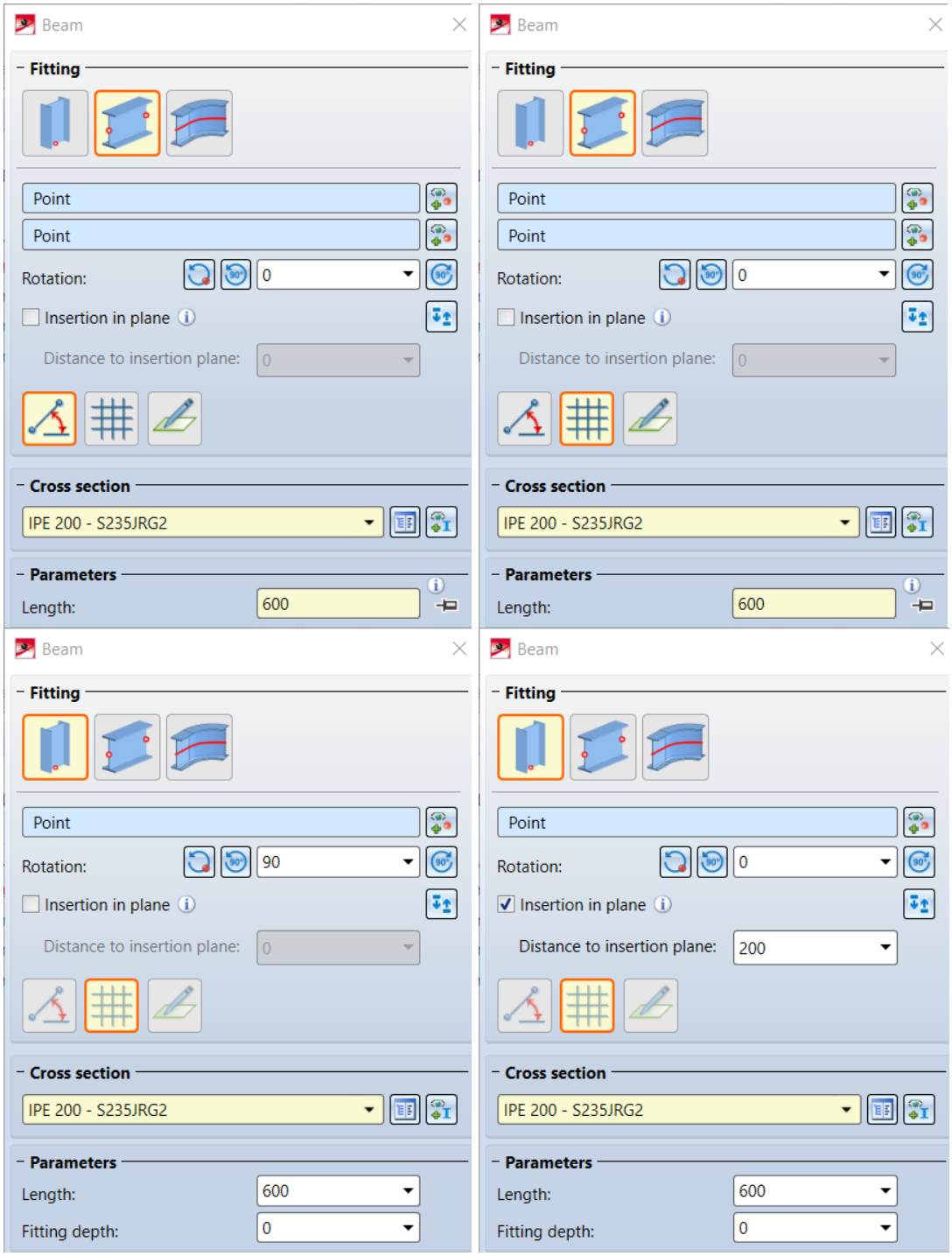


Figure 181 Insert beam configuration dialogues

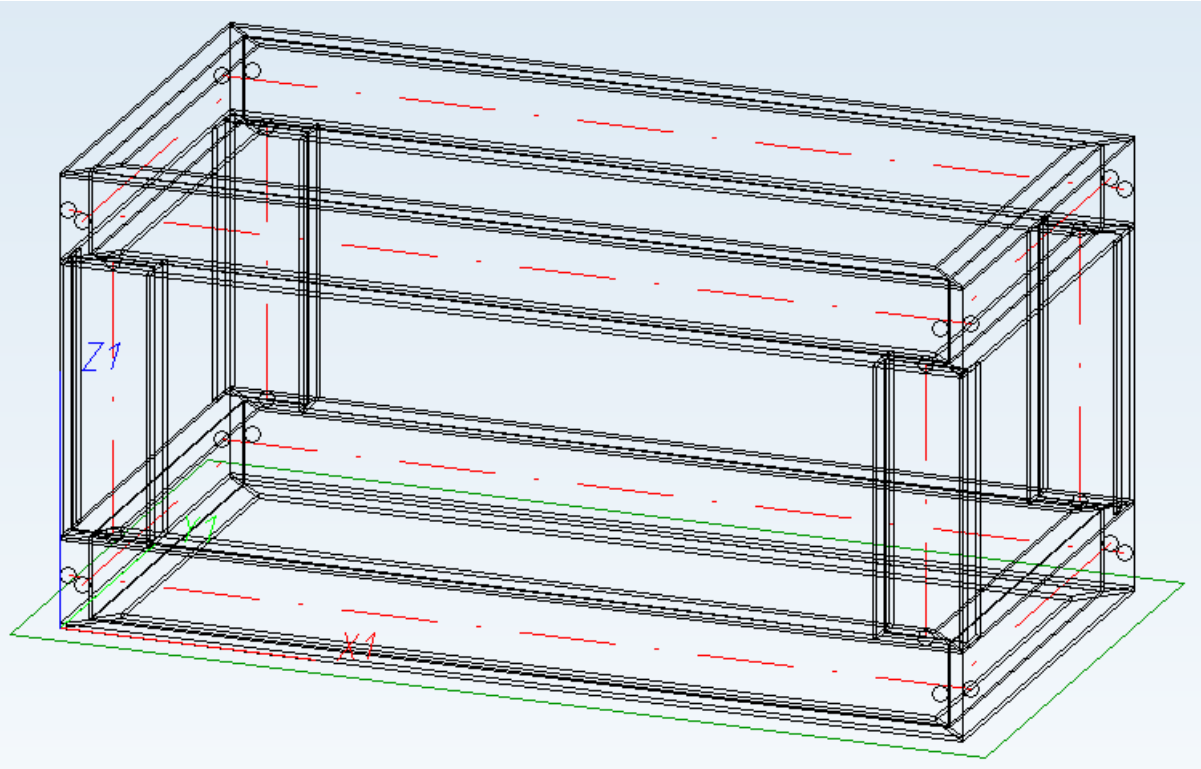
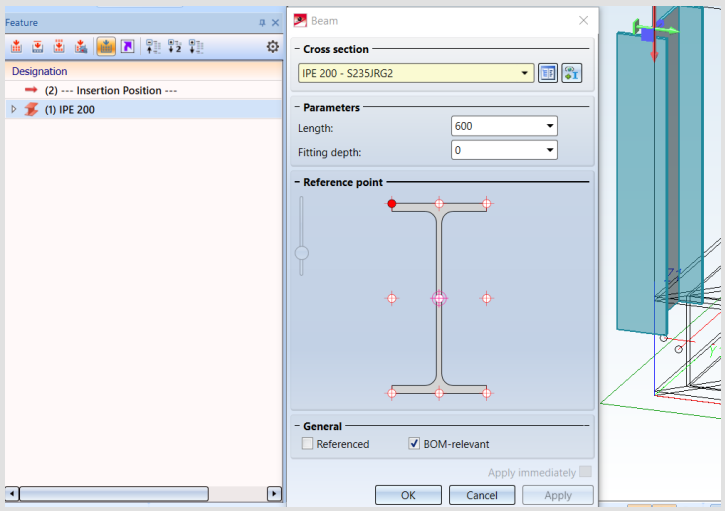


Figure 182 Steel frame

Tips:

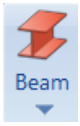
- Don't forget that the profile can always be modified after it is drawn by opening and editing the feature. Activate the beam and double-click on the beam feature (this will always be the first one of the list):



The exercise is finished

11.9 Exercise 9

In this exercise, you will be modifying profiles using the function *"Move + Rotate"*.

- Start a new drawing with settings: Main Assembly, Steel Engineering ribbon, No Processing, Standard axonometric view, Shaded with edges.
- Use the function 

and select the **IPE 200 – S235JRG2** profile via the cataloge.
- Create the following construction:

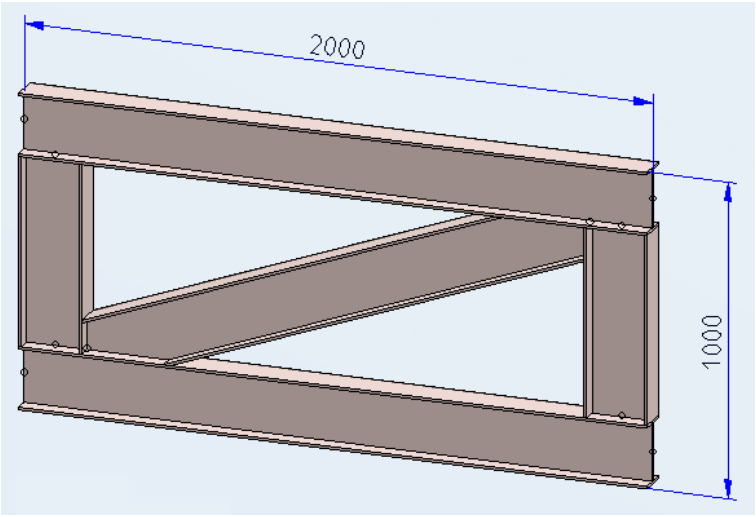


Figure 183 Steel frame dimensioned

- Change the model as you have drawn above to the model shown below

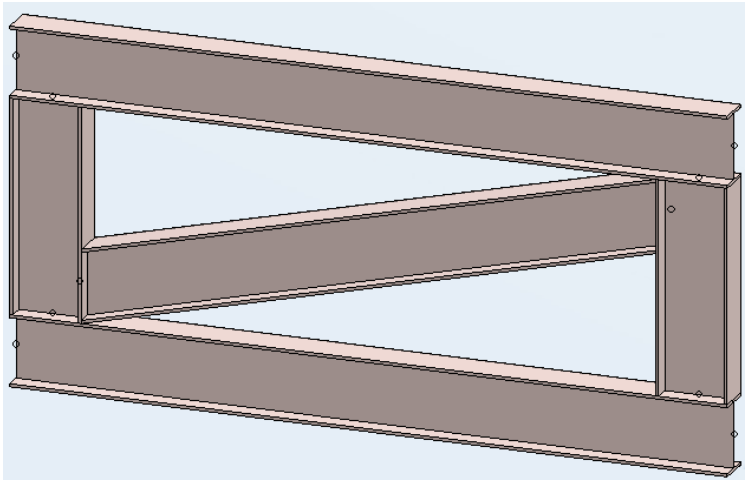
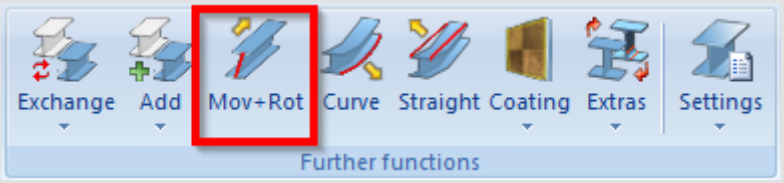


Figure 184 Steel frame after move + rotate

Tips:

- Use the function *"Move + Rotate"* to change the model.



The exercise is finished

11.10 The (automatic) Bolting function

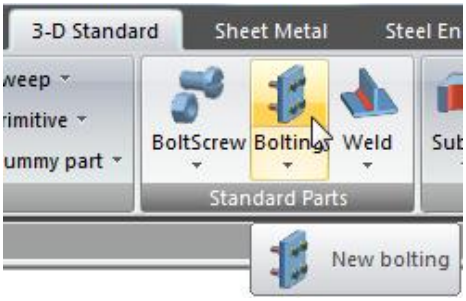


Figure 185 3-D standard ribbon – Insert new bolting

The automatic bolt connection function, also known as 'Bolting', allows bolts, nuts, washers, and holes to be placed in a single operation.

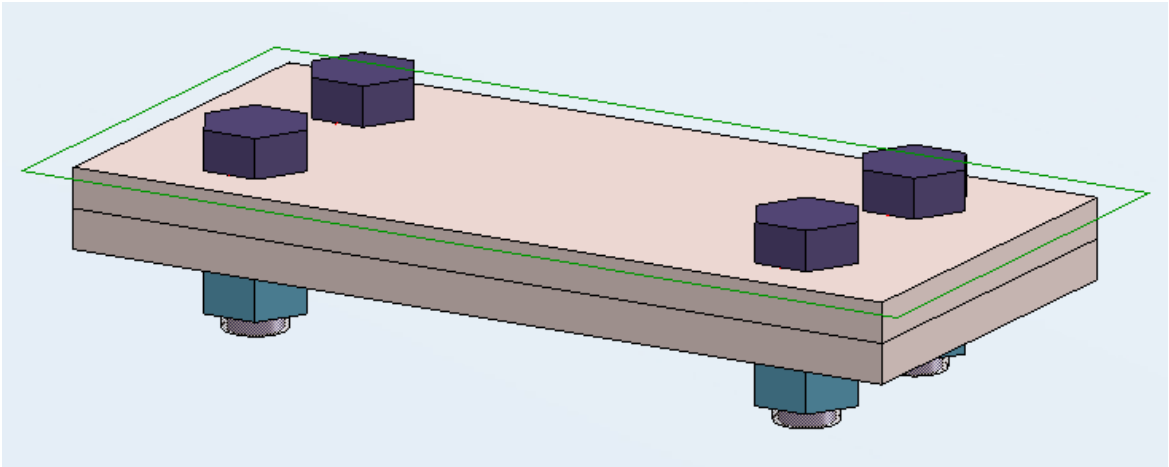
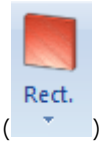


Figure 186 Bolting connection in two steel plates

Users who have access to the 'steel engineering' functionality (steel engineering suite premium) can also use the 'bolting' button in the steel engineering toolbar. The principle is the same as bolting from the 3-D Standard module, but the menu is adjusted so that users can quickly select certain (German) standards. This will not be covered during the course, as we will be using 'Bolting' from the 3D module since it is available to everyone and provides more functionality.

Figure 187 Steel engineering ribbon – Insert SE bolting

Example:

- Draw 2 rectangular plates (

):

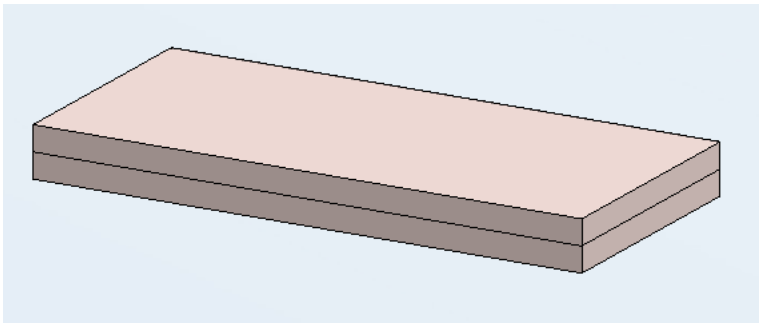


Figure 188 Two steel plates

- Use the “Bolting” function:

Figure 189 3-D standard ribbon – Insert new bolting

The following menu will be shown for an explanation of this please read the online help

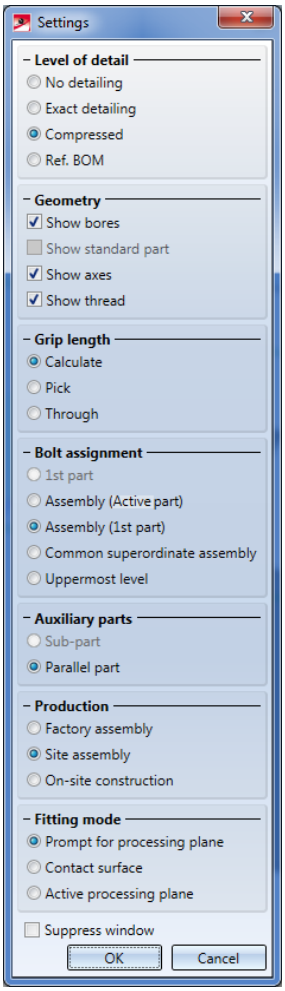


Figure 190 Bolting settings

After pressing OK, a processing plane has to be created:

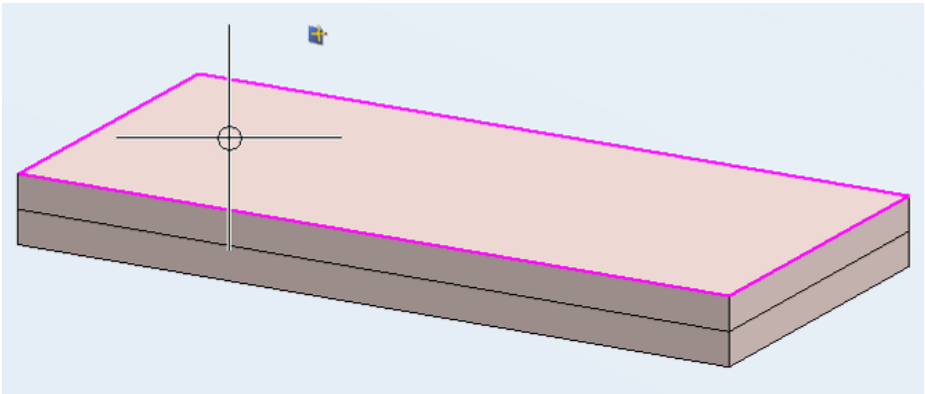


Figure 191 Part selection in HiCAD

Now you can create a bolting set:

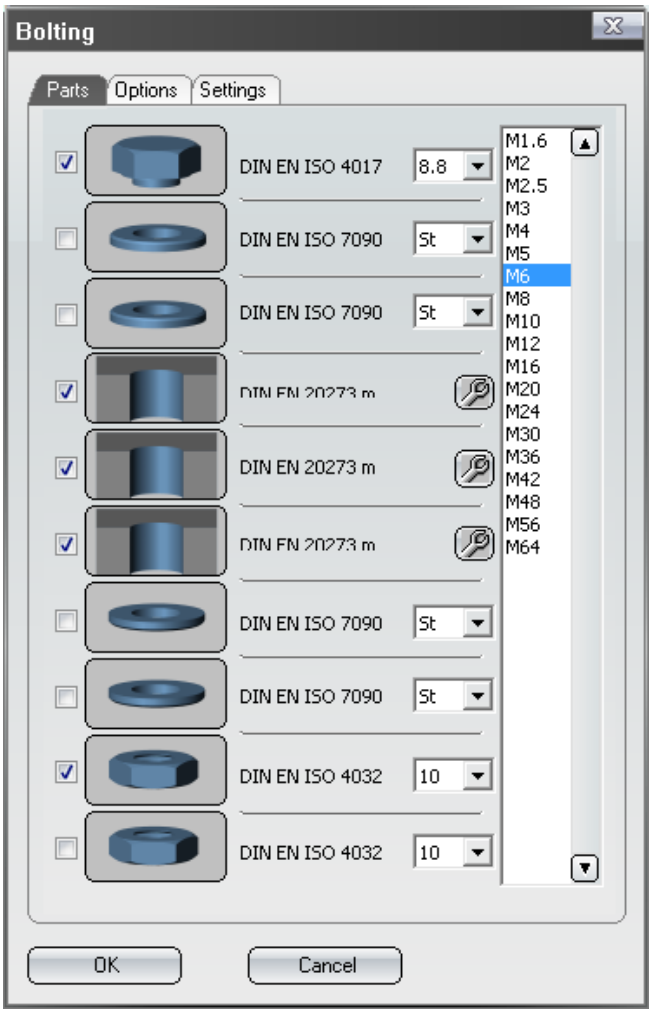


Figure 192 Bolting configuration dialogue

Press OK and select the first plate:

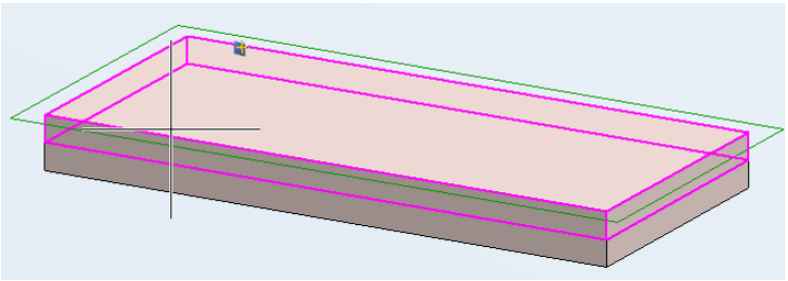


Figure 193 Part selection in HiCAD

- Then select the second plate:

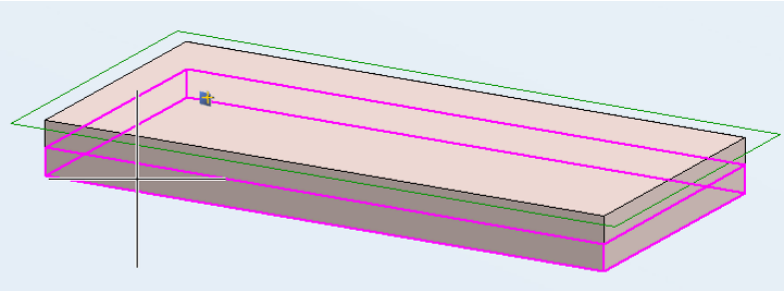


Figure 194 Part selection in HiCAD

- Confirm the selection with the middle mouse button.
- Place the bolt connection on the plates (You can use a circular or linear pattern):

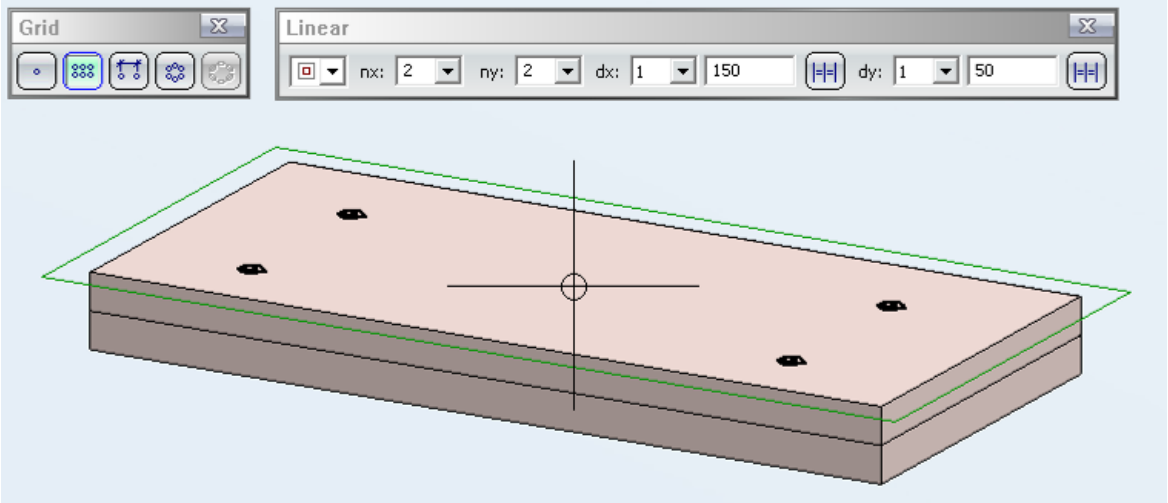


Figure 195 Bolting insertion

- The bolting connection is now completed:

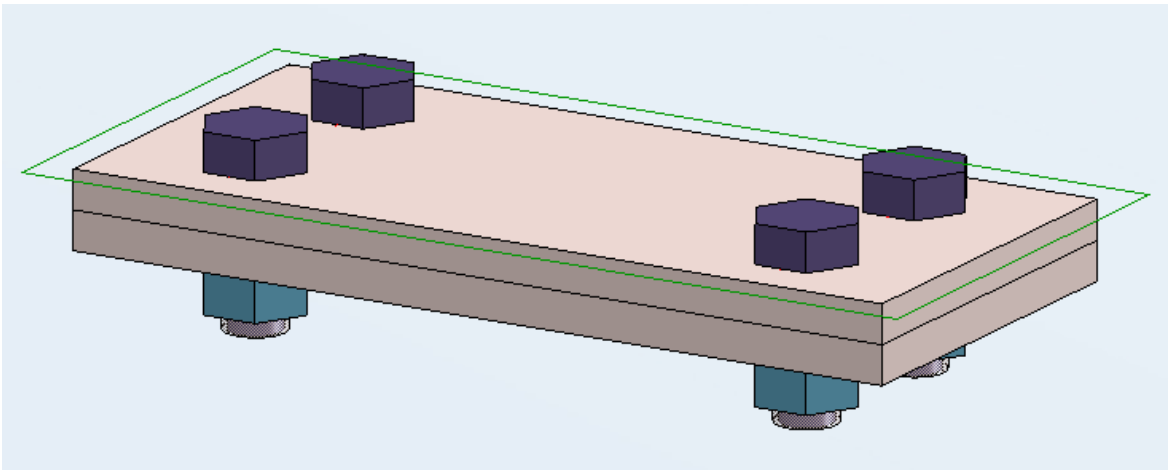


Figure 196 Resulting bolt connection

For modifications, right-click on one of the bolts and choose one of the following options:

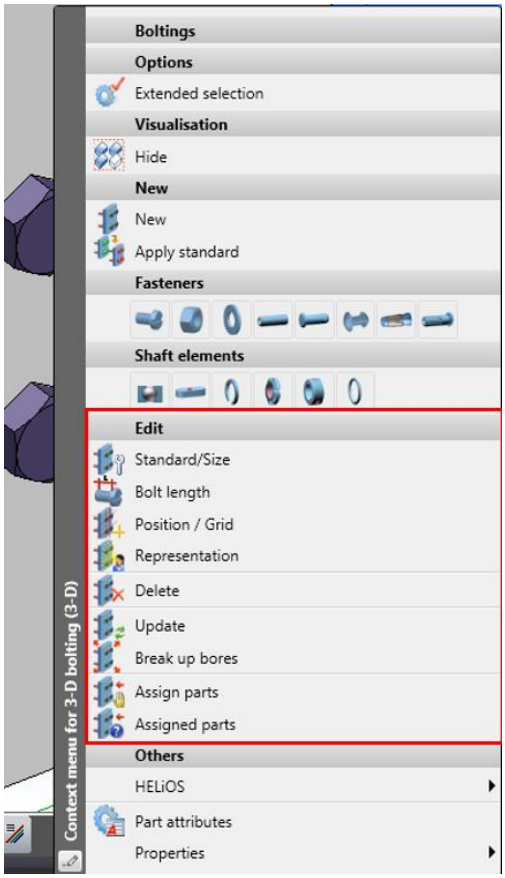


Figure 197 Bolting context menu

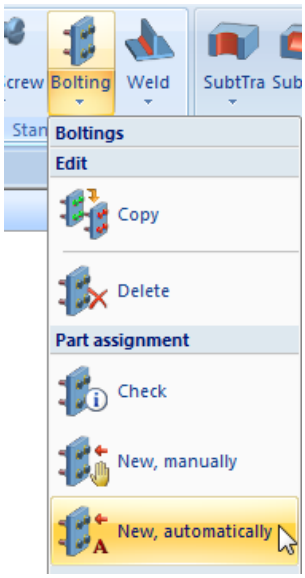


Figure 198 Sub-menu of insert new bolting

11.11 Exercise 10

In this exercise, you will create Steel Engineering profiles and plates and connect them with the automatic bolt connection. Users with access to the steel construction module may also use the automatic connections (civil engineering functions).

- Create the following model according to the recommended approach as given below:

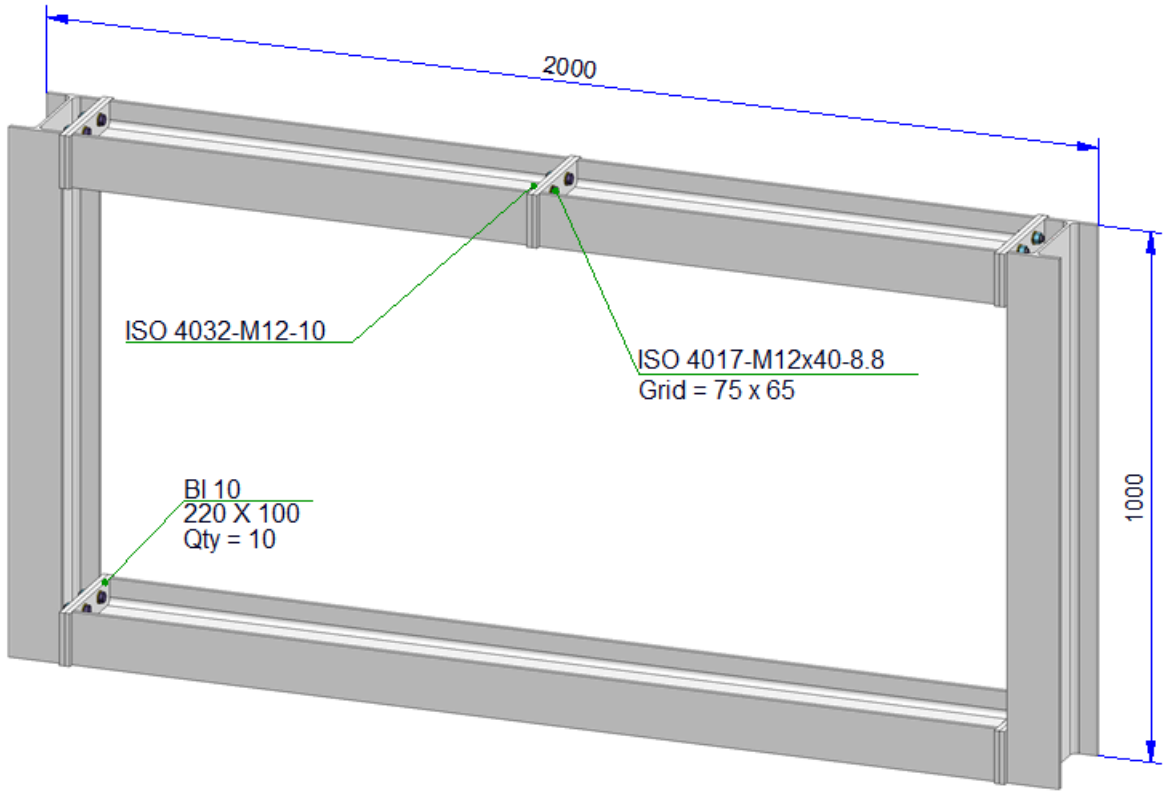


Figure 199 Steel frame with annotations and dimensioning

Recommended approach:

- Draw the four outer profiles in one plane (IPE 200 DIN EN 1025).
  Tip: Start drawing in the world X-Z plane!
- Divide one of the long beams in half (divide).
- Place end plates.
- Place 1 (or 2) bolt connections.
- Model the remaining bolt connections by copying an existing 'bolting'.
- Assign the plates to the copied bolt connections using 'assign parts'. Also, test the 'assign bolt automatically' function from the bolting submenu in the 3-D standard ribbon.
- Create a 'sheet' with an axonometric view and annotations as shown in the above image. Use 'Part annotation, with free text and leader line (3-D)' for annotations:

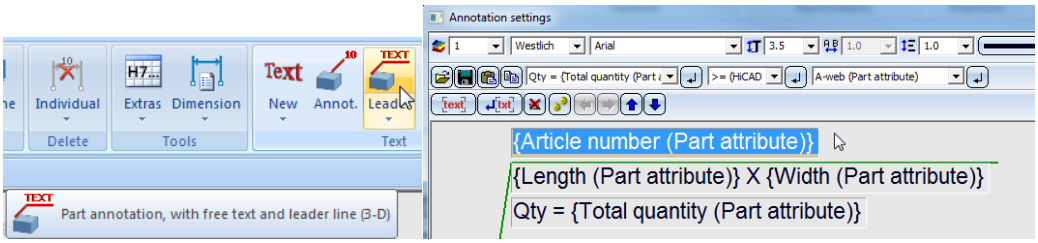


Figure 200 Insert and edit annotations

Tips:

- The 'assigned parts' function (right-click on a component of the connection) allows you to check which plates (or other solids) are assigned to a bolt connection. With 'assign parts', you can make a new selection here.

The exercise is finished

11.12 Exercise 10-2

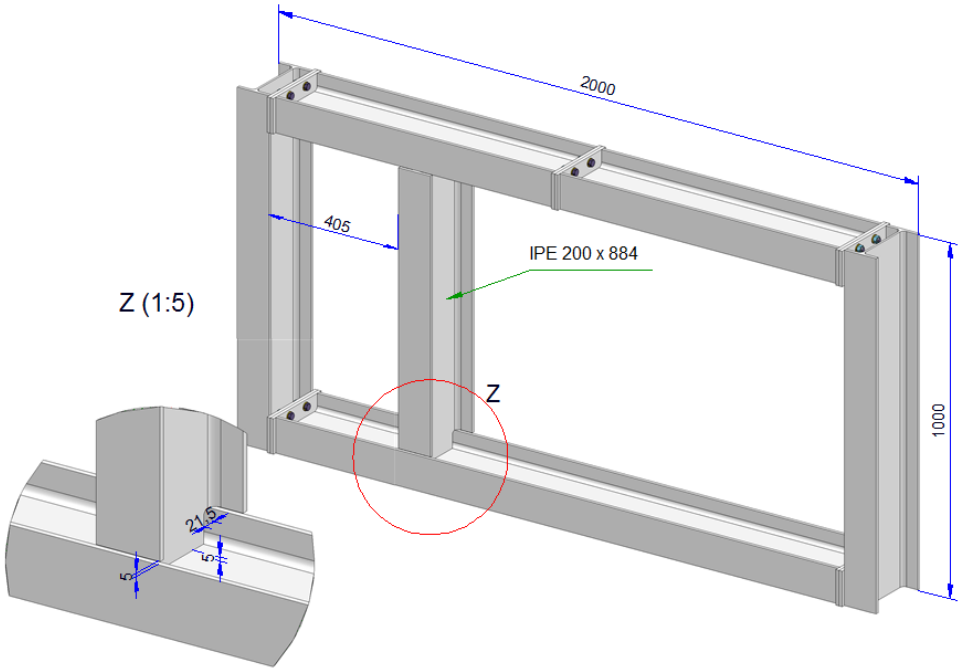


Figure 201 Steel frame detail view

Recommended approach:

- Draw a reinforcement profile in the assembly. Use the 3D built-in option for this.
- Notch the profile onto the other profiles using the 'notch' function.

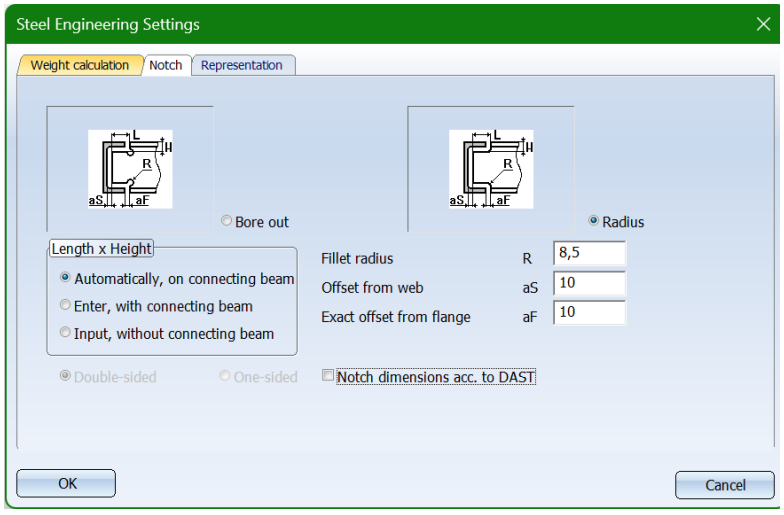


Figure 202 Steel engineering settings – Notch tab

The exercise is finished

12 Extra exercises

With the knowledge you've acquired, you can try to create the following models according to your own judgment:

12.1 Exercise 11-1

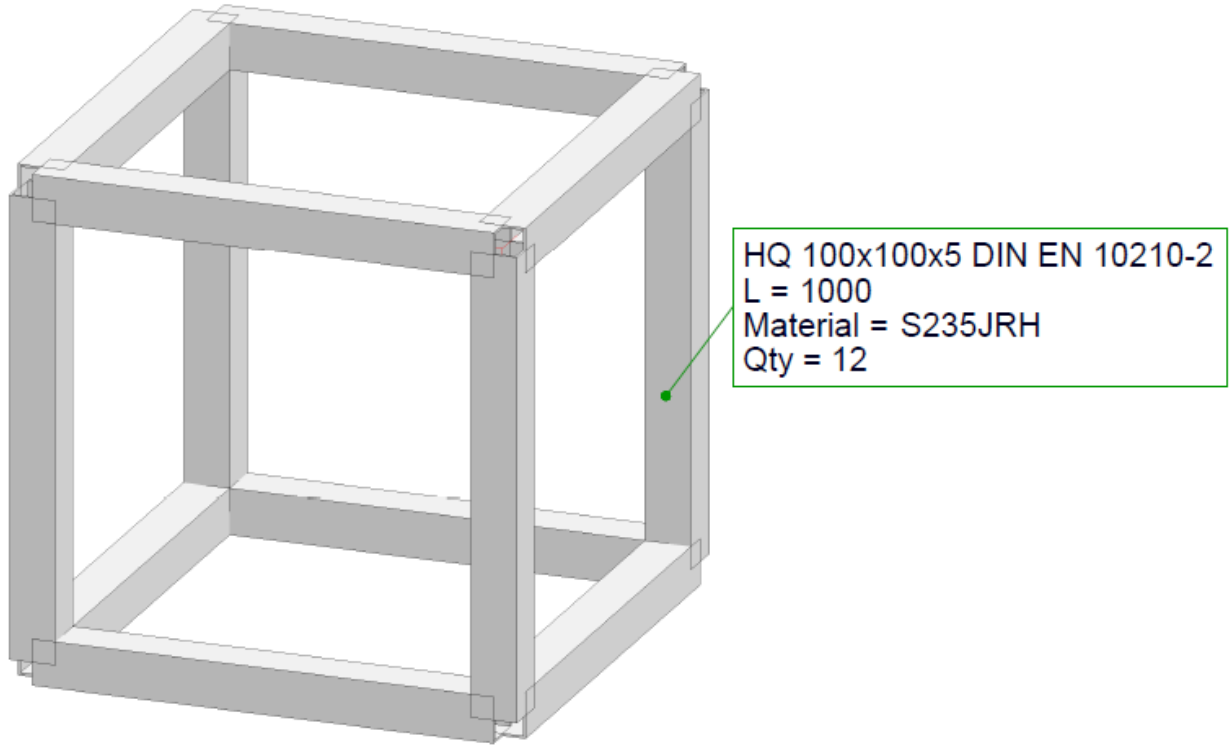


Figure 203 Steel frame of hollow profiles

- Place the profiles
- Go to the sheet environment and try to place the same annotation as in the image above.Note: Use the automatically filled part attributes for this!

The exercise is finished

12.2 Exercise 11-2

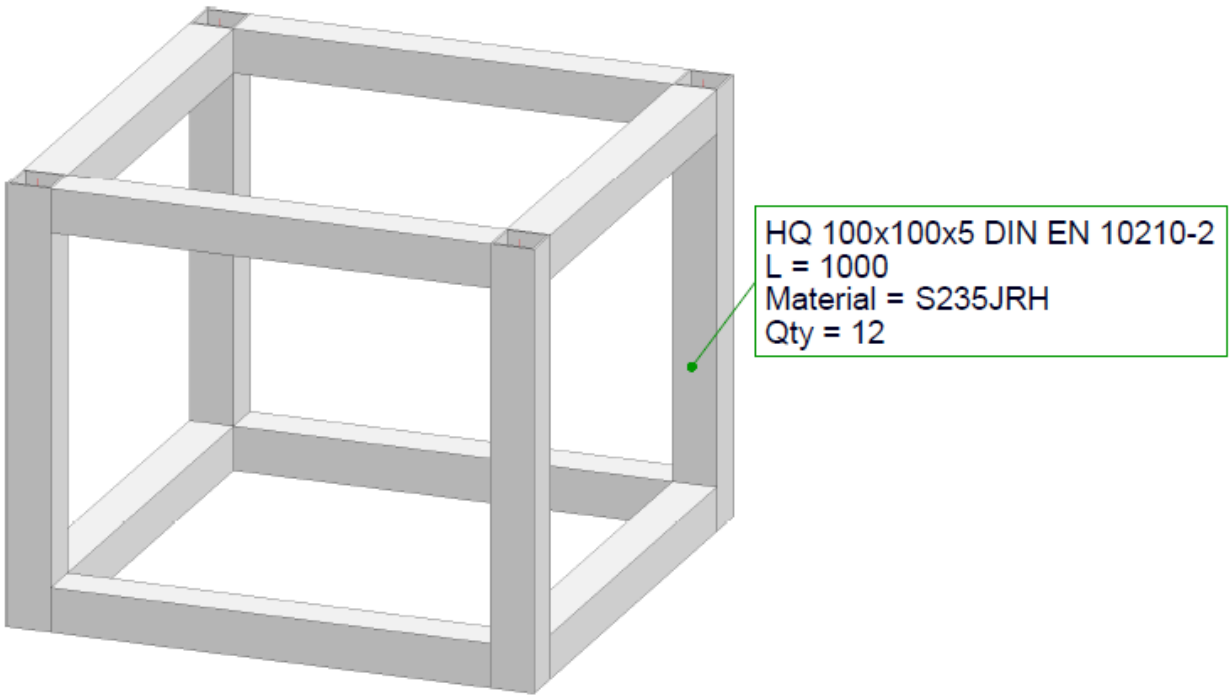


Figure 204 Modified frame of hollow profiles

Modify exercise 10-1 so that no additional features need to be added to the profiles.

Tips:

- Use functions like 'move parts → Move part, 2-D via 2 lines (3D)' and make use of rectangular selections.

The exercise is finished

12.3 Exercise 11-3

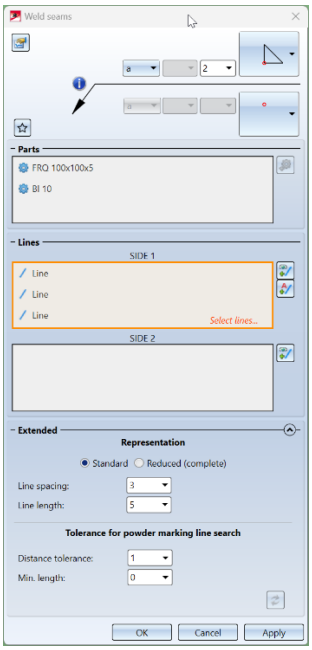


Figure 205 Weld seam dialogue

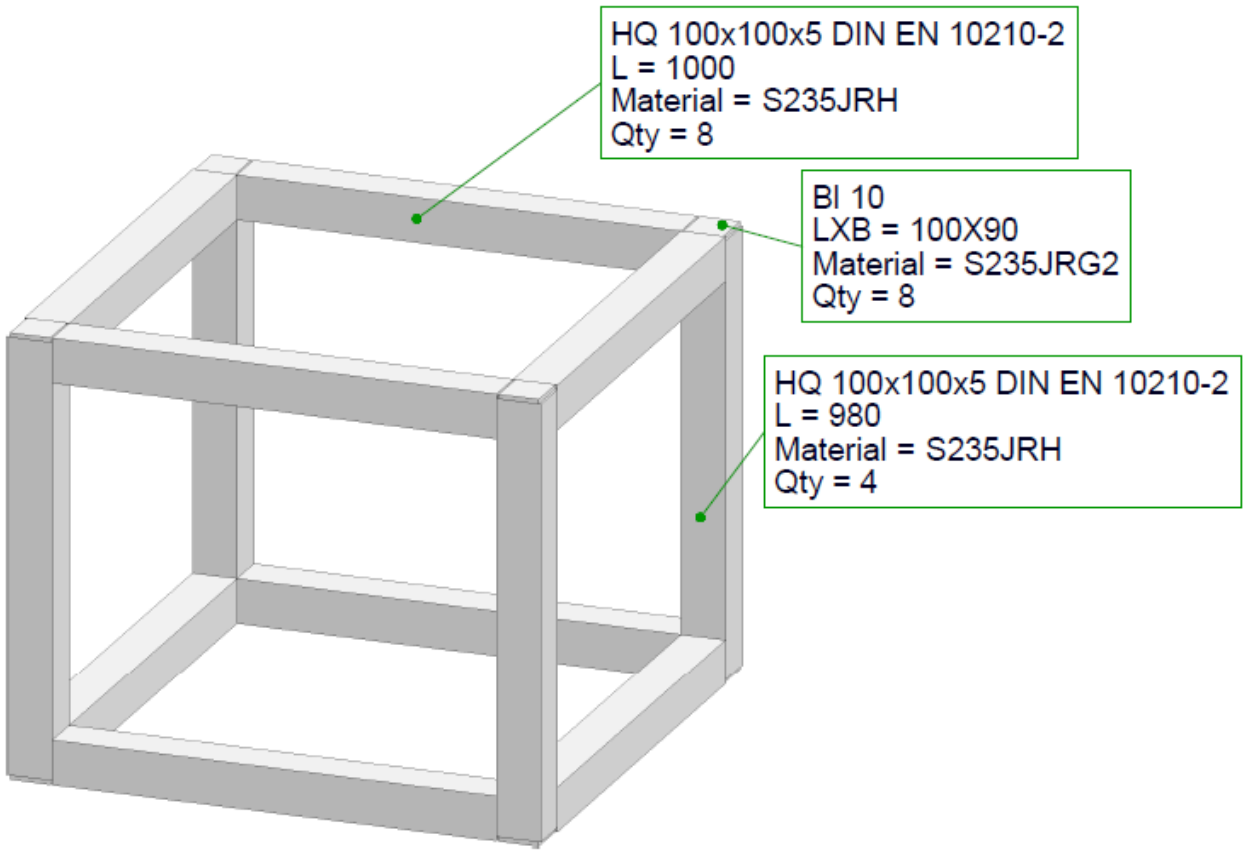


Figure 206 Adjusted frame with annotations

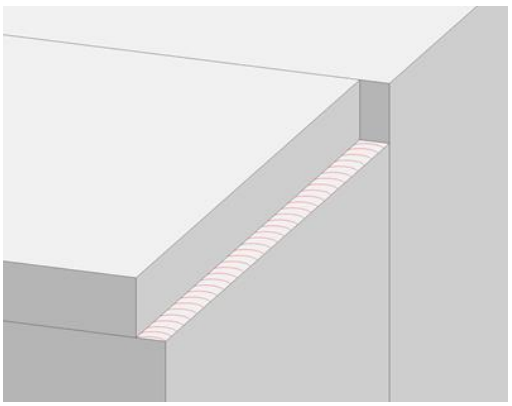


Figure 207 Close-up of weld seam

- Now, place the end plates in the drawing, making sure there is still room to weld them securely.
- Finally, try placing a 'weld seam' on one of the end plates.

The exercise is finished

12.4 Exercise 12-1 (change length)

Learning objectives:

- Adjusting profiles by specifying a new total length.
- Shortening or lengthening profiles by a specified value.

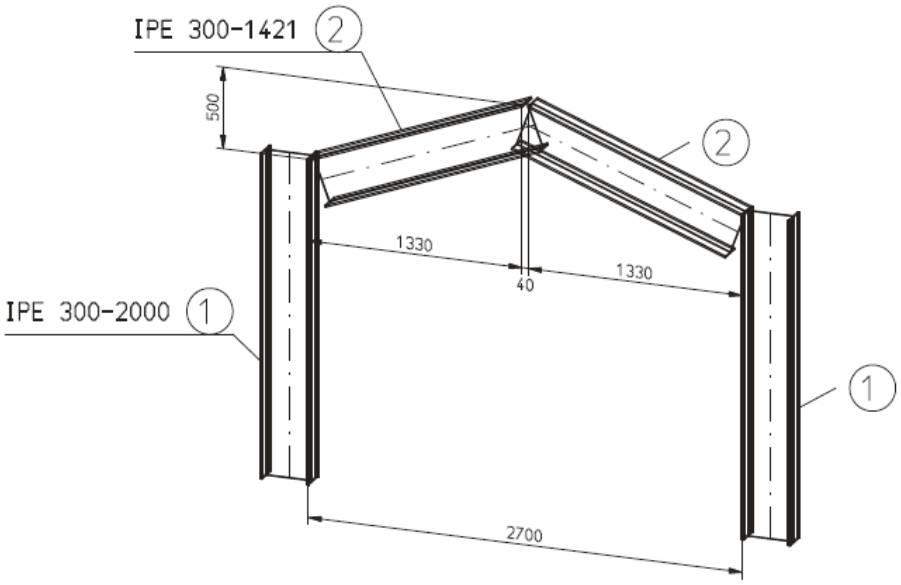


Figure 208 Frame of IPE profiles

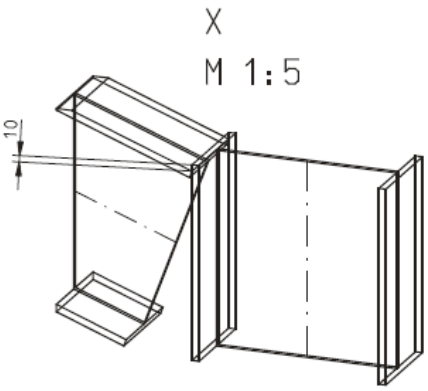


Figure 209 Detail view of IPE profiles

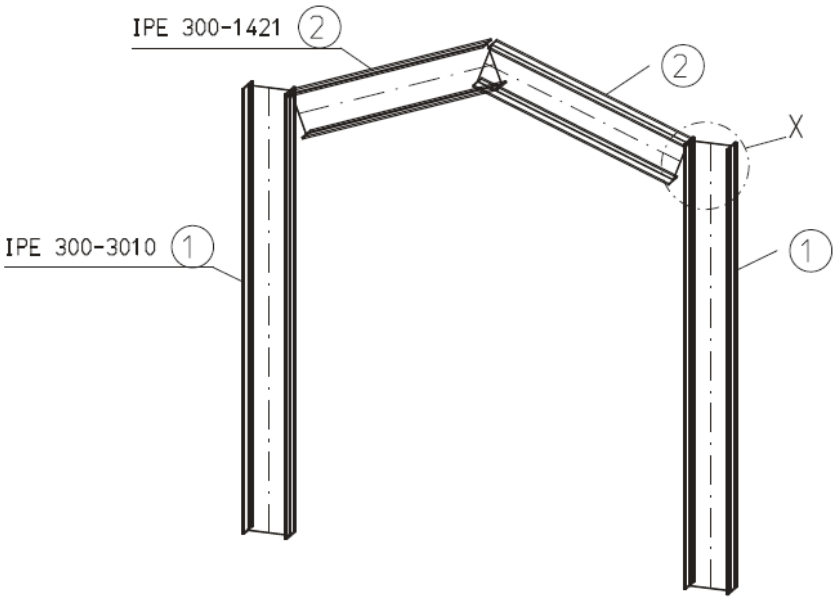


Figure 210 Steel frame with annotations

Recommended approach:

- Draw the profiles as shown in the first image.
- Extend the 2 vertical profiles by specifying a new total length (via the function in the ribbon, note that the extension side cannot be influenced via the feature).
- Extend the 2 vertical profiles by 10 mm at the top. This is intended for welding the profile, as seen in detail X.
- Save the drawing, we will continue with this in the next assignment. Users with access to the 'drawing management' module may save the drawing in a HELiOS project using the function in the 'drawing management' tab. This function also ensures that the product structure is saved and that all links for new, modified, and deleted steel construction parts are generated.

The exercise is finished

12.5 Exercise 12-2 (Trimming, Fitting of Plates, Steel Engineering Boltings)

Learning objectives:

- "Trimming" of profiles
- Using the automatic steel engineering connection "Purling joint, 2 plates with mitre cut acc. To DAST IH (2201)"
  Ór "manual", when you **do not** have access to the steel construction module.

- Change bolting connections.

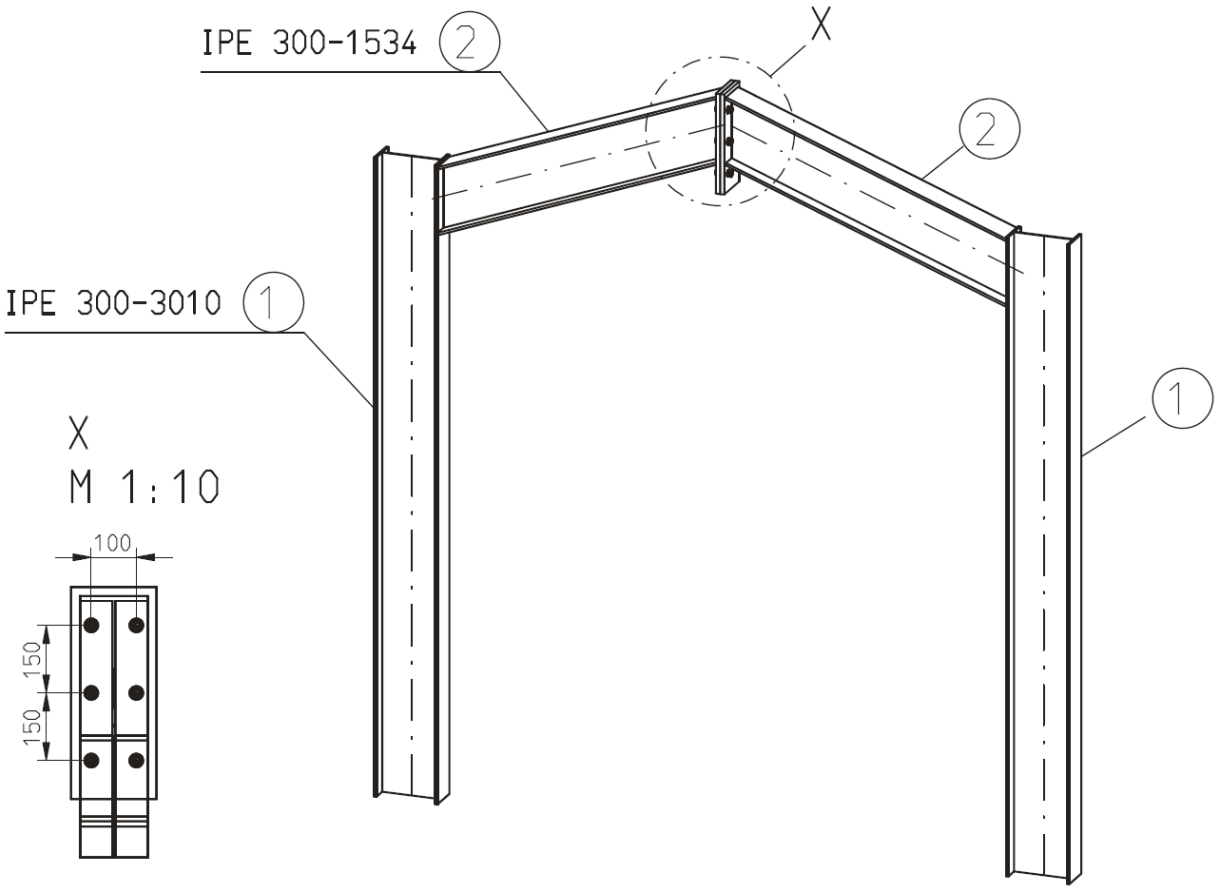


Figure 211 Steel frame with civil engineering connection 2201

Recommended approach:

- Trim the 2 profiles at position 2 to the profiles at position 1.
- Place the automatic connection from the "civil engineering functions" screen (on the right) with a plate thickness of 20 mm, projection below of 130 mm, remaining projections of 20 mm, and a bolt diameter of 16.
- Right-click on the bolt connection for numerous options to edit it. When dealing with an automatic connection, you can double-click on the feature.

Tips:

- When the 2 profiles at position 2 are exchanged with another type or placed at a different an-gle, the 'update connections + variants in active parts' function can be used to update auto-matic connections.

The exercise is finished

12.6 Exercise 12-3 (Excange beams – end plates – plate from sketch)

Learning objectives:

- Swap profiles with another type of profile
- End plate
- Plate from sketch

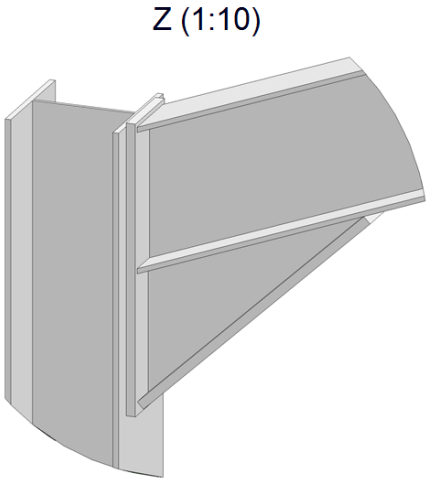


Figure 212 Detail of Steel engineering connection

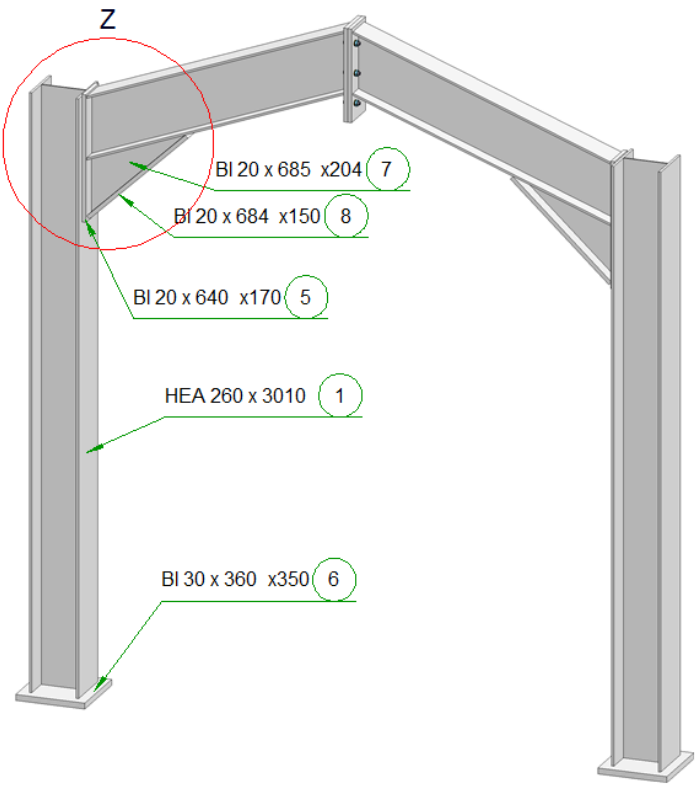


Figure 213 Steel frame with annotations and detail

Recommended approach:

- Use the "exchange, with standard beam" function via the right mouse button or the ribbon to swap the 2 vertical profiles with an HEA 260. Make sure the profiles align neatly with the inclined profiles by choosing the correct fixation points when swapping. They can also be adjusted afterward if needed.

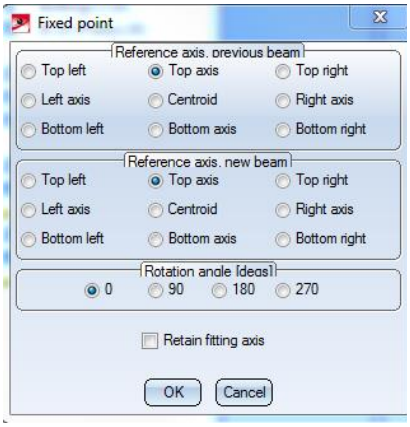


Figure 214 Fixed point dialogue

- Place the plates between the IPE and HEA beams (pos 2101) using "rectangular plate." Position them relative to the IPE with a 10 mm offset on all sides, a thickness of 20 mm, and a reduction in the beam.
- Extend the plate at the bottom to a total length of 640 mm. Do this once with the right mouse button and once via the feature list (this requires a subsequent displacement, for example, using 2 2D lines in the front view).
- Add the plates at the bottom (pos. 2102) with an overhang of 50 mm on all sides and a thickness of 30 mm (without reducing the profile). This can also be done with an automatic connection (steel construction module), and holes or anchoring can be added directly:

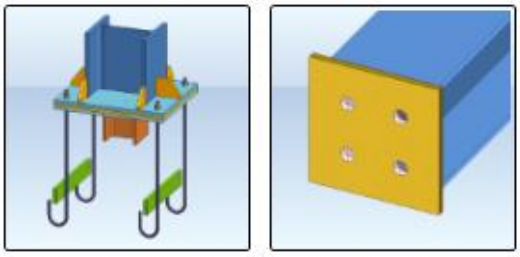


Figure 215 Steel engineering functions foot plates

- Next, draw the sketch shown below in the front view, and we will then convert it into a (haunched) plate. You can take over the top line from the IPE profile:

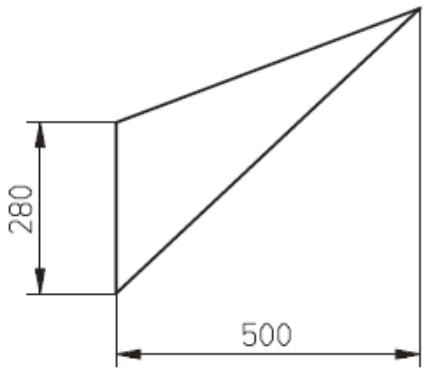


Figure 216 Schematic visualisation of triangular plate

- Finally, we place the plate that serves as the flange for the corner plate. The height is 684 mm, the length is 150 mm, and the thickness is 20 mm. When placing a workplane on the underside of the corner plate beforehand, the flange can be positioned correctly directly.

The exercise is finished

13 Add parts to the HiCAD cataloge

13.1 Introduction

At the purchase of HiCAD, you have gained access to a specific library of standard components. This library includes not only standard components such as hexagonbolts, nuts, etc. but also profiles. Perhaps you don't use certain standard components or feel the absence of some. The lack of standard components may be due to a limited library of standard components.

13.2 Adding standard component with new parameters

When, for example, you need an ISO 4017 hexagon bolt with the dimensions M6x100, you won't find it in HiCAD. This is because ISD follows the ISO standard in such cases. That is, if an M6x100 is not part of the standard ISO norm, but is present in the Fabory catalog, it's not considered a bug but rather a adherence to the standard. To gain access to this M6x100 bolt, we will use the CATEditor.

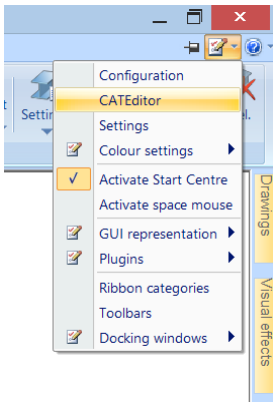


Figure 217 Open CATeditor via settings

- You can start the cateditor from HiCAD.
- You can also find/start the **CATeditor.exe** in the C:\HiCAD\exe directory.

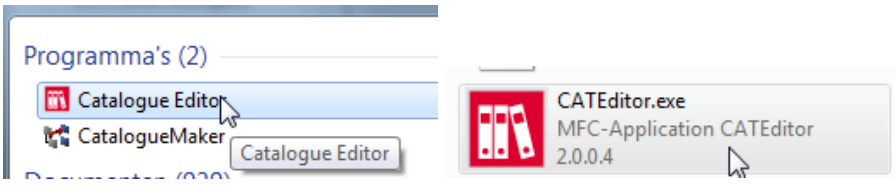


Figure 218 CATeditor from windows start and windows file explorer

You'll find the following menu:

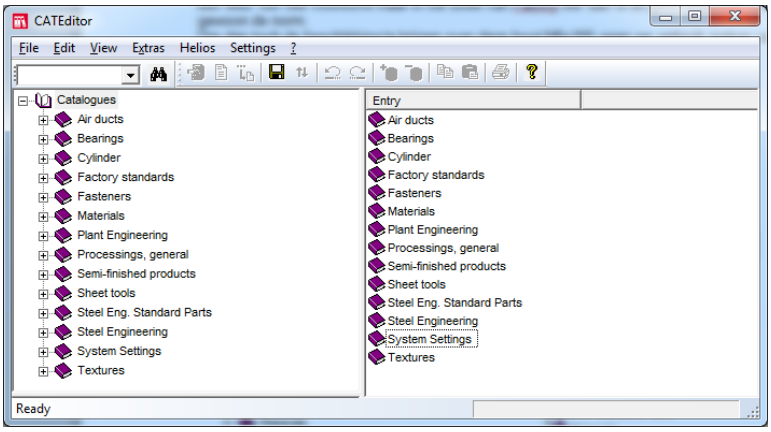


Figure 219 CATeditor

Now we're going to search the norm we want to change.

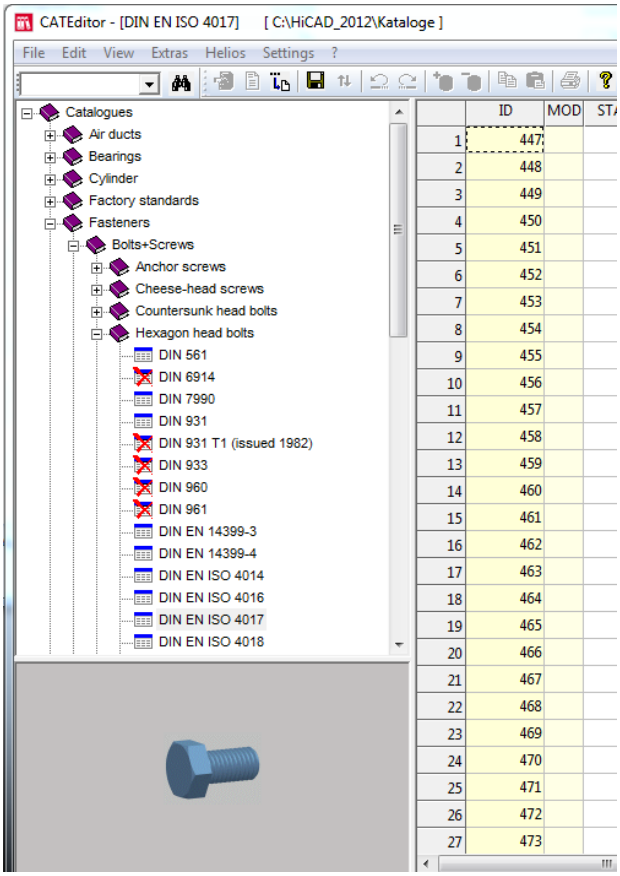


Figure 220 CATeditor hexagon head bolts

You can change the name of the folders via "Change alias name". However, this is not changing the name of the bolt or nut as it appears in the bill of materials. For that, adjustments need to be made in other files.

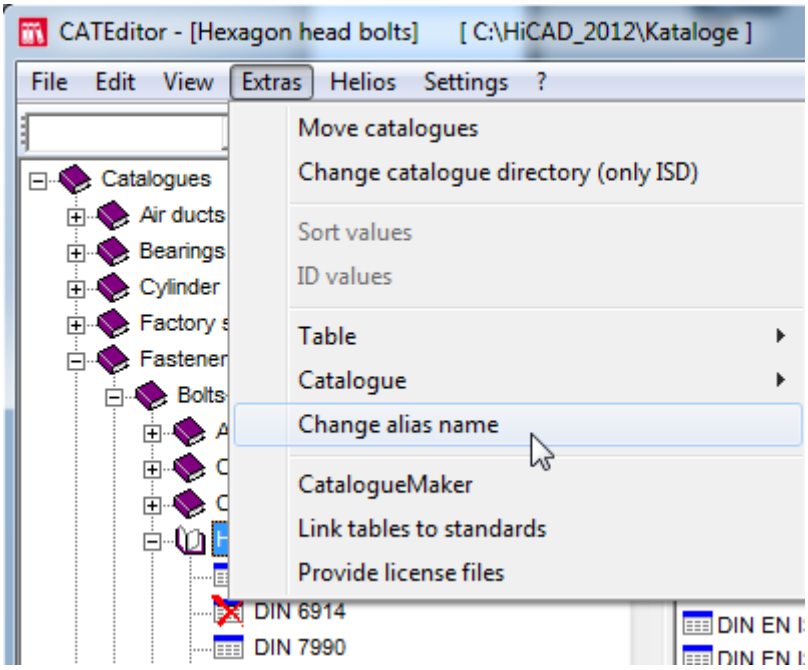


Figure 221 Change alias name in CATeditor

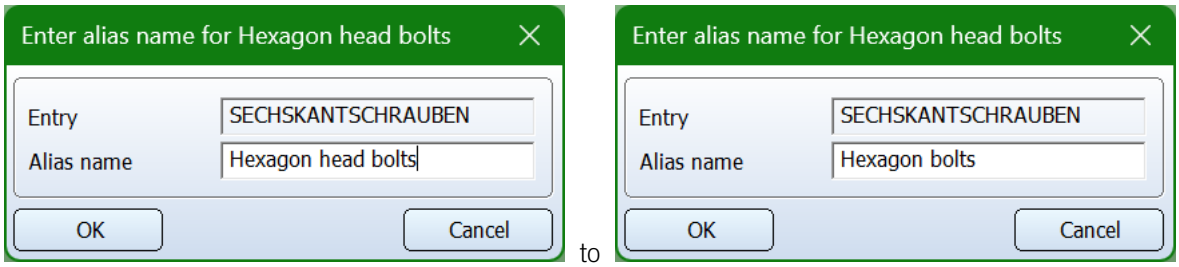


Figure 222 Change alias name dialogue

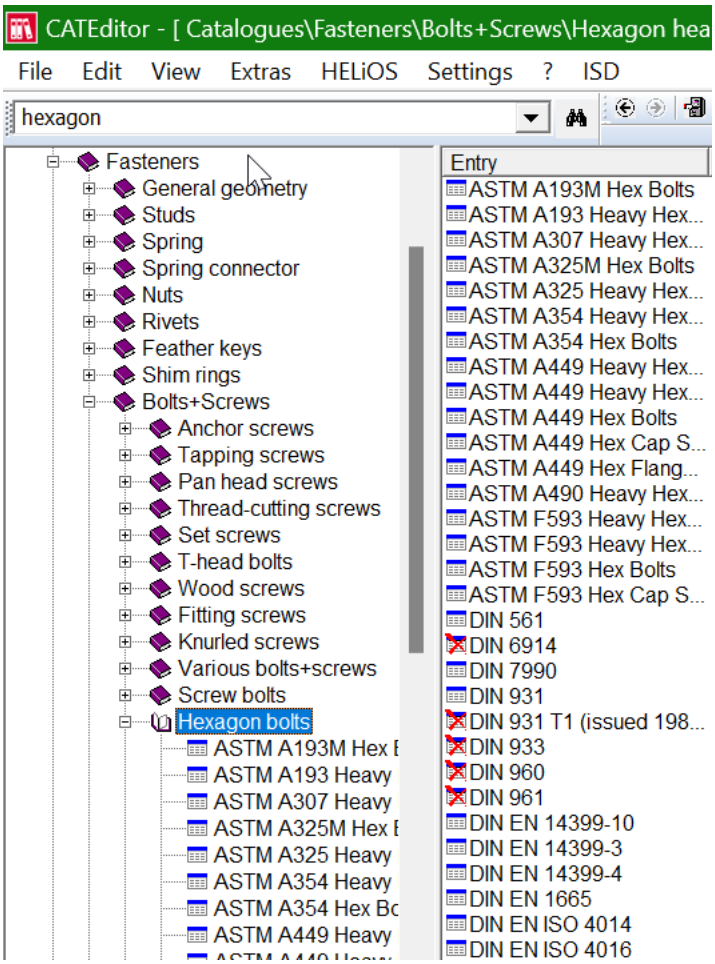


Figure 223 Result of alias name change in CATeditor

- This is purely a menu/folder name adjustment. The name that appears on the bill of materials is adjusted in the catalog. There are some IPT files in the catalog that we are allowed to modify to some extent.

  The catalog is usually located on a network drive, e.g., H:\cataloge.

- Now, if we call the part attributes of a bolt (type 4017) in HiCAD, it shows Hexagon bolts.

Figure 224 Result of alias name change in HiCAD

- Now that the name has been adjusted to your preference, we can expand or block standard parts. Here's an example of an M6 bolt with a length of 120 mm. M6x60 is usually the last option. In this example, M6x100 is also visible (self-created).

69	506			ISO 4017-M6x35-10.9	M6x35	10.9		10.9	M6
70	507			ISO 4017-M6x40-10.9	M6x40	10.9		10.9	M6
71	508			ISO 4017-M6x45-10.9	M6x45	10.9		10.9	M6
72	509			ISO 4017-M6x50-10.9	M6x50	10.9		10.9	M6
73	510			ISO 4017-M6x55-10.9	M6x55	10.9		10.9	M6
74	511			ISO 4017-M6x60-10.9	M6x60	10.9		10.9	M6
75	512			ISO 4017-M8x12-10.9	M8x12	10.9		10.9	M8

Figure 225 Single record in catalogue table

- To get an M6x120, click once on, in this case, the line number. Then, right mouse button (RMB) and choose “Copy”:

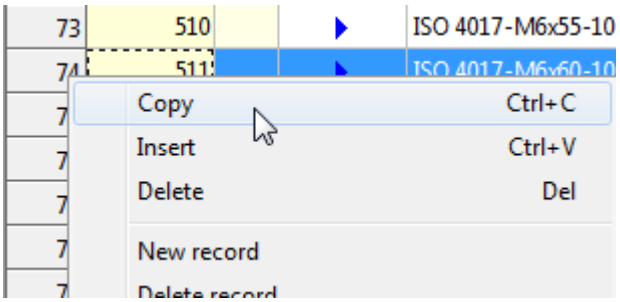


Figure 226 Copy entry in CATeditor table

- Scroll all the way down in the list and use RMB on the empty line and use “Insert”:

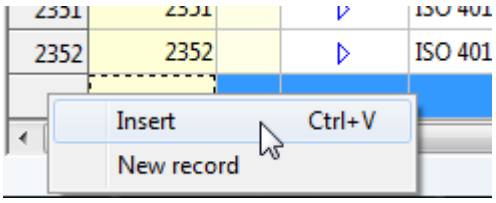


Figure 227 Insert entry in CATeditor table

- At the last number in the table, right-click and select 'Paste'.

Figure 228 Paste new entry in CATeditor table

- You now see a high id appears with an asterisk (*) behind it. This protects your modifications in the catalog against future updates to this catalog when HiCAD is updated.

Figure 229 Pasted entry

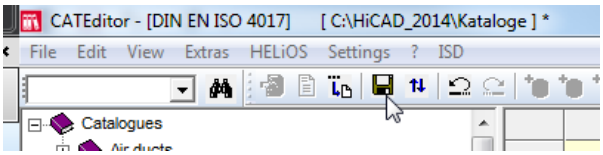


Figure 230 Save changes in catalogue table

- After clicking save, the bolt is saved in the catalog, and the overview is sorted.

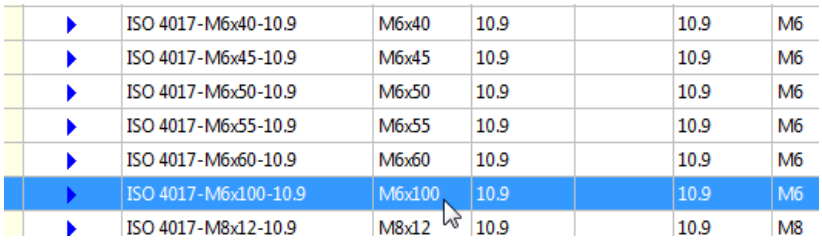


Figure 231 New entry sorted in catalogue table

- If you do not want engineers to be able to select the M6x60 bolt, you can prevent this by setting the the bolt as ‘Deleted’.

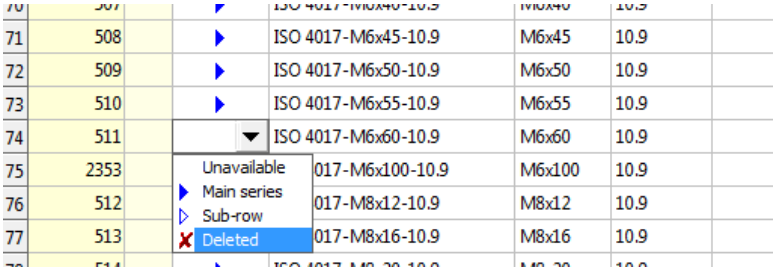


Figure 232 Series selection in catalogue table

- By double-clicking on the blue triangle in this row, we can now select "Deleted." Now, Engineers can no longer use this bolt in HiCAD.

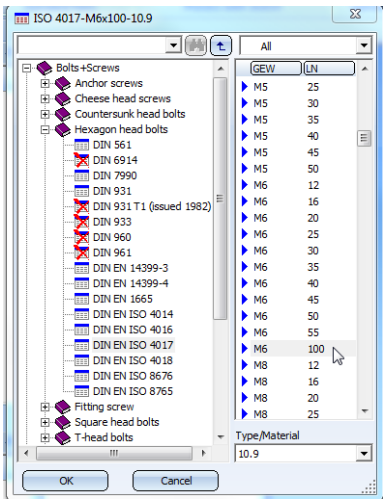


Figure 233 Result of new entry in HiCAD

13.3 Change the designations

Now that we know how to customize the menu names and create our own standard parts, we can assign article numbers to these standard parts.

It is of GREAT importance to ensure that all descriptions are as we want them to be. This applies, for example, to profiles.

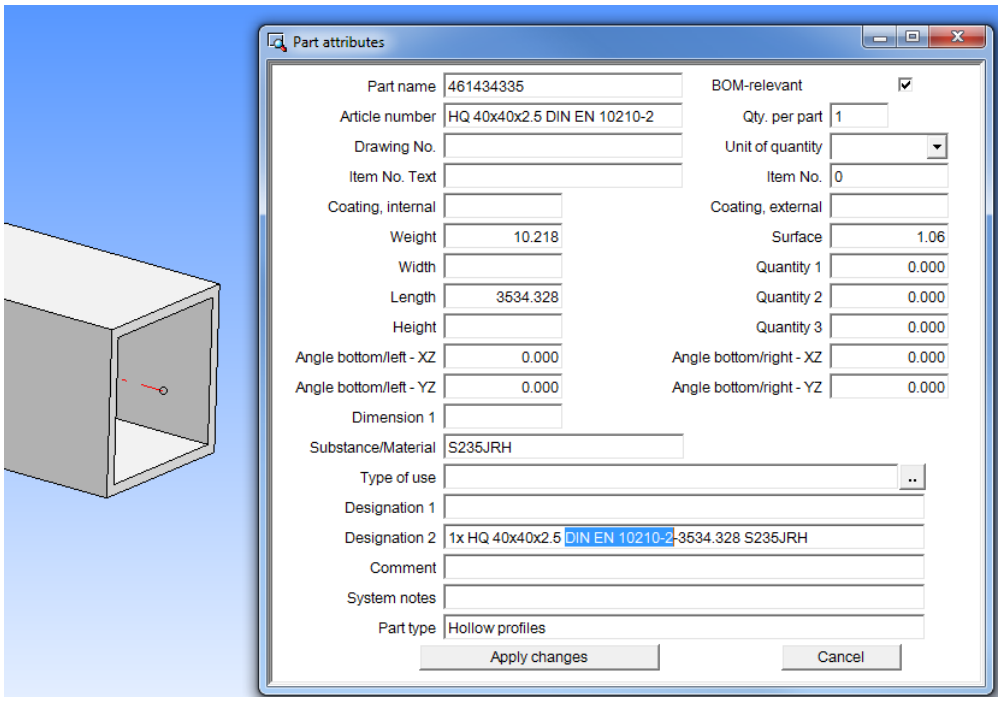


Figure 234 Part attribute dialogue

You probably don't want to see the text DIN EN 10210-2 here. You can remove this text via the CATeditor.

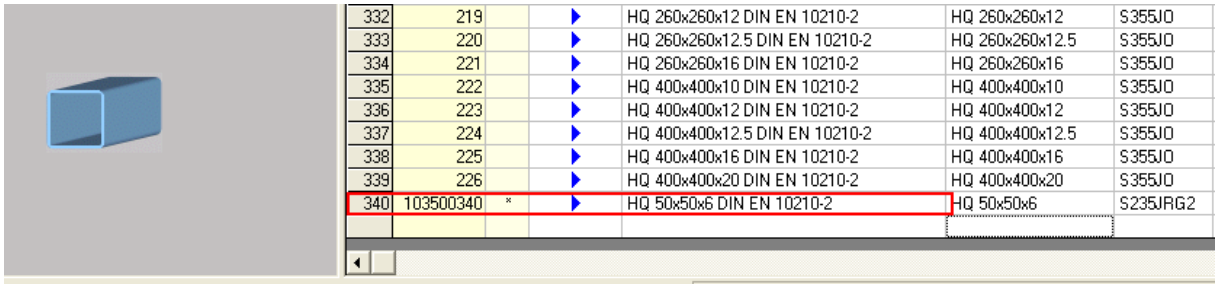
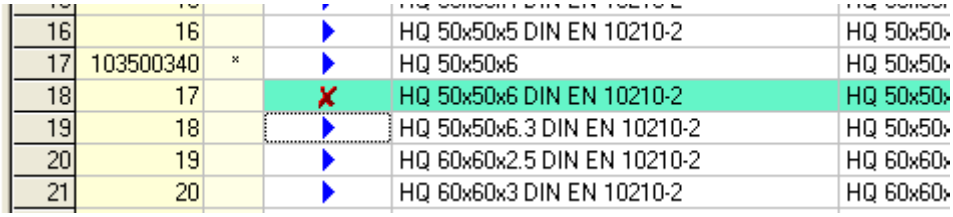


Figure 235 Entry to be changed in catalogue table

Tips:

- Copy existing profiles and modify the copies!! You can see the text DIN EN 10210-2 on the bottom line. Once the copy is made, you can remove the text DIN EN 10210-2.



16	16			HQ 50x50x5 DIN EN 10210-2	HQ 50x50x
17	103500340	*		HQ 50x50x6	HQ 50x50x
18	17		✘	HQ 50x50x6 DIN EN 10210-2	HQ 50x50x
19	18			HQ 50x50x6.3 DIN EN 10210-2	HQ 50x50x
20	19			HQ 60x60x2.5 DIN EN 10210-2	HQ 60x60x
21	20			HQ 60x60x3 DIN EN 10210-2	HQ 60x60x

Figure 236 Deleted and and adjusted entries in catalogue table

If the CATeditor finds a similar type somewhere, you will be alerted with a green bar.

When saving the modified profile, a warning will appear that the profile already exists. This is graphically indicated by a green bar over the duplicate line. Delete the unnecessary box (as in this example). Then save again, and the green overlay will disappear..

14 Create own profiles

(Create own profiles)

In this chapter, we will explain how to create a custom profile that is not included in the standard catalogue. If certain extrusion profiles or other profiles are frequently used, one can choose to draw a cross-section to extrude it as a solid model. The alternative, which naturally saves time, is to add these profiles to the "user catalogue."

With the latter option, the working method of which is described below, HiCAD recognizes the component as a profile with all its associated benefits. Simple and exact representations, cutting angles, lengths, and weight are automatically calculated, and so on.

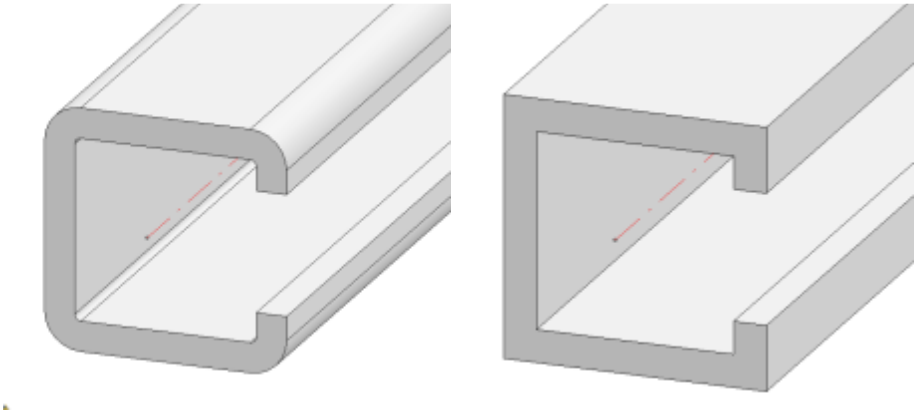


Figure 237 C-Profiles exact and simpified

14.1 Creating 2D Part Structure

- Create a new 2D part and name it according to the profile it will become (such as IPE200 or HEA180).
- Beneath this new 2D part, two sub-parts should be added.
- These sub-parts are always named SIMPLE and EXACT.

See the image below for the correct structure:

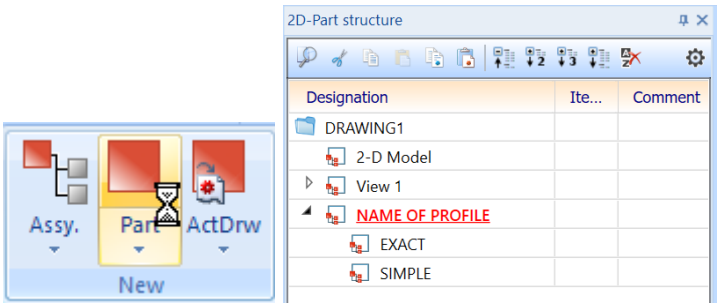


Figure 238 Insert new 2D part and 2D part structure

14.2 Drawing cross-section (EXACT)

- Use the 2D Geometry Ribbon to draw the cross-section of the profile in the EXACT section. for example:

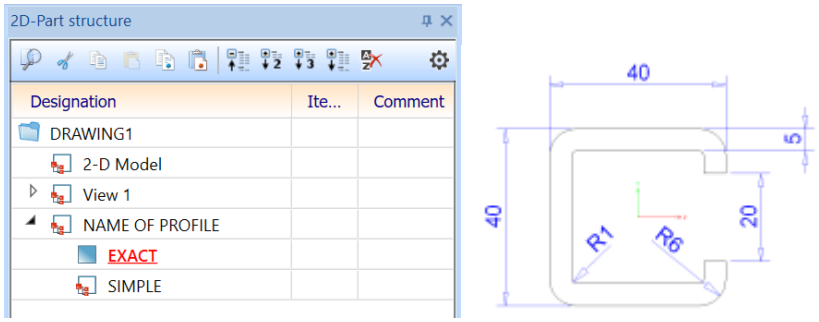


Figure 239 2D part structure and exact cross-section of C-Profile

14.3 Positioning of the cross-section (EXACT)

When creating a custom profile, the center of gravity must be located ON the origin. The exact representation in the example above is drawn relative to the absolute origin point. Due to the cutout on the right side, the center of gravity is slightly off-center.

- To align it correctly, select the Move function in the 2D Part ribbon. Pick up the component using the "Centroid" option (the center of gravity of the geometry) and place it on the absolute origin.

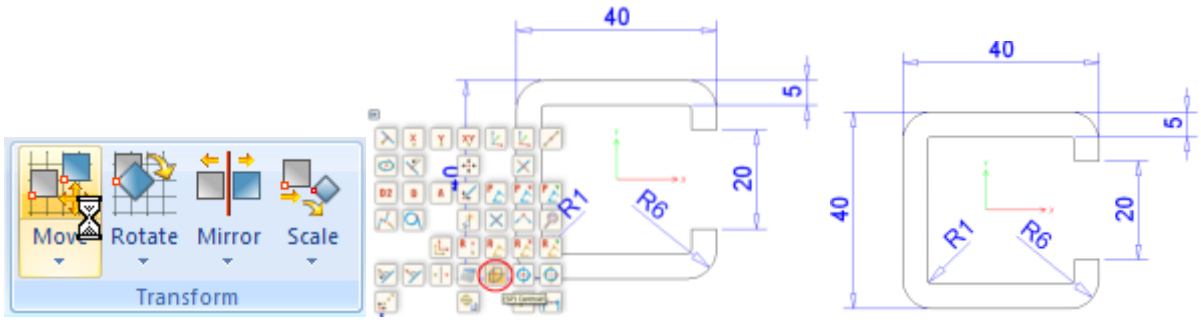


Figure 240 Move part, surface centroid point option

14.4 Drawing cross-section (SIMPLE)

In the SIMPLE part, a cross-section must be drawn, which will be represented as a profile with the "simple representation" setting. This is done to reduce the data size of the drawing. The level of simplification is up to the drafter: (the pink lines in the image represent the simplified cross-section in the "SIMPLE" part.)

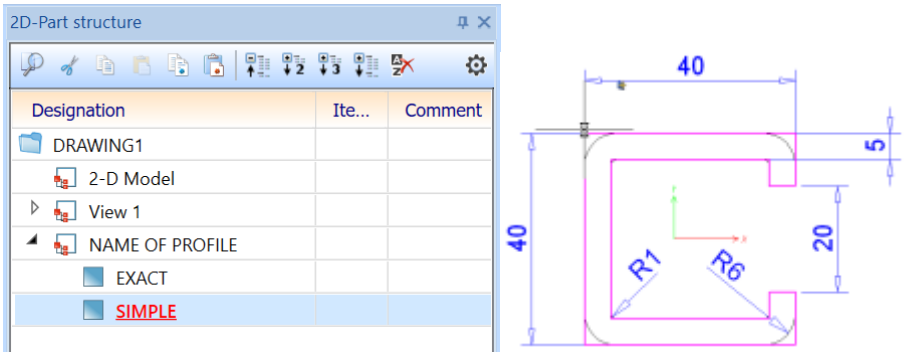


Figure 241 2D part structure and simple cross-section of C-profile

14.5 Assign attributes

- First, select the Steelengineering Ribbon. In this Ribbon, within the submenu of the Settings button, choose the "Assign attributes" function:

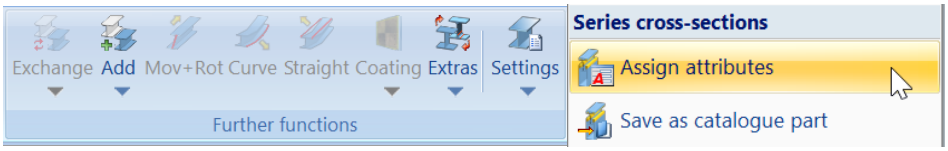


Figure 242 Further functions and Assign attributes in Extra's sub-menu

- Now, choose either the EXACT part or the SIMPLE part, but never the parent part!

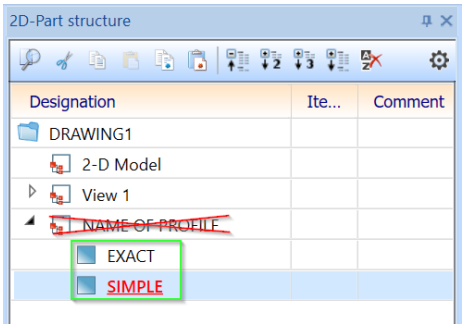


Figure 243 2D part structure – parts to assign attributes to

- In the following menus, we can assign material and give in all attribute values ourselves:

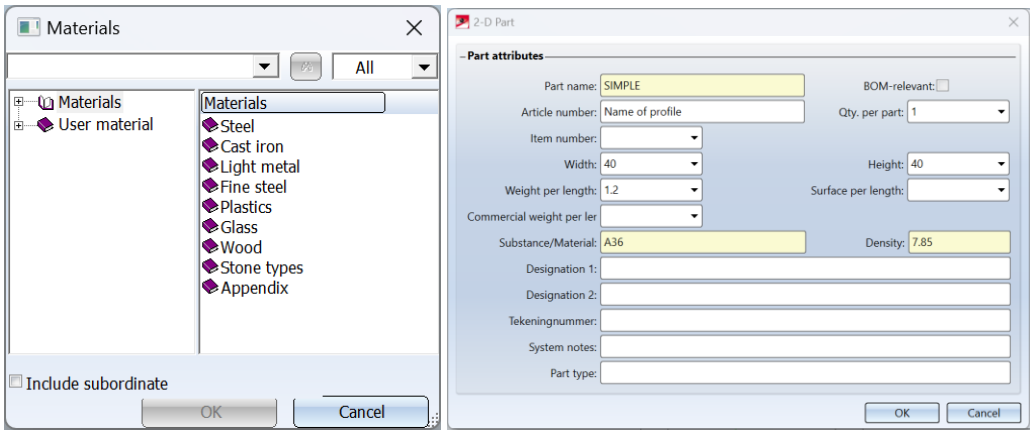


Figure 244 Material catalogue and part attributes

- In the part structure, we can now see both sub-components changed in name.

14.6 Save as catalogue part

- In the same submenu as the button from the previous step, we now select: "Save as catalog part".

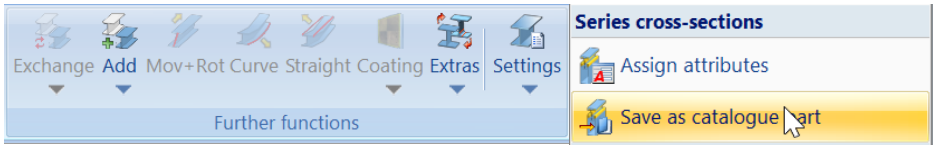


Figure 245 Further functions and Save as catalogue part in Extra's sub-menu

- Now select the parent part:

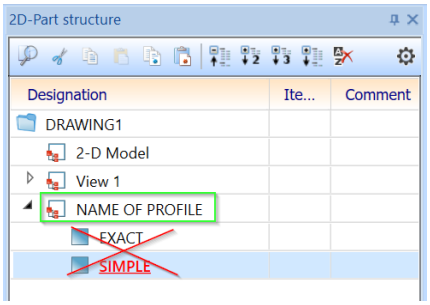


Figure 246 2D part structure – part to save in catalogue

Now a few questions will follow:

Where do we store the geometry: Select a folder (create your own folder)

In which company specific catalogue will the profile be placed: Choose Isd Example.

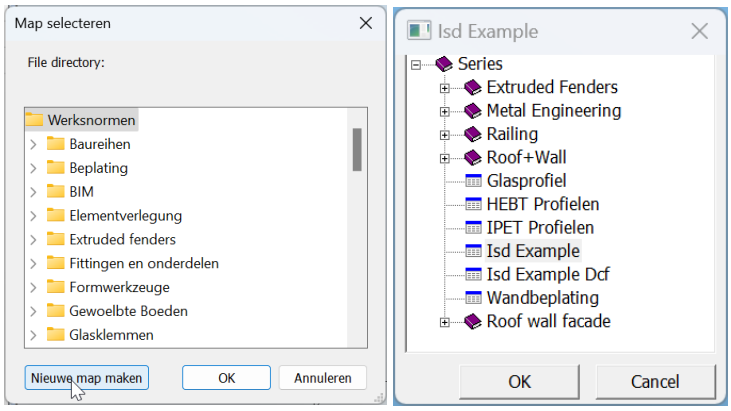


Figure 247 Save part in catalogue

- If necessary, change the name of the files. (in this case we do not do this)
- Have a picture taken of the profile as a preview

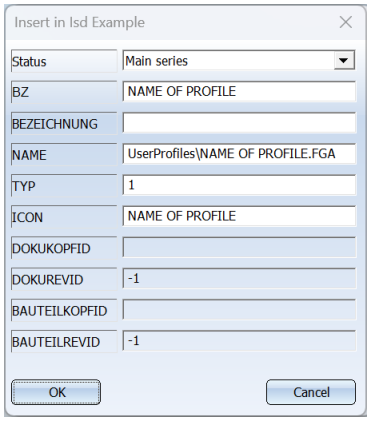


Figure 248 Insert part in catalogue table

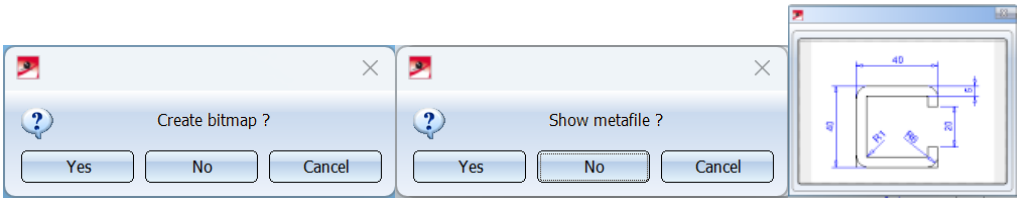


Figure 249 Create bitmap messages

14.7 Test the new profile

- Open a new Drawing and go to the "**Steel Engineering > New > Beam**" button

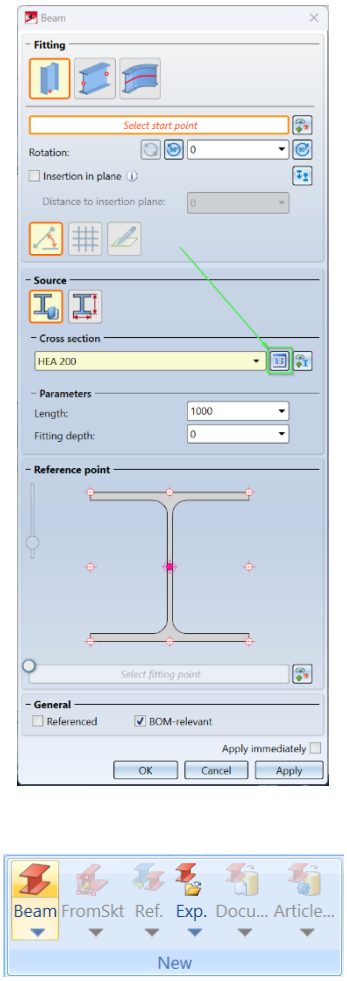


Figure 250 Insert beam from catalogue

- Go to “Select from catalogue” and select the profile from the ISD examples table:
- Now draw a profile just as a standard profile is drawn.

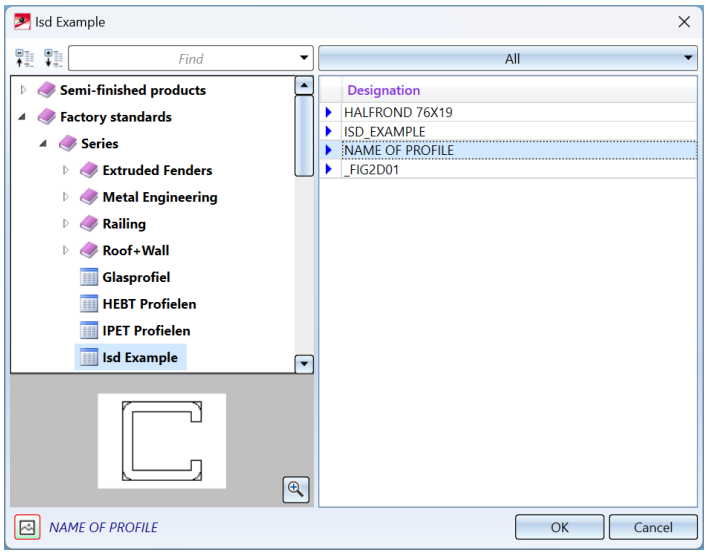


Figure 251 2D part structure – parts to assign attributes to

- Switch between simple and exact representation and check the result.

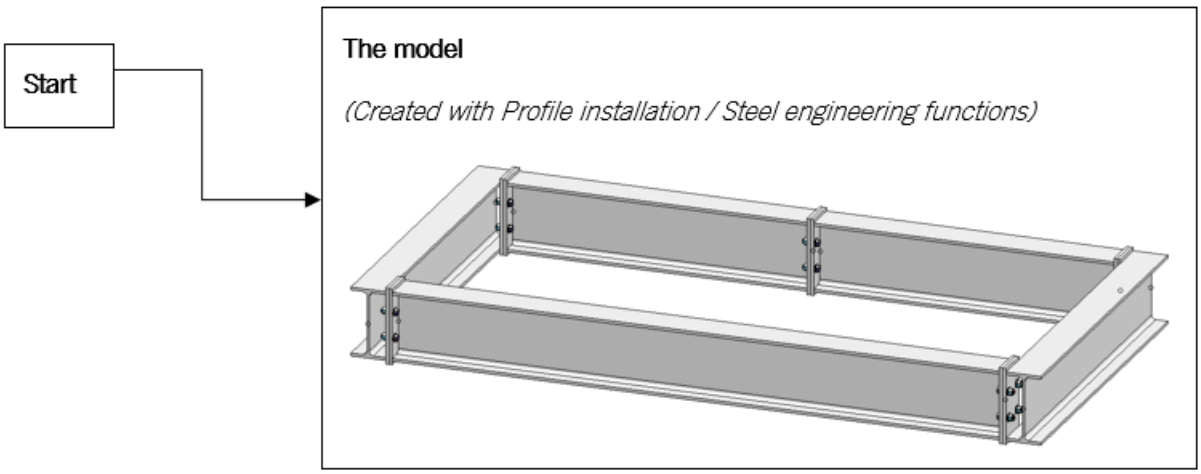
15 Steel engineering

The HiCAD steel engineering module provides users with the capability to automatically detail models created using the Profile Installation / Steel Engineering functions. This automatic detailing includes:

- Position numbering
- View generation
- Dimensioning
- Drawing generation (to detail or assembly drawings)
- Bill of materials generation

Components that are NOT drawn using the Sheet Metal / Profile Installation / Steel Engineering functions are limited in detailing! The goal is to draw components that can be drawn with these functions to fully leverage the automation capabilities of HiCAD Steel Engineering.

Because it is going to be highly automated, the input needs to be of high quality. This is what we call the model. Below the steps that needs to be taken to come to a succesfull automatic generation of production data are set out.



The bills of materials

(Quantity list / Structure list)

Quantity list | Structure List

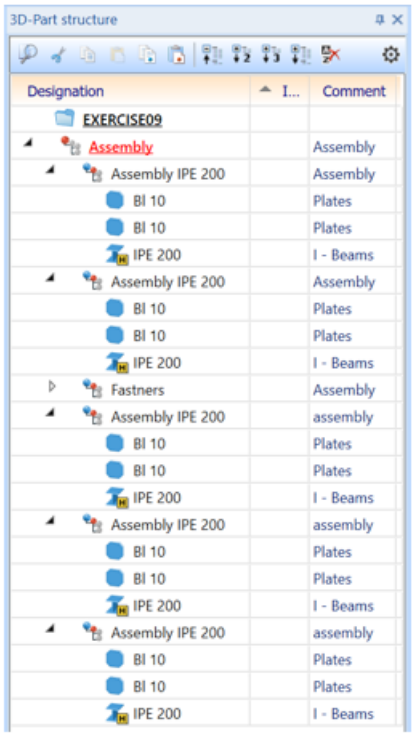
Item	Qty.	Designation	L [mm]	W [mm]	Cut (Web)	Cut (Flange)	Material	Su [m²]
100	1	IPE 200	1760.0	100.0	I--------I	I--------I	S235JRG2	1.4
101	1	IPE 200	1000.0	100.0	I--------I	I--------I	S235JRG2	0.8
102	1	IPE 200	1000.0	100.0	I--------I	I--------I	S235JR	0.8
103	2	IPE 200	870.0	100.0	I--------I	I--------I	S235JRG2	1.3
104	10	Bl 10	100.0	220.0			S235JRG2	0.4
10000	20	ISO 4017-M12x40-8.8	40.0					
10001	20	ISO 4032-M12-10						
10002	40	ISO 7090-12-200 HV						
		Σ						4.7

Quantity list | Structure List

Level	Item	Qty.	Designation	L [mm]	W [mm]	Cut (Web)	Cut (Flange)
1	1	1	Assembly IPE 200	1000.0	110.0		
2	101	1	IPE 200	1000.0	100.0	I--------I	I--------I
2	104	2	Bl 10	100.0	220.0		
1	2	1	Assembly IPE 200	1000.0	110.0		
2	102	1	IPE 200	1000.0	100.0	I--------I	I--------I
2	104	2	Bl 10	100.0	220.0		
1	3	1	Fastners	1835.0	989.0		
2	10000	20	ISO 4017-M12x40-8.8	40.0			
2	10001	20	ISO 4032-M12-10				
2	10002	40	ISO 7090-12-200 HV				
1	4	1	Assembly IPE 200	1780.0	100.0		
2	100	1	IPE 200	1760.0	100.0	I--------I	I--------I
2	104	2	Bl 10	100.0	220.0		
1	5	2	Assembly IPE 200	890.0	100.0		
2	103	2	IPE 200	870.0	100.0	I--------I	I--------I
2	104	4	Bl 10	100.0	220.0		
Σ							

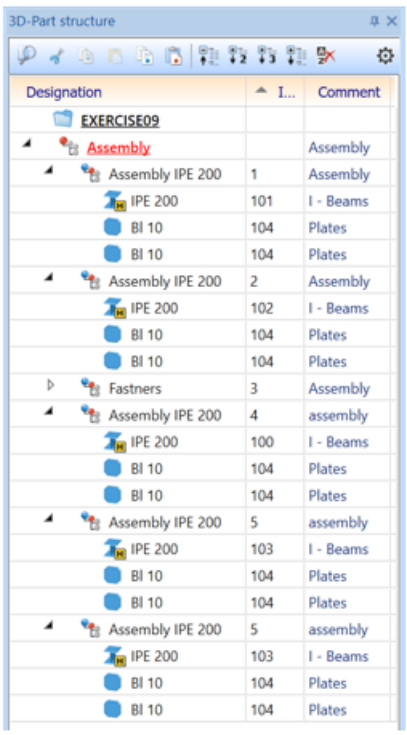
The structure

(part structure based on production methods)



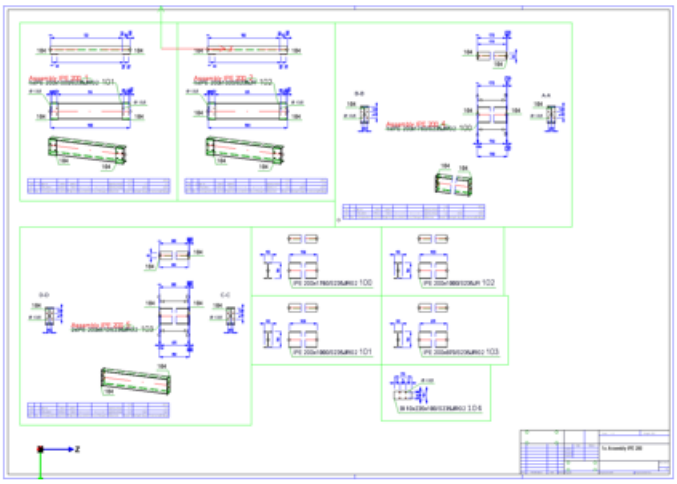
The position numbering

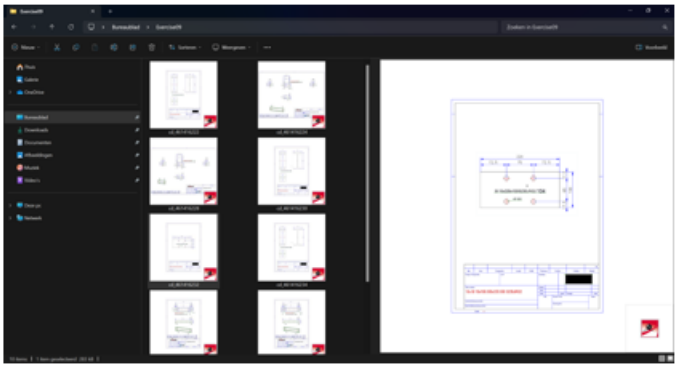
(attribute assignment and determination of main parts for assemblies)



The derived drawings

(mono's in one sheet)





The End

15.1 Structure

15.1.1 Part structure

In HiCAD, it is possible to organize components within a structure. This structure can be used to maintain an overview in a drawing. However, in steel construction, this structure takes on an additional meaning.

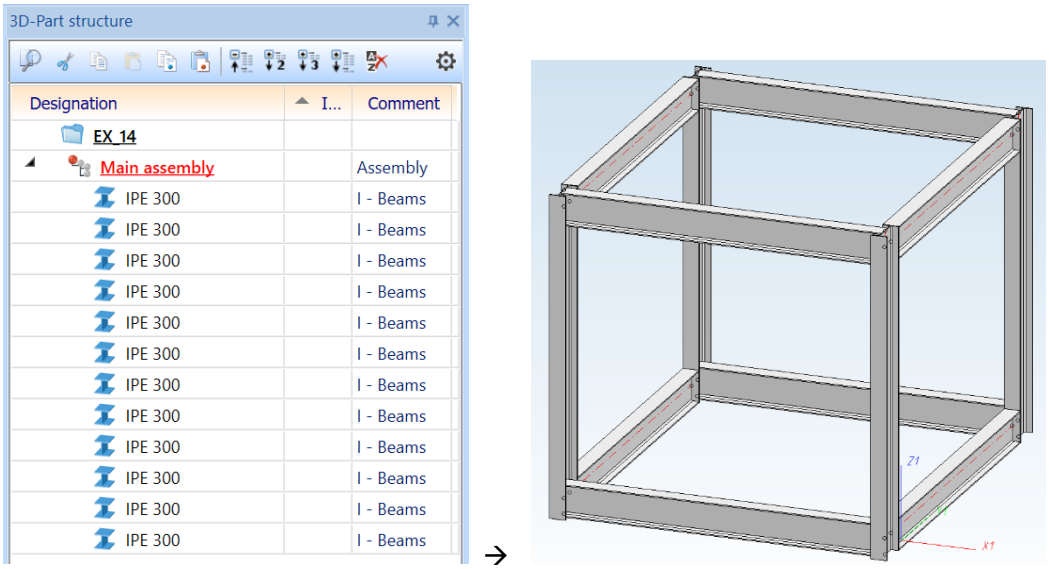


Figure 252 Example of a drawing without structure

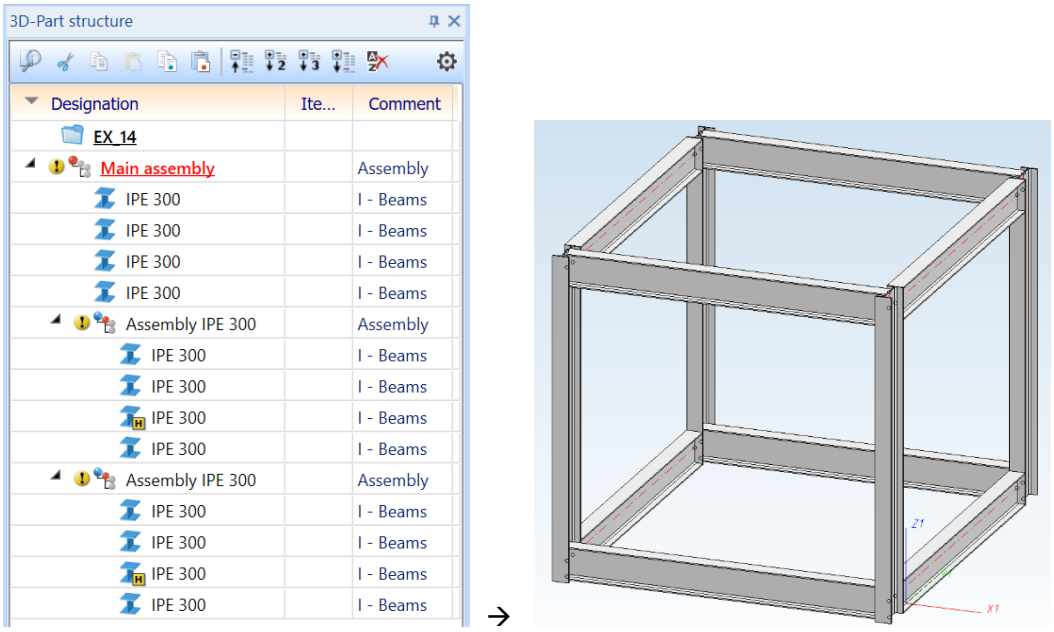


Figure 253 Example of a drawing with structure

The structure can be created using the functions: **3-D Standard > New > Assy. > Main assembly**

Or **3-D Standard > New > Assy**. in the 3D standard ribbon of HiCAD:

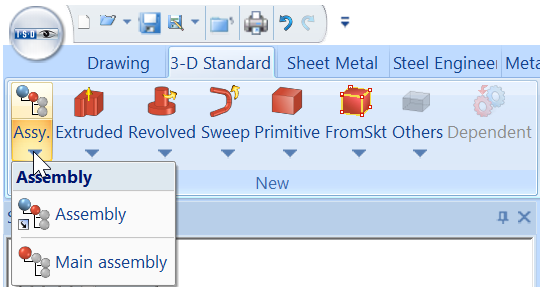


Figure 254 3-D standard ribbon – insert Assembly and sub-menu

After creating these components, the structure can be established using drag-and-drop.

The structure of a drawing does not pertain to the geometry of the drawing. However, as mentioned earlier, this structure is crucial for steel engineering. The position numbering and the eventual automatic generation of the drawings are determined by this structure.

Tips:

- There is only one Main Assembly in each drawing, and there can be multiple Assemblies in each drawing (sub-assemblies).

15.1.2 Main part of assembly

HiCAD can generate detailed drawings from components drawn using the profile/steel engineering functions. This can also been done for Assemblies. These Assemblies are typically referred to as welding assemblies (marks) or mounting assemblies in steel engineering. The content of these assemblies corresponds to what is actually welded or assembled in practice.

HiCAD can only generate a detailed drawing for an Assembly if there is a component in the composition that serves as the "assembly main part". These components can be identified by the following symbol attached to the part:

"Main part of assembly" is a property of a component and can be assigned to the part by right-clicking on it and selecting the option (Into Assembly main part):

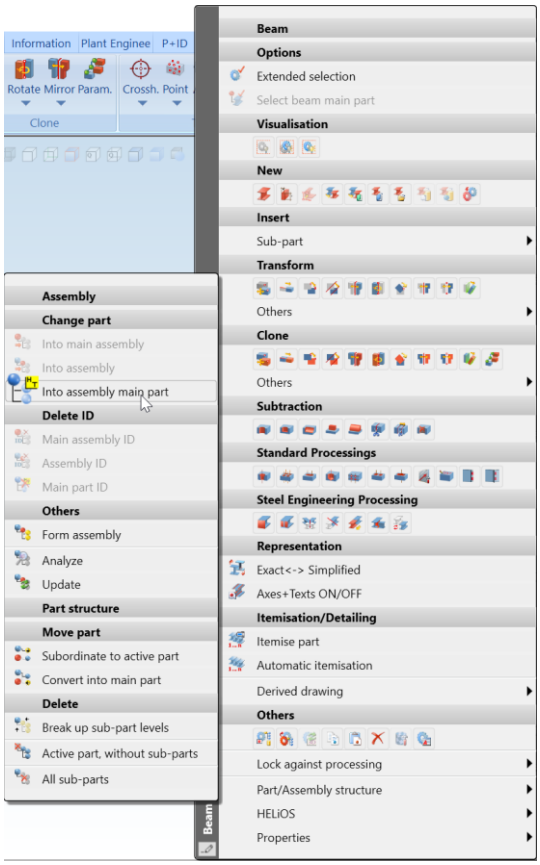


Figure 255 Beam context menu – Part/Assembly structure sub-menu

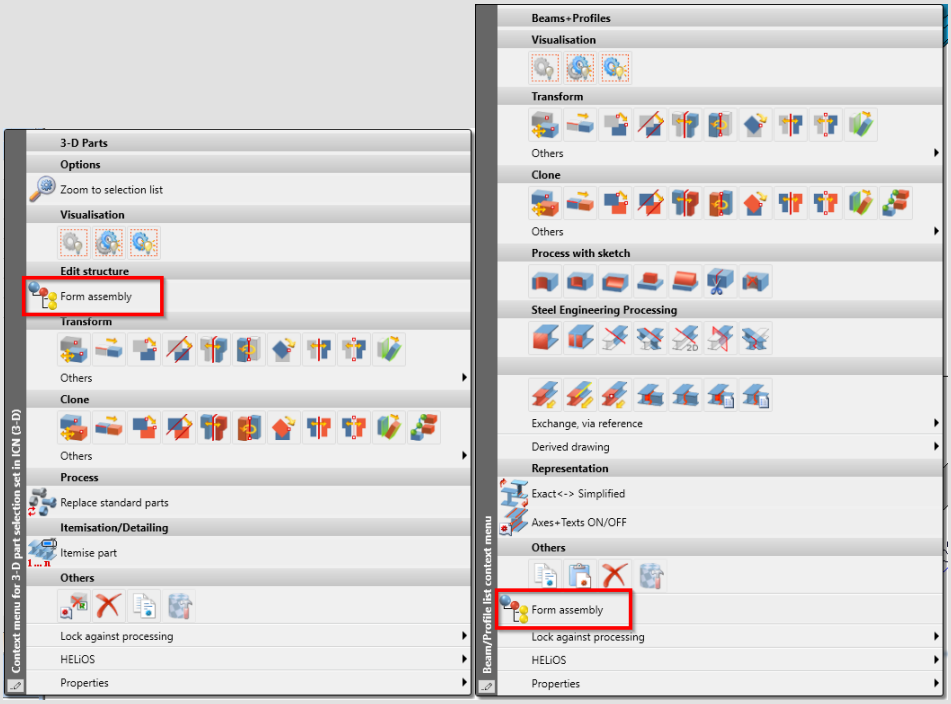
"Main part of assembly" has now been assigned to a component. This has the following consequences:

Assembly drawings can automatically be generated by HiCAD

The component with the property "Main part of assembly" is used for the elaboration of the automatic working drawing.

Tips:

- The creation of an assembly can also be done with multiple selections (Ctrl and/or Shift) in the 3D part structure or the graphic window. Subsequently, right-click on the selection:
- RMB in the 3D Part structure is shown on the left image below.
- RMB in the drawing area is shown on the right image below.



Important:

The part where the right-click is performed is now also automatically assigned as "Main part of assembly"!

Assembly IPE 300		Assembly
IPE 300		I - Beams
IPE 300		I - Beams
IPE 300		I - Beams
IPE 300		I - Beams

15.1.3 Assembly Points

When creating Assemblies, points are queried or created:

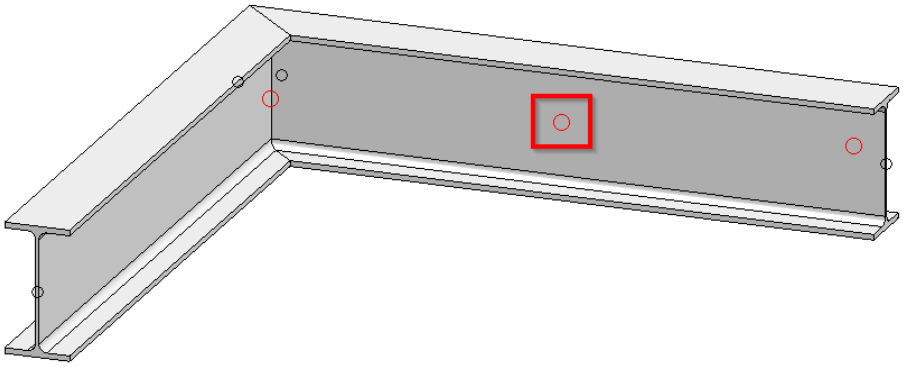


Figure 256 Assembly points on IPE profile

These points are called Assembly Points. They are created to allow the graphical selection of the Assembly:

They can be turned on/off via right-click on the drawing area:

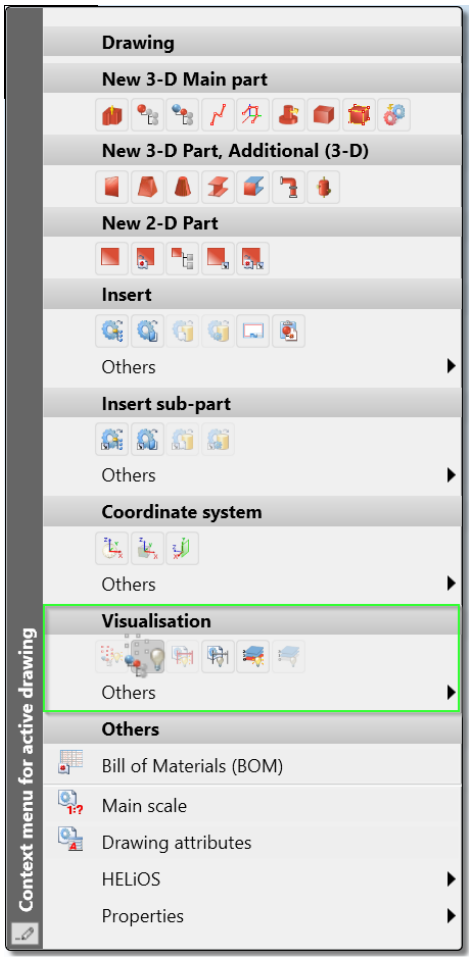


Figure 257 Drawing context menu – Visualisation options

15.2 Itemisation

Once a model is drawn, the next step is the positioning of the components. The positioning determines not only the numbering but also which parts are or are not identical to each other (identical part recognition). This numbering can be configured as desired. For example:

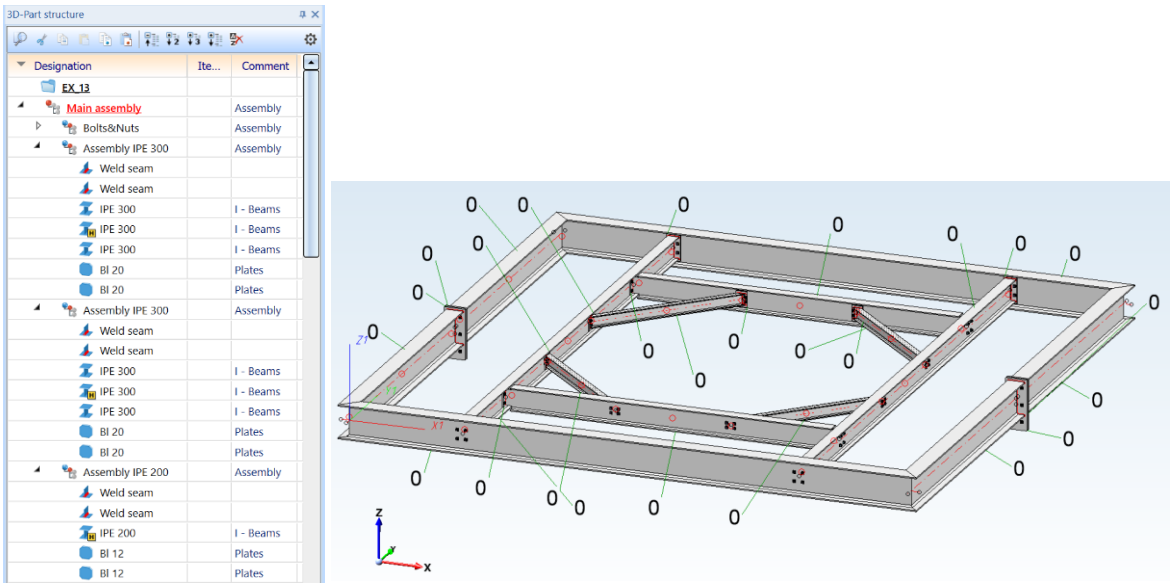


Figure 258 3D Part structure and annotated model without item numbers

Now perform automatic itemisation 

.

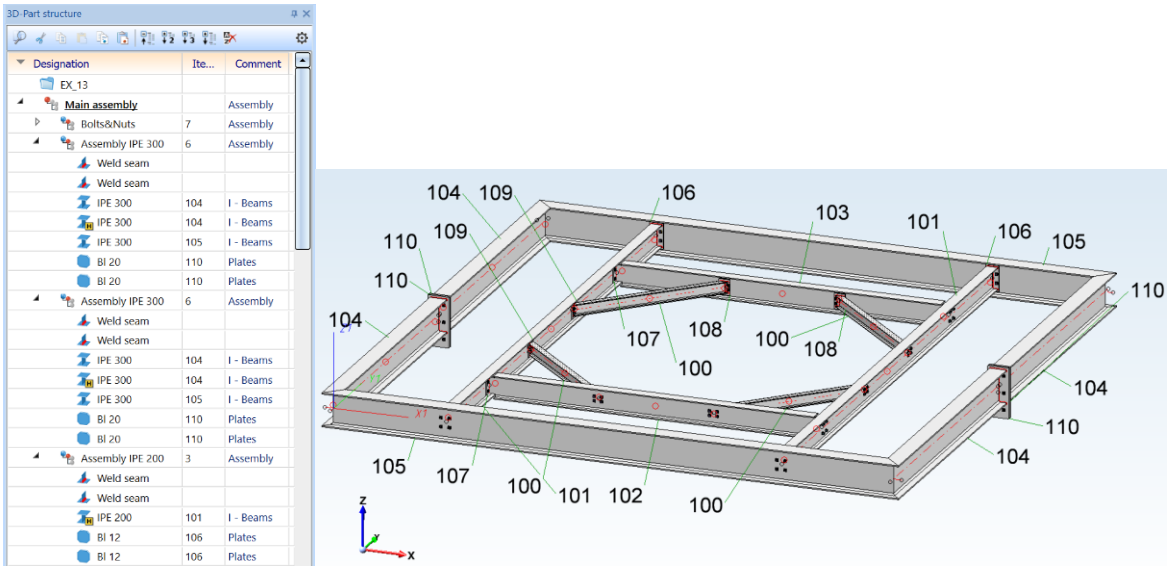


Figure 259 3D Part structure and annotated model with item numbers

HiCAD has now identified the identical parts and assigned numbers based on these findings.

IMPORTANT:

- The numbers must be assigned; otherwise, HiCAD cannot generate automatic drawings.
- The numbers must be assigned; otherwise, HiCAD cannot create an automatic bill of materials.
- In case of geometric or attribute changes, parts are marked as invalid.
- This indicates that HiCAD cannot garantee that parts can still have the number they had, Item-isation MUST be perfomed again to kick off the identical part recognision which is logical af-ter these changes. Example: The model is drawn and then numbered:

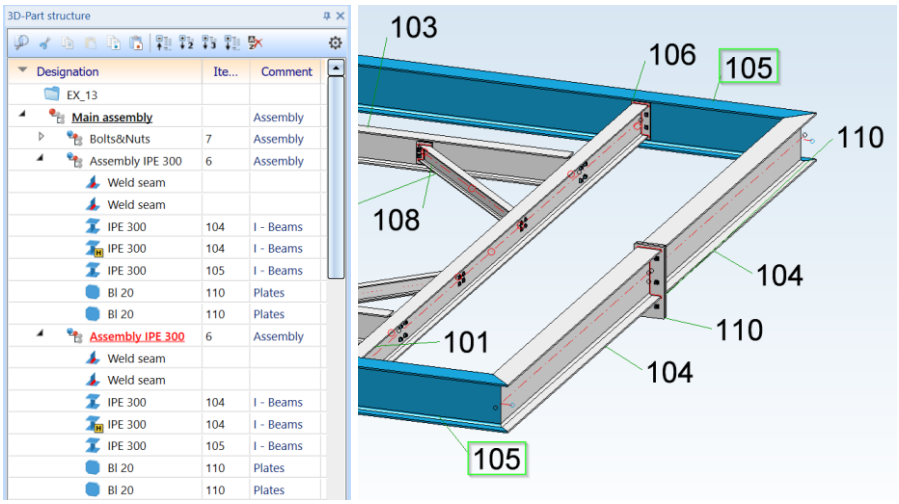


Figure 260 Two identical parts in steel construction

Modify the geometry of the model:

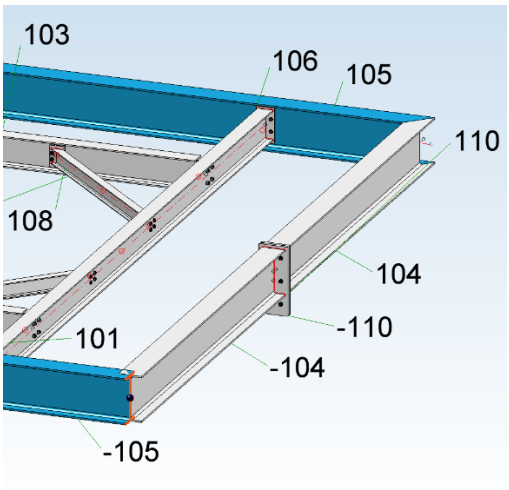


Figure 261 Invalid item number after part change

The numbers of the changed parts are marked as invalid now.

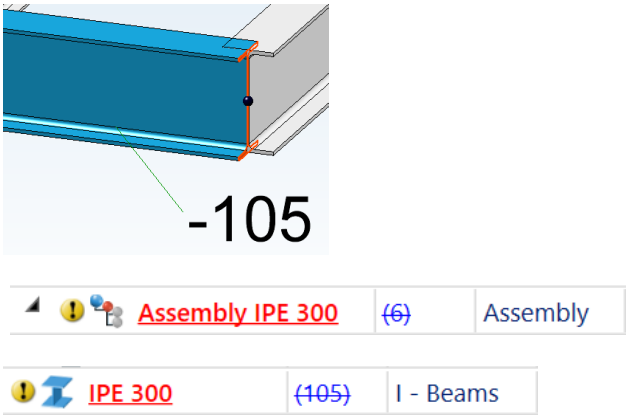


Figure 262 Invalid item number after part change (2)

Perform a new automatic itemisation, this will result as follows:

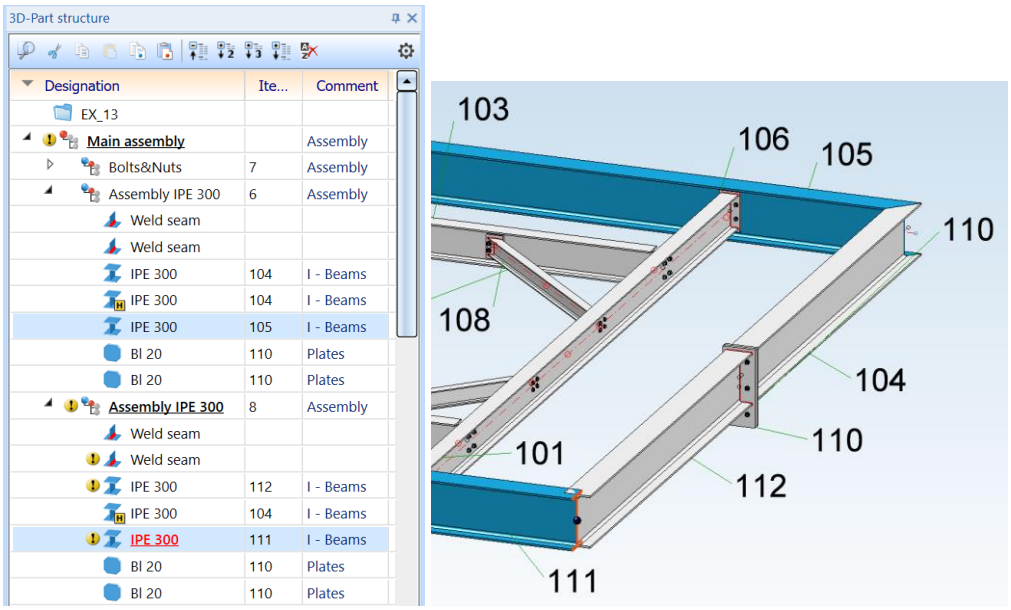


Figure 263 Changed item numbers after new itemisation

The modified part comes back with a new number. If the modifications resulted in a geometry identical to another part that already had a number, the modified part would have received the same number.

15.2.1 Itemisation Parameters

The numbering scheme that HiCAD adheres to can be configured. These configurations can be changed during the process using the function:

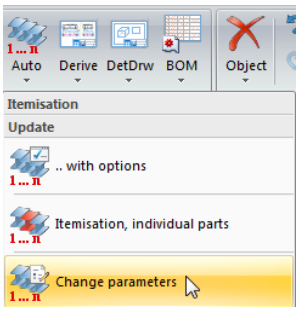


Figure 264 Change parameters in sub-menu of automatic itemisation

The following menu appears:

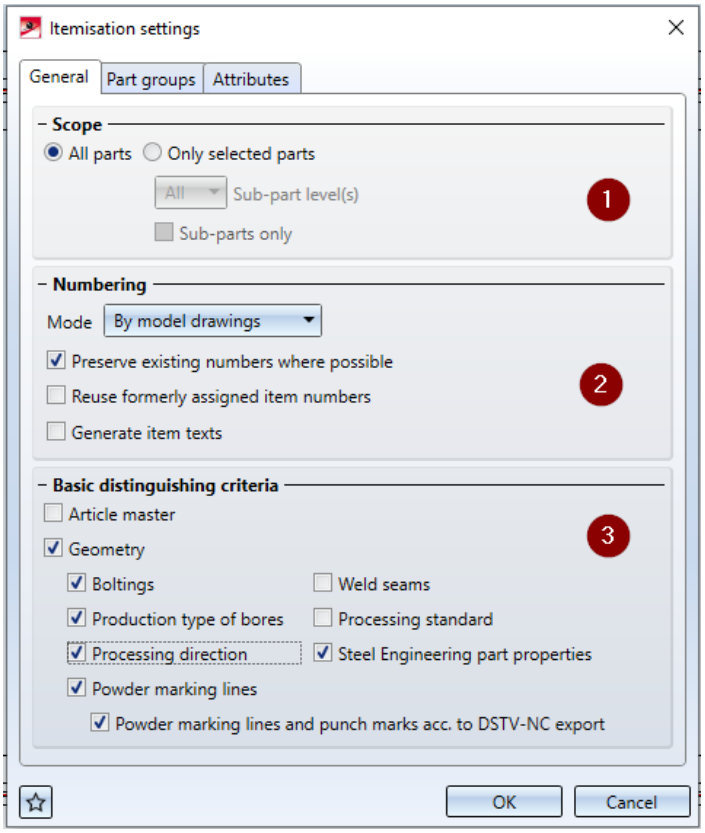


Figure 265 Itemisation settings dialogue

The settings as depicted above are the most common configurations within the steel construction industry.

Explanation:

- (1) Specifies which parts should be numbered. Only selected parts with or without sub-parts, or all parts in the drawing.
- (2) With "By model drawings," HiCAD searches for identical parts in the entire drawing. With "By Assemblies," HiCAD starts counting from scratch for each Assembly and level. "Preserve" tries to retain the existing item numbers as much as possible. "Permission for Reuse" allows old item numbers to be reused if they are not currently in use. "Generate item text" provides the option to set and apply item text to the desired parts.
- (3) Specifies the basic geometric differences with their associated additional options.

  Under the "Part Groups" tab, a starting number and increment number can be set for each type of part.

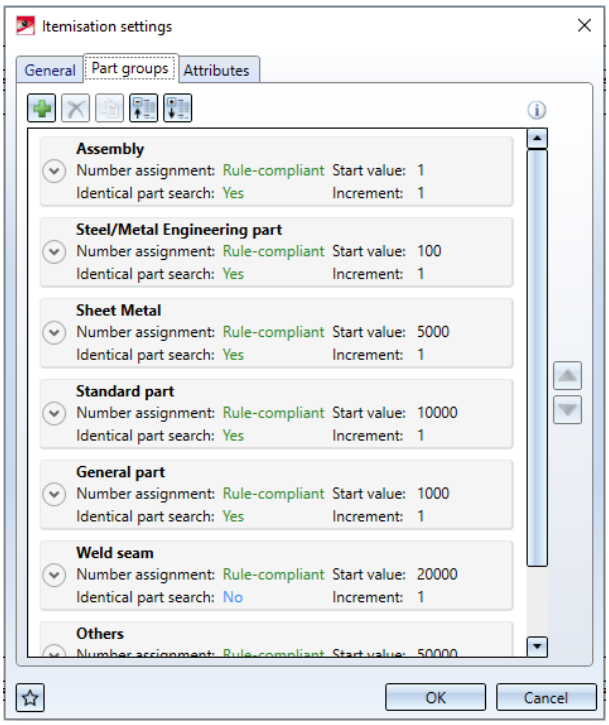


Figure 266 Part group tab of Itemisation settings dialogue

In the "Attribute" tab, further filtering and order of itemisation on attributes can be applied.

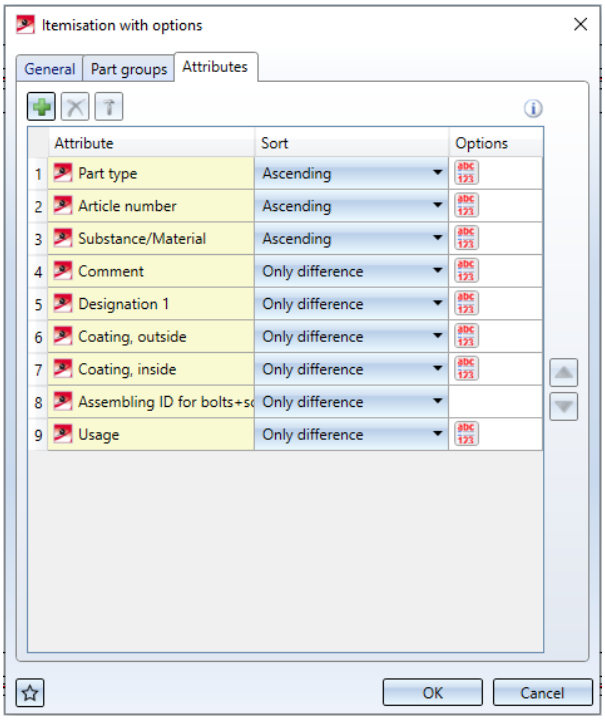


Figure 267 Attributes tab of Itemisation settings dialogue

15.2.2 Automatic detail drawings – overview drawings

To keep a model organized for the eventual assembly, an overview drawing is created from the main assembly of the model. For example:

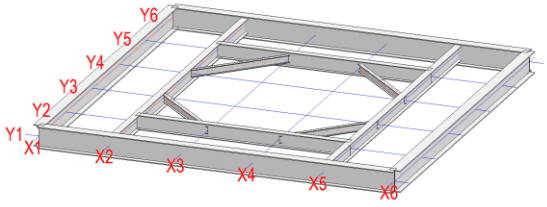


Figure 268 Steel frame in steel engineering grid

- Activate the Main-assembly:

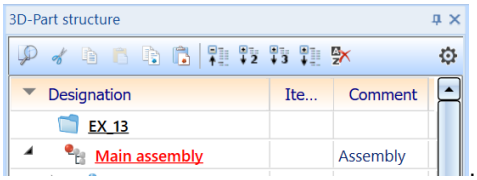


Figure 269 Main assembly in 3D part structure

- Now choose from the Drawing Ribbon:

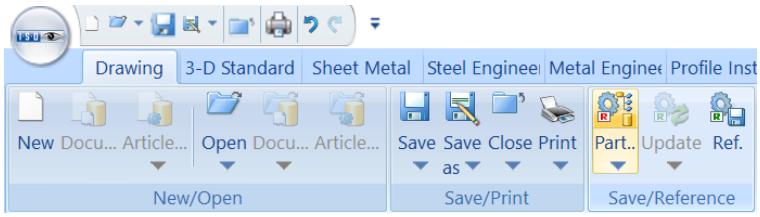


Figure 270 Drawing ribbon – Reference, save, detail drawing

- Thereafter:

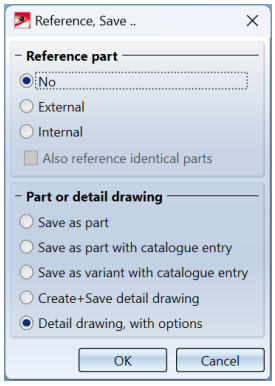


Figure 271 Reference, save, detail drawings dialogue without HELiOS

- Then choose Yes to create the drawing in the current SZA and not create a new SZA:

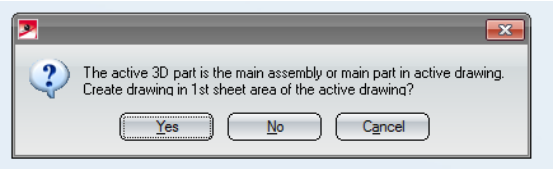


Figure 272 Message asking to create detail drawing in sheet 1 of current drawing

The following menu appears:

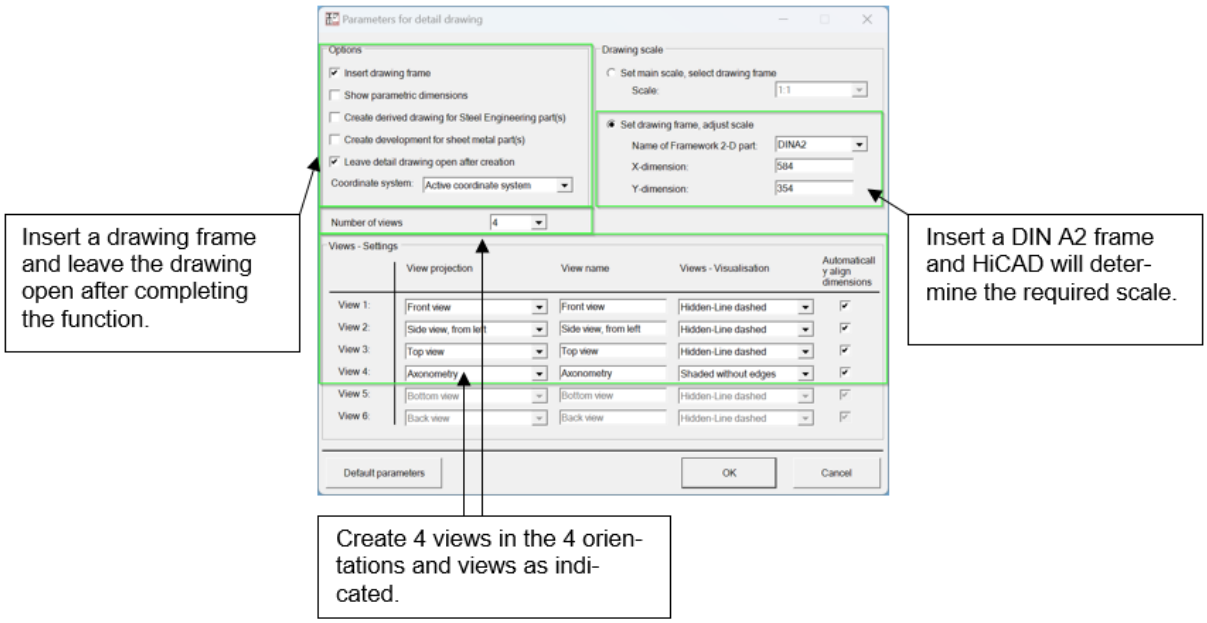
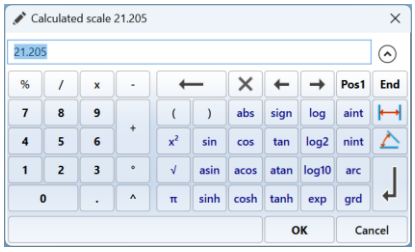


Figure 273 Parameter menu for detail drawings

- Click OK. HiCAD then creates the drawing and makes a proposal for the scale, which can still be adjusted:



Change to

and press OK.

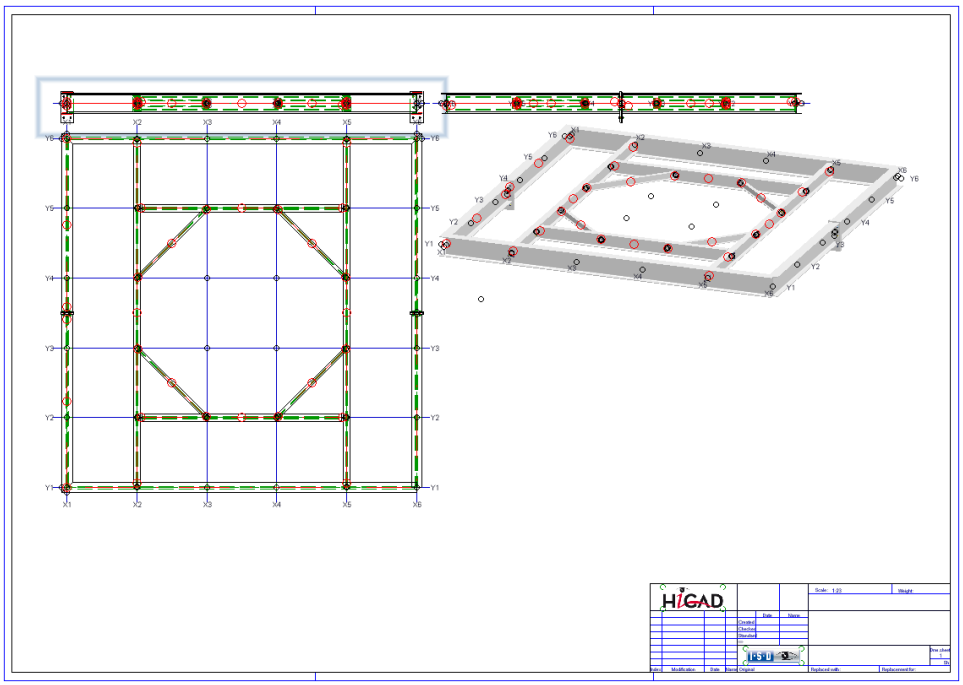


Figure 274 Example of automatically created detailed drawing

Note:

- The shortcut "O" can be used to fill in the drawing frame.

Tip:

- To visualize the position numbers in the overview model at once, activate a view and select the desired parts (multiple selection can also be done via Ctrl/Shift):

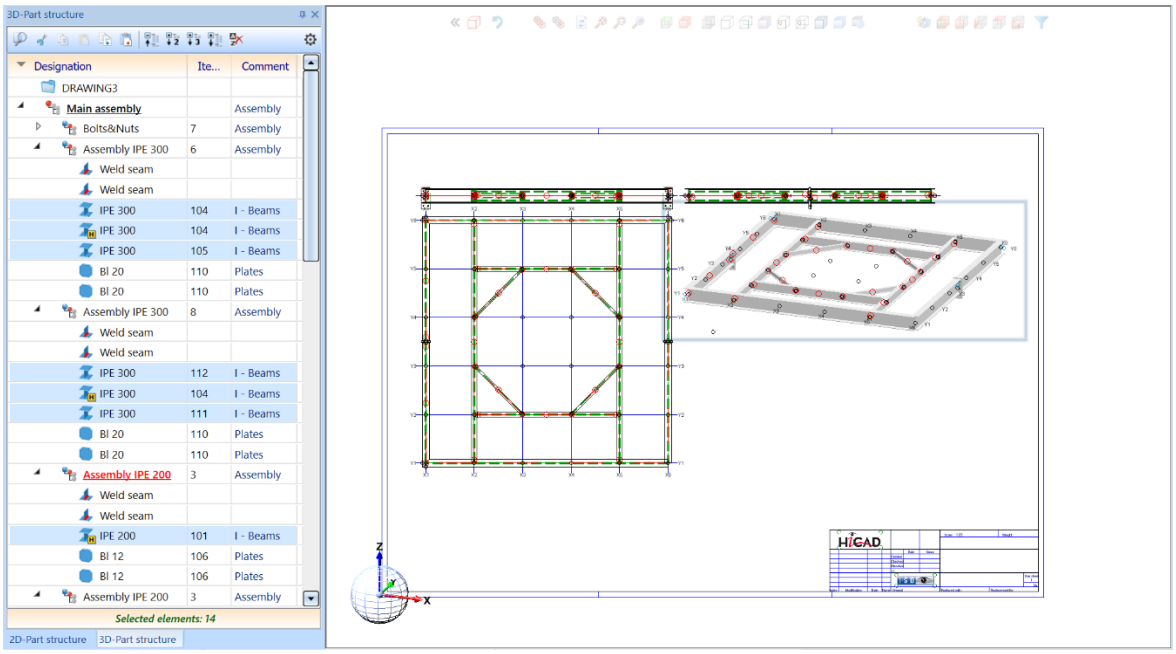


Figure 275 Part selection for automatic part annotation

Then choose the function: **3-D Dimensioning+Text > Text > LLine > Automatic part annotation**

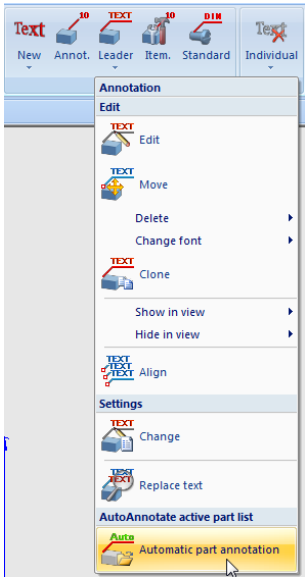


Figure 276 Automatic part annotation in sub-menu of text with leaderline

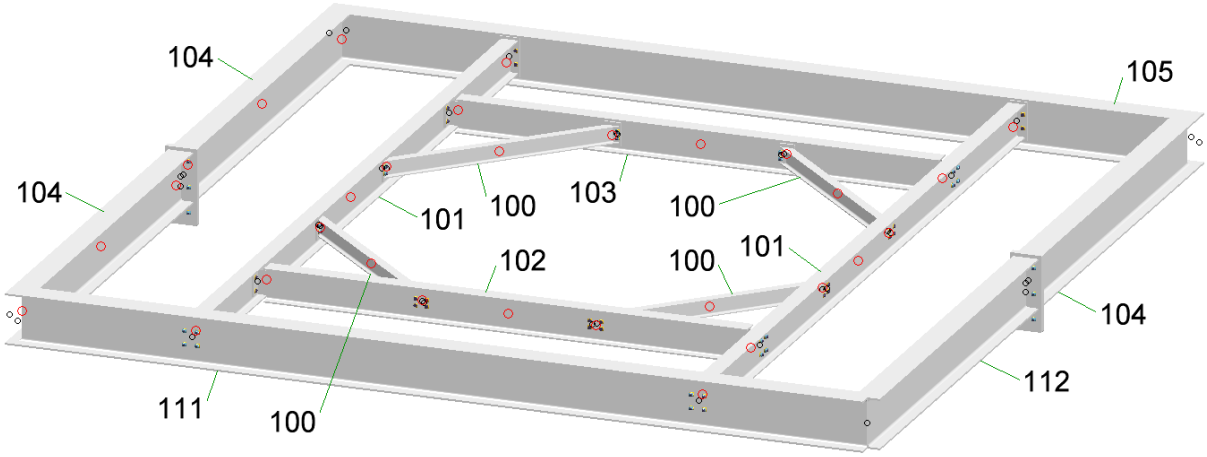


Figure 277 Itemised and annotated steel model

15.3 BOM – Bill of Material

Conditions to generate a parts list:

The model must be structured.

All part attributes of a component must be filled in correctly (either manually or automatically).

Note:

- Part attributes can be accessed by double-clicking on a component (graphically).

The model must be itemised.

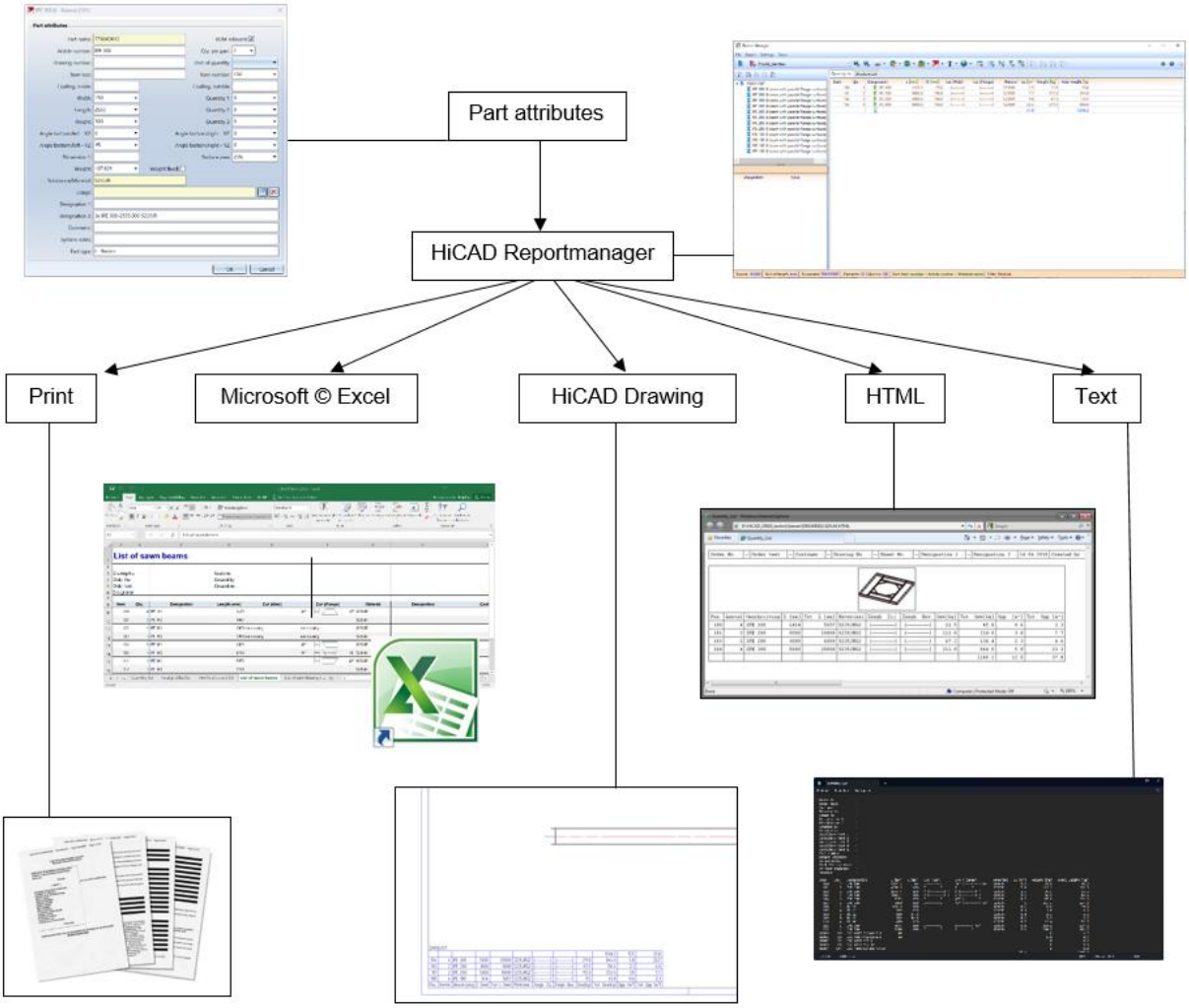


Figure 278 Schematic overview of how a HiCAD parts list is generated

Example:

- Start the function (in the “drawing” ribbon):

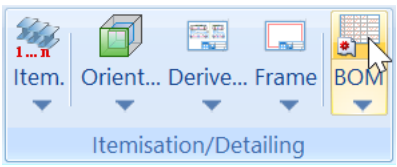


Figure 279 Insert BOM button in drawing ribbon

- Choose the format (RM_Settings) and to which the export should be done:

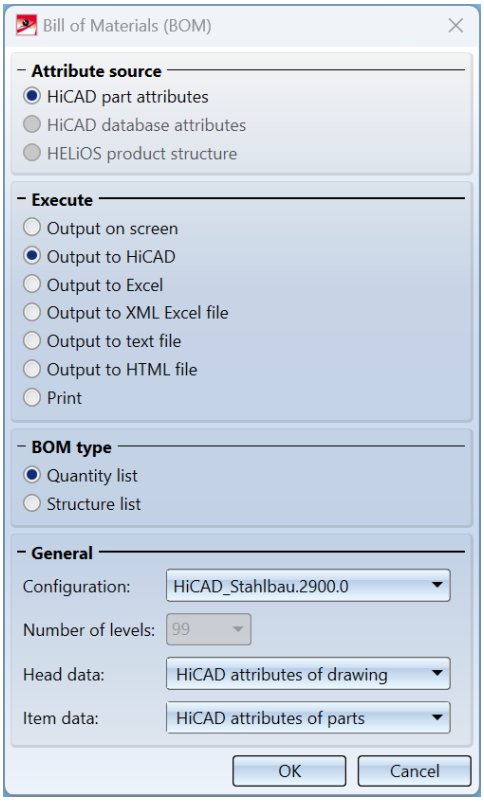


Figure 280 Insert Bill of materials general settings dialogue

- Choose OK. The report manager briefly appears on screen and minimizes itself.
- Now the frame can be placed in the drawing:

Figure 281 Select insertion point for BOM in HiCAD

								38.1		1261.3
112	1	IPE 300	2480.0	150.0	I--------I	I--------I	S235JR	2.9	104.7	104.7
111	1	IPE 300	5075.0	150.0	I--------I	I--------/ 45°	S235JR	5.9	214.2	214.2
105	1	IPE 300	5150.0	150.0	I--------I	45° \--------/ 45°	S235JR	6.0	217.3	217.3
104	3	IPE 300	2555.0	150.0	I--------I	45° \--------I	S235JR	8.9	107.8	323.5
103	1	IPE 200	2968.4	100.0	? X--------X ?	? X--------X ?	S235JR	2.3	66.5	66.5
102	1	IPE 200	2968.4	100.0	? X--------X ?	? X--------X ?	S235JR	2.3	66.5	66.5
101	2	IPE 200	4966.9	100.0	I--------I	I--------I	S235JR	7.6	111.3	222.5
100	4	IPE 100	1424.5	55.0	I--------I	45° /--------\ 45°	S235JR	2.3	11.5	46.2
Item	Qty.	Designation	L [mm]	W [mm]	Cut (Web)	Cut (Flange)	Material	Su [m²]	Weight [kg]	Total weight [kg]

Figure 282 Resulting BOM in HiCAD drawing frame

Note:

- If you want to add your own Quantity list / Cutting list / Assembly list / Marking list, you can do so in the HiCAD Report Manager. After placing a parts list, the HiCAD Report Manager is opened and can be accessed through the Windows taskbar.

The Report Manager offers numerous configuration options:

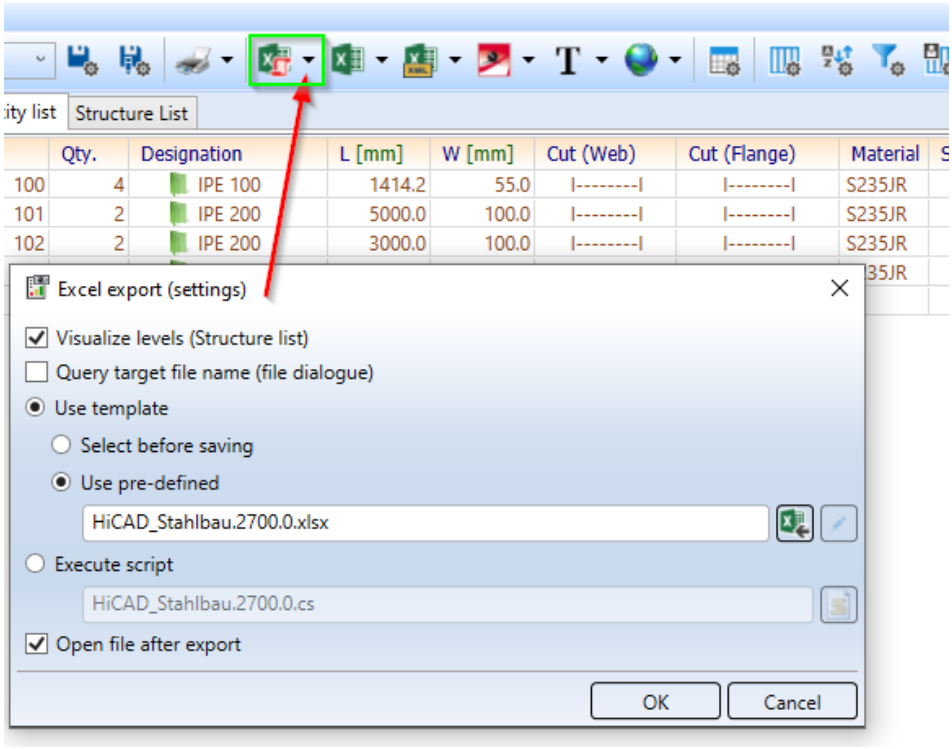


Figure 283 Excel export settings

Within the Excel settings, there is an option to choose the Excel template.

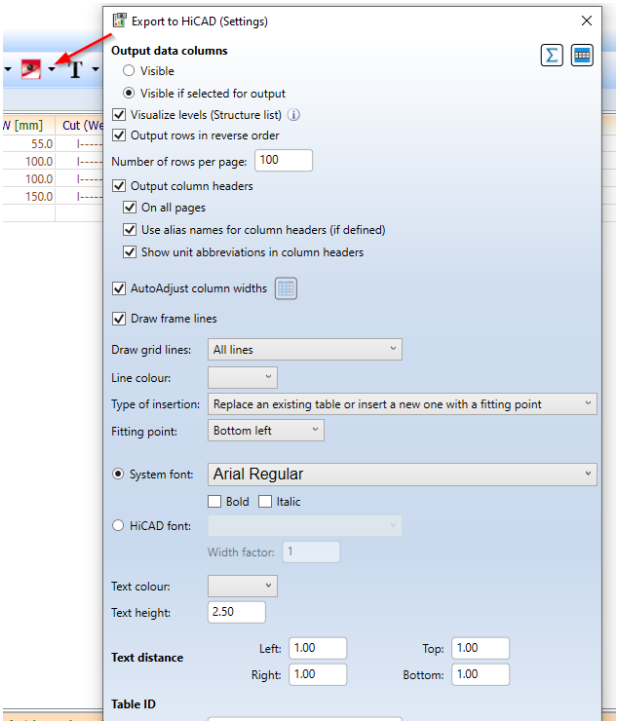


Figure 284 HiCAD export settings

Within the HiCAD settings, you can determine how it should be exported to HiCAD.

Furthermore, there are options to show or hide columns via the column settings.

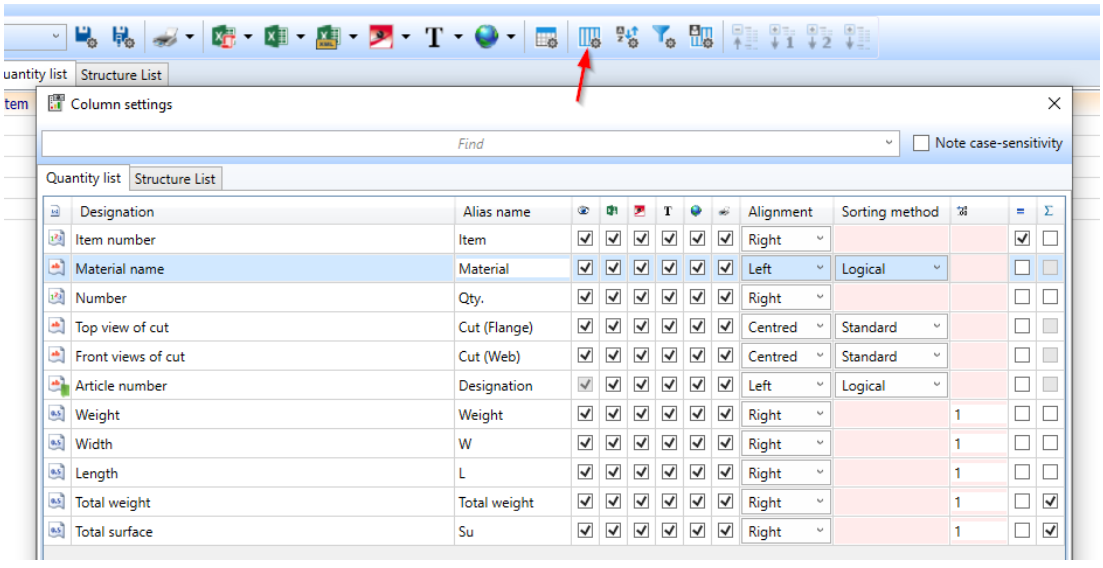


Figure 285 Collumn settings in report manager

To filter in those columns, you can use the filter settings.

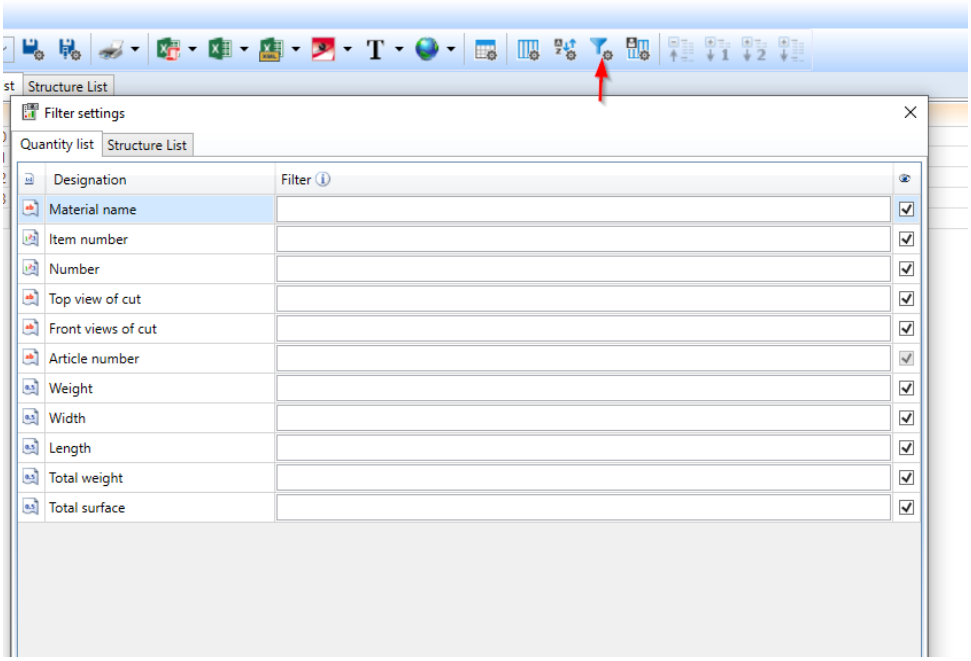


Figure 286 Invalid item number after part change

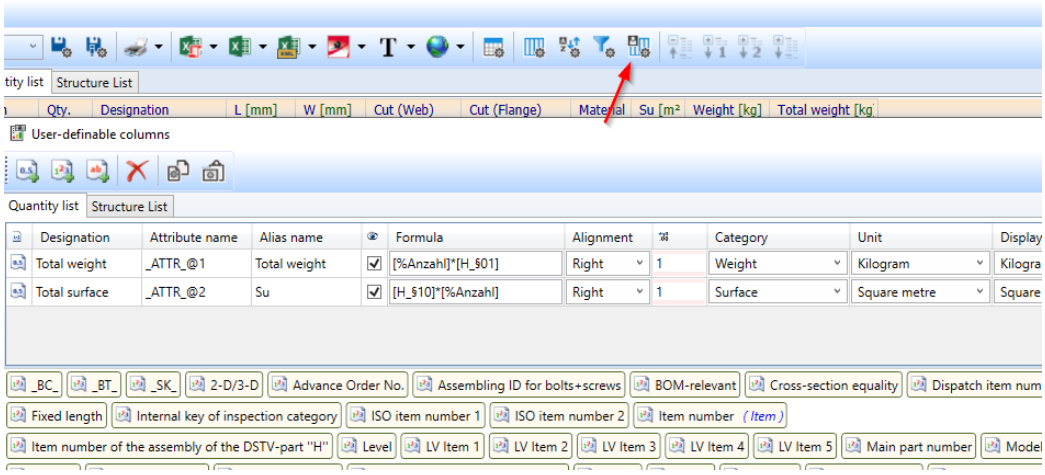


Figure 287 Invalid item number after part change

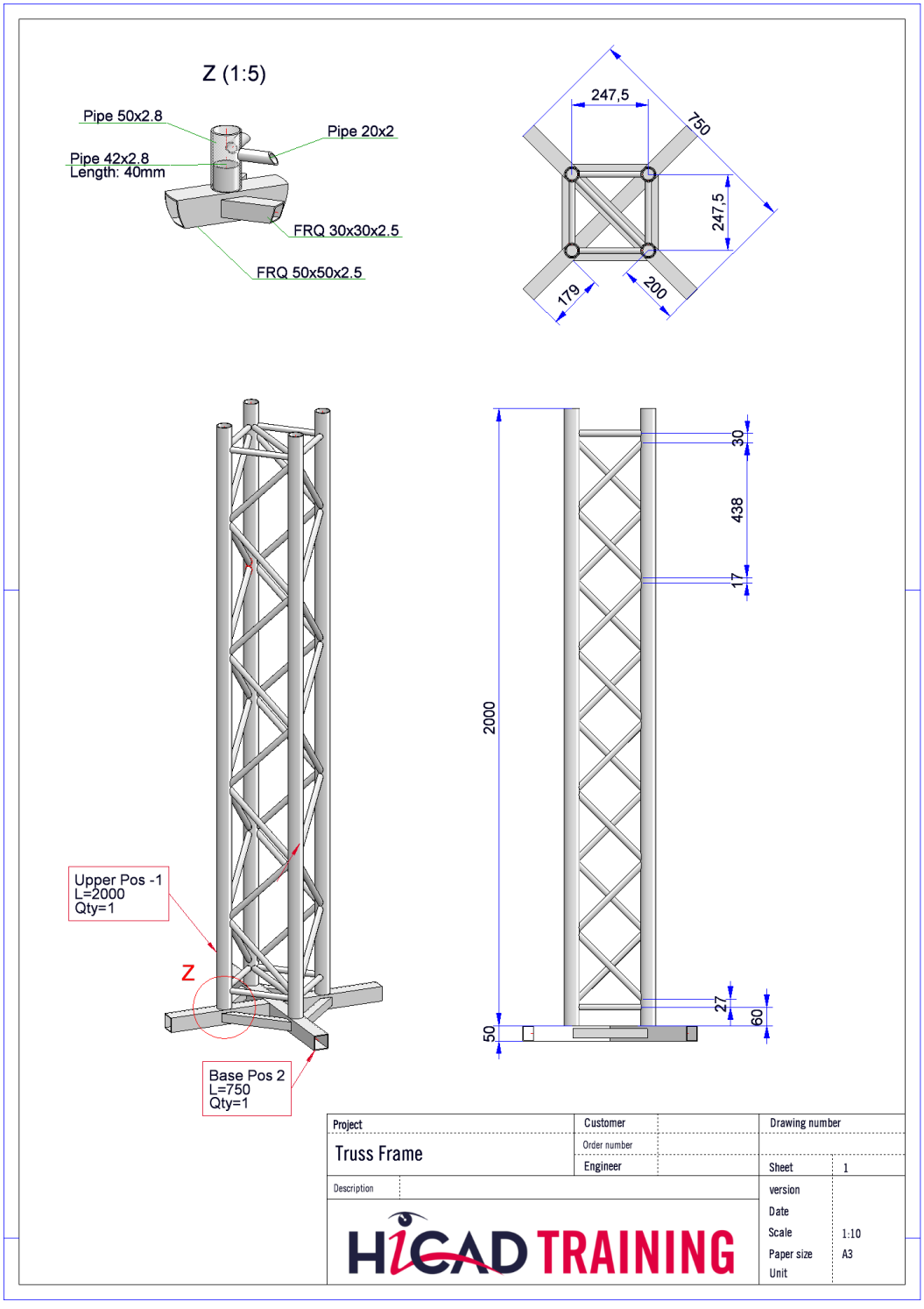
And through User-Defined columns, you can customize a column according to your own preferences.

Further information can be found in the Help function of the HiCAD Report Manager. After you have finished making adjustments, save them using "Save as" and create an RM_Settings file in the C:/HiCAD/SYS folder with a name starting with "HiCAD_". By doing this, you can select it from the list when invoking the parts list function.

HiCAD includes several standard parts lists, which can also be converted to Excel if needed.

15.4 Exercise 13 Truss Frame

Create the following model:



The exercise is finished

15.5 Exercise 13 B

- Create the following model:

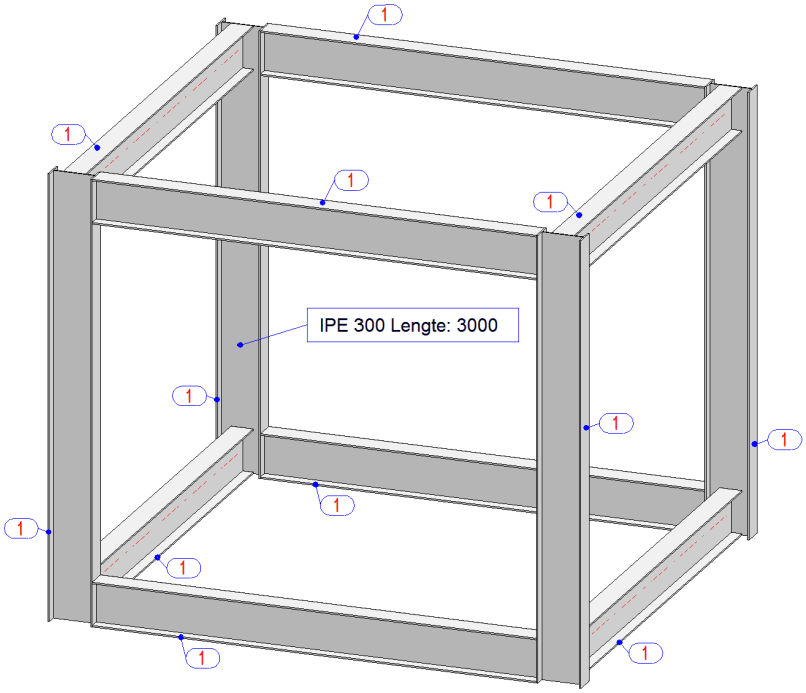


Figure 288 IPE frame

This will be used in Exercise 15

- Structure the layout according to your own discretion. For example:

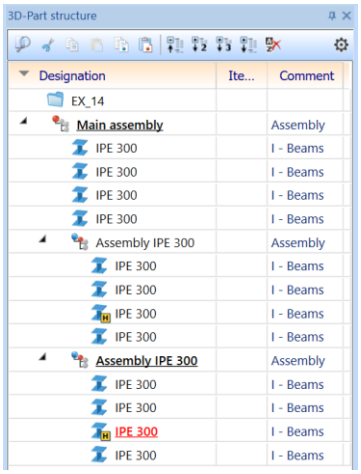
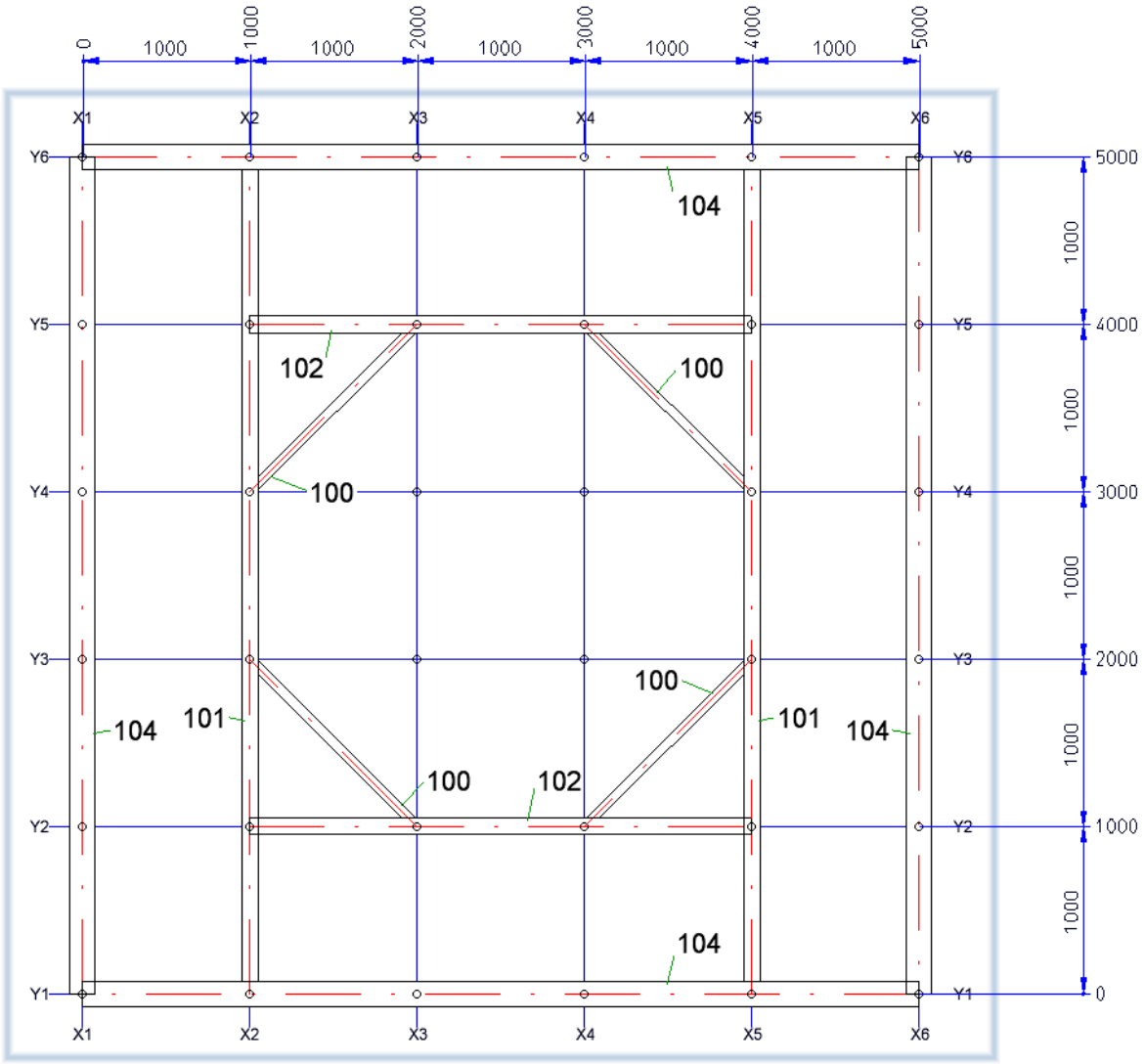


Figure 289 Example structure for IPE frame

The exercise is finished

15.6 Exercise 14

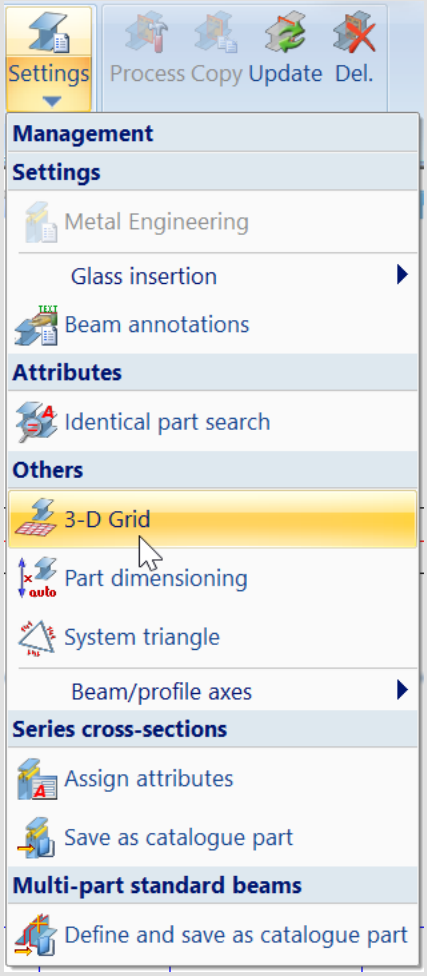
Create the following model:



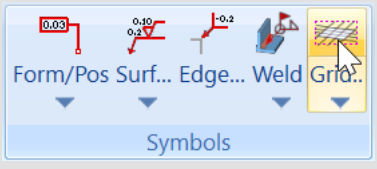
								37.8		1248.2
104	4	IPE 300	5000.0	150.0	I--------I	I--------I	S235JR	23.2	211.0	844.0
102	2	IPE 200	3000.0	100.0	I--------I	I--------I	S235JR	4.6	67.2	134.4
101	2	IPE 200	5000.0	100.0	I--------I	I--------I	S235JR	7.7	112.0	224.0
100	4	IPE 100	1414.2	55.0	I--------I	I--------I	S235JR	2.3	11.5	45.8
Item	Qty.	Designation	L [mm]	W [mm]	Cut (Web)	Cut (Flange)	Material	Su [m²]	Weight [kg]	Total weight [kg]

Tip:

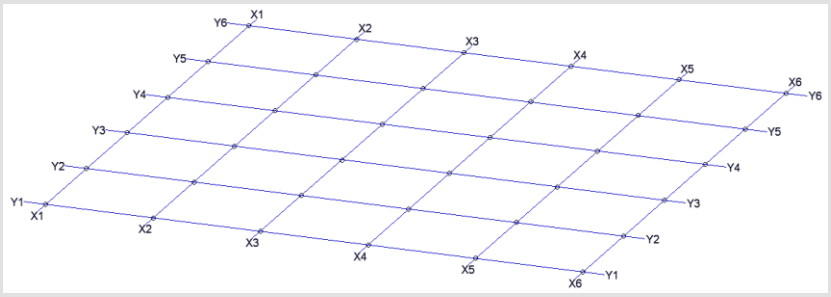
- Create a grid using the function: **Steel Engineering > Further functions > Settings > 3-D Grid**



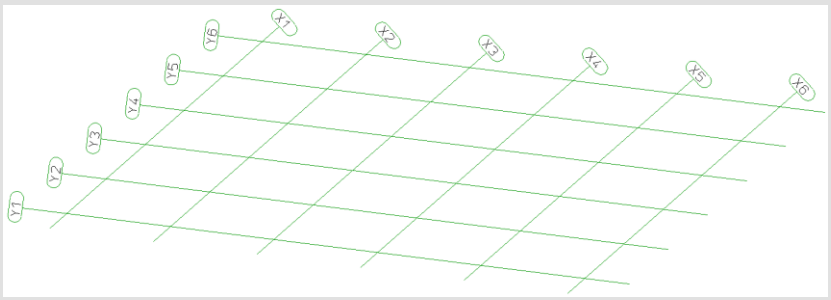
- Add annotations of the axes to the grid with the function: **3-D Dimensioning+Text > Symbols > Grid..**



Before:



Afther:



15.6.1 Civil Engeneering connection functions

When you are finished with placing the beams continue and make adjustmens using the Civil Engeneering connection functions. This can be done according to your preferences.

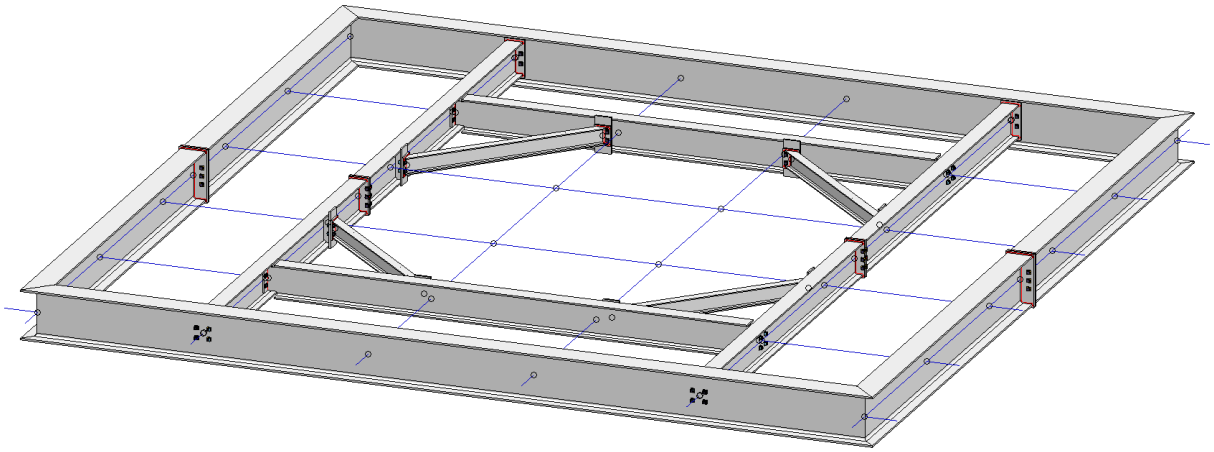


Figure 290 Example of using civil engineering connections

15.6.2 3D-Part structure

When this is finished create a neat 3D-part structure.

Finally make an overview drawing for this model and insert a bill of materials.

3-D Part structure

Designation	Item number	Comment
EX14		
3-D Grid		
3-D Grid		
Main assembly		Assembly
North	5	Assembly
Assembly IPE 100	1	Assembly
Assembly IPE 100	1	Assembly
Assembly IPE 200	3	Assembly
Assembly IPE 200	2	Assembly
Assembly IPE 200	2	Assembly
Assembly IPE 300	4	Assembly
Assembly IPE 300	4	Assembly
Bolted connection		
Bolted connection		
Bolted connection		
Bolted connection		
Bolted connection		
Bolted connection		
Bolted connection		

Figure 291 Example of part structure

The exercise is finished

15.7 Automatic Workshop drawings

With this function, Steel engineering parts and Assemblies can be detailed.

Preconditions:

The structure must be correct (including "Assembly Main Part").

The components must be itemised (parts without numbers or marked parts will be skipped).

This model will be detailed:

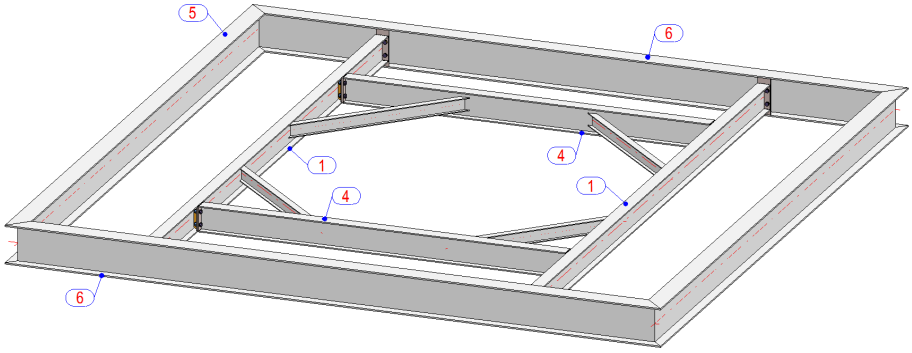


Figure 292 Steel structure

➢ Choose the function: **Drawing > Itemisation/Detailing > Derive...**

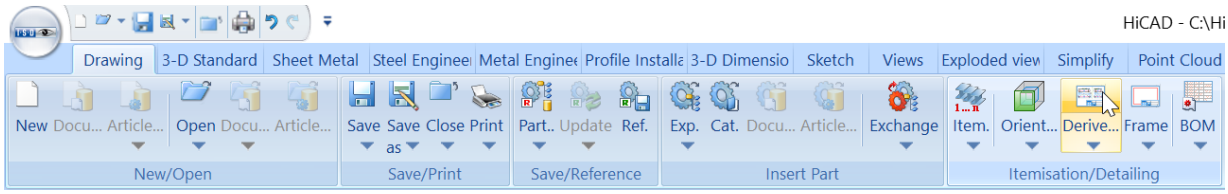


Figure 293 Drawing ribbon – Derive drawings button

The following screen appears:

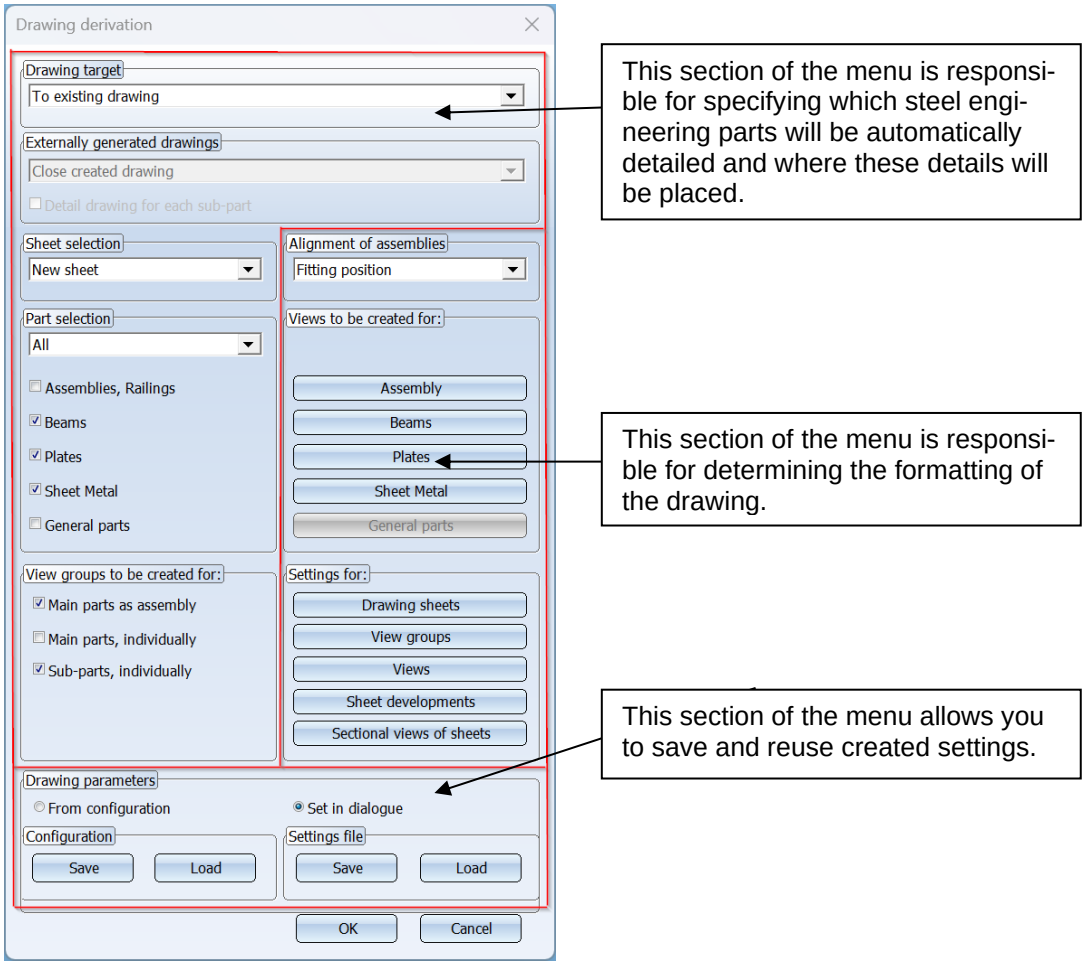
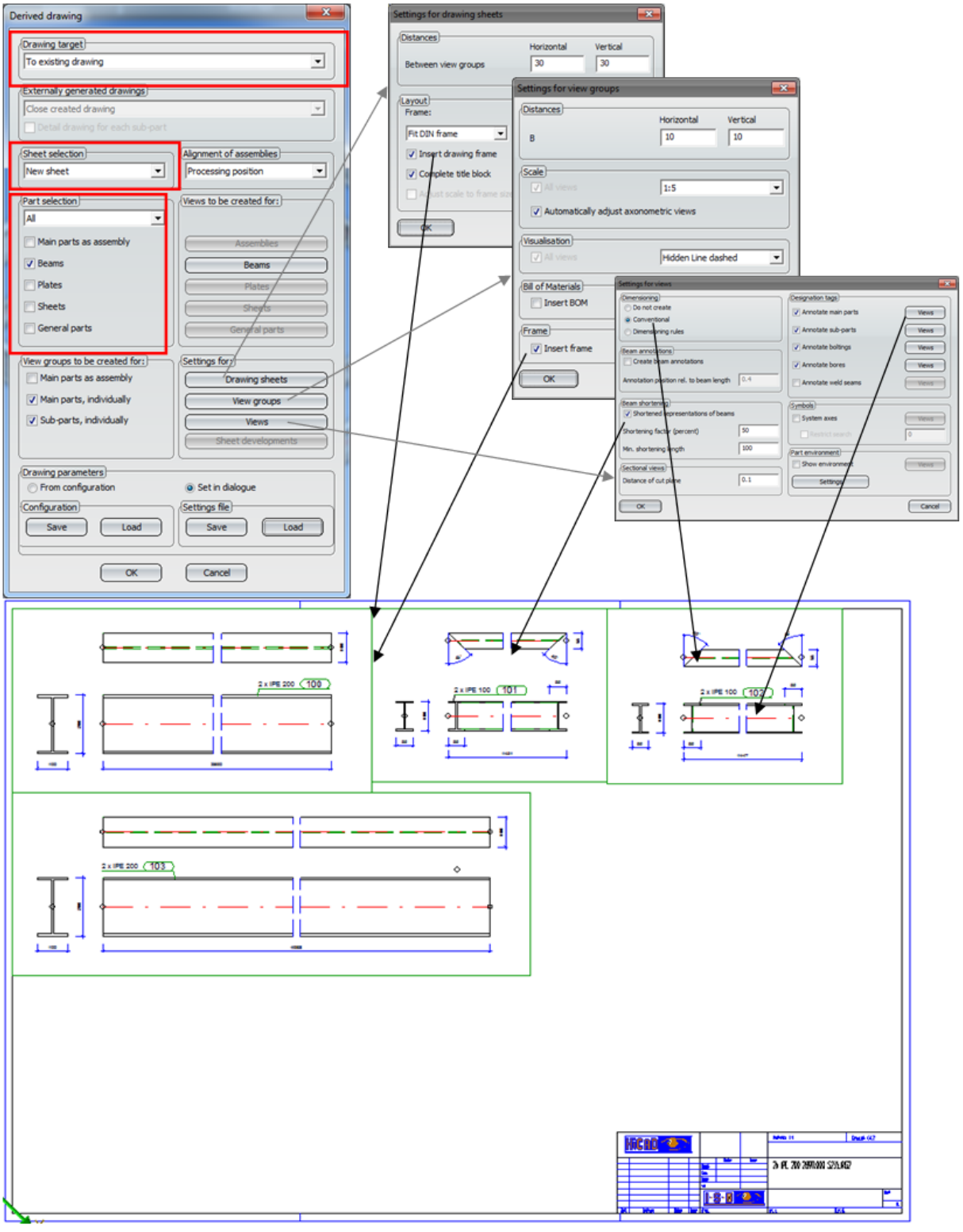


Figure 294 Derive drawings dialogue with explainations

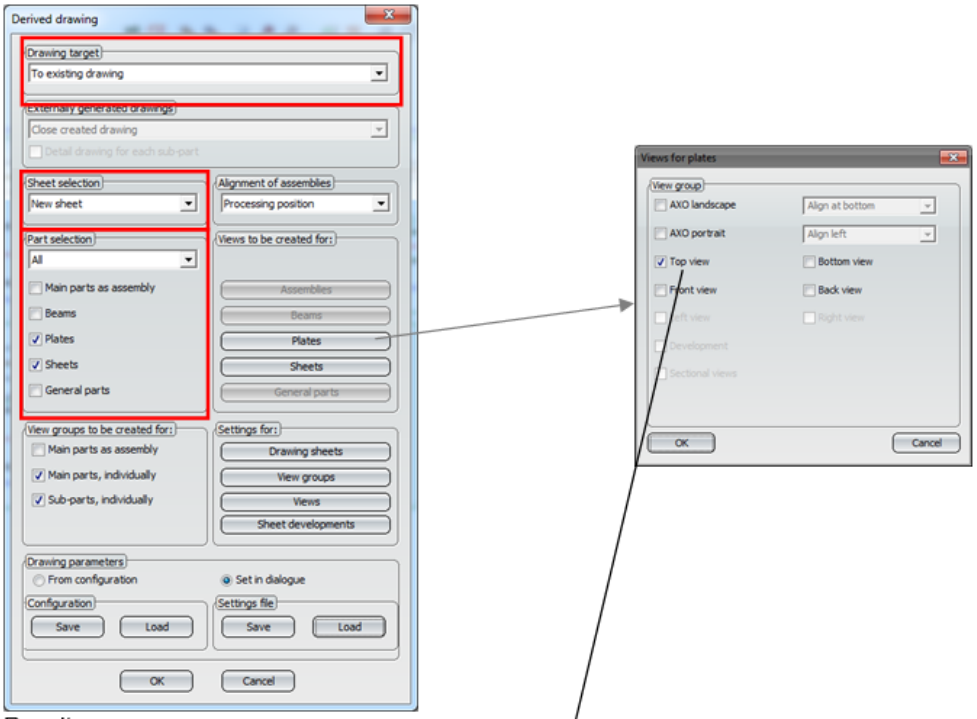
The following settings result in a drawing with:

- all profiles
- in a new sheet
- within the SZA of the main assembly

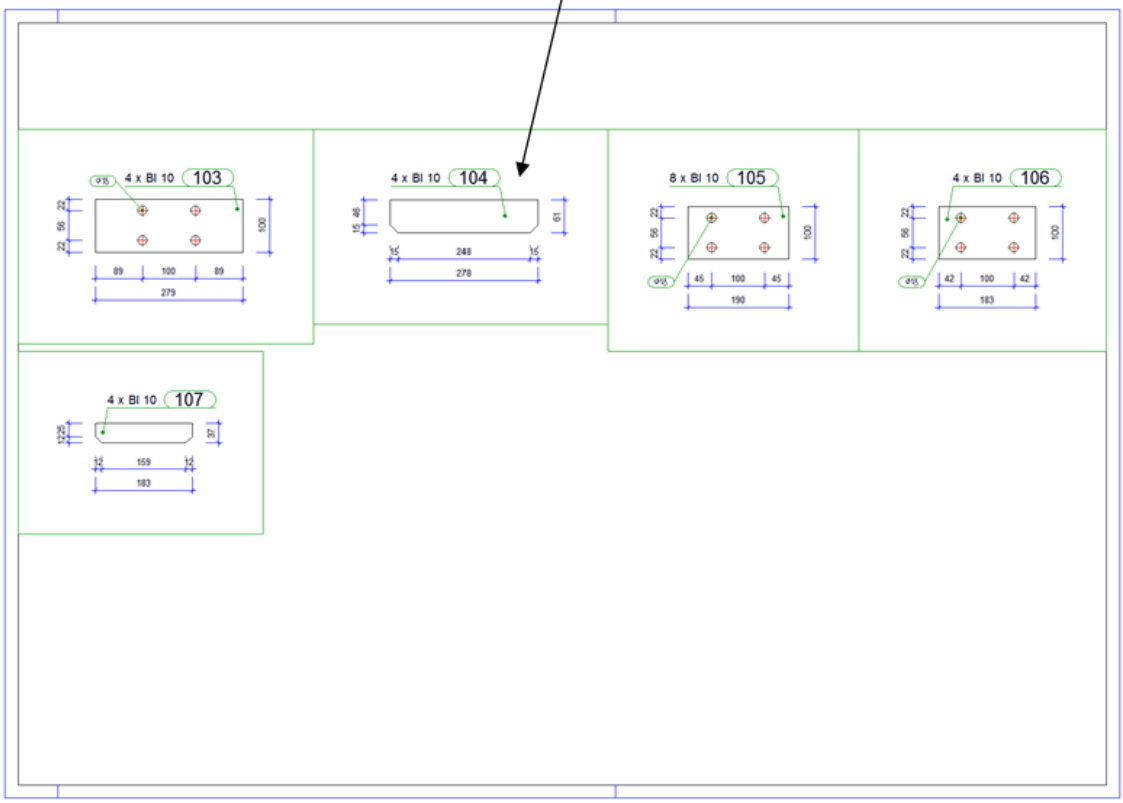


The following settings result in a drawing with:

- all plates (steel plates and sheet metal plates)
- in a new sheet
- within the SZA of the main assembly

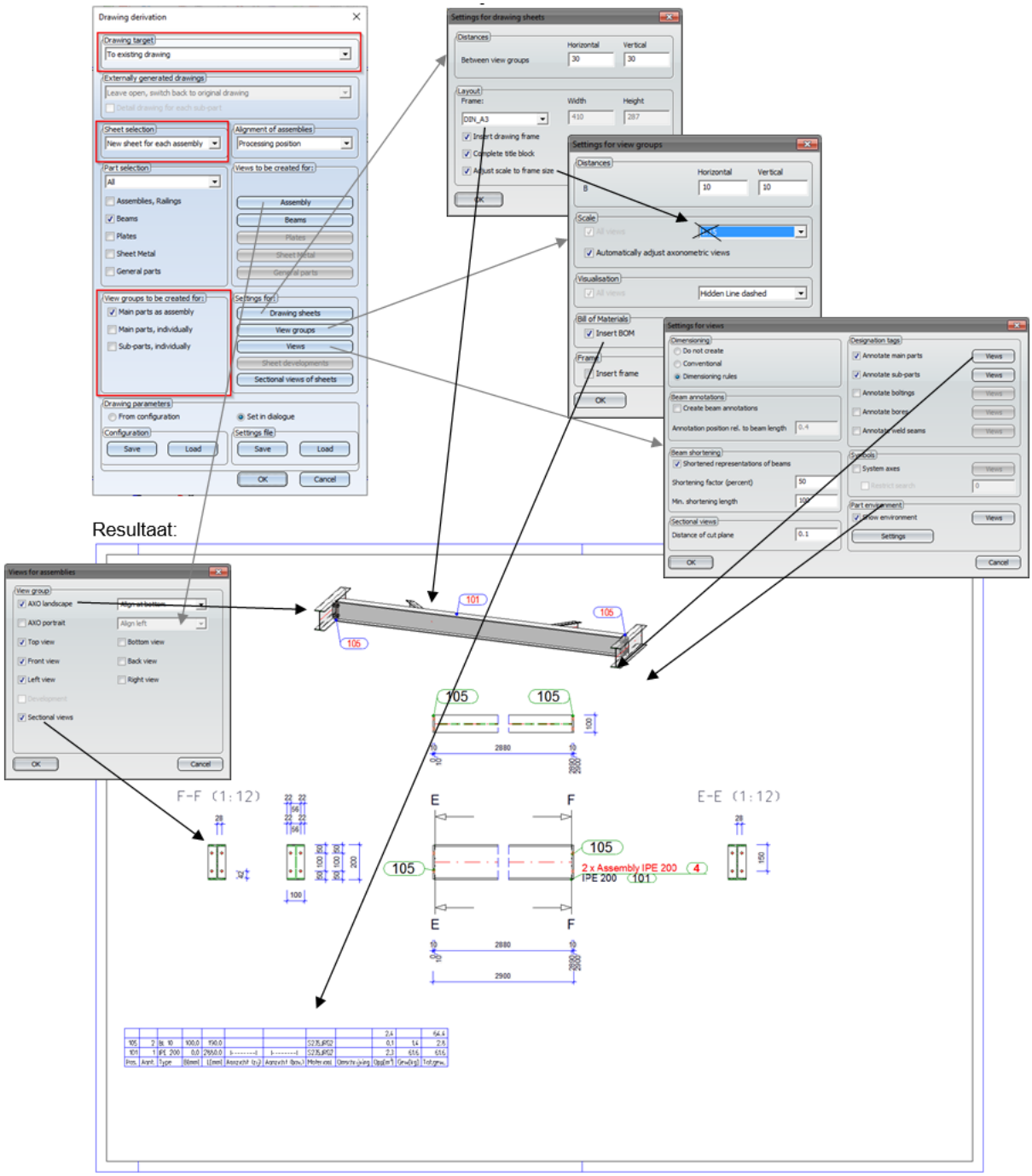


Result:



The following settings result in a drawing with:

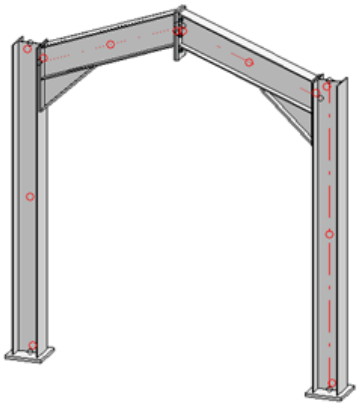
- all assemblies
- each one separately in a new sheet
- within the SZA of the main assembly

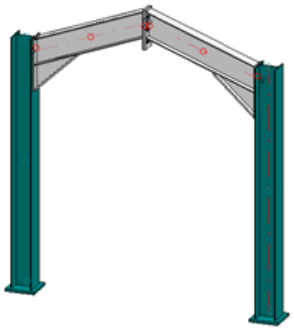


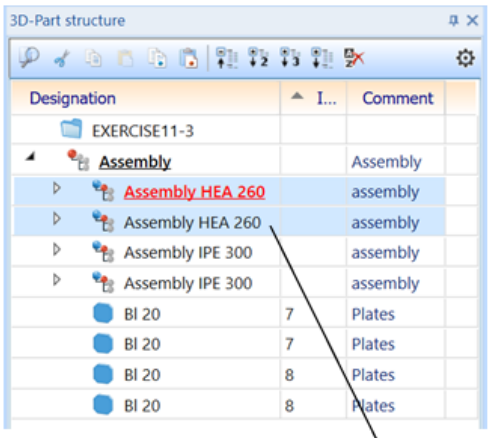
15.8 Automatic Workshop drawings – Type of use (Usage)

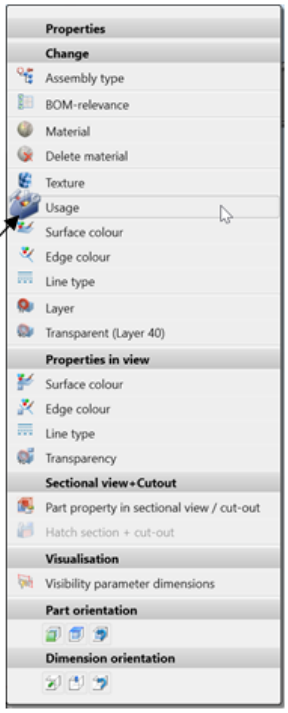
Required for this exercise is the drawing from Exercise 11-3.

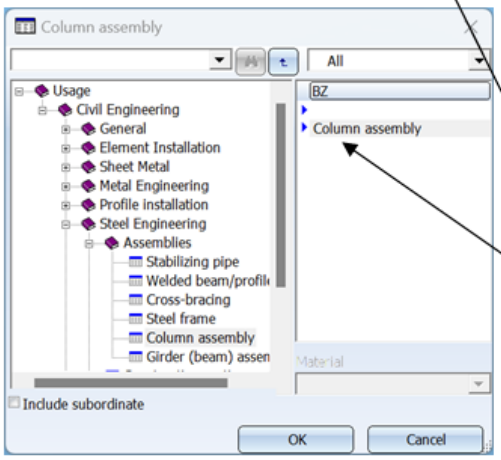
In this exercise, we use the "Usage" principle and detail the drawings via derivation, but this time with the option "From configuration."



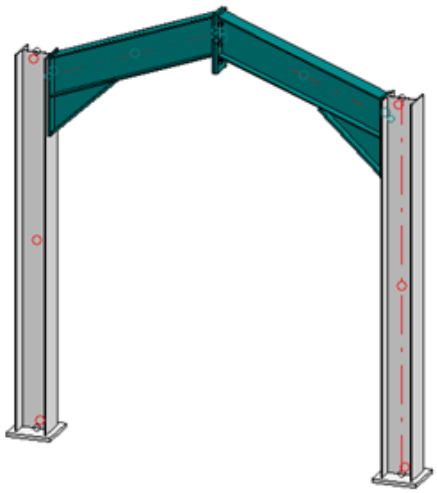


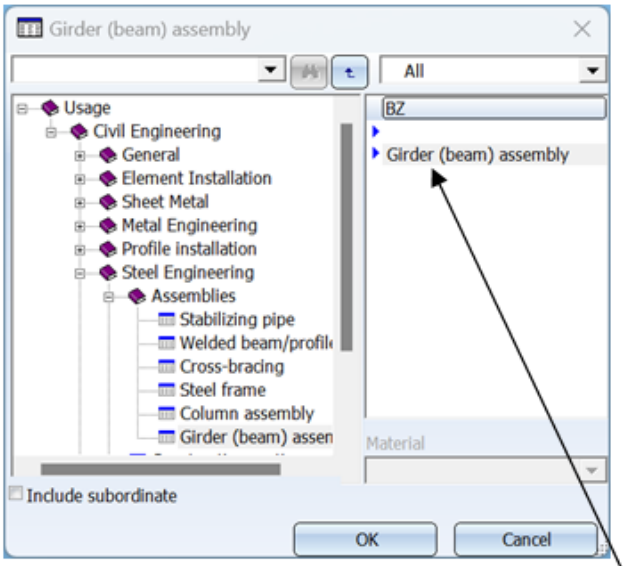


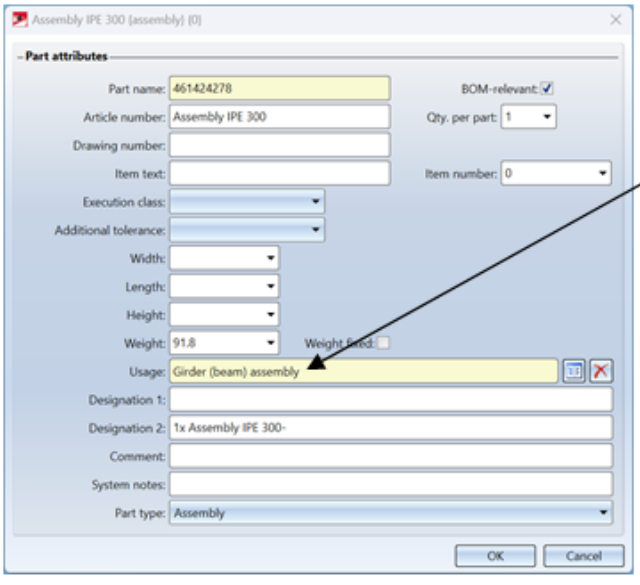




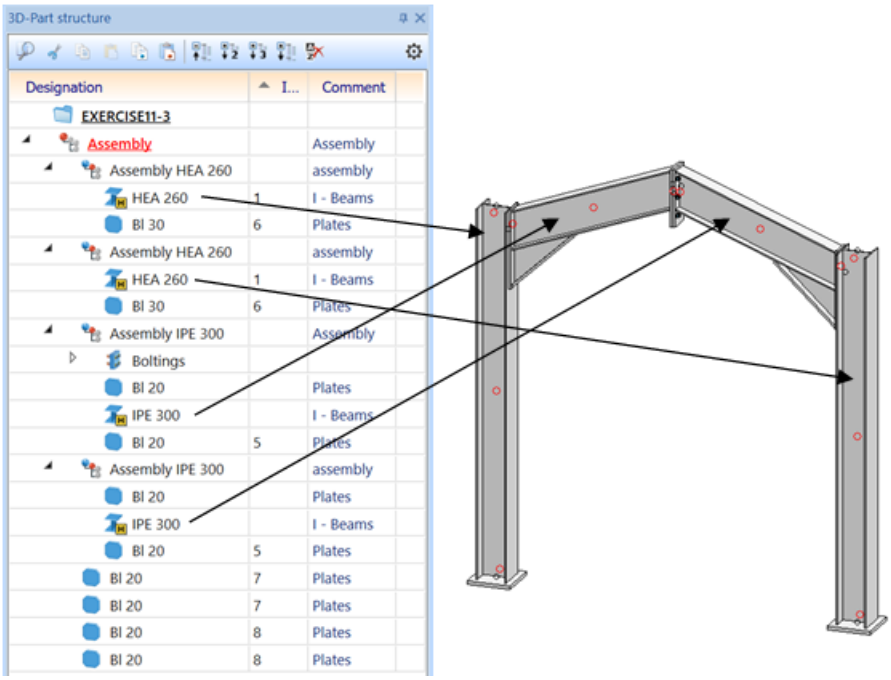
For the columns, select "Usage: Column assembly"





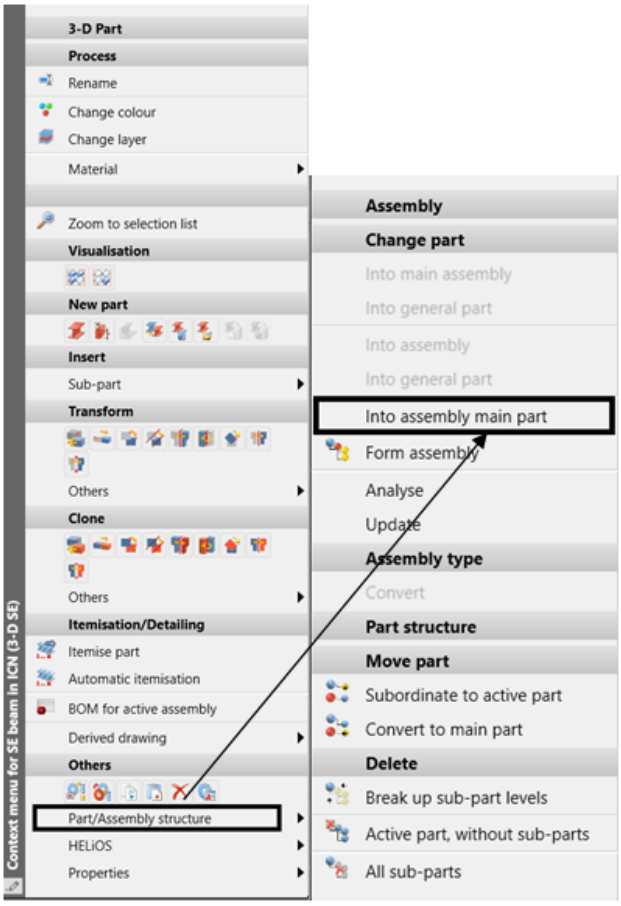


For these truss members, choose the "Usage: Girder (beam) assembly"



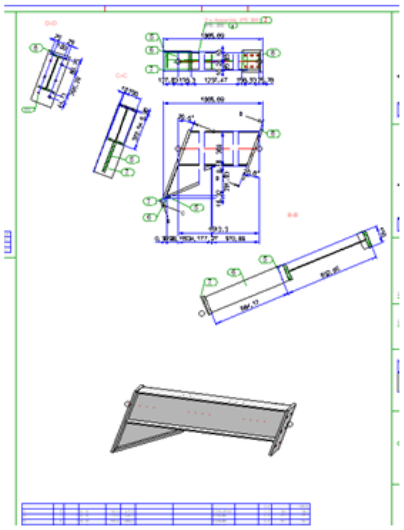
Ensure that the correct parts are marked as “Assembly Main Part”.

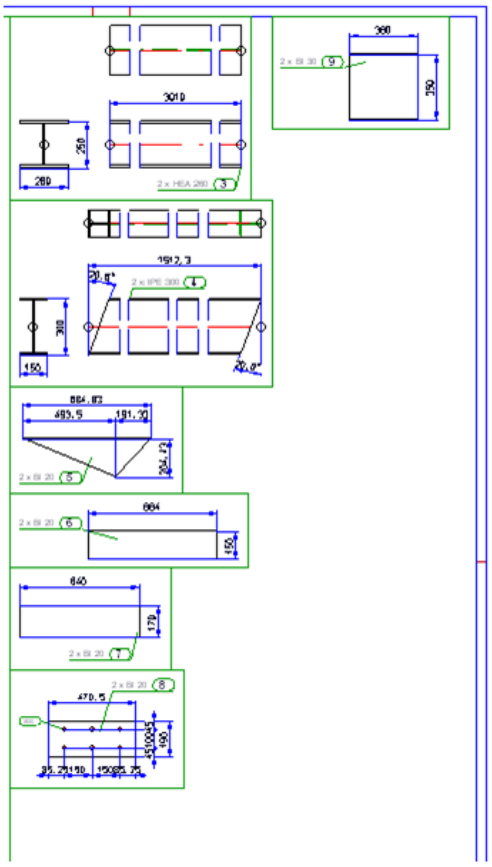
The “Assembly Main Part” determines the orientation on the drawing and how the assemblies are placed on it. All dimensions are measured with the “Assembly Main Part” as reference. Be sure to mark a profile as an “Assembly Main Part”.

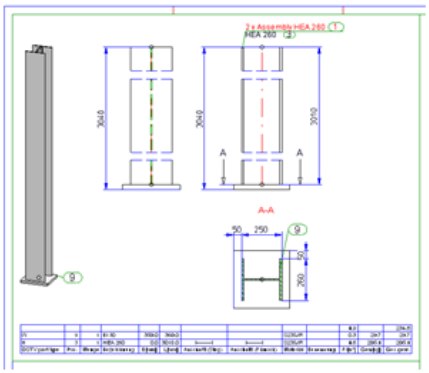


The components must be itemised (parts without numbers or marked parts will be skipped).

Via automatic drawing derivation, we will now detail the drawing, but this time with Drawing parameters set to "From configuration."







When working with Drawing parameters set to "From configuration," you are working from the configuration database, as shown below.

Customizing according to customer requirements can be done based on consultancy by an ISD consultant.

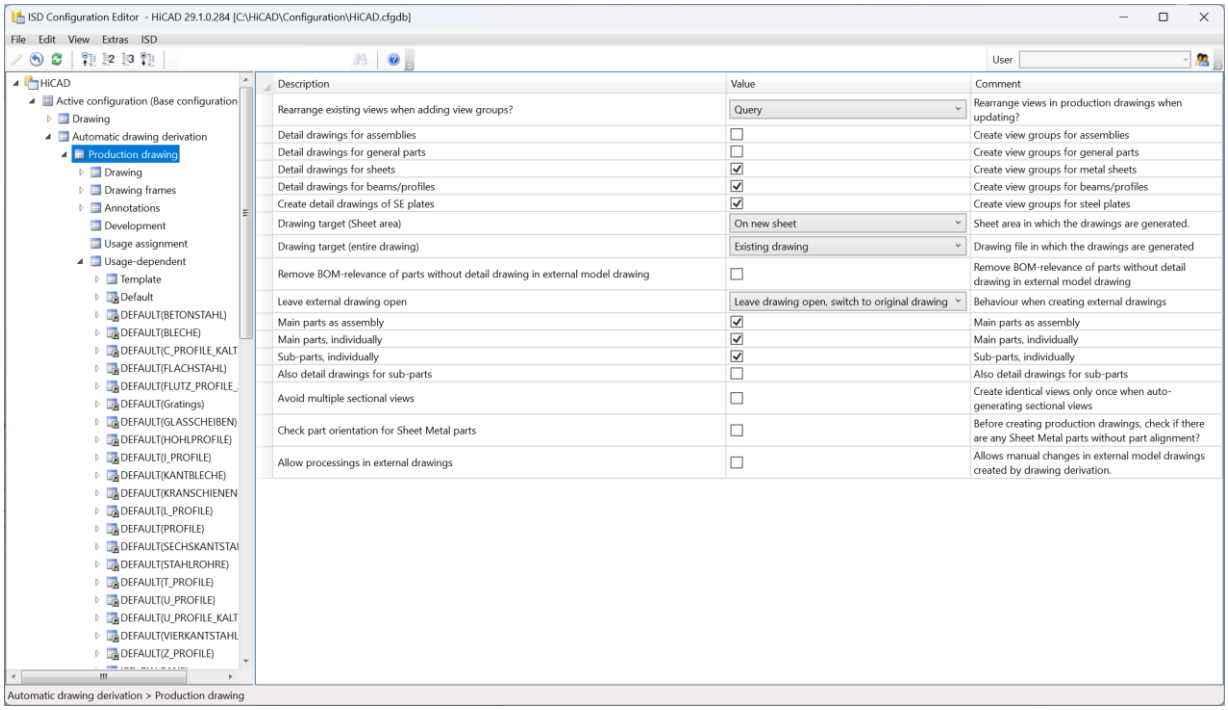


Figure 295 Automatic drawing derivation settings in Configuration database

15.9 Assembly main Part versus Active view as top / front view

15.9.1 Standard situation: Part as main part

In this situatiion you are working with a beam that's is the main part. Most of the time, the beam will be the main part of the assemblie not a plate or sheet. The advantage of working with main part indentifiers, are the possibilies to get dimensions with the drawing derivation and the orientation of the views. The internal coordinate system of the main part is being used for the orientation of the views

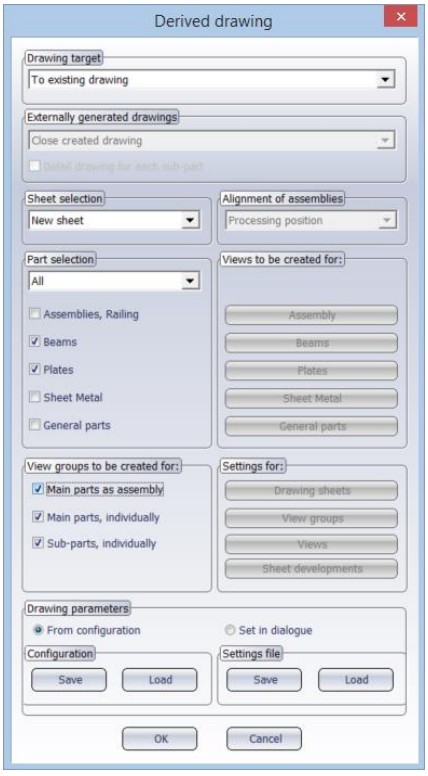
Settings in drawing derivation menu:

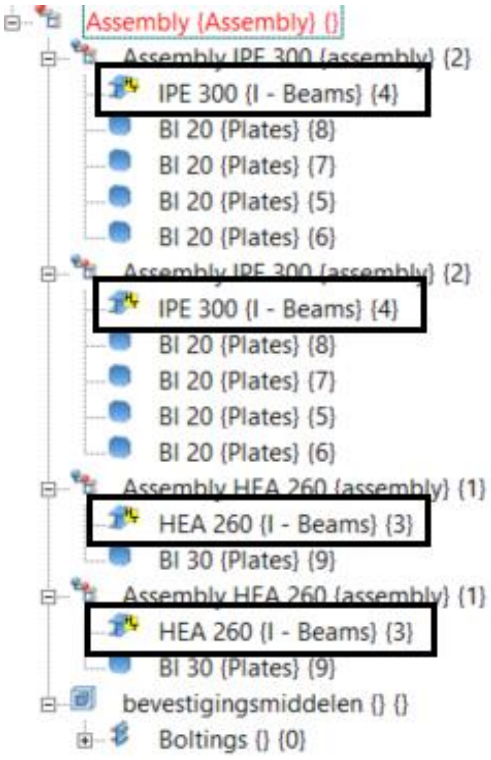
- Drawing Parameters: From Configuration
- Part selection: The part type of the main part must be checked (Beam in this case)
- View groups to be created for: Main parts as assembly, So hicad knows which dimensions go use and how to place the views

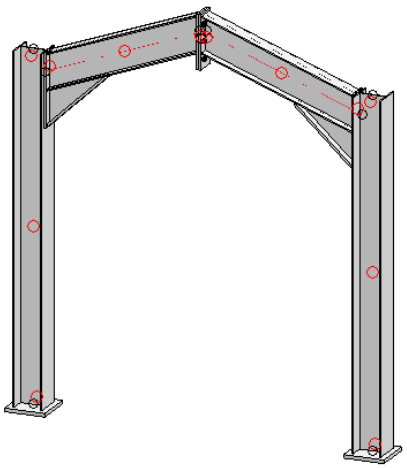
  There is no need to define the front views for drawing derivation, because the main part takes care of that. (Which also means, that the Main part overrules the setting for "Front view for derived drawings")

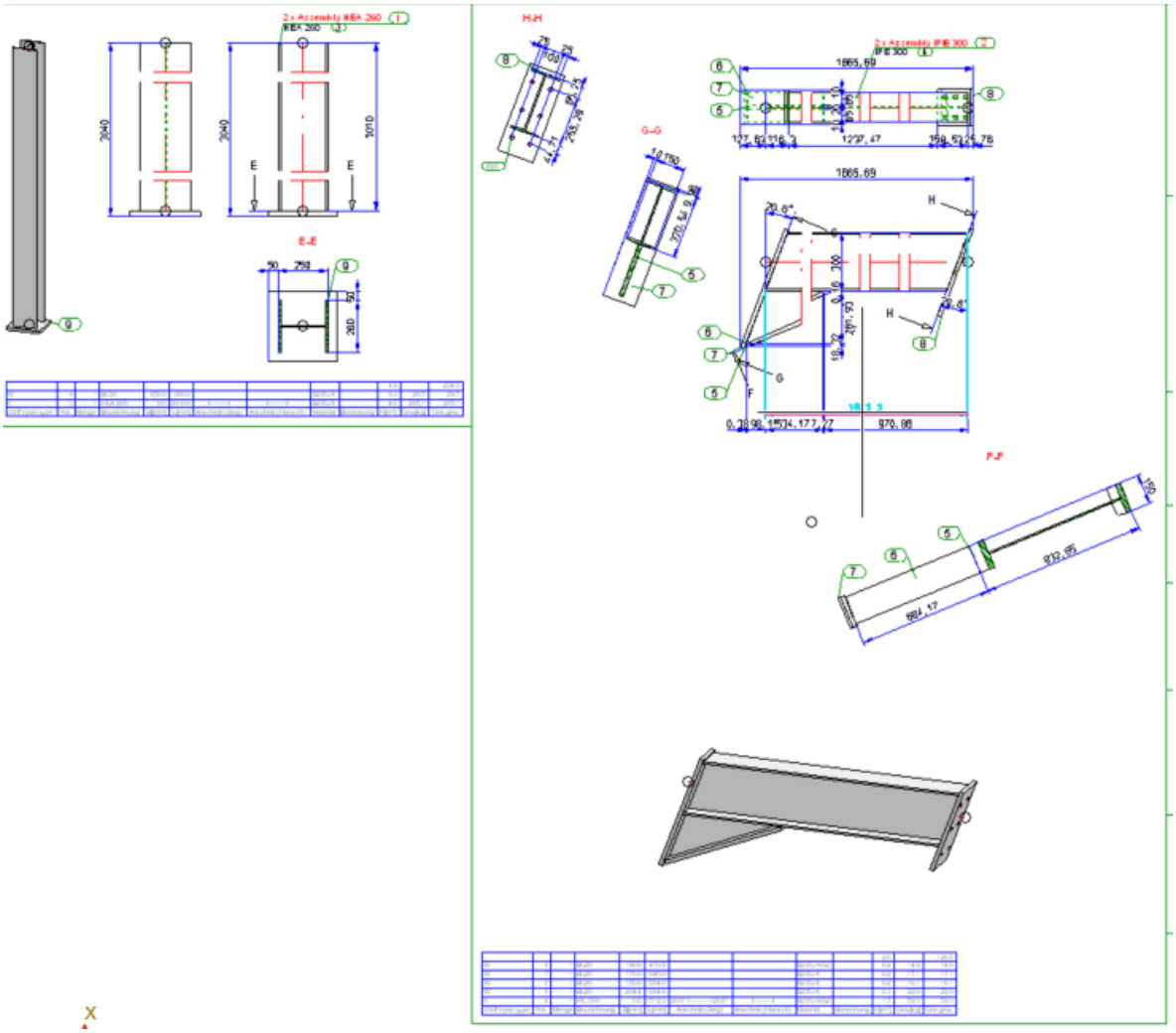
Tip:

- Make a beam the main part.









15.9.2 Exempt situations: No assemblie main part

What to do when there is no good main part, or the drawing derivation views are not good enough

In that case we define the “Active view as front view” or “Active view as top view”.

Tip:

- This is also for parts available.

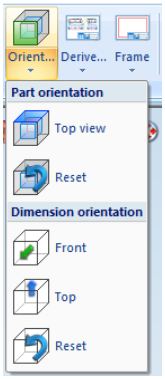
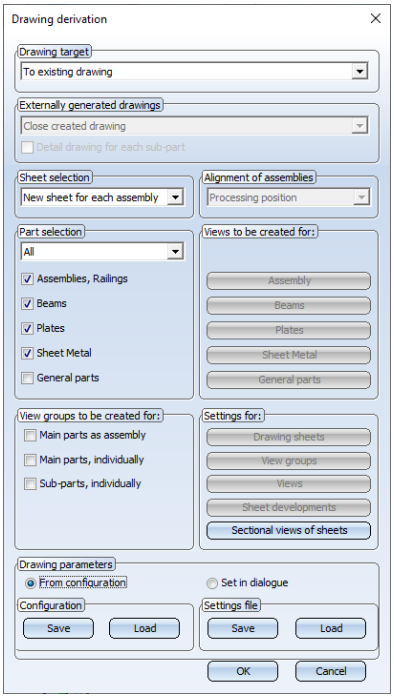
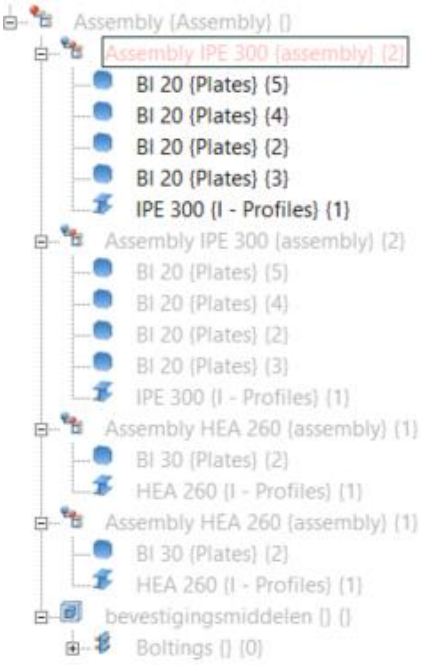


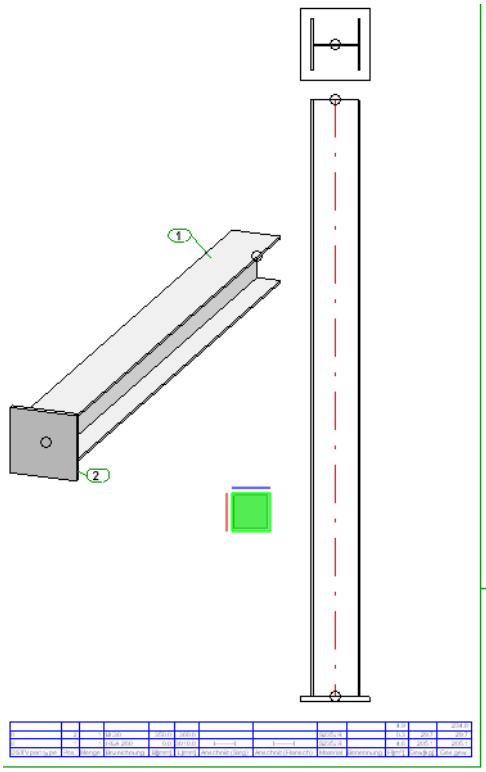
Figure 296 Define orientation for derived drawings

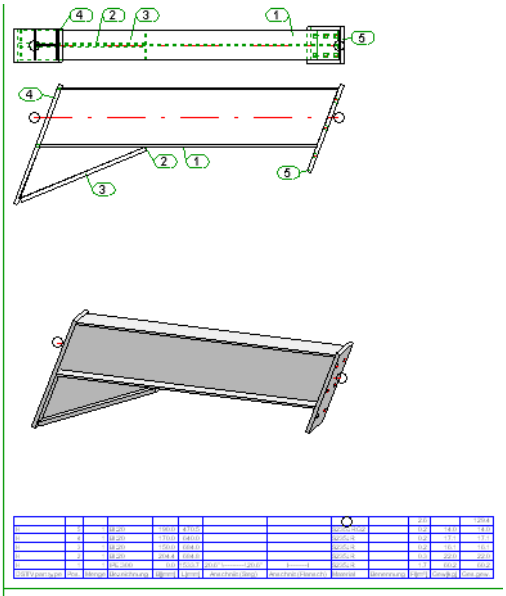
Settings in drawing derrivation menu:

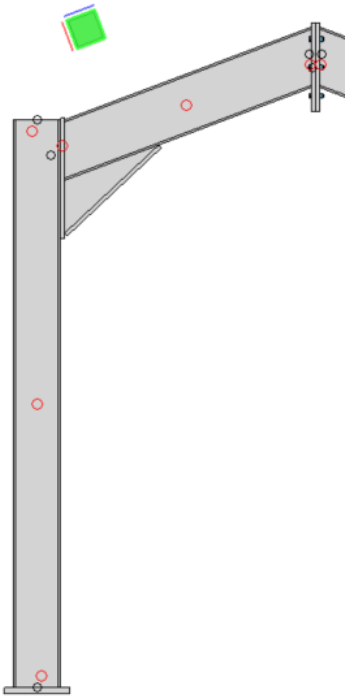
- Drawing Parameters: From Configuration
- Part selection: The assemblies must be checked
- View groups to be created for: No checks

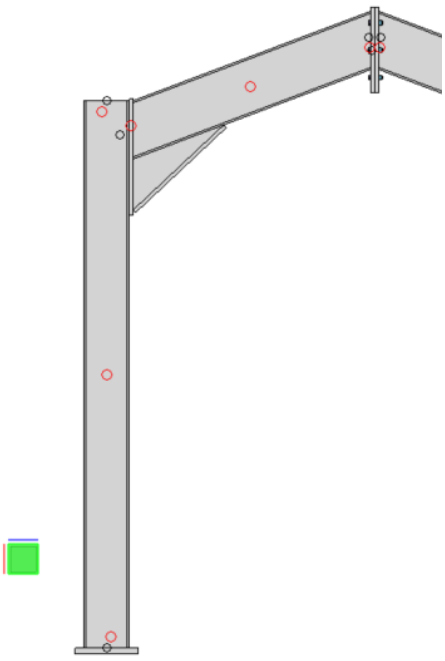












15.10 Automatic drawing derivation – Detail drawings

With this function Steel constructions and other assemblies can be processed till production drawings.

Conditions:

- 3D-Part structure is correct (With or without main part)
- Part have an itemnumber
- The following model will be derived

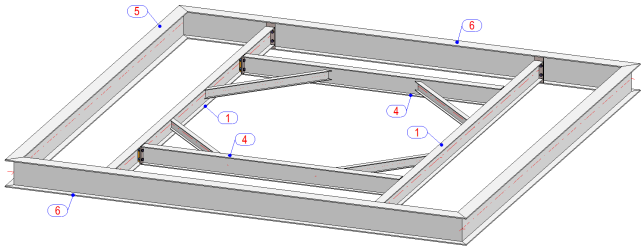


Figure 297 Steel structure

Choose the drawing derivation button, in the drawing ribbon:

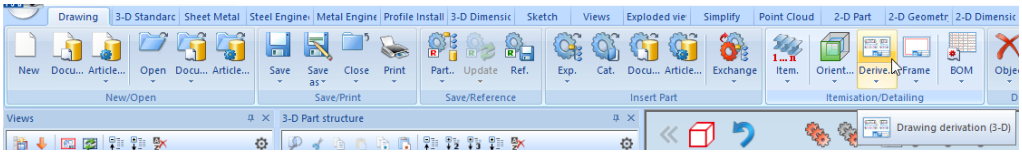


Figure 298 Drawing ribbon – Automatic drawing derivation button

The following settings are set to create one page that contains a Beams, plates and sheet metal parts of the drawing:

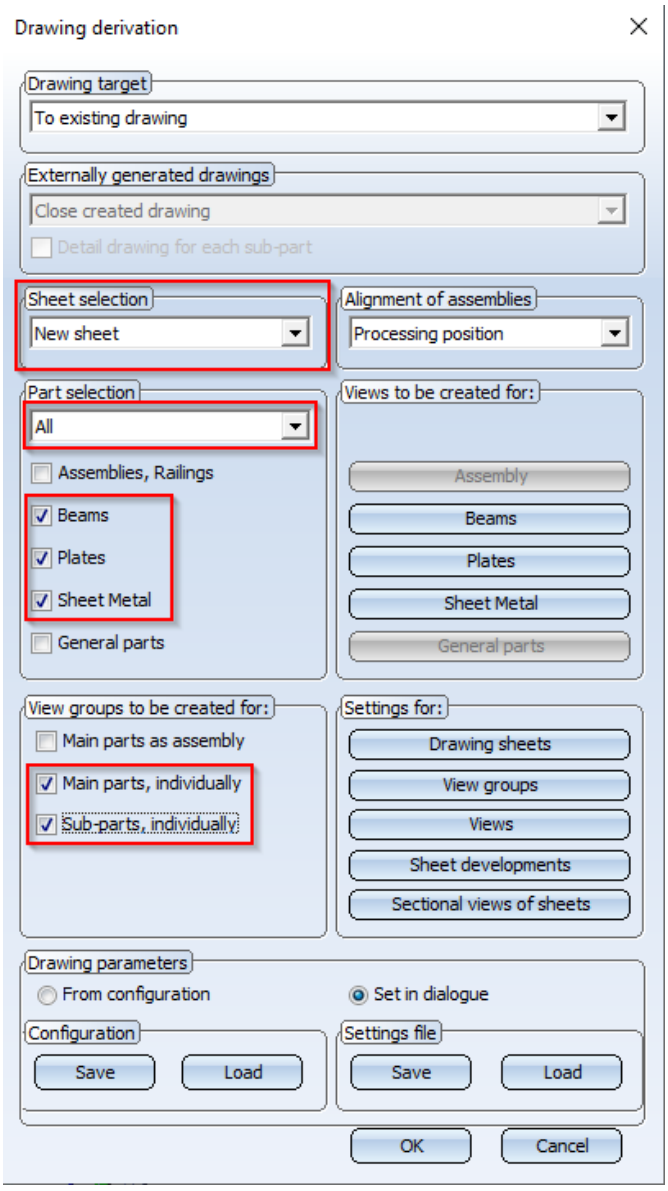


Figure 299 Derive drawings dialogue – settings for detail drawings

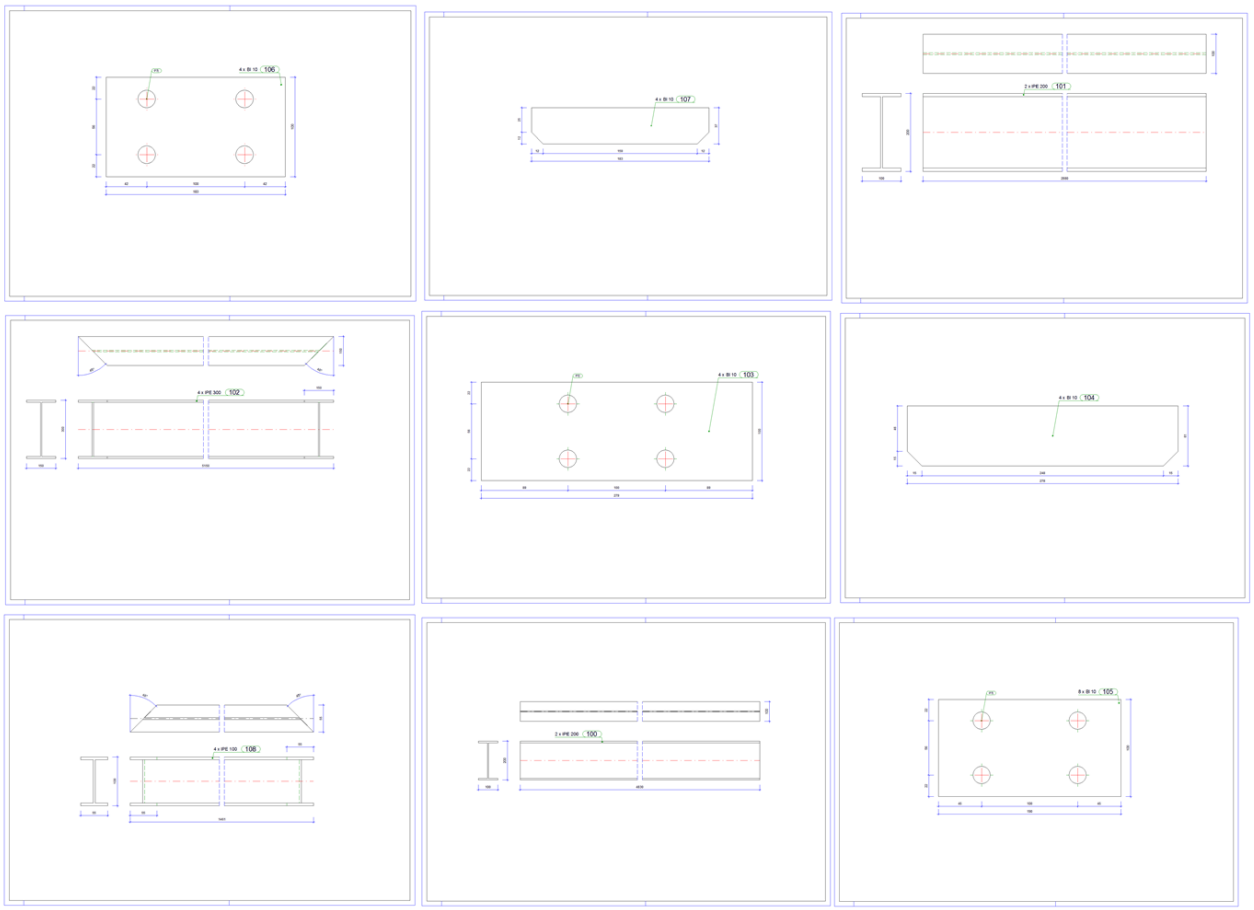


Figure 300 Resulting detail drawings

15.11 Exercise 15

- Use the model of exercise Exercise 13 B
- Add the Plates and Bolted connection
- Make on sheet 1 an overview drawing
- Add a Bill of Materials list
- Use Drawing derivation to make the assembly and production drawings

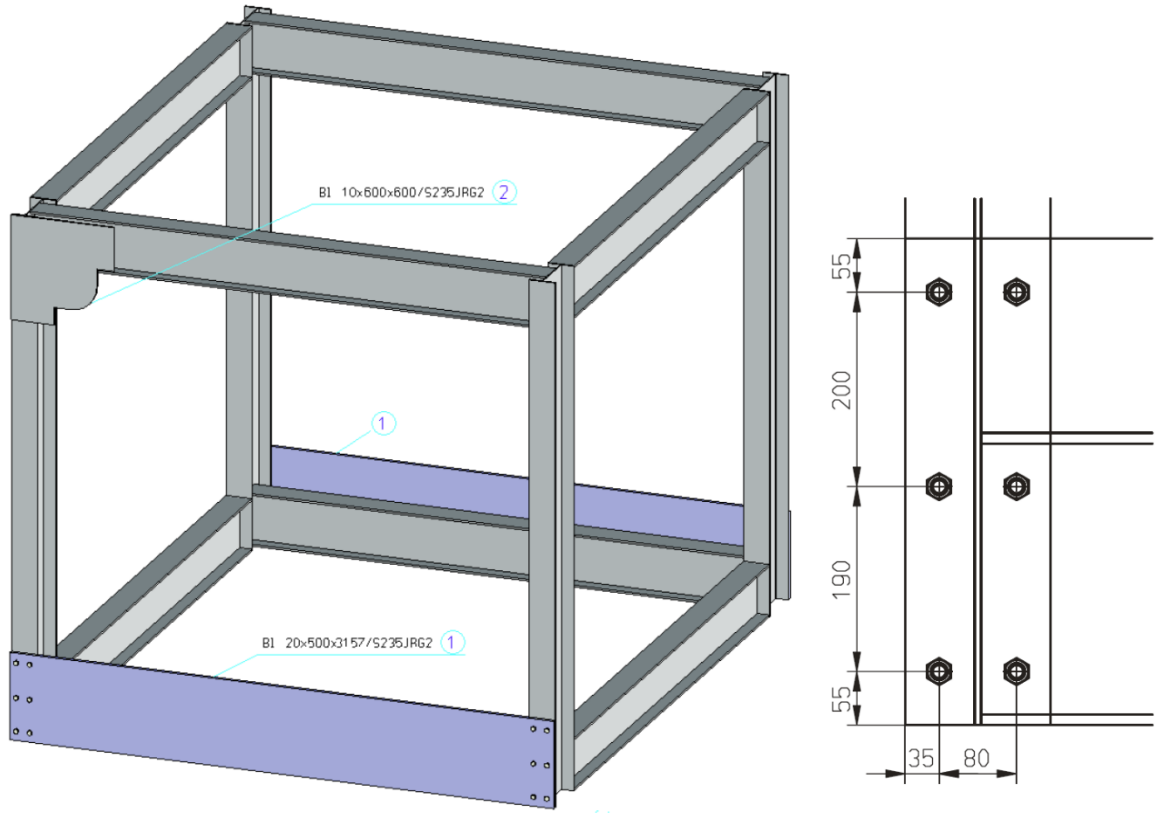


Figure 301 Final result of exercise 15 with detail of bolting

Tip:

- There are multiple ways to create the plate
- Plate from solid
- Plate from sketch
- Rectangular plate via 2 points
- Beam function and select plate or flat steel from catalogue.

To draw Elongate plates use the Beam function and search for “flat steel” or “plate”.

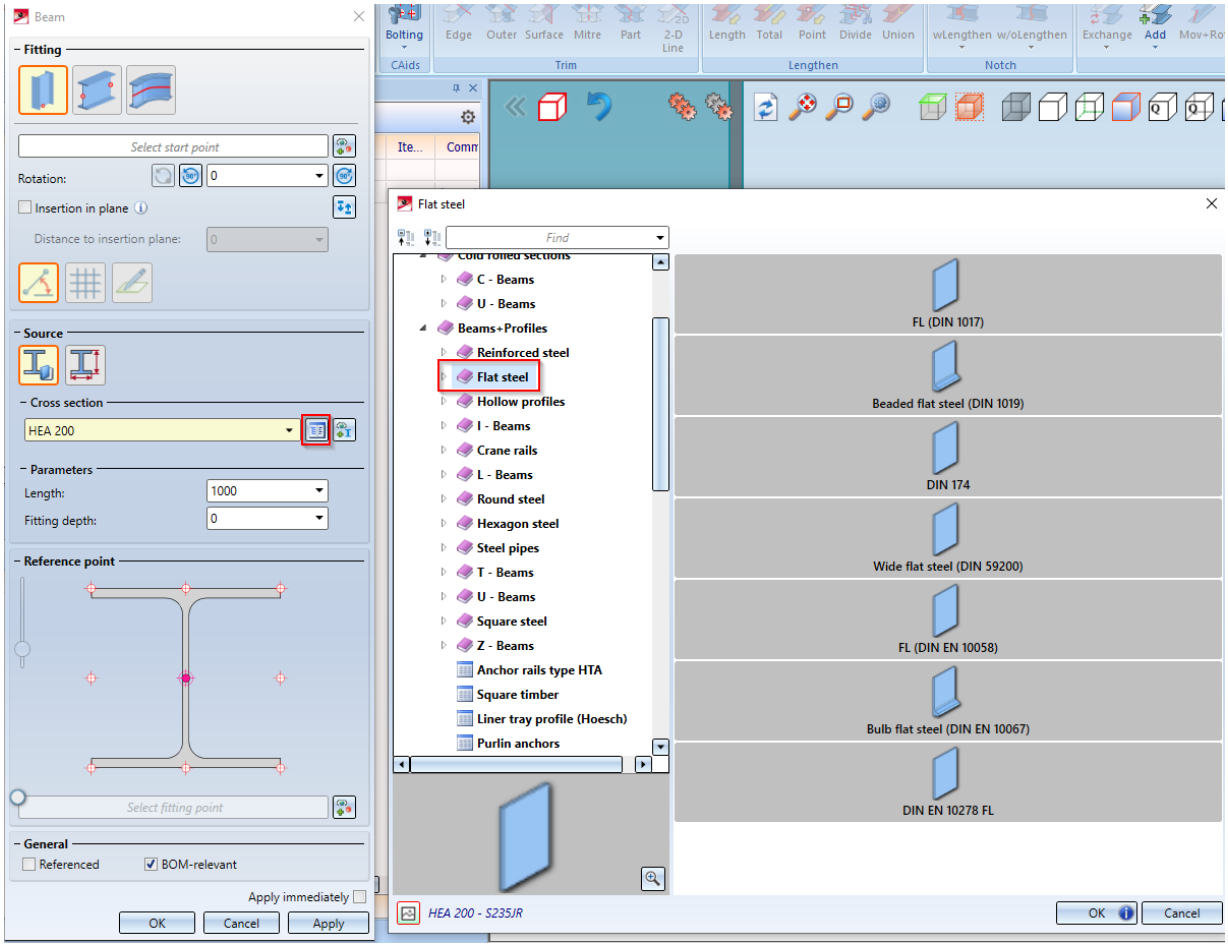


Figure 302 Insertion of elongated plates

Tip:

- When you copy + rotate bolting, the part assignment can be applied automatically via the following function: **3-D Standaard > Standard Parts > Bolting > New, automatically**

The exercise is finished

15.12 Exercise 16

- Make a 3D sketch
- Draw the lines with polyline
- Add the IPE 300 beams over the sketch
- Make the necessary trims and mitre's
- When time is no issue, let's try and make a bridge
- Make on sheet 1 an **overview** drawing
- Add a Bill of Materials list
- Use **Drawing derivation** to make the assembly and production drawings

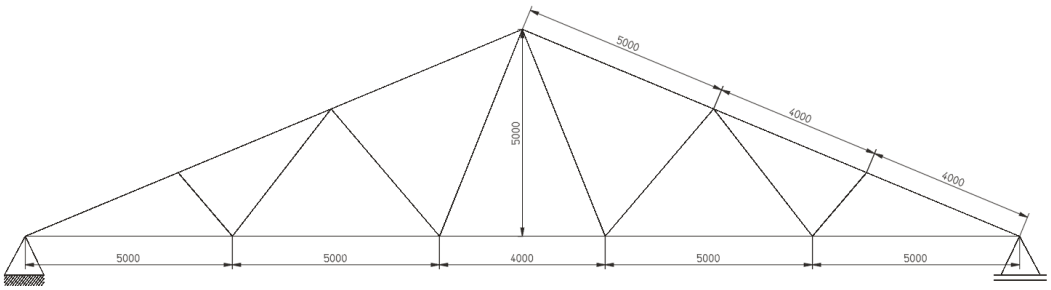


Figure 303 Schematic representation of steel construction

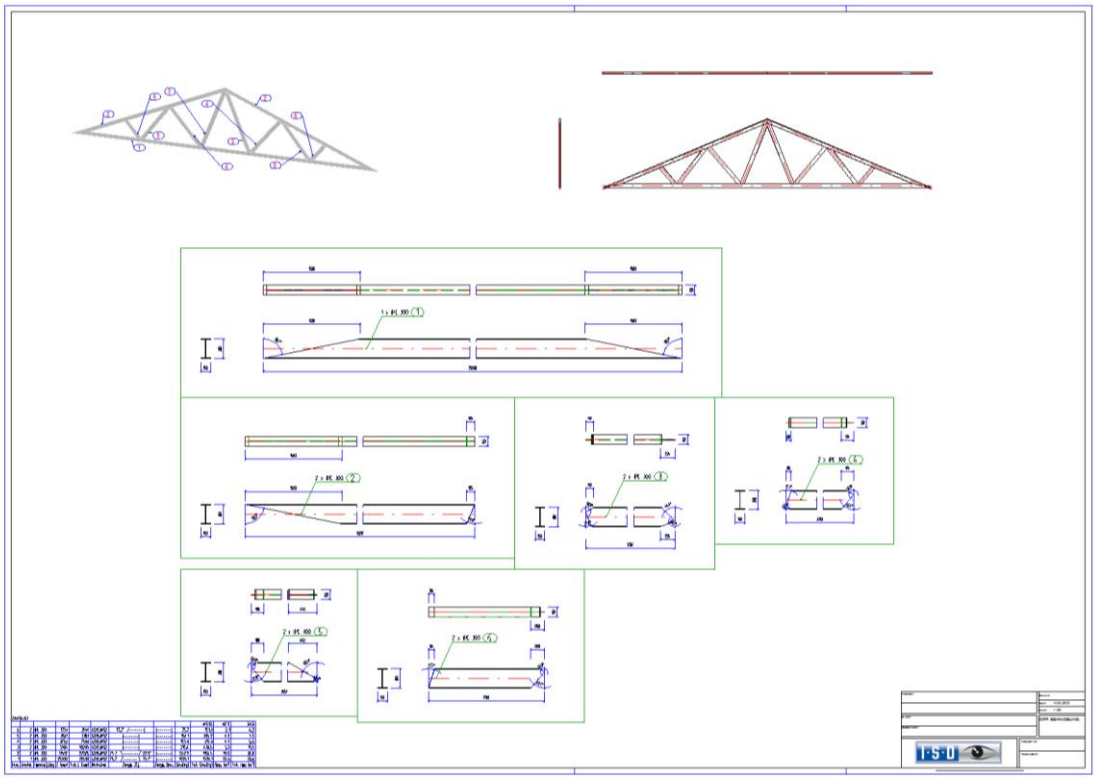
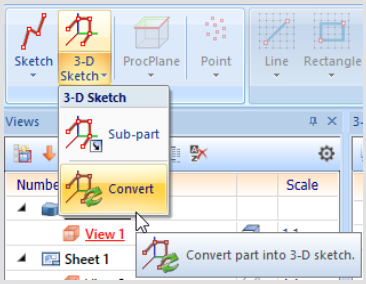


Figure 304 Resulting HiCAD drawing

Tip:

- You could open a dwg of the sketch lines via **Drawing > New/Open > Open > 2-D Import** or im-port it to your existing drawing via **Drawing > Insert Part > Exp. > 2-D Import.**
- You could convert this to sketch



The exercise is finished

15.13 Exercise 17

Create the following beam in your own way.

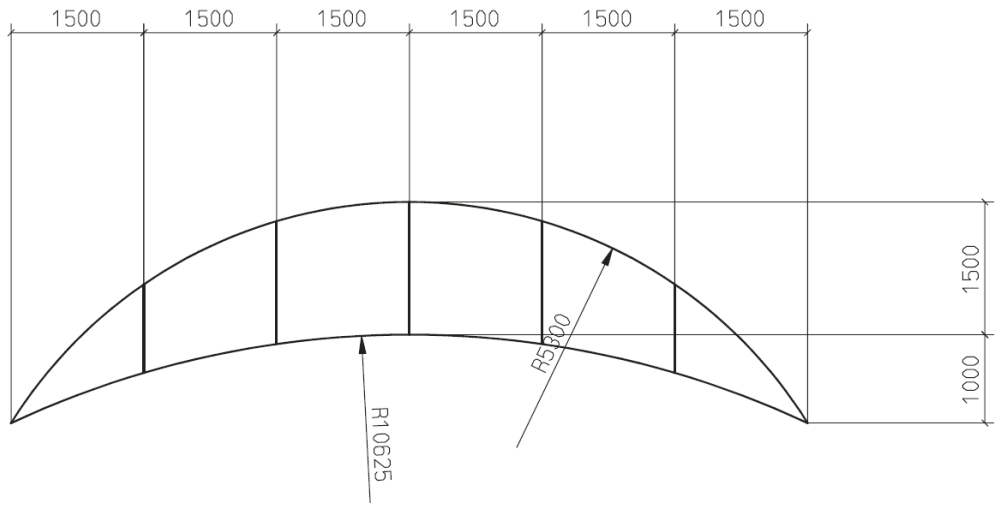


Figure 305 Schematic representation of steel construction

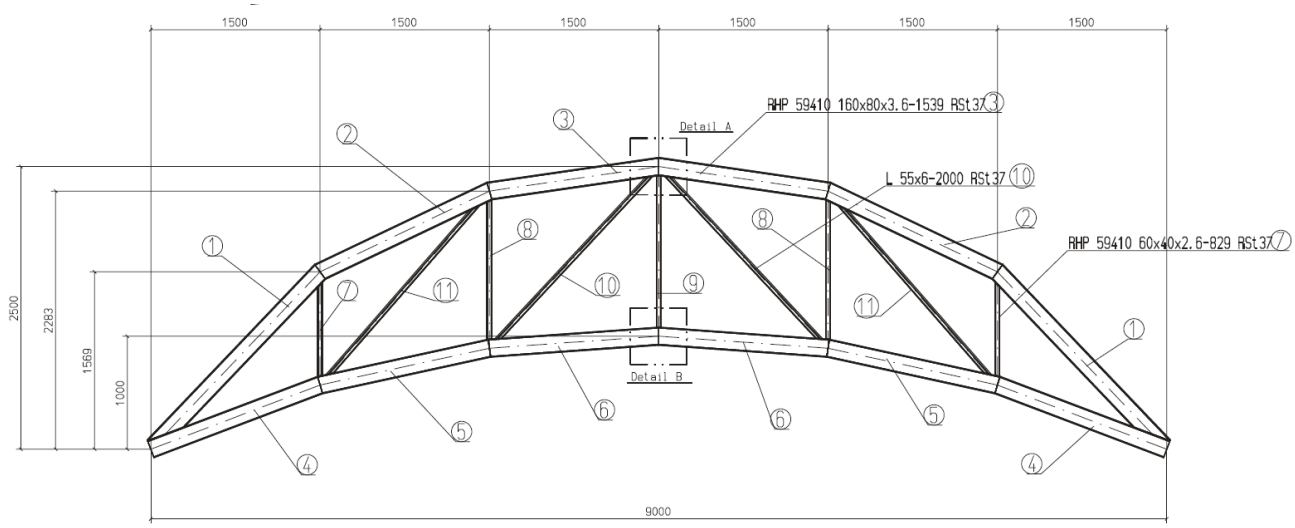


Figure 306 Resulting steel construction in HiCAD

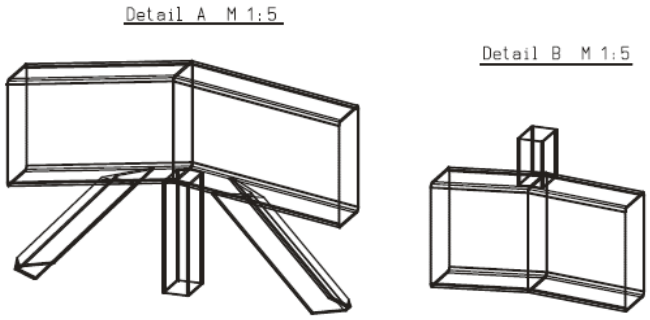
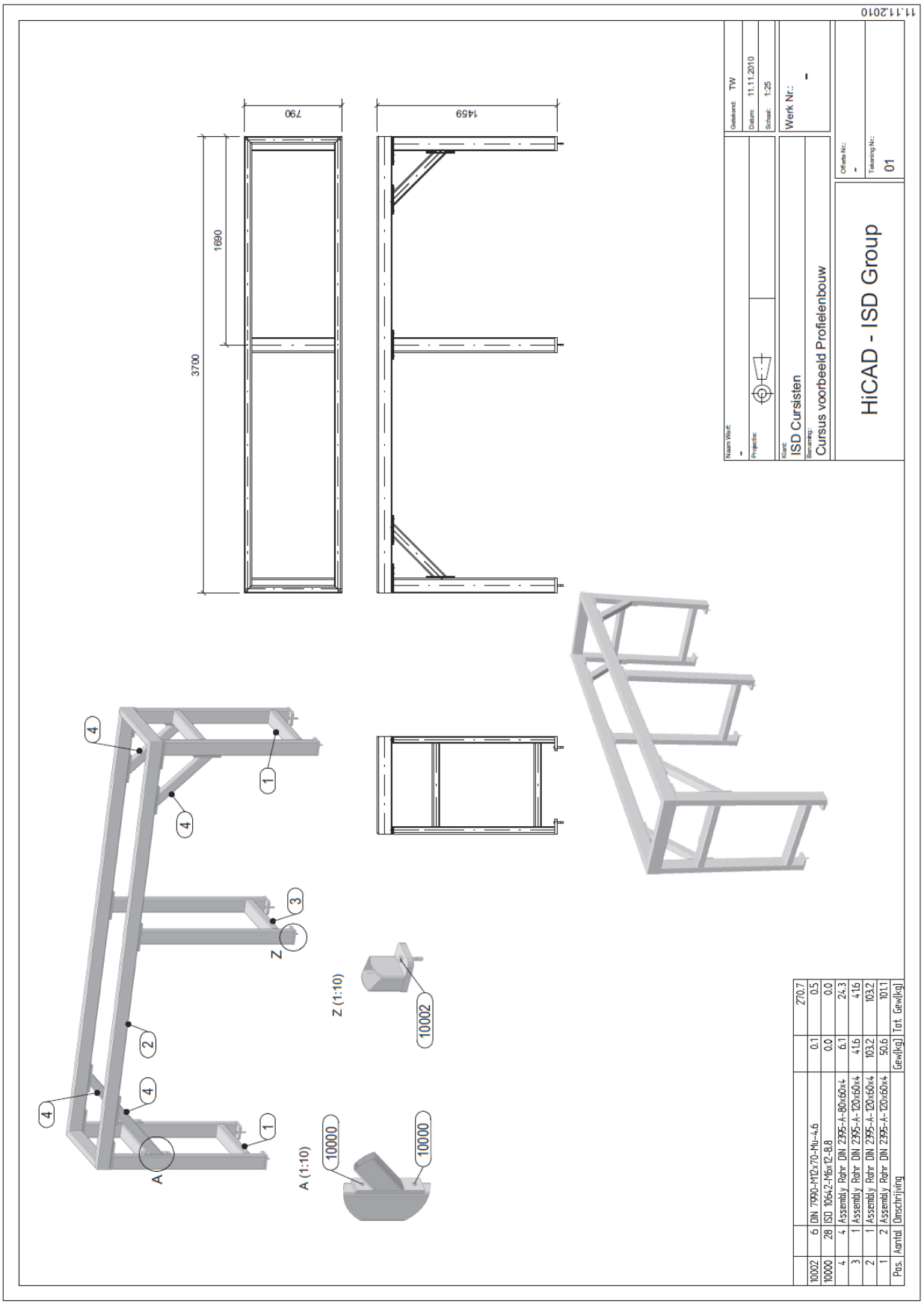
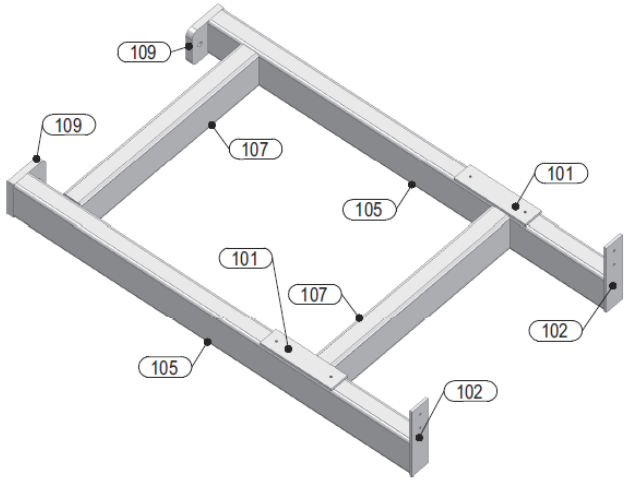
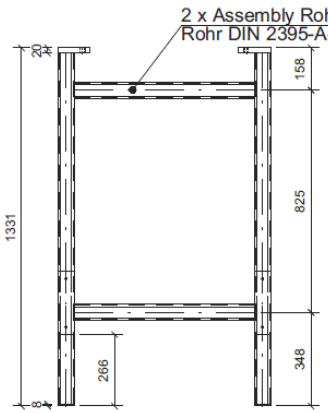


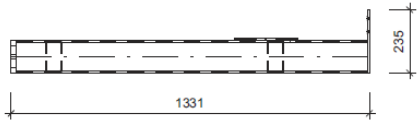
Figure 307 Details of connections

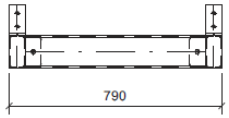
15.14 Exercise 18











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110	2	BL 20	120.0	120.0	|--------|	|--------|	S235JRG2		0.1	2.2	4.4
108	2	Rohr DIN 2395-A-120x60x4	0.0	670.0	|--------|	|--------|	S235JRH		0.9	7.2	14.5
106	2	Rohr DIN 2395-A-120x60x4	0.0	1303.0	|--------|	|--------|	S235JRH		1.8	14.1	28.1
102	2	FL 60x8	0.0	235.0	|--------|	|--------|	S235JRG2		0.1	0.9	1.8
101	2	FL 60x8	0.0	235.0	|--------|	|--------|	S235JRG2		0.1	0.9	1.8
Pos.	Aant.	Type	B[mm]	L[mm]	Aanzicht (zij)	Aanzicht (bov.)	Materiaal	Omschrijving	Opp[m²]	Gew[kg]	Tot.gew.	

Naam Werf:
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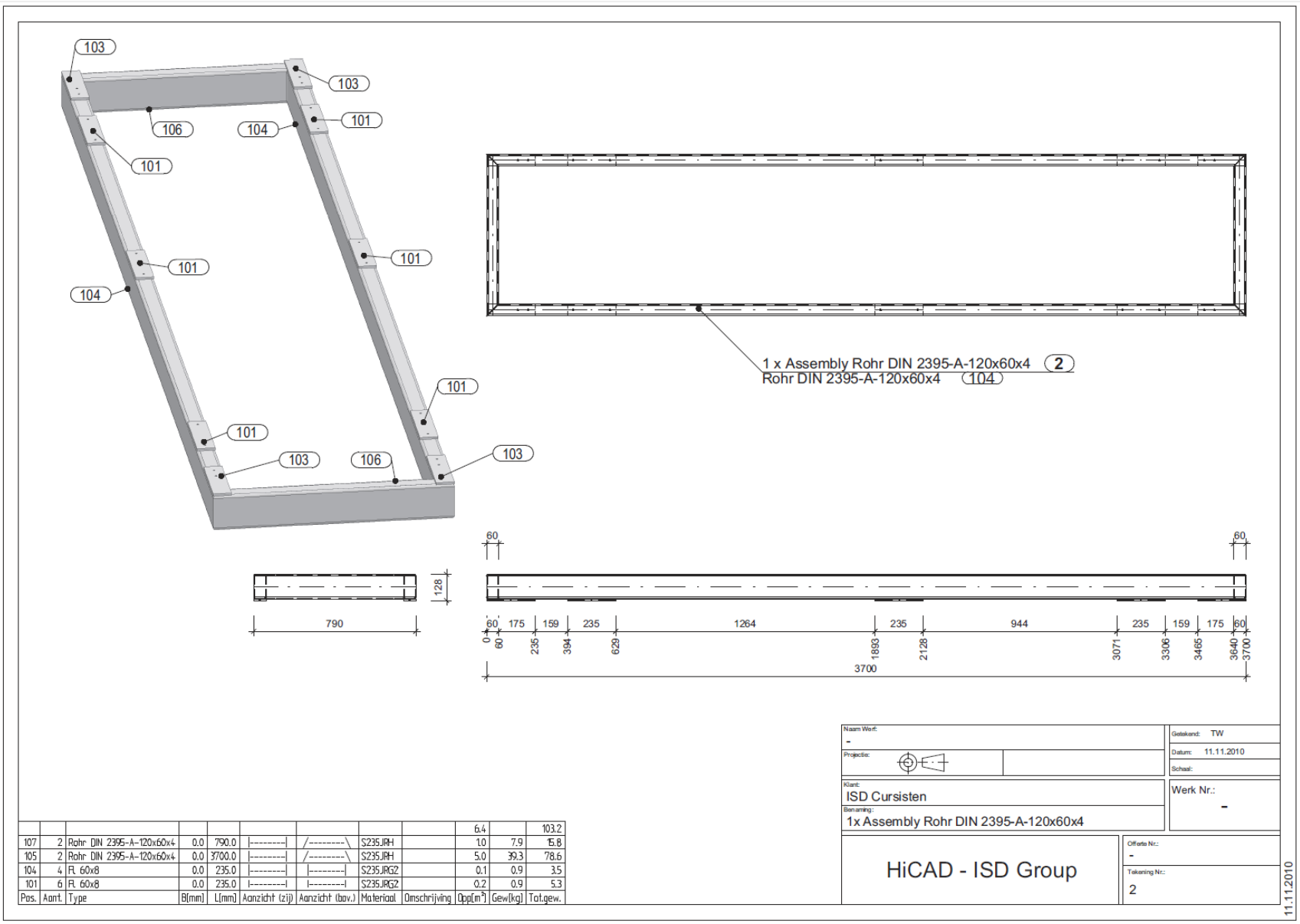
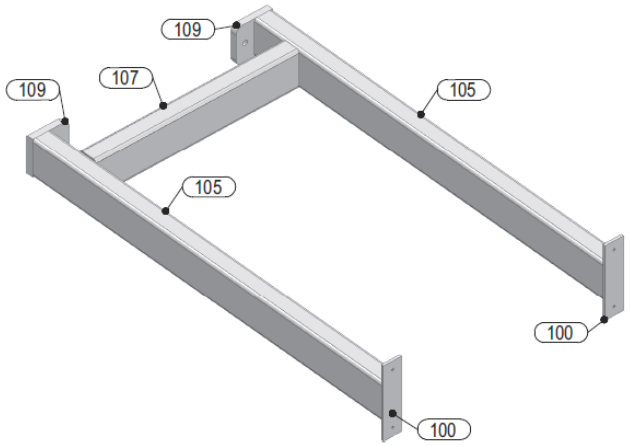
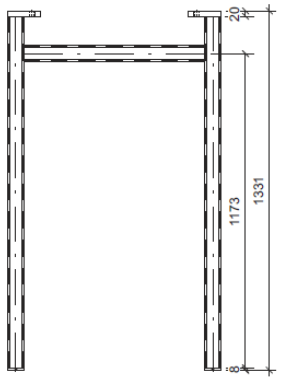
Projectie:
Getekend: TW
Datum: 11.11.2010
Schaal:
Klant:
ISD Cursisten
Benaming:
2x Assembly Rohr DIN 2395-A-120x60x4
Werk Nr.:
-
HiCAD - ISD Group
Offerte Nr.:
-
Tekening Nr.:
1
11.11.2010

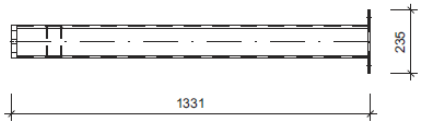


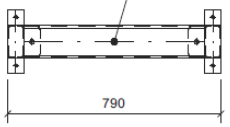
									6.4		103.2
107	2	Rohr DIN 2395-A-120x60x4	0.0	790.0	|--------|	/--------\	S235JRH		1.0	7.9	15.8
105	2	Rohr DIN 2395-A-120x60x4	0.0	3700.0	|--------|	/--------\	S235JRH		5.0	39.3	78.6
104	4	FL 60x8	0.0	235.0	|--------|	|--------|	S235JRG2		0.1	0.9	3.5
101	6	FL 60x8	0.0	235.0	|--------|	|--------|	S235JRG2		0.2	0.9	5.3
Pos.	Aant.	Type	B[mm]	L[mm]	Aanzicht (zij)	Aanzicht (bov.)	Materiaal	Omschrijving	Opp[m²]	Gew[kg]	Tot.gew.

Naam Werf: -
Projectie:
Getekend: TW
Datum: 11.11.2010
Schaal:
Klant: ISD Cursisten
Benaming: 1x Assembly Rohr DIN 2395-A-120x60x4
Werk Nr.: -
HiCAD - ISD Group
Offerte Nr.: -
Tekening Nr.: 2
11.11.2010









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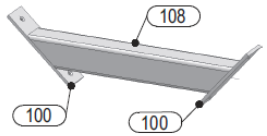
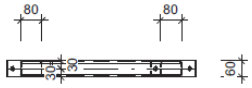
Rohr DIN 2395-A-120x60x4 (107)

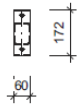
									2.4		41.6
110	2	BL 20	120.0	120.0			S235JRG2		0.1	2.2	4.4
108	1	Rohr DIN 2395-A-120x60x4	0.0	670.0	|--------|	|--------|	S235JRH		0.5	7.2	7.2
106	2	Rohr DIN 2395-A-120x60x4	0.0	1303.0	|--------|	|--------|	S235JRH		1.8	14.1	28.1
100	2	FL 60x8	0.0	235.0	|--------|	|--------|	S235JRG2		0.1	0.9	1.8
Pos.	Aant.	Type	B[mm]	L[mm]	Aanzicht (zij)	Aanzicht (bov.)	Materiaal	Omschrijving	Opp[m²]	Gew[kg]	Tot.gew.

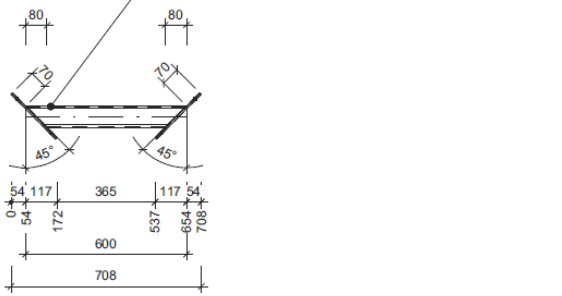
Naam Werf: -
Projectie:
Getekend: TW
Datum: 11.11.2010
Schaal:
Klant: ISD Cursisten
Benaming: 1x Assembly Rohr DIN 2395-A-120x60x4
Werk Nr.: -
HiCAD - ISD Group
Offerte Nr.: -
Tekening Nr.: 3
11.11.2010





4 x Assembly Rohr DIN 2395-A-80x60x4 (4)
Rohr DIN 2395-A-80x60x4 (108)





									0.3		6.1
109	1	Rohr DIN 2395-A-80x60x4	0.0	599.6	\--------/	|--------|	S235JRH		0.3	4.3	4.3
100	2	FL 60x8	0.0	235.0	|--------|	|--------|	S235JRG2		0.1	0.9	1.8
Pos.	Aant.	Type	B[mm]	L[mm]	Aanzicht (zij)	Aanzicht (bov.)	Materiaal	Omschrijving	Opp[m²]	Gew[kg]	Tot.gew.

Naam Werf:
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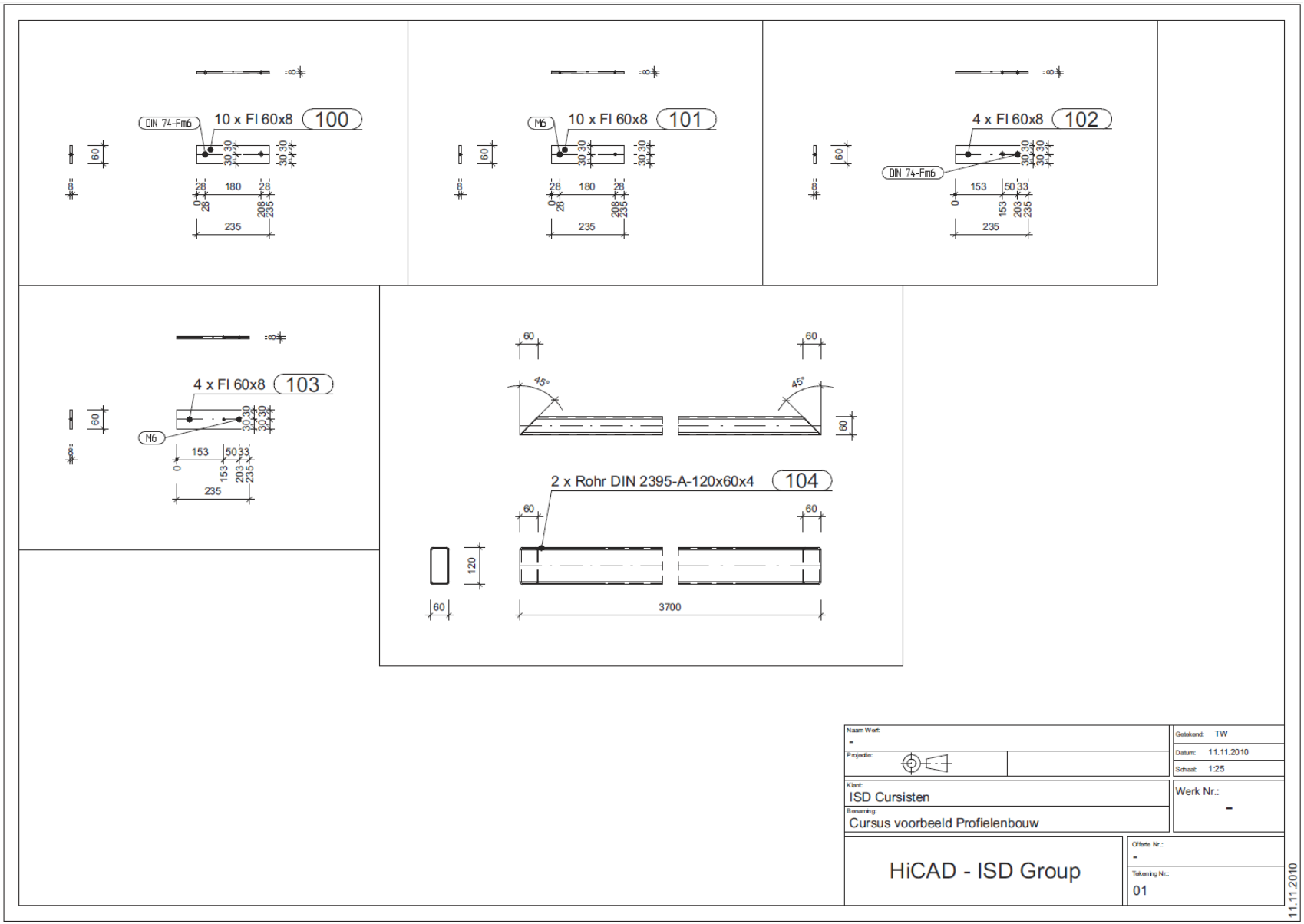
Projectie:
Getekend: TW
Datum: 11.11.2010
Schaal:
Klant:
ISD Cursisten
Benaming:
4x Assembly Rohr DIN 2395-A-80x60x4
Werk Nr.:
-
HiCAD - ISD Group
Offerte Nr.:
-
Tekening Nr.:
4

11.11.2010


DIN 74-Fm6
10 x Fl 60x8
100
M6
10 x Fl 60x8
101
4 x Fl 60x8
102
DIN 74-Fm6
4 x Fl 60x8
103
M6
45°
45°
2 x Rohr DIN 2395-A-120x60x4
104
3700
Naam Werf:
-
Projectlei:
Klant:
ISD Cursisten
Benaming:
Cursus voorbeeld Profielenbouw
Getekend: TW
Datum: 11.11.2010
Schaal: 1:25
Werk Nr.:
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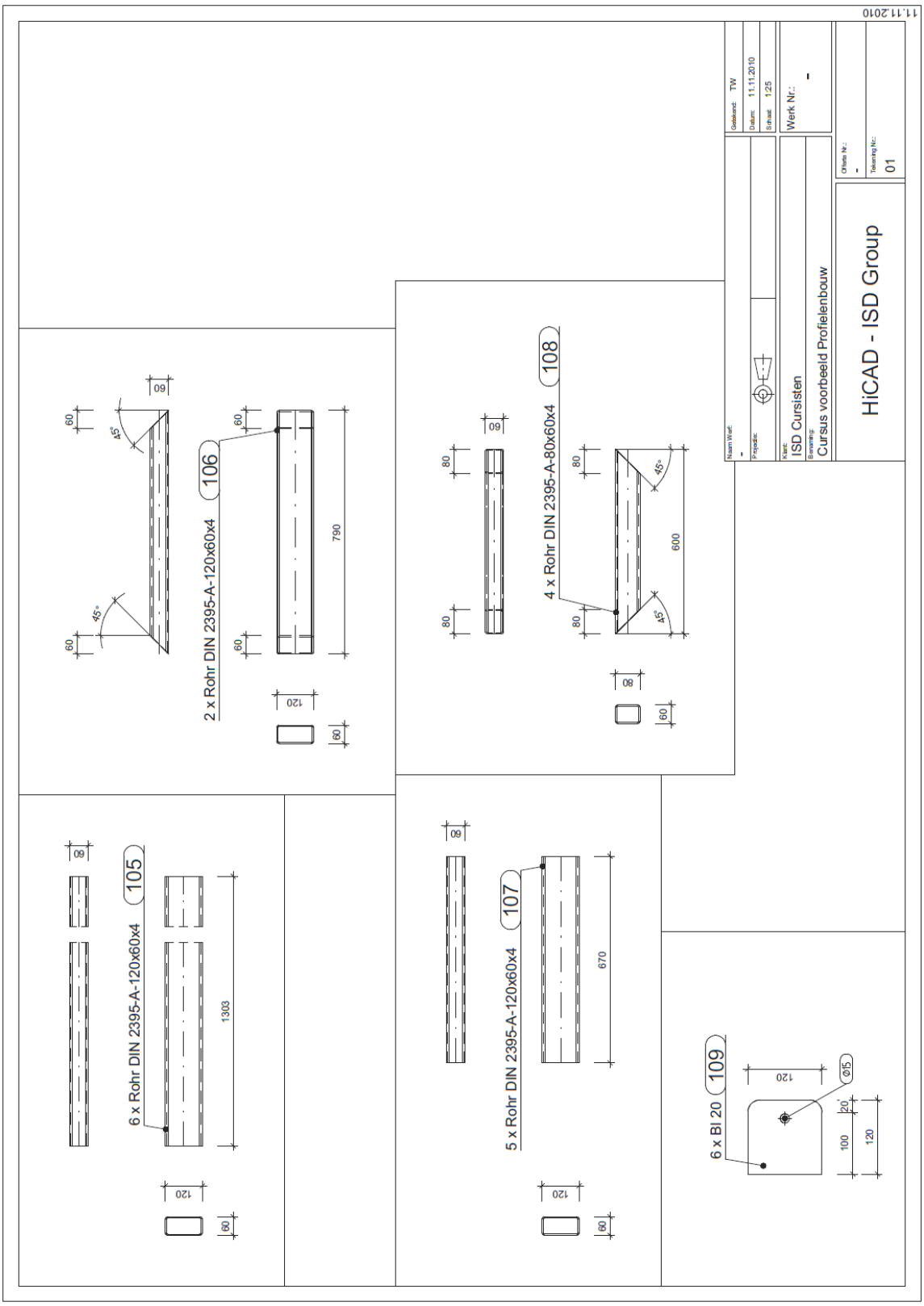
HiCAD - ISD Group
Offerte Nr.:
-
Tekening Nr.:
01
11.11.2010



The exercise is finished

15.15 Generating options for Hicad Steel engineering

To help the engineer, HiCAD contains several automated connections and drawing options

Like Staircases and Railings. These functions, which are in the “Civil engineering Functions”, contain a lot of options. But ofcourse not all the options your customers wants. Most of the time you have to finish the design yourself. And for the railing you can add your own design.

15.15.1 Stairs and Railings

Underneath some examples of the possibilities:

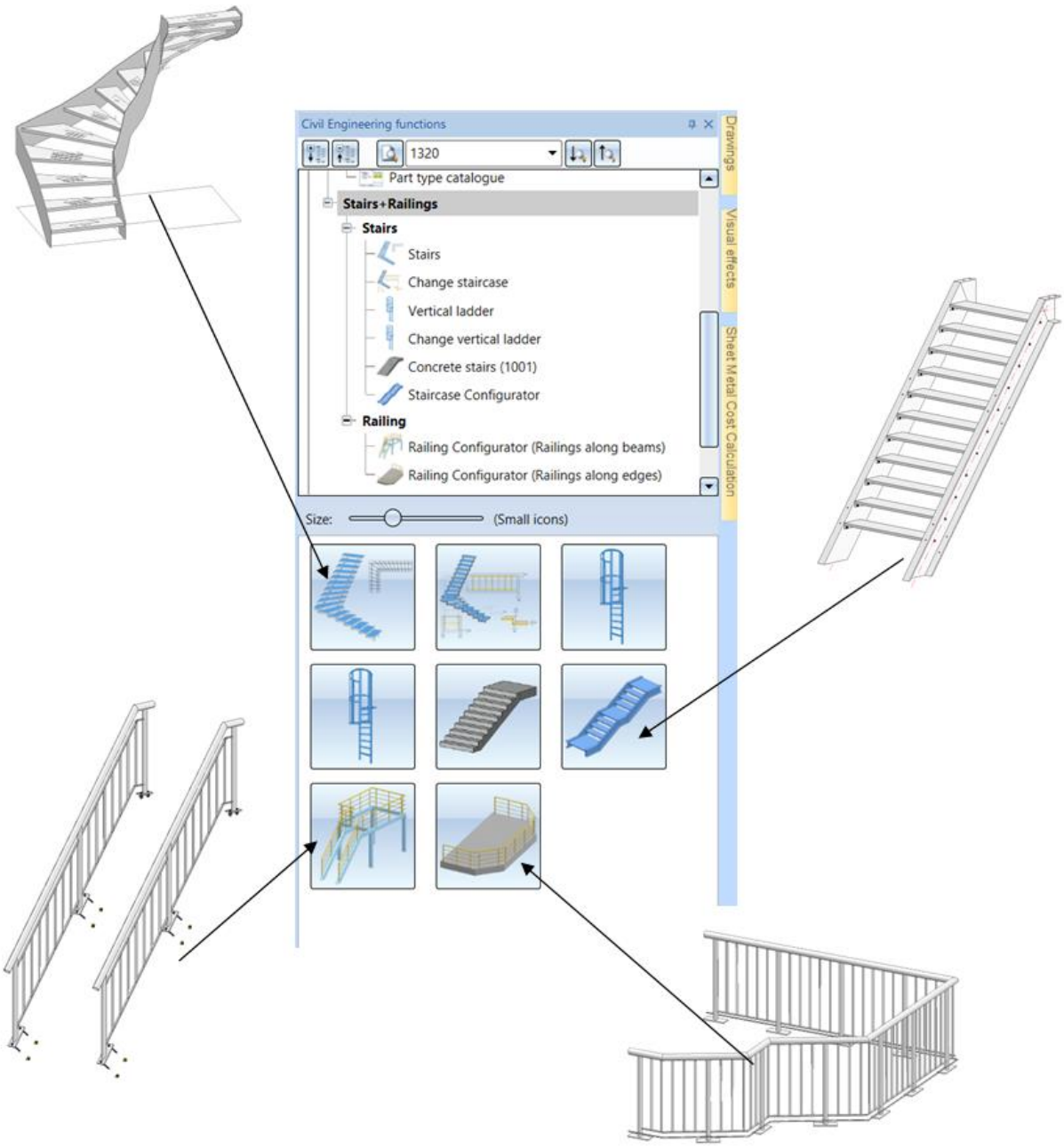


Figure 308 Stair and railing examples

15.15.2 Automatical connections

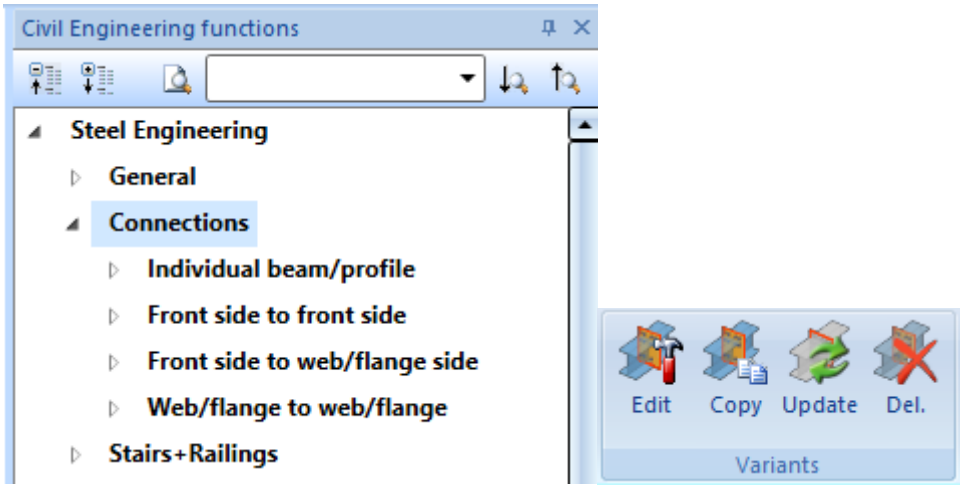


Figure 309 Civil engineering docking window and design variant functions

With the following options, the following examples can be created:

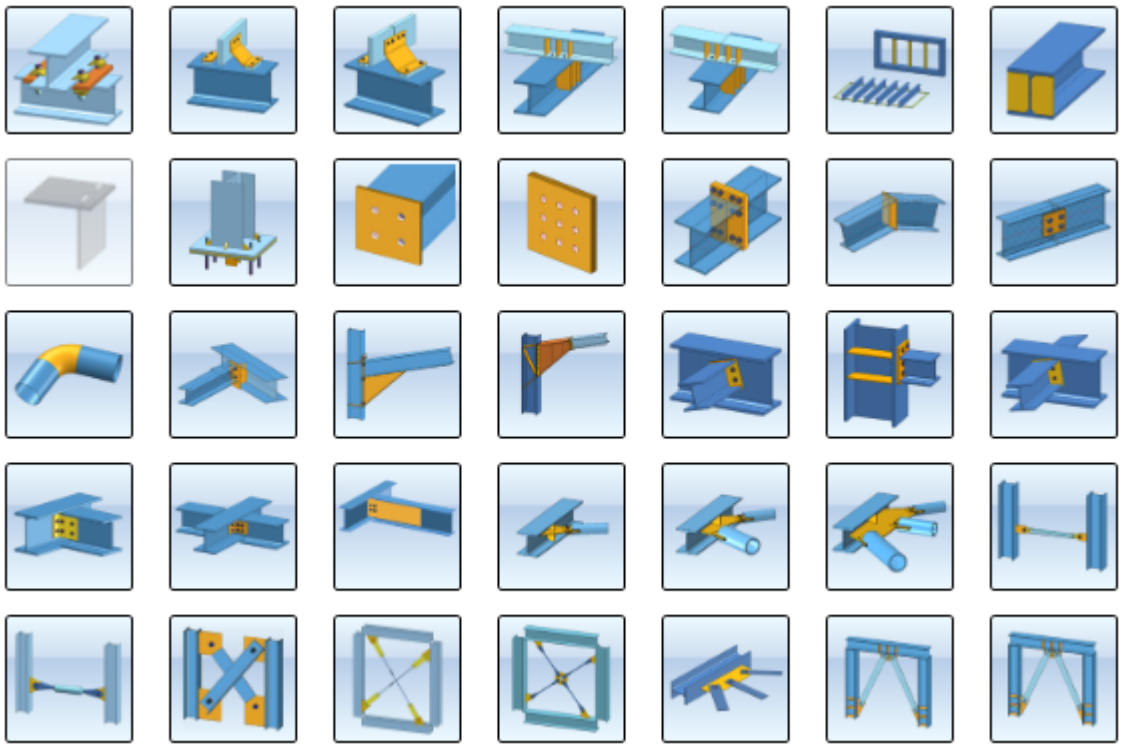
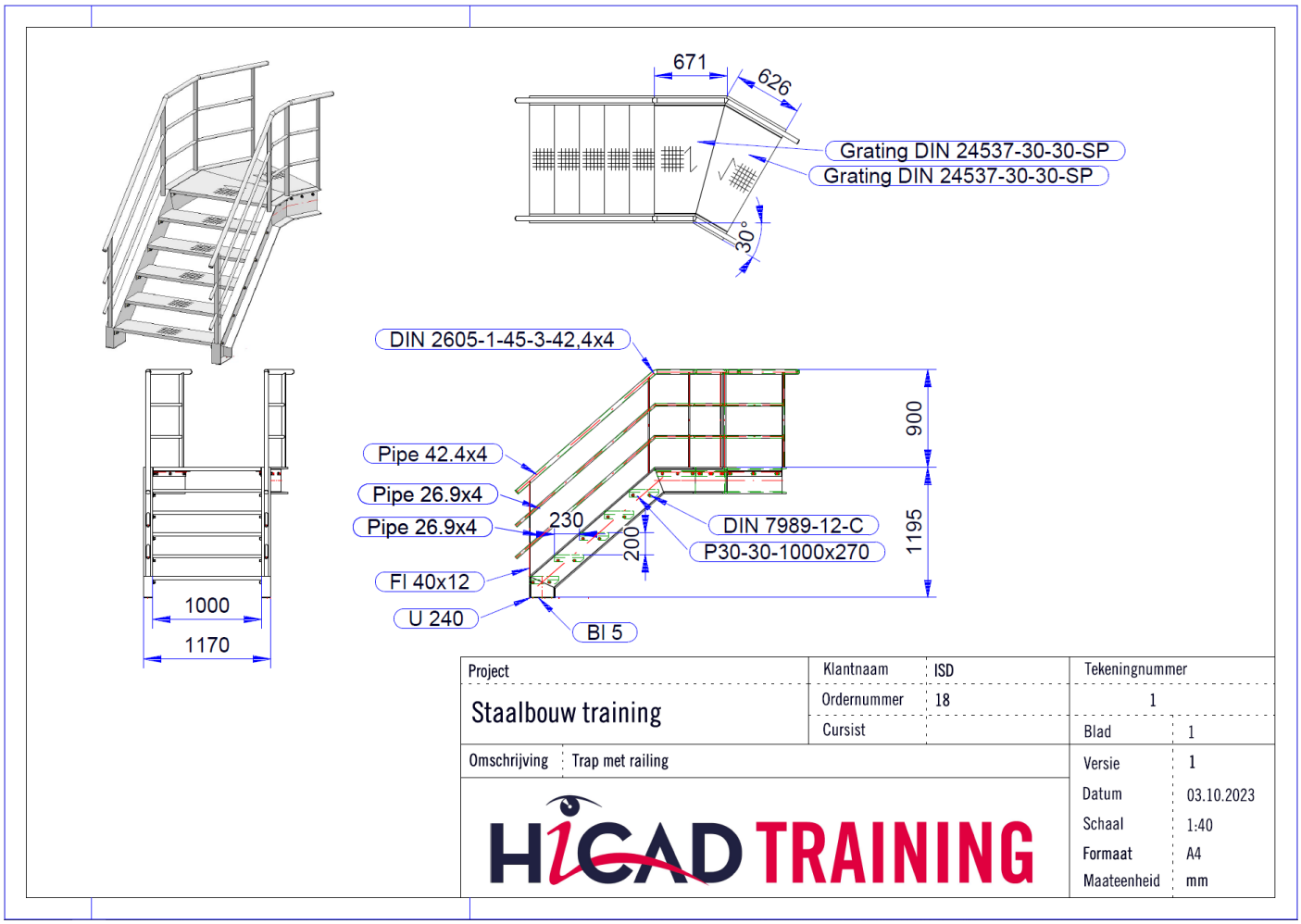


Figure 310 Civil engineering functions

16Exercise 19 Staircase with railing

In this exercise we will be creating a staircase with the help of the “Staircase Configurator” and the “Railing configurator”. Followed by some adding with steel engineering.



We start with the **Staircase configurator**. This will provide our bases of the stairs. Click on the icon and then MMB in the drawing area. This way we start the function, without having a start sketch made.

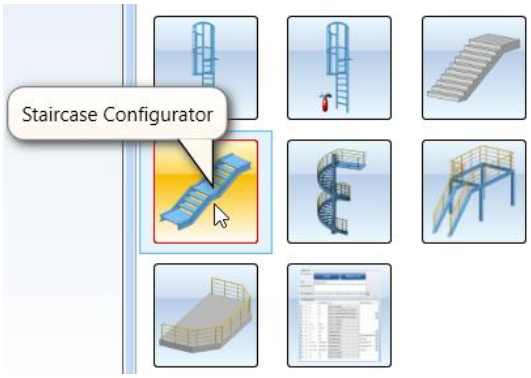


Figure 311 Staircase configurator

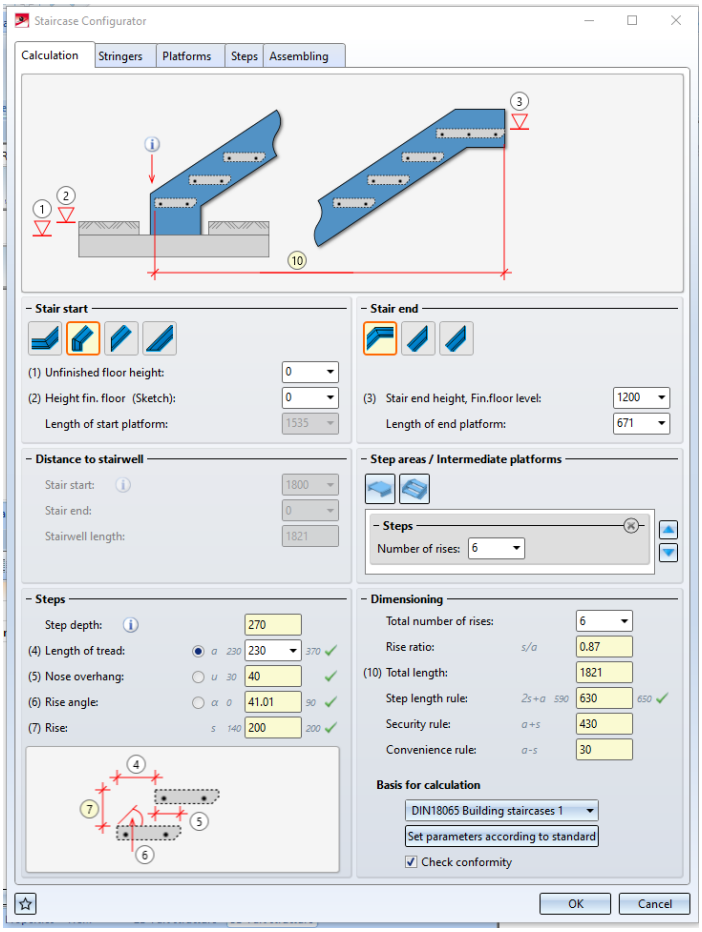


Figure 312 Staircase configuration dialogue

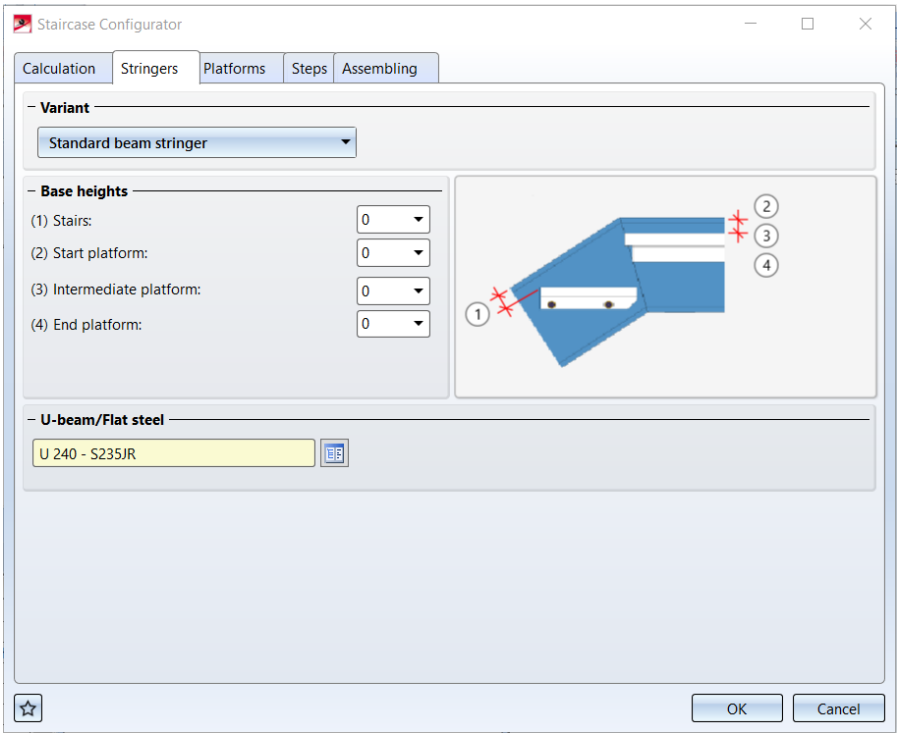


Figure 313 Staircase configurator dialogue – stringer tab

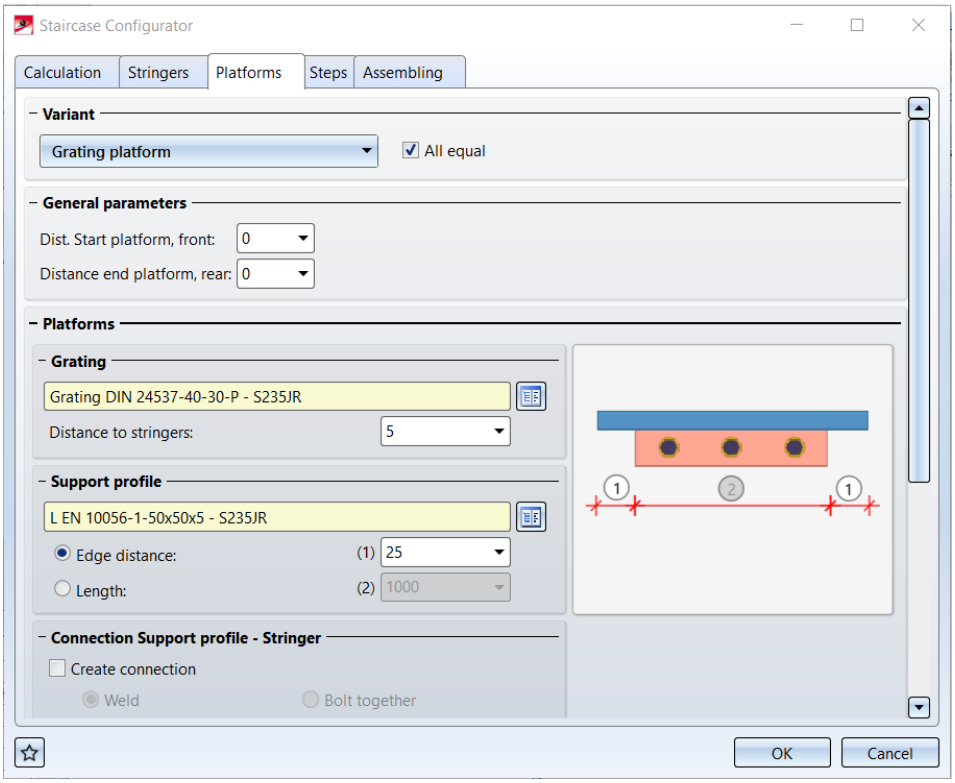


Figure 314 Staircase configurator dialogue - platforms tab

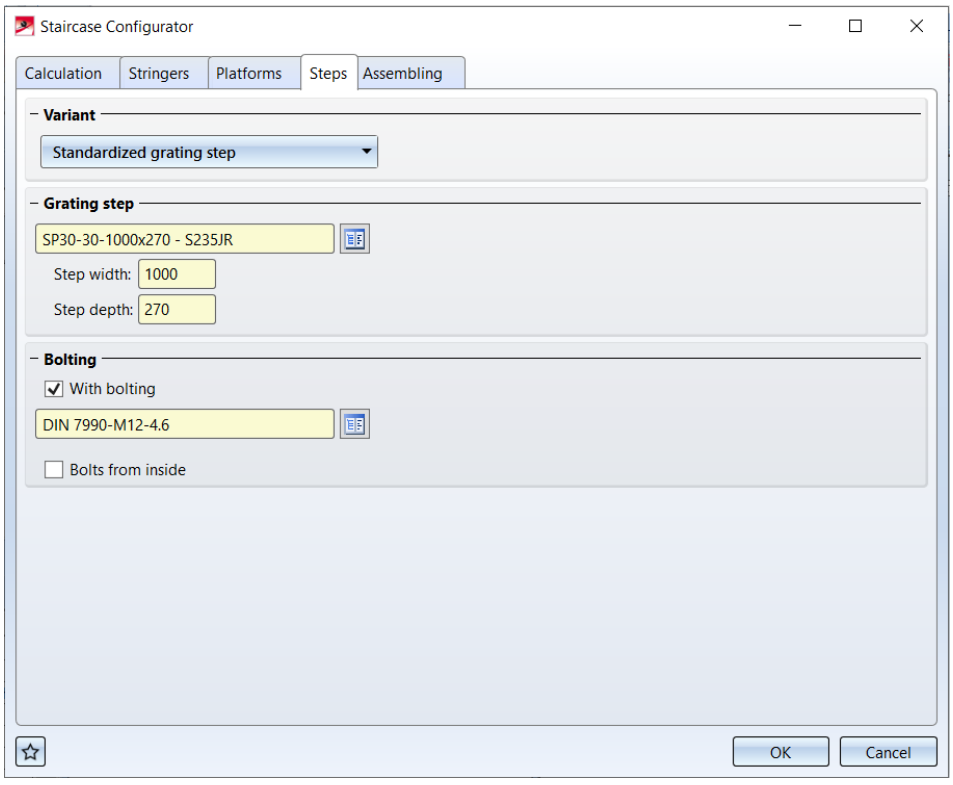


Figure 315 Staircase configurator dialogue – steps tab

- When al paramaters have being chosen, press on “OK” to place the stairs.

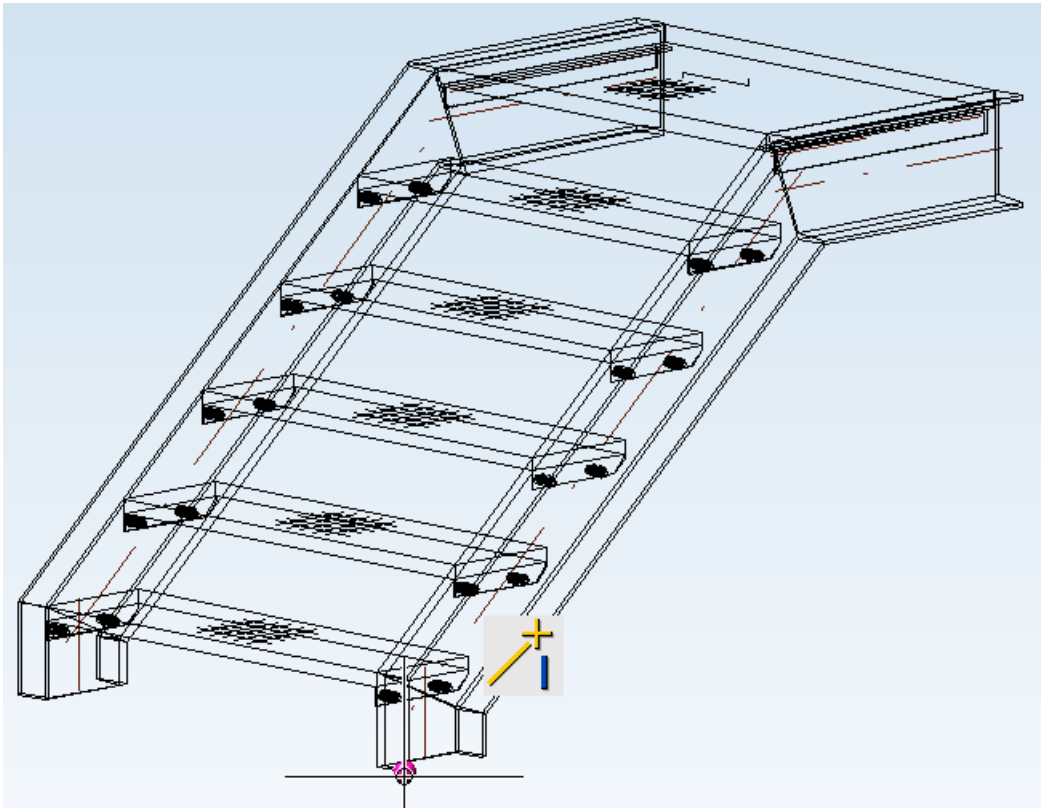


Figure 316 Insert stairs

- After placing the stairs, make a new processing plane on top of the U240 beam.

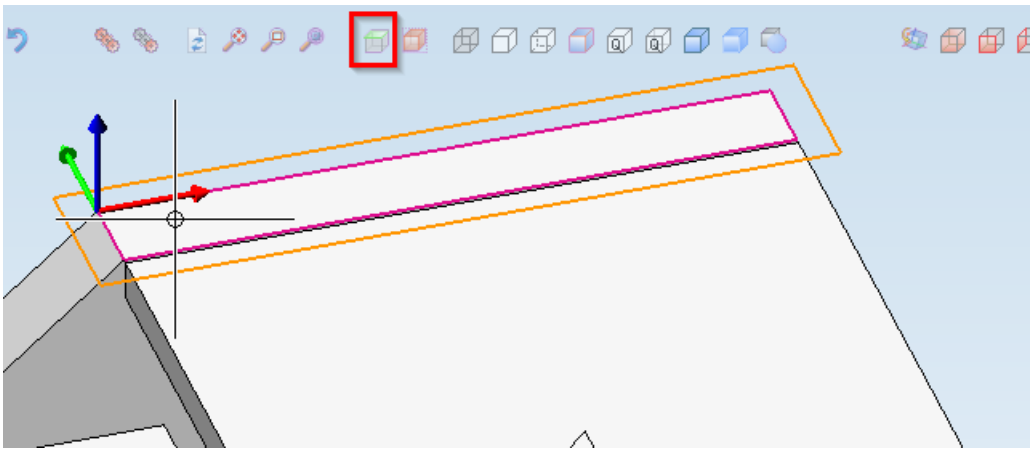


Figure 317 Processing plane insertion

This processing plane will be used to draw the next beam on the same height.

- Add the next two beams, in an angle of 30 degrees
- You can use addopt Cross-Section from refrerence profile to select the same profile as the stair.

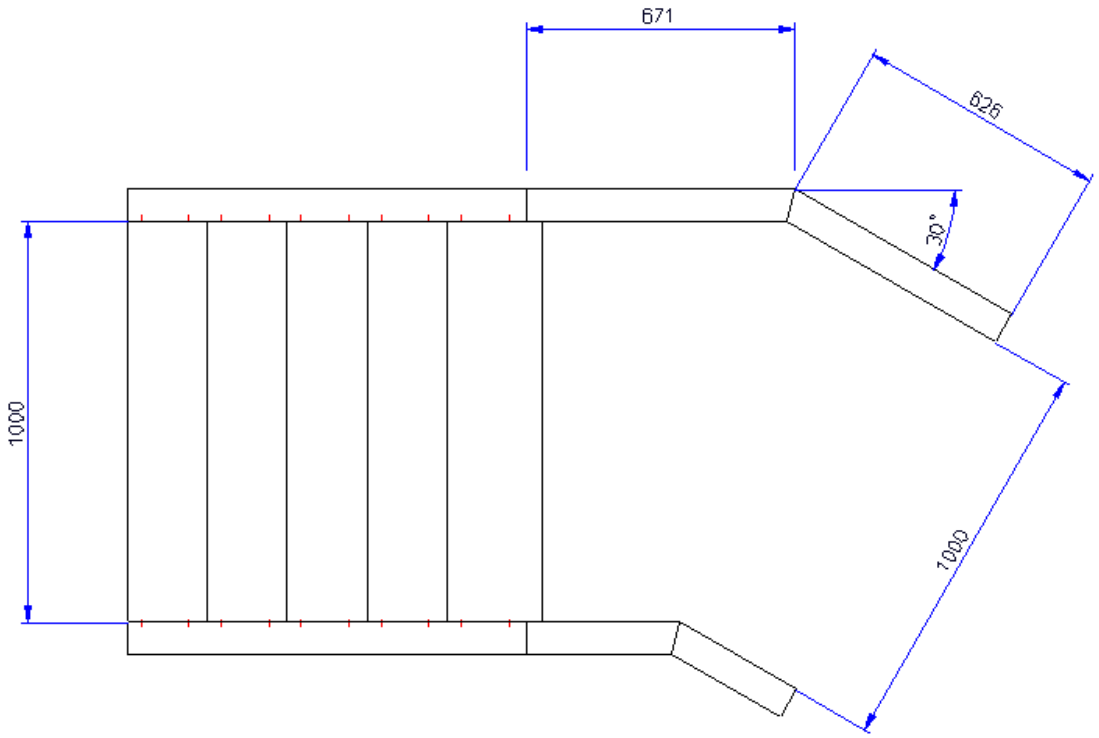


Figure 318 Topview of stairs after adaptions

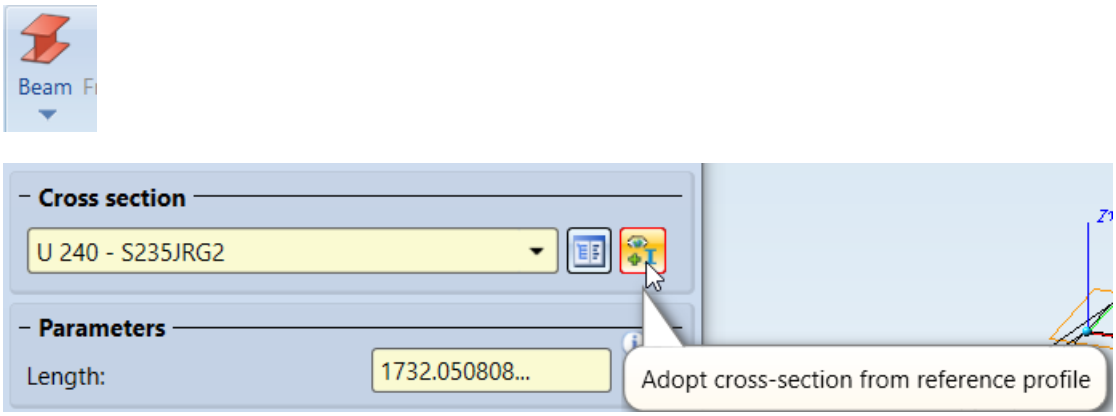


Figure 319 Insert standard beam – adopt cross-section from reference profile

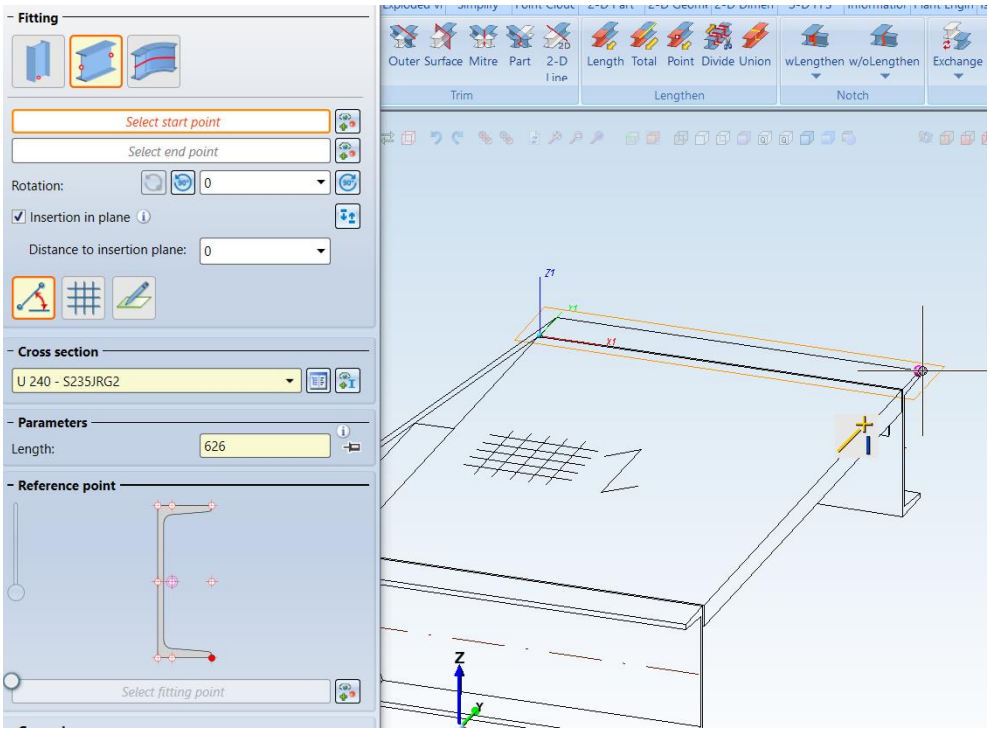


Figure 320 Insert standard beam via 2 points

Use insertion in plane with the angle grid system. To define the 30 degrees and the length

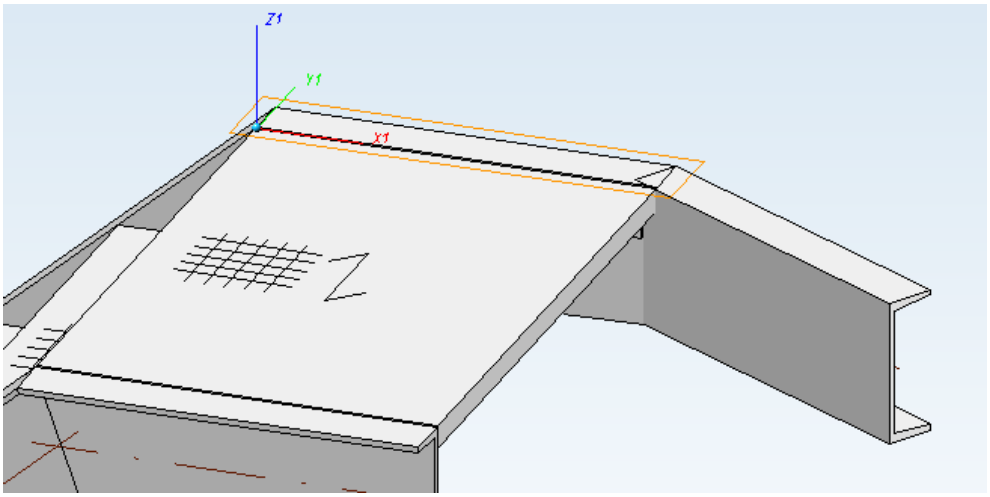


Figure 321 result of beam insertion

- Clone or draw the other beam on the other side.
- If you youse clone make sure to rotate the part aswell.

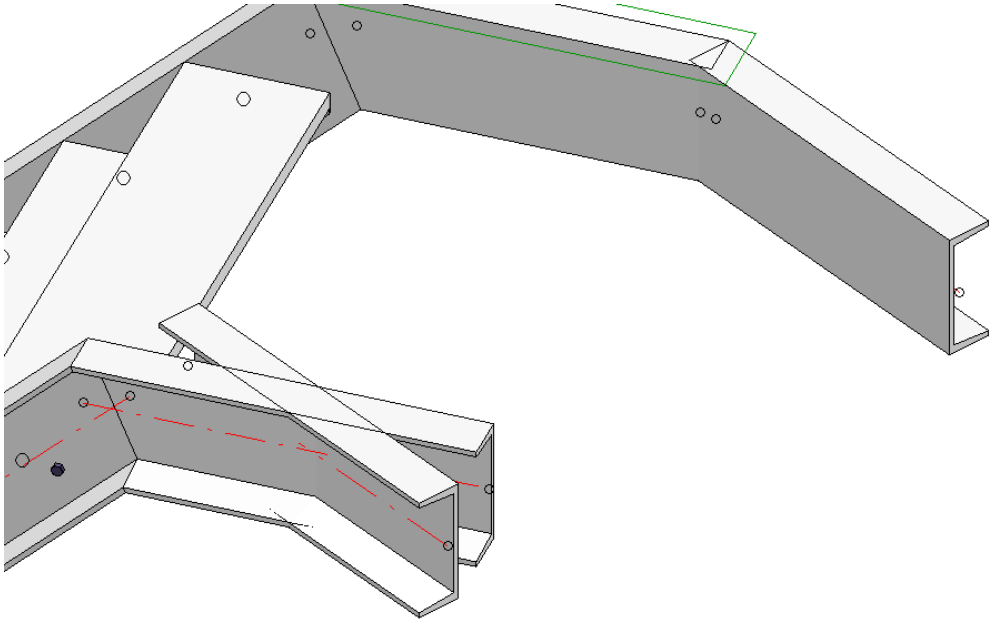


Figure 322 Extra beams inserted

- Use Mitre to connect the beams.

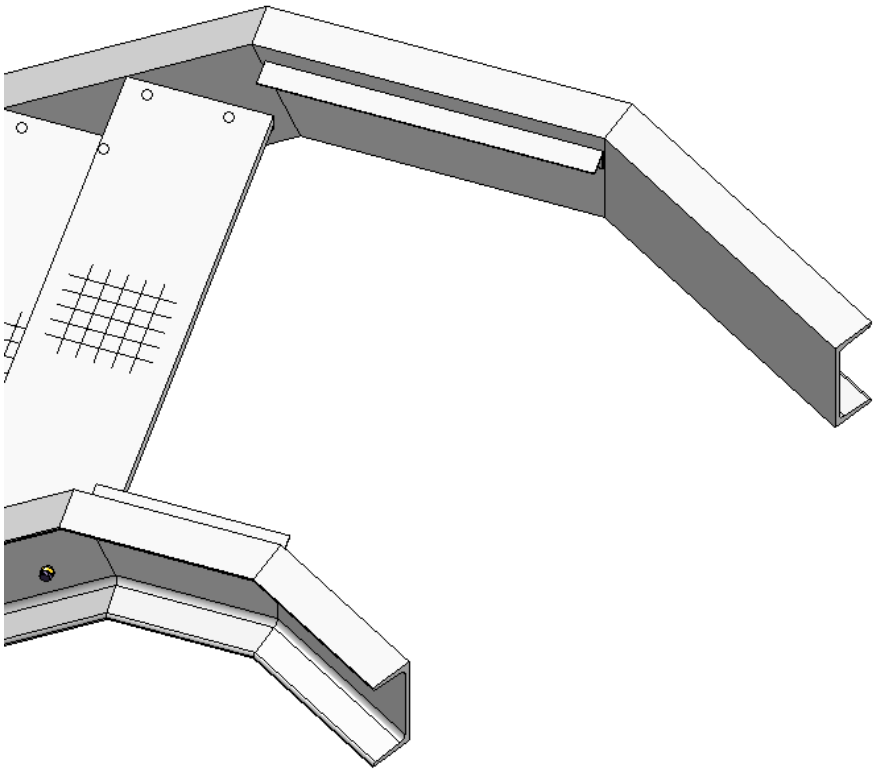


Figure 323 Extra beams trimmed

- Create a new sketch and place the processing plaine on the L beam

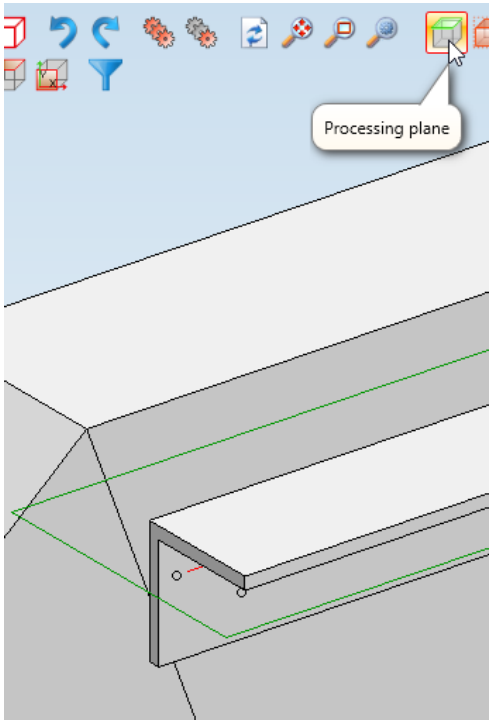


Figure 324 New processing plane for L profile

- Draw the beam alone the 2 new created beams to create support for a platform.

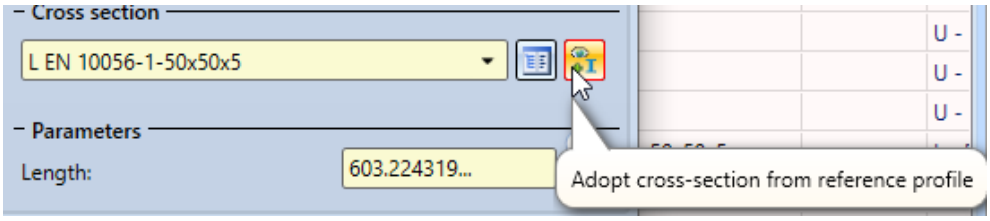


Figure 325 Adopt cross-section in insert beam dialogue

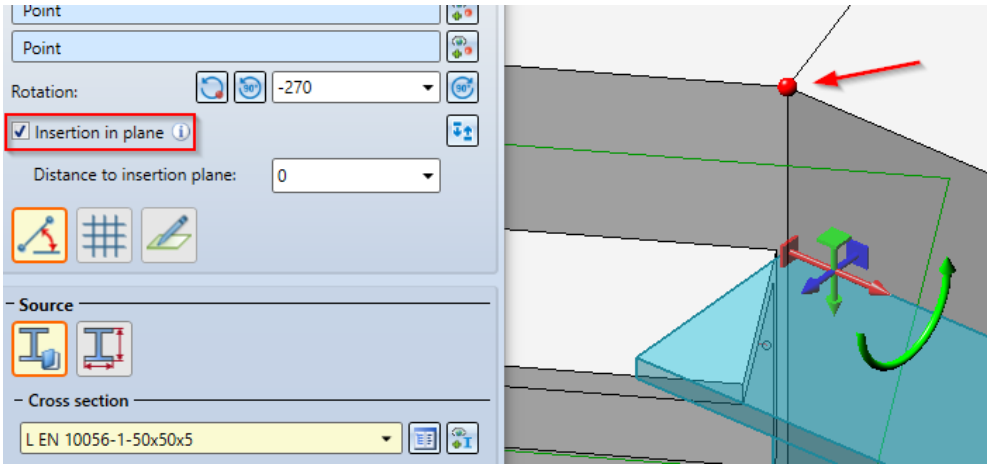


Figure 326 Insertion in plane in insert beam dialogue

Tip:

- Don't forget the beam on the other side.

Now we make a sketch to create a grading plate.

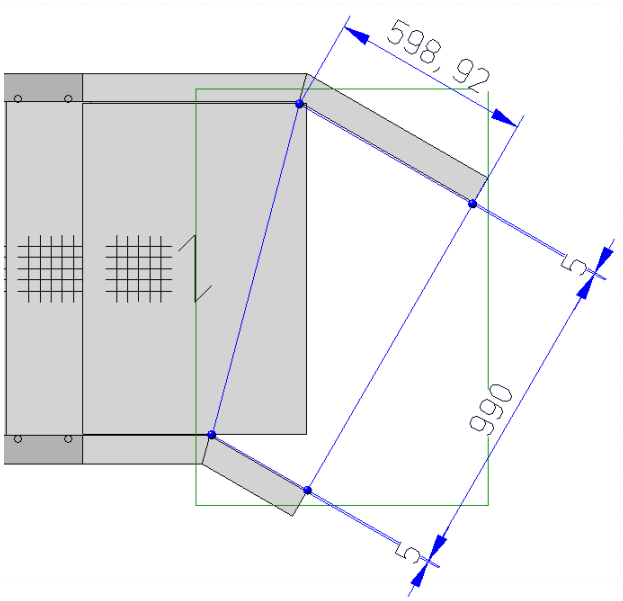


Figure 327 Dimensions for grating

Use the Grating function to place the floor. 

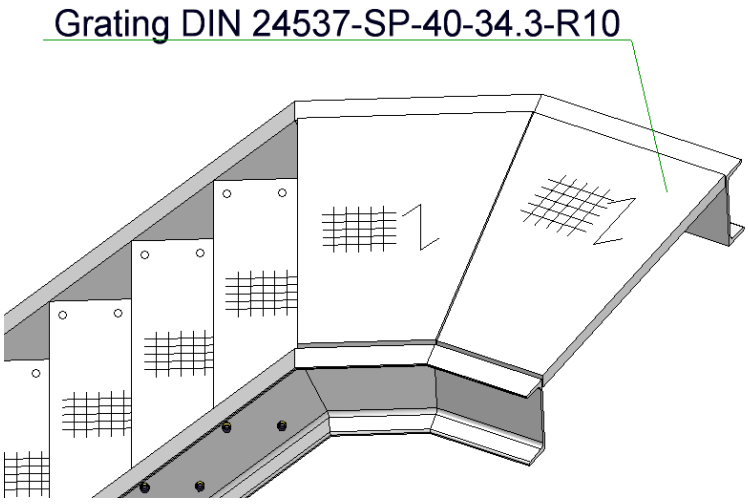


Figure 328 Grating with annotation

Adjust the other grading plate by using Substract.

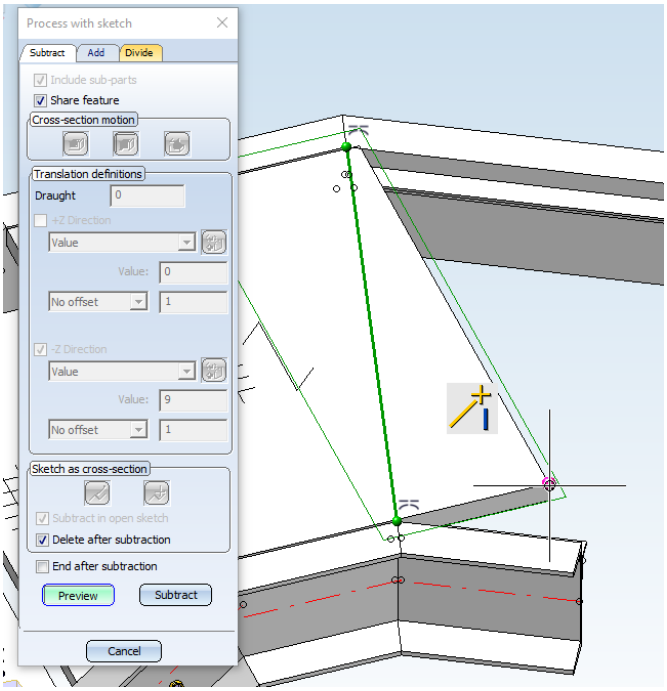
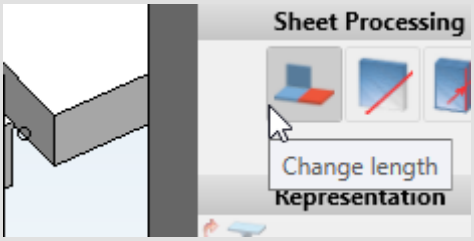


Figure 329 Subtract dialogue

Tip:

- It's also possible to change the sheet length via the Change length function .
- RMB on the part
- Or go to **Sheet Metal > Change length > Lengthen.**



Now it is time to secure the L profile that hold the grating.

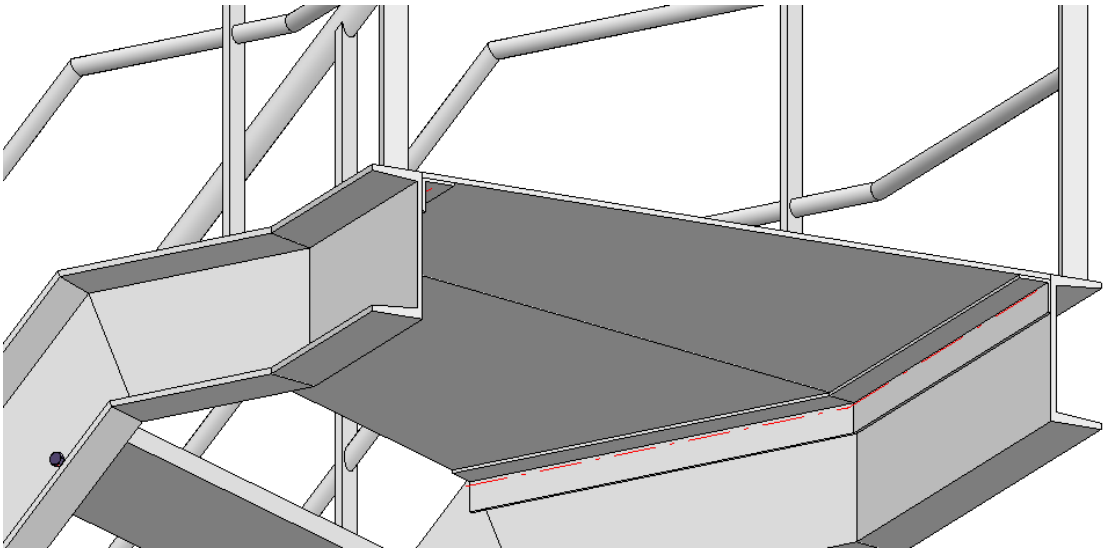


Figure 330 L-profiles beneath gratings

Add a new bolted connection or copy one from the staircase.

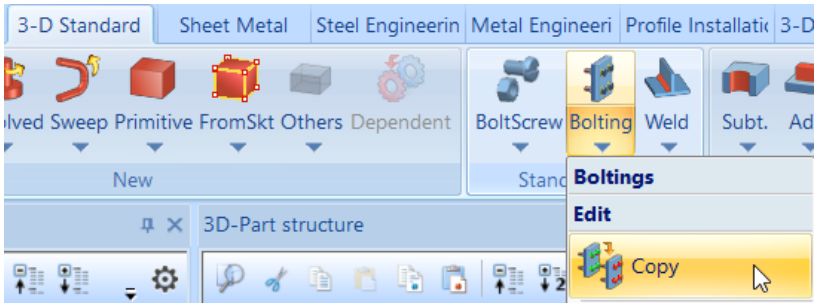


Figure 331 Copy bolting in sub-menu of insert Bolting

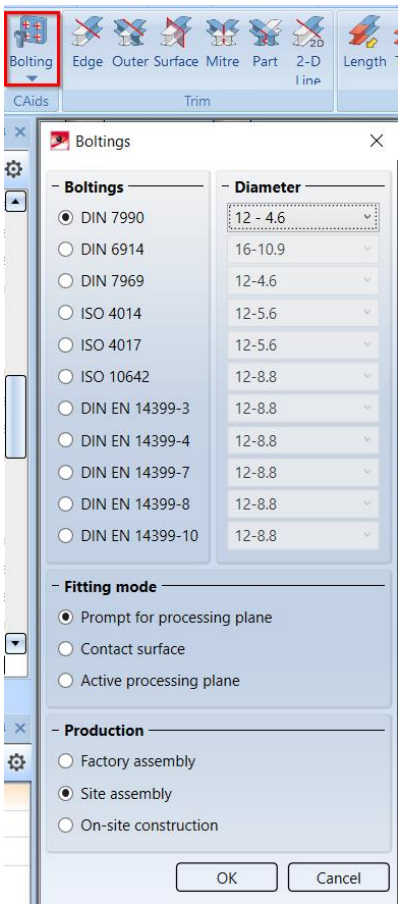


Figure 332 Bolting function in Steel engineering ribbon

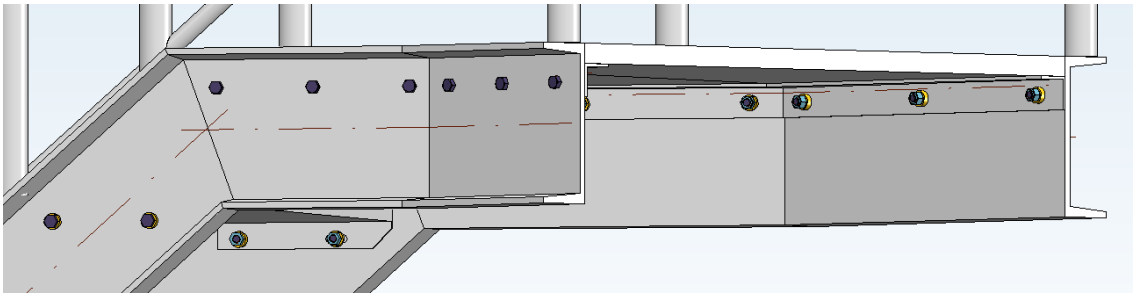


Figure 333 Resulting bolting connections

Now the stairs is placed its time for the railing. Use the **Railing configurator (Railing along beams)**

› Select the beams in the correct order and fill in the parameters accordingly.

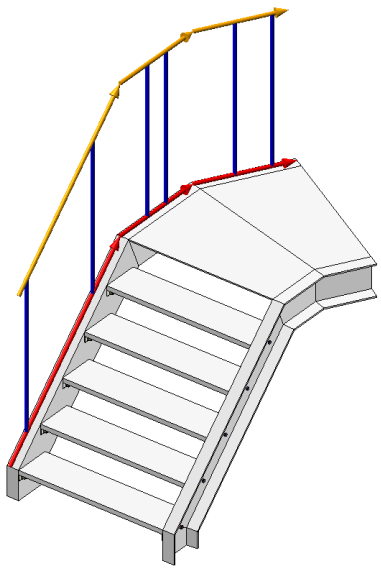


Figure 334 Preview of railing path

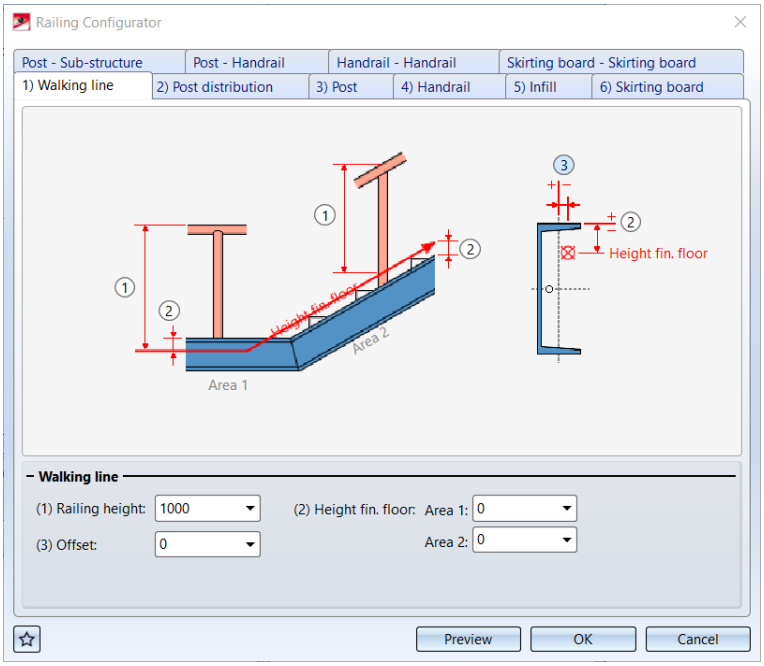


Figure 335 Railing configurator – Walking line tab

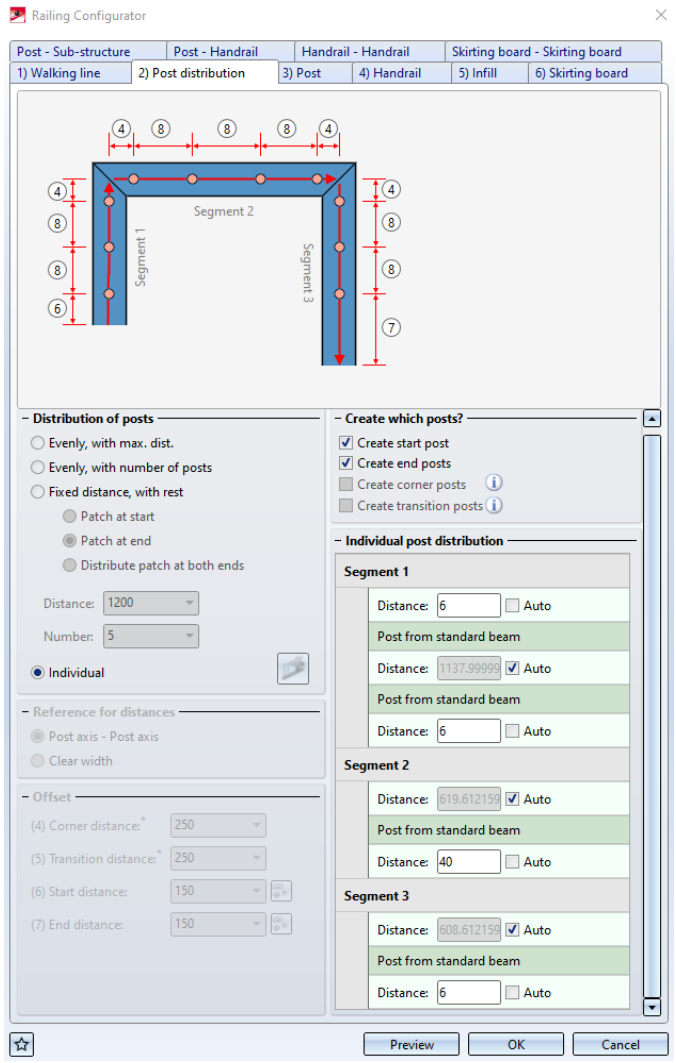


Figure 336 Railing configurator – Post distribution tab

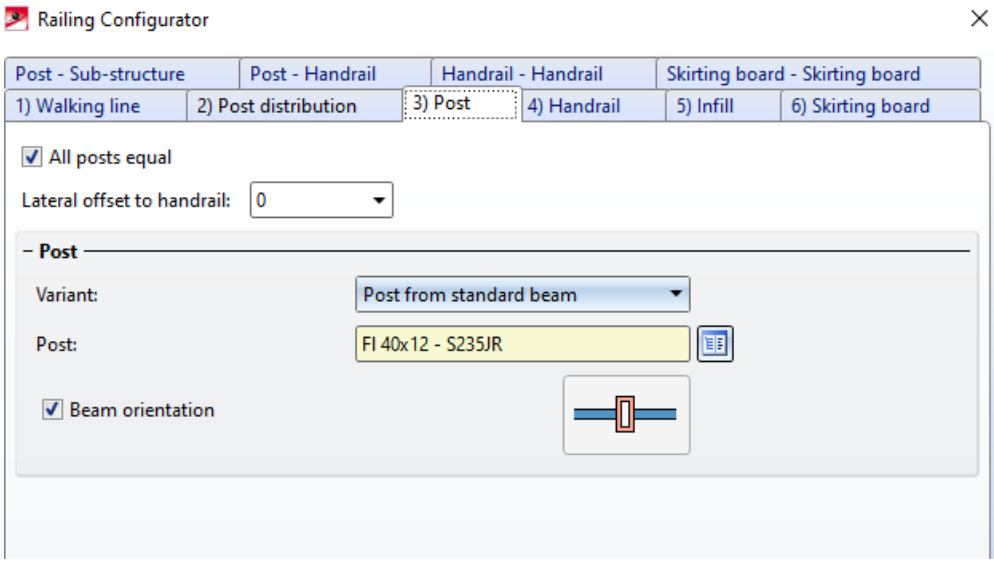


Figure 337 Railing configurator – Post tab

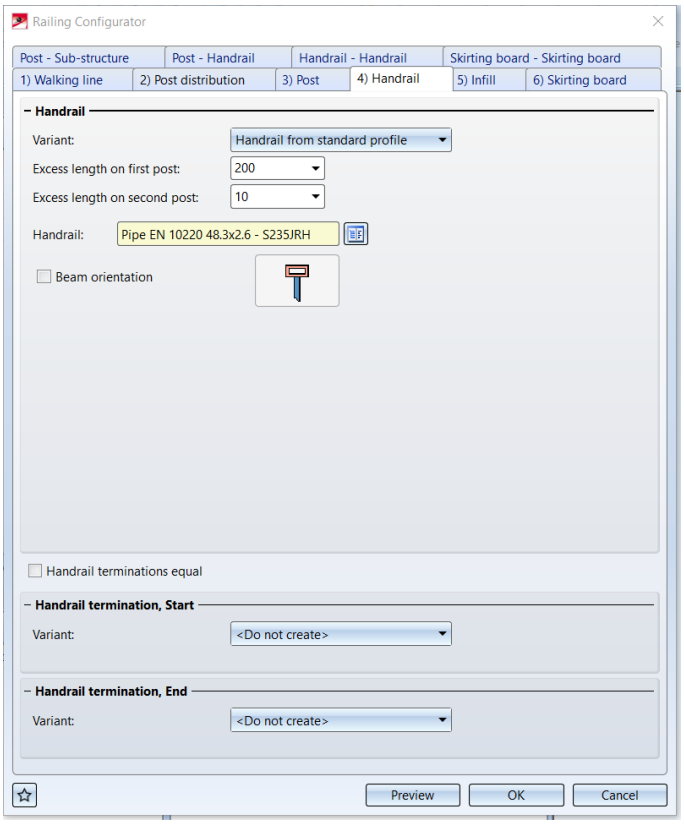


Figure 338 Railing configurator – Handrail tab

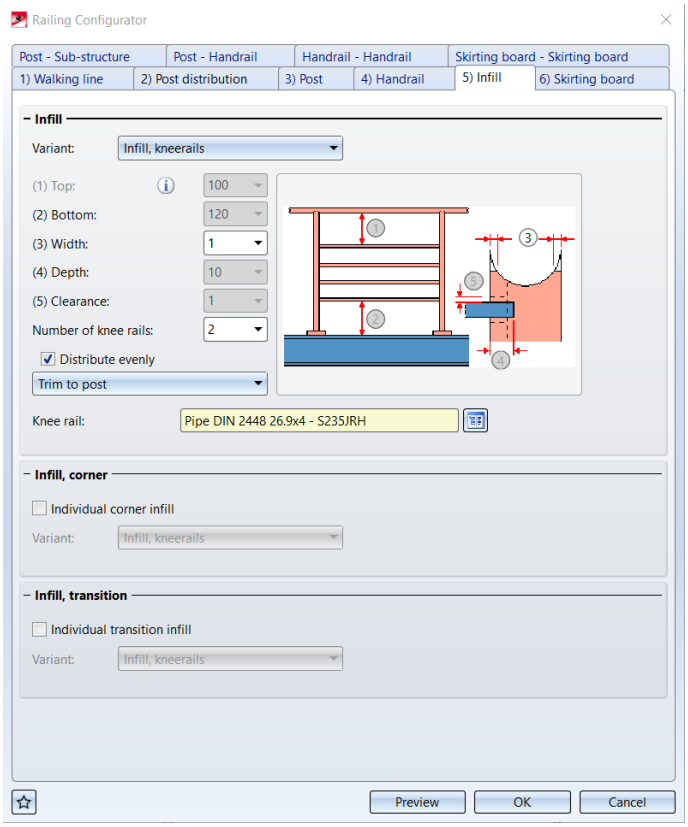


Figure 339 Railing configurator – Infill tab

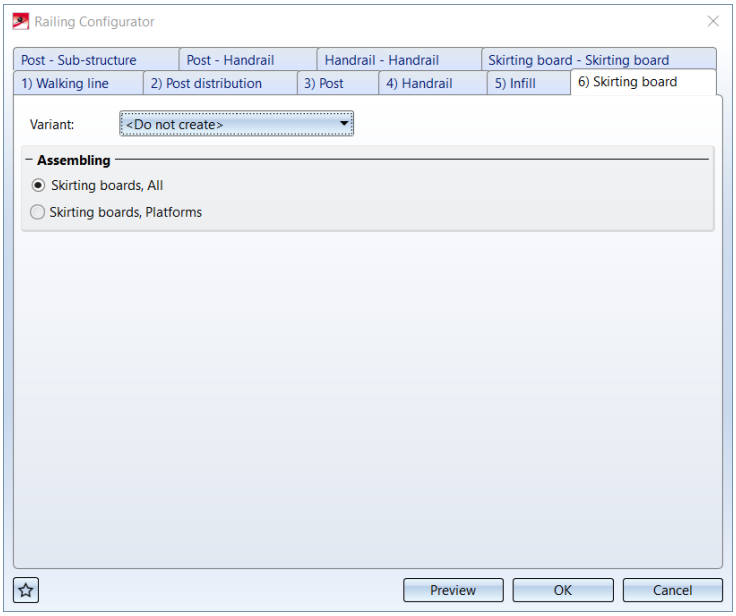


Figure 340 Railing configurator – Skirting board tab

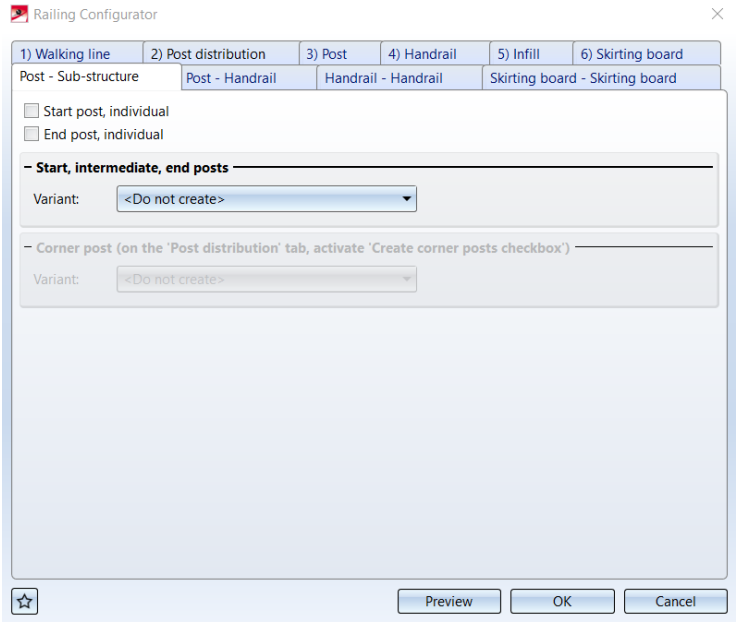


Figure 341 Railing configurator – Post – Sub-structure tab

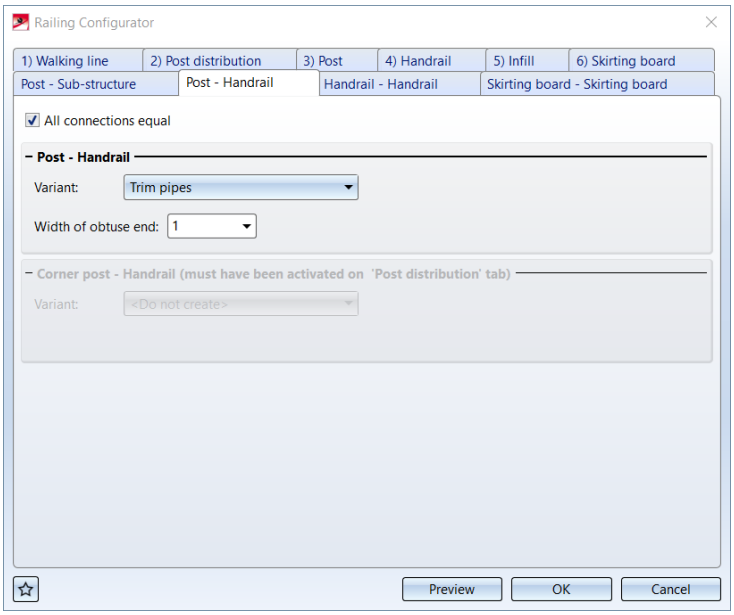


Figure 342 Railing configurator – Post – Handrail tab

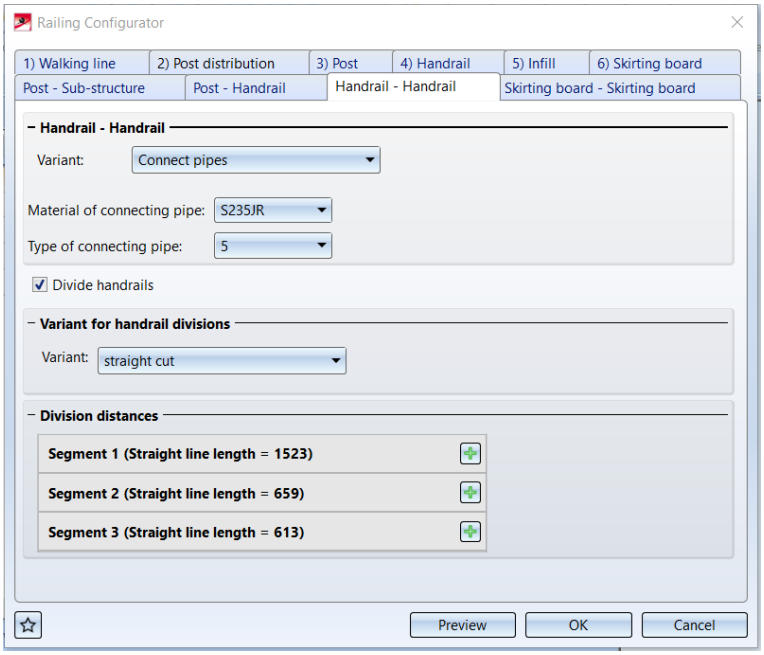


Figure 343 Railing configurator – Handrail-Handrail tab

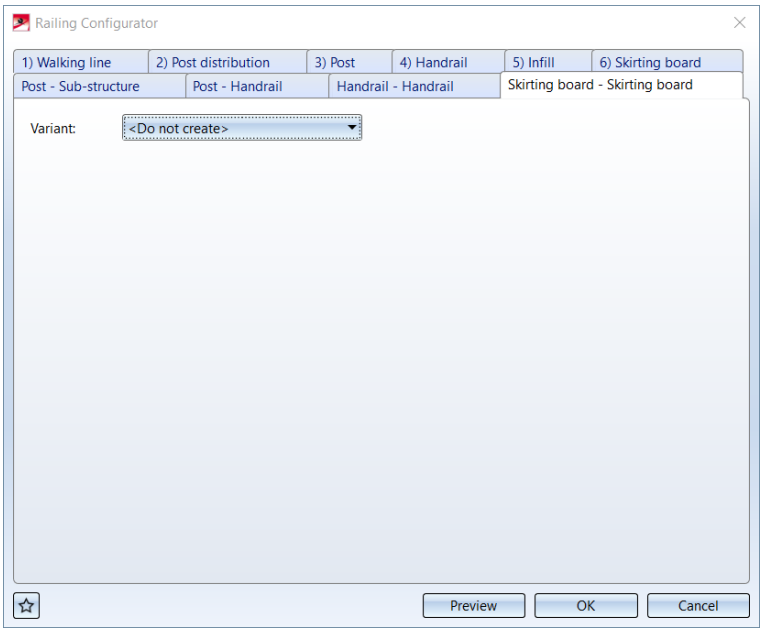


Figure 344 Railing configurator – Skirting board-Skirting board tab

- Click on Preview and when done on OK.
- Now it is time for the railing on the other side

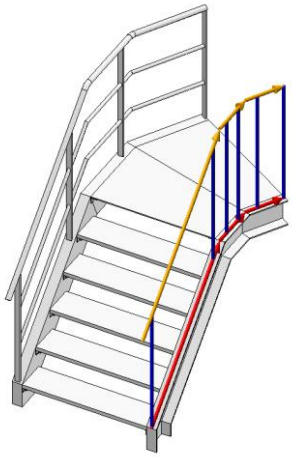


Figure 345 Preview of railing path

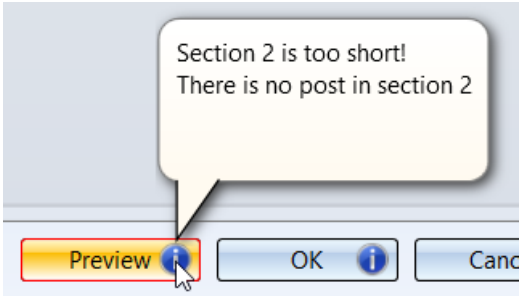


Figure 346 Error message in railing configurator dialogue

The Post distribution of the previous values are not possible on the new beams.

So the value will be resetted

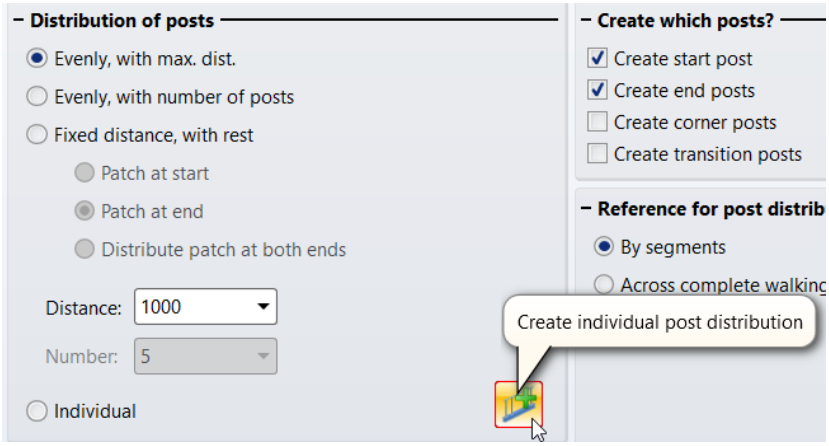


Figure 347 Post distribution area in railing configurator – Create individual post distribution

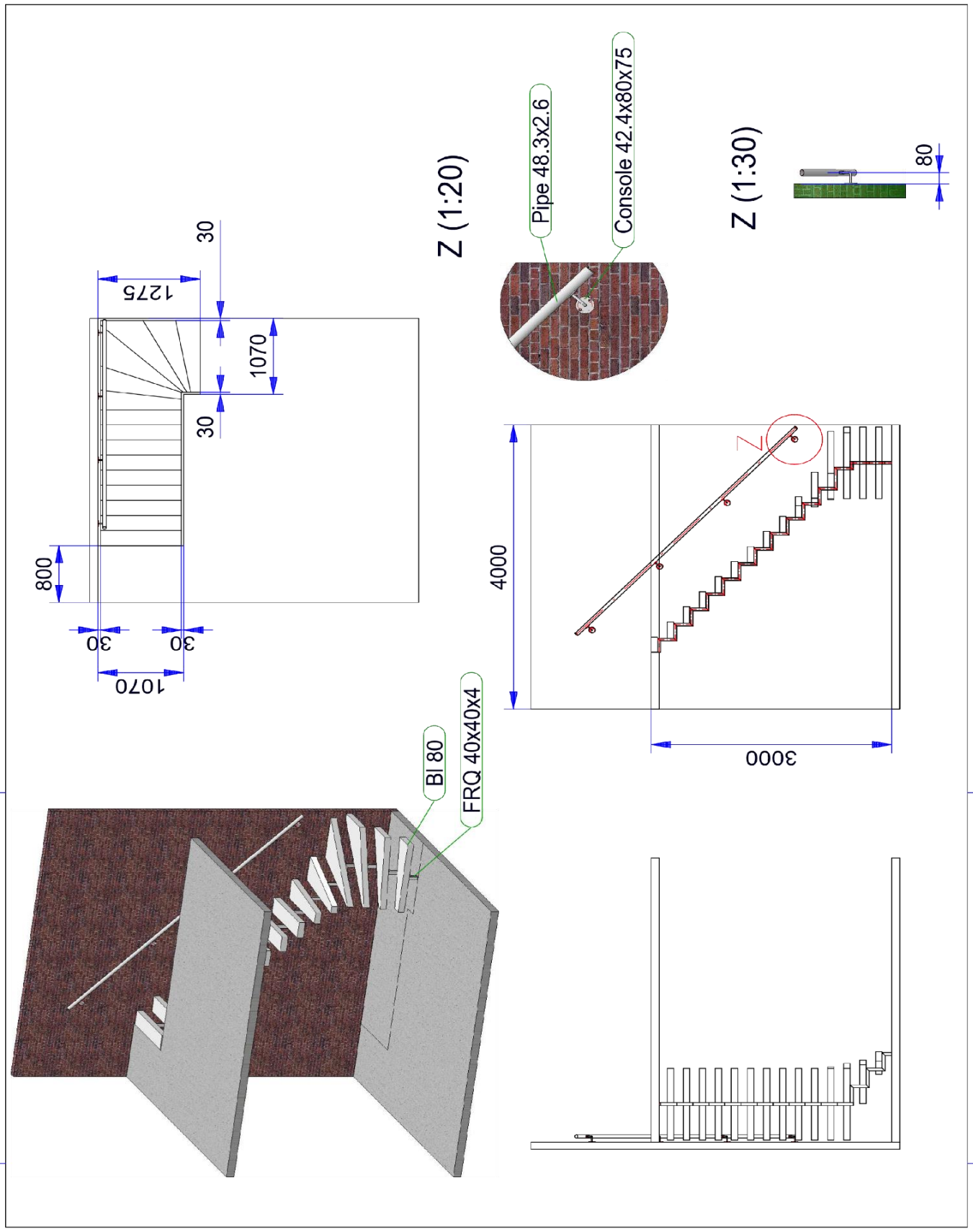
Use the same values as the other side.

Tip:

- Every Segment needs one distance on “Auto”. So de seqeunce is minimum distance -> post -> distance

The exercise is finished

16.1 Exercise 20 A (additional) Staircase with wall-mounted railing



Step 1: Use image below to draw the sketch:

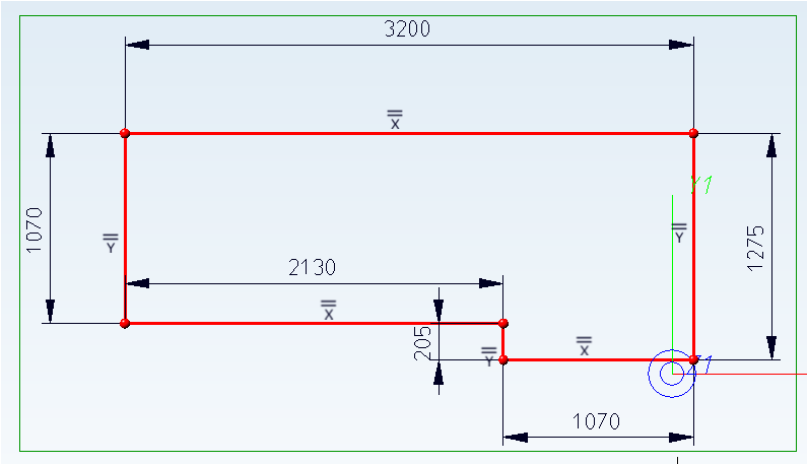


Figure 348 Staircase sketch

Step 2: Start the Industrial staircase configuration

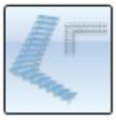


Figure 349 Civil engineering button Industrial staircase

Step 3: Click on the second tap and adjust the settings accordingly:

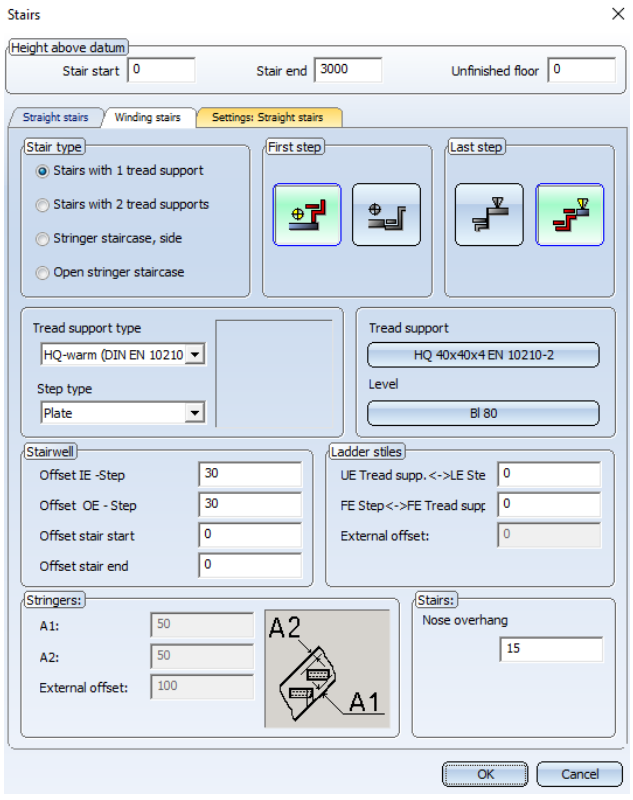


Figure 350 Industrial starcase dialogue

- Click on OK when you are finished.
- Step 4: Select the sketch
- Step 5: Select the start of the stairs

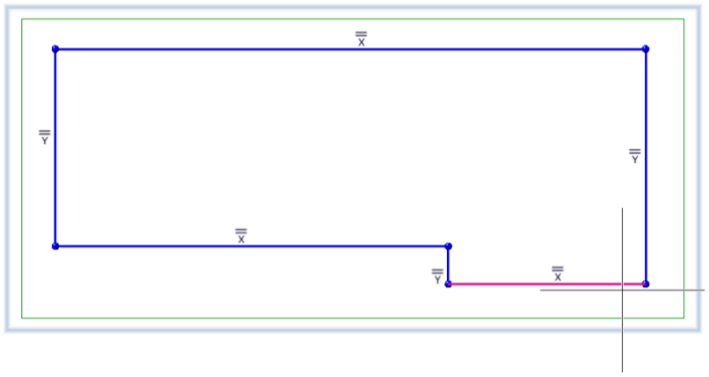


Figure 351 Start of winding stair selection

- Step 6: Select the end of the stairs:

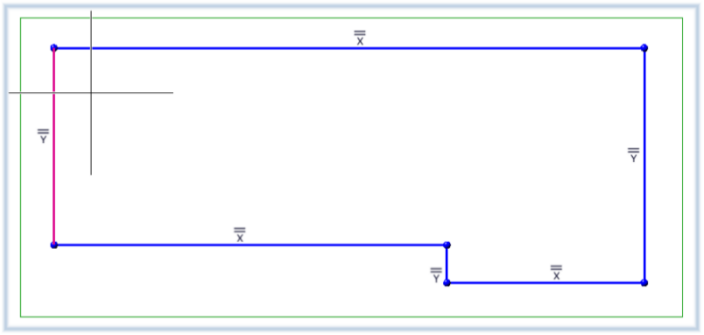


Figure 352 End of winding stair selection

- Step 7: Define the distance walking line. Automaticaly the middel of the path is calculated and click on OK.

Figure 353 Walking line definition

- Step 8: In the Rise variants menu you can select the number of rises, which depend on your settings.
- Click on preview to get the following result:

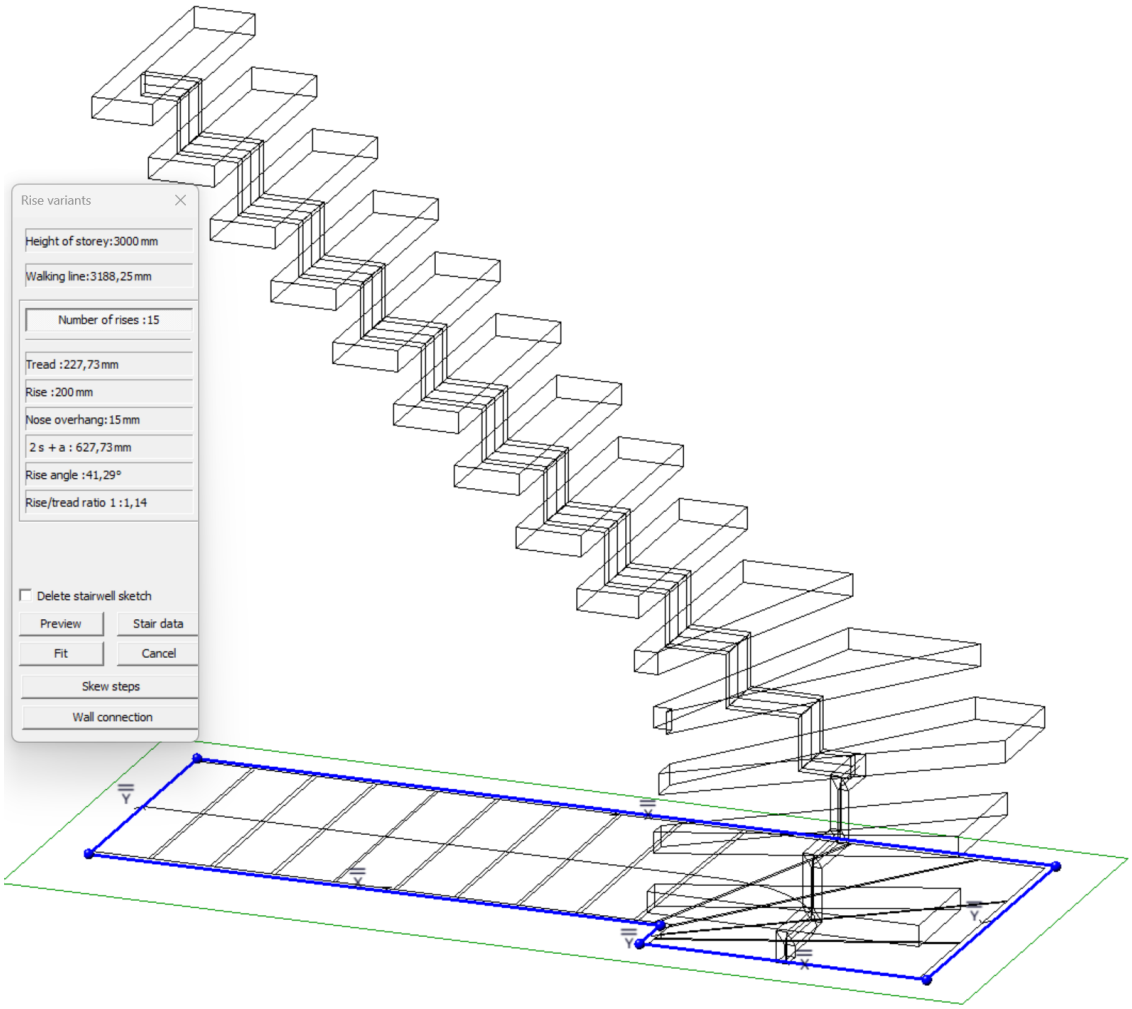


Figure 354 Preview of winding stairs with rise configuration

Via the button "**Stair data**" you can go back to the setting menu of the staircaise

If you are satisfight with the result you can click on the "**Fit**" button to place the staircaise.

If you want to undo everithign click on "Cancel" or "MMB" or "Esc"

If you want to change the angle of line from the front of a step (skew) you can do this via the "**Skew steps**" button.

- Please cick on the cross in this new menu when you are finished adjusting the step.

The exercise is finished

16.2 Excersize 20 B Settings for the railing on the wall

- To make a wall and a floor add 2 solid cuboids with the following dimensions:
  - X = 4000
  - Y = 4000
  - Z = 100
- You can add a texture to the floor and the wall via RMB → properties → texture

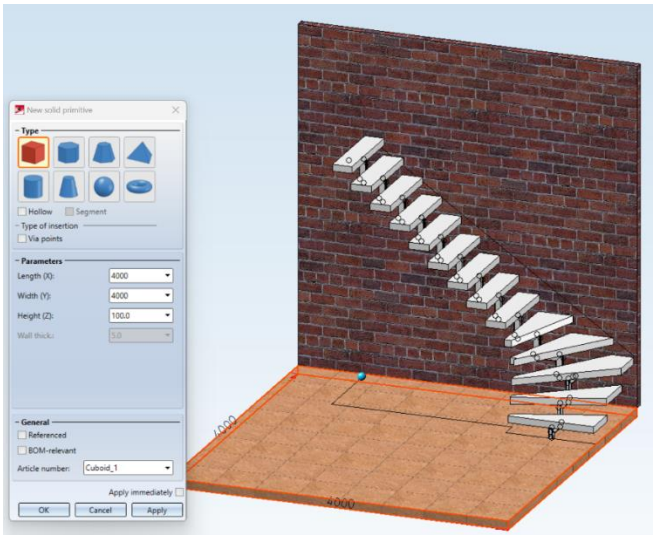


Figure 355 Wall and flooring

- Step 1: Make a sketch with 1 line that goes allong the steps of the stair that are touching the wall.

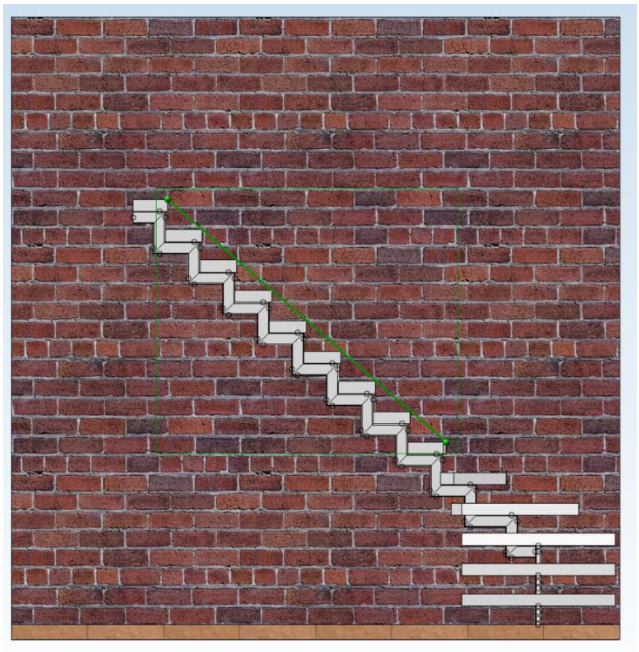


Figure 356 Sketch along stairs

- Step 2: Select the main assambly to active a differend processing plane than the sketch.
- Step 3: Start the railing configurator (Railings along edges)

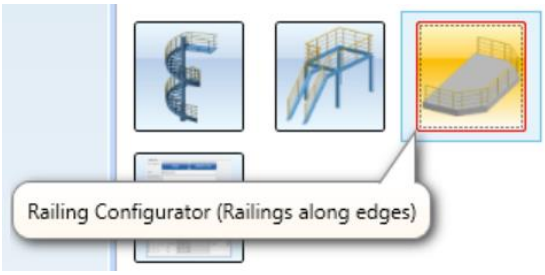


Figure 357 Civil engineering function – Railing along edges

- Step 4: Select the sketch line and press MMB

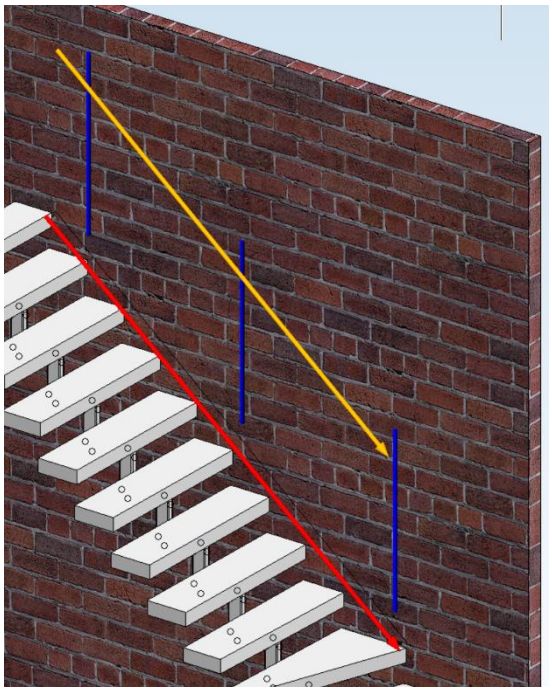


Figure 358 Preview of railing along edge

Tip:

- Make sure the red line points down to have the correct direction for the wall railing

Step 5:Set the settings acordingly:

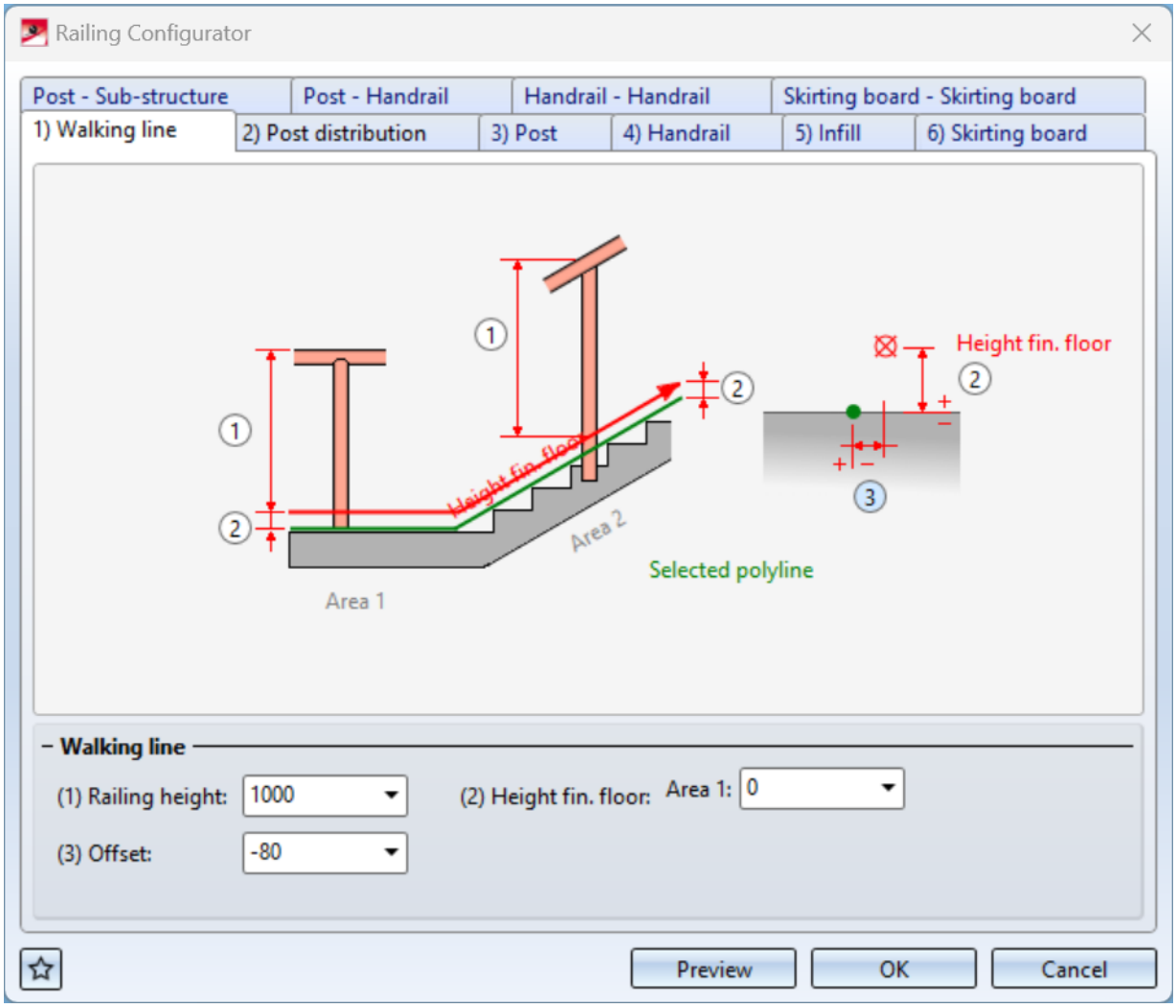


Figure 359 Railing configurator along edge – Walking line tab

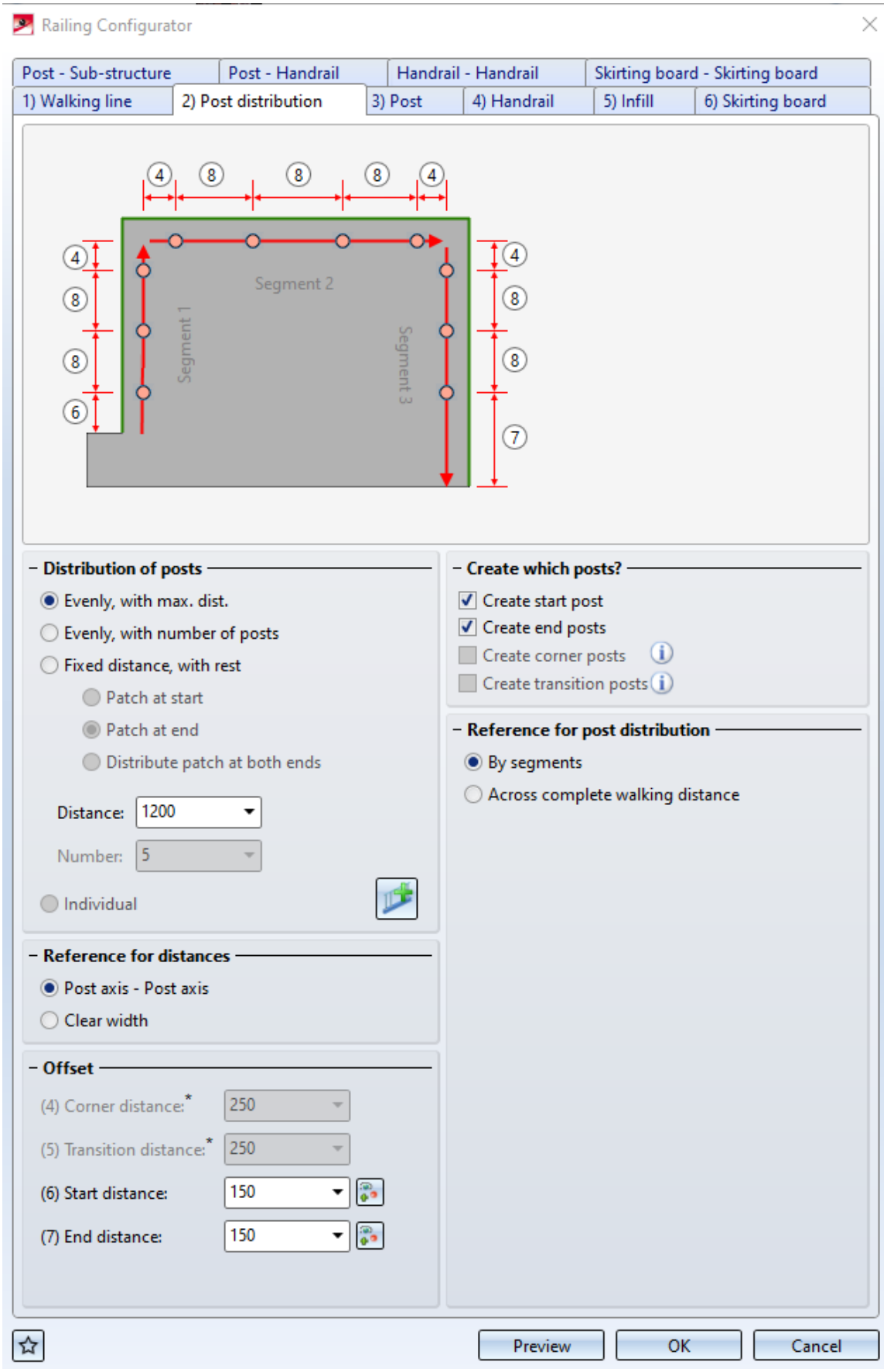


Figure 360 Railing configurator along edge – Post distribution tab

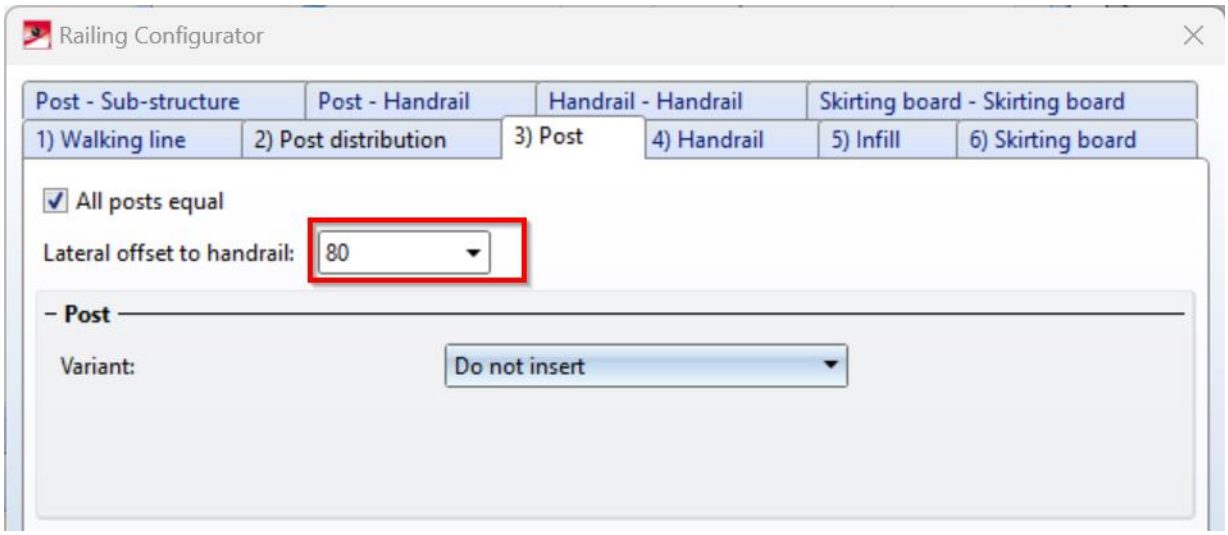


Figure 361 Railing configurator along edge – Post tab

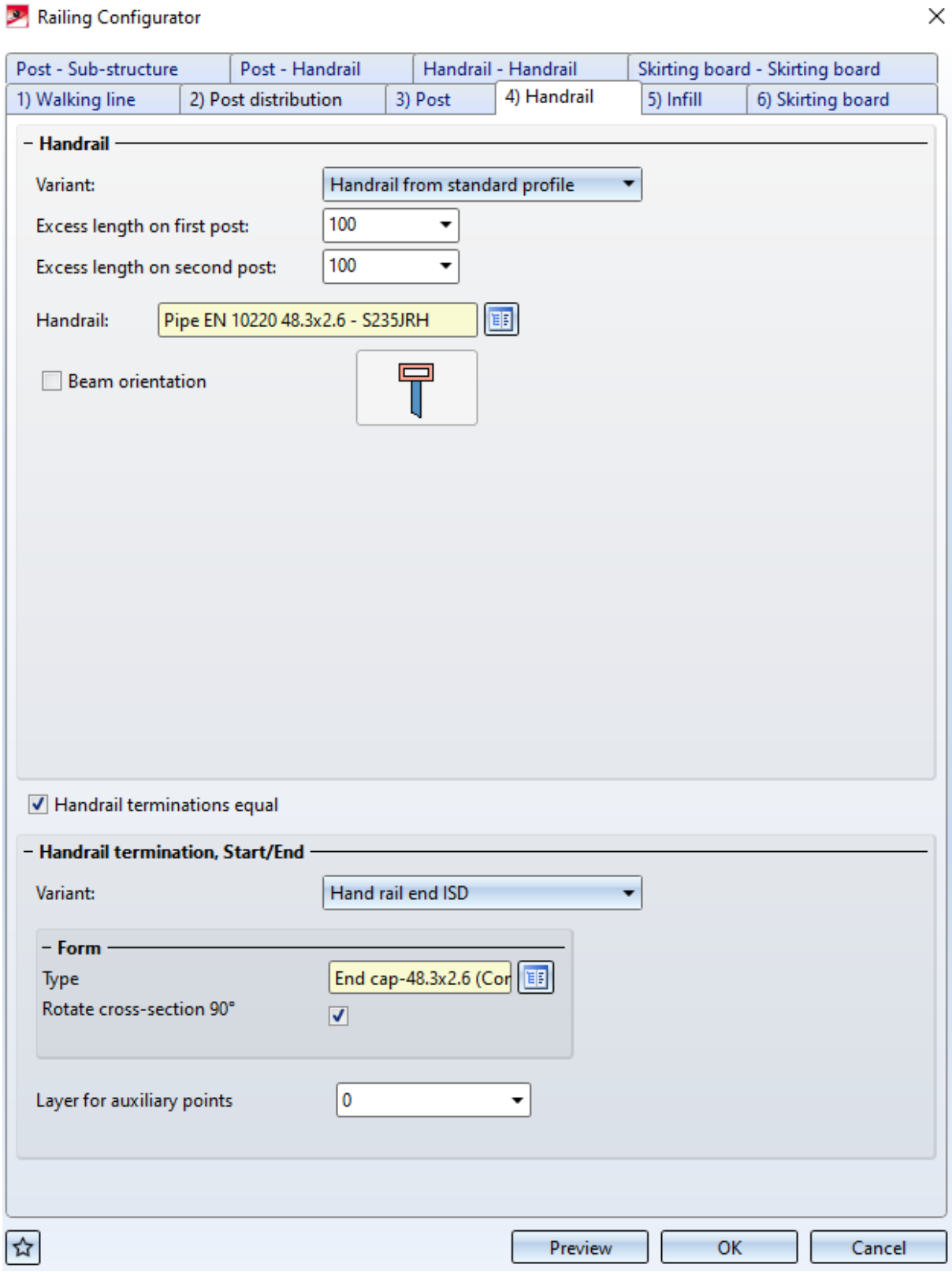


Figure 362 Railing configurator along edge – Handrail tab

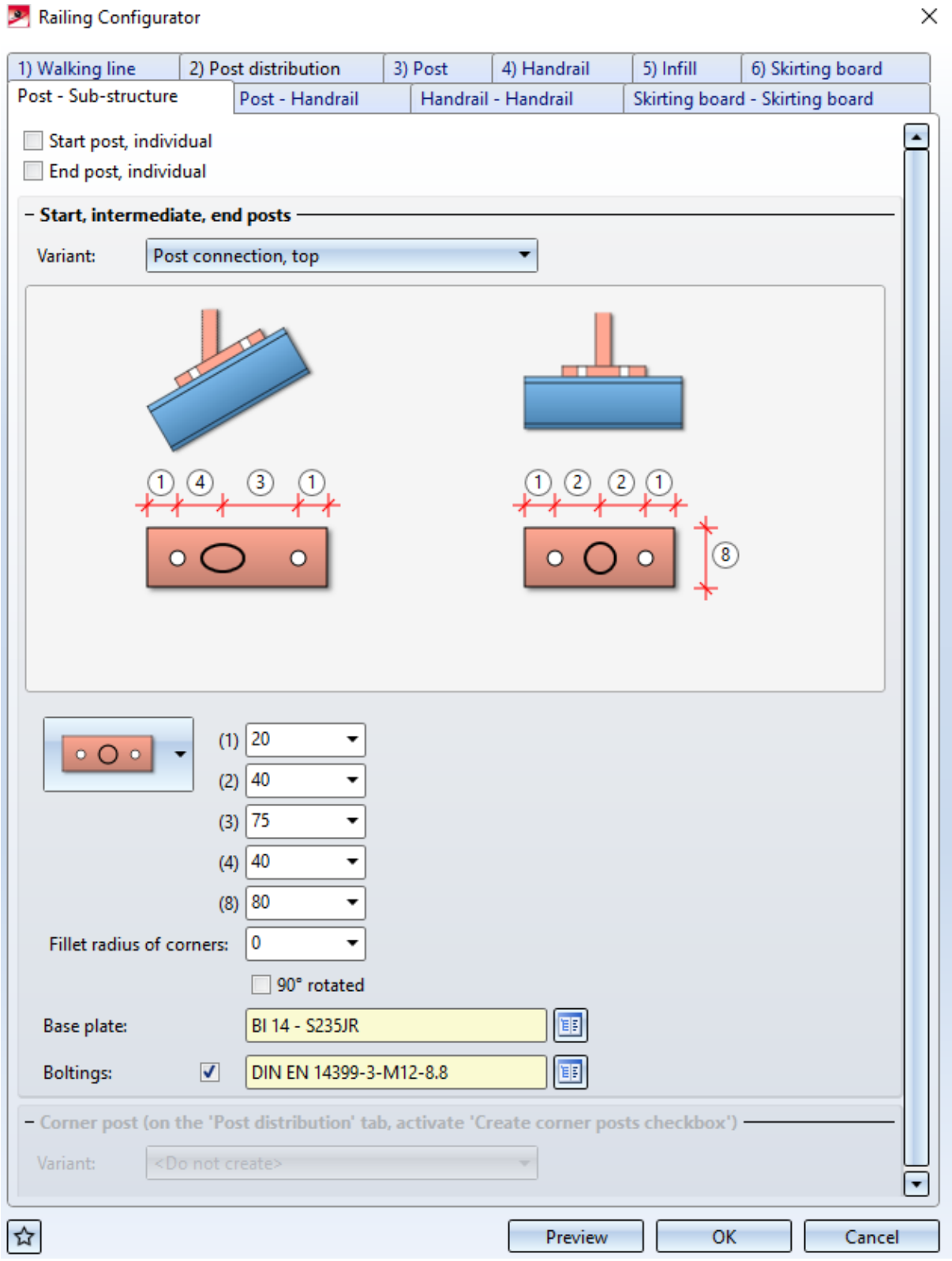


Figure 363 Railing configurator along edge – Post – Sub-structure tab

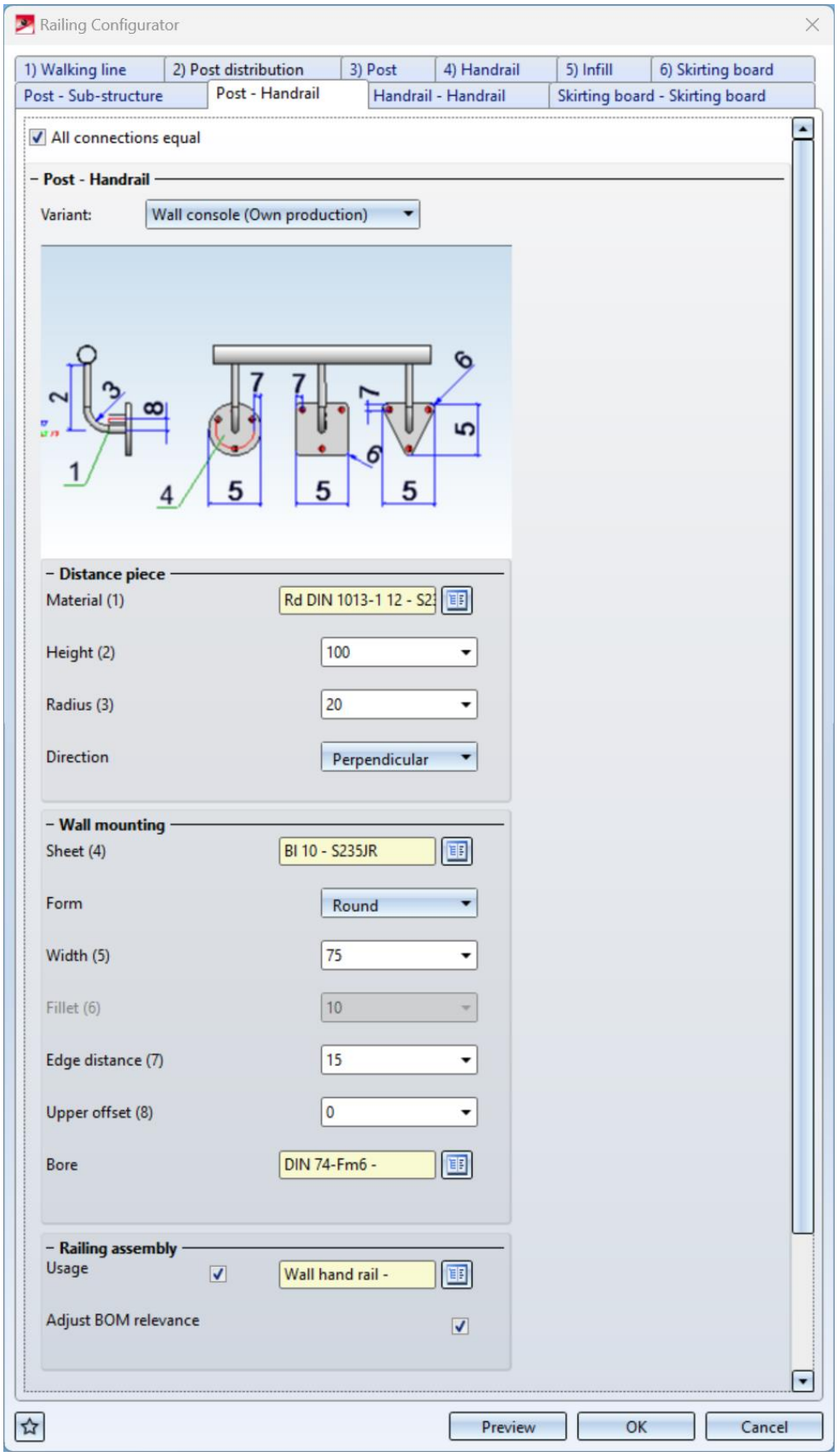


Figure 364 Railing configurator along edge – Post – Handrail tab

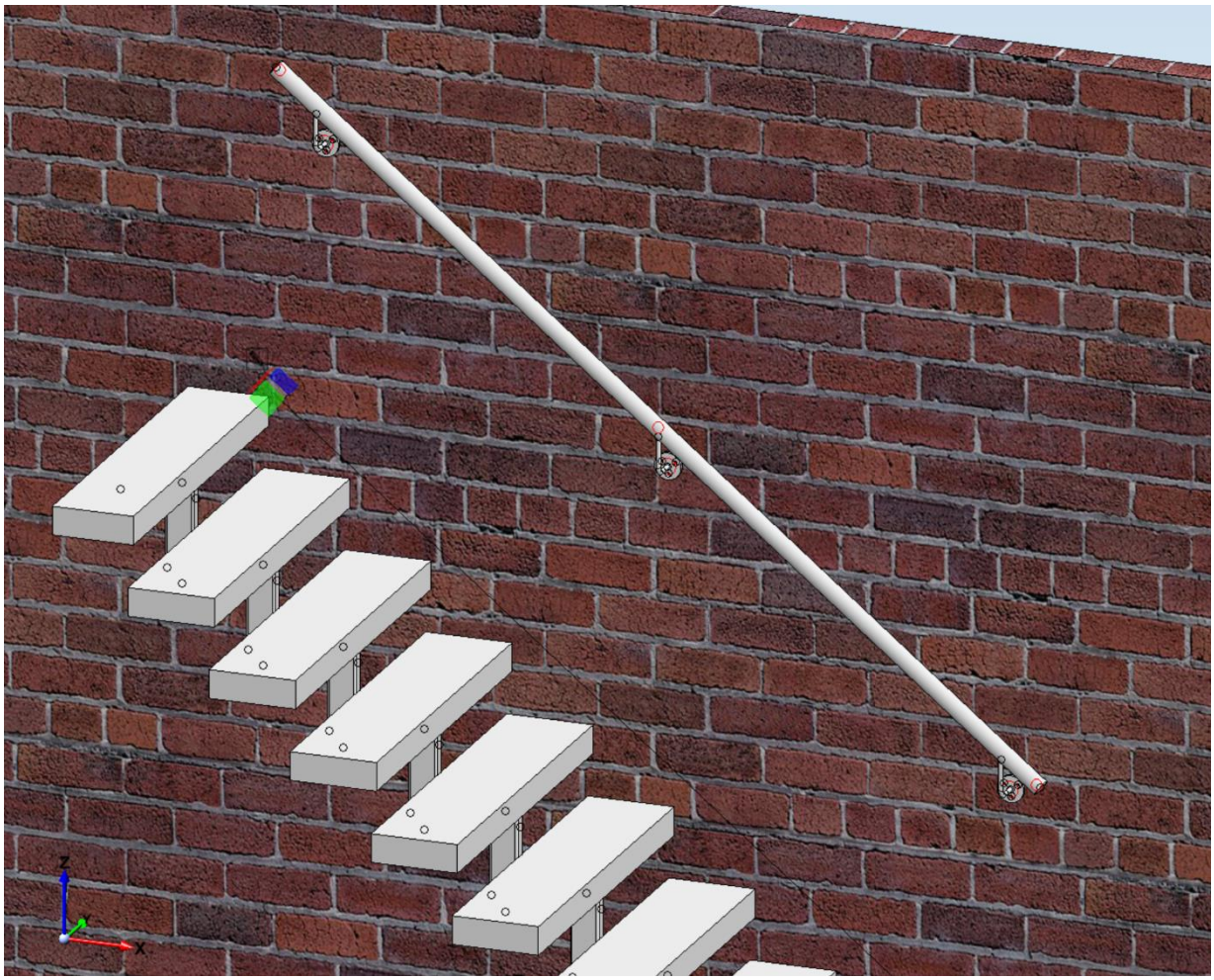


Figure 365 Resulting handrail

The exercise is finished

16.3 Exercise 21 Storage with staircase and railing

Learning target:

Learning the staircase and railing configurator.

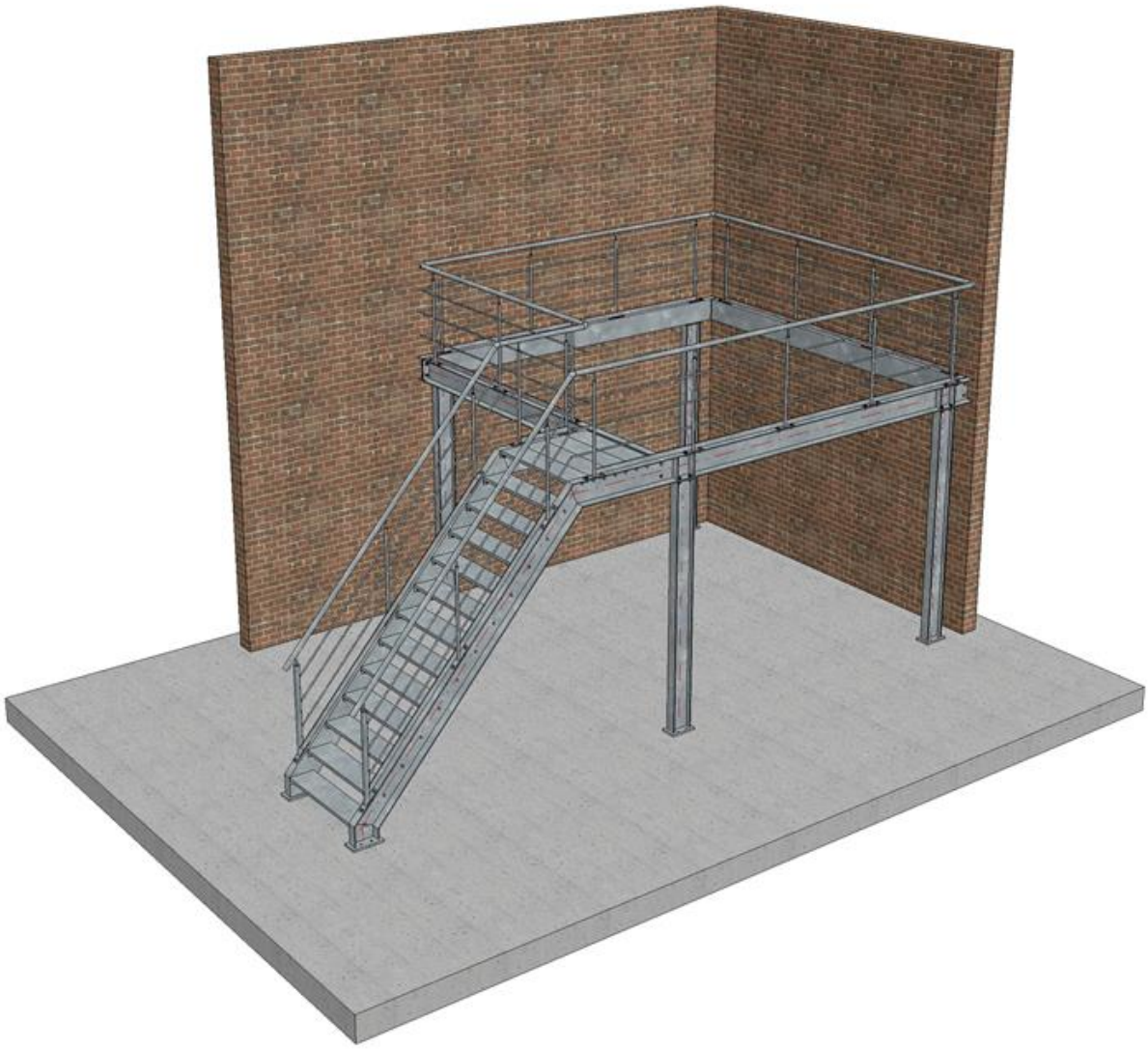


Figure 366 Preview of exercises resulting model

Setting up the construction:

- Place the flooring and walls by using solids. You could use wall and concrete textures to make it more stand out as wall and flooring. Give these solids there own assembly.

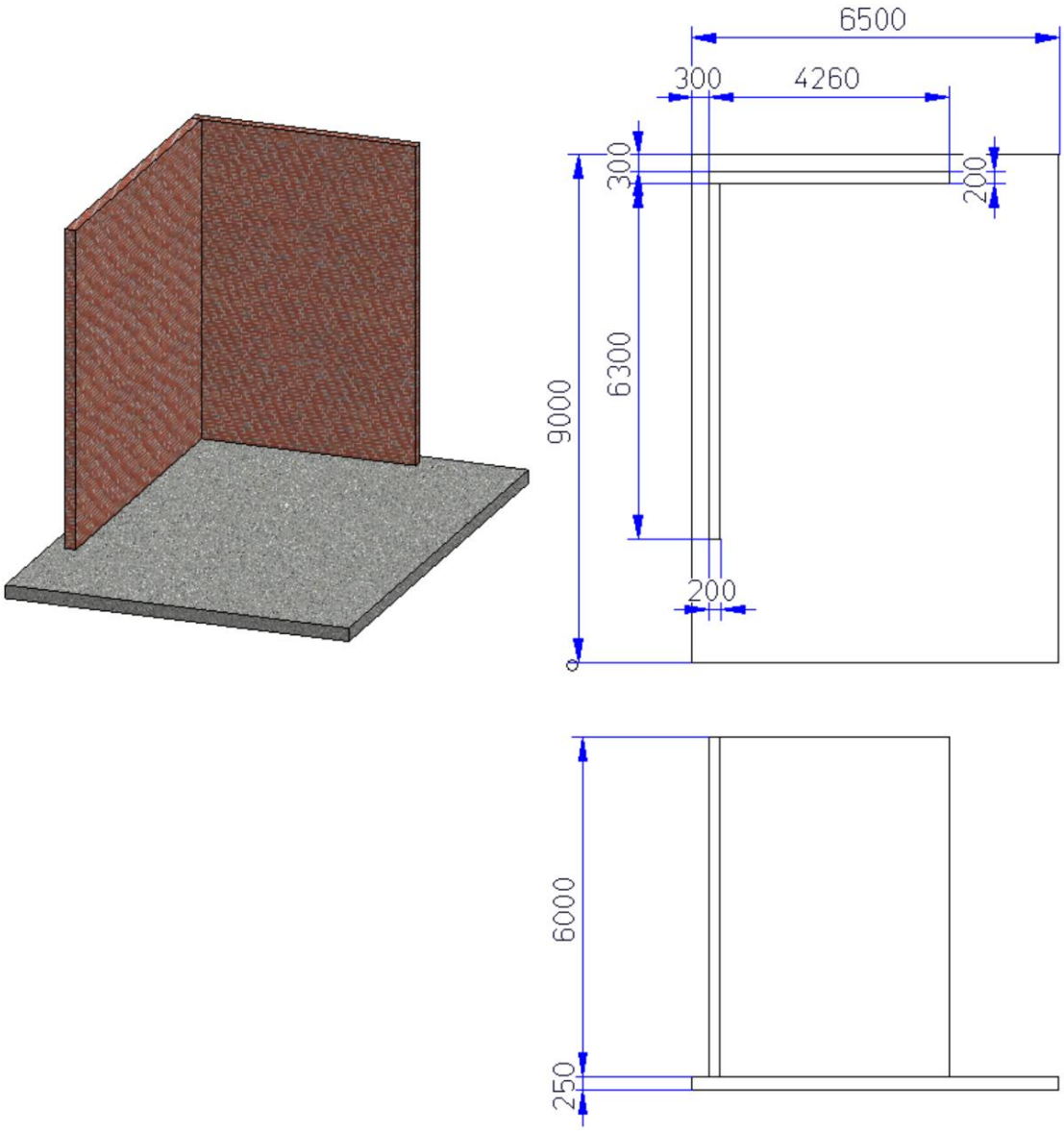


Figure 367 Walls and flooring

16.3.1 Recommended steps for the construction:

- Start with making a grid: **Steel Engineering > Further functions > Settings > 3-D Grid**

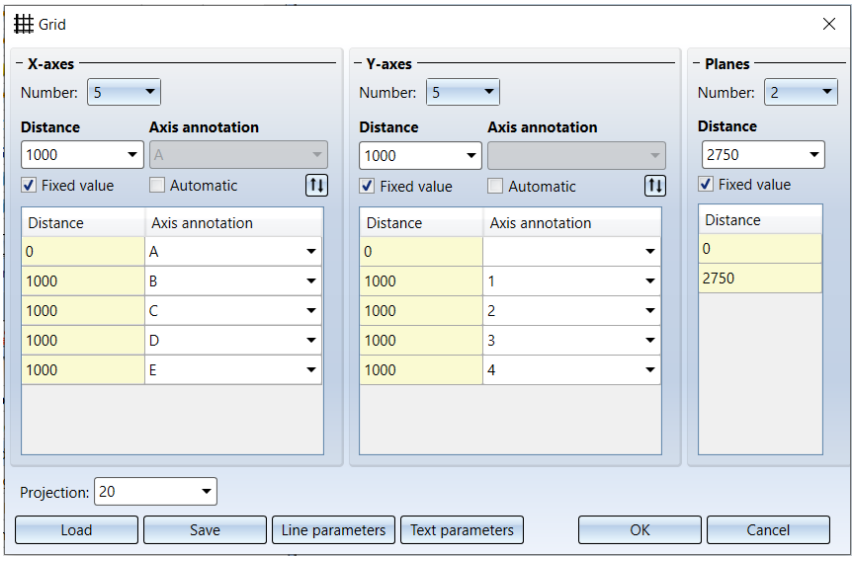


Figure 368 Steel engineering grid dialogue

- Place it in the corner of the 2 walls

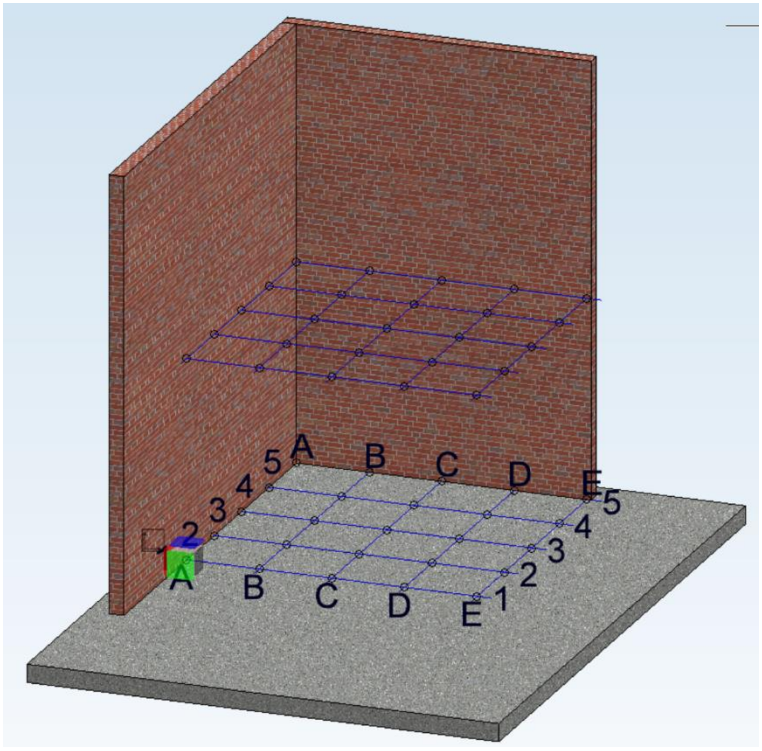


Figure 369 Grids placed in model

- Place the beams on top of the grid. Type = U240. – U (DIN 1026 U)

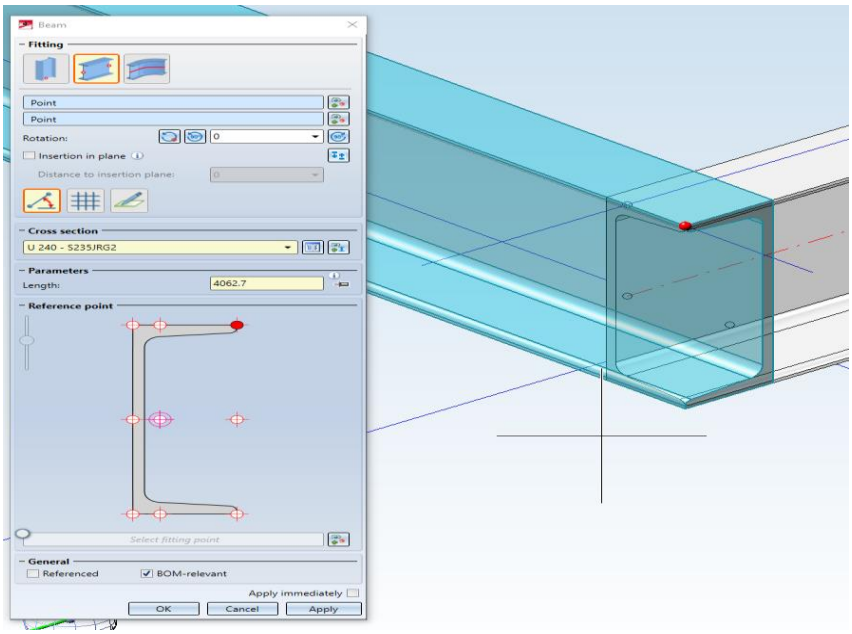


Figure 370 Insertion of standard U-profiles

- As well as vertical pillars according to the image below:

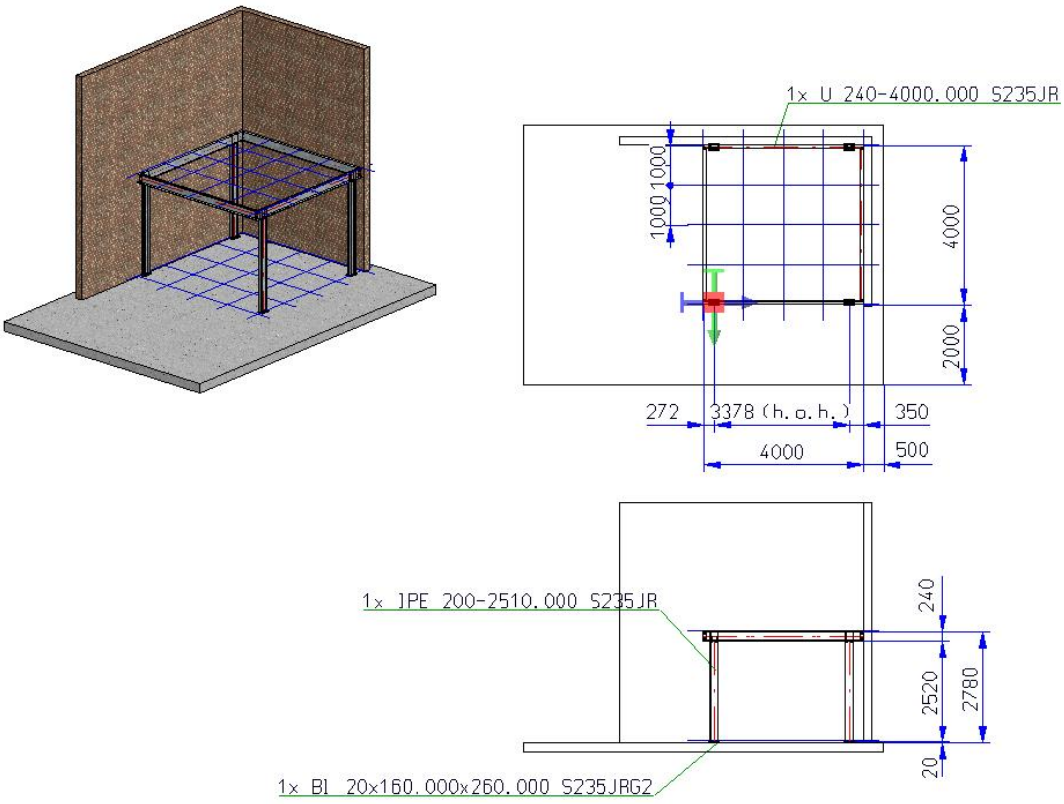


Figure 371 Post and girder distribution

16.3.2 Front plate connection to web/flange (2320)

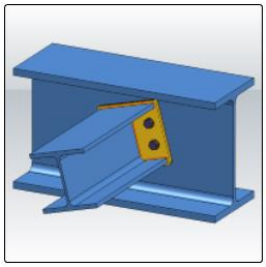


Figure 372 Civil engineering function - Front plate connection to web/flange (2320)

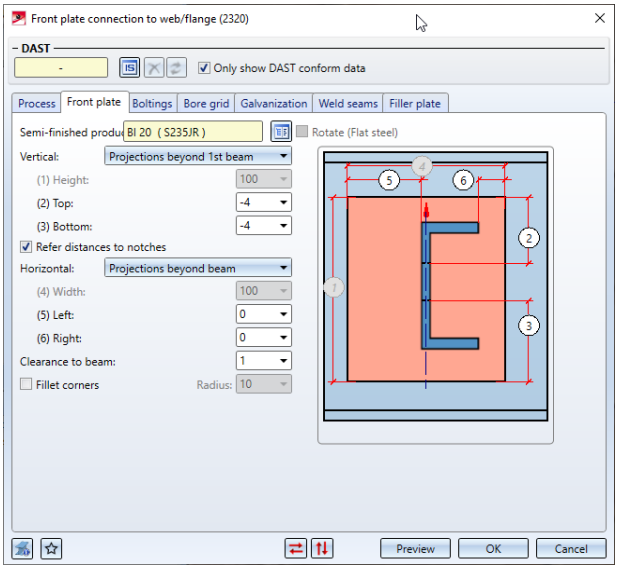


Figure 373 Front plate connection to web/flange (2320) – Front plate tab

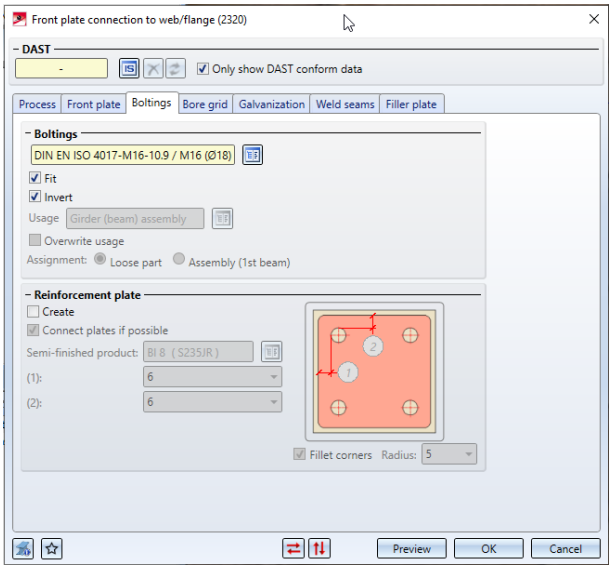


Figure 374 Front plate connection to web/flange (2320) – Boltings tab

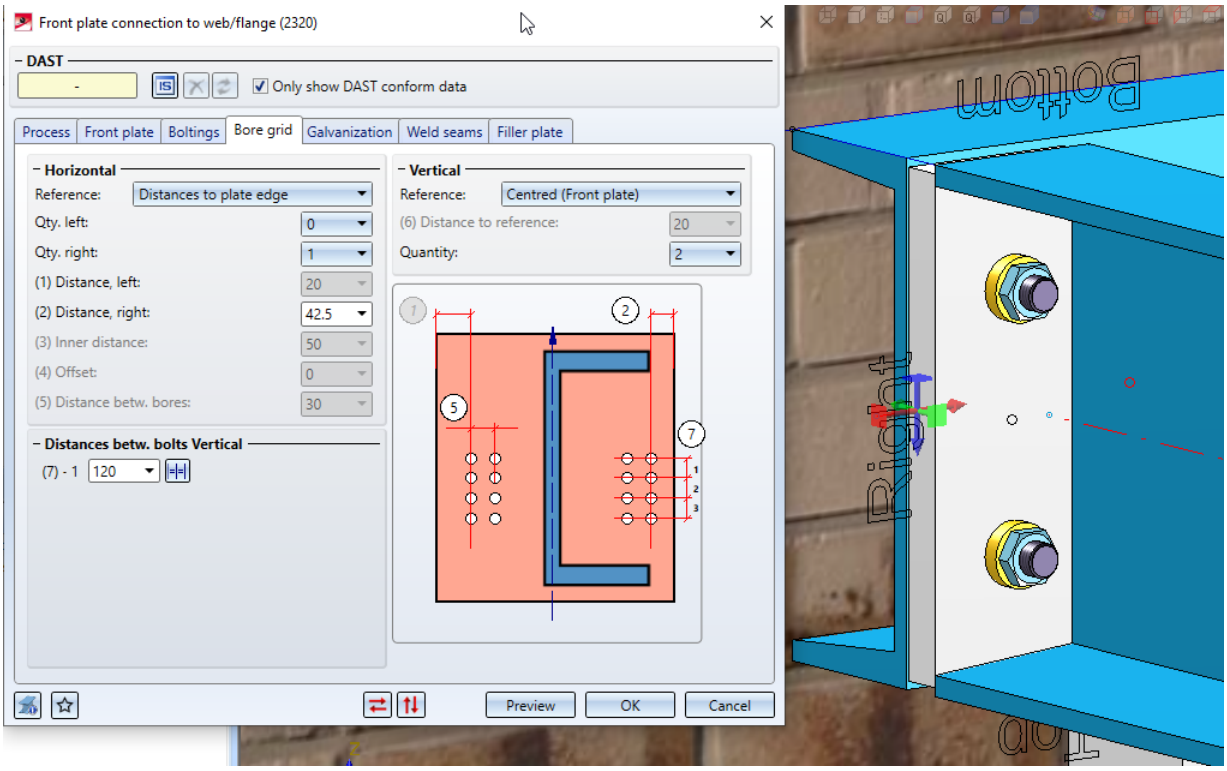


Figure 375 Front plate connection to web/flange (2320) – Bore grid tab and preview

- Start with the 2320 connection on the corners.

Tip:

- Use copy so you don't need to start every corner again

16.3.3 Staircase configurator

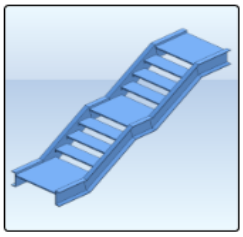


Figure 376 Civil engineering button - Staircase configurator

Start the staircase configurator. And press MMB, use the following parameters:

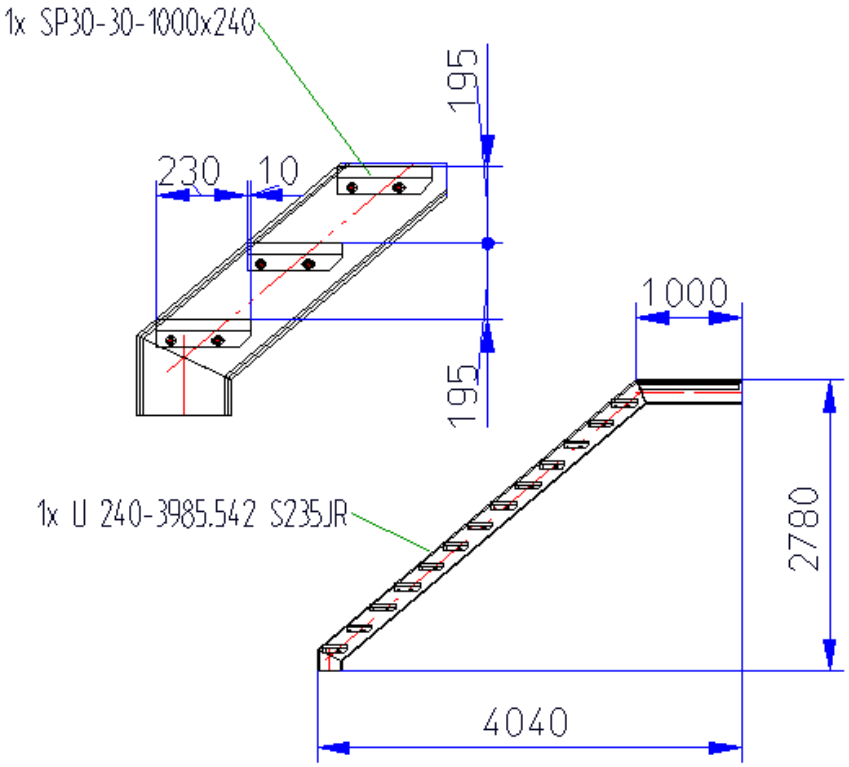


Figure 377 Side views of staircase with dimensioning

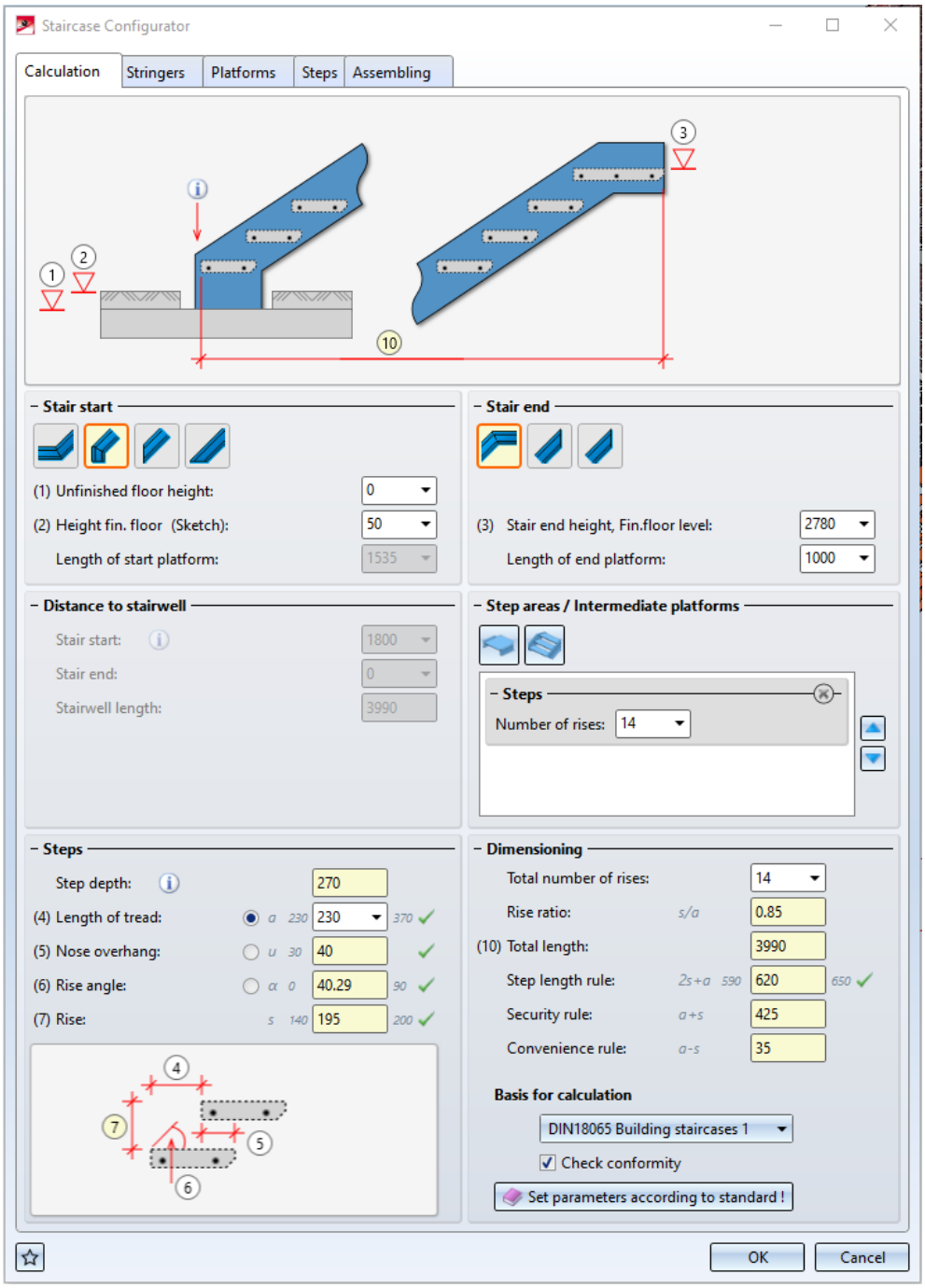


Figure 378 Staircase configurator – Calculation tab

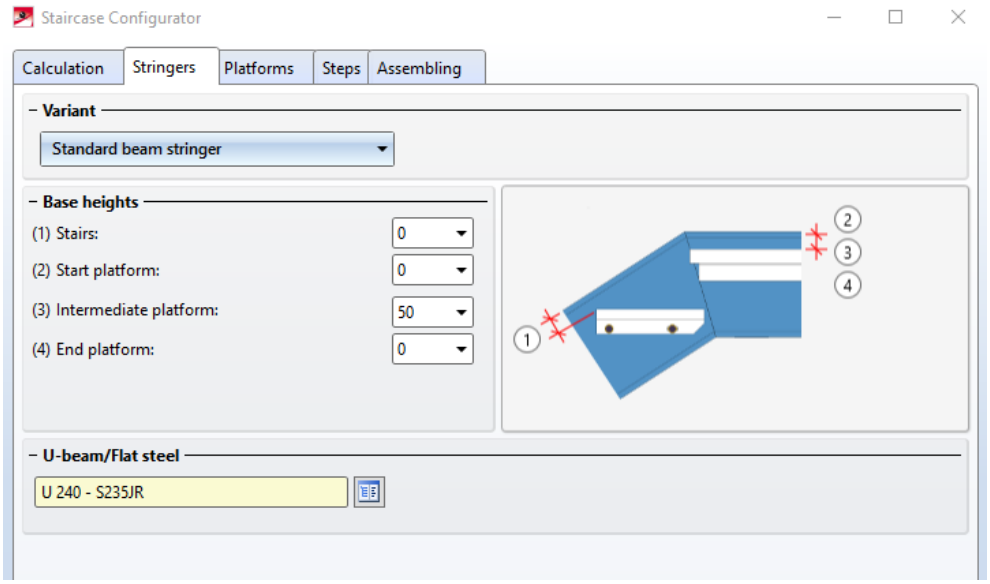


Figure 379 Staircase configurator – Stringers tab

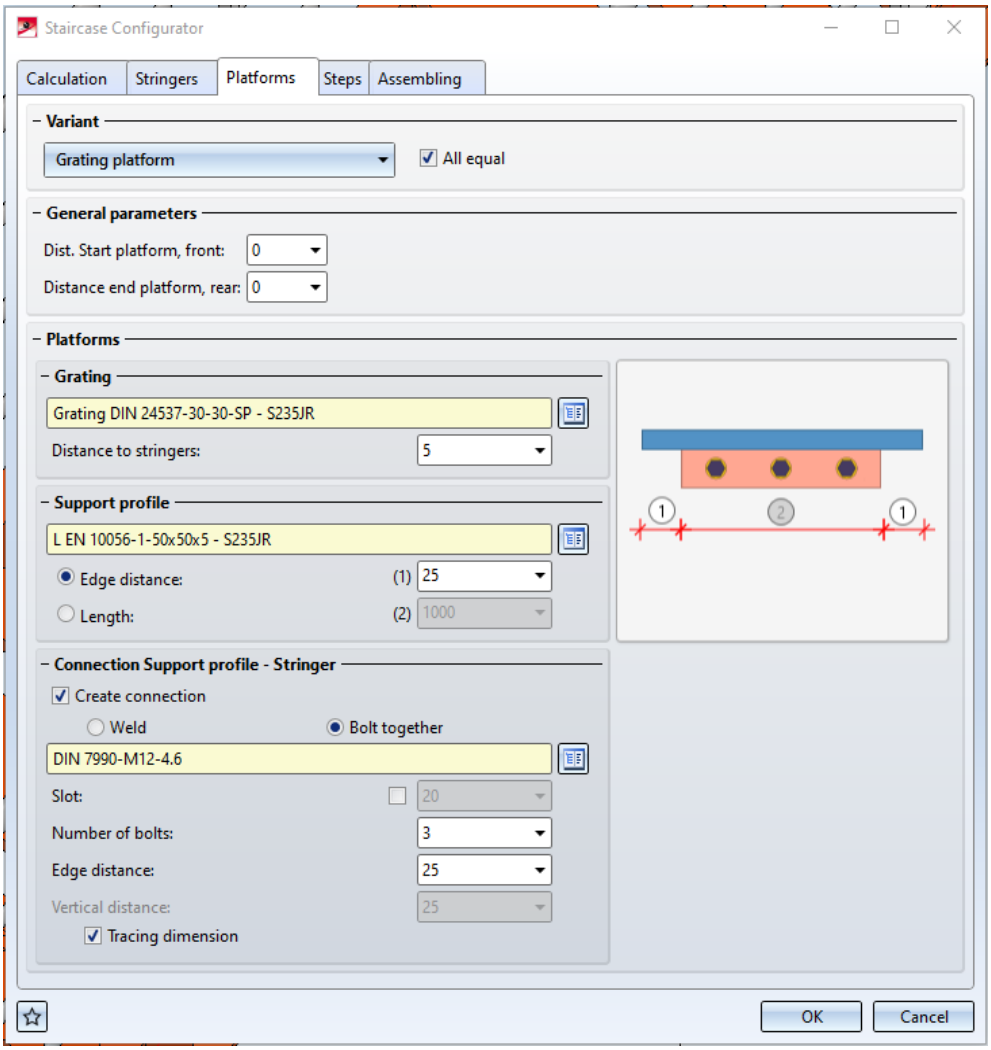


Figure 380 Staircase configurator – Platforms tab

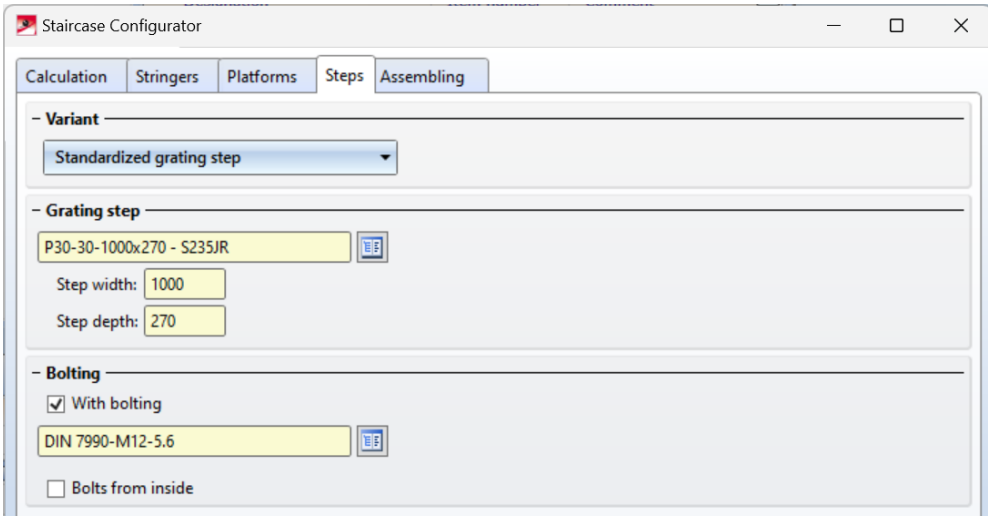


Figure 381 Staircase configurator – Steps tab

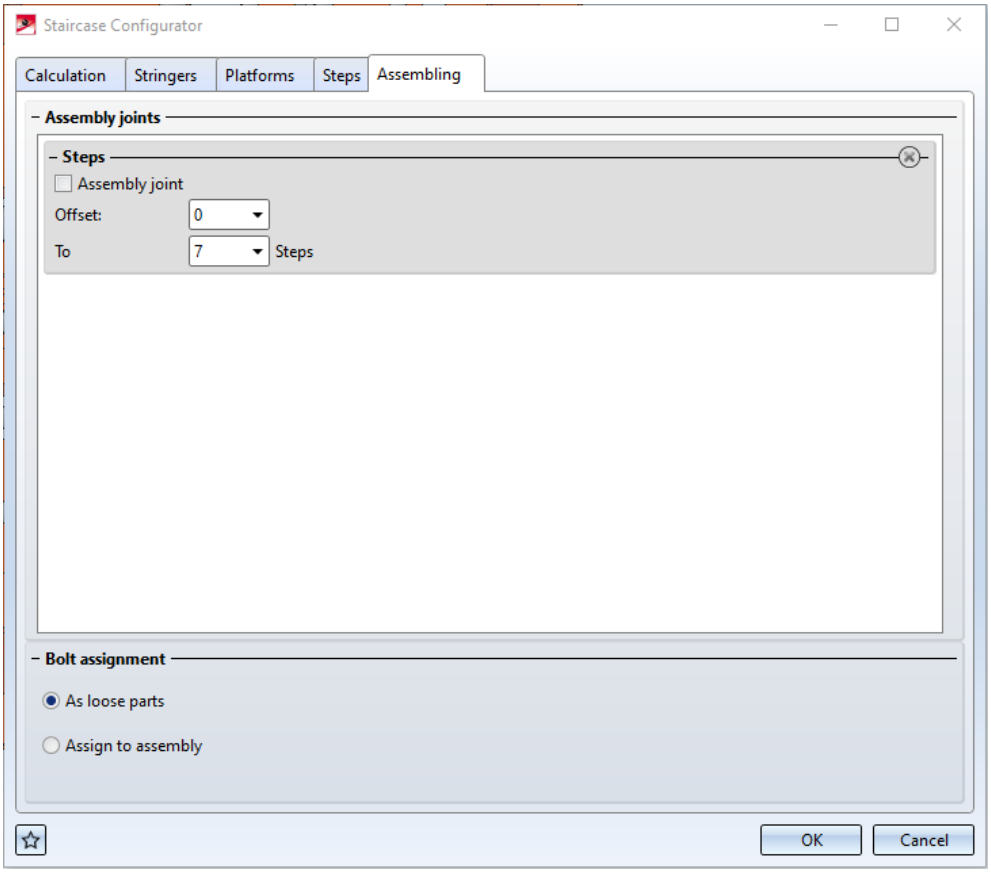


Figure 382 Staircase configurator – Assembling tab

- Press Ok and place the stair in the right position.
- If the stair is oriented wrong this can be solved by using the Move+Rotate part, via 2 planes function.

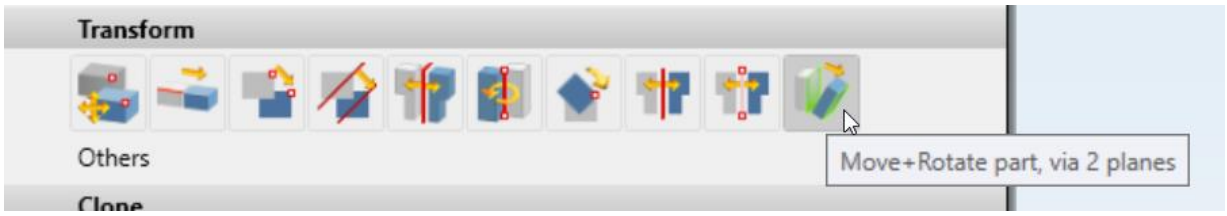


Figure 383 Assembly context menu – Move+Rotate part, via 2 planes

- Select on the stair the X axis by 2 points from right to left and select the Y axis by a line. Now the plain has it's Z direction away from you. Therefore you can easly select a plain on the beam where it should fit.

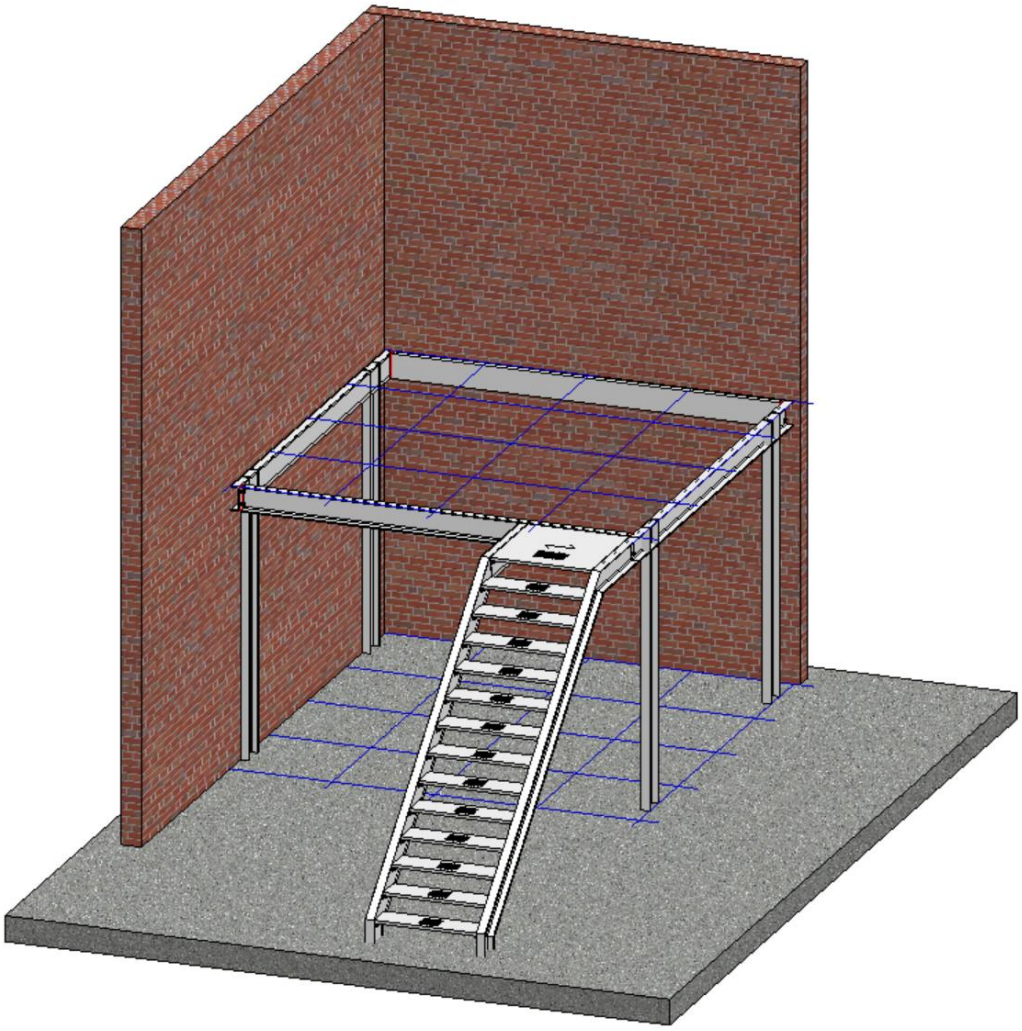


Figure 384 Resulting staircase

- Remove the upper beam to make it one long beam with mire. Alternative: Make the staircase a bolt on staircase.

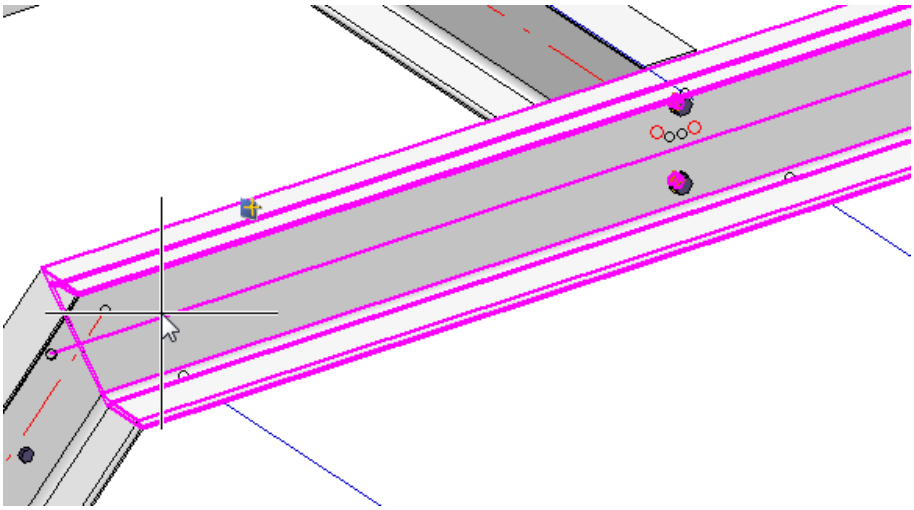


Figure 385 Mitre staircase to platform

16.3.4 Girder connection beam to web with 2 plates and stiffener (1211)

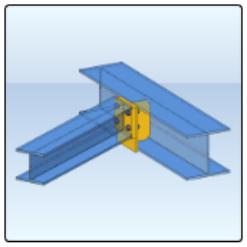


Figure 386 Civil engineering function button - Girder connection beam to web with 2 plates and stiffener (1211)

- Use the 1211 connection to connect the left side of the staircase.

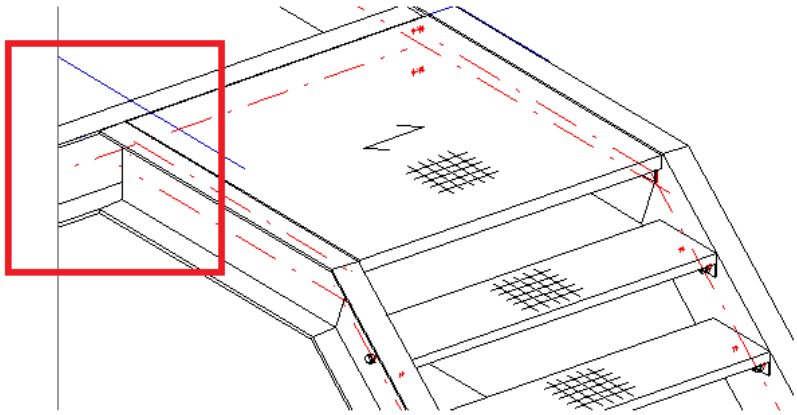


Figure 387 Indication of connection position

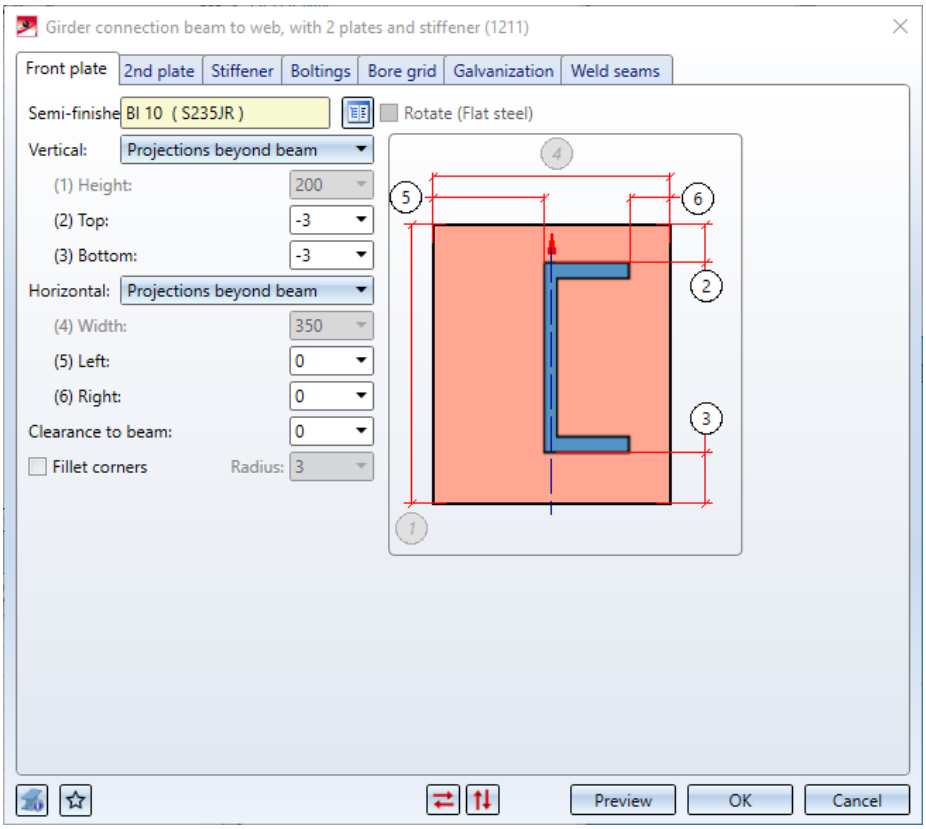


Figure 388 Girder connection beam to web with 2 plates and stiffener (1211) – Front plate tab

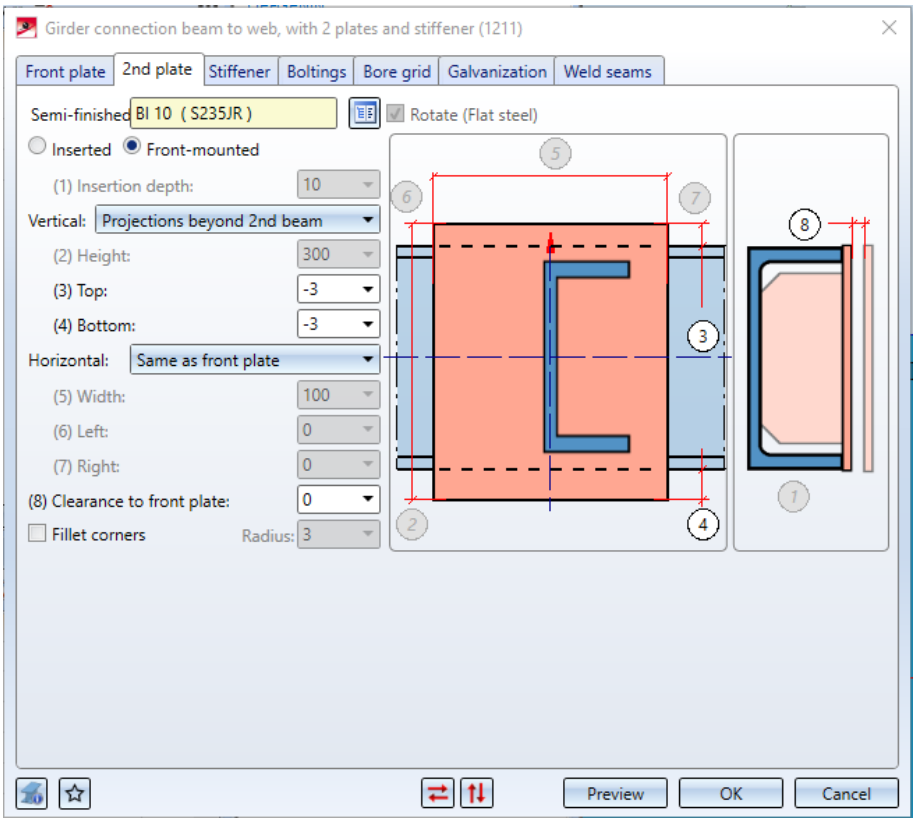


Figure 389 Girder connection beam to web with 2 plates and stiffener (1211) – 2nd plate tab

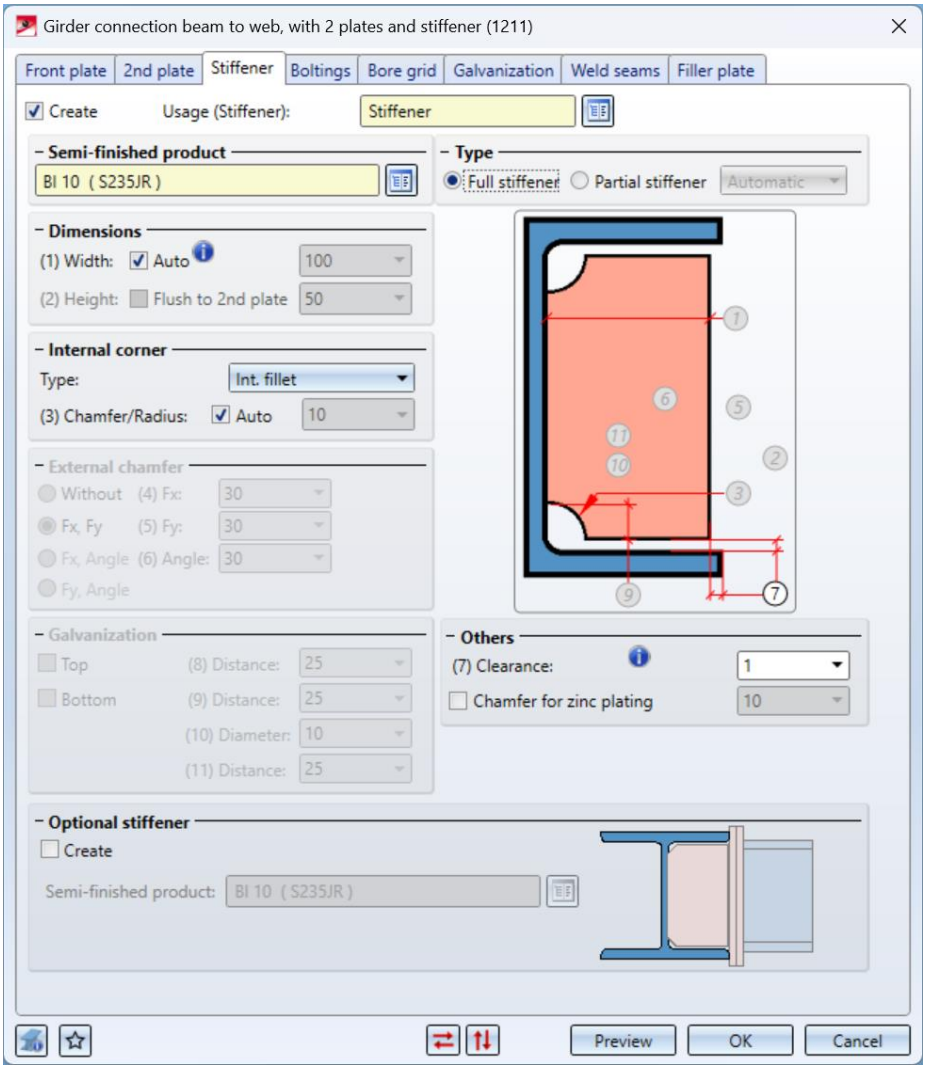


Figure 390 Girder connection beam to web with 2 plates and stiffener (1211) – Stiffner tab

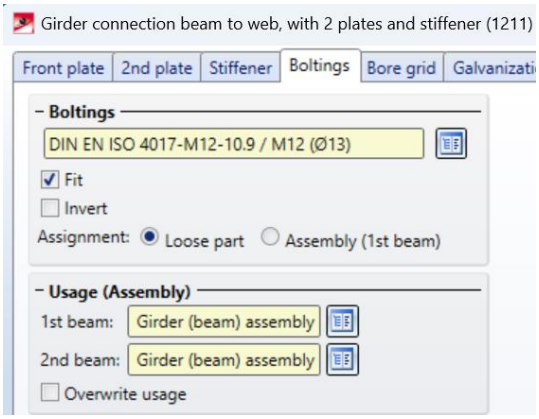


Figure 391 Girder connection beam to web with 2 plates and stiffener (1211) – Boltings tab

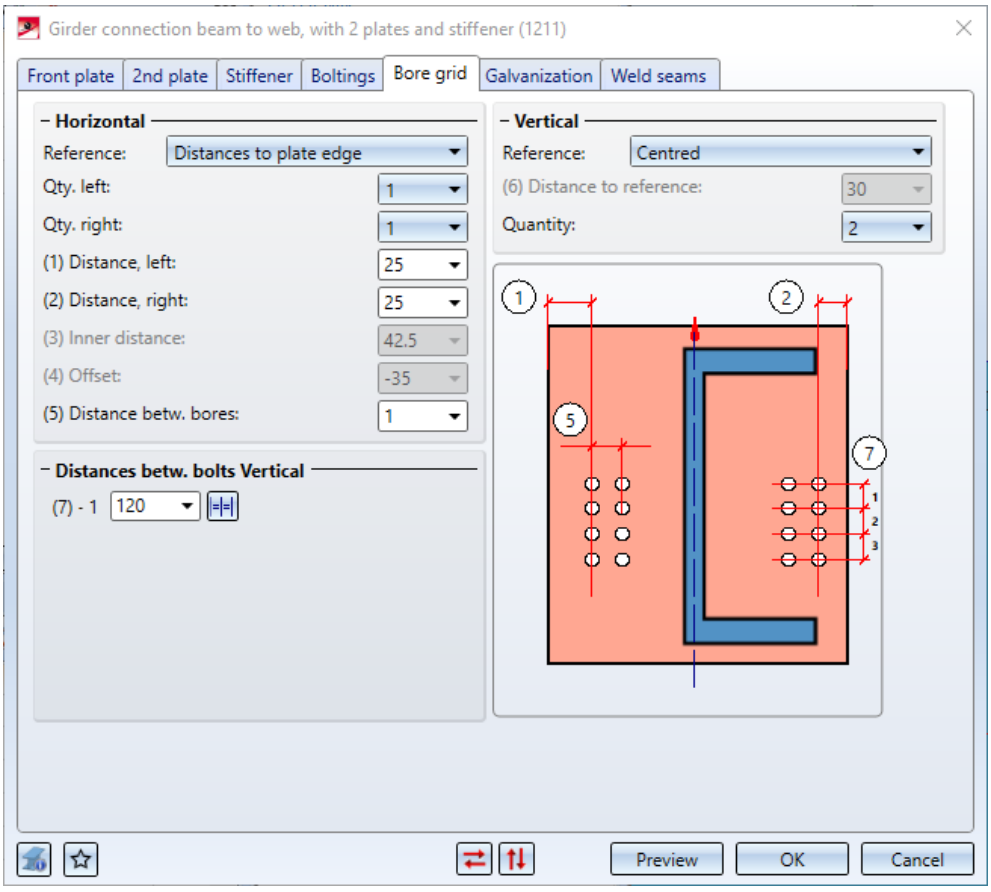


Figure 392 Girder connection beam to web with 2 plates and stiffener (1211) – Bore grid tab

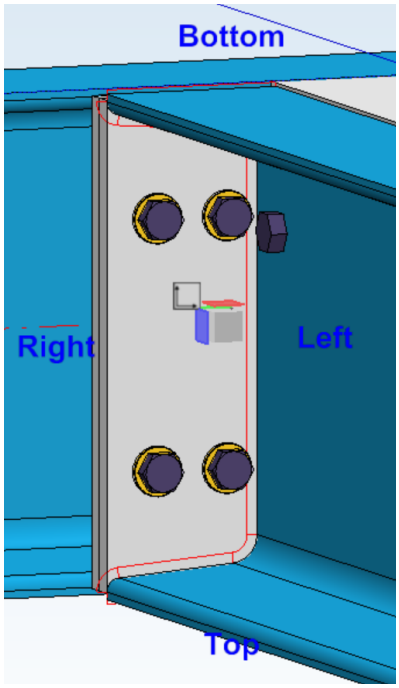


Figure 393 Resulting connection (1211)

16.3.5 Front plate connection to flange (2330)

Figure 394 Civil engineering function button - Front plate connection to flange (2330)

- Connect the standing beams with the construction using the function of 2330

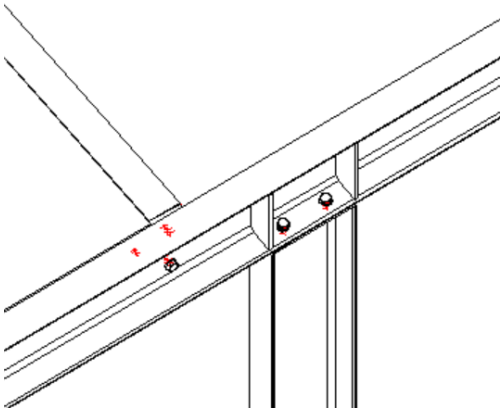


Figure 395 example of Front plate connection to flange (2330)

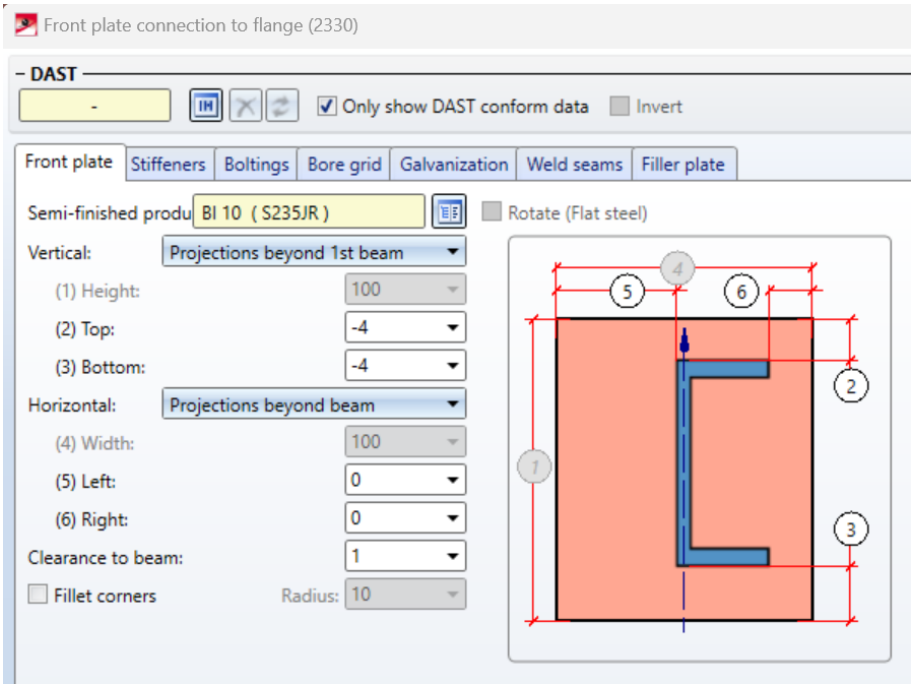


Figure 396 Front plate connection to flange (2330) – Front plate tab

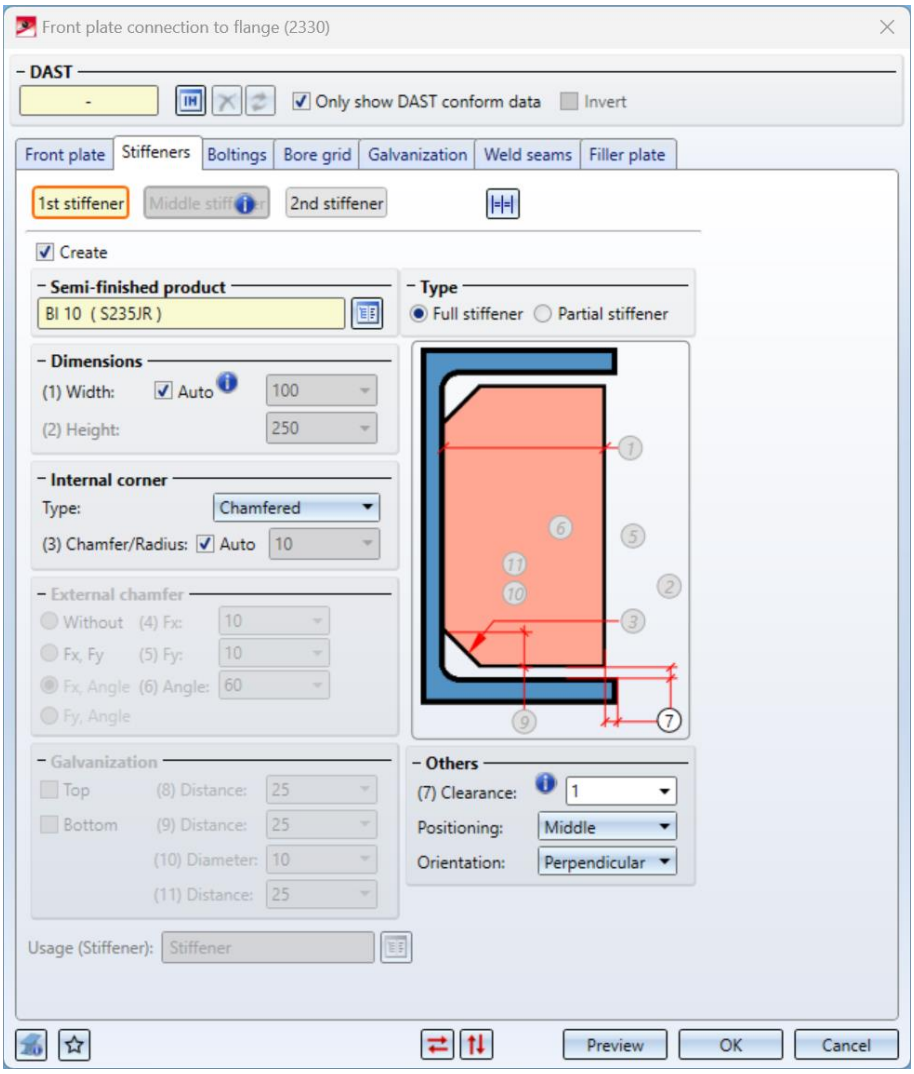


Figure 397 Front plate connection to flange (2330) – Stiffners tab

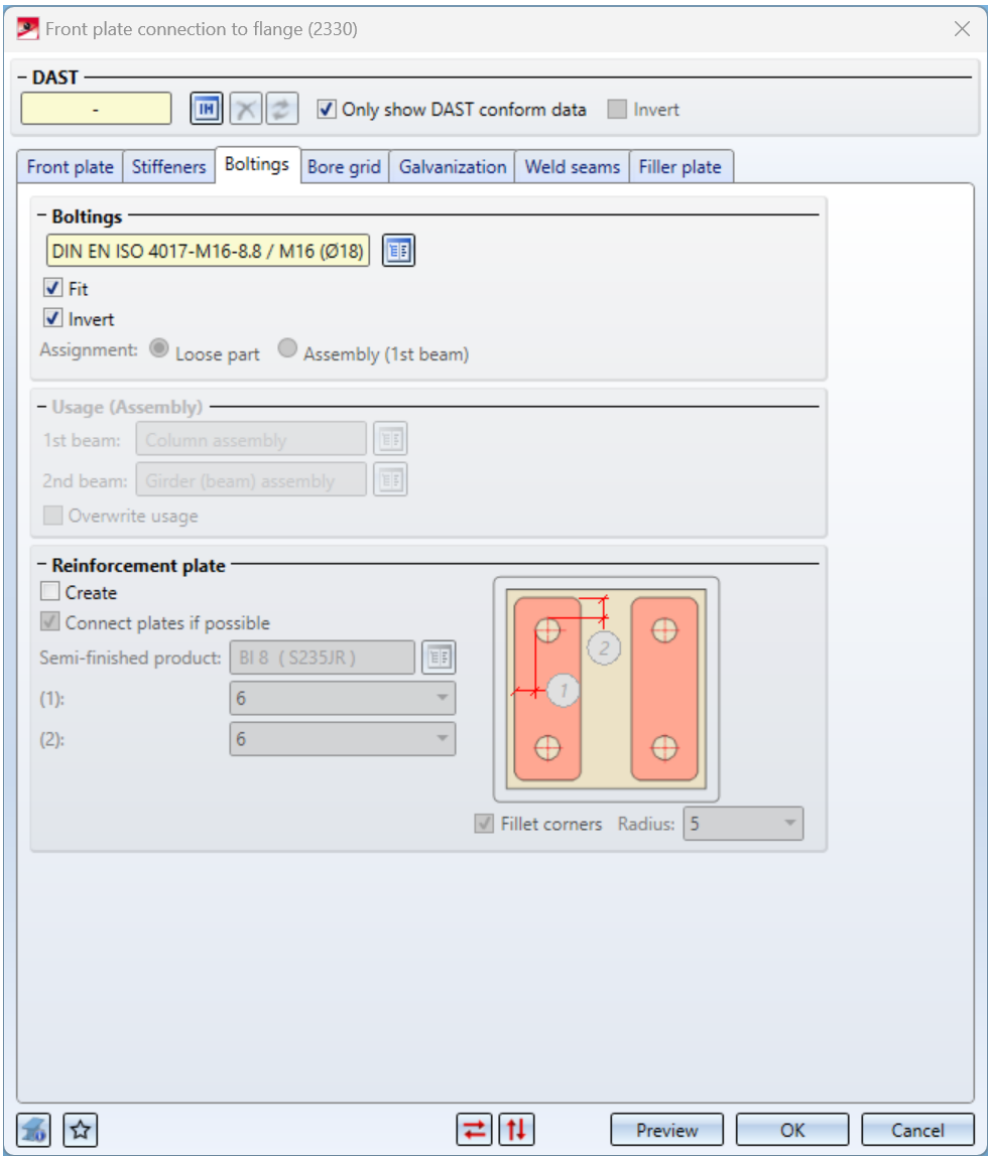


Figure 398 Front plate connection to flange (2330) – Boltings tab

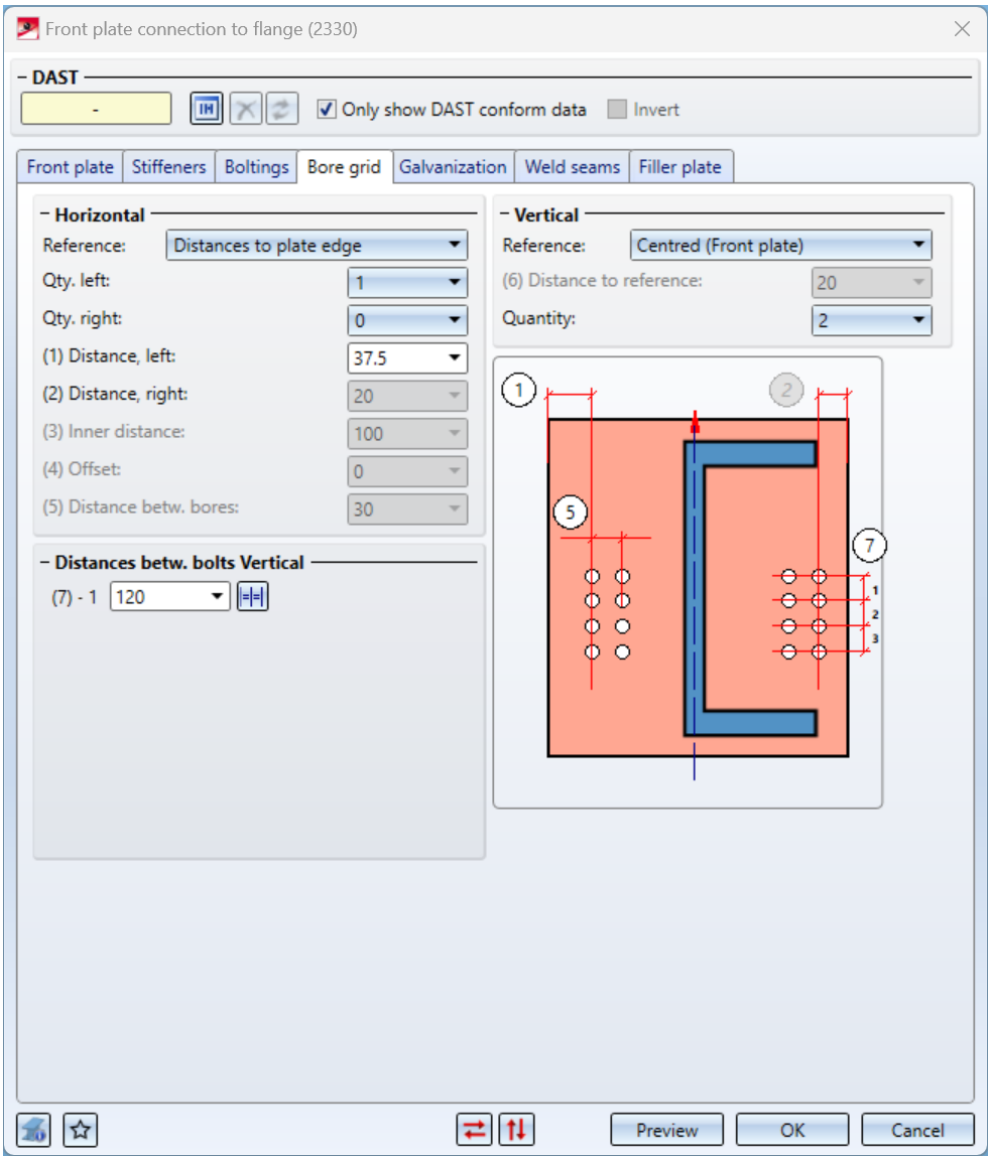


Figure 399 Front plate connection to flange (2330) – Bore grid tab

- Use copy to adjust the other pillars

16.3.6 Placing a endplate using: Endplate (2102)

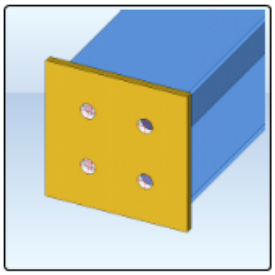


Figure 400 Civil engineering function button - Endplate (2102)

Use endplate or anchor to secure the construcion on the flooring.

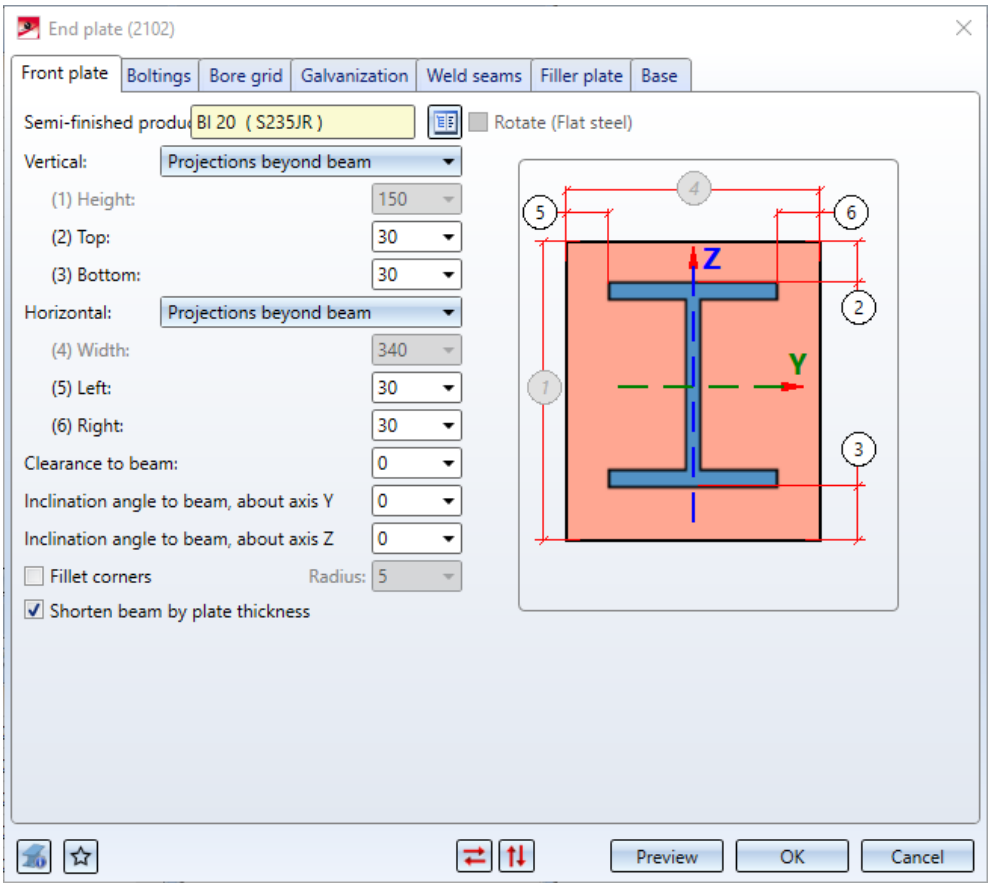


Figure 401 Endplate (2102) – Front plate tab

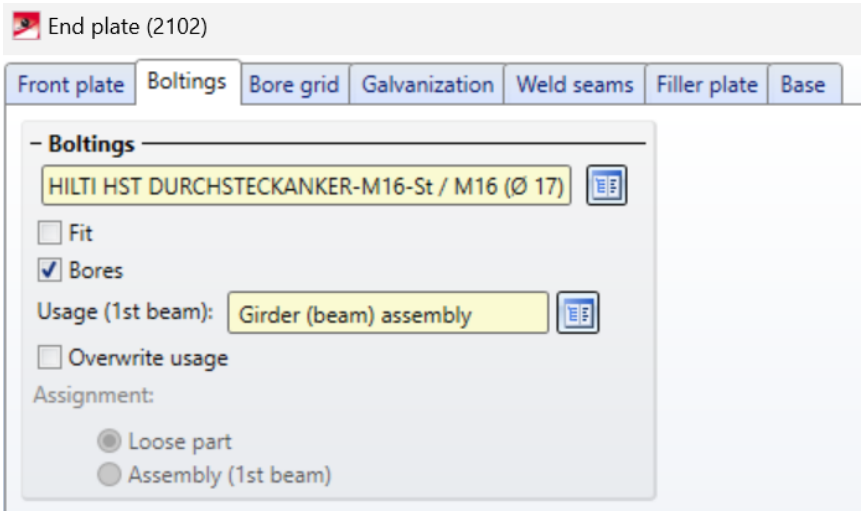


Figure 402 Endplate (2102) – Boltings tab

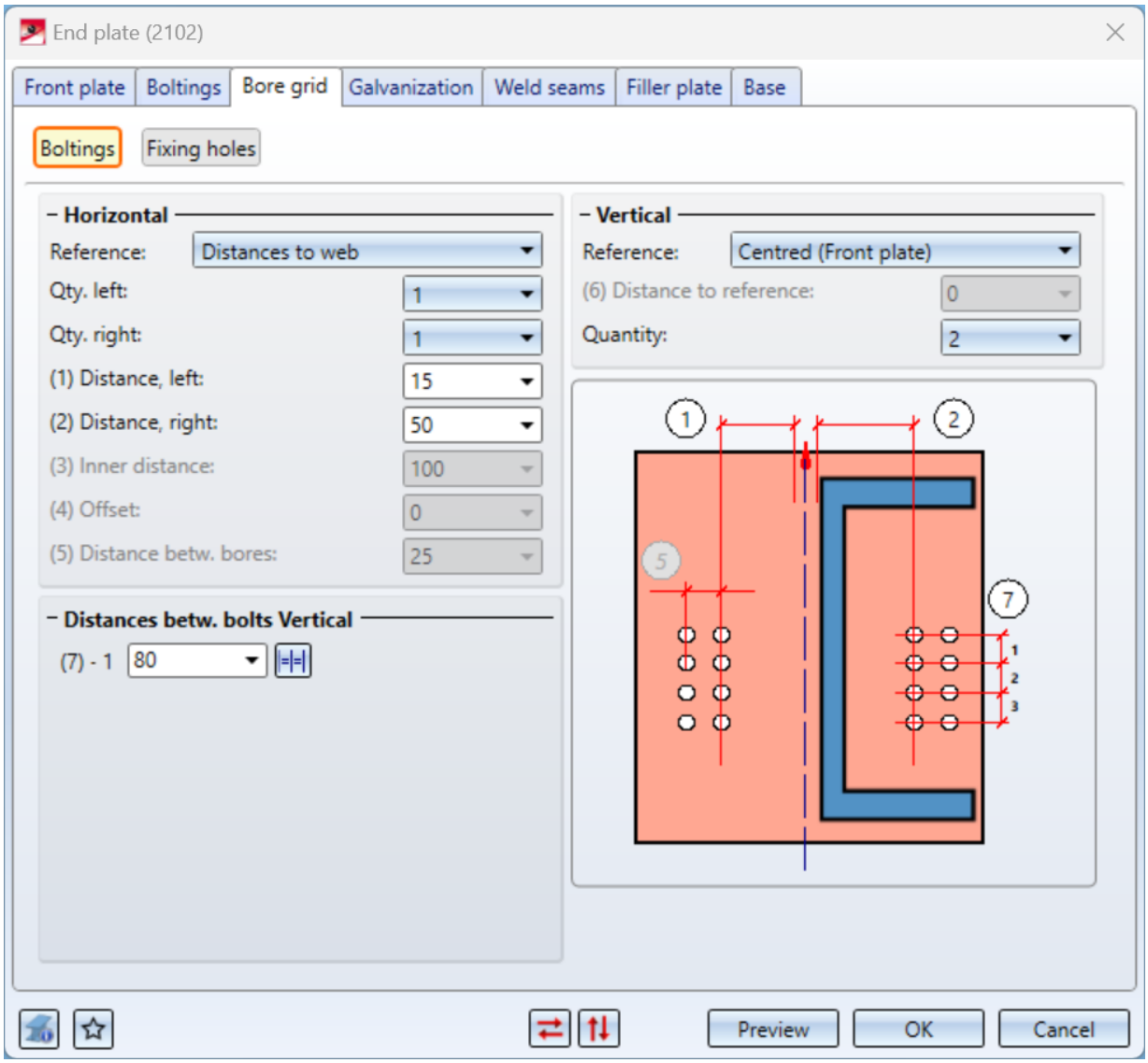


Figure 403 Endplate (2102) – Bore grid tab

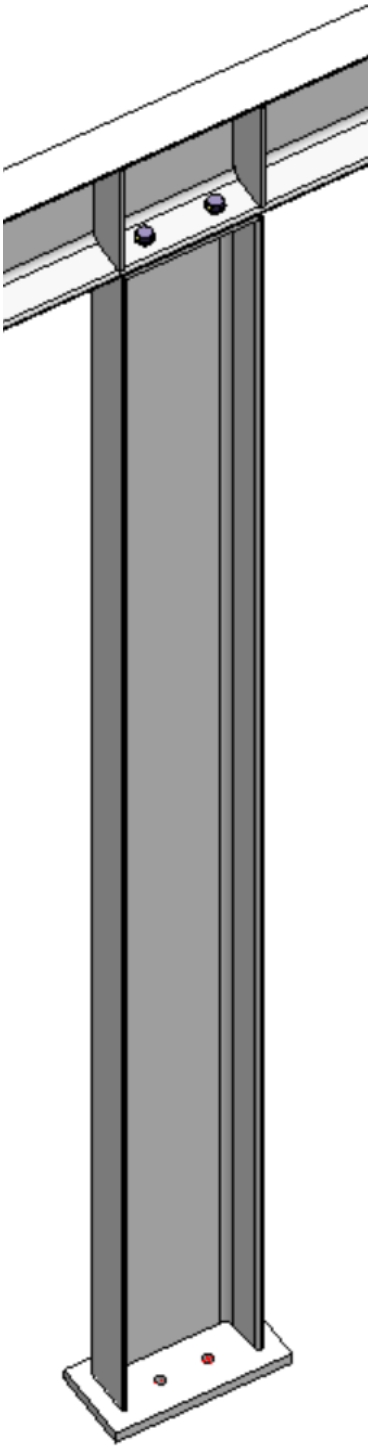


Figure 404 Resulting Endplate (2102)

16.3.7 Railing configurator (Railing along beams)

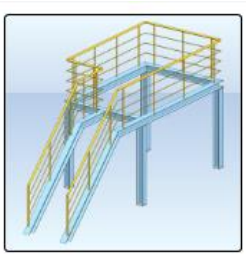


Figure 405 Civil engineering function button - Railing configurator (Railing along beams)

Tip:

- When using the railing configurator make favourites you would like to start your design. This way you can add more and more details. Instead of removing them.

Place the railing with the railing configurator. Make sure to select all beams. The parameters are on the next page.

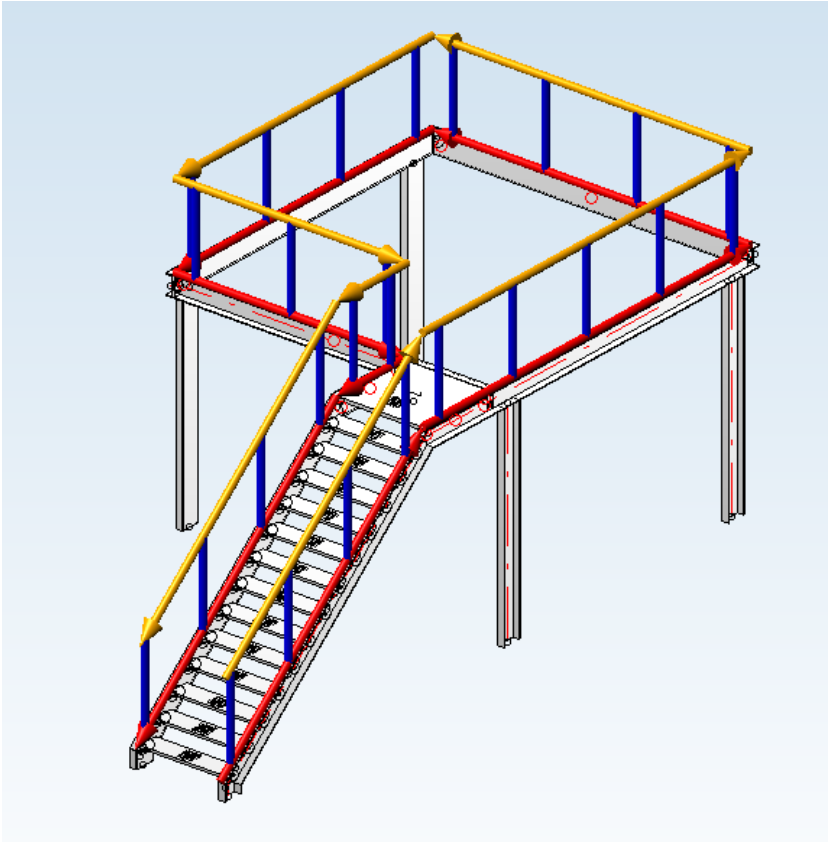


Figure 406 Preview of railing along beams

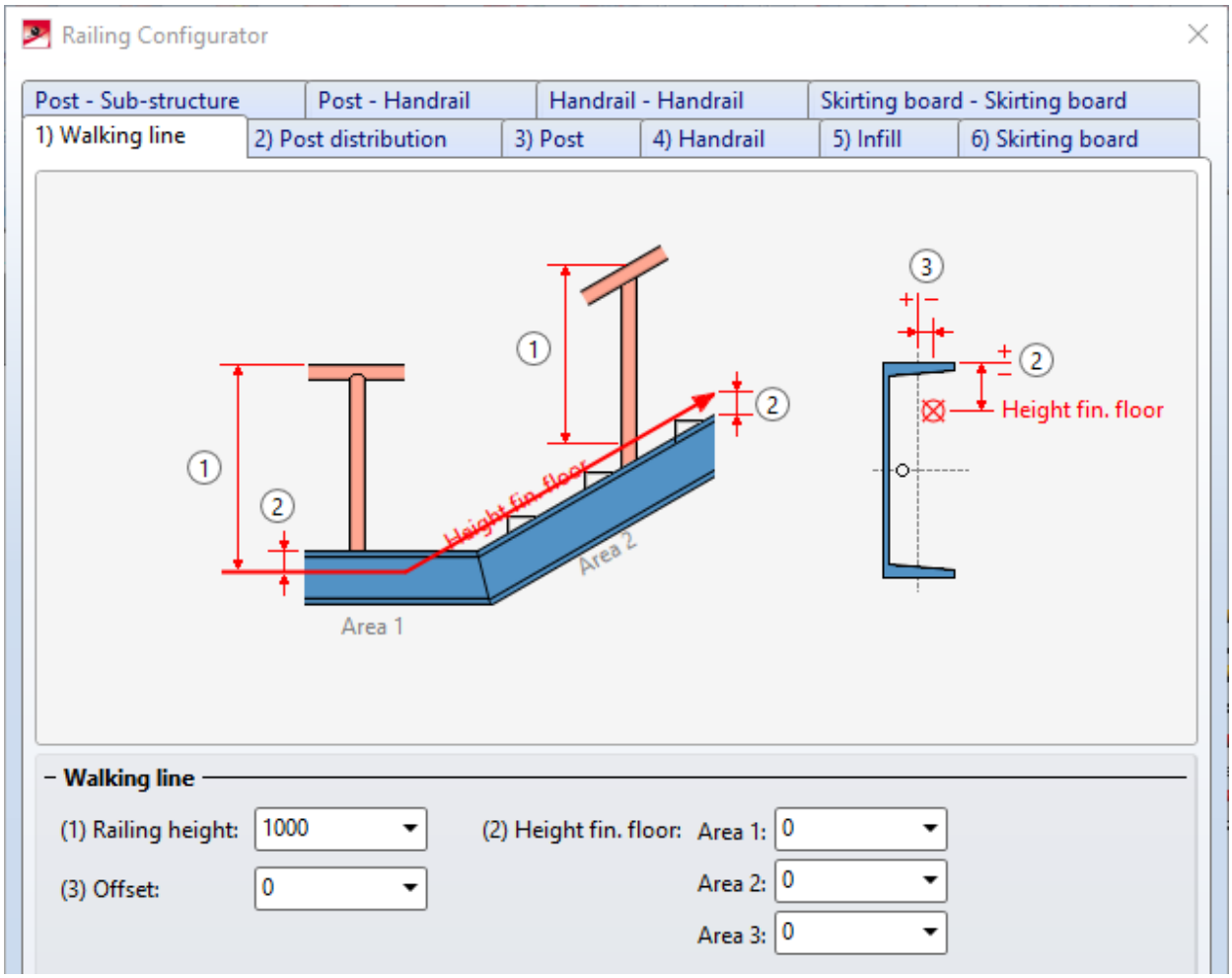


Figure 407 Railing configurator (Railing along beams) – Walking line tab

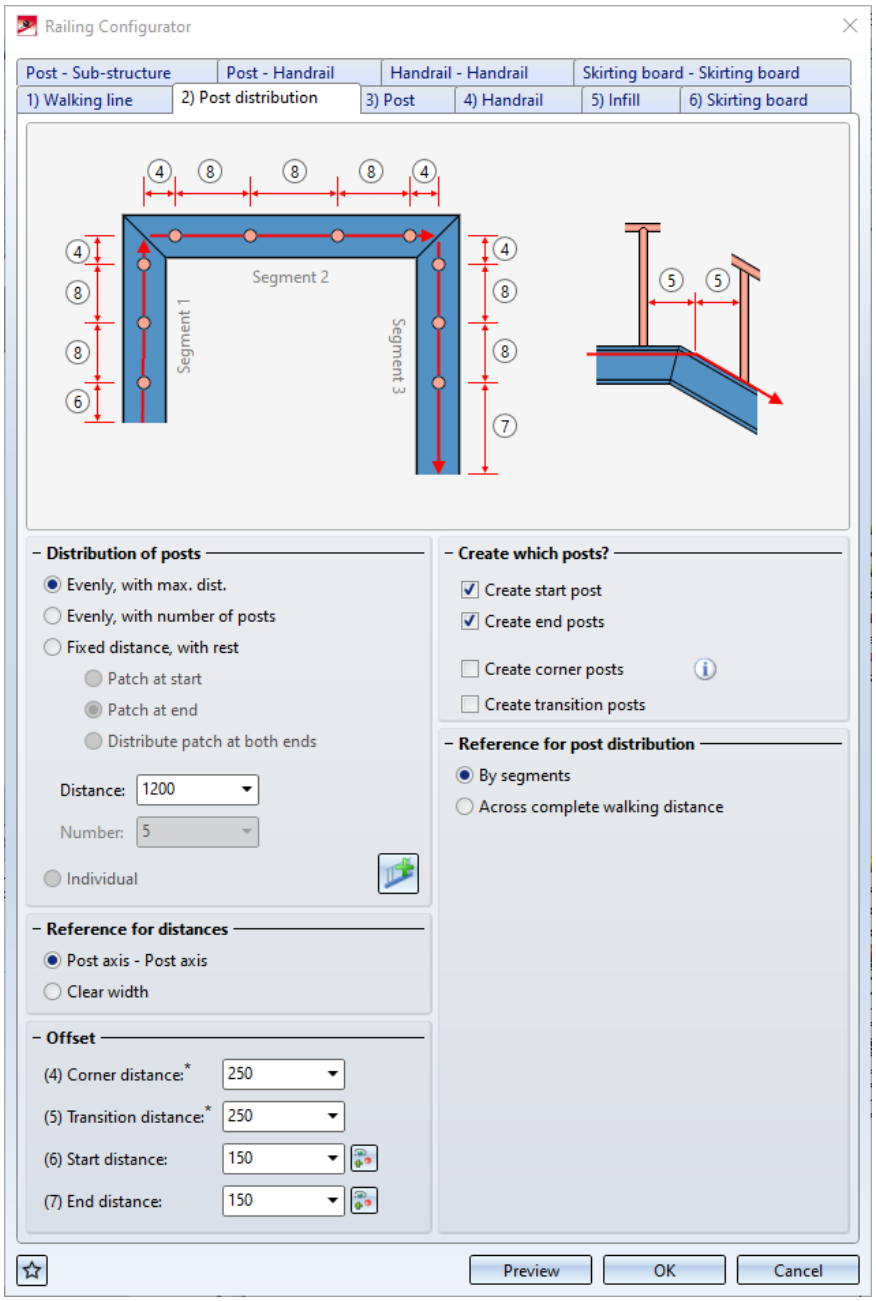


Figure 408 Railing configurator (Railing along beams) – Post distribution tab

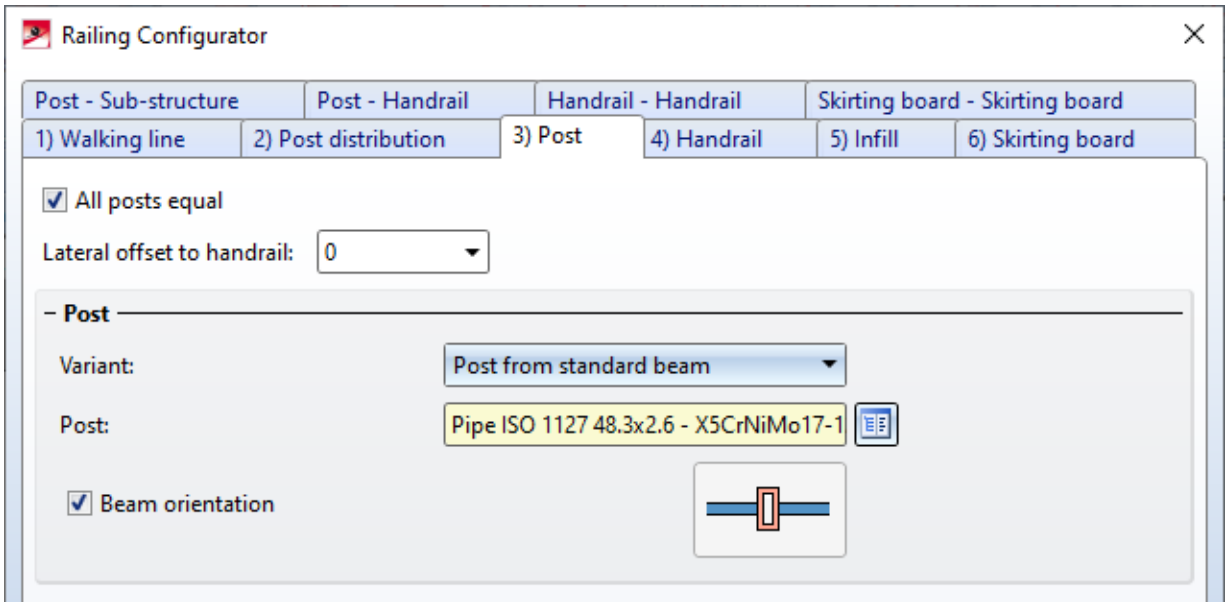


Figure 409 Railing configurator (Railing along beams) – Post tab

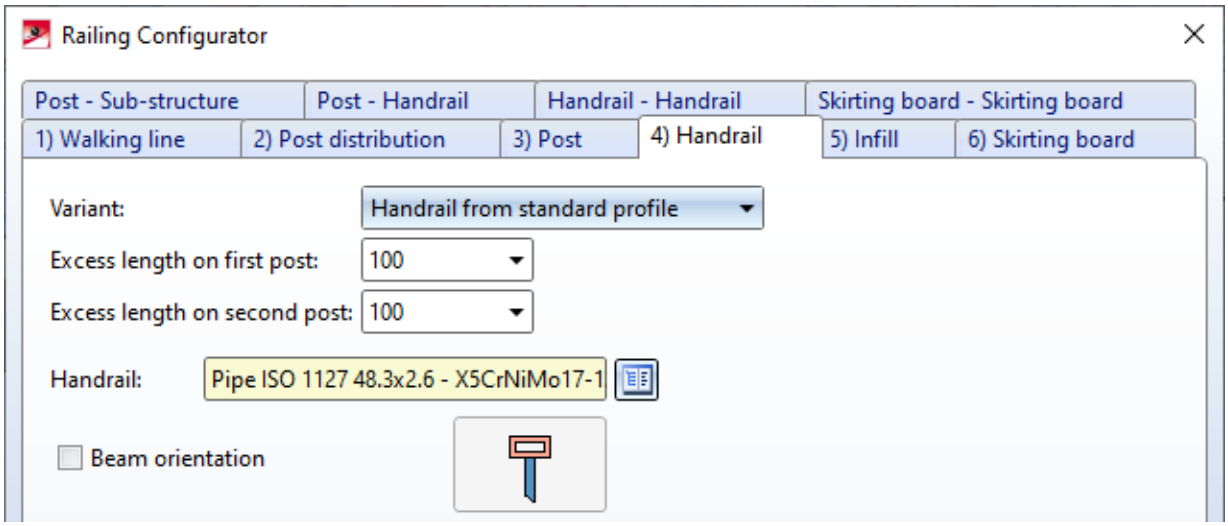


Figure 410 Railing configurator (Railing along beams) – Handrail tab

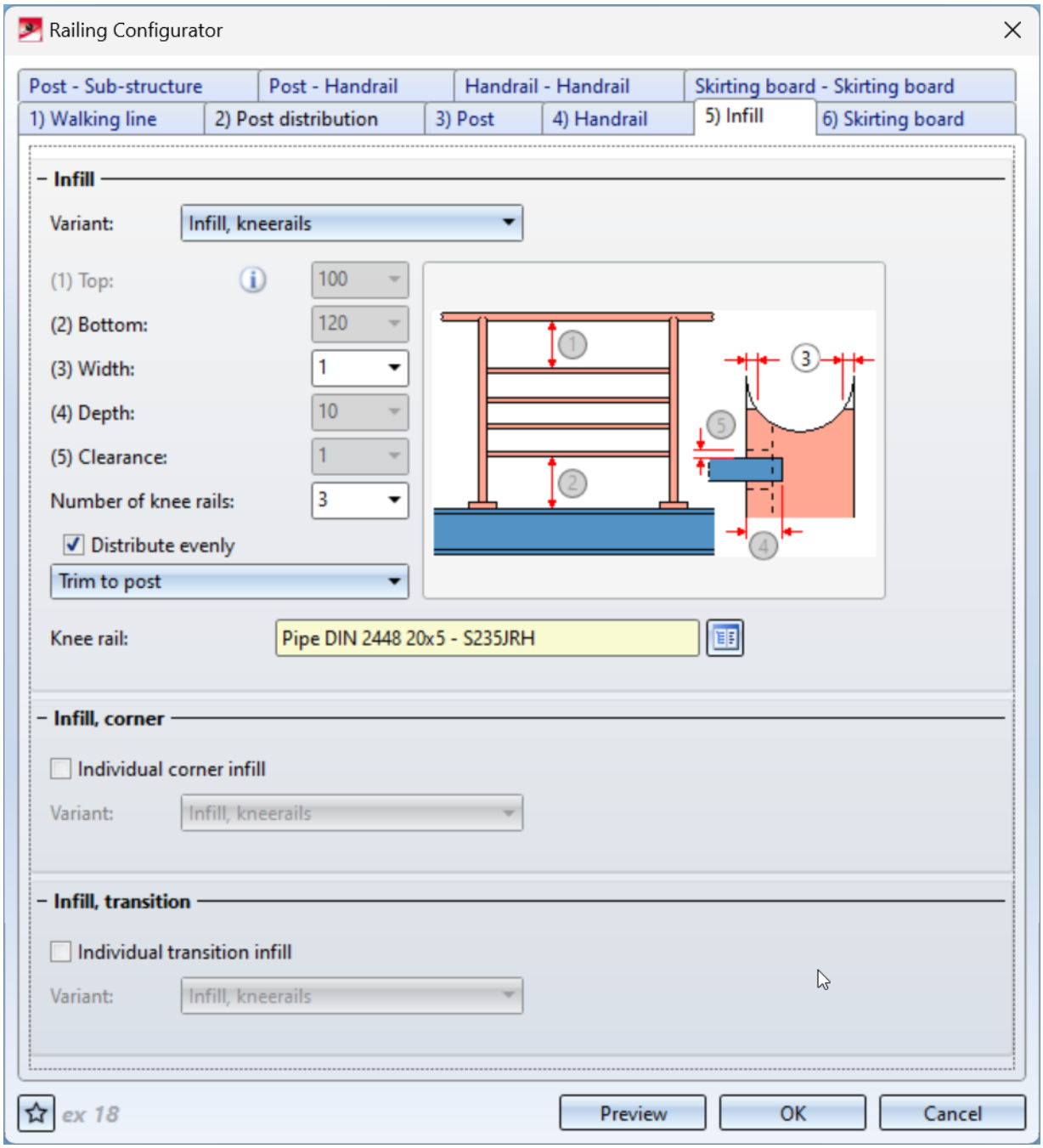


Figure 411 Railing configurator (Railing along beams) – Infill tab

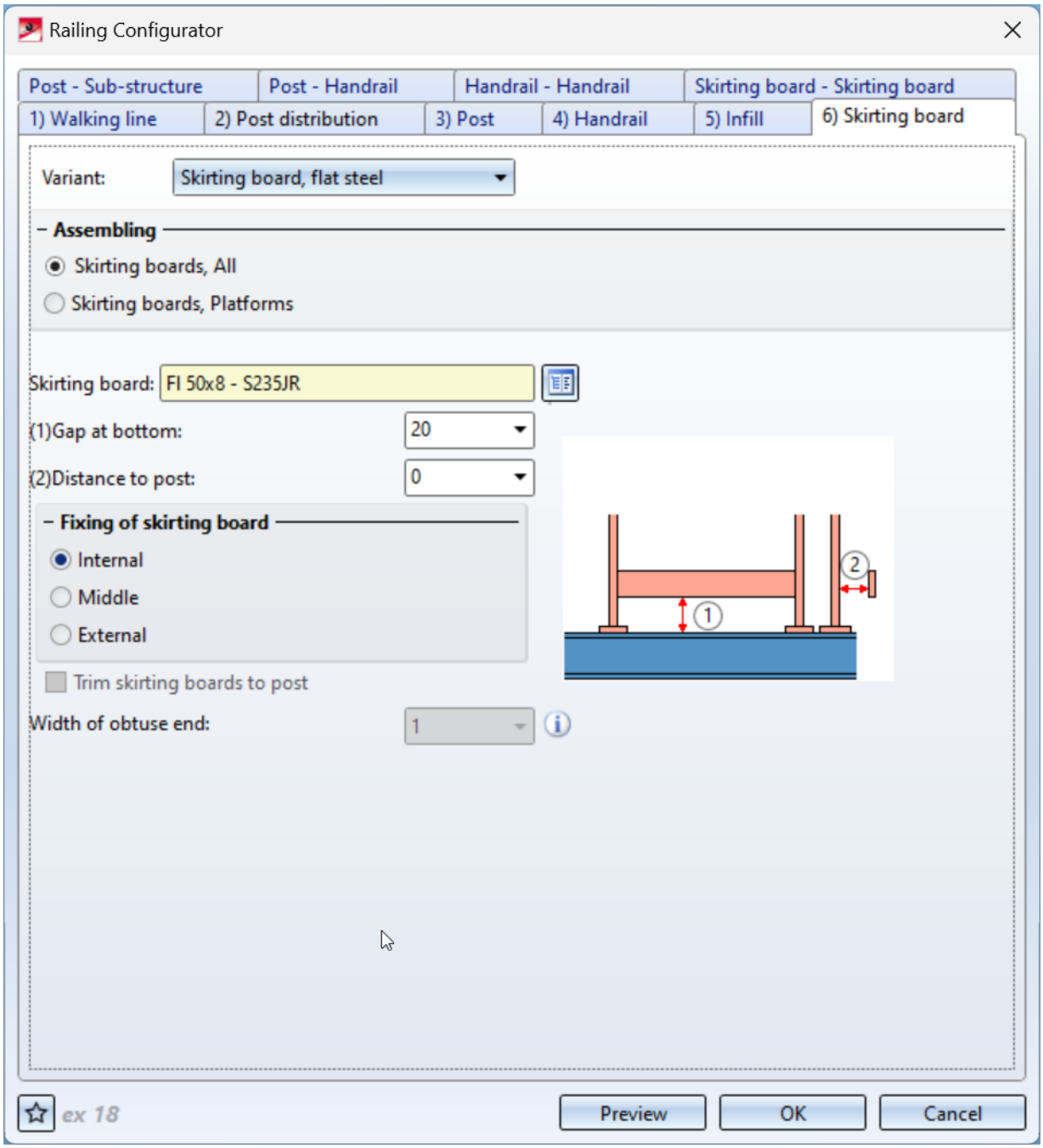


Figure 412 Railing configurator (Railing along beams) – Skirting board tab

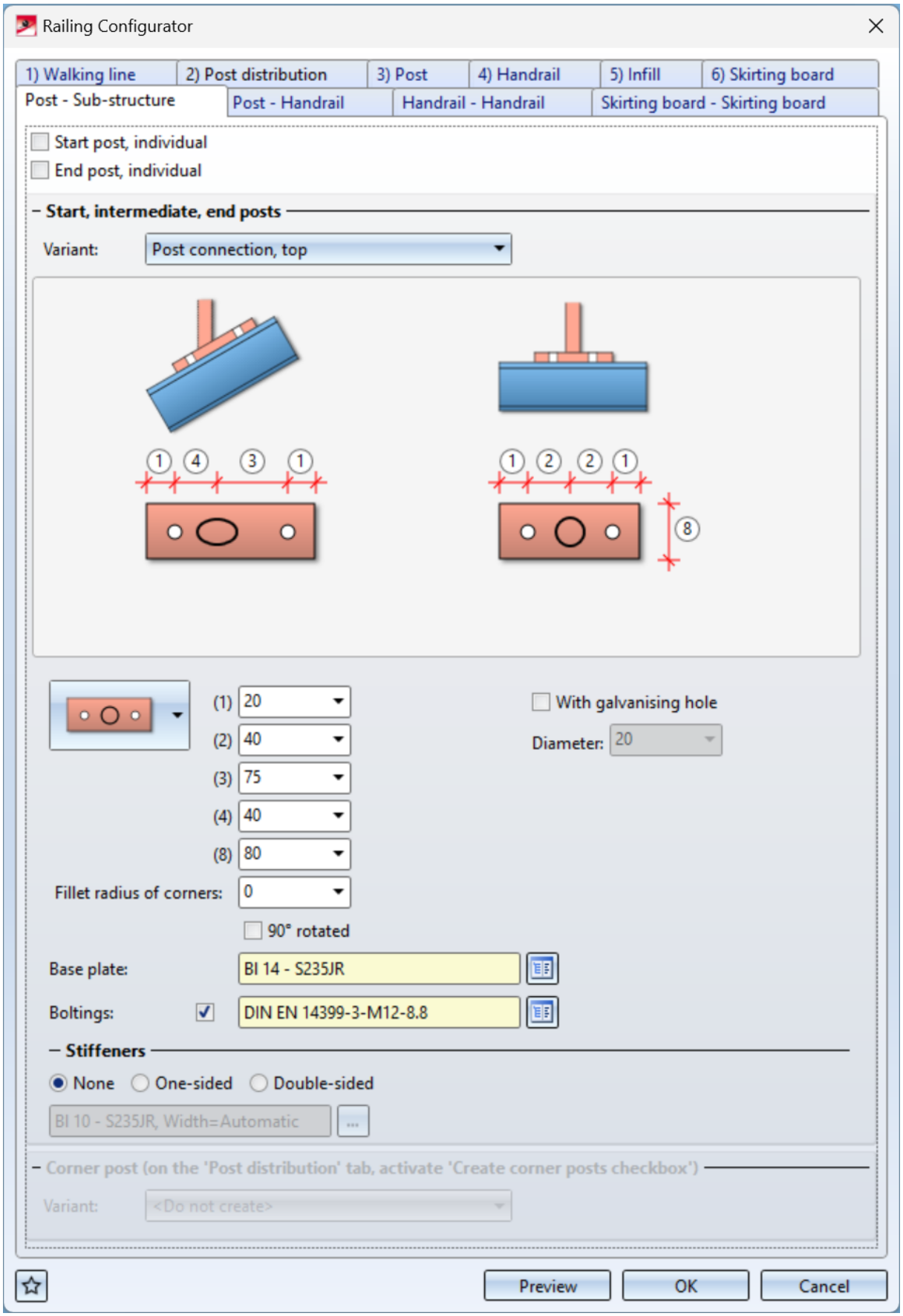


Figure 413 Railing configurator (Railing along beams) – Post-Sub-structure tab

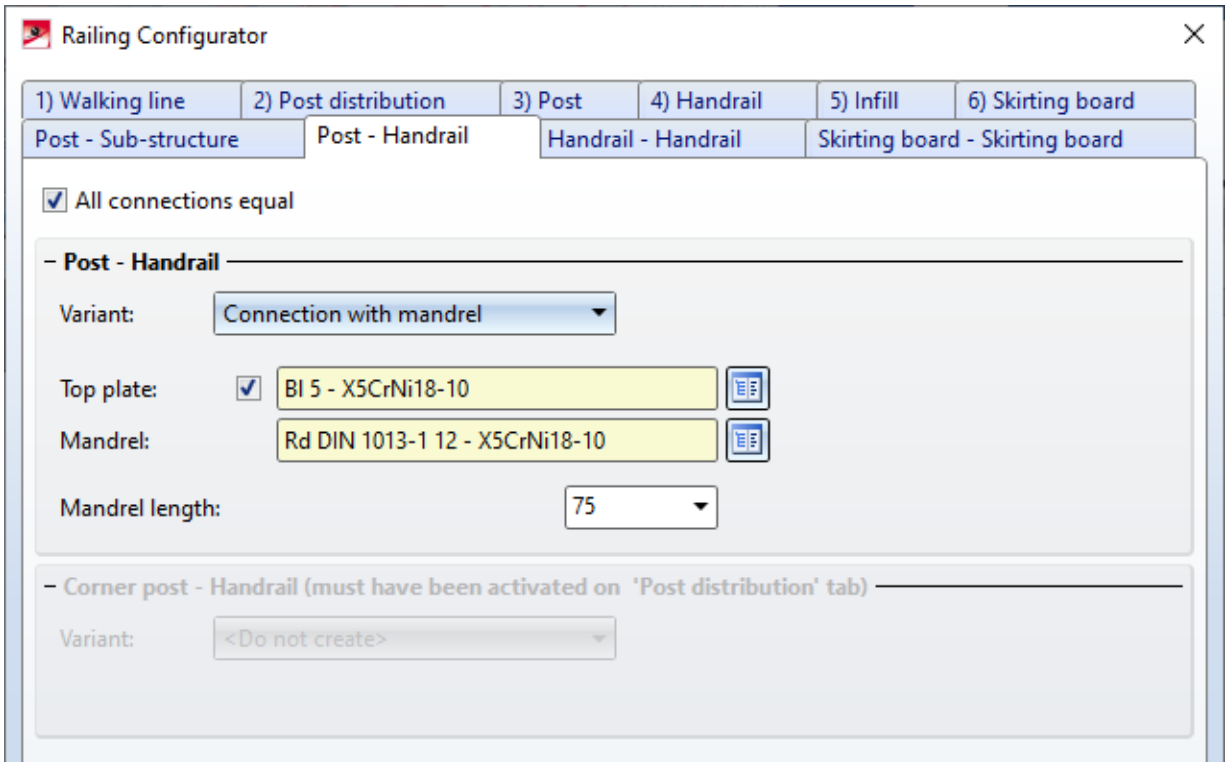


Figure 414 Railing configurator (Railing along beams) – Post-Handrail tab

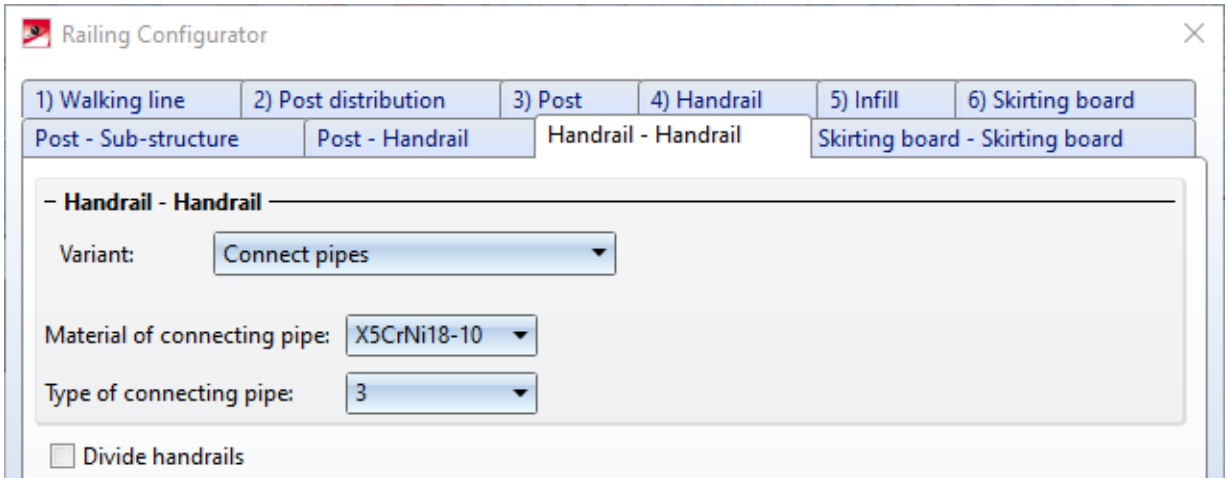


Figure 415 Railing configurator (Railing along beams) – Handrail-Handrail tab

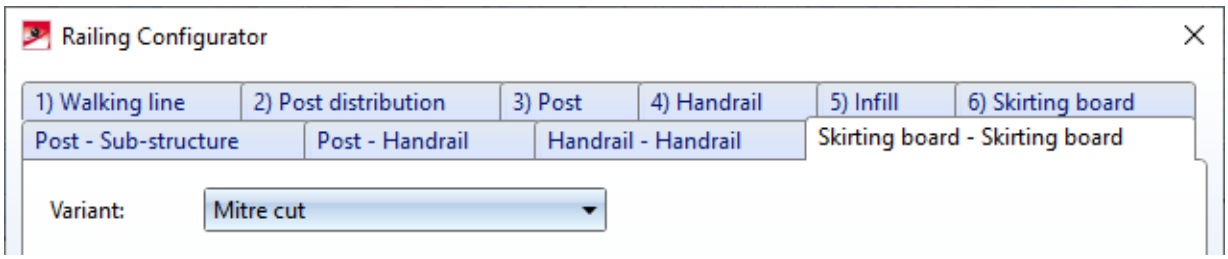


Figure 416 Railing configurator (Railing along beams) – Skirting board-Skirting board tab

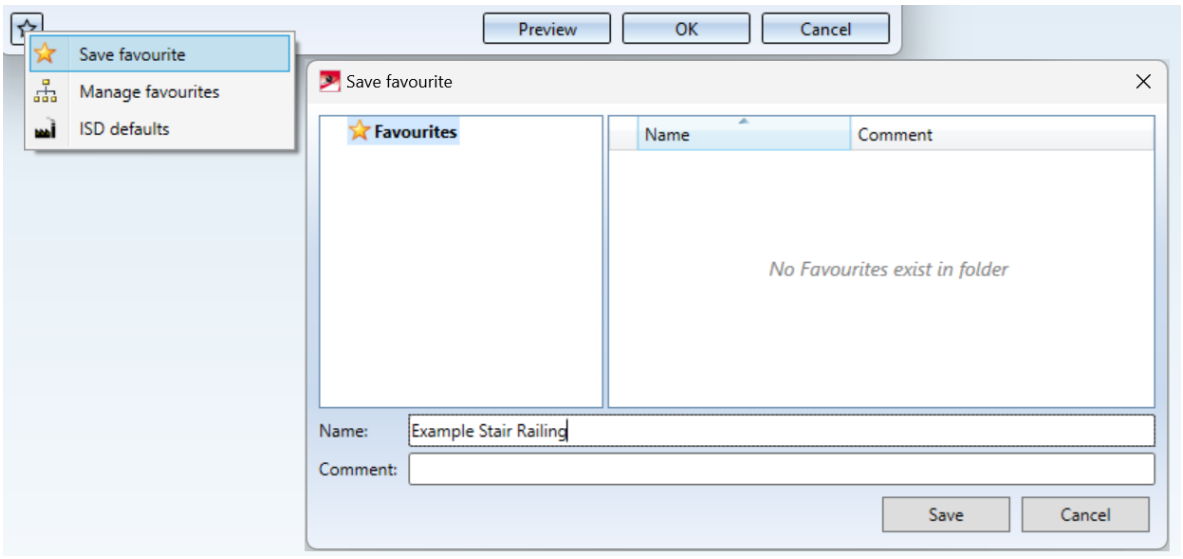


Figure 417 Save favourite for Railing configurator (Railing along beams)

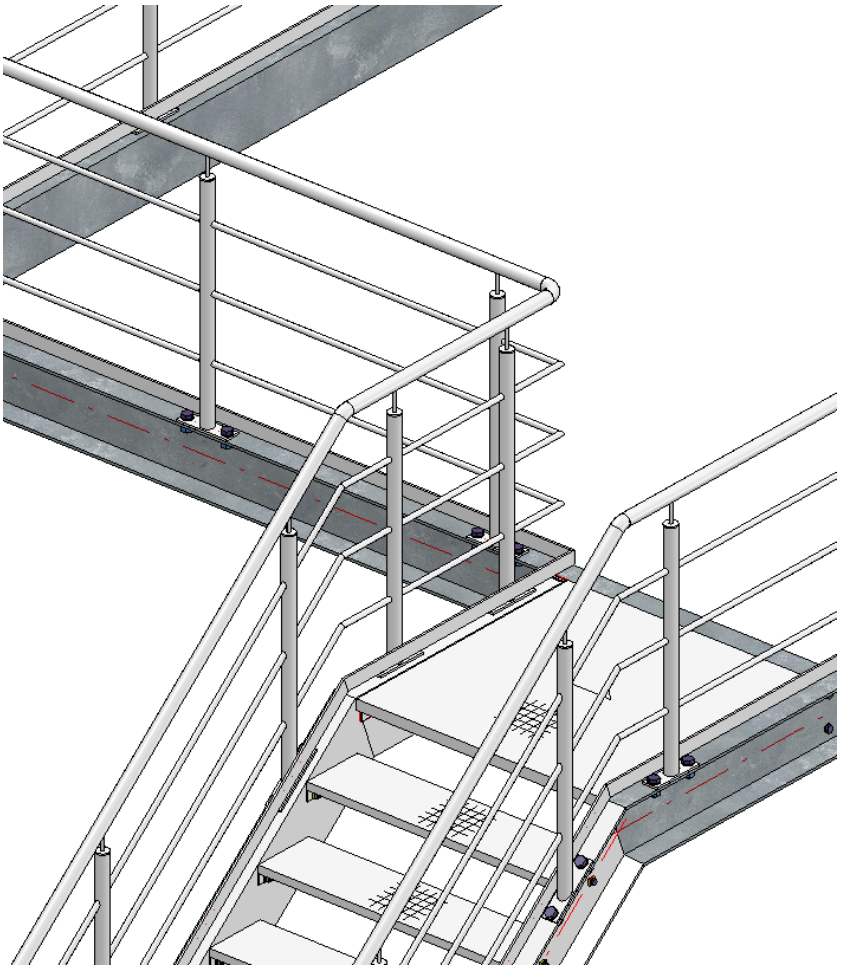


Figure 418 Resulting Railing

Now the contruction is complete, it is time to sort the 3D-part structure accordingly, and make all necessary pages with views and production drawings.

The exercise is finished

16.4 Exercise 22 Spiral staircase

Learning target:

- Making a spiral staircase by using parametric clone.

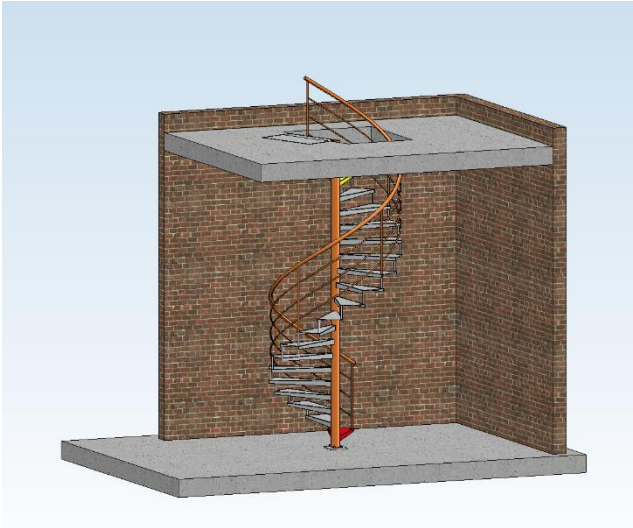


Figure 419 Preview of examples resulting spiral stairs

- Place a "steel pipe" **Din 2393 Rohr 120x5** perpendiculair to the XY vlak with a length of **4230**mm.

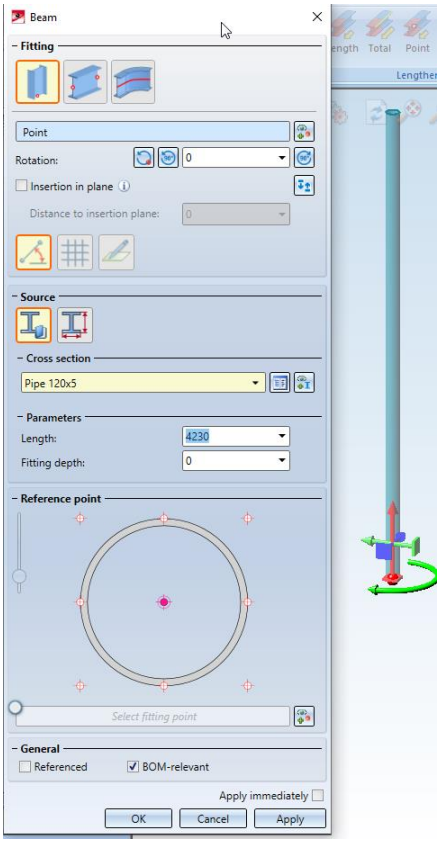


Figure 420 Insert standard beam from catalogue dialogue

- Draw one step using sheet metal from sketch and make it 3mm thick. **Sheet Metal > New > FromSkt**

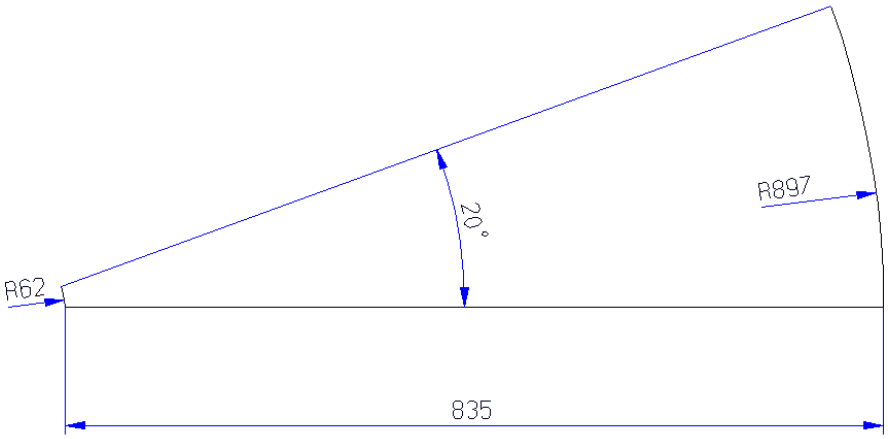


Figure 421 Sketch of spiral stairs step

- Use the images below for the position of the planes, that are being used for the bores. The bores are 21mm in diameter and are 20mm x 20mm from the corners.

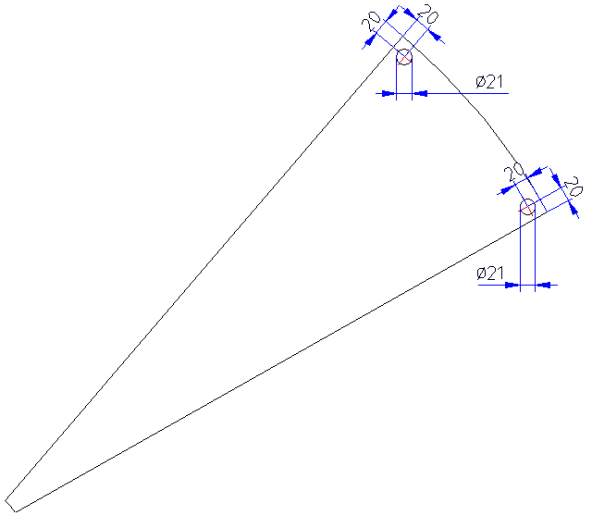


Figure 422 Position and measurements of post holes

Figure 423 Resulting step

- Move the Sheet metal upward 60mm above the floor.
- Give the sheet metal flanges that go from 50 to 35mm in heigth or add a normal flange
- Reference the step internaly

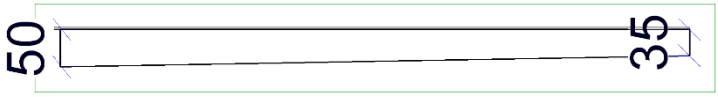


Figure 424 Flange to be added

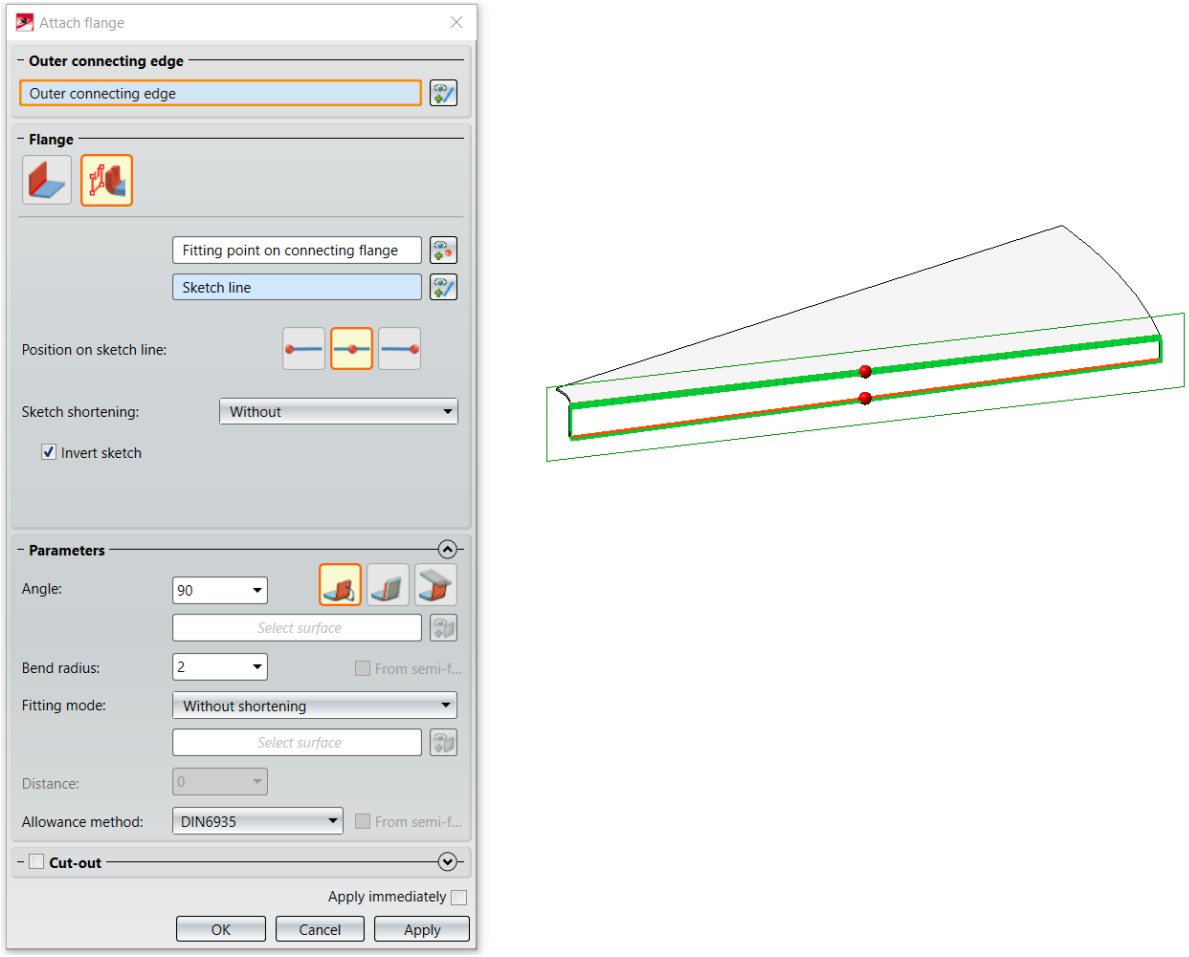


Figure 425 Attach flange with sketch dialogue

- Parametric clone the step:

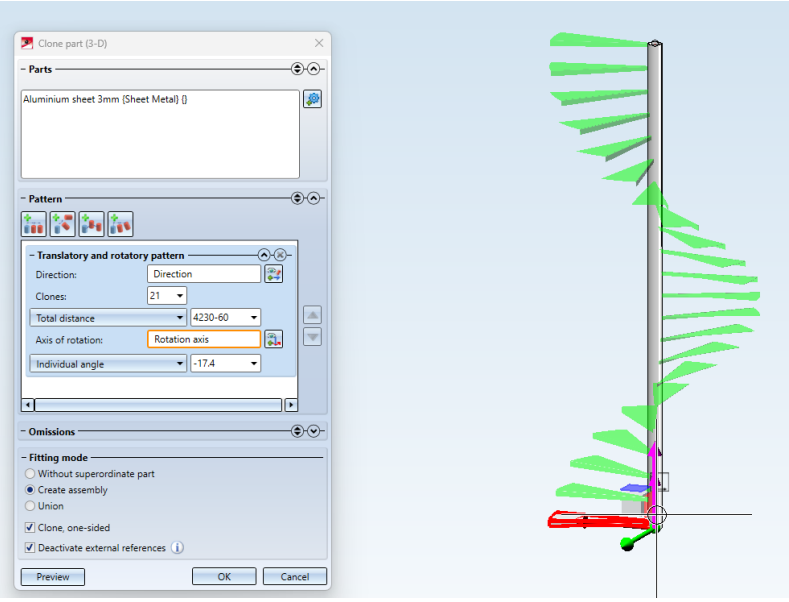


Figure 426 Parametric clone dialogue with preview in drawing field

- Place the connecting rods with ‘’DIN 2393 Rohr 20x1.2” Length 200

Figure 427 Resulting step with post

- Parametric clone the rod with the same settings except for the clone, one-sided checkbox.

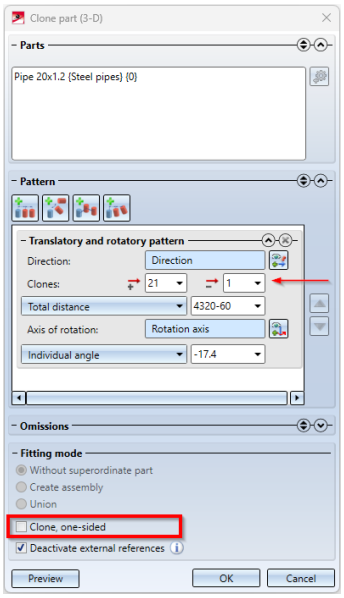


Figure 428 Parametric clone dialogue – Clone, one sided option

- Now one step is completely finished, we will parametrically clone it using the **3-D Standard > Clone > Param**. function. Select the components to be cloned (step + tube) for this purpose.

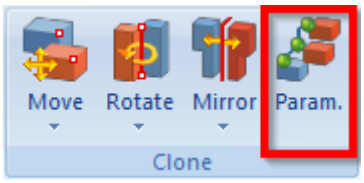


Figure 429 3-D standard ribbon – Parametric clone button

- In the rotatory pattern, we have a total of 22 steps, so 21 copies, and the vertical displacement is the tube length 4230 - the run of 60mm.
- Next, the balusters need to be placed, which is also done using the **3-D Standard > Clone > Param**. function. Place a tube 'DIN 2393 Rohr 20x1.2' with a length of 925mm perpendicular to the step in the center of the hole. Then, copy the baluster using the **3-D Standard > Clone > Param.**

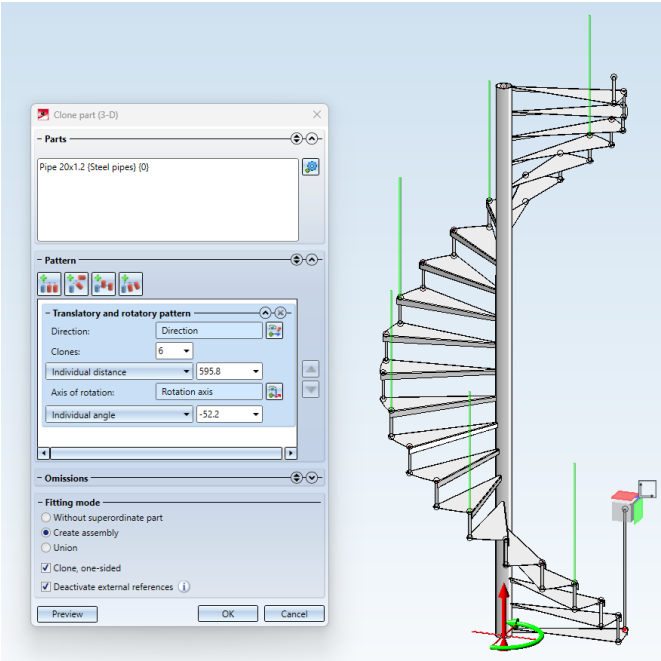


Figure 430 Parametric clone dialogue with preview of post distribution

In total, 6 balusters are placed with a rotational angle of 60 degrees, and the vertical displacement is 586mm. Therefore, a baluster will be placed on every 4th step.

Now that the balusters are placed, the railing can be laid out using a '3-D Sketch' and the spiral function.

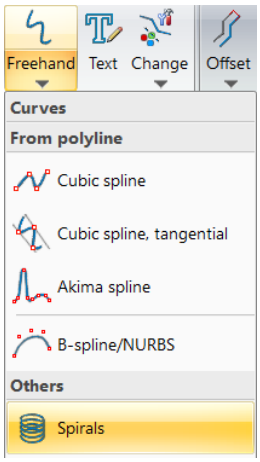


Figure 431 Sub-menu of Freehand function in Sketch ribbon - Spirals

When creating the railing, the 'start point' of the spiral is positioned on the first baluster, and the 'spiral axis' is the Z-axis of HiCAD Coordinate system.

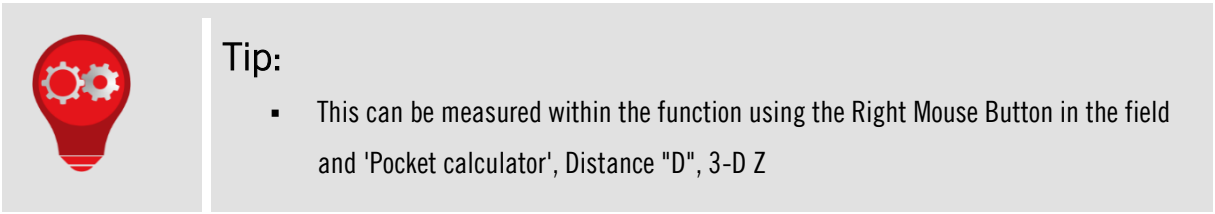
Diameter:

This field can be set to automatic, allowing HiCAD to find the correct diameter itself, ensuring that the spiral aligns precisely with the centerline of all balusters.

Height:

This value represents the distance parallel to the Z-axis between the start point and the end of the spiral.

- Measure the distance from the top of the first step to the top of the top step. Add twice the riser height to this value (top of step to top of step).



Tip:

- This can be measured within the function using the Right Mouse Button in the field and 'Pocket calculator', Distance "D", 3-D Z

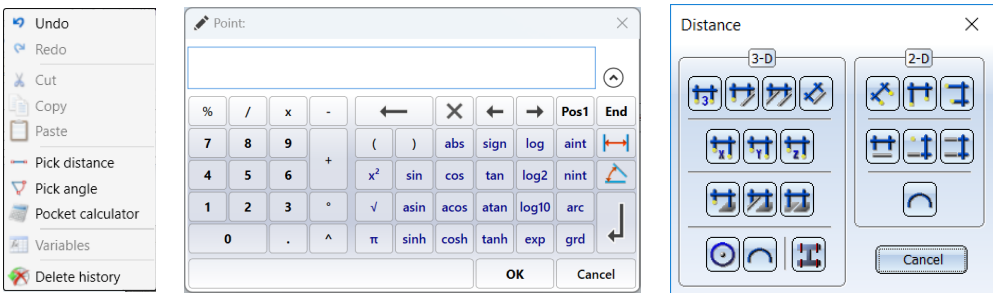


Figure 432 Pick distance in pocket calculator

Windings/Angle:

To calculate the correct angle, the remaining angle rotation needs to be measured. The spiral should extend one step further than the last step. Calculate the degree difference between the front of the bottom step and the front of the top step using the "Pocket calculator". Add twice the degree difference between the front of one step and the front of the next step to this value.

Switch to winding angle in the Spiral function and click the triangle behind Lead to let the function calculate the lead instead of the windings/angle:

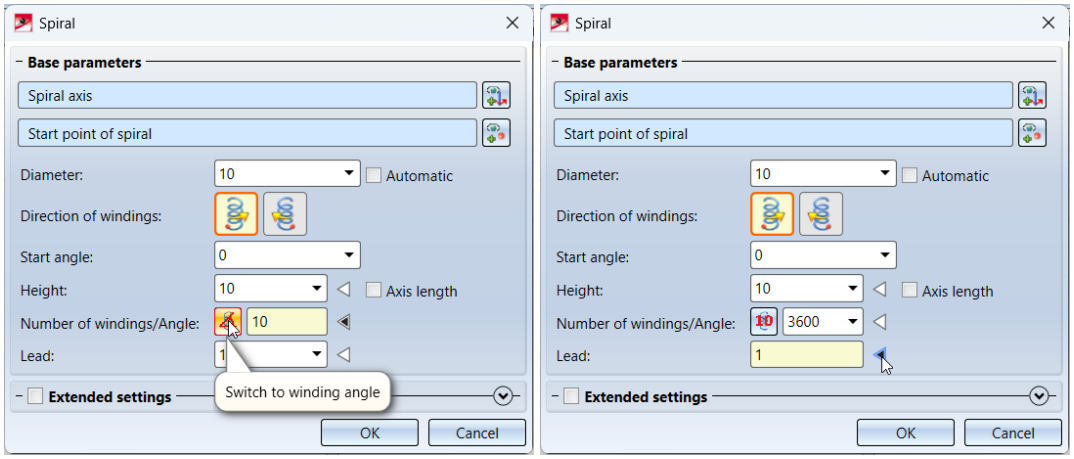


Figure 433 Sketch spiral dialogue

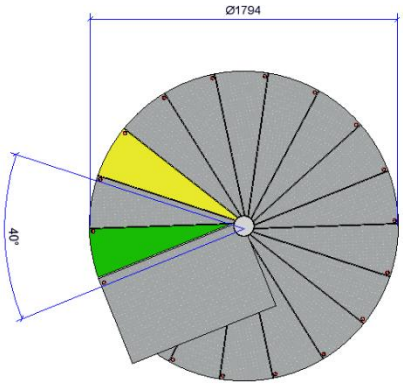


Figure 434 Top view of spiral stairs

- To convert the spiral into a railing, **3-D Standard > New > Sweep** is utilized. First, the guideline must be copied downwards to evenly distribute 3 balusters over the length of the baluster, which is 925mm.

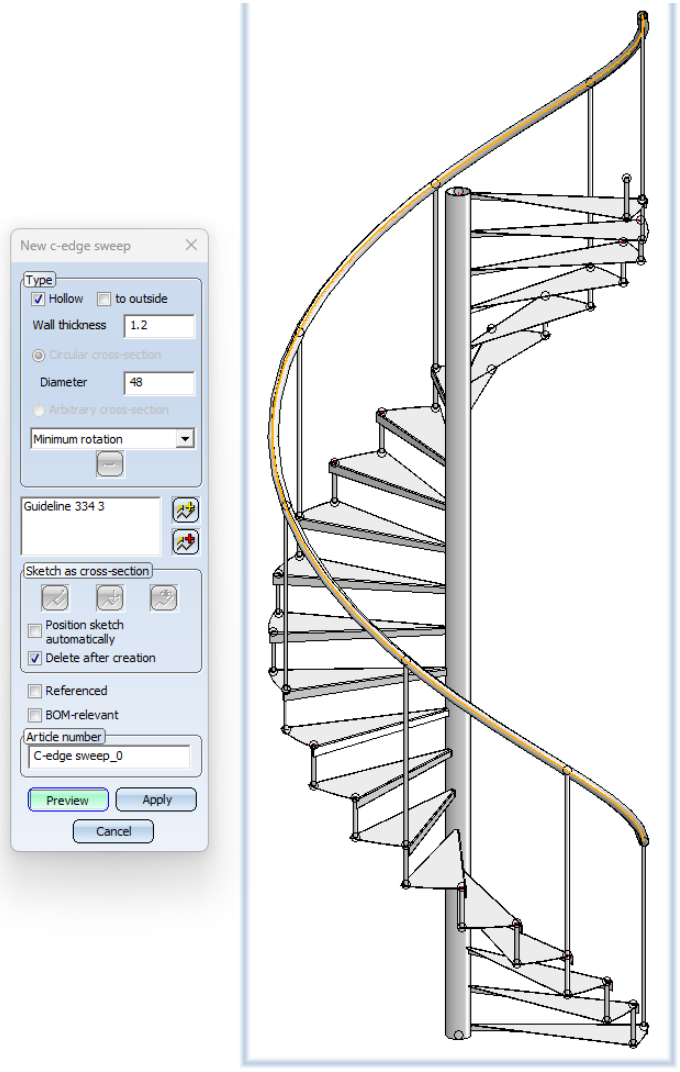


Figure 435 C-Edge sweep dialogue and spiral stairs with handrail

Optional:

- Create the railing from a beam:
- Delete the HCM constraint of the Spiral line and delete the axis line segment
- Replace line by clicking on : **Sketch > Derive > Offset > Replace line**
- Use beam function along sketch

- Copy the railing via clone in edge direction with distance 250

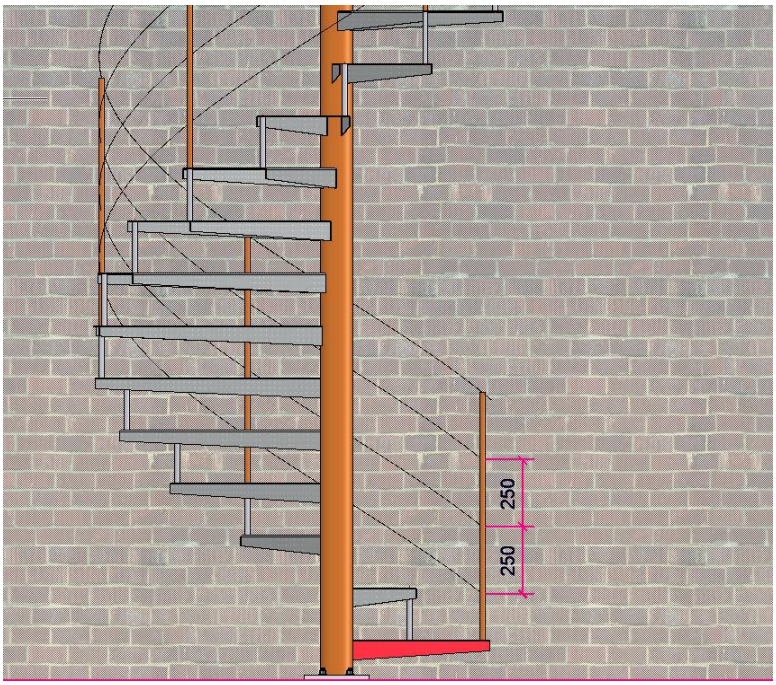


Figure 436 Measurement of middle rods

- Now, using the **3-D Standard Sweep**, create a sweep of all 3D sketches. Give the top railing a diameter of 48mm and the balusters 15mm in diameter.
- (Possibly, you can make the top railing slightly longer than the baluster using the 'Sketch' function 'trim to surface/line/point' or 'by value'.)

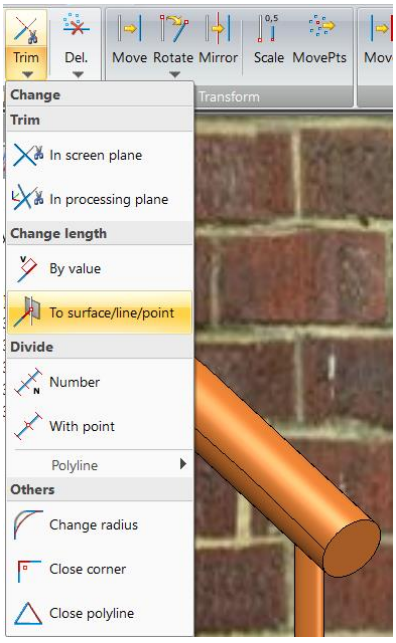


Figure 437 Trim edge to surface/line/point in trim sub-menu

- As the final step, the balusters can be cut to the top railing using the **3-D Standard > Process > Add > Subtract** function. Select the part from which the subtraction will occur, followed by the collision part. When prompted with 'retain second part', select 'yes' to keep both components in the drawing.
- (Select the baluster and then call the subtract function, then select the handrail.)

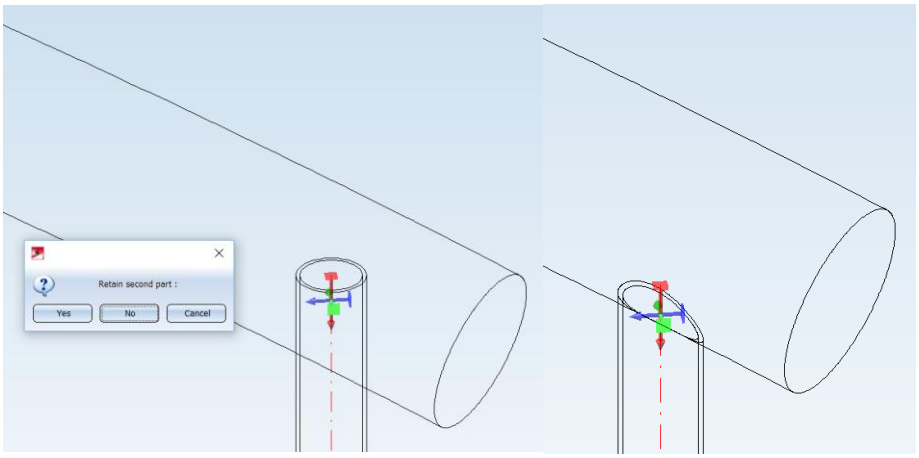


Figure 438 Subtraction of railing from post with retain second part message and result

The staircase is now ready, optionally you can do some post-processing on the other balusters with the same functions as used before.

The exercise is finished