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ADVANCE DESIGN STEEL CONNECTIONS
TUTORIAL

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Advance Design Steel Connections

Tutorial

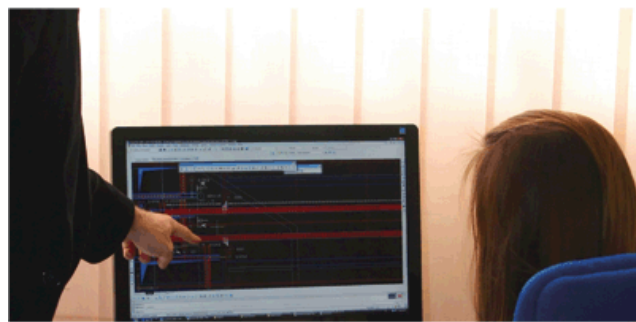


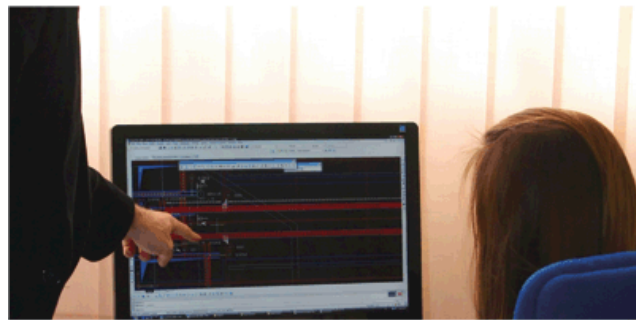
Table of Contents

About this tutorial	1
Connection design	1
Knee of frame bolted, with haunch	3
<i>Data</i>	3
<i>Creating the project</i>	4
<i>Step 1: Define the loads</i>	5
<i>Step 2: Define the connection properties</i>	6
<i>Step 3: Checking the connection</i>	9
<i>Step 4: Generate the calculation report</i>	10
<i>Step 5: Print the connection drawing</i>	11
Apex haunch	13
<i>Data</i>	13
<i>Creating the project</i>	14
<i>Step 1: Define the properties of the connection members</i>	14
<i>Step 2: Define the loads</i>	15
<i>Step 3: Define the connection properties</i>	16
<i>Step 4: Checking the connection</i>	18
Additional remarks	19
<i>A Project explorer to manage the project files</i>	20
<i>Connection description the same as in Advance Steel</i>	20
<i>Two modes for displaying a connection</i>	21
<i>The possibility to use the drawing in Advance Steel</i>	21
<i>The project connections are grouped in a folder</i>	21

About this tutorial

The goal of this document is to help you achieve the first connection calculations according to Eurocode 3 using the new module "Advance Design - Steel Connection". This tutorial contains step-by-step instructions for calculating two connections: Knee of frame bolted, with haunch and Apex haunch.

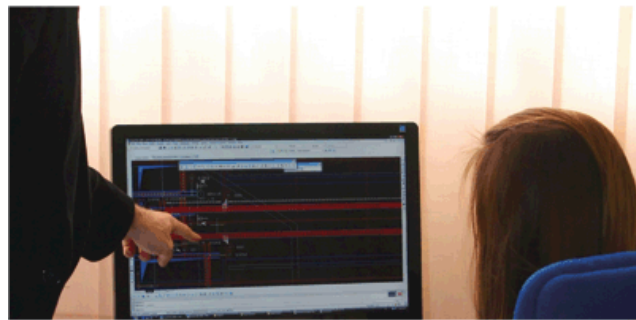
Note: *In this document, the ADSC abbreviation refers to Advance Design Steel Connection.*



Connection design

In this chapter

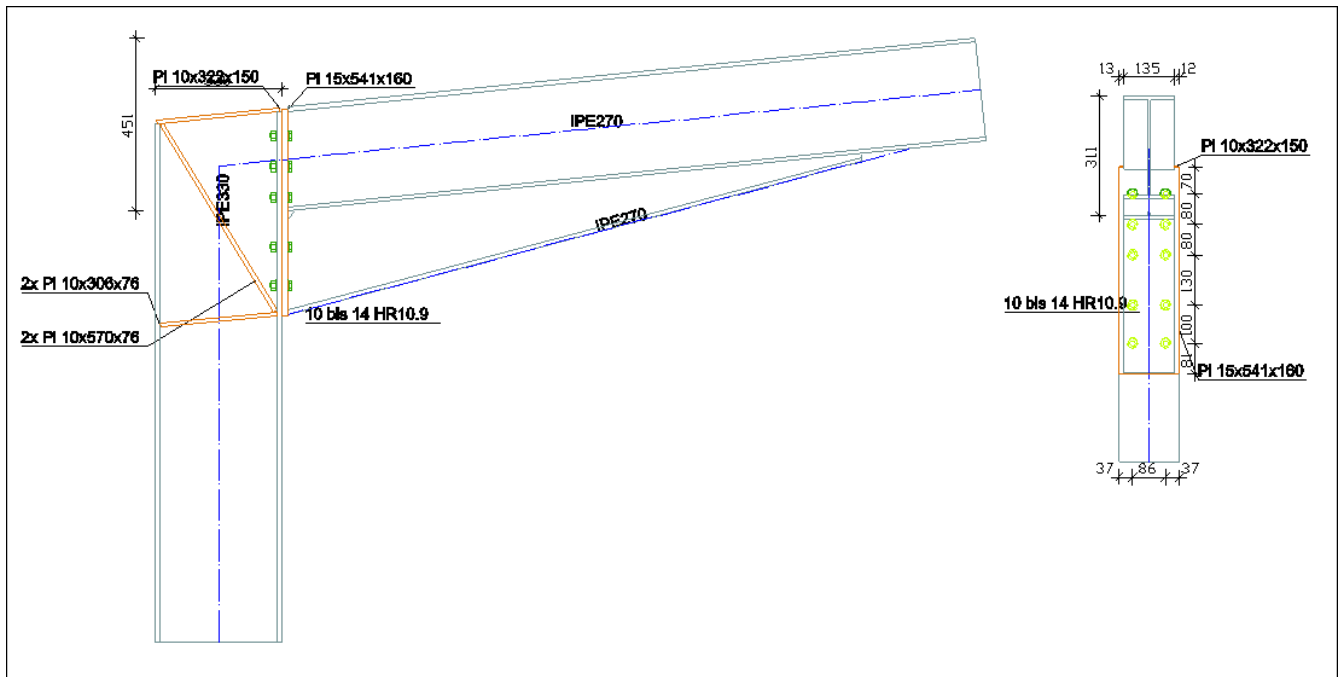
- *Knee of frame bolted, with haunch*
- *Apex haunch*



Knee of frame bolted, with haunch

In this example you will create and define the properties of the following connection.

Data



The loads are:

Case	Name	Nx (kN)	Vz (kN)	My (kNm)
G	Dead Loads	-11.9	-15.7	51.3
SNOW	Snow	-12.6	-16.3	54.4

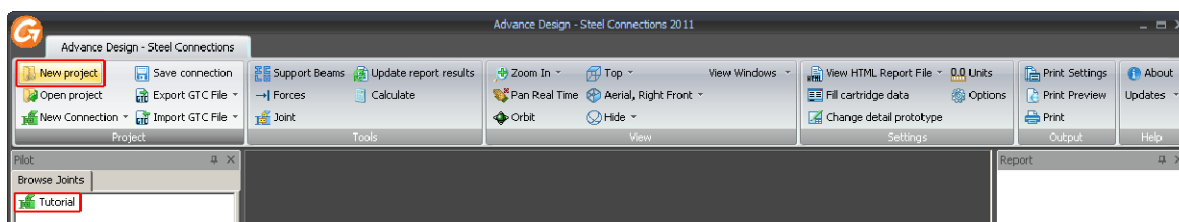
They correspond to the following forces:

Maximum forces in the end plate plane					
	Max	Fx	Ty	Mz	Combination
		kN	kN	kN.m	
D2	Shear Moment	-29.97	-48.55	-149.84	1.33*G+1.5*SNOW
G8	Compression	-38.99	41.65	-149.84	1.33*G+1.5*SNOW

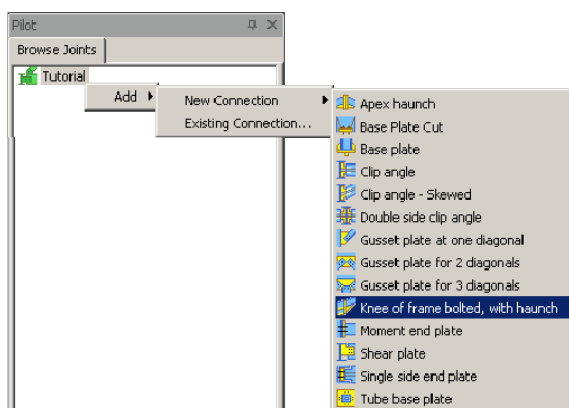
Creating the project

From the Windows **Start** menu, select **Programs > Graitec > Advance Design > Advance Design - Steel Connection**.

1. On the **Project** tab, click **New project**.

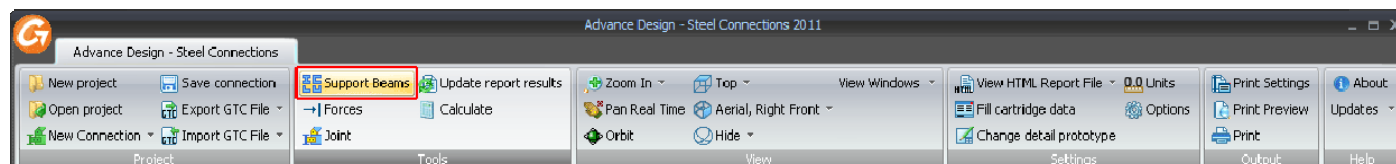


2. In the “New project” dialog box enter **Tutorial** for the project name.
3. In the created project, create the desired connection:



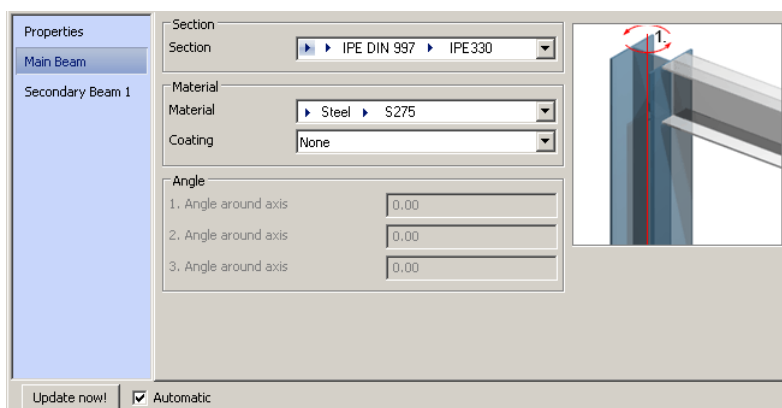
Step 1: Define the connection members properties

1. On the **Tools** tab, click **Support Beams**.

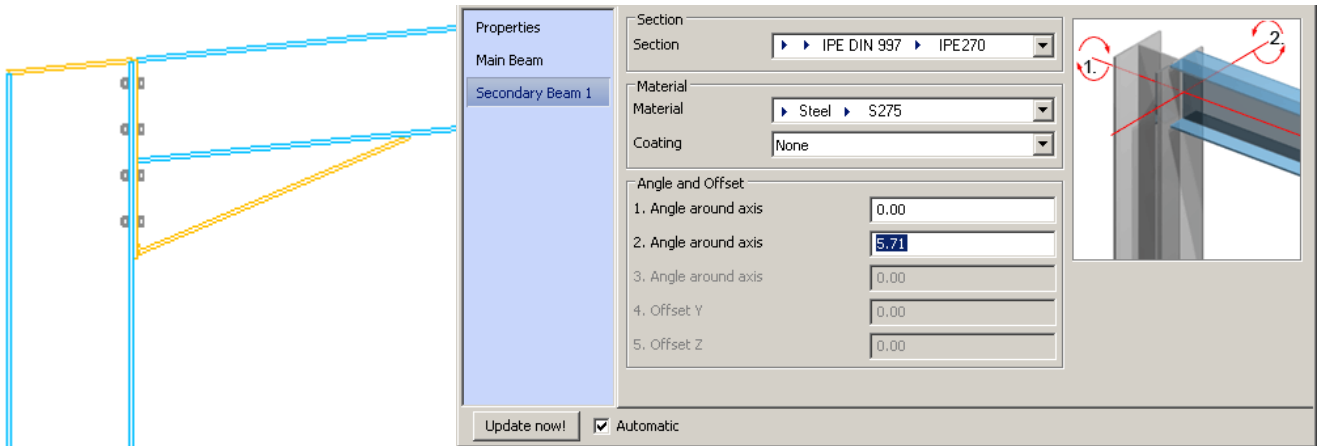


The “Support Beams” dialog box appears.

2. Define the main member properties:

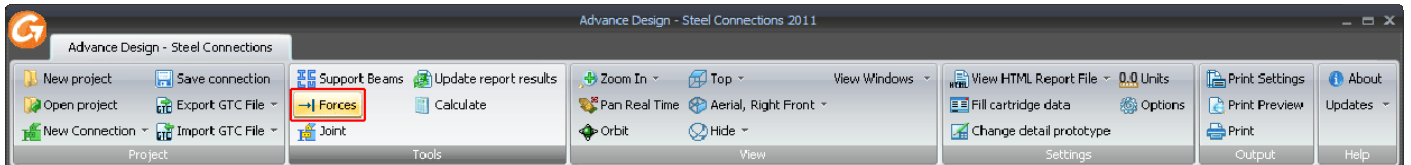


3. Define the secondary member properties, also the angle around the axis (**5.71°**):

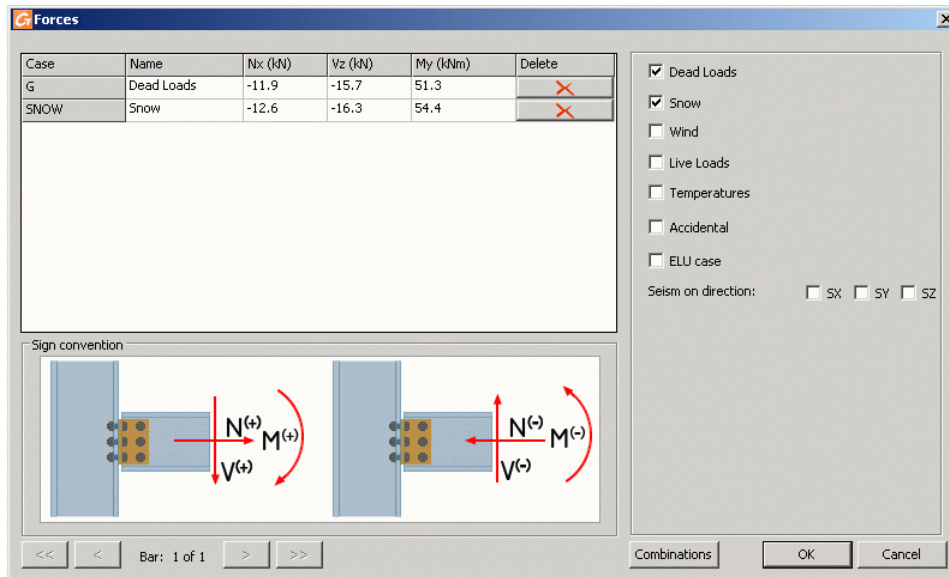


Step 1: Define the loads

1. On the **Tools** tab, click **Loads**.

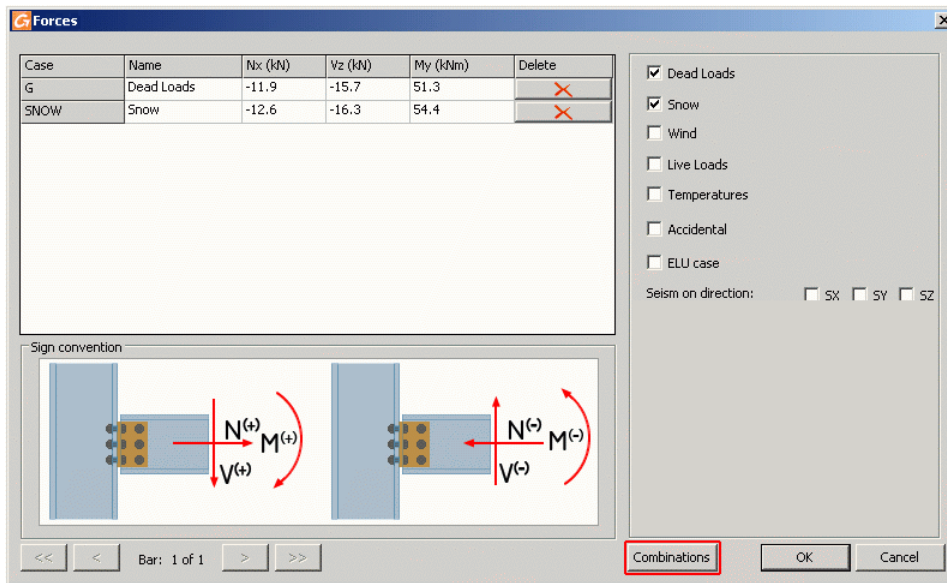


2. Define the load cases and the loads:



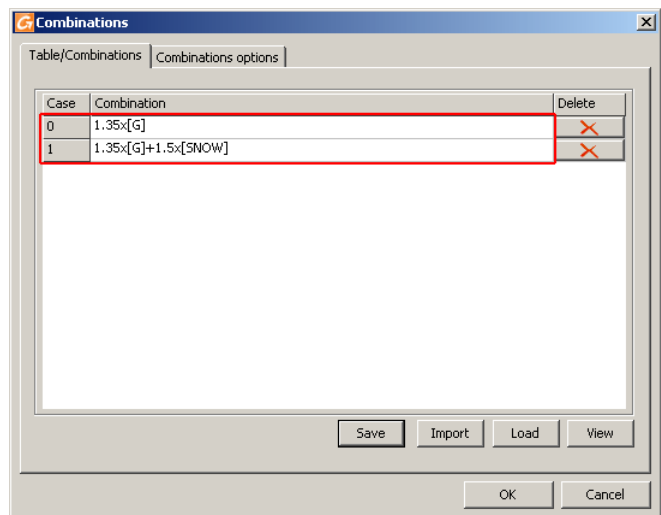
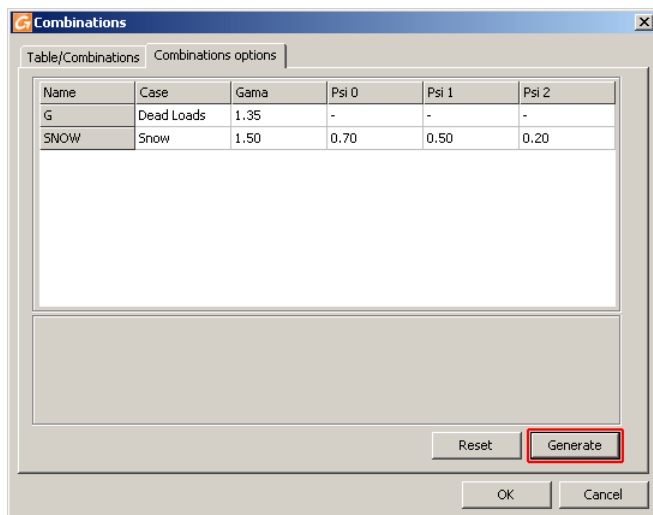
⚠ Beware the sign convention, which is not the same as in MELODY (in ADSC, a positive moment affects the upper bolts).

3. Click **Combinations**.



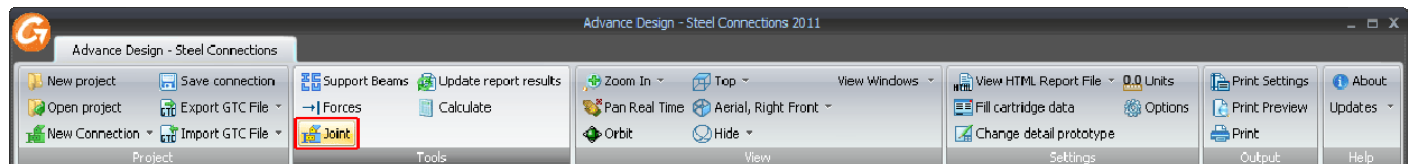
The combinations dialog box appears.

4. On the **Combinations options** tab, click **Generate** to obtain the ULS combinations:



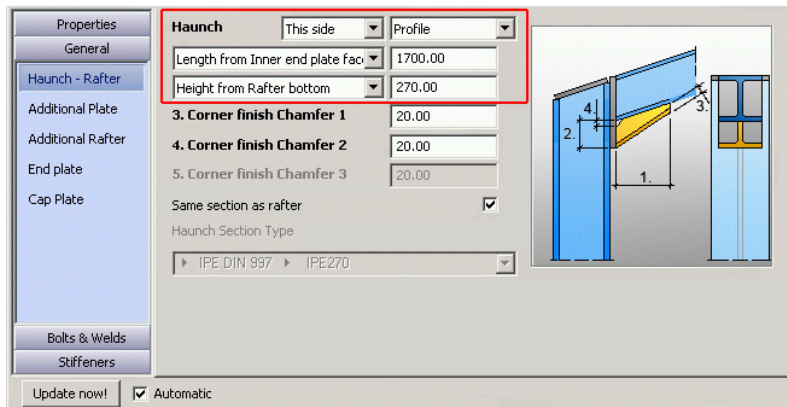
Step 2: Define the connection properties

1. On the **Tools** tab, click **Joint** to display the properties dialog box.

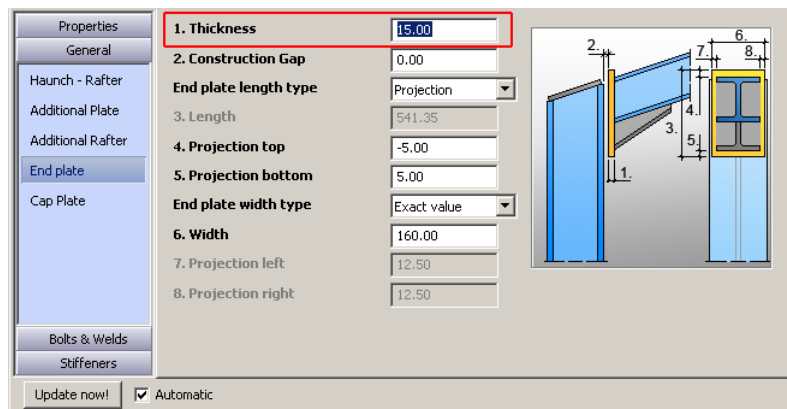


The “Knee of frame bolted, with haunch” dialog box appears.

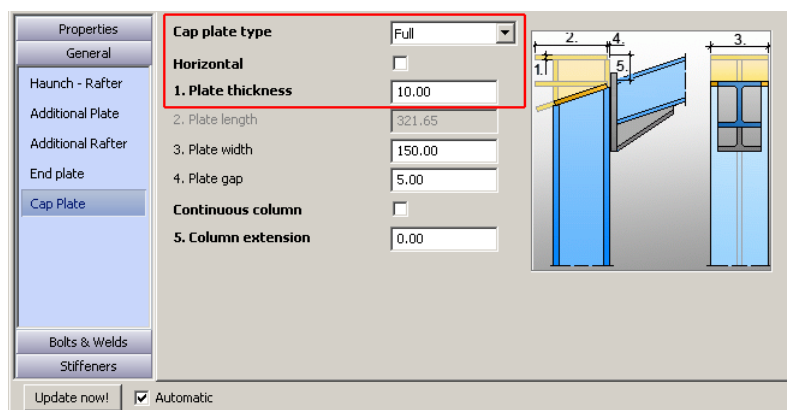
- Define the haunch properties (length and height).



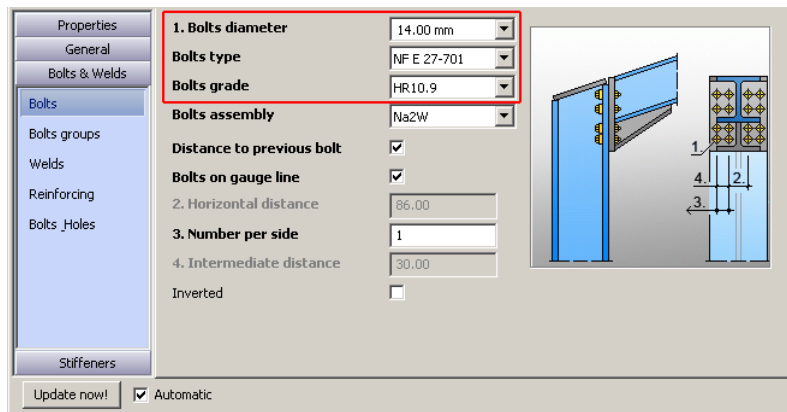
- Define the end plate thickness.



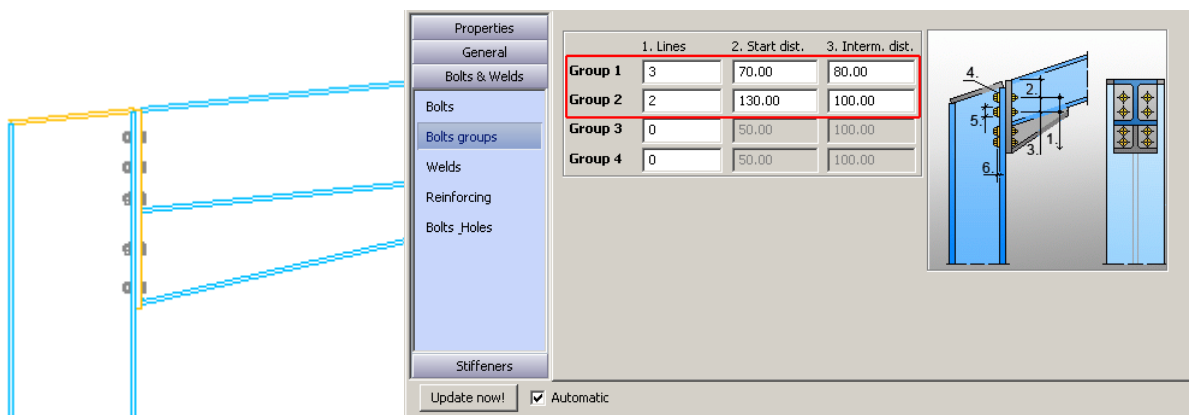
- Define the cap plate thickness.



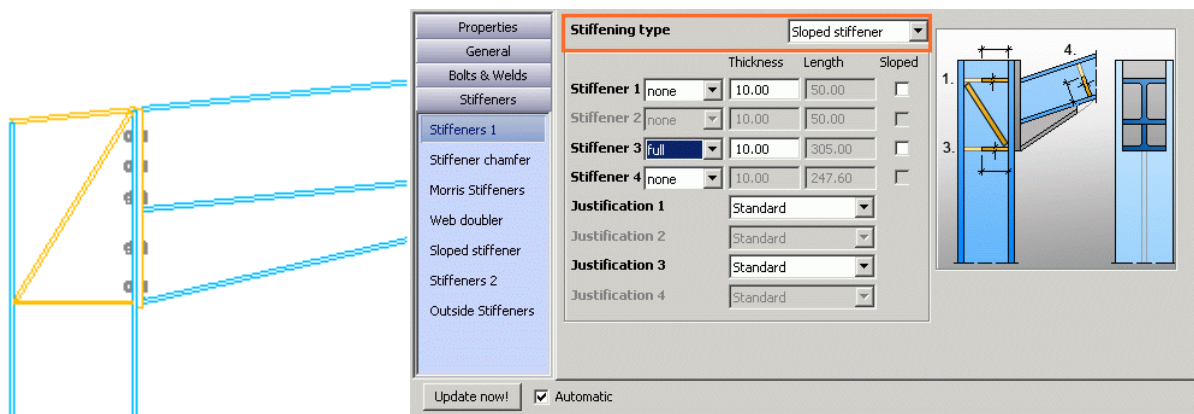
5. Define the bolt properties. Select the **NF E 27-701** bolt type.



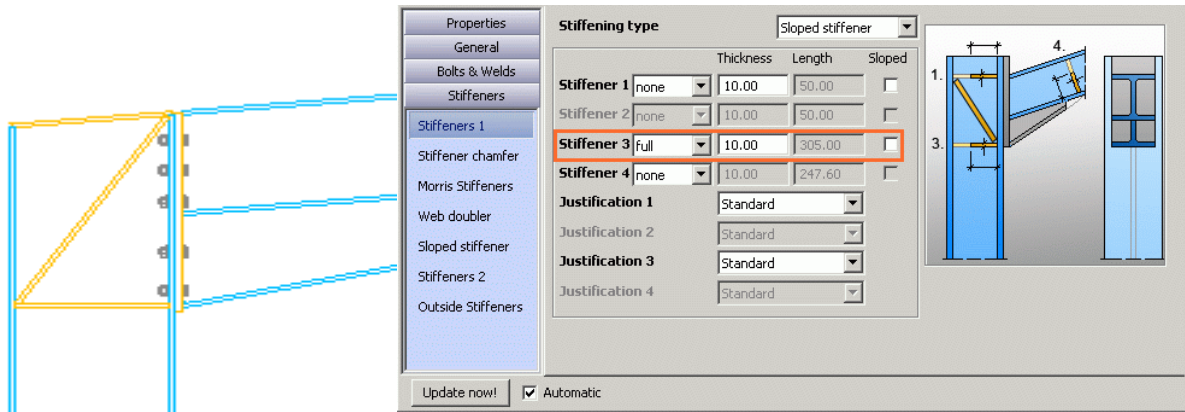
6. Define the distances between the bolts within the groups.



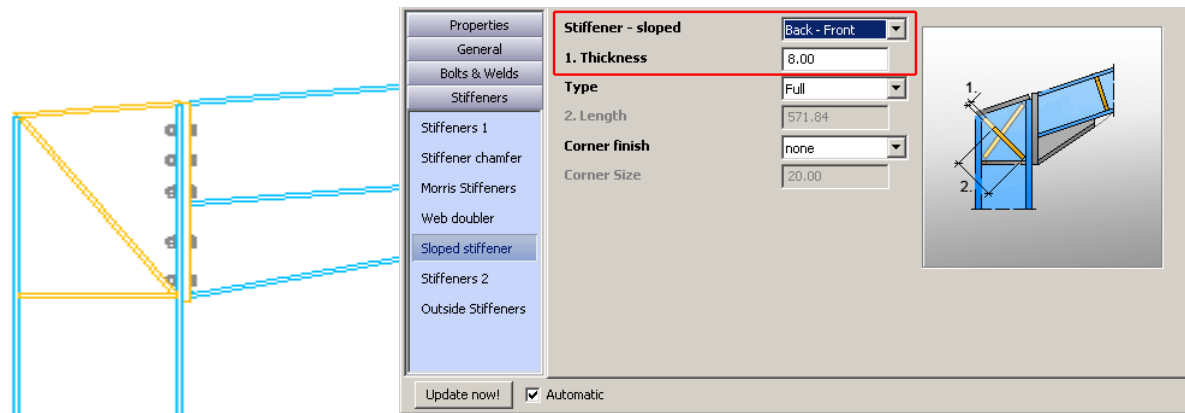
7. Create a sloped stiffener and the bottom stiffener.



8. Define the thickness of the bottom stiffener:



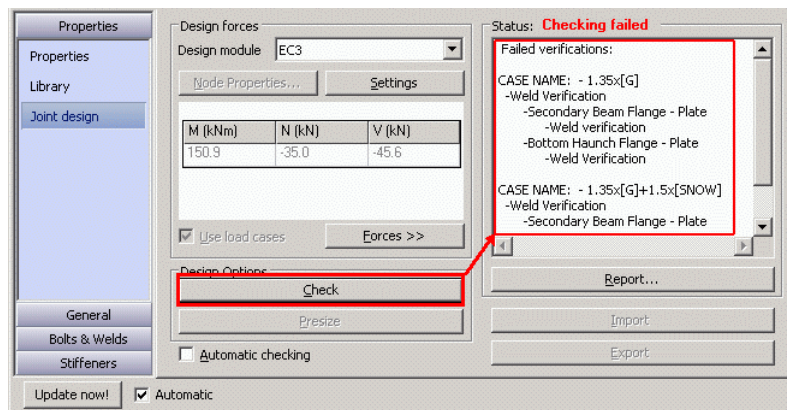
9. Define the sloped stiffener orientation and thickness.



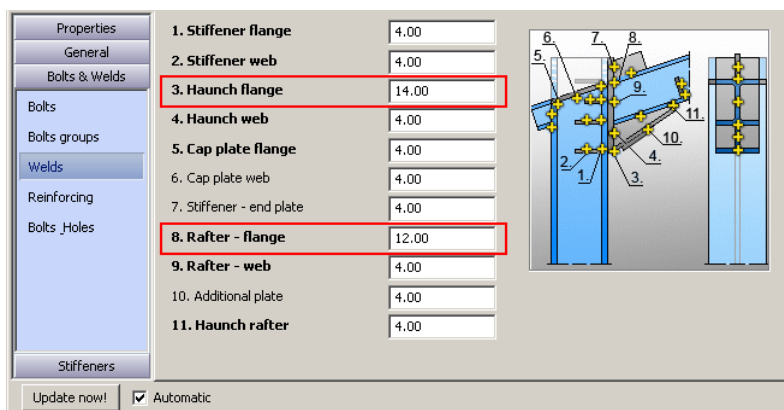
Step 3: Checking the connection

1. Click **Check**.

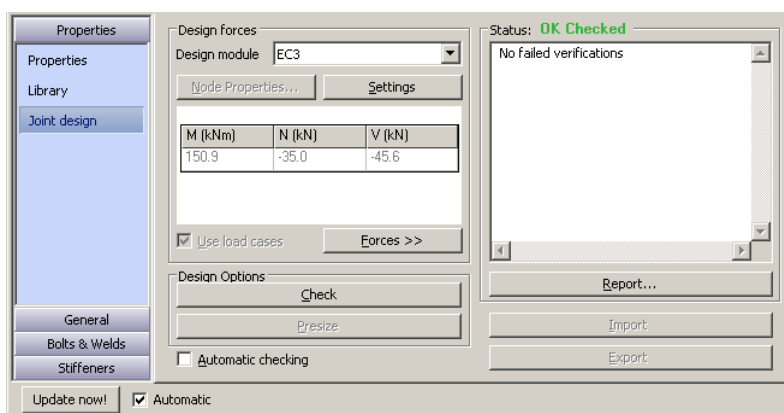
The checking failed because of several errors with the weld thickness at the haunch flange and the rafter top flange.



2. To fix the connection, increase the thickness of the welds at the haunch and rafter.

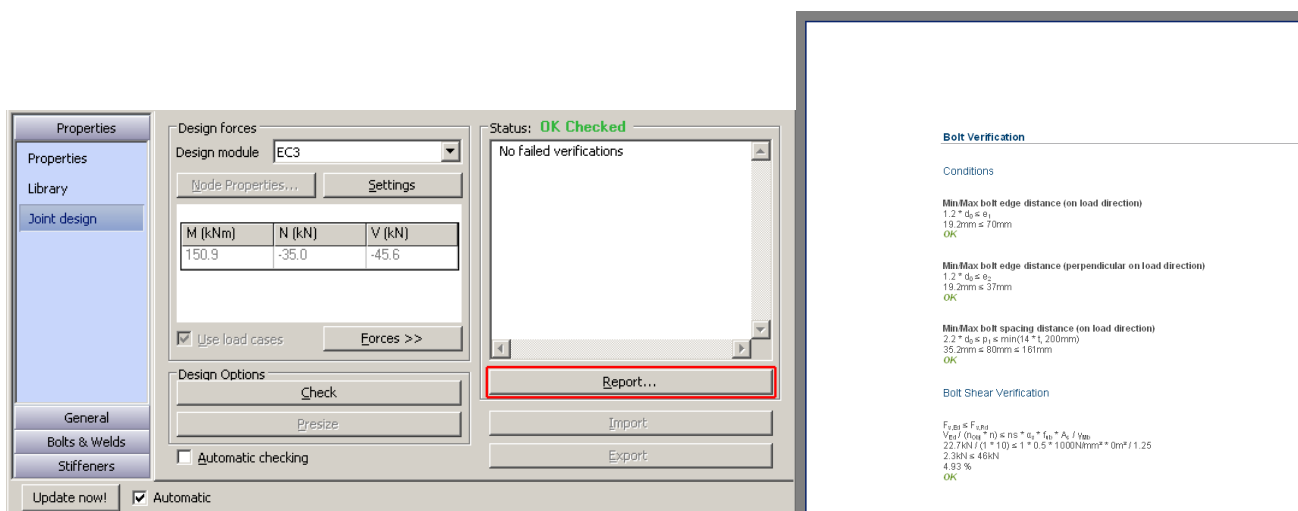


3. Return to the **Joint design** tab and click **Check**. The connection is correct:



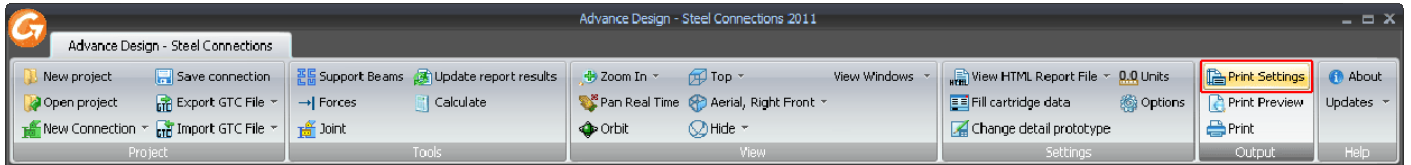
Step 4: Generate the calculation report

The detailed calculations can be verified. Click **Report** to generate the calculation report:

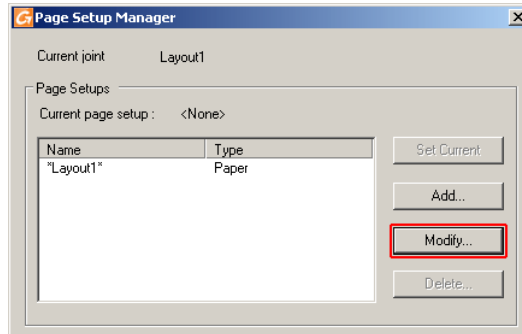


Step 5: Print the connection drawing

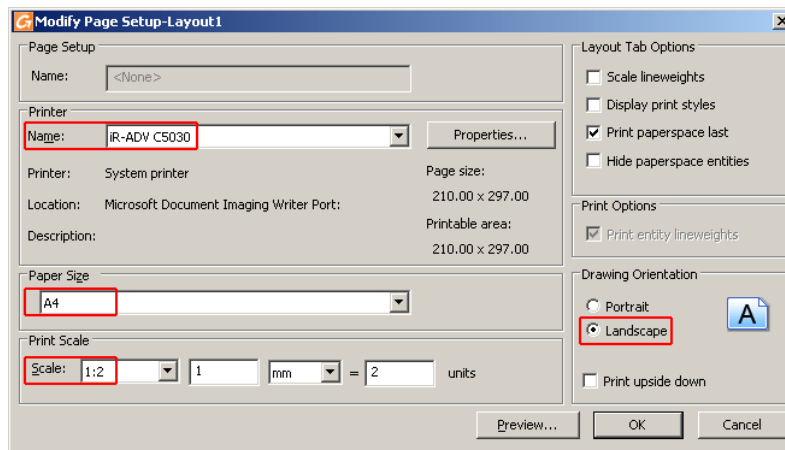
1. On the **Output** tab, click **Print Settings** to access the print options.



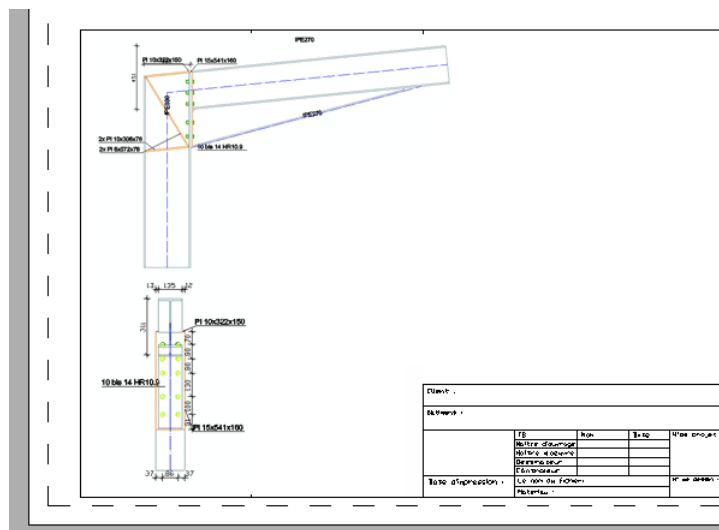
2. Click **Modify** to access the page setup options:









3. Select the printer and the paper size. Make sure to select a suitable print scale and drawing orientation.



The drawing is ready for print.



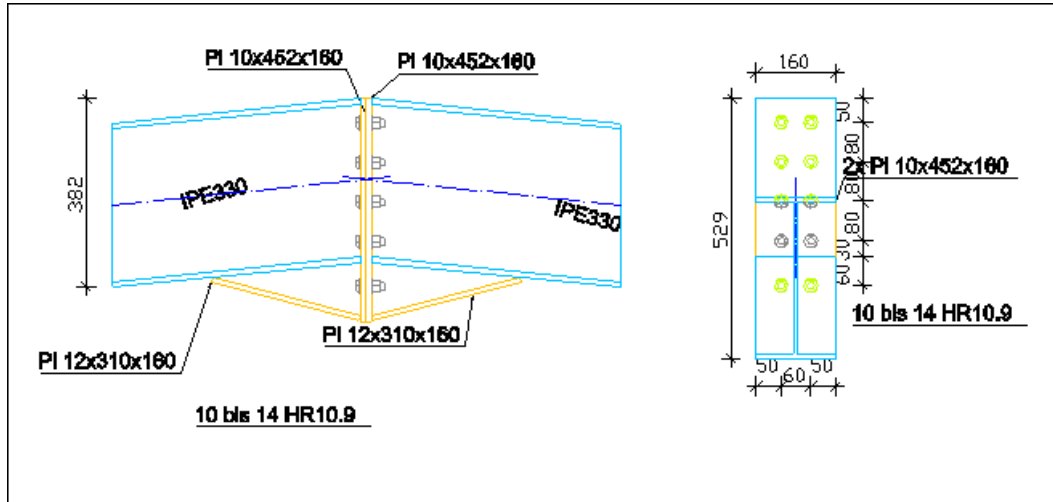
 **Note:** ADSC creates a .dwg file. Therefore, it is possible to open and edit it using Advance Steel.

 Knee of frame bolted, with haunch1	File Folder	
 Knee of frame bolted, with haunch1.bak	BAK File	65 KB
 Knee of frame bolted, with haunch1.dwg	AutoCAD Drawing	65 KB
 Knee of frame bolted, with haunch1.ldb	Microsoft Office Access Record-Locking Information	0 KB
 Knee of frame bolted, with haunch1.mdb	Microsoft Office Access Application	376 KB

Apex haunch

Data

In this example you will design the following connection.



The loads are:

Case	Name	Nx (kN)	Vz (kN)	My (kNm)
G	Dead Loads	-13.2	-1.3	27.2
SNOW	Snow	-23.1	-2.3	48.0

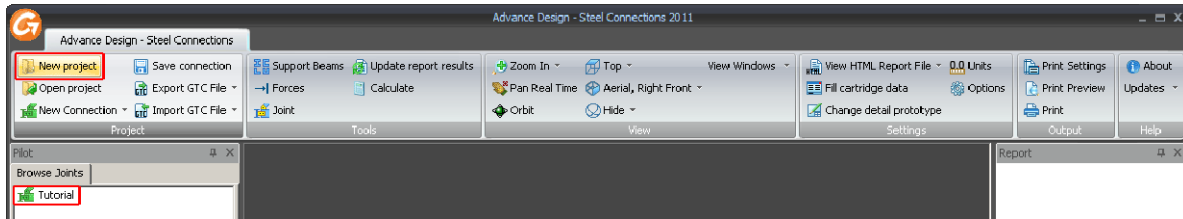
They correspond to the following forces:

NuMax	Fx	Ty	Mz	Maximum types	Combination
	kN	kN	kN.m		
1	-52.26	5.22	108.18	MinFx MaxMz MaxFy MinEz	1.33*G+1.5*SNOW

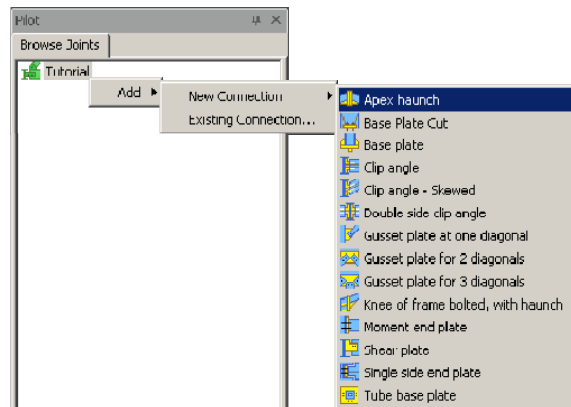
Creating the project

From the Windows **Start** menu, select **Programs > Graitec > Advance Design > Advance Design - Steel Connection**.

1. On the **Project** tab, click **New project**.

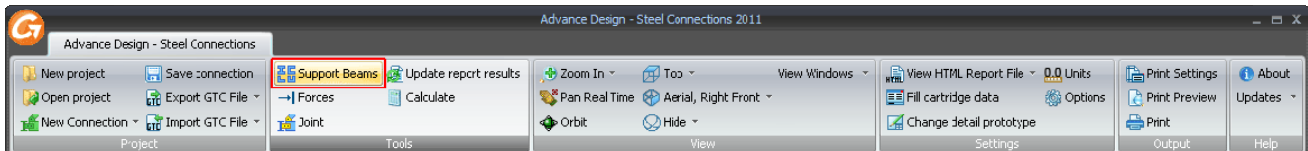


2. In the “New project” dialog box enter **Tutorial** for the project name.
3. In the created project, create the desired connection:



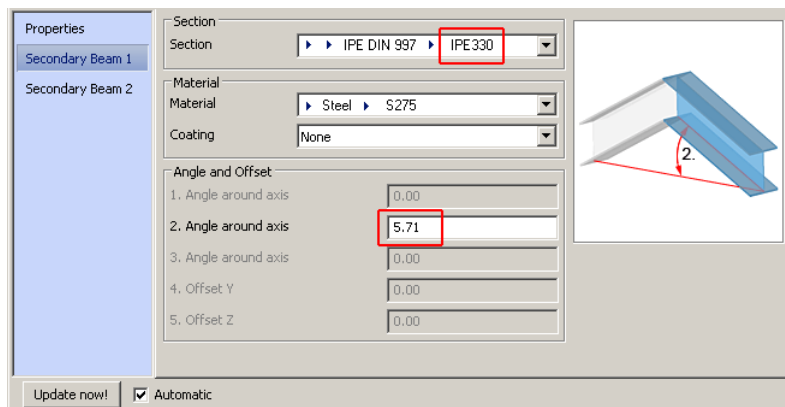
Step 1: Define the properties of the connection members

1. Click **Support Beams**.



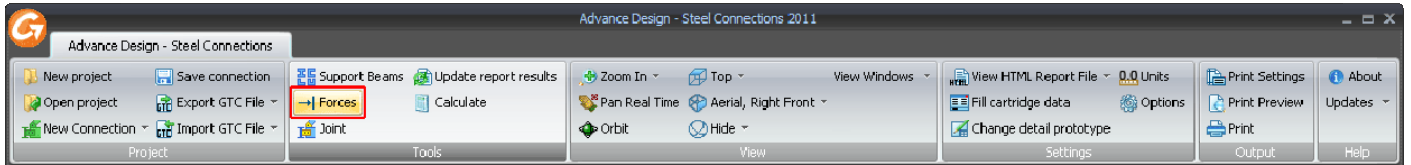
The “Support Beams” dialog box appears.

2. Define the main member section and the slope. Select the same options for both members.

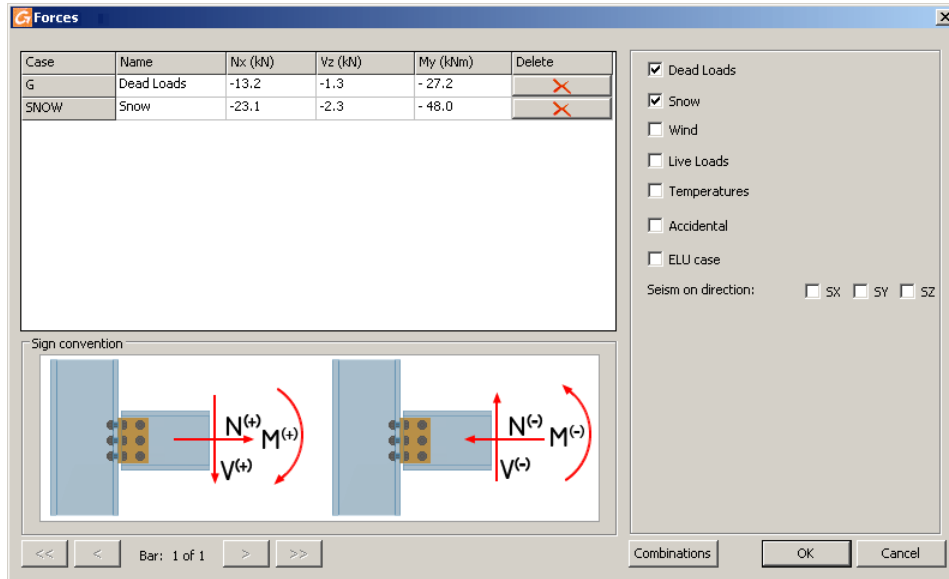


Step 2: Define the loads

1. On the **Tools** tab, click **Loads**.

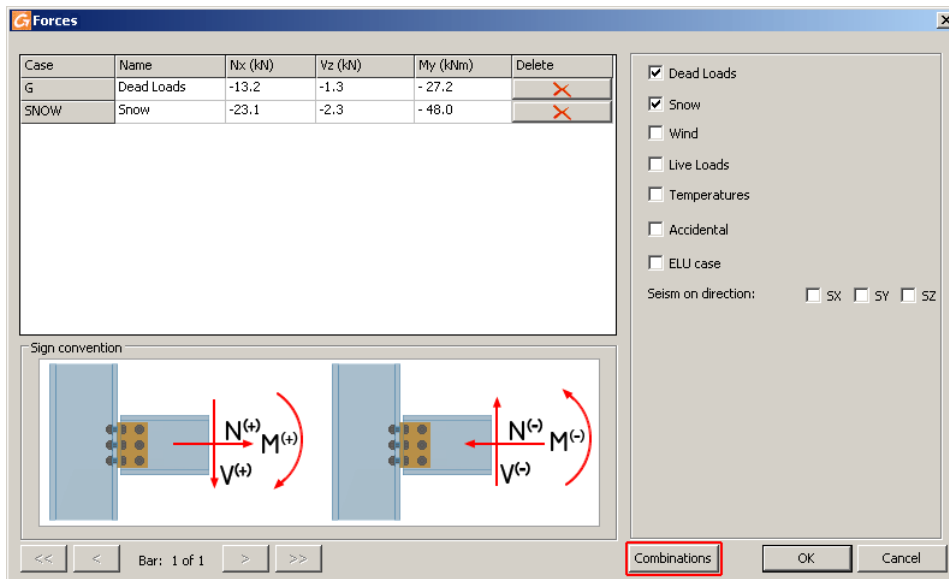


2. Define the load cases and the loads:

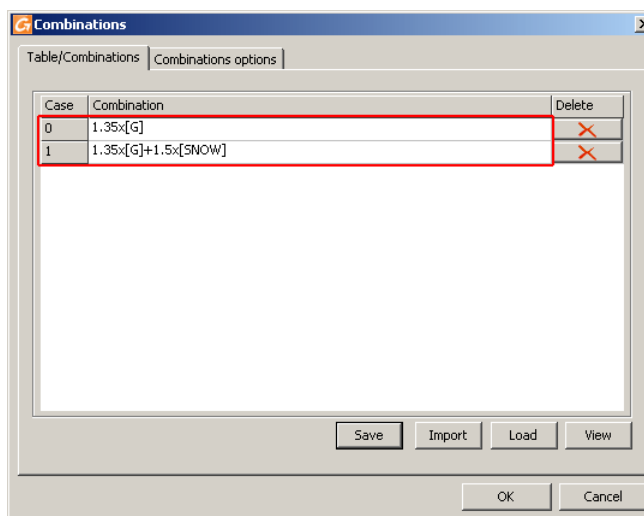
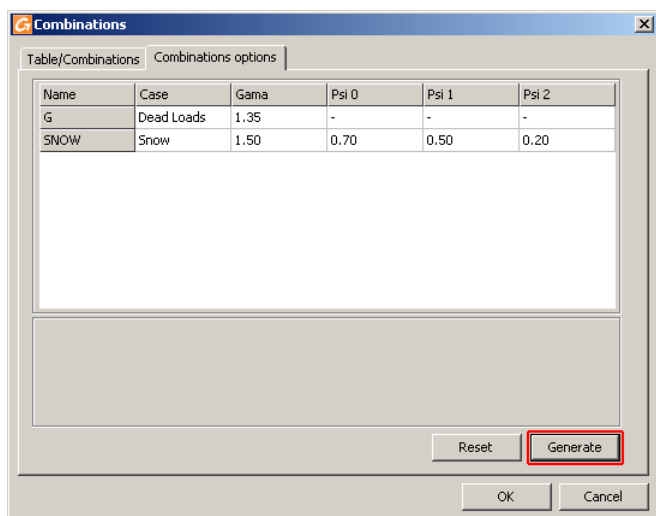


⚠ Beware the sign convention, which is different from MELODY (in ADSC, a positive moment affects the upper bolts).

3. Click **Combinations** to display the combinations dialog box.

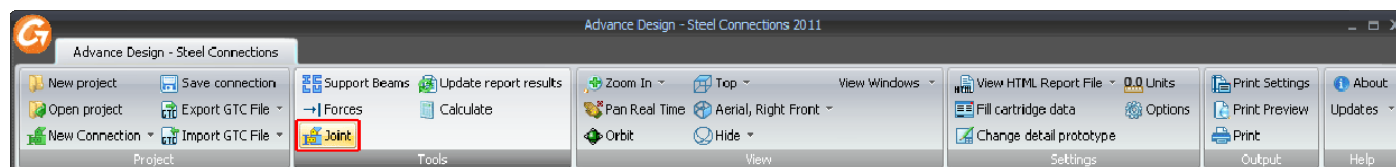


4. In the **Combinations options** tab, click **Generate** to obtain the ULS combinations:



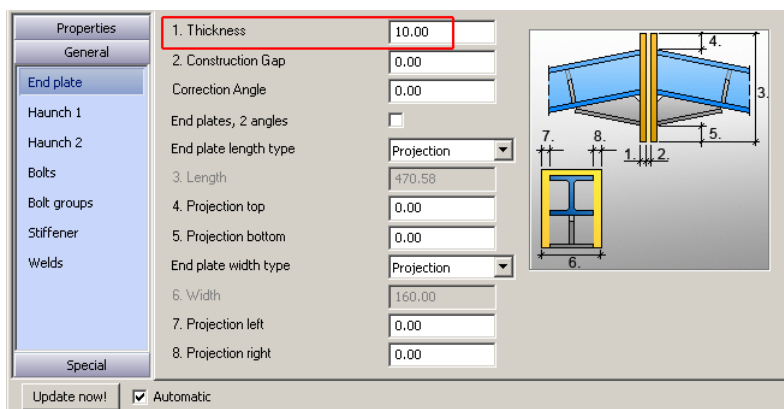
Step 3: Define the connection properties

1. On the **Tools** tab, click **Joint** to display the properties dialog box.

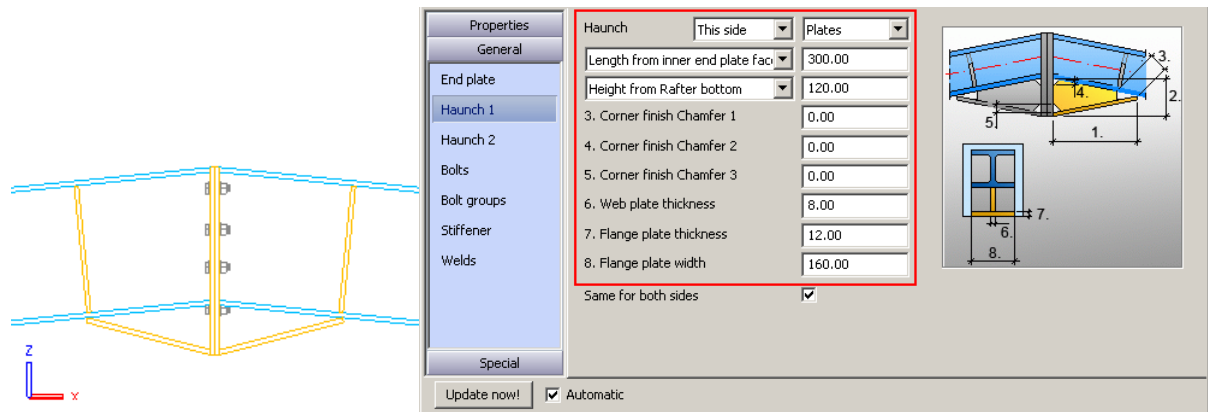


The "Apex bolted with haunch" dialog box appears.

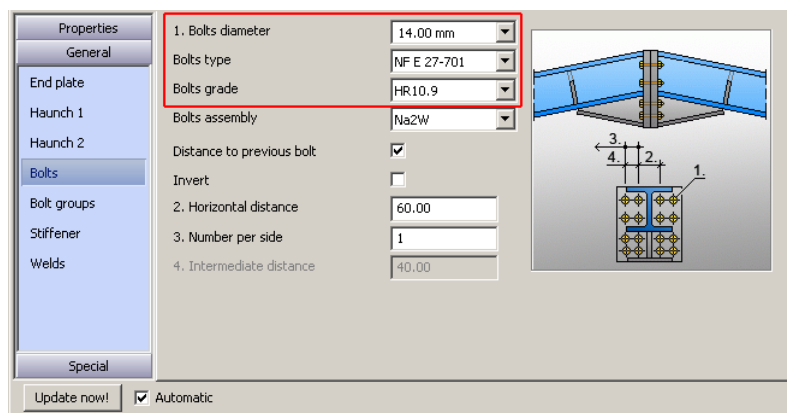
2. Define the end plate thickness.



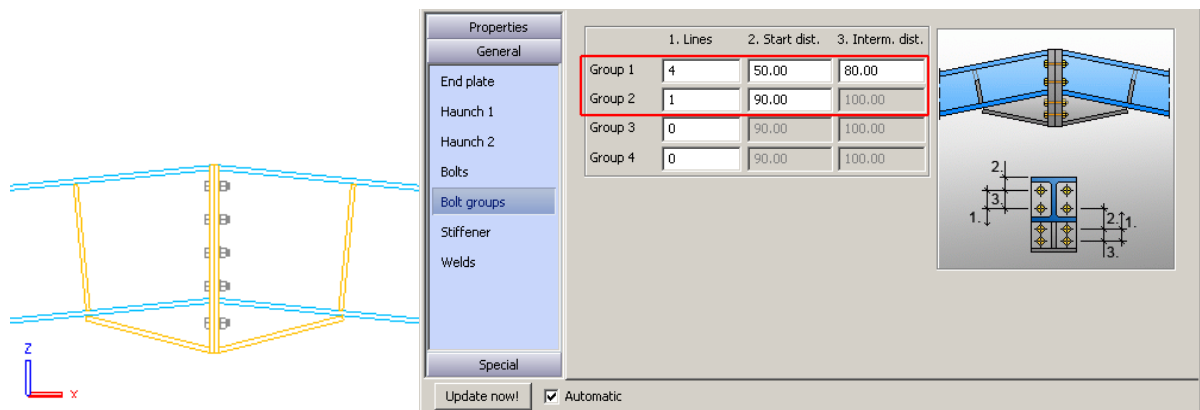
3. Define the haunch plate properties.



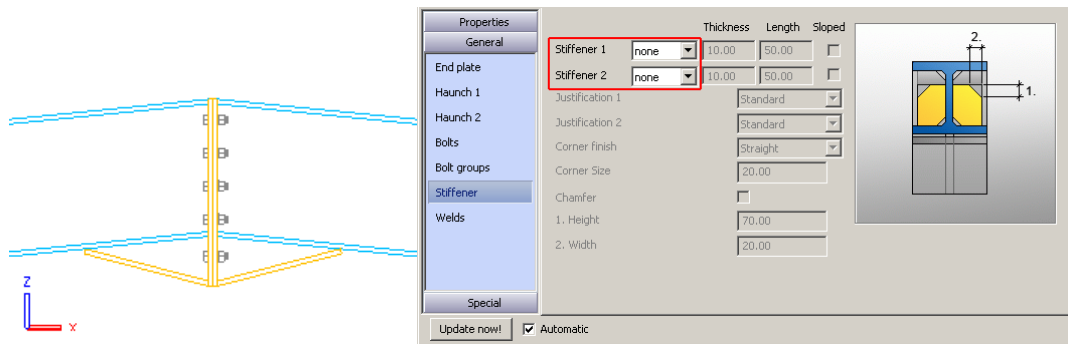
4. Define the bolt properties. Select the **NF E 27-701** bolt type.



5. Define the distances between the bolts within the groups.



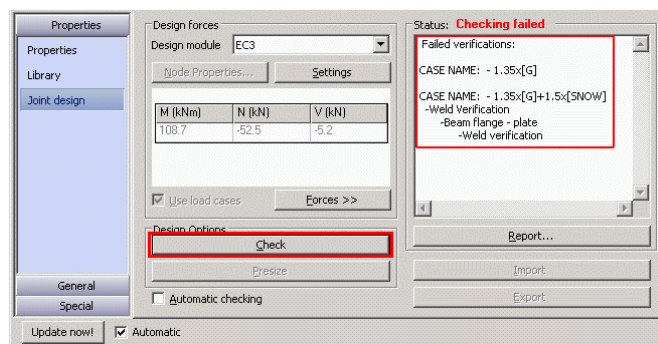
6. Remove the stiffeners:



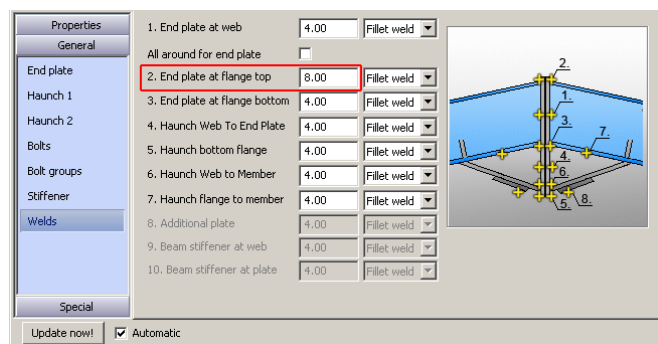
Step 4: Checking the connection

1. Click **Check**.

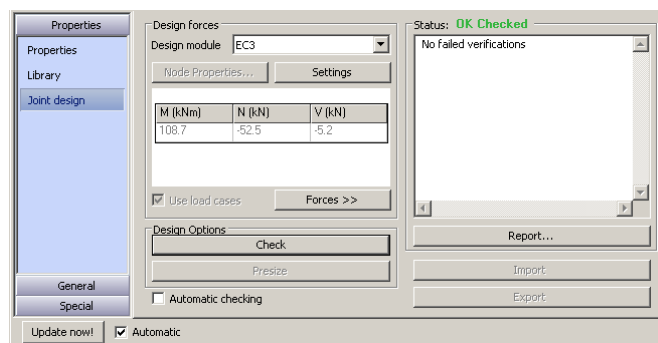
The checking failed because of several errors with the weld thickness connecting the top flange and the end plate.



2. Increase the thickness of the end plate – top flange weld.



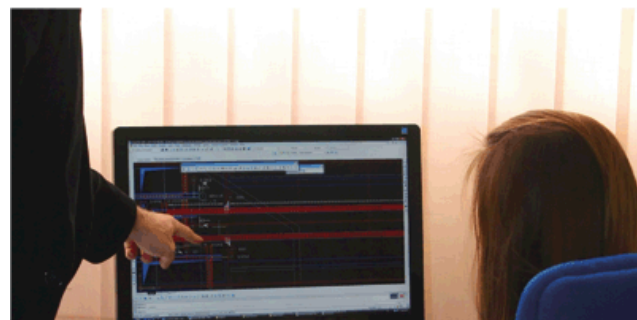
3. Return to the **Joint design** tab and click **Check**. The connection is correct:



Additional remarks

In this chapter

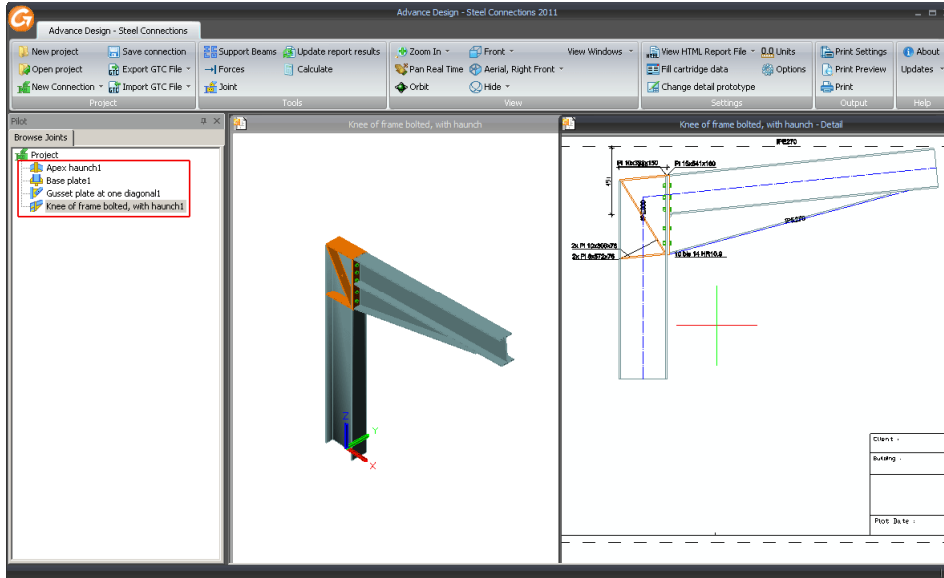
- *A Project explorer to manage the project*
- *Connection description the same as in Advance Steel*
- *Two modes for displaying a connection*
- *The possibility to use the drawing in Advance Steel*
- *The project connections are grouped in a folder*



A Project explorer to manage the project files

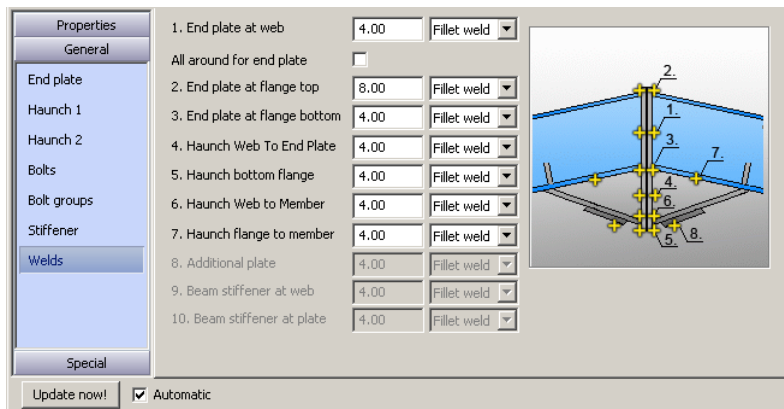
An ADSC project may contain several connections. The project explorer (on the left side) provides an overview of the project content:

- All the project connections are displayed in the project explorer.
- You can easily switch from a connection to another by double clicking a connection.



Connection description the same as in Advance Steel

If you or your designers are using Advance Steel, you will notice that the connection properties dialog boxes in ADSC are identical to Advance Steel. This allows the transfer of the connections information from the calculation environment to the drawing environment and vice versa without any loss of information.



Two modes for displaying a connection

ADSC provides two connection display options:



- A 3D realistic rendering, completely customizable (view angles, shadows, etc.)
- 2D drawing display (adjustable scale, automatic dimensions and labels)

The possibility to use the drawing in Advance Steel

The DWG drawing created by ADSC (located in the “Detail” subfolder of the current project) can be opened in Advance Steel, where all advanced detailing tools allow adding dimensions and annotations, changing the label position, etc.









The project connections are grouped in a folder

All the project files are grouped in a folder having the project name.

 Tutorial	File Folder	
 Tutorial.grproj	GRPROJ File	1 KB

This folder contains the DWG file of the 3D model. It also contains several subfolders, including:

- “Detail”, that contains the DWG drawing
- “Document”, that contains the calculation report

 Apex haunch1	File Folder	
 Base plate1	File Folder	
 Gusset plate at one diagonal1	File Folder	
 Knee of frame bolted, with haunch1	File Folder	
 Apex haunch1.dwg	AutoCAD Drawing	69 KB
 Base plate1.dwg	AutoCAD Drawing	61 KB
 Gusset plate at one diagonal1.dwg	AutoCAD Drawing	57 KB
 Knee of frame bolted, with haunch1.dwg	AutoCAD Drawing	64 KB

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