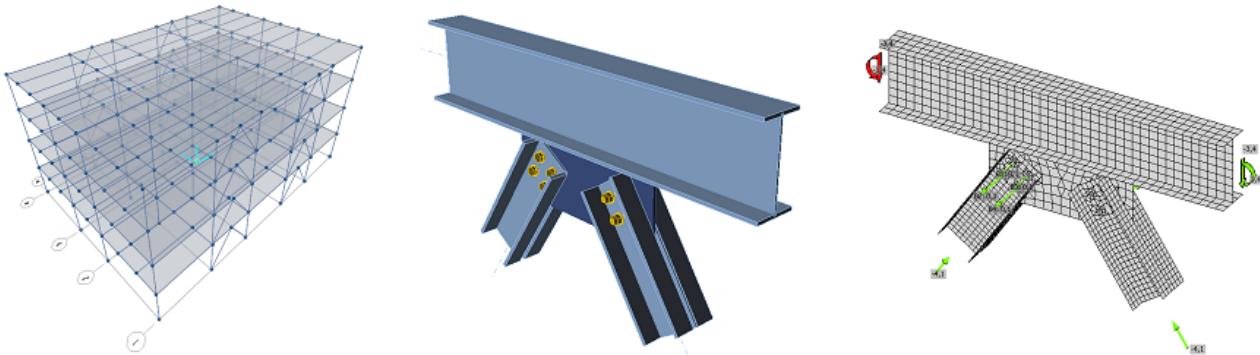


IDEA StatiCa Tutorial – SAP2000 link

This tutorial will show how to activate and use the link between SAP2000 and IDEA StatiCa Connection.



[Activate the link](#)

[Use the link](#)

[Update the project](#)

[Known limitations](#)

1 How to activate the link

Install the latest version of IDEA StatiCa, get it in the [Downloads](#)

Make sure you are using a supported version of SAP2000 – updates are published in the [BIM section](#)

IDEA StatiCa automatically integrates the BIM link into your CAD/CAE software during its installation. You can check the status and activate more BIM links for later installed software in the BIM link installer.

Open IDEA StatiCa and navigate to the panel **BIM** and open the **BIM link installer**. A notification "*Run as administrator*" may appear, please confirm with the **Yes** button.



Select the software to integrate the IDEA StatiCa BIM link, click the **Install** button and check the Installed status.

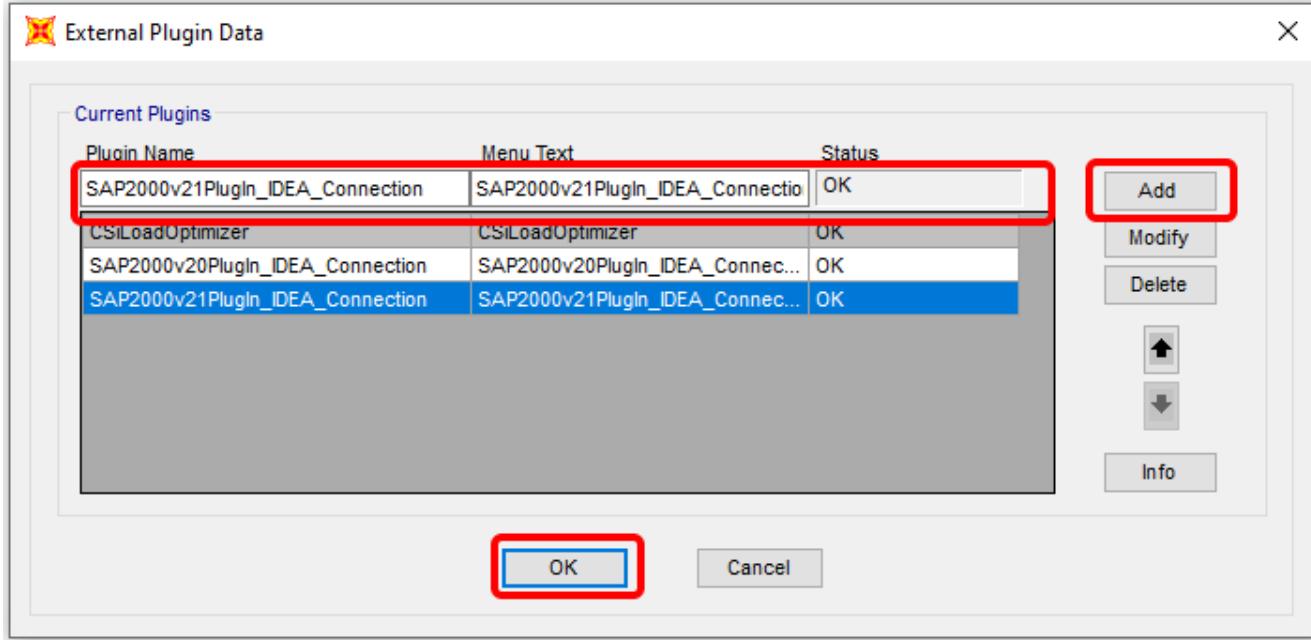
IDEA StatiCa® Calculate yesterday's estimates	
 Advance Design 2018	Target application not found
 Tekla 2017i	Target application not found
 Tekla 2016i	Target application not found
 Advance steel 2018	Install
 Advance steel 2017	Target application not found
 ETABS 2016	Please add our Add-in into your ETABS 2016
 SAP 2000 v 20	Install
 SAP 2000 v 19	Install
 SAP 2000 v 18	Install
 Axis VM	Install
 Robot Structural Analysis	Install
 Revit 2017	Install
 Revit 2018	Install
 SCIA Engineer	Install
 STAAD.Pro v8i	Installed
 RFEM 5	Install
 RSTAB 8	Installed

Start **SAP2000**. In menu **Tools** and **Add/Show Plugins** fill the Plugin Name field as follows:

SAP2000v20PlugIn_IDEA_Connection (in Version 20)

SAP2000v21PlugIn_IDEA_Connection (in Version 21)

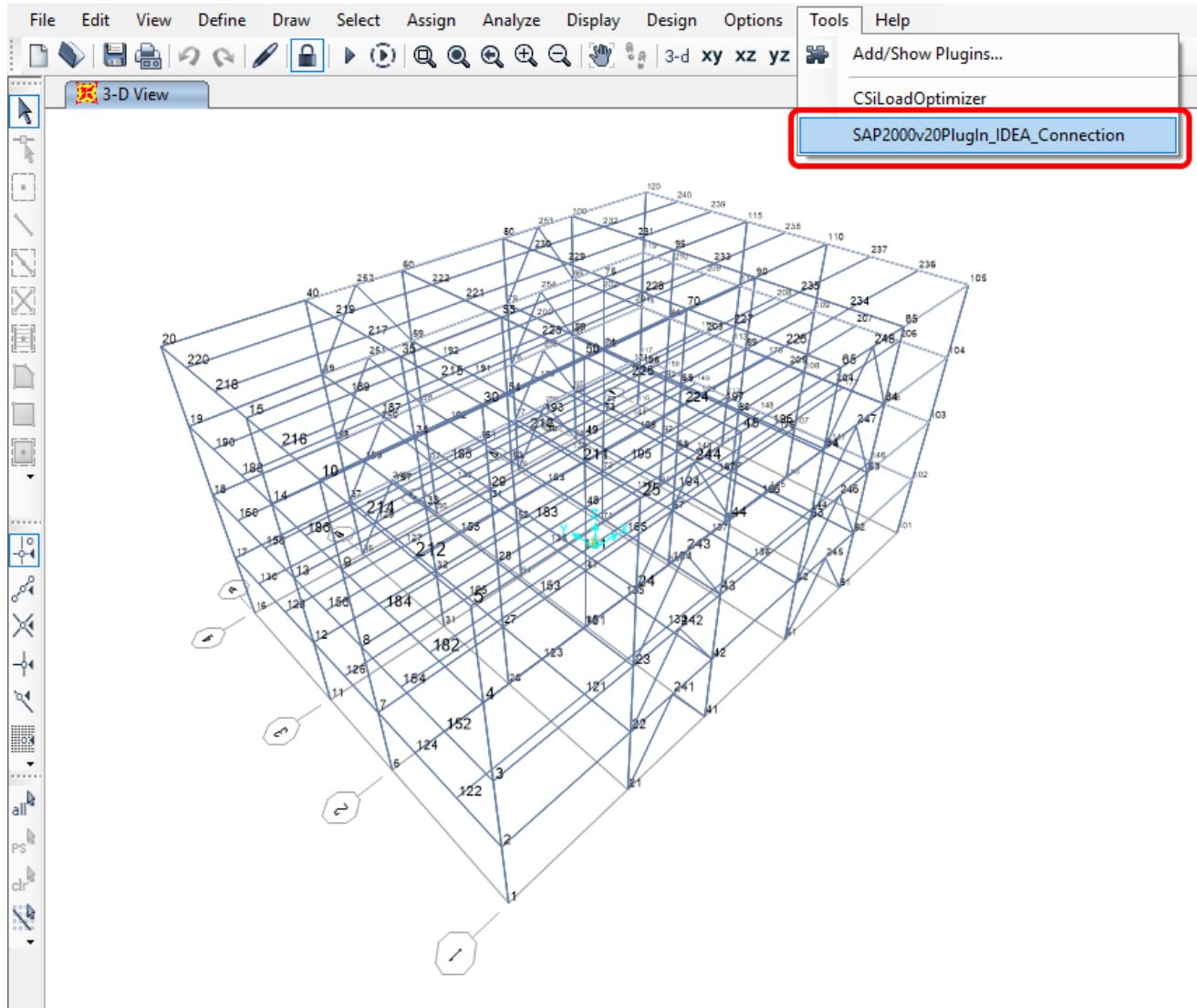
Then type in the Menu Text (command name displayed in the menu) and click **Add**.



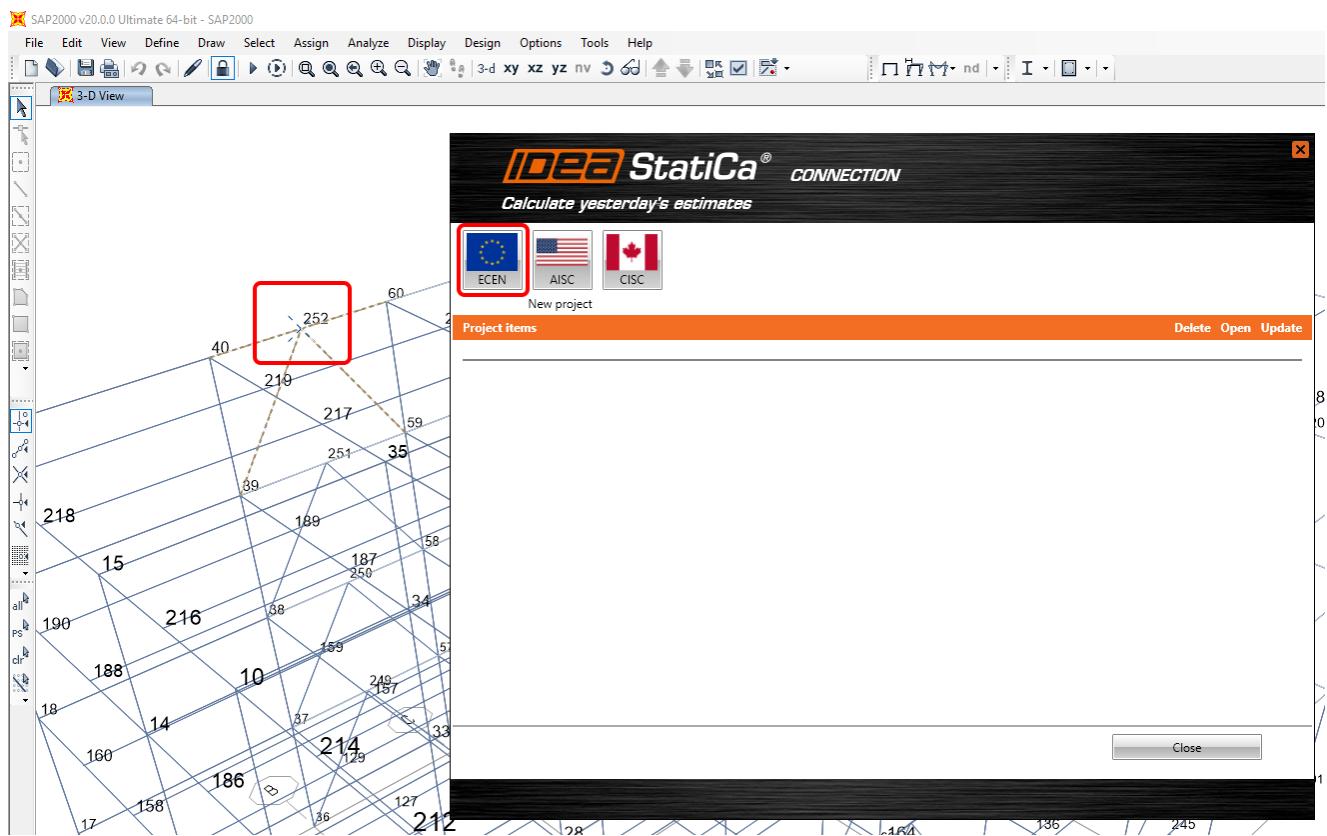
2 How to use the link

Open the attached project in SAP2000 and run the CBFEM analysis.

Go to menu item **Tools** and choose **SAP2000v20PlugIn_IDEA_Connection** .or
SAP2000v21PlugIn_IDEA_Connection



A wizard window is opened, select the join you want to transfer to IDEA StatiCa Connection and click on **ECEN**.



Finally, we click **Connection design** to directly start IDEA StatiCa Connection.



Connection design needs more data to be able to provide a proper design according to national codes. You can use default settings or define them in this wizard.

Design code: EN

Type of structure: General structure

Default setting:

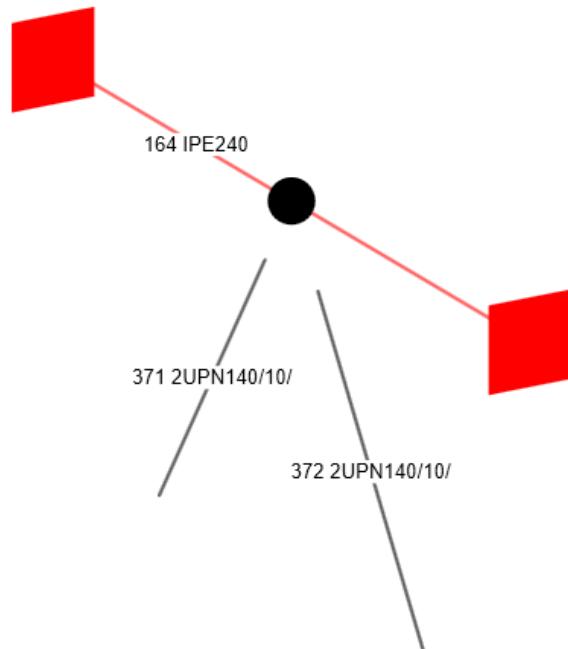
All load combinations are used for the design.

Load combinations are sorted into classes ULS, SLS etc.

Con 252-Node N1

Connected members:

	Cross-section	Role	Type
>	164 IPE240 (IPE240)		Bearing
	371 2UPN140/10/ (2UPN)		Continuous
	372 2UPN140/10/ (2UPN)		Ended



Connection design

< Previous

Next >

Cancel

3 Design

We right-click on **Operation** in the tree menu to add a New operation and select **Stiffening plate**.

IDEA StatiCa CONNECTION SAP2000[Joint252]IdeaCon

Project **Design** Check Report Materials

Con 252 EPS ST MC DR New Copy Undo Redo Save Data Members Plates LCS New Gallery Apply Create Manager Code setup CBFEM Loads in equilibrium Options XLS Import Overall check XLS Export Import/Export loads Member Load Operation New Solid Transparent Wireframe

Project Items

Members

- ✓ DM1
- ✓ 371 2UPN140/10/
- ✓ 372 2UPN140/10/

Load effects

COMBO_DEAD

- ✓ STR1
- ✓ STR2
- ✓ STR3
- ✓ STR4
- ✓ STR5
- ✓ STR6
- ✓ STR7
- ✓ STR8
- ✓ STR9
- ✓ STR10
- ✓ QKE1
- ✓ QKE2
- ✓ WS

Operations

COMBO_DEAD [Load]

Member	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
DM1 / Begin	0,0	0,0	-4,8	0,0	-2,0	0,0
DM1 / End	0,0	0,0	-4,8	0,0	2,0	0,0
371 2UPN140/10/ / End	-6,0	0,0	-0,3	0,0	0,0	0,0
372 2UPN140/10/ / End	-6,0	0,0	-0,3	0,0	0,0	0,0

Description
DEAD + G1
Values in disabled cells are not taken into account in CBFEM analysis. Members can be loaded only by that components of internal forces which are defined in member "Model type".

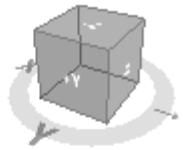
Unbalanced forces

X [kN]	Y [kN]	Z [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
0,0	0,0	0,0	0,0	0,0	0,0

Design code: EN Analysis: Stress, strain Load effects: In equilibrium Units: mm

www.ideastatica.com

Solid Transparent Wireframe



Members

- DM1
- 371 2UPN140/10/
- 372 2UPN140/10/

Load effects

- COMBO_DEAD
- STR14
- STR15
- STR16
- STR17
- STR18
- STR19
- STR20
- QKE1
- QKE2
- WS

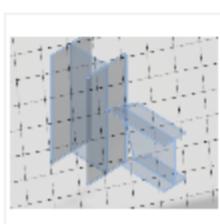
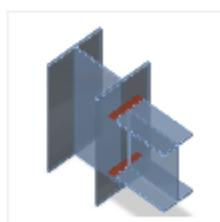
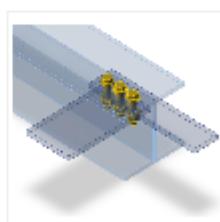
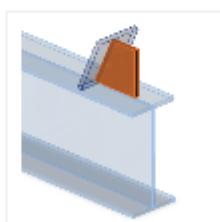
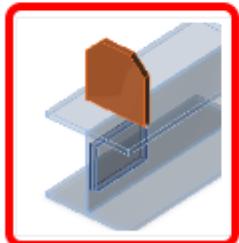
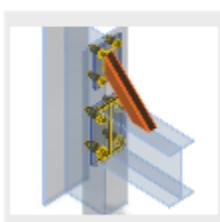
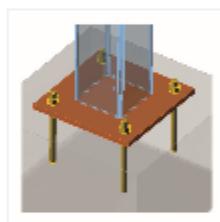
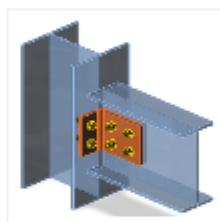
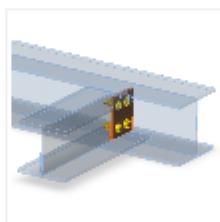
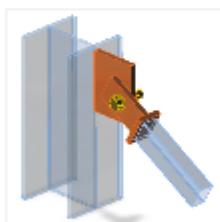
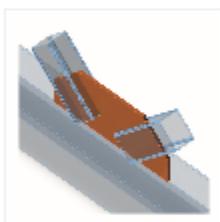
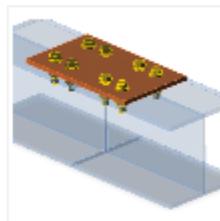
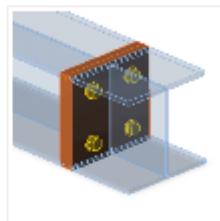
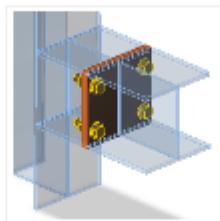
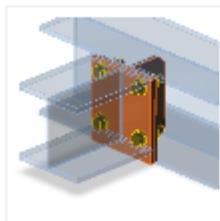
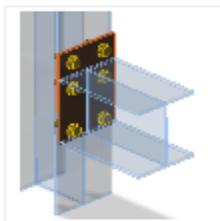
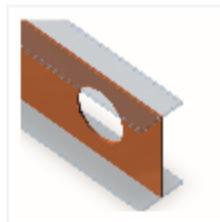
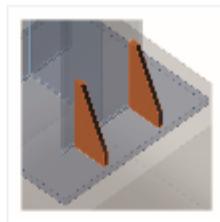
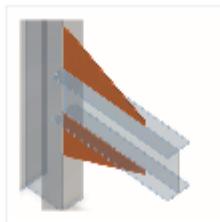
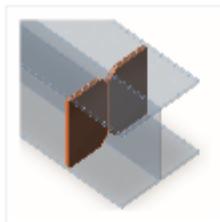
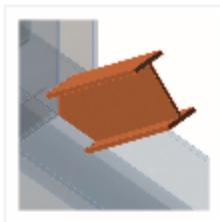
Operations

New operation

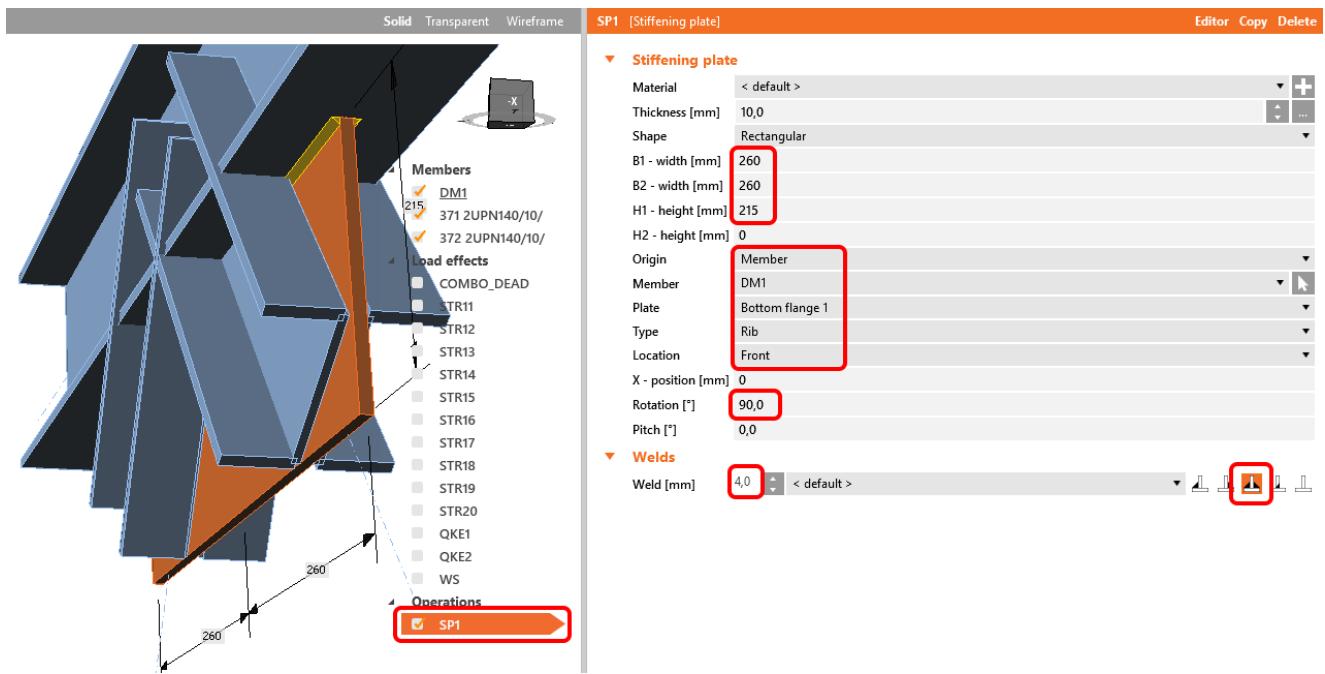
Clear

Select operation

X



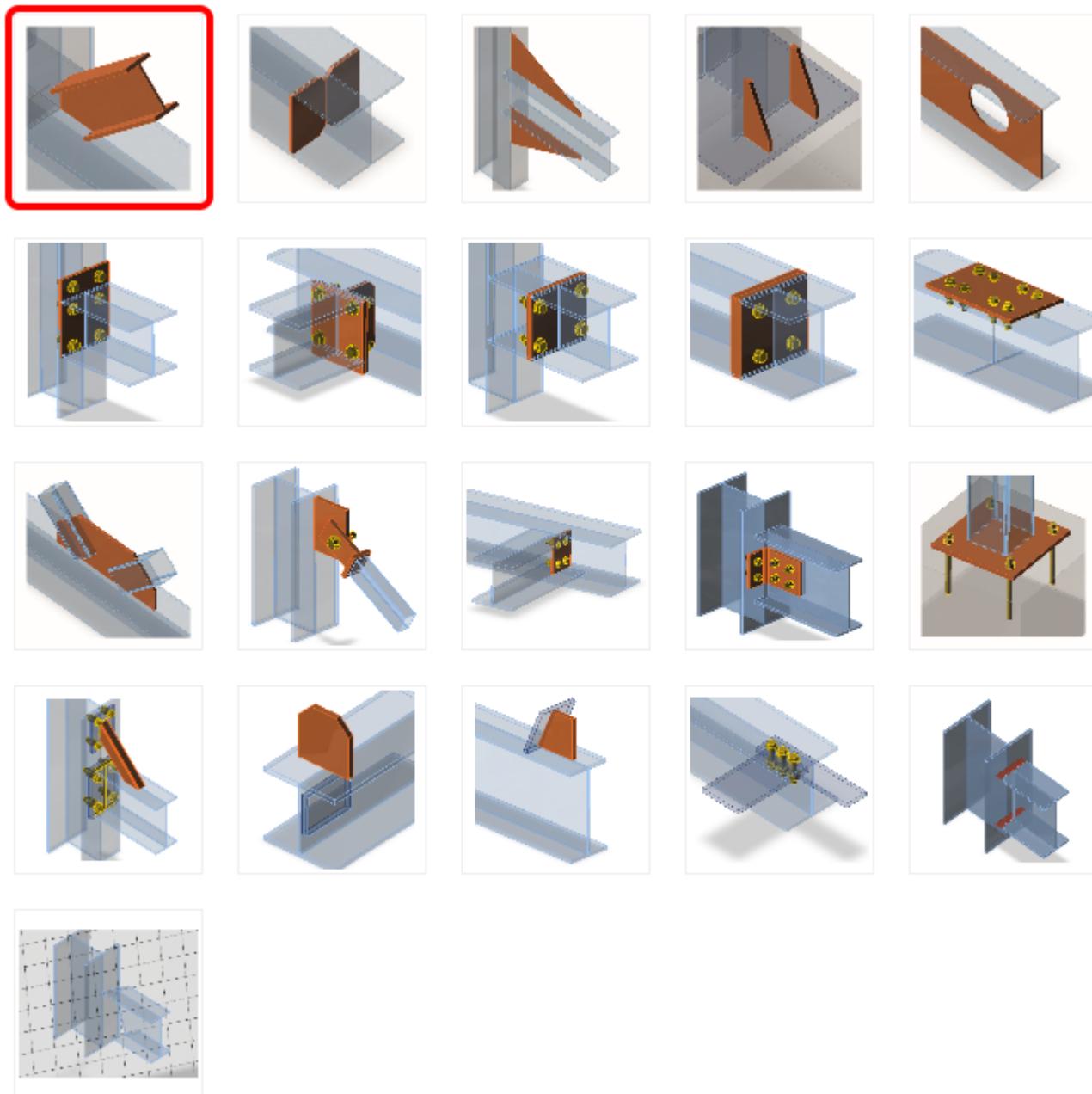
Cancel



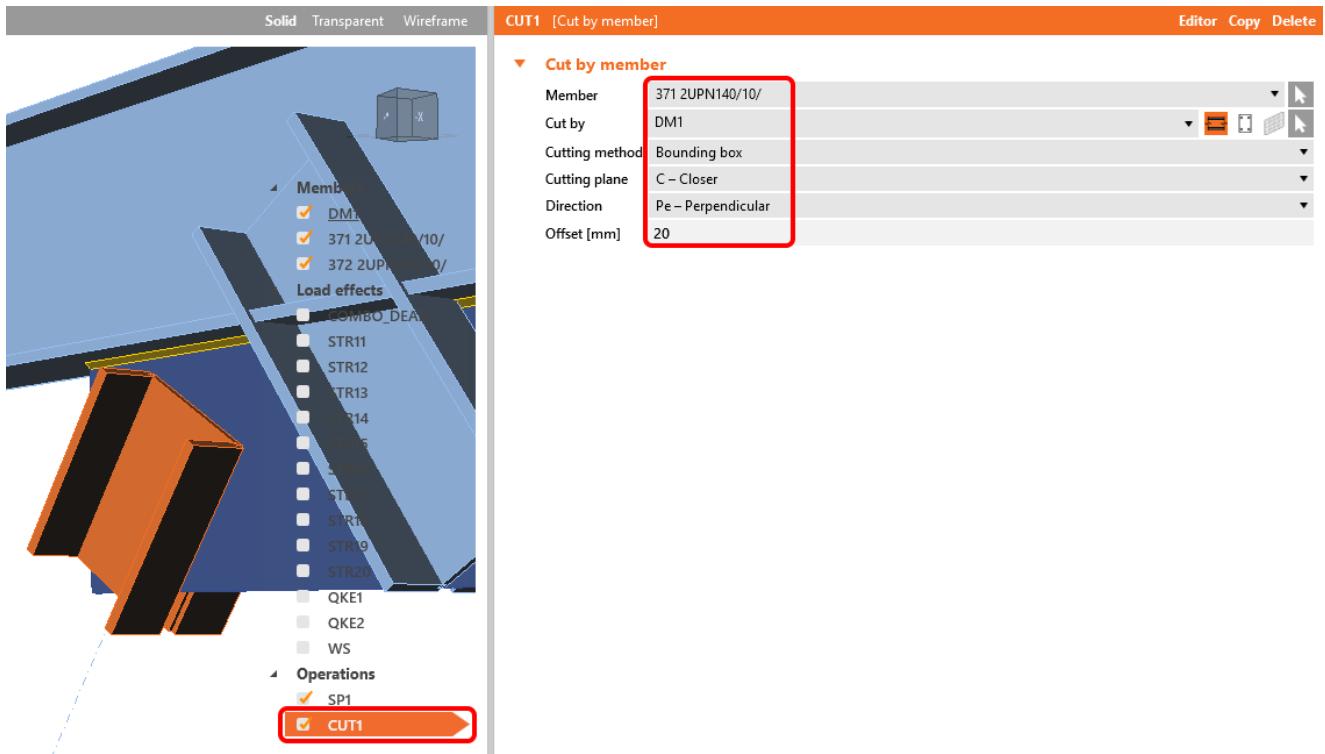
In the same way we add the manufacturing operation **Cut** and fill in the values below.

Select operation

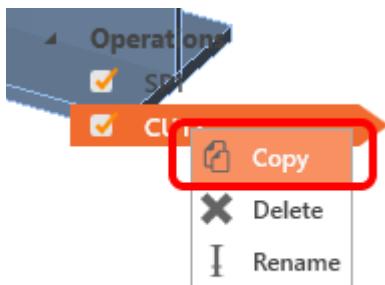
X

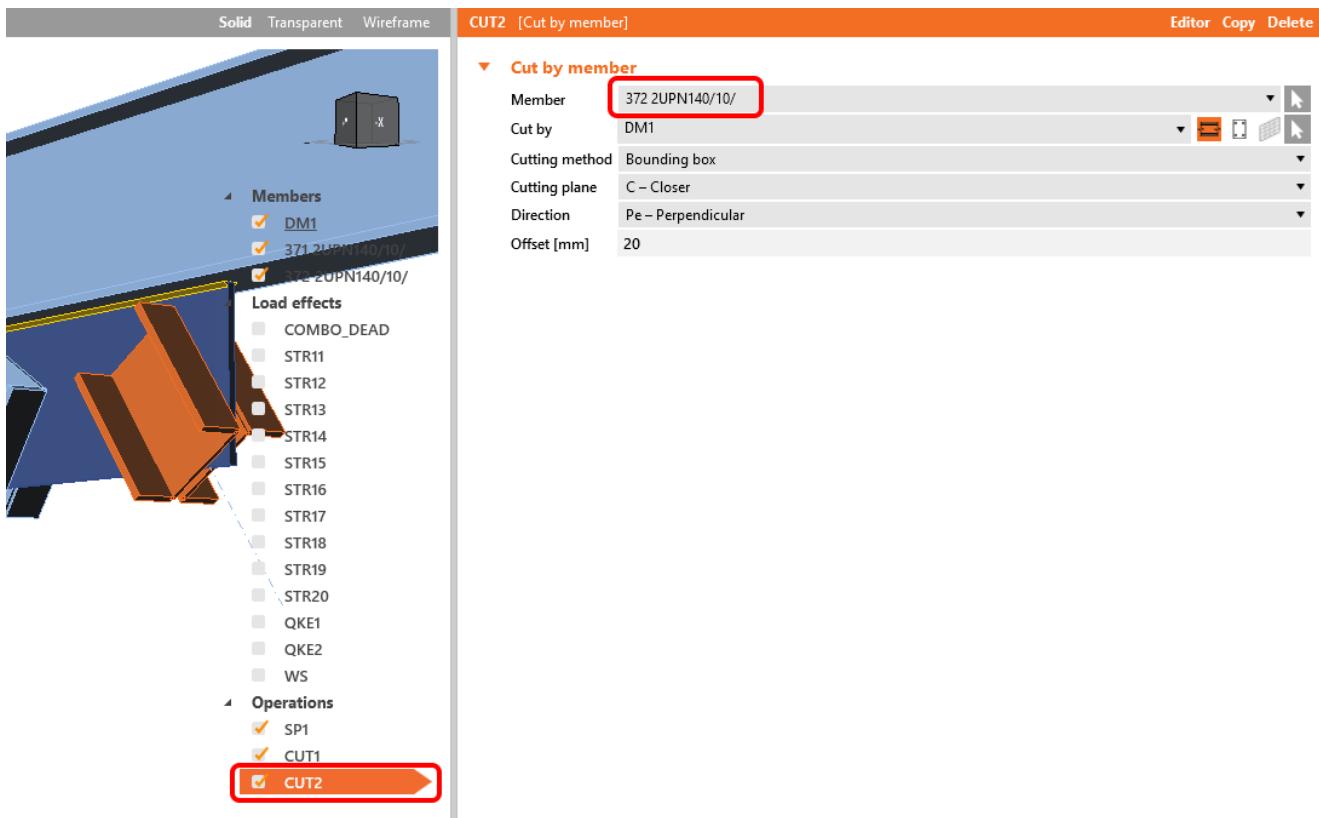


Cancel



In the next step, right-click on Operation **CUT1** and select **Copy**. Then change the value for Member to **372**.

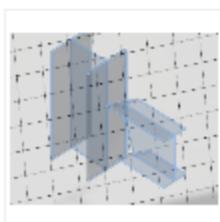
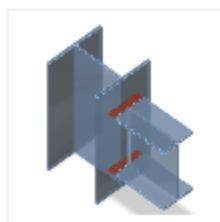
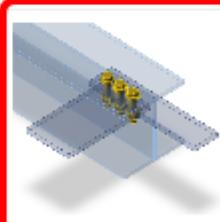
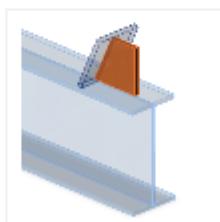
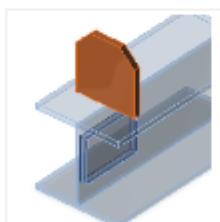
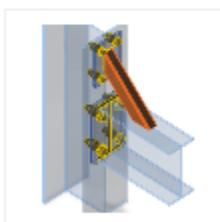
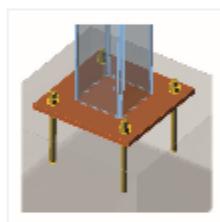
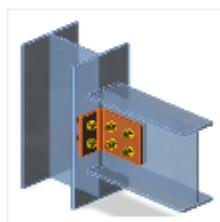
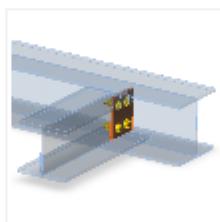
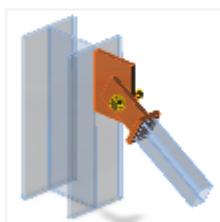
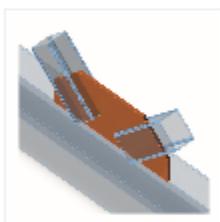
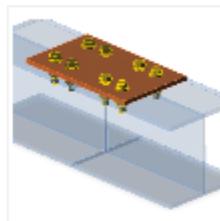
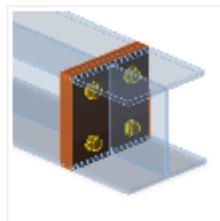
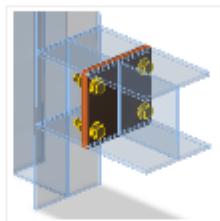
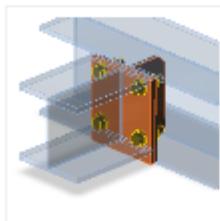
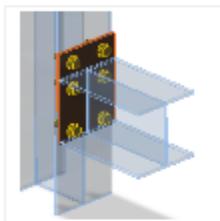
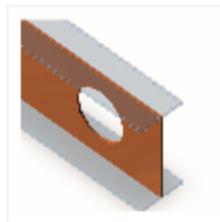
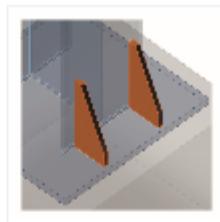
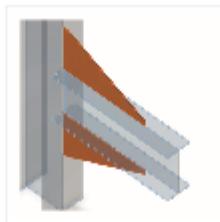
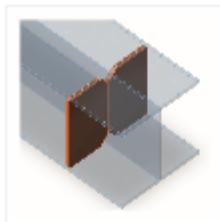
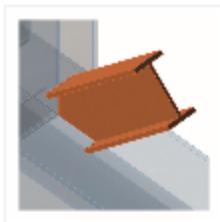




Let's continue with input of manufacturing operation **Bolt grid or contact**. Values set according picture.

Select operation

X



Cancel

Bolt assembly

4.6	M12 10.9
4.8	M16 10.9
5.6	M20 10.9
5.8	M22 10.9
6.8	M24 10.9
8.8	M27 10.9
10.9	M30 10.9
EC	M36 10.9
	M39 10.9
	M42 10.9
	M48 10.9
	M52 10.9

OK

Cancel

Solid Transparent Wireframe

GRD1 [Bolt/Anchor grid or Contact]

Editor Copy Delete

Bolt/Anchor grid or Contact

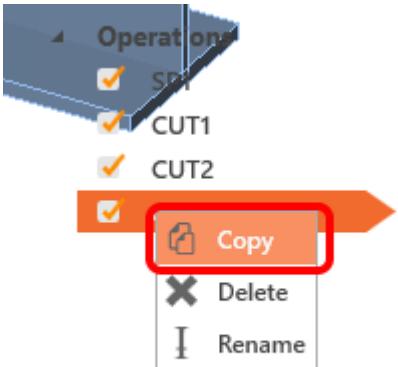
Fastener

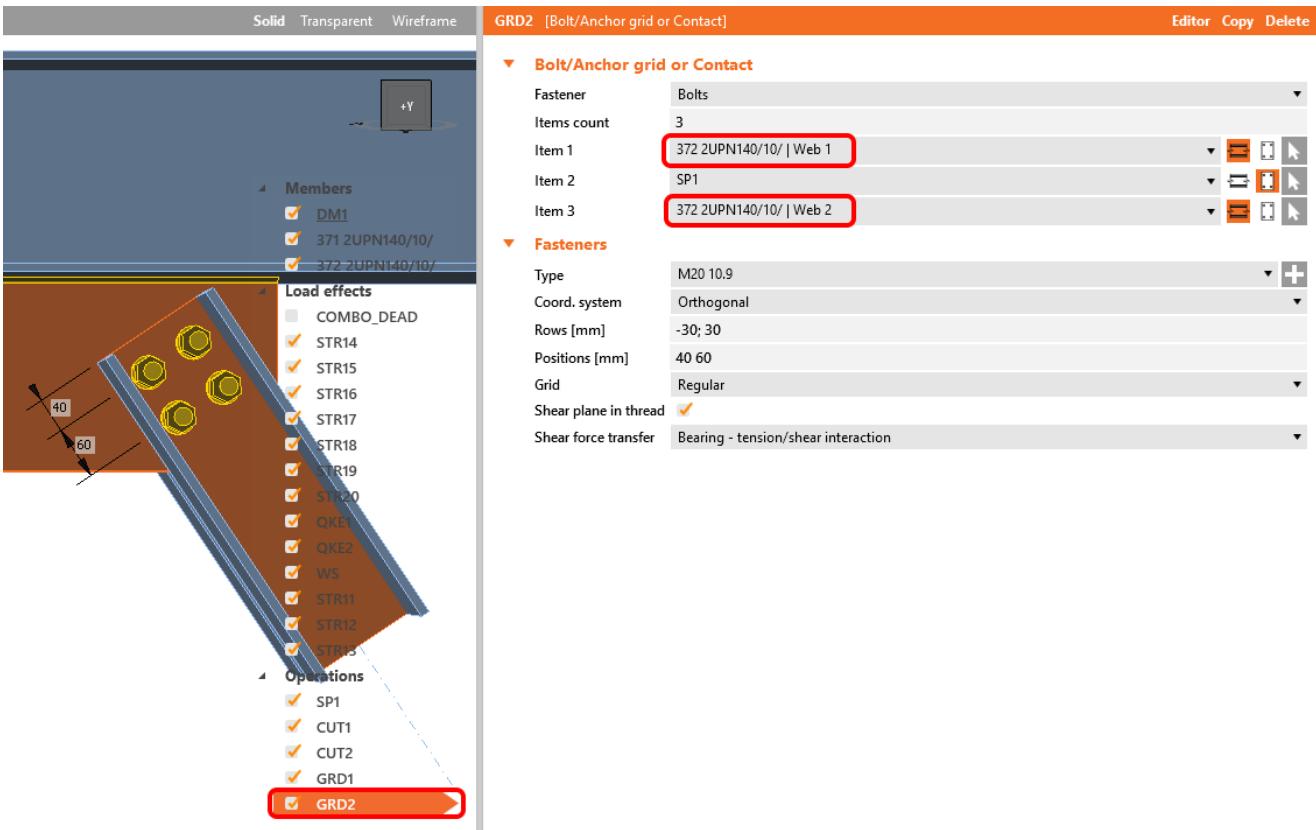
- Items count: 3
- Item 1: 371 2UPN140/10/ | Web 1
- Item 2: SP1
- Item 3: 371 2UPN140/10/ | Web 2

Fasteners

- Type: M20 10.9
- Coord. system: Orthogonal
- Rows [mm]: -30; 30
- Positions [mm]: 40 60
- Grid: Regular
- Shear plane in thread: checked
- Shear force transfer: Bearing - tension/shear interaction

In the next step, right-click on **Operation GRD1** and select **Copy**. Then change the value for Item 1 type and Item 2 type to 372.

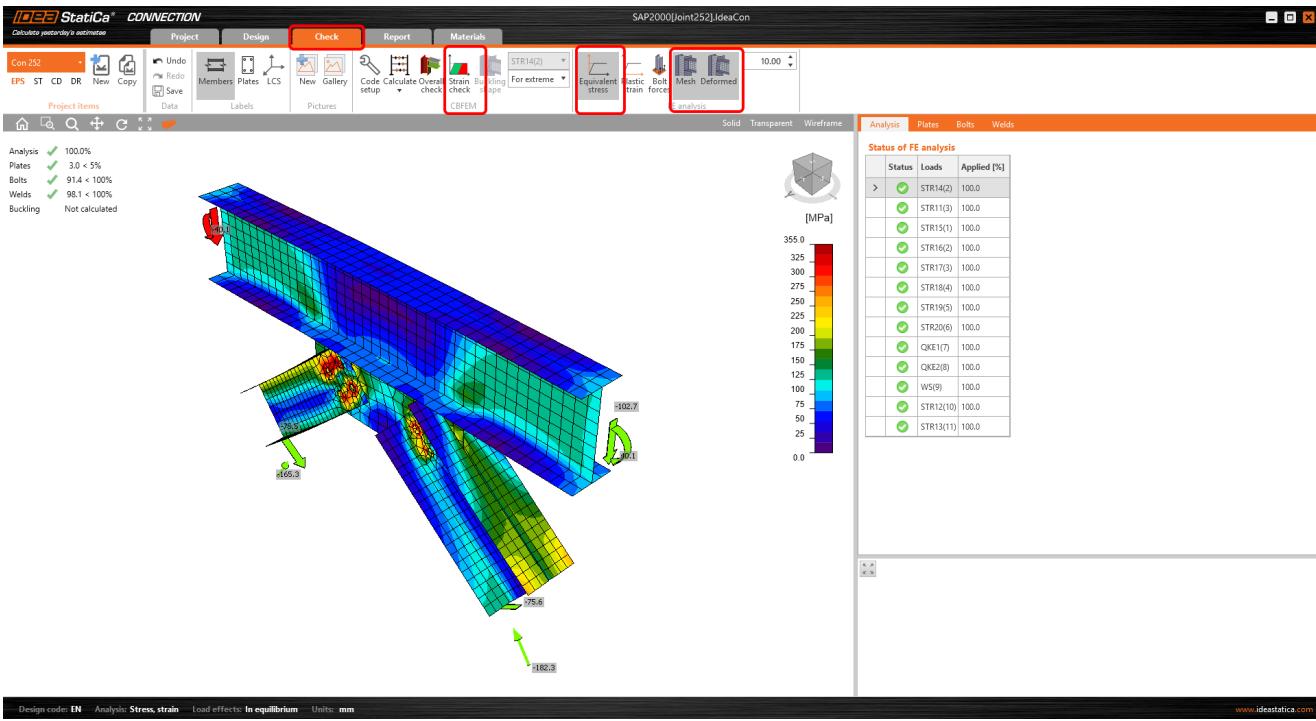




4 Check

Nonlinear analysis is started by icon **Calculate** from the top ribbon. Analysis model is automatically generated, calculation is performed and we can check results.

Activate **Strain check**, **Equivalent stress**, **Mesh** and **Deformed** from the ribbon to get a full picture of what is happening in the joint. Everything is displayed in the 3D window.



All values can be reviewed in detailed in the tables and 2D window. For example to display check of bolts select tab Bolts/Anchors tab.

Check of bolts for extreme load effect

		Status	Item	Grade	Loads	Ft [kN]	V [kN]	Fb,Rd [kN]	Utt [%]	Uts [%]	Utts [%]
>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	B1	M20 10.9 - 1	STR14(2)	10.3	82.0/82.2	204.0	5.8	83.8	88.0
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	B2	M20 10.9 - 1	STR14(2)	14.1	75.2/75.2	204.0	8.0	76.7	82.4
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	B3	M20 10.9 - 1	STR14(2)	15.6	63.2/63.2	204.0	8.8	64.5	70.8

Tension resistance check (EN 1993-1-8 Table 3.4)

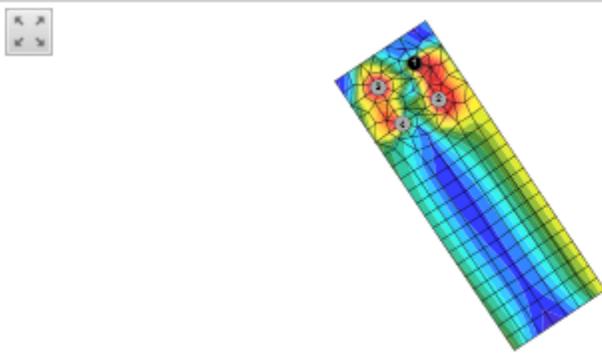
$$F_{t,Rd} = \frac{k_2 f_{ub} A_s}{\gamma_M 2} = 176.4 \text{ kN} \geq F_t = 15.6 \text{ kN}$$

where:

- $k_2 = 0.90$ – Factor
- $f_{ub} = 1000.0 \text{ MPa}$ – Ultimate tensile strength of the bolt
- $A_s = 245 \text{ mm}^2$ – Tensile stress area of the bolt
- $\gamma_M = 1.25$ – Safety factor

Design data

	Item	Ft,Rd [kN]	Bp,Rd [kN]	Fv,Rd [kN]
>	M20 10.9 - 1	176.4	193.3	98.0
	M20 10.9 - 2	176.4	206.2	98.0



5 Report

At last we go to the tab **Report**. IDEA StatiCa offers fully customizable report to print out or save in editable format.

The screenshot shows the IDEA StatiCa Connection interface. At the top, there's a toolbar with various icons for file operations (New, Copy, Refresh, Print, Preview, DOC, PDF, DXF) and report types (Brief, One page, Detailed, BOM). Below the toolbar, the main area displays 'Project data' (Project name: Con 252, Project number: 26.03.2018, Design code: EN), 'Material' (Steel: S355, Concrete: C25/30), and a detailed view of 'Con 252' showing its analysis (Stress, strain/ loads in equilibrium). It includes a 3D model of the joint and a table of beams and columns with their dimensions and material properties. On the right, a sidebar titled 'Report' lists various sections with checkboxes, many of which are checked (e.g., Project data, Project items, Code settings, Theoretical background, Software info).

We have imported a joint from SAP2000 and designed and code-checked it according to Eurocode.

6 Synchronize models

The screenshot shows the IDEA StatiCa Code-check manager interface. The toolbar at the top has buttons for 'New', 'Open', 'Synchronize', 'Calculate', and 'Calculate All'. The 'Synchronize' and 'Calculate All' buttons are highlighted with red boxes. Below the toolbar, there are two main sections: 'Project items' on the left and 'Current item' on the right. The 'Project items' section is currently empty.

Code-check manager is a BIM tool to export and synchronize connections from other programs. It is launched directly in the 3rd party applications via a command/icon.

Synchronize - IDEA StatiCa detects changes in already imported entities (changes in thickness, changes in cross-section, modification of properties of welds, bolts, etc.) and updates the project in IDEA StatiCa Connection.

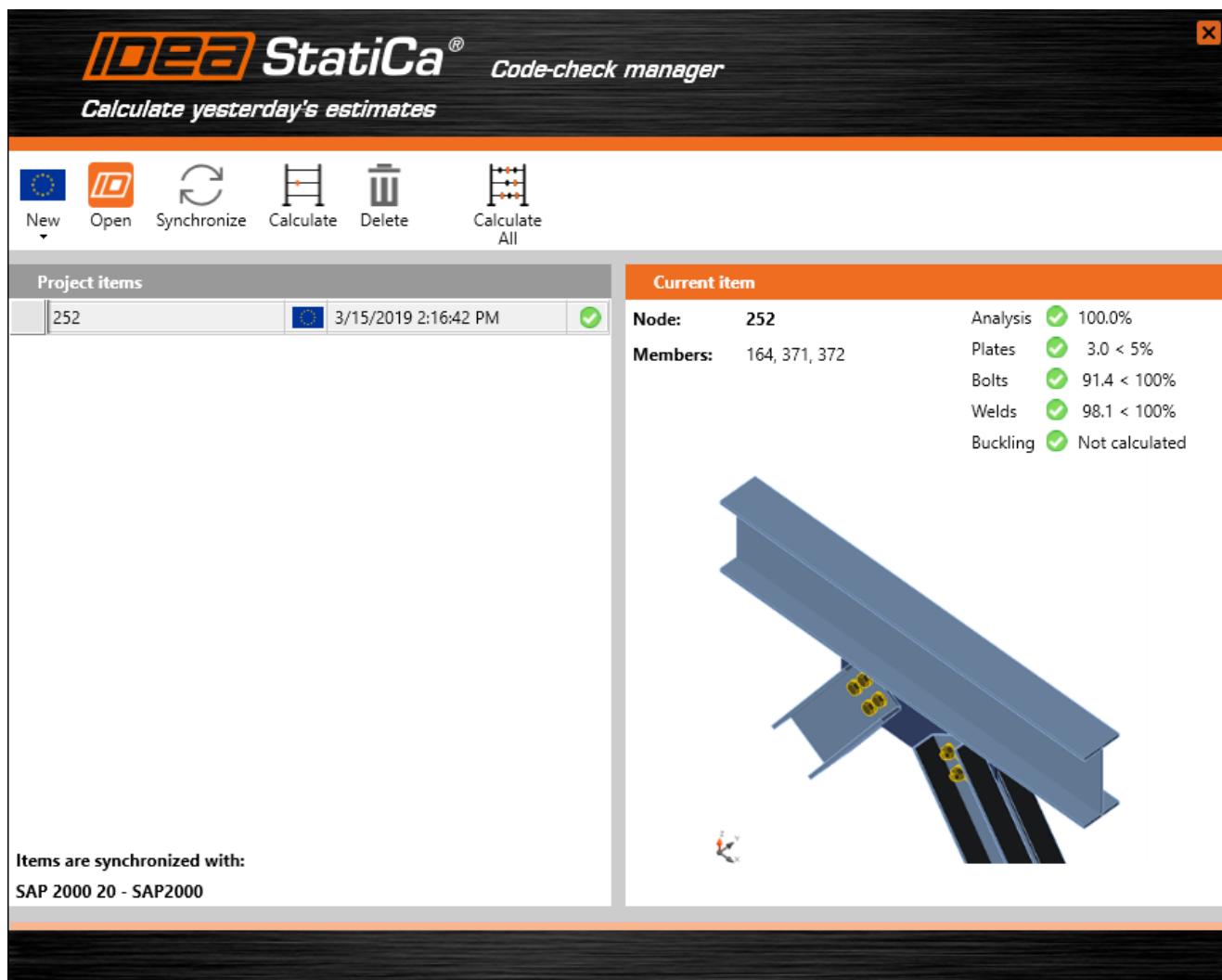
Calculate - Synchronize and calculate current item and provide a new set of results.

Calculate all - Synchronize and calculate all items and provide new set of results.

Note

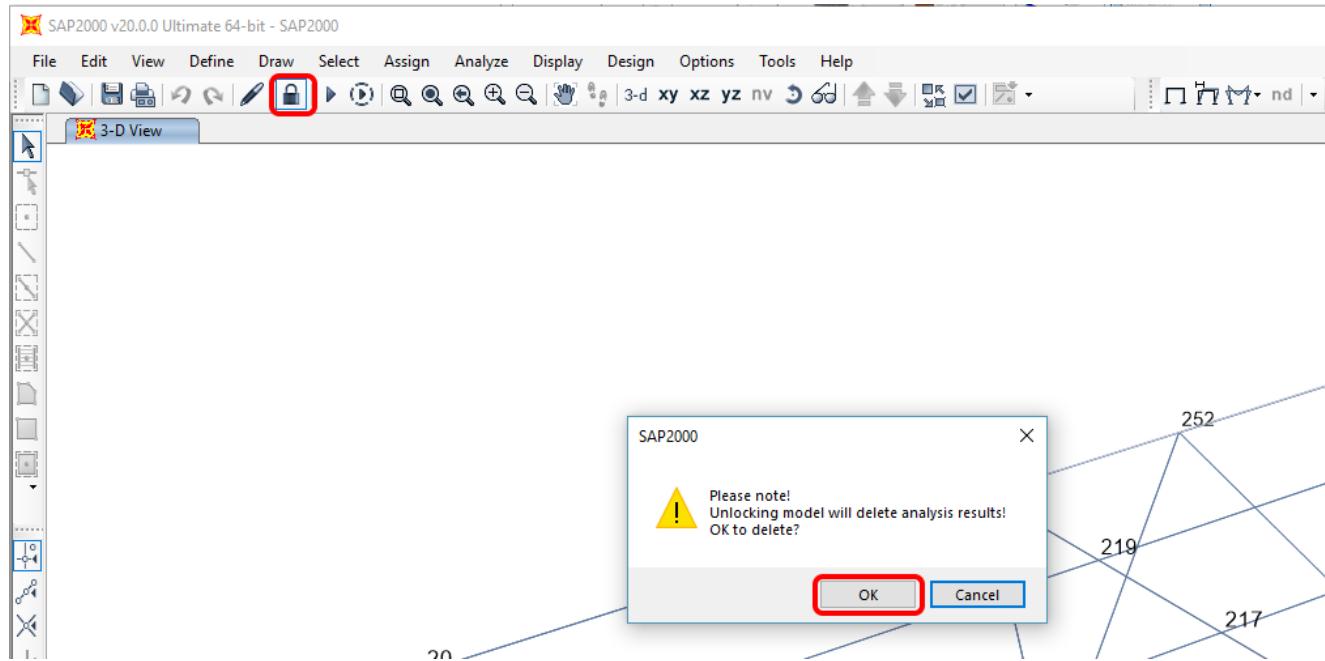
Kindly be aware that IDEA StatiCa syncs with a model of the 3rd party application, not the other way around. If we **add operations** in IDEA StatiCa and then use the options described above (Synchronize; Modify; Calculate; Calculate all), the additionally added operations will be deleted.

We save the project in IDEA StatiCa and close the application Connection. All joints exported from SAP2000 project to IDEA StatiCa are kept on the list inside SAP2000.

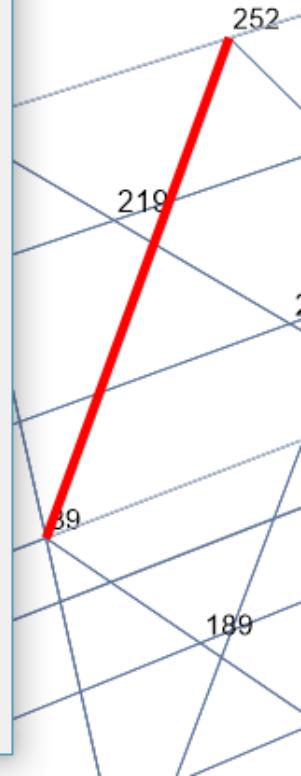
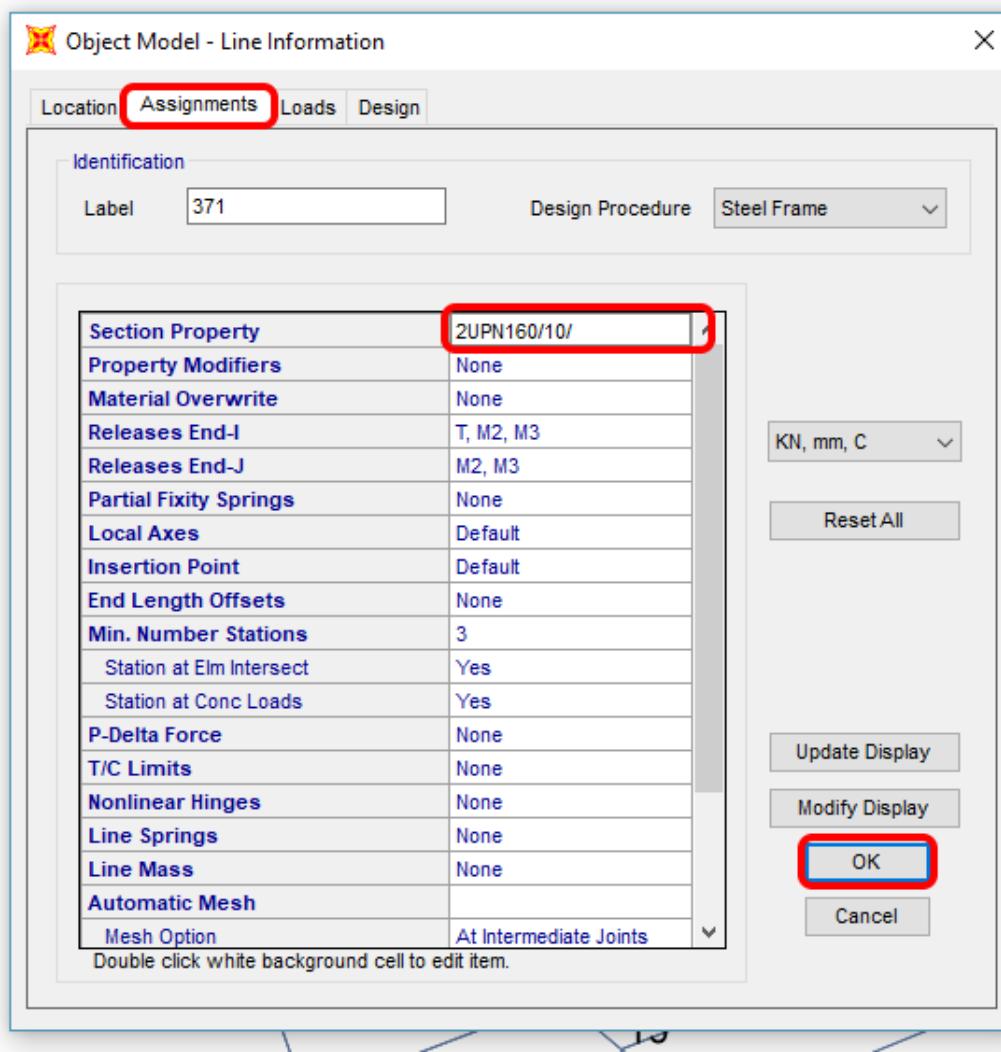


If we modify the project in SAP2000 (e.g. change cross section of any member or add another loads) we can simply update the project in IDEA StatiCa without modeling it all again. Let's change the cross section of one of the members.

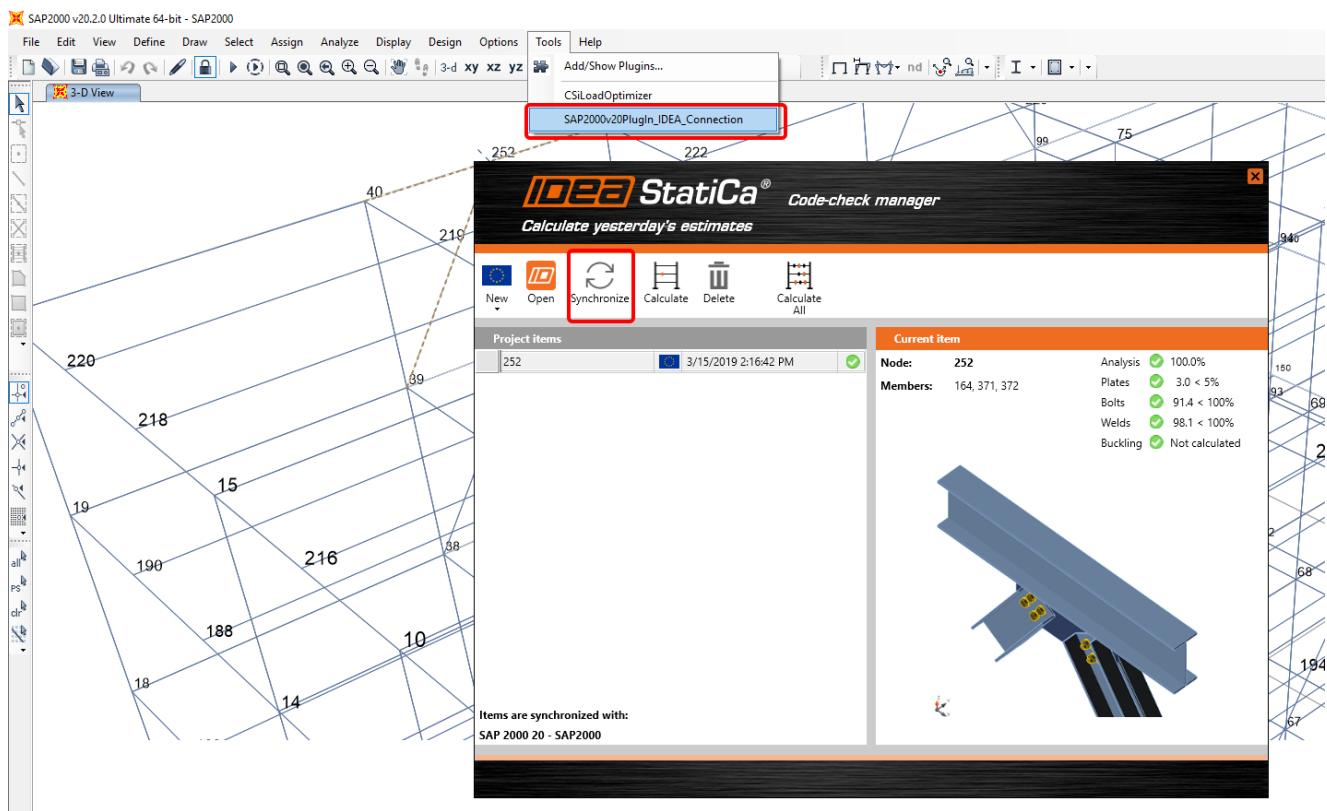
First, we unlock the project in SAP2000.



Right-click on the member 371 and following window appears. Go to **Assignments** and change the cross-section from 2UPN140/10/ to **2UPN160/10/** and click **OK**.



We repeat the same for the Member 372 as well. Run the analysis, select **SAP2000v20PlugIn_IDEA_Connection** in the upper ribbon and in the Code-check manager click on **Synchronize**.



In the next window just select Connection design.

IDEA StatiCa® CONNECTION

Calculate yesterday's estimates

Connection design needs more data to be able to provide a proper design according to national codes. You can use default settings or define them in this wizard.

Design code: EN

Type of structure: General structure

Default setting:
All load combinations are used for the design.
Load combinations are sorted into classes ULS, SLS etc.

Con 252-Node N1

Connected members:

	Cross-section	Role	Type
>	164 IPE240 (IPE240)	Bearing	Continous
	371 2UPN160/10/ (2UPN		Ended
	372 2UPN160/10/ (2UPN		Ended

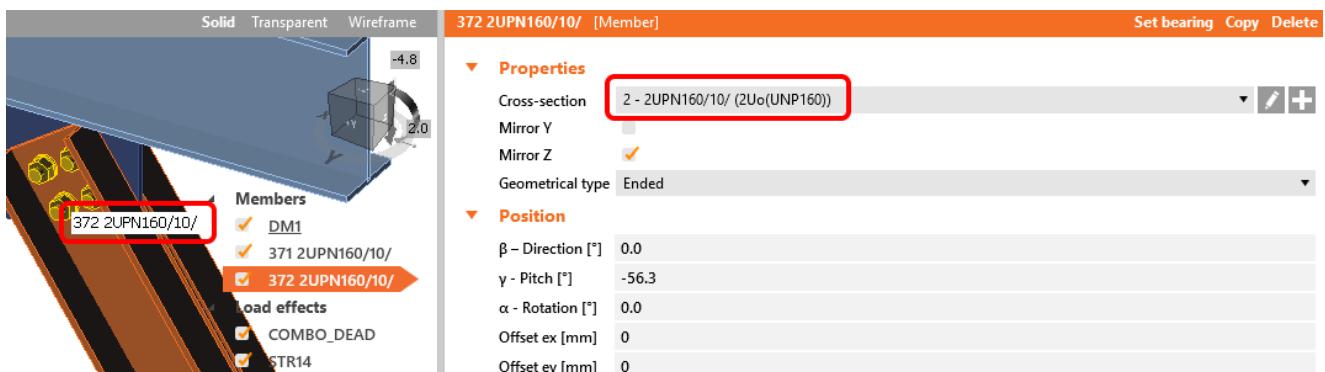
Connection design (button highlighted with a red box)

< Previous

Next >

Cancel

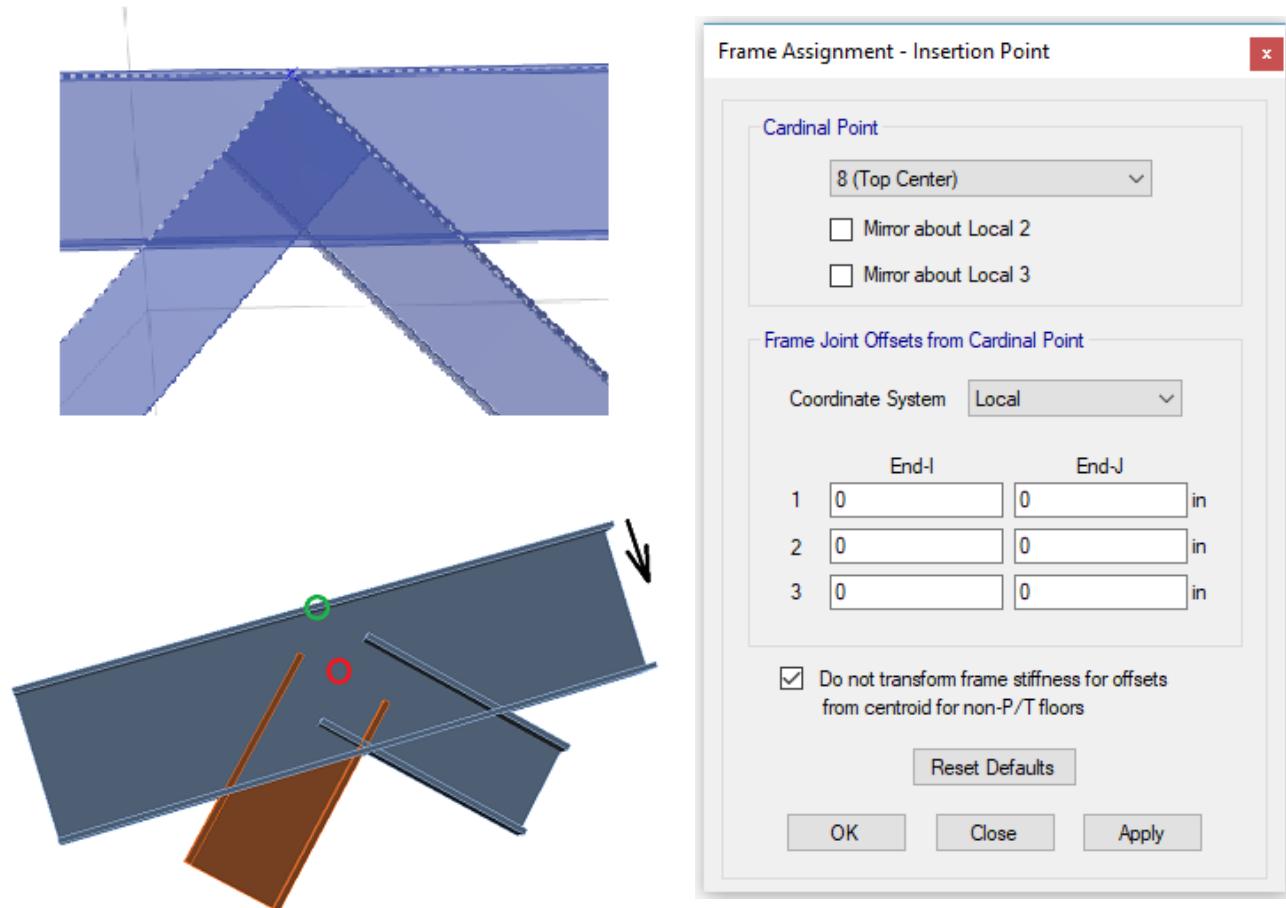
As you can see, the cross-section of the Members 371 and 372 has changed, but all previous operations remained.



7 Known limitations

Link now works for a wide variety of connections/joints. However, please take into account yet unsupported functionality:

Eccentricity - Centroid is not set as Cardinal point



Workaround: Import the whole joint and manually move the beams with eccentricity to the proper position.

Keywords:

connection, joint, Eurocode, bevel, cut, stub, SAP2000, BIM, BIM link, code-check manager, CBFEM

Related articles and tutorials:

[IDEA StatiCa tutorial – How to combine Tekla Structures and SAP2000](#)

