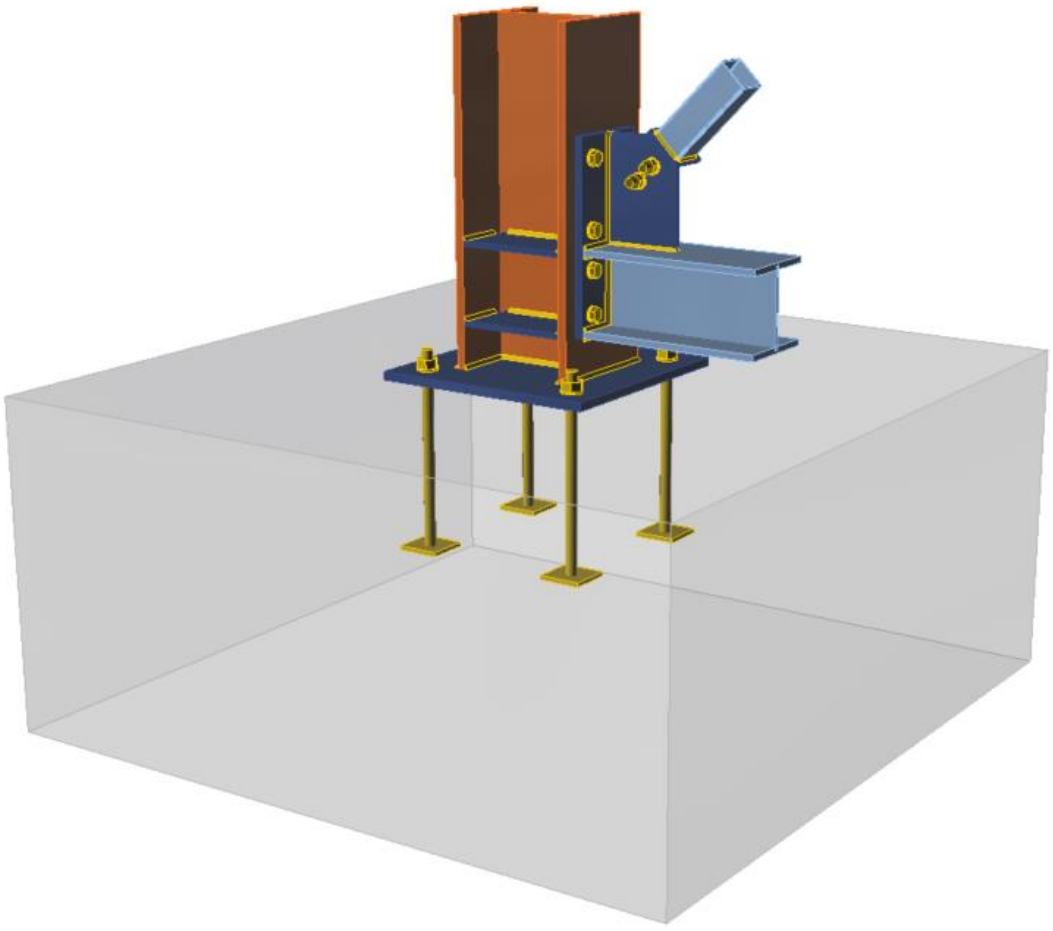
IDEA StatiCa Steel - Tutorial

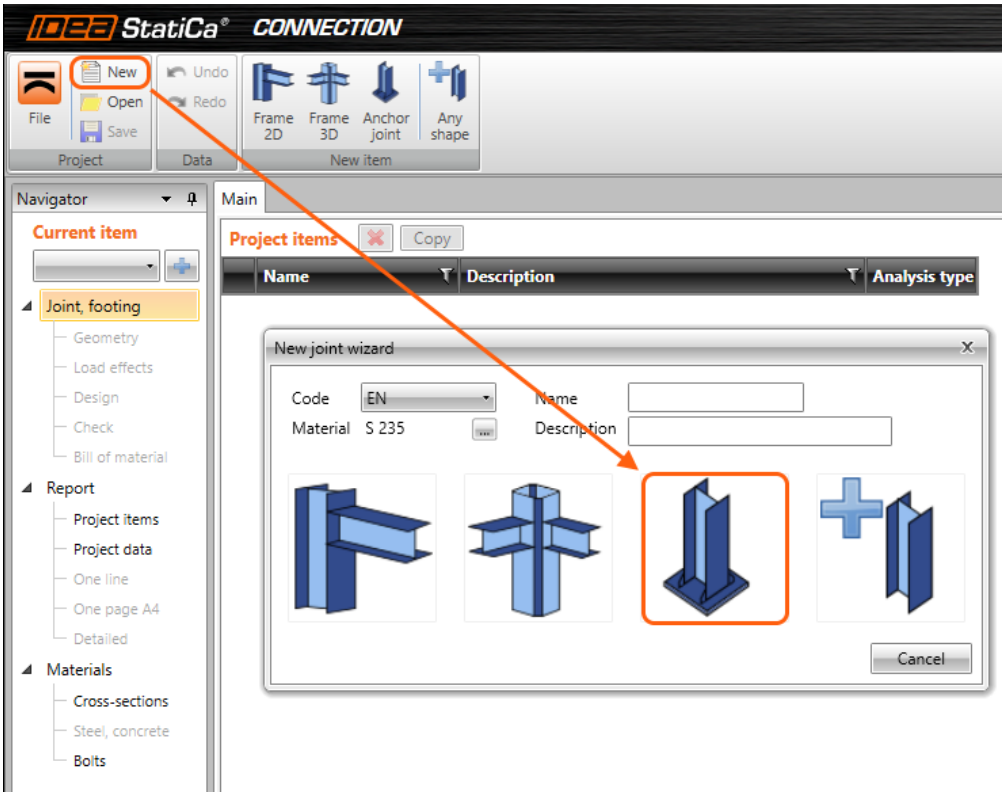


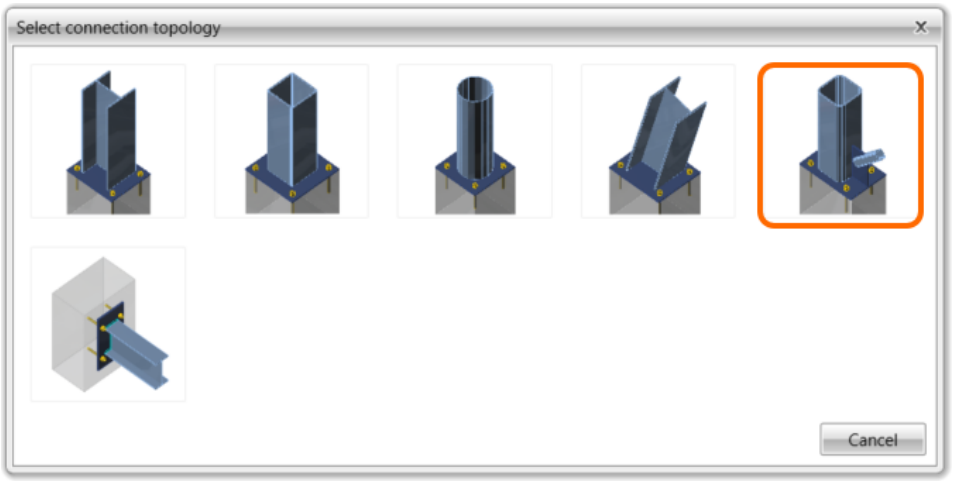
Design of footing with a diagonal

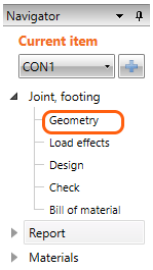
This tutorial will show how to use software IDEA StatiCa to model, design and check a structural steel joint, example being footing with a diagonal.

New project

We create a new project by clicking **New.** Wizard window is opened. We select **Footing** and **Column with diagonal** topology.

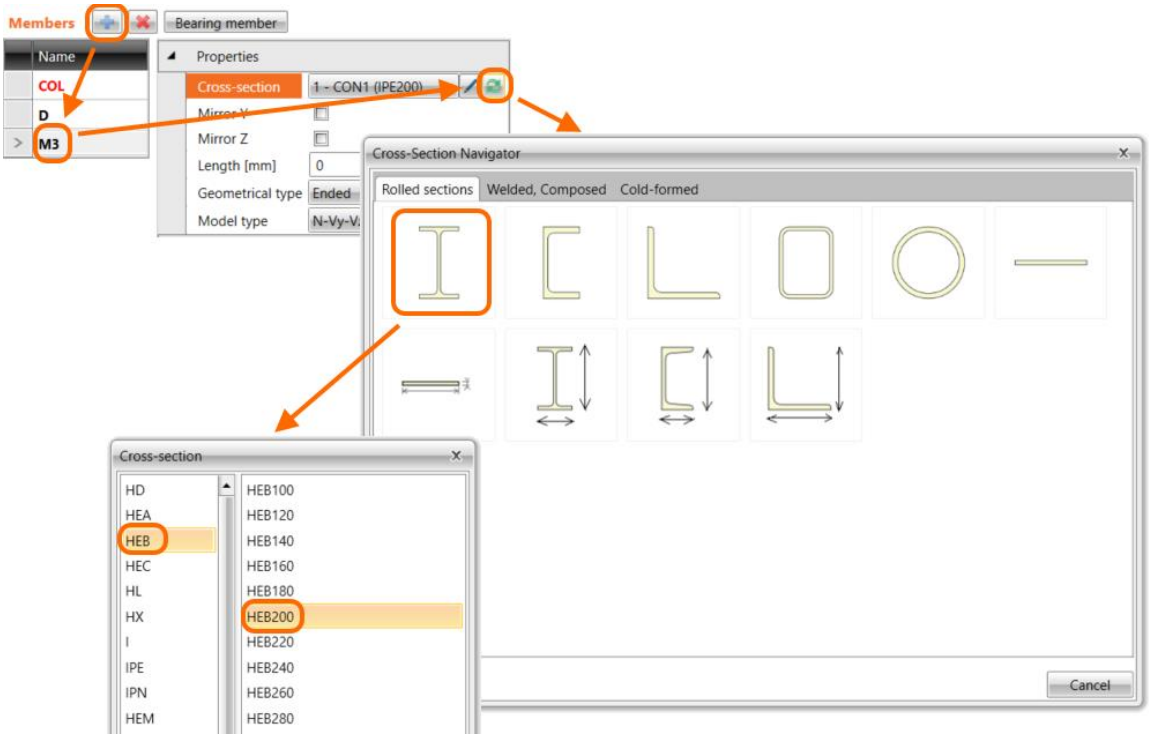


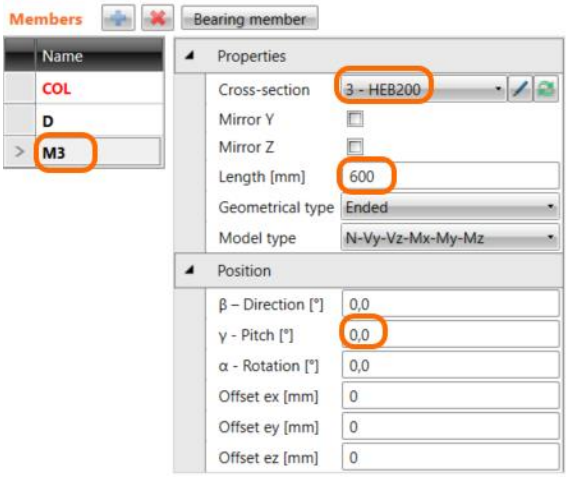




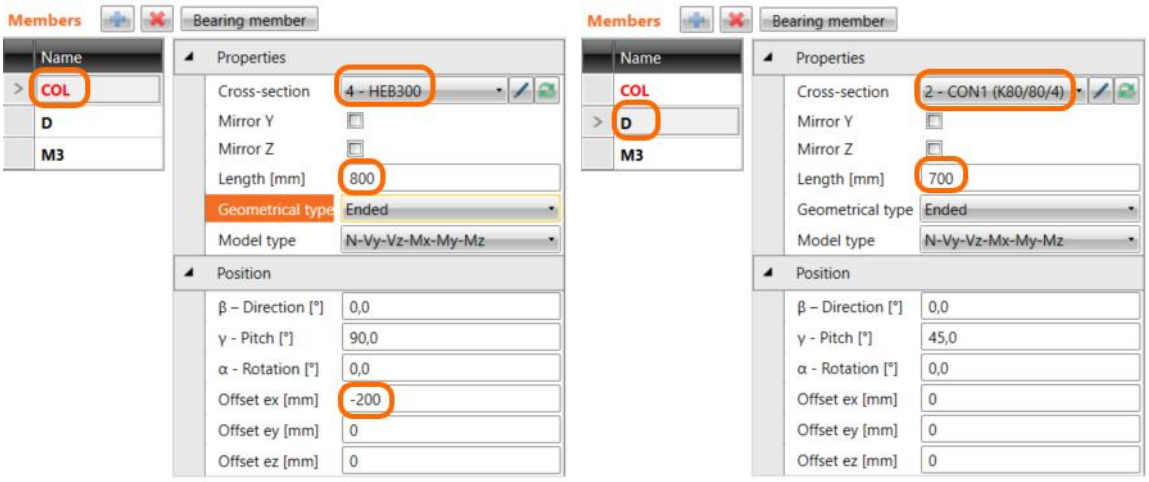
Geometry

Two beams were automatically generated. We add a new beam, set its cross-section and modify some properties.

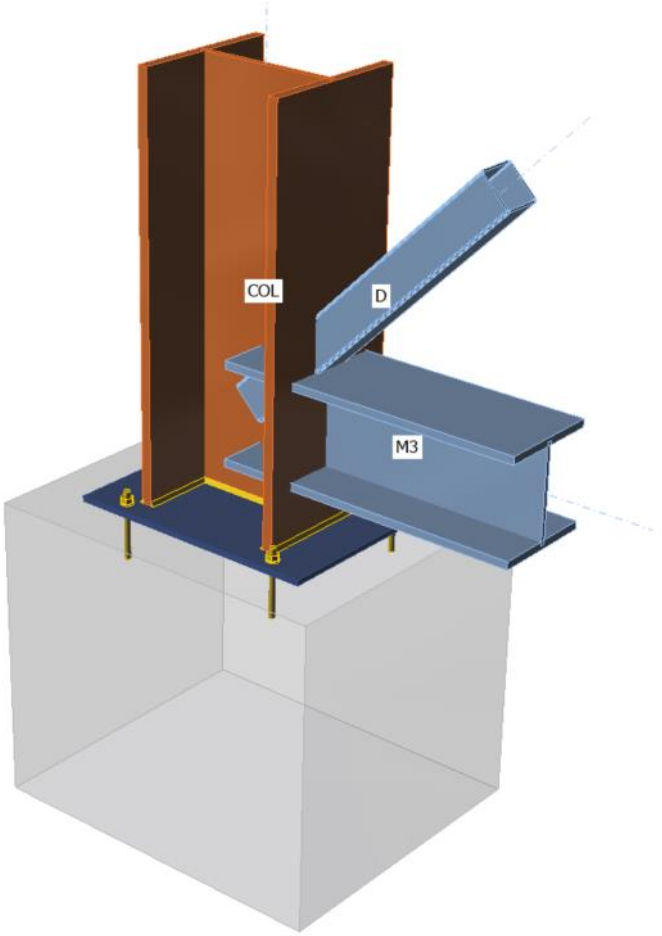


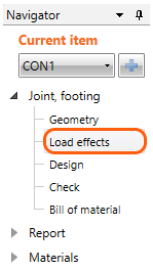


Next we modify properties of members **COL** and **D**.



Let's check defined geometry of the joint.



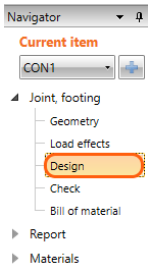


Load effects

One load effect was automatically added by the wizard. We define it by inputting values into the table. More load cases can be added.

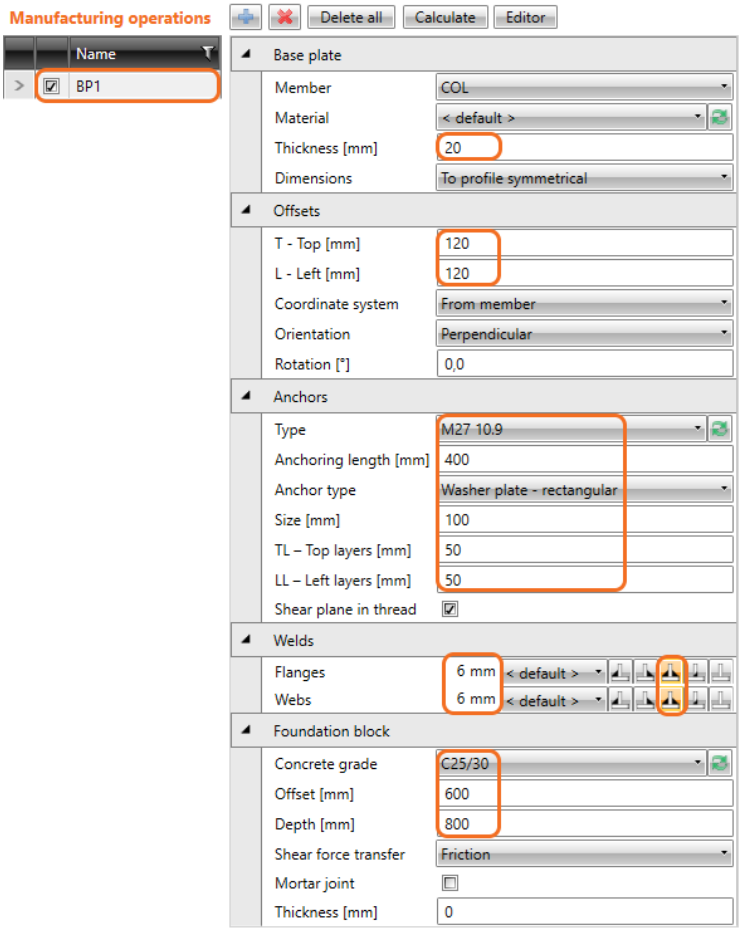
Internal forces | Clean | Copy X position

	Member	Position	X [mm]	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
	COL	End	0	-350,0	0,0	0,0	0,0	0,0	0,0
	D	End	0	-50,0	0,0	0,0	0,0	0,0	0,0
	M3	End	0	10,0	0,0	-80,0	0,0	150,0	0,0

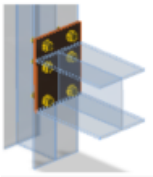


Design

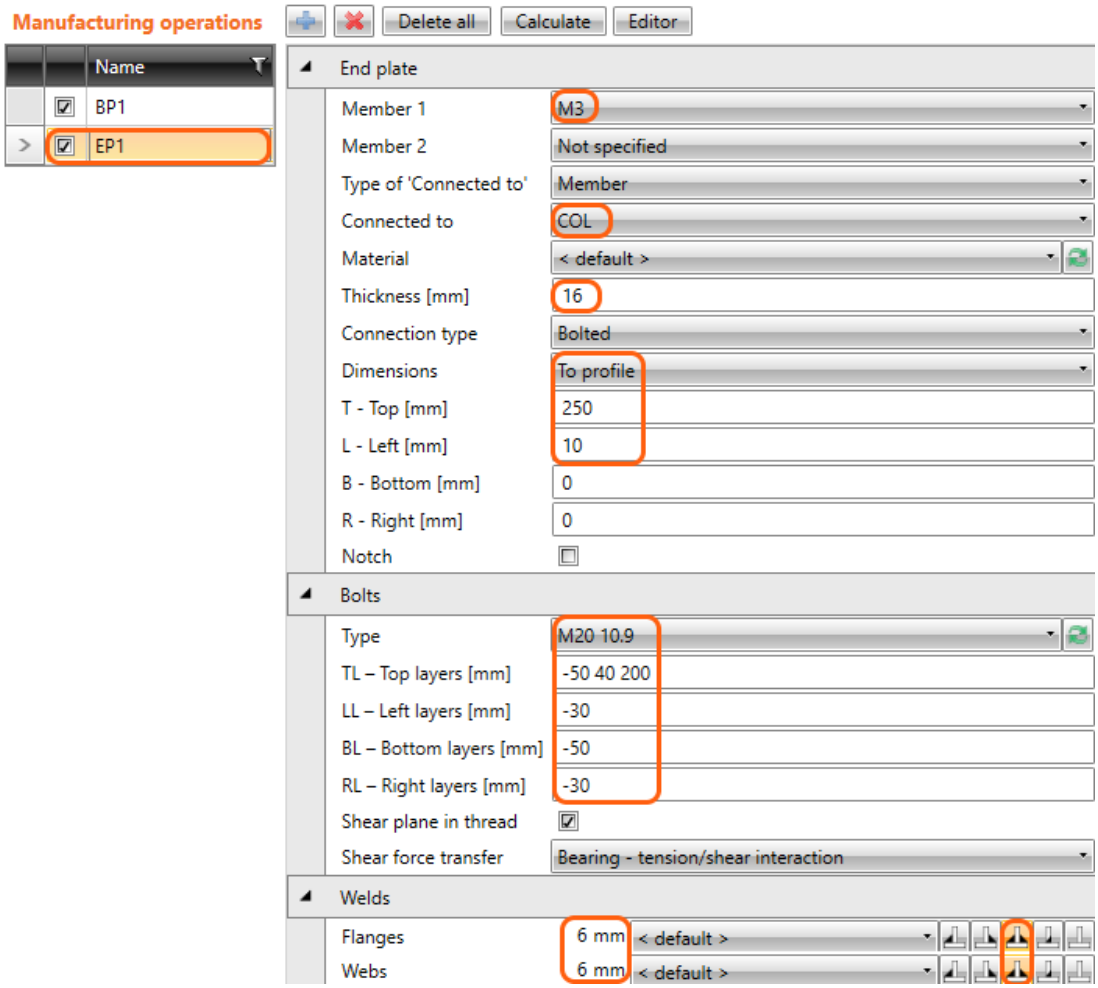
Manufacturing operation **Base plate** was added by the wizard. We just need to update some properties.



We will define a set of manufacturing operations to model connections between members. A new operation can added by  button.



End plate



Connecting plate

Manufacturing operations

Delete all | Calculate | Editor

	Name
☑	BP1
☑	EP1
☑	CPL1

Connecting plate

Member	D
Connected to	New plate

New gusset plate

R1 Type	Member
R1 - related to	M3
R2 Type	Plate
R2 – related also to	EP1
Material	< default >
Thickness [mm]	10
B – width [mm]	180
H – depth [mm]	250
Shape	Rectangular

Connection

X - position [mm]	460
Material	< default >
Thickness [mm]	0
Alignment	Rear
Type	Cap plate
L - plate length [mm]	150
B – plate width [mm]	0
E – plate excentricity [mm]	0
Thickness of cap [mm]	0
Cap plate offset (LL RR TT BB) [mm]	10
Cap plate shape	Rectangle
Connection type	Bolted

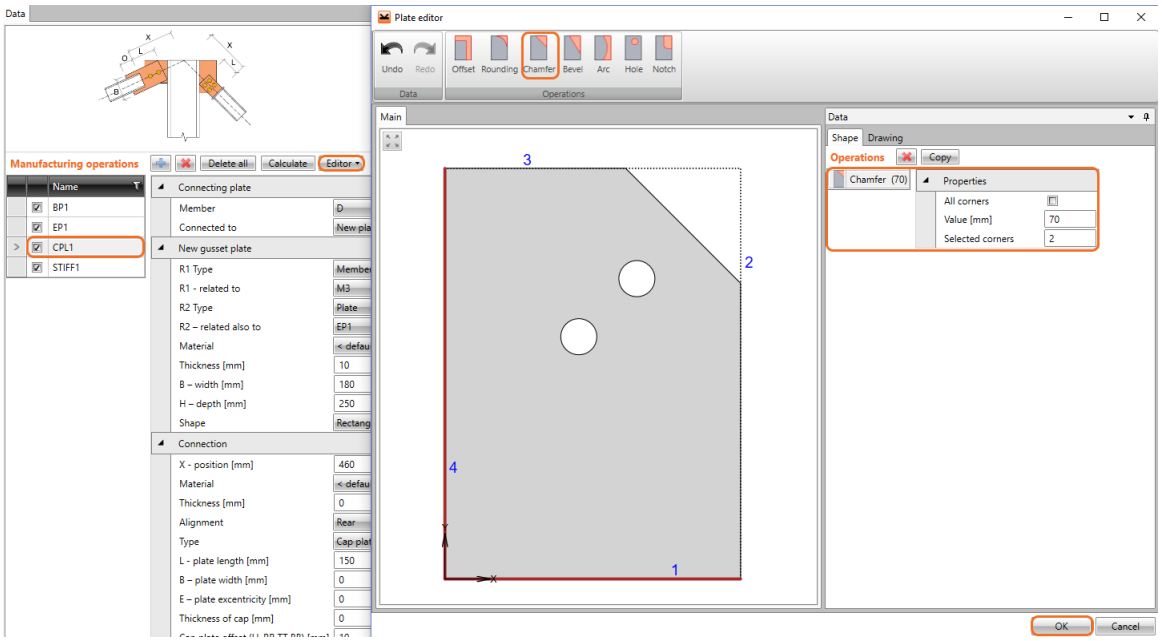
Welds

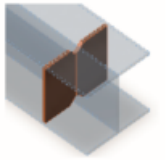
Plate	4 mm	< default >
Cap plate	4 mm	< default >
Tongue	4 mm	< default >

Bolts

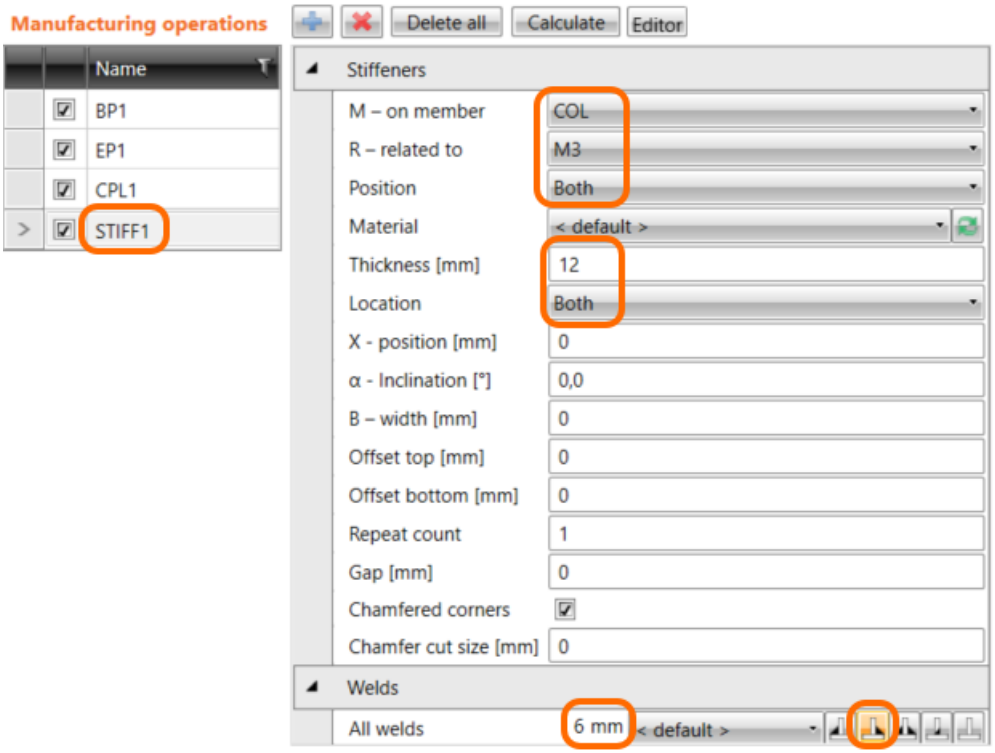
Type	M20 10.9
Reference line	Member x-axis
Rows [mm]	0
Positions [mm]	40 50
Grid	Regular
Shear plane in thread	☑
Shear force transfer	Bearing - tension/shear interaction

Let´s cut a corner in **gusset plate** in connecting plate **CPL1**. For this operation we need to go into editor – gusset plate and make a chamfer with 70mm size on corner with index 2.

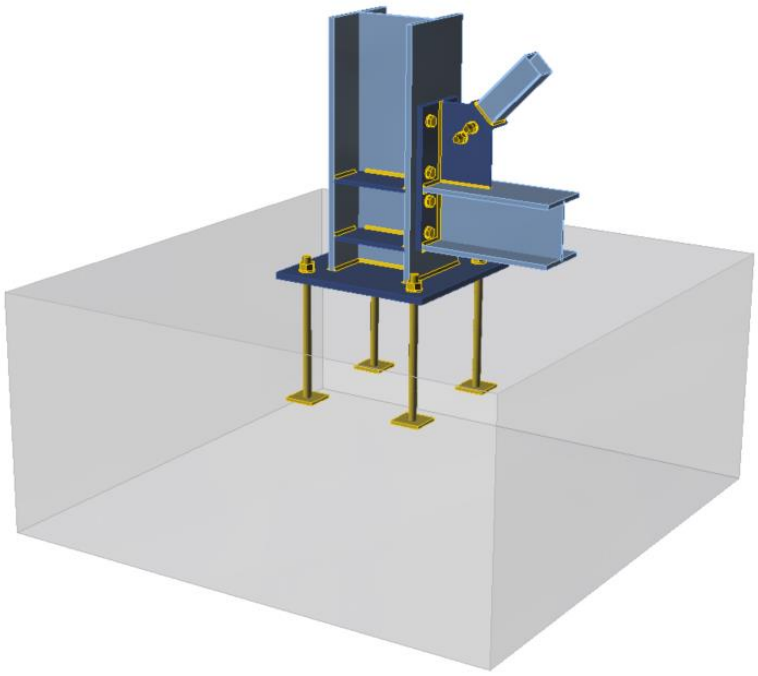


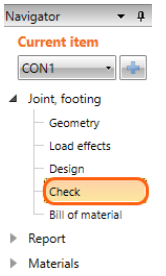


Stiffeners



Let’s check defined operations of the joint.



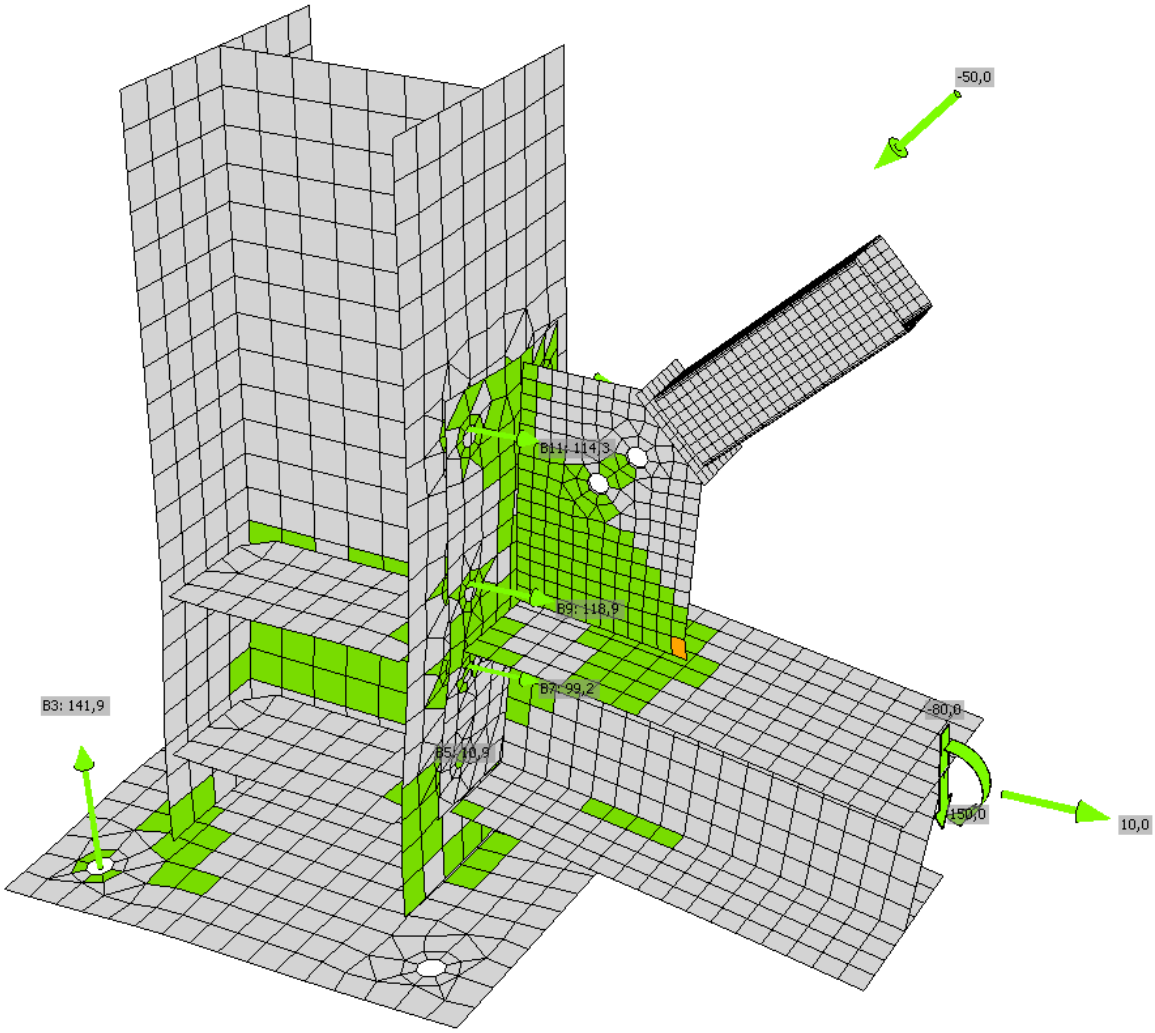


Check of a structural steel joint

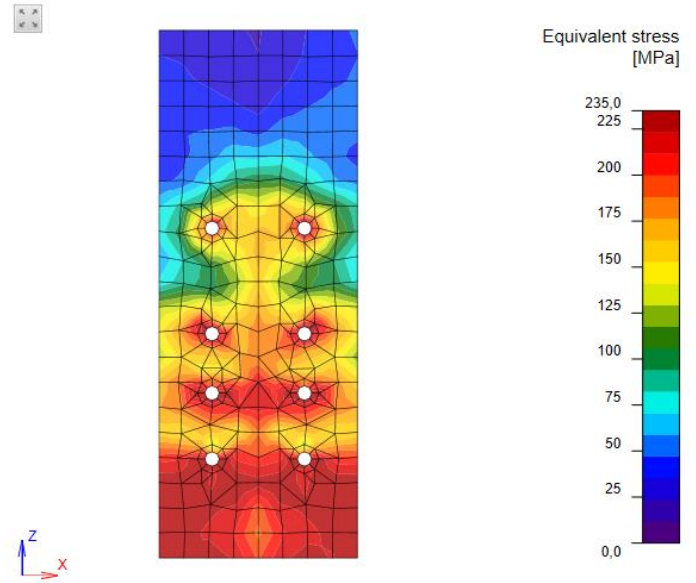
Nonlinear analysis is started by icon 

from the top ribbon. Analysis model is automatically generated, calculation is performed and we can check results.

We activate **Strain check**, **Bolt forces**, **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.



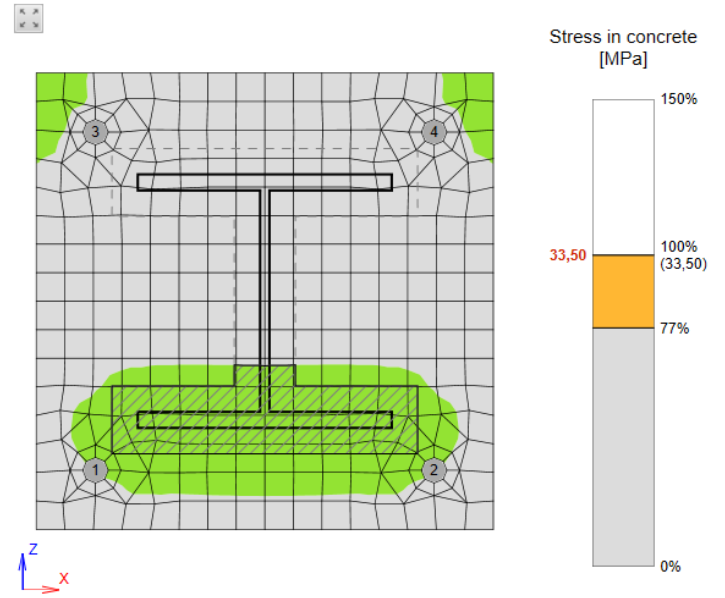
All values can be checked in detailed in the tables and 2D window. For example to display check of plates and stresses we select tab **Plates** and icon **Equivalent stress** from the ribbon.



Summary | Analysis | Plates | Bolts | Anchors | Welds | Concrete block | Shear

	Item	Th [mm]	Loads	σ,Ed [MPa]	ε,Pl [%]	Status
>	COL-bfl 1	19	LE1	235,3	0,2	✓
	COL-tfl 1	19	LE1	235,6	0,3	✓
	COL-w 1	11	LE1	236,0	0,5	✓

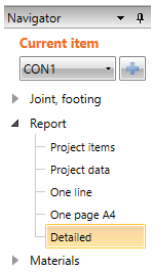
And to see check of contact stress in concrete we select tab **Concrete block** and icon **Concrete check** from the ribbon.



Summary | Analysis | Plates | Bolts | Anchors | Welds | Concrete block | Shear

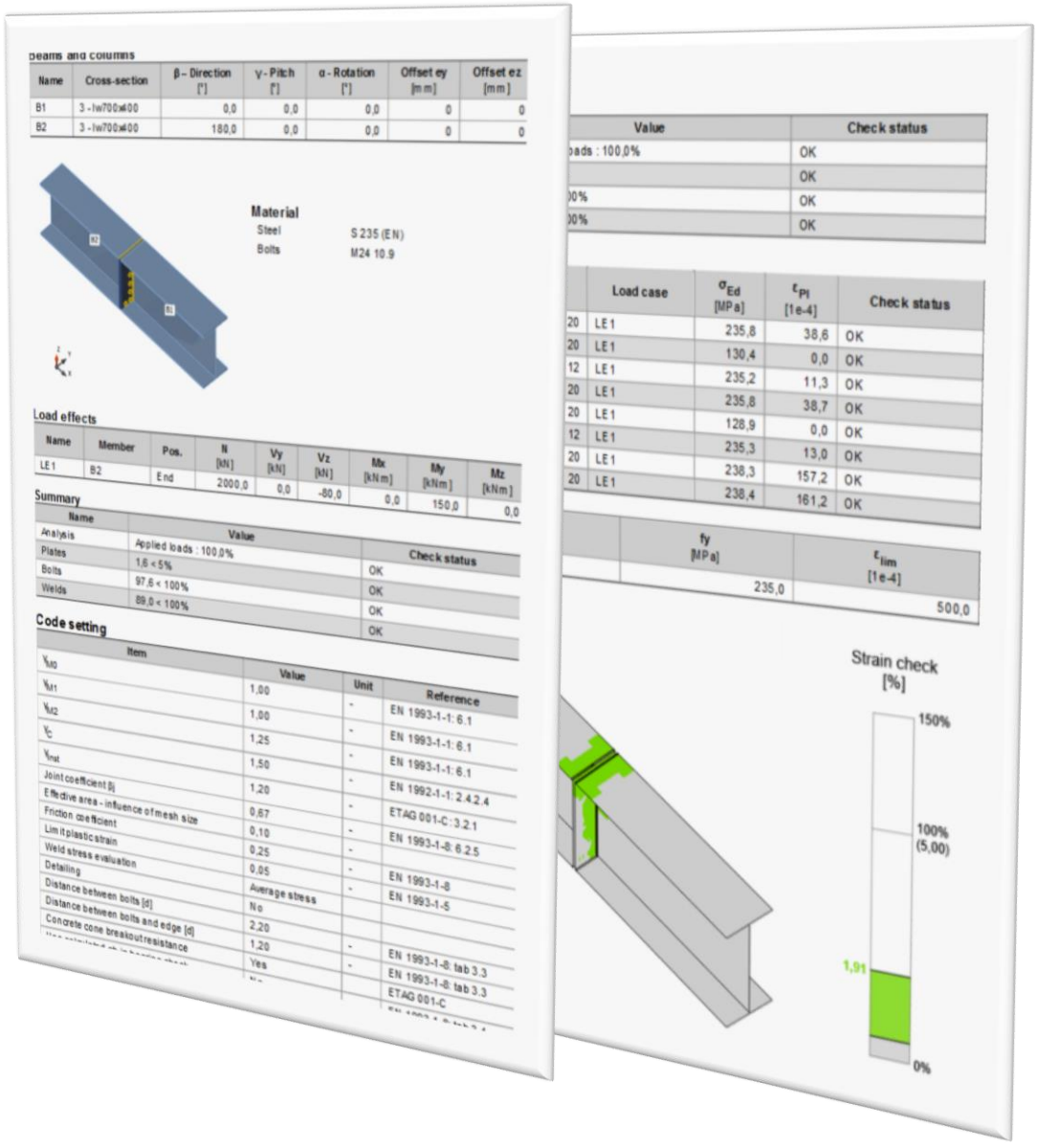
Check of contact stress in concrete for extreme load effect

	Item	Loads	c [mm]	Aeff [m2]	σ [MPa]	Kj	Fjd [MPa]	Ut [%]	Status
>	C25/30	LE1	31	0,03	25,7	3,00	33,5	76,6	✓



Report

IDEA StatiCa offers three types of output reports – one line, 1 page and detailed.



Structural steel joint was modelled, designed and checked

Thank you for spending time on this example. For further information please visit our website or drop us an email to info@idea-rs.com.

IDEA StatiCa team

Steel connection design reinvented – any topology, any loading, in minutes. Check of joint/connections acc. to EC/AISC. Unique CBFEM method. Get more resources at www.idea-rs.com and www.ideastatica.com