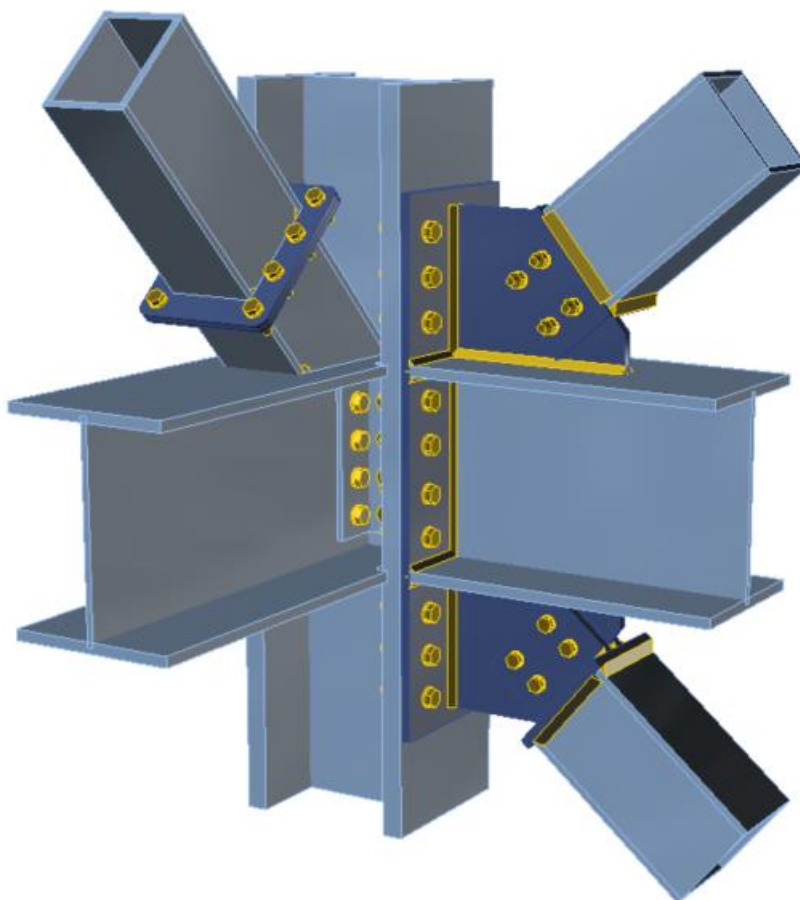


IDEA StatiCa Steel - Tutorial



Robot Structural Analysis link

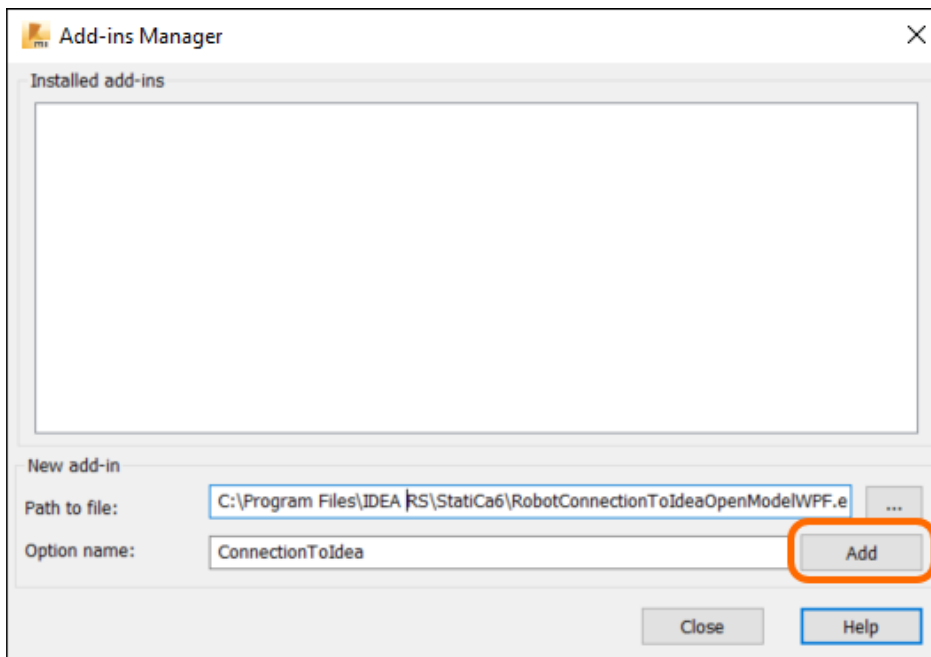
This tutorial will show how to activate and use the link between Robot Structural Analysis and IDEA StatiCa Connection.

Robot Structural Analysis

How to activate the link

1. Robot Structural Analysis Professional (RSAPRO) **2016**, version 29.0.0.5650 (x64) or later must be installed on the computer.
2. Download and install the latest version of **64-bit IDEA StatiCa Steel** .
Enhanced edition is required.

After installation of both programs, start RSA and Click Add-ins > **Add-ins Manager** to open the Add-ins Manager dialogue. This option lets you install and implement add-ins (programs) to the appropriate places in the Robot menu. Browse to folder where IDEA StatiCa is installed (c:\Program Files\IDEA RS\StatiCa6) and open file: **RobotConnectionToIdeaOpenModelWPF.exe** Finally click **Add** and **Close** buttons.

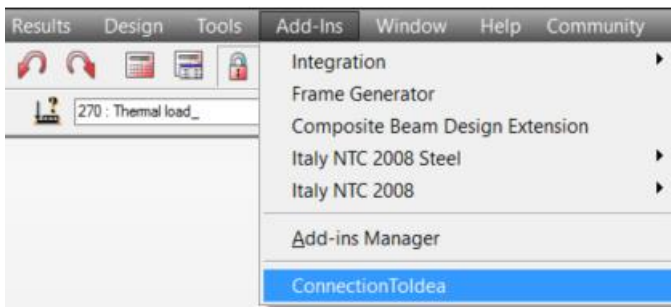


How to use the link

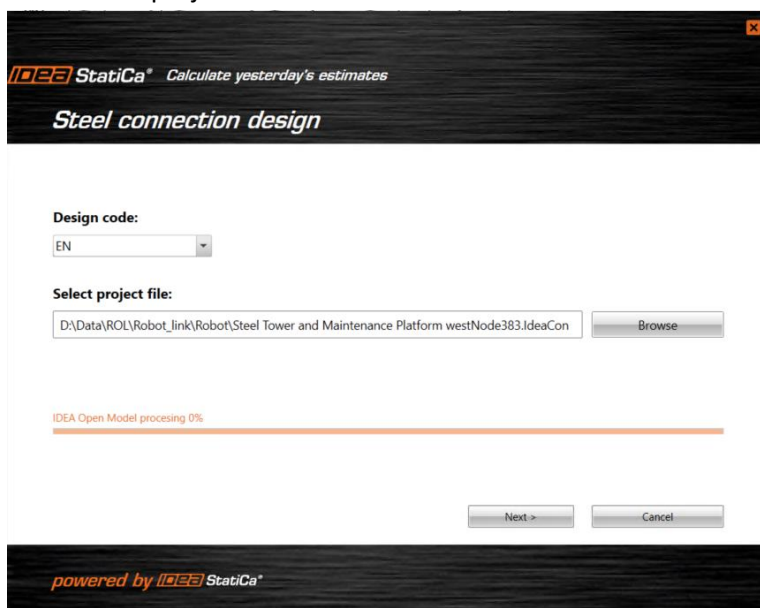
1. Open attached project in Robot Structural Analysis.
2. Select a joint **node** and connected **members**.



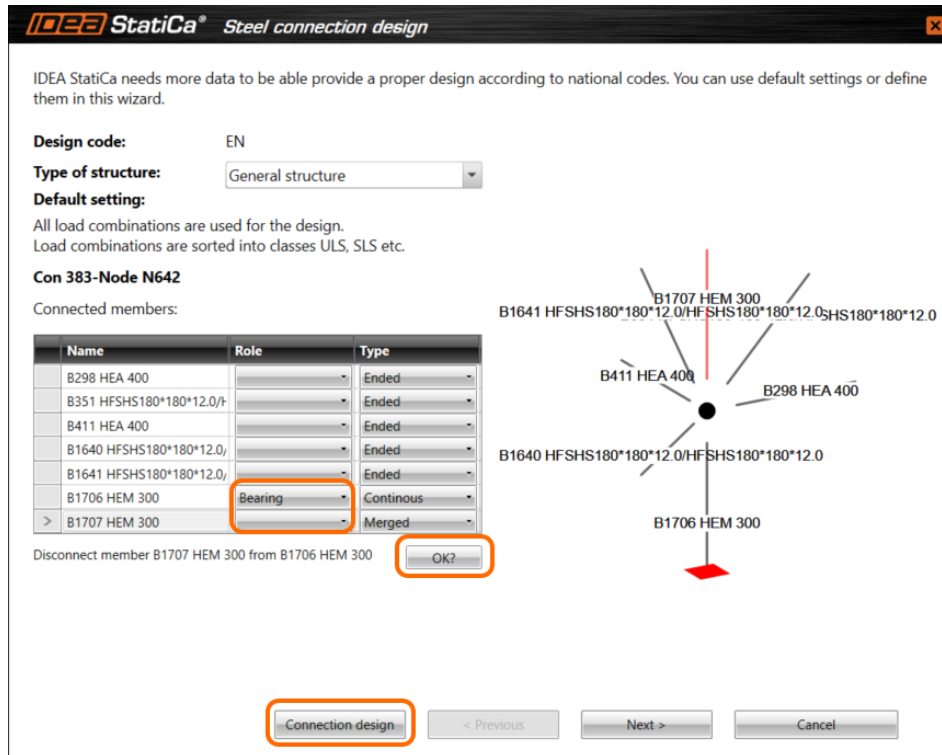
3. Start IDEA Connection add-in from the menu.



4. IDEA StatiCa joint import wizard is launched. Set file name and path of IDEA StatiCa Connection project to save and click button **Next**

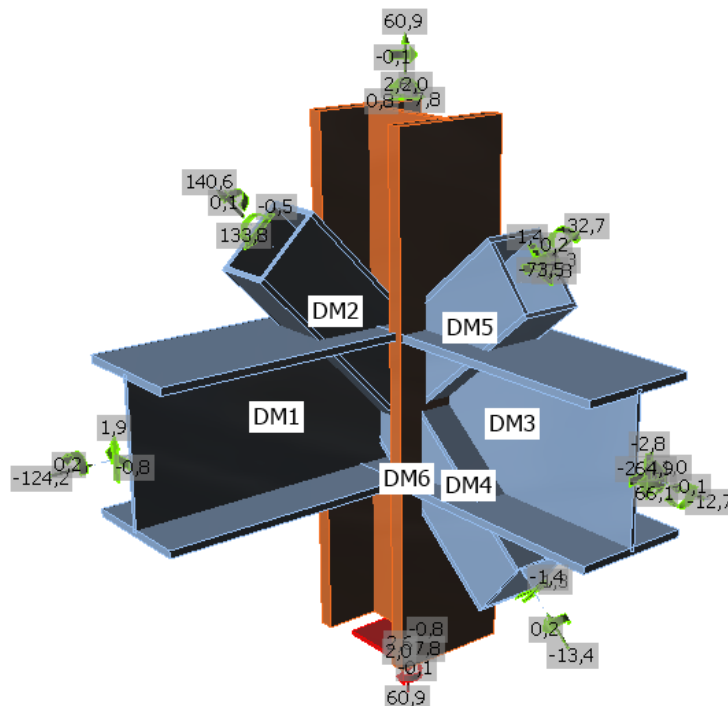


5. Select bottom column member and set it as **Bearing** and merge column members by **OK** button. Finish settings by **Connection design** button.




IDEA StatiCa Connection

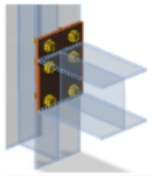
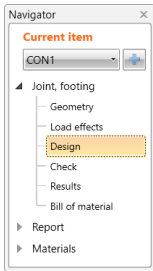
Automatic data transfer is started and IDEA StatiCa Connection with generated project is launched. All members and load effects were added automatically.



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



Design

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


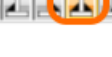


End plate

Manufacturing operations



 Delete all Calculate Editor

Name	
EP1	

End plate	
Member 1	DM3
Member 2	Not specified
Type of 'Connected to'	Member
Connected to	DM6
Material	< default >
Thickness [mm]	16
Connection type	Bolted
Dimensions	To profile symmetrical
T - Top [mm]	300
L - Left [mm]	0
Notch	<input type="checkbox"/>
Bolts	
Type	M20 10.9
TL - Top layers [mm]	-70 -150 70 150 230
LL - Left layers [mm]	-60
Shear plane in thread	<input checked="" type="checkbox"/>
Tension/shear interaction	<input checked="" type="checkbox"/>
Welds	
Flanges	0 mm < default > 
Webs	0 mm < default > 



Connecting plate

Manufacturing operations

	Name
<input checked="" type="checkbox"/>	FP1
<input checked="" type="checkbox"/>	CPL1

Connecting plate

Member: **DMS**

Connected to: New plate

New gusset plate

R1 Type: **Member**

R1 - related to: **DM3**

R2 Type: **Plate**

R2 - related also to: **EP1**

Material: < default >

Thickness [mm]: 0

B - width [mm]: **350**

H - depth [mm]: **270**

X - position [mm]: 0

Shape: Rectangular

Connection

X - position [mm]: **600**

Material: < default >

Thickness [mm]: 0

Alignment: **Front**

Type: **Cap plate 2x**

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: Rectangular

Connection type: Bolted

Welds

Plate: 0 mm

Cap plate: 0 mm

Tongue: 0 mm

Bolts

Type: **M16-10.9**

Reference line: Member x-axis

Rows [mm]: **50 ; -50**


Positions [mm]: **30 60**



Grid: Regular

Shear plane in thread:

Tension/shear interaction:



Copy CPL1 operation by  button from the ribbon and set that on member DM4.

Manufacturing operations   Delete all Calculate Editor

Name	
<input checked="" type="checkbox"/>	EP1
<input checked="" type="checkbox"/>	CPL1
<input checked="" type="checkbox"/>	CPL2

Connecting plate

Member: **DM4**

Connected to: New plate

New gusset plate

R1 Type: Member

R1 - related to: DM3

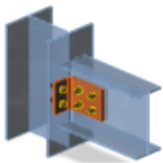
R2 Type: Plate

R2 - related also to: EP1



Material: < default >

Thickness [mm]: 0

B - width [mm]: 350



Cleat

Manufacturing operations   Delete all Calculate Editor

Name	
<input checked="" type="checkbox"/>	EP1
<input checked="" type="checkbox"/>	CPL1
<input checked="" type="checkbox"/>	CPL2
<input checked="" type="checkbox"/>	CLEAT1

Cleat

Member: **DM1**

Member part: **Web 1**

Type of 'Connected to': Member

Connected to: **DM6**

Profile: **100011 - L100X10**

Profile conversely:

L - Cleat length [mm]: **300**

S - Cleat shift [mm]: 0

Location: Both

Connection type: Bolted

Notch:

Notch offset [mm]: 10

Bolts

Type: **M20 10.9**

Rows [mm]: 0

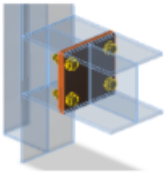
Positions [mm]: **-30 -70 ; 40 70**

Grid: Regular

Shear plane in thread:

Tension/shear interaction:

Same on both legs:

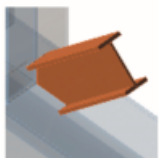


Stub

Manufacturing operations

	Name
<input checked="" type="checkbox"/>	EP1
<input checked="" type="checkbox"/>	CPL1
<input checked="" type="checkbox"/>	CPL2
<input checked="" type="checkbox"/>	CLEAT1
<input checked="" type="checkbox"/>	STUB1

Plate to plate	
Member	DM2
X - position [mm]	550
Material	< default >
Thickness [mm]	10
Connection type	Bolted
Dimensions	To profile symmetrical
T - Top [mm]	50
L - Left [mm]	50
Bolts	
Type	M16 10.9
TL - Top layers [mm]	20 -60
LL - Left layers [mm]	20
Shear plane in thread	<input checked="" type="checkbox"/>
Tension/shear interaction	<input checked="" type="checkbox"/>
Welds	
Flanges	0 mm < default >
Webs	0 mm < default >
Stub	
Explode	<input type="checkbox"/>



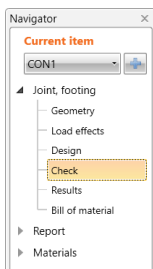
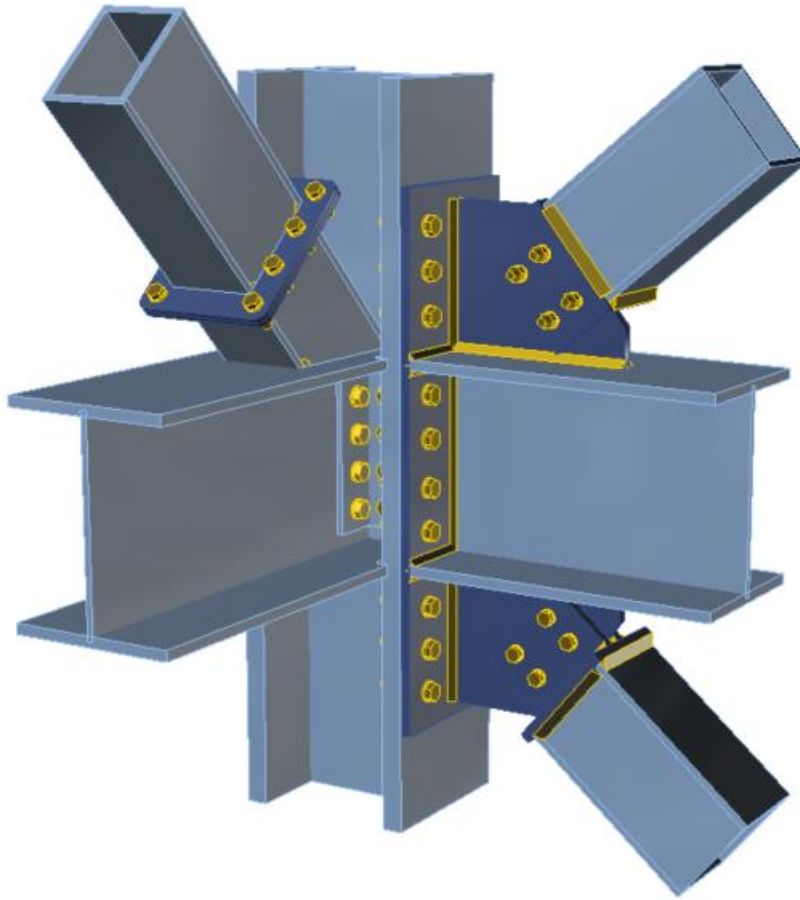
Cut

Manufacturing operations


	Name
<input checked="" type="checkbox"/>	EP1
<input checked="" type="checkbox"/>	CPL1
<input checked="" type="checkbox"/>	CPL2
<input checked="" type="checkbox"/>	CLEAT1
<input checked="" type="checkbox"/>	STUB1
<input checked="" type="checkbox"/>	CUT2

Cut by member	
Member	DM2
Cut by	DM1
Type	Member
Cutting method	Bounding box
Cutting plane	C - Closer
Direction	Pa - Parallel
Offset [mm]	0
Welds	
Flanges	0 mm < default >
Webs	0 mm < default >

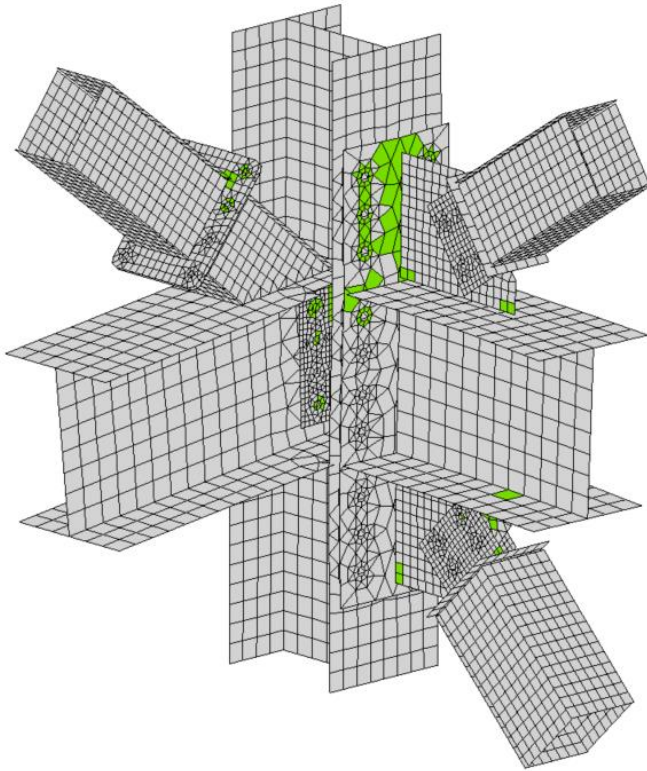
Let's check defined operations of the joint.



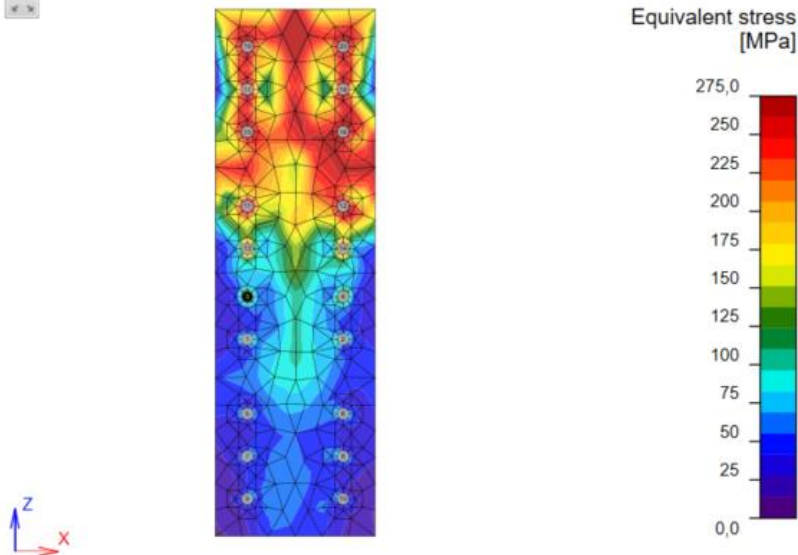
Check of a structural steel joint

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 bolts we select tab **Bolts/Anchors** tab. We can also activate icon **Equivalent stress** from the ribbon.

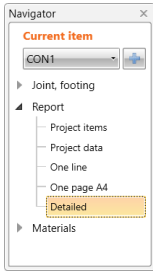


Item	Material	Loads	Ft [kN]	V [kN]	Utt [%]	Uts [%]	Utts [%]	Status
B1	M20 10.9 - 1	ULS100_	2,5	7,048	1,4	7,2	8,2	✓
B2	M20 10.9 - 1	ULS100_	3,0	2,789	1,7	2,8	4,1	✓
> B3	M20 10.9 - 1	ULS100_	15,2	6,653	8,6	6,8	12,9	✓
B4	M20 10.9 - 1	ULS100_	17,3	3,55	9,8	3,6	10,6	✓

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

Report

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



beams and columns

Name	Cross-section	β -Direction [°]	γ -Pitch [°]	α -Rotation [°]	Offset ey [mm]	Offset ez [mm]
B1	3-lw700x600	0,0	0,0	0,0	0	0
B2	3-lw700x600	180,0	0,0	0,0	0	0

Material
Steel: S 235 (EN)
Bolts: M24 10.9

Load effects

Name	Member	Pos.	N [kN]	Vy [kN]	Vz [kN]	Mx [kNm]	My [kNm]	Mz [kNm]
LE1	B2	End	2000,0	0,0	-80,0	0,0	150,0	0,0

Summary

Name	Value	Check status
Analysis	Applied loads: 100,0%	
Plates	1,6 < 5%	OK
Bolts	97,6 < 100%	OK
Welds	89,0 < 100%	OK

Code setting

Item	Value	Unit	Reference
γ_{M2}	1,00	-	EN 1993-1-1: 6.1
γ_{M1}	1,00	-	EN 1993-1-1: 6.1
γ_{M3}	1,25	-	EN 1993-1-1: 6.1
γ_{M5}	1,50	-	EN 1993-1-1: 6.1
Joint coefficient (j)	1,20	-	EN 1992-1-1: 2.4.2.4
Effective area - influence of mesh size	0,67	-	ETAG 001-C: 3.2.1
Friction coefficient	0,10	-	EN 1993-1-8: 6.2.5
Limit plastic strain	0,25	-	
Weld stress evaluation	0,05	-	EN 1993-1-8
Detailing	Average stress	-	EN 1993-1-5
Distance between bolts [d]	No		
Distance between bolts and edge [d]	2,20		
Concrete cone breakout resistance	1,20	-	EN 1993-1-8: tab 3.3
	Yes	-	EN 1993-1-8: tab 3.3
		-	ETAG 001-C

Value	Check status
Applied loads: 100,0%	OK
Plates: 1,6%	OK
Bolts: 97,6%	OK
Welds: 89,0%	OK

Load case	σ_{Ed} [MPa]	ϵ_{pl} [1e-4]	Check status
20 LE1	235,8	38,6	OK
20 LE1	130,4	0,0	OK
12 LE1	235,2	11,3	OK
20 LE1	235,8	38,7	OK
20 LE1	128,9	0,0	OK
12 LE1	235,3	13,0	OK
20 LE1	238,3	157,2	OK
20 LE1	238,4	161,2	OK

f_y [MPa]	ϵ_{lim} [1e-4]
235,0	500,0

Strain check [%]

150%
100% (5,00)
1,91
0%

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