

US Webinar

Troubleshooting IDEA StatiCa models

April 24, 2024

IDEA StatiCa®

Calculate yesterday's estimates

Analysis Singularity
Plates 0.0 - 5.0%
Bolts 0.0 - 100%
Welds 0.0 - 100%

Maximum cost - 4365 US\$

Status	Loads	Applied [%]	Nonconformity
>	LE2	0.0	Singularity - Member - SM2

Analysis 29.3%
Plates 1.08 - 5.00%
Loc. deformation 0.3 - 3%
Bolts 37.5 - 100%
Welds 75.1 - 100%
Buckling Not calculated
GMNA Calculated

Analysis Plates Bolts Welds

Status of FE analysis

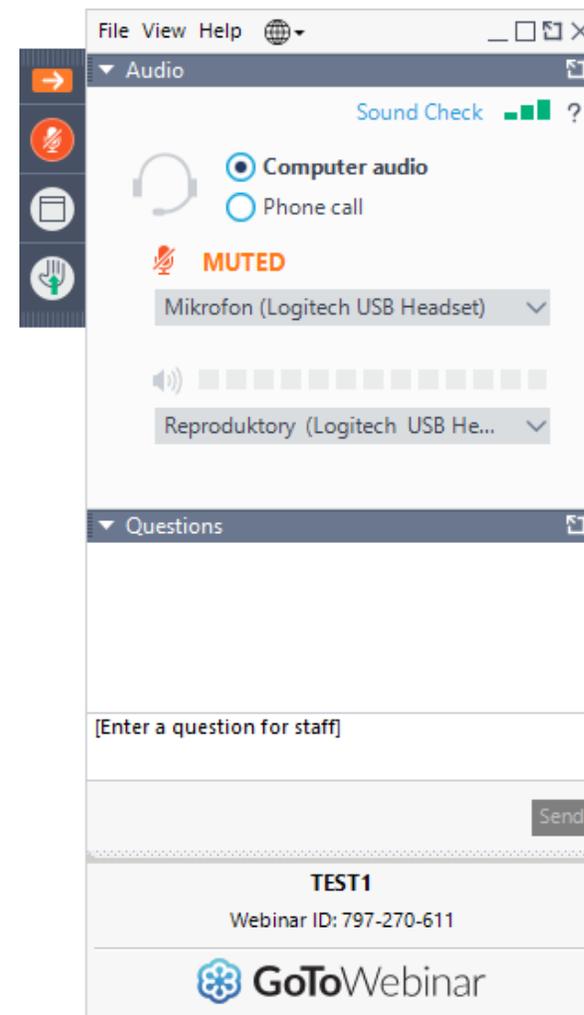
	Status	Loads	Applied [%]	Nonconformity
>	✘	Pc = 250	12.50	Ry - 50.99[kip.ft]
	✘	Pt = 235	13.28	Ry - -50.72[kip.ft]

Control Panel

When you first join a session, the Control Panel appears on the right side of your screen. Use the Control Panel to manage your session. To free up space on your desktop, you can collapse the Control Panel and use the Grab Tab to continue to manage your session.

- **Grab Tab:** From the Grab Tab, you can hide the Control Panel, mute yourself (if you have been unmuted by the organizer), view the webinar in full screen and raise your hand.
- **Audio Pane:** Use the Audio pane to switch between Telephone and Mic & Speakers.
- **Questions Pane:** Ask questions for the staff.

QUESTIONS



Agenda

The IDEA StatiCa Tech support checklist

What is a singularity warning?

How to identify meshing problems?

The analysis ended before applying 100% of the loads

What is the non-conformity table?

Detailing check errors

IDEA StatiCa Tech Support Checklist

1. Calculate button

- Review the msg at the modeling window top left side
- Version of the software

2. Check tab

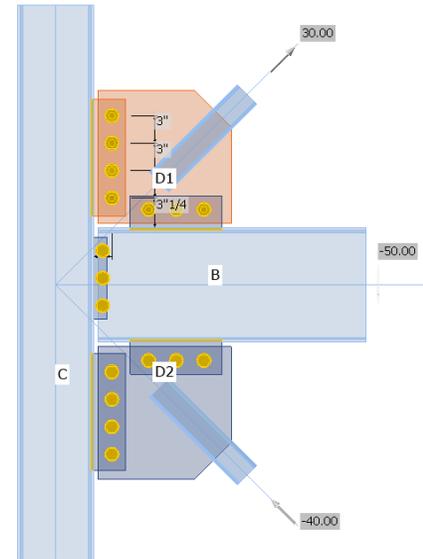
- Analysis tab>Deformed shape
- You get more info on the singularity

3. Modeling tab

- Ensure correct bearing member and position at 0,0,0
- Model type and force position of all the members

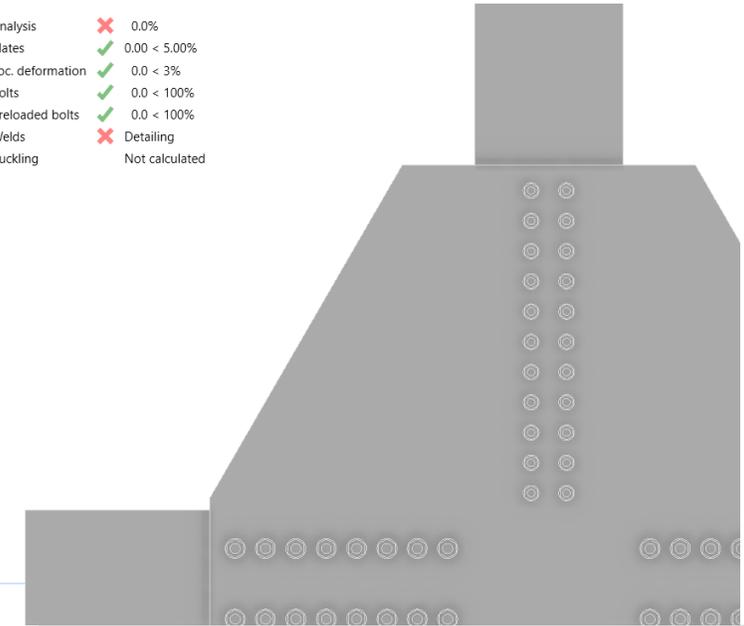
Modeling window > Top left side

Analysis
Bolts are too close to plate edge or outside of the connected plate. - Manufacturing operations:FP1



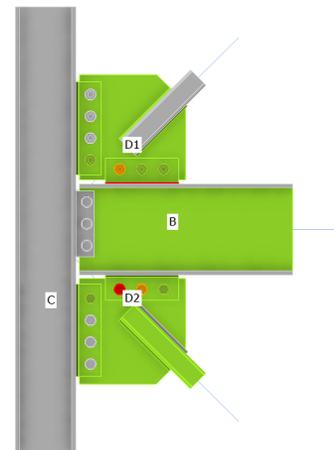
Pr

Analysis	✗	0.0%
Plates	✓	0.0 < 5.00%
Loc. deformation	✓	0.0 < 3%
Bolts	✓	0.0 < 100%
Preloaded bolts	✓	0.0 < 100%
Welds	✗	Detailing
Buckling		Not calculated



✓	100.0%
✓	0.72 < 5.00%
✓	0.0 < 3%
✗	100.0 > 100%
✗	133.6 > 100%
	Not calculated

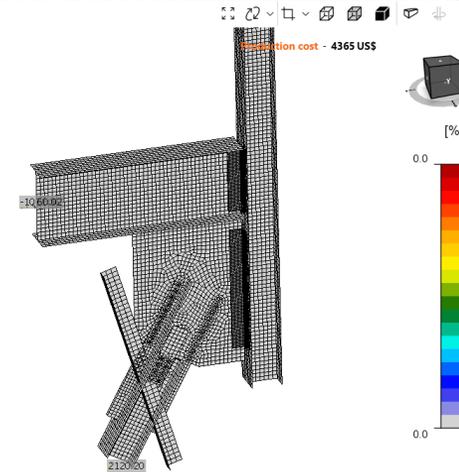
Production cost - 193 US\$



Production cost - 4365 US\$

Analysis	✗	Singularity
Plates	✓	0.0 < 5.0%
Bolts	✓	0.0 < 100%
Welds	✗	0.0 < 100%

- FP1
- ✓ GUSS1
- ✓ GUSS2
- ✓ CUT1
- ✓ CUT2
- ✓ SP5
- ✓ PCUT5
- ✓ PCUT6
- ✓ GRD5
- ✓ SP6
- ✓ PCUT7
- ✓ PCUT8
- ✓ GRD6
- ✓ SP4
- ✓ PCUT9
- ✓ PCUT10
- ✓ GRD4
- ✓ SP7
- ✓ PCUT11
- ✓ PCUT12
- ✓ GRD7



Version of the software

The screenshot displays the IDEA StatiCa CONNECTION software interface. The main window shows a 3D model of a steel connection. A version update dialog box is open, displaying the current version as 23.1.5.0979 and an 'Update' button. A dashed purple arrow points from the 'Update' button to a 'DOWNLOADS' page. The 'DOWNLOADS' page features a 'CURRENT VERSION' section for IDEA STATICA 23.1.5.0979, released on March 12, 2024, with a 'DOWNLOAD' button. The software interface includes a ribbon with tabs for Project, Design, Check, Report, and Materials, and a toolbar with various icons for file operations and analysis. A status bar at the bottom indicates the design code as AISC - ASD (2016) and the analysis as Stress, strain.

IDEA StatiCa® CONNECTION
Calculate yesterday's estimates

Project Design Check Report Materials

BT-F New Copy Undo Redo Save Members Plates LCS New Gallery Propose Publish Manage Code Calculate Overall setup CBFEM Settings Loads in equilibrium Loads - percentage XLS Import XLS Export Model Load Operation entity

Project items Data Labels Pictures Connection Library CBFEM Options Import/Export loads

chord 1 [Member] Set bearing Copy Delete

33 - W14X109 (W14X109)

Ended

Rotations
180.00
0.00
90.00
0°
0°
0°
In node
N-Vy-Mz
Node

Force

gusset 1
✓ CUT1
✓ chord 1 bolt 1
✓ CUT2
✓ chord 2 bolt 1
✓ gusset 2
✓ GRD5

Design code: AISC - ASD (2016) Analysis: Stress, strain Load effects: In equilibrium Units: in

IDEA StatiCa®
Calculate yesterday's estimates

Version: 23.1.5.0979

Developed by IDEA StatiCa®
Software Copyright © 2010-2024

www.ideastatica.com

Update Close

One member of the joint is considered as 'connected'. The support in the bearing member.

IDEA STATICA - DOWNLOADS

DOWNLOADS

Installation setups, CAD plugins, licensing

CURRENT VERSION

IDEA STATICA 23.1.5.0979
RELEASED MARCH 12, 2024

470 MB file, 30-second download, 1-minute installation, automatically detects your FEA/CAD software and activates relevant BIM links

DOWNLOAD →

IDEA StatiCa Tech support Checklist

1. Calculate button

- Review the msg at the top left of the modeling window
- Version of the software

2. Singularity

- Analysis tab>Deformed shape
- You get more info on the singularity

3. Modeling tab

- Ensure correct bearing member and position at 0,0,0
- Model type and force position of all the members

Singularity

- The mesh was created but the analysis couldn't start
- Something is unconnected, gaps, overlap of welds and bolts, etc.

Analysis	✗	Singularity
Plates	✓	0.00 < 5.00%
Bolts	✓	0.0 < 100%
Welds	✗	Detailing

- Review Check tab>Analysis tab>Deformed shape

Production cost - 255 US\$

Status	Loads	Applied [%]	Nonconformity
> ✗	T	0.00	Singularity : Member - M3
> ✗	C	0.00	Singularity : Member - M3

IDEA StatiCa Tech Support Checklist

1. Calculate button

- Review the msg at the top left of the modeling window
- Version of the software

2. Check tab

- Analysis tab>Deformed shape
- You get more info on the singularity

3. Modeling tab

- Ensure correct bearing member position at 0,0,0
- Model type and force position of all the members

Members

- COLUMN 5C1 5m1
- BRACE 5BR1 m1 BR
- BEAM 6B1 m1 R
- BRACE 6BR1 m1 TR
- BRACE 6BR1 m1 TL
- BEAM 6B1 m1 L
- BRACE 5BR1 m1 BL

Position

Axis X [ft] 0" 0" 3'-3"3/8

Axis Y [ft] 3'-3"3/8 0" 0"

Axis Z [ft] 0" 3'-3"3/8 0"

α - Rotation [°] 0.00

Offset ex [in] 0"

Offset ey [in] -3/16

Offset ez [in] -4 1/8

Align In node

Model

Model type N-Vy-Vz-Mx-My-Mz

Forces in Position

X [in] 0"

Review all the members

- Bearing member at the node position= All offsets set to 0
- [Geometrical type: continuous/ended](#)
- Review offset 'ex'
- [Model type](#)
- Force position

IDEA StatiCa Tech Support Checklist

4. Meshing Error

- It tells you what operation is stopping the analysis

5. Check the bolts operation

- Incorrect plate selection
- Slotted hole in the direction of the load

6. Code set up

- Reset to default
- Stop at limit strain
- GMNA

7. Nonconformity

- Analysis and design OK, but you get non-conformities

Meshing error

✘ Analysis

Mesh generation error – M564-Arc 14 – An item with the same key has already been added.

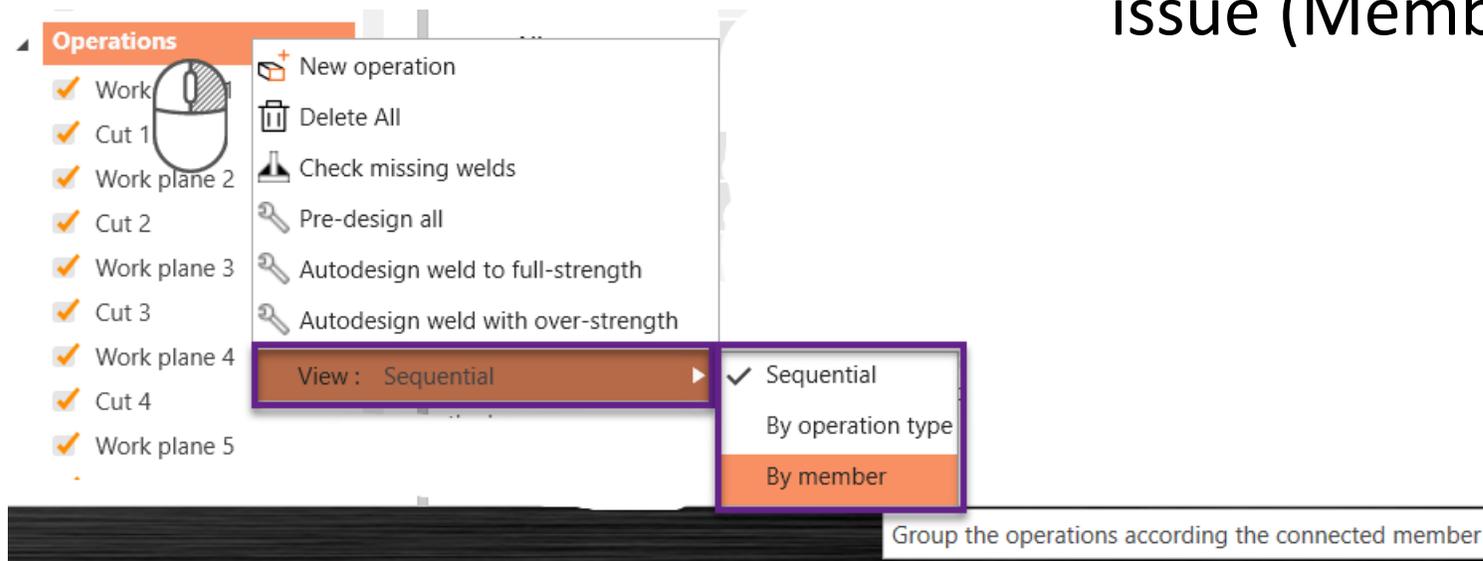
✘ Analysis

Mesh generation error – Boomerang Gusset L6. – An item with the same key has already been added.

✘ Analysis

Mesh generation error – 4-39-Web 1 – Mesh generation error – 4-39-Web 1 – Error code: -105

- Stops immediately the analysis, as it wasn't possible to create a mesh
- It tells you exactly where is the issue (Member or operation)



IDEA StatiCa Tech Support Checklist

4. Error msg in the modeling window

- It tells you what operation is stopping the analysis

5. Check the bolt operations

- Incorrect plate selection
- Slotted hole in the direction of the load
- The max allowable gap between plates is 1/16"

6. Code set up

- Reset to default
- Stop at limit strain
- GMNA

7. Non-conformity

- Analysis and design OK, but you get non-conformities

Bolts related error

- Incorrect plate selection in a grid operation

The screenshot displays a software interface for a bolted plate assembly. At the top left, a red error message box states: "Analysis Bolts are too close to plate edge or outside of the connected plate. - Member 249 - Manufacturing operations:GRD1". Below this, a 3D model of a brown plate with yellow bolts is shown. Dimensions are indicated below the plate: 6", 6", 3", 6", and 6". To the right of the model is a tree view showing the assembly structure:

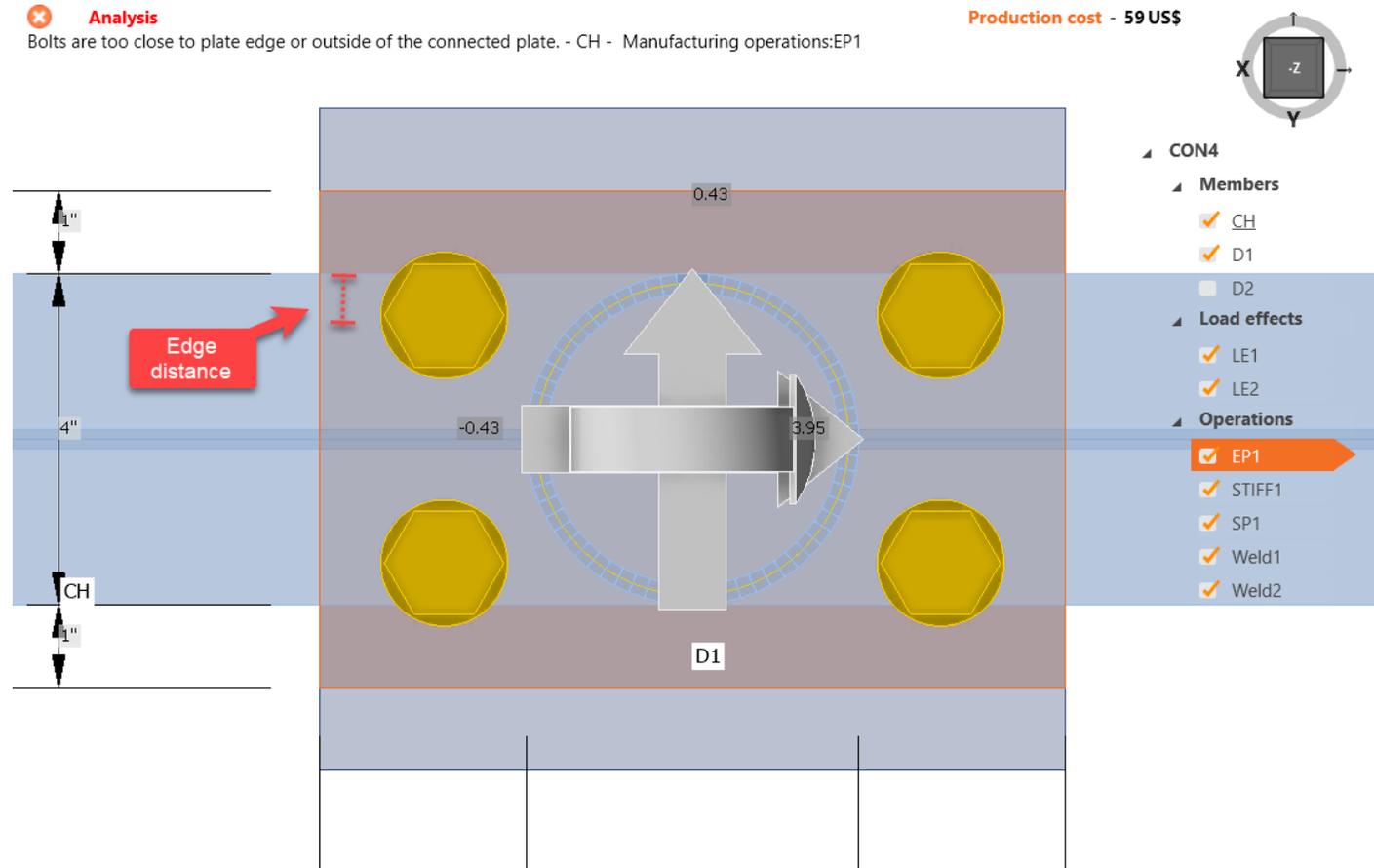
- Member 249 - Me...
 - Members
 - Member 249
 - Member 394
 - Load effects
 - Operations
 - SP1
 - GRD1**
 - SP2
 - GRD2

The "GRD1" operation is highlighted with a purple box. To the right of the tree view is a properties panel for "GRD1 [Bolt/Anchor grid or Contact]". The panel includes a toolbar with "Editor", "Copy", and "Delete" buttons. The main content area is divided into sections:

- Bolt/Anchor grid or Contact**
 - Fastener: Bolts
 - Items count: 3
 - Item 1: SP1
 - Item 2: Member 249 | Web 2
 - Item 3: Member 394 | Web 2
- Fasteners**
 - Type: 3/4 A325
 - Coord. system: Orthogonal
 - Origin [in]: 0" 1"1/2
 - Rows [in]: 0" 6"*2; -3" -6"*2
 - Positions [in]: 2"1/2 -5"
 - Grid: Regular
 - Shear plane in thread:
 - Shear force transfer: Bearing - tension/shear interaction

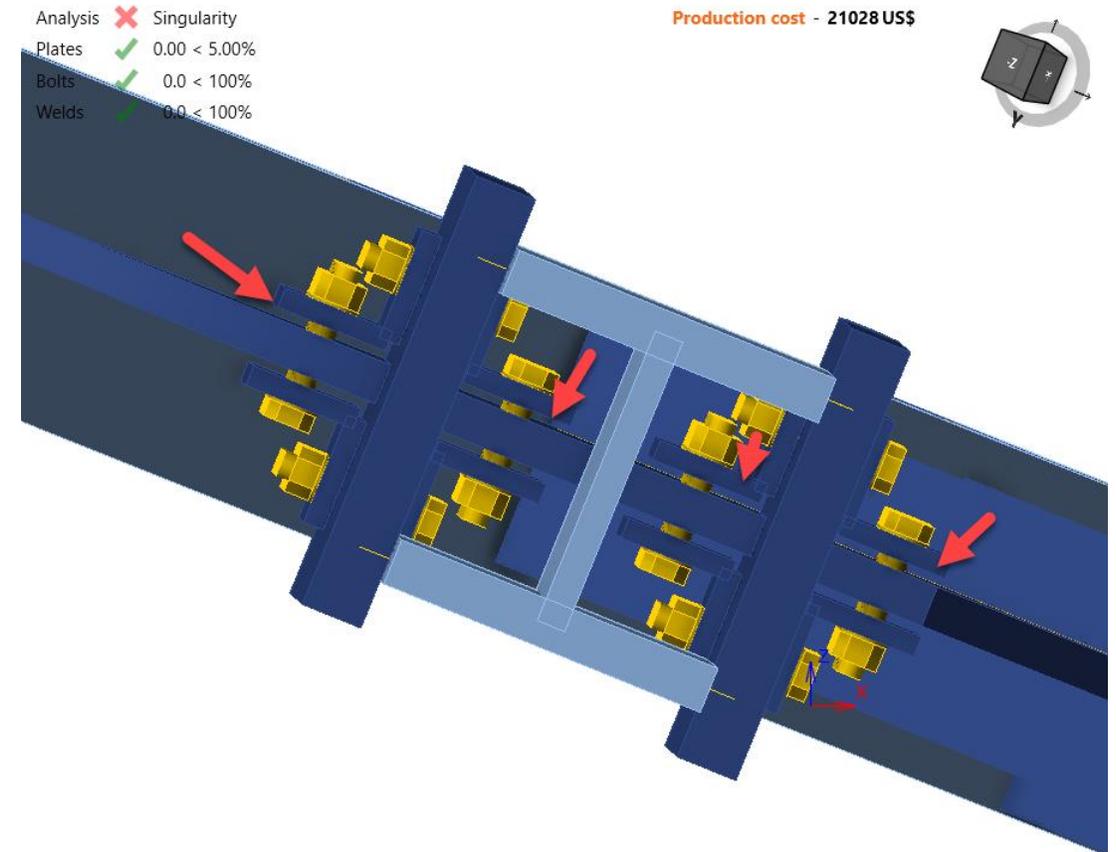
Bolts related error

- Not enough edge distance



Bolts related error

- The max allowable gap between plates is 1/16"

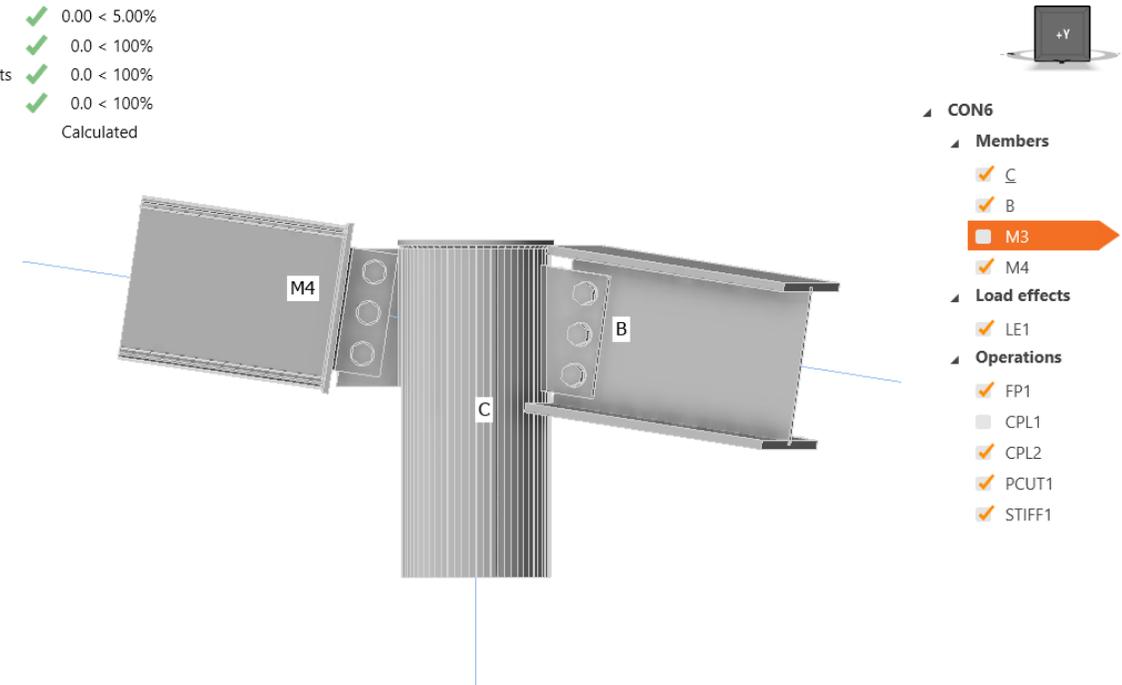


Bolts related error

- Slotted hole in the direction of the load
- Opening in the same position as the bolt

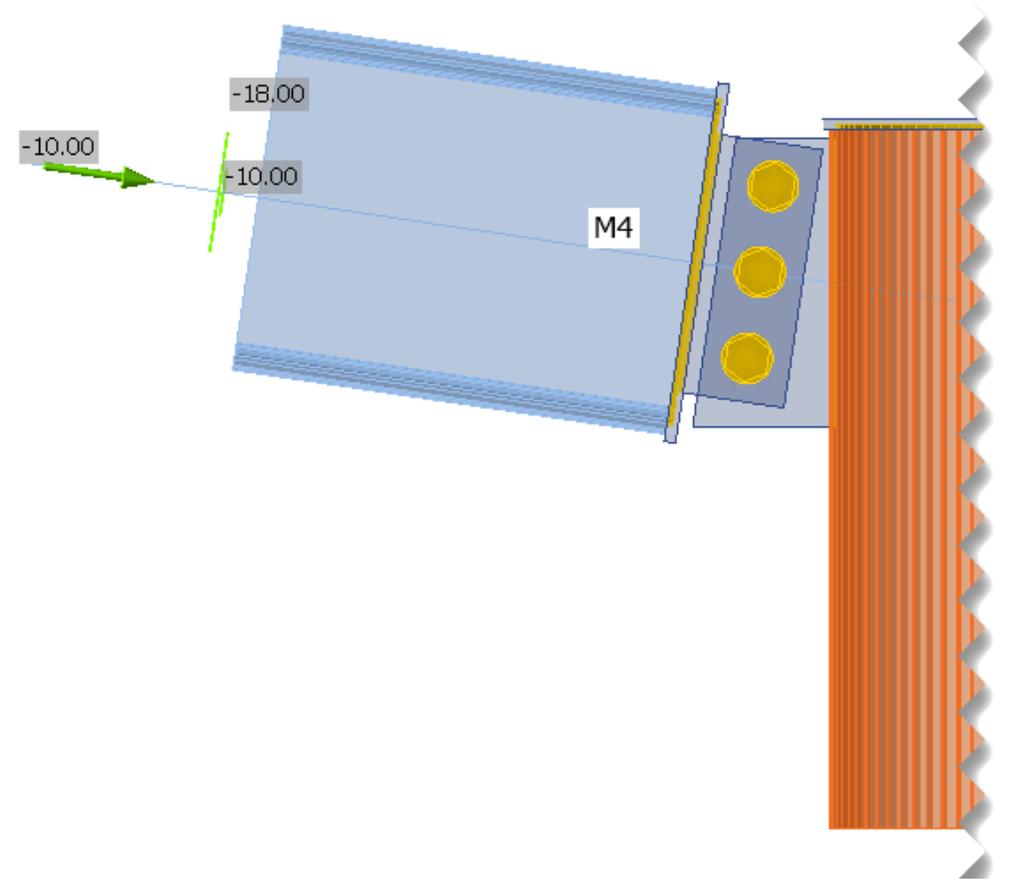
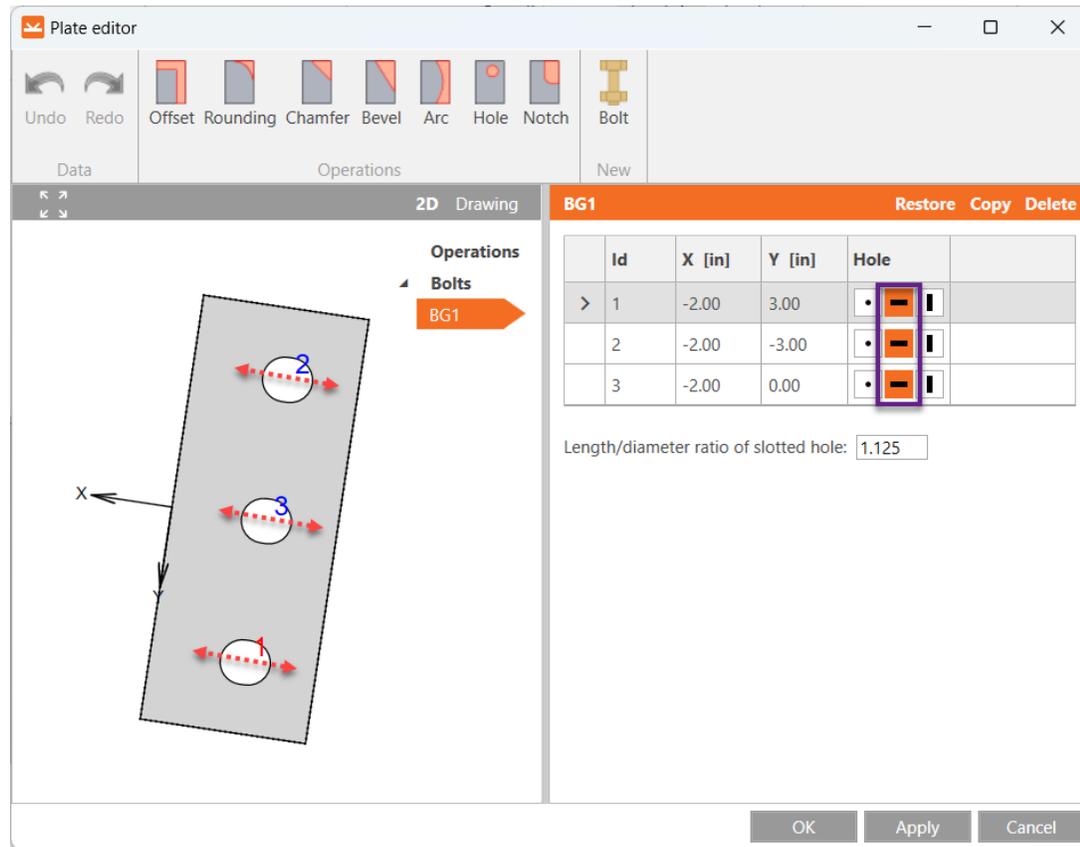
Analysis	✘	0.0%
Plates	✔	0.00 < 5.00%
Bolts	✔	0.0 < 100%
Preloaded bolts	✔	0.0 < 100%
Welds	✔	0.0 < 100%
GMNA		Calculated

Production cost - 99 US\$



- CON6
 - Members
 - ✔ C
 - ✔ B
 - ✔ M3
 - ✔ M4
 - Load effects
 - ✔ LE1
 - Operations
 - ✔ FP1
 - ✔ CPL1
 - ✔ CPL2
 - ✔ PCUT1
 - ✔ STIFF1

Editor>Slotted holes



IDEA StatiCa Tech Support Checklist

4. Error msg in the modeling window

- It tells you what operation is stopping the analysis

5. Check the bolts operation

- Incorrect plate selection
- Slotted hole in the direction of the load

6. Code set up

- Reset to default
- Stop at limit strain
- GMNA

7. Non-conformity

- Analysis and design OK, but you get non-conformities

Code set up

- Reset to default

The screenshot shows the 'Code and calculation settings' dialog box in the IDEA StatiCa software. The 'Code setup' button in the top toolbar is highlighted with a red box. The dialog box is titled 'Code and calculation settings' and contains the following settings:

Category	Setting	Value
Analysis and checks	Stop at limit strain	<input type="checkbox"/>
	Geometrical nonlinearity (GMNA)	<input checked="" type="checkbox"/>
	Detailing	<input checked="" type="checkbox"/>
	Concrete breakout resistance	Both
	Local deformation check	<input checked="" type="checkbox"/>
	Plate and weld clash check	<input checked="" type="checkbox"/>
	Friction coefficient in slip-resistance [-]	0.30
	Base metal capacity at the fusion face	<input type="checkbox"/>
Deformation at bolt hole at service load is design c	<input checked="" type="checkbox"/>	
Concrete block	Anchor length for stiffness calculation [d]	8
	Concrete loaded area: Stress cut-off	0.1
	Friction coefficient - concrete	0.4
	Cracked concrete	<input checked="" type="checkbox"/>
LRFD - Resistance factors ϕ	Tensile and shear strength - bolts	0.75
	Combined tensile and shear strength - bolts	0.75
	Bearing at bolt holes	0.75
	Fillet welds	0.75

At the bottom of the dialog box, the 'Reset' button is highlighted with a red box, along with 'Save', 'OK', and 'Cancel' buttons.

The analysis didn't get to 100%

1. Stop at limit strain?

Analysis	✗	25.8%
Plates	✓	0.36 < 5.00%
Welds	✓	99.8 < 100%
Buckling		Not calculated
GMNA		Calculated

Code and calculation settings

▼ **Analysis and checks**

Stop at limit strain

Geometrical nonlinearity (GMNA)

Detailing

Concrete breakout resistance Both

Local deformation check

Plate and weld clash check

Friction coefficient in slip-resistance [-] 0.30

Base metal capacity at the fusion face

Deformation at bolt hole at service load is design c

▼ **Concrete block**

Anchor length for stiffness calculation [d] 8

Concrete loaded area: Stress cut-off 0.1

Friction coefficient - concrete 0.4

Cracked concrete

▼ **LRFD - Resistance factors ϕ**

Tensile and shear strength - bolts 0.75

Combined tensile and shear strength - bolts 0.75

Bearing at bolt holes 0.75

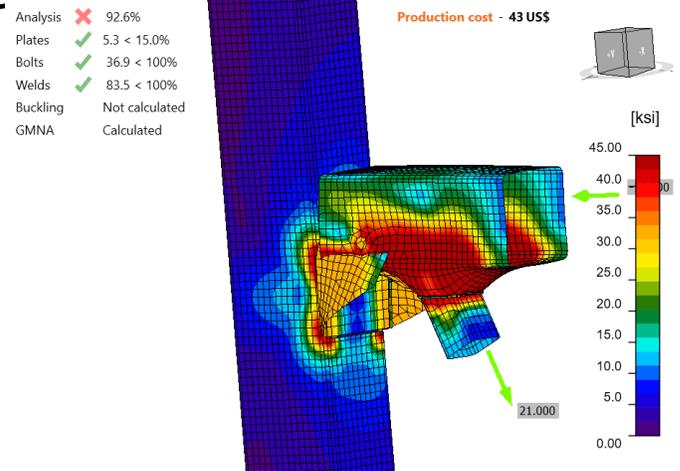
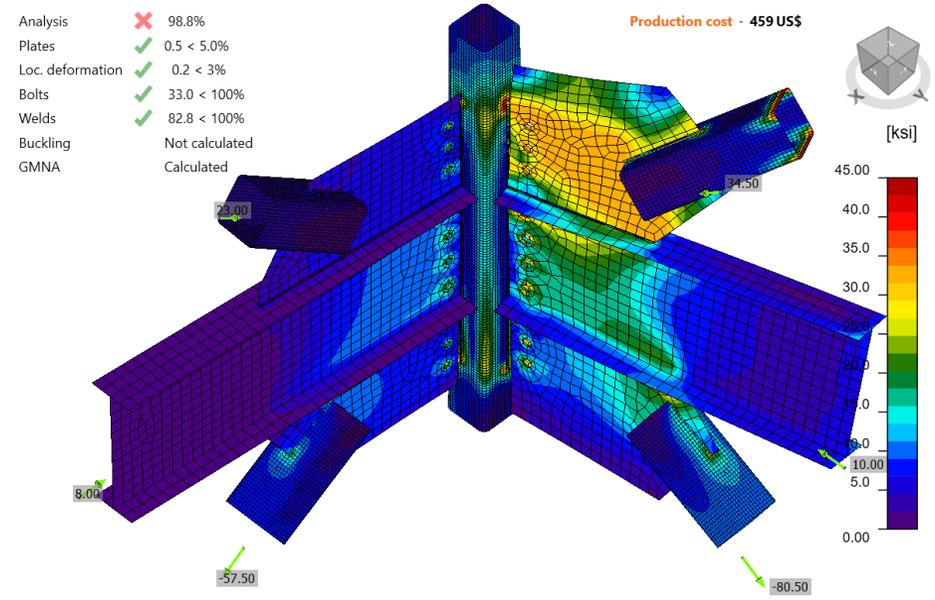
Fillet welds 0.75

Reset Save OK Cancel

B-Top flange 1: Cross-section with ID 24x94, material A992, thickness 176 mm

The analysis didn't get to 100%

1. Stop at limit strain is not active and still the analysis stops
2. Bearing member is a hollow section?
3. Huge deformation?
4. GMNA Issue?



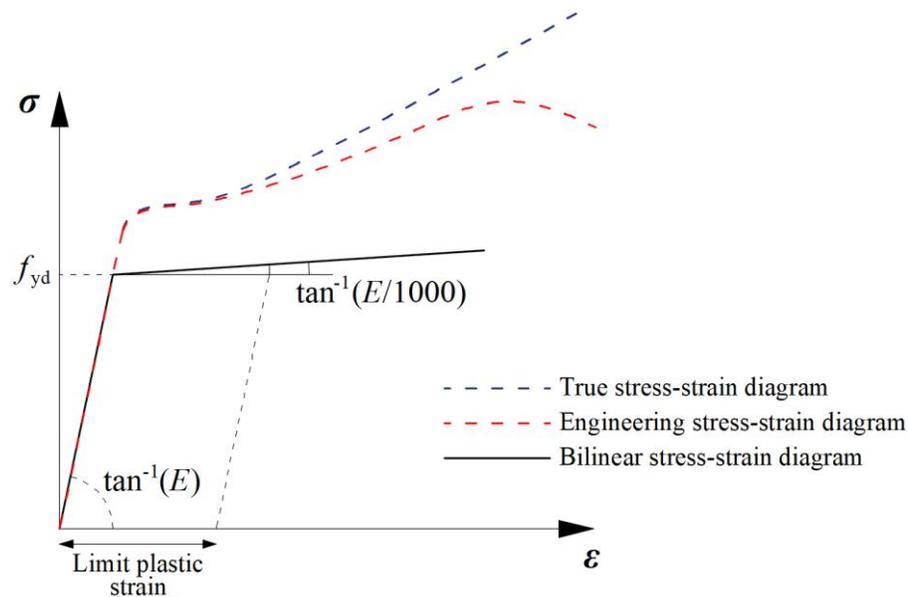
Analysis	✗	29.3%
Plates	✓	1.08 < 5.00%
Loc. deformation	✓	0.3 < 3%
Bolts	✓	37.5 < 100%
Welds	✓	75.1 < 100%
Buckling		Not calculated
GMNA		Calculated

Analysis		Local deformation	
Status of FE analysis			
	Status	Loads	Applied [%]
>	✗	LE1	42.19
	✗	LE2	29.30

Nonlinear analysis in IDEA StatiCa

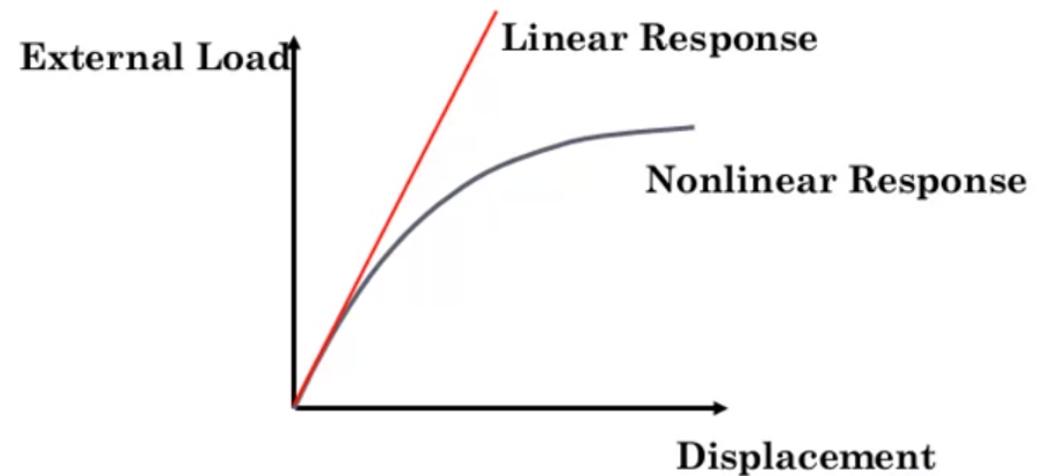
Material nonlinearity

*Active in all the analysis

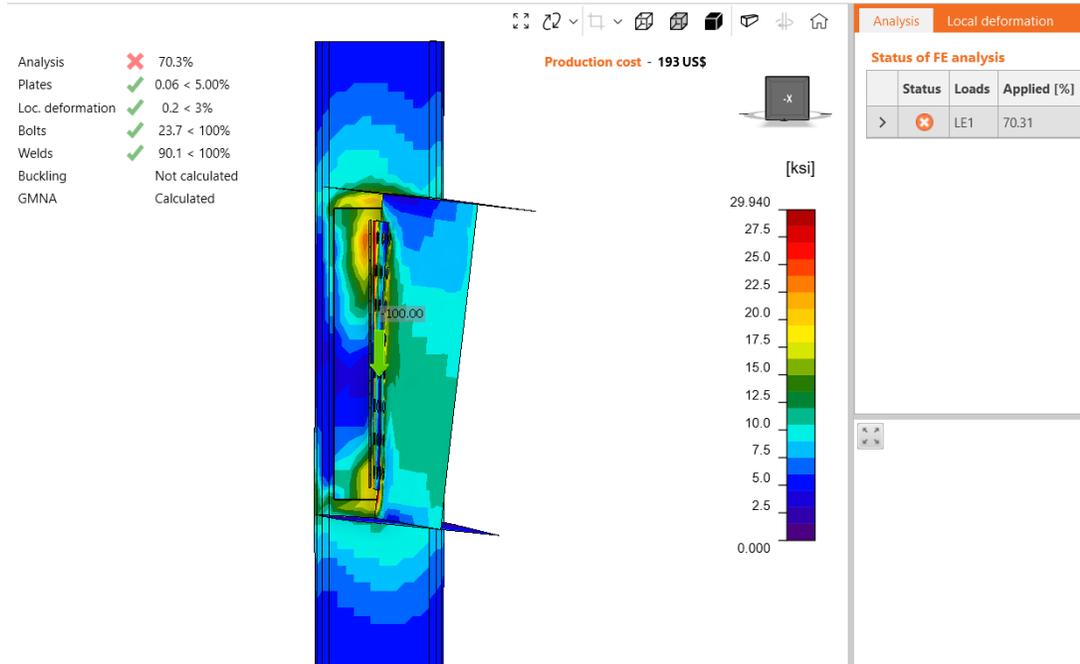


Geometrical nonlinearity

*Only active when the bearing member is a Hollow section



HSS Stability solution



1. Turn off GMNA from Code set up

2. Run the analysis

4. Fix the design and run the analysis again

3. Spot the issue

5. All good?

6. Now run the analysis with GMNA Active again and ensure design is OK.

IDEA StatiCa Tech Support Checklist

4. Error msg in the modeling window

- It tells you what operation is stopping the analysis

5. Check the bolts operation

- Incorrect plate selection
- Slotted hole in the direction of the load

6. Code set up

- Reset to default
- Stop at limit strain
- GMNA

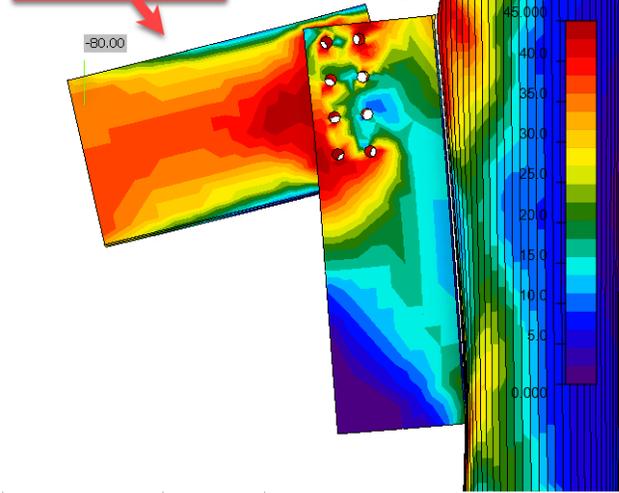
7. Non-conformity

- Analysis and design OK, but you get non-conformities

Non-conformity

Analysis	✓	100.0%
Plates	✓	3.68 < 5.00%
Loc. deformation	✓	0.8 < 3%
Bolts	✓	93.1 < 100%
Welds	✓	95.1 < 100%
Buckling		Not calculated
GMNA		Calculated

Model type: N-Vy-Vz

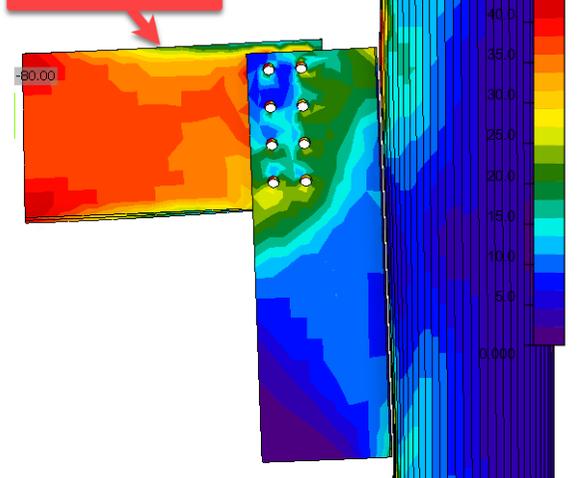


Status of FE analysis				
Status	Loads	Applied [%]	Nonconformity	
>	✓	LE1	100.00	Rx - -0.03[kip.ft] Ry - -110.42[kip.ft] Rz - 0.29[kip.ft]

Analysis	✓	100.0%
Plates	✓	0.42 < 5.00%
Loc. deformation	✓	0.4 < 3%
Bolts	✓	35.8 < 100%
Welds	✓	79.3 < 100%
Buckling		Not calculated
GMNA		Calculated

Model type: N-Vy-Vz-Mx-My-Mz

Model type: N-Vz-My



Status of FE analysis				
Status	Loads	Applied [%]	Nonconformity	
>	✓	LE1	100.00	Y - 0.54[kip] Rx - -0.39[kip.ft] Rz - 3.38[kip.ft]

IDEA StatiCa Tech Support Checklist

8. Detailing error?

- Review the detailing warning under Check tab>Welds or bolts

9. Order of operations

- The modeling order matters and affect the analysis

10. Round HSS cross section modeling issue

- Use the hollow polygon section under cold formed database

Detailing checks

Code and calculation settings

Analysis and checks

- Stop at limit strain
- Geometrical nonlinearity (GMNA)
- Detailing**
- Concrete breakout resistance: Both
- Local deformation check
- Plate and weld clash check
- Friction coefficient in slip-resistance [-]: 0.30
- Base metal capacity at the fusion face
- Deformation at bolt hole at service load is design

Code setup

Analysis 100.0%

Plates 0.9 < 5.0%

Bolts Detailing

Buckling Not calculated

Analysis Plates Bolts

Check of bolts for extreme load effect

	Status	Item	Loads	Ft [kip]	V [kip]	Bearing ϕR_n [kip]	Utt [%]	Uts [%]	Utts [%]	Detailing
> +	<input checked="" type="checkbox"/>	B1	LE1	0.880	3.925	15.869	4.3	31.6	-	<input checked="" type="checkbox"/>
+ +	<input checked="" type="checkbox"/>	B2	LE1	0.404	3.982	15.869	2.0	32.1	-	<input checked="" type="checkbox"/>
+ +	<input checked="" type="checkbox"/>	B3	LE1	0.054	4.037	15.869	0.3	32.5	-	<input checked="" type="checkbox"/>
+ +	<input checked="" type="checkbox"/>	B4	LE1	0.000	4.036	15.869	0.0	32.5	-	<input checked="" type="checkbox"/>
+ +	<input checked="" type="checkbox"/>	B5	LE1	0.000	4.022	15.869	0.0	32.4	-	<input checked="" type="checkbox"/>
+ +	<input checked="" type="checkbox"/>	B6	LE1	9.869	7.057	16.684	47.7	56.8	65.2	<input checked="" type="checkbox"/>
+ +	<input checked="" type="checkbox"/>	B7	LE1	4.716	4.801	24.419	22.8	38.7	-	<input checked="" type="checkbox"/>
+ +	<input checked="" type="checkbox"/>	B8	LE1	3.605	3.931	15.869	17.4	31.7	-	<input checked="" type="checkbox"/>

Check of bolts for extreme load effect

	Status	Item	Loads	Ft [kip]	V [kip]	Bearing ϕR_n [kip]	Utt [%]	Uts [%]	Utts [%]	Detailing
-	<input checked="" type="checkbox"/>	B1	LE1	0.880	3.925	15.869	4.3	31.6	-	<input checked="" type="checkbox"/>

Interaction of tension and shear check (AISC 360-16: J3-2)
The required stress, in either shear or tension, is less than or equal to 30% of the corresponding available stresses need not be investigated.

Detailing check (AISC 360-16: J2-1b)
Error No1: Bolt B1 is too close to bolt B2. Spacing between bolts must be greater than 1"11/16 in.

Detailing checks (bolts)

3. Minimum Spacing

The distance between centers of standard, oversized or slotted holes shall not be less than $2\frac{2}{3}$ times the nominal diameter, d , of the fastener. However, the clear distance between bolt holes or slots shall not be less than d .

User Note: A distance between centers of standard, oversize or slotted holes of $3d$ is preferred.

TABLE J3.4
Minimum Edge Distance^[a] from
Center of Standard Hole^[b] to Edge of
Connected Part, in.



Bolt Diameter, in.	Minimum Edge Distance
1/2	3/4
5/8	7/8
3/4	1
7/8	1 1/8
1	1 1/4
1 1/8	1 1/2
1 1/4	1 5/8
Over 1 1/4	1 1/4 d

^[a] If necessary, lesser edge distances are permitted provided the applicable provisions from Sections J3.10 and J4 are satisfied, but edge distances less than one bolt diameter are not permitted without approval from the engineer of record.

^[b] For oversized or slotted holes, see Table J3.5.

Detailing checks welds

Analysis Plates Bolts Welds

	Status	Item	Edge	Xu	Th [in]	Ls [in]	L [in]	Lc [in]	Loads	F _n [kip]	φR _n [kip]	Ut [%]	Detailing
+	✓	C-bfl 1	FP1	E70xx	1/8	3/16	8"15/16	9/16	LE1	2.574	3.428	75.1	✓
+	✓			E70xx	1/8	3/16	8"15/16	9/16	LE1	1.203	3.247	37.0	✓
-	✓	GUSS1	D1-w 1	E70xx	1/8	3/16	10"11/16	3/8	LE1	0.370	1.609	23.0	✗

◦ θ = 27.3° – angle of loading measured from the weld longitudinal axis

$A_{we} = 0.0442 \text{ in}^2$ – effective area of weld critical element
 $\phi = 0.75$ – resistance factor for welded connections

Detailing check (AISC 360-16: J2.2b, Table J2.4)
Error No1: Weld is too small. Weld's size must be greater than 3/16 in.

Equivalent stress [ksi]

TABLE J2.4
Minimum Size of Fillet Welds



Material Thickness of Thinner Part Joined, in. (mm)	Minimum Size of Fillet Weld, ^[a] in. (mm)
To 1/4 (6) inclusive	1/8 (3)
Over 1/4 (6) to 1/2 (13)	3/16 (5)
Over 1/2 (13) to 3/4 (19)	1/4 (6)
Over 3/4 (19)	5/16 (8)

^[a] Leg dimension of fillet welds. Single pass welds must be used.
 Note: See Section J2.2b for maximum size of fillet welds.

IDEA StatiCa Tech Support Checklist

8. Detailing error?

- Review the detailing warning under Check tab>Welds or bolts

9. Order of operations

- The modeling order matters and affect the analysis

10. Round HSS cross section modeling issue

- Use the hollow polygon section under cold formed database

IDEA StatiCa Tech Support Checklist

8. Detailing error?

- Review the detailing warning under Check tab>Welds or bolts

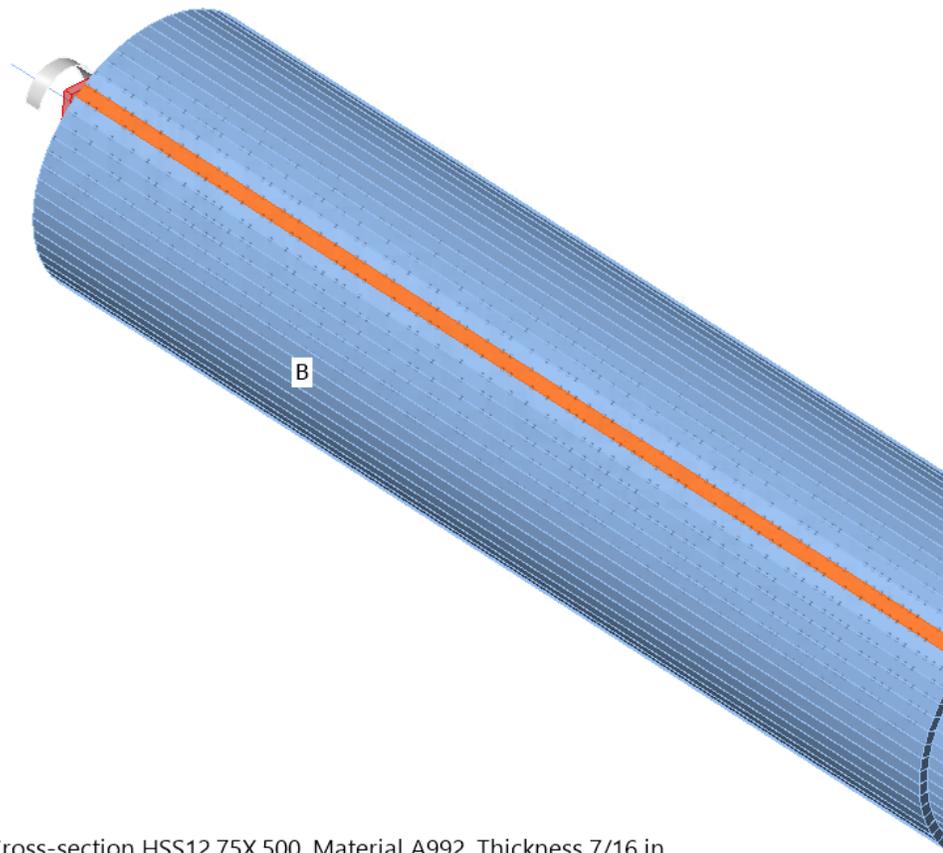
9. Order of operations

- The modeling order matters and affect the analysis

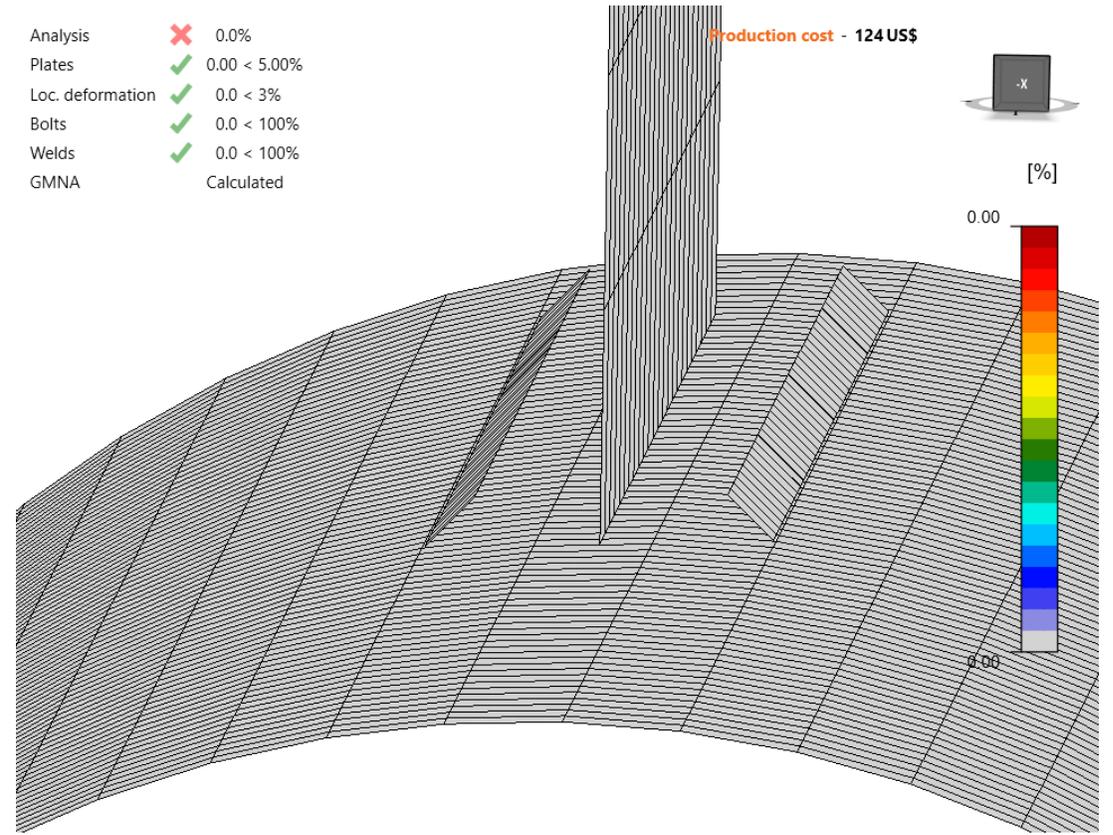
10. Round HSS cross section modeling issue

- Use the hollow polygon section under cold formed database

Round HSS Cross section



Analysis	✗	0.0%
Plates	✓	0.00 < 5.00%
Loc. deformation	✓	0.0 < 3%
Bolts	✓	0.0 < 100%
Welds	✓	0.0 < 100%
GMNA		Calculated



B-Arc 24: Cross-section HSS12.75X.500, Material A992, Thickness 7/16 in

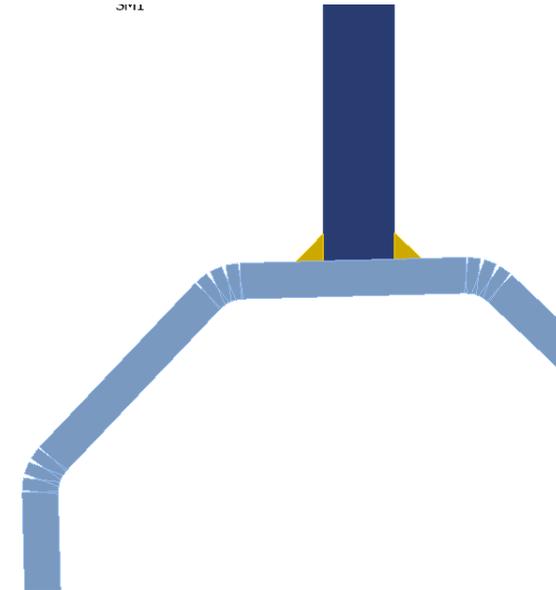
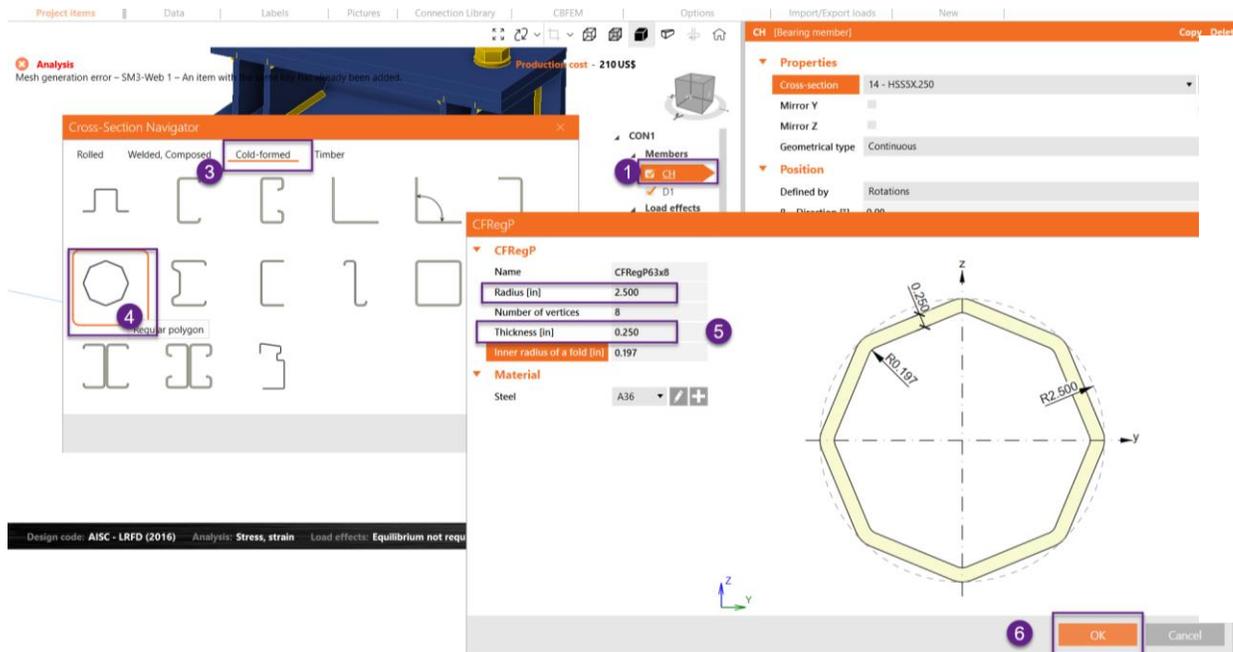
Solution 1: Division of HSS surface

▼ **Model and mesh**

Default length of standard member [h]	1.25
Default length of member with hollow section [h]	1.25
Division of surface of the biggest circular hollow m	64
Division of arc of rectangular hollow member	3
Number of elements on biggest member web or fl	12
Number of elements on biggest web of RHS memb	16
Number of elements on individual plates	20
Number of analysis iterations	25
Divergent iterations count	3
Minimal size of element [in]	5/16
Maximal size of element [in]	1"15/16
Number of buckling modes	6

Reset Save OK Cancel

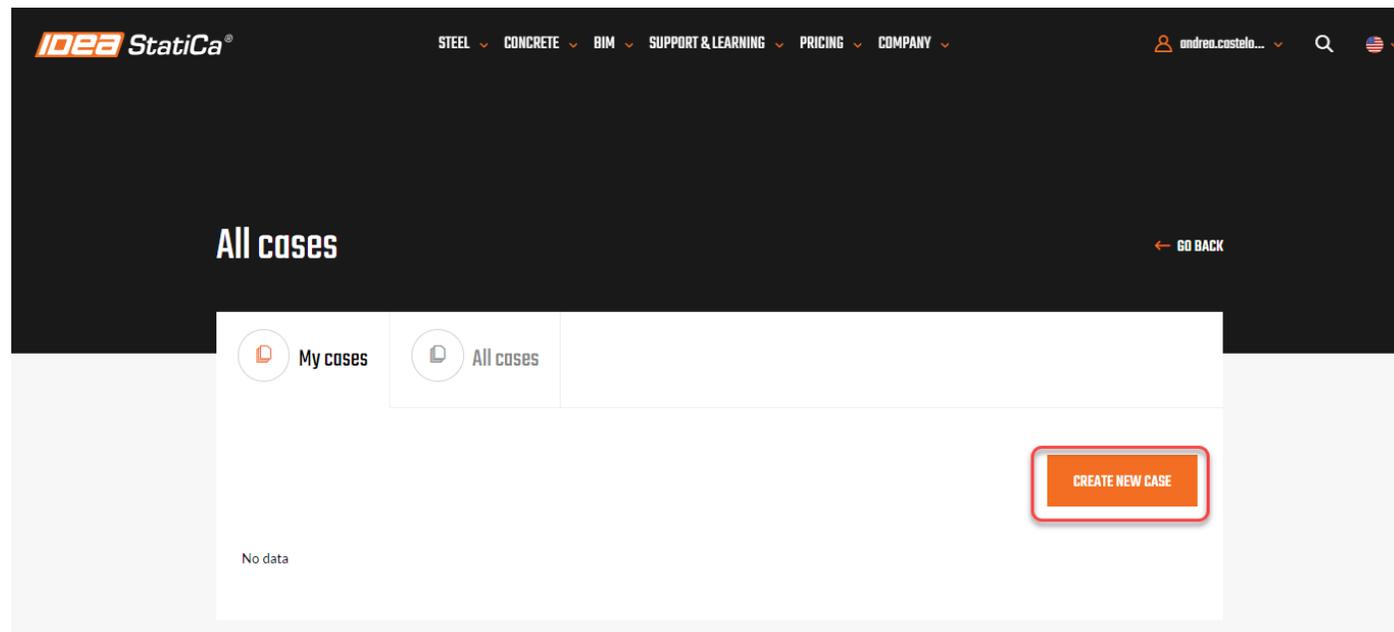
Solution 2: Use hollow section polygon under cold formed database



CH [Bearing member]	
Properties	
Cross-section	21 - CFRegP63x8
Mirror Y	<input type="checkbox"/>
Mirror Z	<input type="checkbox"/>
Geometrical type	Continuous
Position	
Defined by	Rotations
β - Direction [°]	0.00
γ - Pitch [°]	0.00
α - Rotation [°]	24.00
Offset ex [in]	0"
Offset ey [in]	0"
Offset ez [in]	0"
Align	In node
Model	
Model type	N-Vy-Vz-Mx-My-Mz
Forces in	Node

User portal > User case

<https://www.ideastatica.com/Portal/Case>



Q&A



UP COMING EVENTS

SEA Kentucky, May 22nd

SEA Arizona, June 20th

Webinar: IDEA StatiCa v24, May 22nd

Webinar: TBD, June 26th