




# Tutorial

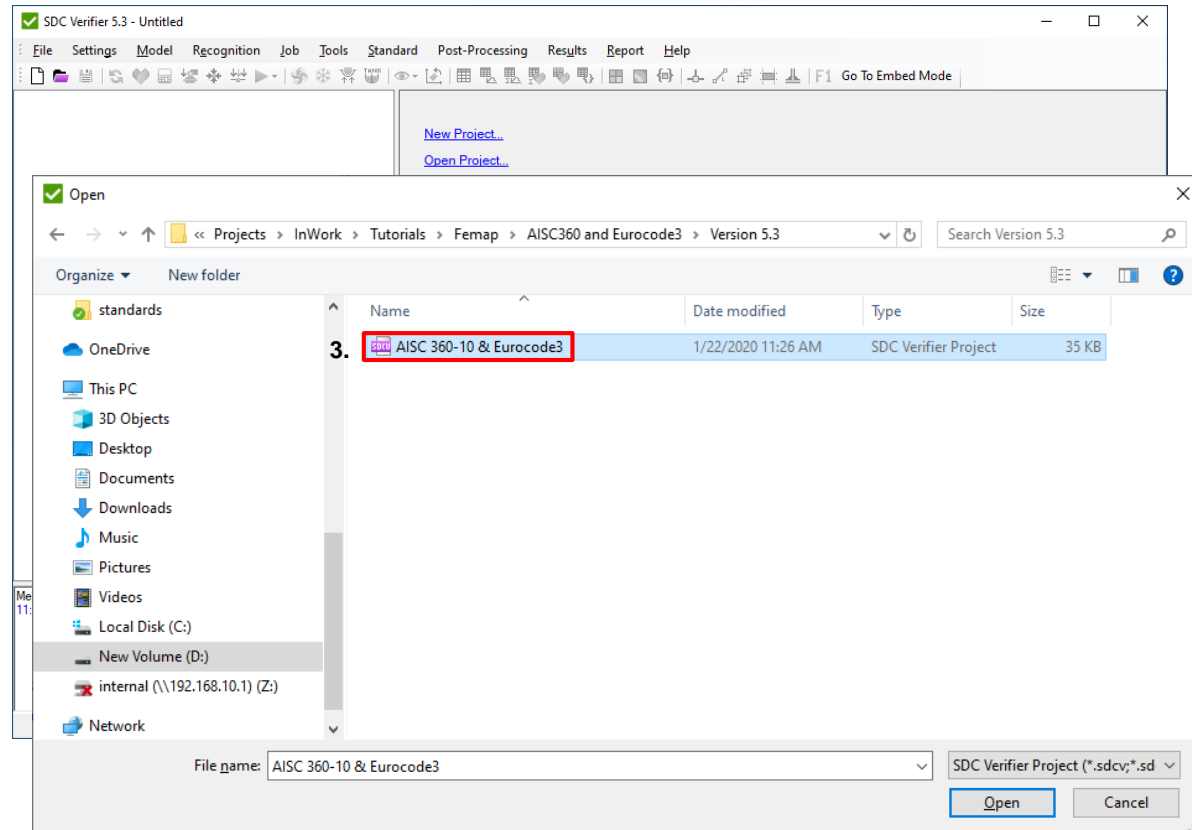
## **AISC 360-10 & Eurocode3**

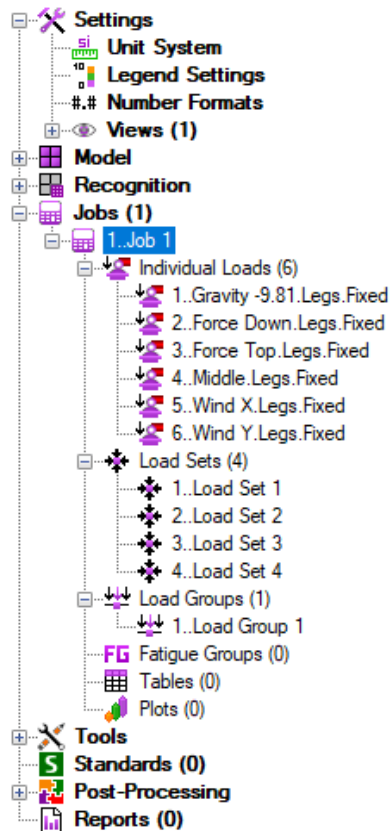
20 Jan 2020  
version 5.3

- ▶ In this tutorial, AISC 360-10 & Eurocode3 Member Check are reviewed in details.
- ▶ A beam model structure has been used as a start FEM model.
- ▶ Beam member finder was used to recognize beam member dimensions.
- ▶ Report was automatically generated in SDC Verifier Report Tool to represent beam checks results according AISC 360-10 and Eurocode3 standards.

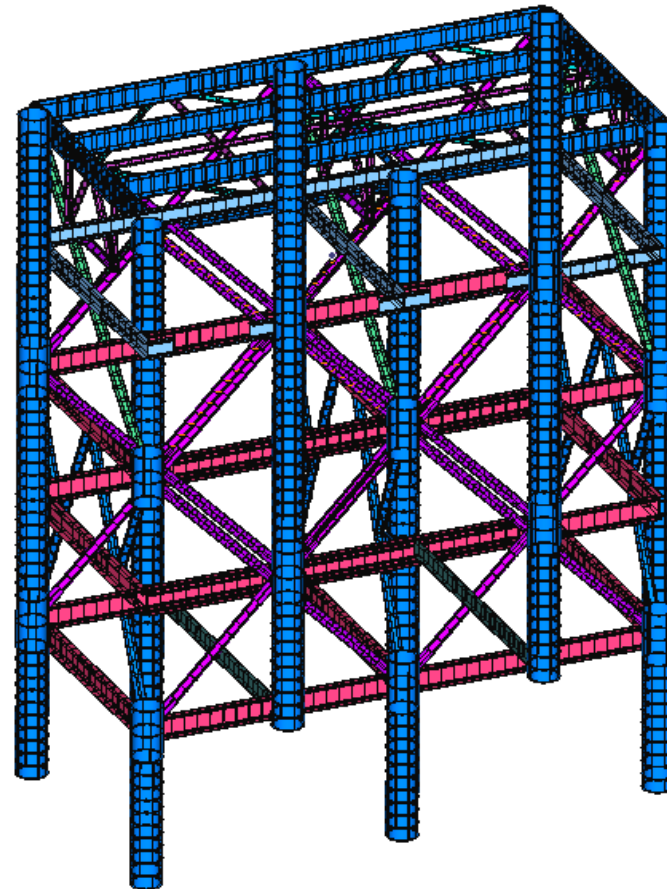
# Open Project

- 1 Launch **SDC Verifier** 
- 2 Execute *File - Open Project*.
- 3 Project: **AISC 360-10 & Eurocode3.sdcv**





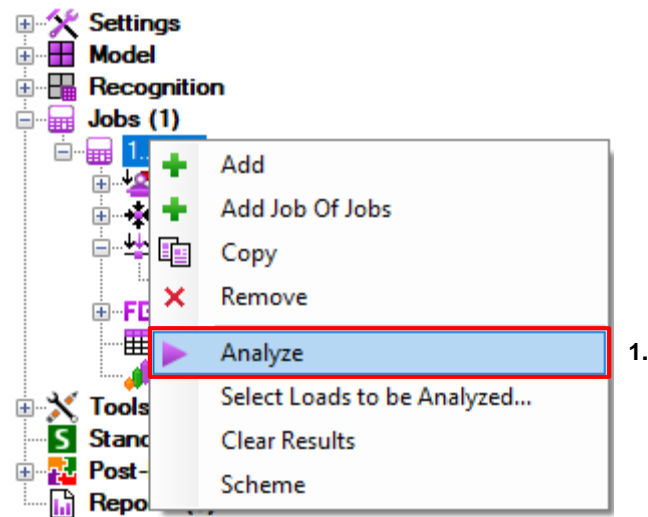
This tutorial uses project with predefined boundary condition, load combinations and load group. The model contains only beam elements of the following types: I-Beam, Circular and Rectangular Tubes



# Analyze Job

1

Execute ► **Analyze** from *Job1*  
context menu



Joint – location where different beam members connect. They are used to recognize beam member length by Beam Member Finder Tool.

There are 6 types of Joints:

1D Joint – 2 beam members that lie on the curve but with different properties;

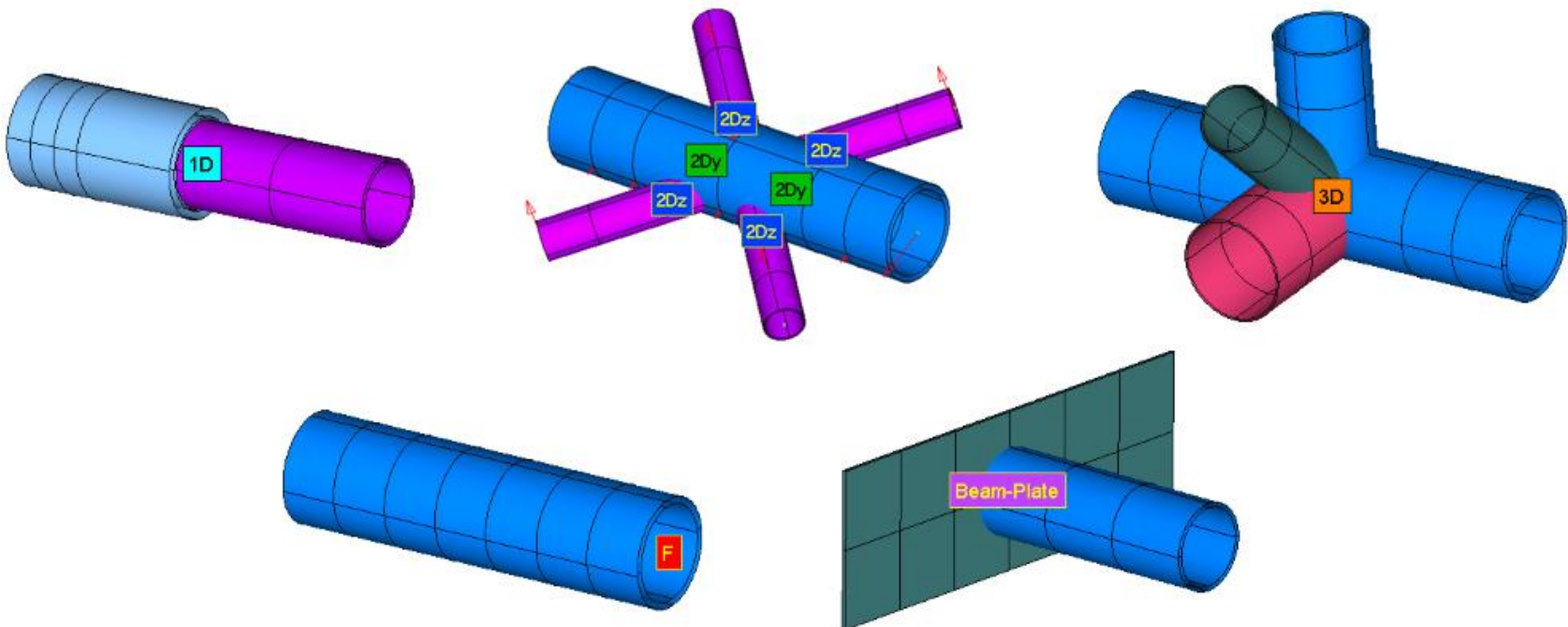
2D Joint – beam members connected in one plane;

3D Joint – beam members connected in space;

Free Joint – node which belongs only to one element (free);

Beam-Plate Joint – beam member connected to plates (perpendicularly);

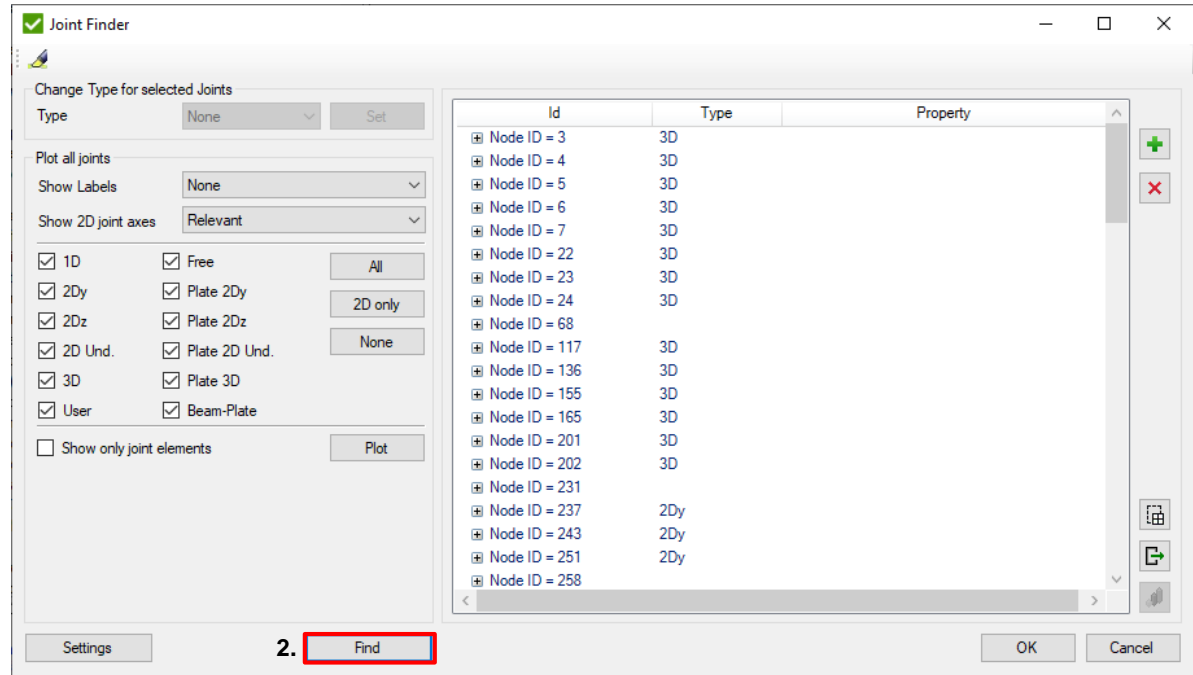
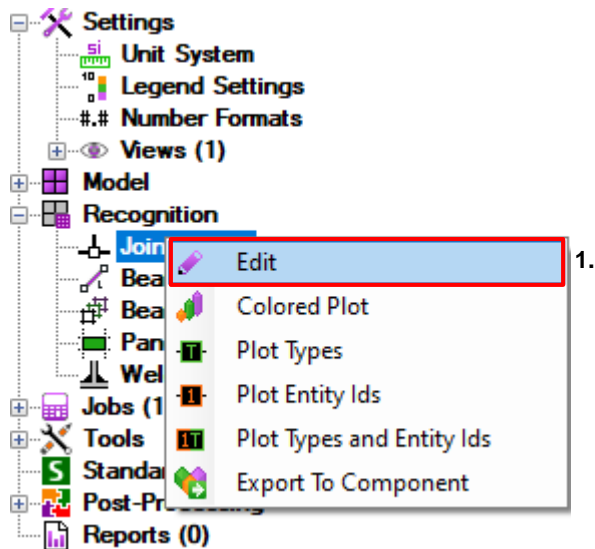
User Defined;



# Joint Recognition

1 Execute *Edit* from *Joint Finder* context menu


2 Press *Find*.



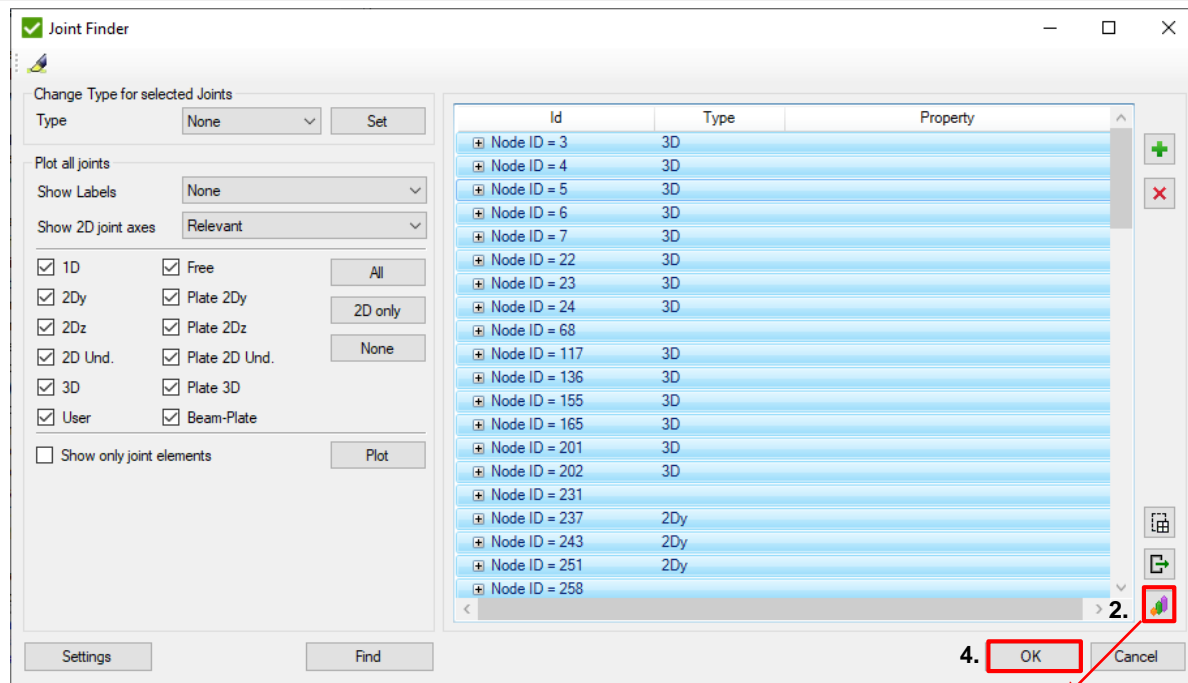
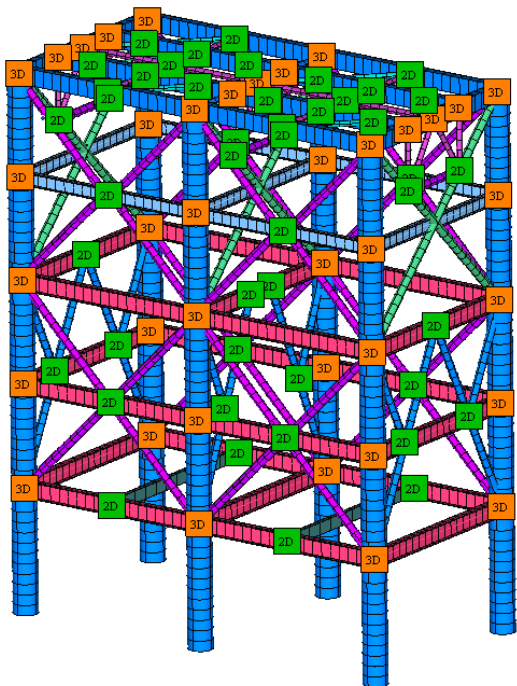
# Joints Plot

1 Select All Joints (Ctrl+A).

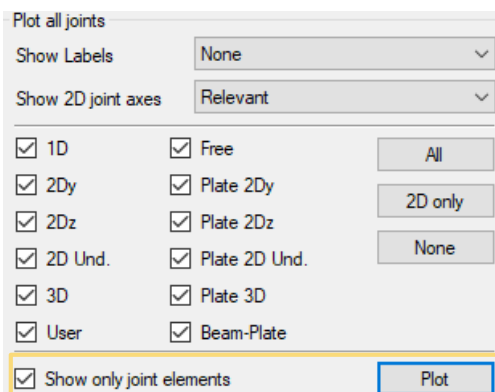
2 Press 


3 Press  Plot Joint Type Labels


4 Press OK



Plot Joints of specific type:



3.  Plot Joint Type Labels

 Plot Joint Type in colors

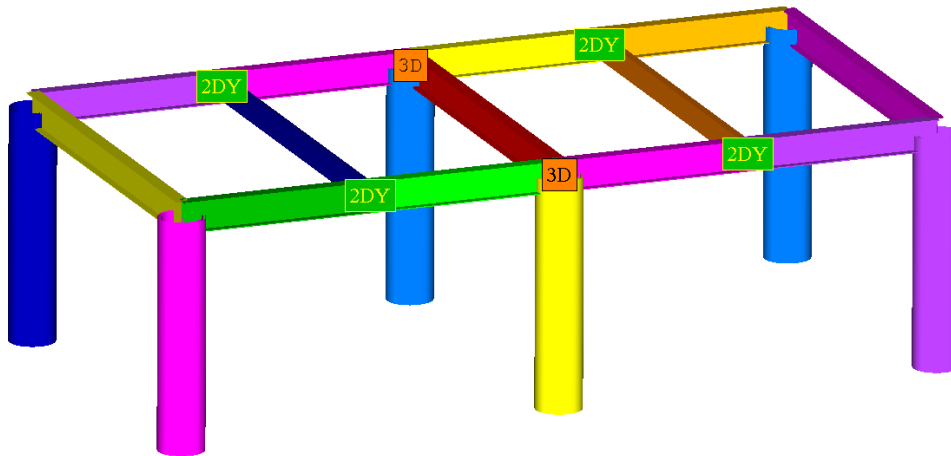
Modify Joint Type:

Change Type for selected Joints

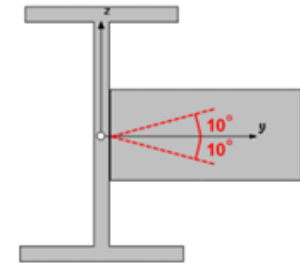
Type None Set

# Beam Member Finder. Members Length

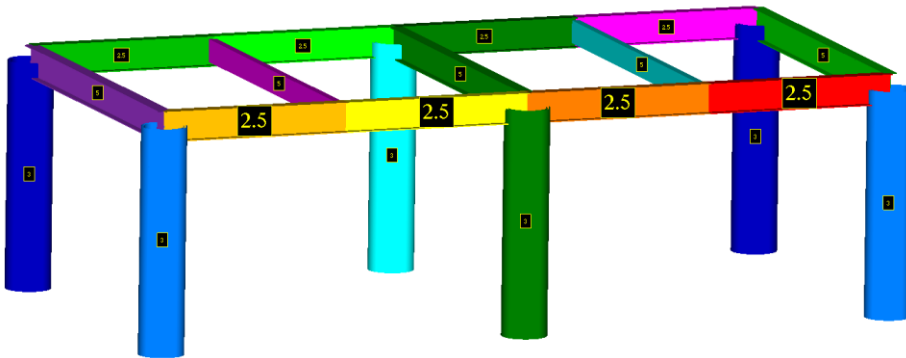
Beam Member Finder recognizes beam members and (buckling) lengths for different directions (Y, Z and Torsional).



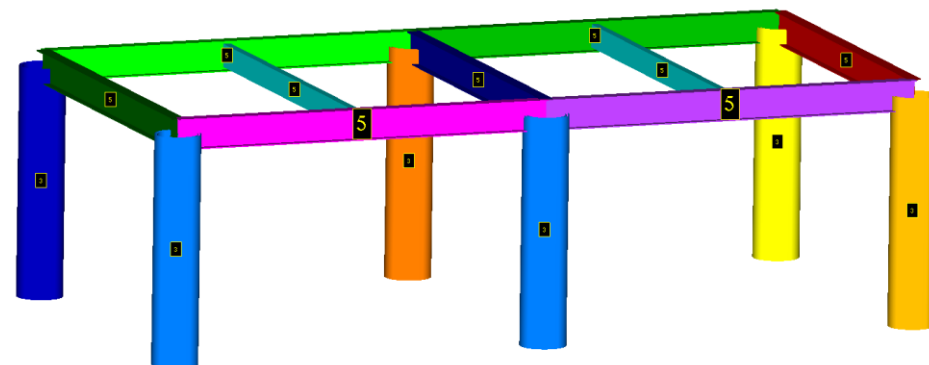
2DY  
Joint



Length Y – 4 Beam Members with  $L = 2.5$



Length Z – 2 Beam Members with  $L = 5$



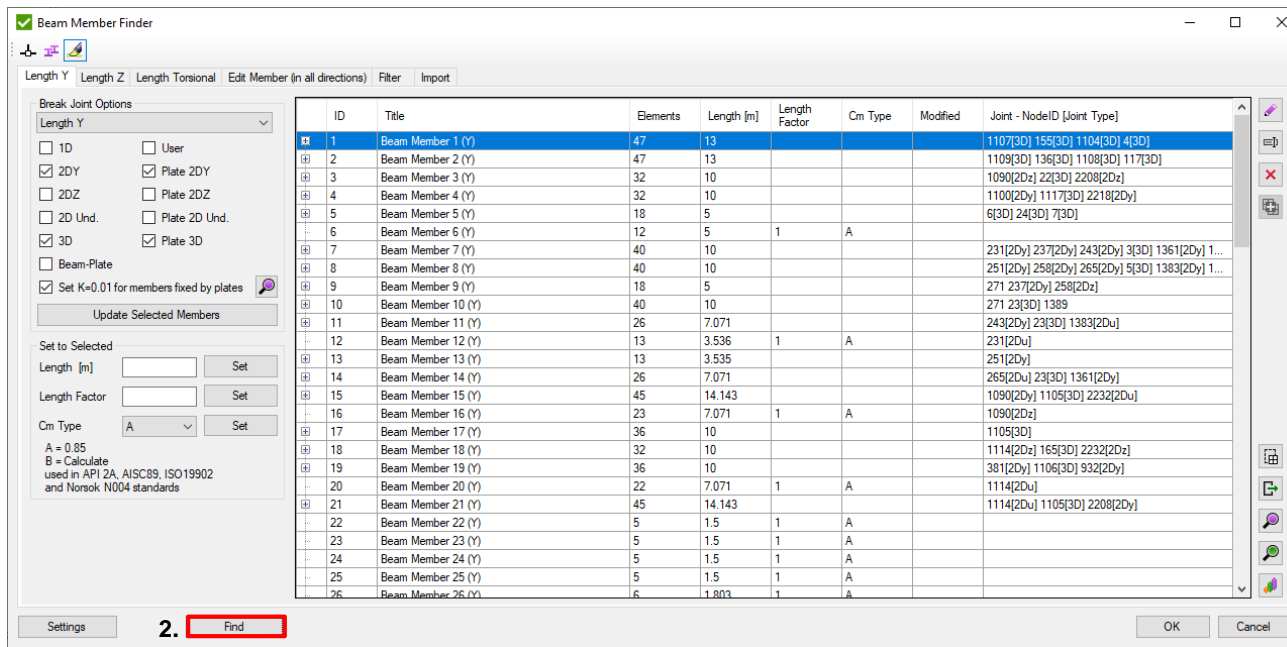
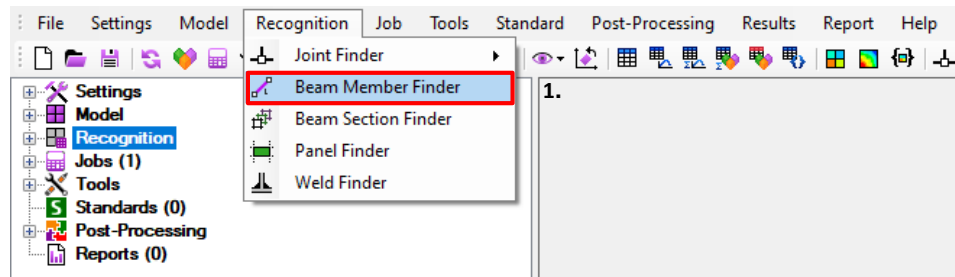
# Recognize Length Y

1

Execute *Recognition – Beam Member Finder*

2

Press *Find*



# Beam Member Finder Explanation

Break Options define what joints are used to split beam members

Change Length/Factor for selected beam members

Cm Type is used in API 2A, ISO 19902 and Norsok N004 standards

**Beam Member Finder**

Length Y Length Z Length Torsional Edit Member (in all directions) Filter Import

**Break Joint Options**  
Length Y  
☐ 1D ☐ User  
☒ 2DY ☒ Plate 2DY  
☐ 2DZ ☐ Plate 2DZ  
☐ 2D Und. ☐ Plate 2D Und.  
☒ 3D ☒ Plate 3D  
☐ Beam-Plate  
☒ Set K=0.01 for members fixed by plates  
 Update Selected Members

**Set to Selected**  
 Length [m]  Set  
 Length Factor  Set  
 Cm Type A  Set  
 A = 0.85  
 B = Calculate used in API 2A, AISCS9, ISO 19902 and Norsok N004 standards

ID	Title	Elements	Length [m]	Length Factor	Cm Type	Modified	Joint - NodeID [Joint Type]
1	Beam Member 1 (Y)	47	13				1107[3D] 155[3D] 1104[3D] 4[3D]
2	Beam Member 2 (Y)	47	13				1109[3D] 136[3D] 1108[3D] 117[3D]
3	Beam Member 3 (Y)	32	10				1090[2Dz] 22[3D] 2208[2Dz]
4	Beam Member 4 (Y)	32	10				1100[2Dy] 1117[3D] 2218[2Dy]
5	Beam Member 5 (Y)	18	5				6[3D] 24[3D] 7[3D]
6	Beam Member 6 (Y)	12	5	1	A		
7	Beam Member 7 (Y)	40	10				231[2Dy] 237[2Dy] 243[2Dy] 3[3D] 1361[2Dy] 1...
8	Beam Member 8 (Y)	40	10				251[2Dy] 258[2Dy] 265[2Dy] 5[3D] 1383[2Dy] 1...
9	Beam Member 9 (Y)	18	5				271 237[2Dy] 258[2Dz]
10	Beam Member 10 (Y)	40	10				271 23[3D] 1389
11	Beam Member 11 (Y)	26	7.071				243[2Dy] 23[3D] 1383[2Du]
12	Beam Member 12 (Y)	13	3.536	1	A		231[2Du]
13	Beam Member 13 (Y)	13	3.535				251[2Dy]
14	Beam Member 14 (Y)	26	7.071				265[2Du] 23[3D] 1361[2Dy]
15	Beam Member 15 (Y)	45	14.143				1090[2Dy] 1105[3D] 2232[2Du]
16	Beam Member 16 (Y)	23	7.071	1	A		1090[2Dz]
17	Beam Member 17 (Y)	36	10				1105[3D]
18	Beam Member 18 (Y)	32	10				1114[2Dz] 165[3D] 2232[2Dz]
19	Beam Member 19 (Y)	36	10				381[2Dy] 1106[3D] 932[2Dy]
20	Beam Member 20 (Y)	22	7.071	1	A		1114[2Du]
21	Beam Member 21 (Y)	45	14.143				1114[2Du] 1105[3D] 2208[2Dy]
22	Beam Member 22 (Y)	5	1.5	1	A		
23	Beam Member 23 (Y)	5	1.5	1	A		
24	Beam Member 24 (Y)	5	1.5	1	A		
25	Beam Member 25 (Y)	5	1.5	1	A		
26	Beam Member 26 (Y)	6	1.803	1	A		

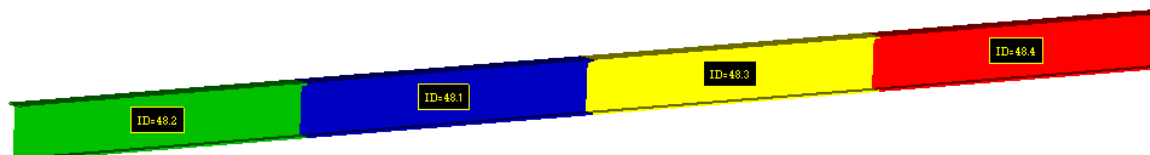
Settings Find OK Cancel

**Colored Plot of members with labels (ID, Length, Factor or Cm Type).**

Plot selected members  
 Plot Members ID labels  
 Plot Full Members ID labels  
 Plot Length labels  
 Plot Cm Type labels  
 Plot Length Factor labels  
 Plot Joints for Selected Members  
 Plot Members Y and Z axes



Beam Member – straight line. If it contains joints it is split on sub members



48	Beam Member 48 (Y)	36	10				1111[3D] 520[2Dy] 68[2Dy]
48.1	Beam Member 48.1 (Y)	9	2.5	1	A		
48.2	Beam Member 48.2 (Y)	9	2.5	1	A		
48.3	Beam Member 48.3 (Y)	9	2.5	1	A		
48.4	Beam Member 48.4 (Y)	9	2.5	1	A		

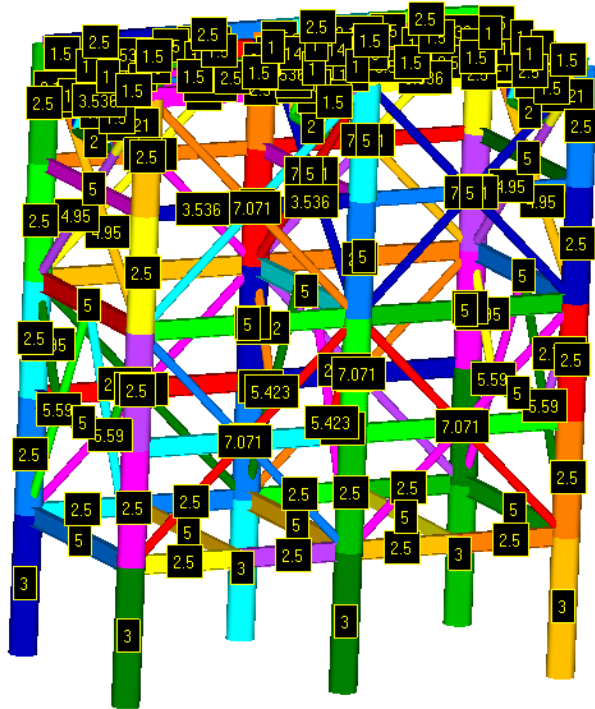


# Beam Member Finder Plots

1 Select All Beam Members (Ctrl+A)

2 Press  and Execute  Plot Length labels to display members Length.

3 Press  and Execute  Plot Members ID labels to display beam members IDs.



Beam Member Finder

Length Y | Length Z | Length Torsional | Edit Member (in all directions) | Filter | Import

Break Joint Options

Length Y

☐ 1D ☐ User

☒ 2Dy ☒ Plate 2Dy

☐ 2Dz ☐ Plate 2Dz

☐ 2D Und. ☐ Plate 2D Und.

☒ 3D ☒ Plate 3D

☐ Beam-Plate

☒ Set K=0.01 for members fixed by plates

Update Selected Members

Set to Selected

Length [m]  Set

Length Factor  Set

Cm Type A  Set

A = 0.85  
B = Calculate  
used in API 2A, AISCS89, ISO19002  
and Norsok N004 standards

ID	Title	Elements	Length [m]	Length Factor	Cm Type	Modified	Joint - NodeID [Joint Type]
31	Beam Member 31 (Y)	16	5	1	A		610[2Dy]
32	Beam Member 32 (Y)	23	7.071				640[2Dy]
33	Beam Member 33 (Y)	23	7.071				1097[2Dz]
34	Beam Member 34 (Y)	15	5	1	A		1099[2Dz]
35	Beam Member 35 (Y)	14	5	1	A		1099[2Dz]
36	Beam Member 36 (Y)	18	5	1	A		1099[2Dz]
37	Beam Member 37 (Y)	16	5.59	1	A		1099[2Dz]
38	Beam Member 38 (Y)	16	5.59	1	A		1099[2Dz]
39	Beam Member 39 (Y)	7	2.795	1	A		1099[2Dz]
40	Beam Member 40 (Y)	7	2.795	1	A		1111[3D]
41	Beam Member 41 (Y)	32	10				1111[3D]
42	Beam Member 42 (Y)	45	14.142				1111[3D]
43	Beam Member 43 (Y)	32	10				1111[3D]
44	Beam Member 44 (Y)	23	7.071	1	A		1111[3D]
45	Beam Member 45 (Y)	36	10				1111[3D]
46	Beam Member 46 (Y)	18	5.423	1	A		1111[3D]
47	Beam Member 47 (Y)	18	5.423	1	A		1111[3D]
48	Beam Member 48 (Y)	36	10				1111[3D]
48.1	Beam Member 48.1 (Y)	9	2.5	1	A		1111[3D]
48.2	Beam Member 48.2 (Y)	9	2.5	1	A		1111[3D]
48.3	Beam Member 48.3 (Y)	9	2.5	1	A		1111[3D]
48.4	Beam Member 48.4 (Y)	9	2.5	1	A		1111[3D]
49	Beam Member 49 (Y)	45	14.142				1111[3D]
50	Beam Member 50 (Y)	22	7.071	1	A		1111[3D]
51	Beam Member 51 (Y)	32	10				1111[3D]
52	Beam Member 52 (Y)	47	13				1111[3D]

Settings Find OK Cancel

Plot selected members

☒ Plot Members ID labels

☒ Plot Full Members ID labels


☒ Plot Length labels

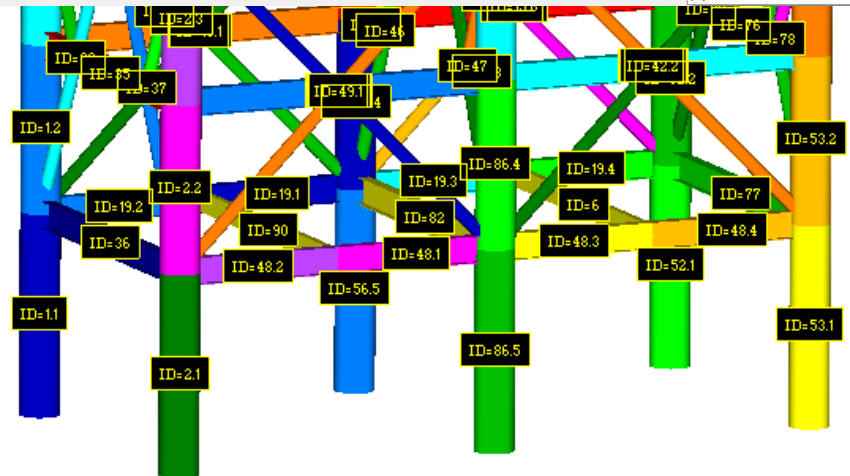
☐ Plot Cm Type labels

☐ Plot Length Factor labels

☐ Plot Joints for Selected Members

☐ Plot Members Y and Z axes

Also it is possible to display beam members IDs by pressing 



## STEEL CONSTRUCTION



## MANUAL

AMERICAN INSTITUTE  
OF  
STEEL CONSTRUCTION  
INC.

THIRTEENTH EDITION

ANSI/AISC 360-10 - an American national standard "Specification for Structural Steel Buildings", released on June 22, 2010. Checks are performed according to the provisions for load and resistance factor design (LRFD) and allowable strength design (ASD). The standard implements checks for design of members for tension, compression, bending, shear and combined.

## Specification for Structural Steel Buildings

March 9, 2005

Supersedes the *Load and Resistance Factor Design Specification for Structural Steel Buildings* dated December 27, 1999, the *Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design* dated June 1, 1989, including Supplement No. 1, the *Specification for Allowable Stress Design of Single-Angle Members* dated June 1, 1989, the *Load and Resistance Factor Design Specification for Single-Angle Members* dated November 10, 2000, and the *Load and Resistance Factor Design Specification for the Design of Steel Hollow Structural Sections* dated November 10, 2000, and all previous versions of these specifications.

Approved by the AISC Committee on Specifications and issued by the AISC Board of Directors



AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.  
One East Wacker Drive, Suite 700  
Chicago, Illinois 60601-1802

It is possible to check a design according to load and resistance factor design (LRFD) or allowable strength design (ASD). The difference between 2 designs is in load combinations and resistance factors:

Resistance Factors		Resistance Factors	
<input checked="" type="radio"/> LRFD	<input type="radio"/> ASD	<input type="radio"/> LRFD	<input checked="" type="radio"/> ASD
Tension (F <sub>t</sub> )	0.9	Tension (F <sub>t</sub> )	0.6
Tensile Rupture (F <sub>tr</sub> )	0.75	Tensile Rupture (F <sub>tr</sub> )	0.5
Compression (F <sub>c</sub> )	0.9	Compression (F <sub>c</sub> )	0.6
Shear (F <sub>v</sub> )	0.9	Shear (F <sub>v</sub> )	0.6
Bending (F <sub>b</sub> )	0.9	Bending (F <sub>b</sub> )	0.6

Design for Strength Using Load and Resistance Factor Design (LRFD)

Design will be performed in accordance with Equation B3-1:

$$R_u \leq \phi R_n \text{ (B3-1)},$$

where:

$R_u$  = required strength using LRFD load combinations;

$R_n$  = nominal strength, specified in Chapters B through K;

$\phi$  = resistance factor, specified in Chapters B through K;

$\phi R_n$  = design strength.

Design for Strength Using Allowable Strength Design (ASD)

Design will be performed in accordance with Equation B3-2:

$$R_a \leq R_n / \Omega \text{ (B3-2)},$$

where:

$R_a$  = required strength using ASD load combinations;

$R_n$  = nominal strength, specified in Chapters B through K;

$\Omega$  = safety factor, specified in Chapters B through K;

$R_n / \Omega$  = allowable strength.

According to the standard Design Strength is multiplied by LRFD factor and divided by ASD factor.

For tensile yielding in the gross section:


$$P_n = F_y A_g \quad (D2-1)$$

$$\phi_t = 0.90 \text{ (LRFD)} \quad \Omega_t = 1.67 \text{ (ASD)}$$

In SDC Verifier multiplication is always used ASD factor is converted to  $1 / \Omega$  (ASD). For example: tensile resistance factor ( $F_t$ ) =  $1 / 1.67 = 0.6$ .

1 Execute *Standards-Add-AISC-AISC 360-10 Members (14<sup>th</sup>, 2010)*.

2 Resistance Factors: **LRFD**

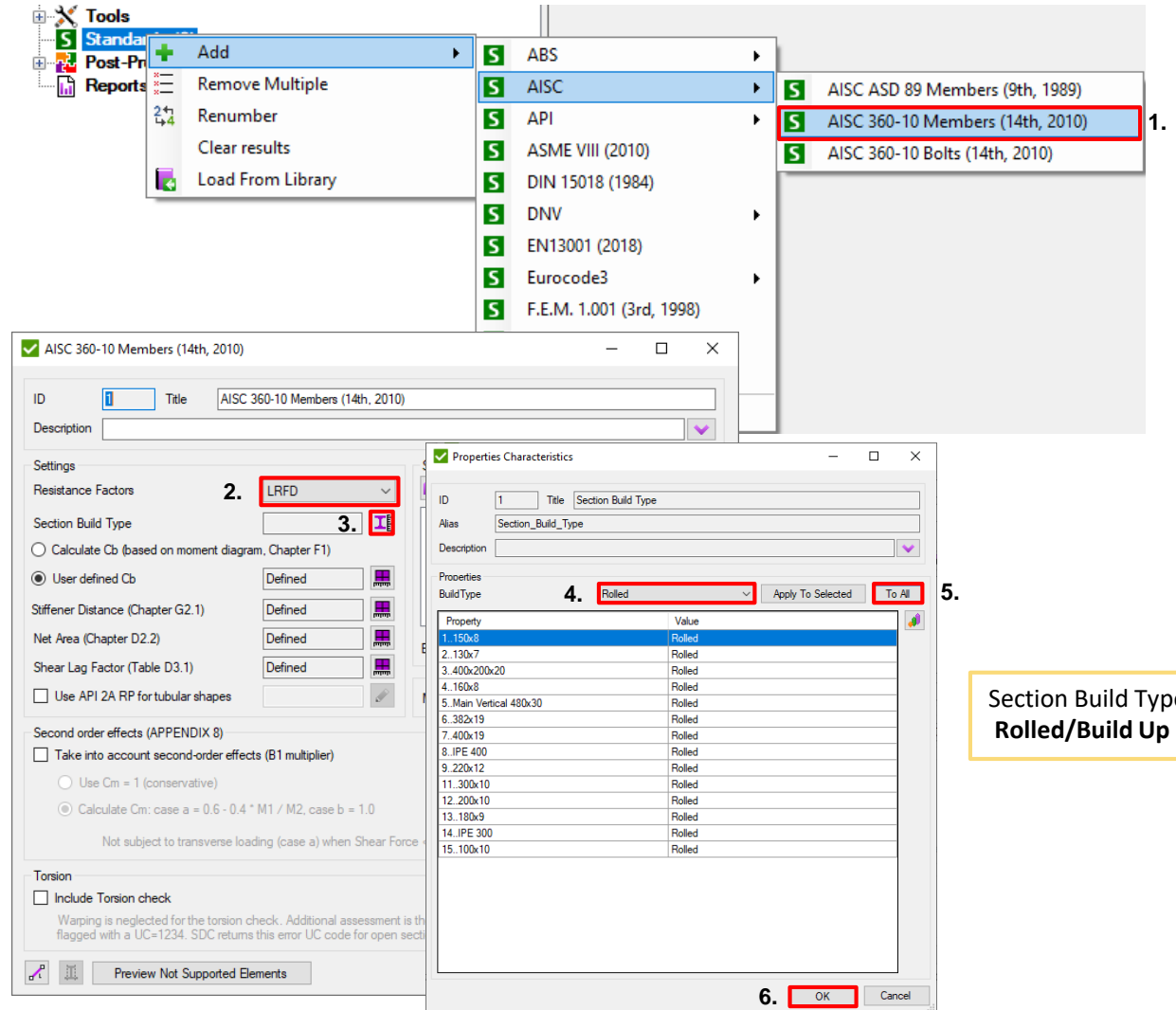
3 Press  to set *Section Build Type*

4 Execute - **Rolled**

5 Press *To All*

6 Press *Ok*


Go to the next slide to Continue



The screenshot shows the SDC Verifier interface with several dialog boxes open. The 'Tools' menu is open, showing the 'Standards' option. The 'Standards' dialog box is open, showing a list of standards. The 'AISC 360-10 Members (14th, 2010)' standard is selected. The 'Properties Characteristics' dialog box is open, showing the 'Section Build Type' dropdown set to 'Rolled'. The 'To All' button is highlighted. The 'OK' button is highlighted.

1. AISC 360-10 Members (14th, 2010)

2. LRFD

3. 

4. Rolled

5. To All

6. OK

Section Build Type: Rolled/Build Up

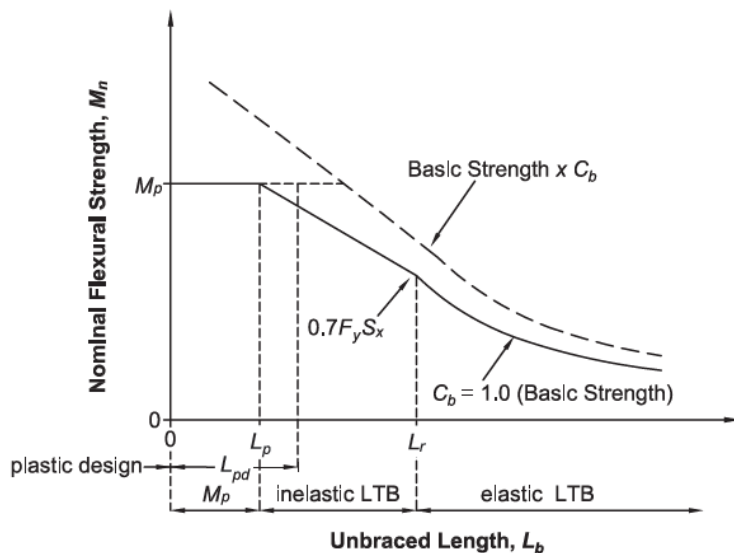
# Lateral-torsional buckling modification factor ( $C_b$ )

1

Select – Calculate  $C_b$

2

Press *Ok*



SDC Verifier follows conservative approach and uses  $C_b = 1.0$ .  $C_b$  is implemented as a characteristic which can be modified. For the details see Chapter F “Design of members for Flexure”, F1 General Provisions

1.

AISC 360-10 Members (14th, 2010)

ID 1 Title AISC 360-10 Members (14th, 2010)

Description

Settings

Resistance Factors LRFD

Section Build Type Defined

☒ Calculate  $C_b$  (based on moment diagram, Chapter F1)

☐ User defined  $C_b$  Defined

Stiffener Distance (Chapter G2.1) Defined

Net Area (Chapter D2.2) Defined

Shear Lag Factor (Table D3.1) Defined

☐ Use API 2A RP for tubular shapes

Second order effects (APPENDIX 8)

☐ Take into account second-order effects (B1 multiplier)

☐ Use  $C_m = 1$  (conservative)

☒ Calculate  $C_m$ : case a =  $0.6 - 0.4 \cdot M_1 / M_2$ , case b = 1.0

Not subject to transverse loading (case a) when Shear Force < 0.1 Percent of Axial Force

Torsion

☐ Include Torsion check

Warping is neglected for the torsion check. Additional assessment is therefore required for open sections flagged with a UC=1234. SDC returns this error UC code for open sections with an UF.torsion exceeding: 0.3

Preview Not Supported Elements

2. OK Cancel

# Standard is created

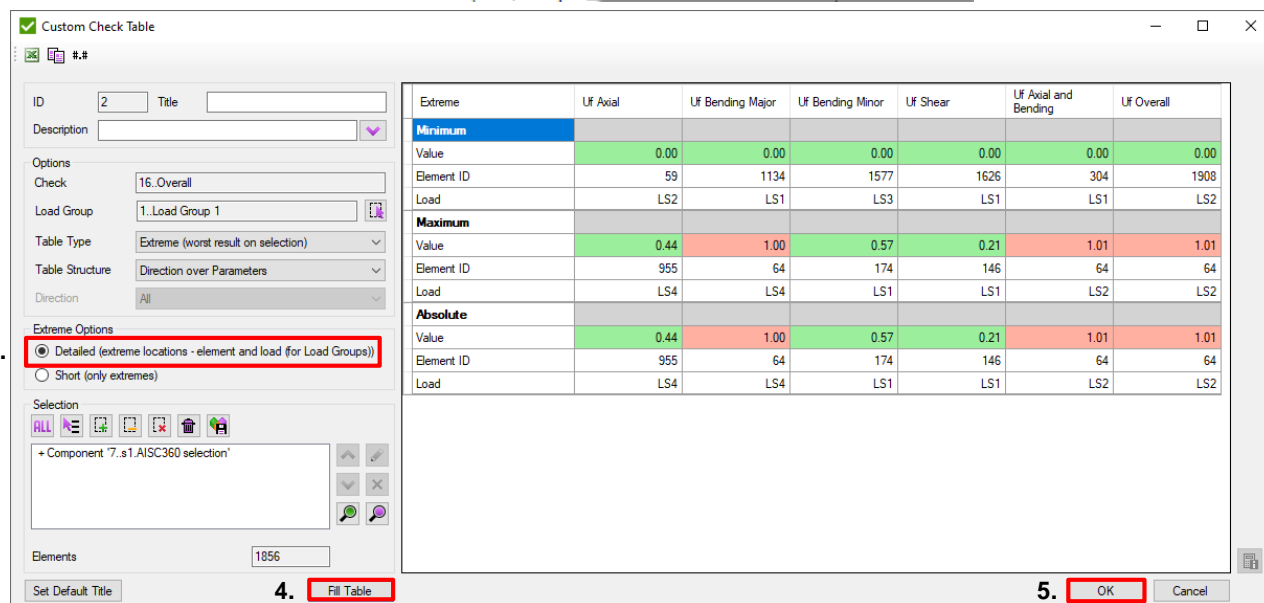
It is possible to modify Safety Factors in Constants section.

Standard contains 16 checks:  
1 - Beam member characteristics;  
2-6 - calculation dimensions and factors for 5 different shapes;  
7-11 – strength for different shapes ;  
12 – tension and compression check;  
13 – additional shear check;  
14 – additional bending check;  
15 – torsion check;  
16 - All Checks together with combined.

Id	Title (Alias)	Value	Description
1	CalculateCb	1	Set 1 to calculate Cb based on formula (F1-1). Set 0 to use r
2	SecondOrderEffect	0	Set 1 to take into account second order analysis effect (App
3	PercentOfAxial	0.1	if shear force is lower than percent of axial force than memb
4	CalculateCm	1	Cm will be calculated only when second analysis order effec
5	IncludeTorsionCheck	0	Include torsion check with neglected warping?
6	F_t	0.9	Tension Resistance Factor
7	F_c	0.9	Compression Resistance Factor
8	F_v	0.9	Shear Resistance Factor
9	F_b	0.9	Shear Resistance Factor
10	F_tr	0.75	Tensile Rupture Resistance Factor
11	F_vl	1	Shear rolled IBeam Resistance Factor
12	F_tor	0.9	Torsional Resistance Factor
13	Alpha	1	LRFD force level adjustment factor. Used in (A-8-1)
14	UFTorsionLimit	0.3	Additional assessment on torsion is required for open sectio
15	UFTorsionCode	1234	Code is used for Torsional Utilization Factor when it is highe
16	rolled	1	
17	built_up	2	
18	nonslender	3	
19	slender	4	
20	NotSupported	12345678	
21	compact	5	
22	noncompact	6	

- 1..Beam Characteristics
- 2..Circular Tube
- 3..Rectangular Tube
- 4..Bars
- 5..Section C
- 6..Section I
- 7..Axial Strength
- 8..Shear Strength
- 9..Bending Strength Bars
- 10..Bending Strength I-beams
- 11..Bending Strength Channels
- 12..Axial
- 13..Shear
- 14..Bending
- 15..Torsion
- 16..Overall

- Utilization Factor on element ID = 64 doesn't pass the check  $1.01 > 1$ .



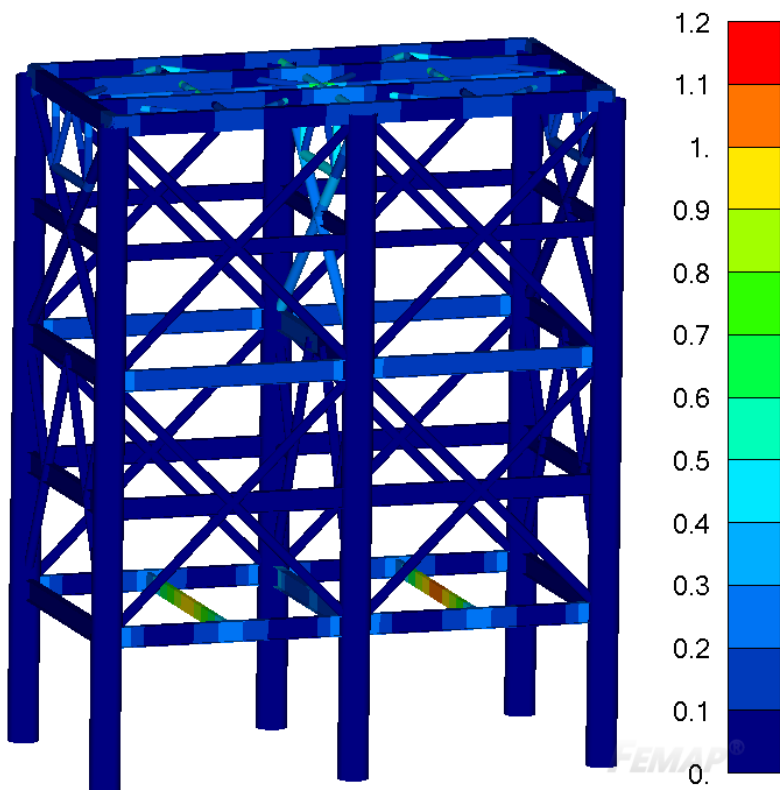
# Utilization Factor Plot

1 Select Plots

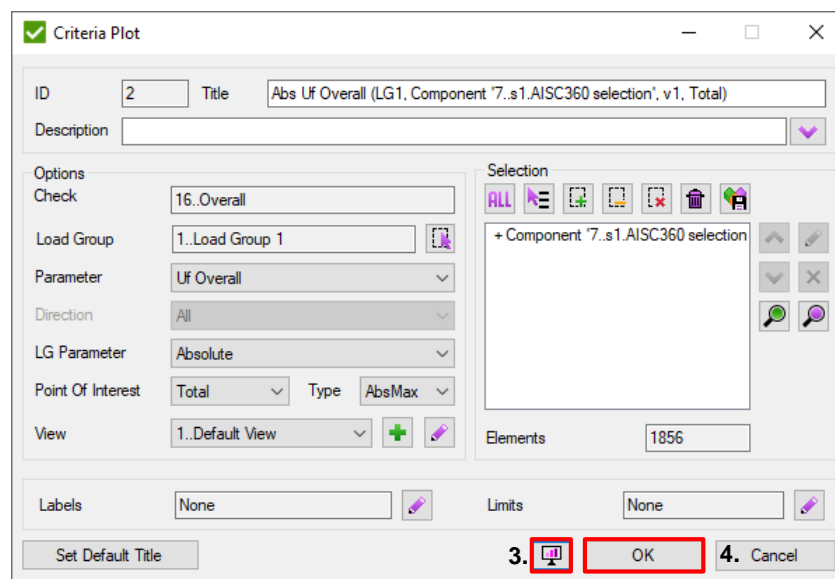
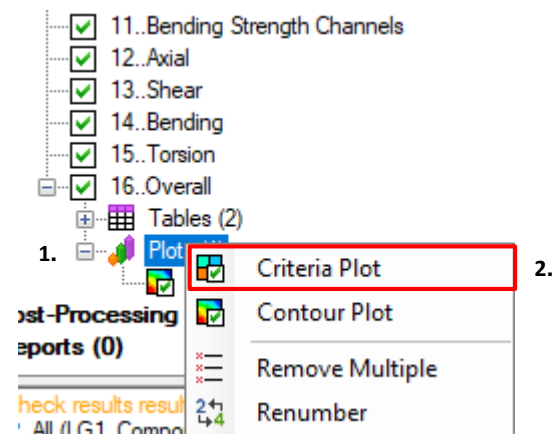
2 Execute *Criteria Plot* in context menu

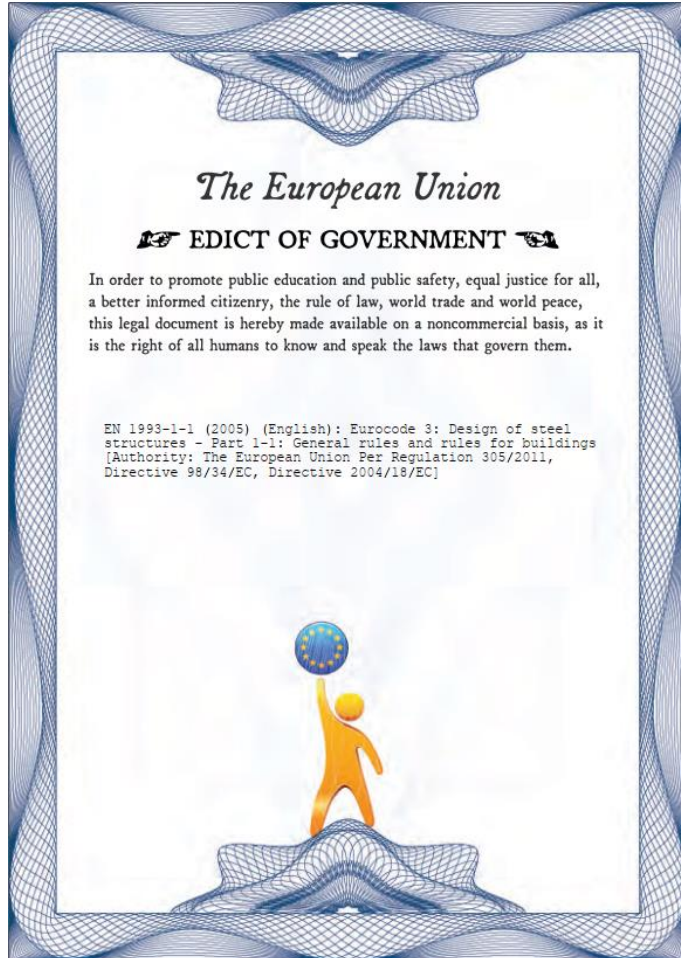
3 Press  to preview Plot

4 Press *Ok*



SDC Verifier uses legend from 0 to 1.2 for Utilization factor. Elements in orange and red do not pass the check





## Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings



# Description of Eurocode3 (EN1993-1-1, 2005)

**Gm0** - resistance of cross-sections whatever the class is;  
**Gm1** - resistance of members to instability assessed by member checks;  
**Gm2** - resistance of cross-sections in tension to fracture.  
 **$\lambda_{LT,0}$**  – plateau length of the lateral torsional buckling curves for rolled sections;  
 **$\beta$**  - correction factor for the lateral torsional buckling curves for rolled sections;  
 **$\eta$**  - is used in the shear area calculations.

**Note:** All parameters may be taken from the National Annex

**Options**

Partial Factor Gm0	1
Partial Factor Gm1	1
Partial Factor Gm2	1.25
Lambda LT,0	0.4
Beta	0.75
Eta	1.2

**Correction Factor Kc**

☒ Calculate according to Table 6.6

☐ Set Kc = 1 for all members

Materials with Yield and Tensile = 0 0

Selection 14 Properties

**Fabrication Type**

Fabrication Type	Defined
Manufacture Method	Defined
Fillet	Defined
Section Net Area	Defined
Material Type	Defined

**Lengths for Torsional-Flexural and Lateral Torsional Buckling**

☒ LT = max(Ly, Lz)  
L LT = length in strong axis (Ly or Lz)

☐ Use Torsional Length from Beam Member Finder

**Lateral Torsional Buckling Method**

☒ General Case (6.3.2.2)

☐ For rolled sections or equivalent welded sections (6.3.2.3)

☐ Worst of (6.3.2.2) and (6.3.2.3)

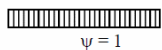




**Fabrication Type:**  
Rolled/Welded;  
**Manufacture Type:** Hot  
Finished/Cold Formed  
**Fillets** has to be defined in the characteristic (they are missing in the model);  
**Section Net Area** - for fasteners with holes net area has to be defined;  
**Material Type** - the buckling curve (Table 6.2) depends on the material type.

It is possible to choose the calculation method for Lateral Torsional Buckling: General Case (chapter 6.3.2.2), For rolled sections or equivalent welded sections (chapter 6.3.2.3) or the worst of two (min reduction factor is used from 2 methods):




# Description of Eurocode3 (EN1993-1-1, 2005) (Continue)

A correction Factor  $K_c$  can be calculated using the  $C_m$  Tool for each member. Also it is possible to set the  $K_c$  equal to 1.

Table 6.6: The Correction Factor:

Moment distribution	$k_c$
 $\psi = 1$	1,0
 $-1 \leq \psi \leq 1$	$\frac{1}{1,33 - 0,33\psi}$
	0,94
	0,90
	0,91

The following cases are NOT recognized and are skipped:

	0,86
	0,77
	0,82

Eurocode3 Members (EN 1993-1-1, 2005)

ID: 2 Title: Eurocode3 Members (EN1993-1-1, 2005)

Description:

Options

Partial Factor  $G_m0$ : 1

Partial Factor  $G_m1$ : 1

Partial Factor  $G_m2$ : 1.25

Lambda  $LT,0$ : 0.4

Beta: 0.75

Eta: 1.2

Fabrication Type: Defined

Manufacture Method: Defined

Fillet: Defined

Section Net Area: Defined

Material Type: Defined

Correction Factor  $K_c$

☒ Calculate according to Table 6.6

☐ Set  $K_c = 1$  for all members

Materials with Yield and Tensile = 0 0

Selection: 14 Properties

Preview Not Supported

OK Cancel

Lengths for Torsional-Flexural and Lateral Torsional Buckling

☒  $LT = \max(L_y, L_z)$   
L LT = length in strong axis (Ly or Lz)

☐ Use Torsional Length from Beam Member Finder

Lateral Torsional Buckling Method

☒ General Case (6.3.2.2)

☐ For rolled sections or equivalent welded sections (6.3.2.3)

☐ Worst of (6.3.2.2) and (6.3.2.3)

Member Length for Torsional and Torsional-Flexural Buckling Check (LT) by default is max among  $L_y$  and  $L_z$  lengths. For lateral torsional buckling (L LT) is length in strong axis.

It is possible to use Torsional Length from Beam Member Finder. In this case it can be modified manually by user.

Beam Member Finder

Length Y Length Z Length Torsional Edit Member (in all directions) Filter Import

Break Joint Options

Torsion (Lb)

☐ 1D ☐ User

☒ 2DY ☐ Plate 2DY

☒ 2DZ ☐ Plate 2DZ

ID	Title	Elements	Length [m]	Length Factor	Cm Type	Modified
1	Beam Member 1 (T)	47	13			
1.1	Beam Member 1.1 (T)	11	3	1	A	
1.2	Beam Member 1.2 (T)	9	2.5	1	A	
1.3	Beam Member 1.3 (T)	9	2.5	1	A	

# Eurocode3. Fabrication Type

1

Execute *Standards-Add-Eurocode3-Eurocode3 Members*

2

Press  to set *Fabrication Type*

3

Execute - **Rolled**

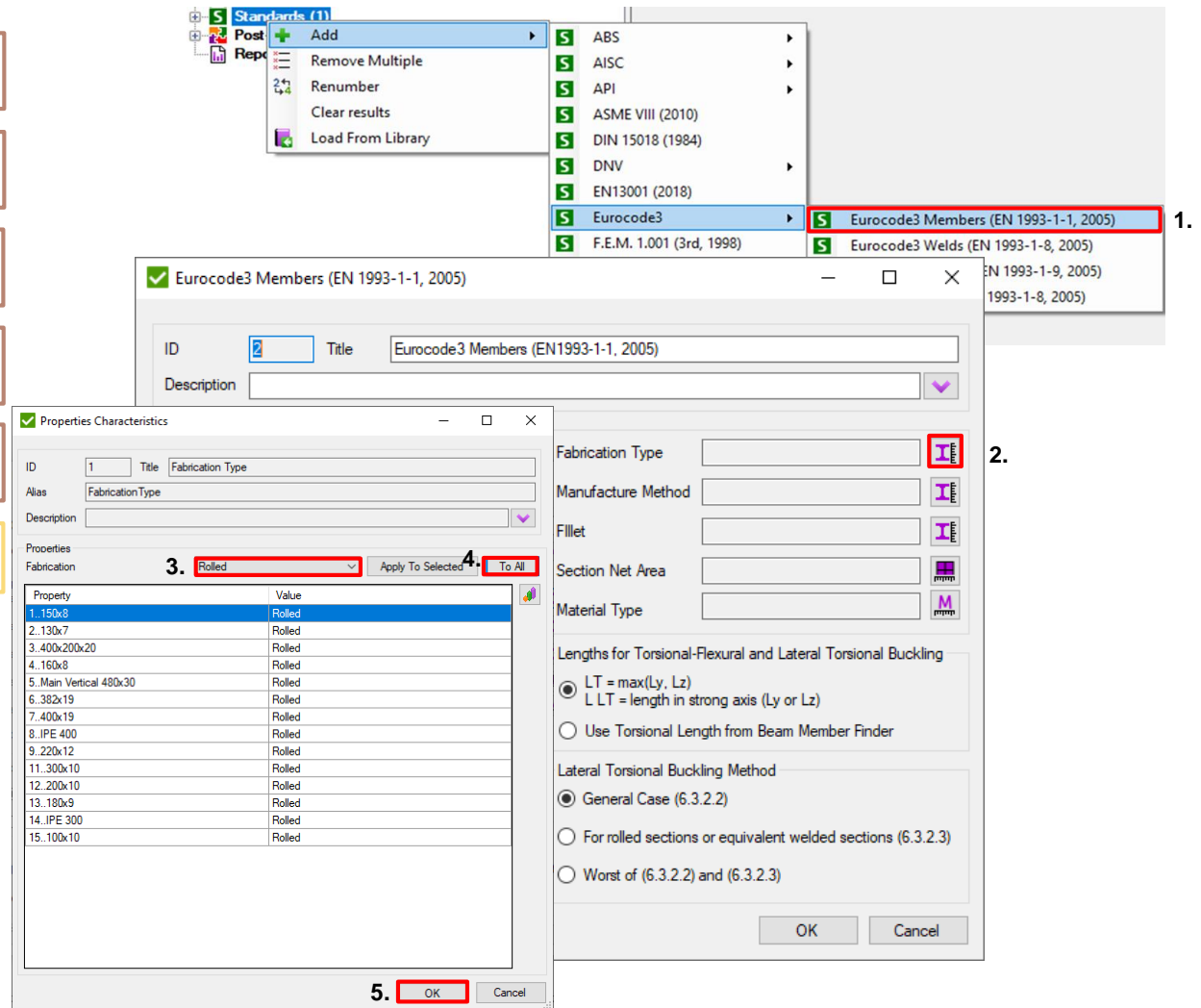
4

Press *To All*

5

Press *Ok*

Go to the next slide to Continue



The screenshot shows the SDC Verifier interface with several windows open. The 'Standards (1)' window is open, showing a list of standards. The 'Eurocode3 Members (EN 1993-1-1, 2005)' window is open, showing the 'Properties Characteristics' tab. The 'Fabrication' dropdown is set to 'Rolled'. The 'Apply To Selected' dropdown is set to 'To All'. The 'Properties Characteristics' window is open, showing the 'Fabrication Type' dropdown set to 'Rolled'. The 'Material Type' dropdown is set to 'Rolled'. The 'Lengths for Torsional-Flexural and Lateral Torsional Buckling' section is visible, with 'LT = max(Ly, Lz)' selected. The 'Lateral Torsional Buckling Method' section is visible, with 'General Case (6.3.2.2)' selected. The 'OK' button is highlighted.

1. Standards (1)

- ABS
- AISC
- API
- ASME VIII (2010)
- DIN 15018 (1984)
- DNV
- EN13001 (2018)
- Eurocode3**
  - Eurocode3 Members (EN 1993-1-1, 2005)**
  - Eurocode3 Welds (EN 1993-1-8, 2005)
- F.E.M. 1.001 (3rd, 1998)

2. Eurocode3 Members (EN 1993-1-1, 2005)

ID: 2 Title: Eurocode3 Members (EN1993-1-1, 2005)

Description:

3. Rolled

4. To All

5. OK

Properties Characteristics

ID: 1 Title: Fabrication Type

Alias: FabricationType


Description:


Properties


Fabrication: Rolled


Apply To Selected: To All


Property	Value
1..150x8	Rolled
2..130x7	Rolled
3..400x200x20	Rolled
4..160x8	Rolled
5..Main Vertical 480x30	Rolled
6..382x19	Rolled
7..400x19	Rolled
8..IPE 400	Rolled
9..220x12	Rolled
11..300x10	Rolled
12..200x10	Rolled
13..180x9	Rolled
14..IPE 300	Rolled
15..100x10	Rolled

Fabrication Type: 

Manufacture Method: 

Fillet: 

Section Net Area: 

Material Type: 

Lengths for Torsional-Flexural and Lateral Torsional Buckling

☒ LT = max(Ly, Lz)  
L LT = length in strong axis (Ly or Lz)

☐ Use Torsional Length from Beam Member Finder

Lateral Torsional Buckling Method

☒ General Case (6.3.2.2)


☐ For rolled sections or equivalent welded sections (6.3.2.3)

☐ Worst of (6.3.2.2) and (6.3.2.3)

OK Cancel

# Eurocode3. Manufacture Method

1

Press  to set *Manufacture Method*

2

Execute – **Hot Finished**

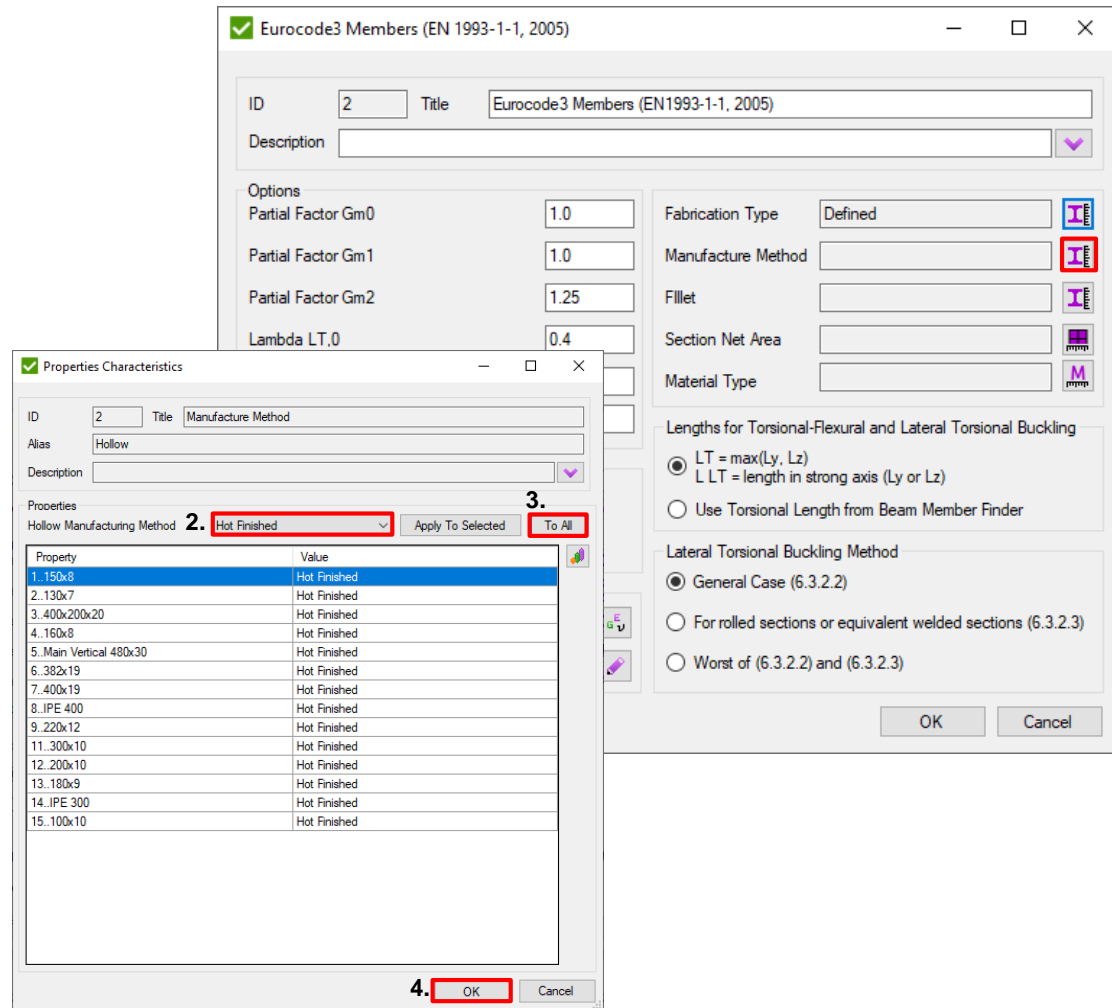
3

Press *To All*

4

Press *Ok*

Go to the next slide to Continue



The image shows two overlapping software dialog boxes. The background dialog is titled "Eurocode3 Members (EN 1993-1-1, 2005)". It has fields for ID (2), Title (Eurocode3 Members (EN1993-1-1, 2005)), and Description. Below these are "Options" for Partial Factor Gm0 (1.0), Gm1 (1.0), Gm2 (1.25), and Lambda LT,0 (0.4). To the right are fields for Fabrication Type (Defined), Manufacture Method (empty), Fillet, Section Net Area, and Material Type. At the bottom right are radio buttons for "Lengths for Torsional-Flexural and Lateral Torsional Buckling" (LT = max(Ly, Lz) selected, or LT = length in strong axis) and "Lateral Torsional Buckling Method" (General Case selected, or For rolled sections or equivalent welded sections, or Worst of (6.3.2.2) and (6.3.2.3)).

The foreground dialog is titled "Properties Characteristics". It has fields for ID (2), Title (Manufacture Method), Alias (Hollow), and Description. Below these are "Properties" for Hollow Manufacturing Method (Hot Finished selected), Apply To Selected (To All selected), and a table of properties.

Property	Value
1..150x8	Hot Finished
2..130x7	Hot Finished
3..400x200x20	Hot Finished
4..160x8	Hot Finished
5..Main Vertical 480x30	Hot Finished
6..382x19	Hot Finished
7..400x19	Hot Finished
8..IPE 400	Hot Finished
9..220x12	Hot Finished
11..300x10	Hot Finished
12..200x10	Hot Finished
13..180x9	Hot Finished
14..IPE 300	Hot Finished
15..100x10	Hot Finished

Annotations on the image include: "1." pointing to the Manufacture Method icon in the background dialog; "2." pointing to the Hot Finished dropdown in the foreground dialog; "3." pointing to the To All button in the foreground dialog; and "4." pointing to the OK button in the foreground dialog.

1.

# Eurocode3. Fillet

1 Press  to set *Fillet*

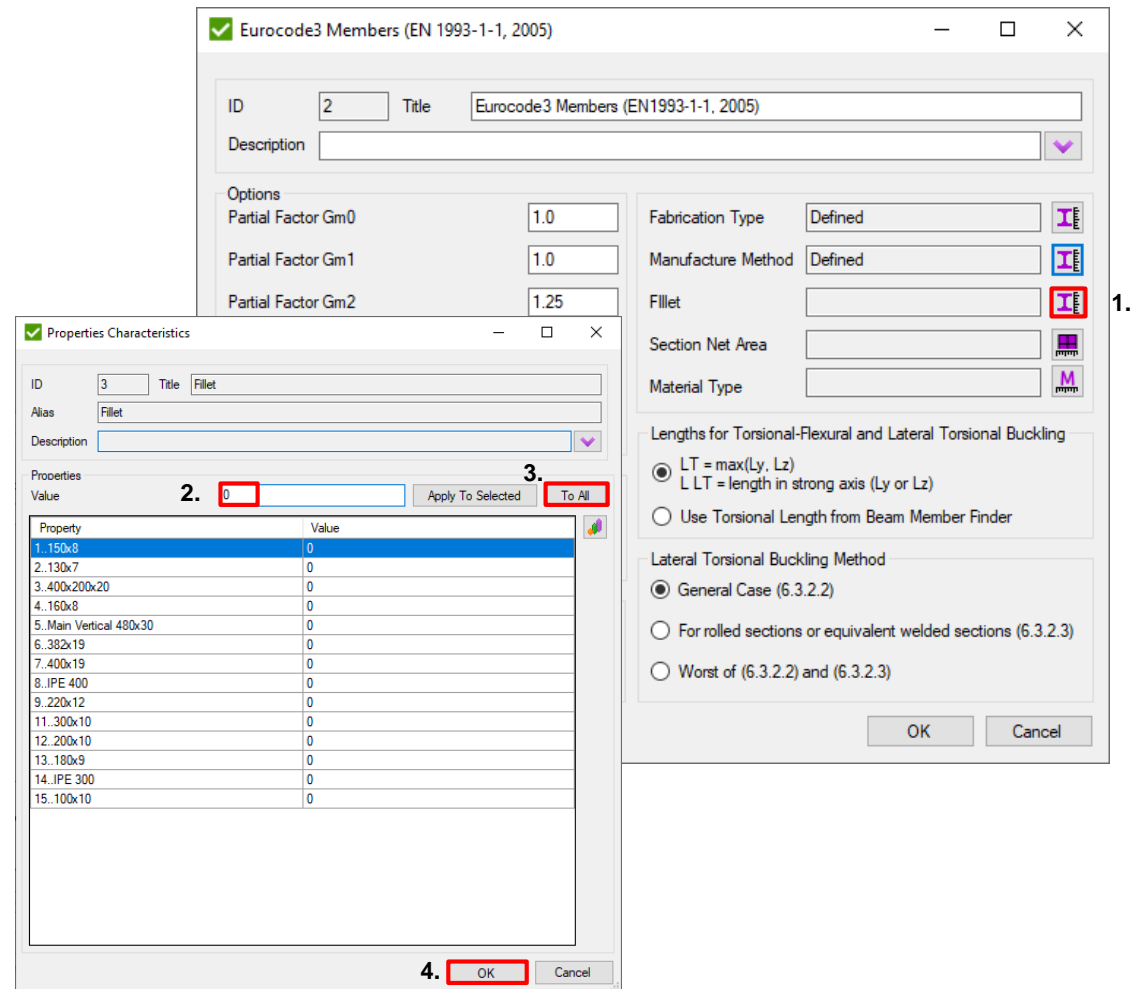
2 Properties Value - **0**

3 Press *To All*

4 Press *Ok*

Repeat Steps 1-4 for *Section Net Area*

Go to the next slide to Continue



**Eurocode3 Members (EN 1993-1-1, 2005)**

ID: 2 Title: Eurocode3 Members (EN1993-1-1, 2005)


Description:


Options


Partial Factor Gm0	Partial Factor Gm1	Partial Factor Gm2
1.0	1.0	1.25

Fabrication Type: Defined

Manufacture Method: Defined

Fillet: 

Section Net Area: 

Material Type: 

Lengths for Torsional-Flexural and Lateral Torsional Buckling

☒ LT = max(Ly, Lz)  
L LT = length in strong axis (Ly or Lz)

☐ Use Torsional Length from Beam Member Finder

Lateral Torsional Buckling Method

☒ General Case (6.3.2.2)

☐ For rolled sections or equivalent welded sections (6.3.2.3)

☐ Worst of (6.3.2.2) and (6.3.2.3)

OK Cancel

**Properties Characteristics**

ID: 3 Title: Fillet

Alias: Fillet

Description:

Properties Value: 0


Apply To Selected To All

Property	Value
1. 150x8	0
2. 130x7	0
3. 400x200x20	0
4. 160x8	0
5. Main Vertical 480x30	0
6. 382x19	0
7. 400x19	0
8. IPE 400	0
9. 220x12	0
11. 300x10	0
12. 200x10	0
13. 180x9	0
14. IPE 300	0
15. 100x10	0

OK Cancel

# Eurocode3. Material Type

1

Press  to set *Material Type*

2

Execute – *S235\_S275\_S355\_S420*

3

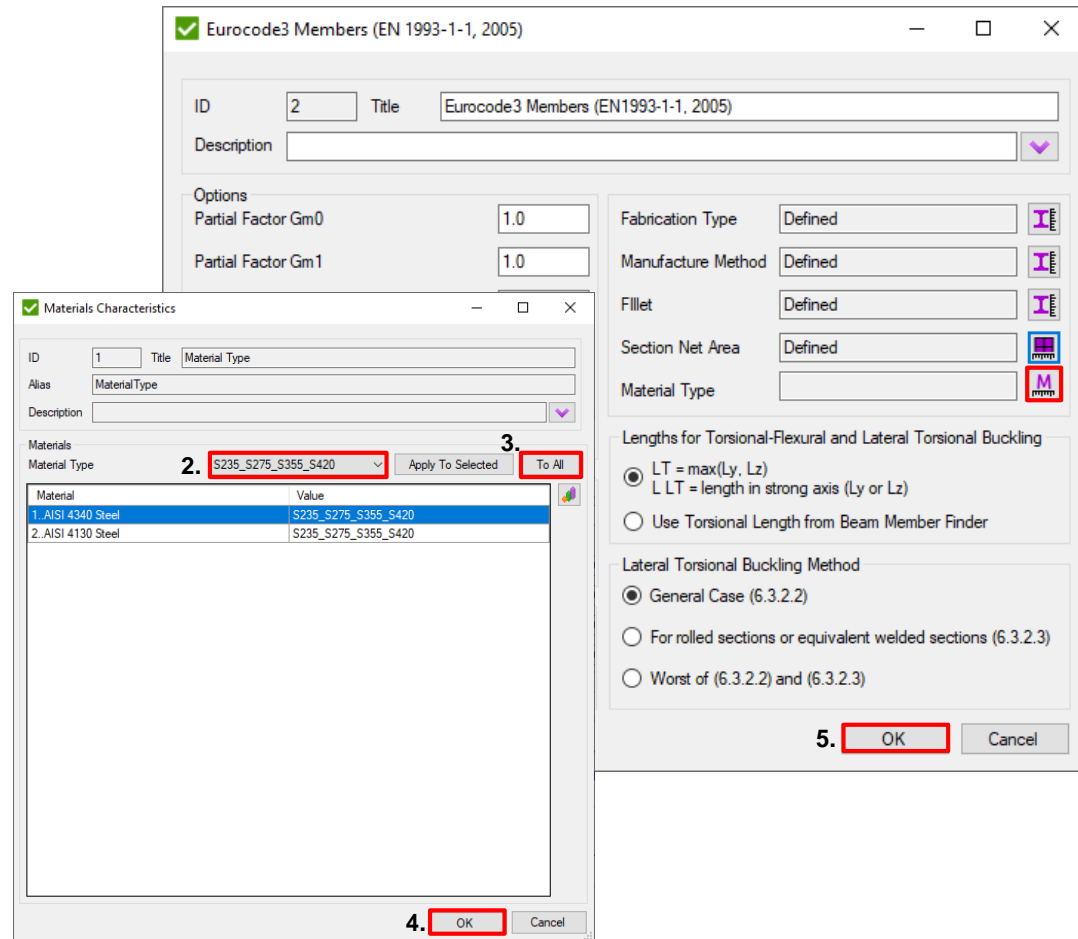
Press *To All*

4

Press *Ok*

5

Press *Ok*



**Eurocode3 Members (EN 1993-1-1, 2005)**

ID: 2 Title: Eurocode3 Members (EN1993-1-1, 2005)

Description:

Options

Partial Factor Gm0: 1.0

Partial Factor Gm1: 1.0

Fabrication Type: Defined

Manufacture Method: Defined

Fillet: Defined

Section Net Area: Defined

Material Type:

Lengths for Torsional-Flexural and Lateral Torsional Buckling

☒ LT = max(Ly, Lz)  
L LT = length in strong axis (Ly or Lz)

☐ Use Torsional Length from Beam Member Finder

Lateral Torsional Buckling Method

☒ General Case (6.3.2.2)

☐ For rolled sections or equivalent welded sections (6.3.2.3)

☐ Worst of (6.3.2.2) and (6.3.2.3)

5. **OK** Cancel

**Materials Characteristics**

ID: 1 Title: Material Type

Alias: MaterialType

Description:

Materials

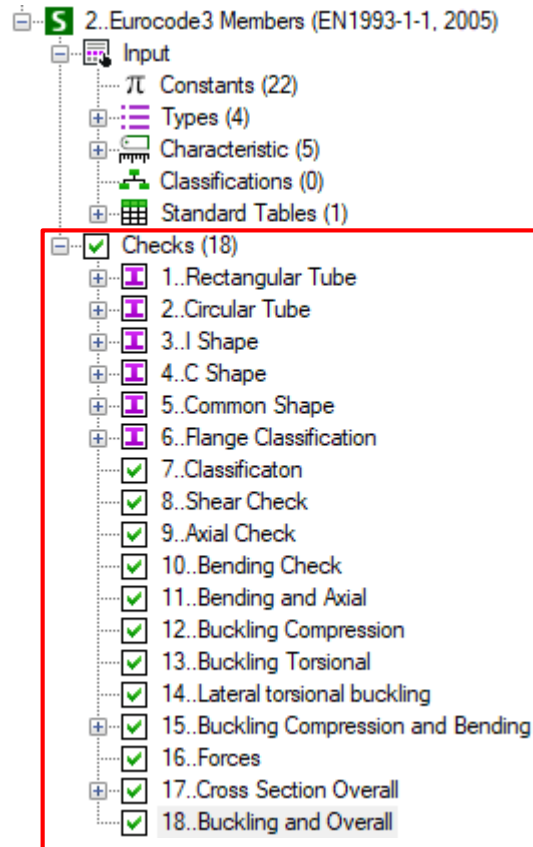
Material Type: 2. **S235\_S275\_S355\_S420** Apply To Selected 3. **To All**

Material	Value
1. AISI 4340 Steel	S235_S275_S355_S420
2. AISI 4130 Steel	S235_S275_S355_S420

4. **OK** Cancel

1.

# Standard is created



Standard contains 18 checks:  
1-6 - calculation dimensions and factors for 5 different shapes;  
7 – cross section resistance;  
8 – shear strength check;  
9 – tension and compression strength check;  
10 – bending strength check;  
11 – bending, tension and compression strength check;  
12-14 – buckling strength checks ;  
15 – additional buckling compression and bending check;  
16 – forces;  
17 - cross section overall strength check;  
18 – buckling and overall strength check.

# Preview Table Results

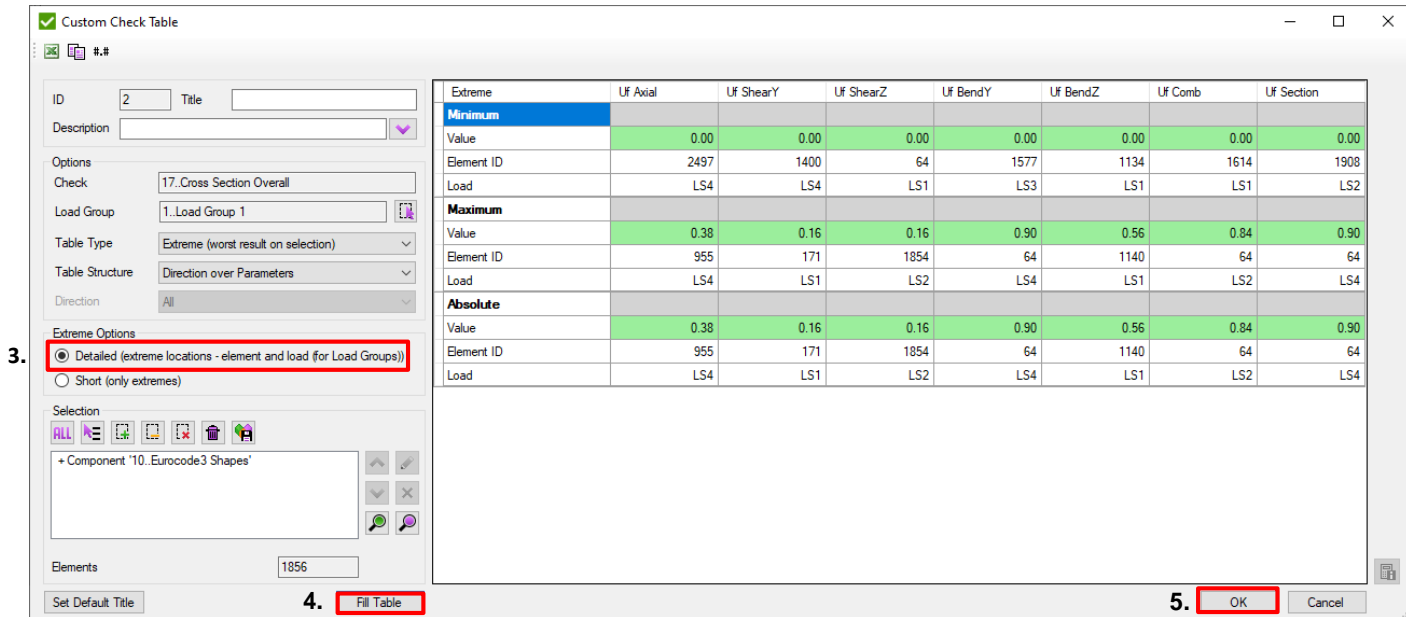
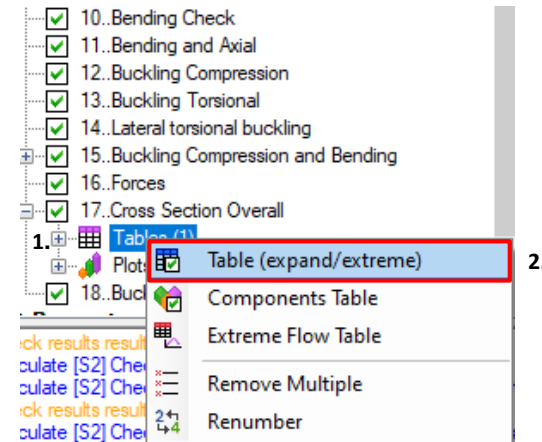
1 Select Tables

2 Execute Table (expand/extreme) in context menu

3 Select Extreme Options - Detailed

4 Press Fill Table

5 Press Ok



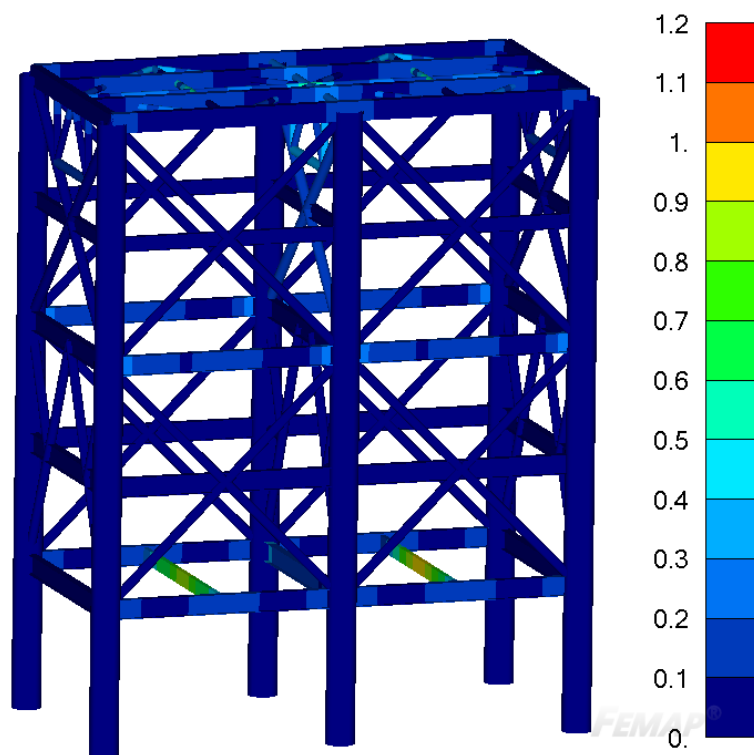
# Utilization Factor Plot

1 Select *Plots*

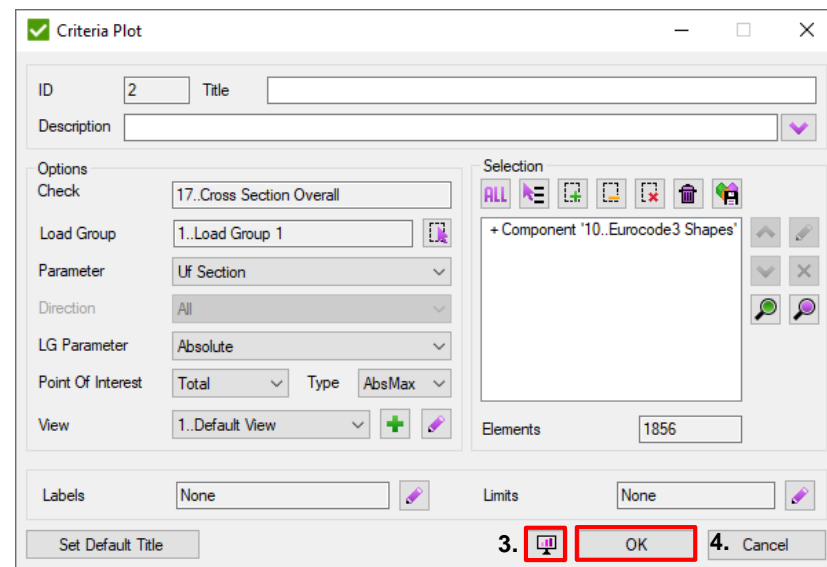
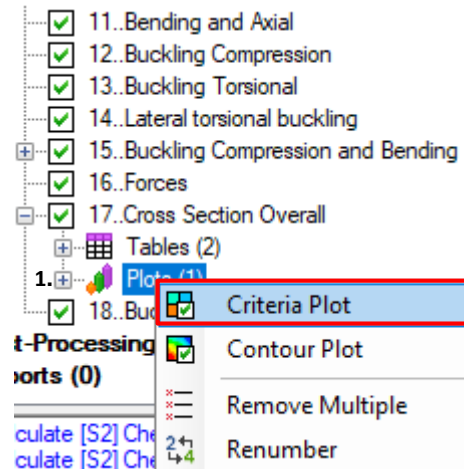
2 Execute *Criteria Plot* in context menu

3 Press  to preview Plot

4 Press *Ok*



SDC Verifier uses legend from 0 to 1.2 for Utilization factor. Elements in orange and red do not pass the check




# Create Predefined Report

1

Execute *Reports - Add - Designer-Results*.

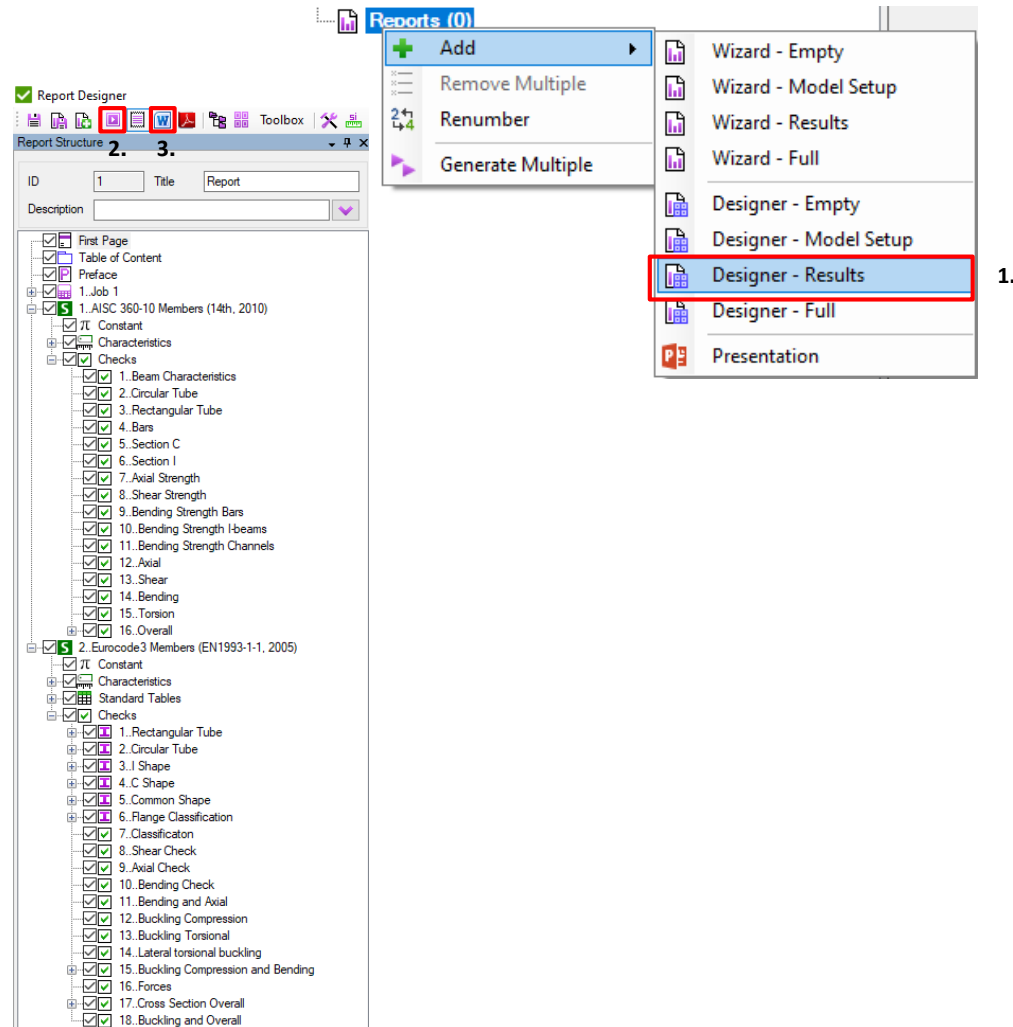
2

Press  to generate report

3

When report is generated press 

Results report includes an overview of the displacements and stresses for all loads and standards with all predefined tables and plots



## 16..Overall

Property	Value
Category	Elemental Custom Check
Selection	Component '7..s1.AISC360 selection'
Parameters	8

### 1..Over Load Groups

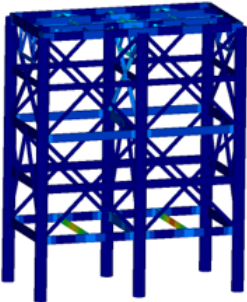
Check Selection	[S1] 16..Overall 16 Shapes		Load Group		LG1..Load Group 1	
Load	Uf Axial	Uf Bending Major	Uf Bending Minor	Uf Shear	Uf Axial and Bending	Uf Overall
Load Group '1..Load Group 1'	0.44	1.00	0.57	0.21	1.01	1.01

### 2..All (LG1, Component '7..s1.AISC360 selection')

Standard	1..AISC 360-10 Members (14th, 2010)			Check	[S1] 16..Overall	
Load Group	LG1..Load Group 1			Selection	Component 7..s1.AISC360 selection'	
Extreme	Uf Axial	Uf Bending Major	Uf Bending Minor	Uf Shear	Uf Axial and Bending	Uf Overall
Minimum						
Value	0.00	0.00	0.00	0.00	0.00	0.00
Element ID	59	1134	1577	1626	304	1908
Load	LS2	LS1	LS3	LS1	LS1	LS2
Maximum						
Value	0.44	1.00	0.57	0.21	1.01	1.01
Element ID	955	64	174	146	64	64
Load	LS4	LS4	LS1	LS1	LS2	LS2
Absolute						
Value	0.44	1.00	0.57	0.21	1.01	1.01
Element ID	955	64	174	146	64	64
Load	LS4	LS4	LS1	LS1	LS2	LS2

### 2..Abs Uf Overall (LG1, Component '7..s1.AISC360 selection', v1, Total)

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AISC 360 - 10

Check	[S1] 16..Overall	Point	Total
www.sdcverifier.com	Prepared by SDC Verifier	SDC VERIFIER	Prepared for company Company

## 17..Cross Section Overall

Property	Value
Category	Elemental Custom Check
Selection	Component '10..Eurocode3 Shapes'
Parameters	7

### 1..Over Load Groups

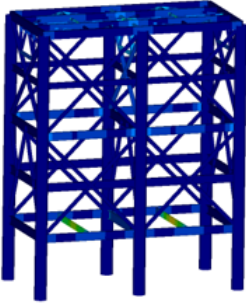
Check Selection	[S2] 17..Cross Section Overall 14 Properties	Load Group				LG1..Load Group 1	
Load	Uf Axial	Uf ShearY	Uf ShearZ	Uf BendY	Uf BendZ	Uf Comb	Uf Section
Load Group '1..Load Group 1'	0.38	0.16	0.16	0.90	0.56	0.84	0.90

### 2..All (LG1, Component '10..Eurocode3 Shapes')

Standard	2. Eurocode3 Members (EN1993-1-1, 2005)			Check	[S2] 17. Cross Section Overall		
Load Group	LG1. Load Group 1			Selection	Component '10. Eurocode3 Shapes'		
Extreme	Uf Axial	Uf ShearY	Uf ShearZ	Uf BendY	Uf BendZ	Uf Comb	Uf Section
Minimum							
Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Element ID	2497	1400	64	1577	1134	1614	1908
Load	LS4	LS4	LS1	LS3	LS1	LS1	LS2
Maximum							
Value	0.38	0.16	0.16	0.90	0.56	0.84	0.90
Element ID	955	171	1854	64	1140	64	64
Load	LS4	LS1	LS2	LS4	LS1	LS2	LS4
Absolute							
Value	0.38	0.16	0.16	0.90	0.56	0.84	0.90
Element ID	955	171	1854	64	1140	64	64
Load	LS4	LS1	LS2	LS4	LS1	LS2	LS4

### 2..Abs Uf Section (LG1, Component '10..Eurocode3 Shapes', v1, Total)

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Eurocode3

Check	[S2] 17..Cross Section Overall	Point	Total
Load Group	LG1..Load Group 1	Parameter	Absolute Uf Section
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