



Tutorial

AISC 360-10 & Eurocode3

Updated on: 8 Jun 2023

Tested with: SDC Verifier 2023 R1

Femap version 2022.1

Preface

- In this tutorial, AISC 360-10 & Eurocode3 Beam Design Checks 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 to represent beam checks results according AISC 360-10 & Eurocode3 standards.

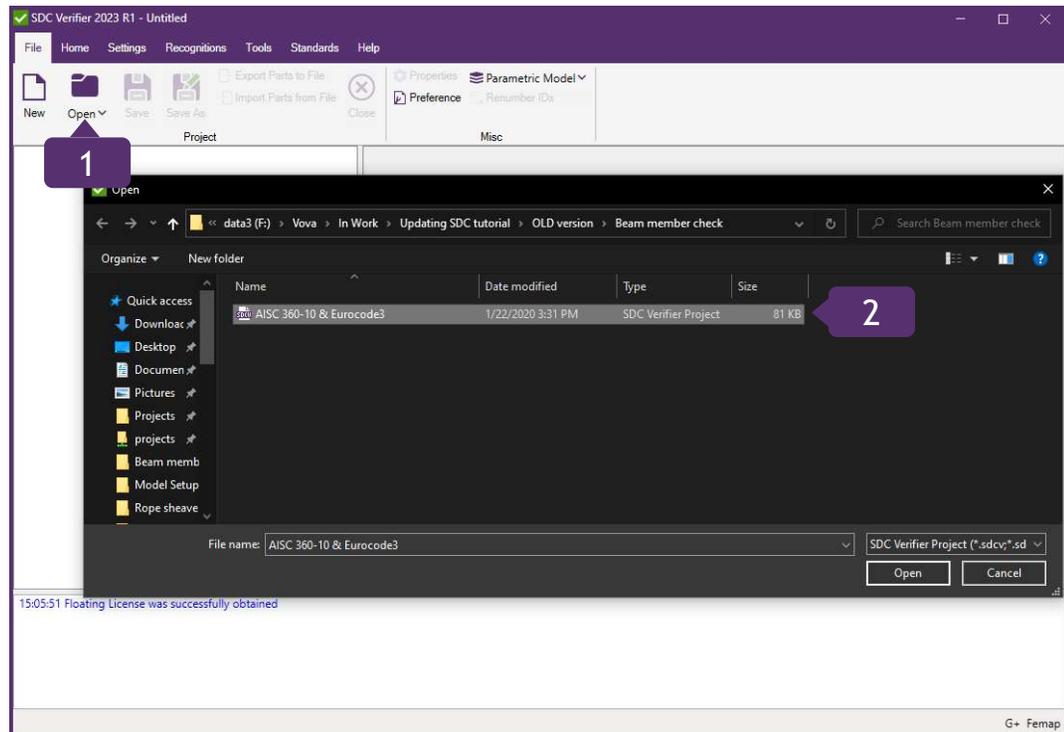
Launch SDC Verifier



1 Launch *SDC Verifier* 

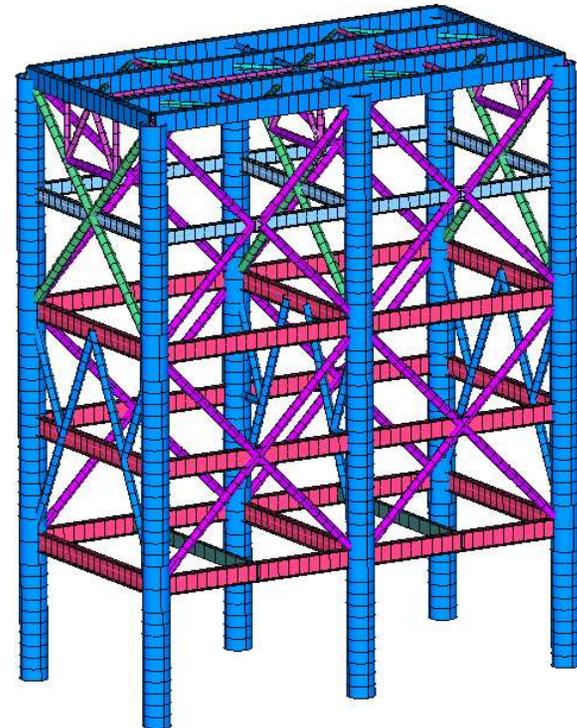
2 Execute *File - Open Project*

3 Project: *AISC 360-10 & Eurocode3.sdcv*



Predefined project

- Views (1)
- Model
- Recognition
- Jobs (1)
 - 1..Static Structural
 - Individual Loads (6)
 - 1..Gravity -9,81.Legs.Fixed
 - 2..Force Down.Legs.Fixed
 - 3..Force Top.Legs.Fixed
 - 4..Middle.Legs.Fixed
 - 5..Wind X.Legs.Fixed
 - 6..Wind Y.Legs.Fixed
 - Load Sets (4)
 - 1..Load Set 1
 - 2..Load Set 2
 - 3..Load Set 3
 - 4..Load Set 4
 - Load Groups (1)
 - 1..Load Group 1
 - FG Fatigue Groups (0)
 - Tables (0)
 - Plots (0)
- Tools
- Standards (0)
- Post-Processing
- Optimizations (0)
- Reports (0)

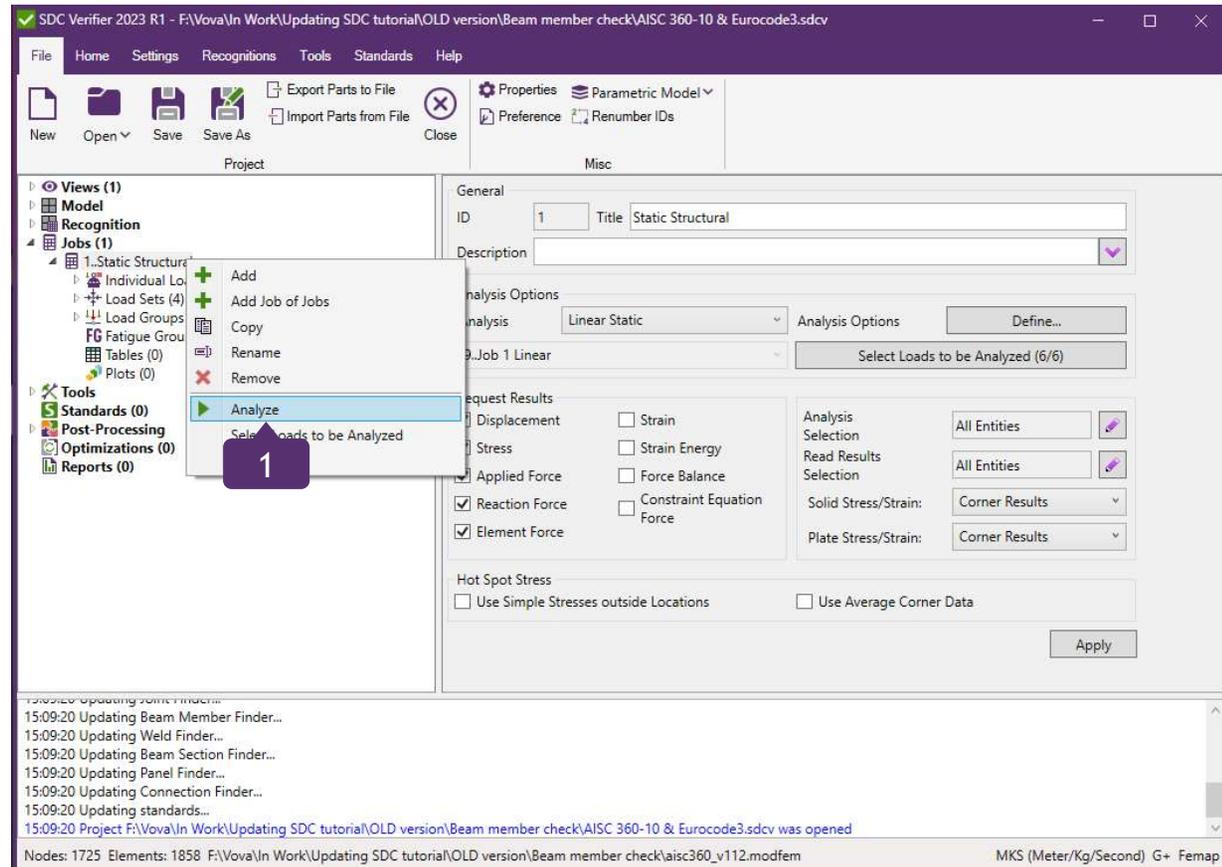


This tutorial uses project with predefined boundary condition, load combinations and load group.
The model contains only beam elements of the following types: I-Beam, Circular and Rectangular Tubes

Analyze Job

1

Execute  **Analyze** from *Static Structural* 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:

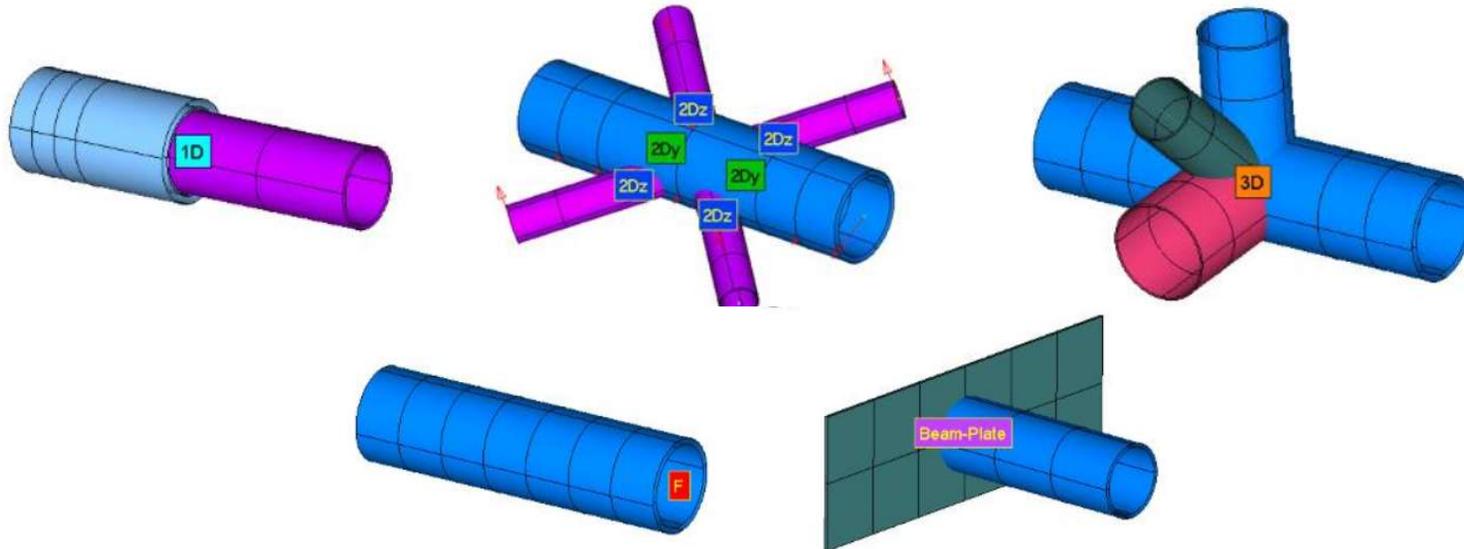
1D Joint - 2 beam members that lie on the curve but with different properties;

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);

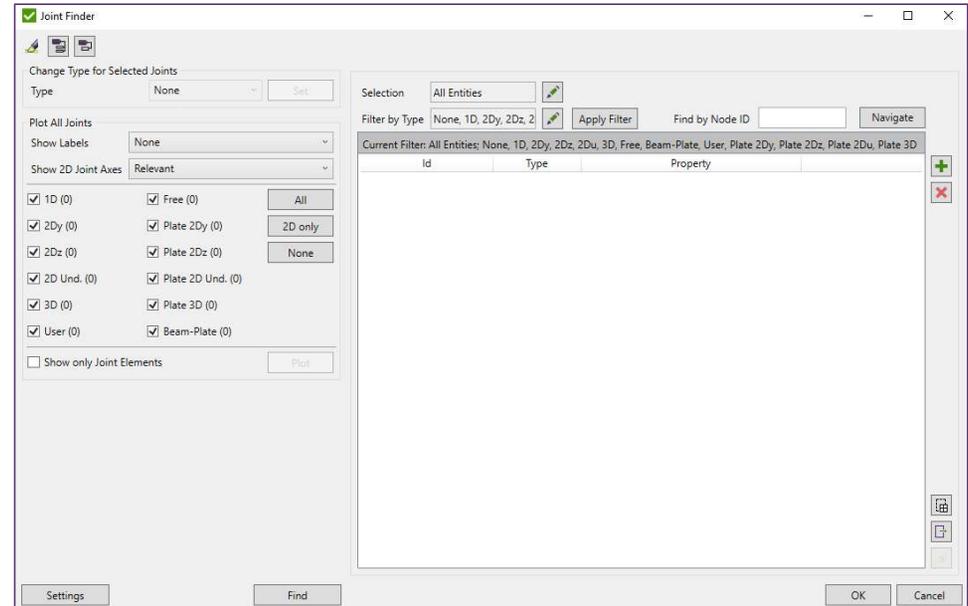
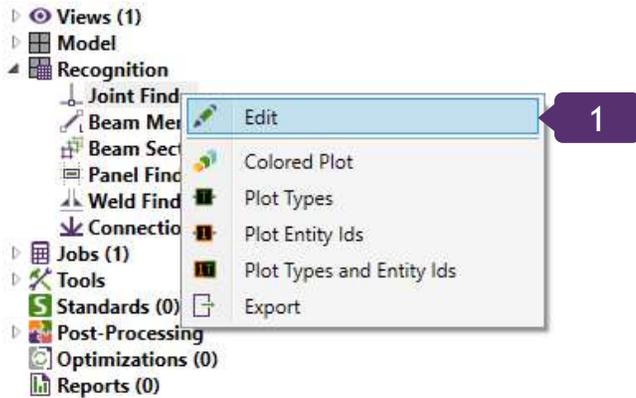
Beam-Plate Joint - beam member connected to plates (perpendicularly); User Defined;



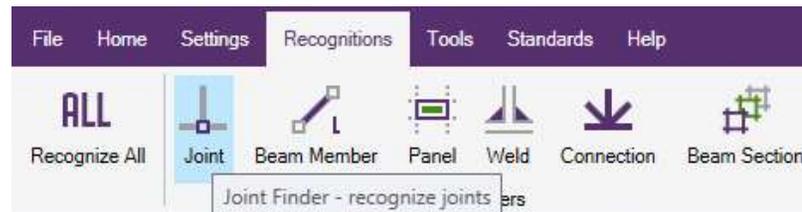
Joint Recognition

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

2 Press **Find**.



It is possible go to **Recognitions** on Ribbon tab and press **Joint**:

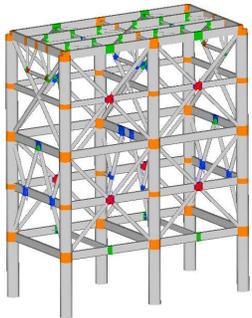


Joints Plot

1 Select All Joints (Ctrl+A).

2 Press and execute Plot Joint Type in Colors

3 Press **OK**.



O: 1
C1: 300087 / 300088

Modify Joint Type

Plot Joints of specific type

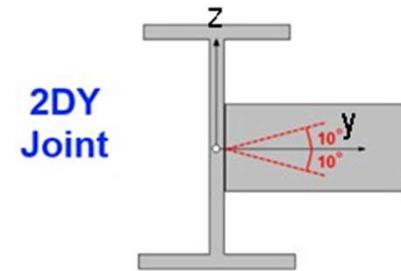
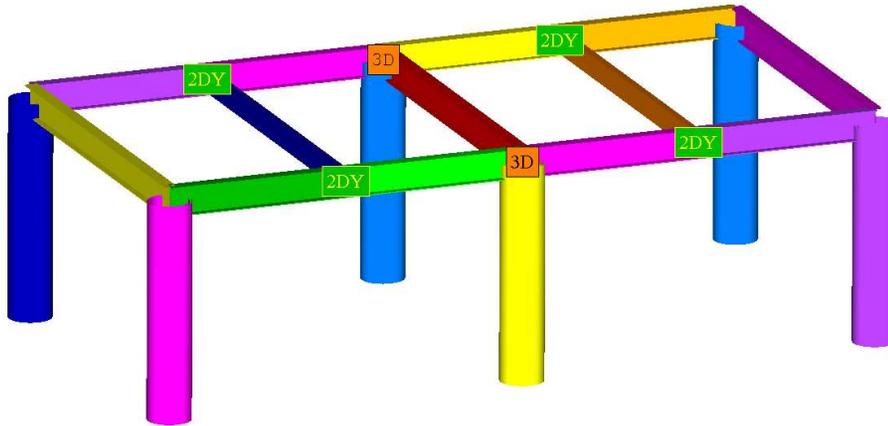
Id	Type	Property
Node ID = 3	3D	
Node ID = 4	3D	
Node ID = 5	3D	
Node ID = 6	3D	
Node ID = 7	3D	
Node ID = 22	3D	
Node ID = 23	3D	
Node ID = 24	3D	
Node ID = 68	3D	
Node ID = 117	3D	
Node ID = 136	3D	
Node ID = 155	3D	
Node ID = 165	3D	
Node ID = 201	3D	
Node ID = 202	3D	
Node ID = 231	3D	
Node ID = 237	2Dy	
Node ID = 243	2Dy	
Node ID = 251	2Dy	
Node ID = 258	2Dy	
Node ID = 265	2Dy	

3

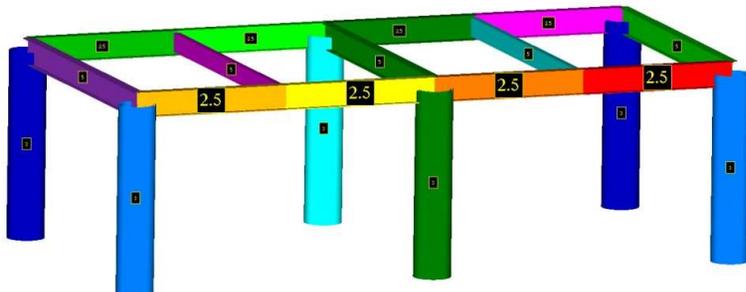
2

Beam Member Lengths in 2 directions

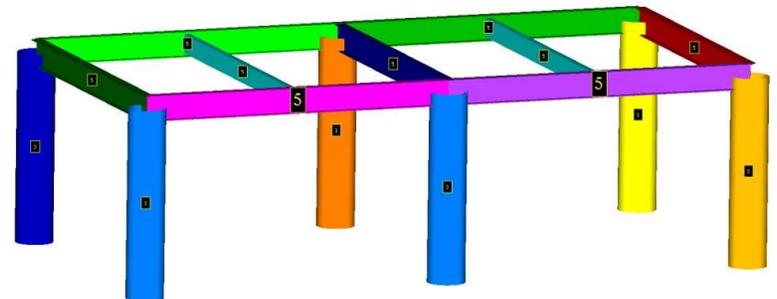
Beam Member Finder recognizes beam members and (buckling) lengths for different directions (Y, Z and Torsional).



Length Y - 4 Beam Members with L = 2.5



Length Z - 2 Beam Members with L = 5



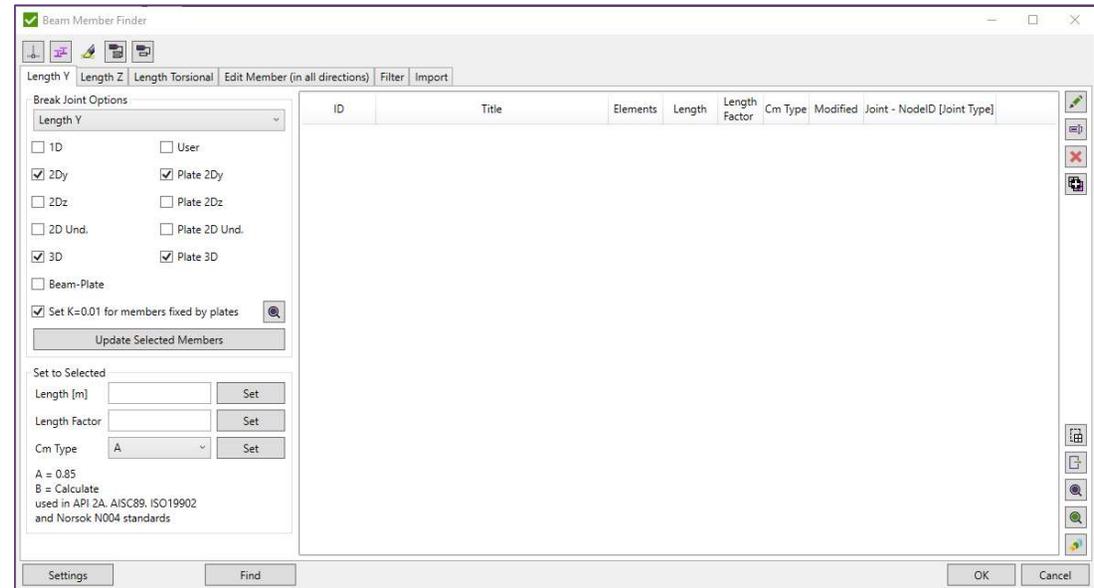
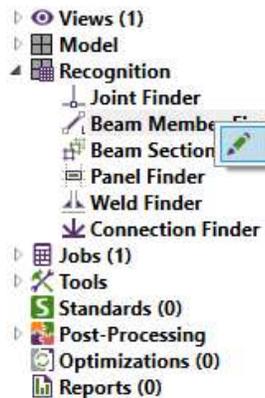
Recognize Length

1

Execute **Edit** from **Beam Member Finder** context menu

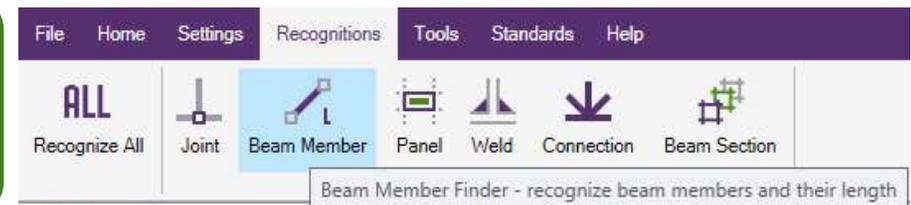
2

Press **Find**.



Default *Break Joint Options* for Tabs:
Length Y: 2DY, 3D, Plate 2DY, Plate 3D
Length Z: 2DZ, 3D, Plate 2DZ, Plate 3D
Length Torsional: 2DY, 2DZ, 2D Und, 3D

It is possible to open it another way - go to **Recognitions** tab in Ribbon and press **Beam Member**:



Beam Member's Length Plot

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

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

Press Settings to define recognition options: selection, default title

ID	Title	Elements	Length	Length Factor	Cm Type	Modified	Joint - NodeID
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] 1
8	Beam Member 8 (Y)	40	10				251[2Dy] 258[2Dy] 265[2Dy] 5[3D] 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				
16	Beam Member 16 (Y)	23	7.071	1	A		
17	Beam Member 17 (Y)	36	10				
18	Beam Member 18 (Y)	32	10				
19	Beam Member 19 (Y)	36	10				
20	Beam Member 20 (Y)	22	7.071	1	A		
21	Beam Member 21 (Y)	45	14.143				

Press Find to automatically recognize Beam Members and Sub Members for all 3 directions (Y, Z and torsional)

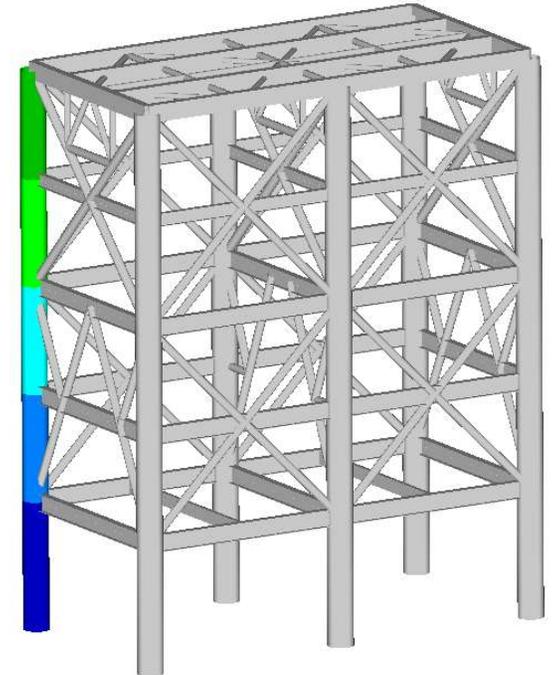
Colored Plot of members with labels (ID, Length, Factor or Cm Type).

Sub beam members

Break Joint Options define which types of joints will be used to split Beam Member on sub members. There are 3 predefined Break Joint Options (Length Y, Length Z, and Torsional) and custom.

Sub members from table on a plot:

ID	Title	Elements	Length	Length Factor	Cm Type	Modified	Joint - NodeID [Joint Type]
1	Beam Member 1 (Y)	47	13				1107[3D] 155[3D] 1104[3D] 4[3D]
1.1	Beam Member 1.1 (Y)	11	3	1	A		
1.2	Beam Member 1.2 (Y)	9	2.5	1	A		
1.3	Beam Member 1.3 (Y)	9	2.5	1	A		
1.4	Beam Member 1.4 (Y)	9	2.5	1	A		
1.5	Beam Member 1.5 (Y)	9	2.5	1	A		
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] 1355[2Dy] 1349[2Dy]
8	Beam Member 8 (Y)	40	10				251[2Dy] 258[2Dy] 265[2Dy] 5[3D] 1383[2Dy] 1376[2Dy] 1369[2Dy]
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]



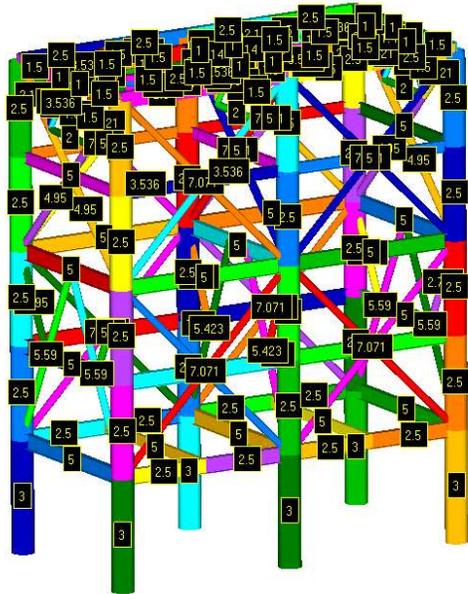
Beam Member Finder interface

1 Select all Beam Members (Ctrl+A)

2 Press and execute to display **Length Plot**

Plot Length labels

3 Press **OK**.



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, AISC89, ISO19902
and Norsok N004 standards

ID	Title	Elements	Length	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] 1355[2Dy] 1349[2Dy]
8	Beam Member 8 (Y)	40	10				251[2Dy] 258[2Dy] 265[2Dy] 5[3D] 1383[2Dy] 1376[2Dy] 1369[2Dy]
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[2Dz]
12	Beam Member 12 (Y)	13	3.536	1	A		231[2Dy]
13	Beam Member 13 (Y)	13	3.535				251[2Dy]
14	Beam Member 14 (Y)	26	7.071				265[2Dy] 23[3D] 1361[2Dy]
15	Beam Member 15 (Y)	45	14.143				1090[2Dy] 1105[3D] 2232[2Dz]
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[2Dz]
21	Beam Member 21 (Y)	45	14.143				1114[2Dz] 1105[3D] 2208[2Dy]
22	Beam Member 22 (Y)	5	1.5	1	A		

Settings Find OK Cancel

2

3

2

- Plot selected members
- Plot Length Criteria
- 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
- Plot Length Labels in Y and Z axes

STEEL CONSTRUCTION



MANUAL

AMERICAN INSTITUTE
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STEEL CONSTRUCTION
INC.

THIRTEENTH EDITION

About AISC 360-10:

- 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.

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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"/> LRFD	
		<input checked="" type="radio"/> ASD	
Tension (F _t)	<input type="text" value="0.9"/>	Tension (F _t)	<input type="text" value="0.6"/>
Tensile Rupture (F _{tr})	<input type="text" value="0.75"/>	Tensile Rupture (F _{tr})	<input type="text" value="0.5"/>
Compression (F _c)	<input type="text" value="0.9"/>	Compression (F _c)	<input type="text" value="0.6"/>
Shear (F _v)	<input type="text" value="0.9"/>	Shear (F _v)	<input type="text" value="0.6"/>
Bending (F _b)	<input type="text" value="0.9"/>	Bending (F _b)	<input type="text" value="0.6"/>
Torsion (F _{tor})	<input type="text" value="0.9"/>	Torsion (F _{tor})	<input type="text" value="0.6"/>

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

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

$R_u \leq \phi R_n$ (B3-1), where:

- R_u = required strength using LRFD load combinations;
- R_n = nominal strength, specified in Chapters B through K;
- ϕ = resistance factor, specified in Chapters B through K;
- ϕR_n = design strength.

Design for Strength Using Allowable Strength Design (ASD)

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

$R_a \leq R_n / \Omega$ (B3-2), where:

- R_a = required strength using ASD load combinations;
- R_n = nominal strength, specified in Chapters B through K;
- Ω = safety factor, specified in Chapters B through K;
- R_n / Ω = 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:

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

$\phi_t = 0.90$ (LRFD) $\Omega_t = 1.67$ (ASD)

In SDC Verifier multiplication is always used ASD factor is converted to $1 / \phi$ (ASD).

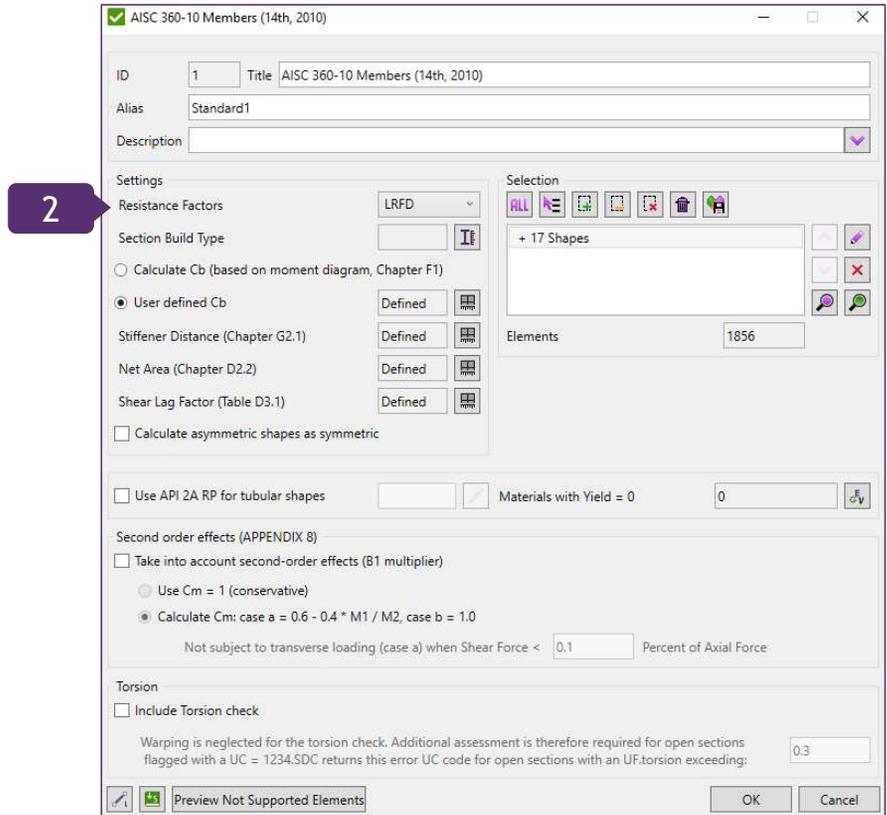
For example:

tensile resistance factor (F_t) = $1 / 1.67 = 0.6$.

Add AISC360-10 standard

1 Execute **Standards** => **Add** => **AISC** => **AISC 360-10 Members** from context menu

2 Resistance Factors: **LRFD**



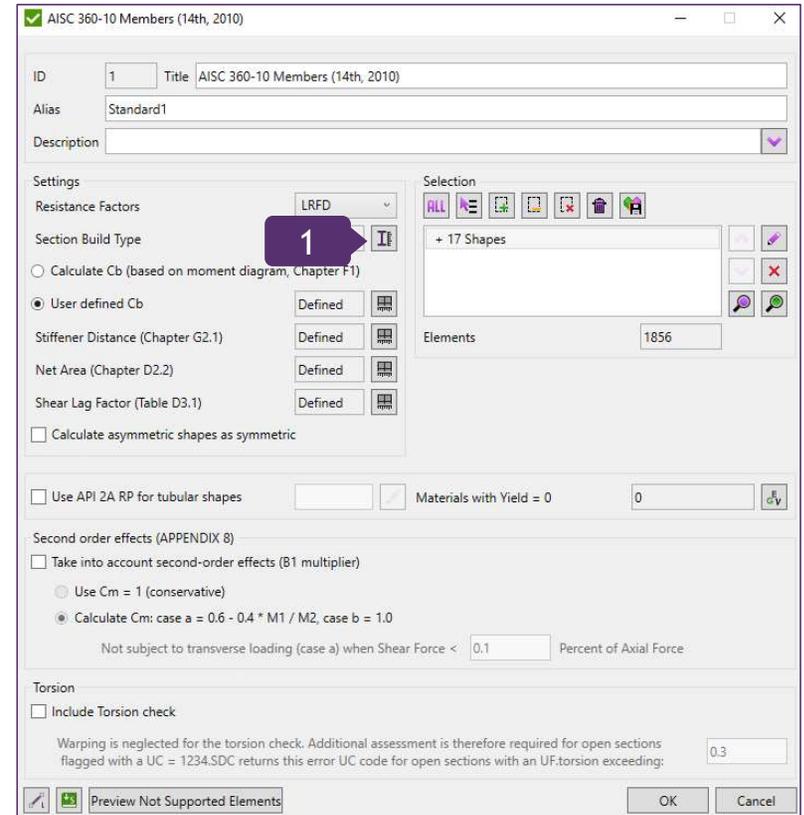
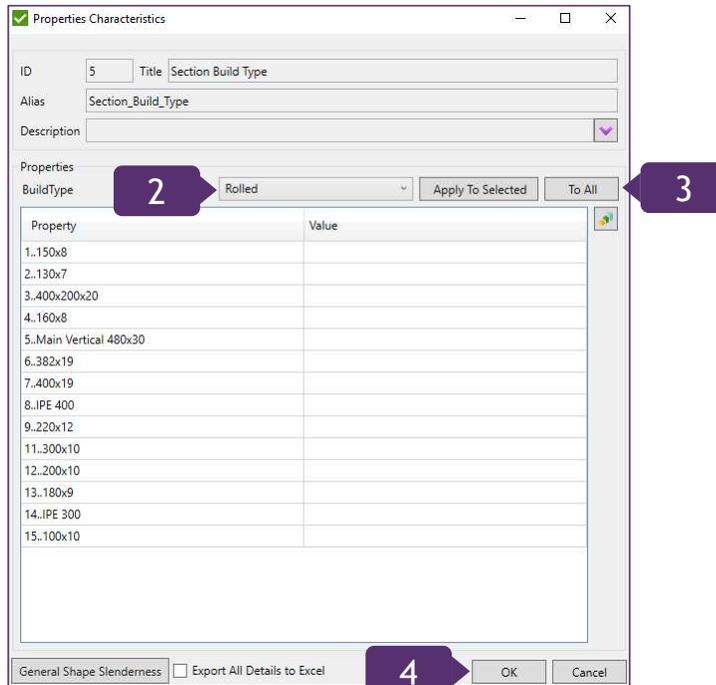
Section Build Type

1 Press for **Section Build Type**

2 Build Type: **Rolled**

3 Select **To All**

4 Press **OK**.

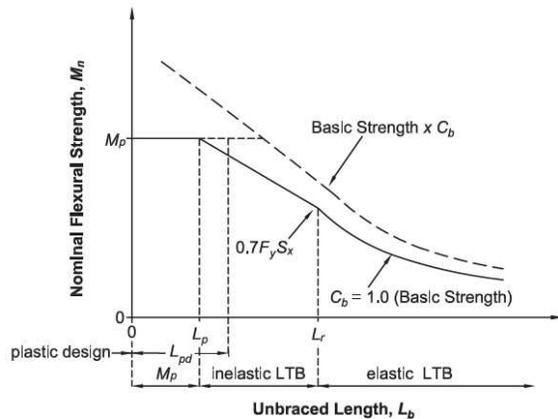


Lateral-torsional buckling factor (C_b)

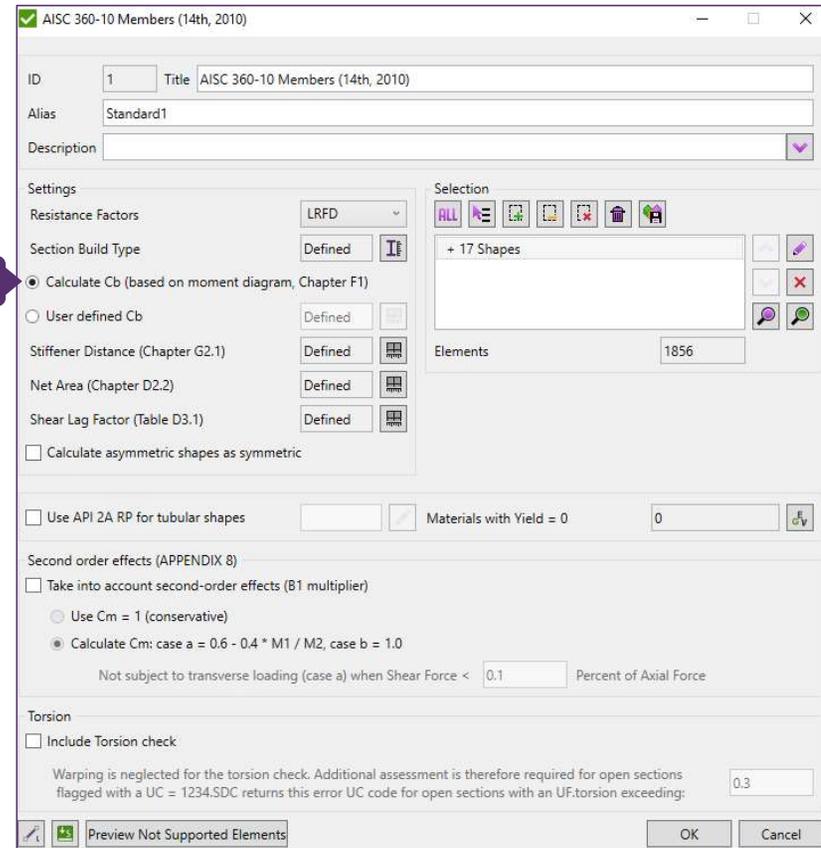
1 Select - Calculate C_b

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



Define Material Characteristics

1

Press to set the material yield stress and tensile strength

2

Select all Materials (Ctrl+A)

3

Tensile Strength: **360e+6**

4

Yield Stress: **240e+6**

5

Press **Set**

6

Press **OK**

7

Press **OK**

Material Fatigue Parameters

Materials	Tensile Strength [Pa]	Yield Stress [Pa]
1..Structural Steel	360000000	240000000

Properties

Tensile Strength [Pa]

Yield Stress [Pa]

Set

Update f

6

OK Cancel

AISC 360-10 Members (14th, 2010)

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

Alias: Standard1

Description:

Settings

Resistance Factors: LRFD

Section Build Type: Defined

Calculate C_b (based on moment diagram, Chapter F1)

User defined C_b

Stiffener Distance (Chapter G2.1): Defined

Net Area (Chapter D2.2): Defined

Shear Lag Factor (Table D3.1): Defined

Calculate asymmetric shapes as symmetric

Selection

ALL

+ 17 Shapes

Elements: 1856

1

Properties

Tensile Strength [Pa]

Yield Stress [Pa]

3

4

5

Update f

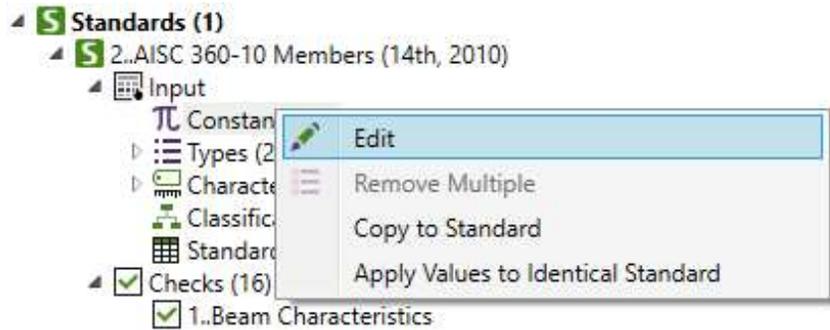
Supported Elements Percent of Axial Force

OK Cancel

7

Standard is created

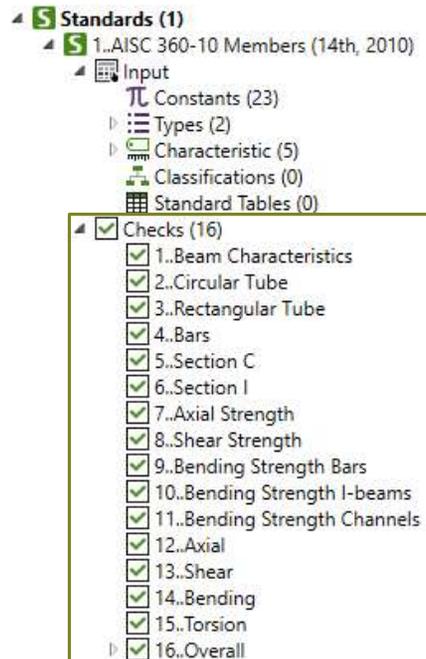
It is possible to modify Safety Factors in Constants section.



A screenshot of the 'Constants' dialog box. The dialog has a title bar with a checkmark and the text 'Constants'. It contains a table with the following data:

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

The dialog box has 'OK' and 'Cancel' buttons at the bottom right.



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 - Additional Axial Check;
- 13 - Additional Shear Check;
- 14 - Additional Bending Check;
- 15 - Torsion Check;
- 16 - All Checks together with combined.

Preview Table Results

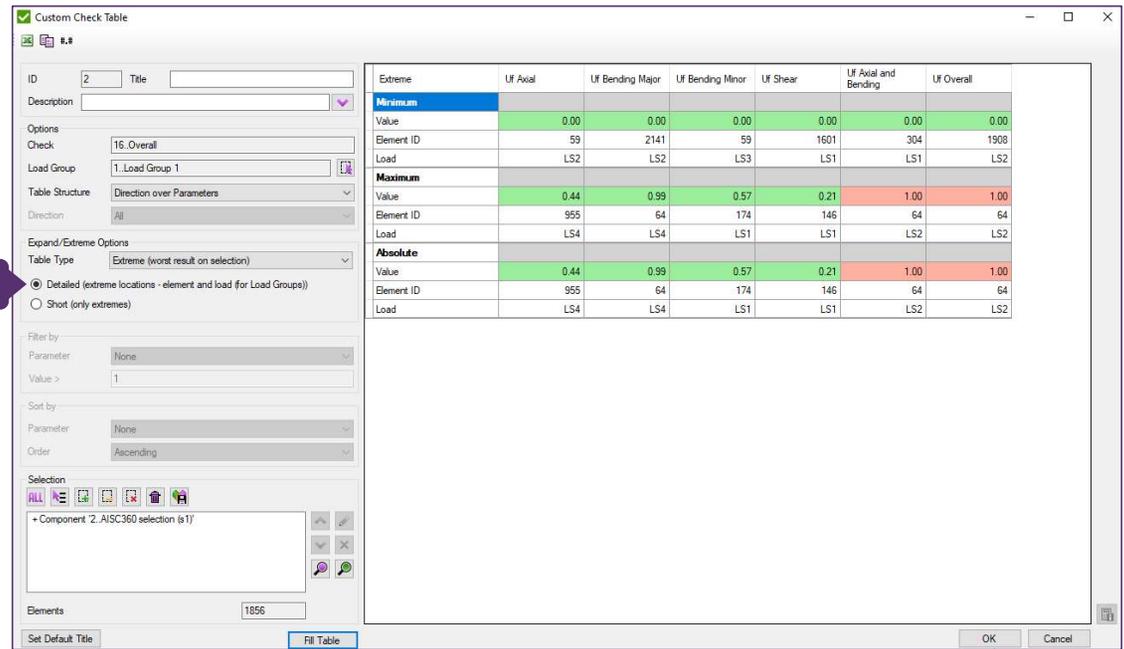
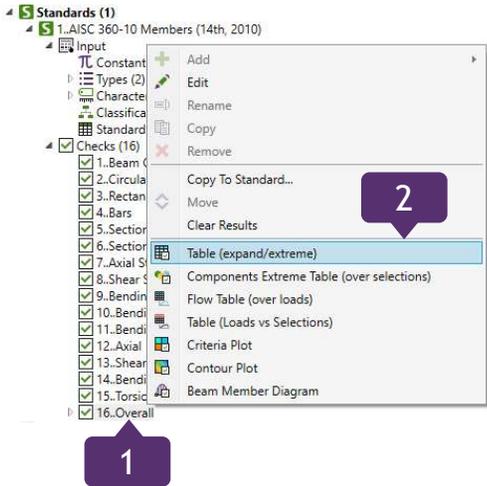
1 Execute **Overall**

2 Execute **Table (expand/extreme)** in context menu

3 Select Extreme Options - **Detailed**

4 Press **Fill Table**

5 Press **OK**



View for plots

1 Select **Overall**

2 Execute **Criteria Plot** in context menu

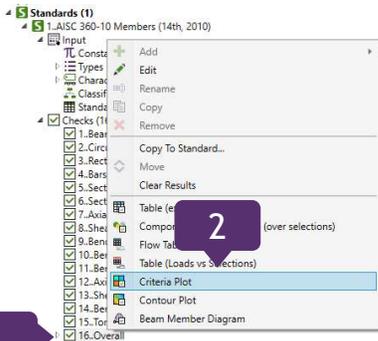
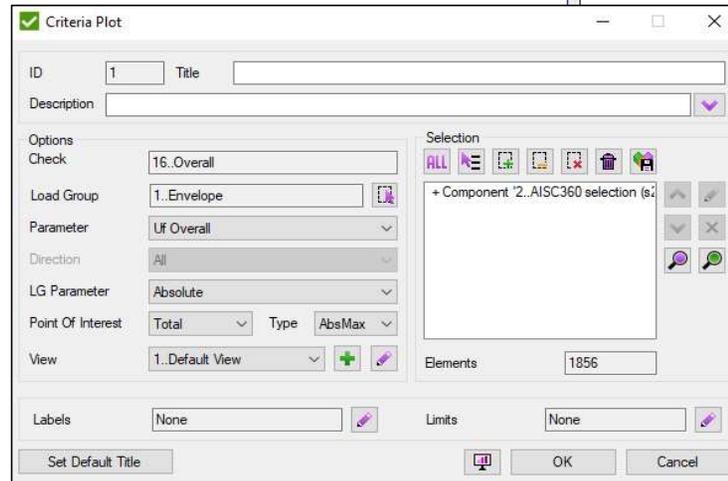
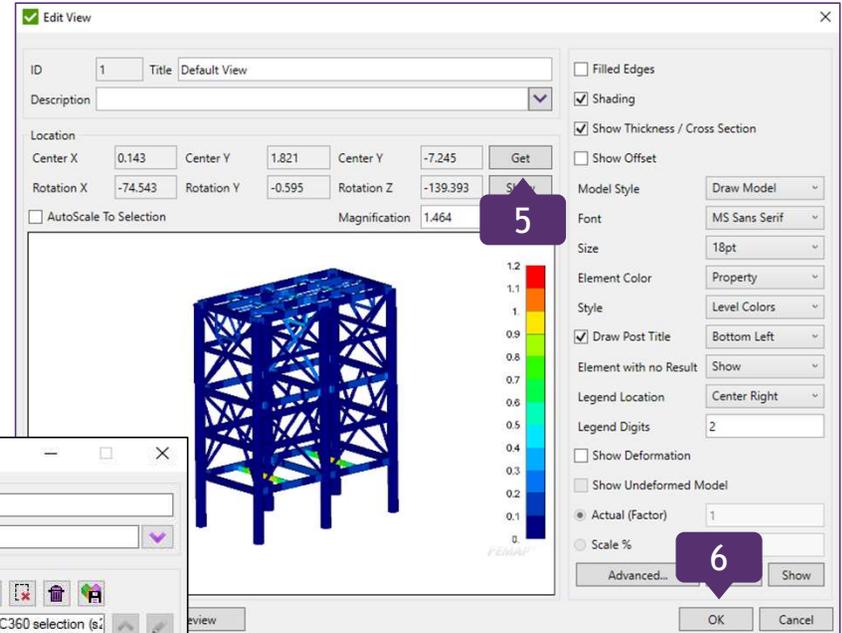
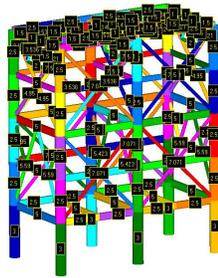
3 Press to edit view

4 Replace your model in Femap

5 Press **Get**

6 Press **Ok**

4 Example of view in Femap



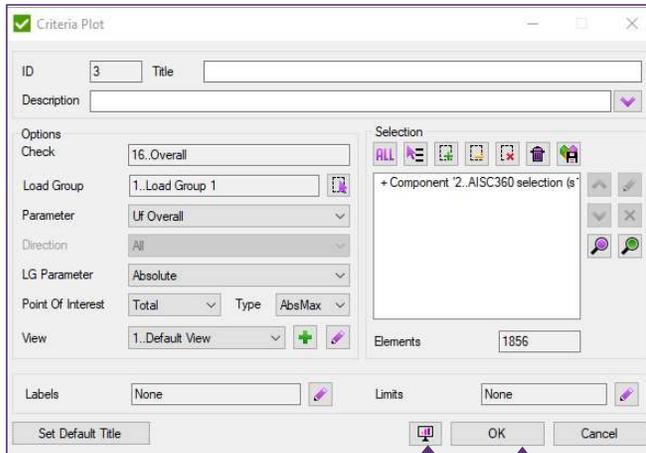
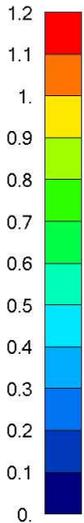
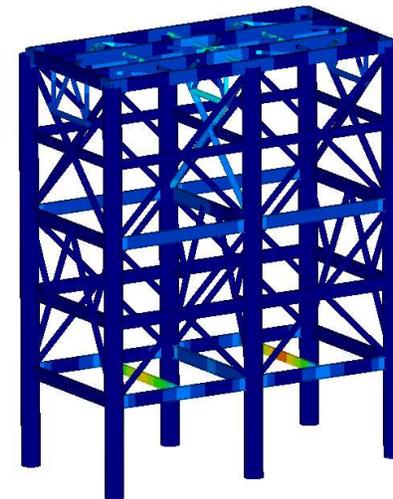
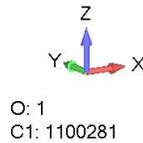
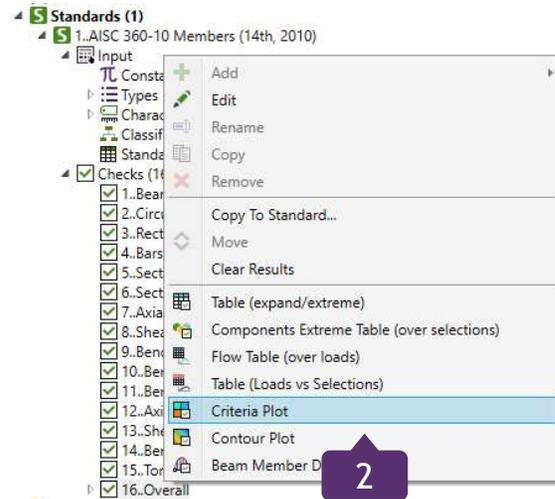
Utilization Factor Plot

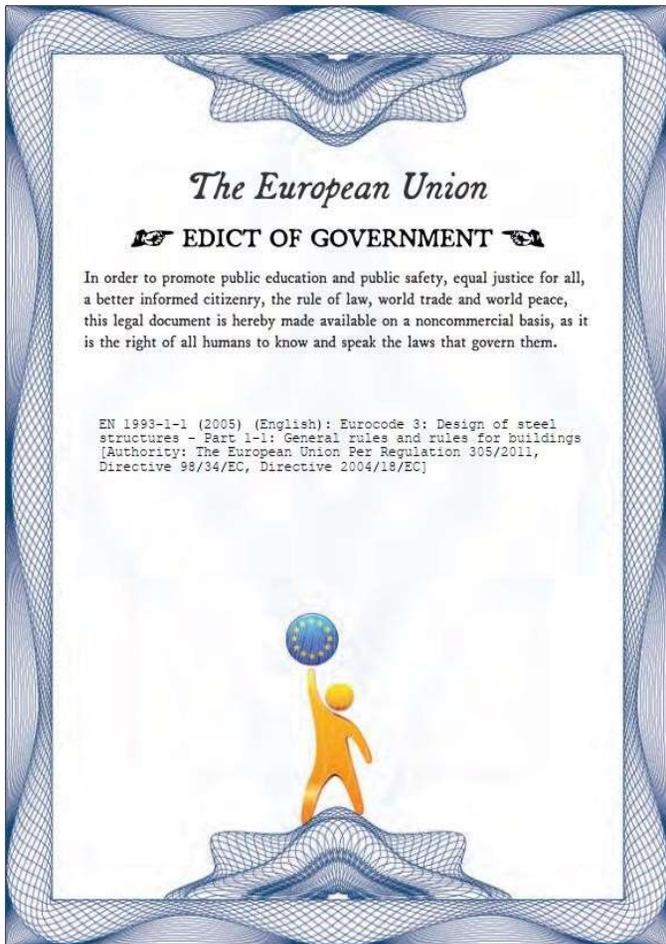
1 Select **Overall**

2 Execute **Criteria Plot** in context menu

3 Press  to preview **Plot**

4 Press **Ok** to save plot





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



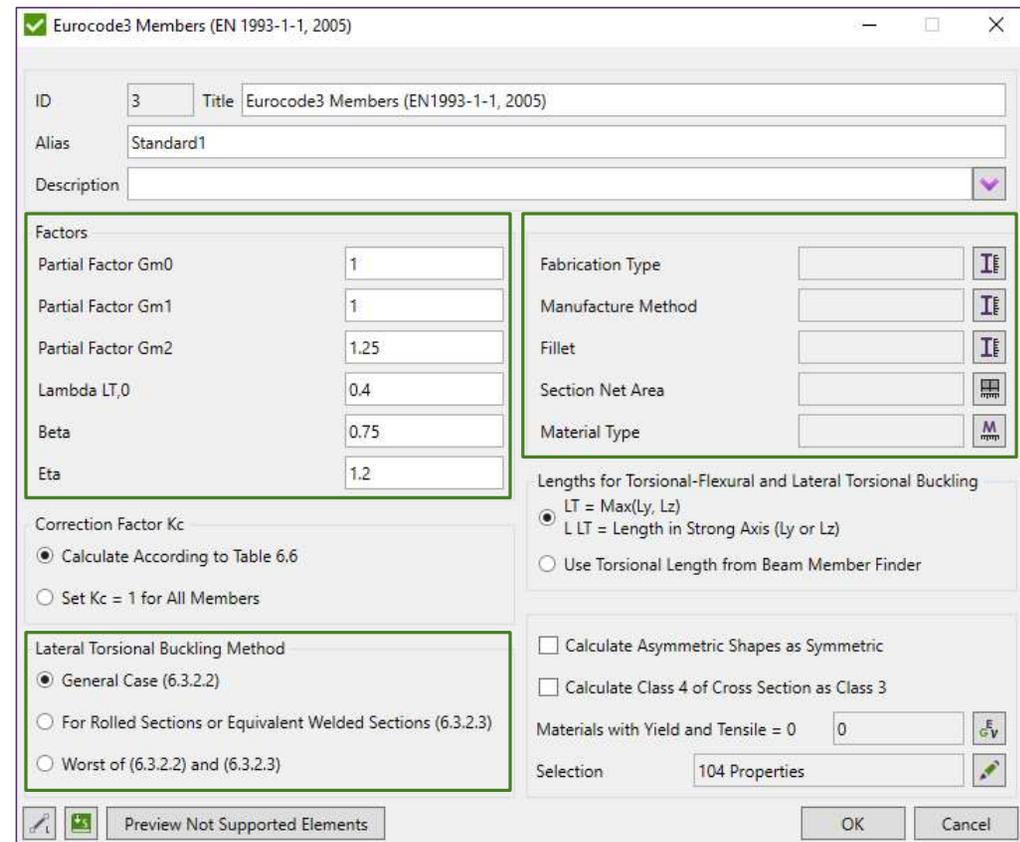
Description of Eurocode3 (EN1993-1-1, 2005)

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;
B - correction factor for the lateral torsional buckling curves for rolled sections;
 η - is used in the shear area calculations.

Note: All parameters may be taken from the National Annex

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):

Fabrication Type: Rolled/Welded; **Manufacture Type:** Hot Finished/Cold Formed
Fillet 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.



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

ID: 3 Title: Eurocode3 Members (EN1993-1-1, 2005)
Alias: Standard1
Description: [Dropdown]

Factors

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

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

Fabrication Type: [Field] 
Manufacture Method: [Field] 
Fillet: [Field] 
Section Net Area: [Field] 
Material Type: [Field] 

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

Calculate Asymmetric Shapes as Symmetric
 Calculate Class 4 of Cross Section as Class 3

Materials with Yield and Tensile = 0: 0 
Selection: 104 Properties 

Preview Not Supported Elements

OK Cancel

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

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
	1.0
	$\frac{1}{1,33 - 0,33\psi}$
	0,94
	0,90
	0,91

NOT recognized and are skipped:

	0,86
	0,77
	0,82

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.

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**

The screenshot shows the 'Standards' menu with the following items:

- 1.AISC
- 2.AISC
- 3.API
- 4.AU (2005 Edition, 2017)
- 5.AS 3990 (1993)
- 6.ASME
- 7.DIN 15018 (1984)
- 8.DNV
- 9.DVS 1608 and 1612
- 10.EN 13001 (2018)
- 11.Eurocode3
 - 12.Eurocode3 Members (EN 1993-1-1, 2005)
 - 13.Eurocode3 Welds (EN 1993-1-8, 2005)
 - 14.Eurocode3 Fatigue (EN 1993-1-9, 2005)
 - 15.Eurocode3 Bolts (EN 1993-1-8, 2005)
 - 16.Eurocode3 Fire Design (EN 1993-1-2, 2005)
 - 17.Eurocode3 Plate Buckling (EN 1993-1-5, 2006)
 - 18.Eurocode3 Connections (EN 1993-1-8, 2005)
- 19.F.E.M 1.001 (3rd, 1998)
- 20.FKM
- 21.ISO
- 22.Norsok N004 (rev.3, 2013)
- 23.Comparison Standard
- 24.Deflection
- 25.Custom
- 26.Load from Library

The dialog box shows the following fields and options:

- ID: 2, Title: Eurocode3 Members (EN1993-1-1, 2005)
- Alias: Standard2
- Description: (empty)
- Factors: Partial Factor Gm0: 1, Partial Factor Gm1: 1, Partial Factor Gm2: 1.25, Lambda LT,0: 0.4, Beta: 0.75, Eta: 1.2
- Fabrication Type: (dropdown menu)
- Manufacture Method: (dropdown menu)
- Fillet: (dropdown menu)
- Section Net Area: (dropdown menu)
- Material Type: (dropdown menu)
- 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
- Correction Factor Kc: Calculate According to Table 6.6, Set Kc = 1 for All Members
- 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)
- Materials with Yield and Tensile = 0: 0
- Selection: 14 Properties
- Buttons: Preview Not Supported Elements, OK, Cancel

The dialog box shows the following fields and options:

- ID: 1, Title: Fabrication Type
- Alias: FabricationType
- Description: (empty)
- Properties: Fabrication: Rolled, Apply To Selected, To All
- Table:

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

Buttons: General Shape Slenderness, Export All Details to Excel, OK, Cancel

Eurocode3. Manufacture Method

1

Press  to set **Manufacture Method**

2

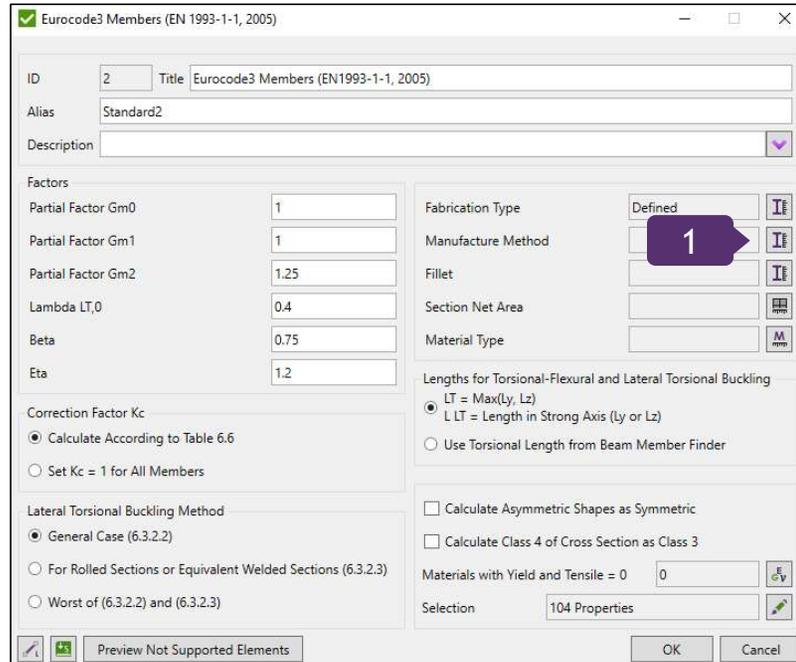
Execute - **Hot Finished**

3

Press **To All**

4

Press **Ok**



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

ID: 2 Title: Eurocode3 Members (EN1993-1-1, 2005)
Alias: Standard2
Description: [dropdown]

Factors

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

Fabrication Type: Defined  **1**

Manufacture Method: [dropdown]

Fillet: [dropdown]

Section Net Area: [dropdown]

Material Type: [dropdown]

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)

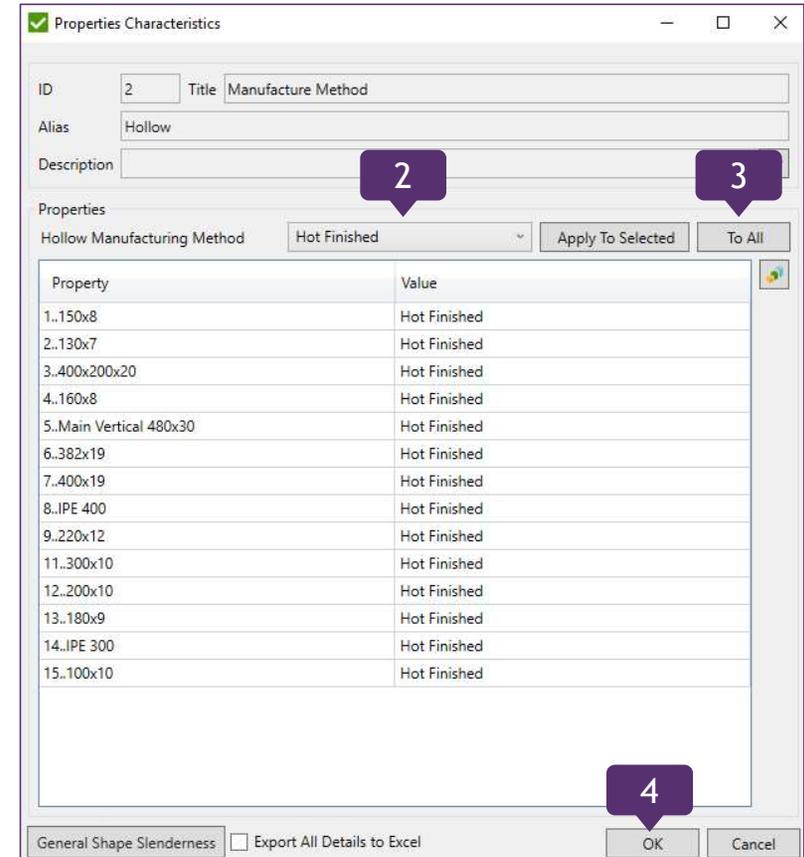
Correction Factor Kc

- Calculate According to Table 6.6
- Set Kc = 1 for All Members

Materials with Yield and Tensile = 0 [input]

Selection: 104 Properties

Buttons: Preview Not Supported Elements, OK, Cancel



Properties Characteristics

ID: 2 Title: Manufacture Method
Alias: Hollow
Description: [dropdown] **2** **3**

Properties

Hollow Manufacturing Method: Hot Finished **2** Apply To Selected To All **3**

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

Buttons: OK **4**, Cancel

General Shape Slenderness Export All Details to Excel

Eurocode3. Fillet

1 Press to set **Fillet**

2 Properties Value - 0

3 Press **To All**

4 Press **Ok**

5 Repeat Steps 1-4 for **Section Net Area**

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

ID: 2 Title: Eurocode3 Members (EN1993-1-1, 2005)
Alias: Standard2
Description: [dropdown]

Factors

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

Fabrication Type: Defined
Manufacture Method: Defined
Fillet: (1)
Section Net Area: [icon]
Material Type: [icon]

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)

Correction Factor Kc

- Calculate According to Table 6.6
- Set Kc = 1 for All Members

Materials with Yield and Tensile = 0 [input]

Selection: 104 Properties

Buttons: Preview Not Supported Elements, OK, Cancel

Properties Characteristics

ID: 3 Title: Fillet
Alias: Fillet
Description: [input] (2) (3)

Properties Value: 0 [input] 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

Buttons: OK, Cancel

Eurocode3. Material Type

1 Press to set **Material Type**

2 Execute - **S235_S275_S355_S420**

3 Press **To All**

4 Press **Ok**

The screenshot shows the 'Eurocode3 Members (EN 1993-1-1, 2005)' dialog box. The 'Material Type' field is highlighted with a purple callout '1'. The dialog includes various input fields for factors and buckling lengths, and radio buttons for different calculation methods.

The screenshot shows the 'Materials Characteristics' dialog box. The 'Material Type' dropdown is set to 'S235_S275_S355_S420'. A table lists materials and their corresponding values. A purple callout '2' points to the description field, and callout '3' points to the 'To All' button. Callout '4' points to the 'OK' button at the bottom right.

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

Preview Table Results

1 Select **Buckling and Overall**

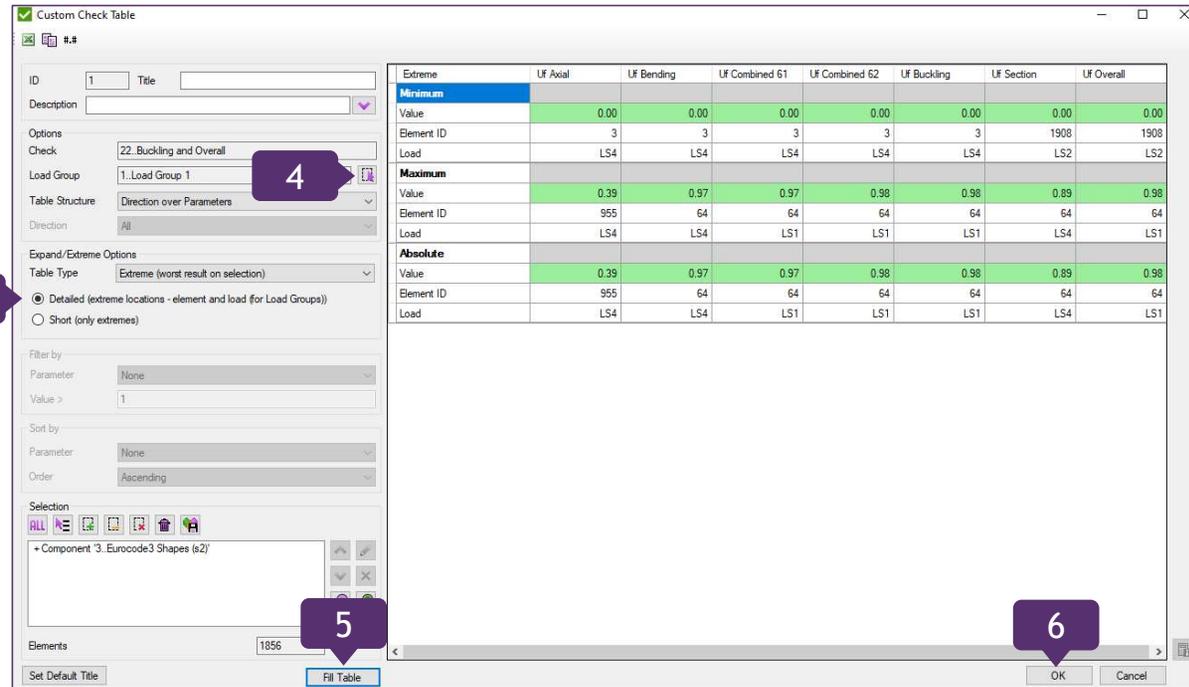
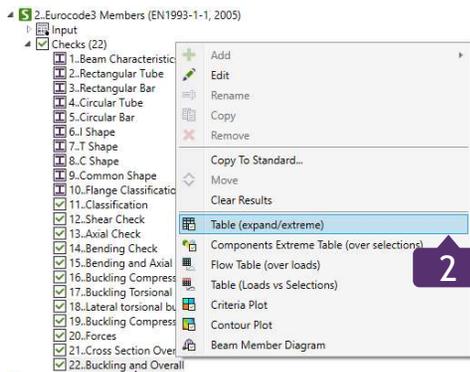
2 Execute **Table (expand/extreme)** in context menu

3 Select Extreme Options - **Detailed**

4 Select **Overall** Load Group

5 Press **Fill Table**

6 Press **OK**



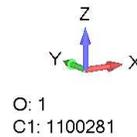
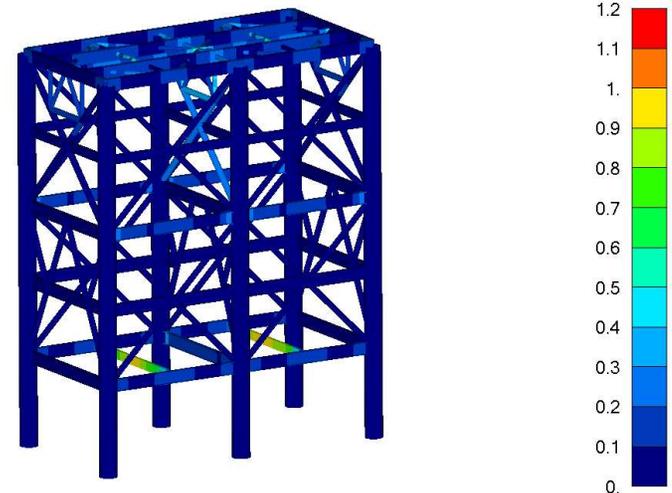
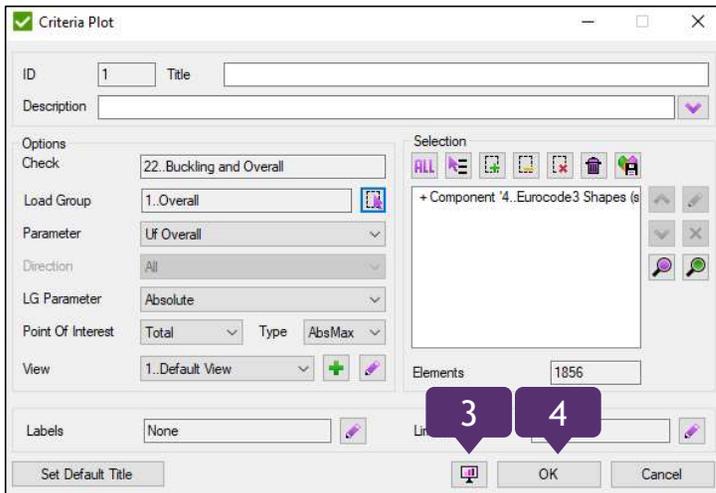
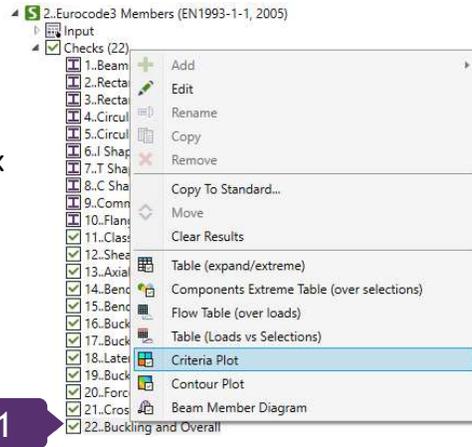
Utilization Factor Plot

1 Select **Overall and Buckling**

2 Execute **Criteria Plot** in context menu

3 Press to preview Plot

4 Press **Ok**

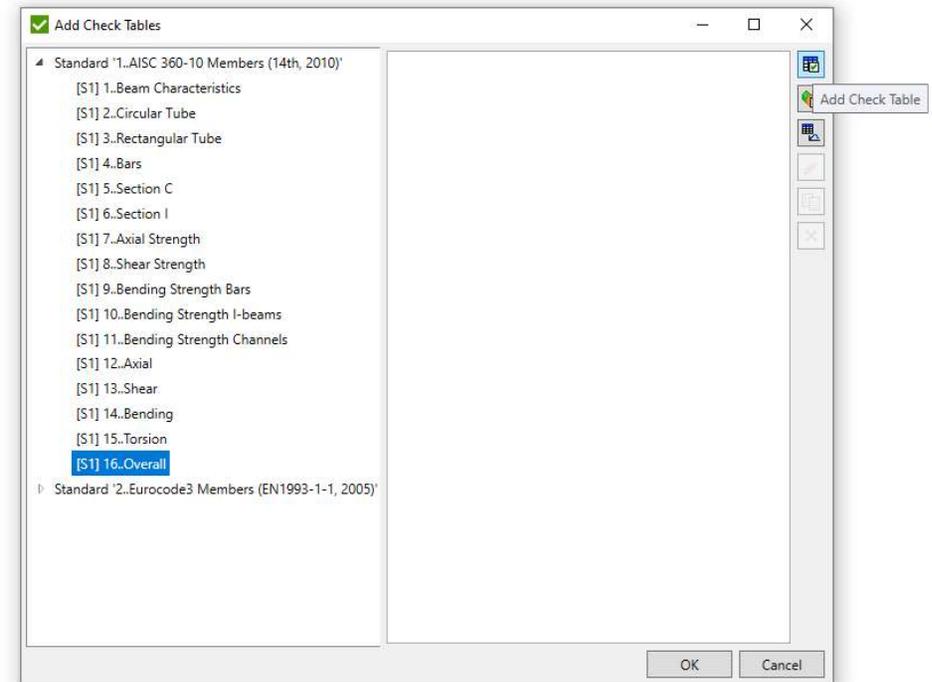
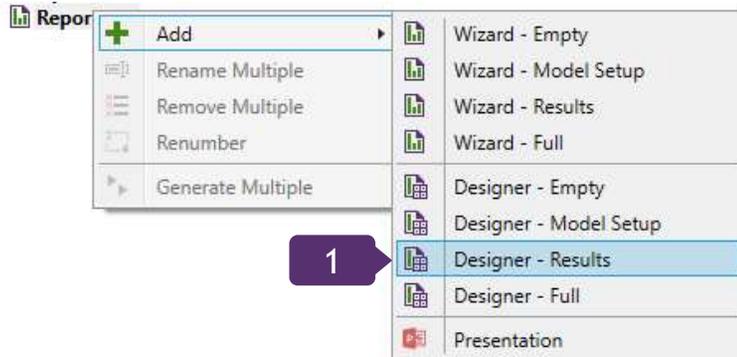


Report - Tables

1 Execute *Reports* => *Add* => *Designer Results*

2 Execute *Results* => *Check Tables*

3 Select Standard *AISC 360-10 Members* and press *Add Check Table*



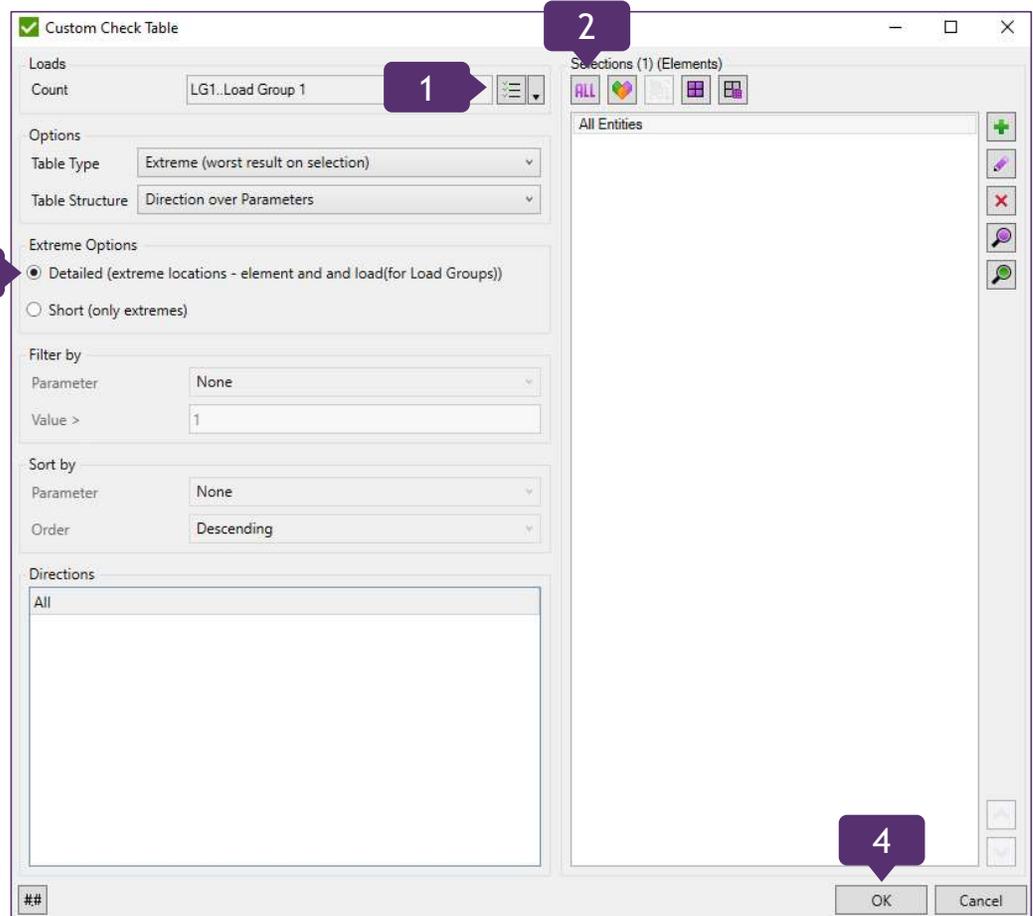
1 Select **Load Group 1** Load Group

2 Apply **All Entities**

3 Select **Detailed**

4 Press **Ok**

5 Repeat 1-4 step for Standard **Eurocode3 Members**



5 Add Check Tables

- Standard '1..Eurocode3 Members (14th, 2010)'
- Standard '2..Eurocode3 Members (EN1993-1-1, 2005)'
 - [S2] 1..Beam Characteristics
 - [S2] 2..Rectangular Tube
 - [S2] 3..Rectangular Bar
 - [S2] 4..Circular Tube
 - [S2] 5..Circular Bar

Report - Plots

1

Execute **Results** => **Check Plots**

2

Select Standard **AISC 360-10 Members** and press **Add Criteria Plot**

3

Select **Load Group 1** Load Group

4

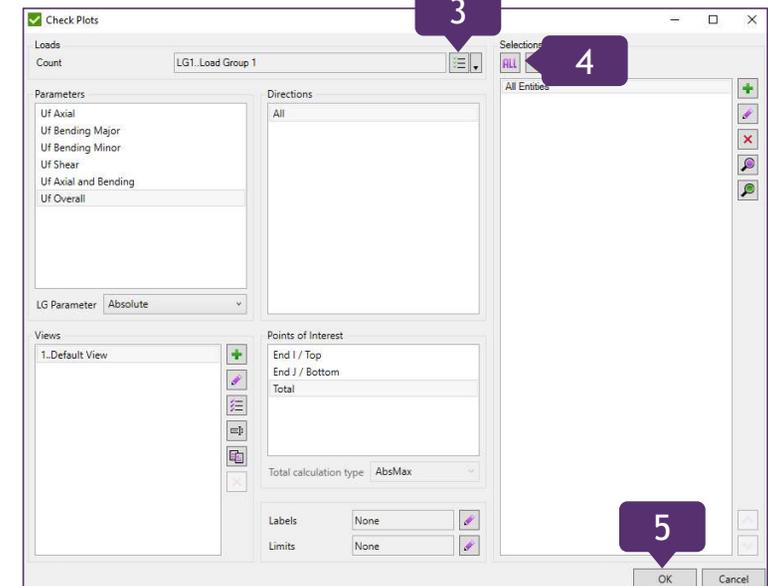
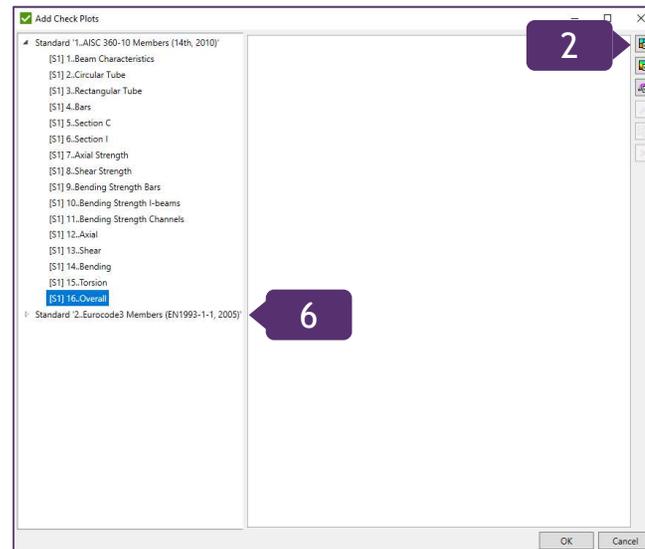
Select **All Entities**

5

Press **OK**

6

Repeat 1-5 step for Standard **Eurocode3 Members**



Report - Tables

1

Select plot in *AISC 360-10 Members*
=> *Abs UF Overall*

2

Select *Break Page Before* and press *No*

3

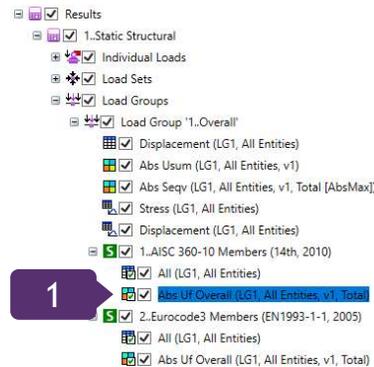
Select plot in *AISC 360-10 Members*
=> *Abs UF Overall*

4

Select *Break Page Before* and press *No*

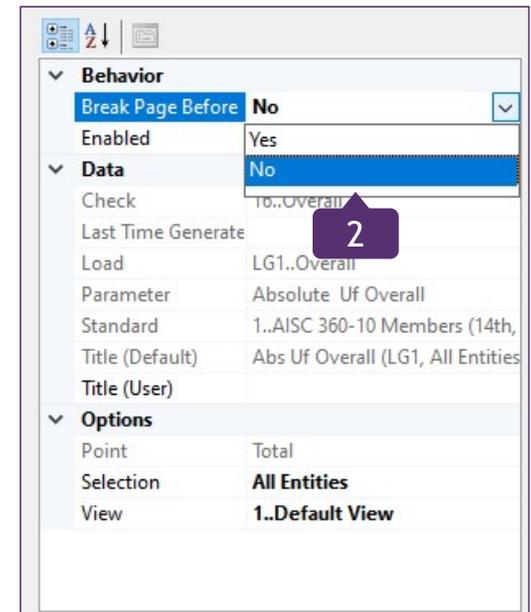
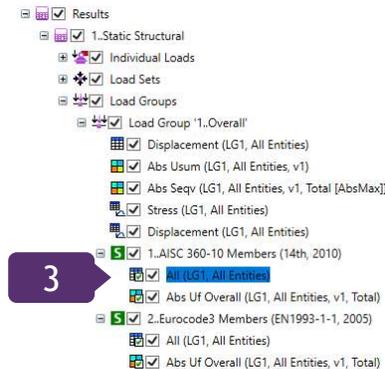
5

Repeat 1-4 step for Eurocode3
Members



1

3



Generated Report

1

Select both Standards and press **Generate**

2

After generation is finished press to export generated report to Word

AISC 360-10 Members (14th, 2010)
 All (LG1, All Entities)
 Abs Uf Overall (LG1, All Entities, v1, Total)
 Eurocode3 Members (EN1993-1-1, 2005)
 All (LG1, All Entities)
 Abs Uf Overall (LG1, All Entities, v1, Total)
 Summary
 Appendix

Generate
 Move Up
 Move Down
 Copy Ctrl + C
 Cut Ctrl + X
 Remove Del
 Select Items
 Apply to Selected

2

Page 2 of 3

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

All (LG1, Component '2_AISC360 selection (s1)')

Standard	LG1_Load Group 1	Uf Axial	Uf Bending Major	Uf Bending Minor	Uf Shear	Uf Axial and Bending	Uf Overall
Minimum		0.00	0.00	0.00	0.00	0.00	0.00
Value		59	2141	59	1601	304	1908
Element ID		LS2	LS2	LS3	LS1	LS1	LS2
Load							
Maximum		0.44	0.99	0.57	0.21	1.00	1.00
Value		955	64	174	146	64	64
Element ID		LS4	LS4	LS1	LS1	LS2	LS2
Load							
Absolute		0.44	0.99	0.57	0.21	1.00	1.00
Value		955	64	174	146	64	64
Element ID		LS4	LS4	LS1	LS1	LS2	LS2
Load							

Abs Uf Overall (LG1, Component '2_AISC360 selection (s1)', v1)

O: 1
 C1: 309131 / 300132
 C2: 60050
 C3: 7050 / 9050

Check Parameter	[S1] 16_Overall Absolute Uf Overall	Load Group Selection	LG1_Load Group 1	Component '2_AISC360 selection (s1)'
View	3_Default View	Data Conversion	No Averaging, Corner	

Prepared by <https://sdcverifier.com>

Page 3 of 3

2. Eurocode3 Members (EN1993-1-1, 2005)

All (LG1, Component '3_Eurocode3 Shapes (s2)')

Standard	LG1_Load Group 1	Uf Axial	Uf Bending	Uf Combined 61	Uf Combined 62	Uf Buckling	Uf Section	Uf Overall
Minimum		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Value		3	3	3	3	3	1908	1908
Element ID		LS4	LS4	LS4	LS4	LS4	LS2	LS2
Load								
Maximum		0.39	0.97	0.97	0.98	0.98	0.89	0.98
Value		955	64	64	64	64	64	64
Element ID		LS4	LS4	LS1	LS1	LS1	LS4	LS1
Load								
Absolute		0.39	0.97	0.97	0.98	0.98	0.89	0.98
Value		955	64	64	64	64	64	64
Element ID		LS4	LS4	LS1	LS1	LS1	LS4	LS1
Load								

Abs Uf Overall (LG1, Component '3_Eurocode3 Shapes (s2)', v1, Total)

O: 1
 C1: 1100281

Check Load Group Selection	[S2] 22_Buckling and Overall LG1_Load Group 1	Point Parameter View	Total Absolute Uf Overall 3_Default View
	Component '3_Eurocode3 Shapes (s2)'		

Prepared by <https://sdcverifier.com>