



Tutorial

Weld Strength Eurocode3, DNV PS-C101 and C201

Updated on: 7 Jul 2023

Tested with: SDC Verifier 2023 R1.1

Ansys version 2022

This step-by-step tutorial demonstrates how to perform the weld strength check according to Eurocode 3, DNV OS-C101-LRFD, DNV OS-C201-WSD standards in SDC Verifier.

- The following steps are covered:
- Weld Finder Tool detailed review;
- Weld Stress calculations;
- Standards creation;
- Report preparation and results.

Launch SDC Verifier

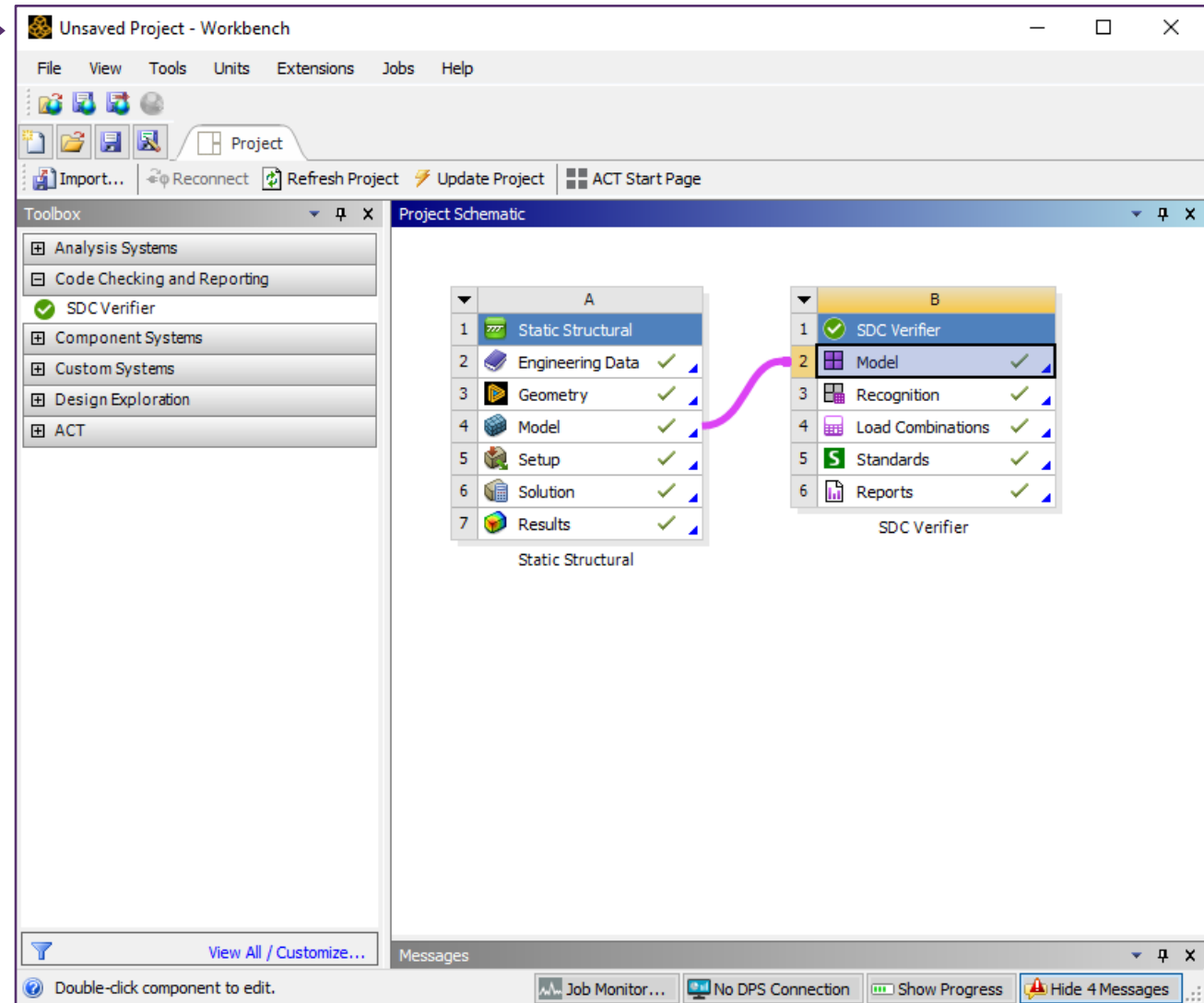
1

Open in Ansys Workbench 
Weld Strength Check Tutorial for Ansys.wbpj

2


Double Click on  Model 
or in context menu click **Edit**.

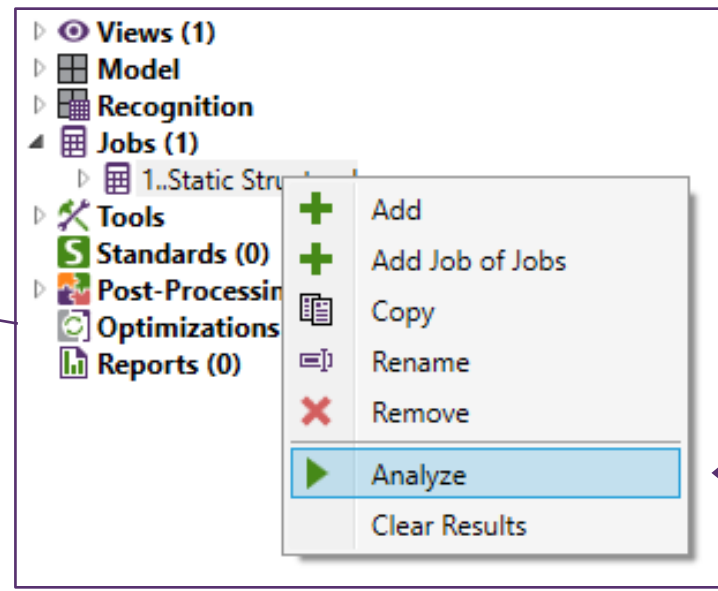
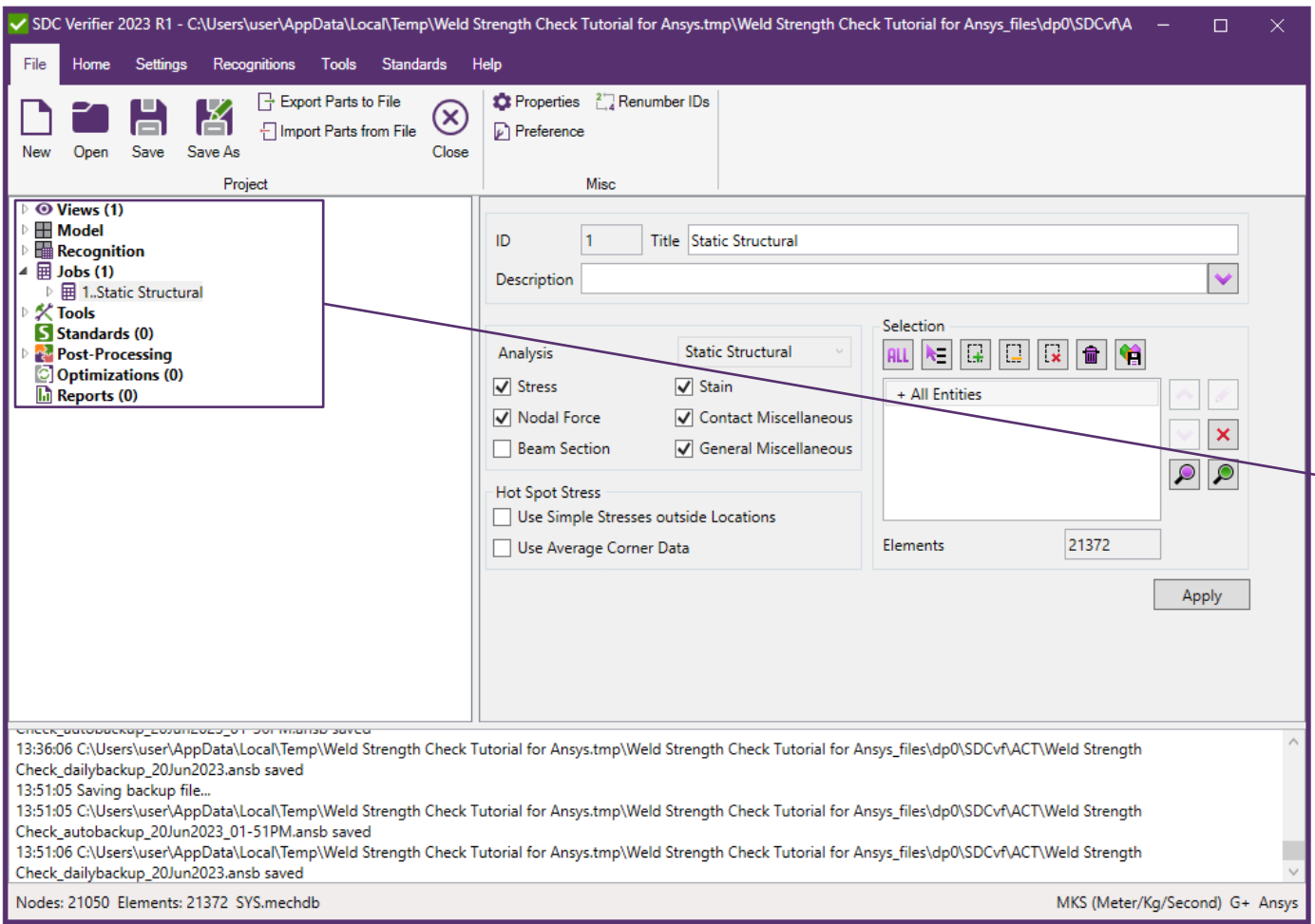
1



2

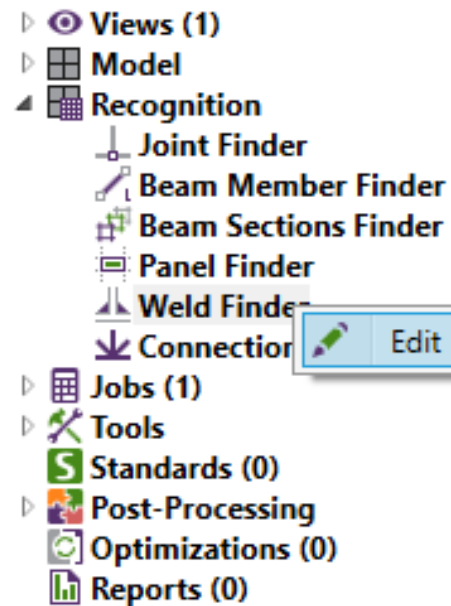
1

Execute  **Analyze** from *Static Structural* context menu.

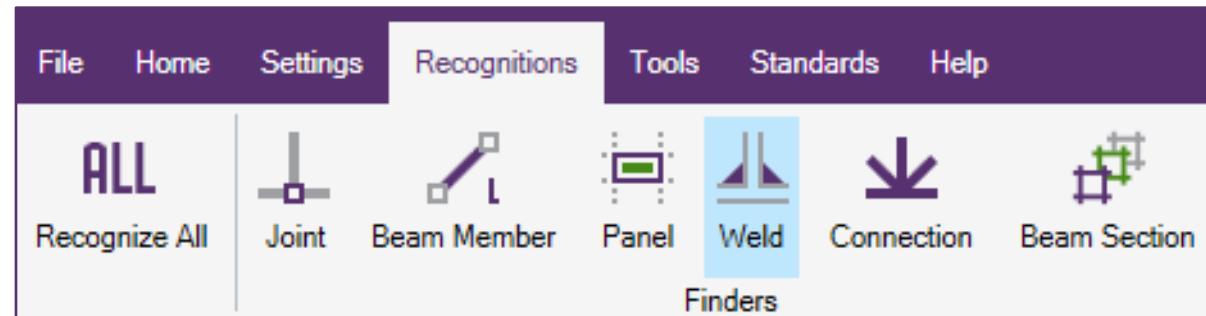


1

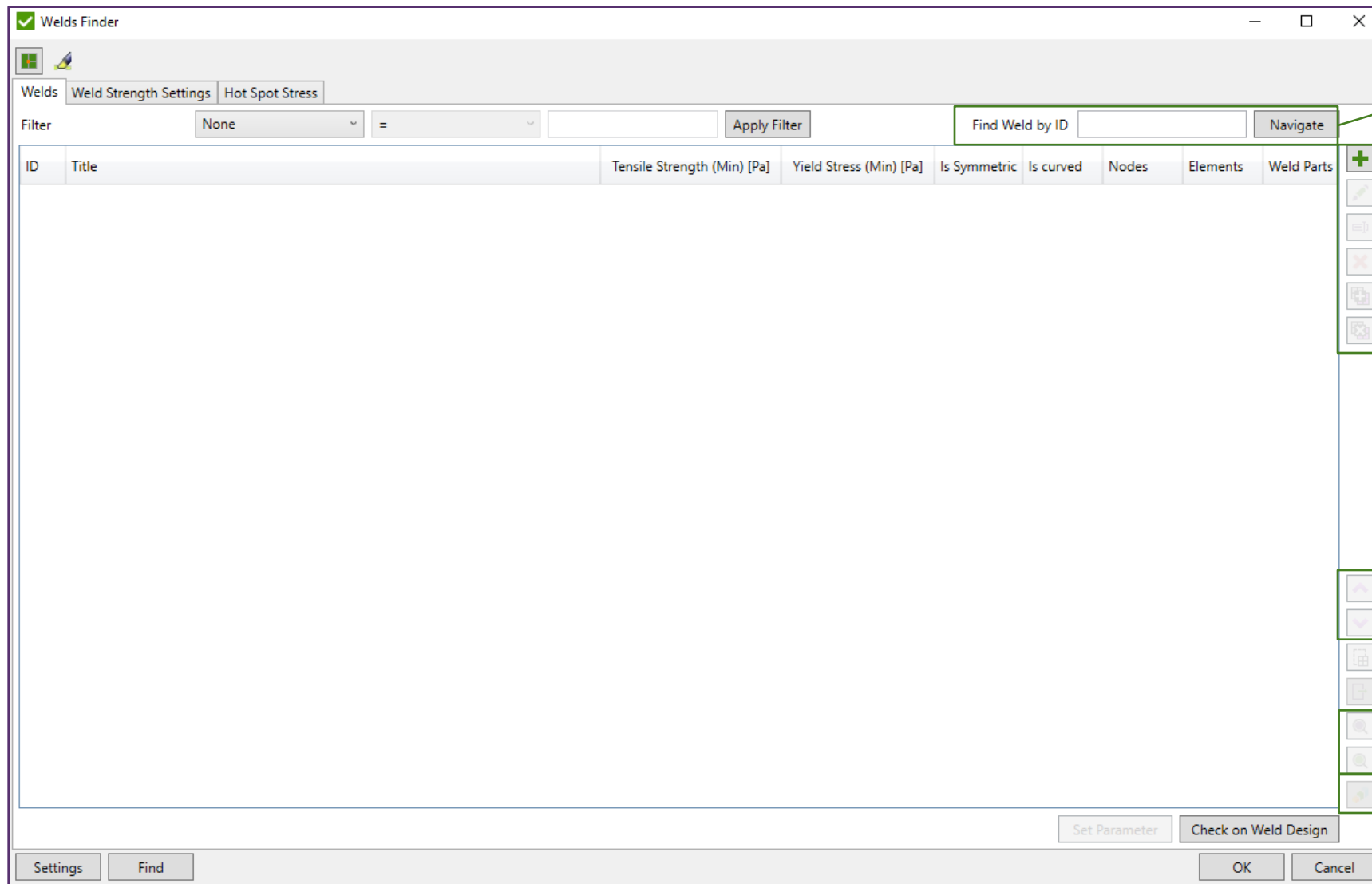
Execute *Recognition* -> *Weld Finder* -> *Edit*.




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

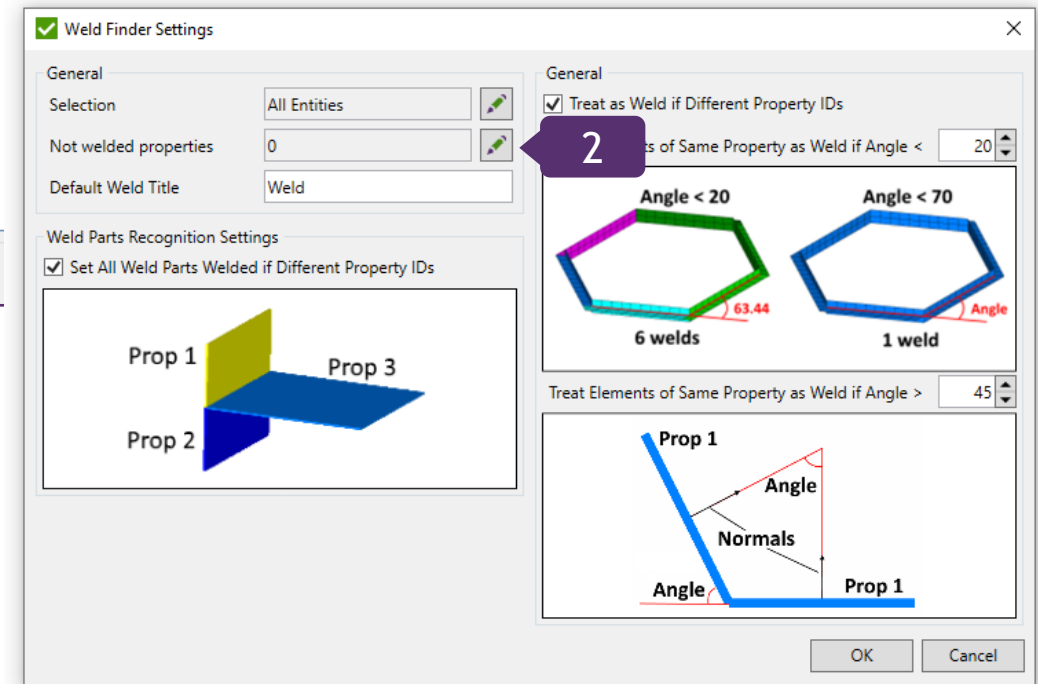
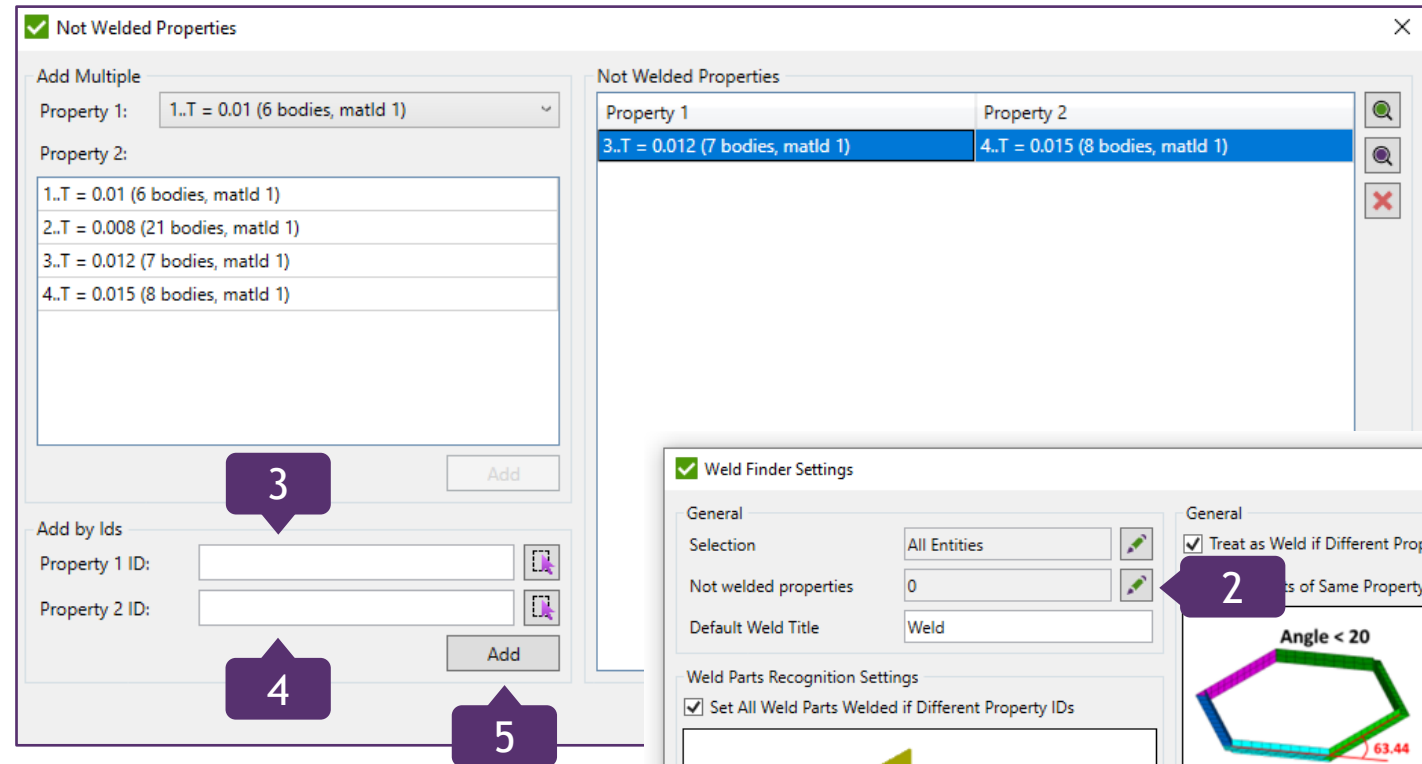
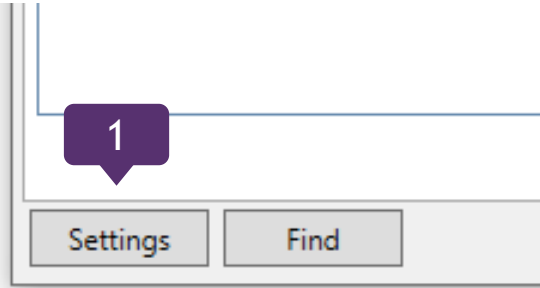


Weld Finder - General overview

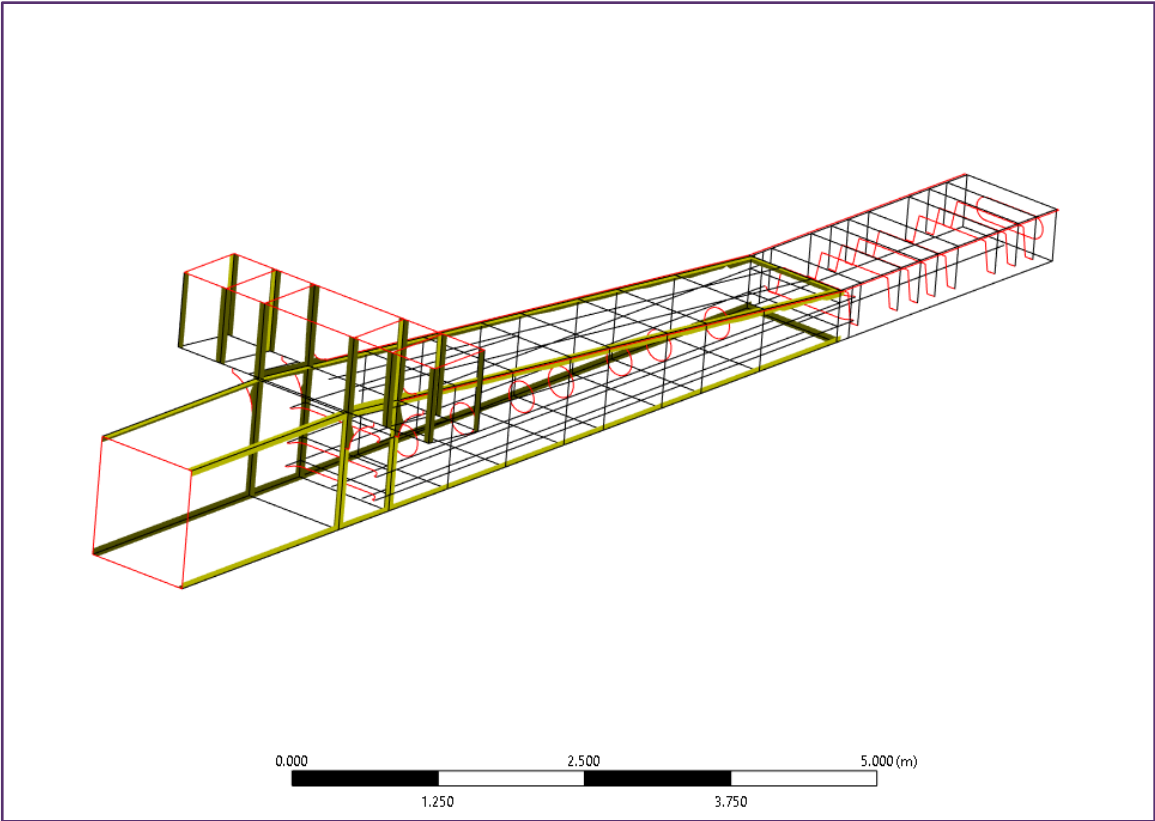


Add exception rule for recognition

- 1 Press **Settings**.
- 2 Press **Edit** for **Not weld properties**.
- 3 Select **property ID3**.
- 4 Select **property ID4**.
- 5 Press **Add**.
- 6 Press 



Plot of Connections with properties
3 and 4 are not treated as welds



It is possible to select properties manually in Ansys by elements to add a not welded combination

Not Welded Properties

Add Multiple

Property 1: 1..T = 0.01 (6 bodies, matld 1)

Property 2:

1..T = 0.01 (6 bodies, matld 1)
2..T = 0.008 (21 bodies, matld 1)
3..T = 0.012 (7 bodies, matld 1)
4..T = 0.015 (8 bodies, matld 1)

Add

Add by Ids

Property 1 ID:

Property 2 ID:

Add

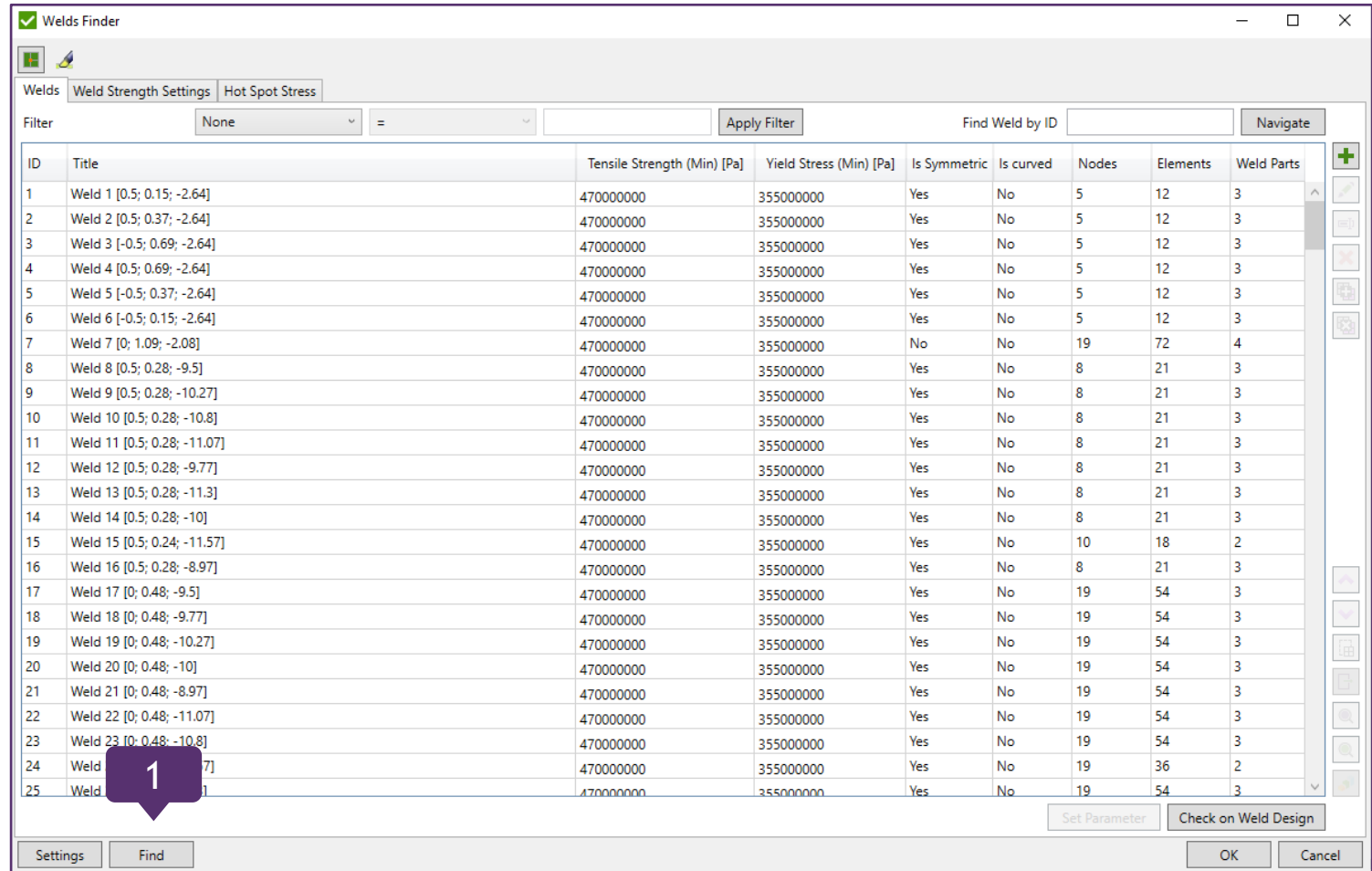
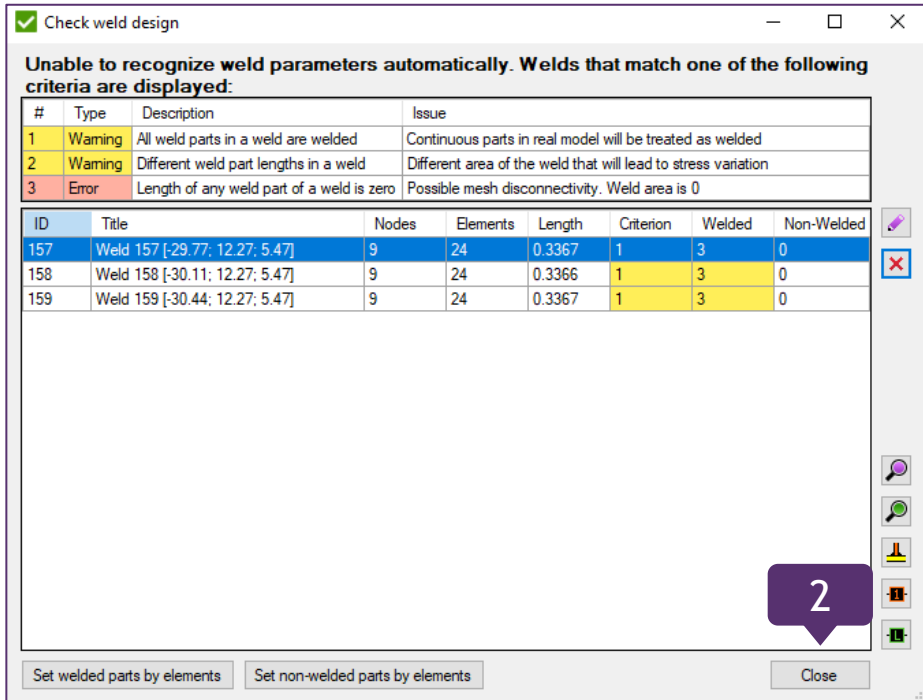
Not Welded Properties

Property 1	Property 2
3..T = 0.012 (7 bodies, matld 1)	4..T = 0.015 (8 bodies, matld 1)

OK Cancel

Recognize welds

- 1 Press *Find*.
- 2 Press *Close*.
- 3 Press *Weld Strength Settings*.



Weld Finder - Details

Selection gives a possibility to select a part of the model (group, component) for making changes.

This filter can be used to search the weld(s) due to different parameters (length, thickness, area, weld only, non weld only etc.)

Navigate option in order to find a weld by ID

Edit, Combine, Split, Export and Remove Weld(s)

Preview selected weld(s).

Welds Finder

Welds Weld Strength Settings Hot Spot Stress

Information

Selection: All Entities

Display Weld Parts: ☐ All ☒ Welded ☐ Non-Welded

Filter Rule: Show all

Apply Filter Find Weld by ID Navigate

Current Filter: All Entities; Display Welded Weld Parts; Show all

Weld ID	Title	Length [m]	Weld Type	Welded	Csys	t [m]	Weld Side	r [m]	h [m]	s [m]	Alpha	Throat Thickness (a) [m]
1	Weld Part 1.1 [0.49; 0.15; -2.64]	0.204	None	Yes	Rotation [-180; -90; 0]	0.008						
2	Weld Part 2.1 [0.49; 0.37; -2.64]	0.205	None	Yes	Rotation [180; -90; 0]	0.008						
3	Weld Part 3.1 [-0.49; 0.69; -2.64]	0.205	None	Yes	Rotation [180; 90; 0]	0.008						
4	Weld Part 4.1 [0.49; 0.69; -2.64]	0.205	None	Yes	Rotation [0; -90; 0]	0.008						
5	Weld Part 5.1 [-0.49; 0.37; -2.64]	0.205	None	Yes	Rotation [-180; 90; 0]	0.008						
6	Weld Part 6.1 [-0.49; 0.15; -2.64]	0.205	None	Yes	Rotation [180; 90; 0]	0.008						
7	Weld Part 7.3 [0; 1.09; -2.08]	1	None	Yes	Rotation [174.77; 0; -180]	0.015						
7	Weld Part 7.4 [0; 1.09; -2.08]	1	None	Yes	Rotation [-5.23; 0; -180]	0.015						

Restore Default Set Welded Parts by Elements Set Non-Welded Parts by Elements

Apply to selected weld parts

Set Welded / Non-Welded: Yes

Length [m]: 0

Weld part thickness (t) [m]: 0

Csys: [0;0;0]

Origin: [0;0;0]

Weld Side: +Y

Apply to selected weld parts (only for welded parts)

Weld Type: None

Apply by sizes: ☒ Apply by throat thickness (a): ☐

Weld leg horizontal (r) [m]: 0

Weld leg vertical (h) [m]: 0

Penetration depth (s) [m]: 0

Side By Weld Part Csys: +Y

Side By Direction: [0, 0, 0]

Throat thickness (a) [m]:

Set a = t / 2

Override type: All

Alpha

Apply

Settings Find OK Cancel

- Welded/non-welded parts
- Weld parts
- Welds in colors
- Welds in colors + Labels of IDs
- Weld parts lengths + Labels of values
- Weld parts throat thickness + Labels of values
- Weld types + Labels of values
- Coordinate systems
- Weld part throat
- Welded/non-welded parts + throat

Plot of selected weld(s) in colors and with labels of IDs (drop-down menu).

Weld Finder - Set weld parameters

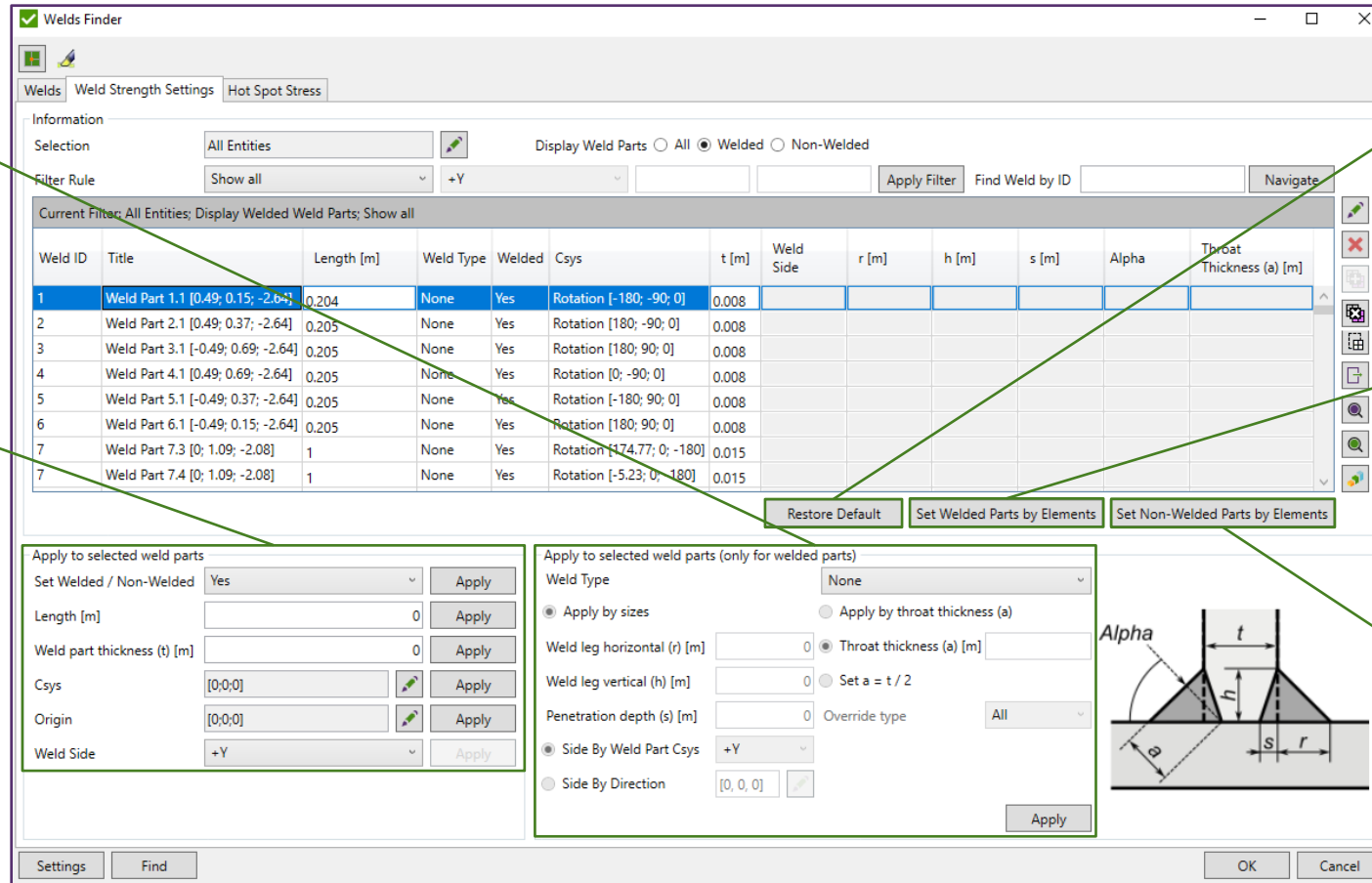
Possibility to apply weld type and dimensions of weld to all selected weld(s) parts.

Possibility to modify or change length, thickness, coordinate system and origin to all selected weld(s) parts

Restore default data if some of them were assigned incorrectly

Set Welded only - change selected non-welded parts by selecting elements on the model.


Set Non-welded only - change selected welded parts by selecting elements on the model.



Welds Finder

Welds | Weld Strength Settings | Hot Spot Stress

Information

Selection:  Display Weld Parts: ☐ All ☒ Welded ☐ Non-Welded

Filter Rule: Find Weld by ID:

Current Filter: All Entities; Display Welded Weld Parts; Show all


Weld ID	Title	Length [m]	Weld Type	Welded	Csys	t [m]	Weld Side	r [m]	h [m]	s [m]	Alpha	Throat Thickness (a) [m]
1	Weld Part 1.1 [0.49; 0.15; -2.64]	0.204	None	Yes	Rotation [-180; -90; 0]	0.008						
2	Weld Part 2.1 [0.49; 0.37; -2.64]	0.205	None	Yes	Rotation [180; -90; 0]	0.008						
3	Weld Part 3.1 [-0.49; 0.69; -2.64]	0.205	None	Yes	Rotation [180; 90; 0]	0.008						
4	Weld Part 4.1 [0.49; 0.69; -2.64]	0.205	None	Yes	Rotation [0; -90; 0]	0.008						
5	Weld Part 5.1 [-0.49; 0.37; -2.64]	0.205	None	Yes	Rotation [-180; 90; 0]	0.008						
6	Weld Part 6.1 [-0.49; 0.15; -2.64]	0.205	None	Yes	Rotation [180; 90; 0]	0.008						
7	Weld Part 7.3 [0; 1.09; -2.08]	1	None	Yes	Rotation [174.77; 0; -180]	0.015						
7	Weld Part 7.4 [0; 1.09; -2.08]	1	None	Yes	Rotation [-5.23; 0; -180]	0.015						


Apply to selected weld parts

Set Welded / Non-Welded:

Length [m]:

Weld part thickness (t) [m]:

Csys: 

Origin: 

Weld Side:

Apply to selected weld parts (only for welded parts)

Weld Type:

☒ Apply by sizes ☐ Apply by throat thickness (a)

Weld leg horizontal (r) [m]: ☒ Throat thickness (a) [m]:

Weld leg vertical (h) [m]: ☐ Set a = t / 2

Penetration depth (s) [m]: Override type:


☒ Side By Weld Part Csys: ☐ Side By Direction: 

Diagram: A cross-section of a weld joint showing parameters: t (throat thickness), h (weld leg vertical), s (penetration depth), r (weld leg horizontal), and Alpha (weld angle).

Set welded parts by Elements

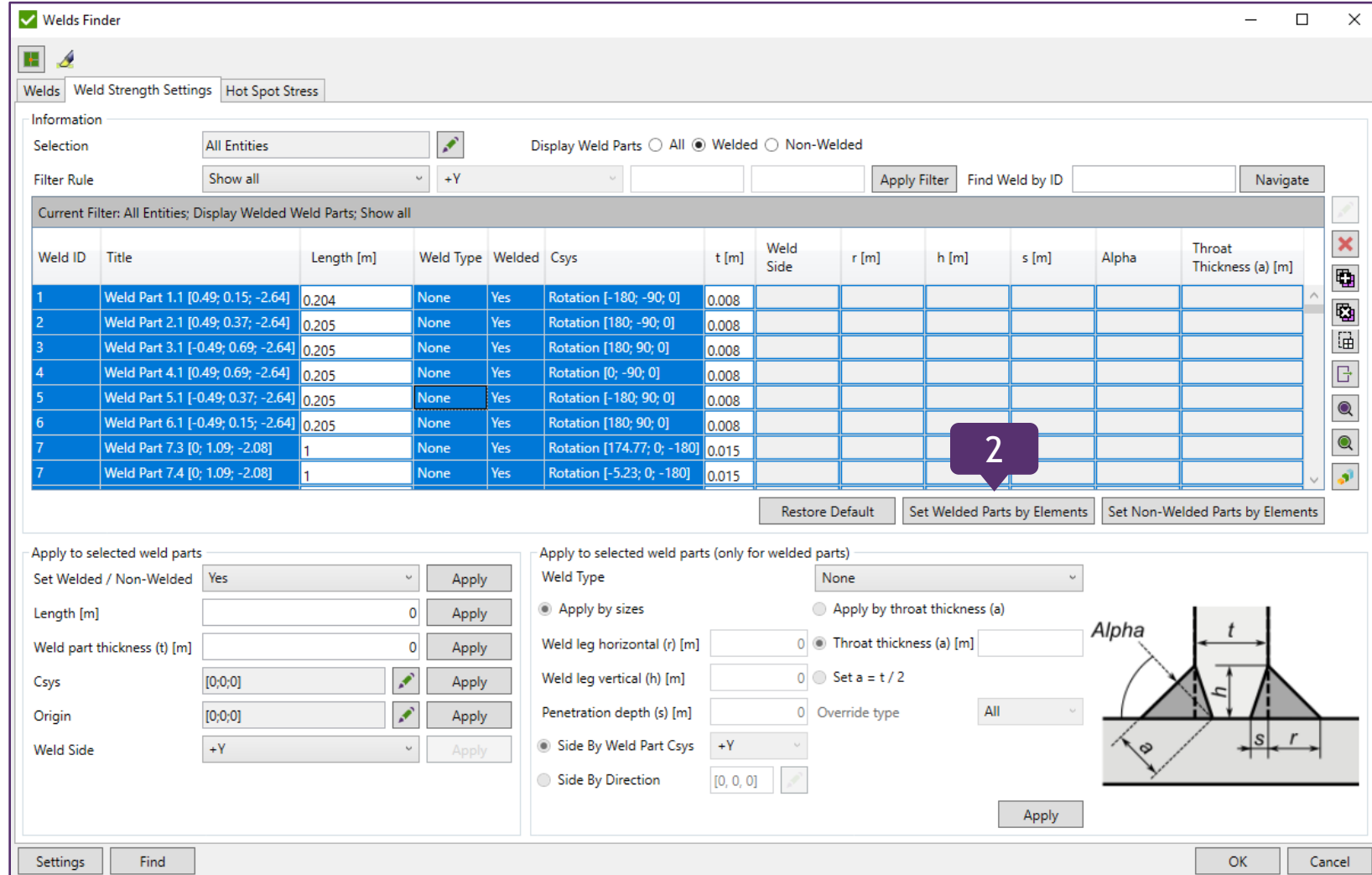
1

Select all welds part by pressing **Ctrl+A** keys combination.

2

Press **Set welded parts by Elements** to find weld parts by elements.

It includes them in weld strength calculations (also this command could be performed for few or single weld part).



Welds Finder

Welds | Weld Strength Settings | Hot Spot Stress

Information
Selection: All Entities | Display Weld Parts: ☐ All ☒ Welded ☐ Non-Welded
Filter Rule: Show all | +Y | Apply Filter | Find Weld by ID | Navigate

Current Filter: All Entities; Display Welded Weld Parts; Show all

Weld ID	Title	Length [m]	Weld Type	Welded	Csys	t [m]	Weld Side	r [m]	h [m]	s [m]	Alpha	Throat Thickness (a) [m]
1	Weld Part 1.1 [0.49; 0.15; -2.64]	0.204	None	Yes	Rotation [-180; -90; 0]	0.008						
2	Weld Part 2.1 [0.49; 0.37; -2.64]	0.205	None	Yes	Rotation [180; -90; 0]	0.008						
3	Weld Part 3.1 [-0.49; 0.69; -2.64]	0.205	None	Yes	Rotation [180; 90; 0]	0.008						
4	Weld Part 4.1 [0.49; 0.69; -2.64]	0.205	None	Yes	Rotation [0; -90; 0]	0.008						
5	Weld Part 5.1 [-0.49; 0.37; -2.64]	0.205	None	Yes	Rotation [-180; 90; 0]	0.008						
6	Weld Part 6.1 [-0.49; 0.15; -2.64]	0.205	None	Yes	Rotation [180; 90; 0]	0.008						
7	Weld Part 7.3 [0; 1.09; -2.08]	1	None	Yes	Rotation [174.77; 0; -180]	0.015						
7	Weld Part 7.4 [0; 1.09; -2.08]	1	None	Yes	Rotation [-5.23; 0; -180]	0.015						

Restore Default | Set Welded Parts by Elements | Set Non-Welded Parts by Elements

Apply to selected weld parts

Set Welded / Non-Welded: Yes | Apply

Length [m]: 0 | Apply

Weld part thickness (t) [m]: 0 | Apply

Csys: [0;0;0] | Apply

Origin: [0;0;0] | Apply

Weld Side: +Y | Apply

Apply to selected weld parts (only for welded parts)

Weld Type: None

☒ Apply by sizes ☐ Apply by throat thickness (a)

Weld leg horizontal (r) [m]: 0 ☒ Throat thickness (a) [m]:

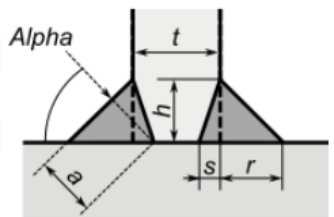
Weld leg vertical (h) [m]: 0 ☐ Set a = t / 2

Penetration depth (s) [m]: 0 Override type: All

☒ Side By Weld Part Csys: +Y ☐ Side By Direction: [0, 0, 0]

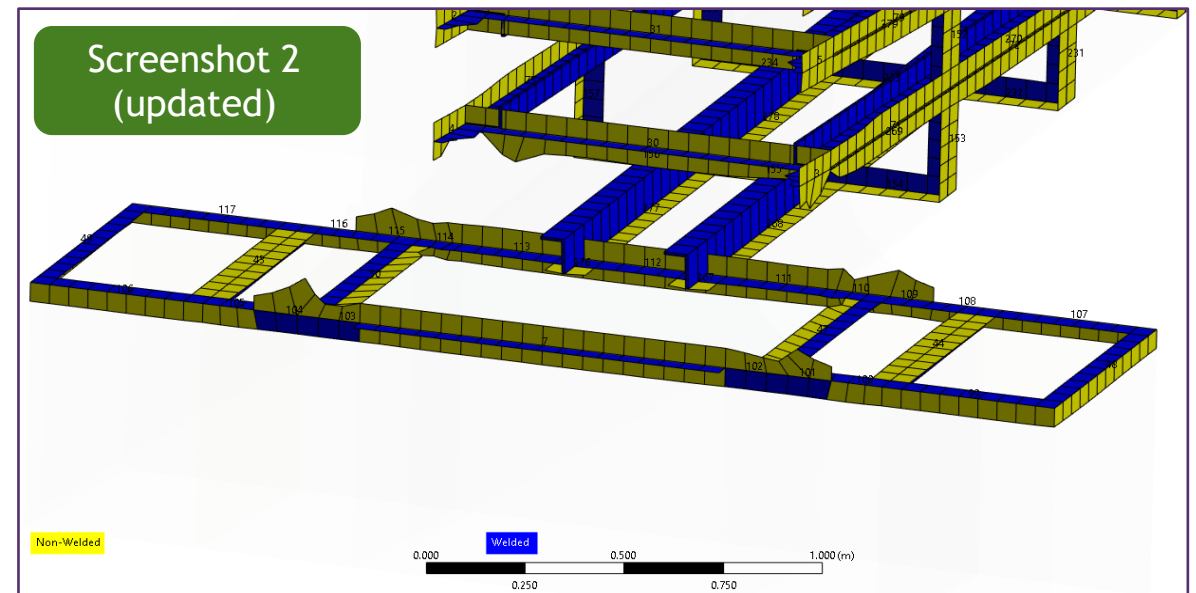
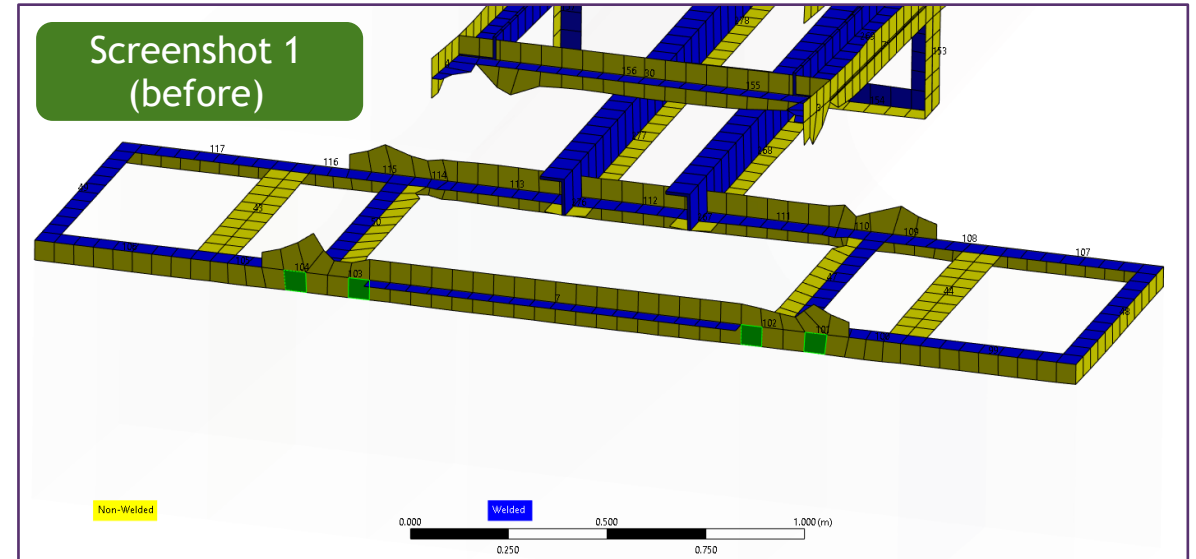
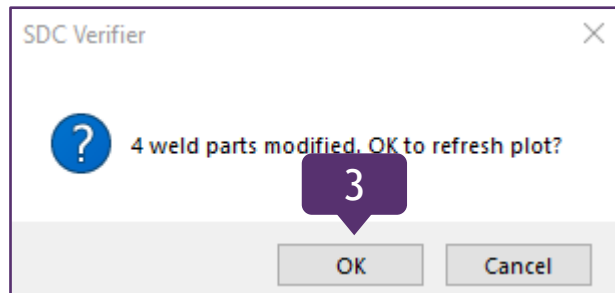
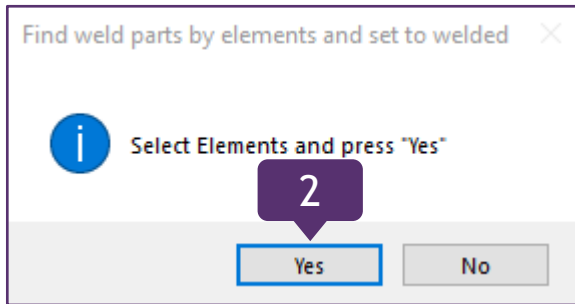
Apply

Settings | Find | OK | Cancel



Set weld part type welded

- 1 Select elements according to Screenshot 1.
- 2 Press *OK*.
- 3 Press *OK*.



Set weld parameters

1

Select all welds part by pressing **Ctrl+A** keys combination

2

Select the type of weld **Double fillet**.

3

Choose the method: **Apply by throat thickness**.

4

Select type **Set $a = t / 2$** (half of thickness welded plate).

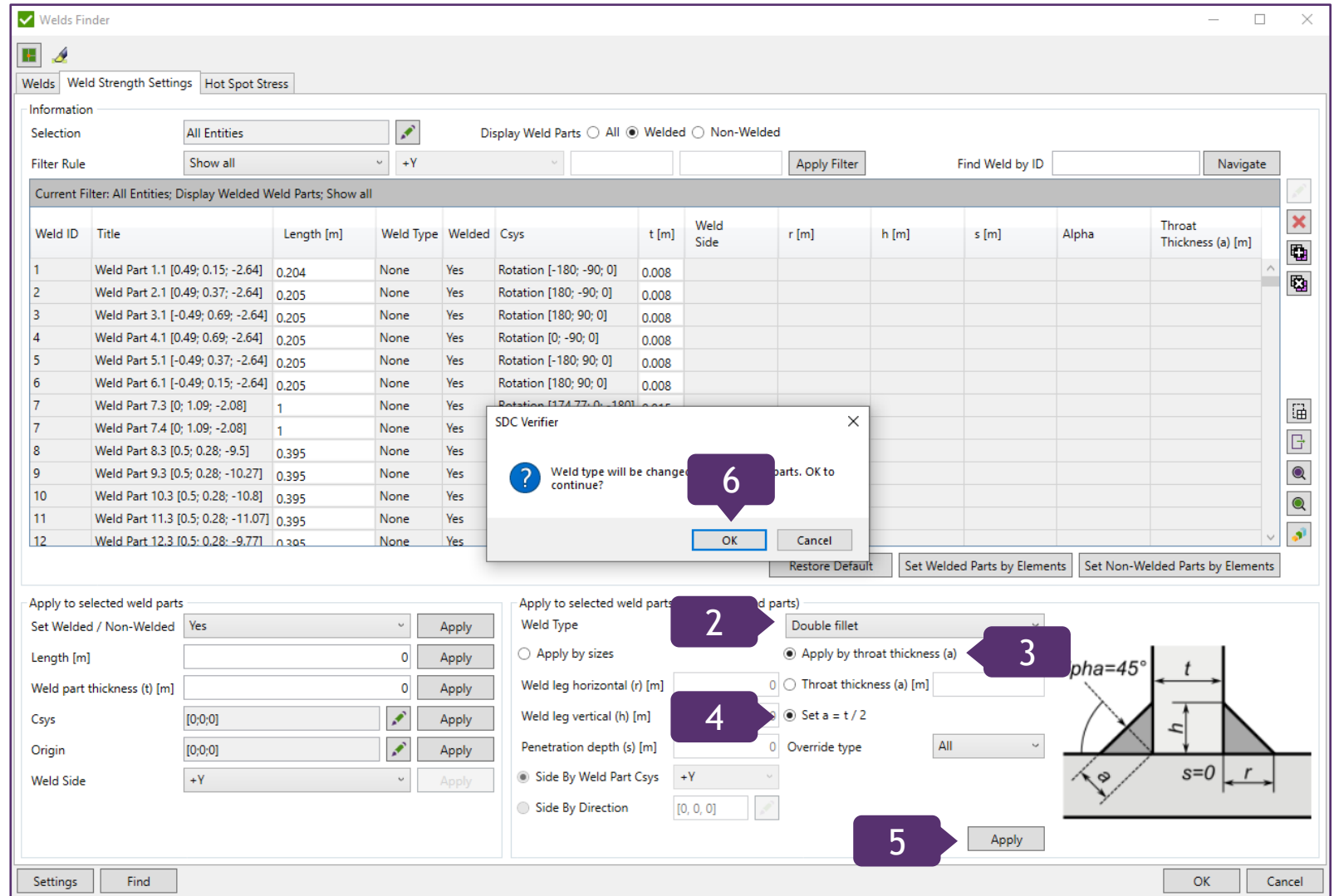
5

Press **Apply**.

6

Press **OK**.

For beams elements t is the minimum thickness of shape. For bars element t is the minimum of height/width. For plates element t is a plate thickness.



Export Welds

1 Select all welds by pressing Ctrl+A keys combination and Press **Export weld**.

2 Select **Export welds**.

3 Press **Export**.

4 Press **OK** twice

Export

☒ Export Related Welds (284)

☒ Export Weld Parts (290)

Export Types

☒ Single Component

Title

☐ Single Named Selection

Title

☐ Separate Components

☐ Separate Named Selections

Export **Close**

Welds Finder

Welds Weld Strength Settings Hot Spot Stress

Information

Selection Display Weld Parts ☐ All ☒ Welded ☐ Non-Welded

Filter Rule **Apply Filter** Find Weld by ID **Navigate**

Current Filter: All Entities; Display Welded Weld Parts; Show all

Weld ID	Title	Length [m]	Weld Type	Welded	Csys	t [m]	Weld Side	r [m]	h [m]	s [m]	Alpha	Throat Thickness (a) [m]
1	Weld Part 1.1 [0.49; 0.15; -2.64]	0.204	Double fillet	Yes	Rotation [-180; -90; 0]	0.008		0.005656854	0.005656854		45	0.004
2	Weld Part 2.1 [0.49; 0.37; -2.64]	0.205	Double fillet	Yes	Rotation [180; -90; 0]	0.008		0.005656854	0.005656854		45	0.004
3	Weld Part 3.1 [-0.49; 0.69; -2.64]	0.205	Double fillet	Yes	Rotation [180; 90; 0]	0.008		0.005656854	0.005656854		45	0.004
4	Weld Part 4.1 [0.49; 0.69; -2.64]	0.205	Double fillet	Yes	Rotation [0; -90; 0]	0.008		0.005656854	0.005656854		45	0.004
5	Weld Part 5.1 [-0.49; 0.37; -2.64]	0.205	Double fillet	Yes	Rotation [-180; 90; 0]	0.008		0.005656854	0.005656854		45	0.004
6	Weld Part 6.1 [-0.49; 0.15; -2.64]	0.205	Double fillet	Yes	Rotation [180; 90; 0]	0.008		0.005656854	0.005656854		45	0.004
7	Weld Part 7.3 [0; 1.09; -2.08]	1	Double fillet	Yes							45	0.0075
7	Weld Part 7.4 [0; 1.09; -2.08]	1	Double fillet	Yes							45	0.00
8	Weld Part 8.3 [0.5; 0.28; -9.5]	0.395	Double fillet	Yes							45	0.00
9	Weld Part 9.3 [0.5; 0.28; -10.27]	0.395	Double fillet	Yes							45	0.004
10	Weld Part 10.3 [0.5; 0.28; -10.8]	0.395	Double fillet	Yes							45	0.004
11	Weld Part 11.3 [0.5; 0.28; -11.07]	0.395	Double fillet	Yes							45	0.004
12	Weld Part 12.3 [0.5; 0.28; -9.77]	0.395	Double fillet	Yes							45	0.004

SDC Verifier

2 Component(s) and 0 Groups were created.

OK

Apply to selected weld parts

Set Welded / Non-Welded **Apply**

Length [m] **Apply**

Weld part thickness (t) [m] **Apply**

Csys **Apply**

Origin **Apply**

Weld Side **Apply**

Apply to selected weld parts (only for welded parts)

Weld Type

☐ Apply by sizes ☒ Apply by throat thickness (a)

Weld leg horizontal (r) [m] ☐ Throat thickness (a) [m]

Weld leg vertical (h) [m] ☒ Set a = t / 2

Penetration depth (s) [m] Override type

☒ Side By Weld Part Csys

☐ Side By Direction

Apply

Settings Find

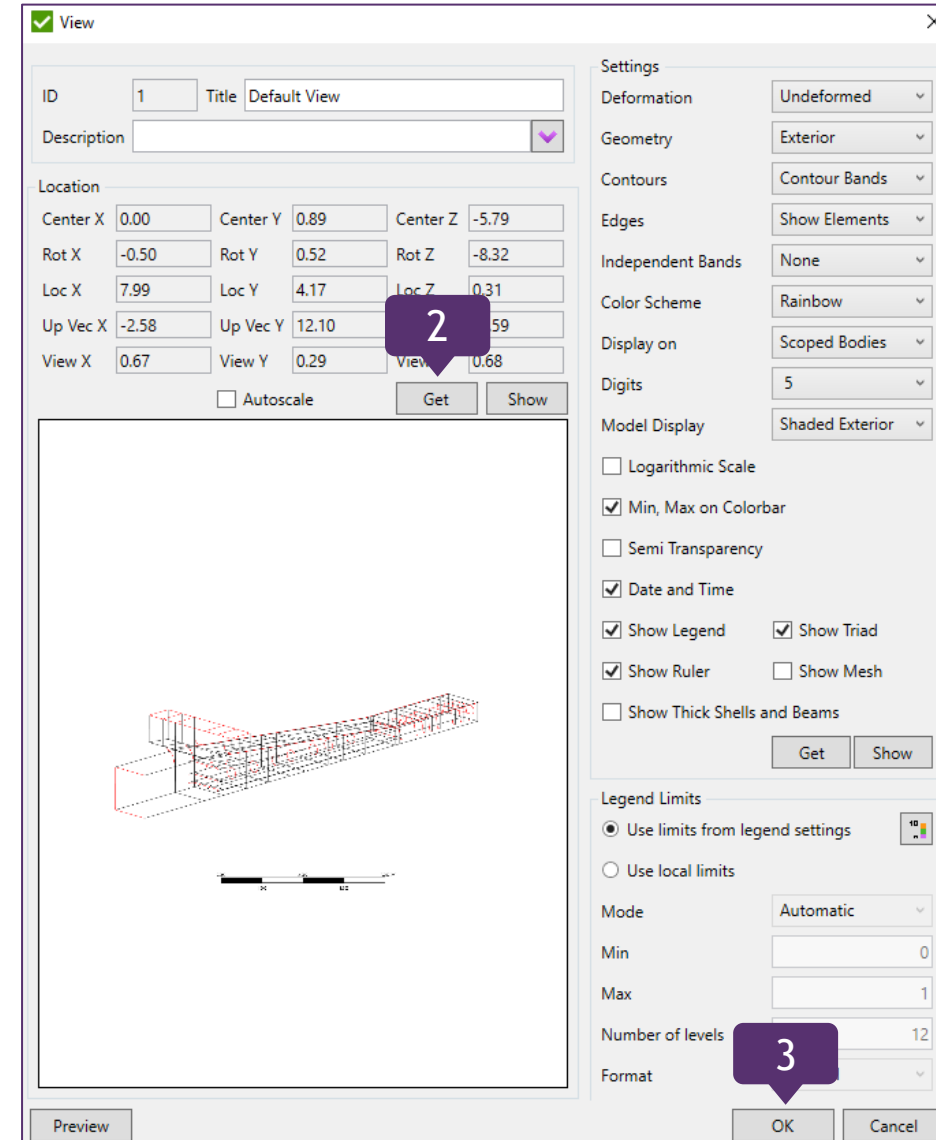
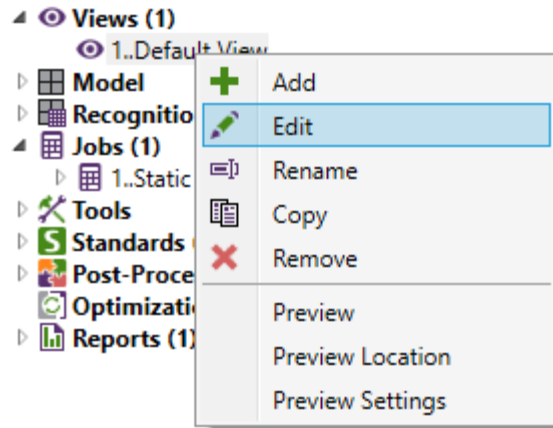
OK Cancel

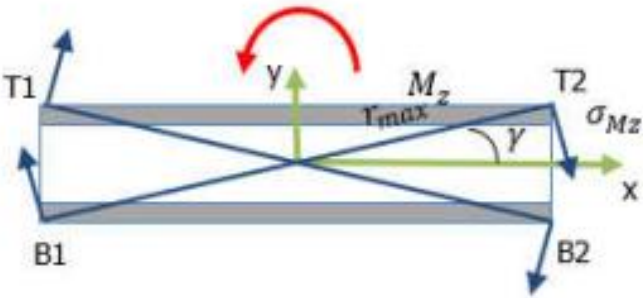
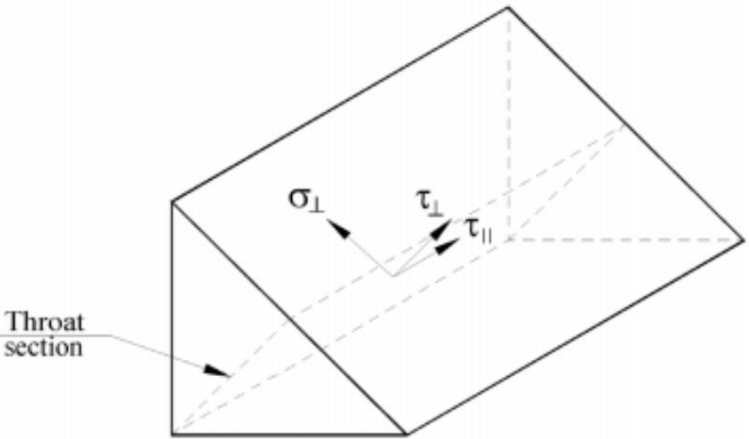
View

1 View -> **Default View** -> **Edit**

2 Locate View in Mechanical as shown on picture and press **Get**.

3 Press **OK**.





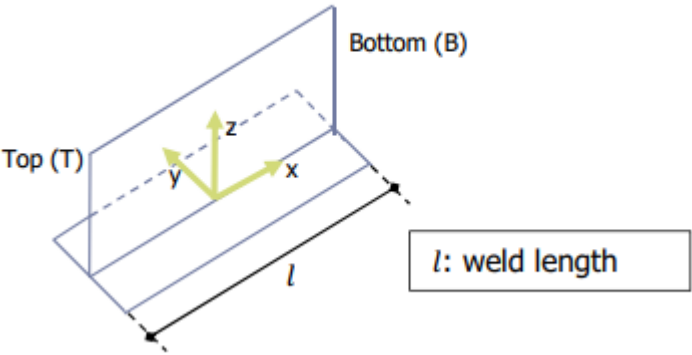
Moments depend on the axis in a weld plane and are also included in the weld strength calculations

The stresses \parallel , and are evaluated at the points T1, T2, B1 and B2 as follows:

τ_{\parallel} = shear design stress (in plane of the throat) parallel to the axis of the weld (equal to X direction in the check); σ_{\perp} = normal design stress perpendicular to the throat (equal to Y direction of the check); τ_{\perp} = shear design stress (in plane of the throat) perpendicular to the axis of the weld (equal to XY direction of the check)

Angles matrix of rotations due to weld throat plane.

Stress calculations



$\tau_{\parallel,T1}$	1	0	0	0	0	$-\sin \gamma$
$\sigma_{\perp,T1}$	0	$-\sin \alpha$	$\cos \alpha$	$\cos \alpha$	$\cos \alpha$	$\cos \gamma * \sin \alpha$
$\tau_{\perp,T1}$	0	$-\cos \alpha$	$-\sin \alpha$	$-\sin \alpha$	$-\sin \alpha$	$\cos \gamma * \cos \alpha$
$\tau_{\parallel,T2}$	1	0	0	0	0	$-\sin \gamma$
$\sigma_{\perp,T2}$	0	$-\sin \alpha$	$\cos \alpha$	$\cos \alpha$	$-\cos \alpha$	$-\cos \gamma * \sin \alpha$
$\tau_{\perp,T2}$	0	$-\cos \alpha$	$-\sin \alpha$	$-\sin \alpha$	$\sin \alpha$	$-\cos \gamma * \cos \alpha$
$\tau_{\parallel,B1}$	1	0	0	0	0	$\sin \gamma$
$\sigma_{\perp,B1}$	0	$\sin \alpha$	$\cos \alpha$	$-\cos \alpha$	$\cos \alpha$	$-\cos \gamma * \sin \alpha$
$\tau_{\perp,B1}$	0	$\cos \alpha$	$-\sin \alpha$	$\sin \alpha$	$-\sin \alpha$	$-\cos \gamma * \cos \alpha$
$\tau_{\parallel,B2}$	1	0	0	0	0	$\sin \gamma$
$\sigma_{\perp,B2}$	0	$\sin \alpha$	$\cos \alpha$	$-\cos \alpha$	$-\cos \alpha$	$\cos \gamma * \sin \alpha$
$\tau_{\perp,B2}$	0	$\cos \alpha$	$-\sin \alpha$	$\sin \alpha$	$\sin \alpha$	$\cos \gamma * \cos \alpha$

$$\frac{F_x}{A_w} \frac{F_y}{A_w} \frac{F_z}{A_w} * \frac{M_x}{I_x} d_y \frac{M_y}{I_y} d_x \frac{M_z * r_{max}}{I_p}$$

Implementation of weld stresses

Weld Check (built-in, not editable)

ID: 3 Title: Throat stresses for T1 point

Alias: Stresses_T1

Description:

Options

Selected Welds: 227 Welds

☒ Calculate Results over Directions

☒ Show Parameter Description

Parameters (7) / Replacements (0)

Parameter = S Fx (Throat stress due to Fx)
All: 0
X: Weld.Fx_Summed / Dimensions.Aw

Parameter = S Fy (Throat stress due to Fy)
All: 0
Y: -Weld.Fy_Summed / Dimensions.Aw * sin (Dimensions.Alpha_rad)
XY: -Weld.Fy_Summed / Dimensions.Aw * cos (Dimensions.Alpha_rad)

Parameter = S Fz (Throat stress due to Fz)
All: 0
Y: Weld.Fz_Summed / Dimensions.Aw * cos (Dimensions.Alpha_rad)
XY: -Weld.Fz_Summed / Dimensions.Aw * sin (Dimensions.Alpha_rad)

Parameter = S Mx (Throat stress due to Mx)
All: 0
Y: Weld.Mx_Summed / Dimensions.Wx * cos (Dimensions.Alpha_rad)
XY: -Weld.Mx_Summed / Dimensions.Wx * sin (Dimensions.Alpha_rad)

Parameter = S My (Throat stress due to My)
All: 0
Y: Weld.My_Summed / Dimensions.Wy * cos (Dimensions.Alpha_rad)
XY: -Weld.My_Summed / Dimensions.Wy * sin (Dimensions.Alpha_rad)

Parameter = S Mz (Throat stress due to Mz)
All: 0
X: -Weld.Mz_Summed * Dimensions.Rmax / Dimensions.Ip * sin (Dimensions.Gamma_rad)
Y: Weld.Mz_Summed * Dimensions.Rmax / Dimensions.Ip * cos (Dimensions.Gamma_rad) * sin (Dimensions.Alpha_rad)
XY: Weld.Mz_Summed * Dimensions.Rmax / Dimensions.Ip * cos (Dimensions.Gamma_rad) * cos (Dimensions.Alpha_rad)

Parameter = S Total (Throat stress total)
All: S Fx + S Fy + S Fz + S Mx + S My + S Mz
Equivalent: sqrt(pow(me.y, 2) + 3 * (pow(me.x, 2) + pow(me.xy, 2)))

Clear results Find Parameters OK Cancel

$$\begin{matrix} \tau_{||,Mz} \\ \sigma_{\beta,Mz} \\ \tau_{\beta,Mz} \end{matrix}$$

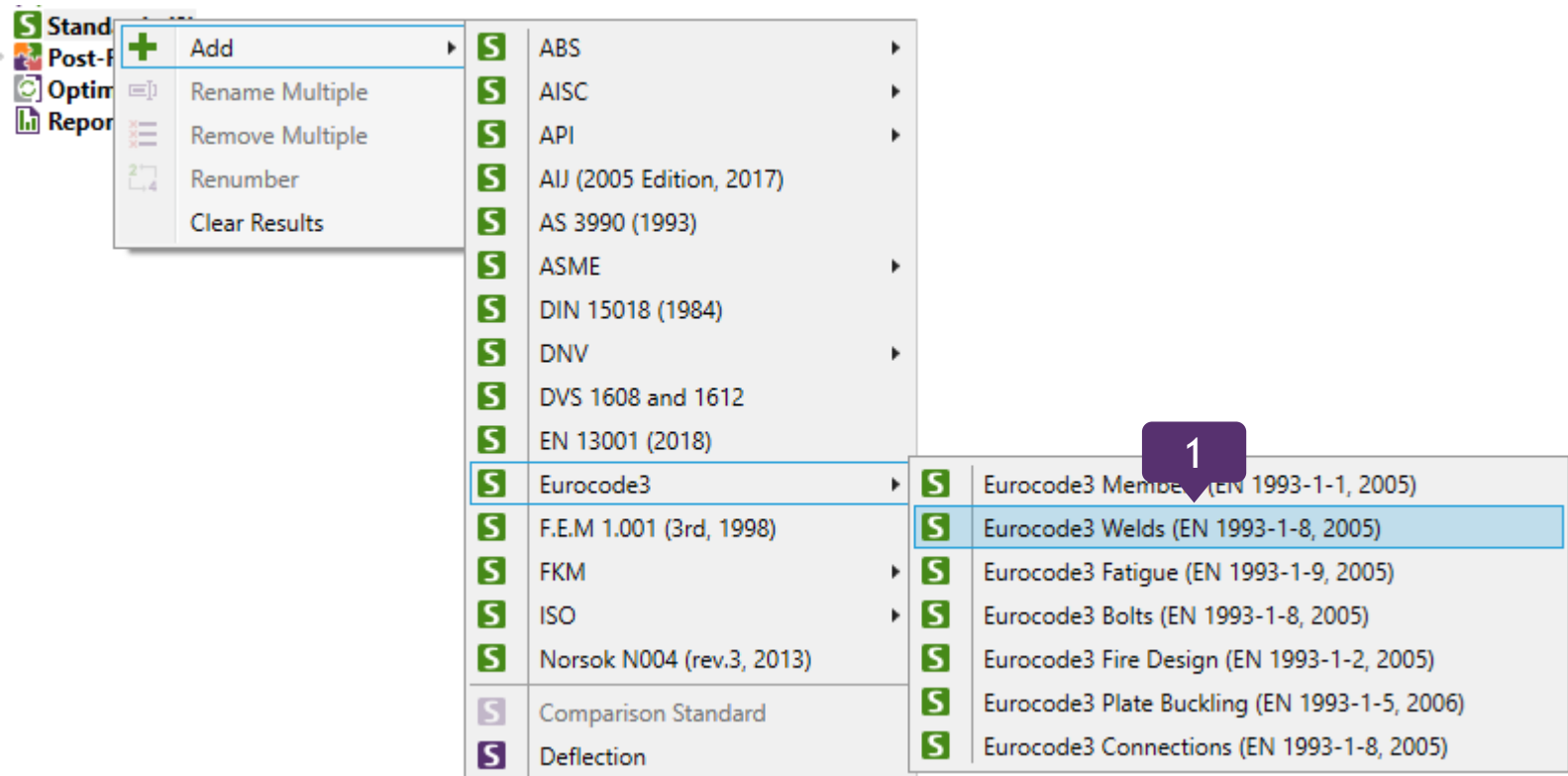
$$\begin{aligned} \tau_{||} &= \tau_{||,Fx} + \tau_{||,Fy} + \tau_{||,Fz} + \tau_{||,Mx} + \tau_{||,My} + \tau_{||,Mz} \\ \sigma_{\beta} &= \sigma_{\beta,Fx} + \sigma_{\beta,Fy} + \sigma_{\beta,Fz} + \sigma_{\beta,Mx} + \sigma_{\beta,My} + \sigma_{\beta,Mz} \\ \tau_{\beta} &= \tau_{\beta,Fx} + \tau_{\beta,Fy} + \tau_{\beta,Fz} + \tau_{\beta,Mx} + \tau_{\beta,My} + \tau_{\beta,Mz} \end{aligned}$$

$$\sigma_{VM} = \sqrt{\sigma_{\perp}^2 + 3 * (\tau_{\perp}^2 + \tau_{||}^2)}$$

Von Mises stress at certain point.

Add Eurocode3 (EN1993-1-8)

1 Execute **Add -> Eurocode3 Weld**
(EN 1993-1-8. 2005) in the Standards context menu.



Eurocode3 Weld (EN 1993-1-8. 2005) Design of joints is implemented to verify the structure stability of each structural member (weld).

1

Press the button  to select the **Correction factor**.

2

Select the material for which the **Correction factor** will be applied.

3

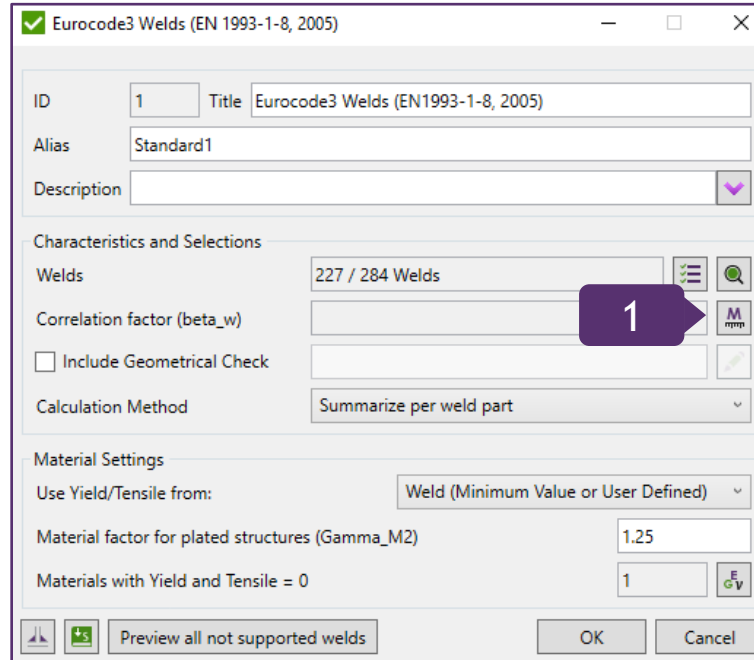
Input value of the **Correction factor** according to the table 4.1, and press **Apply to selected**.

4

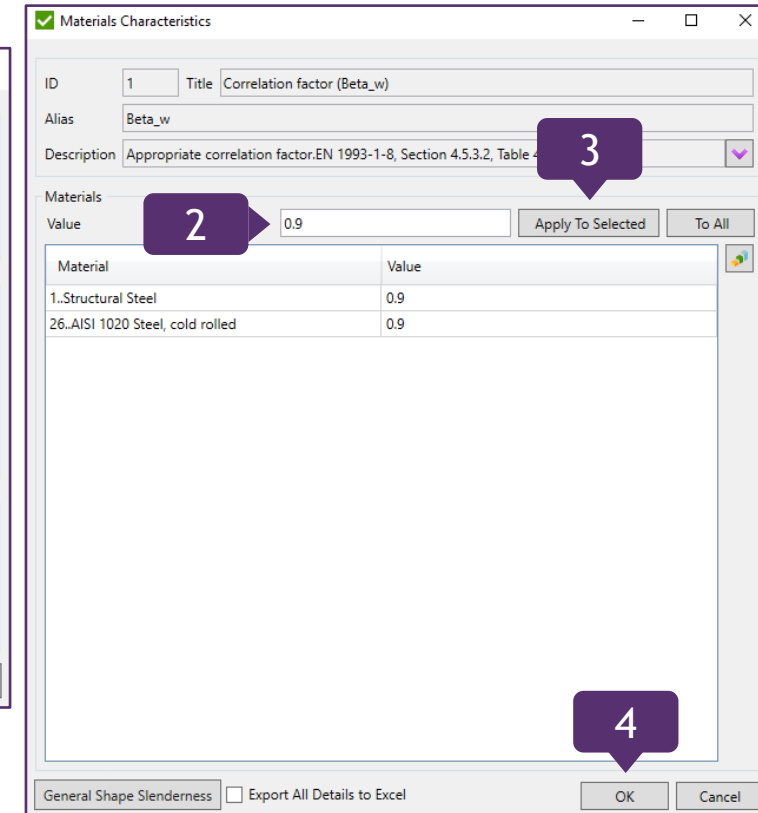
Press **OK**.

Table 4.1: Correlation factor β_w for fillet welds

Standard and steel grade			Correlation factor β_w
EN 10025	EN 10210	EN 10219	
S 235 S 235 W	S 235 H	S 235 H	0,8
S 275 S 275 N/NL S 275 M/ML	S 275 H S 275 NH/NLH	S 275 H S 275 NH/NLH S 275 MH/MLH	0,85
S 355 S 355 N/NL S 355 M/ML S 355 W	S 355 H S 355 NH/NLH	S 355 H S 355 NH/NLH S 355 MH/MLH	0,9
S 420 N/NL S 420 M/ML		S 420 MH/MLH	1,0
S 460 N/NL S 460 M/ML S 460 Q/QL/QL1	S 460 NH/NLH	S 460 NH/NLH S 460 MH/MLH	1,0



Weld Selection gives a possibility to include or exclude weld(s), preview chosen weld(s) or go to weld finder.



1

Press the button  to apply **Material Yield and Tensile** parameters.

2

Select the material for which the **Properties** will be applied.

3

Input value of the **Material Yield and Tensile** parameters, and press *Set*.

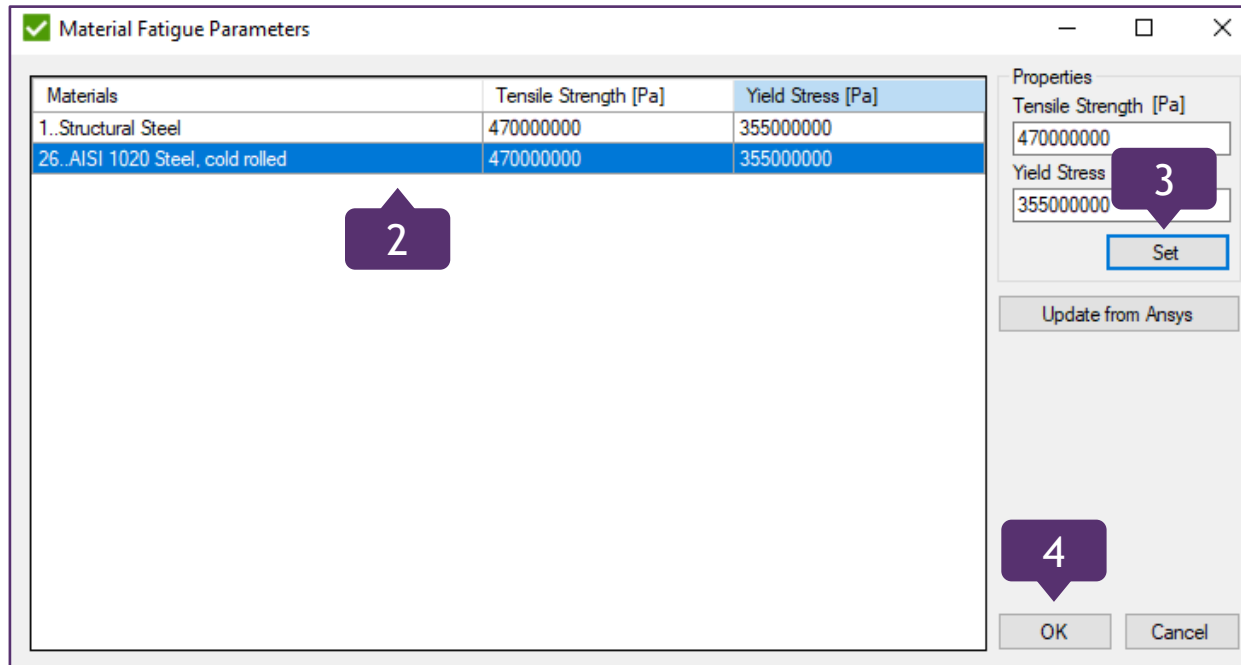
4

Press *OK*.

5

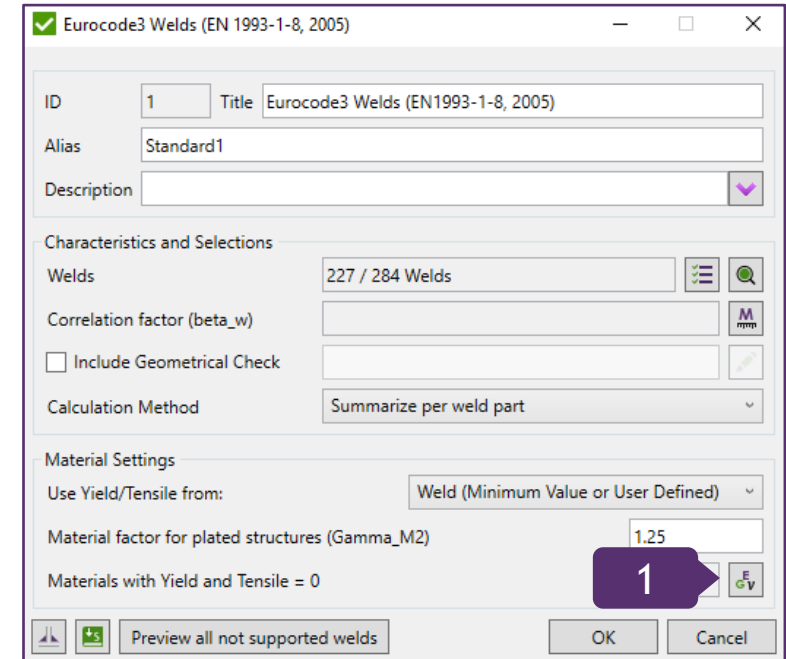
Press *OK*.

Gamma_M2 - material resistance factor for plated structures is a constant value (=1.25) and used in calculations to check a base material strength.



The dialog box 'Material Fatigue Parameters' contains a table with two columns: 'Materials' and 'Yield Stress [Pa]'. The first row is '1...Structural Steel' with a yield stress of 355000000. The second row is '26..AISI 1020 Steel, cold rolled' with a yield stress of 355000000. A callout '2' points to the second row. To the right of the table, there are input fields for 'Tensile Strength [Pa]' (470000000) and 'Yield Stress' (355000000), with a callout '3' pointing to the 'Yield Stress' field. Below these fields is a 'Set' button. At the bottom of the dialog are 'Update from Ansys', 'OK', and 'Cancel' buttons. A callout '4' points to the 'OK' button.

Materials	Tensile Strength [Pa]	Yield Stress [Pa]
1...Structural Steel	470000000	355000000
26..AISI 1020 Steel, cold rolled	470000000	355000000




The dialog box 'Eurocode3 Welds (EN 1993-1-8, 2005)' has several sections. The 'Characteristics and Selections' section includes 'Welds' (227 / 284 Welds), 'Correlation factor (beta_w)', 'Include Geometrical Check' (unchecked), and 'Calculation Method' (Summarize per weld part). The 'Material Settings' section includes 'Use Yield/Tensile from:' (Weld (Minimum Value or User Defined)), 'Material factor for plated structures (Gamma_M2)' (1.25), and 'Materials with Yield and Tensile = 0'. A callout '1' points to the 'Gamma_M2' field. At the bottom are 'Preview all not supported welds', 'OK', and 'Cancel' buttons. A callout '5' points to the 'OK' button.

Create extreme table

1

Execute **Extreme Table** in the **Weld Check Total** context menu.

2

Press the  button and select **Load Group 1**.

3

Press **OK**.

4

Select **Extreme**.

5

Selection: **All Entities**.

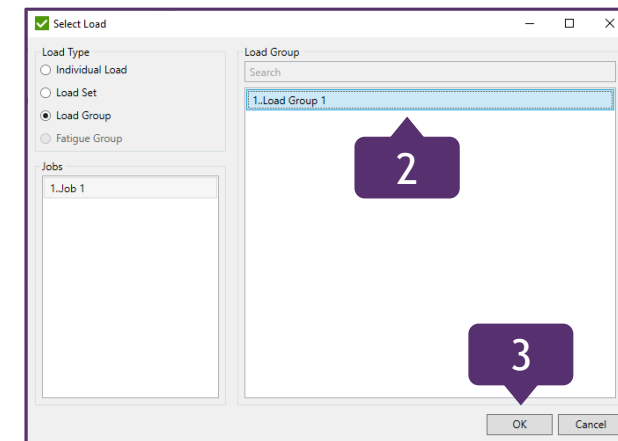
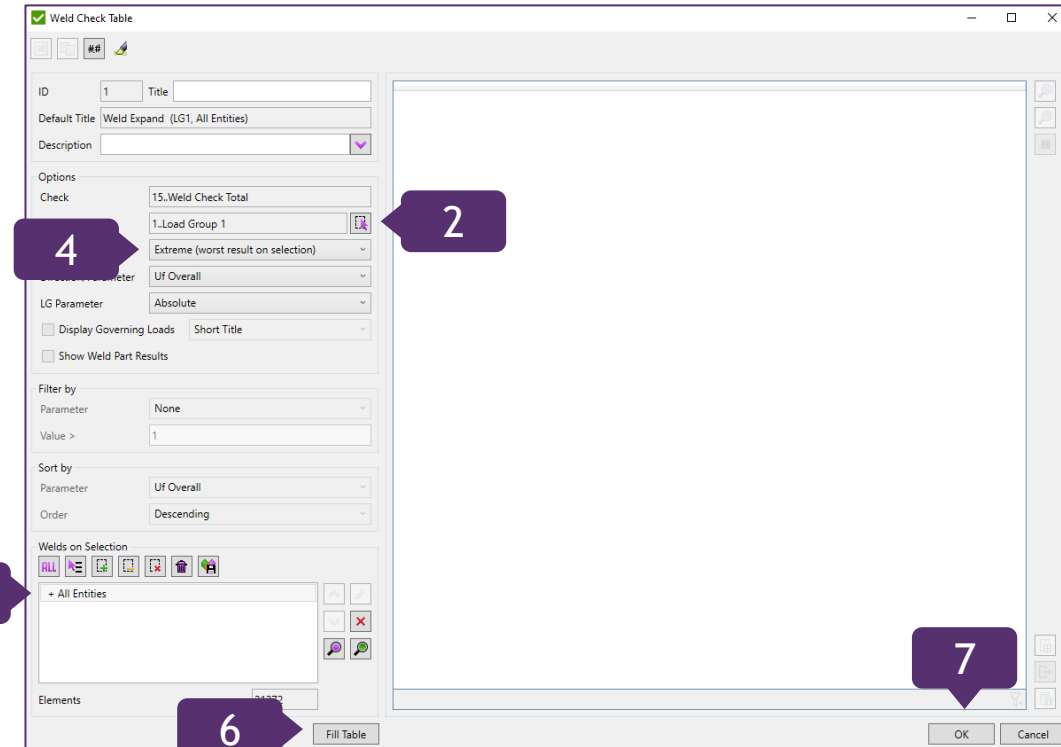
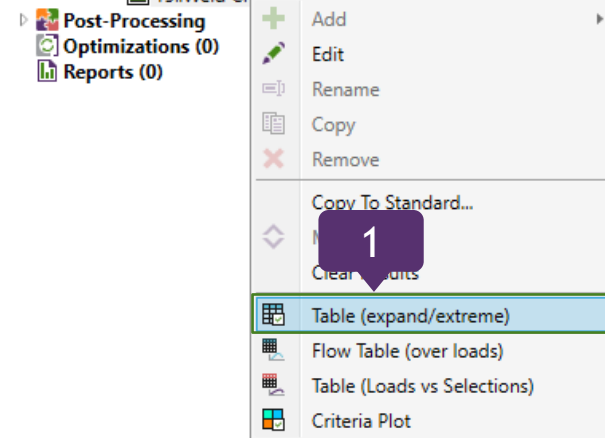
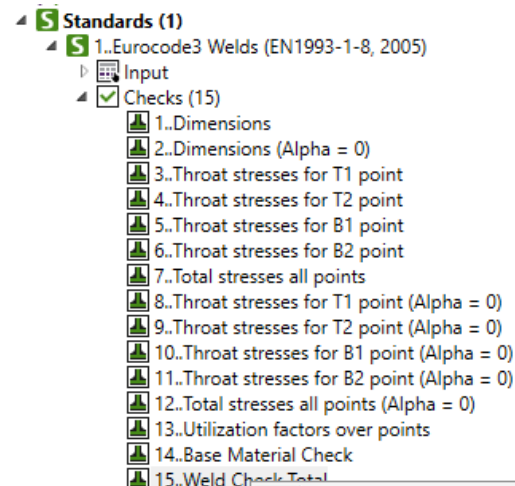
6

Press **Fill Table**.

7

Press **OK**.

Extreme table for '1..Load Group 1' can be added to DNV OS-C101 and DNV OS-C201 standards respectively.



Create criteria plot

1

Execute *Criteria Plot* in the *Weld Strength Check* context menu

2

Load: *Load Group 1*;
Parameter: *UF Overall*.

3

Press *Save as component*.

4

Name *All Welds*.

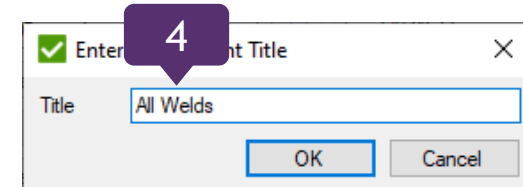
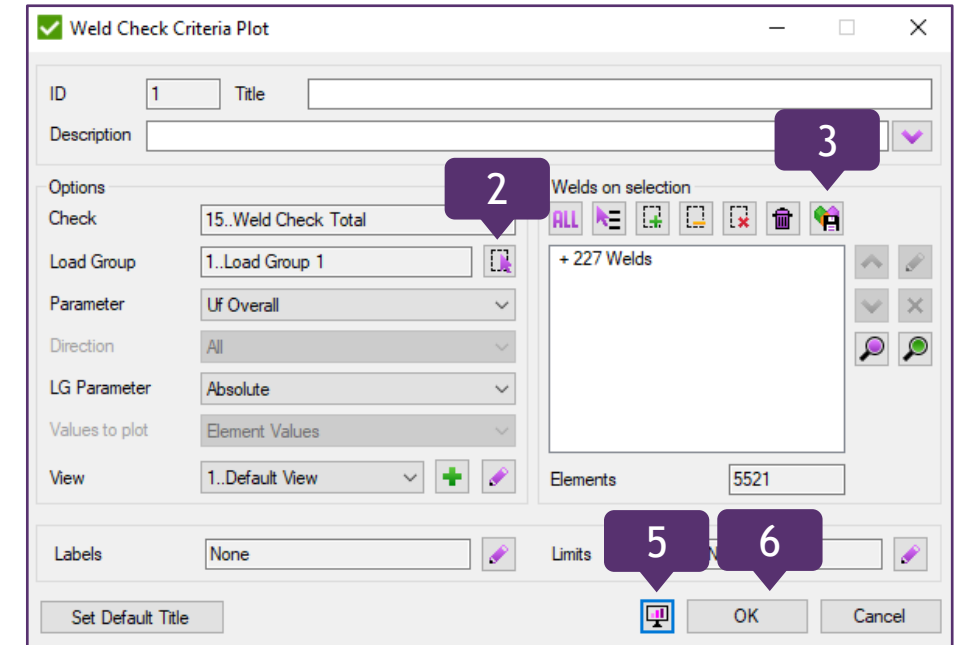
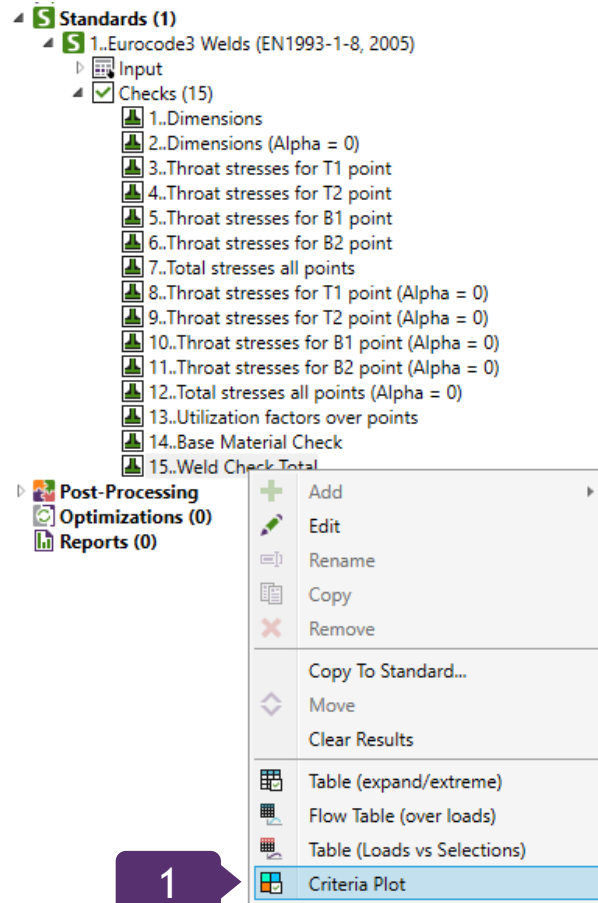
5

Press the  to preview Plot in Femap

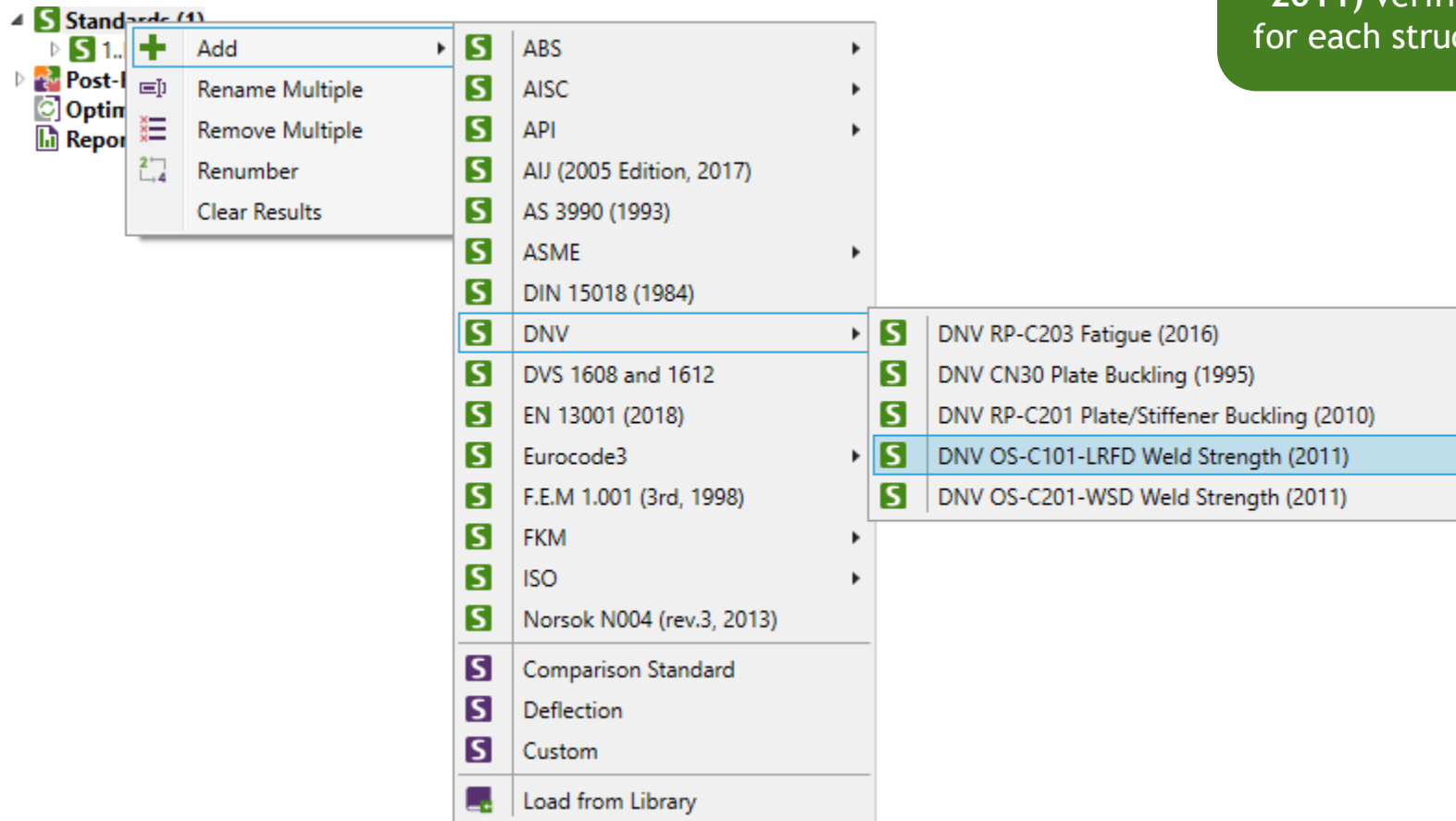
6

Press *OK*.

Criteria plot for '1..Load Group 1'
can be added to DNV OS-C101 and
DNV OS-C201 standards respectively.



- 1 Execute **Add -> DNV -> DNV OS-C101-LRFD Weld Strength (2011)** in the Standards context menu.



The offshore standard DNV OS-C101 (released in April, 2011) verifies structural stability for each structural member (weld).

1

Press the button  to select the **Correction factor**.

2

Select the material for which the **Correction factor** will be applied.

3

Input value of the **Correction factor** according to the table.

4

Press **Apply to selected**.

5

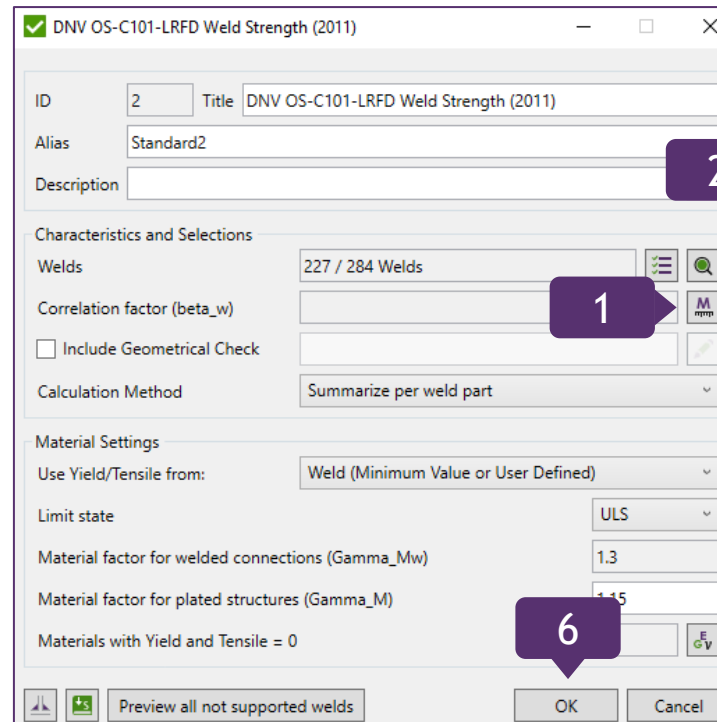
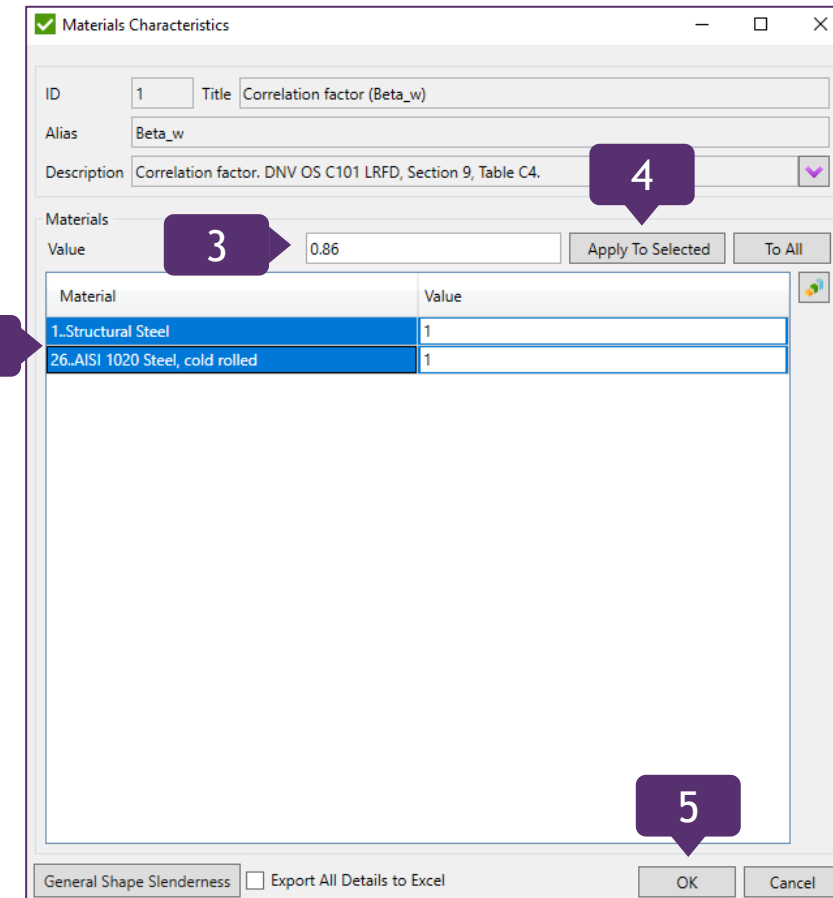
Press **OK**.

6

Press **OK**.

Steel grade	Lowest ultimate tensile strength f_u	Correlation factor β_w
NV NS	400	0.83
NV 27	400	0.83
NV 32	440	0.86
NV 36	490	0.89
NV 40	510	0.9
NV 420	530	1.0
NV 460	570	1.0

Weld Selection gives a possibility to include or exclude weld(s), preview chosen weld(s) or go to weld finder.

✓ DNV OS-C101-LRFD Weld Strength (2011)

ID: 2 Title: DNV OS-C101-LRFD Weld Strength (2011)

Alias: Standard2

Description:

Characteristics and Selections

Welds: 227 / 284 Welds

Correlation factor (beta_w): Defined

☐ Include Geometrical Check

Calculation Method: Summarize per weld part

Material Settings

Use Yield/Tensile from: Weld (Minimum Value or User Defined)

Limit state: ULS

Material factor for welded connections (Gamma_Mw): 1.3

Material factor for plated structures (Gamma_M): 1.15

Materials with Yield and Tensile = 0

Preview all not supported welds

OK Cancel

Gamma_Mw - material factor that is used for DNV OS C 101 calculation can be found in Table C1, section 9 of the standard.

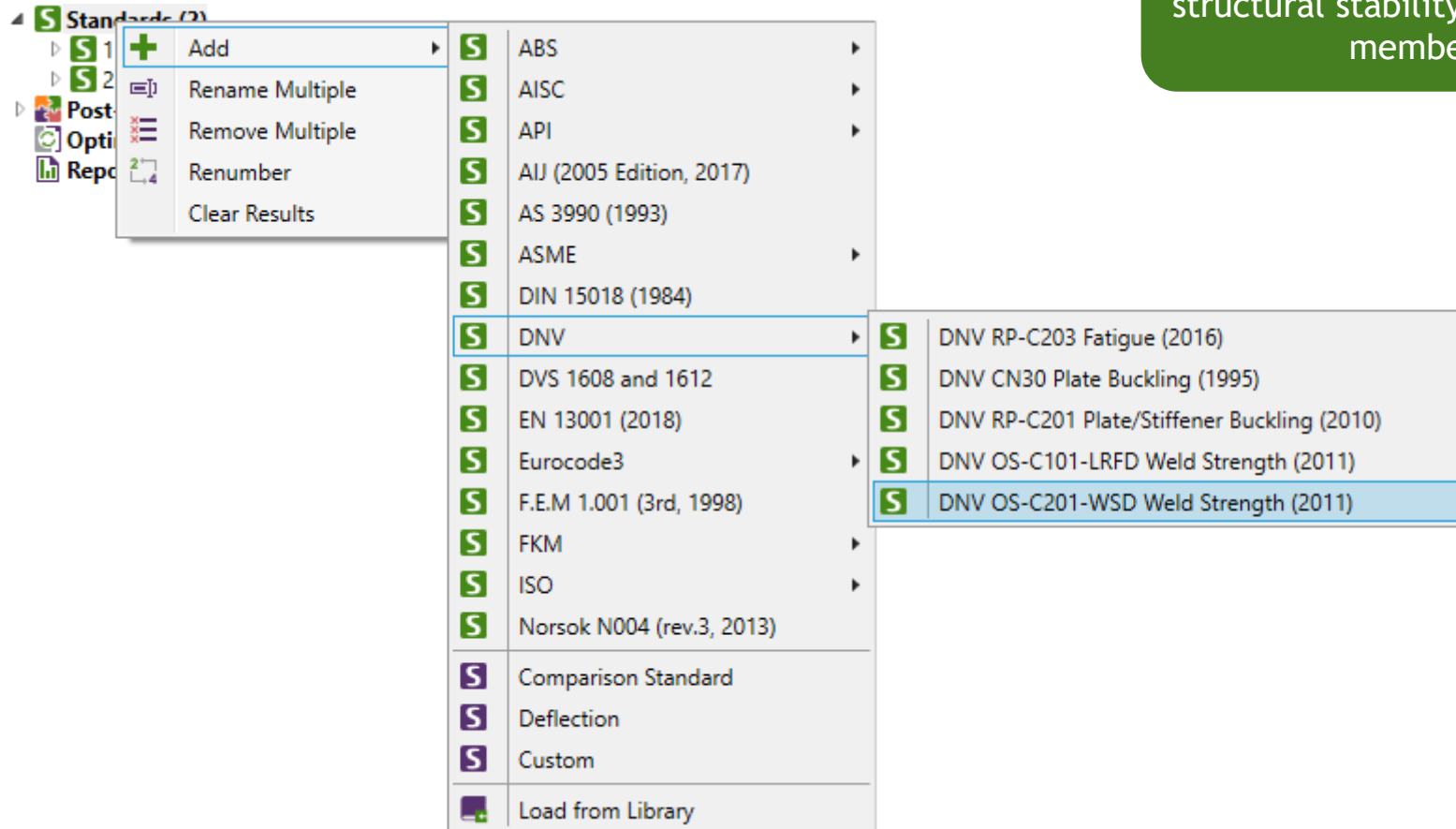
Gamma_M - material resistance factor for plated structures is a constant value (=1.15) and used in calculations to check base material strength.

101 The material factors γ_{Mw} for welded connections are given in Table C1.

Table C1 Material factors γ_{Mw} for welded connections	
Limit states	Material factor
ULS	1.3
ALS	1.0

1

Execute **Add** -> **DNV** -> **DNV OS-C201 WSD Weld Strength (2011)** in the Standards context menu.



The offshore standard **DNV OS-C201 (released in April, 2011)** verifies structural stability for each structural member (weld)

1

1

Press the button  to select the **Correction factor**.

2

Select the material for which the **Correction factor** will be applied.

3

Input value of the **Correction factor** according to the table.

4

Press **Apply to selected**.

5

Press **OK**.

6

Press **OK**.

Weld Selection gives a possibility to include or exclude weld(s), preview chosen weld(s) or go to weld finder.

DNV OS-C201-WSD Weld Strength (2011)


ID: 3 Title: DNV OS-C201-WSD Weld Strength (2011)

Alias: Standard3

Description:

Characteristics and Selections

Welds: 227 / 284 Welds

Correlation factor (beta_w): 

☐ Include Geometrical Check



Calculation Method: Summarize per weld part

Material Settings

Use Yield/Tensile from: Weld (Minimum Value or User Defined)

Materials with Yield and Tensile = 0

Material factor for plated structures (Gamma_M): 5

  Preview all not supported welds

OK Cancel


Materials Characteristics

ID: 1 Title: Correlation factor (Beta_w)

Alias: Beta_w

Description: Correlation factor. DNV OS C201 WSD, Section 9, Table C3.

Materials

Value: 0.86  Apply To Selected To All

Material	Value
1.Structural Steel	1
26.AISI 1020 Steel, cold rolled	1

General Shape Slenderness ☐ Export All Details to Excel

OK Cancel

Steel grade	Lowest ultimate tensile strength f_u	Correlation factor β_w
NV NS	400	0.83
NV 27	400	0.83
NV 32	440	0.86
NV 36	490	0.89
NV 40	510	0.9
NV 420	530	1.0
NV 460	570	1.0

Add Governing Load

1 Home -> Post Processing -> Governing Loads.


2 Result - from Check.

3 Standard: *Eurocode 3 Weld*.

4 Check: *Weld Check Total*.

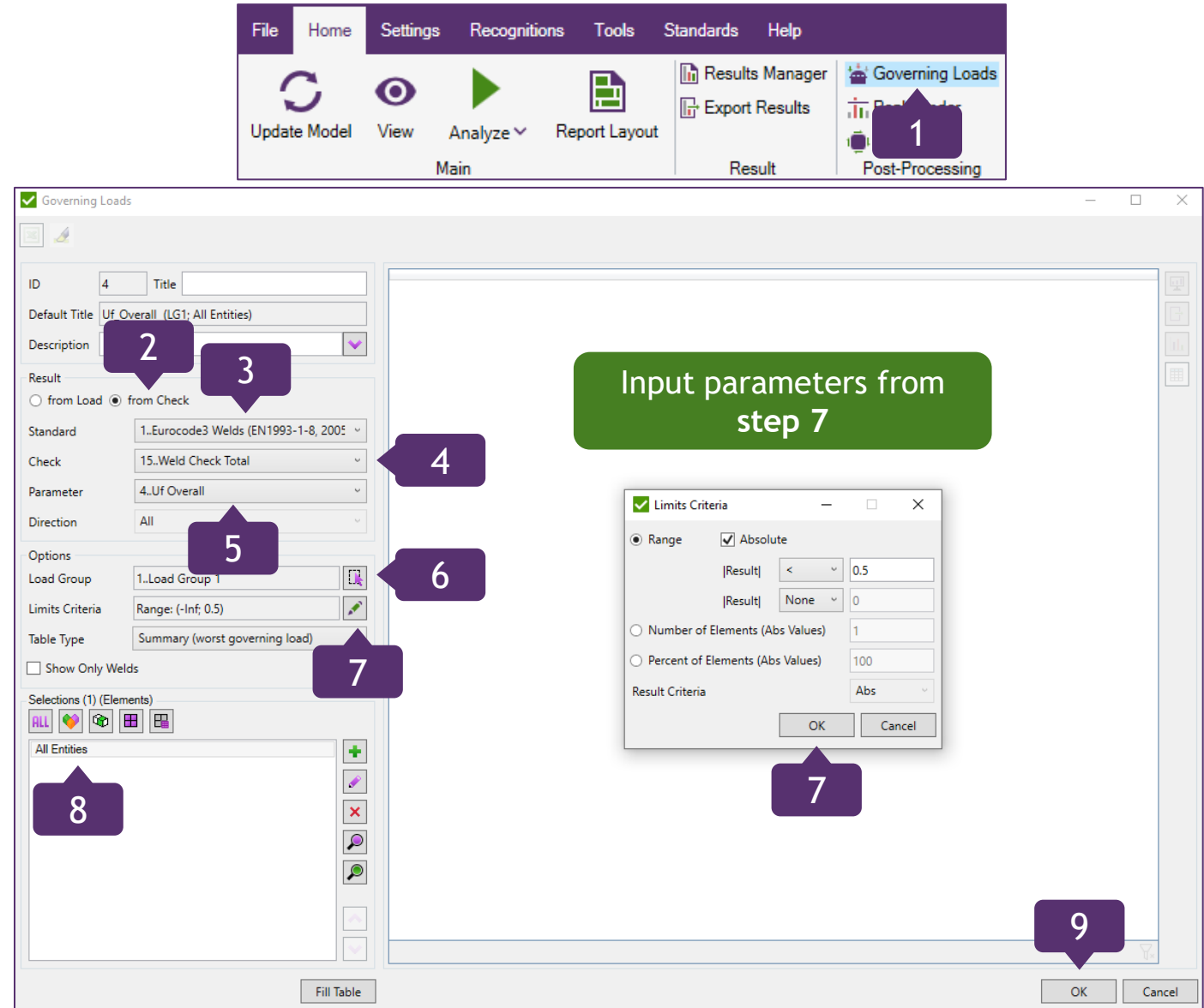
5 Parameter: *Uf Overall*.

6 Load Group: *Load Group 1*.

7 Press  in *Limits Criteria* -> *Absolute*; *Result* < 0.5 and press *OK*.

8 Selection: *All Entities*.

9 Press *OK*.



Add Governing Load (DNV)

1

Make the action as in 22,23 and 29 slide for
DNV OS-C101-LRFD Weld Strength (2011)

2

Make the action as in 22,23 and 29 slide for
DNV OS-C201-WSD Weld Strength (2011)

▲ S Standards (3)

▶ S 1..Eurocode3 Welds (EN1993-1-8, 2005)

1

▶ S 2..DNV OS-C101-LRFD Weld Strength (2011)

▶ S 3..DNV OS-C201-WSD Weld Strength (2011)

2

1 Execute *Reports* -> *Add* -> *Designer - Results*.

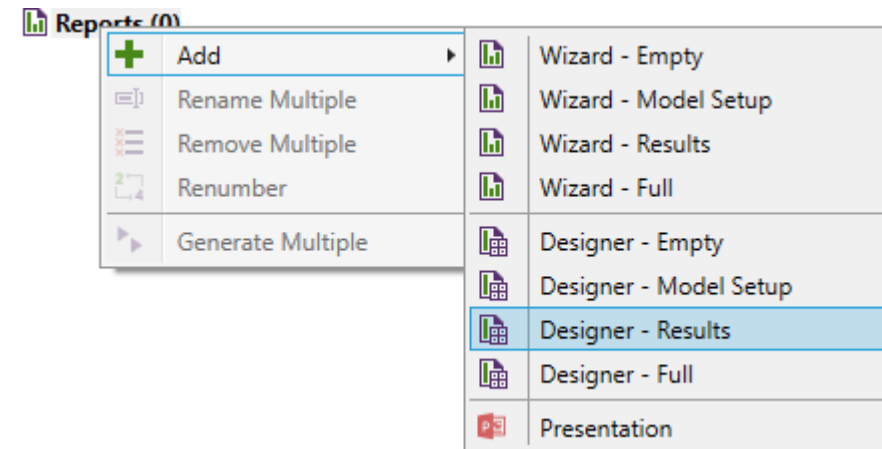
There are 4 templates of the reports:

Empty - only first page and preface items are included;

Model Setup - description of the model data (materials, properties, components, boundary conditions) is included;

Results - for each load extreme displacement tables, stress and displacement plots are included. Predefined tables: sum of reaction forces, stresses/displacements summary tables. In addition all standards are included with a set of tables/plots created in the project;

Full - Model Setup + Results + all tables/plots created in jobs.



1

Post Processing -> Governing Loads -> Import Governing Loads Tables

2

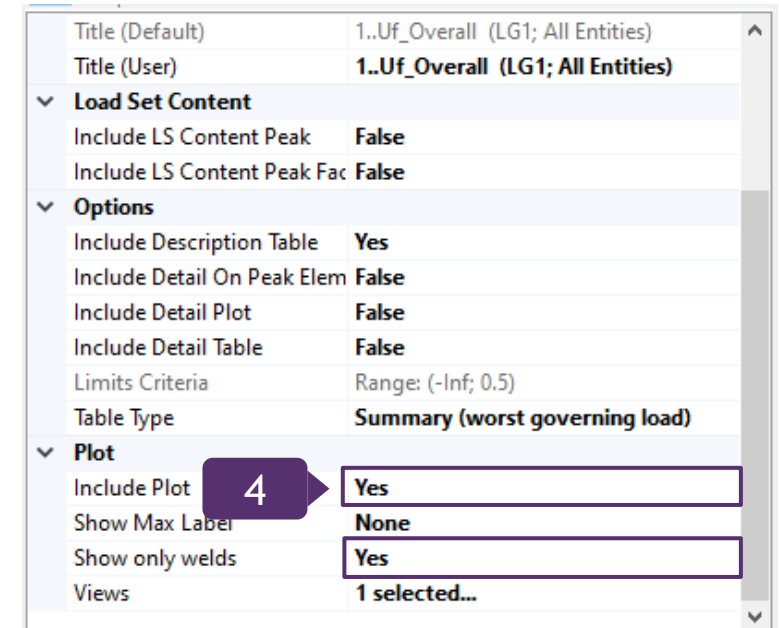
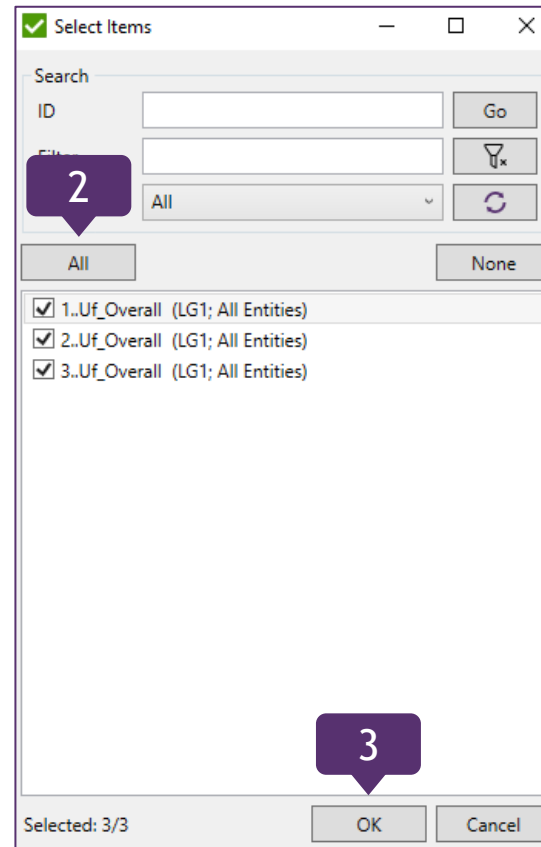
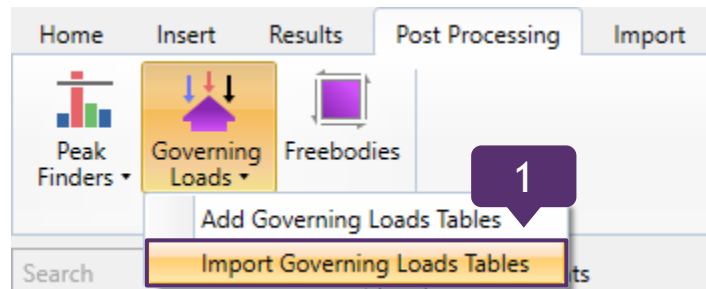
Press *All*.

3

Press *OK*.

4

Include Plot: *Yes*.
Show only welds: *Yes*.



1

Break Page Before -> No.

The screenshot displays the SDC Verifier software interface. On the left, a tree view lists various weld strength checks under three main categories: 1..Eurocode3 Welds (EN1993-1-8, 2005), 2..DNV OS-C201-WSD Weld Strength (2011), and 3..DNV OS-C101-LRFD Weld. Each category has sub-items for 'Weld Extreme', 'Abs Uf Overall', and 'Uf Overall'. Below the tree, there are options for 'Load Group '2..L3-L4'', 'Load Group '3..L2-L4'', 'Summary', and 'Appendix'. A context menu is open over the tree, showing options like 'Generate', 'Move Up', 'Move Down', 'Export to Project', 'Copy', 'Cut', 'Remove', 'Replace Standard', 'Apply to Selected', and 'Copy To Loads'. The 'Apply to Selected' option is highlighted, and a sub-menu is visible, showing options like 'View(s)', 'Selection(s)', 'Load(s)', 'Sort Sub-Items', 'Sort Sub-Items and Group', 'Break Page Before', 'Enable/Disable', 'Restore Default Title', 'Include Selection Plot', and 'Clear Items Content'. The 'Break Page Before' option is highlighted, and a dialog box is open with 'Yes' and 'No' buttons. The 'No' button is selected.

1..Eurocode3 Welds (EN1993-1-8, 2005)

- 1..Weld Extreme (LG1, All Entities)
- 1..Abs Uf Overall (LG1, Component '9..All Welds', v1)
- 1..Uf_Overall (LG1; All Entities)

2..DNV OS-C201-WSD Weld Strength (2011)

- 1..Weld Extreme (LG1, All Entities)
- 1..Abs Uf Overall (LG1, 23)
- 2..Uf_Overall (LG1; All Ent)

3..DNV OS-C101-LRFD Weld

- 1..Weld Extreme (LG1, All)
- 1..Abs Uf Overall (LG1, 23)
- 3..Uf_Overall (LG1; All Ent)

Load Group '2..L3-L4'

Load Group '3..L2-L4'

Summary

Appendix

Generate

Move Up

Move Down

Export to Project

Copy Ctrl + C

Cut Ctrl + X

Remove Del

Replace Standard

Apply to Selected

Copy To Loads

View(s)

Selection(s)

Load(s)

Sort Sub-Items

Sort Sub-Items and Group

Break Page Before

Enable/Disable


Restore Default Title

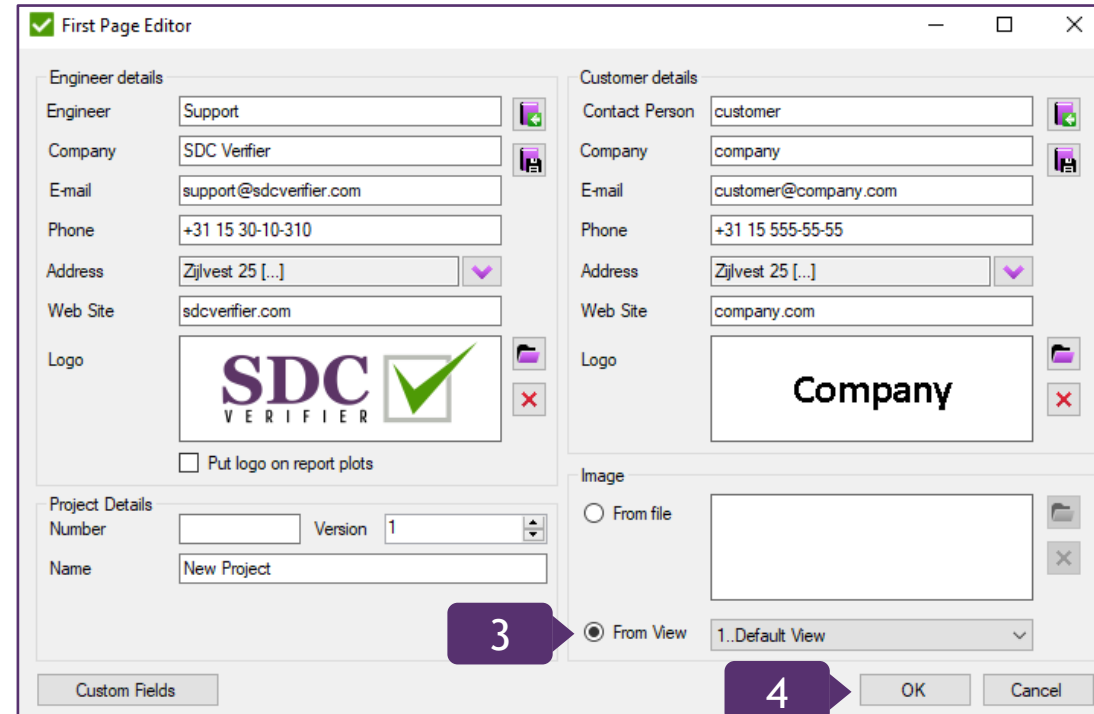
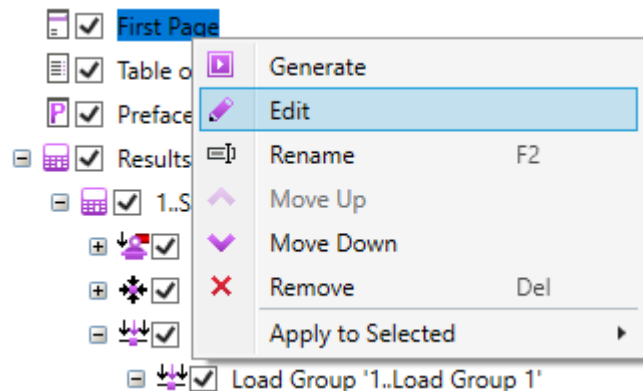
Include Selection Plot

Clear Items Content

Yes

No

- 1 Right click on **First Page** -> **Edit**.
- 2 Fill in information about project.
- 3 Select image **From View** and pick.
- 4 Press **OK**.
- 5 Press button  to generate report.

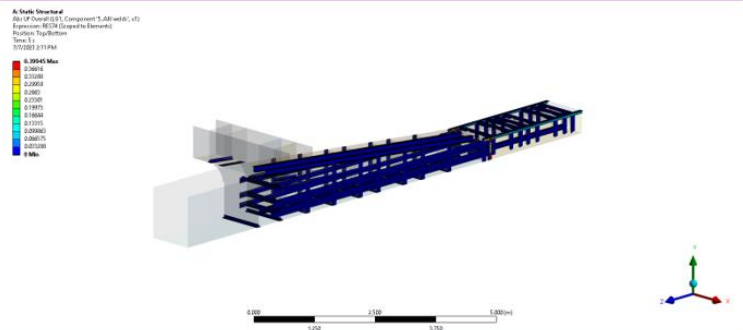


Eurocode3

Weld Extreme (LG1, All Entities)

Standard	1..Eurocode3 Welds (EN1993-1-8, 2005)	Check Selection	[S1] 15..Weld Check Total
Load Group	LG1..Load Group 1		All Entities
Extreme		All	
Minimum			0.00
Maximum			0.40
Absolute			0.40

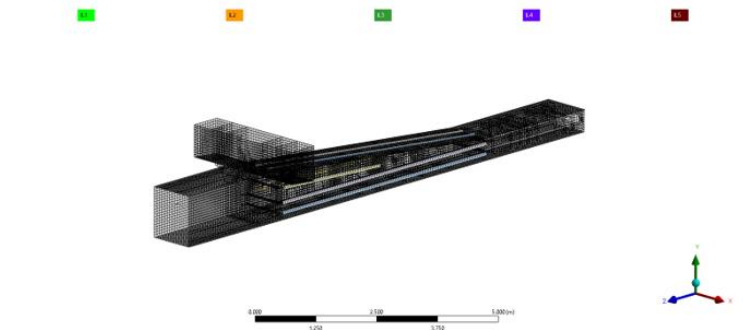
1..Abs Uf Overall (LG1, Component '5..All welds', v1)



Check	[S1] 15..Weld Check Total	Load Group	LG1..Load Group 1
Parameter	Absolute Uf Overall	Selection	Component '5..All welds'
View	1..Default View		

1..Uf_Overall (LG1; All Entities)

Standard	1..Eurocode3 Welds (EN1993-1-8, 2005)	Direction	All
Check	15..Weld Check Total	Parameter	4..Uf Overall
Criteria	Range: (-Inf; 0.5)		
Selection	Elements Count	Peak Entity Id	Peak Value
All Entities	5615 / 21372	453	0.40
			IL2..L1 - Step #2 (2)

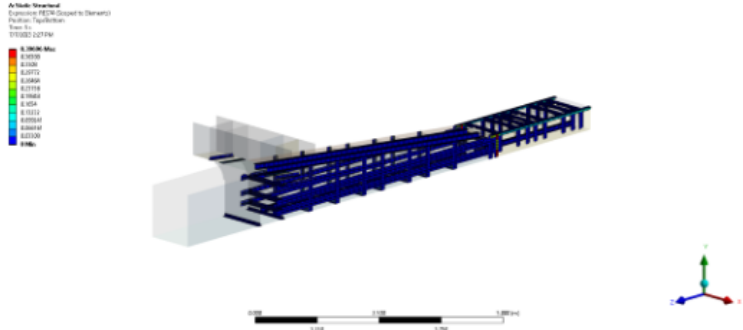


DNV OS-C101

Weld Extreme (LG1, All Entities)

Standard	2..DNV OS-C101-LRFD Weld Strength (2011)	Check Selection	[S2] 15..Weld Check Total
Load Group	LG1..Load Group 1		All Entities
Extreme		All	
Minimum			0.00
Maximum			0.40
Absolute			0.40

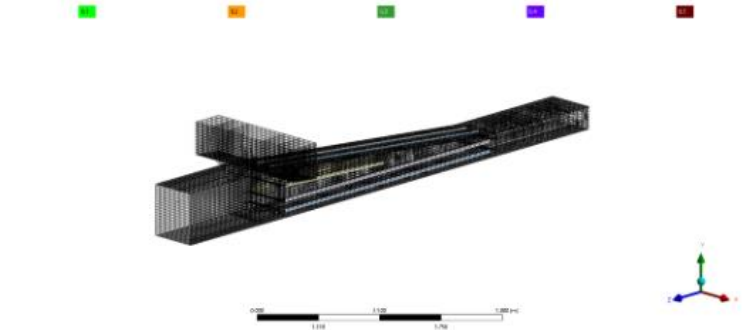
Abs Uf Overall (LG1, Component '5..All welds', v1)



Check	[S2] 15..Weld Check Total	Load Group	LG1..Load Group 1
Parameter	Absolute Uf Overall	Selection	Component '5..All welds'
View	1..Default View		

2..Uf_Overall (LG1; All Entities)

Standard	2..DNV OS-C101-LRFD Weld Strength (2011)	Direction	All
Check	15..Weld Check Total	Parameter	4..Uf Overall
Criteria	Range: (-Inf; 0.5)		
Selection	Elements Count	Peak Entity Id	Peak Value
All Entities	5615 / 21372	453	0.40
			IL2..L1 - Step #2 (2)

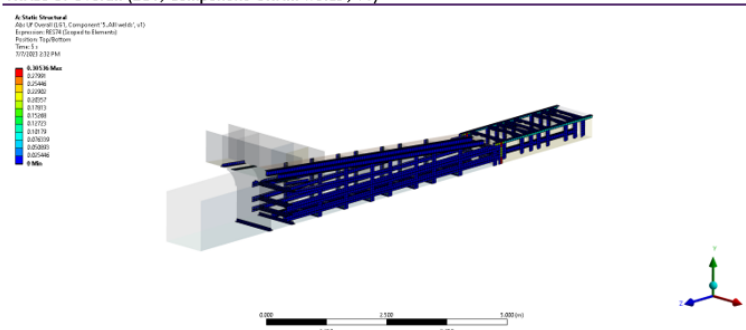


DNV OS-C201

Weld Extreme (LG1, All Entities)

Standard	3..DNV OS-C201-WSD Weld Strength (2011)	Check Selection	[S3] 15..Weld Check Total
Load Group	LG1..Load Group 1		All Entities
Extreme		All	
Minimum			0.00
Maximum			0.31
Absolute			0.31

1..Abs Uf Overall (LG1, Component '5..All welds', v1)



Check	[S3] 15..Weld Check Total	Load Group	LG1..Load Group 1
Parameter	Absolute Uf Overall	Selection	Component '5..All welds'
View	1..Default View		

3..Uf_Overall (LG1; All Entities)

Standard	3..DNV OS-C201-WSD Weld Strength (2011)	Direction	All
Check	15..Weld Check Total	Parameter	4..Uf Overall
Criteria	Range: (-Inf; 0.5)		
Selection	Elements Count	Peak Entity Id	Peak Value
All Entities	5615 / 21372	453	0.31
			IL2..L1 - Step #2 (2)

