



Tutorial

Plate Buckling DNV

Updated on: February 6th 2024

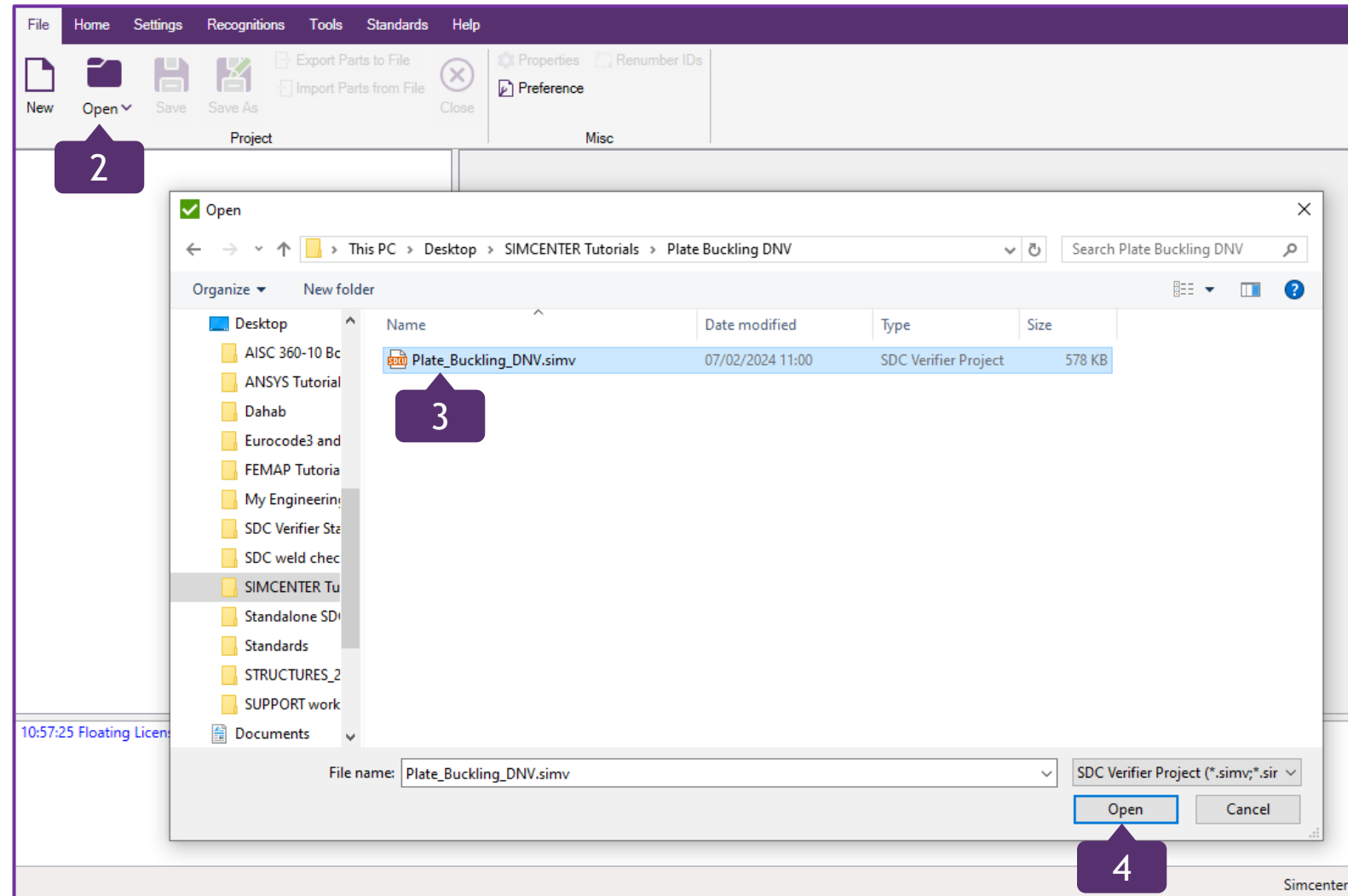
Tested with: SDC Verifier 2023 R2

Simcenter3D 2306

- In this tutorial, DNV Plate Buckling and Stiffener Buckling Checks are reviewed in details;
- A part of plate model of the ship has been used as a start FEM model;
- Individual Loads, Load Sets and Load Group (Envelope) are created;
- Recognition of Plates, using Panel Finder Tool is carried out;
- To elicit failing Panels, Custom Copy of DNV Buckling Strength of Plated Structures (2010) for Panel Check has been created;
- Plate Buckling and Stiffener Buckling Tables and Plots are created;
- The functionality of SDC Verifier Report Designer can be checked via the link to a separate tutorial (Slide 41).

Open the Starter Model

- 1 Launch SDC Verifier for Simcenter 3D
- 2 In *File* section, press *Open*
- 3 Select a project *Plate_Buckling_DNV.simv*
- 4 Press *Open*



1

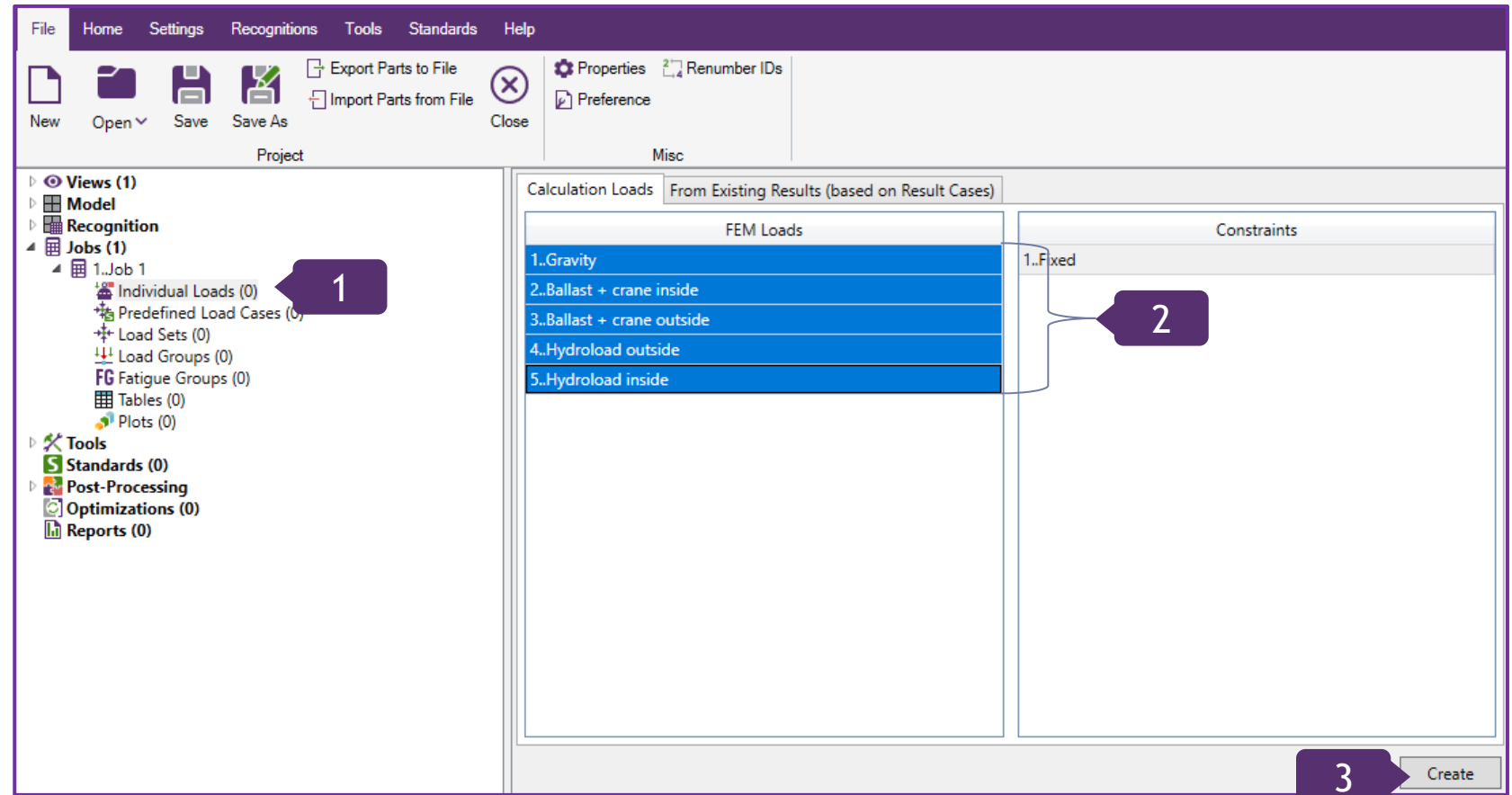
Select *Individual Loads* in Jobs (1) =>
1..Job 1 in the *Model Tree*

2

Select 5 *FEM Loads*

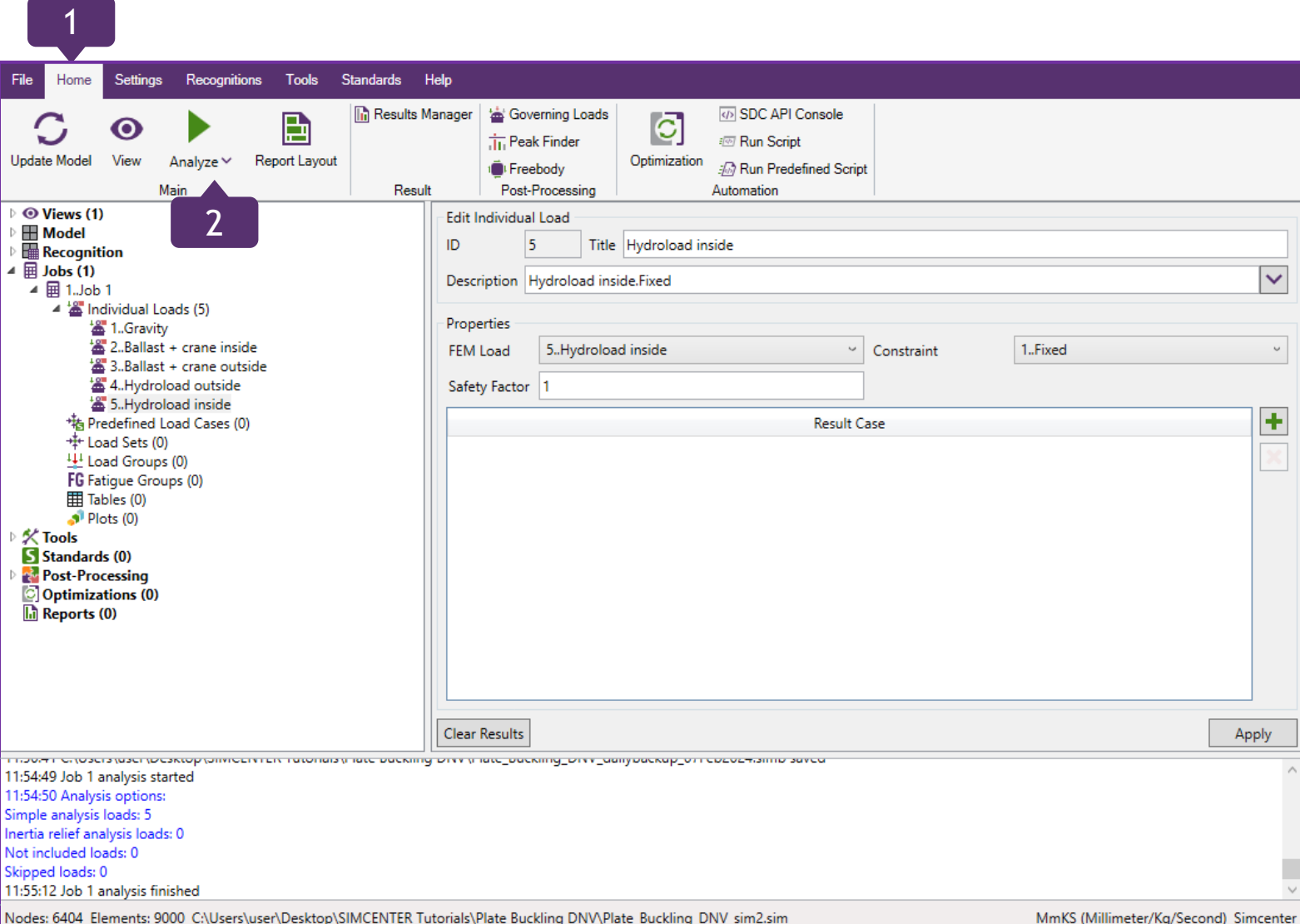
3

Press *Create*



1 Go to *Home* section on the Ribbon


2 Press  on the toolbar to analyze Job



The screenshot displays the SDC Verifier software interface. The 'Home' ribbon is active, and the 'Analyze' button is highlighted. The 'Jobs' tree on the left shows 'Job 1' with 5 individual loads. The 'Edit Individual Load' panel on the right shows details for 'Hydroload inside'. The bottom status bar shows 'Job 1 analysis started and finished'.

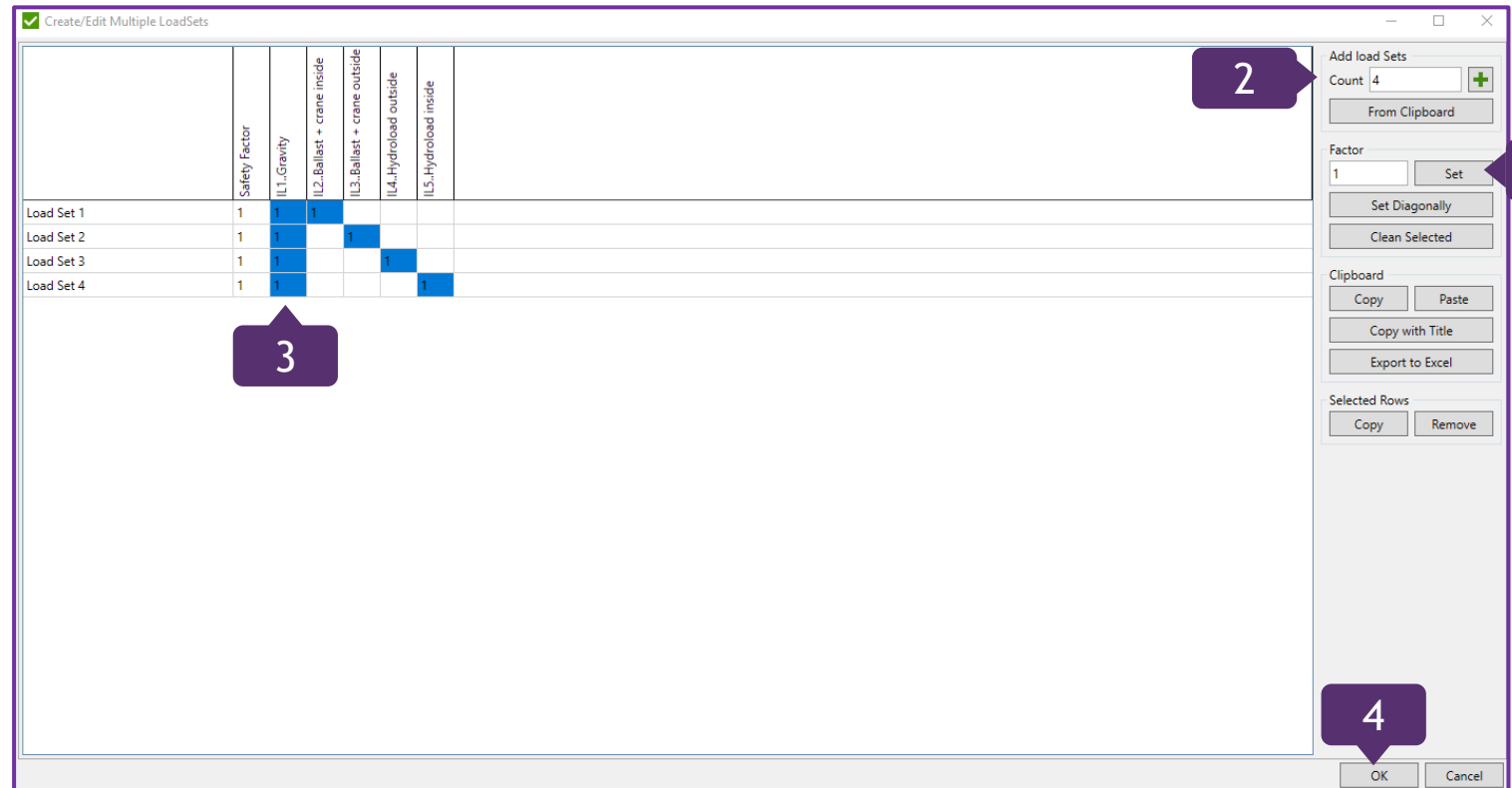
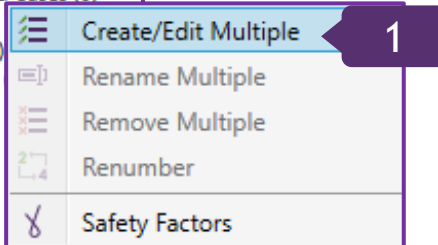
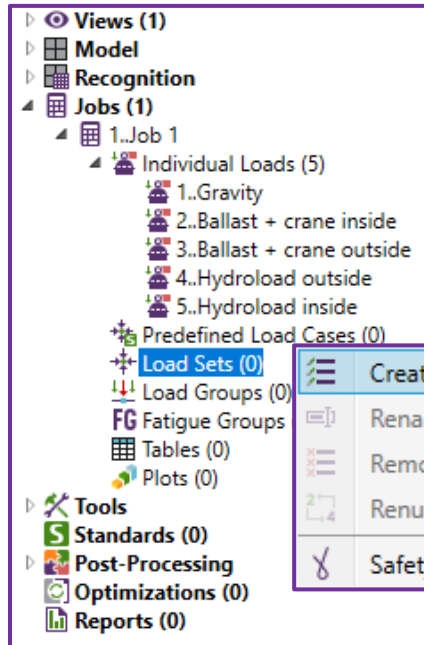
Job 1 analysis started and finished.

Nodes: 6404 Elements: 9000 C:\Users\user\Desktop\SIMCENTER Tutorials\Plate Buckling DNV\Plate_Buckling_DNV_sim2.sim MmKS (Millimeter/Kg/Second) Simcenter

- 1 Right click on *Load Sets* => *Create/Edit multiple*
- 2 Fill in “4” into *Count* and press  to add four Load Sets
- 3 Select highlighted cells in table like shown on the picture and press *Set* to define Factors of Load Sets
- 4 Press *OK*

Note: Load Sets are created with default titles “Load Set #”. It is possible to rename them.

Alternatively, titles and factors can be pasted from Clipboard using *Paste* button.

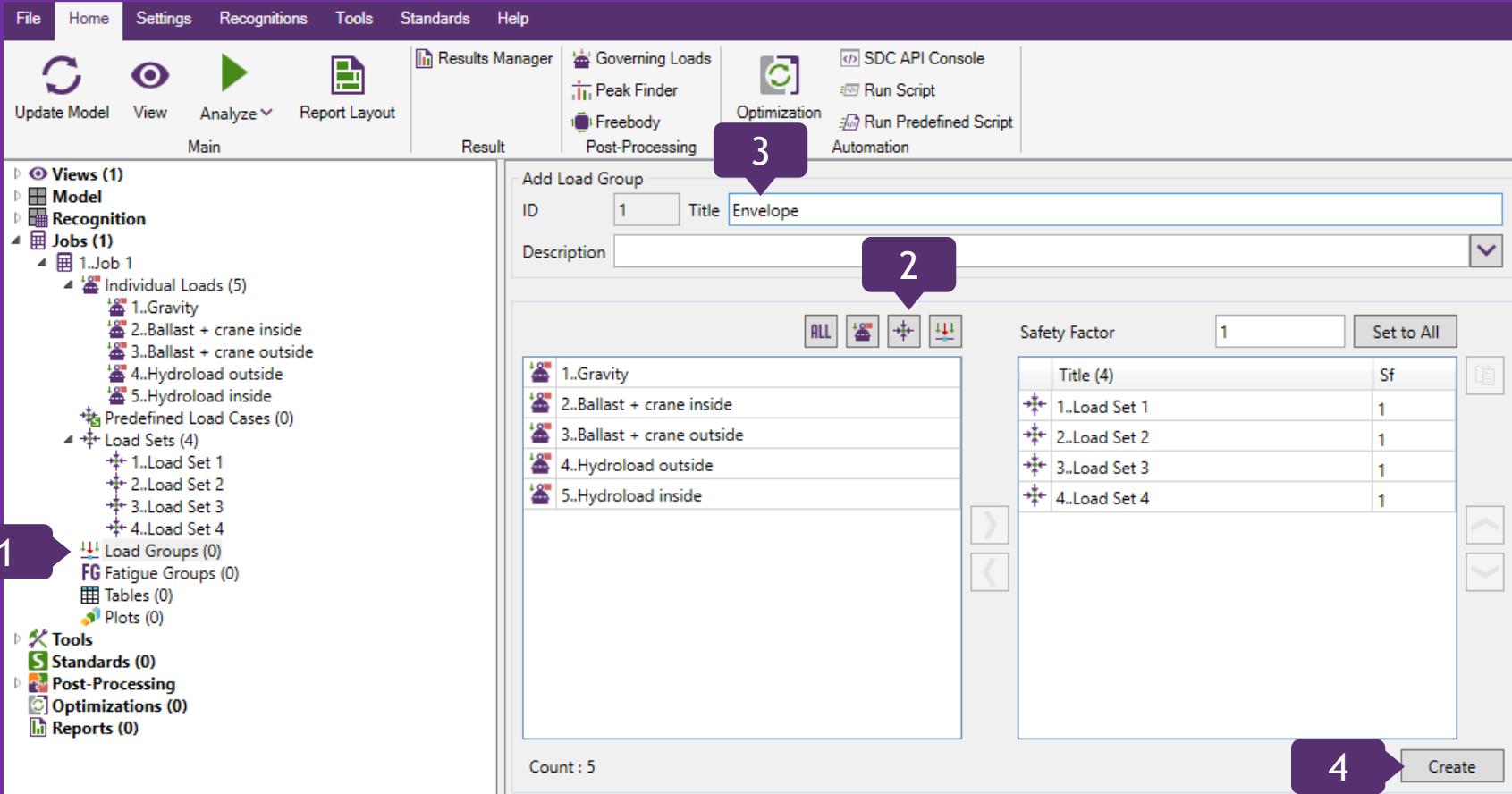


1 Click on *Load Groups (0)*

2 Press  to select *All Load Sets*

3 Title: *Envelope*

4 Press *Create*



The screenshot shows the SDC Verifier software interface. The 'Jobs (1)' tree on the left has 'Load Groups (0)' selected, indicated by a purple callout '1'. The 'Add Load Group' dialog is open, showing 'ID' 1 and 'Title' 'Envelope', indicated by a purple callout '3'. The 'Description' field is empty, indicated by a purple callout '2'. The 'Safety Factor' is set to 1. The 'Load Sets (4)' list contains: 1..Gravity, 2..Ballast + crane inside, 3..Ballast + crane outside, 4..Hydroload outside, and 5..Hydroload inside. The 'Create' button is highlighted with a purple callout '4'. The 'Count : 5' is displayed at the bottom of the dialog.

Title (4)	Sf
1..Load Set 1	1
2..Load Set 2	1
3..Load Set 3	1
4..Load Set 4	1

Note: Load Sets and Load Groups are analyzed by SDC Verifier.

Panel Finder. Recognize Sections

1

In the Model Tree, expand *Recognition* and select *Panel Finder*

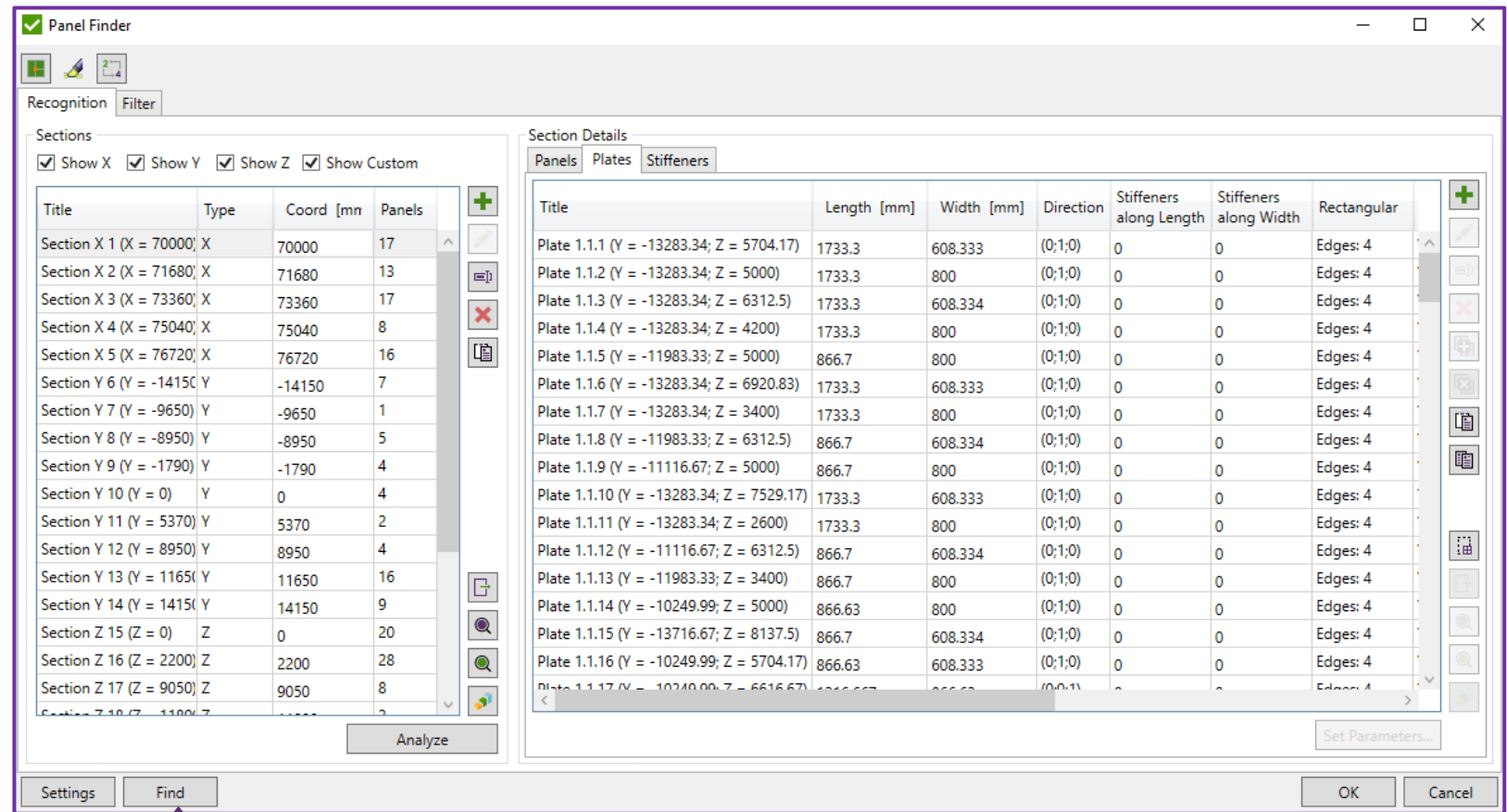
2

Execute right click on *Panel Finder* and press *Edit*

3

Click on *Find*

All Frames, Longitudinals and Decks are recognized automatically.



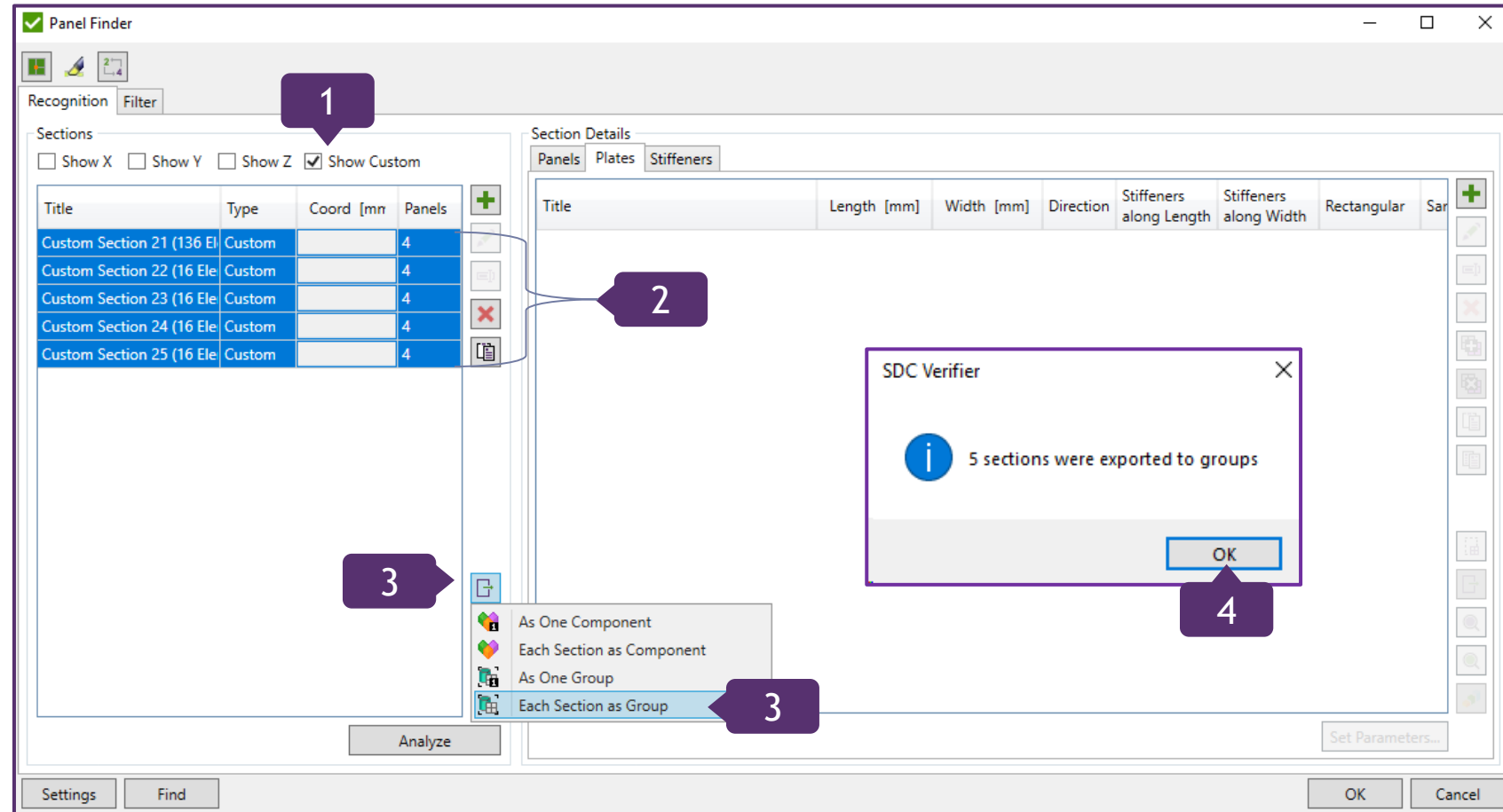
Custom Section should be used for inclined/curved sections and selections like hull.

1 Show Custom: *ON* (the rest is OFF)

2 Select all Sections in the list

3 Press  and select  *Each Section as Group* to export sections to Groups

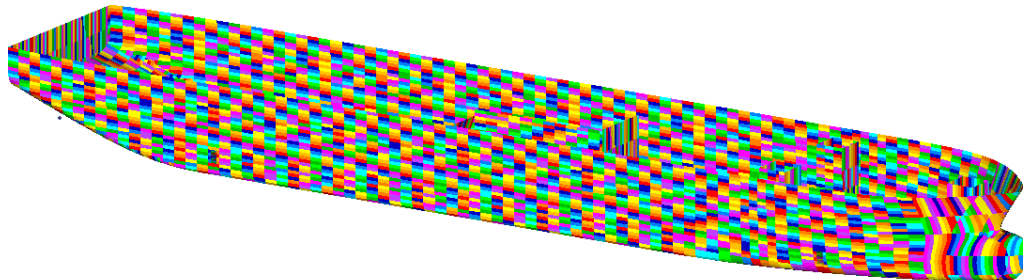
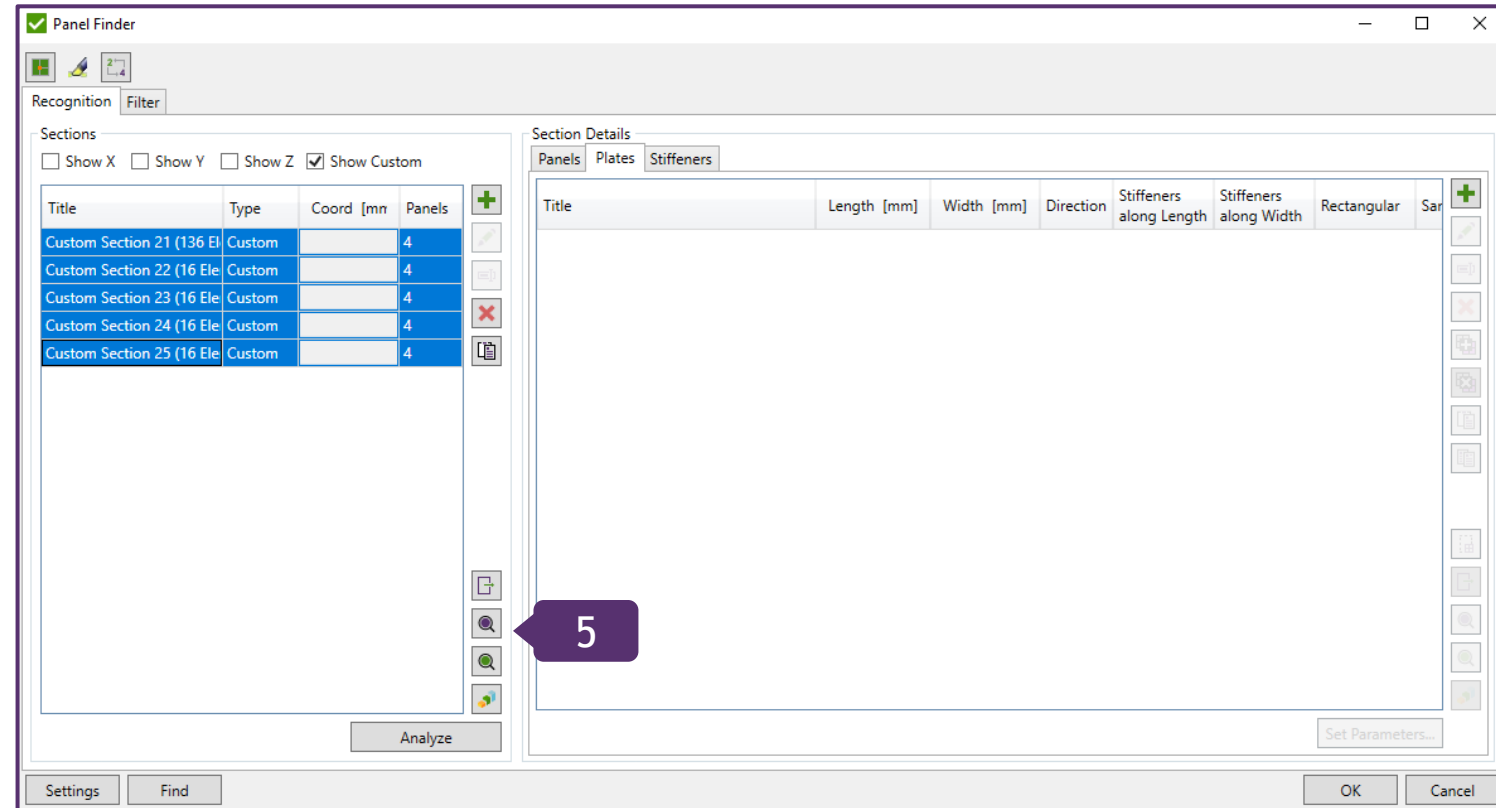
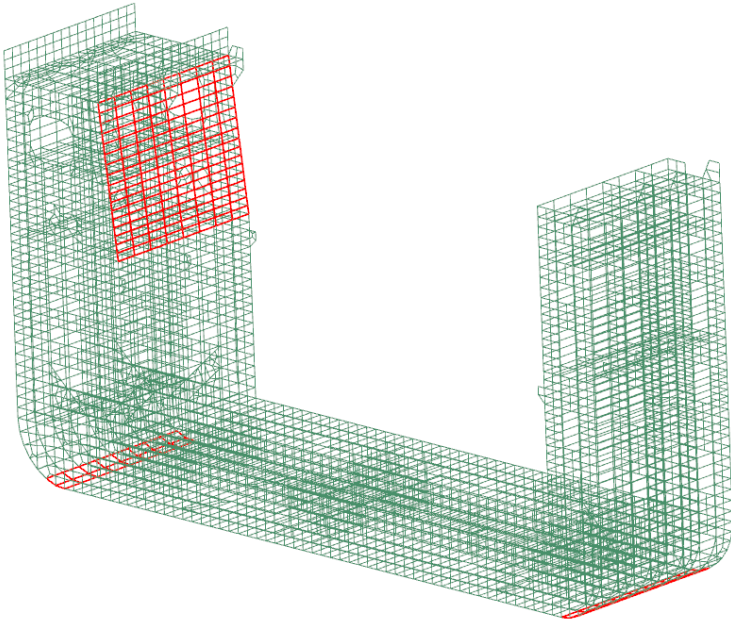
4 Press *OK*



Panel Finder. Custom Section (Continuation)

5

Press



Example: It is possible to create custom section, based on hull selection.

Note: Before Plates Recognition, the model should be checked on free edges. Incorrect plate dimensions/direction, plates with undefined dimensions and, as result, wrong buckling factor may result in possible consequences of free edges.

1 Click  to detect Free edges

2 Press *Find*

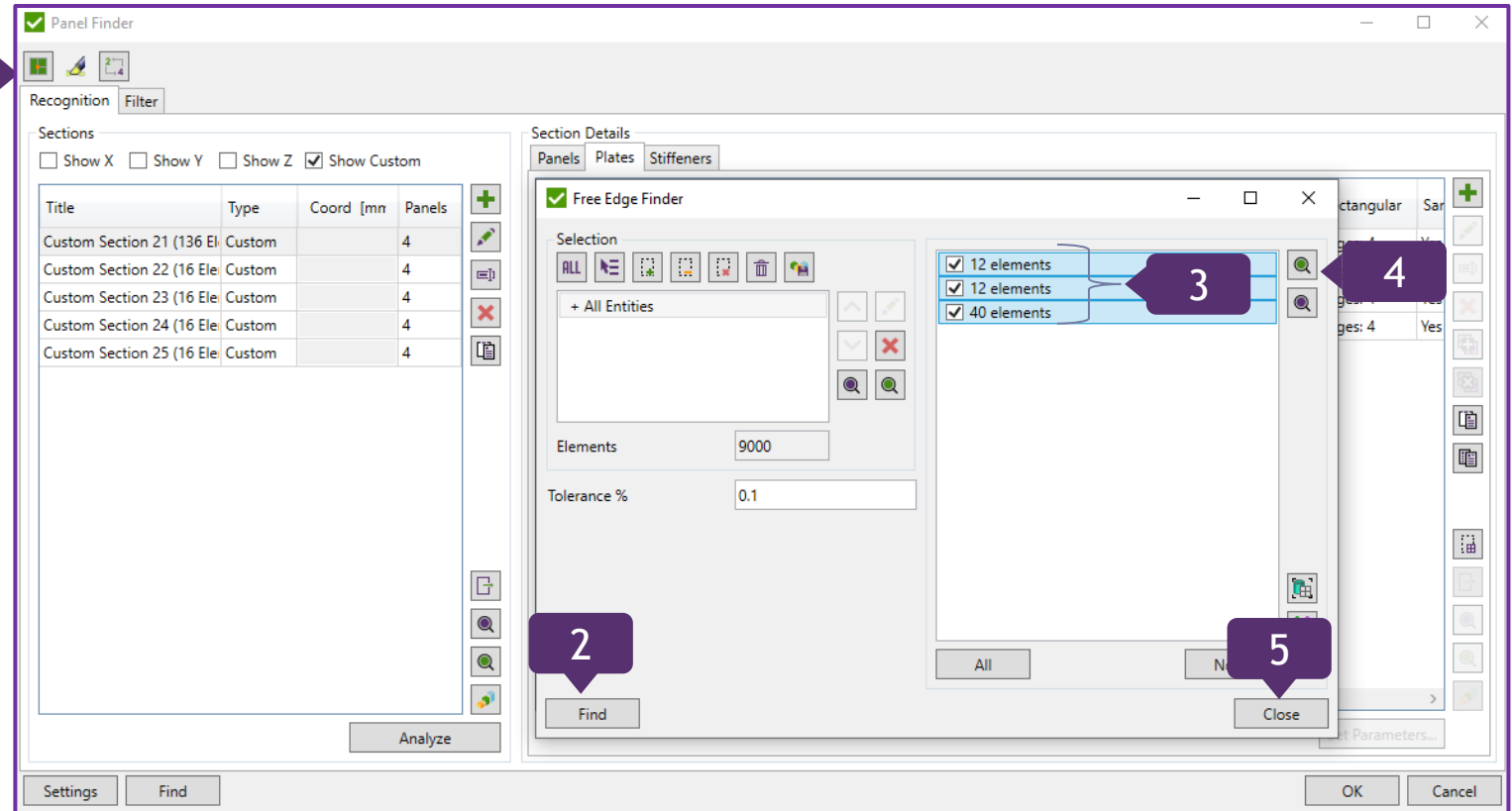
3 Select the elements from the list

4 Press  to preview elements with Free edges

5 Press *Close*

Two elements,
connected to one

Mesh does not coincide



Note: Free edges should be fixed by remeshing the model and run recognition of plates. (In tutorial we skipped the step with remeshing, but for commercial project, it is a crucial step to do).

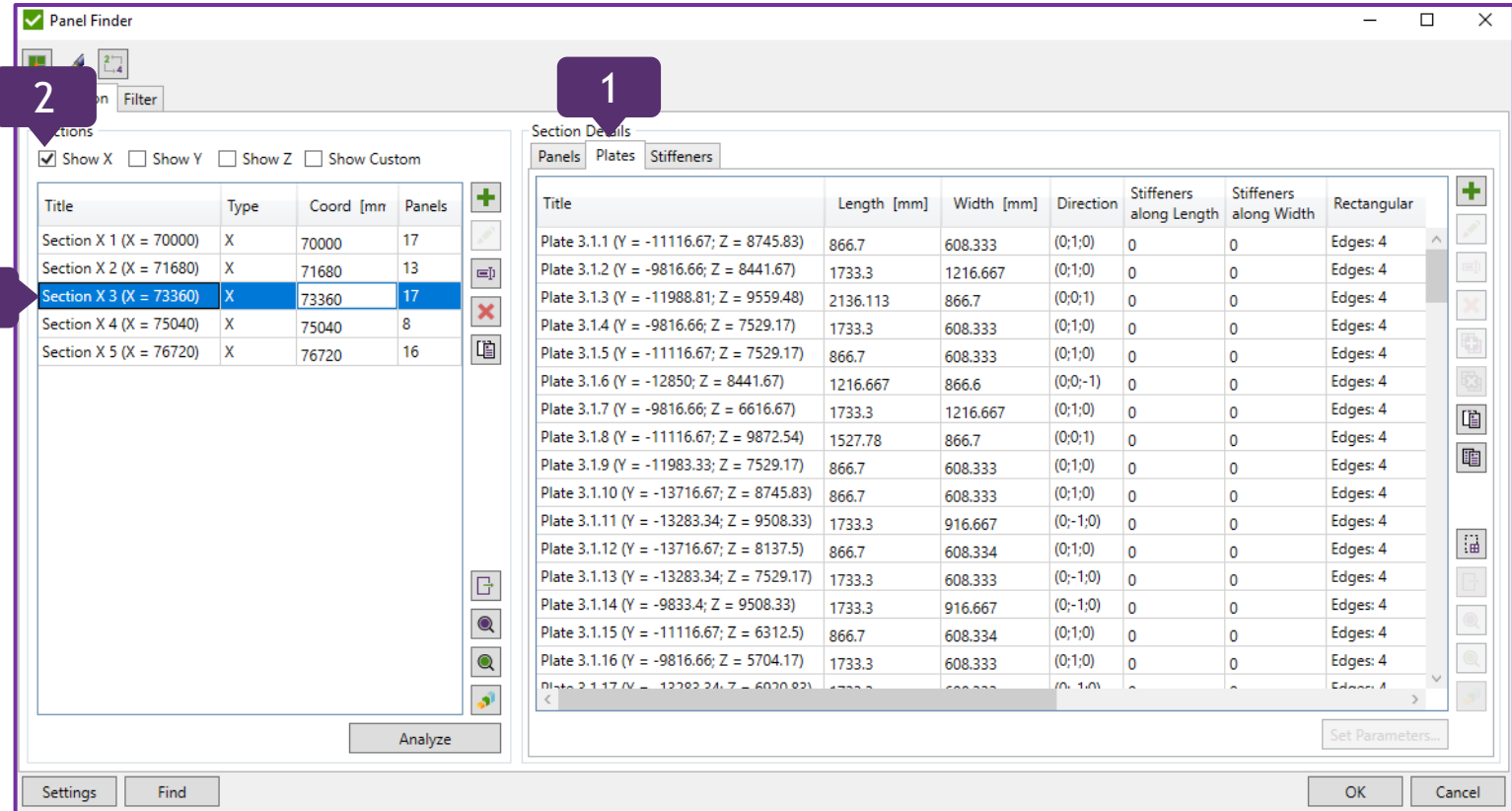
Panel Finder. Recognize plates

1 In Selection Details press *Plates*

2 Show X: *ON* (the rest is *OFF*)

3 Select *Section X3*

Tip: If it is necessary to recognize plates only for one section, press *Analyze*



Title	Length [mm]	Width [mm]	Direction	Stiffeners along Length	Stiffeners along Width	Rectangular	Same Material	Thickness [mm]	Related Panel	C1	C2	Psi X	P:
Plate 3.1.2 (Y = -9816.66; Z = 8441.67)	1733.3	1216.667	(0;1;0)	0	0	Edges: 4	Yes	16	Panel 3.1	1	1.1	1	1
Plate 3.1.3 (Y = -11988.81; Z = 9559.48)	2136.113	866.7	(0;0;1)	0	0	Edges: 4	Yes	Min = 16	Panel 3.1	1	1.1	1	1

Section ID. Panel ID. Plate ID

Plate is rectangle with all corners = 90°

Plate has elements more than from one property

Dimensions: Results depend on plate dimensions and direction. Therefore, it is important to understand how Panel Finder performs recognition. Length is considered the longest edge of plate, and width is the longest perpendicular to the longest edge:

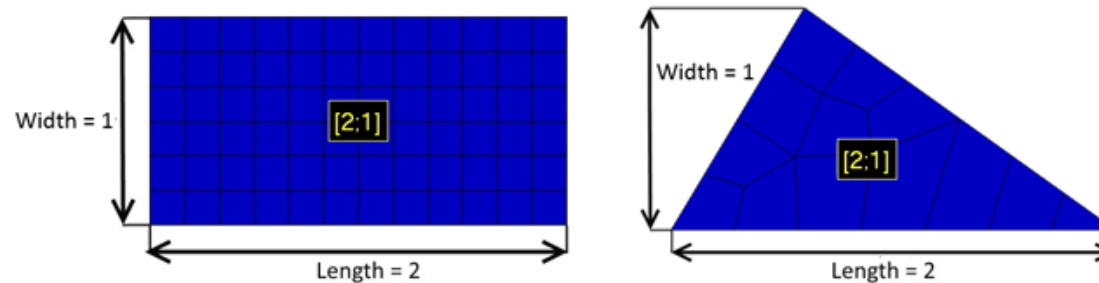
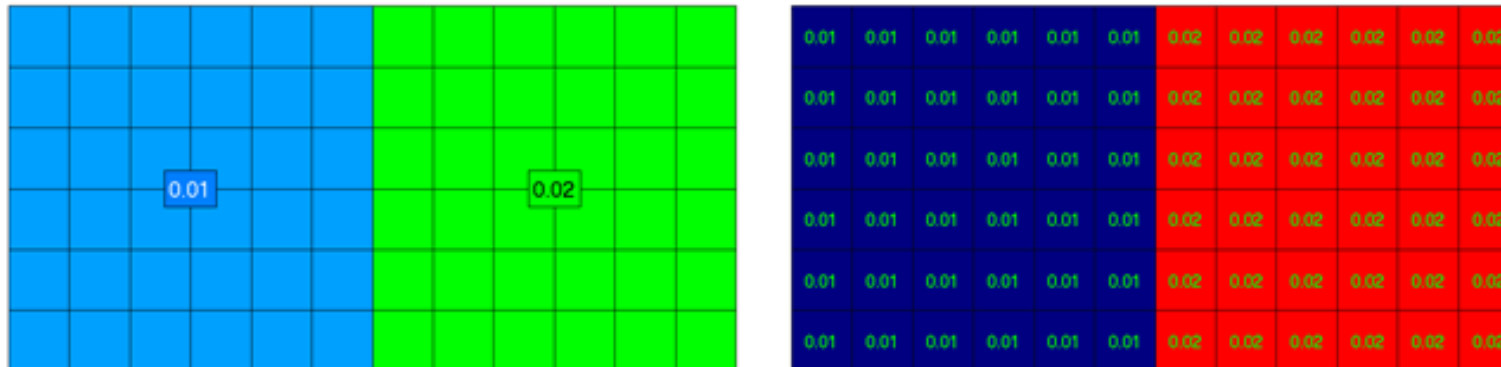


Plate Thickness: Calculations are performed on every element, and thickness is taken directly from each element. It is possible to set thickness manually for plate. In this case, element thickness will be ignored and a user defined thickness will be used.

Example: a plate with 2 properties 0.01 and 0.02 thicknesses. Left picture displays property labels with property thicknesses and the right one presents plate buckling plot of thickness parameter:



Editing plates manually

1

In Section X 1 (X = 70000), select Plates and press *Set Parameters*

2

Make the required modifications and press *OK*

When modifying Plates, it is possible to edit Length / Width / Thickness / Coefficients / Direction.

Also, there is possibility to define parametric Stiffeners along the Length and Width.

If thickness is changed, in the table below you can see the original thickness that was recognized from model:

Thickness [mm]
12
12
12
17 (Original: 16)
17 (Original: 12)
17 (Original: 12)

2

The screenshot shows the SDC Verifier software interface. The 'Panel Finder' window is open, displaying a list of sections and a detailed table of plates. A callout '1' points to the 'Plates' tab in the 'Section Details' section. The 'Set Plates Parameters' dialog box is also open, showing various settings for plate dimensions and direction. A callout '2' points to the 'Set Direction' checkbox, which is checked. Another callout '1' points to the 'Set Parameters...' button in the bottom right corner of the 'Set Plates Parameters' dialog.

Panel Finder - Sections

Title	Type	Coord [mn]	Panels
Section X 1 (X = 70000)	X	70000	17
Section X 2 (X = 71680)	X	71680	13
Section X 3 (X = 73360)	X	73360	17
Section X 4 (X = 75040)	X	75040	8
Section X 5 (X = 76720)	X	76720	16

Section Details - Plates

Title	Length [mm]	Width [mm]	Direction	Stiffeners along Length	Stiffeners along Width	Rectangular	Same Material
Plate 1.1.1 (Y = -13283.34; Z = 5704.17)	1733.3	608.333	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.2 (Y = -13283.34; Z = 5000)	1733.3	800	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.3 (Y = -13283.34; Z = 6312.5)	1733.3	608.334	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.4 (Y = -13283.34; Z = 4200)	1733.3	800	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.5 (Y = -11983.33; Z = 5000)	866.7	800	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.6 (Y = -13283.34; Z = 6920.83)	1733.3	608.333	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.7 (Y = -13283.34; Z = 3400)	1733.3	800	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.8 (Y = -11983.33; Z = 6312.5)	866.7	608.334	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.9 (Y = -11116.67; Z = 5000)	866.7	800	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.10 (Y = -13283.34; Z = 7529.17)	1733.3	608.333	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.11 (Y = -13283.34; Z = 2600)	1733.3	800	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.12 (Y = -11116.67; Z = 6312.5)	866.7	608.334	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.13 (Y = -11983.33; Z = 3400)	866.7	800	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.14 (Y = -10249.99; Z = 5000)	866.63	800	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.15 (Y = -13716.67; Z = 8137.5)	866.7	608.334	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.16 (Y = -10249.99; Z = 5704.17)	866.63	608.333	(0;1;0)	0	0	Edges: 4	Yes
Plate 1.1.17 (Y = -10249.99; Z = 6616.67)	1216.667	866.63	(0;0;1)	0	0	Edges: 4	Yes
Plate 1.1.18 (Y = -11983.33; Z = 7529.17)	866.7	608.333	(0;1;0)	0	0	Edges: 4	Yes

Set Plates Parameters (Leave Empty Field to not to Set a Value)

Dimensions

☒ Set Length/Width Value

Length [mm]:

Width [mm]:

☐ Set Stiffeners Amount along Plate's:

Length:

Width:

Thickness [mm]:

Coefficients

C1:

C2:

Psi X:

Psi Y:

Direction

☐ Swap Direction for

☒ Plates where Width > Length

☐ All Plates

☒ Set Direction

Direction: X Y Z

OK Cancel

If the direction of plate should be modified, define global axis or custom vector and press *Set Direction*.

Panel Finder, Plates Plot

1

Select *Section X3*

2

Select *All Plates*

3

Press 

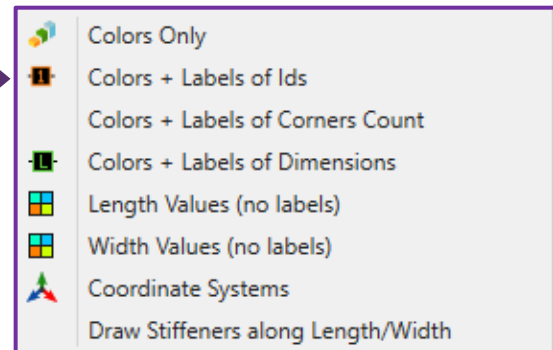
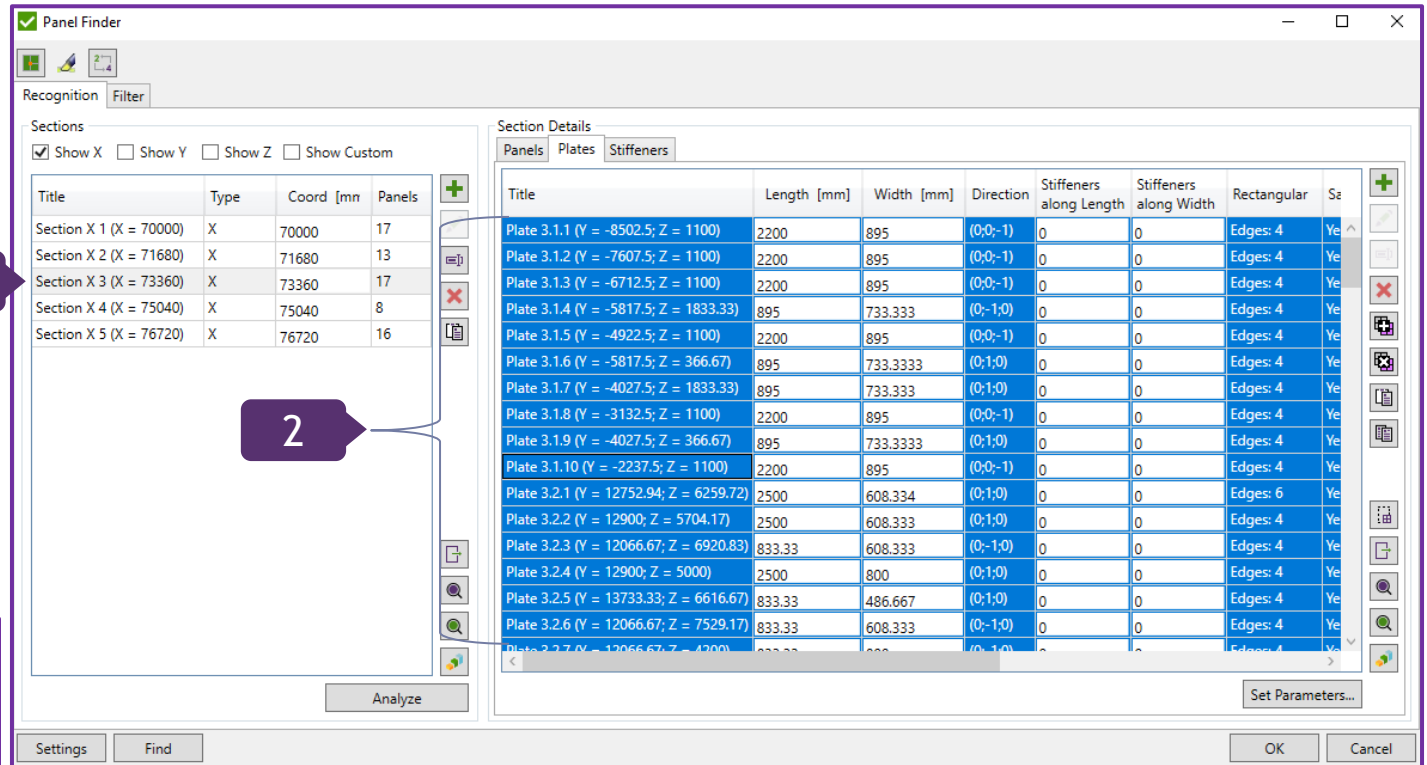
4

Click on *Colors + Labels of Ids*

1

2

4



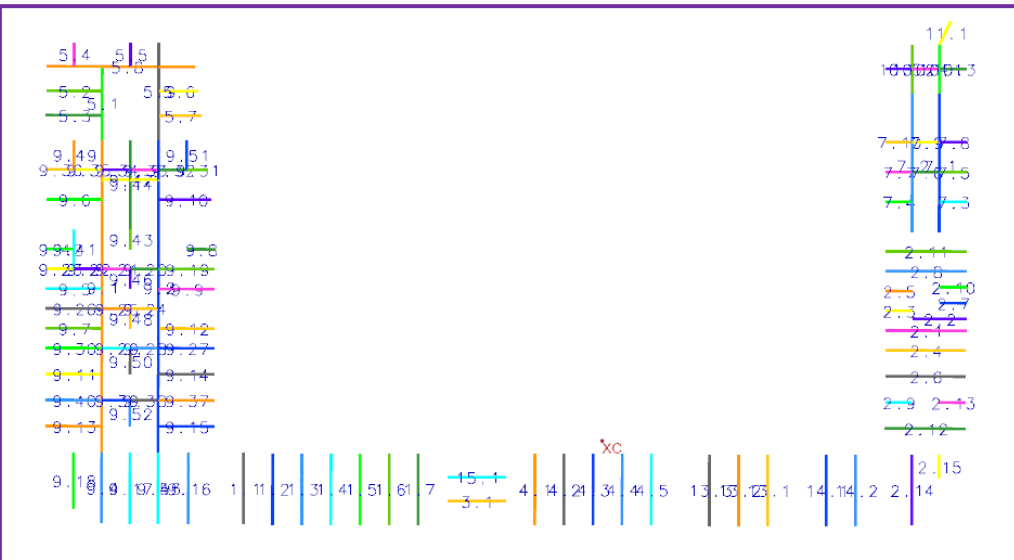
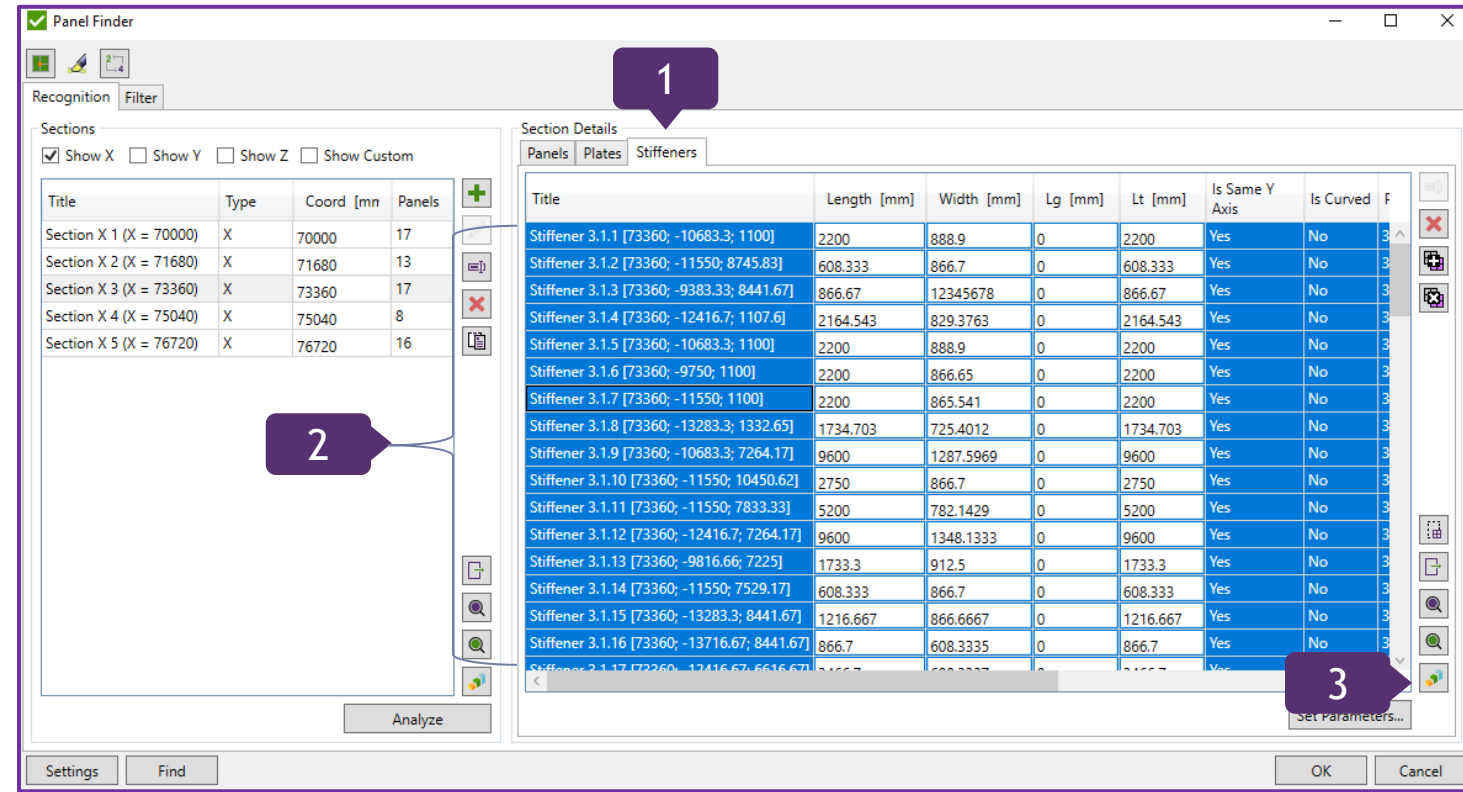
Panel Finder. Stiffeners Plot

1 Select *Stiffeners* section

2 Select All *Stiffeners*

3 Press 

4 Click on *Colors + Labels of Ids*



Note: It is very important to check if all plates dimensions were recognized. If in the model there are coincidental nodes, elements or free edges, Panel Finder will not be able to recognize plate dimensions.

1 Click on *Filter* tab

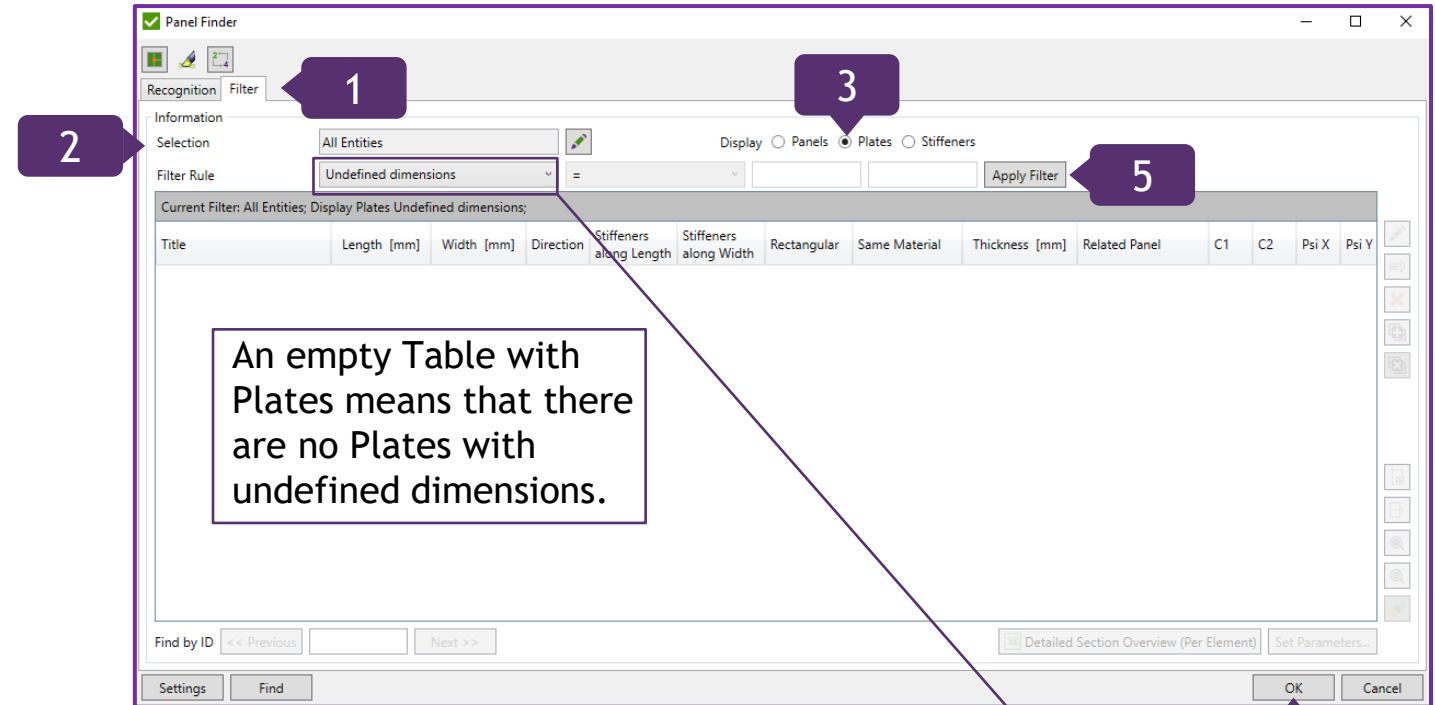
2 Selection: *All Entities*

3 Display: *Plates*

4 Filter Rule: *Undefined dimensions*

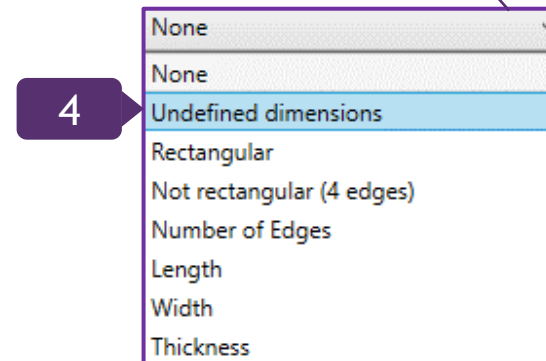
5 Press *Apply Filter*

6 Press *OK*

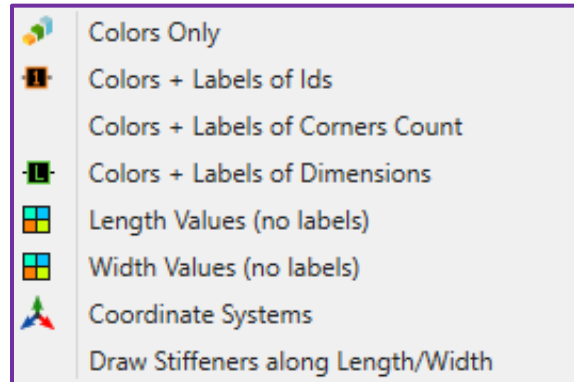


Tip: It is also possible to filter Plates by shape (triangle, rectangular) or number of edges parameters.

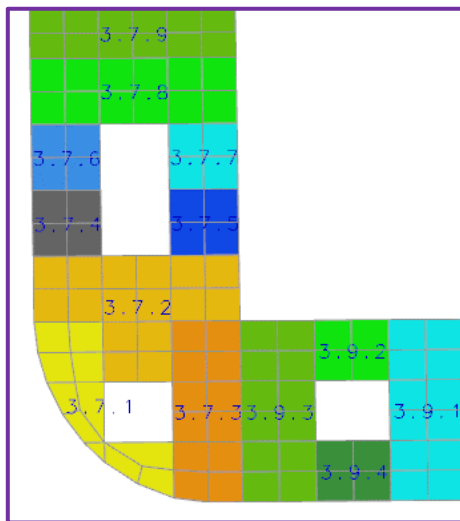
E.g. Plates with numbers of edges > 4 can be displayed.
Control, using Selection plates from which Sections should be filtered.



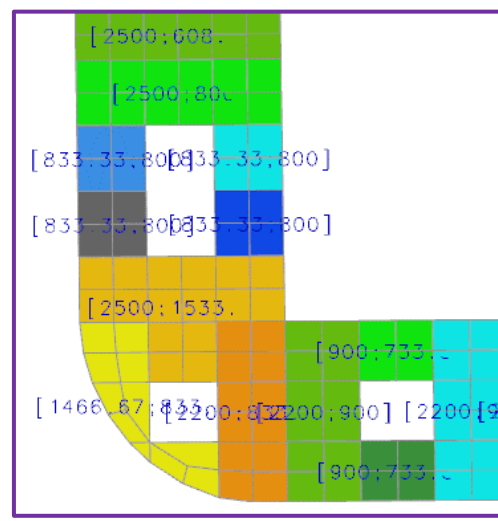
Note: Plate Plot can be displayed with different Colors Labels (Labels of Ids, Labels of Corners Count or Labels of Dimensions). Also, it is possible to show Plates in length and width, coordinate systems etc.



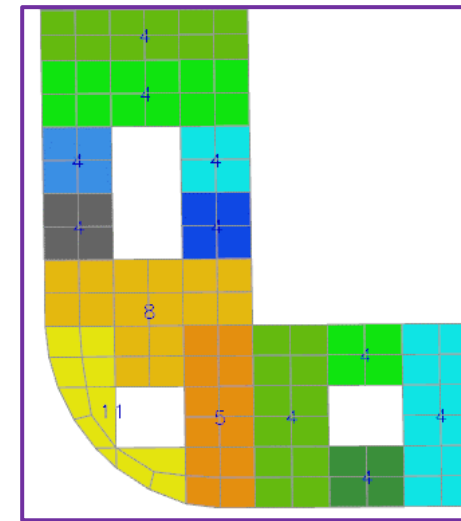
Labels of Ids



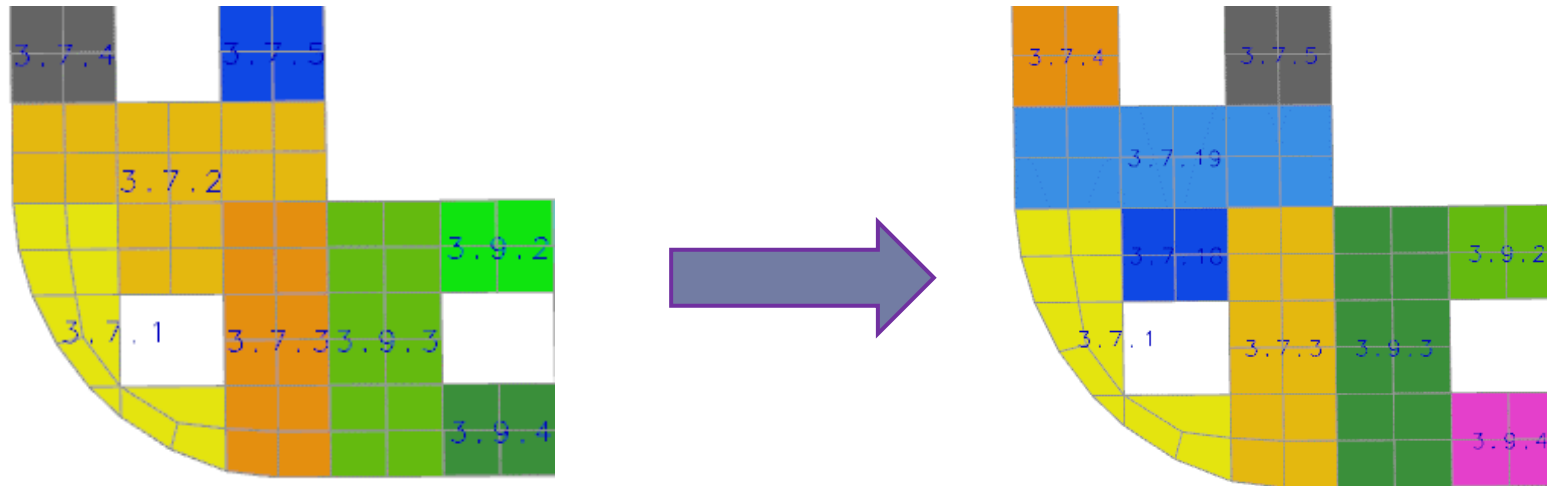
Labels of Dimensions



Labels of Corners Count

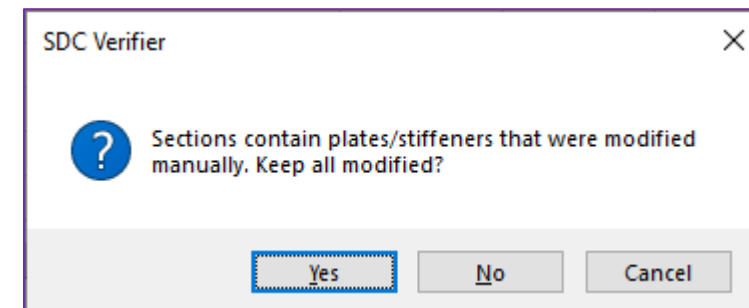


In some cases (e.g. Stiffener is not modeled), when a Plate is recognized incorrectly, dimensions are bigger than in reality. Consequently, it leads to wrong results. A Plate has to be updated manually. In Section X3 plate with Id = 3.7.2 should be split in two Plates.



Note: if Plates were modified manually, but then a user decides to run recognition of Plates - Panel Finder will ask what to do with modified Plates:

- Keep Plates that were modified;
- Clear everything and start recognition from scratch;



Panel Finder. To Split a Plate

1

In Recognition page, select *Section X1*
(X = 70000)

2

Select *Plate 1.1.31*

3

Press  select *Split by Elements*

4

Selected plate is displayed in Simcenter.
Select elements for one plate;
Press *OK*

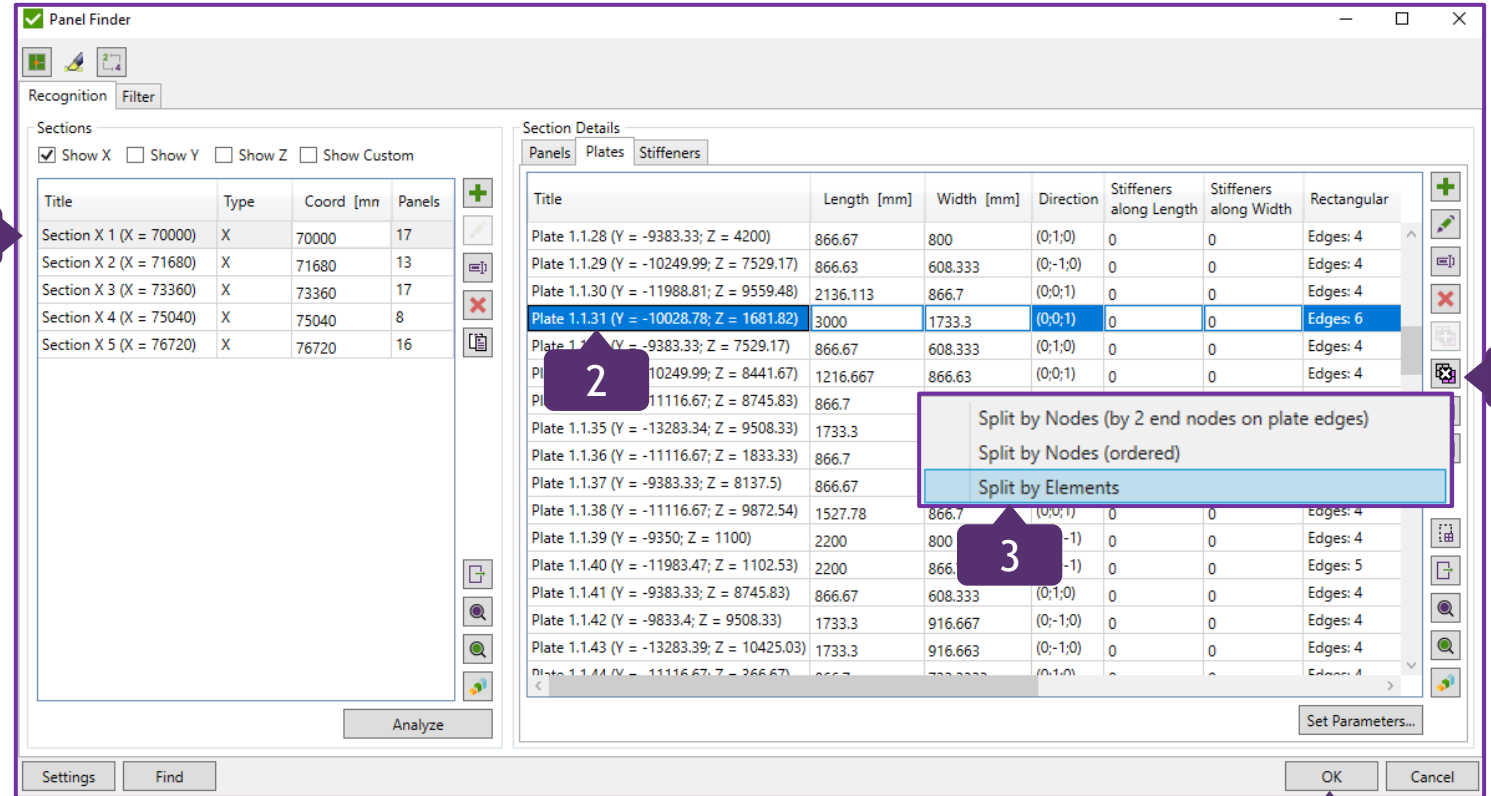
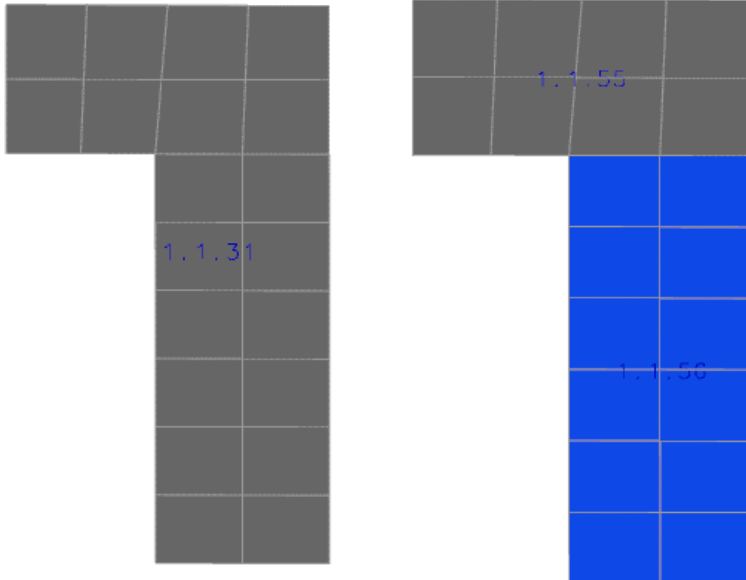


Plate 1.1.31 is replaced with Plates 1.1.55 and 1.1.56.
Dimensions and directions are updated automatically.



Title
Plate 1.1.55 (Y = -9803.33; Z = 2600)
Plate 1.1.56 (Y = -10216.67; Z = 1100)

Add DNV RP-C201 Plate/Stiffener Buckling 2010 Standard

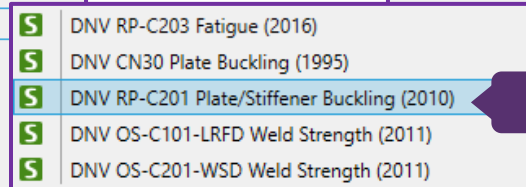
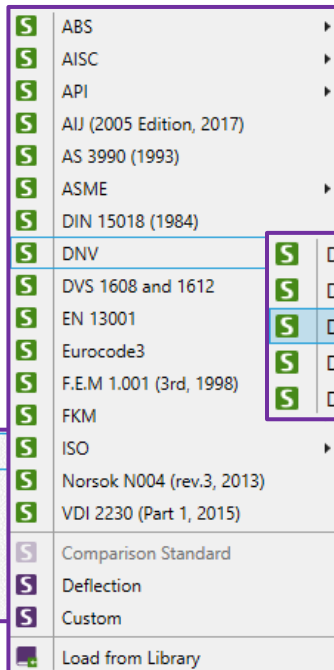
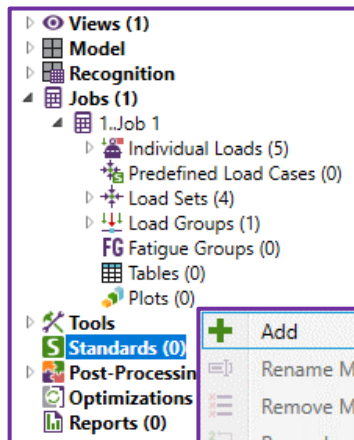
1 In the *Model tree*, in Standards execute *Add => DNV => DNV RP Plate/Stiffener Buckling (2010)*

2 Utilization Factor (Eta) = 1.15

3 Use Plate Average Stress: *On*

4 Include Plate Dimensions (Length, Width, Thickness) in the table: *On*

5 Press *OK*



DNV Plate/Stiffener Buckling (2010)

ID: 1 Title: DNV Buckling Strength of Plated Structures (2010)

Alias: Standard1

Description: [Dropdown]

Options

Resulting Material Factor: 1.15

Buckling Resistance is divided on Resulting Material Factor

Materials with Yield = 0: 0

Sections: 25 sections

Plate Buckling

Thickness Factor: 1.0

☒ Use Plate Average Stress

☐ Use Absolute Shear for Plate Average (Conservative)

Stress on Element: Average

☒ Include Plate Dimensions (Length, Width, Thickness) in table

☒ Calculate Design Lateral Pressure by Formula 5.1

☐ User Defined Design Lateral Pressure

Stiffener Buckling

Psi: Defined

Z* - distance from neutral axis to axial force point: Defined

OK Cancel

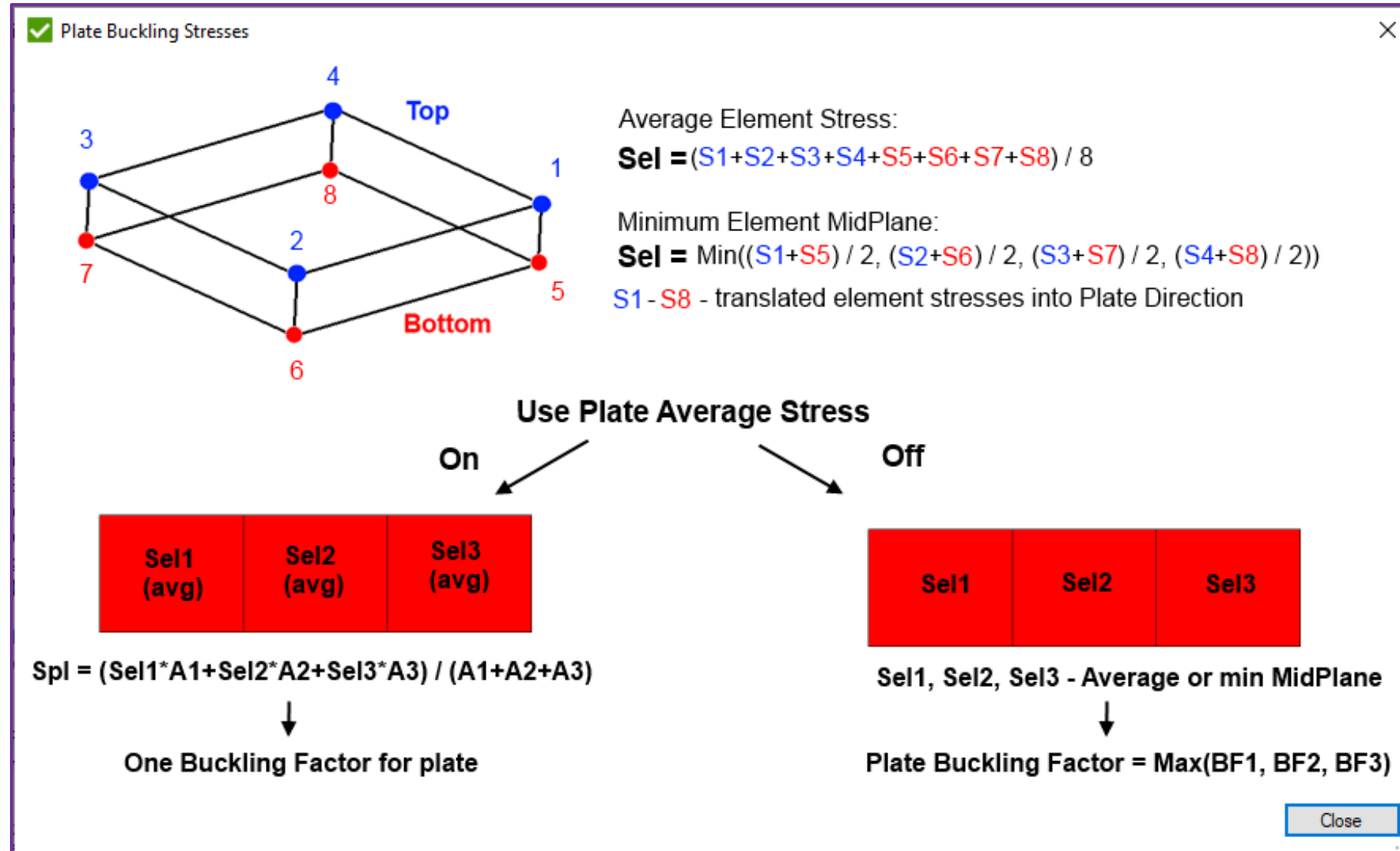
Thickness factor gives a possibility to increase / decrease all plates thicknesses without reanalyzing the model. E.g. 1.2 means to increase thickness on 20% and decrease stresses.

Materials with Yield Stress = 0 shows how many materials have yield equal to 0. If value is > 0 press to define yield.

By default, all sections will be checked. Click to modify them.

Plate Buckling transforms stresses automatically into Plate direction.

Options about element stresses and Plate stresses are described in the next slide.



Convert to Custom Standard

1

Execute right click on *1..DNV Buckling Strength of Plated Structures (2010)* and select *Convert to Custom*

2

Enter Standard Title and press *OK*

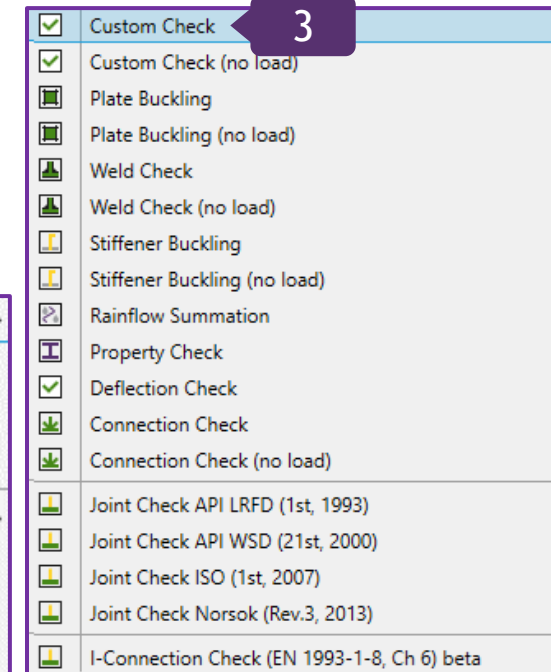
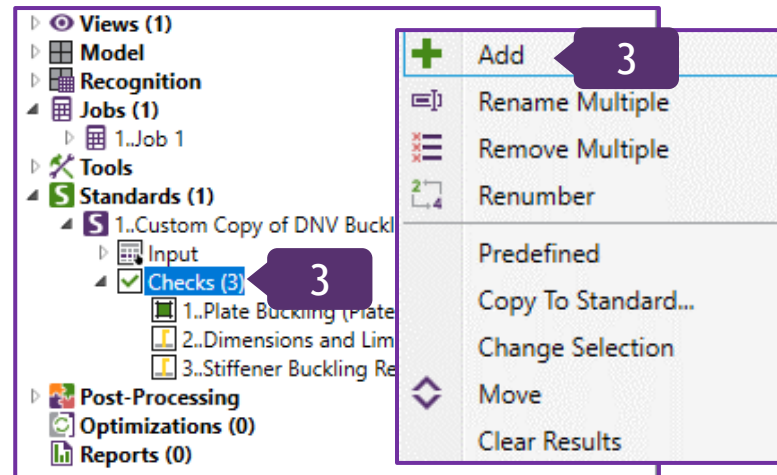
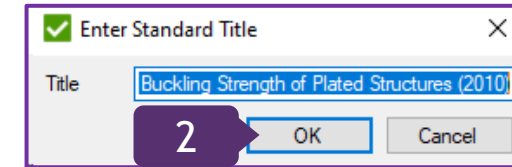
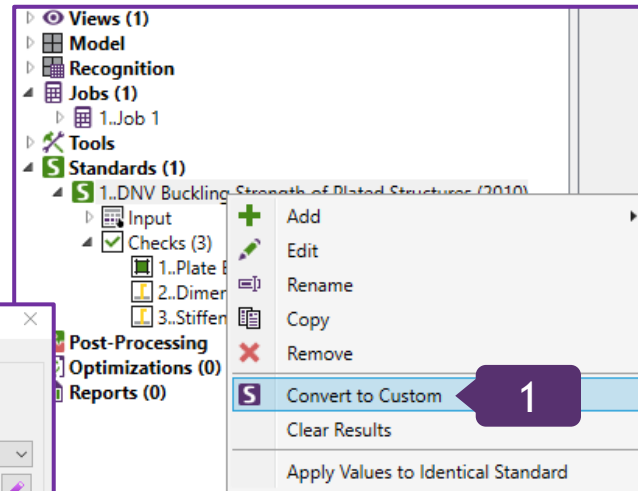
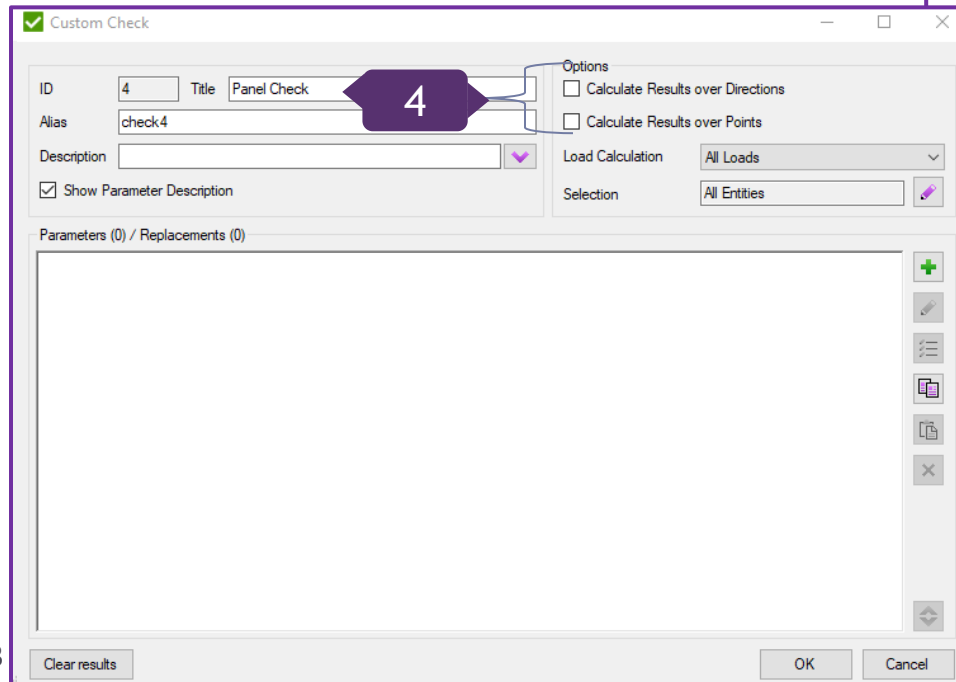
3

Execute right click on *Checks (3)* => *Add* => *Custom Check*

4

Title: *Panel Check*;
Options: *OFF*

Note: There are three separate checks for Plate Buckling, Dimensions and Limits and Stiffener Buckling. In order to add an additional Check, which will combine Stiffener and Plate Buckling (for demonstrative purposes in Plots and Tables), DNV Buckling Strength of Plated Structures (2010) Standard is supposed to be converted to Custom.



SDC
VERIFIER

-
- ✓ Add Parameter
- Title
- Alias
- Description ▼
- ☐ Replacement (without results)
- Limits
- ☐ Highlight
- ☐ Absolute Value
- Value1
- Value2
- Category
- Main Functions
- \sqrt{x} x^y
- Min Max
- AbsMax IF
- Average Switch
- Items
- $F(x)$ π τ
- γ ∞ L
- I E ☒
- \ln \log \log_{10}
- 2
- All Directions
- Add constant ...
- OK Cancel

Extract Utilization Factor from Previous Calculation (Continuation)

5

Title: *Plate check*;
Alias: *Plate_check (without gaps)*;
Press OK

6

Press  to add Parameter

7

Press  to add Check Result Variable

8

Select 1..Custom Copy of DNV Buckling Strength => 3..Stiffener Buckling Results => *Uf Overall*, and press OK

9

Title: *Stiffener check*;
Alias: *Stiffener_check (without gaps)*;
Press OK

Add Parameter

Title:

Alias:

Description:

☐ Replacement (without results)

Limits: ☐ Highlight, ☐ Absolute Value

Value1: ,

Value2: ,

Category:

Main Functions: , , , , , , ,

Items: , , , , , , , ,

All Directions:

OK Cancel

Custom Check

ID: Title:

Alias:

Description:

☒ Show Parameter Description

Options: ☐ Calculate Results over Directions, ☐ Calculate Results over Points

Load Calculation:

Selection:

Parameters (1) / Replacements (0):

OK Cancel

Add Parameter

Title:

Alias:

Description:

☐ Replacement (without results)

Limits: ☐ Highlight, ☐ Absolute Value

Value1: ,

Value2: ,

Category:

Main Functions: , , , , , , ,

Items: , , , , , , , ,

OK Cancel

Add Parameter

Title:

Alias:

Description:

☐ Replacement (without results)

Limits: ☐ Highlight, ☐ Absolute Value

Value1: ,

Value2: ,

Category:

Main Functions: , , , , , , ,

Items: , , , , , , , ,

All Directions:

Add constant ...

OK Cancel

Add Check Parameter

Standards:

Custom Checks:

Parameters:


Directions:

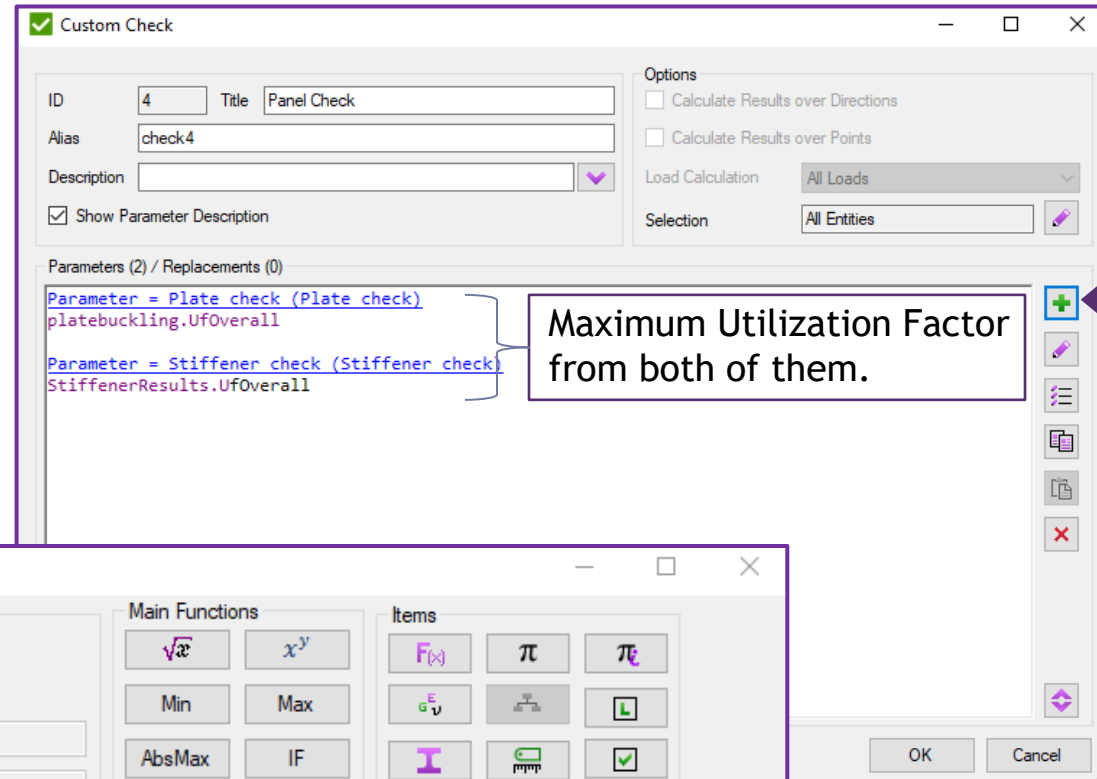
Points Of Interest:

Variable:

OK Cancel

Utilization Factor of Panel Buckling


- 1 Press  to add Parameter
- 2 Title: *Panel check*;
Alias: *Panel_check* (without gaps);
- 3 All Directions: $\text{absmax}(\text{Plate_check}, \text{Stiffener_check})$
by pressing Enter;
Press OK



Custom Check

ID: 4 Title: Panel Check

Alias: check4

Description: 

☒ Show Parameter Description

Options

☐ Calculate Results over Directions

☐ Calculate Results over Points

Load Calculation: All Loads

Selection: All Entities

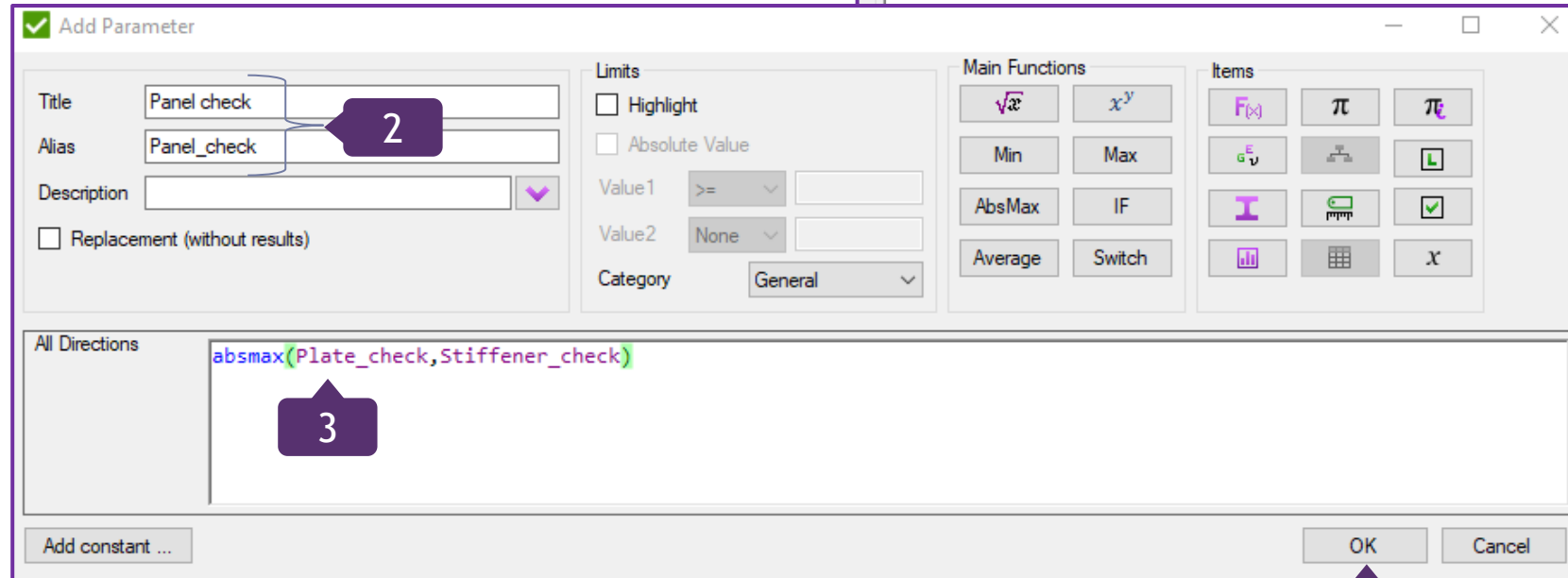
Parameters (2) / Replacements (0)

Parameter = Plate check (Plate check)
platebuckling.UfOverall

Parameter = Stiffener check (Stiffener check)
StiffenerResults.UfOverall

Maximum Utilization Factor from both of them.


1



Add Parameter

Title: Panel check

Alias: Panel_check

Description: 

☐ Replacement (without results)

Limits

☐ Highlight

☐ Absolute Value

Value1: >=

Value2: None

Category: General

Main Functions

\sqrt{x} x^y

Min Max

AbsMax IF

Average Switch

Items

$F(x)$ π πe

e^x \ln L

I \int \checkmark

\log \sum x

All Directions

$\text{absmax}(\text{Plate_check}, \text{Stiffener_check})$

3

Add constant ...

OK Cancel

2

-
- Custom Check**
- ID: 4 Title: Panel Check
- Alias: check4
- Description:
- ☒ Show Parameter Description
- Options
- ☐ Calculate Results over Directions
- ☐ Calculate Results over Points
- Load Calculation: All Loads
- Selection: All Entities
- Parameters (3) / Replacements (0)
- Parameter = Plate check (Plate check)
platebuckling.UfOverall
- Parameter = Stiffener check (Stiffener check)
StiffenerResults.UfOverall
- Parameter = Panel check (Panel check)
absmax(Plate_check,Stiffener_check)
- 1
- Main Functions
- Items
- OK Cancel

27

Edit Multiple Parameters

1 Press  to *Edit Parameters Multiple*

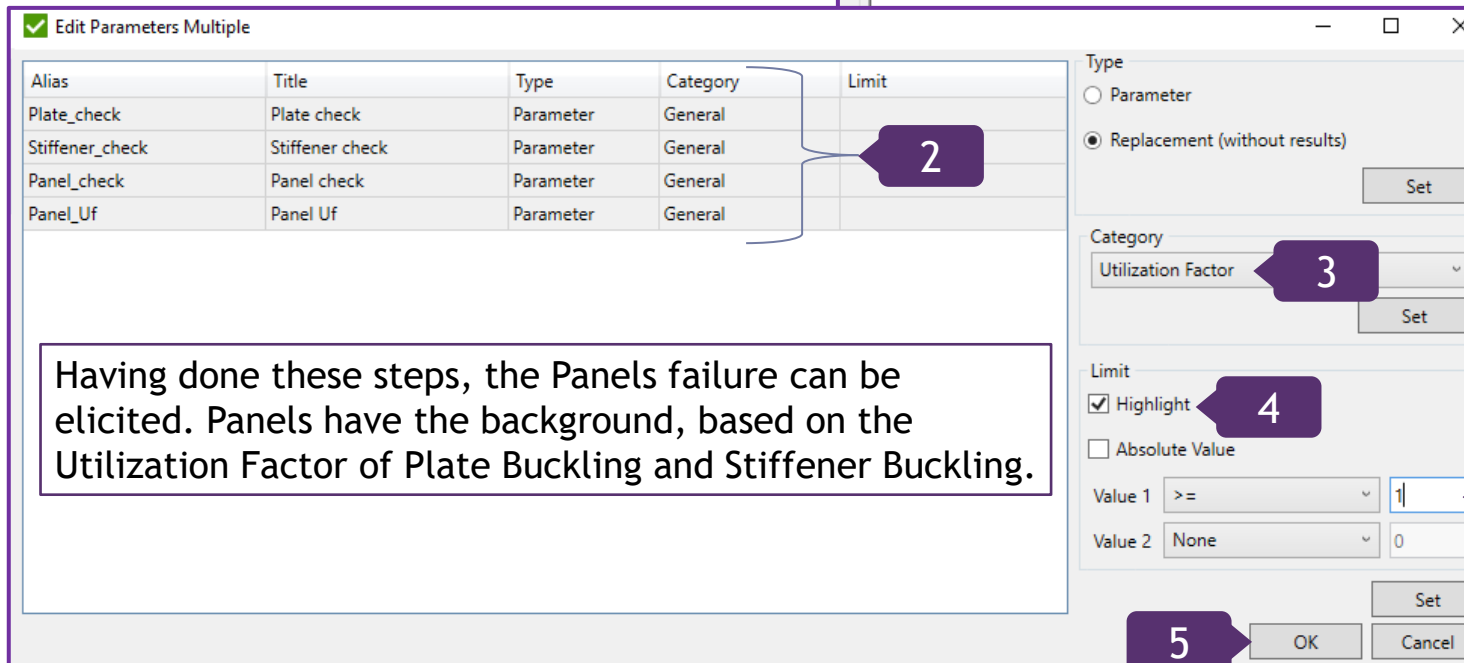
2 Select all of them

3 Category: *Utilization Factor*

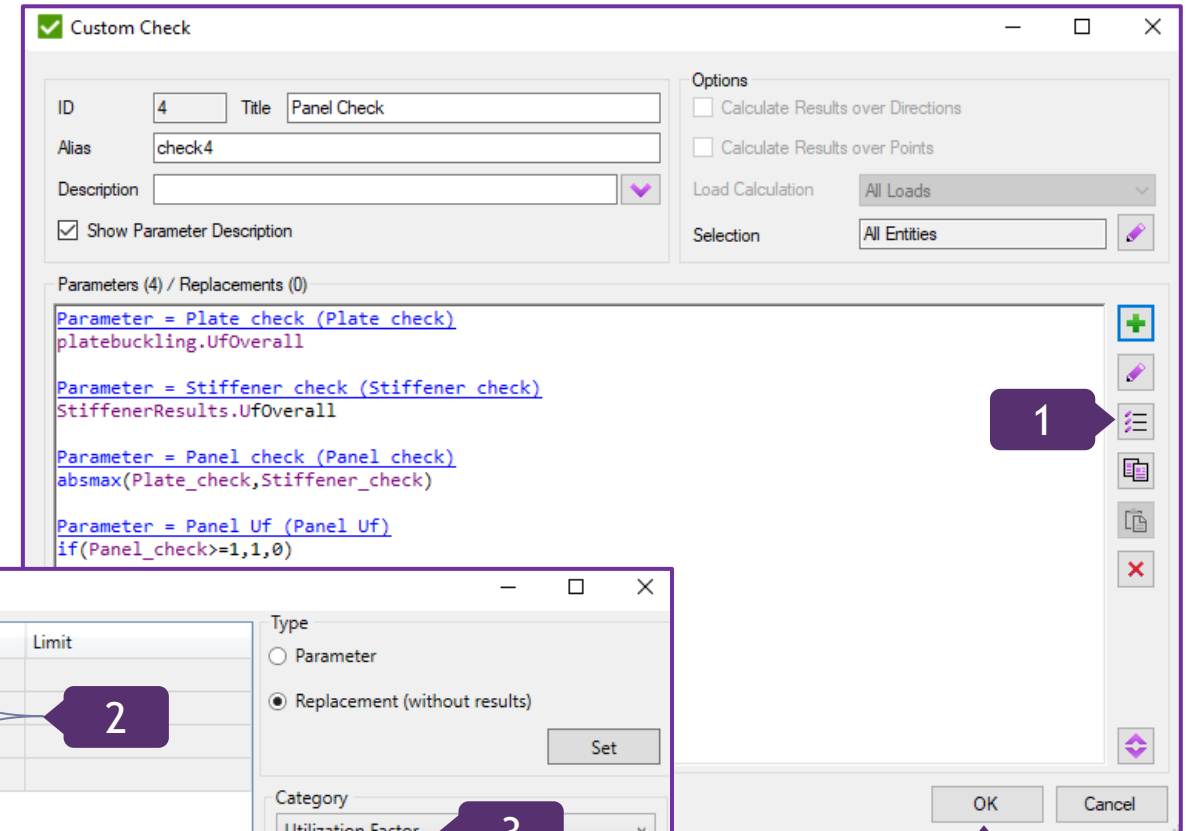
4 Limit: Highlight is *ON*;
Value 1 ≥ 1

5 Press *OK*

6 Press *OK*

The 'Edit Parameters Multiple' dialog box is shown. It contains a table with columns: Alias, Title, Type, Category, and Limit. The table lists four parameters: Plate_check, Stiffener_check, Panel_check, and Panel_Uf, all of type 'Parameter' and category 'General'. A bracket labeled '2' is under the 'Category' column. A text box labeled '4' contains the text: 'Having done these steps, the Panels failure can be elicited. Panels have the background, based on the Utilization Factor of Plate Buckling and Stiffener Buckling.'

Alias	Title	Type	Category	Limit
Plate_check	Plate check	Parameter	General	
Stiffener_check	Stiffener check	Parameter	General	
Panel_check	Panel check	Parameter	General	
Panel_Uf	Panel Uf	Parameter	General	

The 'Custom Check' dialog box is shown. It has fields for ID (4), Title (Panel Check), Alias (check4), and Description. There are checkboxes for 'Show Parameter Description' and 'Options' (Calculate Results over Directions, Calculate Results over Points). A dropdown for 'Load Calculation' is set to 'All Loads', and a dropdown for 'Selection' is set to 'All Entities'. Below these are four parameter definitions: 'Parameter = Plate check (Plate check) platebuckling.UfOverall', 'Parameter = Stiffener check (Stiffener check) StiffenerResults.UfOverall', 'Parameter = Panel check (Panel check) absmax(Plate_check,Stiffener_check)', and 'Parameter = Panel Uf (Panel Uf) if(Panel_check>=1,1,0)'. A bracket labeled '1' is under the parameter definitions. At the bottom are 'OK' and 'Cancel' buttons, with a bracket labeled '6' under the 'OK' button.

Export Panels as Separate Components

1

In Model Tree, in Recognition, execute right click on *Panel Finder*; Press *Edit*

2

Select *Filter* section

3

Display: *Panels*

4

Press *Apply Filter*

5

Select all Panels, using CTRL+A; Press  to export them to Components as separate Components

6

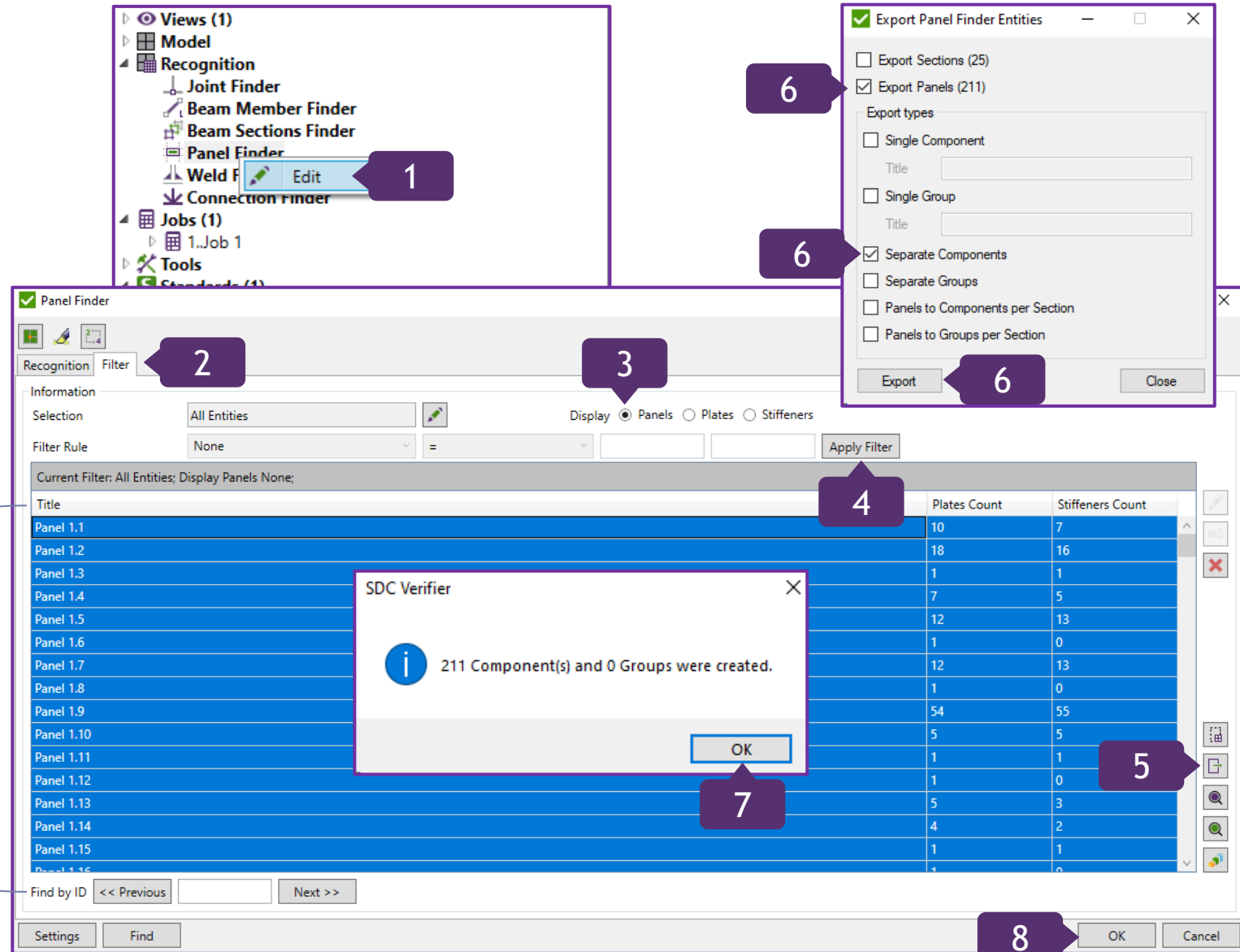
Export Panels (211): *ON*; Separate Components: *ON*; Press *Export*

7

Press *OK*

8

Press *OK*



The screenshot illustrates the steps to export panels as separate components in SDC Verifier. It shows the Model Tree, the Panel Finder dialog, the Export Panel Finder Entities dialog, and the resulting table of exported components.

Model Tree: The 'Recognition' folder is expanded, and the 'Panel Finder' item is right-clicked, with the 'Edit' option selected.

Panel Finder Dialog: The 'Filter' tab is selected. The 'Display' radio button is set to 'Panels'. The 'Apply Filter' button is visible.

Export Panel Finder Entities Dialog: The 'Export Panels (211)' checkbox is checked. Under 'Export types', the 'Separate Components' checkbox is also checked. The 'Export' button is highlighted.

Exported Components Table: A table listing 15 panels (Panel 1.1 to Panel 1.15) with their respective 'Plates Count' and 'Stiffeners Count'.

Title	Plates Count	Stiffeners Count
Panel 1.1	10	7
Panel 1.2	18	16
Panel 1.3	1	1
Panel 1.4	7	5
Panel 1.5	12	13
Panel 1.6	1	0
Panel 1.7	12	13
Panel 1.8	1	0
Panel 1.9	54	55
Panel 1.10	5	5
Panel 1.11	1	1
Panel 1.12	1	0
Panel 1.13	5	3
Panel 1.14	4	2
Panel 1.15	1	1

SDC Verifier Message Box: A message box states: "211 Component(s) and 0 Groups were created." with an 'OK' button.

Build Components Extreme Table (over selections)


1

In Standards => 1..Custom Copy of DNV Buckling Strength of Plated Structures => Checks, select 4..Panel Check

2

Execute right click on 4..Panel Check and select Components Extreme Table (over selections)

3

In Load Group, press ; Select Load Group => 1..Envelope; Press OK

4

Direction/Parameter: All; Extreme Options: Absolute

5

Press  and select From List

6

Press All and press OK

7

Press Fill Table

The screenshot illustrates the process of building a Components Extreme Table in SDC Verifier. The interface shows the following steps:

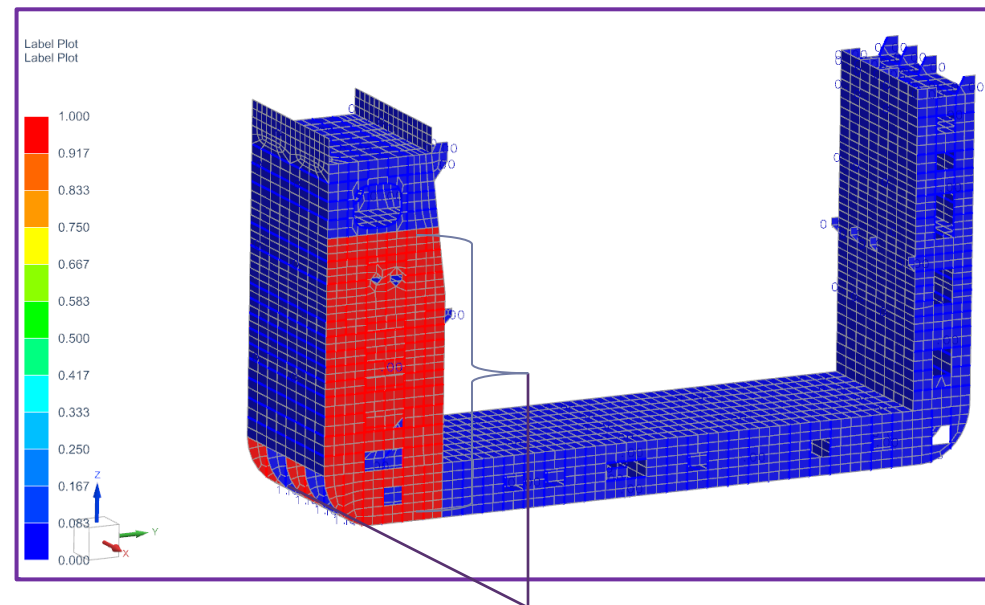
- Right-click on '4..Panel Check' in the tree view.
- Select 'Components Extreme Table (over selections)' from the context menu.
- In the 'Select Load' dialog, select 'Load Group' and '1..Envelope'.
- In the 'Components' dialog, select 'All' for the 'Show' filter.
- In the 'Components Extreme Table' dialog, click the 'From List' button.
- In the 'Components Extreme Table' dialog, click the 'All' button in the 'Show' filter.
- Click the 'Fill Table' button at the bottom of the 'Components Extreme Table' dialog.

Build Panel Uf Plot

1 Select all *Components*, using CTRL + A

2 Press  and select *Panel Uf*

3 Press *OK*



These sections do not pass the verification in the calculation.

Components Extreme Table

Table Info: 211 Selections, LG1..Envelope, Direction: X, Extreme Types: Abs

Components	Plate check	Stiffener check	Panel check	Panel Uf
Component '1..Panel 1.1'	0.34	0.29	0.34	0.00
Component '2..Panel 1.2'	0.31	0.34	0.34	0.00
Component '3..Panel 1.3'	0.27	0.19	0.27	0.00
Component '4..Panel 1.4'	0.28	0.25	0.28	0.00
Component '5..Panel 1.5'	0.25	0.32	0.32	0.00
Component '6..Panel 1.6'	0.03	0.00	0.03	0.00
Component '7..Panel 1.7'	0.31	0.56	0.56	0.00
Component '8..Panel 1.8'	0.03	0.00	0.03	0.00
Component '9..Panel 1.9'	0.39	6.56	6.56	1.00
Component '10..Panel 1.10'	0.65	0.29	0.65	0.00
Component '11..Panel 1.11'	0.04	0.01	0.04	0.00
Component '12..Panel 1.12'	0.02	0.00	0.02	0.00
Component '13..Panel 1.13'	0.29	0.28	0.29	0.00
Component '14..Panel 1.14'	0.21	0.18	0.21	0.00
Component '15..Panel 1.15'	0.19	0.08	0.19	0.00
Component '16..Panel 1.16'	0.03	0.00	0.03	0.00
Component '17..Panel 1.17'	0.01	0.00	0.01	0.00
Component '18..Panel 2.1'	0.10	0.10	0.10	0.00
Component '19..Panel 2.2'	0.17	0.08	0.17	0.00
Component '20..Panel 2.3'	0.06	0.06	0.06	0.00
Component '21..Panel 2.4'	0.07	0.08	0.08	0.00
Component '22..Panel 2.5'	0.34	0.17	0.34	0.00
Component '23..Panel 2.6'	0.15	0.05	0.15	0.00
Component '24..Panel 2.7'	0.35	0.23	0.35	0.00

Displaying 211 of 211 rows and 5 of 5 columns

1

2

3

Views (Frames)

1

Execute right click on *Views* and select *Add*

2

In Simcenter, orient the model as shown on picture (ZY plane)

3

Title: *Frames*

4

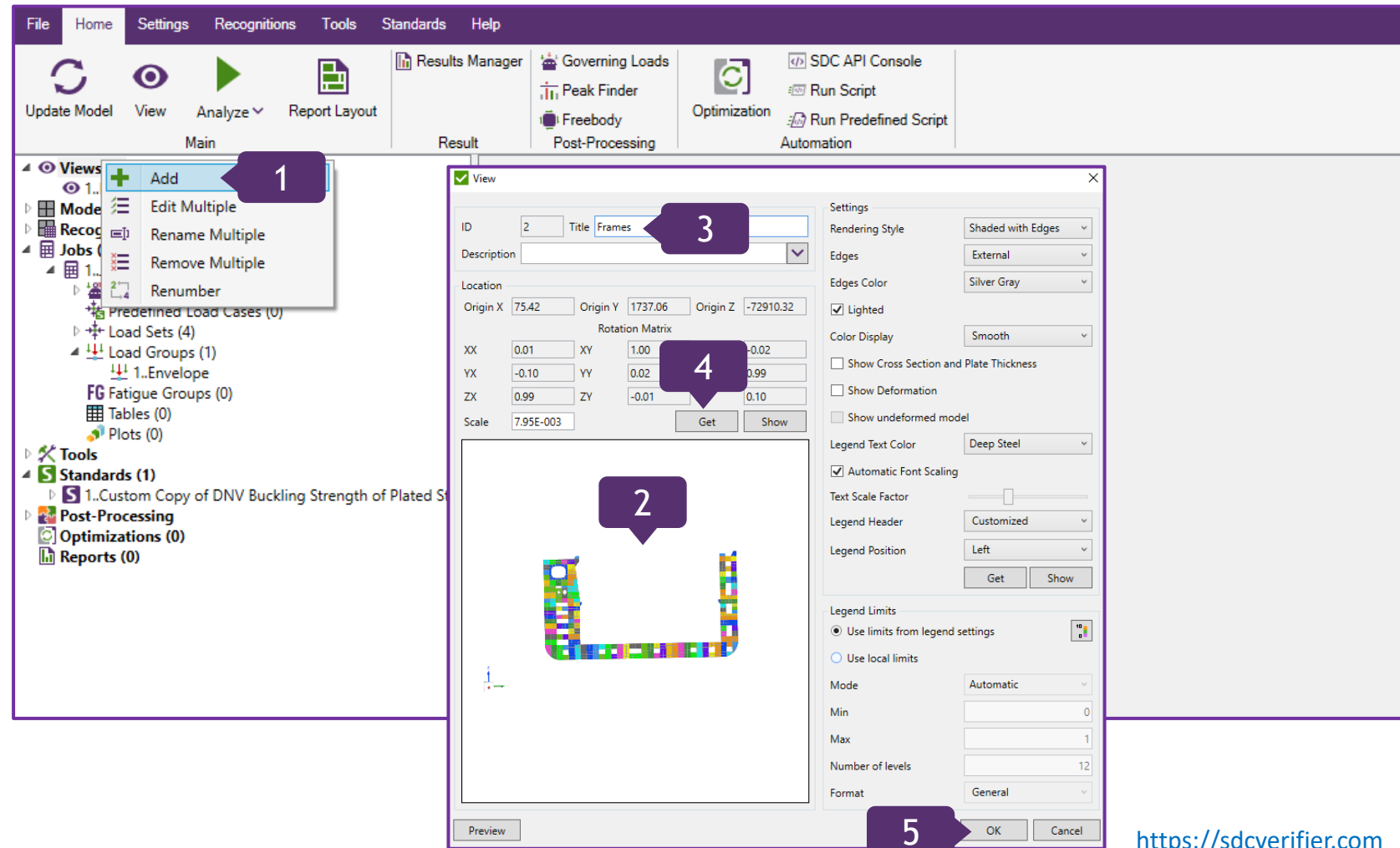
Press *Get*

5

Press *OK*

Repeat Steps 1-5 two times to create Views for Longitudinals (plane ZX) and Decks (plane XY)

To make relevant Plots, in the first place Views should be created (a set of settings of how to display a Plot).



Views (Stiffeners)

To make relevant Plots, in the first place Views should be created (a set of settings of how to display a Plot).

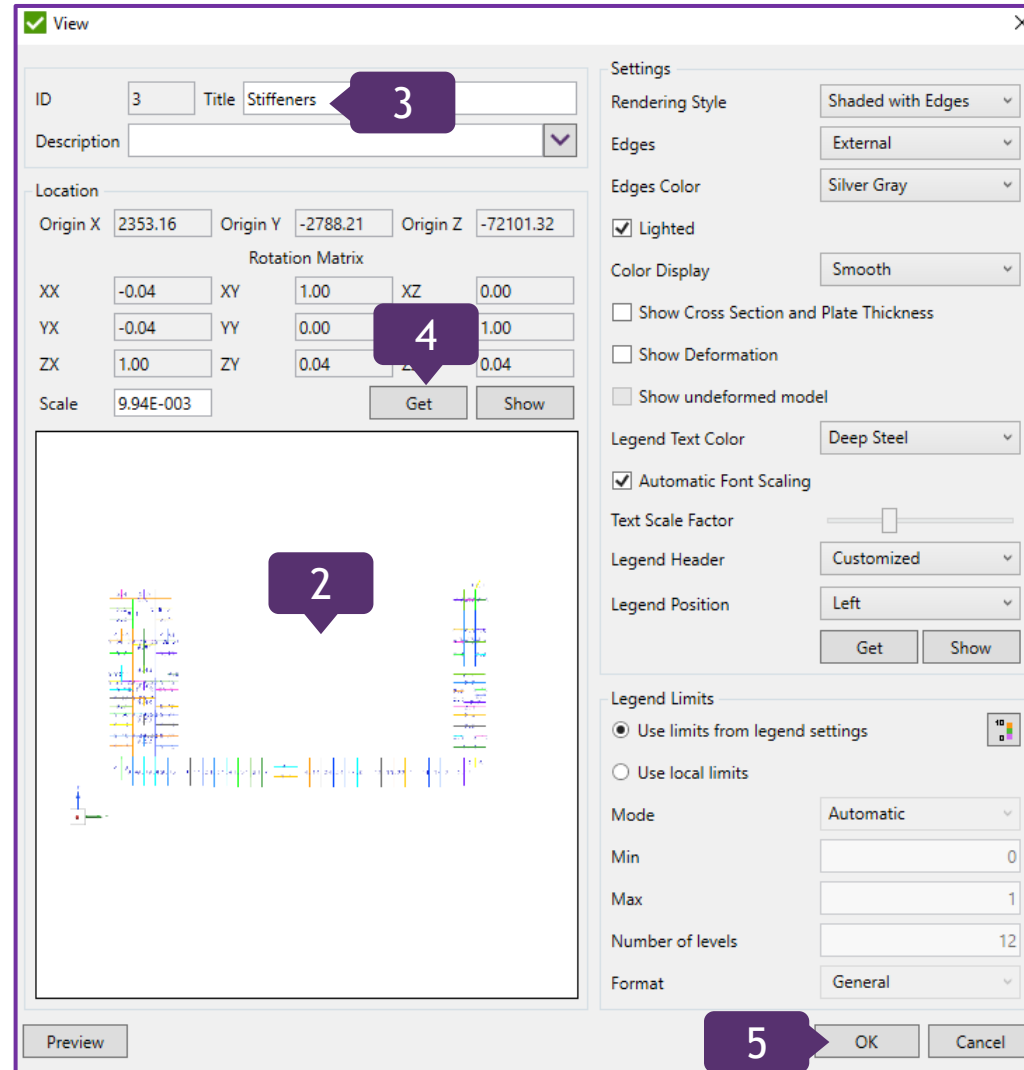
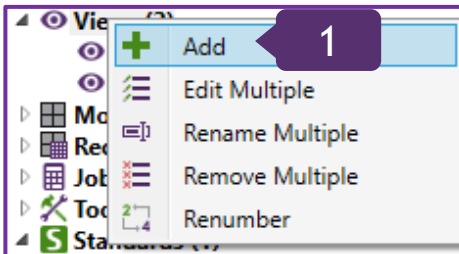
1 Execute Views => Add

2 In Simcenter, orient model as shown on picture (ZY plane)

3 Title: *Stiffeners*

4 Press *Get*

5 Press *OK*



1

In *Checks* section, execute right click on *1..Plate Buckling* and select *Table (expand/extreme)*

2

In Load Group, press



3

Select *Load Group* => *1..Load Group 1* and press *OK*

4

Show plates results: *OFF*

5

Press *Fill Table*

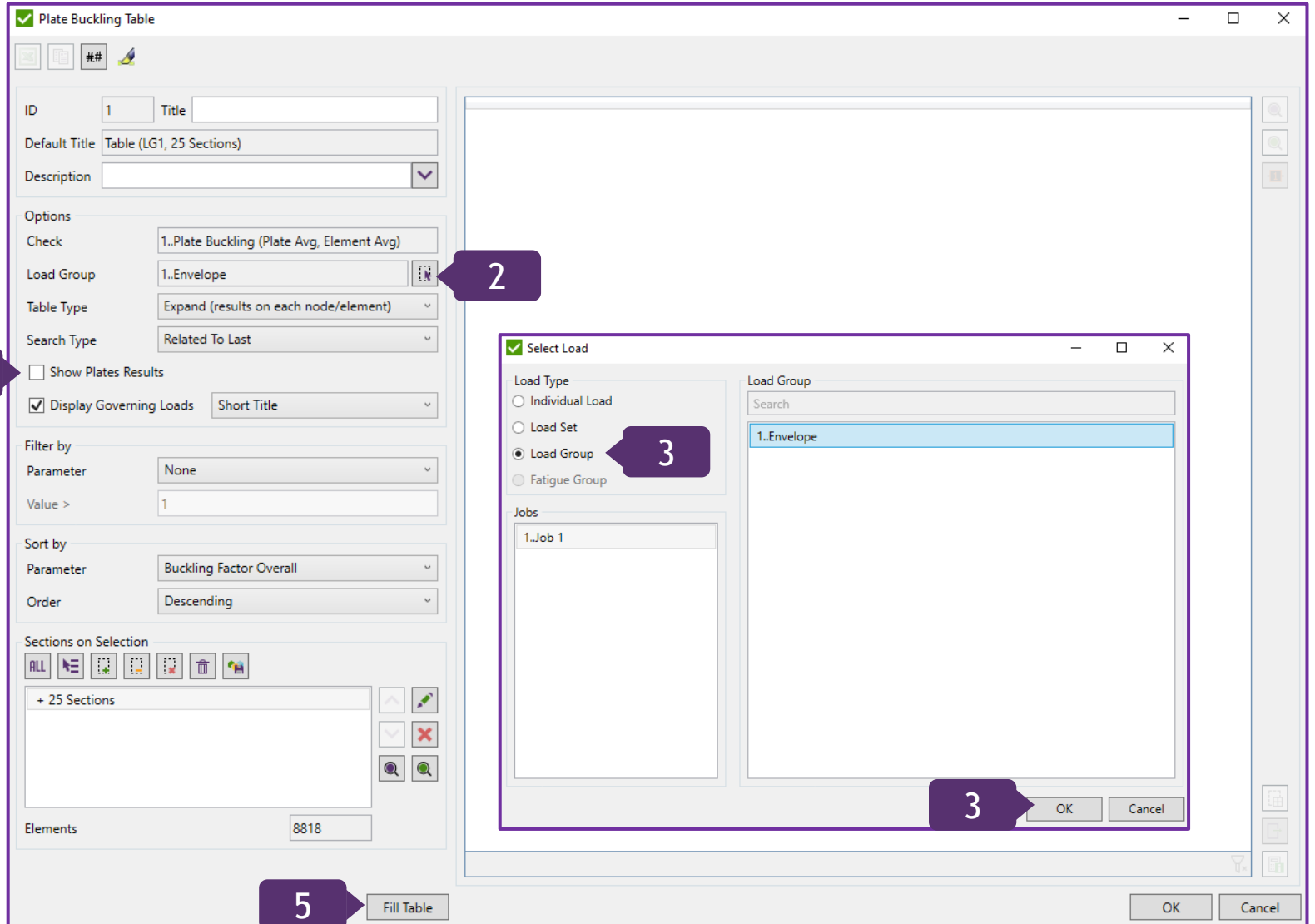
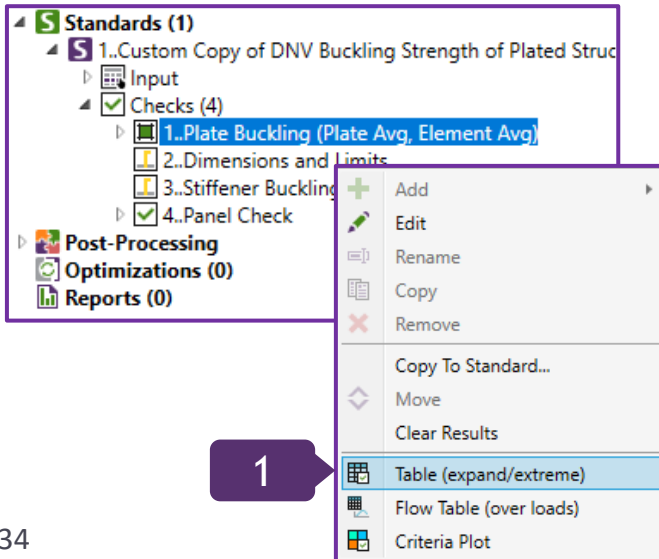


Plate Buckling Table (Continuation)

Section Title	Plate Length [m]	Plate Width [mr]	Plate Thickness	Sx in plate direc	Sy in plate direc	Sxy in plate dire	Seqv [kPa]	Are Requirem	Buckling Factor	Buckling Factor	Load
8..Section Y 8 (Y = -8950)	9050.00	3360.00	12.00	-35302.00	-1830.18	1970.75	34592.24	1.00	0.80	0.90	LS4

6

Press OK

All results (Dimensions, Stresses) are from the Plate, which causes the highest BF=0.90, because Search Type = Related to Last Parameter.

It is advised to use Show Plates results for detailed table with results for all Plates. Otherwise, only the worst results over Sections will be shown.

Plate Buckling Table

Table Info: 25 Sections, LG1..Envelope, Search Type: Related To Last, Filter by: Parameter: None Value: 1, Table Type: Expand

Sectid	Plate	Plate	Plate	Sx in	Sy in	Sxy in	Seqv	Are R	Buckl	Buckl	Load
8..Section	9050.00	3360.00	12.00	-35302.00	-1830.18	1970.75	34592.24	1.00	0.80	0.90	LS4
15..Section	3360.00	895.00	14.00	-2043.74	-49127.24	-760.12	48155.93	1.00	0.64	0.80	LS4
5..Section	833.33	750.00	12.00	0.00	0.00	-64968.95	150850.13	1.00	0.52	0.72	LS1
13..Section	2200.00	1680.00	6.00	-28291.03	-2507.60	522.20	27139.38	1.00	0.50	0.71	LS3
1..Section	833.33	750.00	12.00	0.00	0.00	-54728.20	135139.67	1.00	0.42	0.65	LS1
16..Section	1680.00	800.00	10.00	0.00	-37843.79	-4089.04	45814.21	1.00	0.35	0.59	LS4
14..Section	3360.00	916.66	13.00	-5767.74	-32022.60	3877.02	30316.82	1.00	0.32	0.57	LS4
3..Section	895.00	733.33	14.00	-31473.86	-13045.45	-57011.91	102475.70	1.00	0.26	0.51	LS3
11..Section	2200.00	840.00	6.00	-22042.78	-688.98	10056.64	27831.28	1.00	0.12	0.35	LS4
2..Section	833.33	800.00	16.00	0.00	0.00	32752.31	72240.24	1.00	0.12	0.35	LS1
4..Section	3000.00	2600.00	16.00	0.00	-17214.97	-7224.30	21508.72	1.00	0.11	0.33	LS4
19..Section	3360.00	2500.00	10.00	0.00	0.00	12098.18	21556.67	1.00	0.07	0.27	LS1
12..Section	2200.00	1680.00	13.00	-797.43	0.00	17086.14	29716.13	1.00	0.04	0.20	LS3
21..Custor	3360.00	2770.30	21.00	-534.25	-11525.86	1486.54	11558.66	1.00	0.03	0.18	LS4
9..Section	2200.00	1680.00	13.00	-1626.04	0.00	13614.01	23707.40	1.00	0.03	0.16	LS4
6..Section	3360.00	750.00	32.00	0.00	0.00	12305.22	28488.77	1.00	0.02	0.14	LS1
22..Custor	1680.00	417.01	14.00	0.00	-17038.34	-6423.35	20371.20	1.00	0.02	0.13	LS1
23..Custor	1680.00	473.44	14.00	-4132.57	-14891.39	-2951.73	14262.89	1.00	0.01	0.11	LS1
10..Section	2200.00	1680.00	15.00	0.00	-440.07	8253.76	14336.48	1.00	0.01	0.09	LS1
18..Section	4865.22	3360.00	11.00	-2.80	0.00	3166.85	5494.14	1.00	0.01	0.09	LS1
20..Section	3360.00	866.70	20.00	-4183.28	-7378.77	-6205.66	12514.36	1.00	0.01	0.09	LS4
17..Section	2500.00	1680.00	10.00	-1332.10	-2733.15	-2517.89	4962.16	1.00	0.01	0.09	LS1
24..Custor	1680.00	432.95	14.00	-2226.32	0.00	-2569.71	8919.13	1.00	0.00	0.04	LS4
25..Custor	1680.00	486.44	14.00	-3268.88	0.00	-1906.14	7325.40	1.00	0.00	0.04	LS4
7..Section	6720.00	1050.00	32.00	0.00	-83.33	408.48	408.48	1.00	0.00	0.00	LS1
Max ove	9050.00	3360.00	12.00	-35302.00	-1830.18	1970.75	34592.24	1.00	0.80	0.90	LS4

Displaying 26 of 26 rows and 12 of 12 columns

6

OK Cancel

Plate Buckling Plot

1

Execute *Criteria Plot* from Plate Buckling DNV 2010 context menu

2

In Load Group, press 

3

Select *Load Group* => *1..Envelope* and press *OK*

4

View: *2..Frames*

5

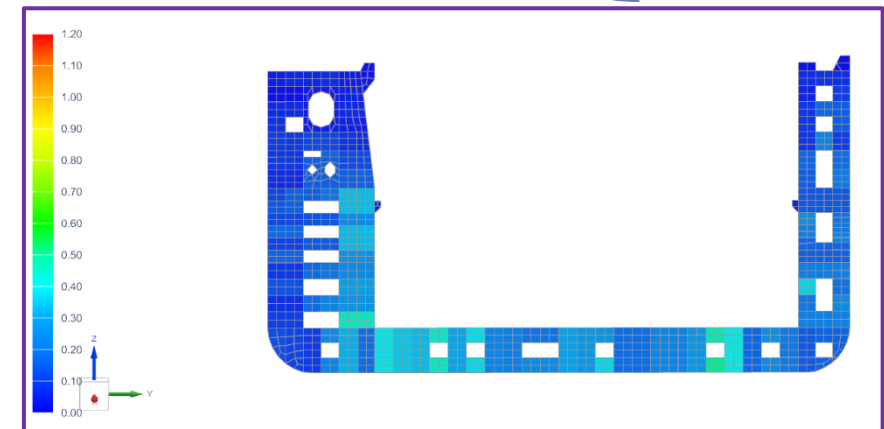
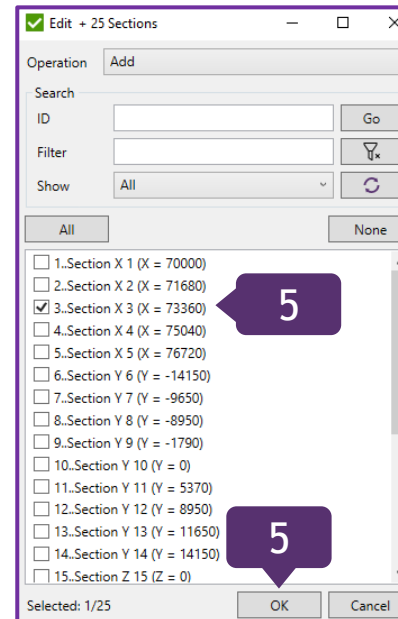
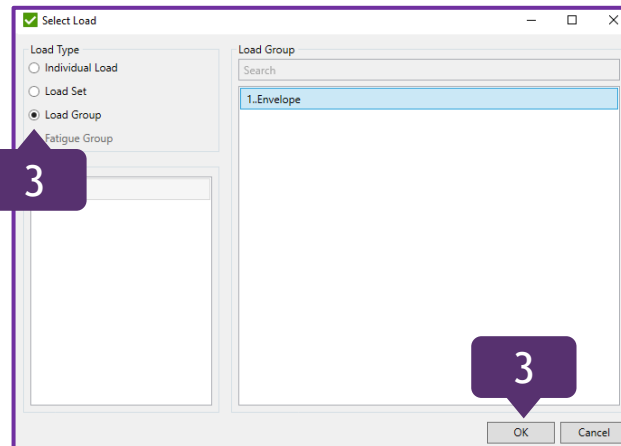
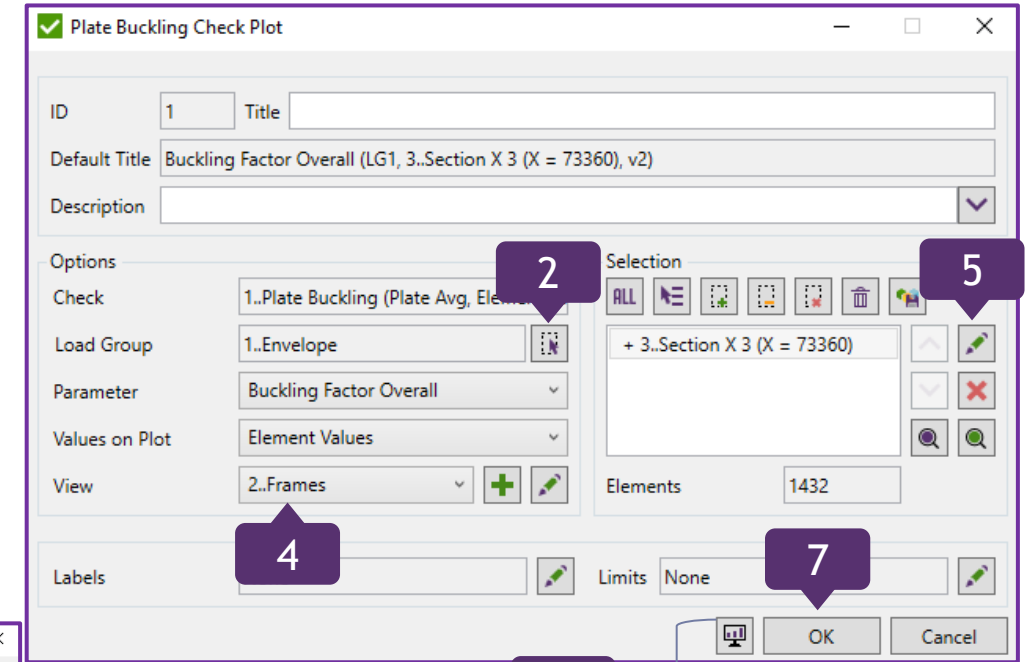
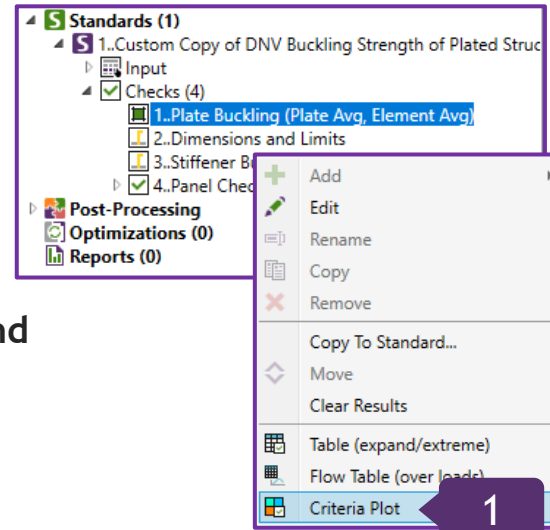
Press  and select: *Section X3*; Press *OK*

6

Press , and then *Preview*

7

Press *OK*



Stiffener Buckling Table


1

In *Checks* section, execute right click on *3..Stiffeners Buckling Results* and select *Table (expand/extreme)*

2

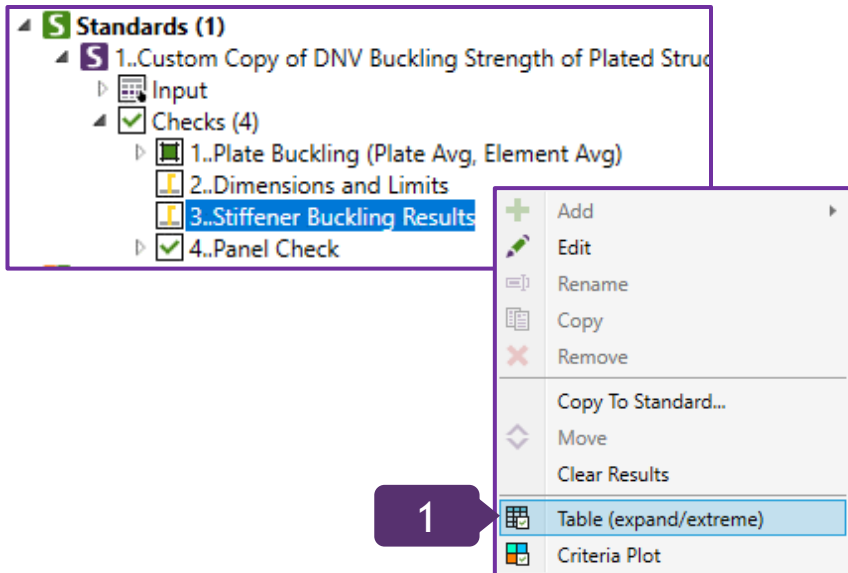
Show Stiffeners Results: *ON*

3

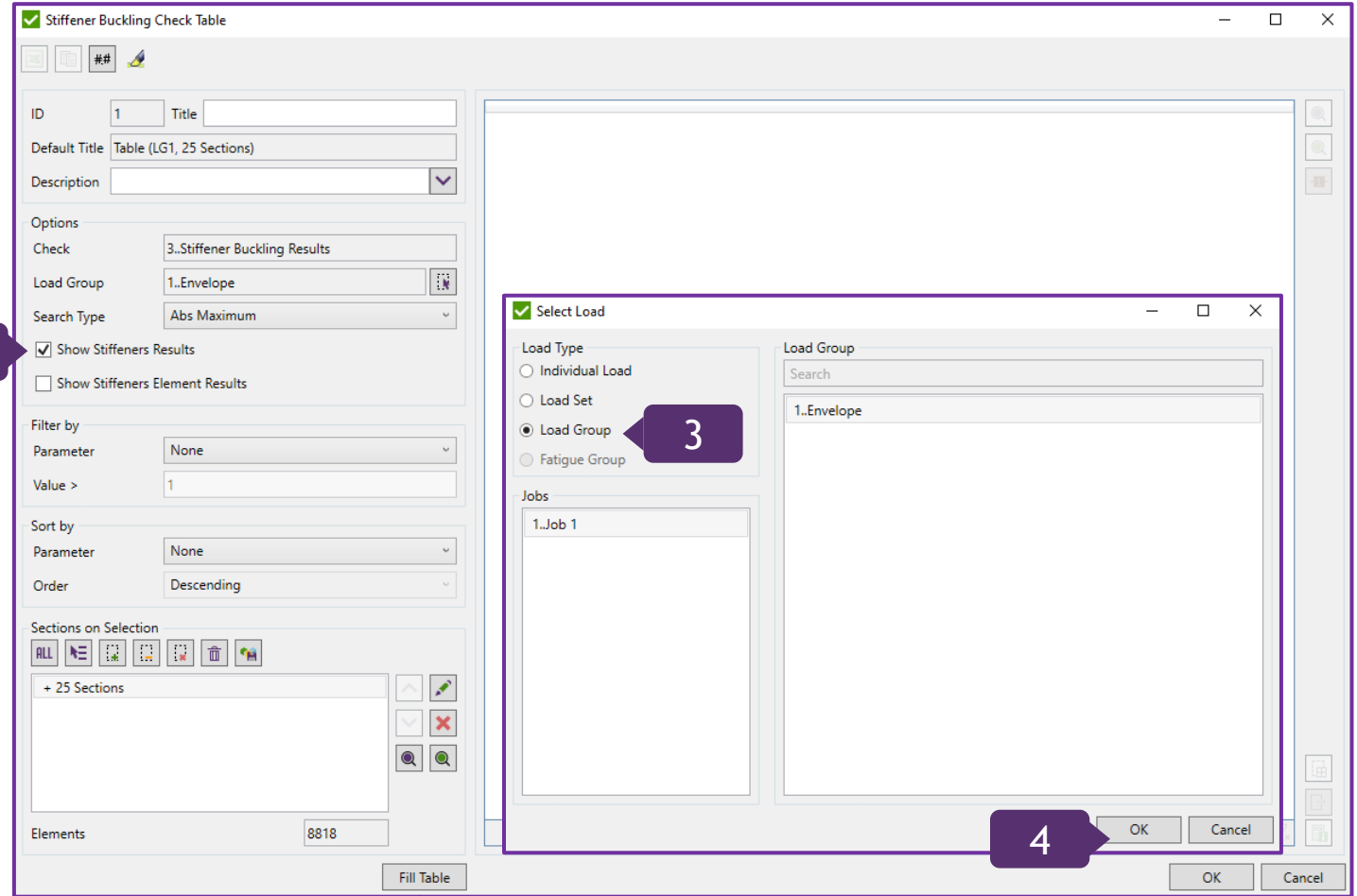
Select  Load => Load Group: *1..Envelope*

4

Press *OK* and *Fill Table*



2



4

Stiffener Buckling Table (Continuation)

5

Press OK

Use Show stiffener results for detailed table with results for all stiffeners. Otherwise only the worst results over Sections will be shown.

Stiffener Buckling Check Table

ID: 1 Title: []

Default Title: Table (LG1, 25 Sections)

Description: []

Options

Check: 3..Stiffener Buckling Results

Load Group: 1..Envelope

Search Type: Abs Maximum

☒ Show Stiffeners Results

☐ Show Stiffeners Element Results

Filter by

Parameter: None

Value >: 1

Sort by

Parameter: None

Order: Descending

Sections on Selection

+ 25 Sections

Elements: 8818

Fill Table

Table Info: 25 Sections, LG1..Envelope, Search Type: Abs Maximum, Show plates results, Table Type: Expand

Stiffener / Element	Qsd	Nsd	Vsd	M1Sd	M2Sd	Uf She	Uf Pla	Uf Stif	Uf Ov
1..Section X 1 (X = 7)	16382.81	717718720	4057239.2	258080296	129040148	0.02	6.56	6.36	6.56
1..Stiffener 1.1.1 [70]	5322.17	81667192.0	3250621.2	214660838	107330419	0.01	0.20	0.15	0.20
2..Stiffener 1.1.2 [70]	3326.29	19345436.0	-1166566.2	134160486	670802432	0.01	0.22	0.21	0.22
3..Stiffener 1.1.3 [70]	3156.90	26611536.0	-954253.5	127328243	636641216	0.01	0.25	0.24	0.25
4..Stiffener 1.1.4 [70]	3167.73	35200768.0	-804129.3	127765222	638826112	0.01	0.27	0.25	0.27
5..Stiffener 1.1.5 [70]	3299.28	36602816.0	-772206.6	133070860	665354304	0.01	0.29	0.26	0.29
6..Stiffener 1.1.6 [70]	3113.10	31802870.0	-500035.4	125561561	627807808	0.00	0.27	0.25	0.27
7..Stiffener 1.1.7 [70]	3814.79	32040538.0	-846119.8	153863360	769316800	0.00	0.14	0.11	0.14
1..Stiffener 1.2.1 [70]	2724.20	5614788.0	131707.75	141885184	709425920	0.00	0.19	0.19	0.19
2..Stiffener 1.2.2 [70]	3822.49	-19896398	422138.31	884839296	442419648	0.00	0.13	0.11	0.13
3..Stiffener 1.2.3 [70]	4483.29	44507196.0	76525.45	259447680	129723840	0.00	0.05	0.05	0.05
4..Stiffener 1.2.4 [70]	3082.21	16816242.0	122424.44	160531916	802659584	0.00	0.24	0.22	0.24
5..Stiffener 1.2.5 [70]	6174.83	-8207381.5	38627.09	357336704	178668352	0.00	0.06	0.05	0.06
6..Stiffener 1.2.6 [70]	4450.34	18792630.0	171900.22	231788646	115894323	0.00	0.34	0.32	0.34
7..Stiffener 1.2.7 [70]	4450.34	18792630.0	171900.22	231788646	115894323	0.00	0.34	0.32	0.34
8..Stiffener 1.2.8 [70]	5516.70	-10184217	-255245.41	319250720	159625360	0.00	0.05	0.04	0.05
9..Stiffener 1.2.9 [70]	3818.22	8300980.0	-216637.67	198865651	994328256	0.00	0.26	0.26	0.26
10..Stiffener 1.2.10 []	8117.68	-2121688.0	60591.04	469769440	234884720	0.00	0.07	0.07	0.07
11..Stiffener 1.2.11 []	4912.07	7664536.0	435522.88	284260832	142130416	0.00	0.04	0.04	0.04
12..Stiffener 1.2.12 []	3043.46	6848354.0	106024.77	158513472	792567360	0.00	0.21	0.21	0.21
13..Stiffener 1.2.13 []	3103.74	67798696.0	441380.78	161653184	808265920	0.00	0.29	0.23	0.29
14..Stiffener 1.2.14 []	4334.76	15794938.0	192119.70	250852352	125426176	0.00	0.05	0.03	0.05
15..Stiffener 1.2.15 []	1292.81	53384336.0	1117575.5	496406112	248203056	0.01	0.10	0.08	0.10
16..Stiffener 1.2.16 []	1109.97	47438420.0	-1018417.5	269730304	134865152	0.00	0.03	0.03	0.03
1..Stiffener 1.3.1 [70]	2095.68	380566240	840663.25	559564032	279782016	0.00	0.19	0.19	0.19
1..Stiffener 1.4.1 [70]	4408.21	26363544.0	-789612.86	177797683	888988416	0.00	0.12	0.09	0.12

Displaying 624 of 624 rows and 10 of 10 columns

5 OK Cancel

Stiffener Buckling Plot

1

In *Checks* section, execute right click on *3..Stiffener Buckling Results* and select *Criteria Plot*

2

In Load Group, press 

3

Select *Load Group* => *1..Envelope* and press *OK*

4

View: *3..Stiffeners*

5

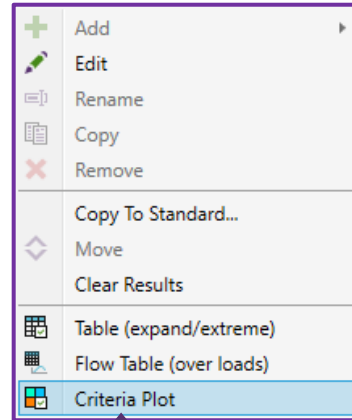
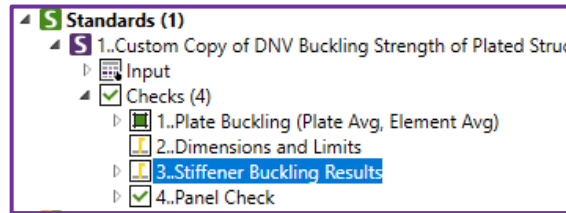
Press  and select: *Section X3*

6

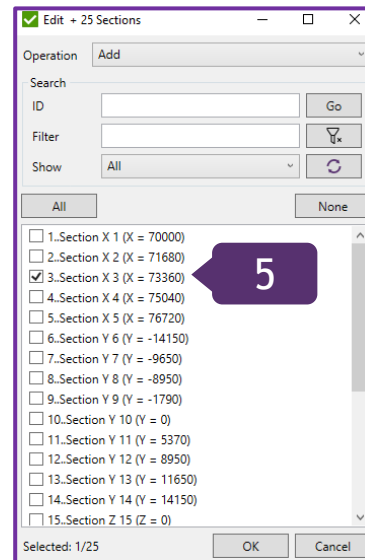
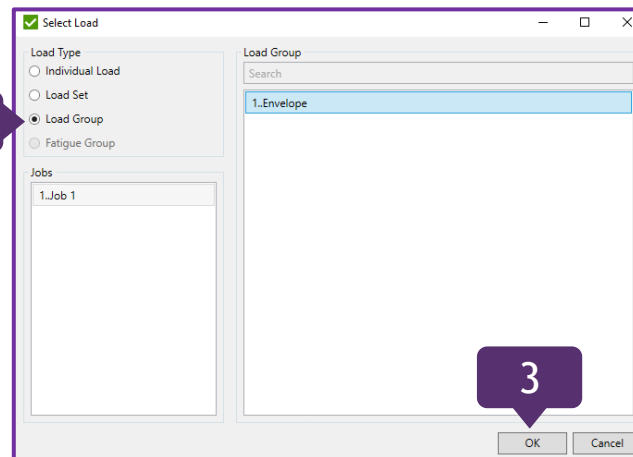
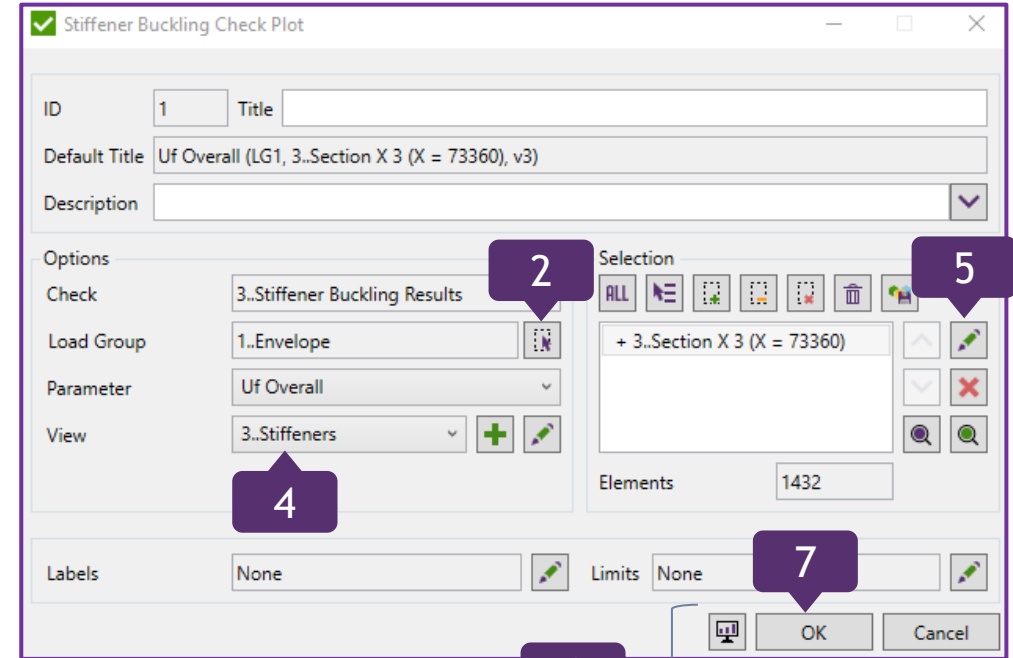
Press , and then *Preview*

7

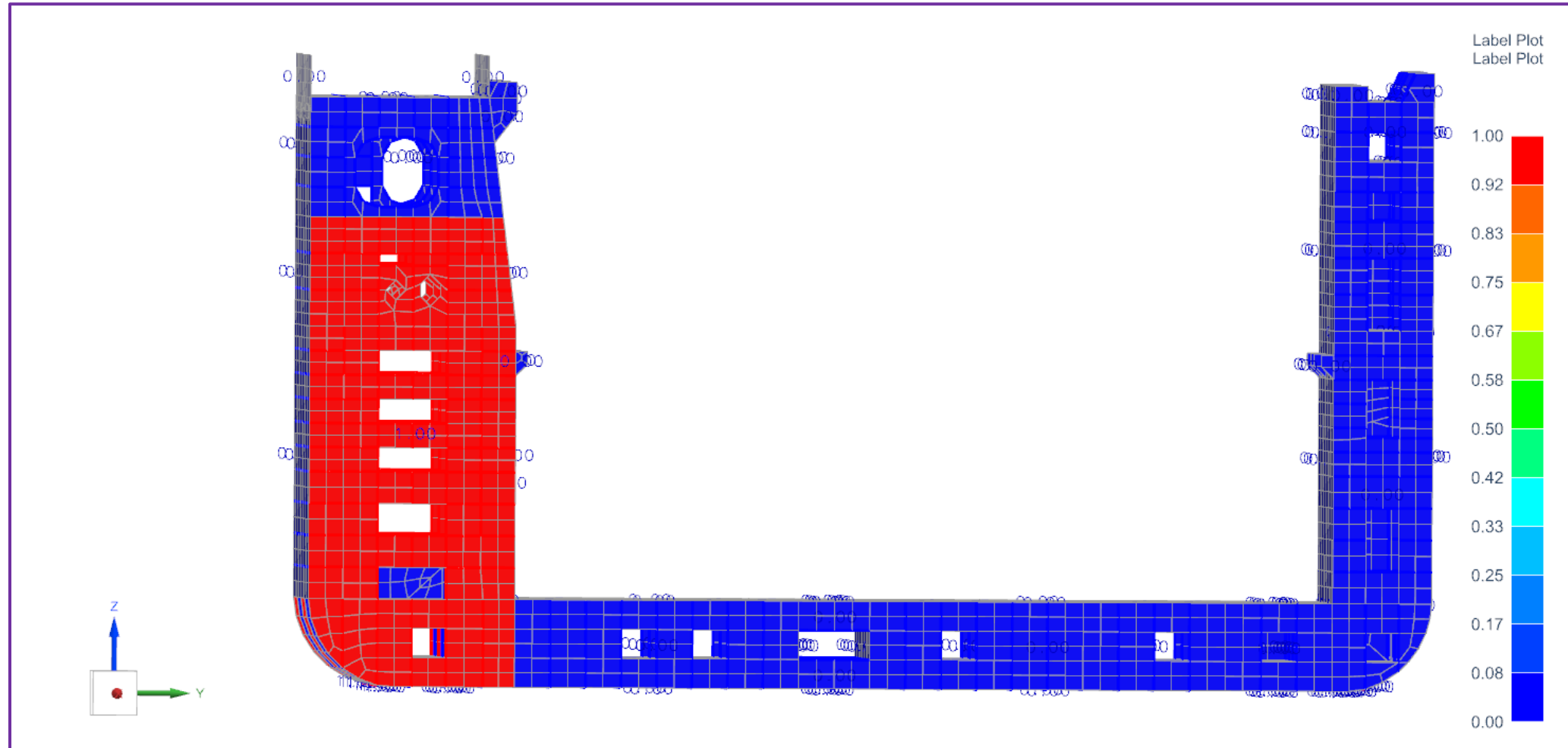
Press *OK*



1



This Plot gives us possibility to elicit Panels that fail. They have the background, based on the Utilization Factor of Plate Buckling and Stiffener Buckling.



To learn how to obtain reports, please check a separate Tutorial that depicts the functionality of SDC Verifier Report Designer. It may be downloaded via this link:

<https://sdcverifier.com/tutorials/report-designer/>