



## SDC Verifier tutorials


### **Custom Check. Bolt check**

**ANSYS**<sup>®</sup>

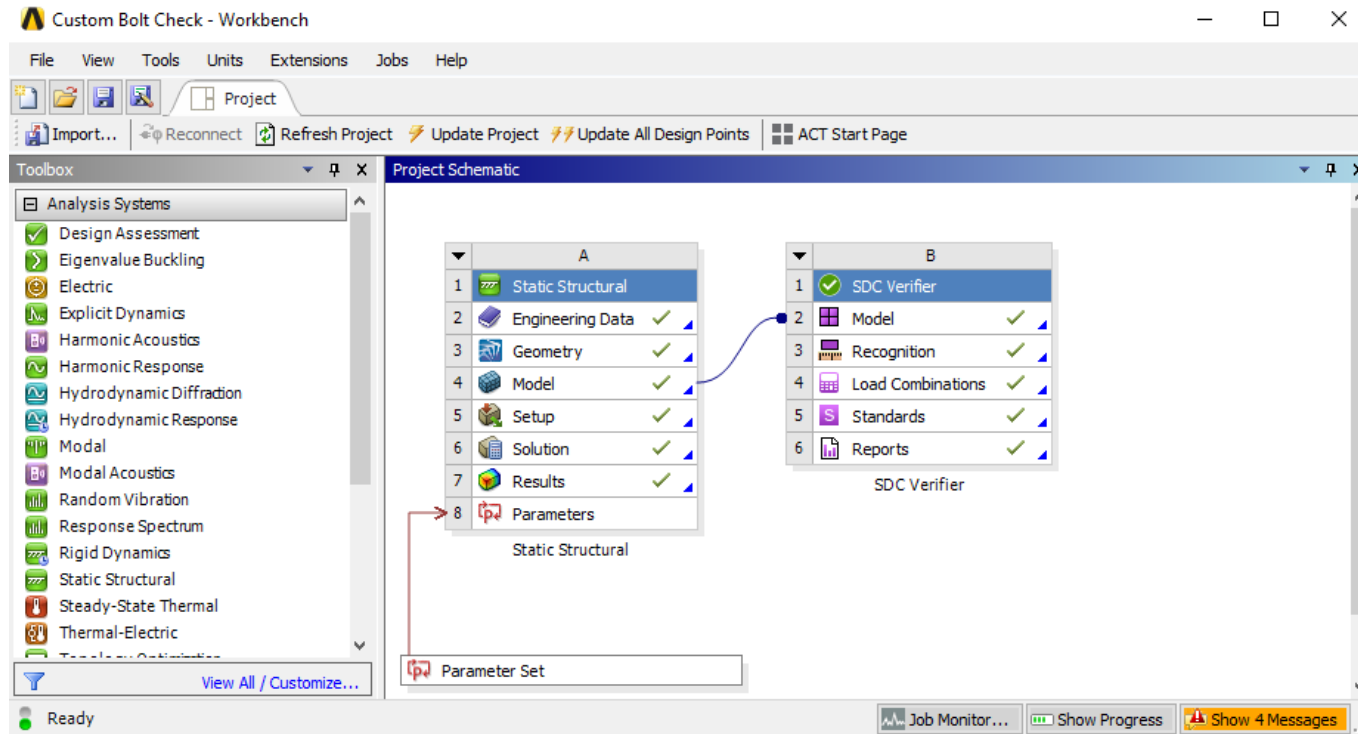
25.10.2018  
version 5.1

- ▶ In this tutorial the procedure of creation custom check using SDC Verifier is reviewed in details.
- ▶ Part of the gantry crane structure with bolted connection detail has been used as a start FEM model.
- ▶ Axial and Shear Bolt check were performed.
- ▶ Plots and tables are created to present the results.

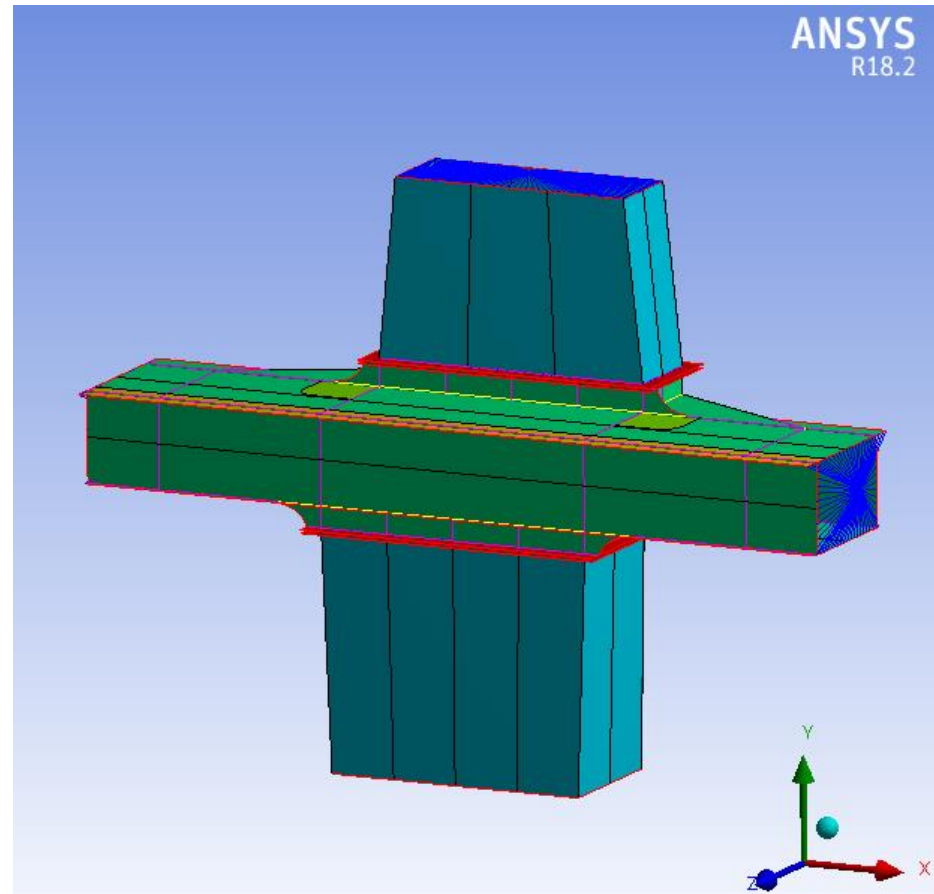
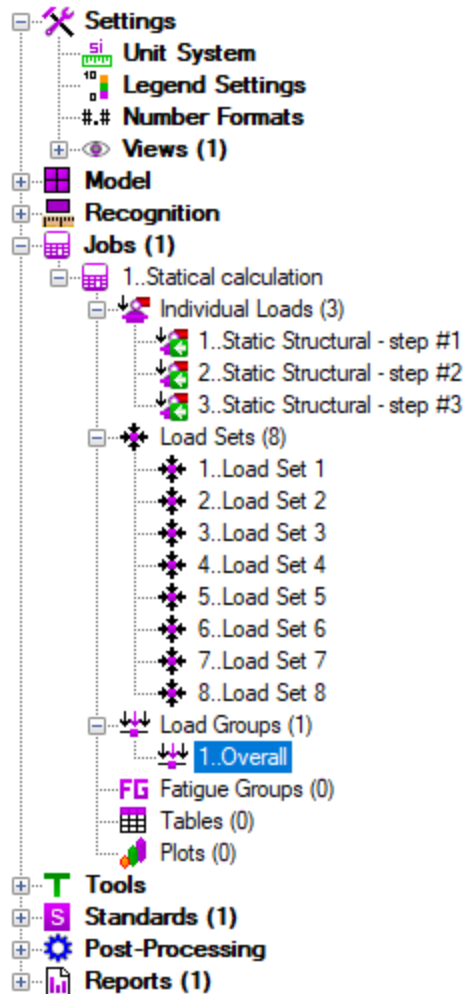
Open in **Ansys Workbench**   
**Custom bolt Check.wbpj**

Double Click on  or in context menu click *Edit*

A screenshot of the Project Navigator in a software development environment. The 'SDC Verifier' component is selected, and a context menu is open. The menu items are: 'Edit...', 'Duplicate', 'Transfer Data From New', 'Transfer Data To New', 'Update', and 'Update Upstream Components'. The 'Edit...' option is highlighted with a red rectangle.



# Predefined model and project



This tutorial uses predefined model with already created constraints, Individual Loads, Load Sets and Load Group.

# Creating Custom Standard

1

Execute *Add => Custom* from the Standards context menu

2

Standard Title: **Bolt Check**

3

Press *OK*

**Standard** is set of checks and items to perform calculations according to Code. It contains: Constants, Characteristics, Classification, Standard Tables, Checks, Variables.

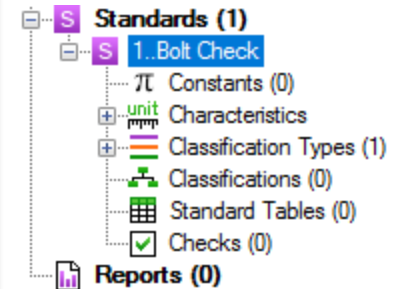
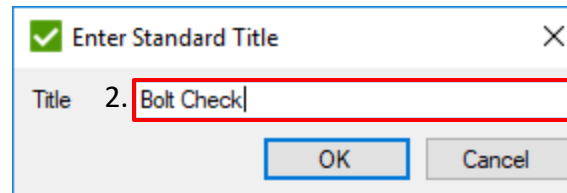
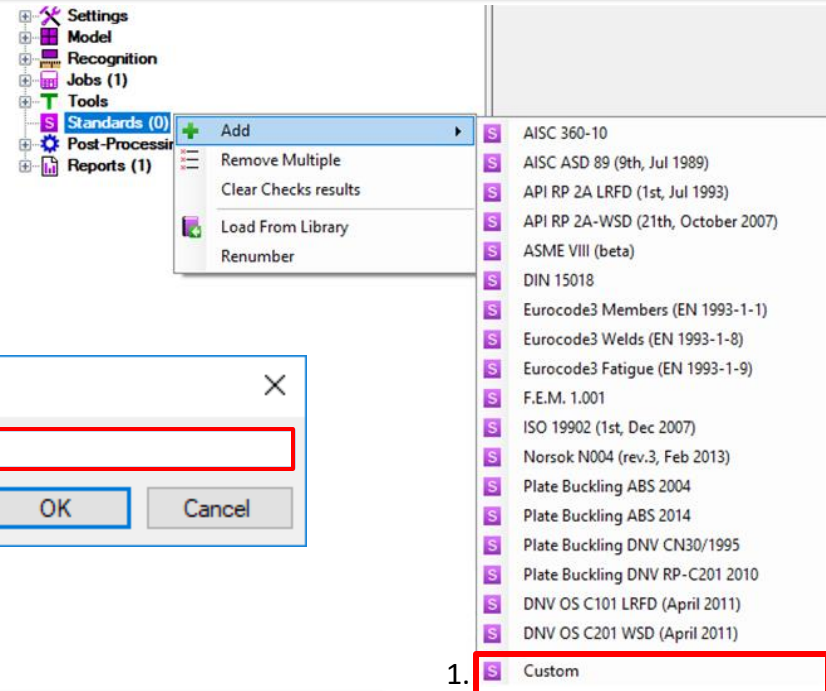
**Constants** is a static value which can be used in checks with help of Alias. It is useful to create constants and use them in formulas because in case of modifications (related to constants) it is required to make change in one place only.

SDC Verifier allows to add extra properties called **Characteristics** to use them in Standard check formulas. There are five types of characteristics: Material, Property, Node, Element, Linked and Loads.

**Classification type** is a list of titles that can be used in classification or characteristic instead of numbers. It is available only in Custom standard.

**Classification** is an extra elements characteristic that can be set over directions and points of interest.

**Standard table** is a two dimensional matrix of static values.



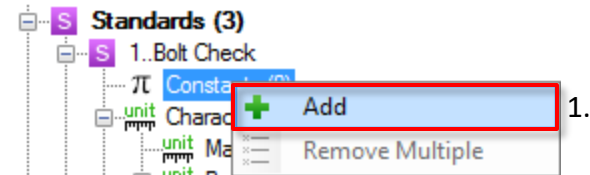
# Create Safety Factor Constant

1 Execute Constants – Add from context menu

2 Title (Alias): **SafetyFactor**

3 Value: **1.1**

4 Press *OK*



Standard Constant

ID 1 Title (Alias) 2. SafetyFactor

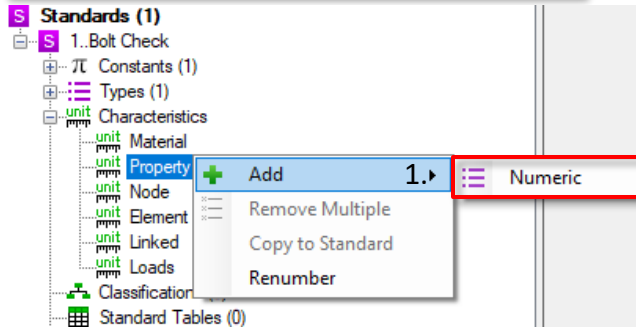
Value 3 1.1

Description

4. OK Cancel

Use Constants instead of numbers in your formulas. It helps to make the formulas more understandable. In case of change it should be modified in one place.

Execute *Property* => *Add* => *Numeric*  
from the *Characteristics* context menu



Title: **Bolt Prestress**

Enter Alias: **F\_Prestress**

Alias is a unique name for Standard items through which they can be accessed in Custom check formulas.

Select property 15.. Bolts\_M24 and enter the characteristic value: 160 000 N

Press Apply. Press OK

Create another Characteristic “Friction Coefficient” with alias – “mu” and value = 0.3

**Properties Characteristics**

ID: 1 Title: Bolt Prestress

Alias: F\_Prestress

Description:

Characteristic Value: 160000 Apply

Property	Value
1..T = 0.01 (39 bodies)	0
2..T = 0.008 (10 bodies)	0
3..T = 0.025 (4 bodies)	0
4..T = 0.018	0
5..T = 0.015 (2 bodies)	0
6..L100x50x6_bridge (3 bodies)	0
7..T = 0.005	0
8..L100x50x6_bracing columns (6 bodies)	0
9..L100x50x6_WS (8 bodies)	0
10.. Bolt M24 (154 bodies)	160000
11..Connections (3 bodies)	0

OK

Characteristic is a predefined variable which is assigned to material, property or selection because it can't be read from Ansys like properties or results values. In this case friction coefficient and bolt prestress has to be set.

6.

Properties Characteristics

ID: 2 Title: Friction Coefficient

Alias: mu

Description:

Characteristic Value: 0.3 Apply

Property	Value
1..T = 0.01 (39 bodies)	0
2..T = 0.008 (10 bodies)	0
3..T = 0.025 (4 bodies)	0
4..T = 0.018	0
5..T = 0.015 (2 bodies)	0
6..L100x50x6_bridge (3 bodies)	0
7..T = 0.005	0
8..L100x50x6_bracing columns (6 bodies)	0
9..L100x50x6_WS (8 bodies)	0
10. Bolt M24 (154 bodies)	0.3
11..Connections (3 bodies)	0

# Create Custom Check

1. Execute **Add** => **Custom Check** in **Checks** context menu

2. Title: **Custom Bolt Check**

3. Alias: **boltcheck**

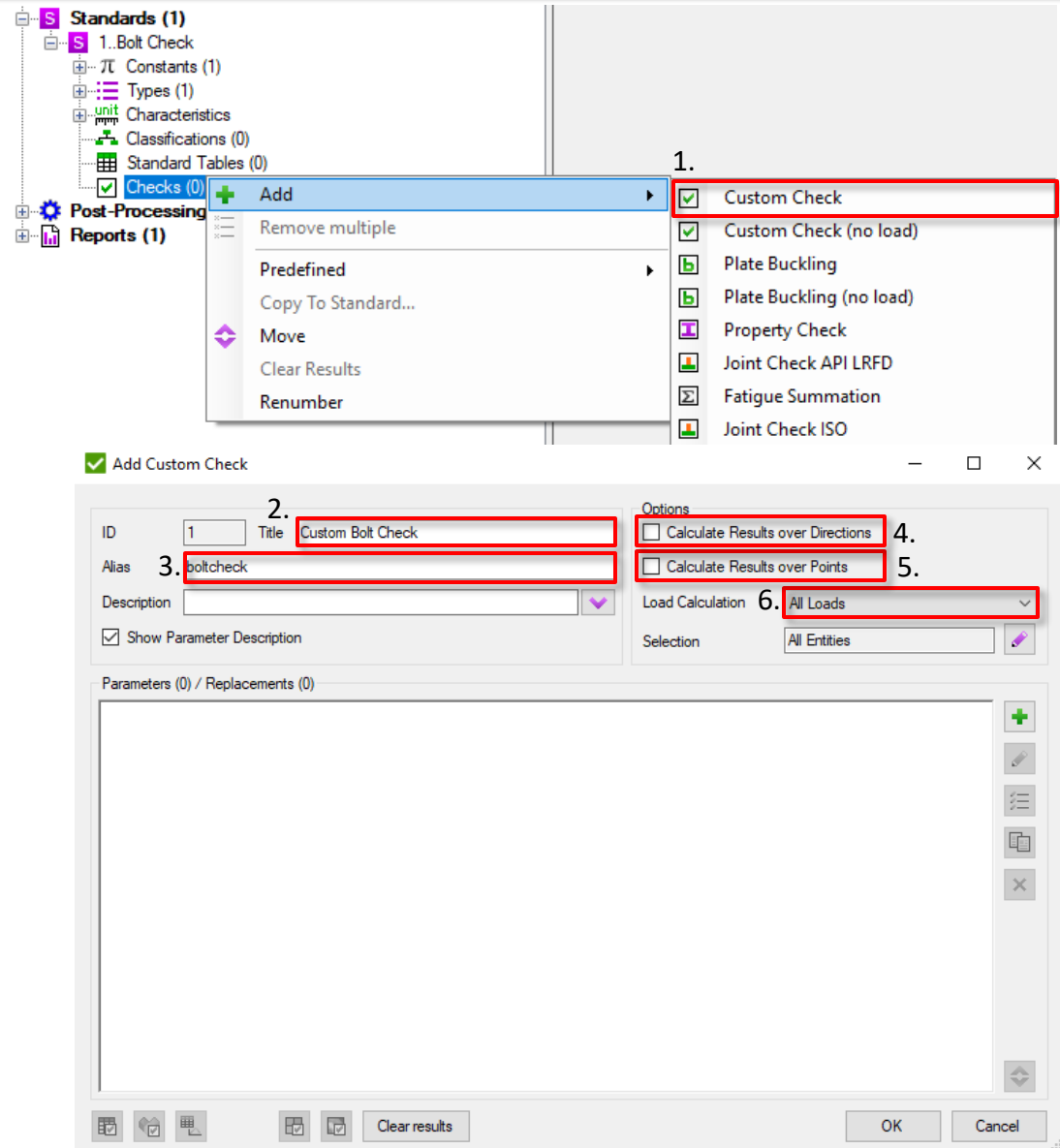
4. Calculate Results over Directions: **OFF**

5. Calculate Results over Points: **OFF**

6. Load Calculation: **All Loads**

Check Alias gives a possibility to use current check results by other checks.

All Loads: Individual Loads and Load Sets are calculated based on formulas and Load Group as envelope.  
Load Group Only: Check is calculated on Load Groups Results (e.g. Min/Max/Delta Stresses)





# Calculate Results over Direction

Allowable Axial Stress for Circular Tubes (ISO 19902 standard) requires calculation only in X direction.  
Calculate Results over Directions: **OFF**

Options

☐ Calculate Results over Directions

☐ Calculate Results over Points

Load Calculation: All Loads

Selection: All Entities

Allowable Static Stress for plates/solids (F.E.M 1.001 standard) requires to check normal (x,y,z) and shear (xy, yz, zx) stresses.  
Calculate Results over Directions: **ON**

✓ Add Parameter

Title: Allowable Axial Stress

Alias: Sallow

Description: -1) - tension. (13.2-5 to 13.2-7) - compression

☐ Replacement (without results)

Limits: ☐ Highlight, ☐ Absolute Value, Value: >=, Category: Stress

Main Functions:  $\sqrt{x}$ ,  $x^y$ , Min, Max, AbsMax, IF, Average, Switch

Items:  $F_y$ ,  $\pi$ ,  $\pi$ ,  $\sigma_y$ ,  $\sigma_z$ ,  $L$ ,  $I$ , unit,  $\mu$ ,  $x$

All Directions: `if(Saxial > 0, Yield, IsoLimits.Fc)`

OK Cancel

✓ Add Parameter

Title: Allowable Static Stress

Alias: Sallow

Description: s is corrected with formula in chapter 3.2.1.1

☐ Replacement (without results)

Limits: ☐ Highlight, ☐ Absolute Value, Value: >=, Category: Stress

Main Functions:  $\sqrt{x}$ ,  $x^y$ , Min, Max, AbsMax, IF, Average, Switch

Items:  $F_y$ ,  $\pi$ ,  $\pi$ ,  $\sigma_y$ ,  $\sigma_z$ ,  $L$ ,  $I$ , unit,  $\mu$ ,  $x$

All Directions: `if(yield / tensile < 0.7, yield, (yield + tensile) / (360 + 510) * 360) / Load.Sf`

☐ X

☐ Y

☐ Z

☒ XY: `if(yield / tensile < 0.7, yield, (yield + tensile) / (360 + 510) * 360) / sqrt(3) / Load.Sf`

☒ YZ: `if(yield / tensile < 0.7, yield, (yield + tensile) / (360 + 510) * 360) / sqrt(3) / Load.Sf`

☒ ZX: `if(yield / tensile < 0.7, yield, (yield + tensile) / (360 + 510) * 360) / sqrt(3) / Load.Sf`

☐ Equivalent

☐ Overall

Absolute Maximum Set to Overall

OK Cancel

# Calculate Results over Points

Slenderness - single result per element.  
Calculate over Points: **OFF**

Options

☐ Calculate Results over Directions

☐ Calculate Results over Points

Load Calculation: All Loads

Selection: All Entities

Stresses for plate elements should be checked  
for every single point of interest.  
Calculate over Points: **ON**

Parameter = lambda\_z (Slenderness Z)

Description: (13.2-7)

All:  $\text{memberZ.K} * \text{memberZ.L} / (\text{PI} * \sqrt{\text{Iyy} / \text{Area}}) * \sqrt{\text{Fyc} / \text{Young}}$

## Slenderness Z (4 Elements)

Standard	1..ISO 19902 (1st, Dec 2007)	Check	2..Limits
Parameter	Slenderness Z	Selection	4 Elements
Element ID	Slenderness Z		
1941	0.190		
1943	0.190		
1945	0.220		
1946	0.220		

Parameter = Uf (Utilization Factor)

All:  $\text{Abs}(S / S_{allow})$

Overall:  $\text{Max}(m.e.x, m.e.y, m.e.z, m.e.xy, m.e.yz, m.e.zx, m.e.eqv)$

## Table Profiles

This paragraph represents result table profiles previously created in a job.

Eqv (LS4, Element ID=1945)

Standard	3..FEM 1.001	Check	[S3] 1..Static Stress Check
Load Set	LS4..Load Set 4	Selection	Element ID=1945
ID / Point	Stress	Allowable Static Stress	Utilization Factor
1945			
1 I / Top	1.08e+8	240.00e+6	0.00
2 I / Top	1.38e+8	240.00e+6	0.01
3 I / Top	4.74e+8	240.00e+6	0.02
4 I / Top	5.04e+8	240.00e+6	0.02
1 J / Bottom	1.03e+8	240.00e+6	0.00
2 J / Bottom	5.23e+8	240.00e+6	0.02
3 J / Bottom	1.57e+8	240.00e+6	0.01
4 J / Bottom	1.07e+8	240.00e+6	0.00
End I / Top	5.04e+8	240.00e+6	0.02
End J / Bottom	5.23e+8	240.00e+6	0.02
Total	5.23e+8	240.00e+6	0.02

# Change Check Selection

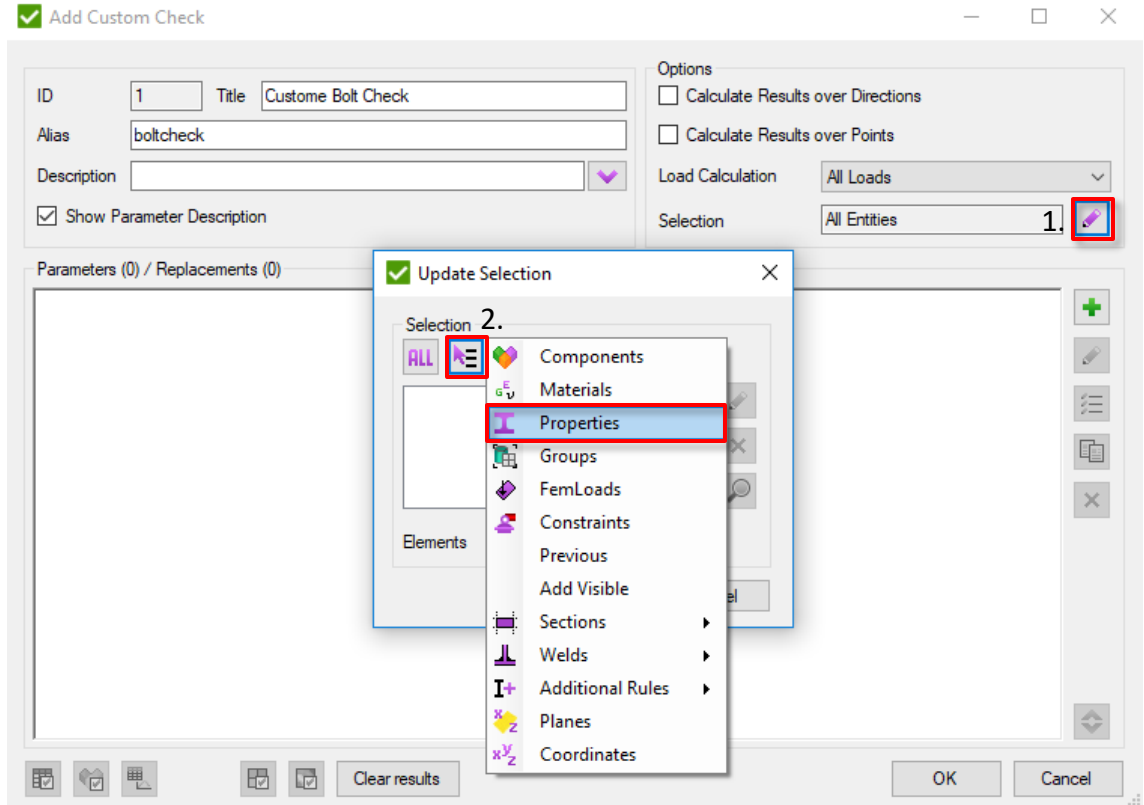
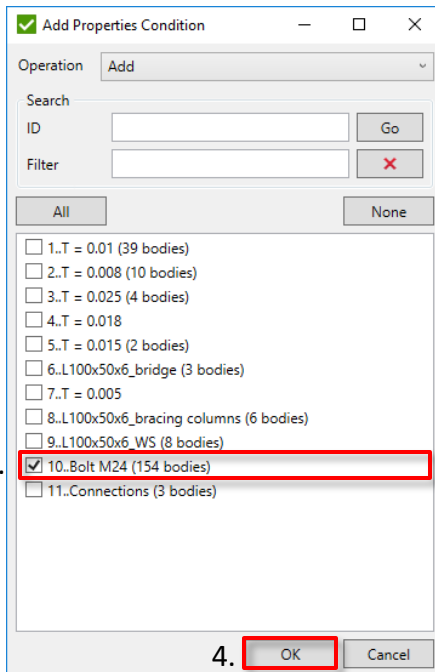
1 Press to edit selection

2 Press add condition and choose properties

4 Select: **15..Bolts\_M24**

5 Press *OK* 2 times

6 Press  to add parameter



By limiting check selection to elements of bolt property we reduce significantly the calculation time. (Full model is 28 183 elements, bolts – 154).

# Add Parameter

- 1 Title: **Allowable shear**
- 2 Alias: **F\_shear\_a**
- 3 Description: **Allowable shear force**

*Main functions* area contains quick access buttons with most used functions: Minimum, Maximum, Average, Absolute, IF, etc.

*Items* area contains quick access buttons for all the items and parameters available in formulas: Inner constants, Result variables, Characteristics, Parameters, Functions, Properties, etc.

✓ Add Parameter

Title 1. Allowable shear

Alias 2. F\_shear\_a

Description 3. Allowable shear force

☐ Replacement (without results)

Limits

☐ Highlight

☐ Absolute Value

Value >=

Category General

Main Functions

Items

All Directions

OK Cancel

*Replacement* – parameters for which outcome is not stored. It is not possible to plot their results or to display in table. Their purpose is to be used in other parameters of current check. Using replacement check consumes less memory and improve performance.

# Enter Formula

1 Press **Min** and put cursor: **Min(,)**

2 Press **unit** to add characteristic

3 Select: **Bolt Prestress** and press **OK**

4 Copy **F\_Prestress** and paste it after comma in **Min( F\_Prestress, ,)**, enter “-”

5 Press add result variable

6 Select **Line Element Force, Axial force, Total**. Press **OK**.

7 Enter “\* mu” in the end

**Note:** All the formulas can be entered manually. If alias is highlighted with color it is written correctly. In case you don't remember alias refer to Items group box, it contain all available variables and functions

✓ Add Parameter

Title: Allowable shear  
Alias: F\_shear\_a  
Description: Allowable shear force  
☐ Replacement (without results)

Limits  
☐ Highlight  
☐ Absolute Value  
Value: >=  
Category: General

Main Functions  
1. **Min**  
Max  
AbsMax  
IF  
Average  
Switch

Items  
2. **unit**  
3. **F\_Prestress**  
4. **mu**

All Directions  
Min( F\_Prestress, F\_Prestress - F\_Axial[total])\*mu

OK Cancel

✓ Characteristics

ID	Title	AliasName	Description
1	Bolt Prestress	F_Prestress	
2	Friction Coefficient	mu	

3. **OK** Cancel

List of all characteristics

All variables to access results are available in this dialog.

✓ Add Result

Result Category  
Stress  
Strain  
Line Element Force  
Plane Element Force  
Weld Stress

Group Parameter  
Min  
Max  
Var

Directions  
Bending Plane Moment 1 (x)  
Bending Plane Moment 2 (x)  
Shear Plane 1 (xy)  
Shear Plane 2 (xz)  
Axial Force  
Torque  
Warping Torque

Points Of Interest  
End I  
End II  
Total

Variable  
F\_Axial

6. **OK** Cancel

# Parameter Category

1 Category: **Forces**

2 Press **OK**

Parameter Category determines the displaying format in tables and legend settings for plots.

**Add Parameter**

Title: Allowable shear  
Alias: F\_shear\_a  
Description: Allowable shear force

☐ Replacement (without results)

Limits  
☐ Highlight  
☐ Absolute Value  
Value: >=

Category: **1. Forces**

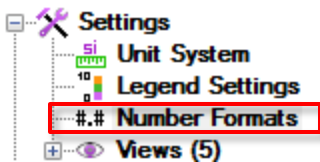
Main Functions  
 $\sqrt{x}$   $x^y$   
Min Max  
AbsMax IF  
Average Switch

Items  
 $F_{0.9}$   $\pi$   $\pi_e$   
 $\sigma_c$   $\sigma_{cr}$   $L$   
 $I$   $unit$   $\checkmark$   
 $\mu$   $\mu$   $x$

All Directions  
`Min( F_Prestress, F_Prestress - F_Axial[total])*mu`

2. **OK** Cancel

Number Format Settings are available under Settings on Main window. It also can be accessed from any table by pressing **##**



Utilization Factor	General	2	<input type="checkbox"/>		160000000.00
Buckling Factor	General	2	<input type="checkbox"/>		160000000.00
Forces	Scientific	1	<input checked="" type="checkbox"/>	3	160000.0e+3

All (LG1, All Entities)

Check Selection	[S1] 1..Custom Bolt Check All Entities	Load Group	LG1..Overall
Components	Allowable shear	Shear force	Bolt Shear Force Axial Bolt Check Overall Bolt Check
All Entities	48000.00	36.4e+3	1.20 0.84 1.20

# Shear force parameter

1 Press  to add parameter

2 Title: **Shear force**

3 Alias: **F\_shear**

4 Formula:  $\text{Sqrt}(\text{Pow}(\text{FShear1}[\text{Top}], 2) + \text{Pow}(\text{FShear2}[\text{Top}], 2))$

5 Category: **Forces**

6 Press OK

`FShear1[Top]` and `FShear2[Top]` can be found in *Add results dialog* 

☒ Add Result

Result Category	Directions	Points Of Interest
Stress	Bending Plane Moment 1 (xy)	End I
Strain	Bending Plane Moment 2 (xz)	End J
Line Element Force	Shear Plane 1 (xy)	Total
Plane Element Force	Shear Plane 2 (xz)	
Weld Stress	Axial Force	
	Torque	
	Warping Torque	

Group Parameter: Min, Max, **Avg**

Variable: `FShear1`

OK Cancel

☒ Add Parameter

Title 2. **Shear force**

Alias 3. **F\_shear**

Description

☐ Replacement (without results)

Limits: ☐ Highlight, ☐ Absolute Value, Value  $\geq$ , Category 5. **Forces**

Main Functions:  $\sqrt{x}$ ,  $x^y$ , Min, Max, AbsMax, IF, Average, Switch

Items:  $F(x)$ ,  $\pi$ ,  $\pi e$ ,  $\frac{d}{dx}$ ,  $\frac{d^2}{dx^2}$ ,  $\frac{d^3}{dx^3}$ , unit,  $\frac{1}{x}$ ,  $\frac{1}{y}$ ,  $\frac{1}{z}$

All Directions 4.  $\text{Sqrt}(\text{Pow}(\text{FShear1}[\text{top}], 2) + \text{Pow}(\text{FShear2}[\text{top}], 2))$

5. **OK** Cancel

# Shear Force Utilization Factor

1 Press  to add parameter


2 Title: **Bolt shear force check**  
Alias: **Uf\_shear**

3 Highlight: **ON**, Absolute value: **ON**,  
Value: **>= 1**

4 Category: **Utilization Factor**

5 Formula:  $F_{shear} / (F_{shear\_a} / \text{SafetyFactor})$

6 Press **OK**

 Add Parameter

Title 2. **Bolt Shear Force Check**

Alias **Uf\_shear**

Description

☐ Replacement (without results)

3. Limits

☒ Highlight

☒ Absolute Value


Value **>=** **1**

Category 4. **UtilizationFactor**

5.  $F_{shear} / (F_{shear\_a} / \text{SafetyFactor})$


6. **OK** Cancel

Limits highlights background of the cell in table.  
If Result is above value – red, below – green. If  
Absolute Value option is ON it means that also  
negative values higher than the limit Value will  
be highlighted with red (e.g. **-1.1**)

 Local Parameters

ID	Title	AliasName	Description
1	Allowable shear	F_shear_a	Allowable shear force
2	Shear force	F_shear	

OK Cancel

 List of constants

 List of local parameters (e.g.  $F_{shear}$ )


**All (LG1, All Entities)**

Check Selection	[S1] 1..Custom Bolt Check All Entities	Load Group	LG1..Overall
<b>Components</b>	<b>Allowable shear</b>	<b>Shear force</b>	<b>Bolt Shear ForceAxial Bolt Check Overall Bolt Check</b>
All Entities	48000.00	36.4e+3	1.20 0.84 1.20



# Axial Force Utilization Factor

1

Press  to add parameter

2

Title: **Axial bolt force check**  
Alias: **Uf\_axial**

3

Highlight: **ON**, Absolute value: **ON**,  
Value: **1**

4


Category: **Utilization Factor**

5

Formula: **F\_Axial[total]** / ((0.7 \*  
**F\_prestress**) / **SafetyFactor**)

6

Press **OK**

 Add Parameter

Title 2: **Axial Bolt Check**

Alias: **Uf\_axial**

Description

☐ Replacement (without results)

3. Limits

☒ Highlight

☒ Absolute Value

Value **>=** **1**

Category 4: **UtilizationFactor**

Main Functions

$\sqrt{x}$   $x^y$

Min Max

AbsMax IF

Average Switch

Items

$F(x)$   $\pi$   $\pi$

$\frac{a}{b}$   $\frac{a}{b}$   $\frac{a}{b}$

$I$   $unit$   $\checkmark$

$\frac{a}{b}$   $\frac{a}{b}$   $x$

All Directions 5: **F\_Axial[total]/((0.7\* F\_Prestress)/ SafetyFactor)**

6. **OK** Cancel

# Overall Bolt Check

1 Press  to add parameter

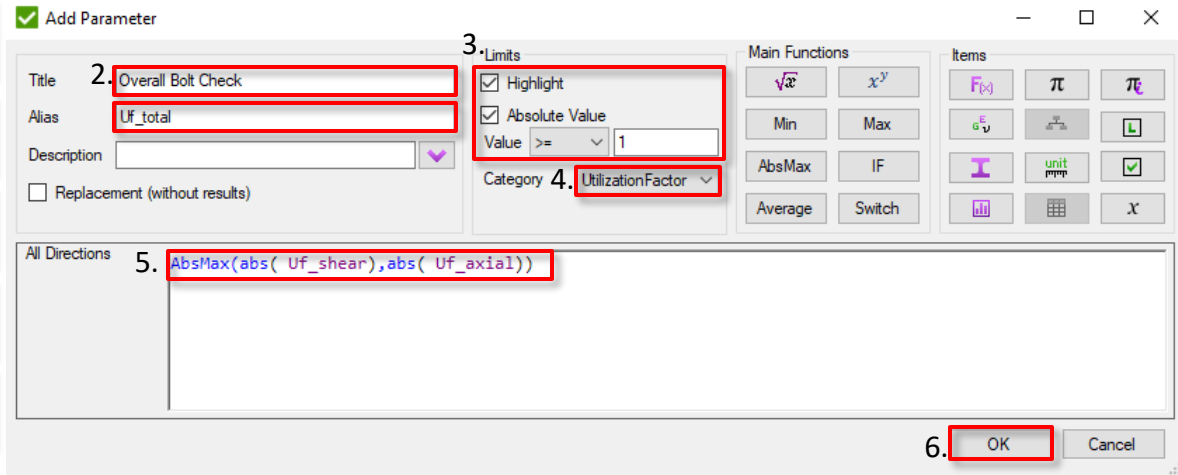
2 Title: **Overall bolt check**  
Alias: **Uf\_total**

3 Highlight: **ON**, Absolute value: **ON**,  
Value: **1**

4 Category: **Utilization Factor**

5 Formula: **Absmax(Abs(Uf\_shear),**  
**Abs(Uf\_axial))**

6 Press **OK**



3.Limits

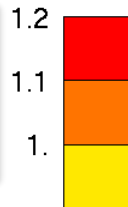
4.UtilizationFactor

5. **AbsMax(abs(Uf\_shear),abs(Uf\_axial))**

6. **OK**

Overall Bolt Check contains results from both axial and shear checks. It gives a possibility to verify the results using one plot.

Abs value of Shear and Axial check is used to make the values positive. In this case negative and positive values will have same color on plot.



Parameter = F\_shear\_a (Allowable shear)

Description: Allowable shear force

All: **Min( F\_Prestress, F\_Prestress - AbsMax( Faxial[Top], Faxial[Bot])) \* mu**

Parameter = F\_shear (Shear force)

All: **Sqrt(Pow(FShear1[Top],2)+ Pow( FShear2[Top],2))**

Parameter = Uf\_shear (Bolt shear force check)

All: **F\_shear / (F\_shear\_a / SafetyFactor)**


Parameter = Uf\_axial (Axial bolt force check)

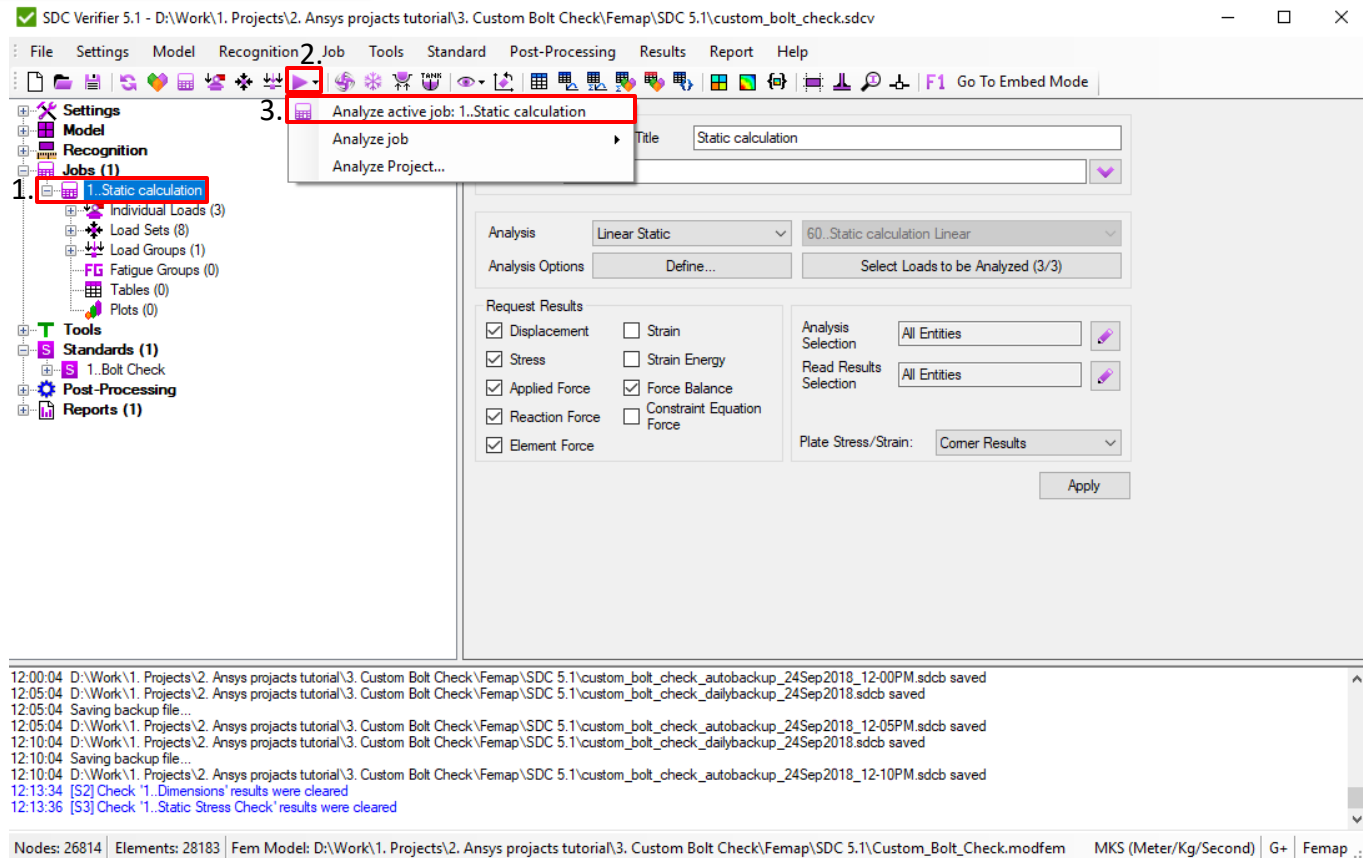
All: **AbsMax(FAxial[Top], Faxial[Bot]) / ((0.7 \* F\_prestress) / SafetyFactor)**

Parameter = Uf\_total (Overall bolt check)

All: **absmax(abs(Uf\_shear),abs(Uf\_axial))**

# Analyze Job

- 1 Select Job **"Static Calculation"** in the *Model Tree*
- 2 Press  on toolbar to analyze the job
- 3 Choose analyze active job: **1..Static calculation**



# Results Table

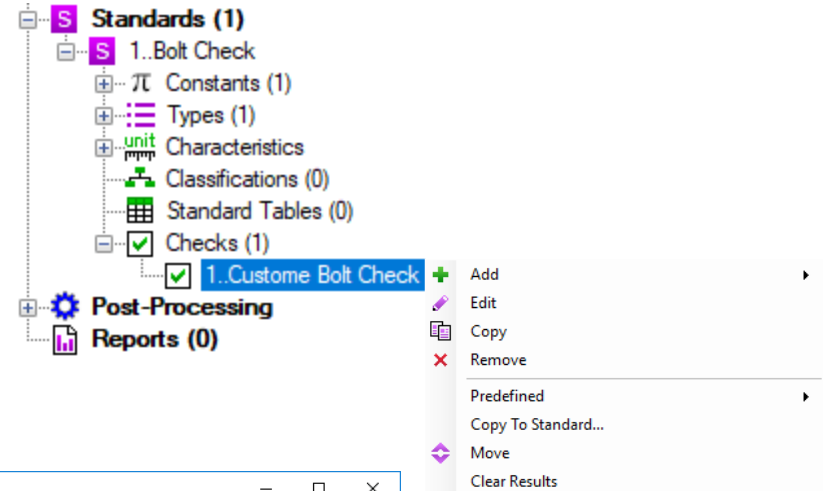
1 Execute *Extreme* table in *Custom Bolt Check* context menu

2 Load Group: **1..Overall**

3 Table type: **Extreme**  
Table Structure: **Direction over Parameters**

4 Selection: **Property 15.. Bolts**

5 Press *Fill Table*



Custom Check Table

ID: 1 Title: All (LG1, Beam '10..Bolt M24 (154 bodies))

Description:

Options

Check: 1..Custom Bolt Check

Load Group: 2..1..Overall

Table Type: 3..Extreme (worst result on selection)

Table Structure: 3..Direction over Parameters

Direction: All

Extreme Options

☐ Detailed (extreme locations - element and load (for Load Groups))

☒ Short (only extremes)

Selection

ALL

4..+ Beam '10..Bolt M24 (154 bodies)

Elements: 154

Set Default Title

5..Fill Table

Extreme	Allowable shear	Shear force	Bolt Shear Force Check	Axial Bolt Check	Overall Bolt Check
Minimum	22443.19	0.0e+3	0.00	-0.84	0.01
Maximum	48000.00	36.4e+3	1.20	0.84	1.20
Absolute	48000.00	36.4e+3	1.20	0.84	1.20

1. Table (expand/extreme)
- Components Extreme Table (over selections)
- Flow Table (over loads)
- Table (Loads vs Selections)
- Criteria Plot

# Results Plot

1 Execute *Criteria plot* in *Custom Bolt Check* context menu

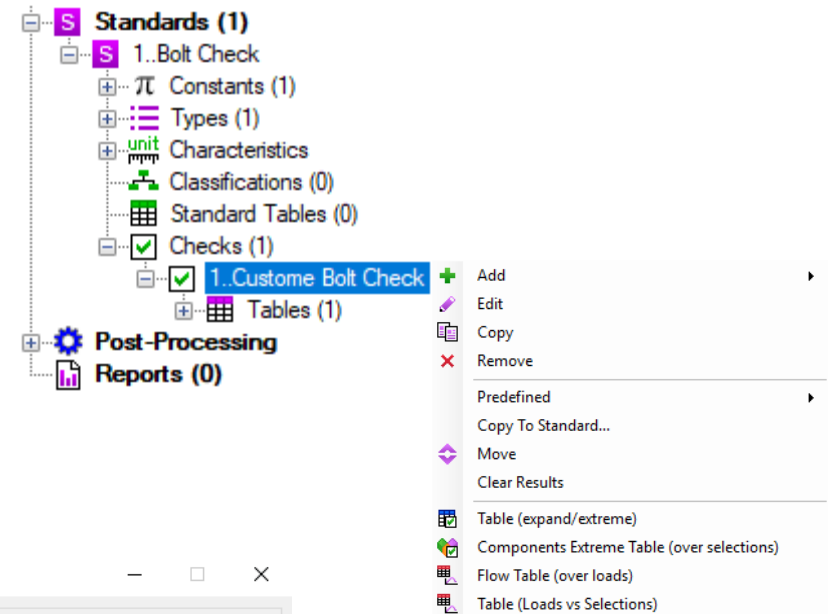
2 Load Group: **1..Overall**


3 LG Parameter: **Absolute**

4 View: **1..Detail**

5 Selection: **Property 15.. Bolts**

6 Press 



1.  Criteria Plot

**Criteria Plot**

ID: 1 Title: Abs Overall Bolt Check (LG1, Beam '15..Bolts\_M24', v1)

Description:

Check: 1..Custom Bolt Check

Load Group: 2. 1..Overall

Options

Parameter: Overall Bolt Check

Direction: All

LG Parameter: 3. Absolute

Point Of Interest: Value Type: AbsMax

View: 4. 2..Detail

Selection: + Beam '15..Bolts\_M24'

Elements: 154

Limits


Type: None

Minimum: 0

Maximum: 0

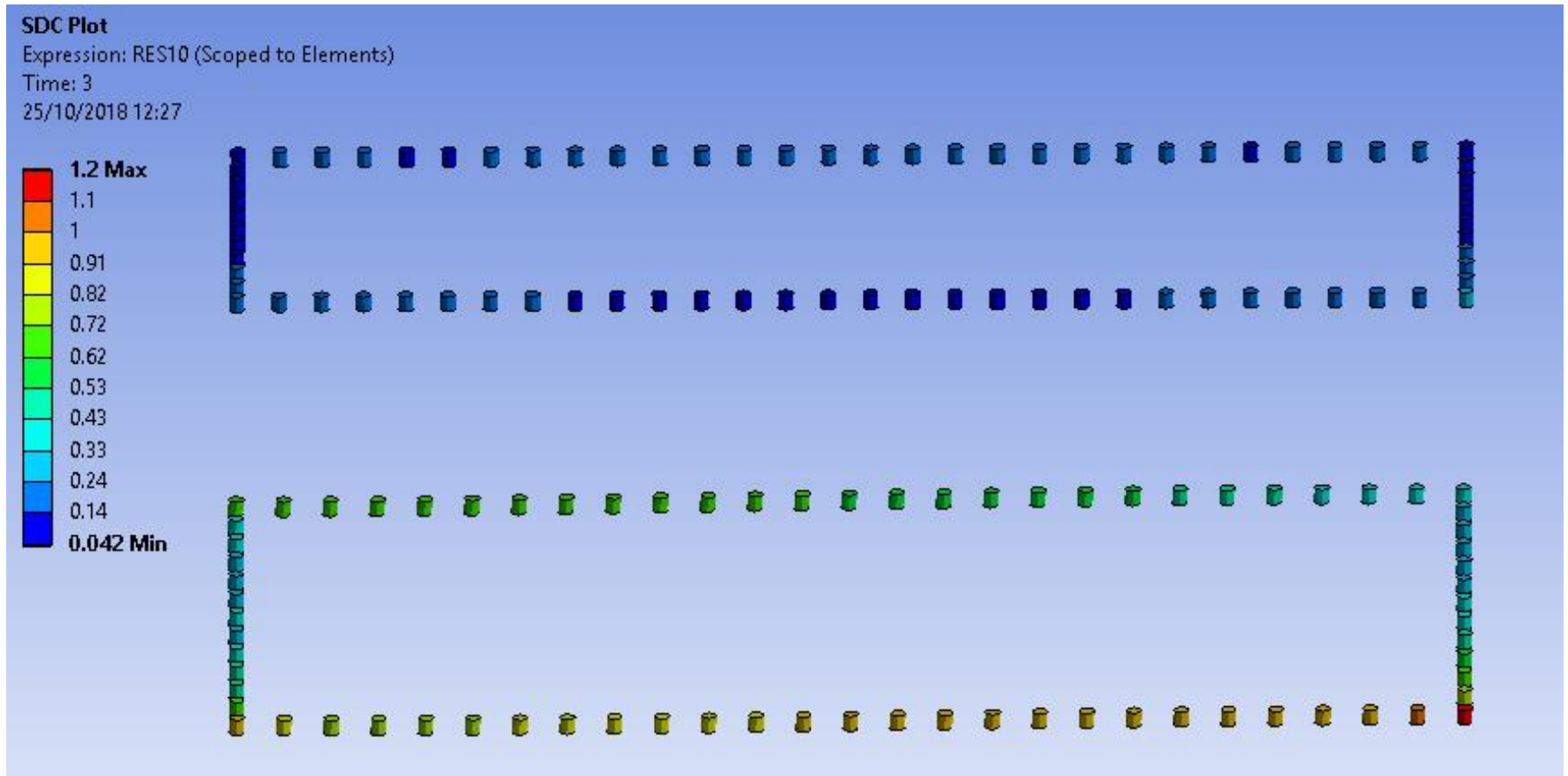
☐ Absolute Value

Set Default Title

6.  OK Cancel

# Results Plot

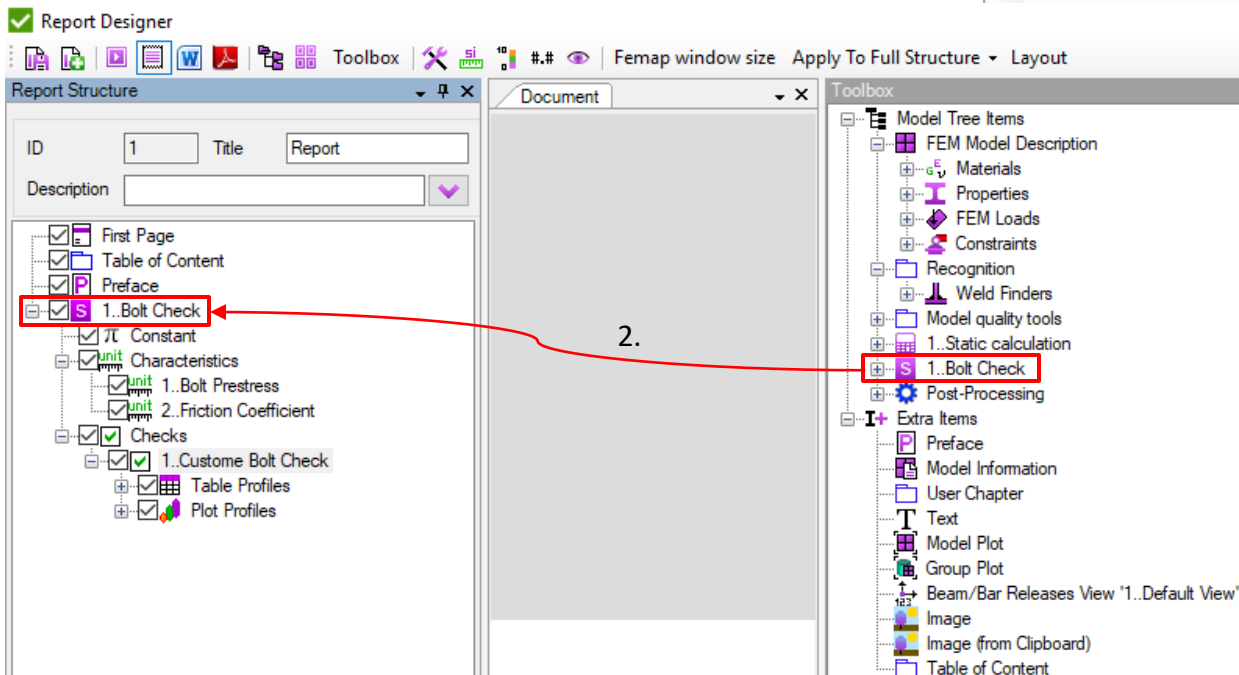
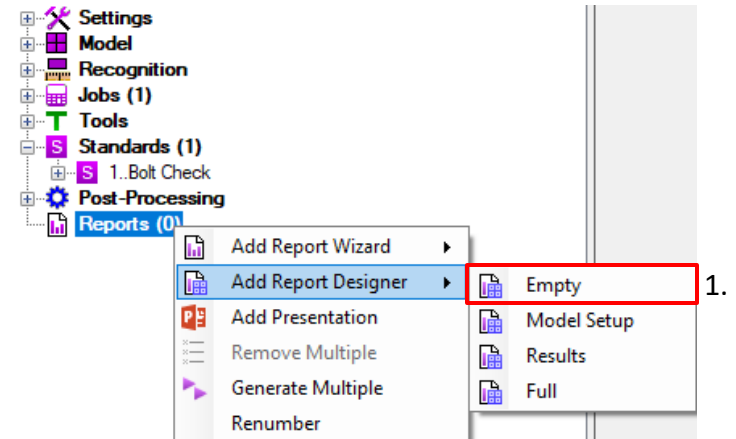
Overall bolt check plot is displayed. Elements with value more than 1 (orange and red) are not passing the check



# Creating Report

1 Execute *Add report designer* => *Empty* in *Reports* context menu

2 Drag NEN 2018\_2019 Standard from *Toolbox* to the *Report Structure*



# Add Tables in Report

1 Execute *Tables* in *Custom Bolt Check* context menu

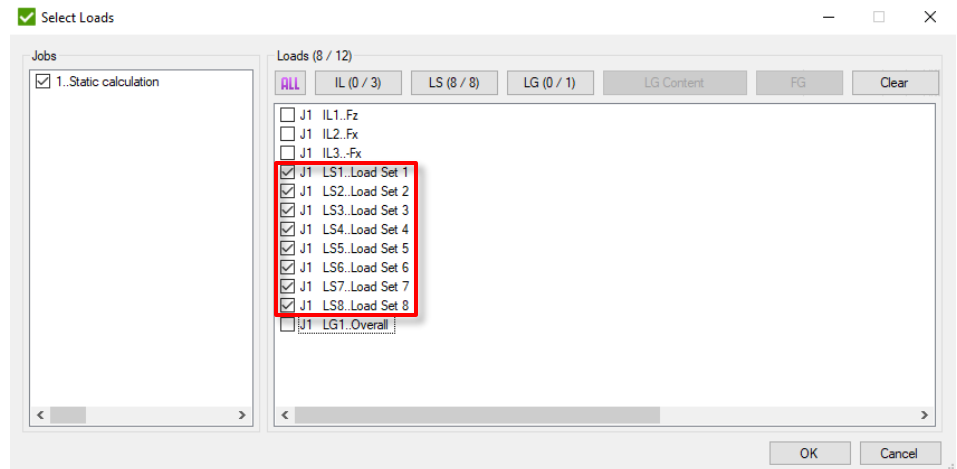
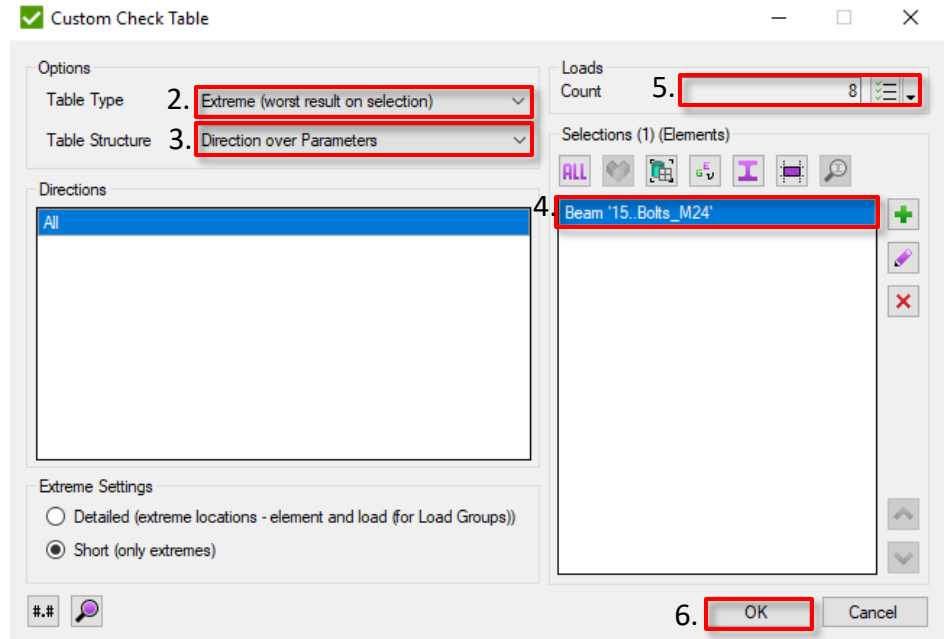
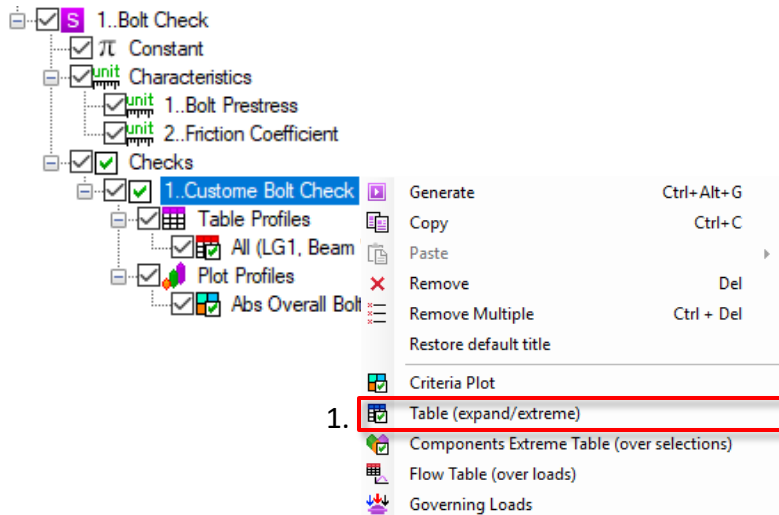
2 Type: **Extreme**

3 Parameter: **Direction over Parameters**

4 Selection: **Property 15.. Bolts\_M24**

5 Loads: **All Load Sets**

6 Press **OK**





# Add Plots in Report

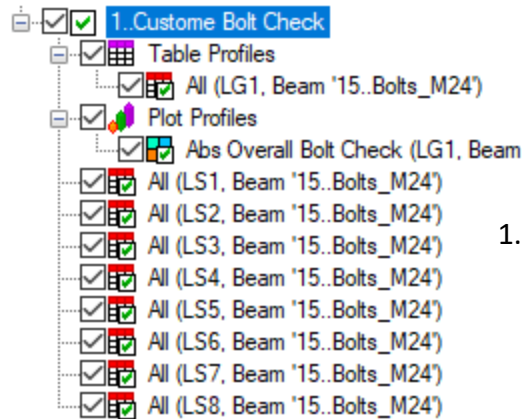
1. Execute *Criteria Check Plot* in *Custom Bolt Check* context menu

2. Parameter: **Overall bolt check**

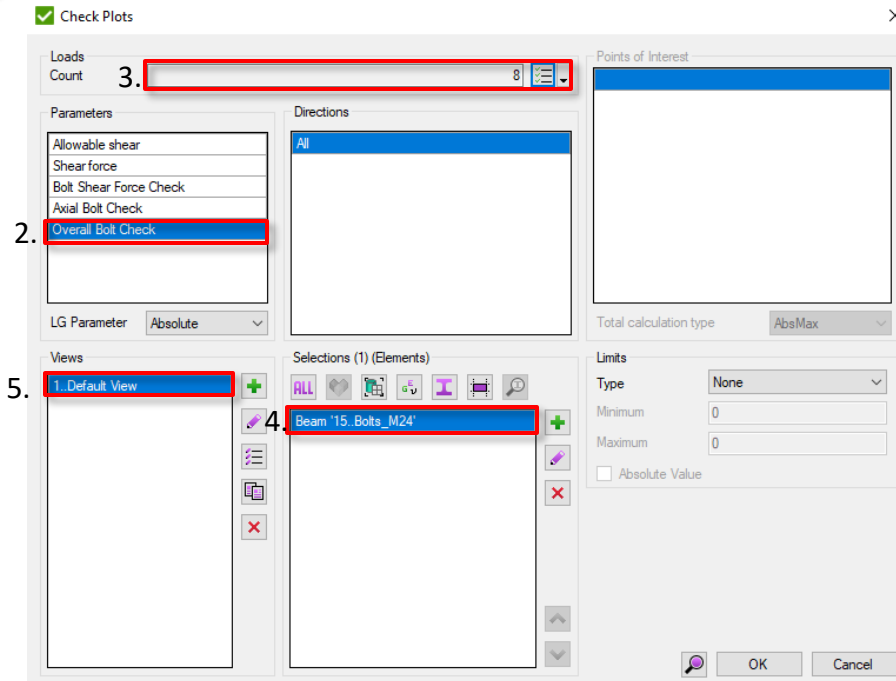
3. Loads: **All Load Sets**

4. Selection: **Property 15.. Bolts\_M24**

5. View: **Default View.**



1. **Criteria Plot**
- Table (expand/extreme)
- Components Extreme Table (over selections)
- Flow Table (over loads)
- Governing Loads
- Apply To All
- Replace
- Sort Tables/Plots
- Sort Tables/Plots and put in chapters
- Add User Chapter
- Add load containers
- Add selection containers
- Copy structure Ctrl+1
- Paste structure Ctrl+2
- Group selected sub-items
- Move all sub-items to parent (ungroup)

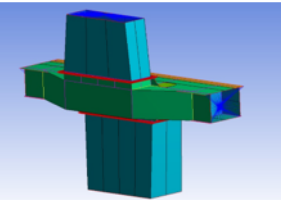


Click *Generate* and *Export to Word*



Report

Custom Bolt Check



Prepared by:  
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2011 VB Haarlem  
The Netherlands

Engineer: Support  
Customer:  
Project Number:  
Version: 1  
Date: 25/10/2018

1..Custom Bolt Check

Property	Value
Category	Elemental Custom Check
Selection	Beam "10_Bolt M24 (154 bodies)"
Parameters	5

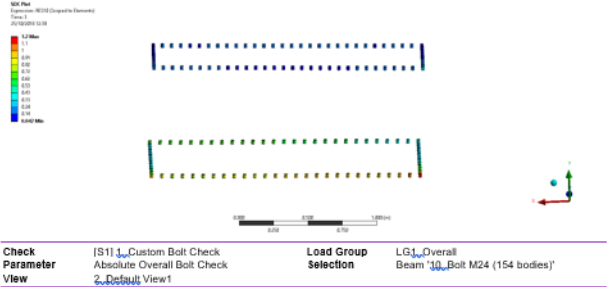
Table Profiles

This paragraph represents result table profiles previously created in a job.  
All (LG1\_Beam "10\_Bolt M24 (154 bodies)")

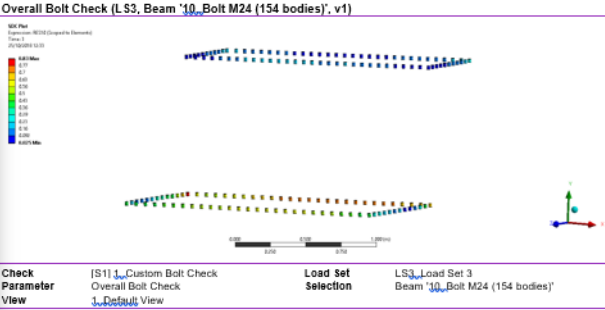
Standard	1_Bolt Check	Check	[S1] 1_Custom Bolt Check		
Load Group	LG1_Overall	Selection	Beam '10_Bolt M24 (154 bodies)'		
Extreme	Allowable shear	Shear force	Bolt Shear Force Check	Axial Bolt Check	Overall Bolt Check
Minimum	22443.19	0.0e+3	0.00	-0.84	0.01
Maximum	48000.00	36.4e+3	1.20	0.84	1.20
Absolute	48000.00	36.4e+3	1.20	0.84	1.20

Plot Profiles

This paragraph represents result plot profiles previously created in a job.  
Abs Overall Bolt Check (LG1\_Beam "10\_Bolt M24 (154 bodies)", v2)



Check Parameter	[S1] 1..Custom Bolt Check	Load Group Selection	LG1_Overall
View	Absolute Overall Bolt Check		Beam "10_Bolt M24 (154 bodies)"
	2..Default View1		



Check	[S1] 1 Custom Bolt Check	Load Set	LS3 Load Set 3
Parameter	Overall Bolt Check	Selection	Beam '10_Bolt M24 (154 bodies)'
View	1 Default View		