

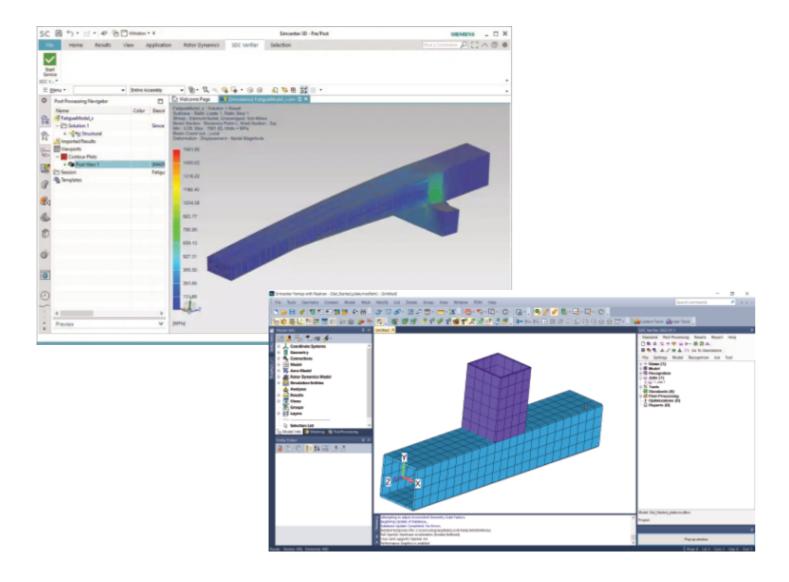


STRUCTURAL VERIFICATION ACCORDING TO STANDARDS



# **SDC VERIFIER FOR FEMAP AND** SIMCENTER 3D

**SDC Verifier** is the powerful extension for **Femap** and **Simcenter 3D** which automates verification of structures in accordance with different industries design and safety standards.



# TAILOR MADE FOR THE FOLLOWING INDUSTRIES



OFFSHORE AND



OIL AND GAS

PETROCHEMICAL



**HEAVY LIFTING** 

**AEROSPACE** 



MACHINERY **EOUIPMENT** 



**RAILWAY** 



RENEWABLE



**DEFENSE** 

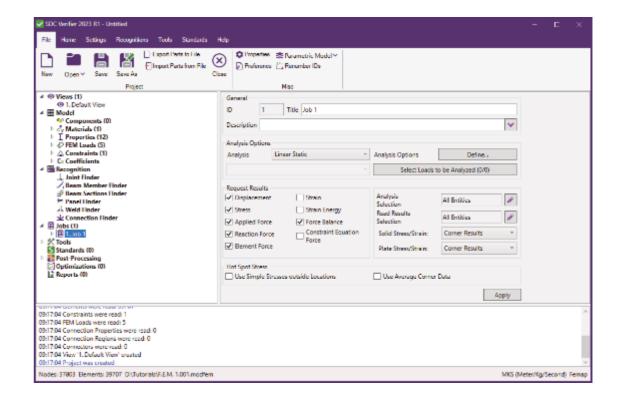
Femap and Simcenter 3D offers an advanced engineering analysis environment for simulation of complex engineering problems.

**SDC Verifier** together with Femap or Simcenter 3D makes the calculation procedure more transparent and facilitates checking of a complete set of load cases according to predefined design code rules or own standards.

Full model description and all calculations are presented in reports. Consequences of updates to the design can be reviewed and compared with the original design using the report regeneration.

The optimization module allows the best design decision to be made for the structure by calculating different combinations of design inputs.

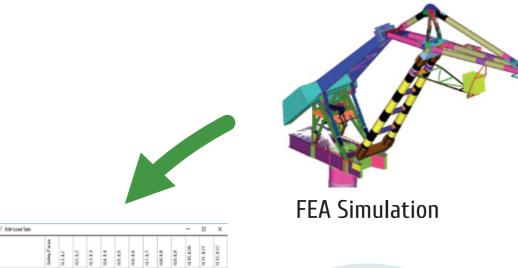
In addition SDC Verifier has an open API to help automate interaction with software.



sdcverifier.com

# SDC VERIFIER WORKFLOW

**Load Combinations** 



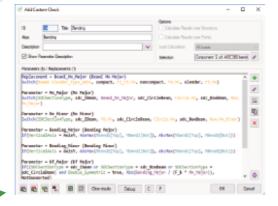
The complete structure verification procedure is stored so you can generate the updated report in one click in case of design changes







Recognition



Checks

# **IMPLEMENTED STANDARDS**











VDI 2230 Bolts





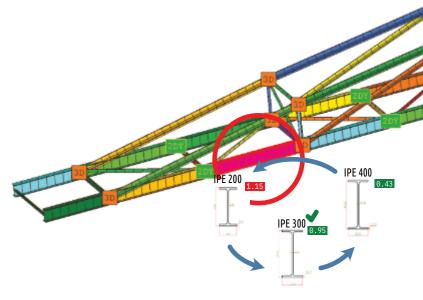


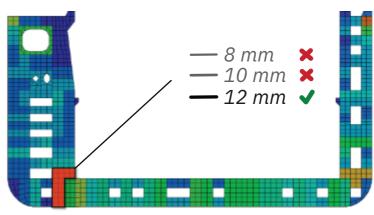


# DESIGN OPTIMIZATION SPECIFIC LOADS



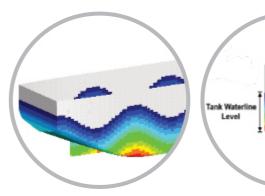
The **Optimization module** helps to take the best possible design decision acquired from codechecking results. Optimization can be based on Cross Section, Weld Type, Yield Stress, and Plate Thickness parameters.



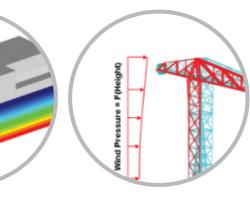


Optimization helps to automatically calculate various design input combinations and ensure cost-effectiveness by adjusting the existing model parts for specific terms of usage.

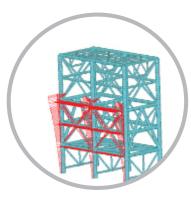
# SDC Verifier automates the application of the specific loads:



**Buoyancy** – a water pressure acting on a construction (e.g. ship hull), including wave parameters. **Tank Ballast** – fluid level based on a mass content transferred into a pressure level on a tank surface.



Wind – height dependent pressure applied to the model taking into account the element area exposed to the wind direction.



Wave and current loads – apply force and pressure based on wave parameters (height, length, crest, amplitude, etc.).

© SDC Verifier

# MEMBER CHECKS. BUCKLING LENGTH RECOGNITION. DEFLECTION CHECK





AIJ (2017)

EN 13001

AISC/ANSI 360-10 and AISC 360-22 (Specification for Structural Steel Buildings), API RP 2A (Planning, Designing, and Constructing Fixed Offshore Platforms — Working Stress Design), Eurocode 3 (Design of steel structures), ISO 19902 (2007,

checking large (offshore) lattice structures:

**SDC Verifier** implements the following standards for

**2020)** (Petroleum and natural gas industries — Fixed steel offshore structures) and **Norsok N-004** (Design of steel structures), **EN 13001** (Cranes General Design, 2018)



AP

AISC 89 & 2010 AISC 360-22

API RP 2A RP





Norsok N004

AS 3990 (1993)



ISO 19902

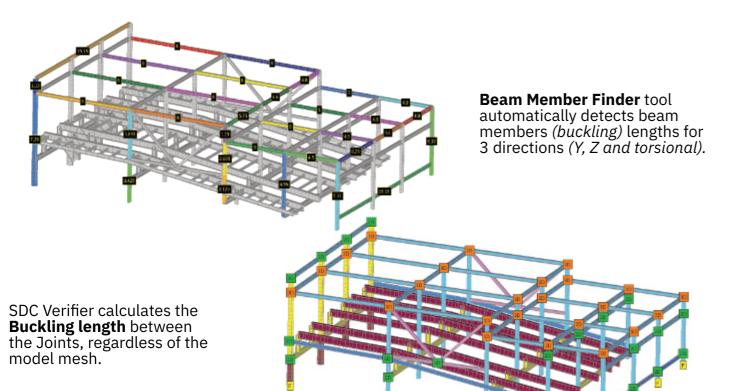
(2007, 2020)



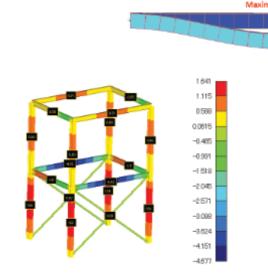
Eurocode 3

Joint Finder tool is used to verify tubular joints according to API RP 2A, Eurocode 3, ISO 19902 (2007, 2020), and Norsok N-004 standards.

**JOINT CHECK** 

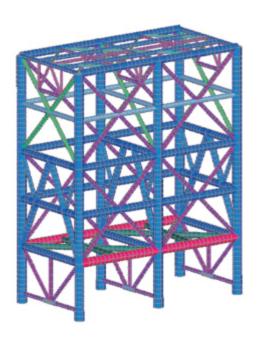


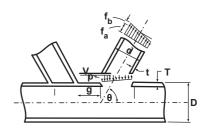
The deflection of members is one of the checks that should be performed for serviceability limit state design. With the help of the **Beam Member Finder** tool SDC Verifier automatically detects beam member lengths:



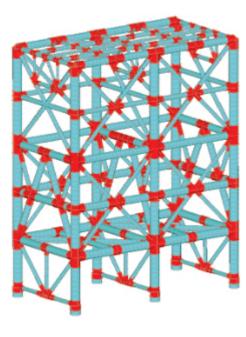
SDC Verifier contains all the necessary tools to quickly perform the **deflection check**.

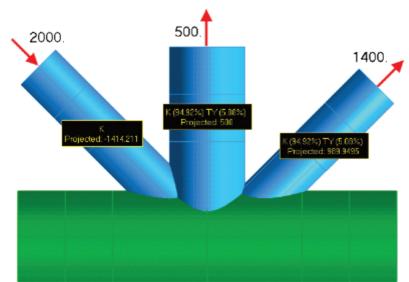
The automatic beam member recognition, result transformation, and the usage of the envelope results of a load group reduce the calculation and post-processing time significantly.

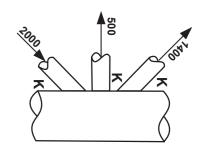




**SDC Verifier** automatically calculates Brace classification (depending on the load pattern) for each load situation, which significantly speeds up the verification process.







Connection ID	Brace Number	Joint Type
1	#1 (ElemID = 27)	K
	#2 (ElemID = 13)	K (94.92%) TY (8.08%)
	#3 (ElemID = 19)	K (94.92%) TY (8.08%)

# **AUTOMATIC DETECTION OF SECTIONS,** PANELS, PLATE FIELDS, STIFFENERS, **AND GIRDERS**

Plate buckling strength is an important aspect of offshore steel construction design. Each plate should be checked as it influences the strength and stability of the whole construction. In SDC Verifier plates can be checked against buckling according to the ABS 2004/2014, DNV RP-C201 **2010** and **Eurocode 3** rules:



DNV 1995 & 2010

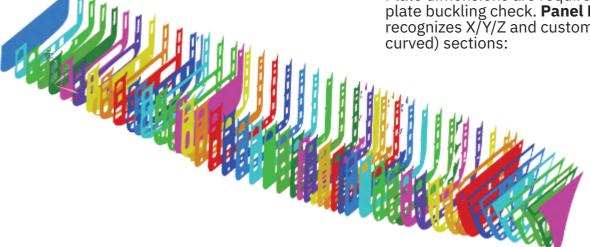




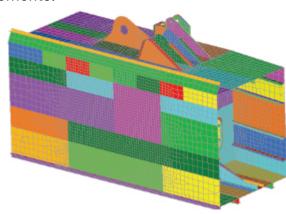
Eurocode 3

ABS 2004 & 2014

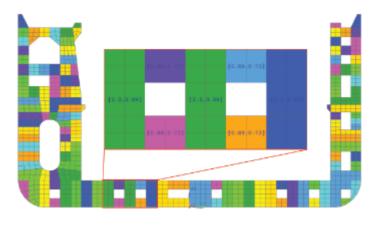
Plate dimensions are required to perform a plate buckling check. Panel Finder recognizes X/Y/Z and custom (inclined and curved) sections:



The recognition is based on the mesh connectivity and can be performed on any structure using plate (shell) elements:



Plates with their dimensions are recognized automatically for each section:



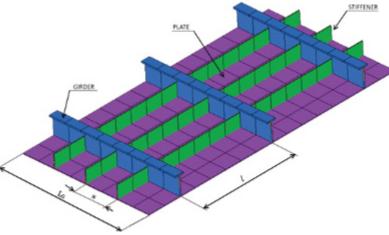
The results can be presented over sections (frames/longitudinals/decks). Those above the limit are highlighted in red:

	9						
Buckling(LS2, 5 Sections)							
Standard Load Set Search Type	10Plate Buckling DNV 2010 2Load Set 2 Related To Last		Check Sections	Plate Buckling (Element Avg)			)
Section Title		Stress X in plate direction	Stress Y in plate direction	Stress XY in plate direction	Equivalen t Stress	Buckling Factor Combined	Buckling Factor Overall
1Section X 1 (X	= 70) [MaxID=86]	-62.0e+6	-38.3e+6	-38.4e+6	85.8e+6	0.952	0.976
2Section X 2 (X	= 71.68) [MaxID=10]	-7.2e+6	-31.6e+6	-8.1e+6	31.9e+6	0.335	0.579
3Section X 3 (X	= 73.36) [MaxID=63]	-57.0e+6	-42.5e+6	-44.3e+6	92.3e+6	1.034	1.017
4Section X 4 (X	= 75.04) [MaxID=9]	-7.2e+6	-31.5e+6	-8.1e+6	31.9e+6	0.334	0.578
5Section X 5 (X	= 76.72) [MaxID=67]	-63.7e+6	-38.9e+6	-39.2e+6	87.8e+6	0.993	0.996
Max over Sections	s [3 / 63]	-57.0e+6	-42.5e+6	-44.3e+6	92.3e+6	1.034	1.017

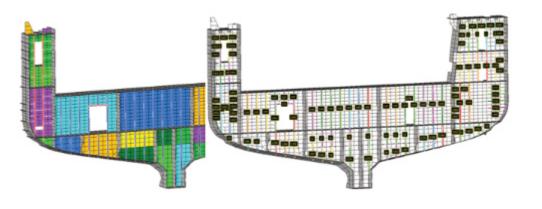
# PLATE BUCKLING AND STIFFENER **BUCKLING CHECKS**

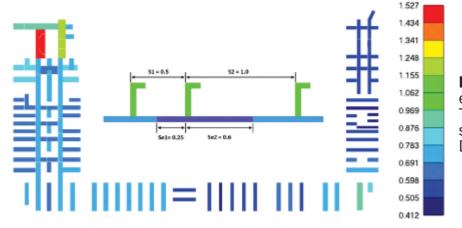
Colored plots with labels (dimensions) make it easy to preview the results of the tool. The following plot presents buckling plates on a part of the hull (curved section).

**Stiffened Panel Finder** — recognizes sections, panels, plates, stiffeners and girders and their dimensions automatically. This tool is an advanced version of the Panel Finder.



In the figure below, panels, simple stiffeners (marked in blue) and girders or stiffeners supporting also other stiffeners (marked in red) are plotted.





**Effective Width** — calculates the plate effective width for every load situation. The Effective width is used in the stiffener buckling check according to DNV-RP-C201 2010.

© SDC Verifier

# AUTOMATIC WELDS RECOGNITION. FATIGUE CHECKS AND WELD STRENGTH

**Fatigue** is a progressive structural damage of materials under the cyclic loading. SDC Verifier implements the following standards (based on the S-N curves): **Eurocode 3** (Design of steel structures), **F.E.M 1.001** (Rules for the Design of Hoisting Appliances), **DIN 15018** (Cranes. Steel structures. Verification and analyses), **FKM** (Analytical strength assessment (5<sup>th</sup>, 6<sup>th</sup> revised edition, 2003)), **EN 13001** 

(Cranes General Design, 2018).





FKM (5th and 6<sup>th</sup> edition) DIN 15018



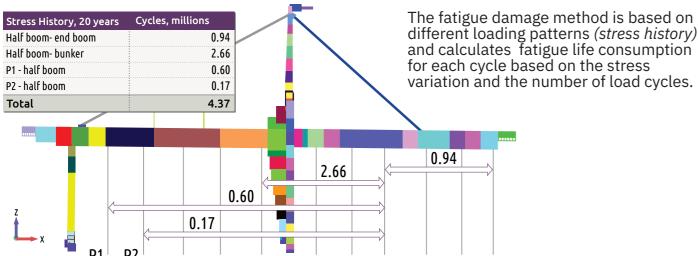


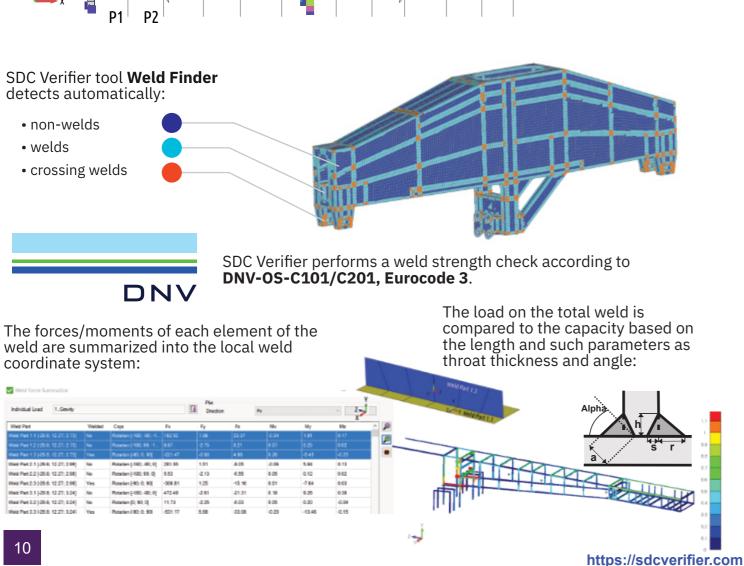


EN 13001

Eurocode 3

F.E.M 1.001





### WELD CLASSIFICATION

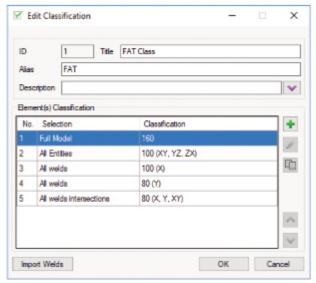


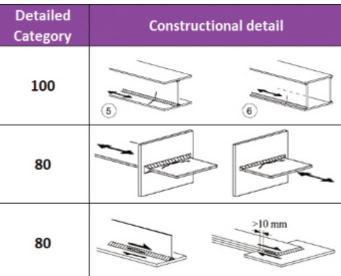
DVS 1608 (2010), DVS 1612 (2014)

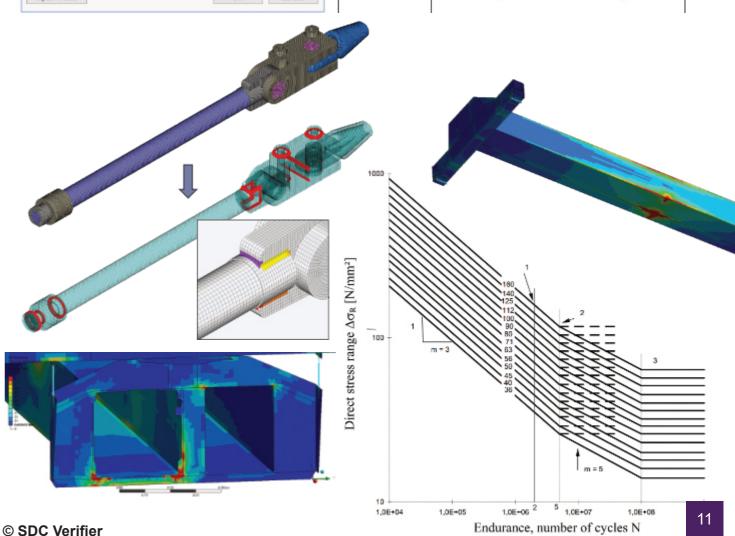
**DVS 1608** (Design and strength assessment of welded structures from aluminum alloys in railway applications) — Aluminium Fatigue Check.

**DVS 1612** (Design and endurance strength analysis of steel welded joints in rail-vehicle construction) — Steel Fatigue Check and Static Stress Check.

The notch group classification or fatigue strength of the welds depends on the quality and the stress direction, along the weld (X), perpendicular to the weld (Y) and the shear (XY). Stresses are converted into weld direction automatically by the weld finder.







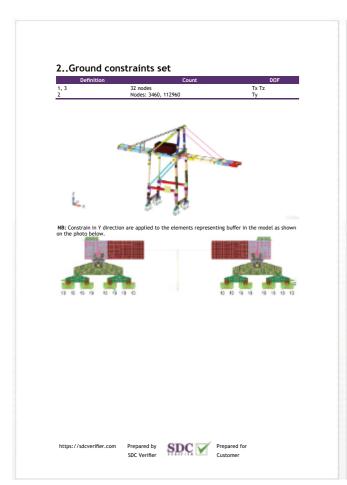
## REPORT. MODEL SETUP

Preparing a full calculation report is one of the most time-consuming parts of the project. From project to project, an engineer repeats the same routine to create a calculation report. With SDC Verifier, the process of report generation is done automatically, reducing time expenses.

Materials and properties data (including mass overview) are described. Elements related to material/property are highlighted:



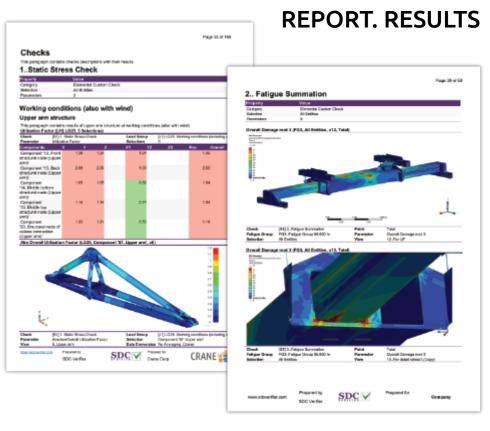
Description of applied loads and constrains, mass overview over materials/properties/groups:



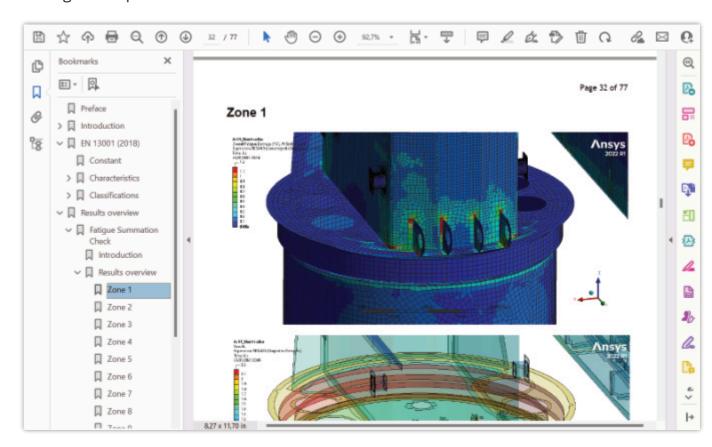
Title	-	OT 30		94.7900.0703.070		
1_atainisaa ates		ements Mass		Gravity Center		
2.200		283 0.7		[1.52: -49.32; 16.49]		
3.HPL		11365 294.6		[1.41; -49.24; 17.08]		
4. Ine connection material	39	0.0		[0.00; 0.00; 0.00]		
5. perforated stainless steel, h	orizontal :	2195 17.1		[1.33; -49.44; 16.36]		
G.botom frame stainless stee		10716 174.4		[1.43; -49.23; 15.62]		
7_front HPL covering		2277 8.9		[1.41; -49.80; 16.25]		
8.side HPL covering		438 6.3		[0.40; -49.38; 17.91]		
Mass Elements Overall		20 0.0 13266 563.8		[0.00; 0.00; 0.00] [1.41; -49.20; 10.63]		
Properties Sum	mary ements	Material	Mass	Gravity Center		
Libelt diaSmm	175	2_steel	0.4	[1.50; -49.30; 15.74]		
2.1=00 steel angles	2259	1. stainless steel	50.0	[1.46; -49.32; 15.66]		
4. Plate t=12	32200	3.HPL	124.1	[1.40: -40.24: 10.78]		
7_covering with angle Plate =12	1210	3.HPL	4.8	[1.60: -40.32: 10.67]		
0. plate t=5, bottom frame	10715	5. bottom frame stainless steel	174.4	[1.43; -49.23; 15.62]		
9_bet dip/mm	07	2_steel	0.1	[1.68: -49.84: 10.08]		
10, buit dia 14mm	10	2_steel	0.2	[1.66: -40.30: 10.07]		
			0.4	[1.71; -49.75; 15.34]		
11. plate t=4mm	163	1_stainless steel				
11.plate t=4mm 12.apper covering Plate t=12	2031T	3.HPL	116.5	[1.42; -49.11; 17.08]		
11. plate t=4mm		3. HPL 1. stainless steel 5. perforated stainless ste	116.5			
11. plate t=4mm 12. apper covering Plate t=12 12. t=03_support plate 14. plate t=2mm perforated	2031T 0 2195	HPL     stainless steel     perforated stainless ste horizontal	116.5 0.0 el. 17.1	[1.42; -49.11; 17.06] [0.00; 0.00; 0.00] [1.30; -49.44; 16.36]		
11. plate t=4mm 12. upper covering Plate t=12 13. t=00_aupport plate	2031T 0	3. HPL 1. stainless steel 5. perforated stainless ste	116.5	[1.42; -49.11; 17.06] [3.00; 0.02; 0.00]		
11. plate t=4mm 12. apper covering. Plate t=12 13. t=03, support plane 14. plate t=2mm perforated 16. plate t=2mm perforated 16. plate t=2mm operations 21. front middle covering. Place t=12 22. dide upper covering. Plate t=12	2031T 0 2198 2262 2277 438	HPL     trainless steel     perforated stainless ste horizontal     stainless steel     finitely steel     finitely steel     steel	116.5 0.0 17.1 5.1 8.0 0.3	[1.42; 49.11; 17.08] [0.00; 0.00; 0.00] [1.30; 49.44; 16.38] [1.84; 40.83; 10.68] [1.41; 40.80; 10.26] [0.40; 40.80; 17.04]		
11. plate In-4mm 12. apper covering Plate 1-12 12. apper covering Plate 1-12 13. apper plate 14. plate In-2mm performed 15. plate In-2mm performed 16. plate In-2mm performed 16. plate In-2mm performed 17. plate In-2mm performed 17. plate In-2mm performed 17. plate In-2mm performed 18. plate	2031T 0 2198 2262 2277 438 3891	3.HPL 1.stahless steel 5.perforated stainless steel bercontal 1.stainless steel 7.stort-PL covering 8.side HPL covering 3.HPL	116.5 0.0 17.1 5.1 8.0 0.3 28.4	[1.42; 49.11; 17.06] [1.00; 0.02; 0.00] [1.33; 49.44; 19.36] [1.84; 49.42; 19.68] [1.41; 49.80; 19.26] [0.40; 49.85; 17.01] [1.40; 49.32; 19.19]		
11. plate t=4mm 12. speer coseting. Plate t=12 12. speer coseting. Plate t=12 13. +003_support plate 14. plate t=2mm perforated 16. plate t=2mm secall beam 21. from middle govering. Plate t=12 22. side upper govering. Plate t=12 23. too upper covering. Plate t=12 25. too upper covering. Plate	2031T 0 2198 2262 2277 438 3891	HPL     trainless steel     perforated stainless ste horizontal     stainless steel     finitely steel     finitely steel     steel	116.5 0.0 17.1 5.1 8.0 0.3	[1.42; 49.11; 17.08] [0.00; 0.00; 0.00] [1.30; 49.44; 16.38] [1.84; 40.83; 10.68] [1.41; 40.80; 10.26] [0.40; 40.80; 17.04]		

Results contain plots and tables. Detailed results for each entity, extreme results on selection, and advanced tables to compare

load results are shown:



A complete setup with headings and bookmarks enables a quick navigation through the reports.



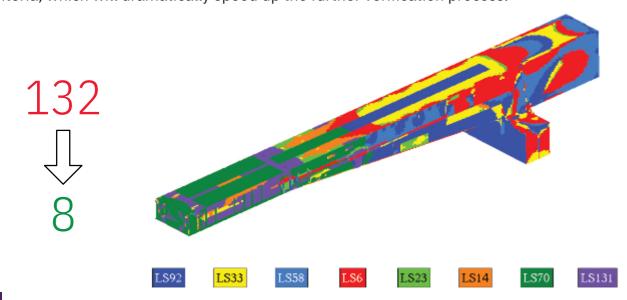
With Report Designer, you can control the report's structure and easily preview and modify it. A variety of tools helps to create a huge amount of plots and tables quickly.

# Peak Finder finds all peak zones based on output results and presents them using a special plot and a summary table. The peaks for both simple FEA results, such as stresses, strains, or displacements, and all available results of SDC Verifier checks (Fatigue, Beam Buckling, etc.) can be found.

Zone	Value	Zone	Value
Zone 1 (Elements: 2)	1.45	Zone 5 (Elements: 15)	1.41
Zone 2 (Elements: 2)	1.44	Zone 6 (Elements: 1)	1.21
Zone 3 (Elements: 2)	1.43	Zone 7 (Elements: 3)	1.09
Zone 4 (Elements: 2)	1.42	Zone 8 (Elements: 1)	1.01

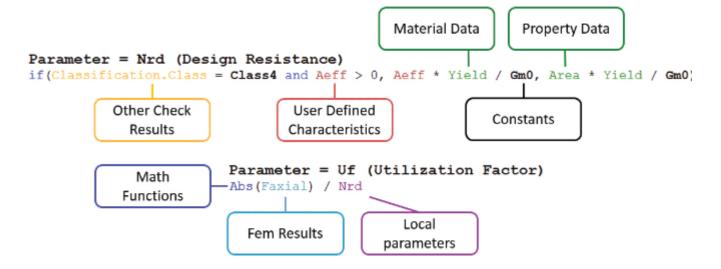
**Governing loads** tool extracts the critical loads out of a large group of load combinations. Save time focusing on important situations instead of checking each and every.

Only 8 load cases are defined as critical for this model and selected criteria, which will dramatically speed up the further verification process.

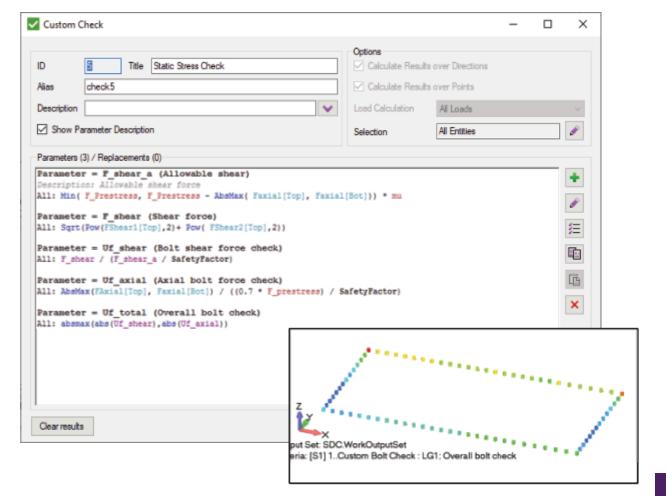


### **CUSTOMIZED CHECKS**

The checks in SDC Verifier are fully customizable. With the help of the formula editor, user-defined formulas can be created based on results, model properties and recognized dimensions.



The following example demonstrates a verification of bolted connections. The Axial Force of bolts is compared with the bolt design resistance:



# **EXTENSIBLE MODULES**

Acquire only some modules if you need specific features of the software



SDC Reporting and SPDM



**Weld Check** 



**Fatigue** 



**Bolt Check** 



Plate & Stiffener Buckling



Beam Member and Joint Checks



Beam Member Check



Eurocode 3 Beam Member



**FKM App** 



AISC Beam Member



# ASK FOR A TRIAL AT



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