SOFiSTiK

SOFiSTiK | 2018

New Features

Front Cover:

The new SOFiSTiK office building in Nuremberg, developed using an end-to-end BIM workflow. Groundbreaking was performed on 21st of July 2017, 30 years after the foundation of SOFiSTiK.

Credits:
Design & Build Contactor: WOLFF & MÜLLER, Stuttgart
Architecture: WABE-PLAN ARCHITEKTUR, Stuttgart
Structural Engineer: Boll und Partner, Beratende Ingenieure VBI, Stuttgart
MEP: GM Planen + Beraten, Griesheim
Lead Architect: Gerhard P. Wirth gpwirtharchitekten, Nuremberg
Image: Armin Dariz, BiMOTiON

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SOFiSTiK | 2018 – 30 years of software for better design

It's here, with this brochure you get the first taste of our new release. Our main development goals for version 2018 were to optimize usability and performance in combination with a totally redesigned workflow for BIM analysis and design.

Another special focus for this release was to better integrate into existing documentation and design workflows by providing more powerful interfaces to standard office software like Microsoft Word or Excel. A completely redesigned user interface of the FEA Extension for Autodesk® Revit® addresses the challenges posed by 3D building design using BIM models. Additional features for integrated design allow users to combine the latest technology with an engineer's approach to member design without losing the benefits of a BIM model. To further improve our bridge design functionality, which is core to our product, a new BIM-App has been introduced to close the gap between parametric structural design using the CABD technology and detailed design using a 3D Revit BIM model.

In addition, all Autodesk® AutoCAD® based products have been improved and released for the latest AutoCAD 2018 version. Finally the new version is about to be delivered using a completely new web-based tool, the SOFiSTiK Application Manager. This new technology assist with coordinating updates and performing installations of our products through a modern interface. We hope that this new release will find its way into your everyday software portfolio.

Your SOFiSTiK Team

		Licence Year	Revit			AutoCAD			OEM Kernel		OS			FEA Version	
			2016	2017	2018	2016	2017	2018	2016	2018	Win 7 Pro 64bit	Win 8.1 Pro 64bit	Win 10 64bit	2016	2018
FEA-Extension	2016	2016	x								x	x		x	
	2016 R2	2017		x							x	x	x	x	
	2018	2018			x						x	x	x		x
SOFiPLUS	2016 (64bit)	2016				x					x	x		x	
	2016 R2 (64bit)	2017				x	x				x	x	x	x	
	2018	2018						x			x	x	x		x
SOFiPLUS-X	2016 (64bit)	2016							x		x	x		x	
	2016 R2 (64bit)	2017							x		x	x	x	x	
	2018	2018								x	x	x	x		x
SOFiCAD	2016 (64bit)	2016				x					x	x			
	2016 R2 (64bit)	2017				x	x				x	x	x		
	2018	2018						x			x	x	x		
SOFiCAD-OEM	2016 (64bit)	2016							x		x	x			
	2016 R2 (64bit)	2017							x		x	x	x		
	2018	2018								x	x	x	x		

SOFiSTiK Product Line Overview

SOFiSTiK | 2018

This product line contains all structural analysis, dynamics and finite element modules of SOFiSTiK. Graphical pre-processing based on Autodesk AutoCAD and Revit as well as McNeel Rhinoceros are parts of this family. A core component is the SOFiSTiK Structural Desktop (SSD), the central control and input program for all structural computations.

SOFiCAD | 2018

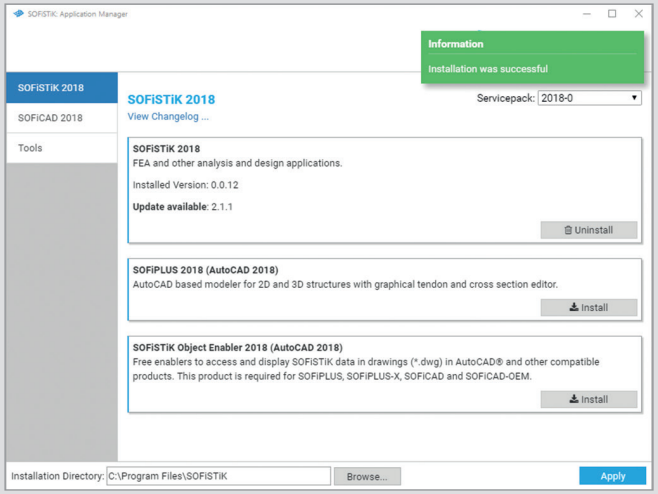
Reliable 2D drafting and R/C detailing on an AutoCAD platform or using integrated Autodesk Technology as SOFiCAD-OEM (German only).

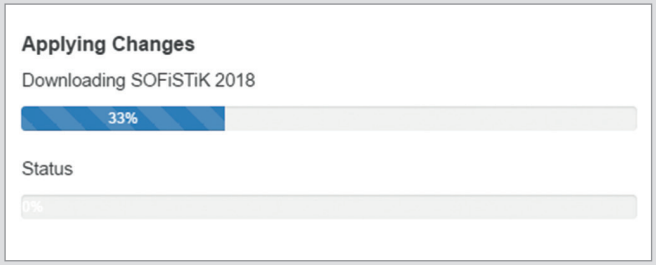
BIM Products | 2018

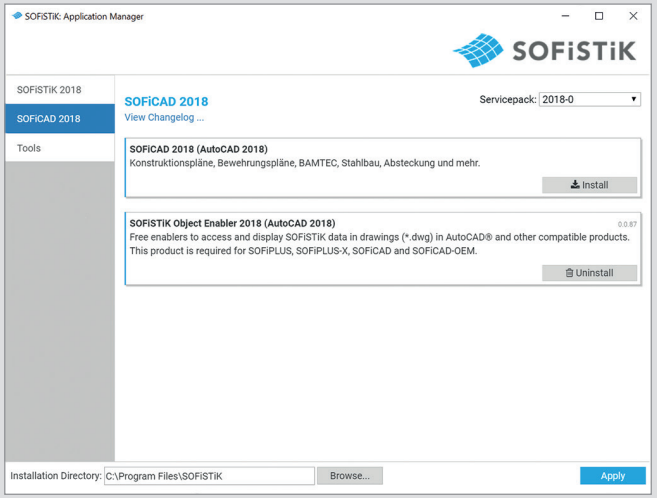
From the Revit BIM model with 3D reinforcement from design results towards structural drafting and R/C detailing in 2D, the BIM-Apps support your BIM workflow. The BIM-Apps are available via the Autodesk App Store with additional features and support for Revit 2018.

SOFiSTiK Application Manager (SAM)

+ Installation, automatic and manual updates for SOFiSTiK FEA and SOFiCAD using one central tool.
+ Your SOFiSTiK installation is simplified using an intuitive and clear procedure.
+ Automatic license year – servicepack mapping.
+ Servicepack downgrades possible.
+ On-demand download of the installation files allows efficient use of bandwidth.
+ Simplified setup procedure using latest Windows Installer technology.







SOFiSTiK Structural Desktop (SSD)

Configurable Unit Sets and New Codes

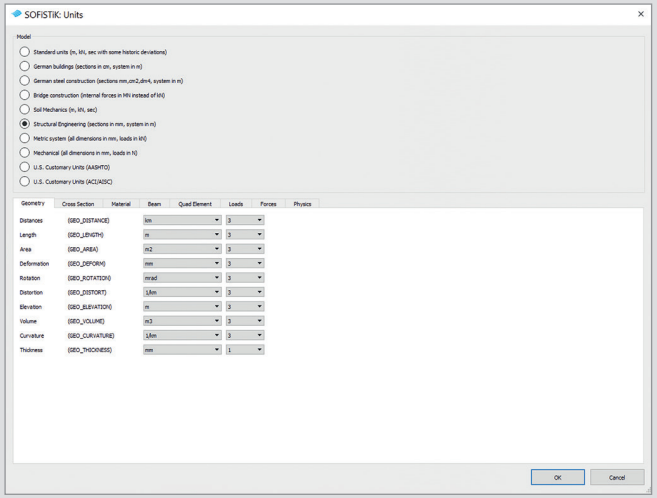
+ Configurable unit sets and New Codes.
+ Predefined unit sets allow for individual modifications of units and precision settings.
+ U.S. customary unit sets have been reviewed and improved, U.S. Customary AASHTO and ACI/AISC sets are available.
+ New U.S. codes: American Association of State Highway and Transportation.
+ Officials AASHTO-2014 and American Concrete Institute ACI-318-14 have been implemented.

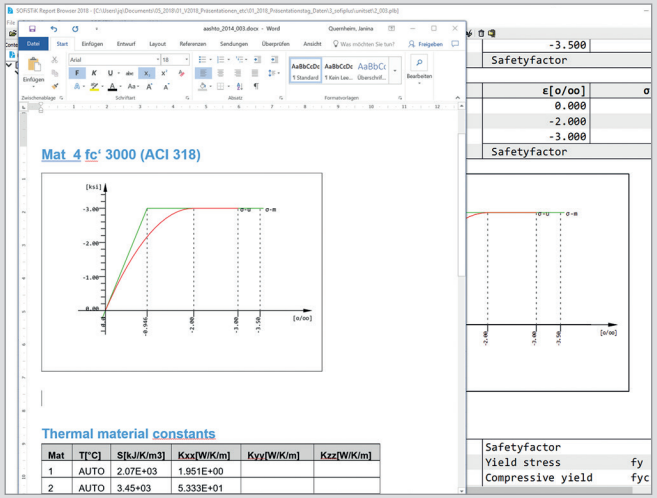
DOCX output in addition to PLB

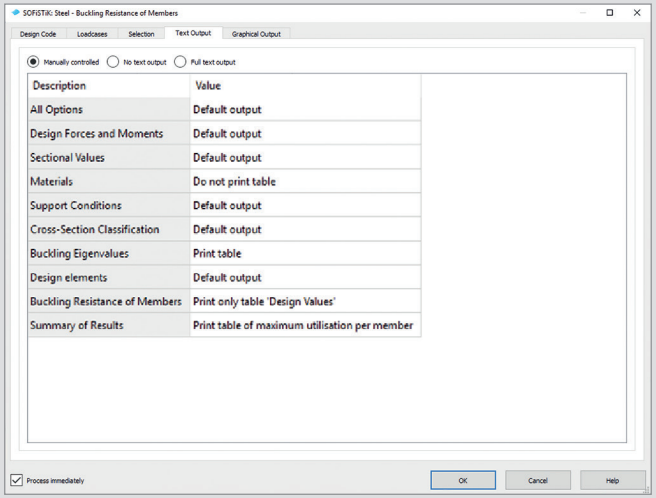
+ For higher documentation flexibility of calculation results an optional DOCX output can be activated.
+ Most tables and figures of the Report Browser format (.plb) are supported. The full functionality of the Report Browser will not be supported.

Improved General Usability

+ New design, revised texts and descriptions for the output and control parameters of all SSD tasks.
+ In addition to the English and German output and software interface language, French is supported with the 2018 release.







Standard Section Dialogs

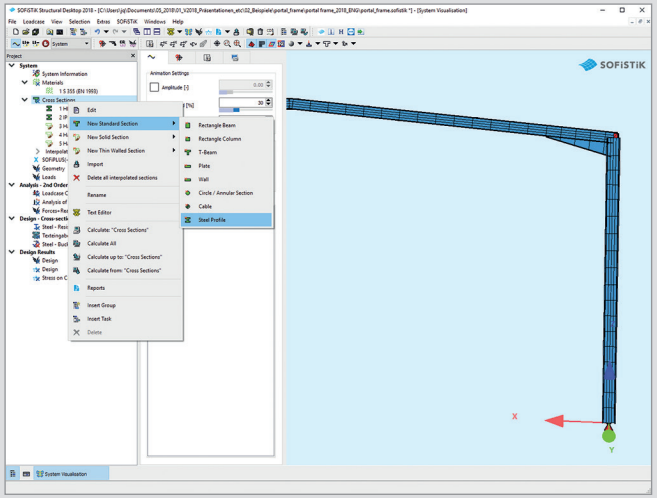
+ Standard section types can now be accessed faster with a new selection menu in the SSD's section task.
+ The input dialogs have been redesigned for an easier workflow with the most important parameters presented clearly and concisely.
+ Dimensional lines for main rebar spacing are displayed.

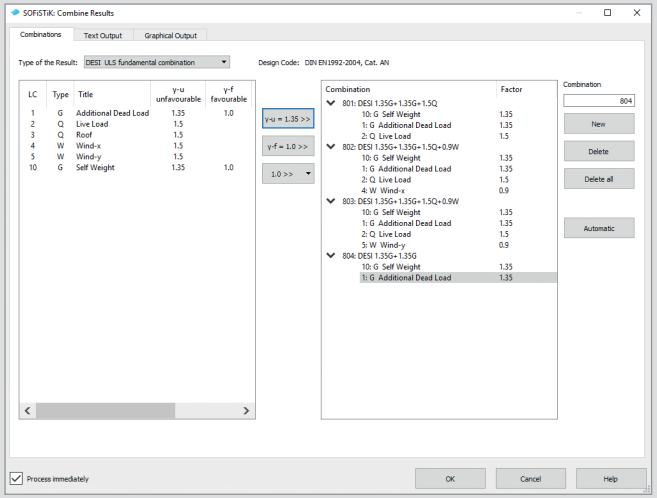
Superpositioning

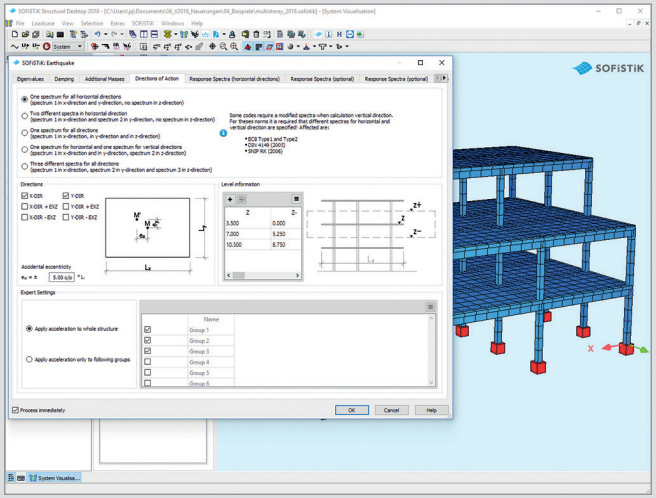
+ In the "Superposition Manager", element groups can be selected for isolated superpositioning calculations on them.
+ With the new task "Combine Results", single loadcase results can be combined and summarized with user-defined factors.

Earthquake Task

+ Accidental eccentricities according to Eurocode can be defined for each level and each direction.
+ The resulting earthquake forces for each level can be calculated based on level information defined in the task.
+ Definition of the response spectra has been simplified and focused on the input of the main parameters.







Column Design

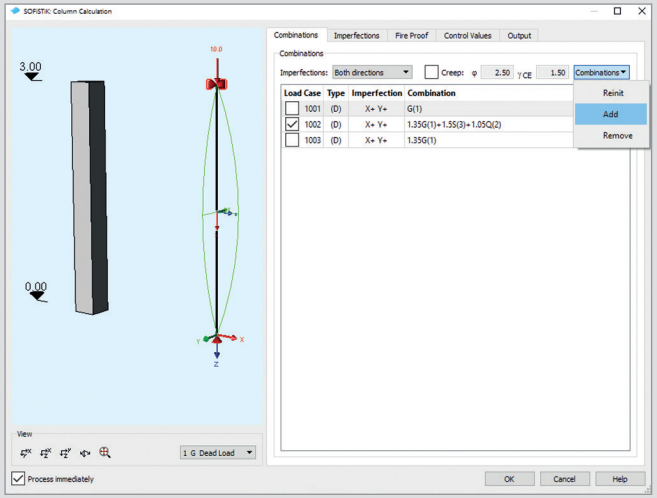
+ For each load combination, a corresponding creep-active permanent load case is generated.
+ User-defined load combinations can be added to the automatically generated design code combinations.
+ Nominal curvature method according to Eurocode added as design method.

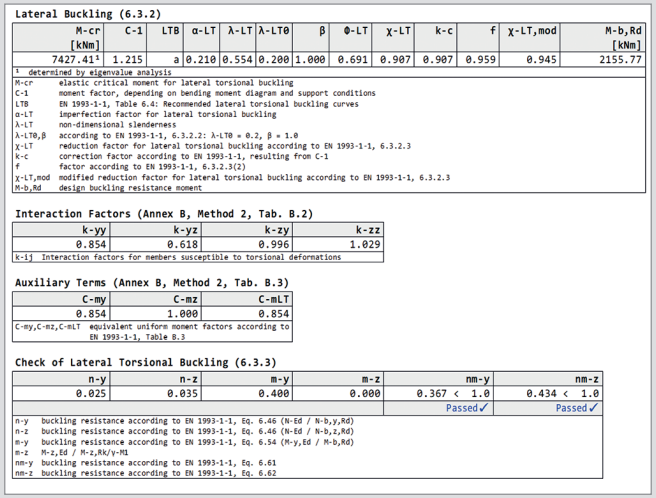
Buckling Resistance of Steel Members

+ Interaction factors can be calculated as an alternative method according to Annex B of EN 1993-1-1.
+ Intermediate supports and lateral point restraints can be defined for the members under investigation.

CSM Bridge Design Tasks

+ The new “CSM Bridge Design” task family allows a full graphical bridge design workflow for Eurocode based design.
+ The superpositioning task prepares design envelopes and check printouts.
+ Specific design tasks for detailed design code checks for reinforced or post-tensioned bridges, both for beam and area element models.





Lateral Buckling (6.3.2)

M-cr [kNm]	C-1	LTB	α-LT	λ-LT	λ-LT0	β	Φ-LT	χ-LT	k-c	f	χ-LT,mod	M-b,Rd [kNm]
7427.41¹	1.215	a	0.210	0.554	0.200	1.000	0.691	0.907	0.907	0.959	0.945	2155.77

¹ determined by eigenvalue analysis

M-cr elastic critical moment for lateral torsional buckling
C-1 moment factor, depending on bending moment diagram and support conditions
LTB EN 1993-1-1, Table 6.4: Recommended lateral torsional buckling curves
α-LT imperfection factor for lateral torsional buckling
λ-LT non-dimensional slenderness
λ-LT0,β according to EN 1993-1-1, 6.3.2.2: λ-LT0 = 0.2, β = 1.0
χ-LT reduction factor for lateral torsional buckling according to EN 1993-1-1, 6.3.2.3
k-c correction factor according to EN 1993-1-1, resulting from C-1
f factor according to EN 1993-1-1, 6.3.2.3(2)
χ-LT,mod modified reduction factor for lateral torsional buckling according to EN 1993-1-1, 6.3.2.3
M-b,Rd design buckling resistance moment

Interaction Factors (Annex B, Method 2, Tab. B.2)

k-yy	k-yz	k-zy	k-zz
0.854	0.618	0.996	1.029

k-ij Interaction factors for members susceptible to torsional deformations

Auxiliary Terms (Annex B, Method 2, Tab. B.3)

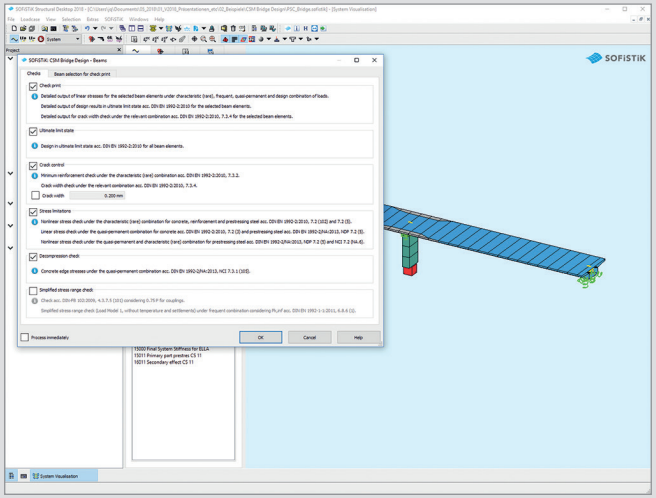
C-my	C-mz	C-mLT
0.854	1.000	0.854

C-my,C-mz,C-mLT equivalent uniform moment factors according to EN 1993-1-1, Table B.3

Check of Lateral Torsional Buckling (6.3.3)

n-y	n-z	m-y	m-z	nm-y	nm-z
0.025	0.035	0.400	0.000	0.367 < 1.0	0.434 < 1.0
				Passed✓	Passed✓

n-y buckling resistance according to EN 1993-1-1, Eq. 6.46 (N-Ed / N-b,y,Rd)
n-z buckling resistance according to EN 1993-1-1, Eq. 6.46 (N-Ed / N-b,z,Rd)
m-y buckling resistance according to EN 1993-1-1, Eq. 6.54 (M-y,Ed / M-b,Rd)
m-z M-z,Ed / M-z,Rk/γ-M1
nm-y buckling resistance according to EN 1993-1-1, Eq. 6.61
nm-z buckling resistance according to EN 1993-1-1, Eq. 6.62



Structural Analysis and FEA

Unit Sets and AQUA

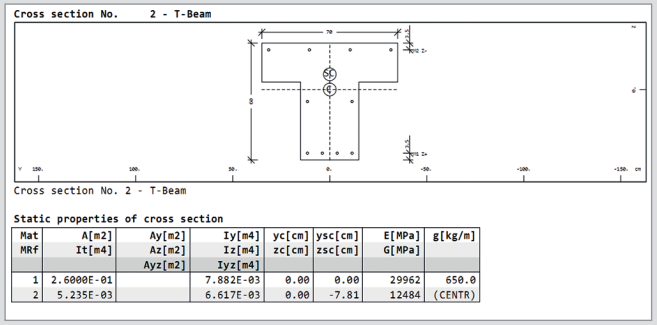
+ New unit sets: U.S. Customary Units according to American Association of State Highway and Transportation Officials (AASHTO) or American Concrete Institute (ACI) and American Institute of Steel Construction (AISC).
+ Optional shear design for flanges of standard T-Beam sections.

MAXIMA

+ For documentation, MAXIMA allows the selection of structural elements in addition to groups. (SUPP FROM SLN, SUPP FROM SAR)
+ With version 2018 it is possible to perform isolated superpositioning calculations for selected members. (SUPP OPT)
+ A new input record (SUM) allows the creation of result combinations of single loadcases.

Steel Design

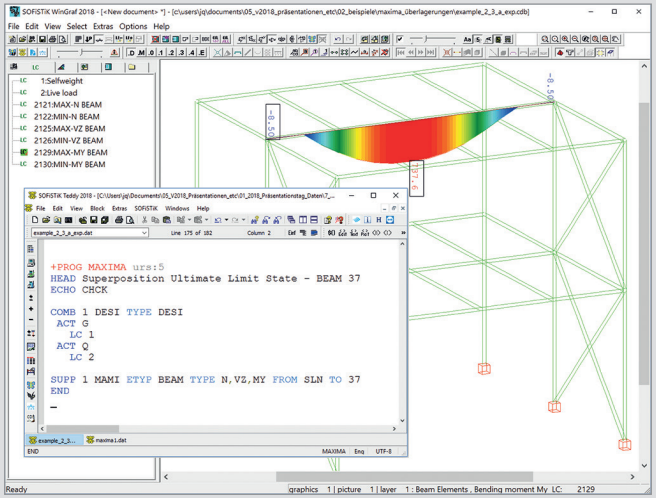
+ AQUA: Exponents for My and Mz of the Interaction formula Eq. 6.41 of EN 1993 can be adjusted. (SECT ALF BET)
+ AQUA: Prescribing stresses for calculation of effective section properties is now possible. (NEFF TYPE SIG SMIN)
+ BDK: Intermediate supports and lateral point restraints can be defined for the members under investigation. (CVM, CVL)
+ BDK: Direct cross sectional classification is possible using AQB functionality.

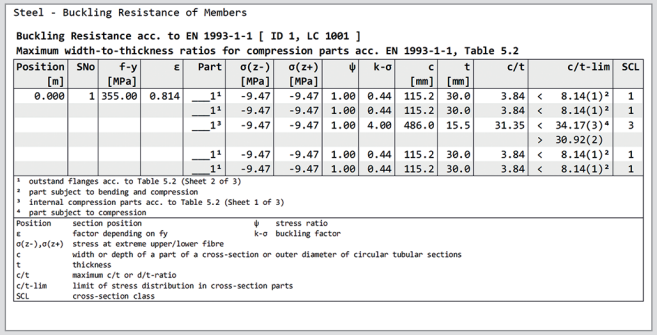


Cross section No. 2 - T-Beam

Static properties of cross section

Mat	A[m2]	Ay[m2]	Iy[m4]	yc[cm]	ysc[cm]	E[MPa]	g[kg/m]
MRf	It[m4]	Az[m2]	Iz[m4]	zc[cm]	zsc[cm]	G[MPa]	
		Ayz[m2]	Iyz[m4]				
1	2.6000E-01		7.882E-03	0.00	0.00	29962	650.0
2	5.235E-03		6.617E-03	0.00	-7.81	12484	(CENTR)





Steel - Buckling Resistance of Members

Buckling Resistance acc. to EN 1993-1-1 [ID 1, LC 1001]

Maximum width-to-thickness ratios for compression parts acc. EN 1993-1-1, Table 5.2

Position [m]	SNo	f-y [MPa]	ε	Part	σ(z-) [MPa]	σ(z+) [MPa]	ψ	k-σ	c [mm]	t [mm]	c/t		c/t-lim	SCL
0.000	1	355.00	0.814	___1¹	-9.47	-9.47	1.00	0.44	115.2	30.0	3.84	<	8.14(1)²	1
				___1¹	-9.47	-9.47	1.00	0.44	115.2	30.0	3.84	<	8.14(1)²	1
				___1³	-9.47	-9.47	1.00	4.00	486.0	15.5	31.35	<	34.17(3)⁴	3
												>	30.92(2)	
				___1¹	-9.47	-9.47	1.00	0.44	115.2	30.0	3.84	<	8.14(1)²	1
				___1¹	-9.47	-9.47	1.00	0.44	115.2	30.0	3.84	<	8.14(1)²	1

¹ outstand flanges acc. to Table 5.2 (Sheet 2 of 3)
² part subject to bending and compression
³ internal compression parts acc. to Table 5.2 (Sheet 1 of 3)
⁴ part subject to compression

Position	section position	ψ	stress ratio
ε	factor depending on fy	k-σ	buckling factor
σ(z-),σ(z+)	stress at extreme upper/lower fibre		
c	width or depth of a part of a cross-section or outer diameter of circular tubular sections		
t	thickness		
c/t	maximum c/t or d/t-ratio		
c/t-lim	limit of stress distribution in cross-section parts		
SCL	cross-section class		

TALPA - Geotechnics

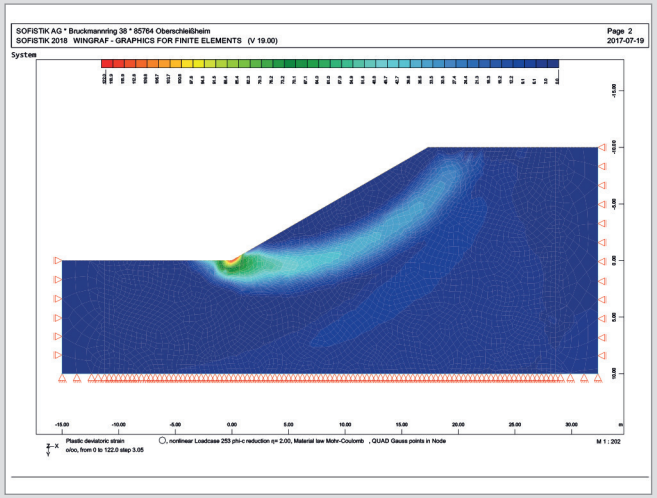
+ Better handling of “Design Approach 3” and “Dual Factoring” from EN 1997 with extended stability analysis (phi-c reduction) with arclength control. (CTRL STEP PHIC)
+ New general adaptive load stepping with arclength control. (CTRL STEP ARCL)
+ Extension of parallel element processing for QUAD elements.

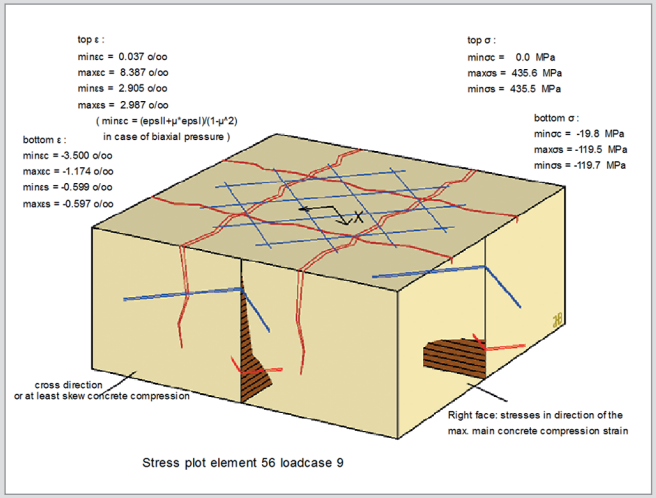
BEMESS: Layer Design for Quads

+ For QUAD ULS design, the user can choose an exact iteration of the strain state (layer design) as an alternative to the default design method according to Baumann. (CRTL LAY -/0/1)
+ The new method is set as default for the stress checks in the SLS. The same applies for the design of skew 2- and 3-layer reinforcement.
+ The layer approach also integrates tendons realistically in the strain analysis and is therefore applied for ULS design of post-tensioned concrete.

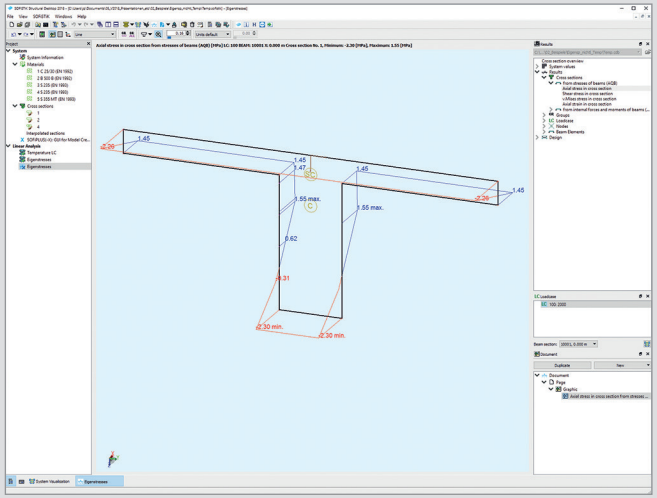
Nonlinear Temperature Gradient

+ Vertical nonlinear temperature gradients according to e.g. AASHTO or BS 5400 regulations can be evaluated as global equivalent loads in SOFiLOAD. (EVAL TEIG)
+ The eigenstress part can be considered in AQB 2018 for single loadcases on beam sections containing temperature gradients.
+ Benchmark BE54 of the Verification Manual – Mechanical has been adapted accordingly.





Stress plot element 56 loadcase 9



Result Viewer

New Design

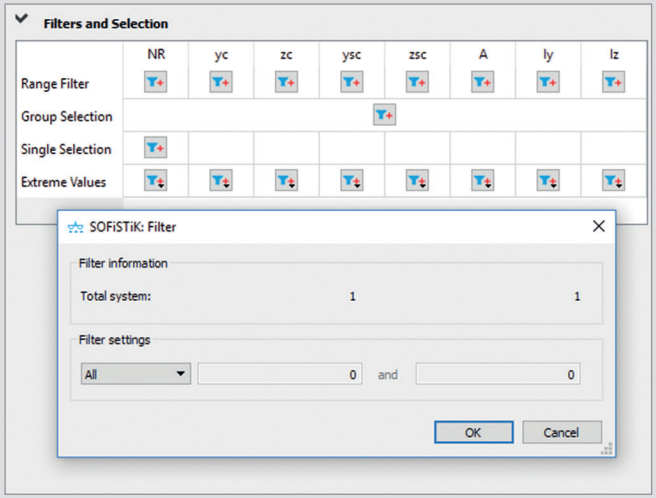
+ The Result Viewer's user interface has been restructured for an optimal workflow.
+ Important functionalities are now placed more prominently.
+ The filter management functionality has been improved with a complete redesign.

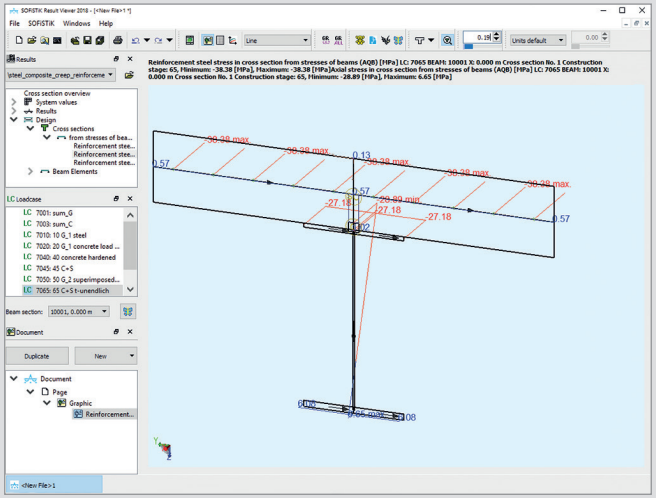
New Results

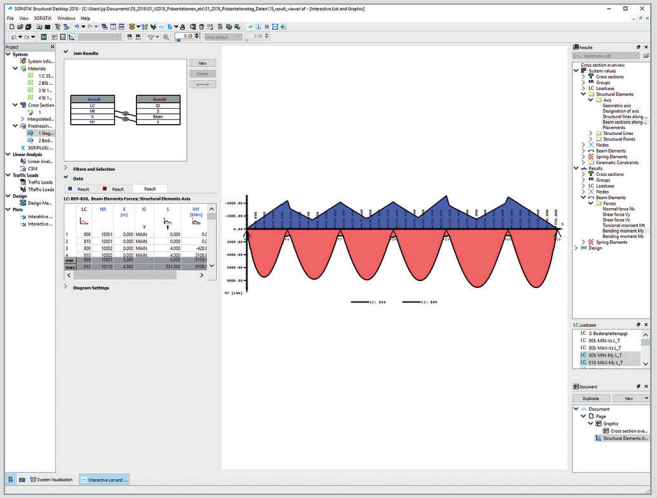
+ Effective cross-section properties are displayed.
+ Tangent intersection points for cross-sections consisting of circles and arcs are displayed.
+ Corresponding structural elements, beams and placements for axes can be selected and used for result representation.
+ Start and end sections of beams are marked and can be filtered.
+ Axial stresses in the reinforcement of a composite section can be displayed.

New Representations and Interfaces

+ Results in tables can be exported to Microsoft Excel sheets in batch mode and directly.
+ With the new diagram assistant different results can easily be combined in a diagram.
+ Improved stress check and result plotting functionality with diagram plots along unrolled bridge axes or structural lines for forces and selected stress results.







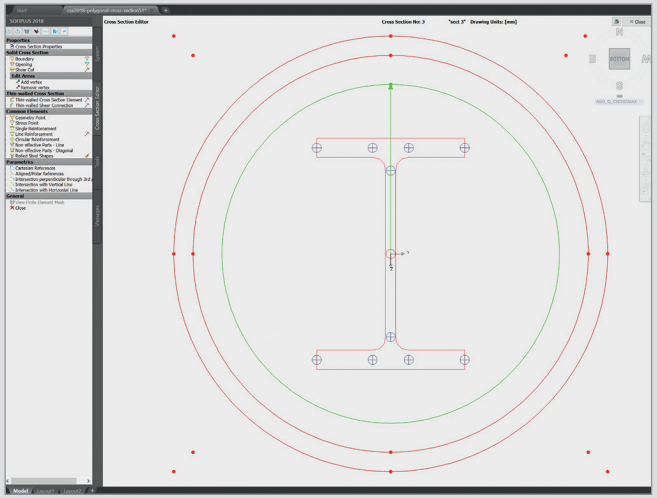
SOFiPLUS (-X)

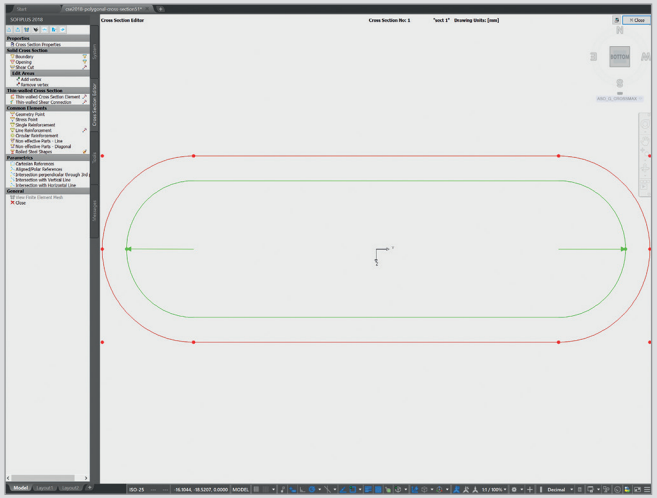
Cross-Section Editor

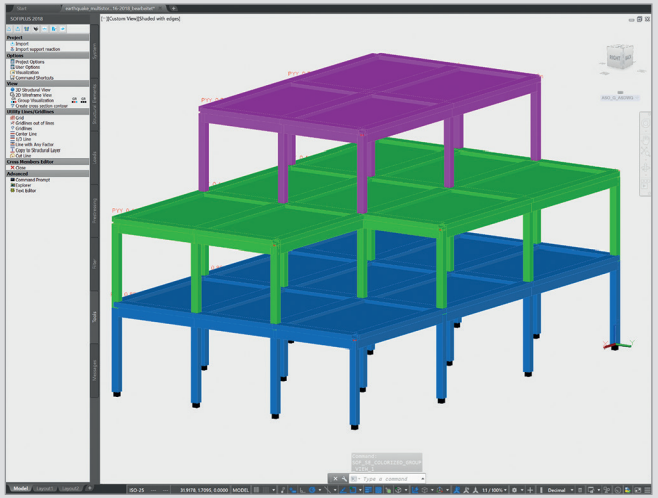
+ The definition of circles and arcs for solid cross-sections now refers to the tangent intersection points.
+ Line reinforcement can be placed along circular cross-section elements.
+ The insertion point of a structural steel section can also be used as reference point for variables.
+ Lateral torsional buckling curves can be defined directly in the cross-section definition task.
+ The exponents for My and Mz for the interaction according to EN 1993 Eq. 6.41 can be defined for class-1 and class-2 cross-sections.
+ Class-4 sections allow manual compressive stress limitations for effective sectional values.

Group Visualization

+ With activated “Group Visualization”, all group members are shown in the same color. This provides a better overview and control of the current group assignment of the model.





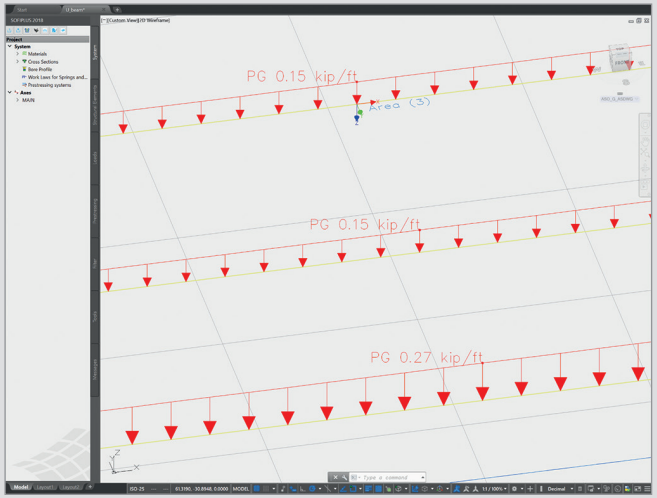


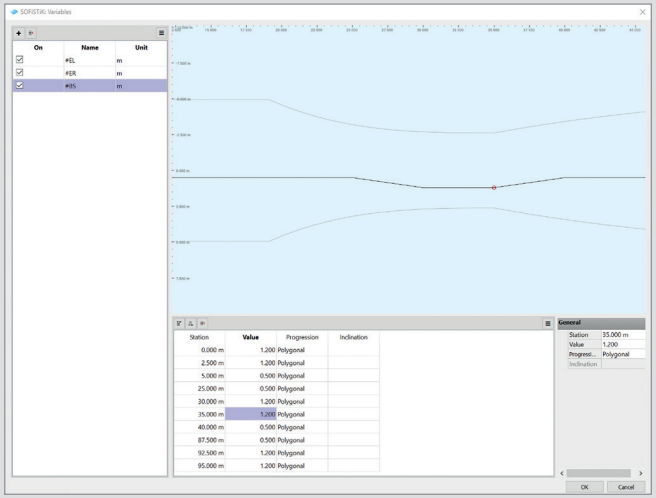
U.S. Customary Units for Loads

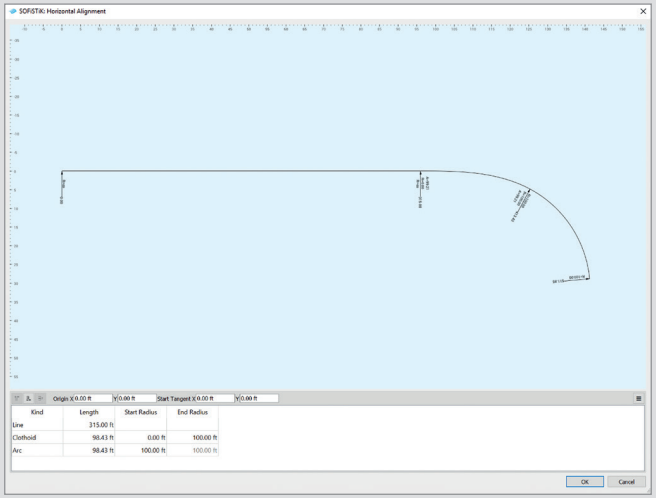
+ If a U.S. Customary Unit Set is chosen, the load input dialogs are set to U.S. units automatically (kip, kip/ft, psf…).

Redesigned CABD Dialogs

+ The dialogs for the graphical input using the Computer Aided Bridge Design (CABD) technology have been redesigned completely.
+ Vertical and horizontal alignment dialogs have been simplified and focuses on fewer more important parameters.
+ The new variables dialog provides better multi-edit functionality and overview.
+ Units of variables are consequently displayed.
+ All new dialogs allow simple data transfer via copy-and-paste from spreadsheets.







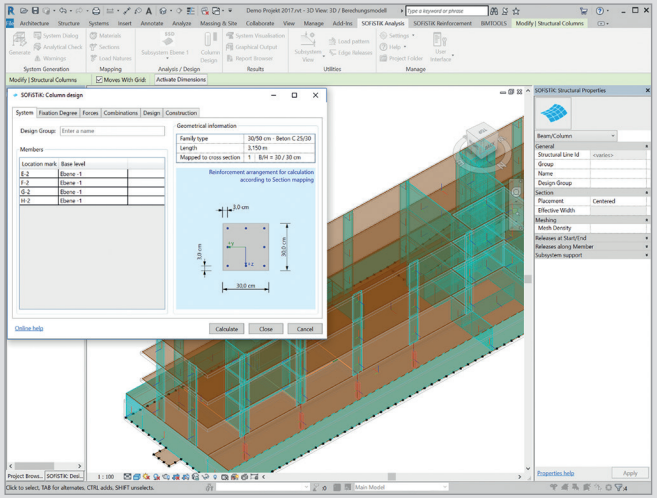
BIM for Structural Analysis

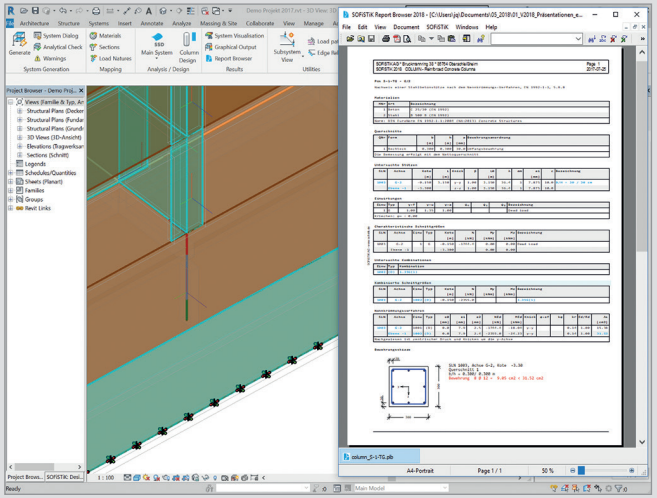
FEA Extension for Revit

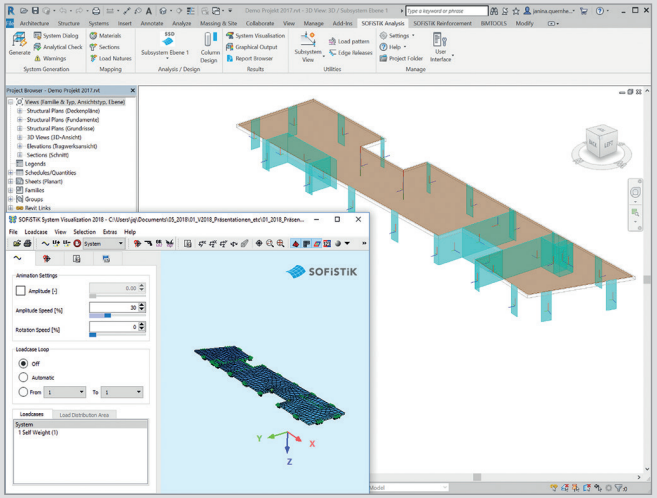
+ The ribbon bar and icons have been redesigned completely following the Revit platform style.
+ New “Analytical Check” functionality supports the analytical model optimization.
+ New command family “Subsystem View” allows the generation of views automatically for suitable subsystem analysis.
+ Automatic load transfer option between analytical subsystem levels.

Member Design

+ Individual instances of members can be grouped as design types with additional information and an identifier.
+ For columns all necessary loads and effects are extracted from the analyzed 3D building model. Effects can be displayed in Revit tables for grouping purposes.
+ A dedicated “Colum Design” dialog allows interactive column design using the nominal curvature method from Eurocode.
+ Final design and checks for column members can be performed using the nominal curvature method and nonlinear design directly in Revit.
+ Design report for members with unique identifier and location information such as level and axis information.
+ Design for members such as continuous beams and footings are in development.





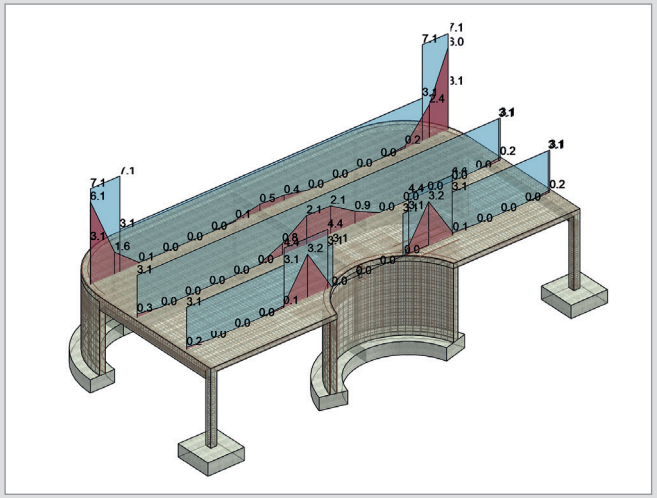


BIM for Bridge Design

Labs Version available from Fall 2017

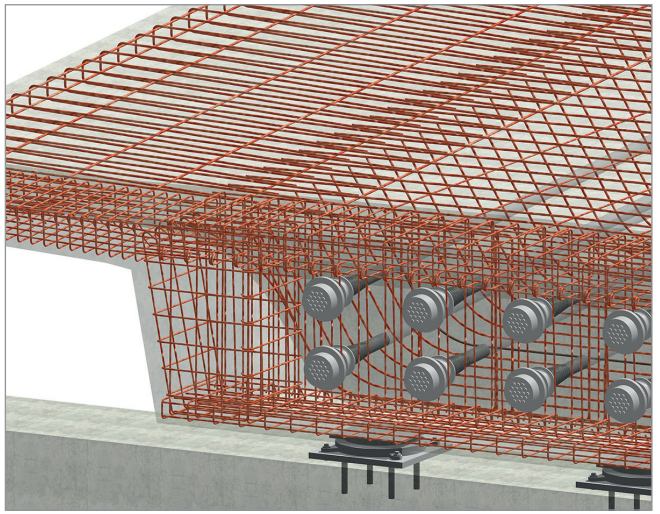
Reinforcement Generation 2018

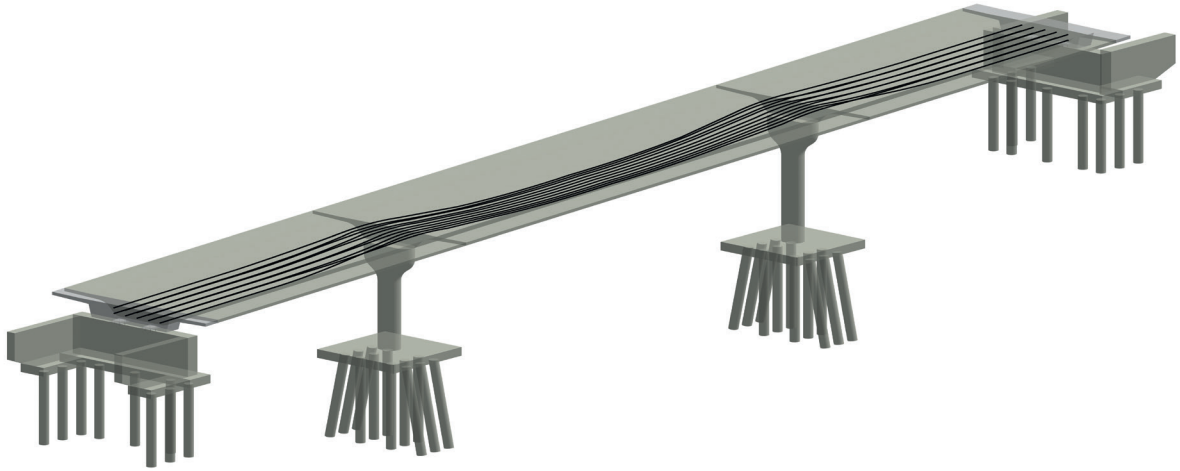
+ Automatic generation of 3D reinforcement for beams, columns, walls and slabs using results from analysis and design (also for SOFiSTiK design results of version 2016).
+ Column reinforcement functionality has been optimized for member design of the FEA Extension 2018.



SOFiSTiK Infrastructure Extension 2018 (SiX)

+ Labs Version of BIM-App „SOFiSTiK Infrastructure Extension“ for Revit 2018 will provide geometry import functionality for CABD bridge superstructures.
+ Single girder beam bridge models can be imported from SOFiSTiK CDBs including axes and placement information.
+ Tendons can be imported to Revit as free-form rebars.
+ Several import options allows the adjustment of mapping and modelling options of Revit.

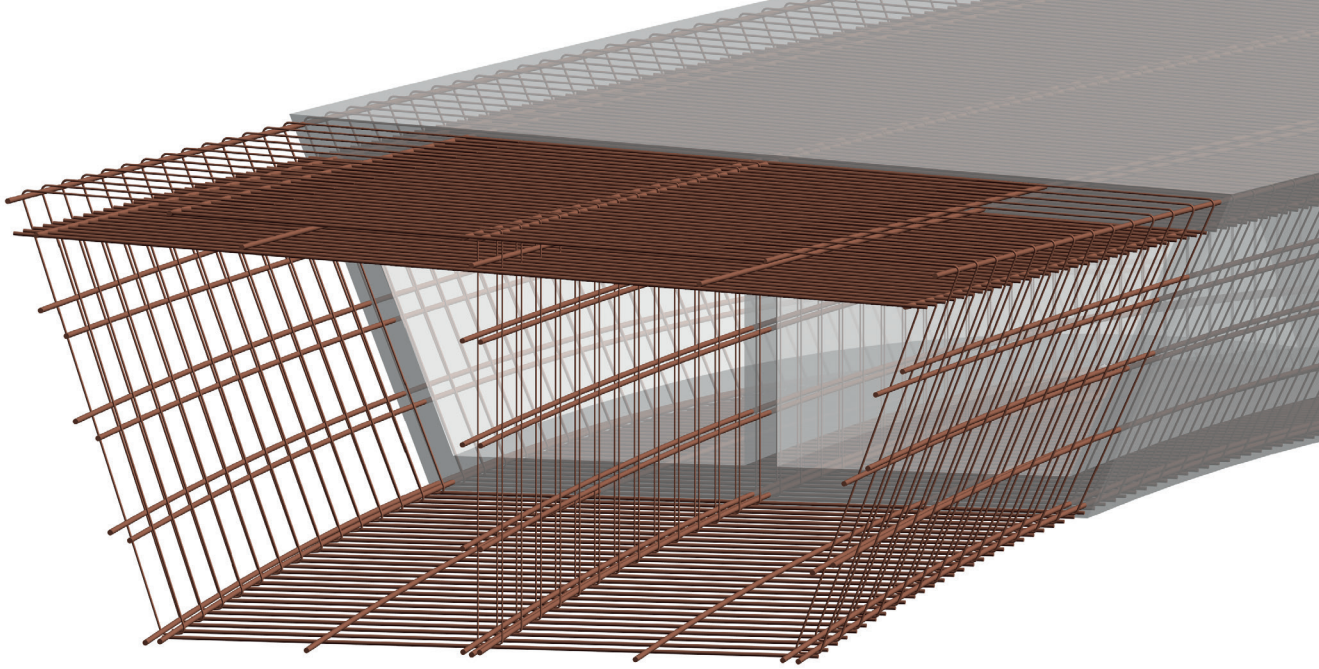


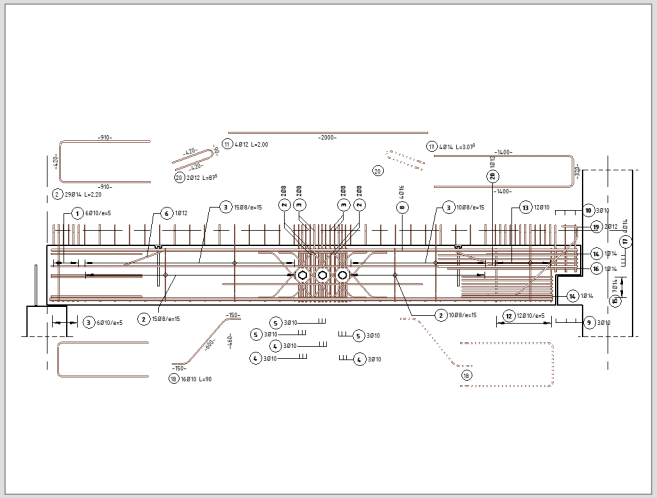


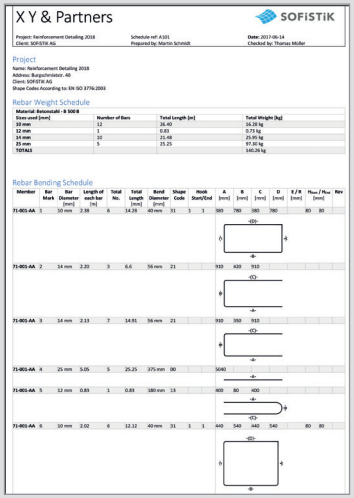
BIM for Construction

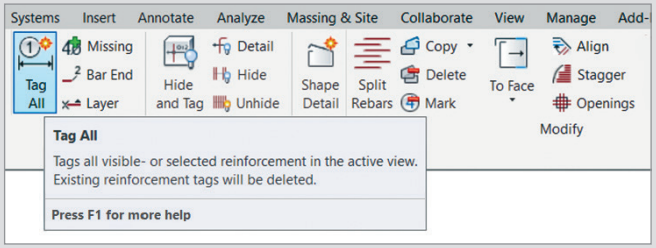
Reinforcement Detailing 2018

- Reinforcement can now be distributed in elements with complex shapes.
- Reinforcement can be copied with all annotations, details, dimensions and related views.
- The creation of rebar or fabric shape details is now possible.
- Bending schedules based on DOCX templates allow individual user adjustments of layout and style.









SOFiCAD (-OEM German only)

Label Objects

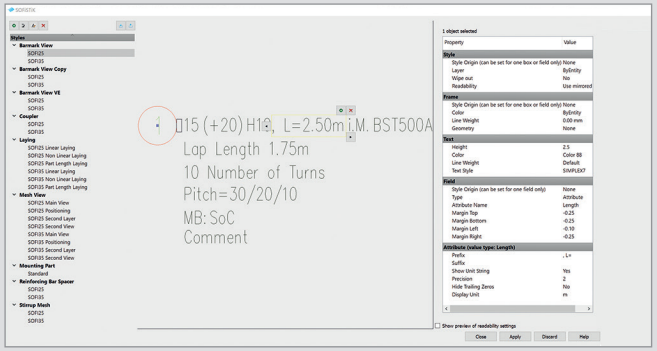
+ Label components can be moved freely using grip-handles at text boxes. Grip-handles can be added within the label editor.
+ Label styles are now exported or imported via the label editor. An assignment to a reinforcement style is not necessary.

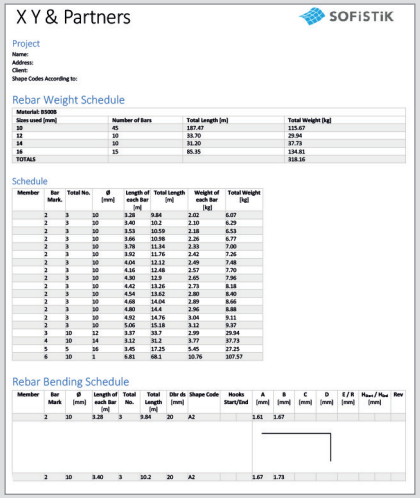
Reinforcement Schedules

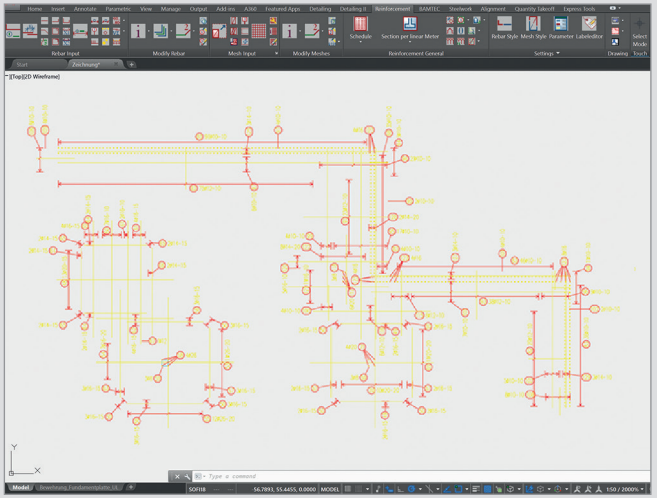
+ In addition to the standard reinforcement schedule, a new schedule is introduced with version 2018.
+ The content and layout can be customized in the new reinforcement schedule, granting the user a high amount of flexibility.
+ The schedule content is defined in a DOCX template using parameters, which can be added or removed.

Further Improvements

+ New “Browse Diameter” function allows to scan, sort and visualize bars according to their diameter.







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