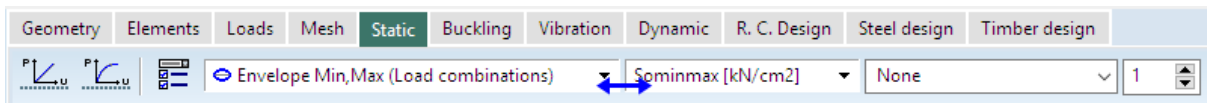


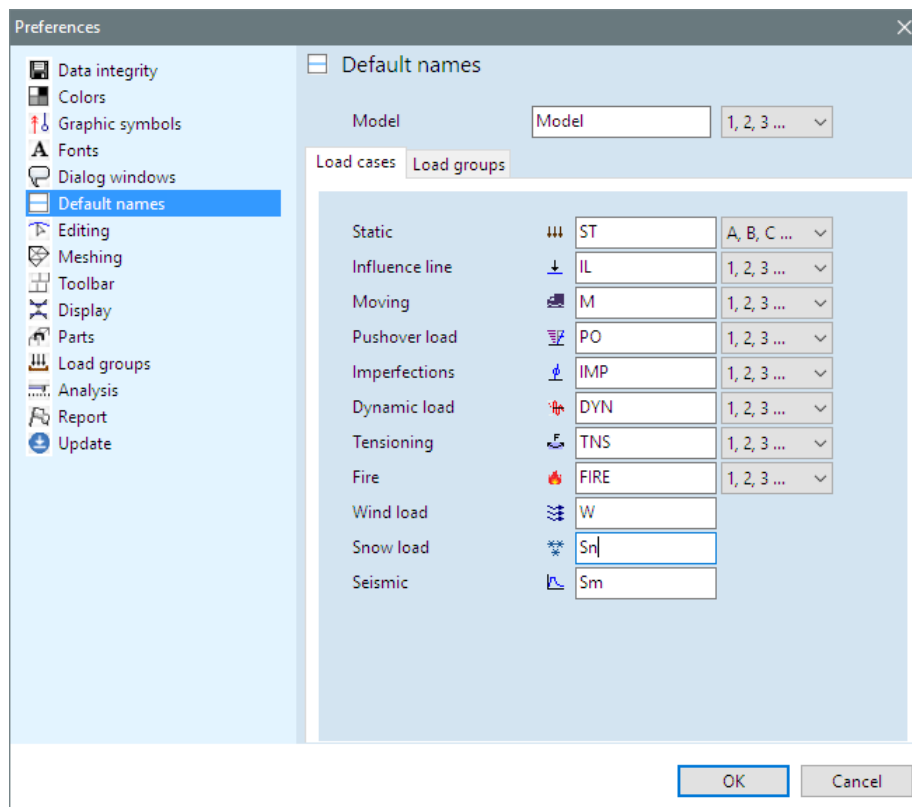
New features in AxisVM X5

GENERAL FEATURES

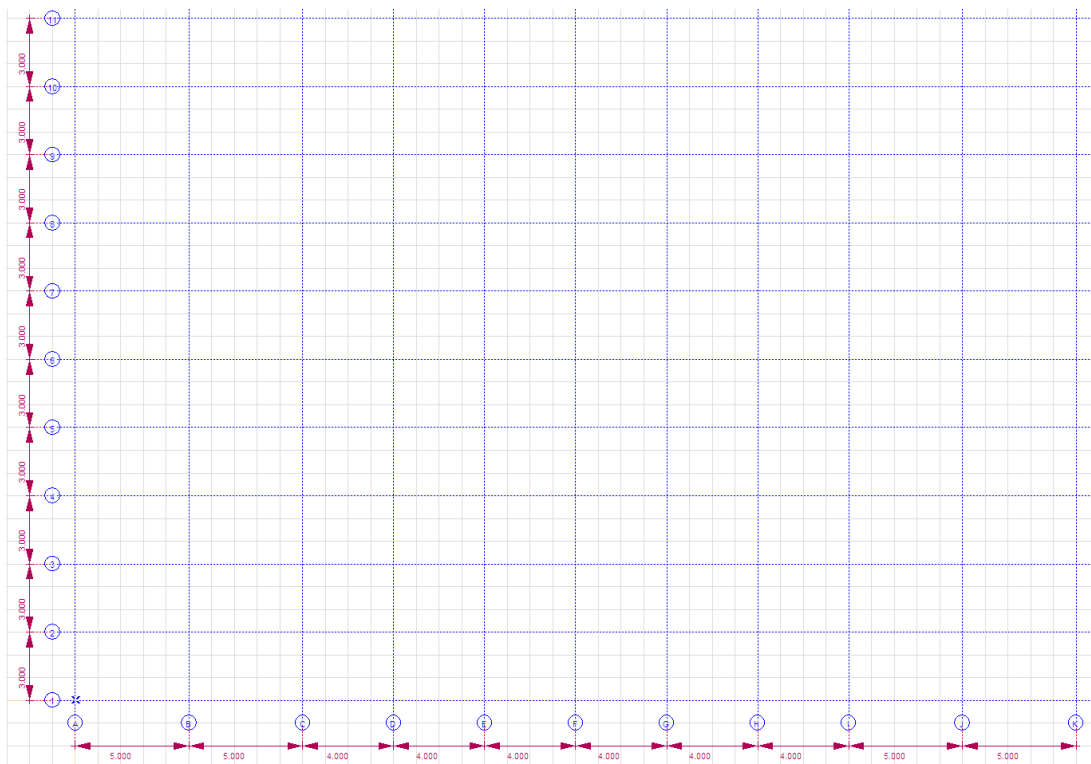
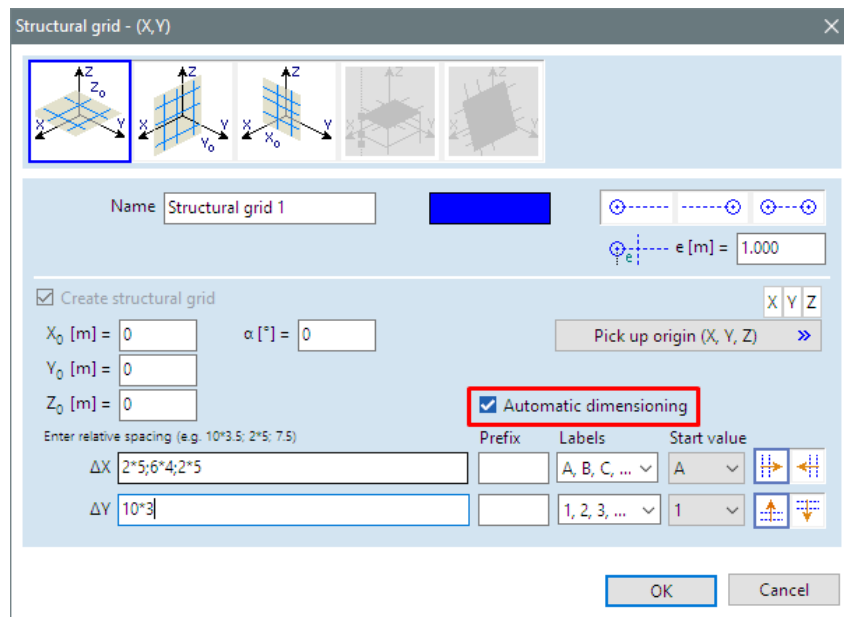
- Dropdown lists displaying load cases / combinations, result components and result display modes on the main window and on design dialogs are directly resizable.



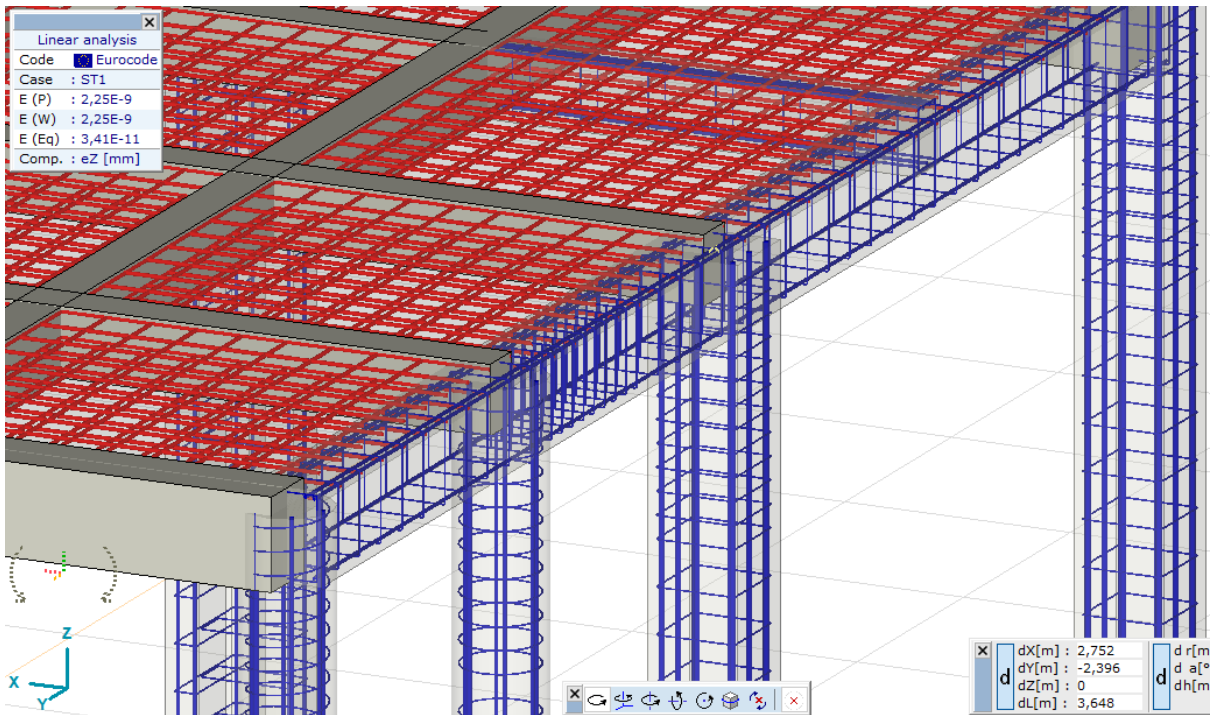
- Customizable default names for new models, load cases and load groups



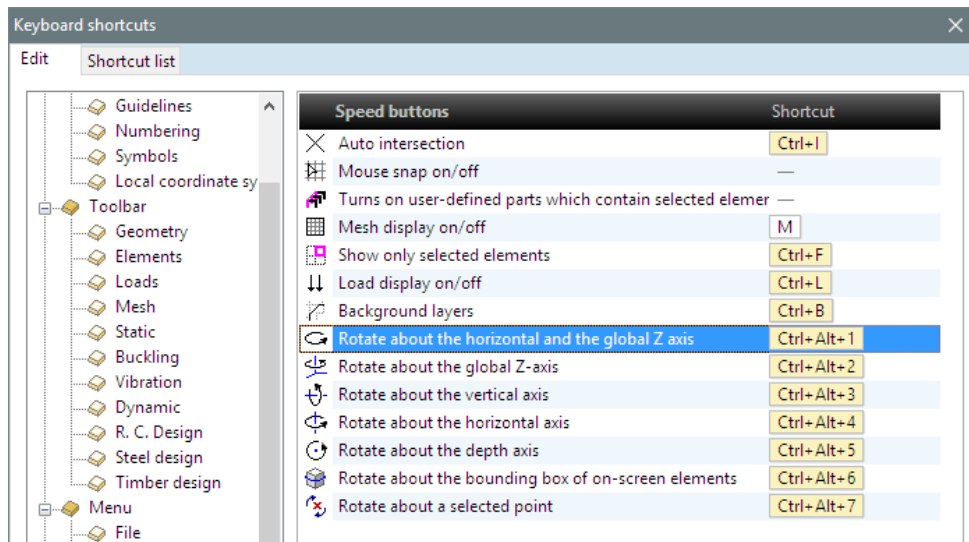
- Automatic dimensioning of structural gridlines



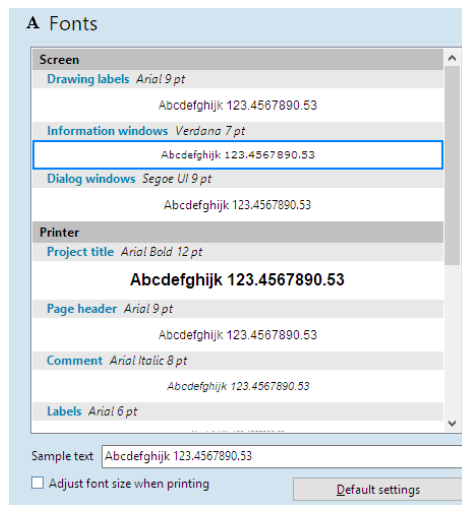
- Displaying applied reinforcement in rendered view / **R2**



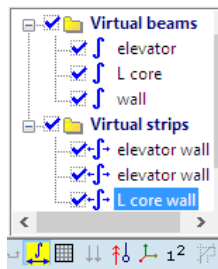
- Keyboard shortcuts can be assigned to *Deformed shape*, *Show non-visible parts grayed* (see *Menu.View* category) and several rotation control commands (see *Speed buttons* category).



- All font settings in one dialog



- New speed button to control the display of virtual beams and strips / R2



CONNECTIVITY

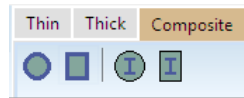
- Import/export of tapered walls from/to IFC (Open BIM connection)
- Import of 3D shapes represented as CSG solid models from IFC files / R2
- Export of selected elements from Revit to AxisVM
- Updating Revit model from AxisVM with detecting changes (Close BIM connection)
- Updating AxisVM model from Revit with detecting changes (Close BIM connection)
- Grasshopper and Dynamo interface to build parametric structures
- Import of models created with Tekla Structures / R2

CROSS-SECTION EDITOR

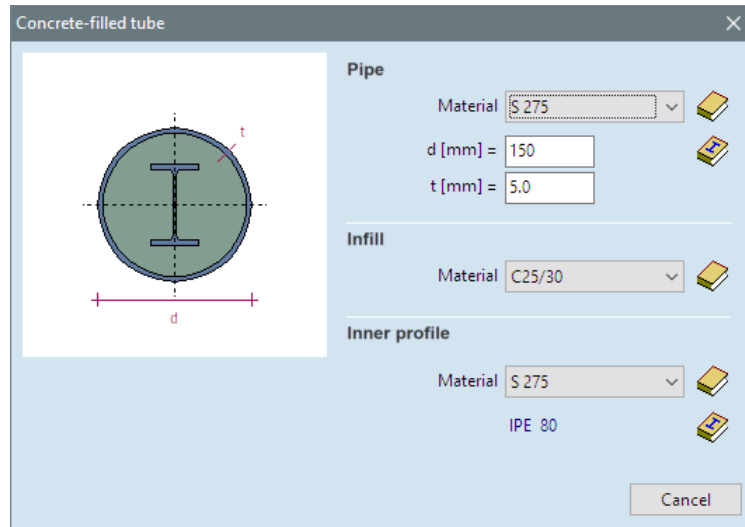
- Cross-section Editor allows editing of thick-walled sections
- Parametric thick walled C, L, T sections



- Composite cross-sections (static analysis in R1, RC column design in R2)

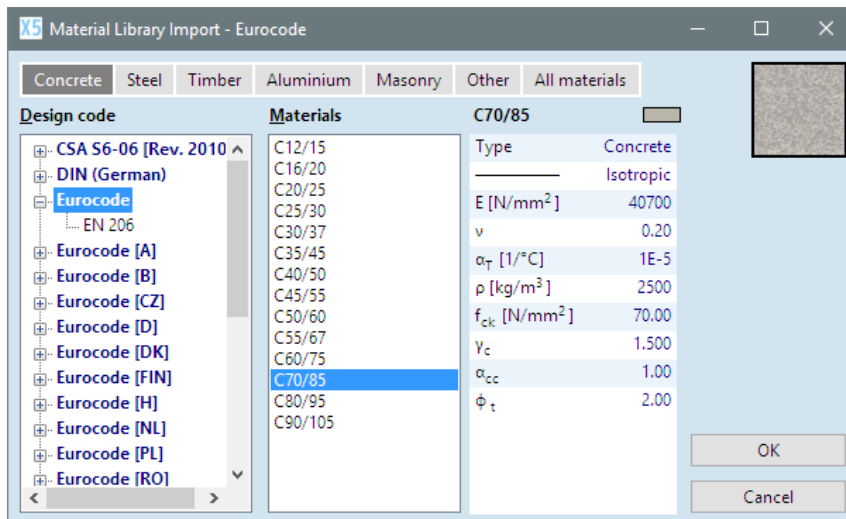


- Concrete-filled tube with an optional inner profile
- Concrete-filled box shape with an optional inner profile
- Circular concrete encased profile
- Rectangular concrete encased profile

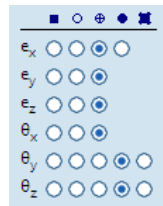


ELEMENTS

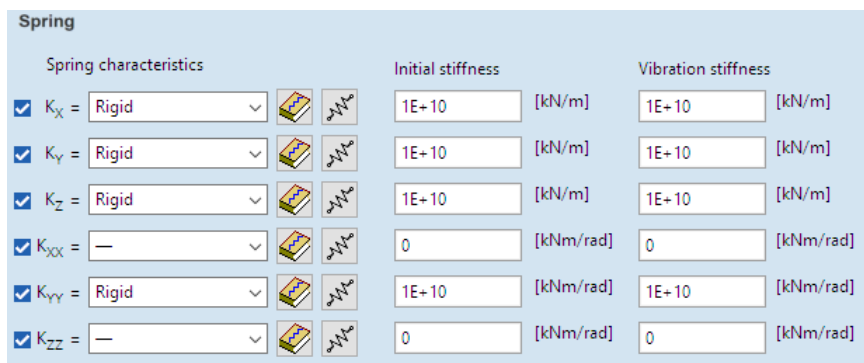
- High-strength concrete grades
- Material Library: material type can be preselected



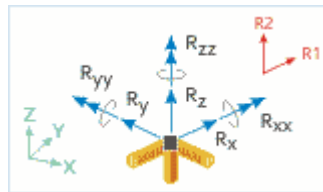
- Stiffness and resistance of beam end releases can be specified in each direction, plastic hinge is available in x direction



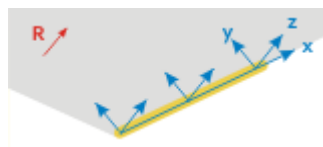
- New type of spring elements with plastic behavior and hysteresis for nonlinear and dynamic analysis
- Nodal supports made of such spring elements / **R2**



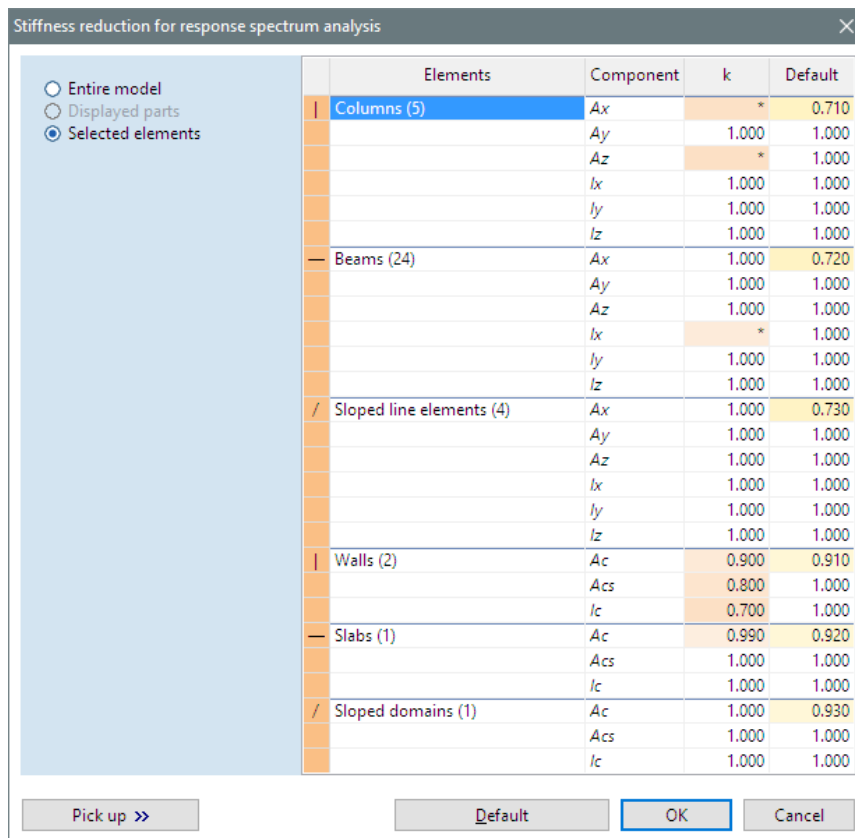
- Dashpot damping elements can be added to nodal supports for dynamic analysis (DYN module) / **R2**
- Nodal support defined in a custom local system / **R2**



- Line support in reference direction / **R2**

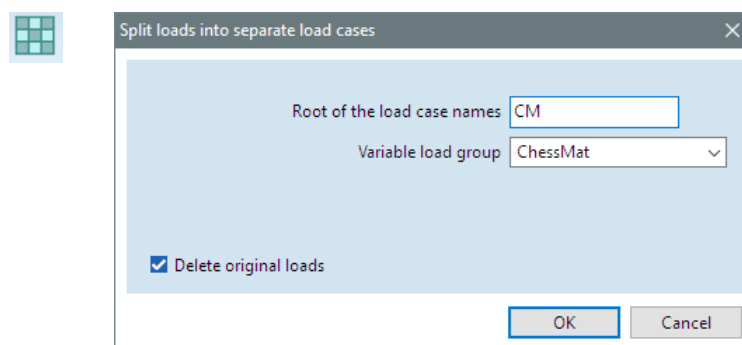


- Enhanced stiffness reduction options for response spectrum analysis / **R2**



LOADS

- Splitting loads into separate load cases. Loads of each selected line element and/or domain are placed into a separate load case. Generated load cases can be gathered in a variable load group.



- Moving selected loads to separate load cases
- SMX..SMZ seismic load cases can also be included in load combinations
- Position of concentrated or distributed loads on beams can be edited in the load table
- Mesh independent dynamic loads on load panels / **R2**
- Fire curve editor to define customized fires / **R2**
- Optional new tendon geometry editor using linear or parabolic segments and arcs / **R2**

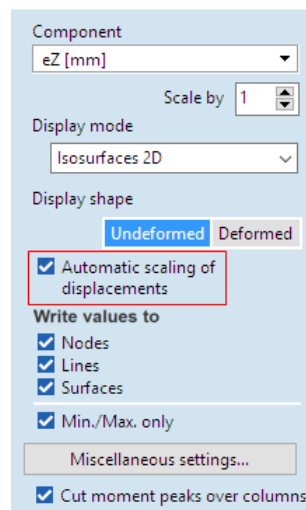
- Tensioning of curved or polyline beams / R2
- Displaying tendons in 3D or in uncoiled view / R2
- Updated response spectra for Eurocode(NL) / R2

ANALYSIS

- Checking erroneously hinged nodes before analysis / R2
- Automatic iteration control for nonlinear analysis to improve convergence. If sudden changes (big translation or rotation increments) are detected the iteration step is temporarily reduced to properly trace the transition. / R2
- Improved plastic and dynamic analysis / R2

RESULTS

- New setting in the *Display parameters* dialog: *Automatic scaling of displacements*. In earlier versions displacements were scaled automatically to make the deformed shape clearly recognizable but only for linear results. Now scaling of displacement result diagrams can be controlled. / R2



- Faster calculation of beam stresses
- Labeling of extremes can be switched on/off within the Drawings Library
- New result component derived from support forces:

$$\alpha = \frac{1}{R_z} \sqrt{R_x^2 + R_y^2}$$

- New surface principal force components: $an1$, $an2$, $am1$, $am2$, $avRz$
- Point of application is calculated for unbalanced loads

- It is easier to compare critical combinations as their numeric identifier can also be displayed

-0.007	<17>	[1.35*0.85*ST1+1.35*0.85*ST2] {1.5*Snow DX-}
0.081	<84>	[ST1+ST2] {1.5*Wd [krov] X+.S.O} (1.5*0.5*Snow DX+)
-1.113	<10>	[1.35*0.85*ST1+1.35*0.85*ST2] {1.5*Snow DX-} (1.5*0.6*Wd [krov] X+-.P.O)
-0.195	<10>	[1.35*0.85*ST1+1.35*0.85*ST2] {1.5*Snow DX-} (1.5*0.6*Wd [krov] X+-.P.O)
-0.078	<99>	[1.35*ST1+1.35*ST2] {1.5*0.5*Snow DX-} (1.5*0.6*Wd [krov] Y+-.P.O)
-0.556	<96>	[1.35*ST1+1.35*ST2] {1.5*0.5*Snow DX-} (1.5*0.6*Wd [krov] Y+-.P.O)
-0.250	<83>	[1.35*0.85*ST1+1.35*0.85*ST2] {1.5*Wd [krov] Y+-.P.O} (1.5*0.5*Snow DY-)
0.094	<86>	[ST1+ST2] {1.5*Wd [krov] Y+-.P.O} (1.5*0.5*Snow DY+)
-0.107	<9>	[1.35*0.85*ST1+1.35*0.85*ST2] {1.5*Wd [krov] Y+-.P.O}
0.249	<10>	[1.35*0.85*ST1+1.35*0.85*ST2] {1.5*Snow DX-} (1.5*0.6*Wd [krov] X+-.P.O)
-1.116	<10>	[1.35*0.85*ST1+1.35*0.85*ST2] {1.5*Snow DX-} (1.5*0.6*Wd [krov] X+-.P.O)
0.253	<10>	[1.35*0.85*ST1+1.35*0.85*ST2] {1.5*Snow DX-} (1.5*0.6*Wd [krov] X+-.P.O)

DESIGN

- Surface reinforcement parameters: Concrete cover can be specified for the secondary (inner) layer of reinforcement as well (**RC1 module**)

Concrete cover

Diameter (mm) Direction

c_T [mm] = 26 \geq 26 $\varnothing = 16$ x y

c_T [mm] = 42 \geq 42 $\varnothing = 16$ x y

c_B [mm] = 42 \geq 42 $\varnothing = 16$ x y

c_B [mm] = 26 \geq 26 $\varnothing = 16$ x y

Apply minimum cover

- Limiting crack width for surface reinforcement calculation can be defined both for the axis of rebars ($w_{k,max}$) and at the extreme concrete fiber ($w_{k2,max}$) (**RC1 module**)

Limiting crack width

In SLS combinations calculate required amount of reinforcement from limiting crack width

$w_{k,max}$ [mm] = 0.30 $w_{k2,max}$ [mm] = 0.5

$w_{k,max}$ [mm] = 0.30 $w_{k2,max}$ [mm] = 0.5

- Division / union of reinforcement domains (**RC1 module**)
- Design of composite columns (**RC2 module**)
- Diameter of side rebars can be defined for reinforced concrete beams (**RC2 module**)

- User-defined actual stirrup spacing for reinforced concrete beams (**RC2 module**)

Stirrup spacing

	x [m]	L [m]	s* [mm]	Util.
1	0	2,000	250.0	0.191
2	2,000	9,000	500.0	0.421
3	11,000	2,000	250.0	0.211
4	13,000	3,500	500.0	0.318
5	16,500	5,500	500.0	0.321

- Punching analysis can be limited to selected domains (**RC3 module**)
- Punching analysis of wall ends (**RC3 module**) / **R2**
- Footing design for seismic action (**RC4 module**)

Seismic analysis

The model partial factor

$\gamma_{Rd} = 1.500 \geq 1$

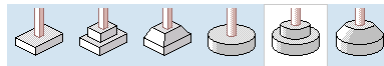
Cohesion type

Cyclic undrained shear strength for cohesionless soils

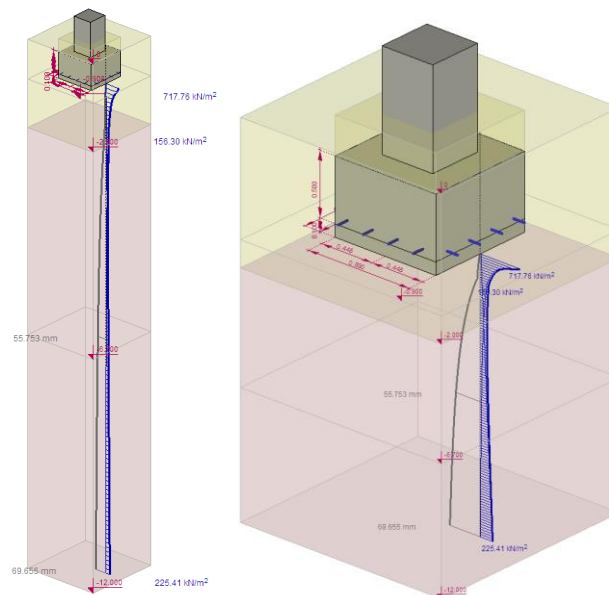
$\tau_{cy,u}$ [kN/m²] =

Coefficient for seismic forces $f_{se} = 1 \geq 0.100$

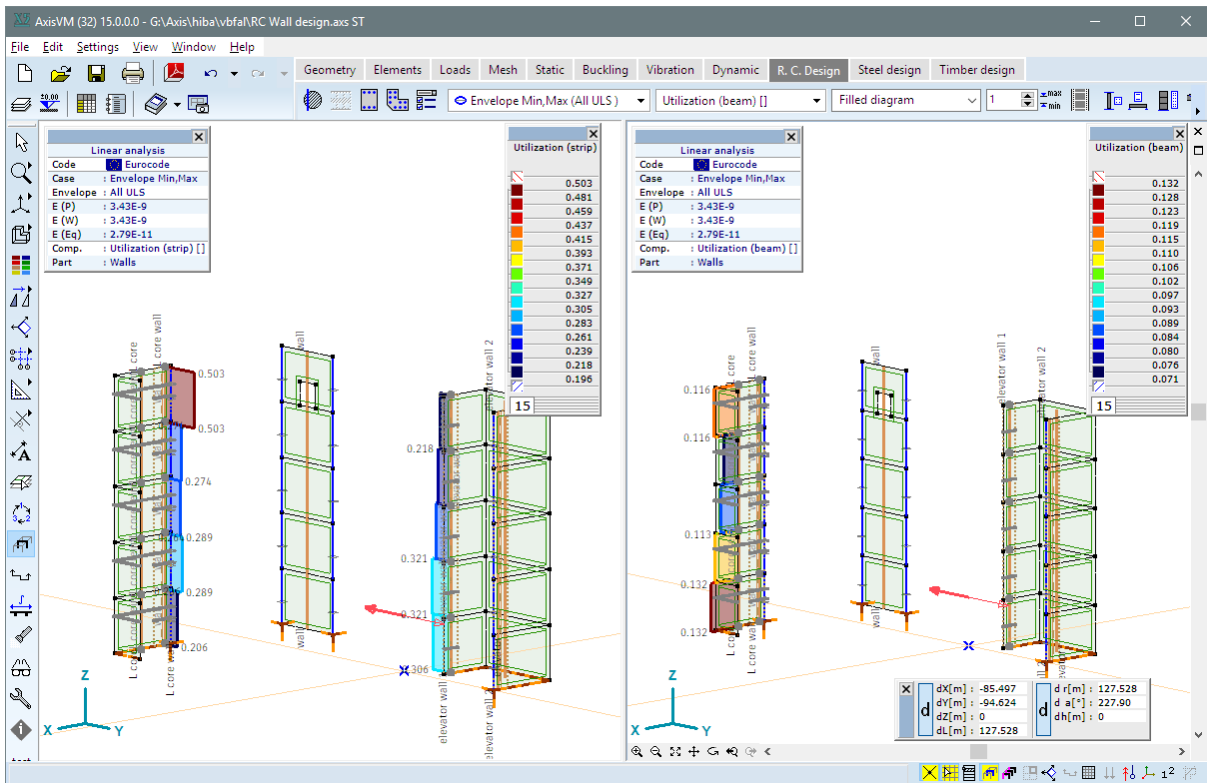
- Circular pad footings (**RC4 module**)



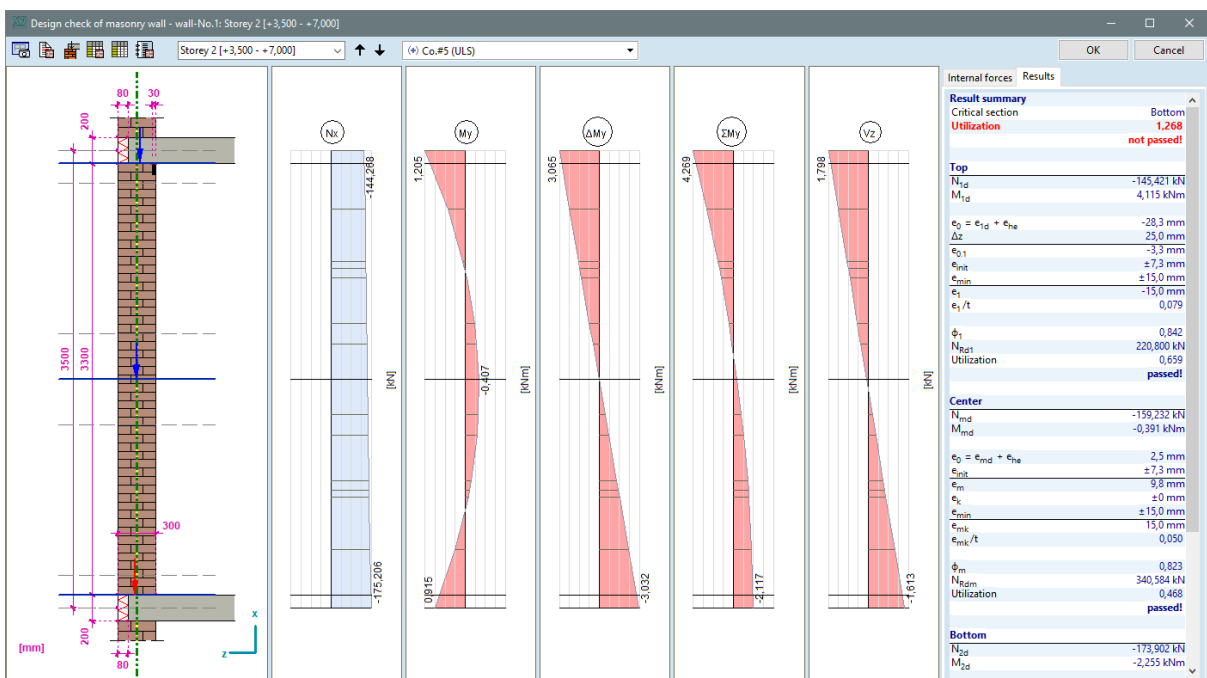
- Different vertical scaling of soil layers under the footing to make the diagram more compact (**RC4 module**) / **R2**



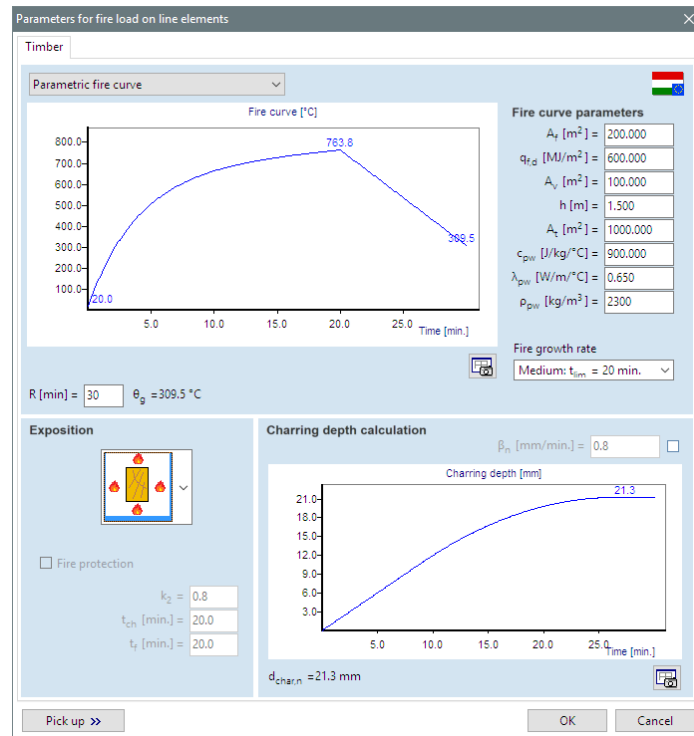
- Design of reinforced concrete walls and core walls (**New module RC5**)



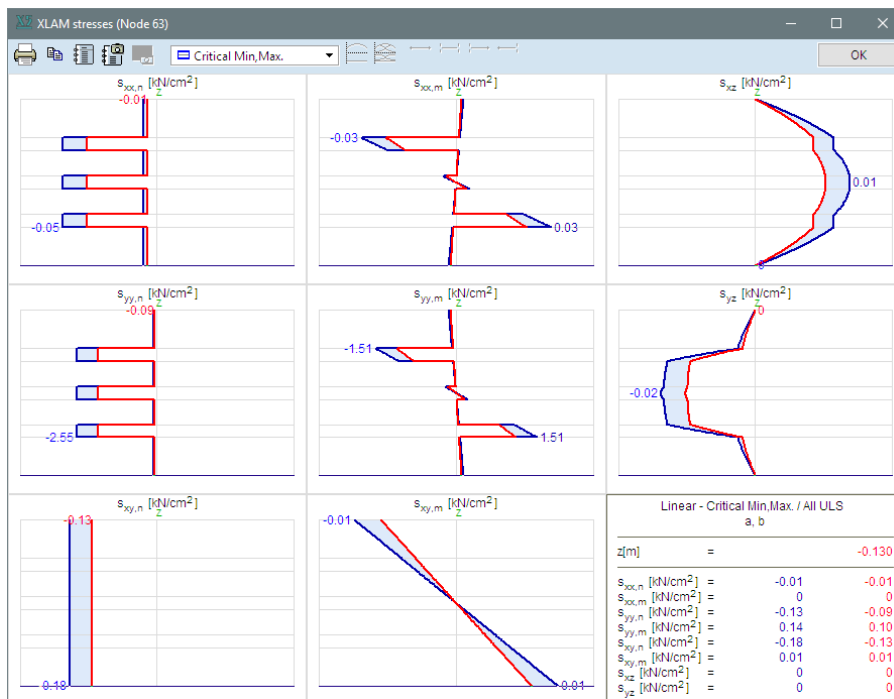
- Display of displacement result components is available also during steel and timber design (**SD1, TD1 module**) / R2
- Steel design module checks Class 4 T sections (**SD1 module**) / R2
- Optional display of symbols for lateral supports of steel design members (**SD1 module**) / R2
- Masonry wall design for vertical loads (**New module MD1**) / R2



- Fire design of timber structures (**New module TD8**)



- Nodal stress diagrams for XLAM panels / R2



In preparation for Release 3

GENERAL

- Displaying loads in rendered view

ELEMENTS

- Trapezoidal steel plates
- General lightweight concrete domains (replacing Cobiax)
- Domains with a Winkler-Pasternak foundation

LOADS

- Tensioning of surface structures
- Multiple seismic load cases

ANALYSIS

- A constant load case can be added to the nonlinear analysis simulating loads that must be present in all increments (like dead load)

RESULTS

- Displaying color coded results in rendered view

REPORTING

- Design calculation report for reinforced concrete beams
- Report template enhancements

May 15, 2019