lateral buckling restraint - attaches - steel check - creep - charges climatiques - dynamic analysis - lateral buckling - brandweerstandsanalyse - timber - 1st order - verstijvers - buisverbinding - diseño de planos de armaduras - pandeo lateral - verbindingen - shear connection - verificación - armatures longitudinales - pórtico - unión base columna - voorontwerp - unión tubular - haunch - connexion moment - cimbras - vérification acier - unity check - Eurocode 2 - mesh - retaining wall - raidisseur - Eurocode 3 - longitudes de pandeo - connections - ACI 138 - acero - 2nd ordre - portal frame - Eurocode 8 - andamios - kip - dwarskrachtverbinding - BS 8110 - dalle de fondation - seismische analyse - armaduras longitudinales - BIM - gelaste verbinding - 2de orde - buckling - funderingszool - poutre sur plusieurs appuis - maillage - malla - uniones - 2D raamwerken - fire resistance analysis - voiles - cracked deformation - gescheurde doorbuiging - longueurs de flambement - pandeo - reinforcement - unity check - cantonera - dynamische analyse - hout - ossatures 3D - koudgevormde profielen - placa de extreme - 1er orden - continuous beam - connexion soudée - momentverbinding - praktische wapening - renforts au déversement - fluencia - estribos - déformation fissurée - EHE - beugels - Eurocódigo 3 - platine de bout - análisis dinámico - column base plate - kruip - rigid link - welded connection - charpente métallique - moment connections - estructuras 2D - kniestuk - assemblage métallique - 3D raamwerken - second ordre - beam grid - cargas climáticas - Eurocode 2 - Eurocode 5 - wall - deformación fisurada - lien rigide - enlace rígido - 2D frames - estructuras 3D - éléments finis - vloerplaat - steel connection - scheurvorming - integrated connection design - armatures pratiques - analyse sismique - nieve y viento - practical reinforcement - charges mobiles - dalle - wapening - perfiles conformados en frío - Eurocode 3 - connexion tubulaire - unión a momento - 3D frames - treillis de poutres - roof truss - practical reinforcement design - portique - kipsteunen - análisis sísmico - Eurocode 8 - seismic analysis - B.A.E.L 91 - uniones atornilladas - bolts - ossatures 2D - eindige elementen - losa de cimentación - restricciones para el pandeo lateral - optimisation - wand - kniklengtes - end plate - dakspanten - kolomvoetverbinding - stirrups - acier - staalcontrole - cálculo de uniones integrado - paroi - dessin du plan de ferraillage - stiffeners - mobiele lasten - Eurocódigo 8 - Eurocódigo 5 - longitudinal reinorcement - doorlopende liggers - rigidizador - beton armé - fluage - CTE - connexion pied de poteau - langswapening - connexions - hormigón - neige et vent - elementos finitos -

Release information

Diamonds 2019

armaduras - cold formed steel - jarret - uittekenen wapening - puente grúa - analyse dynamique - flambement - keerwanden - optimisation - steel - cercha - 2º orden - slab on grade foundation - entramado de vigas - Eurocode 5 - prédimensionnement - multi span beam - bouten - armatures - floor slab - poutre continue - pared - staal - 1er ordre - NEN 6770-6771 - connexion cisaillement - losa - déversement - viga continua - predimensionering - 1ste orde - unión metálica - CM 66 - madera - análisis resistencia al fuego - verbindingen - 2nd order - bois - Eurocode 2 - profilés formés à froid - verificación acero - predesign - unión soldada - fisuración - beton - muro de contención - optimalisatie - foundation pads - fissuration - concrete - AISC-LRFD - HCSS - assemblage métallique - Eurocode 3 - viga con varios apoyos - armaduras prácticas - balkenroosters - unión a cortante - buckling length - boulons - cracking - Eurocode 8 - knik - Eurocode 2 - radier - eindplaat - Eurocódigo 2 - FEM - tornillos - NEN 6720 - moving loads - balk op meerdere steunpunten - cargas móviles - funderingsplaat - étriers - analyse resistance au feu - cercha - globale knikfactor - dynamische analyse - wapening

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1. Work environment

1.1. Language

The Diamonds interface is now also available in Lithuanian, Latvian and Russian.

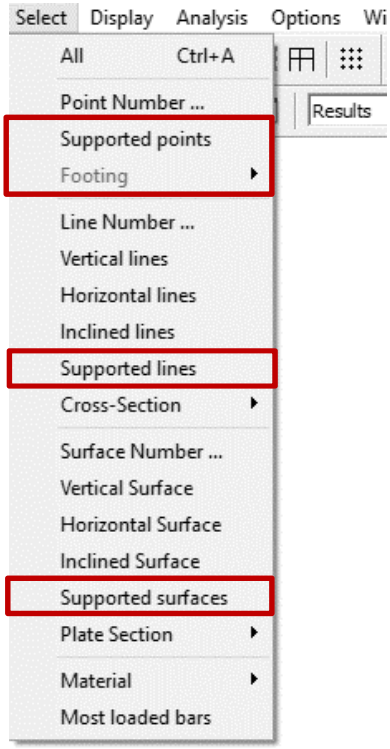
1.2. Material library

Two fire-resistant paints were added to the material library: Euroquimica Paints and Hempel Paints. As the thermal properties of these paints depend on the applied thickness, you cannot consult their thermal properties in the library. The mechanical and advanced properties are not relevant.

Note: the old Euroquimica Paints were removed from the library.

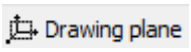
1.3. Selection based on support conditions

Via the menu 'Select' you can select based on support conditions. The selection can be made for points, lines, planes and footings. The selection is independent of which degrees of freedom are or are not retained. From the moment that one degree of freedom is fixed or a spring, it is seen as a support.

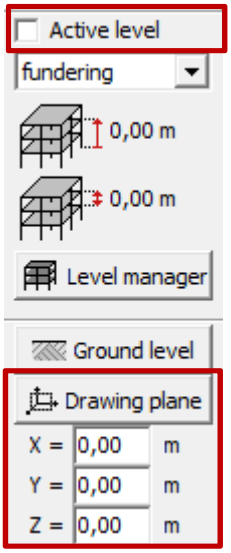


1.4. Turning off the Level Manager

You can disable the level manager by unchecking the 'Active Level'. Disabling the Level Manager has the following consequences:

- If you're selecting using a selection box in a top view, then the selection will continue over all levels and not only on the visible level.
- All changes made in the Level Manager dialogue window (adjustment of the heights, adding levels, …) will not affect the geometry.
- Use the button 

to select the desired drawing plane.

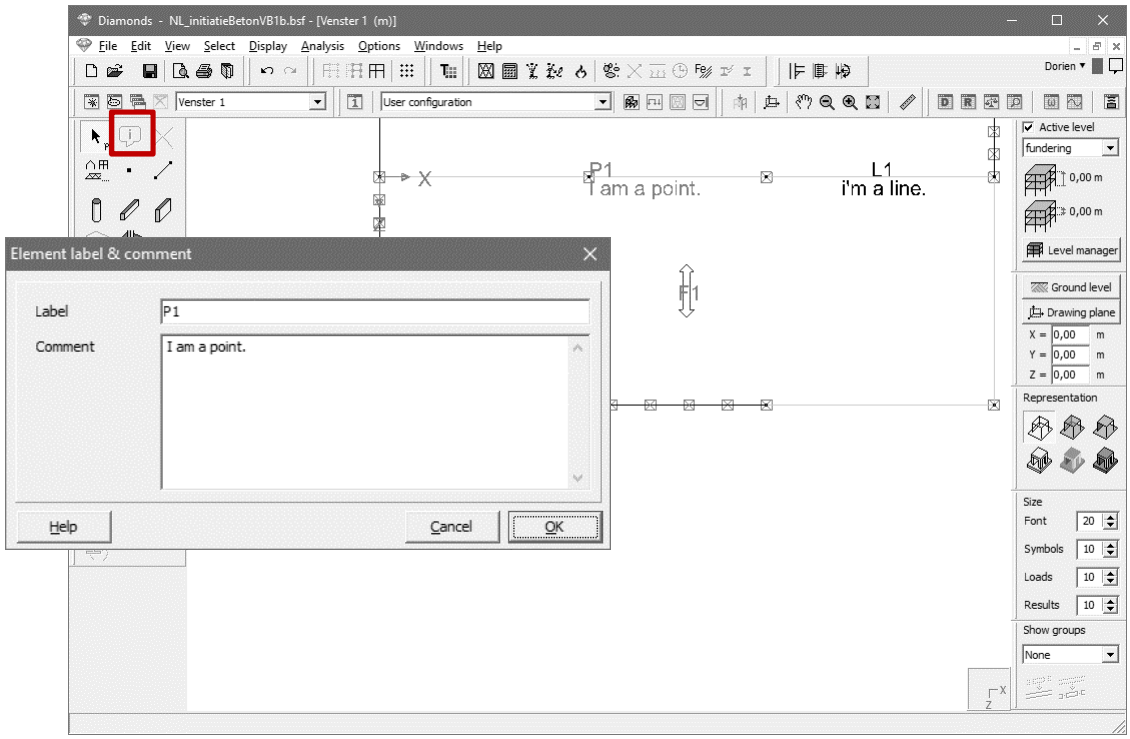


2. Geometry

2.1. New element properties 'Label' and 'Comment'

With the icon you can assign a Label and Comment to points, lines and surfaces.

'Label' can for example be used the assign a personal number to the elements. While 'Comment' can be used to mention points of attention.

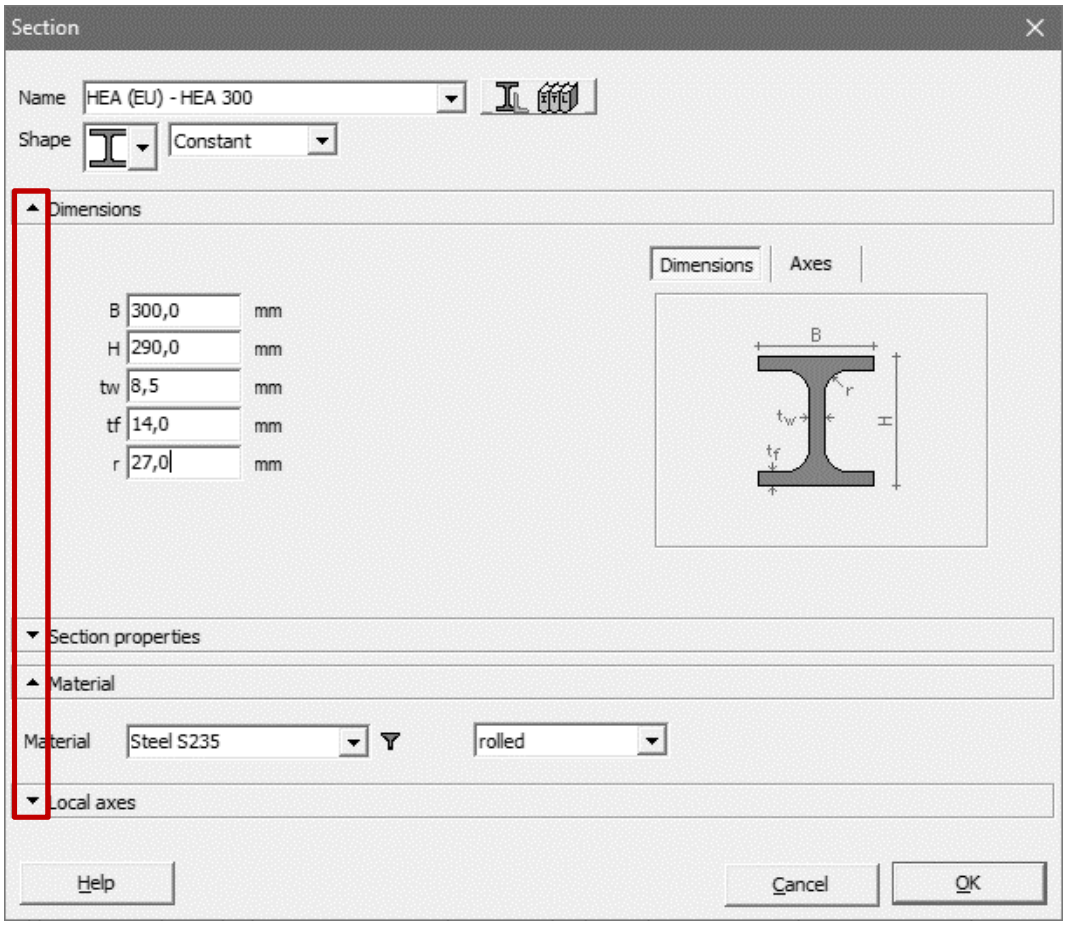


Both ‘Label’ and ‘Comment’ can be visualized on the screen (tab page ‘Geometry’), shown and edited in the Data table and printed using the Report Manager .

2.2. Foldable window Section Dialog

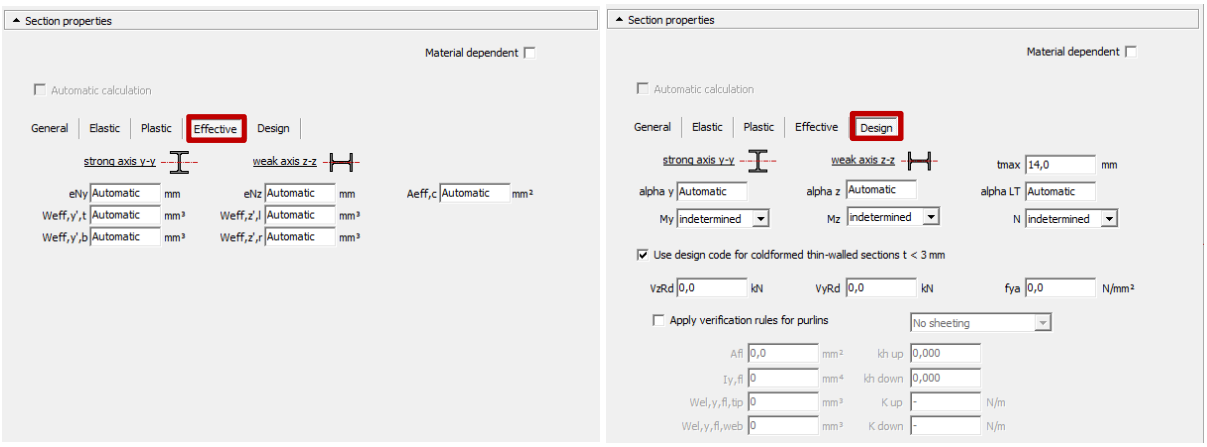
To make the Section Dialog clearer on the one hand, and more fitted on smaller (tablet) screens on the other hand, different parts are now foldable.

Click on the little arrows in front of the categories ‘Dimensions’, ‘Section Properties’, ‘Material’ or ‘Local Axes’ to hide or show the data. The category ‘Section properties’ is closed by default.



2.3. Section Dialog expanded for cold formed sections

The section properties specifically related to the material 'steel' have been split op in two tab pages:



- Tab page 'Effective'
  Containing the following properties: e_{Ny}, e_{Nz}, $W_{eff,y',t}$, $W_{eff,y',b}$, $W_{eff,z',t}$, $W_{eff,z',b}$, $A_{eff,c}$.

  - These properties have the same meaning as in previous versions of Diamonds and are necessary for sections of class 4.
  - Practical:

- The effective properties are calculated automatically during the steel verification for these shapes:

- For Joris Ide, MRP, Brausa and Sadef cross sections, the effective properties are loaded from the library.
- For random cross sections (Section Utility) the user must impose the effective properties with the button 'Imposed sections classes'.
- For all other cross sections, the user must impose the effective properties by replacing 'Automatic' with the correct value. If not, an error message will be shown during the steel verification.

Note: for sections with variable dimensions, the user must impose the effective properties for both the smallest and largest section.

- Tab page 'Design'
  Contains the following properties: α_y, α_z, α_{LT}, t_{max}, section class for M_y, M_z, N.
  These properties have the same meaning as in previous versions of Diamonds.

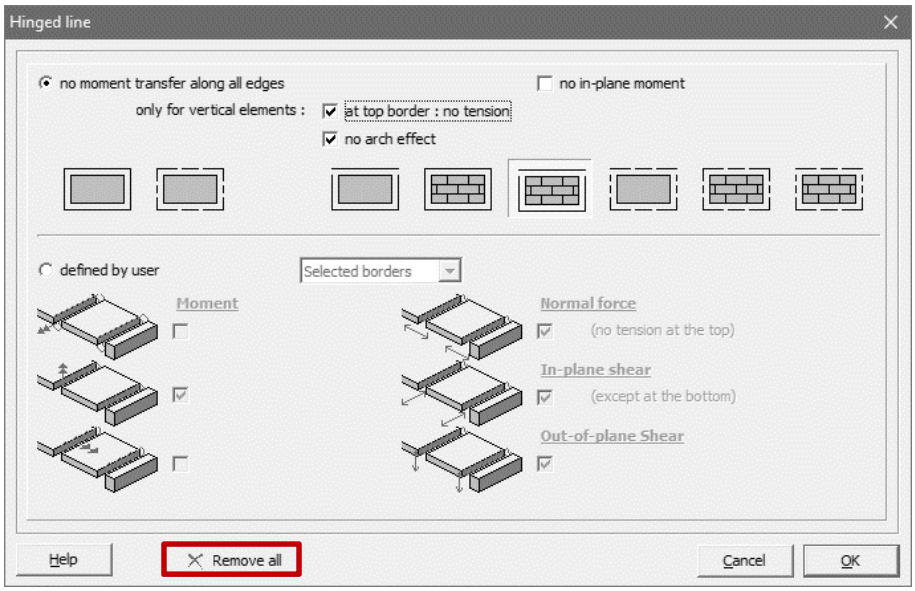
  Eurocode 3 divides the verification of steel cross section in 2 parts:
  - EN 1993-1-1 for sections with a thickness t ≥ 3mm
  - EN 1993-1-3 for cold formed sections with a thickness t <3mm.

  If the option 'Use design code for cold formed thin-walled sections t <3mm' (= apply EN 1993-1-3) is checked, also the following properties are required: $V_{z,Rd}$, $V_{y,Rd}$, f_{ya}. These properties have the same meaning as in previous versions of Diamonds.

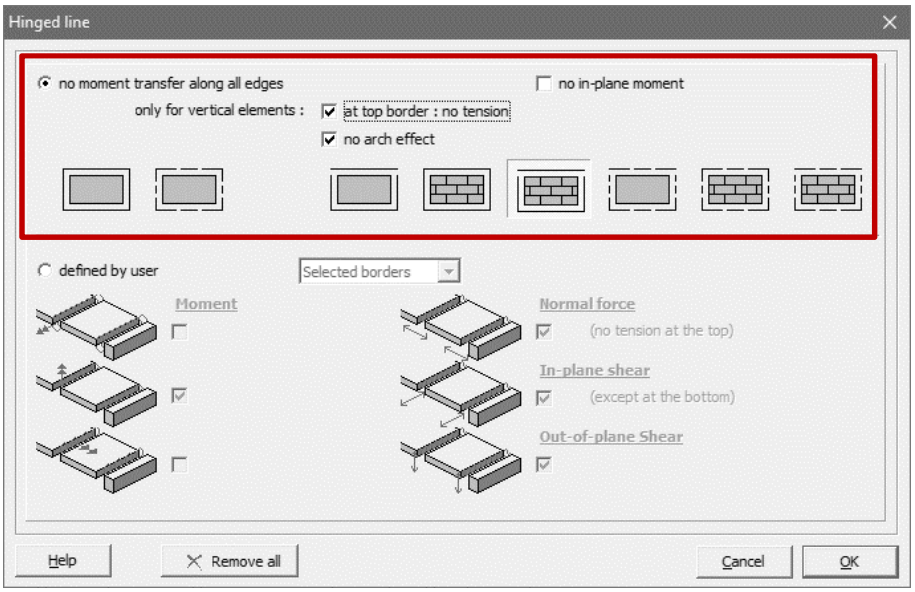
  Finally you can check the option to apply additional rules for the purlins (EN 1993-1-3 §10).

2.4. Boundary contions walls

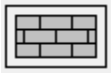
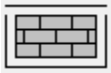
- A button was added to remove all boundary conditions at once.

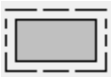
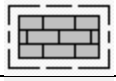
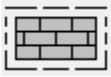


- An option was added to disable the moment transfer in the plane.



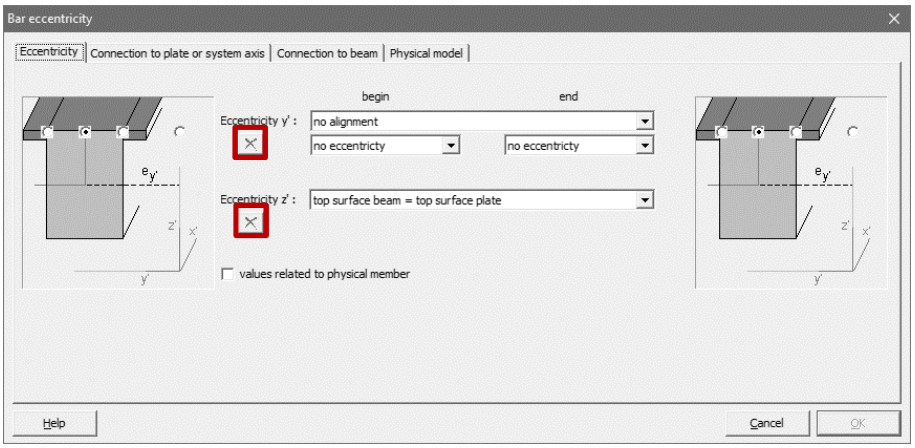
This results in 4 new icons. The icons have the following meaning:

	No moment transfer out of the plane	No moment transfer in the plane	No tension on top border	No arch effect
	☑			
	☑	☑		
	☑		☑	
	☑			☑
	☑		☑	☑

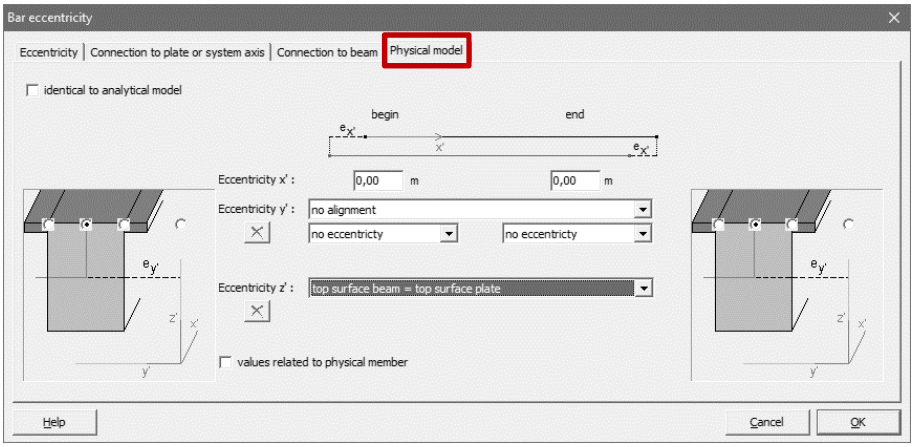
	☑	☑	☑	
	☑	☑		☑
	☑	☑	☑	☑

2.5. Eccentricities

- A button was added to remove all excentricities at once.

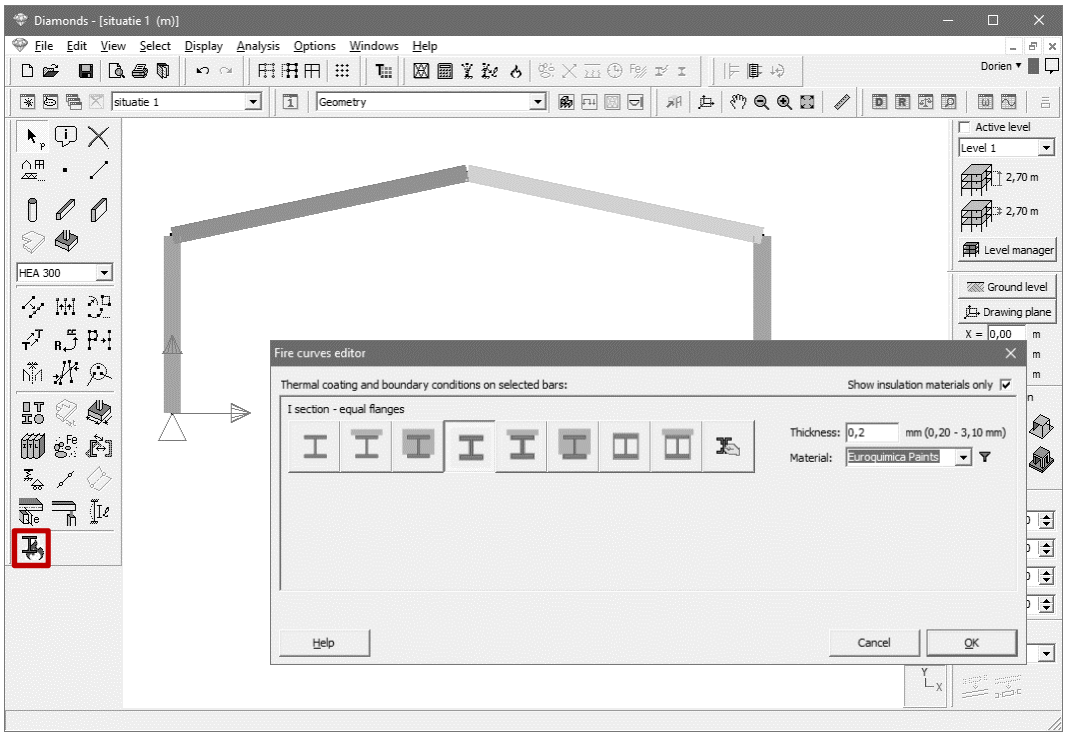


- Diamonds offers the possibility to define physical eccentricities (this is only important for the BIM-link with modelling software such as Tekla Structures).



2.6. Window Fire protection

Select a bar and click on to define the fire protection.



As from Diamonds 2019, the fire curve and fire resistance time is to be defined in the Loads configuration (see §3.2).

2.7. Ground level

As from Diamonds 2019 it is possible to define the position of the ground level

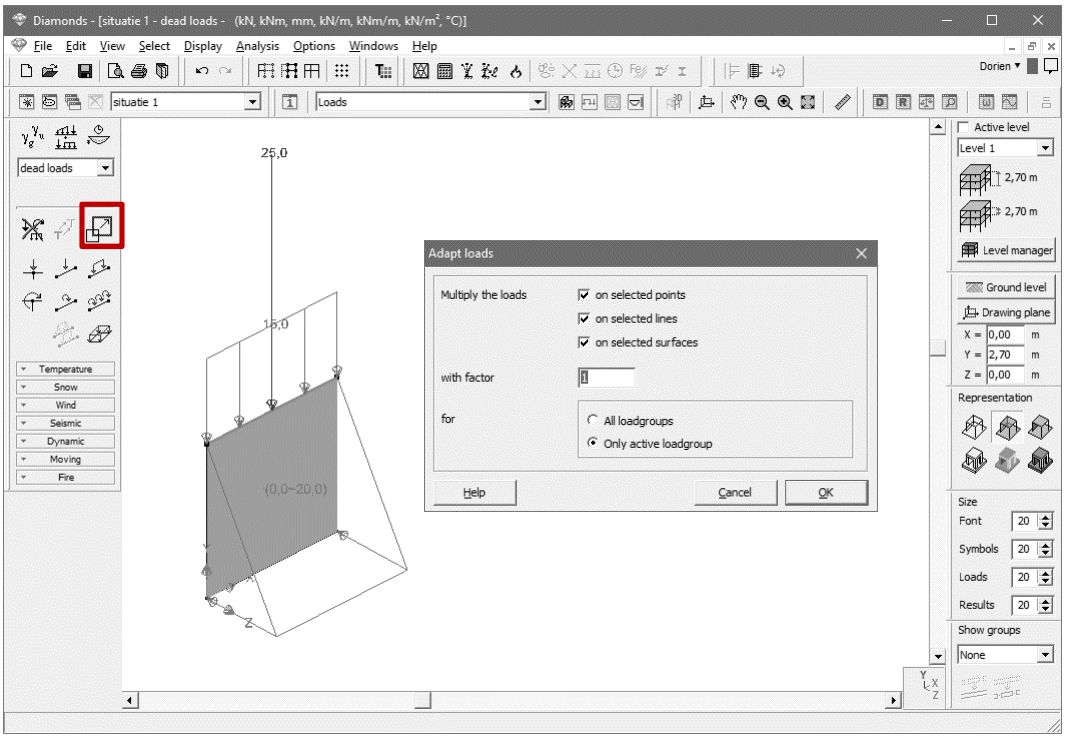
by selecting a point directly on the screen.

3. Loads

3.1. Scale factor

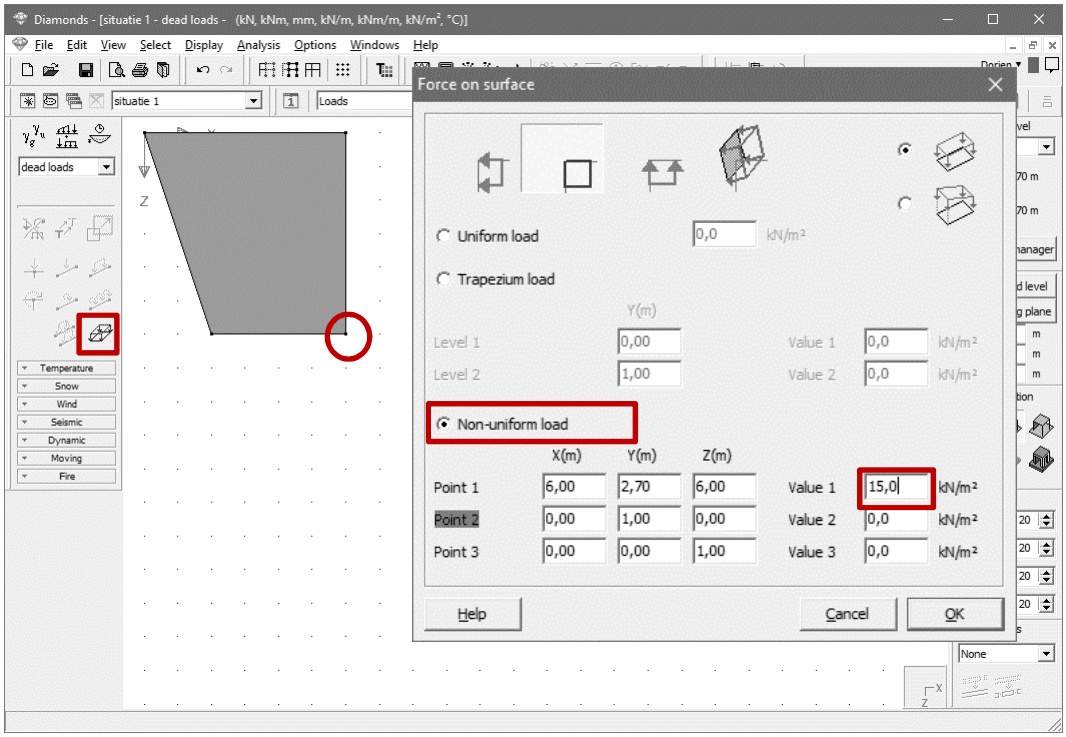
It is possible to multiply the value of loads with a certain factor:

1. Select the elements for which you would like to scale the loads.
2. Click on .
3. Indicate which type of loads (points, line or surface loads) should be scaled.
4. Enter the scale factor.
   The scale factor can have a positive or negative value. With a negative value, the direction of the load is reversed.
5. Indicate if only the loads in the current load group should be scaled or the loads in all load groups.
6. Hit 'OK'.



3.2. Trapezium and non-uniform surface loads

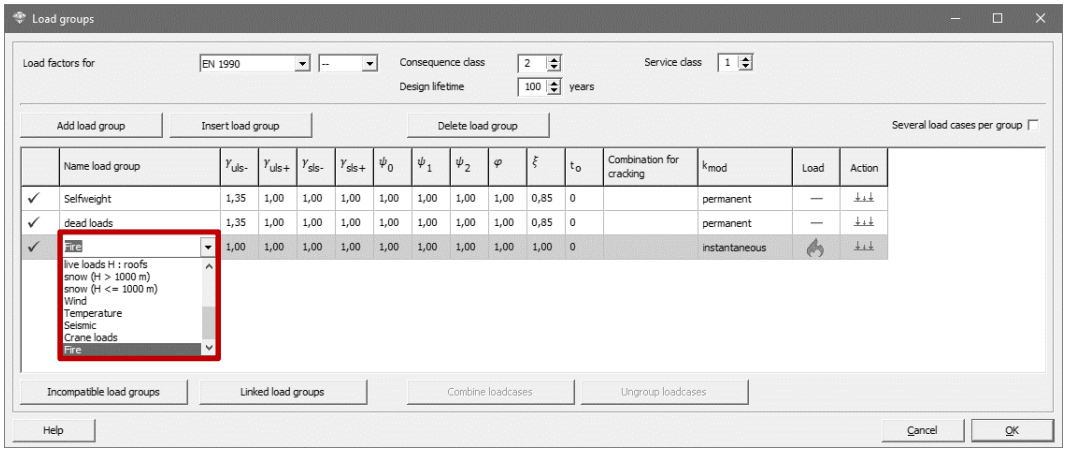
You can now easily define a trapezium or non-uniform surface load by directly indicating the relevant points directly on screen.



3.3. Adjustments for fire

Fire hazards are now to be added in the loads window.

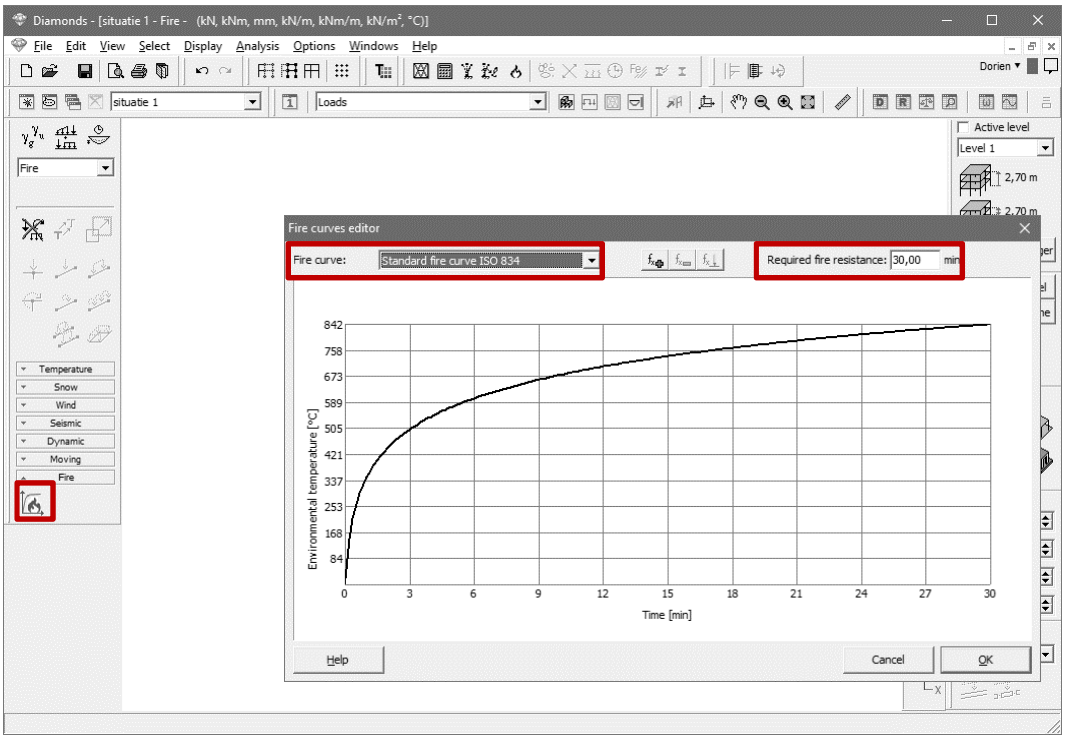
1. Add a load group for fire like this:
   a. Click on .
   b. Then click on .
   c. Choose ‘Fire’ from the list.
   d. Hit ‘OK’.



Notes:

- There can only be one load group ‘Fire’ in a project.
- It is not possible to add multiple sub load cases for the load group ‘Fire’.

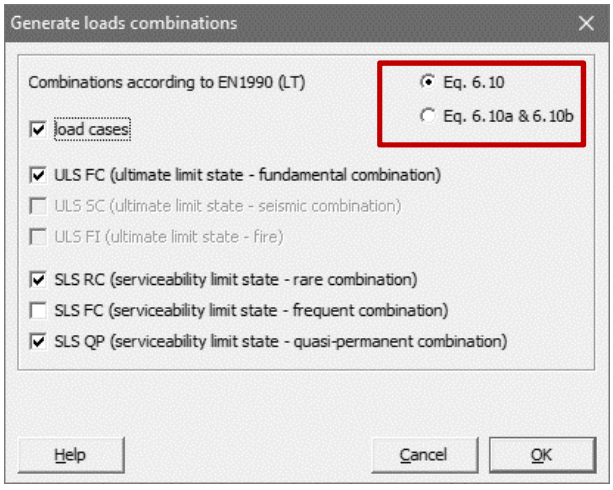
2. Assign a fire curve and fire resistance on one or more bar(s):
   a. Activate the load group ‘Fire’.
   b. Select the relevant bar(s).
   c. Click on .
   d. Choose the desired curve from the list and impose the fire resistance [min] in.



Click on to remove the fire curve from the selected bar(s).

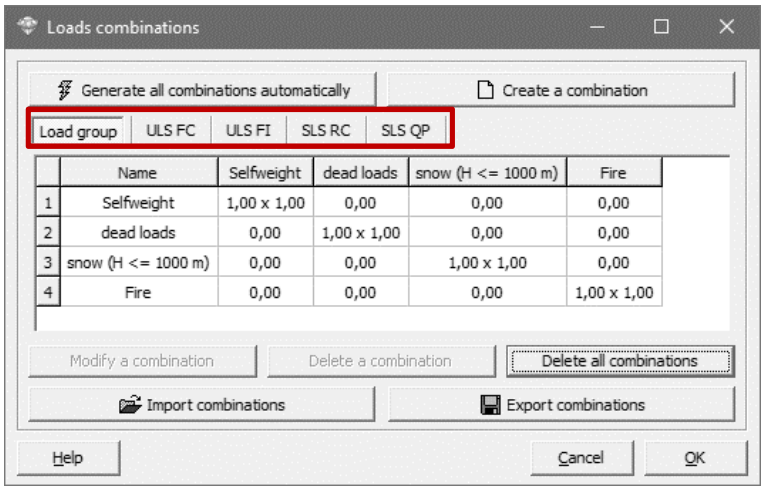
3.4. Choice between equation 6.10 and 6.10a & 6.10b

If the standard allows it, the choice between equations 6.10 and 6.10 a & b is now proposed by using radio buttons.



3.5. Generating the combinations

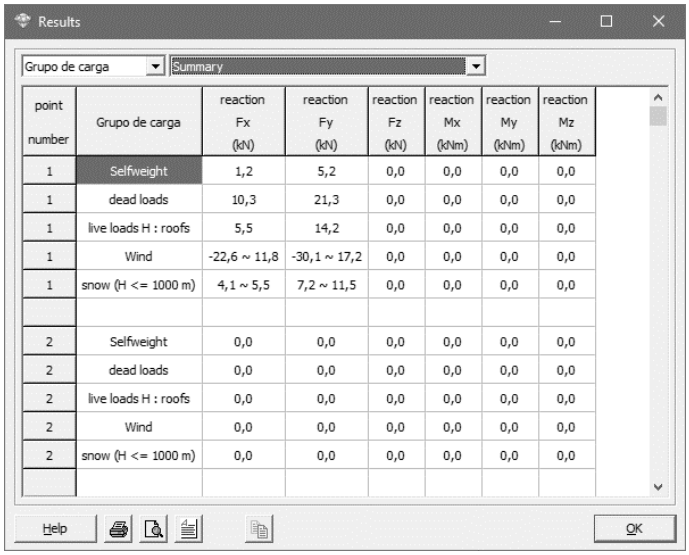
The combinations are now organized in tab pages instead of pull down lists.



4. Calculation and results

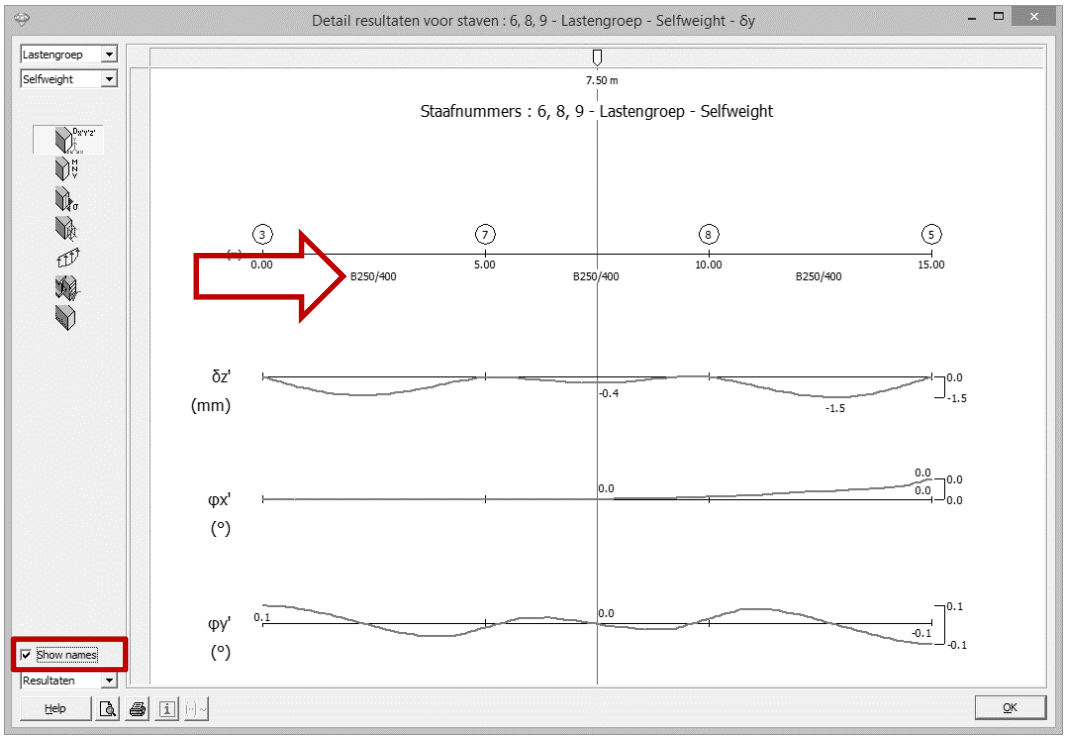
4.1. Summary in the Results table

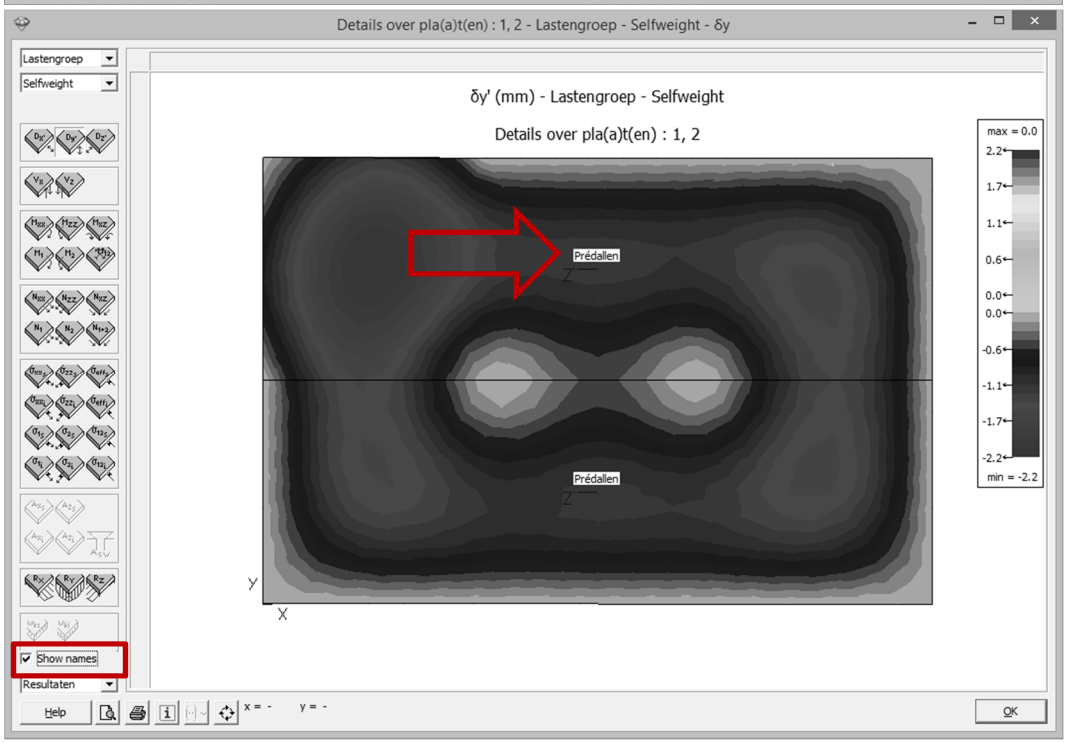
Since Diamonds 2018 r02, you can request a summary table of the results (eg reaction forces for all load groups per point/ per bar). In the past, you should have merged it manually into one table using for example Excel.



4.2. Section name in Detailed Results window

Since Diamonds 2018r02 it is possible to show the section name of bars and surfaces in the Detailed results window . To do so, tick the option 'Show names' in the lower left corner of the screen.

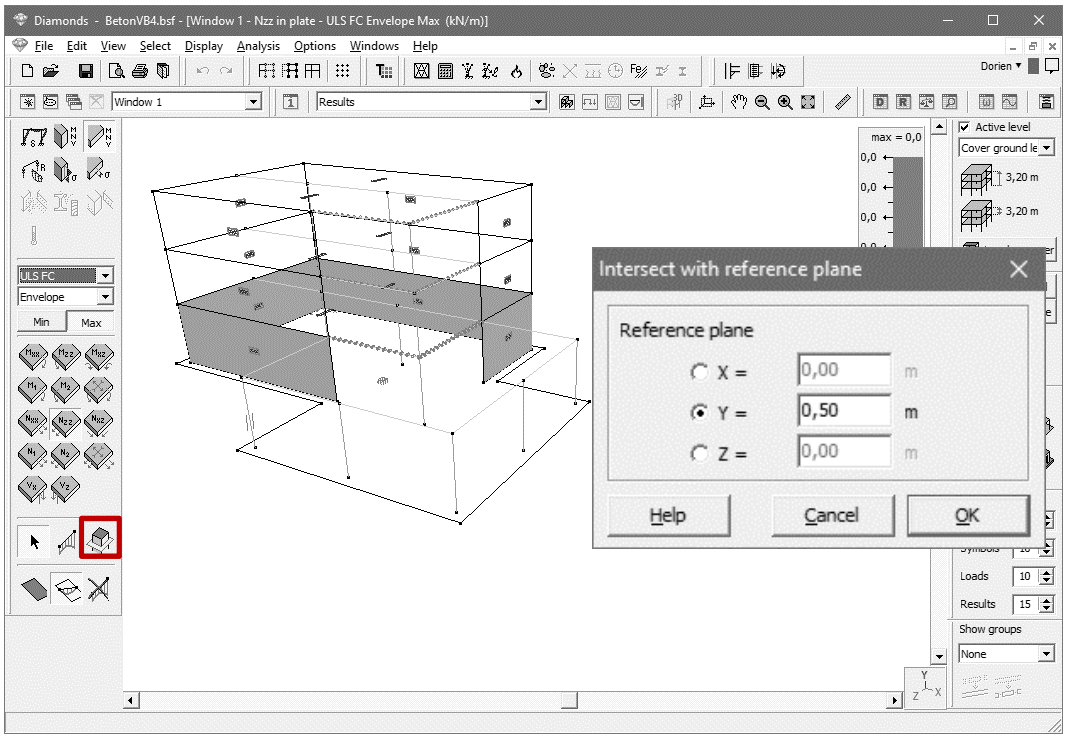




4.3. Generate cut lines using an intersection plane

If you want multiple cut lines in the same plane, you can now generate them all at once:

1. Select the elements in which you'd like a cut line.
2. Click on .
3. Specify the relevant coordinate and hit 'OK'.



5. Design

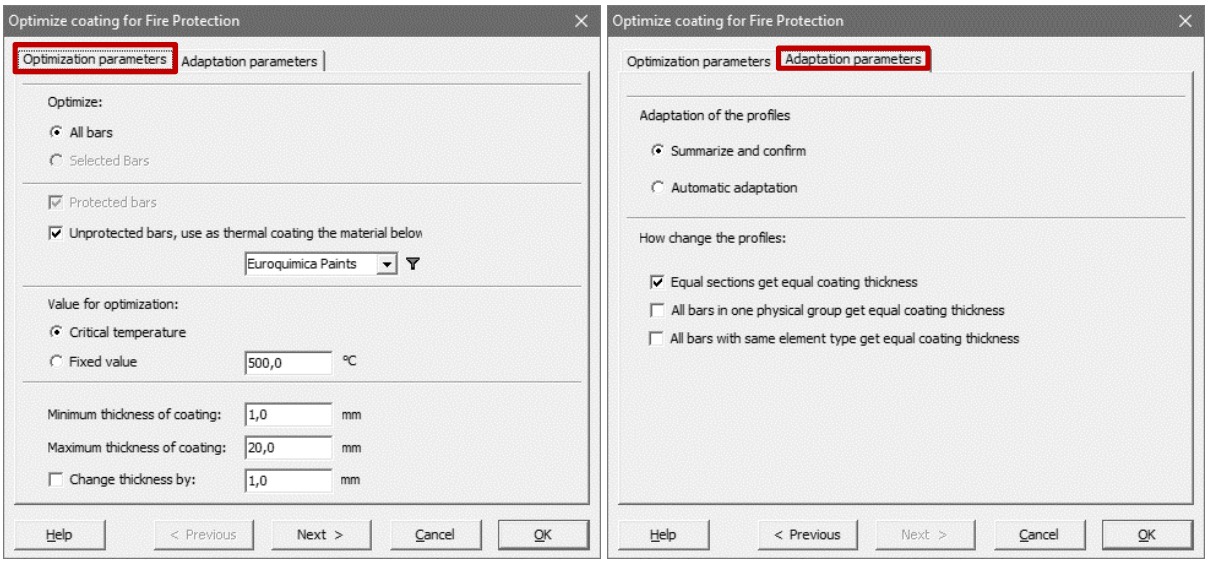
5.1. Timber

The Swiss standard for timber SIA 265 has been implemented.

5.2. Steel verification for bars covered with fire resistant paints

To do a fire resistance analysis based on fire-resistant paints (intumescent paints), proceed as follows:

1. Draw the structure.
2. Apply a fire-resistant paint to the desired bars if necessary .
3. Add a load groups for fire and assign the desired fire curve to the bars (see §3.3).
4. Generate the fire combinations ULS FI .
5. Calculate the thermal response .
6. Do an elastic analysis .
7. Do the steel verification .
8. Optimize the paint thickness for protected and unprotected bars . The content of two tab pages is discussed in the next paragraphs.



5.2.1. Optimization parameters

- Optimize all bars or only the selected bars.
- The optimization will default run on the protected bars.
  Select if you also want to apply a thermal coating on the unprotected bars. In that case, selected the relevant thermal coating (= thermal paint from Euroquimica or Hempel, gypsum boards, …)
- Indicate if the thickness of the thermal coating should be optimized to the critical temperature or a user defined value (specify the value).
  The critical temperature is the temperature at which the steel verification reaches 100% for a unprotected bar.
- Indicate the minimum thickness of the thermal coating.
  The minimum thickness for Euroquimica and Hempel paints is 0,2mm. This is the minimum thickness that can be sprayed in practice. Below this thickness extrapolation will be used.
- Indicate the maximum thickness of the thermal coating.
  The maximum thickness for Euroquimica is 3,1mm and 5,4 mm for Hempel paints. Above this thickness extrapolation will be used.
- Set the step to increase the coating thickness by a certain step.

5.2.2. Adaptation parameters

- Choose if Diamonds should adapt the profiles automatically after the optimization or show a summary in which you can select the profiles that should be adapted.
- Specify the rules for adapting the sections.

5.3. Module to define the practical reinforcement in detail

After calculating the reinforcement, you can define the practical reinforcement in detail by selecting one or more plates in the same plane and clicking on .
Note: you need a separate license for this module! This module is not available in a demo version.

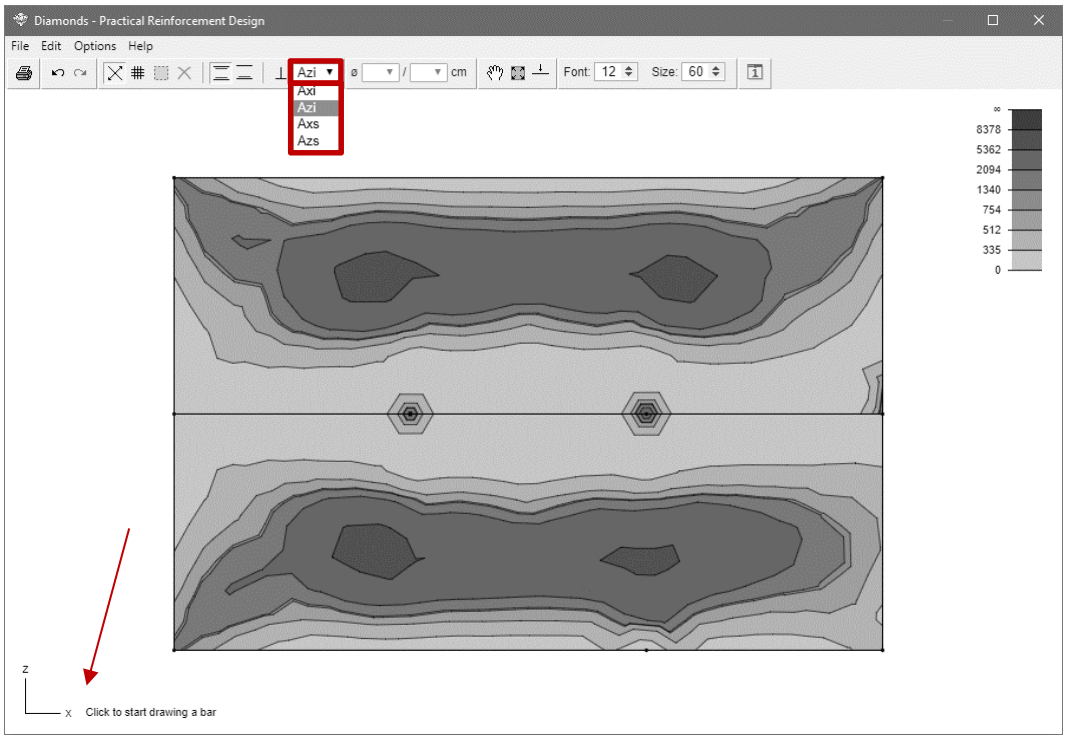
To return to Diamonds, press or use the shortcut CTRL + W. The changes are saved automatically.

5.3.1. Adding a reinforcement zone

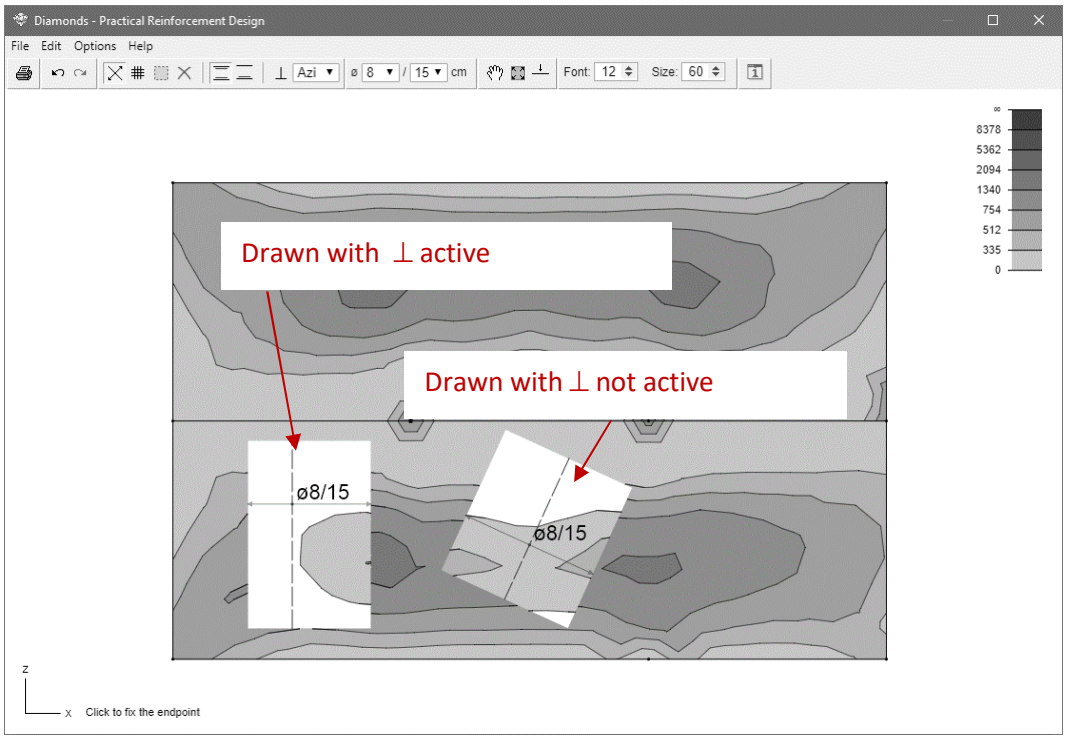
5.3.1.1. Zone with practical reinforcement bars

1. Choose which practical reinforcement you want to draw Axi.
   - The 'x' and 'z' refer the the coordinate system on the left bottom, NOT to the LOCAL COORDINATE SYSTEM OF THE PLATES!
   - The 'i' is the lower (inferior) and 's' the upper (superior) reinforcement.

   In the image below, the displayed layers is the one of the lower reinforcement (Azi) parallel with the z-axis.



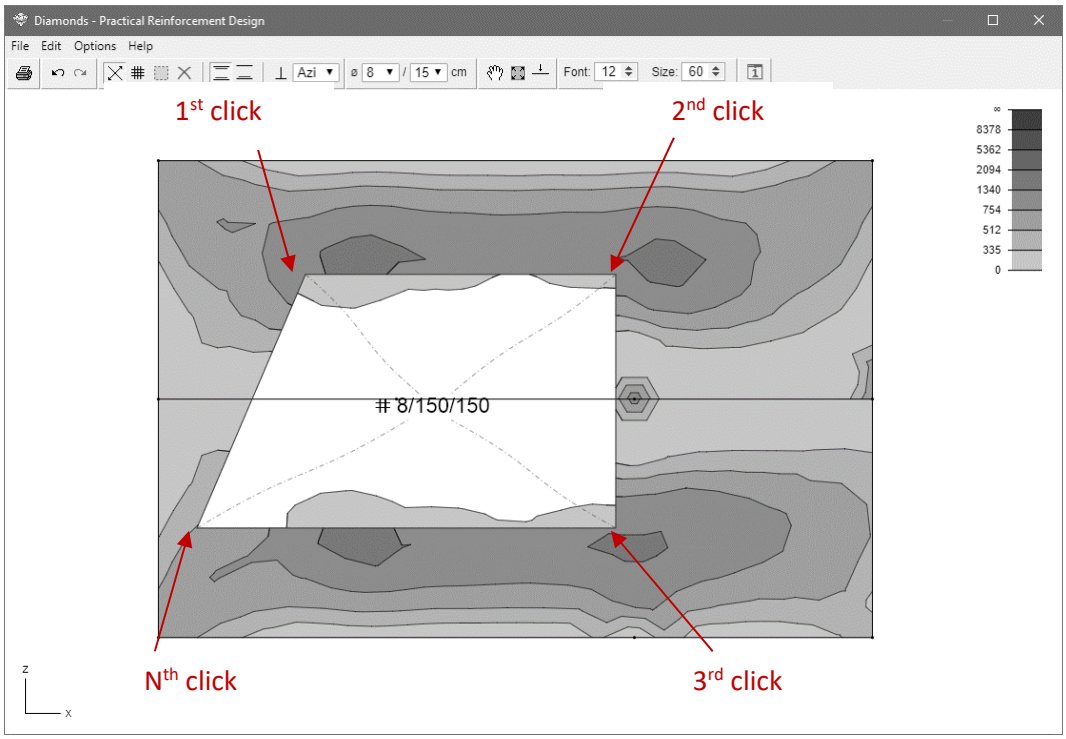
2. Click on to activate the orthogonal mode.
   - When is active (or SHIFT is pressed), you can only draw reinforcement zones parallel the to x- and z-axis.
   - When is not active, you can also draw inclined reinforcement zones.



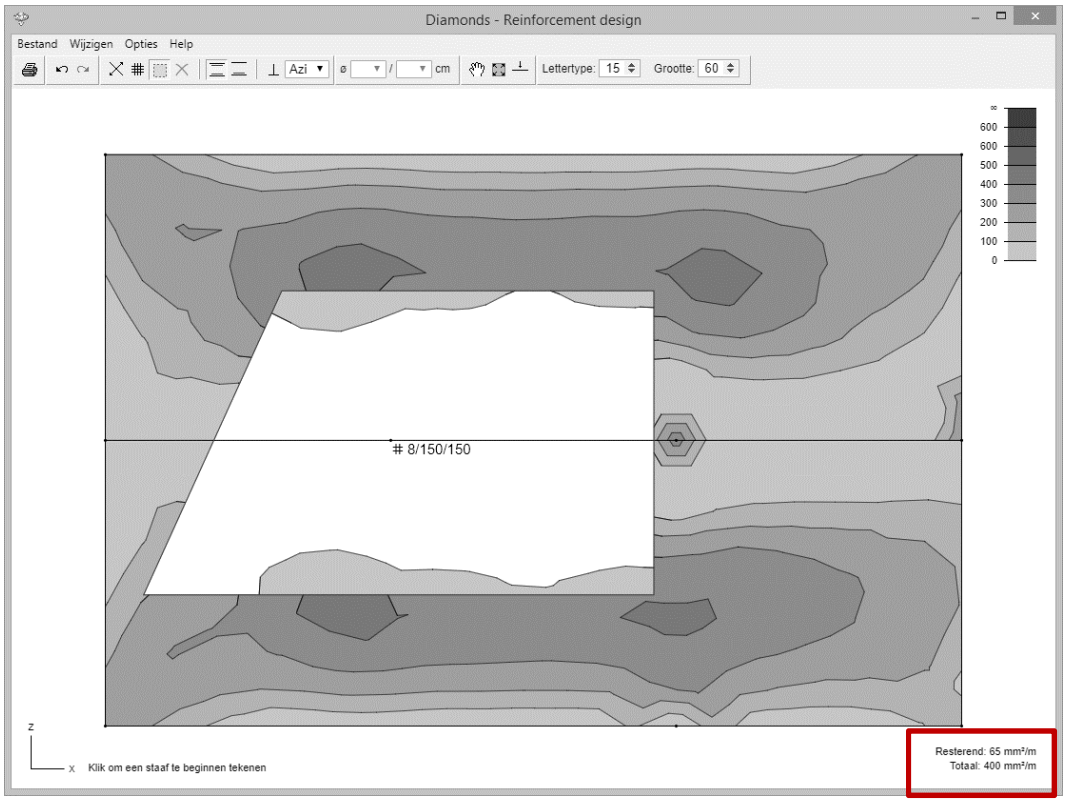
3. Click on ⤫ to draw a zone with practical reinforcement bars.
   - Draw a line parallel to the z-axis (because Azi was selected).
     This defines the direction and the length of the reinforcement bars.
   - Draw a line parallel to the x-axis.
     This defines the width of the reinforcement zone.
   - Use the ↑ and ↓ keys on the keyboard to adjust the diameter.
     Use the ← and → keys on the keyboard to adjust the spacing.
     You can also specify the desired diameter and spacing via ø 8 / 15 cm or with the right mouse button.
   - Click one last time to position the name of the reinforcement zone.
   - The zones where the applied practical reinforcement is more than the theoretically calculated reinforcement are coloured white and considered satisfactory.
     The required additional reinforcement is shown in all other zones.

5.3.1.2. Zone with practical reinforcement nets

- Choose which practical reinforcement you want to draw Axi.
  - The 'x' and 'z' refer the the coordinate system on the left bottom, NOT to the LOCAL COORDINATE SYSTEM OF THE PLATES!
  - The 'i' is the lower (inferior) and 's' the upper (superior) reinforcement.
- Click on # to draw a zone with practical reinforcement nets.
  - Click multiple times on the screen to define a polygon. End the drawing function with ENTER.
    The reinforcement zone does not have to be in the plate or neatly match the plate edges.
    The circumference may be drawn roughly drawn around it.
    This defines the dimensions of the reinforcement zone.



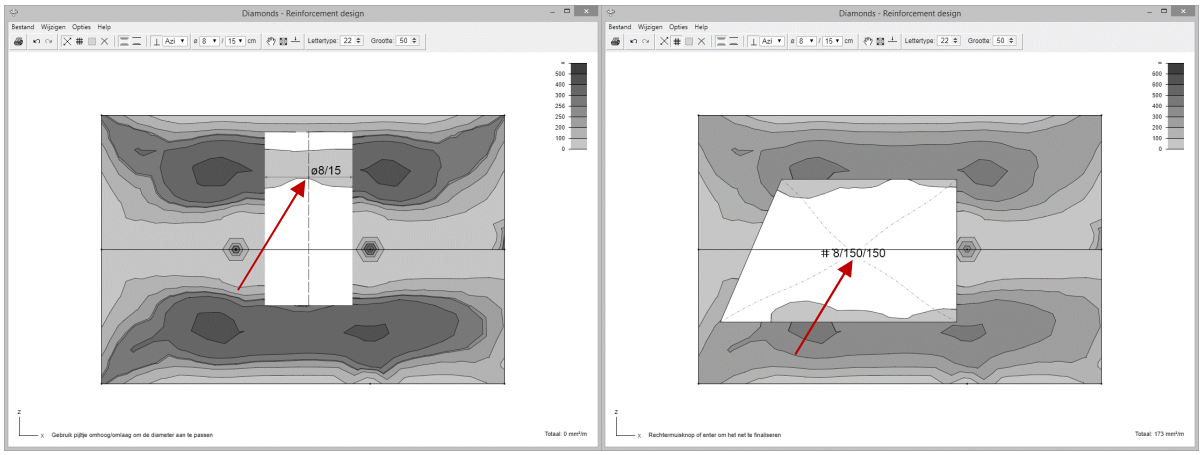
- Use the ↑ and ↓ keys on the keyboard to adjust the diameter.
  Use the ← and → keys on the keyboard to adjust the spacing.
  You can also specify the desired diameter and spacing via ø 8 / 15 cm or with the right mouse button.
- The zones where the applied practical reinforcement is more than the theoretically calculated reinforcement are coloured white and considered satisfactory.
  The required additional reinforcement is shown in all other zones. Move the mouse over the drawing to see at the bottom right how much additional reinforcement is still needed. Next to 'Total' you can see the total calculated theoretical reinforcement.



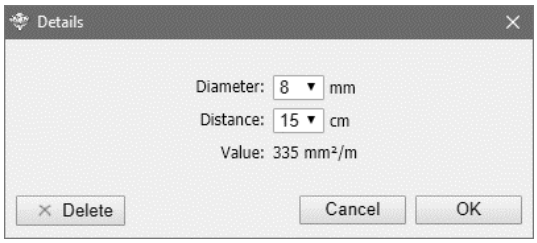
5.3.2. Adjust a reinforcement zone

5.3.2.1. Adjust diameter/ spacing in a reinforcement zone

- Activate the selection mode .
- Click on the name (in case of reinforcements nets and bars) or in the intersection point of the arrows (in case of reinforcement bars). The selected reinforcement zone will light up.



- Use the ↑ and ↓ keys on the keyboard to adjust the diameter.
  Use the ← and → keys on the keyboard to adjust the spacing.
  You can also specify the desired diameter and spacing via ø 8 / 15 cm.
  You can also double click the zone and adjust the diameter/ spacing in the window that pops up.

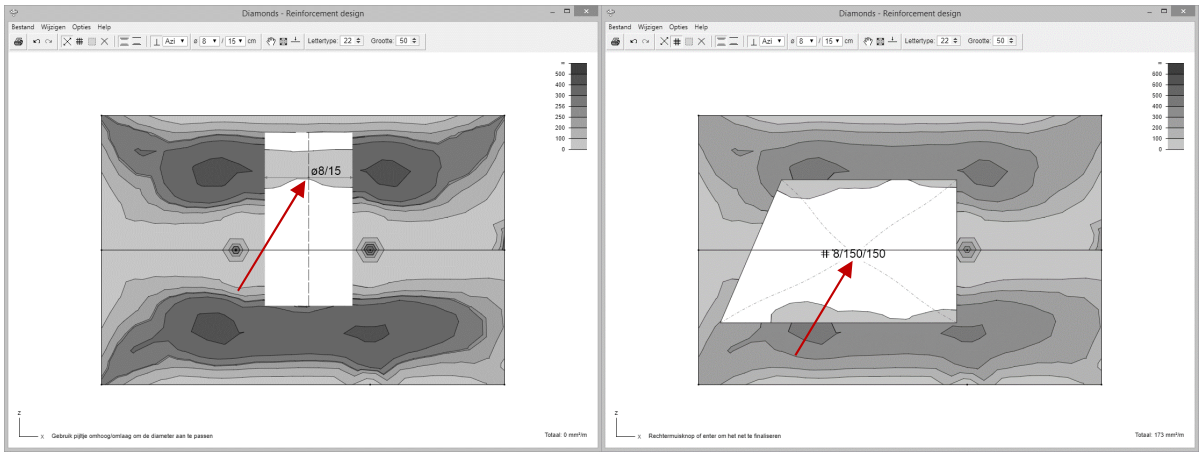


5.3.2.2. Adjust length/ width of a reinforcement zone

- Activate the selection mode .
- Move the mouse to the edge of the reinforcement zone. The pointer will change to a double arrow ↔.
- Now you can push or pull on the relevant edge to adjust the length / width.

5.3.2.3. Adjust the position of a reinforcement zone

- Activate the selection mode .
- Click on the name (in case of reinforcements nets and bars) or in the intersection point of the arrows (in case of reinforcement bars). The selected reinforcement zone will light up.



- Drag the reinforcement zone to the desired location.

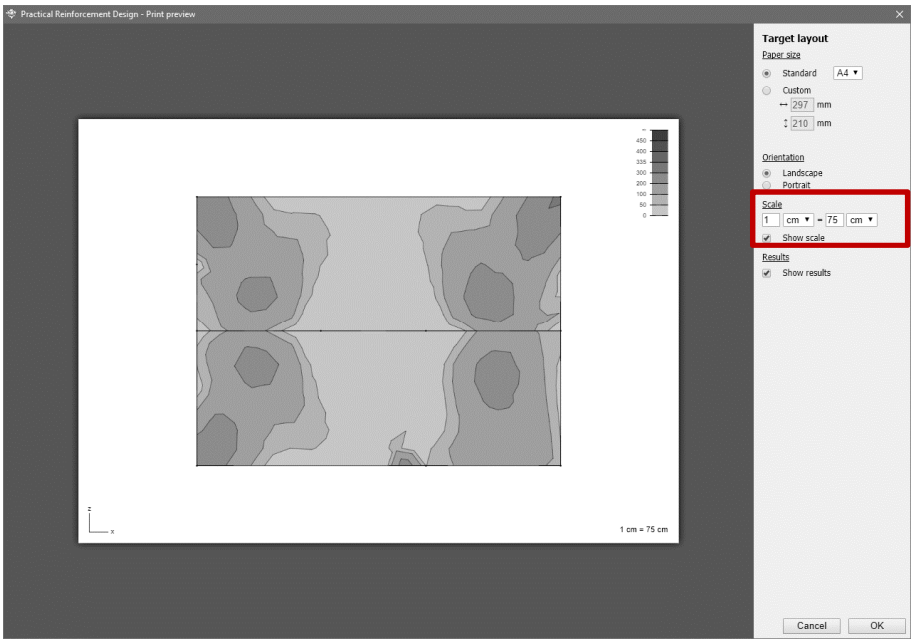
5.3.3. Remove a reinforcement zone

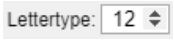
- Activate the selection mode .
- Click on the name (in case of reinforcements nets and bars) or in the intersection point of the arrows (in case of reinforcement bars). The selected reinforcement zone will light up.
- Click on or hit DEL.

5.3.4. Other functions

You will also find the following buttons:

- print
  The print is a vectorial image where you can set the scale yourself.



- Undo/redo
- Show upper and lower reinforcement / show only the active layer top or bottom reinforcement
- Pan
- Show everything as large as possible on the screen
- Reverse the viewing direction
- 

  Adjusts the font size
-

  Zooms in or out
- Opens the preferences
- Show the weight of the applied practical reinforcement

5.3.4.1. Overview shortcuts

- F1 Open Help-function
- F11 Open Preferences
- F12 Show everything as large as possible on the screen

- CTRL + D Export to DXF
- CTRL + E Export to PDF
- CTRL + P Print
- CTRL + W Close Practical reinforcement module. The changes are saved automatically.

- CTRL + Y Redo
- CTRL + Z Undo

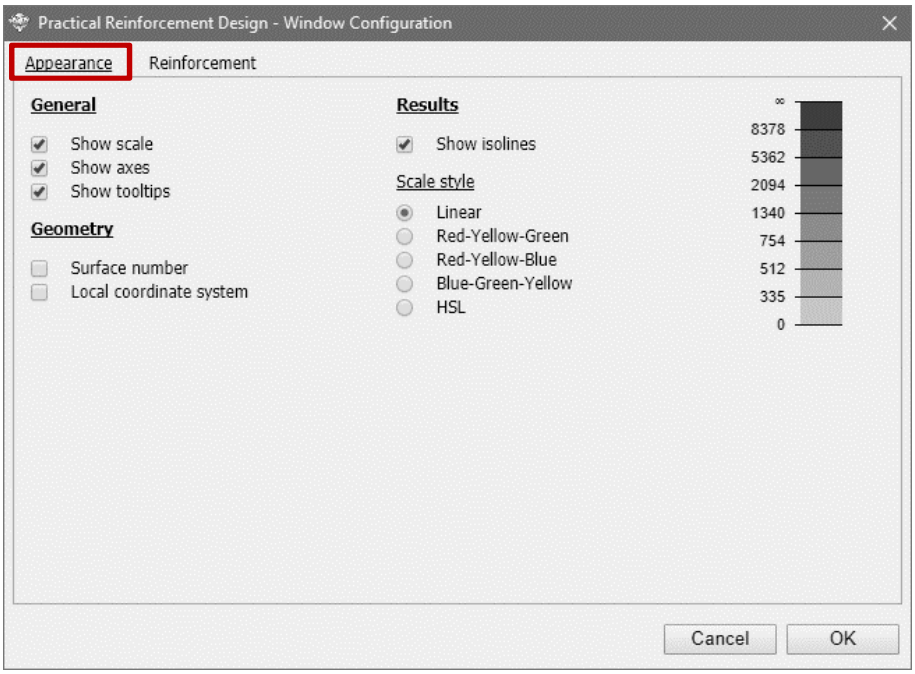
- DEL Remove selection
- ESC Quit function
- SHIFT Activate orthogonal mode
- Arrows ↑↓ Switch between the different diameters
- Arrows ←→ Switch between the different spacing

- Letter ‘b’ Draw a zone with reinforcement bars
- Letter ‘n’ Draw a zone with reinforcement nets
- Letter ‘x’ Set the active layer to the reinforcement in the x-direction
- Letter ‘z’ Set the active layer to the reinforcement in the z-direction
- Letter ‘i’ Set the active layer to the lower reinforcement
- Letter ‘s’ Set the active layer to the upper reinforcement
- Double click Adjust the diameter and spacing in the reinforcement zone

5.3.5. Preferences

The preferences for this module can be found with ‘Options > Window Configuration (F11)’.

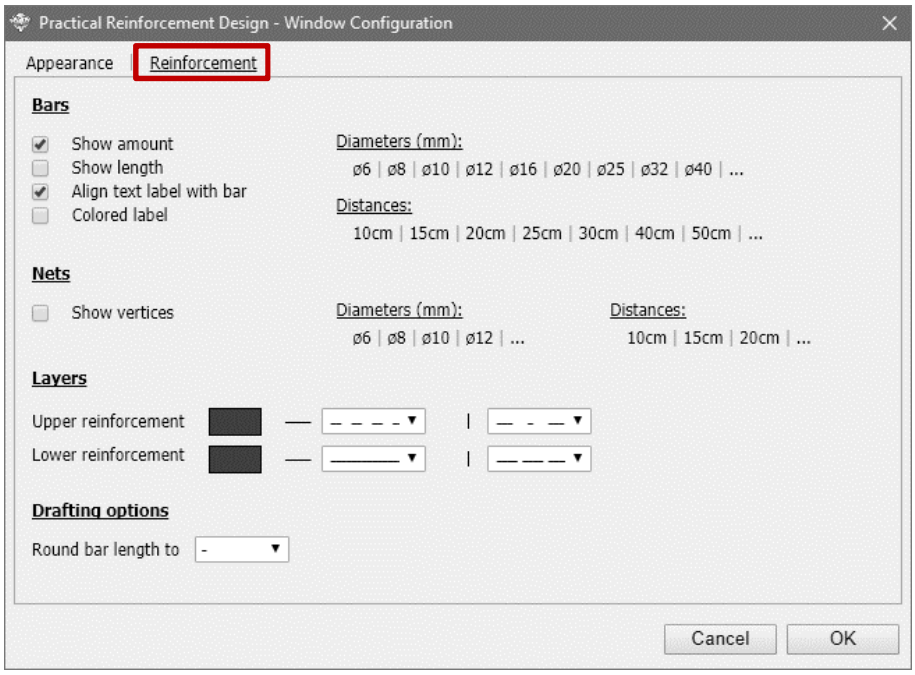
5.3.5.1. Tab page ‘Appearance’



- General
  Select here if the scale, the axes and the tool-tips next the buttons should be shown.
- Geometry
  Select here if the plate numbers and the local coordinate system of the plates should be shown.

- Results
  - Select here if the isolines should be shown
  - Choose the colour gradient of the scale.
  - The values in the scale can be adjusted by clicking on them and entering the desired value. The scale recognizes the command 'bars ∅8, all 150', if you enter it as '8/150'. The tool will calculate how many mm² corresponds to that.

5.3.5.2. Tab page 'Reinforcement'



- Bars
  - Opt to show the length of the bars
  - Set the preference diameters and spacing
    - Click on the relevant diameter/ spacing to remove it.
    - Click on ... to add a diameter/ spacing.
- Nets
  - Set the preference diameters and spacing
    - Click on the relevant diameter/ spacing to remove it.
    - Click on ... to add a diameter/ spacing.
- Layers
  - Choose a colour and line style for the upper and lower reinforcement.
- Drafting options
  - Specify (if desired) the tolerance on the bar lengths.
    The tolerance is applied to the reinforcement zones that are to be drawn from that moment. The reinforcement zones that have already been drawn will not be affected.

5.3.6. Practical reinforcement in the cracked deformation

In the cracked deformation the maximum of the following reinforcements is taken into account:

- The theoretical calculated reinforcement
- The minimum reinforcement imposed by the standard
- The (possibly) defined practical reinforcement via the old method (= select the plate (s) and click while looking at a reinforcement result on plates).
- The (possibly) defined practical reinforcement via the new module .