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 – estructur as 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 2014 R01

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 - maillage - malla - uniones - radier

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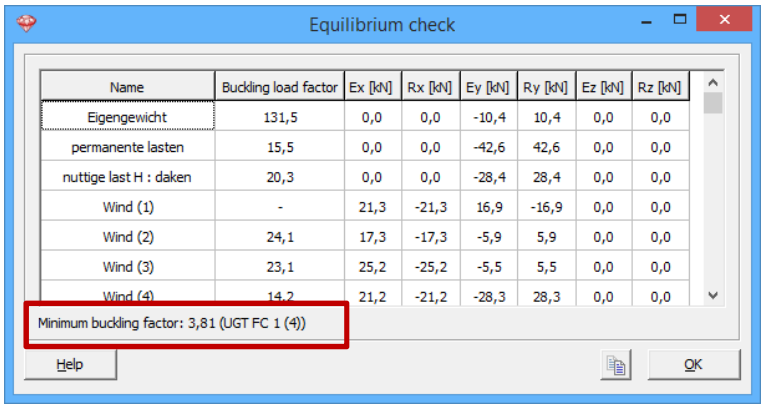
1. System requirements

Install CodeMeter version 5.20 before installing Diamonds 2014 R01.

2. Work environment

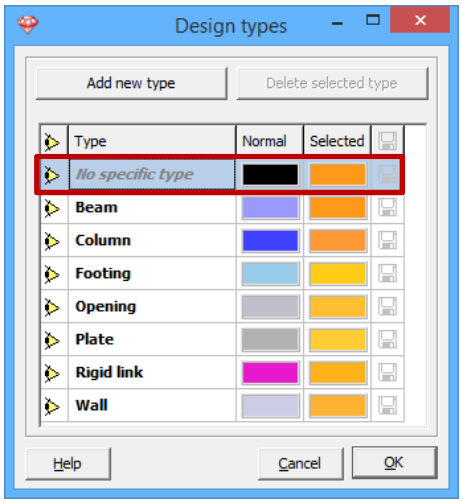
2.1. Window with equilibrium check



The minimum buckling factor α_{cr} is displayed at the bottom of the window with the equilibrium check . This way you do not have to run through the entire list of combinations.

2.2. Design types

The design type ‘No specific type’ was added to the list with default types.



When you remove the cross section of a bar, the type of the bar will automatically change from ‘Beam’ (or ‘column’) to ‘No specific type’. The bar will be drawn in black again.

2.3. Material library

The strength properties of solid and glued laminated timber are adjusted according to the latest version of respectively EN 338 and EN 14080.

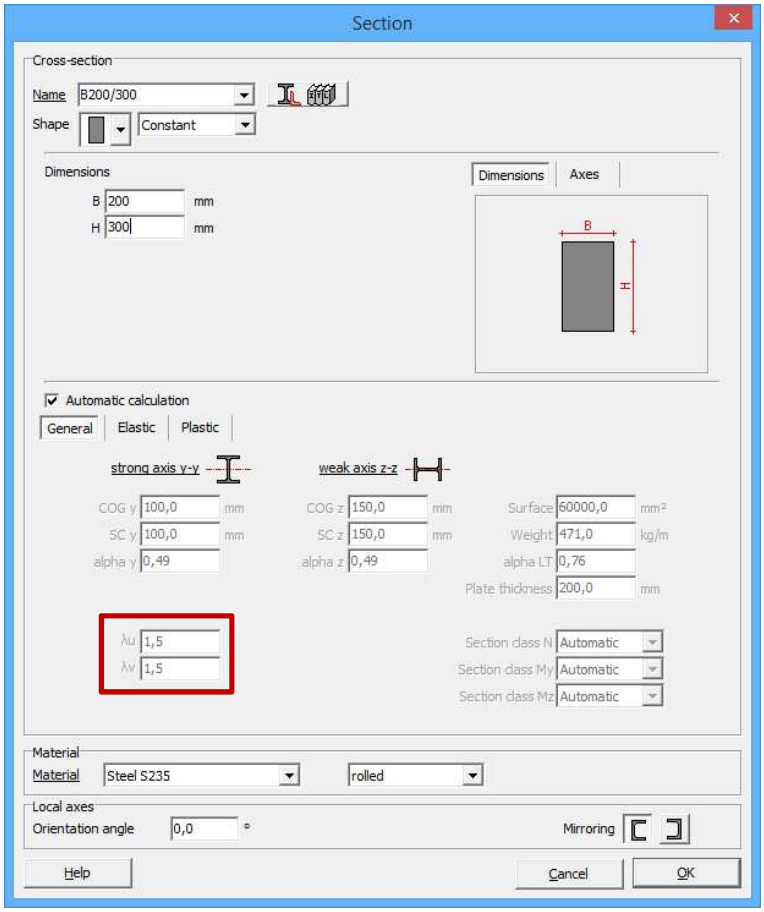
3. Geometry

3.1. Expansion of the cross section properties for bars

The cross section properties of bars have been expanded with the parameters λ_u and λ_v to take into account the **shear deformation** of bars (see §5.1).

λ_u and λ_v are factors > 1 that depend on the shape of the cross sections and which can be estimated using the Jourawsky formula for the shear stresses τ:

$$\tau = \lambda_{u\ of\ v} \cdot \frac{V}{A_{u\ of\ v}}$$



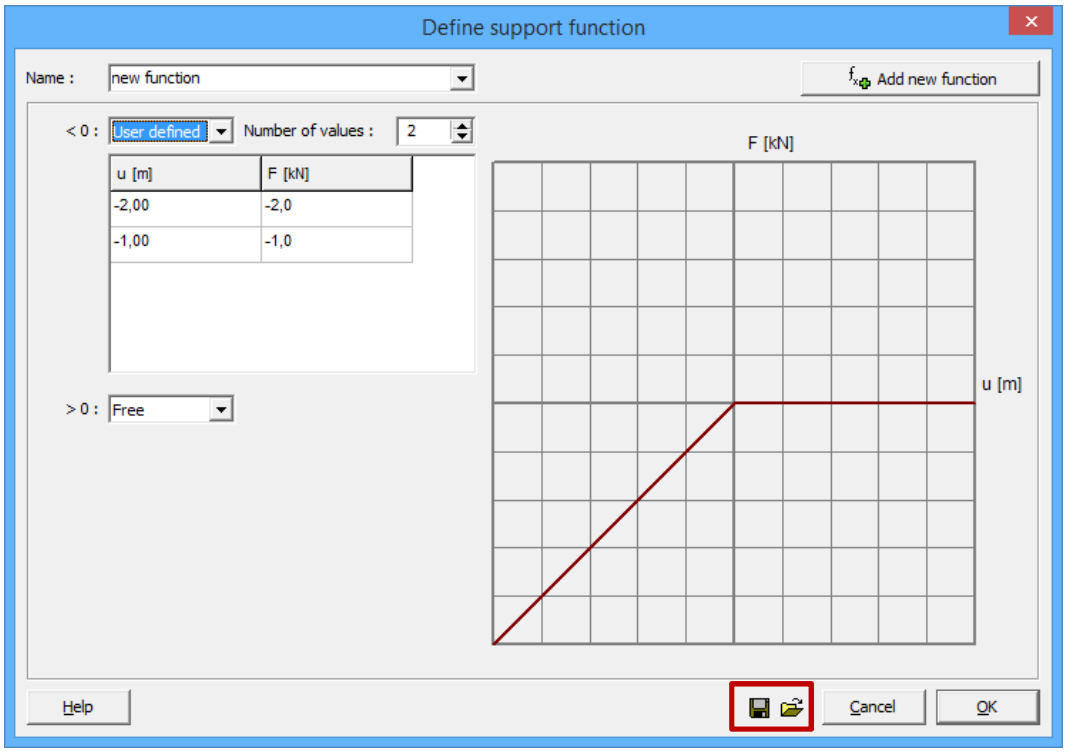
Remarks:

- These parameters have to be determined by the user for Section Utility profiles.
- The indices ‘u’ and ‘v’ refer to the principal axis of inertia of the cross section.

- The values for λ_u and λ_v can be printed out in the report manager by selection the options 'Cross section properties' in the tabpage 'Geometry'.

3.2. Import and export of support functions

You can save a defined support function in an extern TXT-file using the button . An existing function (TXT format) can be loaded via .



4. Loads

4.1. Wind loads on canopy roofs

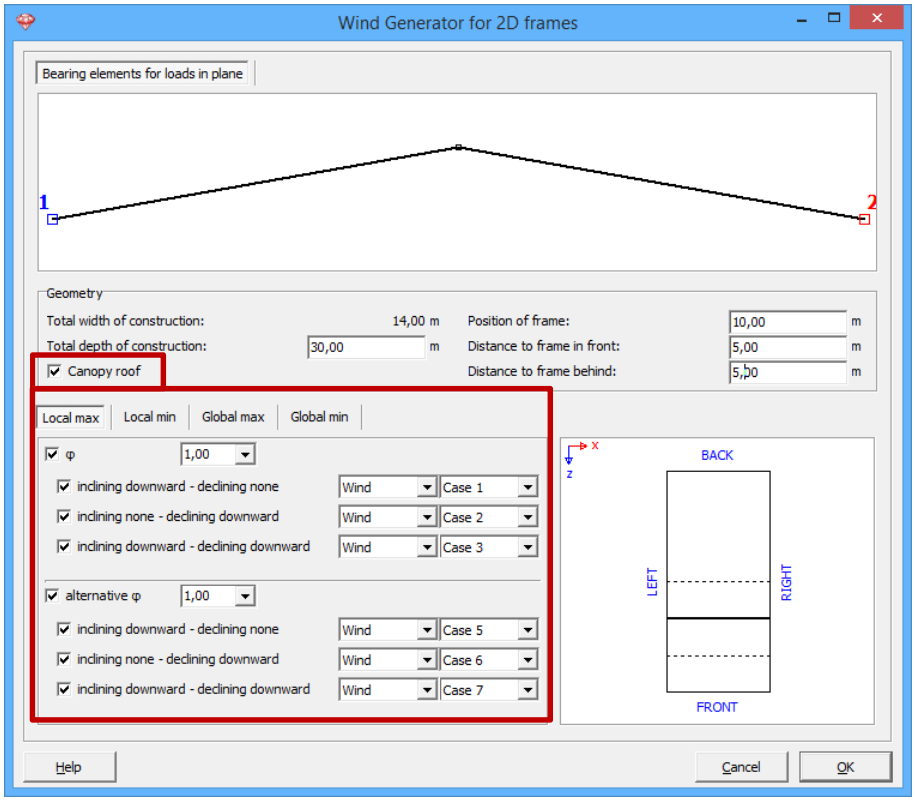
A canopy roof is defined as the roof of a structure that does not have permanent walls, such a petrol stations, dutch barns, etc.

The method of generating wind loads on a canopy roof has been adjusted. This is how it works now:

- Define the position of the ground level with Ground level.
- Set the wind standard and the terrain parameters using .
- Select the canopy roof and click on .

The button is used both for wind loads on frames as for wind loads on canopy roofs. To indicate that the selected structure is a canopy roof, check the option Canopy roof. The only difference between

the wind generation on a frame and to a canopy roof is that pressure coefficients are used for frames and that force/net pressure coefficients are used for canopy roofs.
That is way only the lower part of this window changes when you switch between a frame and a canopy roof.



Let's go over the content of the lower part of this window:

- The wind loads on a canopy roof can be determined using a **global** force coefficient or a net pressure coefficient (= a **local** coefficient). The global coefficient is used to determine the global strength/stability of the structure, while the net pressure coefficient is used to design the roofing and the anchoring of the roofing.
  Both the global and the net pressure coefficient can have a positive (maximum) and negative (minimum) value (see EN 1991-1-4 Table 7.7). Therefore you see **4 tab pages**:
  - Local max
  - Local min
  - Global max
  - Global min
- The global and net pressure coefficient depend on **the blockage ratio φ**. $\varphi = 0$ represents an empty canopy, and φ = 1 represents the canopy fully blocked with contents to the down wind eaves only (this is not a closed building).
  Because the blockage ratio can have two values (0 and 1), you can opt to enter an alternative φ in Diamonds.

- Finally figure 7.17 of EN 1991-1-4 indicates that different combinations of the coefficients on the roof pitches should be considered. These combinations result in **different load cases**. An overview can be found at the end of this document.

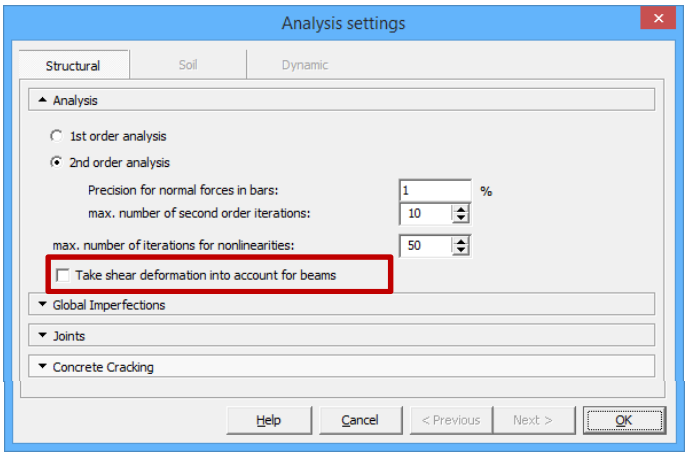
4.2. Wind according to the Colombiaan standard

You can also generate wind loads according to NSR-10. The used method in this standard is analogous to the American standard ASCE 7-10.

5. Analysis

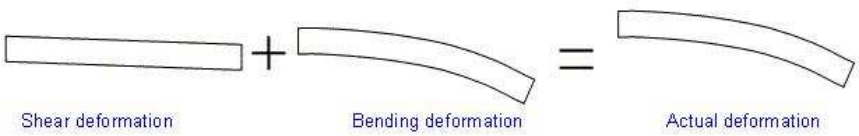
5.1. Tabpage 'Structural'

From Diamonds 2014 R01 you can obt to take the shear deformation into account. To do so, check the option 'Take shear deformation into account for beams' in the tabpage 'Structural'.



The final deflection $\delta_{y',tot}$ of a bar is the sum of the deformation due to the moment $\delta_{y',M}$ and the deformation due to the shear force $\delta_{y',V}$.

$$\delta_{y',V} + \delta_{y',M} = \delta_{y',tot}$$

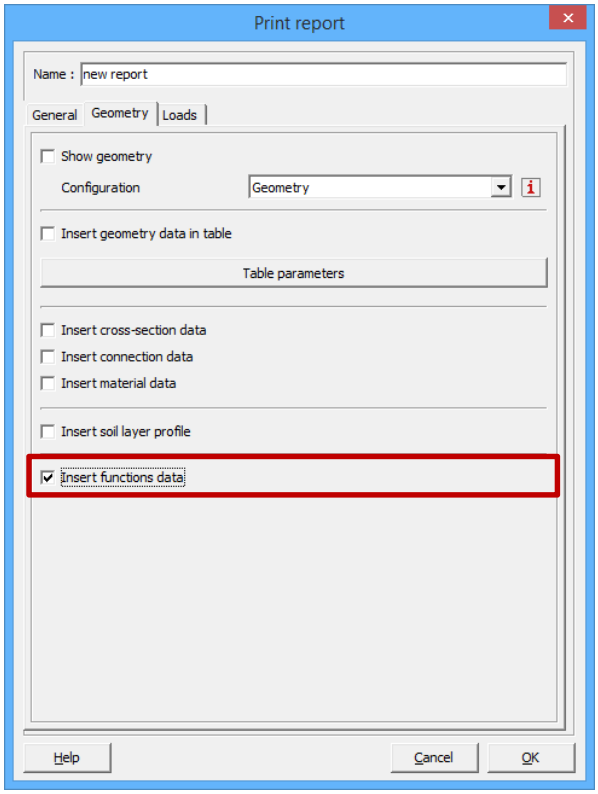


The theoretical back ground of the shear deformation can be found in Timoshenko's Beam Theory.

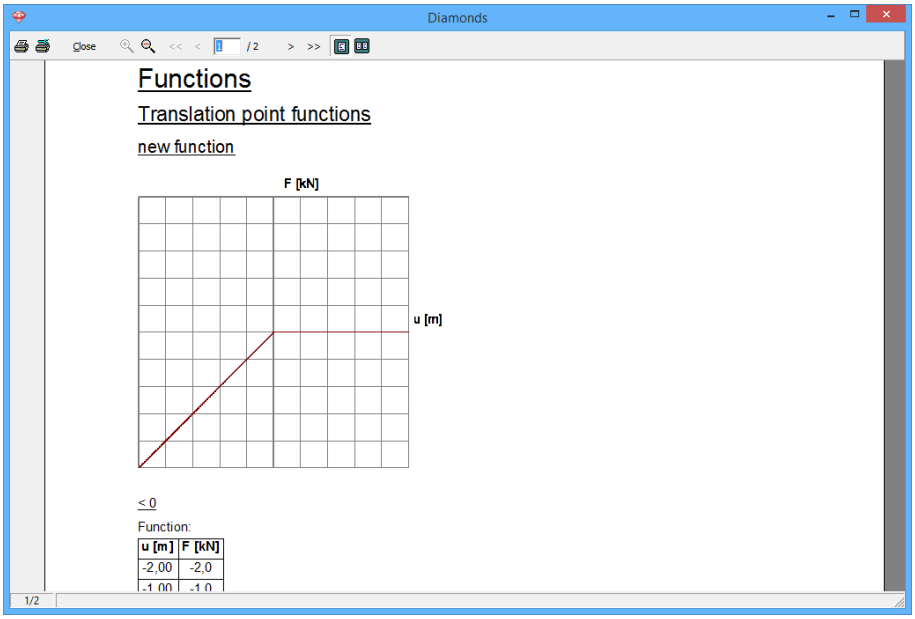
6. Report manager

6.1. Tabpage 'Geometry'

With the option 'Insert functions data' you can insert the function data of supports or bar ends in the report.



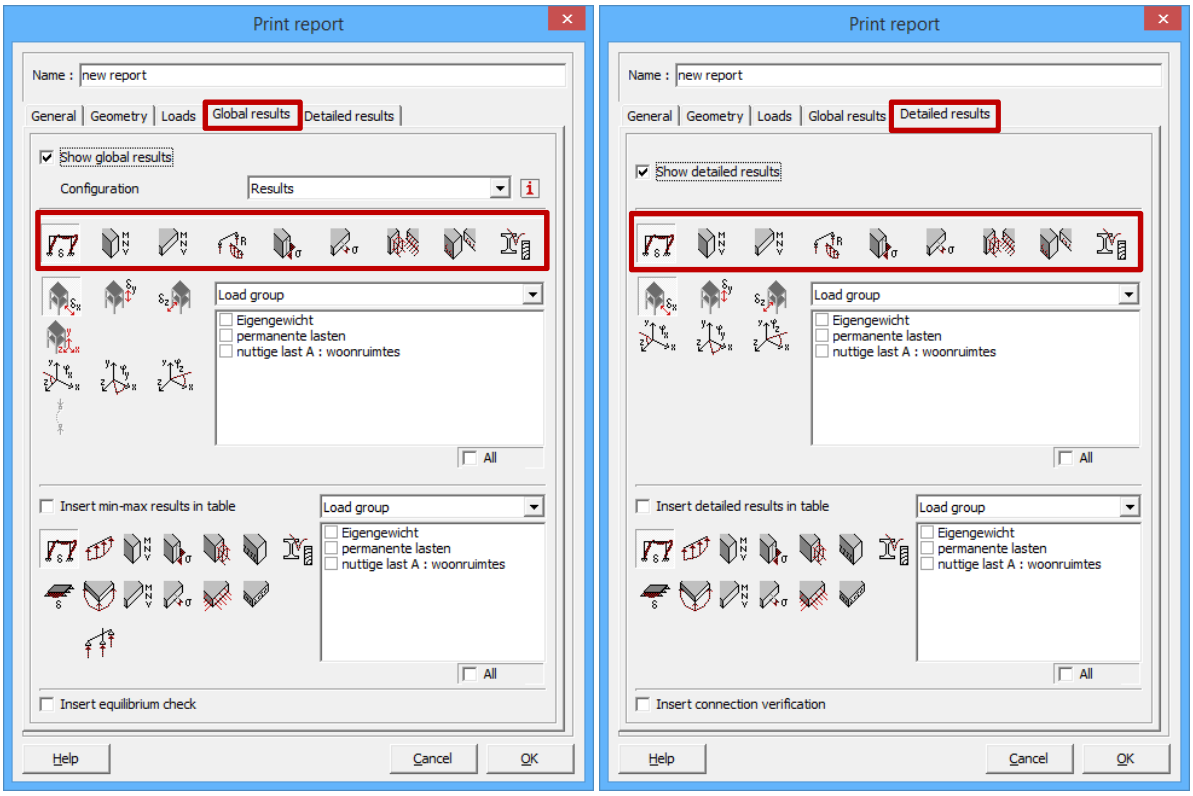
Result:



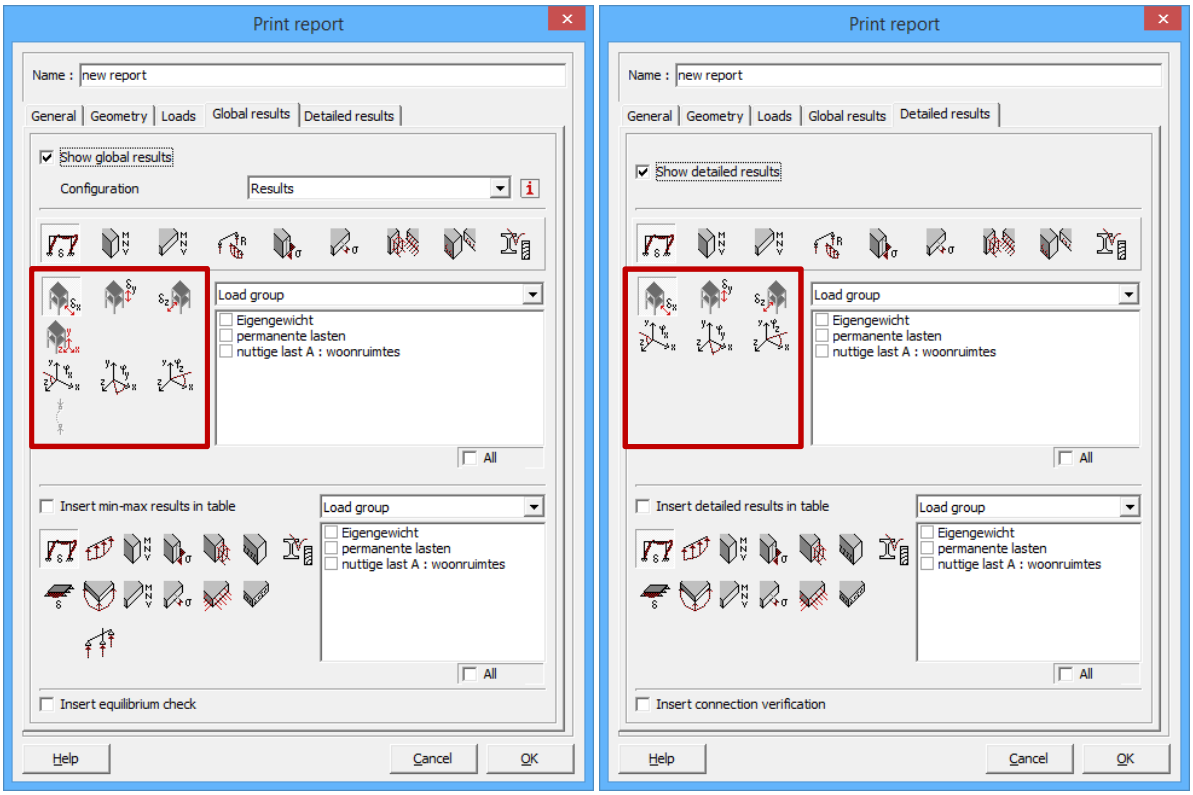
6.2. Lay out of the tabpages ‘Results’ and ‘Detailed results’

The lay-out of the tabpages ‘Global results’ and ‘Detailed results’ have changed in Diamonds 2014 R01.

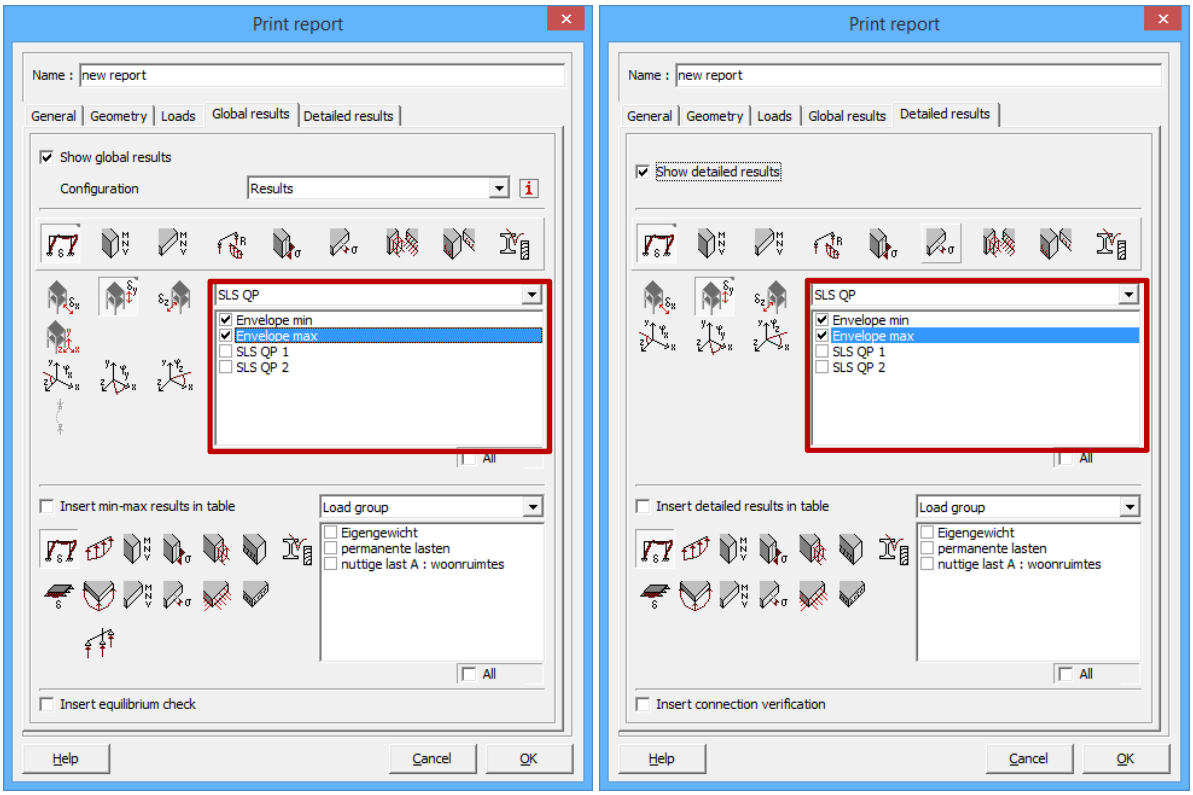
- At the top you’ll find the buttons representing the partial results.



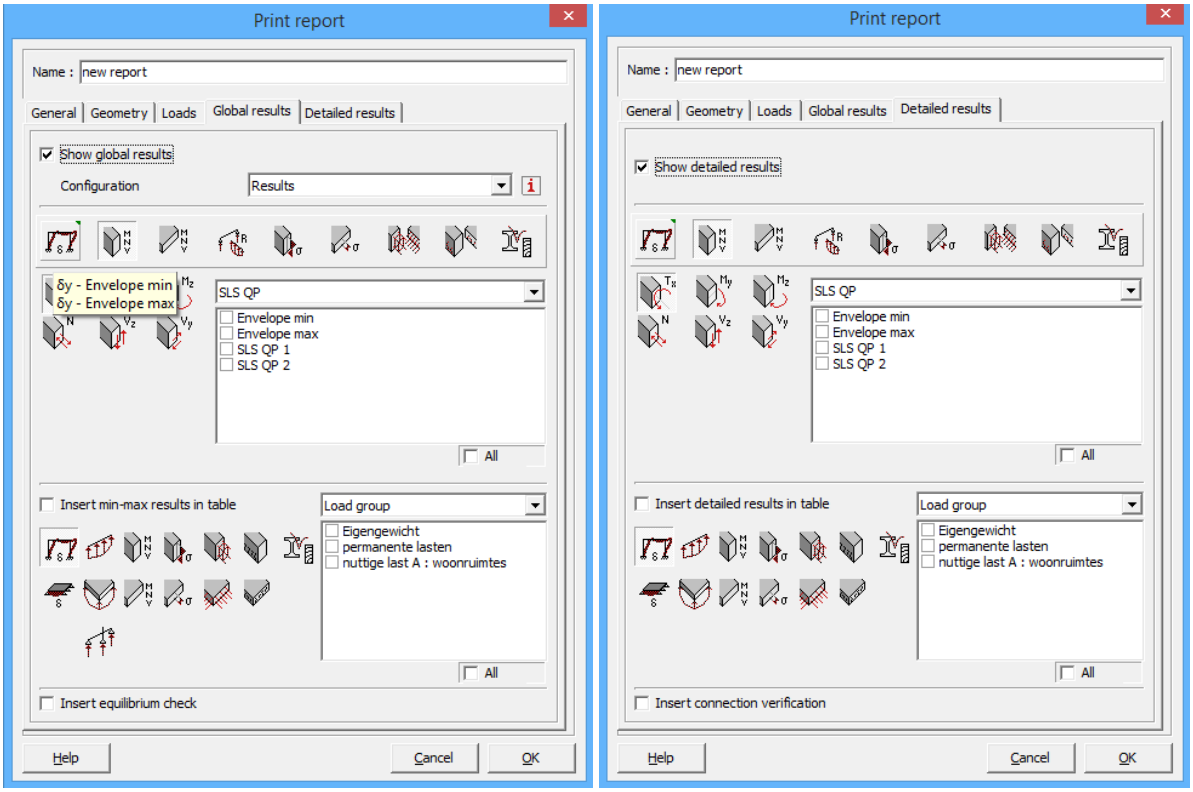
- Once one of the above buttons is pressed, you can retrieve the corresponding detailed results by clicking on one of the underlying buttons:



- Next, on the right indicate the load combinations for which you want to view the results.



- You can obtain a list of the results have already been retrieved by moving the mouse or the corresponding button with partial results.



Remarks:

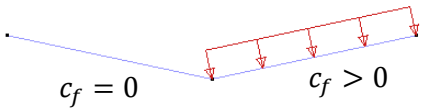
- Buttons for which no results are available are shown in grey.
- Using the icon you can retrieve the first global buckling mode in the **global results**.

ANNEX: LOAD CASES FOR WIND LOADS **ON CANOPY ROOFS** IN DIAMONDS

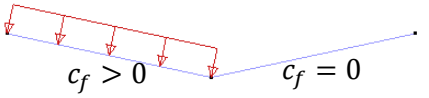
For a **duopitch canopy: 6 cases**

If only one value for the blockage ratio φ is required, there are 6 load cases for a duopitch canopy to be considered. If two values for the blockage ratio are required, there are 12 load cases to be considered. We go over the different load cases in case 1 value for the blockage ratio is needed:

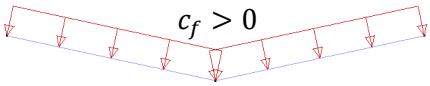
IN THE TABPAGE 'MAX'



= 1.Inclining downloads – declining none
On the inclining part a positive force coefficient is applied (= downward wind load), on the declining part no wind load is applied.

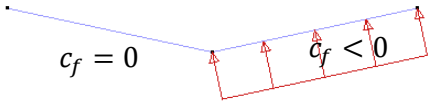


= 2. Inclining none – declining downloads
On the inclining part no wind load is applied, on the declining part a positive force coefficient is applied (=downward wind load)

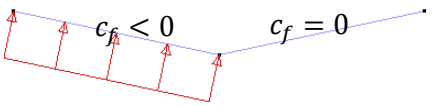


= 3. Inclining downloads – declining downloads
On both roof parts a positive force coefficient is applied (= downward wind load)

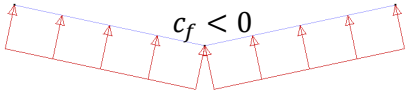
IN THE TABPAGE 'MIN'



= 1. Inclining upward – declining none
On the inclining part a negative force coefficient (= upward wind load) is applied, on the declining part no wind load is applied.



= 2. Inclining none – declining upward
On the inclining part no wind load is applied, on the declinging part a negative force coefficient is apllied (= upward wind load)



= 3. Inclining upward – declining upward
On both roof parts a negative force coefficient is apllied (= upward wind load)

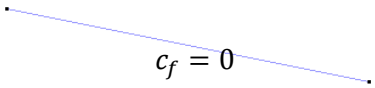
Remarks:

- As can be seen on Figure 7.17 from EN 1991-1-4, positive and negative values shouldn't be combined.

For a **monopitch canopy: 2 cases**

If only one value for the blockage ratio φ is required, there are 2 load cases for a monopitch canopy to be considered. If two values for the blockage ratio are required, there are 4 load cases to be considered. We go over the different load cases in case 1 value for the blockage ratio is needed:

IN THE TABPAGE 'MAX'

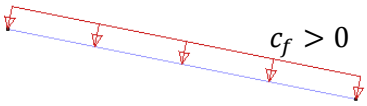


=

1.Inclining downloads – declining none

On the inclining part a positive force coefficient is applied (= downward wind load), on the declining part no wind load is applied.

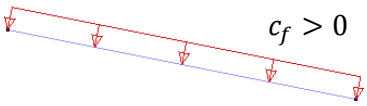
THIS IS A DECLINING ROOF PART, SO NO WIND LOADS WIL BE OBTAINED IN THIS CASE! SO NO NEED TO GENERATE IT.



=

2. Inclining none – declining downloads

On the inclining part no wind load is applied, on the declining part a positive force coefficient is applied (=downward wind load)



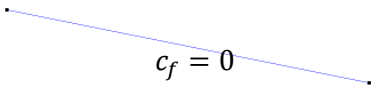
=

3. Inclining downloads – declining downloads

On both roof parts a positive force coefficient is applied (= downward wind load)

BECAUSE THERE'S NOT INCLINING ROOF PART, THIS WILL GIVE THE SAME RESULT AS THE PREVIOUS LOAD CASE. SO NO NEED TO GENERATE THIS CASE!

IN THE TABPAGE 'MIN'



=

1. Inclining upward – declining none

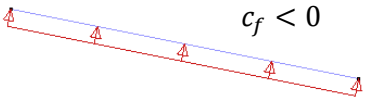
On the inclining part a negative force coefficient (= upward wind load) is applied, on the declining part no wind load is applied.

THIS IS A DECLINING ROOF PART, SO NO WIND LOADS WIL BE OBTAINED IN THIS CASE! SO NO NEED TO GENERATE IT.

=

2. Inclining none – declining upward

On the inclining part no wind load is applied, on the declinging part a negative force coefficient is apllied (= upward wind load)



=

3. Inclining upward – declining upward

On both roof parts a negative force coefficient is apllied (= upward wind load).

BECAUSE THERE'S NOT INCLINING ROOF PART, THIS WILL GIVE THE SAME RESULT AS THE PREVIOUS LOAD CASE. SO NO NEED TO GENERATE THIS CASE!

Remarks:

- As described in the images aboven, you should pay attention to the load cases you generate for a monopitch canopy.