Release information Diamonds 2012

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1. Modeling

1.1. Importing Diamonds files with load group transfer

Diamonds 2012 will ask what to do with the load groups when importing an existing Diamonds file. You have the choice between:

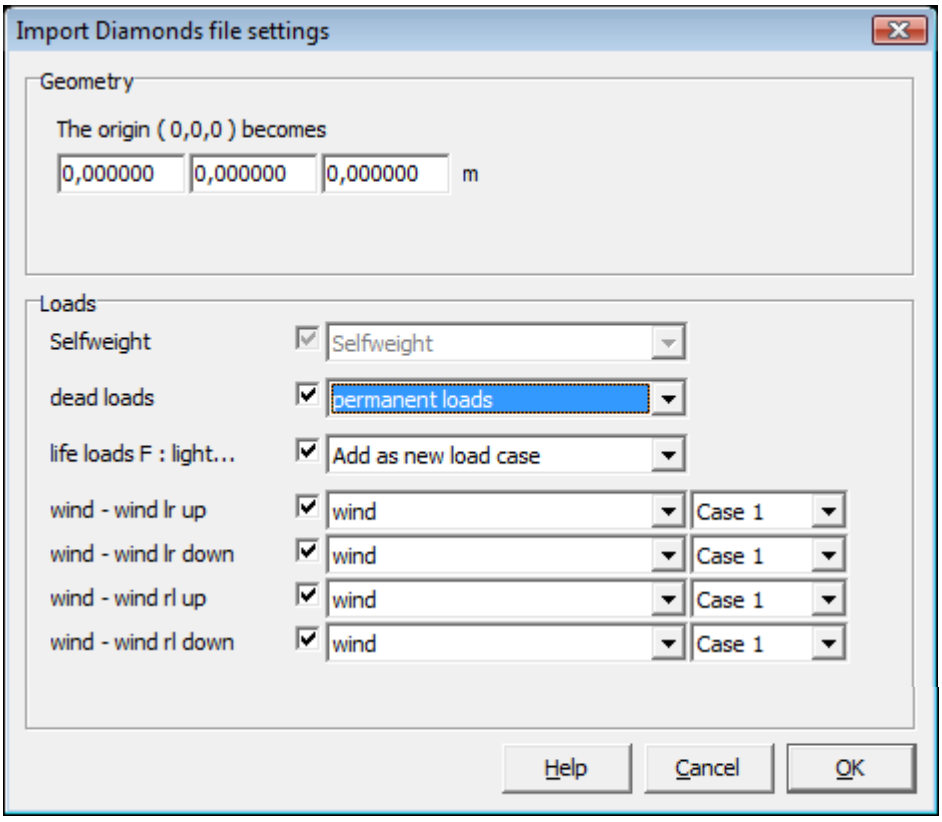
- Importing a load group in an existing load group
- Importing a load group and preserving its name and safety factors
- Importing a load group and assigning a new name
- Not importing a load group

Example: assume that an existing project contains following load groups:

- 'Self-weight'
- 'Dead loads'
- 'Live loads F'
- 'wind', with 4 sub-load groups: 'wind lr up, 'wind lr down, 'wind rl up, 'wind rl down'.

The current project includes the load groups 'Self weight', 'permanent loads' and 'wind' with 4 sub-load groups (Case 1 until 4).

When import the existing model, Diamonds will present you following dialog box:



- The load group 'Self weight' will be imported in the existing load group 'Self weight'.
- The load group 'dead loads' will be imported in the existing load group with the name 'permanent loads'.
- The load group 'live loads F' will be imported as a new load group with the name 'live loads F'. All safety factors and combination factors will be imported as well.
- The load group 'wind' with 4 sub-load groups will be imported in the existing load group 'wind', including the 4 sub-load groups.

Confirm you choice with 'OK'. If you do not wish to import a certain load group, just uncheck it.

1.2. Physical groups

1.2.1. What is a physical group?

A physical group consists of separate aligned bars, which behave as if they are a continuous entity. Physical groups are useful when defining variable sections, eccentricities and loads.

1.2.2. How to make a physical group?

To make a physical group, follow these steps:

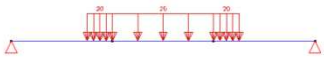
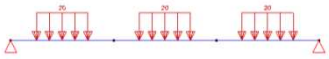
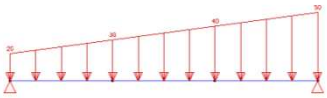
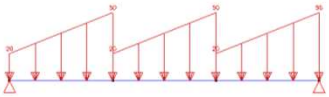
- Select the relevant bars.
  Remarks:
  - When you select multiple bars, Diamonds will make all possible physical groups.
  - To group bars in a physical group, they must lie on one line, regardless of their material, section or orientation.
- Choose 'Physical' in the 'Groups' window.
- Click on the button 'Group' to group the bars.

To nullify a physical group, work analogous but select 'Ungroup' .

1.2.3. What can you do with physical groups?

Because Diamonds will consider a physical group as one continuous bar, the variable sections, eccentricities and loads will continue along the sub-bars, and not restart for each sub-bar.

	NO physical groups defined	Physical groups defined
Variable sections		
Eccentricities		

Distributed load/moment		
Trapezoidal loads		

If you want a variable section, an eccentricity or a load to take the physical groups into consideration, you must check the option 'Values (and distances) related to physical members' in the appropriate dialog box.

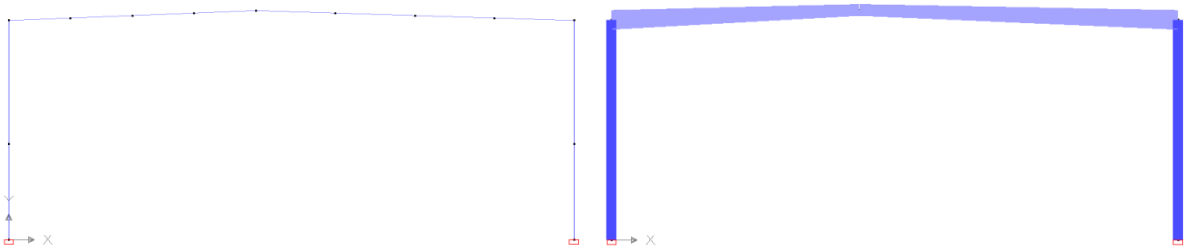
The physical group definition may seem twice the same, but is not:

- In 'Groups' you define the physical entity by grouping (or ungrouping) several bar segments into 1 physical member.
- With the option 'Values (and distances) related to physical members', you assign loads and properties to the physical element, and not to the individual bar segments.

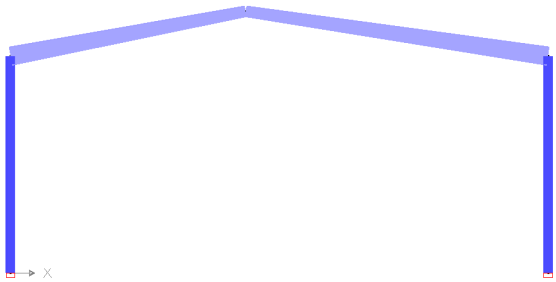
1.2.4. Transformations with physical groups

When you apply a translation as a displacement ($N = 0$) or a rotation with$N = 0$, you will get the option 'rescale physical elements'. This feature ensures that the involved physical groups will be extended or shortened.

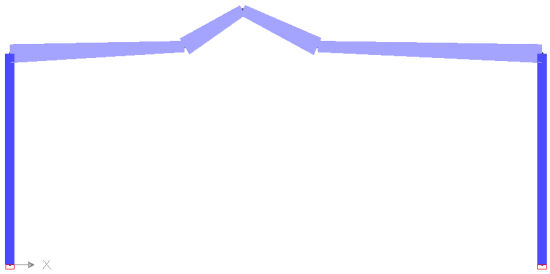
Example: each beam is divided into 4 sub-beams, but forms a physical group:



Translation of the top over 1m.

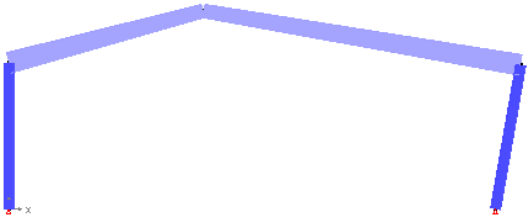


Rescale physical elements



DO NOT rescale physical elements

Rotation of the right column over 10°



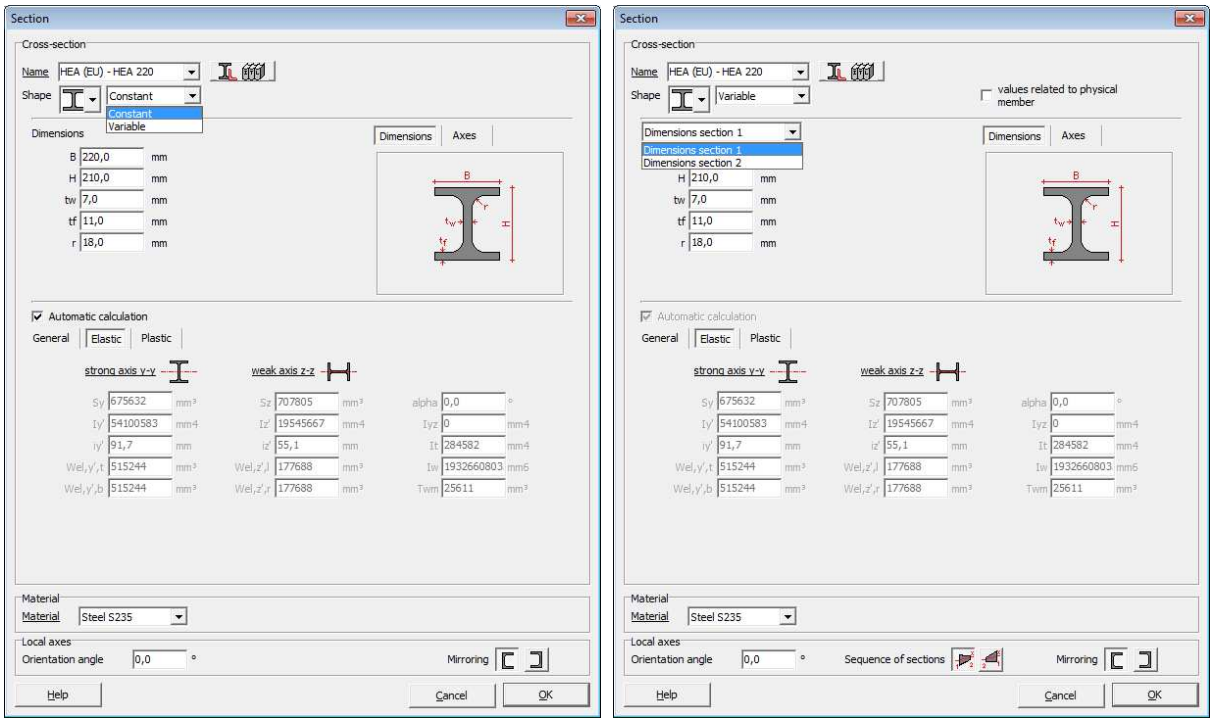
Rescale physical elements

DO NOT rescale physical elements

1.3. Variable sections

1.3.1. Definition

As from Diamonds 2012, it is possible to calculate variable sections. In the dialog 'Section' ( ) you have the choice between a constant and a variable section:



When you choose a variable section, you must specify cross-sectional dimensions at the beginning of the bar (section 1) and at the end of the bar (section 2). Depending on the chosen profile, one or two dimensions for section 2 should be completed.

1.3.2. Variable sections and physical groups

The option 'values related to physical member' ensures that the dimensions of section 1 and 2 refer to the endpoints of the physical group, and not to the individual sub-beams.

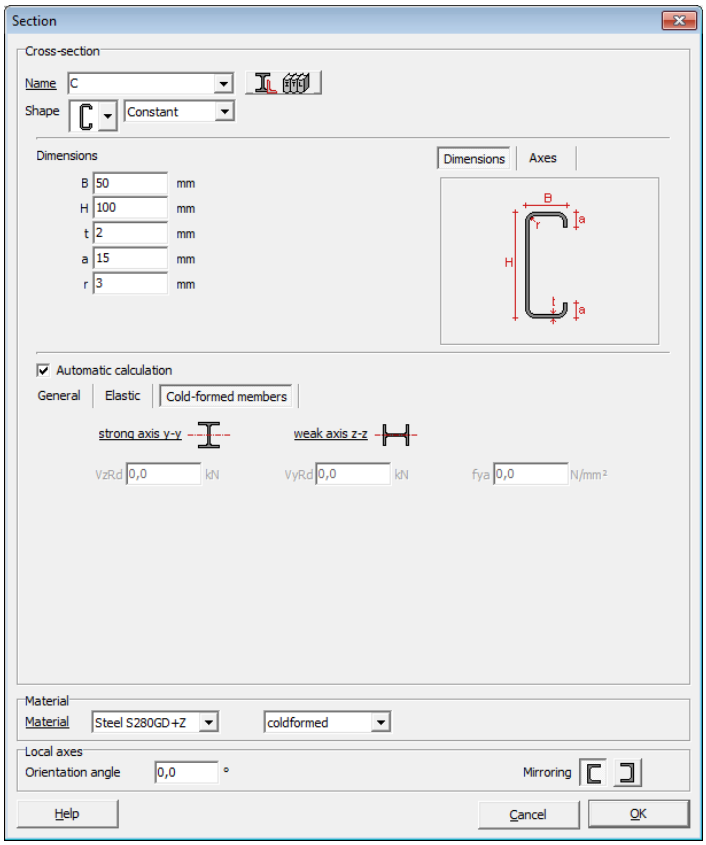
Remarks:

- Diamonds automatically determines the properties of a variable section, you cannot change them.
- Variable sections are not applicable to user-defined profiles (Section Utility) and cold formed sections.
- By using the buttons and , you can switch the assigned section at the beginning and end node. These buttons are only visible for variable sections.

1.4. C-profile

In Diamonds 2012 you can define a C-section. You can calculate this profile hot rolled or cold formed.

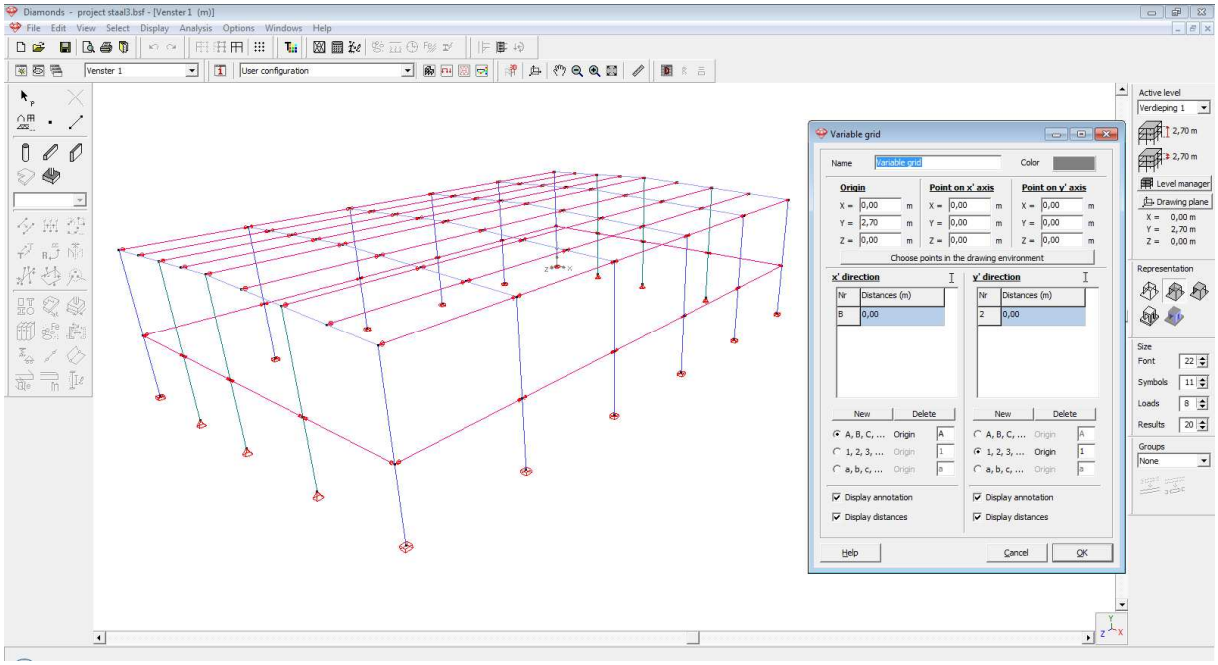
In case of a cold formed section, the standard EN 1993-1-3 will be applied. The effective properties are calculated automatically by Diamonds. You will get an extra tab page 'Cold formed members', which allows you to enter extra properties fort his section, such as $V_{z,Rd}$, $V_{y,Rd}$ and $f_{y,a}$. Note that you have to uncheck 'Automatic calculation' first, to complete these parameters. When no value for $V_{z,Rd}$ of $V_{y,Rd}$ is filled in, the check for shear force will not be performed.



1.5. Variable grid optimized for dimensioning

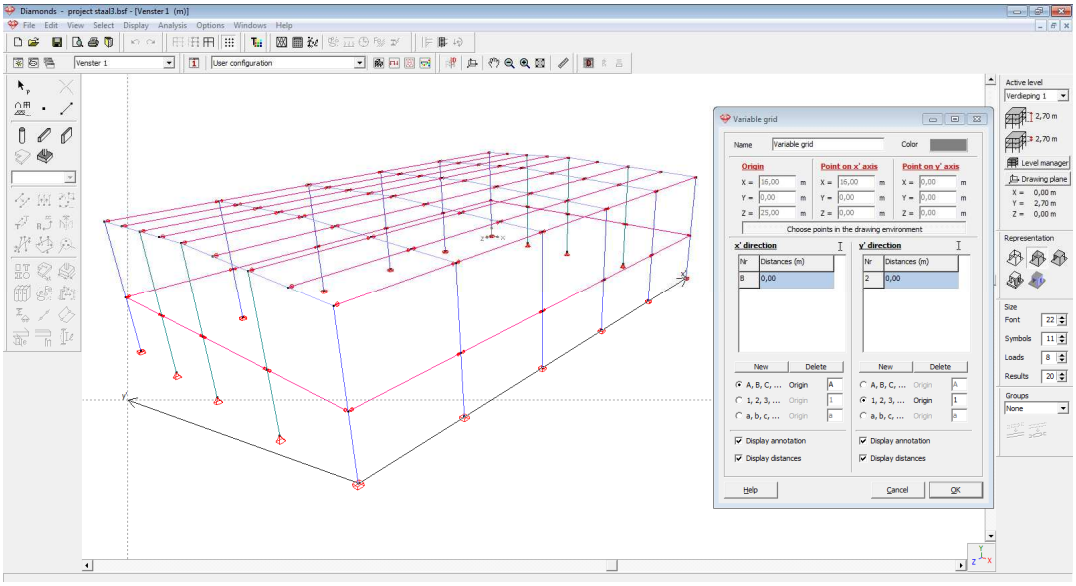
The principle of the 'variable grid' is extended with dimensioning possibilities. In order to add dimensions to a model, proceed as follows:

- Click on to open het dialog 'Grid settings'. To execute a variable grid, click . The dialogue box for creating a variable grid will appear on the screen.



- You enter a name and color as you like for the new grid.
- Next you define the plane in which the dimensions will appear. This can be done in 2 ways:

  - Either fill out the coordinates for ‘Origin’, ‘Point on x’ axis’ and ‘Point on y’ axis’
    Or, mark these coordinates directly in the model geometry using the mouse, by clicking the button Choose points in the drawing environment. Start by clicking on the desired point of origin. Then an x'-axis will appear, following your cursor. Click on a second point to determine the direction of the x-axis. Once the x-axis is fixed, you can analogously define the y-axis by clicking on another point.



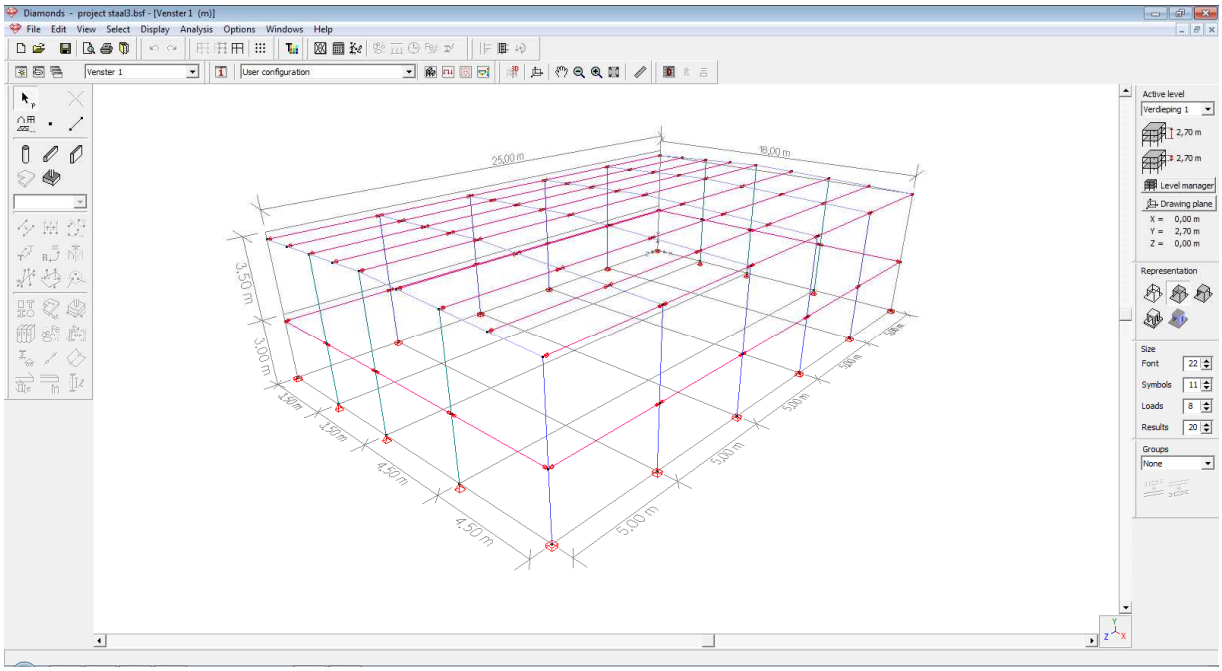
- In the bottom tables, determine the distances between the axes according to the two directions, this can be done in two ways as well:

  - If the icon I is active, you will need to add point by point using the button New. The coordinates of these points can be entered manually enter or you can select them in the model geometry.
  - When you click once on I, it changes in , now you can select multiple points in the model geometry without needing to click New each time. Press the ‘SHIFT’-key while selecting. When you select a bar, both points (end & beginning) are included in the list. You can specify either direction (x ', y') at the same time by changing each I in , or you can select each direction separately.

  You can remove point from the list by selecting the point and clicking Delete.

- Finally, specify how you wish to number the directions and whether the numbers or annotation lines should be visible in the corresponding direction.

Possible result:



Remark: you also can use this function to easily define a variable grid, not aiming on dimensioning the structure.

1.6. Joining lines

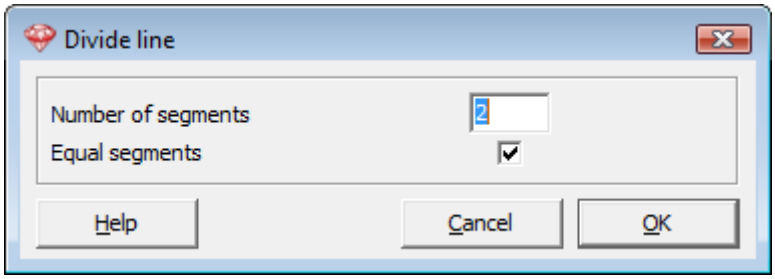
As from Diamonds 2012, you can join lines by selection the common point and using the 'DEL' button.

Remarks:

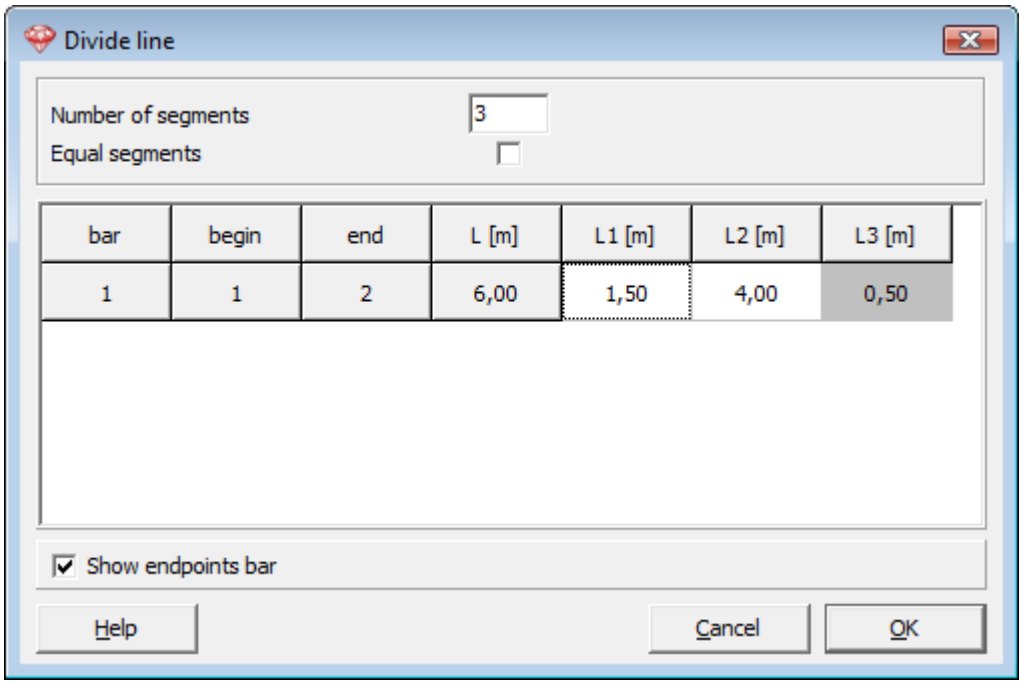
- When you erase a point using the 'DEL'-button, all supports attached to this point, will be deleted as well.
- Points can only be deleted when the section, material, coverage, eccentricity, are the same. In other words, if all properties for both bars are identical.

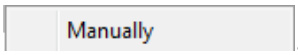
1.7. Dividing lines in unequal segments

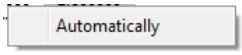
Start by selecting the lines you want to divide. Once the lines are selected, you can divide them with the help of . The following dialog will show:



By default, Diamonds will divide a line into 2 equal segments. You can divide the line into more parts, by filling the required number in the box 'Number of segments'. By unchecking the option 'Equal segments', you can specify the length of the parts.



The length of one segment is determined automatically as the current overall length must be maintained (L3 [m] = L [m] - L1 [m] - L2 [m]). This segment has a gray background. You can assign this to a different segment by right-clicking and selecting 

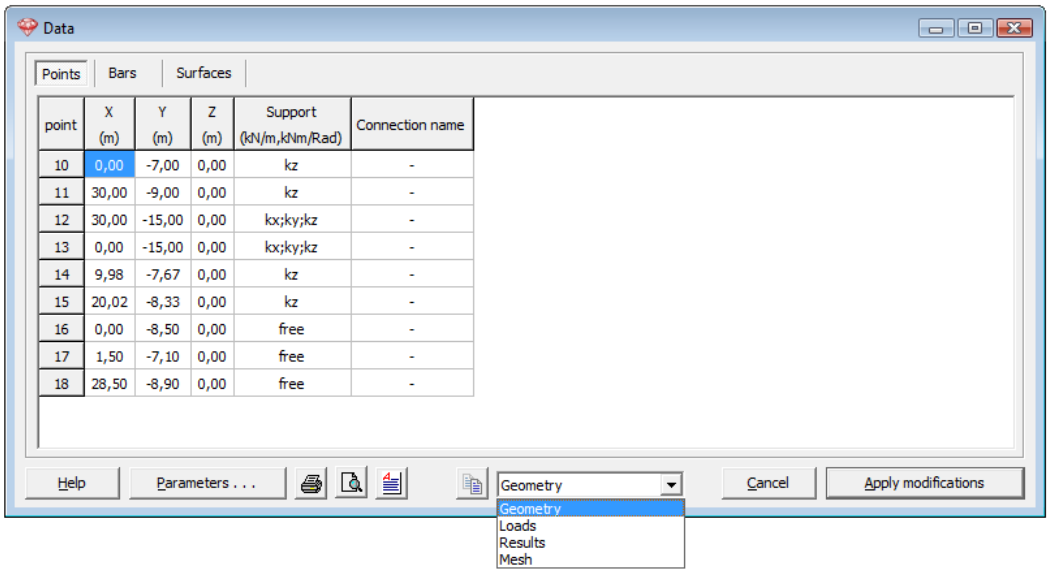
. The 'fixed' length shifts to another segment. You can also click on another cell with the mouse and click 

. The length L1[m] always starts from the begin node.

By checking the option 'Show endpoints bar', the node number of the begin- and endpoint of the bar will be shown in the table.

1.8. Quick access to all data in the 'Data'-window

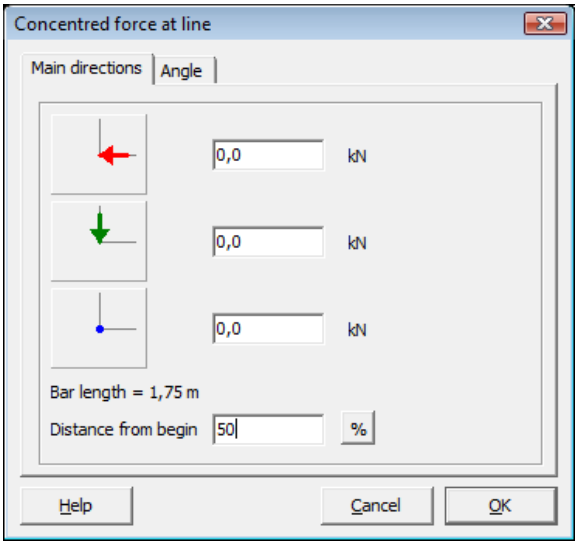
Using the pull down list you can easily switch between different data in the table.


Data
Points
Bars
Surfaces
point
X (m)
Y (m)
Z (m)
Support (kN/m,kNm/Rad)
Connection name
10 0,00 -7,00 0,00 kz -
11 30,00 -9,00 0,00 kz -
12 30,00 -15,00 0,00 kx;ky;kz -
13 0,00 -15,00 0,00 kx;ky;kz -
14 9,98 -7,67 0,00 kz -
15 20,02 -8,33 0,00 kz -
16 0,00 -8,50 0,00 free -
17 1,50 -7,10 0,00 free -
18 28,50 -8,90 0,00 free -
Help
Parameters . . .
Geometry
Geometry
Loads
Results
Mesh
Cancel
Apply modifications

2. Loads

2.1. Inserting loads using a relative distance

When placing a concentrated force on a bar, you will see the following dialog. Here you define the size of the point load, the direction and the sense and the position on the bar.



When the button m is active, you specify an absolute distance. By clicking once on the button m, it changes to %. Now you can enter a relative distance using a percentage. 0% corresponds to the beginning of the beam, with 25% of $\frac{L}{4}$ from the beginning point, 50%, with $\frac{L}{2}$ from the start point (= the middle of the line), etc.

You can do the same for:

- Moments on a bar
- Distributed loads on a bar
- Distributed torsion on a bar

Once the load is placed on the bar, the position of this load will not chance when adapting the length of this bar.

2.2. Wind and snow

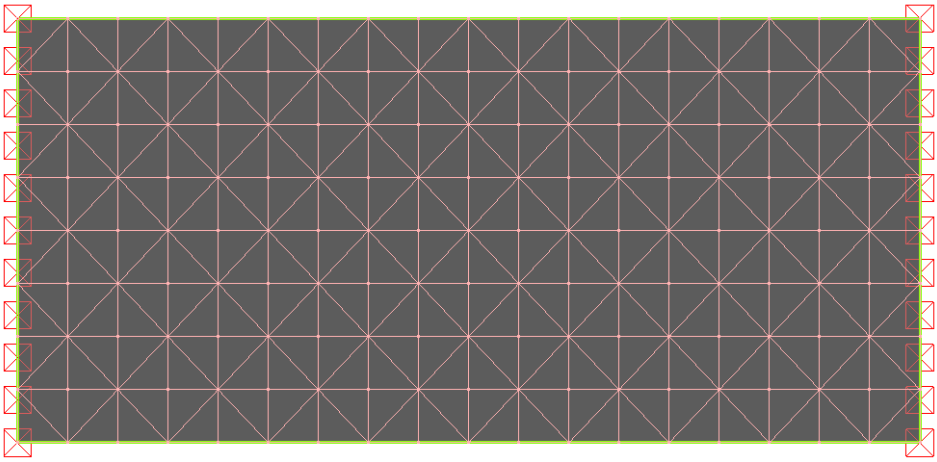
The wind- and snow generator contain the extra standards NEN EN 1991-1-4 en NEN EN 1991-1-3 for creating wind and snow loads.

In Diamonds 2012, wind and snow loads are always placed on the physical group. When you define physical groups correctly, this will allow you to change the lengths of the sub-bars (segments), without having to redefine the wind loads.

3. Analysis and results

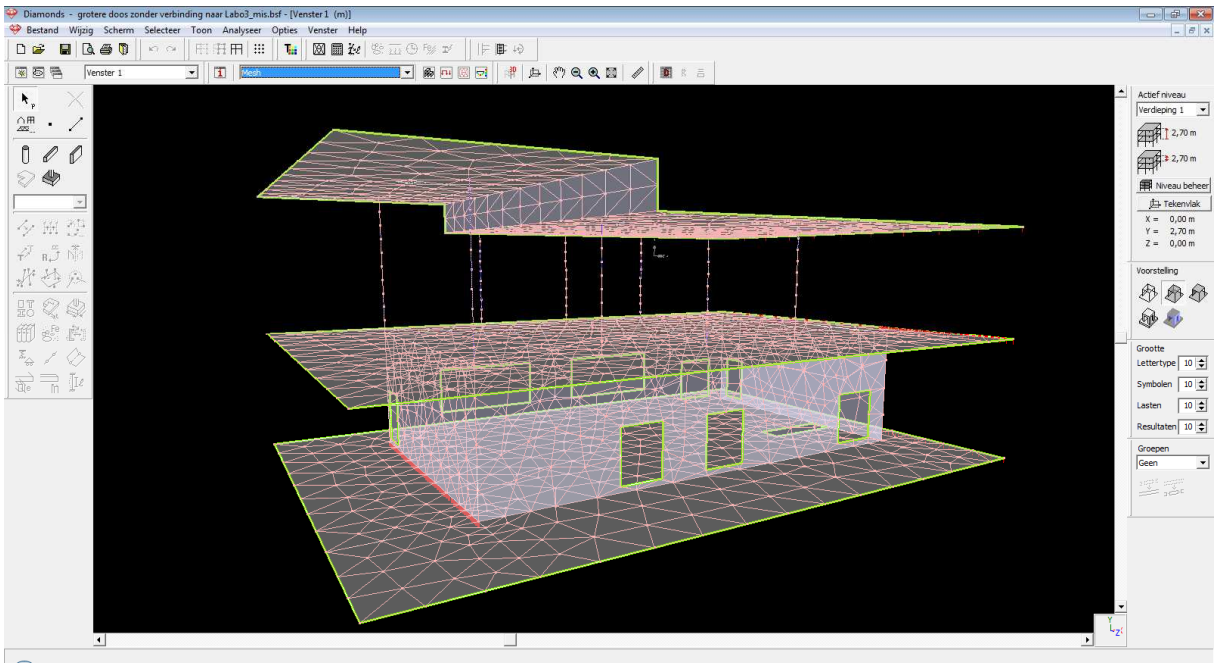
3.1. New mesh generator

Diamonds 2012 contains a new mesh generator that Note that meshes rectangular plates symmetrical.



3.2. Configuration mesh

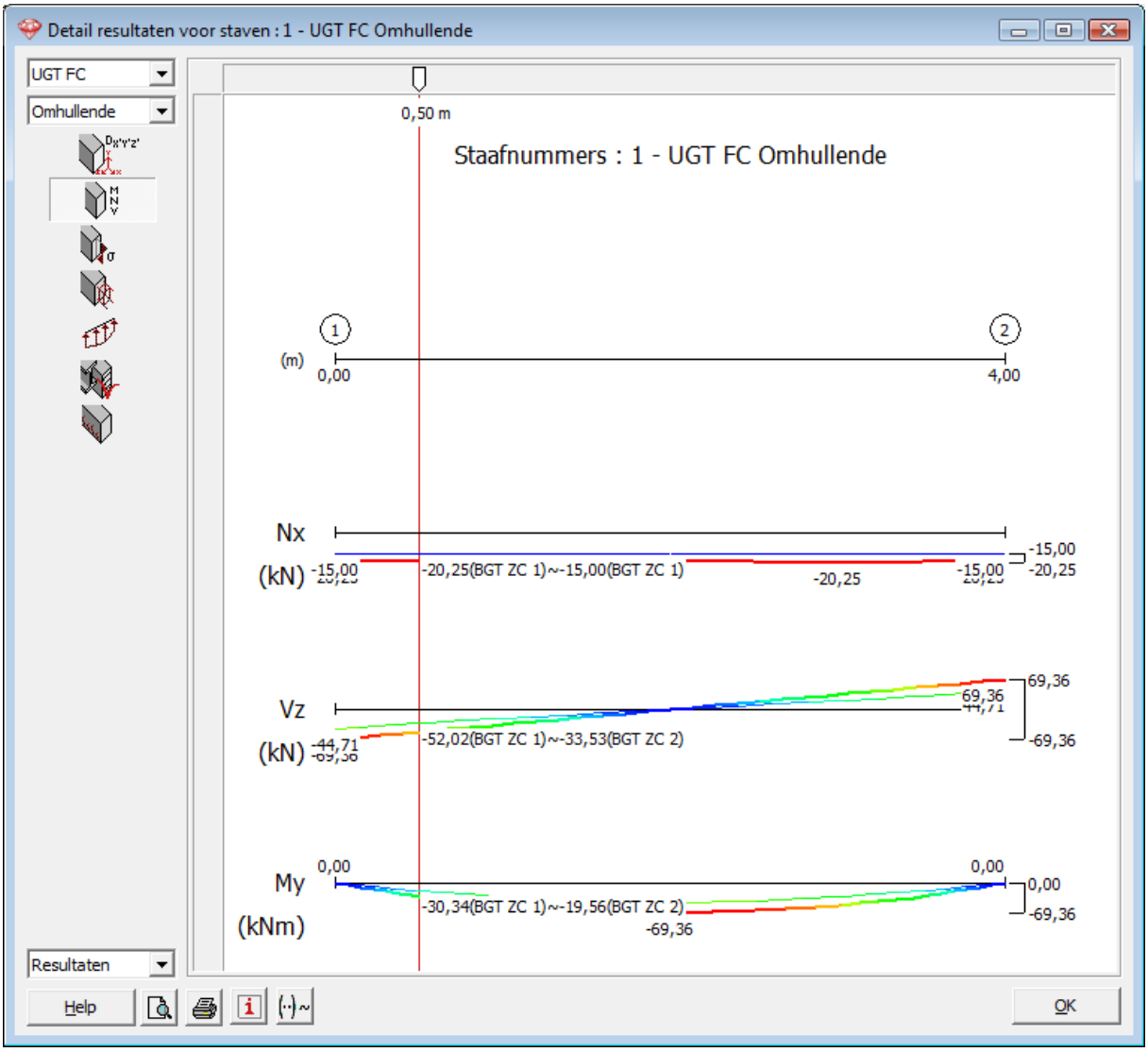
The ‘Mesh’ configuration is now standard available in Diamonds. In the toolbar ‘Display’ you will find the button , which allows you to easily verify the mesh.



If you wish to modify the configuration, click the icon.

3.3. The determining combination

When looking at detailed results of beams and plates, Diamonds will show you which combinations (minimum and maximum combination) are determining for the envelop values. By clicking once on , this button will chance in and will hide the determining combinations.

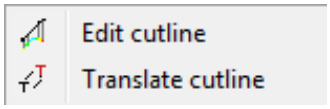


3.4. Adapting cut lines

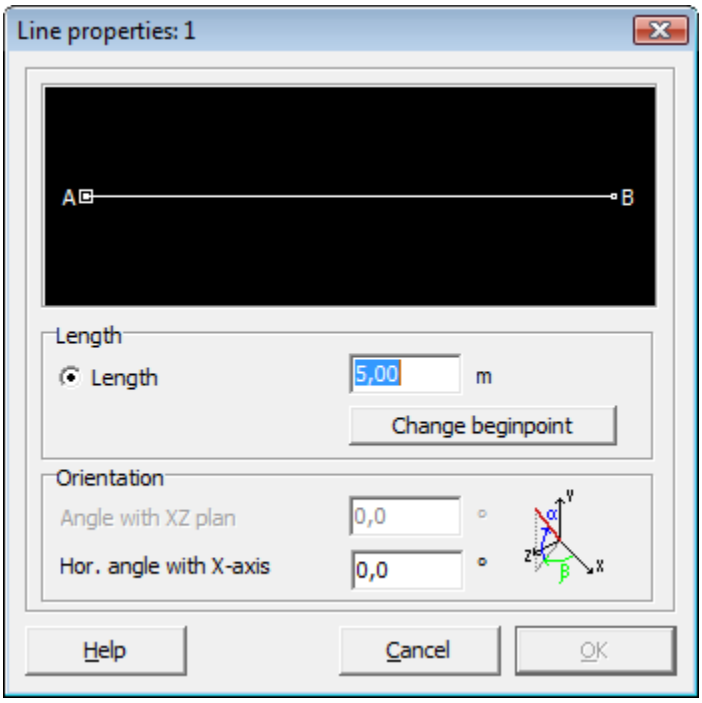
Cut lines are often used to averaging reinforcement peaks above supports and columns, but only over limited distance.

You can easily adjust the length and slope of a cutline:

1. Select the cut line and click once on the right mouse button:
2. In the floating menu that appears, you have the choice between:



a. *Edit a cut line*



You can adjust the length of the cutline. By default, begin point (A) will be fixed- notice the square around point A. Therefore the position of B will change. If you prefer B fixed and A translated, click Change beginpoint.
Here you can also adjust the angle with the X-axis and/or XZ plan.

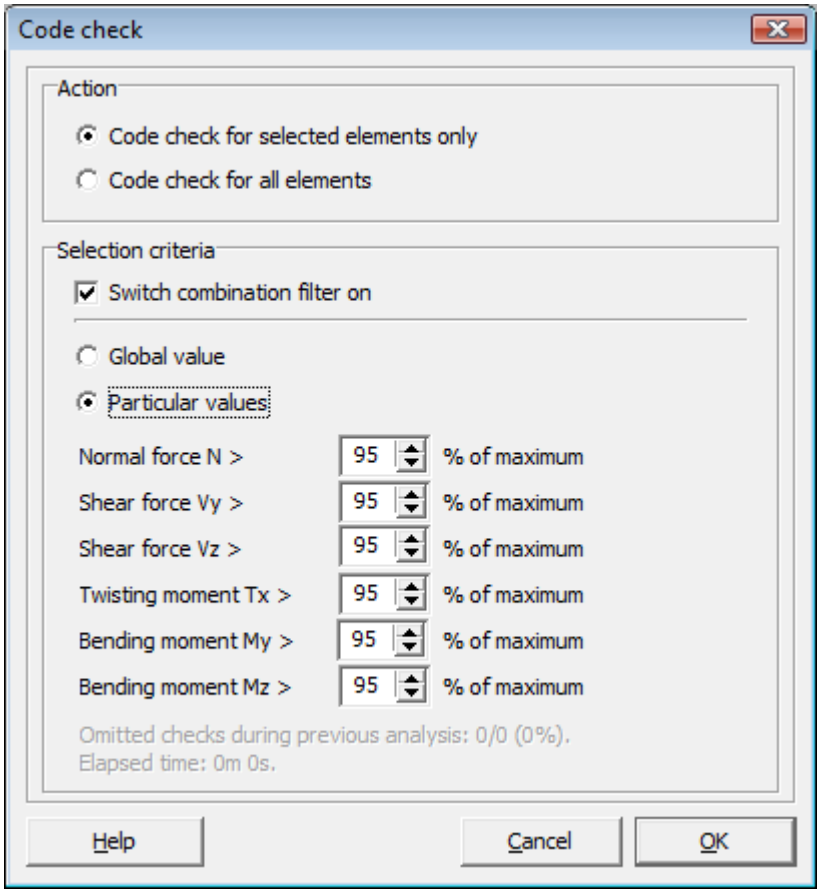
b. *Translate a cut line*
With this known feature you can easily move a cutline within the perimeter of the plate.

These features allow you to give a cutline the correct length. Note that you can only move a cutline in the plane it is drawn. If you fill out lengths, angles or translation distances so that the cutline falls out of the plate, then the cutline will be deleted.

4. Dimensioning

4.1. Filter on load combinations on a steel and timber verification

When performing steel and timber verification, you will see the following dialog as from Diamonds 2012:



In the frame '**Action'** select whether you want to perform the steel and timber verification for the selected bars or all bars.

In the frame '**Selection criteria'** you can specify whether the verification should be done for all combinations or only for those with the most unfavorable internal forces. By performing the verification only for the unfavorable ones, calculation time will decrease.

You can select the most unfavorable combinations by 2 ways:

- By entering a global value so that for each internal force the same percentage is applied;
- By entering a particular value for each internal force

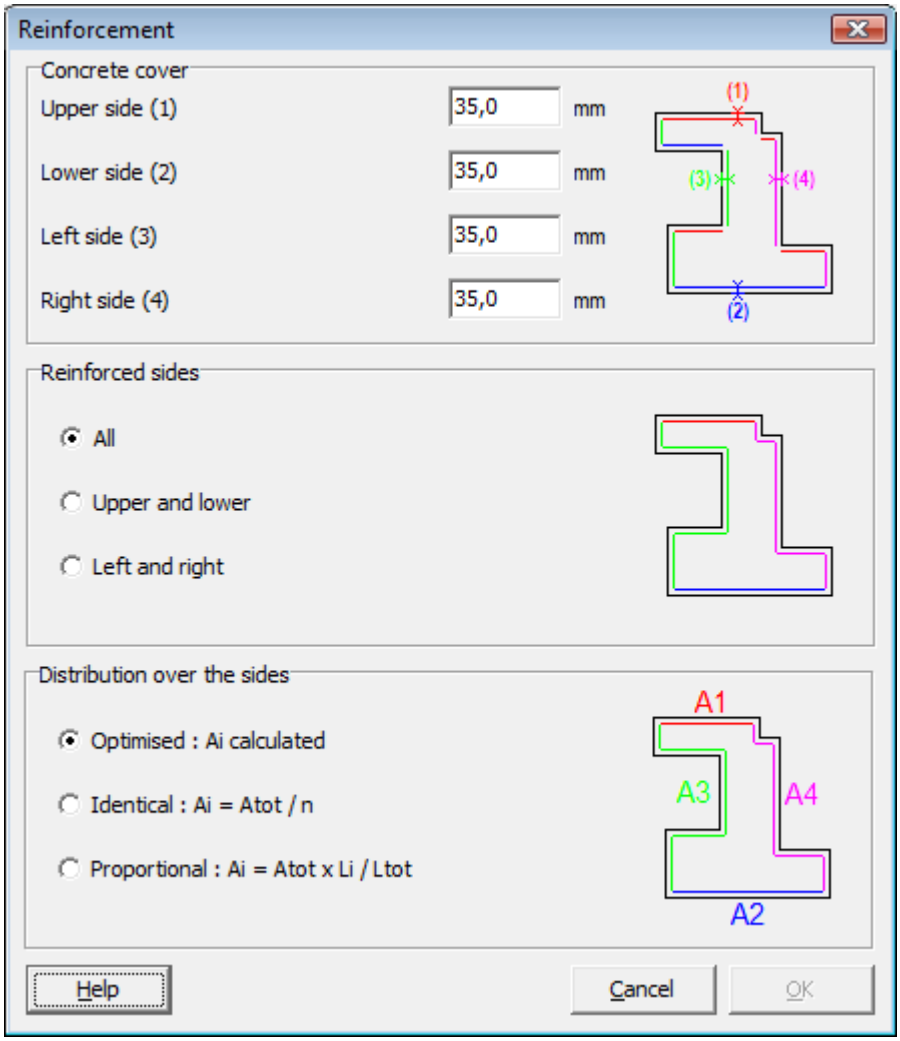
Based on the given percentages, Diamonds will select the combinations with these internal forces.

When you open this window after calculation, Diamonds will display the omitted checks and elapsed time.

Note that if you set the percentages too high, you risk a wrong evaluation. If, for example, you set a limit of 95%, the combinations for which each of the 3 values of M, N and V, reaches 90% will not be verified. However, they pose a potential non negligible risk whereas a combination with a value of M of 95% and the negligible values of N and V may not pose any risk. All precautions in this matter are therefore to be respected.

4.2. Reinforcement distribution

Diamonds 2012 allows you to distribute the reinforcement according to your choice. You can select the desired way by clinking on Gross cover, in the 'Section' window ( ).



You have 3 options for placement:

- All sides
- Upper and lower side
- Left and right side

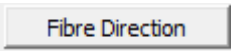
You have 3 options for distribution:

- Optimized
- Identical
- Proportional

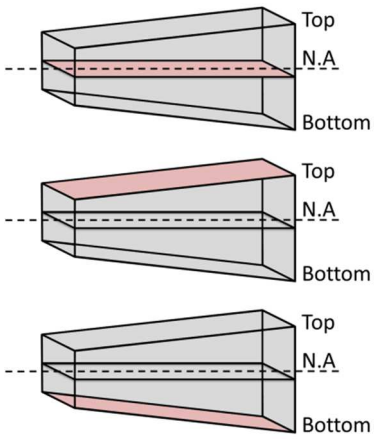
You can combine any placement with any distribution, although in some cases this will lead to less economic quantities. Up to (and including) Diamonds 2011 R04 the options "All sides" and "Optimized" are used to determine the reinforcement.

When you modify the reinforcement distribution and placement for certain elements, you only have to recalculate the reinforcement for these modified elements.

4.3. Fiber direction for timber

For rectangular variable timber sections, an additional button 

is shown in the 'Section' dialog . Here, you can specify the angle between the fiber direction and the axis of the bar. You can choose between:



The timber fiber direction is parallel to the axis of the bar.

The timber fiber direction is parallel to the upper side of section.

The timber fiber direction is parallel to the lower side of section.

Based on the fiber direction set, Diamonds will calculate the angle between the fiber direction and the x'-axis. This angle will be taking into consideration when calculation the resistance and stability according to §6.2.4 of EN1995-1-1.

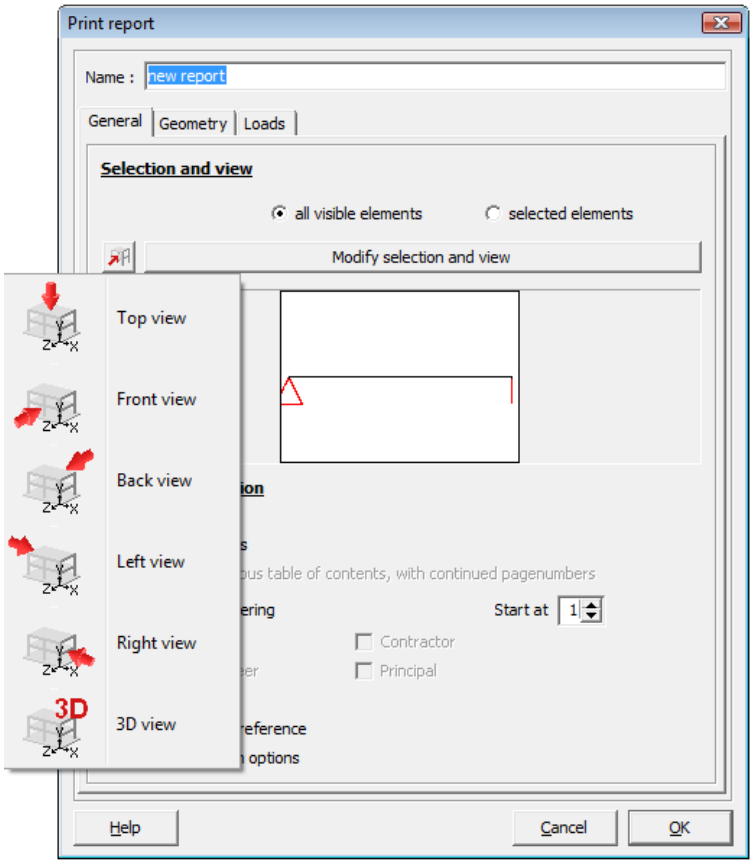
For all other variable timber sections, the fiber direction is set parallel to the axis of the bar.

5. Reports

5.1. Content

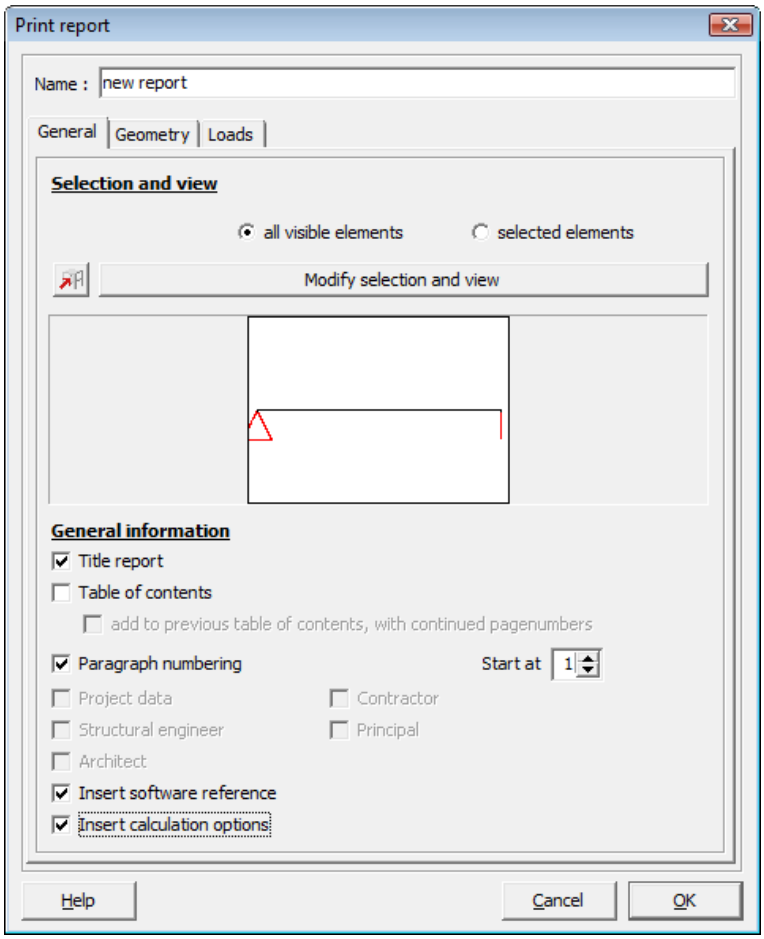
5.1.1. Choosing a basic view

When you click the button , you will see the list with the standard Diamonds views. At the same time the model will be centered a maximized in the window.



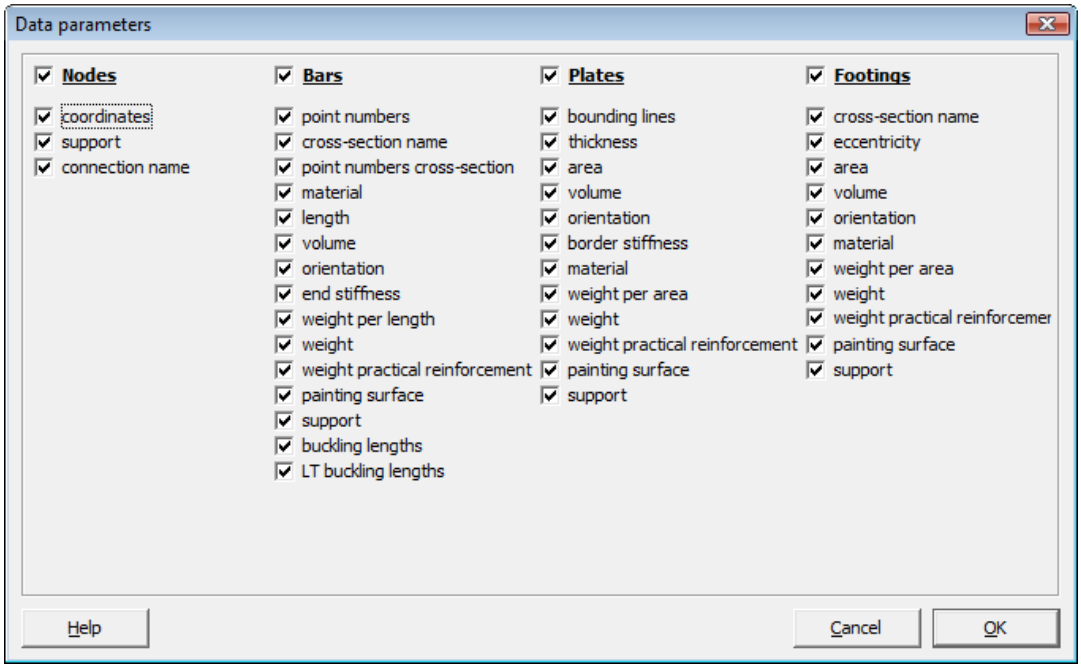
5.1.2. Paragraph numbering

You can for each individual project, choose whether and at what number the paragraph number should start.



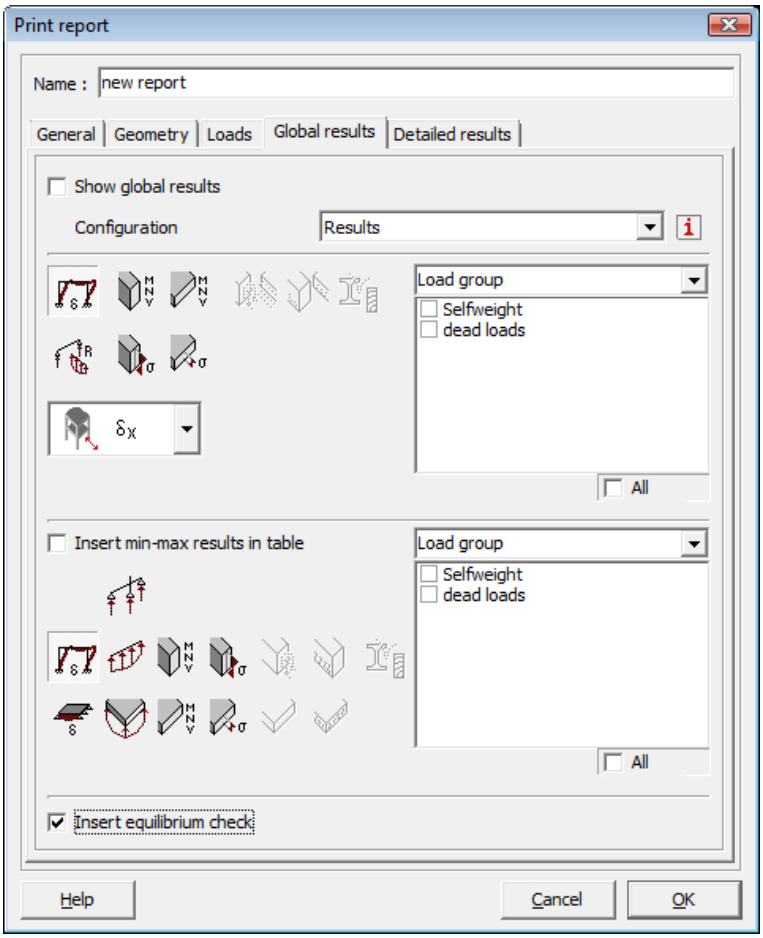
5.1.3. Option select all/none

In all list with data and combinations, you will find the options ‘Select all’ or ‘Select none’.

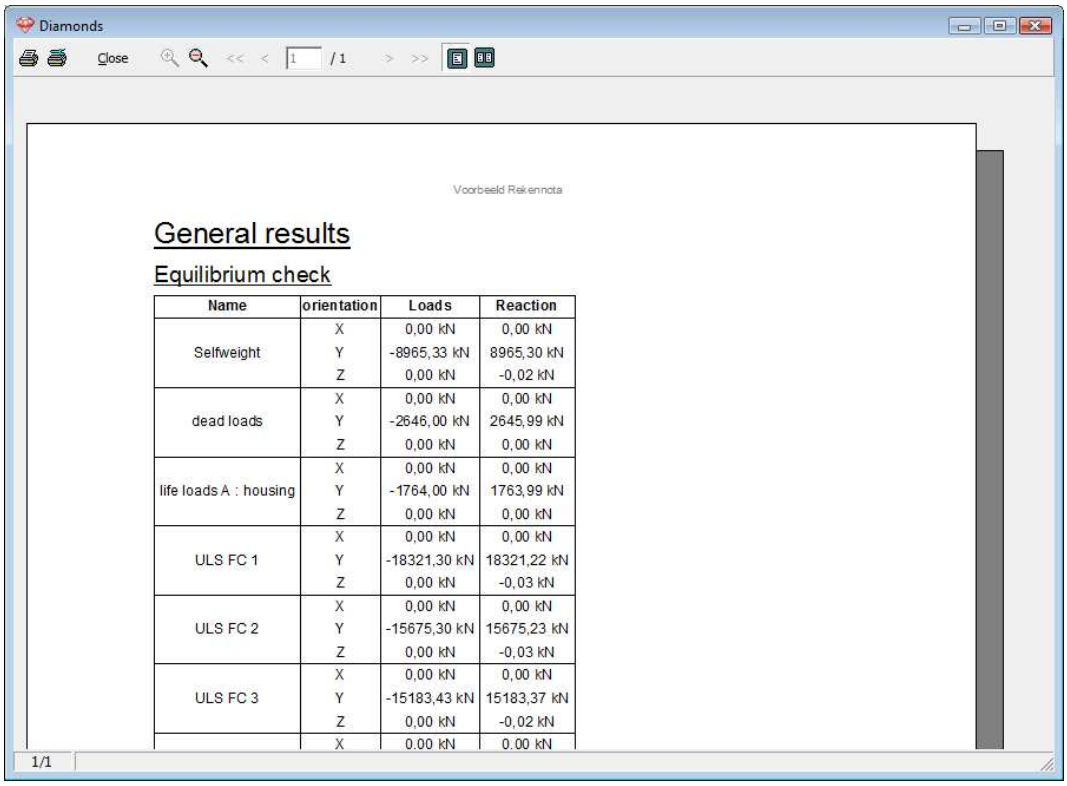


5.1.4. Equilibrium check

In the 'Global results' tab you can opt to insert an equilibrium check in the report.



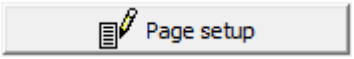
This equilibrium check contains an overview of the vertical and horizontal loads and the resulting reactions for each load combination. The equilibrium check looks like this:



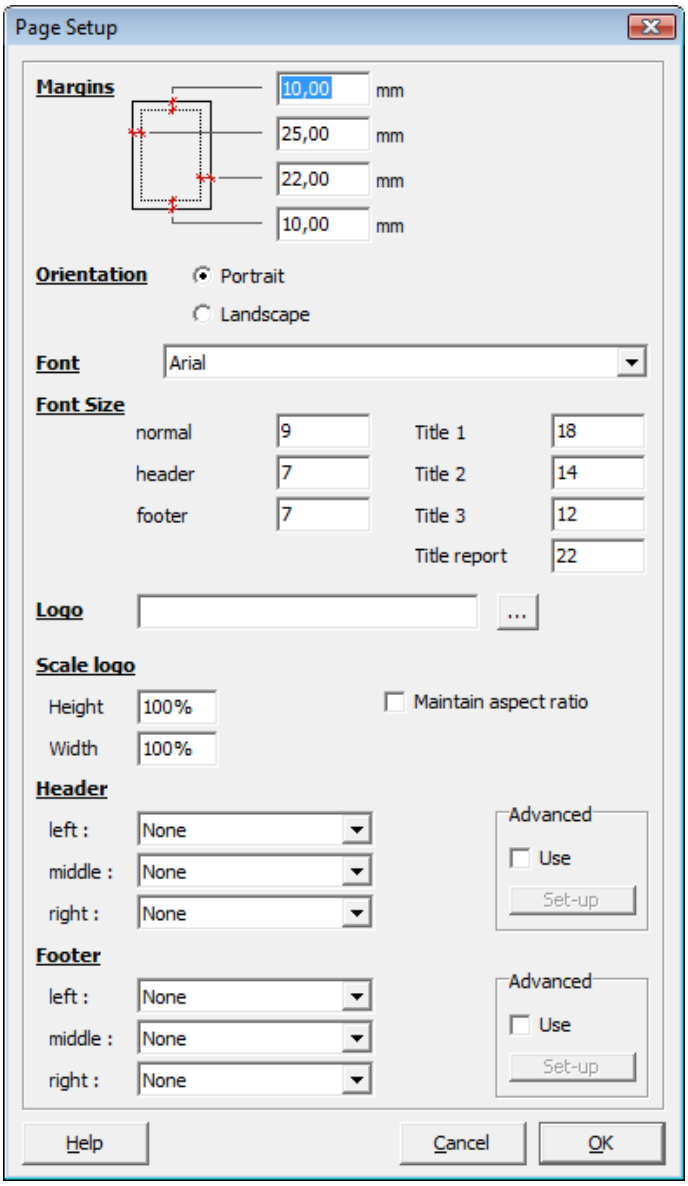
5.2. Lay-out

5.2.1. Logo and font size

When printing a report with Diamonds 2012, you can place a logo in the header or footer.

Open the 'Report Manager' (by using 'File – 'Report Manager' or) and click on 

. The following dialogue box will appear:



To add a logo, follow these steps:

- Click ... to find the logo on your computer
  Note that the logo will be saved for your next projects. Therefore it should be set only once.
- Under 'Scale logo' indicate how Diamonds should scale the logo. By selecting the option 'Maintain aspect ratio', Diamonds will keep the percentage for the width and height equal.
- Finally indicate where Diamonds should place the logo in the report: in the header/footer and on the right/left/middle of the page. The logo is also available in the advanced header or footer.

In this window you can also adjust the font size of the title.