

Automated General Arrangement Drawings

Plane section entity
Automated general arrangement drawings
Drawing view

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Introduction

Plane section entity (PSE) is new object in Scia Engineer. It enables users to prepare fully customized 2D drawings.

General arrangement drawings (Automated General Arrangement Drawings) are a special type of technical drawings. They can be generated using Plane section entity and Drawing view. Predefined drawing styles can be used for easier creation of those drawings. It is also possible to create some automatic content – dimensions, labels.

Plane section entity generates two types of view:

- Model view,
- Drawing view.

In order to be able to create Drawing view, drawing rules (including use of all needed managers and editor) for projection of a section, 2D Dimensions and to insert Drawing view to paperspace, the **GA Drawing** functionality must be selected in Project properties.

2D Linegrid and Dimensions style manager do not require this checkbox to be selected.

Abbreviations:

Automated General Arrangement Drawings - General arrangement drawings

PSE – Plane section entity

AL – autolabel

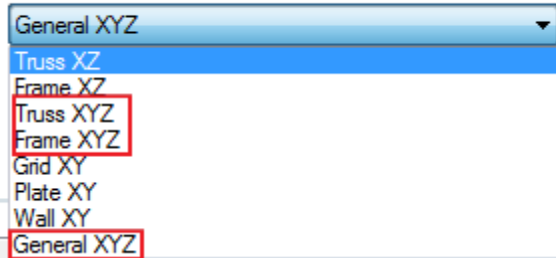
AD – autodimension

Settings for Automated General Arrangement Drawings functionality

Functionality

Automated General Arrangement Drawings functionality is available only for some types of structure: Truss XYZ, Frame XYZ, General XYZ.

Structure:

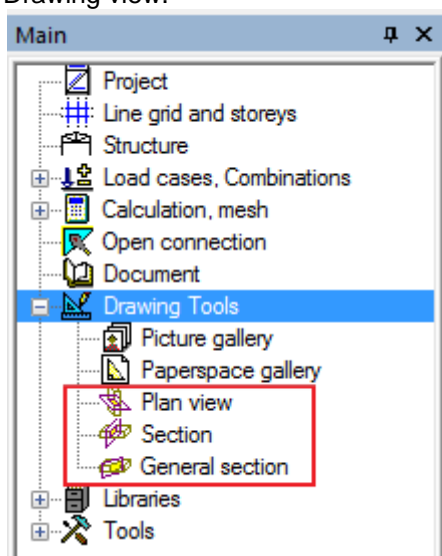


Then Automated General Arrangement Drawings functionality is displayed in the list with functionalities.

Dynamics	<input type="checkbox"/>
Initial stress	<input type="checkbox"/>
Subsoil	<input type="checkbox"/>
Nonlinearity	<input type="checkbox"/>
Stability	<input type="checkbox"/>
Climatic loads	<input type="checkbox"/>
Prestressing	<input type="checkbox"/>
Pipelines	<input type="checkbox"/>
Structural model	<input type="checkbox"/>
Parameters	<input type="checkbox"/>
Mobile loads	<input type="checkbox"/>
GA drawings	<input checked="" type="checkbox"/>
External application checks	<input type="checkbox"/>
Property modifiers	<input type="checkbox"/>

Creating of Plane section entity

Scia Engineer contains Plane section entity. The Plane section is extended by Model view and Drawing view.



Plane section entity

Introduction

Plane section entity (PSE) is a separate object in Scia Engineer. It enables the user to create a 2D projection of the structure. This projection together with dimension lines and labels will be used as a drawing.

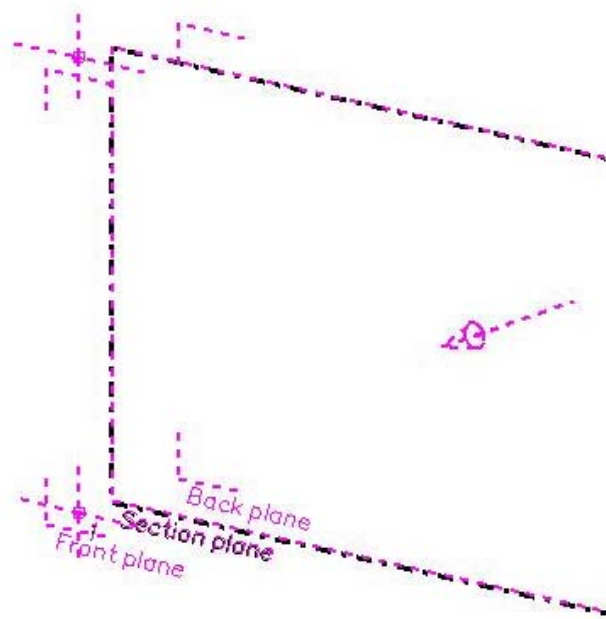
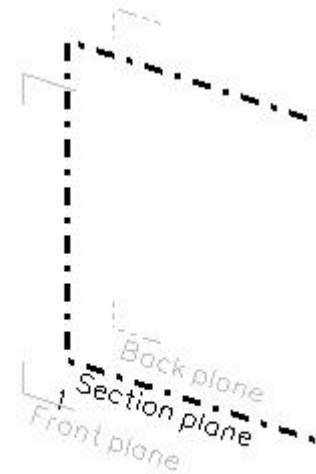
PSEs have their own properties and can be manipulated using standard geometrical manipulations. View parameters are not available in Drawing view, displaying of drawings is controlled by drawing rules.

The PSE consists of 4 basic planes. The meaning of those planes is:

1. Geometry plane (labelled by "1" on the picture) is the real geometry created by the user. Vertices of this plane are used for modifications of PSE shape.
2. Section plane: in this plane the 2D projection of the structure is drawn
3. Front plane: is the front limit of the structure. Structure further from the section plane will not be projected.
4. Back plane: is the back limit of the structure. Structure further from the section plane will not be projected.

The geometry of PSE is a planar polygon and it represents the geometry plane. Positions of other planes are defined in properties of PSE.

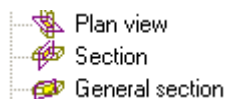
The arrow for the selected PSE shows the user's view direction. The view direction is from the back plane to the front plane. This direction is derived from process of inserting the Plane section.



Types of Plane section entity

There are three basic types of PSE differentiated according to its intended usage:

1. Plan view: created as a polygon in the current work-plane (similarly as a slab is created).



2. Section: user specifies the line and the top and bottom. The section is created according to properties from inserted command (similarly to a wall input). The section is always created as a plane perpendicular to the XY plane of the current UCS.
3. General section: created in the same way as a plan view but this type has identical geometry plane and section plane.

Note:

Geometry of all types of PSE is always a polygon and can be changed any time later - individual vertex points can be moved.

Plan view can be inserted also in XZ or YZ type of work-plane.

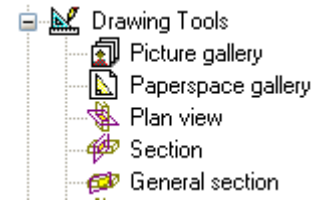
Geometry can be changed also by Table edit geometry.

Note:

Drawing view generates a drawing from the 3D analysis model, the only exception is 1D members like plate rib.

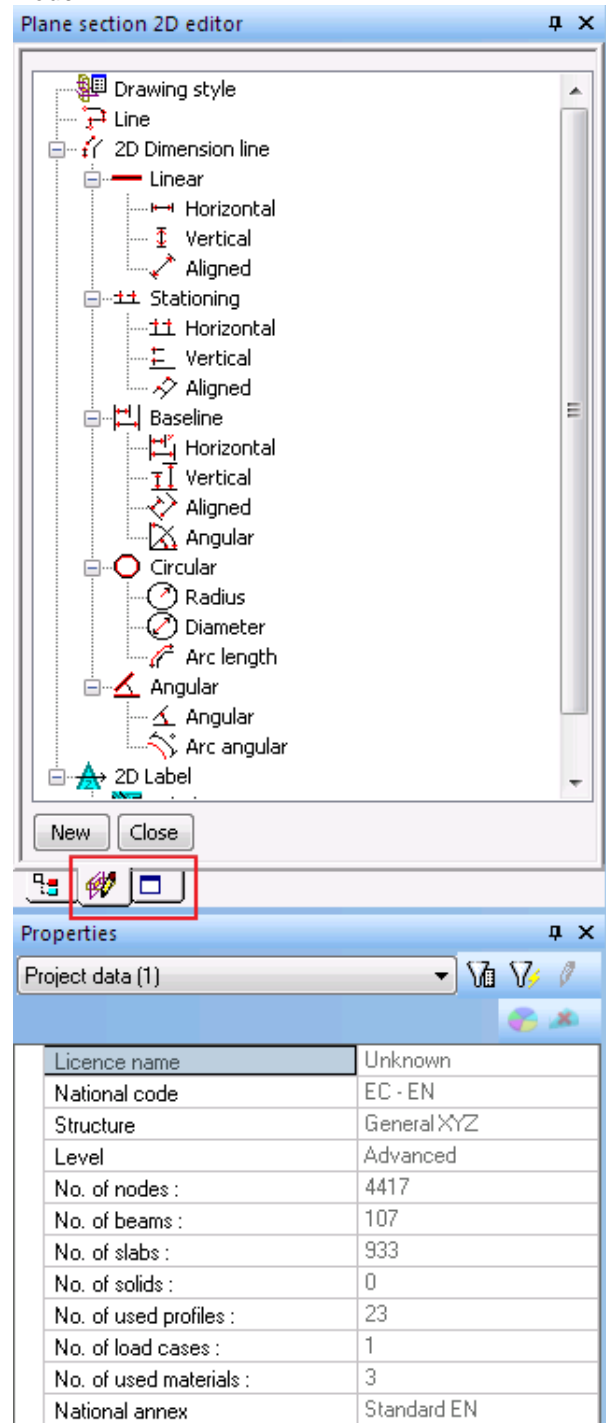
Creating new PSE

Inputting commands for PSE are accessible from main group "Drawing tools". Three basic types are available.

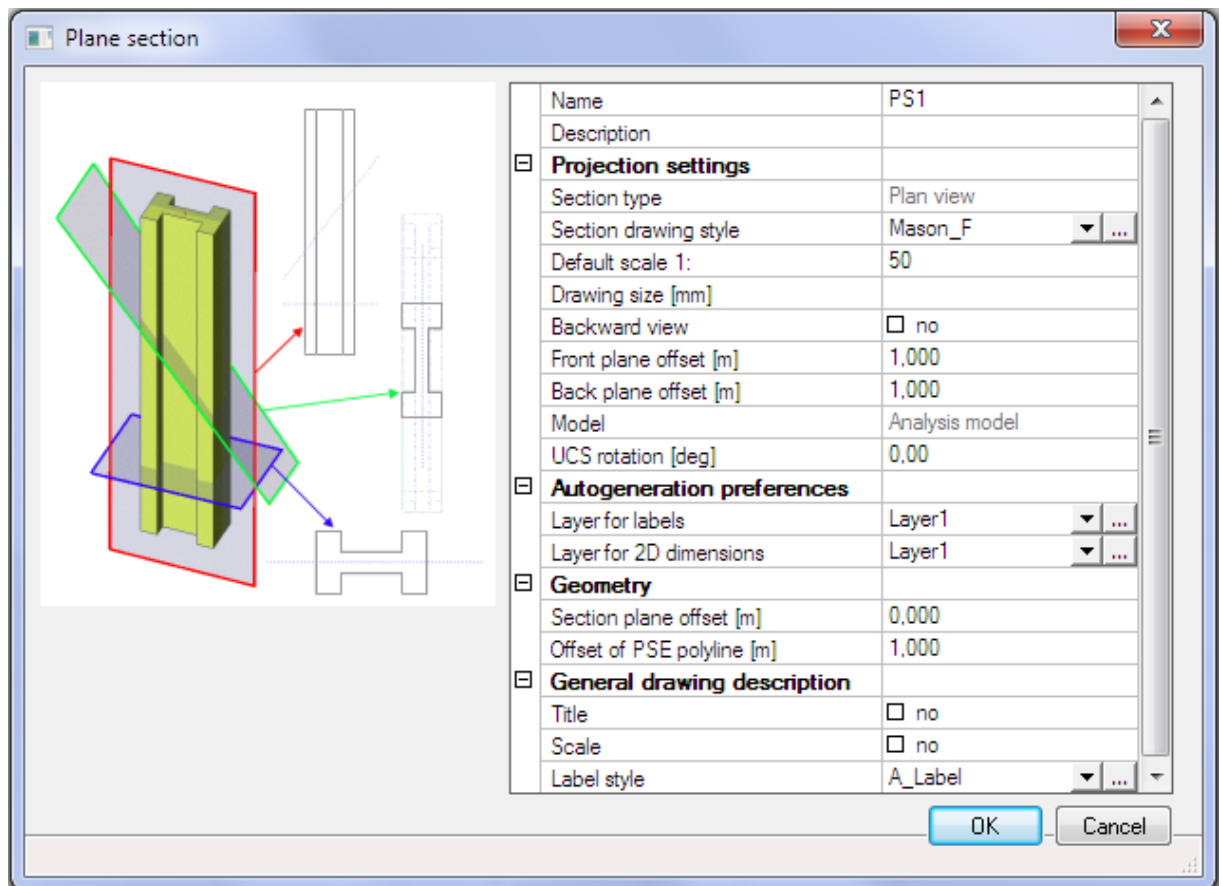


Note:

When the user creates a PSE then the application opens tree menu called 2D editor. If, together with the 2D editor tree menu, also the Structure service is opened, the Drawing view has no properties to prevent deleting PSE in 3D model.

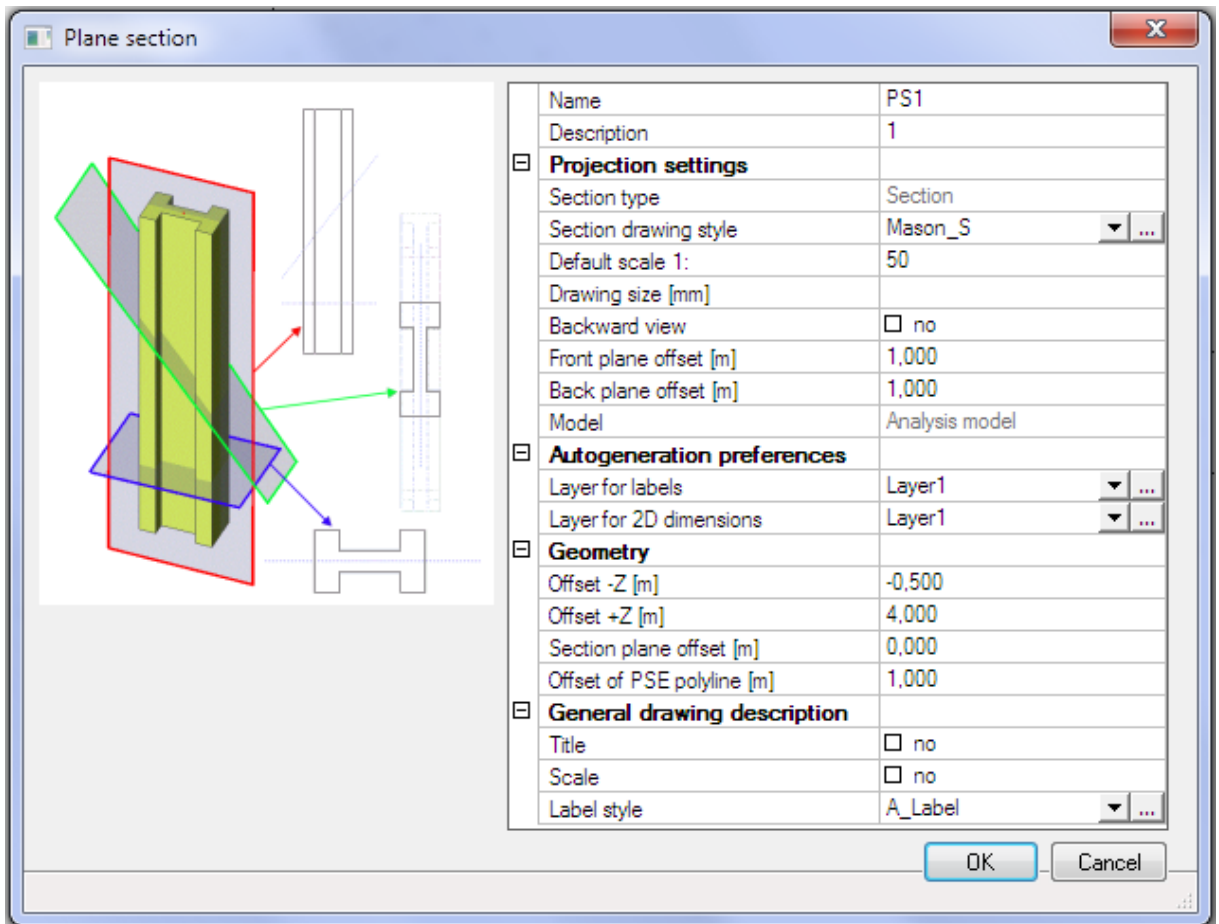


New PSE – Plan view



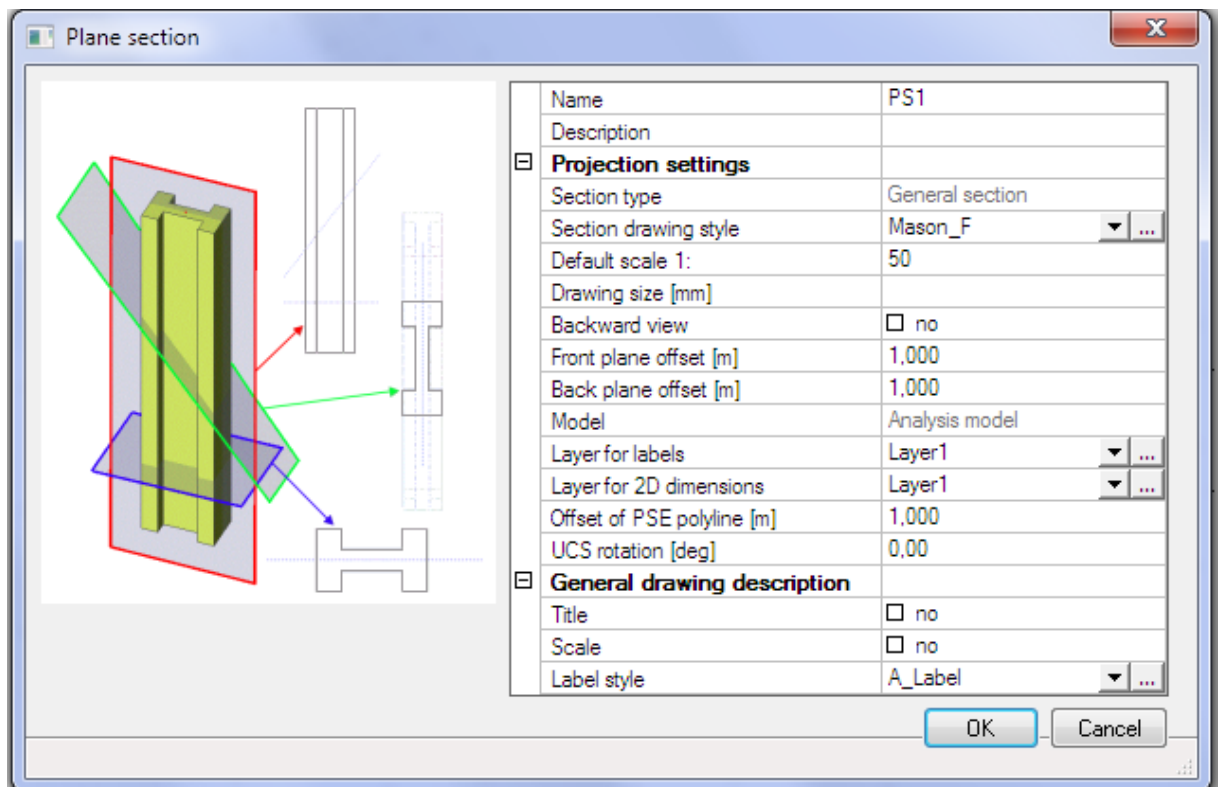
The plane section dialog with properties is displayed as the first step in creating each PSE. The plan view is defined by a polygon graphically inserted to the working plane. Each PSE has its default Drawing style in the properties. The Refresh button for generation of the drawing is displayed as an action button in the properties of already created Plane section.

New PSE – Section



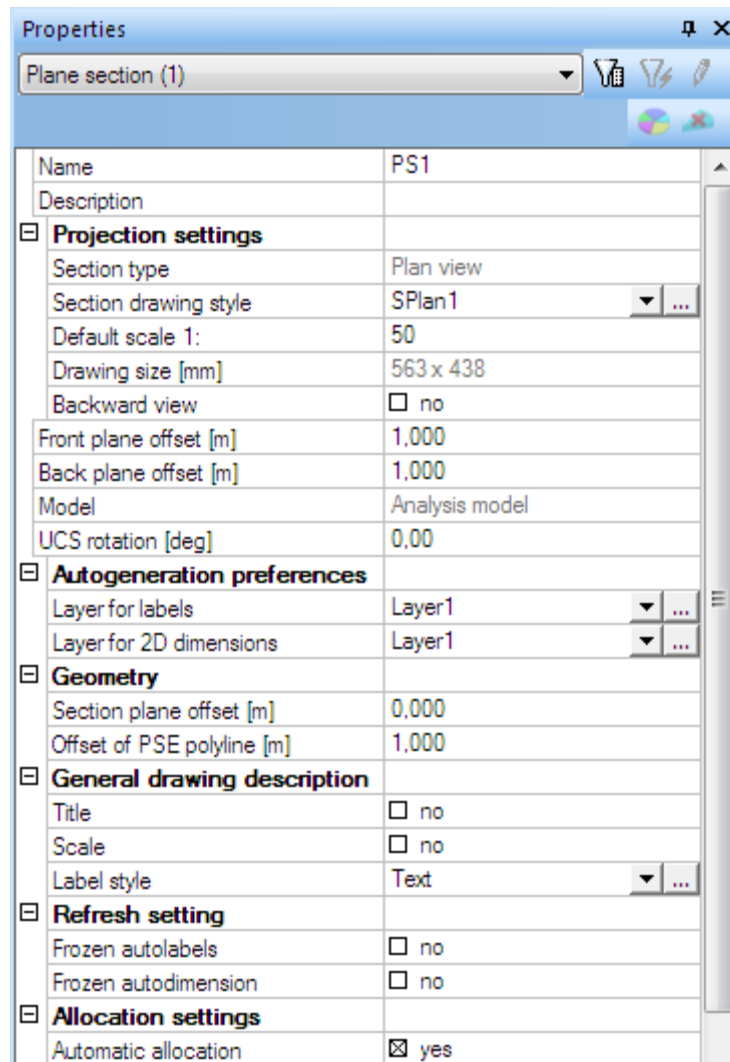
The Property dialogue for insertion of a Section is similar to the property dialogue for Plan view, but the geometry is limited in the Z direction by offset $-Z$ and $+Z$ (The same definition as for a wall).

New PSE – General section



Input of a General section is similar to the input of the Plan view. Only the Section plane offset property is missing.

Properties of plane section



- **Name:** standard property for all entities in Scia Engineer
- **Description:** the “real” name of the section (plan view). It can be changed in the property dialogue. Only type Section fills in the Description automatically by a number.

Note:

The description is automatically numbered for copied or newly created sections.

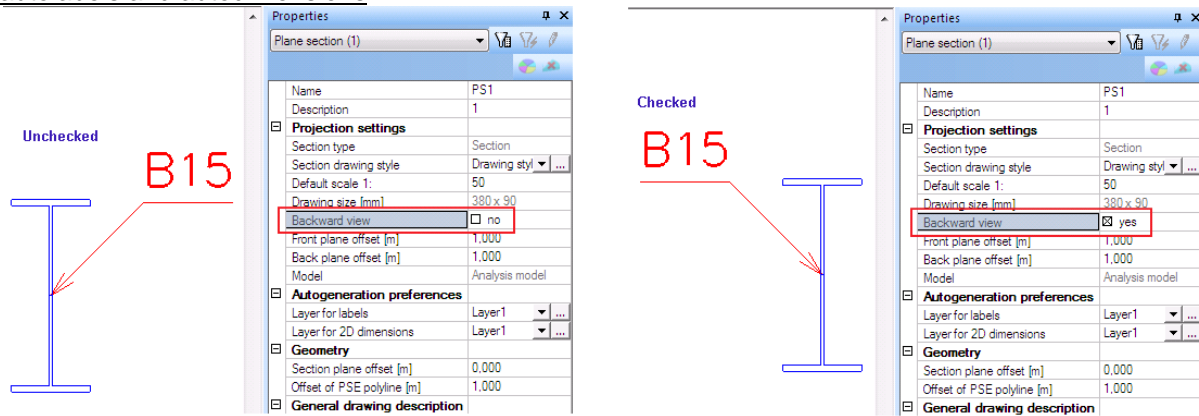
- **Section type:** information about section type. See separate chapter
- **Section drawing style:** list of available drawing styles. The selected drawing style is used for creation of the projection. See separate chapter.
- **Default scale:** the scale which is assigned to a picture when it is placed on the paperspace or when it is placed to the picture gallery. Displaying of projection in Drawing view is based on this scale (see separate chapter). This scale is compared with “Intended scale” (see Drawing style) and when it does not match a warning message is displayed.

Note:

The scale in the picture gallery is automatically generated only during insertion of the picture. Further changes of scale will not affect the Drawing view.

- **Drawing size:** the size of the drawings in selected units (settings are in Setup>Units>Geometry>Length-drawing), it is calculated according to the scale of the PSE.

- Backward view: mirrors the whole Drawing view scene – generated structure, autolabels and autodimensions



- Front plane offset (m): the distance between “Section plane” and “Front plane”, only positive values are accepted
- Back plane offset (m): the distance between “Section plane” and “Back plane” , only positive values are accepted

Note:

Geometry of Front and Back plane can be changed by function “modify vertexes”.

- Model: the user can select which model will be used for generation of the projection. The structural model can be selected only when the Structural model functionality is checked. In this case all Autolabels are generated to the centreline of the Structural model (not Analysis model) and the projection is generated according to the structural model.
- UCS rotation: the angle of UCS of appropriate PSE
- Layer for labels: The layer for all labels created in the Drawing view
- Layer for 2D dimensions: The layer for all 2D dimension lines created in the Drawing view

Note:

Layers can be changed either during the definition of PSE or later.

- Section plane offset: the distance between “Geometry plane” and “Section plane”
- Offset of PSE polyline: the function for enlargement of the PSE geometry, only positive values and zero are accepted, this offset is applied to all the sides of the PSE polyline
- Title and Scale: Places autolabels to the drawing, Title is generated from the “Description” and Scale from “Default scale 1:...”

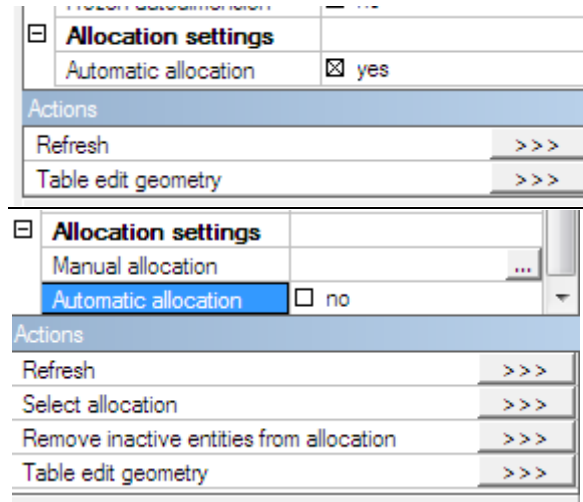
Note:

The visibility of Title and Scale is handled by checkboxes. When a particular label is moved, it keeps its position during unmarking and marking of the checkbox. Action button Reset modifies their position to the default. The change of Label style affects Title and Scale immediately.

- Frozen autolabels: checking of this checkbox disables any changes for autolabels – it is frozen for refresh and reset action button
- Frozen autodimensions: checking of this checkbox disable any changes done for autodimensions – it is frozen for refresh and reset action button

Frozen autolabels	<input type="checkbox"/> no
Frozen autodimension	<input type="checkbox"/> no

- Allocation settings: the list of entities which will be projected on the Section plane
- Automatic allocation: all entities between the front plane and back plane are included to Filtered allocation. Other entities are removed from the allocation
- Manual allocation: list with available and selected entities for allocation

**Note:**

Automatic allocation: allocates automatically all entities included in PSE, i.e. between the front and back plane of PSE, by default it is checked. When it is unchecked – Manual allocation is possible and new action buttons appear.

Manual allocation: the user can choose entities in allocation using graphic selection (by Select allocation action button) or from a list.

The projection is created from all entities included in the Filtered allocation. It is independent on activity settings.

Action buttons:

- **Refresh:** recreates the projection of the structure on the Section plane, refreshes autolabels and autodimensions according to the rules. It can be used for multirefresh (for more selected PSE in 3D model).

Note:

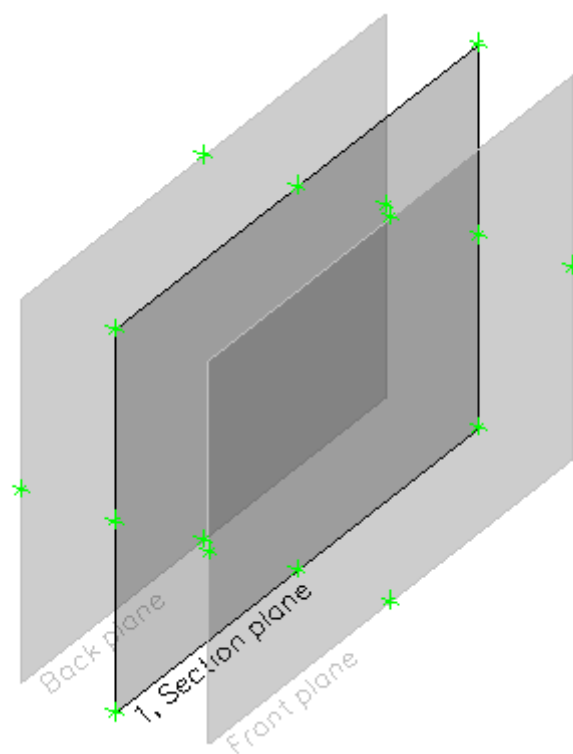
To see the projection in 3D window, relevant view parameter must be switched ON (see chapter about the Drawing view)

- **Reset:** erases autolabels and autodimensions, also their position is changed to the default if they are not frozen
- **Select allocation:** graphical selection of allocated entities
- **Remove inactive entities from allocation:** entities currently inactive are removed from the Filtered allocation
- **Table edit geometry:** standard tool for manual editing of a polygon (PSE geometry) shape

Change of PSE geometry using “Move vertexes” function

Moving of corner vertexes on Geometry plane influences the shape of PSE polygon itself. Corner vertexes can be moved only in the plane of the Plane Section Entity.

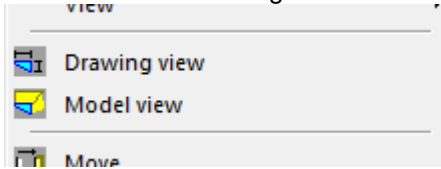
Moving of vertexes in the middle of edges influences the value in the properties describing the position of the planes (see description of the properties). The inner vertexes can be moved only perpendicularly to the plane of the Plane Section Entity.



Views of structure generated by Plane section entity

Drawing view and model view

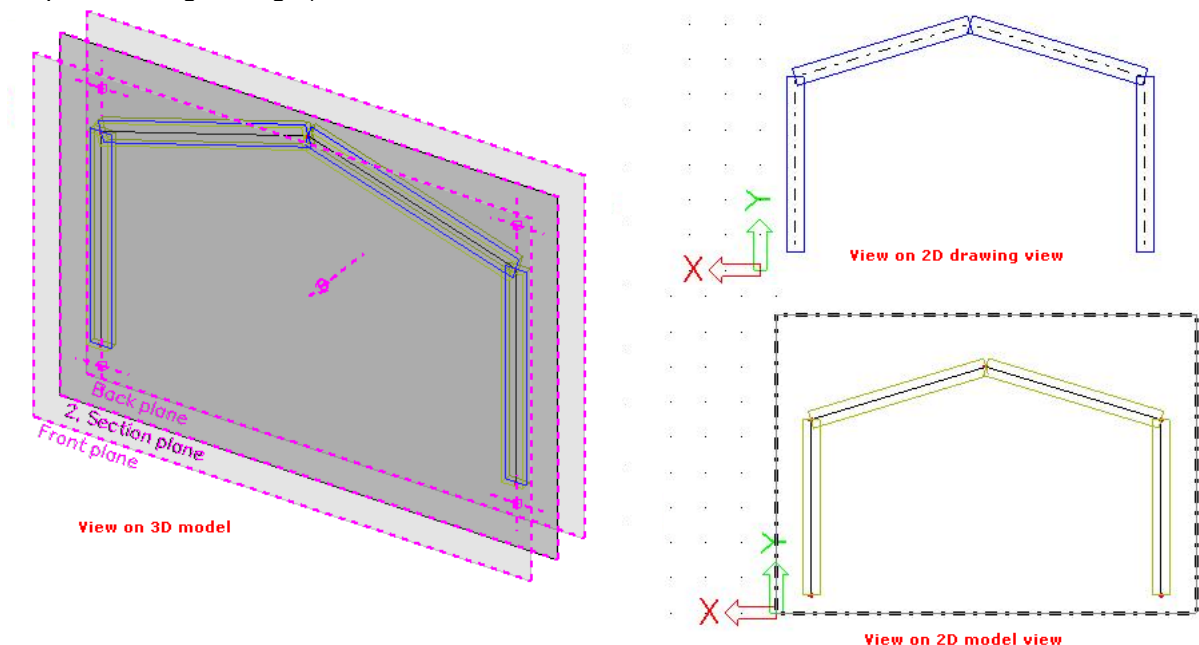
New types of window are available only after at least one Plane section entity has been defined. Model view and Drawing view. Both are 2D but they display the structure in a different way.



Both views can be opened from the pop-up menu when a PSE is selected. The view direction is fixed, rotation is disabled there. It is also possible to switch between windows using CTRL+TAB.

Another possibility is to open the Drawing view using the Drawing manager. There is a list of defined PSEs with a checkbox for every defined PSE. Checked PSEs open the Drawing view after confirmation by OK.

The properties of the active (highlighted) PSE are displayed in the right part of the dialogue (see chapter Drawing manager).



Model view

The Model view is in fact the same as a 3D window, but it has fixed view direction (perpendicular to the section plane) and it has fixed workplane (equal to the geometry plane). When creating a new model view the clipping box is switched ON and its boundary is set according to the Back plane and Front plane of the parent PSE.

All functions from the 3D window are available in the model view. The structure can be modified, new entities can be inputted here.

Drawing view


Drawing view is a new special type of window. It is 2D in the same way as the Model view, but what is displayed in it is not based on view parameters but on drawing styles.

Drawing view has the same status as e.g. document. It has its own tree and its own toolbars.

In this drawing view the user can edit (fine tune) the drawing generated on the Plane section entity. Objects from the tree can be added to the PSE. They are stored together with the Plane section entity and they are visible only on PSE to which they were added.

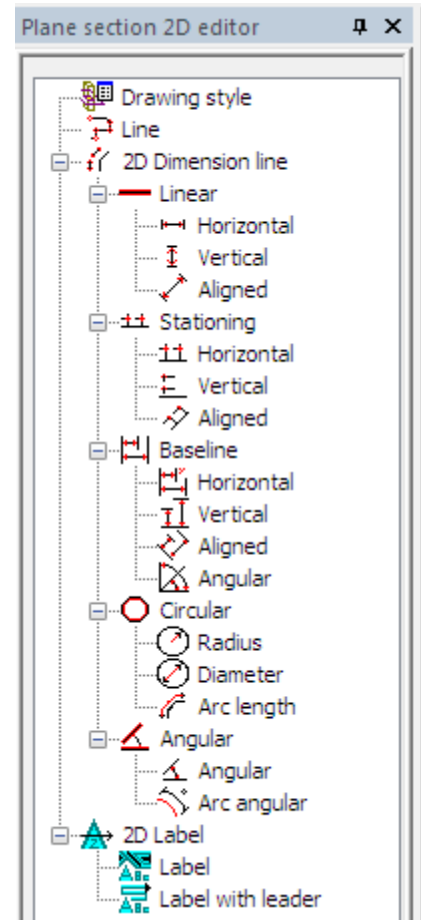
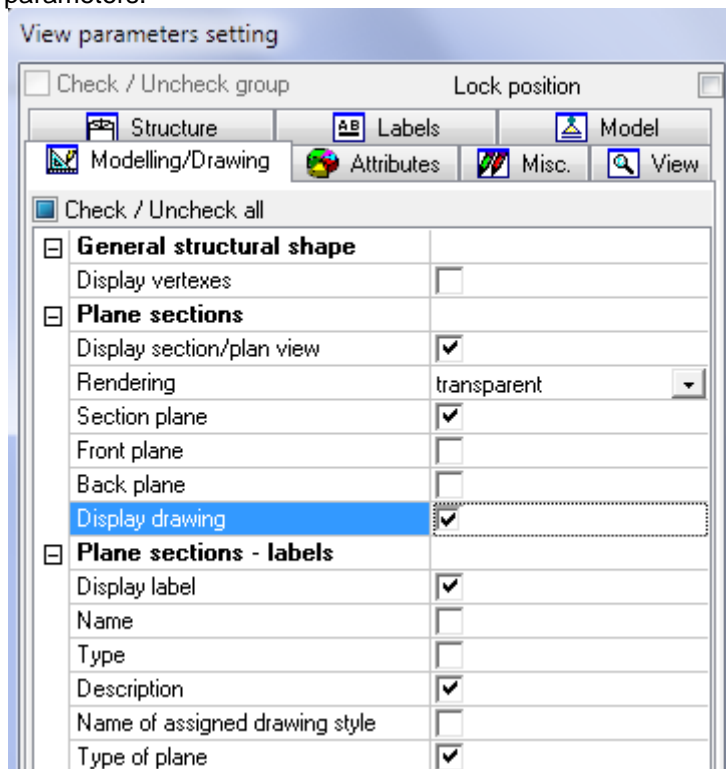
Any object from the model can be selected in the drawing view and its properties can be changed, they can be manipulated or deleted, but it is not possible to create new model objects (members, add data, etc.)

Note:

The button Regenerate view  of structure does not refresh the Drawing view. To refresh the Drawing view the user needs to click the refresh action button.

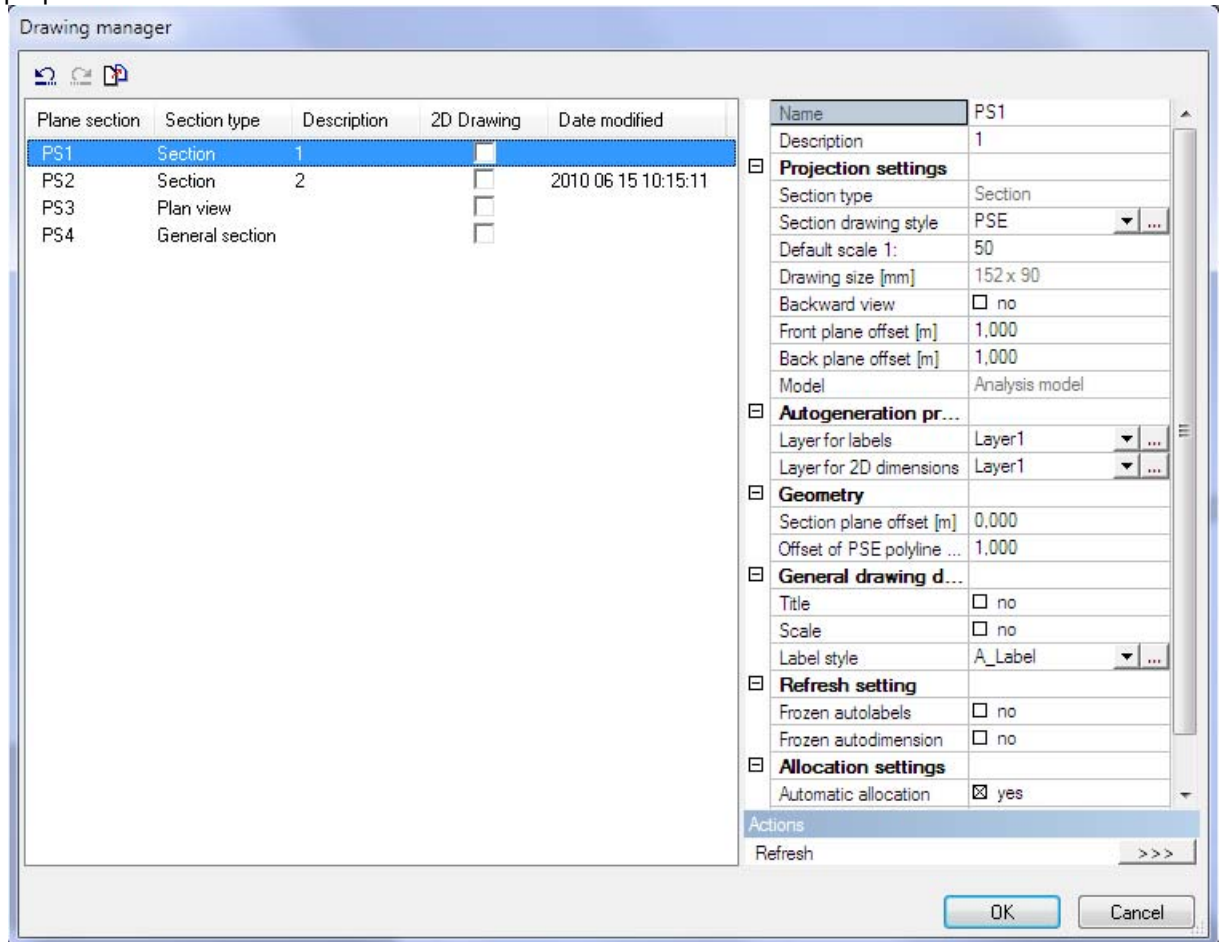


The display style of Projection in the 3D model is set in View parameters.



Drawing manager

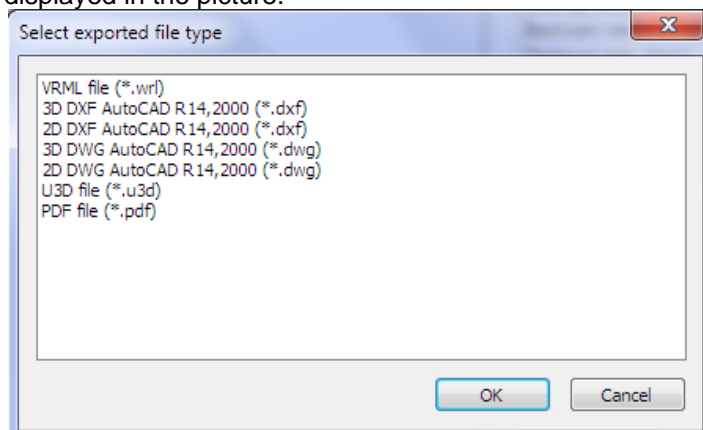
The Drawing manager dialogue can be used to select and open Drawing views and to edit their properties.



The left side of the dialogue shows a list of PSEs (including some details) available in the model and check boxes for Drawing views. The Date modified item detects when the drawing was refreshed for the last time. The right side of the dialogue shows the properties of the selected PSE. The check boxes select the PSEs that will be opened in Drawing views.

The properties of the PSEs can be changed in this dialogue. The multi select and multi edit options are possible (including "Ctrl + A" to select all).

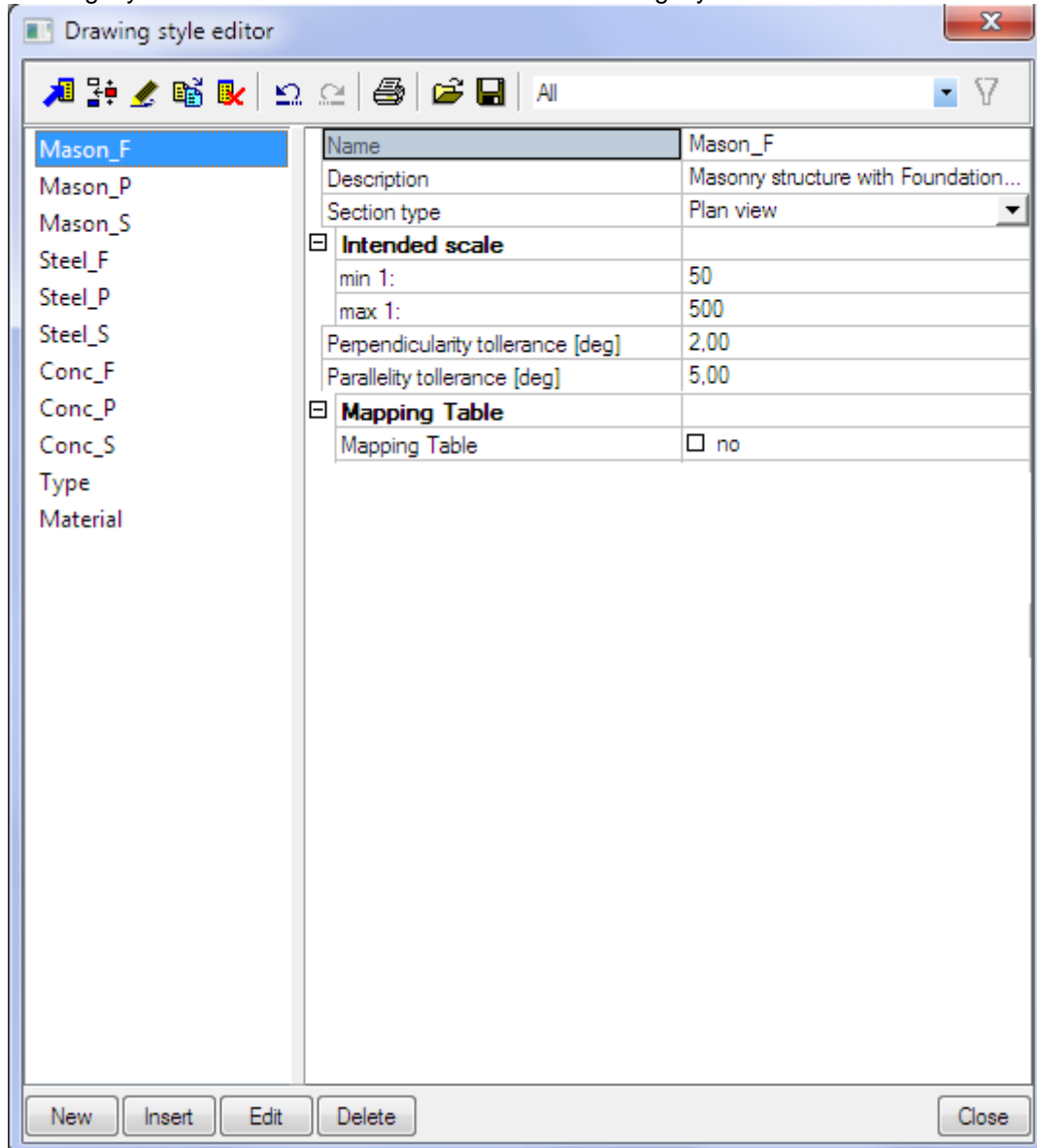
Undo and Redo functions are available to undo or redo the user's changes in the dialogue. Next the Undo/Redo there is a button for mass export of selected PSEs to various formats – the list is displayed in the picture.



2D drawing generation

Drawing style editor

Each PSE has assigned one drawing style – how the projection will be displayed. The existing Drawing styles can be reviewed and edited in the Drawing style editor.



Note:

Drawing styles can be stored / read in DB4 format as other library entities in Scia Engineer

Each Drawing style has these properties:

- Name: name of Drawing style
- Description: specification of possible use of Drawing style
- Section type: Section/Plan view/Both – if a Drawing style is defined only for Section or Plan view – then during creating of a new Section only those Drawing styles are displayed in the properties. Option Both says that the Drawing style can be used for both Sections and Plan views, it is displayed for each type of a new PSE.
- Scale: min - max: informative value for “users” of the drawing style. The range of intended scale is compared to the “Default scale” (property of PSE).

- Perpendicularity tolerance: it is connected with drawing rule “Direction” – tolerance for lines that are to be considered perpendicular to the section plane
- Parallelity tolerance: it is connected with drawing rule “Direction” – tolerance for lines to be considered parallel with the section plane
- Mapping table: see separate chapter

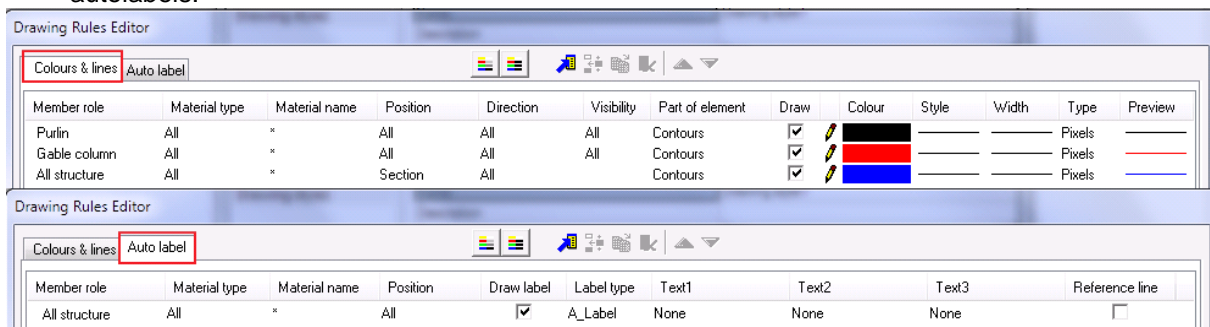
Drawing style

Drawing styles are handled by a standard Library manager. The detailed setup of a drawing style (Concept of drawing rules – see separate chapter) is accessible using the “Edit” function.

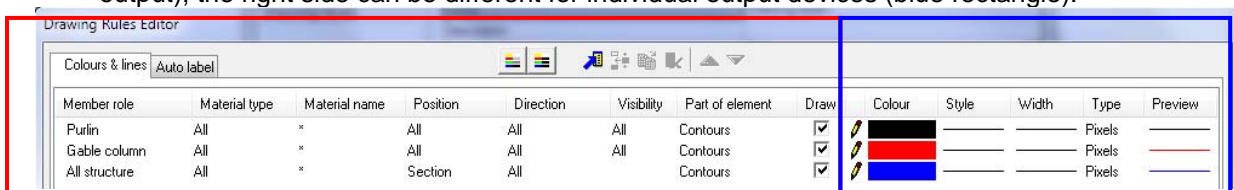
Name	Drawing style 1
Description	
Section type	Both
<input checked="" type="checkbox"/> Intended scale	
min 1:	50
max 1:	500
Perpendicularity tolerance [deg]	2,00
Parallelity tolerance [deg]	5,00

Definition of drawing rules

There are two types of rules available: i) rules for lines, hatches and fillings; ii) rules for autolabels.

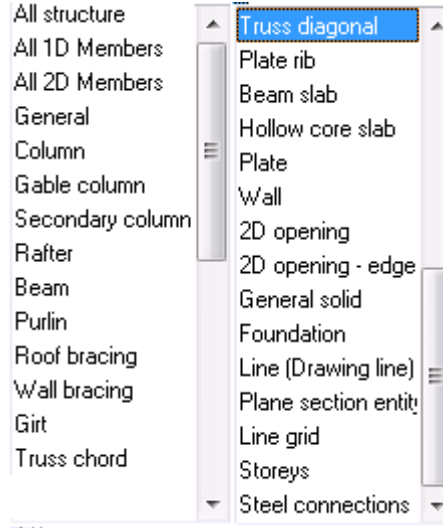


Drawing rules has two different parts, the left side is formed by the definition conditions and the right side is the specification how the structure matching the conditions is to be projected. The left part (condition – red rectangle) is the same for all output devices (screen, document, graphic output), the right side can be different for individual output devices (blue rectangle).

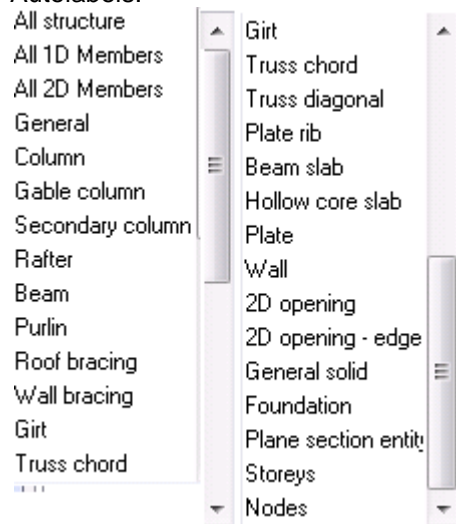


- Member role: the user can select specific structural type (could be different for lines and autolabels)

Colours & lines:



Autolabels:



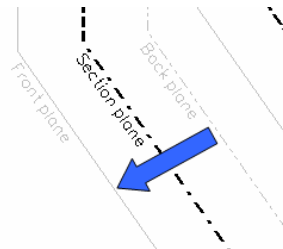
Some types of member role have disabled a part of settings (material, position, etc...).

- **Material type:** the user can select a specific material
- **Material name:** specification of material by a text string (e.g. C12/15)

- **Position:** the user can select the position of the part for which the rule will be applied. Standard view direction is from the Back plane towards the Front plane.



- **Direction:** the user can select the direction of the line for which the rule will be applied. It is possible to set tolerances for perpendicular and parallel direction in the properties of drawing rule.



- **Visibility:** this condition specifies whether the rule will apply to visible or hidden or all lines.



Note:

The rule for a hidden part of structure can be used only with a rule for a visible part, otherwise it has no meaning.

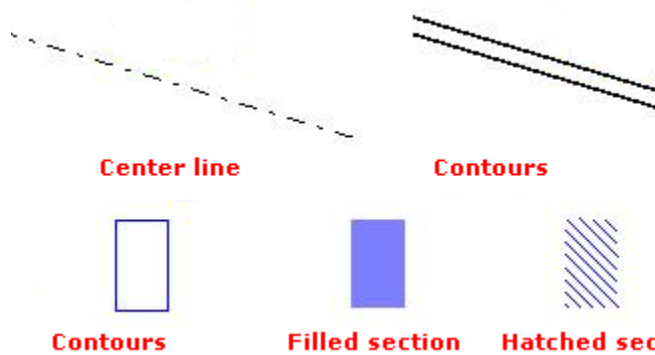
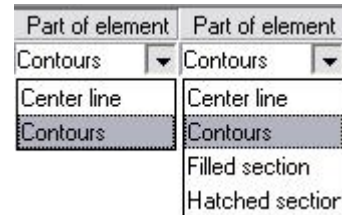
Note:

Drawing style where all Visibility conditions are set to "All" does not need evaluation of hidden lines and is faster than a style where the visibility must be evaluated.

Note:

Visibility condition is disabled for Position = "Section".

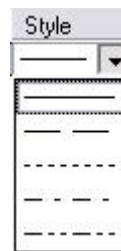
- **Part of element:** this condition specifies which part of the element will be projected by this rule. There are different Parts of element available for Position = "Section" and different for other positions.



- **Draw:** controls the drawing of the element, if it is checked then the respective part of the element will be displayed according to the rule. Important is the position of the rule in the list of drawing rules and whether it is checked or not – first rule in the list has the highest priority.



- **Colour:** specifies the colour of the projection.
- **Style:** defines the line type of the projection.



- **Width:** specifies the line width of the projection.



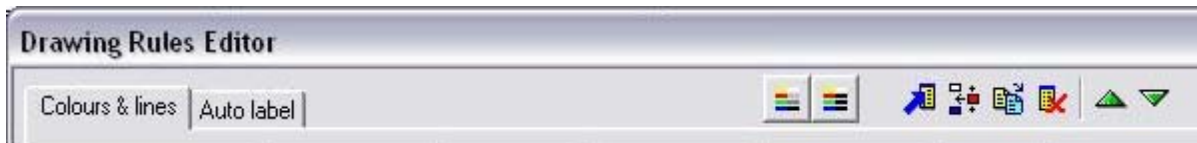
- **Type:** selects the type of unit for the line width. If the type is metric then the width will be listed in mm. If the type is in pixels then the width will be listed in pixels.



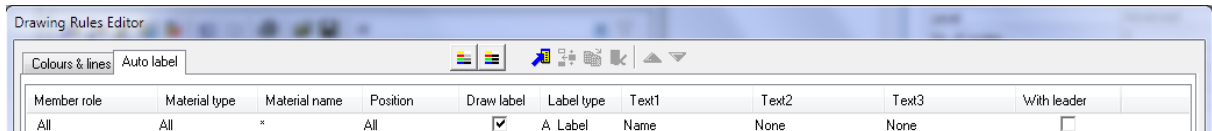
- **Preview:** shows the preview of used lines, hatches and styles.



Concept of drawing rules



- Buttons to convert the tab to grey scale or to black and white
- Standard buttons – new, insert, copy, delete
- Buttons moving the selected row up or down – important for specification of higher priority of the rule



Drawing rules can be specified for lines (hatches, filled polygons) and for Automatic labels. Drawing rules define how parts of the structure will be projected on the section plane. The user can specify a predefined set of conditions (columns) and then specify how the lines matching the condition will be displayed (pen colour, thickness, hatching, colour of filling) or labelled. The dialog for drawing rules is similar to the dialog for palette setting. The concepts of drawing rules for lines and labels are:

1. the priority of rules is based on the order of the list (with exception for the same rule for back, section or front position of the projection)
2. the more general the rule is the lower priority it should have: (see example b)

Example a)

Member role	Material Type	Material Name	Position	Direction	Visibility	Part of element	Draw	Colour
Column	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>	
All Structure	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>	

Such drawing style will project contours of concrete columns as red lines, contours of all other elements will be displayed as black line.

Example b)

Member role	Material Type	Material Name	Position	Direction	Visibility	Part of element	Draw	Colour
All Structure	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>	
Column	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>	

Such drawing style will project all elements as black lines because the first row has higher priority than the second one. This would be more-likely the mistake in drawing style specification because nothing will be generated by the second drawing rule.

Example c)

Member role	Material Type	Material Name	Position	Direction	Visibility	Part of element	Draw	Colour
All Structure	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>	
Column	All	*	All	All	All	Center Line	<input checked="" type="checkbox"/>	

Such drawing style will project all contours of structure parts as black lines and then center lines of all columns will be generated as red line. In this case the order of rules is not important as the rules are for different element parts and therefore are independent. The same projection will be displayed by a drawing rule with reverse order.

Exception for Back, Front and Section in the same type of rule – see Advanced tips.

Example d)

Member role	Material Type	Material Name	Position	Direction	Visibility	Part of element	Draw	Colour
Column	All	*	All	All	All	Contours	<input type="checkbox"/>	
All Structure	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>	

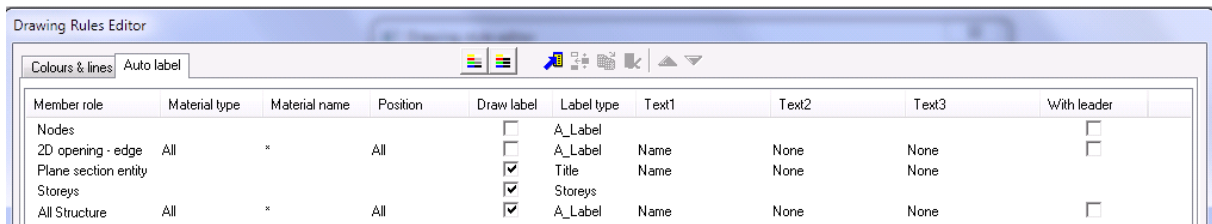
Such drawing style will project contours of all structure parts as black lines except columns. Columns will not be projected (see unchecked checkbox).

Example e)

Member role	Material Type	Material Name	Position	Direction	Visibility	Part of element	Draw	Colour
All Structure	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>	

This drawing rule will project contours of the whole structure as black lines without any exception.

Definition of rules for Auto labels

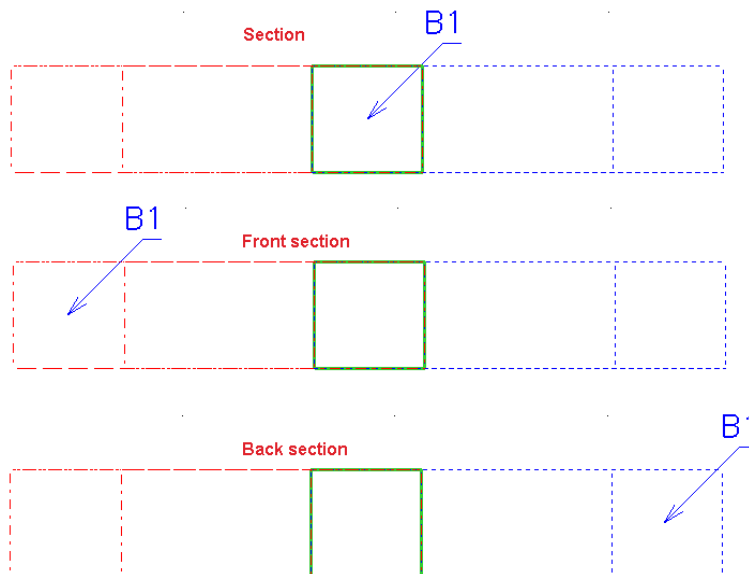
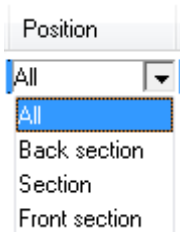


The definition part of rules for Autolabels is similar to the drawing rules for lines. In the specification part the user can select a label type from the existing label types stored in the Label type manager (see separate chapter). Then automatic texts are available (according to the Member role). Those texts are then used as text values of labels during their regeneration.

Note:

More about Autolabels – see separate chapter about Labels

- **Member role:** the user can select specific structural type (could be different for lines and autolabels)
- **Material type:** the user can select a specific material
- **Material name:** specification of material by text string (e.g. C12/15)
- **Position:** the autolabel is generated at the selected part of member, option "all" ensures placing of autolabel even when it is only in front or back plane

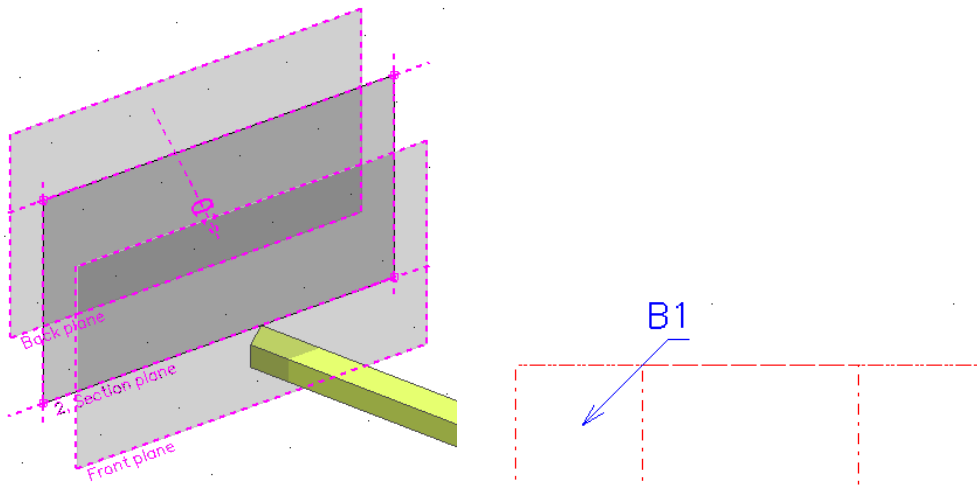


Note:

Position – ALL

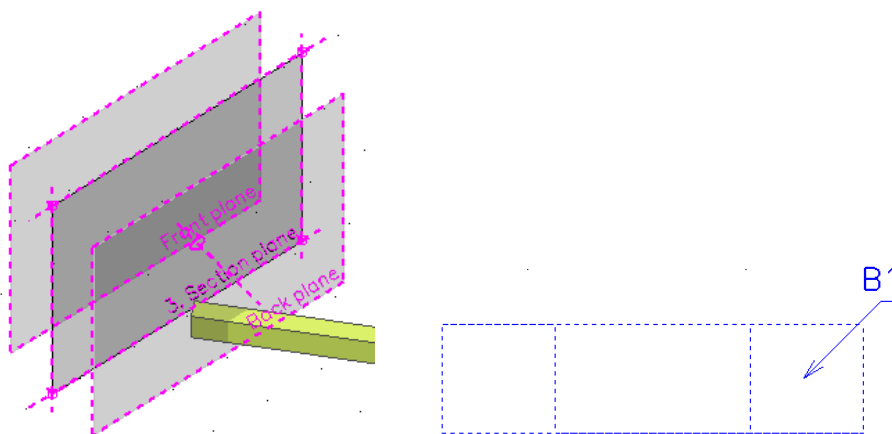
Member is placed only in the Front plane, it does not intersect the Section plane.

The user can use Position Front section or All. Both rules place autolabels to front part of generated structure.



Member is placed only in the Back plane, it does not intersect the Section plane.

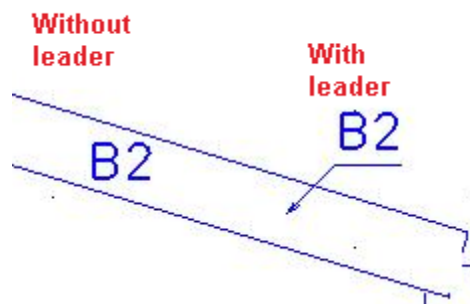
The user can use Position Front section or All. Both rules place autolabels to back part of generated structure.



- Label type: controls label type used for autolabel, definition of style is in the Label type manager.
- Text1, 2, 3: controls attribute displayed as autolabel – example – material, CSS type, name, ...
Three texts are available to allow for creation of multiple texts in a single label. This option (multiple text) must be allowed in the Label type manager using multitext Label – type Multi in system default.

With leader

- With leader: creates the leader line for autolabels

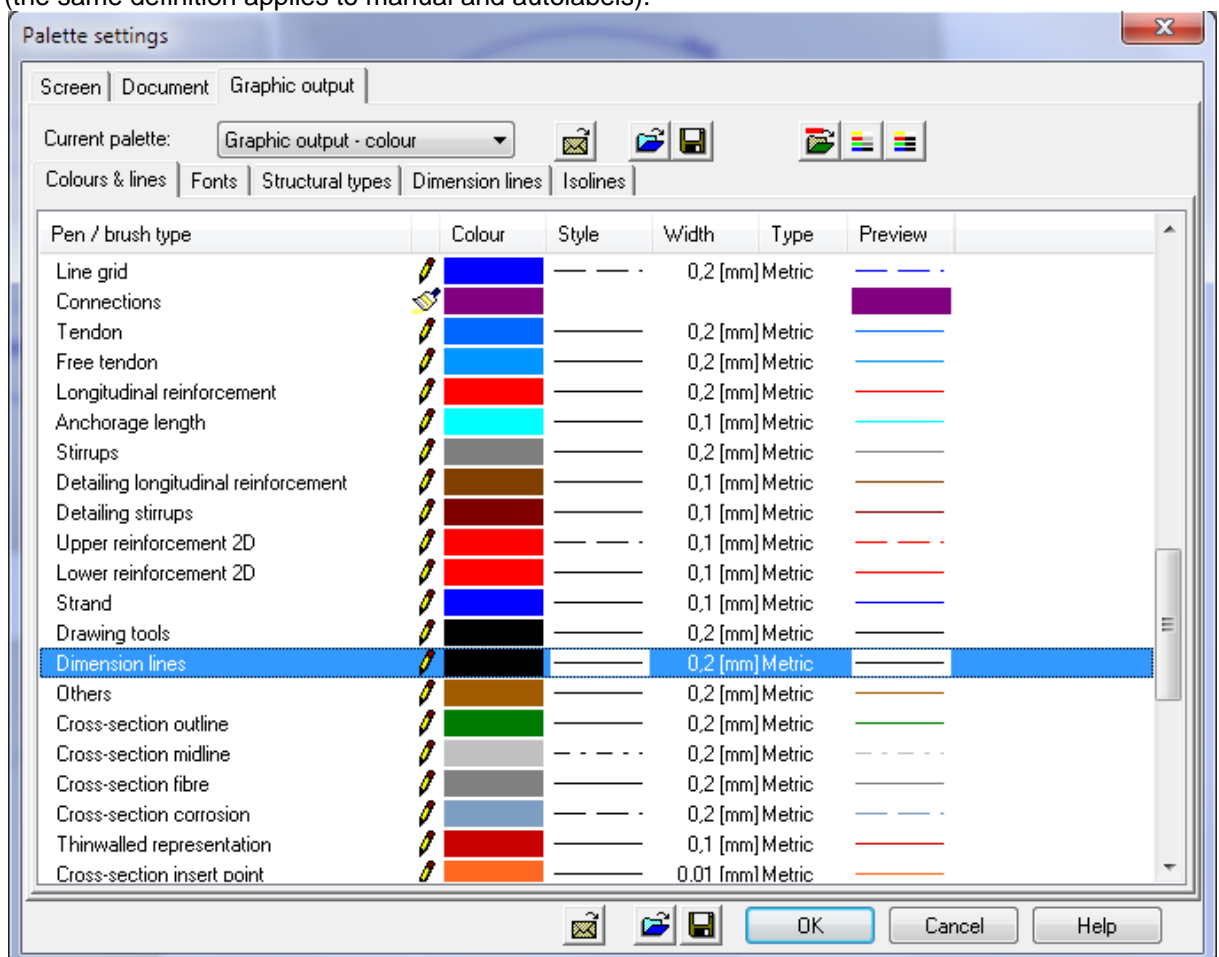


Note:

There is also a rule to display another PSE in the current PSE or to display Storeys or Linegrid lines.

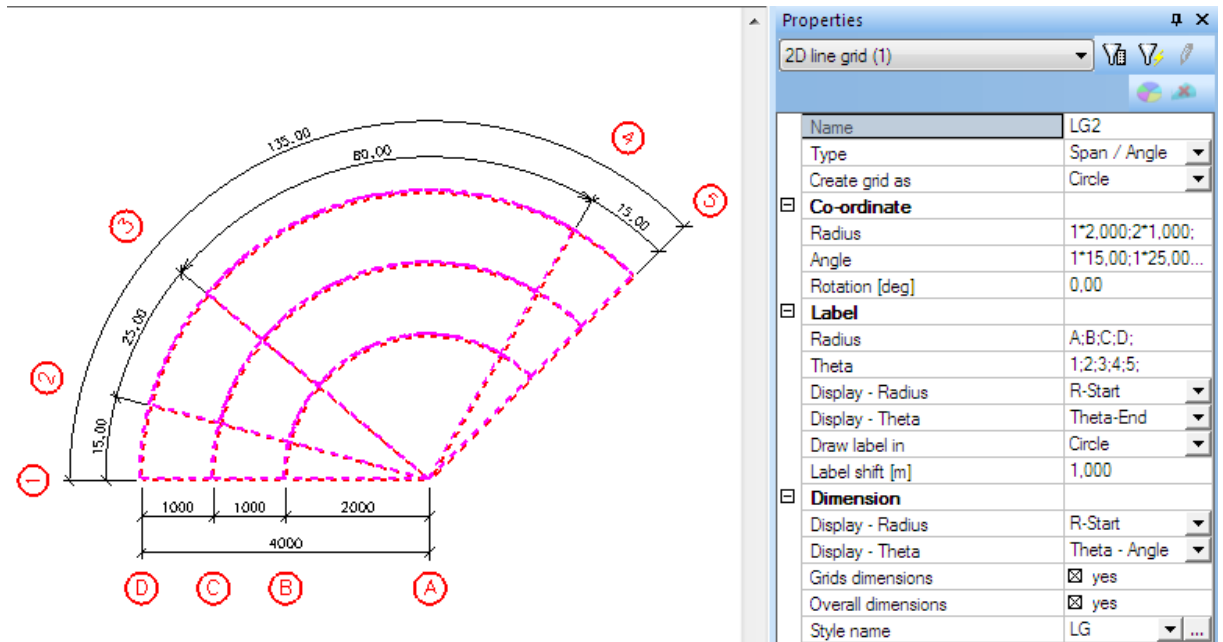
Autodimension

Autodimensions are automatically generated dimension lines that are defined by drawing rules. The colour for autodimensions is controlled by Palette settings/Graphic output/Dimension lines (the same definition applies to manual and autolabels).



Linegrid autodimension

The rule for generation of Autodimensions is the "2D linegrid" drawing rule. This rule generates linegrid lines, linegrid dimensions and linegrid labels according to the definition in the properties.

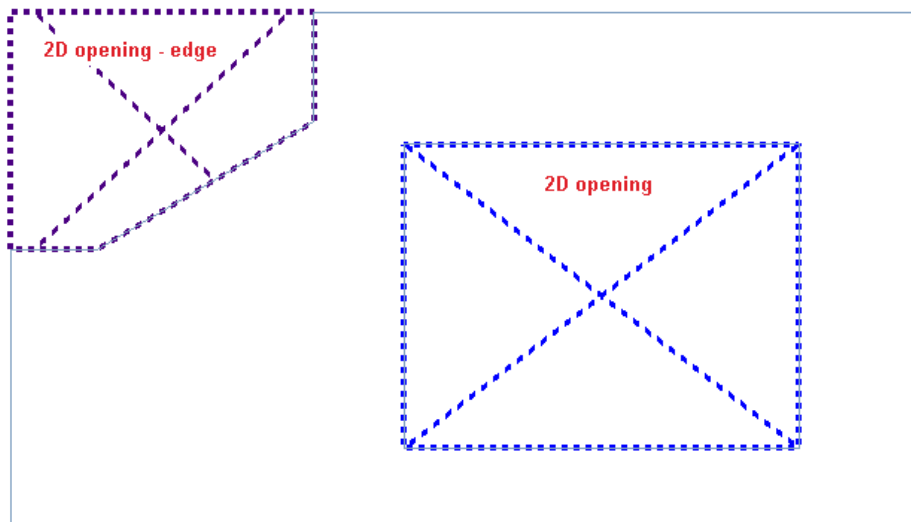


The properties of autodimension are the same as for manual dimensions. The Style name is set to none (no style is assigned) after refreshing of Drawing view (however, if autodimensions are frozen the style – if it has been assigned - is preserved).

Special drawing rules

2D opening, 2D opening – edge

These two rules have been developed for drawings of openings in 2D members. Rule “2D opening” generates all types of opening in the 2D member and rule “2D opening – edge” controls only openings on the edge of the member so at least one side of the opening matches with a 2D member edge or is even behind the edge.

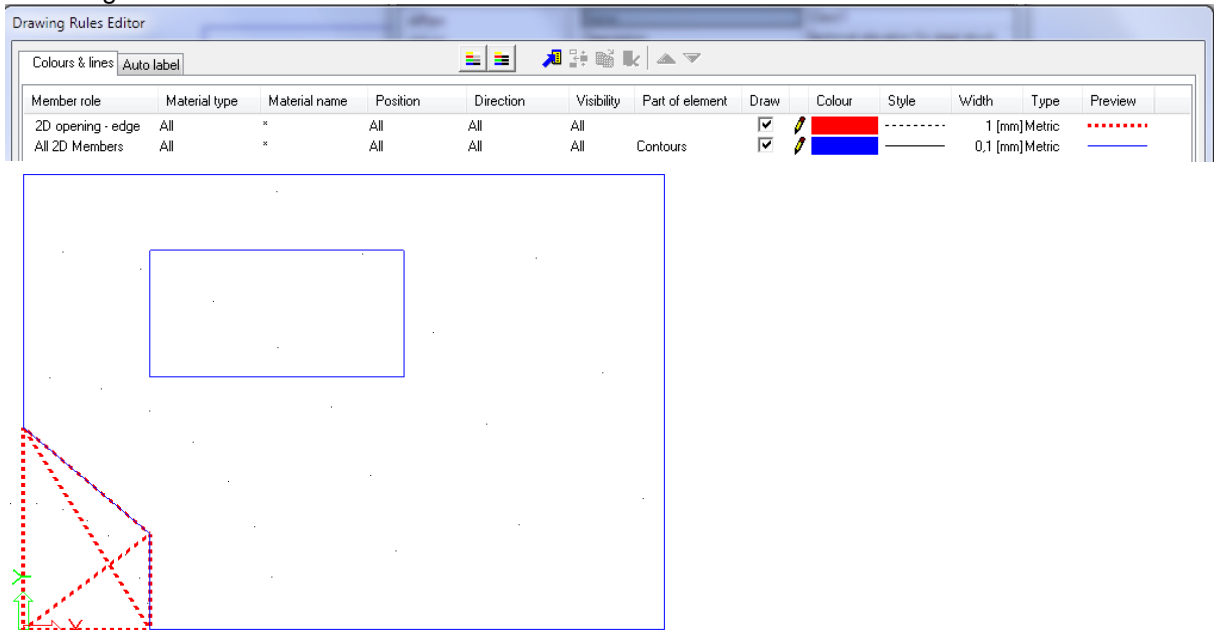


Drawing Rules Editor

Member role	Material type	Material name	Position	Direction	Visibility	Part of element	Draw	Colour	Style	Width	Type	Preview
2D opening - edge	All	*	All	All	All		<input checked="" type="checkbox"/>		-----	1 [mm]Metric		
2D opening	All	*	All	All	All		<input checked="" type="checkbox"/>		-----	1 [mm]Metric		
All 2D Members	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>		-----	0,1 [mm]Metric		

Rule “2D opening” generates all types of openings (inner and outer) if it has higher priority than rule “2D opening – edge” or if it is the only rule for openings in the drawing rules.

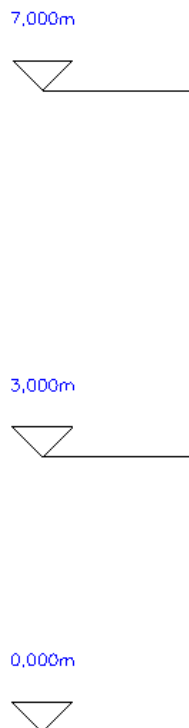
Rule “2D opening – edge” generates only outer openings (openings located on the edge) and it must be placed with higher priority (above “2D opening” rule).
 When rule “2D opening – edge” is the only rule for openings it generates only edge opening and the inner openings are displayed without intersects lines. Edges of inner openings are generated according to the rule for 2D members.



Rule “2D opening” and “2D opening – edge” are not part of rules All structure and All 2D members.

Storeys

The rule for storeys generates similar mark for storeys we have in the 3D model. It is placed out of structure. Displaying of complete drawing for the storeys is composed of the rule for lines and the rule for Auto labels.



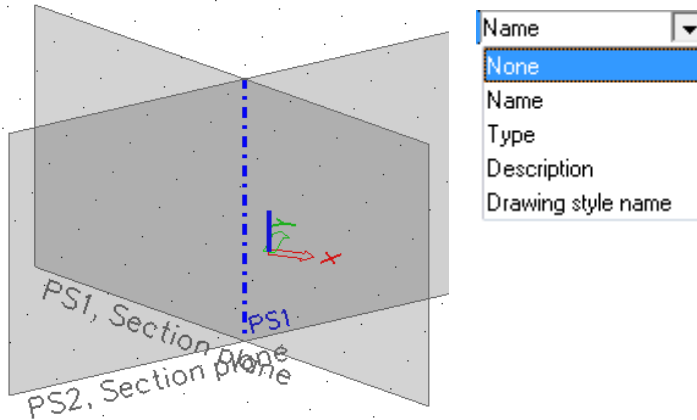
Drawing rule for Storeys generates horizontal and vertical lines.

The rule for autolabels generates triangle marks for levels and text labels with Z-bottom value from Storey manager:

	Name	Z-Bottom [m]	h_fl [m]	Rep	Z-Top [m]
1	FL1	0,000	2,000	1	2,000
2	FL2	2,000	1,000	1	3,000
3	FL3	3,000	3,000	1	6,000
4	FL4	6,000	0,000	1	6,000

Plane section entity

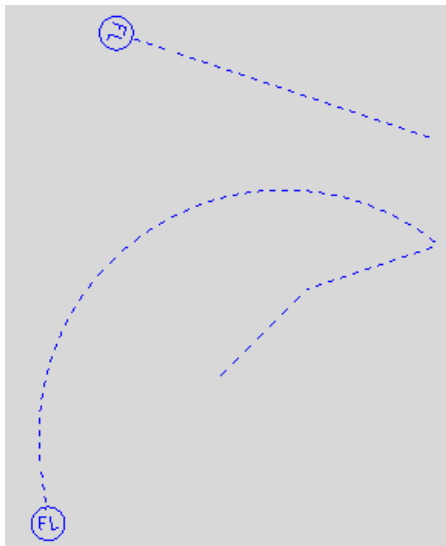
The drawing rule for Plane section entity generates a line in the intersection of two Plane section entities. This line can be labelled by name, type or description of drawing style name.



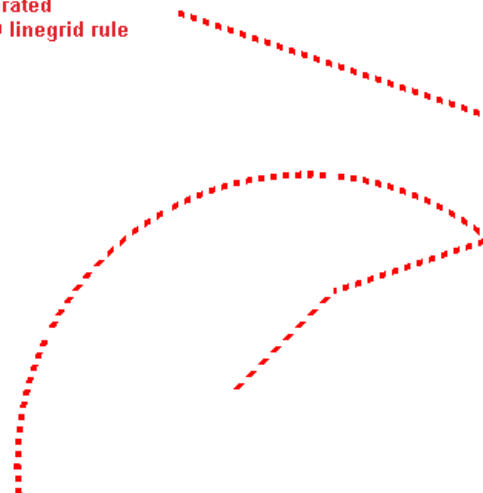
2D linegrid

The 2D linegrid rule generates Free lines, 2D rectangular grids and 2D circular grids. The 2D rectangular and circular grids have also autodimensions and autolabels. The dimension style can be selected and edited in the autodimension properties. Dimensions and labels are not generated during auto-refresh of the drawing view, manual refresh is requested. The colour of autolabels and autodimensions is controlled by Palette settings/Colours&lines/2D labels, Dimension lines. The font for autolabels is controlled by Palette settings/Fonts/2D labels. The font for autodimensions is defined in the dimension style. If the dimension style is not defined in the properties, the size is defined in Palette settings/Fonts/Dimension lines.

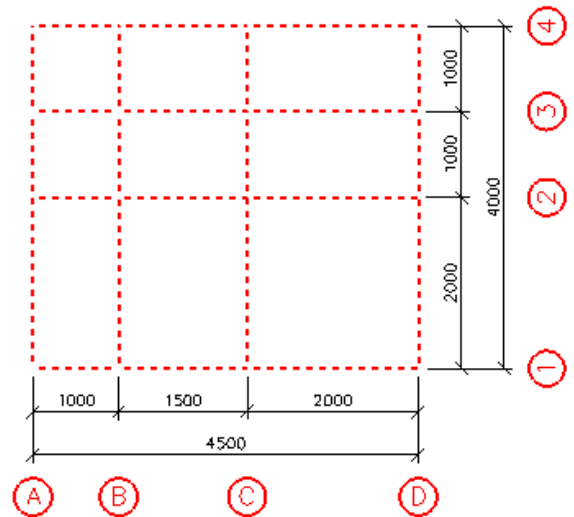
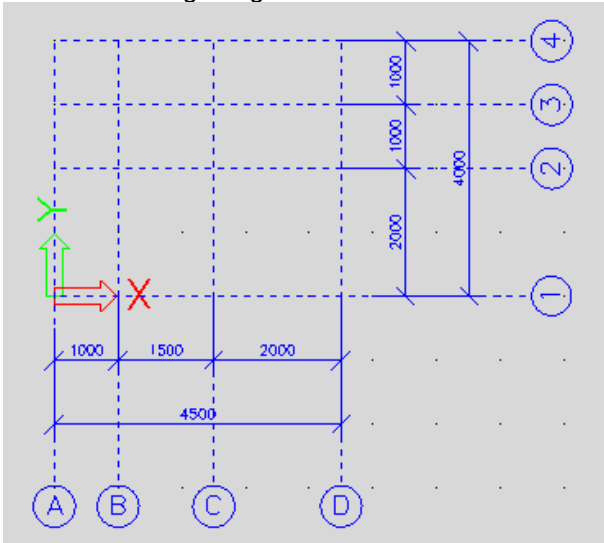
Free lines:



Generated by 2D linegrid rule

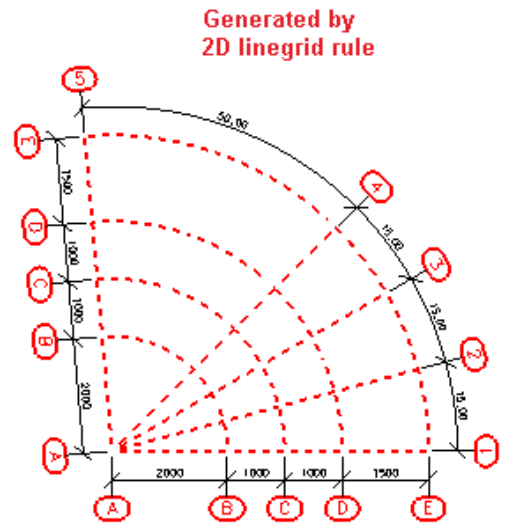
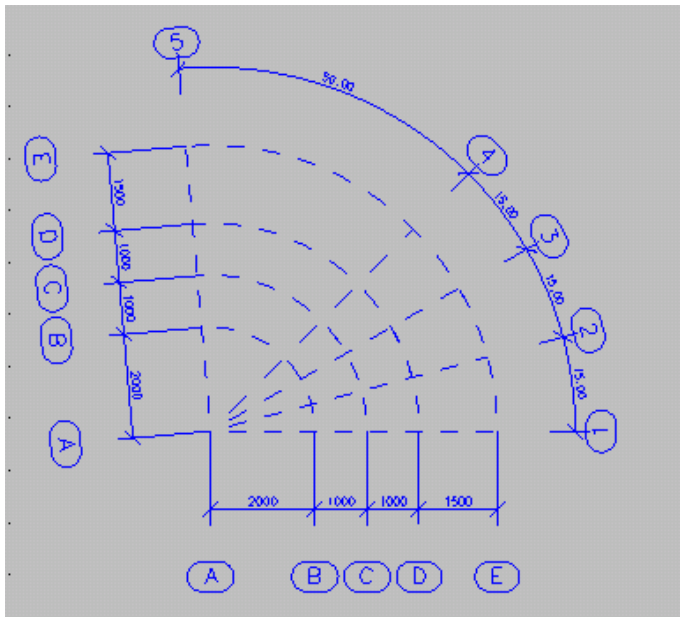


2D rectangular grid:



Generated by 2D linegrid rule

2D circular grid:



Generated by 2D linegrid rule

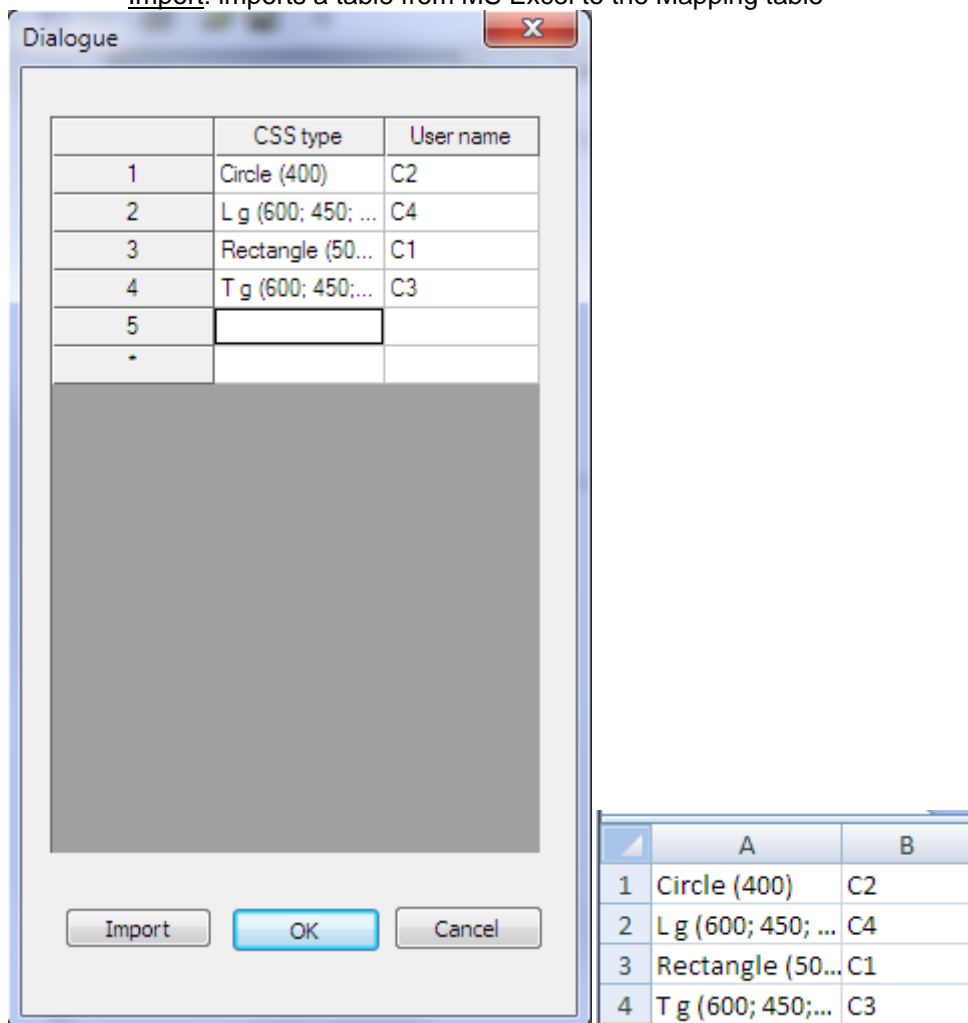
Note:

The 2D linegrid and its autolabels and autodimensions are generated only by rule "2D linegrid".

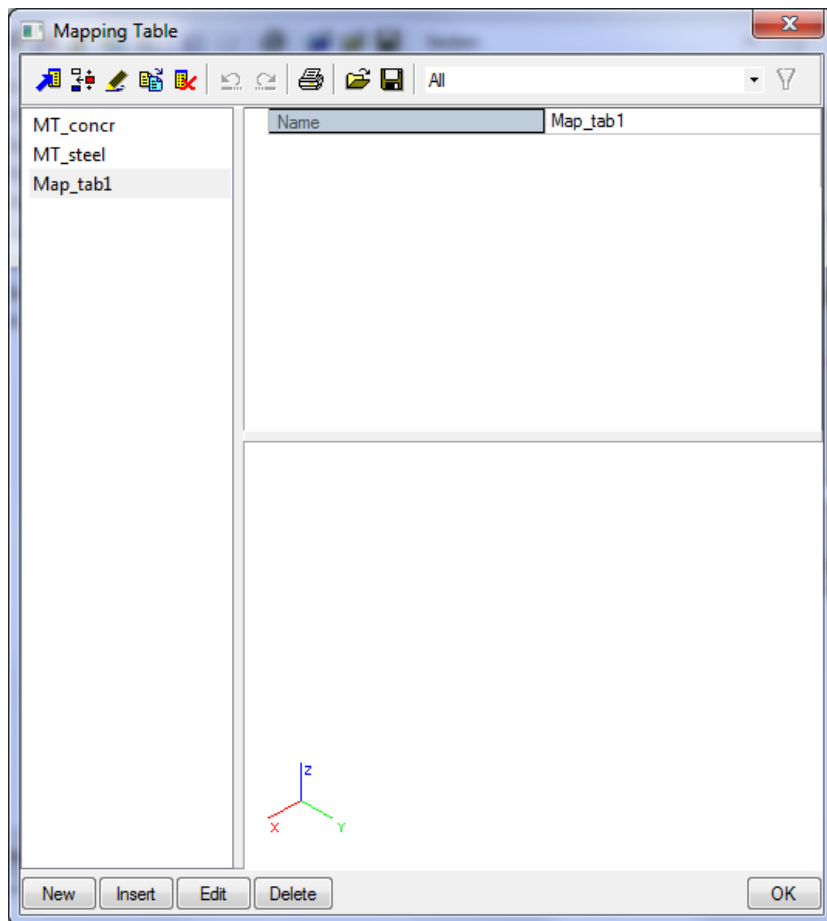
Improvement of Autolabels – the mapping table

The mapping table is a simple tool for changing names of cross-sections. Autolabels in 2D drawings allow for displaying of various pieces of information about the generated structure. One option is to display the Scia Engineer type of cross-section – CSS type. The functionality Mapping table allow the user to change the standard name to any user defined name.

- CSS type: standard type from CSS library
- User name: user defined name of the cross-section
- Import: imports a table from MS Excel to the Mapping table



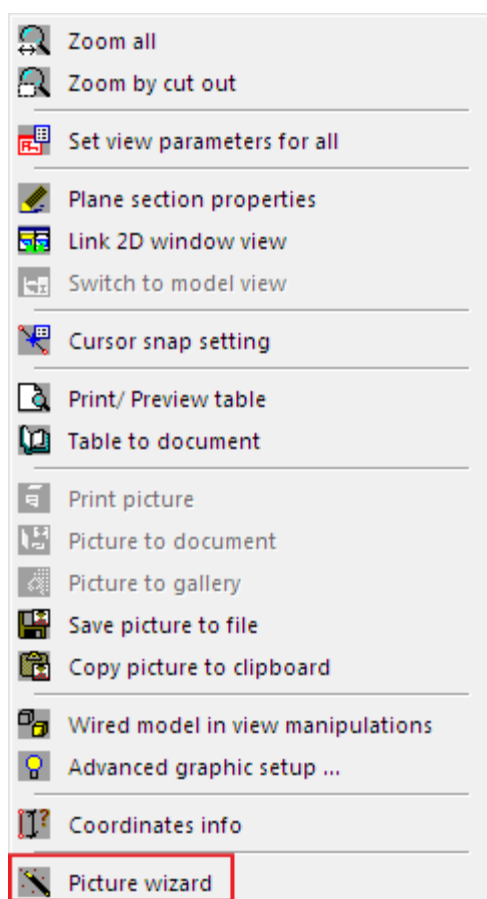
All used Mapping tables are controlled by a standard dialogue.

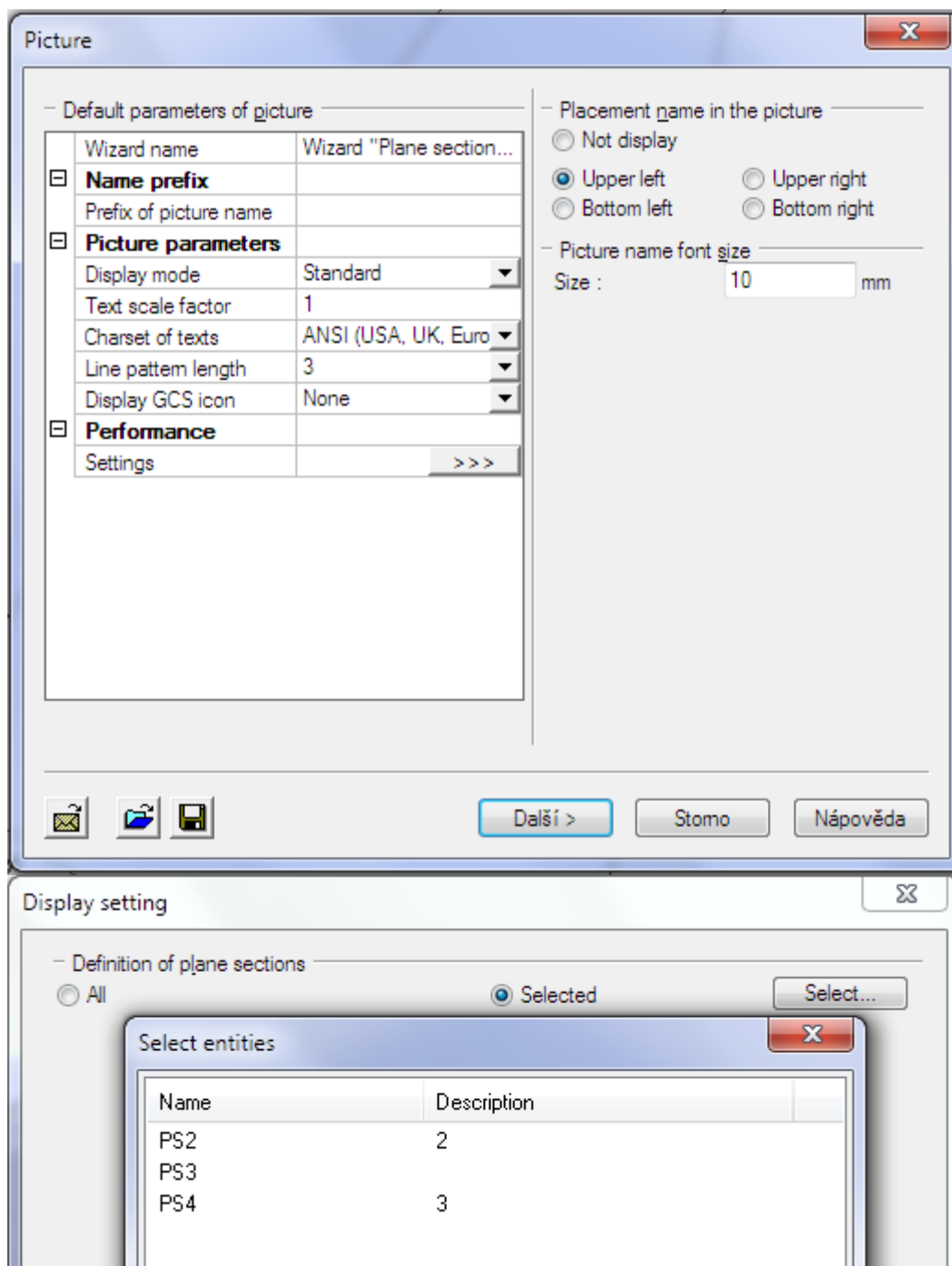


Plane section output

New picture wizard

A new picture wizard is available for the PSE. It is similar to the existing wizard for steel overview drawings. The wizard is accessible from the context (pop-up) menu in the Drawing view or from the context menu in the 3D window.





The user can decide whether the wizard will create pictures from all PSEs or just from the selected ones.

The names of pictures created by the wizard are generated automatically in the form PSE type + description. When the Display mode is set to Standard the scale of pictures is according to the property value "Default scale and the size corresponds to the property value "Drawing size".

The drawing view is saved when its window is closed, therefore the picture can be correctly refreshed after closing the Drawing view. The scale of the picture is not automatically refreshed after change in the PSE properties (this is adjusted automatically only during inserting picture to the gallery).

Manually placed dimensions and labels are saved during closing Drawing view and do not need refresh. The structure needs refresh according to changed Drawing rules.

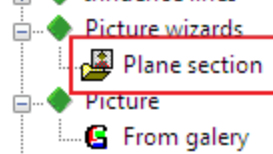
Note:

Dimensions on linegrid and dimensions in 2D and 3D window react to the change of scale of the picture only when the picture is editable.

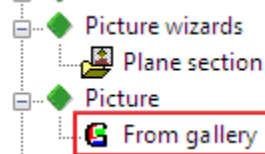
Picture to document

A picture from a Plane section can be placed to the Document using functions Picture wizard or From gallery. All pictures are without scale as any other pictures, because they must fit the paper.

By wizard:



From gallery:




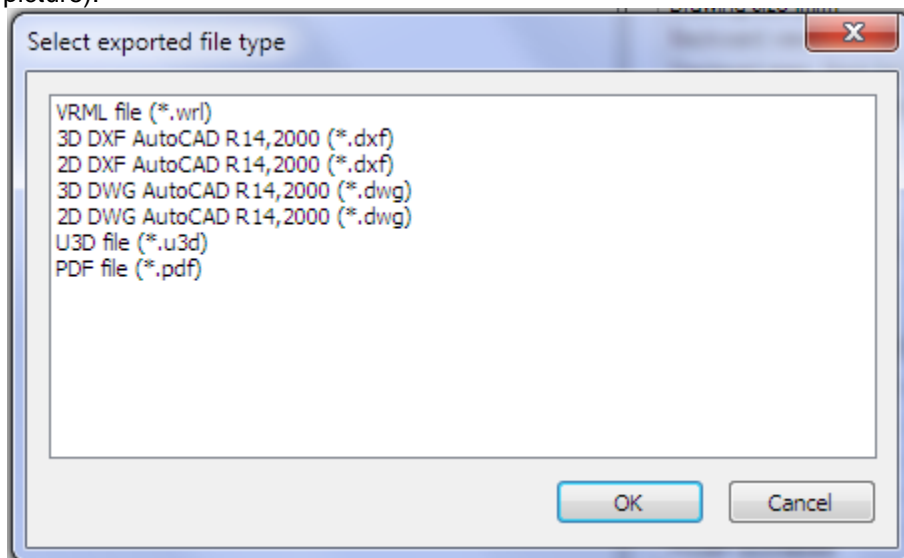
Export of 2D drawings

Mass export of 2D drawings is handled by the Drawing manager.

Note:

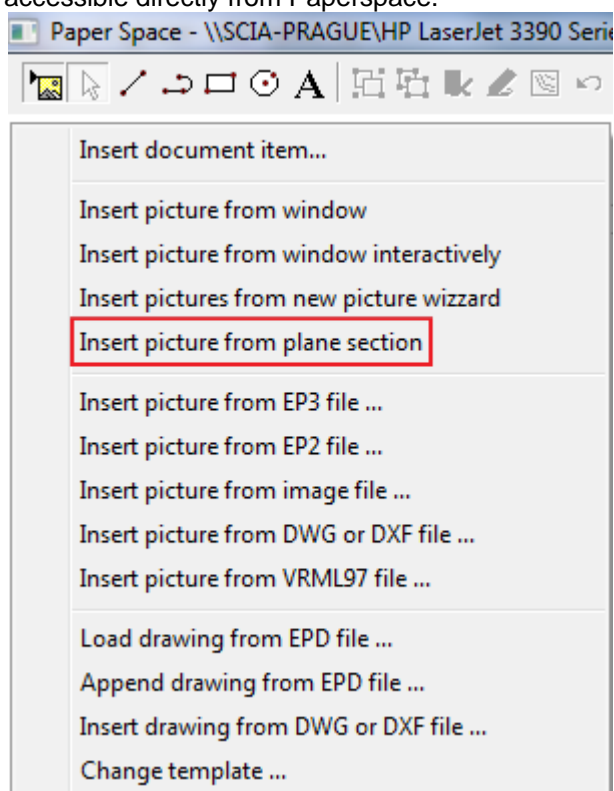
Drawing manager – see next chapter

Export drawing to file -  - selected 2D drawings can be exported to several formats (see the picture).



2D drawing on Paperspace

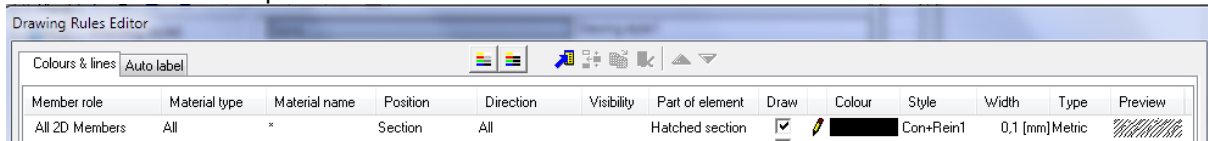
The command for placing a 2D drawing view from the PSE to the Paperspace gallery is accessible directly from Paperspace.



Paperspace use scale from PSE to insert the drawing in the appropriate size.

Hatching

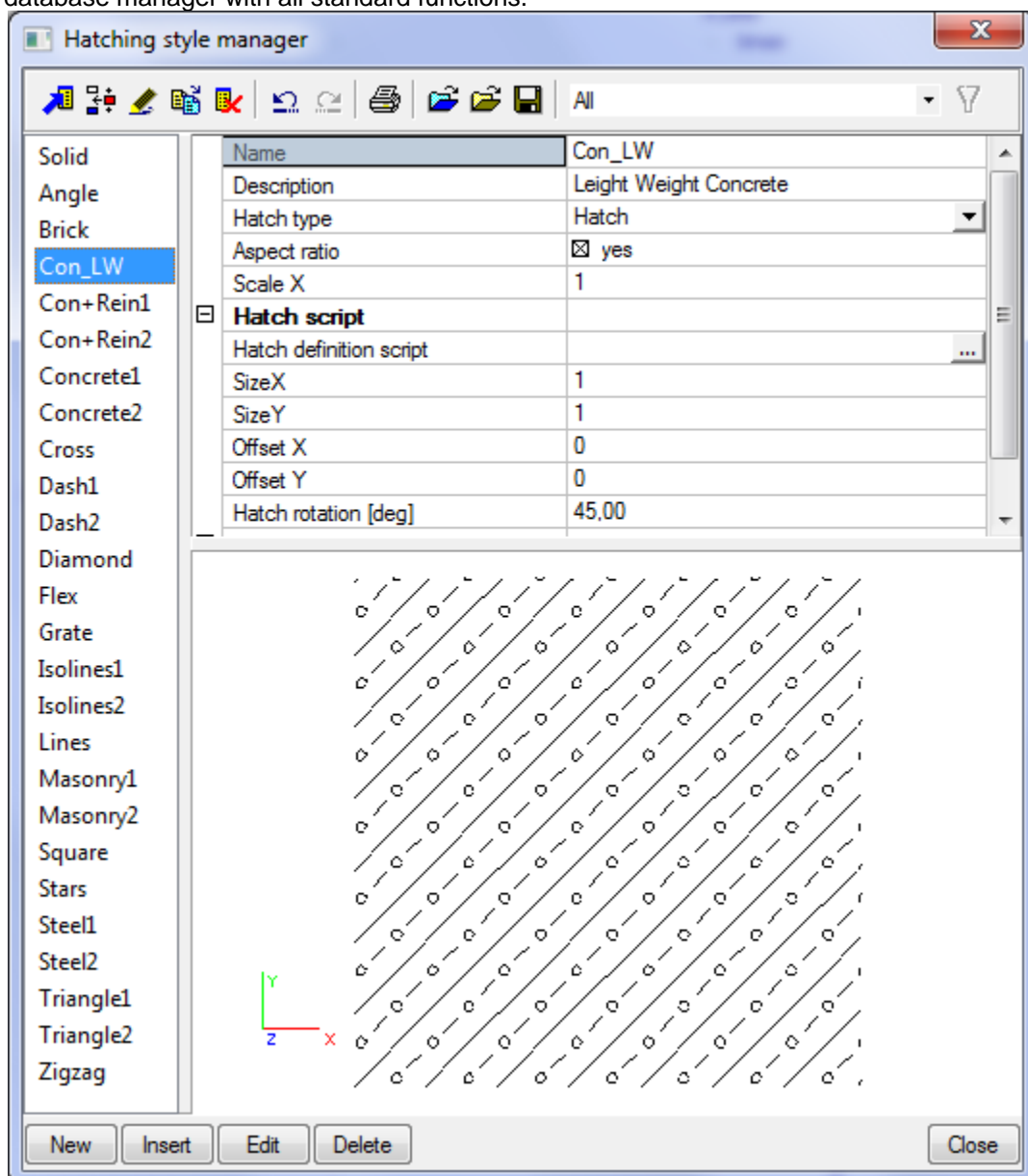
Hatches can be introduced to drawings via drawing style (drawing rules). Hatches are available for sections and plan views for Position defined as Section.



The line type and pen width can also be defined for a particular drawing rule with hatching. Hatching style is available in a combo-box "style". The user can select from available hatching styles which are predefined by Hatching style manager.

Hatching styles

Hatching styles can be added / deleted / modified in the Hatch style manager. It is a standard database manager with all standard functions.



When some kind of hatch is used in a PSE, then it is undeletable.

Properties:

- Scale: overall scale of hatch pattern
- Hatch definition script: enables to modify the script pattern (see further for syntax)
- Size X, Size Y: defines the size of basic hatch pattern
- Offset X, Offset Y: the offset of script pattern origin (0;0 coordinate from the script is moved)
- Hatch rotation: rotation of hatch pattern with respect to the LCS of the plane section entity

The shape of the hatch is defined by the script with simple syntax – Hatch definition script:

```
line;0;0;1;0;
  (LINE;STARTPT;ENDPT;)
circle;0.35;0.25;0.05;
  (CIRCLE;CENTREPT;RADIUS)
circle3P;0.35;0.75;0.25;0.5;0.4;0.4;
  (CIRCLE3P;STARTPT;INTERMEDIATEPT;ENDPT;)
arc;0.35;0.75;0.25;0.5;0.4;0.4;
  (ARC;STARTPT;INTERMEDIATEPT;ENDPT;)
```

Note:

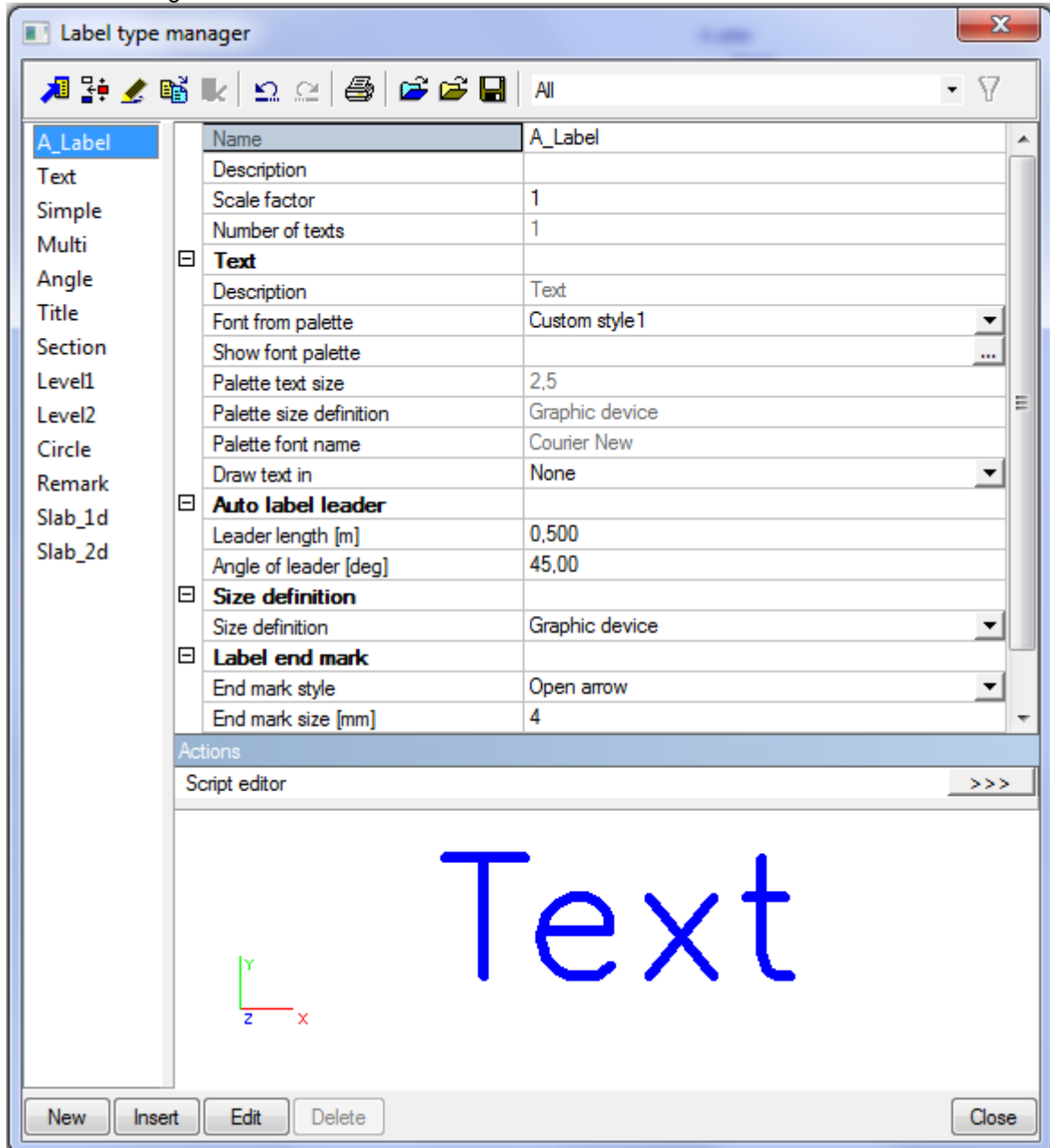
Drawing styles, hatching styles, label styles and dimension styles can be saved to the same .db4 file.

Labels

Labels can be introduced to drawings via drawing style (labelling rules) or manually in the Drawing view. Manually inserted labels can be set as simple or with leader.

Label type

Label types can be added / deleted / modified in the Label type manager. It is a standard database manager with all standard functions.



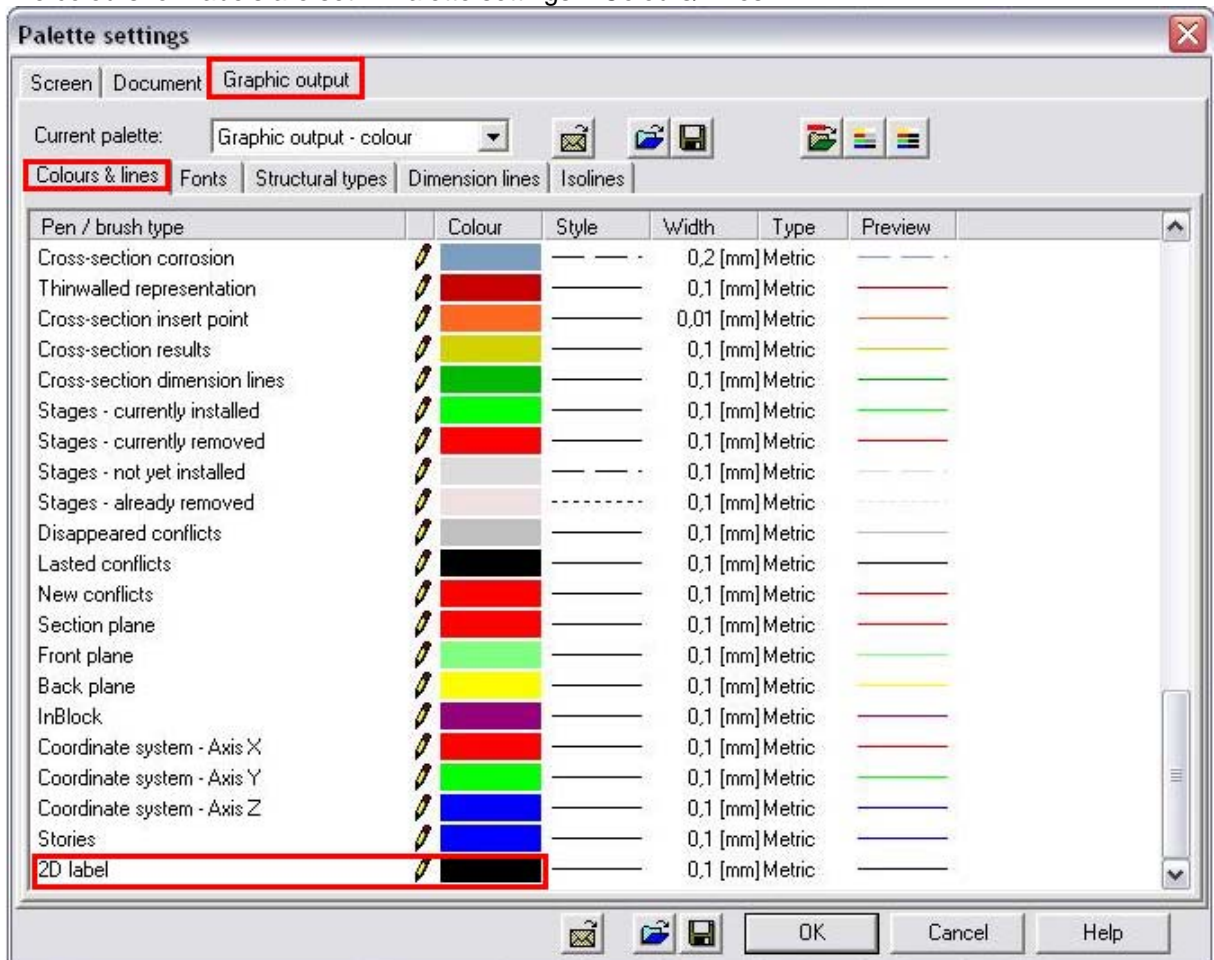
A label is defined as a set of lines and texts. Their shape and position is specified by the script. All texts mentioned in the script have their properties in the label type (see later).

Properties:

- Size definition: specifies how the size of the label is defined
- Number of texts: informative value (how many texts items are in the script). Each text item has its own group in the properties of the label type
- Text / description: informative value from the script to distinguish particular text items
- Text / Font from palette: the style of used texts is according to the selected font (it is followed by the information from the palette about the font)

- Text / Draw text in: the user can select a rectangle, rounded rectangle, oval or cloud which will surround the text

When some kind of Label type is used in a PSE, then it is undeletable.
The colours for Labels are set in Palette settings – Colours/Lines:



Syntax of label definition script

Script commands

LINE *Start pt ; End pt*

CIRCLE *Centre ; Radius*

CIRCLE3P *Start pt ; Intermediate pt ; End pt*

ARC *Start pt ; Intermediate pt ; End pt*

TEXT *Description ; Insertion pt ; Alignment ; Rotation angle*
 Top left, bottom left, top right, bottom right, center left, ... , center, ...

1	2	3
4	5	6
7	8	9

Example

Line;0;0;0;5;0;0;

Circle;0;0;0;5;

Circle3p;0;0;0;5;0;0;1;4;0;

Arc;0;0;0;5;0;0;1;4;0;

Text;Section No ;0;2;0;45

Automatic labelling

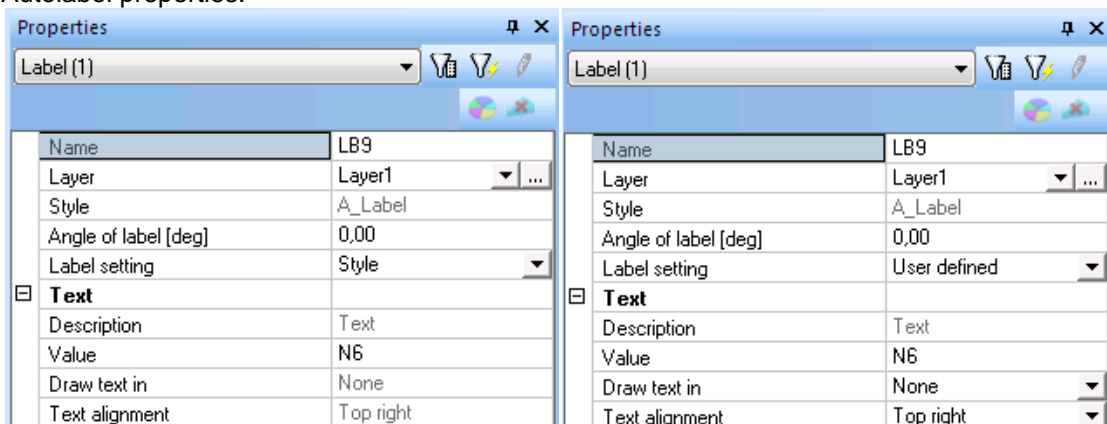
All autolabels are created according to the predefined Label type in the Label type manager. When the type is modified then all autolabels created by this type are newly generated.

The position of autolabels is automatically defined to the right top corner. Autolabels are generated by a manual Refresh of the drawing view. When an autolabel has been moved to a new position, then this new position is preserved even after any next Refresh. The saved position is deleted by Reset.

Button Reset deletes all autolabels and button Refresh generates all autolabels according to the defined autolabel rules.

The first automatic refresh in a new opened Drawing view generates only the structure, the automatic labelling is started by manual Refresh in the Plane section properties.

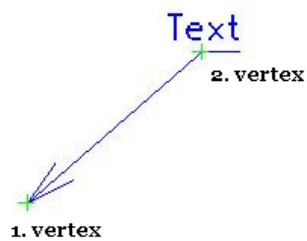
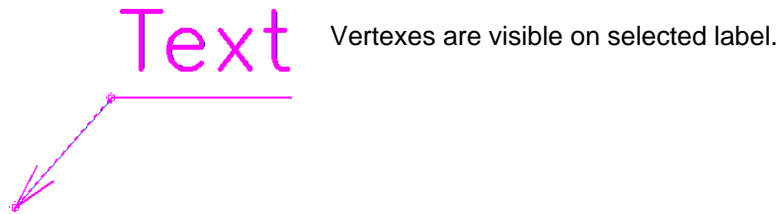
Autolabel properties:



Manual labelling

Labels can be inserted manually in the Drawing view. The user can select the label type and enter manually the text values.

Labels with / without leaders are available in the 2D editor service. The geometry of labels with a leader can be modified using Drag-and-drop function or by “Modify vertexes” function.



“Modify vertexes” displays the points in green as anywhere else on the structure.

Manual label properties:

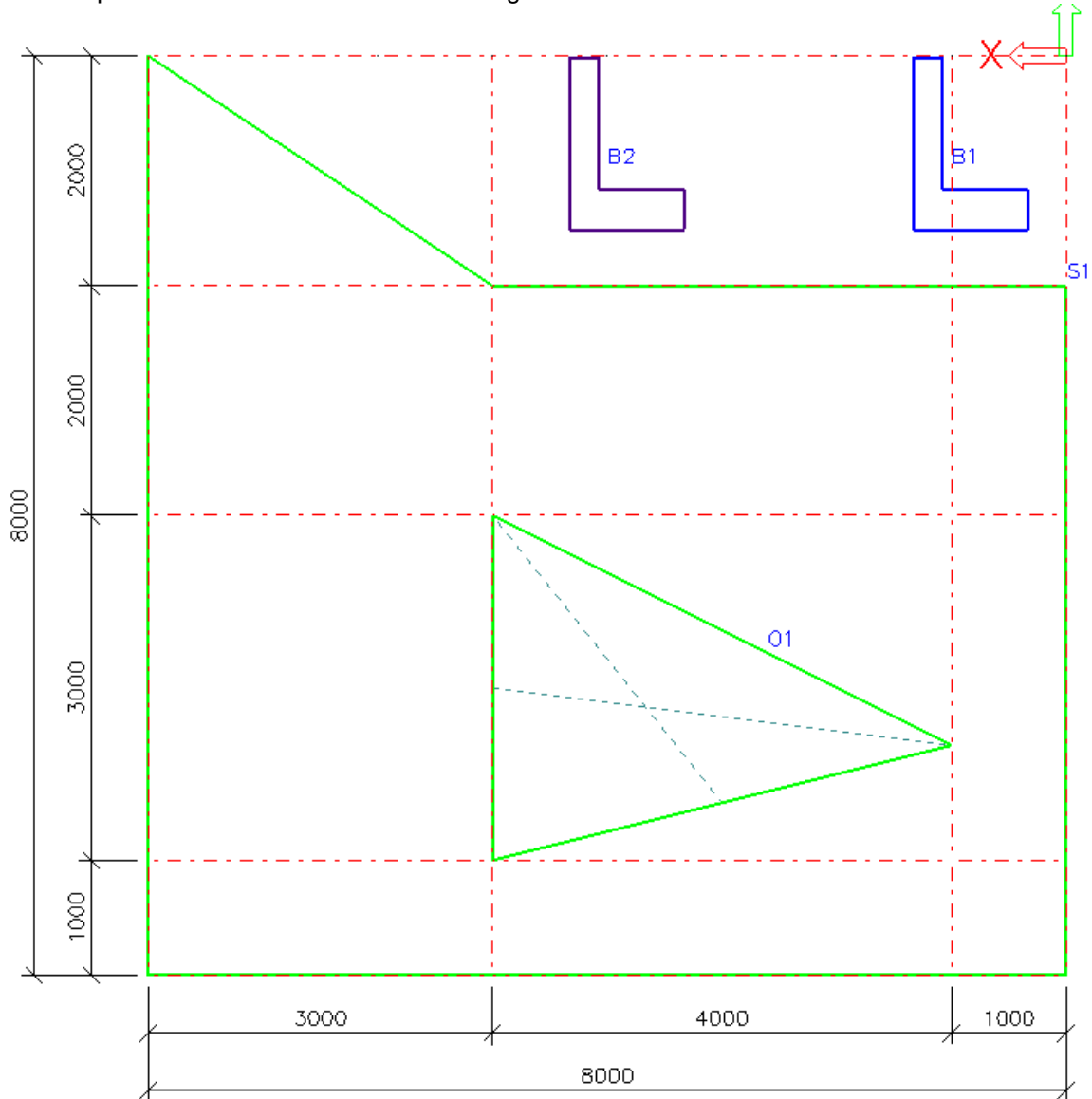
Properties		Properties	
Label with leader (1)		Label with leader (1)	
Name	LBR1	Name	LBR1
Layer	Layer1	Layer	Layer1
Style	A_Label	Style	A_Label
Angle of label [deg]	0,00	Angle of label [deg]	0,00
Label setting	Style	Label setting	User defined
Text		Text	
Description	Text	Description	Text
Value	1st column	Value	1st column
Draw text in	None	Draw text in	None
Text alignment	Top right	Text alignment	Top right

Note:

The main difference between the autolabel and manual label properties is in the Style definition. The autolabel style is defined in the Drawing rules so it is uneditable in the properties. The manual label style is defined for each label separately so it is editable in the properties.

Examples

Example 1: 1D and 2D members with Linegrid and Autolabels



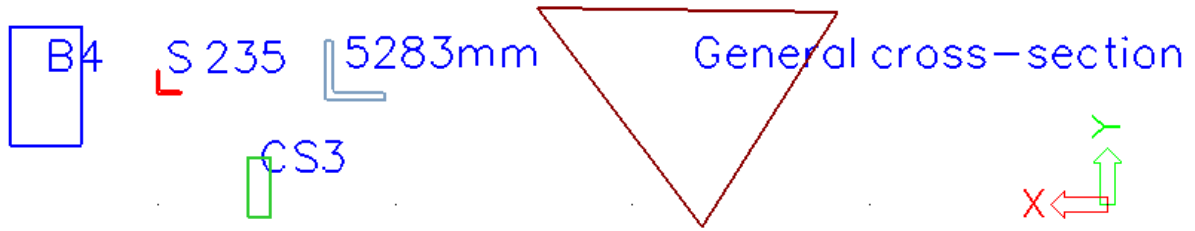
Drawing Rules Editor

Member role	Material type	Material name	Position	Direction	Visibility	Part of element	Draw	Colour	Style	Width	Type	Preview
Column	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>		—	0,5 [mm] Metric		
General	All	*	All	All	All	Contours	<input checked="" type="checkbox"/>		—	0,5 [mm] Metric		
2D opening	All	*	All	All	All		<input checked="" type="checkbox"/>		----	0,1 [mm] Metric		
All 2D Members	All	*	All	All	All		<input checked="" type="checkbox"/>		----	0,5 [mm] Metric		
2D linegrid							<input checked="" type="checkbox"/>		----	0,1 [mm] Metric		

Drawing Rules Editor

Member role	Material type	Material name	Position	Draw label	Label type	Text1	Text2	Text3	With leader
2D opening	All	*	All	<input checked="" type="checkbox"/>	A_Label	Name	None	None	<input type="checkbox"/>
All Structure	All	*	All	<input checked="" type="checkbox"/>	A_Label	Name	Name	None	<input type="checkbox"/>

Example 2: 1D members with different type of material – structure and autolabels are generated according to the different material type



Drawing Rules Editor

Member role	Material type	Material name	Position	Direction	Visibility	Part of element	Draw	Colour	Style	Width	Type	Preview
All Structure	Concrete	*	Section	All		Contours	<input checked="" type="checkbox"/>			0.5 [mm] Metric		
All Structure	Steel	*	Section	All		Contours	<input checked="" type="checkbox"/>			0.5 [mm] Metric		
All Structure	Timber	*	Section	All		Contours	<input checked="" type="checkbox"/>			0.5 [mm] Metric		
All Structure	Aluminium	*	Section	All		Contours	<input checked="" type="checkbox"/>			0.5 [mm] Metric		
All Structure	Other material	*	Section	All		Contours	<input checked="" type="checkbox"/>			0.5 [mm] Metric		

Drawing Rules Editor

Member role	Material type	Material name	Position	Draw label	Label type	Text1	Text2	Text3	With leader
All Structure	Concrete	*	All	<input checked="" type="checkbox"/>	A_Label	Name	None	None	<input type="checkbox"/>
All Structure	Steel	*	All	<input checked="" type="checkbox"/>	A_Label	Material	None	None	<input type="checkbox"/>
All Structure	Timber	*	All	<input checked="" type="checkbox"/>	A_Label	CSS name	None	None	<input type="checkbox"/>
All Structure	Aluminium	*	All	<input checked="" type="checkbox"/>	A_Label	Length	None	None	<input type="checkbox"/>
All Structure	Other material	*	All	<input checked="" type="checkbox"/>	A_Label	CSS type	None	None	<input type="checkbox"/>

Advanced tips

This final chapter describes common Plane section and views related advanced tips.

Q: *A new member was introduced to a model but it is not visible in the Drawing view and in the Plane section projection.*

A: There are several possible reasons:

- The member is not included in the allocated entities -> Press “Select allocation” or “Allocate automatically”.
- The Projection or Drawing view was not refreshed -> Press action button “Refresh” .
- There is no drawing rule for such a member -> change the drawing style or modify the drawing rules.
- The member is generated as a structural model -> change model to analysis model.

Q: *A new 2D drawing view cannot be created.*

A: There are several possible reasons:

- It has been already created, the user must switch on it.
- The user has not activated the Automated General Arrangement Drawings functionality.
- There is no drawing rule for such a member -> change the drawing style or modify the drawing rules.

Q: *The properties of a 2D drawing view are not available.*

A: There are several possible reasons:

- There is also the structure service displayed in the tree menu – the user must close it (this protects a PSE in the 3D window from deleting).
- Another member is selected.

Q: *The colour of generated structure is different than the user expected.*

A: There are several possible reasons:

- There is different colour specified in the drawing rules.
- There is a different drawing rule with a higher priority that generates the structure.

Q: *After opening an old project with Overview drawings the user can see only the checkbox with Automated General Arrangement Drawings.*

A: The old functionality Overview drawings was merged with the new functionality Automated General Arrangement Drawings under one checkbox, so from now on we have all functionality for creating drawings together under one checkbox.

Q: *The user has no default styles in Hatching, Label, Drawing rule or Dimension manager after opening an old project with Overview drawings.*

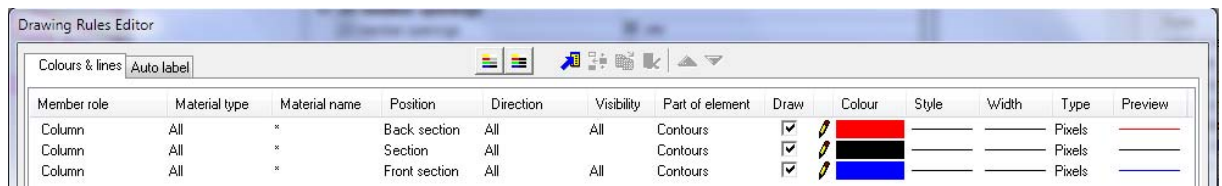
A: The old project must be converted to a new version and Automated General Arrangement Drawings checkbox checked automatically, not manually, that is the reason, why default DB4 is not loaded.

Q: *The user cannot delete some Label type, Dimension style, Drawing rule or Hatching style.*

A: There are several possible reasons:

- The label type may be used in Drawing rules, in the combo box for title and scale or in the combo box for manual labels, then it cannot be deleted.
- The dimension style can be used in 3D dimensions, 2D dimensions, linegrid dimensions or autodimensions.
- The hatching style can be used in Drawing rules.
- The drawing rule can be used for any PSE.
- Some problems in the Data server can be solved using Cleaner.

Q: The user does not see the projection according to the specified drawing rules – see picture.



A: The projection of the rule with item “Position” set to different options has a specific order. This type of rules is sorted: back section-> front section -> section.

The reason is the use of OpenGL. OpenGL does not allow for mixing colours on one pixel of drawing.

It is recommended to set back and front section to some different style than solid line and section width to some thicker type and darker colour.

Q: The user does not see autolabels generated according to the specified rule for the position of autolabel.

A: Positions All, Front section, Section and Back section have different logic for placing an autolabel to the structure.

- 1) The autolabel in the ALL position – the application defines the position of the autolabel with respect to the cross section of the member and plane section.
 - a) The member intersects only the Front plane -> the rule places the autolabel to the projection of the structure generated in the Front position.
 - b) The member intersects the Front plane and Section plane (the structure has some projection for Front section, Section and also Back section) -> the rule places the autolabel to the structure generated in the Section
 - c) The member intersects only the Back plane -> the rule places the autolabel to the structure generated in the Back position
 - d) The member intersects all three planes -> the rule places the autolabel to the structure generated in the Section
- 2) The autolabel in the Front section – the application searches for the part of the structure which intersects only the Front plane
 - a) The member intersects only the Front plane -> the rule places the autolabel to the structure generated in the Front position
 - b) The member intersects the Front plane and Section plane -> the rule does not generate any autolabel
 - c) The member intersects the Front plane, Section plane and Back plane -> the rule does not generate any autolabel
 - d) The member intersects only the Back plane -> the rule does not generate any autolabel
 - e) The member intersects the Back plane and Section plane -> the rule does not generate any autolabel
- 3) The autolabel in the Section – the application searches for the structure which intersects Section plane
 - a) The member intersects only the Front plane -> the rule does not generate any autolabel
 - b) The member intersects the Front plane and Section plane -> the rule places the autolabel to the structure generated in the Section
 - c) The member intersects the Front plane, Section and Back plane -> the rule places the autolabel to the structure generated in the Section
 - d) The member intersects only the Back plane -> the rule does not generate any autolabel
 - e) The member intersects the Back plane and Section plane -> the rule places the autolabel to the structure generated in the Section
- 4) The autolabel in the Back section – the application searches for the structure which intersects only the Back plane
 - a) The member intersects only the Front plane -> the rule does not generate any autolabel
 - b) The member intersects the Front plane and Section plane -> the rule does not generate any autolabel
 - c) The member intersects the Front plane, Section plane and Back plane -> the rule does not generate any autolabel
 - f) The member intersects only the Back plane -> the rule places the autolabel to the structure generated in the Back section
 - g) The member intersects the Back plane and Section plane -> the rule does not generate any autolabel

Q: *Some types of solids are not generated in the drawings.*

A: Problematic shapes of solids and curved walls are not generated in drawing view. The only way how to avoid this problem is to use simple geometry – using polylines, curves converted to polygons and so on.

Q: *There are no autotags in the drawing.*

A: There are several possible reasons:

- There is no Drawing rule for generation of automatic labels.
- The Drawing view needs a manual refresh for generating of autotags.

Q: *Some part of generated structure is displayed with a black solid line, but there is no such rule in the Drawing rules.*

A: The black line is generated by the rules which does not contain this type of rule indicates a mistake in the drawing rules. E.g. it means that there is only type hidden, but not type visible – this makes no sense for the system and then it generates the structure using the default black solid lines.

Q: *The position of the generated projection of a 1D member is different from the 3D model.*

A: The plane section entity has different projection for the structural and analysis model of the structure. This is controlled by a the Model combobox in the properties.
