



# User Guide nanoCAD Construction 21

## Contents

<b>Contents</b> .....	<b>2</b>
<b>Intro</b> .....	<b>12</b>
Legend.....	12
Abbreviations.....	12
Main sections.....	12
<b>Basic knowledge</b> .....	<b>13</b>
About the program.....	13
Copyrights and Licenses.....	13
Compatibility.....	13
Selected and allotted object.....	13
Allotted object.....	14
Selected object.....	14
Object context menus.....	14
Workspace.....	14
Menu.....	14
Toolbars.....	15
Functional panels.....	15
Help system.....	16
Scale.....	16
Option 1. Making projections in model space.....	16
Option 2. Making projections in model space.....	17
Option 3. Making projections in paper space.....	18
Paper space commands.....	19
Example of design drawings of extended objects.....	20
Controls features.....	23
Intelligent controls grips.....	23
Special characters and fonts.....	23
Parameters hatch.....	24
Jobs in the current scale.....	25
Selecting the direction of drawing.....	28
Special keys.....	29
Key SHIFT.....	29
Key Alt.....	29
Key Ctrl.....	29
Shortcuts.....	29
Geometric constructions.....	30
Object-dependent parts.....	30

Context menu entry fields.....	30
Template.....	32
Regen.....	36
The cursor-pointer.....	36
The application of a single object.....	36
Recognition of object-dependent parts.....	37
Application of the bearing on the shaft neck.....	37
Recognition of the insertion point in the tapered portion of the pipe bushings.....	38
Application of standard shaft end.....	39
Drawing sign of torque.....	39
<b>Settings.....</b>	<b>39</b>
Settings.....	39
Main menu.....	40
Work area.....	41
Main options.....	42
Common settings.....	43
Line Types.....	45
Edit.....	46
Design.....	51
Notifications.....	53
Hot keys.....	53
Databases access.....	54
Standard elements.....	58
Standard.....	59
Beam calculations.....	60
Architectural decisions.....	61
Engineering networks.....	62
IFC.....	63
Symbols.....	63
Dimensions.....	64
Notes.....	67
Views, sections.....	74
Symbols.....	75
Welds.....	81
Boundary form.....	82
Distribution range.....	83
End markers.....	83

Plane elevation marks.....	83
Elevation mark.....	83
Designation stationing.....	84
Construction axis.....	84
Axes array.....	85
Similar object.....	86
Holes.....	86
Line of break.....	86
Fixed Joints.....	86
Forms.....	87
Table.....	88
Drawing borders.....	89
Technical conditions.....	89
Notepad.....	91
3D.....	91
Common settings.....	92
2D views.....	94
3D. Pseudo section properties.....	95
Configuration utility.....	96
Configuration Utility.....	96
Configuration Utility (system data).....	101
Transfer settings to another computer.....	102
Layers and profiles.....	102
Layer Profiles.....	104
Overriding styles.....	104
Quick options.....	104
<b>Drawing design.....</b>	<b>105</b>
Coordinate axes.....	105
Array of orthogonal axes.....	105
Array of polar axes.....	109
Single axis.....	112
Arc construction axis.....	116
Circular construction axis.....	117
Add markers.....	118
Orientation mark for construction line.....	119
Separate markers.....	119
Rename construction lines.....	119
Similar construction line.....	120

Refresh intersections of constructions axes.....	121
Adding axis to the array.....	122
Removing the axes of the array.....	124
Architectural decisions.....	125
Wall.....	125
Polygonal wall.....	128
Editing walls.....	130
Window.....	136
Door.....	140
Column.....	143
Add Object.....	145
Stairs.....	147
Room.....	149
Explication.....	153
Engineering networks.....	156
Project Manager.....	156
Equipment.....	157
Trace.....	159
Port.....	161
Table of connections.....	163
Automatic tracing.....	165
Template library.....	167
Library.....	179
Area.....	179
Net area by internal point.....	179
Area by internal point.....	181
Area by rectangle.....	182
Area by contour.....	183
Area(Text).....	185
Area by polyline.....	185
Area Editing Dialog.....	186
Form premises.....	187
Convert areas into rooms.....	188
Working with parametric objects.....	189
Working with Database Objects.....	189
Tab Manager.....	190
Standard parts library.....	198
Reinsert object.....	203

Threaded fastening.....	204
Rivet joint.....	210
Markers, groups.....	214
Create a Group.....	215
Insert group.....	216
Editing a Group.....	217
Group dependencies.....	217
Control overlapping objects.....	238
Part trim.....	244
Add View.....	251
Simplified / Full View.....	251
Mirror Part.....	251
Regenerate STD parts.....	251
User defined object.....	252
Dialog "Overrides".....	253
Dimensions.....	255
Dimension Style Manager.....	255
Auto.....	268
Linear dimensions.....	270
Radius.....	271
Diameter.....	272
Large arc radius.....	273
Arc length dimension.....	273
Ordinate dimension.....	275
Angle dimension.....	276
Dimensions Chain.....	277
Baseline dimension.....	281
Group dimension.....	285
Offset dimension.....	286
Edit dimension.....	288
Break and Restore dimension line.....	289
Oblique dimension.....	291
Arrange dimensions.....	291
Elevation marks.....	292
Elevation mark.....	292
Align level marks by baselines.....	297
Align level marks by arrows.....	298
Level mark on plane.....	300

Recalculate level marks.....	302
Notes.....	304
Mechanical note.....	304
Construction note.....	306
Comb leader note.....	308
Chain note.....	311
Section note.....	312
Node note.....	314
Note for multilayered constructions.....	316
Linear aligned note.....	318
Distribution range.....	319
Editing Notes.....	320
Save template note.....	321
Drawing symbols.....	322
Gradient symbol.....	322
Node.....	324
Fragment mark.....	324
Correction Mark.....	324
Position marker.....	325
Position.....	325
Views and sections.....	327
Section.....	327
View.....	328
View and Section Label.....	328
Bound forms.....	329
Bound forms.....	329
Breaks.....	330
Procedure.....	331
Dialogue.....	331
Grips.....	331
Linear break.....	332
Two-linear break.....	332
Curved break.....	332
Two-curved break.....	333
Shaft break.....	333
Welding.....	333
Welding.....	333
Simple welding.....	336

Weld seam.....	336
Fixed joint.....	337
Simplified weld joint.....	342
Edge preparation.....	344
Tables.....	347
Tables.....	347
Import, export from Excel.....	352
Table recognition.....	352
Editing a table in the drawing.....	353
Table editor.....	356
Split the table by pages.....	405
Drawing borders.....	408
Working with standard formats.....	408
Creating custom formats and stamps.....	411
Text.....	417
Technical conditions.....	417
Technical parameters.....	423
Construction text.....	428
<b>Utilities.....</b>	<b>430</b>
Creating a hatch.....	430
Procedure.....	431
Objects numeration.....	433
Procedure.....	433
Measurements.....	436
Fragment Copy.....	437
Plate Array.....	437
Creating an array of objects.....	439
Arrays along an arbitrary path(Trajectory).....	440
Arrays for arc trajectory.....	441
Rectangular array.....	442
Steps of an array.....	443
Area array.....	444
Procedure.....	445
Centerlines.....	446
Procedure.....	446
Fillet.....	449
Command Options.....	449
Features of the Command.....	450

Chamfer.....	453
Command Options.....	454
Features of the command.....	455
Anchor.....	457
Procedure.....	458
Dialog.....	458
Hole group.....	460
Procedure.....	460
Dialog.....	461
Properties.....	463
Grips.....	463
Static beam calculation.....	464
Calculate section characteristics.....	468
Calculator.....	468
Insert material designation to the table.....	470
Notebook.....	471
Magnet.....	474
<b>Editing.....</b>	<b>477</b>
Editing.....	477
Edit in-place.....	478
Group Edit.....	479
Regenerate.....	480
Explode all.....	480
Explode primitives.....	480
Procedure.....	480
Export drawing file.....	481
Parameters Redefinitions.....	481
The basic rules.....	482
Command Options.....	483
Action sequence.....	483
Checking the settings of design elements.....	483
Find and Replace.....	484
Search.....	485
Search result.....	486
Replace.....	487
Quick selection.....	487
Procedure.....	487
Dialog.....	487

Viewport context toolbar.....	490
<b>MechWizard.....</b>	<b>490</b>
ScriptMaster.....	490
Dialog.....	490
The menu bar.....	492
Object description.....	498
Object Name.....	498
Object type.....	498
Object subtype.....	499
Specification.....	499
Not used.....	499
Protected (used internally).....	499
Public (visible).....	499
Changeable (available for editing).....	500
Set parameter in the dialogue.....	500
Dynamic selection.....	500
Calculate after dialouge is shown using dynamic selection by expression.....	500
Dont calculate parameter.....	500
Minimum value.....	500
Maximum.....	501
Object tree.....	509
Managing Dependencies.....	533
Compound objects.....	537
Symmetry axis.....	537
Set Parameter.....	537
Enter additional values.....	539
Insert point.....	539
Suppression contour.....	540
Procedure.....	540
Hatch contour.....	541
Procedure.....	542
Array.....	543
Test Model.....	544
Create sketch.....	544
Procedure.....	544
Examples.....	547
Creating a template layout tiles.....	547



## Intro

This manual describes work in Construction 21

### Legend

**Important!** Information on actions that may lead to work difficulties

**Note:** Useful information on the topic

**Example:** Link to the internal manual page or file

**Link:** Link to a resource on the Internet

**Video:** Link to the video instruction

### Abbreviations

*LBM* - left button mouse.

*RBM* - right button mouse.

### Main sections

*Procedure* - The section describes the user actions for constructing the object being described.

*Edit dialog* - This section describes the commands and parameters of the object editing dialog. As a rule, the editing dialog is invoked by double-clicking on the object.

*Properties* - the section describes the parameters on the functional panel "Properties", referring directly to the object being described.

*Grips* - the section describes the intelligent design handles of the object being described. Handles appear when selecting an object in the drawing.

*Features of the team* - the section describes special techniques for working with the called team.

## Basic knowledge

### *About the program*

Construction 21 – it is an integrating software solution for platforms nanoCAD, designed to speed up and simplify the design of components, the development, design and editing of design documentation, project data management, focused on the domestic user, made on the basis of regulatory recommendations.

The tools Construction 21 complement the familiar environment nanoCAD, without disabling or reassigning its commands, toolbars, and menu items.

Technology work *Construction 21* is based on the use of object-dependent parts with assembly and parametric dependencies pre-installed on them.

**Important!** Save drawings only in the format \*.dwg. When resaving to other formats (for example \*.dxf), objects of *Construction 21* will be permanently converted into proxy graphics and cannot be edited.

### *Copyrights and Licenses*

No section of the documentation may be changed, adapted or translated into other languages without the prior written permission of the firm "Nanosoft". It is not permitted to create derivative documents based on material from this publication.

The Construction software complex described in this manual is distributed in accordance with the terms set forth in the License Agreement and cannot be used, transferred or sold under any conditions other than those expressly specified in this agreement.

#### **Licenses:**

WpfToolkit (c) Xceed Software Inc

[Xbim Toolkit by Xbim](#)

### *Compatibility*

Construction 21 platform support nanoCAD, as well as vertical solutions nanoCAD versions 2, 3, 4, 5, 6.

If the drawing is created *Construction 21*, it opens on a computer that does not have any one of the modules of the complex, the special objects Construction 21 converted into so-called proxy-objects. To preserve the ability to edit them using "handles", as well as view and change the objects in the dialog box "Properties" on a computer, you must install a freeware distribution Construction 21 Enabler, located on the CD with a licensed copy Construction 21.

When transferring files to a user or customer drawings that do not have Construction 21 and not having the ability or desire to use Construction 21 Enabler, you need to convert all the objects Construction 21 in the standard system primitives nanoCAD.

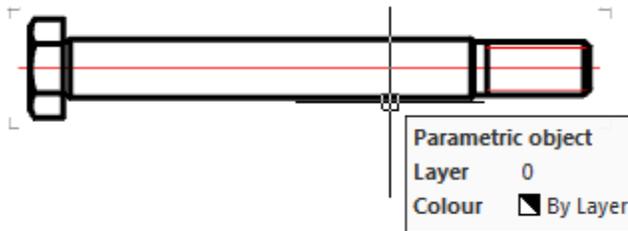
To do this, use a special command  **"Break all objects"** (the toolbar "Edit"). This command will automatically select all of the objects in the drawing, and divides them into primitives nanoCAD. For individual subdivision Construction 21 - objects can use the standard command nanoCAD "EXPLODE".

In the dialog box *Construction 21 - Setting* possible as a random location Construction 21 - objects on any current layer and automatic fixing Construction 21 - objects on said layer. In the second case, creating Construction 21 - subject to pre-select the desired layer in the list and make it current is not required: the program will automatically execute it, regardless of the current layer.

### *Selected and allotted object*

An object refers to an nanoCAD graphic item as well as an object created by the Construction 21.

## Allotted object



An object is considered allotted (indicated) if additional graphic information appears on the screen when the mouse cursor is moved to it:

- the object is highlighted in color;
- the "rectangle corners" of the object appeared;
- the object information tooltip appeared.

*Note:* The mouse keys are not pressed in this case - you just hover the cursor over the object.

### Scaling to the allotted object

- Move the mouse pointer over the Construction 21 object until "rectangle corners" appears, the object color changes, or an info tip appears;
- Hold down the SHIFT key and press RMB. It will auto scale to the center of the screen.

To scale to the selected object, the user coordinate system (UCS) must be set to \* WORLD \*.

## Selected object



An object is considered selected after it has been clicked with LMB:

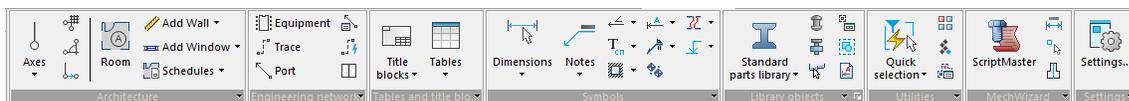
- the image becomes dotted or highlighted;
- the insertion point is displayed;
- "grips" are displayed.

## Object context menus

To set additional options for the current command, right-click context menus are widely used when invoking commands. The content of the context menu depends on whether the editable object is selected or allotted.

## Workspace

### Menu



All tools Construction 21 located in the ribbon (in the main menu) tab "Construction".

Commands Construction 21 grouped by purpose and organized hierarchically. When you select a menu item marked with a black triangle, the corresponding drop-down menu is activated. This way you can access all the tools Construction 21.

Menu Construction 21 also serves for loading / unloading individual functional panels Construction 21, call dialogue "Construction 21 - Settings" and to access some common features Construction 21.

## Toolbars

You can access the Construction 21 tools through the toolbars. Toolbars are divided by purpose. The user can place on the screen those panels that contain the most frequently used groups of tools.

There is also a universal toolbar "Construction Main" - instrumental two-level panel on which groups of tools are located for working with symbols and graphical constructions defined by standards Construction 21.



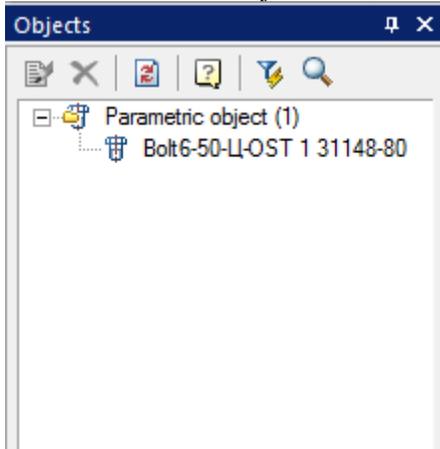
Tools are grouped by purpose (group of callouts, group of commands for setting level marks, etc.).

Click the LMB user to select the first in order tool of the group. If you click and hold the corresponding button on the panel with the mouse, a sub-panel opens, containing the rest of the tools in this group. Without releasing the LMB, you need to move the cursor to another command of this group, and then release the button. As a result, the selected command will be launched.

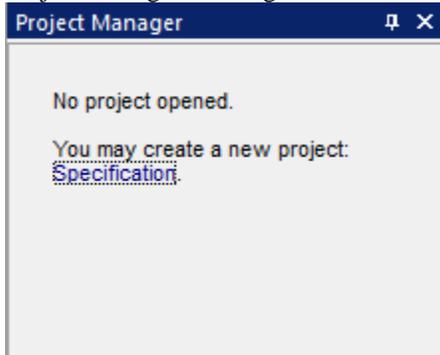
## Functional panels

On the left side of the screen are added functional panels, such as:

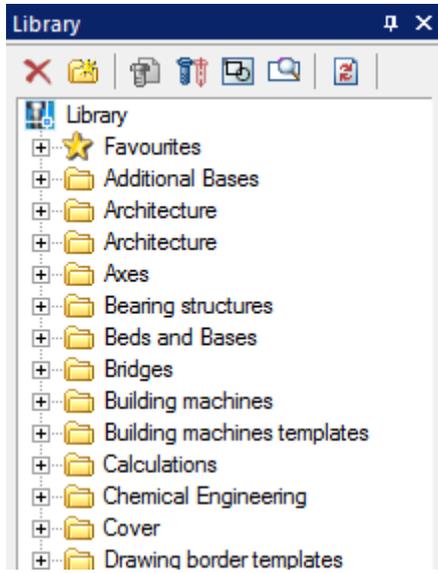
Objects - displays all objects Construction 21 created in the drawing. Directly from this palette you can perform a series of actions with objects: edit, delete, hide and search for them.



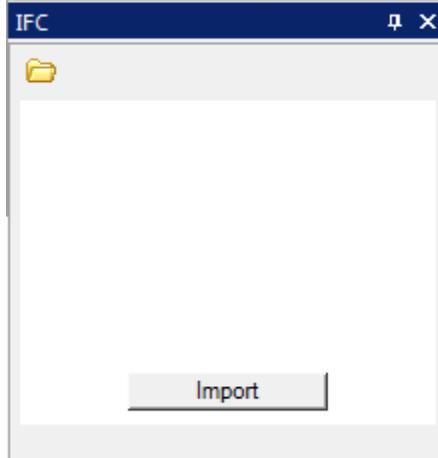
Project Manager - Manages all available projects Construction 21.



Library - contains a database of objects Construction 21 used for design.



*IFC* - works with IFC objects in the drawing.



## Help system

Background information is available to the user at any time. The help system has two access modes - general and contextual.

General mode provides access to the help content in the absence of a command being executed.

Contextual mode automatically provides access to reference information that corresponds to the command being executed.

Background information is divided into two parts.

The first part is the program help Construction 21.

The second part - the basic standards Construction 21.

## Scale

### Option 1. Making projections in model space

Suppose the principal species in the model space are performed one by one.

Additional types, sections are made with scale factors other than the main species.

## Features insert frame

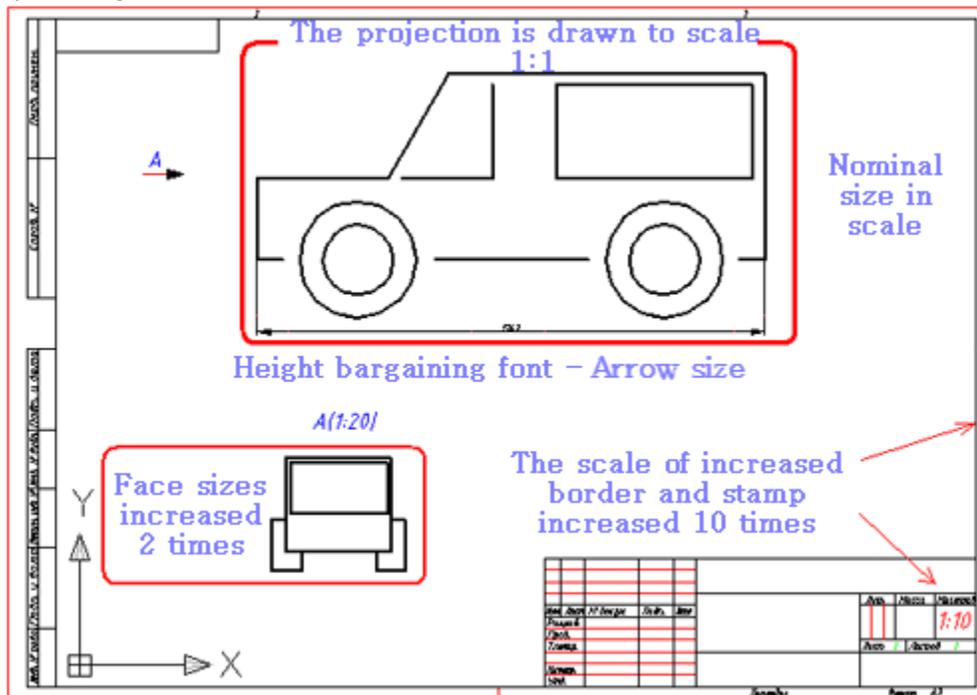
When placing a border with a title stamp in model space given its scale relative to the principal species. Frame increases or decreases.

## Features design drawings

When dimensioning must take into account the scale factor drawing (the value of the dimension text, the value of the arrow, spacing, etc.) and numerical designations for each species.

Assume frame is increased with respect to the main sight 10 times. In this case the arrowheads, dimension text height and other text labels should be increased by 10 times. A nominal size of the text for the main species should be marked on a scale of 1:1.

When applied to the kinds of sizes, made in a different scale (in our example, 1:20), nominal size must be multiplied by a scaling factor.



Example of projection drawing frame, increased 10 times

## Especially when printing

In this example, the sheet is printed at 1:10 in order to maintain a standard frame size, title block text and symbols. Such technology is not supported Construction Site 21.

## Option 2. Making projections in model space

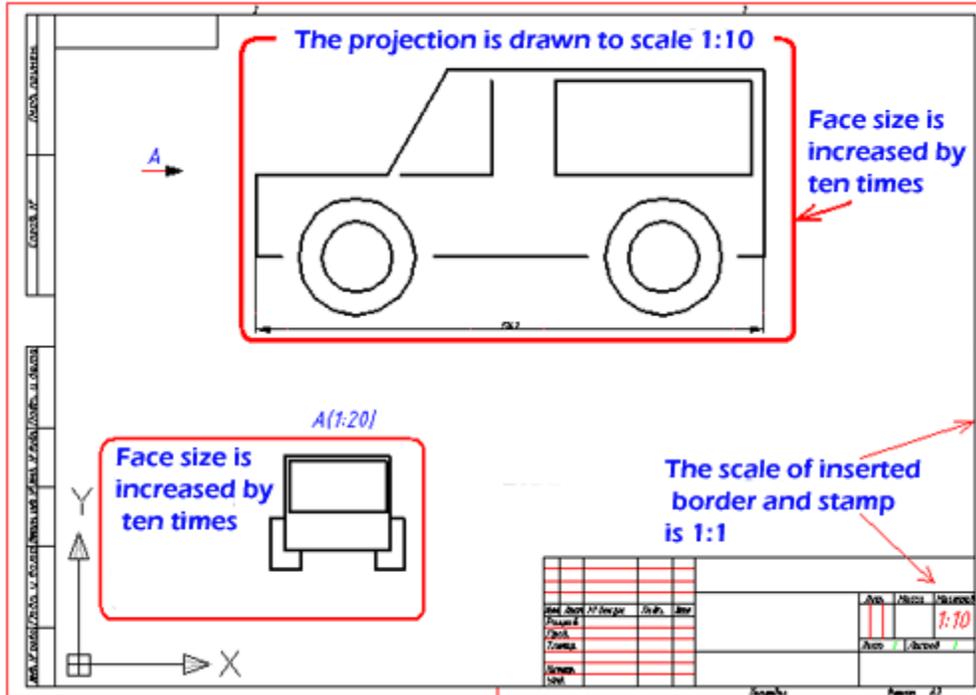
### Features insert formats

The frame is inserted into the space pattern in the scale of 1:1.

Main types, made a scale of one to one in the model space scale when placed on a frame with a title block.

## Particulars of

The magnitude of arrowheads, dimension text height and other text refer to all types are specified in a scale of 1:1. When dimensioning must take into account only the scale factor of the form in which they are applied.



Example of drawing. Frame in a 1:1 projection in a given scale

## Especially when printing

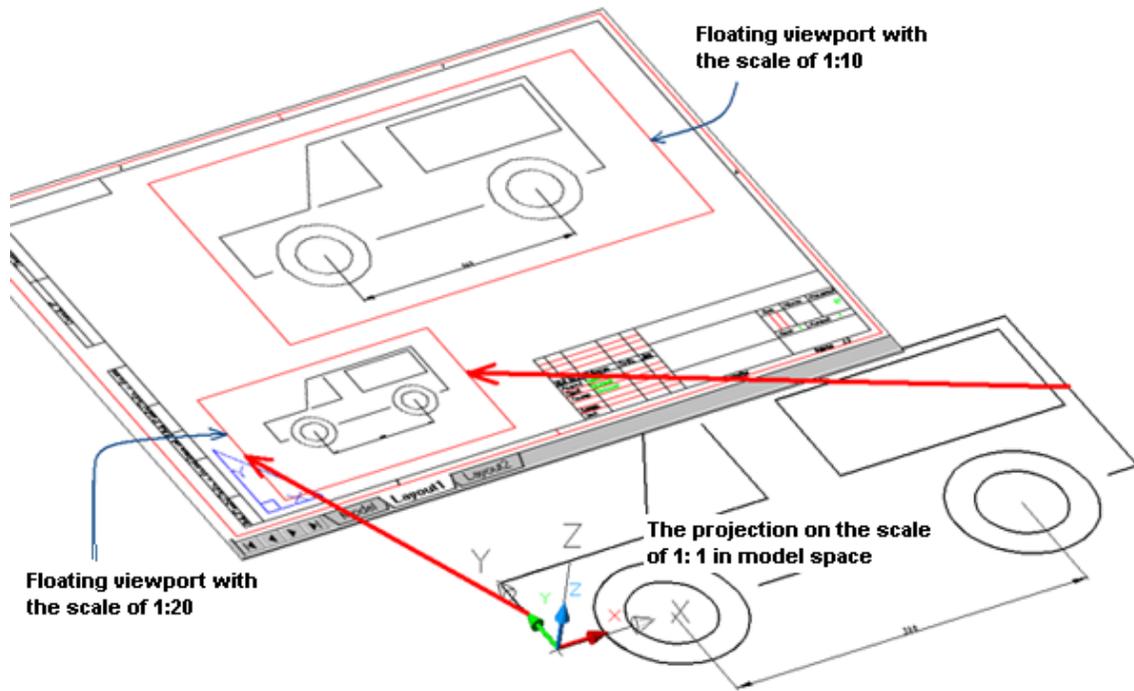
Under this option, registration in model space frame with projections printed at a scale of 1:1. This variant of design drawings in model space adopted in Construction Site 21.

## Option 3. Making projections in paper space

The most convenient way to design drawings projections. All images of objects executed in one-to-one scale model space.

Border and title stamp inserted in 1:1 scale in paper space.

Scale for each species, cut or section is given in the floating viewport in paper space. No need to convert the nominal values of dimensional numbers. Floating viewport - a kind of lens with a predetermined magnification (scale) of the portion of the drawing.



*Border and two floating viewports placed in paper space*

## Particulars of

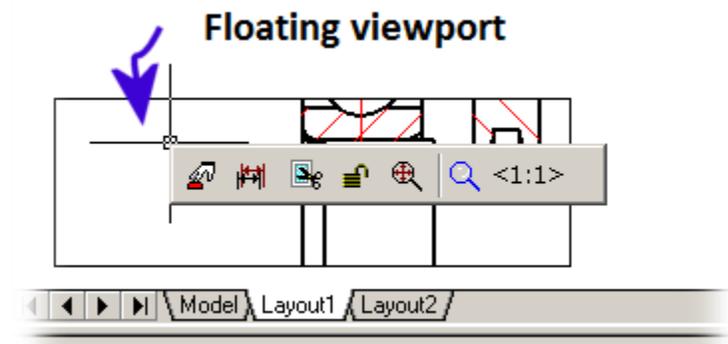
Scale factor when dimensioning for each species is taken into account automatically.

## Especially when printing

Frame with projections printed in 1:1. scale in Construction 21 frame and title block inserted in model space or sheet at a scale of 1:1.

## Paper space commands

When designing drawing projections in paper space, the context menu is available Construction 21. To call the menu, place the cursor in the area of the floating viewport and press RMB.





*Activate viewport* - command activates viewport for editing.



*Refresh dimensions* - command updates the dimensions in the viewport.



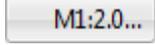
*Cut viewport* - command allows you to change the shape of the viewport.



*Lock viewport* - command fixes scales (including zoom commands) of viewport.



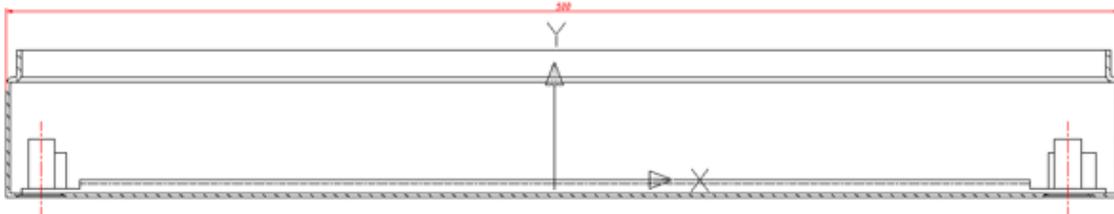
*Zoom all* - command inserts all the graphics from the model space into the viewport.



*Scale* - a drop-down spikok allows you to select a viewport scale.

### Example of design drawings of extended objects

Especially useful when you make a paper space drawings of extended objects. A small example. In model space, one to one (in real terms) has been drawn projection with dimensions 500 mm horizontally.



*Projection with dimensions of 500 mm horizontally*

**Objective:** To formalize this projection in paper space on the frame size A3.

The screenshot shows a paper space layout with two floating viewports. The left viewport is labeled "First floating" and the right one is labeled "Second floating". Below the viewports is a title block with the following fields:

FILE NAME	DATE	PROJECT	SCALE
SIZE			
DRAWN			
CHECKED			
APPROVED			
ISSUED			
REV		DATE	
DESCRIPTION			

A blue arrow points to the title block with the text "Frame and format on the scale 1:1".

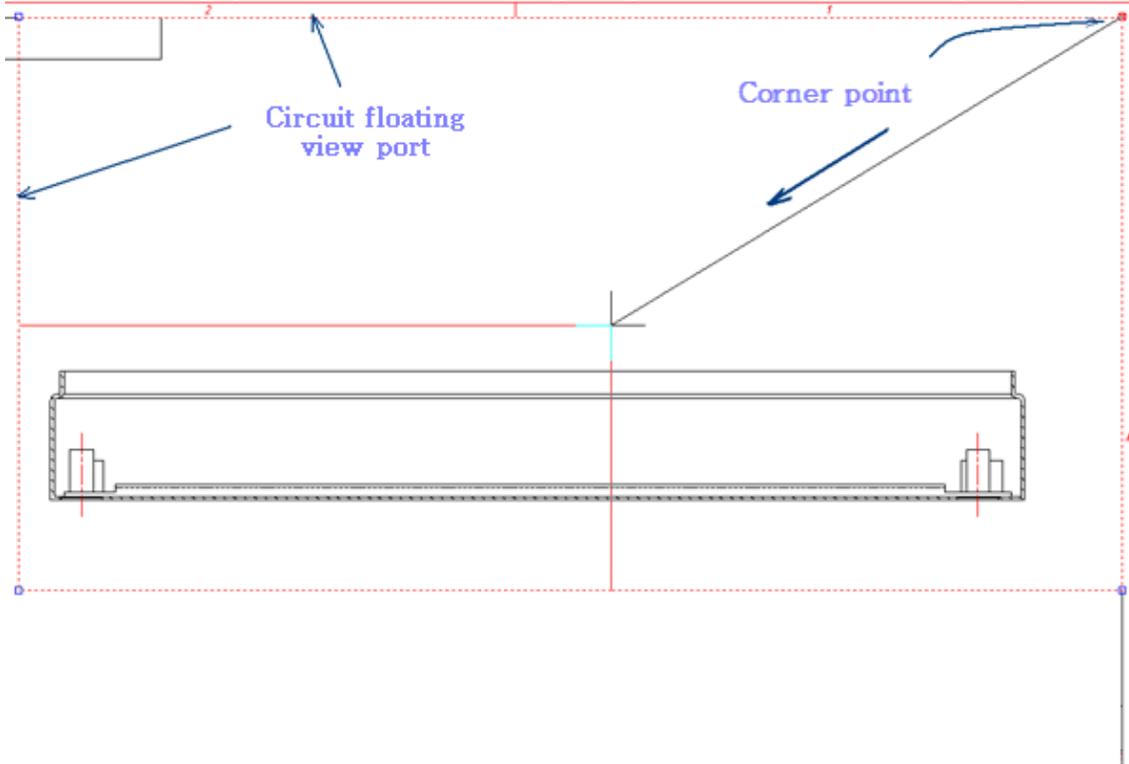
*Result projection design in paper space*



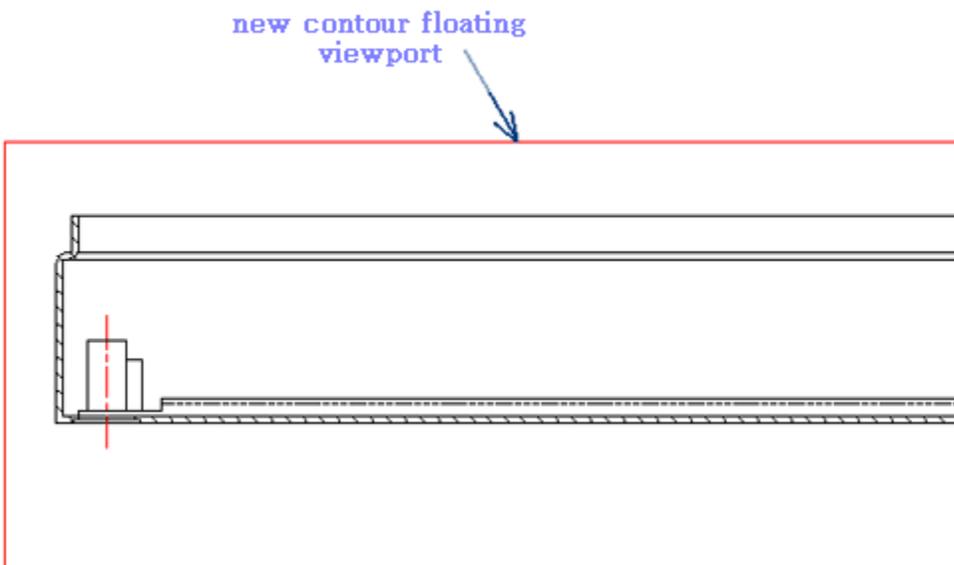
We turn to paper space by selecting a bookmark *Sheet1 (Layout1)*. Insert Frame A3 clicking the icon *format* in the main toolbar Construction 21.

After placing the frame in paper space is created by default floating viewport rectangular shape. Inside it displays all the objects in the model space. Zoom while arbitrary and requires further editing.

Resize a floating screen. To do this by clicking on its contour the left mouse button, move the highlight corner points. Part of the projection will then be hidden loop viewport. We did a kind of trimming images.



*Move the corner points of the floating viewport*

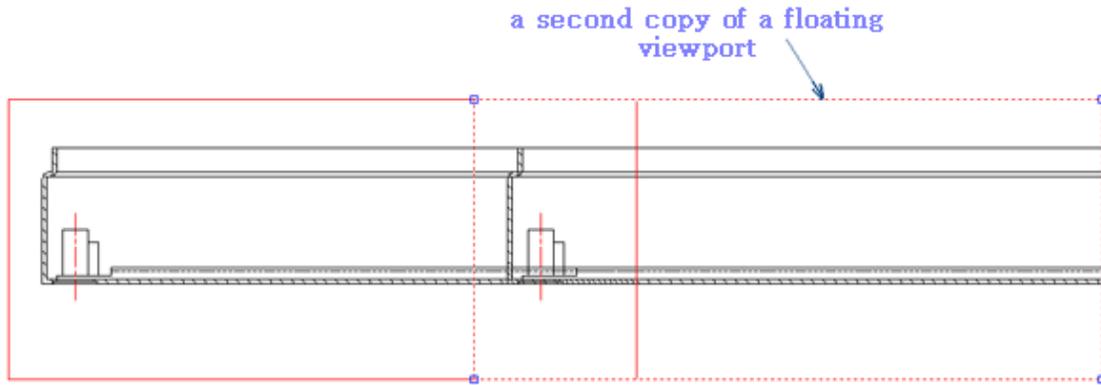


Result after the transfer of the image projection of the angular points of the contour floating viewport

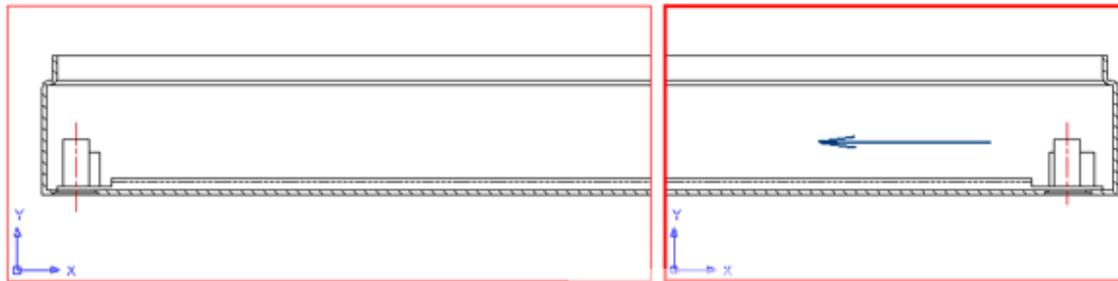


Panel **Viewports (Viewports)**

Once the boundaries of the first viewport defined, define the scale of the image. Distinguish the border of the viewport. We define the scale of the image using the dashboard Viewports (Viewports) . To get the image on the right part of the projection make a copy of the floating screen and move it to the right.



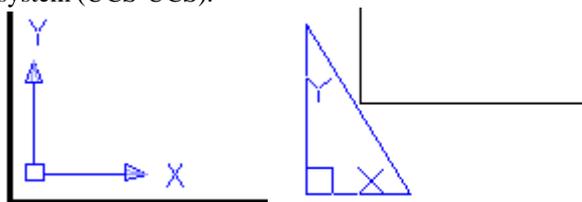
Move the copy right of the screen



direction of movement of the slider

Changed the boundary of the right floating viewport

With a team of pan define the right side projection view inside the right floating viewport. To do this, double-click the left mouse button within the contour of the viewport. Sign space layout changes to mark the user coordinate system (UCS-UCS).



**Especially when printing**

Before printing frame with the projections need to go out of the floating viewport to paper space. To do this, double-click the left mouse button outside the boundaries of the viewport. Sign appears in paper space.

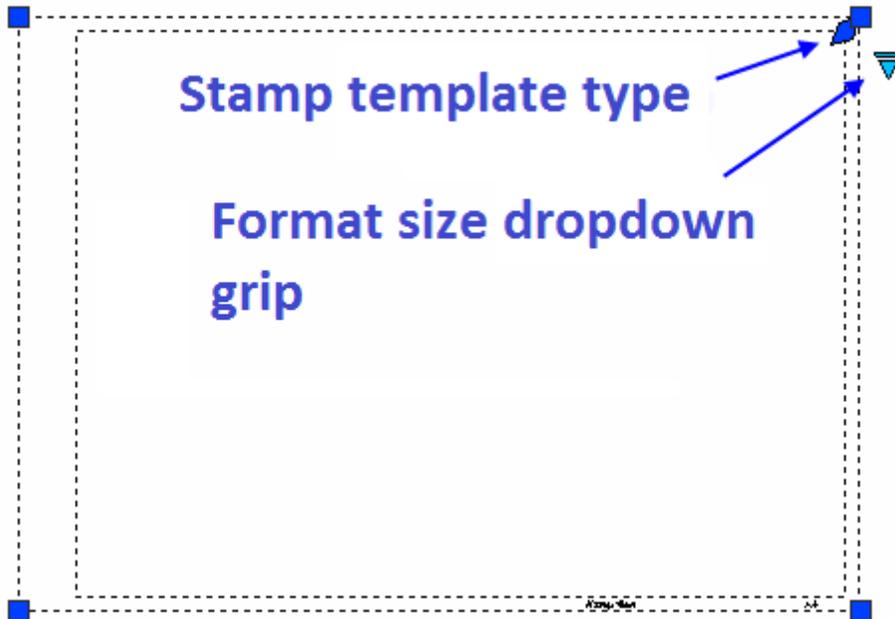
## Controls features

### Intelligent controls grips

Intelligent grips are intended for editing the properties of design elements inserted into the drawing without calling the editing dialog.

Intelligent grips are included in the settings *Construction : Main options - Edit - Enable enhanced grips.*

Descriptions of grip actions are found in the description of the corresponding design elements.



The appearance of the grip corresponds to its action (frequently used ones are shown):

-  Node move grip
-  Graphics move grip
-  Grip for adding a new node
-  Grip for adding additional graphics
-  Direction grip
-  Tilt grip
-  Text alignment grip
-  Grip for selecting a value from a drop-down list

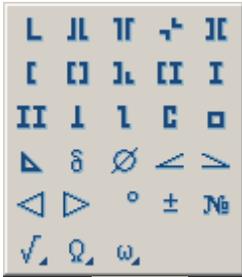
### Special characters and fonts

The dialogs remote printing and editing tables are buttons insert special characters by which a dialog box in which you presented the symbols used in architectural design.

For remote printing button  "Insert special character".

To the Editor button table  "Insert Character".

Select the character you want by clicking on it with the left mouse button, after which it is automatically inserted at the current cursor editing table.



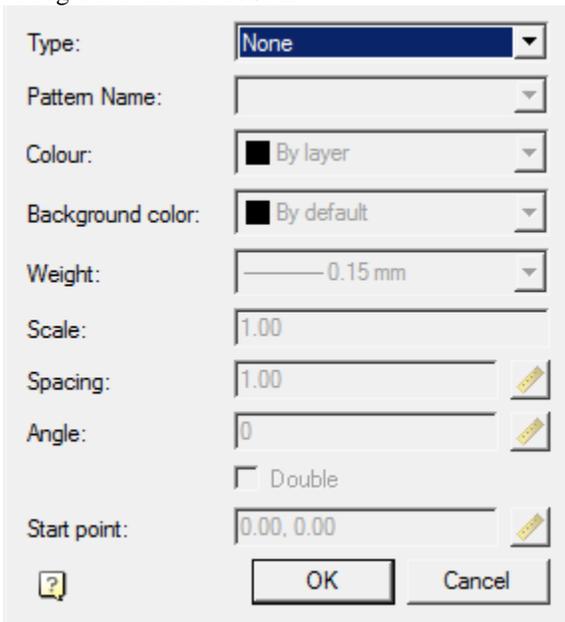
Buttons  opens a list of uppercase and lowercase letters of the Greek alphabet.



Special characters are correctly displayed only text based on the fonts Construction (.shx). Displaying characters when pasting in text based on TrueType-font, the screen looks incorrect (replaced by question marks, boxes, etc., depending on the settings of TrueType-font).

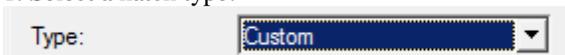
## Parameters hatch

In the dialogs for editing Construction objects, there may be a  "Hatch" button, which opens the "Hatch" editing dialog other than nanoCAD.



## Procedure

1. Select a hatch type:



- *None* - hatch will not;

- *Predefined* - hatch is selected by abrasive from the list of standard hatches;
  - *Custom* - hatch is selected by abrasive pattern from the list of custom hatches;
  - *User-Defined* - hatching is formed in the form of parallel lines with a set interval and rotation angle. When you turn on the "Double" switch, the second row of lines will be drawn perpendicular to the first.
2. Select a hatch pattern (if possible). Depending on the selected sample, certain parameters will become available.

Pattern Name:

3. Configure the available options.

Colour:

Background color:

Weight:

Scale:

Spacing:  

Angle:  

Double

Start point:  

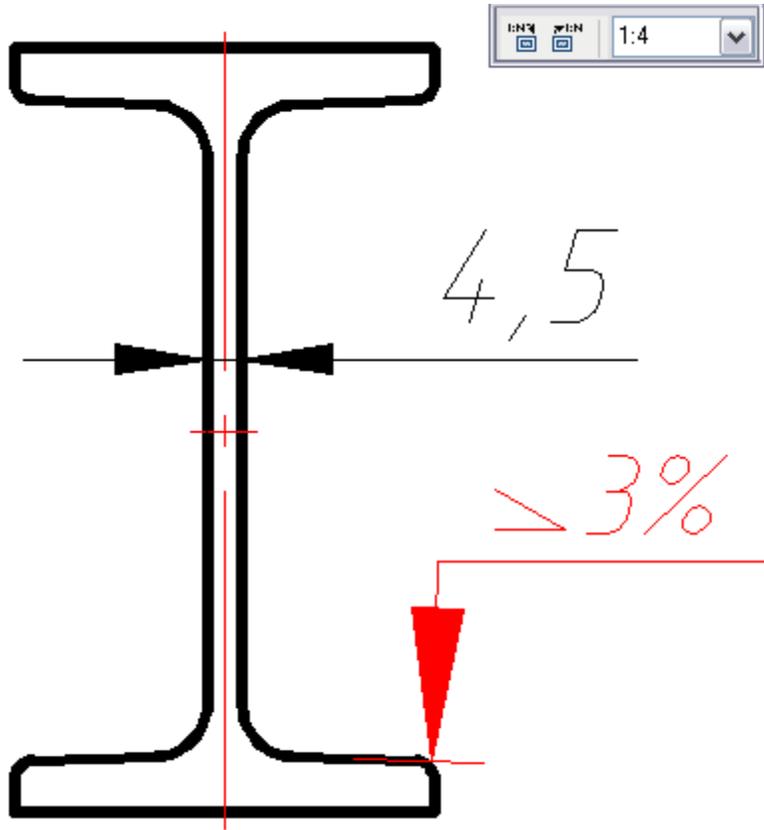
4. Click the "OK" button. The hatching will be adjusted and added to the appropriate location.

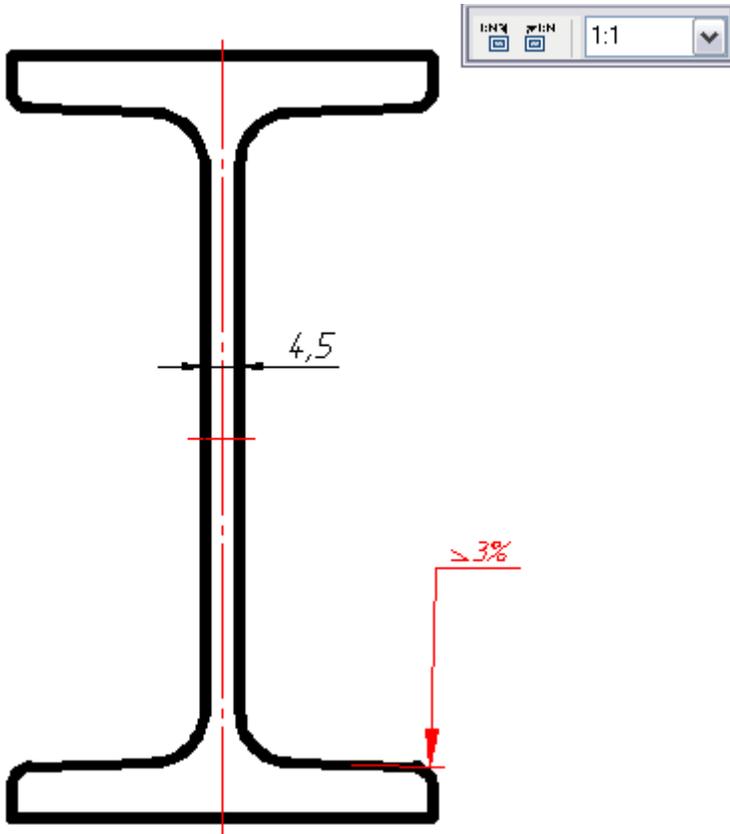
### ***Jobs in the current scale***

The Construction 21 uses the concept of the current scale. The current scale is different from the current global proportions, expressed in units (units).

Scale objects made depending on the setting of "Use the global scope to design elements" ([see. Customizing the appearance / General settings / Registration](#))

If the value of this setting - "Yes", the dimensions are scaled design elements and standard elements Construction 21base data types defined by the appropriate scale lines.

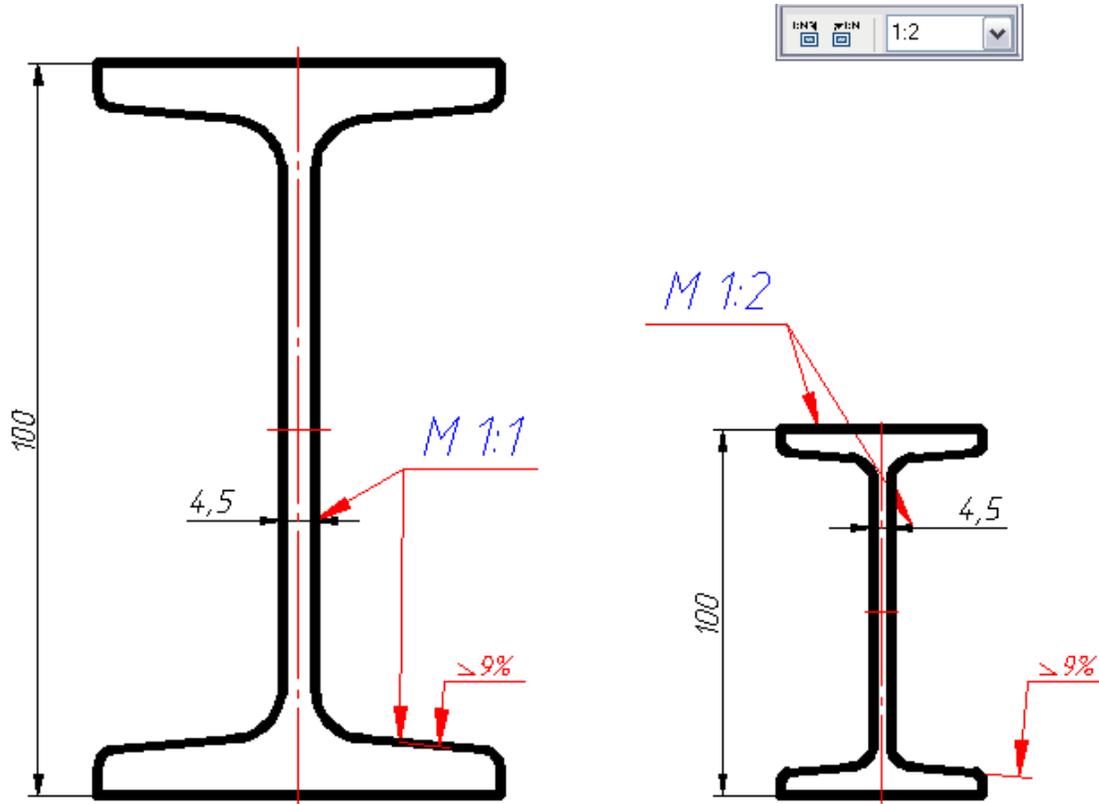




This setting is useful when drawing in model space on the scale of 1: 1, followed by design drawings in paper space viewport on an appropriate scale. In this case, design elements will appear consistently in viewports with different scales.

If the "apply globally to design elements" is set to "no" to the size of standard parts varies in accordance with the scale and size of the design elements remain unchanged. In addition, there is a linear scaling sizes by setting a linear scale factor.

This method is used when plotting the initial scale model other than 1:1.



The scale of the database objects of standard products and design elements can be installed with the help of the scale.



In the absence of selected objects using the zoom panel zoom button or change the current zoom scale drawing. If you have selected objects, the button and the panel scale display their scale. Zooming only affects the selected items without changing the current scale drawing.

The program features the ability to zoom the selected object Construction 21 center of the screen as a display frame around the object (the default frame is disabled). To do this, move the cursor to the object that appeared "Overall corners", hold down the SHIFT key, click on the right mouse button - will automatically increase the screen of the selected object.

If you press on an object at the same time the right mouse button and SHIFT key returns to the previous display with automatic centering of the object on the screen.

### Selecting the direction of drawing

When drawing some graphics Construction 21 may require special functions choice of direction of drawing. For example, when constructing [Weld seam](#).

Auxiliary toolbar "Destination" is automatically activated when a call instruction Construction 21, which is available for control of the direction of drawing.



**Perpendicular.** Construction perpendicular to the selected segment.

**Free.** The choice is arbitrary direction.

**Along.** Construction along the selected segment. The direction of the object is aligned to the segment, and will not indicate the direction of the opposite side.

⇒ **Parallel**. Parallel to the selected segment.

When constructing select the desired command and specify the length of the drawing, to be followed by leveling (except commands available).

## Special keys

### Key SHIFT

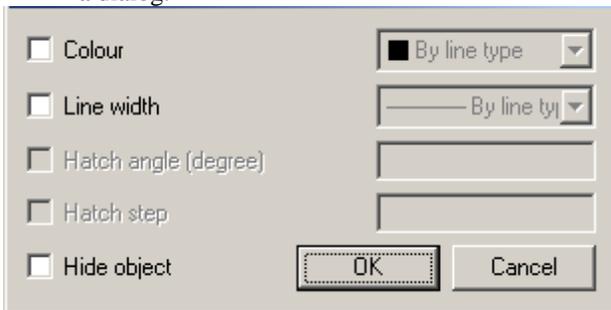
Key Shift used:

- When placing the dimension number. To accommodate the size of close to any external dimension line, move the mouse pointer, hold down the SHIFT key. To complete the team, click on the left mouse button.



### Key Alt

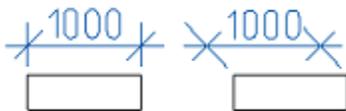
- To override *entities included in the standard components* a combination of Alt + right-click, which brings up a dialog:



Allowed to override the following properties: color, line thickness, slope and pitch hatch of hidden objects.

### Key Ctrl

- Used to set the angle of the extension lines when placing dimensions.



- Used in the [form editor](#) to select the type of control when you drag a variable in a custom form.
- [Editing a table at the place](#) called the keyboard shortcut Ctrl + left click.

## Shortcuts

*Ctrl+5* - strikethrough text works in text input fields (in callouts, sizes, etc.), table cells, TT and TX.

*Ctrl+U* - text underline, works in input text fields (in callouts, sizes, etc.).

*Ctrl+O* - overline text, works in input text fields (in callouts, sizes, etc.).

## Geometric constructions

Tools Construction 21 for the geometric constructions are specific for mechanical design. All objects created with their help, made up of primitives nanoCAD, and does not require special tools for editing.

Editing inserted objects in a drawing can be performed using a universal object editor Construction 21, called button  Editing. After selecting the object being edited is automatically recognized by the type and loads the appropriate dialog box.

Furthermore, editing objects Construction 21 it can be made by other means:

- clicking the right mouse button and then selecting the command "Edit in the context menu";
- double-clicking the left mouse button on the object Construction 21. Adjust settings registration ([Customizing the appearance / General settings / edit / double click](#));
- use grips;
- in window "Properties";
- standard command prompt ERASE, MOVE, COPY, ROTATE, STRETCH.

## Object-dependent parts

Object-specific details - the details of this database Construction 21 with the described properties of behavior when they are placed in the context of the assembly. With the change in the parameters of one such detail all the related object-specific details are automatically changed in accordance with their values in the database. Using this technology works, it is important to take into account the order of application of object-dependent items.

When applying standardized object-dependent parts of the image cursor-pointer signals the automatic recognition of the insertion point and the direction of the applied rendering details.

## Context menu entry fields

In the context menu the following entry is available.

Superscript	Ctrl+Up
Subscript	Ctrl+Down
Insert division	
Pick from drawing	
Create hyperlink...	
Symbols	▶
Undo	Ctrl+Z
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Delete	Del
Select all	Ctrl+A

*History* - recall last entry.

*Recent* - recall the most frequently used values.

*Superscript* - insert superscript (a combination of *Ctrl+Up*).

*Subscript* - insert a subscript (a combination of *Ctrl+ Down* ).

*Insert division* - insert shot.

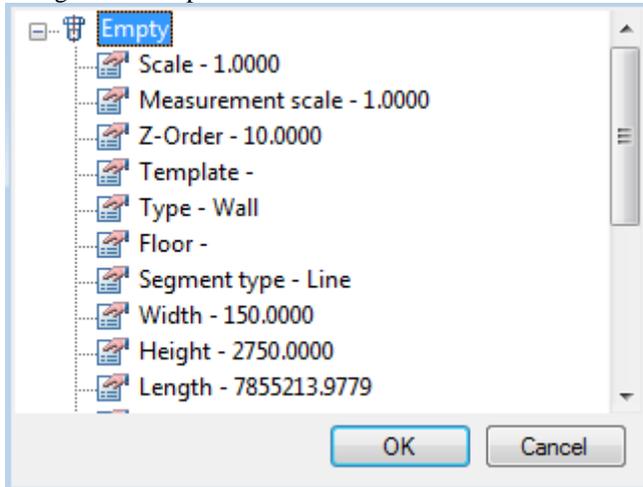
*Pick from drawing* - the command allows you to take data from the drawing and the properties of a standard part.

When you select this command, the panel *Select the value* apperas :



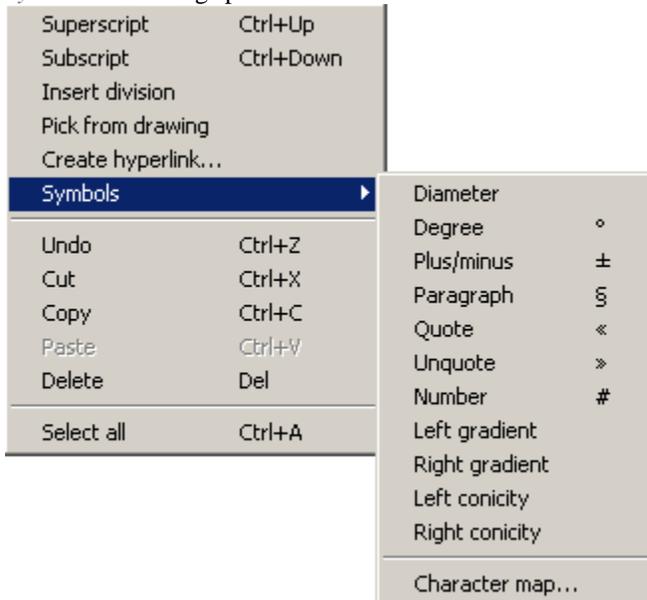
 *Measure distance (Z)* - to take drawing dimensionally linear or geometric size. Command can be selected by pressing Z.

-  *Measure angle (X)* - take the angular size of the drawing. Command can be selected by pressing *X*.
-  *Measure Perimeter (C)* - to take drawing the perimeter of a closed polygonal line or length. Command can be selected by pressing *C*.
-  *Measure area (V)* - take the value of the drawing area of the closed loop. Command can be called by pressing *V*.
-  Complex area(Shift+V) - take a few drawing value areas closed loop.
-  Calculator (M) - Calculate the number with built-in calculator in Construction 21.
-  Take from notes (,) - insert text information from the notebook.
-  *Take from property (B)* - allows you to take command of the sub-parameters database in Construction Site 21. Parameter is inserted preserving the dynamic link with the object. When you change a parameter line items are changed in the input field.



**Note:** To insert static text, hold the Ctrl key while selecting parameter.

-  *Mark text object (N)* - to take the text from the drawing.
- Cancel* - stop the command and return to the Previous menu.
- Symbols* - inserting special characters



*Undo* - Undo the last command (the combination of *Ctrl+Z*).

Clipboard operations

*Cut* (a combination of *Ctrl+X*).

*Copy* (combination *Ctrl+C*).

*Paste* (a combination of *Ctrl+V*).

*Delete* - Delete the entry field.

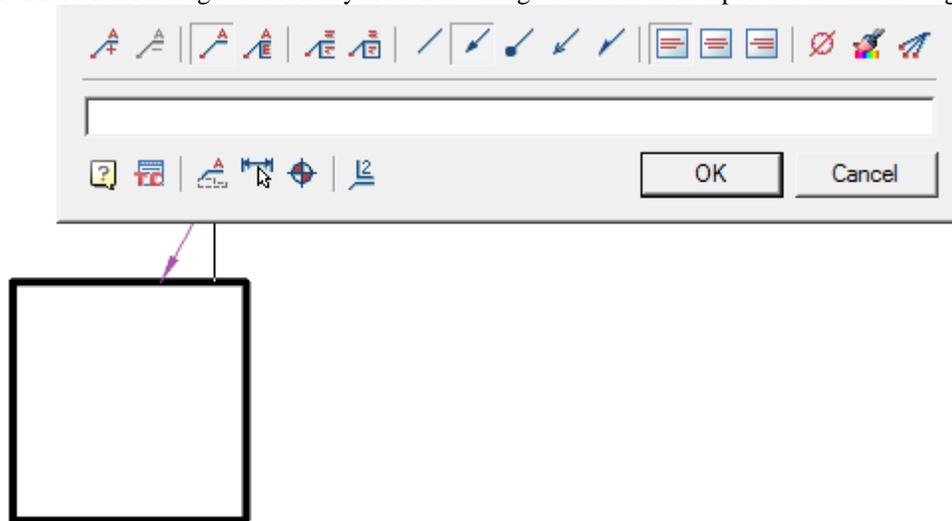
*Select all* - highlight the input field.

## Template

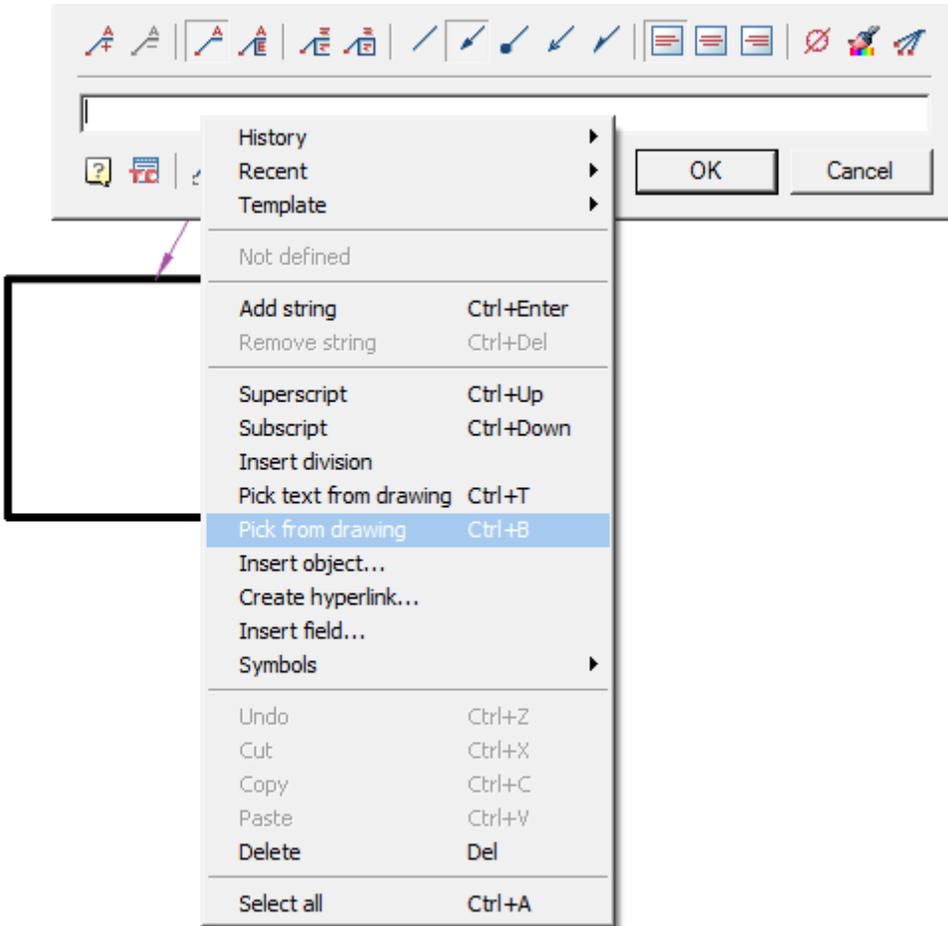
Templates are used to create objects of the same type with the same properties.

*An example of creating and applying a template based on callouts.*

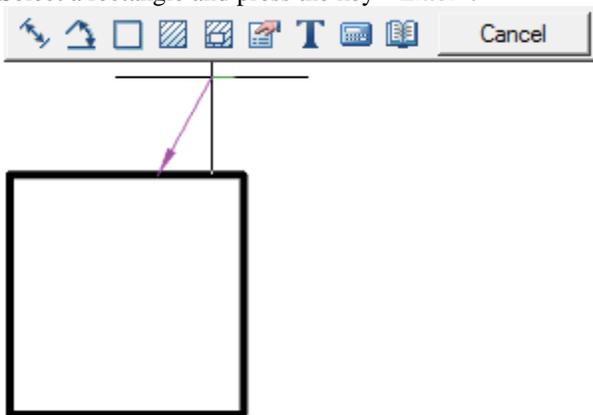
1. There is a rectangle of arbitrary area. Let's assign a callout to it. Open the callout editing dialog.



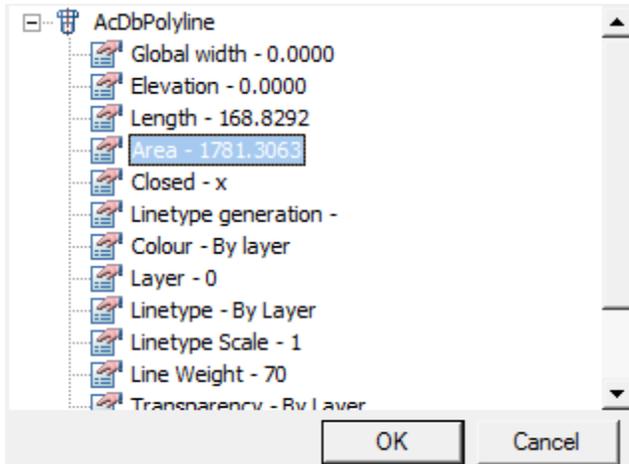
2. From the entry field callouts call the context menu and select the command "Pick from drawing." The "Value picker" dialog opens.



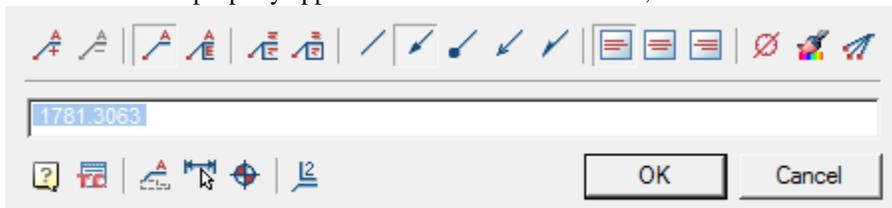
3. In dialogue "Value picker" call command  "Take from property".
4. Select a rectangle and press the key "Enter".



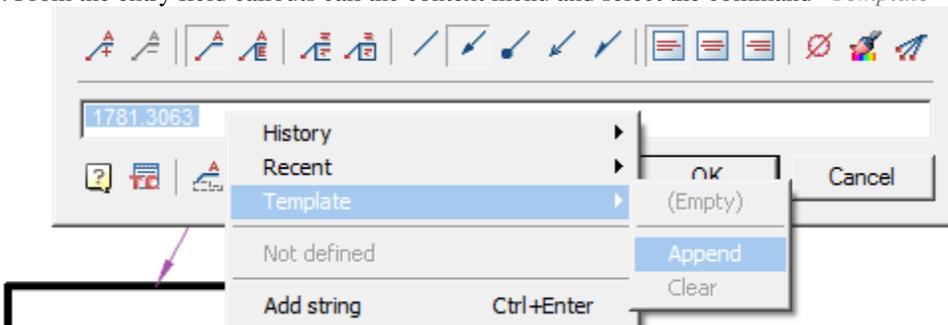
5. In dialogue "Properties" selecting "Area" and press "OK".



6. The link to the property appeared in the text of the callout, in this case - the area of the figure.

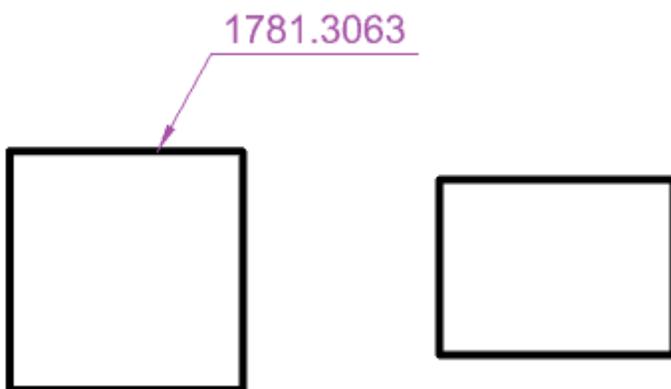


7. From the entry field callouts call the context menu and select the command "Template - Append".

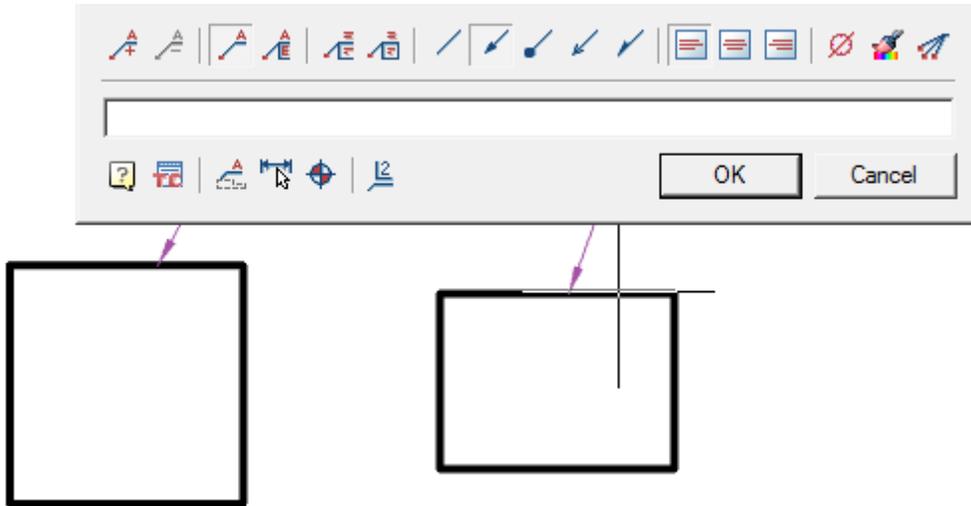


8. Close the callout editing dialog.

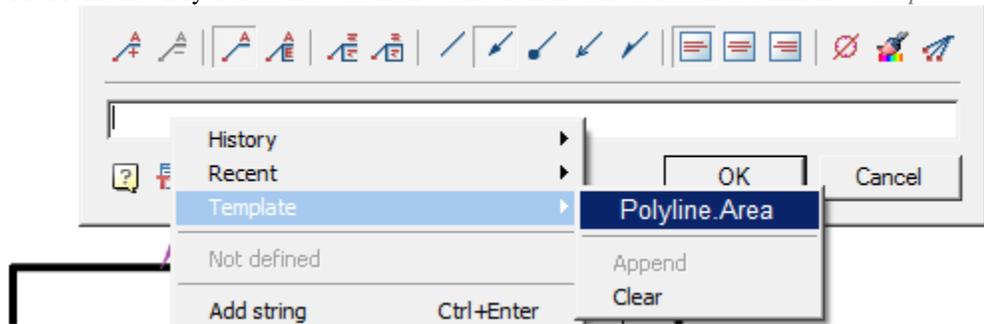
9. We build another rectangle, different in size from the first.



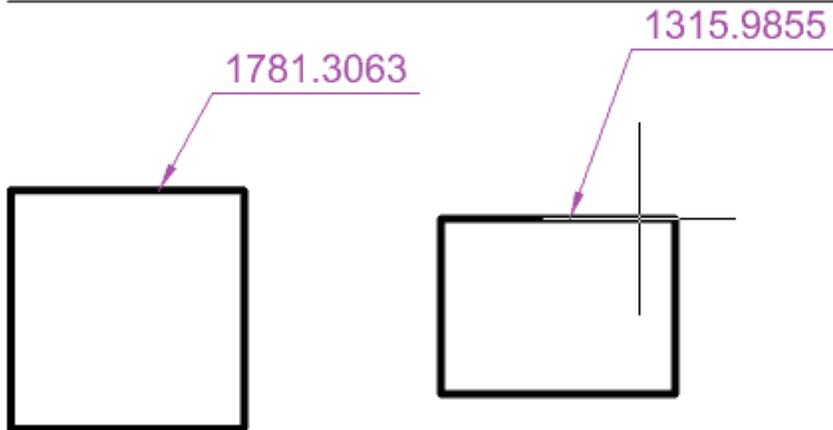
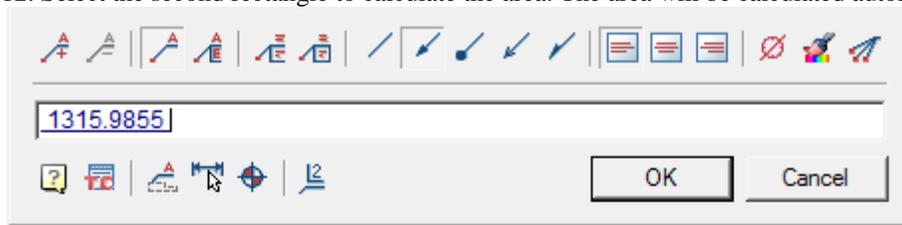
10. Assign him a callout. Open the callout editing dialog.



11. From the entry field callouts call the context menu and select the command "Template - Polyline.Scale".



12. Select the second rectangle to calculate the area. The area will be calculated automatically.



Such templates can be used not only for callouts, but also for other elements, for example:

- position designation;
- node designation;
- note level field;
- e.t.c.

## ***Regen***



Command line: *SPREGEN, RE, REGEN*.

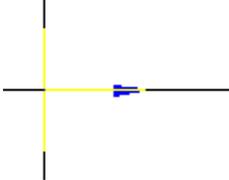
- Update objects Construction
- It recalculates table
- Updates overlapping objects
- Updates automatically calculates the attribute values

## ***The cursor-pointer***

Depending on the graphics platform (AutoCAD or Autodesk Inventor) and executes commands mouse pointer takes different forms.

## **The application of a single object**

Under a single object we understand insert parts from a database without automatic reference to other object-dependent parts.

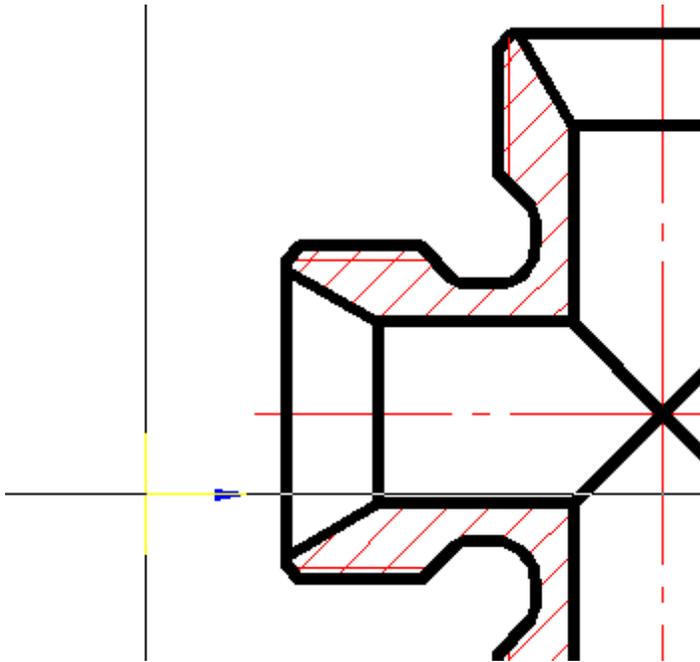


In the nanoCAD mouse pointer is displayed as a standard cross-hair, blue arrows and if there is a preview of the items - the item itself displayed.

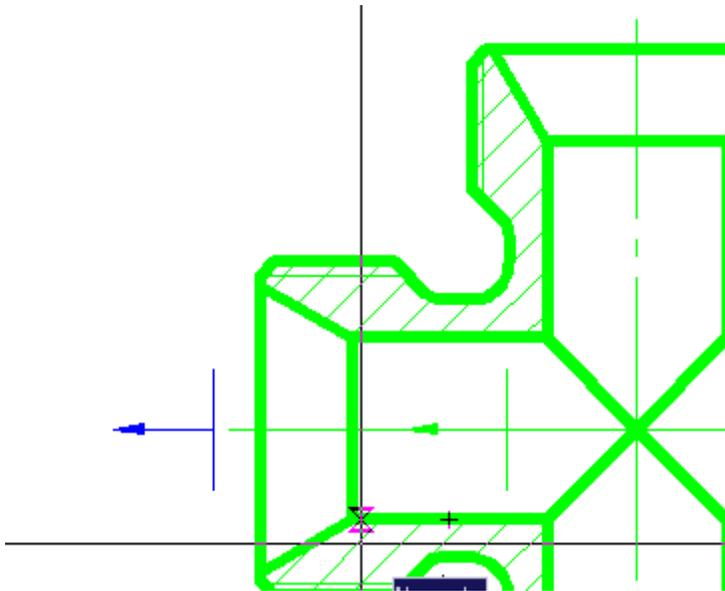
Blue arrow indicates the insertion point and the direction of the applied drawing object.

After you specify the insertion point of the applied object of the cursor, the mouse pointer changes, the user is prompted to set the direction of drawing an object, it will coincide with the direction of the blue arrow. To confirm the direction you need to click the left mouse button.

### Recognition of object-dependent parts



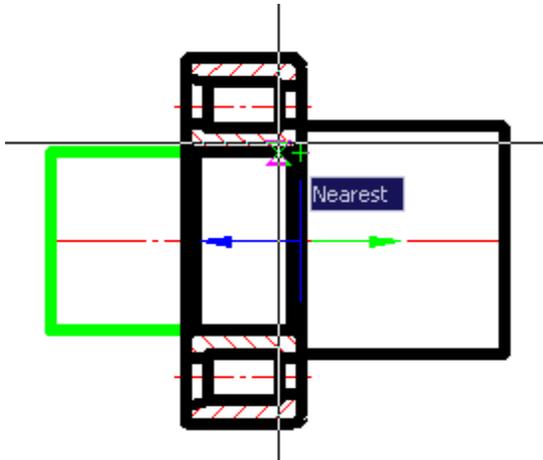
If you insert a part in an assembly before the cursor passes over the inserted workpiece, with inserted part can be installed according to the parts over which the cursor is, the original item is highlighted, and the position is determined automatically inserted details. To confirm the installation of dependencies inserted details, just click the left mouse button.



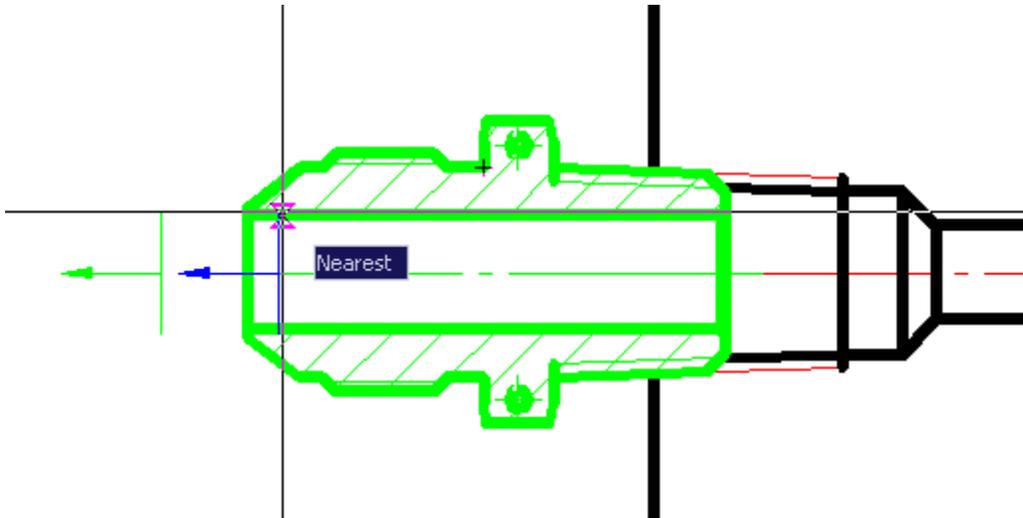
After this, a dialog box appears with parameters inserted parts.

### Application of the bearing on the shaft neck

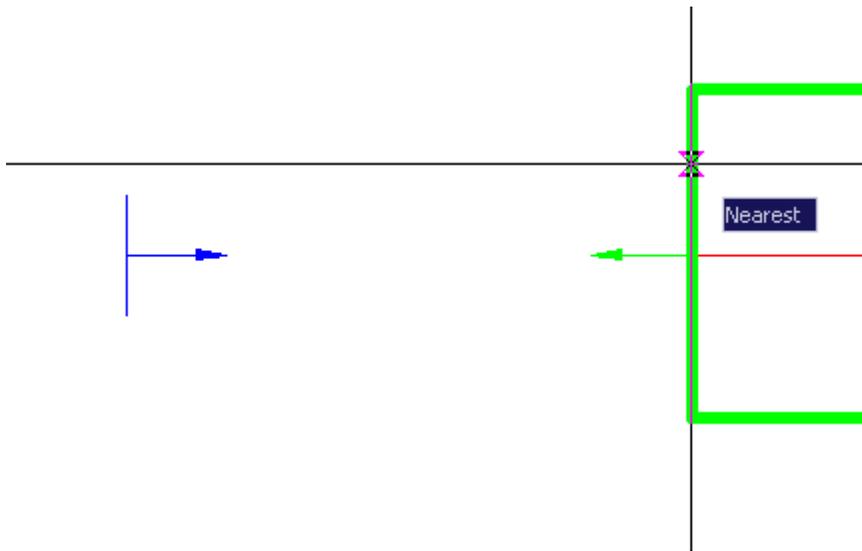
The cursor-pointer indicates that as the insertion point of the bearing end of the bead is recognized and given the direction of its rendering (left).



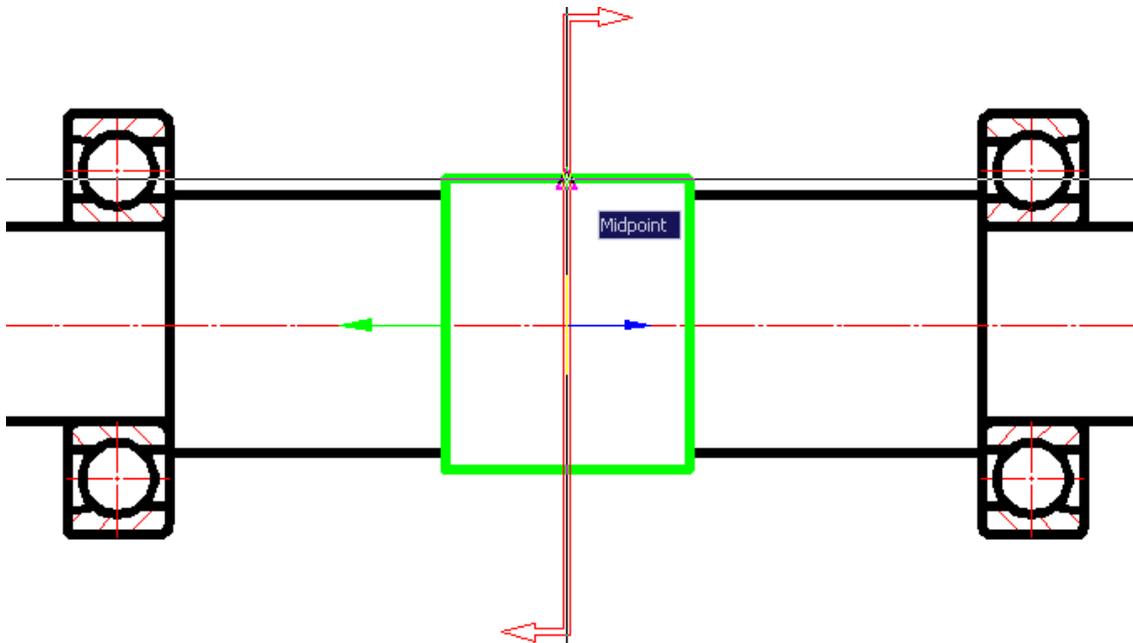
**Recognition of the insertion point in the tapered portion of the pipe bushings**



### Application of standard shaft end



### Drawing sign of torque



## Settings

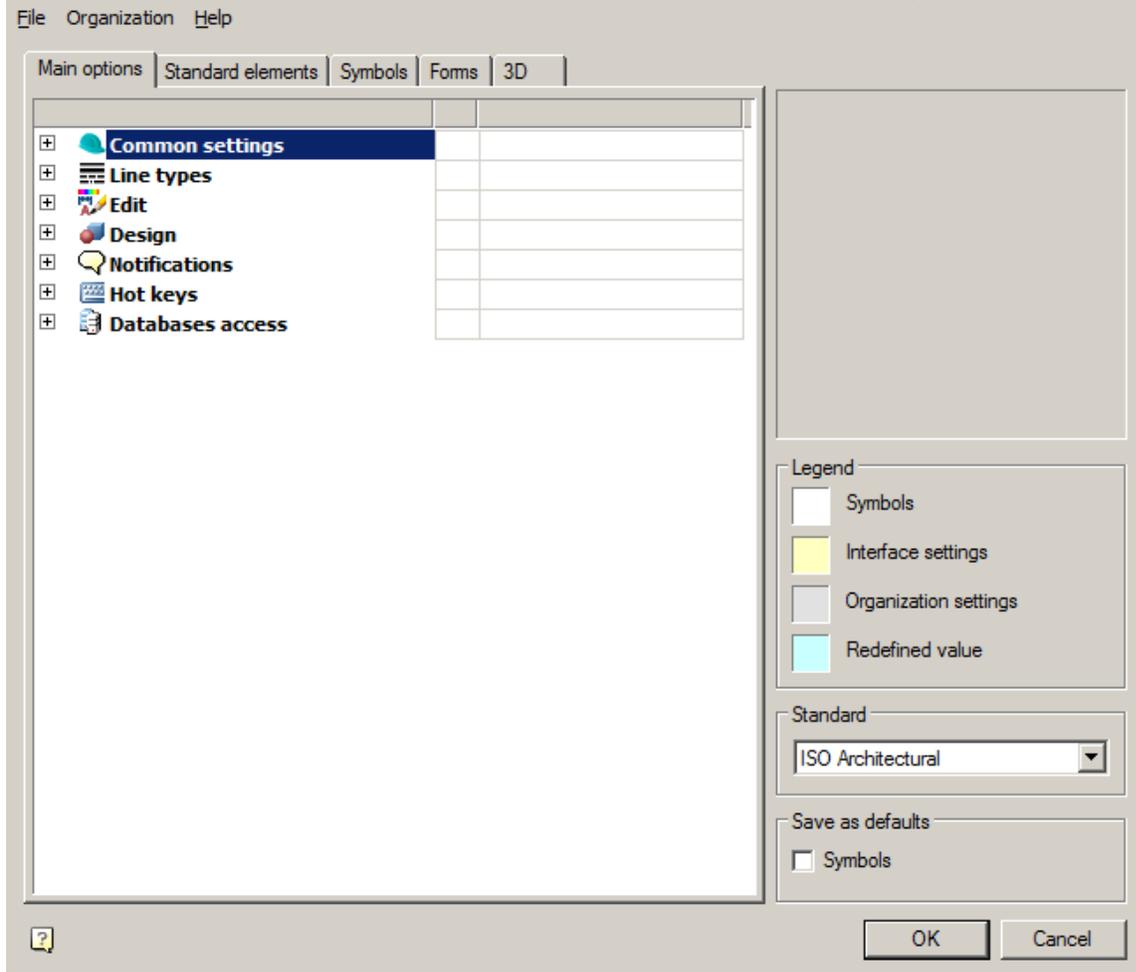
### Settings

-  Main menu: *Tools* -  *Design Settings...*
-  Main menu: *Construction* -  *Settings...*

Toolbar:  *Settings...* ( "Main").

Command line: *SPPARAMS, PARAMS*.

Customizing the interface and settings for design elements nanoCAD run in the dialog box Construction :



The header of the dialog displays the path to the settings file.

## Main menu

### Menu "File"

Menu "File" contains controls:

*Save settings* - saves changes to the current settings file.

*Save settings as...* - saves changes in settings to a new settings file.

*Load settings* - loads settings from the specified file.

Types of uploaded files:

- Configuration files (\*.xml)
- Skin Settings (\*.cfg)
- Interface Settings (\*.icf)

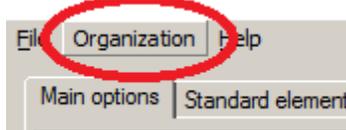
Configuration files \*.cfg and \*.icf used in Construction lower version 5 and contain settings that are currently stored in AppOptions.xml.

*Restore start settings* - loads settings preinstalled in Construction .

**Important!** The function of saving the settings, when the saved file is the same as the one already existing, does not overwrite the old file, but complements it. When changing the standard, for example, from the ESKD to ISO, both standards will be available in the settings file.

## Menu "Organisation"

Menu "*Organisation*" manages enterprise standard settings.



Enterprise Standard - a single configuration file (parameters, layers, profiles) for the enterprise. All settings are stored in one file.

In the settings dialog, the profiles table and the "*Organisation*" settings layers are highlighted in light gray.

Menu "*Organisation*" contains controls:

- *Create organisation settings* - command allows you to create a corporate settings file for subsequent transfer to other machines or for location on a shared server.

Creating the settings file:

1. After the command is called, a selection field appears next to each parameter and section.



2. You must specify (check) which settings will be included in organisation settings. Then click the "*OK*" button.

The dialog box prompts you to enter the location and name of the corporate settings saving.

3. Indicate the path, name and confirm. A file with corporate settings will be created.

- *Set settings file...* - the assigned organisation settings settings file overrides the custom settings file AppOptions.xml. New documents will be created in accordance with the values in organisation settings settings file.
- *Flush* - command to refuse to use the organisation settings. In this case, the control file becomes the user settings file AppOptions.xml.
- *Apply organisation settings to document* - the command applies corporate settings to files created earlier or in another place that do not have these settings.

**Important!** The user can not delete layers and profiles of organization settings from the corresponding tables in the settings dialog. When saving settings with new values, they are saved only in the current document. The configuration settings in the organization settings file and the standards within the configuration must strictly correspond to the downloaded settings in the application. If there is a mismatch, the override of the settings will not work!

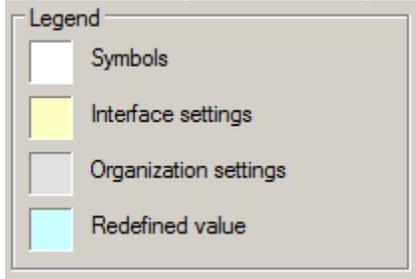
## Work area

Contains:

1. Tabs with settings settings:

- [Main options](#)
- [Standard elements](#)
- [Symbols](#)

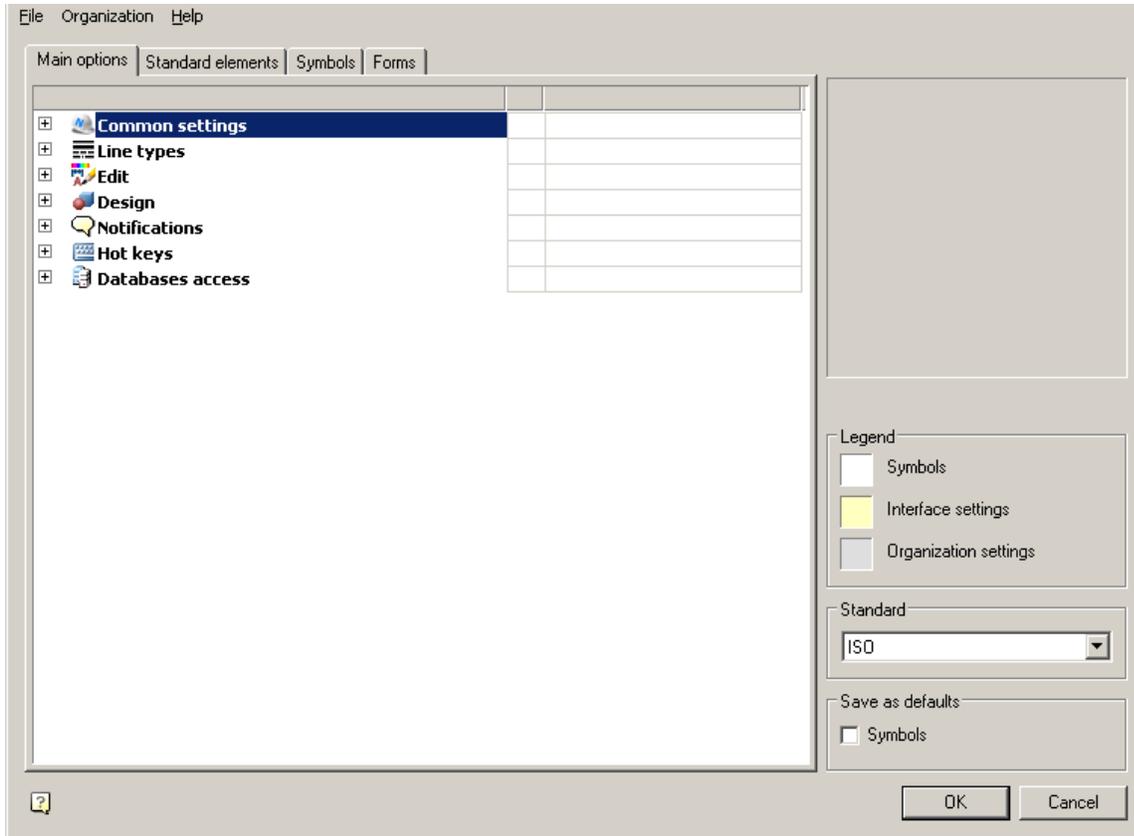
- [Forms](#)
2. Graphic window for displaying custom parameters (not editable).
  3. Container "Legend" with the legend of the kind of settings (not editable).



- *Symbols* - parameters with this background refer to the design parameters. In the Construction low version 5 settings are stored in the format files \*.cfg
  - *Interface settings* - parameters with this background refer to the interface parameters. In the Construction low version 5 settings are stored in the format files \*.icf
  - *Organisation settings* - parameters with this background indicate that they were downloaded from the Organization settings.
  - *Redefined value*- parameters with this background indicate that they have been changed by the user.
4. The "*Standard*" container is intended for displaying the default development system of the design documentation (the choice is possible if there are more than one standards).
  5. The "*Save as defaults*" container contains configuration items that indicate what will be saved by default when you click the "*OK*" button. Contains the selection field "*Symbols*".

## ***Main options***

The tab is used to configure the general parameters of the interface Construction .



It contains sections:

- [Common settings](#)
- [Line types](#)
- [Edit](#)
- [Design](#)
- [Notifications](#)
- [Hot keys](#)
- [Database access](#)

## Common settings

<b>Common settings</b>	
Current profile	ISO_
Execute command 'Regenerate' on opening document	No

### Current profile

Layer profiles are designed to organize the work of different departments of the enterprise over a single drawing file. Each user at the same time works with their group of layers, controlling their visibility by means *nanoCAD*.



## Line Types

Line types	
Enable option "Use paper space uni	Yes
Change current linetype scale	Yes
Use table of colors and weights	No
Standard text weight	Off
Base line color	■ ByLayer
Base thin line color	■ Red
Wavy solid line color	■ Red
Dashed line color	■ Red
Dash-dotted line (axis)line color	■ Red
Dash-dotted thicken line color	■ Red
Disconnected line color	■ Red
Broken solid thin line color	■ Red
Dash-double-dotted line color	■ Red
Base line width	▬ 0.60 mm
Base thin line width	▬ 0.25 mm
Wavy solid line width	▬ 0.25 mm
Dashed line width	▬ 0.40 mm
Dash-dotted (axis) line width	▬ 0.25 mm
Dash-dotted line thicken width	▬ 0.25 mm
Disconnected line width	▬ 1.00 mm
Broken solid thin line color width	▬ 0.25 mm
Dash-double-dotted line width	▬ 0.25 mm

### *Enable option "Use paper space units fo scaling" automatically*

Automatically changes the setting Construction "Scale to paper space units" ("Use paper space units for scaling") for the types of lines.

### *Change current linetype scale*

It enables or disables the scaling of line types in the standard objects when you change their size.

### *Use table of colors and weights*

It enables or disables the use of the table of colors and weights. If enabled, you can use the standard colors from the table. "Compatibility Mode" - is used when working with documents created in early versions of Construction .

### *Standard text weight*

It standardizes the value of the weight of the text for all text in the document.

### *Color and line width*

Is to set the standard design elements.

## Edit

Edit	
Decimal delimiter correction	Use dot '.' as decimal delimiter
Create and activate standard text and dimension styles	No
Explode Block References under drawing desing elements	No
Enable enchanced grips	Yes
Set associativity during insertion of objects	Yes
Use localized abbreviations of command keywords	Yes
Highlight color	Green
Automatically switch keyboard layout to local language	No
Show rectangle around objects	No
Automatically turn on snaps: Nearest, Endpoint, Quadrar	Yes
To show the toolbar "Direction" automatically	No
Scale dimensions	Yes
Scale texts	Yes
Scale hatches	Yes
Ignored layers	
Unplotted layer	UNPLOTTED
Mini-toolbar for viewports	Yes
<b>+</b> <b>Tooltips</b>	
<b>+</b> <b>By double-click</b>	

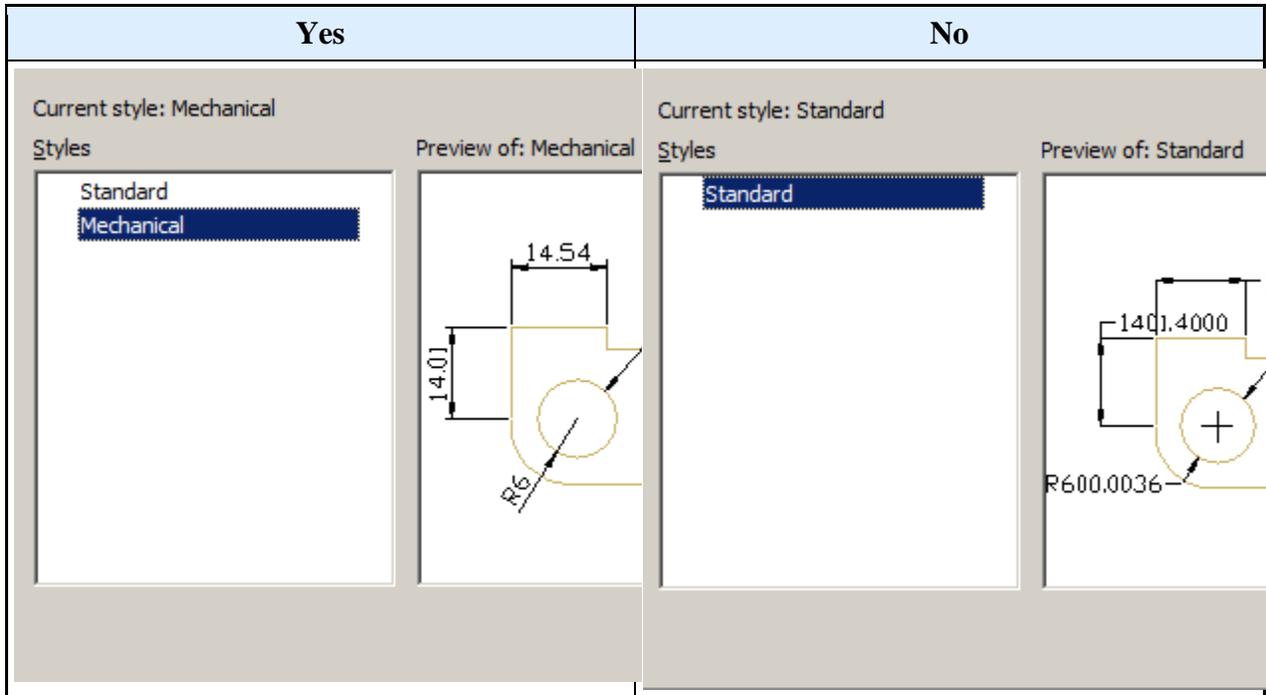
### Decimal delimiter correction

- *Do not correct decimal delimiter* - does not perform any actions with a separator.
- *Use dot '.' as decimal delimiter* - automatically replaces the delimiter with a dot.
- *Use system locale decimal delimeter* -in this case, the separator will be replaced with the symbol set in the system settings.

### Create an activate standard text and deimension styles in new documents

Managing the creation of standard styles. The default setting is "Yes". Specifying the value "No" allows you to create new documents without predefined standard dimensional styles.

<b>Yes</b>	<b>No</b>
------------	-----------



**Explode Block References under drawing design elements**

*Yes* - when overlapping objects Construction blocks nanoCAD break up.

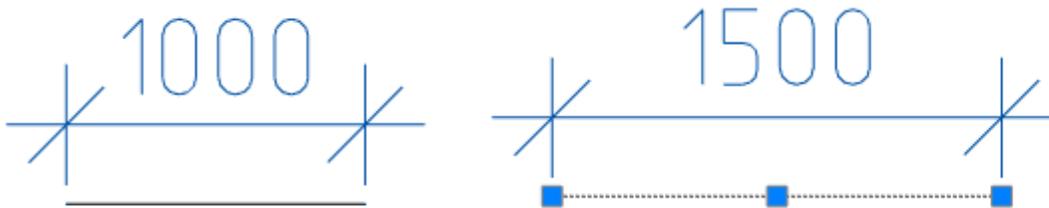
*No* - when overlapping objects Construction blocks nanoCAD masked with the command *wipeout*.

**Enable enhanced grips**

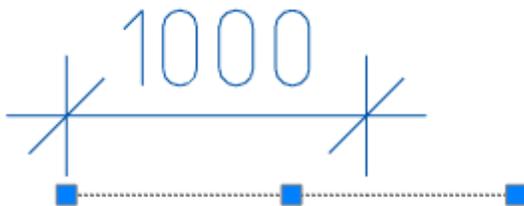
When this function is enabled, additional handles are displayed on the objects Construction .

**Set associativity during insertion of object**

By default, the setting is enabled. When you turn off, the binding of the inserted objects to the primitives is inactive. Example with dimensions. If the setting is enabled, then, when setting the dimensions on the line, the size will be associated with the line. When you change the line, the size changes.



If the setting is turned off, only the line will change.



**Use localized abbreviations of command keywords**

Abbreviations for the keywords of the commands are described in the file with the extension .pgp and are located in the installation location Construction

### *Highlight color*

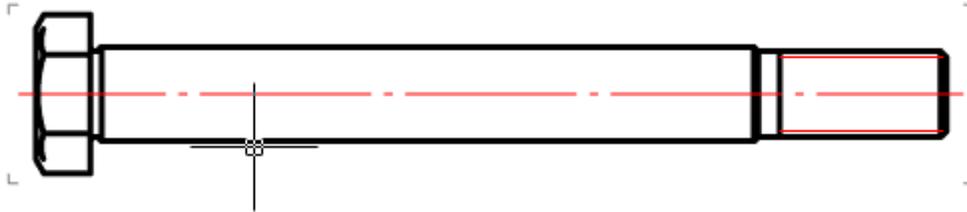
The color of the highlighting of primitives, when their indication is required. For example, the line's highlight when specifying a size for the placement.

### *Automatically switch keyboard layout to local language*

When you call dialogs with fields Construction automatically turns on the layout set in the system settings.

### *Show rectangle around objects*

Display control of the frame around objects Construction and blocks nanoCAD.



When this option is enabled, scaling is turned off Shift+RBM.

### *Automatically turn of snaps: Nearest, Endpoint, Quadrant, Center*

Temporarily includes bindings when inserting objects Construction .

With the option disabled, the "Direction" toolbar may not work correctly.

### *To show the toolbar "Direction" automatically*

The "Direction" toolbar control that appears when you insert database objects and a number of drawing design teams.



### *Scale dimensions*

Yes value:

1. The measurement scale specified in the "Dimensional Styles" on the "Primary units" tab is replaced by the measurement scale specified in the Design Settings - Main Options - Design.

2. The global scale specified in the "Dimension Styles" on the "Fit" tab is replaced by the design scale specified in the Design Settings - Main Options - Design.

The value is "No". The scale is not replaced.

### *Scale texts*

The value is "Yes". When you change the scale using the Scale toolbar, the "Height" parameter in the "Text Format" dialog for the multi-line text and the command line for the single-line text proportionally changes.

The value is "No". When you zoom in using the Zoom toolbar, the Height option does not change.

### *Scale hatches*

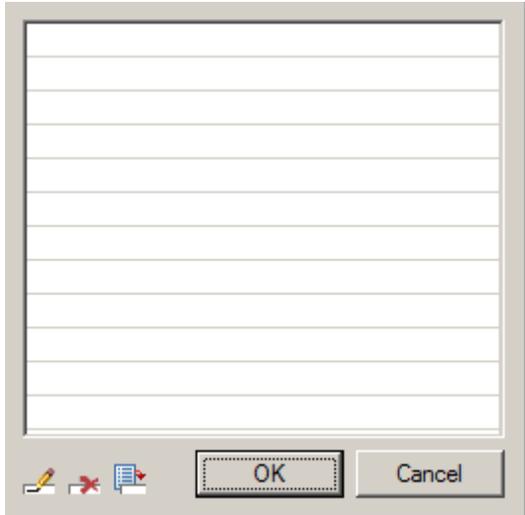
The value is "Yes". When zooming with the Scale toolbar, the Scale parameter in the Hatch dialog is proportionally changed.

The value is "No". When zooming with the Scale toolbar, the Scale option in the Hatch dialog does not change.

### *Ignored layers*

Specifies layers nanoCAD, on which primitives will not overlap with objects Construction .

When you click on the ellipsis, the "Excluded Layers" dialog opens to edit the list of layers.



The dialog menu allows you to add a layer and enter it manually, delete a row with a layer or select a layer from the ones available in the drawing.

***Unplotted layer***

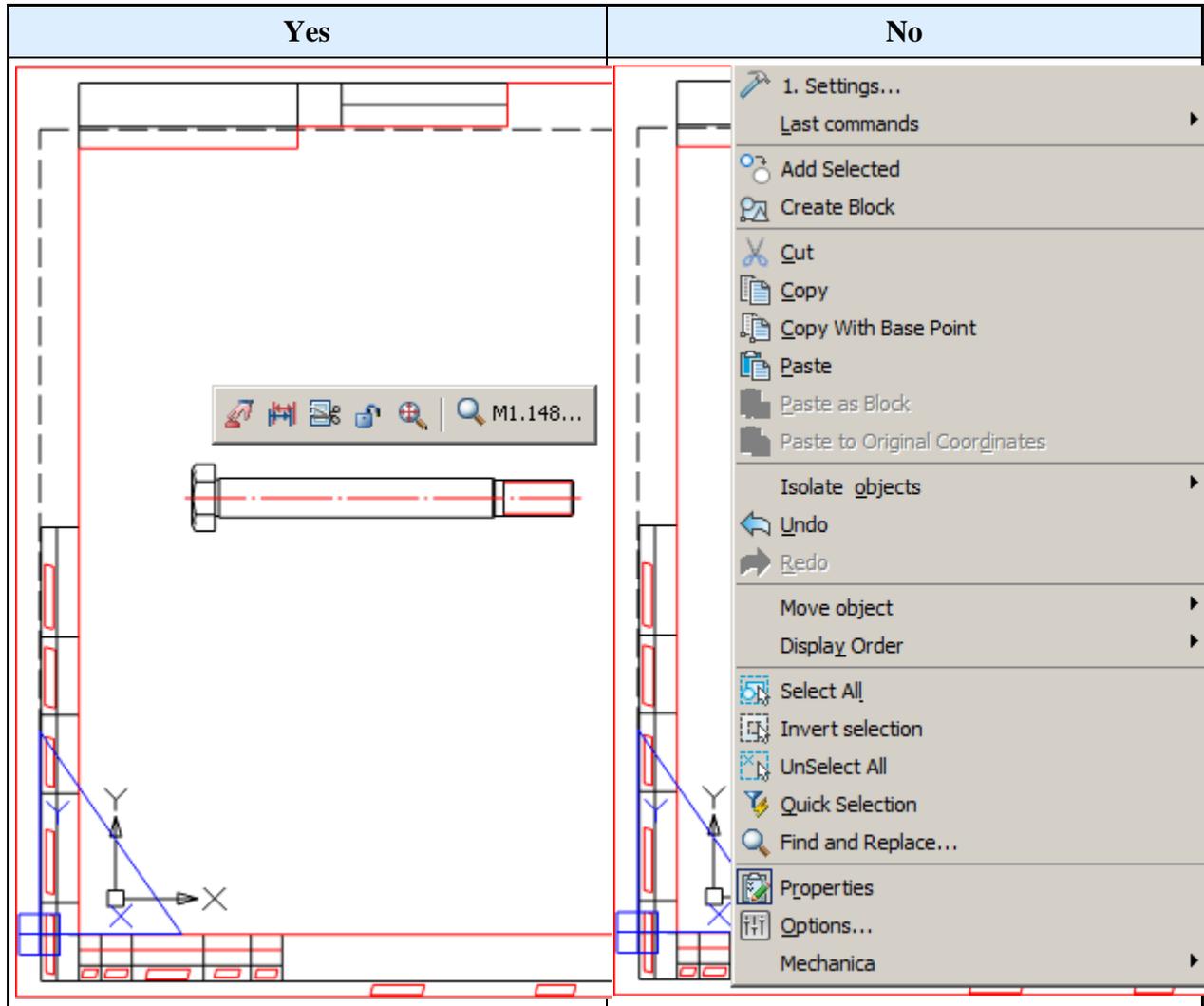
Specifies which layer the objects will be placed on Construction , which will not be printed.

***Mini-toolbar for viewports***

The Construction toolbar control that appears when you right-click inside the viewport.

If the option is off, then when you right-click inside the viewport nanoCAD the standard menu will be called up nanoCAD.

<b>Yes</b>	<b>No</b>
------------	-----------

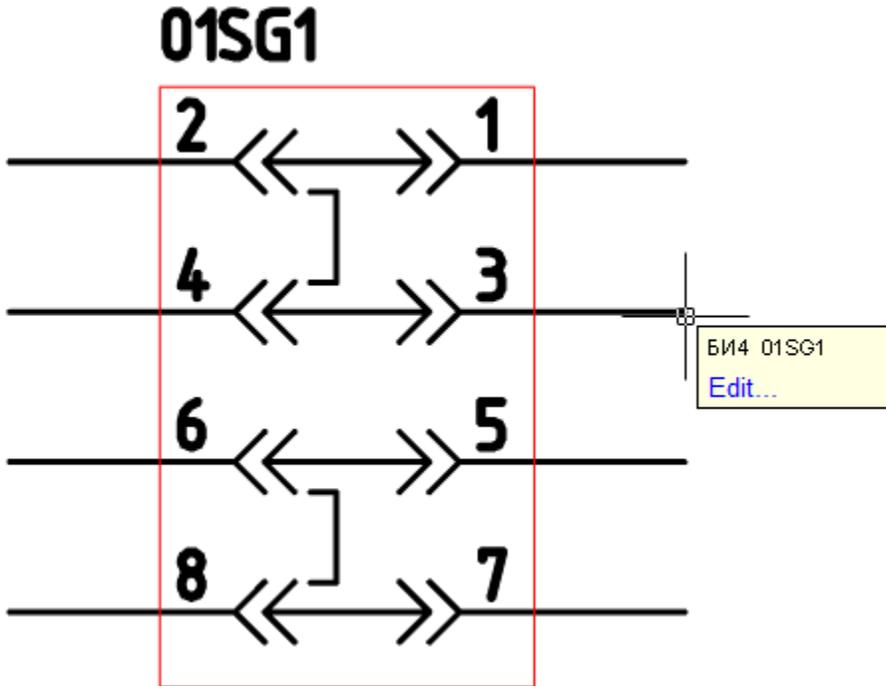


### Tooltips

 <b>Tooltips</b>	
Show tooltips	<input checked="" type="checkbox"/> Yes
Show delay, ms	300
Hide delay, ms	900

#### Show tooltips

Advanced Tooltip Management Tool (with hyperlink "Edit...") for objects Construction and blocks nanoCAD.



*Show delay, ms*

Tool to control the speed of the appearance of tooltips.

*Hide delay, ms*

Tool for managing the duration of the tooltip display.

**By double-click**

- By double-click**
  - Program objects
  - Dimensions
  - Regular texts
  - Multi-texts

<input checked="" type="checkbox"/>	Yes
<input checked="" type="checkbox"/>	Yes
<input type="checkbox"/>	No
<input type="checkbox"/>	No

*Program objects*

Sets the rule that when you double-click on object Construction , the editing dialog of this object will be called. With the option disabled, the properties of the object are called.

*Dimensions, Regular texts, Multi-texts*

With the option enabled, double-clicking the left mouse button on the size brings up the editing dialog Construction .

With the option disabled, the properties of the object nanoCAD or edit dialog nanoCAD.

**Design**

<input checked="" type="checkbox"/> <b>Design</b>	
Use symbol scale	<input checked="" type="checkbox"/> Yes
Drawing scale	1:100
Model scale	1:1
Text wipeout offset	0.2
Cut CAD-platform elements	Wipeout

*Use symbol scale*

Changes the type of scaling:

- *Yes* - Drawing scale.
- *On* - Model scale.

[More details in the description of work with the current scale.](#)

*Drawing scale*

Sets the default scale of design elements and the scale of the types of geometry lines.

*Note:* The scale type of the dimension lines is reserved and is always 1 by default.

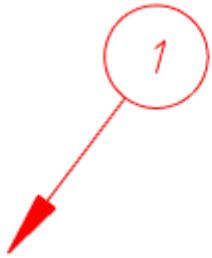
*Model scale*

Sets the default measurement scale. The displayed value, which is set when dimensioning, increases in direct proportion to the scale value. For example, if you set the size of a 10 mm section and the measurement scale is 1:10, the displayed value is 100.

*Text wipeout offset*

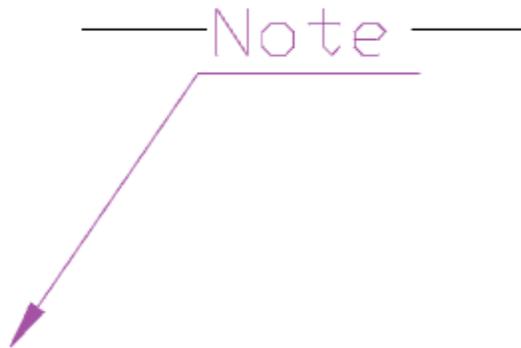
Sets the standard indentation of the geometry marking from the text.

Using the example of a size marker. With a larger size, the square background overlaps the geometry.

0.2	1
	

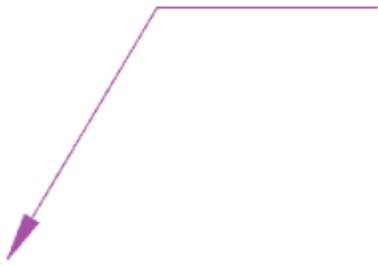
*Cut CAD-platform elements*

"Wipeout" - closes the primitive.



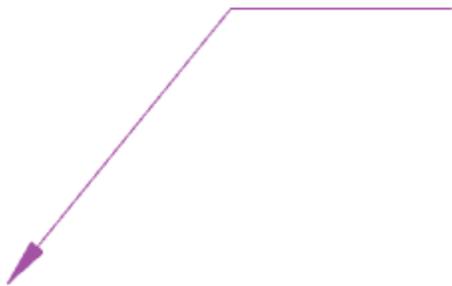
"Cut" - cut the portion of the primitive. If you delete or move carved primitive returns its status.

————— Note —————



"No" - It does not cover the primitive.

————— Note —————



## Notifications

☐	🗨️ <b>Notifications</b>	
	Enable hints	Yes
	Avoid mouse pointer	Yes

### Enable hints

Tool tips display control.

This option does not apply to messages with the status "Error".

### Avoid mouse pointer

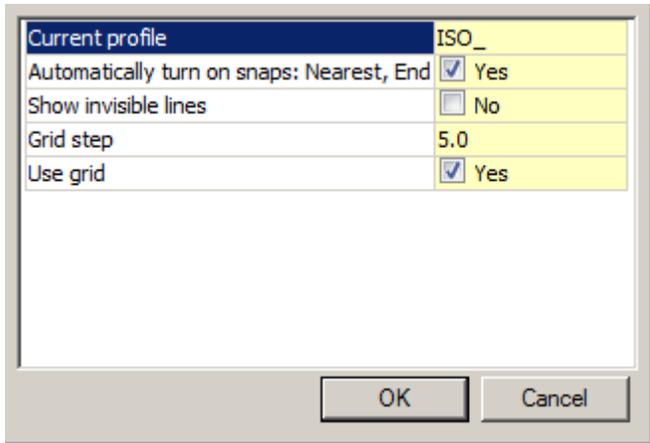
When this option is enabled the message will be moved around the screen so as not to obstruct the selection.

## Hot keys

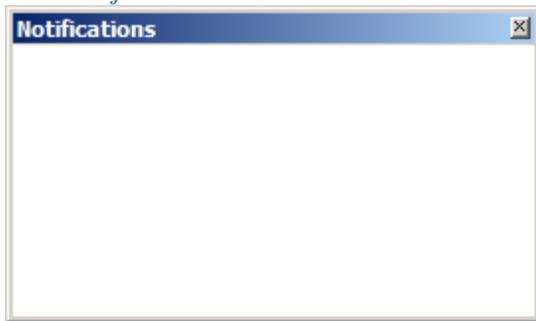
Keyboard Assignment Tool for calling the quick settings dialog and the notification messages window.

☐	🗨️ <b>Hot keys</b>	
	Show <Quick Options> dialogue	CTRL + SHIFT + Q ...
	Show notification window	CTRL + SHIFT + W

### Show <Quick Options> dialogue



Show notification window



## Databases access

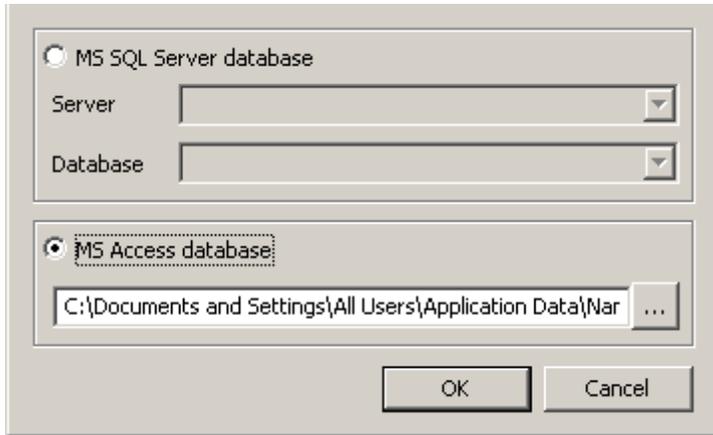
The database includes, in addition to standard elements, table and format templates, bolt assembly templates, groups and markers, as well as examples and other user elements. The choice of a specific database is determined by the configuration of the path to the data source.



### Data Source

The database Construction 21 includes, in addition to standard elements, table and format templates, bolt assembly templates, groups and markers, as well as examples and other user elements. The choice of a specific database is determined by the configuration of the path to the data source.

When you click on the button  in the "Data source" field, the dialog for specifying the data source appears.



Construction 21 provides work, both with local databases, and with the database on the MSSQL server.

*If you are using an MS SQL database,* you must select the "Data Source - MSSQL" radio button. In the "Server" field, specify the server name (along with the name of the SQL Database Server Instance). For example: SERVER, or SERVER\SQLEXPRESS. In the "Database" field, you must specify the name of the database to which you are connecting.

*If you are using a local database,* you must select the "Data Source - Local Database" radio button, and then specify the path to the database file.

As a local database for computers with the x32 bit capacity, format files \*.mcs (MS Access).

As a local database for computers with the x64 bit capacity, format files \*.mdf (LocalDB, for Windows Vista and higher).

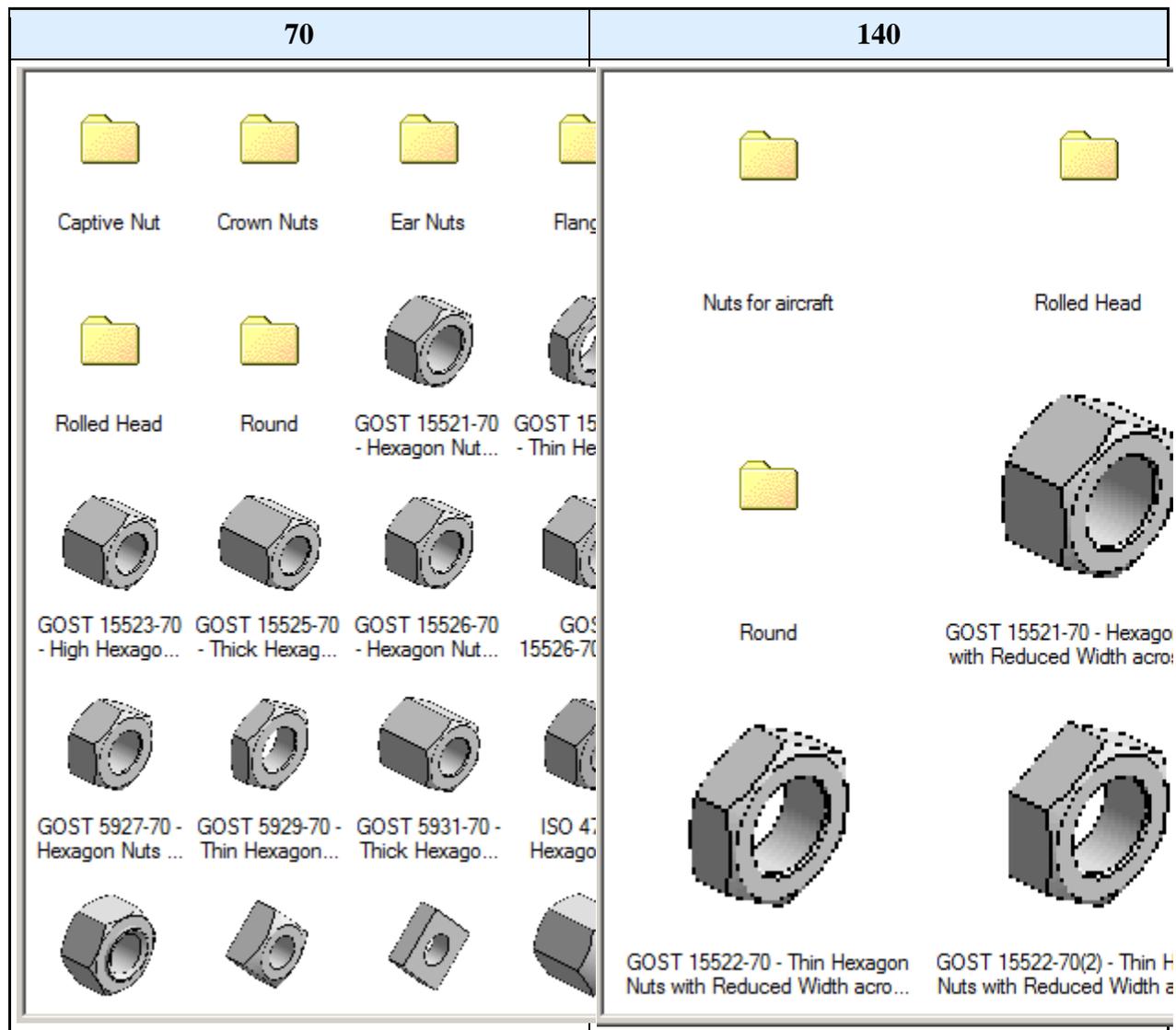
Required drivers are installed automatically when installed Construction 21.

By default, with a local installation, the database is located in the folder %programdata%\nanosoft\Construction 217.0\DataRW\.

**Picture size**

The size of the preview image for the database elements in pixels.

<b>70</b>	<b>140</b>
-----------	------------

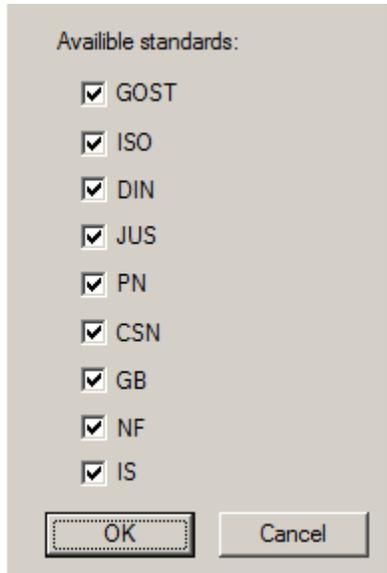


*Select object in browser*

- Single click
- Double click

*Use only these standards from the library*

Restricting the used standards filter.

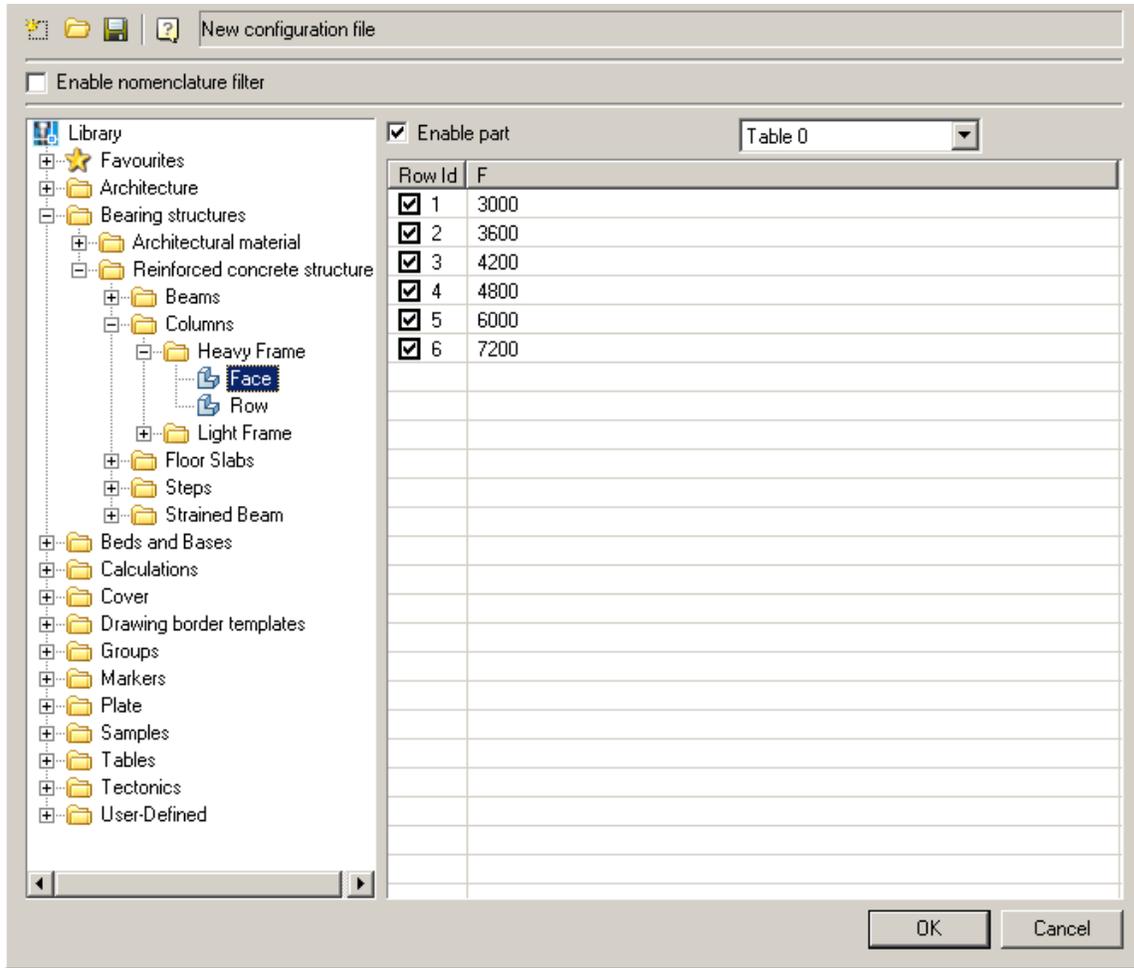


*Filter of nomenclature*

To limit the selection of parts from the catalog of standard and standardized products Construction 21 it is possible to automatically filter the database using nomenclature filters.

To enable and configure a nomenclature filter, you must enable this feature in the settings Construction 21.

The filter editor is called by pressing the button with the ellipsis. As a result, the settings window of the nomenclature filter appears:



In the upper part of the window there are buttons for creating, downloading and saving files of the nomenclature filters, as well as a switch for enabling / disabling database filtering according to the selected filter. Construction 21 allows you to switch between different filters and temporarily turn them off.

The structure of the database is displayed in the left part of the window Construction 21, the icons of which show the current state of each element of the database:

-  - the standard icon of the database element. Indicates that all sizes and the element itself are allowed to be used.
-  - prohibition to use icon. Indicates that this element is not allowed to be used.
-  - partial use icon. Indicates that this element is allowed for use with a limited set of standard sizes.

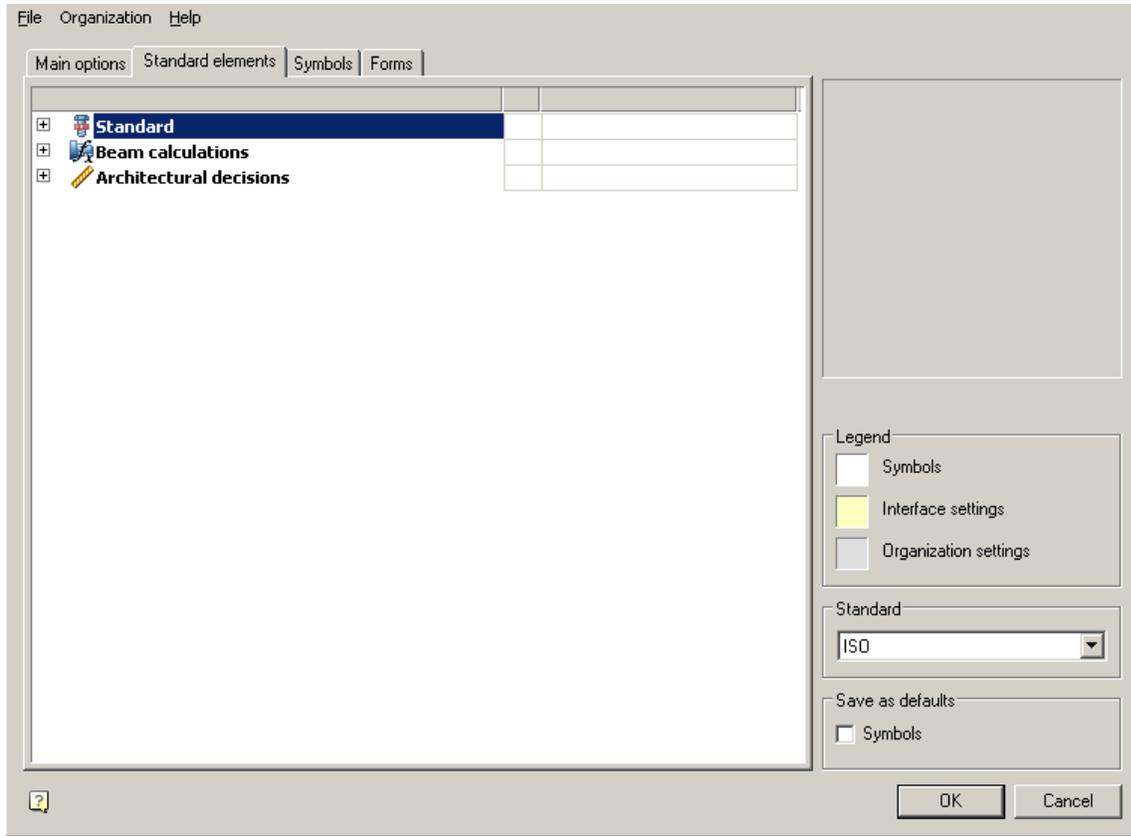
To enable / disable the use of the entire element, use the "Allow part use" switch. To disable a specific part size, you must uncheck the column ID of a line of this size in the part dimension table.

Database access settings are interface settings.

*Note:* If you use data compression on a disk, you may experience problems connecting to local databases (for x64 versions).

## Standard elements

The tab is used to configure standard elementsConstruction .



## Standard

[-] Standard	
Color of cursor, plane ...	Blue
Show invisible lines	No
Color of invisible lines	Colour 9
Default layer for parametric objects	Current
Default layer for holes	Current
Hatch step	1.5
Grid step	5.0
Use grid	Yes
Highlight color for working planes	Green

### Color of cursor, plane...

The control display color selection standard elements when they are selected, the automatic installation of dependencies.

The color display can be selected from a set and the built-in color picker.

### Show invisible lines

Control the display of invisible (hidden) lines of standard graphic elements.

### Color of invisible lines

The control display color selection invisible (hidden) lines of standard graphic elements.  
The color display can be selected from a set and the built-in color picker.

### Default layer for parametric objects

The control layer selection, which by default will be placed standard parts database.  
A layer can be selected from the existing (previously created) or create a new layer in the same window.

### Default layer for holes

The control layer selection, which by default will be placed holes created by the operation "Bolting".  
A layer can be selected from the existing (previously created) or create a new layer in the same window.

### Hatch step

How to set the hatching step, is used by default.

### Grid step

The control is used for the step of asking the values of the diameter and length of the shaft sections created using the "Spindles".

When you insert a section of the shaft the value of its length and diameter will be rounded up to a multiple grid spacing.

### Use grid

Control Using the "spacing".

If the grid is not used, the values of the diameter and length of the shaft portions are not rounded.

### Highlight color for working planes

Highlight color for working planes

### Beam calculations

Beam calculations	
Travel curve color	Red
Bend curve color	Yellow
Torque curve color	Cyan
Force curve color	Blue
Tension curve color	Black
Acceleration of gravity, OX	0.0
Acceleration of gravity, OY	-9.8
Acceleration of gravity, OZ	0.0
Points number on diagram	50
Calculate bearings as a pair	Yes
Show values on plot	No
Equivalent stress theory	IV

### Curve colors travel, bend, torque, force, tension

Color control diagrams displayed in the calculation of gross.  
 The selected color is preserved when exporting diagrams in the drawing.  
 The color display can be selected from a standard set and set of built-in your palette.

### Acceleration of gravity OX, OY, OZ

Set design parameters for the respective axes of acceleration of the shaft.

### Points number on diagram

Control increments partition diagram plotted in the entire length.

### Calculate bearings as a pair

Complementing the strength calculation of shaft reactions bearings.

### Show values on plot

Control the display of numerical values on the diagram exported to the drawing.  
 The values are displayed at the critical points of the shaft.

### Equivalent stress theory

Sets the strength of the theory to calculate the equivalent stresses shafts.

### Architectural decisions

Setting up layers for different elements of the standard, the size and type of stairs, and the appointment of templates to various reports Construction .

<input type="checkbox"/>	 <b>Architectural decisions</b>		
<input type="checkbox"/>	 <b>Layers</b>		
<input type="checkbox"/>	 <b>Stairs</b>		
<input type="checkbox"/>	 <b>Report templates</b>		

### Layers

<input type="checkbox"/>	 <b>Architectural decisions</b>		
<input type="checkbox"/>	 <b>Layers</b>		
	Walls	WALLS	
	Windows	WINDOWS	
	Doors	DOORS	
	Wall Objects	WALL_OBJECTS	
	Objects	OBJECTS	
	Columns	COLUMNS	
	Stairs	STAIRS	
	Door marks	DOOR_MARKS	
	Window marks	WINDOW_MARKS	
	Column marks	COLUMN_MARKS	
	Room marks	ROOM_MARKS	

The names of the layers under the standard elements. After inserting a standard element, it will be placed on the appropriate layer is configured.

### Staris

☐	<b>Staris</b>	
	Linear break	No
	Arrow size	3.0
	Guiding line marker size	Without mark
	Size of mark	1.0



1. Linear break
2. Arrow size
3. Guiding line marker size: Without mark, Empty, Filled, Opaque
4. Size of mark

### Report templates

☐	<b>Report templates</b>	
	List of decorations	List of decorations (template)
	List of rooms	List of rooms (template)
	List of floors	List of floors (template)
	List of openings	List of openings
	List of columns	List of columns(template)

When forming report templates will be taken from the settings.

### Engineering networks

☐	<b>Engineering networks</b>	
	Connectors	DB\Engineering networks\Connect
	Traces	DB\Engineering networks\Traces
	Equipment	DB\Engineering networks\Equipme

#### Connectors

Set the storage address labels connectors in the base element.

#### Traces

Set the address tag storage paths in the database elements.

#### Equipment

Set the address tag storage equipment in the base elements.

## IFC

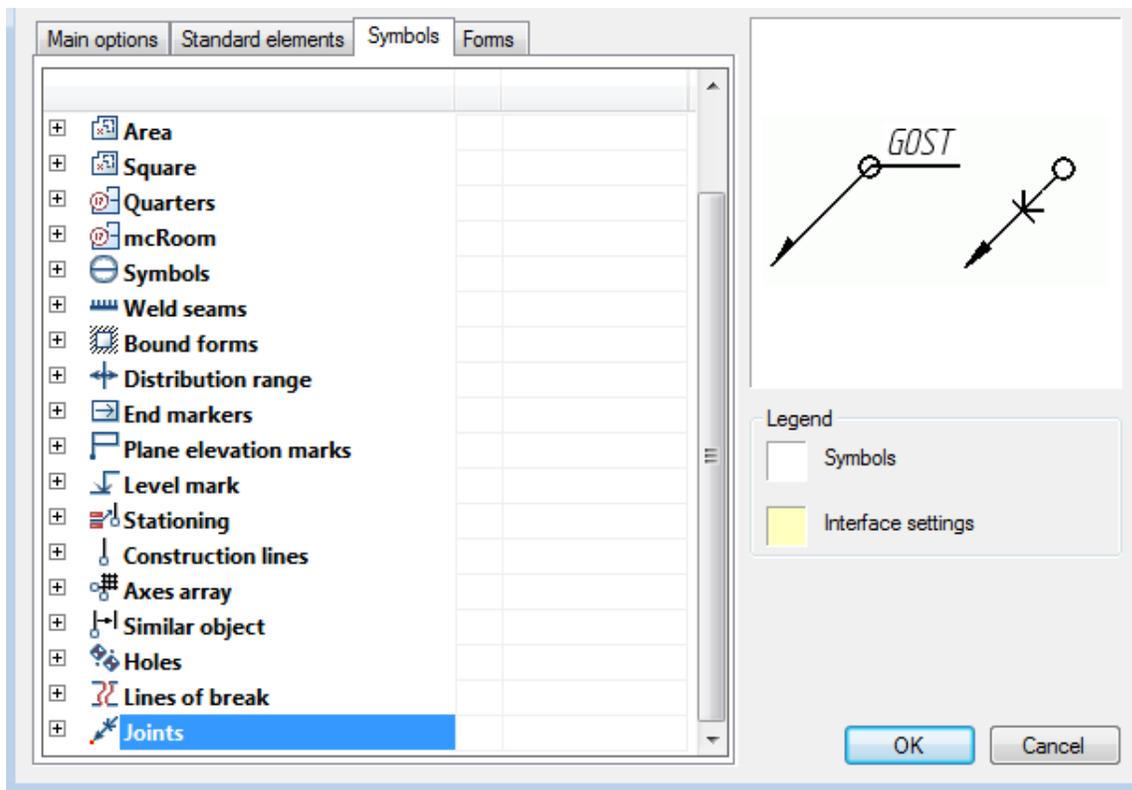
### Import

It allows you to configure the IFC objects disposable layer and color.

IFC	
[-] Import	
[-] IfcWall	
Layer	WALLS
Color	<input type="checkbox"/> Colour 254
[+] IfcCurtainWall	
[+] IfcFeatureElement	
[+] IfcDoor	
[+] IfcWindow	
[+] IfcColumn	
[+] IfcSlab	
[+] IfcRoof	
[+] IfcFooting	
[+] IfcPlate	
[+] IfcBeam	
[+] IfcPile	
[+] IfcMember	
[+] IfcStair	
[+] IfcStairFlight	
[+] IfcRamp	
[+] IfcRampFlight	
[+] IfcRailing	
[+] IfcCovering	
[+] IfcSpace	
[+] IfcSite	
[+] IfcFurnishingElement	
[+] IfcElectricalElement	
[+] IfcDistributionElement	
[+] IfcProxy	
[+] Other	

### *Symbols*

Tab "Symbols". Designed to customize the display of drawing symbols of Construction .



- [Dimensions](#)
- [Notes](#)
- [Views, sections, cuts etc](#)
- [Symbols](#)
- [Welds seams](#)
- [Bound forms](#)
- [Distribution range](#)
- [End marks](#)
- [Plane elevation marks](#)
- [Level mark](#)
- [Stationing](#)
- [Construction lines](#)
- [Axes array](#)
- [Similar object](#)
- [Holes](#)
- [Lines of break](#)
- [Joints](#)

## Dimensions

Setting allows you to change the size of the layer, which is automatically updated with new dimensions and copied settings dialogs, etc.

<div style="border: 1px solid black; padding: 2px;"> <span style="font-size: 10px;">☐</span> <b>Dimensions</b> <ul style="list-style-type: none"> <li>Layer</li> <li>Apply layer when copying</li> <li>Show dialogue for new dimensions</li> <li>Arrows in chains</li> <li>Fit list template</li> </ul> </div>		
		DIMENSIONS
		Yes
		<b>No</b>
		Notch

## Layer

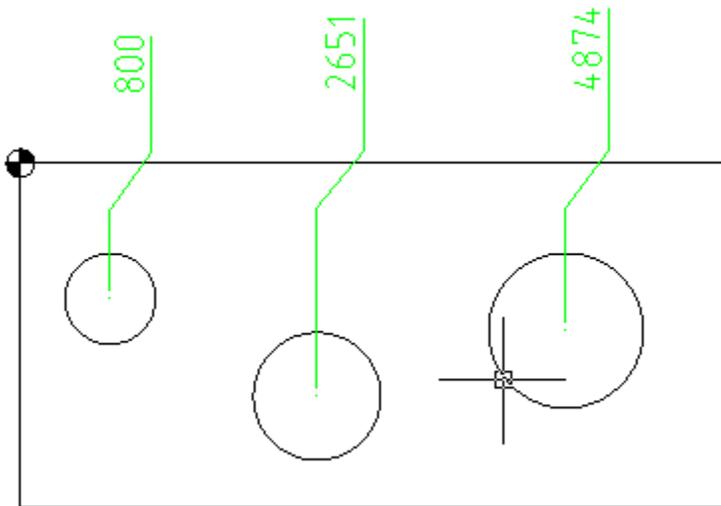
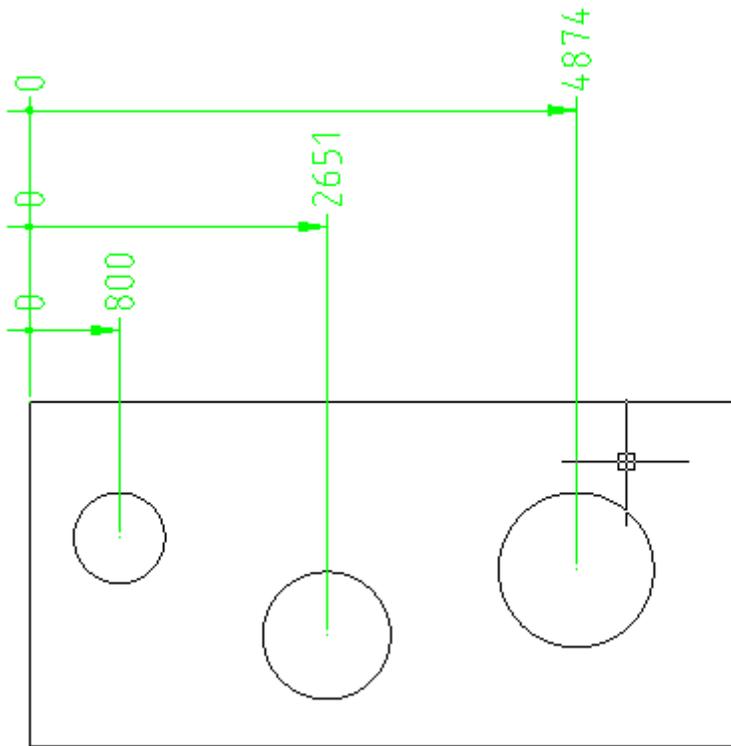
Allows you to choose the layer, which by default will include new dimensions and copied.

## Apply layer when copying

When this option is copied dimensions will be placed on the drawing layer selected for size. When off, dimensions placed on the active layer.

## Show dialog for new dimension

Control built ordinate dimensions. If the option is used ordinate dimensions standard ISO, built-in platform nanoCAD. When this option is used ordinate dimensions Construction .



**Open a dialog to automatically**

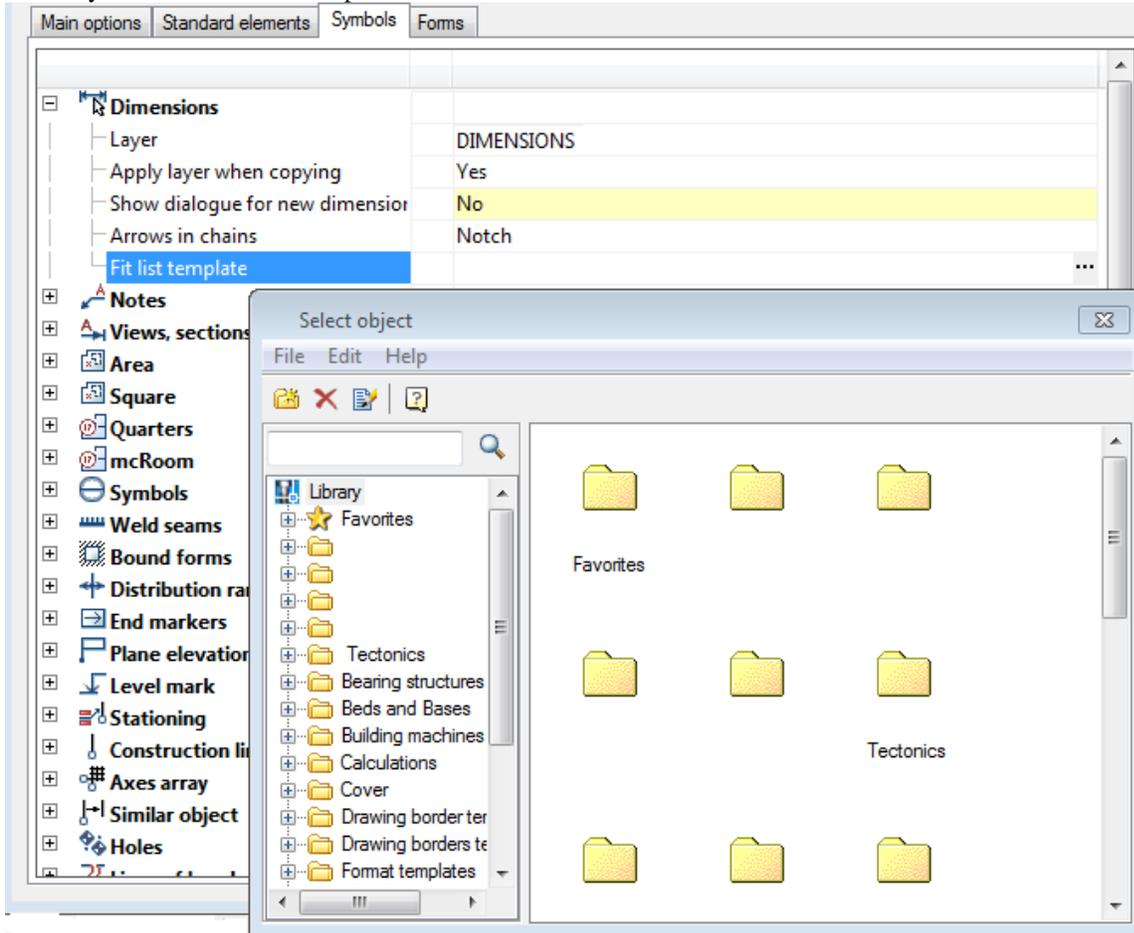
Control automatic opening dialogue sizes.

## Arrows in chains

Replaces used in nanoCAD arrows in dimensional chains. There is a possibility to replace the serifs, or replace point at all.

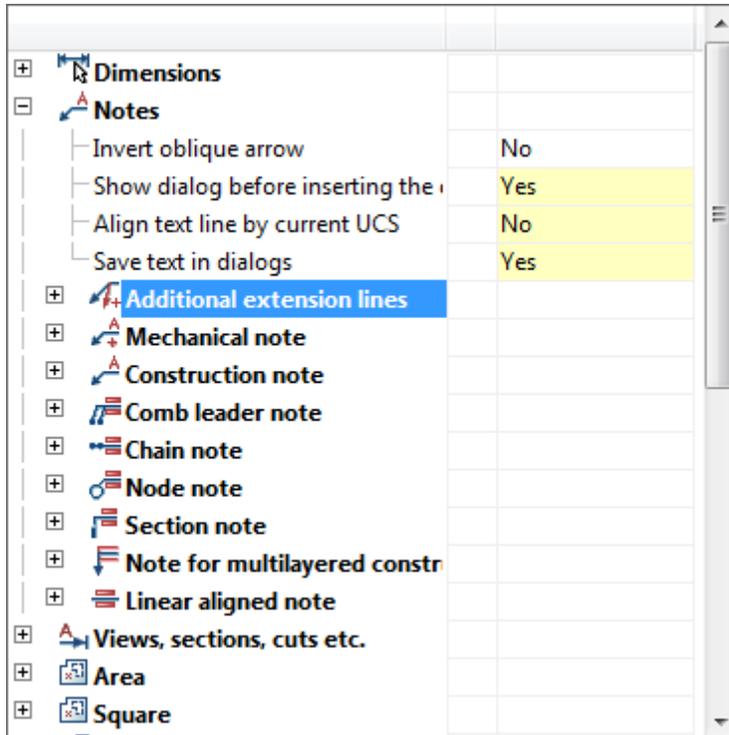
## Spreadsheet template tolerances

Allows you to select a table template tolerances available in the database.



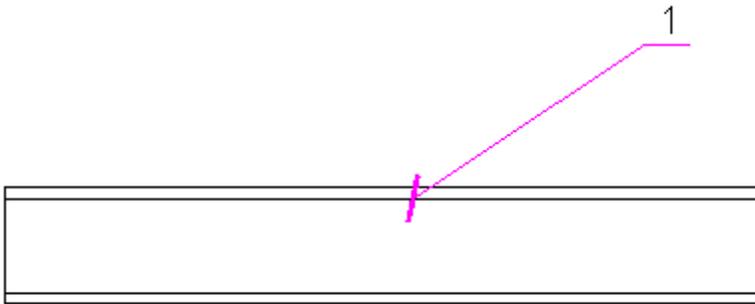
## Notes

Settings of notes, such as text, arrows, pointers.



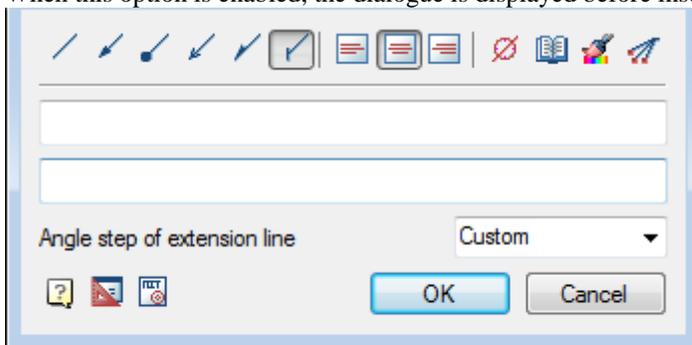
### Invert oblique arrow

Allows you to choose the direction of oblique arrow in leader.



### Show dialog before inserting the object

When this option is enabled, the dialogue is displayed before inserting note.



### Align text line by current UCS

When this option is on, shelves of leaders are rotated by the User coordinate system.

### Save text in dialogs

When this option is enabled on inserting the following notes previously entered text remains in the input field. The remaining options allow you to change the size of text, indexes, thickness, layer placement, color, etc.

+ <b>Dimensions</b>		
- <b>Notes</b>		
	Invert oblique arrow	No
	Show dialog before inserting the object	Yes
	Align text line by current UCS	No
	Save text in dialogs	Yes
- <b>Additional extension lines</b>		
	Layer	SYMBOL
	Arrow size	a 3.0
	Dot size	b 1.5
	Oblique arrow size	5.0
	Oblique arrow width	0.3
	Triangle size	c 3.0
	Open arrow size	a 3.0
	Half arrow size	a 3.0
	Right angle size	5.0
	Right angle width	0.3
	Blank arrow size	5.0
	Blank triangle size	5.0
	Blank dot size	5.0
	Thick line size	5.0
	Thick line width	0.3

### Additional extension lines

- <b>Additional extension lines</b>		
	Layer	SYMBOLS
	Arrow size	a 3.0
	Dot size	b 1.5
	Oblique arrow size	3.0
	Oblique arrow width	0.0
	Triangle size	c 3.0
	Open arrow size	a 3.0
	Half arrow size	a 3.0
	Right angle size	3.0
	Right angle width	0.0
	Blank arrow size	3.0
	Blank triangle size	3.0
	Blank dot size	3.0
	Thick line size	3.0
	Thick line width	0.3

## Mechanical note

[-] <b>Mechanical note</b>	
Layer	SYMBOLS
Colour	■ ByObject
Line thickness	—— ByLayer
Designation font size	c 7.0
Arrow size	a 3.0
Open arrow size	a 3.0
Half arrow size	a 3.0
Dot size	b 1.5
Oblique arrow size	3.0
Oblique arrow width	0.0
[-] <b>Text</b>	
Text style	Standard
Text color	■ Black
Text height	c 2.5
Text weight	—— ByObject
Horizontal text offset from the end of line	d 1.5
Vertical text offset from line	e 1.0
Width factor	0.0

## Construction note

[-] <b>Construction note</b>	
Layer	SYMBOLS
Colour	■ ByLayer
Line thickness	—— 0.25 mm
Arrow size	e 3.0
Dot size	f 1.5
Open arrow size	g 3.0
Half arrow size	h 3.0
Oblique arrow size	i 3.0
Oblique arrow width	j 0.0
[-] <b>Text</b>	
Text style	Standard
Text color	■ ByLayer
Text height	a 2.5
Text weight	—— ByObject
Small text size	b 2.5
Horizontal text offset from the end of line	c 1.5
Vertical text offset from line	d 1.0
Width factor	0.0

### Comb leader note

<div style="background-color: #002060; color: white; padding: 2px;"> <span style="font-size: 1.2em;">☐</span> <b>Comb leader note</b> </div>		
Layer		SYMBOLS
Colour		■ ByLayer
Line thickness		—— 0.25 mm
Arrow size	d	3.0
Dot size	e	1.5
Open arrow size	f	3.0
Half arrow size	g	3.0
Oblique arrow size	h	3.0
Oblique arrow width	i	0.0
<div style="background-color: #002060; color: white; padding: 2px;"> <span style="font-size: 1.2em;">☐</span> <b>Text</b> </div>		
Text style		Standard
Text color		■ Black
Text height	a	2.5
Text weight		—— ByObject
Horizontal text offset from the end of line	b	1.5
Vertical text offset from line	c	1.0
Small text height		2.5
Width factor		0.0

### Chain note

<div style="background-color: #002060; color: white; padding: 2px;"> <span style="font-size: 1.2em;">☐</span> <b>Chain note</b> </div>		
Layer		SYMBOLS
Colour		■ ByLayer
Line thickness		—— 0.25 mm
Arrow size	d	3.0
Dot size	e	1.5
Open arrow size	f	3.0
Half arrow size	g	3.0
Oblique arrow size	h	3.0
Oblique arrow width	i	0.0
<div style="background-color: #002060; color: white; padding: 2px;"> <span style="font-size: 1.2em;">☐</span> <b>Text</b> </div>		
Text style		Standard
Text color		■ ByLayer
Text height	a	2.5
Text weight		—— ByObject
Horizontal text offset from the end of line	b	1.5
Vertical text offset from line	c	1.0
Small text height		2.5
Width factor		0.0

### Node note

<div style="background-color: #003366; color: white; padding: 2px;"> <span style="font-size: 1.2em;">📄</span> <b>Node note</b> </div>		
Layer		SYMBOLS
Colour		■ ByLayer
Line thickness		—— 0.25 mm
Space between knot and sheet	c	1.0
Linetype of mark's line		—— ByObject
Color of mark's line		■ ByObject
Lineweight of mark's line		—— ByObject
<div style="background-color: #003366; color: white; padding: 2px;"> <span style="font-size: 1.2em;">📄</span> <b>Text</b> </div>		
Text style		Standard
Text color		■ ByLayer
Text height	a	3.5
Text weight		—— ByObject
Small text size	b	2.5
Horizontal text offset from the end of line	d	1.5
Vertical text offset from line	e	1.0
Width factor		0.0

### Section note

<div style="background-color: #003366; color: white; padding: 2px;"> <span style="font-size: 1.2em;">📄</span> <b>Section note</b> </div>		
Layer		SYMBOLS
Colour		■ ByLayer
Line thickness		—— 0.25 mm
Space between knot and sheet	c	1.0
Stroke length	f	10.0
Output through the blank line	g	3.0
Distance between a stroke and the beginning of a ext	h	2.0
Stroke weight	i	1.0
<div style="background-color: #003366; color: white; padding: 2px;"> <span style="font-size: 1.2em;">📄</span> <b>Text</b> </div>		
Text style		Standard
Text color		■ ByLayer
Text height	a	3.5
Text weight		—— ByObject
Small text size	b	2.5
Horizontal text offset from the end of line	d	1.5
Vertical text offset from line	e	1.0
Width factor		0.0

### Note for multilayered constructions

<input type="checkbox"/> <b>Note for multilayered constructions</b>		
Layer		SYMBOLS
Colour		■ ByLayer
Line thickness		—— 0.25 mm
Arrow size	d	3.0
Dot size	e	1.5
Open arrow size	f	3.0
Half arrow size	g	3.0
Oblique arrow size	h	3.0
Oblique arrow width	i	0.0
Right angle size		2.0
Right angle width		0.0
<input type="checkbox"/> <b>Text</b>		
Text style		Standard
Text color		■ ByLayer
Text height	a	2.5
Text weight		—— ByObject
Horizontal text offset from the end of line	b	1.5
Vertical text offset from line	c	1.0
Width factor		0.0

### Linear aligned note

<input type="checkbox"/> <b>Linear aligned note</b>		
Layer		SYMBOLS
Colour		■ ByLayer
Line thickness		—— 0.25 mm
<input type="checkbox"/> <b>Text</b>		
Text style		Standard
Text color		■ ByLayer
Text height	a	2.5
Text weight		—— ByObject
Horizontal text offset from the end of line	b	1.5
Vertical text offset from line	c	1.0
Small text height		2.5
Width factor		0.0

### Views, sections

Settings of views, sections, detail views. It allow you to choose the layout for placing cuts and sections, color of symbols, text, size of text, lines, arrows.

⊕	Dimensions	
⊕	Notes	
⊖	Views, sections, cuts ...	
	Layer	SYMBOLS
	Text style	GOST 2.304
	Text color	■ Blue
	Text size	a 7.0
	Small text size	7.0
	Horizontal text offset from the end	1.0
	Vertical text offset from line	2.0
	Leader length	e 20.0
	Arrow size	c 7.0
	Space of an arrow from the beginning	b 2.0
	Length of the first line of a cut	d 20.0
	Length of an average line of a cut	f 8.0
	Show additional section symbols	No
	First line of section is continuous	Yes
	Space between dashes	6.0
	Length of short segment between	2.0
	Sheet template	#
	Delete the connected elements	Never
	Joint editing of the connected elements	Yes
	Zone automatically	No
	Sheet automatically	No

## Symbols

### Node

⊖	Node	
	Layer	SYMBOLS
	Colour	■ ByLayer
	Line thickness	—— 0.25 mm
	Big text height	b 3.5
	Diameter	d 10.0
⊖	Text	
	Text style	Standard
	Text color	■ ByObject
	Text height	a 2.5
	Vertical text indent	c 0.9
	Space around	0.9

#### Layer

Selection of the layer on which is located the node designation.

By clicking on the ellipsis to open the dialog "Table layers", where you can configure the layer.

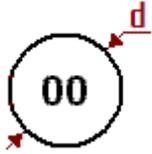
#### Colour

The color of a node designation lines.

#### Line thickness

The thickness of the unit designation lines.

*Diameter (d)*



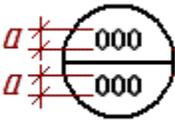
**Text**

*Text style*

Text style node designation.

*text height (a)*

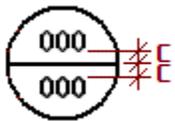
When the value of unfilled "Page" at installation site designations.



*Text color*

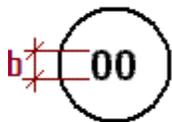
The color of the text node designation.

*Vertical text indent (c)*



*Big text height (b)*

When you empty the meaning of "Page" at installation site designations.



**Fragment**

Fragment		
Layer		SYMBOLS
Colour		■ ByLayer
Line thickness		— 0.25 mm
Leader indent	c	0.0
Radius	d	5.0
Minimal leader length	e	4.0
Text		
Text style		Standard
Text color		■ ByObject
Text height	a	2.5
Vertical text indent	b	0.9

*Layer*

Selection of the layer on which is placed a fragment of the designation.

By clicking on the ellipsis to open the dialog "Table layers", where you can configure the layer.

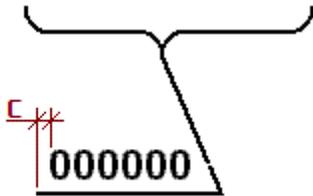
**Colour**

Color designations fragment lines.

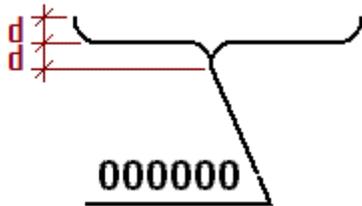
**Line thickness**

The thickness of the lines refer to the fragment.

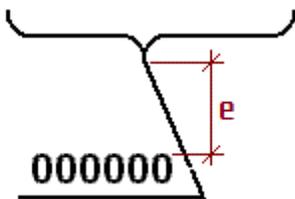
**Leader indent (c)**



**Radius (d)**



**Minimal leader length (e)**



With a length of less than the specified callout, the text will be placed without bubbles.

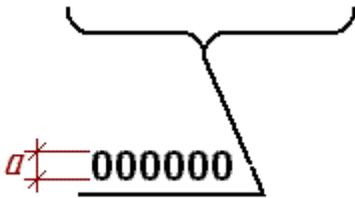
More than the set value	Less than the set value
<p>A diagram showing a text fragment '000000' with a leader line. The leader line is long enough to form a bubble at its tip.</p>	<p>A diagram showing a text fragment '000000' with a leader line that is too short to form a bubble.</p>

**Text**

**Text style**

Text style notation fragment.

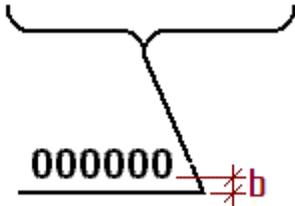
**Text height (a)**



**Text color**

The color of the text refer to the fragment.

**Vertical text indent (b)**



**Marker**

[-] <b>Marker</b>	
Layer	SYMBOLS
Colour	■ ByLayer
Line thickness	— 0.25 mm
Size	10.0
[-] <b>Text</b>	
Text style	Standard
Text color	■ ByObject
Text height	a 3.5
Space around	b 0.9

**Layer**

Selection of the layer on which is placed a marker position.

By clicking on the ellipsis to open the dialog "Table layers", where you can configure the layer.

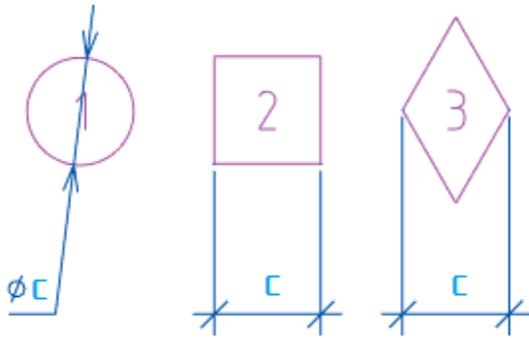
**Colour**

Color positional marker lines.

**Line thickness**

Thickness positional marker lines.

**Size (c)**

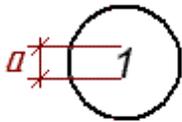


**Text**

*Text style*

Text Style node designation.

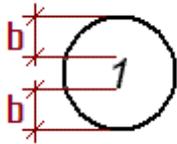
*Text height (a)*



*Text color*

The color of the text node designation.

*Space around (b)*



**Correction marker**

<input type="checkbox"/> <b>Correction marker</b>	
Layer	SYMBOLS
Colour	■ ByLayer
Line thickness	— 0.25 mm
Height factor	2.0
Snap angle	15°
<input type="checkbox"/> <b>A Text</b>	
Text style	Standard
Text color	■ ByObject
Text height	a 3.5
Comment height	b 2.5
Vertical text indent	c 0.9
Space around	0.9
Horizontal indent	d 0.9

*Layer*

Selection of the layer on which is placed a marker changes.

By clicking on the ellipsis to open the dialog "Table layers", where you can configure the layer.

*Color*

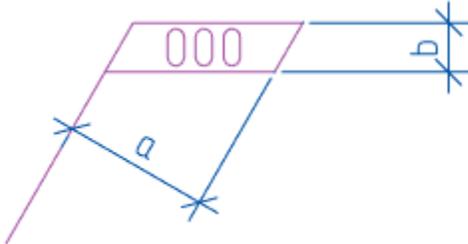
The color of the marker line changes.

*Line thickness*

The thickness of the marker line changes.

*Height factor*

Attitude a/b



*Snap angle*

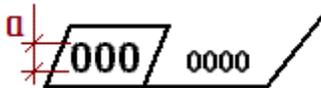
Step-lines to callouts.

**Text**

*Text style*

Text Style marker changes.

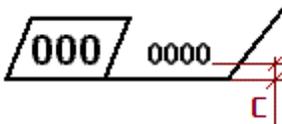
*Text height (a)*



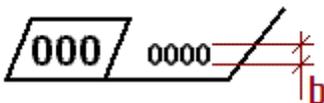
*Text color*

Text color marker changes.

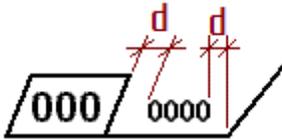
*Comment height (c)*



*Vertical text indent (b)*



*Horizontal indent (d)*



## Position

Setup Menu icon designation position.

Position	
Layer	SYMBOLS
Text color	Blue
Text height	5.0
Text style	GOST 2.304
Diameter	14.0
Large amplitude	2.0
Arrow type	Arrow
Arrow size	5.0
Dot size	1.5
Open arrow size	3.0
Oblique size	3.0
Datum target size	3.0

## Gradient

Setup menu icon gradient.

Gradient	
Layer	SYMBOLS
Color	ByLayer
Line thickness	0.25 mm
Text color	Blue
Text height	a 2.5
Vertical text indent	b 0.9
Horizontal text indent	c 1.5
Arrow size	d 5.0
Decimal precision	2
Text style	GOST 2.304

## Welds

Settings of weld symbols allow you to change the layer for label placement, color, style and size of lines and text.

<ul style="list-style-type: none"> <li>▣ <b>Weld seams</b></li> <li>├ Layer</li> <li>├ Colour</li> <li>├ Line width</li> <li>├ Small cross height</li> <li>├ Large cross half-height</li> <li>├ Small notch height</li> <li>├ Large notch half-height</li> <li>├ Small cross pitch</li> <li>├ Large cross pitch</li> <li>├ Notch pitch</li> <li>├ Series length</li> <li>├ Series interval</li> <li>└ Space length</li> </ul>	<table border="1"> <tr><td colspan="2">SYMBOL</td></tr> <tr><td>■</td><td>ByObject</td></tr> <tr><td>—</td><td>ByLayer</td></tr> <tr><td>a</td><td>2.0</td></tr> <tr><td>b</td><td>2.0</td></tr> <tr><td>c</td><td>2.0</td></tr> <tr><td>d</td><td>2.0</td></tr> <tr><td>k</td><td>4.0</td></tr> <tr><td>e</td><td>4.0</td></tr> <tr><td>f</td><td>2.0</td></tr> <tr><td>i</td><td>4.0</td></tr> <tr><td>g</td><td>3.0</td></tr> <tr><td>j</td><td>4.0</td></tr> </table>	SYMBOL		■	ByObject	—	ByLayer	a	2.0	b	2.0	c	2.0	d	2.0	k	4.0	e	4.0	f	2.0	i	4.0	g	3.0	j	4.0
SYMBOL																											
■	ByObject																										
—	ByLayer																										
a	2.0																										
b	2.0																										
c	2.0																										
d	2.0																										
k	4.0																										
e	4.0																										
f	2.0																										
i	4.0																										
g	3.0																										
j	4.0																										

## Boundary form

Settings of boundary forms allow you to change the layer for label placement, color symbols, line thickness, and the dimensions of the various elements of the boundary shapes.

<ul style="list-style-type: none"> <li>▣ <b>Bound forms</b></li> <li>├ Layer</li> <li>├ Colour</li> <li>└ Line width</li> <li>▣ <b>Dashband</b></li> <li>├ Dash height</li> <li>└ Dash pitch</li> <li>▣ <b>Heat isolation</b></li> <li>├ Element height</li> <li>├ Element pitch factor</li> <li>└ Element fillet radius factor</li> <li>▣ <b>Water isolation</b></li> <li>├ Line width</li> <li>├ Dash length</li> <li>├ Space length</li> <li>└ Fillet radius</li> <li>▣ <b>Bound hatch</b></li> <li>├ Dash height</li> <li>├ Dash pitch</li> <li>└ Dash angle</li> <li>▣ <b>Ground border</b></li> <li>├ Dash height</li> <li>├ Dash pitch</li> <li>└ Dash angle</li> </ul>	<table border="1"> <tr><td colspan="2">SYMBOL</td></tr> <tr><td>■</td><td>ByLayer</td></tr> <tr><td>—</td><td>ByLayer</td></tr> <tr><td>a</td><td>10.0</td></tr> <tr><td>b</td><td>5.0</td></tr> <tr><td>a</td><td>10.0</td></tr> <tr><td>b</td><td>1.5</td></tr> <tr><td>c</td><td>0.2</td></tr> <tr><td>a</td><td>2.0</td></tr> <tr><td>b</td><td>8.0</td></tr> <tr><td>c</td><td>6.0</td></tr> <tr><td></td><td>200.0</td></tr> <tr><td>a</td><td>4.0</td></tr> <tr><td>b</td><td>4.5</td></tr> <tr><td>c</td><td>45.0</td></tr> <tr><td>a</td><td>4.0</td></tr> <tr><td>b</td><td>4.5</td></tr> <tr><td>c</td><td>45.0</td></tr> </table>	SYMBOL		■	ByLayer	—	ByLayer	a	10.0	b	5.0	a	10.0	b	1.5	c	0.2	a	2.0	b	8.0	c	6.0		200.0	a	4.0	b	4.5	c	45.0	a	4.0	b	4.5	c	45.0
SYMBOL																																					
■	ByLayer																																				
—	ByLayer																																				
a	10.0																																				
b	5.0																																				
a	10.0																																				
b	1.5																																				
c	0.2																																				
a	2.0																																				
b	8.0																																				
c	6.0																																				
	200.0																																				
a	4.0																																				
b	4.5																																				
c	45.0																																				
a	4.0																																				
b	4.5																																				
c	45.0																																				

## Distribution range

Settings of distribution range allow you to change the layer for label placement, color, size lines, arrows.

[-] [↔] <b>Distribution range</b>	
Layer	SYMBOLS
Colour	■ ByLayer
Line width	— ByLayer
Arrow size	a 3.0
Point diameter	b 1.5
Bound length	c 4.5

## End markers

Settings for end markers allow you to change the layer for label placement, color and size designations.

[-] [→] <b>End markers</b>	
Layer	SYMBOL
Colour	■ ByLayer
Size A1	3.0
Size A2	3.0
Size B1	3.5
Size B2	3.5

## Plane elevation marks

Settings of elevation mark on the plane, that allow you to change the layer for label placement, color lines and text, lines, and text size.

[-] [↔] <b>Plane elevation marks</b>	
Layer	SYMBOLS
Colour	■ ByLayer
Line thickness	— 0.25 mm
Text color	■ Red
Text height	a 2.5
Space around	b 0.9
Arrow size	5.0
Dot size	1.5
Open arrow size	3.0
Text style	ГОСТ 2.304
Snap angle	15°
Decimal delimiter	,

## Elevation mark

Settings of symbol of Elevation mark, that allow you to change the layer for label placement, color lines and text, lines, and text size.

Elevation mark	
Layer	Current
Color	■ ByLayer
Line thickness	—— 0.25 mm
Text color	■ ByObject
Text height	a 2.5
Comment height	2.5
Vertical text indent	b 0.9
Horizontal indent	c 0.9
Shelf overhang	d 1.5
Minimum height	e 6.0
Arrow size	f 2.0
Base line indent	g 0.0
Base line overhang	h 1.5
Precision	3
Decimal delimiter	,
Arrow line weight	0.0
Text style	
Show plus	Yes

### Designation stationing

Settings of stationing.

Stationing	
Show dialog before insert	Yes

### Show dialog before inserting

If enabled, shows dialogue before inserting the stationing symbol.

### Construction axis

Settings of construction axes, that allow you to change the layer for label placement, color lines and text, size markers, axial lines, arrows.

<b>Stationing</b>	
<b>Construction lines</b>	
Layer	AXIS
Color	■ ByLayer
Lineweight	—— 0.25 mm
<b>Marker</b>	
Text style	GOST 2.304
Text height	3.5
Marker radius	6 5.0
Marker line color	■ ByLayer
Marker text color	■ Red
Marker lineweight	—— 0.25 mm
Text gap	r 0.7
<b>Axis line</b>	
Bend	b 10.0
Begin jut	0.0
Break point jut	0.0
Break point jut back	0.0
<b>Axis orientation pointer</b>	
Arrow size	3.0
<b>Explode</b>	
Marker layer	AXIS

### Axes array

Settings of construction axes array. It allows you to change the location of the construction axes, place symbols, color, size and style of text and lines.

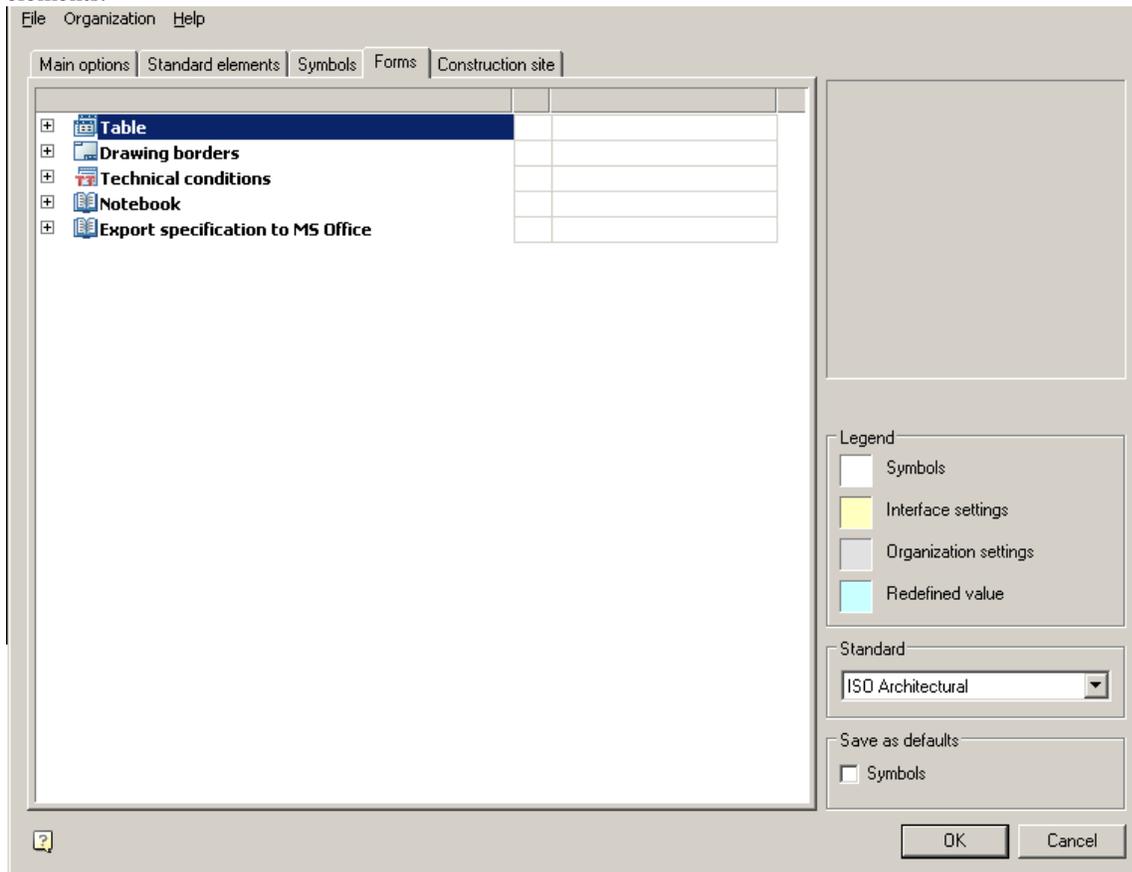
<b>Axes array</b>	
<b>Axes placement</b>	
Jut	a 5.0
Minimum markers gap	6 3.0
Indent of bend	b 5.0
Bend	r 10.0
Indent	d 20.0
Step	e 7.0
<b>Axes dimensions</b>	
Layer	DIMENSIONS
Color	■ ByLayer
Lineweight	—— 0.25 mm
Dimension style	SPDS
<b>Options</b>	
Store grid options	Yes
Explode array	No



<ul style="list-style-type: none"> <li>[-] Joints             <ul style="list-style-type: none"> <li>[-] Default layer for parametric objects</li> <li>[-] Colour</li> <li>[-] Line width</li> <li>[-] Text style</li> <li>[-] Arrow size</li> <li>[-] Leg size</li> <li>[-] Weld spot size</li> <li>[-] Font height on skew line</li> <li>[-] Font height on leader shelf</li> <li>[-] Text indent</li> <li>[-] Denotation size</li> <li>[-] Radius sign &lt;Along closed contour&gt;</li> <li>[-] Text color</li> </ul> </li> </ul>	<table border="1"> <tr><td>SYMBOL</td></tr> <tr><td>■ ByLayer</td></tr> <tr><td>— ByLayer</td></tr> <tr><td>GOST 2.304</td></tr> <tr><td>a 3.5</td></tr> <tr><td>d 5.0</td></tr> <tr><td>e 5.0</td></tr> <tr><td>b 3.5</td></tr> <tr><td>c 3.5</td></tr> <tr><td>j 1.0</td></tr> <tr><td>g 6.0</td></tr> <tr><td>R 2.0</td></tr> <tr><td>■ Red</td></tr> </table>	SYMBOL	■ ByLayer	— ByLayer	GOST 2.304	a 3.5	d 5.0	e 5.0	b 3.5	c 3.5	j 1.0	g 6.0	R 2.0	■ Red
SYMBOL														
■ ByLayer														
— ByLayer														
GOST 2.304														
a 3.5														
d 5.0														
e 5.0														
b 3.5														
c 3.5														
j 1.0														
g 6.0														
R 2.0														
■ Red														

## Forms

Menu tab "Forms". Designed for setting up the parameters of parts of the text tools to create a standard layout elements.



It contains the following sections:

- [Table](#)
- [Drawing borders](#)
- [Technical condition](#)

- [Notebook](#)

## Table

Settings of the tables in *Construction* .

<div style="border: 1px solid black; padding: 5px;"> <div style="background-color: #0070C0; color: white; padding: 2px 5px; display: flex; align-items: center;"> <span style="font-size: 12px;">☰</span> <span style="margin-left: 5px;">Table</span> </div> <ul style="list-style-type: none"> <li>Layer</li> <li>Colour</li> <li>Line thickness</li> <li>Text style</li> <li>Text height</li> <li>Text color</li> <li>Text weight</li> <li>Width factor</li> <li>Text indent</li> </ul> </div>		
	TABLES	
	■ ByLayer	
	—— ByLayer	
	GOST 2.304	
	2.5	
	■ Red	
	—— ByLayer	
	0.0	
	0.6	

### Layer

Specifies layer for placing tables.

### Color

Sets color of table elements.

### Line thickness

Allows you to choose the thickness of the lines of text in the table.  
 Option "by layer" sets the line width from the layer it is placed (default value).  
 Option "By block" sets the line width for by the block in which it is included.  
 Option "By object" sets the line width individually using properties palette.  
 Selecting "Default" sets the default line thickness for the table.  
 You can also set the line width of a standard set of values.

### Text style

Sets the default text style in the table

### Text Height

Allows you to choose the standard text height.

### Text Color

Control choice of color of text in tables.

### Text weight

Allows you to choose the thickness of the lines of text in the table.  
 Option "by layer" sets the line width from the layer it is placed (default value).  
 Option "By block" sets the line width for by the block in which it is included.

Option "By object" sets the line width individually using properties palette.  
 Selecting "Default" sets the default line thickness for the table.  
 You can also set the line width of a standard set of values.

### Width factor

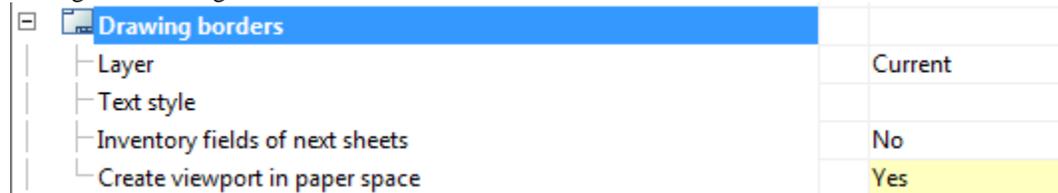
Sets width factor for text in table cells.

### Text Indent

Sets text indent in table cells.

### Drawing borders

Settings for drawing borders in Construction



### Layer

Allows you to select the layer for the drawing border.

### Text style

Sets the default text style within the drawing border.

### Inventory fields of the next sheets

Enables placing of inventory title blocks on drawing border.

### Create viewport in paper space

Creates a viewport when drawing border is inserted on the sheet.

### Technical conditions

It specifies settings of text of the technical requirements of *Construction* .

Technical conditions	
Line spacing default	Single
Font height	2.5
Text oblique	0
Text color	■ Red
Text style	GOST 2.304
Header height	2.5
Header oblique	0
Header color	■ Colour 240
Header style	Standard
Header align	Left
Default layer	SYMBOL
Offset from stamp(x)	x 5.0
Offset from stamp(y)	y 10.0

### Line spacing default

Sets the default line spacing in the text of the technical requirements.

### Font Height

Sets a default text height.

### Text oblique

Sets a default value of the slope of the text in degrees.

### Text Color

Sets color of text in technical requirements

### Text style

Sets the default text style specifications.

### Header height

Sets a default value of header height in technical requirements.

### Header oblique

Sets a default value of the header oblique angle in degrees.

### Header Color

Sets color of header

### Header Style

Sets the default header style.

### Header align

Aligns the heading of technical requirements for the title block.

### Default Layer

Sets the standard layer to accommodate the technical requirements.

### Designations indicate areas near to the position

Automatically inserts lettering area next to the item number.

### Offset from title block(x)

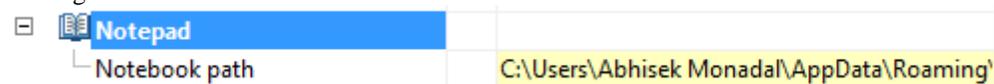
Sets the value of the indentation from the left edge of the title block horizontally.

### Offset from title block(y)

Sets the offset value from the main vertical lettering.

### Notepad

Settings for notebook in *Construction 21*.



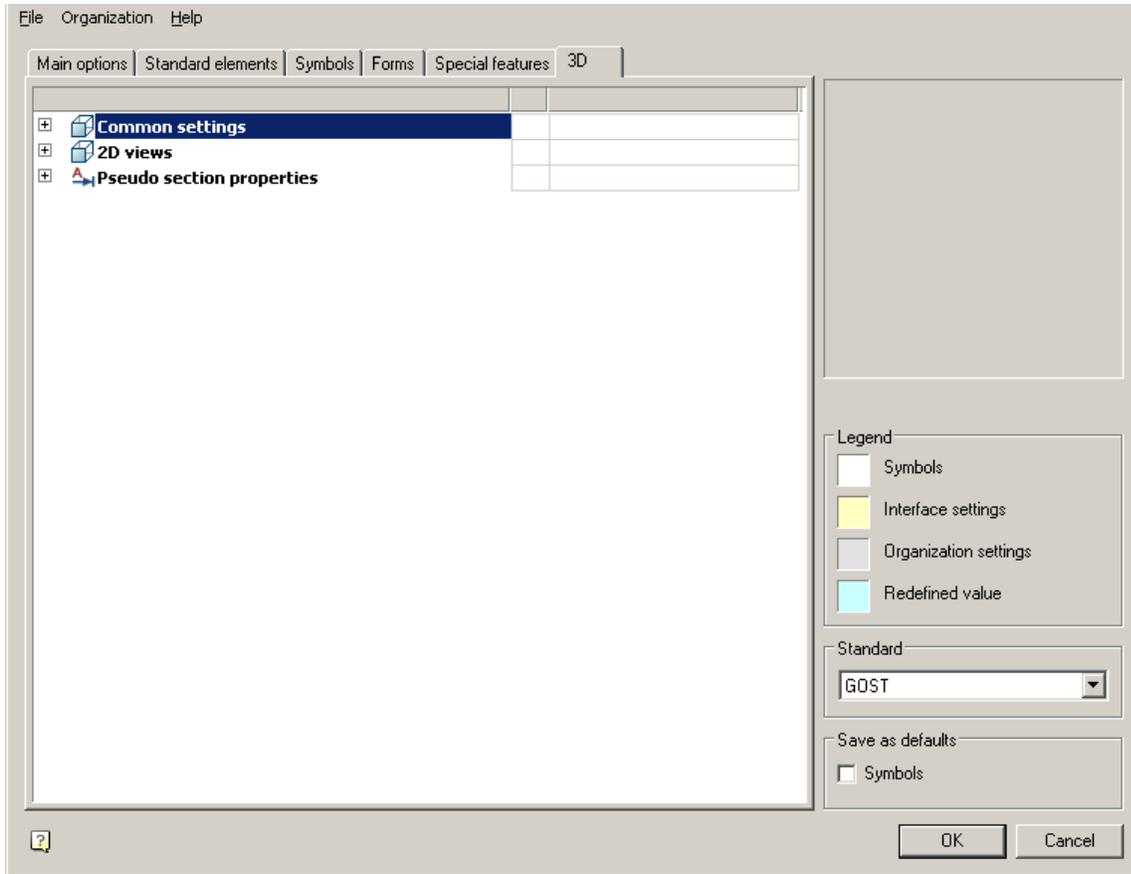
### Path to the notebook

Specifies the path to the notebook.

Additional information on configuring the notebook [here](#).

### 3D

The tab is used to configure 3D settings Construction . The tab is available with a license for 3D.



- [Common settings](#)
- [2D views](#)
- [Pseudo section properties](#)

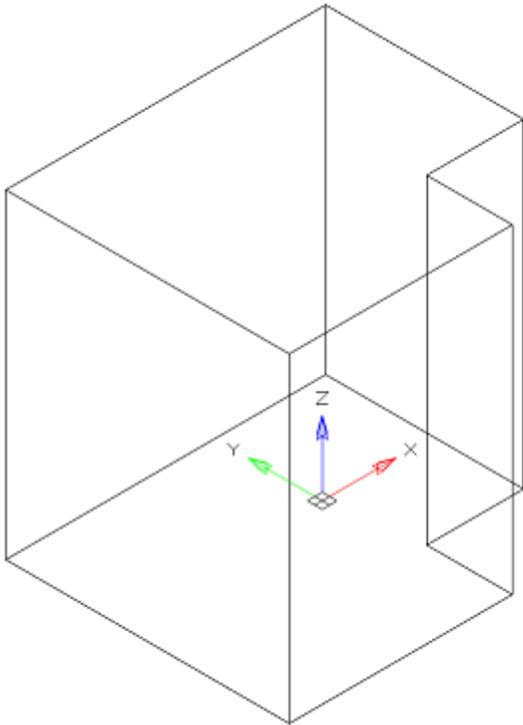
## Common settings

[-] <b>Common settings</b>	
Automatically project edges on sketch	Yes
Layer for sketches	SKETCHES
Layer for working objects	WORKING_ELEMENTS
Layer for sections	SECTIONS

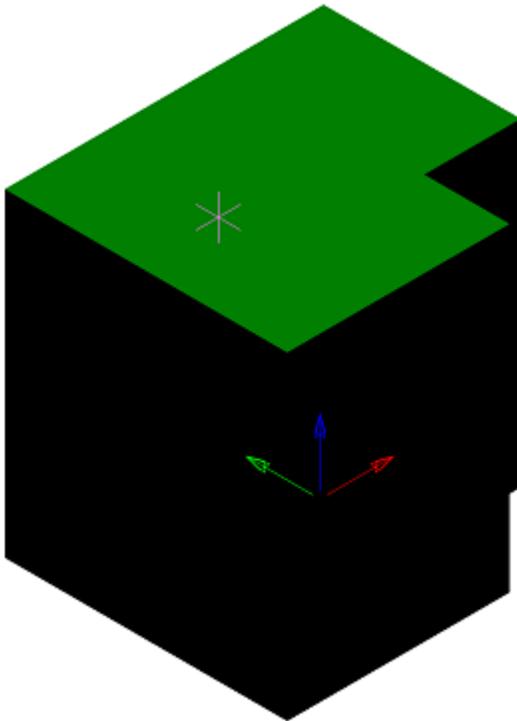
### *Automatically project edges on sketch*

The parameter when adding a new sketch adjusts the display of the projection of the edges of a flat face taken as the working plane for the sketch.

Call command *"Add planar sketch"*.

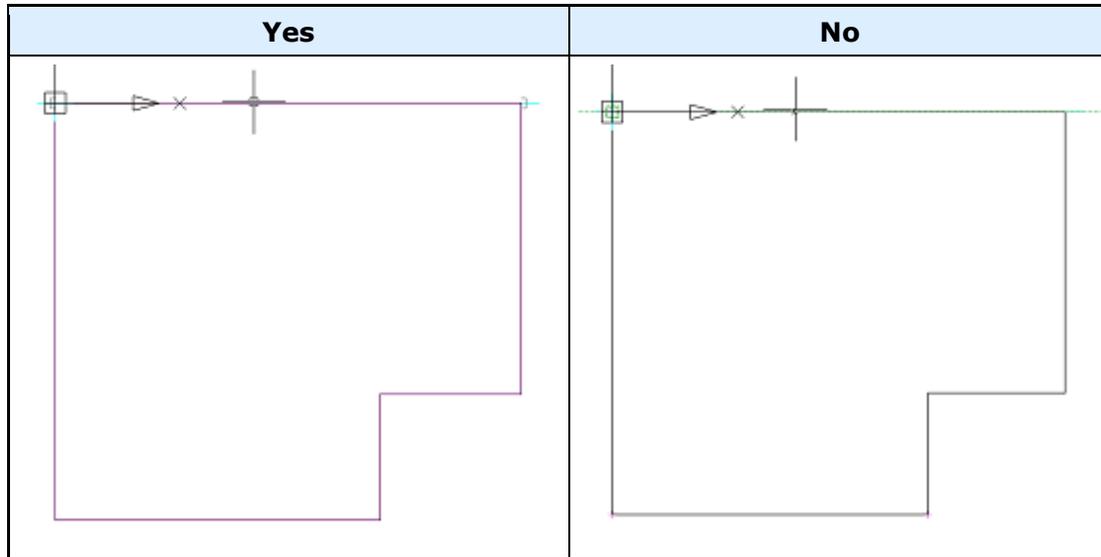


Specify a flat face as a work plane.



Depending on the setting, a projection will be added to the sketch.

<b>Yes</b>	<b>No</b>
------------	-----------



*Layer for sketches*

It allows you to customize the name of the layer on which will be placed flat sketches.

*Layer for working objects*

It allows you to customize the name of the layer on which the objects will be located.

*Layer for sections*

It allows you to customize the name of the layer on which section will be located.

**2D views**

[-] 2D views	
Automatic update	Yes
Layer	VIEWS
[-] Visible lines	
Show on sections	Yes
Line color	■ ByObject
Linetype	—— ByObject
Lineweight	—— ByObject
[-] Hidden lines	
Show on views	No
Line color	■ ByObject
Linetype	- - - ГОСТ 2.303 4
Lineweight	—— 0.20 mm
[-] Section border	
Settings differ from visible lines	No
Line color	■ ByObject
Linetype	—— ByObject
Lineweight	—— ByObject
[-] Hatch	
Show	Yes
Face hatch	Type - [User-Defined]

*Automatic update*

Sets the update mode 2D views

*Layer*

It defines the layer which will be located 2D views

**Visible lines**

*Show on sections*

Adjusts the image visible lines on sections

*Line color*

Specifies the color of visible lines

*Linetype*

Specify the type of visible lines

*Lineweight*

It determines the weight of visible lines

**Hidden lines**

*Show on sections*

It adjusts the display of invisible lines on 2D views

*Line color*

Specifies the color of hidden lines

*Linetype*

Specify the type of hidden lines

*Lineweight*

It determines the weight of invisible lines

**Section border**

*Settings differ from visible*

It determines whether the parameters are different boundary lines of the section visible lines  
If not, the next line settings are not valid.

*Line color*

Specifies the color of the boundary line section

*Linetype*

Specifies the type of the boundary line section

*Lineweight*

It determines the weight of the boundary line section

**Hatch**

*Show*

It controls the display of hatching

*Face hatch*

Settings such as shading

**3D. Pseudo section properties**

☐ A	<b>Pseudo section properties</b>	
☐	<b>Hatch</b>	
	— Show	Yes
	— Face hatch	Type - [User-Defined]
	— Surface transparency	0

## Hatch

### Show

It controls the display of hatching.

### Face hatch

Settings such as shading.

### Surface transparency

Settings such as shading. Default 0 - full transparency.

## Configuration utility

### Configuration Utility

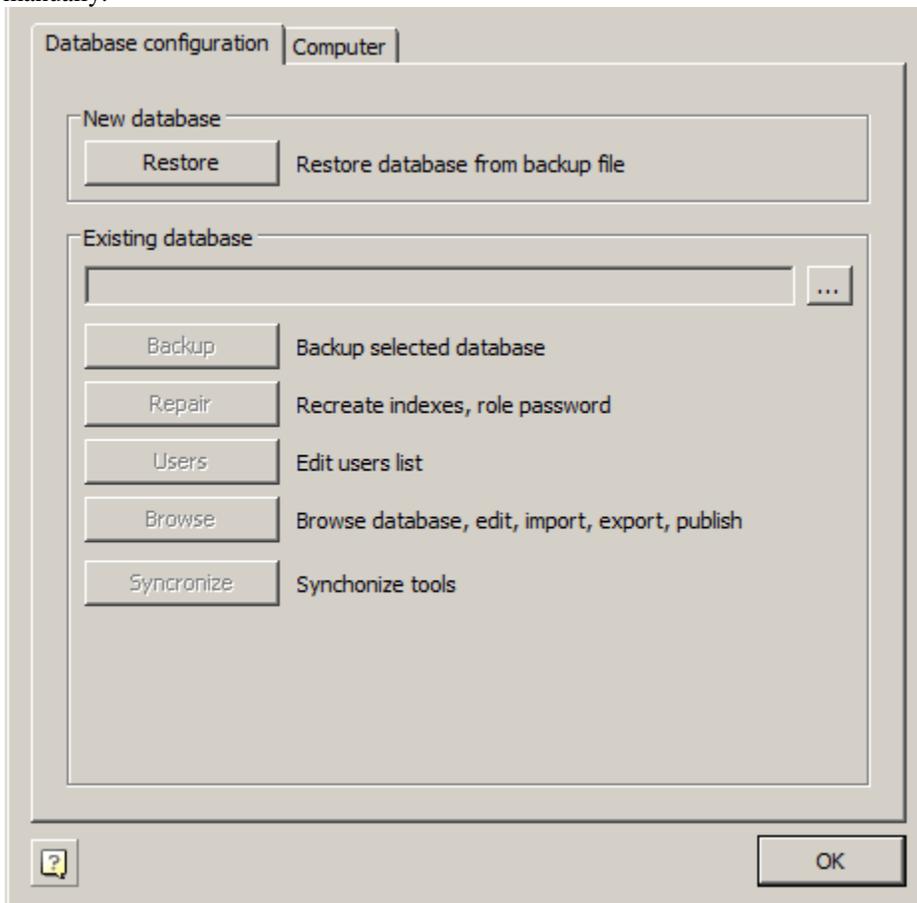
C:\Program Files\Nanosoft\Construction 21\mg11\  McConfiguration.exe

The utility is designed to manage a database of parametric objects of Construction 21.

The choice of a particular database depends on the size of the organization and the number of licenses used in it.

If the application is used in a large organization that uses a lot of licenses Construction , it is advisable to store the database on one server(MSSQL). Any change to the database will be immediately available to all users.

If you have multiple licenses in your organization, or you can not maintain the server, it is advisable to use local databases without using a server. The configuration utility allows you to connect files \*.mcs - for win32 and \*.mdf - for win64 (on Windows Vista and higher). Updating the database on different machines will have to be done manually.



## Creating and restoring the database

### *Restore*

Creates the database MS SQL Server from a backup created earlier. File *"std.mdf"* from the distribution as an archive does not fit.

For initial creation of a database it is possible to use a file of a backup of a database published on [spds.ru](http://spds.ru).

When you select a command, a dialog appears *"Select Data Source"*.

In this dialog, specify the machine name and the name of the Instance of SQL Server on this machine, which is supposed to restore the database. The desired values can be entered manually, or choose from a list of SQL Server present on the local subnet.

<b><i>Important!</i></b>	To restore a database, you have access to it and have sufficient rights established by the administration of SQL Server
--------------------------	---

In the *"Database"* must specify a new database name standard Construction 21, and then click *"OK"*.

In field *"Path to backup file (relative to server):"* appears enter the relative path to the database. It must be a local path (UNC is not supported).

Note that when restoring a database on the server (different machine from the one that runs the configuration utility), database backup file must also reside on the server. This is necessary to ensure that SQL Server account have the right to recover the database from the specified file.

When you click on *"OK"* to start the recovery process (restore) the database.

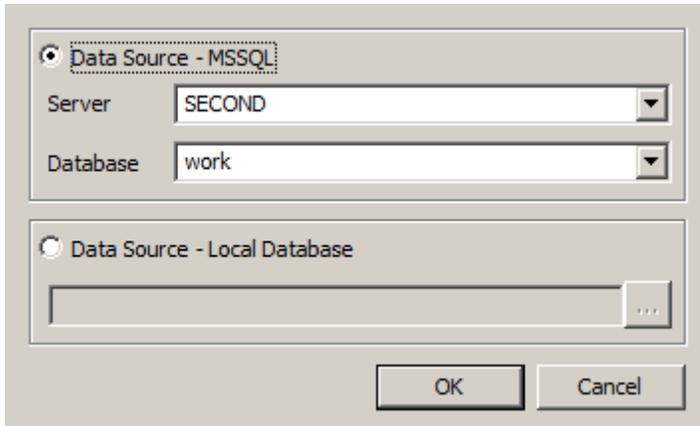
In the menu of the current database, use the following commands:

<b><i>Important!</i></b>	You should not use administrative tools SQL Server (Enterprise Management or SQL Management Studio) to restore the database from a file archive created by archiving of the configuration utility
--------------------------	---

## Current database

### *The path to the current database.*

By clicking on the button  opens a dialog *"Select Data Source"* to specify the server and database.



In the dialog box, you can select the type of data source:

- MSSQL - The server and database fields are filled in.
- Local base - The file on the disk is selected. The format of the local database files can be mcs(Access) and mdf(LocalDB).

This field contains the path to the current database in the form of:

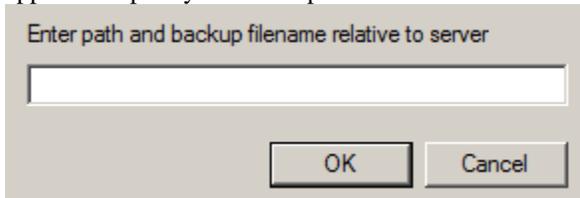
*SQL:<Server Name \ Name Instance>:<database name>*

The field to the local database contains the absolute path to the database file.

**Important!** After specifying the database, the base control buttons will be available, depending on the type of database and access rights.

**Backup**

Creates a file - a copy of the current SQL Server database for subsequent recovery. By pressing the button, a dialog appears to specify a relative path to the file archive database.



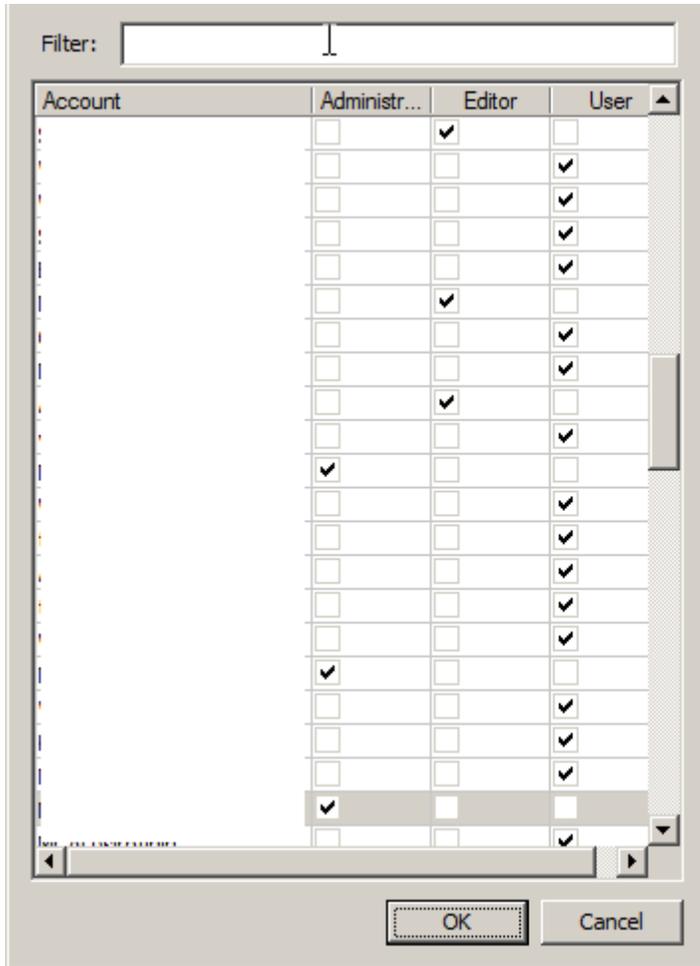
Clicking on "OK" will create an archive file.

**Repair**

Fixes corrupted database.

**Users**

Allows you to edit user rights (to run, you need to have the appropriate rights).



The following templates are right:

*User* - sees only system and its objects. Edits only its objects.

*Editor* - sees only system and its objects. Edits only its objects. Has the right to publish its objects.

*Administrator* - sees all the objects in the database. Has the rights to edit all objects and publish them.

Filter selects from the list of users on the typed letters contained in the user name. The list can be sorted by attributes, for this click on the column headings.

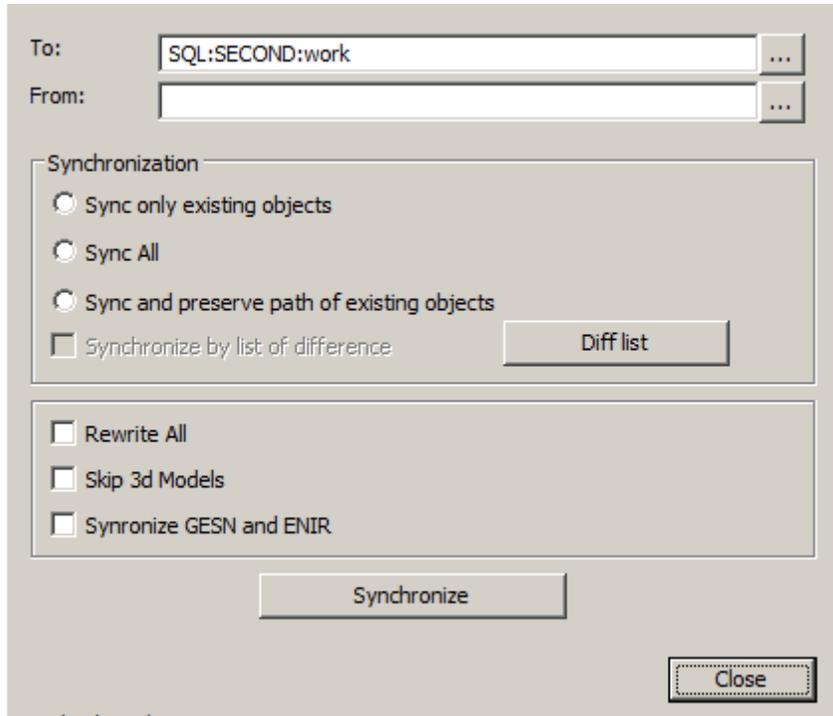
#### **View**

Starts [window browser base](#), where you can modify the database structure:

- Delete and move folders and objects;
- Import and export objects (it is possible to import multiple files at once);
- Publication and editing objects;
- Create shortcuts;
- Renaming, editing notes, setting the preview pictures.

#### **Synchronize**

Open dialog "Database Management".



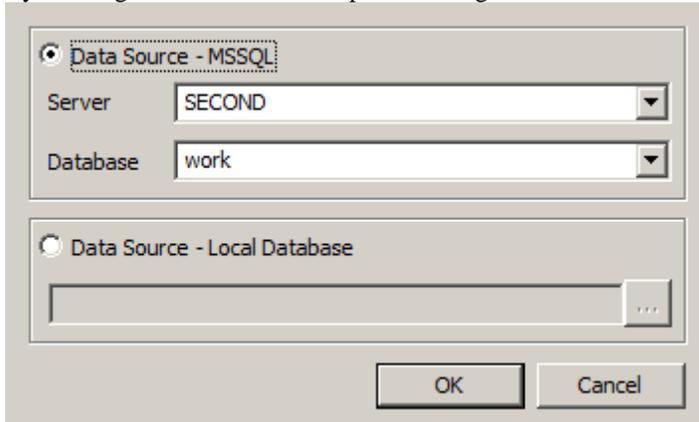
This utility is designed to provide an update target databases from the source. Through it may be, for example, to update the local database sections or individual users with respect to a single central database Company (located, for example, on a server).

To synchronize the database to choose:

*Target database* - this database to be updated;

*Source database* - this update source.

By clicking on the button  opens a dialog "Select Data Source" to specify the server and database.



In the dialog box, you can select the type of data source:

- MSSQL - The server and database fields are filled in.
- Local base - The file on the disk is selected. The format of the local database files can be mcs(Access) and mdf(LocalDB).

This field contains the path to the current database in the form of:

*SQL*:<Server Name \ Name Instance>:<database name>

The field to the local database contains the absolute path to the database file.

### Database Synchronization:

- *Synchronize only existing objects* - in the target database will be updated only those objects that are present in the target database.
- *Synchronize all* - in the target database will be updated all the objects present in the original database (if the target object does not present, it will be created), object paths are set as in the original database.
- *Synchronize and preserve path of existing objects* - in the target database will be updated all the objects present in the original database (if the target object does not present, it will be created), the path to the objects that exist in the target database will be stored for no longer exist - will be created.

*Synchronize by list of difference* - synchronizes the database objects selected in the difference list.

*Rewrite All* - overwrites all database objects from the source database to the target database.

*Skip 3d Models* - do not modify the 3d model found in the database.

*Synchronize GESN and ENIR* - for the product "Construction Site": synchronizes the tables of the GESN and ENIR. Button "*Synchronize*" synchronizes to the previously configured parameters. When synchronizing, it imports from the target database to the source database based on the specified synchronization parameters. When you import, only those objects will be updated, the modification date of which in the source database is later than the modification date in the target database.

### Procedure for updating Construction .

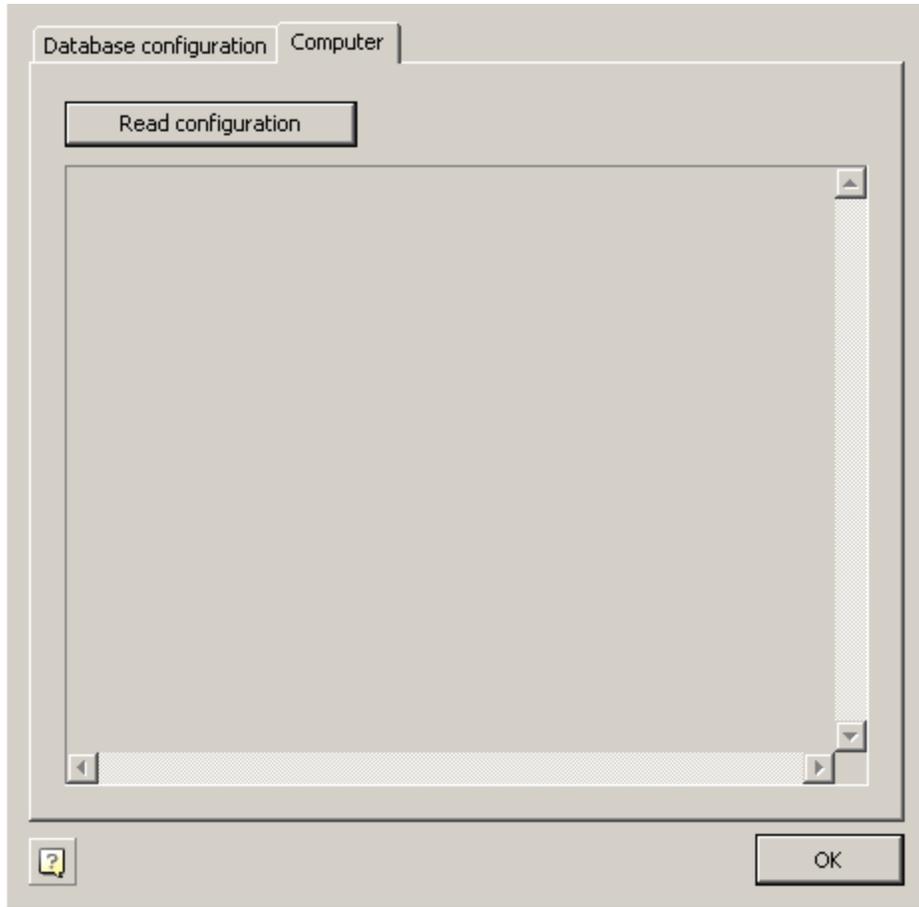
On the SQL-server there is a database of enterprise details containing user-defined elements. The company received an update Construction , including an updated backup of the database.

To update the database correctly, you must:

1. Run the Configuration Utility.
2. Restore the update database Construction from a backup.
3. Press button "*Synchronize*", a dialog will open. Analyze the list of differences of objects in the current database and in the update, for which in the "*Synchronize*" dialog it is necessary to click on the button "*Diff list*". All necessary facilities (concerns standard objects Construction , change of which is not required) export, and after synchronization - import into an already updated database.
4. In the dialogue "*Synchronize*" select the type of synchronization "*Synchronize all*" and press button "*Synchronize*":
  - 4.1. User objects created in the database will be saved when they are synchronized.
  - 4.2. Modified standard objects Construction will be merged. When synchronizing, each different item will be analyzed - if a new view is added - it will be saved, if the script is changed, for example - the date of changes in the current database and in the update will be compared, a newer script will remain. Thus, these details merge, and if they are present and different in both bases, the new ones are taken.

### Configuration Utility (system data)

Tab "Computer" is designed to collect data about the hardware of the computer running the utility.



To display information simply click "Read configuration".

### ***Transfer settings to another computer***

Custom settings files are located in the folder

`%APPDATA%\Nanosoft\Construction 21\ru-RU\AllOptions.xml` - configuration file nanoCAD

To transfer settings, you must copy these files to the appropriate folders, and then in the settings Construction 21 specify the path to the settings for the design elements.

The application database is located along the following path:

`%programdata%\Nanosoft\Construction 21\DataRW\std.mcs`

User objects stored in the local database must be exported or transferred as part of the entire database.

#### ***Important!***

The function of saving the settings, when the saved file is the same as the one already existing, does not overwrite the old file, but complements it. I.e., when changing the standard, for example, from the ESKD to ISO, both standards will be available in the settings file.

All changes to the profile table must be saved to the configuration file, otherwise these changes will only be displayed in the current work session.

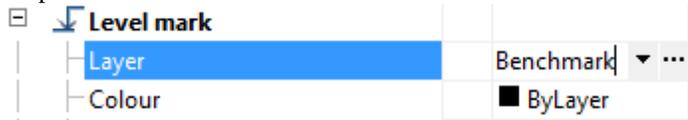
### ***Layers and profiles***

Objects Construction 21 when inserted, can be placed on a special layer. In this case, you do not need to pre-create the desired layer or make it the current one: the program will automatically do this regardless of the current layer.

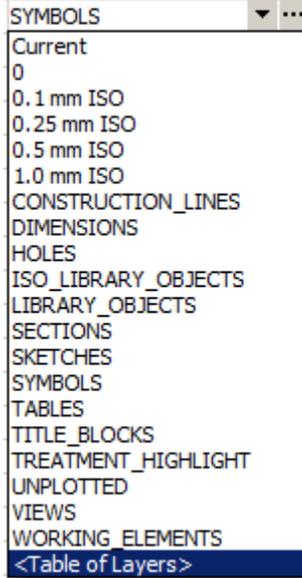
In the settings of design elements, some objects have a parameter *Layer*.

Each time an insert is inserted, the object is placed on the current layer nanoCAD.

To change the object's insertion layer, select the desired layer in the list or write its name in the input field of the drop-down list:



You can also take advantage of *Table of Layers*, selecting an item in the layer selection drop-down list.



Name	O	Colour	Lineweight	Linetype	P.	Comment
Current		Black	Default	Continuous		
0		Black	Default	Continuous		
Defpoints		Black	Default	Continuous		
0.1 mm ISO		Black	0.09 mm			
0.25 mm ISO		Black	0.25 mm			
0.5 mm ISO		Black	0.50 mm			
1.0 mm ISO		Black	1.00 mm			
AXES		Red	0.25 mm	Continuous		
COLUMN_MARKS		Colour 164	0.25 mm	Continuous		
COLUMNS		Colour 32	0.60 mm	Continuous		
DIMENSIONS		Colour 152	0.25 mm	Continuous		
DOOR_MARKS		Colour 164	0.25 mm	Continuous		
DOORS		Colour 162	0.35 mm	Continuous		
DRAWING_BORDERS		Black	0.25 mm			
OBJECTS		Colour 62	0.25 mm	Continuous		
ROOF		Colour 32	0.50 mm	Continuous		
ROOFS		Black	Default	Continuous		
ROOM_MARKS		Colour 164	0.25 mm	Continuous		
ROOMS		Colour 144	0.25 mm	Continuous		
SECTIONS		Colour 254	Default	Continuous		
SKETCHES		Colour 4	Default	Continuous		
SLABS		Black	Default	Continuous		
STAIRS		Colour 32	0.30 mm	Continuous		
SYMBOLS		Colour 213	0.25 mm	Continuous		
TABLES		Black	0.25 mm	Continuous		
TITLE_BLOCKS		Black	Default	Continuous		
UNPLOTTED		Colour 254	Default	Continuous		
VIEWS		Black	0.60 mm	Continuous		
WALL_OBJECTS		Colour 62	0.50 mm	Continuous		
WALLS		Colour 12	0.50 mm	Continuous		
WINDOW_MARKS		Colour 164	0.25 mm	Continuous		
WINDOWS		Colour 142	0.35 mm	Continuous		
WORKING_ELEMENTS		Colour 31	Default	Continuous		

In the dialog box "Table of Layers" a list of the layers available for use is given.

the symbol in the "On driving" column indicates the layers that are present in the current drawing.

Button " *New Layer*" adds a new layer to the table.

Button " *Delete Layer*" removes the selected layer from the table.

## Layer Profiles

*Layer Profiles* used when working together on drawings. Profiles allow you to automatically add a prefix to the names of the layers used to insert objects Construction 21.

To add and edit profiles, use the button  in the parameter line "*Current profile*" dialog box "*Settings*", tab "*Main options*".

In the dialog box *Table of profiles* lists available profiles.

Button " *Add profile*" adds a new profile to the table.

Button " *Delete profile*" removes the selected profile from the table.

Add a profile, select it in the table and close the dialog with the OK button. Close the dialog box "*Settings*".

When inserting objects Construction 21 to the special layer, a prefix corresponding to the current profile will be added to the layer name:

**Important!** The function of saving the settings, when the saved file is the same as the one already existing, does not overwrite the old file, but complements it. I.e., when changing the standard, for example, from the ESKD to ISO, both standards will be available in the settings file.

All changes to the profile table must be saved to the configuration file, otherwise these changes will only be displayed in the current work session.

## Overriding styles



Command line: *SPSETGOST*.

This command is required to create (override) dimension style, text style and line types in accordance with the standards of environmentConstruction for further work correctly.

Using this command can take in two cases:

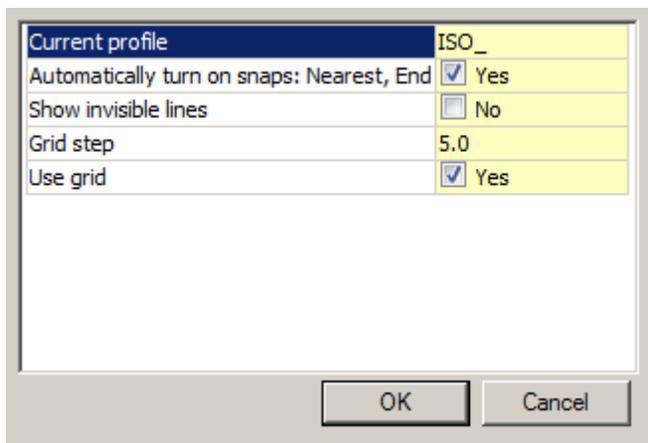
1. If the file was not created in the environment Construction
2. Dimension styles, text styles, or types of lines have been changed by hand and requires their recovery.

## Quick options

Shortcuts for calling quick settings are [set by setting hotkeys](#):

Hot keys	
Show <Quick Options> dialogue	CTRL + SHIFT + Q
Show notification window	CTRL + SHIFT + W

The Quick Settings dialog contains the following items:



- *Current profile* - indicates the current profile.
- *Automatically turn on snaps: Nearest, Endpoint, Quadrant, Center* - when you insert objects from the binding database, they automatically trigger.
- *Show invisible lines* - displays and hides invisible lines of standard parts hidden with the "Alt+RBM".
- *Grid step* - step of changing the diameter and length of a section of the shaft with its dynamic rendering.
- *Use grid* - to use or not to use a grid snap when dynamically rendering a portion of a shaft.

## Drawing design

### *Coordinate axes*

#### Array of orthogonal axes



Main menu: *Construction - Coordinate axes* - *Construction grid*.



Ribbon: *Construction - Architecture* - *Construction grid*.

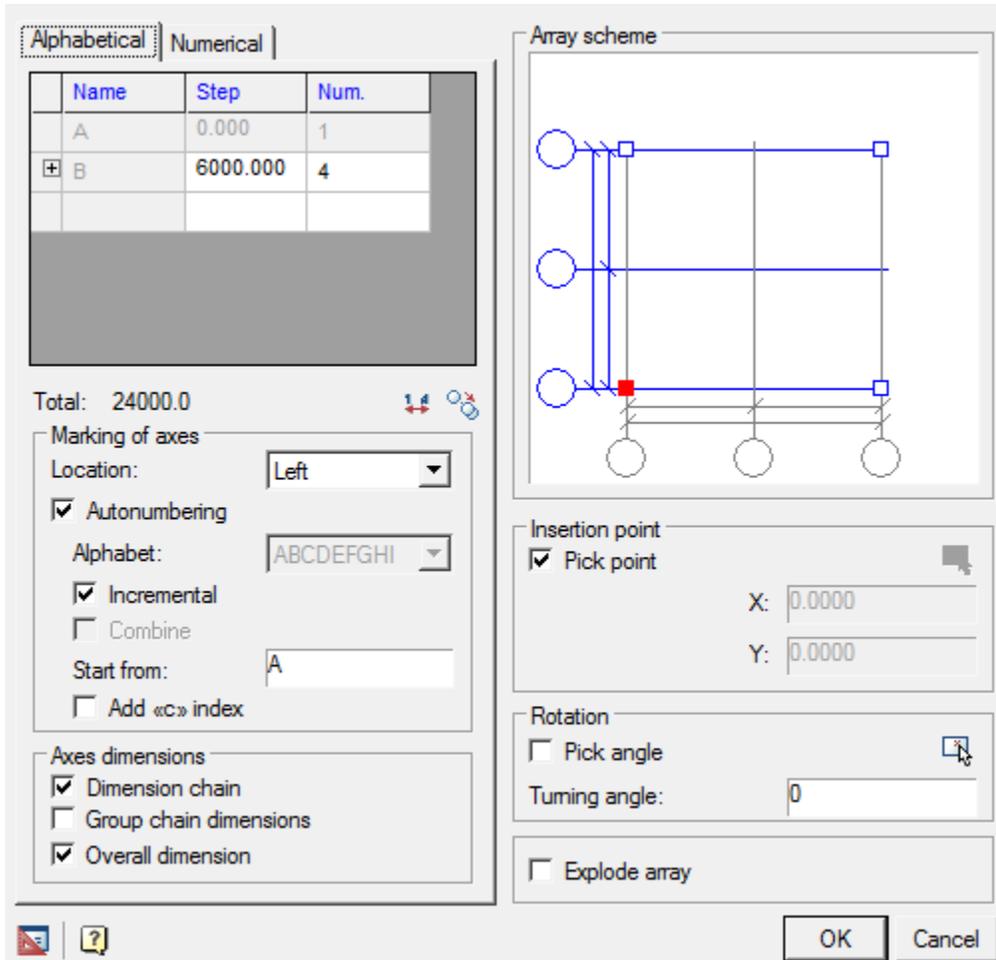


Toolbar: *Construction grid* ( "Coordinate axes").

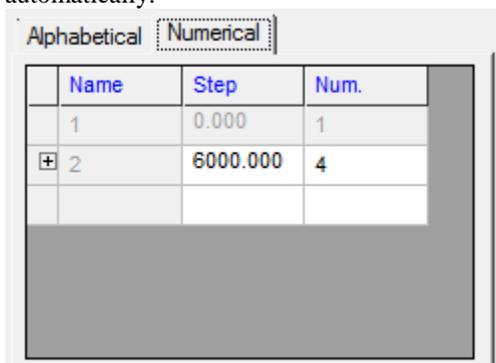


Command line: *SPGRID*.

Dialog *array axes* has two tabs - *Digital* and *Letter* to adjust accordingly alphanumeric array axes.



In the table, select the first line *step* between adjacent axes (in units of nanoCAD) and the total *number of axes*. You can create multiple sequences with different axes step between the axes and a different number of axes in each sequence. To do this, the bottom line in the column *Step* select the desired step value. The new line will be added automatically.



Column *Total* under the table, the distance between the extreme axes of the array.

Button  allows you to copy the settings from another array axes inserted into the drawing.

Button  reverses the number and letter codes available when auto-numbering is disabled, ie. modes: Disabled, According to GOST, Decremental.

Marking Tool Group axes includes the following elements:

list of *markers* to select the position of the markers in the array axes or to disable their display.

Available options markers vertical axes *Left\Right\Two Sided\Hide*

Available options markers vertical axes *Up\Down\Two Sided\Hide*

in the entry field *Start with* specified value of the first axes. By default, digital axes numbering starts at "1" for the letter - from "A".

Switch *Add 'c' index* to the notation of the axes.

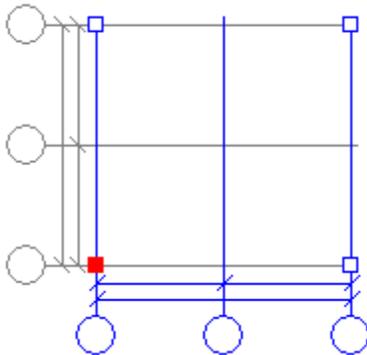
switch *Autonumbered* to control automatic placement of axes numbers.

Available options Autonumber *Incremental\Decremental\GOST\disabled*.

Axial Tool Group comprises three dimensions switch for controlling the display sizes between the axes of the array:

- *dimensional chain*
- *group chain dimensions*
- *overall dimension*

In the graphics window, specify the position of the base point in the array, which will correspond to the insertion point. Move the cursor to the desired site and click the left mouse button. Base point indicated by the red squares.

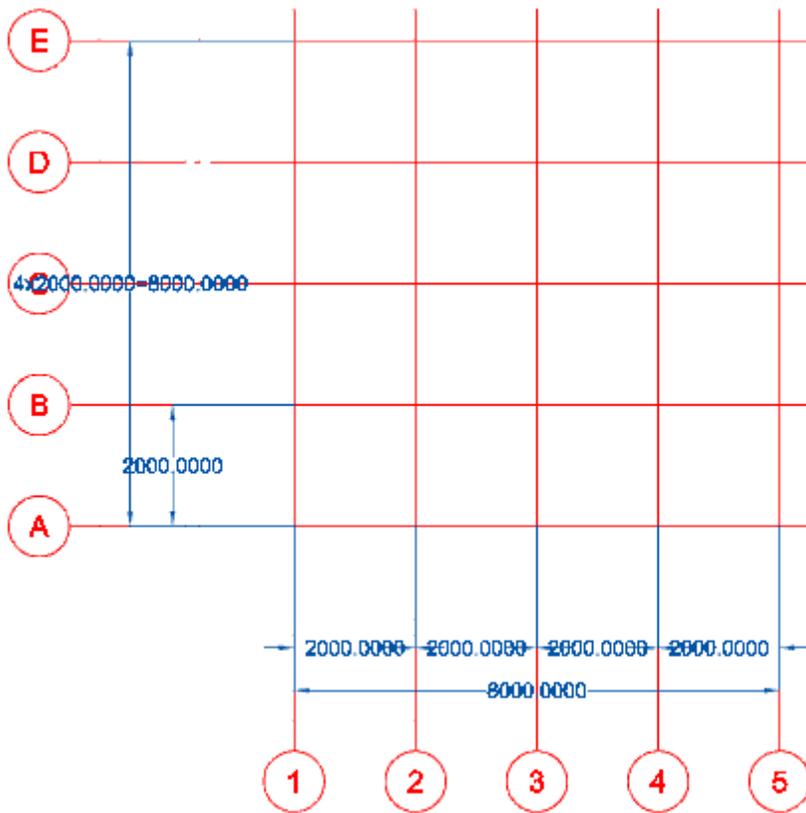


By default, when you insert the array you want to specify the insertion point in the drawing. To disable this mode, clear *Specify a point*. In the fields below, specify the X, Y coordinates of the insertion point, or select a point on the drawing by clicking .

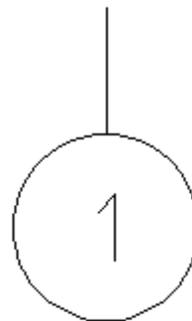
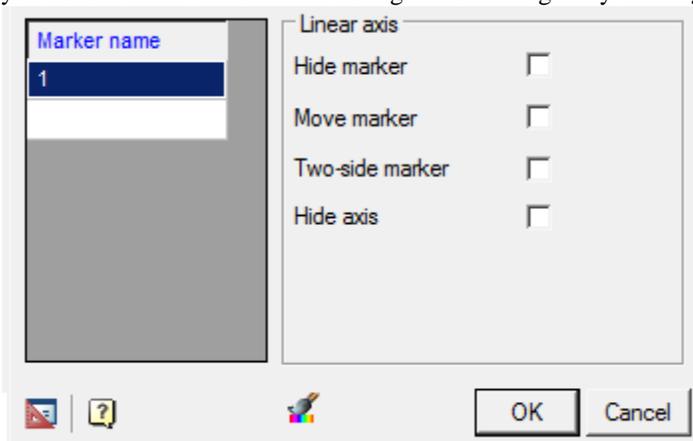
Switch *Specify angle* serves to activate the visual selection angle array axes. If required, enter the exact value of the angle of rotation in the input field, enter the angle in the drawing by clicking .

Turn on the switch *Split an array* if you want to insert an array broken into separate axes and axial dimensions.

When the switch is on *group chain dimensions*, the size of the axes will be as follows:



You can edit individual array axes on the drawing after insert. Call of axes editing can be done by double-clicking on the marker axes (you must enable edit mode by double-clicking in the settings Construction 21). To edit the axes can zoom the display so as to bring it closer to the marker. If the display scale of the array axes is small, then when you double-click will be called configuration dialog array. Editing dialog array axes has the form



You can change the name of the marker (if configured array mode is in mode of disabled Autonumbering). Controls the display of the axes by means of a switch *Hide axes*.

You can edit the distance between axes by double-clicking dimensions on the drawing and entering its value.

The drawing can be edited using an array of axes [grips](#).

Position of the axes can also be changed via the *STRETCH* command.

## Array of polar axes



Main menu: *Construction - Coordinate axes - Polar grid.*



Ribbon: *Construction - Architecture - Polar grid.*



Toolbar: *Polar grid* ( "Coordinate axes").



Command line: *SPPGRID.*

Dialog *array axes* has two tabs - *Digital* and *Letter* to adjust accordingly alphanumeric array axes.

Numerical | Alphabetical

	Name	Step	Num.
	1	0.000	1
+	2	45.000	2

Total: 90.000 ↔ ↻

Marking of axes

Location: Show

Autonumbering

Alphabet: 123456789

Clockwise

Combine

Start from: 1

Add «c» index

Axes dimensions

Dimension chain

Group chain dimensions

Overall dimension

Array scheme

Insertion point

Pick point

X: 0.0000

Y: 0.0000

Rotation

Pick angle

Turning angle: 0

Explode array

?
OK
Cancel

In the table, select the first line *step* between adjacent axes (degrees for digital and literal axes mm) and the total *number of* axes. You can create multiple sequences with different axes step between the axes and a different number of axes in each sequence. To do this, the bottom line in the Step column select the desired step value. The new line will be added automatically.

Numerical		Alphabetical	
	Name	Step	Num.
<input type="checkbox"/>	A	6000.000	3
<input type="checkbox"/>	B	6000.000	1
<input type="checkbox"/>	C	6000.000	1

Meaning the first step in the alphabet first axis determines the distance from the center axis of the array.

Button  allows you to copy the settings from another array axes inserted into the drawing.

Button  reverses the number and letter codes.

Tool Group *Labeling axes* includes the following elements:

list of *markers* to select the position of the markers in the array axes or to disable their display.

Available options markers arc axes *Start\End \On both sides\Castle\Hide*.

Available options markers radial axes *Show\Hide*.

in the entry field *Start with* specified value of the first axis. By default, digital axes numbering starts at "1", for the letter - from "A".

Switch *Add C index* to the axis name.

switch *Autonumbered* to control automatic placement of axis numbers.

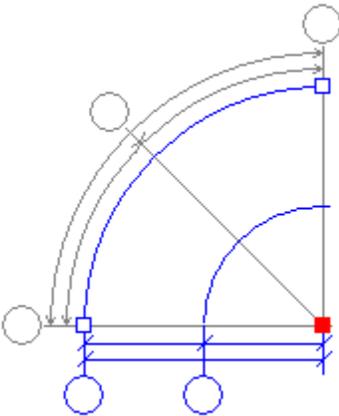
Available options Autonumber radial axes *Clockwise\CCW \disabled*.

Available options Autonumber arc axis *from the center of\K Center\Disable*.

Tool Group *Axial dimensions* contains two switches that serve to control the display size between the axes of the array:

- *dimension chain*
- *group chain dimensions*
- *overall dimensions*

In the graphics window, specify the position of the base point in the array, which will correspond to the insertion point. Move the cursor to the desired site and click the left mouse button. Base point indicated by the red squares.

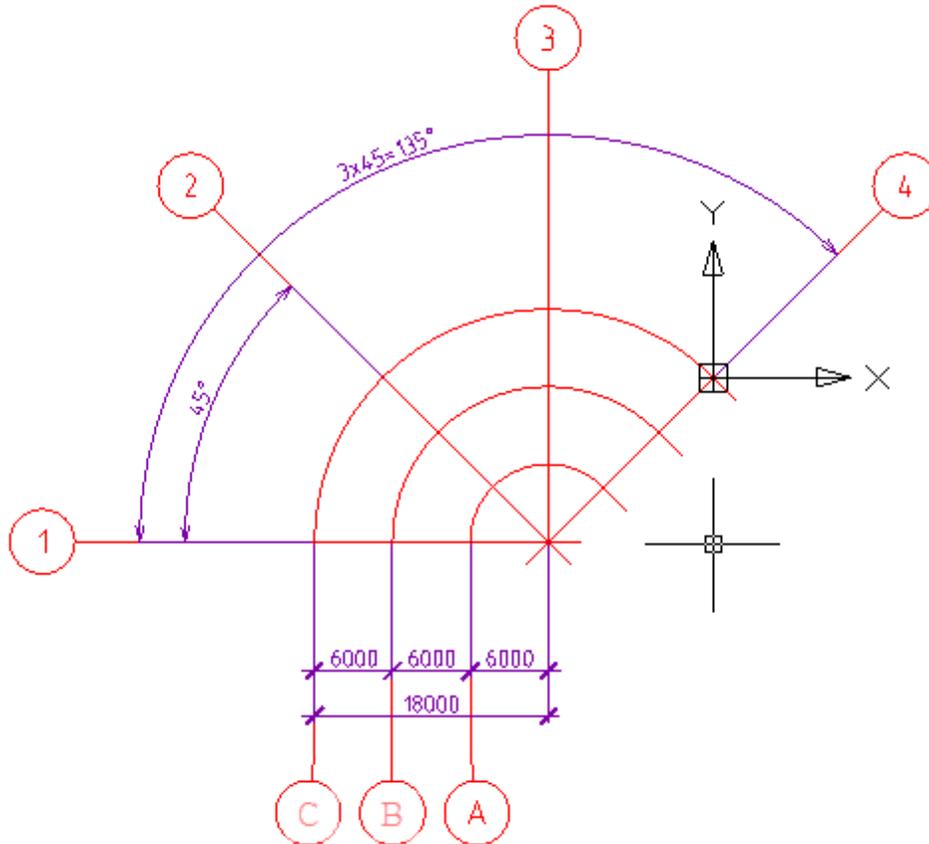


By default, when you insert the array you want to specify the insertion point in the drawing. To disable this mode, clear *Specify a point*. In the fields below, specify the X, Y coordinates of the insertion point, or select a point on the drawing by clicking .

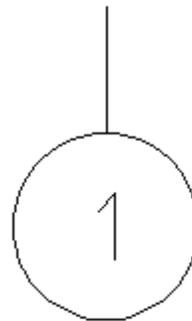
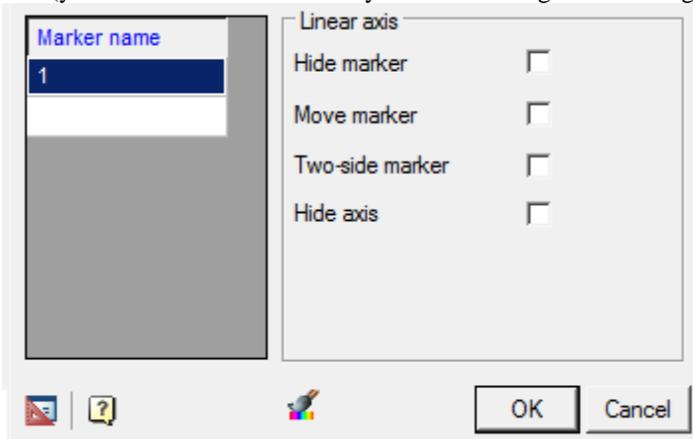
Switch *Pick angle* serves to activate the visual selection angle array axes. If required, enter the exact value of the angle of rotation in the input field, enter the angle in the drawing by clicking .

Turn on the switch *Explode array* if you want to insert an array broken into separate axis and axial dimensions.

When the switch is on *group size*, the size of the axes will be as follows:



On the drawing you can edit individual array axis. Call of axis editing can be done by double-clicking on the marker axis (you must enable edit mode by double-clicking in the settings Construction 21).



You can change the name of the marker (if configured array mode is in state of disabled Autonumbering).

Controls the display of the axis by means of a switch *Hide axis*.

Double click, you can change the value of the axial sizes (included in the chain, or the total size). When resizing shifted all axes, watching this.

The drawing can be edited using an array of axes [grips](#).

## Single axis



Main menu: *Construction - Coordinate axes - Construction axis*.



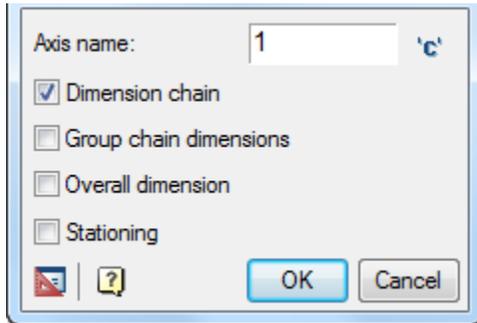
Ribbon: *Construction - Architecture - Construction axis*.



Toolbar: *Construction axis* ("Coordinate axes").



Command line: *SPCLINE*.



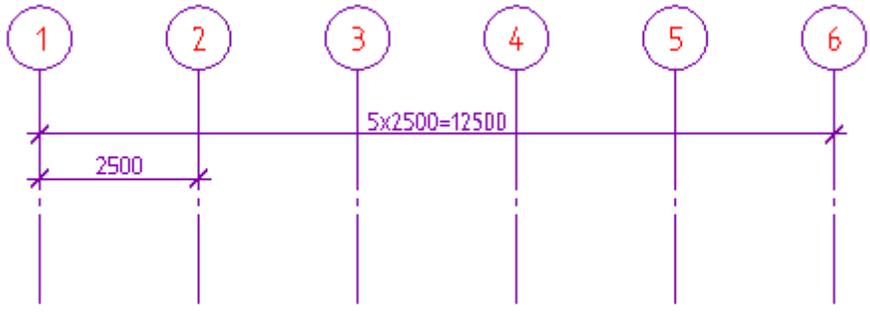
1. In the dialog box *Single axis* indicate the number of the first axis inserted. Click OK.
2. Specify *start point* or *the name* of the first axis.
3. Specify the *endpoint* of the first axis.
4. Enter the *distance* to the next axis or *the insertion point*. Complete the cyclic command by pressing Esc.

When you enter the distance from the keyboard position of the axis the current cursor position is given.

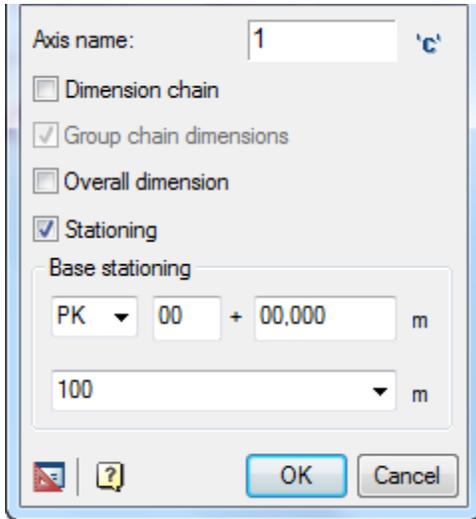
Switch *'c'* *Add the index 'c'* to automatically add an index to the designation of the axis.

Switches *Dimensional chain* and *total size* includes automatic dimensioning between the axes. Dimensions may be linear or angular.

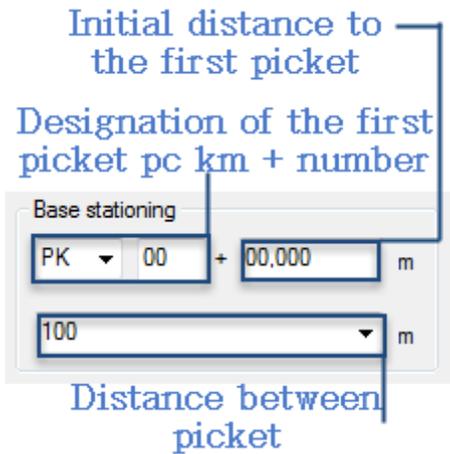
*Dimension grouping* joins chain of dimension into one single group dimension.



Switch *Stationing* displays stationing dialog.

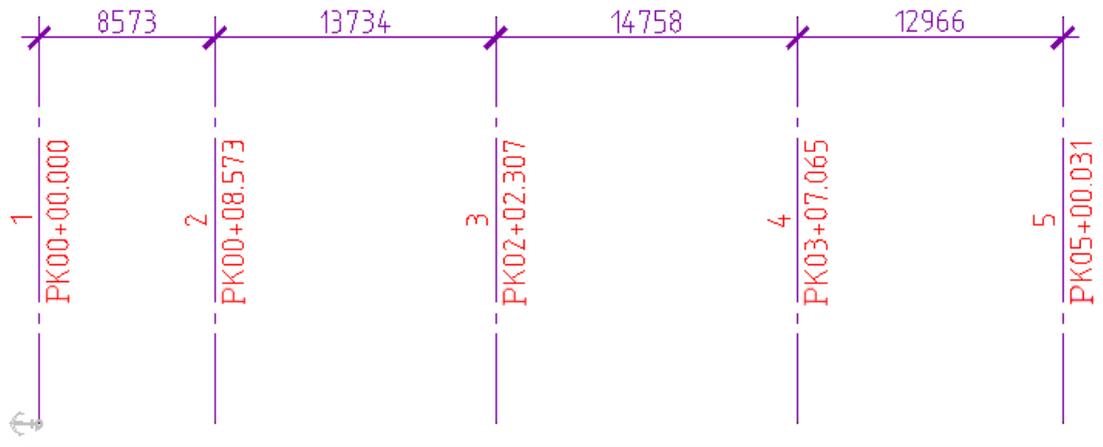


Stationing can be chosen from a list of *PC* or *CM*. You can also specify the number of the first picket. You can set the initial value, enter it in the appropriate input box.



Stationing is calculated as the ratio of the actual distance between pickets to the specified distance in meters plus supplement.

At a given distance between pickets 10m axis will be as follows:

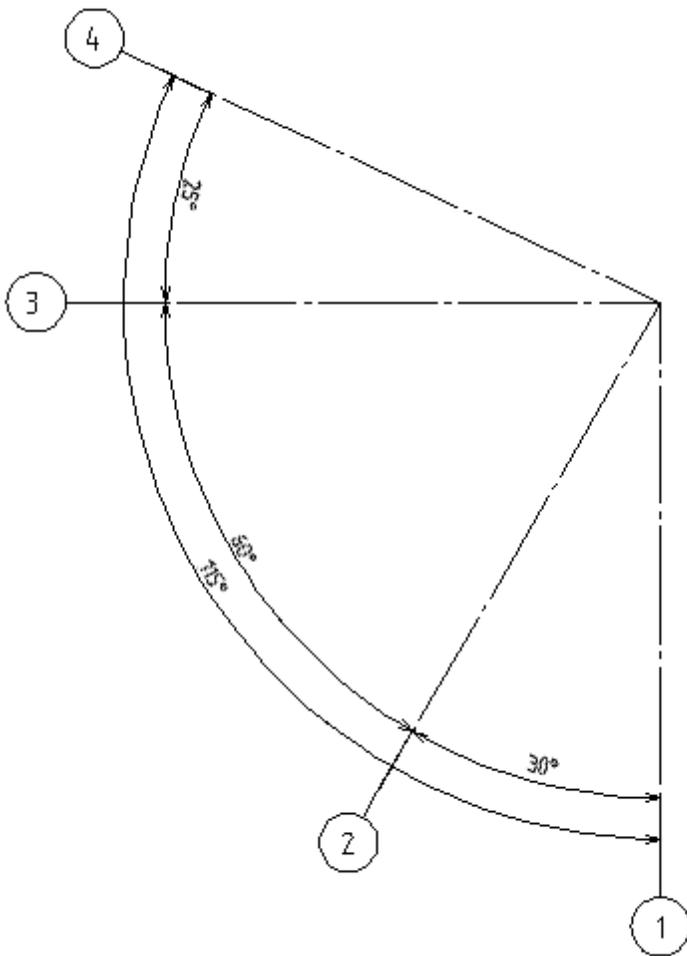


Anchor shows the direction of reference between the axes.

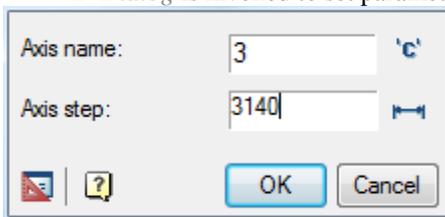
Axes inserted into the drawing are automatically numbered in ascending order by numbers or letters (depending on the designation of the first axis).

When you insert an axis , in context menu also some commands are available (N-Name, E-New, A-angle, and D-Dialog):

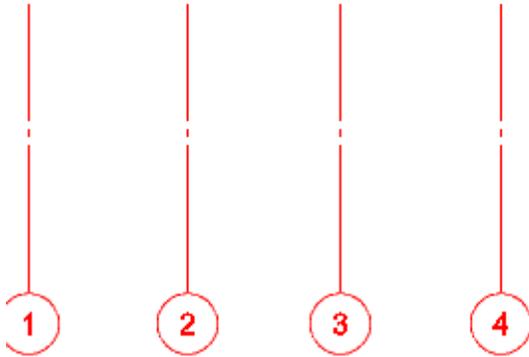
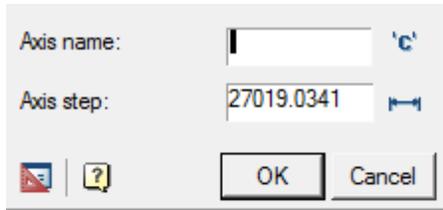
- When you choose *N-name* on the command line, you are prompted to enter a new designation for the next axis
- *Team New* Allows you to select a new location inserted axis.
- *A-angle* translates insert axis in append mode radial axis



- *D-Dialog* is invoked to set parameters and add another axis.



When you click on "OK" dialog will be created in the drawing axis, located at a predetermined distance (angle) from the previous dialog with the entered name.



When the command completes *Single axis* is finished the markers of axes are separated automatically.

### Arc construction axis



Main menu: *Construction - Coordinate axes - Separate arc construction Axis*.



Ribbon: *Construction - Architecture - Separate arc construction Axis*.



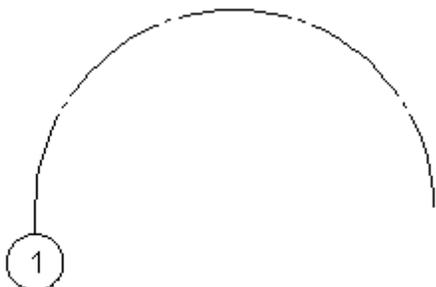
Toolbar: *Separate arc construction Axis* ( "Coordinate axes").



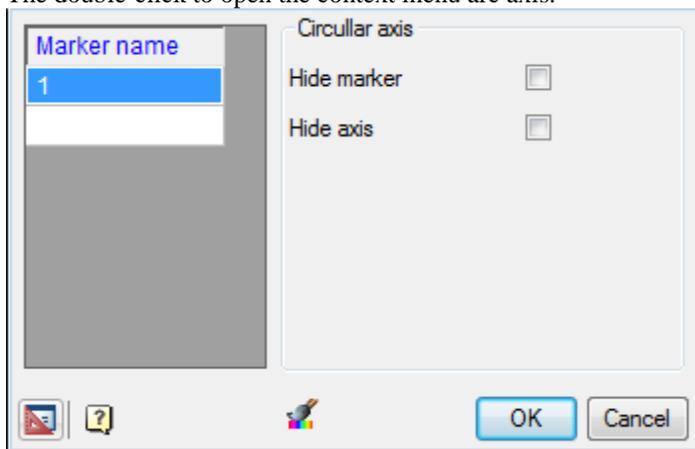
Command line: *SPARCCLINE*.

To create a separate arc axis

1. Specify *center point of the* axis.
2. Specify *radius of* arc (click or enter a value on the keyboard).
3. Specify *the start angle* (click or enter a value on the keyboard).
4. Specify *end angle* (click or enter a value on the keyboard).



The double-click to open the context menu arc axis.



Column *Marker name* contains a list of the names of the markers. To add a new marker, click in an empty field and enter the name of the marker.

Options arc axis:

- *Hide marker* - hides the marker so it is only displayed in the drawing axis;
- *Move marker* - moves marker to the other end of the shaft;
- *Two side marker* - adds a marker at the other end of the axis;
- *Hide axis* - the axis hides, only the marker;

### Circular construction axis



Main menu: *Construction - Coordinate axes - Separate Circular Construction Axis*.



Ribbon: *Construction - Architecture - Separate Circular Construction Axis*.



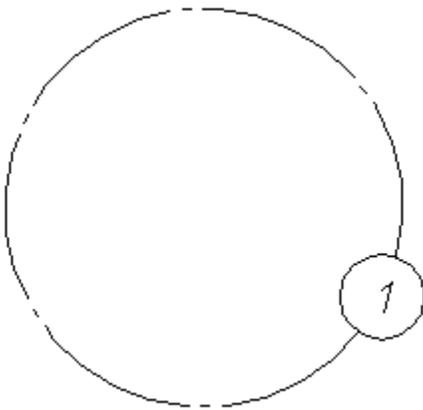
Toolbar: *Separate Circular Construction Axis* ( "Coordinate axes").



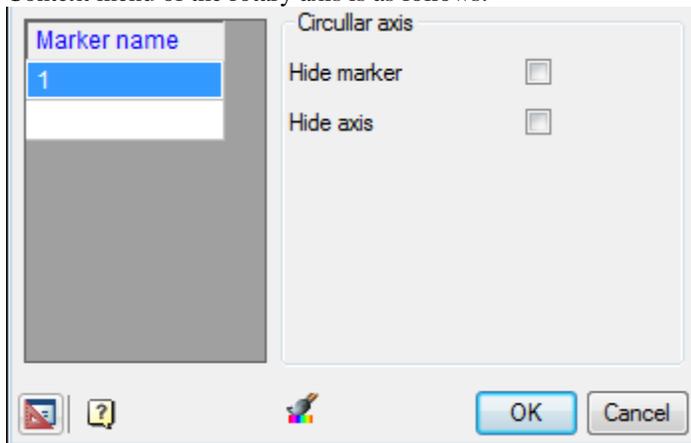
Command line: *SPCIRCCLINE*.

To create a separate rotary axis:

1. Specify *center point of the axis*.
2. Specify the *radius of the arc*.
3. Specify *marker angle*.



Context menu of the rotary axis is as follows:



Column *Marker name* contains a list of the names of the markers. To add a new marker, click in an empty field and enter the name of the marker.

*Arc axis*

- Hide marker - hides the marker and is only displayed in the drawing axis;
- Hide axis - the axis hides, showing only the marker;

## Add markers



Main menu: *Construction - Coordinate axes - Add marker*.



Ribbon: *Construction - Architecture - Add marker*.



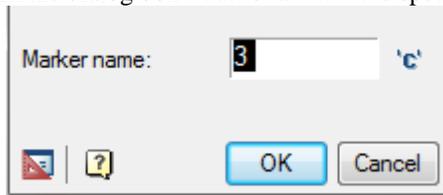
Toolbar: *Add marker* ( "Coordinate axes").



Command line: *SPADDMARKER*.

1. In the drawing *select the coordination axis*.

- In the dialog box *Additional markers* specify a name to the marker.



- Click *OK*.
- Specify the name of the second additional marker and click *OK* or click *Cancel* to exit.

## Orientation mark for construction line



Main menu: *Construction - Coordinate axes - Orientation Mark for Construction Axis*.



Ribbon: *Construction - Architecture - Orientation Mark for Construction Axis*.



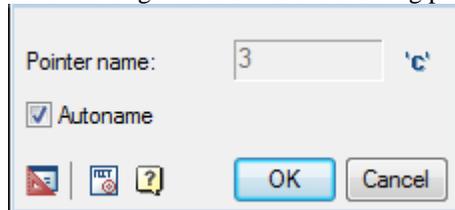
Toolbar: *Orientation Mark for Construction Axis* ( "Coordinate axes").



Command line: *SPCLINEORIENT*.

- In the drawing *select the coordination axis*.
- Specify *insertion point* or *distance* in the selected direction. Distance is introduced based on the current scale Construction 21.

When editing inserted into the drawing pointer orientation dialog box appears *pointer axis orientation*



Marker *Autoname* automatically sets the name of the pointer axis orientation. By turning off the marker, you can specify your own name index.

Set the input field with a new name index. If necessary, add to the name of the index 'C', using the button 'c'

## Separate markers



Main menu: *Construction - Coordinate axes - Separate Markers*.



Ribbon: *Construction - Architecture - Separate Markers*.



Toolbar: *Separate Markers* ( "Coordinate axes").



Command line: *SPSEPARATEMARKERS*.

Select the drawing focal axis and confirm. Markers axes are automatically moved apart so as to avoid overlapping.

## Rename construction lines



Main menu: *Construction - Coordinate axes - Rename Construction Axes*.



Ribbon: *Construction - Architecture - Rename Construction Axes*.

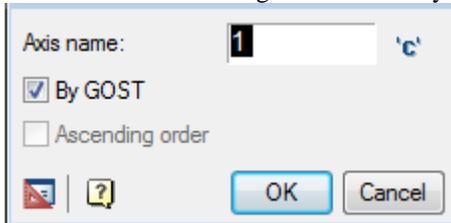


Toolbar: *Rename Construction Axes* ( "Coordinate axes").



Command line: *SPRENAMECLINES*.

1. Select *construction line*.
2. In the dialog box, enter *the name of the axis*. Click *OK*.
3. Select the drawing focal axis that you want to rename.

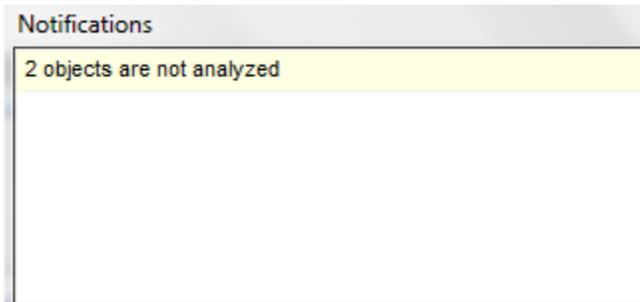


Switch *by GOST* enabled by default is used to select the direction of renaming. Also included is a marker which will verify compliance with GOST: axis names: exception letters, Cyrillic characters, similar numbers, etc.

When the switch is *ascending* order axes from left to right and top to bottom.

If you turn off both switches numbering axes in descending order, i.e, from right to left and top to bottom.

If some of the selected axes are arranged non-parallel to the first axis, a message is shown, which indicates the number of these axes.



## Similar construction line



Main menu: *Construction - Coordinate axes* - *Similar to Construction Axis*.



Ribbon: *Construction - Architecture* - *Similar to Construction Axis*.



Toolbar: *Similar to Construction Axis* ("Coordinate axes").



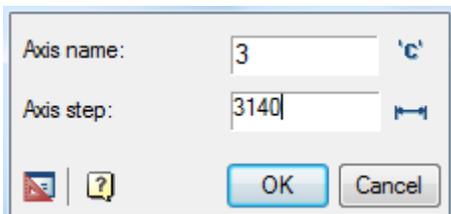
Command line: *SPSIMILARCLINE*.

1. Select the drawing *coordination axis*.
2. Specify the *distance* or *the insertion point* next axis. In the context menu of available commands (*N-Name/E-New/D-dialog/A-fill angle*).
3. Complete the action of the cyclic command.

Plug-axis automatically numbered in ascending order

When you insert available context menu commands (*1-Name*, *2-Dialog* and, *3-Angle*)

- When you choose *one-name* on the command line, you are prompted to enter a new designation for the following axis.
- Command *2 Dialog* brings up a box *next axis*



When you click *OK* to the axis it is added to the input field name in the distance determined in the pitch axis of the previous axis.

Push-button pitch / angle  or  changes over the distribution of axes when inserting - orthogonal or polar. Exit the dialog box by clicking *Cancel*.

- Command *3-angle (3-distance)* changes over the distribution of axes when inserting.

## Refresh intersections of constructions axes



Main menu: *Construction - Coordinate axes - \*Refresh Intersections of Constructions Axes*.



Ribbon: *Construction - Architecture - \*Refresh Intersections of Constructions Axes*.



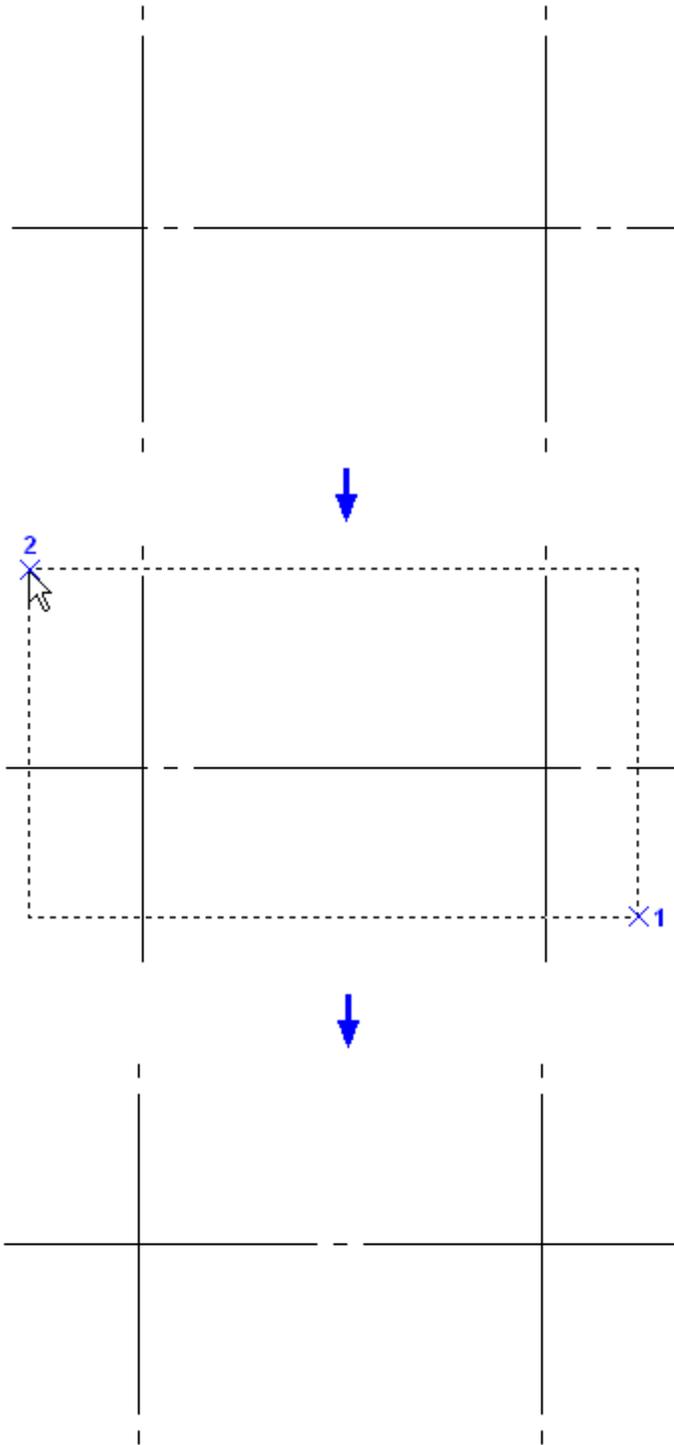
Toolbar: *\*Refresh Intersections of Constructions Axes* ( "Coordinate axes").



Command line: *SPREFRESHLINECROSS*.

Updates intersection focal axes, providing the requirements of GOST dash-dotted lines crossing in long strokes.

- Select the drawing *focal axis* and confirm
- Intersection will be updated automatically.



### Adding axis to the array

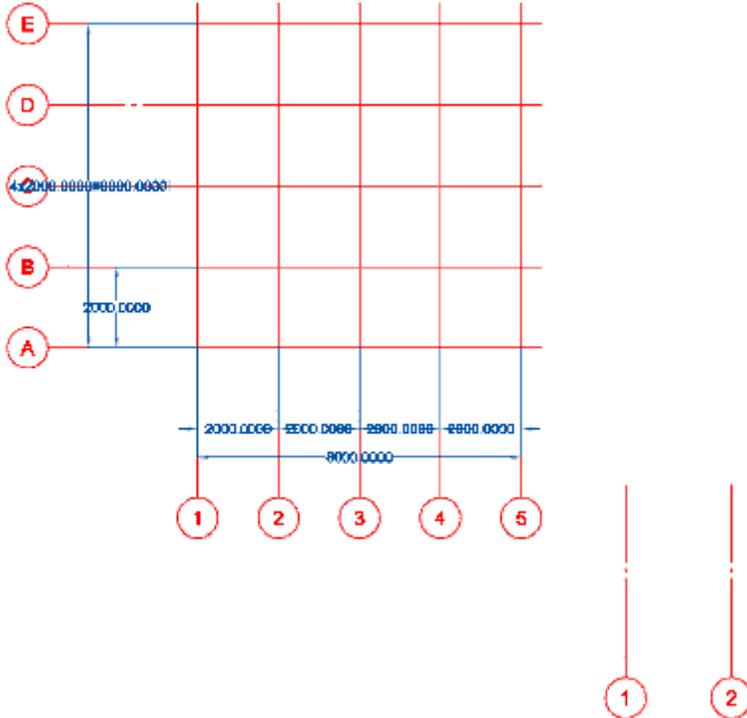


Main menu: *Construction - Coordinate axes -  Add Axes to Grid.*

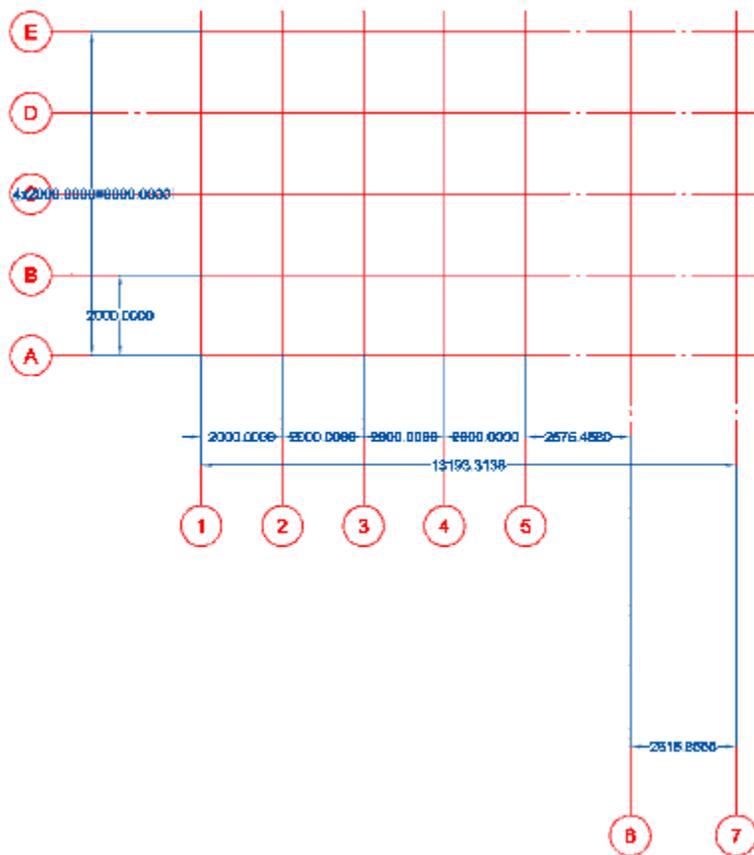
 Ribbon: *Construction - Architecture* -  *Add Axes to Grid*.

 Toolbar:  *Add Axes to Grid* ("Coordinate axes").

 Command line: *SPGRIDADDAXES*.



- Select an array of axes
- Select the axis you want to add



Axis will be added to the array, and will be numbered in accordance with the sequence of the array.

### Removing the axes of the array



Main menu: *Construction - Coordinate axes - Extract Axes from Grid.*



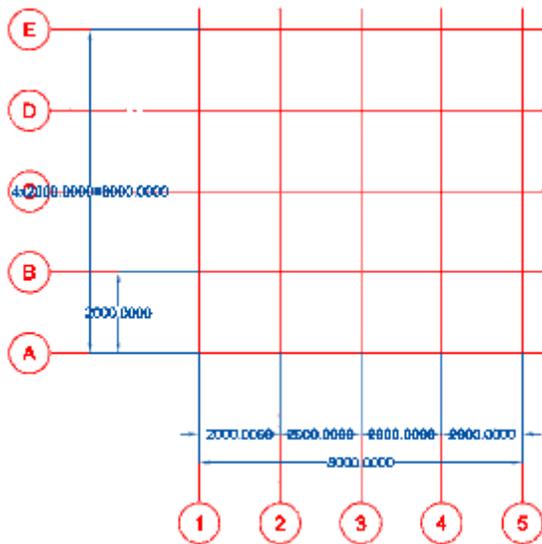
Ribbon: *Construction - Architecture - Extract Axes from Grid.*



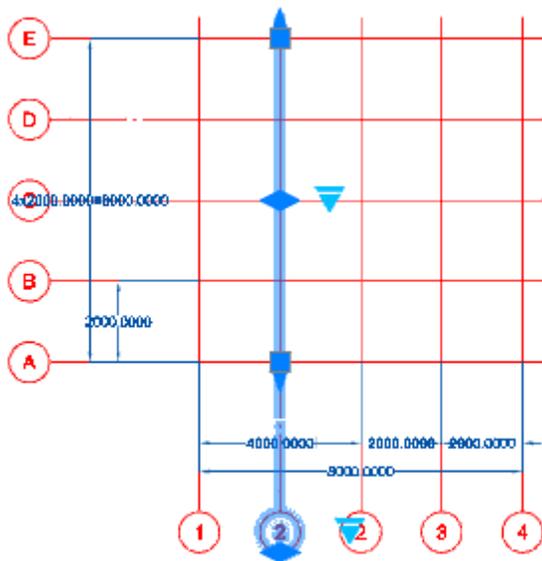
Toolbar: *Extract Axes from Grid* ("Coordinate axes").



Command line: *SPGRIDEXTRACTAXES.*



- Select an array of axes
  - Select the axis you want to remove from the array, for example, the axis 3
- The extracted axis is excluded from the numbering of the array and will be independent axis.



## Architectural decisions

### Wall



Main menu: *Construction - Architecture - Add Wall.*



Ribbon: *Construction - Architecture - Add Wall.*



Toolbar: *Architecture* - *Add Wall*.



Command line: *SPWALLADD*.

Walls can be straight and arc sections. To construct the arc wall segment in the context menu select the command *arc*.

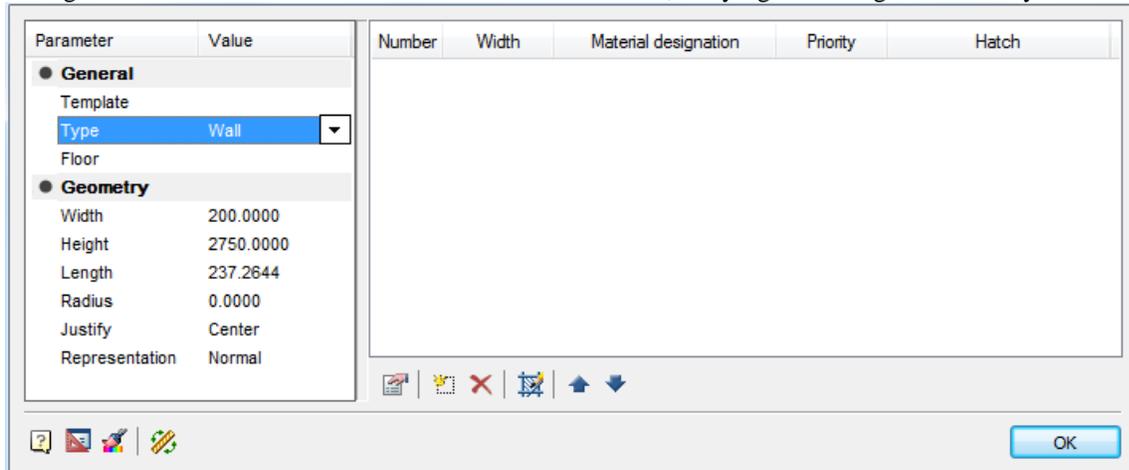


Ways of building arcs will be available in the context menu:

- Arc* - consistently indicates the starting, middle and end Points;
  - Bulge* - consistently indicates the initial endpoint of the arc and the given bend;
  - Center* - consistently indicates the arc center's starting and end points;
  - Segment* - used for constructing rectilinear segments;
  - Justify* - Consistently indicates left, center and right points;
- Also in the context menu are the following options:
- Axis* - toggles for drawing the wall relative to its axis (*left, center, right*);
  - Offset* - lets you draw a wall with an indent;
  - Properties* - opens the properties dialog box wall;
  - Match* - allows you to copy the properties being built with any existing walls.

## Properties dialog wall

Dialog can be accessed from the context menu to create a wall, or by right-clicking on an already built facility.



Key parameters are displayed in the left pane of the dialog box. In the right pane of the dialog box you can set the wall material. You have the opportunity to create a multi-layered wall.

All parameters of the walls can be set independently or choose *Template*. The template determines the composition of the wall, its width and height. If the user changes any of these parameters, then the connection is lost with the template.



- **Wall material**. Opens the material of the wall, where you can see and edit the list of available materials.



- **New layer**. Creates a new blank layer comprising the wall. Column *Material* selects the required material from the drop-down list. Priority layer will determine cleanup schedules while crossing the walls: a layer with a higher priority is displayed on top of layers with a lower priority.



- **Delete Layer**. Removes the layer from the wall.



- **Hatch**. Allows you to set or change the shading layer.



- **Move Up**. Moves the list of layers on the active layer above the line.



- **Move Down**. Moves the list of layers on the active layer below the line.

You can specify *full* or *simplified* representation. In the simplified representation layers and hatching are turned off.

### Complete

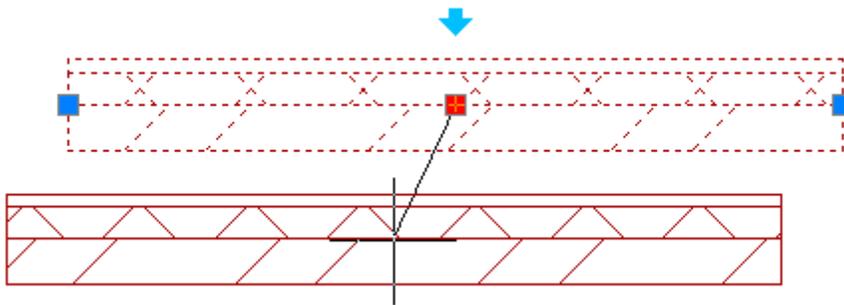


### Simplified

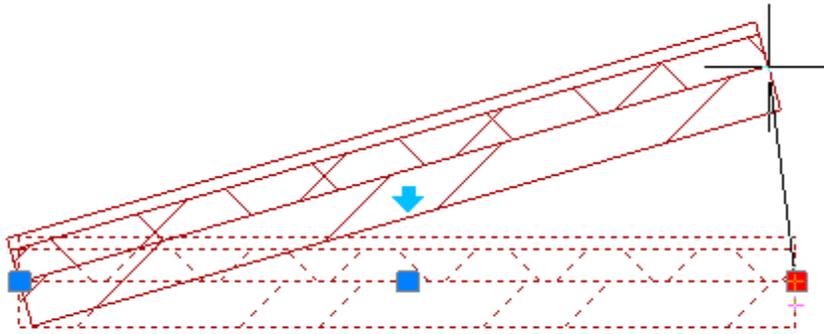


### Editing with grips

Central grip moves wall parallel to its original position.



Recent handles allow the wall to turn.



Blue arrow allows you to turn the wall.

## Polygonal wall



Main menu: *Construction - Architecture - Add PolyWall*.



Toolbar: *Add PolyWall (toolbar "Architecture")*.



Command line: *SPPOLYWALLADD*.

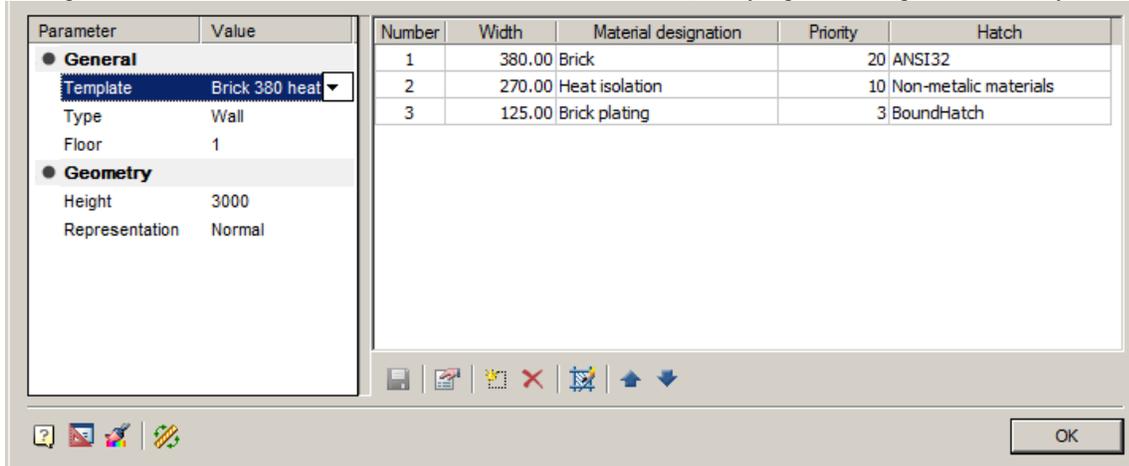
Polygonal wall provided in the form of a closed polygon.

## The order of insertion

- 1. Call command.
- 2. Specify the first point of the construction of the wall.
- 3. Specify the following point.
- 4. To complete the construction of press Enter. Wall will be closed automatically.

## Dialog properties wall

Dialogue can be accessed from the context menu to create a wall, or by right-clicking on the already-built facility.



The main parameters of the wall are displayed on the left side of the dialog box. In the right part of the dialog is set composition of the wall. In this case it is possible to create multi-layered walls.

*Options*

Parameter	Value
<b>● General</b>	
Template	Brick 380 heat ▾
Type	Wall
Floor	1
<b>● Geometry</b>	
Height	3000
Representation	Normal

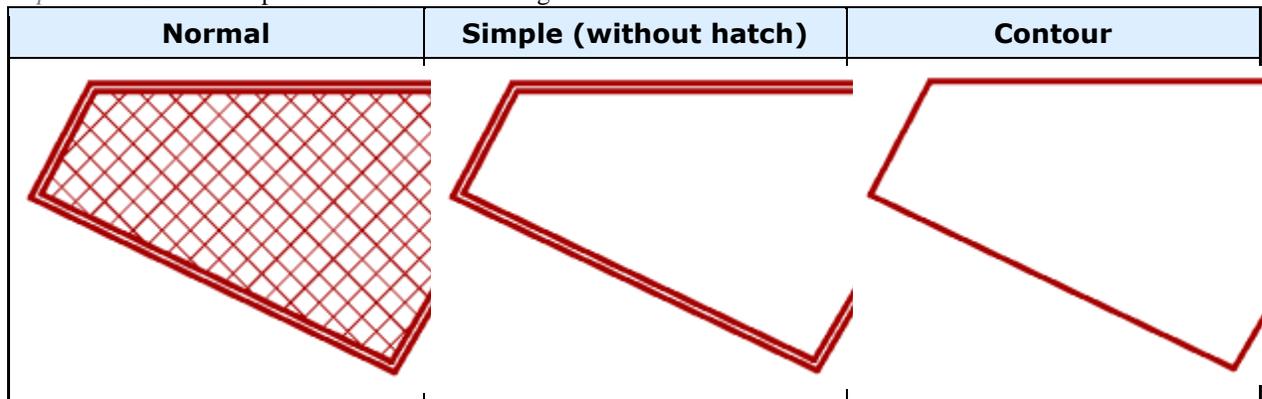
*Template* - Selecting the wall structure template.

*Type* - Wall Type: wall or partition.

*Floor* - Choose the floor

*Height* - The height of the wall.

*Representation* - The representation in the drawing.



***The composition of the wall***

All parameters of the wall you can set your own or choose from option "Template". The template determines the composition of the wall, its width and height. If the user changes any of these settings, the connection is lost with the template.

Number	Width	Material designation	Priority	Hatch
1	380.00	Brick	20	ANSI32
2	270.00	Heat isolation	10	Non-metalic materials
3	125.00	Brick plating	3	BoundHatch

The composition of the wall is controlled by commands:

 - **Wall's materials**. Opens the "Wall Material" dialog box, where you can see and edit the list of available materials.

 - **Add layer**. Create a new blank layer as a part of the wall. In the column "Material" it is necessary to choose the desired material from the dropdown list. Layer Priority will determine how cleanup schedules at the intersection of walls: a layer with a higher priority is displayed on top of the layer with a lower priority.

**Important!** The last layer of the wall fills the remaining space inside the wall, regardless of the specified width.

 - **Remove layer**. Removes a layer from the walls.

 - **Hatch**. It allows you to create or change the shading layer.

 - **Move up**. Moves in the list of layers of the active layer on the line above.

 - **Move down**. Moves in the list of layers of the active layer on the line below.

 - **Flip wall**. Visually changes the order of the layers of the wall.

## Editing walls

### Convert to wall

 Main menu: **Construction - Architecture - Wall Edit -  Convert to Wall...**

 Ribbon: **Construction - Architecture -  Convert to Wall...**

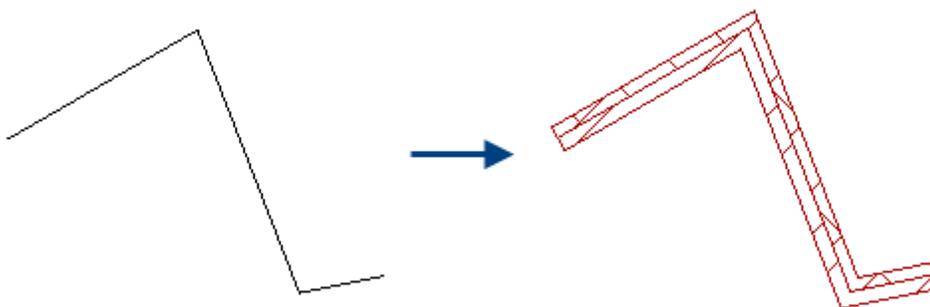
 Toolbar: **Architecture -  Convert to Wall...**

 Command line: **SPWALLCONV**.

Command allows you to convert the wall lines and arcs.

Call the command and specify the primitives for conversion. In the [dialog box](#), specify the required parameters of the wall.

At the end of the command, specify the delete source primitives or not.



### Wall modifier

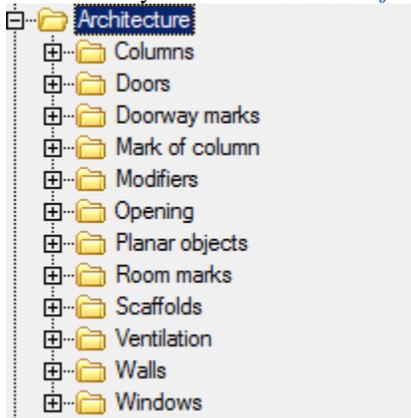
 Main menu: **Construction - Architecture - Wall Edit -  Add Wall Modifier.**

 Ribbon: *Construction - Architecture -  Add Wall Modifier.*

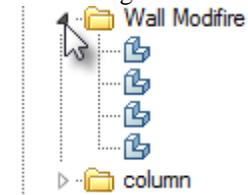
 Toolbar: *Architecture -  Add Wall Modifier.*

 Command line: *SPWALLMODADD.*

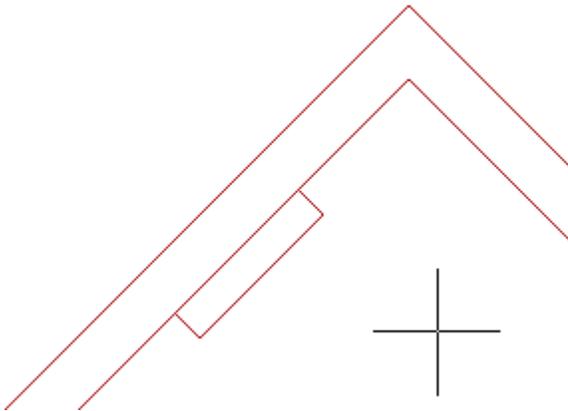
 Library: *Architecture - Modifiers*



When using a build modifier of base elements, you can choose different configuration object.



To connect the modifier to the wall run the mouse pointer across any wall modifier bound to the *walls*. To unbind modifier from the wall or tie it again, you can through the context menu commands *Attach/Detach*.



## Convert to wall modifier

 Main menu: *Construction - Architecture - Wall Edit -  Convert to Wall Modifier.*

 Ribbon: *Construction - Architecture -  Convert to Wall Modifier.*

 Toolbar: *Architecture -  Convert to Wall Modifier.*



Command line: *SPWALLMODCONV*.

Command is working as follows:

- After launch the command you need to select objects on the drawing;
- Specify insertion point.

After that, the user-created modifier can be used as ordinary modifier from database, but its graphics and parameters are fixed.

## Join wall



Main menu: *Construction - Architecture -Wall Edit - Join*.



Ribbon: *Construction - Architecture - Join*.

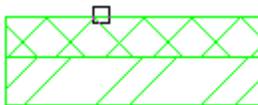


Toolbar: *Architecture - Join*.



Command line: *SPWALLJOIN*.

The team brings together two walls in one. The properties of the final wall will be taken to that the command was specified first.



## Break the wall



Main menu: *Construction - Architecture -Wall Edit - Break*.

 Ribbon: *Construction - Architecture - Break*.

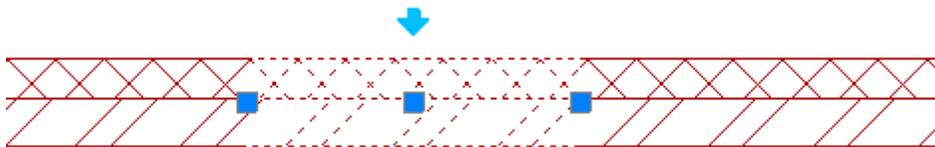
 Toolbar: *Architecture - Break*.

 Command line: *SPWALLBREAK*.

Command allows you to break the wall into several sections. The mouse cursor indicates the point of decomposition.



When the command completes space partition walls are not visible, and see how there can be a partition of the individual segments were selected.



## Extend wall

 Main menu: *Construction - Architecture -Wall Edit - Extend*.

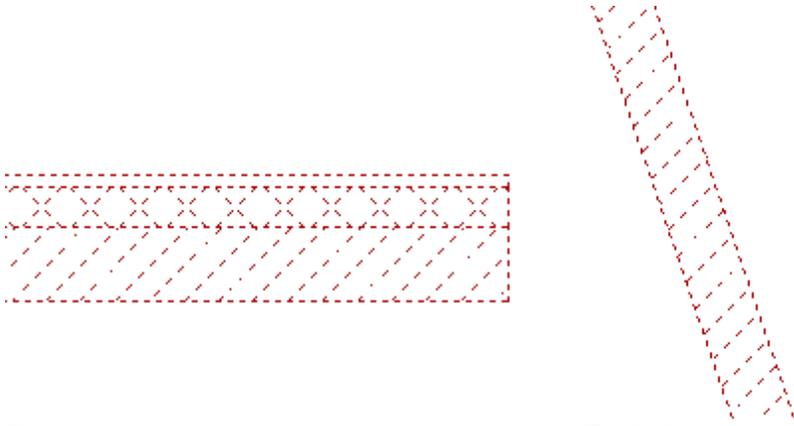
 Ribbon: *Construction - Architecture - Extend*.

 Toolbar: *Architecture - Extend*.

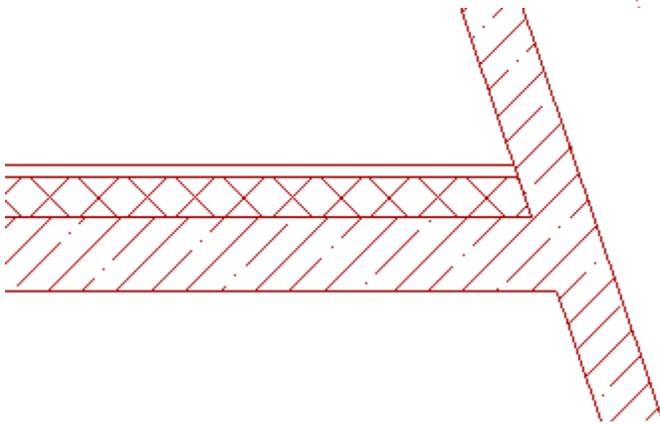
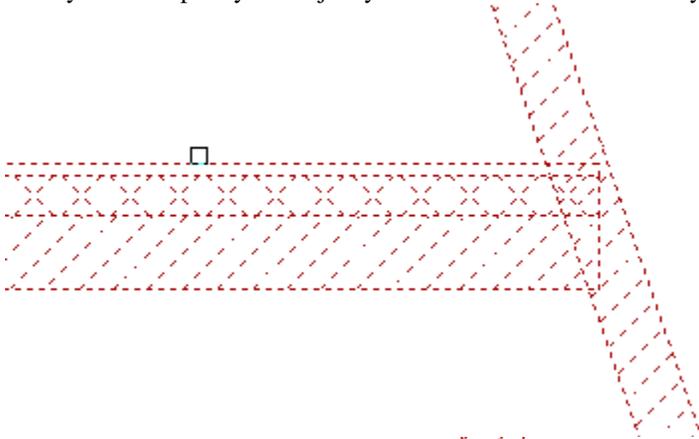
 Command line: *SPWALLEXTEND*.

Wall extends to the nearest intersection.

The first step in the implementation of both teams are selected object.



Then you must specify the object you want to extend. The facility will be completed before crossing.



If, after calling the command instead of selecting objects press *space bar* on the keyboard, then, were selected for the second stage of the command wall, will be extended to the nearest intersection.

### Trim wall

 Main menu: *Construction - Architecture - Wall Edit -  Trim.*

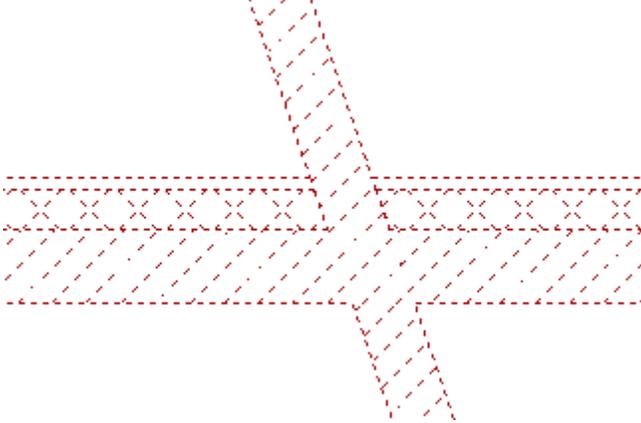
 Ribbon: *Construction - Architecture -  Trim.*

 Toolbar: *Architecture -  Trim.*

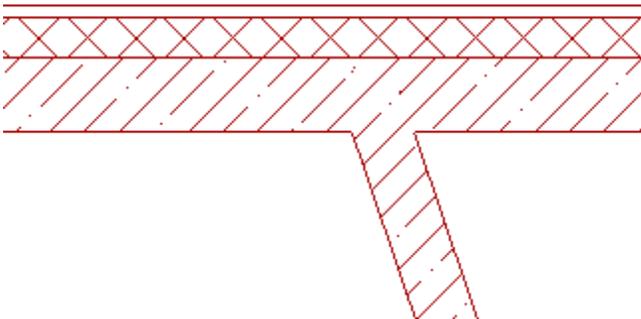
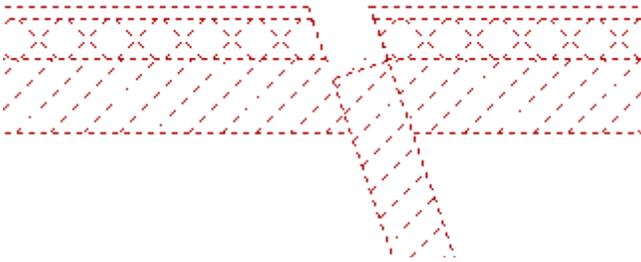


Command line: *SPWALLTRIM*.

The first step in the implementation of both teams are selected object.



Mouse indicate the portion of the wall that you want to crop.



If, after calling the command instead of selecting objects, press *space bar* on the keyboard, then, were selected for the second stage of the command wall will be cut to the nearest intersection.

## Make Corner



Main menu: *Construction - Architecture - Wall Edit -  Make Corner*.



Ribbon: *Construction - Architecture -  Make Corner*.

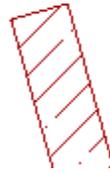


Toolbar: *Architecture* -  *Make Corner*.

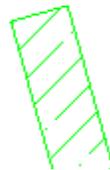


Command line: *SPWALLCORNER*.

Command allows you to create the angle between the walls.



Both walls are selected alternately, the angle between them to be formed. selection order does not matter.



## Window



Main menu: *Construction - Architecture* -  *Add Window*.



Ribbon: *Construction - Architecture* -  *Add Window*.



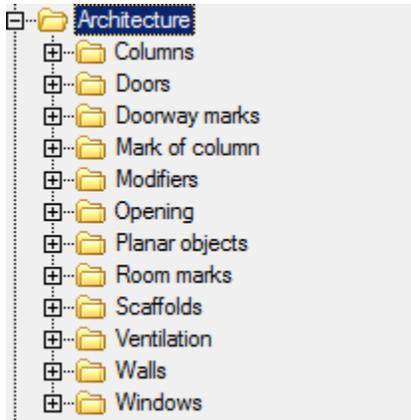
Toolbar: *Architecture* -  *Add Window*.



Command line: *SPWINDOWADD*.



Library: *Architecture - Windows*



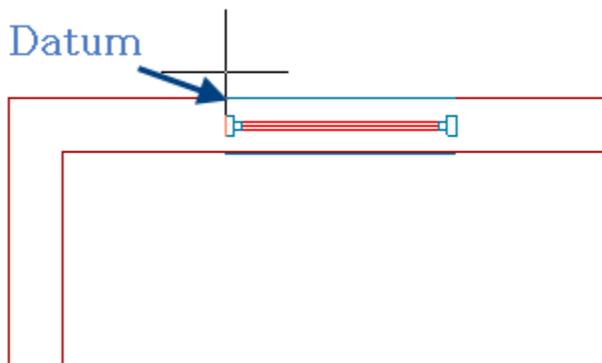
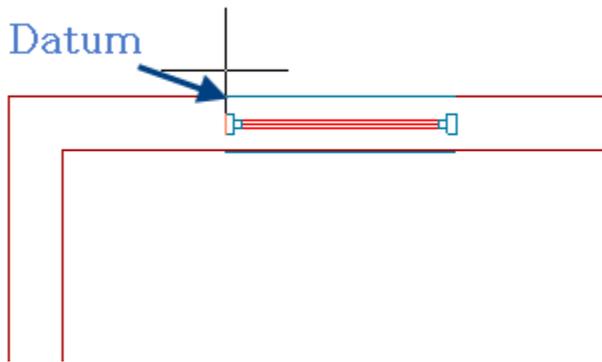
Using the construction of the base elements of the window, you can choose different configurations for the object.



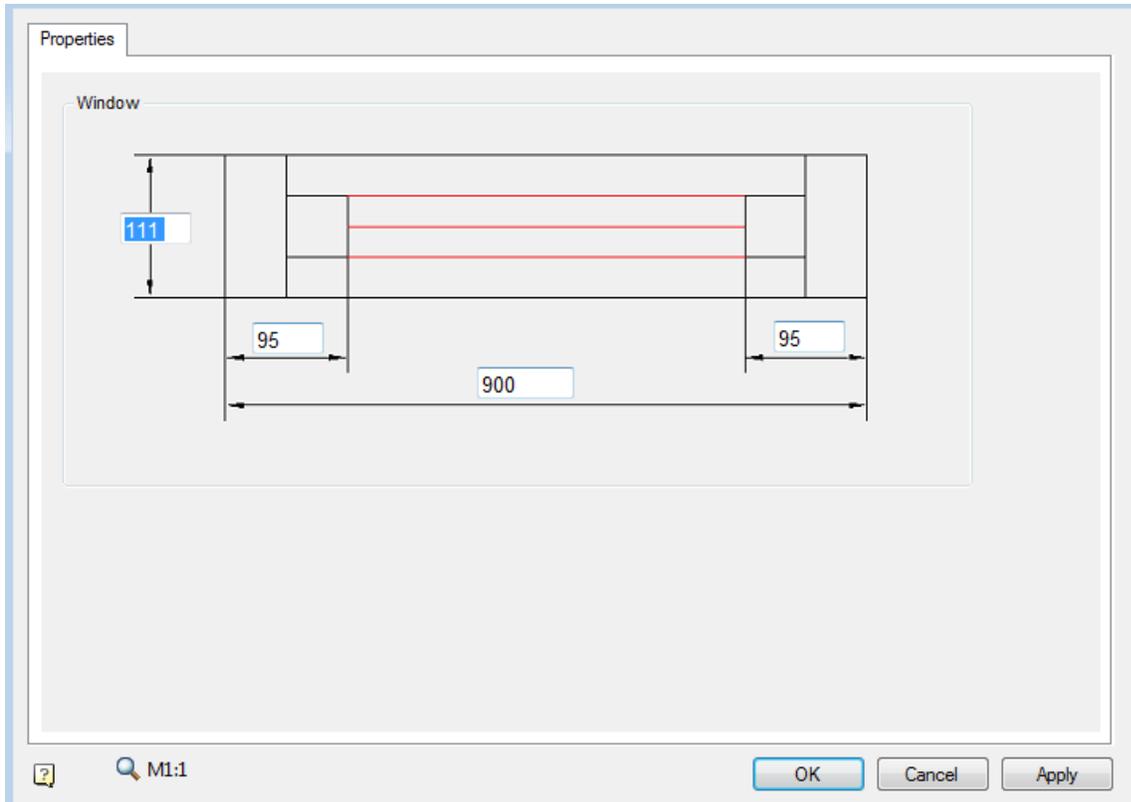
A window can be constructed either as a separate entity or attached to a wall. Run the mouse pointer across any wall window bound to the *walls*. Detach from the window wall or tie it again, through the context menu commands *Attach/Detach*.



*Base point* - allows you to change the position of the base point of the window. Click on the shortcut menu, you must specify the new position of the base point. Inserting an object distance is measured from the base point.



*Properties* - opens a dialog box where you can specify the window dimensions.

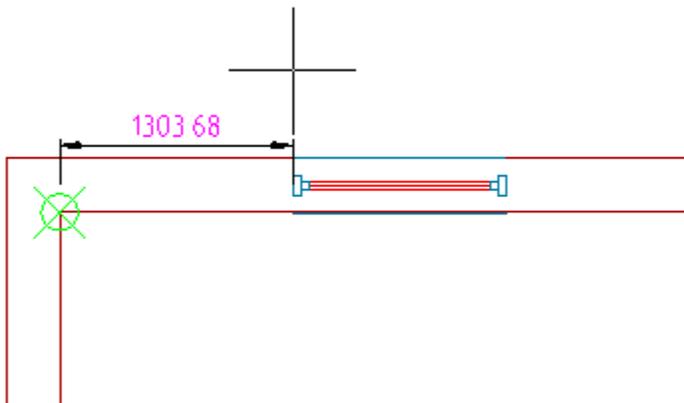


**Analog** - allows you to copy the properties of the window being created with the existing one.

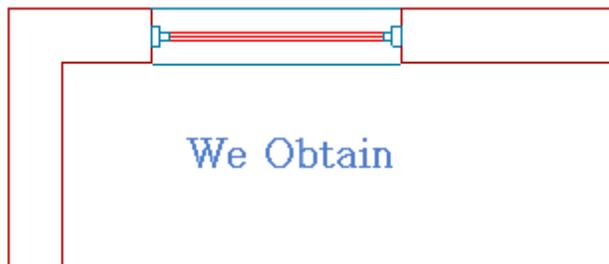
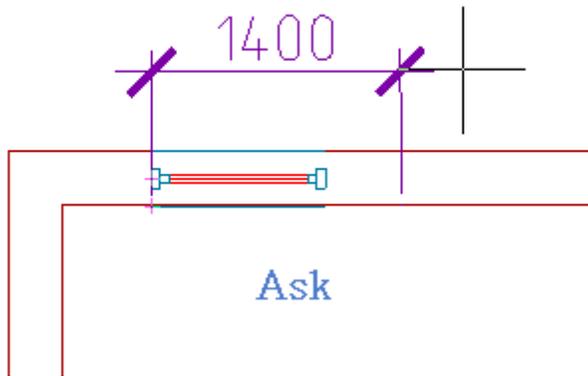
**Snap** - the ability to bind to the window wall.

**Unbind** - allows user to detach from the window wall and build an independent object.

**Reference** - allows you to set the benchmark for accurate positioning of the window.



**Width** - allows you to set the width of the window, indicating it on the drawing.



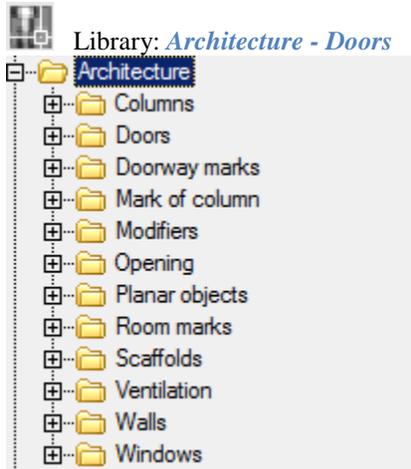
### Editing handles

Square blue knob lets you change the position of the window. Light blue arrows allow flipping of the window.



### Door

-  Main menu: *Construction - Architecture - Add Door*.
-  Ribbon: *Construction - Architecture - Add Door*.
-  Toolbar: *Architecture - Add Door*.
-  Command line: *SPDOORADD*.



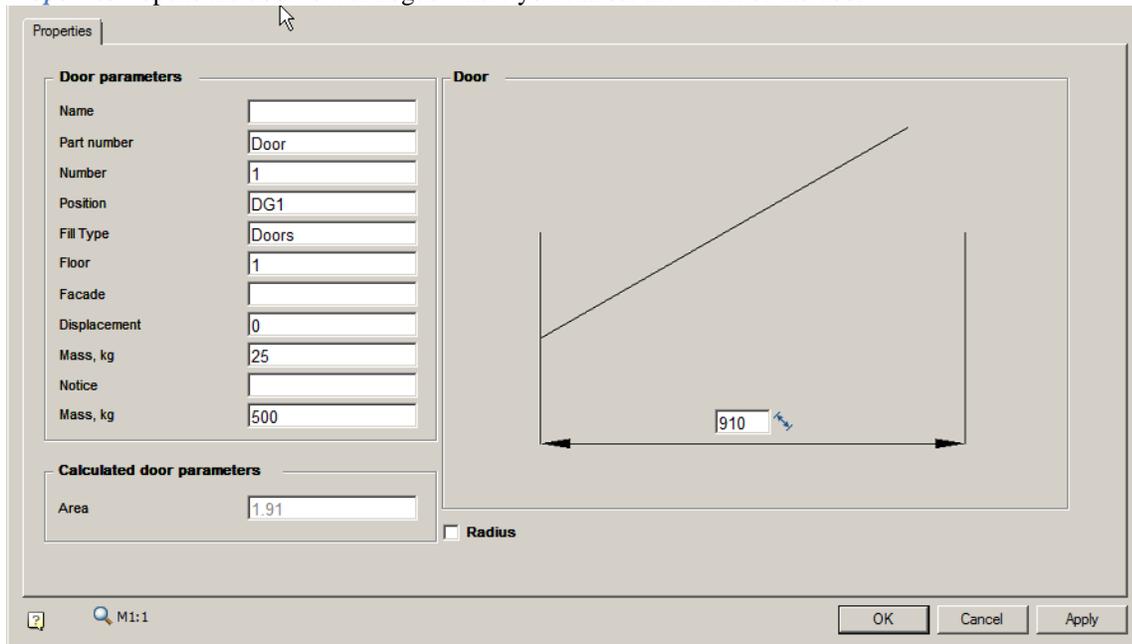
Causing the construction of the base elements of the door, you can choose different configuration object. The door can be constructed as a separate entity located or attached to a wall. When the command, as soon as the mouse crossed any wall, door is bound to the *wall*. Disconnecting from the walls is possible through the context menu commands.

**Base point** - allows you to change the position of the reference point door. Clicking on the shortcut menu, you must specify the new position of the base point. Inserting an object distance is calculated from the base point.

**Flip horizontally** - deploys an object horizontally.

**Flip vertically** - expands vertically.

**Properties** - opens the door to a dialogue where you can set the width of the door.

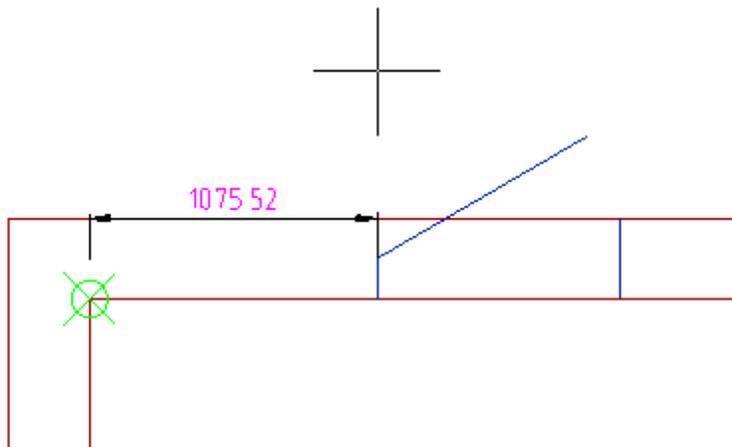


**Analog** - to copy properties of the future with the existing door.

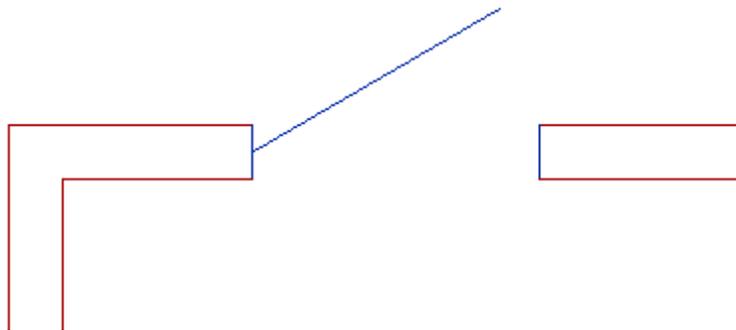
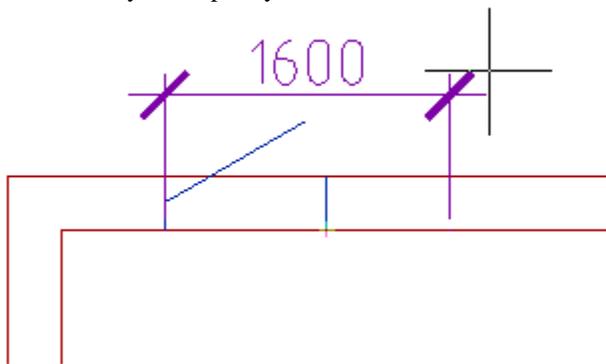
**Snap** - the ability to bind the door to the wall.

**Unbind** - allows to decouple the door from the wall and build an independent object.

**Reference** - allows you to set the benchmark for accurate positioning door.

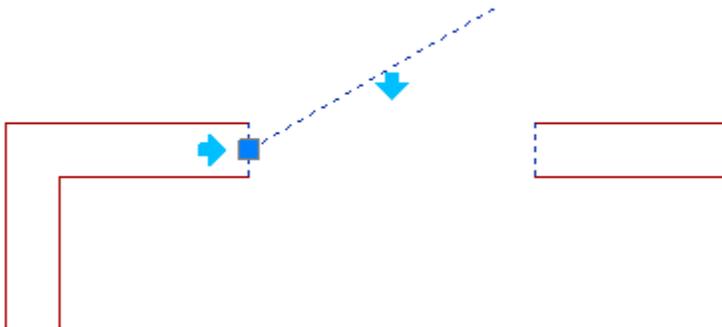


*Width* - allows you to specify the width of the door, indicating it in the drawing.



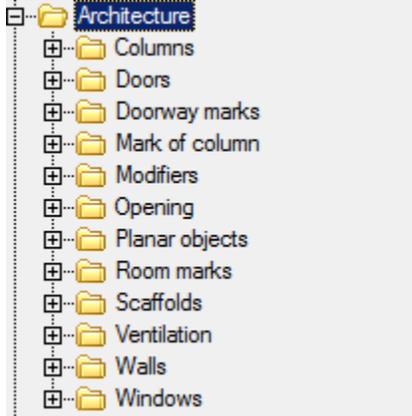
### Editing grips

Square blue knob lets you change the position of the door. Light blue arrows allow flip door.



## Column

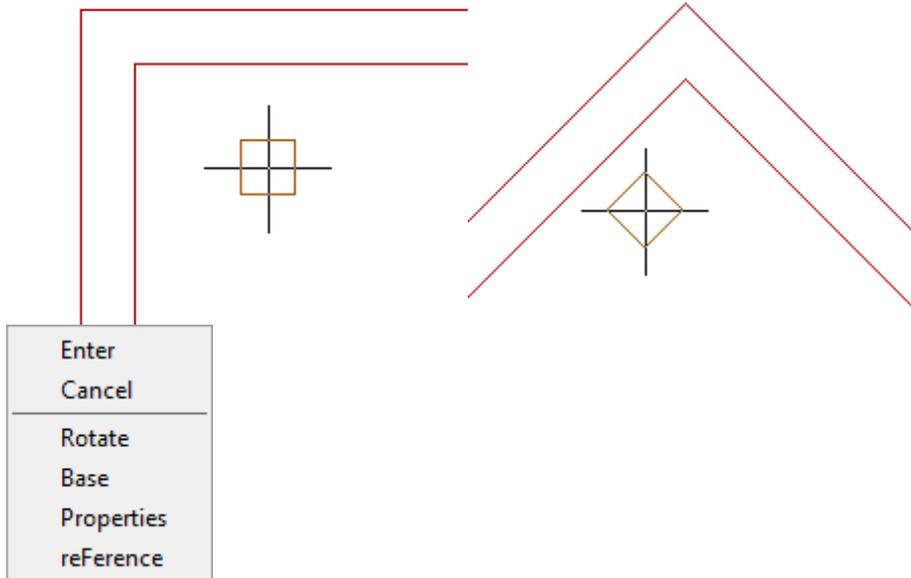
-  Main menu: *Construction - Architecture - Add Column.*
-  Ribbon: *Construction - Architecture - Add Column.*
-  Toolbar: *Architecture - Add Column.*
-  Command line: *SPCOLUMNADD.*
-  Library: *Architecture - Columns*



Using the library you can select different types columns as your need.



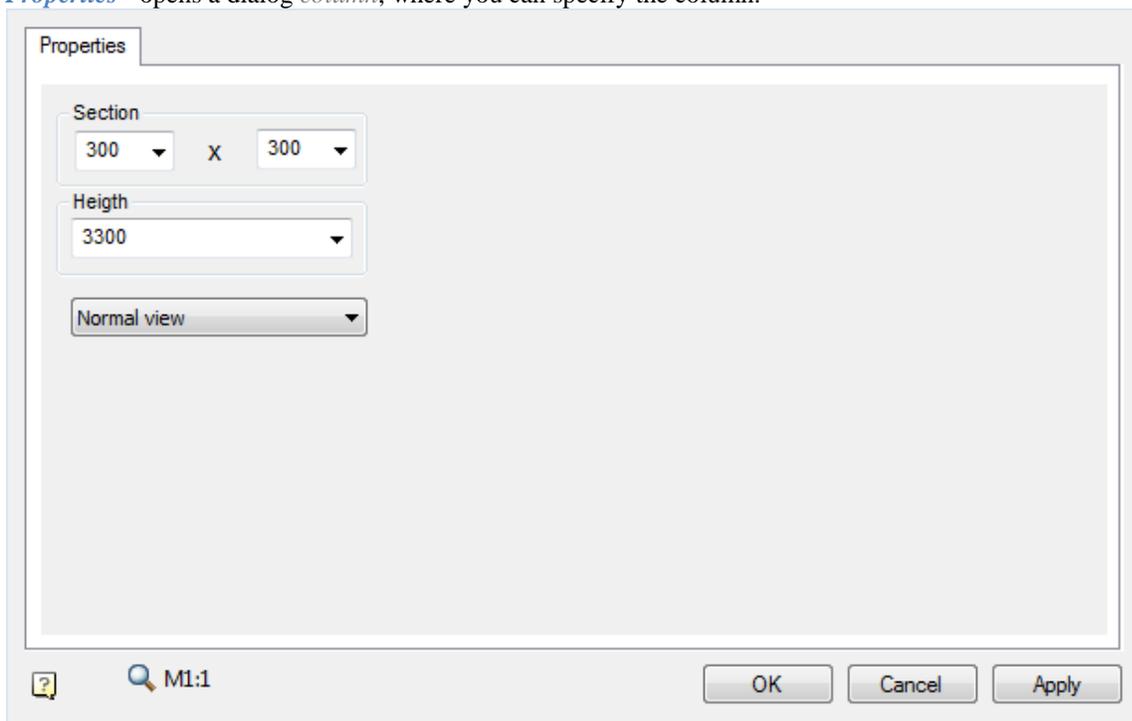
The column is not attached to the wall, but the slewing angle is oriented to the nearest wall. Needed to build the object and show the command to specify the insertion point.



**Rotate** - allows you to set the angle of rotation of the column.

**Base** - allows you to change the position of the reference point of the column. Clicking on the shortcut menu, you must specify the new position of the base point.

**Properties** - opens a dialog *column*, where you can specify the column.



**Reference** - allows you to set the starting point for accurate positioning of the column.

## Editing handles

In the column there is only one handle, allowing movement of the object.



## Add Object



Main menu: *Construction - Architecture - Add Object*.



Ribbon: *Construction - Architecture - Add Object*.



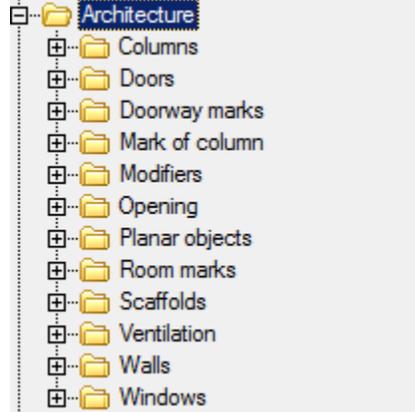
Toolbar: *Architecture - Add Object*.



Command line: *SPOBJECTADD*.

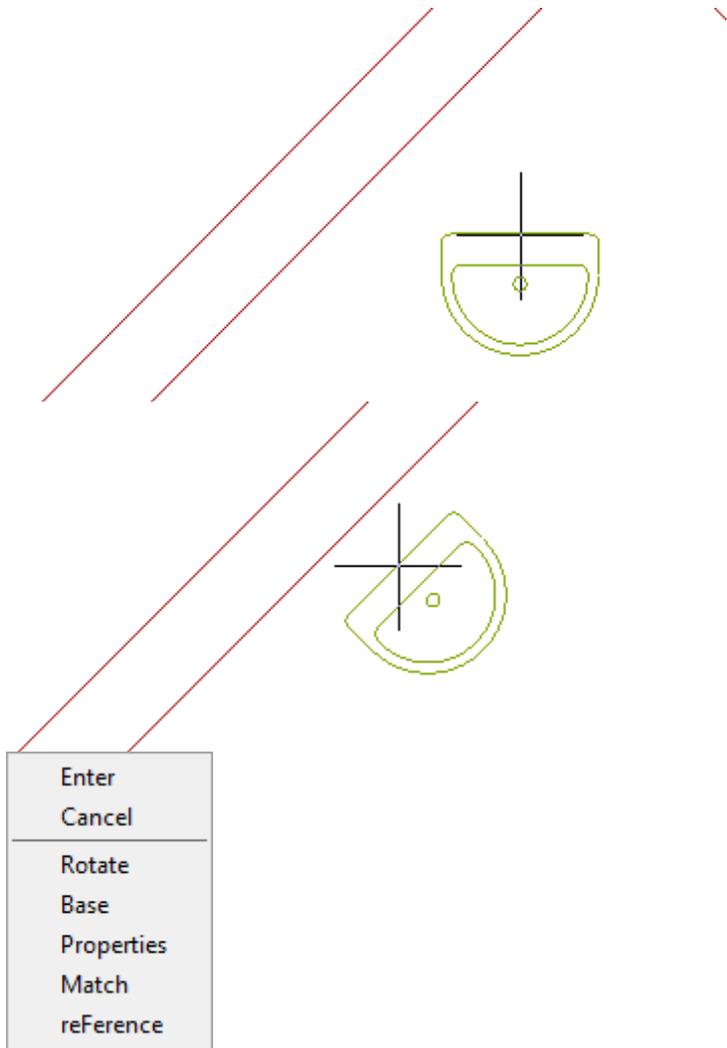


Library: *Architecture - Planar objects*



Database elements required can choose the type of object.

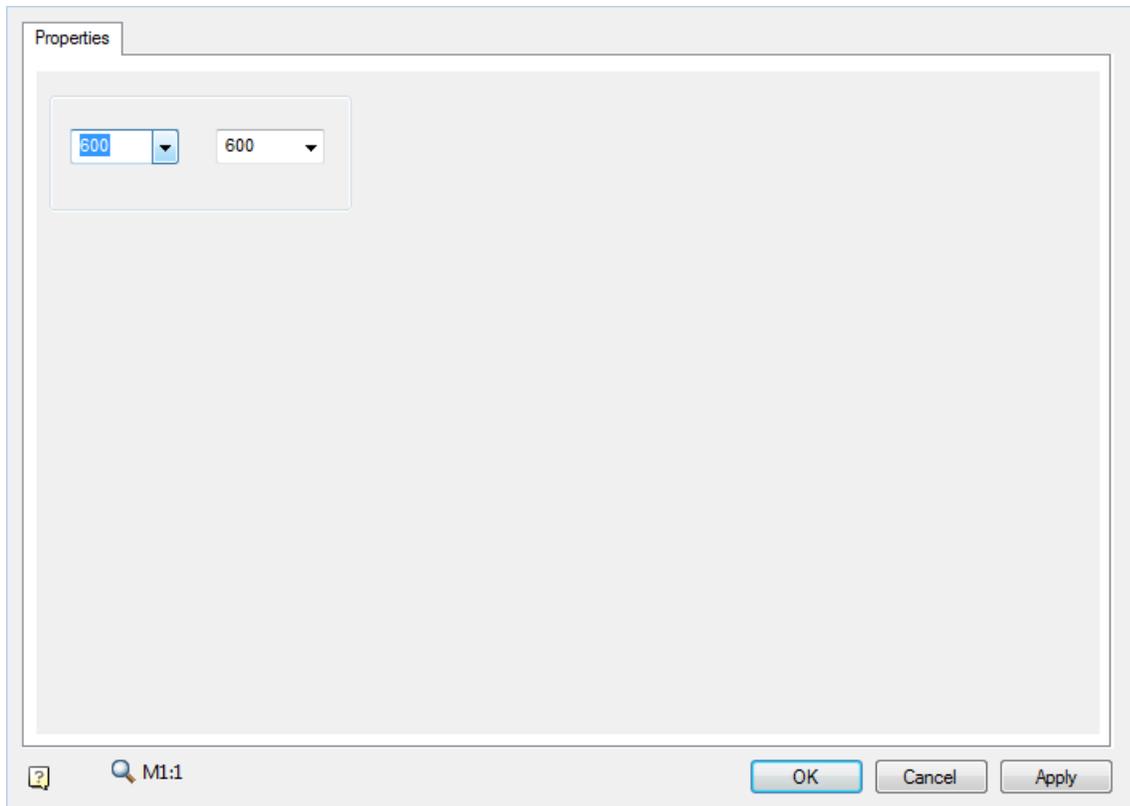
Construction of the *facility plan* can be directed to the wall. To do this, move the cursor to the wall and change its angle according to the angle of the wall.



**Rectangle** - allows you to set the angle of rotation of the object.

**Base** - allows you to change the position of the reference point of the object. Clicking on the shortcut menu, you must specify the new position of the base point.

**Properties** - opens the Properties dialog box of the object if the object has editable properties.



*Reference* - allows you to set the benchmark for accurate positioning of the object.

## Editing handles

The object plan usually has only one handle, which moves the object.

## Stairs



Main menu: *Construction - Architecture - Stairs*.



Ribbon: *Construction - Architecture - Stairs*.

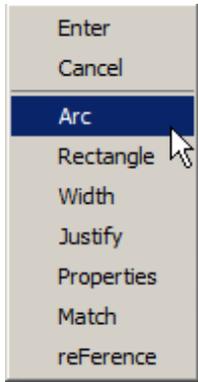


Toolbar: *Architecture - Stairs*.



Command line: *SPSTAIRADD*.

Stairs include linear and arc segments. For building arc section you need to select *Arc* in context menu.



After that in context menu will be options for creating arc available.



*Line* - starts mode for creating linear segments.

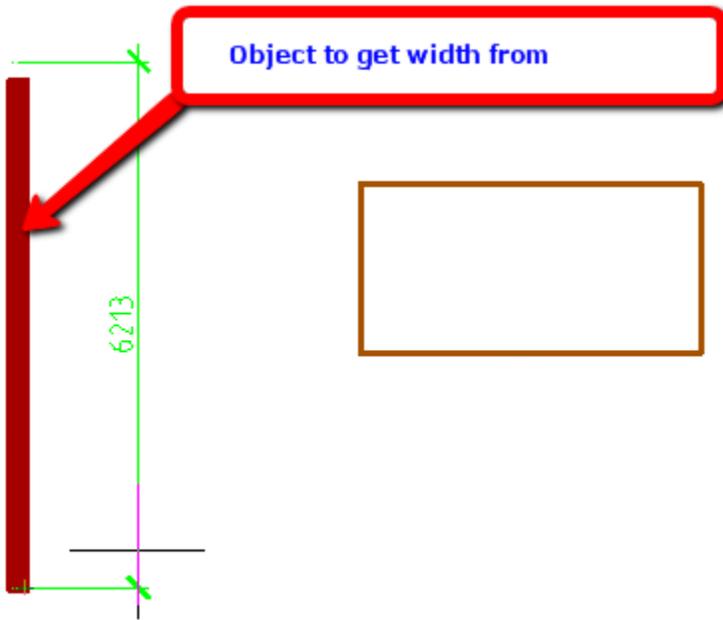
*Bulge* - starts mode for specifying first, middle and end points of arc.

*Center* - starts mode for specifying center, start and end point of arc.

Besides these there are following options available:

*Rectangle* - starts mode for creating stairs by specifying rectangle.

*Width* - allows to specify width of stairs by selecting it on the drawing.



**Axis** - switches position of point of insertion of stairs (Left, Center, Right).

**Properties** - opens stairs' dialogue.

**Match** - allows to copy properties of current stairs from existing one.

**Reference** - allows to create stairs from any reference point on specified distance.

To create stairs you have to specify required parameters in properties panel.

Justify	Center
Width	1200.0000
Start left march width	600.0000
Start right march width	600.0000
End left march width	600.0000
End right march width	600.0000
Stair type	Top
Orienting line	At footsteps only
Step width	300.0000
Footstep count is driven of step length	Yes
Footstep count	28
First footstep offset	0.0000
Last footstep offset	0.0000

## Room



Main menu: *Construction - Architecture -  Room.*



Ribbon: *Construction - Architecture -  Room.*



Toolbar: *Architecture -  Room.*



Command line: *SPROOM*.

## Procedure

1. Call the command.
2. Select the construction method (from the context menu or from the command line).

Variants of "rooms":

- *Full* - Automatically detects the contour of the room along the closed contour of the walls and without taking into account the inner islands.
  - *cLear* - Automatically defines a room outline along a closed wall contour, taking into account internal islands.
  - *Rectangle* - Mode of building a room in the form of a rectangle.
  - *Polyline* - Creates a room by specifying an existing polyline.
  - *Contour* - Freeform room construction mode with the ability to create arc segments. Switching between arc and straight line segments is also called via the context menu.
  - *Magnet* - Allows you to create rooms with complex shapes, automatically defining the shape of the contour segments. Pick the first point of the contour, then move the mouse cursor close to the existing walls or contour.
  - *mUltiple contours* - Switches to the mode of building a room consisting of several contours.
  - *One contour* - Switches to the mode of building a room consisting of one contour.
3. Build the room using the chosen method.
  4. After creating a room, the "Room" dialog box opens.

## Dialog

After defining the outline, the "Room" dialog box opens.

Parameters   Finishing	
<b>Basic</b>	
Name	Room
Number	1
Category	D
Group of rooms	Living quarters
Floor	
Rooms apartment types	1-room quarters
Show contour	<input type="checkbox"/>
Floor mark	K5
<b>Geometry</b>	
Height, mm	3000
Area, m2	1261.56
Perimeter, m	143.97
Capacity, m3	3784.67

Markers	Mark preview
<input checked="" type="checkbox"/> The name and the area	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Room</p> <hr/> <p>1261,56</p> </div>
<input type="checkbox"/> Room number	
<input type="checkbox"/> Area	
<input type="checkbox"/> Name and finished area	
<input type="checkbox"/> Finished area	
<input type="checkbox"/> Mark floor circular	
<input type="checkbox"/> Mark of rectangular floor	

Buttons: ? | [Icons] | OK | Cancel | Apply

### Toolbar



"Hatch modify" - calls the room [hatch editing dialog](#).



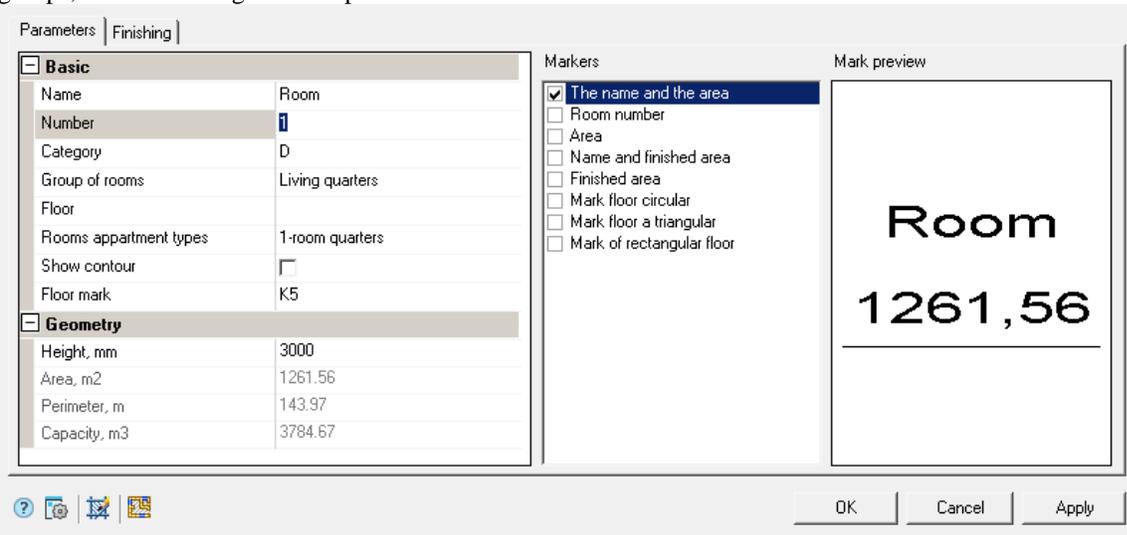
Overridden area - starts the room selection process.

The dialog has 2 tabs:

- [Parameters](#)
- [Finishing](#)

## Parameters

Tab "*Parameters*" allows you to change the display settings of various elements of the room, assign different space groups, as well as the geometric parameters of the room.



### Basic

*Name* - sets the name of the room that is displayed when the corresponding mark is applied.

*Number* - changes the value of the room number when the corresponding mark is applied.

*Category* - sets the room category.

*Group of rooms* - sets the room group.

*Floor* - sets the number of storeys in the room.

*Rooms apartment types* - sets the type of apartment.

*Show contour* - controls the display of a selected or newly constructed room. By default, rooms are displayed without a border, only as marks.

*Floor mark* - sets the value of the floor mark.

### Geometry

*Height* - room height, assigned individually for each room.

*Area* - room area, calculated parameter.

*Perimeter* - perimeter of the room, calculated parameter.

*Capacity* - room volume, calculated parameter.

### Markers

On the right side of the "*Parameters*" tab there is a list of markers that can be added to indicate a room. The highlighted marker is displayed in the preview window.

The number of selectable markers for placement is limited only by the list.

The markers "*The name and the area*", "*Room number*", "*Area*" are part of the room, the rest of the markers are tied to the room. Anchored markers can be edited and deleted directly in the drawing.

## Finishing

On the "*Finishing*" tab, interior elements are indicated with an indication of finishing materials and calculation of areas. When creating a room, the finishing list is generated automatically, taking into account all openings.

Parameters Finishing

	Element	Finishing	Height, mm	Wall finishing thickness, mm	Area, m2	Calculate	Note
▶	Walls and interior walls	Plaster by grid, Prime coat, filling, acryl painting	3000	10	431.68	Wall area:Default group	
	Ceiling	Prime coat, acryl painting	-	10	1,260.12	Area	
	Plinth	Wooden lath	-	10	143.89	Perimeter	
*							





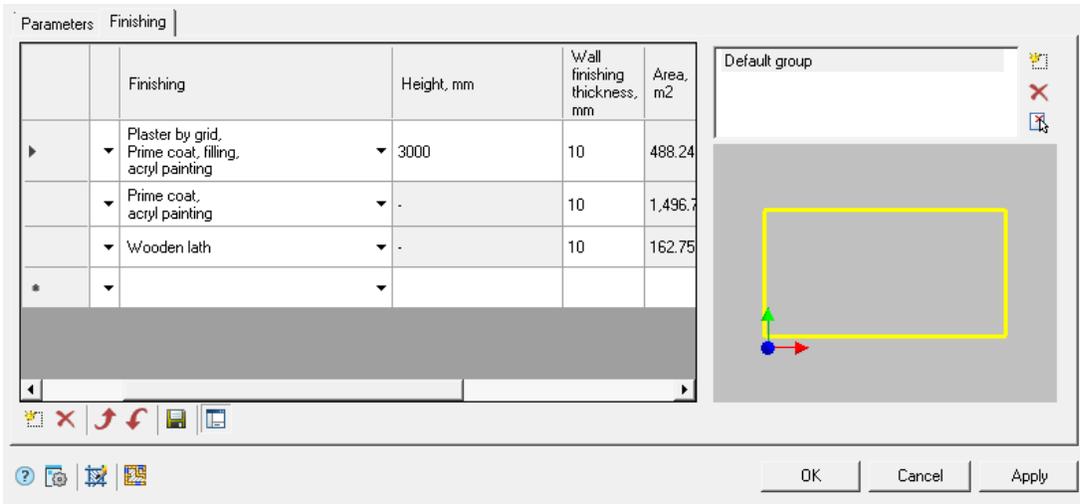



### Table columns

- *Element* - selectable finishing element.
- *Finishing* - selection of the type of finishing produced.
- *Height, mm* - element height, the field is available for editing when the "Wall area: Default group" value is selected in the "Calculate" column.
- *Wall finishing thickness, mm* - entering the thickness of the finish, the field is available for editing when you select the values "Area", "Wall area: Default group" and "Perimeter" in the "Calculate" column.
- *Area, m2* - input of the finishing area, the field is available for editing when the "Modifier" and "Opening" values are selected in the "Calculate" column, for other values the area is calculated automatically.
- *Calculate* - this column sets the type of finishing calculation. Each item from the list has its own calculation type.
- *Note* - text box for entering a note on the trim element.

### Toolbar

-  *Add* - button for adding finishing line. Adds a line identical to the selected line. The line immediately following the selected line is added.
-  *Delete* - removing finishing line button. Deletes the selected line.
-  *Up* - button for changing the order of lines. Moves the selected line up one.
-  *Down* - button for changing the order of lines. Moves the selected line down one line.
-  *Save as default finishing* - button for saving the finishing pattern. A saved finishing list will be created by default in every new room.
-  *Wall group selector* - allows you to create an additional group of walls and interior walls with a finish other than the "Walls and interior walls" element. When the command is activated, an additional panel for configuring wall groups is displayed.



The panel consists of a list of groups and a graphic window.

The list of groups is used to display, add and edit groups. There is a "Default group" group in the list. This group belongs to the "Walls and interior walls" element and cannot be deleted. The list is controlled by three buttons:

- *New wall group* - Adds a new empty group to the group list and a new element with the same name to the trim list. The name of the group is changed directly in the list of groups by pressing the highlighted group again.
- *Delete wall group* - Removes a group from the list. All walls that belong to the group will be moved to the "Default group". You cannot delete the "Default group".
- *Get from drawing* - The command allows you to specify the walls of the group directly in the drawing, similar to the selection in the graphics window.

The graphic window for selecting walls is necessary for displaying and specifying the walls included in the group. To add or remove a wall from a group, click LMB on the required wall. When a wall is added to a group, the wall will be moved from the group in which it was previously, when deleted, it is moved to the "Default group".

## Explication

### Explication of rooms



Main menu: *Construction - Architecture - Schedules - Schedule of rooms.*



Ribbon: *Construction - Architecture - Schedule of rooms.*

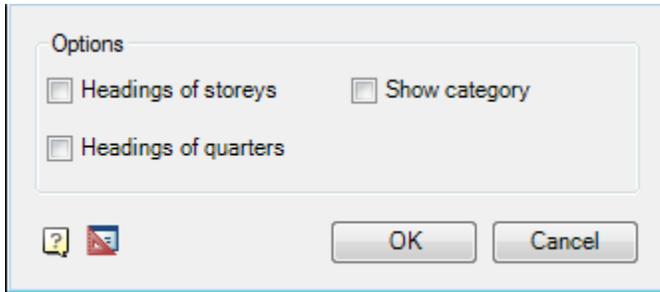


Toolbar: *Architecture - Schedule of rooms.*



Command line: *SPEXPLOOMS.*

For the formation of Explication of rooms after calling the command to all premises were selected to be included in the statement.



Explication of Rooms

Room number	Name	Area, m2
1st floor		
1	Store Room	1,08

### Sheet of decorations

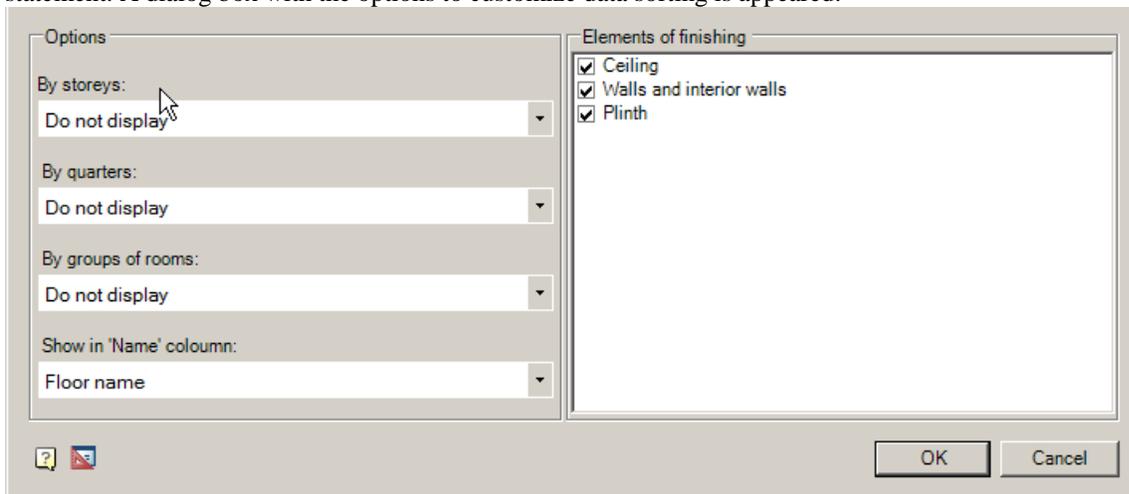
Main menu: *Construction - Architecture - Schedules - Sheet of Decoration*.

Ribbon: *Construction - Architecture - Sheet of Decoration*.

Toolbar: *Architecture - Sheet of Decoration*.

Command line: *SPTABLEROOMS*.

For the preparation of list of decorations after the call of command to you need to select rooms to be included in the statement. A dialog box with the options to customize data sorting is appeared.



Settings for table generation and grouping:

- By storeys: Do not display \Column + union \Title

- By quarters: Do not display \Group
- By groups of rooms: Do not display \Group \Merge
- Show in Name column: Name space \ number and name space

When selecting settings on the floors: Do not print, the flats: Do not display by category spaces: Do not display - displays the source table as is.

In the dialog box, you can delete unwanted items in statement finishes.

List of decorations

Names of rooms	Type of decoration					Note
	Ceiling	Area, m <sup>2</sup>	Walls and interior walls	Area, m <sup>2</sup>	Plinth	
Room	prime coat, acryl painting	8238,1	Plaster by grid, Prime coat, filling, acryl painting	1227,6	Wooden lath	409,2

Double-clicking on a table placed in the drawing, a dialog box opens Gazette decoration, ie at any point in the table can be edited to change the output options and grouping data.

## List of openings



Main menu: *Construction - Architecture - Schedules - List of openings*.



Ribbon: *Construction - Architecture - List of openings*.



Toolbar: *Architecture - List of openings*.



Command line: *SPLISTOFOPENINGS*.

Command to generate a list of all allocated openings in the drawing.

## Procedure

After running the command you need to select the insertion point of the table.

Then select the openings included in the statement. To do this, select a region (rectangle) all necessary doorways.

Important!	In order to correctly fill the list of openings the openings on the drawing must have different positions.
------------	--

## List of columns



Main menu: *Construction - Architecture - Schedules - List of columns*.



Ribbon: *Construction - Architecture - List of columns*.



Toolbar: *Architecture - List of columns*.



Command line: *SPLISTOFCOLUMNS*.

Command formation for all selected columns specification drawing.

## Procedure

After running the command you need to select the insertion point of the table.  
Then select the columns that are included in the specification. To do this, select a region (rectangle) all the necessary columns.

List of columns

Pos.	Designation	Name	Quantity	Mass, kg	Note
1	Column	300x300x3300	4	200	

## Engineering networks

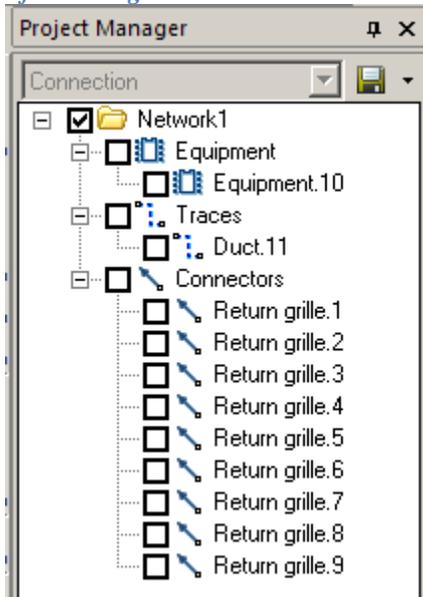
### Project Manager

**Main menu:** Construction - Library objects- Tab manager.

**Toolbar:** Tab manager (toolbar "Library objects").

**Command line:** SPTABS.

*After calling the command "Tab Manager" select "Project Manager".*

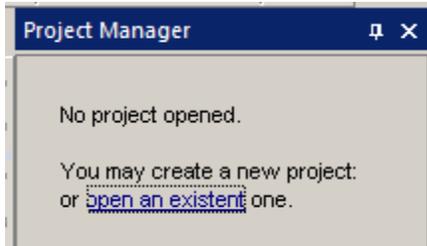


Project Manager is a functional panel that controls all of the engineering networks (equipment, port, trace).

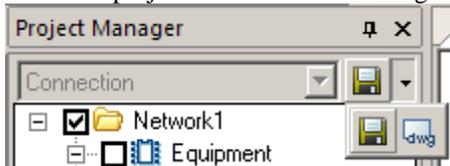
### Create project

To create a project, you must:

1. Go to the tab of the project.



2. Click on "Communications". The project is created.
3. Choose how to save the project file in xml or drawing. To do this, there are in the top right corner of the Project Manager button:  
 "Specify project path" - it saves the project in xml file on your computer.  
 "Save the project in the current drawing" - it saves the project in the drawing.



If the drawing objects will be installed utilities to create a project, the project is automatically created, saved in an xml file. Xml file name will be similar to the name of the drawing.

## Add new Network

Adding a new network is calling the command "Create New Network" from the context menu function bar "Project Manager".

To rename the network, you must:

1. Select network
2. Press "F2"
3. Enter a new name. Submit (button "Enter").

## Make tracing

Context menu command "Make tracing" is similar to the ["Automatic tracing"](#)

## Edit selected objects

To edit certain objects, you must:

1. Select objects(put a check on the objects).
2. In the context menu select "Edit checked objects".
3. In the dialog box, make the necessary manipulations (see. [Template library](#)) and submit.

## Save project

By default, the project is stored in the same document dwg file xml, or in the drawing.  
 Saving a project occurs when you save a document dwg.

## Equipment

 **Main menu:** Construction - Communications -  Equipment.

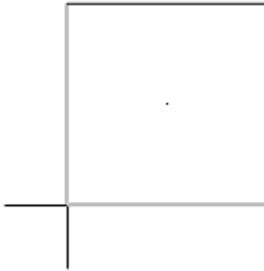
 **Toolbar:**  Equipment (toolbar "Communications").

 **Command line:** SPEQUIPMENT.

This command is used to insert the object "Equipment" from [Template library](#).

## Insertion

1. Call the command insertion equipment. You will be prompted to leave the last used equipment from a library of templates, or if there is no such equipment by default.



2. Select the necessary equipment if needed. To do this in the context menu, select "Dialog". On the form template library to select the necessary equipment and confirm.



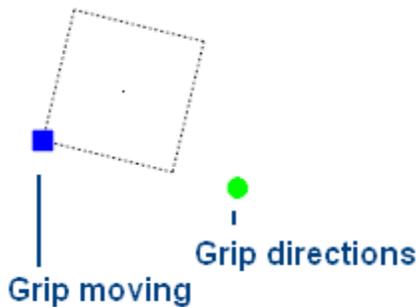
3. Select the base point and the direction of insertion.

4. Continue to insert the same type of objects equipment (item 1,2,3) or end (press Enter).

*Note:* Equipment, trace and ports when inserting receive a unique number (the "Number" in the properties)

## Editing

### *Edit location*



The object "Equipment" has two grips:

- Grip moving- it allows you to move an object,
- Grip directions- changes the direction of the object.

### Editing options

Call for editing by choosing from the context menu of a selected object the command "Edit" or double-clicking on the object editing.

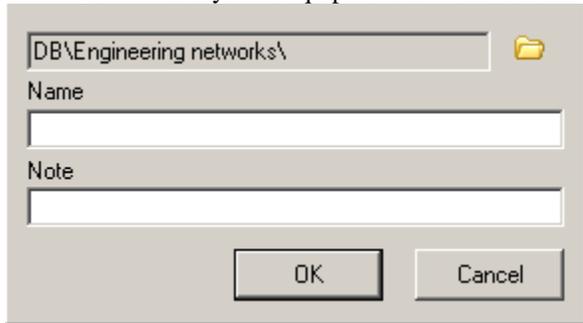
When you call opens the edit form, this form [Template library](#).

The process of editing an object "Equipment" is similar to the process of editing the template "equipment".

### Save as Template

If you want to save the object "Equipment" as a template to be:

- In the form of editing select "Save as Template" .
- In the form of "Create element" and enter the name of the note.
- Confirm entry. The equipment will be added to the [Template library](#).



### Trace

 **Main menu:** Construction - Communications -  Trace.

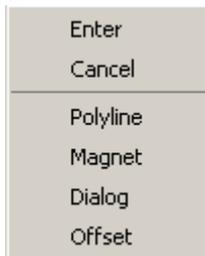
 **Toolbar:**  Trace (toolbar "Communications").

 **Command line:** SPTRACE.

This command is used for laying tracks between objects "Port" and "Equipment". The trace is taken from [Template library](#).

### Insertion

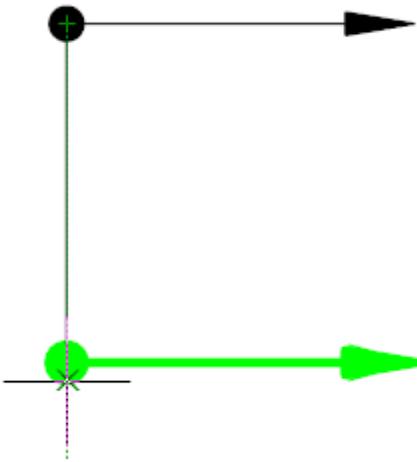
1. Call the command inserts trace. You will be prompted to insert the last used trace from the template library, or, if not, the default trace.
2. Select the right trace, if necessary. To do this in the context menu, select "Dialog". On the form template library select the desired trace and confirm.



3. Select the first object anchor. If the type of connection trace and the connection type of the object (trace, equipment or port) will be the same, then the object will be highlighted.



4. Select the second object.

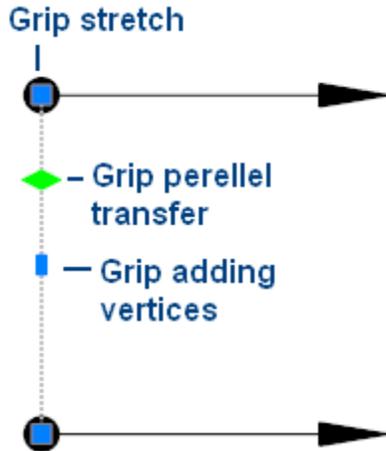


5. Continue inserting trace (paragraph 1,2,3,4) or end (press Enter).

<i>Note:</i>	Equipment, trace and ports when inserting receive a unique number (the "Number" in the properties)
--------------	--

## Editing

### *Edit location*



The object "Port" has 3 grips:

- Grip parallel transfer - it allows you to move an object parallel to the fixed position,
- Grip adding vertices - adds the top of the object,
- Grip stretch - modifies the provisions of the basic points of the object.

### **Editing options**

Call for editing by choosing from the context menu of a selected object the command "Edit" or double-clicking on the object editing.

When you call opens the edit form, this form [Template library](#).

The process of editing the object "Trace" is similar to the process of editing the template "Trace".

### **Save as Template**

If you want to save the object "Trace" as a template to be:

- In the form of editing select "Save as Template" .
- In the form of "Create element" and enter the name of the note.
- Confirm entry. The equipment will be added to the [Template library](#).

The screenshot shows a dialog box with a folder path 'DB\Engineering networks\' in the top field. Below it are two text input fields labeled 'Name' and 'Note'. At the bottom are 'OK' and 'Cancel' buttons.

### **Port**

 **Main menu:** Construction - Communications -  Port.

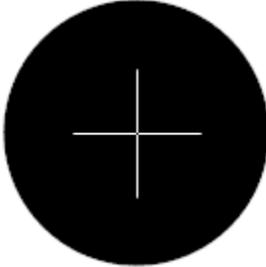
 **Toolbar:**  Port (toolbar "Communications").

 **Command line:** SPPORT.

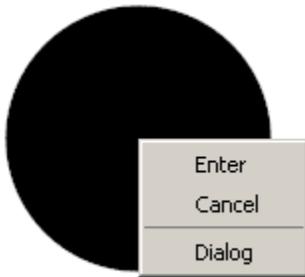
This command is used to insert the object "Port" of [Template manager](#).

## Insertion

1. Call the command insert the connector. You will be prompted to insert the connector of the last used template library, or, if not, the port by default.



2. Select the appropriate connector if necessary. To do this in the context menu, select "Dialog". On the form template library select the port and confirm the selection.

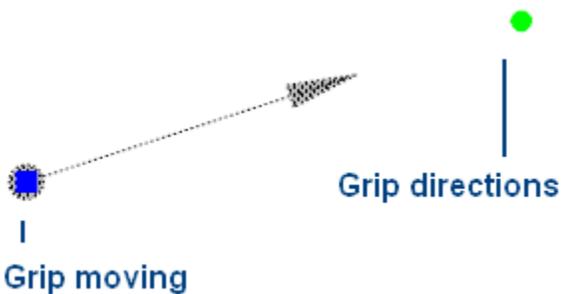


3. Select the base point and the direction of insertion.  
4. Continue to insert the ports (point 1,2,3) or end (press Enter).

*Note:* Equipment, trace and ports when inserting receive a unique number (the "Number" in the properties)

## Editing

### *Edit location*



The object "Port" has two grips:

- Grip moving- it allows you to move an object,
- Grip directions- changes the direction of the object.

### Editing options

Call for editing by choosing from the context menu of a selected object the command "Edit" or double-clicking on the object editing.

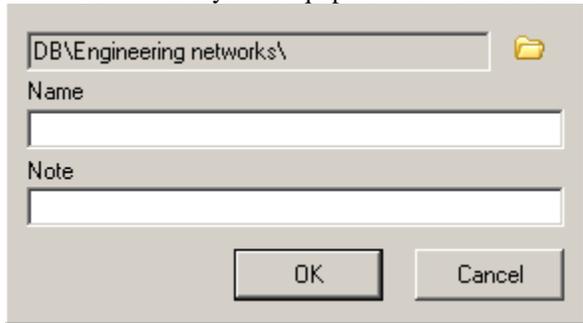
When you call opens the edit form, this form [Template library](#).

The process of editing the object "Port" is similar to the process of editing the template "Port".

### Save as Template

If you want to save the object "Port" as a template to be:

- In the form of editing select "Save as Template" .
- In the form of "Create element" and enter the name of the note.
- Confirm entry. The equipment will be added to the [Template library](#).



### Table of connections

 **Main menu:** Construction - Communications -  Table of connections.

 **Toolbar:**  Table of connections (toolbar "Communications").

 **Command line:** SPPORTTABLE.

Table of connections allows to connect a conditional links between ports.

These compounds are primarily needed to automatically trace divorce.

## Dialogue

Nu...	Template	Equ...	Con...
1	No template	?	_
2	Return grille	?	_
3	Return grille	?	_
4	Return grille	?	_
5	Return grille	?	_
6	Return grille	?	_
7	Return grille	?	_
8	Return grille	?	_

Nu...	Template	Equ...	Con...
1	No template	?	_
2	Return grille	?	_
3	Return grille	?	_
4	Return grille	?	_
5	Return grille	?	_
6	Return grille	?	_
7	Return grille	?	_
8	Return grille	?	_

The form of dialogue "ConnectorsTableForm" consists of two overlapping lists. This is done for the convenience of the binding.

Each is equipped with a list of commands:

- *Filer* - opens the panel filter for columns. It used to filter the list.
- *Columns* - customizable columns.
- *Remove selected links* - remove links from the selected object.

## The columns

*Number* - indicates the sequence number of the object

*Template* - a template in which the object was created

*Equipment* -the equipment to which it belongs port

*Connection* - a list of numbers of objects to which a view objects.

**Note:** Sign "?" - It is not defined

## Linking objects

To assign a connection to another object should be:

1. Select the object. Press and hold the left mouse button.
2. Lead one to connect objects. You can move an object in the same list and in the backup.

3. Lower the left mouse button. The object will be contacted and a mix of both fields to add a number of objects connected to the objects.

*Note:*

When going through the list of object over which the mouse cursor will be highlighted in the drawing. This allows you to verify the correctness of the choice of object.

### Delete links

1. Select the object.
2. Call the popup menu
3. From the pop-up menu, choose the remote connection, or "All"

### Showing links in the drawing

In imposing relations on the drawing shown links between objects on the non-printed layer "ISO\_UNPLOTTED"



### Automatic tracing

 **Main menu:** Construction - Communications -  Automatic tracing.

 **Toolbar:**  Automatic tracing (toolbar "Communications").

 **Command line:** SPTRACINGADD.

Team automatically separates trace on the already established relations between ports.

### The guide trace

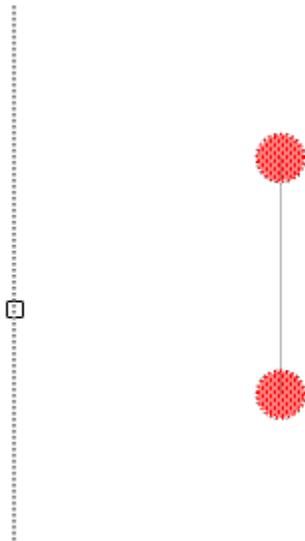
In order to build the correct trace, it is necessary to construct the auxiliary directional trace, which may for example, be positioned along the walls.

Auxiliary trace - trace which is set to "Directional trace" ("Yes").

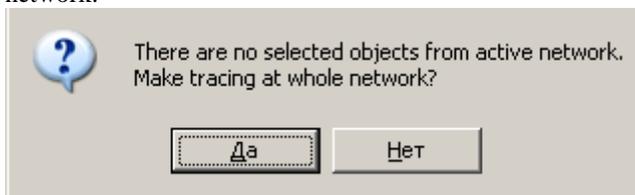
### Building trace

To build trace should:

1. Select the command "Automatic tracing"
2. Specify equipment, ports and directional trace, or select all of the active network by pressing "Enter".



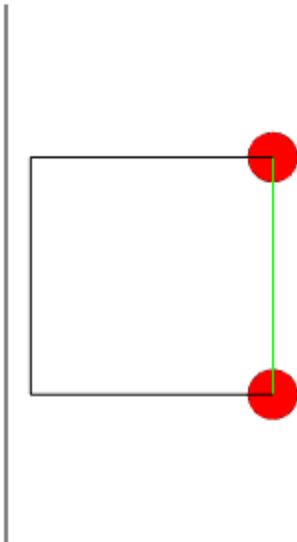
If there is no specified equipment and ports or directional trace, a dialog appears offering to separate trace on the network.



5. After selecting objects in the dialog "Connection Type" select the types of connections through which trace should be diluted.



6. Confirm your selection. The trace is automatically built according to the design rules.



**Note:** If the guide has the same pattern as the communications facilities, communications facilities will be connected to the rail.

If necessary, you can cancel by trace, rail and adjust the command again or [manually edit the trace built](#).

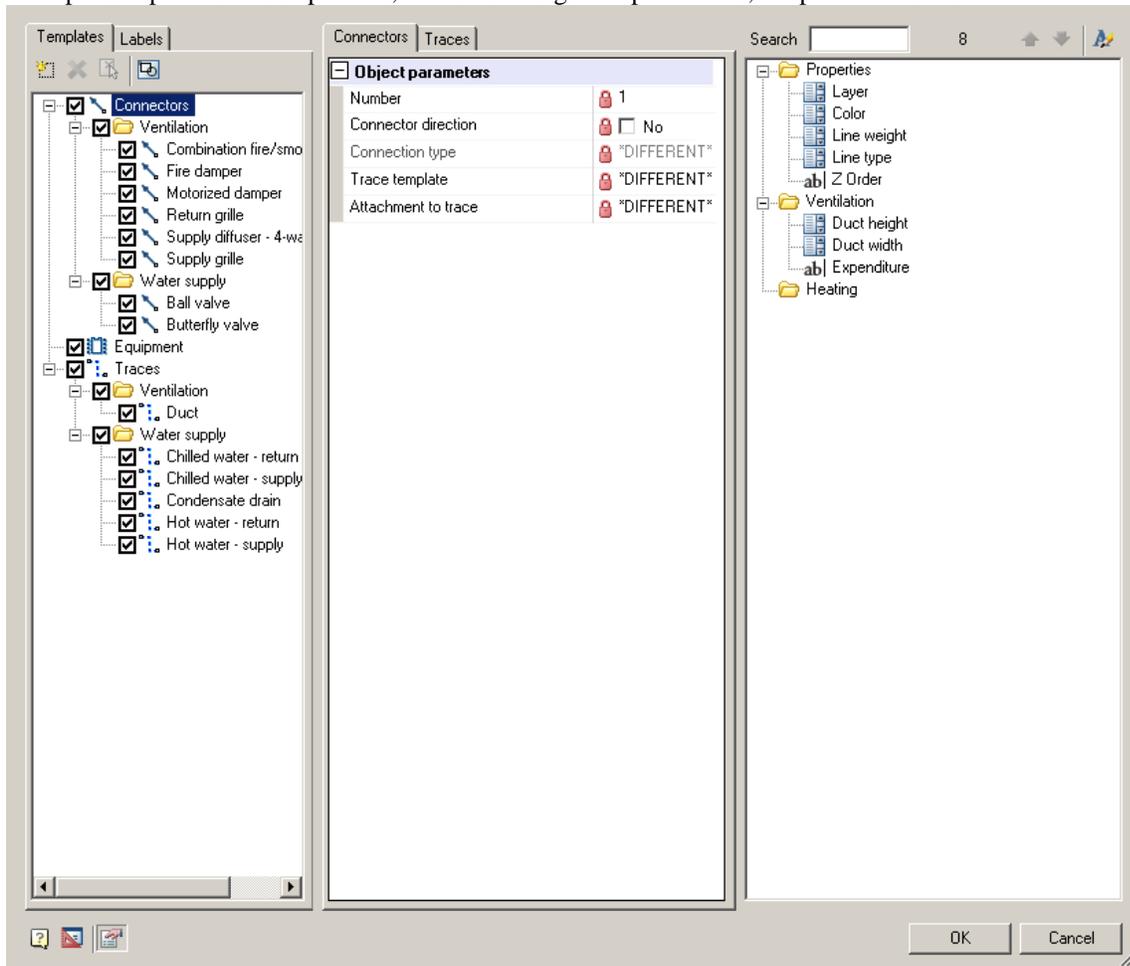
## Template library

 **Main menu:** Construction - Communications -  Template library.

 **Toolbar:** Template library (toolbar "Communications").

 **Command line:** SPEQUIPMENTLIBRARY.

Form template library is required to work with templates of engineering networks (add, edit, delete) and consists of three parts: a panel of wood patterns, the list of designated parameters, the panel attributes.



## Tree patterns

### **Tab templates**

Tree patterns is divided into 3 main sections: ports, traces and equipment. In each section of the corresponding templates are added.

Switch notes whether the pattern present when editing the parameter list. When the level of several patterns of one type, the parameters will change them together.

Each type of template tab gets its parameter list.

**Important!** When you activate the equipment, its ports automatically added to the list of options on the "Connectors".

### **Replacing graphic**

When you select a particular pattern, its schedule will be displayed in the "Preview panel" below.

Displaying the setting knob  "Preview panel".



To change the schedule template should:

1. Activate pattern
2. Press button  "Select graphics"
3. Specify the new graphics and confirm (press Enter)
4. Specify the insertion point and confirm (press Enter)

### Adding template

The  "New template" adds a new template *is selected in the tree section*.

When you run the command, the creation of a form of the element, which you must specify the location to save the template in the database elements, name, note and confirm.

The new template is added to the appropriate section.

**Important!** For the "Equipment" and "Port" do not forget to specify the schedule. If the schedule is not specified, will use the default schedule.

**Note:** To add a template is better to use separate rooms creating [Equipment](#), [Trace](#) and [Port](#)

### Delete template

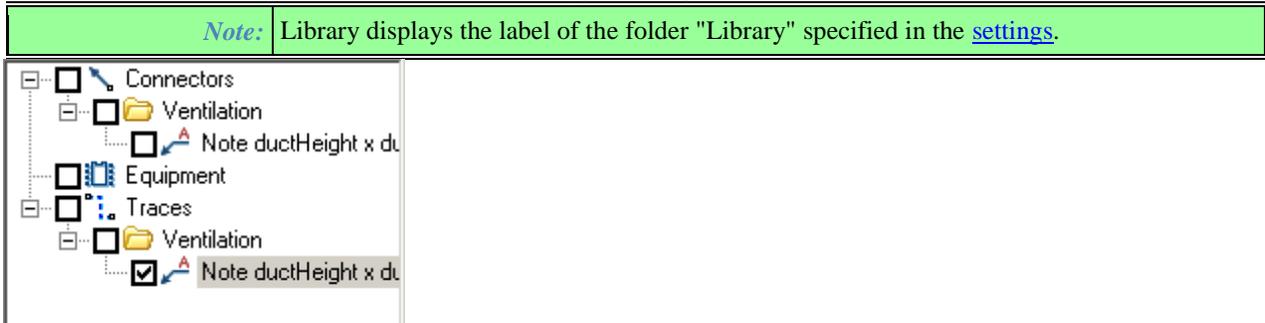
The  "Erase template" deletes the selected object in the tree. Section can not be deleted.

### Save as template

The "Save as template" is active when editing objects Equipment and port, and allows you to save the object as a template.

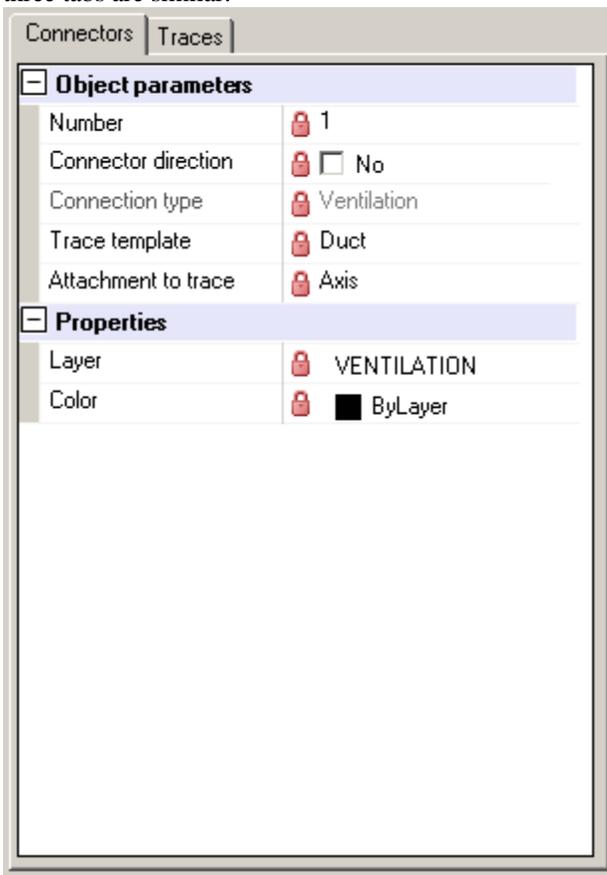
### Tab Labels

In the tab "Labels", you specify which tags will be added to the objects in the inset to the drawing. The number of labels can be more than one for each type of template.



### Parameter List

The parameter list contains the settings of the selected template(s) and allows them to edit. The parameter list is divided into tabs: Connectors, Traces, Equipments. Each tab displays the parameters of ports, traces, equipments, respectively. Options ports belonging to the equipment are displayed on the "Connectors". All three tabs are similar.



### Adding an attribute

Adding a new optional parameter is from the Control attributes for this:

1. Select attribute
2. Not omitting the left button to move the key attribute in the parameter list.

If the list of parameters are specified attributes for all templates defined species, and a new attribute will be added for all.

Re-attribute can not be added.

### ***Edit attribute***

The parameter list is divided into two parts: the left-name right - the input field.

Entry fields with a gray background can not be edited.

### ***Remove attribute***

removal of property carried out by pressing the  "Erase attribute" from the context menu of the selected attribute. If the property can not be removed, the button will be disabled.

### **Panel attributes**

Panel attribute contains additional parameters that may be added to the list of parameters by gripping and handling. The panel is a two-level tree. The first level of the section, the second - the attribute.

If the panel does not need attributes, you can turn to the  "attributes panel" (in the lower left corner of the form).

### ***Adding properties***

To add a parameter to the list of parameters necessary to:

1. Select an attribute
2. Do not omitting left button to transfer the key attribute in the parameter list.

If the list of parameters are specified attributes for all templates defined species, and a new attribute will be added for all.

Re-attribute can not be added.

### ***Options properties***

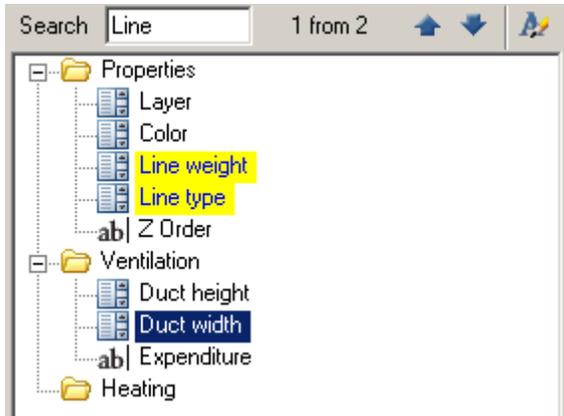
Attributes are divided into 3 types:  Dropdown list,  checkbox and  editbox.

### ***Finds***

If you want to find a particular attribute, for this is the search.



Search is provided with a field for entering text search, as well as buttons to navigate through the attributes found. Found attributes are marked in yellow.



### Create attribute

Creating an attribute is carried out from the editor library attributes. Button  in the upper right corner.

### Create trace

 **Main menu:** Construction - Communications -  Create trace.

 **Toolbar:**  Create trace (toolbar "Communications").

 **Command line:** SPCREATETRACE.

This command creates a new template trace and places it in [Template library](#).

### To create

1. Select command
2. A form will appear "Create element", in which said storage elements in the base template, name, note and confirm the entered parameters.

3. Next, open the edit form, this form [Template library](#). The process of editing the template "Trace" is described in detail in the section [Template library](#).

### Create port

 **Main menu:** Construction - Communications -  Create port.

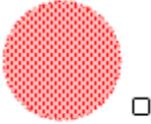
 **Toolbar:**  Create port (toolbar "Communications").

 **Command line:** SPCREATEPORT.

This command creates a new template port and places it in [Template library](#).

**To create**

1. Select command
2. Show on drawing a new graphics for the port. Confirm your selection (press Enter). If the graphics is not selected, the graphics will be taken by default.



3. Specify the base point of insertion port created.



4. After specifying the form will be "Create element", in which said storage elements in the base template, name, note and confirm the entered parameters.

5. Next, open the edit form, this form [Template library](#). The process of editing the template "Port" is described in detail in the section [Template library](#).

**Create equipment**

**Main menu:** Construction - Communications - Create equipment.

**Toolbar:** Create equipment (toolbar "Communications").

**Command line:** SPCREATEEQUIPMENT.

This command creates a new template equipment and places it in [Template library](#).

**To create**

1. Create graphics equipment.



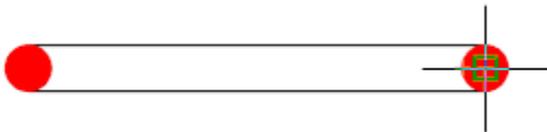
2. Set the necessary ports. Subsequently, the interconnection of networks will be carried out between the ports.



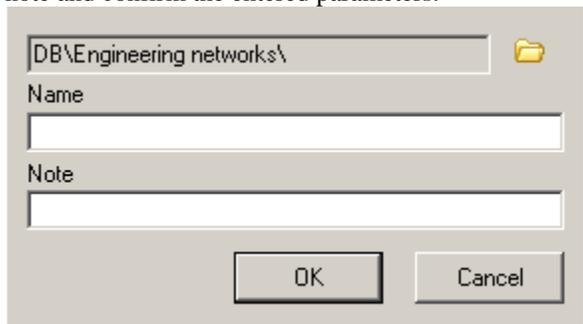
3. Select a team creation of the equipment.
4. Specify the drawing graphics with ports for the equipment. Confirm your selection (press Enter). If graphics and ports are not selected, the graphics will be taken by default.



5. Specify the base point of the insertion created equipment.



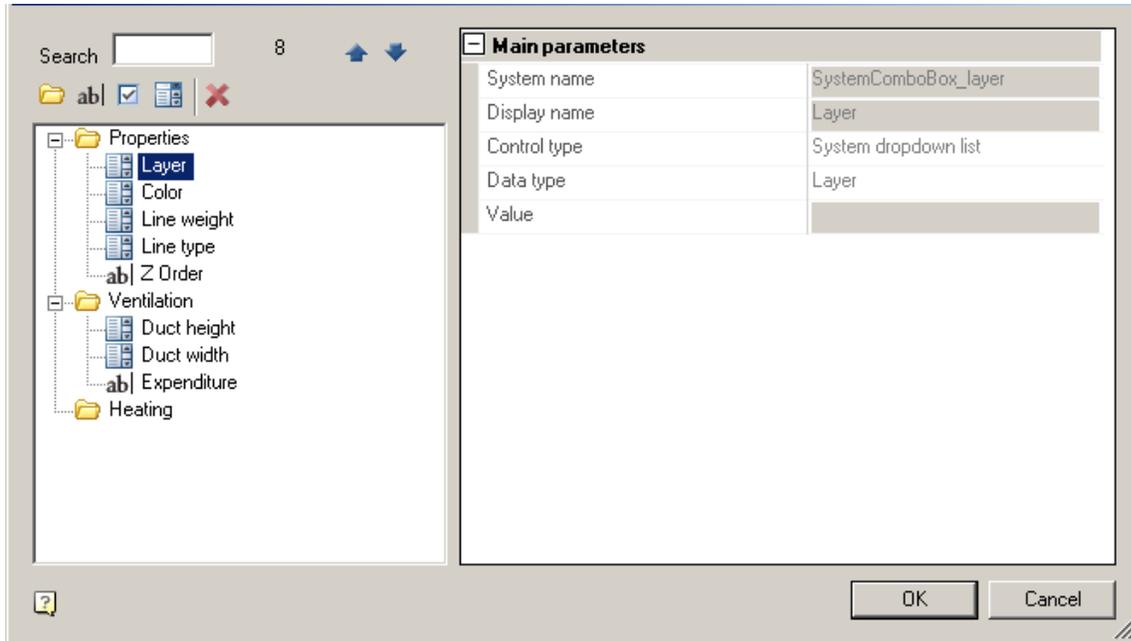
6. After specifying the form will be "Create element", in which said storage elements in the base template, name, note and confirm the entered parameters.



7. Next, open the edit form, this form [Template library](#). The process of editing the template "Equipment" is described in detail in the section [Template library](#).

### Attribute library editor

Called from the edit form templates. It is necessary to create a new (missing) attribute.



### Dialog

**Toolbar** - Includes "search attribute" button and edit the attributes of a tree.

**Attribute tree** - It displays a list of available attributes for editing.

**Properties window** - It displays the properties of the attribute or class.

### Adding an attribute

To add a command is carried out:

Add category

Add a textbox

Add checkbox

Add dropdown list

Adding an attribute or category is made in the selected category or parent category selected attribute.

### Edit attribute

To change the location attribute in the tree attributes, attribute to press the left mouse button and drag it to the desired part of the tree.

To edit the properties of the attribute must be:

1. Select an attribute or category
2. Make changes in the "Parameters window":

#### For the category of available properties for the change:

**Display Name** - a name that will be displayed in the tree attributes.

#### For the "Editbox" properties are available for changing:

**System name** - work name attribute to identify it in the system (for example, when building reports).

**Display name** - a name that will be displayed in the tree attributes.

**Control type** - feature allows you to change the type attribute. Possible values: textbox, checkbox, dropdown list.

*Data type* - property defines the value of the type attribute will return.

*Value* - default value.

**For the "Checkbox" properties are available for changing:**

*System name* - work name attribute to identify it in the system (for example, when building reports).

*Display name* - a name that will be displayed in the tree attributes.

*Control type* - feature allows you to change the type attribute. Possible values: textbox, checkbox, dropdown list.

*Data type* - property defines the value of the type attribute will return (always Boolean).

*Value* - default value (Yes all No).

**For the "Dropdown list" properties are available for changing:**

*System name* - work name attribute to identify it in the system (for example, when building reports).

*Display name* - a name that will be displayed in the tree attributes.

*Control type* - feature allows you to change the type attribute. Possible values: textbox, checkbox, dropdown list.

*Data type* - property defines the value of the type attribute will return.

*Value* - default value.

*List items* - a list of possible values.

*Fixed list* - The default is "Yes". Allow only values from the list by using the attribute. If you set to "No", permits to enter their values in a list by using the attribute with the new values will be added to the list. It will also be available the "Maximum size of the list."

**Remove attribute**

To delete an attribute you must:

1. Select a category, or delete attributes (by selecting a category remove all attributes included in it).
2. Press "✗ Erase selected".

<i>Important!</i>	You can not delete attributes from the category "Properties." This will affect the further work with the utilities.
-------------------	---

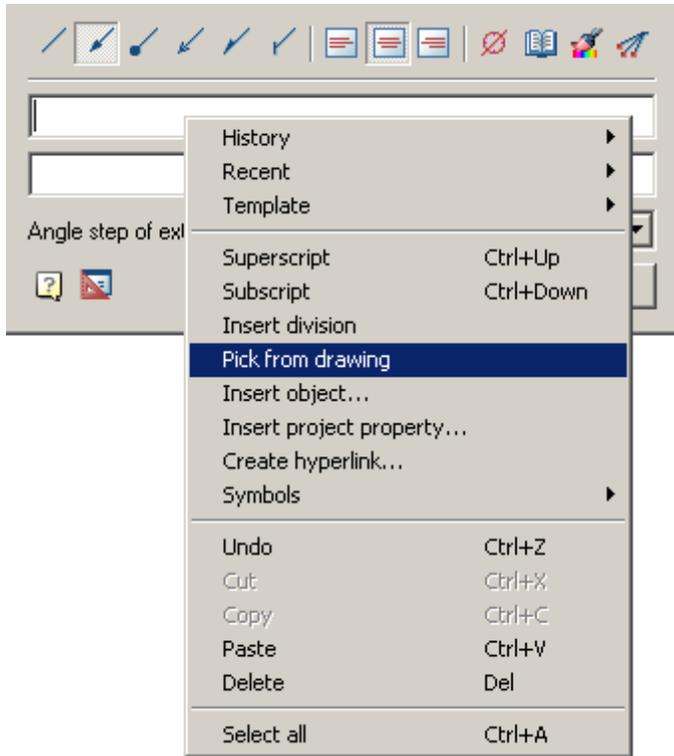
**Sample create label**

Create a label for equipment.

1. Insert equipment



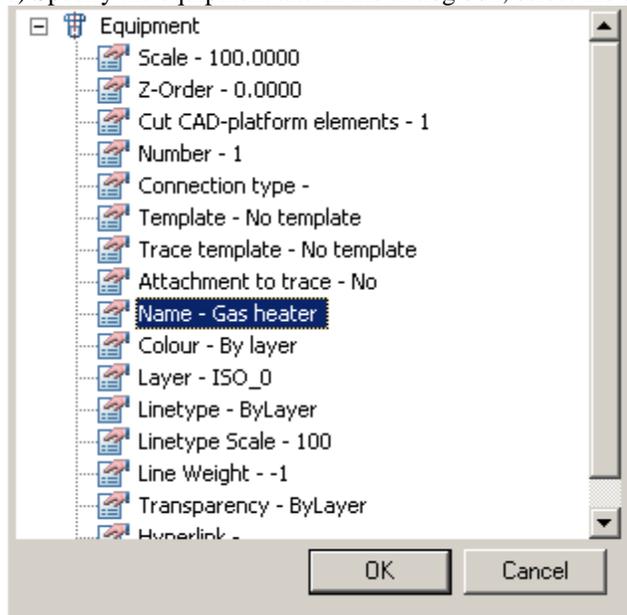
2. Add a note (eg, constructional note (spnotep))
3. The dialogue form editing notes to add the necessary fields to the drawing for this:
  - a) from the context menu of the field call the command "Pick from drawing"



b) In the dialog box "Value picker" choose "Take from property"



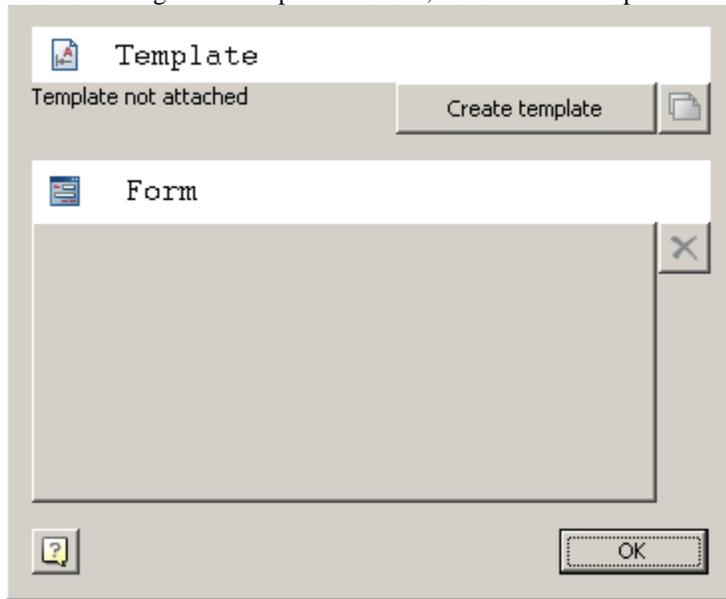
c) Specify the equipment and in the dialog box, select the desired option



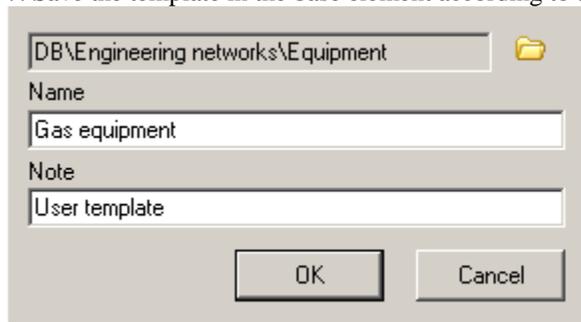
4. Confirm the settings notes and paste it to the drawing.



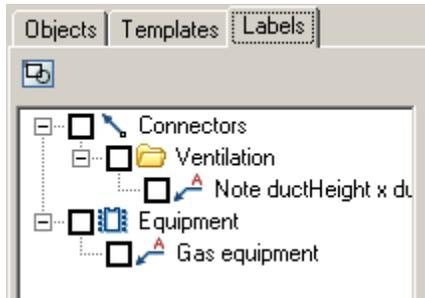
5. From the context menu, select notes "Save object as template"
6. In the dialog box "Template Wizard", click "Create template"



7. Save the template in the base element according to the [settings](#).



8. Now create a label will be available in the "Labels" in "Equipment"



## Library

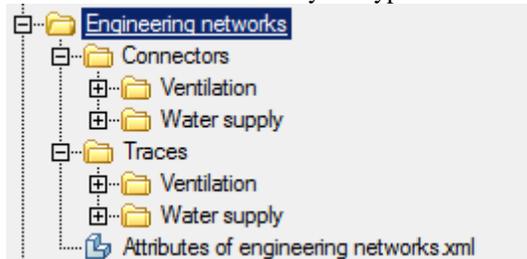


Library: *Communications*.

The objects of engineering networks (equipment, connectors, tracks) available in the template library are also available in the base of elements.

The section is divided into subsections by type of object: Equipment, Connectors, Routes.

Each subsection is divided by the type of network: domestic gas supply, ventilation, ...



## Area

### Net area by internal point

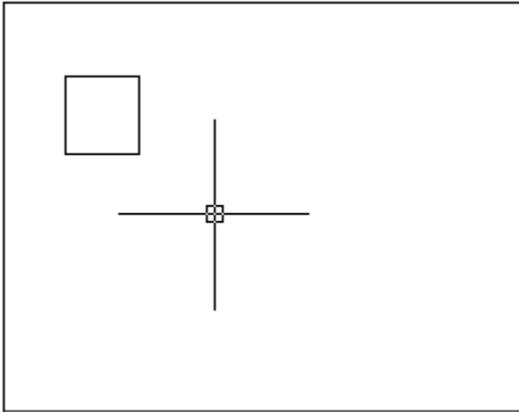


Command line: *SPAREA*.

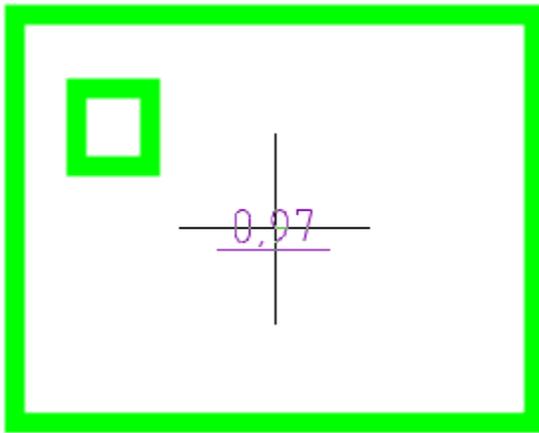
The command allows you to calculate and build the net area by specifying the inner point of the closed contour.

### Procedure

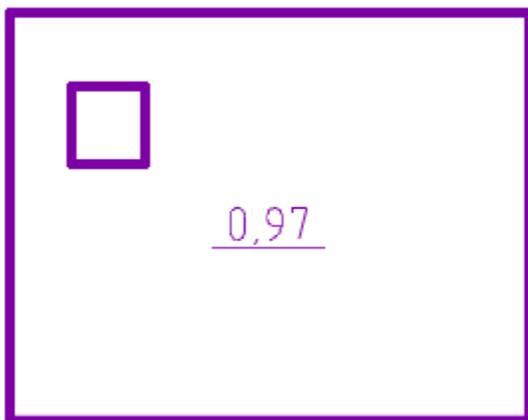
1. Call the command.
2. Pick a point within the closed contour. The contour will be highlighted.



3. Specify the position of the text (area value). A dialogue "Area" will open.



4. In the dialogue "Area" customize the type of inscription and confirm with the "OK" button. The object area will be built.



## Area by internal point

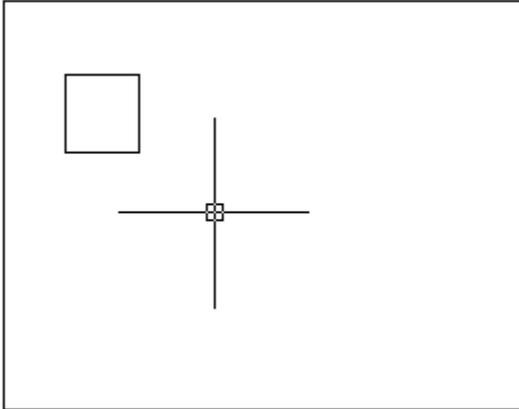


Command line: *SPAREAI*.

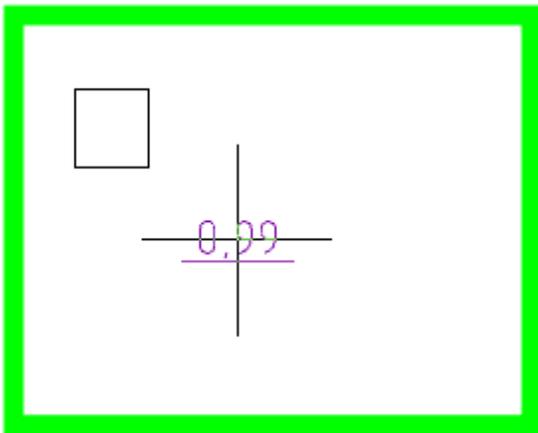
The command allows you to calculate and build the total area by specifying the inner point of a closed contour.

### Procedure

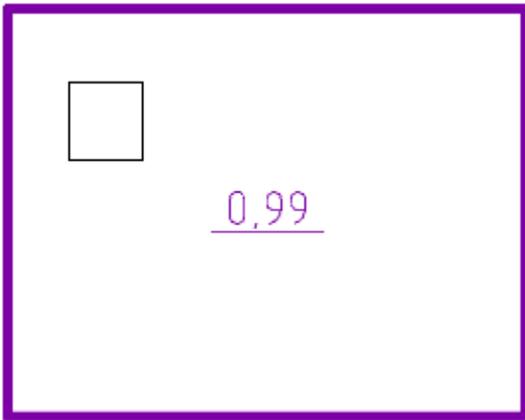
1. Call the command.
2. Pick a point within the closed contour. The contour will be highlighted.



3. Specify the position of the text (area value). A dialogue "Area" will open.



4. In the dialogue "Area" customize the type of inscription and confirm with the "OK" button. The object area will be built.



### Area by rectangle

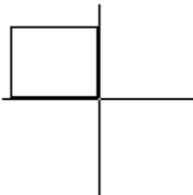


Command line: *SPAREA2*.

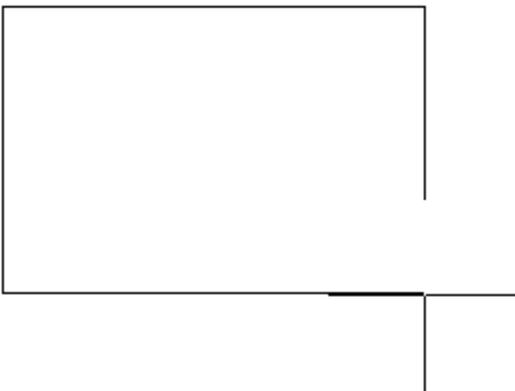
The command allows you to build an area by specifying the diagonal of a rectangle.

### Procedure

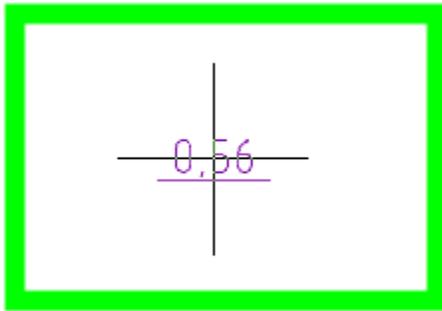
1. Call the command.
2. Pick the first corner point.



3. Pick the second corner point.



4. Specify the position of the text (area value). A dialogue "Area" will open.



5. In the dialogue "*Area*" customize the type of inscription and confirm with the "OK" button. The object area will be built.



### Area by contour

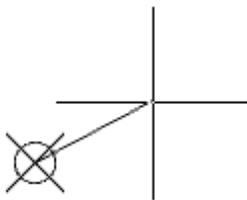


Command line: *SPAREA3*.

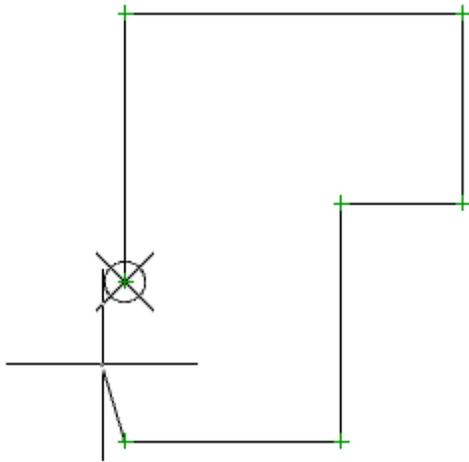
The command allows you to build an area by specifying a contour.

### Procedure

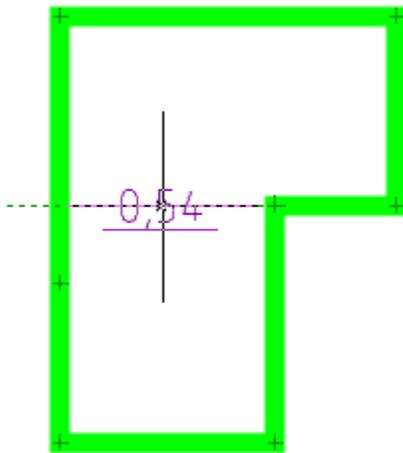
1. Call the command.
2. Specify the starting point of the contour.



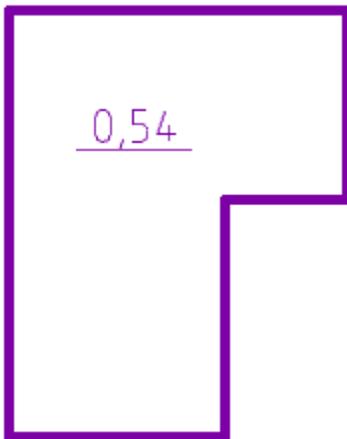
3. Pick subsequent points of the contour. To finish, press the "Enter" key, the contour will close automatically.



4. Specify the position of the text (area value). A dialogue *"Area"* will open.



5. In the dialogue *"Area"* customize the type of inscription and confirm with the "OK" button. The object area will be built.



## Area(Text)

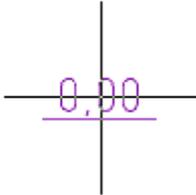


Command line: *SPAREA4*.

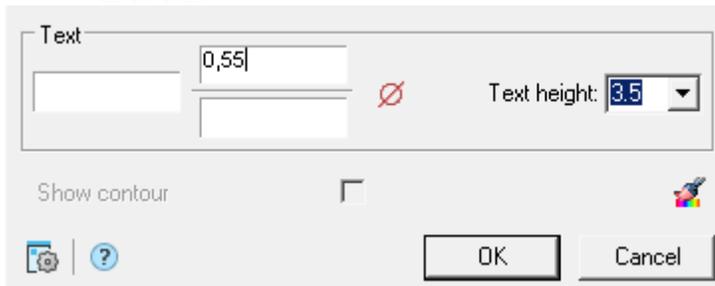
The command allows you to set the text label of the area.

### Procedure

1. Call the command.
2. Specify the position of the text (area value). A dialogue "Area" will open.



3. In the dialogue "Area" customize the type of inscription and confirm with the "OK" button. The object area will be built.



0,55

## Area by polyline

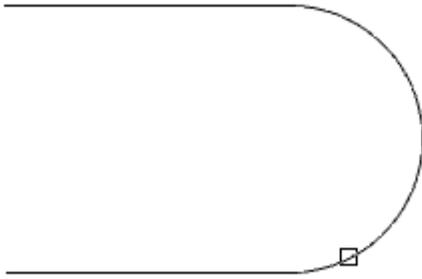


Command line: *SPAREA5*.

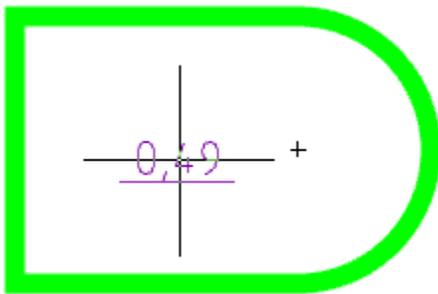
The command allows you to build an area by specifying a polyline.

### Procedure

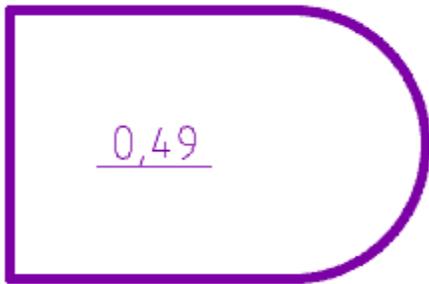
1. Call the command.
2. Select a polyline in the drawing. An open polyline will be closed automatically.



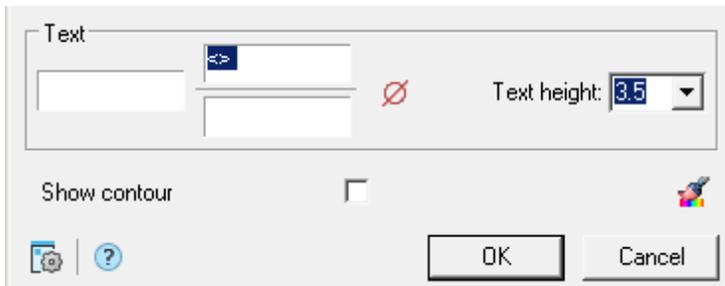
3. Specify the position of the text (area value). A dialogue "Area" will open.



4. In the dialogue "Area" customize the type of inscription and confirm with the "OK" button. The object area will be built.



### Area Editing Dialog



The dialogue consists of:

1. Three text fields for entering explanatory text. [Auxiliary commands](#) are available in the context menu of text boxes for editing a label. The expression "<>" in fields is a reference to the calculated area value. In addition to

entering the expression "<>" in the value fields to display the calculated area value, you can also use the "Face-value" context menu command.

2. The  "Symbols" button calls the table of special [symbols](#) for insertion into the current cursor position of the edited input field.
3. The "Text height" input field indicates the height of the text font.
4. The switch "Show contour" controls the selection of the border of the measured area in the drawing.
5. The  "Copy Property" button allows you to copy design parameters from another drawing object.

## Form premises

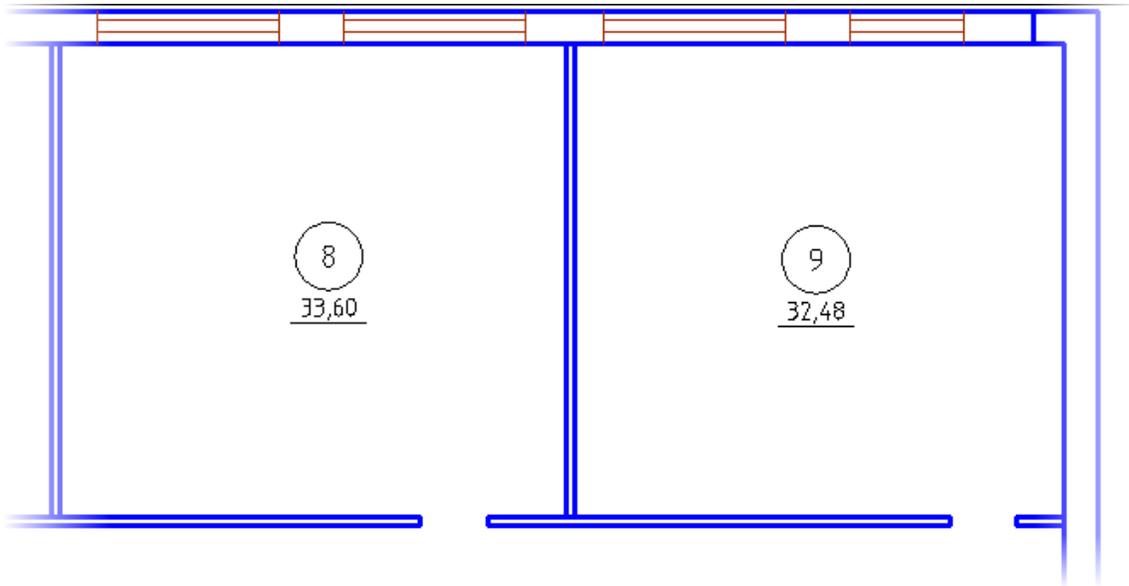


Command line: *SPQUARTERS*.  
The command creates a quarters object.

## Procedure

1. Call the command. The "Quarters" dialog will open.

2. In the "Marker" group, select the type of marker (Type 1, Type 2 or Type 3).
3. Using the commands for creating areas in the "Measuring square" group, draw the outline of the quarter.
4. Set the parameters, properties and category of the quarter.
5. Confirm the settings with the "OK" button.
6. Specify the position of the text.
8. The quarter will be built.



### Convert areas into rooms

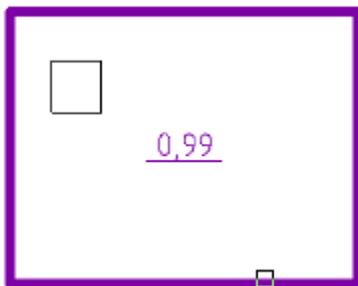


Command line: *SPCONVERTTOROOMS*.

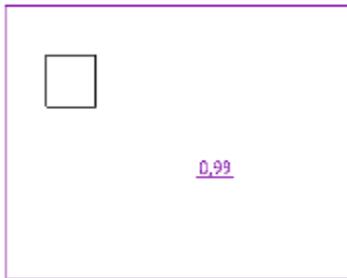
The command is used to change the object type "Area" to the object type "Space".

### Procedure

1. Call the command.
2. Select the object(s) to transform in the drawing. Objects for transformation can be both "Areas" and "Quarters".



3. The selected objects will be converted to "Space" objects.



## Working with parametric objects

### Working with Database Objects

Parts Library Construction 21 is a database stored as a file on a local computer or on a server.

It is possible to select a base in the settings Construction 21 in chapter "[Databases access](#)".

Parts of the database can be exported as individual files, or import from external files into the current database of standard elements.

### The basic tools for working with database objects

The basic tools for working with database objects are:

"*Main menu- Construction - Library objects*"

or on the toolbar "*Library objects*"



- [Tab manager](#)
- [Standard parts library](#)
- [Reinsert object](#)
- [Threaded fastening](#)
- [Rivet joint](#)
- *Markers, Groups*
  - [Insert group](#)
  - [Group objects](#)
  - [Add marker](#)
  - [Template wizard](#)
- *Cover*
  - [Move up](#)
  - [Move down](#)
  - [Change hidden mode](#)
  - [Regenerate suppression contours](#)
- *Part trim*
  - [Add part trim](#)
  - [Remove part trim](#)
- [Add view](#)

-  [Change representation](#)
-  [Mirror part](#)
-  [Regenerate Std Parts](#)
-  [User defined object](#)

## Tab Manager

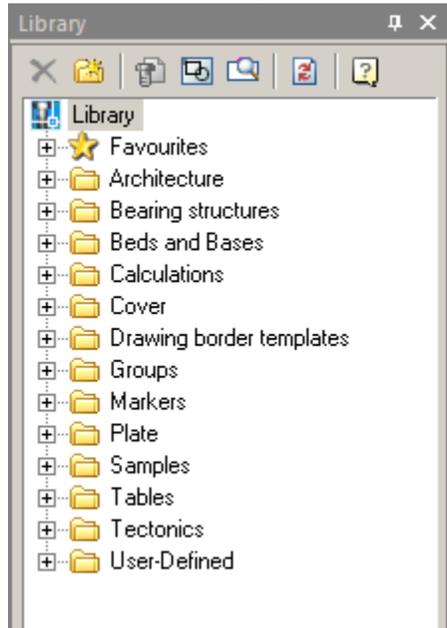
-  Main menu: *Construction - Library objects -  Tab manager.*
-  Ribbon: *Construction - Library objects -  Tab manager.*
-  Toolbar: * Tab manager (on toolbar "Library objects").*
-  Command line: *SPTABS.*

Object Manager Construction 21 includes the following tools:

- Manager database of standard objects
- Objects
- Pruning of standard parts
- Finding and replacing text
- Copying properties

## Tab "Library"

Tab "Library" object manager is a universal means of access to the standard database objects Construction 21. Details in the database are classified according to their design purpose.



Management and structure the database by using the toolbar and the context menu that includes the ability to add, delete, or rename folders.

## Toolbar

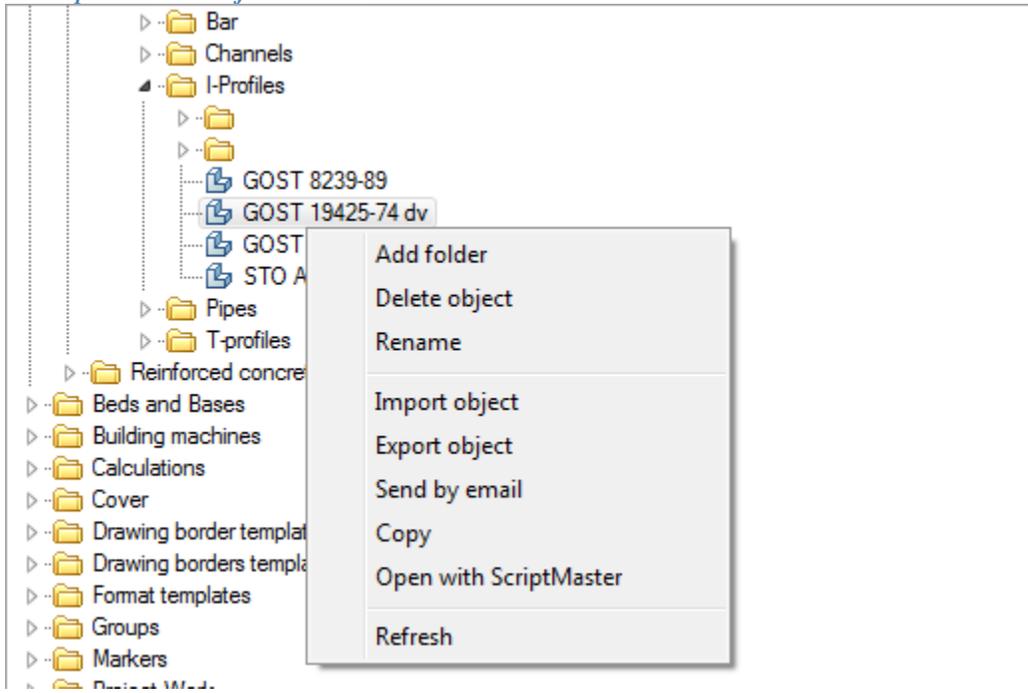
-  *Del object.* Removes the selected item or folder from the database

-  **Add folder.** Adds a folder to the database
-  **Insert object.** Performs insert the selected database object in the drawing
-  **View.** Includes preview of database objects
-  **Search panel.** It includes search bar facilities on base
-  **Refresh.** Updates the tree base in the object manager. Press this button after making changes to the database

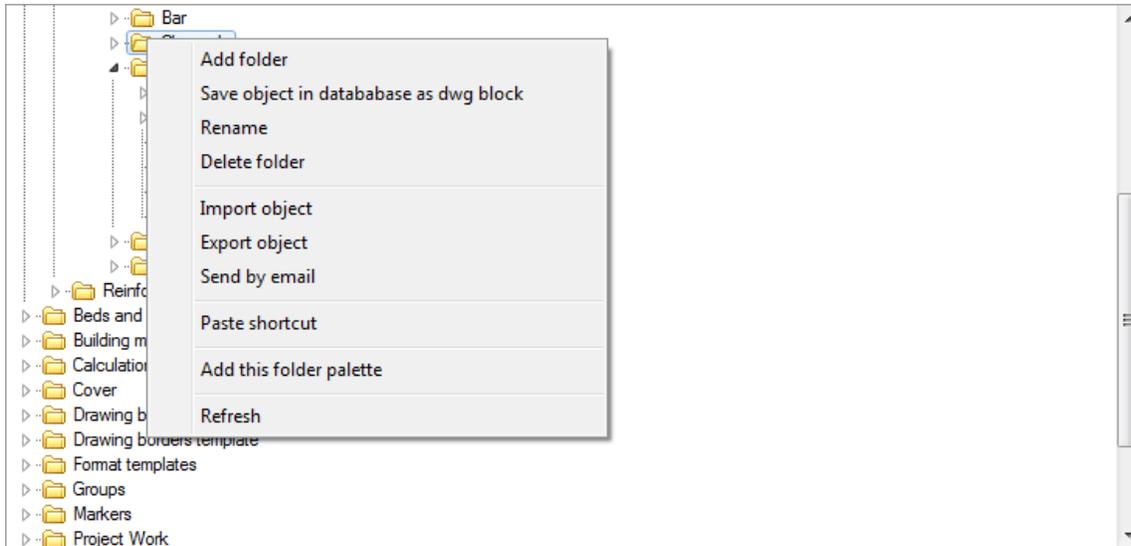
**Context menu**

The context menu has a different structure depending on call.

*In the palette - the object context menu:*



*In the palette - the context menu of a folder:*



**"Add Folder"** - adds the folder to a dedicated subsidiary. If the command was run on the selected object, the folder will be added to the parent folder object.

**"Save object in database as dwg block"** - This utility allows you to save a single database of the drawings in format dwg, including standard items Construction 21, design elements and primitives nanoCAD.

**"Delete object"** - This command deletes the selected object.

**"Delete folder"** - This command deletes the selected folder with all its contents.

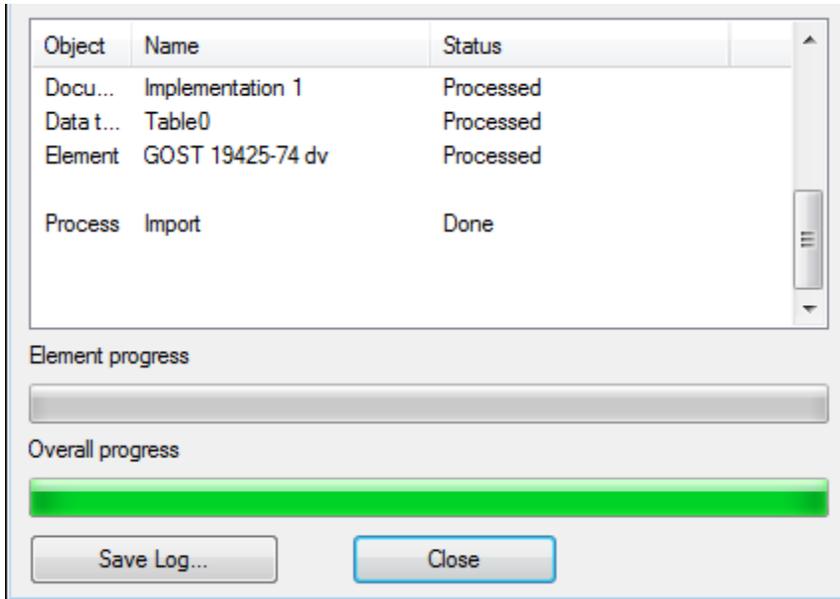
**"Rename"** - The command allows you to rename an object (folder).

**"Import object"** - Adding to our previously exported file or folder object database DB.

To import a database from an external file, use the command "Import object" in the context menu invoked by a right-click on any folder or object in the section "Library" object manager. This will bring up a dialog box in which you specify the path to the file.

When importing compares the last modification date of the original (stored in the database) and the imported object. At concurrence of the imported content from content database objects will be updated only if they have more recent modification date.

If the command "Import object" was called for a standard lens, the outer fragment is imported to the folder containing the object.

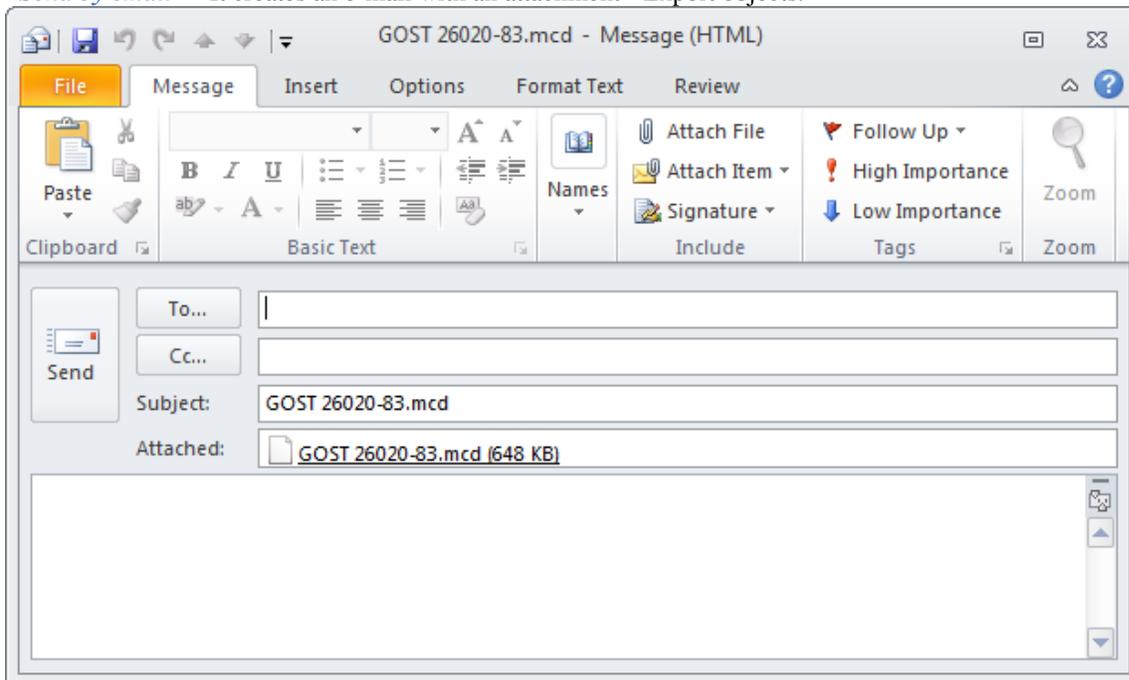


*"Export object"* - Save the file to disk or folder object database DB.

To export any portion of the database you should use the command "Export object". In the resulting dialog box, then you need to specify the path and file name for saving the captured designated section base.

*Note:* Import operation into the database or export from the database can be made as separate objects, and entire folders with libraries of parts.

*"Send by email"* - It creates an e-mail with an attachment - Export objects.



*"Copy"* - Stored in a buffer object reference to paste a label on it.

*"Paste shortcut"* - Inserts a shortcut to a previously copied object

*"Open with ScriptMaster"* - Opens the object in the Object Wizard to edit.

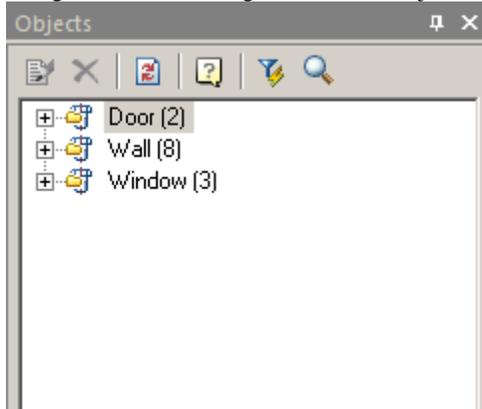
*"Add this folder palette"* create a bookmark in the palette manager of the objects of the selected folder.

*"Refresh"* - Updating of the database (for example, after editing).

## Tab "Objects"

Tab "Objects" object manager is a universal means of reviewing, monitoring, editing facilities Construction 21, are on the drawing.

Places on this tab are grouped into sections - for example, standard parts, callout, bolted connections, etc. In order to navigate in the drawing the selected object is highlighted.

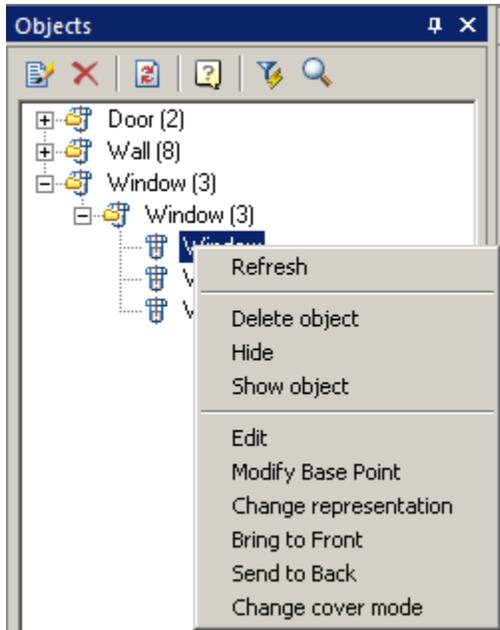


## Toolbar

-  **Edit object.** It calls the dialog for editing the selected object
-  **Del object.** Deletes the selected object
-  **Refresh.** Updates the list of objects. The button is used when adding or removing objects from the drawing
-  **Quick select.** Search Tool Construction 21 objects in the drawing on the set parameters, run the command "Quick Pick"
-  **Find and Replace.** Open dialog box *Find and Replace*.

## Context menu

In addition to the teams that are in the toolbar, the context menu of a selected object contains the following items depending on the selected object, and includes a team of repeating the context menu of the object on the drawing. Thus the tab "Objects" allows you to edit objects without having to search for them saturated drawing regardless of layer.



For example, for sub-database Construction 21, further include items ["Change representation"](#), ["Bring to Front"](#), ["Send to Back"](#), and ["Change cover mode"](#).

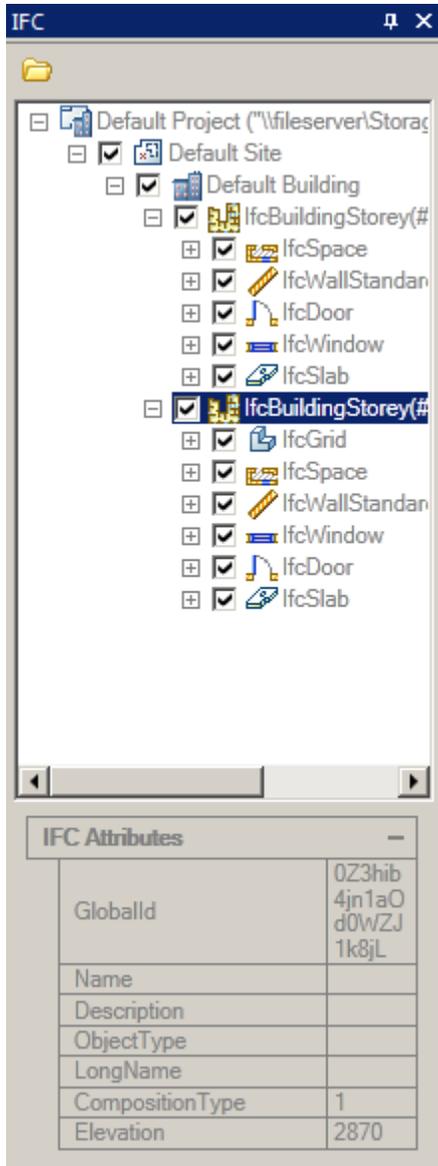
Option "Hide" makes the selected object invisible in the drawing.

## IFC viewer



Functional panel:*IFC*.

File viewer IFC (Industry Foundation Classes). IFC is used as the format for the information model building BIM (Building Information Modeling).



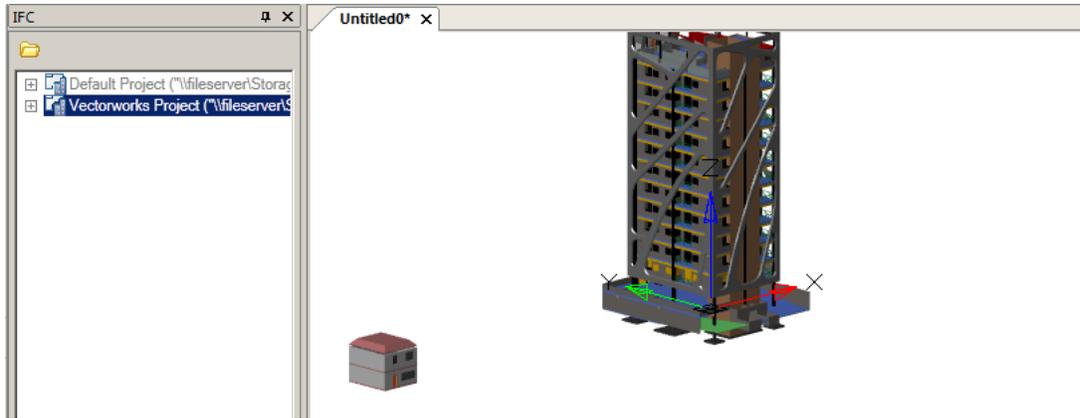
### Import models

- Run the import command:
  - Button  "Import" in the main function bar menu "IFC".
  - Button "Import" in the tree.
  -  Command line: **IFCVIEW3D**.

2. Select the IFC file and confirm.

Begin analysis and file import nanoCAD environment. Download time depends on the capacity of the computer and the complexity of the file.

- After importing the tree items will be available, obedennenoe in one project. When you import multiple serial models, the tree will be displayed several projects.



### View models

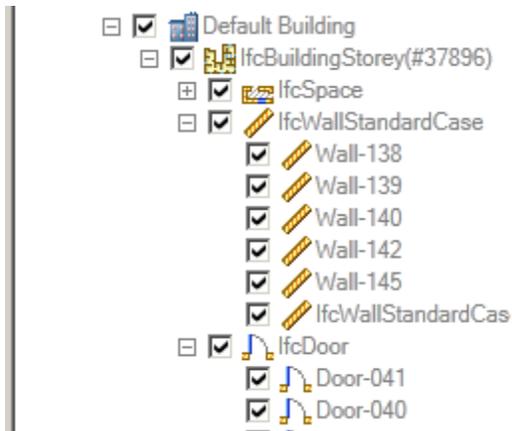
Viewing patterns by using wood elements.

When you select a tree node (object), its attributes are displayed. Each type of object attributes its composition.

IFC Attributes	
GlobalId	3qbXnEmA5DGQ4 0a_e5oRSB
Name	Default Building
Description	
ObjectType	
LongName	
CompositionType	1
ElevationOfRefHeight	
ElevationOfTerrain	
BuildingAddress	Vectorworks Architect
Pset_BuildingCommon	
SprinklerProtection	No
SprinklerProtectionAuto...	No
NumberOfStoreys	16
IsLandmarked	No

Each type of object is located on its own layer and has its own color. Layer and color for objects is configured in the design settings.

The visibility of an object is controlled by removing or ticking a checkbox on an object.



Rotate the model by standard means nanoCAD.

## Standard parts library



Main menu: *Construction - Library objects - I Standard parts library.*



Ribbon: *Construction - Library objects - I Standard parts library.*

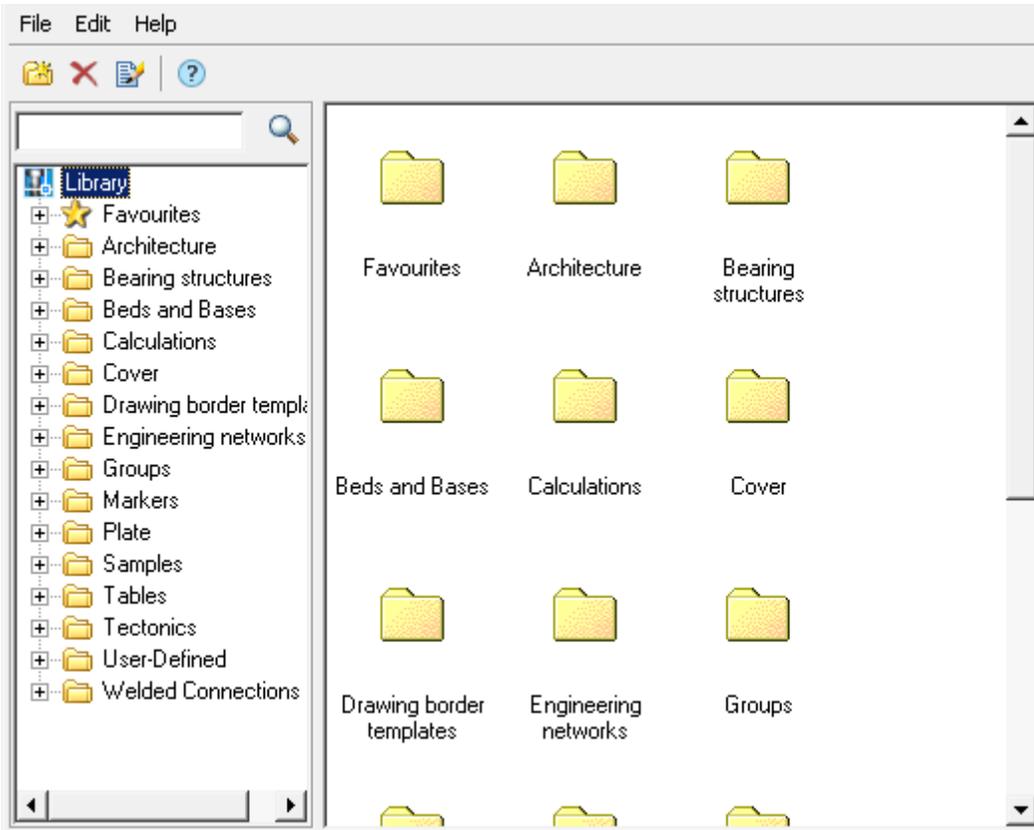


Toolbar: "Library objects") - *I Standard parts library .*



Command line: *SPSTD.*

Inserting standard parts from the Construction 21 database is carried out using the database manager, which can be presented in full (dialog) form and in the form of a tool palette.



## Inserting standard parts

1. Select the insert object.
2. After selecting the object, specify the insertion point for the object.
3. Select the insertion direction (not all parts need to specify a direction vector). The dialog box for selecting object parameters will open.
4. Adjust the options in the dialog box.

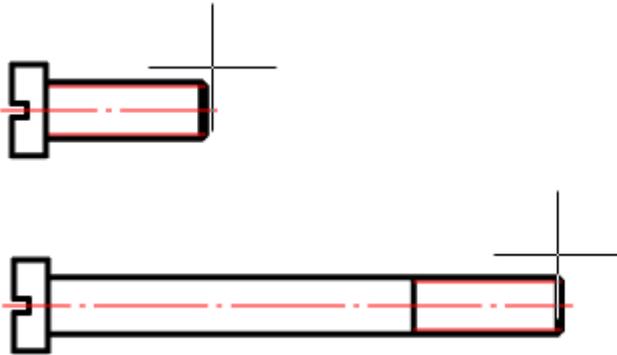
The standard dialog contains the following sections (sections are divided into tabs):

- [Table parameters](#)
- [Properties](#)
- [Dependencies](#)
- [Calculations](#)

### *Important!*

The composition of the sections (tabs of the insert dialog) is determined by the class of the part, its parameters and the environment of the insert.

The button  "Dynamic input" turns on the mode of visual definition of parameters when inserting.



As you move the mouse cursor, follow the change in the size of the object. LMB click to confirm the selection of the parameter value.

The "Apply" button allows you to apply the selected parameter values to the object without closing the dialog box. This deactivates the "Dynamic input" mode.

**Important!** The description given here refers to the standard dialog for selecting parameters. Some objects of the Construction 21 base use special dialog boxes. In special dialog boxes, the location of the controls may vary.

**Note:** If the path to the custom help is specified in the "Help" parameter of the standard part form, it will be called if the focus is on the form control. If the focus is on the "Cancel" or "OK" buttons, the help for standard items opens.

5. Click "OK" to complete the dialog.

## Toolbar Commands

- *Add folder* - Adds a folder at the specified location in the object tree.
- *Delete* - Deletes the selected object or folder.
- *Edit note* - Changes the name and note of the selected object.

Name  
Balcony doors

Note  
Balcony doors

## Context menu commands

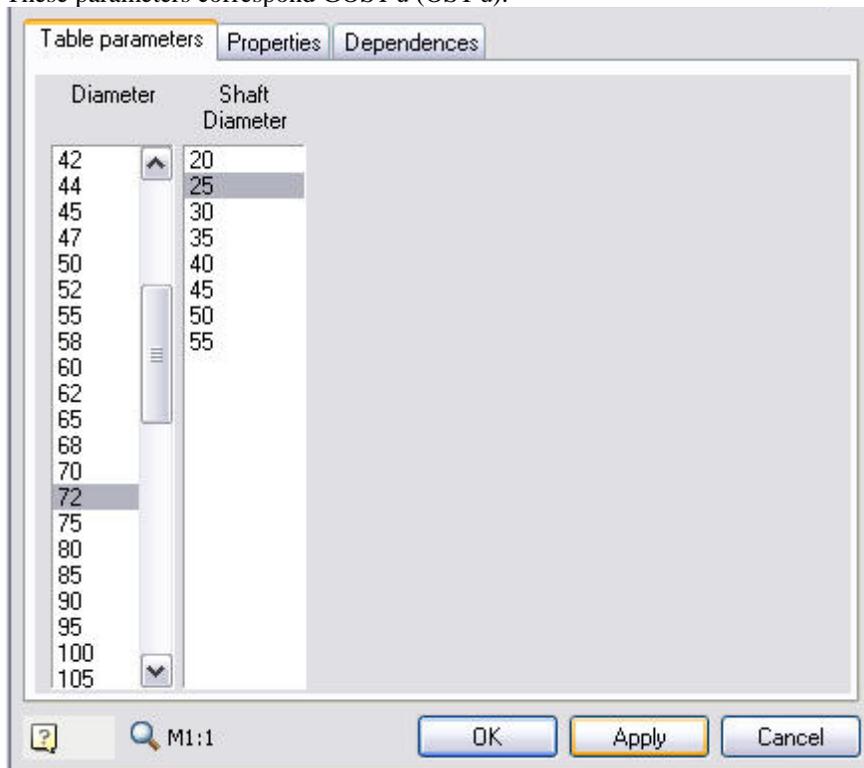
- *Import* - Imports a base object.
- *Export* - Exports a base object.
- *Send by email* - Exports the object and sends it to the specified mail address.
- *Cut* - Cuts an object, folder.

- *Paste* - Inserts a previously cut object, folder.
- *Paste shortcut* - Inserts a shortcut to a previously cut object, folder.
- *Add folder* - Adds a folder at the specified location in the object tree.
- *Delete* - Deletes the selected object or folder.
- *Edit note* - Changes the name and note of the selected object.
- *Publish*- Makes the object visible to other users of the network database. Objects can be published by [administrators and editors \(editors only their own objects\)](#).
- *Remove publish* - Makes the object invisible to other users of the network database. Objects can be unpublished by [administrators and editors \(editors only their own objects\)](#).

*Note:* The "Publish" and "Remove publish" commands are only available to [editors and database administrators](#).

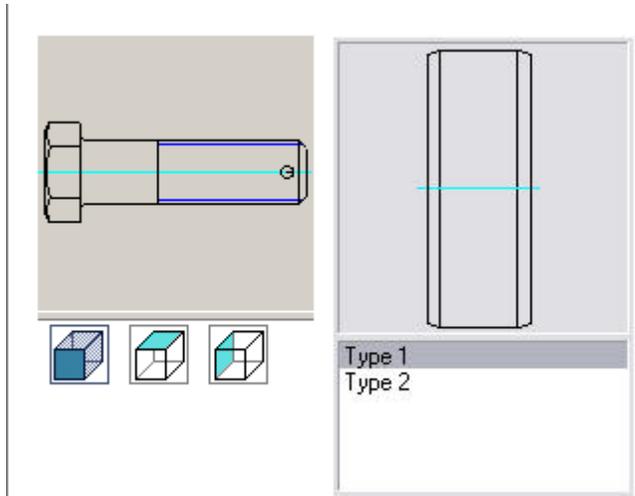
## The table settings

On the "table settings" dialog insert standard parts displayed parameters responsible for the geometry of the object. These parameters correspond GOST'u (OST'u).



## Properties

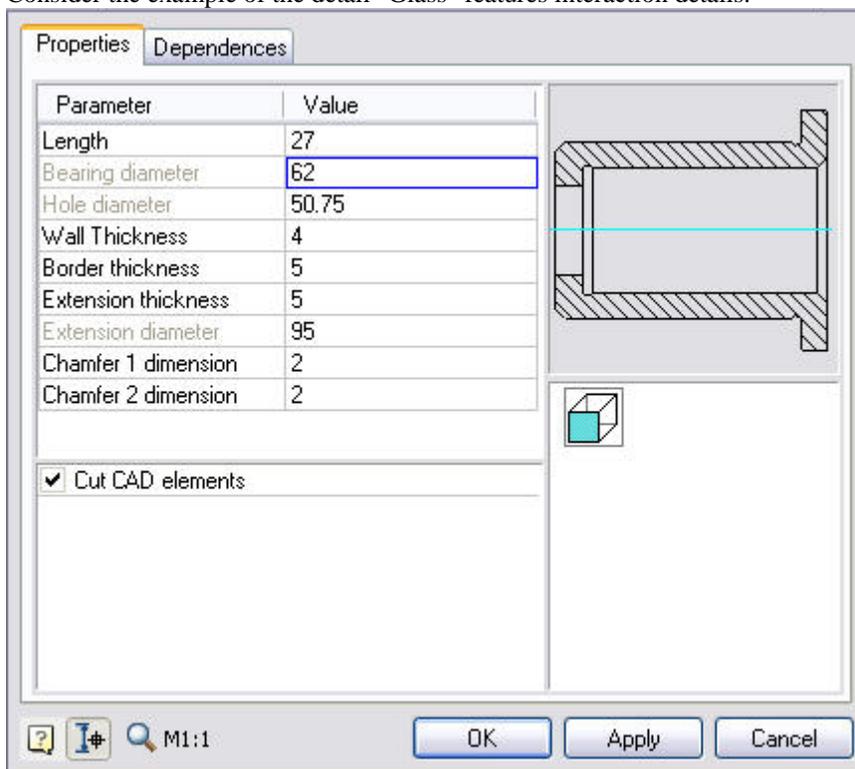
Properties of the parts that can be changed and described in the script are displayed on the "Properties". On this tab located custom and reference parameters, switches species details and details of performances.



In the process of inserting parts "Glass" automatically set the relationship between the items "Bearing", "End caps" and "Glass" (with parts falling into the aperture).

For items that have parameters available for manual entry or dynamically change tab "Properties" presents additional opportunities.

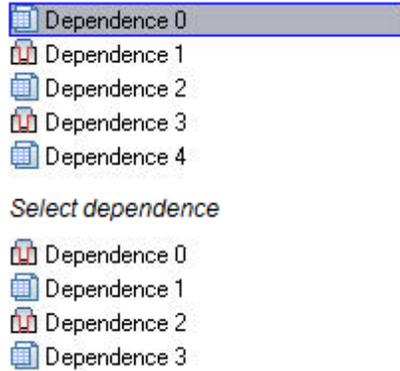
Consider the example of the detail "Glass" features interaction details.



The "Bearing diameter" - gray. This says that this option is not available for editing and dependence associated with the diameter of the bearing.

Bearing diameter	62
Hole diameter	50.75

To enable editing of this option, you must go to the tab "Dependencies" and remove the dependency between the diameter of the items "Bearing" and an inner diameter of workpiece "glass."



*Remove Dependency pressing the "Delete"*  
After this option is available for editing.

Parameter	Value
Length	27
Bearing diameter	70
Hole diameter	50.75
Wall Thickness	4

## Dependencies

The "Dependencies" tab allows editing of dependencies set automatically during the details allocation on the drawing, and dependencies set with the "Dependencies control dialog" .

### *Types of dependencies:*



Parametric - settable parameter object equality arithmetic expression object parameters, which occurs accession.



Geometrical **dependencies** - defines the object position in relation to the object to which there is an addition.

To edit parametric dependence it is necessary to select it and set parameter names or arithmetic expressions. The Bidirectional dependence switch defines whether changes in the child object will be transferred to the parent.

To edit parametric dependence it is necessary to select it and set the value of numerical parameter dependence, view - Contradirectional or CoDirectional dependence, dependence type, and axial and surface alignment.

## Calculations

For rod attachment parts provided estimation during insertion. The result of the calculation is the recommended thread diameter for given loading conditions and strength class details.

For some types of rolling bearings estimation is also provided. The result of the calculation is the life of the bearing for the given loading conditions.

## Reinsert object



Main menu: *Construction - Library objects -  Reinsert object.*

 Ribbon: *Construction - Library objects -  Reinsert object.*

 Toolbar:  *Reinsert object (on toolbar "Library objects").*

 Command line: *SPPICKPOINT, SPREINSERT.*

Serves to re-insert the object in the drawing, combines editing commands properties and movement of item.

1. Click *reinsert object* .
2. Select the drawing or pasted object from the database.
3. Specify the new position of the object and insertion point.
4. Click *OK*.

## Threaded fastening

 Main menu: *Construction - Library objects -  Threaded fastening.*

 Ribbon: *Construction - Library objects -  Threaded fastening.*

 Toolbar: "Library objects" -  *Threaded fastening.*

 Command line: *SPJOINT.*

Tool for inserting a threaded fastening from library Construction 21.

## Procedure

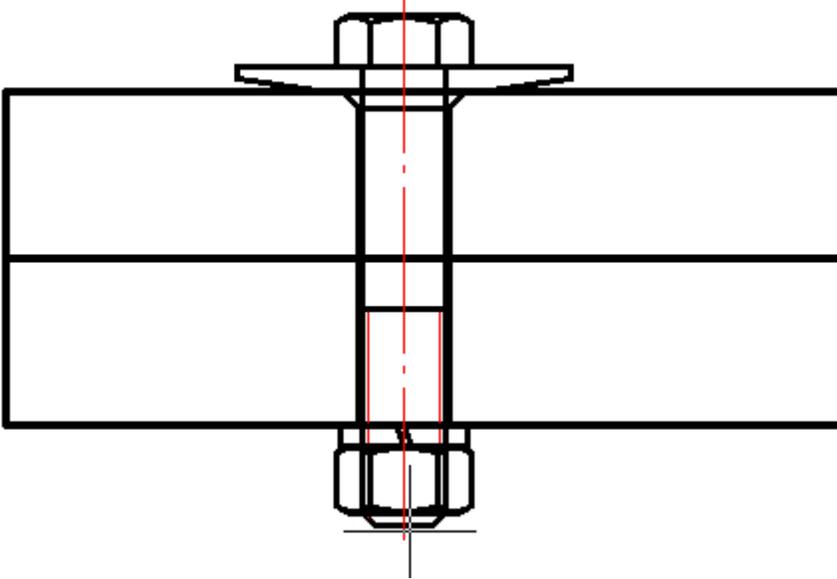
1. Specify the starting point of the threaded fastener in the drawing.
2. Specify the end point of the threaded fastener, the "*Fasteners*" dialog will open. When inserting, tools are [available to select the direction of drawing](#). Specifying the start and end points defines the centerline of the fastener. The intersected lines make up the thickness of the part package being fastened.



3. In the "*Fasteners*" dialog box, customize the look of the threaded fastener.

**Note:** The thread fastener insert dialog automatically saves the last selected template and thread diameter.

4. Confirm the settings with the "Apply" button, or with the "OK" button if you want to close the dialog at the same time. A threaded fastener will be built.



### Editing a threaded fastener

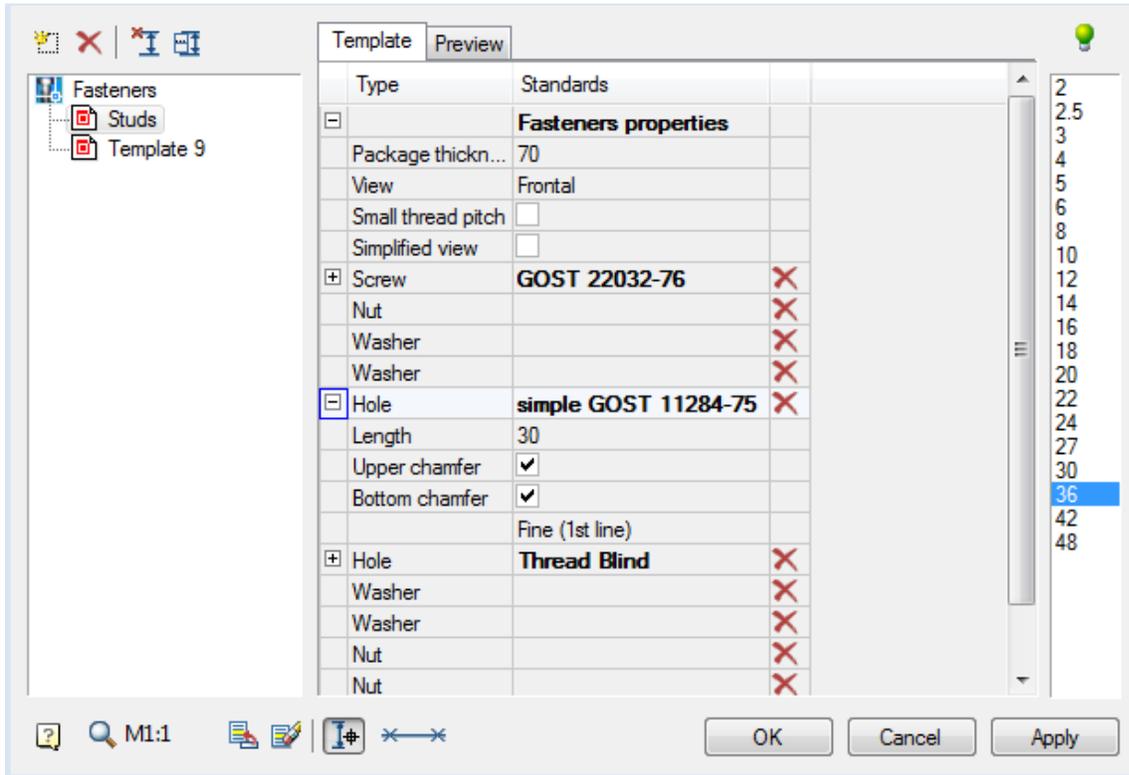
You can edit a threaded fastener by editing the "Threaded fastener" object, or by editing individual parts included in the threaded fastener.

When editing, you can change the composition, diameter of the threaded fastener, as well as the parameters of the individual parts that are included in it.

To open the threaded fastener setup dialog, apply any of the standard [editing tools](#) to the centerline of a group of parts.

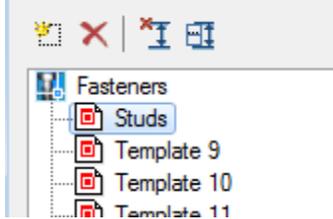
If tooltips are enabled in Construction 21 settings, then when you hover the cursor over the centerline, the "Threaded fastening" tooltip appears.

## Threaded fastener settings dialog box



### Template list panel

It is possible to save a threaded fastener template for later reuse of assemblies with the same set of parts. To work with templates, use the buttons at the top of the dialog box, and below is a list of available templates:

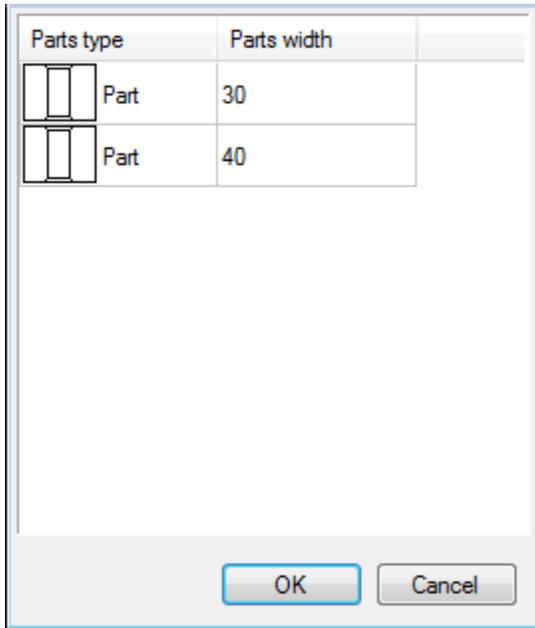


Button "Create new template" adds a new empty template. When creating a new template, the required number of holes is automatically added depending on the number of lines crossed in the drawing.

Button "Delete template" removes the selected template from the list. "Editing template" stores the current setting of the threaded fasteners. It cannot be removed.

Button "Selecting insertion point" is intended to reselect the insertion point and the length of the threaded fastener in the drawing.

Button "Manually select holes length and placement" opens a window for setting parameters of a package of connected parts.



LMB clicking on one of the cells in the "Parts type" column switches the part / gap:



In the "Parts width" column, the thickness of the corresponding part (or gap) is set. After setting the parameters of the connection package, close the window with the "OK" button.

The context menu of the list of templates contains the commands:

- Add folder
- Delete object
- Rename
- Import object
- Export object
- Send by email
- Copy
- Configuration tool

These commands are similar to those used in the [object manager](#) Construction 21.

#### Tab "Template"

The following settings are available on the "Template" tab in the center of the dialog:

- Fasteners properties
  - *Package thickness* - thickness of the package of parts to be joined, in mm.
  - *View* - selection of standard image projection.
  - *Small thread pitch* - fine pitch switch.
  - *Simplified view* - simplified / full image switch.
- Details of the threaded assembly. The components included in the assembly are listed here in order.
  - Screw
  - Hole
  - Spot facing
  - Washer
  - Nut

To select a part of a threaded assembly from the Construction 21 base, click in the cell of the GOST column of the corresponding element.

The "Select object" dialog box will open the attachment parts folder.

+	Hole	simple GOST 11284-75	✗
+	Hole	Thread Blind	✗
	Washer		✗

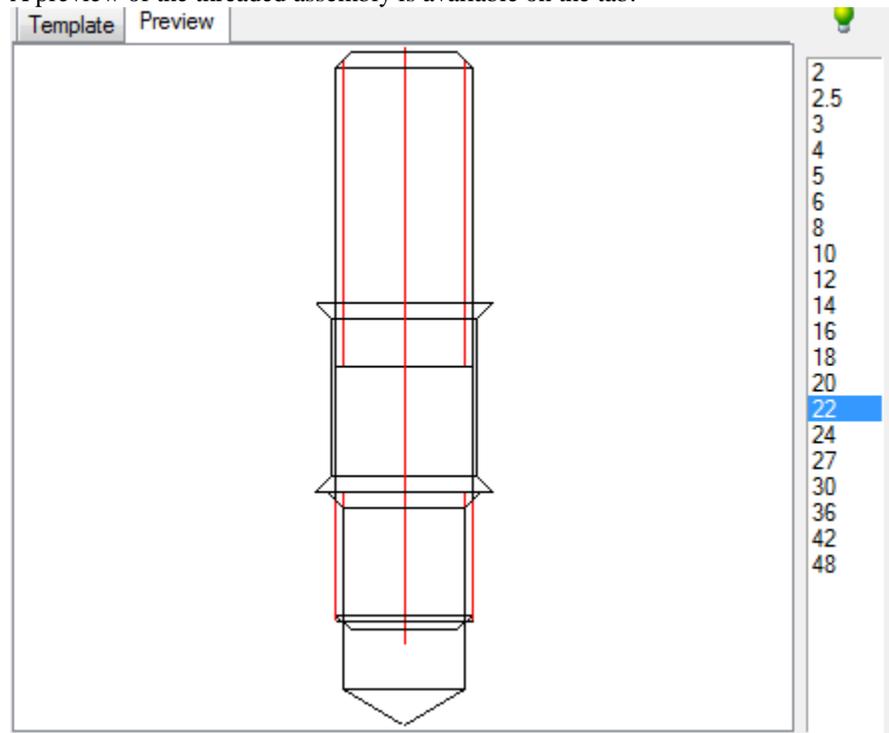
Additional settings for assembly components are available when expanding the list:

-	Hole	Thread Blind	✗
	Length	29.92	
	Small thread step	<input checked="" type="checkbox"/>	
	Upper chamfer	<input checked="" type="checkbox"/>	

Button ✗ "Clear" in the right column of the list table clears the selected position.

**Tab "Preview"**

A preview of the threaded assembly is available on the tab.

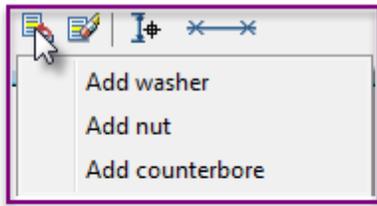


**List of thread diameters**

- The "lightbulb" icon above the list indicates that the selected diameter value can be used for all objects in the assembly:
- The diameter value does not match one or more parts. Assembly is not possible.
- The diameter value applies to all parts in the assembly. Assembly is possible.

**Button "Add part to template"**

Adds a part to the assembly after being selected from the list. The list of details available for adding depends on the currently selected object:



Washer	GOST 11371-78(2)	✗
Washer	GOST 11371-78	✗
Washer		✗
⊕ Nut	GOST 15526-70	✗

**Button  "Remove part from template"**

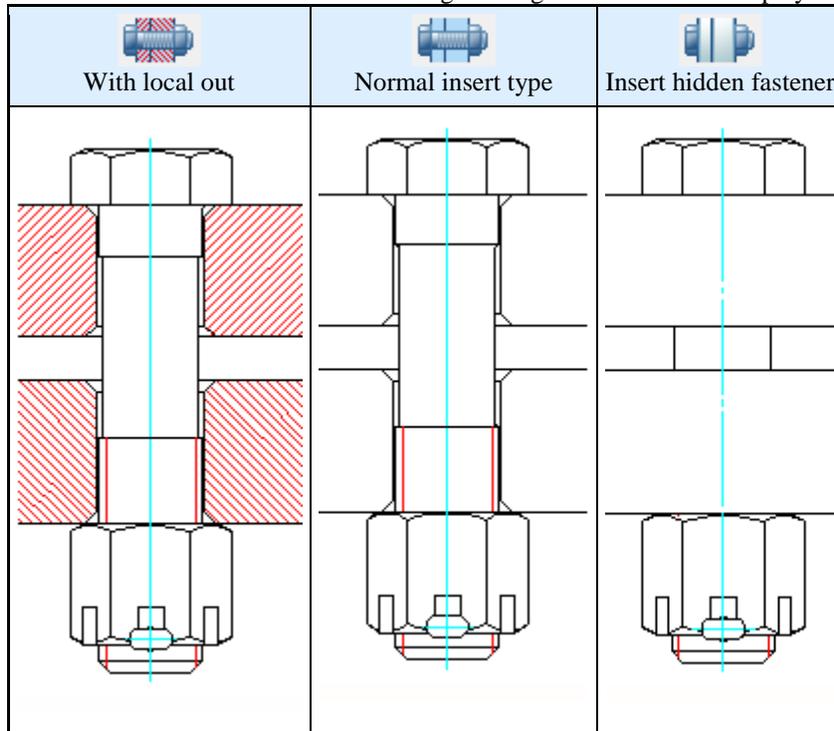
Removes the selected object from the parts list.

**Button  "Dynamic selection"**

Turns on the mode of visual selection of the bolt length after closing the dialog.

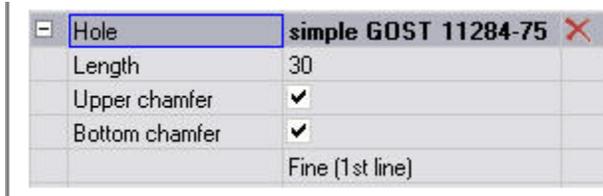
**Graphical display type selection list**

When inserting a threaded fastener, 3 display methods are available, selected by the "Select fasteners insert part" button on the bottom toolbar of the dialog. The figure on the button displays the currently selected display method:



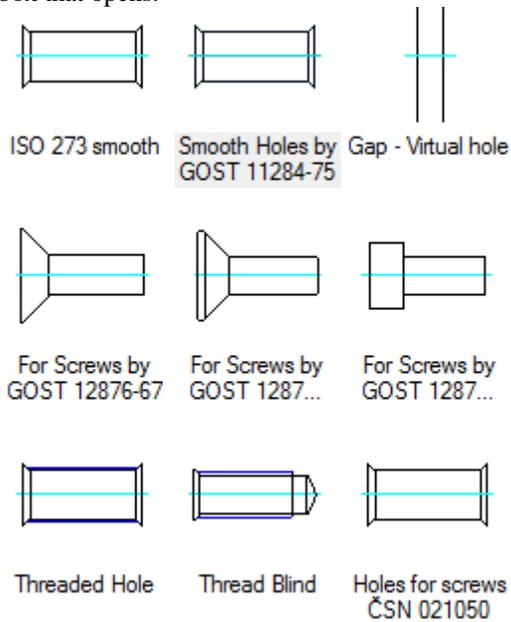
**Displaying chamfers on holes**

To select the options for displaying chamfers in the drawing, you must correctly place the marks in the hole properties.



## Setting the hole type

To change the hole type, click on it in the connection part set and select a different type in the "Select object" dialog box that opens.



## Rivet joint

 Main menu: *Construction - Library objects - Rivet joint*.

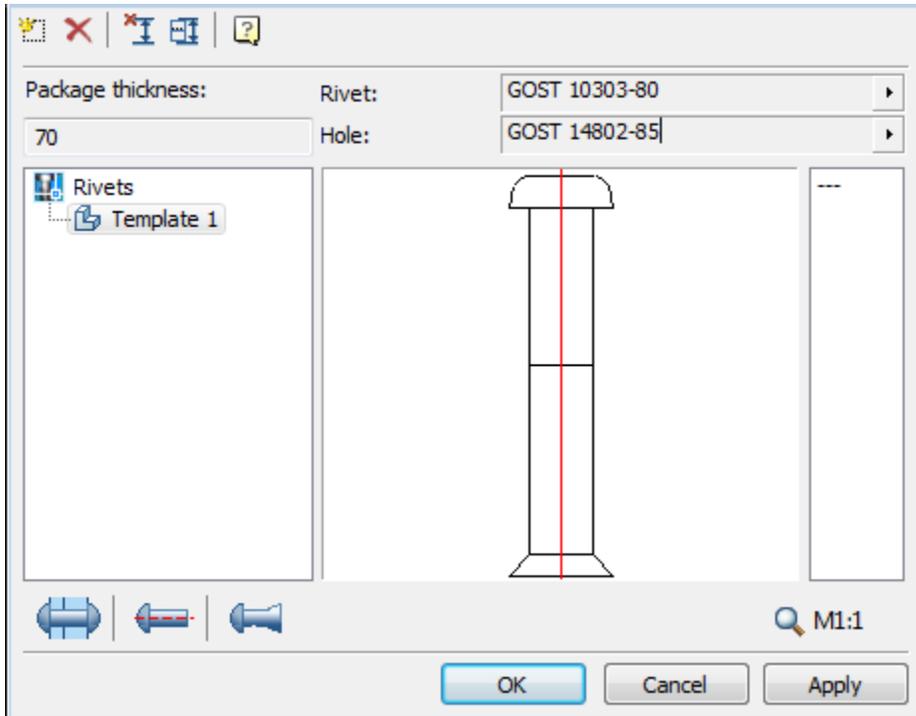
 Ribbon: *Construction - Library objects - Rivet joint*.

 Toolbar:  *Rivet joint* ("Library objects").

 Command line: *SPRIVET*.

Insertion tool riveted joint parts of the base standard elements Construction 21.

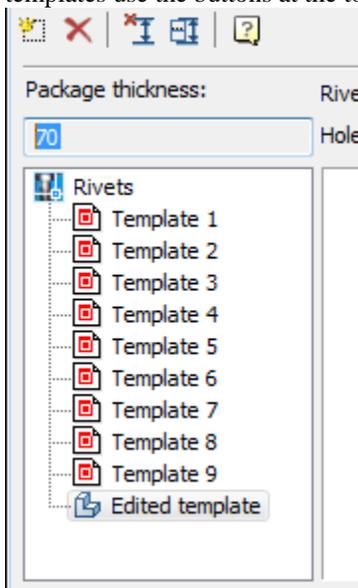
1. Specify the starting point for drawing the rivet assembly.
2. Specify the endpoint of the rivet assembly. When you insert the available tools [of choice destinations rendering](#).
3. In the dialog box *mounting parts* adjust the view of the rivet connections.



To select the type of rivet base Construction 21 click in the *rivet*.

To select the type of base openings Construction 21 click in the *hole for rivets*.

It is possible to save *the template riveted joint* for later reuse assemblies with the same set of items. To work with templates use the buttons at the top of the dialog box, and below is a list of available templates:



"Editable Template" stores the current settings bolting. It can not be deleted.

Button  *Create a new template*. Adds a new blank template.

Button  *Delete template*. Deletes the selected template from the list.

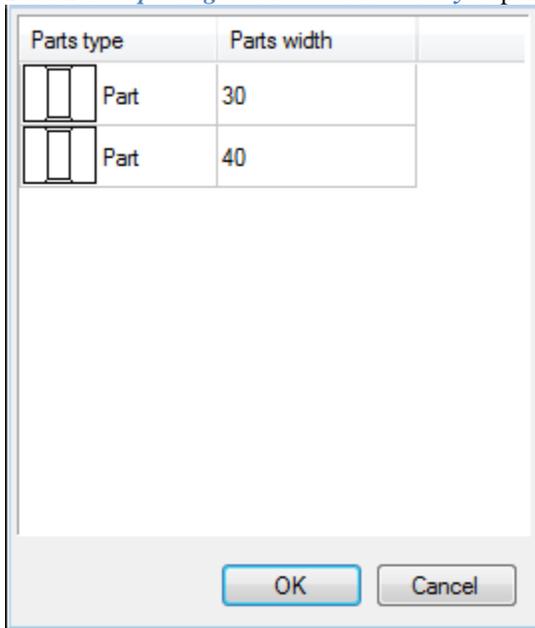
In the context menu templates available commands:

- Add Folder
- Delete object
- Rename
- Import from file
- Export to file
- Send by email
- Copy

These commands are similar to those used in [in the Object Manager](#) Construction 21.

Button  *Select the insertion point and the length of the riveted joint.* Designed to re-select the insertion point and the length of the rivet assembly drawing.

Button  *Set package connection manually.* Opens setup package of the parts.



Left-click on one of the cells in the column "type items" to switch the item / gap:



In the "Thickness" is set to the thickness of the relevant part (or gap) After configuring the package connected, close the window by pressing **OK**.

The right side of the dialog box *mounting parts* is a list of values diameter rivets.

- 1
- 1.2
- 1.6
- 2
- 2.5
- 3
- 4
- 5**
- 6
- 8
- 10

When you insert the rivet connections are available 3 ways to display selected button *Insert mode riveted joint* at the bottom of the dialog box toolbar. Drawing on the button displays the currently selected display method:



*With a local cutaway*



*Normal Box*



*Insert hidden*

2 types available (front and side) display riveted joint:



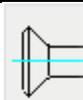
*Front view*



*Left side view*

You can choose the *type rivet connections*:

	The number of types depending on the type of rivet.
---	---

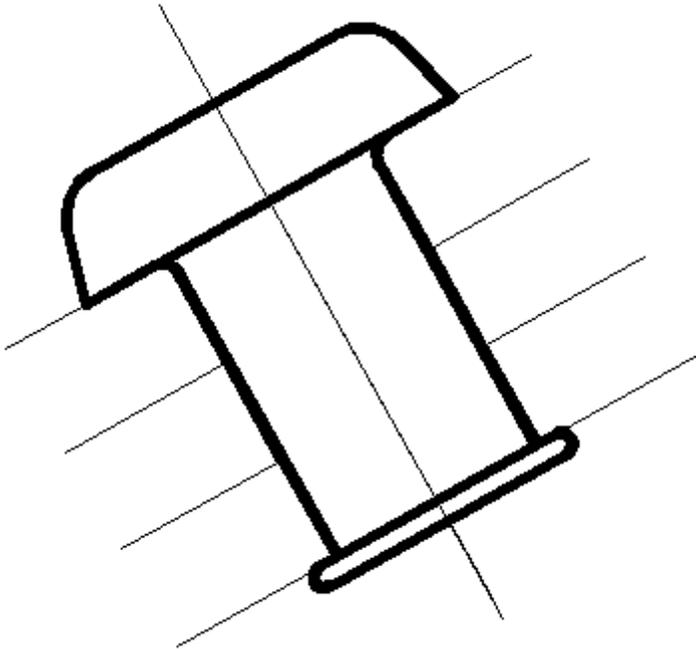


***Automatic detection of packet connection***

When you insert the rivet connections made automatically recognize the boundaries of the parts. If the line crosses the insertion direction *perpendicular to* a few segments in the drawing, they are defined as the boundaries of parts and installs Connection:



Insertion point and the length of the rivet assembly are determined automatically based on the thickness of the package details.



### *Editing riveted joint*

A dialog box settings riveted joint, apply any of the standard [editing tools](#) to the centerline of the group details. If the settings Construction 21 included tooltips, then when you move the cursor to the center line will show "Rivet connection".

## Markers, groups

### User Groups

Working with groups in Construction 21 is performed using the following commands:

- [Create custom groups](#)
- [Inserting User Groups](#)

### *Create custom groups*



Main menu: *Construction - Library objects - Markers, Groups - Group objects.*



Ribbon: *Construction - Library objects - Group objects.*



Toolbar:  *Group objects* ("Library objects").



Command line: *SPGROUPOBJECTS.*

Constraints describing the interaction of two or more objects, It is advisable to store these in the objects database in a related group. *Group Construction 21* has the following features:

- Group is stored in the object database, has a pattern preview before pasting.
- Components of the group in addition to objects Construction 21 can be primitives and blocks in nanoCAD.

- Group may be transferred as part of the database file to other users.
- Group may have additional dependencies with other groups and objects.
- Components of the group remain together parametric dependence.
- Components in the group can be specified both individually and in groups.

Thus, the group is a powerful way of organizing and structuring graphics data in a separate local file drawing document.

## Create a Group

Button  *Group objects*

Gather and create database objects in the design position in the drawing. On the toolbar, *Library objects*, click *Group objects*.

Select the required objects in the drawing AutoCAD specify the origin of the group.

In the dialog box *New group* on the left side is a list of objects in the group. Name objects in the list is taken from the string value for the specifications set in the properties of objects.

Button  *Highlight group objects* highlights and centers on the screen objects in the group.

Button  *Set parameter table*. Opens the editor table settings. Table of parameters used to select the group attribute values from a predefined list of values.

Button  *Show form editor*. Opens *Form Editor* to create a special dialog box.

Button  *save changes to database*. Saves the base group Construction Site 21.

In the right part of the window picture preview and a list of attributes for the group.

Editing attributes produced in the cells of the table.

Name	Description	Value	A...
Group ...	Name	New group	
massa	mass	0.05005	↔ m.
Name		Angle25 x 16 x 3 GOST	↔ N.

Adding attributes produced from the parameter list of objects in the group.

Expand the selected entry in the list (with the "+" next to the name of the object) and double click on the parameter, add an attribute in the table.

You can install a bidirectional relationship between the group and attribute parameter object that is associated with this attribute. The list of attributes in the column Attribute Properties, click the left mouse button on the icon .

Depending on the mode change bidirectional, it will indicate the icon . Thus, when the value of the attribute group, and the parameter of the object is changed.

Save the group of objects in the database by pressing the button  *save changes to database*. Choose a location and name for the group (the default group name matches the specified value attribute Group Name). Click *OK*.

Group created and saved to the database. Now you can insert multiple grouped objects in a drawing, resizing and positioning of objects, while preserving established parametric and geometric constraints.

<b><i>Important!</i></b>	Group objects only retains information about dependencies between objects and attributes set. For insertion to be carried out correctly, you must have a database of all the objects in this group.
--------------------------	---

When working with a group of attributes of the various available methods for selecting values. In the context menu of the column *Properties attribute* in the attribute list, select:

Name	Description	Value	A...
Group ...	Name	New group	
Name		Angle25 x 16 x 3 GOST	

- Add property from object
- Set To Unique string
- Set to calculated field
- Automatically increment
- Set to simple field

- **Add property from object** - allows you to set the attribute value by linking it with an attribute value of another object in the drawing.
- **Set to unique string** - allows you to set the attribute-counter, which will increase its value by 1 for each subsequent inserted marker. In the Value column for the visible attribute counter must specify a character string - prefix. The drawing will be appended to the prefix value of the counter.
- **Set to calculated field** - allows you to set the attribute value using a mathematical expression, using references to other attributes of the marker and mathematical functions. In reference to another attribute marker use the name of the attribute recorded in braces.
- **Automatically increment** - allows you to set the attribute-counter, which will increase its value to 1, compared with the same attribute of the previous insertion marker. This attribute allows the counter-repetition of identical values for several markers that distinguishes it from the attribute set to a unique value.
- **Set to simple field** - sets the attribute type by default.

## Insert group

Insert group may be carried out as the *object manager* , and with a tool *insert group* .

Button  *Insert Group* toolbar *Library objects* opens a dialog *Box group* .

In the list of the group and press *OK* . If you insert a group of objects , you must specify the insertion point of the group. If you insert a group of dependencies , you need to select the drawing objects that you want to associate with the dependencies.

In the dialog box *Insert group* commands are available:

 *Create group* . Creates a new group.

 *Delete group* . Deletes the selected group from the database.

 *Select items from the drawing for the group* . Used to edit an existing or new group.

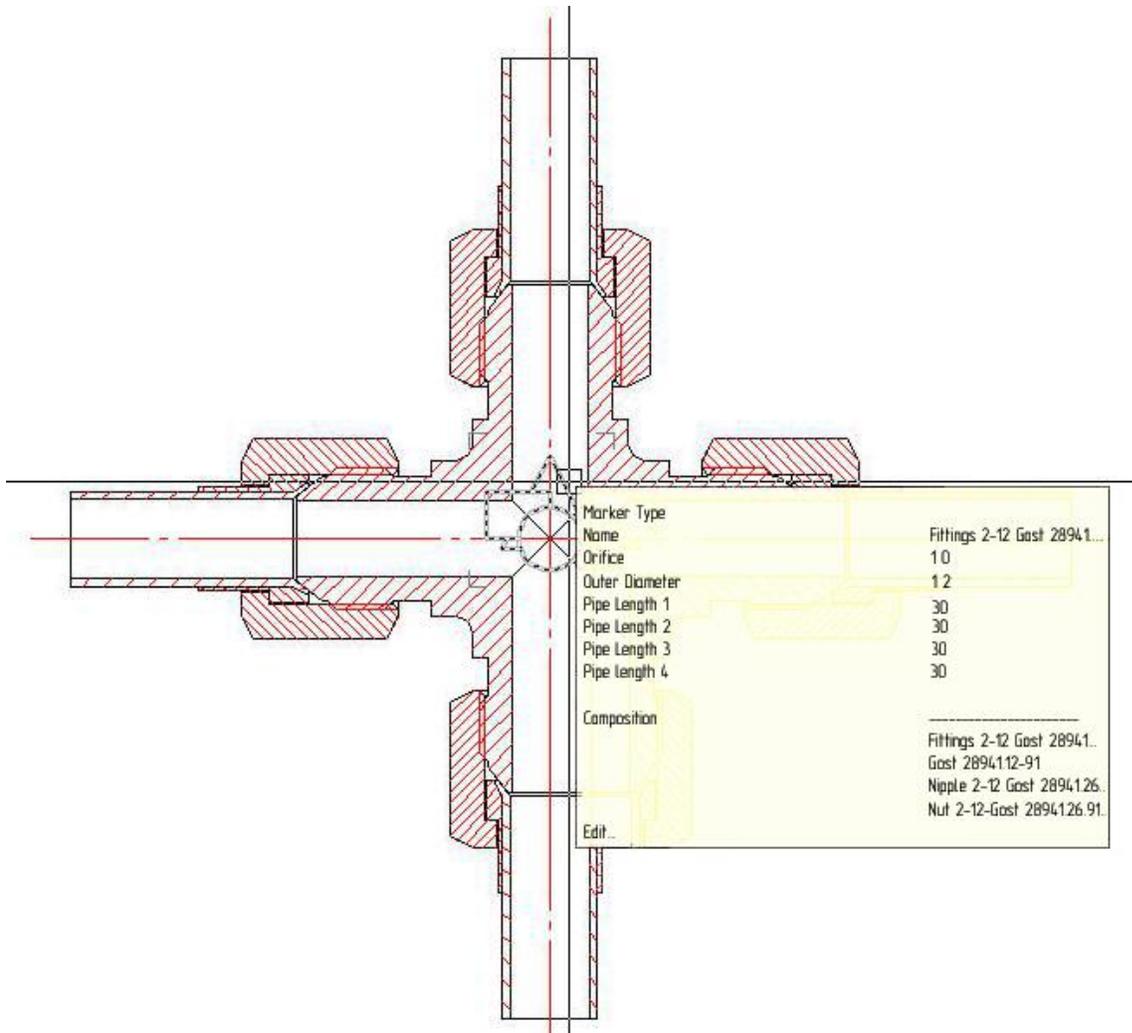
 *Detail groups* . Opens a list of groups of items.

 *Dependence group* . Opens a list of *groups dependencies* .

Switch *multiple* . Enables insertion of multiple groups in the drawing.

Switch *Add group marker* . If installed, together with a group of drawing a marker is added to the group.

*Marker group* is designed for group editing and data to other objects in the drawing (see *Binding arbitrary graphical and tabular data* ).



## Editing a Group

After you insert a group of objects in the drawing, or when the command to edit the marker group opens the edit dialog group.

 **Highlight group objects.** Highlights and centers on the screen objects in the group.

 **Edit marker Properties.** Includes editing mode, where you can change the set of objects in the group, add or remove attributes.

 **Object tree.** Enables and disables the object tree in the left pane.

 **Set parameters table.** This button is available if the group contains a table of parameters. In the dialog box, select the row attribute values, and click **OK**.

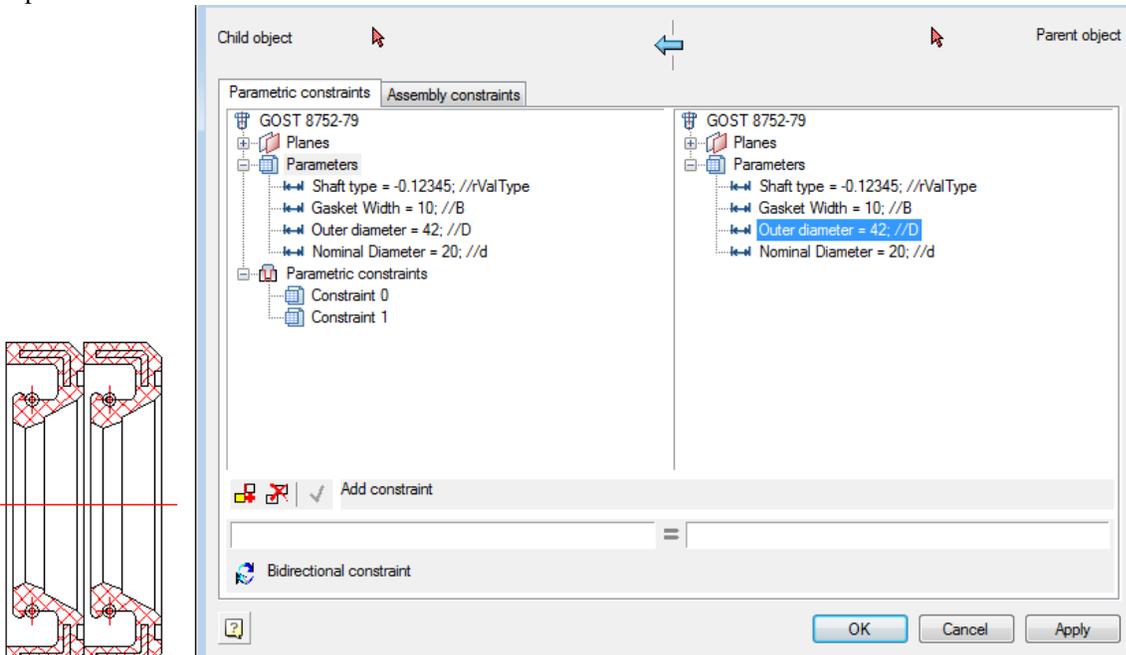
## Group dependencies

Group dependencies remain parametric description and assembly relationships between objects. When you insert such groups they are not added to the drawing objects, but only established the relationship between existing objects. Consider creating and maintaining relationships between the two cuffs.

<b>Important!</b>	Before you create a group, you must place the drawing objects to be included in the group
-------------------	---

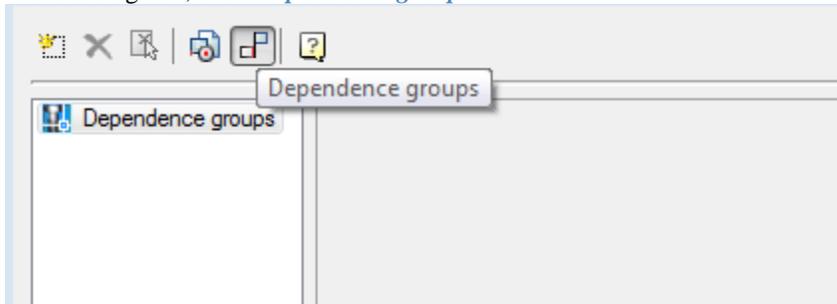
and set the dependencies between objects.

Insert the base of the two objects Cuff GOST 8752-79. Set between the geometric co-directional dependence *Combining axis and the plane* at a distance obj.B (see Constraints between two objects ) and the parametric dependence of the outer diameter.

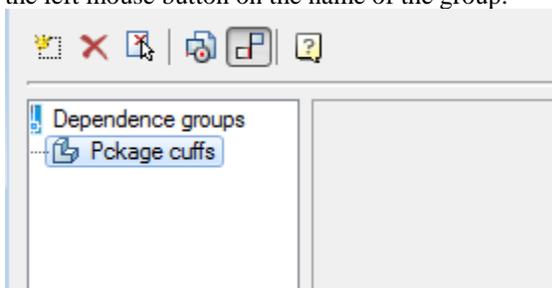


Select *Insert group*.

In the dialog box, click *Dependence groups*.



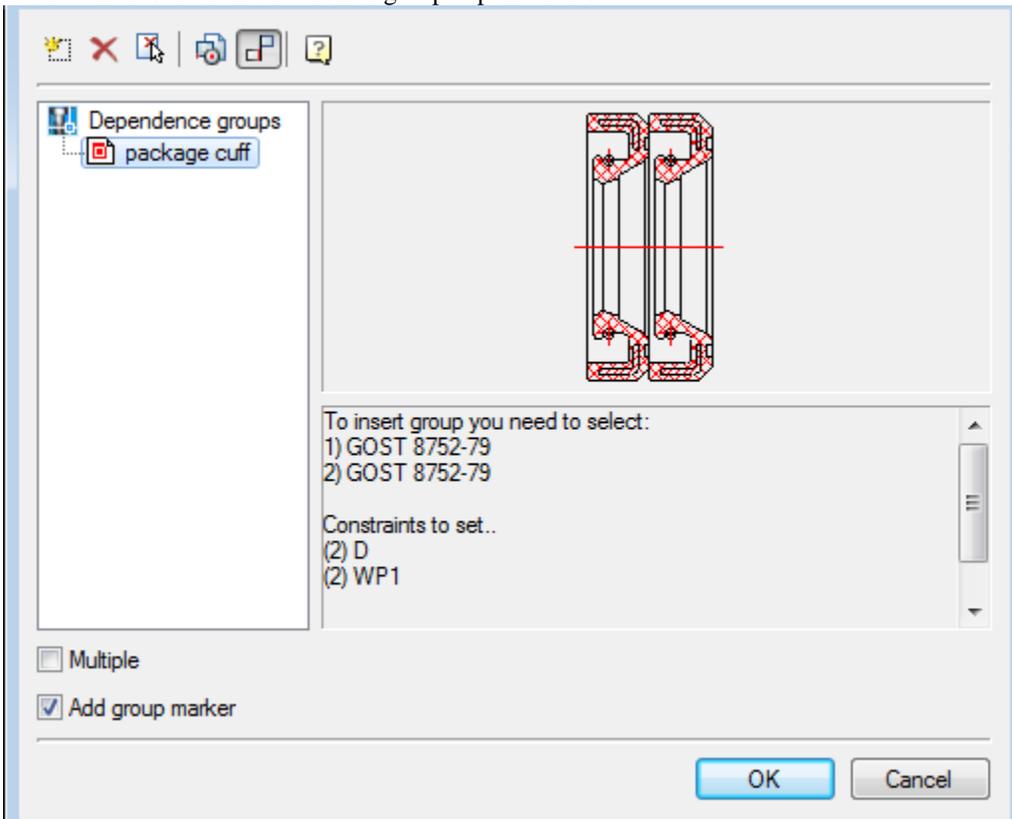
Button  Creates group. In the groups list, change the name of the new group (eg, "Package cuffs"). To edit, click the left mouse button on the name of the group.



Click  Select group details from drawing and select the drawing both cuffs. Press *Enter*. In the dialog box, *select the dependent* listed in the list established between objects. Click *OK*.

Name	Parent	Child	Bi	To	Dir	Constraint	From
Depend...	Cuff #20x42-1...	Cuff #20x42-1...		D		obj.D	D
Depend...	Cuff #20x42-1...	Cuff #20x42-1...		WP1		obj.B	WP1

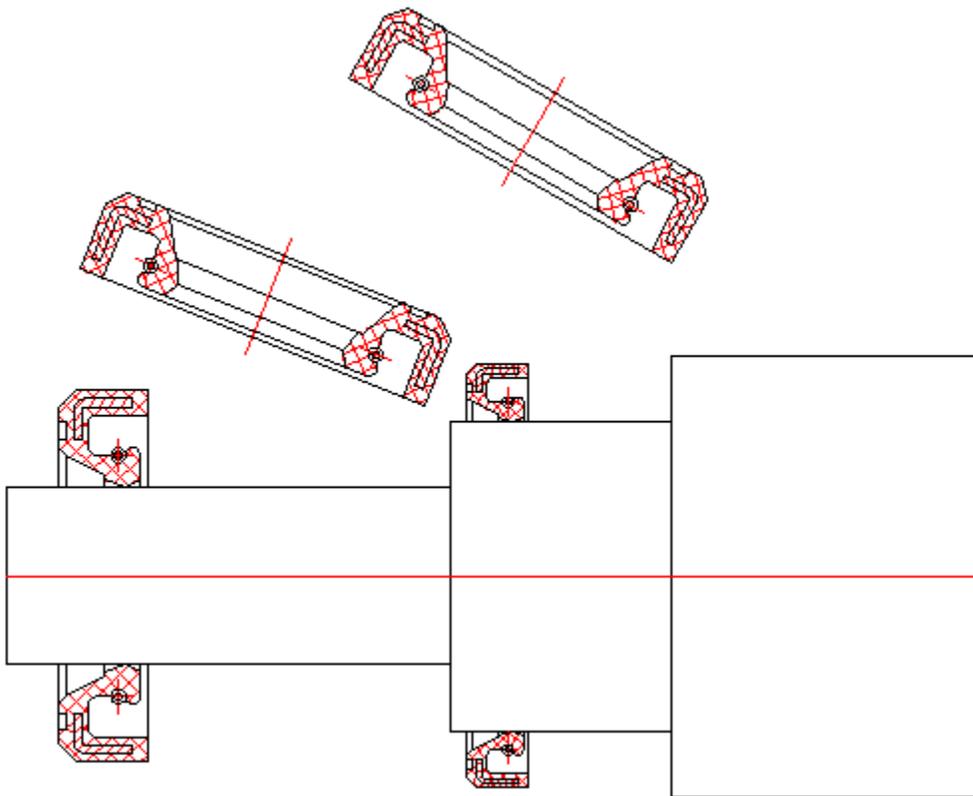
Look at the result of the creation of group dependencies.



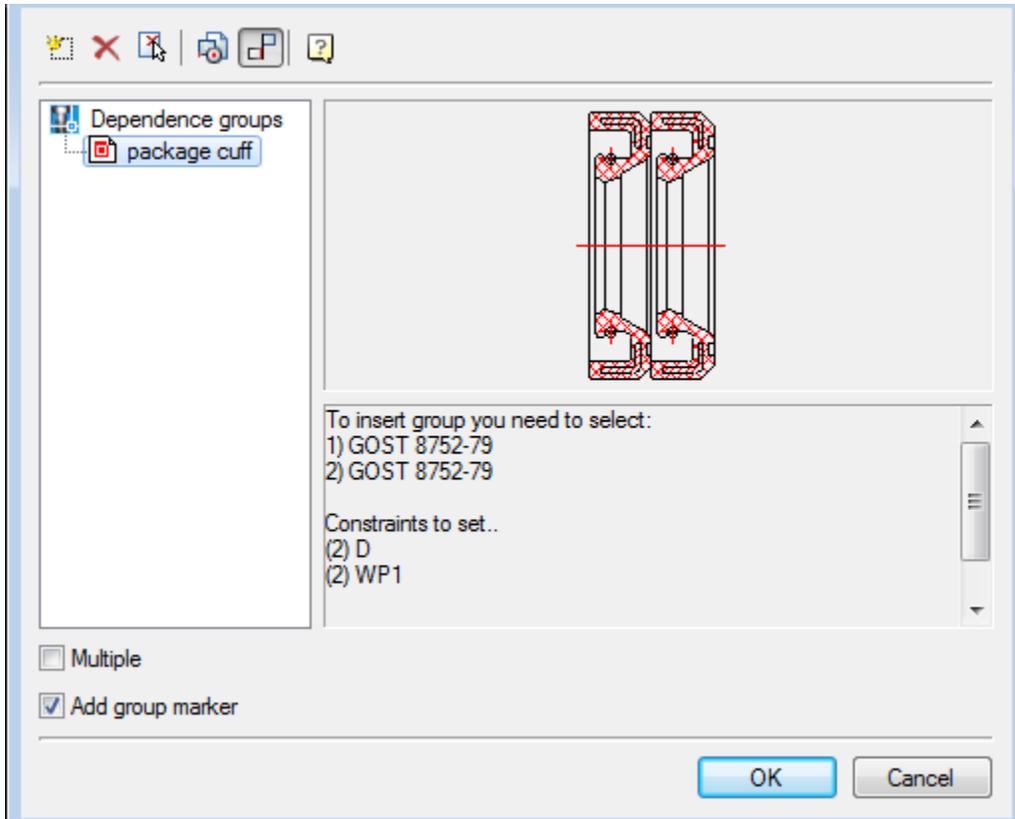
In the description of the group under the picture preview Set the selection order when inserting objects group dependencies.

Group dependencies are stored in the database automatically. Click Cancel to complete the group.

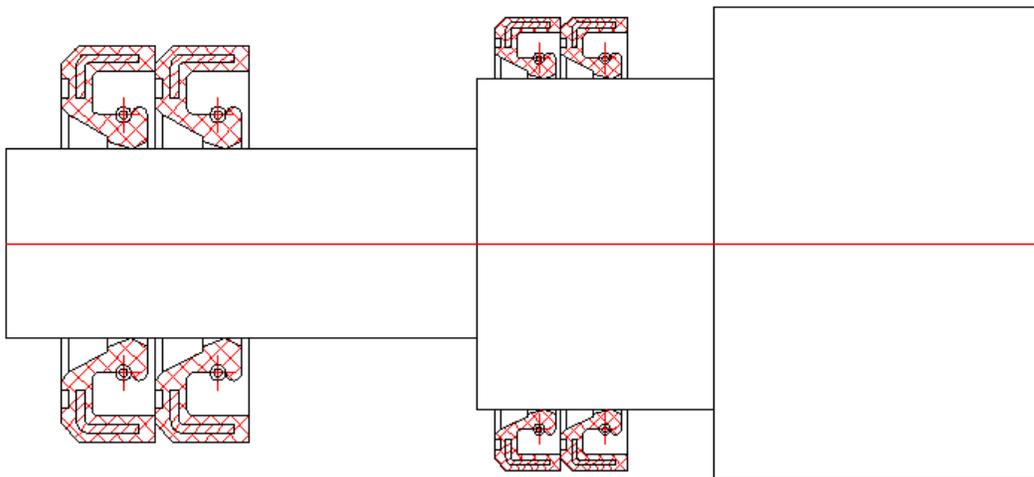
Insert a drawing of the base of the cuff, which must be applied to create a dependency.



Select *Insert group* , click *Group Dependency* . In the list of dependence " *Package cuffs.* " Click *OK.*



Select the drawing cuffs to be connected sequentially (in the example need to perform steps 10-11 twice).



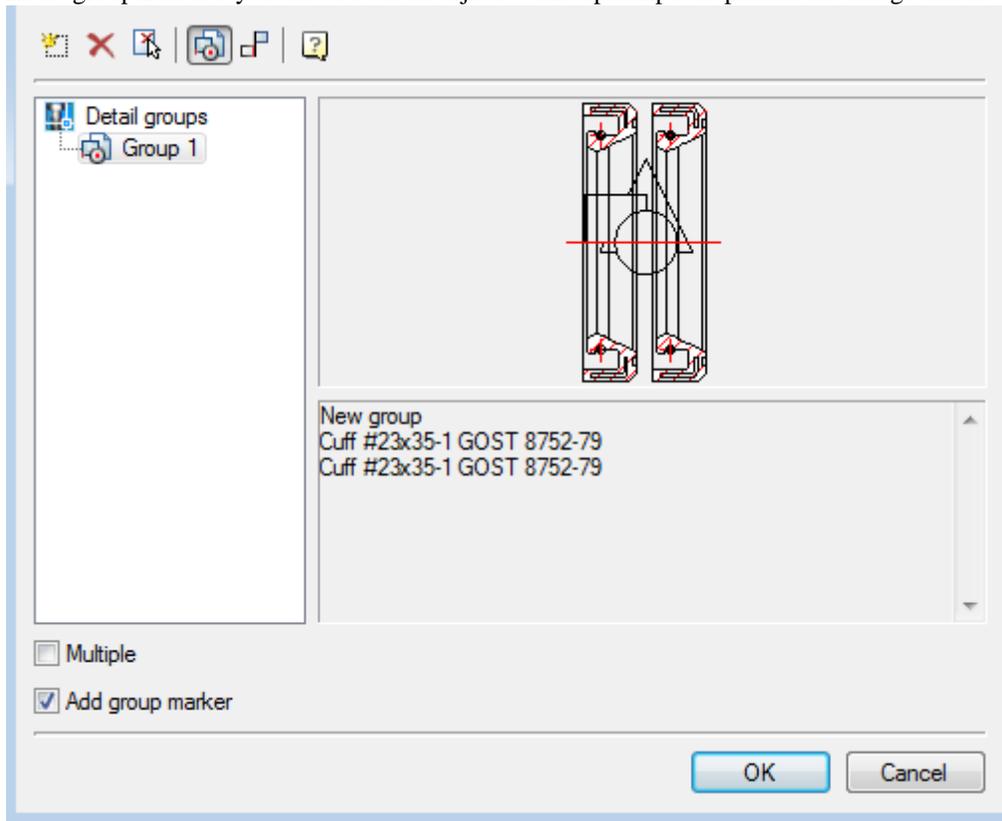
Automatically set dependence stored in the description of the group.

### Inserting Groups

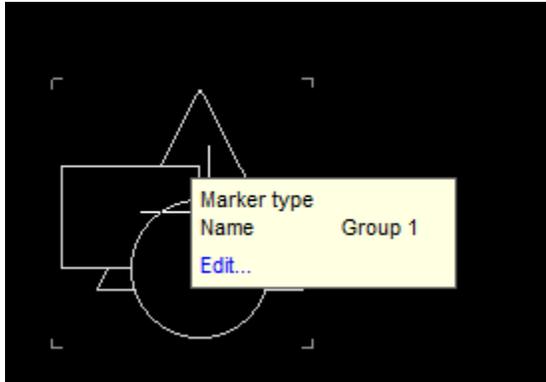
-  Main menu: *Construction - Library objects - Markers, Groups -  Insert group*.
-  Ribbon: *Construction - Library objects -  Insert group*.
-  Toolbar:  *Insert group* ("Library objects").
-  Command line: *SPINSERTGROUP*.
-  Library: *Groups*.

### Command Options

Insert group Box lets you create a set of objects with superimposed parametric and geometric constraints.



-  Create group
  -  Deleting Group
  -  Select group details from drawing
  -  Switch between groups of objects and dependencies
- The mechanism used in the *team group insert* , you can insert a group of objects

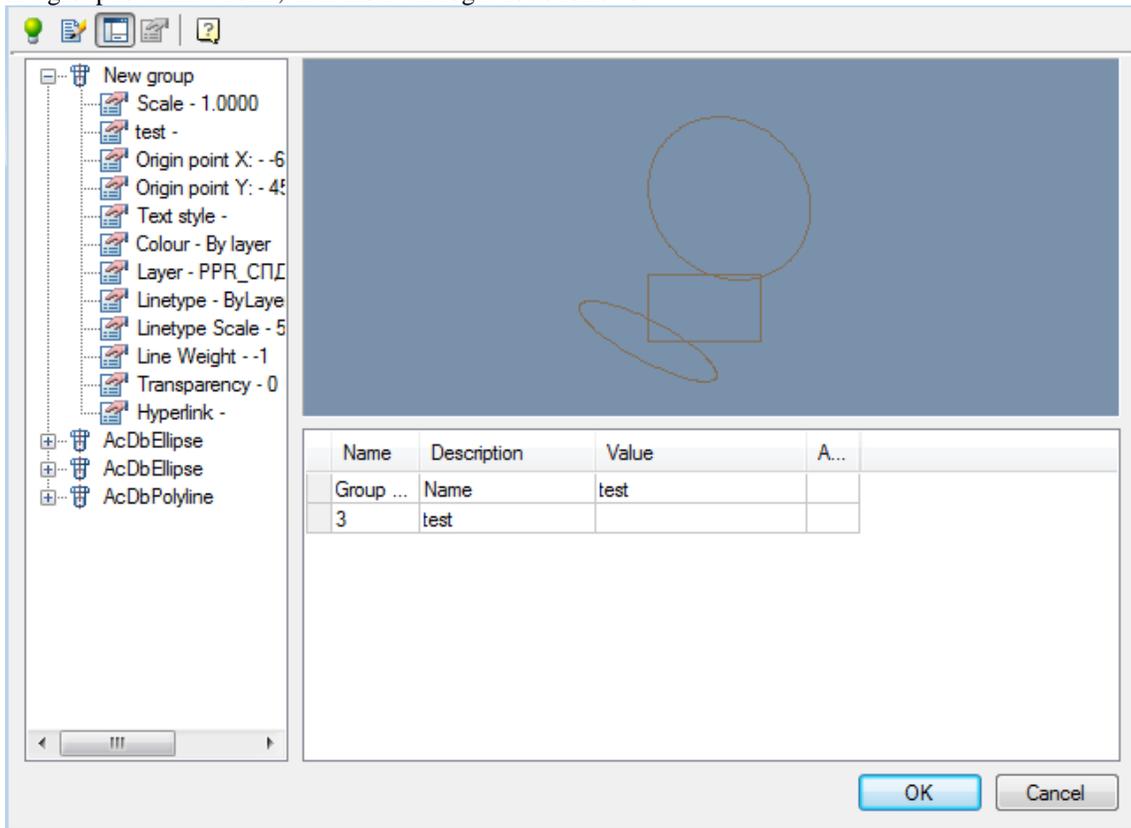


The "Add marker group" enables the group a graphic element - a marker located at the insertion point of the group. In marker may include parameters of individual parts group that can help you when pasting automatically change the geometry of related components.

"Multiple insert" allows you to create multiple copies of the selected group.

If a user group has been maintained by the standard in the folder \$\\MCS\\Groups, then insert it in the tree by choosing the object manager.

If a group is defined form, then insert dialogue is as follows:



- The dialog box includes a tree of groups - a list of objects and their parameters group. This tree can disable button 
- The preview window group
- Form input values group

When you click on  you can switch to edit mode group settings.

## Universal marker



Main menu: *Construction - Library objects - Marks and groups - Add marker.*



Ribbon: *Construction - Library objects - Add marker.*



Toolbar: "Library objects" - *Add marker.*



Command line: *SPCREATEUMARKER.*

The "Marker" tool is designed specifically to create a connection between an arbitrary graphic object (primitive) nanoCAD and a spreadsheet-specification. A universal marker is a translator of data from drawing objects into the Construction 21 table by means of special means - marker attributes.

Marker attributes can be visible or hidden. The values of the visible attributes are displayed in the drawing as text strings.

The marker, as an object Construction 21, can be saved in the object library and used repeatedly. The marker can also be included in the groups of objects Construction 21, providing the ability to specify the entire functional groups.

### Create marker

Let's consider creating a marker in the form of a positional leader.

1. Set the required current scale.
2. Insert two text lines into the drawing and draw a horizontal line between them.

**\$ Position**

**\$ Marker**

These objects will form a leader shelf template with two text labels. To use text strings as marker attributes, the first character must be "\$".

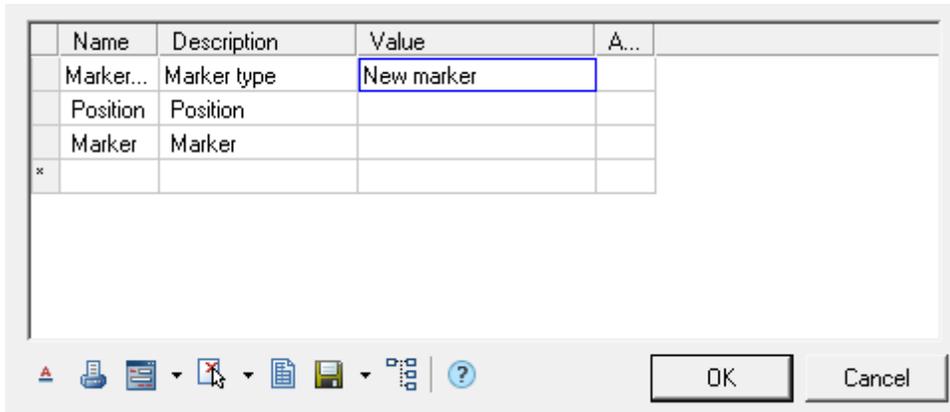
3. Call the command *Add marker*, use a box or crossing box to select the objects that made up the marker.



4. Snap the base point of the marker.



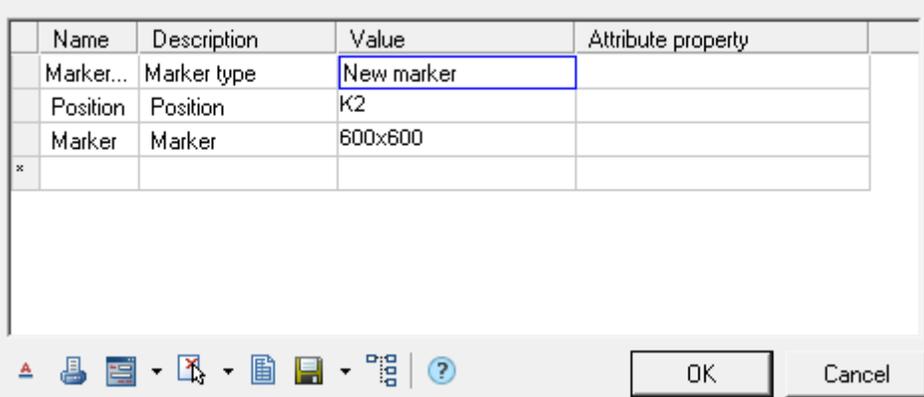
5. The "Creation of a marker" dialog box appears. The properties table will list the attributes entered in the callout text boxes:



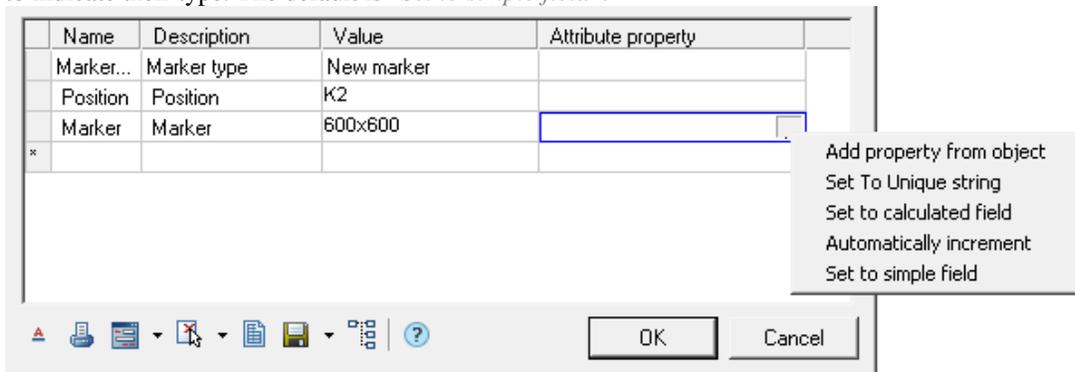
Column "Name" contains the working name of the attribute.

Column "Description" describes the attribute.

In column "Value" the values of the attribute are entered. Values can be either numeric or text. Auxiliary commands are available in the [context menu](#) of the "Value" column.



Column "Attribute property" is used to indicate the type of the input attribute. Various attribute labels are provided to indicate their type. The default is "Set to simple field".

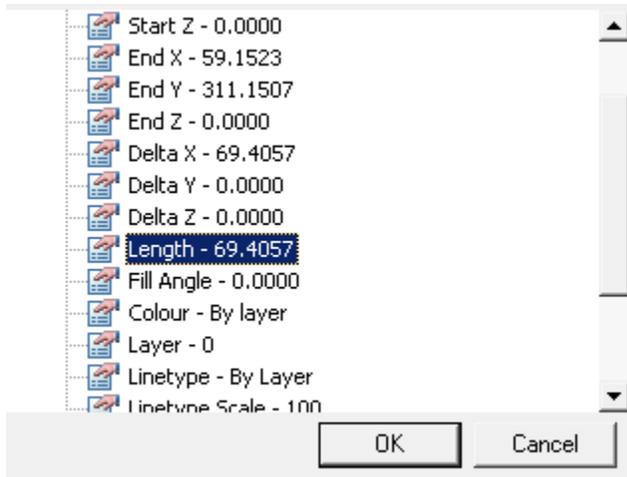


Attribute types:

- *Add property from object* - allows you to set an attribute value by associating it with the attribute value of another object in the drawing.

**Important!** An object is understood as an object from the base of standard products.

After choosing the type, it is suggested to select the object and the object attribute.



After selecting an attribute, its value falls into the "Value" column, and in the "Attribute property" column the name of the selected attribute.

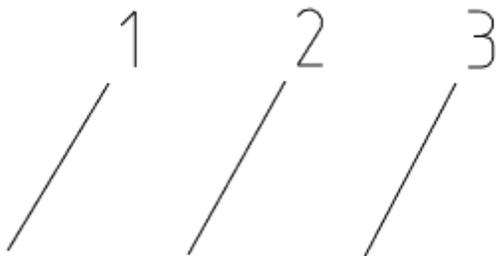
Name	Description	Value	Attribute property
Marker...	Marker type	New marker	
Position	Position	K2	
Marker	Marker	69.405711111957	Length
*			

After assigning an attribute, you can change the type of relationship with an object attribute:

- One-way communication - changing the value in an attribute of an object affects the value of the marker.
- ↔ Two way communication - changing the value in the marker affects the attribute of the object, and vice versa.
- 📁 Basic communication - an attribute of an object can only be changed from a marker. If the attribute is a table value in a basic relationship, the closest value from the table is displayed. The entered value will be displayed in brackets.
  - *Set To Unique string* - allows you to set a counter attribute that will increase its value by 1 for each subsequent inserted marker. In the "Value" column for the visible counter attribute, you can specify a character string - a prefix. In the drawing, the counter value will be appended to the prefix.

Name	Description	Value	Attribute property
Marker...	Marker type	New marker	
Position	Position	K2	
Marker	Marker	69.4057111111957	+1 ...

\* [Toolbar icons] [OK] [Cancel]



- *Set to calculated field* - allows you to set the value of an attribute using a mathematical expression, using references to other marker attributes, operators, and mathematical functions. The name of the desired attribute is used as a reference to another marker attribute.

**Note:** Computed attributes are defined and calculated from top to bottom.

**Important!** Calculations are performed in curly braces.

Function:

Name	Description	Value	Attribute property
Marker...	Marker type	New marker	
Position	Position	9	
Marker	Marker	{sqrt(4)}and{sqrt(Position)-1}	[Copy icon]

\* [Toolbar icons] [OK] [Cancel]

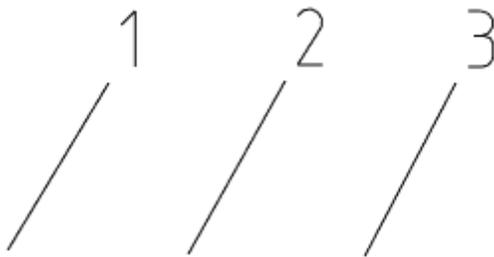
Result:

Position	Position	9	
Marker	Marker	2and2	

- *Automatically increment* - allows you to set a counter attribute that will increase its value by 1 compared to the same attribute of the previous inserted marker. Such a counter attribute allows repetition of the same values for several markers, which distinguishes it from an attribute set to a unique value.

Name	Description	Value	Attribute property
Marker...	Marker type	New marker	
Position	Position	K2	
Marker	Marker	69.405711111957	+1 ...

\* 



- *Set to simple field* - sets the default attribute type to plain text.

**Note:** Attributes included in the block can be included in the marker attribute table nanoCAD!

6. Edit the marker using the marker controls at the bottom of the dialog box.

Include:

- *"Marker draw mode"*. When you click on this button, a drop-down list of rendering modes appears:
  -  Simple marker.
  -  Draw position line.
  -  Linear align.

When you select the display method with the addition of a leader line, an additional button  "Arrow Type" appears to select the type of arrow:

Click this button and select the desired extension line arrow type.

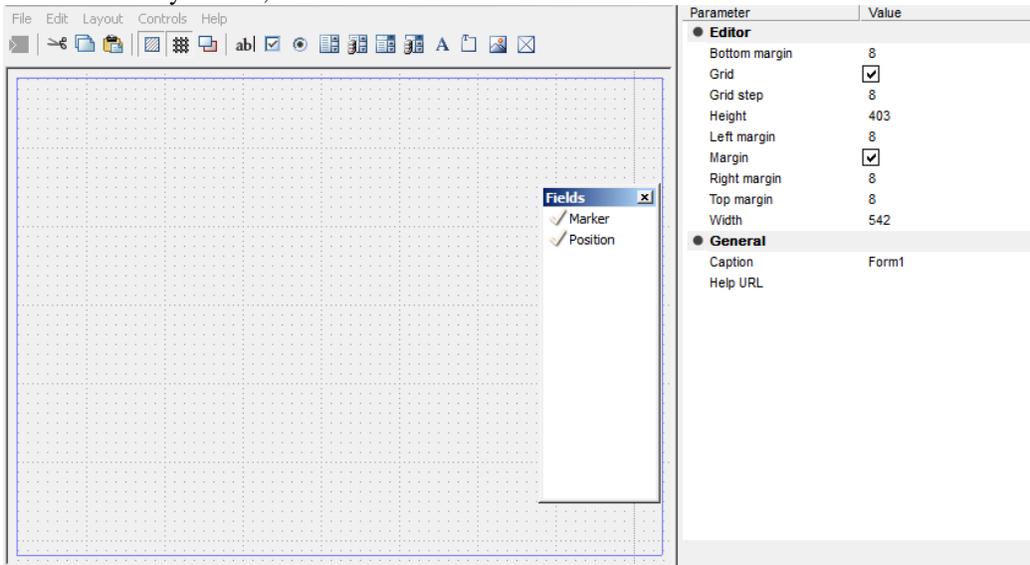
Arrow display parameters are defined in the ["Settings - Symbols - Extension - Additional extension lines"](#) settings.

-  "Unplotted". When this button is enabled, the marker is placed on a special layer that is not displayed when printing. When this mode is activated, the icon on the  button changes and the marker is displayed in gray on the screen (in accordance with the color of the non-printed layer).
-  "Show form editor" - calls the custom form editor to create a dialog for working with marker attributes.

The following commands are available in the drop-down menu:

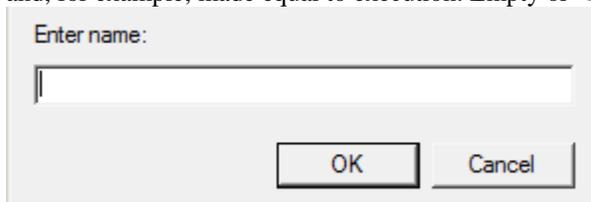
"Edit Form". Open [Form Editor](#).

"Add Form". Adds additional forms, while the marker can change the appearance of the form, by condition or by the user's choice. By default, the marker has one form.



The form editor uses standard Windows form generation technology. The toolkit consists of three blocks - the graphic editor area, the toolbar with form objects and the properties window of the inserted elements. For inserted fields, the "Field Name" ("Variable") can be selected from the list of existing marker description fields. In this case, the default field value is equal to the field value in the marker description.

When adding a second form, you are prompted to enter a name for the form. The variable *Tag - mcFormName* is added to the properties table. This variable is responsible for the name of the form, it can be set in a calculated field and, for example, made equal to execution. Empty or "Main" is considered the main form.



-  "Geometry". Used to change the appearance of the generic marker and define the insertion point.

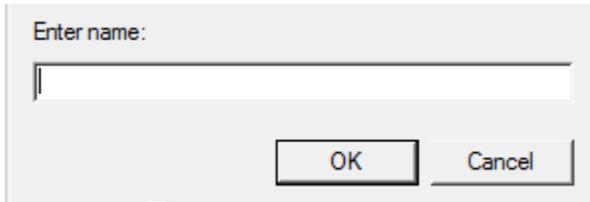
The following commands are available in the drop-down menu:

*Get new geometry*. The button is used to change the appearance of the universal marker and define the insertion point.

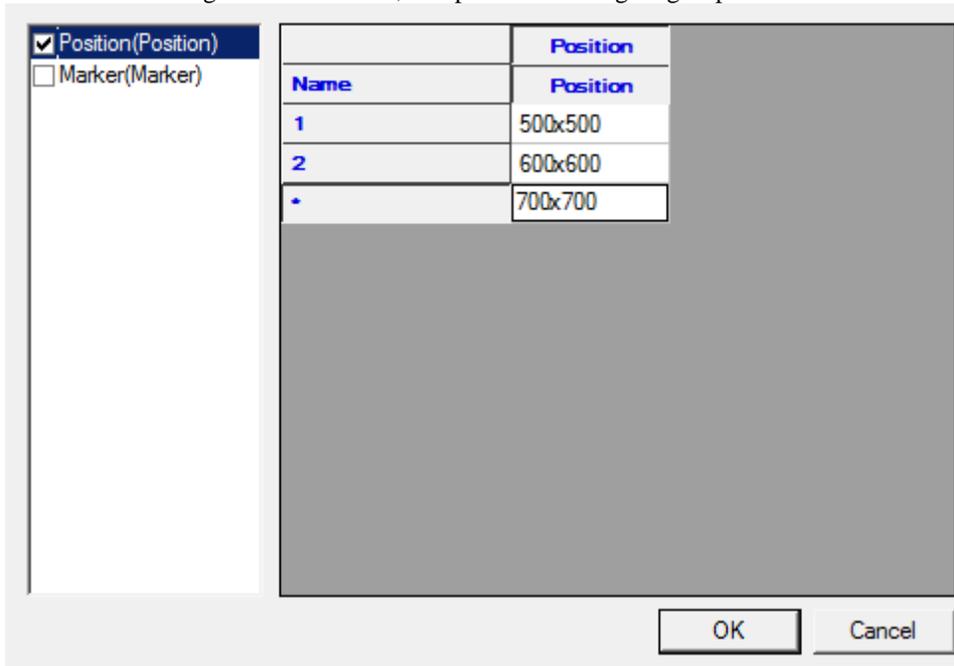
*Export marker source graphics*. Exports marker geometry to a file.

*Add Implementation*. Adds additional performances, while the marker can change its appearance, by condition or by the user's choice.

When creating a new implementation, you are prompted to enter its name. When adding implementation, the *Tag - mcImplementation* variable is added to the properties table. This variable is responsible for the name of the current marker implementation. It can be set to a calculated field or linked to a list on a form. Empty or "Main" is considered the main implementation.

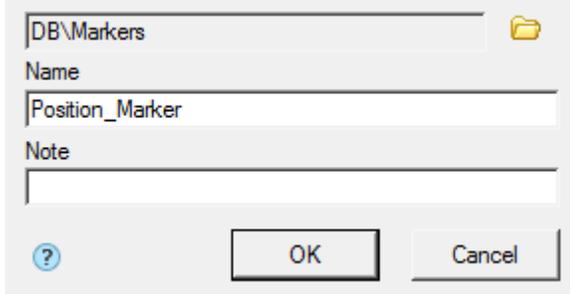


-  "Set parameters table". Opens the marker parameter table editor. When inserting a marker and having a table of values, it is possible to assign a group of values to the marker attributes.



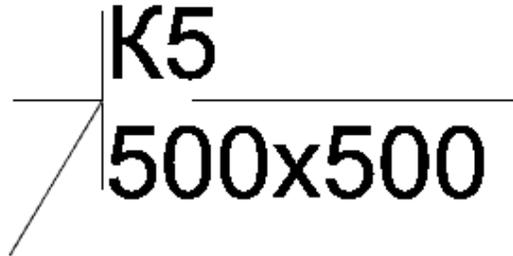
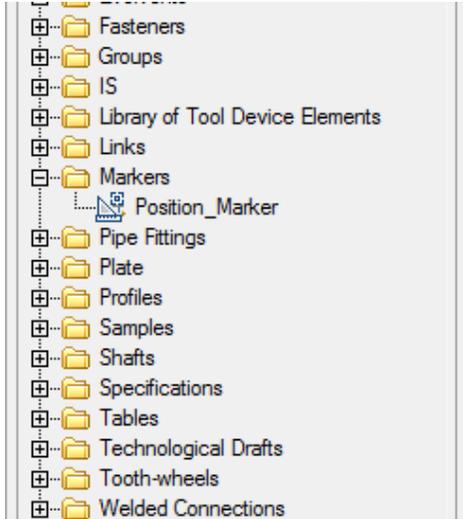
In the list, select the parameters whose values will be selected from the table. In the right part of the window, enter the required number of lines with values. Close the dialog with the "OK" button.

-  Save changes to odatabase. The button is intended for writing a marker to library Construction 21.
  -  Apply changes to all markers of this types. Applies changes to all markers of this type in the drawing. Serves for changing the marker template for all markers made according to this template and inserted into the drawing.
7. If necessary, add any number of hidden attributes, filling in the rows of the table in sequence. The attribute is added in the bottom line of the table, marked with an "\*" symbol.
  8. For future use of the marker, save it to the database as a named object.



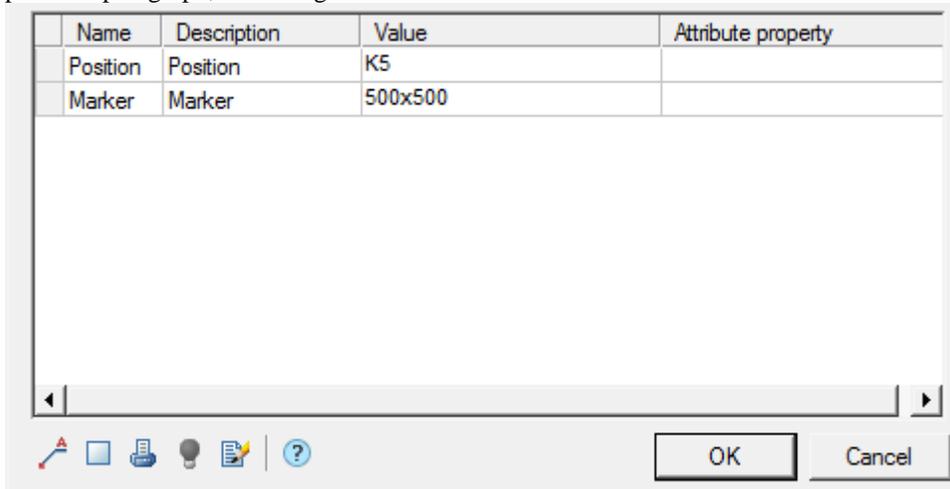
In the "Create element" dialog box, specify the path to save, the name of the object and the note (for more information on working with the object base, see [the Construction 21 Object Manager](#)). After you save the marker, a message appears prompting you to update the existing copies of the marker in the drawing.

- Construction 21 makes it possible to immediately apply the created marker. The command line prompts you to install the generated token. Pick an insertion point in the drawing. Identical markers can be simply copied in the future. In other cases, the marker is inserted directly from the base.



### Edit marker

Editing of a marker is carried out in a dialog box, the title of which corresponds to the name of the marker. For example, when you call for editing the "Position\_Marker" marker, the creation of which was described in the previous paragraph, the dialog box will look like this:



Additional commands are located at the bottom of the window:

- "Marker draw mode". When you click on this button, a drop-down list of rendering modes appears:
  - Simple marker.
  - Draw position line.
  - Linear align.

When you select the display method with the addition of a leader line, an additional button  "Arrow Type" appears to select the type of arrow:



Click this button and select the desired extension line arrow type.

Arrow display parameters are defined in the "[Settings - Symbols - Extension - Additional extension lines](#)" settings.

- "Unplotted". When this button is enabled, the marker is placed on a special layer that is not displayed when printing. When this mode is activated, the icon on the button changes and the marker is displayed in gray on the screen (in accordance with the color of the non-printed layer).
- "Highlight info source object". Highlights in the drawing the object with which the marker is associated (The function is available if the "Add property from object" mode is set for one or several attributes and the corresponding object was specified when inserting the marker).
- "Edit marker properties". Turns on the edit mode, in which you can change the appearance of the marker, add or remove attributes.

### System variables in marker

mcImplementation - Execution management. Empty or "Main" means the main view.

mcFormName - Form management. Empty or "Main" means the main form.

mcArrowSize - Arrow size control.

mcDefLayer - Controls the marker location layer. The "Value" field contains the name of the layer.

mcShowFormOnInsert - Controls the display of the dialog when inserting. If the value is 0, the dialog is not shown when inserting. The value can be calculated.

### Template Wizard



Main menu: *Construction - Library objects - Markers, Groups - Template wizard.*



Ribbon: *Construction - Library objects - Template wizard.*



Toolbar: *Template wizard* ("Library objects").

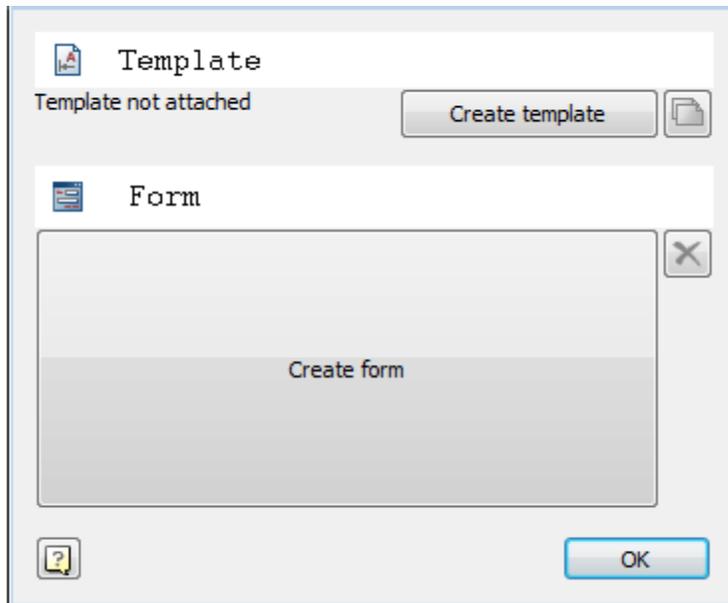


Command line: *SPTWIZ.*

Template Wizard is designed to create easy to use tools of commonly used design elements drawing.

### Basic rules

When the command will be asked to select an object to create a template. If the object was preselected, then immediately start dialogue Template Wizard.



### **Command Options**

Button *Create template* - creates a template in the database or applies the changes made in the editor.

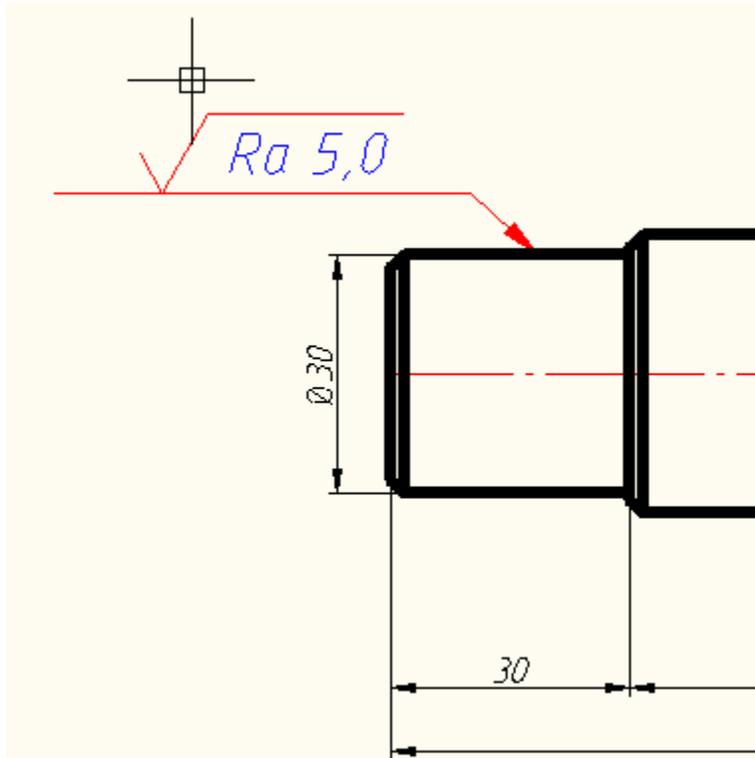
Button *From* - Starts the form template.

Button  *Create a new template* - Creates a new template in the database based on the selected graphics and created form.

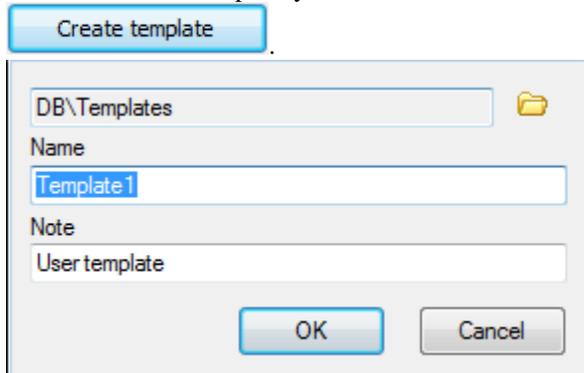
Button  *Delete form* - deletes the created form template.

### **Example of creating a template**

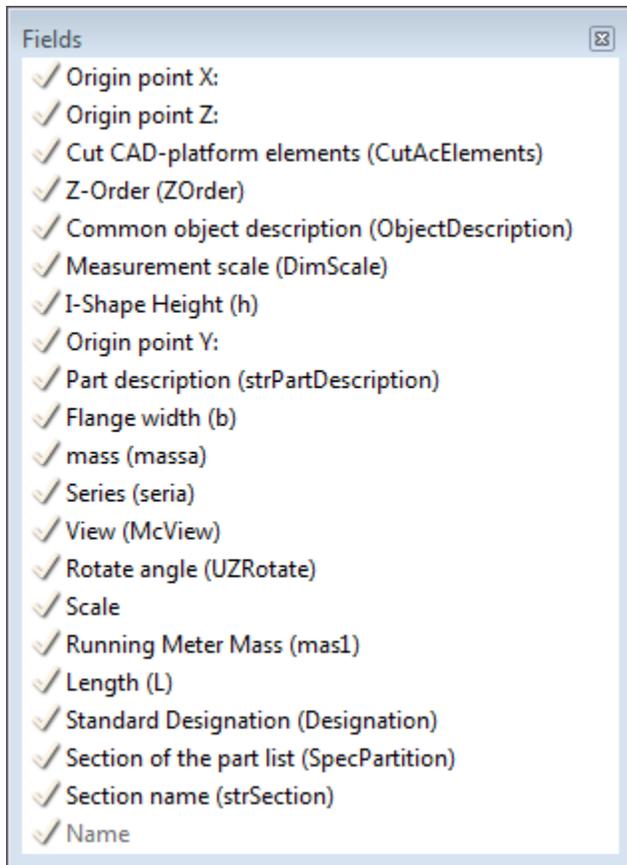
Consider the example of creating a template signs of roughness. To do this, the drawing shall bear one designation:



After you run the Wizard Templates chosen designation roughness.  
To work with the template you must save it in the database that will be invited to do by pressing the button

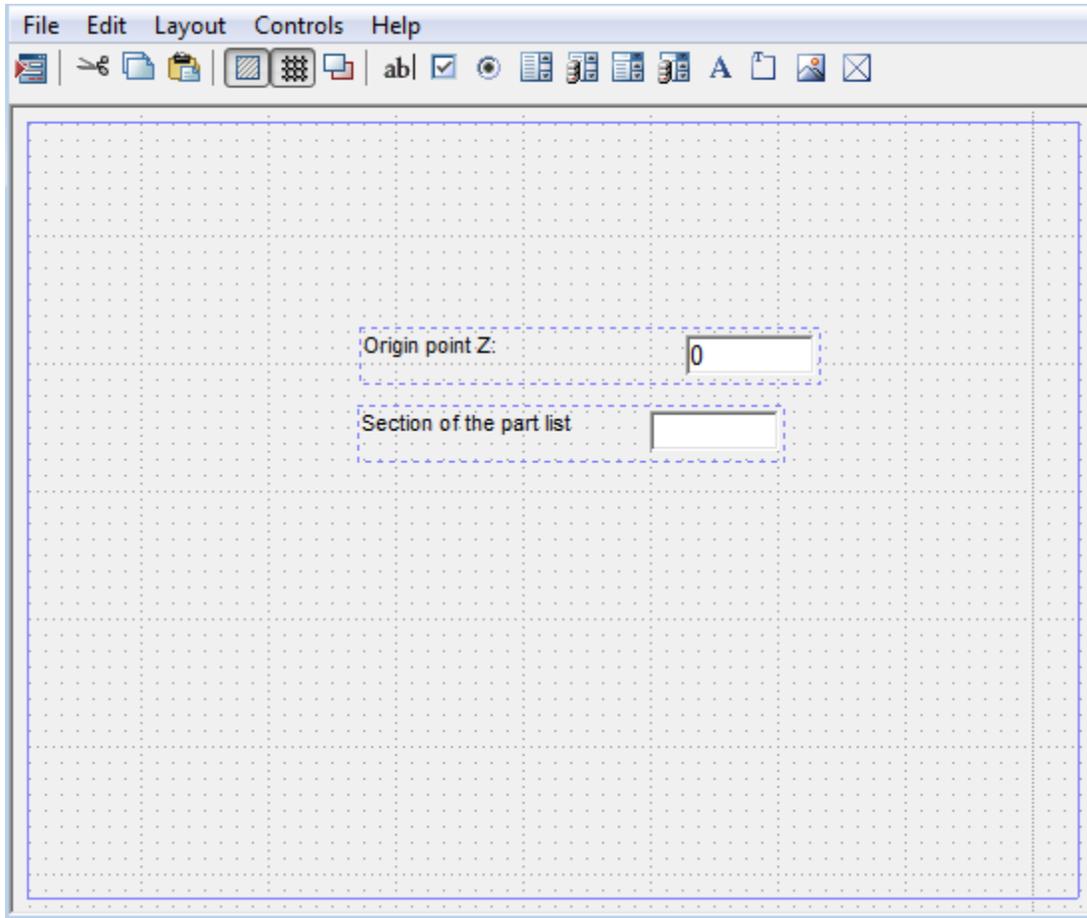


Then click on the *Create a form* and create a form using the notation tools online forms.  
For example, we can take two parameters - the first line designations and direction of irregularities. Both parameters are added to the form as a combo box (drag while holding Ctrl).

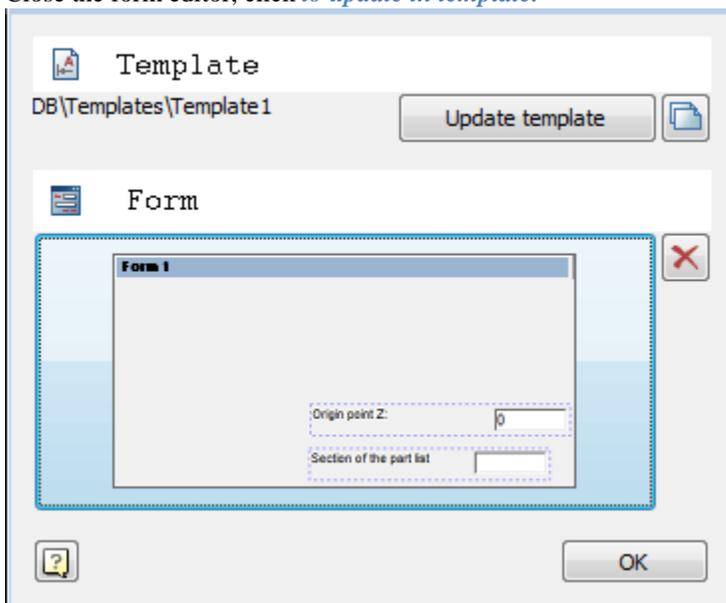


Edit	Ctrl+E
Check box	Ctrl+H
Radio button	Ctrl+R
List view	Ctrl+L
DB-Listbox	
Combo box	Ctrl+M
DB-Combobox	
Text label	Ctrl+T
Group box	Ctrl+G
Image	Ctrl+I
Panel	

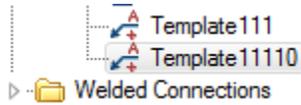
After editing, we obtain the form of the following form:



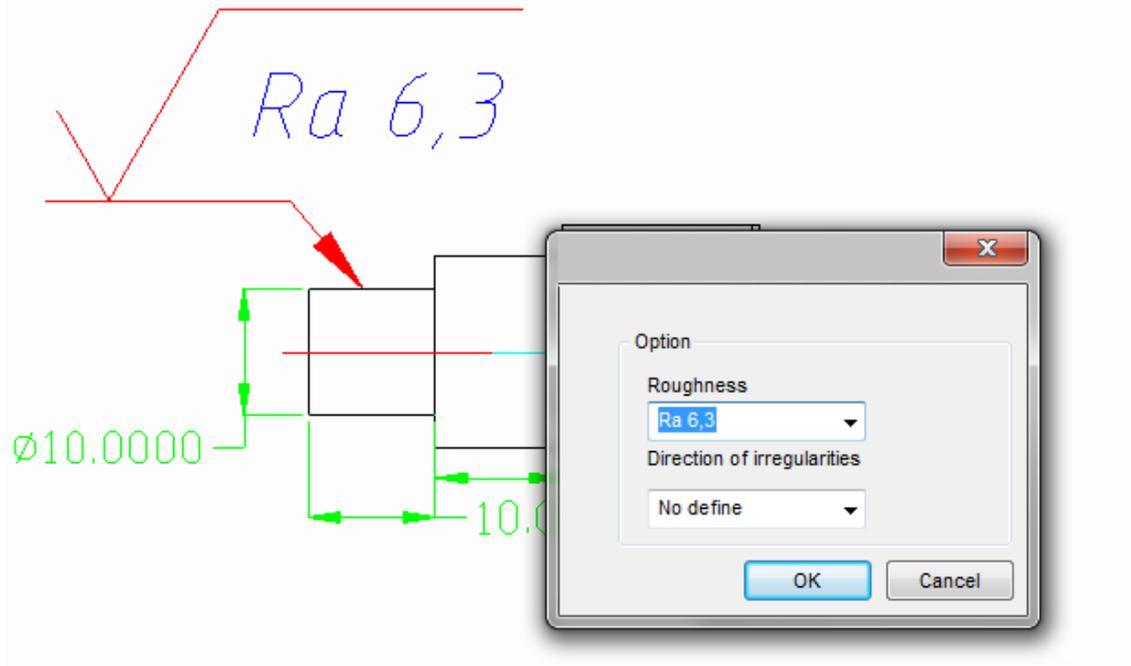
Close the form editor, click *to update in template*.



Template will be saved in the database and will be displayed in the object manager.

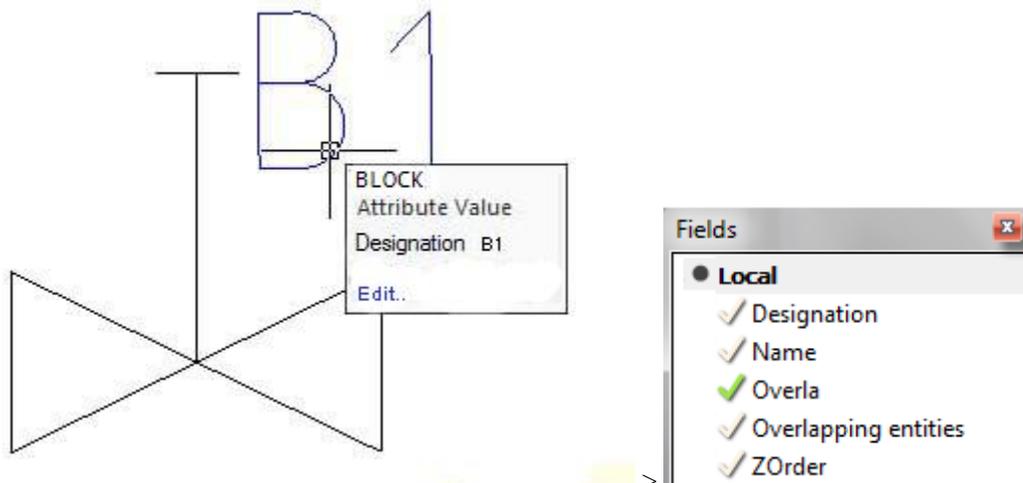


Now when you insert from the database will be able to also place the designation of roughness on the shelf line-outs, but when you edit your form will appear:

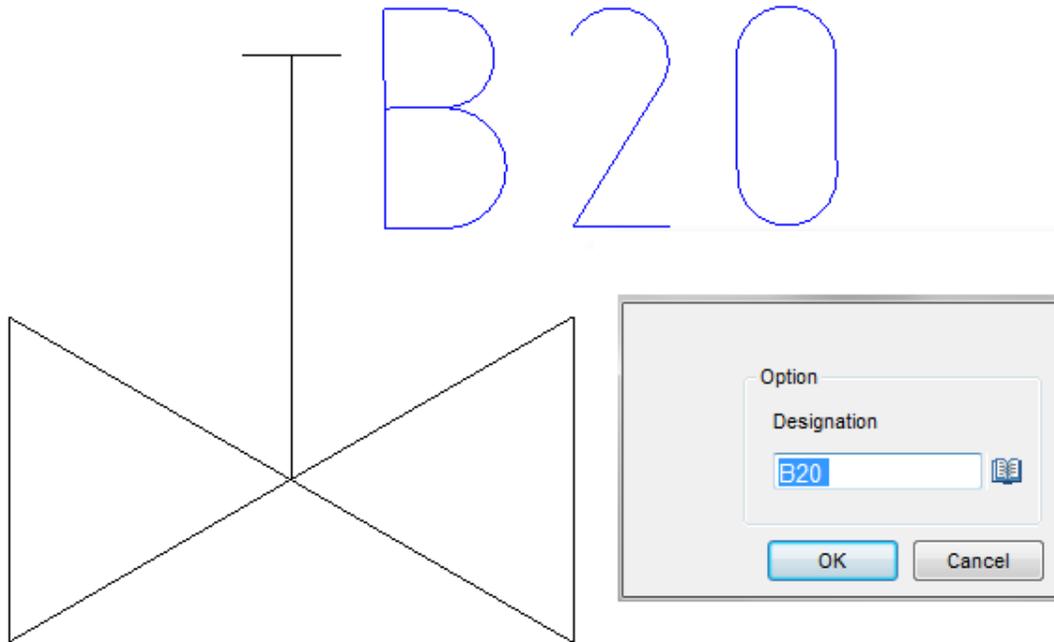


### Editing blocks nanoCAD

If the original graphics selected block nanoCAD, its attributes are also displayed in the form editor as available variables.



When creating a form in the database and maintaining such a block is inserted into the drawing as a block of the same source, only the attributes can be set up via a custom form.



## Control overlapping objects

### Change hidden mode



Main menu: *Construction - Library objects - Cover - Change hidden mode.*



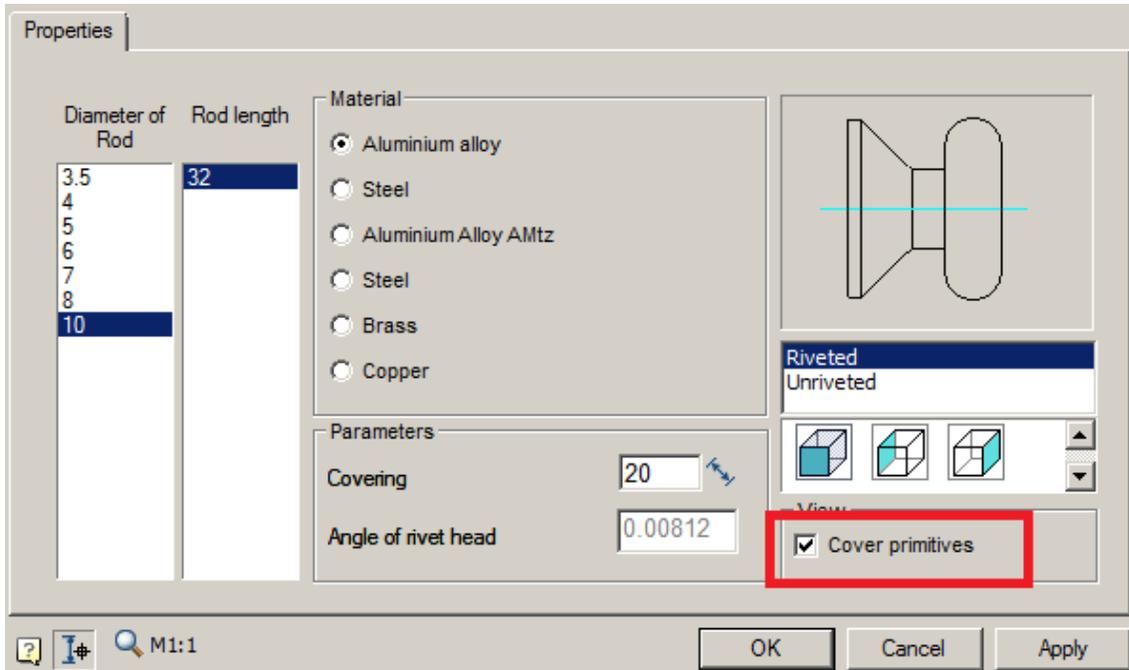
Toolbar: *Change hidden mode* ("Library objects").



Command line: *SPCHCOVER.*

The command switches the display mode of hidden lines.

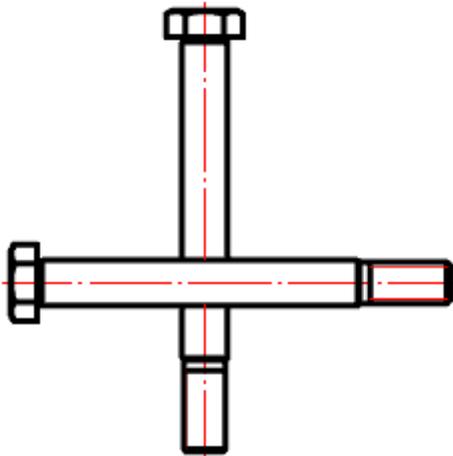
Construction 21 allows you to hide individual graphics elements. The overlapping nature of the base object or user block is determined by a special parameter - the overlap level *ZOrder*. *ZOrder* - this is a numeric parameter whose value determines the overlap priority. An object with a large *ZOrder* value overrides an object with a lower value. Primitives nanoCAD have the lowest overlapping level and therefore are always overlapped by objects from the database. That at an insertion of object Construction 21 objects nanoCAD did not overlap, it is necessary to disable the switch in the object insert dialog "*Cover primitives*":



The area in the drawing that the base object covers Construction 21, is called "*Contour of suppression*". An overlap exists within this contour.

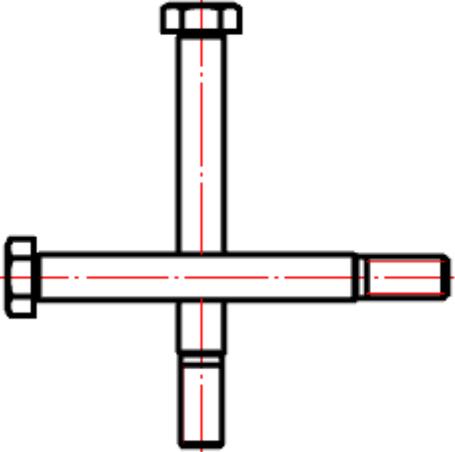
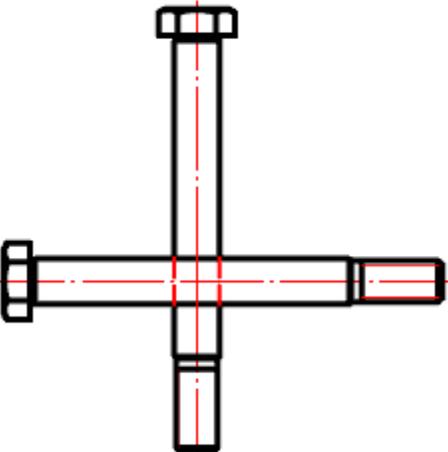
**Procedure**

1. Call command.



2. In the context menu, select the desired view of the overlapped objects "*Normal*", "*Dotted*" or "*Switch*".

<b>Normal</b>	<b>Dotted</b>	<b>Switch</b>
---------------	---------------	---------------

Normal	Dotted	Switch
		<p>The command appends the value. Those. If a normal overlap has been established, then the dashed line becomes, and vice versa.</p>

3. Select the secant frame for the objects for which you want to change the overlapping mode.
4. Repeat if necessary items 2 and 3, or complete the command on the key "Enter".

### Regenerate suppression contours



Main menu: *Construction - Library objects- Cover -  Regenerate suppression contours.*

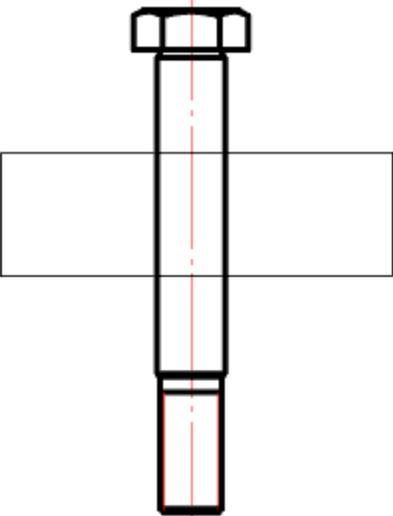
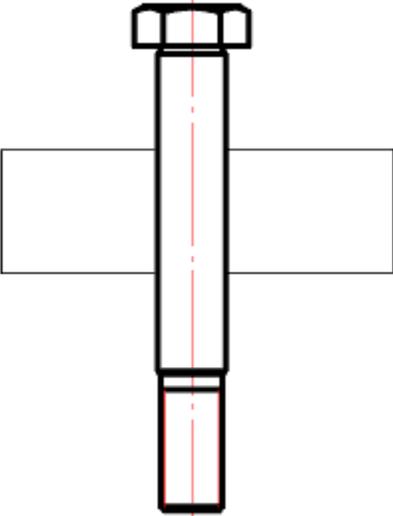


Toolbar:  *Regenerate suppression contours* ( "Library objects").



Command line: *SPCOVER.*

Regenerate the drawing and redraw the contents of the current viewport.

Before	After
	

## Move up



Main menu: *Construction - Library objects - Cover - Move up*.



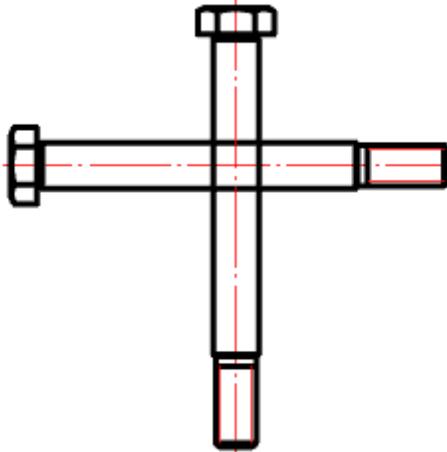
Toolbar:  *Move up* ( "Library objects" ).



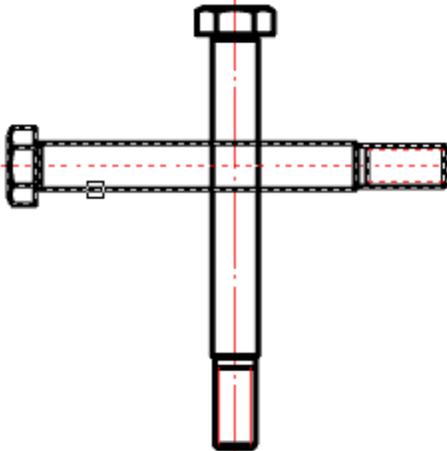
Command line: *SPMOVEUP*.

### Procedure

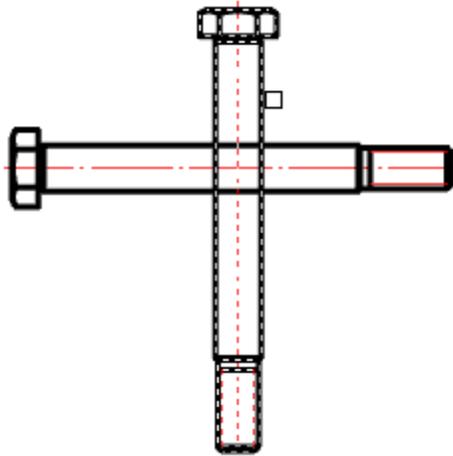
1. Call command;



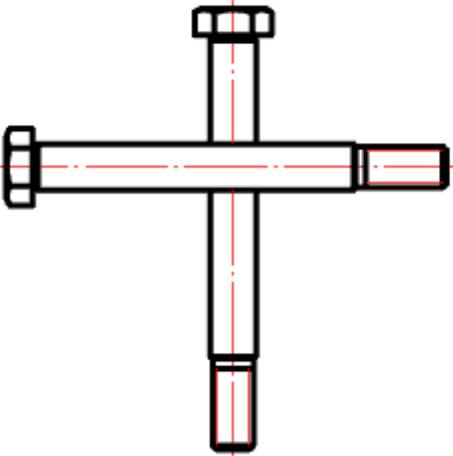
2. Select the objects you want to move up;



3. Select the objects to be compared;



4. After the selection is complete, the objects that need to be moved up will automatically increase the overlap level (ZOrder).



## Move down



Main menu: *Construction - Library objects - Cover - Move down.*



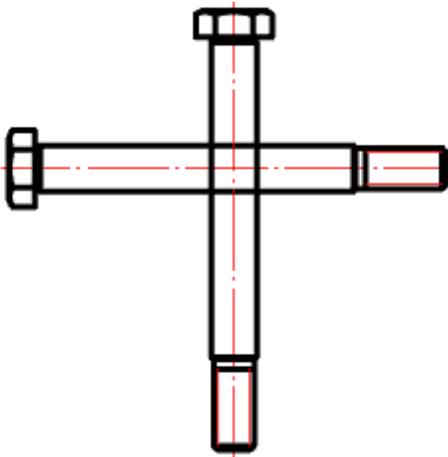
Toolbar:  *Move down* ("Library objects").



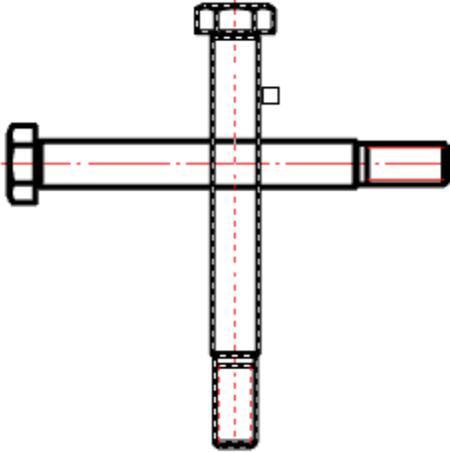
Command line: *SPMOVEDOWN.*

## Procedure

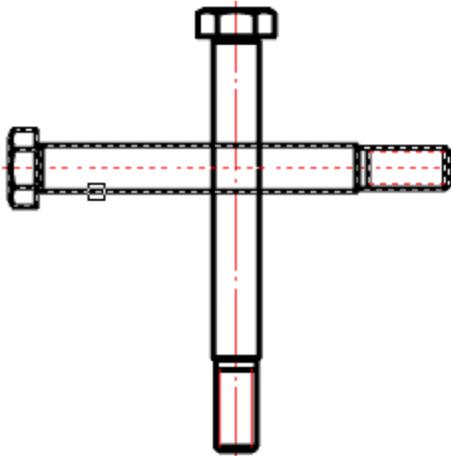
1. Call command;



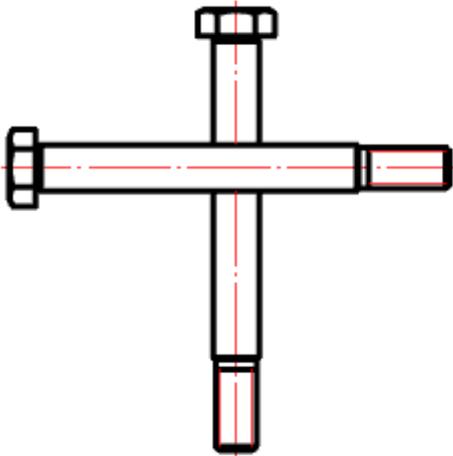
2. Select the objects you want to move down;



3. Select objects to be compared;



4. After the selection is complete, the objects that are to be moved down will automatically decrease the overlap level (ZOrder).



## Part trim

### Add part trim



Main menu: *Construction - Library objects - Part trim - Add part trim.*



Ribbon: *Construction - Library objects - Add part trim.*



Toolbar: "Library objects" - *Add part trim.*

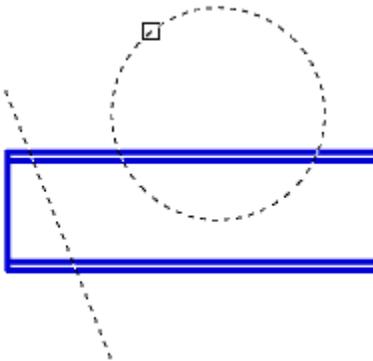


Command line: *SPTRIM.*

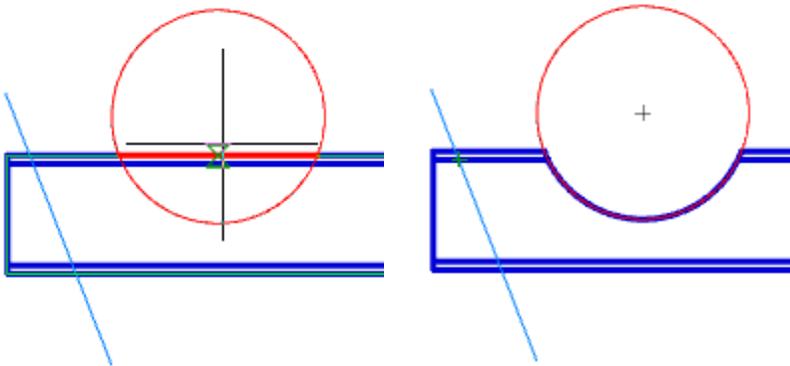
The command allows you to trim objects of metal structures.

### ***Trimming with contour indication***

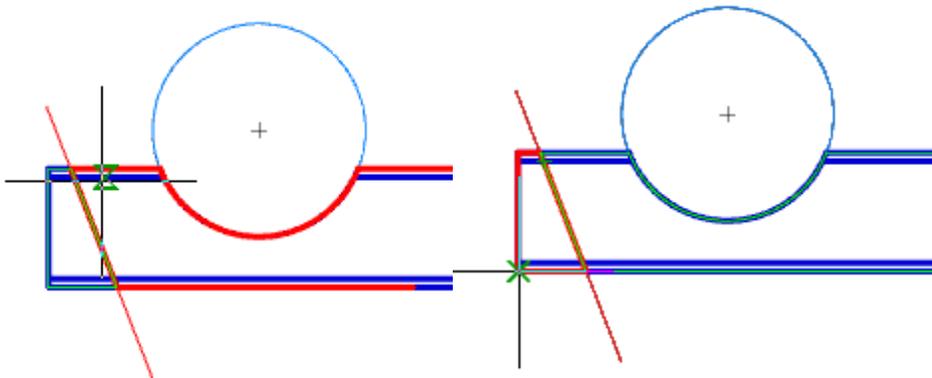
1. Call the command  "Add part trim".
2. Pick an outline. A contour can be a line segment, circle, arc, polyline (closed and open).



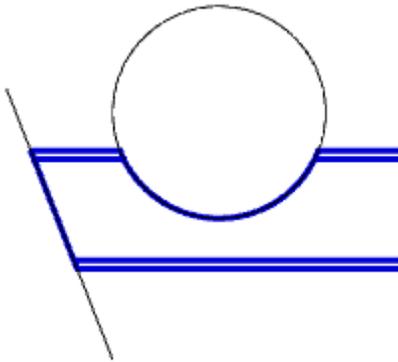
3. Specify trimming objects.  
If a circle or closed polyline is used as a path, the trimming object is selected within the path.



If a linear path is used, the trimming object is selected from one side of the path.

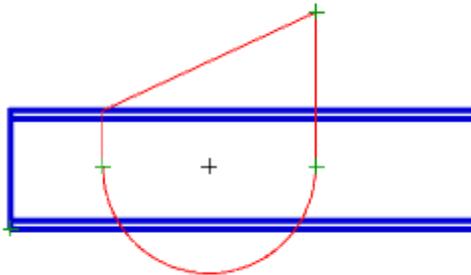


4. Press the "Esc" button to end trimming. The object will be trimmed.

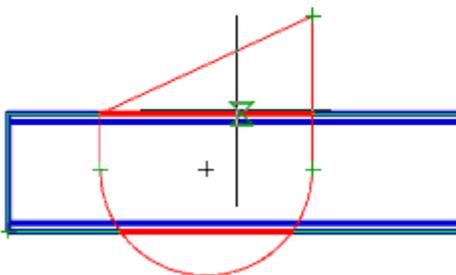


### Trimming mode "C**Ontour**"

1. Call the command  "Add part trim".
2. Select trim mode "C**Ontour**".
3. Draw a closed polyline path.



4. Pick a trimming object within the path.

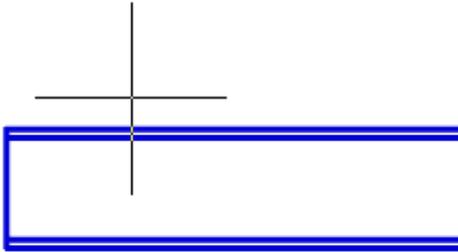


5. Trimming an object is made.

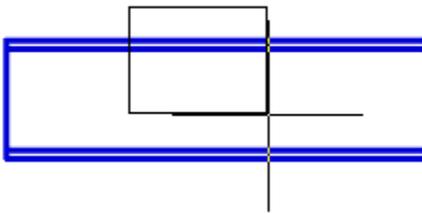


### Trimming mode "rectangle by t**WO** points"

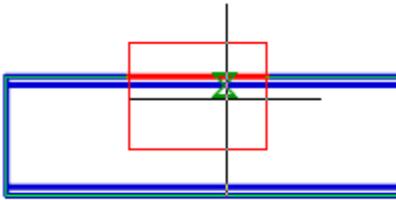
1. Call the command  "Add part trim".
2. Select trim mode "rectangle by tWO points".
3. Pick the first corner.



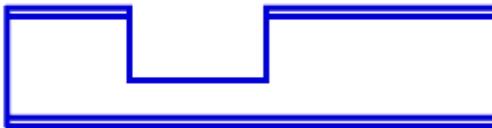
4. Pick the second corner.



5. Pick a trimming object inside the rectangle.



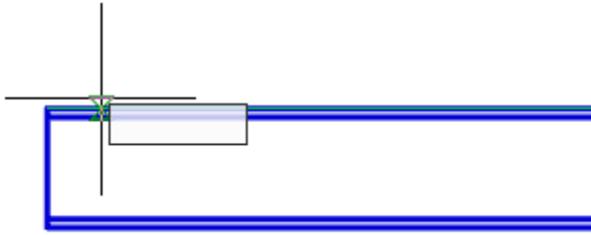
6. Trimming an object is made.



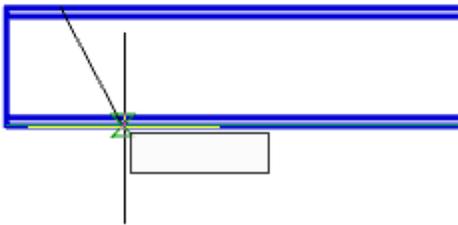
### **Trimming mode "rectangle by thrEE points"**

Allows for trimming at the desired angle.

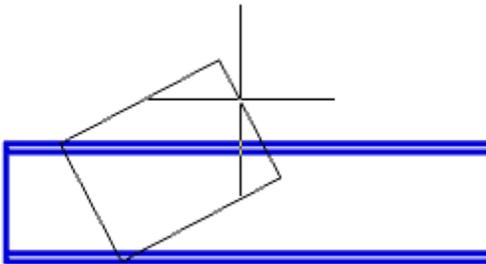
1. Call the command  "Add part trim".
2. Select trim mode "rectangle by thrEE points".
3. Pick the first point.



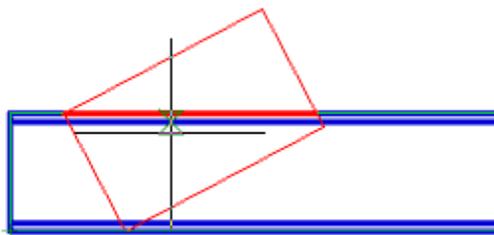
4. Pick the second point.



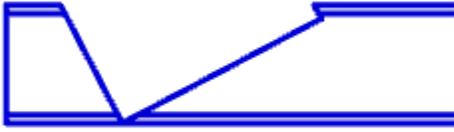
5. Pick the size of the outline.



6. Pick a trimming object inside the rectangle.

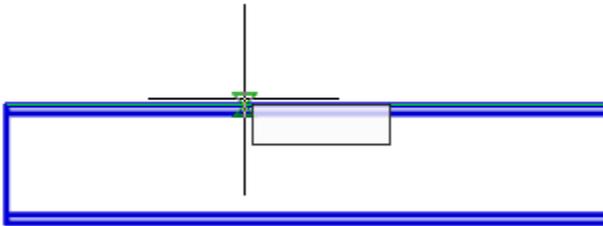


7. Trimming an object is made.

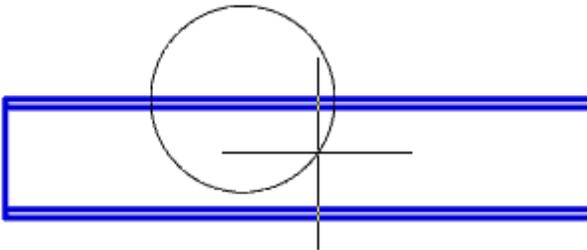


**Trimming mode "HOle"**

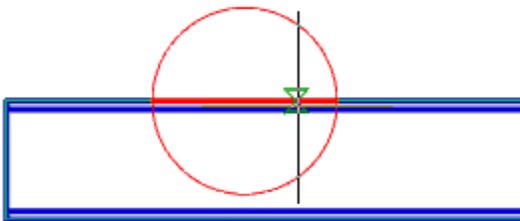
1. Call the command  "Add part trim".
2. Select trim mode "HOle".
3. Pick the center of the hole.



4. Pick a radius for the hole.



5. Pick a trimming object inside the circle.



6. Trimming an object is made.



## Remove part trim



Main menu: *Construction - Library objects - Part trim - Remove part trim*.



Ribbon: *Construction - Library objects - Remove part trim*.



Toolbar: "Library objects" - *Remove part trim*.

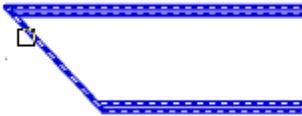


Command line: *SPTRIMDELETE*.

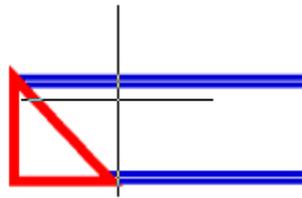
The command removes a previously created trim.

### Procedure

1. Call the command *Remove part trim*.



2. Specify the objects you want to reset and press "Enter" (or press "Spacebar") to select all objects.



3. The specified objects will be restored to their original state.



## Add View

-  Main menu: *Construction - Library objects -  Add view.*
-  Ribbon: *Construction - Library objects -  Add view.*
-  Toolbar: * Add view (on toolbar "Library objects").*
-  Context menu: * Add view (on select object).*
-  Command line: *SPADDVIEW.*

Designed to quickly add a new type of projection from the base of the inserted object to the drawing.

- Select the object to copy.
- Specify the insertion point of the object. Context menu commands *Front / left / right / top / bottom* standard projection (to insert a particular projection, it is necessary that it be recognized in the object).
- Context menu commands *Point, Angle* mode selection switch, respectively the insertion point or selection mode direction.
- Complete the cyclic command.

Adding a projection view to the object database can be done using the *Add View* from the context menu for the selected object.

## Simplified / Full View

-  Main menu: *Construction - Library objects -  Change representation.*
-  Ribbon: *Construction - Library objects -  Change representation.*
-  Toolbar: * Change representation (on toolbar "Library objects").*
-  Context menu: * Change representation (on select object).*
-  Command line: *SPCHANGEREPRESENT.*

- Press the button and select the database object in the drawing.
- Context menu commands *Full, Simplified* select the object representation.

Switching presentation can be accomplished by using the *Change view* from the context menu for the selected object.

## Mirror Part

-  Main menu: *Construction - Library objects -  Mirror part.*
-  Ribbon: *Construction - Library objects -  Mirror part.*
-  Toolbar: * Mirror part (on toolbar "Library objects").*
-  Command line: *SPMIRRORSTD.*

- Press the button and select the database object in the drawing.
- Press *Enter*.

Occur along the axis of revolution object *X*.

## Regenerate STD parts

-  Main menu: *Construction - Library objects -  Regenerate Std Parts.*



Toolbar: *Regenerate Std Parts (on toolbar "Library objects")*.



Command line: *SPREGENSTD*.

The team needed to upgrade the graphics part of the object (s).

### Operation

1. Call the command "Regenerate STD parts"
2. Specify the objects that you need to update or Enter, if you need to update all of the objects.
3. These objects will be updated

### User defined object



Main menu: *Construction - Library objects - User defined object*.



Ribbon: *Construction - Library objects - User defined object*.



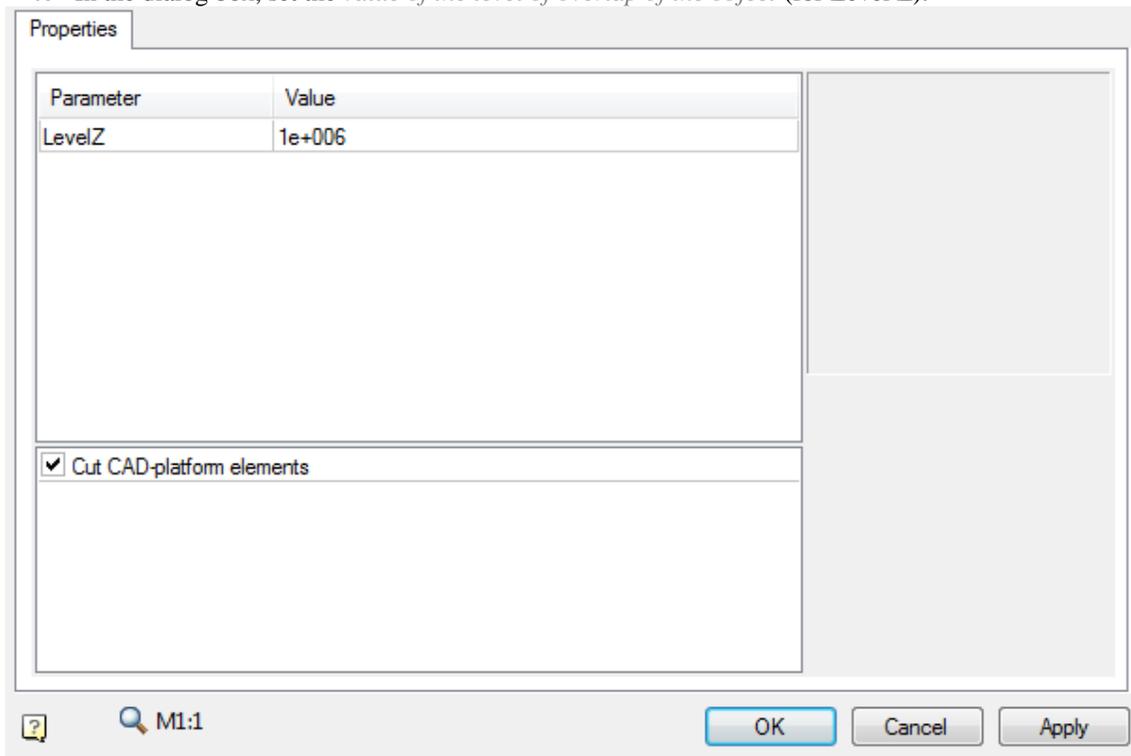
Toolbar: *User defined object (on toolbar "Library objects")*.



Command line: *SPCUSTOMOBJ*.

Tool *User object* makes it easy to group in objects nanoCAD and Construction 21 into a single object. Custom objects support the ability to overlap other objects in the drawing.

1. Select the *objects to create a custom object*.
2. Specify *part origin point*.
3. Specify the drawing *insertion and direction*.
4. In the dialog box, set the *value of the level of overlap of the object (for Level Z)*.



When you create a custom object contour suppression, external contour of the object is automatically detected contour suppression external contour of the object. Subsequently, the control circuit is used when objects overlap on the drawing..

Custom objects support editing with standard tools Construction 21.

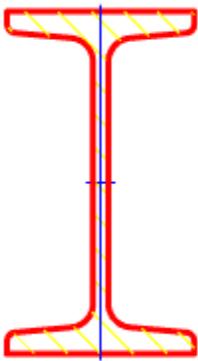
## Dialog "Overrides"



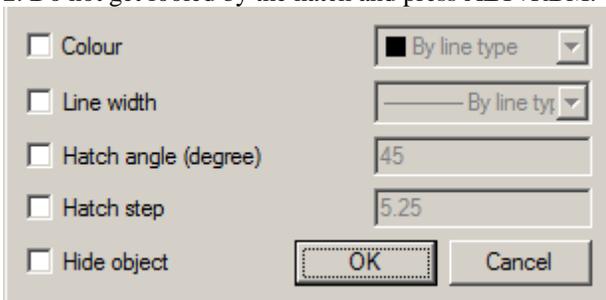
Shortcut: **ALT+RBM** (*when you hover over a line or shading standard element*).  
It overrides the style of the individual lines in a standard cell.

## Sample call

1. Insert a standard element, such as I-beams. In the properties, select the rendition of "left view" and the type of display "view with a cut".

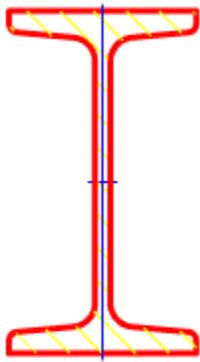


2. Do not get fooled by the hatch and press ALT+RBM. The "Overrides" dialog box.

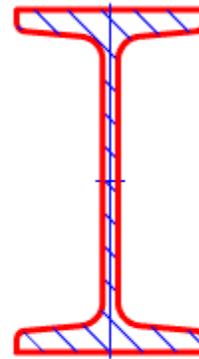


## Options

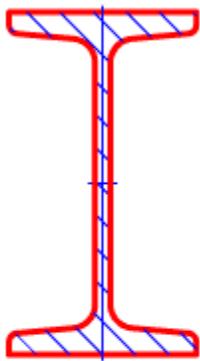
**Colour** -changes the color of the line.



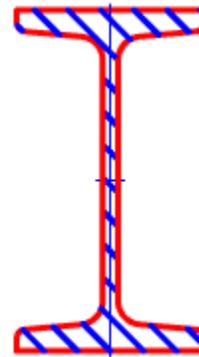
<input checked="" type="checkbox"/> Colour	Blue
<input type="checkbox"/> Line width	By line type
<input type="checkbox"/> Hatch angle (degree)	45
<input type="checkbox"/> Hatch step	5.25
<input type="checkbox"/> Hide object	
OK Cancel	



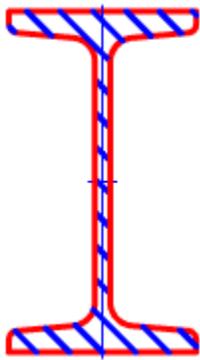
*Line width* - change the line width.



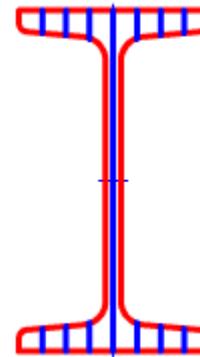
<input checked="" type="checkbox"/> Colour	Blue
<input checked="" type="checkbox"/> Line width	0.70 mm
<input type="checkbox"/> Hatch angle (degree)	45
<input type="checkbox"/> Hatch step	5.25
<input type="checkbox"/> Hide object	
OK Cancel	



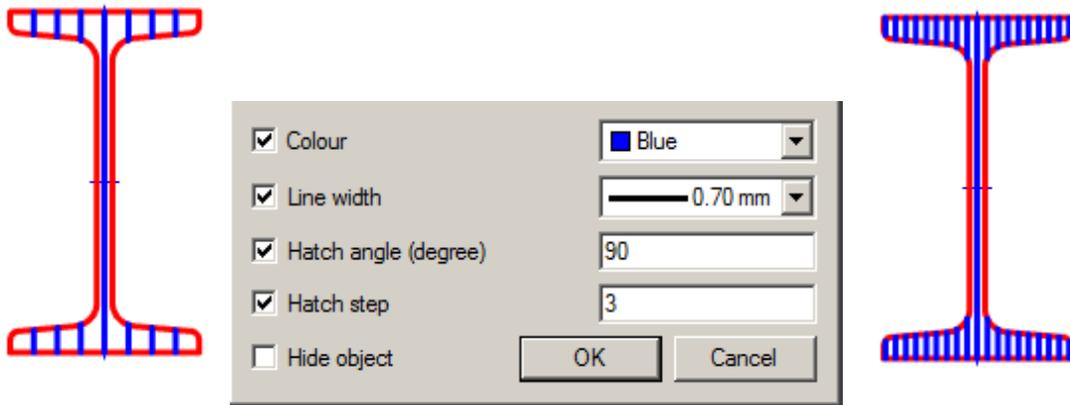
*Hatch angle (degree)* - controls the tilt hatch. The parameter is active only for the hatch.



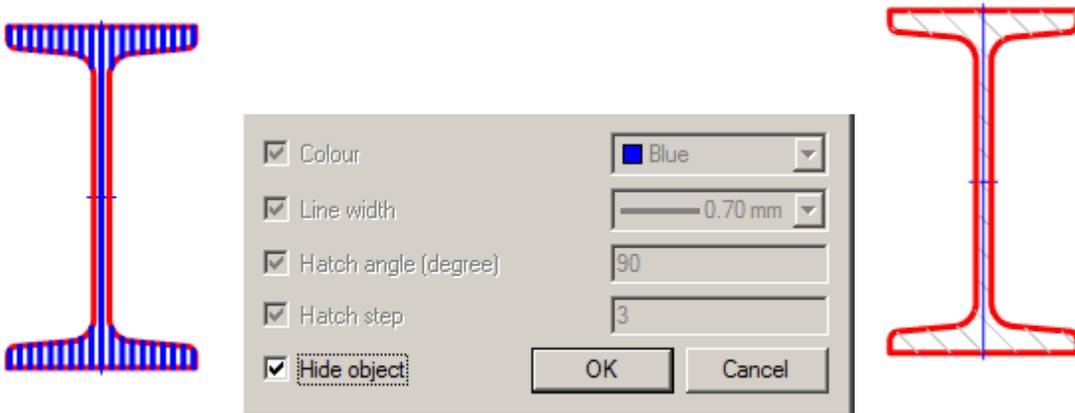
<input checked="" type="checkbox"/> Colour	Blue
<input checked="" type="checkbox"/> Line width	0.70 mm
<input checked="" type="checkbox"/> Hatch angle (degree)	90
<input type="checkbox"/> Hatch step	5.25
<input type="checkbox"/> Hide object	
OK Cancel	



*Hatch step* - changes hatching step. The parameter is active only for the hatch.



*Hide object* - it makes an invisible line. The other parameters are ignored.



If the [setting](#) "Show invisible lines" is "Yes", then the line will be displayed with a color according to the setting of "Color of invisible lines".

## Dimensions

### Dimension Style Manager



Main menu: *Format* - *Dimension Styles...*



Main menu: *Dimensions* - *Dimension Styles...*



Ribbon: *Home - Annotation* - *Dimension Style Manager*.



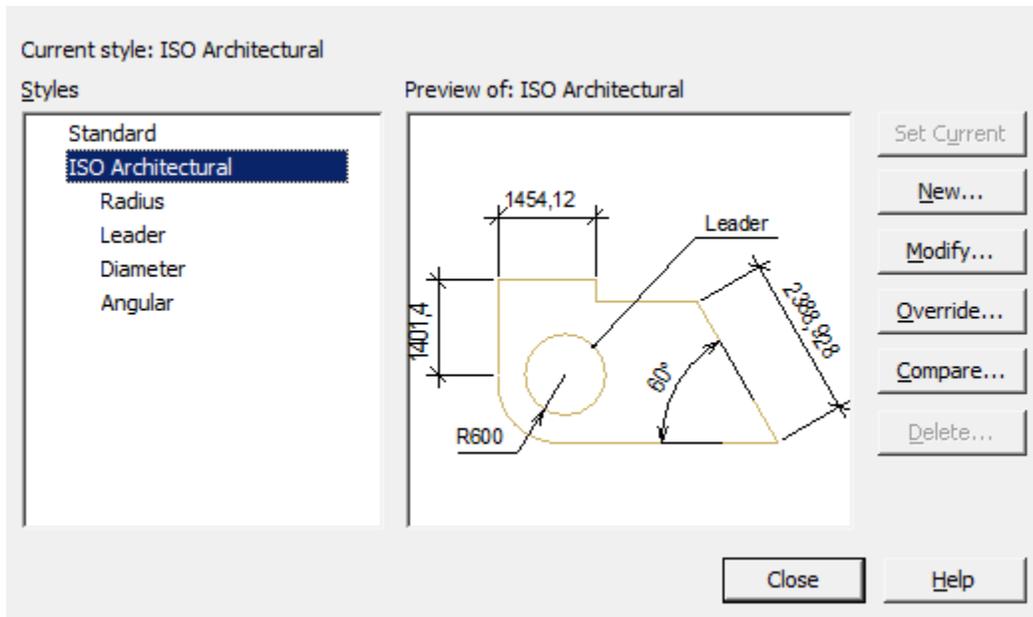
Toolbar: *Settings* - *Dimension Style Manager*.



Command line: *DIMSTYLE*.

The software defaults to a government industry standard dimension style.

Dimension styles allow you to control the appearance of dimensions and quickly format them.



## Dialog box composition

The inscription "*Current style: ...*" - information about the current dimension style, which is used when applying dimensions.

"*Styles*" list - a list of all dimension styles in the document.

The "*Preview of: ...*" window is a graphical representation of the style selected in the "*Styles*" list.

Buttons:

- *Set current* – sets the selected dimension style current.
- *New...* – opens a dialogue "*Creating style*".
- *Modify...* – change the parameters of the style selected in the list. Opens dialog "*Modify dimension style*".
- *Override...* – change the parameters of the current dimension style. Opens dialog "*Modify dimension style*".
- *Compare...* - compare two dimension styles, or view a list of all the properties of a style. The comparison results can be copied to the clipboard. Opens dialog "*Comparing Dimension Styles*".
- *Delete...* – deletes the selected dimension style.

## Restoring the Dimension Style



Command line: ***SPSETGOST, SETGOST***.

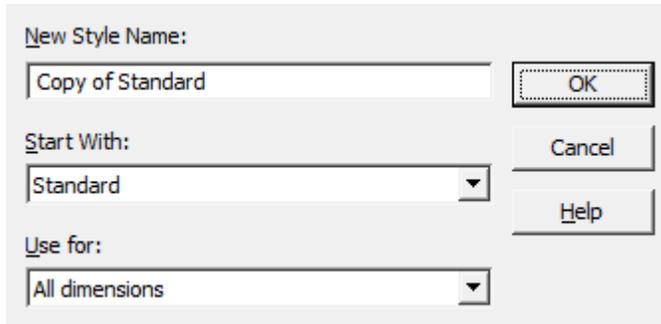
This command is necessary to create (restore) the standard dimensional style of the environment Construction .

Dimension style settings are stored within drawing files. If the file was not created in Construction , then it may not have the required dimension style for correct work in the Construction environment.

## Creating a dimension style

Button "*New...*" in the dialog box "*Dimension style manager*".

The new style is based on the existing style.



### Dialog box composition

Field "New Style Name" – style name.

List "Start With" – the style on the basis of which the new one will be created.

List "Use for" – a dimension sub-style is selected from the list (applicable only to certain types of dimensions).

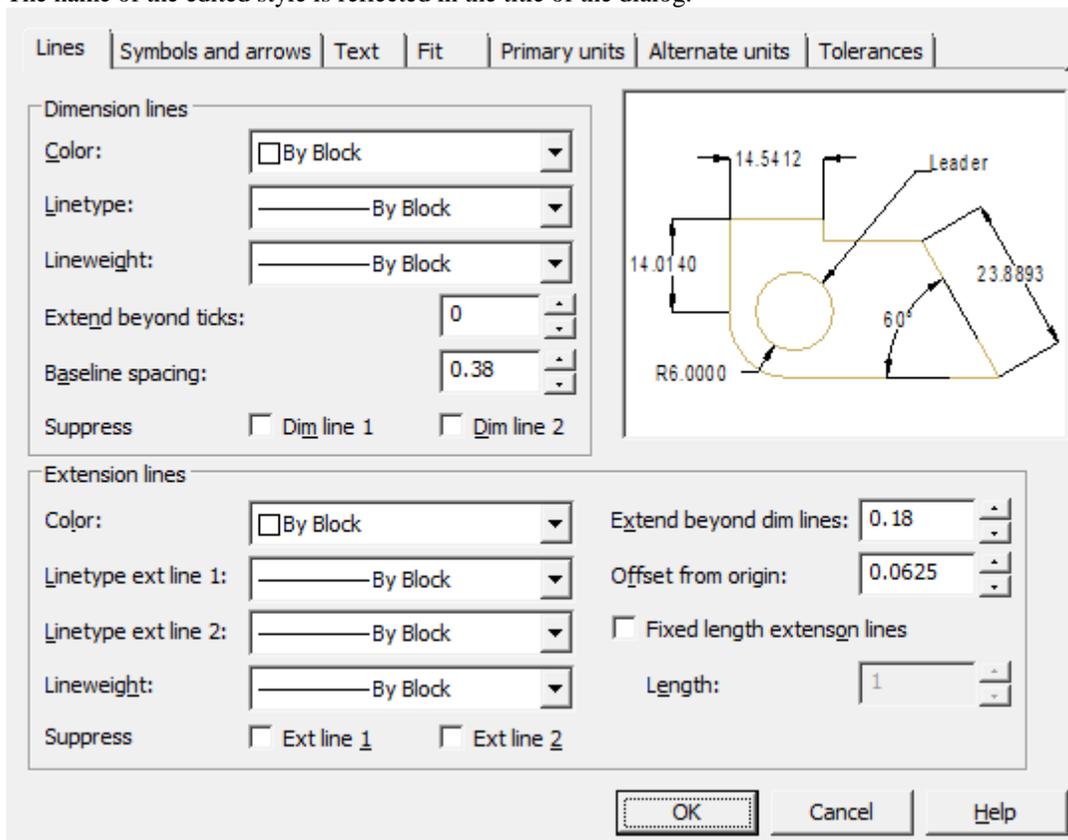
Button "OK" – opens a dialogue "Modify dimension style".

### Modify dimension style

In the "Modify dimension style" dialog, properties for a new style are set and parameters of an existing one are edited.

This dialog is called when you click the "Modify..." or "Override..." buttons from the "Dimension Style Manager", as well as from the "Creating style" window.

The name of the edited style is reflected in the title of the dialog.



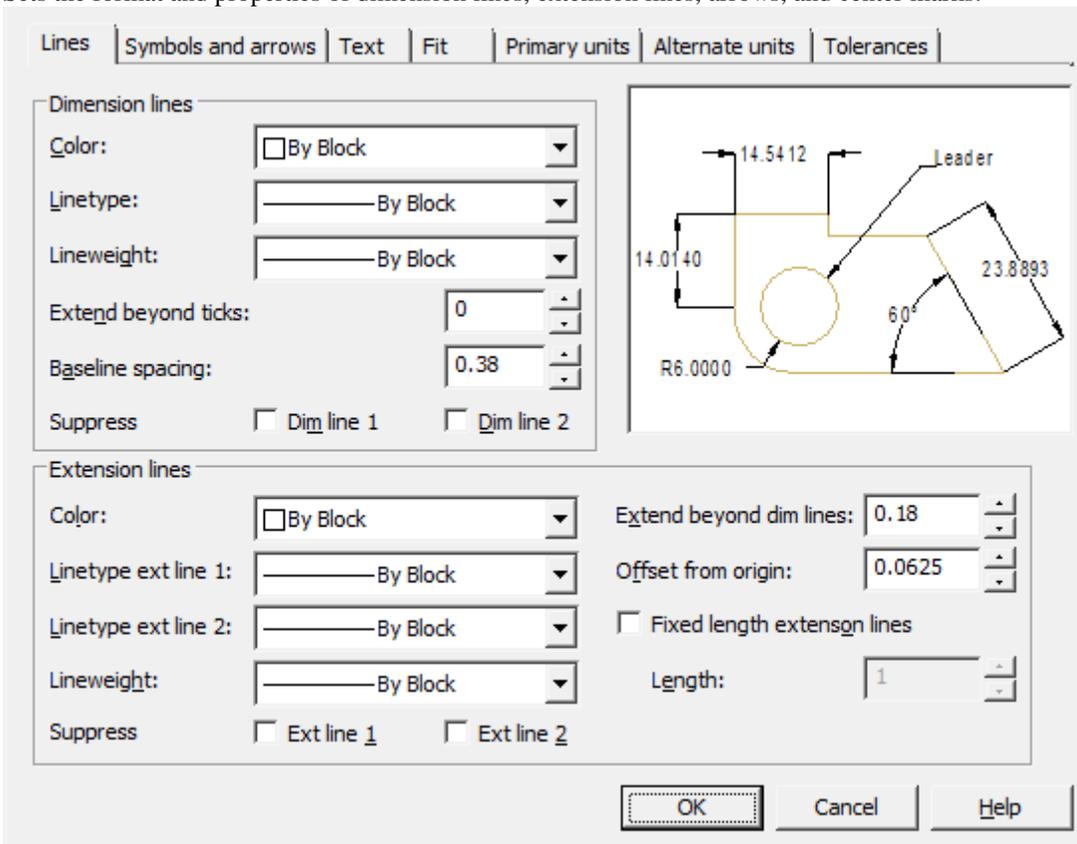
Dialog "Modify dimension style" contains tabs:

- Lines
- Symbols and arrows
- Text
- Fit
- Primary units
- Alternate units
- Tolerances

The model image on each tab shows a preliminary result of the property changes.

### Tab Lines

Sets the format and properties of dimension lines, extension lines, arrows, and center marks.



#### Dimension lines

*Color* – setting the color of dimension lines.

*Linetype* – setting the dimension line type.

*Lineweight* – setting weights for dimension lines.

*Extend beyond ticks* – when using serifs as dimension arrows, setting the distance the dimension line should extend beyond the extension lines.

*Baseline spacing* - setting the distance between dimension lines in dimensions from a common base.

*Suppress* – sets the suppression of the display of dimension lines if they go beyond the extension lines.

- *Dim line 1* – suppress the first dimension line.
- *Dim line 2* – suppress the second dimension line.

#### Extension lines

*Color* - setting the color of the extension lines.

*Linetype ext line 1* – setting the type of the first extension line.

*Linetype ext line 2* – setting the type of the second extension line.

*Lineweight* – setting weights for extension lines.

*Suppress* – set to suppress extension lines:

- *Ext line 1* – suppress the first extension line.
- *Ext line 2* – suppress the second extension line.

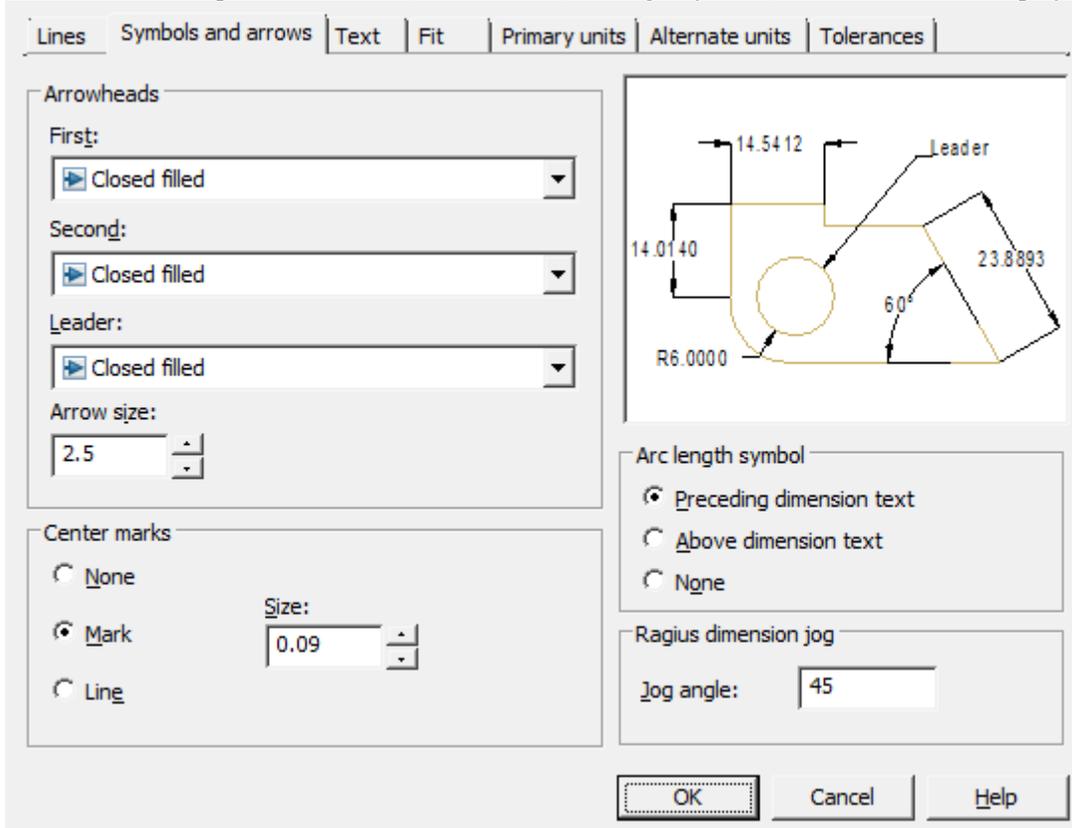
*Extend beyond dim lines* – setting the distance that extension lines should protrude beyond the dimension line.

*Offset from origin* – sets the distance by which extension lines deviate from object points.

*Fixed length extension lines* - sets the full length of the extension lines from the dimension line to the origin of the dimension.

### Tab Symbols and arrows

Sets the format and position of arrows, center marks, arc length symbols, and radius dimension polylines.



#### Arrowheads

Controls the appearance of dimension arrows.

*First* – selection of the arrow type for the first dimension line. When you change the type of the first arrow, the type of the second is automatically changed.

*Second* – selection of the arrow type for the second dimension line.

*Leader* – setting the arrow type for the leader.

*Arrow size* – displaying the existing one and setting a new size for the arrows.

#### Center marks

Controls the placement of center marks and centerlines when placing a diameter or radius.

*None* - do not create center mark and centerlines.

*Mark* - create a center mark.

*Line* - create centerlines.

*Size* - displays an existing one and sets a new size for the center mark or centerline.

**Arc length symbol**

Controls the display of the arc symbol in the arc length dimension.

*Preceding dimension text* - inserts arc length characters before dimension text.

*Above dimension text* - inserts arc length characters above dimension text.

*None* - prohibiting the display of arc length symbols.

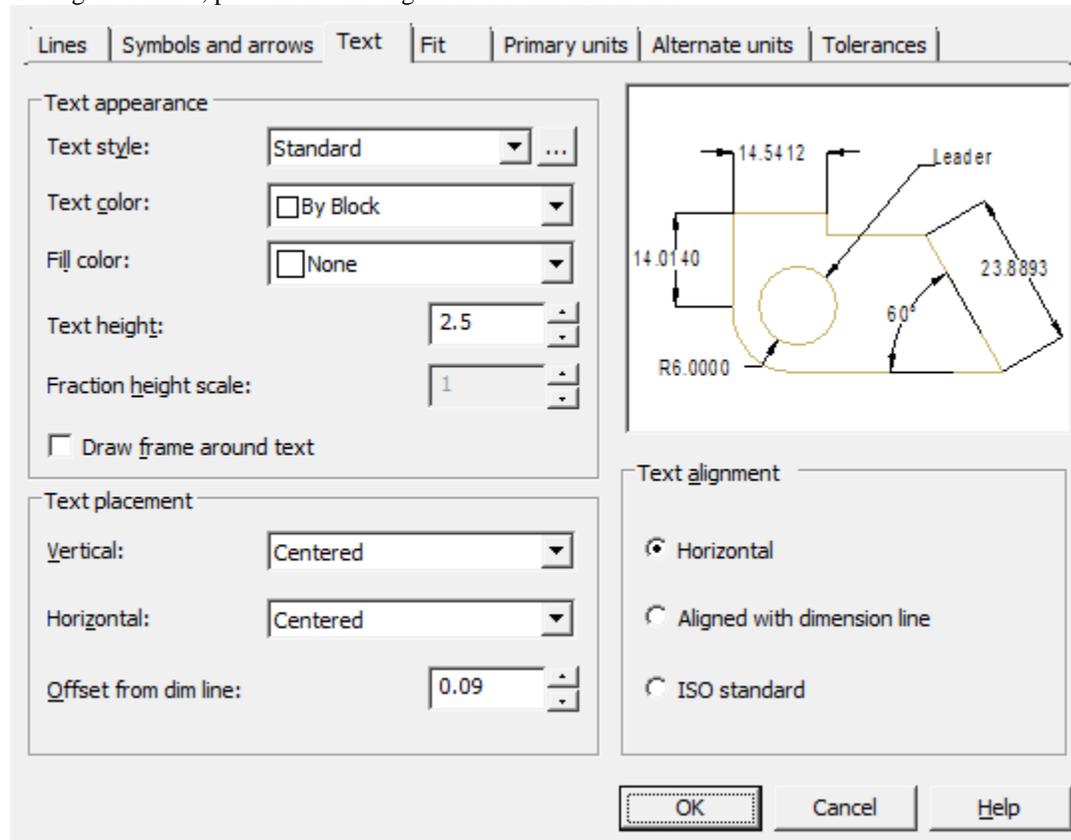
**Radius dimension jog**

Controls the display of broken lines (zigzags) of radius dimensions, in cases where the center is located outside the page.

*Jog angle* - sets the angle of the perpendicular line connecting the extension and dimension lines of the radius dimension.

**Tab Text**

Setting the format, placement and alignment of dimension texts.



**Text appearance**

*Text style* – selects the current dimension text style from the list.

*Text color* – setting the color of the dimension text.

*Fill color* – setting the background color of the text in dimensions.

*Text height* - sets the current height of the dimension text. If the text style specifies a fixed height (that is, the style's height value is not 0), then the height entered here is ignored.

*Fraction height scale* – setting the scale of fractional values relative to the rest of the text. This option is available if the "Unit format" is set to "Fractional" on the "Primary units" tab. The height of fractional texts is determined by multiplying the height of the regular text by a given factor.

*Draw frame around text* – sets the display of dimension text in a frame.

### **Text placement**

*Vertical* – select the option to align the dimension text vertically relative to the dimension line:

- *Centered* - centered dimension text between extension lines.
- *Above* - positioning the dimension text above the dimension line. The distance from the dimension line to the bottom border of the text is equal to the value specified in the "*Offset from dim line*" option.
- *Outdise* - positioning the dimension text next to the dimension line on the side farthest from the first fit point.
- *JIS* - placement of dimension text in accordance with the requirements of Japanese industrial standards JIS (Japanese Industrial Standards).
- *Below* - the location of the dimension text below the dimension line. The distance from the dimension line to the top border of the text is equal to the value specified in the "*Offset from dim line*" option.

*Horizontal* – select an option to position the dimension text horizontally along the dimension line relative to the extension lines:

- *Centered* - centered dimension text between extension lines along the dimension line.
- *At Ext Line 1* - the location of the text to the left of the first extension line. The distance from the extension line to the text is equal to the sum of twice the dimension arrow ("*Symbols and arrows*" tab) and the text gap (the "*Offset from dim line*" option).
- *At Ext Line 2* - the distance from the extension line to the text is equal to the sum of twice the dimension arrow ("*Symbols and arrows*" tab) and the text gap (the "*Offset from dim line*" option).
- *Over Ext Line 1* - positioning text above or along the first extension line.
- *Over Ext Line 2* - positioning text above or along the second extension line.

*Offset from dim line* – setting the size of the current text gap (the width of the empty space around the text located at the break in the dimension line). This value is also used as the minimum length of the broken dimension line fragments.

The text is located between the extension lines only if the lengths of these fragments are not less than the size of the text gap. If text is above or below the dimension line, it will only fit between the extension lines if there is enough space for the dimension arrows and dimension text to be spaced apart by the text gap.

### **Text alignment**

Sets the orientation of the dimension text between and outside dimension lines.

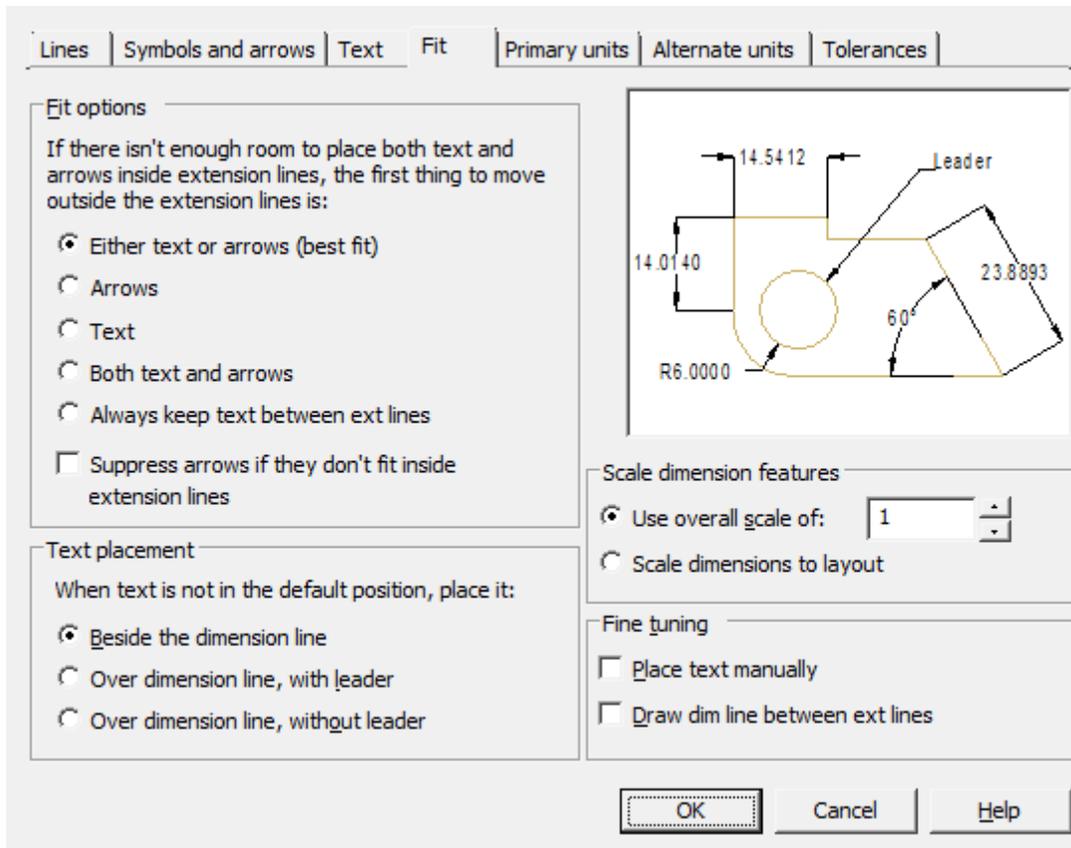
*Horizontal* – place text horizontally.

*Aligned with dimension line* – place text along the dimension line.

*ISO standart* - place along the dimension line if the text is inside the extension lines, or horizontally if the text is outside.

### **Tab Fit**

Controls the position of dimension text, arrows, leaders, and dimension lines.



### Fit options

Set the layout of text and arrows if there is not enough space between the extension lines to place them together:  
*Either text or arrows (best fit)* - move either the text or arrows outside the dimension lines, whichever is the best location.

*Arrows* - move outside the extension lines, first arrows, then text.

*Text* - move outside the extension lines, first the text, then the arrows.

*Both text and arrows* - if there is not enough space, then both text and arrows are located outside the extension lines.

*Always keep text between ext lines* – always place text between extension lines.

*Suppress arrows if they don't inside extension lines* - if there is not enough space for arrows between the extension lines, they are not displayed.

### Text placement

Selecting an action when the dimension text is moved from the default position (specified by the dimension style):

*Beside the dimension line* – the dimension line moves with the text.

*Over dimension line, with leader* – dimension lines do not move, but a leader is drawn that connects them and the text. The leader is not drawn if the text is too close to the dimension line.

*Over dimension line, without leader* – no connections are made between the text and the dimension line.

### Scale dimension feature

*Use overall scale of* – setting the scale factor for all dimension style parameters that specify dimensions, distances and indents, including the height of the text and the size of the arrows.

*Scale dimensions to layout* - sets a scale factor based on the ratio of units in the current model space viewport and paper space.

### Fine tuning

*Place text manually* – places the dimension at the point specified when prompted for Dimension line position. All horizontal placement modes are ignored.

*Draw dim line between ext lines* – draw dimension line between extension lines, even if dimension arrows are positioned outside of them.

### Tab Primary units

Sets the format and precision of base units, and dimension text prefixes and suffixes.

#### Linear dimensions

*Unit format* - controls the display and format of tolerances in dimension text.

*Precision* – setting the number of decimal places in the dimension text.

*Fraction format* – setting format for fractional texts.

*Decimal separator* – selection of separator type for sizes expressed in decimal units.

*Round off* – setting rounding rules for all types of dimensions, except for angular dimensions. Example: for a given accuracy of 0.25, all measured distances are rounded to the nearest multiple of 0.25. When you enter a value of 1.0, all measured distances are rounded to the nearest whole value. The number of digits in fractional parts of distances depends on the precision specified in the "Precision" field.

*Prefix* – defining the dimension text prefix. You can enter special characters or use control codes to display special characters. For example, the control code "% c" matches the diameter character. An explicit prefix takes precedence over default prefixes such as those used for diameter and radius.

*Suffix* – definition of a dimension text suffix. You can enter special characters or use control codes to display special characters. For example, typing the suffix mm will add it to the dimension text. The suffix entered here takes precedence over the default suffixes.

#### Measurement scale

*Scale factor* – setting the scale factor for linear dimensions. It is recommended not to change the default value of 1.00. The factor has no effect on angular dimensions, rounding accuracy, positive and negative tolerances.

*Apply to layout dimension only* – applies a scale factor only to dimensions plotted in layout viewports. It is recommended to disable the setting.

**Important!** Changing the value of the scale of the dimensions of a style in a customization changes the value in the dimensions of the same style that are already assigned. This bug is unrecoverable for technical reasons.

*Zero suppression* - Controls the suppression of leading and trailing zeros, as well as feet and inches zero.

- *Leading* – suppress leading zeros in all decimal sizes. Example: 0.3000 is written as .3000.
- *Trailing* – suppress trailing zeros in all decimal sizes. Example: 11.5000 is represented as 11.5 and 30.0000 is represented as 30.

**Angular dimensions**

Sets the current corner format for angular dimensions.

*Units format* – selection of units of measure for angular dimensions.

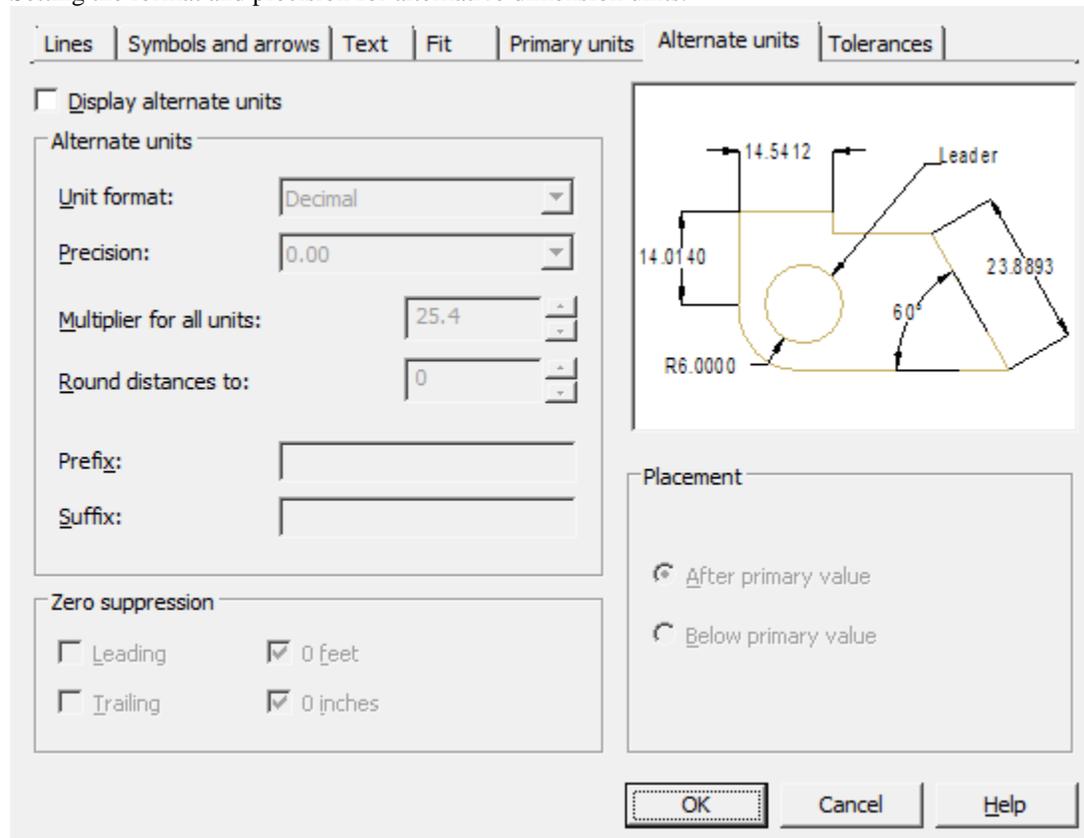
*Precision* – setting the number of decimal places in angular dimensions.

*Zero suppression* - control of suppression of leading and trailing zeros.

- *Leading* – suppress leading zeros in all decimal sizes. Example: 0.3000 is written as .3000.
- *Trailing* – suppress trailing zeros in all decimal sizes. Example: 11.5000 is represented as 11.5 and 30.0000 is represented as 30.

**Tab Alternate units**

Setting the format and precision for alternative dimension units.



*Display alternate units* – inclusion of the possibility of using alternative dimensional units.

**Alternate units**

*Unit format* - setting the format of alternative units.

*Precision* – setting the number of decimal places after the decimal point.

*Multiplier for all units* - setting the conversion factor from basic units to alternative ones. Example: To convert inches to millimeters, enter 25.4. The value has no effect on angular dimensions and does not apply to rounding precision or positive and negative tolerances.

*Round distances to* – sets the rounding rule for all types of dimensions, except for angular dimensions. Example: when setting the accuracy to 0.25, all measured distances are rounded to the nearest multiple of 0.25. When you enter a value of 1.0, all measured distances are rounded to the nearest whole value. The number of digits in fractional parts of distances depends on the precision specified in the "Precision" field.

*Prefix* – defining the prefix of the alternate dimension text. You can enter special characters or use control codes to display special characters. For example, the control code "% c" matches the diameter character. An explicit prefix takes precedence over default prefixes such as those used for diameter and radius.

*Suffix* – defining the suffix of the alternate dimension text. You can enter special characters or use control codes to display special characters. For example, entering the suffix mm will add it to the text. The suffix entered here takes precedence over the default suffixes.

### **Zero suppression**

Controls the suppression of leading and trailing zeros and feet and inches zero.

*Leading* – suppress leading zeros in all decimal sizes. Example: 0.3000 is written as .3000.

*Trailing* – suppress trailing zeros in all decimal sizes. Example: 11.5000 is represented as 11.5 and 30.0000 is represented as 30.

### **Placement**

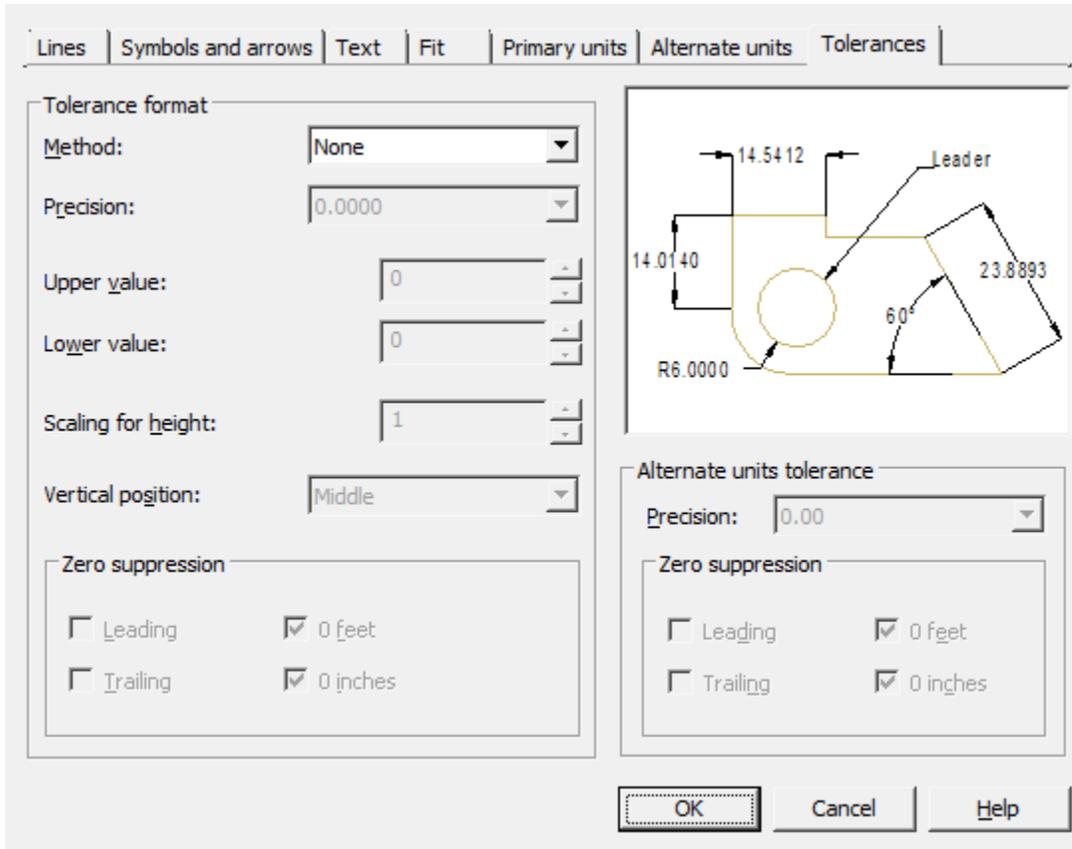
Sets the position of alternate units in dimension text.

*After primary value* – display the value in alternate units immediately following the value in base units.

*Below primary value* - display the value in alternate units below the value in base units.

### **Tab Tolerances**

Controls the display and format of tolerances in dimension text.



**Tolerance format**

*Method* – choice of method for determining tolerances.

*None*- disable display of tolerances.

*Symmetrical* – application of two limit deviations, with which the dimension text is displayed with the same upper and lower limit deviation from the dimension by the "±" symbol. The value is entered in the "Upper value" field.

*Deviation* – application of two limiting deviations. Dimension text is displayed with different upper and lower tolerance limits. When a plus sign is put in front of the upper limit deviation and a minus sign in front of the lower one.

*Limits* – displays dimension text as limit dimensions. The maximum size limit is above the minimum size limit. The largest limit is obtained by adding the upper deviation to the nominal size; the smallest - by subtracting the lower limit deviation from the nominal size.

*Basic* – displays the dimension text as a nominal boxed dimension.

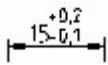
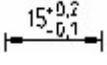
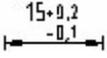
*Precision* - setting the number of decimal places after the decimal point.

*Upper value* - setting the value of the upper limit deviation. When the "Symmetrical" method is turned on, both deviations are assigned this value.

*Lower value* - setting the value of the lower limit deviation.

*Scaling for height* - setting the current text height for deviations.

*Vertical position* - alignment of deviation texts:

- *Bottom* - alignment of deviation and nominal size on the bottom. 
- *Middle* - aligning deviation and nominal size to the middle of the dimension text. 
- *Top* - alignment of deviation and nominal size at the top. 

*Zero suppression* - control of suppression of leading and trailing zeros.

- *Leading* – suppress leading zeros in all decimal sizes. Example: 0.3000 is written as .3000.
- *Trailing* – suppress trailing zeros in all decimal sizes. Example: 11.5000 is represented as 11.5 and 30.0000 is represented as 30.

**Alternate units tolerance**

Alternative unit tolerance formatting.

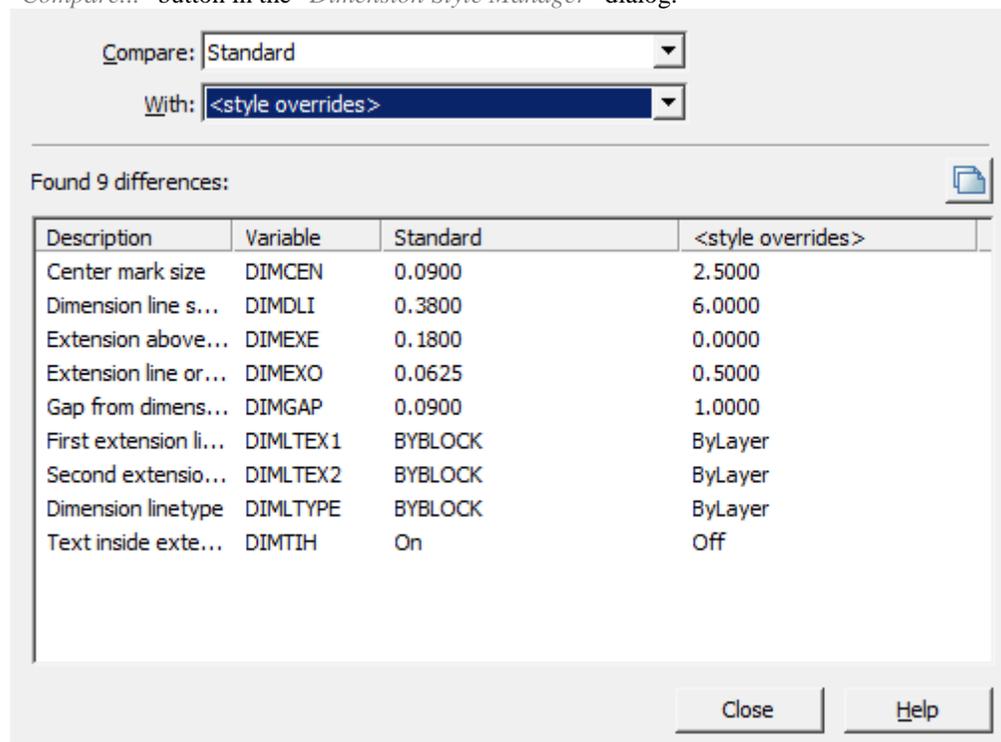
*Precision* - setting the number of decimal places after the decimal point.

*Zero suppression* - control of suppression of leading and trailing zeros.

- *Leading* – suppress leading zeros in all decimal sizes. Example: 0.3000 is written as .3000.
- *Trailing* – suppress trailing zeros in all decimal sizes. Example: 11.5000 is represented as 11.5 and 30.0000 is represented as 30.

**Comparing Dimension Styles**

The dialog for comparing two dimension styles or viewing a list of all style properties is invoked by the "Compare..." button in the "Dimension Style Manager" dialog.



"Compare:" field - selects the first dimension style to compare.

"With:" field - selects the second dimension style for comparison.

"Difference table" - the table contains data on non-matching properties.

Table columns:

- *Description* - parameter name.
- *Variable* - parameter system name.
- *Variable value columns* - parameter values in compared styles.

Button  "Copy to clipboard" - allows you to copy comparison results to the clipboard.

## Auto



Main menu: *Dimensions* -  *Auto*.



Ribbon: *Annotate - Dimensions* -  *Auto*.



Ribbon: *Construction - Symbols* -  *Dimensions*.



Toolbar: *Dimensions* -  *Dimensions*.



Command line: *SPMDIM, MDIM*.

When inserting dimensions, context menu commands are available to switch the dimension view:

- Auto
- [Aligned](#)
- [Horizontal](#)
- [Vertical](#)
- [Radius](#)
- [Diameter](#)
- [Large arc radius](#)
- [Arc](#)
- [Ordinate](#)
- [Angle](#)
- [Chain](#)
- [Base](#)
- [Properties](#) (Opens the size edit dialog)
- [Group](#)

If you hold down the CTRL key while placing linear dimensions at the time you select the dimension line, you can skew the dimension extension lines.

*Note:* If you hold down the SHIFT key while placing linear or angular dimensions while selecting the position of the dimension line, you can move the dimension text along the dimension line.

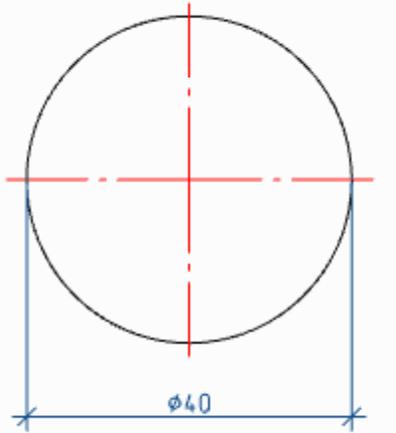
## Linear dimensioning

To apply the dimension you need:

1. Select a segment;
2. Place the dimension number.

Dimensions can change to horizontal, vertical, or parallel, depending on the position of the drop point.

### Dimensioning by selecting characteristic (anchor) points

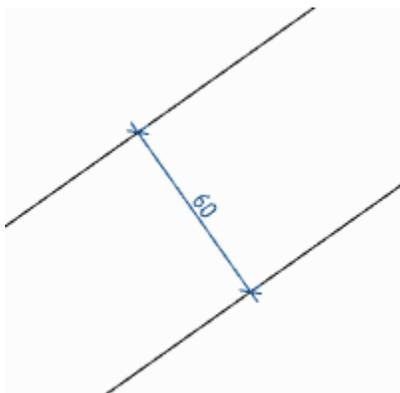


To apply dimensions, you must:

1. Select the first node;
2. Select the second node;
3. Place the dimension number.

When selecting anchor points of the circle, the diameter sign is automatically set.

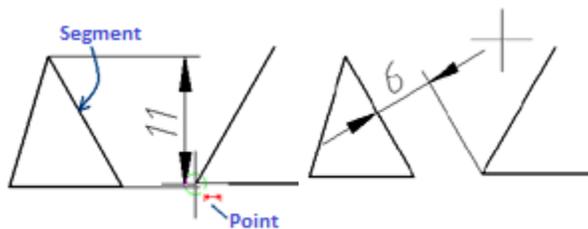
### Dimensioning between two parallel lines



To apply the dimensions shown above, you must:

1. Select the first segment;
2. Select the second segment;
3. Place the dimension number.

### Dimensioning through a point perpendicular to the selected line



To apply the dimensions shown above, you must:

1. Specify the segment, perpendicular to which the dimension will be applied;
2. Without interrupting the commands, point to the end point of the line segment (a circle of small diameter should appear around the point);
3. Place the dimension number.

## Undo an erroneously inserted dimension without exiting the command

Dimensioning is performed in a cyclic mode, i.e. when applying one dimension, the team does not stop its work, but suggests setting the next dimension or choosing a different type of dimension. In some cases, the previous dimension may not be set correctly. To remove an erroneous dimension, there is the "Undo" context menu command. You can also call the command with the "Ctrl + Z" hotkeys. The command is available when setting the dimension after specifying the dimension number.

## Auxiliary markers

Auxiliary autodimension markers appear when you hover over a drawing object and show what type of dimension will be built in this case:

-  Indicates that the diametral dimension will be drawn.
-  Shows what a linear dimension will be drawn (horizontal, vertical or parallel).
-  Shows that the angular dimension will be drawn.
-  Shows that the chain of dimensions will be built.
-  Shows that the slanted dimension will be drawn.
-  Indicates that the radial dimension will be drawn.

## Linear dimensions

### Aligned dimension



Main menu: *Dimensions -  Aligned.*



Ribbon: *Annotate - Dimensions -  Aligned.*



Toolbar: *Dimensions -  Aligned.*



Context menu: *aLigned - when calling any dimension.*



Command line: *SPMDIMALI, MDIMALI.*

### Horizontal dimension



Context menu: *Horizontal - when calling any dimension.*



Command line: *SPMDIMHOR, MDIMHOR.*

## Vertical dimension



Context menu: *Vertical - when calling any dimension.*



Command line: *SPMDIMVER, MDIMVER.*

## Parallel, horizontal, vertical dimensions

To apply dimensions, you must:

1. Choose dimension;
2. Select the type of binding:
  - "nEarest snap gets object" - dimensions the entire selected object;
  - "nEarest snap gets point" (default) - sets dimension nodes at a selected location on an object.
3. Specify the end nodes of the dimension based on the selected snap type:
  - "nEarest snap gets object" - specify an object, the end nodes of the dimension will be the end points of the object;
  - "nEarest snap gets point" - specify the start and end nodes on the selected object.
4. Place the dimension number. The dimension will be built.

## Auxiliary markers

Construction markers appear when you select a certain linear dimension:

-  Parallel dimension is selected.
-  Horizontal dimension is selected.
-  Vertical dimension is selected.

## Linear dimension



Main menu: *Dimensions -  Linear.*



Ribbon: *Annotate - Dimensions -  Linear.*



Toolbar: *Dimensions -  Linear.*



Command line: *DIMLINEAR.*

## Linear dimensioning

To apply dimensions, you must:

1. Call the  "Linear" command;
2. Specify the first node;
3. Indicate the second node;
4. Place the dimension number. Linear dimension will be created.

## Radius



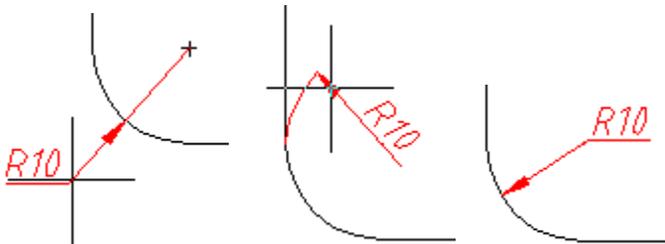
Main menu: *Dimensions -  Radius.*



Ribbon: *Annotate - Dimensions -  Radius.*

-  Ribbon: *Construction - Symbols - Radius*.
-  Toolbar: *Dimensions - Radius*.
-  Context menu: *Radial - when calling any dimension*.
-  Command line: *SPMDIMRAD, MDIMRAD*.

### Procedure



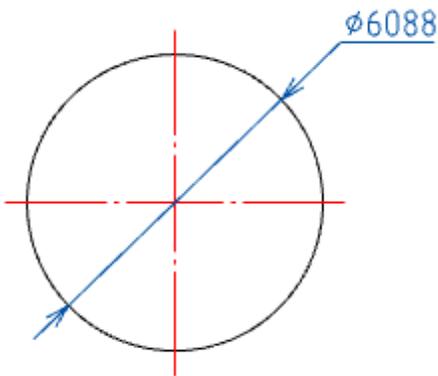
To apply a radial dimension, you must:

1. Select the "Radius" dimension;
2. Select an arc (circle), the dimension will snap to the arc;
3. Specify the insertion point.

### Diameter

-  Main menu: *Dimensions - Diameter*.
-  Ribbon: *Annotate - Dimensions - Diameter*.
-  Ribbon: *Construction - Symbols - Diameter*.
-  Toolbar: *Dimensions - Diameter*.
-  Context menu: *Diametral - when calling any dimension*.
-  Command line: *SPMDIMDIA, MDIMDIA*.

### Procedure



To apply the dimension of the circle, you must:

1. Select the dimension "Diameter";
2. Select the circle, the dimension snaps to the circle;
3. Pick an insertion point.

## Large arc radius



Main menu: *Dimensions* - *+Large arc radius*.



Ribbon: *Annotate - Dimensions* - *+Large arc radius*.



Ribbon: *- Symbols* - *+Large arc radius*.



Toolbar: *Dimensions* - *+Large arc radius*.

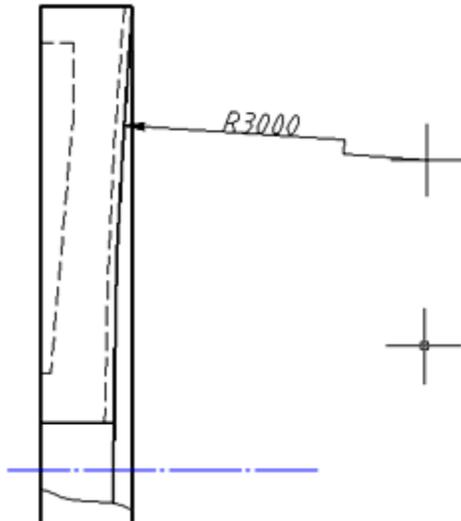


Context menu: *big RADIUS* - *when calling any dimension*.



Command line: *SPDIMHRAD, DIMHRAD*.

## Procedure



To dimension a large arc radius, you need to:

1. Select the "Large arc radius" dimension;
2. Select an arc (circle), the dimension will snap to the arc;
3. Specify the insertion point of the arrow;
4. Specify the insertion point of the value on the arrow.

## Arc length dimension



Main menu: *Dimensions* - *Arc*.



Ribbon: *Annotate - Dimensions* - *Arc length*.



Ribbon: *- Symbols* - *Arc length dimension*.



Toolbar: *Dimensions* - *Arc length*.



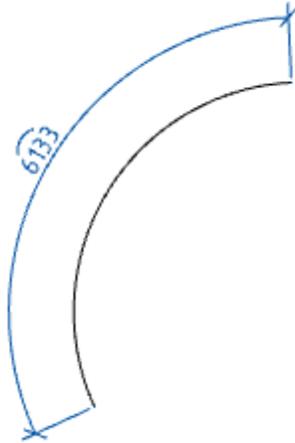
Context menu: *arC* - when calling any dimension.



Command line: *SPMDIMARC*, *MDIMARC*.

## Procedure

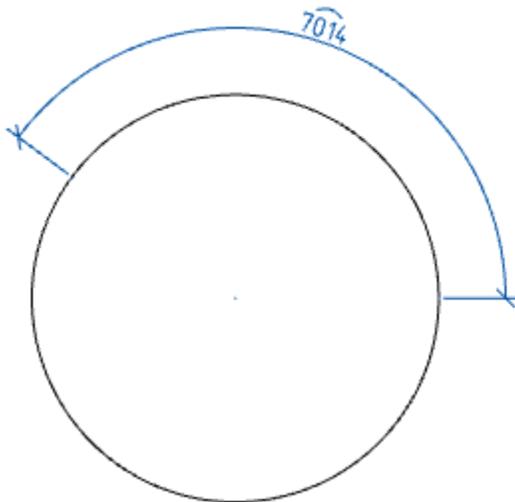
### *Arc dimension*



To apply the dimension you need:

1. Select the arc dimension;
2. Select an arc (the arc dimension will snap to the arc);
3. Specify the insertion point.

### *Circle dimension*



To apply the dimension you need:

1. Select the arc dimension;
2. Specify the starting point on the circle;
3. Specify the end point on the circle;
4. Specify the insertion point.

## Ordinate dimension



Main menu: *Dimensions* -  $\rightarrow$  *Ordinate dimension*.



Ribbon: *Annotate - Dimensions* -  $\rightarrow$  *Ordinate*.



Ribbon: *Construction - Symbols* -  $\rightarrow$  *Ordinate dimension*.



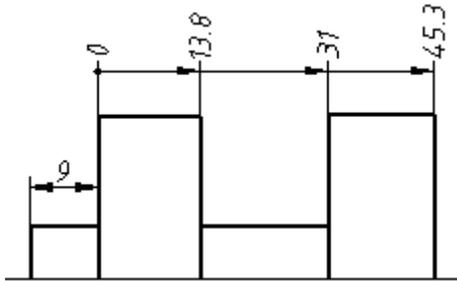
Toolbar: *Dimensions* -  $\rightarrow$  *Ordinate dimension*.



Context menu: *Ordinate* - *when calling any dimension*.

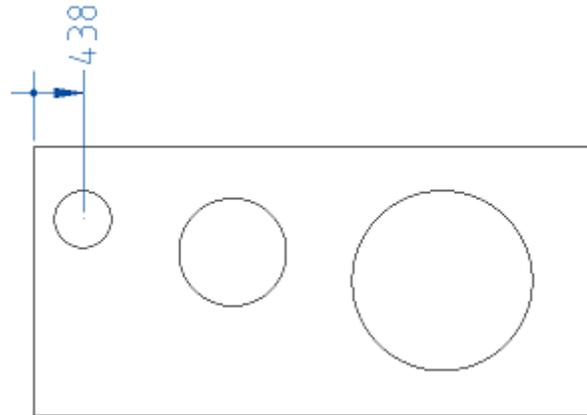


Command line: *SPMDIMORD*, *MDIMORD*.

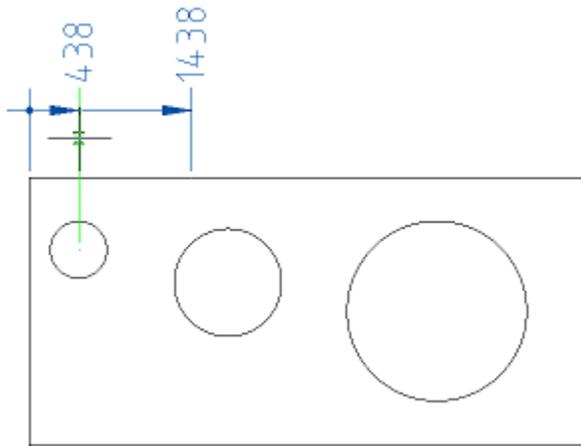


## Procedure

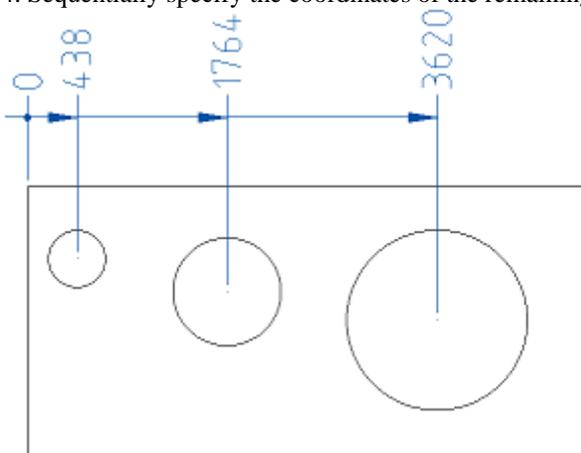
1. Call the "Ordinate dimension" command.
2. Pick the location of the first dimension of the ordinate chain.



3. Select the first dimension you set. All subsequent dimensions will be snapped to it. If for some reason dimensioning has been completed (after the first dimension has been added), select the ordinate dimension (or autosize) again and specify the dimensioned.



4. Sequentially specify the coordinates of the remaining dimensions.



5. Press the "Esc" key to end the command.

## Angle dimension



Main menu: *Dimensions* - *Fill angle*.



Ribbon: *Annotate - Dimensions* - *Angular*.



Ribbon: *Construction - Symbols* - *Angle dimension*.



Toolbar: *Dimensions* - *Angle dimension*.



Toolbar: *Construction Dimensions* - *Angle dimension*.



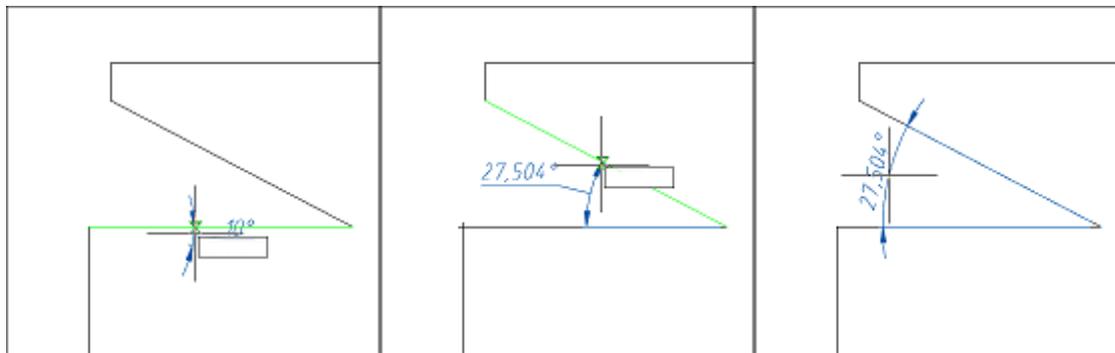
Context menu: *aNguLar* - *when calling any dimension*.



Command line: *SPMDIMANG, MDIMANG*.

## Procedure

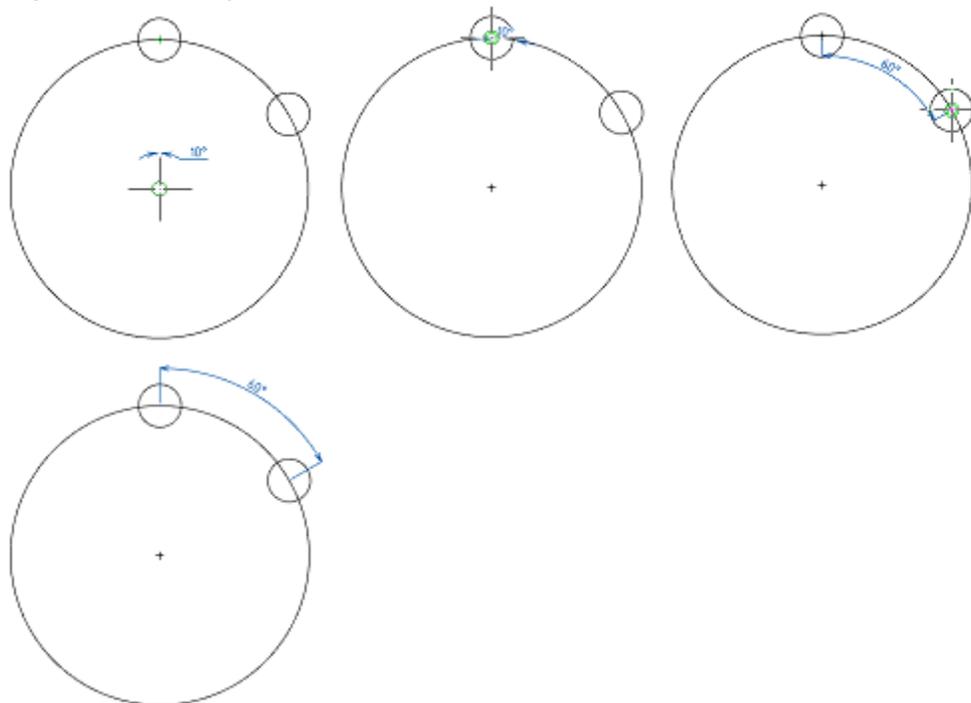
*Create an angular dimension by specifying two line segments*



To apply an angular dimension, you must:

1. Select an angular dimension;
2. Select the first segment;
3. Select the second segment;
4. Pick an insertion point.

*Angular dimension of hole centers*



To apply the angular dimension with the indication of the centers, you must:

1. Select an angular dimension;
2. Specify the center of the axial circle (on which the holes lie);
3. Pick the center of the first hole;
4. Pick the center of the second hole;
5. Pick an insertion point.

**Dimensions Chain**



Main menu: *Dimensions - Dimensions Chain.*



Ribbon: *Annotate - Dimensions -  Continue dimension.*



Ribbon: *Construction - Symbols -  Continue dimension.*



Toolbar: *Dimensions -  Dimensions Chain.*



Command line: *SPCHAINCONT, CHAINCONT.*

A chain of dimensions is a sequence of dimensions counted from the end of the previous dimension (the beginning of each new dimension coincides with the end of the previous one).

Dimension chains can be linear, ordinate, or angular. Before building the base dimensions, at least one linear, ordinate or angular dimension must be applied to the object.

## Procedure

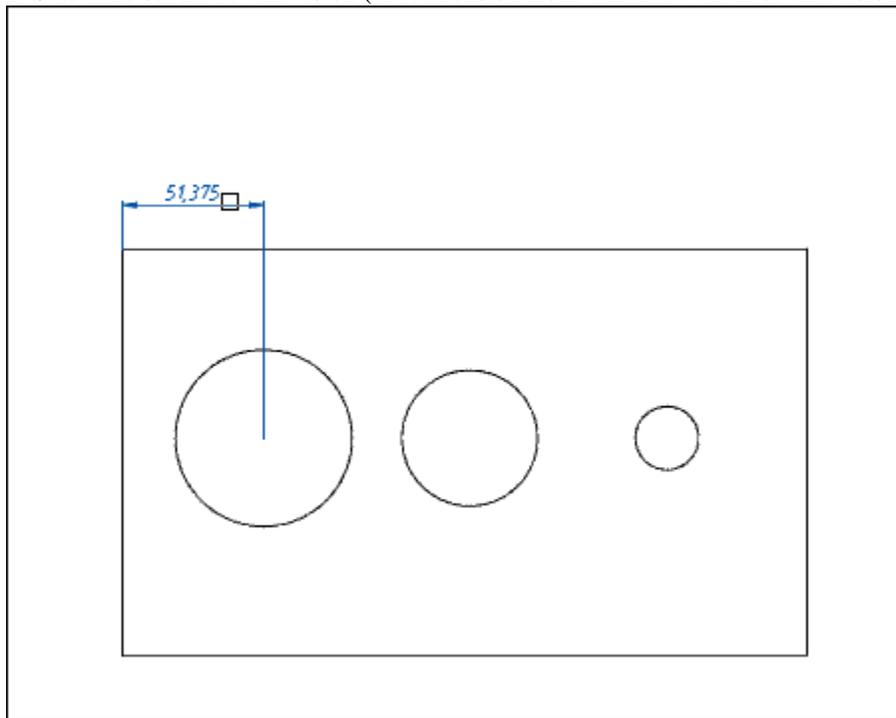
### *Ordinate chain of dimensions*

*Note:* Constructing an ordinate chain of dimensions is similar to constructing [ordinate dimensions](#).

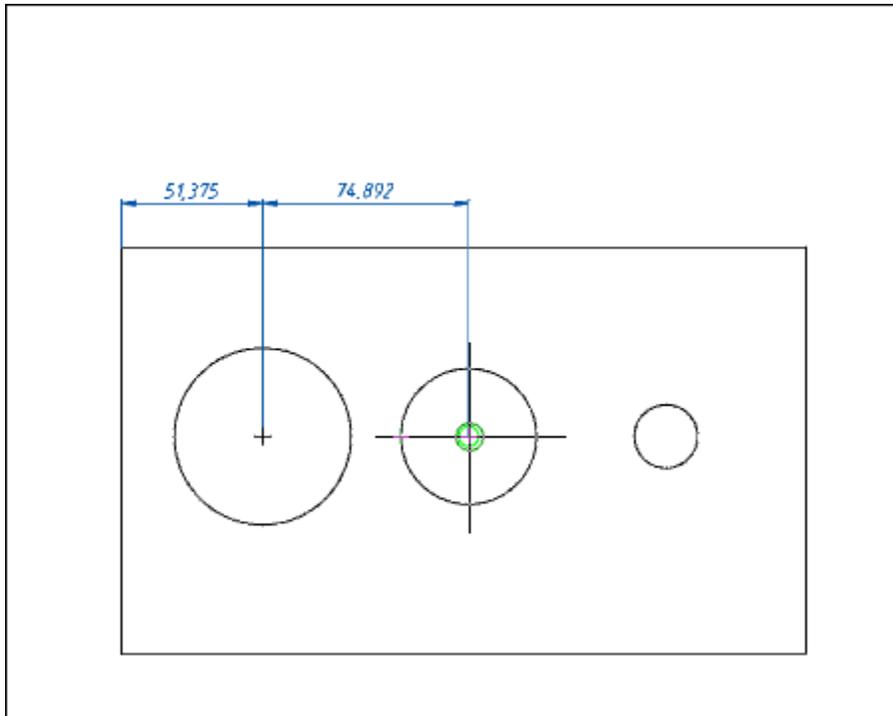
1. Call the command;
2. Select the set ordinate dimension (the dimension from which the ordinate sizes will begin to form);
3. Construct the ordinate dimensions in sequence;
4. Press the "Enter" key to complete the construction.

### *Linear dimension chain*

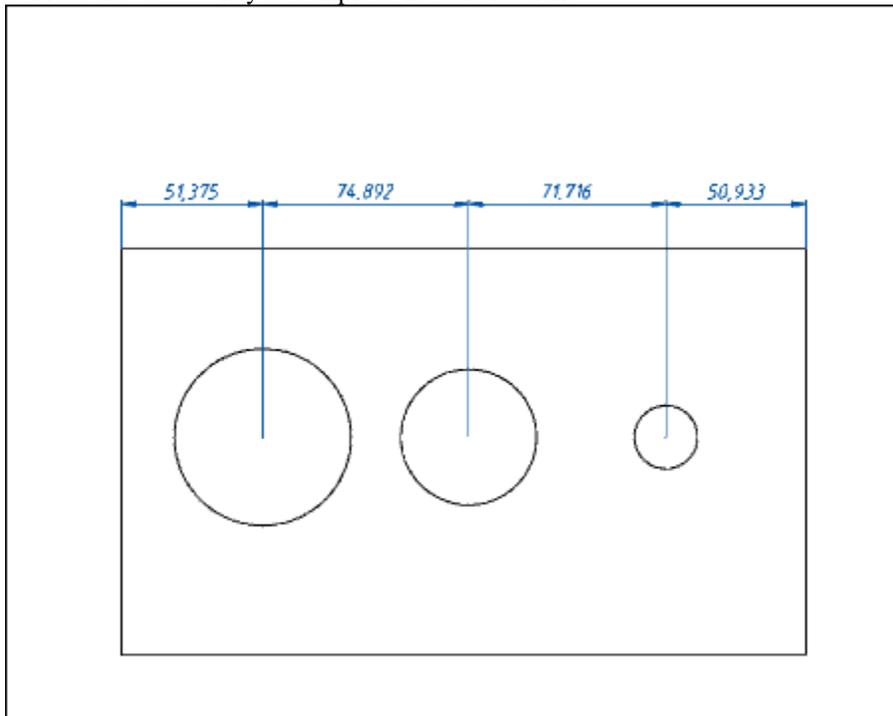
1. Call the command;
2. Select the set linear dimension (the dimension from which the chain of dimensions will begin to form);



3. Specify the required number of anchor points;

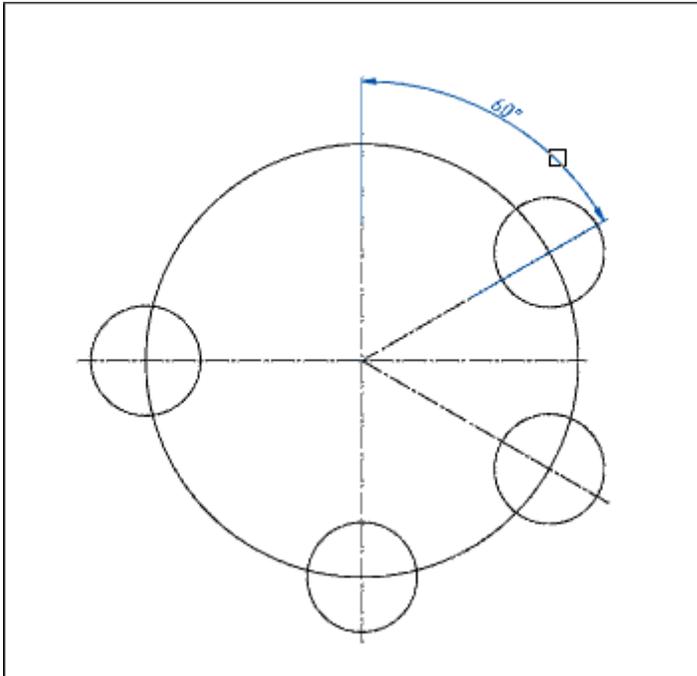


4. Press the "Enter" key to complete the construction.

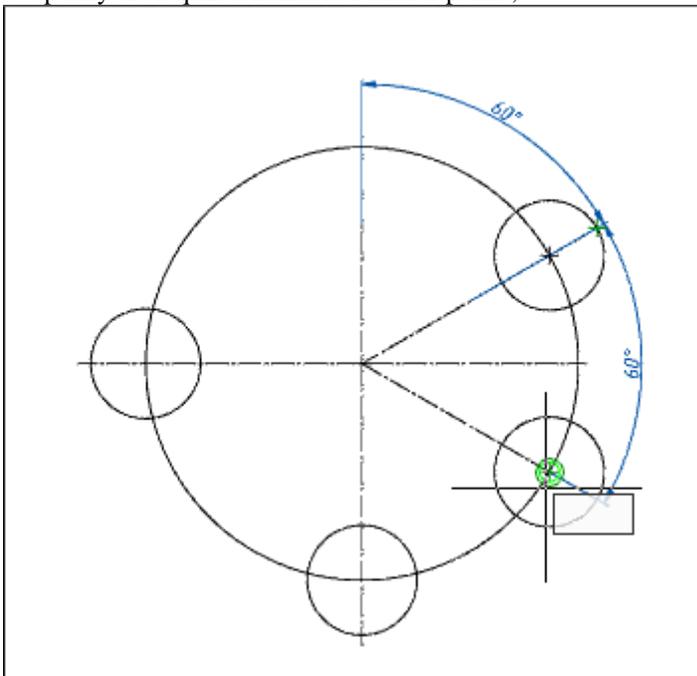


*Angle chain dimensions*

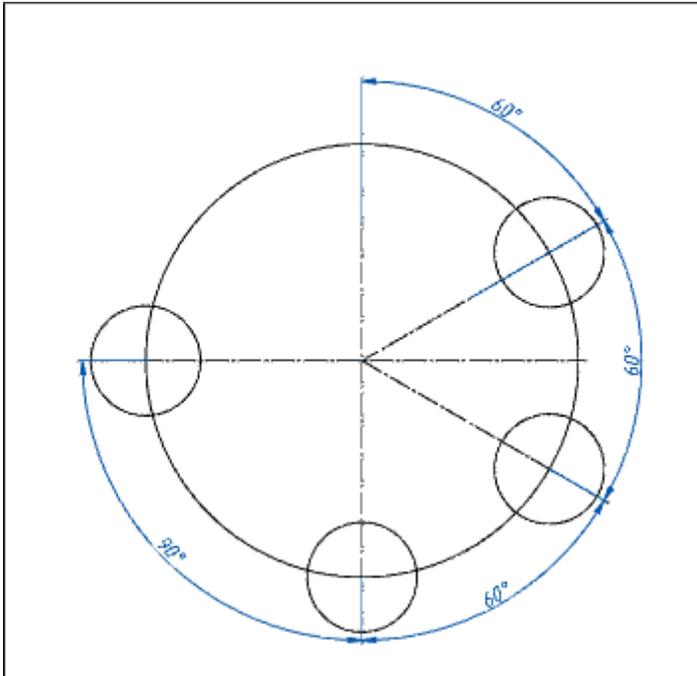
1. Call the command;
2. Select the preset angular dimension (the dimension from which the chain of dimensions will begin to form);



3. Specify the required number of anchor points;



4. Press the "Enter" key to complete the construction.



## Baseline dimension



Main menu: *Dimensions* - *Base dimension*.



Ribbon: *Annotate - Dimensions* - *Baseline dimension*.



Ribbon: *Construction - Symbols* - *Baseline dimension*.



Toolbar: *Dimensions* - *Base dimension*.



Context menu: *Base* - *when calling any dimension*.



Command line: *SPCHAINBASE*, *CHAINBASE*.

Base dimensions are a sequence of dimensions measured from one base point.

Base dimensions can be linear, ordinate, or angular. Before building the base dimensions, at least one linear, ordinate or angular dimension must be applied to the object.

## Procedure

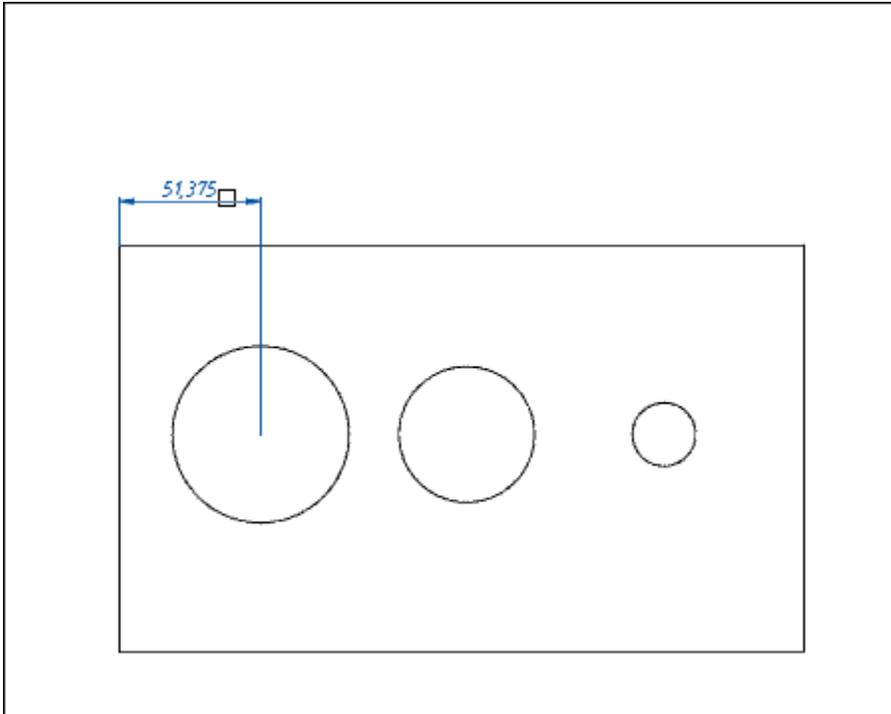
### *Ordinate chain of dimensions*

*Note:* The construction of an ordinate chain of dimensions is similar to construction [ordinate dimension](#).

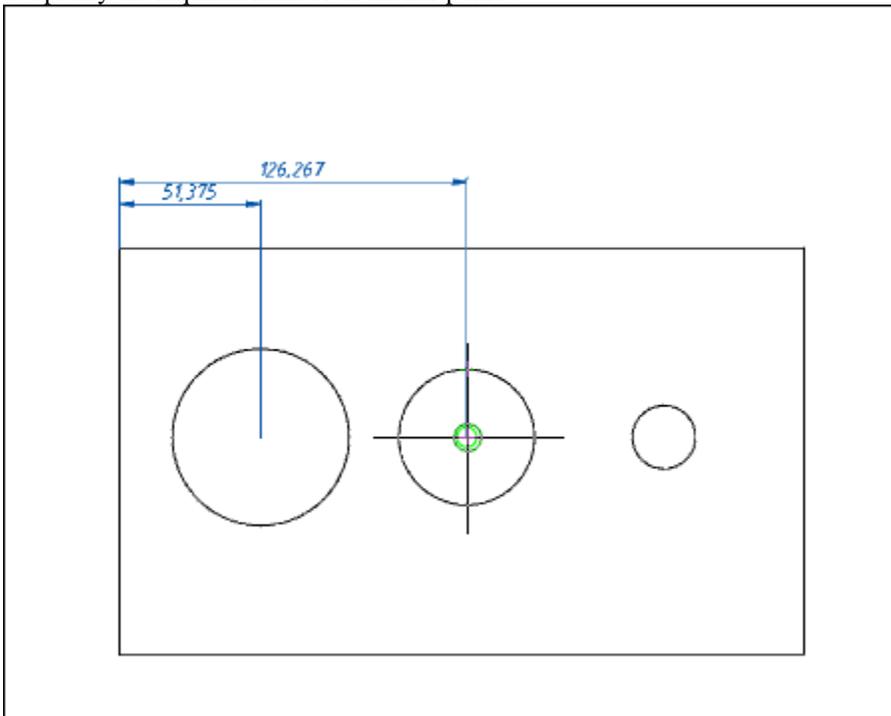
1. Call the command;
2. Select the set ordinate dimension (the dimension from which the ordinate sizes will begin to form);
3. Construct the ordinate dimensions in sequence;
4. Press the "Enter" key to complete the construction.

### *Linear base dimensions*

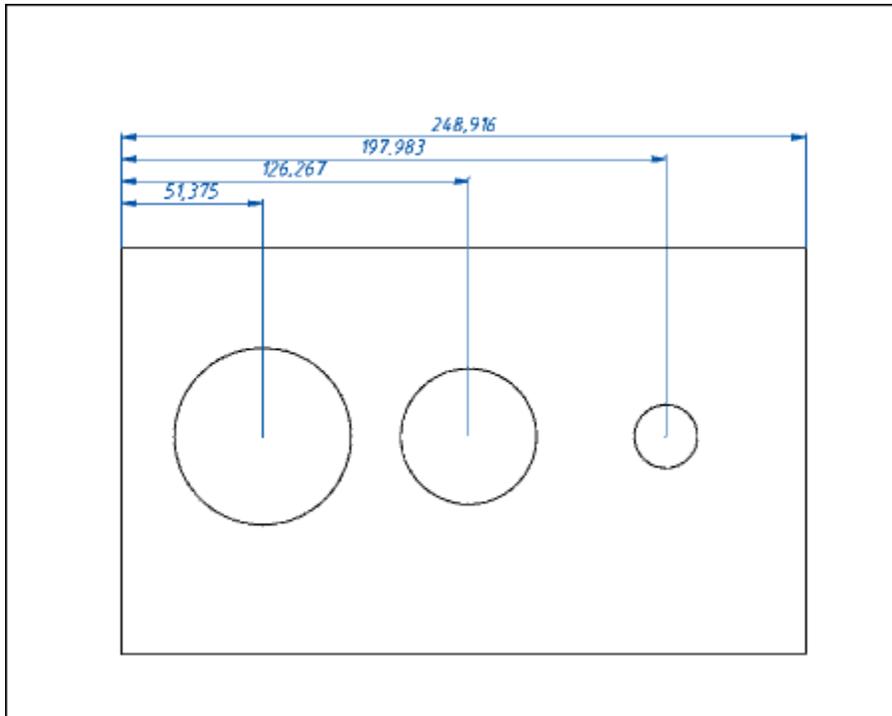
1. Call the command;
2. Select the set dimension as the base (the dimension from which the base sizes will begin to form);



3. Specify the required number of anchor points.



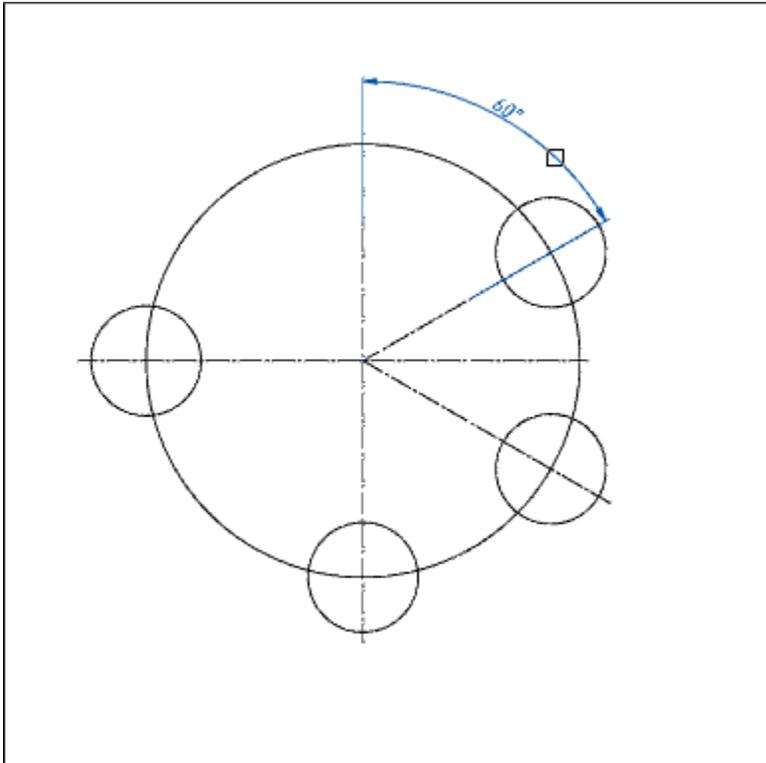
4. Press the "Enter" key to complete the construction.



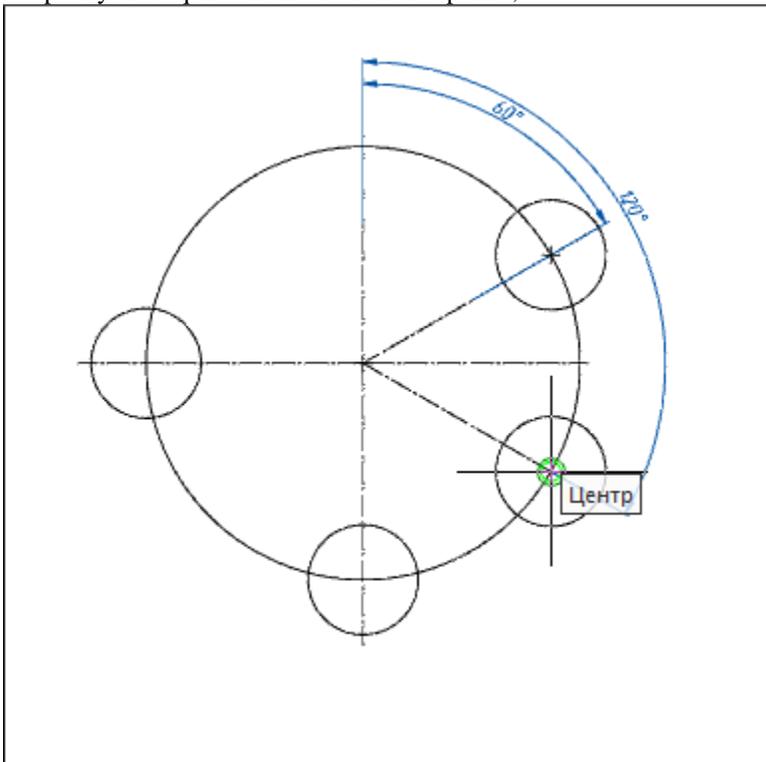
*Note:* Each new dimension is set at a specified distance from the previous one. The value of the offset of the dimensions is set by the "Step" parameter in the base dimensions in the "Lines" tab of the ["Modify dimension style"](#) dialog.

#### *Corner base dimensions*

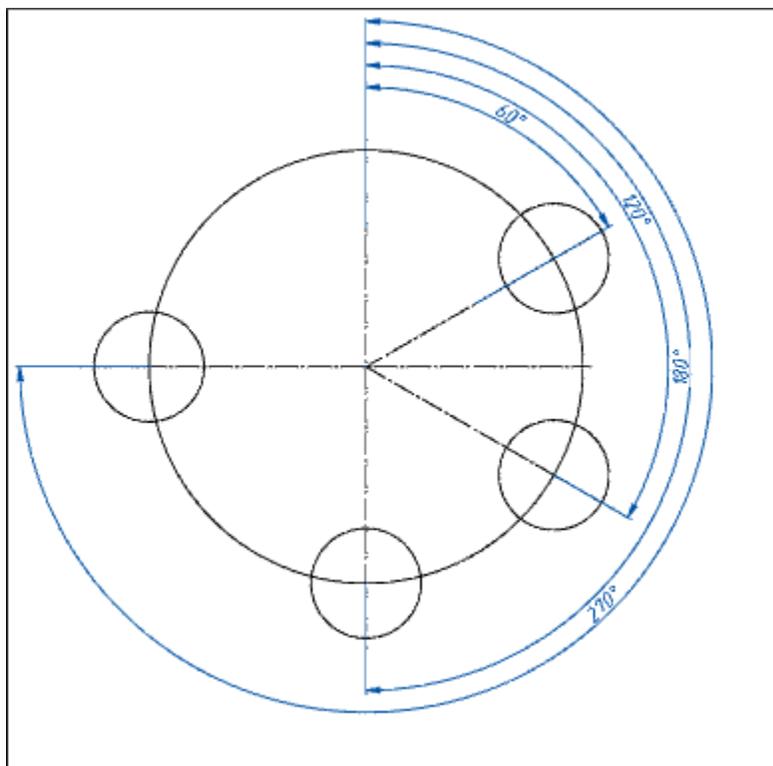
1. Call the command;
2. Select the preset angular dimension (the dimension from which the base dimensions will begin to form);



3. Specify the required number of anchor points;



4. Press the "Enter" key to complete the construction.



## Group dimension



Main menu: *Dimensions* - *Group dimension*.



Ribbon: *Annotate* - *Dimensions* - *Group dimension*.



Ribbon: - *Symbols* - *Group dimension*.



Toolbar: *Dimensions* - *Group dimension*.

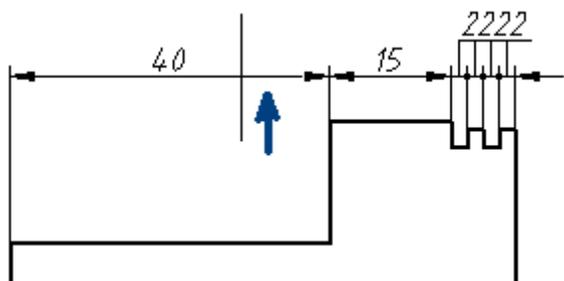


Context menu: *Grouped* - *when calling any dimension*.



Command line: *SPDIMGROUP, DIMGROUP*.

## Procedure

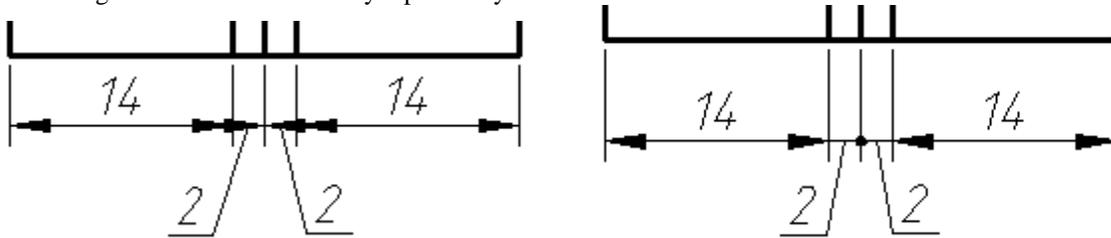


1. Call the command;

2. Select all the objects that will participate in creating the group dimension. To complete the selection press the "Enter" key;

3. Specify the location of the chain of dimensions.

If the setting "Arrows in chains" is set to "Point", then when dimensioning a chain of small numerical dimensions, intersecting arrows are automatically replaced by dots.



## Offset dimension



Main menu: *Dimensions - Offset dimension.*



Ribbon: *- Symbols - Offset dimension.*



Toolbar: *Dimensions - Offset dimension.*

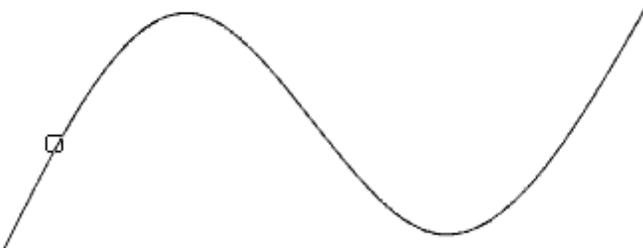


Command line: *SPDIMOFFSET, DIMOFFSET.*

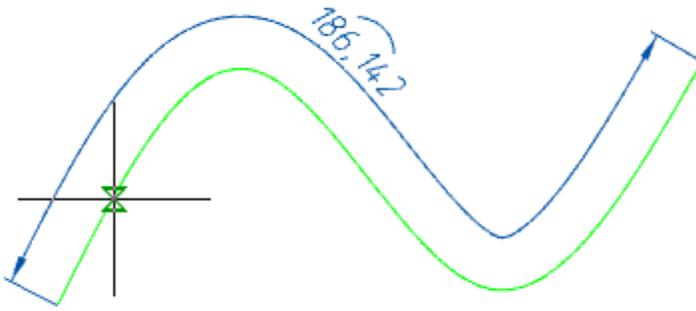
The command allows you to build a size similar to the contour of the selected object. Similarity size is indicated by an arc above the value.

## Procedure

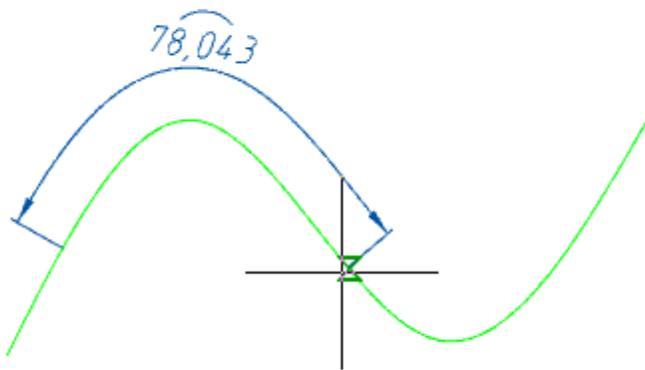
1. Call the command *"Offset dimension"*.
2. Select the method for specifying the object: "sElection" or "frEe". The "sElection" method is used in paper space when you need to dimension an object in an inactive viewport. In all other cases, the "frEe" method is used.
3. Specify the object from which the dimension will be built. The selected object can be specified: line, arc, spline, polyline, circle or ellipse.



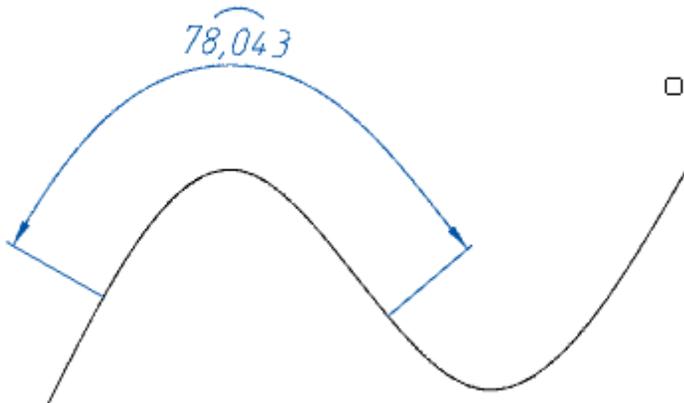
4. Specify the first insertion point (starting point of origin of the dimension) or press the "Space" (or RMB) to automatically add endpoints to the entire length of the object (does not work for closed objects).



5. Specify the second insertion point (end point of origin of the dimension), if you have not pressed the "Space" (or RMB) key.



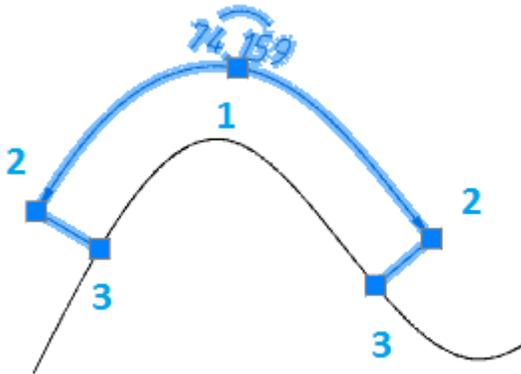
6. Place the dimension leader in the drawing.



7. Offset dimension will be built. The command will continue to work in a cyclic mode. Press the "Esc" key to exit cyclic mode.

## Grips

1. Dimension value placement grip.
2. Extension line position grips.
3. Dimension endpoint grips.



## Edit dimension



LMB double click on the dimension.



Context menu: *Properties - when calling any dimension.*

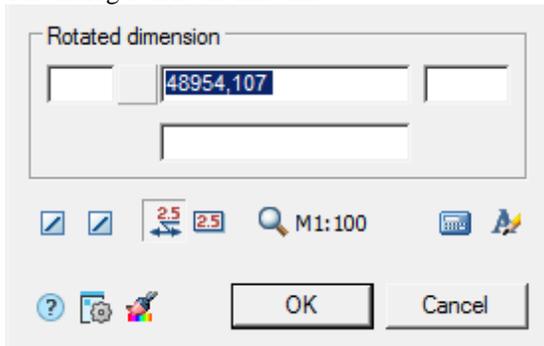


Context menu: *Edit - at the selected dimension.*



Command line: *SPFEDIT, FEDIT.*

The dialog box looks like this:



The window is divided into an area of text input fields with the name of the dimension type and a set of dimension design commands.

Additional auxiliary commands are available in the context menu of the dialog box text fields:

- History - the list contains the values previously entered in this field;
- Recent - the list contains frequently used values when filling in this type of field;
- Insert division- allows you to insert a division;
- Pick from drawing - allows you to copy values from drawing objects;
- Symbols - allows you to insert symbols from a list or from a symbol table;
- etc.

The presence of this or that command in the context menu depends on the purpose of the field.

The button in front of the dimension value input field allows you to add special characters to the dimension text.



Buttons "First arrow" and "Second arrow" allow you to select the type of arrows. When you click on them, a list with images of arrow options appears.



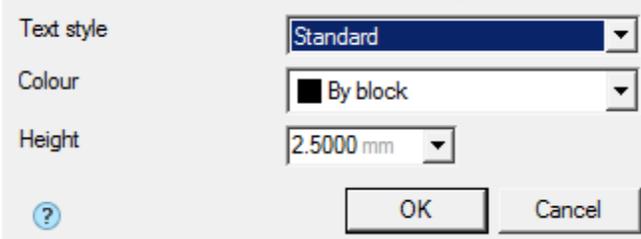
Button "Text on leader" - toggles the display mode of the text on the leader.

Button "Text in rectangle" - toggles the display mode of dimension text in a rectangle.

Button M1:100 "Dimension value display scale" - provides a list of display scales for the size value. Default 1:100.

Button "Calculate value" - calls the calculator to calculate the value.

Button "Text style" - calls the text settings dialog box.



Button "Match properties" - allows you to copy properties from an existing dimension in the drawing.

## Break and Restore dimension line

### Break dimension line



Main menu: *Dimensions* - *Break dimension*.



Main menu: *Construction* - *Breaks* - *Break dimension line*.



Ribbon: *Annotate* - *Dimensions* - *Break dimension line*.



Ribbon: *Construction* - *Symbols* - *Break dimension line*.



Toolbar: *Dimensions* - *Break dimension line*.



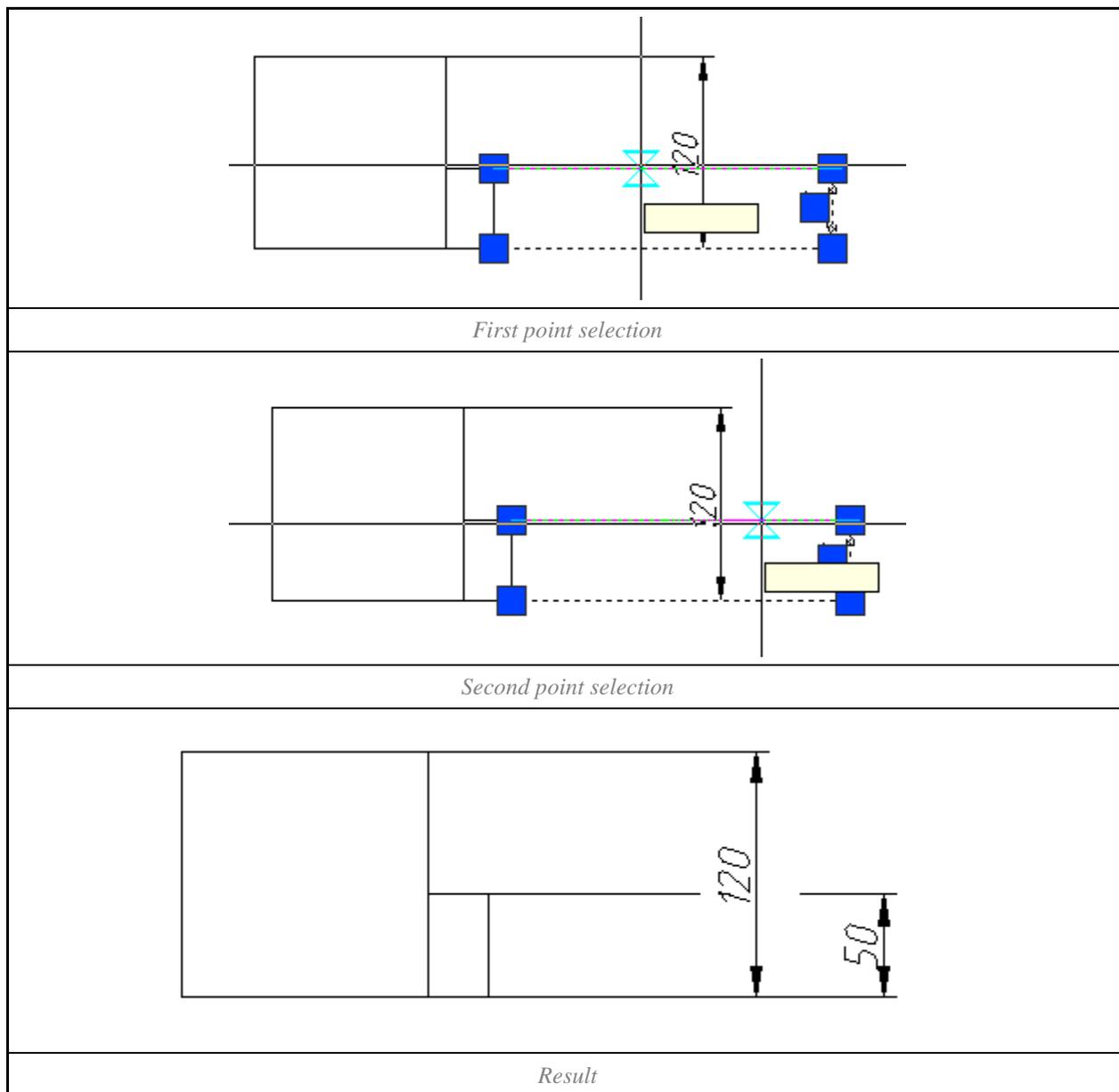
Toolbar: *Construction Breaks* - *Break dimension line*.



Command line: *SPDIMBREAK*, *DIMBREAK*.

To create a dimension line break, you must:

- Call the command;
- Select the dimension. If the size was selected before calling the command, you do not need to select it again;
- Select two points by specifying a section of the dimension line to create a break;
- The break will be made.



### Restore dimension line

-  Main menu: *Dimensions* -  *Restore dimension*.
-  Main menu: *Construction* - *Breaks* -  *Unbreak dimension line*.
-  Ribbon: *Unnotate* - *Dimensions* -  *Unbreak dimension line*.
-  Ribbon: *Construction* - *Symbols* -  *Unbreak dimension line*.
-  Toolbar: *Dimensions* -  *Unbreak dimension line*.



Toolbar: Construction Breaks - *Unbreak dimension line.*



Command line: *SPDIMUNBREAK, DIMUNBREAK.*

To restore the dimension line, you must:

- Call the command;
- Select the dimension. If the size was selected before calling the command, you do not need to select it again;
- The restoration will be done.

## Oblique dimension



Main menu: .



Ribbon: .



Command line: *SPDIMOBLIQUE, DIMOBLIQUE.*

The command allows you to skew the dimension.

## Procedure

1. Call the command "Oblique Dimension".
2. Select the required dimensions. Press the "Enter" key to complete the selection.
3. Enter the angle of inclination and press the "Enter" key.
4. The selected dimensions will change the angle of inclination.

## Arrange dimensions

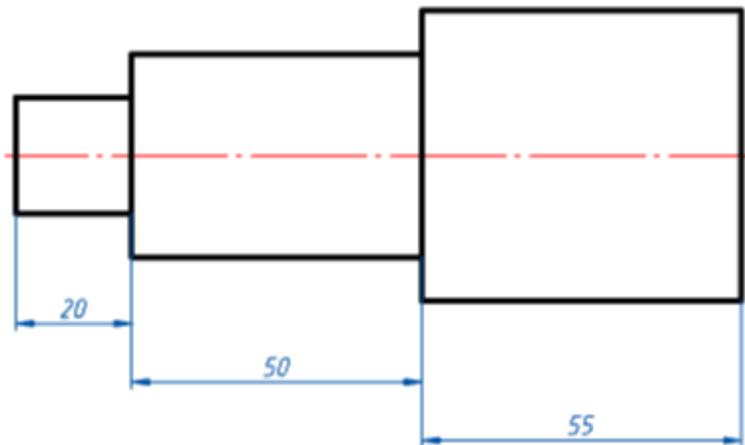


Command line: *SPDIMARRANGE.*

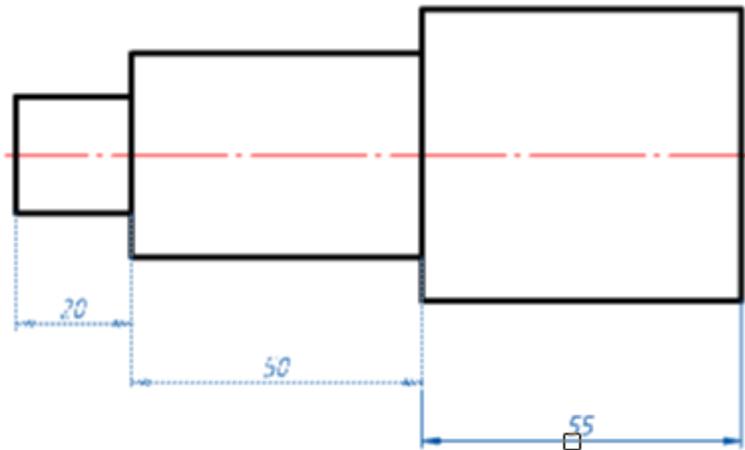
## Procedure

To arrange, you need:

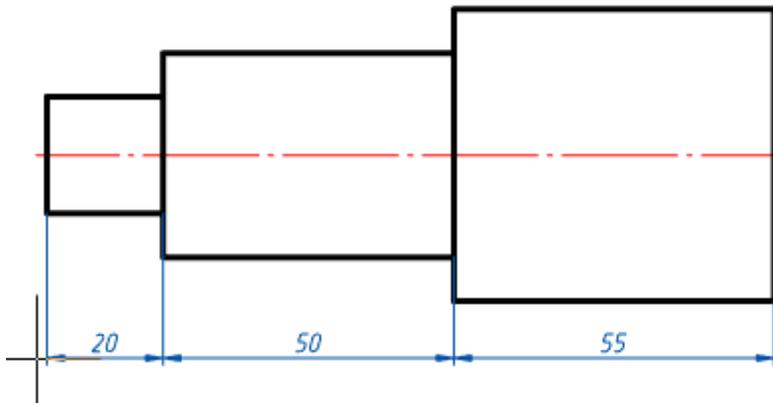
1. Call the command;



2. Indicate the dimensions to be aligned;



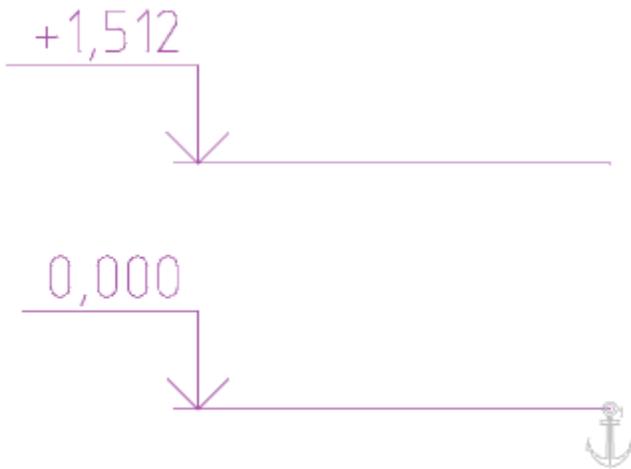
3. Confirm the selection with the "Enter" key;
4. Pick a new location for the dimension group.



## ***Elevation marks***

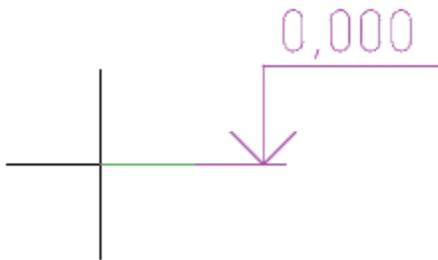
### **Elevation mark**

-  Main menu: *Construction - Level marks -  Elevation mark.*
-  Ribbon: *Construction - Symbols -  Level mark.*
-  Toolbar: *Level marks -  Elevation mark.*
-  Command line: *SPLEVEL.*



### Procedure

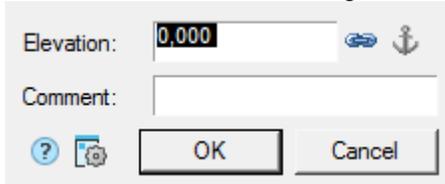
1. Call the command  "Elevation mark".
2. Pick an insertion point for the base elevation mark.



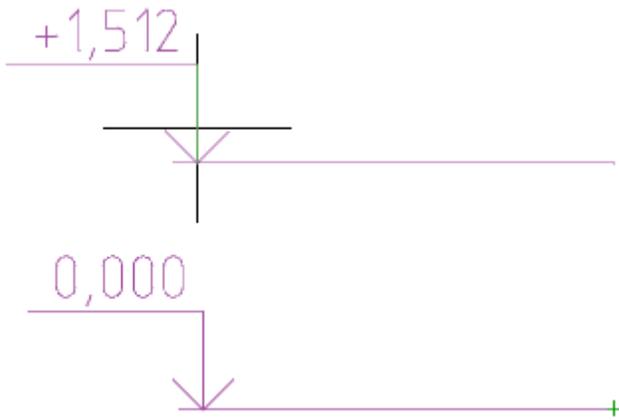
3. Select the position of the elevation mark text. The "Elevation mark" dialog will open.



4. In the "Elevation mark" dialog box enter the required values.

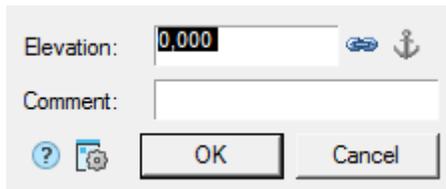


5. Click the "OK" button.
6. Specify the insertion points and text position for subsequent elevation marks. Subsequent elevation marks are associated with the baseline and their value is calculated automatically.



7. Press the "Enter" key or RMB to complete the construction of elevation marks.

## Dialog



The "Elevation" text box contains the numerical value of the level in meters. The default value that appears in the window is automatically calculated and is the Y-axis distance from the insertion point of the base elevation to the specified elevation point (for the base elevation, the default is 0). Marks above zero are displayed with a "+" prefix, and below zero with a "-" prefix. The 0.000 mark has no prefix.

In the "Comment" column, you can enter explanatory text for the mark.

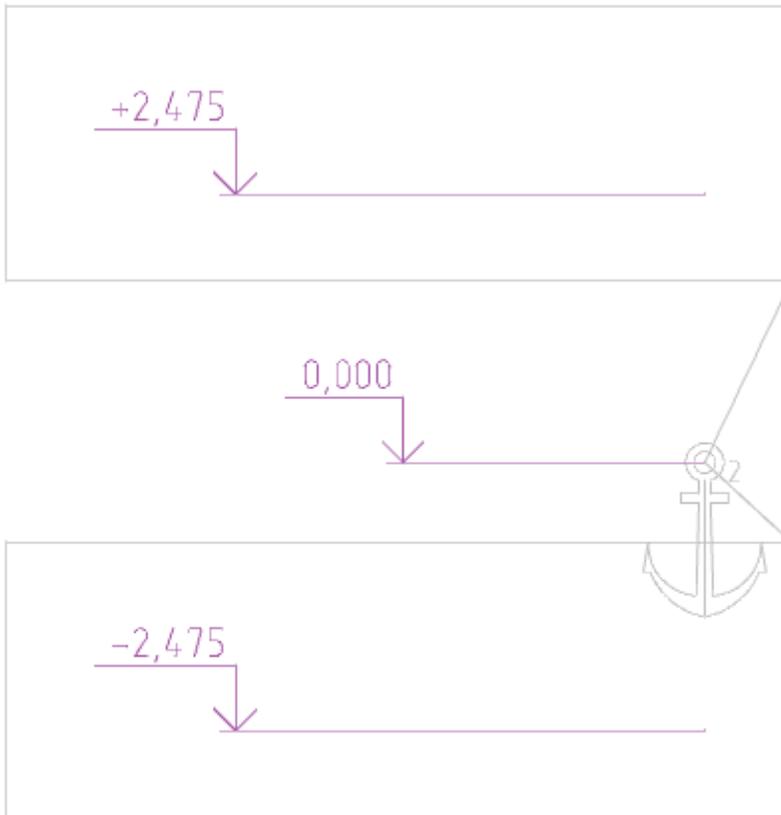
The  "Associative" button controls the association of the elevation mark with the base elevation. When editing associative elevations in the dialog box, the height value field is grayed out and the  "Associative" button is shown when pressed.



To turn off the associativity of the editable mark, turn off the  "Associative" button. If necessary, set associativity with a different elevation, click the  "Associative" button and select the desired elevation in the drawing as the base.

If, after inserting, you call the base mark for editing, the  "Detach owned markers" (anchor) button will be highlighted in the dialog box. When you click on it, the base elevation mode is disabled and all associated elevations lose associativity. A level elevation automatically becomes base if one or more other elevations are associated with it.

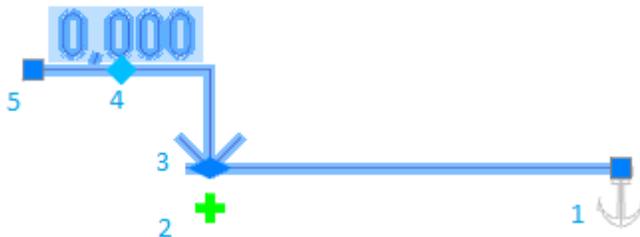
## Anchor



The "Anchor" object points to a base elevation mark to which other elevation marks are associated. The number of associated level marks is indicated next to the anchor. The display of associativity links is turned on / off by calling the "Edit" command: in the tooltip, in the context menu, RMB on the anchor.

## Grips

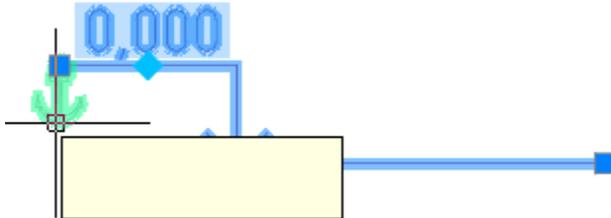
### Elevation mark grips



1. Grip for moving the base.
2. Grip for adding new level marks. Pressing the knob activates the command for adding new level marks. The new level marks will be associated with the edited level mark, which in turn will become the base mark.

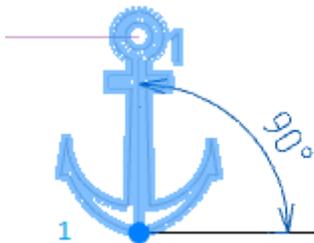
3. Grip for moving the position of the arrow.
4. Grip for specifying the base mark. When you press the grip, you must select the level mark that is the base for the edited level mark.
5. Grip for moving the level mark shelf along the Y axis.

The base elevation in the drawing is highlighted with an "Anchor" icon. When you hover over the "Anchor", a tooltip appears with a link to edit. When you select the "Edit" command for the "Anchor" icon, the elevation marks associated with the selected base elevation mark are highlighted in the drawing. To turn off the highlight, re-invoke the "Edit" command for the "Anchor" icon.



*Note:* Hints are included in ["Construction - Settings... - Tab "Main options" - Notifications - Enable Hints"](#)

**Elevation mark anchor grips**



1. A grip for changing the calculated angle (by default, the coefficient of distance between marks is  $\sin(90) = 1$ ). The grip is used when calculations need to be performed not in the XY plane, but in some other custom coordinate system.

<b>sin(90)</b>	<b>sin(30)</b>

*Linked elevation mark grips*



1. Grip for aligning to baselines. X-aligns the insertion point of the level mark with the insertion point of the base level mark.
2. Grip for moving the base.
3. Grip for moving the position of the arrow.
4. Arrow alignment grip. Aligns the X axis of the insertion point of the level mark arrow with the insertion point of the base level mark arrow.
5. Grip for moving the level mark shelf along the Y axis.

### Align level marks by baselines



Main menu: *Construction - Level marks -  Align level marks by baselines.*



Ribbon: *Construction - Symbols -  Align level marks by baselines.*



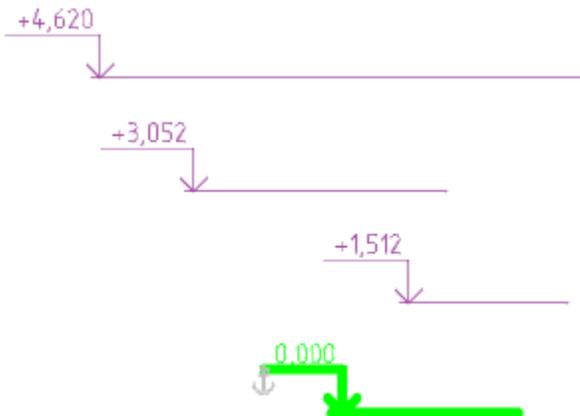
Toolbar: *Level marks -  Align level marks by baselines.*



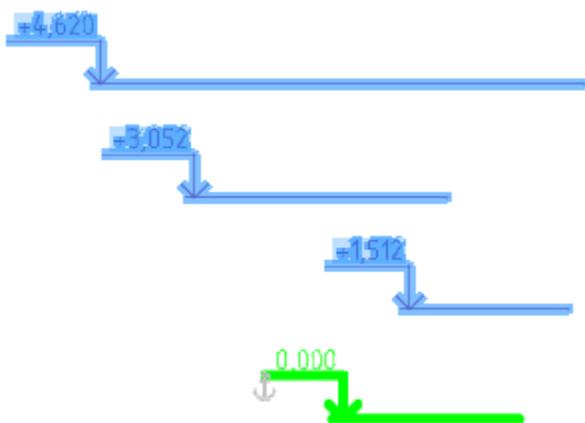
Command line: *SPLVBASE.*

### Procedure

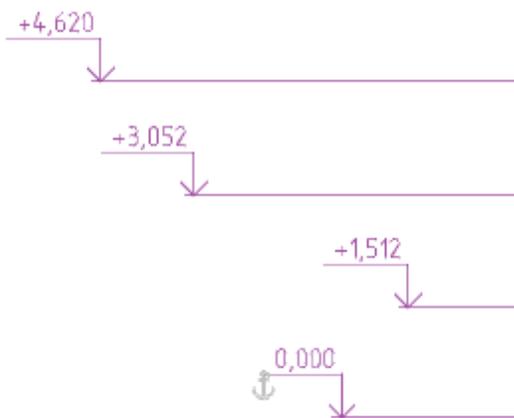
1. Call the command  "Align level marks by baselines".
2. Specify the level mark in the drawing to which the alignment will be carried out.



3. Select the level marks you want to align (with a box or any other method).



4. Press the "Enter" key or RMB to complete the selection. The level marks will be aligned to the baselines.



### Align level marks by arrows



Main menu: *Construction - Level marks -  Align level marks by arrows.*



Ribbon: *Construction - Symbols -  Align level marks by arrows.*



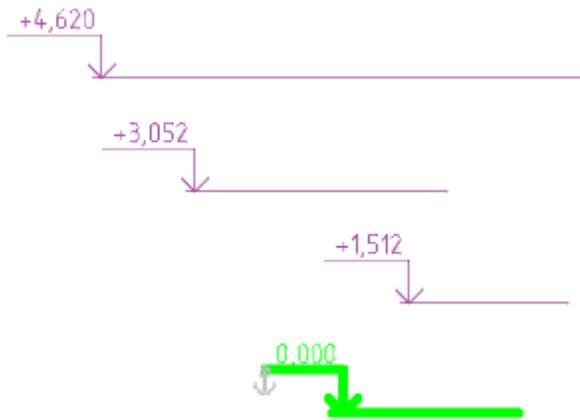
Toolbar: *Level marks -  Align level marks by arrows.*



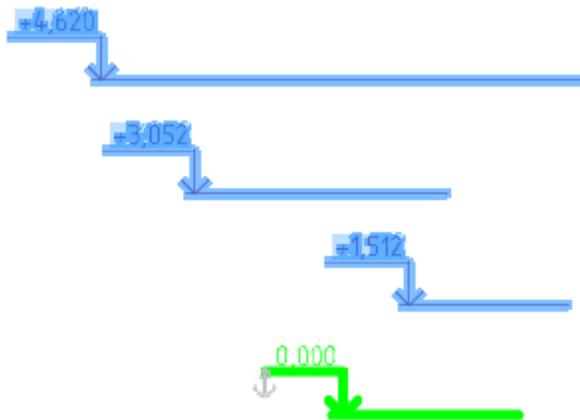
Command line: *SPLVARROW.*

### Procedure

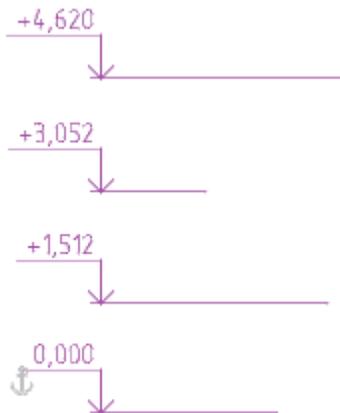
1. Call the command  "Align level marks by arrows".
2. Specify the level mark in the drawing to which the alignment will be carried out.



3. Select the level marks you want to align (with a box or any other method).



4. Press the "Enter" key or RMB to complete the selection. The level marks will be aligned with the arrows.



## Level mark on plane



Main menu: *Construction - Level marks -  Level mark on plane.*



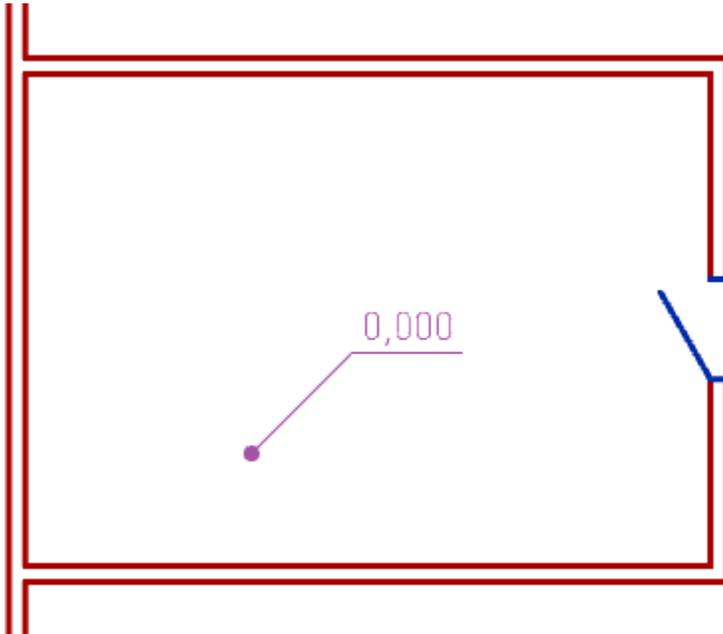
Ribbon: *Construction - Symbols -  Level mark on plane.*



Toolbar: *Level marks -  Level mark on plane.*

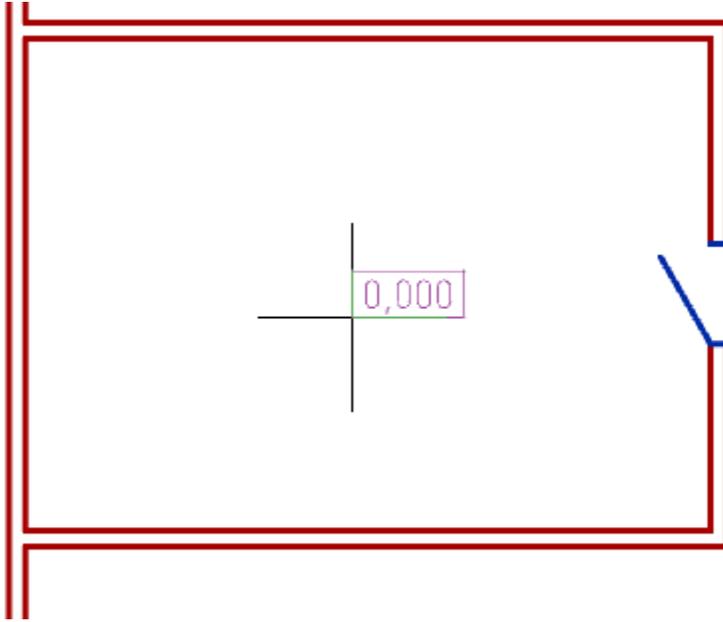


Command line: *SPLLLEVEL.*

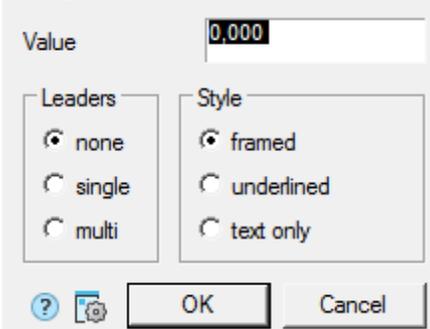


## Procedure

1. Call the command  "Level mark on plane".
2. Specify the insertion point for the first level mark in the drawing. The "Plane elevation marks" dialog will open.

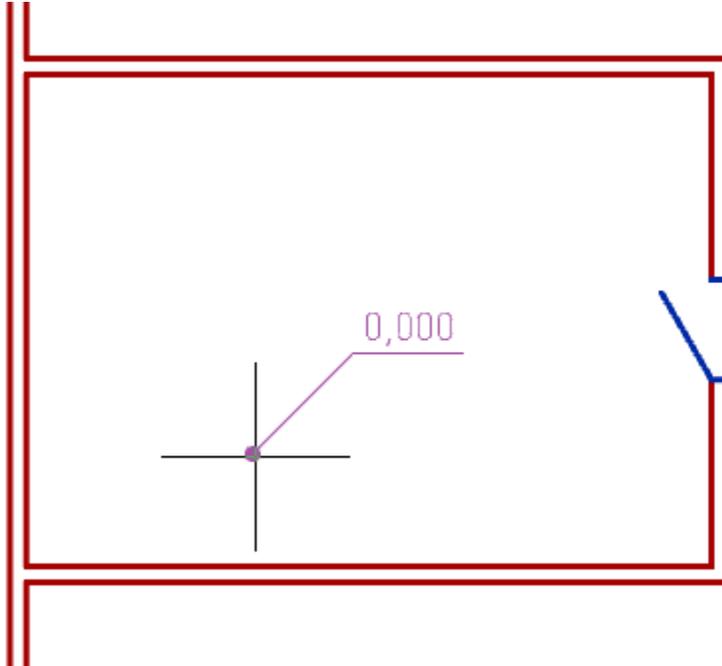


3. In the *"Plane elevation marks"* dialog box, enter a level value. Determine the number of extension lines. Select the appearance of the level mark: framed, underlined, or text only.



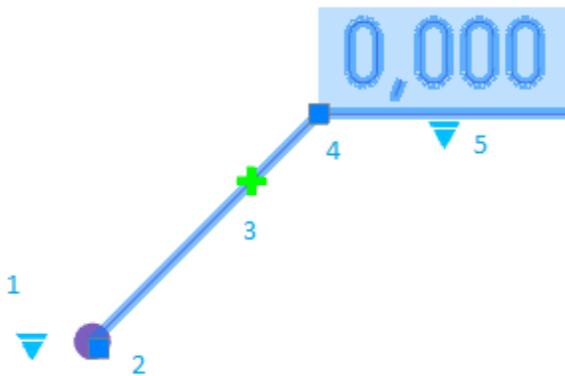
4. Confirm your selection with the *"OK"* button.

5. Specify the extension lines (if you selected the value of the extension lines "single" or "multi", to complete the selection of lines, press the *"Esc"* key).



6. The command works in cyclic insert mode. Insert the required number of level marks into the drawing. End the loop command with the "Esc" key.

## Grips



1. Drop-down arrow type selection grip.
2. Leader line position grip.
3. Leader line grip.
4. Grip for changing the position of the shelf.
5. Drop-down grip for selecting the type of drawing.

## Recalculate level marks



Main menu: *Construction - Level marks -  Recalculate level marks.*



Ribbon: *Construction - Symbols -  Recalculate level marks.*



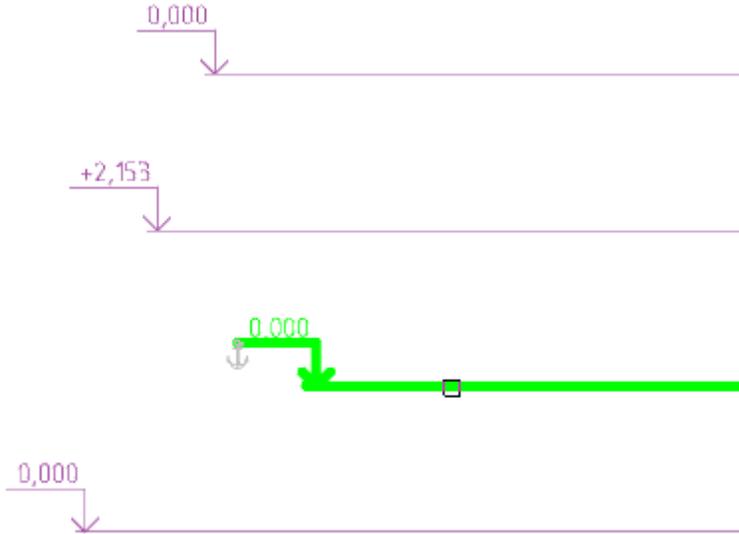
Toolbar: *Level marks - Recalculate level marks*.



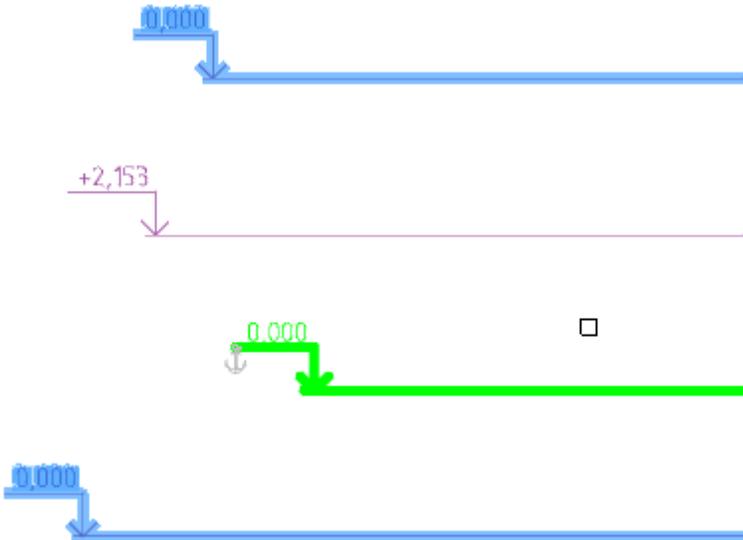
Command line: *SPLVRENUM*.

### Procedure

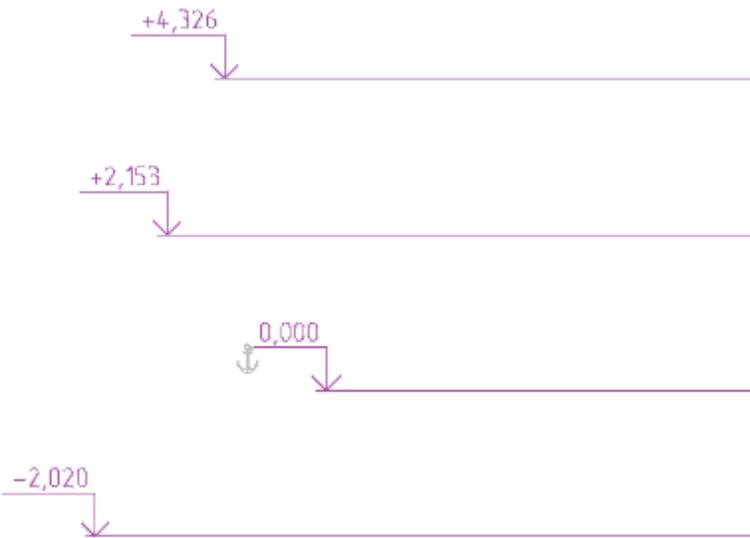
1. Call the command *Recalculate level marks*.
2. Select the level mark to be the reference point.



2. Select the non-associative level marks to be recalculated (with a box or any other method).



3. Press the "Enter" button. A recalculation will be performed.



## Notes

### Mechanical note



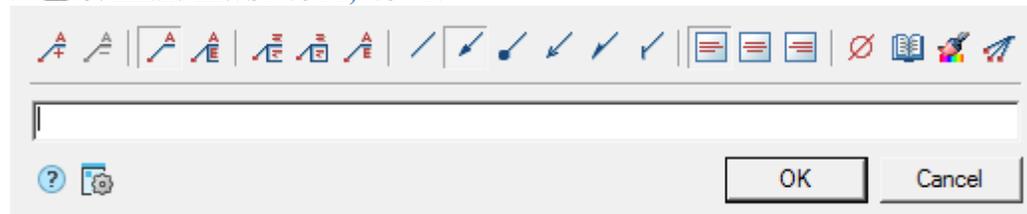
Main menu: *Draw - Notes -  $\sqrt{+}$ Mechanical note.*



Ribbon: *Annotate - Leaders -  $\sqrt{+}$ Mechanical note.*



Command line: *SPNOTE, NOTE.*



## Procedure

1. Call the command.
2. If the option "[Show dialog before inserting objects](#)" is active, the "*Mechanical note*" dialog opens. In the "*Mechanical note*" dialog box, enter text and define the note options. Click "*OK*".
3. Pick a point on the object (position of the leader arrow).
4. Place a note leader in the drawing.
5. If the "[Show dialog before inserting objects](#)" option is disabled, the "*Mechanical note*" dialog will open. In the "*Mechanical note*" dialog box, enter text and define the note options. Click "*OK*".
6. Note will be build.

## Menu

- *Add string* - command adds an extra input field;
- *Remove string* - command deletes the input field where the cursor is located;

-  *Simple note* - command toggles the display of the note;
-  *Multiline note* - command toggles the display of the note;
-  *Multi-line text* - the switch controls the display of multi-line text on the shelf;
-  *Frame* - text under the shelf is framed;
- Type arrows:
  -  *None*,
  -  *Arrow*,
  -  *Point*,
  -  *Open arrow*,
  -  *Half-arrow*,
  -  *Oblique*;
- Align text horizontally:
  -  *By left edge*
  -  *By center*
  -  *By right edge*
-  *Insert special symbol* - the command allows you to insert a special character into the input field;
-  *Notebook* - the command allows you to insert data from a notebook into the field;
-  *Match properties* - command copies appearance parameters from another object;
-  *Add extension line* - the command allows you to add an additional note line;
-  *Global options* - note settings;

## Context menu

The context menu opens in the input field. [View Context menu entry fields.](#)

## Fields

By default, "Mechanical note" contains one text box for the label above the leader flange.

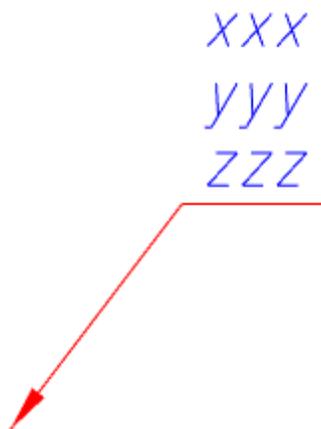
Using the  "Simple note" and  "Multiline note" menu commands, you edit the presence of additional shelves.

Use the  "Add string" and  "Remove string" menu commands to edit the number of leader ledges. When using a simple note, these commands control the presence of text under the shelf.

**Note:** Hotkeys are available for the  "Add string" command. "Ctrl + Enter" - adds a shelf below the selected shelf. "Shift + Enter" - adds a shelf above the selected shelf.

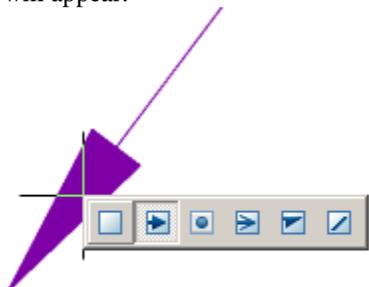
The  "Multi-line text" option allows you to display multiline text on the shelf. When this parameter is enabled, the transition to another line is performed by the "Ctrl + Enter" key combination.

```
xxx
yyy
zzz
```



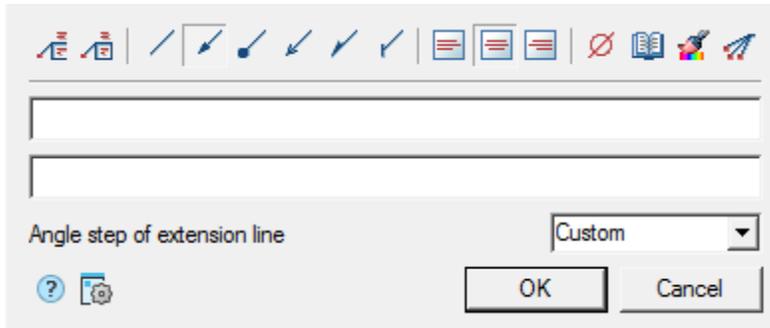
### Arrow type selection context menu

When you call the context menu on the note arrow (without selecting the note), a dialog box for selecting the arrow type will appear.



### Construction note

-  Main menu: *Draw - Notes - Construction note.*
-  Main menu: *Construction - Notes - Construction note.*
-  Ribbon: *Annotate - Leaders - Construction note.*
-  Ribbon: *Construction - Symbols - Construction note.*
-  Toolbar: *Notes - Construction note.*
-  Command line: *SPNOTE, NOTEP.*



## Procedure

1. Call the command  "Construction note".
2. If ["Show dialog before inserting the object"](#) is active, the "Construction Note" dialog opens. In the "Construction Note" dialog box, enter text and define the leader options. Click the "OK" button.
3. Pick a point on the object (select the object) to which the leader arrow will point. To select an object, use the "Select" context menu command; to freely specify a point in the drawing, use the "Free" context menu command.
4. Place the leader shelf in the drawing.

If the parameter "Angle step of extension line" is arbitrary, it is possible to place the leader ledge orthogonally in the ORTO mode (F8). When you turn on the ORTO mode via the "SHIFT" key, Object Snap (F3) must be turned on.

5. If the ["Show dialog before inserting the object"](#) option is disabled, the "Construction Note" dialog will open. In the "Construction Note" dialog box, enter text and define the leader options. Click the "OK" button.
6. The note is built.

## Menu

-  *Multi-line text* - the switch controls the display of multi-line text on the shelf;
-  *Frame* - text under the shelf is framed;
- Type arrows:
  -  *None*,
  -  *Arrow*,
  -  *Point*,
  -  *Open arrow*,
  -  *Half-arrow*,
  -  *Oblique*;
- Align text horizontally:
  -  *By left edge*,
  -  *By center*,
  -  *By right edge*;
-  *Insert special symbol* - the command allows you to insert a special character into the input field;
-  *Notebook* - the command allows you to insert data from a notebook into the field;
-  *Match properties* - command copies appearance parameters from another object;
-  *Add extension line* - the command allows you to add an additional note line;
-  *Global options* - note settings.

## Context menu

The context menu opens in the input field. [View Context menu entry fields.](#)

## Fields

The default positional leader contains two input lines and a list for specifying the pitch of the bevel angle.

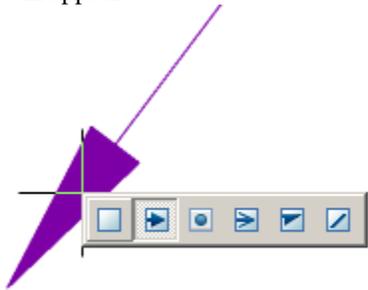
The first line is for the label above the leader shelf, the second is under the leader shelf.

In the "*Angle step of extension line*" list box, the slope angle of the leader lines is selected:

- *Custom* - a leader line is placed arbitrarily (default);
- *step 15°* - the leader line is put down with a step multiple 15°;
- *step 30°* - the leader line is put down with a step multiple 30°;
- *step 45°* - the leader line is put down with a step multiple 45°;
- *step 90°* - the leader line is put down with a step multiple 90°.

## Arrow type selection context menu

When you call the context menu on the note arrow (without selecting the note), a dialog box for selecting the arrow type will appear.



## Comb leader note



Main menu: *Draw - Notes -  Comb leader note.*



Main menu: *Construction - Notes -  Comb leader note.*



Ribbon: *Annotate - Leaders -  Comb leader note.*



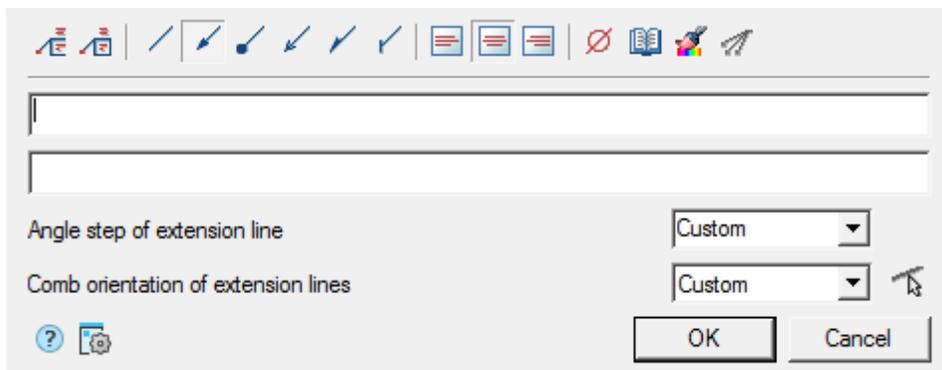
Ribbon: *Construction - Symbols -  Comb leader note.*



Toolbar: *Notes -  Comb leader note.*



Command line: *SPNOTE<sup>C</sup>, NOTE<sup>C</sup>.*



## Procedure

1. Call the command.
2. If the option "[Show dialog before inserting objects](#)" is active, the "*Comb leader note*" dialog opens. In the "*Comb leader note*" dialog box, enter text and define the note options. Click "OK".
3. Insert the required number of leader lines. When you specify the location of the leader line, the specified line segment is highlighted. Press the "Enter" key to complete the paste.
4. Specify the slope of the leader lines. Commands for switching the ridge direction are available in the context menu: H - horizontal, V - vertical, P - parallel (parallel to the selected line).
5. Place a note leader in the drawing.
6. If the "[Show dialog before inserting objects](#)" option is disabled, the "*Comb leader note*" dialog will open. In the "*Comb leader note*" dialog box, enter text and define the note options. Click "OK".
7. Note will be build.

## Menu

- *Multi-line text* - the switch controls the display of multi-line text on the shelf;
- *Frame* - text under the shelf is framed;
- Type arrows:
  - *None*,
  - *Arrow*,
  - *Point*,
  - *Open arrow*,
  - *Half-arrow*,
  - *Oblique*;
- Align text horizontally;
  - *By left edge*
  - *By center*
  - *By right edge*
- *Insert special symbol* - the command allows you to insert a special character into the input field;
- *Notebook* - the command allows you to insert data from a notebook into the field;
- *Match properties* - command copies appearance parameters from another object;
- *Add extension line* - the command allows you to add an additional note line;
- *Global options* - note settings.

## Context menu

The context menu opens in the input field. [View Context menu entry fields.](#)

## Fields

Comb leader note by default contains: two lines of input, a list for specifying the pitch of the angle of inclination and the orientation of the ridge.

The first line is for the label above the leader shelf, the second is under the leader shelf.

In the "*Angle step of extension line*" list box, the slope angle of the leader lines is selected:

- *Custom* - a leader line is placed arbitrarily (default);
- *step 15°* - the leader line is put down with a step multiple 15°;
- *step 30°* - the leader line is put down with a step multiple 30°;
- *step 45°* - the leader line is put down with a step multiple 45°;
- *step 90°* - the leader line is put down with a step multiple 90°.

In the "*Comb orientation of extension lines*" list box, you can select the ridge orientation of the leader lines:

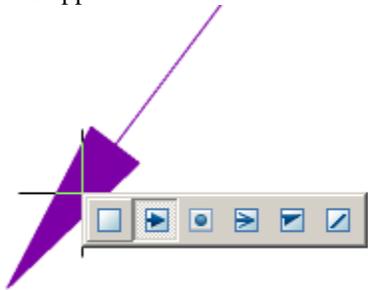
- *Custom*;
- *Horizontal*;
- *Vertical*.

The list is equipped with an additional button  "Select line", which allows you to select the direction of the ridge of the leader lines parallel to any line segment in the drawing.

The  "*Multi-line text*" option allows you to display multiline text on the shelf. When this parameter is enabled, the transition to another line is performed by the "*Ctrl + Enter*" key combination.

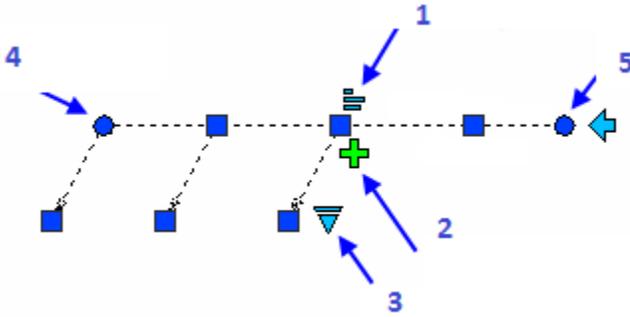
## Arrow type selection context menu

When you call the context menu on the note arrow (without selecting the note), a dialog box for selecting the arrow type will appear.



## Grips

1. Text alignment toggle grip.
2. Leader lines grip.
3. Arrow type switch-grip.
4. Ridge line rotation grip.
5. Shelf rotation grip.



## Chain note



Main menu: *Draw - Notes -  Chain note.*



Main menu: *Construction - Notes -  Chain note.*



Ribbon: *Annotate - Leaders -  Chain note.*



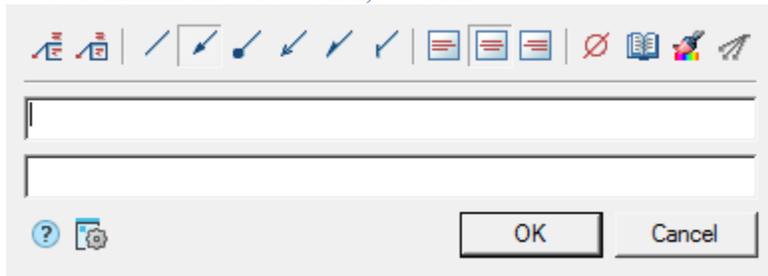
Ribbon: *Construction - Symbols -  Chain note.*



Toolbar: *Notes -  Chain note.*



Command line: *SPNOTEH, NOTEH.*



A chain note has several coaxial (collinear) series-connected pointers.

If the first node of the note is placed on a line segment, then the note will be located perpendicular to this segment.

## Procedure

1. Call the command.
2. If the option "[Show dialog before inserting objects](#)" is active, the "Chain note" dialog opens. In the "Chain note" dialog box, enter text and define the note options. Click "OK".
3. Specify note nodes, at least two. To complete the selection of nodes, press "Enter".
4. Specify the position of the leader where the text will go.
5. If the "[Show dialog before inserting objects](#)" option is disabled, the "Chain note" dialog will open. In the "Chain note" dialog box, enter text and define the note options. Click "OK".
6. Note will be build.

## Menu

-  *Multi-line text* - the switch controls the display of multi-line text on the shelf;
-  *Frame* - text under the shelf is framed;

- Type arrows:
  -  *None*,
  -  *Arrow*,
  -  *Point*,
  -  *Open arrow*,
  -  *Half-arrow*,
  -  *Oblique*;
- Align text horizontally;
  -  *By left edge*
  -  *By center*
  -  *By right edge*
-  *Insert special symbol* - the command allows you to insert a special character into the input field;
-  *Notebook* - the command allows you to insert data from a notebook into the field;
-  *Match properties* - command copies appearance parameters from another object;
-  *Add extension line* - the command allows you to add an additional note line;
-  *Global options* - note settings;

## Context menu

The context menu opens in the input field. [View Context menu entry fields.](#)

## Fields

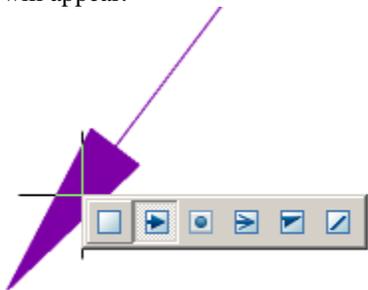
Chain note contains two lines of input by default.

The first line is for the label above the leader shelf, the second is under the leader shelf.

Input fields are expandable. Switching to another line of the input field is performed by the "*Ctrl + Enter*" key combination.

## Arrow type selection context menu

When you call the context menu on the note arrow (without selecting the note), a dialog box for selecting the arrow type will appear.

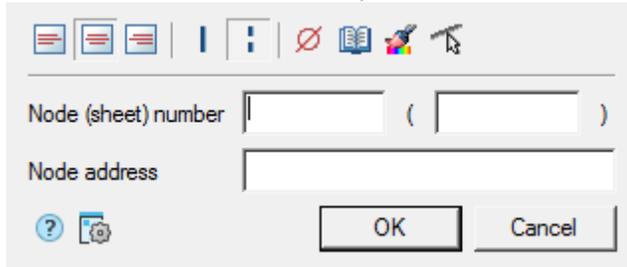


## Section note



Main menu: *Draw - Notes -  Section note.*

-  Main menu: *Construction - Notes -  Section note.*
-  Ribbon: *Annotate - Leaders -  Section note.*
-  Ribbon: *Construction - Symbols -  Section note.*
-  Toolbar: *Notes -  Section note.*
-  Command line: *SPNOTES, NOTES.*



## Procedure

1. Call the command.
2. If the option ["Show dialog before inserting objects"](#) is active, the *"Section note"* dialog opens. In the *"Section note"* dialog box, enter text and define the note options. Click *"OK"*.
3. Select the insert mode *"Free"* or *"Selection"*:
  - *"Selection"* - you need to specify the first and second lines to place the note, the cursor is in the form of a square,
  - *"Free"* - no lines are required, can be placed anywhere by 2 points, the cursor is in the form of a cross.
 To switch from the *"Selection"* mode to the *"Free"* mode, press the RMB and select the *"Enter"* command in the context menu. To switch from the *"Free"* mode to the *"Selection"* mode, press the RMB. Also, switching modes is carried out with the *"Space"* key.
4. Pick the first point (select the first line) in the drawing.
5. Pick the second point (select the second line) in the drawing.
6. Specify the position of the leader.
7. If the ["Show dialog before inserting objects"](#) option is disabled, the *"Section note"* dialog will open. In the *"Section note"* dialog box, enter text and define the note options. Click *"OK"*.
8. Section note will be build.

## Menu

- Align text horizontally;
  -  *By left edge*
  -  *By center*
  -  *By right edge*
- Lines;
  -  *Single-stroked line*
  -  *Double-stroked line*
-  *Insert special symbol* - the command allows you to insert a special character into the input field;
-  *Notebook* - the command allows you to insert data from a notebook into the field;
-  *Match properties* - command copies appearance parameters from another object;

-  *Select line* - the command allows you to relocate the location of the leader line by specifying a line in the drawing;
-  *Global options* - note settings.

## Context menu

The context menu opens in the input field. [View Context menu entry fields.](#)

## Fields

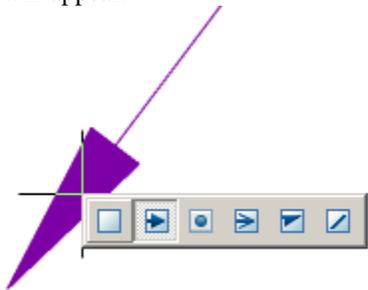
Section note contains two lines of input by default.

The first line of input consists of two fields for specifying the "*Node (sheet) number*".

Second line of input for specifying the "*Node address*".

## Arrow type selection context menu

When you call the context menu on the note arrow (without selecting the note), a dialog box for selecting the arrow type will appear.



## Node note



Main menu: *Draw - Notes -  Node note.*



Main menu: *Construction - Notes -  Node note.*



Ribbon: *Annotate - Leaders -  Node note.*



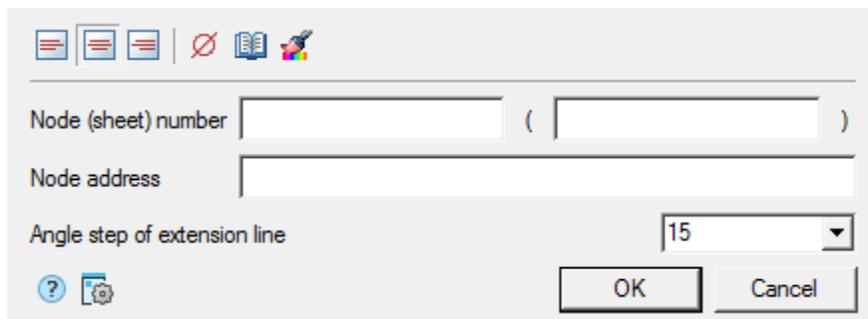
Ribbon: *Construction - Symbols -  Node note.*



Toolbar: *Notes -  Node note.*



Command line: *SPNOTEK, NOTEK.*



## Procedure

1. Call the command.
2. If the option ["Show dialog before inserting objects"](#) is active, the *"Node note"* dialog opens. In the *"Node note"* dialog box, enter text and define the leader options. Click *"OK"*.
3. Pick the center of the leader oval (circle).
4. Specify the size of the leader oval (circle).
5. Show the position of the shelf or enter in advance in the command line the step of the angle of inclination of the leader line.
6. If the ["Show dialog before inserting objects"](#) option is disabled, the *"Node note"* dialog will open. In the *"Node note"* dialog box, enter text and define the leader options. Click *"OK"*.
7. Node note will be build.

## Menu

- Align text horizontally;
  - *By left edge*
  - *By center*
  - *By right edge*
- *Insert special symbol* - the command allows you to insert a special character into the input field;
- *Notebook* - the command allows you to insert data from a notebook into the field;
- *Match properties* - command copies appearance parameters from another object;
- *Global options* - note settings.

## Context menu

The context menu opens in the input field. [View Context menu entry fields.](#)

## Fields

Node note by default contains: two input lines and a drop-down list for specifying the pitch of the slope.

The first line of input consists of two fields for specifying the *"Node (sheet) number"*.

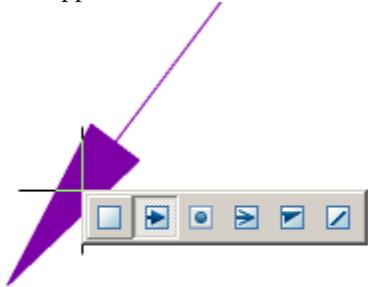
Second line of input for specifying the *"Node address"*.

In the drop-down list *"Angle step of extension line"*, the slope angle of the leader lines is selected:

- *Custom* - a leader line is placed arbitrarily (default);
- *step 15°* - the leader line is put down with a step multiple 15°;
- *step 30°* - the leader line is put down with a step multiple 30°;
- *step 45°* - the leader line is put down with a step multiple 45°;
- *step 90°* - the leader line is put down with a step multiple 90°.

## Arrow type selection context menu

When you call the context menu on the note arrow (without selecting the note), a dialog box for selecting the arrow type will appear.



## Note for multilayered constructions



Main menu: *Draw - Notes -  Note for multilayered constructions.*



Main menu: *Construction - Notes -  Note for multilayered constructions.*



Ribbon: *Annotate - Leaders -  Note for multilayered constructions.*



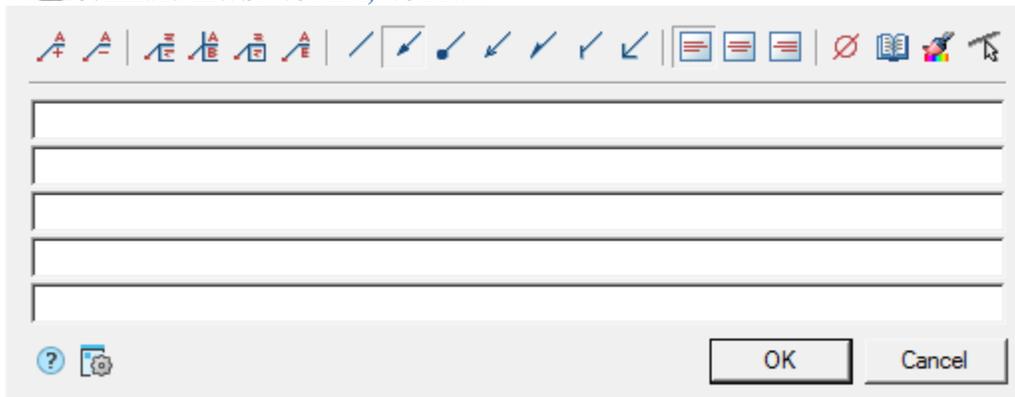
Ribbon: *Construction - Symbols -  Note for multilayered constructions.*



Toolbar: * Notes -  Note for multilayered constructions.*



Command line: *SPNOTEM, NOTEM.*



## Procedure

1. Call the command.
2. If the option "[Show dialog before inserting objects](#)" is active, the "Note for multilayered constructions" dialog opens. In the "Note for multilayered constructions" dialog box, enter text and define the leader options. Click "OK".
3. Pick a point on an object (drawing).
4. Specify the position of the shelf.

5. If the ["Show dialog before inserting objects"](#) option is disabled, the *"Note for multilayered constructions"* dialog will open. In the *"Note for multilayered constructions"* dialog box, enter text and define the leader options. Click OK.
6. The note will be built.

## Menu

-  *Add string* - command adds an extra input field;
-  *Remove string* - command deletes the input field where the cursor is located;
-  *First line* - the command adds a border (vertical line before the line) for the first line;
-  *Multi-line text* - the switch controls the display of multi-line text on the shelf;
-  *Frame* - text under the shelf is framed;
- Type arrows:
  -  *None*,
  -  *Arrow*
  -  *Point*,
  -  *Open arrow*,
  -  *Half-arrow*,
  -  *Oblique*,
  -  *Right angle*;
- Align text horizontally;
  -  *By left edge*
  -  *By center*
  -  *By right edge*
-  *Insert special symbol* - the command allows you to insert a special character into the input field;
-  *Notebook* - the command allows you to insert data from a notebook into the field;
-  *Match properties* - command copies appearance parameters from another object;
-  *Select line* - the command allows you to relocate the location of the leader line by specifying a line in the drawing;
-  *Global options* - note settings.

## Context menu

The context menu opens in the input field. [View Context menu entry fields.](#)

## Fields

By default, *"Note for multilayered constructions"* contains 5 input fields.

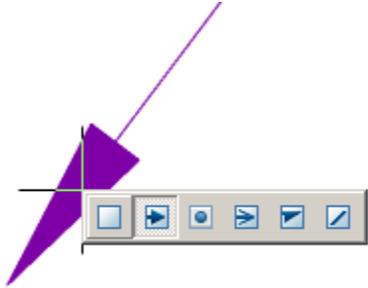
The number of fields is edited using the menu commands *"Add string"* and *"Remove string"*.

With the help of the *"First line"* menu command, the presence of a border on the first line is edited.

Using the *"Multi-line text"* menu command, you edit the presence of shelves in multiline notes.

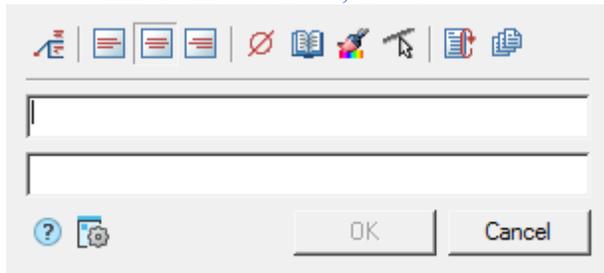
## Arrow type selection context menu

When you call the context menu on the note arrow (without selecting the note), a dialog box for selecting the arrow type will appear.



## Linear aligned note

-  Main menu: *Draw - Notes -  Linear Aligned note.*
-  Main menu: *Construction - Notes -  Linear Aligned note.*
-  Ribbon: *Annotate - Leaders -  Linear Aligned note.*
-  Ribbon: *Construction - Symbols -  Linear Aligned note.*
-  Toolbar: *(Notes -  Linear Aligned note.*
-  Command line: *SPLINM, LINM.*



## Procedure

1. Call the command. A dialogue will open "*Linear aligned note*"
2. In the "*Linear aligned note*" dialog box, enter text and define the leader options. Click the "*OK*" button.
3. Specify the subassembly line on which the line subassembly will be located.
4. Specify text position.
5. "*Linear aligned note*" will be build.

## Menu

-  *Multi-line text* - the switch controls the display of multi-line text on the shelf;
- Align text horizontally;
  -  *By left edge*
  -  *By center*
  -  *By right edge*
-  *Insert special symbol* - the command allows you to insert a special character into the input field;

-  *Notebook* - the command allows you to insert data from a notebook into the field;
-  *Match properties* - command copies appearance parameters from another object;
-  *Select line* - the command allows you to relocate the location of the leader line by specifying a line in the drawing;
-  *Auto repeat* - when the switch is on, the "*Linear aligned note*" command, upon completion of the previous command, is restarted;
-  *Global options* - note settings;
-  *Multiple insert* - when the switch is on, the insert is looped. To exit the cycle, press the "*Enter*" key.

### Context menu

The context menu opens in the input field. [View Context menu entry fields.](#)

### Fields

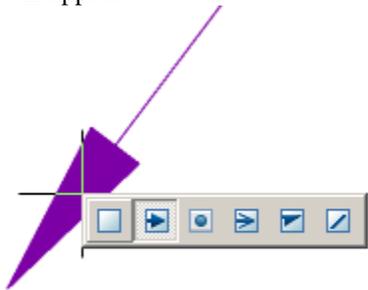
By default "*Linear aligned note*" contains 2 input fields.

The first field for the label is above the linear structure, the second - under the linear structure.

The  *Multi-line text* parameter allows you to display multi-line text on the shelf. When this parameter is enabled, the transition to another line is performed by the "*Ctrl + Enter*" key combination.

### Arrow type selection context menu

When you call the context menu on the note arrow (without selecting the note), a dialog box for selecting the arrow type will appear.



### Distribution range



Main menu: *Construction - Notes - + Distribution range.*



Ribbon: *Construction - Symbols - + Distribution range.*

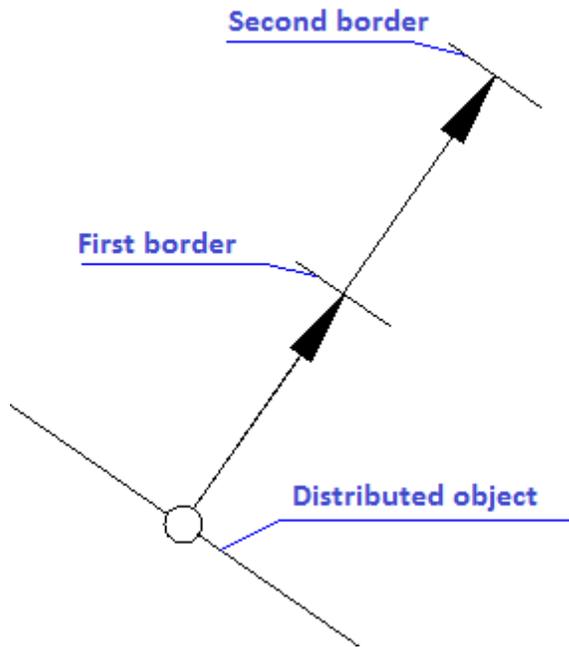


Command line: *SPRANGE.*

### Procedure

1. Select the *shared object*.
2. Select the *first point of the border*.
3. Select the *second point of the border*.

The command to create a symbol distribution range recurring structural elements in the specified bounds. Arrow pointer automatically aligned perpendicular to the *shared object*. Beginning marker band (contour point) automatically closes the line on which is situated.



## Editing Notes

There are 3 commands for editing leaders:

### Append leader



Main menu: *Construction - Notes - + Append leader*.



Ribbon: *Construction - Symbols - + Append leader*.



Toolbar: *+Append leader* ("Notes").



Command line: *SPPLADD*.

1. Call the team.
2. Pick a point on the object (point of arrow position).
3. Indicate the required number of intermediate points that form a break in the leader line.
4. Point to the desired leader inserted in the drawing to complete the command.

### Detach leader



Main menu: *Construction - Notes - - Detach leader*.



Ribbon: *Construction - Symbols - - Detach leader*.



Toolbar: *-Detach leader* ("Notes").



Command line: *SPPLDEL*.

1. Call the team.
2. In the drawing, select the leader line you want to delete.

## Edit leader



Main menu: *Construction - Notes* - *Edit leader*.



Ribbon: *Construction - Symbols* - *Edit leader*.



Toolbar: *Edit leader* ("Notes").

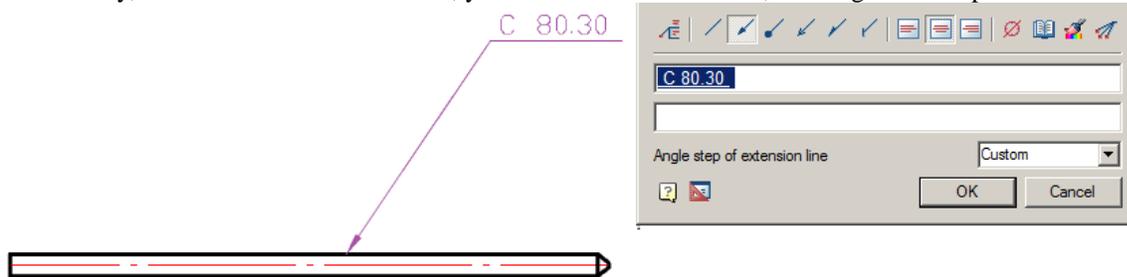


Command line: *SPPLREC*.

1. Call the team.
2. Highlight on the drawing a leader line that should be chained.
3. Pick a point on the desired leader in order to fix the new position of the leader line.

## Save template note

If necessary, save the callouts for later use, you need to create a balloon, defining it related parameters.

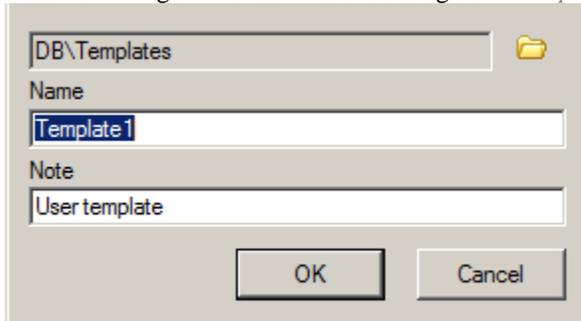


Further, by selecting it, specify the context menu - *"Save object as template"*.

In the *"Template wizard"* press button *"Create template"*.

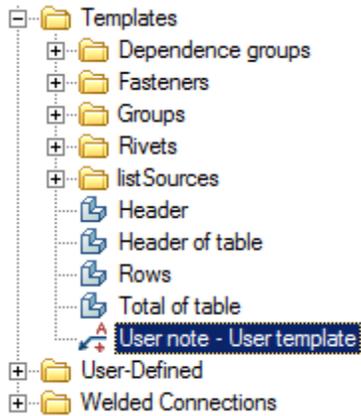
In the dialog box *"Create element"* specify the storage folder in the base elements, Name and Note (if necessary).

Press *"OK"*. Again we return to the dialog box *"Template wizard"*.



Press button *"Update template"* and close *"Template wizard"*.

Update the tree base elements, the template will be created by the note.



Subsequently, this note can be inserted into a drawing for new objects. Adaptive communication with new objects and their settings will be saved.

## Drawing symbols

### Gradient symbol



Main menu: *Construction - Symbols - Gradient symbol.*



Ribbon: *Construction - Symbols - Gradient symbol.*



Toolbar: *Symbols - Gradient symbol.*

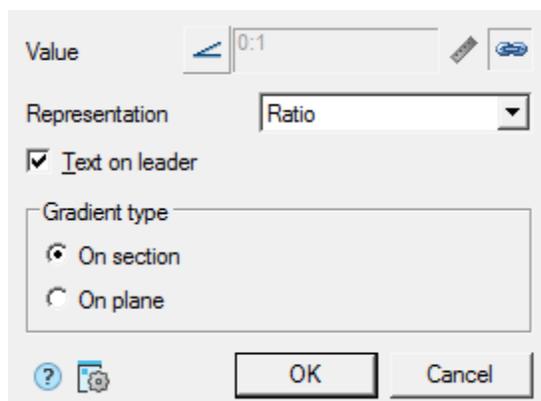


Command line: *SPGRAD.*

### Procedure

1. Call the command.
2. Using the "Properties" context menu command, open the "Gradient symbol" dialog box. Make the gradient symbol settings and confirm the changes with the "OK" button.
3. Select the line in the drawing for which you want to set the gradient symbol.
4. Place the gradient symbol on the selected line or leader flange.
5. The gradient symbol is drawn and associated associatively with the specified line.

### Dialog



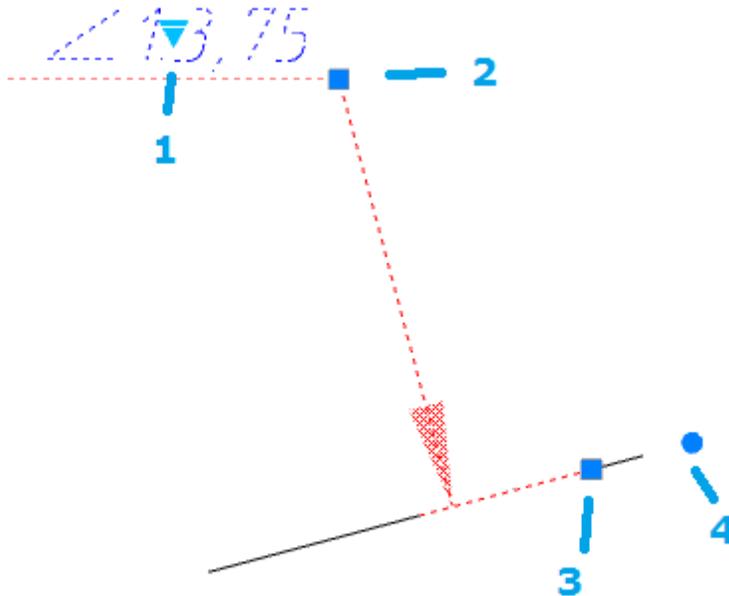
The editing dialog contains:

- Selection button type of designation: Gradient without designation, Left gradient and Left taper.



- Input field for gradient symbol value. The input field is active if the associativity mode is disabled. If necessary, turn off the associative connection mode by turning off the "Associative" switch (when setting, the associativity mode is turned on automatically).
- "Pick from drawing" button. When the associativity mode is off, the button is active and allows you to measure the gradient symbol value in the drawing.
- Switch "Associative". Controls the display of the gradient symbol value. If the switch is on, the value is taken from the associated line, if it is off, it is entered manually.
- Drop-down list "Representation". Allows you to select how the slope units are represented:
  - As is
  - Ratio
  - Decimal
  - Percent
  - Per mille
  - Degree
- "Text on leader" checkbox. Toggles whether the gradient symbol is on a shelf or on a line.
- "Gradient type" group. Allows you to select the type of gradient symbol:
  - On section
  - On plane

## Grips



1. Grip for selecting the slope symbol representation.
2. Shelf movement grip.
3. Base move grip. When you move, the associativity with the line is lost and an additional fourth grip appears.

- Grip for changing the angle of inclination of the base.

## Node



Main menu: *Construction - Symbols - Node*.



Ribbon: *Construction - Symbols - Node*.

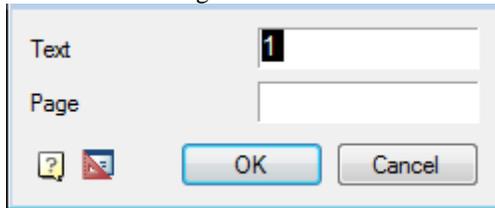


Toolbar: *Node* ("Symbols").



Command line: *SPNODE*.

- Select *location* or type an index "properties".
- In the dialog box *that describes the node* type the text. Click OK.



- Insert the desired number of drawing markers. Subsequent node number is automatically incremented from the previous one.

## Fragment mark



Main menu: *Construction - Symbols - Fragment*.



Ribbon: *Construction - Symbols - Fragment*.



Toolbar: *Fragment* ("Symbols").

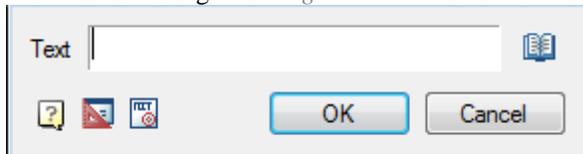


Command line: *SPFR*.

- Select *first point* (1).
- Select *second point* (2).



- In the dialog box *Fragment mark* enter text. Click OK.



- Select *location*.
- Complete the cyclic command.

## Correction Mark



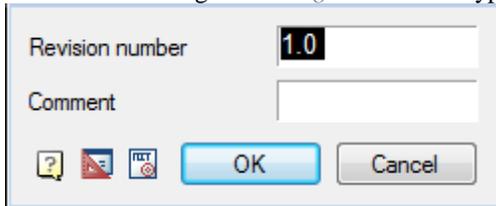
Main menu: *Construction - Symbols - Correction mark*.

 Ribbon: *Construction - Symbols - P Correction mark*.

 Toolbar: *P Correction mark* ("Construction").

 Command line: *SPCORRMRK*.

1. Select *leader position*.
2. Select *marker location or properties* and call the context menu command "P-properties."
3. In the dialog box *change the marker type* in the text. Click OK.



## Position marker

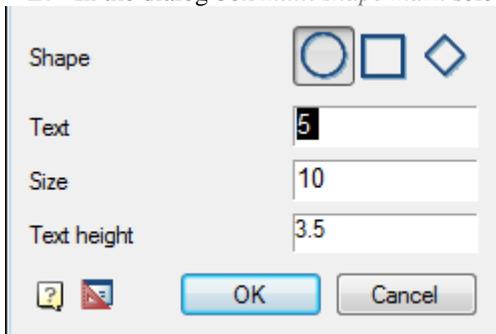
 Main menu: *Construction - Symbols - Marker*.

 Ribbon: *Construction - Symbols - Marker*.

 Toolbar: *Marker* ("Symbols").

 Command line: *SPMRKU*.

1. Select *location or type an index* for the first marker, or call the context menu command "P-properties".
2. In the dialog box *multi shape mark* select the marker icon form, enter text. Click OK.



3. Insert the desired number of drawing markers. Item numbers subsequent token is automatically incremented from the previous one.

## Position

 Main menu: *Construction - Symbols - Position*.

 Toolbar: *Position* (toolbar "Symbols").

 Command line: *SPPOS*.

1. Specify *the insertion point* to the first marker position or call the context menu command "P-properties."
2. In the dialog box *Tagging* enter text.
3. Select an arrow. Click OK.

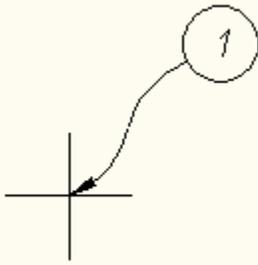
4. Insert the desired number of drawing markers. Subsequent node number is automatically incremented from the previous.

## Fundamental rules

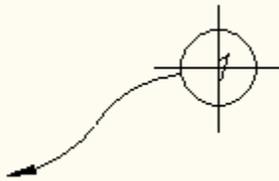
This command draws the drawing reference numerals used in the drawings.

## Sequencing

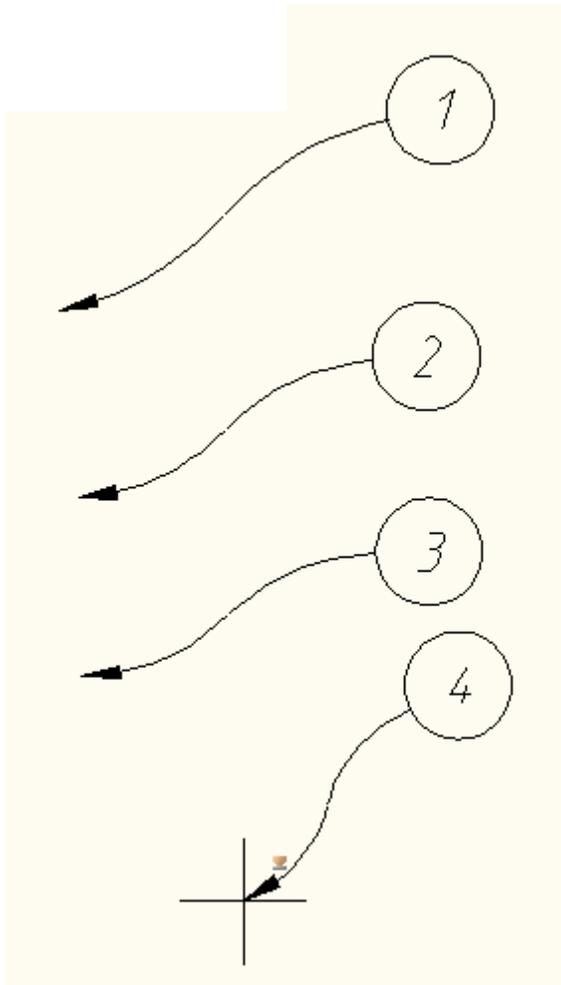
Insert position by specifying the datum marker



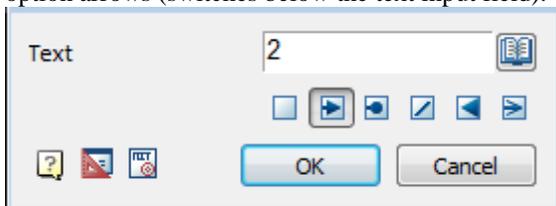
Next, mark the position statement of the position:



Inserted into a single command cycle positions are automatically numbered



To specify additional options position must call dialog "Position", where you can specify the text position display option arrows (switches below the text input field).



## ***Views and sections***

### **Section**

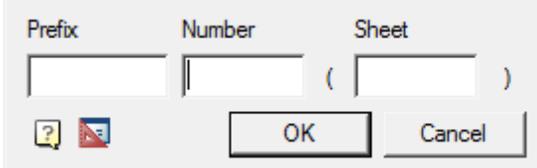
-  Main menu: *Construction - Views and Sections - k<sup>A</sup>Sections*.
-  Ribbon: *Construction - Symbols - k<sup>A</sup>Sections*.
-  Toolbar: *k<sup>A</sup>Sections (on toolbar "Views and Sections")*.



Command line: *SPSECT*.

## Procedure

1. Call the team. A dialog box will open "Cut";
2. In the dialog box, enter the required parameters. Press the button "OK";



3. Select path type: Arc or Segment. For each type its own order of postorieniya;
  - *Segment*. Allows you to create a cut in the form of a broken line;
    - Pick the first cut point;
    - Pick the subsequent cut points. To finish entering points, press the key "Enter";
  - *Arc*. Creates an arc section;
    - Select the desired arc construction method: Arc (3 points), Arc (2 points and bend), ARc (2 points and center);
    - Build an arc according to your choice.
4. Select the direction of the cut arrows.

## View



Main menu: *Construction - Views and Sections - View*.



Ribbon: *Construction - Symbols - View*.

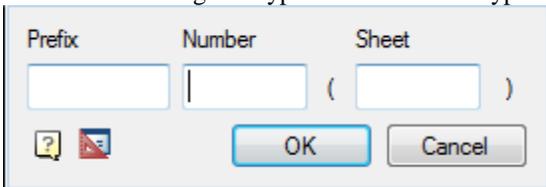


Toolbar: *View (on toolbar "Views and Sections")*.



Command line: *SPVIEW*.

1. In the dialog box type the number and type of sheet. Click OK.



2. Select view insert point of the arrow type.
3. Select view angle.

## View and Section Label



Main menu: *Construction - Views and Sections - View and Sections label*.



Ribbon: *Construction - Symbols - View and Sections label*.

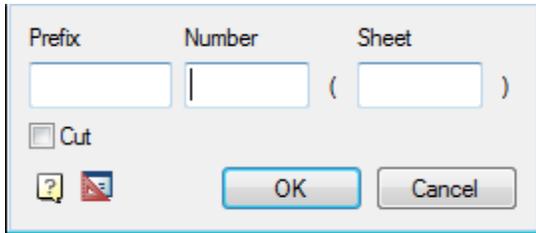


Toolbar: *View and Sections label (on toolbar "Views and Sections")*.



Command line: *SPVSDDESC*.

1. In the dialog box "Designation of views, cuts..." enter the text notation. To denote the section or section select "Cut".



2. Click "OK".
3. Specify the insertion point notation.

## ***Bound forms***

### **Bound forms**

#### **Bounding hatch**

-  Main menu: *Construction - Bound forms -  Bounding hatch.*
-  Ribbon: *Construction - Symbols -  Bounding hatch.*
-  Toolbar:  *Bounding hatch* ("Bound forms").
-  Command line: *SPBHATCH.*

#### **Ground border**

-  Main menu: *Construction - Bound forms -  Ground border.*
-  Ribbon: *Construction - Symbols -  Ground border.*
-  Toolbar:  *Ground border* ("Bound forms").
-  Command line: *SPGBORDER.*

#### **Heat isolation**

-  Main menu: *Construction - Bound forms -  Heat isolation.*
-  Ribbon: *Construction - Symbols -  Heat isolation.*
-  Toolbar:  *Heat isolation* ("Bound forms").
-  Command line: *SPHISOL.*

#### **Water isolation**

-  Main menu: *Construction - Bound forms -  Water isolation.*
-  Ribbon: *Construction - Symbols -  Water isolation.*
-  Toolbar:  *Water isolation* ("Bound forms").



Command line: *SPWISOL*.

## Bar strip



Main menu: *Construction - Bound forms -  Bar strip*.



Ribbon: *Construction - Symbols -  Bar strip*.



Toolbar:  *Bar strip* ("Bound forms").

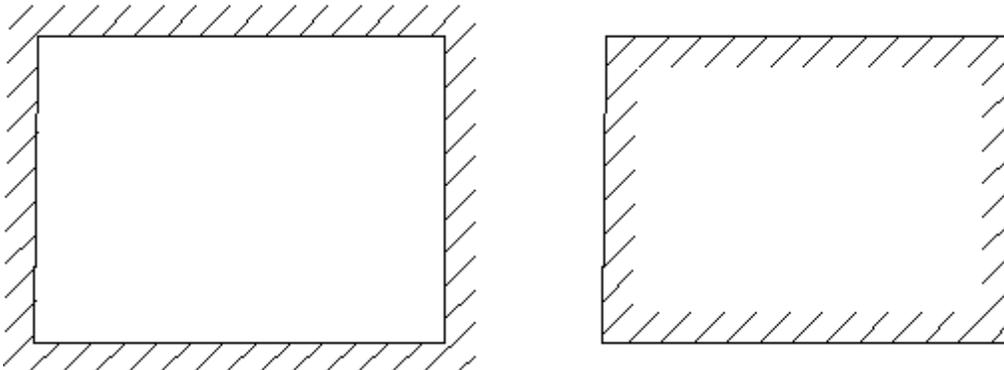


Command line: *SPDBAND*.

The special lines include: bounding hatch barstrip, heat isolation, water isolation, ground border. Lines have a wide range of applications. For example, the line-border soil formation on geological section.

Drawing bound forms

- To draw a bound form, select the desired Dialog box *bounding hatch*.
- You can immediately apply contour shading on the polyline using the command *Simple Polyline* context menu.
- To build a complex contour on the basis of the drawing objects you can use the command *M-magnet* context menu.
- If you want to create a new path, select the first point and then successively adding segments of the contour line, as is done when creating polylines. In the context menu commands are available for selecting the next segment (line segment or arc) and the method of construction.
- To complete the construction of the circuit, press Enter.
- In the next window *boundary forms* can change the type of boundary hatch. Button  *Hatch side* is used to change the part of the overlay relative to the boundary contour shading:



To change the contour and side hatch overlay grips (Grips) can be used.

When drawing certain types of boundary forms (notation waterproofing, insulation and dashed lines) before building the circuit the values of hatching must be specified. The values given are based on the current scale Construction 21. Editing the values of the parameters can be made through the Properties panel (Properties) nanoCAD. For example, the entered value corresponds to 4 400 mm on the standard scale M100.

## Breaks



Main menu: *Construction - Breaks -  Break lines*.



Ribbon: *Construction - Symbols -  Break lines*.



Toolbar:  *Break lines* ("Breaks").



Command line: *SPBREAK*.

## Procedure

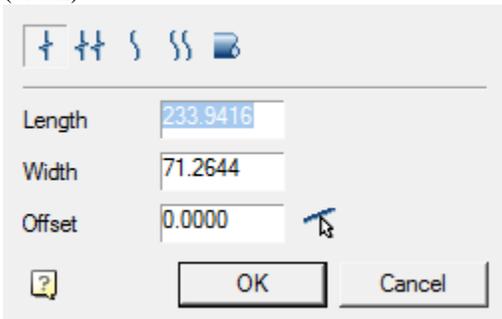
1. Select the first point to insert the break line.
2. In the context menu, select the type of break (break) (Linear, Two-linear, Curved, tWo-curved, tuBular).
3. Pick the second break point.
4. In the context menu, select the type of cursor movement control (FreeOffset, OrthoOffset).
5. Specify the width of the cliff (break). A cliff (break) will be built.

*Note:* The whole clipped geometry between the break lines is not actually deleted and can be restored either by removing the break line or editing its contour with the grips nodal points.

*Note:* All objects Construction 21 have a so-called Z-Order. This value sets the level of the Z-coordinate in relation to other object-dependent details Construction 21. Editing the value of the order, you can control the mutual overlap of objects Construction 21.

## Dialogue

The edit dialog is opened from the tooltip when you hover on a break (break) or when you double-click on a break (break).

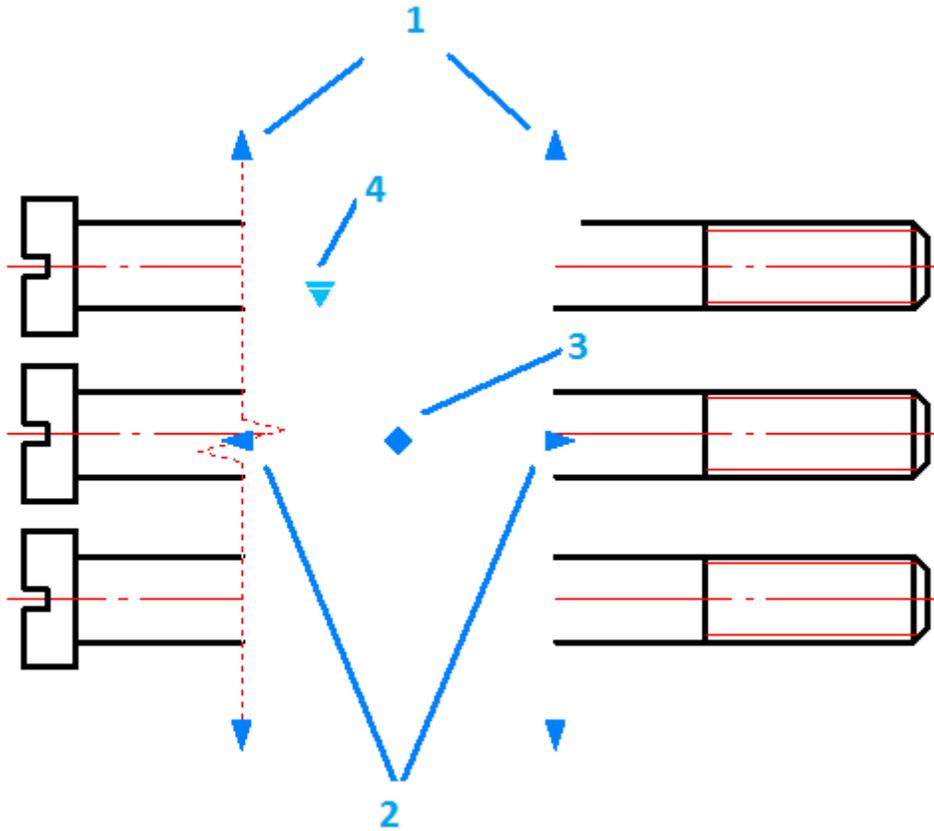


Editing dialog includes:

- Graphic break type switch;
- Field "*Length*";
- Field "*Width*";
- Field "*Offset*". You can get the value using the offset command  "*Parallel to specified line*".

## Grips

1. Grips length setting
2. Grips break width settings
3. Break displacement grip
4. Drop-down type grip
  - Linear
  - Two-linear
  - Curve
  - Two-curve
  - Tubular



## Linear break

-  Main menu: *Construction - Breaks - Linear break.*
-  Ribbon: *Construction- Symbols - Linear break.*
-  Toolbar: *Linear break ("Breaks").*
-  Command line: *SPBREAK\_LINEAR.*

## Two-linear break

-  Main menu: *Construction - Breaks - Two-linear break.*
-  Ribbon: *Construction- Symbols - Two-linear break.*
-  Toolbar: *Two-linear break ("Breaks").*
-  Command line: *SPBREAK\_TWOLINEAR.*

## Curved break

-  Main menu: *Construction - Breaks - Curved break.*

-  Ribbon: *Construction - Symbols - } Curved break.*
-  Toolbar: *} Curved break ( "Breaks").*
-  Command line: *SPBREAK\_CURVED.*

## Two-curved break

-  Main menu: *Construction - Breaks - }} Two-curved break.*
-  Ribbon: *Construction- Symbols - }} Two-curved break.*
-  Toolbar: *}} Two-curved break ( "Breaks").*
-  Command line: *SPBREAK\_TWOCURVED.*

## Shaft break

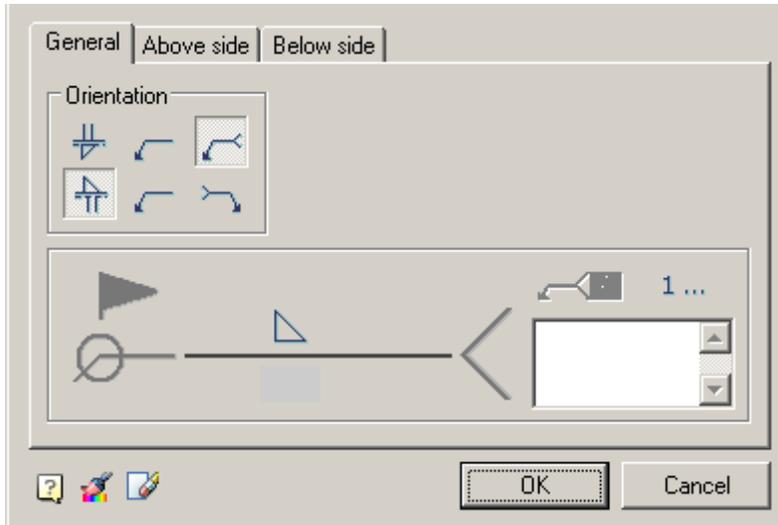
-  Main menu: *Construction - Breaks - Shaft break.*
-  Ribbon: *Construction- Symbols - Shaft break.*
-  Toolbar: *Shaft break ( "Breaks").*
-  Command line: *SPBREAK\_TUBULAR.*

## Welding

### Welding...

-  Main menu: *Construction - Weld - Welding....*
-  Toolbar: *"Weld" - Welding....*
-  Command line: *SPISOWELD.*

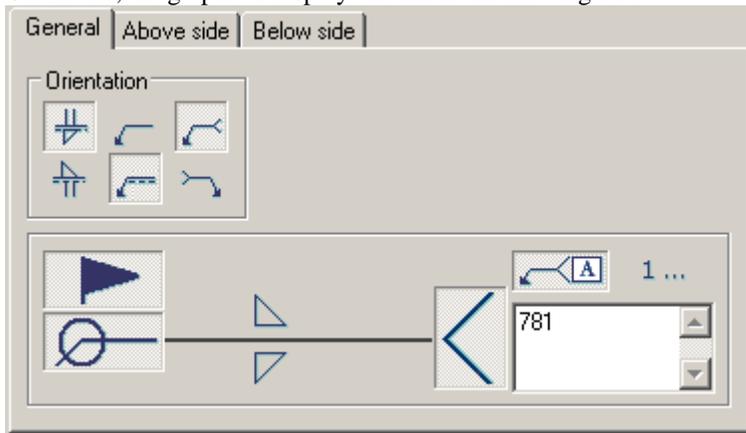
Setting notes refer to welding.



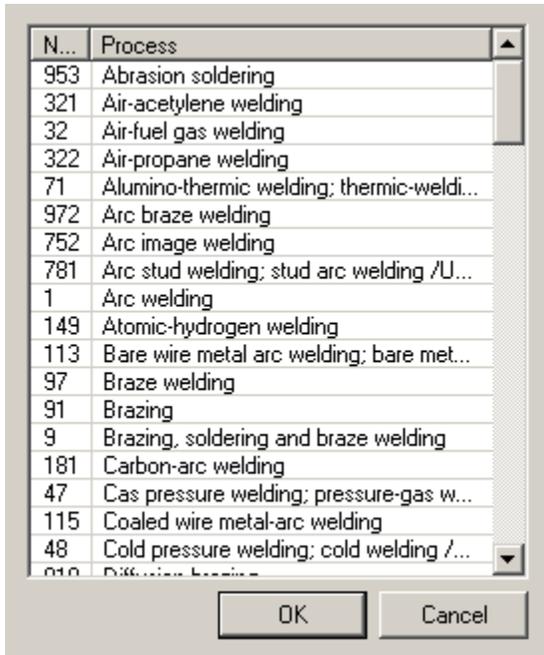
The dialog box consists of three tabs:

General

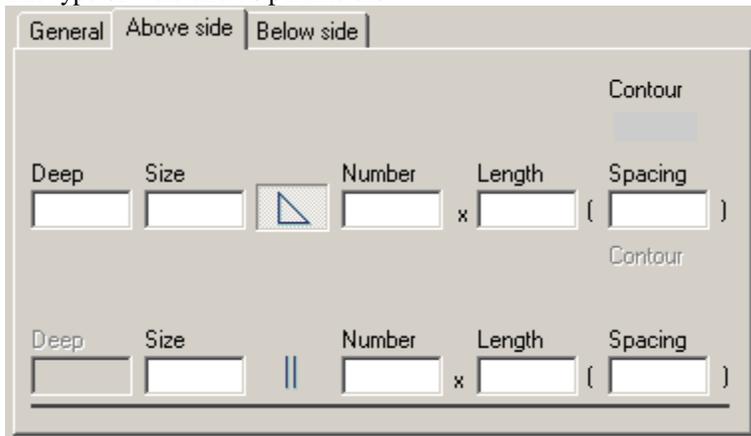
On the tab, the graphical display and fill in the drawing note.



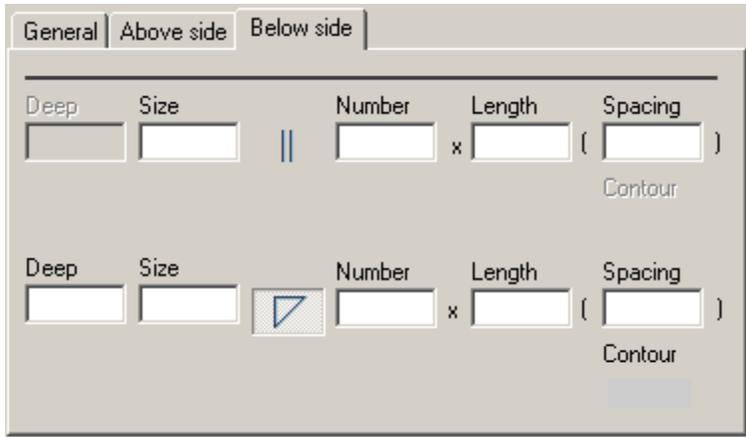
For convenient entry process, you can use Process list.  
Process list poddrezhivaet multiple selection processes.



Above side  
 Tab necessary to fill in the values above the side  
 The type of weld and its parameters.



Below side  
 Tab necessary to fill in the values below the side  
 The type of weld and its parameters.



## Simple welding



Main menu: *Construction - Welding - Simple welding.*



Toolbar: "Weld" - *Simple welding.*



Command line: *SPWLEG.*

This command is used to render the weld leg between two intersecting segments.

1. Enter *the first rib.*
2. Enter *the second rib.*
3. Press "Enter" or right mouse button to exit the cyclic command.

## Weld seam



Main menu: *Construction - Weld - Weld seam.*

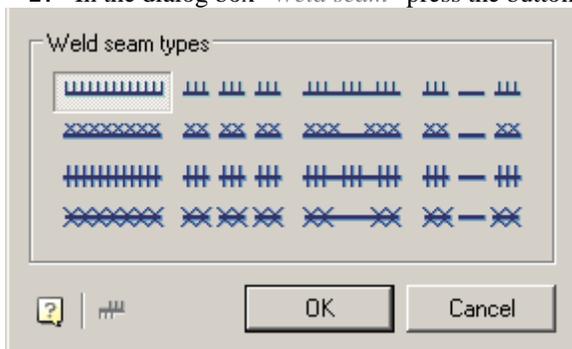


Toolbar: "Weld" - *Weld seam.*



Command line: *SPWELD.*

1. In the dialog box "Weld seam" press the button corresponding to the desired type of weld. Click OK.



2. Specify *the first point of the circuit* (or P - polyline, C - circle M - magnet).
3. Specify *the next point of the contour* (or L - line A - arc, C - close, U - rollback, M - a method for constructing the arc).
4. Press *Enter* or right mouse button to exit the cyclic command.

In the dialog box are available 16 types of welds. Each type of weld corresponds to the button with his picture. To select the desired type of seam, press the button and confirm with the OK button.

Construction of the circuit is made by the following methods:

*L - via line*: construction of straight segments of the weld points introduced;

*A - by arc*: construction of the weld arc segments in three points;

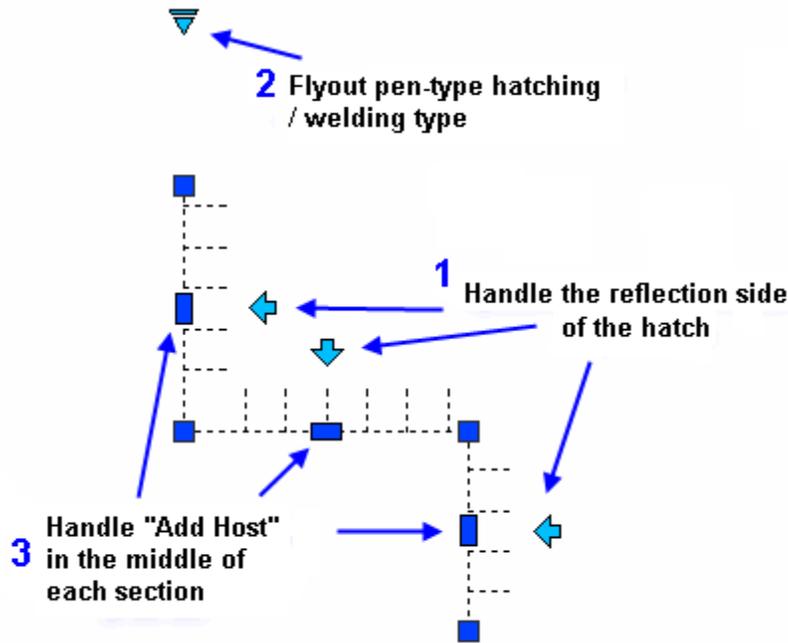
*C - close*: automatic generation of the last segment, closing the main line of the weld;

*U - recoil*: undo the last segment of the weld;

*M - a method for constructing the arc*: T - tangentially, S - by three points.

Button  *Side hatch* allows you to select the direction of the hatch.

Change the direction of the hatch, you can select the "handle" the reflection side hatch:



## Fixed joint



Main menu: *Construction - Weld -  Fixed joint*.



Ribbon: *Construction - Symbols -  Fixed joint*.



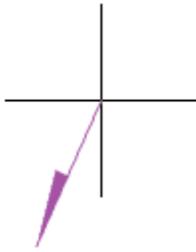
Toolbar: "Weld" -  *Fixed joint* .



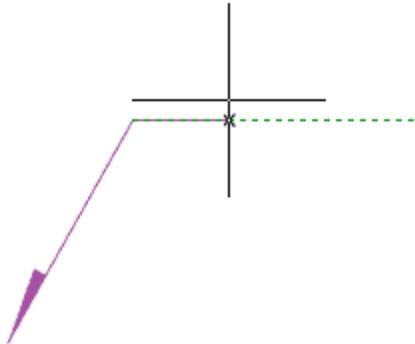
Command line: *SPFIX*.

## Procedure

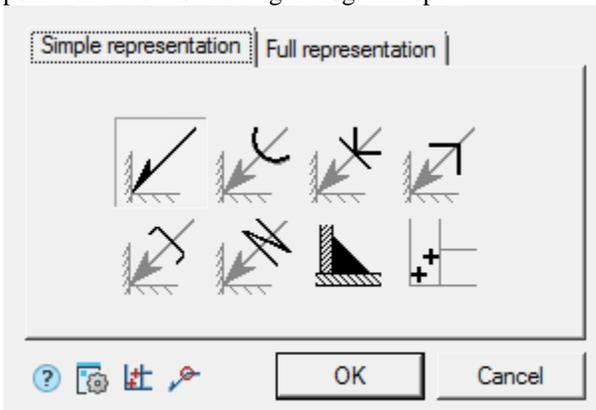
1. Call the command  *"Fixed joint"*.
2. Indicate the place of the fixed joint.



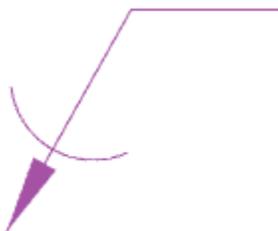
3. Pick a break point.



4. Specify the end point of the leader or press the "Enter" key, then the end point of the leader will be the break point. The "Joints" editing dialog will open.

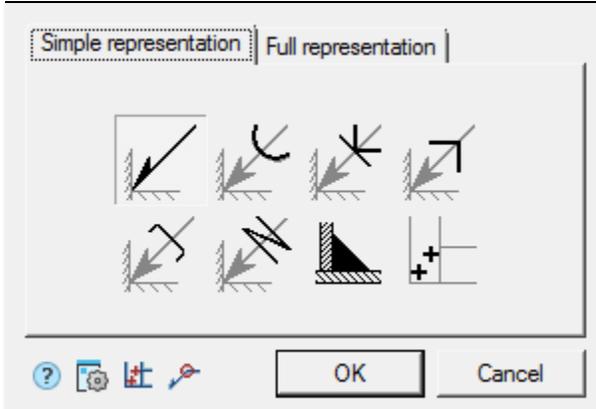


5. Set the type of joint in the "Joints" editing dialog and confirm the setting with the "OK" button.  
6. The Fixed joint will be built.



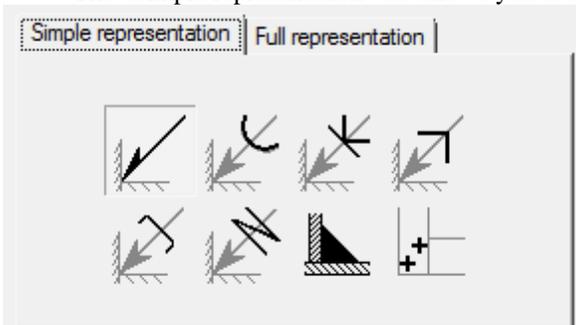
## Dialog

**Important!** When you select the fixed joint "Soldired Joint Leg" or "Weld point", you cannot call the dialog from the object for editing.



The editing dialog contains additional commands and two tabs: "Simple representation" and "Full representation".

-  *Place spot welds* - the command is intended for insertion of weld point elevations in the drawing.
-  *Along closed contour* - the command is intended to add the symbol "Joint along closed contour" to the connection designation.
- The "Simple representation" tab allows you to select the type of fixed joint.

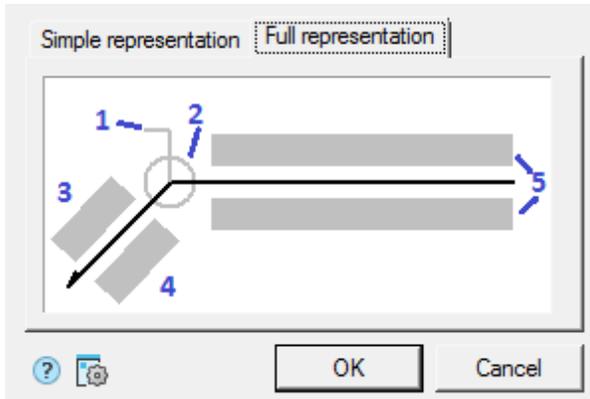


The following designations for fixed joints are available:

<i>Seam denotation</i>	<i>Soldering</i>	<i>Pasting together</i>	<i>Clamps, type 1</i>
			
<i>Clamps, type 2</i>	<i>Lacing</i>	<i>Soldired Joint Leg</i>	<i>Weld point</i>
			

Depending on the selected type, the "Full representation" tab will be available.

- The "Full representation" tab allows you to customize the fixed joint symbol.



Input fields and graphic elements are edited on the tab. To edit input fields and turn on / off graphic elements, click LMB on them. When editing input fields, dialogs for editing fields appear, containing an input field and additional commands.

1. Graphic element "Field joint".



2. Graphic element "Joint along closed contour".



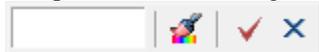
3. Number designation input field.



The editing dialog contains:

- Value input field.
- Command  $\Sigma$  "Sum" - the number of welded seams with the same number is counted. Deleting or changing a seam number designation is automatically displayed in the full designation for that joint number.
- Command "Copy properties" - allows you to copy properties from an existing dimension in the drawing.
- Command "OK" - closes the dialog, saving changes.
- Command "Cancel" - closes the dialog without saving changes.

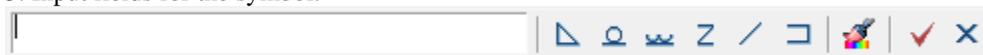
4. Input field for the designation of the control complex or the seam control category.



The editing dialog contains:

- Value input field.
- Command "Copy properties" - allows you to copy properties from an existing dimension in the drawing.
- Command "OK" - closes the dialog, saving changes.
- Command "Cancel" - closes the dialog without saving changes.

5. Input fields for the symbol.



The editing dialog contains:

- Value input field.
- Buttons for quick insertion of special symbols for fixed joint:

- ▴ - Soldered leg;
- ⊖ - Remove weld reinforcement;
- ⊕ - Treat seam overflows and unevenness with graded junction to parent metal;
- ∩ - Discrete double unfaced seam;
- ∪ - Discrete double faced seam;
- - Opened contour seam.

- Command  "Copy properties" - allows you to copy properties from an existing dimension in the drawing.
- Command  "OK" - closes the dialog, saving changes.
- Command  "Cancel" - closes the dialog without saving changes.

## Properties

Seam denotation:

- Text above self of leader
- Text under self of leader
- Text above leader
- Text under leader
- Enable calculate joints
- Count of joints
- Field joint
- Joint along closed contour

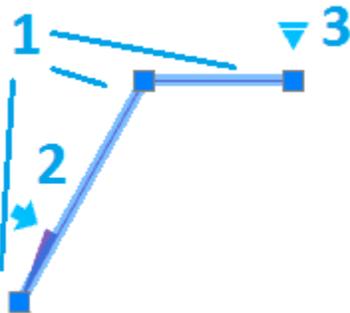
Soldering, Lacing, Clamps type 1, Clamps type 1, Pasting together:

- Joint along closed contour
- TR item number

## Grips

Seam denotation:

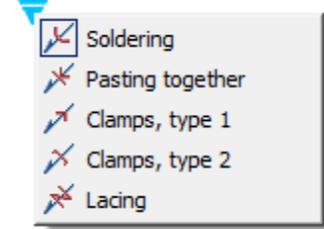
1. Move grips - Move the endpoints of the parts of the weld symbol.
2. "Mirror arrow side" grip - changes the side of the arrow.
3. "Weld seam properties" grip - opens a list of available graphic elements. In the list, you can enable or disable the display.



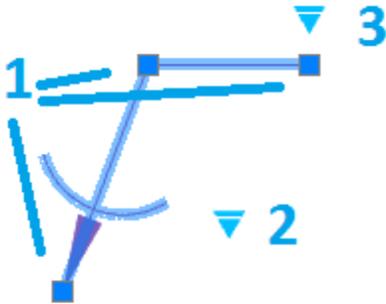
Soldering, Lacing, Clamps type 1, Clamps type 1, Pasting together:

1. Move grips - Move the endpoints of the parts of the weld symbol.

2. Joint type selection grip - opens a drop-down list for selecting a joint type.



3. "Weld seam properties" grip - opens a list of available graphic elements. In the list, you can enable or disable the display.



Soldered Joint Leg:

1. Move grip - allows you to move the leg.
2. Grips "Change leg size" - allow you to change the size of the leg.



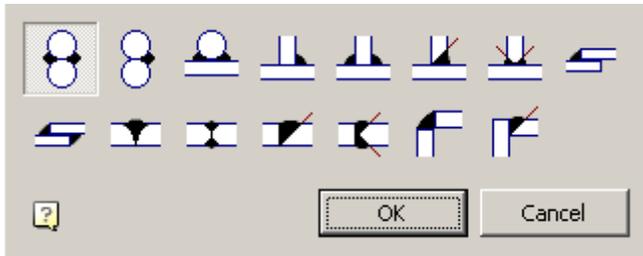
Weld point:

1. Move grip - Allows you to move the weld point in the drawing.



### Simplified weld joint

-  Main menu: *Construction - Weld -  Simplified weld joint.*
-  Toolbar: "Weld" -  *Simplified weld joint.*
-  Command line: *SPWJ.*



**Important!** As the rods and plates can be used primitives nanoCAD: circle and polyline (a special case polylines: rectangles, and polygons). To use the unit as a plate or an object from the database, you must use when choosing an instrument [Magnet](#) plate for constructing the circuit plate. Primitives must be tangent to each other.

**Type: two rods overlap joints.**

To add an overlap joint:

1. Call the command.
2. Select the drawing *first rod* .
3. Select the *second rod*.
4. To select the direction of one-way seam weld placement.



**Type: T-connection between two rods..**

To add a T-joints:

1. Call the command.
2. Select the drawing *first plate* .
3. Select the *second plate*.
4. To select the direction of one-way seam weld placement.



**Type: two plates overlap joints.**

To add an overlap joint:

1. Call the command.
2. Select the drawing *first plate*.
3. Select the *second plate*.
4. To select the direction of one-way seam weld placement.



*Corner seam-sided.*



*Corner sided seam.*

**Type: Butt joint of two plates.**

To add a butt joint:

1. Call the command.
2. Select the drawing *first plate* .
3. Select the *second plate*.
4. To select the direction of one-way seam weld placement.



*One-way butt weld.*



*Sided butt weld.*



*One-way butt weld.*



*Sided butt weld.*

**Type: Angular connection of two plates.**

To add a butt joint:

1. Call the command.
2. Select the drawing *first plate*.
3. Select the *second plate*.
4. To select the direction of one-way seam weld placement.



*Corner seam-sided.*



*Corner sided seam.*

**Edge preparation**



Main menu: *Construction - Weld - Edge preparation.*

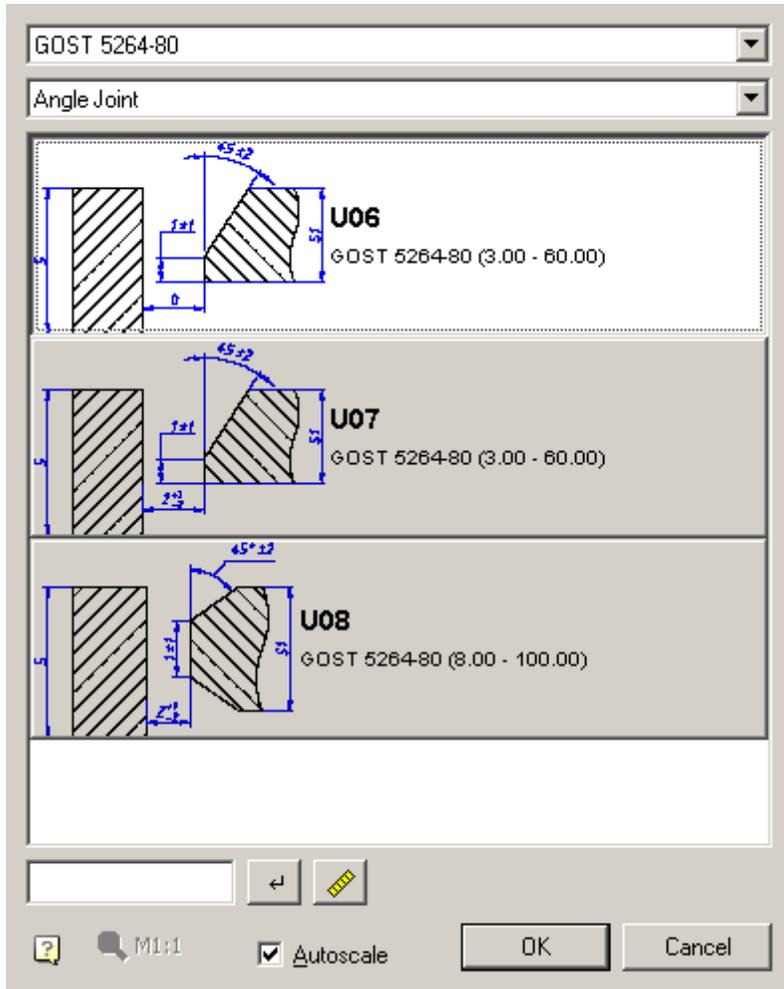


Toolbar: "Weld" - *Edge preparation.*



Command line: *SPEDGEPREPARATION.*

Provides cutting edge parts in the drawing.



Elements of the dialogue:

1) The list of standard cutting edges for welding;

GOST 5264-80

GOST 5264-80

2) List of types of connection plates welded: Butt, T-bar, angle;

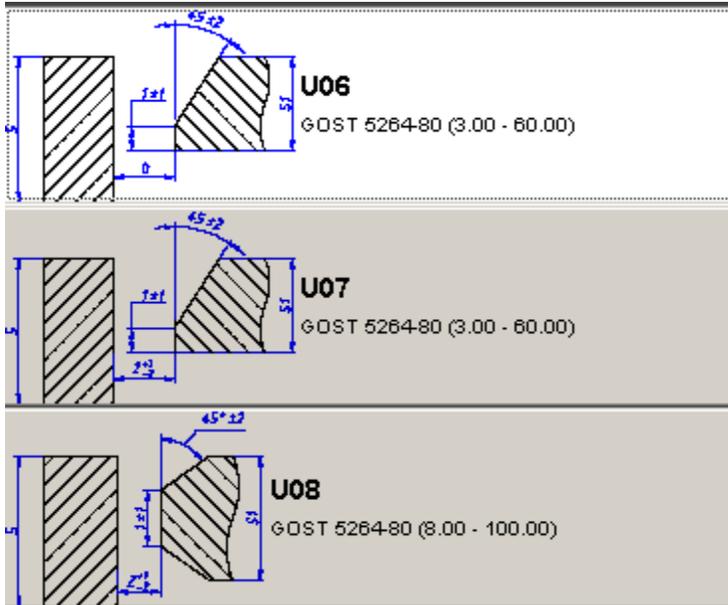
Angle Joint

Angle Joint

Butt Joint

T-Joint

3) List of connection options;



4) Filter the list by the thickness of the plates;



When you enter a numeric value thickness dialogue filters only those types of cutting edges, matching the thickness of the part. The filter is made by pressing the  "Apply filter", or by pressing Enter. The value of the thickness in the filter can be measured by the meter to be launched on the  "Measure".

5) Zoom menu created design elements



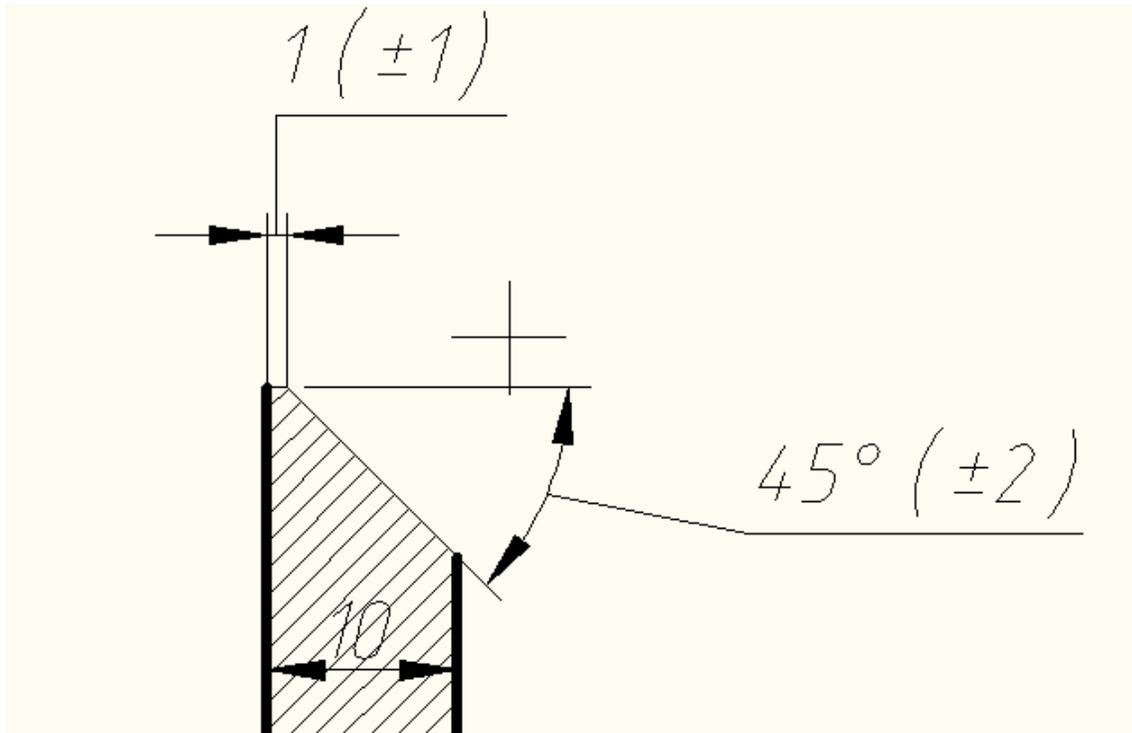
Menu is disabled if *Auto* is enabled check box. In this case, the scale created by the size and design elements set to the current scale decoration.

If you turn off *Auto* box, it will be possible to create a drawing cutting edges in arbitrary scale is selected in this dialog.

## Operation

For the cutting edges must be vyponit following:

1. Select the type of connection: butt, T-bar or angle;
2. If necessary, filter preparation method edges, depending on their thickness. This can be done directly by entering the minimum thickness of the edges, or by measuring the drawing;
3. Determine the scope of dimension lines;
4. Double-click method of preparing the edges;
5. Specify the edge of the weld joint. Depending on the method of preparation is required to select the left and right edges alternately.



When you create a cutting edge bevel one team will cycle to offer select sites for the creation of such ramps. When you create a cutting edge bevel two team provides consistently indicate bevel for one, and then to other parts of the joint.

<i>Important!</i>	The plates can be used as primitives nanoCAD, as well as objects Construction . Turn inserted edge welded connection can hold down Shift. It is necessary to include the "Object Snap" mode and "nearest" or in the settings Construction against the item "Connections" Nearest "automatically when you insert objects" put "Yes".
-------------------	---

## Tables

### Tables



Main menu: *Construction - Tables and title blocks -  Tables.*



Ribbon: *Construction - Tables and title blocks -  Tables.*



Toolbar:  *Tables (on toolbar "Tables and title blocks").*



Command line: *SPTABLE.*

Causes dialog box to insert a new table.

Custom table  
 Load from database  
 Load from file  
 Object based report  
 Import from Excel  
 From clipboard

Title

Columns  x

Rows

Header rows  x

Data rows  x

Footer rows  x

Rows upside down  
 Add drawing border

- To create a custom table, select *Custom*. In input fields specify the dimensions of the created table, or on the layout, drag the mouse to the right as many rows and cells as required. When subsequent editing the number of rows, columns, cell sizes can be changed.
- To insert a standard table, select *load from database*. You can insert a standard table of the base elements Building site . In the dialog box, select the table you want. Database elements Building site is available for all major types of standard tables.
- To insert a table from a file, select *Load from file*.

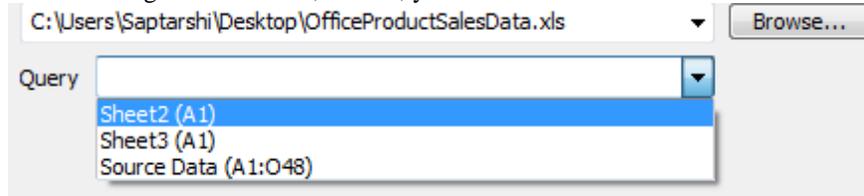
Click *Browse* and select the file table.

Supported formats:

- tbl - tables files
- dat - data file or a text file
- mdb - database Microsoft Access
- xls - Spreadsheet Microsoft Office Excel
- xlsx - spreadsheet Microsoft Office Excel 2007
- csv - table cell separated by commas

- txt - standard text file
- xml - XML document
- odf - OpenDocument Format.

When loading a table of *xlsx*, *xls* file, you must select the Excel document sheet.



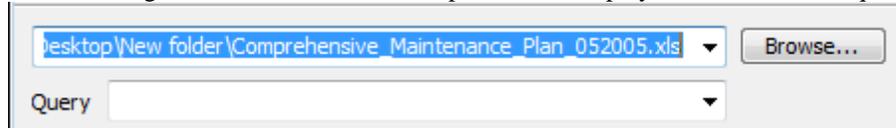
**Important!** Select the sheet can be made after a table is loaded from the file.

Source file	C:\Users\Saptarshi\Desktop...
Source query	Voters (A1:G4001)
Decimal separat...	..
<b>nanoCAD Building Site</b>	
Title	
Scale	
Row count	4001
Coloumn count	7
Text style	GOST 2.304
Text height	2.5
Text color	■ red
Text weight	————— By Layer mm
Width factor	0
Text indent	0.6
Downwards	Yes
Source file	C:\Users\Saptarshi\Desktop...
Source query	Voters (A1:G4001)
Decimal separat...	..
Autoupdate report	On
Insertion point	top right

In the properties of a table row *source file* displays the path to the source file of the table.

Select line *Request* to enter the desired page of the document. Then in the Table Editor, click  *Update Table from an external source*.

When loading a table from a file *mdb* drop-down list displays a list of database query.

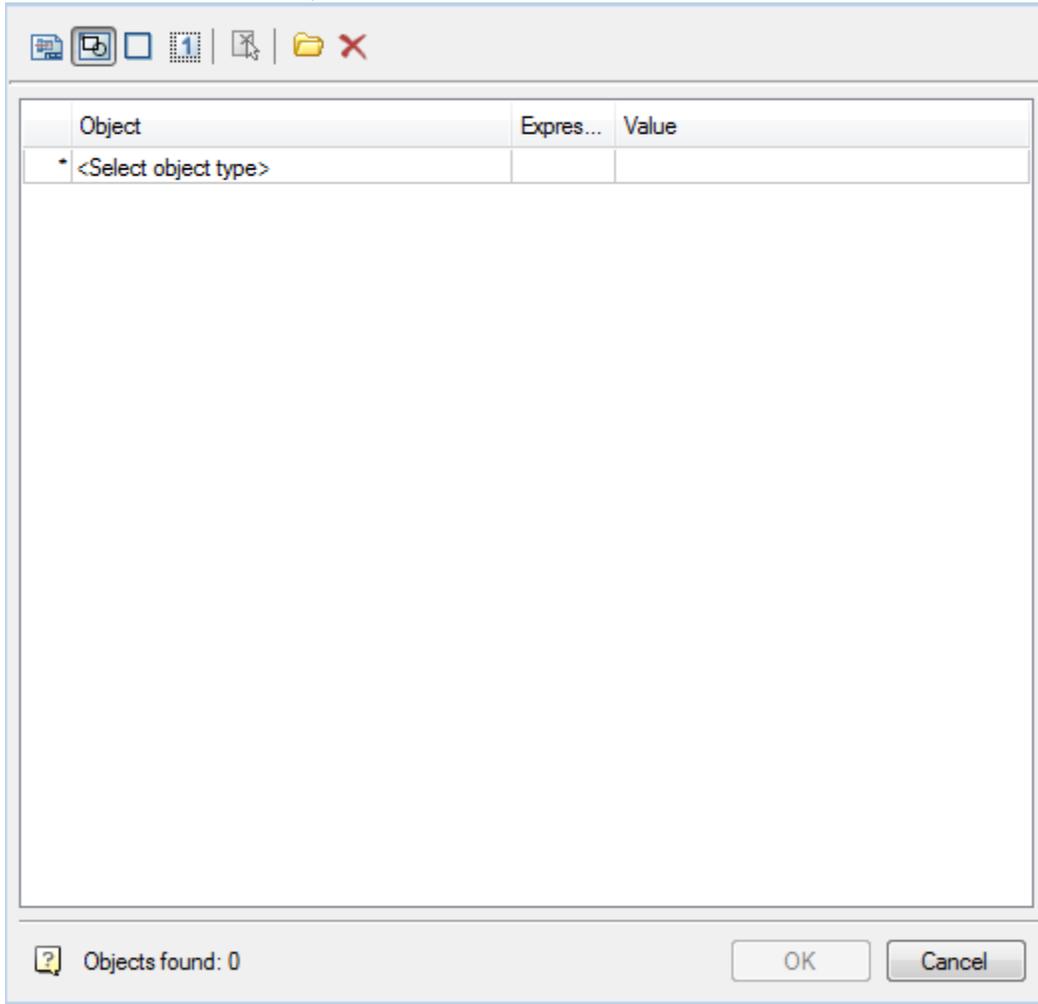


**Note:** To import tables from files, you can drag a file from Explorer to [the dialog table](#).

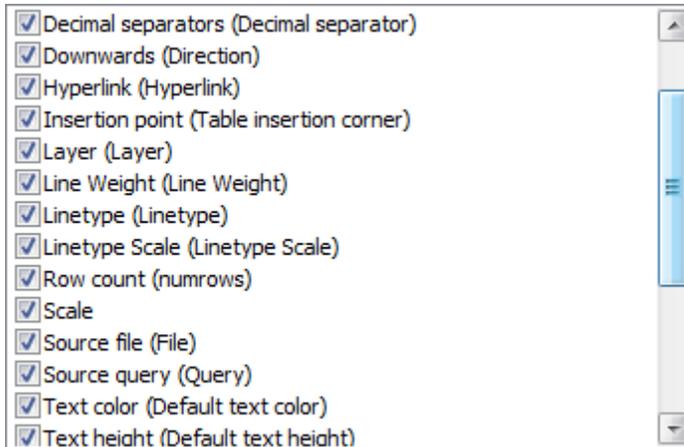
	<p>When you drag a file from Windows Explorer in the imported table is added to the existing table.</p> <p>When you drag a file from Windows Explorer dialog box replaces the existing table to be imported.</p>
--	--

- To generate a report based on a sample of objects, select *the objects in the sample report*.
- 

To make a selection of items, click *Select*.



The search conditions are set in the *Quick selection* dialog.  
 Further dialogue is given based on what the attributes are and creates a report on the selected objects.



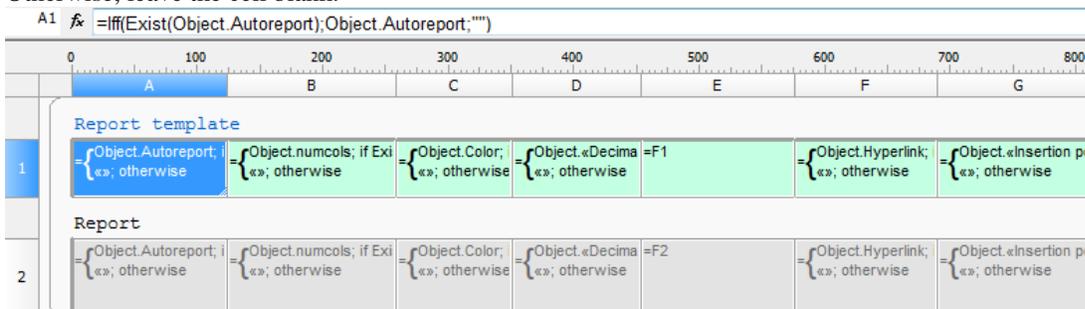
Includ attributes for the report in the list by selecting flags



- **All**- selects all attributes
- **None** - the choice is removed from all the attributes
- **Invert** - inverted selection attributes

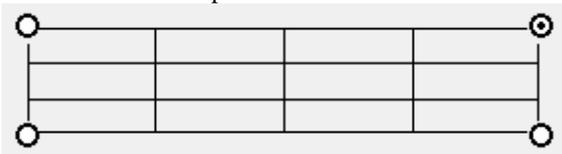
The table is created with a template report form  
`=Iff(Exist(Object."Autoreport");Object."Autoreport";"")`

This formula checks whether there is a line for the attribute named *Autoreport*, and displays its value in a cell. Otherwise, leave the cell blank.



The number of columns in the table determined by the number of selected attributes.

- To import a table from Excel, select *Import from Excel*. To activate this item, the document should be opened.
- Select the insertion point of the table.



- Select the numbering of rows in the table.
- **Rows upside down**
- If the switch *rows upside down* is enabled, the line numbered in reverse order.
- When the checkbox  **Add drawing border** after you insert the table will start a dialogue format.

- Click OK and the insertion point on the drawing table.

*Note:* If the drawing pre-select a group of objects, and then run the  *tables*, you will be prompted to create a report based on a sample of objects.

## Import, export from Excel

### Import



Main menu: *Construction - Tables and title blocks -  Import table from Excel.*



Ribbon: *Construction - Tables and title blocks -  Import table from Excel.*



Toolbar:  *Import table from Excel (on toolbar "Tables and title blocks").*



Command line: *SPTABLEEXCELIMPORT.*

Transmits data from an open book MS Excel.

- In an open Excel worksheet, select the cells whose data you want to import into a table Construction 21.
- Go to the nanoCAD, editor of the table, and then click *Import tables from Excel.*
- Data will be transmitted to the table.

### Export



Main menu: *Construction - Tables and title blocks -  Export table to Excel.*



Ribbon: *Construction - Tables and title blocks -  Export table to Excel.*



Toolbar:  *Export table to Excel (on toolbar "Tables and title blocks").*



Command line: *SPTABLEEXCELEXPRT.*

Designed to transmit tabular data in MS Excel. After clicking on the button opens a new Excel workbook and it migrates all the tabular data with formatting cells established in the table.

*Important!* The tables Construction 21 not to Excel the following data:

- *Blocks nanoCAD*
- *Formatted text*
- *Formulas that do not match the format of Excel*

### Table recognition



Main menu: *Construction - Tables and title blocks -  Table recognition.*



Ribbon: *Construction - Tables and title blocks -  Table recognition.*



Toolbar:  *Table recognition (on toolbar "Tables and title blocks").*



Command line: *SPRECTABLE.*

Table recognition enables automatic search and replace tables created from individual primitives nanoCAD object "Table" Construction 21. Sources are primitives for drawing.

1. Use the command *table recognition.*
2. Specify the drawing point at the table.

The table is created in the current layer. Dimensions of the recognized table are rounded to integer values.

Text belongs to the workpiece table is recognized as the values of the respective cells of the table. Real dimensions of the original graphics are multiplied by the scale design, so if it turns out the table with zero height lines, you need to change the scale clearance in accordance with the size of the original graphics.

## Editing a table in the drawing



Main menu: *Construction - Table and title blocks - Table edit -  Edit table in-place.*



Ribbon: *Construction - Edit table in-place -  Edit table in-place.*



Toolbar: *Tables -  Edit table in-place.*



Command line: *SPIPEDITTBLIPEDITTBL.*



Shortcut: *CTRL+RBM on table frame.*

When editing a table on-screen, the "Edit Table" toolbar appears.



The active cell is highlighted with a green frame. The text entered into the cell is automatically pre-pressed.

## Menu



*Group cells.*

Serves to combine adjacent cells into one.

Procedure:

- Call command.
- Pick the first corner point of the selection.
- Pick second corner point of selection.
- Selected cells will merge.



*Ungroup cells.*

Undoes the grouping of a previously merged cell from multiple cells.

Procedure:

- Call command.
- Pick the first corner point of the selection.
- Pick second corner point of selection.
- Selected grouped cells that fall within the selected area will ungroup.

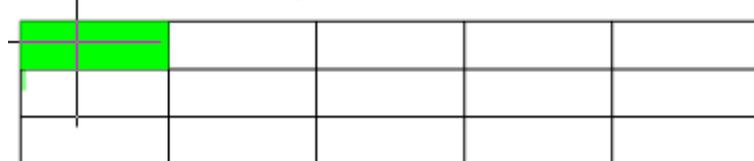


*Split cells.*

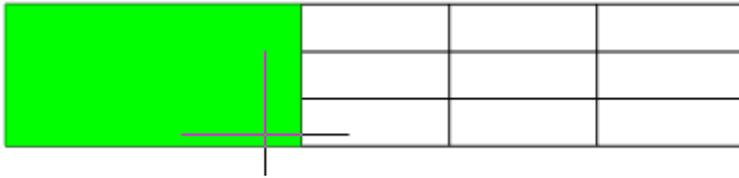
Serves to divide cells into several smaller cells.

Procedure:

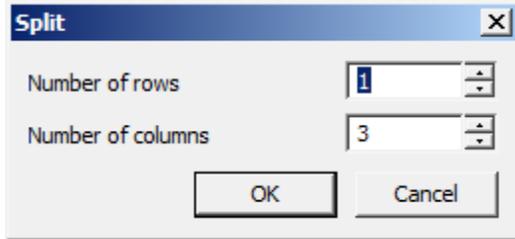
- Call command.
- Pick the first corner point of the selection.



- Pick second corner point of selection.



- In the "Split" dialog box that appears, enter the required numerical values for repartitioning.



- This will result in a new breakdown.



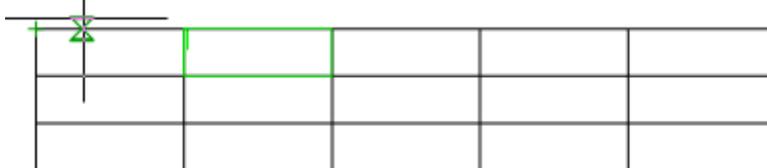
**Note:** When using the "Split" command, the height and width of adjacent cells may be lost.

 **Pencil.**

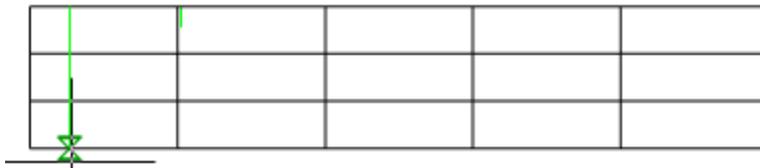
Serves for splitting cells into several by creating additional borders.

Procedure:

- Call command.
- Pick the first point of the dividing line on the table border.



- Pick the second point of the dividing line on the table border.



- The cells that the dividing line will pass through will be split into new cells. Each cell is independent.



 *Add row.* Adds one row at the bottom of the table.

 *Add column.* Adds one column to the end of the table.

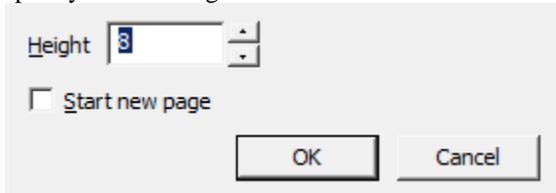
 *Insert row.* Adds one row to the current position of the table cursor.

 *Insert column.* Adds one column to the current position of the table cursor.

 *Delete row.* Deletes the row containing the selected cell.

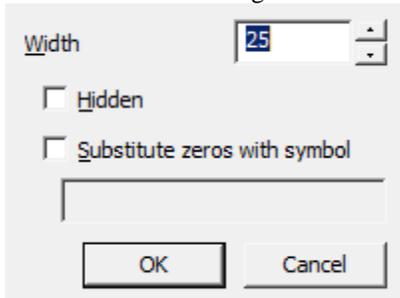
 *Delete column.* Deletes the column that contains the selected cell.

 *Row properties.* Changes the height of the row containing the selected cell. A dialog box is called up in which to specify the line height in millimeters.



The "Start new page" parameter splits the table in an arbitrary place, i.e. where the cell is selected. Other pagination methods are available in the [full editor interface](#).

 *Column properties.* Changes the width of the column that contains the selected cell. Enter the column width in millimeters in the dialog box.



The "Hidden" option hides the selected column. You can return visibility to a column from the full editor interface. The "Substitute zeros with symbol" parameter replaces the null values of the column cells with the row data. In this case, the format of the cells must be numeric.

 *Cell properties.* Calls up the ["Cell Properties"](#) dialog box, which configures the properties of the selected table cell.

 *Cells properties.* Setting properties of a group of table cells. Select the required cells and in the appearing ["Cell Properties"](#) dialog box set the parameters of the selected table cells.

### *Sum*

Calculates the sum of the selected area.

Procedure:

- Select the result cell.
- Call the command.
- Pick the first point of the marquee.
- Pick the second point of the marquee.
- The formula will be entered into the result cell.

### *Selective sum*

Calculates the sum of the selected cells.

Procedure:

- Select the result cell.
- Call the command.
- Specify cells. Press "Enter" to finish.

- The formula will be entered into the result cell.

 [Notebook](#)

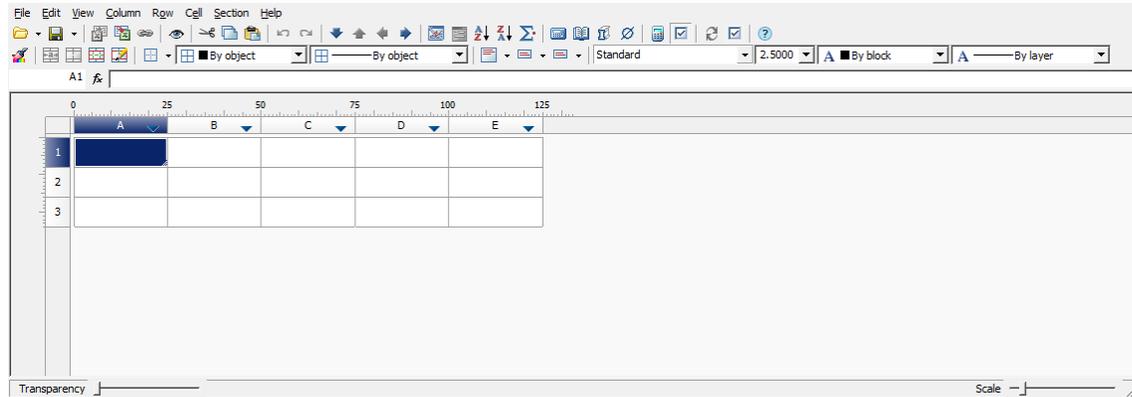
 [Calculator](#)

 [Special symbols](#)

 *Quit*. Exits the table screen editor. You can also exit the on-screen table editor by right-clicking on an empty space in the drawing.

## Table editor

The interface is opened by double-clicking on the table, or by selecting the *"Edit"* command from the context menu of the selected table.



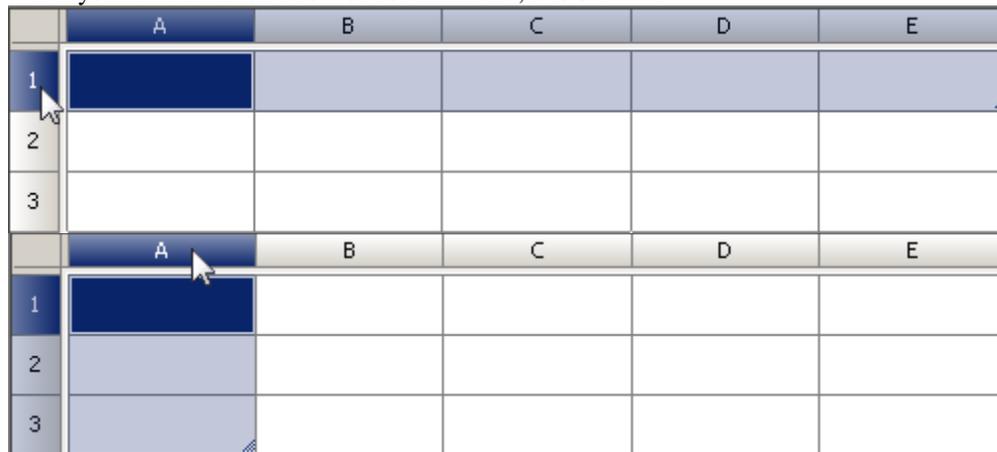
The dialog box contains:

- main menu;
- [toolbar](#);
- parted cells with names (addresses) of rows and columns;
- status bar with transparency and scale caret;

## General Provisions

The names (addresses) of rows and columns are adopted similarly to the MS Excel spreadsheet editor. Vertical columns from left to right are named in alphabetical order in English letters (A, B, C, D, ..., Z, AA, AB, etc.), horizontal rows are named in numbers in order.

When you click LMB on a row or column name, it is selected.



To select the entire table, select a rectangle at the intersection of the row and column names.

	A	B	C	D	E
1					
2					
3					

The shortcut "Ctrl + scrolling mouse wheel" allows you to change the scaling of the table.  
 The shortcut "Ctrl + click mouse wheel" sets the default table scaling.

	A	B	C	D	E
1					
2					
3					

	A	B	C	D	E
1					
2					
3					

When "View sorting" is enabled, sort buttons appear on the right side of the column headings. This sorting is intended to improve the convenience of entering data in the spreadsheet editor and does not affect the state of the table in the drawing.  
 The button has three states: "Not", "Ascending", "Descending".

Not						
	0	25	50	75	100	125
	A	B	C	D	E	
1	1	2	3	4	5	
2	5	1	2	3	4	
3	4	5	1	2	3	

Ascending						
	0	25	50	75	100	125
	A	B	C	D	E	
1	1	2	3	4	5	
3	4	5	1	2	3	
2	5	1	2	3	4	

Descending					
------------	--	--	--	--	--

Not						
	0	25	50	75	100	125
	A	B	C	D	E	
2	5	1	2	3	4	
3	4	5	1	2	3	
1	1	2	3	4	5	

Sorting features:

- Enabling sorting on one column disables sorting on other columns.
- Rows are sorted whole, not just the column.
- Strings are sorted within a section.
- The merging of cells is not broken.
- After enabling view sorting, the vast majority of commands are blocked. Allowed: exit, edit single cells and change sort mode.

*Cell color*

=Object.Name	- cell containing expression;
CSN M 12x120#	- non-editable cell, for example, in a <a href="#">report</a> ;
#ERR	- cell with an error in the expression;
60	- cell containing <a href="#">report section data</a> ;

*Filling adjacent cells with data*

To speed up data entry into the table, automatic data filling functions are used. The spreadsheet editor can automatically continue a series of numbers, combinations of numbers and text according to a given pattern. You can quickly fill in different types of data series by selecting multiple cells and dragging the fill handle.



Filling cells with a sequence of numbers or combinations of numbers and text according to a given pattern:

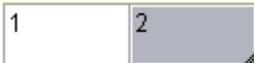
1. Select the first of the filled cells.



2. Enter an initial value for a range of values.



3. Enter a value in the next cell to set the fill pattern.

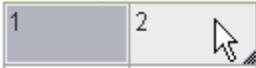


For example, if you want the sequence 1, 2, 3, 4, 5 ..., enter the values 1 and 2 in the first two cells. If you want the sequence 2, 4, 6, 8 ..., enter 2 and 4. If you need sequence 2, 2, 2, 2 ..., the second cell can be left blank.

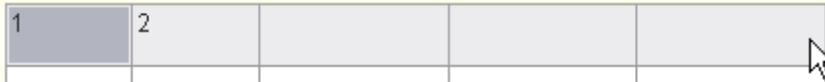
As the sequence is completed, it continues as shown in the table below.

Initial value	Continuation of the series
1, 2, 3...	4, 5, 6 ...
1st period, 2nd period	3rd period ...
Product 1, Product 2	Product 3 ...

4. Highlight cell or cells containing seed values.



5. Drag the fill handle over the range you want to fill.



The cells will be filled with the specified sequence of numbers.



To fill in ascending order, drag the handle down or to the right. To fill in descending order, drag the handle up or left.

## Basic tools

### Main menu commands

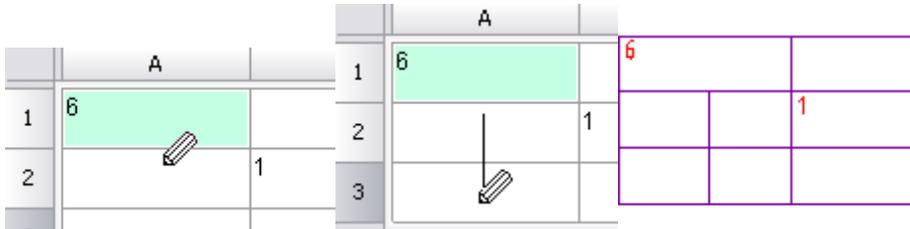
#### File

- *Open file...* - loads table data from a file. Files available for download: \* .tbl, \* .dat, \* .mdb (only for 32-bit Windows), \* .txt, \* .csv, \* .xml, \* .xls, \* .xlsx. When you select an Excel file, only the first sheet of the workbook is inserted.
- *Open database...* - opens a dialog of library to select a table saved in the database.
- *Save as file...* - writing a table to an external file \* .dat, \* .txt, \* .cvs, \* .xml, \* .xls.
- *Save to database...* - writing the table to the base of elements.
- *Edit Form...* - opens the *form editor*. Using the form, you can filter data, control the composition and style of the table.
- *Show Form...* - opens the table filter form.
- *Import from Excel* - the command transfers the results of calculating tabular data from an open MS Excel workbook. The content of the active sheet or a selected range of cells is transferred.
- *Export to Excel* - the command is designed to transfer tabular data to MS Excel. After clicking the button, the ["Conversion options"](#) dialog opens. After specifying the options, a new Excel workbook is opened and all tabular data is transferred into it, while maintaining the cell formatting set in the table.
- *Close* - saves changes and closes the editor.
- *Close without saving* - closes the editor without saving changes.

#### Edit

- *Undo* - undo the last action.
- *Redo* - redo the last undone action.
- *Cut* - cuts data from selected cells to the clipboard.
- *Copy* - copies data from the selected cells to the clipboard.
- *Paste* - pastes data from the clipboard.

*Pencil* - serves for splitting cells into several by building additional borders.



- *Select material...* - This tool is designed to insert into a table, technical requirements and technical characteristics of a formatted line-record for material and assortment. Clicking on the button brings up the "Material" dialog box.
- *Auto calculate expressions* - controls the mode of automatic recalculation of values of table cells. By default, the auto-recalculation mode is on.
- *Recalculate* - serves to recalculate data in a table after editing cell values or correcting formulas.
- *Auto update reports* - controls the mode of automatic recalculation of the report. The mode is on by default.
- *Reports* - update of the report.
- *Synchronize* - updates the table with data from a linked file. Available if the table was loaded from a file. For correct synchronization, the data changed in the file must be previously saved.

**View**

- *Show rulers* - switch, controls the display of the ruler.



- *Show expressions* -switch manages the formula bar display.



- *Formula visualization* - switch, controls the display of the formulas in cells.

$= \sum (B9 \text{---} B12)$	5
	4
	2
	3

- *Zoom to objects* - centers the original report objects in the drawing.
- *View sorting* - controls the display of the sort buttons of the view.



- *Calculator...* - the command calls [calculator](#).
- *Notebook...* - the command calls [notebook](#).

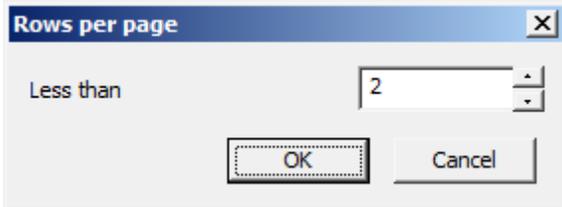
**Column**

- *Add column* - adds a new empty column after the selected column.
- *Insert column* - adds a new empty column before the selected column.
- *Delete column* - deletes the selected column.
- *Hidden* - switch, hides the column. The column appears in the editor but does not appear in the drawing.
- *Properties...* - open [properties of column](#).

**Row**

- *Add row* - adds a line below the selected one.
- *Delete row* - deletes the selected row.

- *Hide row* - hides the line. The line is not visible in both the editor and the drawing.
- *Show hidden rows* - shows hidden lines. To use the command, you must select several lines between which hidden lines are located.
- *Sort ascending* - sorts the table in ascending order relative to the selected column.
- *Sort descending* - sorts the table in descending order relative to the selected column.
- *Custom sort...* - opens a dialogue ["Collections editor"](#).
- *Merging and Grouping...* - opens a dialogue ["Row grouping and merging"](#).
- *Start new page* - switch, controls the page break before the selected line.
- *Limit rows per page...* - opens the *"Rows per page"* dialog, which indicates the maximum number of lines per page. If there are more lines, a page break is inserted.



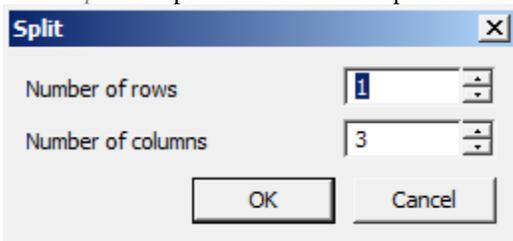
- *Limit page height...* - opens the *"Page height"* dialog in which the maximum page height is indicated. If the page height is greater than the specified height, a page break is inserted.



- *Single page* - the command removes all created page breaks.
- *Up to down* - switch, controls the data display sequence.
- *Properties...* - opens [string properties](#).

**Cell**

- *Edit* - puts the cell into edit mode.
- *Expression...* - opens a dialogue ["Expression builder"](#).
- *Properties...* - opens a dialogue ["Cell properties"](#).
- *Group* - merges the selected cells.
- *Ungroup* - corrodes the selected cells.
- *Split...* - splits a cell into multiple rows and columns. When the command is called, the *"Split"* dialog appears.



1					
2					
3					
4					

- *Cut* - cuts data from the selected cells to the clipboard.

- *Copy* - copies data from the selected cells to the clipboard.
- *Paste* - pastes data from the clipboard.
- *Clear* - clears the selected cells.
- *Insert table* - pastes a range of cells copied from Excel.

#### Section

- *Header of first page* - adds a header for the first page.
- *Header of following pages* - adds a header for pages.
- *Header of last page* - add a header for the last page.
- *Insert Data section* - inserts a data section. If the selected cell is in the data section, then an empty row is added.
- *Insert Report section* - adds a report section. [Used when building reports.](#)
- *Footer of first page* - adds a footer for the first page.
- *Footer of following pages* - adds a footer for pages.
- *Footer of last page* - add footer for the last page.

#### Toolbar commands

- *Open* - allows you to choose one of two commands:

 **Open file**- loads table data from a file. Files available for download: \*.tbl, \*.dat, \*.mdb (only for 32-bit Windows) \*.txt, \*.csv, \*.xml, \*.xls, \*.xlsx. When you select an Excel file, only the first sheet of the workbook is inserted.

 **Load from base**- opens a dialog of standard elements to select a table saved in the database.

- *Save* - allows you to choose one of two commands:

 **Save to base**- writing the table to the base of elements.

 **Save to file**- writing a table to an external file \*.dat, \*.txt, \*.cvs, \*.xml, \*.xls.

-  **Import table from Excel** - the command transfers the results of calculating tabular data from an open MS Excel workbook. The content of the active sheet or a selected range of cells is transferred.
-  **Export table to Excel** -the command is designed to transfer tabular data to MS Excel. After clicking the button, the "[Conversion options](#)" dialog opens. After specifying the options, a new Excel workbook is opened and all tabular data is transferred into it, while maintaining the cell formatting set in the table.
-  **Update table from external source** - updates the table with data from a linked file. Available if the table was loaded from a file. For correct synchronization, the data changed in the file must be previously saved.
-  **Pan and zoom view to show objects** - centers the original report objects in the drawing.
-  **Cut selection** - cuts data from the selected cells.
-  **Copy selection** - copies data from the selected cells.
-  **Paste from clipboard** - pastes data from the clipboard.
-  **Undo last change** - undo the last action.
-  **Redo last change** - redo the previously undone action.
-  **Move row down** - moves the selected line down.
-  **Move row up** - moves the selected line up.
-  **Move column left** - moves the selected column to the left.
-  **Move column right** - moves the selected column to the right.
-  **Page division** -the tool is designed to *split the table* into separate parts, without losing integrity. With this function it is possible to split a large table in order to fit on the format, and still retain the ability to edit the table as a single object.
-  **Open form** - opens the table filter form.
-  **Sort ascend** - sorts the table in ascending order.

-  *Sort descend* - sorts the table in descending order.
-  *Create summary function* - sums the contents of the selected cells.

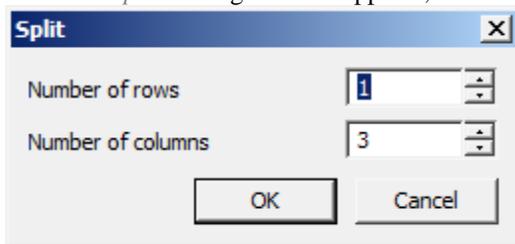
	A	B	C	D
	=summ(B2:D2)			
1	=summ()	1	2	3

Procedure:

1. Select the cell in which you want to calculate the amount, press  *"Create summary function"*.
2. Select the cells whose contents you want to summarize, press "Enter".
  -  *Open calculator* - the command calls [calculator](#).
  -  *Open notebook* - the command calls [notebook](#).
  -  *Insert material* - This tool is designed to insert into a table, technical requirements and technical characteristics of a formatted line-record for material and assortment. When you click on the button, a dialog box is called "Material".
  -  *Special symbols* - inserting a [special character](#) from the list.
  -  *Recalculate table* - serves to recalculate data in a table after editing cell values or correcting formulas.
  - *Automatic calculation* - controls the mode of automatic recalculation of values of table cells. By default, the auto-recalculation mode is on.
  -  *Update reports* - update of the report.
  - *Automatic report update* - controls the mode of automatic recalculation of the report. The mode is on by default.
  -  *Group selection* - serves to combine the selected table cells into one.
  -  *Ungroup selected cells* - cancels the merge for the selected cells.
  -  *Change number of rows and columns* - serves to change the number of rows and (or) columns in the selected range of cells.

Procedure:

1. Select one or more cells and call the command.
2. In the "Split" dialog box that appears, enter the desired numeric values to stake.



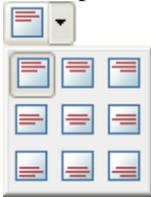
-  *Split table cell with pencil tool* - serves for splitting cells into several by building additional borders.



To split a cell with the mouse cursor, specify the start and end points of the segment that will divide each cell it crosses into two.

Right-clicking on a cell border removes that border.

-  *Select cell style* - calls [the window for applying the style to the selected cells](#).
- *Text alignment* - serves to control the placement of text in selected cells. Additional buttons are available by pressing the black triangle. The purpose of the buttons is clear from the figure on each of them.



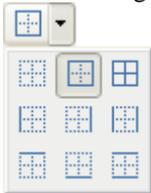
- *Fitting text horizontally* - controls the horizontal alignment of text in the cell. The following options are available in the drop-down list:

-  No horizontal tolerance
-  Shrink horizontally
-  Word wrap

- *Fitting text vertically* - controls the vertical alignment of text in the cell. The following options are available in the drop-down list:

-  No vertical tolerance
-  Shrink text height
-  Expand row height
-  Add virtual rows

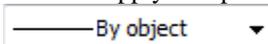
- *Borders* - is designed to control the display of the borders of the selected cells. When you click on the black triangle, additional buttons for displaying borders become available. The purpose of the buttons is clear from the figure on each of them.



- *Color of borders* - drop-down list for choosing border colors. To set the border color, you must first select a color and then select the border (using the  "Borders" command) to which you want to apply the specified parameters.



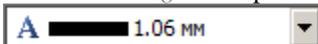
- *Lineweight of borders* - drop-down list of border thickness selection. To set the border thickness, you must first select the thickness and then select the border (using the  "Borders" command) to which you want to apply the specified parameters.



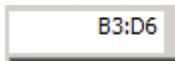
- *Text style* - drop-down list for choosing the text style of the cell.
- *Text height* - drop-down list for selecting the height of the cell text.



- *Text color* - drop-down list for choosing the color of the cell text.
- *Text weight* - drop-down list for choosing the thickness of the lines of the cell text.



- *Selected cell coordinate field* - displays the coordinates of the selected cell (s) and allows you to enter them.



- *Row expressions* - formula input field. The line is displayed if the "Main menu - View - Show expressions" switch is active.

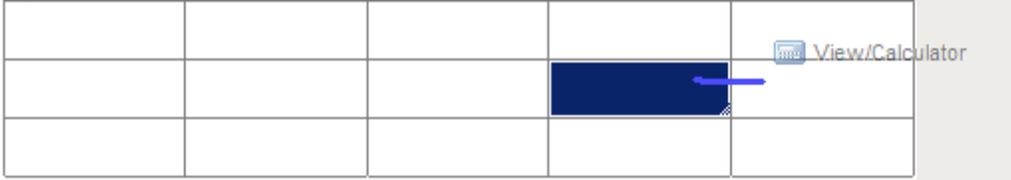


## Using gestures for shortcuts

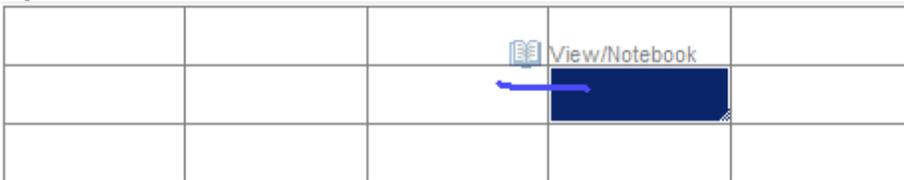
Gestures are designed for quick access to commands from the main menu of the table editor. Gestures made with pressed RMB in the table editor.

**Note:** If when the prompt appears gesture command being executed, you can omit the RMB.

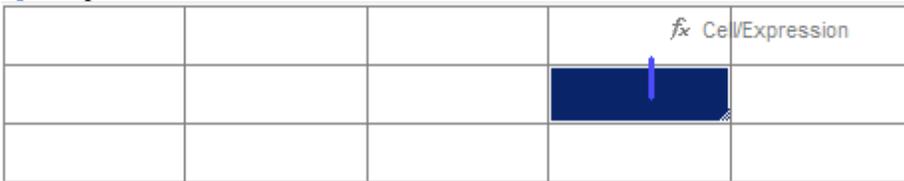
*Right* - Calculator



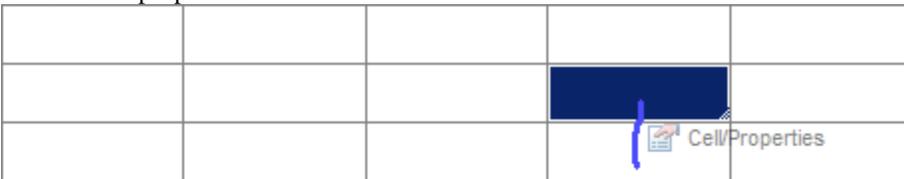
*Left* - Notebook



*Up* - Expression



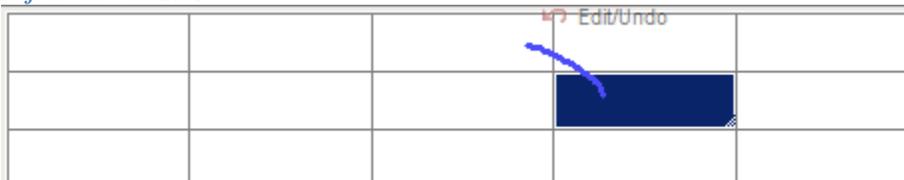
*Down* - Cell properties



*Right hook* - Return



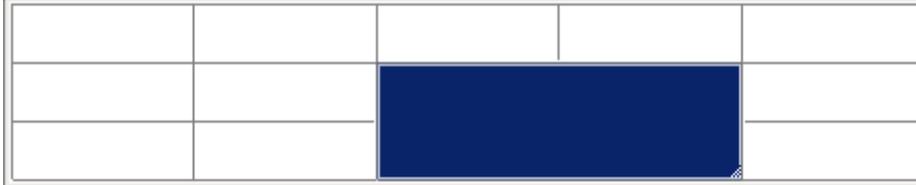
*Left hook* - Cancel



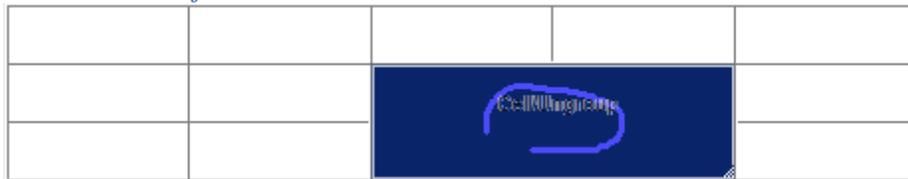
*The closed area of the selected cells in a clockwise direction* - Connection (merged cells pre-allocated)



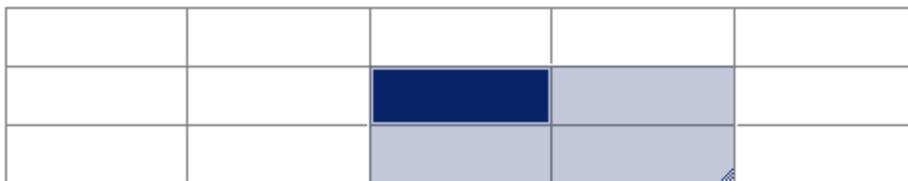
Result:



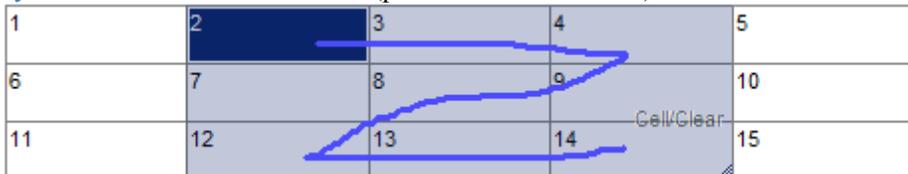
*The closed area of the selected cells counterclockwise* - Disconnection



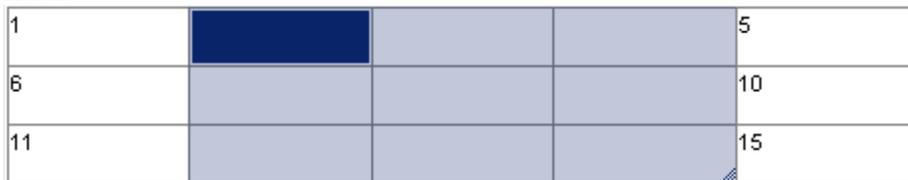
Result:



*Symbol "z" on select cells* - Clear (pre-clean cell is released)



Result:

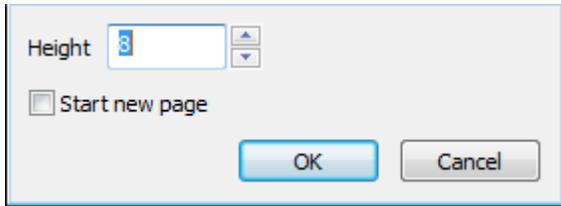


## Editing the size of rows and columns

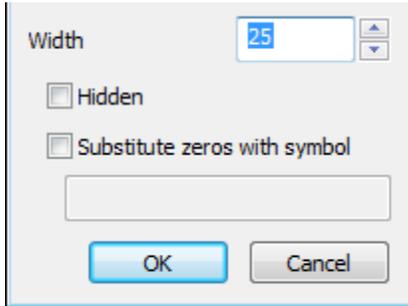
To modify the row height or column width, move your mouse to the border of the row or column. Click the left mouse button and holding the button down drag the border. The move will be highlighted by the current value of the row height or column width, as well as its new size.

Resize a row or column can also be done in the properties dialog box, selected by pressing the right mouse button on the header row or column.

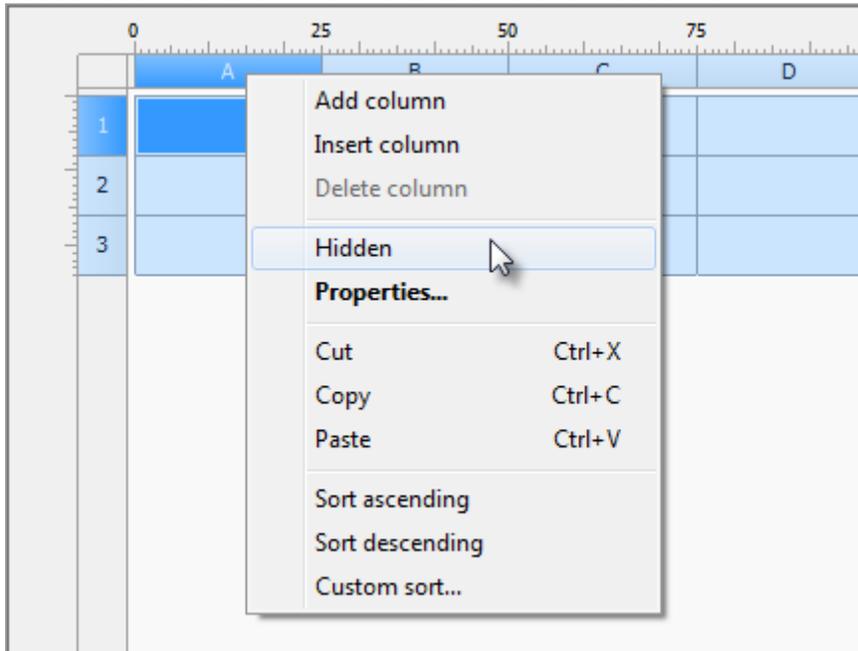
1. In the properties dialog box, specify the height (width) in millimeters.



2. In the Properties dialog box of the column switch is available *Hidden*. With it, you can disable the display of the selected column in the drawing, however, the Editor will be displayed.



You can also hide a column from the context menu for the column.



Command *string Replace null values* (for numeric cells with the value zero, the cell must be a numeric format), replaces the contents of the cells specified text.

**Important!** Format text in a cell value is set in the properties of the cell on the tab *Content* .

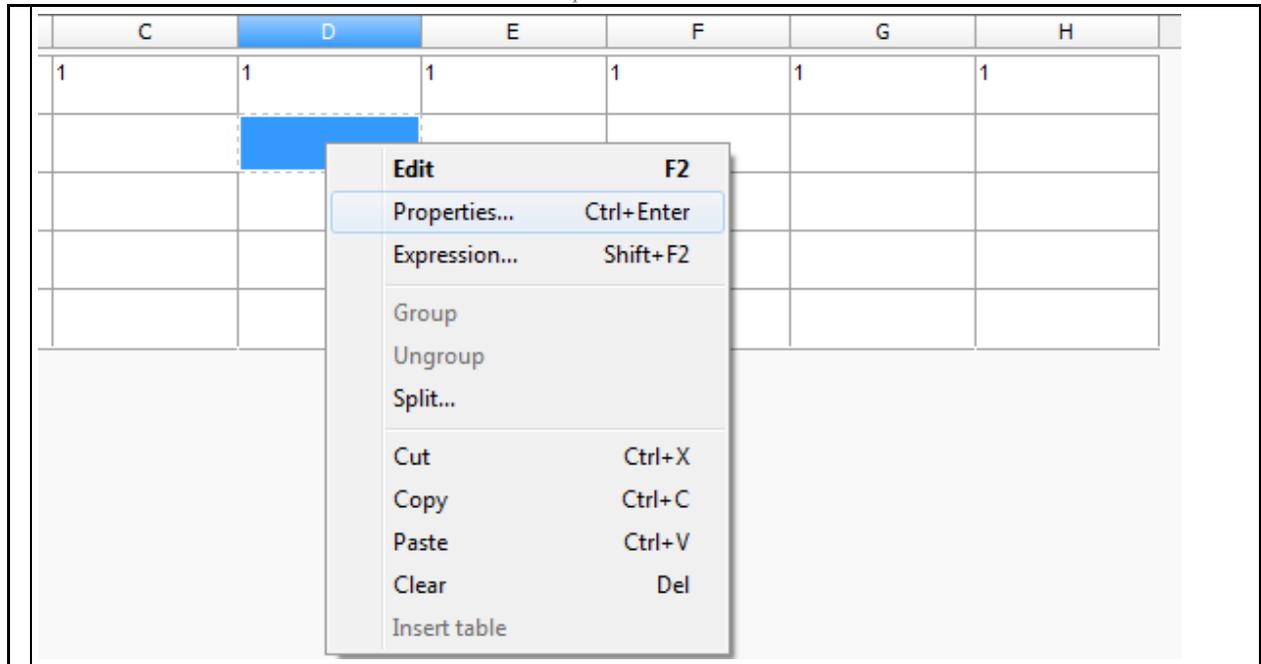
Close the dialog by clicking OK.

## Cell Properties

*In the dialog box Properties parameters are set for table cells.*

*To edit the properties of a single cell* in a table full editor, select the desired cell and issue *Properties* from the context menu or by pressing Ctrl + Enter, double click on the cell, as a gesture to "down" on the cell. The effect of this command is similar *Cell Properties* [screen table editor](#).

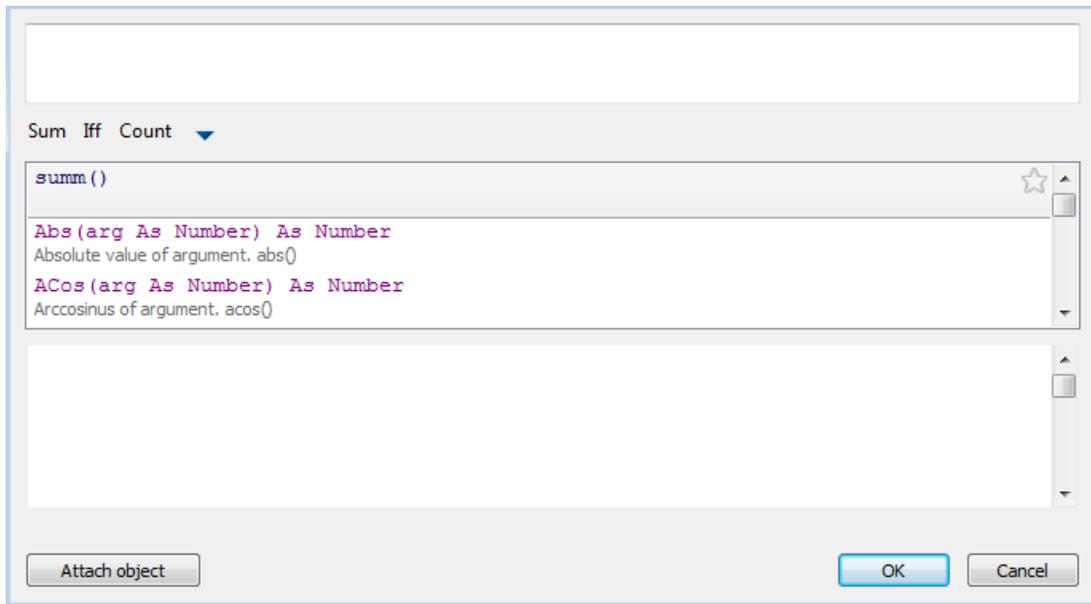
*To edit multiple table cells* in the full editor, select the desired cells and issue the *Properties* from the context menu. The effect of this command is the same action as *Properties* screen editor table.



There are six tabs:

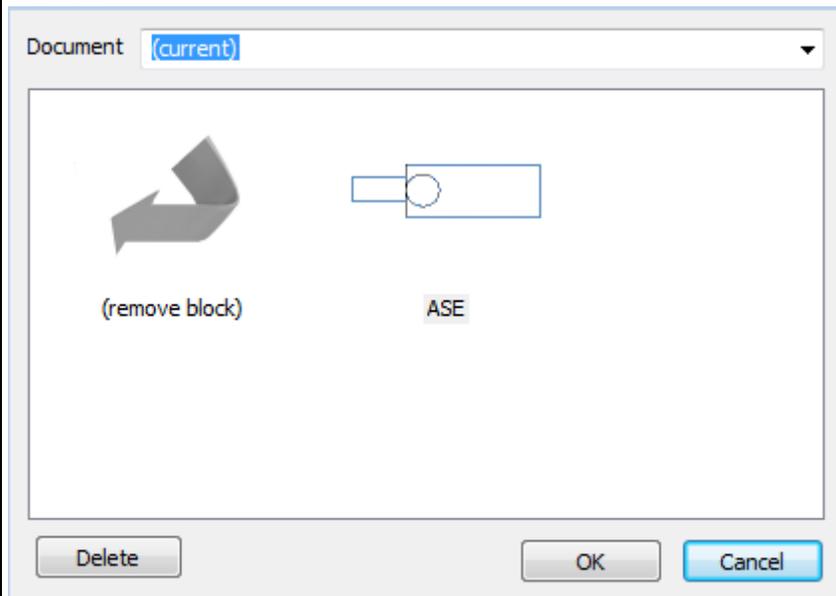
- Flag *Content*. This tab specifies the type of data in a cell the user, set the formula for calculating values. In the properties of the cell can format values and enter the contents of a table cell. Checking *unmodifiable* disables the ability to edit the cell. Such a cell is highlighted in color.

	- Opens the <a href="#">Expression Builder</a> .
--	--



**Block...** - The tool is used to insert the nanoCAD block the cell.

Select the list that appears in the desired unit from the current drawing file. If necessary, select another file using the menu *View*.



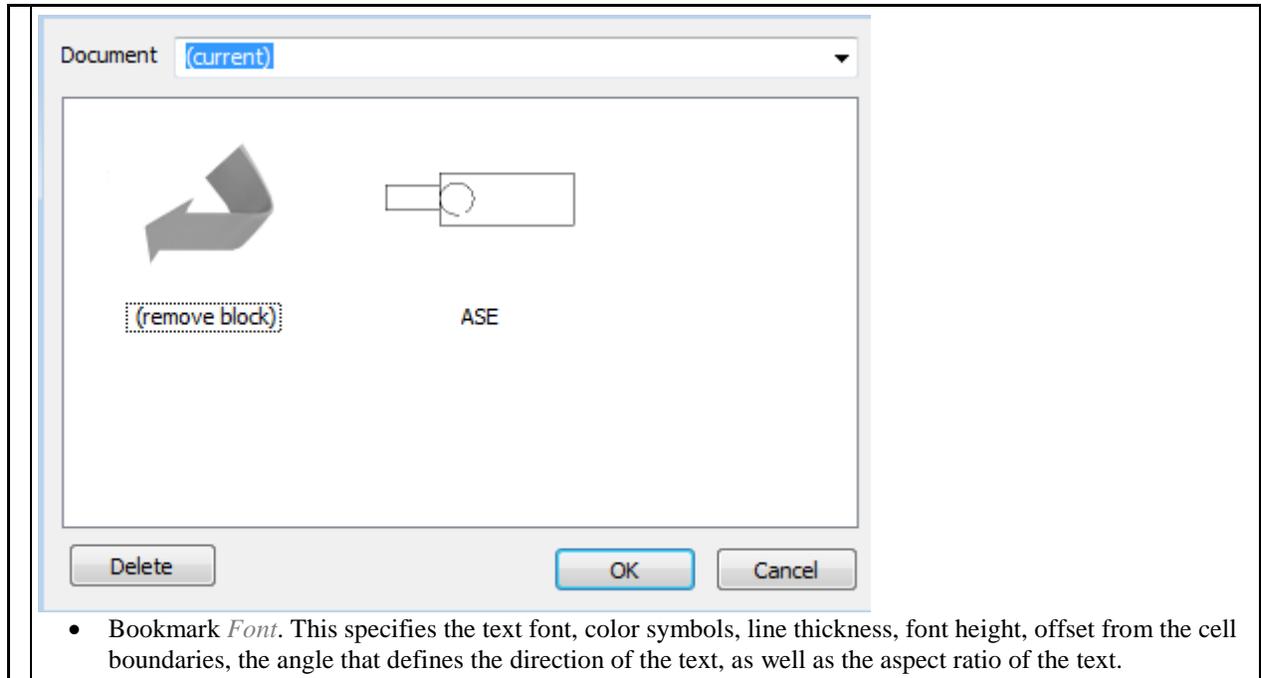
After selecting a unit, it is displayed in the properties window of the cell, as well as in a table cell.

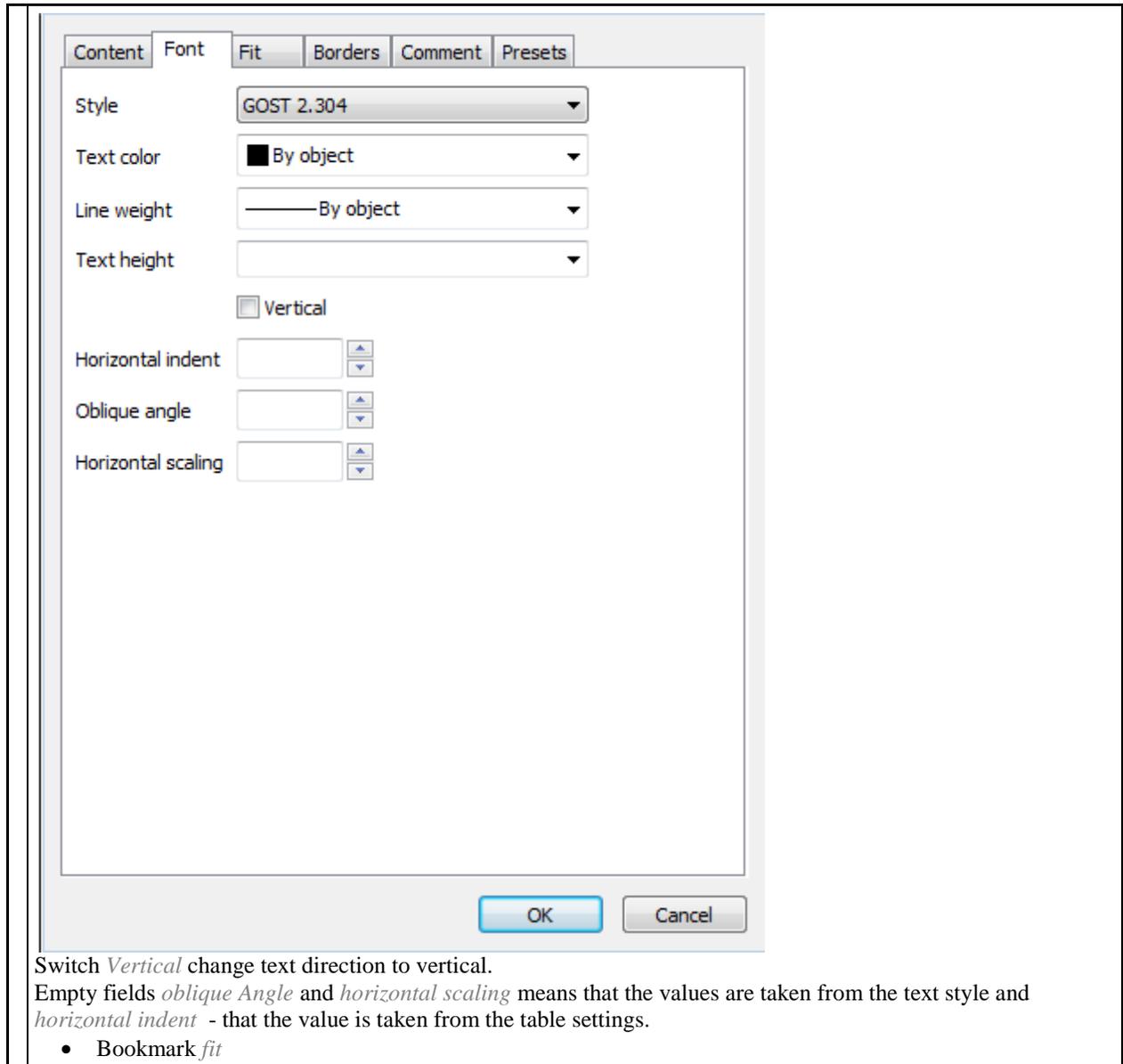
The image shows a software interface with a dialog box and a spreadsheet. The dialog box, titled 'Content', has several tabs: 'Content', 'Font', 'Fit', 'Borders', 'Comment', and 'Presets'. The 'Content' tab is active. It contains the following elements:

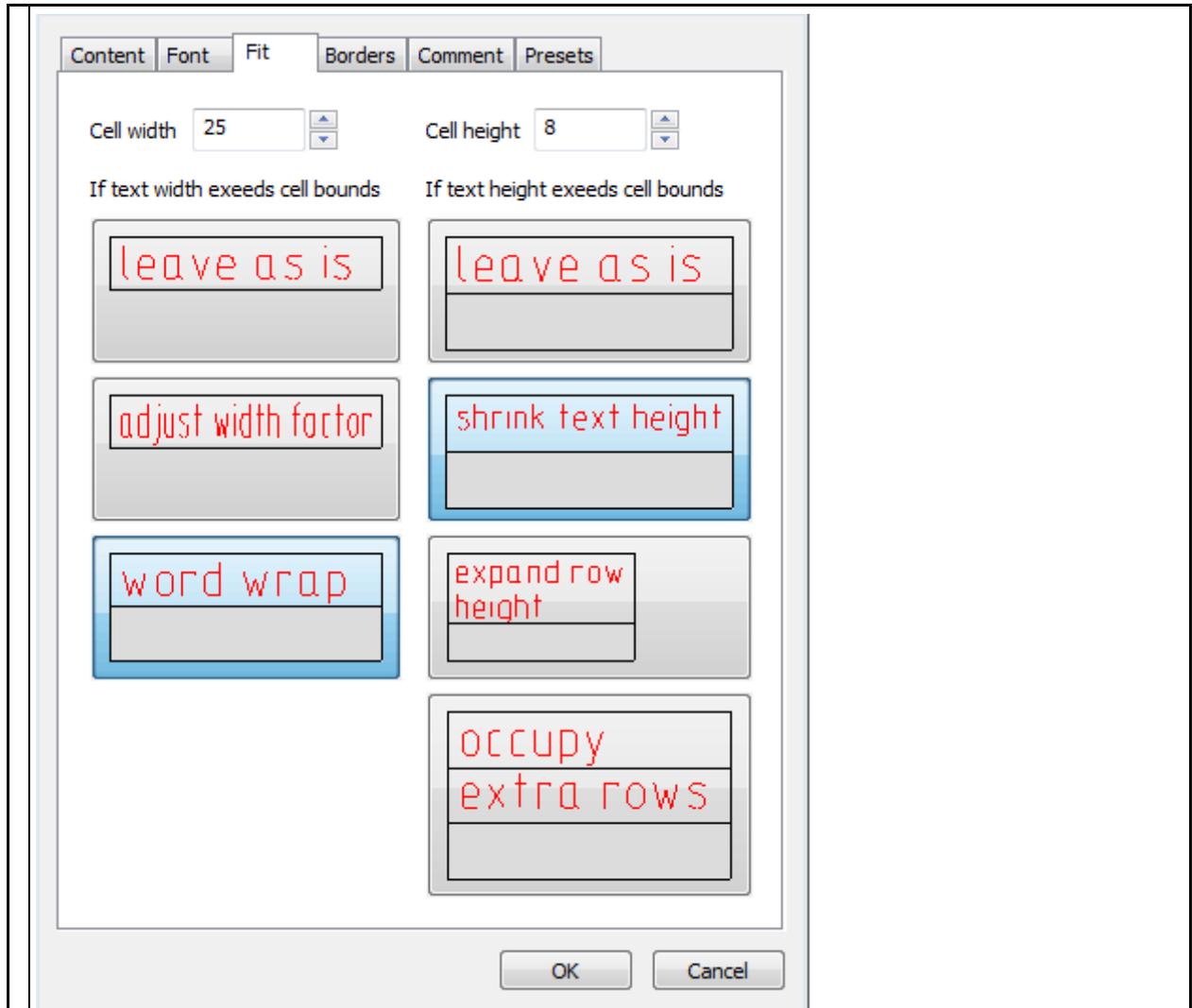
- 'Data format' dropdown menu set to 'Auto format'.
- 'precision' dropdown menu set to '(auto)'.
- Checked checkbox labeled 'Supress trailing zeros'.
- A large empty text box labeled 'Value'.
- Unchecked checkbox labeled 'Read only'.
- 'Expression...' button.
- 'Block...' button.
- 'OK' and 'Cancel' buttons at the bottom.

Below the dialog box is a spreadsheet grid with columns labeled A through J and rows labeled 1 through 4. The cell at the intersection of column D and row 1 (D1) contains a small diagram of a mechanical part, which is a rectangular block with a circular hole on its right side and a smaller rectangular protrusion on its left side.

To disconnect the unit, press the *Remove block* in the *block selection*.





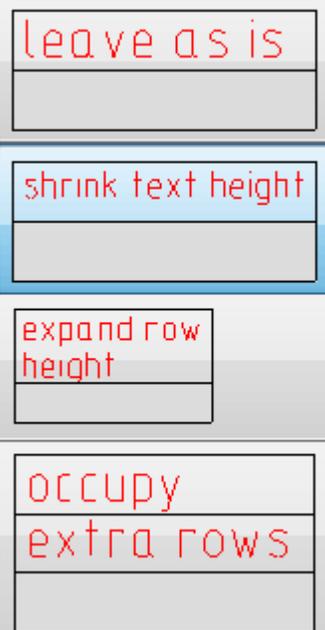


This specifies the *cell*, *cell* as well as parameters of inscribing text into the cell.

If the text width exceeds cell bounds



If the text height exceed cell bounds:



Mode *Occupy extra row* does not change the number of rows in the table, the desired row is made higher by the required number of times and line.

- Bookmark *borders*. Here you specify the type, color, thickness of the boundary line of the selected cell, you can manage the display of individual cell borders. Enable or disable the display of individual boundaries, you can use buttons

Content Font Fit **Borders** Comment Presets

Text

(by object)

(by object)

(by object)

Border color  By layer

Line weight  By object

Fill color  None

OK Cancel

- or in the preview by clicking the left mouse button near one of the cell borders. Alignment of text within a cell preview is set by clicking the left mouse button.

Text

(by object)

(by object)

(by object)

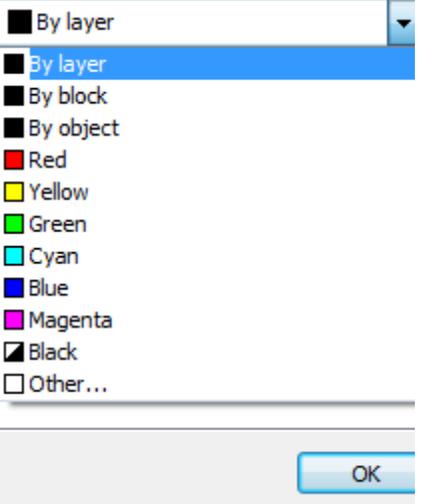
(by object)

(none)

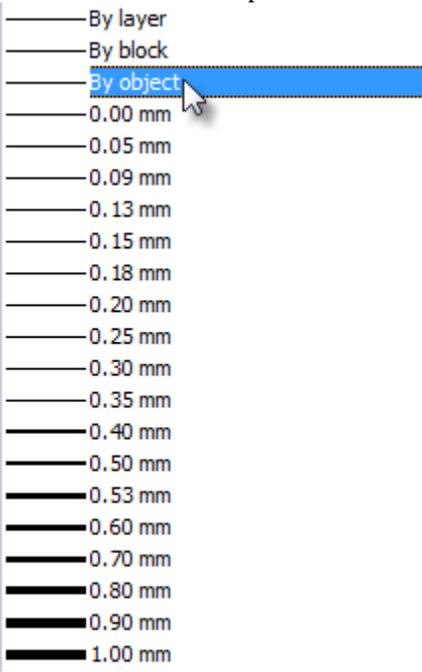
(by object)

(by object)

To set the color of individual borders, click the left mouse button on the icon	<input type="checkbox"/>	and select a color from the drop down list
---	--------------------------	--



To determine the weight of the individual borders, click the left mouse button on the line (*By layer*) and choose the thickness of the drop-down list.

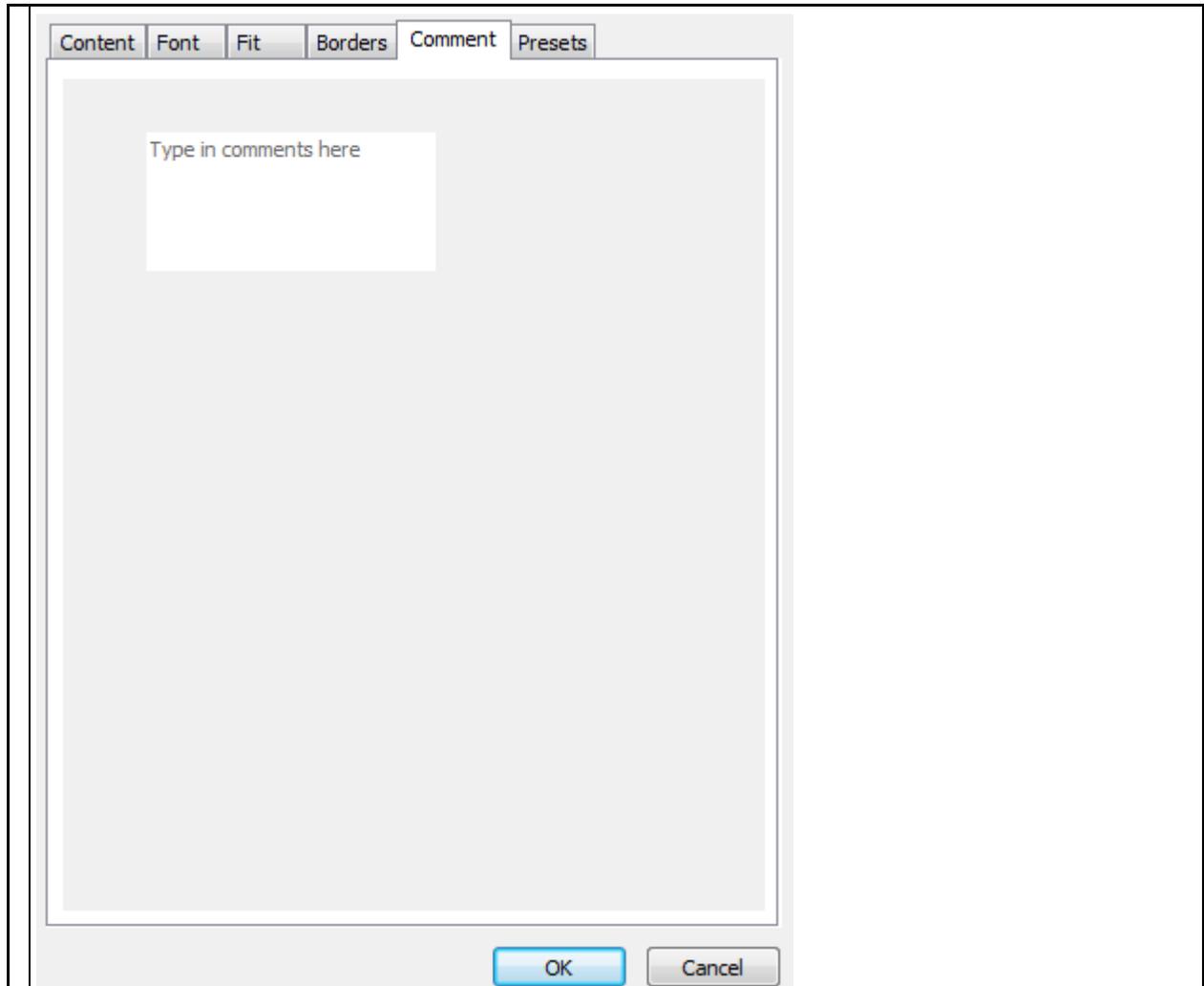


- Color, line thickness for the cell borders, and cell shading can be set from the menu.

- To apply the changes in color and thickness, click on the desired boundary. Can also be selected by using the display boundaries.



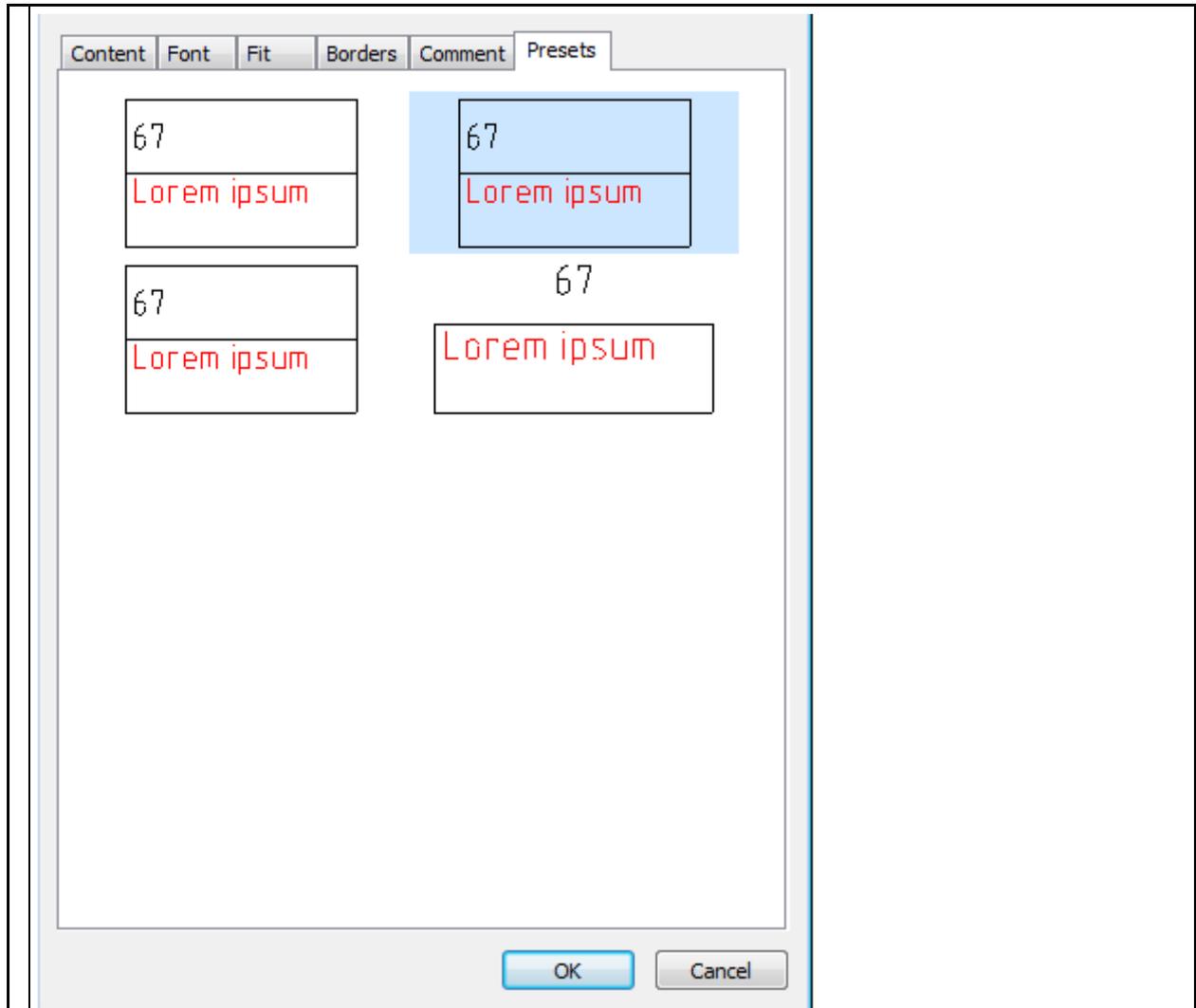
- Flag *Comment*. A field for entering a comment.



Cell with the comment is displayed in the editor by a green label, which displays a hint when you hover the mouse on it, which is displayed as a hint.

	A	B	C	D
1				
2		SDADDDDD		
3		Block		
4		Here you can enter comment		

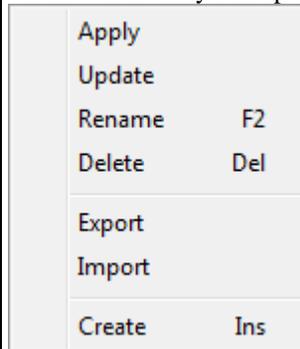
- Bookmark *Styles*. Here you can set the style for the cell.



To create a style, right-click in the blank area of the *Style* tab, then on the shortcut menu, select *Create*.



To work with a style template, open the context menu style.



## Using styles

Style assignment to table cells is performed by the command  "Select cell style" in the toolbar of the table editor or tab "Fit" in dialogue "Cell properties". The choice of style is carried out in the graphics window. Also, styles can be created and edited using the context menu.

### Context menu

- *Apply* - the command applies the selected style on the cell (group of cells).
- *Update* - the command replaces the selected style with the style of the selected cell.
- *Rename* - command allows you to rename the name of the style. The name of the style is generated automatically during creation.
- *Delete* - command removes the selected style from the list.
- *Import* - command imports style in \* .mcd format.
- *Export* - command exports the style in \* .mcd format.
- *Create* - command allows you to create a new style.

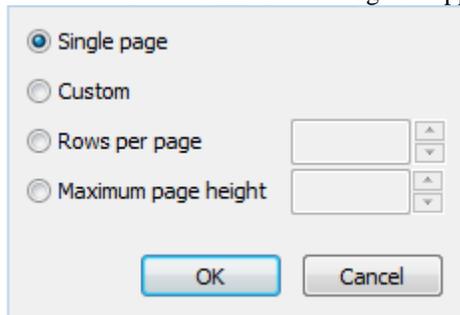
Creation order:

1. Set the cell style.
2. Open the style window
3. Select the "Create" context menu command.
4. A new style will be created. The name of the style is generated automatically during creation.

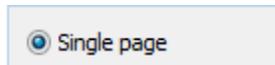
## Division by page

 *Division by page*. tool is designed to separate the table into separate parts, without losing its integrity. With this feature, you can split a large table in order to place a format, while preserving the ability to edit the table as a single object.

- When the command a dialog box appears *page division*.



- Switch *single page* disables table division.
- Select the method of dividing the table:
  1. *Custom*- The table can divided into any parts.



- Page break before a row is set by start new command from the context menu.

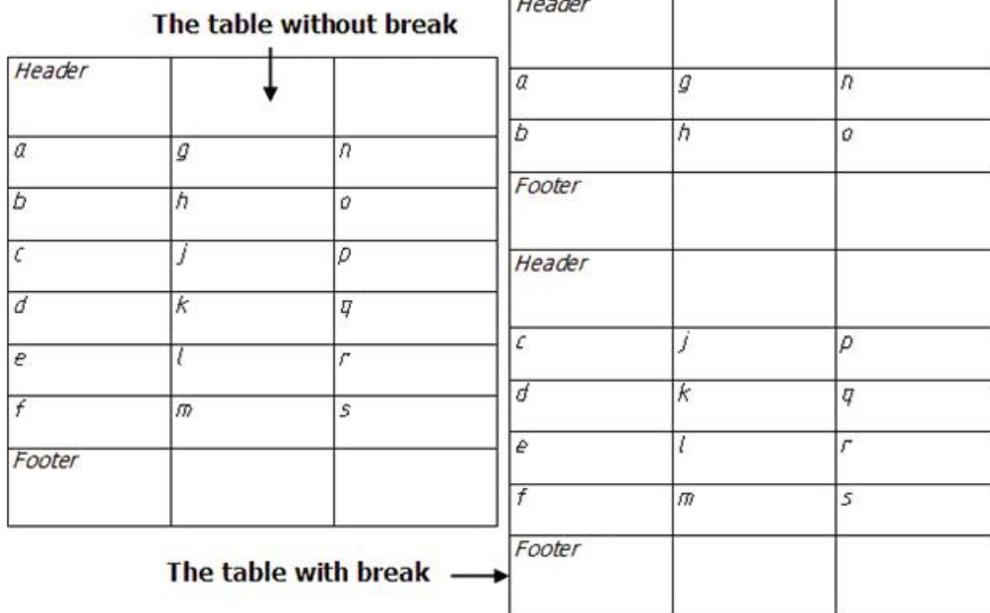
8	c	i
9	d	j
10	e	k
11	f	l
12		
13		
14		

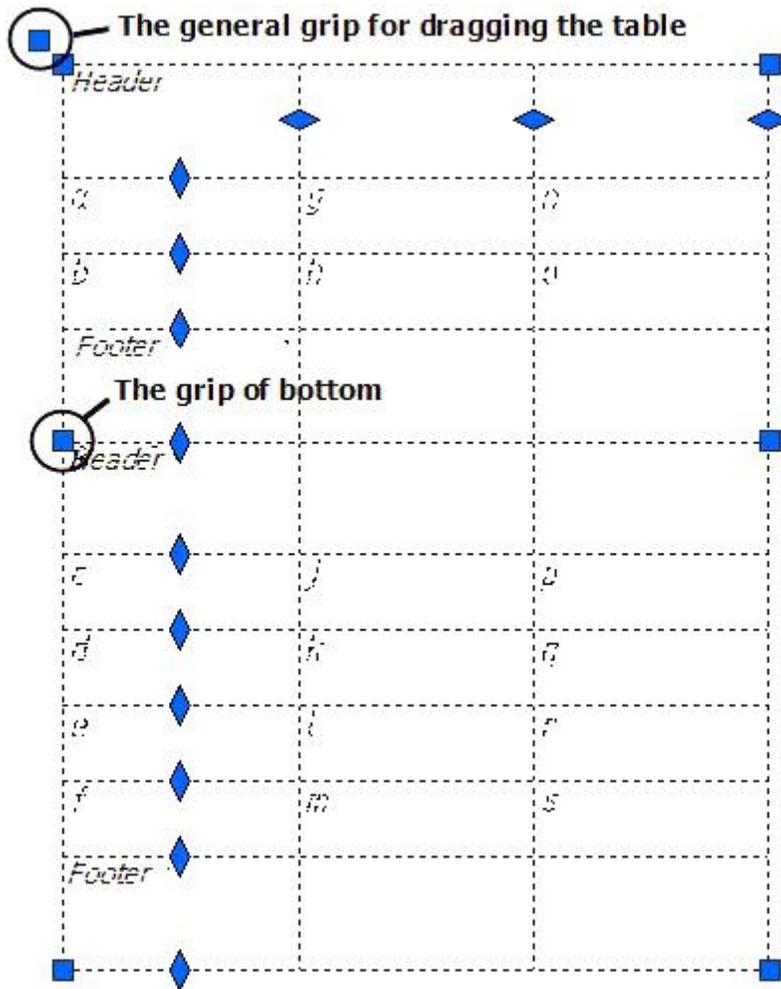
- Add row
- Insert row
- Delete row
- Hide row
- Show hidden rows
- Start new page
- Properties...
- Convert to ▶
- Cut                      Ctrl+X
- Copy                     Ctrl+C
- Paste                    Ctrl+V

- Close the dialog. The editor of the table indicate the boundaries of the gap, with the help of it, you can change the row height.

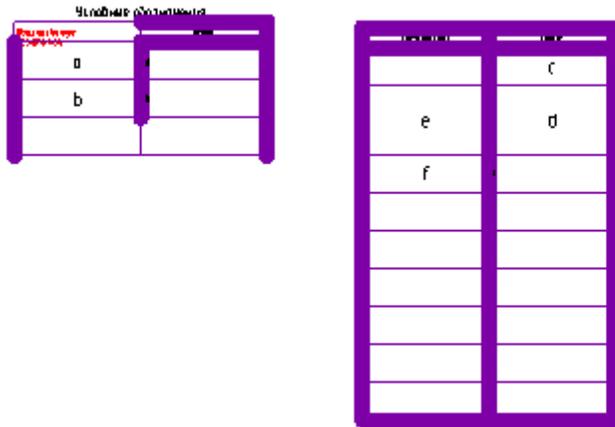
	A	B	C
0	Header <a href="#">Section properties</a>		
1			
3	Data <a href="#">Section properties</a>		
4	a	g	n
5	b	h	o
6	c	j	p
7	d	k	q

- On the drawing table with a gap will be as follows:

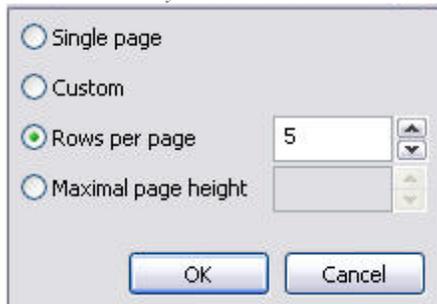




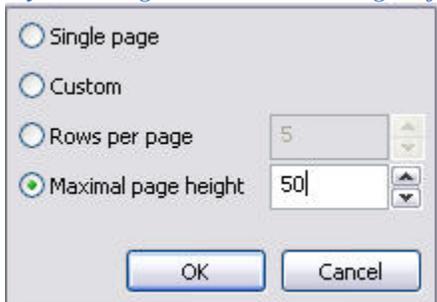
- Side of the split table can be moved in the drawing independently, double-clicking on any part of the full table editor opens.



2. *By row count enter the desired number of rows in a fragment. Headers do not count.*



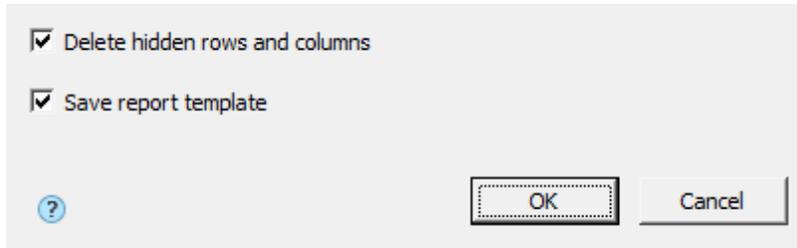
*By table height enter the total height of a fragment, in millimeters, using the current scal.*



- *Dividing the table into parts allows each part to be moved independently:*

## Conversion options

The "Conversion options" dialog is a filter that influences the set of transmitted data. Appears when converting a report to data and when exporting a table to Excel.



**Converting a report to data**

*Delete hidden rows and columns* - affects the conversion of hidden strings. If enabled, hidden rows are not passed to the data.

Table	Turned on	Turned off
line 4 is hidden	no hidden lines	line 3 is hidden

*Note:* The converted hidden lines remain hidden.

*Save report template* - affects the conversion of report template strings to data. If enabled, strings are transferred.

Table	Turned on	Turned off
-------	-----------	------------

Table		Turned on		Turned off	
0	25	0	25	0	25
	A B		A B		A B
1	Data	1	Length Angle	1	Length Angle
2	Length Angle	2	Object.Length Object.Angle	2	100 0
3	Report template <input checked="" type="checkbox"/>	3	100 0	3	100 90
4	=Object.Length =Object.Angle	4	100 90		
3	Report				
4	100 0				
	100 90				

**Export to Excel**

Delete hidden rows and columns - the option does not affect the result, since hidden rows are not exported.

Save report template - affects the export of report template strings. If enabled, strings are transferred.

Table		Turned on		Turned off	
0	25		A B		A B
	A B		A B		A B
1	Data	1	Length Angle	1	Length Angle
2	Length Angle	2	Object.Length Object.Angle	2	100 0
3	Report template <input checked="" type="checkbox"/>	3	100 0	3	100 90
4	=Object.Length =Object.Angle	4	100 90	4	
3	Report	5			
4	100 0	6			
	100 90				

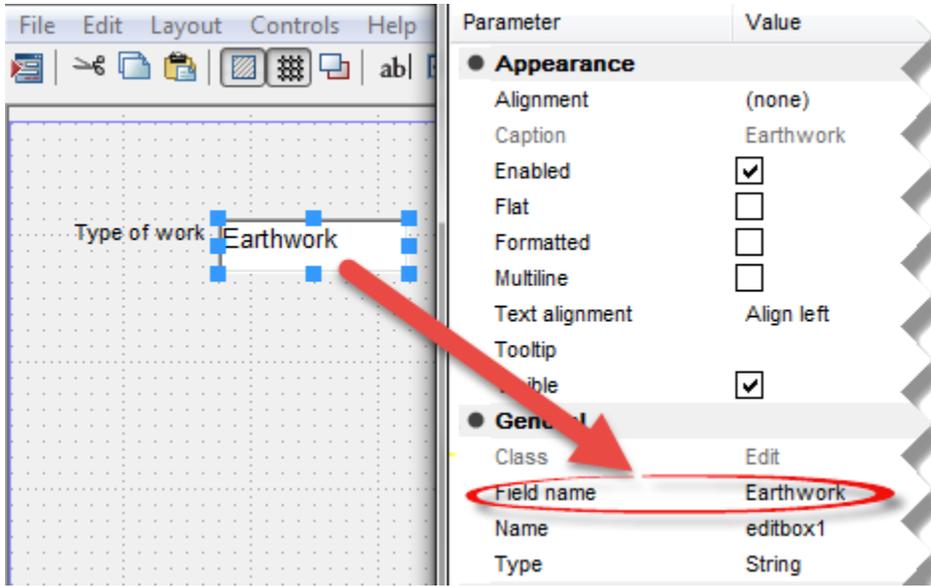
**Using Variables**

**Important!** This function is available only in vertical applications based nanoCAD

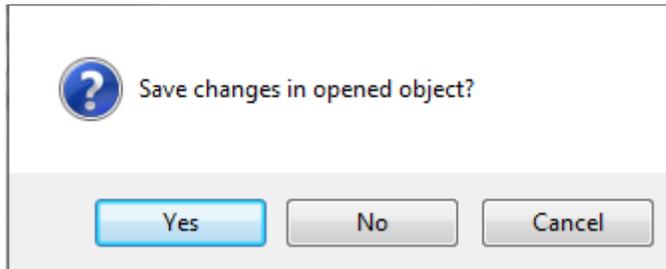
Tables BuildIndustry support the use of additional variables defined in a special dialog (form).

Procedure for creating a set of user-defined variables and their use in the table below:

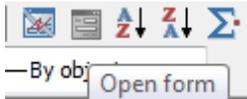
1. In *full table editor* from the menu *Edit* invoke the command *Form Editor*.
2. Create a form with controls and bind each control to a field (variable). More information about the forms, see *Form Editor*.



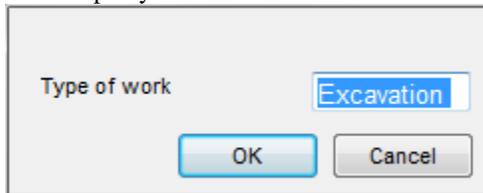
3. Close the form editor and save the form.



4. To set the variable, call the command *form*.



5. Open your form. Enter the desired values. Click *OK*.



6. Linking table cells with custom variables by using *formulas*.

	A	B
	Header	
1	=Trade	
	Data	

Cell value will be associated with the variable.



Variables can also be used in complex formulations.

## Create reports

Reports are necessary in order to organize the data of objects in the drawing.

Recommended report structure:

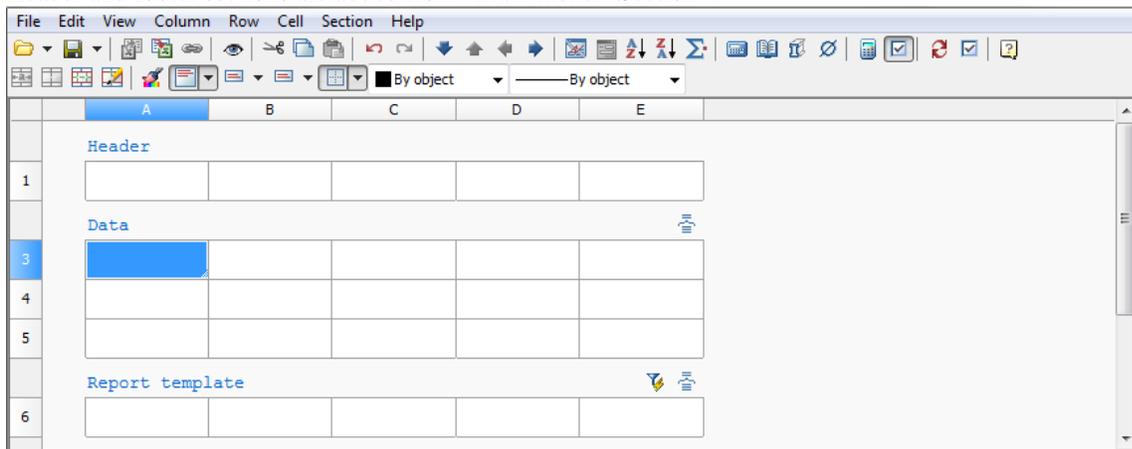
- Header of first page;
- Header of following page;
- Header of last page;
- Report title;
- Report template;
- Report;
- Report summary;
- Footer of first page;
- Footer of following page;
- Footer of last page;

### Generating a report

To create a report in the table editor, call the command from "Main menu - Section - Insert Report section". The command will create a subsection "Report template".

Additional subsections are added using the "Report template" menu: "Report title", "Report Summary".

Header and footer sections are added from "Main menu - Section".



### Report template

The report template defines the content and appearance of the report; it can consist of one or several lines. A separate copy of the report lines is created for each object. Formulas in the report are calculated using the properties of the selection objects.

The following commands are available in the "Report template" menu (click on the subsection name):

- "Object filter..." - opens the "Quick Selection" dialog for forming a selection of drawing objects. The command is duplicated by the  "Select source objects" button on the right in the "Report template" section.
- "Merging and Grouping..." - opens the "[Row grouping and merging](#)" dialog in which the parameters of grouping and merging table cells are configured. The command is duplicated by the  "Group and merge" button on the right in the "Report template" section.
- "Freeze report" - the switch controls the report refresh mode. If the checkbox is selected, the update is performed manually, and the "Update report" command becomes available.
- "Update report" - refreshes the values of report objects, the command is available in manual refresh mode.
- "Report header" - adds a "Report Title" subsection to the beginning of the report, displayed at the beginning of each part of the table.
- "Append Data section" - adds a data section below the report. If the section already exists, an additional line is appended.
- "Append Report section" - adds a new report below the current one.
- "Remove Report" - deletes the report with all associated subsections.
- "Rebuild" - completely rebuilds the report based on the report template. Data entered manually in the "Report" section will be overwritten.
- "Convert to Data section" - the command converts sections of the report to data. Blank lines are not converted. Calling the command opens the "[Conversion options](#)" dialog.
- "Report footer" - Adds the "Report Summary" subsection to the end of the report, displayed after each part of the table.

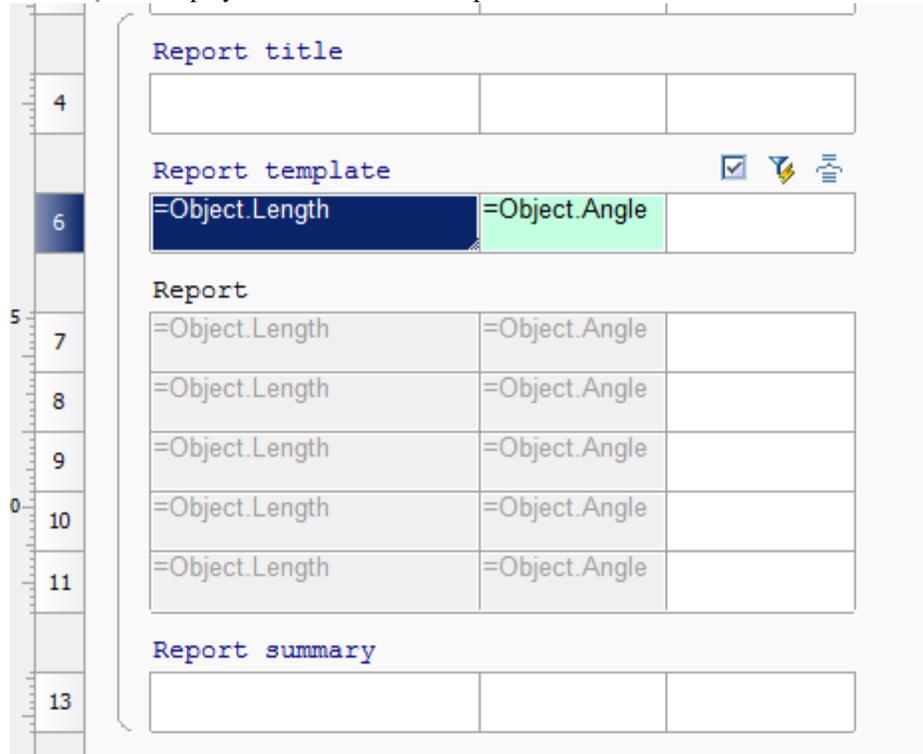
All related subsections of the report are visually combined with brackets.

	A	B	C
	<b>Header</b>		
1			
	<b>Report template</b>   		
3	=Object.Name	=Object.L	=Object.p
4	=Object.Name	=Object.dr	=Object.b
	<b>Report</b>		
5	Bolt 2 M10 # x200	10	32
8	Bolt 2 M10 # x200	200	1,5
9	Bolt M10 # x200 #	10	32
10	Bolt M10 # x200 #	200	1,5
11	Bolt M10 # x200 # GOST 7796-70	10	32
12	Bolt M10 # x200 #	200	1,5
	<b>Report summary</b>		
14			

**Important!** The report template has absolute priority over custom changes. After the refresh, the report colored by the user will become the same as the specified report template. Automatic report lines corresponding to the collected objects will be automatically formatted strictly according to the report template.

### Report

The "Report" displays the values of the template variables.



The report contains cells (with a lilac background) containing object data, marked with a special color. Selecting cells highlights the corresponding objects in the drawing.

When editing such cells, the changes will be applied to the very object to which they refer. For instance:

1. Take a Bolt GOST 7795-70 with a length of 50 mm and place a leader on it.

GOST 7795- Ex. 1.3.4



Length 60

2. Create table, report template and tie to bolt (parametric object).

	A	B	C	D
	Header			
1	Name	Length		
	Report template			
3	=Object.Name	=Object.L		
	Report			
4	Bolt 2 M10 # x60 #	60		

3. Add parameters: *Object.Name* and *Object.L*.

	A	B	C	D
	Header			
1	Name	Length		
	Report template			
3	=B3	=Object.L		
	Report			
4	120	120		

4. Enter the new length, for example 120. Close the table editor.

5. The length of the bolt in the drawing has changed.

GOST 7795- Ex. 1.3.4



Length 120

### Report title

The following commands are available in the "Report Title" menu (click on the subsection name):

- "Remove section" - deletes the "Report Title" section.

### Report summary

The following commands are available in the "Report Summary" menu (click on the subsection name):

- "Remove section" - deletes the "Report Summary" section.

In the context menu of the "Report Summary" cells, there are the following additional commands: "Sum", "Average", "Minimum", "Maximum", "Count".

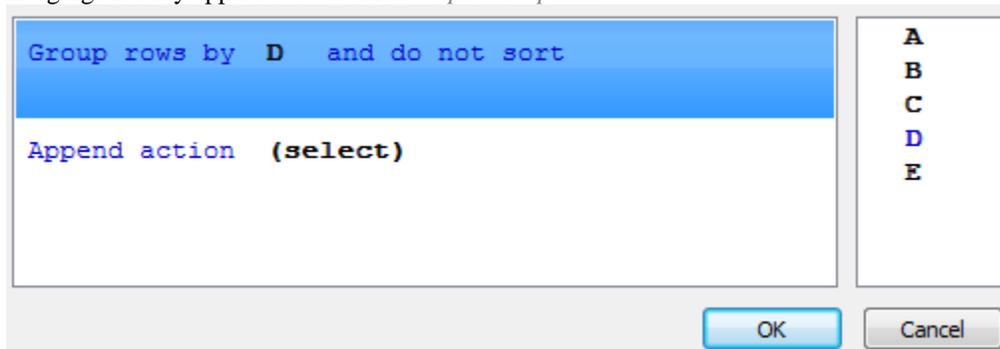
The commands insert into the selected cell corresponding to the name of the expression. The action is applied to a fragment of a column within one section.

Sum
Average
Minimum
Maximum
Count

### **Grouping and merging cells**

Button  *Grouping and merging*. Report template.

In the *Grouping and merging* dialog you can specify settings for grouping and merging table cells. Grouping and merging are only applied to cells in the *report template*.



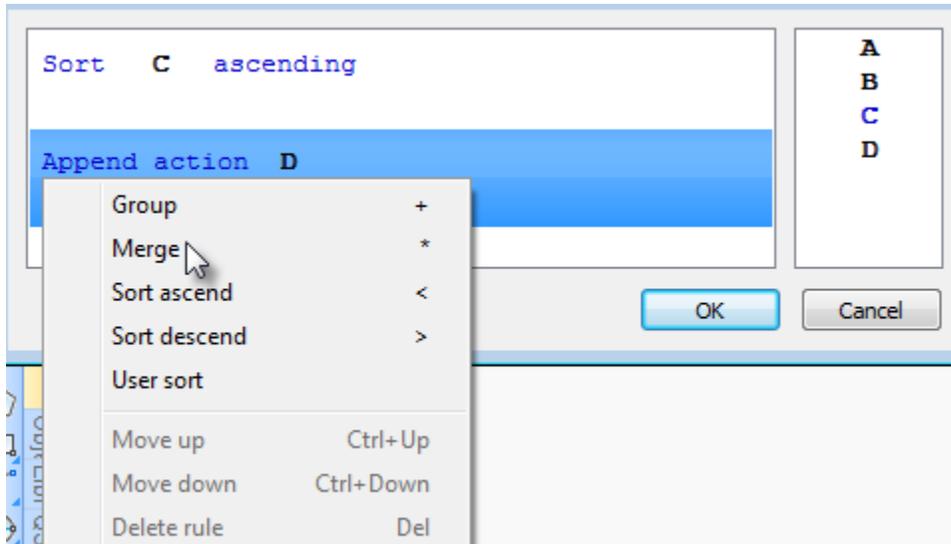
Study the example for how to merge cells.

	A	B	C	D
	First page header			
	<a href="#">Section properties</a>			
1	Description	Name	Length	Diameter
	Data			
	<a href="#">Section properties</a>			
3	GOST 12204-72	Leg7034-0598GOST 12204-72	50	18
4	GOST 12205-72	Leg7034-0185GOST 12205-72	40	20
5	GOST 12204-72	Leg7034-0600GOST 12204-72	80	20
6	GOST 12205-72	Leg7034-0174GOST 12205-72	12	10
7	GOST 12205-72	Leg7034-0183GOST 12205-72	25	20
8	GOST 12204-72	Leg7034-0594GOST 12204-72	40	14
	Report template			
	<a href="#">Section properties</a>			
9	=Object.ObjectID	=Object.Name	=Object.L	=Object.D

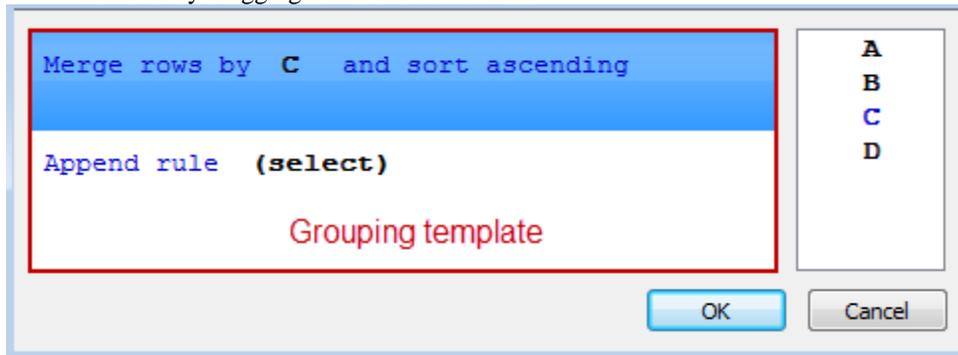
<i>Description</i>	<i>Name</i>	<i>Length</i>	<i>Diameter</i>
GOST 12204-72	Leg7034-0598GOST 12204-72	50	18
GOST 12205-72	Leg7034-0185GOST 12205-72	40	20
GOST 12204-72	Leg7034-0600GOST 12204-72	80	20
GOST 12205-72	Leg7034-0174GOST 12205-72	12	10
GOST 12205-72	Leg7034-0183GOST 12205-72	25	20
GOST 12204-72	Leg7034-0594GOST 12204-72	40	14

## Merging

1. In the *Grouping and merging* dialog box select *Append rule* and select *Merge*.



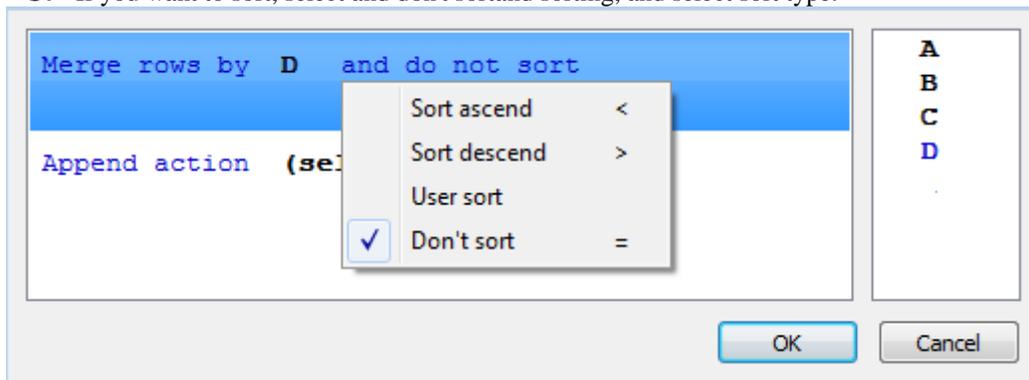
2. Select the column name for the cells you want to merge. Selection is made by double clicking on the column name or by dragging it into the *Select* field.



**Note:** To select another column, you must drag it into the column list and then select it. You can select several columns then place them in the required order.

The columns are processed according to the rules of the *grouping template*.

3. If you want to sort, select and don't sort and sorting, and select sort type.

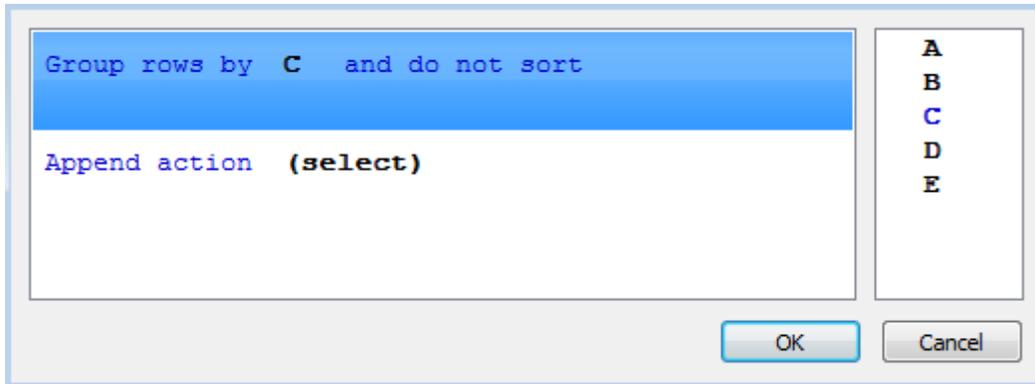


4. Click *OK* to check the result in the table editor. Cells having identical values in the D column will be merged.

	A	B	C	D
	<b>First page header</b> <a href="#">Section properties</a>			
1	Description	Name	Length	Diameter
	<b>Data</b> <a href="#">Section properties</a>			
3	GOST 12204-72	Leg7034-0598GO ST 12204-72	50	18
4	GOST 12205-72	Leg7034-0185GO ST 12205-72	40	20
5	GOST 12204-72	Leg7034-0600GO ST 12204-72	80	
6	GOST 12205-72	Leg7034-0183GO ST 12205-72	25	
7	GOST 12205-72	Leg7034-0174GO ST 12205-72	12	
8	GOST 12204-72	Leg7034-0594GO ST 12204-72	40	14
	<b>Report template</b> <a href="#">Section properties</a>  			
9	=Object.ObjectD	=Object.Name	=Object.L	=Object.D

<p>C, B</p> <p>Rows, which have identical values in B and identical values in C columns, are merged. The order of specifying columns is unimportant.</p>	<p>A C, D</p> <p>Rows, which have identical values in A are merged, then cells in C and D are merged. The order of specifying columns is unimportant.</p>	<p>C, D A</p> <p>Rows, which have identical values in C, are merged, then cells in D and A are merged. The order of specifying columns is unimportant.</p>
--	---	--





3. If you want to sort, click on the link and sorting, and select the type of sort.
4. Click *OK* to view the results in the table editor. Table rows that contain the same values ??in column C, will be grouped.

Section properties

Description	Name	Length	Diameter
Data			
<u>Section properties</u>			
GOST 12205-72	Leg7034-0185GO ST 12205-72	40	20
GOST 12204-72	Leg7034-0594GO ST 12204-72	40	14

## Interface Expression Editor

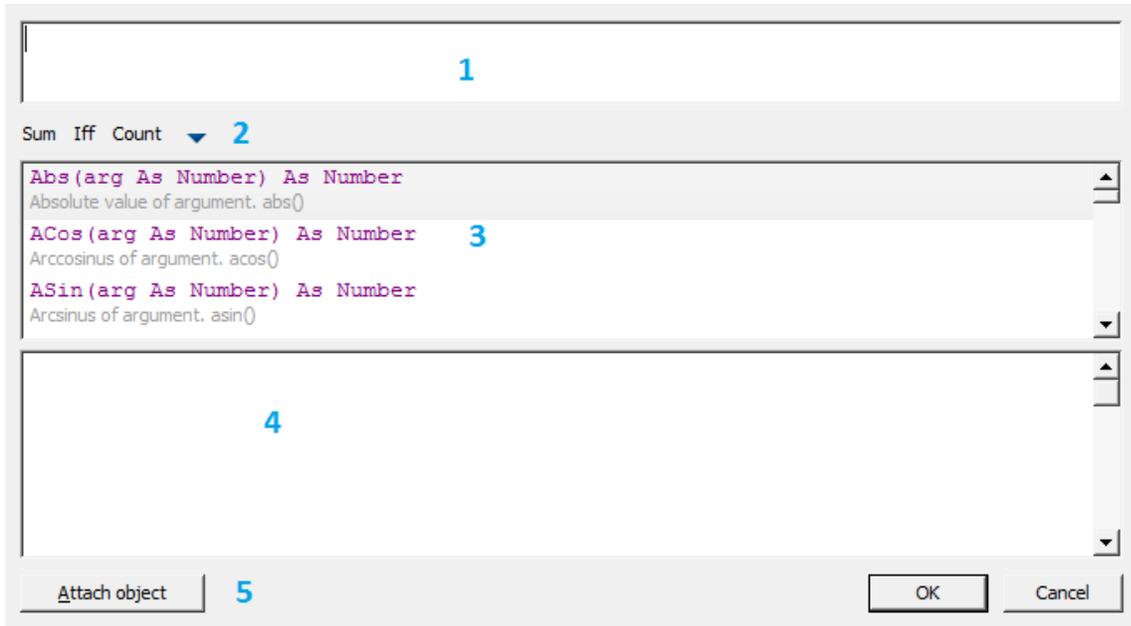
The Formula Editor (Expression Builder) allows you to set parameters, arithmetic expressions, and object property references for a selected table cell.

The formula editor is invoked:

- By clicking on the "fx" button in the formula bar;
- By pressing Shift + F2;
- Right-click upward;
- From the context menu command "Expression ..".

## Dialog

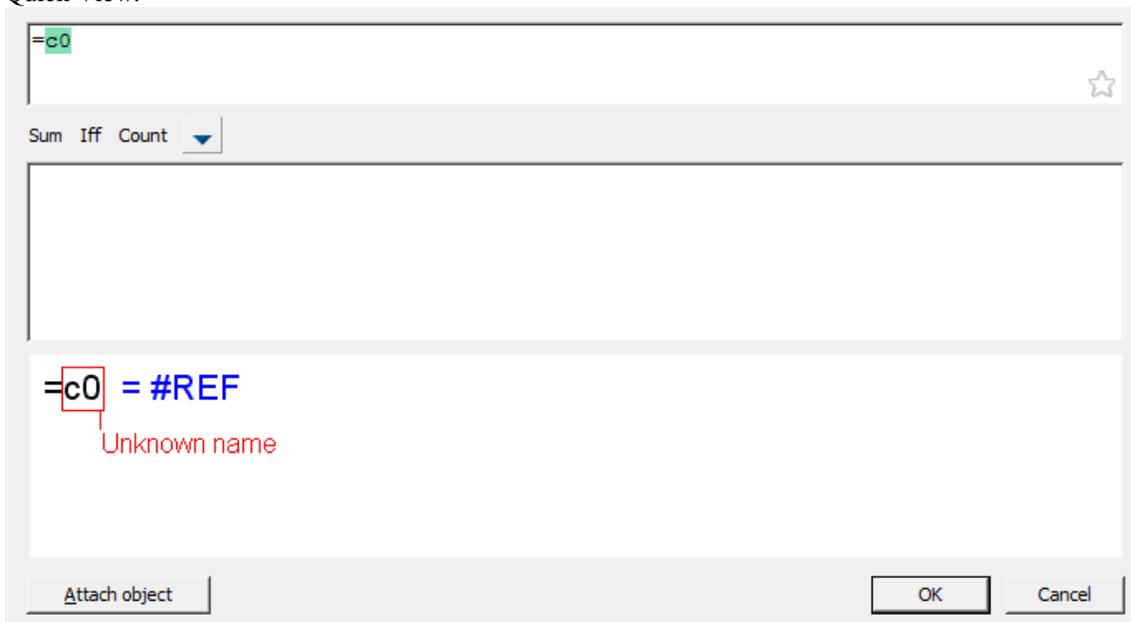
The dialog box consists of the "Expression Input Field", "Formula Templates", "List of Registered Functions", "Quick View Fields" and the "Attach object" button.



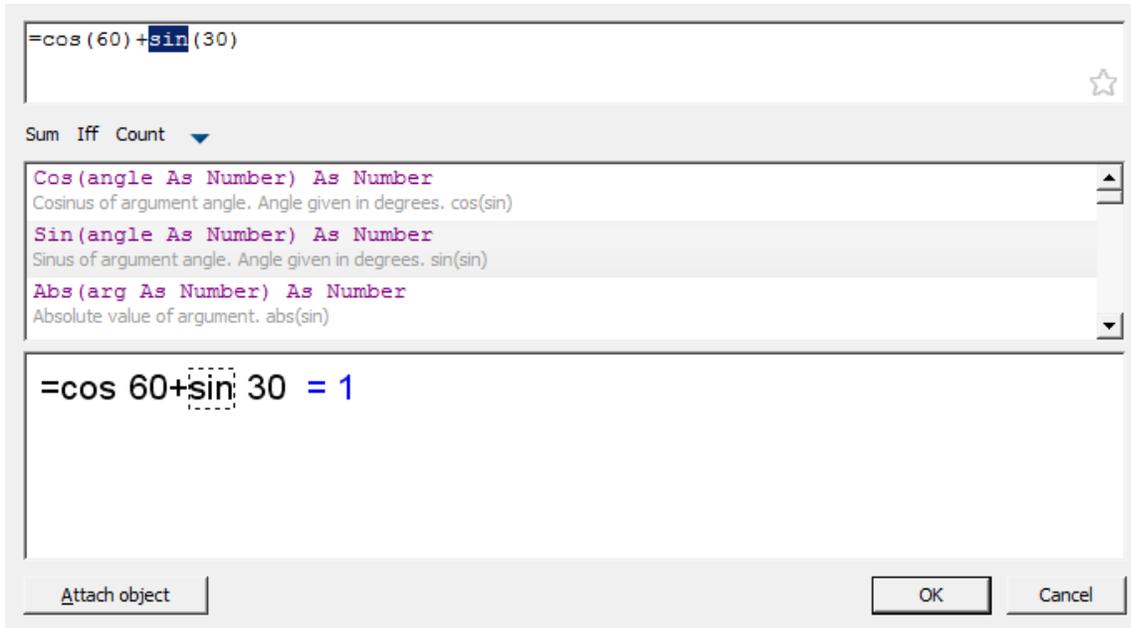
The "Attach Object" button allows you to [attach to objects](#).

At the top of the dialog there is an expression input field, with which you can manually enter any arithmetic expressions, as well as use reserved variables and object properties.

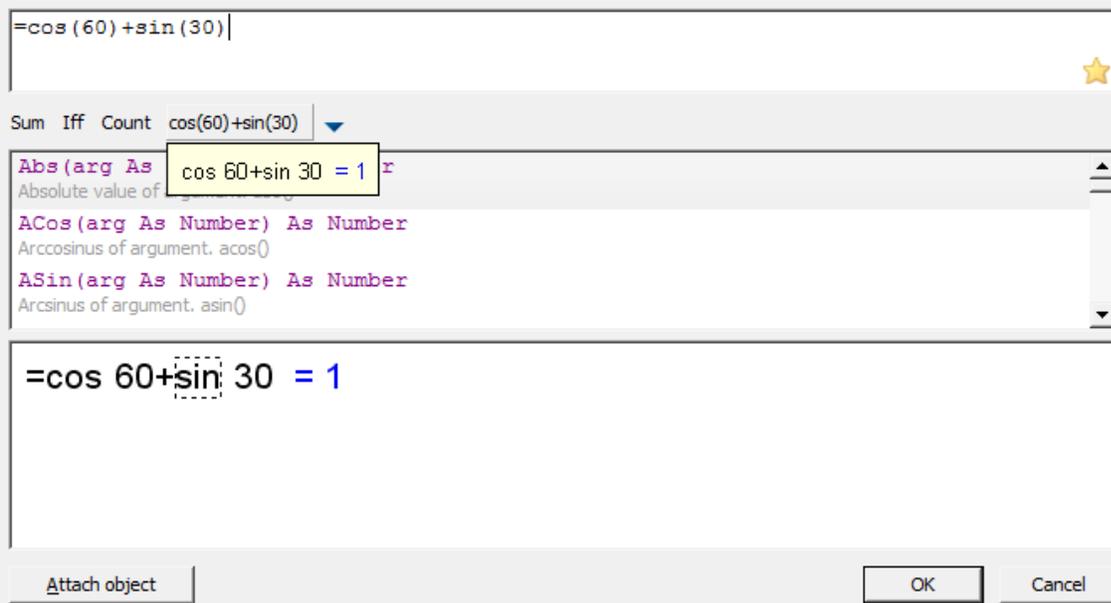
When entering manually, a list of functions and variables containing the word being entered appears in the list of reserved functions; syntax is also checked. If the formula is incorrect, an error warning or hint will appear in the Quick View.



In the quick view field, by clicking the mouse on an expression, the text in the input field related to this expression is selected.

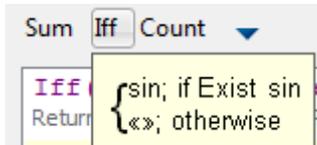


When you click on the  button in the "Expression input field", the entered expression is saved on the formula templates panel for quick recall. Pressing the button again removes the expression from the formula template.



The "Reserved Functions List" contains recently used expressions that are highlighted in yellow. When you click on the  button, expressions are saved in the Formula Templates panel for quick recall. Expressions that are in the Formula Template Bar in the Reserved Functions list will be marked with an asterisk. Pressing the  button again removes the expression from the formula template.

When you hover the cursor over the button of the saved template, a tooltip will appear with the contents of this template.



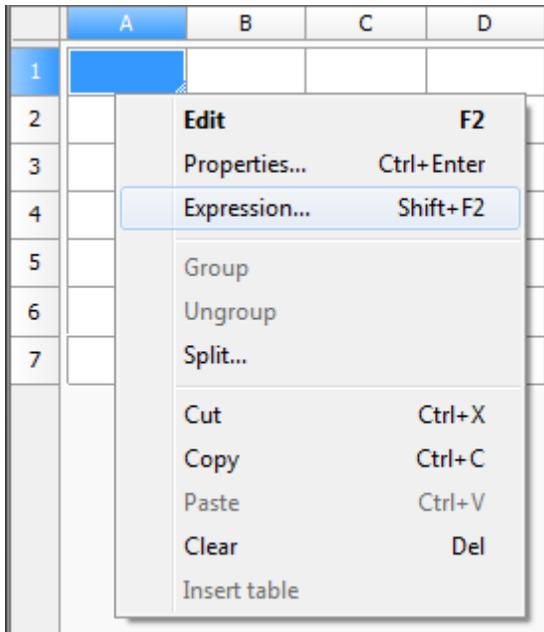
In order to insert an expression from the "Formula template", place the cursor in the required position, press the button with the template.

To delete an expression template, click the triangle button and uncheck the required template in the list that appears.

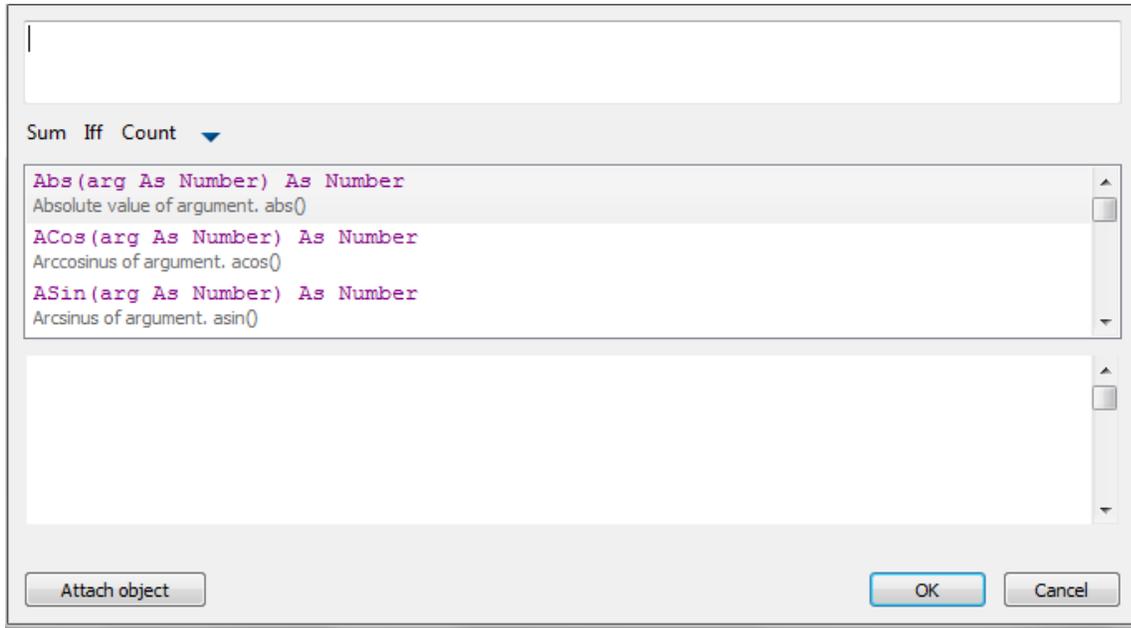
### **Binding to a table cell**

In the formula, you can use any cell values of the properties of another object. If using automatic recalculation of the table, the formula object is automatically recalculated. Each cell can attach one or more objects. Objects are named Object1, Object2, and Object3, ... sequentially numbered in the table. If the object is not used in a formula, it will detach from the table at the next calculation, and the object references are renumbered.

Binding properties for drawing objects to a single cell then use the *expression* or the keys *Shift+F2*. Available in the context menu of the selected cell.

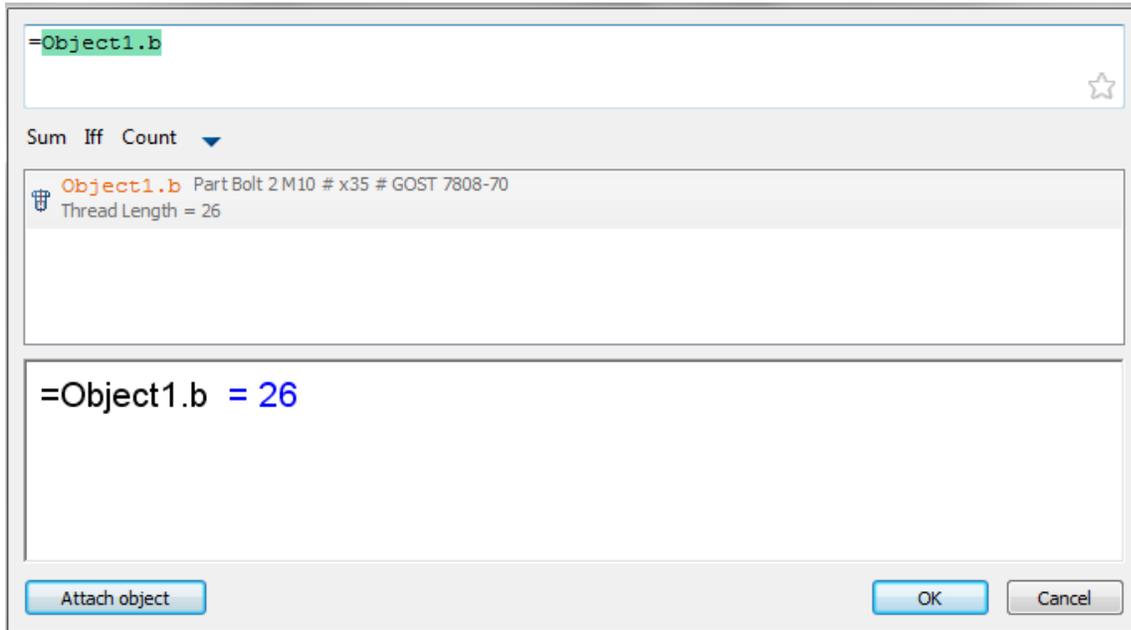


After selecting the command window opens *the Expression Builder*.



Click *Attach it*.

Select the object whose data you want to send to the table (eg, Bolt M52). Now the list of expressions appears in the properties of the selected object. Double-clicking on the property (select Object.Name), adds it to the text in a cell. Click *OK*.



After connection of the facility to the cell the cell color changes (it says that the formula in the cell) and it will display the calculated result, in this case the name of the object:

	A	B
1	=Object1.ClassName	
2		

**Functions in the Formula Editor**

Mathematical operations:

+	Addition
-	Subtraction
*	Multiplication
/	Division
^	Involution
sqrt()	Rootsquaring

Logical comparison and selection:

==	equally
>	more
<	less
!	not
	or
!=	not equal
>=	not less
<=	no more
	or
&&	and

**Functions:***math:***Cos, Sin, Tg** - trigonometric functions, the argument given in degrees.**Acos, Asin, Atg** - inverse trigonometric functions, the result is given in degrees.**Abs** - absolute value of (module).**Int** - rounding to whole number.**Summ** - returns the sum of the values of the variables in a grouped cells.*When you type a function should pay attention to the opening and closing brackets.***For example:***Summ(Row)* - returns the sum of the numbers of grouped rows..*Summ(Standartnaya\_detal.L)* - returns the sum of the values ??of the L parameter object "standard part" in the grouped rows.*data conversion:***Str** - Data conversion to a string type.**Num** - conversion of data into a numeric type.**Frm** - convert a numeric value to a string formatted according to the [settings of a table column](#).**For example:**

Frm(0.001230) returns a string 0,0012, if the column containing the cell is set to zero suppression and accuracy of 0,0000

*selection and comparison:*

**FmtText** - Addition formatted strings.

**FmtSub** - the creation of a subscript.

**FmtSuper** - create superscript.

**FmtDigit** - transfer number in hard copy.

**FmtRaw** - text without formatting.

**DmtDiv** - creation of fractions.

**If/Iff** - The logical choice. Recording Format:

if (Logich\_Uslovie; Esli\_Istina; Esli\_Lozh)

where:

*Logich\_Uslovie* - logical condition using logical comparisons (see above);

*Esli\_istina* - the return value when the logical condition;

*Esli\_Lozh* - return value at default logical condition.

**For example:**

*if(object == Marker\_universalny; Marker\_universalny.position; "Undefined")* . If an object type, which is connected with the cell column has Marker\_universalny value, the function returns the position value of the referenced object. Another type of object it returns a string *Undefined* .

**Exist** - Checks whether there is a constant: =IF(EXIST(Object.Name);Object.Name;0)

**Min/Max** - returns the minimum / maximum value listed in parentheses

**For example:**

*Min(maskimalnoe\_znachenie; MinValue)* - nourishes *MinValue*;

*Max(maskimalnoe\_znachenie; MinValue)* - returns *maskimalnoe\_znachenie*.

**Count** - returns the number of objects (for grouped rows in the table).

**For example:**

*Count()* - returns the number of objects associated with cells grouped rows.

**Avg** - Calculates the arithmetic mean of the arguments. Takes an arbitrary number of arguments understand ranges. Empty arguments are ignored.

**Off** - returns the value of the cell, given the relative index. The index is written in the format:

*Off(string; column)*

**For example:**

*Off(-1;2)* - returns the value of cell in the table on one line above (-1) and two columns to the right (2) of the current

**Cell** - the cell returns the value specified absolute index.

**Merge (Cells,Expression)** - brings together a range of Cells, if Expression is not equal to 0. Returns the value of Expression.

**For example:**

*=merge(A5:C5; "Title")* – integrates cell A5 to C5, in the summary displays the text "Title".

**SetHeight()** – reference line height. In brackets the height value.

**Val()** - computes the value of the argument.

**For example:**

*=val("A"+"1")* - calculates the "A1", and then uses it as another expression (obtained by the value in cell A1). If the argument - not a string, then he comes back, ie *=val(10+2)* - the same thing *=10+2*.

*=val("summ(A"+Str(off(0;-1))+":D"+Str(off(0;-1))+")")* - the amount of cells from rows A to D, the number which is introduced into the cell to the left of the current one. In most cases you can do without val. The classic example, when without it - no way: in a custom form, enter the cell address, then to take the value out of it. Create a variable Addr, associate it with an input field on a form and in the table do so: *= val (Addr)* function allows recursion: *= val (val ("A" + "1"))* - to take the value of the cell whose address is recorded in cell A1. Nesting depth is limited to 64.

**Geometry(Object)** - works as **Implement object**. Height embedded object shrinks to the line height. Object is taken from the report, or attached to the cell.

**SUMM(Section(-1))** - Sum of cells in the current column of the section next to the current.

**COUNT(Section(A3))** - The number of rows in the section containing the cell A3.

**Reserved variables:**

*Pi* - pi.

*Row* - for each cell in the column it returns the number of rows (rows are numbered starting with 1, excluding the header lines).

*Col* - for all cells in a column returns the column number of the table (column "A" is number 1).

*Object* - returns the type of the object, which is associated with the cell line.

*Object1, Object2, ...* - objects attached to the cell.

*Title* - the name of the table.

*RowCount* - total number of rows.

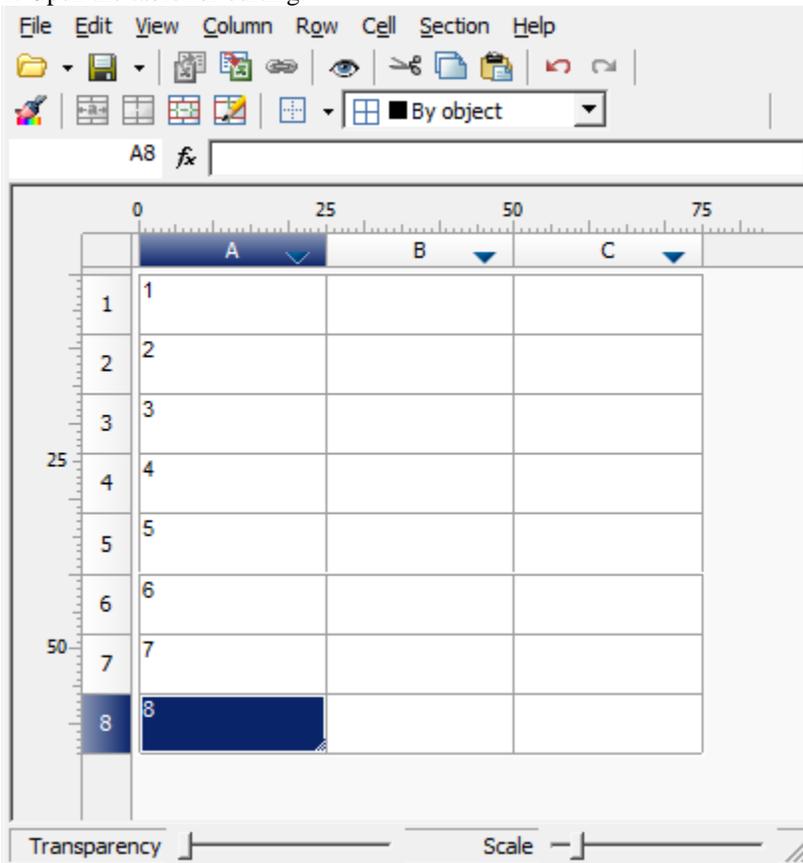
*ColCount* - the total number of columns.

## Split the table by pages

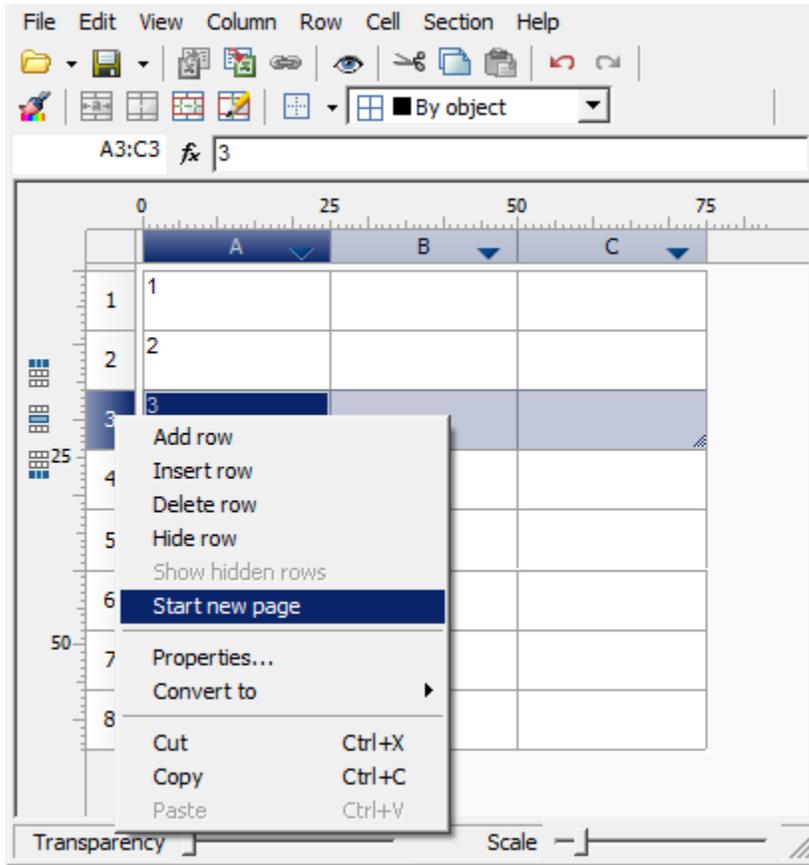
The "*Split the table by pages*" tool is similar to the  "[Division by page](#)" editor tool, but the result is not a split single table, but several separate tables.

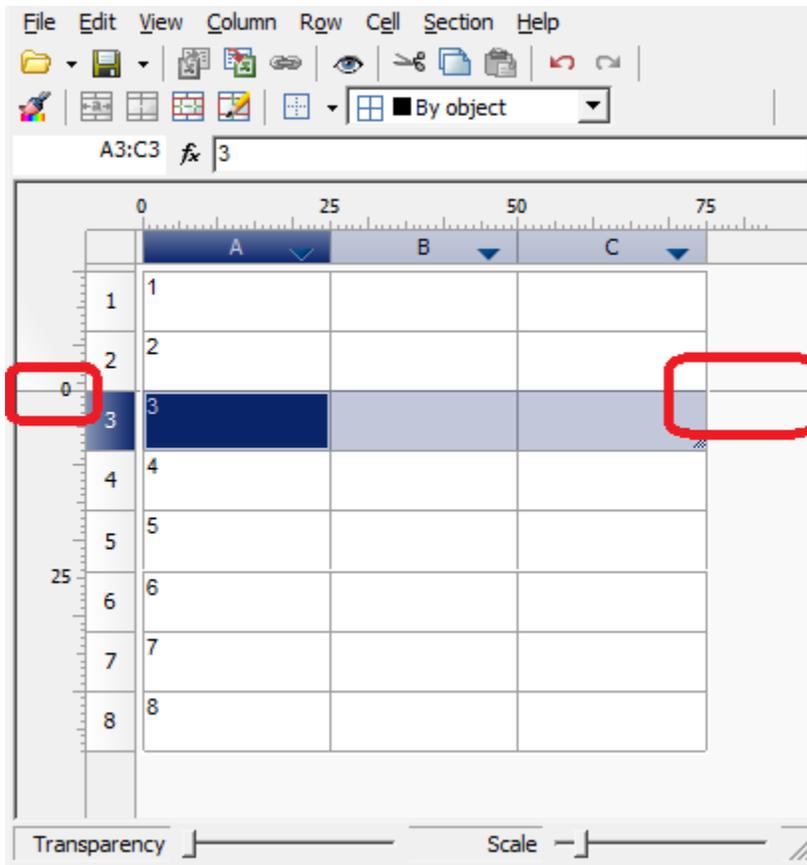
## Procedure

1. Open the table for editing.

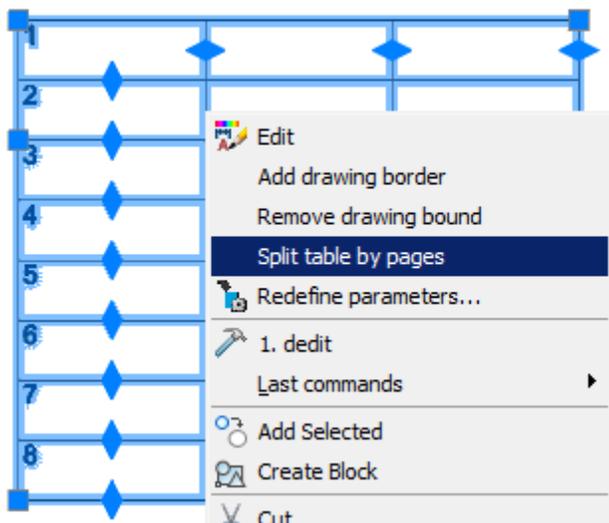


2. In the places where the break will be, set the break with the command "*Start new page*".

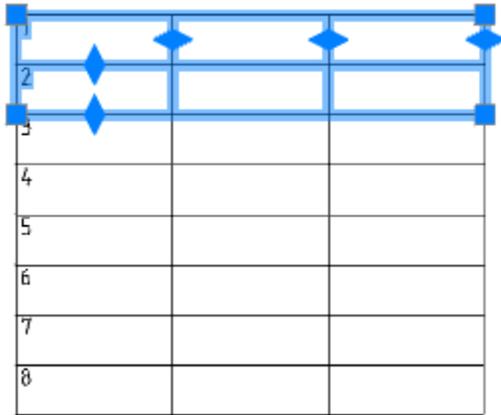




3. Close the editor.
4. Select a table.
5. From the context menu, select the *"Split table by pages"* command.



6. The table will be split into separate tables. The separation will occur at the places of the established breaks.



1		
2		

3		
4		
5		
6		
7		
8		

*Note:* If the command is applied to a report, the following destructive actions are performed:

1. The report is converted into static tables.
2. All connections with objects are broken.
3. All formulas are removed, and the cells begin to display the previously formed text.
4. Rows with report titles are hidden so that the display of the table in the drawing is not changed.

## Drawing borders

### Working with standard formats

 **Main menu:** Construction - Tables and title block -  Drawing title/borders.

 **Toolbar:**  Drawing title/borders ( "Tables and title block").

 **Command line:** SPFORMAT, FORMAT.

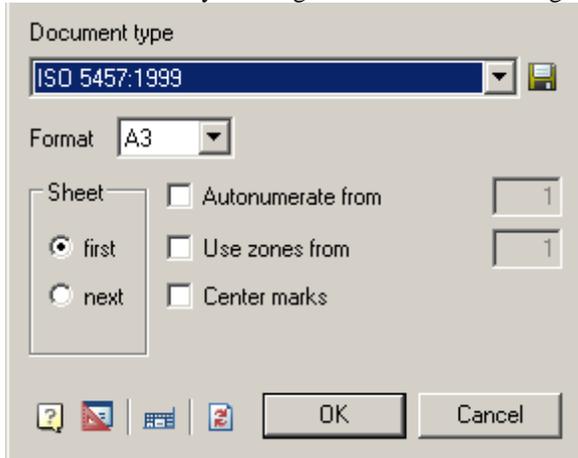
- [Filling in the fields of the title block](#)
- [Drawing title/borders recognition](#)

## Fundamental rules

Each format type is an element of the database Construction 21, which is located in the folder "Drawing border templates" library Construction 21.

emplates major labels and additional fields are located in the subfolder formats "Title block templates". Renaming or deleting existing items in the folder "Drawing border templates" would make it impossible to insert existing formats.

Insert the format by clicking on the icon  Drawing title/borders. This dialog box appears *Format*:



This window is defined by:

- Format.
- Sheet.
- Autonumerate from.
- Use zones from.
- Center marks.

After selecting the type of document, as well as the size and orientation of the sheet is inserted into the selected format.

- To edit the frame size, double-click the left mouse button on the contour of the frame.
- To edit the text in the title block, double-click on the text of the left mouse button.
- To edit entries in the title block, double-click the left mouse button on any line of the title block.

If you remove the first sheet of the scope of its information from the title block is automatically transferred to the second sheet.

To save the settings template attached stamps and their parameters in the database, click on the button , then enter the path stored in the database and the template name.

## General Principles

To change the line frames the template files, edit the frames and other fields.

"Document Type" - Select the document type from the list format template in section database. Depending on the document type is changed appearance and availability of individual dialog items "Format".

"Format" - the choice of the size of the sheet on the basis of standard size and multiplicity (not available for the types of documents based on the standard ISO, because the multiplicity inherent in the choice of format).

"Leaf" - the choice of template title block for the first or subsequent sheets.

"Orientation" - select page orientation (vertical or horizontal).

"Autonumerate from" - Automatic Numbering sheets. It lets you specify the number of the first sheet.

"Use zones from" - avtoprostanovka zones. It lets you specify the number of the first zone.



After you select the document type and size under the proposed set the insertion point of the frame. If you press Enter or right mouse button, the lower left corner of the frame is aligned with the coordinate 0,0.

 *Set default stamps* - restores the template format those stamps which were overwritten while maintaining format template database.

## Filling in the fields of the title block

FILE NAME	FSCM NO	SHEET	SCALE
SIZE			1:1
DRAWN			
CHECK			
APPR			
ASSUEC			
REV		DWG NO	
CONTR/			






To fill the title block fields and additional graph, double-click on any line of the title block.

The main inscription is filled directly into the dialog box, "Stamp"

While filling in the title block previously entered information stored in the section "History" menu. To open the context menu, place the cursor in an editable field and click the right mouse button.

Recent values can be saved in the section "Recent" menu.

## Automatically fill fields of the title block

 *Save as default*

The command saves the current filling of the stamp in the memory. In the following fields will be filled automatically stamp

 *Load defaults*

The command loads the stored filling.

 *Clear*

The team clears stamp field

 *Change template*

The command opens a drop-down menu to change the pattern of the stamp.

## Drawing title/borders recognition

 **Main menu:** Construction - Tables and title blocks -  Drawing title/borders recognition.

 **Toolbar:**  Drawing title/borders recognition ( "Recognition").

 **Command line:** SPREFC.

Master recognition format enables automatic search and replace formats created from individual primitives nanoCAD, transforming them into an object of the "Format" Construction 21. Initial primitives are in the drawing. Recognition takes place in two phases: the first searches for the formats in their dimensions, the second selected title block. Selection is made by comparing the serial patterns of stamps from the library with the existing geometric

objects in the drawing. The remaining seals are installed by default. After the successful recognition format graphs stamps are automatically filled with values from the drawing, and the format is placed on the current layer.

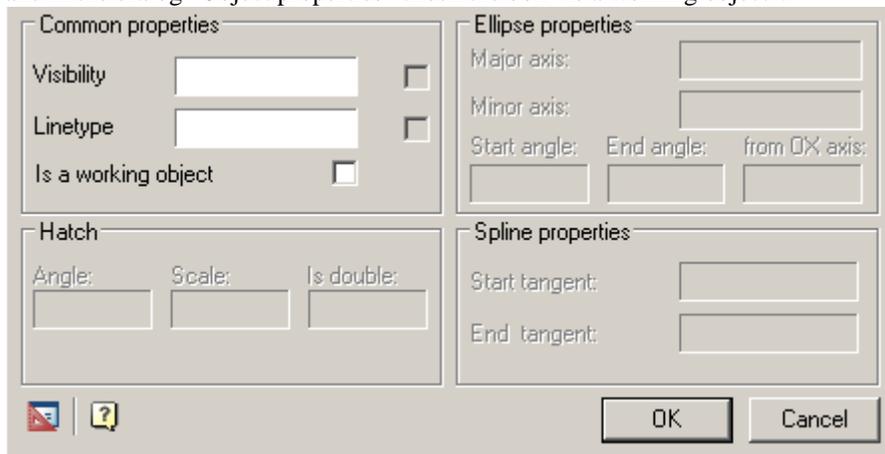
## Creating custom formats and stamps

Before you create a custom size or stamp is necessary to draw a pattern nanoCAD means in accordance with the required desired view object being created. When drawing templates should adhere to the following rules:

- The template can contain lines, arcs, and circles, text (single-line and multi-line), the objects of the library of standard parts Construction 21, blocks nanoCAD;
- the thickness of the lines that are assigned to the template thickness is not equal to zero, and not "layer" to be adopted in accordance with the thickness of the closest standard value;
- the color lines and text included in the template will be saved according to the selected values;
- multiline text (mtext) is inscribed in the boundaries of the rectangular area of text is selected when you create it.

You can use overhead lines and graphic objects, which are not drawn when inserting format or stamp in the drawing.

To install a drawing object as a service, use the button  "Set parameter" toolbar MechWizard, select the object, and in the dialog "Object properties" check the box "Is a working object":



The dialog box "Object properties" is divided into four main sections:

- Common properties:** Includes fields for "Visibility" and "Linetype", each with a corresponding checkbox. There is also a checkbox for "Is a working object".
- Ellipse properties:** Includes fields for "Major axis", "Minor axis", "Start angle", "End angle", and "from OX axis".
- Hatch:** Includes fields for "Angle", "Scale", and "Is double".
- Spline properties:** Includes fields for "Start tangent" and "End tangent".

At the bottom of the dialog, there are icons for a toolbar and a help icon, along with "OK" and "Cancel" buttons.

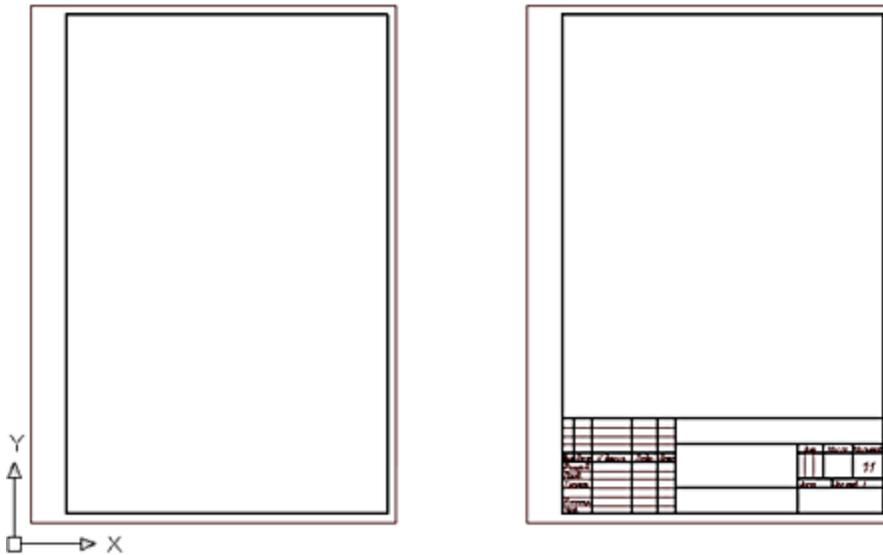
- [Use the links in the templates](#)
- [New border wizard](#)
- [New title wizard](#)

## Use the links in the templates

### Stamps in the format template

Custom format may contain links to templates stamps available in the library. To add a stamp in the format used by [the relevant rules](#).

Stamp Position and orientation when you insert a drawing format will be determined by the insertion point and orientation of text links:



the figure shows the format template added referring to stamp basic inscription. When you insert a drawing format drawn stamp recorded in the library under the specified name.  
the format can be added to any number of references to the stamps from the library.

### Using text fields

In the pattern of the stamp may be used special signage text fields.

Text added to the template and starting with the single character "\$", is recognized as a reference pointer on the field (the Count) input. In the input field of the dialog box, you can edit the stamp to record the text (for example, the name of the developer or check). Name field can contain characters of the Latin alphabet and the national or spaces. Dimensions of the input fields are defined primitives surrounding the insertion point, the reference index. If you found another symbol "\$", the text after it considered the description field:

\$Field\_name [\$field definitions].

the contents of the text box will be displayed in the list of object properties.

To limit the size of the input field or eliminate overlapping fields in the dialog, you can use the service line.

To create a stamp based on an existing base in the sample, the sample to be inserted into the drawing by setting in the dialog box "Stamp" mode "Display field names" . After insertion into the drawing die can be used as the layout of the new stamp.

Standard fields stamps have a description in Russian (GOST), English (ISO) or German (DIN) language, the values of the fields available in the list of object properties.

Name	Description	Contact with the properties of the document Inventor	Note:
\$Designation	Description	+	
\$DrawingName	Name	+	
\$Drawing type	Drawing View		
\$Material	Material	+	
\$Litera 1	Letter 1		
\$Litera 2	Letter 2		

<b>Name</b>	<b>Description</b>	<b>Contact with the properties of the document Inventor</b>	<b>Note:</b>
\$Litera 3	Letter 3		
\$Mass	Weight		
\$DimScale	Scale	+	Sets the size of generated within the format
\$Sheet	Sheet	+	Changes in the automatic numbering
\$SheetCount	Sheets	+	Changes in the automatic numbering
\$Add.text	Position the additional inspection		
\$Author	Developed	+	
\$Control	checked	+	
\$TechControl	Technical control	+	
\$Add.subject	Last additionally checked	+	
\$NormControl	the Regulatory Control	+	
\$Approve	Approved	+	
\$Author (sign)	Developer Signature		
\$Control (sign)	the signature checking		
\$TechControl (sign)	Signature of the technical control		
\$Add.subject (sign)	Signature additional inspection		
\$NormControl (sign)	Text regulatory control		
\$Approve (sign)	the signature approving		
\$Author (date)	the date of	+	
\$Control (date)	Date of Inspection	+	
\$TechControl (date)	Date engineering controls	+	
\$Add.subject (date)	Date further verification	+	
\$NormControl (date)	Date of regulatory control	+	
\$Approve (date)	Approval Date	+	

Name	Description	Contact with the properties of the document Inventor	Note:
\$Original #	Part Number script		
\$Sign & date 1	Signed and dated 1		
\$Instead #	Instead, inventory number		
\$Duplicate #	Inventory number duplicate		
\$Sign \$date 2	Signed and dated 2		
\$Reference #	the reference number	+	
\$First use	the primary use	+	
\$Format	Format	+	
\$Enterprise	Enterprise	+	

In the pattern of the stamp can be used table Construction 21. Included in the stamp table when you insert a drawing can be edited as regular tables Construction 21 (except that the die table can not be modified in the editing mode screen).

### Additional features

*Converting from previous versions* - In file defined fields for name mapping formats of old and new versions. If an entity applies the custom stamps of previous versions, the names of the fields, you can add them into the appropriate section of this file.

### Integration with other objects Construction 21

*Tables* - Format allows you to use tables as stamps. This preserves virtually all the functionality built-in table.

*Universal marker* - The values of any fields format can be used in a universal marker.

*Dimensions* - When you create within the format size, the size takes out set in the title block of the format.

*Legend roughness* - The format may be associated with the designation of a roughness surfaces unspecified. Icon roughness is automatically transferred to the upper right corner of the format.

*Property document* - The value of the standard field format is synchronized with the attributes of the file in which it was created.

*Technical conditions* - Format calculates the coordinates of the columns to accommodate the technical requirements.

*Attribute documents TechnologiCS* - Exchange values between the fields and the format of the document attributes. You can set the matching fields automatically (by the same name), and then specify manually. Establishing appropriate stored for later use.

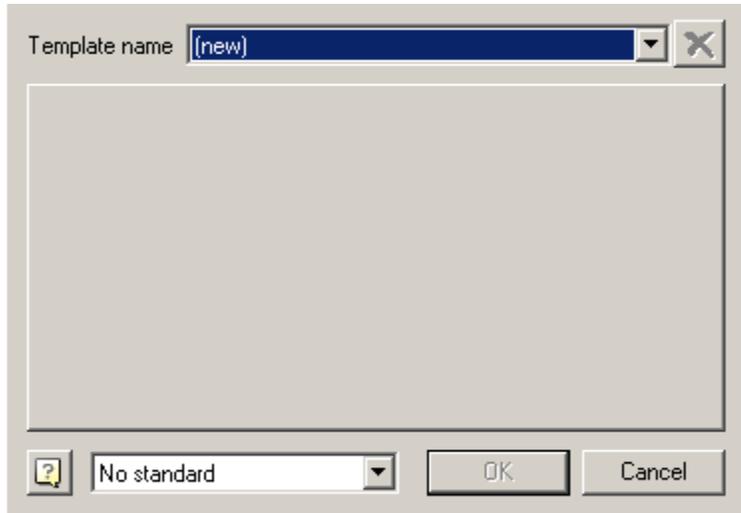
*Zone format* - The format can be calculated, is there any point in it. If so, you can receive the designation area containing the point.

### New border wizard

 **Main menu:** Construction - Tables and title block -  New border wizard.

 **Toolbar:**  New border wizard ( " Tables and title block").

 **Command line:** SPFORMATWIZ.



To change the existing format, select it from the drop-down list of templates. The field, located in the center of the panel will be a general view of the selected format.

To add a new format, select the drop down list "Template name" paragraph (new).

Click the left mouse button on the center field, select the drawing created by pre-layout format template, and confirm the selection click OK.

In the dialog box "Format creation" will be recognized image format.

If you create a new format after closing the dialog box by pressing OK, a dialog "Create element", which follows the format and select the name of the folder in the library of standard parts, which will save the created format:



By default the path "DB \ Drawing borders template". If you want to keep the format in another folder, press  and select the folder that appears in your browser.

Creating a template format is similar to creating templates stamps. Embedded tables are not supported. The texts, starting with the single "#" character, determine the type and position of the stamp format. When you insert the size of the database will be loaded stamped with the name specified in the text (the symbol '#' is ignored and the text "main message" will be replaced with the box on a stamp with the name of "Title Block"), if it is in base. If the name starts with "\$" and contains only hexadecimal digits, it is interpreted as UID template stamp in the database.

Coordinates, direction and alignment of the text will be applied to the stamp.

*Note:* See stamp UID by inserting the drawing title block of the database manager Construction 21. At the command prompt displays the hexadecimal object UID

Predefined templates are stored in the formats "DB \ Drawing borders template". It is recommended that the new template is stored in the same folder, but when loading the template can be seen the whole base.

Frame custom format has a fixed size - the one set in the template. There is a special recognition mode that allows the use of standard scalable framework with their stamps. To enable this mode, select from the list in the dialog master the standard by which the frame will be built. In this mode, all of the graphics in the template are ignored,

except for text and bounding box. The frame can be of any size - in the final format it replaced with standard frame. All texts are considered names stamps. There are two variants of binding stamps:

- If the text begins with the "#" symbol, it is stored offset from the insertion point to the nearest corner of the bounding box.
- If the symbol "#" no stored offset from the text insertion point to the bottom left corner of the bounding box.

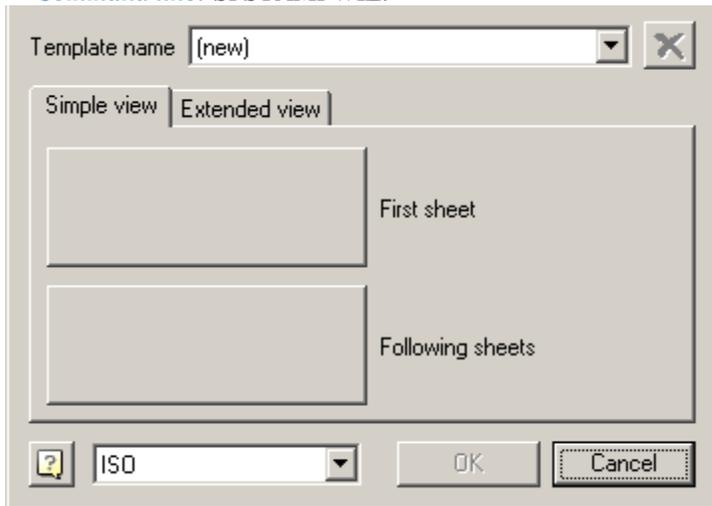
*Note:* Standard sizes have patterns in the database - their patterns are embedded in the program code.

## New title wizard

**Main menu:** Construction - Tables and title block -  New title wizard.

**Toolbar:**  New title wizard ( " Drawing Title/Borders").

**Command line:** SPSTAMPWIZ.



To change an existing stamp, select it from the drop-down list of templates.

To add a new format, select the drop down list "Template name (new)".

A template stamp can have up to four different graphical representations: simple and full (advanced) type, including the form of the first sheet and the view for subsequent sheets.

Select one of the tabs: "Simple view" or "Extended view". Click the left mouse button on one of the fields marked with a stamp type, and select the drawing template you created earlier mock punch. Confirm the selection click OK. In the dialog box "Create stamp" will be recognized image of the stamp.

If you create a new stamp, after closing the dialog box by pressing OK, a dialog "Create element", where you must enter the name of the stamp, and choose a library of standard parts folder in which to save the template created by the stamp:



New templates stamps recommend that you save to the folder "DB \ Drawing borders template \ Title block templates".

If the layout for the die table to use, it will retain its editing capabilities even being introduced to the format. For these tables are only supported editing in place.

The pattern die may be up to four types:

- the main type of the first sheet,
- the main type of follow-up sheets,
- an expanded view of the first sheet,
- an expanded view of the next sheet.

The texts, starting with the single character "\$" are recognized as [the names of the fields](#). The editing dialog stamp they will be displayed in the form input fields. Name field can contain spaces and extended characters. Dimensions of the field defined primitives surrounding the point of its insertion. If you found another symbol "\$", the text after it considered the description field. This text will be displayed in the list of properties:

`$(name_field)[$(description_field)]`

To limit the size of the field or eliminate overlapping fields in the dialog, you can use the service line. This is a primitive with zero thickness or line marked as the utility from mcWizParam. Set the parameter.

If you set daw "Work object", then stamped on tobrazhatsya these primitives will not.

To create a stamp based on an existing base in the sample, the sample to be inserted into the drawing, and in his

dialogue press  "Show Field Names". View selected stamp button "View".

After that, the object can be divided (explode), edited and used as the layout.

The dialogue is a choice of the standard, which is taken from a stamp. This standard is used for the selection of the frame [formats in recognition](#) of the primitives.

## Text

### Technical conditions



Main menu: *Construction - Text* -  *Technical conditions*.



Ribbon: *Construction - Symbols* -  *Technical conditions*.



Toolbar:  *Technical conditions (on toolbar "Text")*.



Command line: *SPTT*.

A distinctive feature of Construction 21 is the possibility of linking the designation of textual information on the drawing with the text in the technical requirements.

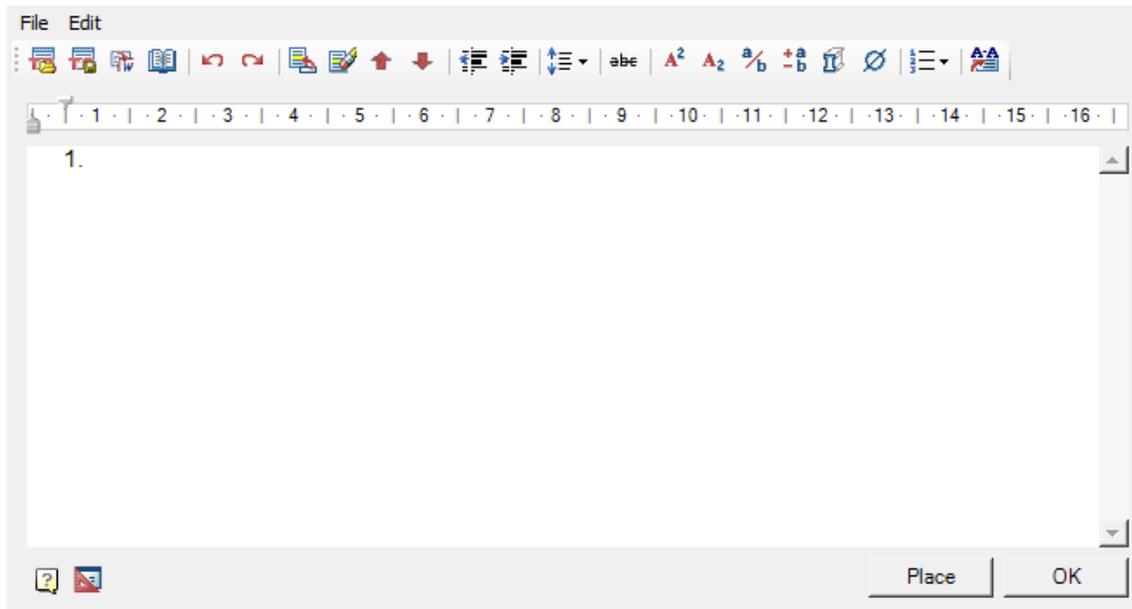
When writing paragraphs of technical requirements (hereinafter TC), you can make reference within the proposal of the paragraph of technical requirements to any position or affixed view.

The textual information is the tolerances and dimensions, drawing zones, designations of types, cuts, sections, marking signs, marking of welded joints, position.

A change in the value of the textual information (for example, a part position number) will result in an automatic change in the TC text. If this position has been deleted, a warning will appear about the need to check a particular item of requirements.

The relationship between the TC and the designation works in the opposite direction. Changing the order of the points of the requirements (their numbering) is automatically reflected in the designation on the drawing (for example, a marking mark, the designation of which contains the item number from the technical requirements).

## Editor



## Main menu

- File
  - *Clear* - clear TC.
  - *Open file* - the command opens the TC from a previously saved file.
  - *Save file* - command saves TC to \* .rtf file.
  - *Close without save* - the command closes the TC editing dialog box without saving.
- Edit
  - *Undo* - command cancels last action.
  - *Redo* - the command repeats the previously canceled action.
  - *Insert title* - command inserts a title in front of TC items.
  - *Delete title* - command removes TC title.

## Toolbar

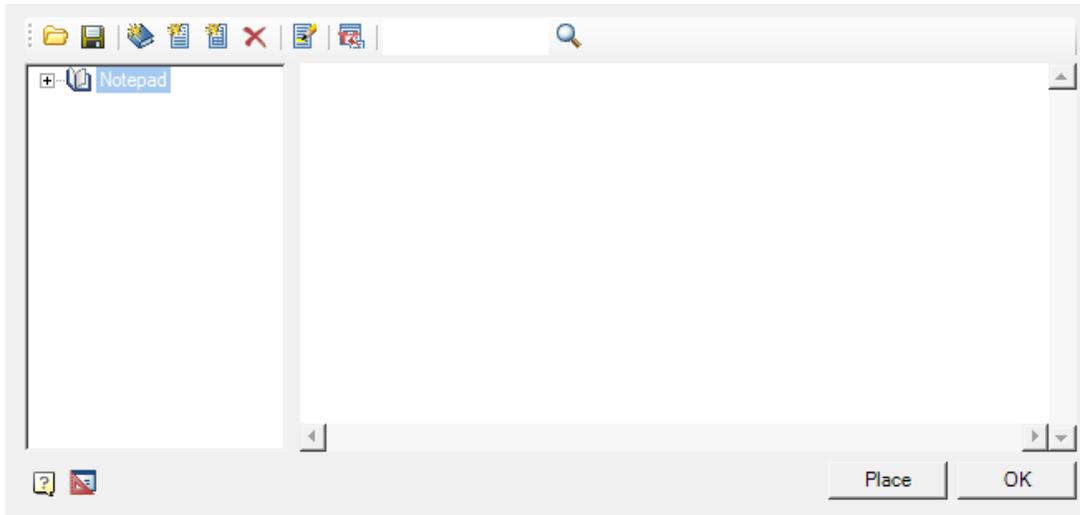
-  *Open file* - the command opens the TC from a previously saved file.
-  *Save file* - command saves TC to \* .rtf file.

**Important!** The special characters used in the editor are lost when they are transferred to an external file.

-  *Fill in MSWord* - the command opens a new document in MSWord and inserts the text TC.

**Important!** The special characters used in the editor are lost when they are transferred to an external file.

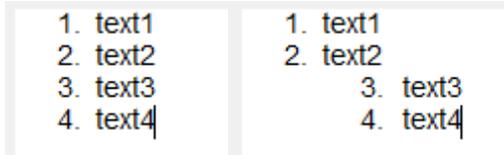
-  *Notebook* - command opens interface [notebook](#).



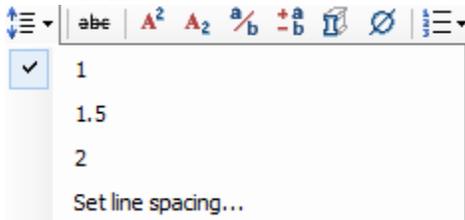
- *Undo* - command cancels last action.
- *Redo* - the command repeats the previously canceled action.
- *Add paragraph (CTRL+ENTER)* - command adds a new TC item.
- *Delete paragraph (CTRL+DEL)* - command deletes TC item.
- *Replace paragraph up* - the command moves the TC item at which the cursor is located, higher up in the list.
- *Replace paragraph down* - the command moves the TC item at which the cursor is located, down the list.
- *Decrease Indent* - the command reduces the indent of selected items.



- *Increase indent* - command increases the indent of selected items.



- *Line Spacing* - the command opens the list for setting the line spacing. Adjust line spacing of selected items.

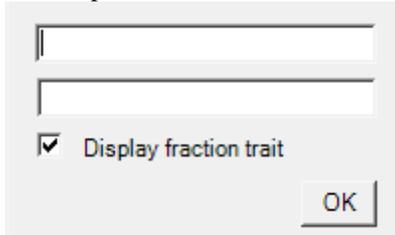


- *1* - set 1 leading (unit for measuring line spacing). Line spacing is added after the TC item.
- *1.5* - set 1.5 leading. Line spacing is added after the TC item.
- *2* - set 2 leading. Line spacing is added after the TC item.
- *Set line spacing...* - the command allows you to specify your own line spacing. Line spacing is added after the TC item.

- $A^2$  *Superscript* - translates the selected text into superscript.

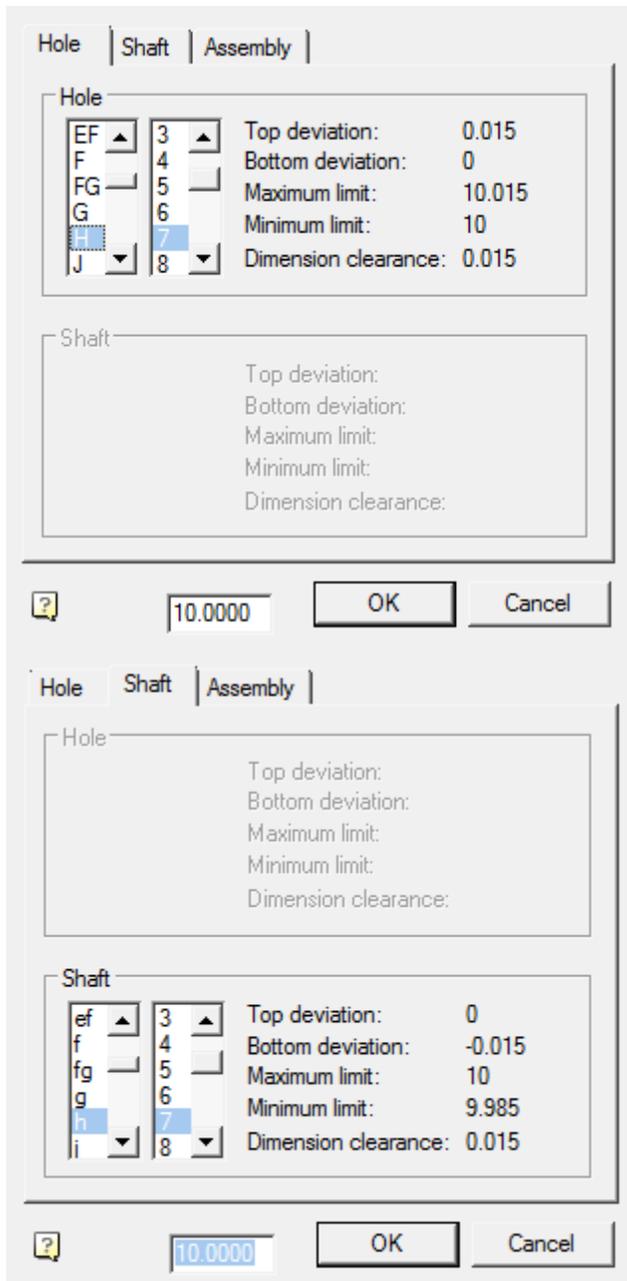
1. text<sup>1</sup><sub>22</sub>

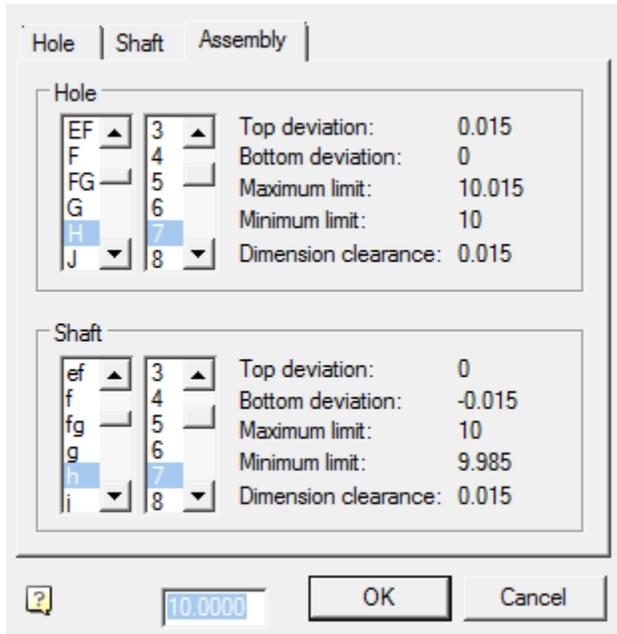
- $A_2$  *Subscript* - translates the selected portion of the text into a subscript.
- $\frac{a}{b}$  *Insert fraction* - the command calls the "Fraction" dialog box in which the numerator and denominator are specified. The fraction is inserted into the text TC.



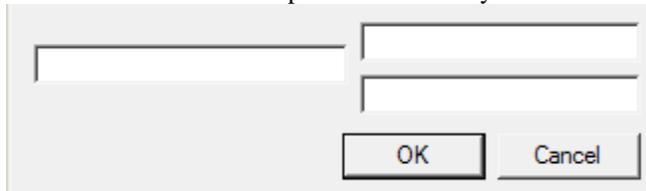
The image shows a dialog box for inserting a fraction. It contains two empty text input fields, one for the numerator and one for the denominator. Below these fields is a checked checkbox labeled "Display fraction trait". At the bottom right of the dialog box is an "OK" button.

- $+a$   
 $-b$  *Insert tolerance* - provides the ability to insert a tolerance. When called, the "Tolerances" dialog box opens.

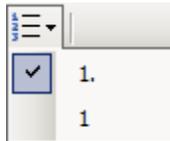




- *Insert material* - provides the ability to insert material. When called, opens the "Material" dialog.



- *Insert spec symbol* - [allows you to insert special characters in the text TC.](#)
- *Numeration* - the command allows you to select the design option for TC items.



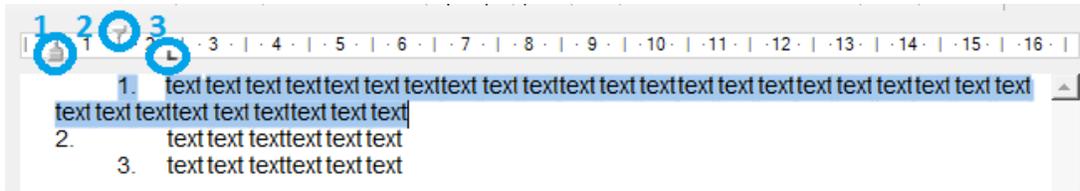
**Note:** To create a hierarchical list it is necessary to press the "Tab" key on an empty item. A new child level has been created. To return to the previous level, press the "Enter" key on an empty item.

- *Insert view/cuts* - the command associates text fragments in TC with a graphical representation of views, sections and sections in the drawing.

To insert a link in the TC editor, place the cursor on the insertion point of the associated symbol and click on the "Insert view / cuts" button, select the view, section or section.

Related information is displayed in blue in the TC editor. When you click on a link, the application will display the associated graphical representation.

- **Ruler.** The ruler is used to position the lines relative to the entire TC document. Sliders are used to position the lines.



1. The bottom slider adjusts the indentation of all paragraph lines except the first line.
2. The top slider adjusts the indent of the first paragraph line.
3. The angle slider adjusts the text indent from the numbered list marker.

## Context menu

[The context menu uses standard commands for text fields.](#)

## Setting text options

To set the TC text parameters (font height and slope, indent from the title block, etc.) open the dialog box *"Settings"*.

## Technical parameters



Main menu: *Construction - Text -  Technical parameters.*



Ribbon: *Construction - Symbols -  Technical parameters.*



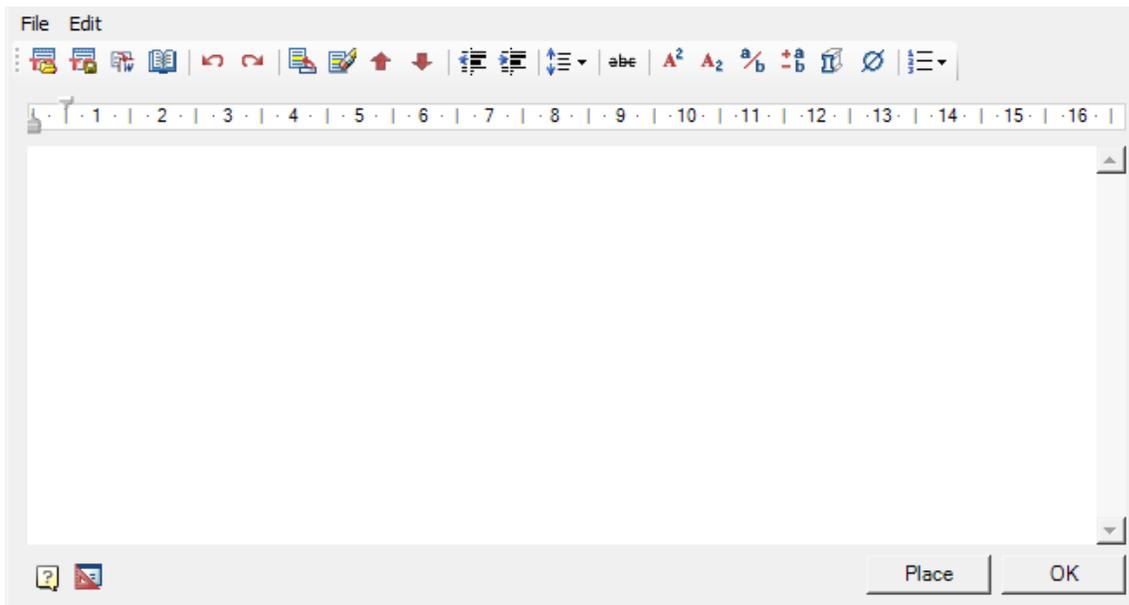
Toolbar:  *Technical parameters (on toolbar "Text").*



Command line: *SPTD.*

Working with the technical description editor is similar to working with the TC editor. The main difference is that the typed text can be placed anywhere in the drawing.

## Editor



## Main menu

- File
  - *Clear* - clear TP.
  - *Open file* - the command opens the TP from a previously saved file.
  - *Save file* - command saves TP to \* .rtf file.
  - *Close without save* - the command closes the TP editing dialog box without saving.
- Edit
  - *Undo* - command cancels last action.
  - *Redo* - the command repeats the previously canceled action.
  - *Insert title* - command inserts a title in front of TP items.
  - *Delete title* - command removes TP title.

## Toolbar

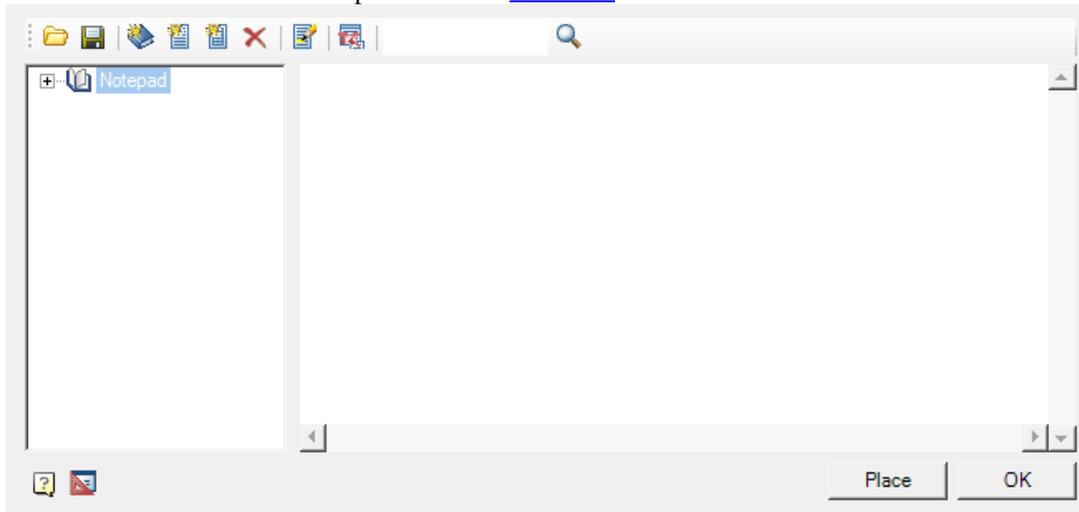
-  *Open file* - the command opens the TP from a previously saved file.
-  *Save file* - command saves TP to \* .rtf file.

**Important!** The special characters used in the editor are lost when they are transferred to an external file.

-  *Fill in MSWord* - the command opens a new document in MSWord and inserts the text TP.

**Important!** The special characters used in the editor are lost when they are transferred to an external file.

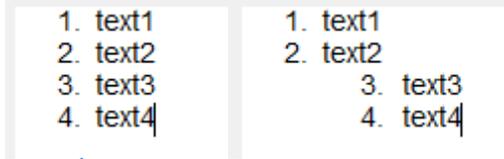
-  *Notebook* - command opens interface [notebook](#).



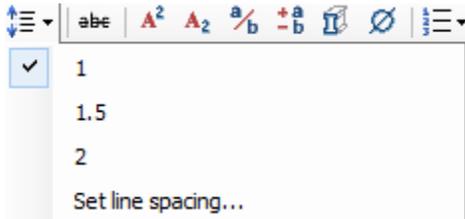
-  *Undo* - command cancels last action.
-  *Redo* - the command repeats the previously canceled action.
-  *Add paragraph (CTRL+ENTER)* - command adds a new TP item.
-  *Delete paragraph (CTRL+DEL)* - command deletes TP item.
-  *Replace paragraph up* - the command moves the TP item at which the cursor is located, higher up in the list.
-  *Replace paragraph down* - the command moves the TP item at which the cursor is located, down the list.
-  *Decrease Indent* - the command reduces the indent of selected items.



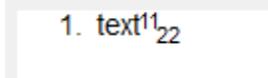
-  *Increase indent* - command increases the indent of selected items.



-  *Line Spacing* - the command opens the list for setting the line spacing. Adjust line spacing of selected items.



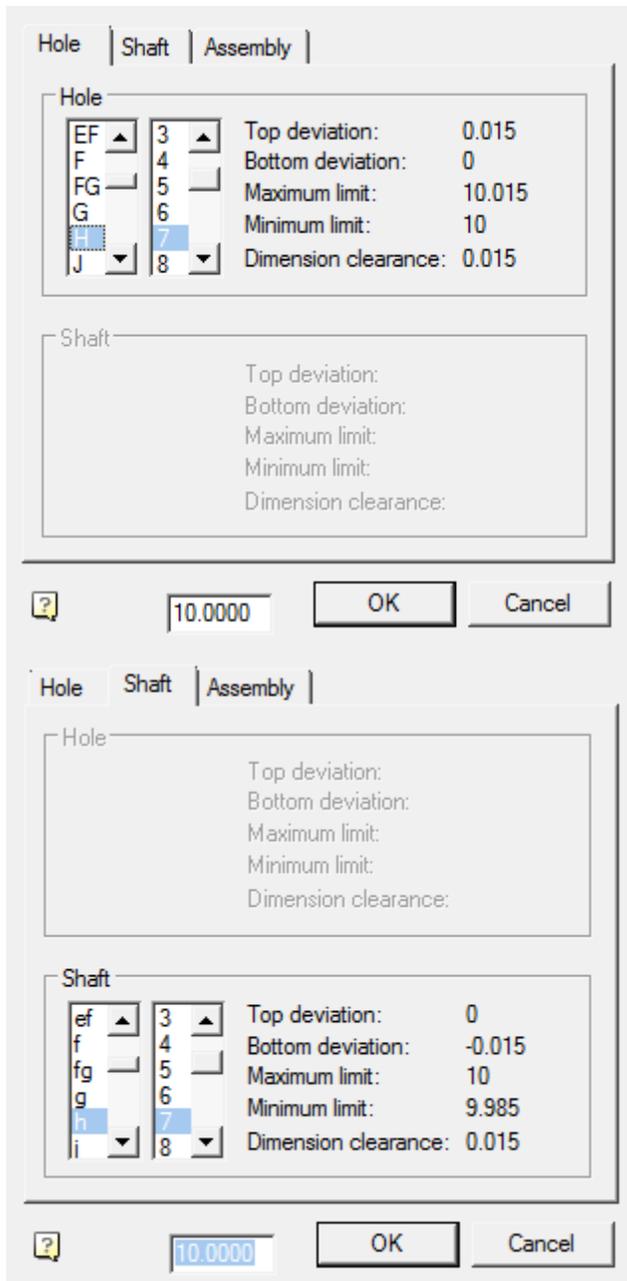
- *1* - set 1 leading (unit for measuring line spacing). Line spacing is added after the TP item.
- *1.5* - set 1.5 leading. Line spacing is added after the TP item.
- *2* - set 2 leading. Line spacing is added after the TP item.
- *Set line spacing...* - the command allows you to specify your own line spacing. Line spacing is added after the TP item.
-  *Superscript* - translates the selected text into superscript.

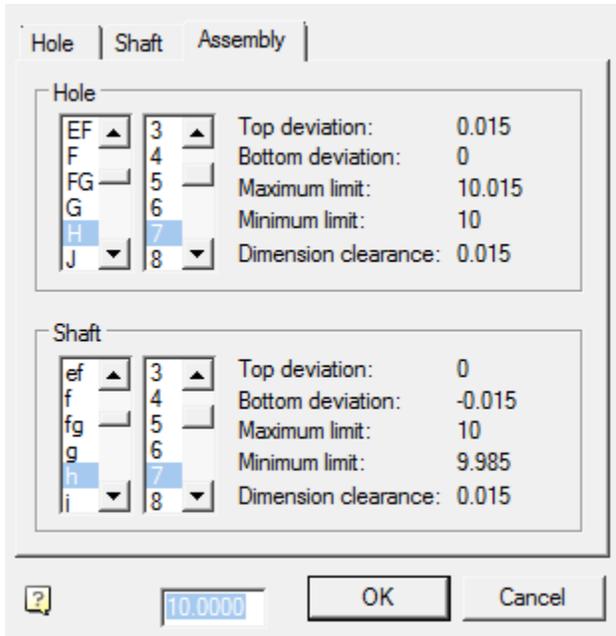


-  *Subscript* - translates the selected portion of the text into a subscript.
-  *Insert fraction* - the command calls the "Fraction" dialog box in which the numerator and denominator are specified. The fraction is inserted into the text TP.

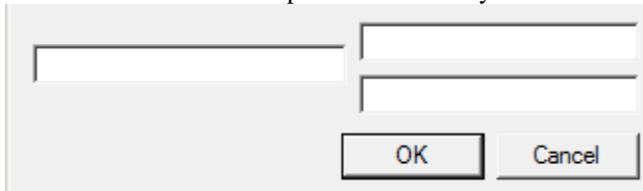


-  *Insert tolerance* - provides the ability to insert a tolerance. When called, the "Tolerances" dialog box opens.

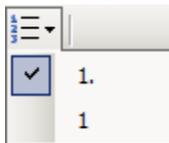




- *Insert material* - provides the ability to insert material. When called, opens the "Material" dialog.

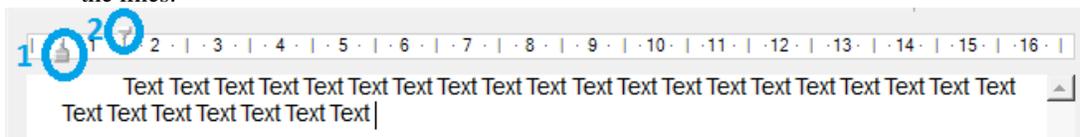


- *Insert spec symbol* - [allows you to insert special characters in the text TP.](#)
- *Numeration* - the command allows you to select the design option for TP items.



**Note:** To create a hierarchical list it is necessary to press the "Tab" key on an empty item. A new child level has been created. To return to the previous level, press the "Enter" key on an empty item.

- **Ruler.** The ruler is used to position the lines relative to the entire TP document. Sliders are used to position the lines.



1. The bottom slider adjusts the indentation of all lines of the paragraph except the first line.
2. The top slider adjusts the indentation of the first line of the paragraph.

## Context menu

[The context menu uses standard commands for text fields.](#)

## Setting text options

To set the TP text parameters (font height and slope, indent from the title block, eTP.) open the dialog box "Settings".

## Construction text



Main menu: *Construction - Text* - *Construction text*.



Ribbon: *Construction - Symbols* - *Construction text*.

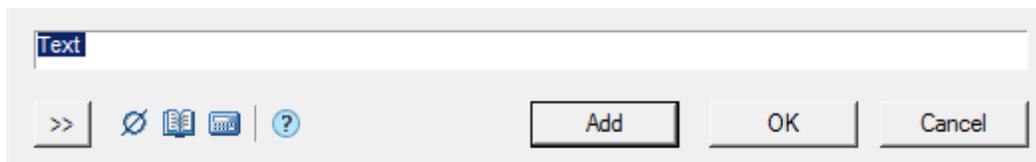


Toolbar: *Text* - *Construction text*.

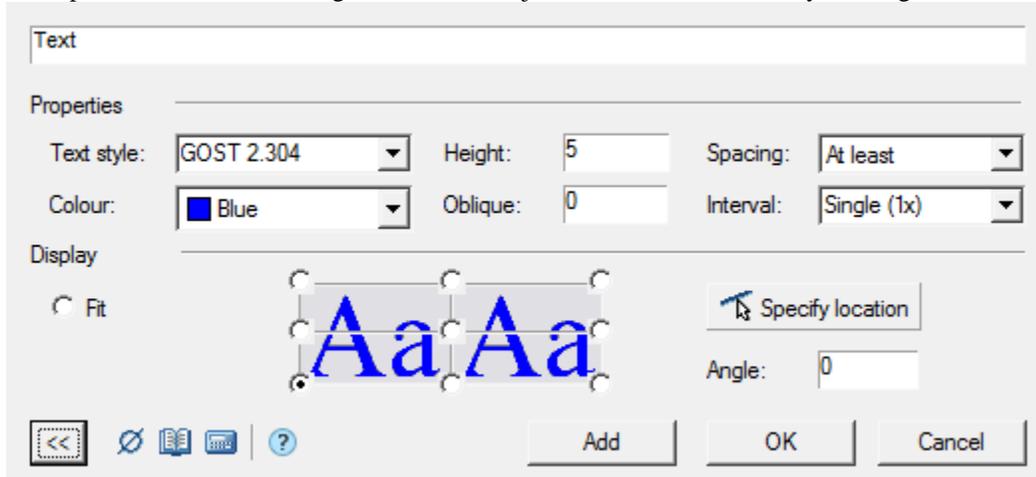


Command line: *SPDTEXT*.

## Dialog



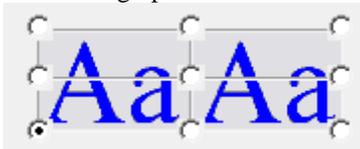
An expanded view of the dialog box with text adjustment tools is enabled by clicking the button



## Procedure

1. Enter the required text in the input field.
2. To insert special characters, use the "Insert special symbol" button.
3. To insert text from a notebook, use the "Notebook" button.
4. To insert the calculation result, use the "Calculator" button.
5. In the "Properties" toolset, choose a text style and options.
  - *Text style* - text style.
  - *Height* - text height.
  - *Colour* - text color
  - *Oblique* - gradient of text in degrees.

- *Spacing* - serves to control the intercharacter spacing during automatic text compression, if the "*Fit*" switch is set.
    - *At least* - compresses the text, respecting the exact value of the spacing between the characters set for the selected text style.
    - *Exactly* - shrinks the text, automatically decreasing or increasing the character spacing to fit the line exactly within the specified input area.
  - *Interval* - determines the spacing between adjacent lines of text, inserted one by one using the "*Add*" button.
6. In the "*Display*" toolset, set the text alignment and position options.
- *Fit* - the text is placed inside the selected area in the drawing. If the line length exceeds the size of the input area, the text is automatically compressed.
  - *Align to point* - the text is aligned to the point specified by the user. Click on the appropriate radio button in the graphics area:

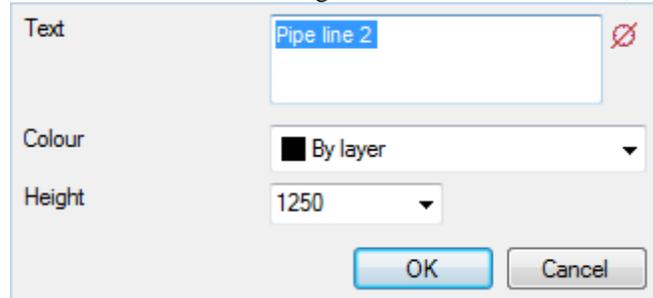


- Button  **Specify location** - is intended to indicate in the drawing the insertion point of the text line and the angle of rotation. If the "*Fit*" radio button is selected, then after specifying the insertion point, you must also select the width of the text input area.
  - *Angle* - the value of the angle of rotation of the text in degrees.
7. Click the "*Add*" button to insert a text string. Click "*OK*" or "*Cancel*" to exit the looping command.

## Text editing

Line types	
<ul style="list-style-type: none"> <li>Edit <ul style="list-style-type: none"> <li>Decimal delimiter correction</li> <li>Create and activate standard styles in new documents</li> <li>Explode Block Reference under drawing desing elements</li> <li>Enable advanced grips</li> <li>Set associativity during insertion of objects</li> <li>Use localized abbreviations of command keywords</li> <li>Highlight color</li> <li>Automatically switch keyboard layout to local language</li> <li>Show rectangle around objects</li> <li>Enable "Nearest" object snap automatically when necessary</li> <li>Show "Direction" toolbar when necessary</li> <li>Scale dimensions</li> <li>Scale texts</li> <li>Scale hatches</li> <li>Ignored layers for drawing elements</li> <li>Unplotted layer</li> <li>Show nanoCAD Building Site toolbar for viewports</li> </ul> </li> <li>Tooltips <ul style="list-style-type: none"> <li>Show tooltips</li> <li>Show delay, ms</li> <li>Hide delay, ms</li> </ul> </li> <li>Double click</li> <li>Design</li> <li>Notifications</li> <li>Hot keys</li> <li>Databases access</li> </ul>	<ul style="list-style-type: none"> <li>Use dot '.' as decimal delimeter</li> <li>Yes</li> <li>No</li> <li>Yes</li> <li>Yes</li> <li>Yes</li> <li>Green</li> <li>Yes</li> <li>No</li> <li>Yes</li> <li>No</li> <li>Yes</li> <li>Yes</li> <li>Yes</li> <li>CS_UNPLOTED</li> <li>Yes</li> <li>Yes</li> <li>300</li> <li>900</li> </ul>

If it's set multiline text editing with tools Construction 21, then clicks on the test will be called dialogue editing.



In this dialog may ask, besides the text, its color, and the Height, and add special symbols.

## Utilities

### Creating a hatch



Main menu: *Construction - Utilities - Create hatch.*



Toolbar: *Utilities - Create hatch.*

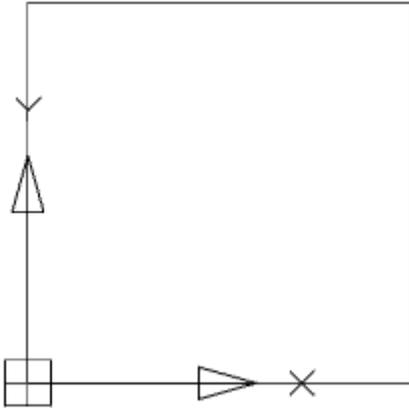


Command line: *SPHPATTERN*.

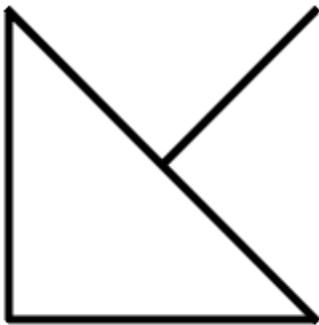
In Construction 21 it is possible to create hatches according to a given pattern - a sketch using the  "Create hatch" tool. The hatch pattern created with it is written as an independent \*.pat file and can be used in other projects or by other users.

### Procedure

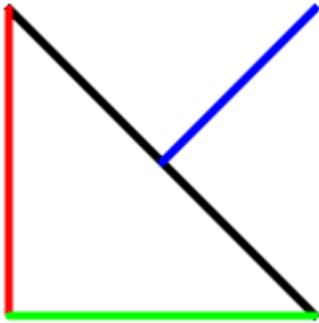
1. Create a border for the hatch sketch. Construct a 300x300mm rectangle and place its bottom-left corner at the origin of coordinate system 0,0,0. The sketch area must be at the origin of the coordinate system. Overall dimensions of the sketch area should not be more than 300x300mm.



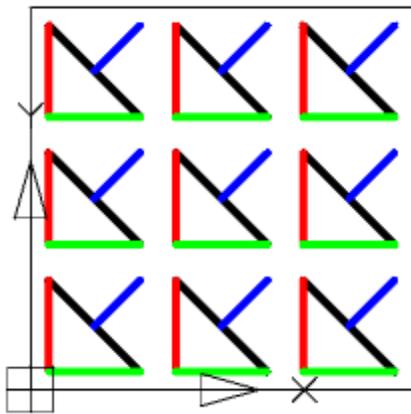
2. Sketch one element of the future hatch. The sketch needs to be done within the created rectangle. The sketch should only be done with lines. It is not allowed to sketch with arcs, circles. It is recommended to approximate curved objects in polylines without arc segments. Sketch polylines must be exploded into line segments.



3. Assign a different color to each section of the sketch. The sketch should be done with segments of different colors. The hatch tool recognizes the periodicity in the sketch by the color of the lines.

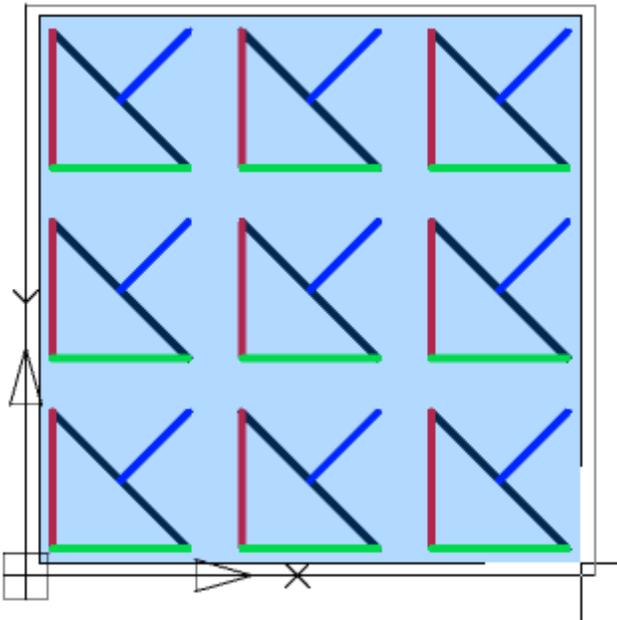


4. Create an array of sketches within a rectangle. The sketch must follow an explicit periodicity. The sketch must include at least three repeating fragments of the future hatching.



5. Call the command  "Create hatch".

6. Create an array of sketches within a rectangle. The sketch must follow an explicit periodicity. The sketch must include at least three repeating fragments of the future hatching.



7. Press the "Enter" key. The process of object recognition and analysis will begin. During recognition, gaps in sketch lines are automatically determined, if in the selected pattern the line break is outside the selection boundary, the line will be defined in the hatch as continuous. If the sketch does not meet the conditions, a message box will appear, otherwise the file save dialog.

8. Correct the errors indicated in the message. Repeat step 5 - step 7.

9. In the file save dialog specify the path to the hatch file.

**Important!** You cannot use the names "Acad.pat", "Acadiso.pat" as the name of the sample file. It is recommended to save in C:\ProgramData\Nanosoft\Construction 21\SHX

10. The custom hatch will be created. The hatch created with the  "Create hatch" tool fully accepts all the properties of the nanoCAD hatch: associativity, the ability to change the scale, the angle of inclination, overlay with a closed tolerance.

**Important!** A drawing file \*.dwg that used a unique hatch must be transferred to another user along with the \*.pat file of the hatch pattern. For a successful translation, use the (eTransmit) "Generate Set" command.

## Objects numeration



Main menu: *Construction - Utilities -  Objects numeration.*



Ribbon: *Construction - Utilities -  Objects numeration.*



Toolbar:  *Objects numeration (on toolbar "Utilities").*

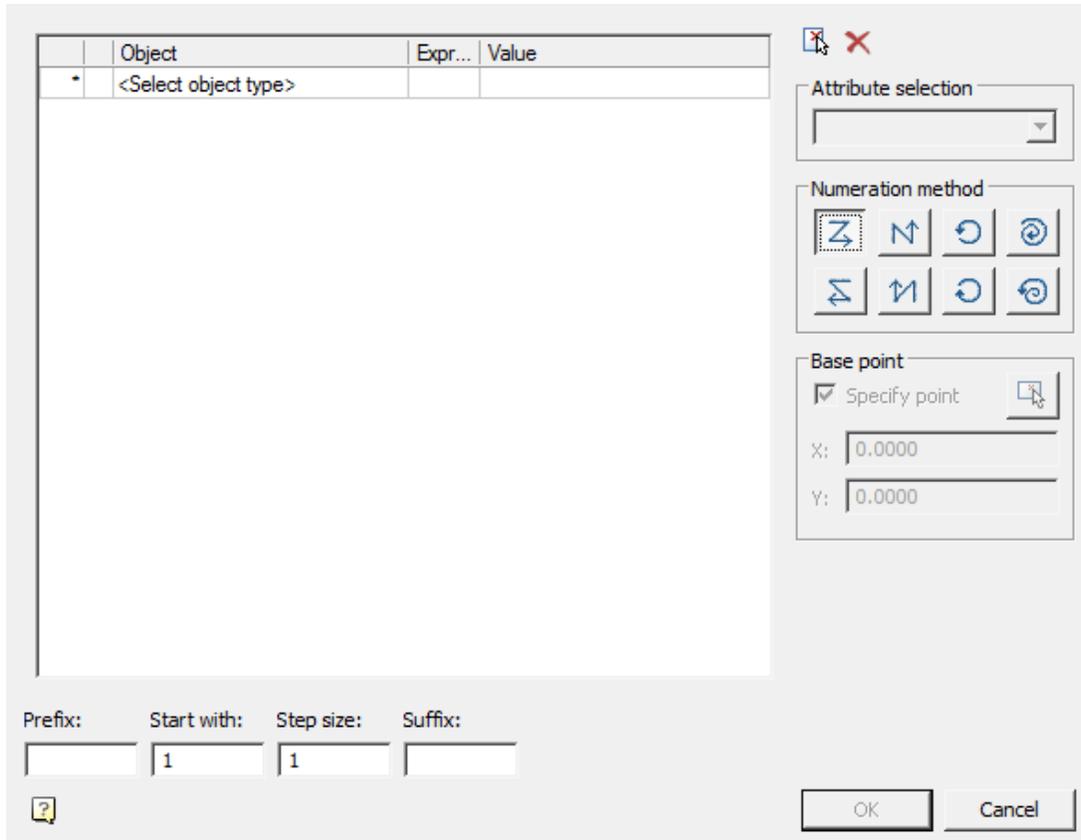


Command line: *SPNUMOBJ.*

The command finds all specified objects with attributes and numbers it according to a given algorithm.

## Procedure

1. Call the team. The "Object Numbering" dialog opens.



2. Select objects. Select an object using the quick selection. All objects that have text editable attributes (block, database object, universal marker, etc.) can be selected.

	Object	Expr...	Value
<input checked="" type="checkbox"/>	<b>Line</b>		<b>Selected: 5 (from 5)</b>
<input type="checkbox"/>	Colour		
<input type="checkbox"/>	Layer		
<input type="checkbox"/>	Linetype		
<input type="checkbox"/>	Linetype Scale		
<input type="checkbox"/>	Line Weight		
<input type="checkbox"/>	Transparency		
<input type="checkbox"/>	Hyperlink		
<input type="checkbox"/>	Thickness		
<input type="checkbox"/>	Start X		
<input type="checkbox"/>	Start Y		
<input type="checkbox"/>	Start Z		
<input type="checkbox"/>	End X		
<input type="checkbox"/>	End Y		
<input type="checkbox"/>	End Z		
<input type="checkbox"/>	Delta X		
<input type="checkbox"/>	Delta Y		
<input type="checkbox"/>	Delta Z		
<input type="checkbox"/>	Length		
<input type="checkbox"/>	Fill Angle		

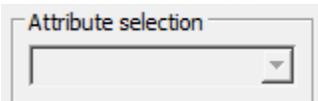
After selecting an object, a list of attributes common to the selected objects and available for editing is formed.

Additional list management commands:

 Set selection - the command allows you to specify objects in the drawing.

 Reset conditions - command clears the list of conditions.

3. Select the attribute in which the result of numbering will be recorded.



4. Select the numbering method:

 - from left to right, from top to bottom. When choosing this method, the command compares the coordinates of points X and Y, respectively, starts numbering from the highest and leftmost objects to the lowest and right relative to the base point.

 - from bottom to top, from left to right. When choosing this method, the command compares the coordinates of points X and Y, respectively, starts numbering from the lowest and leftmost of the entire object to the highest and right relative to the base point.

 - from right to left, from top to bottom. When choosing this method, the command compares the coordinates of points X and Y, respectively, starts numbering from the topmost and to the right of the entire object to the lowest and leftmost relative to the base point.

 - from bottom to top, from right to left. When choosing this method, the command compares the coordinates of points X and Y, respectively, starts numbering from the lowest and most right of the entire object to the highest and left relative to the base point.

 - radial anticlockwise. When choosing this method, the command compares the coordinates of points in the polar coordinate system, the distance from the center (specified by the user base point) and the angle between the zero direction (positive X-axis direction). Numbering is counterclockwise. When this method is selected, the selection of the base point becomes available.

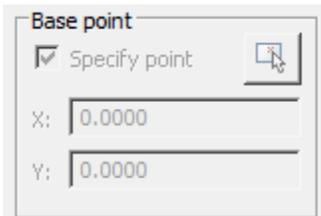
 - radial clockwise. When choosing this method, the command compares the coordinates of points in the polar coordinate system, the distance from the center (specified by the user base point) and the angle between the zero

direction (positive X-axis direction). Priority in comparison has an angle. Numbering is clockwise. When this method is selected, the selection of the base point becomes available.

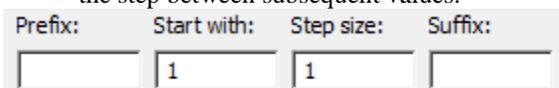
 - spiral anticlockwise from center. When choosing this method, the command compares the coordinates of points in the polar coordinate system, the distance from the center (specified by the user base point) and the angle between the zero direction (positive X-axis direction). Priority when comparing has distance from the center. The numbering is counterclockwise from the center. When this method is selected, the selection of the base point becomes available.

 - spiral clockwise to center. When choosing this method, the command compares the coordinates of points in the polar coordinate system, the distance from the center (specified by the user base point) and the angle between the zero direction (positive X-axis direction). Priority when comparing has distance from the center. Numbering is clockwise to the center. When this method is selected, the selection of the base point becomes available.

5. Indicate a base point if necessary. The base point is indicated either by entering the X and Y coordinates, or by pointing to the screen. When cocking the "Specify point" checkbox, the point is indicated after pressing the "OK" button.



6. Customize the brand. The formation of the brand comes from three parts. The prefix and suffix is specified in the editable field. And the brand value itself is calculated based on the initial value entered by the user and the step between subsequent values.



7. Click "OK."
8. If the "Specify point" checkbox has been set, specify the base point in the drawing.
9. Numbering will be made.

## Measurements

-  Main menu: *Construction - Utilities - Measure*.
-  Ribbon: *Construction - Library objects - Measure*.
-  Toolbar: *Measure (on toolbar "Utilities")*.
-  Command line: *SPMEASURE*.

Measurements or tool with Mark drawing is designed to extract various properties of objects in the drawing. After selecting the command a dialog box *value picker* opens.



 *Measure distance*. Measures the distance between two points, radius or diameter. Switching the measurement method is via the context menu.

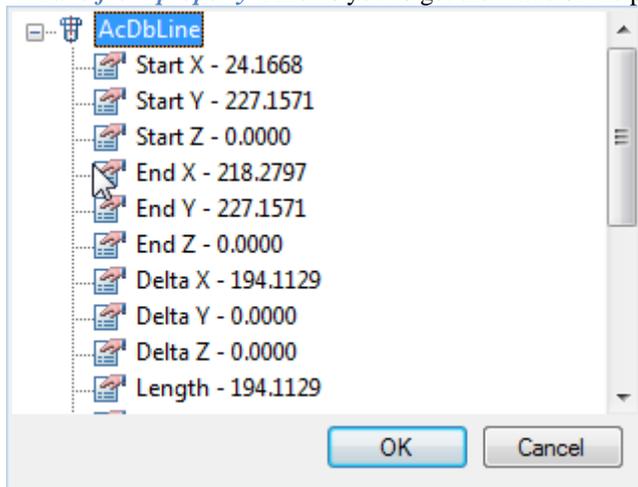
 *Measure angle*. Measures the angle.

 *Measure Perimeter*. Measure the perimeter of the closed area, the length of a closed polyline or circle.

 *Measure area*. Measures the area of the closed area. Select an area in two ways: 1 - Click inside the closed loop, 2 - Click on the closed polyline or circle.

 *Complex area*. Measures the area of several loops. Selecting the area is carried out: 1 - Click to specify the first closed loop, 2 - Click to specify the second closed loop 3 - Press *Enter* to complete the command.

 **Take from property.** Allows you to get the value of the parameter selected in the drawing object Construction 21.



 **Take from text.** Returns the value of the selected single-line or multi-line text.

 **Calculate.** Opens [calculator](#).

 **Take from notes.** Opens the [notebook](#).

The measured values are displayed in the dialog box.

If universal measuring time was part of a command (for example, the dialog box *Construction 21 text* context menu command), the measured value is transmitted to the command being executed.

## Fragment Copy

 Main menu: *Construction - Utilities -  Fragment copy*.

 Ribbon: *Construction - Utilities -  Fragment copy*.

 Toolbar:  *Fragment copy (on toolbar "Utilities")*.

 Command line: *SPCOPY*.

The command is used to create remote views of the drawing.

1. Select the drawing *center point for the detail view*.
2. Select the area of the drawing. In the context menu, you can choose a certain kind of marquee - circle or rounded rectangle. Secure selection click.
3. Specify the drawing *center remote fragment*. available in the context menu command "0-cut" to remove the original objects from the drawing.

## Plate Array

 Main menu: *Construction - Utilities -  Plate array*.

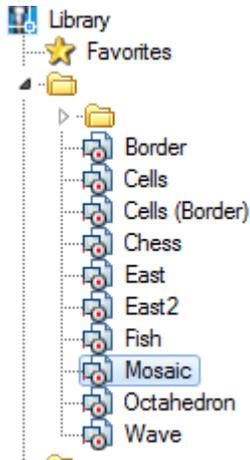
 Ribbon: *Construction - Utilities -  Plate array*.

 Toolbar:  *Plate array (on toolbar "Utilities")*.

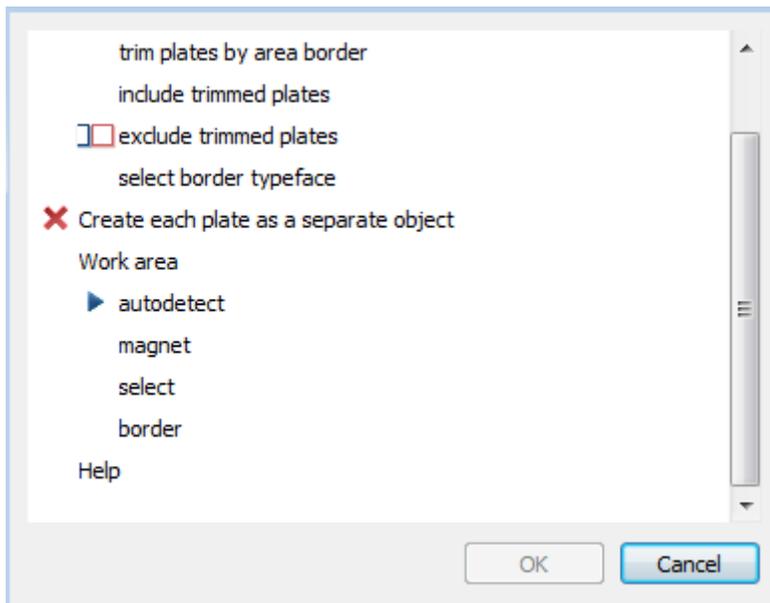
 Command line: *SPPLTARRAY*.

Command to tile layouts for a given circuit.

1. Choose from a [base](#) tile pattern and place it on the drawing.

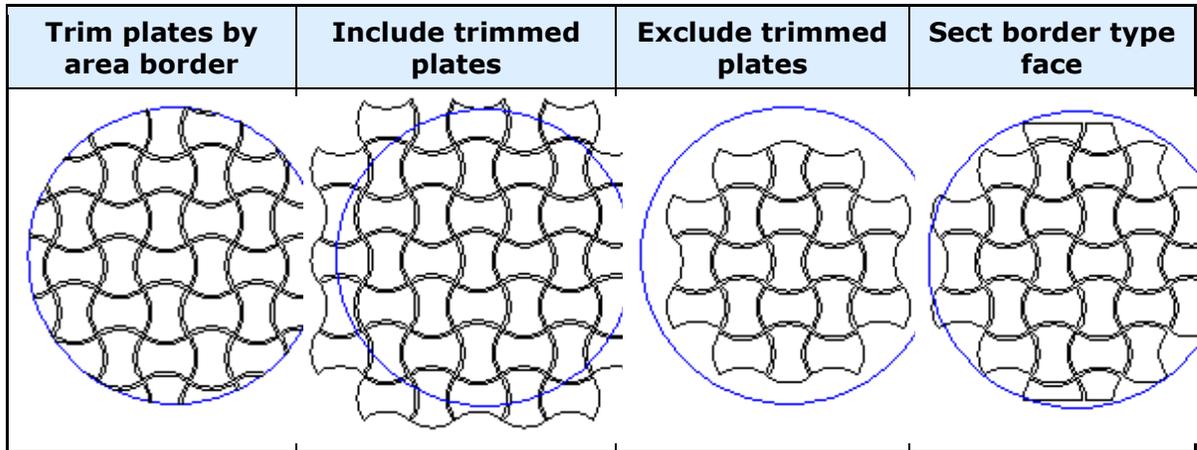


2. Press the  *plate array*.
3. In the opened window, click the *plate shema* and specify the *token group*.



4. Select *Trim mode extreme tiles* .
  - Trim plates by area border - tiles clipped to the boundary of the layout. Circuit tile becomes open. This tile is taken into account in property "Cut". This mode is not available if you enable the check box "Make each tile a separate."
  - Include trimmed plates - extreme tiles stacked atop circuit layout.
  - Exclude trimmed plates - tiles, overlapping circuit layouts do not fit.
  - Sect border type face- if tiles have execution end elements will be selected most podhodyaeshee. When the layout of the area selected by the execution system names: Whole, Left, Right, Top, Bottom. When the layout along the border all versions checked sequentially, regardless of names.

Trim plates by area border	Include trimmed plates	Exclude trimmed plates	Sect border type face
----------------------------	------------------------	------------------------	-----------------------



5. *Create each plate as a separate object.*

If the box is checked, the result will be a group of independent layout objects - copies of the original objects. This mode does not support cutting elements on the boundaries of the area, but allows more flexibility to edit the result. When the check box is created off a single object that includes all geometry. In the properties of this object will be information on the number, weight and costs of each type of tiles, as well as the total weight (based on the whole tiles) and cost. You can delete individual tiles by clicking on them with the right. In this case the total amount will be adjusted, weight and cost.

6. Determine the *work area* tiles.

- auto detect - layout area defined contour, which is located inside the tile pattern. In the inner islands stacked tiles will not.
- magnet - loop selection tool "magnet".
- select - area layout is selected in the drawing indicating one or more loops.
- border - tiles splits along the perimeter or primitives nanoCAD. Cropping mode in this case will simulate laying curbs.

7. To complete the command, press *OK*.

*Note:* Creating a template tile layouts can be done using Object Wizard.

## Creating an array of objects



Main menu: *Construction - Utilities - Array*.



Ribbon: *Construction - Utilities - Array*.



Toolbar: Array (on toolbar "Utilities").



Command line: *SPARRAY*.

Replication called ordered distribution of copies of objects by step and quantity. Duplication of graphics in the Construction 21 is performed using a dialog box arrays.

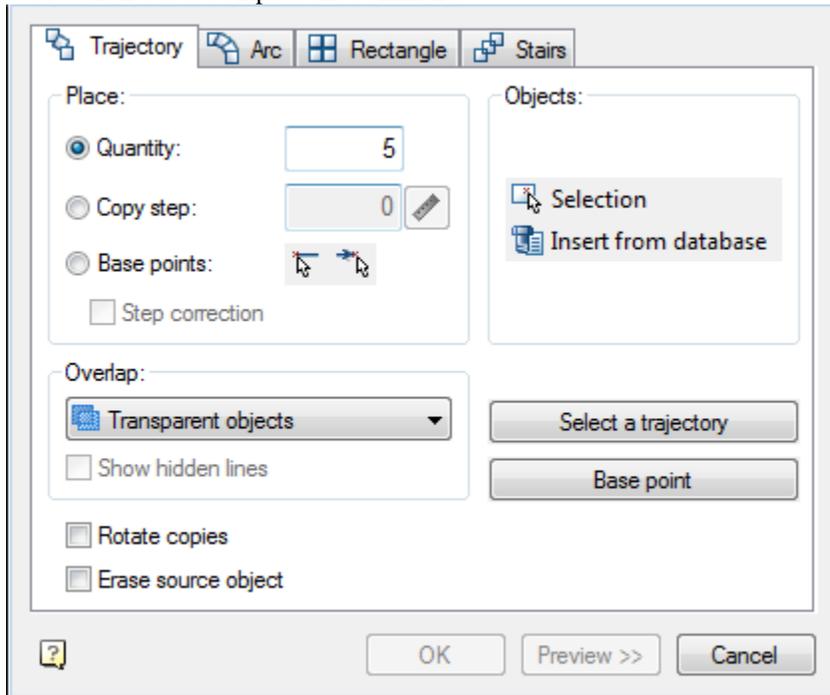
Four tabs in the Arrays dialog box define four (4) different object replications.

- [Arrays along an arbitrary path](#)
- [Arrays for arc trajectory](#)
- [Rectangular array](#)
- [An array of step](#)

For the distribution of objects within a specified area used [for an array field](#).

## Arrays along an arbitrary path(Trajectory)

1. Tab *Path* enter the governing parameters.
2. Follow *The selection object* (object selection).
3. Specify *the base point*.
4. Select *trajectory*.
5. Follow *View* .
6. Click *OK* to complete the command.



At the top of the window is a group of controls *placement*, which allows you to select:

- Quantity;
- Copy step;
- Base point;
- Step correction;

In the drop-down list make a choice of Overlap:

- Transparent objects;
- Next under preceding;
- Next Over preceding;
- Interleave.

Button  *pick from drawing* step allows you to select copies of the objects in the drawing.

Switch *Show hidden line* controls the display of hidden lines in the drawing. If the switch is on the hidden lines are displayed in the drawing.

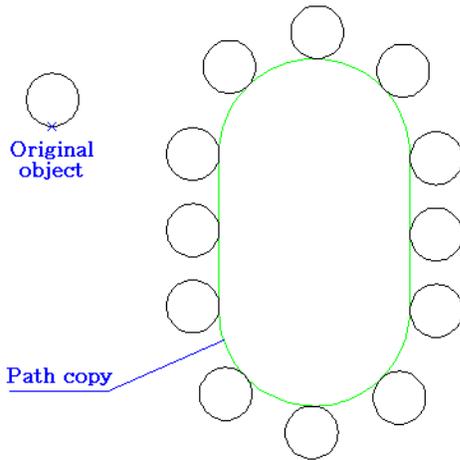
Switch *Rotate copies* controls the orientation of the copied object. If the switch is on when copying objects are rotated so that the vector Y was directed perpendicularly to the path (as shown in the figure).

Button  **Selection** *Selection* to select the replication object in the drawing.

Button  **Insert from database** *from the base* to select the object from the database replication of standard elements.

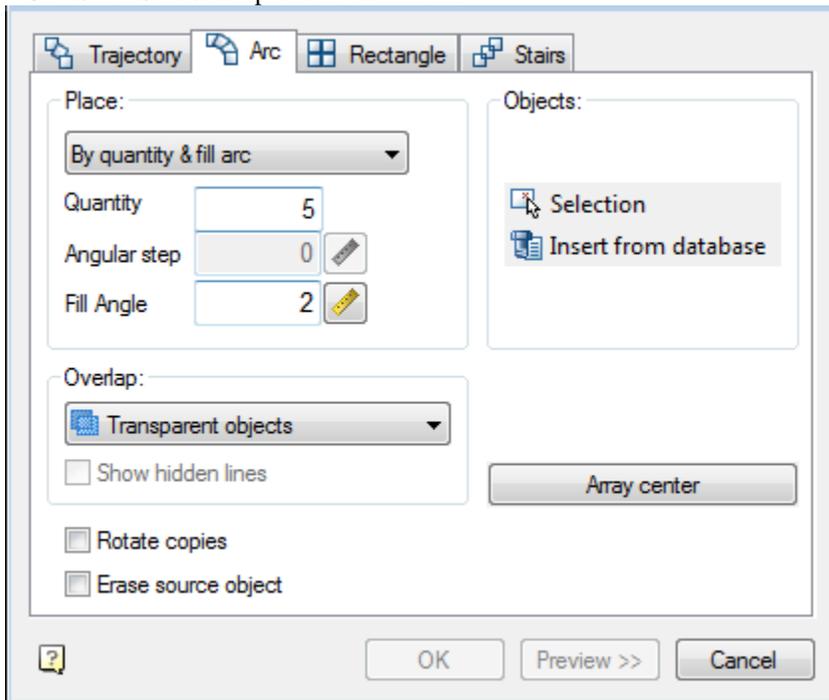
Button *Base point* lets you choose the base point of duplicated object (normally it should be expressed in the center or corner of the object).

Button *select a trajectory* to select a graphic object, along which you will be replicating. As the trajectory can be used lines, polylines, arcs, circles.



### Arrays for arc trajectory

1. Tab *Arc* enter the governing parameters.
2. Follow *The selection object* (object selection).
3. Select *Center array*.
4. Follow *Preview* .
5. Click *OK* to complete the command.



At the top of the window is a control group *accommodation*, which lets you choose placing of replicated objects:

- By number and step;
- By number and angle;
- By step and corner;

In the input field *Number* specify the number of replicated objects.

In the entry field *Step Angle* enter the angle between the replicable elements.

In the input field *angle* specify the angle required.

Button  *with Mark drawing* step allows you to select the corner or angle with the drawing.

In the drop-down list make a choice of Overlap:

- Transparent objects;
- Next under preceding;
- Next over preceding;
- Interleave.

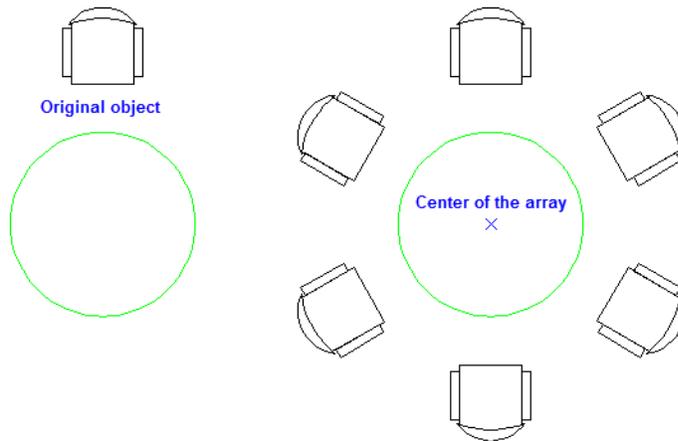
Switch *Show hidden line* controls the display of hidden lines in the drawing. If the switch is on the hidden lines are displayed in the drawing.

Button  **Selection** *Selection* to select the replication object in the drawing.

Button  **Insert from database** *insert from database* used for selecting a center point which the objects will be replicated.

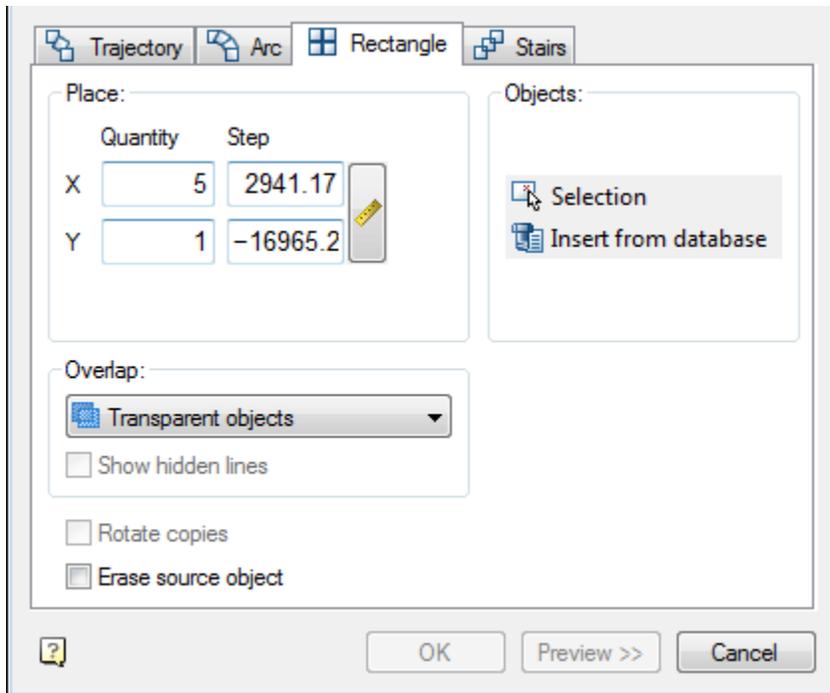
Button *array center* used for selecting a center point which the objects will be replicated.

Switch *Rotate copies* controls the orientation of the copied object. If the switch is on the turn when copying objects are shown in the figure.



## Rectangular array

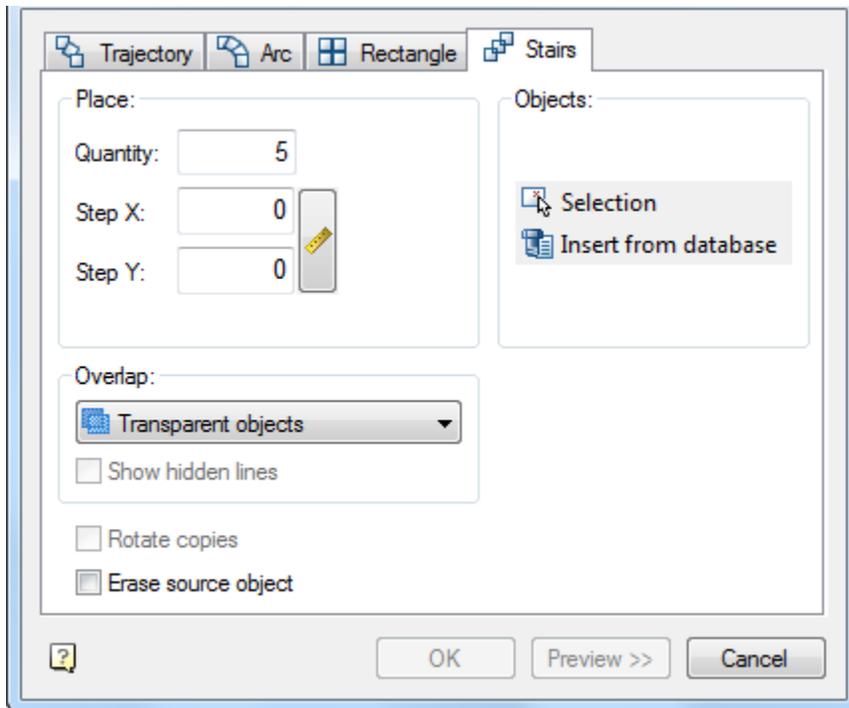
1. Command *Rectangle* enter key parameters.
2. Follow *The selection object* (object selection).
3. Follow *Preview* .
4. Click *OK* to complete the command.



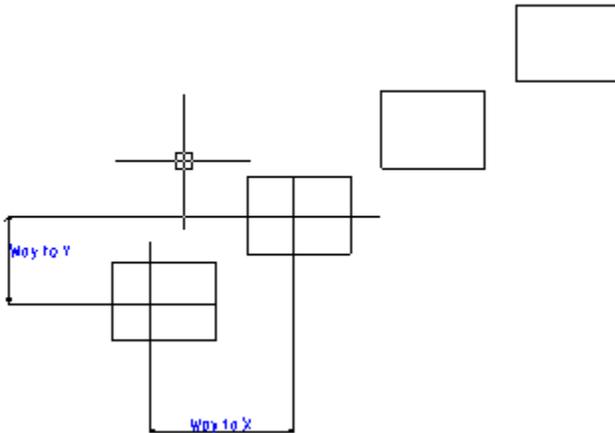
Enter the number of objects in the array horizontally and vertically, to specify the amount of horizontal and vertical steps between objects.

### Steps of an array

1. Tab *steps* enter the governing parameters.
2. Follow *The selection object* (object selection).
3. Follow > *View* .
4. Click *OK* to complete the command.



Enter the number of objects in the array, specify the amount of horizontal and vertical step between objects.



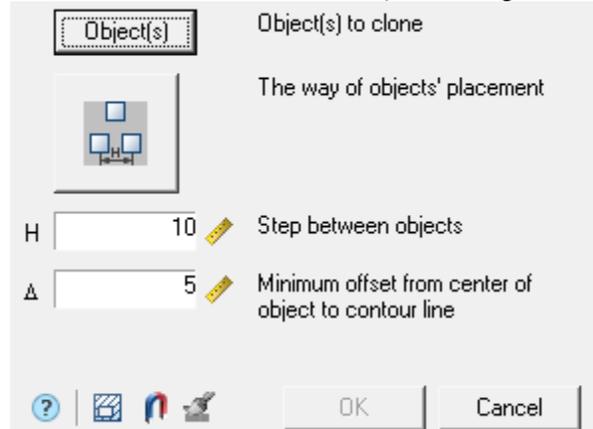
### ***Area array***

-  Main menu: *Construction - Utilities -  Area array.*
-  Ribbon: *Construction - Utilities -  Area array.*
-  Toolbar: *Utilities -  Area array.*
-  Command line: *SPARDARRAY.*

The tool is designed to replicate objects within a given area.

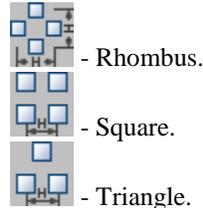
## Procedure

1. Call the command  "Area array". A dialogue will open "Area array".



2. Click the "Object(s)" button and select the original objects to copy in the drawing. Press the "Enter" key to complete the selection.

3. Select the method of placing the copied objects using the graphic switch:



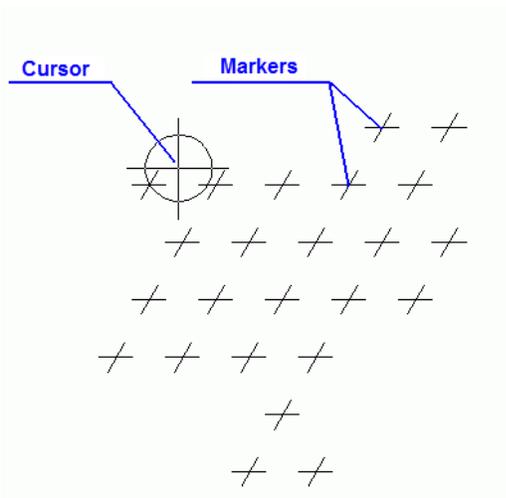
4. Specify the spacing (H) between adjacent copies. The  "[Pick from drawing](#)" button allows you to select a step from the drawing.

5. Specify the minimum indent (?) from the edge of the area. The  "[Pick from drawing](#)" button allows you to select an indent from the drawing.

6. Set the area of the array in one of three ways:

-  "Select an area by the point". The construction area is formed from a set of closed areas. The command allows you to add closed areas to the set by clicking the LMB inside a closed contour in the drawing. Clicking again inside the contour removes the selected area from the set. To complete the selection, press the "Enter" key.
-  "Select contour with the magnet". The contour of the array area is set using the utility "[Magnet](#)".
-  "Paint area". The command allows you to specify an arbitrary placement of copied objects, providing a set step between adjacent copies. This command is available only after selecting the source objects to copy.

The construction of the area is carried out by moving the mouse cursor over the drawing (construction must be started from the location of the original objects). As you move the cursor, markers will appear on the screen to indicate where the copied objects are inserted.



To remove insertion markers, press and hold the "Shift" key. When you hover over a marker, the marker will be deleted.

To temporarily disable the placement of markers, press and hold the "Ctrl" key.

Finish drawing the area by clicking LMB. An array by area will be built.

7. Click the "OK" button. An array by area will be built.

## Centerlines



Main menu: *Construction - Utilities - Centerlines*.



Ribbon: *Construction - Symbols - Centerlines*.



Toolbar: *Utilities - Centerlines*.



Command line: *SPAXIS*.

The command is designed to draw centerlines.

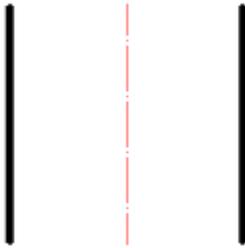
## Procedure

The construction method depends on the selected objects:

- *Parallel lines*. The centerline will be drawn in the middle between these segments.

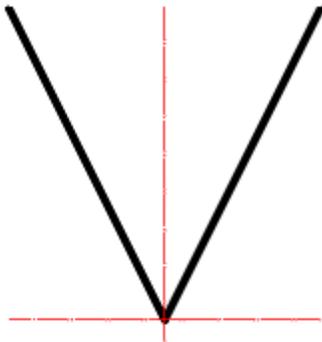
1. Call the command *Centerlines*.
2. Select the first line.
3. Select the second line.
4. Specify manually the first point of the centerline or press the "Enter" key. When you press the "Enter" key, the centerline is drawn automatically with a protrusion specified in the settings (by default 2mm).
5. Specify manually the second point of the centerline or press the "Enter" key. When you press the "Enter" key, the centerline will stop drawing, the second point will be in the calculated center between the lines.

In the case of manual selection of the start / end point of the centerline, the amount of the protrusion is controlled by the user.



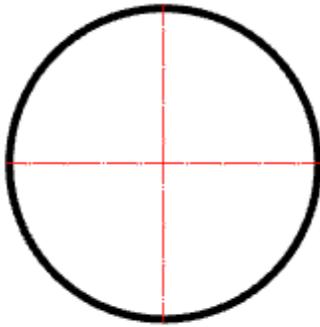
- *Non-parallel line segments.* The centerline will be drawn along the bisector of the angle between the line segments.

1. Call the command  "Centerlines".
  2. Select the first line.
  3. Select the second line.
  4. Select the direction of the centerline. Using the "Rotate" context menu command, you change the direction of the centerline drawing (available only for intersecting line segments).
  5. Specify manually the first point of the centerline or press the "Enter" key. When you press the "Enter" key, the centerline is drawn automatically with a protrusion specified in the settings (by default 2mm).
  6. Specify manually the second point of the centerline or press the "Enter" key. When you press the "Enter" key, the centerline will stop drawing, the second point will be in the calculated center between the lines.
- In the case of manual selection of the start / end point of the centerline, the amount of the protrusion is controlled by the user.



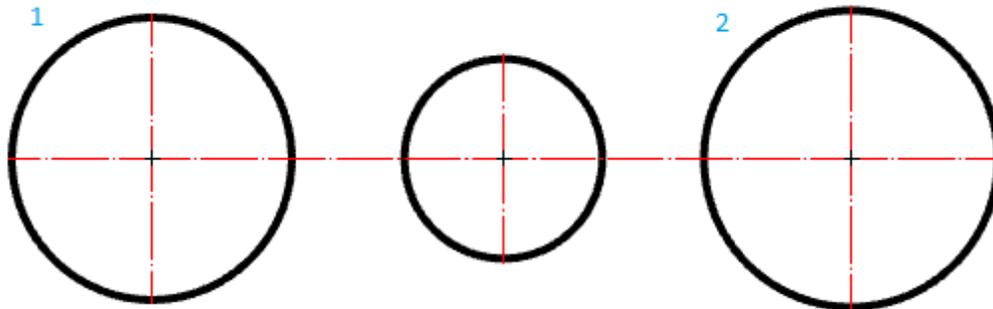
- *One circle.* Draws centerline centerlines on the selected circle.

1. Call the command  "Centerlines".
2. Pick a circle.
3. Press the "Enter" key.



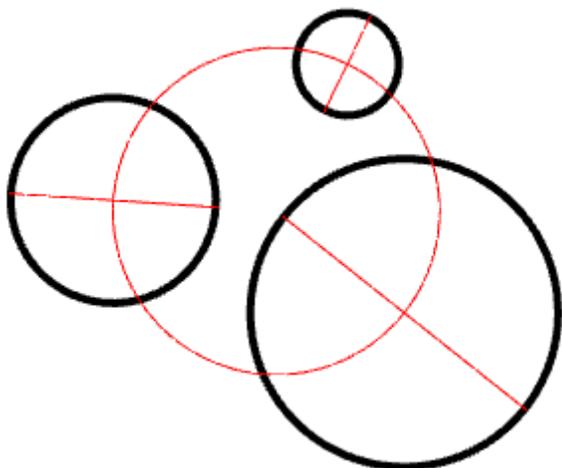
- *Two or more circles.* Draws centerline centerlines on selected circles with one common centerline.

1. Call the command  "Centerlines".
2. Select the first circle.
3. Select the second circle.
4. Press the "Enter" key. If on the line between the centers of the two selected circles there are also centers of other circles, then for such circles, axial ones will also be built.



- *Three mismatched circles.* Creates a circle of centers passing through the centers of the selected circles. Center axes are automatically added to all circles whose centers coincide with the constructed center circle.

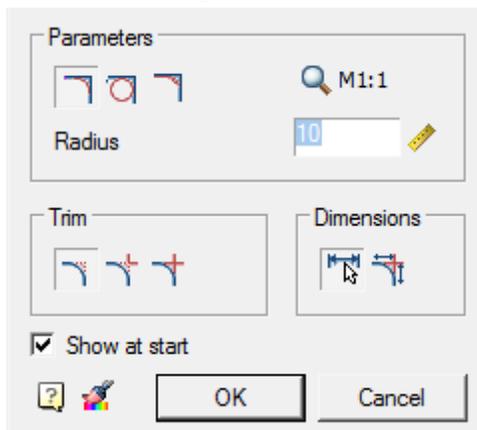
1. Call the command  "Centerlines".
2. Select the first circle.
3. Select the second circle.
4. Select the third circle.



## Fillet

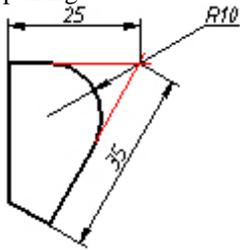
-  Main menu: *Construction - Utilities - Fillet.*
-  Ribbon: *Construction - Utilities - Fillet.*
-  Toolbar: *Fillet (on toolbar "Utilities").*
-  Command line: *SPFILLET.*

## Command Options



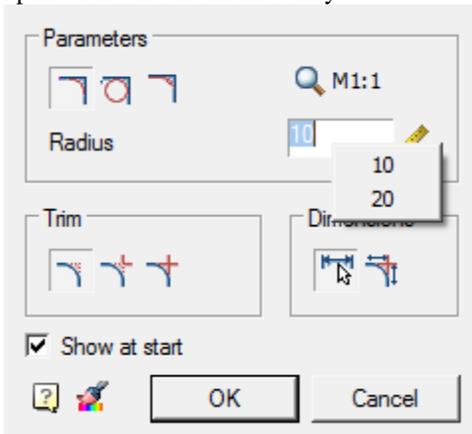
-  *Pick from drawing*
-  *Mode full trim contour lines*
-  *Mode partial trim lines to their intersection*
-  *Mode without cutting*
-  *Copying properties*
-  *Measure fillet. Tabulated fillet radius and the number*

 *Extra measurement.* Stamped dimensions of the original geometry. Active only when the button "dimensioned pairing"

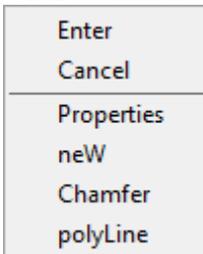


 *Insert circle as fillet.*

Double click the left mouse button or click the right mouse button in the input fields of values, a context menu will open with a list of the last entry:



When a command from the context menu, the following options::



*properties* - Open the dialogue to change the chamfer .

*new* - Completion of a group of facets and the beginning of another. This command is used when you need to, for example, several facets of the same size on the same site, and then with the same dimensions - on the other:

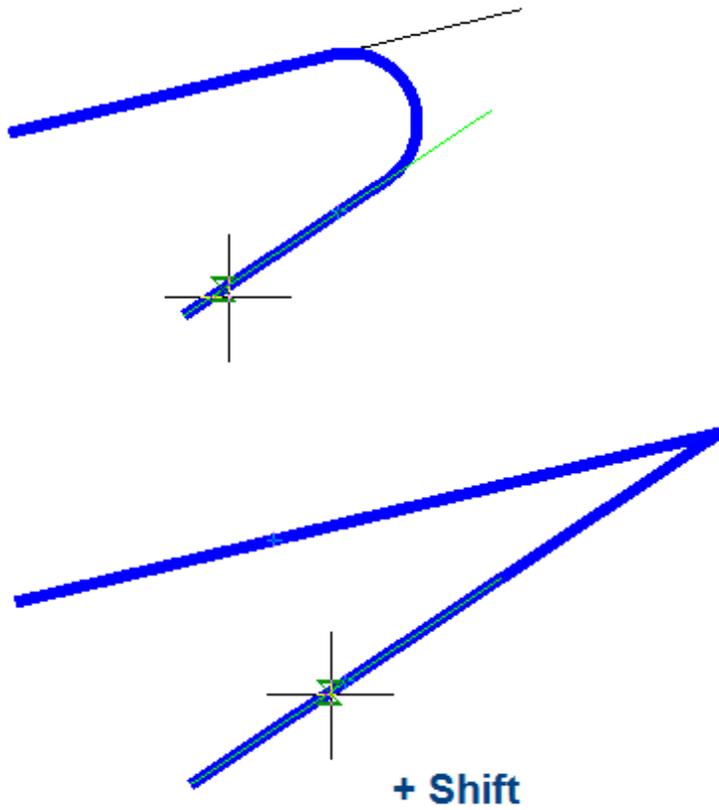
*Chamfer* - Switch to build [Circle](#). After you select the shortcut menu command opens this dialog Pairing parameter setting interface.

*polyline* - Switching to chamfering along the selected polyline. This option is available if you have selected the type of symmetric Circle: one length or two identical length. In operation, the cut-off modes are ignored and dimensioning.

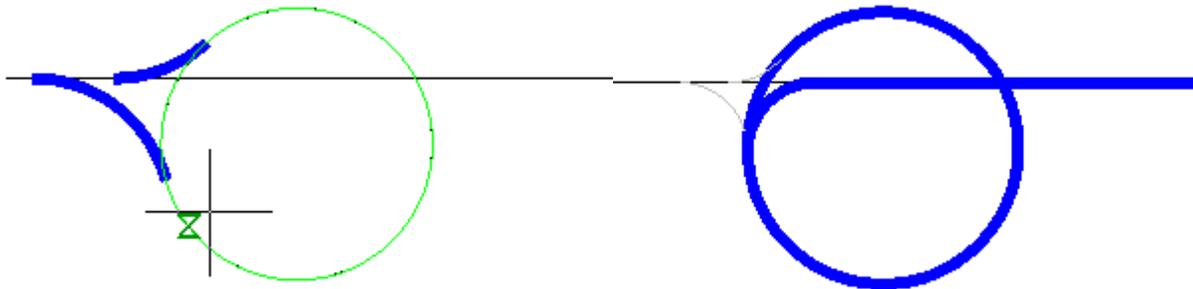
## Features of the Command

Command works in 3D. To execute the command source primitives must lie in one plane

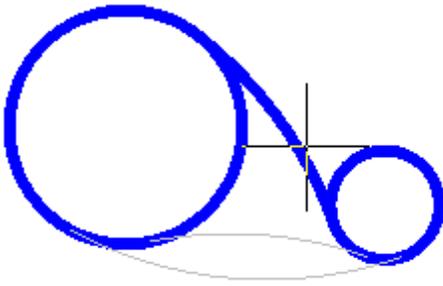
If you select the second object, press and hold SHIFT, then the angle will be formed (at the intersection of the closure and isolation).



For a pair of ARC-ARC additionally available pairing, combining internal and external touch.

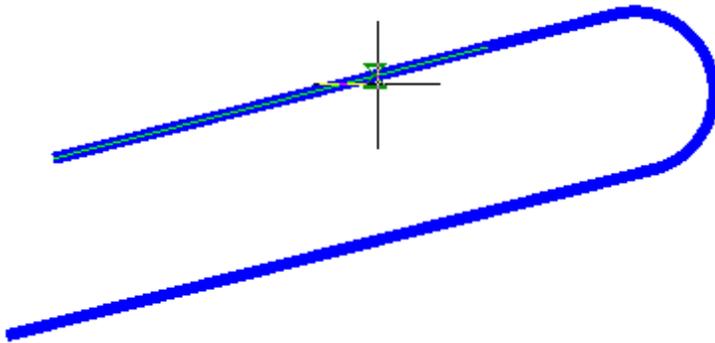


For a pair of ARC-ARC additionally available pairing, combining internal and external touch.

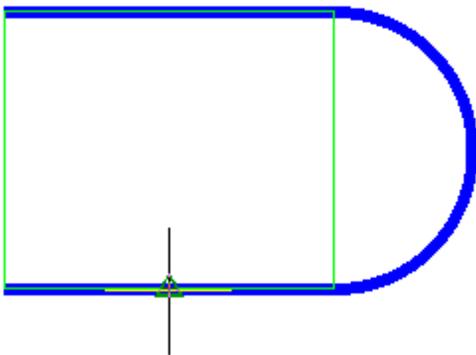


Availability of different types of interfaces depends on the fillet radius. To the outside and combining the radii need greater magnitude than the inner.

When two parallel lines will be constructed pairing radius equal to half the distance between them (regardless of the specified length). Automatically aligns the sides to the longest segment. When two parallel lines will be constructed pairing radius equal to half the distance between them (regardless of the specified length). Automatically aligns the sides to the longest segment.



Pairing works parallel segments and regions of the same polyline.

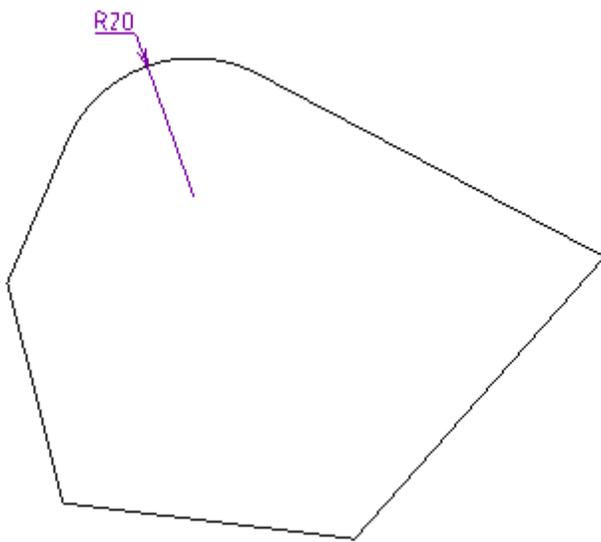
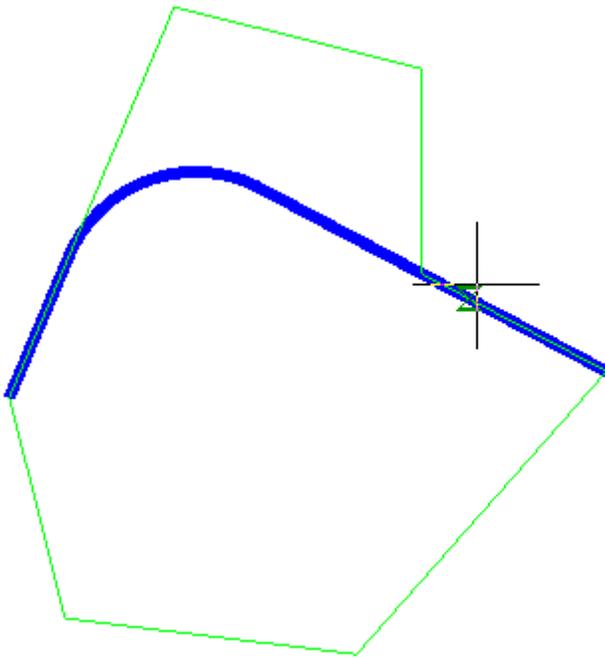


Side interface depends on the position of the mouse cursor when the second object

When you insert a polyline retains its integrity.

If the team is formed of two polylines one, it will be object of a single polyline.

If you select one polyline segments separated by other sites, all the intermediate portions are removed.



## ***Chamfer***



Main menu: *Construction - Utilities - Chamfer.*



Ribbon: *Construction - Utilities - Chamfer.*



Toolbar: *Chamfer (on toolbar "Utilities").*

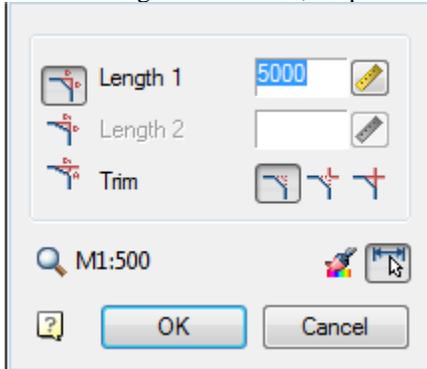


Command line: *SPCHAMFER.*

## Command Options

This command is used for automatic and semi-automatic placement of face on the details with the various versions and with the possibility of automatic dimensioning.

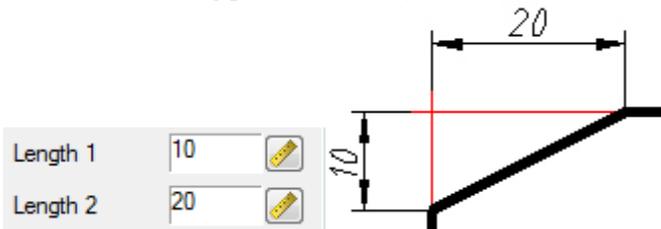
After clicking the command, it opens a dialog box settings Circle:



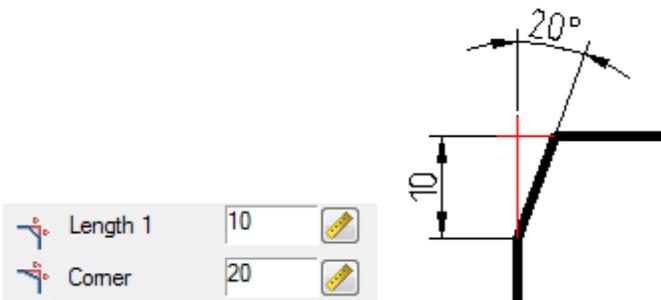
 Mode *chamfering parts with two different sizes*



 Mode *chamfering parts with two different sizes*



 Mode *Chamfer length and angle* in this mode instead of the *length 2* displays the setting *angle*.



 Mode *full cutting contour lines*

 Mode *partial cutting lines to their intersection*

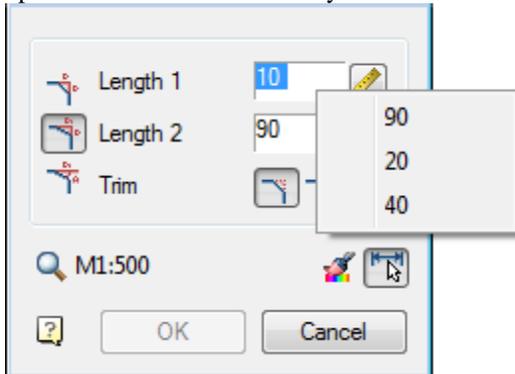
 Mode *without cutting*

 *Measure Chamfer*

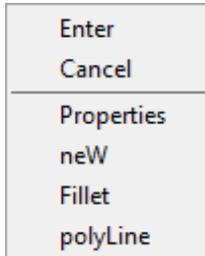
 *Copy properties surrounding face*

 *Pick from drawing*

Double click the left mouse button or click the right mouse button in the input fields of values, context menu will open with a list of the last entry:



When a command from the context menu, the following options:



*Propertise* - Opening the dialogue to change the chamfer chamfer.

*New* - Completion of a group of facets and the beginning of another. This command is used when you need to, for example, several facets of the same size on the same site, and then with the same dimensions - on the other:

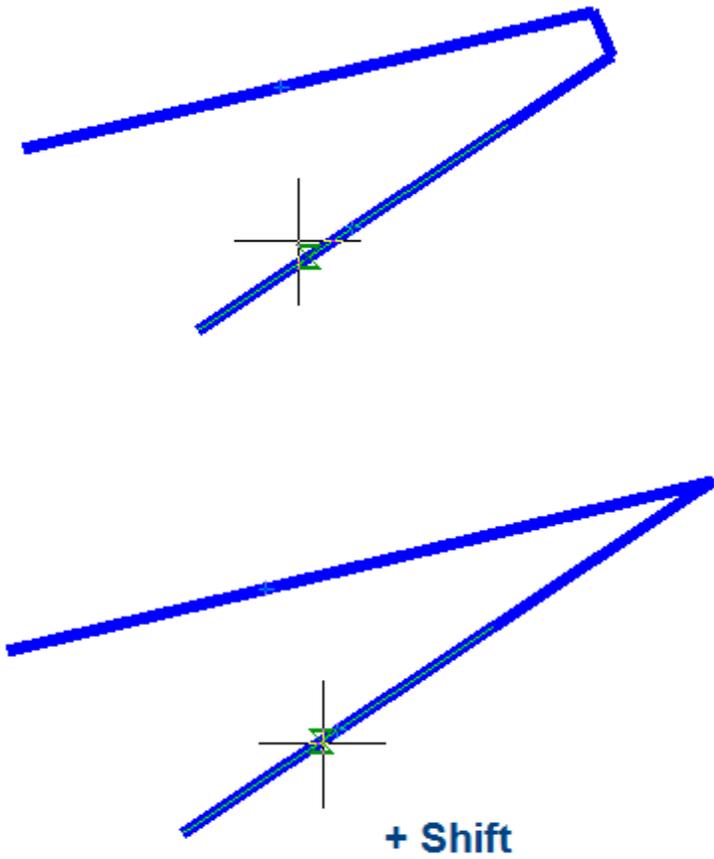
*Fillet* - Switch to build [pairings](#). After you select the shortcut menu command opens this dialog *Pairing* parameter setting interface.

*Polyline* - Switching to chamfering along the selected polyline. This option is available if you have selected the type of symmetric Circle: one length or two identical length. In operation, the cut-off modes are ignored and dimensioning.

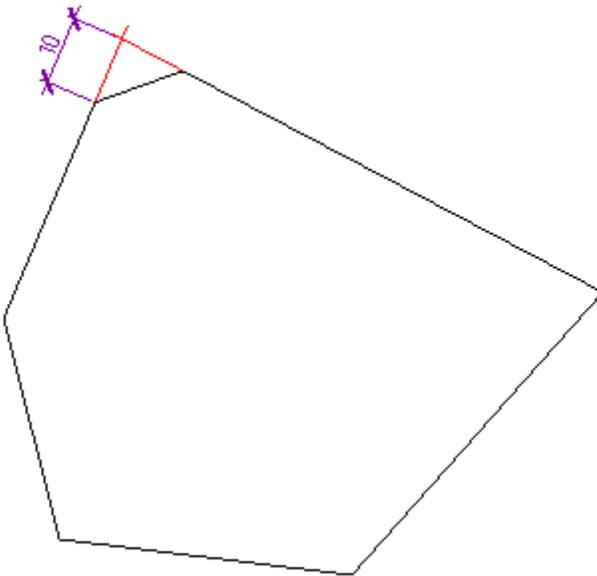
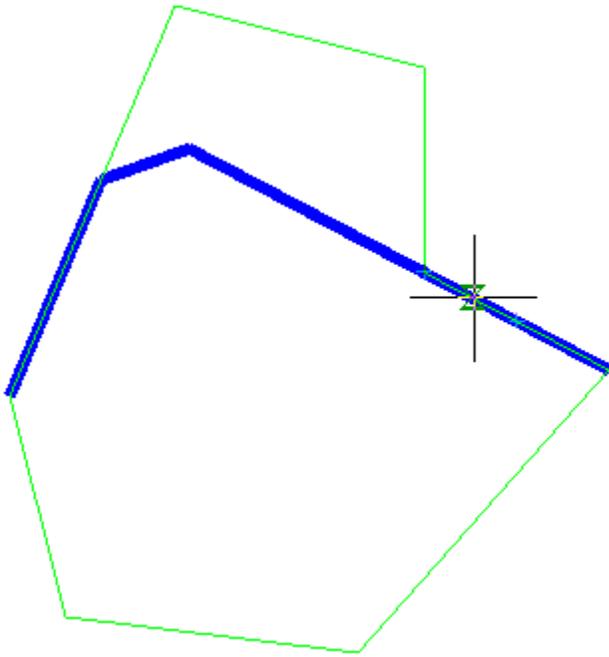
## Features of the command

The command works in 3D. To execute the command source primitives must lie in one plane.

If you select the second object, press and hold SHIFT, then the angle will be formed (at the intersection of the closure and isolation).



When you insert a polyline retains its integrity.  
If the team is formed of two polylines one, it will be object to a single polyline.  
If you select one polyline segments separated by other sites, all the intermediate portions are removed.



## **Anchor**



Main menu: *Construction - Utilities* -  *Anchor*.



Ribbon: *Construction - Symbols* -  *Anchor*.



Toolbar: *Utilities* -  *Anchor*.

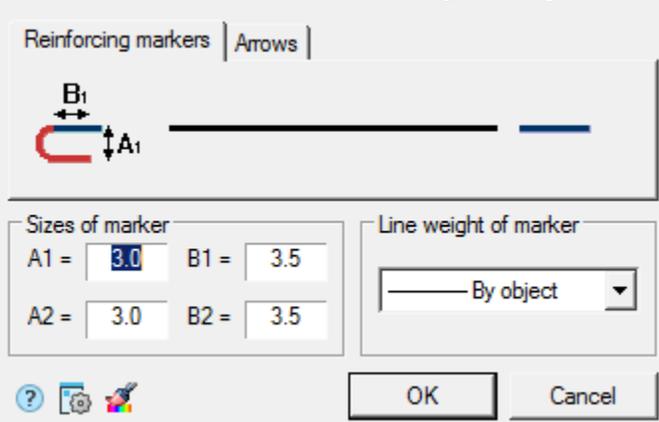


Command line: *SPANCHOR*.

The command is intended for drawing end markers on line segments.

## Procedure

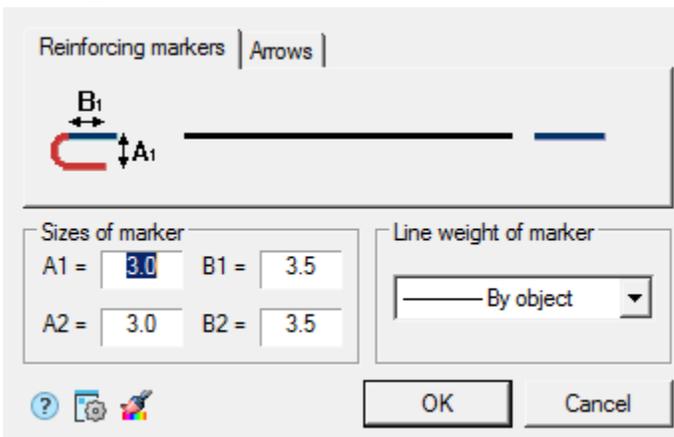
1. Call the command  "Anchor". A dialogue will open "End markers of lines".



2. In the "End markers of lines" dialog select the type of end markers and set their parameters. Click the "OK" button.
3. Specify the necessary lines or polylines in the drawing. "End markers" objects are created from from. Press the "Esc" key to end the circular mode for specifying objects.



## Dialog



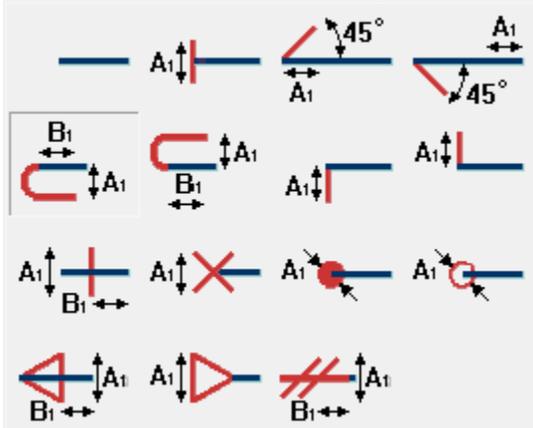
The "End markers of lines" editing dialog contains:

**The panel of tabs for selecting marker types.**

The "Reinforcing markers" tab allows you to define reinforcement markers.



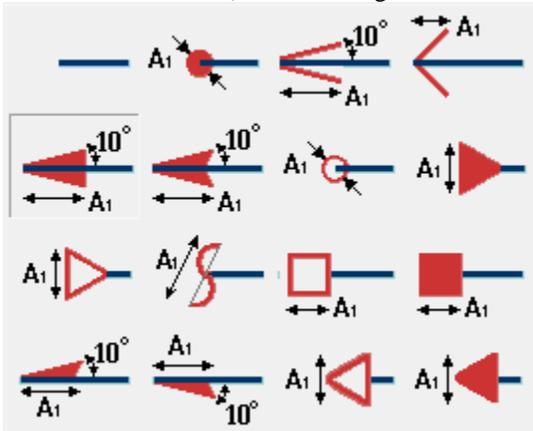
To change, select a marker for the first or second end of the segment by clicking on the graphics field (the button with the reinforcement marker image) and selecting one of the following options:



The "Arrows" tab allows you to define arrows.



To change, select the arrow for the first or second end of the line segment by clicking on the graphic field (the button with the arrow) and choosing one of the following options:



**"Size of marker" group**

Input fields "A1", "A2", "B1", "B2" - allow you to specify the corresponding sizes of markers in the current scale Construction 21. The fields used are indicated on the image of the markers.

**Group "Line weight of marker"**

Drop-down list "Line weight" - allows you to select the line weight of markers.

### Additional commands

The  "Copy Properties" button - allows you to copy the appearance of end markers and their dimensions from a line with reinforcement or arrow markers in the drawing.

## Hole group



Main menu: *Construction - Utilities* -  *Hole group*.



Ribbon: *Construction - Symbols* -  *Hole group*.



Toolbar: "Utilities") -  *Hole group*.

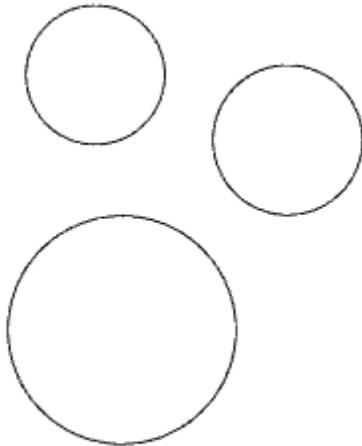


Command line: *SPFILL*.

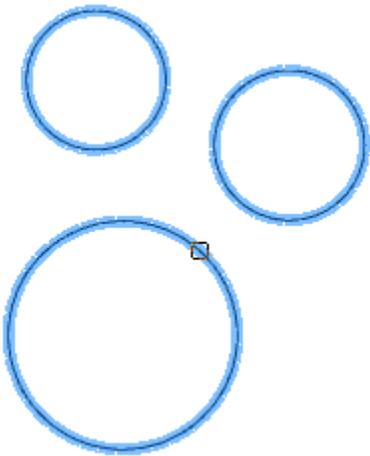
Universal command for drawing holes. With its help, you can draw a new hole with centerlines, or by specifying a group of holes to assign them general properties with filling of a sector.

## Procedure

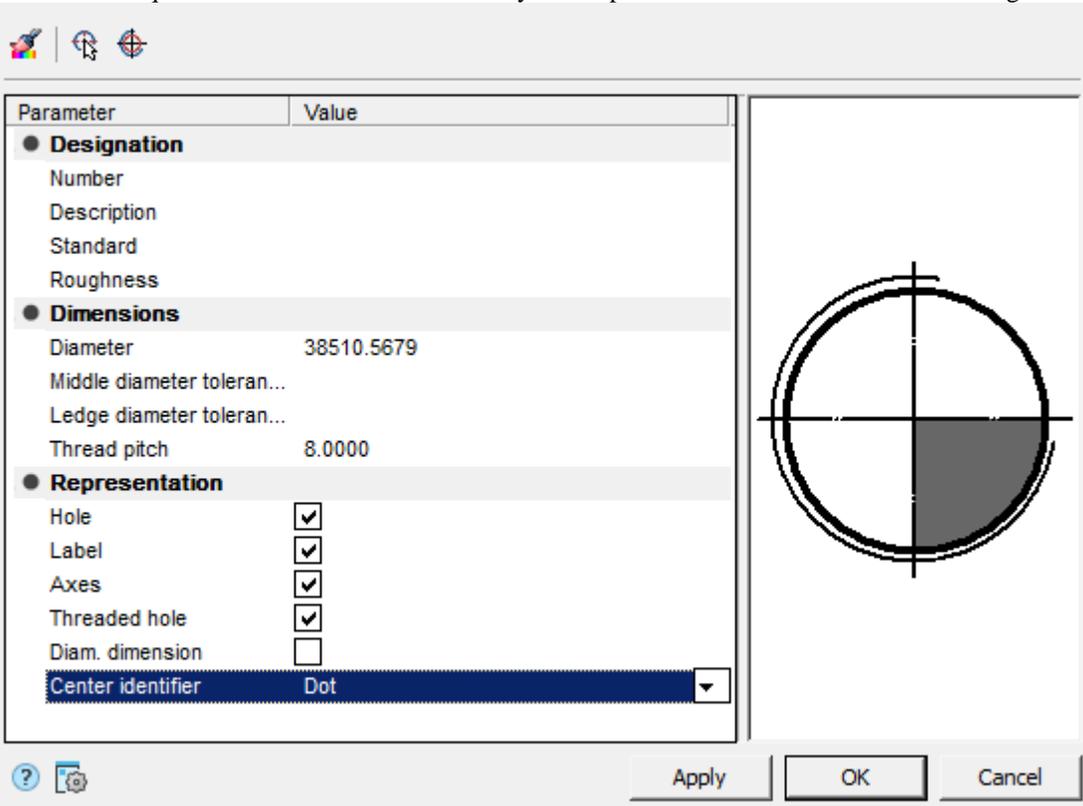
1. Draw holes from circles.



2. Call the command  "Hole group".



3. Select the required circles. Press the "Enter" key to complete the selection. The "Holes" dialog will open.

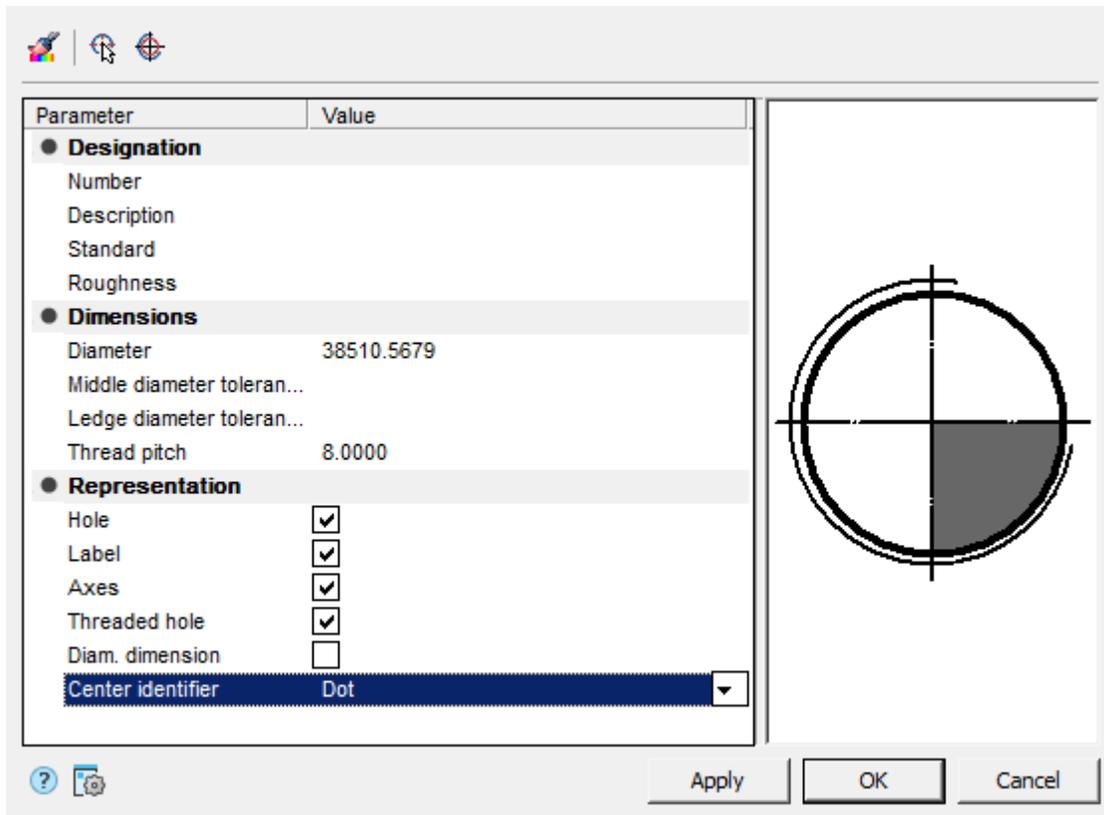


4. Adjust the hole settings and click "OK". The parameters will be applied to the holes. The holes will be created.



## Dialog

The "Holes" editing dialog is opened by double-clicking. The dialog consists of: Toolbar, Parameter List, Graphics Window.



### Toolbar

- Match properties* - this command allows you to copy parameters from holes already installed in the drawing.
- Select holes* - the command allows you to select additional holes from the drawing.
- Create holes* - the command creates holes of the specified diameter. To dynamically set the radius on the screen, hold down the left mouse button and move the cursor.

### Parameter List

#### Designation

- Number - specifies the number of the hole in the group.
- Description - specifies the hole table description field.
- Standard - sets the field to the standard of the hole table.
- Roughness - allows you to specify the roughness of the hole (displayed in the hole table).

#### Dimensions

- Diameter - hole diameter.
- Middle diameter tolerance - the "..." button opens the "Tolerances" dialog, from which you can select a tolerance.
- Ledge diameter tolerance - the "..." button opens the "Tolerances" dialog, from which you can select a tolerance.
- Thread pitch - hole thread pitch.

#### Representation

- Hole - hole display switch.
- Label - label display switch.
- Axes - axis display switch.
- Threaded hole - thread display switch.
- Diam. dimension - diametrical dimension display switch.

- Center identifier - drop-down list for selecting the hole center designation.

*Note:* Also, the parameters of the "Representation" section can be configured through the graphics window.

**Graphics Window**

The graphics window allows you to see the resulting hole representation and customize the representation by directly specifying elements.

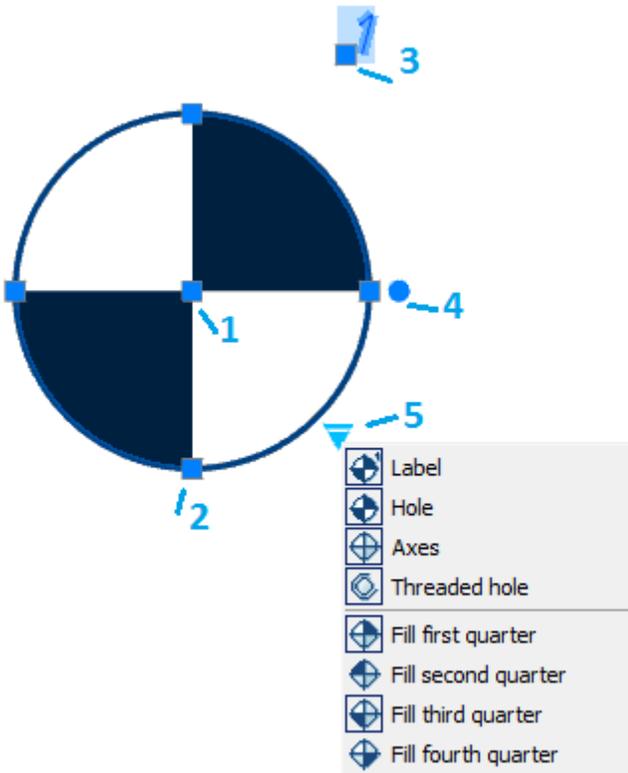
Threaded hole	Axes	Fill first quarter
Fill second quarter	Fill third quarter	Fill fourth quarter

**Properties**

The parameters on the "Properties" functional panel are similar to the parameters from the list of parameters of the "Holes" dialog.

**Grips**

1. Hole position change grip.
2. Diameter change grips.
3. Grip for changing the position of the hole number.
4. Hole rotation grip.
5. View adjustment grip.



### Static beam calculation



Main menu: *Construction - Utilits - Static beam calculation*.



Toolbar: *Calculation beams (toolbar "Utilits")*.



Command line: *SPBEAM*.



Library: *Calculations - Loads - Beam*.



Library: *Calculations - Loads - Calculations - Beam calculation (applied to the finished beam affixed to the supports, loads and moments, see. Calculation)*.

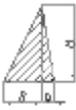
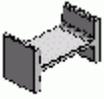
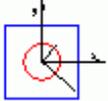
This command is used to calculate the strength of the direct beam of constant cross-section.

After selecting the command a dialog box opens *beam calculation*.

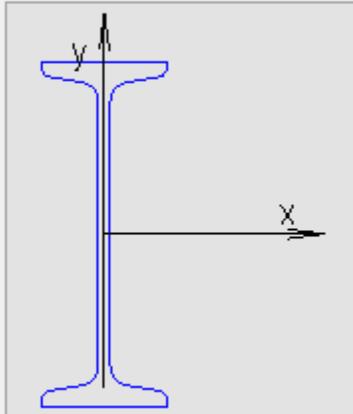
1. On the left side of the dialog box, select the *cross-section of the beam*.
2. Right set *sectional dimensions* and *length L beams*. For visual selection of the beam length, click  *Dynamic input* at the bottom of the dialog box.
3. Enter the *physical characteristics of the material* and the *cut rotation*.
4. Specify moment and the loads acting on the beam.

### Setting section

There are three ways to specify the section:

 <p>&lt; Triangle &gt;</p>	<p>Standard geometric cross section (e.g., triangle).</p>
 <p>GOST8239-89</p>	<p>Rolled metal base elements of Construction 21 (e.g, I-beam GOST 8239-89). To use the base when calculating the beams need to set a Class 725.</p>
 <p>&lt; New Selection &gt;</p>	<p>Arbitrary section defined by the user. Sizing is carried out in several ways:</p> <ul style="list-style-type: none"> <li>• Click inside the closed area. Automatically determined by the outer contour of the closed area and the region is added to the set.</li> <li>• Clicking on a closed polyline or circle. Added to the area bounded by a circle or polyline</li> <li>• Reselection area removes it from the set for the calculation of the cross section.</li> </ul> <p>After selection of the drawing section in the dialog box <i>Beam calculation</i> appears custom cross-section:</p>  <p>Section</p> <p>Change the name of the custom section by selecting it and clicking the left mouse button on the title. Delete a custom section of the list is made by pressing <i>delete</i>.</p>

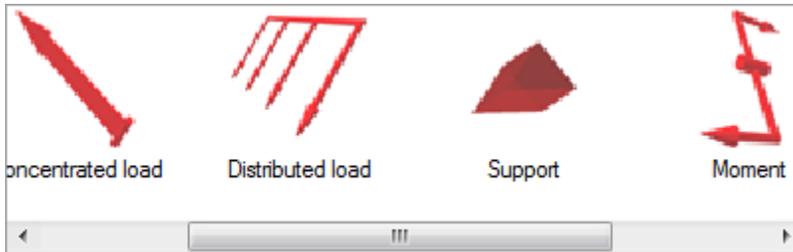
For the standard section of the database items, choose *Type size* from the dropdown list.



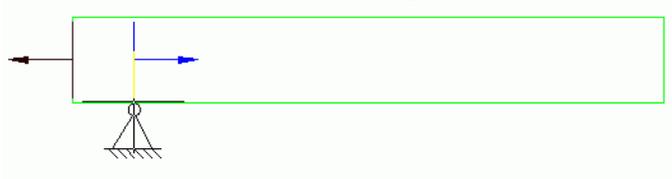
H =	<input type="text"/>	A =	<input type="text" value="2905.23"/>
h =	<input type="text" value="200"/>	Jx =	<input type="text" value="1.79776e+007"/>
B =	<input type="text"/>	Jy =	<input type="text" value="621635"/>
b =	<input type="text" value="73"/>	Jxy =	<input type="text" value="-1.10012e-008"/>
D =	<input type="text"/>	Wx =	<input type="text" value="179776"/>
d =	<input type="text"/>	Wy =	<input type="text" value="17031.1"/>
		Typesize	<input type="text" value="20C"/>
L =	<input type="text" value="143.052"/>	M =	<input type="text" value="3.24168"/>

**Beam Load and moments**

1. In the dialog box, double-click the desired *type of load* or *moment*.



2. Select *insertion point* or the load bearing on the beam. At the time of selecting the insertion point move the cursor to the beam to install dependencies.



3. Set the *parameters* or load bearing in the dialog box.

- **Support**

Point - the distance from the starting point to the point of insertion beam bearing in millimeters. Use keys to select the type of support.

- **Concentrated load**

Position - the distance from the starting point to the point of insertion beam load, mm.

Value - the value component of the load in the selected direction, H.

Point - the distance from the insertion point to the point of load application of the load in the selected direction, mm.

Diagram on the left side of the dialog box explains the meaning of the input parameter.

Tabs on the top of the window are used to select the coordinate system in which the values are set:

- Rectangular
- Spherical
- Cylindrical

- **Distributed load**

Position - the distance from the starting point to the point of insertion beam load, mm.

Length - length of the section, which is attached to a distributed force, KN/mm.

In input fields, set the value component of the load in the selected direction, H.

Diagram on the left side of the dialog box explains the meaning of the input parameter.

Tabs on the top of the window are used to select the coordinate system in which the values are set:

- Rectangular
- Spherical
- Cylindrical

- **Moments**

Diagram on the left side of the dialog box explains the meaning of the parameters.

X, Y, Z - the components of the bending moment , KN\*m.

C - distance from the starting point to the point of insertion beams torque , mm.

### Calculation

Click  **Calculate beam** at the bottom of the dialog box to perform the calculation.



Button  *Export diagrams*. Sell calculation results in a table in Construction Site 21. After selecting the command, specify the insertion point on the drawing table.

### Calculate section characteristics



Main menu: *Construction - Utilities -  Calculate section characteristics*.



Ribbon: *Construction - Library objects -  Calculate section characteristics*.



Toolbar:  *Calculate section characteristics (on toolbar "Utilities")*.



Command line: *SPGCS*.

This command is used to calculate the geometric characteristics of complex sections.

1. Select the command *Geometric characteristics of the section*.
2. In the figure, consistently *select an enclosed area* with one of the following:
  - Click inside the closed area. Automatically determined by the outer contour of the closed area and the region is added to the set.
  - Clicking on a closed polyline or circle. Added to the region bounded by a polyline or circle.
  - Reselection area removes it from the set for the calculation of the cross section.
3. *Make a selection* by clicking the right mouse button or press Enter.
4. Specify the drawing *table insertion point* with the calculated characteristics.

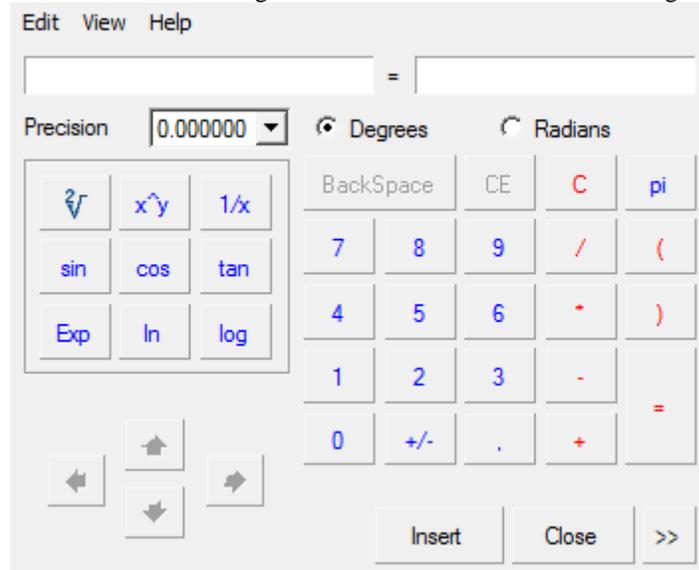
After calculation, the drawing object is added BuildIndustry containing circuit section and schematic representation of the principal central axes. Axes lengths proportional to the values corresponding axial moments of inertia.

### Calculator

The calculator is designed for complex mathematical calculations. The capabilities of the table and text editor are significantly expanded using the powerful functionality of the calculator.

The calculator is available in the table editor, text editor, when using the "Inquiry" utility in the "Value picker" dialog.

The "Calculator" dialog consists of a main menu and a set of grouped commands.



#### Main menu

- Edit

- Copy Ctrl+C - the command copies data from the input field.
- Paste Ctrl+V - the command pastes the copied data into the input field.
- View
  - NoteBook - command opens the notebook panel.
  - Degrees - the command switches the mode of calculating angles in degrees.
  - Radians - the command switches the mode of calculating angles in radians.
  - Expression - the command turns on the formula calculation mode. The input field is divided into two: on the left is the formula, on the right is the result.

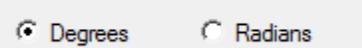


**Commands**

Drop-down list "Precision" - sets the rounding digit of the calculation result.



Switch "Degrees - Radians" - switches the angle calculation mode.



Group of buttons "Mathematical operations".



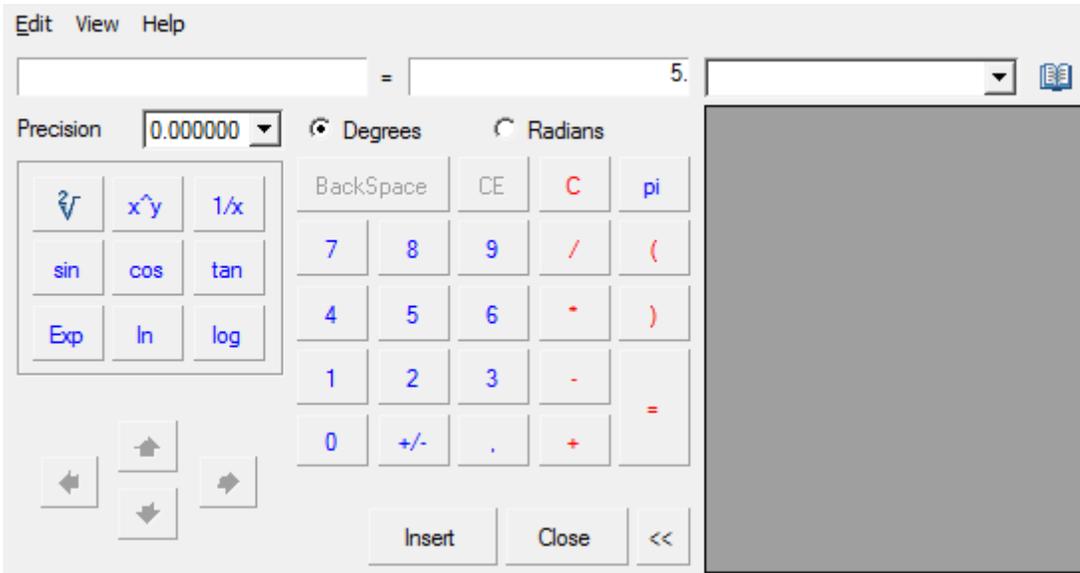
The main group of calculator buttons. The composition of the buttons is similar to all standard calculators.



Buttons for navigating table cells. Available when editing a table cell. It also shows the name of the currently edited cell.



Button  to open the "Notebook" sidebar. It is possible to connect the spreadsheet editor of the ["Notebook"](#) tool. The additional sidebar lists tables from the notebook in a drop-down list. After selecting a table, its composition will be displayed. Double-clicking on a value from the table adds this value to the input field. This tool is useful when you need to perform routine calculation activities frequently.

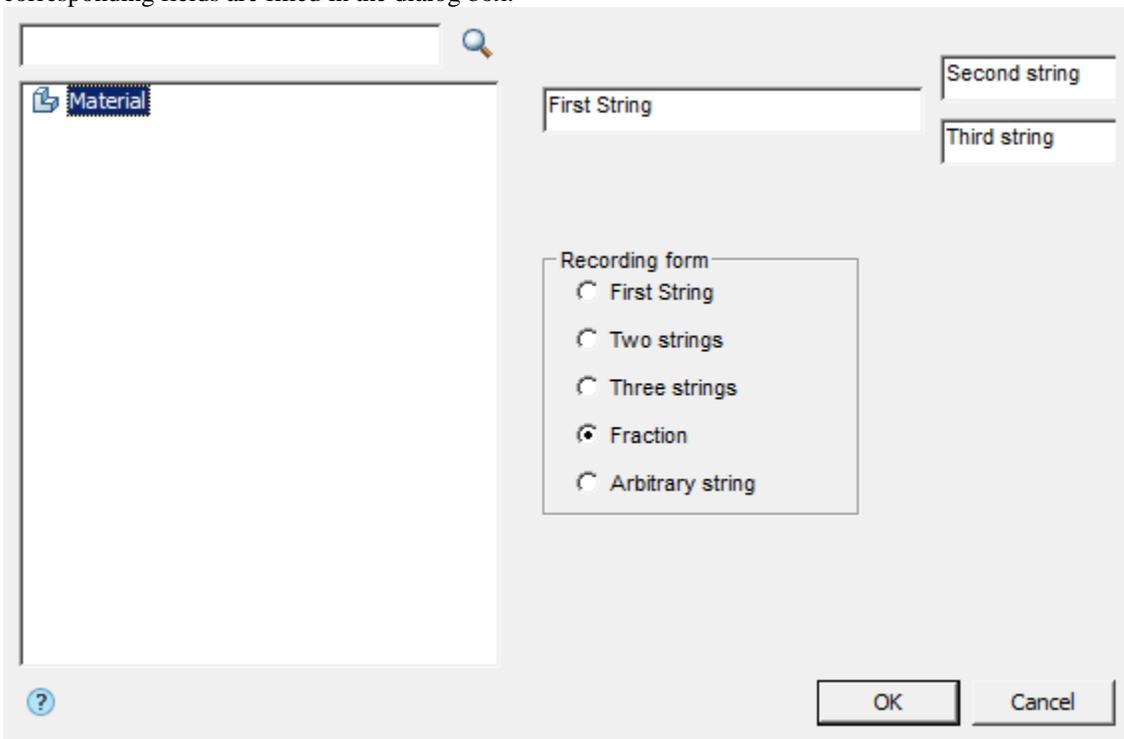


The "Insert" button is designed to insert the result of calculations from the calculator into an editable cell, a text entry field or the "Value picker" dialog.

The "Close" button closes the calculator dialog without transferring the value.

### ***Insert material designation to the table***

This tool is designed to insert into a table, notebook, technical requirements and technical characteristics of a formatted line-record for material and assortment. Pressing the button brings up the "Material" dialog box. The corresponding fields are filled in the dialog box.



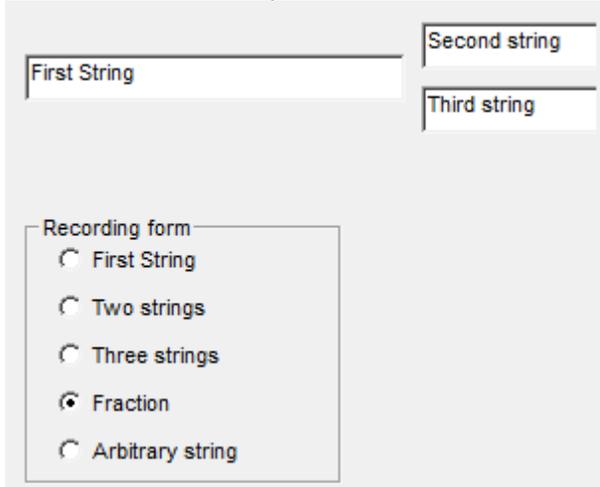
Material can be selected from the list, or entered manually.

*To add material manually, you need:*

1. Select the "Material" object from the list of materials.



2. Select the form of entry.

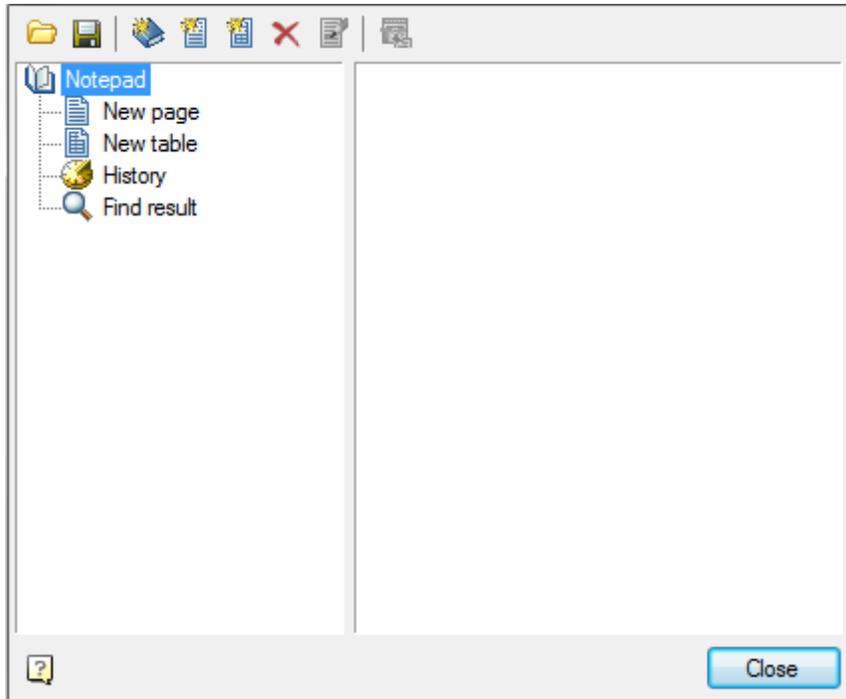


3. Fill in the required fields.
4. Confirm with the "OK" button. The material will be added.

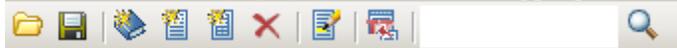
## **Notebook**

Button  *Notebook*

To enter recurring standard text expressions (abbreviations, symbols, etc.) used tool Notebook. This is a versatile tool for some editing tools Construction 21, which is necessary to enter text. Notebook combines the functions of: storing a set of expressions and the structure of their placement in a separate file, input and placement of text expressions, input and placement of small tables, searching and editing tools introduced earlier records.



Dialog *Notebook* divided into two parts. On the left side there is a tree structure of the notebook where the user selects the *sections* and *pages* notebook. In the upper part of the window control buttons notebook.



*Load from file*. Opens the notebook file stored on disk.

*Save*. Saves the changes to the file in your notebook.

***Important!*** Recommended that you save a new notebook in a separate file in the first call to the tool Notebook using the button *Save*.

To search for a text string in a notebook has a special search tool, Right-click on any section or page of the section and in the context menu, call the command *Find*. Found links are placed in the section *results*.

To accelerate the search procedure provided for viewing the latest expressions used in section *history*.

Management structure for the notebook with the buttons:

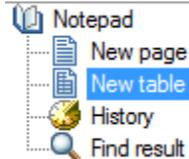
*Add a partition*

*Add this page*

*Add a table*

*Delete tree item*

In the notebook is allowed to create an unlimited number of sections and subsections, pages, and tables.



Moving sections, pages, and tables for structural wood can produce a drag and drop (drag and drop). Rename the selected section or page using the command Rename the shortcut menu.

 *Select / Copy the selected text.* Transmits the selected piece of text pages into editable table cell. If the tree structure of the selected page or table in your notebook, the contents displayed on the right side of the dialog. Highlight the desired entry cursor, and turn the Select / Copy the selected text.

 *Edit Page.* This button is used to activate the edit pages and style notebook. It becomes active only if the tree structure is selected page element or table. In edit mode, the tree structure becomes inactive, and the right side activates the Edit toolbar.

 *Editing tools page*

-  *Clear.* Clears the current page
-  *Load from file.* Allows you to import an existing text file \*.RTF MS Word.
-  *Save the file.* Allows you to record the content into a file \*.RTF for use in MS Word.
-  *Add item.*
-  *Remove the item .*
-  *Move up.*
-  *Move down.*
-  *Superscript.* Includes character mode superscript.
-  *Subscript.* Includes character mode subscript.
-  *Insert fraction.* dialog box set the numerator and denominator.  
Switch controls the display of the slash.

1

---

/

100

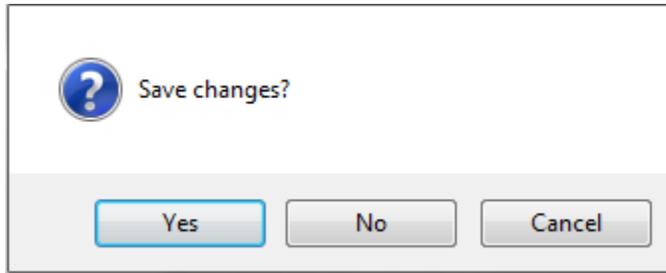
OK Cancel

-  *Insert tolerance.* Opens *Tolerances.*
-  *Insert material.* Opens material.
-  *Calculator.*

 *Tools for editing table*

-  *Insert Row.*
-  *Delete Row.*
-  *Insert Column.*
-  *Delete Column.*
-  *Rename column.* Opens Properties column in which you specify the width and title of the selected column.

After editing, when you exit the notebook dialog appears - prompted to save the changes in a notebook.



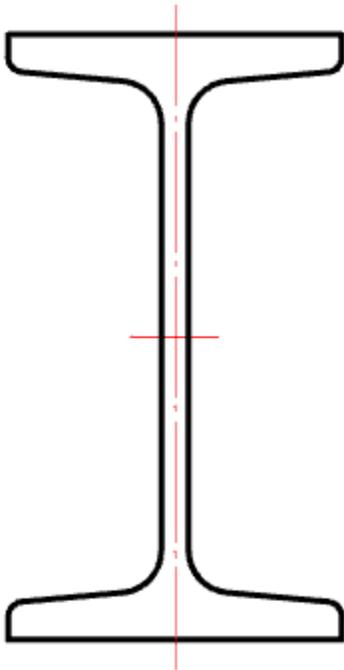
## Magnet

*Magnet* used to draw complex paths based on existing graphics. The contour can be constructed by points or by sequential indication of adjacent segments or arcs.

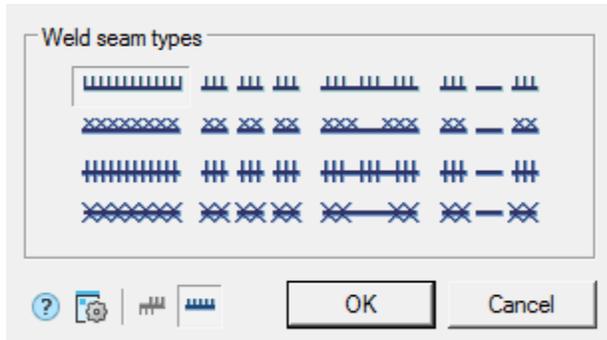
Called by:

- from the context menu ([Weld seam](#), [Simplified weld joint](#), [Bound forms](#))
- button  "Select contour with the magnet" in the dialog ([Area array](#)).

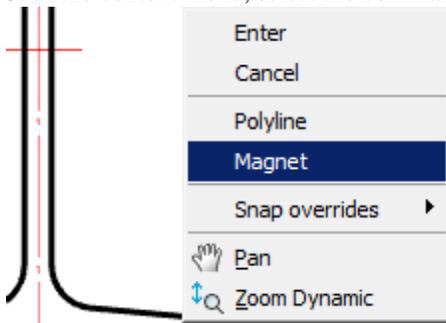
*An example of constructing a weld seam contour, based on an I-beam image inserted into the drawing*



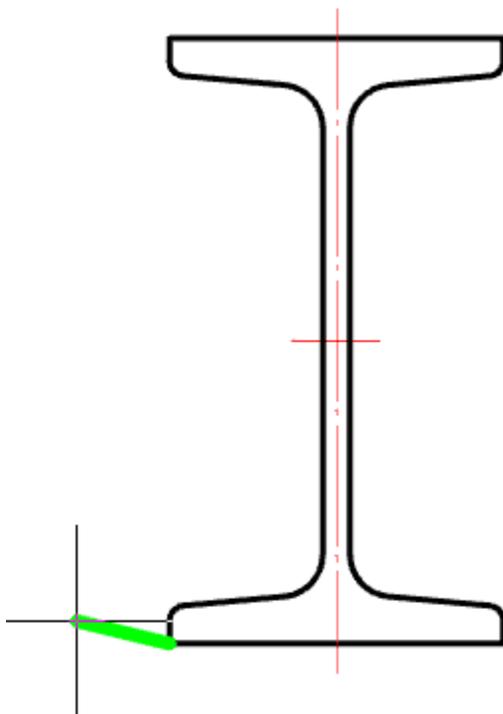
1. We call the command  "Weld seam". A dialogue will open "Weld seam".
2. Select the type of seam and click "OK".



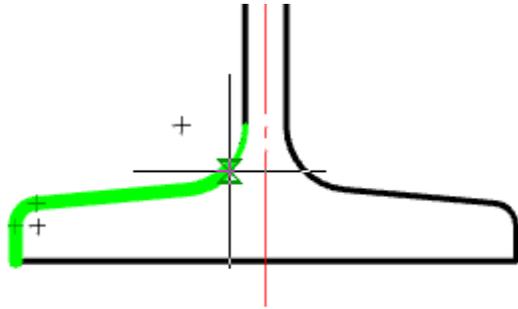
3. In the context menu, select the command "Magnet".



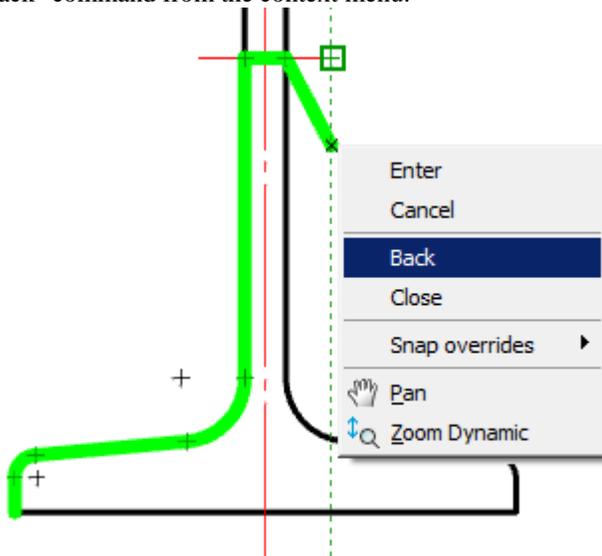
4. We indicate the starting point of the contour.



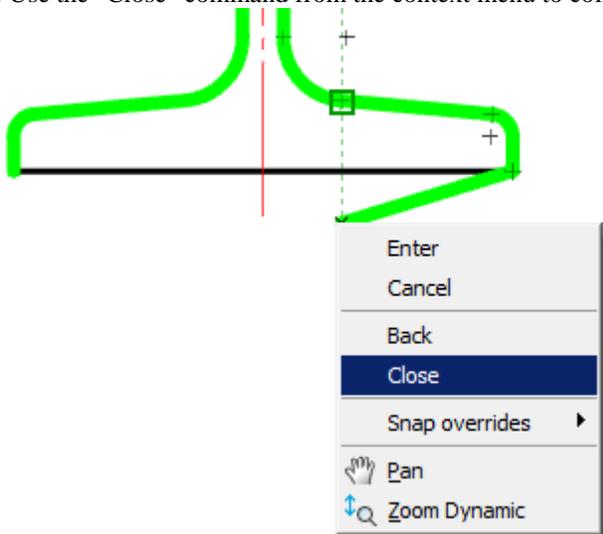
5. Sequentially move the cursor over the end points of the linear and arc sections of the I-beam contour.



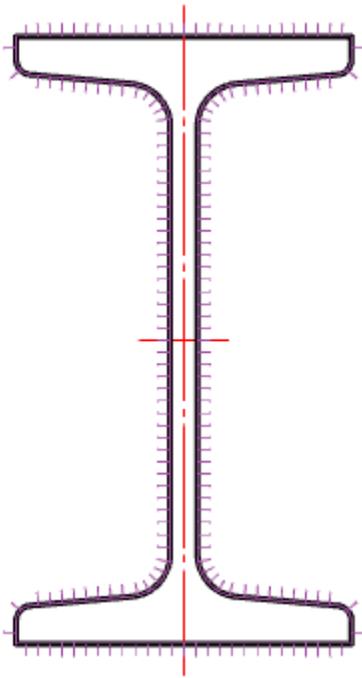
Deselection of the previous segment is made by re-pointing the cursor to the starting point of this segment or by the "Back" command from the context menu.



6. Use the "Close" command from the context menu to complete the construction of the closed contour.



7. The weld will be built along the specified contour.



## Editing

### *Editing*



Main menu: *Construction - Edit -  Edit...*



Ribbon: *Construction - Utilities -  Edit...*



Toolbar:  *Edit...* ("Edit").



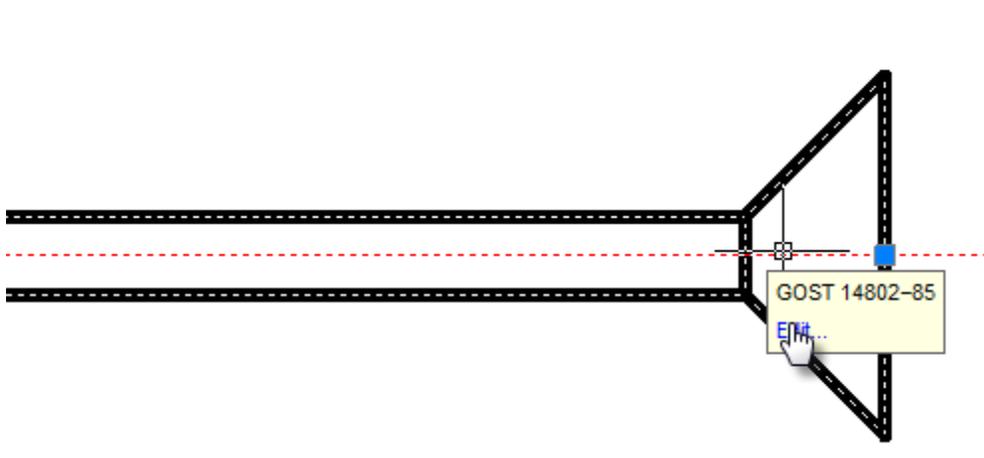
Context menu: *Edit (on select object)*.



Command line: *SPEDIT, EDIT*.

Editing Building Ground21 - objects can be made in the following ways:

- right-clicking and selecting *Edit* Edit from the context menu;
- double-clicking the left mouse button on the Construction 21 - object. This method is specified in the [settings](#);
- with "grips";
- calling on the Edit tooltip that appears when you hover the cursor over an object:



- properties dialog box (properties);
- standard commands Erase (ERASE), Move (MOVE), Copy (COPY), Rotate (ROTATE), Stretch (STRETCH).

### ***Edit in-place***



Main menu: *Construction - Edit -  In-place edit.*



Ribbon: *Construction - Utilities -  In-place edit.*

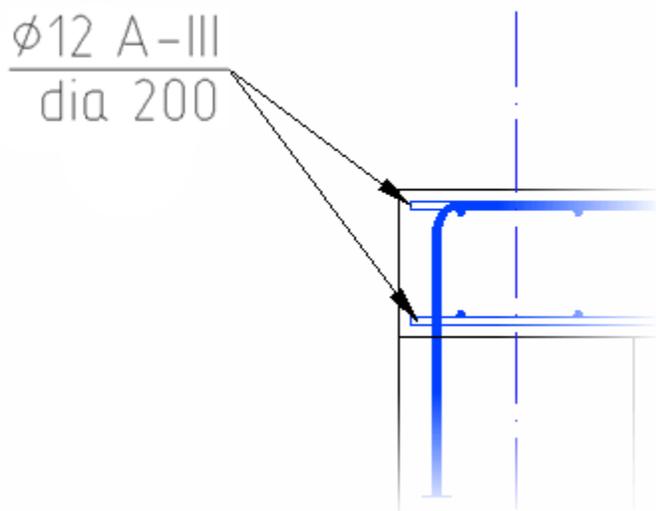
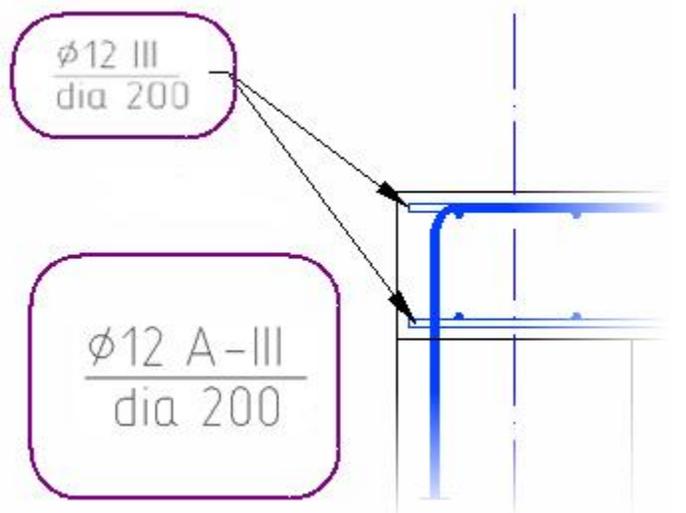


Toolbar:  *In-place edit* ("Edit").



Command line: *SPIEDIT, IPEDIT.*

Command allows you to edit the drawing objects Construction site containing text. Editing can be done on site by clicking the left mouse button while pressing Ctrl.



## Group Edit



Main menu: *Construction - Edit -  Group edit.*



Ribbon: *Construction - Utilities -  Group edit.*



Toolbar:  *Group edit* ("Edit").



Command line: *SPEDITGROUPS.*

The command allows you to edit [bolted](#) or [riveted](#) connections.

- Click on the button  *Group edit*;
- Select any item in the drawing either a bolted or riveted joint;

In the window that opens, make the necessary changes.

Furthermore, editing group Construction 21 - objects can be produced by double-clicking the left mouse button on the axis of the assembly.

## Regenerate



Main menu: *Construction - Edit - Regenerate.*



Ribbon: *Construction - Utilities - Regenerate.*



Toolbar: *Regenerate* ("Edit").



Command line: *SPREGEN, REGEN.*

- Updates the object's Construction
- Recalculates the table
- Updates overlapping objects
- Automatically updates the calculated values of the attributes

## Explode all



Main menu: *Construction - Edit - Explode all objects.*



Ribbon: *Construction - Utilities - Explode all objects.*



Toolbar: *Explode all objects* ("Edit").



Command line: *SPEXPLODEALL, EXPLODEPDEALL.*

Explodes all objects of Construction into drawing primitives.

## Explode primitives



Main menu: *Construction - Edit - Explode All Primitives.*



Ribbon: *Construction - Utilities - Explode All Primitives.*



Toolbar: *Edit - Explode All Primitives.*



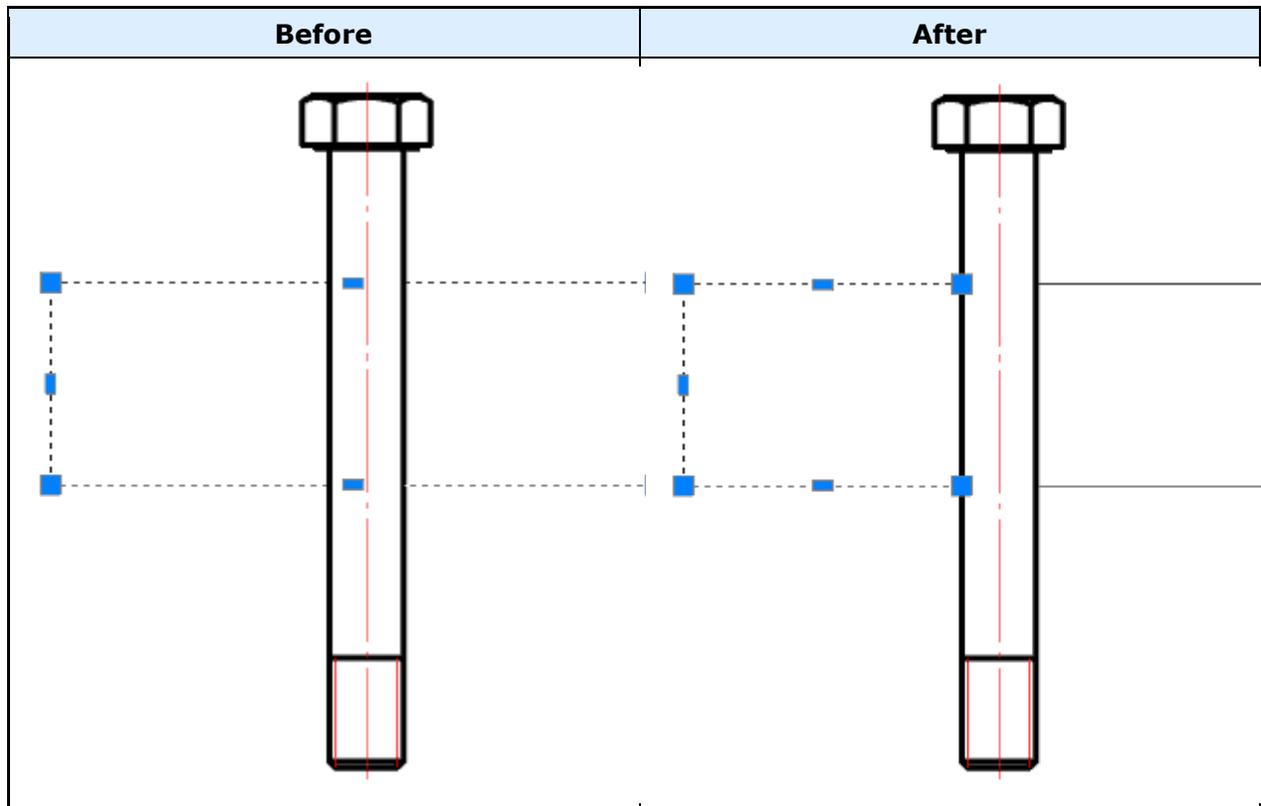
Command line: *SPEXPLODEPSEUDO, EXPLODEPSEUDO.*

Explodes Primitives and Pseudo-Primitives that are generated when nanoCAD graphics are overlapped by objects Construction .

## Procedure

1. Call the command.
2. Confirm the layout of the primitives.
3. The primitives will be broken.

Before	After
--------	-------



### Export drawing file



Main menu: *Construction - Edit - Export to file.*



Ribbon: *Construction - Utilities - Export to file.*



Toolbar: *Export to file ("Edit").*



Command line: *SPEXPORTTOFILE.*

Saves selected objects in the drawing file.

1. Click *Export to file*
2. Select the drawing objects
3. In the dialog box, *type* the required settings drawing
4. Click *OK*
5. In the dialog box, specify a name for the drawing, and then click *Save*

### Parameters Redefinitions



Main menu: *Construction - Edit - Parameters redefinition.*



Ribbon: *Construction - Utilities - Parameters redefinition.*



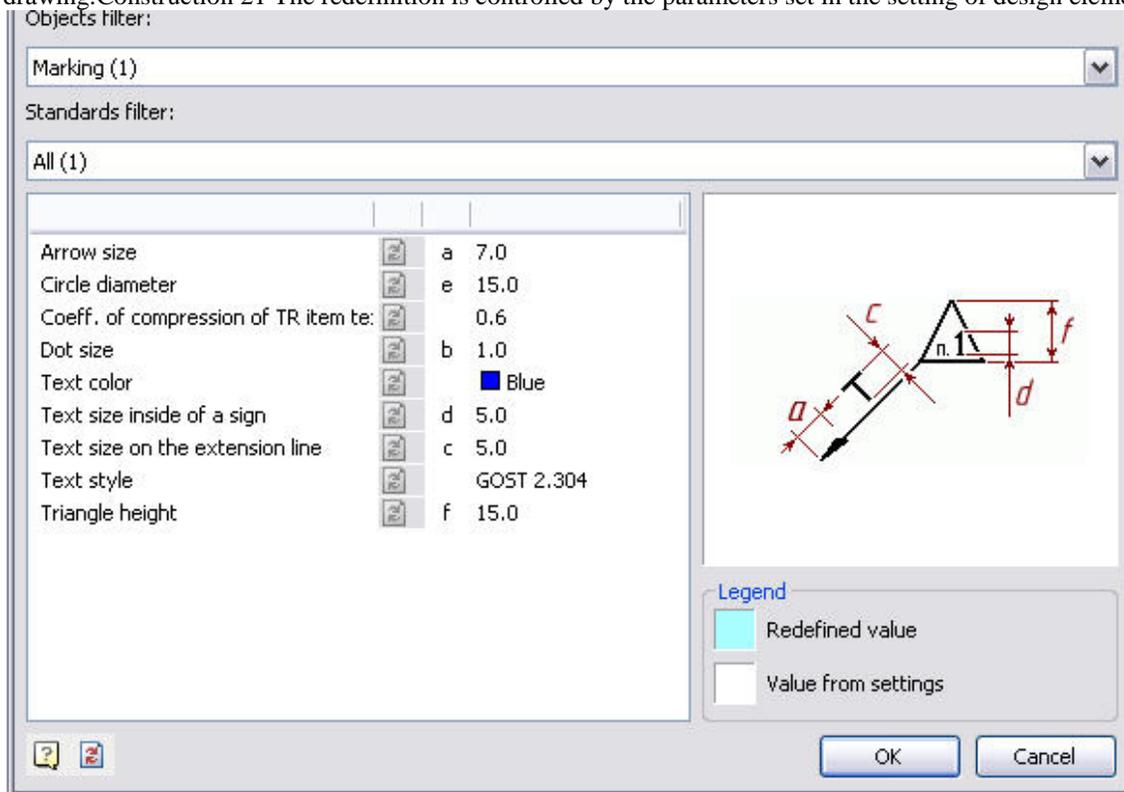
Toolbar: *Parameters redefinition ("Edit").*



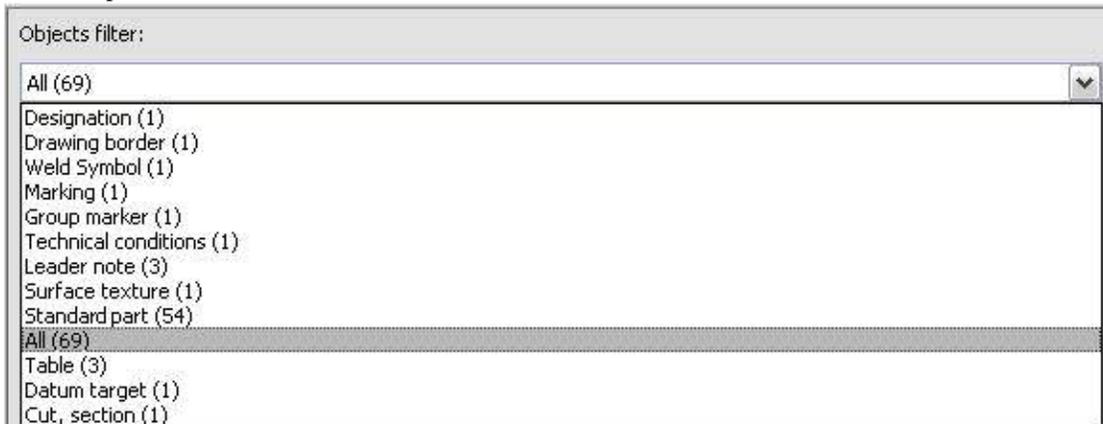
Command line: *SPPR, PR.*

## The basic rules

This command is used to define the variations of the wiseMechanical design objects settings in the current drawing. Construction 21 The redefinition is controlled by the parameters set in the setting of design elements.



The objects are grouped by types in the dialog. The objects parameters are grouped by name. To set the parameters or Redefinition removal filter lists are:



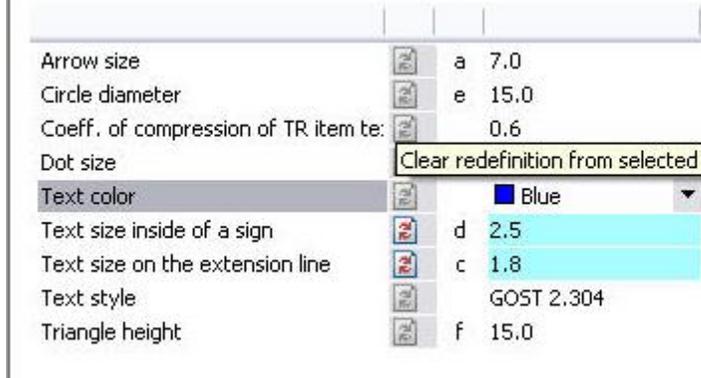
If any type is selected in the parameters table, the parameters list concerning the given type is displayed. The standard filter list allows specifying different settings for single objects created by a different design standard.



If you select "All" standards - the changes will be applied to all objects if you select only one of the standards (eg GOST), the changes will only be used for objects belonging to the chosen standard.

## Command Options

If an object type is selected, its properties will be displayed in the parameters table.



Redefined parameters are shown in blue. To remove the overriding need to press the  opposite setting. In addition, you can manually specify a new value for the selected parameter. If the new value is the same default, the blue light will not be displayed. If the selected object group only some entries have the override, the backlight will override the diagonal.



To remove the override all objects need to click on the  bottom left of the dialog.

## Action sequence

To change the settings of one or more design elements, you must:

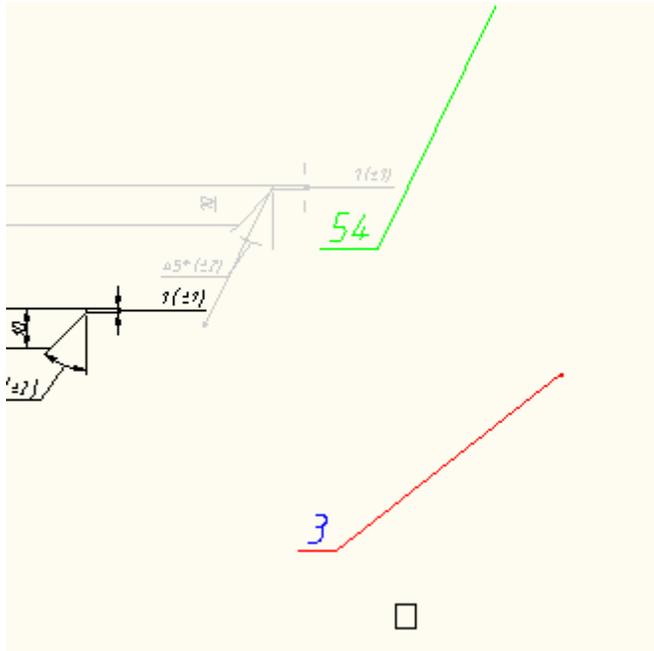
- Select objects
- Choose the parameters redefinition command from the content menu.

Next, in the dialog box to specify the new settings data display objects. Changes apply only to the selected objects.

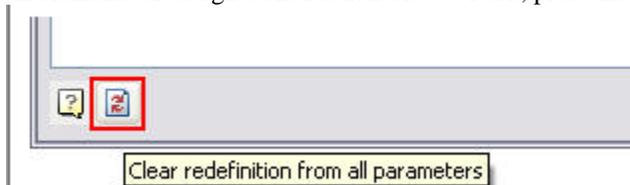
Change the parameters of objects can also be by a separate command  *Parameters redefinitions*.

## Checking the settings of design elements

To verify the design elements specify the settings, you must run the  *Parameters redefinition*. It is proposed to select the objects that will be exposed to the command.



When you press the Enter will select all elements of design Construction Site 4. When you press the Enter will select all elements of design Construction Site 4 . Next, press the button *Clear redefinition from all parameters*

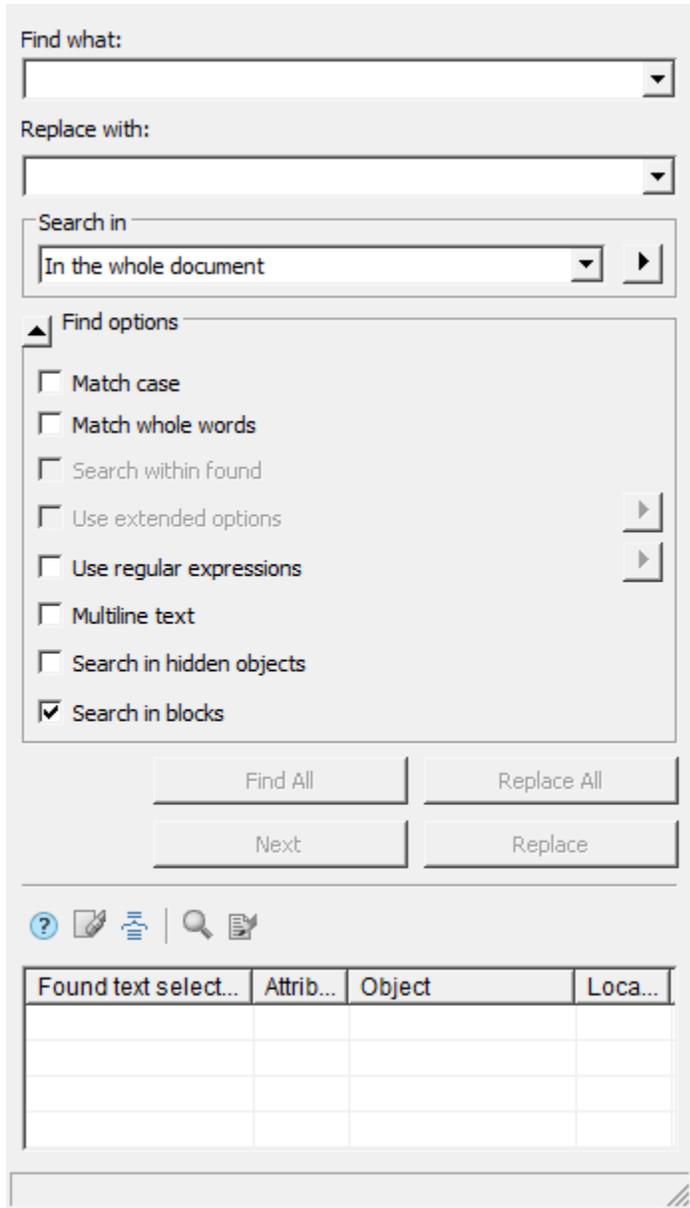


The result is a document issued in accordance with the settings specified in the enterprise (in terms of elements Construction 21).

## Find and Replace

-  Main menu: *Edit - Find and Replace...*
-  Main menu: *Construction - Edit - Find and Replace...*
-  Ribbon: *Construction - Utilities - Find and Replace...*
-  Toolbar: *Edit - Find and Replace...*
-  Command line: *SPFIND, FIND.*
-  Shortcut: *Ctrl+F.*

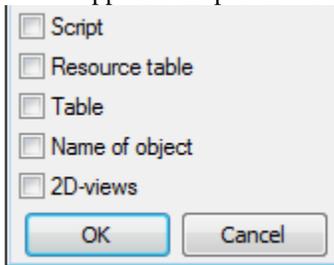
The "Find and Replace" tool is used to find and replace string values in Construction 21 objects in a drawing or in an object base.



## Search

1. Call the command. A dialogue will open "*Find and Replace*".
2. In the "*Find what:*" field, enter the search phrase.
3. Select "*Search in*" from the list, or by using the additional button  that defines the search area. The button action depends on the context of the "*Find and Replace*" command call. If the command is called from the object manager, the "[Quick selection](#)" window opens.
4. Select search parameters :
  - *Match case*. If the flag is set, the search is case-sensitive.
  - *Match whole words*. If the flag is set, the search is performed for individual words, that is, combinations of characters separated by punctuation marks or spaces.

- *Search within found.* The switch is available after the string has been searched and limits the search range.
- *Use extended options.* The switch is available when searching in the object database. Click the button  opposite the parameter and in the window that appears, select the advanced search areas.



- *Use regular expressions.* Enables search mode with additional selection conditions. Click the button  opposite the parameter and select the required expression from the list that appears. When you hover over a list item, a tooltip appears with a detailed explanation. The choice of expression is made with the left mouse button. Multiple regular expressions can be used together.

\	Marks the next character as either a special character or a li...
^	Matches the beginning of input.
\$	Matches the end of input.
*	Matches the preceding character zero or more times. For e...
+	Matches the preceding character one or more times. For example, "zo+" matches "zoo" but not "z".
?	Matches the preceding character zero or one time. For exam...
.	Matches any single character except a newline character.
(Pattern)	Matches pattern and remembers the match. The matched ...
(?:Pattern)	Matches pattern but does not capture the match, that is, it...
(?=Pattern)	Positive lookahead matches the search string at any point ...
(?!Pattern)	Negative lookahead matches the search string at any point...

- *Multiline text.* Turns on the search mode for multi-line text.
  - *Search in hidden objects.* Turns on the mode when both visible and hidden objects are searched.
  - *Search in blocks.* Turns on the mode when the search is carried out inside the blocks.
5. Click the "Find all" button, the search process will start.
  6. The search result will be displayed in the table.

### Search result

The search result is displayed in the table. Data is sorted by mouse click in the column header. The "Next" button allows you to move the active row in the table.

Found text chunk	Attribute	Object
electrode, additional wire	String 1	Leader note
1. electrode, additional wire	Text1	Technical conditions

The table has additional commands:

-  *Clear all* - clears the search result list.
-  *Group results by objects* - displays results for objects.
-  *Show object* - shows the object corresponding to the selected row in the drawing. The object is shown even if it is on an inactive sheet.
-  *Edit object* - opens a dialog box for the object corresponding to the selected row.

## Replace

1. Search for objects to replace.
2. In the "Replace with" input field, enter the text string to replace the found lines with.
3. Click the "Replace" or "Replace All" button:
  - The "Replace All" button replaces all found fragments with a new value.
  - The "Replace" button starts the process of successive replacement of the found fragments. To replace all found fragments, press the "Replace" button each time, while the active line will move through the table below. The "Next" button allows you to move the active row through the table, skipping the next found fragment in the list without replacing it with a new value.

## Quick selection



Main menu: *Construction - Edit - Quick selection.*



Ribbon: *Construction - Utilities - Quick selection.*



Toolbar: *Edit - Quick selection.*

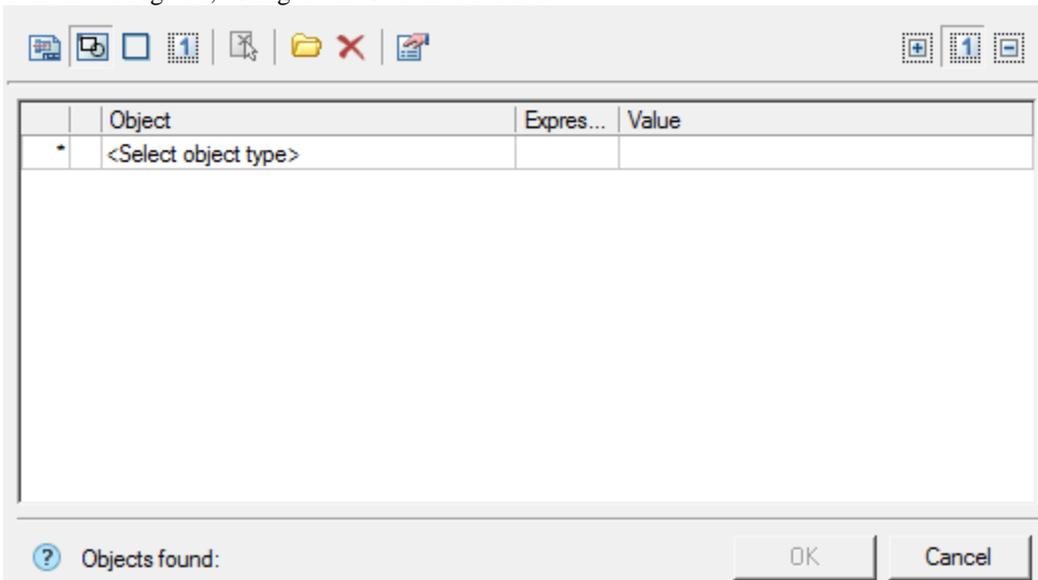


Command line: *SPQS, QS, QSELECT.*

The "Quick selection" tool is used to select the Construction 21 objects inserted into the drawing according to certain conditions.

## Procedure

1. Call the command.
2. In the dialog box, configure the search conditions.



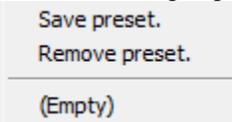
3. Confirm the setting with the "OK" button. The objects in the drawing are selected according to the search conditions.

## Dialog

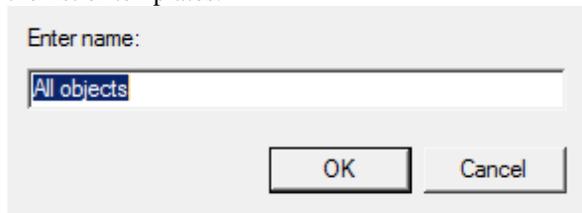
The dialog box consists of a toolbar and a list of search conditions. At the bottom left of the dialog, the number of objects found according to the specified search conditions is displayed.

**Toolbar**

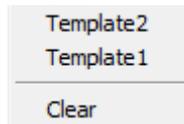
- *Selecting an object search area.* The choice of the search area is carried out using the modes:
  - *In the whole document* - selection of objects is carried out in the column of the list of conditions "Object", the list of objects is taken from the entire drawing;
  - *In the current space* - selection of objects is carried out in the column of the list of conditions "Object", the list of objects is taken from the current sheet;
  - *In bounding box* - objects are selected by specifying a rectangular area in the drawing, to redefine the area, use the command *Set selection*;
  - *In current selection* - objects are selected by specifying a set of objects in the drawing, to redefine a set of objects, use the command *Set selection*;
- *Selecting a method for adding found objects.* The choice of the method of adding is carried out using the modes:
  - *Set result to new selection* - objects matching the search conditions will be selected in the drawing, and all other objects will be deselected;
  - *Add result to selection* - the found objects will be added to the objects already selected in the drawing;
  - *Subtract result from selection* - found objects will be deselected if they were selected.
- *QS Params.* Opens a dropdown menu:  
*Include Frozen and Invisible layers* - the switch determines whether to search for objects on frozen and hidden layers. Does not search by default.
  - *Set selection.* The command allows you to override a set of objects or a rectangular area. Available for "In bounding box" or "In current selection" modes.
  - *Presets.* Opens a dropdown menu. Using the set of tools included in this command, you can select objects according to previously established and saved conditions:



- *Save preset*  
 Opens a dialog box in which the name of the template is entered, after which the template is added to the list of templates.



- *Remove preset*  
 Opens a dialog box in which a template is selected to be removed from the list, or the entire list is cleared.



- *List preset*  
The list displays all saved templates. If the list is empty, "(Empty)" is displayed.

Save preset.
Remove preset.
Template1
Template2

-  *Reset conditions.* The command clears the list of conditions.

**List of conditions**

The list of conditions consists of three main columns:

- "*Object*" - displays objects and their parameters. If you selected the search area "*In the whole document*" or "*In the current space*" you must add objects yourself. In the "*Object*" column, select the desired type of object from the drop-down list of the cell. To deselect or remove an object from the table, select the "-None-" value.

	Object	Expres...	Value
✓	All objects		Selected: 0 (from 0)
-	-None-		
	All objects		
	-None-		

- "*Expression type*" - a comparison operator is assigned to object parameters. Each type of object has its own parameters for which conditions are set.

	Object	Expression type	Value
☐	✓ All objects		Selected: 4 (from 4)
	Colour		
	Hyperlink		
	Layer		
	Line Weight		
	Linetype		
	Linetype Scale		
	Thickness		
	Transparency		
-	<Select object type>		

Possible operators:

- = - equally;
- != - not equal;
- <, > - less - more;
- >=, <= - no less, no more;
- *Like* - substring search. According to this condition, all objects are selected for which the parameter value contains the substring indicated in the "*Value*" column.
- *Unlike* - substring search. According to this condition, all objects are selected for which the parameter value does NOT contain the substring indicated in the "*Value*" column.
- "*Value*" - indicates the value by which the selection will be made. The value can be text, numeric, or selected from the drop-down list.

## Viewport context toolbar

Context menu viewport appears when you right-click in the space of *Layout*.



 *Activate the form*. Opens in model space viewport.

 *Update dimensions*. Sets the scale size of the form in accordance with the layout space.

 *Cut viewport*. Overrides viewscreen on existing polyline or build a new one when you select the context menu option *Polygon*.

 *Fix view*. Commits scale and position relative to the model space viewport.

 *Fit all*. fits into the viewport model space objects.

 *M1.724...* *Select scale*. Opens the context menu to select the viewport scale.

## MechWizard

### ScriptMaster



Main menu: *Construction - Library objects - MechWizard - ScriptMaster*.



Ribbon: *Construction - MechWizard - ScriptMaster*.



Toolbar: *MechWizard - ScriptMaster*.



Library: *Context menu command "Open with ScriptMaster" on any element library*.

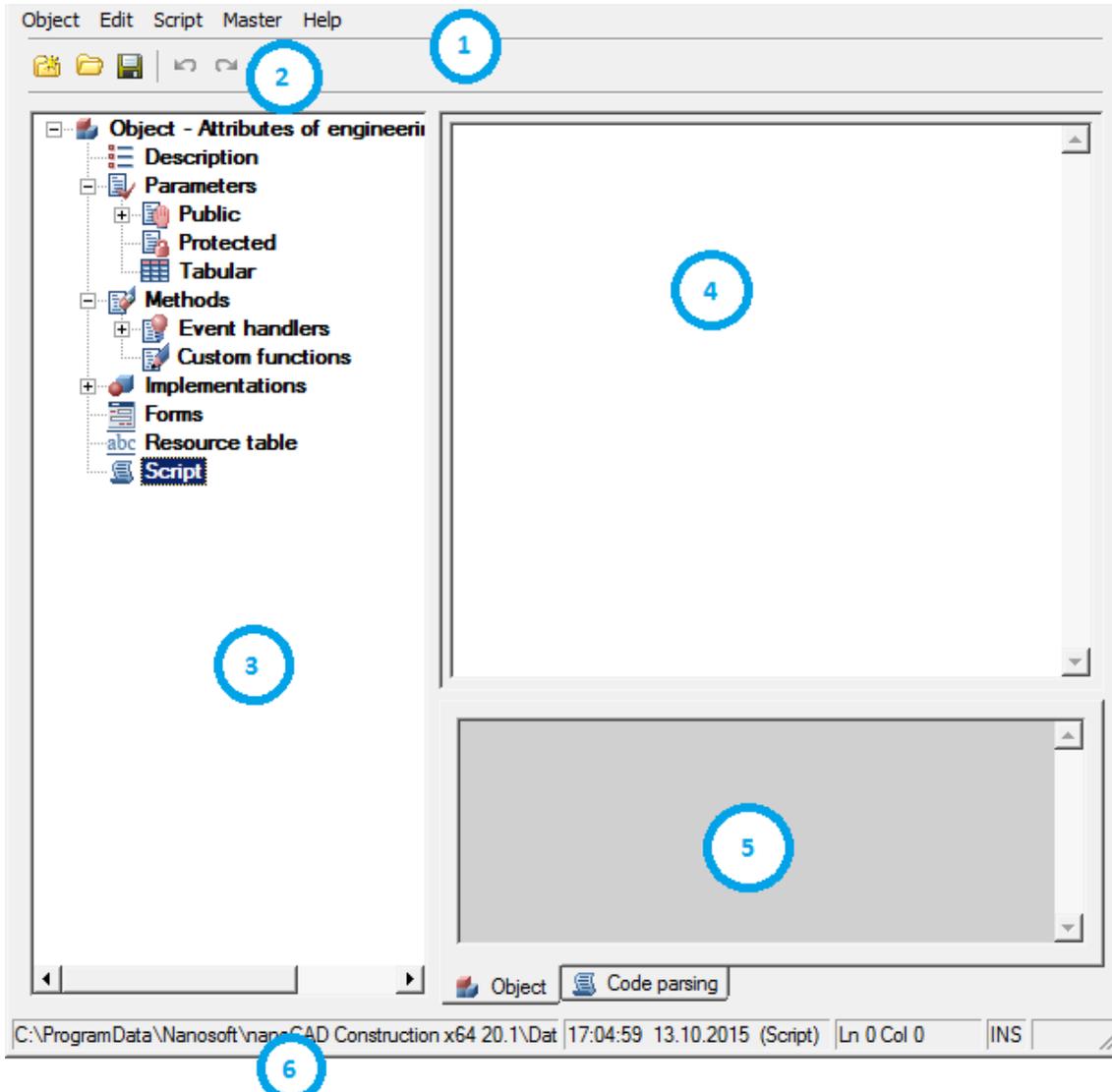


Command line: *SPSMaster*.

The command opens "*ScriptMaster*" for creating and editing a database object.

### Dialog

The title of the current element is indicated in the headers of the "*ScriptMaster*" dialog. An "\*" signifies that unsaved changes were made to the item.



1. Main menu. Contains all commands for creating and editing objects and scripts. Contains sections:
  - [Object](#)
  - [Edit](#)
  - [Script](#)
  - [Master](#)
2. Toolbar. Contains basic commands for creating and editing objects.
  - "New object". The command opens a dialog for creating a new base element.
  - "Open". The command is designed to select another element from the base.
  - "Save". The command saves changes to the current object.
  - "Undo". The command cancels the previous action.
  - "Redo". The command redo the last undone action.
3. [Object tree](#). In the object tree, you can navigate through the object properties and manage them through the context menu.
4. Workspace. The script and table, as well as other properties of the object are edited in the work area.
5. Notification area. The results of the script check and search / replacement are displayed in the notification area.

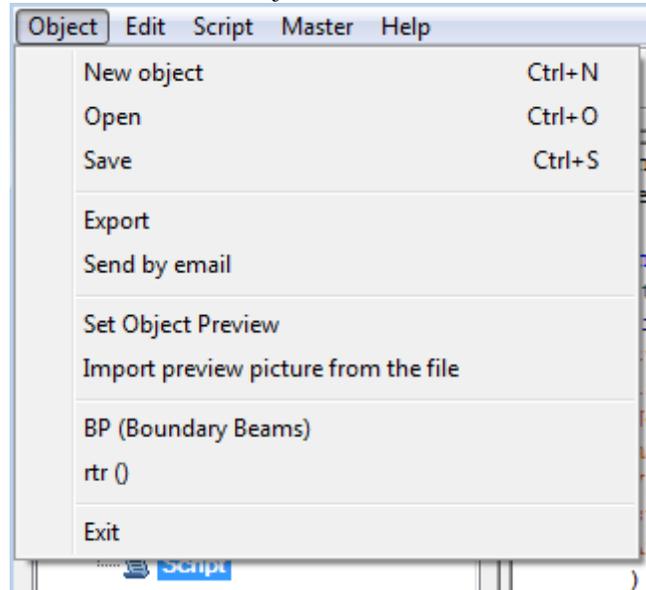
6. Status bar. The status bar displays the current state of work with the object:

- Setting the path to the current database;
- Current cursor position;
- Edit state - insert or replace;
- Script sign for reading or editing.

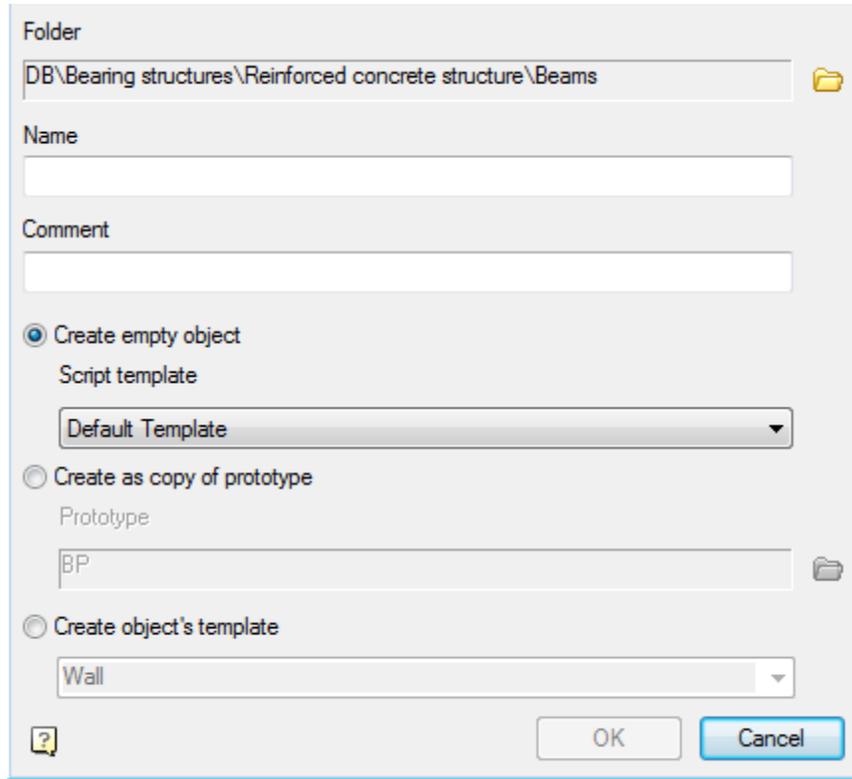
## The menu bar

### Object

Menu item *object* allows it to work with database objects in Construction 21:

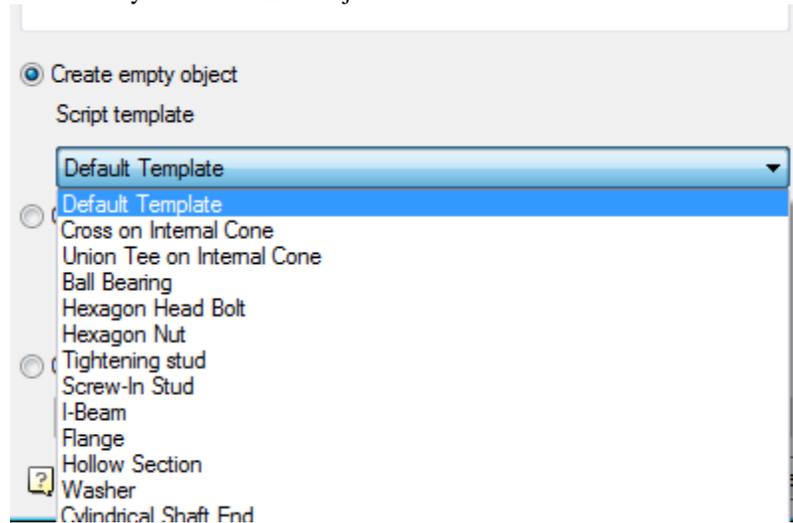


*Object* - creates a new element base (By pressing keys *Ctrl+N* or clicking on the icon  *Create* on the toolbar). After issuing this command, a dialog box appears to *New object*



To create a new object, you must specify:  
**Folder** in which to save the new object  
**Name** (will be displayed in the browser)  
**Comment** (will be displayed in the tooltip)

Select a way to create a new object



*Create an empty object* - creates a table and designs without having one script selected from the template.  
 Default template - empty script.

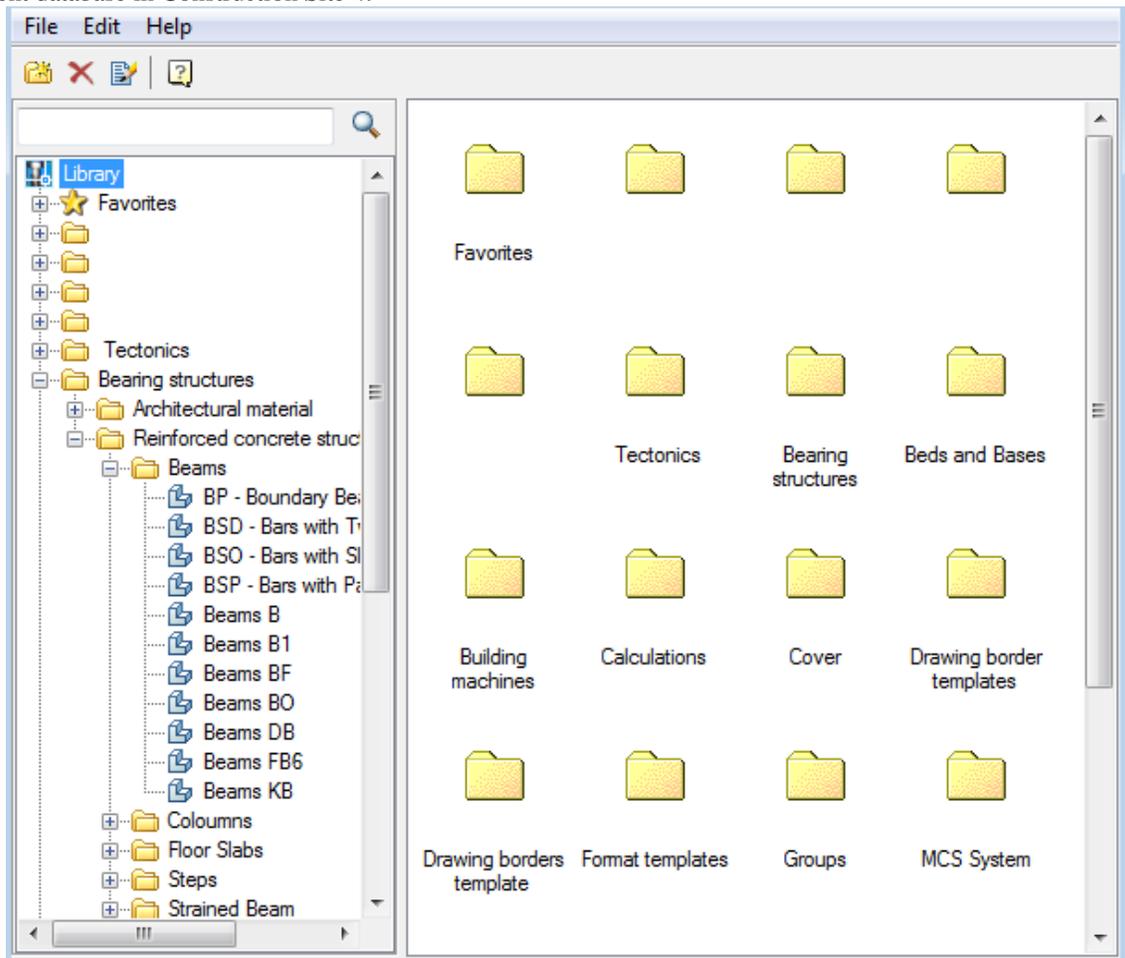
Create as copy of prototype - creates an object by copying the entire prototype object (along with the script, tables, performances and three-dimensional models).



Use the button  to select an object to create a prototype object.

*Open* - Open an existing part (keyboard shortcut *Ctrl+O* or icon  *Open* on the toolbar).

After selecting the command, a dialog box appears *Select the details* allowing you to select or find the item in the current database in Construction Site 4.



*Save* - save changes to the current member base (keyboard shortcut *Ctrl+S* or icon  *Save* on the toolbar).

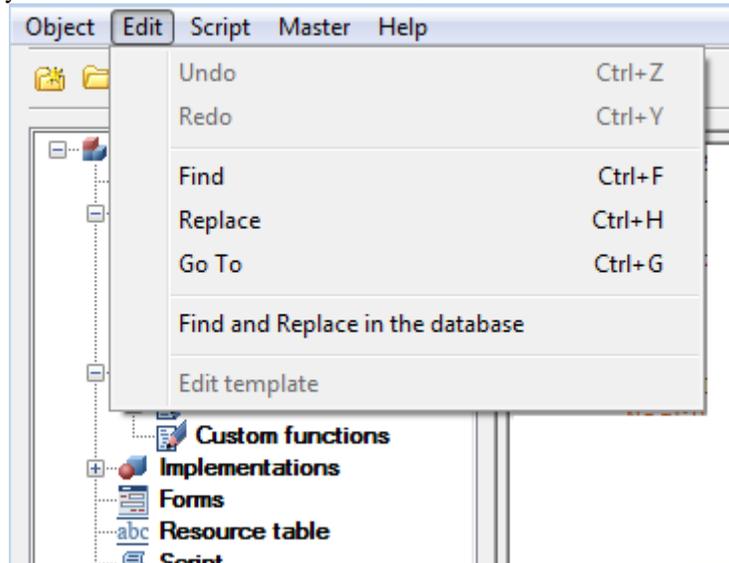
*Set object preview* - allows you to set as a preview for the object in the browser database objects nanoCAD.

*Exit* - close Master objects

In paragraph *object* available list of recently used items.

## Editing

Menu item *Edit* allows you to work with the current database Construction 21:



*Undo* - cancel the last action (promptness pressing keys *Ctrl+Z* or clicking on the icon  *Undo* on the toolbar).

*Redo* - undo the last action (promptness pressing keys *Ctrl+Y* or clicking on the icon  *Repeat* on the toolbar).

*Find* - search for a given string on the script of the current element (promptness keys *Ctrl+F*).

Calling this command opens a dialog box *Find*



Looking provided an opportunity to take into account only whole words and case search string using by appropriate switches.

Also have the opportunity to select the search direction.

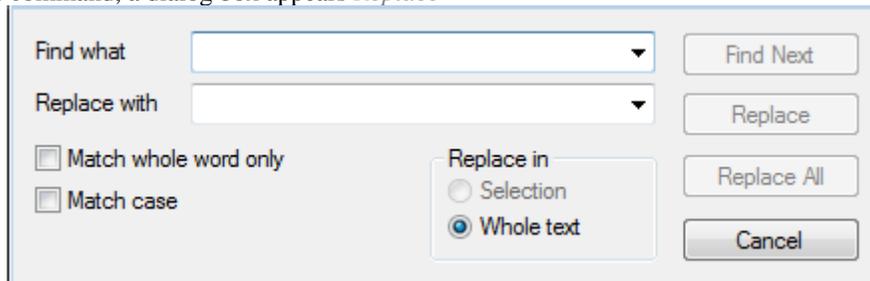
Go to the next matched string by pressing *find Next*.

After you click *Cancel*, you return to the previous menu.

Speas dropdown input field allows you to select the last used values.

*Replace* - search for a given string with a new one.

After calling this command, a dialog box appears *Replace*



When replacing provides an opportunity to consider only whole words and case search string using by appropriate switches. It is also possible to carry out replacement in the selected area or throughout the text.

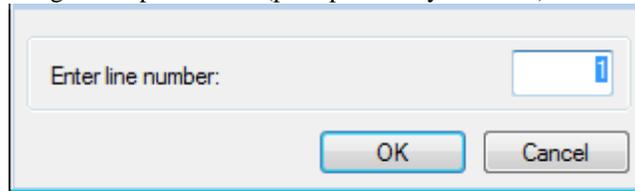
Daylight without replacing the matched string to the next by pressing *find Next*.

When you click *Replace* matched string is replaced by a new one at the current position.

After you click *Replace All* all found strings will be replaced.

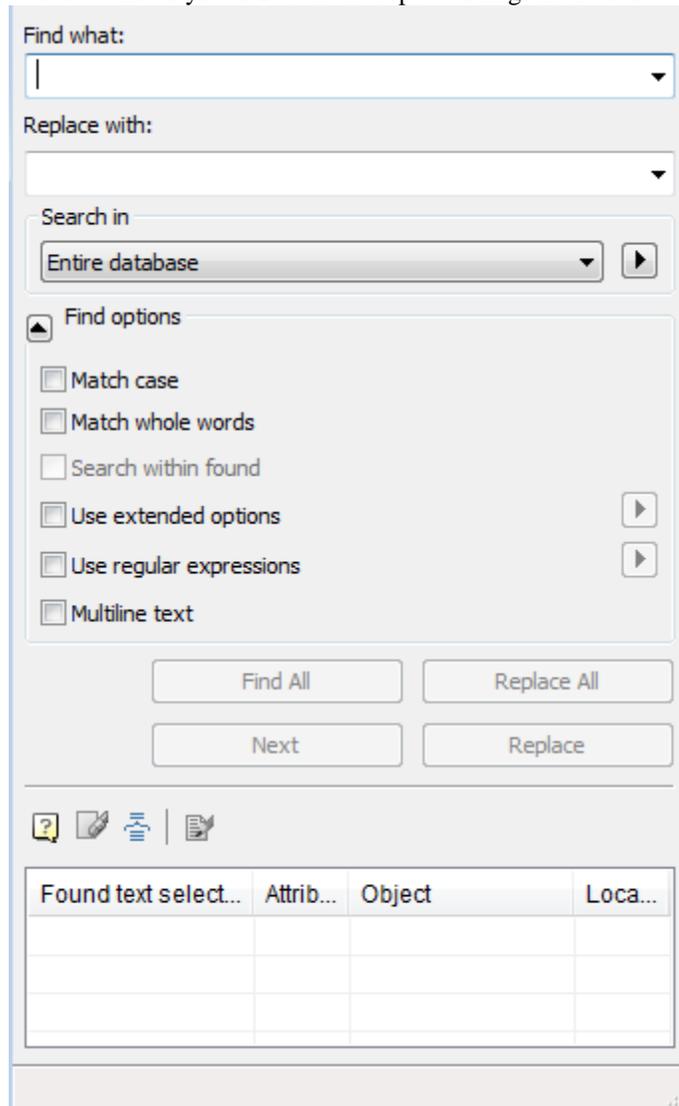
Button to return to the previous menu, press *Cancel*.

*Go to* - command allows you to go to a specific line (promptness keys *Ctrl+G*).



A dialog box titled "Enter line number:" with a text input field on the right containing the number "1". Below the input field are two buttons: "OK" and "Cancel".

*Find and replace on the database* - allows you to search and replace strings in the base.



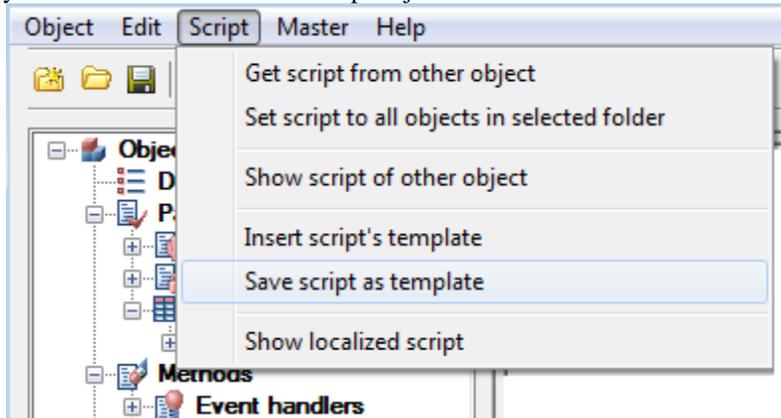
A complex dialog box for "Find and replace on the database". It features several sections:

- Find what:** A text input field with a dropdown arrow.
- Replace with:** A text input field with a dropdown arrow.
- Search in:** A dropdown menu currently set to "Entire database" with a right-pointing arrow button.
- Find options:** A section with a collapsed arrow icon and several checkboxes:
  - Match case
  - Match whole words
  - Search within found
  - Use extended options (with a right-pointing arrow button)
  - Use regular expressions (with a right-pointing arrow button)
  - Multiline text
- Buttons:** "Find All", "Replace All", "Next", and "Replace".
- Footer:** A row of icons: a question mark, a hand, a list, and a document.
- Table:** A table with four columns: "Found text select...", "Attrib...", "Object", and "Loca...". The table is currently empty.

There are opportunities to search the entire database or in a folder, the search is case sensitive, whole words, as well as multi-line test, the search for the script, table, table name resources and facilities (*Use advanced options*)

## Script

Menu *script* allows you to work with the current script object database Construction 21:



*Get script from other object* - command allows you to copy the script from another object.

*Set script to all objects in selected folder* - script command sets the current object to all objects in the selected folder database elements Construction 21.

*Show script of other object* - you can view the script of another object without changing it.

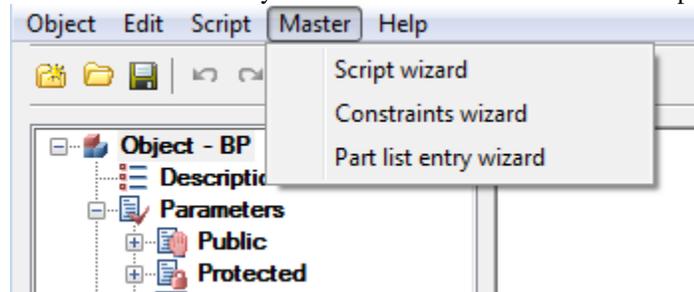
*Insert script template* - command allows you to take in the script as the current object previously saved template.

*Save script as template* - allows you to save the current script object as a template for future use.

*Show localized script* - command allows you to view localized script based on the data of the resource table.

## Editing

From the menu *Master* you can run the wizard available to simplify the creation of objects:



- [Script Wizard](#)
- [Constraints Wizard](#)
- [Part list entry Wizard](#)

### **Script Master**

In general, writing the script for the majority of standard parts is not required. Just open the script details, like on purpose, and copy it. However, it must be remembered that the parameters in the model (figure) must strictly match the prototype.

Construction 21 is a convenient mechanism for self-compilation step algorithms that control the behavior of the items in the time of insertion and editing object - *Master browser*.

Call *Master browser* via the menu item *Master / Script wizard*

- [General properties](#)

- [Parameter Properties](#)
- [Calculation parameter](#)
- [Drawing Conditions](#)
- [working planes](#)
- [show / Hide parameters](#)
- [Display conditions](#)
- [Check boxes](#)
- [Current script](#)

At any step of the script wizard may move buttons << *Back* and *Next* >> .  
Button *Cancel* exits the wizard.

### Basic properties

```

SVersion = 2;
ObjectDescription = "BP";

function OnMakeParameters {
    strTheName = "BP";
    strTheType = "New Folder";
    strTheSub Type = "New Folder";
};

//strPartName = "";
  
```

### Object description

**ObjectDescription** (Property Description). This parameter is optional, it describes the common name of the object. For example, nut, bolt, etc.

### Object Name

**strTheType** (type). This parameter is required, it is advisable to fill it in Latin characters. Serves to identify the object as belonging to a group. For example, StdArborParts - standard parts shaft, StdJointParts - fastenings.

### Object type

**strTheName** (Name of facility). This parameter is required, it is advisable to fill it in Latin characters. Defines elements within the group, given strTheType. For example, a screw bolt - Screw, for nuts - Nut, for washers - Washer etc.

## Object subtype

*strTheSubType* (subtype). Additional parameter, it is desirable to fill it in Latin characters. Defines a specific subtype of GOST. For example, if the name of the object - Nut (Nut), then simple nuts subtype is Simple, from crown - Castle etc.

These parameters set by the user, based on its project object interaction, and can be arbitrary. Hard list is not, and they can be changed at any time. They will only be used in scripts to automatically establish dependencies (details - in the description of scripts).

## Specification

Description line items for transmission specification.

### Parameter Properties

The screenshot shows the 'Parameter Properties' dialog box. On the left is a navigation pane with options: General properties, Parameter properties (selected), Parameter calculation, Drawing conditions, Working planes, Show/hide parameters, Display conditions, Checkboxes, and Current script. The main area shows the parameter 'type (db)' with a green checkmark icon. Below this are several checkboxes: 'Not used' (unchecked), 'Protected (used internally)' (unchecked), 'Public (visible)' (checked), and 'Changeable (available for editing)' (checked). There are also fields for 'String value' (checked), 'Description' (Beam Mark), and 'Initial value' (1). A list on the right shows 'type (db)', 'isp (db)', 'I (db)', and 'V (db)'. At the bottom, there are 'Back', 'Next', and 'Cancel' buttons, and a script editor showing the following code:

```
function ActHeader {
  NPart=0;
  Public(type, "Beam Mark");
  Protected(seted);
  Changeable(type);
  OnDlgBeforeSelectParam = 1;
  ShowWhenSelPrint = 0;
  ContourOnLine = 0;
};
function OnInitialization {
```

### Not used

All parameters specified in the table, are automatically available for operations over them from the program during the insert or edit the object. If a variable is used only in the process of creating a graphic image, then use it in the script is not necessary.

### Protected (used internally)

If necessary, display the parameter dialog during insertion.

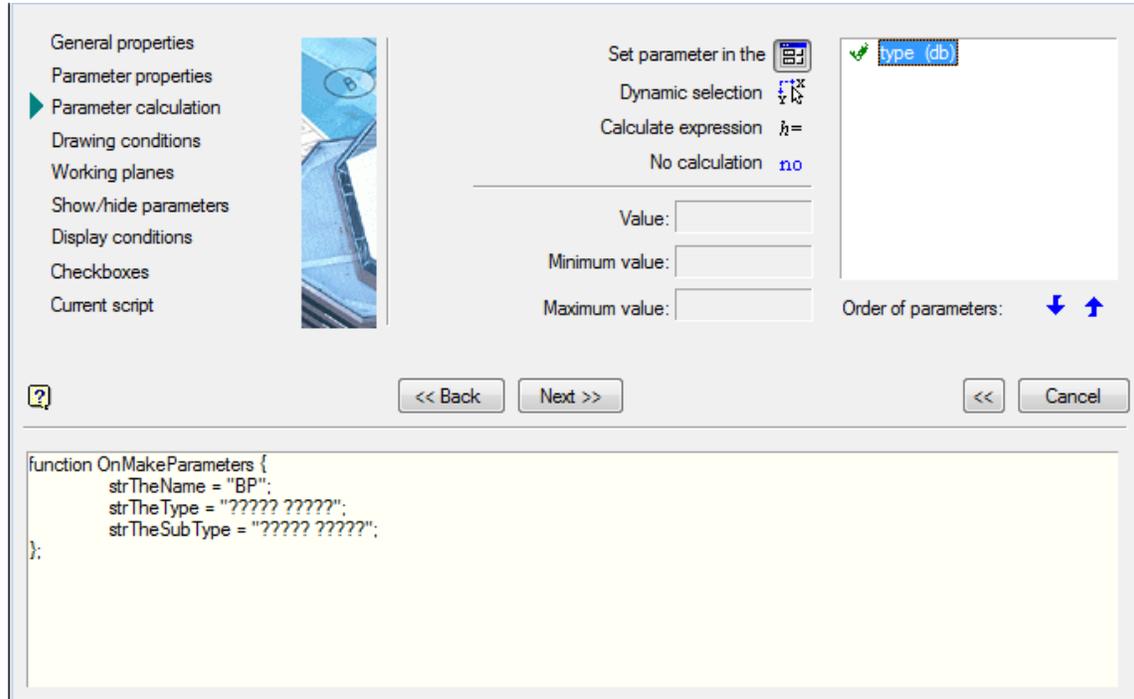
### Public (visible)

Used to transfer parameters during insertion and editing of other objects.

## ***Changeable (available for editing)***

Available to change other objects in the editing process. Variable of the property, will pick up from the table and the necessary parameters on the basis of the obtained values to reconstruct the details of the model.

### **Calculation of parameters**



## ***Set parameter in the dialogue***

Variable for which this flag is set to be available for editing of dialogue insert details.

## ***Dynamic selection***

Processed when the position of the cursor relative to the insertion point of the object according to the formulas in the designated parameter value in the range of "minimum value" - "Maximum".

## ***Calculate after dialouge is shown using dynamic selection by expression***

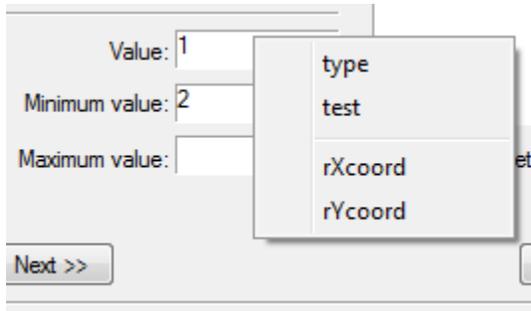
Calculated after the call dialogue and visual selection as expression in the Parameter Value.

## ***Dont calculate parameter***

Defines the minimum value. Can be expressed as a function of other parameters. Determination of the value of the parameter as a function of the cursor or other parameters. Available functions may be called from the context menu or manually entered into the appropriate input box.

## ***Minimum value***

Defines the minimum value. Can be expressed as a function of other parameters.



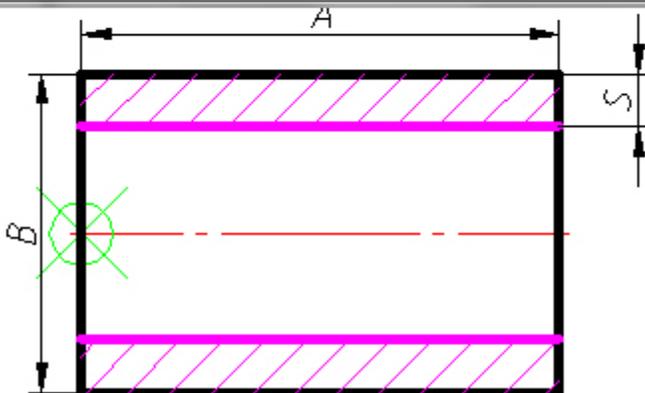
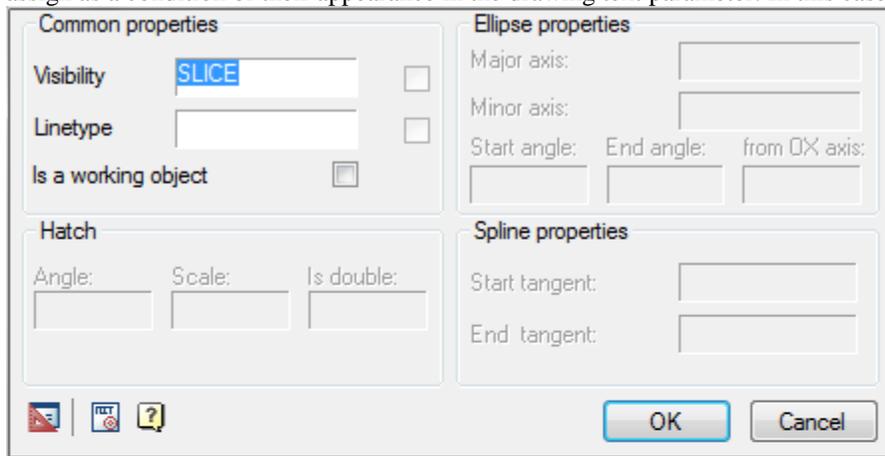
Context menu is available in the input field.

### Maximum

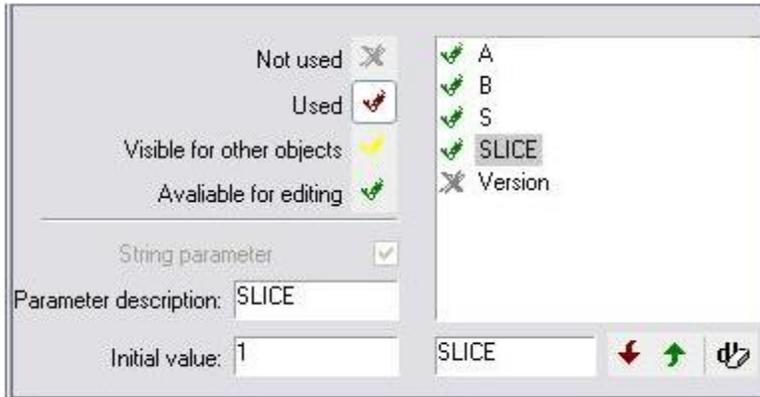
Defines the maximum value. Can be expressed as a function of other parameters. Context menu is available in the input field.

### Conditions rendering

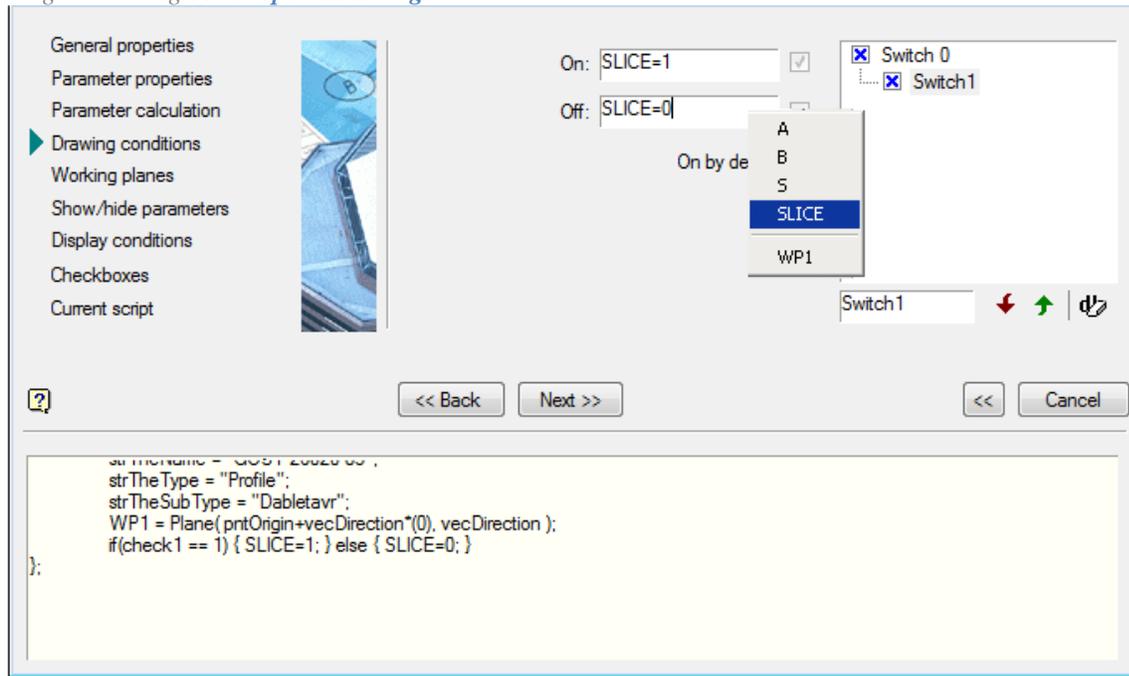
Add a line in the drawing model, rendering which we will operate from the dialog during the insertion of parts (for example, they will be highlighted *Magenta*). Pressing the button  will open a dialog box *object properties* and assign as a condition of their appearance in the drawing text parameter. In this case *SLICE*.



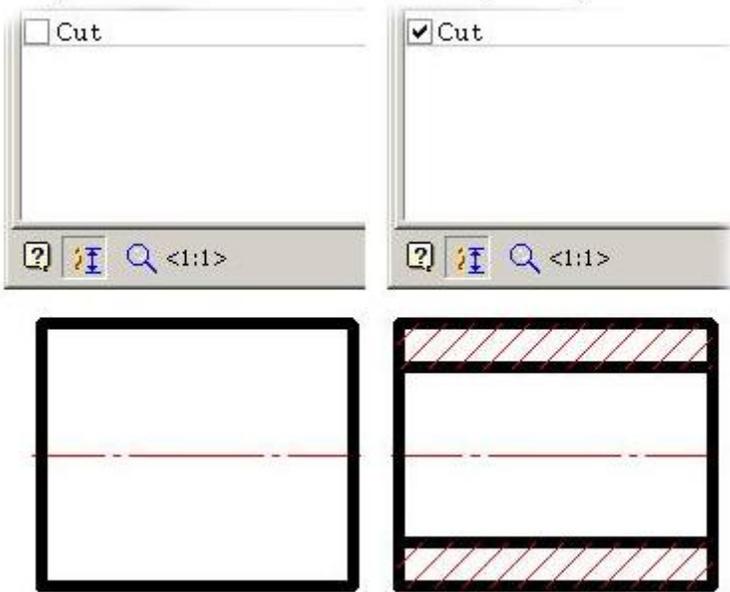
Size "S", necessary for proper recognition, automatically appears in the parameter list, but you must enter a parameter draw.



Fragment dialog box *Properties settings*

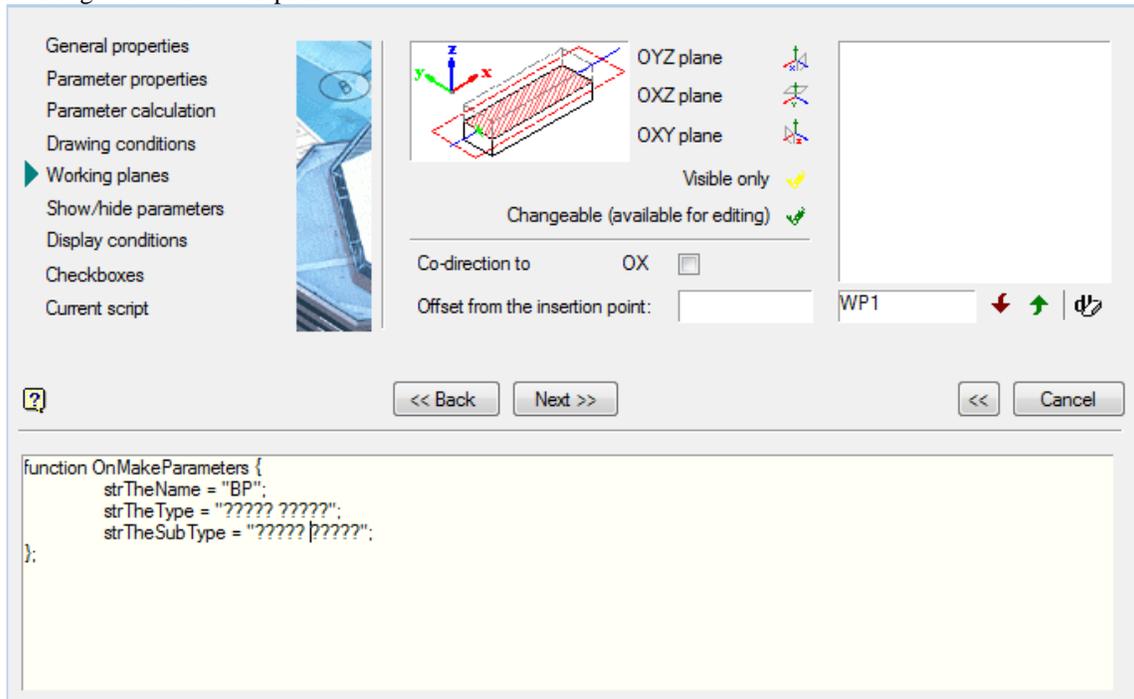


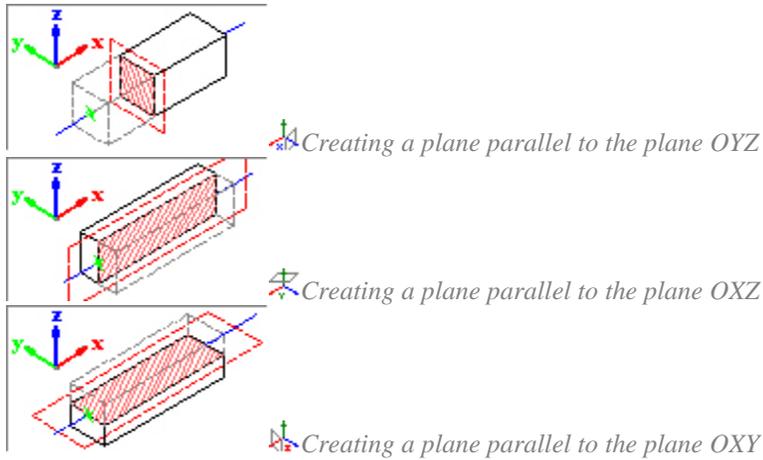
In the name field switch is set *"Cut"*. The parameter rendering paste from the context menu variable *"SLICE"*. After the completion of the script retain the item and exit the editor. Of the database tree select our item and insert it into the model. In the editing dialog parts we have a switch incision through which we can control the rendering of relevant lines.



### Working planes

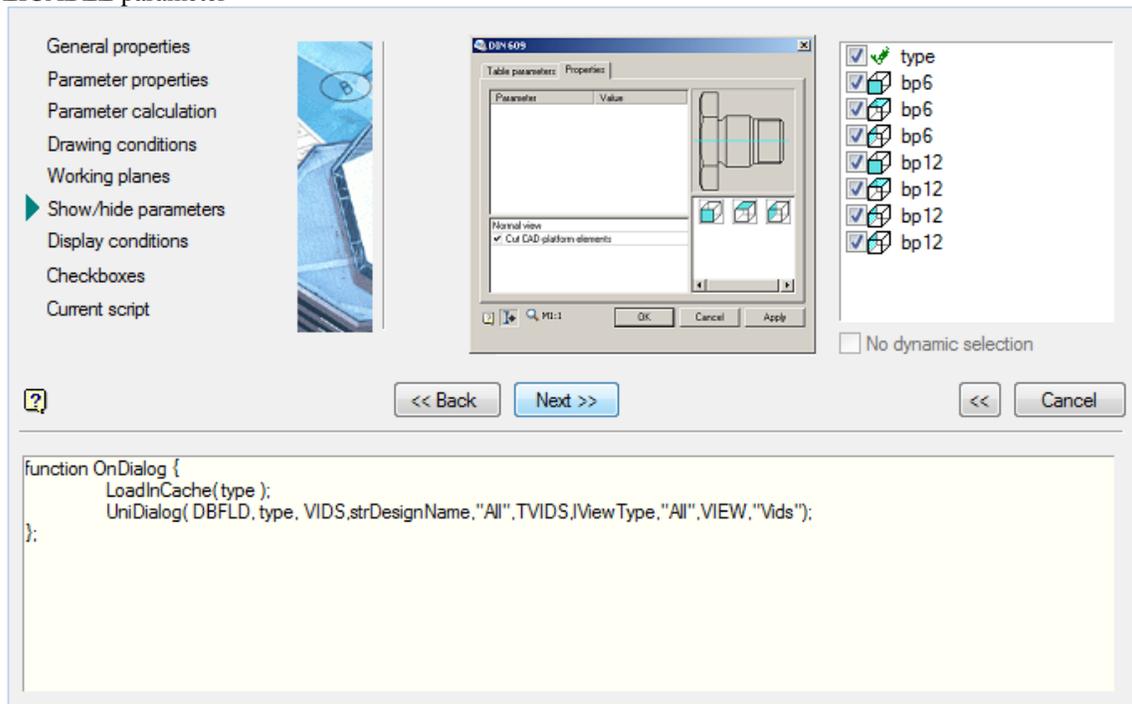
Workplanes determine the position of the items in the time of insertion and editing. Determination of working planes dialog box to the work plane.





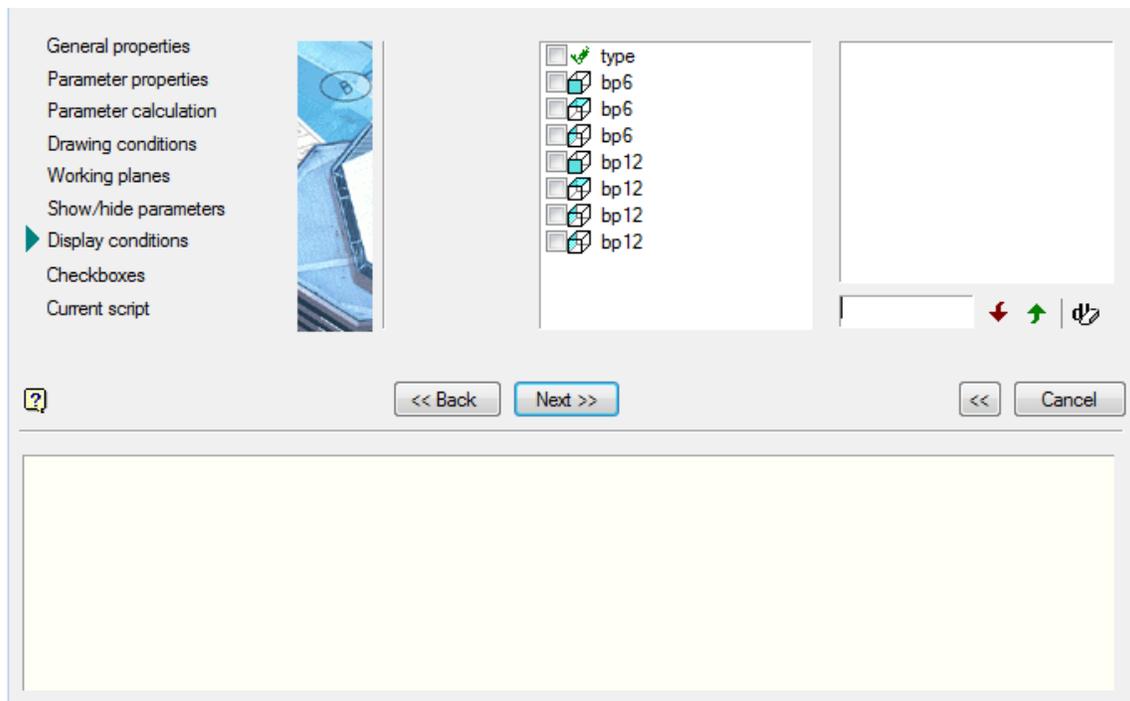
### Show / Hide parameters

In this step, you must identify the available options in the menu items. The selection is made by setting a checkmark APPLICABLE parameter



### Display conditions

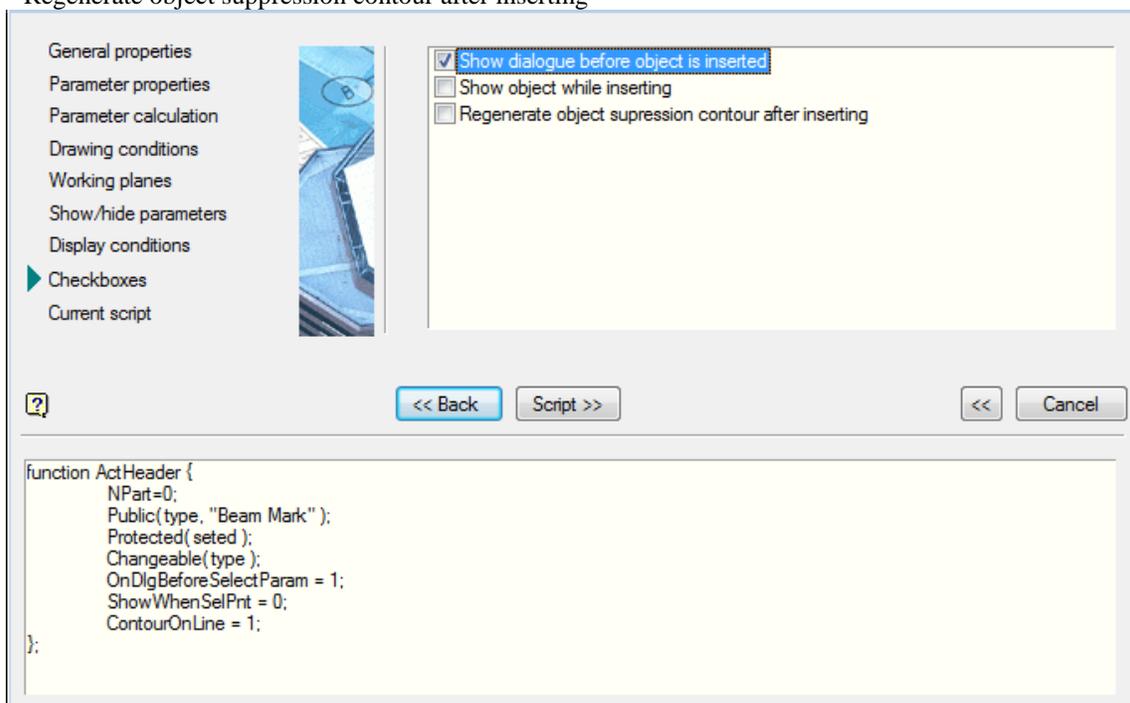
In this step, display conditions defined species . The selection is made by setting a checkmark APPLICABLE parameter and determining the conditions of his hiding



### Check boxes

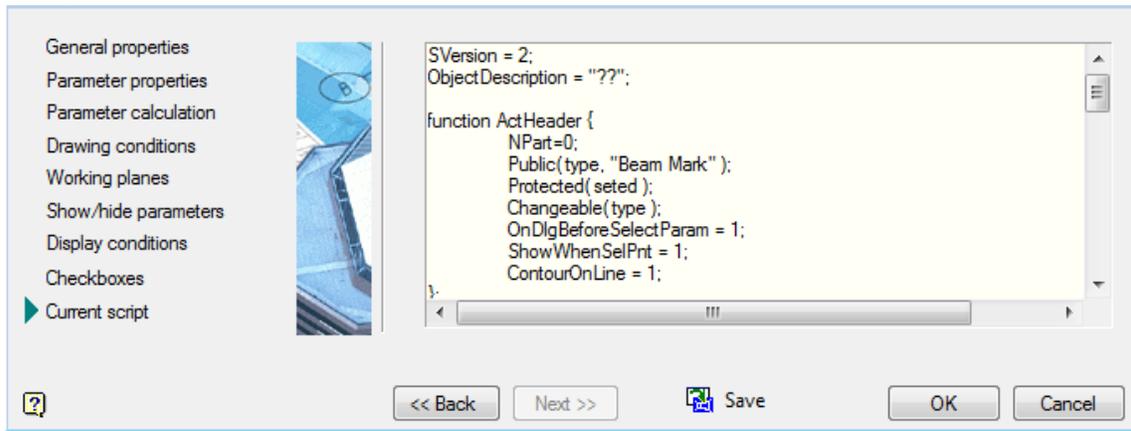
In this step, there are the following settings:

- Show dialogue before object is inserted
- Show object while inserting
- Regenerate object suppression contour after inserting



**Current script**

In this step, you can view and edit the resulting script. Clicking on the button *Save* and OK to apply the current script items



This is the final step.

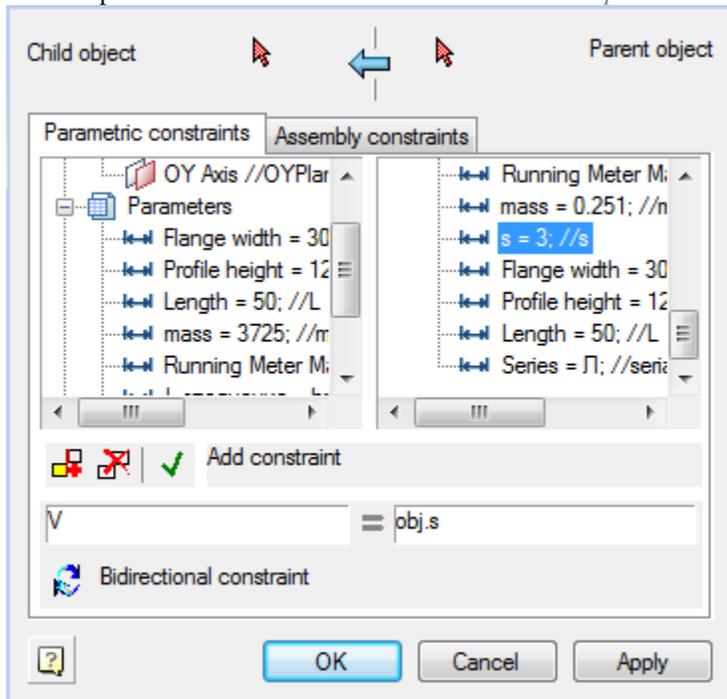
**Master dependencies**

Creating dependencies for interaction with other items going online.

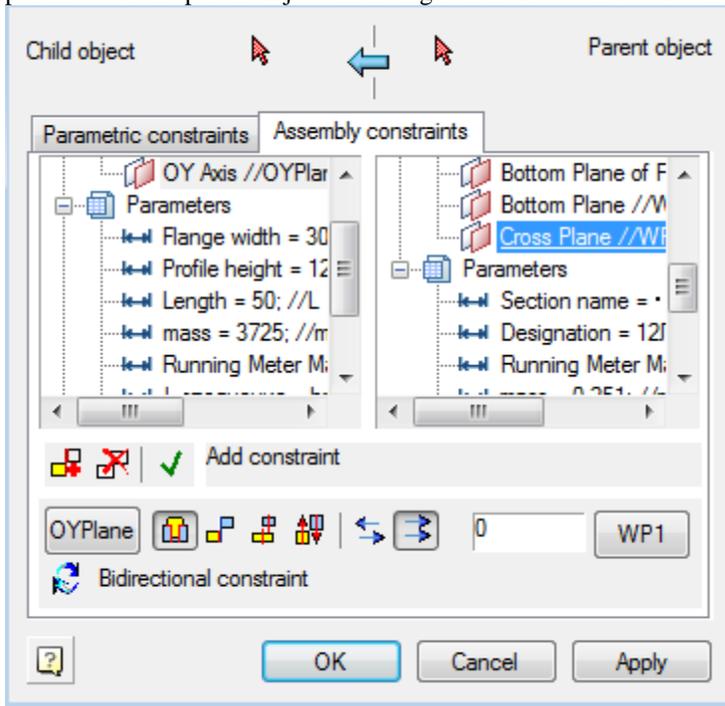
Call *Master dependencies* via menu *Master / Master Dependency* .

Further, following the screen prompts on the command line, place the drawing model details and select the items with which it must interact.

After placing the parts in the drawing, a dialog box *Managing Dependencies*. Functionally, the dialog box is divided into two parts bookmarks. Bookmark this *Parametric dependence* and Assembly constraints.



Definition of parametric relationships occurs directly in the dialog box. It's enough to double-click on the option to specify the details of the child (it will automatically appear in the left-hand side) and bring it into line with the parameter of the parent object. In the right-hand side can be used mathematical expressions.



Types of assembly and parametric relationships are defined in the dialog box. Parameters can serve as table settings objects and definable expression.

 *Axial and surface alignment*

 *Surface alignment*

 *Axial alignment*

 *Direction*

 *Sets the direction for the dependencies (Counter directional / Co-directional)*

Once all the dependencies are installed, you can click OK, successively pass through the dialog boxes and set the options you want.

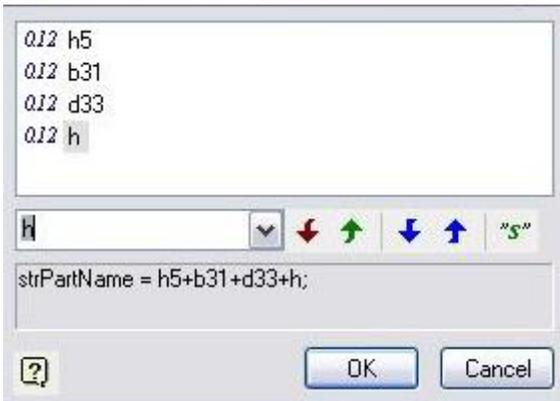
Eventually, an automatically generated string specifications necessary to automatically detect dependencies.

```
function OnConnect
  if(rPart == 0){
    if(obj.strTheType == "temp" && obj.strTheName =
      SetParamConstraint(S, obj, EXPR, "obj
      SetParamConstraint(k, obj, EXPR, "obj
      SetParamConstraint(n, obj, EXPR, "obj
      SetGeomConstraint(INSERT, CODIREC
      NoVectorSelect = 1;
      Handled = OBJ_HANDLED;
  }
}
```

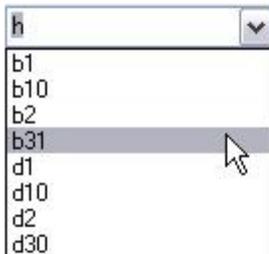
**Master of string of specification**

Formation data for transmission to the specification can be done in automatic and semi-automatic modes. Some information can be inserted on the basis of the table of parameters associated with the geometry of the figure, the part can be entered manually in the editing dialog standard parts.

Call *Master BOM line* via menu *Master / Master BOM line* .

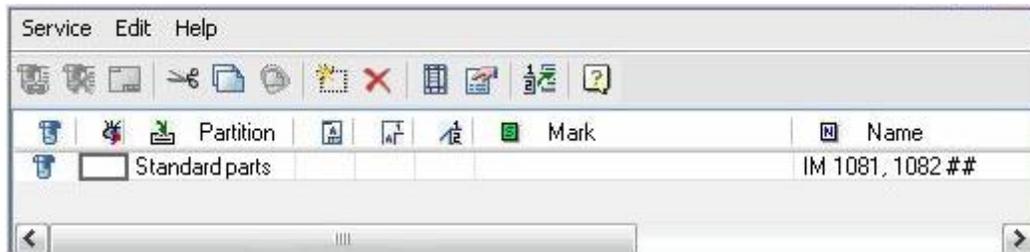


In the drop-down list are tabulated parameters involved in drawing details.

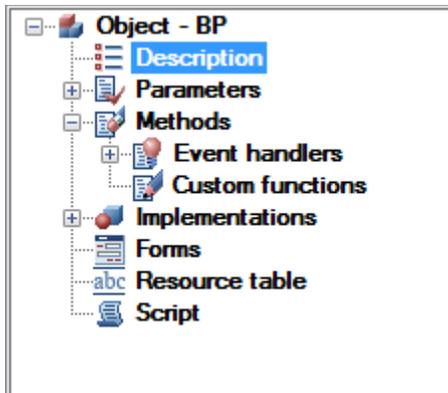


For a complete description of information on standard parts must be able to adjust or supplement information. For example, cover screws or the class thread. In this case, just add a "#".

The editor position will be able to insert text between the two lattices, and then save.



## Object tree



Tree object contains the following sections:

- [Description](#);
- [Parameters](#);
- [Methods](#);
- [Function](#);
- [Forms](#);
- [Resources table](#);
- [Script](#).

If the open file has been modified, its wood properties can be irrelevant. To actualize the properties tree to choose the context menu to update the object tree.

## Description

When you click on the section *Description* of the workspace displays the following properties.

Name	BP
Comment	Boundary Beams
Class	200
Part list entry	
ID	4C925FE2ACD7AA12
STANDARD	GOST
<input checked="" type="checkbox"/> Object Has 3D view	
<input type="checkbox"/> Cutting-in detail	
<input type="checkbox"/> Object for 3D only	

*Property name* - the name of the object to be displayed in the browser database.

*Comment* is displayed in the tooltip to the object.

*Standard* product allows you to set the standard (GOST, DIN, ISO, etc.).

*Part list entry*, is usually not be filled in the properties, and the variable defined in a script.

You can also put a tick:

*Object have 3D view.*

*Cutting in detail*

*Object for 3D only.*

In addition, the properties of the unique identifier for the object.

## Parameters

Section *Parameters* contains three subsections:

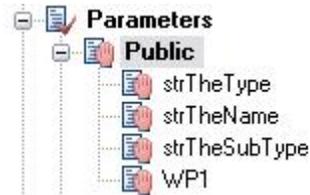
- public,
- protected,
- tabular.



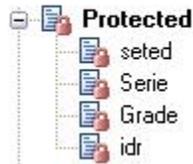
The public section *Upcoming* shows a table of open (public) parameters along with their comments.

	Name	Comment
1	strTheType	Object's type
2	strTheName	Object's name
3	strTheSubType	Object's subtype
4	WP1	Work Plane 1

Furthermore, the parameters are displayed in a tree branch.

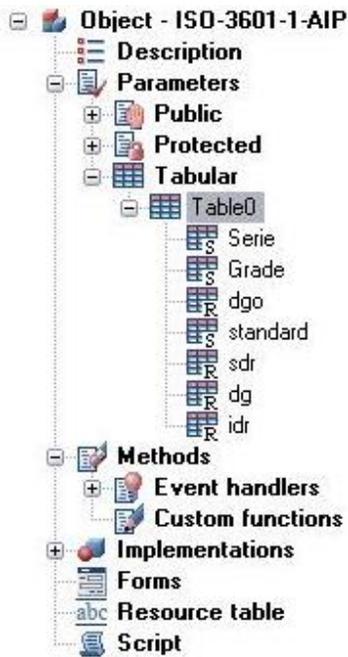


Section *Protected* contains a list of protected (protected) parameters, which are also displayed in a table and drop-down list of branches in the tree object.



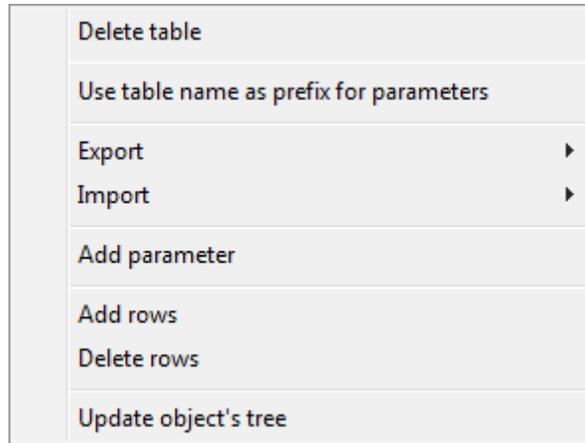
	Name
1	seted
2	Serie
3	Grade
4	idr

Section *Table* includes a list of tables detail



	ID	Serie	Grade
Type		String	String
Comm...	Identif...	Series	Class
1	1	G	N
2	2	A	N
3	3	G	N
4	4	A	N
5	5	G	N
6	6	A	N
7	7	G	N
8	8	A	N
9	9	G	N
10	10	A	N
11	11	G	N
12	12	A	N
13	13	G	N
14	14	A	N

Table and column of the table in the current workspace synchronized depending on the position of the cursor in the object tree. Tables in the object may be a few, while the identification is made on behalf of the table. Popup menu when the cursor position on the table includes the following tools:

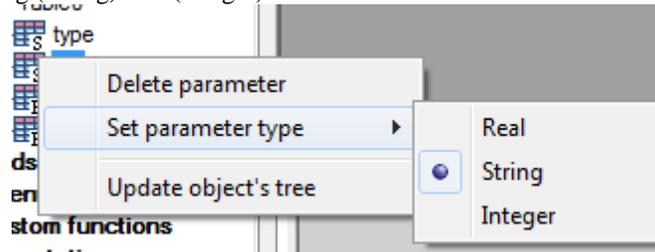


When you select *table name as a prefix to the parameters* of an appeal to the names of variables are prefixed with the table name. For example, Table0.dr.

You can add / delete rows from a table and add a parameter to a table.

There is also exported to Excel, text format and import from them.

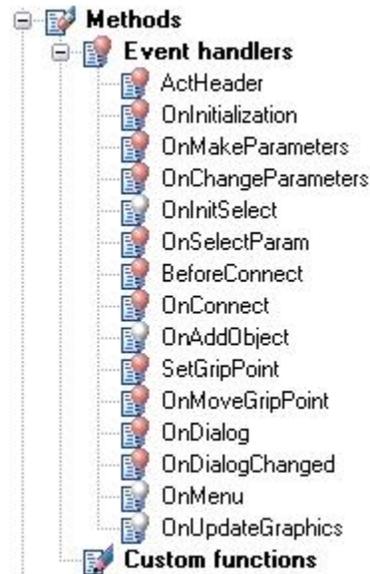
Whenever the context menu on a separate parameter tables are available options remove a single parameter and set the type (Valid (Real), String (String) or a (Integer)).



To rename a table parameter, select it and click on his name left mouse button, or press F2. If the parameter name has changed, it will automatically run search and replace in the script to a new name parameter correctly processed by the script.

## Methods

Section *Methods* includes event handlers and custom functions.



When selecting a specific function in the script is its description (synchronized current line).

Red light icon in the function indicates the presence of a function in the script is present, white - about lack. When you double clicking on the corresponding function in the script created by its pattern.

## Implementation

Section *Versions* list includes 2D and 3D versions

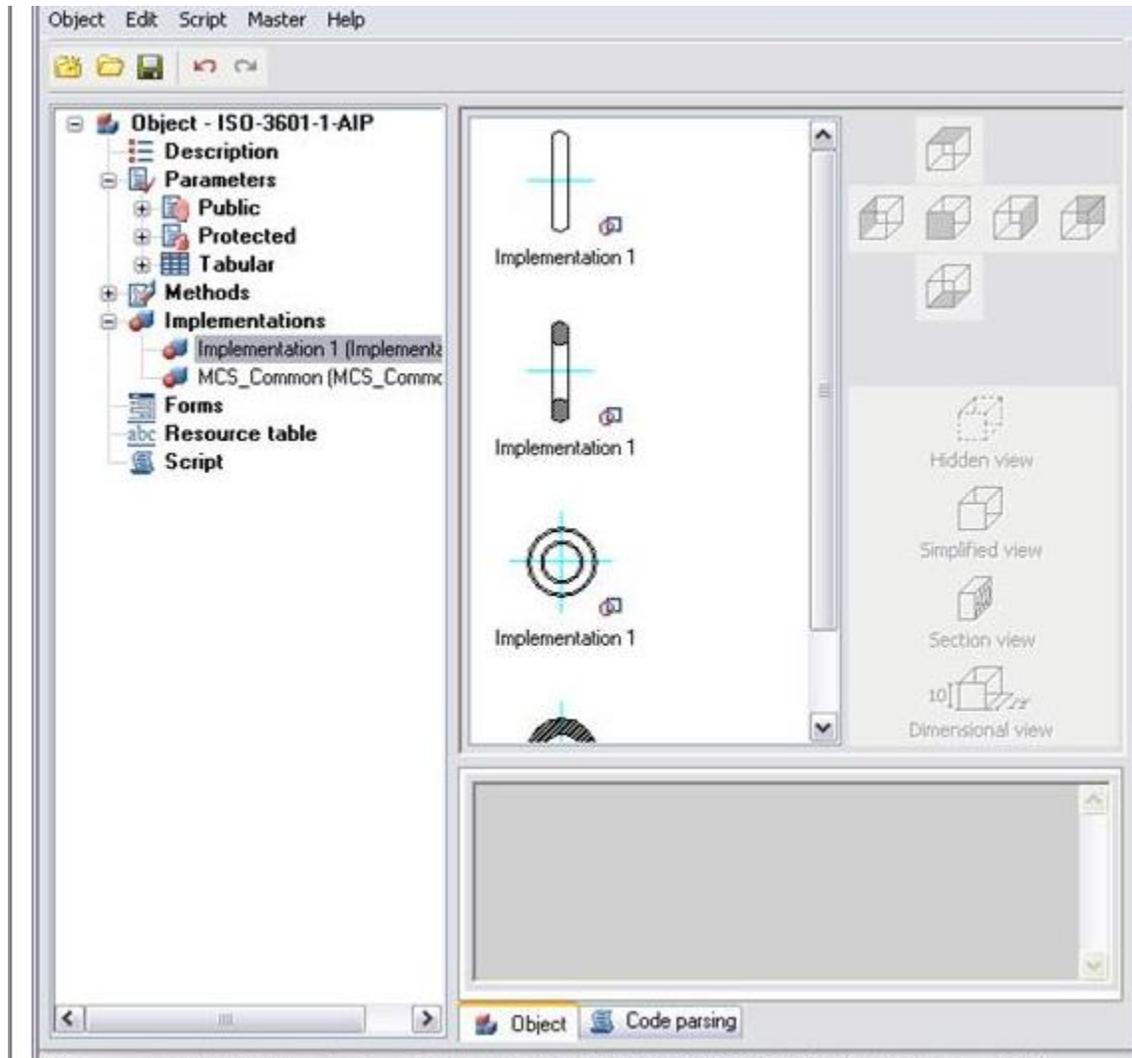
When selecting the root partition *versions* are all the performance, and the choice of a particular (for example, *Version 1*) - displays the filtered views of this execution. To create a two-dimensional view of a new version should be specified in the context menu *Add performance - automatically create 2D views*.

To create this kind of performance you need to select the required performance and the shortcut menu - Add 2D view.

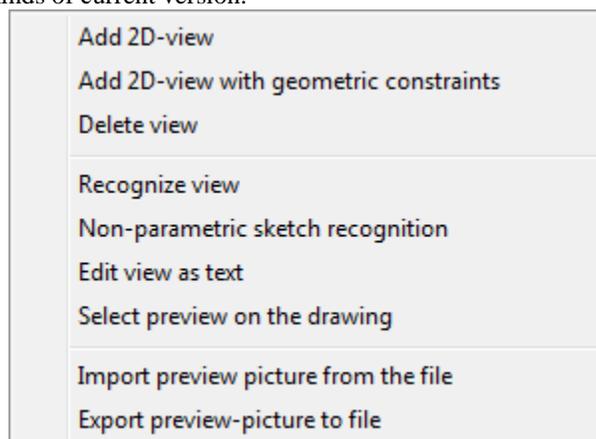
- *2D view* - parametric graphic nanoCAD
- *3D view* of the Construction Site 21 - script to create a solid model (opening section of the shaft, etc.)

Deleted when you delete all kinds of performance of this version.

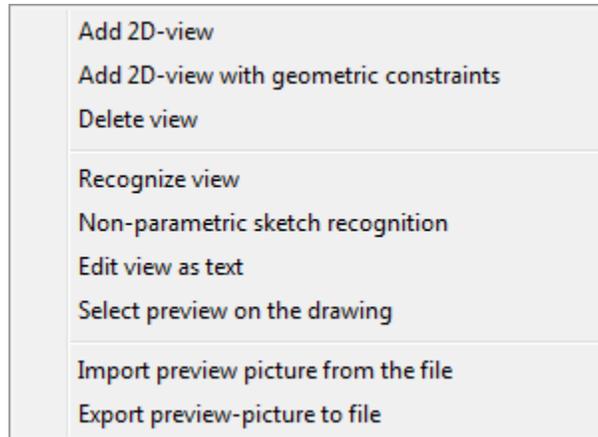
To set the parameters of the form, select it, and the right side of the workspace to set view orientation (*Front, Left, Top*, etc.) and the type of form (*cut, cut C, C size* etc.).



In the context menu, you can select types of operations on this performance. These options add \ remove kinds of current version:



The following context menu options are designed to work with the selected view of the current execution.



*Recognize view* - parametric recognition graphics nanoCAD.

*Nonparametric recognize view* - simple nonparametric reference charts, graphics taken from the object as it is.

*Edit view as text* - description of species opens in a text editor.

*Set preview from objects* - objects selection nanoCAD to create a preview of this species.

*Import preview picture from file* - creating thumbs on the basis of the previously saved file.

*Export preview picture to file* - Saves the preview in a file.

## Form editor

### Form Editor

Database objects Construction 21 supports the use of custom dialogs for inserting and editing. Creating such dialogues (forms) is made in Form Editor, which can be accessed from the dialog boxes [Create Group](#), [Create marker](#) and [Object Wizard](#).

Button  Open the *form editor*.

### Menu

#### File

- *Test* . Opens the form for viewing and testing.
- *Output*. Closes the form editor.

#### Correction

- *Cancel*. Cancels the previous execution of operations.
- *Cut, copy, paste* . Command working with the clipboard.
- *Select all*. Selects all the controls on the panel shape.
- *Remove*. Deletes the selected controls from the form.
- *Group*. Group the selected controls.
- *Ungroup*. Cancels the grouping selected controls.

#### View

- *By ... edge*. Alignment commands selected controls along one edge.
- *Align dimensions*. Aligns the selected controls dimensions.
- *Above and below*. Reverses the order of the tab selected control by moving it up a level or down

- *Forward, backward* . Changes the tab order of the selected control by moving it to the first or the last level.
- *Tab order* . Includes display serial numbers tab controls.
  - To set the tab order to be pressed sequentially controls on the left mouse button. Tab order will be set according to the sequence control option.
- *Properties*. Enables and disables the additional window Properties.
- *Variables*. Enables and disables the additional window variables.
- *Grid* . Turns on and off the grid and snap to grid.
- *Indents* . Enables or disables the frame shape

## Inset

There are commands insert controls

-  *Input field* .<sub>2</sub>
-  *Checkbox* .<sub>2</sub>
-  *Switch* .<sub>2</sub>
-  *List* .<sub>2</sub>
-  *List from the database* .<sub>2</sub>
-  *Combo box* .<sub>2</sub>
-  *Combo box from the database* .<sub>2</sub>
-  *Text* .<sub>2</sub>
-  *Group* .<sub>2</sub>
-  *Figure* .<sub>2</sub>
-  *Panel* .<sub>2</sub>
-  *Button* .<sub>2</sub>
-  *Table with filtering* .<sub>2</sub>
-  *Table* .<sub>2</sub>
-  *Types and performance* .<sub>2</sub>
-  *Viewing* .<sub>2</sub>

## Forms panel

On the forms produced occupancy controls.

In the context menu of the forms are available editing commands: *cut, copy, paste, group, ungroup*.

*To add a control* to the form by one of the following ways:

- Select the desired control from the menu *Insert* or toolbar. Specify the insertion point and set the dimensions of the control panel on the form.

After adding the control you want to bind it to a field in the *Properties*.

- In the open window, *Variables* , select the variable for which you want to add a control. Left-click on the variable in the list, and holding down the mouse button, move the cursor to the panel shape. Release the mouse button. Panel forms added *group controls* - *text* and *input field* .

If you insert a control from the window *variables* hold down Control, then it is possible to select the type of control.

*Selection of the control* panel forms can be accomplished in several ways:

- *Single click of* the left mouse button. Selected one control.
- *Single click of* the left mouse button while pressing Control . If the control is not selected, it is added to the current set. If a control is selected, it is removed from the current set.

- Choosing *a crossing* . Click the left mouse button in the space bar form. Holding the button down and dragging a selection box set. Selected controls that are fully or partially captured by the selection frame.

*Editing the size* of the control is done by using the " grips ". When the grid is resized with a certain step.

*Changing the position* of the selected controls performed with the left mouse button on one of the selected items. When the grid movement occurs incrementally.

### *Align controls*

In the menu *View* available commands align controls on *edge* and *size*.

*Controls aligned to the left, and then by size* .

### *Grouping controls*

Working with multiple controls may need to be fixing their relative position. If grouping is fixed relative position of the controls, and when you move one of the other grouped elements also move.

Select panel forms controls and issue the Group. Selected controls will be grouped.

Removing Controls made the command Delete.

### *Test the form*

Before completing the form creation is recommended to execute the test to view the form.

## Variables window

In the *Variables* are parameters of the object ( *marker* , *database object* , *group* ).

Icon  marked parameters that are associated with controls editable form

## Properties window

In the Properties lists the properties of the selected controls on the form. At the bottom there is a line prompt with a brief description of the selected property

### *Form properties*

<i>General</i>	
Help URL	
Caption	
<i>Editor</i>	
Top margin	8
Height	400
Left margin	8
Bottom margin	8
Margin	<input checked="" type="checkbox"/>
Right margins	8
Grid	<input checked="" type="checkbox"/>
Grid step	8
Width	400

*Note:* In the "Help" parameter, the path to the user help is entered. User help will be invoked if the focus is on form control. If the focus is on the "Cancel" or "OK" buttons, the help of standard elements will open.

**abl** *Input field*. The input field is used to enter numeric or symbolic expressions for further processing.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Alignment	On the edge
Multiline	<input type="checkbox"/>
Flat	<input type="checkbox"/>
Tip	
Linking	(None)
Enable	<input checked="" type="checkbox"/>
Text	None
Formatting	<input type="checkbox"/>
<i>Basic</i>	
Name	editbox1
Class	After entering
Variable	
Type	Line
<i>Position</i>	
Upper limit	56
Height	56
Left boundary	176
Lower limit	112
Right boundary	232
Width	56
<i>Measurements</i>	
Meter	<input checked="" type="checkbox"/>
Mode	Auto
Regime change	<input type="checkbox"/>
<i>Developments</i>	
Activation	

Deactivation	
To change	



**Checkbox**. Allows you to monitor on/off.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)
Allowed	<input checked="" type="checkbox"/>
Text	Flag
<i>Basic</i>	
Enabled	<input type="checkbox"/>
Name	checkbox
Class	Flag
Variable	
<i>Position</i>	
Upper limit	8
Height	16
Left boundary	8
Lower limit	24
Right boundary	72
Width	64
<i>Developments</i>	
by clicking	



**Switch**. Switches to monitor the status on/off. Several individual switches interconnected to form a "group switch" to track more states. Example of use of the group switch.

Description:

Several switches are associated with the same variable script. Each of them set any value. Variable is set to the included switch. Value is of type string. If set to "-1" value is assigned automatically starting with 1, in the tab order for TAB. In this case, the value type is numeric. Switches associated with a single variable group are considered. In the group may be included in only one switch. If a variable is assigned, grouped switches located inside one of the control. Usually this group or panel.

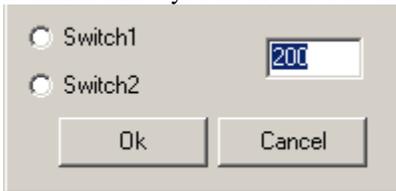
Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	

Linking	(None)
enabled	<input checked="" type="checkbox"/>
Text	Switch
<i>Basic</i>	
Included	<input type="checkbox"/>
Value	-1
Name	radiobutton
Class	Switch
Variable	
<i>Position</i>	
Upper limit	24
Height	24
left boundary	8
Lower limit	48
Right boundary	112
Width	104
<i>Developments</i>	
by pressing	

Example of using.

Switches allow you to choose between discrete values, the result is displayed in the input field



 *List*. Used to select one value from a specified list.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)
Enable	<input checked="" type="checkbox"/>
Text	-1
<i>Basic</i>	
Data	"Element 1"

Name	Listbox
Class	List
Variable	
Current	-1
<i>Position</i>	
Upper limit	48
Height	40
Left boundary	8
Lower limit	88
Right boundary	104
Width	96
<i>Developments</i>	
Activation	
Deactivation	
To change	

 *List from the database..* Used to select one value from a pre-specified list in the database.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)
Enable	<input checked="" type="checkbox"/>
Text	
<i>Basic</i>	
Data	
Name	Listbox1
Class	List of base
Variable	
Current	
<i>Position</i>	
Upper limit	96
Height	60
Left boundary	8

Lower limit	156
Right boundary	104
Width	96
<i>Developments</i>	
Activation	
Deactivation	
To change	

 **Combo box**. Designed to select from the specified list or enter an arbitrary value.

Properties command

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)
enabled	<input checked="" type="checkbox"/>
Text	Combo box
<i>Basic</i>	
Data	
Name	combobox
Class	combobox
Variable	
Editable	<input checked="" type="checkbox"/>
<i>Position</i>	
upper limit	168
Height	76
left boundary	8
Lower limit	244
Right boundary	104
Width	96
<i>Developments</i>	
activation	
deactivation	
to change	

 **Combo box from the database**. Designed to select from the [specified list](#) or enter an arbitrary value.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)
Enabled	<input checked="" type="checkbox"/>
Text	
<i>Basic</i>	
Data	
Name	combobox1
Class	combobox
Variable	
Editable	<input checked="" type="checkbox"/>
<i>Position</i>	
Upper limit	208
Height	64
Left boundary	8
Lower limit	272
Right boundary	104
Width	96
<i>Developments</i>	
Activation	
Deactivation	
To change	

**A Text** . Static (non-editable) text formatting support. Specify the formatting is applied to the entire text.  
 Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Headset	(Info)
Tip	
Linking	(None)
Transparent	<input checked="" type="checkbox"/>
Text	Text
Background	

<i>Basic</i>	
Name	static
Class	Text
Label	
Variable	
<i>Position</i>	
Upper limit	280
Height	32
Left boundary	8
Lower limit	312
Right boundary	104
Width	96

 **Group**. Decorative element, designed to visually group several controls on the form.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)
Enabled	<input checked="" type="checkbox"/>
Text	
<i>Basic</i>	
Name	groupbox1
Class	Group
Variable	
<i>Position</i>	
Upper limit	320
Height	38
Left boundary	8
Lower limit	358
Right boundary	104
Width	96
<i>Developments</i>	
Activation	

Deactivation	
To change	

 **Figure.** Insert a simple bitmap to the form.

Properties command.:

<i>Basic</i>	
Name	Image
Class	Drawing
Variable	
<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Data	(Info)
Tip	
Linking	(None)
Transparent	<input type="checkbox"/>
Proportionally	<input checked="" type="checkbox"/>
Stretch	<input checked="" type="checkbox"/>
<i>Position</i>	
Upper limit	360
Height	57
Left boundary	8
Lower limit	417
Right boundary	105
Width	97

 **Panel.** Designed for grouping and align multiple controls on the form.

Properties command.:

<i>Basic</i>	
Name	panel
Class	Panel
<i>View</i>	
Linking	(None)
<i>Position</i>	
Upper limit	16
Height	49
Left boundary	112

Lower limit	65
Right boundary	185
Width	73

 **Button.** Control "button." Response by pressing the left mouse button.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tooltip	
Linking	(None)
Allowed	<input checked="" type="checkbox"/>
Text	Button
<i>Main</i>	
Icon	-1
Name	button
Class	Button
Variable	
<i>Position</i>	
Upper Bound	72
Height	32
Left bound	112
Lower limit	104
Right border	184
Width	72
<i>Developments</i>	
by clicking	

 **Table with filtering.** Table variables to restrict the number of columns, and automatic filtering of the list columns.

Properties command:

<i>Basic</i>	
Name	Control
Class	Table with filtering
Variable	
<i>View</i>	
Visible	<input checked="" type="checkbox"/>

Tip	
Linking	(None)
Enable	<input checked="" type="checkbox"/>
<i>Position</i>	
Upper limit	112
Height	32
Left boundary	112
Lower limit	144
Right boundary	184
Width	72

 **Table** . Table variables with the ability to view and select a row.

Properties command:

<i>Basic</i>	
Name	Control1
Class	Table with filtering
Variable	
<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)
Enable	<input checked="" type="checkbox"/>
<i>Position</i>	
Upper boundary	152
Height	40
Left boundary	112
Lower limit	192
Right boundary	184
Width	72

 **Views and performance** . Table for selection and execution of standard projection of the object from the database.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)

Enable	<input checked="" type="checkbox"/>
<i>Basic</i>	
Name	Control2
Class	Views and performance
<i>Execution</i>	
Show performance	<input checked="" type="checkbox"/>
<i>Types</i>	
	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>
	<input type="checkbox"/>
	<input checked="" type="checkbox"/>
	<input type="checkbox"/>
	<input type="checkbox"/>
Display Types	<input checked="" type="checkbox"/>
Shows the type form	<input type="checkbox"/>
<i>Position</i>	
Upper limit	200
Height	32
Left boundary	112
Lower limit	232
Right boundary	184
Width	72

 *Preview*. Preview box of the selected object from the database.

Properties command:

<i>View</i>	
Visible	<input checked="" type="checkbox"/>
Tip	
Linking	(None)
Enabled	<input checked="" type="checkbox"/>
Text	PreViewControl
<i>Basic</i>	
Name	control3

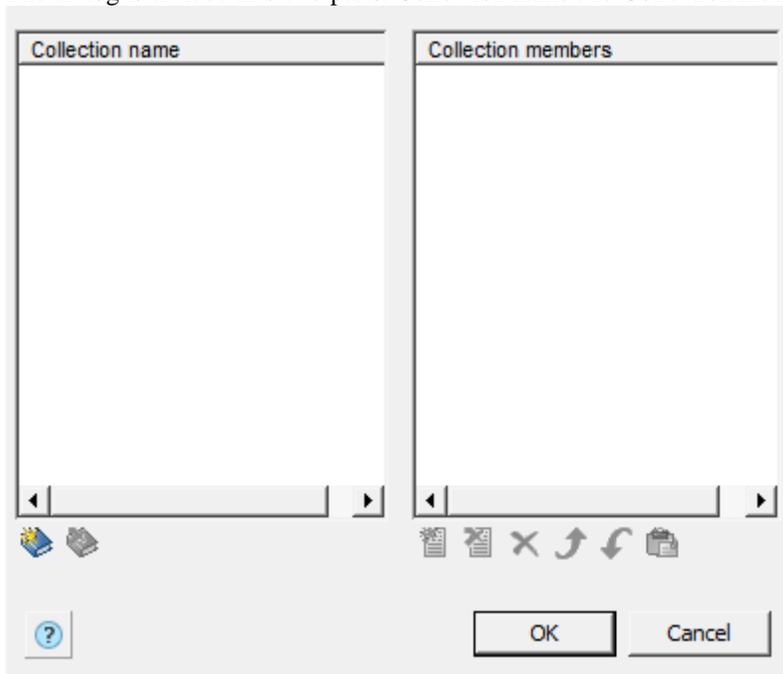
Class	Review
<i>Position</i>	
Upper limit	240
Height	40
Left boundary	112
Lower limit	280
Right boundary	184
Width	72

### **Collection Editor**

Serves for quick creation of lists and their subsequent use in form controls and custom sorting in tables.

#### *Dialog*

The dialog is divided into two parts: Collection name and Collection members.



#### *Collection management tools*

 Add new collection.

 Delete collection.

#### *Collection members management tools*

 Add new collection member.

 Delete collection member.

 Delete all collection members.

 Move collection member upper.

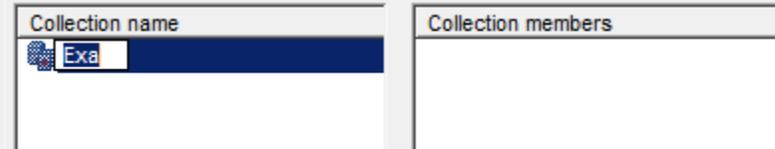
 Move collection member down.

 Paste from clipboard.

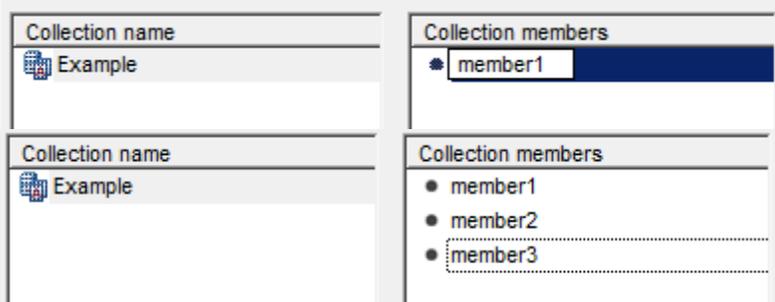
*Create and assign a collection while editing a form*

In order to create a collection you need to:

1. Click the "Data" option in the DB-Listbox or DB-combobox. A dialog box will appear.
2. In the list of collections, call the  "Add new collection" command and enter a name for the collection.



3. Set the composition of the collection.



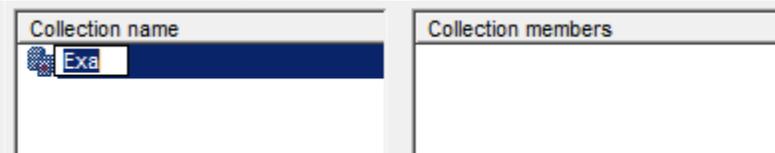
4. Select a collection and click "OK" in the Collection Editor dialog box.
5. The created collection will look like this:



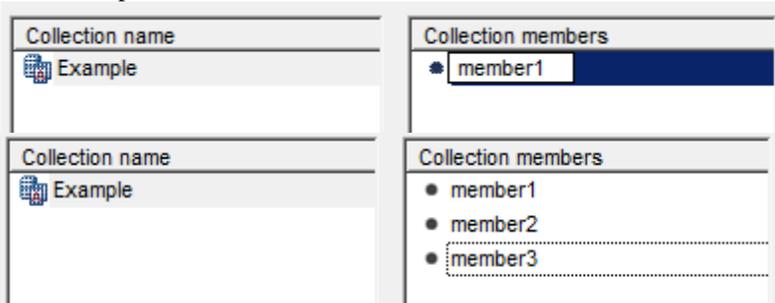
*Creating custom filtering on a table*

In order to create a collection you need to:

1. Go to Edit Table Dialog "Main Menu - Rows - Custom Sort...".
2. In the list of collections, run the  "Add new collection" command and enter a name for the collection.



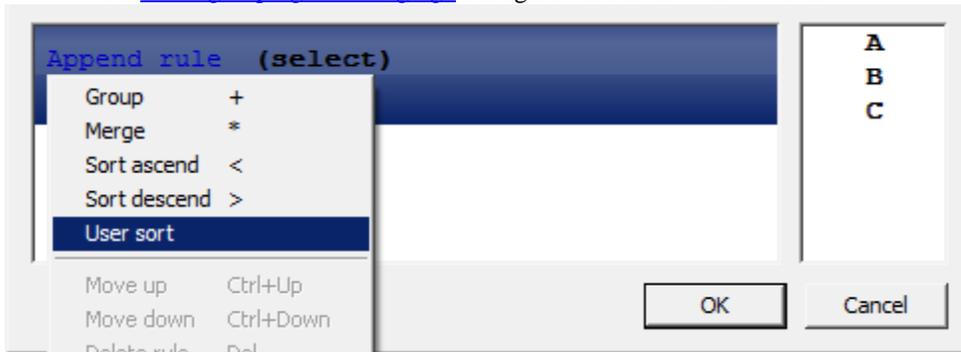
3. Set the composition of the collection.



4. Click "OK" in the Collection Editor window.

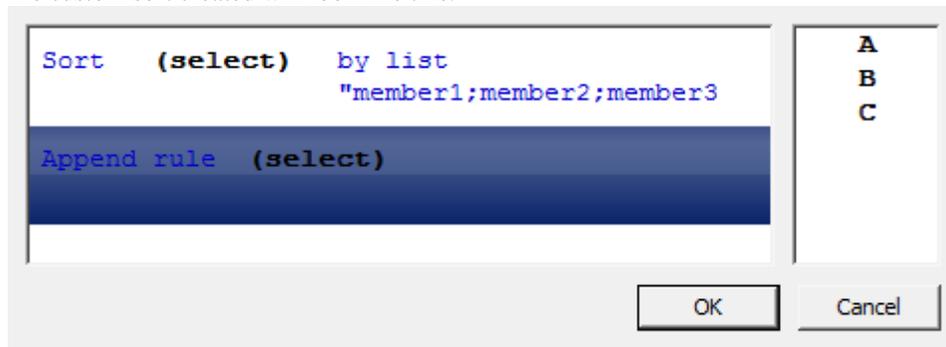
*Purpose of custom filtering in a table*

1. In the "Row grouping and merging" dialog box add a "User Sort" rule.



2. Select a collection and click "OK".

3. The custom sort created will look like this:

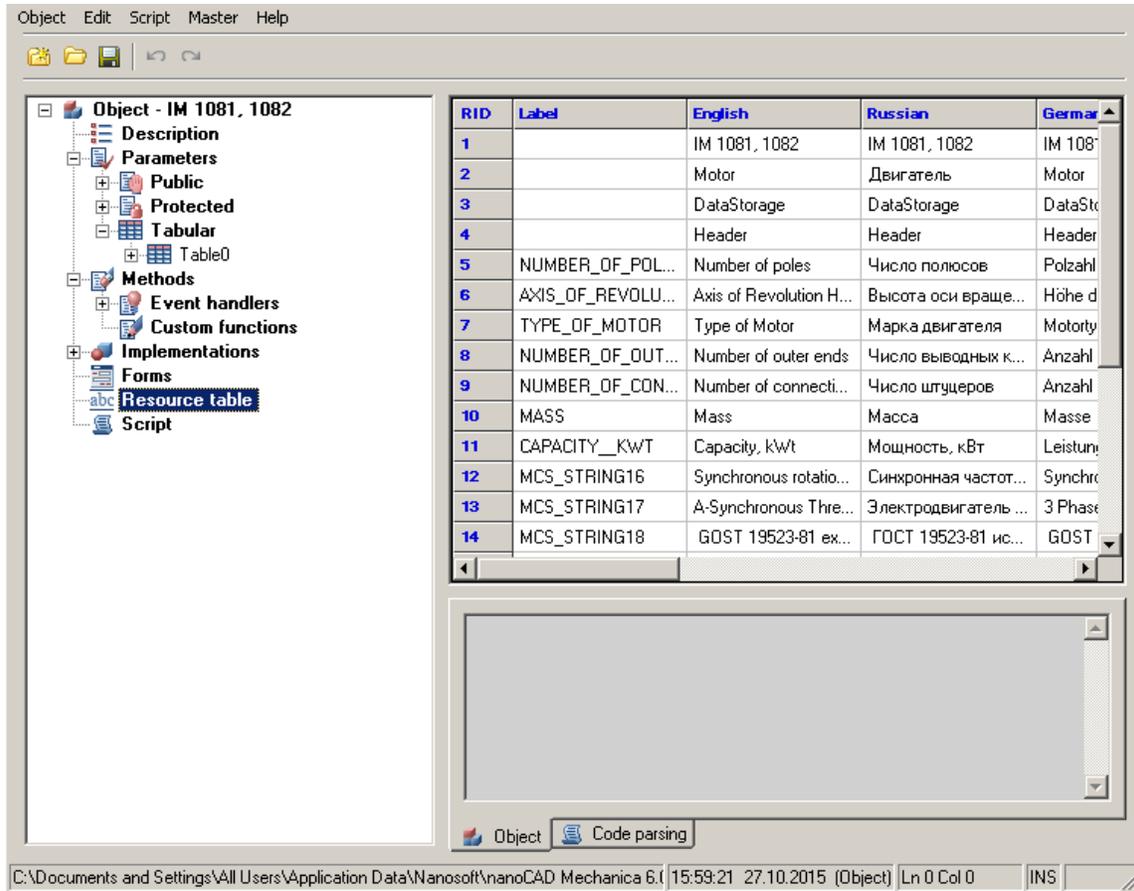


Collections are saved to the database, they can be used in other objects Construction 21. Forms and tables have separate stores.

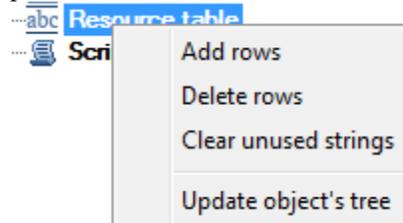
**Important!** Collections created by editors or administrators are available to everyone and cannot be edited by the user (the collection editing buttons will be grayed out). User-created collections are only accessible to the user.

## Table resources

Section *Table of resources* designed to create a multilingual resource strings details.



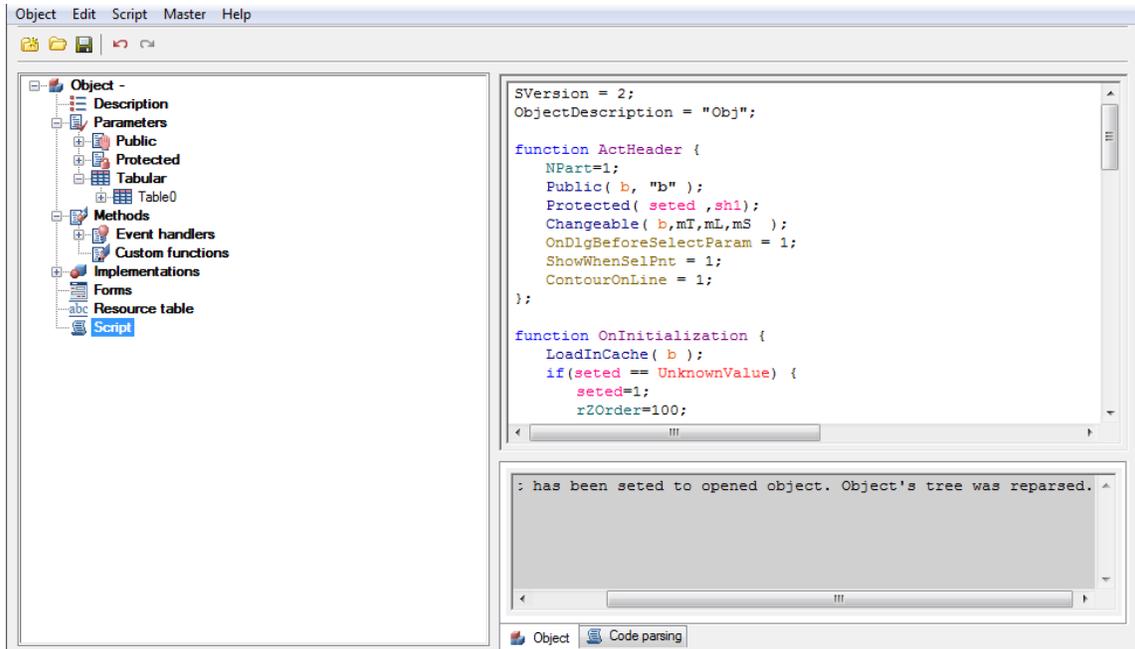
In the context menu section, there are options to add and delete rows.



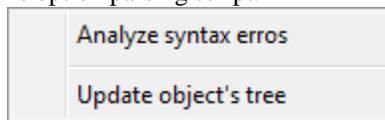
Each resource can have a name (*Label*), by which it will be referenced from the script (by writing the *@Resource Name*). The property is selected, the row that corresponds to the name of the resource (or its ID) and the column corresponding to the application language. Thus, we can ensure the correct operation of applications of different locations on the same database. Of course, the current local line must be completed, otherwise for non-Russian locale is selected resource corresponding to the English language.

## Script

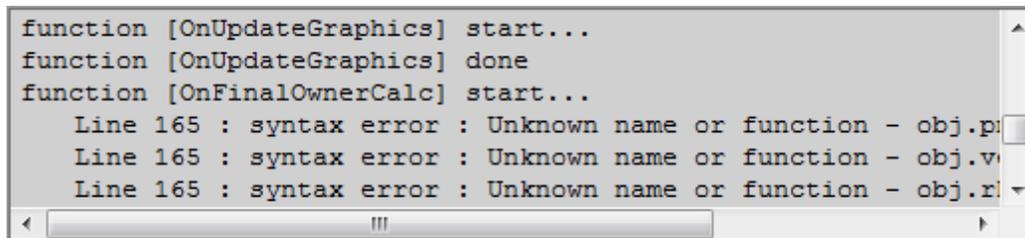
When switching to the section *script* in the workspace displays the script object.



In the context menu of the *script* contains option parsing script.



While parsing the functions performed consistently script object and passed to the notification system error messages. By double-clicking on a line in the notification area on the transition line of the script that contains the error.



## Managing Dependencies



Main menu: *Construction - Library objects - MechWizard - Add constraint.*



Ribbon: *Construction - MechWizard - Add constraint.*

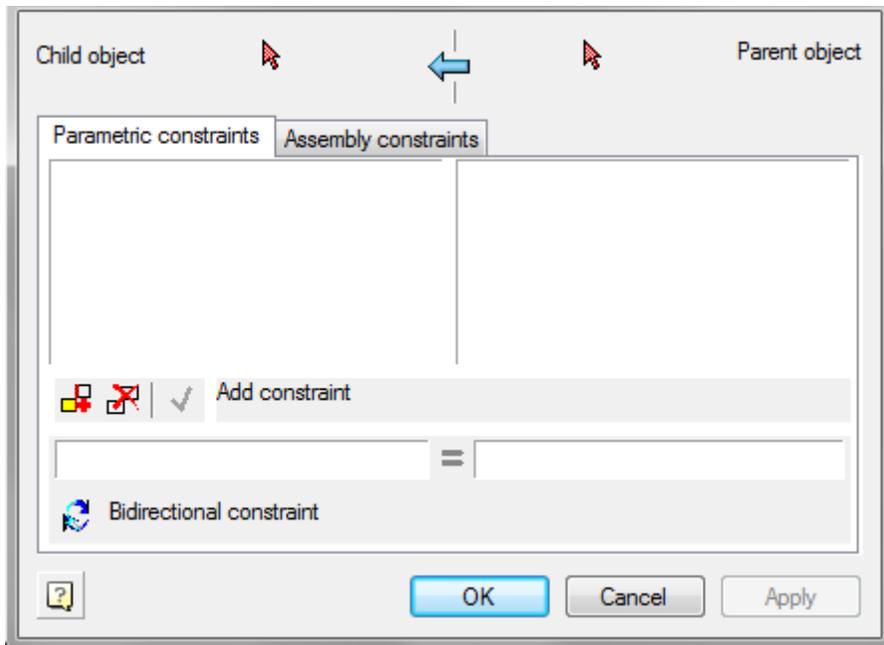


Toolbar: *Add constraint* ( "MechWizard").



Command line: *SPCONSTRAINT.*

In the dialog box *Constraints:*



In the dialog box set parametric and assembly (geometric) dependencies between database objects.

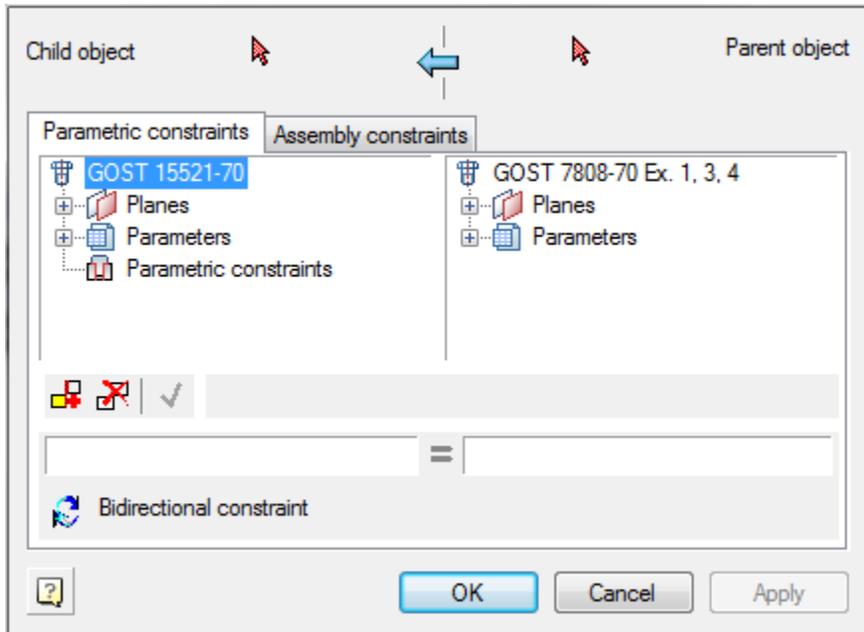
The window is divided into two parts:

Left - *The child*

Right - *The parent object*

Use **1-selected object** and **2 were selected to** the choice made in the drawing, respectively subsidiary and parent objects. After selecting an object in the corresponding half of the window, a list of parameters of the object, which includes:

- Property name
- List surfaces (work surfaces)
- The list object's parameters
- List of installed parametric relationships
- List of installed assembly constraints



On two tabs *depending Parametric* and *Assembly constraints* established relationship between parent and child objects.

*Parametric dependence* connects the parameters of objects.

*Assembly dependence* binds workplanes objects.

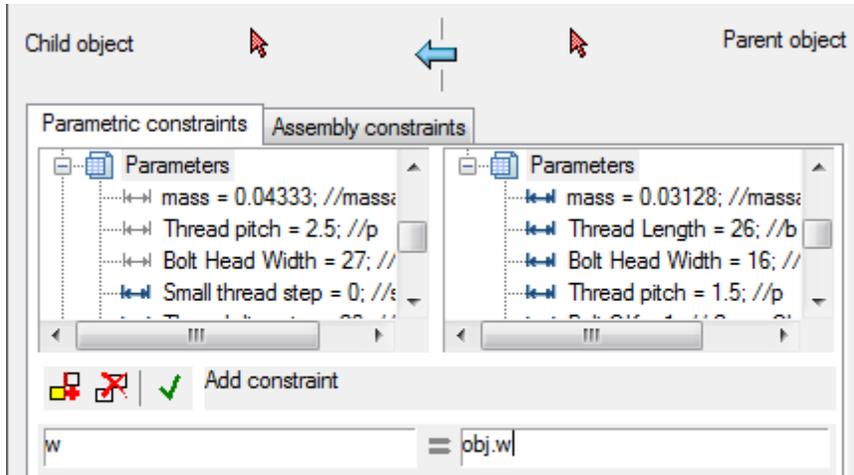
Button  *New dependency*. Allows you to create a new dependency

Button  *Delete dependency*. Deletes the selected list dependence

When adding or editing button is activated depending  *Save dependency*, which allows you to save your changes.

### *Installing the parametric dependence*

When installing the parametric constraints is associated parameters are recorded in the corresponding input fields located below the list object's parameters. Selecting the link parameters by double-clicking on the corresponding parameters in the list.

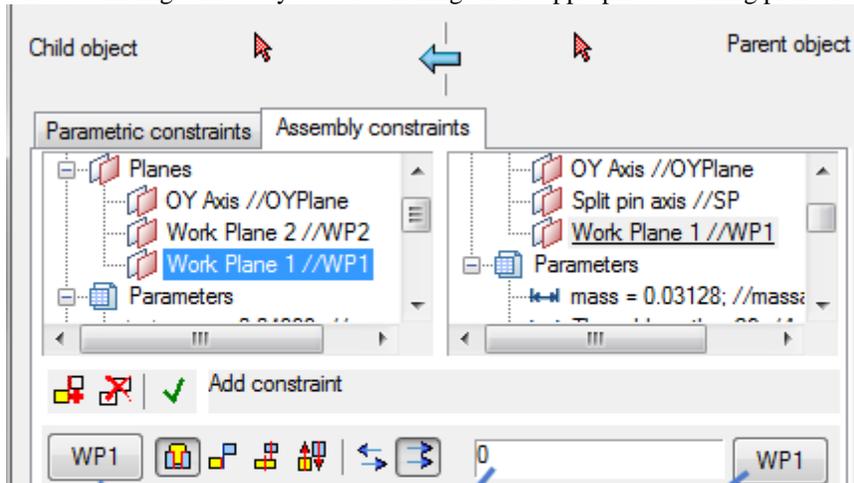


Parameter is a child object

Parameter of the parent object

*Installing assembly according*

To install the switch assembly according to the tab *Assembly constraints*. Choose binding surface by double-clicking on the appropriate working plane from the list.



Working plane child object

Working plane object

The distance between bonding planes

Selecting the plane can also be done visually in the drawing by clicking labelled plane and the linked marker indicating the working plane of the object.



The choice of method depends overlay using the buttons at the bottom:

 *Axial and surface alignment*

 *Surface alignment*

 *Combination axis*

 *Direction*

Choose mutual orientation related planes using the buttons:

 *Counter-directional*

 *Codirectional*

Button  *Bidirectional constraint*. Enables two-way relationship in which a related parameter or surface of the parent object changes with appropriate changes to the child object.

## Compound objects



Main menu: *Construction - Library objects - MechWizard -  Connect objects*.



Ribbon: *Construction - MechWizard -  Connect objects*.



Toolbar:  *Connect objects* ( "MechWizard").



Command line: *SPCONNECTTO*.

This command is used to overlay preset assembly and parametric dependencies on objects in the drawing. After running the command must specify.

1. Child object - an object that will be joining.
2. Parent object - the object to which you will attach the child object.

Upon completion of the command will be imposed on the details of parametric and geometric constraints defined in their script..

## Symmetry axis



Main menu: *Construction - Library objects - MechWizard -  Symmetry axis*.



Ribbon: *Construction - MechWizard -  Symmetry axis*.



Toolbar:  *Symmetry axis* ( "MechWizard").



Command line: *SPWIZSYM*.

Select the segment to set it as the axis of symmetry. Drawing can contain multiple axes of symmetry. Symmetrical layout sketch relating to a particular axis is determined automatically by the recognition of a parametric model.

## Set Parameter



Main menu: *Construction - Library objects - MechWizard -  Set Parameter*.



Ribbon: *Construction - MechWizard -  Set Parameter*.



Toolbar:  *Set Parameter* ( "MechWizard").

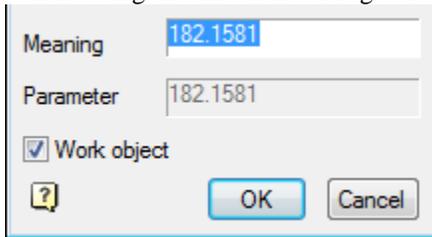


Command line: *SPWIZPARAM*.

Button *Set parameter* is used for setting targets sketch. Press the button and select the object (sketch element). This will bring up a dialog box, the form of which depends on which object was selected.

### Setting size

When setting the size of the dialog box will look like:



Enter a *parameter* expression to control the size. The parameter can be set by a variable name or expression that is allowed to use the number and names of the variables related to mathematical and logical functions.

**Important!** Object parameter names should not coincide with the names of the teams nanoCAD (for example, can not be assigned to the parameter name HATCH or LINE)

Expressions can be used the following functions:

- arithmetic operators +, -, \*, /
- trigonometric functions *sin()*, *cos()*, *tg()* (the function argument is given in degrees)
- inverse trigonometric functions *asin()*, *acos()*, *atg()*
- taking the square root function *sqrt()*
- exponentiation function *^* (recording format:  $x \wedge y$  - x raising y)
- absolute value *abs()*
- rounded to an integer value *int()*.

Logical operations:

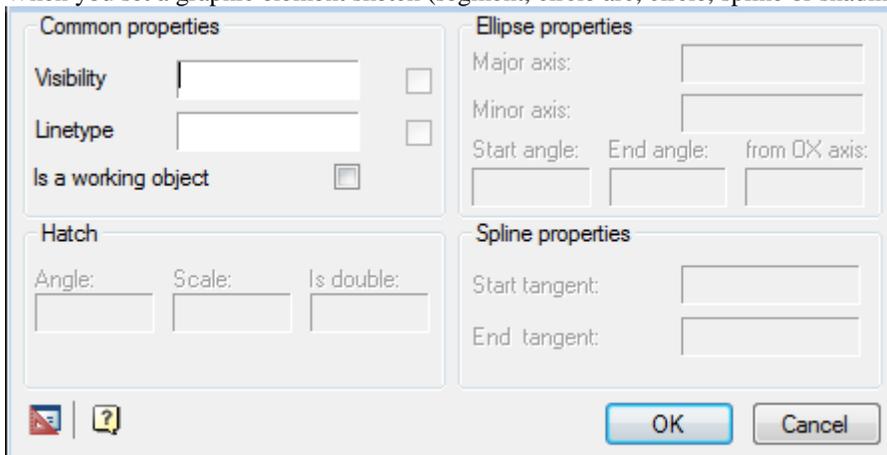
- *Min(x,y)* - returns the minimum value of the argument;
- *Max(x,y)* - returns the greatest value.
- *Iff(boolean, x, y)* - returns the value of the argument x if the logical expression is true, or the value of y if the logical expression is false. Example of using the function, the result of which is similar to the function Min (x, y): *Iff(x<y, x, y)*.

Valid logical conditions: >, <, == (equal), != (Not equal), >= (not less than), <= (not more).

Function within an expression can be nested.

### Setting the graphic element

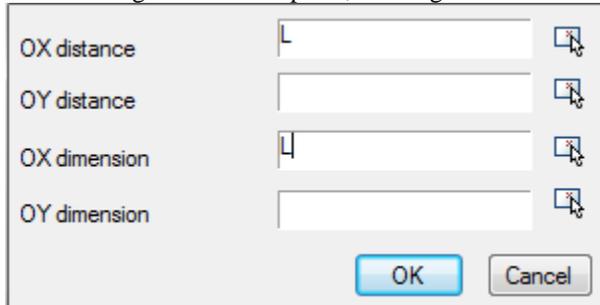
When you set a graphic element sketch (segment, circle arc, circle, spline or shading) dialog box will look like:



Work items are supporting the construction of a thumbnail and are not displayed when you insert a model from the database. Performance object can be any graphic sketch element: line, arc of a circle, etc.

### Setting the insertion point

When setting the insertion point, a dialog box will look like:



Distance along the axes OX and OY determines the position of the handle in the object. Distance can be set expression or numeric value.

Parameter on the x-axis and OX and OY is the name of the script variable whose value will change when stretching the handle.

Button  *specify parameter* lets take a parameter or drawing away.

### Enter additional values

In the sketch may include additional expressions for calculation of parameters. These expressions should be written a single line text entry format each line of text as follows:

$X = \text{EXPR}$

where X - the variable name;

EXPR - an expression that contains the names of variables, mathematical or logical functions.

Examples of additional rows of values:

- $a = b^2$  - assigning the result of an arithmetic operation;
- $\alpha = \text{asin}(b/c)$  - the use of trigonometric functions;
- $k = \text{iff}(a > b, 1, 0)$  - assign a value to the condition;
- $d = \text{min}(m1, 100)$  - the assignment of the smallest of the two values;
- $g10 = \text{sin}(\alpha^2) + \text{sqrt}(b^2 - c^3) / \text{min}(\text{sin}(a), \text{cos}(b))$  - nested functions.

Sequence computing additional rows values - from left to right and top to bottom. Additional values values recognizing parametric form must be selected along with other sketch entities.

### Insert point



Main menu: *Construction - Library objects - MechWizard -  Insert point.*



Ribbon: *Construction - MechWizard -  Insert point.*



Toolbar:  *Insert point ("MechWizard").*



Command line: *SPWIZINS.*

The insertion point should always be shown on the sketch of the parametric model. Click to choose its position on the sketch.

If you try to check the model or recognize the form of a sketch in which the insertion point is not specified on the command line, you are prompted to "Select insert point". Then you need to specify the sketch position of the insertion point.

In the case of several insertion points in the sketch, recognition will be considered only of the one that has been specified later, and all others will be ignored.

## Suppression contour



Main menu: *Construction - Library objects - MechWizard -  Suppression contour.*



Ribbon: *Construction - MechWizard -  Suppression contour.*



Toolbar:  *Suppression contour.*



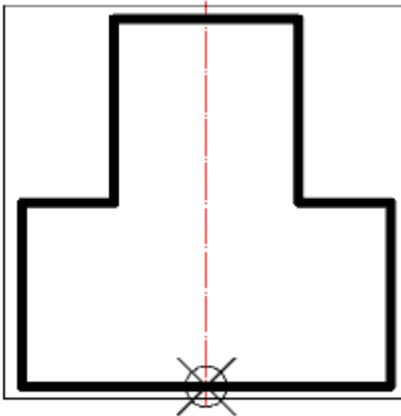
Command line: *SPWIZCONTOUR.*

**Important!** The command prepares the sketch for recognizing the execution type of the base object.

A suppression contour limits the area that the object overlaps with other graphics in the drawing. If the suppression contour is not specified, it is created automatically when the model is recognized by the external outlines of the part, and service objects are not taken into account.

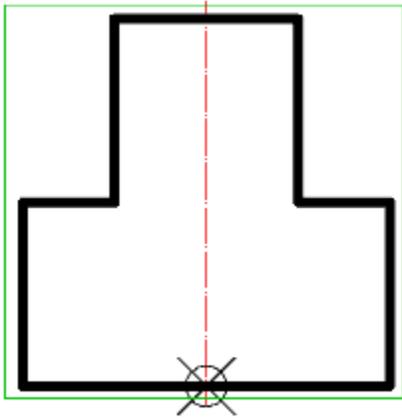
## Procedure

1. Draw a closed polyline on the sketch that matches the shape and size of the required suppression contour (in the figure, a rectangle around the sketch).

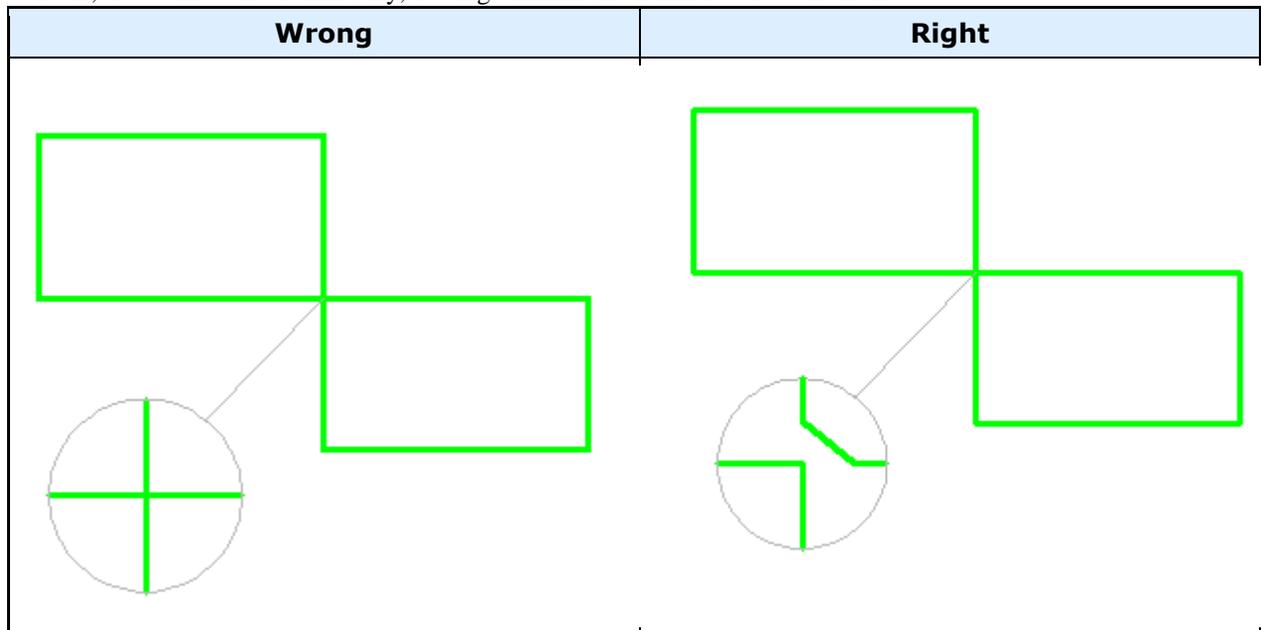


2. Call the command  "Suppression contour".

3. Specify the constructed polyline. The contour is highlighted in green in the sketch.



A prerequisite for the contour is the absence of self-intersections. To avoid self-intersections for a compound contour, create the contour manually, leaving a minimum "isthmus" between the areas:



If the suppression contour cannot be created automatically (the outer boundaries of the object do not form a closed contour), then when the object is inserted into the drawing, a corresponding warning message will be displayed. However, errors in the suppression contour do not affect the applicability of the recognized object, and can only appear in the wrong overlap of other objects in the drawing.

### ***Hatch contour***



Main menu: *Construction - Library objects - MechWizard -  Hatch contour.*



Ribbon: *Construction - MechWizard -  Hatch contour.*



Toolbar: *MechWizard -  Hatch contour.*



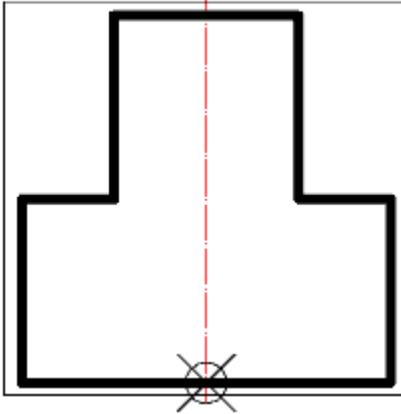
Command line: *SPWIZSECTCONTOUR.*

**Important!** The command prepares the sketch for recognizing the execution type of the base object.

A hatch contour defines the shaded area of an object in the drawing.

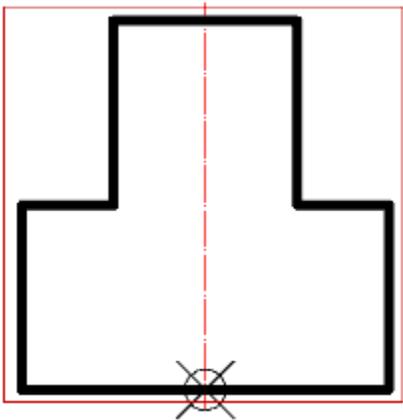
## Procedure

1. Draw a closed polyline in the sketch that matches the shape and size of the required hatch contour (in the figure, a rectangle around the sketch).



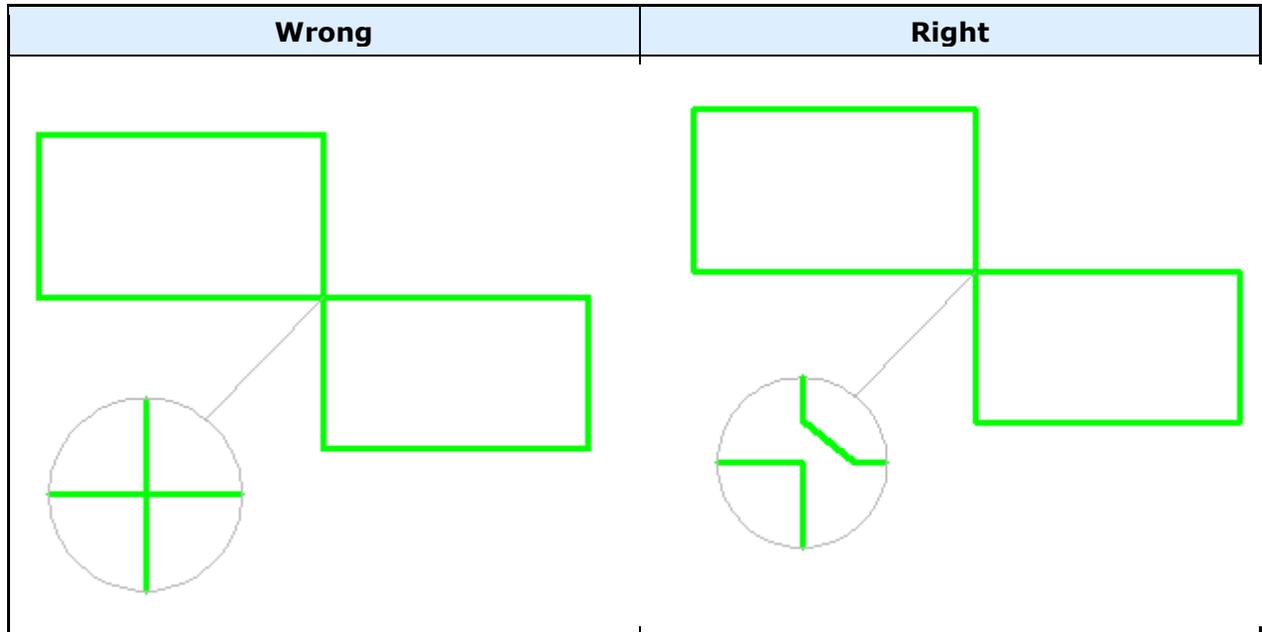
2. Call the command  "Hatch contour".

3. Select the constructed polyline. The outline will be highlighted in red in the sketch.



A prerequisite for the contour is the absence of self-intersections. To avoid self-intersections on a compound contour, create the contour manually, leaving a minimum "isthmus" between the areas.

<b>Wrong</b>	<b>Right</b>
--------------	--------------



## Array



Main menu: *Construction - Library objects - MechWizard - Parametric model.*



Ribbon: *Construction - MechWizard - Parametric model.*

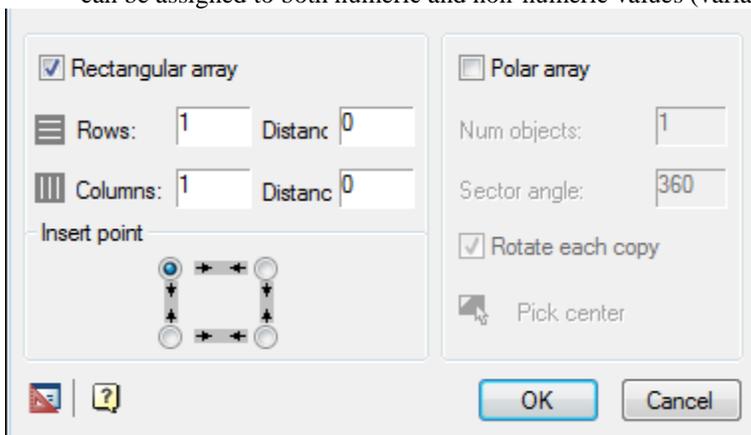


Toolbar: *Parametric model* ("MechWizard").



Command line: *SPWIZARR.*

1. Create primitives of nanoCAD block and select the required dimensions in the sketch to determine its size and location.
2. Press the *array* and selected block in the drawing.
3. In the dialog box, select an array type and parameters that control the construction of the array. Parameters can be assigned to both numeric and non-numeric values (variable names and expressions).



Every single unit with a unique name that is inserted into a sketch can be used only in a single array.

## Test Model



Main menu: *Construction - Library objects - MechWizard - Test model*.



Ribbon: *Construction - MechWizard - Test model*.



Toolbar: *Test model* ("MechWizard").



Command line: *SPWIZ*.

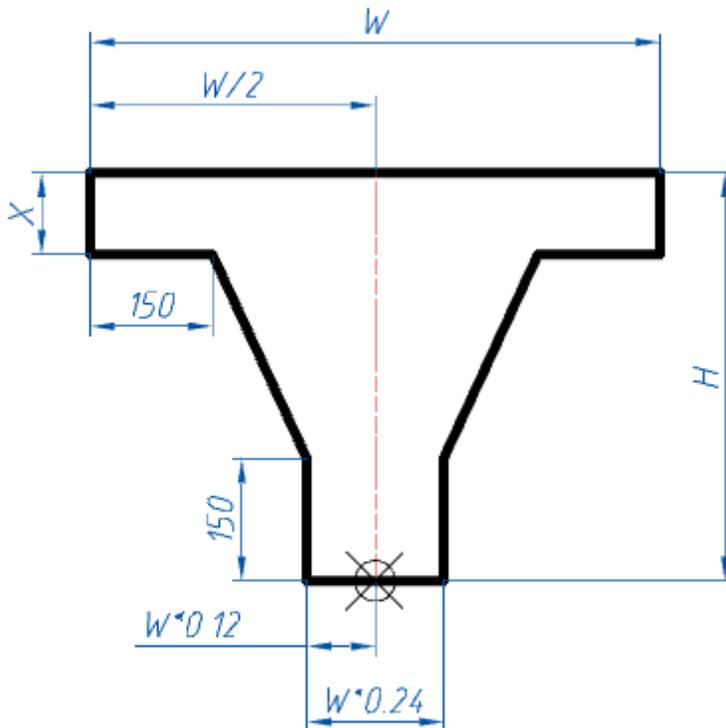
Checks sketch of a parametric model.

Highlight crossing window thumbnail and press Enter. If the sketch contains no errors, a message appears

If the sketch is not large enough, a message appears warning of an error.

## Create sketch

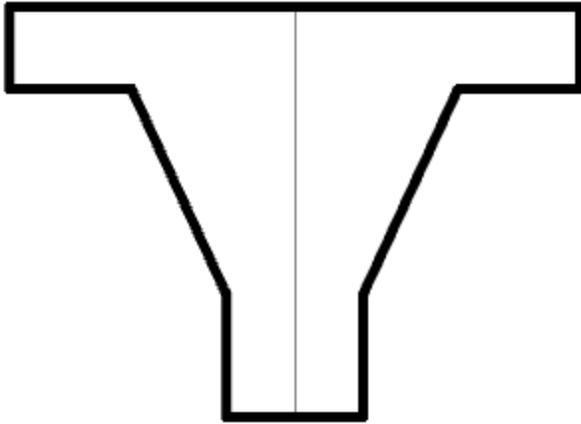
The sketch is the original model of the parametric view of the object.



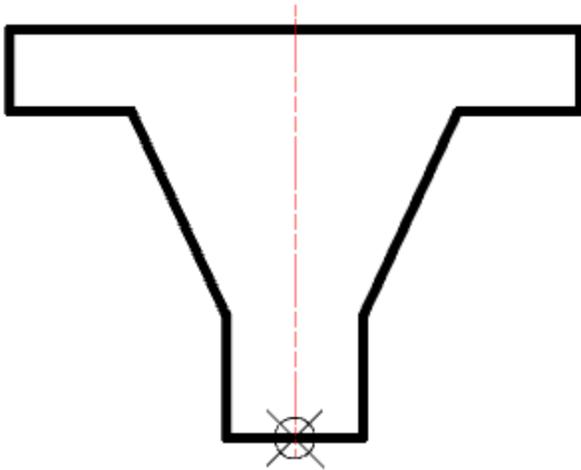
When creating parametric objects, the commands of the "MechWizard" toolbar are used.

## Procedure

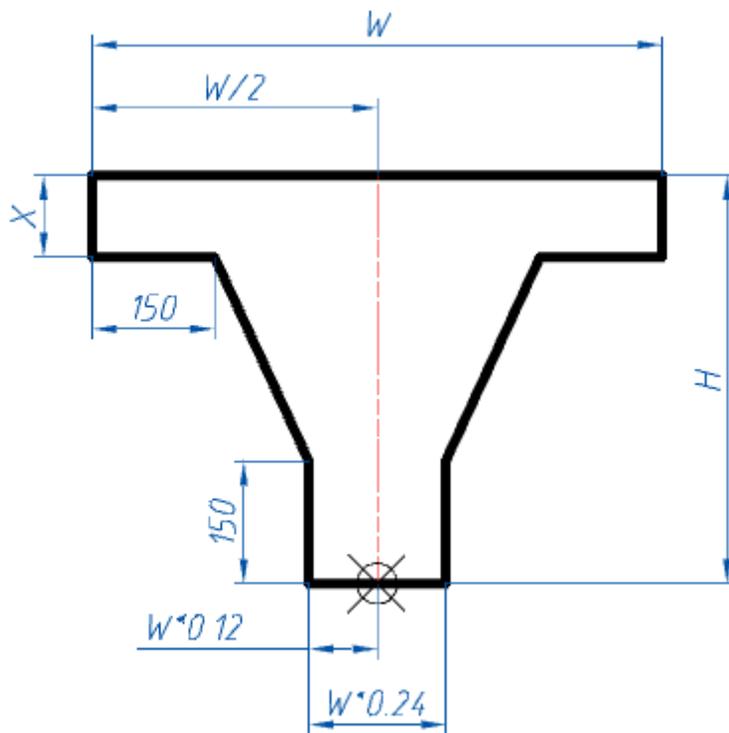
1. Prepare a sketch. For correct recognition, all graphic elements of the sketch (including hatching) must be drawn with the appropriate linetype. Similar types (solid thick and thin, dash-dotted thin and thick) should be distinguished by the color set in the [Construction settings](#).



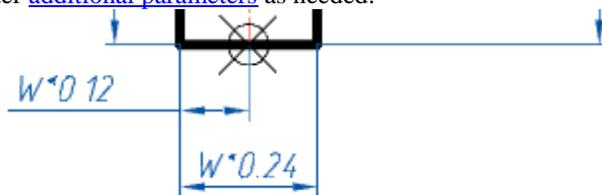
2. Set the [insertion point](#), optionally specify the [axis of symmetry](#), [sketch element options](#), [suppression contour](#), [hatch contour](#) and [parametric array](#).



3. Dimension and assign variables and expressions to them.

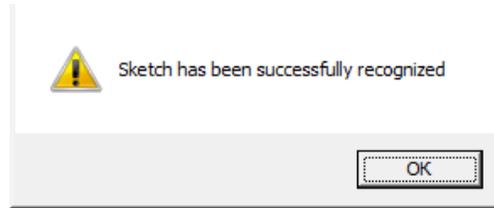
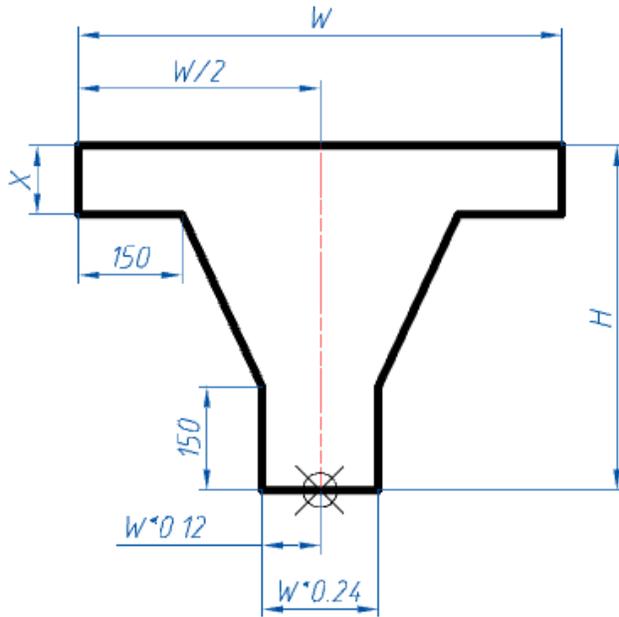


4. Enter [additional parameters](#) as needed.



$$X = 100$$

5. [Check the sketch](#) and make sure there are no errors.



$$X = 100$$

## Examples

### Creating a template layout tiles

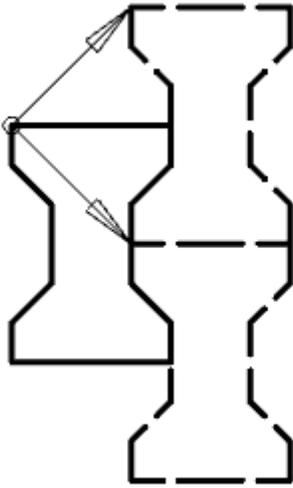
Example of creating a template layout tiles.

1. Create a sketch of the object. If the size of the tiles will not change, then the sketch is not required to specify the size.  
Terms and method of creating a sketch of the parametric object described in section [Rules for creating sketches](#).



2. Create an object and save it to the database. In a script, you must set the variable "type" (strTheType = "Plate")
3. Position the *Bone* in the drawing, insert the base of the two vectors and create a group. (see. [Create user group](#)). These vectors determine the pace and direction of replication of the original group. The basic point

of the vector must coincide with the insertion point of the object.



*If only one vector will create one line layout in any mode selection area.*