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Plant Design Tips and Tricks

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PD13-1 This session is a generic tips and tricks class that focuses on how to use AutoCAD features for plant design. Topics covered will be how new features in AutoCAD 2006, such as Dynamic Blocks, Block attribute extraction, and Tables can be used for creating schematics and isometrics, making calculations, and Bill of Materials. The class leader is the CAD manager at an EPC company with a focus on Plant Design. Learn from his experience, increase your productivity, and learn to have a lot of fun using AutoCAD as well

About the Speaker:

Jimmy is CAD and database development manager at Pharmadule Emtunga AB in Sweden, where he has been working for 8 years. He has also served the company in the position of AEC engineer. Pharmadule Emtunga, an AEC/EPC company, is the world-leading supplier of high-tech modular facilities to the pharmaceutical and biotech industry, living quarters and technical modules to the oil and gas industry, and modules to the telecom sector. Jimmy started to use AutoCAD in 1989. He also owns and operates JTB World, a company that focuses on application development. He has been published in several magazines and writes for his blog http://jtbworld.blogspot.com.

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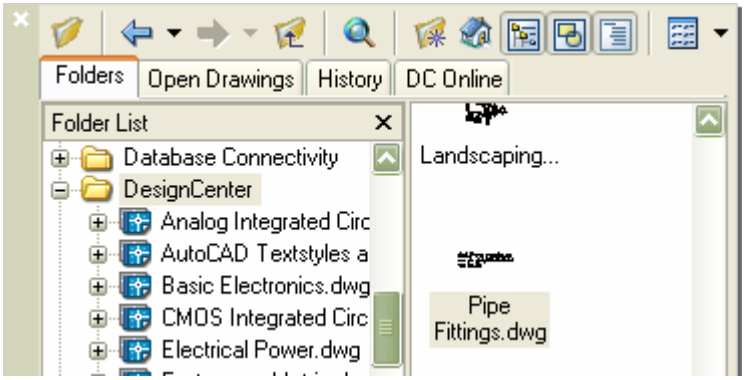
DesignCenter

Start a new drawing and save it with the name *dynamic valves.dwg*.

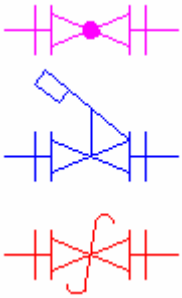
Start DesignCenter by clicking on the toolbar button or press CTRL+2.



Double-click on the drawing *Pipe Fittings.dwg* icon or right-click and select Explore
Double-click on the Blocks icon or right-click and select Explore

Locate the block *Valve - Globe flanged*. Drag and drop it into the drawing or right-click and select Insert Block…

Repeat the above step for the blocks *Valve - Quick Shut-off flanged* and *Valve - Safety flanged*.

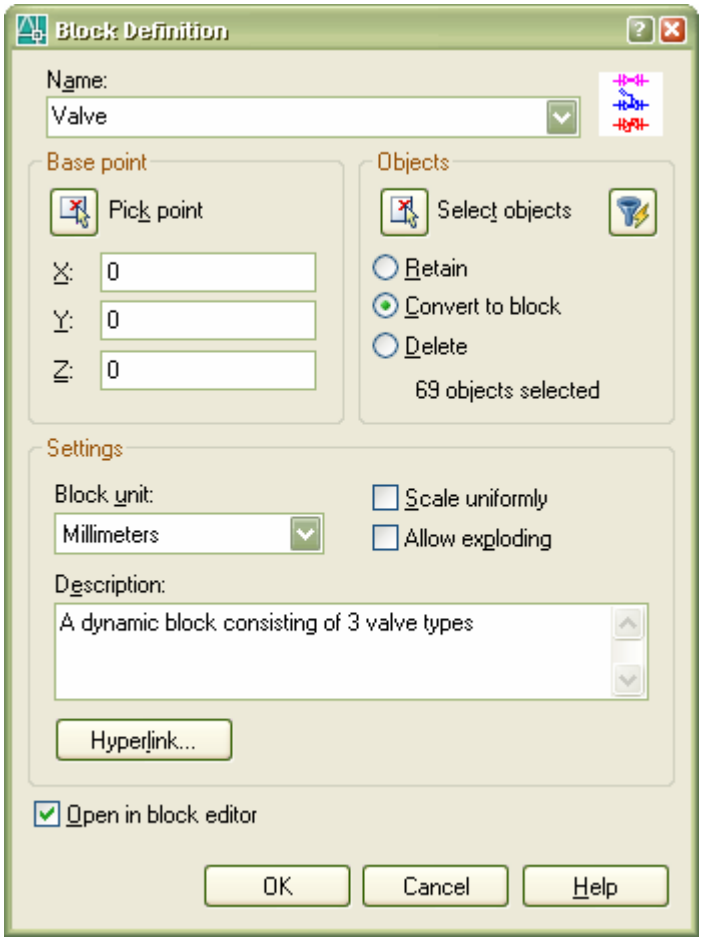


Explode the blocks. Create 3 layers with different colors. Assign each valve a unique layer and remember to set the color on the objects to ByLayer. This is not a mandatory step but it can make it easier.

Tips! To optimize the size of the block geometry that is common between the symbols can be deleted and later showed for all visibility states. (*dynamic valves step optimized.dwg*)

Block

Define a new block with the BLOCK command and enter *Valve* as block name. Select the 3 valves. Uncheck *Allow exploding* and check *Open in block editor*.



Block Editor

To have the valve automatically hide the line where it is drawn on add a wipeout using the WIPEOUT command.

To be sure that the symbol is above the wipeout copy the three valves and delete the originals. Draw order should work but this is a more fool proof way. Move the wipeout so the center of it is in 0,0. Remember to use #0,0 if the pointer input settings format is set to relative coordinates. Now also move each of the valves to 0,0.

Add a *Visibility Parameter* from the Block Authoring Palettes and name the label Type.

Open the *Visibility States* dialog box (command BVSTATE).

Name the visibility states the same as the valve type. Select the alternative *Hide all existing objects in new state*.

Click on the *Visibility Mode* button to show all geometry. It will be a bit shaded.

If Safety flanged is active freeze the two layers where the other types are.

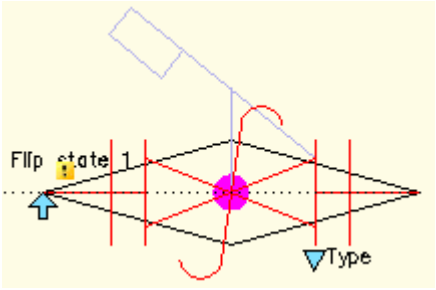
Click on Make Visible and select all geometry.

Repeat for the other two valve types.

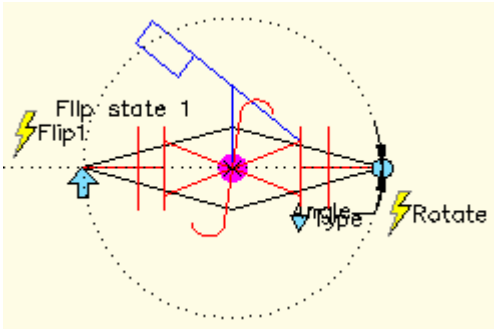
Tips! To make it easier to find any problems with the dynamic block close the block editor, save the changes and try the functionality. You should now be able to change between the three states. (see the drawing *dynamic valves step 1.dwg*)

Double click on the dynamic block to be able to continue the editing.

Now it's time to add a *Flip Parameter*. Add it horizontally. Name the flip label *Flip state 1*. Add a *Flip Action* to the Flip Parameter. Select all objects except the Visibility parameter. Activate one of the visibility states and decide if it should be possible or needed to flip like this. Select the flip parameter, right-click and select Object Visibility and one of the four choices. Repeat this for all visibility states. For each visibility state make sure that the flip action is visible or not.



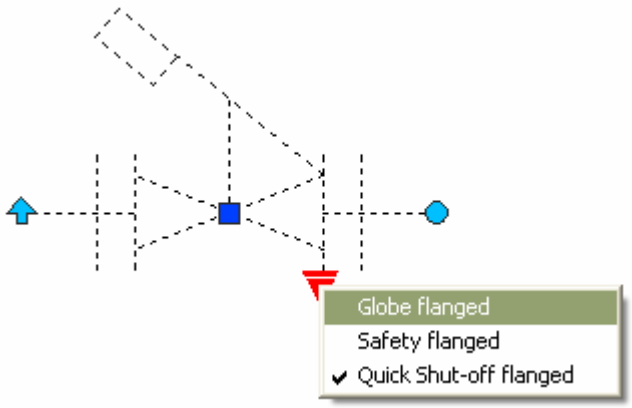
Add a *Rotation Set* (instead of having to add first a Rotation Parameter and then a Rotation Action) with the base point 0,0. Select the Rotate Action, right-click and select Action Selection Set>New Selection Set and select all objects. Click on the Rotation Parameter, right-click and set Object Visibility to Show for All States. For each visibility state make sure that the rotation action is visible or not.



Thaw all layers and select all geometry and change the layer to 0.

TIPS! Press CTRL+A and select layer 0 in the layer dropdown list on the

Close the block editor, save the changes and try the functionality of the dynamic block. Hide the wipeout frame by running the WIPEOUT command using the options Frames and Off. Purge the drawing from blocks and layers that are not used and save the drawing. You should now be able to flip the valve and rotate it. (see the drawing *dynamic valves step 2.dwg*) This is what it look like when the valve is selected.

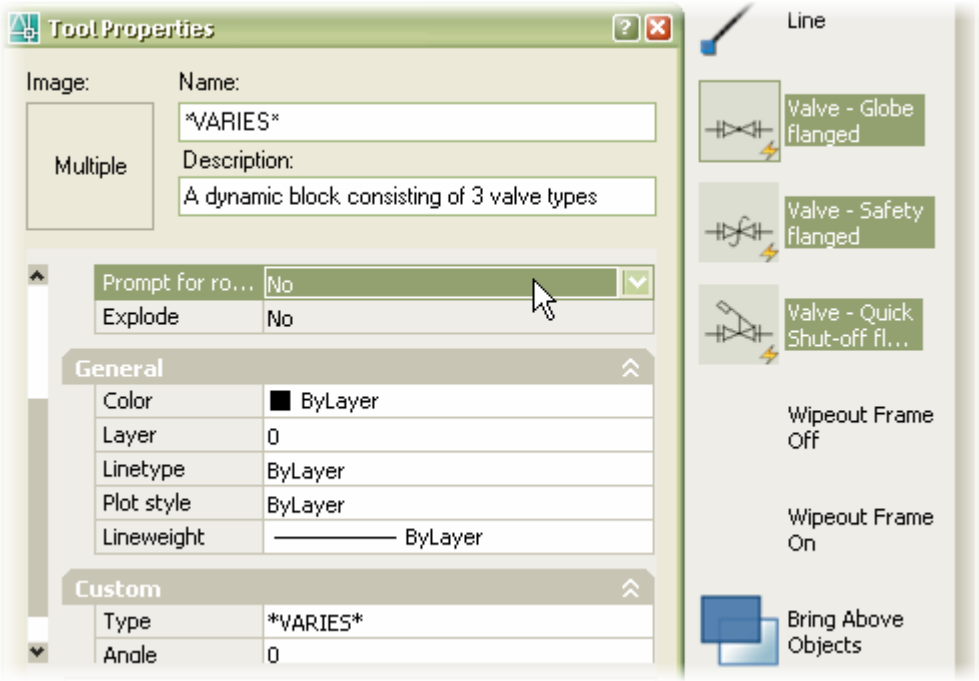


Tips! If you don't want the users to unintentionally use the Block Editor by double-clicking on a block the Block Editor can be disabled by setting the BLOCKEDITLOCK system variable to 1.

If you want the block to automatically align to a line you can use the *Flip Parameter*. Set the base point of reflection line to 0,0 and the endpoint to a point horizontally on the right side of the base point.

Tool Palettes

Create a new Tool Palette. Drag and drop the valve block to the palette to create a new tool. Make two copes of the tool by holding down CTRL and using drag and drop. Now select one of the tools and change the value of the Custom property Type to something else and change also the Name property of the tool. You may also set other properties like layer or color. Do the same for the third tool so the result is something like this.

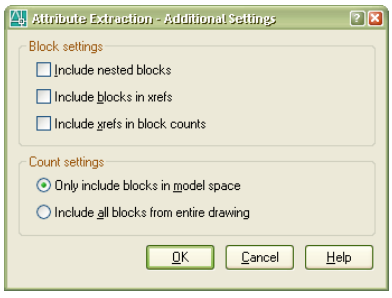


Tips! Notice that it's possible to select multiple tools (holding down CTRL and click on each) and change properties. In this case set the *Prompt for rotation* to No. The properties that are different shows as *VARIES*.

To test the dynamic valve block start a new drawing and draw a line and drag and drop a valve on the line and notice that the line below the valve symbol is hidden and that the valve automatically aligns to the line.

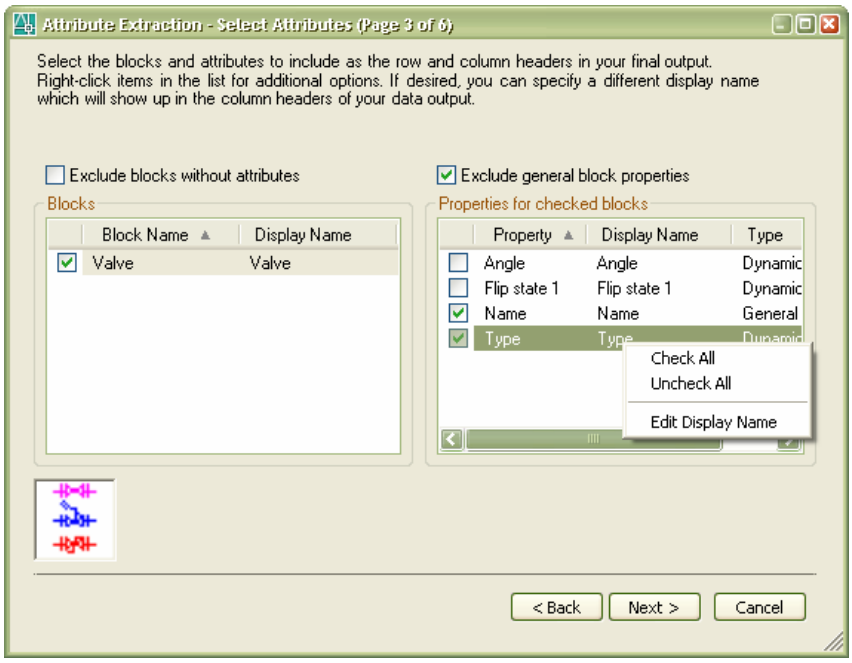
BOM – Bill of Materials

A BOM can be created using Tools>Attribute Extraction (command EATTEXT). The command starts a wizard that guides you through the following settings.



Select *Create table or external file from scratch* and press next.

Select *Current drawing*. Click on *Additional Settings…* Uncheck *Include nested blocks* and *Include blocks in xrefs* and select *Only include blocks in model space*. Press next. (The reason for this is that it increases the performance if there is no need to use these settings.



Select the Valve block name and the Name and Type properties. Press Next.

Tips! If there are a lot of block names in the list you can select the option *Exclude Blocks Without Attributes*. You can also right-click in the list box to get the alternatives *Check All*, *Uncheck All* or *Edit Display Name*.

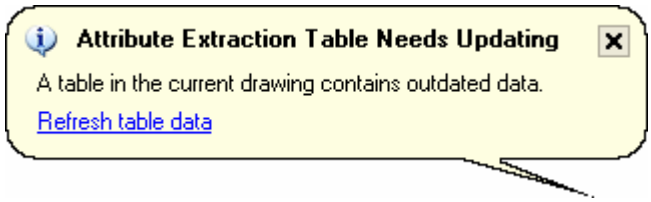
Select to extract attribute data to *AutoCAD table* and press Next.

Enter a Title for the table and press Next.

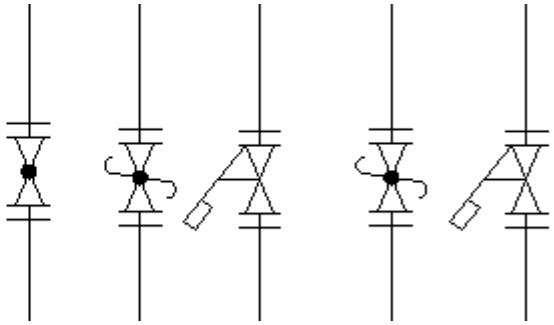
Save the settings to a template so they can be reused and press Finish.

Select an insertion point for the table. To illustrate how the table can be changed select the table, right-click and select Update Table>Edit Extraction Settings. Go to page 4. Right-click on the Name column and select Hide column. Finish the wizard.

Now add some more valves to the drawing and notice that you are notified that the Attribute Extraction Table needs Updating. Click on the *Refresh Table data* link and see how the quantity is updated.



BOM Valves	
Quantity	Type
1	Globe flanged
2	Quick Shut-off flanged
2	Safety flanged



Tips! You cannot drag a table using left mouse button but if you select the table and use the right mouse button you can. That way you can drag the table to a Tool Palette.

Tips! If you saved the attribute extraction to a template you can add a tool that automatically add a table to the drawing based on that template.
Add a command tool and enter: ^C^C(command "-eattext" "t" "C:/datasets/PD13-1/bom.blk" "y")

Tips! To add a command tool for the table do like this. Right-click on the Tool Palettes Window and select Customize… Drag and drop the table button from the Draw toolbar and drop it on the Tool Palette.

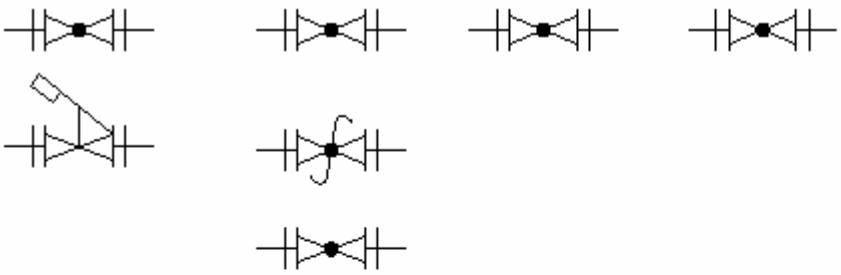
Dynamic Blocks with attributes and lookup parameters

The drawing *dynamic valves.dwg* includes attributes that can be manually edited. It also includes a lookup parameter to translate the Valve type to a Valve Code.

Tips! To control the order use the command BATTORDER.

Tips! If you add or make changes to the attributes you might have to use BATTMAN and Sync the block.

Tips! If you want to visualize a lookup property you can add a field to the attribute and select BlockPlaceholder and then the name of the Lookup parameter.



Sample BOM						
Quantity	Name	Type	Code.	Size	Actuator	Comment
1	Valve	Globe flanged	GLO	300	Gear	
1	Valve	Globe flanged	GLO	400	Gear	
1	Valve	Globe flanged	GLO	300	Handwheel	
1	Valve	Quick Shut-off flanged	QSO	300	Handwheel	
1	Valve	Globe flanged	GLO	400	Gear	Spare
1	Valve	Globe flanged	GLO	300	T-Handle	
1	Valve	Safety flanged	SAF	400	Gear	

Table and Fields

Add a new table to the drawing and notice some less known functionality.

It's possible to make cross references between tables. Select one cell in the table right-click and select *Insert Formula>Sum*. Select the 3 rows in the other table and you will end up with a formula like this: =Table(2125665320).Evaluate(Sum(A3:A5))

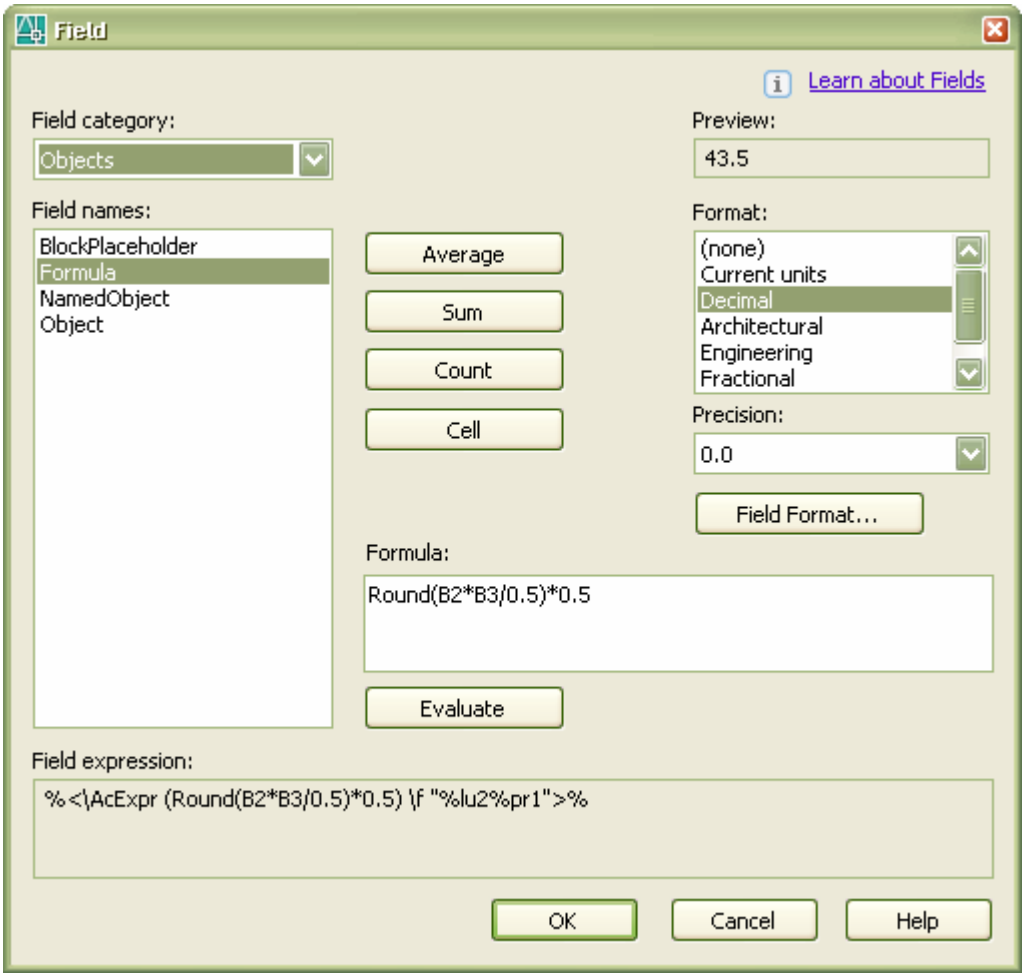
Be aware that if the number of valve types in the BOM table changes to let's say from 3 to 2 the formula doesn't change and the value that shows up after running *Tools>Update Fields* (command UPPDATEFIELD) shows #. The formula has to be changed to have a valid range to show the correct value.

Table and field test	
Total Quantity:	5
Factor:	8,65
Calculation 1:	43.3
Calculation 2:	43.5

On the row Calculation 2 I have inserted a field and used a formula that rounds the value to the closest ½ fraction.

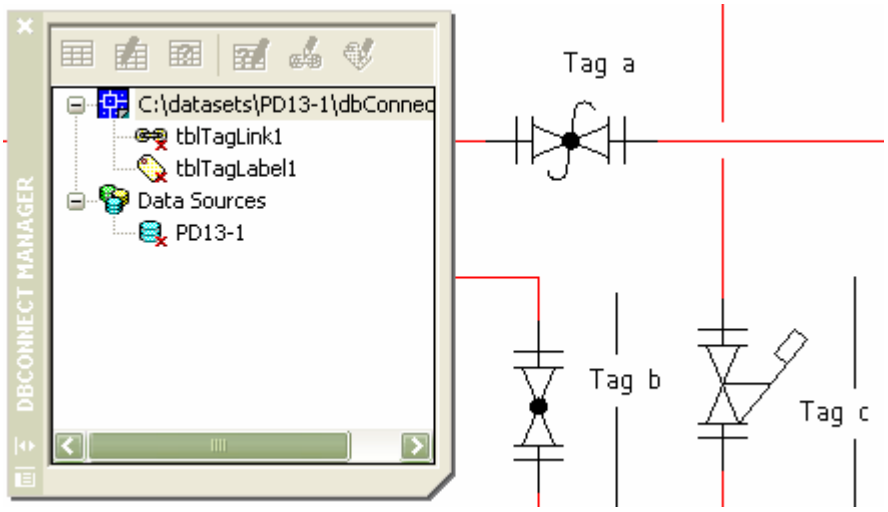
To control the number of visible decimals the UNITS command has to be used.

(See *BOM sample.dwg*)

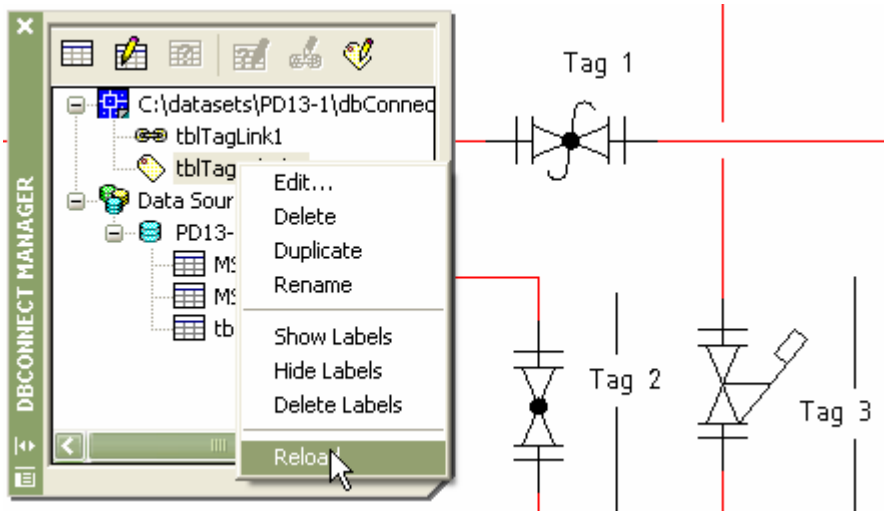


Database Connectivity with dbConnect and Access

If you have data in a database that should be showed on a drawing dBConnect can be really useful. Pharmadule Emtunga AB have used dbConnect since it was introduced in AutoCAD 2000 to show the tag number on the drawings. The tag number often changes during the project and by using dbConnect we can have the text on the drawings updated from the database.



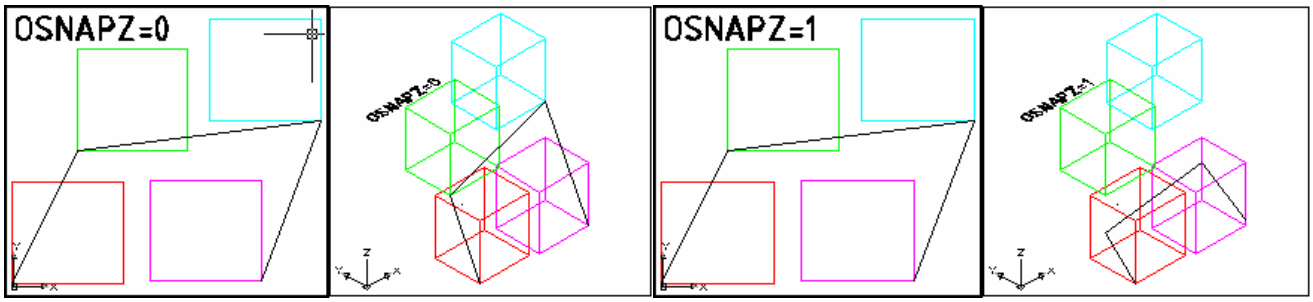
And after reloading the text on the drawing has been updated from the database.



Tips! If you would like to add a background mask to the labels select them and show the background mask using the Properties palette. To place all on top of other geometry select *Tools>Draw Order>Bring Text* and *Dimensions to Front>Text Objects Only*.

Ignoring Object Snap Elevations

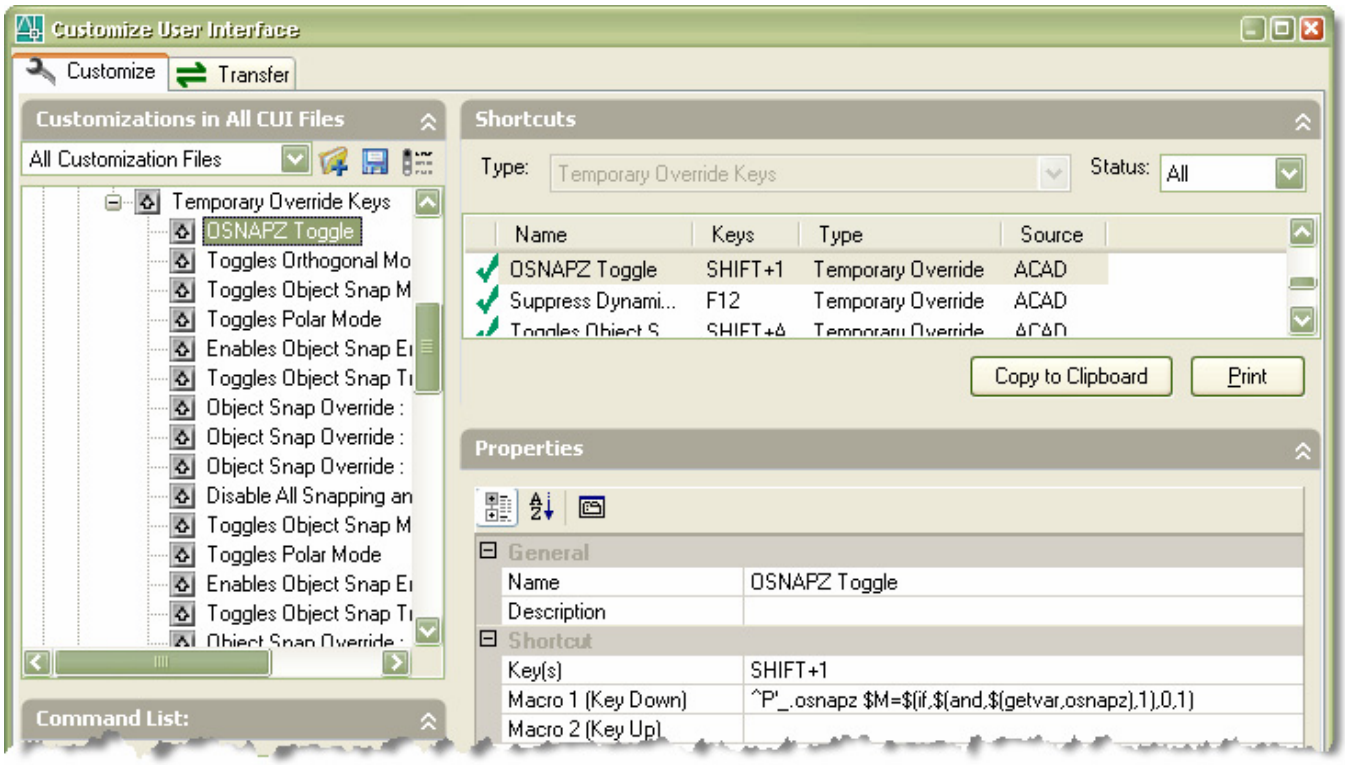
If you work in 2D and traces on top of 3D geometry and snap to you might later have noticed that the Z value of the object you snapped to was used when snapping to the point. AutoCAD 2006 introduced a solution to this with the new OSNAPZ system variable. If set to 0, osnap uses the z-value of the snapped point. If set to 1, it uses the x and y coordinates of the snapped point and the current value of the ELEVATION system variable. It also take the current USC into account. The later is useful if you work in 3D and want to project a point on the current working plane by using other geometry.



With OSNAPZ set to 1 the result is what you probably expected it to be.

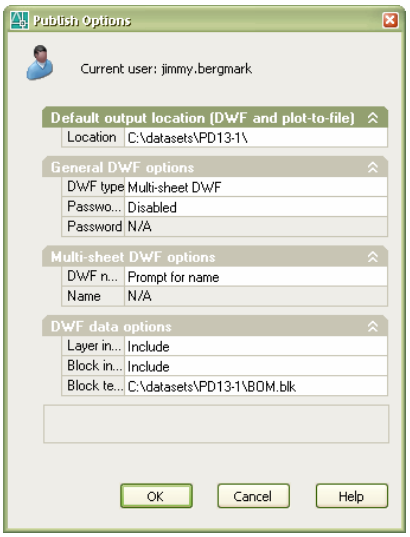
Tips! If you draw using (lightweight) polylines, the elevation of the first snap determines the elevation. After that, any snap works as if OSNAPZ was set to 0.

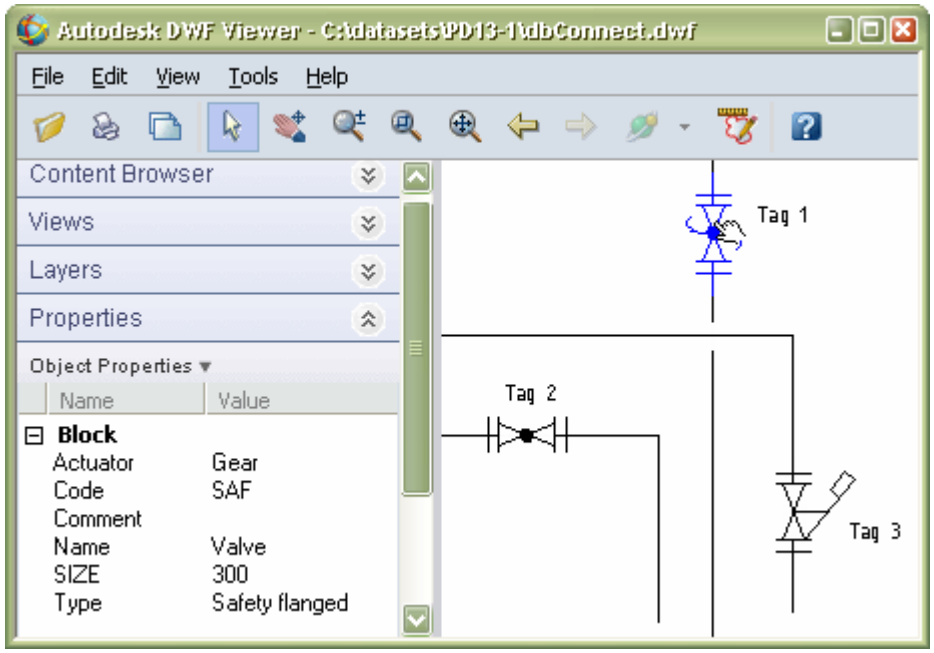
Tips! With the usage of CUI (Customize User Interface) and Temporary Override Keys it's easy to make it easier for you. As you can see below a toggle for OSNAPZ is created and is activated by holding down SHIFT+1. The macro is: `^P'_.osnapz $M=$(if,$(and,$(getvar,osnapz),1),0,1)`



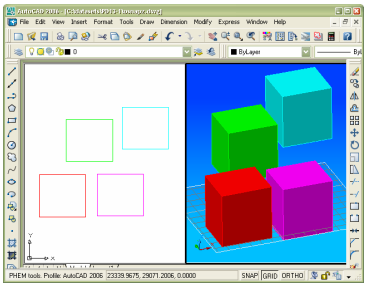
Publish a 2D DWF with data and 3D DWF

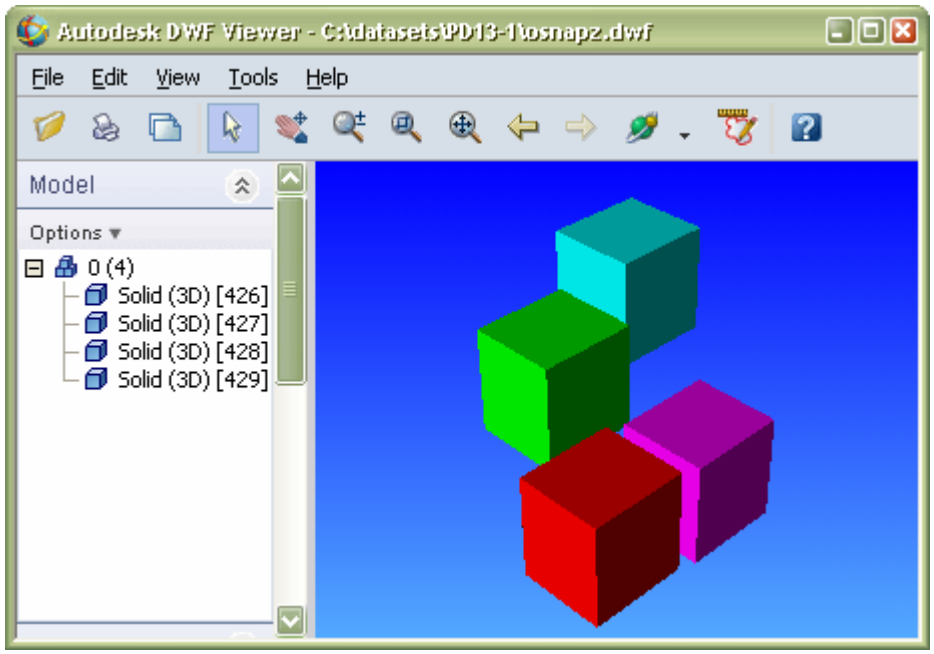
By using the Publish command it's possible to include block information in the published DWF file as seen below.





With the 3DDwfPublish it's possible to create a 3D DWF





Contact Information

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