Autodesk University 2012

Customizing AutoCAD P&ID

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PD1748 In this class, you will learn how to create and customize a sample AutoCAD P&ID software project. We will show you how to customize a title block to include company information, modify AutoCAD P&ID to use your own layering system, and create company blocks for your project. The class will cover how class structure affects symbol creation and how dynamic block tools work with AutoCAD P&ID. You will also learn how to work with project fields and find out where project settings are stored.

Learning Objectives

At the end of this class, you will be able to:

- Customize a title block to include company information.
- Using custom layers
- Create new blocks
- Modify project fields

About the Speaker

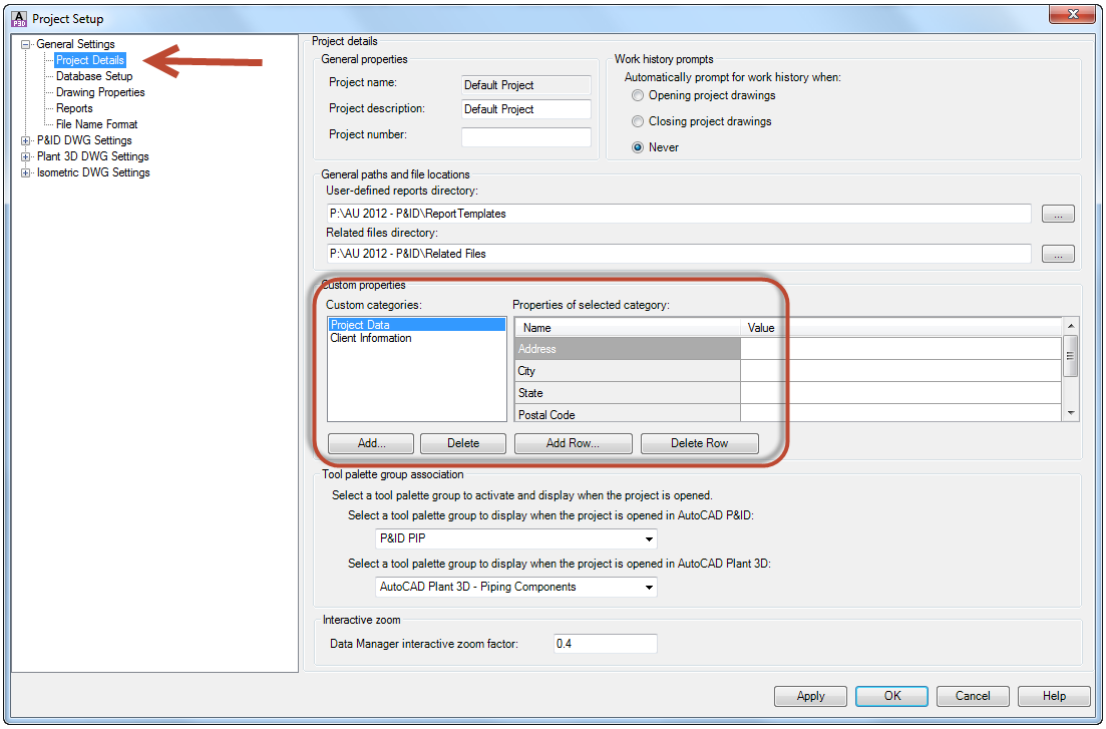
David Wolfe has extensive experience customizing AutoCAD using Lisp, VBA, and .Net. He is a Process and Power Specialist with ECAD, Inc. and trains clients how to use and implement the AutoCAD Plant Design Suite. His experience helps him tailor AutoCAD installations to meet company standards and helps students get quickly up to speed using industry best practices.

Customizing a title block to include Company Information

One of the advantages of using a project-centric approach to P&ID's is easy title block management. Using AutoCAD P&ID, you can modify title blocks in a project from the project manager. Being able to modify drawing and revision information from the title block allows users to avoid repetitive, time-consuming attribute edits manually.

Organizing your Title Block Information

Title blocks attributes can be broken down into two types, drawing attributes and project attributes. AutoCAD P&ID allows defining custom properties at both the project level and the drawing level. Project properties are available under Project Details.



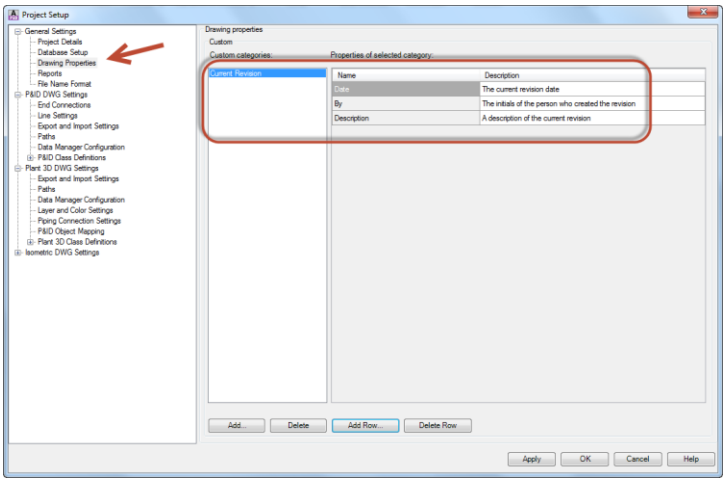
Creating Project Fields

Under project details, you can add categories of properties as well as new properties. Remember that properties created here should be applicable to multiple drawings. The values for the properties will be set here as well. Keep in mind that if you want the properties to display in a particular order, you should create them in that order as there is no editing your field order.

For our title block the default project setup includes all the necessary properties.

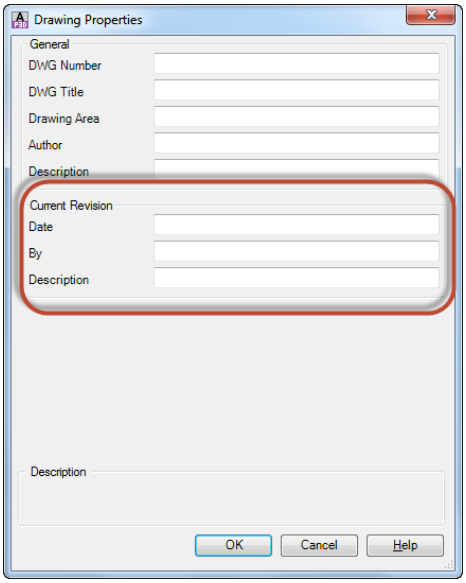
Create Custom Drawing Properties

Drawing properties are available under General Settings > Drawing Properties.



Again, you may create categories to organize your properties. The same rule for property and category order applies to drawing properties. Make a list of what properties you will need first and then create them in the order you need. In our example, we will create the Current Revision category, adding the Revision Date, Revision By, and Revision Description properties.

Users will be able to access and modify the properties by right-clicking on a drawing in the project manager, and selecting properties.

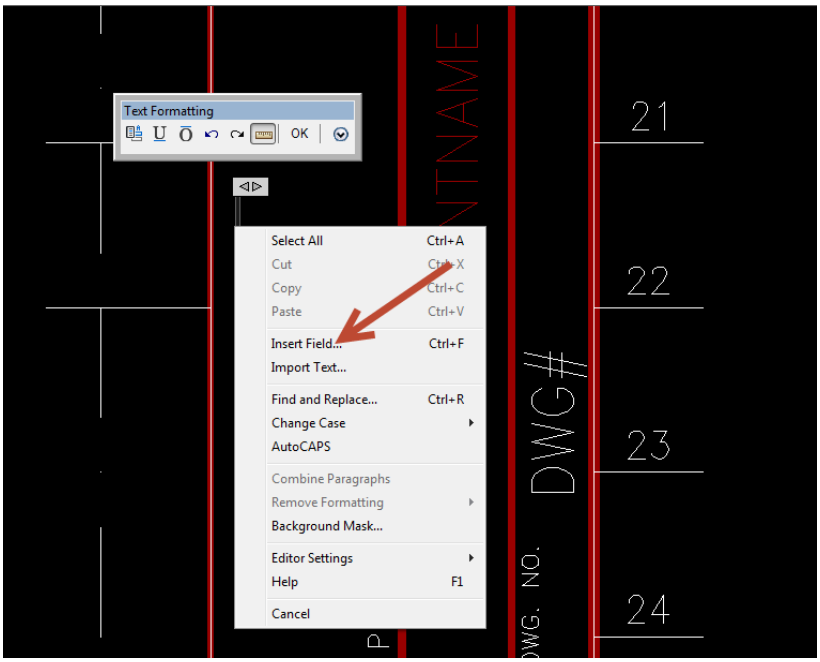


You should create a property for every field that a user would need to edit in the title block. That way, all of the title blocks may be filled out from the project manager without having to open every drawing. For our project we will create the following categories and properties:

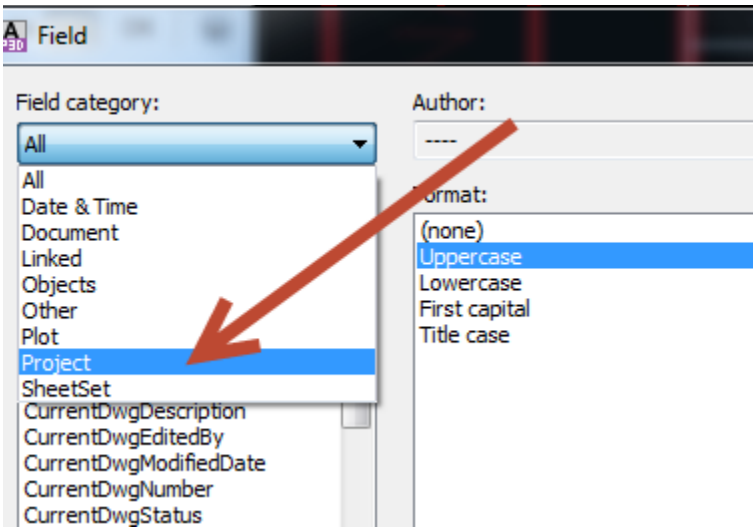
- Current Revision
  - Drawn By
  - Drawn By Date
  - Checked By
  - Checked By Date
  - Approved By
  - Approved By Date
- General
  - Scale
- Revision Line 1 (Line 1 – Line 6)
  - Number
  - Date
  - By
  - Description
  - Approved By
- Reference Drawing (1 – 6)
  - Drawing Number
  - Title

Referencing Properties Using Fields

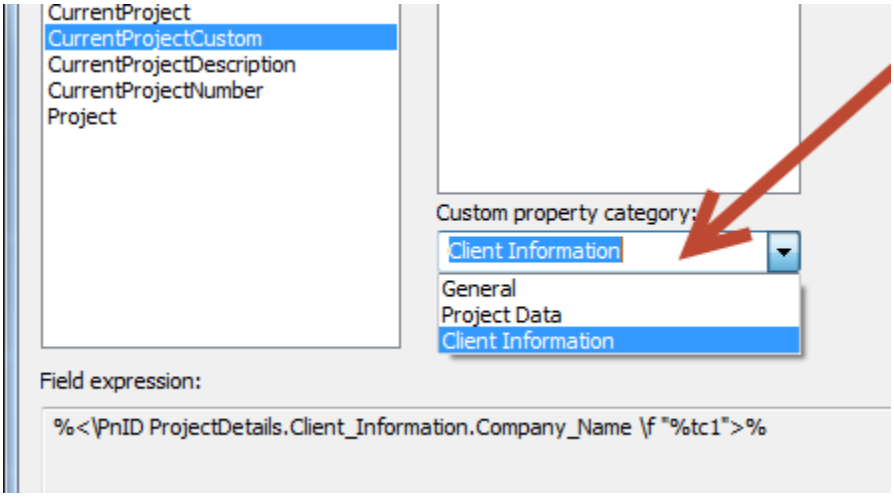
In order to use our new properties, we will have to use AutoCAD fields in our title blocks. Fields may be used in text or attributes by right-clicking and selecting insert field.

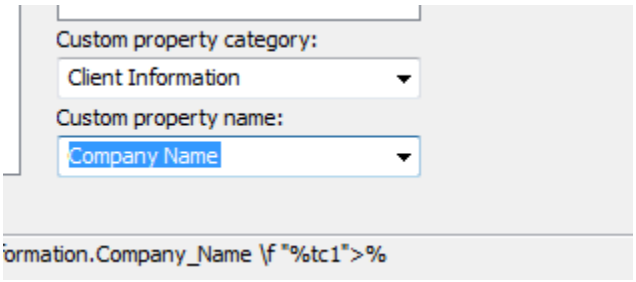


For our properties, we will use the Project field category.



We can add a field referencing the project properties by using the CurrentProjectCustom category and selecting Client Information and then company name.





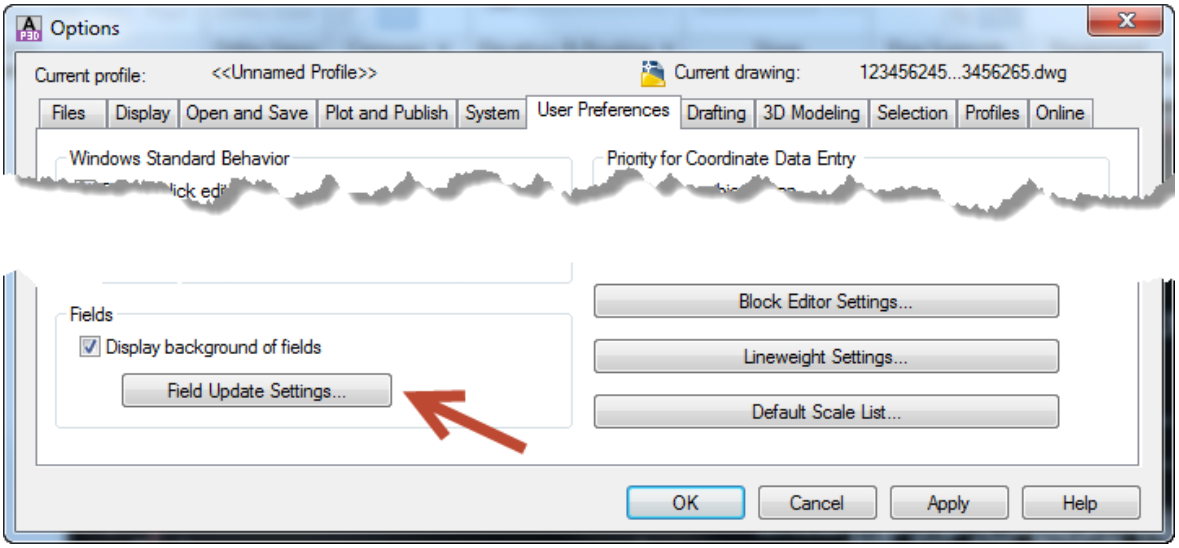
Custom drawing properties are available using the CurrentDwgCustom category and selecting one of the categories and properties you created.

Create Blank Properties Template

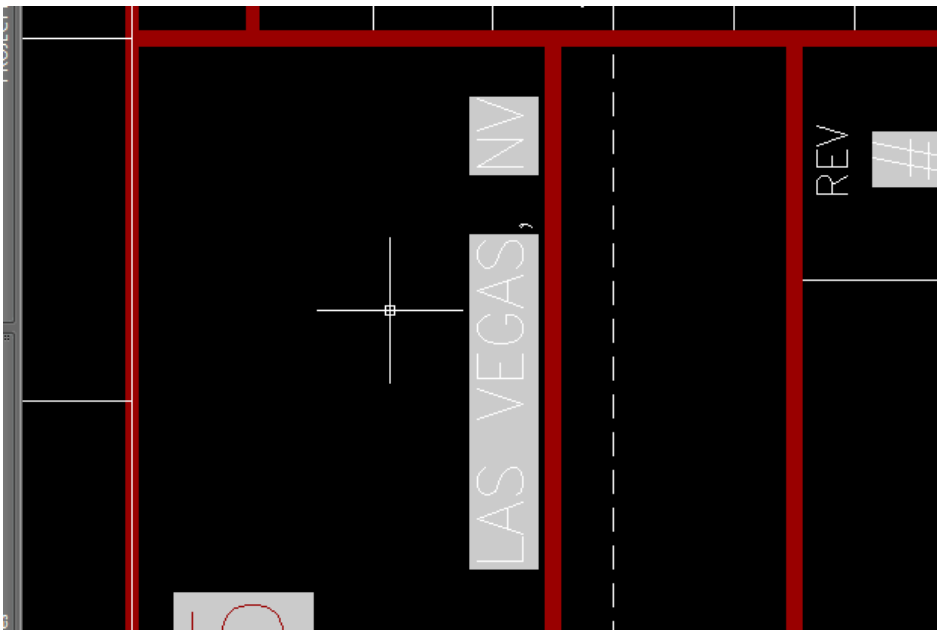
The best way to get started is to create a new drawing in a project. We will insert our title block, modify it to use the properties necessary, and then create a template from the new drawing. Using a drawing that is currently in the project allows us to set our default values to blank so we don't get the pesky #### sounds.

When using fields we must also put our title blocks on a layer that we can lock. Users tend to forget they are supposed to use the project manager, so locking the layer serves as a reminder. Also, we need to keep our field update settings in mind (although Plant updates fields well).

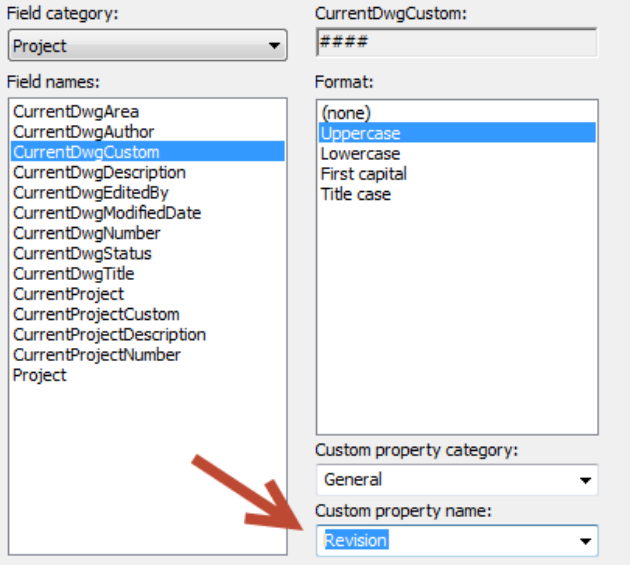
In options under User Preferences, AutoCAD stores a couple system variables. First we can have AutoCAD display a field background so that we know where our fields are. Also, the field update settings are available. Sometimes people may make a change and wonder why the value on the drawing hasn't change. The field update settings controls when fields will be updated in the drawings.



In our project, we will create a new drawing called tbsample.dwg. Then we will insert our company title block (ECADPipingBorder-Houston). Once the title block is inserted, we can add the fields for our properties. A couple of these deserve special mention. Notice that when inserting fields, it's just like putting in text. So for the City/State attribute, we can insert the project field for the city and then a ", " and then insert the state field. Notice also that we can format the letter case.



The second attribute we should mention is the revision. Some may have noticed that I did not include a current revision property. A revision number property is included in the project by default and is available under CurrentDwgCustom > General > Revision. Because this is the revision the program fills out, I prefer to use this built-in property, but the choice is yours.



After the title block is filled in, create a layer for it, and lock the layer. At this point, make sure to include your default styles (annotation, dimension, multi-leader) and layers as the current drawing will become our template file.

The last step is to modify all the drawing properties with Alt+0160. The Alt+0160 is called a non-breaking space and allows us to put a blank value for an attribute. Having this value in our attributes allows us to avoid having the pesky #### signs in our new drawings.

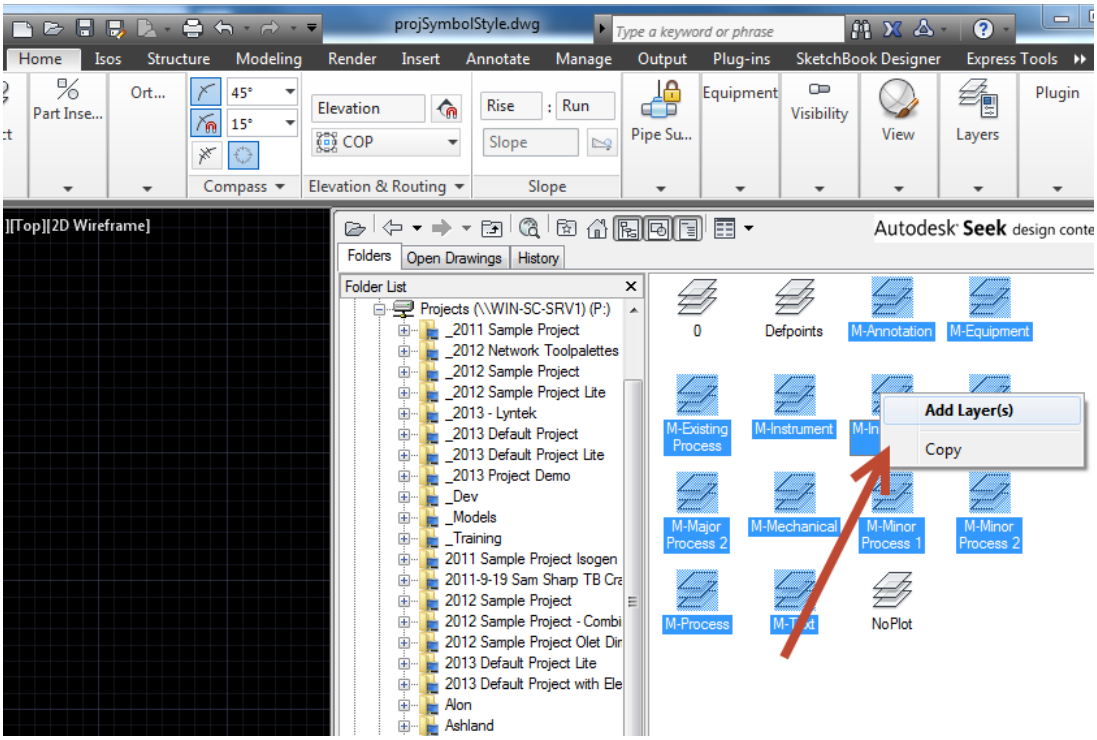
When you have completed your setup, do a SaveAs and choose .dwt. Save the template to a location of your choosing. Open project setup, go to P&ID DWG Settings > Paths and for the Drawing Template (DWT) property, pick the template we created. From now on when creating a new P&ID, your drawings will come in using your custom properties. This tip was from Tomislav on the forums http://forums.autodesk.com/t5/AutoCAD-P-ID/Fields-How-to-hide-quot-quot-from-blank-fields/m-p/3362383/highlight/true#M3315.

Implementing Custom Layers

Part of adopting AutoCAD P&ID as your drafting package is implementing your own layering system. One of the key project files is the projsymbolstyle.dwg which is stored in the project folder (with the project.xml). This file contains the layers that will be referenced in the block settings.

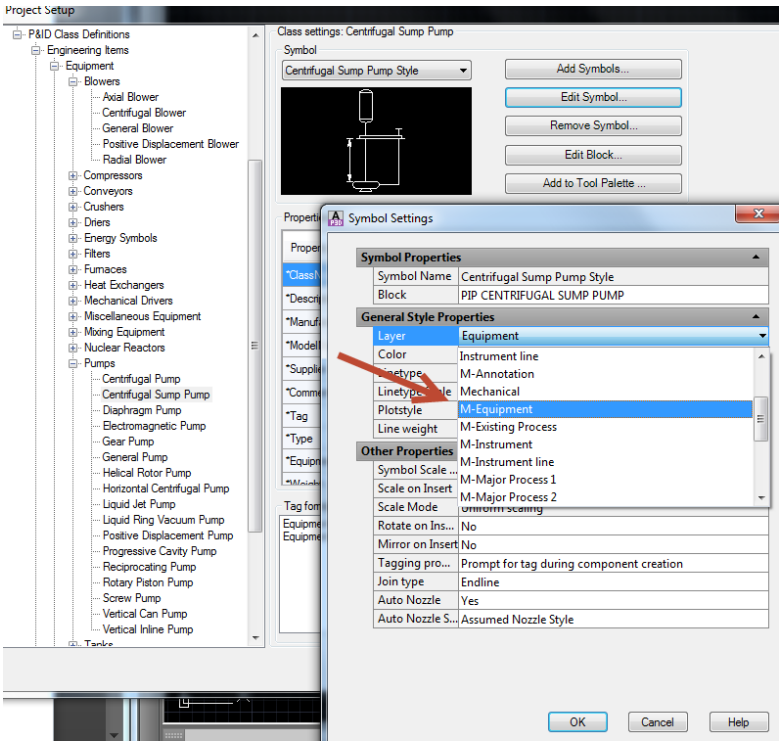
Set up Layers in the Project Symbol Styles Drawing

As with all things AutoCAD, we have many ways to setup layers in a drawing. One of my favorite is using Design Center (Ctrl+2). Using Design Center allows us to browse to a drawing, and select layers to add to our current drawing using drag-and-drop. You can also add layers by selecting them, right-click and choose Add Layer(s).



Modifying the Symbol Layers

After add our layers to the projsymbolstyle.dwg, we can select the new layer to place objects on by clicking the Edit Symbol button.



Create new blocks

Another key to customizing your AutoCAD P&ID setup is to add your own custom symbols. In this section we will show how to customize several types of block content. To know where to create the blocks in the project, we need to examine the project class structure.

Class Structure

The most important aspect of the class structure used by AutoCAD P&ID is inheritance. AutoCAD P&ID uses four top level classes – Engineering Items, Non-Engineering Items, Pipe Line Group, and Signal Line Group.

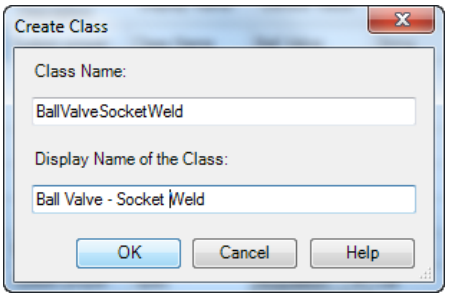
Inheritance starts from the top level class and applies the parent's properties and symbols to the child classes. Properties and symbols passed down to children are read-only from the child.

The other key to class structure and block creation is that the properties of a class are applied to all of the symbols for that class (except for inherited symbols).

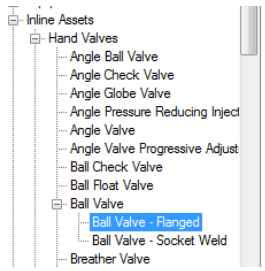
For example, to create ball valve that is flanged on insertion, you have to create a new sub-class of the ball valve and then create symbol with the applicable settings on the child class.

Creating Valves that Insert with End Connections

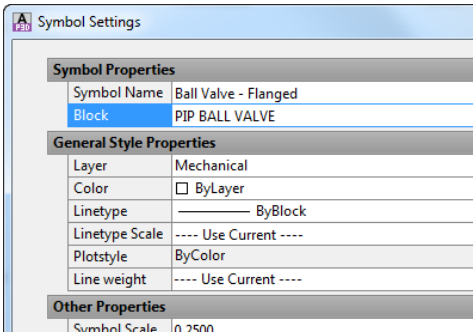
Before opening project setup, make sure your tool palette group is set to PIP and the current palette is valves. One of the first steps in customizing is to create valves of commonly used end types in our valves tool palette. To create socket weld and flanged ball valves, open project setup to P&ID DWG Settings > P&ID Class Definitions > Engineering Items > Inline Assets > Hand Valves > Ball Valve. Right-click and choose New. Create a class called BallValveSocketWeld. After creating that class, create another one called BallValveFlanged.



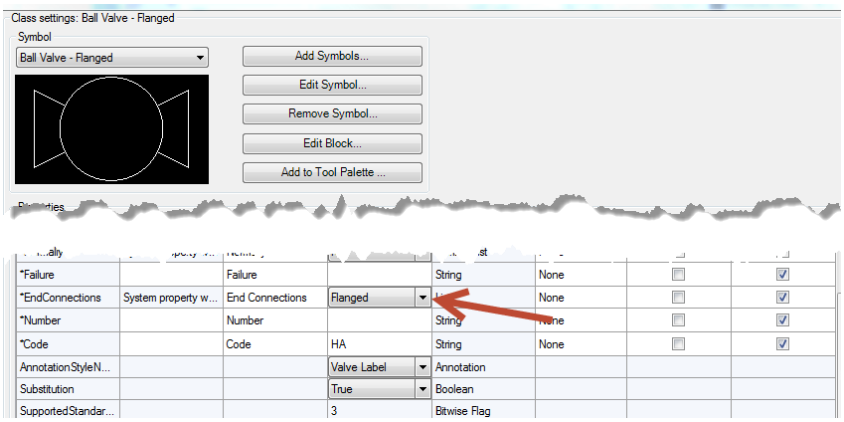
Creating the new classes allows us to use the same properties from the Ball Valve class, but with different values.



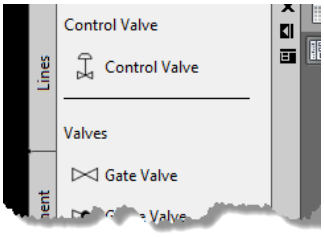
Since the Ball Valve Style is inherited from the parent Ball Valve class, we need to create a new symbol to display our flange end types. We can use the same block as the ball valve. Select the Ball Valve – Flanged class, and click Add Symbols. Use the browse button to select the projSymbolStyle.dwg for the current project. Select the PIP Ball Valve block, and set Symbol Name to Ball Valve – Flanged.

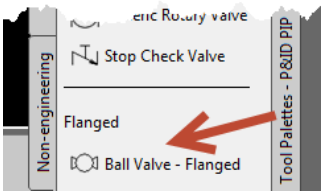


In the properties list, change the EndConnections property for the Ball Valve – Flanged symbol to Flanged.



With the correct settings applied, we can add our new flanged ball valve to our current tool palette. Click Add to Tool Palette. You can organize your symbol on your palettes, once it has been added.



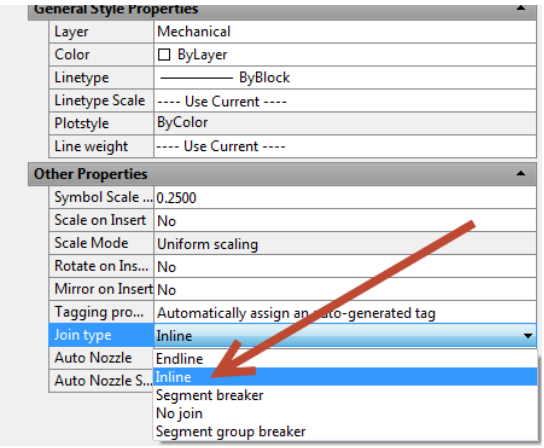


If you are using Plant 3D and P&ID together, you may want to have P&ID start up from an icon. Check out our blog post which details how to create startup icons for P&ID and for Plant.

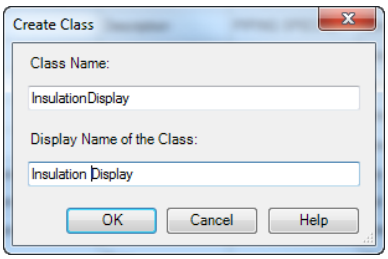
http://www.pdoteam.com/2012/05/launching-in-pid-mode-or-plant-3d-mode/

Creating In-line Insulation

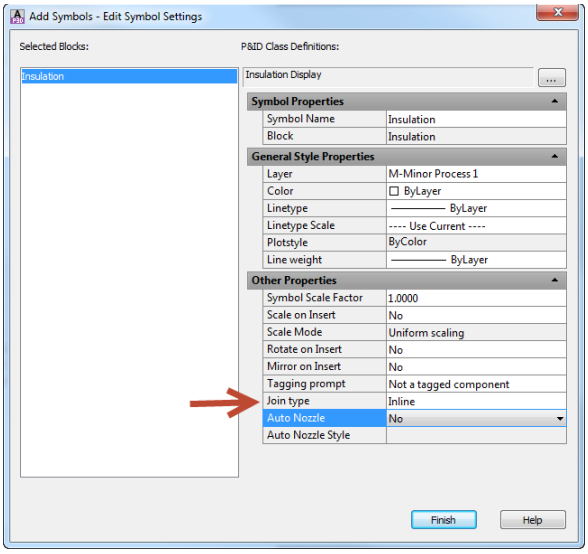
Our next block will be a piece of insulation that displays the insulation thickness and type. While all the blocks have the same properties like layer, line type, explode, and join type, inline blocks seem to work best in the valve class.



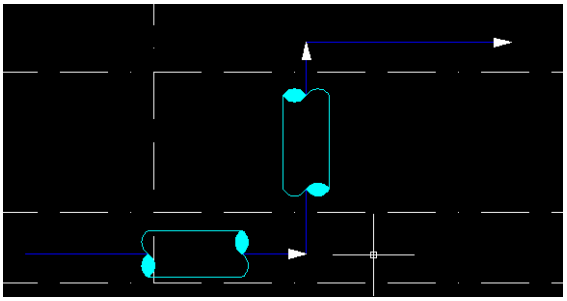
To create an inline insulation block, we will need to use dynamic block parameters and create a new field to filter out items that should not appear in our reports. We will create this property at the Engineering Items level so that we can apply it to any report necessary. First we will create the block in a new class in the Piping Specialty Items Class. Create a class called Insulation Display.



Click create new symbol and we will pull a block from Related Files > Company Blocks.dwg Call the symbol Insulation, and make sure the join type is set to Inline and that the Tagging Prompt is set to not a tagged component.



After clicking Finish add the insulation to a tool palette, and test it in a project drawing. Without any other parameters, the insulation does a good job of rotate and breaking where it needs to.

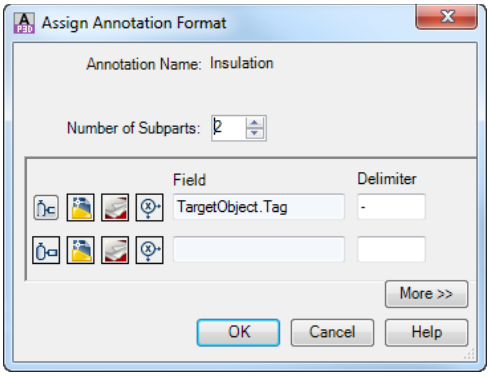


However, we need to add attributes to display the insulation size and type of the line. AutoCAD P&ID works best when you separate the annotations associated with a block from the block definitions. For example instead of adding attributes to the Insulation block in our projsymbolstyle.dwg, we will create a new annotation style on the class. Frequently if the attributes are created inside the block, they may populate with the correct values when the item is inserted, but when the property values are changed, the attributes may not update.

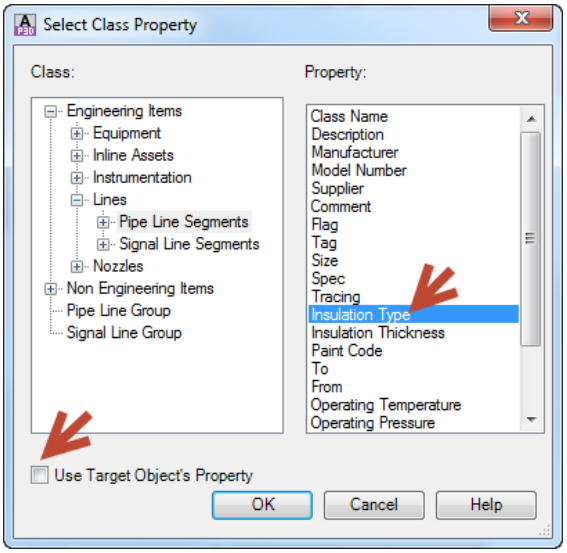
Create an Annotation Format

In project setup select the Insulation Display class we created. At the bottom right, select the Tag Annotation format and click Add Annotation. Set the symbol name to Insulation, and change Auto-Insert? to Auto Insert and the Y offset to 0.3125. After the Annotation is created, click Edit Block.

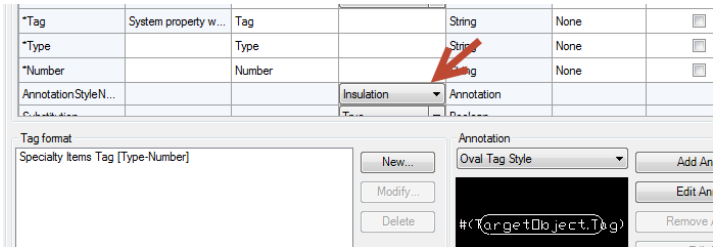
On your screen there should be a button  , called the Assign Annotation format button. Click this button, and select the #(TargetObject.Tag) attribute. Set the number of subparts to 2, and put " – " for the delimiter.

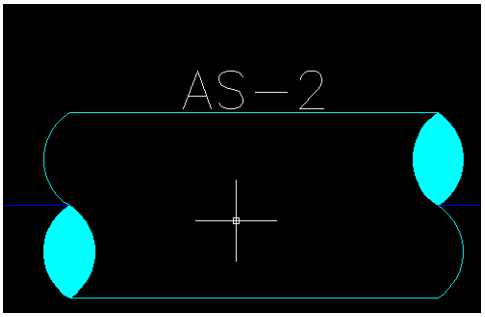


Annotation formats have a feature called target object, whose meaning is not obvious. The point of the target object setting is to allow defining an annotation format for multiple class types. For example, the tag format we started with can be used for any object that has Tag property. In our case, we want information from a specific class – the Pipe Line Segments class. For the first sub part, click the pump icon to launch the Select Class Property dialog. Uncheck use target object property, navigate to the Pipe Line Segments class and select insulation type. Repeat the process for the second sub part, except choose the Insulation Thickness property. Save the changes to the block.



To have the annotation in whenever insulation is placed, we will set the AnnotationStyleName to Insulation. Insert the insulation block into a line to test it. We can create other symbols in the same class to show lines with heat tracing as well.

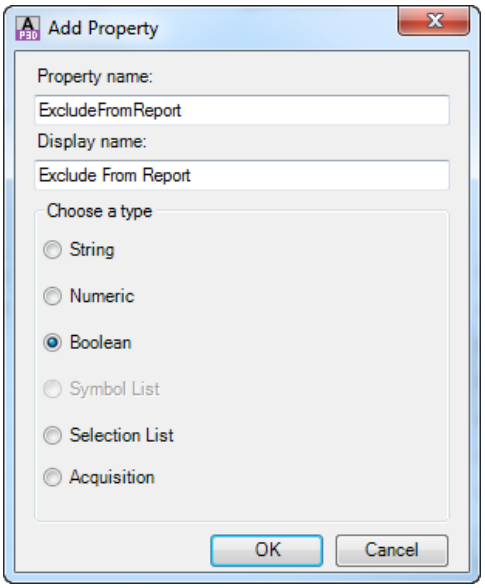




Modify Project Fields

Create a new Property

Even though we have an insulation display block working, we don't want it to show up in any reports we create. To that end, we will create a new property that we can use to exclude items. We will want to be able to use the property for any Engineering Item, so we will have to create it for that class.



The property types help Plant know what kind of formatting your new property should use. String type is the most general and will let you enter any value. Numeric will restrict your input to numbers, while Boolean will use check boxes and store true or false values. Symbol list is use for options like end types and open or closed valves. Selection list is one of the most flexible allowing you to define a list of options. Acquisition allows you to reference a property from another item. For example, you can use an acquisition property to get the equipment tag related to a nozzle.

Apply Default Values

We will use a Boolean property. With the ExcludeFromReport property created, find the Insulation Display Class and set ExcludeFromReport to True.

Update Report

With our data setup we can create a report. The query for specialty items should filter out values where ExcludeFromReport is true where Exclude From report is set to “<> True”.