AUTODESK **UNIVERSITY** 2015

ES10519-L

Customize Your AutoCAD Plant 3D Isometric Configuration

Mike Musgrave
SSOE Group Design Technology Coordinator

Learning Objectives

- Learn how to create and customize a new iso style
- Learn how to automatically populate an iso title block at run time using attributes linked to the database or an external line list
- Learn how to integrate a custom symbol, filter, and annotation scheme into AutoCAD Plant 3D isometrics
- Learn how to navigate the IsoConfig.xml to modify configurable items that are not present in the GUI

Description

AutoCAD Plant 3D Isometrics is a powerful tool for turning your complex plant piping system models into accurate contractor drawings. This class takes a hands-on approach to customization of isometric drawing output from AutoCAD Plant 3D and goes hand-in-hand with the use cases outlined in the "Getting the Most out of Plant 3D Isometrics" tech talk. To start, this lab will cover the creation of a new iso style and then we'll continue into the basic customizations found in the Project Setup interface. From there we'll learn to integrate a custom title block and ways to populate its attributes with project data. We'll then tackle more complex output by delving deeper to make advanced tweaks directly in the configuration files. Finally, we'll wrap up by generating an isometric drawing using the newly created iso style.

Your AU Experts

***Mike Musgrave**, presenter, is a Design Technology Coordinator in the Virtual Design and Construction (VDC) Group at SSOE Group, a global engineering, procurement, and construction management firm. With a bachelor of science in computer science from the University of Toledo, Mike is a programmer by education who has developed a wide-ranging CAD skill set over the past 10 years. At present Mike's key focus is on AutoCAD Plant 3D software, but he is also well versed in everything from AutoCAD software to Navisworks software and ReCap software to offerings from Bentley Systems, Inc.; Intergraph Corporation; and PTC, Inc. He handles AutoCAD Plant 3D software administration, training, support, and development for SSOE's piping engineers and designers.*

Creating a New Iso Style

There are several methods for creating a new iso style. **Project Setup** provides user interface driven methods. We'll do the first two through **Project Setup.** Open it, then browse to Isometric DWG Settings, and then select **Iso Style Setup**.

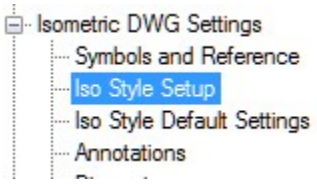


FIGURE 1: ISOMETRIC DWG SETTINGS

To create a new iso style click on the **+** button next to the iso styles drop-down to open the **Create Iso Style** dialog.

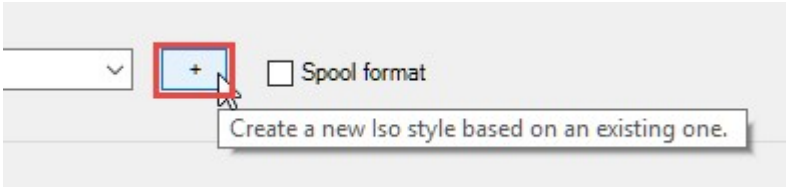


FIGURE 2: CREATE NEW ISO STYLE BUTTON

Copy an Existing Iso Style

If you already have an iso style that serves as a good starting point, then the easiest thing to do is to use it as a seed to create the new style. In the **Create Iso Style** dialog, give the new style a name in the provided text box and then select the **Copy existing style** to use as a basis from the drop-down.

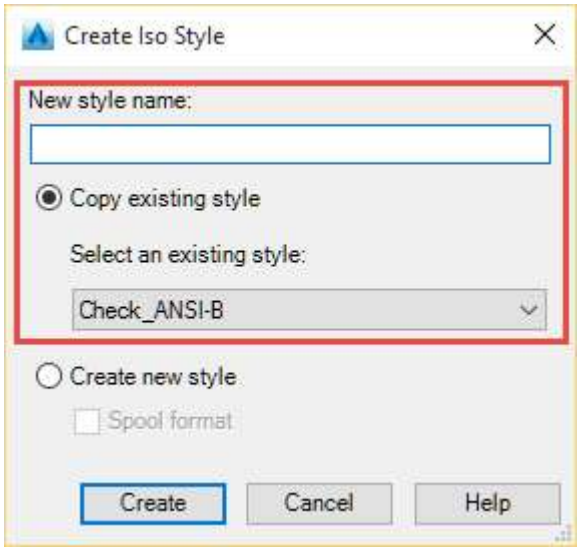


FIGURE 3: CREATE ISO STYLE DIALOG – COPY EXISTING STYLE SETTINGS

Click the **Create** button to build the new style. A new folder with the provided style name is created within the **Isometric** folder of the active project. The iso.atr, iso.dwt, and isoconfig.xml files from the existing style are copied into the new folder after it is created. At this point the new style is an exact duplicate of the style used as a seed. It can now be modified to meet your requirements.

Create a New Style Using the Wizard

The new Iso Style Wizard allows you to start from scratch and configure a brand new iso style. The wizard provides a guided step-by-step tour through the setup of an iso style. It provides several popular options to choose from in each of seven different settings categories. The selected options serve as a good starting point and can be further optimized and tweaked later.

To fire up the wizard, open the **Create Iso Style** dialog by clicking the **+** button next to the iso styles drop-down. Provide a new style name and then select the **Create new style** radio button. If the new style will be for spool drawings, be sure to check the **Spool format** checkbox.

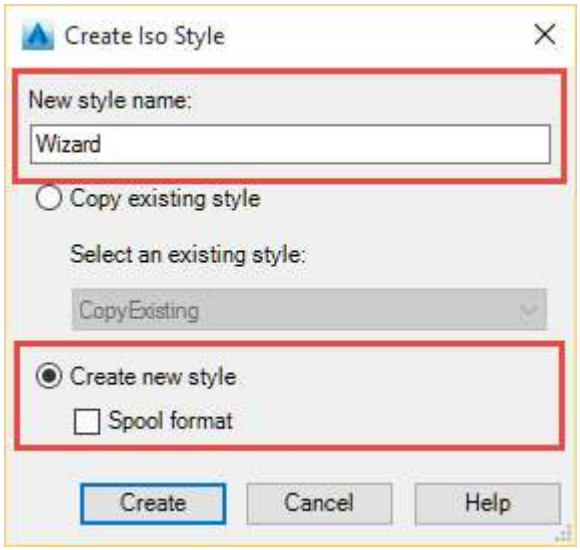


FIGURE 4: CREATE ISO STYLE DIALOG – CREATE NEW STYLE SETTINGS

Click the **Create** button to launch the **Create Isometric Style** wizard.

Navigation in the wizard is straightforward. Clicking the arrows at the top (1) allows for forward/backward navigation through the categories. The arrows near the bottom (2) allow for navigation through the available choices for the current category. Buttons to create the iso style with the current settings (3), to access Plant 3D's help documentation on the iso wizard (4), and to cancel the process (5) are also present.

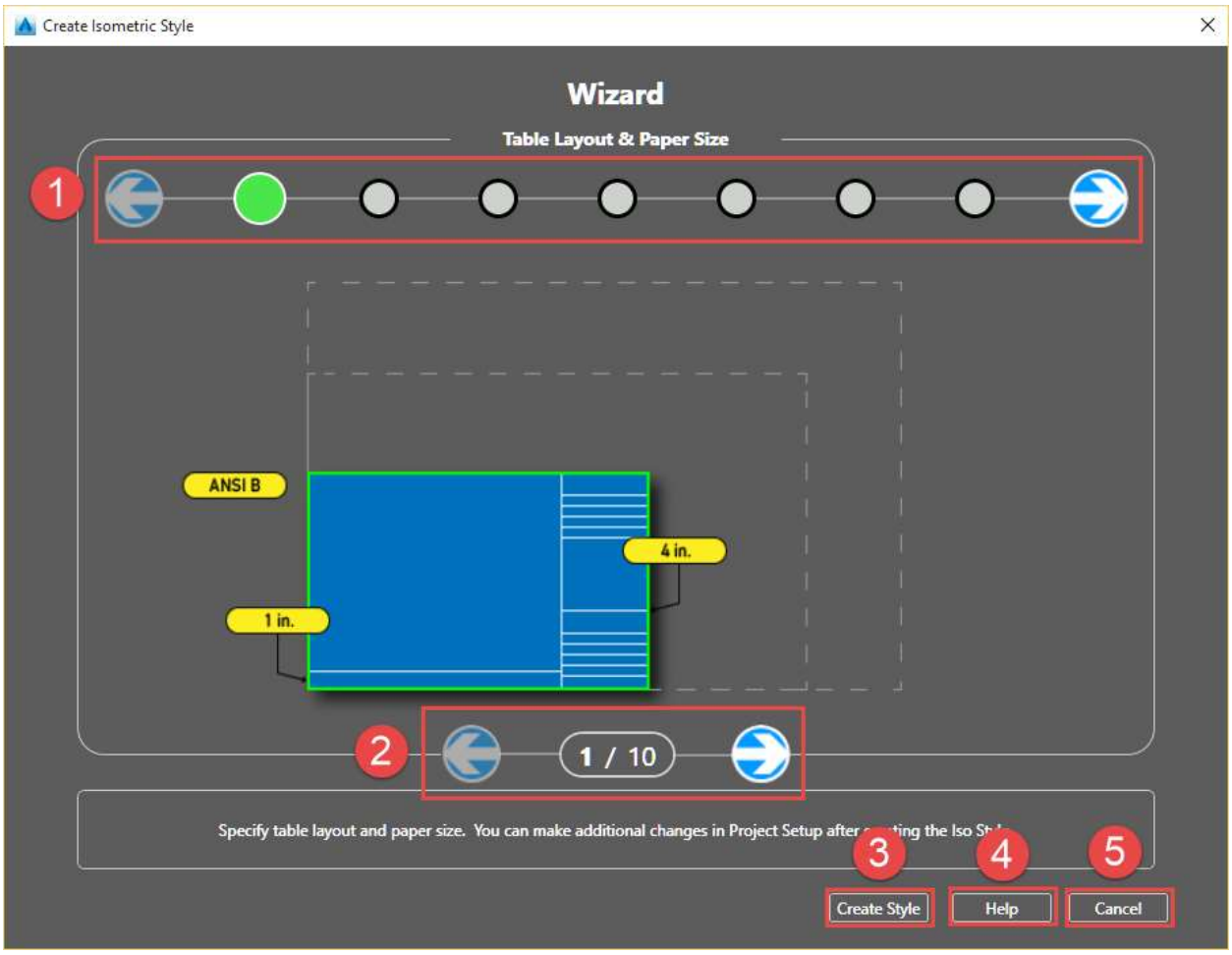


FIGURE 5: ISO STYLE WIZARD – TABLE LAYOUT & PAPER SIZE

There are several options in the **Table Layout & Paper Size** category which range from ANSI B up through ANSI D for Imperial projects and from A3 up through A1 for metric projects. Select the one that most closely resembles the final setup required.

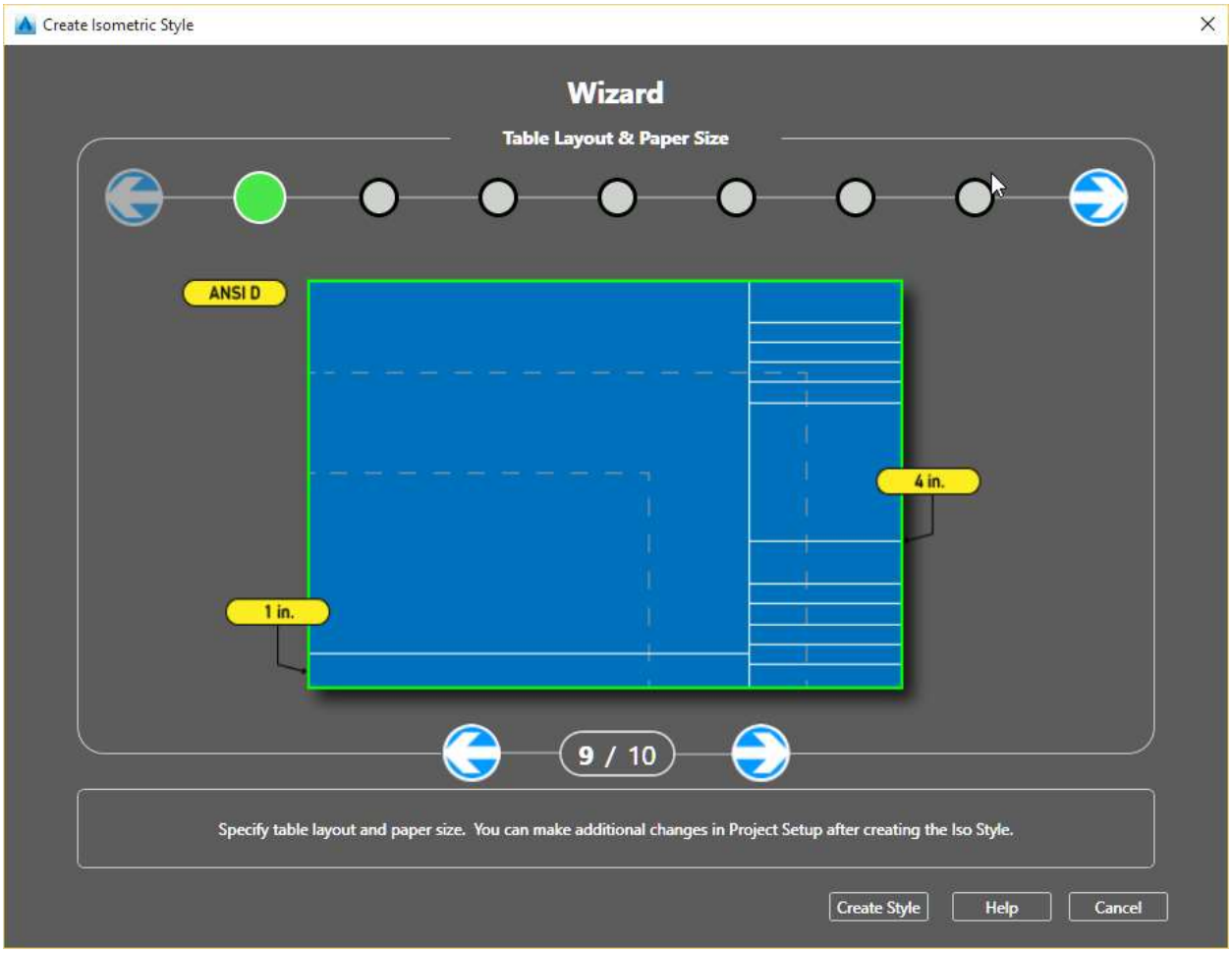


FIGURE 6: ISO STYLE WIZARD – TABLE LAYOUT & PAPER SIZES

The **Leader lines & Enclosures** category provides a ten different settings from which to choose. Each option applies different settings for spool, manual valve, and control valve callouts as well as different cut piece, weld, and part identifiers. Here again, every possible combination isn't represented so pick the option that is closest to the new iso style requirements.

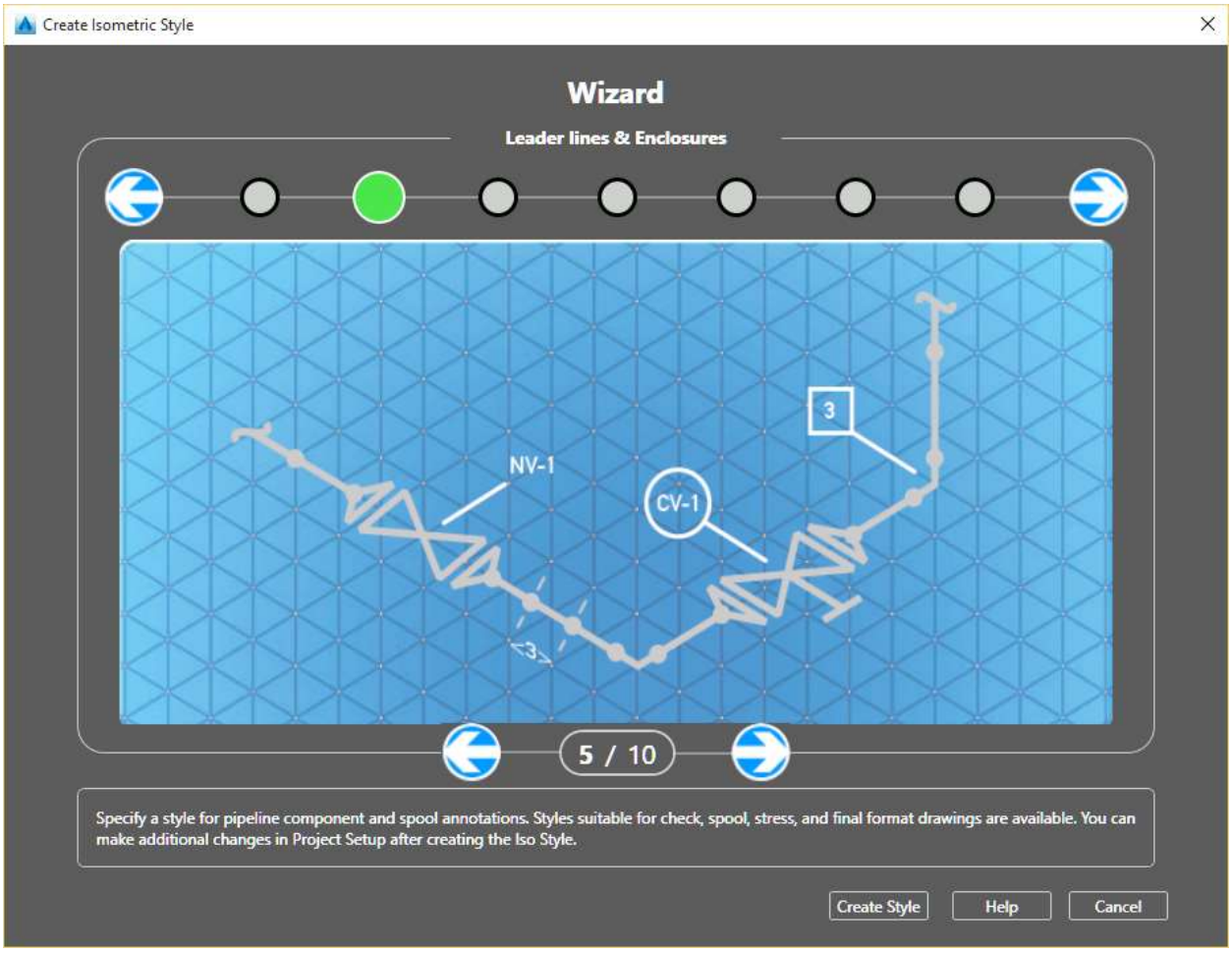


FIGURE 7: ISO STYLE WIZARD – LEADER LINES & ENCLOSURES

The **Ribbon Planes** category allows you to select between three different stand-off distance options for string type and overall dimensions.

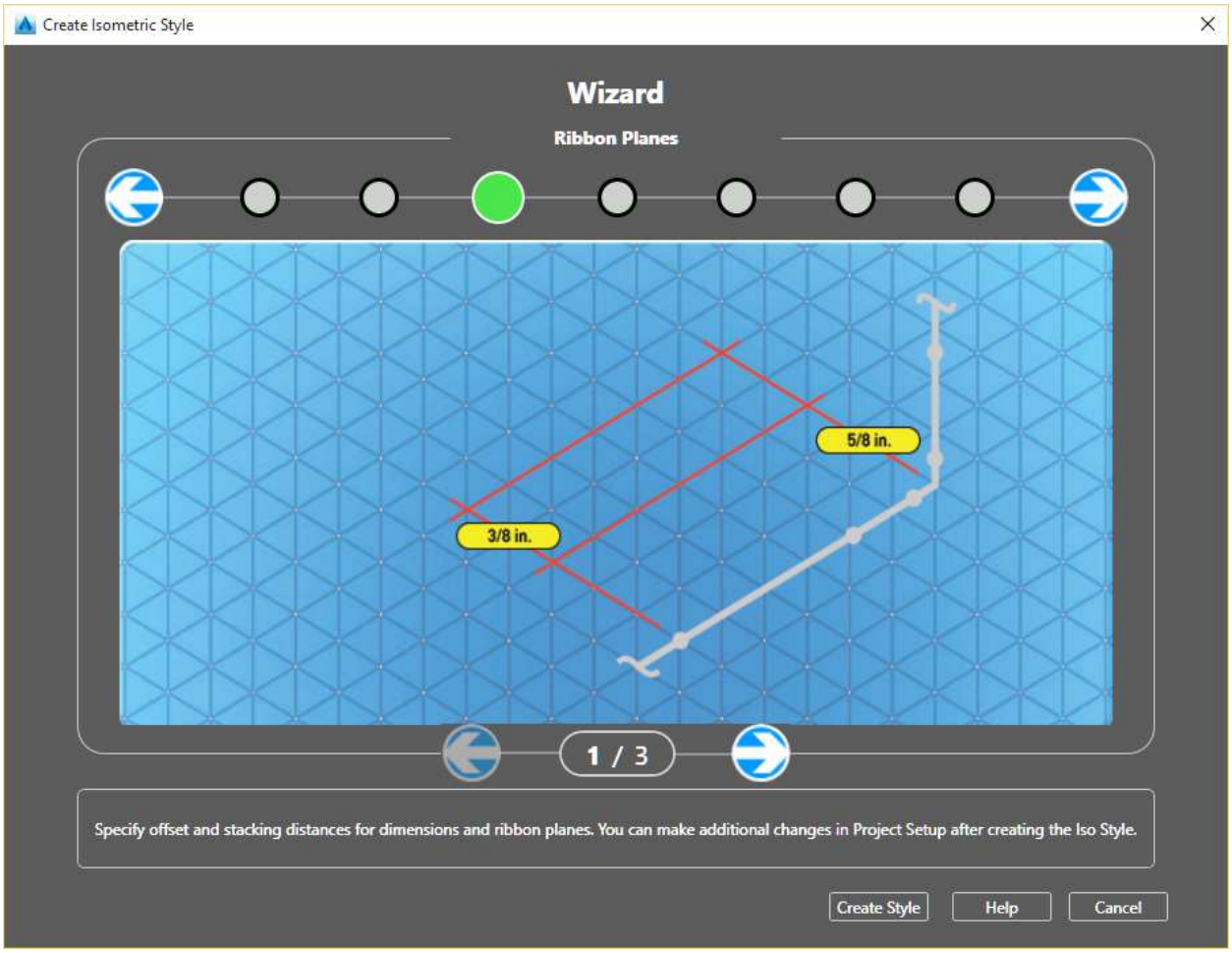


FIGURE 8: ISO STYLE WIZARD – RIBBON PLANES

The **Default piping styles** category allows for the selection of the default dimensioning style from three options. Small bore and existing piping styles that follow can override this style when specific criteria are met. The options provided show various combinations of string and locating dimensions to go along with the standard end-to-end dimensions.

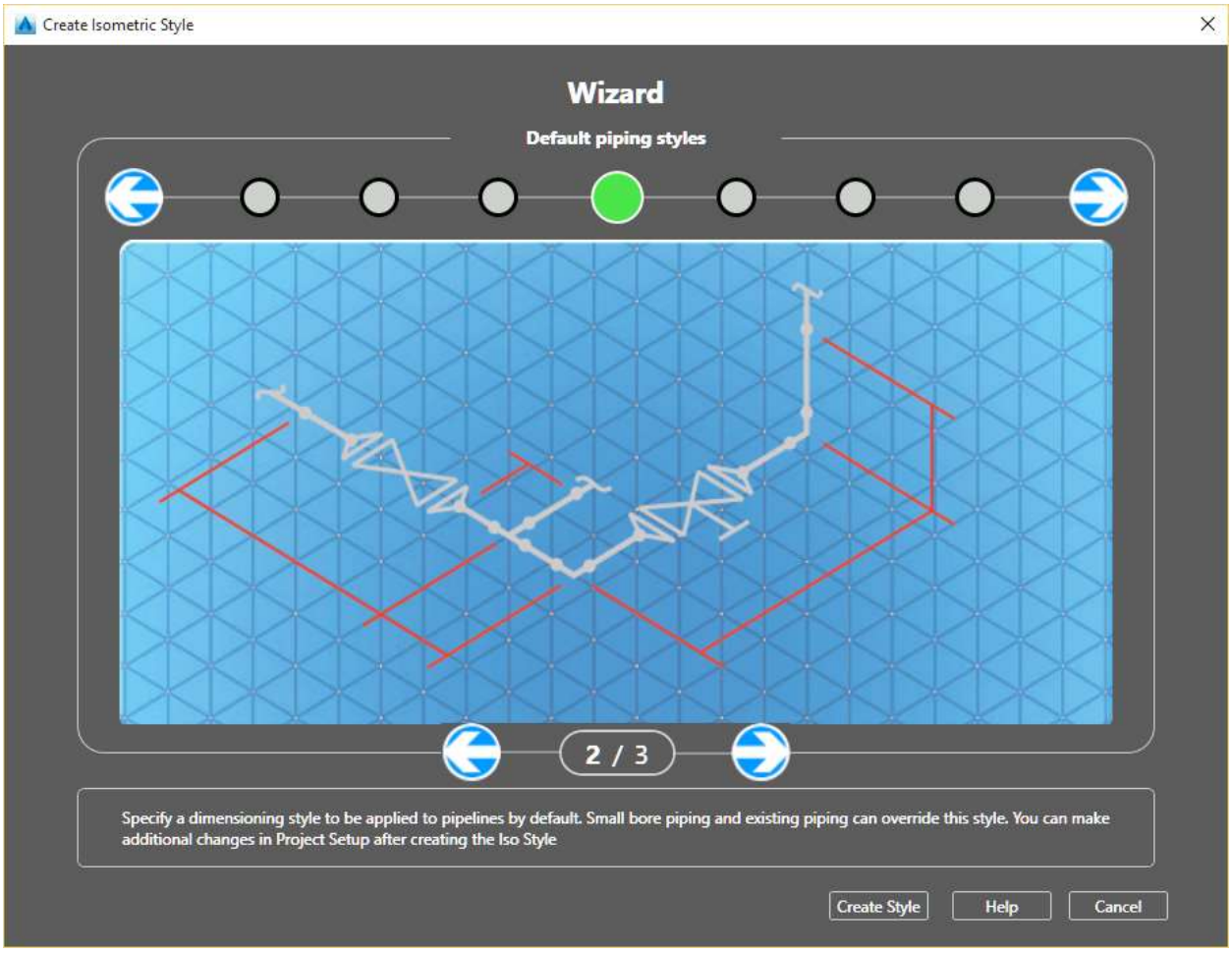


FIGURE 9: ISO STYLE WIZARD – DEFAULT PIPING STYLES

The **Fitting-to-fitting piping styles** category provides a few starting choices for fitting-to-fitting pipe runs. The options provided show a couple of variations on string and locating dimensions to go along with the standard overall dimensions.

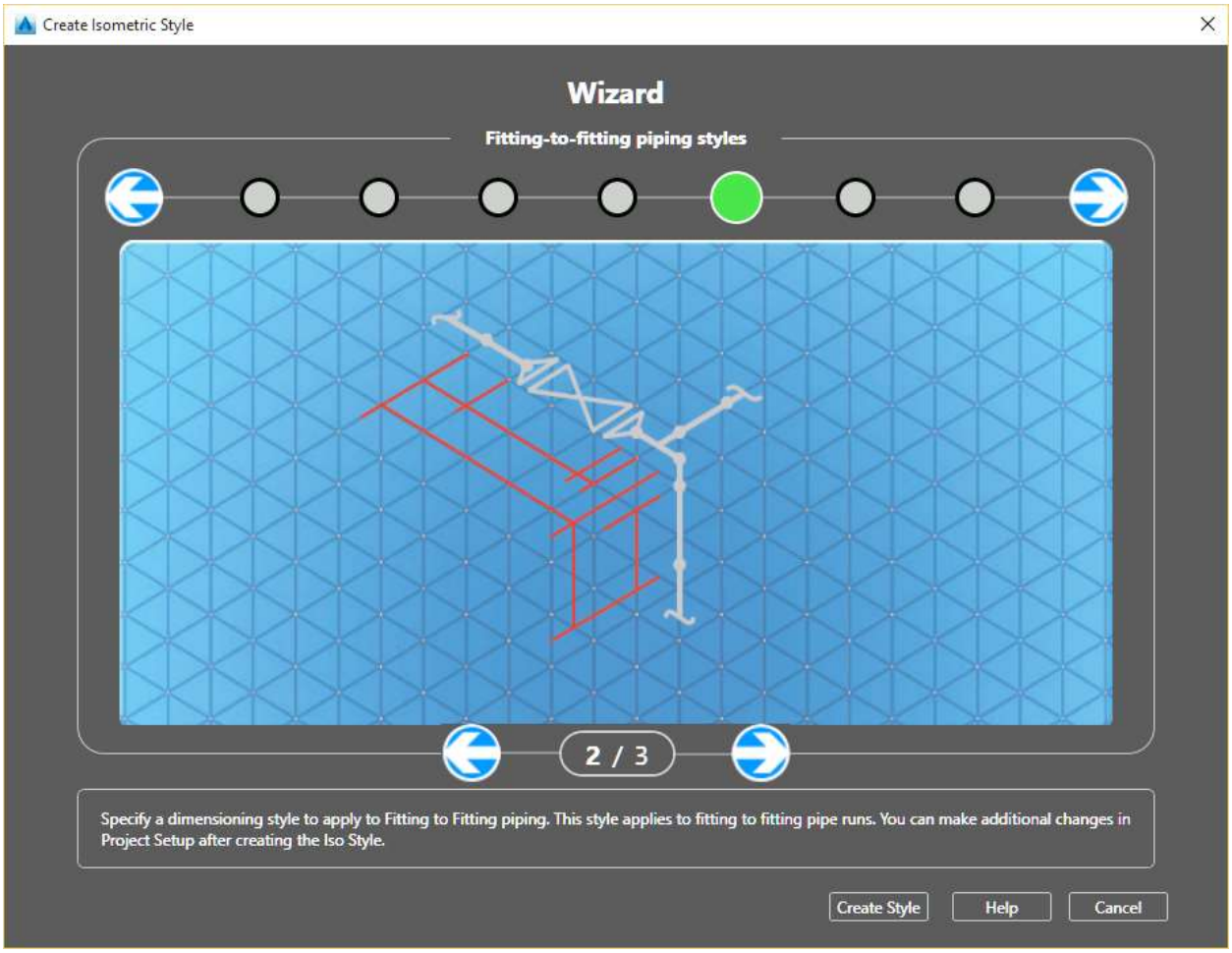


FIGURE 10: ISO STYLE WIZARD – FITTING-TO-FITTING PIPING STYLES

Small bore piping styles is the sixth category. This is another override style that is applied to pipe components whose size falls under a specified limit. There are two options provided, one with overall dimensions, and a second with some additional locating dimensions enabled.

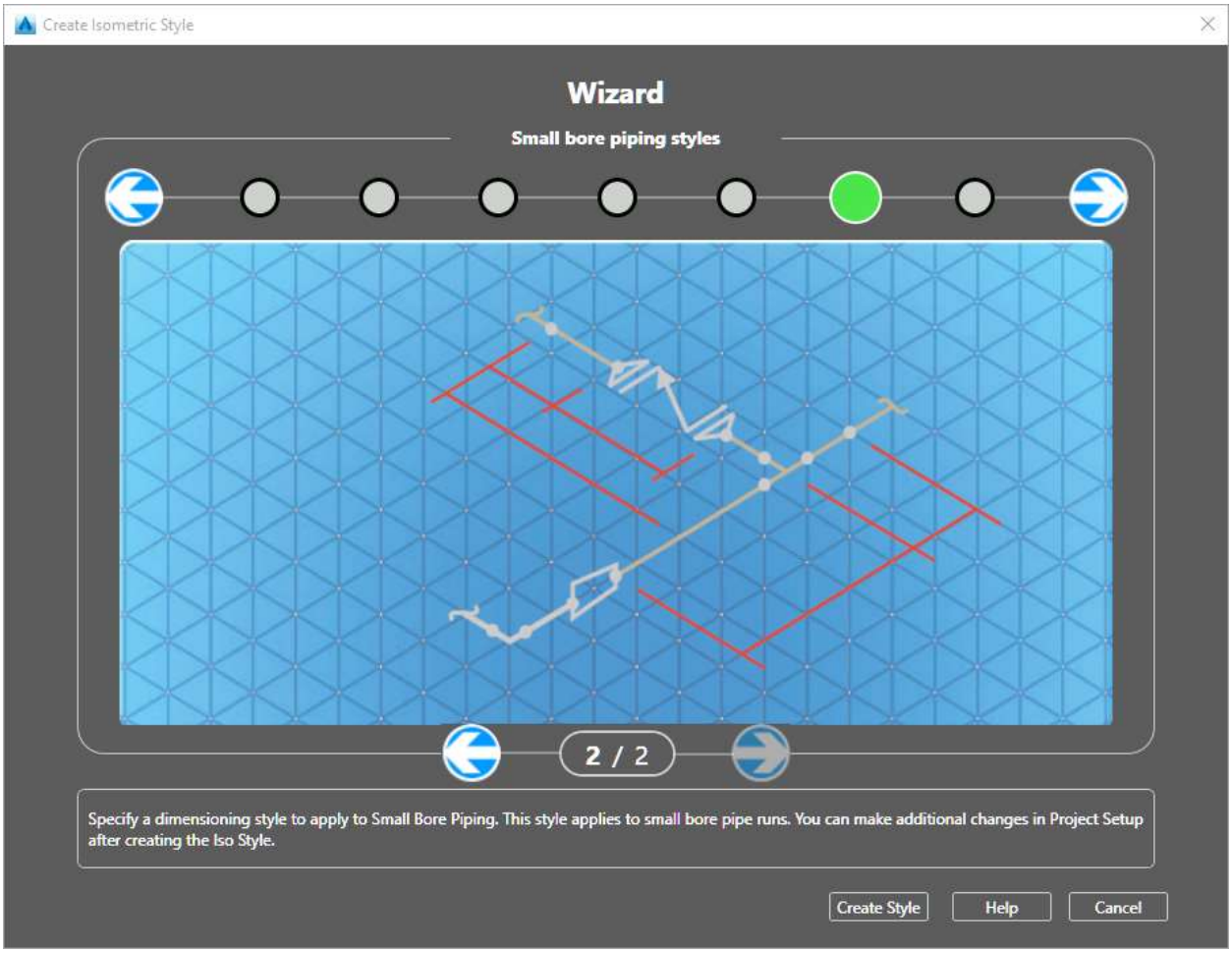


FIGURE 11: ISO STYLE WIZARD – SMALL BORE PIPING STYLES

The final category that the wizard guides you through is for **Text height & Symbol scale** category. There are four options provided with text height ranging from 1/10” up to 1/8”. The symbol scale that goes along with the text height varies proportionally. Again, pick the setting closest to the desired result.

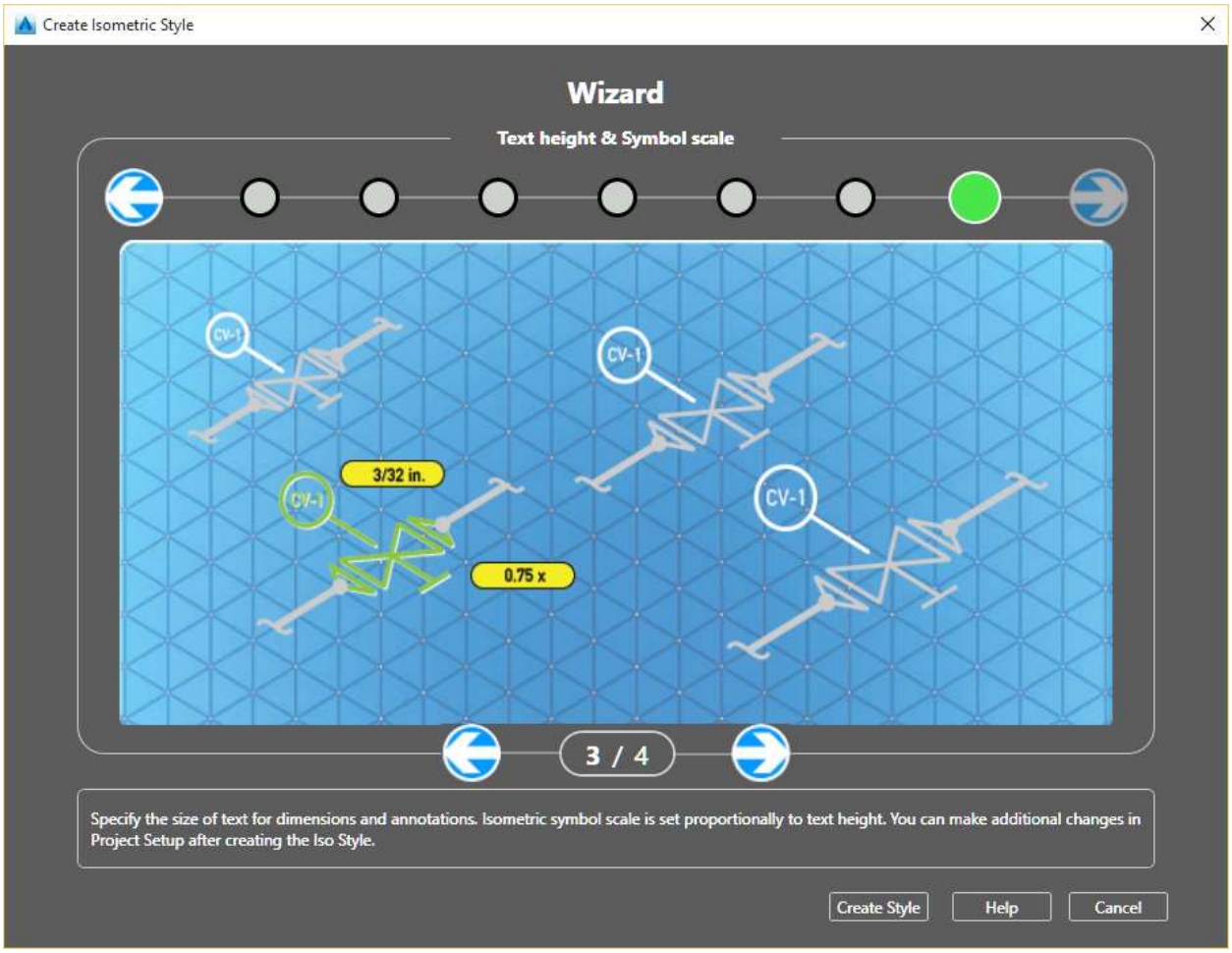


FIGURE 12: ISO STYLE WIZARD – TEXT HEIGHT & SYMBOL SCALE

Now that all of the choices are reviewed and the best option is chosen, click on the **Create Style** button to finish up.

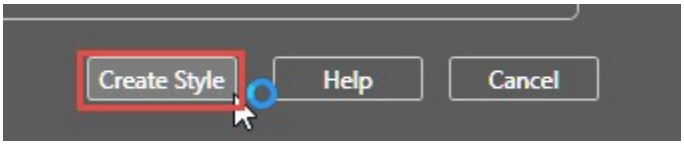


FIGURE 13: ISO STYLE WIZARD – CREATE STYLE BUTTON

After clicking the button, the wizard closes and the new style is created. The **Project Setup** dialog will come back up and the newly created iso style will be the active entry in the iso style drop-down.

The Manual Method

There is one other method to create a new iso style. This one doesn't even involve you being in the software! This method involves the good ol' copy and paste method in Windows File Explorer. The project doesn't necessarily have to be closed, but it's best to do this to avoid quirky behavior in Plant 3D. The following steps show how to create a new iso style manually.

1. Browse out to the **Isometric** folder of the project.

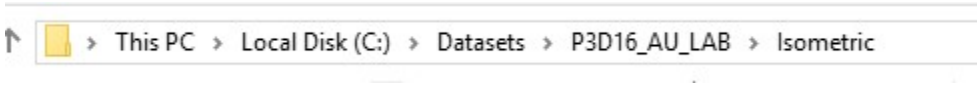


FIGURE 14: PATH TO ISOMETRIC FOLDER

2. Select the iso style folder that will serve as the basis for the new style.

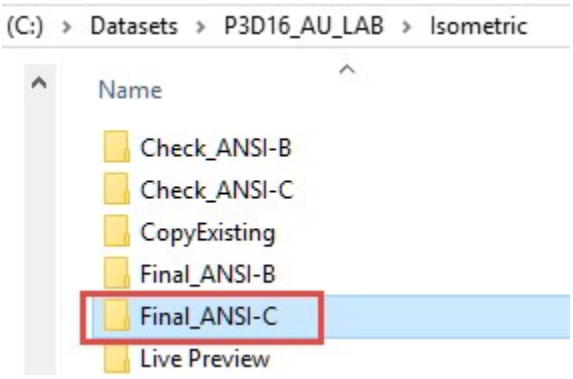


FIGURE 15: ISO STYLE SELECTED IN CURRENT PROJECT

3. Hit CTRL+C to copy and then CTRL+V to paste.

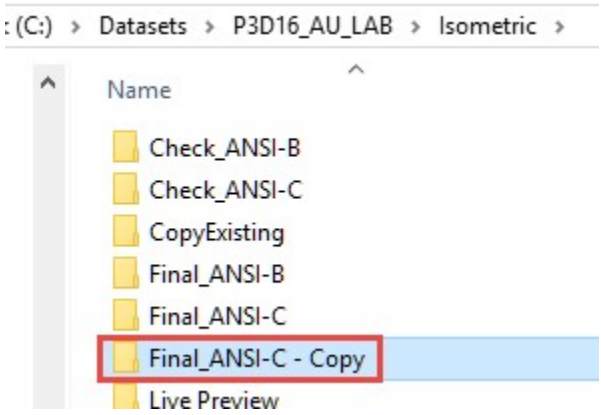


FIGURE 16: NEW ISO STYLE CREATED USING COPY PASTE

4. Select the new folder, which will have the same name as the copied folder with a "- Copy" appended to it, and rename it with the new iso style name.

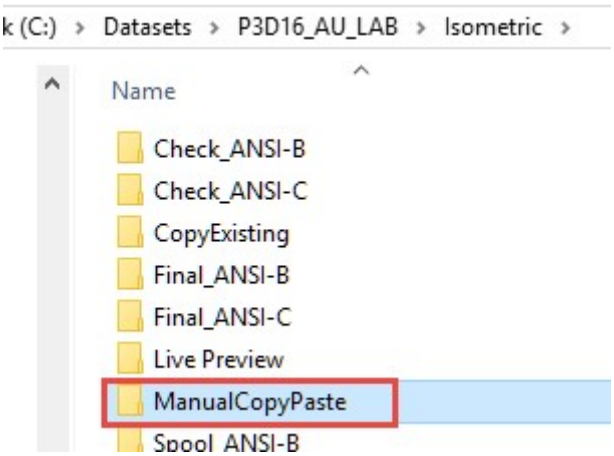


FIGURE 17: RENAMED ISO STYLE FOLDER

5. Open Plant 3D and the iso style will show up! It'll be in the iso styles drop-down list on the **Isometric DWG settings** page in **Project Setup** and it'll also have its own folder on the Isometric DWG tab in **Project Manager**.

FIGURE 18: NEW ISO STYLE SHOWING IN PROJECT SETUP

Iso Style Modifications using Project Setup

Open project setup and browse to the 'Isometric DWG Settings' section. This area of **Project Setup** contains all of the available options for configuring isometrics using the user interface.

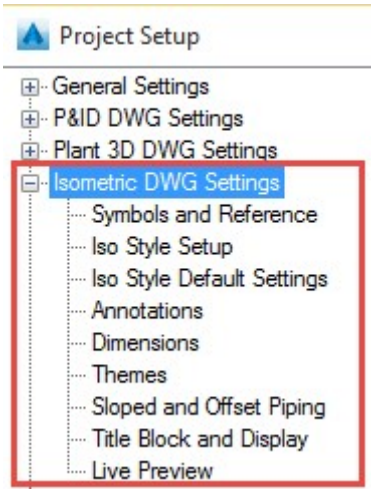


FIGURE 19: PROJECT SETUP TREE

Symbols and Reference

The **Isometric Symbology** section contains only one item, a button that links to the block editor for iso symbols. Clicking the **Edit Isometric Symbols…** button will open up the IsoSymbolStyles.dwg or ISS file. This is similar to the PSS or projSymbolStyle.dwg, only it is specifically for iso symbology. Existing symbols can be modified and new ones can be created by clicking on the button. Any new symbols also need to be mapped in the **IsoSkeyAcadBlockMap.xml** file in the root Isometric folder in the project workspace.

FIGURE 20: ISOMETRIC SYMBOLOGY SETTINGS

The **Reference Dimension Default Settings** section provides a way to manage the default settings for the iso reference dimensions. Each type of reference dimension has an assignable enclosure, message, and centerline line style. The message for intelligent Plant 3D items can contain references to Plant 3D class attributes which will populate in the annotation on the isometric drawing.

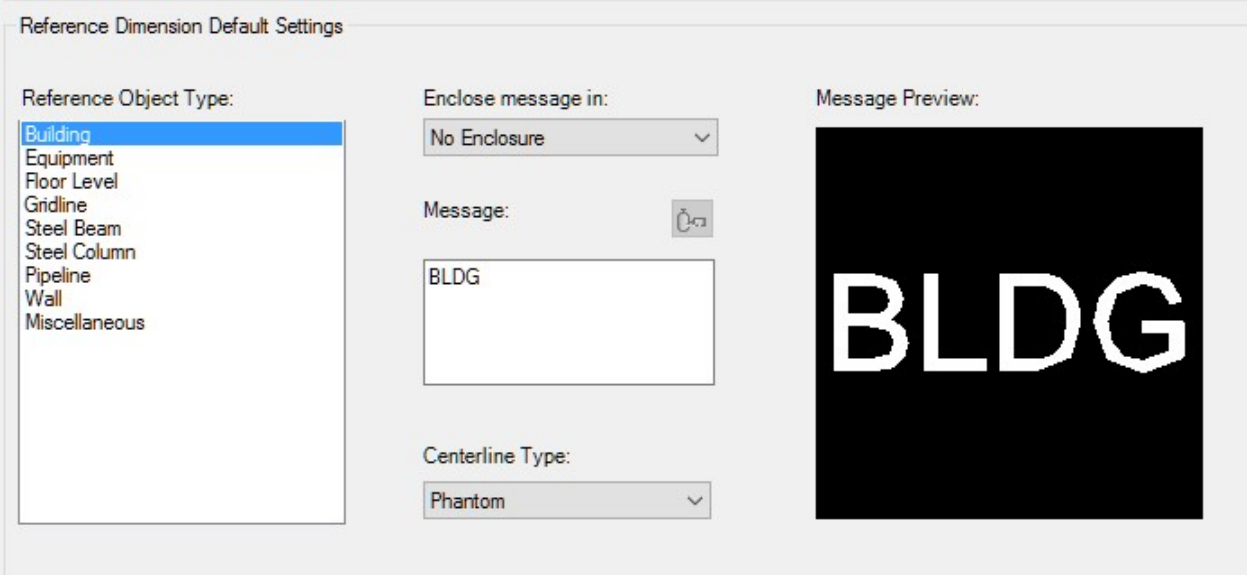


FIGURE 21: REFERENCE DIMENSION SETTINGS

Iso Style Setup

This section has several different settings areas on it. In the **Drawing format** section there is an option to toggle field welds at maximum pipe lengths. When checked a field weld will automatically be placed on the isometric drawings at the specified interval. There is another toggle for pipe makeup lengths at field fit welds. When checked, the provided makeup length will be added to the total pipe length at every field fit weld.

On the right side there is a toggle for **Table overflow** control on standard isometrics. The toggle will do one of two things. If it's set to **Use a blank sheet** then the BOM will spill over onto a new sheet with an empty iso border. On the other hand, if it's set to **Split the drawing** then the iso engine will attempt to break up the pipeline differently, creating two smaller sheets with a BOM that fits into the given constraints. If the style that you are editing is a spool style, then the table overflow options are grayed out because they do not apply.

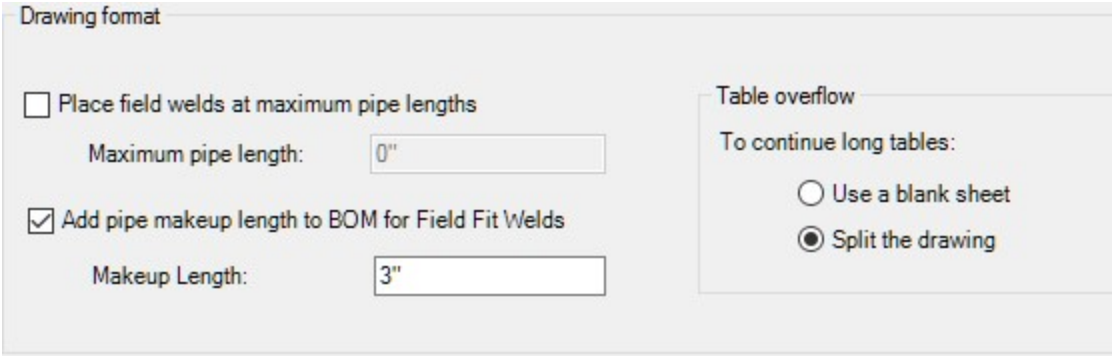


FIGURE 22: DRAWING FORMAT OPTIONS

The **File naming** area provides a way to customize the file naming convention used by the iso engine. Properties can be selected from the **Add property** dropdown and are added to the **Prefix** textbox. Notice that each property is enclosed with % characters. The **Suffix** dropdown gives an option for numeric or alphabetic sheet identification. The value in the **Delimiter** textbox controls only the delimiter between the prefix and the "suffix".

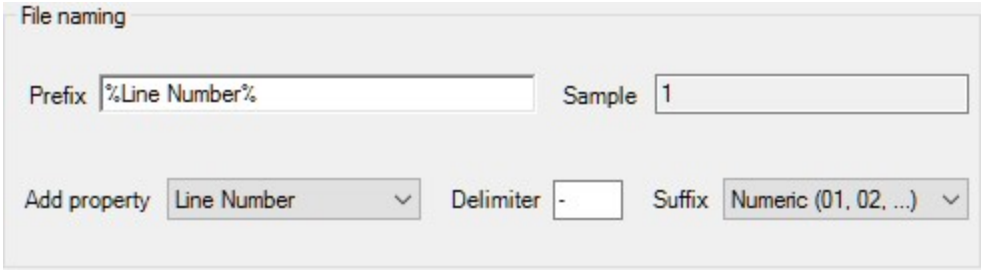


FIGURE 23: FILE NAMING SETTINGS

The **Spool naming** setting is to the right of the **File naming** settings. A dropdown provides a variety of options for the naming convention that'll be used. The **Spools** areas controls the split method for pipe spools. Splitting can be based on a given cube size, by weight, or by model property. When the sizing method is set to use the spool number from the model, the spool naming convention must also be set to use the same otherwise issues will be encountered.

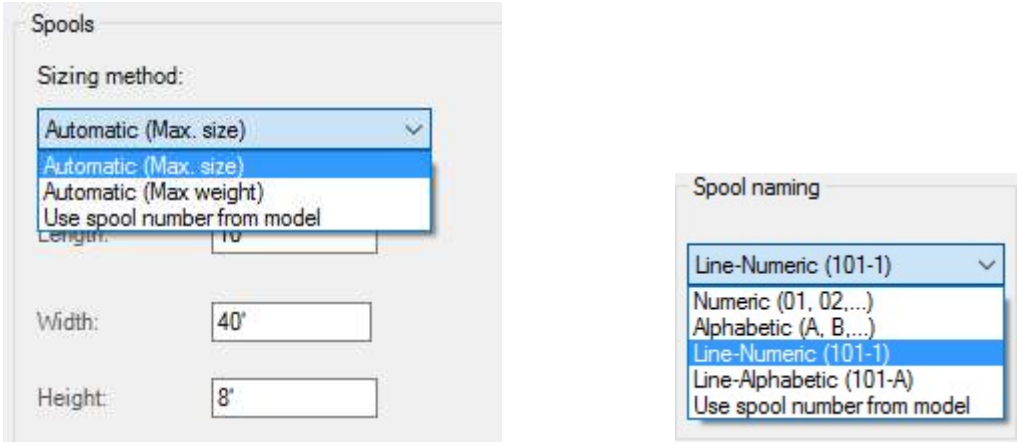


FIGURE 24: SPOOL SETTINGS

The last area on this settings page is the **Paths**. The production iso path and the quick iso path can be configured independently of one another and they can be stored outside of the core project environment if desired.

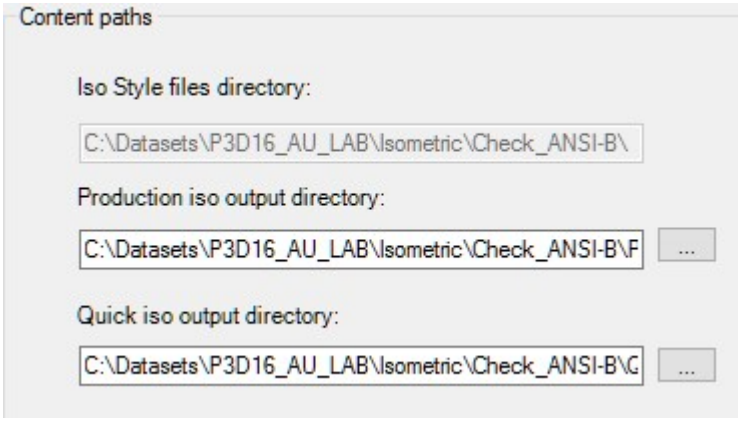


FIGURE 25: OUTPUT PATH SETTINGS

Iso Style Default Settings

This page controls the default output settings that are configurable every time an iso is created within Plant 3D. The basic options in the **Create Production Iso** dialog and the advanced options in the **Advanced Iso Creation Options** dialog can all be controlled here. These should be configured so that the end users don't have to worry about setting the options each time they create an isometric drawing. However, for better or worse, there is no option to prevent the end user from changing a setting should they feel the need. There are also settings to control the default data formats, toggles for the various dimension types to be included, and toggles for the desired table outputs for the drawings.

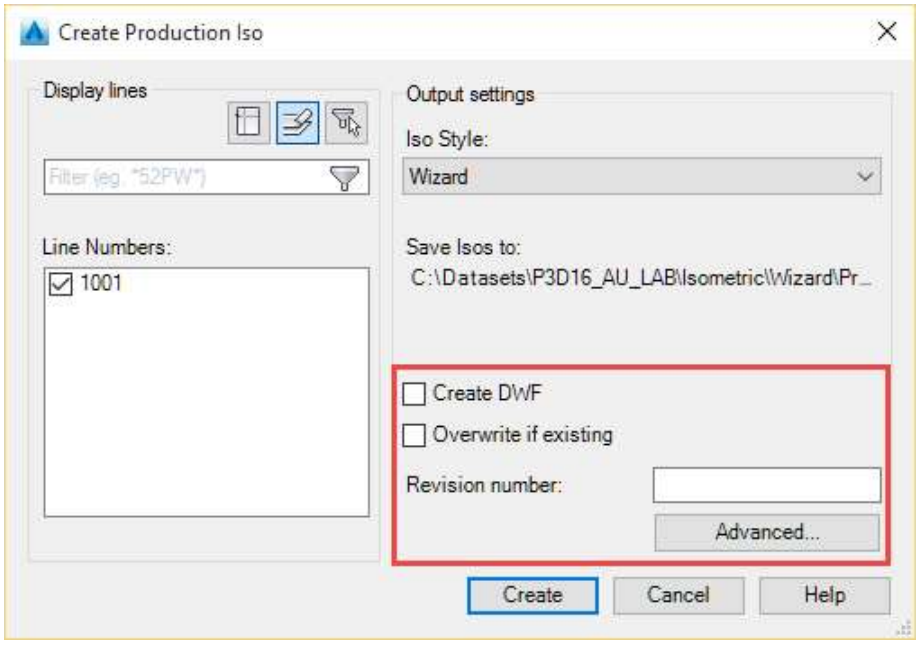


FIGURE 26: CREATE PRODUCTION ISO DIALOG

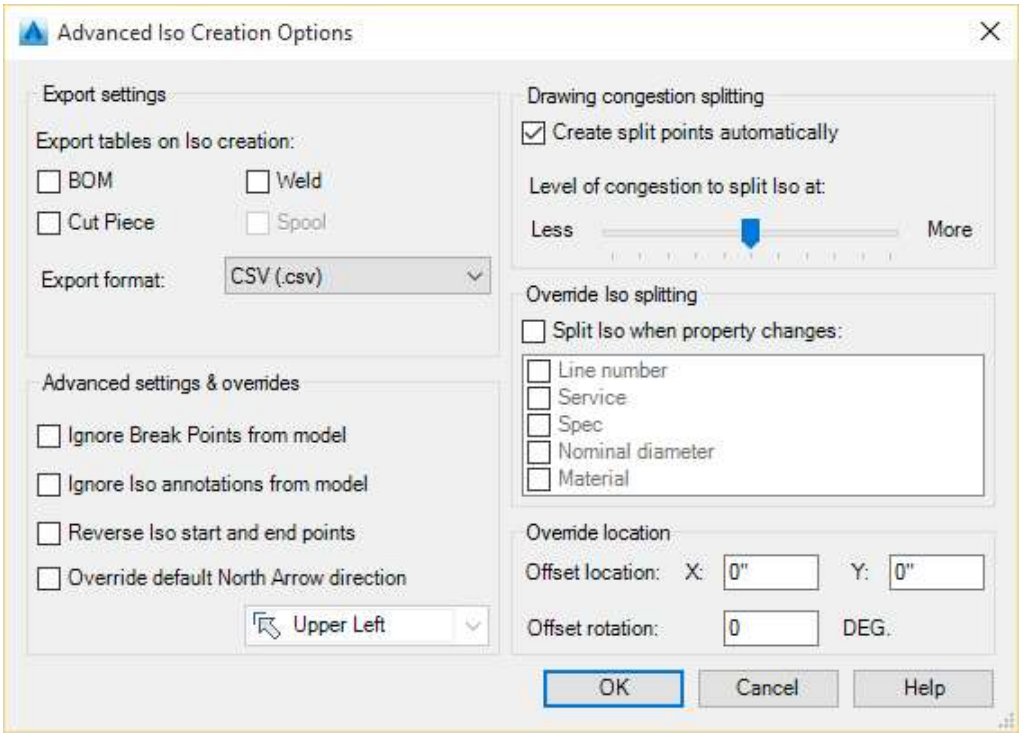


FIGURE 27: ADVANCED ISO CREATION OPTIONS DIALOG

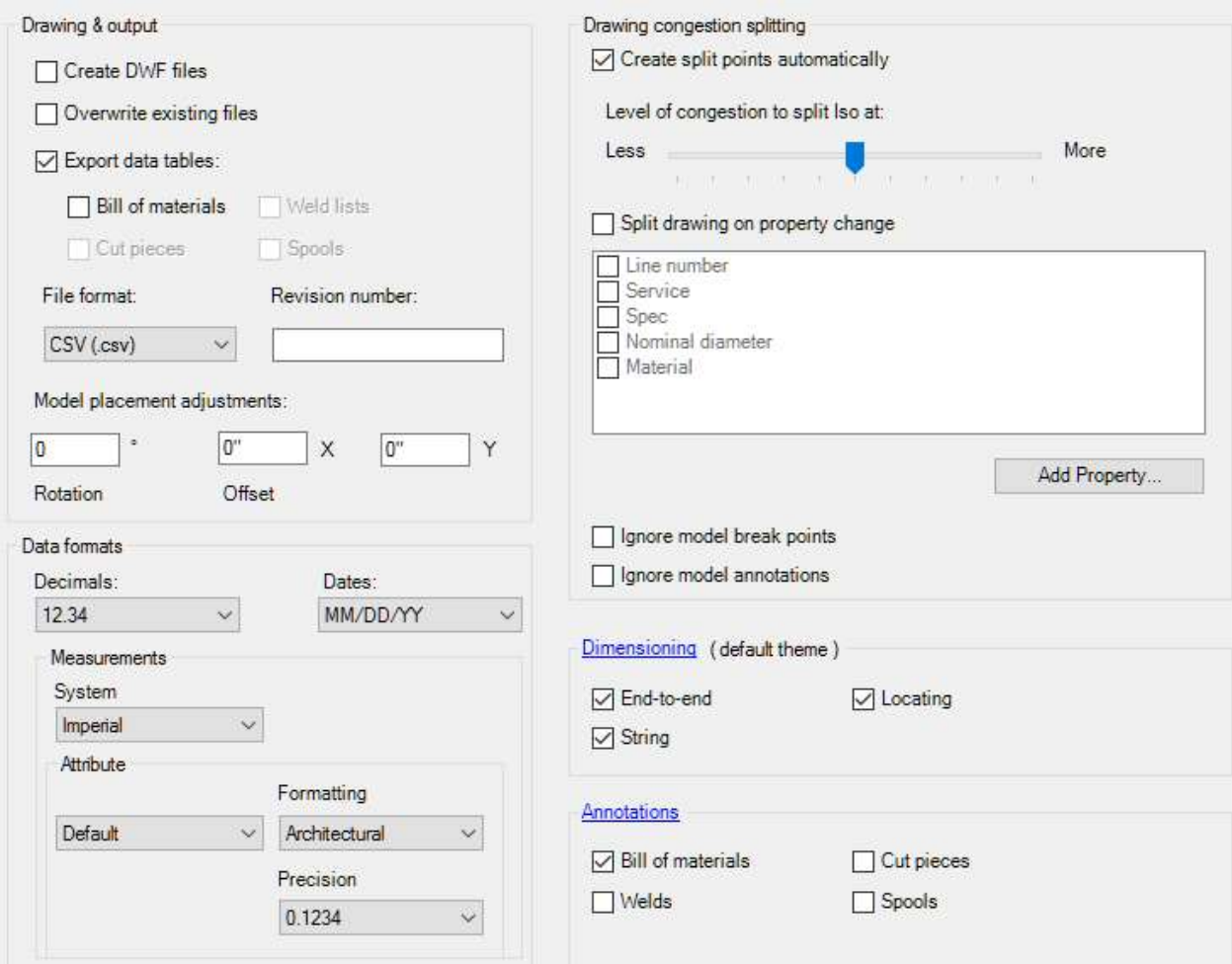


FIGURE 28: DEFAULT SETTINGS PAGE

The **Model placement adjustments** are of importance when isometric deliverables are required to reflect the state plane coordinates instead of plant coordinates. At present the rotation, x-offset, and y-offset can be specified to align the isometrics to the state plane coordinate system. Be sure to model pipe at the actual elevation required on the isometric drawings because that cannot currently be manipulated with this feature.

Annotations

This page contains all of the basic settings for the automatic annotations on the isometric drawings. Enclosure and leader styles, planes, and expandable enclosures are selectable for bills of material, spools, cut pieces, valve tags, and welds. Bills of material, welds, and cut pieces also have an indexing option to specify numeric or alphabetic identification. Monikers for flanges, gaskets, bolts, x-direction, y-direction, and elevation can be set in their respective textboxes. There is also a section for toggling various continuation and connection callouts and to customize the text that is displayed. Finally, the general text size for annotations can be set in the adjacent textbox.

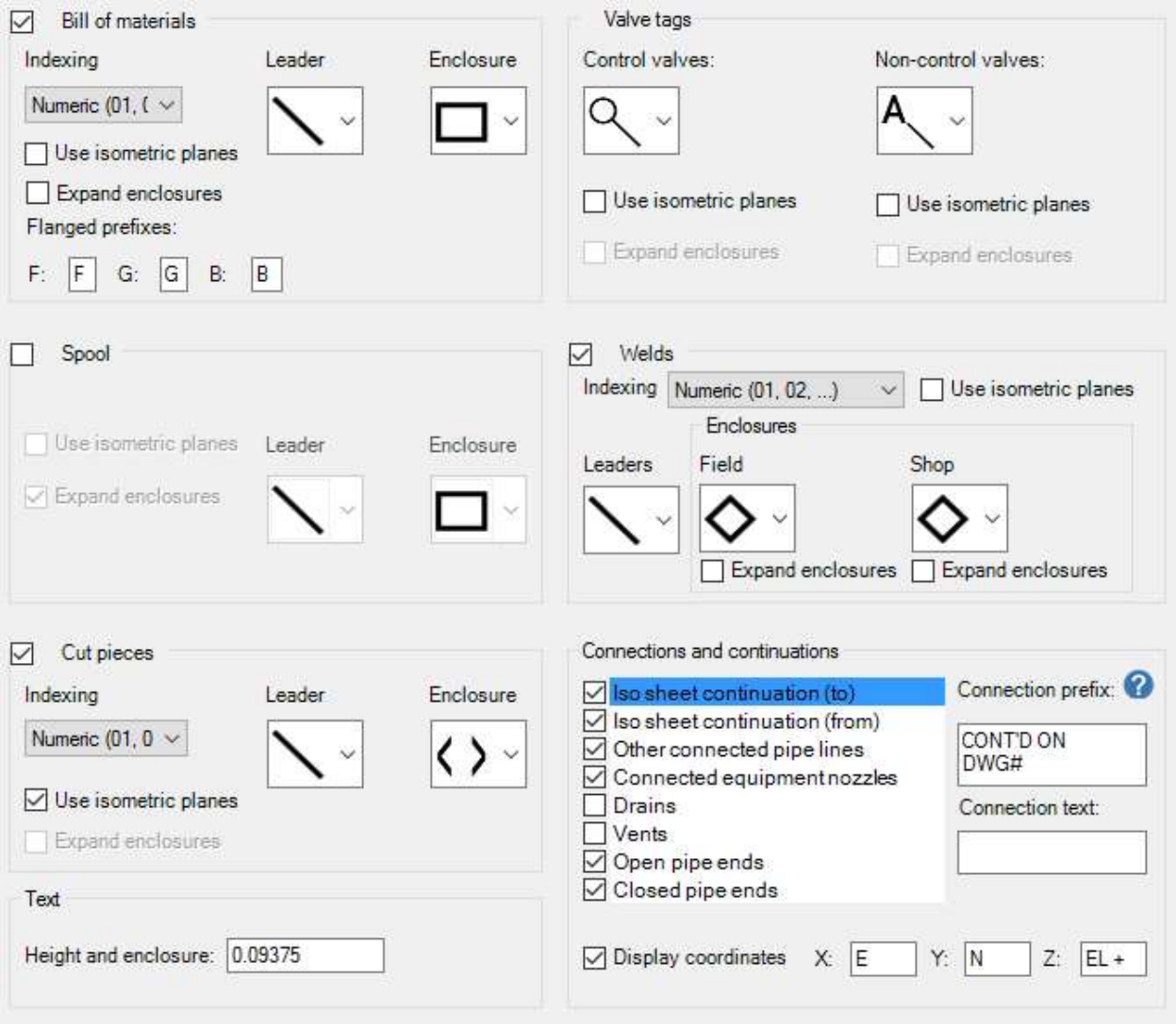


FIGURE 29: ANNOTATION SETTINGS

Dimensions

This page handles the general dimension settings that apply regardless of the theme. The text size to use with dimensions should be set on this page. It can be configured independently of the annotation text size if desired. Each valve type can be configured to dimension from the center of the valve or from end-to-end. Gaskets can be included with the adjacent component, dimensioned individually, or excluded from dimensioning. Dimension spacing is controlled in the Offsets area. Both the initial offset distance and the stacking distance are configurable. The **Show reference dimension** toggle prevents the final string dimension on a line from being show when overall dimensions are turned on for the default dimensioning theme. The **Do not overconstrain string dimensions** toggle does the same exact thing, but for the other dimensioning themes. The final two settings control the pipe sizes included with small bore piping and whether or not the existing piping theme should include another type of pipe, such as demolition.

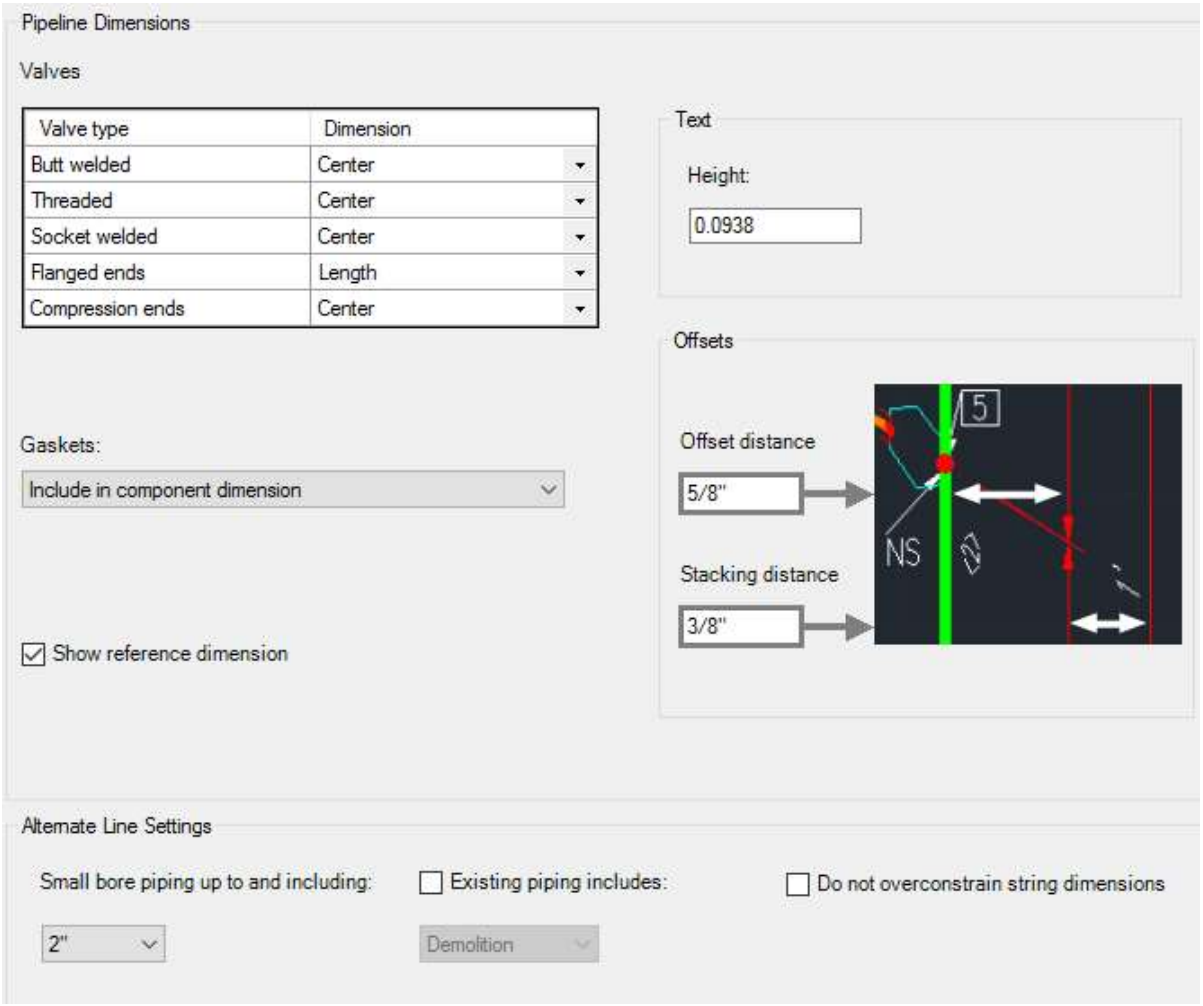


FIGURE 30: GENERAL DIMENSION SETTINGS

Themes

This page is where the iso themes are configured. A big component of each theme is the dimension settings. The extreme flexibility of the dimensioning system makes it very powerful, but also a bit intimidating. Each theme is selectable via the drop-down in the upper left corner. All of them have their own group of settings which include whether or not the theme is enabled, the symbol scale, whether or not dimensions, annotations, and/or a BOM are shown, the enabled dimension types, and fine-grained control over the dimension sub-types. A diagram is provided in the upper right corner to give you a general idea for the enabled dimensions. There are a lot of settings available on this page. It is best to spend a lot of time exploring the behavior of each toggle to fully understand the impact of turning each one on or off.

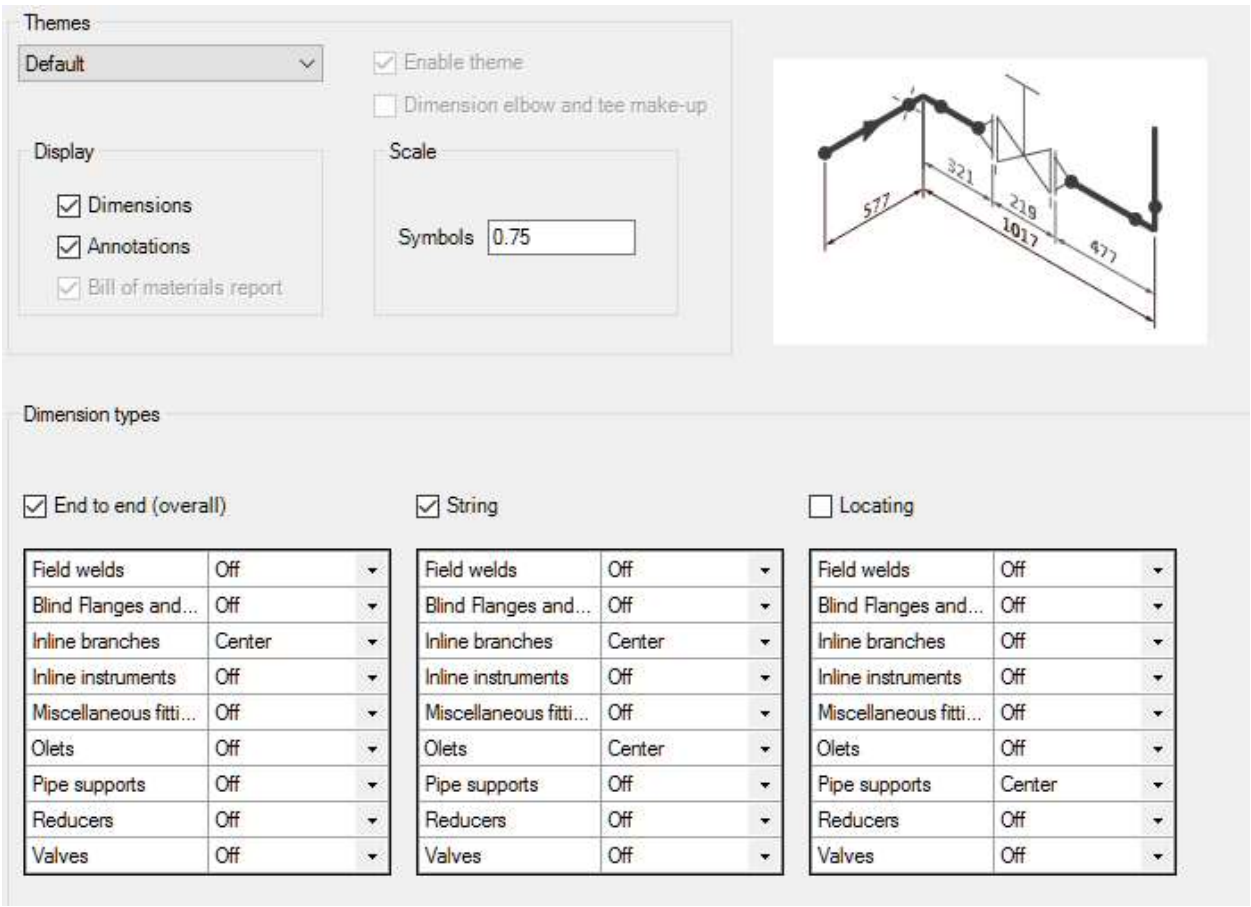


FIGURE 31: ISO THEME SETTINGS

Sloped and Offset Piping

Controls for the display of sloped pipe and piping offsets are shown on this page. There are a variety of choices for slope callouts in the drop-down in the upper left. The max slope angle to call out is set directly below the drop-down. Offset callout options are to the right and include the amount of the offset triangle to hatch and the monikers for horizontal and vertical that show in the annotation. The overall look is controlled in the **Offset Piping** section. Each of the 3 options for 2D offsets, 2D sloped pipe, and 3D rolled offsets have pictures for each option that show a good depiction of the final output for each situation.

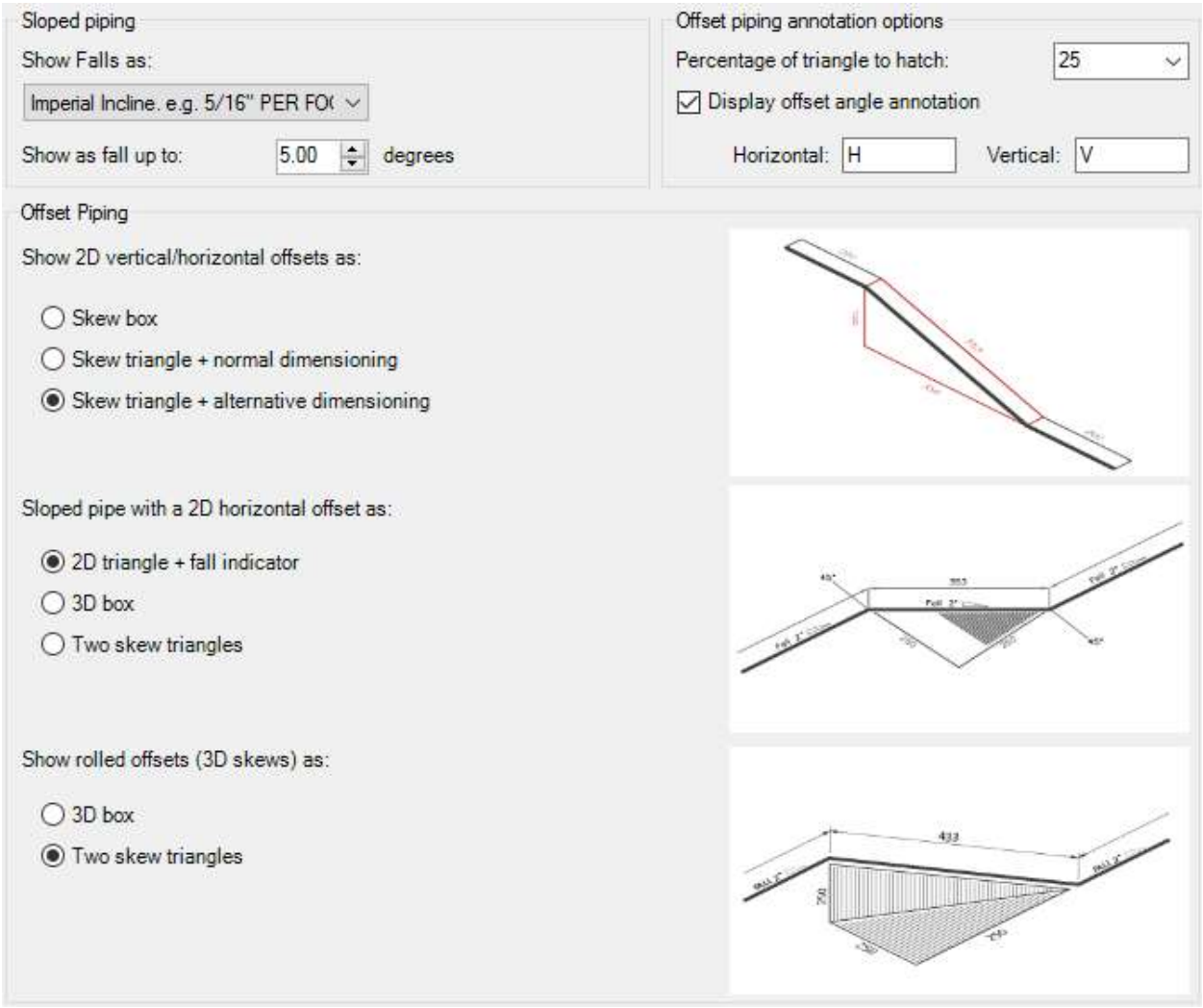


FIGURE 32: SLOPE AND OFFSET SETTINGS

Title Block and Display

The title block settings page provides a preview of the title block that is specified in the drawing template path. There is also a button to launch into title block setup. This will be covered in more depth in the next section of this handout.

FIGURE 33: TITLE BLOCK PREVIEW AND SETTINGS

A couple of other random display settings appear at the bottom of this page. The look of elbows and bends is controlled with the two drop-downs. Each can be either square or round. To the right of these are the toggles to display insulation and pipe supports if required.

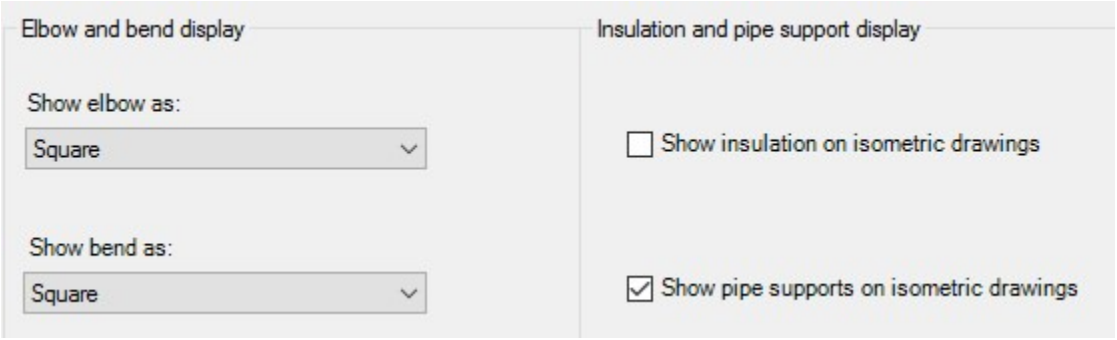


FIGURE 34: MISC DISPLAY SETTINGS

Live Preview

This very cool feature comes in handy when tweaking the iso configuration using the user interface. After each change is applied, switching over to this page triggers an iso to be generated and shown in the viewing window. The iso that's created is based on the PCF file path provided in the only setting on this page. The sample PCF shows a lot of variety, but a custom one can always be put in its place.

On occasion, the preview will fail to generate. If this happens, click **OK** to close out Project Setup and to force all of the changes to be synced into the IsoConfig.xml. Re-open Project Setup and the preview will generate.

FIGURE 35: LIVE ISO PREVIEW PAGE

Title Block Setup

Now that you have created a new iso style, we will set up the title block. Title block customization is straightforward, but as always, there are a couple of “gotchas” here and there. This section of the handout will walk through the various steps involved with setting up and customizing an iso title block.

Sheet Size

Believe what you will, but size does matter! Yes, if you ask the iso engine, bigger is definitely better! A bigger drawing area that is! The deliverable size for isometrics is typically a B-Size drawing. By the time the title block area and tables are taken into account the final draw area is only between a third and a half of the total space. Start adding in no-draw areas on top of that to accommodate the North arrow and general notes and then even less space is available.

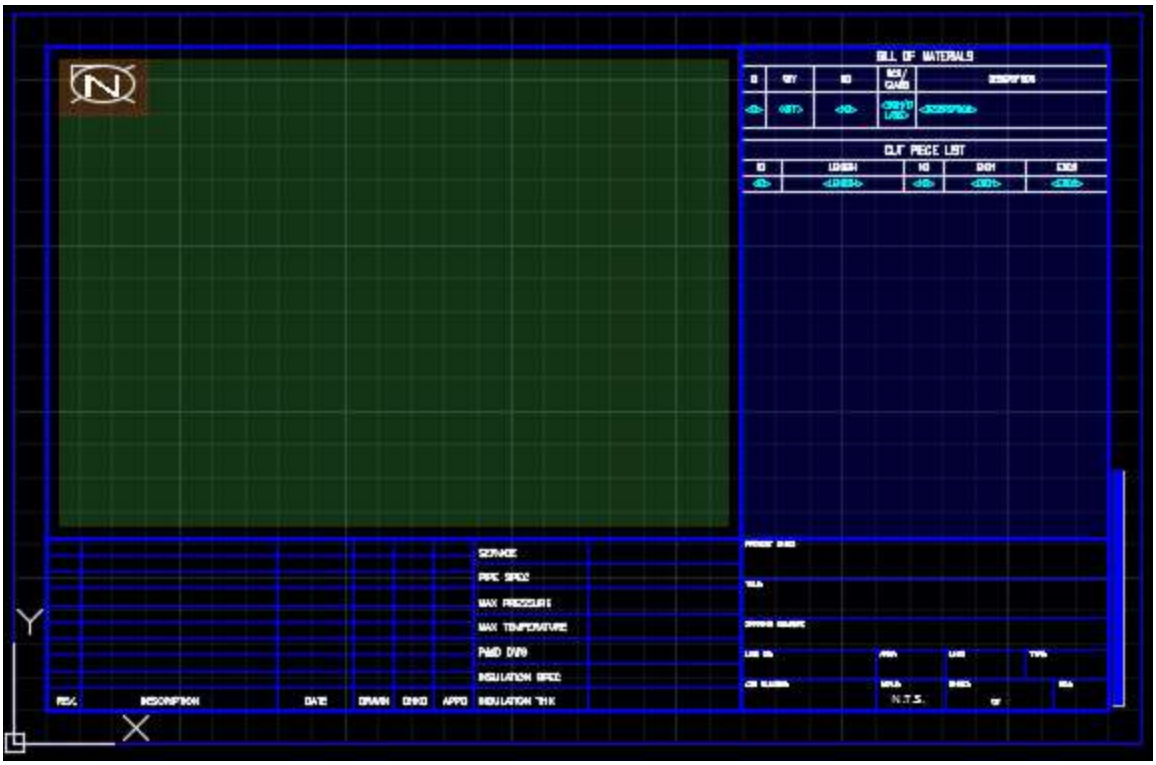


FIGURE 36: EXAMPLE DRAW AREA

The small drawing area can lead to a few different outcomes. First, there can be absolutely no issues whatsoever and everything may work perfectly for a given set of pipelines. In my experience this was the case on small projects with small pipe runs, but only about 75% true on large projects with very long pipe runs.

The second scenario is that a pipeline may iso, but it will have an excessive number of sheets. With little room to work with, the iso engine will break the pipeline up more than it really needs to. The **MaxDirectionChanges** and **CongestionLevel** settings in the IsoConfig.xml can be tweaked to try to force the iso engine to cram as much as possible onto a sheet, but they only help so much.

```
<Spool SpoolSplitMethod="OnSize" SizeLimits="480 120 96" OverflowLength="6" MaxDirectionChanges="3"
MaxWeight="0" MaxPipeLength="0" PropertyChange="PIPING-SPEC" MinimizeFieldWelds="false">
```

FIGURE 37: MAXDIRECTIONCHANGES ATTRIBUTE OF THE SPOOL ELEMENT

```
<Auto DisableAutoSplit="false" SplitSymbol="SplitMark" SpoolSplit="false" IdentifySpools="true"
SplitOnCongestion="true" CongestionLevel="2" />
```

FIGURE 38: CONGESTIONLEVEL ATTRIBUTE OF THE AUTO ELEMENT

Third and most extreme, is that the iso will not run. The iso engine will try to figure out how to arrange the pipeline in the allotted drawing area, but it entirely possible that the iso can outright fail due to the space constraints. Even if the iso doesn't outright fail, it can fail due to reaching the timeout limit. When an iso is created in Plant 3D, it will process in the background for up to 30 minutes. After 30 minutes, the timeout limit is reached and Plant 3D kills the iso creation task.

To get around these issues our approach is to use a D-size or 22x34 sheet size. The extra area works wonders on pipelines that are hundreds or thousands of feet in length. The iso engine does not have nearly as many hiccups and we encounter fewer timeouts and a lower number of total sheets than with a B-size border. In order to achieve a good looking 11x17 deliverable for our clients, the text size for dimensions and annotations is doubled in the iso style configuration. The final prints are then done at full D-size in the PDF's as well. If printouts are required, then the PDF's are printed at 11x17 to give to the client.

The Template File

The template for creating new drawings is the Iso.dwt file. It is located in the iso style folder that resides in the Isometric folder of the project structure. The template contains the layers, text styles, dim styles and drawing areas that are used when generating the drawing. To get started, open **Project Setup**, then go to **Isometric DWG Settings**, **Title Block and Display** and then click on the **Setup Title Block…** button. This will open the Iso.dwt file and set the **Title Block Setup** contextual tab as the active tab in the ribbon. All of the tools required to set up the areas, tables, attributes, and themes are on this ribbon tab.

FIGURE 39: TITLE BLOCK SETUP CONTEXTUAL TAB

Aside from the tools, the most important thing to note is that this drawing should only contain a block named “Title Block”.

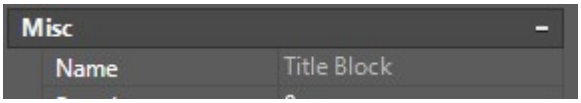
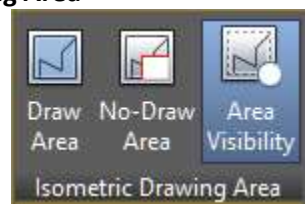


FIGURE 40: ISO.DWT TITLE BLOCK NAME

Important note: Blocks not named “Title Block” in this file are deleted the next time that the **Iso.dwt** template is opened using **Project Setup**. Working with blocks that have other names is possible but requires some workarounds.

Drawing Area



On the left side of the **Title Block Setup** ribbon tab is the Isometric Drawing Area pane. Draw Area, No-Draw Area, and Area Visibility are the three tools. Start by defining the draw area. This will appear as a green hatched area once it is placed. No-Draw areas define areas that overlap the draw area that should remain blank. This is usually used to identify the north arrow location, where a table overlaps the draw area, or for general notes. Area visibility can be toggled on/off with the respective button.

Important note: It is best to pull the draw area back from the outer edges of the true draw area to prevent annotations from extending outside of the printable drawing area.

Tables

The hatch areas for the four different tables, Bill of Materials, Cut Piece List, Weld List, and Spool List can be placed using the respective buttons.

Clicking **Table Setup** launches the Table Setup dialog. The layout of the four table types can be tweaked on the **Table Layout** tab. The table type is selectable from the drop-down in the upper right corner of the dialog. Columns can be added to the layout by clicking the **Add Column…** button. Column order can be arranged by clicking on the column header and then dragging and dropping it into position.

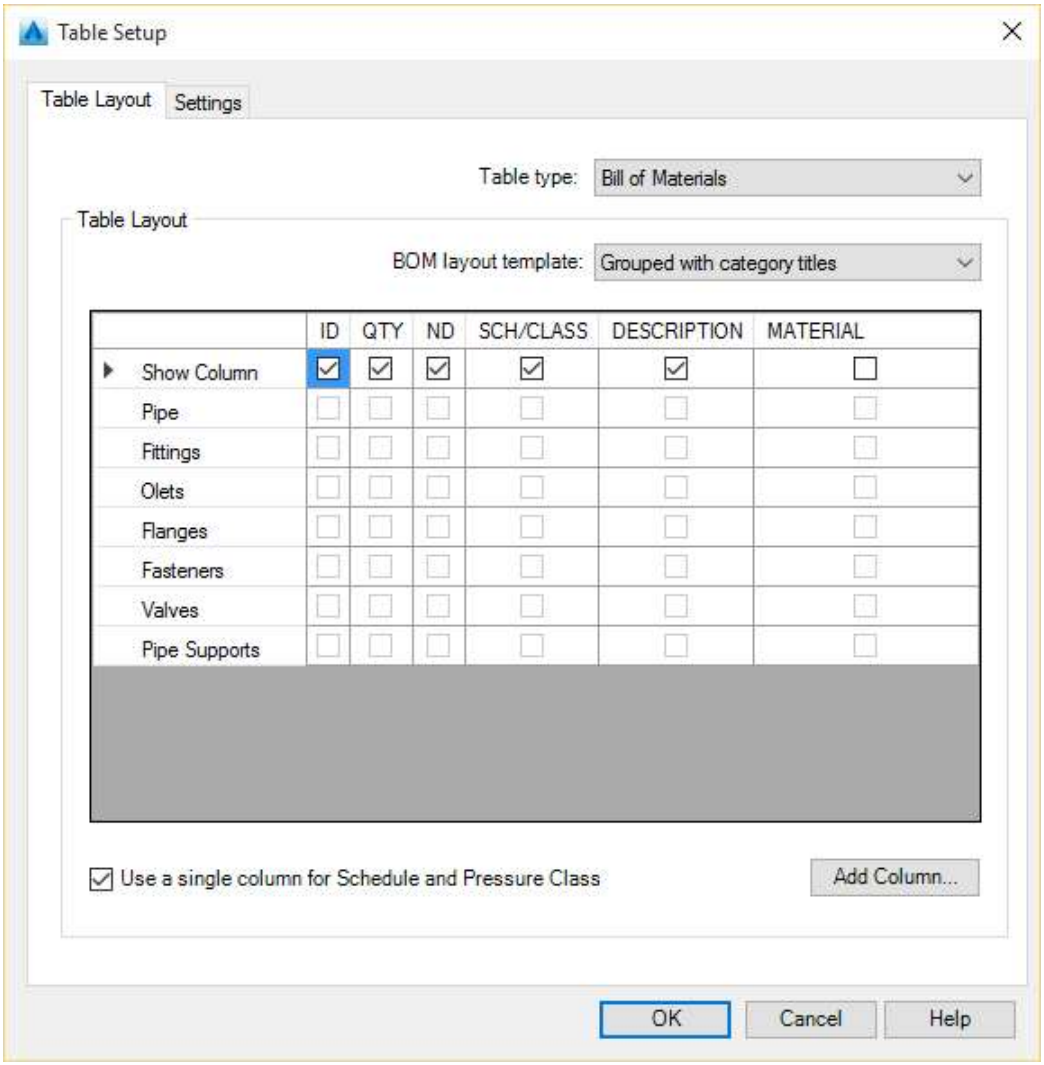


FIGURE 41: TABLE SETUP DIALOG

The bill of materials table has two special options associated with it. The first is a checkbox to use a single column for schedule and pressure class. When checked, the software will reconcile the two attributes and place the proper value in that column. The second is the layout method. The layout can be a simple materials list, a material list with like components grouped under a component title, or a material list with like components grouped, each group having its own set of columns.

The settings tab in the **Table** Setup dialog contains several miscellaneous bills of material settings. Going from top to bottom the list contains sort control, separation of fabrication and erection items, cutback elbow settings, fixed length pipe settings, and description settings.

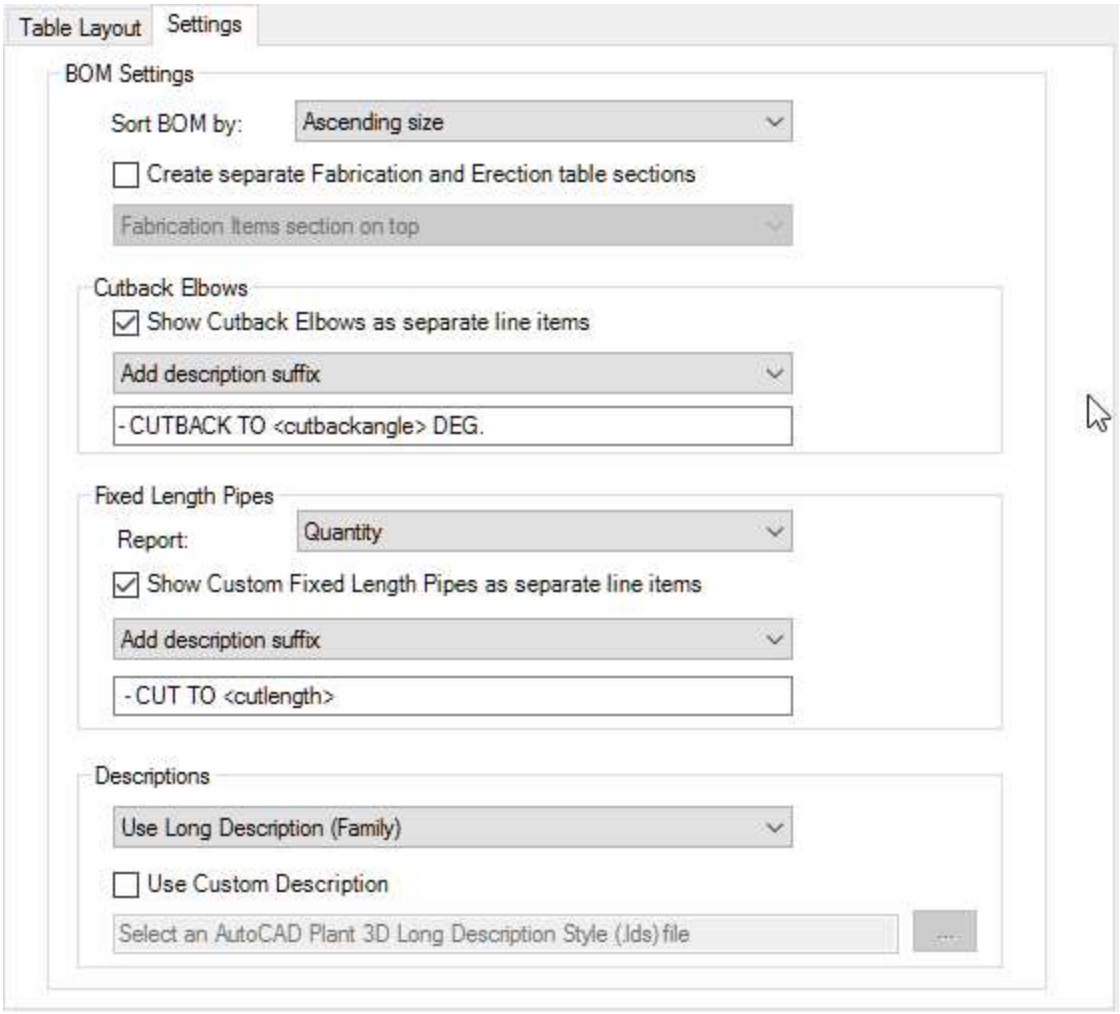
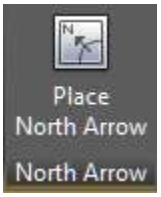


FIGURE 42: ADDITIONAL BOM SETTINGS

North Arrow



The next pane contains a single button to place the North Arrow. The North Arrow is a dynamic block which can be configured to point to any of the four corners of the page. The iso will be arranged on the drawing according to the direction that is selected for the North Arrow.

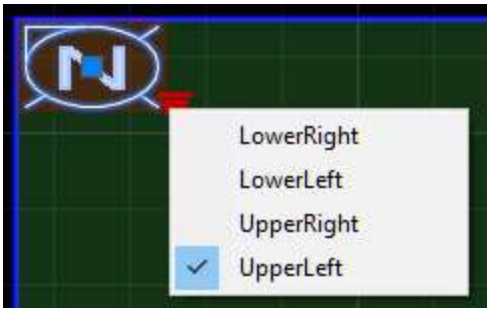


FIGURE 43: THE NORTH ARROW DYNAMIC BLOCK OPTIONS

Attributes

Continuing to the right in the **Title Block Setup** ribbon tab, next up is the **Attributes** panel. Clicking on the **Title Block Attributes** button will launch the **Insert Title Block Attributes** dialog. This dialog provides options for placing new attributes that are linked to project data and for mapping existing drawing attributes to project data. Additionally, it provides a mechanism for linking an external line list into the project. Once linked, the data in the line list essentially becomes project data and can be used to populate drawing attributes.

The first step to place new attributes into the drawing is to select the **Attribute category** from the drop-down. The categories list will show any custom general categories, custom drawing properties, line group properties, and, if configured, external line list data. Once a category is selected, the **Attribute names** list is populated with the available properties.

To place and attribute, select it from the list, pick a text style, a justification, and enter a text height and click the **Place** button. Place the attribute on the title block and then repeat the process until all required attributes are in the Title Block.

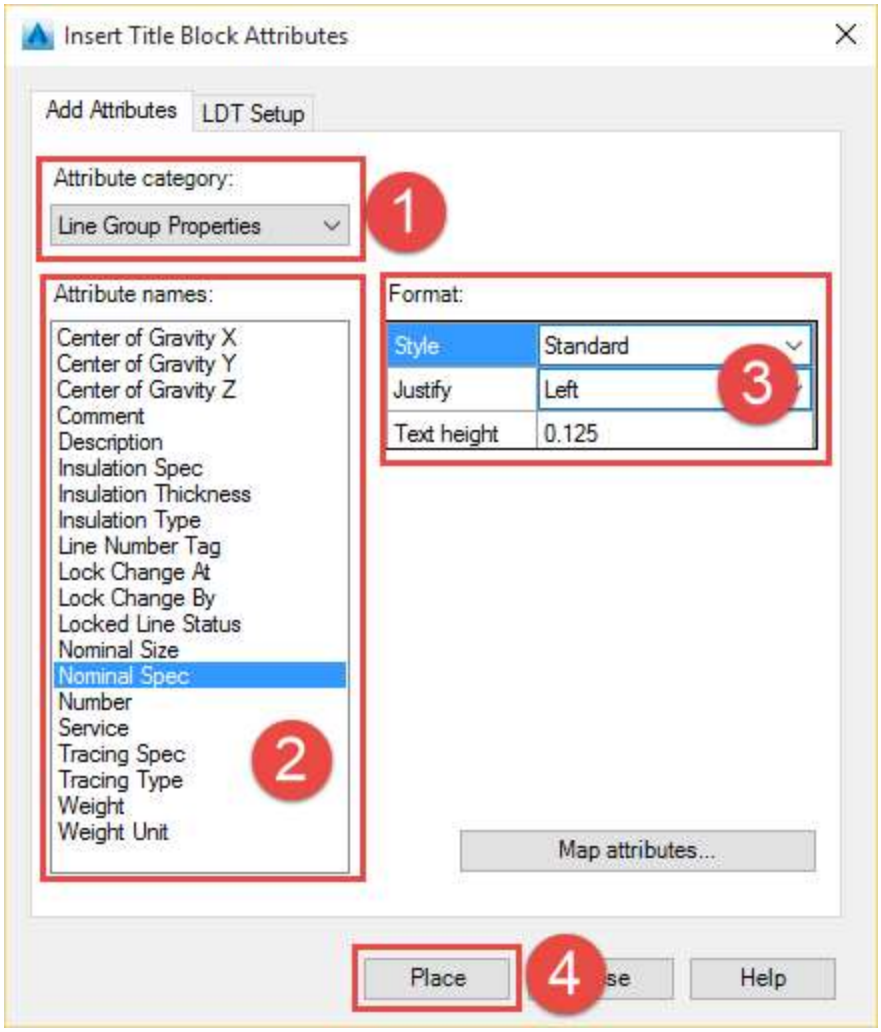


FIGURE 44: TITLE BLOCK ATTRIBUTES DIALOG

If the title block already contains attributes to place information, then the Plant 3D data can be mapped to the existing attributes. There's no need to delete them all and start over. Clicking the **Map attributes…** button opens up the **Map Title Block Attributes** dialog box. This box provides a list of the available attributes in the "Title Block". For each attribute in the list, a drop-down is provided in the right column that has a list of available Plant 3D properties. Selecting a Plant 3D property will map the project data to the block attribute in the drawing.

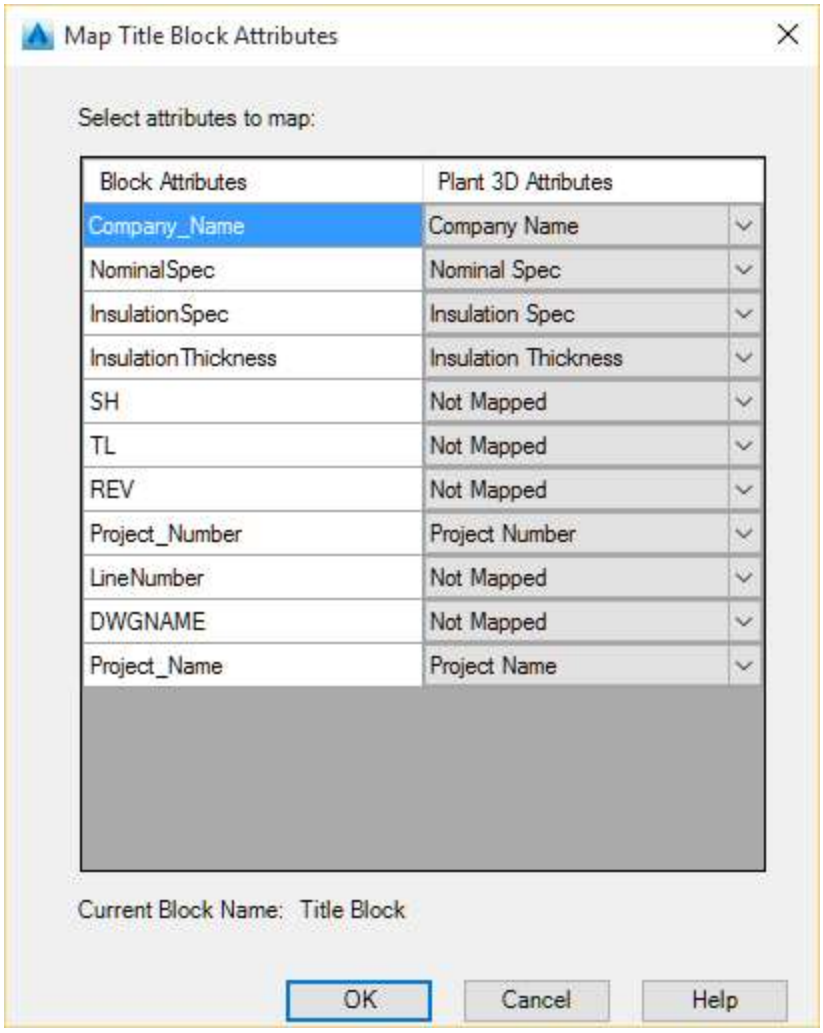


FIGURE 45: ATTRIBUTE MAPPING DIALOG

The **LDT Setup** tab provides the means to link in an external Line Designation Table otherwise known as a line list. The line list must be in Excel xls or xlsx format in order to be linked.

Before using a line list in a Plant 3D project it needs to be prepped. To prepare the line list each column will need to have a unique identifier. If this criterion isn't already met, insert a new first row and create one an identifier for each column. The second requirement is a column that matches the format of the line number tag that is used within the Plant 3D project. If necessary, add a new column and create a formula to build the tag or educate the engineer on how to enter the data. Once these two requirements are met, the line list is ready to use with isometrics.

To link the line list into the project click the ellipsis button to the right of the **LDT file (XLS)** textbox and then browse to the line list Excel file. If more than one worksheet is present in the line list document, select the correct one from the drop-down list. Next, select the number of

the header row that contains the unique identifiers in the line list. Finally, select the name of the column that contains the line number tag information.

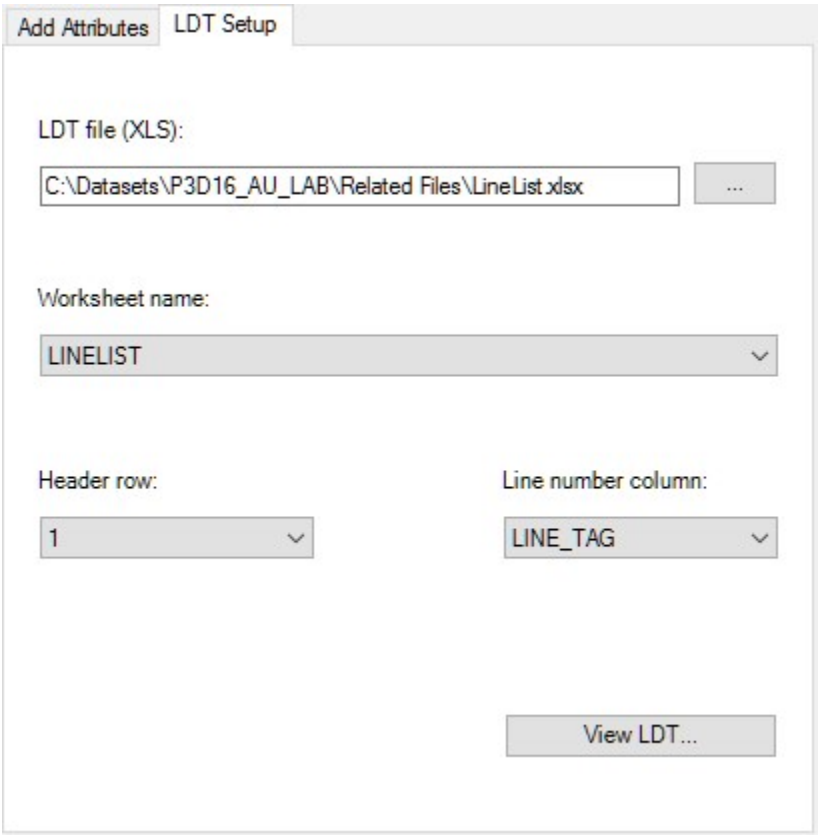


FIGURE 46: LINE LIST SETTINGS TAB

Setup is now complete and the line list data is linked into the project. Line list data can now be placed or mapped to the title block. If everything is populated correctly in the Excel sheet, then data from the line list will come through on the isometric drawings when they're created.

Themes

The last stop on this guided tour of the **Title Block Setup** ribbon tab is the **Themes** panel. Once again, a single button resides on the panel. Clicking the **Iso Themes** button launches the **Iso Themes** dialog box which is used to configure the default and override settings for the themes.

The **Default Theme** tab has the **Default Styles** settings on the left and the **Layer Setup** on the right. Under **Default Styles** the dimension, multileader, table, and text styles can be selected from their respective drop-downs. The buttons to the right of each drop-down launch the respective AutoCAD configuration utility so that the styles can be tweaked. For consistency's sake, the selected styles apply to all of the iso themes.

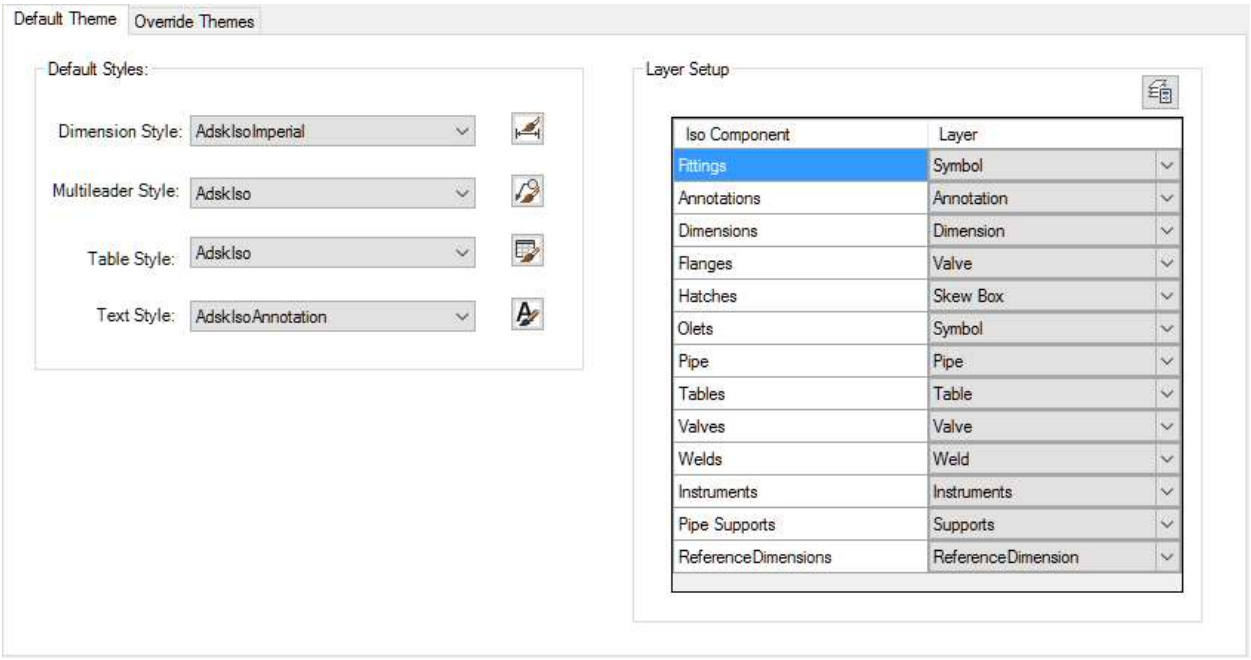


FIGURE 47: DEFAULT ISO THEME SETTINGS

The **Layer Setup** on the other hand, can be configured differently for each iso style. The Default theme settings are on the **Default Theme** tab while all of the other style's layer settings are on the **Override Theme** tab. To assign an iso component to a layer simply select the appropriate layer from the drop-down that is adjacent to each component category. Be sure to go through the settings for all of iso themes to make sure components appear on the proper layer.

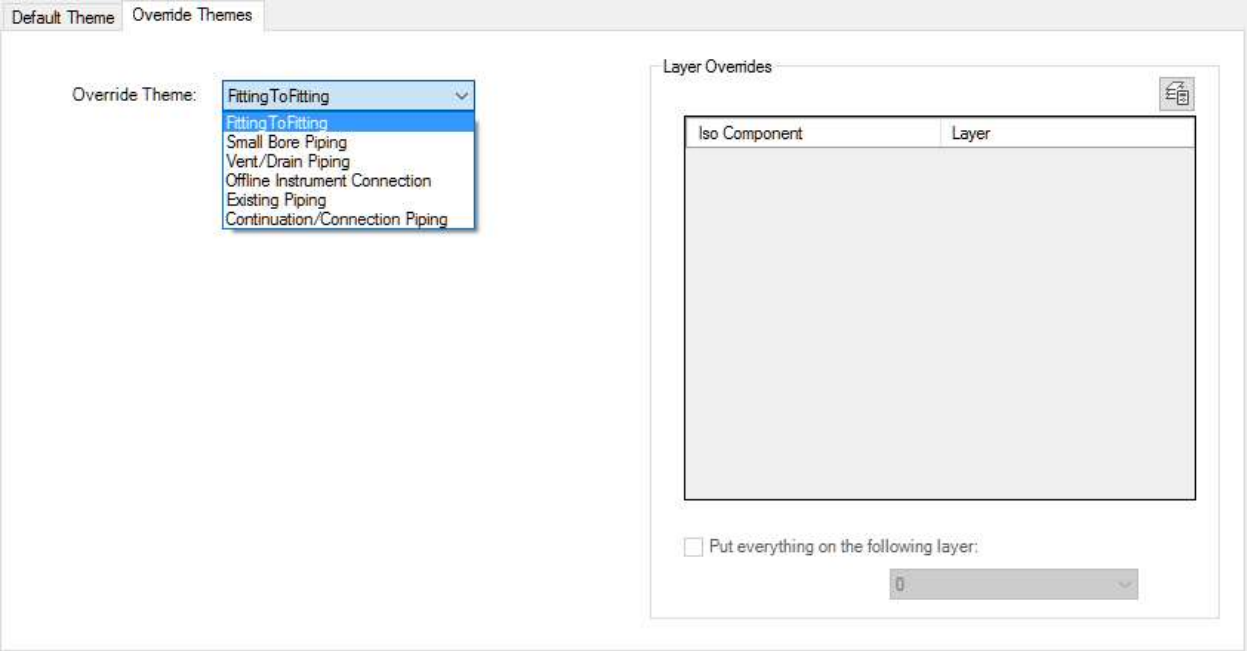


FIGURE 48: OVERRIDE THEME SETTINGS

Displaying Alternate Units on Dimensions

On certain projects, you may be required to show alternate units alongside the base units on the isometric drawings. Doing this requires an adjustment to the dimension style in the iso.dwt file's **Default Theme**. Click on the button to the right of the **Dimension Style** drop-down.

FIGURE 49: DIMENSION STYLE BUTTON IN THEME DIALOG

Before you do any editing, you need to verify the dimension style in use on the isometric drawings. To do this open the IsoConfig.xml file and search for the **DimensionsStyle** element. Note the dimension style in use based on the type of units your project uses.

```
<DimensionsStyle Imperial="AdskIsoImperial" Metric="AdskIsoMetric" />
```

FIGURE 50: DIMENSIONSSTYLE ELEMENT IN ISOCONFIG.XML

Select the correct dimension style in the **Dimension Style Manager** and then click on the **Modify…** button to make changes to it.

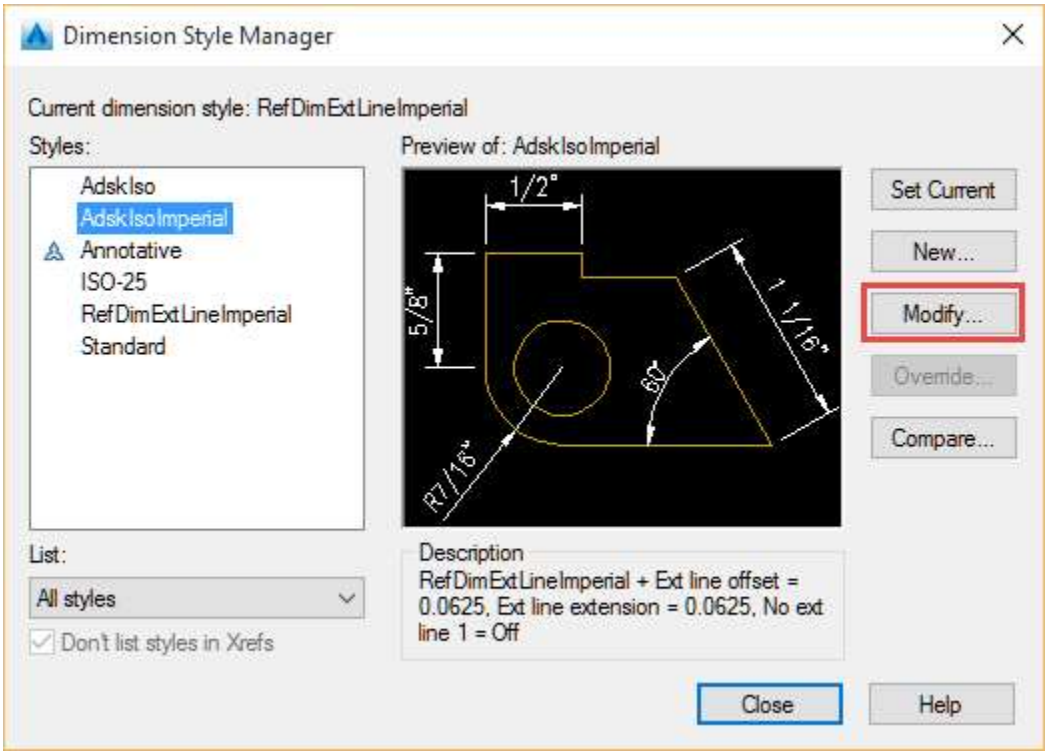


FIGURE 51: DIMENSION STYLE MANAGER

To modify the alternate units for the dimension style, click on the **Alternate Units** tab. The following figure shows the settings that I used on a project to display the metric dimension value in millimeters alongside the Imperial value. After making the changes click the **OK** button to save them and be sure to save the changes to the Iso.dwt file when you return to **Project Setup**.

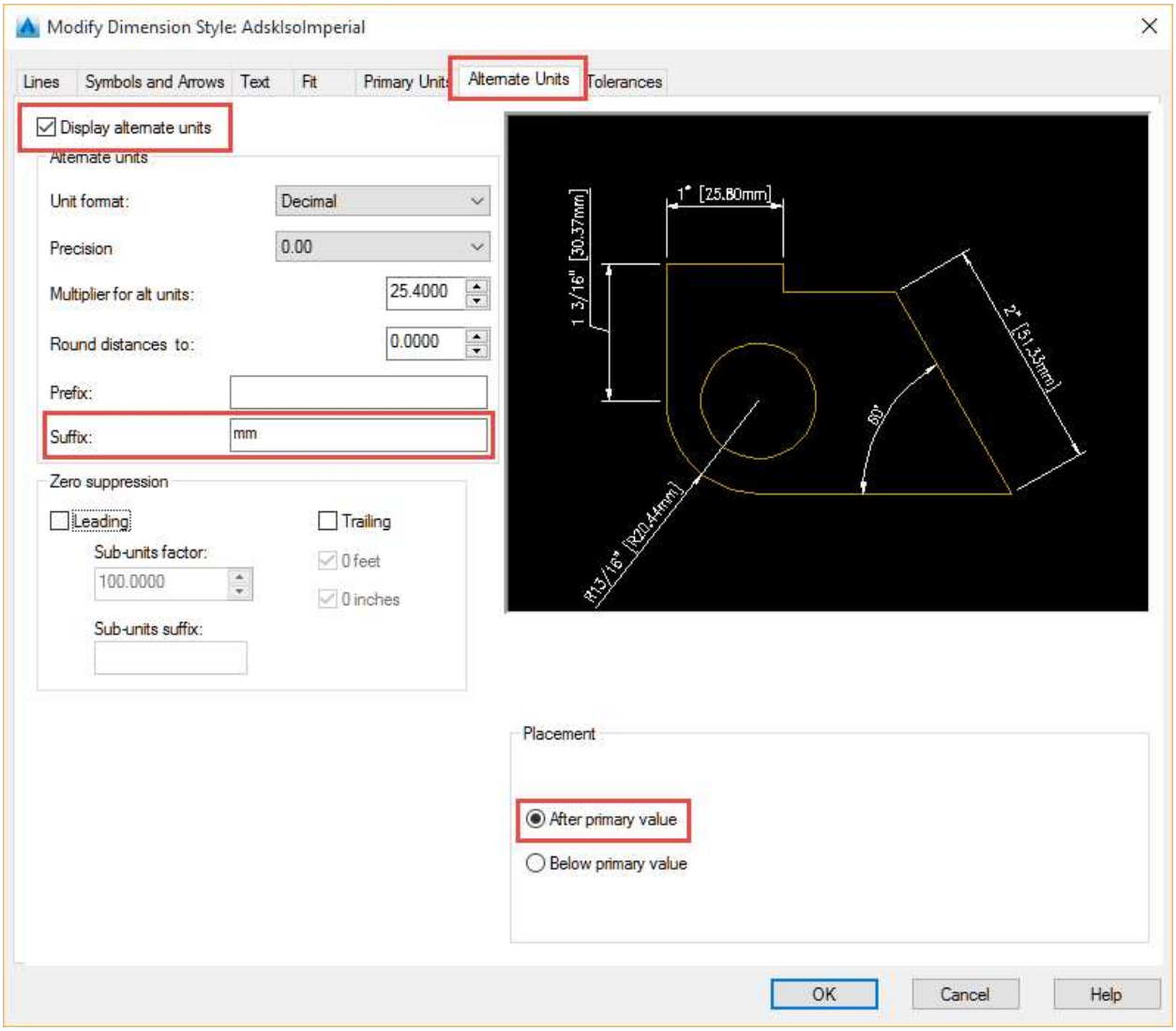


FIGURE 52: ALTERNATE UNITS SETTINGS

Using a Client Title Block

More often than not, when configuring a Plant 3D project for a client, the isometric template will also need to match the client's seed file. Sometimes there are multiple blocks in the client's seed file and even if there is only one, rarely is it ever named "Title Block". So what do you do? First, try pushing back on the client a bit. A lot of times they treat isometrics as disposable documents and they don't care how the digital file is configured as long as it looks correct. Other times, you won't be so lucky, so now what?

You'd think it should be as simple as pointing the dwt path at the client dwt and then using Project Setup to configure the title block, right? Nope. As mentioned before, any blocks that aren't named "Title Block" are deleted when the Iso.dwt is opened through **Project Setup**. There are ways around this, but it's tedious. Here are the methods that I use for client title block integration.

Title Block Consists of a Single Block with Different Name

In this case, the client title block is a single block, it just has a different name. To make it play nice with Project Setup RENAME the block from its current name to "Title Block". At this point, continue as normal. Open the iso.dwt through **Project Setup**, delete and purge the existing block, and then bring the new one into the file. Make adjustments to page setups, viewports, drawing limits, and then configure the drawing areas, tables, themes, etc. The catch with this method is that the "Title Block" will need to be renamed back to the client's block name prior to turning the isometric drawings over to them. Using a batch script works well and isn't difficult.

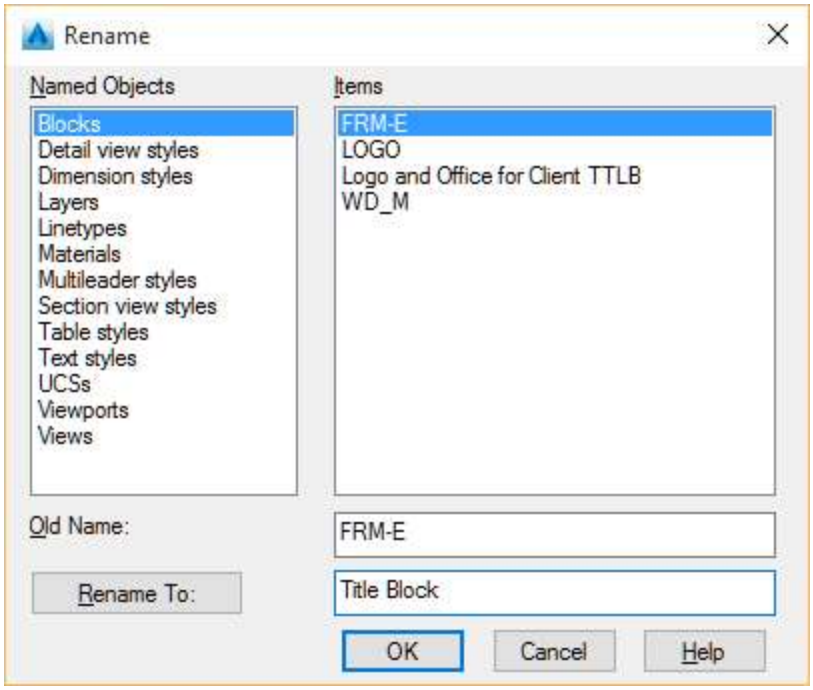


FIGURE 53: RENAME DIALOG

Title Block Contains Multiple Blocks

The other case is a client title block that is composed of multiple blocks. The method that I use in this case starts with opening the client seed file directly, that is, outside of the Project Setup interface. Once open, select everything that makes up the client's title block and then turn it into a block using the BLOCK command. Be sure to name it "Title Block" and then save the file. At this point it can be brought into the iso.dwt and configured without issue. At the end, before turning the drawings over to the client, a simple EXPLODE reverts the file to the client title block setup.

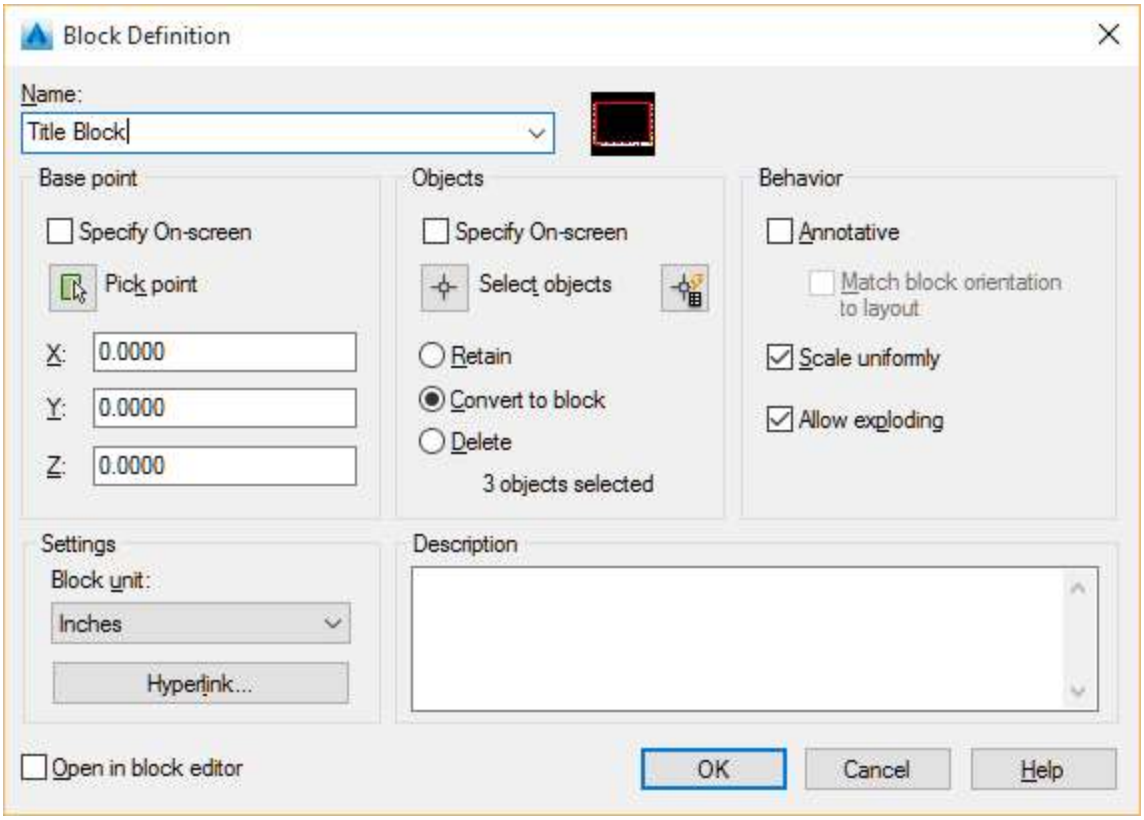


FIGURE 54: BLOCK DIALOG

Custom Drawing and File Names

Custom Drawing, File, and Spool Names

By default the IsoConfig.xml names the drawing and file based on the PIPELINE-REFERENCE which is the pipeline's tag in Plant 3D followed by a dash ('-') and a single digit sheet number. This output isn't locked down by any means. Both the drawing name and filename can be customized using various properties from the model, independently of one another.

The names consist of three components, a prefix, a sheet or spool number, and a suffix. The prefix can be comprised of any number of pipeline properties, each with its own appended delimiter. The sheet and spool numbers are numeric or alphabetic indices to represent the sheet or spool. However, for single sheet isometrics, the field is always blank. The suffix is built exactly like the prefix and can consist of any number of pipeline properties with preceding delimiter.

Project Setup

Project Setup provides a method of changing only the file naming convention and to be completely honest the implementation was poorly done. The interface allows properties to be added to the prefix by selecting them from the dropdown. Alternately, they can be keyed in by typing the property name enclosed in % characters in the textbox. The delimiter box provides a means to enter a delimitation character, but it only applies to the last property entered into the prefix box. The suffix drop-down isn't actually the suffix at all, but rather is the type of sheet

numbering that you prefer. Numeric or alphabetic are selectable, but the number of characters to use is not.

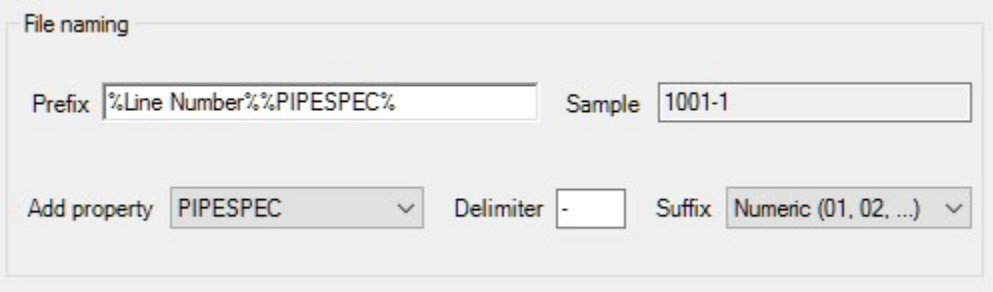


FIGURE 55: FILE NAMING TOOLS IN PROJECT SETUP

IsoConfig.xml

To get more flexibility and control over the drawing and file naming conventions I recommend that you skip **Project Setup** and go straight to the IsoConfig.xml.

The **FileNameFormat** and the **DrawingNameFormat** sections of the configuration are identical with the exception of the main element name. There is one attribute on the main element, the boolean **UseSpoolNameAsFileName** attribute. This only comes into play for spool iso styles. Setting it to true uses the spool name defined in that configuration instead of using the file or drawing name settings. For standard isometrics, the attribute should be false.

The **PrefixModelProperties** element contains one or more **ModelProperty** elements. Each **ModelProperty** element has two attributes, one to reference a model property by name and another to specify the delimiter that comes immediately after the property.

The **SheetNumber** element contains 3 attributes. The **AutoLabelOption** can be either “Number” or “Alphabet”. The **NumberOfDigits** attribute only applies when **AutoLabelOption** is set to “Number” and it represents the total number of digits used to show the sheet number. Leading zeroes are used to fill in extra digits to the left of the sheet number if required. For example, if **NumberOfDigits** is set to 3 and the sheet number is 2 then the output on the drawings will say “002”.

The last element of the **FileNameFormat** is the **SuffixModelProperties**. This is set up the same way as the **PrefixModelProperties**. Adding **ModelProperty** elements to the suffix element will append values after the sheet number. There is a slight difference in the handling of the delimiter though. For the suffix, the delimiter precedes the model property whereas in the prefix it came afterwards.

```
<FileNameFormat UseSpoolNameAsFileName="false">
  <!-- Properties included in the file name prefix -->
  <!-- PrefixModelProperties contains one or more ModelProperty elements. -->
  <PrefixModelProperties>
    <!-- Model property -->
    <!-- 'Name': (string); The model property name. -->
    <!-- 'Delimiter': (string); The delimiter. -->
    <ModelProperty Name="PIPELINE-REFERENCE" Delimiter="-" />
    <ModelProperty Name="PIPING-SPEC" Delimiter="-" />
  </PrefixModelProperties>
  <!-- Sheet number format -->
  <!-- 'AutoLabelOption': 'Number' or 'Alphabet' -->
  <!--     'Number' = numeric increment -->
  <!--     'Alphabet' = alphabetic increment -->
  <!-- 'NumberOfDigits': (decimal); Number of digits. -->
  <!-- 'StartFrom': (decimal); The number or alphabet the auto label starts from. -->
  <SheetNumber AutoLabelOption="Number" NumberOfDigits="2" StartFrom="1" />
  <!-- Properties included in the file name suffix -->
  <SuffixModelProperties>
    <ModelProperty Name="" Delimiter="" />
  </SuffixModelProperties>
</FileNameFormat>
```

FIGURE 56: FILENAMEFORMAT IN ISOCONFIG.XML

```
<DrawingNameFormat UseSpoolNameAsDrawingName="false">
  <!-- Properties included in the Isometric drawing file name prefix -->
  <PrefixModelProperties>
    <!-- 'Name': (string); The model property name. -->
    <!-- 'Delimiter': (string); The delimiter. -->
    <ModelProperty Name="PIPELINE-REFERENCE" Delimiter="-" />
  </PrefixModelProperties>
  <!-- Sheet number format -->
  <!-- 'AutoLabelOption': 'Number' or 'Alphabet' -->
  <!--     'Number' = numeric increment -->
  <!--     'Alphabet' = alphabetic increment -->
  <!-- 'NumberOfDigits': (decimal); Number of digits. -->
  <!-- 'StartFrom': (decimal); The number or alphabet the auto label starts from. -->
  <SheetNumber AutoLabelOption="Number" NumberOfDigits="1" StartFrom="1" />
  <!-- Properties included in the Isometric drawing file name suffix -->
  <SuffixModelProperties>
    <ModelProperty Name="" Delimiter="" />
  </SuffixModelProperties>
</DrawingNameFormat>
```

FIGURE 57: DRAWINGNAMEFORMAT IN ISOCONFIG.XML

The **SpoolNameFormat** is only used on spool isometric styles. The element is very close in structure to the drawing and file name sections. In fact, the **PrefixModelProperties** and **SuffixModelProperties** elements are identical in setup and behavior. There are two key differences though.

The first difference is that there are two attributes on the **SpoolNameFormat** element, **Prefix** and **Suffix**. These are both strings which are prepended and appended, respectively, to the spool name. For example, if all spools should begin with "MK-" then that would be the **Prefix** attribute value.

The other difference is the **SpoolNumber** element that appears in place of the **SheetNumber** element. This element drives the spool names on the isometrics. This can be done either automatically or manually in Plant 3D.

To use automatic naming, the option to create spools based on cube size or weight must be enabled. When these items are set, the **UseModelPropertyAsSpoolName** attribute is set to false and the iso engine uses the **AutoLabelOption**, **NumberOfDigits**, and **StartFrom** attributes to assign the spool names.

To use manual naming, the iso configuration must be set to use the spool number from the model. In this case, the **UseModelPropertyAsSpoolName** attribute is set to true. The **SpoolNumber** element then relies on the value of the **ModelPropertyForSpoolNumber** attribute to pull data from the model for the spool number. The attribute must be populated by the designer for this method to work.

```
<SpoolNameFormat Prefix="" Suffix="">
  <!-- Properties included in the spool name prefix -->
  <!-- PrefixModelProperties contains one or more ModelProperty elements. -->
  <PrefixModelProperties>
    <!-- 'Name': (string); The model property name. -->
    <!-- 'Delimiter': (string); The delimiter. -->
    <ModelProperty Name="PIPELINE-REFERENCE" Delimiter="-" />
  </PrefixModelProperties>
  <!-- Sheet number format -->
  <!-- 'AutoLabelOption': 'Number' or 'Alphabet' -->
  <!--     'Number' = numeric increment -->
  <!--     'Alphabet' = alphabetic increment -->
  <!-- 'NumberOfDigits': (decimal); Number of digits. -->
  <!-- 'StartFrom': (decimal); The number or alphabet the auto label starts from. -->
  <!-- 'Name': (string); spool number name -->
  <!-- 'StartFrom': (string); which number or alphabet the auto label starts with -->
  <!-- 'UseModelPropertyAsSpoolNumber': 'true' or 'false' -->
  <!--     'true' = use the model property as spool number -->
  <!--     'false' = use simple numeric or alphabetic increment as spool number -->
  <!-- 'ModelPropertyForSpoolNumber': (string); The property in the model. -->
  <SpoolNumber AutoLabelOption="Number" NumberOfDigits="1" StartFrom="1" Name="SpoolNumber"
  UseModelPropertyAsSpoolNumber="false" ModelPropertyForSpoolNumber="SPOOL-IDENTIFIER" />
  <!-- Properties included in the spool name suffix -->
  <SuffixModelProperties>
    <ModelProperty Name="" Delimiter="" />
  </SuffixModelProperties>
</SpoolNameFormat>
```

FIGURE 58: SPOOLNAMEFORMAT IN ISOCONFIG.XML

You can now see that there is a lot more to file, drawing, and spool naming than there seems on the surface through the **Project Setup** interface.

Show Insulation and Tracing

The options for insulation are quite limited in **Project Setup.** The single option is located on the **Title Block and Display** options page under **Isometric DWG Settings.** You can choose to either show insulation or not show insulation. This is great, but what about tracing?

FIGURE 59: INSULATION IN PROJECT SETUP

At present the only way to modify the tracing settings is in the IsoConfig.xml file. The options are controlled by the attributes in the **Insulation** element. To enable tracing the **UseDoubleLineInsulation** attribute must be set to false.

```
<!-- Insulation and Heat Tracing configuration -->
<!-- 'InsulationLineLayerName': (sting); reference the layer name of the insulation line
in the generated drawing.  -->
<!-- 'HeatTracingLineLayerName': (sting); reference the layer name of the heat tracing
line in the generated drawing.  -->
<!-- 'InsulationTracingOffsetDistance': (double) > 0.0 -->
<!--     The distance between the insulation/heat-tracing line and the component. -->
<!-- 'UseDoubleLineInsulation': 'true' or 'false' -->
<!--     'true' = display the instulatin line in both side of the pipe -->
<!--     'false' = display the insualtion lin in one sidd of the pipe -->
<!-- 'UseOffsetLineInsulation': 'true' or 'false' -->
<!--     'true' = display offset line as Insulation & Heat Tracing -->
<!--     'false' = do not display Insulation and Heat Tracing line -->
<!-- 'Filter': reference the filter which specify those component types having insulation
and heat tracing. -->
<Insulation InsulationLineLayerName="Insulation Line" HeatTracingLineLayerName="Heat
Tracing Line" InsulationTracingOffsetDistance="0.1531" UseDoubleLineInsulation="true"
UseOffsetLineInsulation="false" Filter="InsulationShowFor" />
```

FIGURE 60: INSULATION AND TRACING IN ISOCONFIG.XML

Important Note: If you toggle the insulation setting off in the GUI, then the XML setting will revert to the default state. If you re-enable it and want tracing as well, you must redo the manual change to the IsoConfig.xml as well.

Custom Line Callouts – Simple Yet Tricky at Times

Yes, the title of this section is 100% true. Custom line callouts can be either a piece of cake or they can be extremely difficult. To understand why this is, we need to look at the **LineNumberScheme** element in the IsoConfig.xml file. The **AnnotationStyle**, **Alignment**, and **LeaderStyle** attributes are all aesthetic and have no bearing on the difficulty. The key attributes are **Format**, **ComponentFormat**, **LineFormat**, **ComponentFields**, and **LineFields**.

Format defines the final layout of the line callout that shows up on the isometric. The {0} and {1} correspond to the **ComponentFormat** and **LineFormat**, respectively. They can be placed in any order and be separated by other text. The '\n' character combination can be used to force a newline in the annotation if needed.

The **ComponentFormat** is built using {0}, {1}…{x}. Each represents a property from the **ComponentFields** attribute. **LineFormat** is similar, except that it is built using the properties that show up in the **LineFields** attribute. I know, this is a bit confusing, especially if you're not used to writing code!

Let's look at the example below and do a few substitutions to make sense of everything. The **Format** is {0}-{1}. Substituting in the other attributes, we get **ComponentFormat**-**LineFormat**. Going a step further and substituting again, we end up with **ComponentField**{0}-**ComponentField**{1}-**LineField**{0}. Now by doing a final substitution the result is SIZE-PIPINGSPEC-PIPELINEREFERENCE.

```
<!-- Line Number annotation scheme -->
<!-- 'Name': Unique Identifier. -->
<!-- 'AnnotationStyle': (string); Used to generate annotations. -->
<!--    If a block annotation style is used the attribute tag must be set in the Tag field. -->
<!--    The style with the id is should be available in the annotationstyle list above. -->
<!-- 'Format': (string); Used to add an annotation suffix and to create multiline text. -->
<!--   <example>
       Component - Pipe {PartNumber: 5, Tag: SL-1000}
       Fields - PartNumber Tag
       Format - {0} STATIC\nNEXT LINE {1}
       Annotation -
       5 STATIC
       NEXT LINE SL-1000
       </example>
       -->
<!-- 'Enabled': 'true' or 'false'; If 'true' the scheme generates annotations. -->
<!-- 'Tag': (string); Block Attribute definition Tag. -->
<!-- 'Alignment': Can be 'FlatHorizontal', 'FlatAligned', or SkewAligned. -->
<!-- 'Positioning': Can be 'Anywhere', 'Above', or 'Below'. -->
<!-- 'LineFields': (list of strings); PipeLine attributes, PCF header info. -->
<!-- 'LineFormat': (string): Line properties formatting string. -->
<!-- 'ComponentFields': (list of strings); Component properties such as spec, size, etc. -->
<!-- 'ComponentFormat': (string); Component properties formatting string. -->
<!-- 'Format': (string); Line and component formatted properties combined format. -->
<LineNumberScheme Name="LineNumber" AnnotationStyle="Standard" Format="{0}-{1}" Alignment=
"SkewAligned" LeaderStyle="AsNeeded" ComponentFields="Size PIPING-SPEC" LineFields=
"PIPELINE-REFERENCE" ComponentFormat="{0}-{1}" LineFormat="{0}" />
```

FIGURE 61: LINENUMBERSCHEME IN ISOCONFIG.XML

The difficult part of this whole setup is that component and line fields cannot be easily mixed together. For a simple line callout, everything lines up nicely. Component fields are separate from the line fields and everything comes together in a simple fashion.

A more difficult, advanced line callout, if you will, is one where the component fields are intermixed with some of the line group fields. In these cases, the Calculated Properties Manager, which requires the PLANTDEFINECALCPROPERTIES key-in, comes in handy. An example of a more advanced line callout is:

Size-Service-LineNumber-Spec-InsulationThickness

There is no way to do this easily because Spec and Size are component fields and there are line fields mixed in between them.

To get around this limitation a new calculated property named LineSuffix is created on the PipeRunComponents class. A formula is used to form the part of the line callout that comes after the size. This is an effective way to combine a series of fields that cannot be done in the XML file.

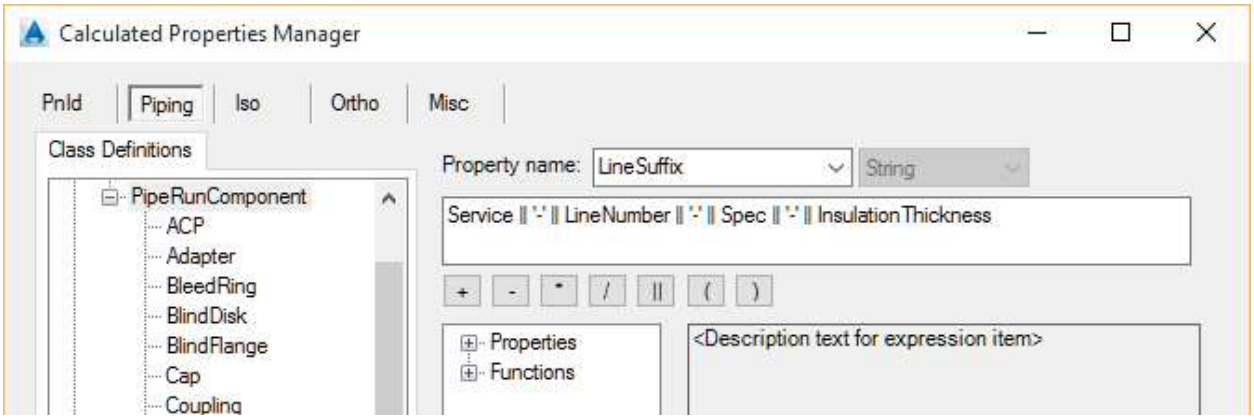


FIGURE 62: A SAMPLE CALCULATE VALUE

The resultant property can be added to the **Iso.atr** file and pulled into the **LineNumberScheme** as a line field. The final line callout is then easily set up in the IsoConfig.xml file.

```
11
12  BOM-ATTRIBUTES
13  EngineeringItems.Schedule
14  EngineeringItems.PressureClass
15  EngineeringItems.Material
16  PipeRunComponent.LineSuffix
17
```

FIGURE 63: ISO.ATR COMPONENT PROPERTY ADDITIONS

Just when you think you have your head around line callouts, a request comes in from so far out of left field that you find yourself asking “Why me?”! These ones really require you to tap into your ingenious nature and be creative! An example of a ridiculous line callout of this nature is:

Size-[MetricConversion]-Spec-Service-LineNumber-InsulationType-TracingType

To accomplish this, you need to jump through a few flaming circus hoops!

Step one is to create a new class property on the Pipe Run Component class in the **Plant 3D DWG Settings** in **Project Setup**. The new attribute will hold the data for the metric conversion of the Imperial size.

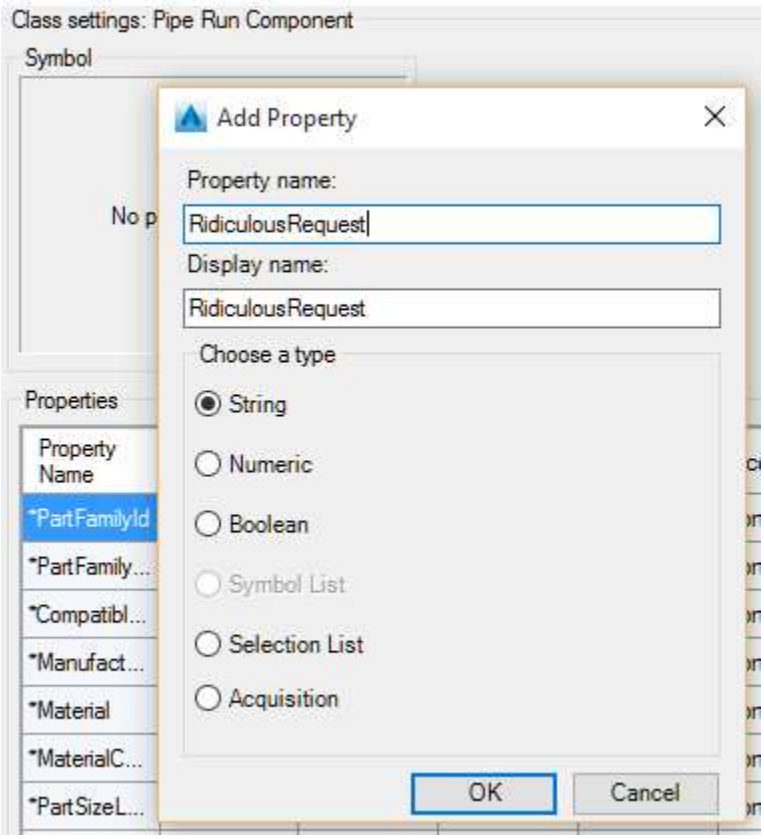


FIGURE 64: ADDING A CLASS PROPERTY

Continuing on, there are a couple of options to get the metric size. Both of them boil down to doing a lookup using the Imperial size information in the model to get the metric size.

The first option is to use the **External Database Reference Manager** inside of Plant 3D. It can be launched using the PLANTXDBMANAGER key-in. Running the command will open the dialog below. Of course to use the utility, you need to have a database with a table that contains the Imperial to metric mappings. Microsoft Access or Microsoft SQL are good choices depending on your individual skill set. After the database is created, you can connect to it and then map the information to the new class property.

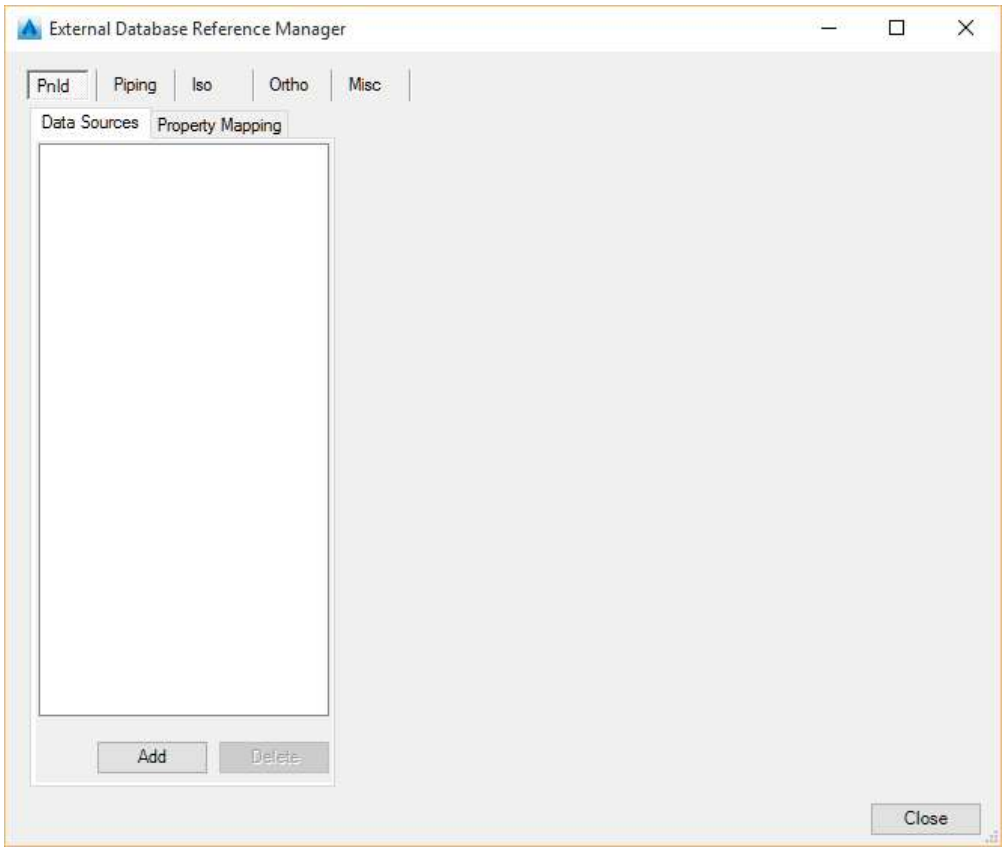
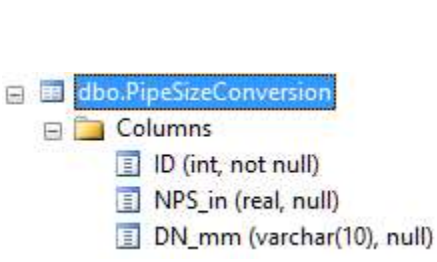


FIGURE 65: EXTERNAL DB REFERENCE MANAGER DIALOG

The details of how to use this utility are beyond the scope of this class, but there is an AU 2015 course, OG10334-L, that goes into it in detail if you're interested.

The other option, which I must note is entirely unsupported by Autodesk, involves the creation of a table within the Plant 3D Piping database and some SQL magic to populate the attribute. To begin, create the table in the SQL database and then populate it with the mapping information.



	ID	NPS_in	DN_mm
1	1	0.125	DN6
2	2	0.25	DN8
3	3	0.375	DN10
4	4	0.5	DN15
5	5	0.75	DN20

FIGURE 66: PIPESIZECONVERSION SQL SERVER TABLE

Now this is where things get a bit hairy if you're not familiar with SQL. You need to write a SQL trigger that runs on the EngineeringItems table every time a record is inserted or updated. Nothing overly complicated, but more than enough to scare some of you into learning the other method I'm sure!

```
USE [P3D14_TPCO_0130209600_Piping]
GO
/****** Object:  Trigger [dbo].[TRG_Set_NomDiamAlt_after_insert_or_update]
Script Date: 11/10/2015 1:13:22 PM ******/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
-- =============================================
-- Author:      Mike Musgrave
-- Create date: 7/28/2014
-- Description: Updates the NominalDiameterAlt field based on a lookup using
NominalDiameter
-- =============================================
ALTER TRIGGER [dbo].[TRG_Set_NomDiamAlt_after_insert_or_update]
   ON  [dbo].[EngineeringItems]
   AFTER INSERT,UPDATE
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    -- grab current values first
    DECLARE @NominalDiameter FLOAT, @PnPID BIGINT

    SELECT @NominalDiameter = NominalDiameter FROM inserted
    SELECT @PnPID = PnPID FROM inserted

    -- update NominalDiameterAlt field
    UPDATE dbo.EngineeringItems SET NominalDiameterAlt = (SELECT DN_mm FROM dbo.
    PipeSizeConversion WHERE NPS_in = @NominalDiameter) WHERE PnPID = @PnPID
END
```

FIGURE 67: SQL TRIGGER

That takes care of new components and components being updated. To populate the new property on all existing components in the project you need to write and run a SQL update query on the **EngineeringItems** table.

```
UPDATE [Piping].[dbo].[EngineeringItems]
SET NominalDiameterAlt = (SELECT dbo.PipeSizeConversion.DN_mm FROM dbo.PipeSizeConversion WHERE dbo.
PipeSizeConversion.NPS_in = dbo.EngineeringItems.NominalDiameter)
```

FIGURE 68: SQL UPDATE QUERY

Now that all of the legwork is done, the **LineNumberScheme** can be built. Since the component and line fields are mixed together, you need a new calculated property to represent the suffix of the callout, basically everything that comes after the size. Add the new suffix property to the **Iso.atr** file, build the formats in the **LineNumberScheme**, and then test away.

Custom Property Breakers

Hopefully you're beginning to understand how powerful the IsoConfig framework really is. There really is a lot that you can do with it. For property breakers, it's common practice to indicate where spec changes occur on an isometric for a pipeline. But what about schedule or insulation type or tracing? These can all be added by creating a new **PropertyBreakerScheme**. To do this, copy the **SpecBreaker** scheme and give it a new name, such as **TraceBreaker**. After that change the value of the Field attribute to **TracingType**. Now the breaker flags will appear whenever the tracing changes on a pipeline.

```
<!-- Property breaker annotation scheme -->
<PropertyBreakerScheme Name="SpecBreaker" AnnotationStyle="SpecBreak" Tag="Left Right"
Alignment="FlatHorizontal" LeaderStyle="AlwaysNonArrowed" Filter="SpecBreakItems" Field
="PIPING-SPEC" DefaultAnnotationStyle="Standard" DefaultLeaderStyle="Always"
WordWrapLimit="10" EnableMultiple="true" />
```

FIGURE 69: PROPERTYBREAKERSCHEME IN ISOCONFIG.XML

Turn the Weld List into a Connection List

Let's say that you have a desire to more accurately track the labor estimate for the various piping connections on a project. There is a weld list, but you don't really want it to be just a weld list. You want to track welds, threads, glue joints, etc. To do this you have to do a little digging into how the Weld list is getting the data. If you look in the Data section of the IsoConfig.xml you'll see the **AggregatedLists** section. The **AggregatedList** named Welds is the one that we want. The **Filter** attribute on the **RowFilter** element is used to build the list which, in turn, shows up in the weld table on the isometric drawing. In this case the filter is called **Weld**.

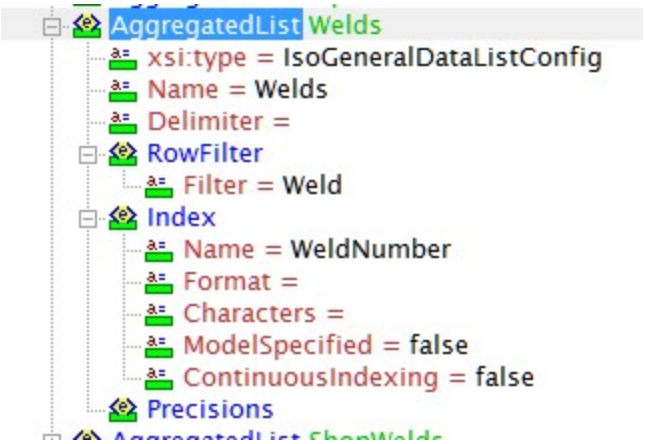


FIGURE 70: WELD DATA IN ISOCONFIG.XML

Now skip down to the **Filter** section near the end of the IsoConfig.xml file. Find the **Weld** filter. The **Value** attribute of the filter is a component query that is used on the model. The value here shows that only items with a "Type that is like '*Weld'" are considered. The '*' serves as a wildcard.

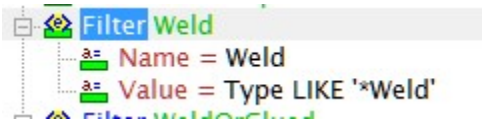


FIGURE 71: WELD FILTER IN ISOCONFIG.XML

To include more connection types in the Weld table, change the value to "Type LIKE '*Weld' OR Type LIKE 'Thread' OR Type LIKE 'Glued'". Now when the iso is created all weld connections, threaded connections, and glued connections will appear in the list!

Custom Flange, Gasket, Bolt set Callouts

An issue that has come up several times on various projects is the flange, gasket, bolt group callouts. The **Project Setup** has a minimal number of settings that directly affect the output of the flange, gasket, bolt group callouts.

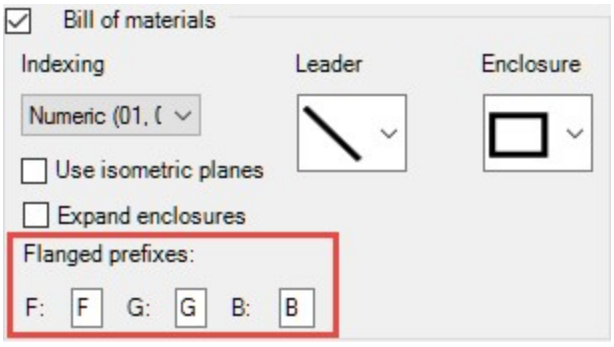


FIGURE 73: FLANGE SETTINGS IN PROJECT SETUP

As we have gone over in multiple examples now, the power to configure this callout also falls to the IsoConfig.xml. Notice that there are two **GroupScheme** elements that work with flanges, only one of which is enabled. The one with **Enabled="true"** is the active scheme that controls the output on the isometric drawings. **FlangeGroup** generates a single rectangle, or circle or hexagon if you prefer, that contains the F, G, and B information.

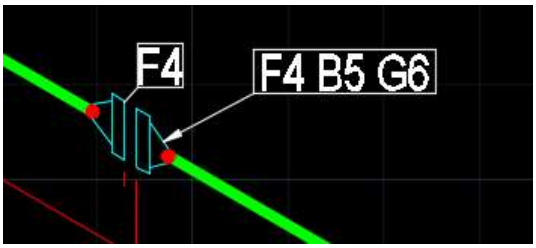


FIGURE 74: FLANGEGROUP CALLOUT

FlangeGroupMulti generates individual circles, or rectangles or hexagons with a little tweaking, that each contain one of the F, G, B monikers and the respective BOM part number.

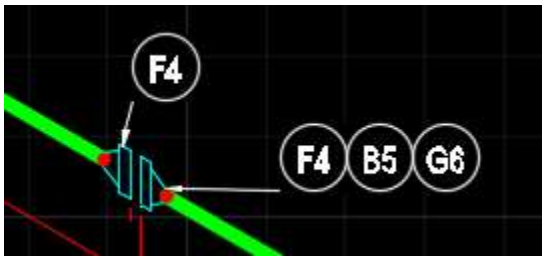


FIGURE 75: FLANGEGROUPMULTI CALLOUT

```
<GroupScheme Name="FlangeGroup" AnnotationStyle="SRectangle" Enabled="true" Tag="XX"
Alignment="FlatHorizontal" LeaderStyle="AsNeeded" Components="Flange Bolt Gasket" Field=
"PartNumber" IncludeMate="true" MateComponent="Flange" MateTag="XX" MateAnnoStyle=
"Rectangle" MultipleBlocks="false">
  <Formats>
    <Format Component="Flange" Format="F{0}" />
    <Format Component="Bolt" Format="B{0}" />
    <Format Component="Gasket" Format="G{0}" />
  </Formats>
  <GroupFormats>
    <GroupFormat Count="1" Format="{0}" />
    <GroupFormat Count="2" Format="{0} {1}" />
    <GroupFormat Count="3" Format="{0} {1} {2}" />
    <GroupFormat Count="4" Format="{0} {1} {2} {3}" />
  </GroupFormats>
</GroupScheme>
<GroupScheme Name="FlangeGroupMulti" Enabled="false" Alignment="FlatHorizontal"
LeaderStyle="AsNeeded" Components="Flange Bolt Gasket" Field="PartNumber" IncludeMate=
"true" MateComponent="Flange" MateTag="X00" MateAnnoStyle="OneCircle" MultipleBlocks=
"true">
  <Formats>
    <Format Component="Flange" Format="F{0}" />
    <Format Component="Bolt" Format="B{0}" />
    <Format Component="Gasket" Format="G{0}" />
  </Formats>
  <GroupFormats>
    <GroupFormat Count="1" Format="{0}" AnnotationStyle="OneCircle" Tags="X00" />
    <GroupFormat Count="2" Format="{0}" AnnotationStyle="TwoCircle" Tags="X00 X03" />
    <GroupFormat Count="3" Format="{0}" AnnotationStyle="ThreeCircle" Tags="X00 X03 X06"
     />
    <GroupFormat Count="4" Format="{0}" AnnotationStyle="FourCircle" Tags="X00 X03 X06
    X09" />
  </GroupFormats>
</GroupScheme>
```

FIGURE 76: FLANGE SETTINGS IN ISOCONFIG.XML

The INSTRUMENT Spec

Every project has its own collection of one-off specialty control valves and other items that are requested by the client or one of the many engineers on the job. Over time some of the same items get requested over and over again. Rather than reinvent the wheel every time one of these items is requested, we create them all in catalogs and then load them into a generic INSTRUMENT spec that is copied into every project that we do in Plant 3D.

For years, going back to our Isogen days, each of these items was indicated on our isometrics in the same fashion. A custom symbol based on the Isogen SKEY of “II??” with a capital ‘I’ added into the center of the box. This is not an out-of-the-box symbol in Plant 3D either so a new symbol must be created.

This is done by modifying the **IsoSymbolStyles.dwg** (ISS) file through **Project Setup**. To find the block to use as a template we first need to look in the **IsoSkeyAcadBlockMap.xml** file.

```
<!-- Begin: Instrument symbols -->
<SkeyMap SKEY = "ITFL" AcadBlock ="Instrument-Tee" />
<SkeyMap SKEY = "II??" AcadBlock ="Instrument-Inline"/>
<!-- End: Instrument symbols -->
```

FIGURE 77: SKEY TO ACAD BLOCK MAPPING

To create the new block, open up the ISS file, and find the Instrument-Inline block. Save a copy of it as AU-Instrument-Inline block. Now modify it to your liking, save, and return to **Project Setup**. Now add the name to a new entry in the **IsoSkeyAcadBlockMap.xml** file.

```
<!-- Begin: Instrument symbols -->
<SkeyMap SKEY = "ITFL" AcadBlock ="Instrument-Tee" />
<SkeyMap SKEY = "II??" AcadBlock ="Instrument-Inline"/>
<SkeyMap SKEY = "AUII??" AcadBlock ="AU-Instrument-Inline" />
<!-- End: Instrument symbols -->
```

FIGURE 78: NEW SKEY MAPPING

Each custom instrumentation component with the AUII?? SKEY has a special symbol on the isometric drawing. However, there is a slight problem! Spec break flags are showing up on each side of the custom component! This is definitely not something that we want to show. Recall from above the information on the **SpecBreaker PropertyBreakerScheme**. Looking at the element in the IsoConfig.xml shows that the breaker is generated based on the **SpecBreakItems** filter.

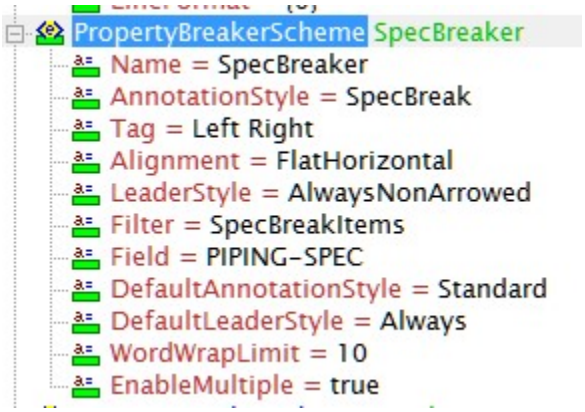


FIGURE 79: PROPERTYBREAKERSCHEME IN ISOCONFIG.XML

The filter needs to be modified to exclude components that have a spec equal to INSTRUMENT.

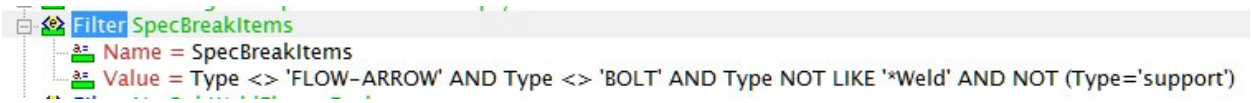


FIGURE 80: SPECBREAKITEMS FILTER IN ISOCONFIG.XML

By adding an AND clause to the filter the spec flags are no longer generated at INSTRUMENT spec components.

```
<Filter Name="SpecBreakItems" Value="Type &lt;&gt; 'FLOW-ARROW' AND Type &lt;&gt; 'BOLT' AND
Type NOT LIKE '*Weld' AND NOT (Type='support') AND [PIPING-SPEC] NOT LIKE 'INSTRUMENT'" />
```

FIGURE 81: MODIFIED SPECBREAKITEMS FILTER

One last step is required to get the items from the Instrument spec to show up in the BOM on the isometric drawings. Currently there is not a group for instruments so you have to add one to the Materials **AggregatedList**. Start by copying the **Group** element for PIPE and then tweak it to make it work for instruments. The **Name** attribute in both the **Group** element and the **Label** element are changed to “Instrument”. The **RowFilter** element is the most important item though. The **Filter** attribute must be set to a filter that will select only the instrument items from the pipeline. Luckily there is already a filter name Instrument that works for us.

```
<Group Name="INSTRUMENT" UseAlternateUnitsStyle="true">
  <!-- An expression that is used to filter which rows are included in the list -->
  <!-- Refer to
  http://msdn.microsoft.com/en-us/library/system.data.datacolumn.expression.aspx -->
  <!-- for expression syntax. -->
  <RowFilter Filter="Instrument" />
  <!-- List of 'Label' configurations -->
  <Labels>
    <!-- 'Label': (string) -->
    <!--    The label of the group. Used only in table templates. -->
    <Label Name="instrument" />
  </Labels>
  <!-- List of columns to group rows by -->
  <Columns>
    <!-- 'name': (string); Column name -->
    <Column Name="Category" />
    <Column Name="Code" />
    <Column Name="Description" />
  </Columns>
  <!-- Specifies the sort columns and sort order -->
  <!-- 'SortBy': (string); Contains the column name followed by a space and 'ASC'
  (ascending) or 'DESC' (descending). -->
  <!-- Columns are sorted ascending by default. Multiple columns can be separated by
  commas. -->
  <Sort SortBy="Type ASC,ConnectionSize ASC" />
  <Precisions />
</Group>
```

FIGURE 82: INSTRUMENT GROUP FOR MATERIALS AGGREGATEDLIST

BOM Tweaks

If your projects are anything like ours, then you know that piping specifications can be quite the moving target at times. As the piping specs evolve, some components are removed, some are added, and some are only tweaked. The tweaked items aren't such a big deal because there are mechanisms in Plant 3D to assist with that. Adding and removing parts however, cause changes to the associated PnPID's in the specs and, in turn, the model. The bigger problem is that some of the old parts still live in the model and short of deleting and redrawing, which could be a substantial effort, there's no way to make sure everything is completely up-to-date with the spec.

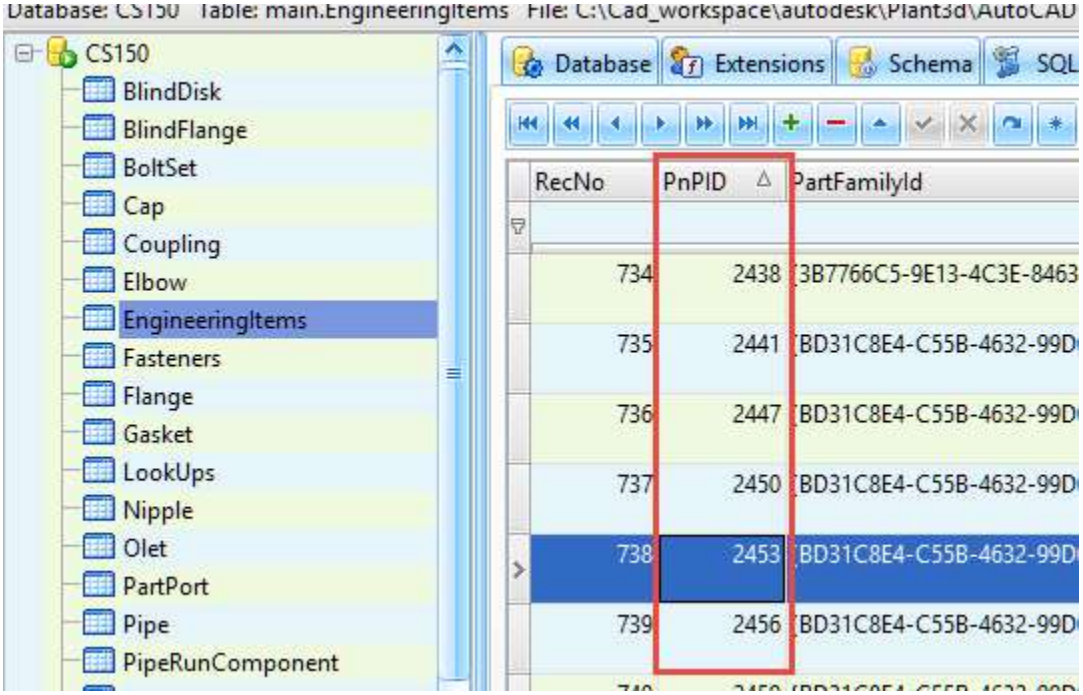


FIGURE 83: PNPID'S ON THE ENGINEERINGITEMS TABLE IN A PIPING SPEC

The mismatches can cause a couple of issues with BOM's on the isometrics. Duplicate line items with differing quantities and two size entries for a single line item are two that I commonly see. The solution to these issues lies in the aggregated list section of the IsoConfig.xml. To fix these two particular issues the Materials aggregated list requires modification.

The root cause of the duplicate line item issue is that the aggregated list is taking too many criteria into account when combining things. In this case the component's code is the extra bit of information that is causing the issue. The code is generated from the component's PnPID in the **EngineeringItems** table of the piping spec. If a component was removed and then re-added to a spec, then it will have a different PnPID, even if it is the exact same component. Removing the code from the aggregate list will force the

software to combine like items based on category and description alone. This will cause the duplicate line items to be combined on subsequent iso runs.

BILL OF MATERIALS			
ID	QTY	ND	DESCRIPTION
1	163'-3"	6"	PIPE STD WT SMLS STL A106-B
2	30'-6"	6"	PIPE STD WT SMLS STL A106-B
3	8	6"	ELL 90 LR, BW, ASME B16.9

FIGURE 84: DUPLICATE LINE ITEMS, DIFFERENT QUANTITIES

For the second case, where multiple sizes are showing for a single line item, the opposite problem is causing the issue; too little information is being considered. The result is that two different sizes match up based on the data being combined. In this case, the Size of the items in question needs to be added to the equation. To resolve the issue a new Column element must be added to the component type that is combining incorrectly.

2	3	4" 6" 8"	ELL 90 LR, BW, ASME B16.9

FIGURE 85: MULTIPLE SIZES FOR SINGLE LINE ITEM

Spool Drawings

Streamlining fabrication is becoming more and more important as project schedules and budgets continue to get compressed. Creating spool drawings is an easy way to streamline the pipe fabrication and construction process in Plant 3D. Creating spool drawings can be as easy as copying an existing iso style and tweaking a couple of settings.

To begin, go through the process of copying your existing iso style. After you create the new style, check the **Spool format** checkbox, select a spool naming method from the drop-down, and select an automatic spool sizing method. At this point you're ready to go. Each pipeline will be broken up and named based on the selected settings.

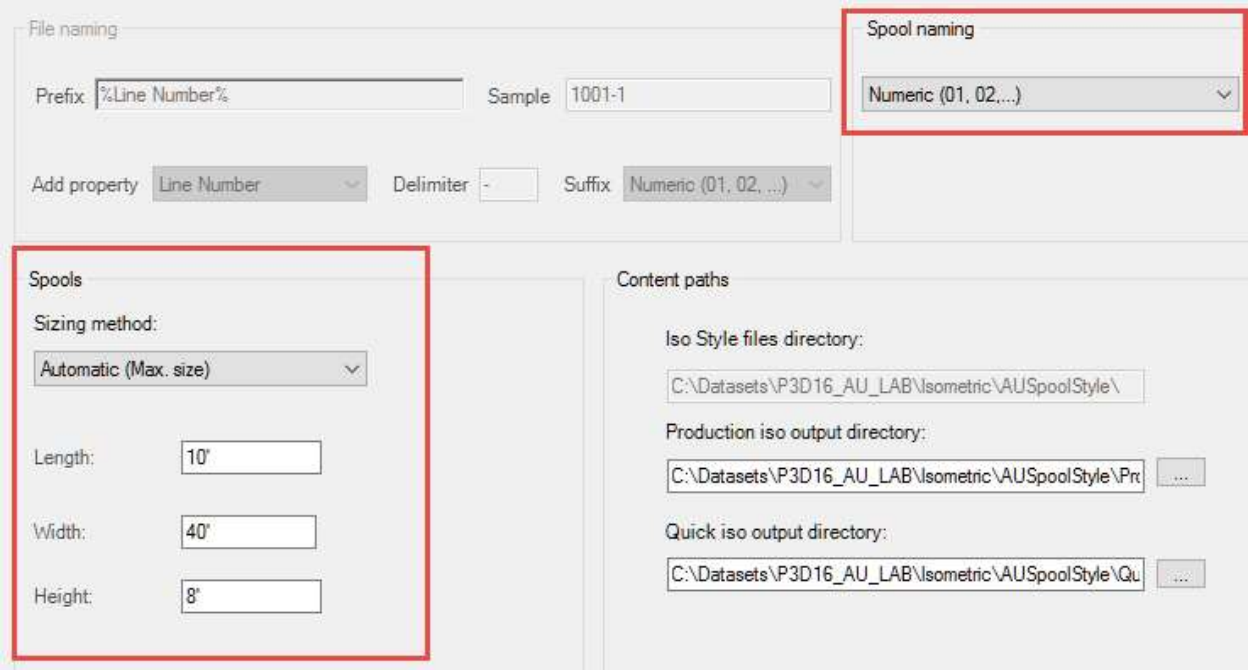


FIGURE 86: AUTOMATIC SPOOL SETTINGS

If the resulting output isn't desirable, then you can go a step further to control the spooling output. Doing this involves manually adding a spool number to the components in the model. The spool iso style can be configured to use the spool number from the model to create the spool drawings. In **Project Setup** change the naming and sizing method to **Use spool number from model**. Setting these will also automatically change the **SpoolNameFormat** setting to use the model property as well. Once these changes are made, assign the spool numbers in the model and run the isometrics.

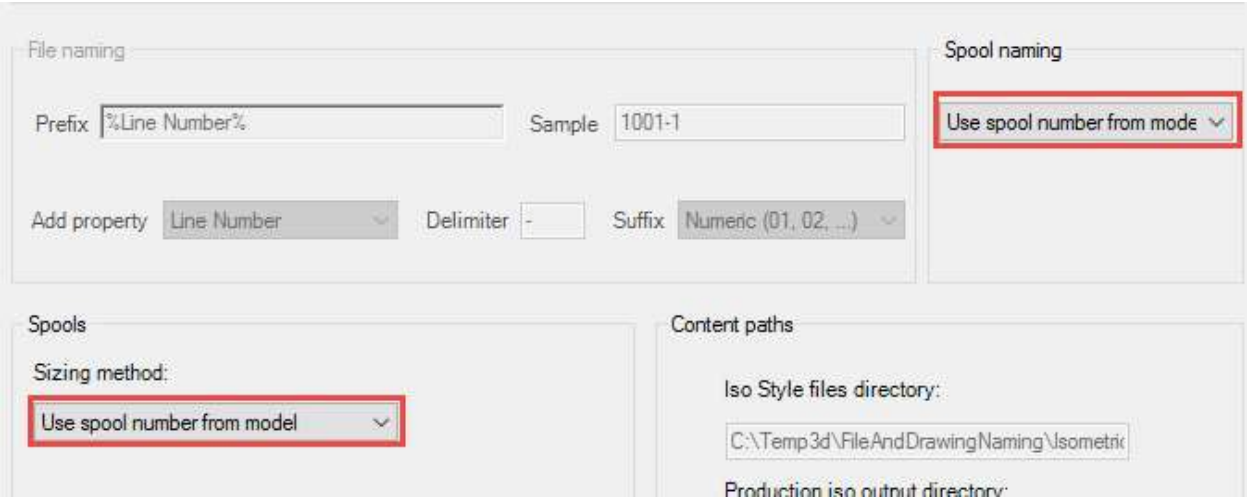


FIGURE 87: MANUAL SPOOL NAMING SETTINGS

Project Iso Style Management

It always seems that no matter how much time you spend educating the users, they always manage to muck things up in one way or another! Believe it or not, a frequent problem for us when it came to isometrics was the simple act of getting them to pick the right iso style!

Up until now, the default iso styles liked to hang around in the project. Try to delete them and they always managed to pop back into the project when it was re-opened. There were a couple of tricky workflows out there that attempted to circumvent this "functionality", but they weren't foolproof and I didn't have much luck with them in my experience. Now with the 2016 release, the default iso styles can be deleted from your project and they won't come back! The available iso styles are now easily controlled and your users can be limited to the choices that they should use.

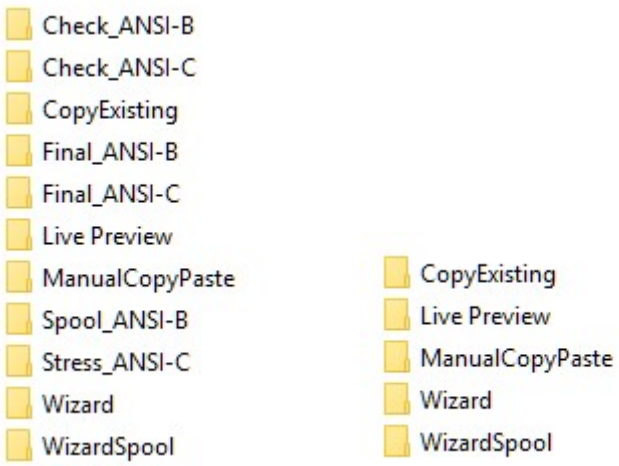


FIGURE 88: PROJECT ISO STYLES BEFORE AND AFTER CLEANUP

Important note: In order to maintain the live preview functionality in Project Setup, be sure to keep the 'Live Preview' folder in addition to the iso style folders that you wish to keep.

Additional Resources

This handout is meant to be a reference, but it is by no means all-inclusive. There are a lot of other great places out on the Internet to find help with isometric setup and configuration. Here are a few that I find myself visiting frequently, some not only for isometric support, but for Plant 3D in general.

De-mystifying AutoCAD Plant 3D Isometrics

The Autodesk white paper, De-mystifying AutoCAD Plant 3D Isometrics.pdf is an excellent resource. It provides good information on iso symbology and blocks, themes, IsoConfig.xml layout, and a whole host of other topics.

Autodesk Plant 3D General Discussion Forum

Participation in the Autodesk Plant 3D Discussion Forum is a great way to find answers to your questions. Search functionality allows you to find existing posts that may solve your dilemma or give insight on a solution. If nothing is out there on your topic, post a question. Both Autodesk and community experts keep a constant eye on the posts and are always there to help out when needed.

In-the-Pipes Blog

In-the-Pipes is a Plant 3D blog that is maintained by the Autodesk product support team. The topics aren't solely focused on isometrics, but there are some excellent posts that deserve a read.

Autodesk Screencast

New instructional workflow videos show up on Autodesk's Screencast site every day. Chances are someone has done a demo concerning the problem that you're currently facing. Better yet, become a contributor and help other users out!

Autodesk University Website

Visit the AU website and search for information on isometrics. There are quite a few classes over the past several years that have tackled this topic. Browse through the handouts, presentations, and datasets for ideas and solutions to problems that you encounter. There are even some recorded sessions to watch.