



AUTODESK UNIVERSITY 2015

OG11295

MISTAKES = TIME = MONEY. INDUSTRIAL SOLUTIONS: Plant Design Suit Workflow

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Learning Objectives

- Create a Spec Sheet from a Catalog with Spec Editor.
- Place Custom Symbol Equipment, design and tag P&ID drawings.
- Work with references to place equipment and route pipe with components in Plant 3D.
- Generate list of materials and drawing documentation.

Description

This presentation will focus on the necessary knowledge required to start a project in Autodesk Plant Design Suite software by analyzing examples and procedures in order to show how the most relevant tools of this software works. It will show how to enter, manipulate, validate, extract and export information through the programs included in the suite. Last but not least, the audience will realize how this technology can facilitate the coordination between disciplines, time and managing as well as helping minimize design hours for missing errors.

Your AU Experts

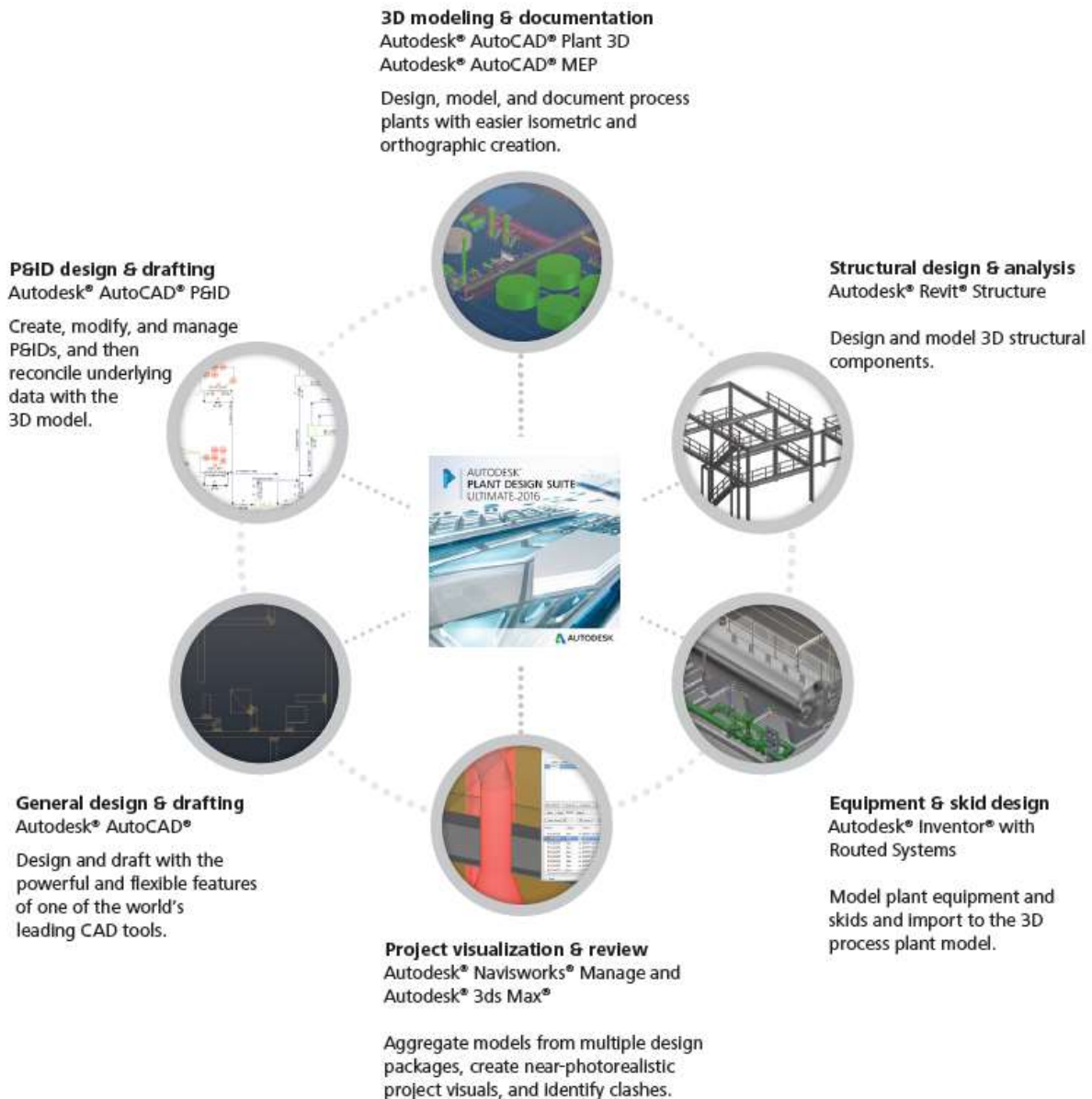
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Analyzing Autodesk Plant Design Suite Workflow 2016

Learn and Work at the same time

All projects managements have different needs but always respect a procedure for a successful development. In my experience I will explain what are benefits and common issues that I learned working in large projects.

This presentation will be separated by modules to understand and reduce rework time and improve coordination between disciplines.



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Create a Spec Sheet from a Catalog with AutoCAD Spec Editor

1- Introduction to Autodesk AutoCAD Spec Editor 2016

This is the first and the most important step when you start a project in Autodesk Plant Design Suite software, because all the components that you load in the spec you will use when you start design pipe lines and after extract valve reports, bill of material, etc.

1.1- Spec & Catalog Menu Options

The second windows will pop up when you open Spec Editor software will be a Spec & Catalog Menu options. To create a Spec File in the *Spec* options, click “create” as is it shown below in the Figure 1.

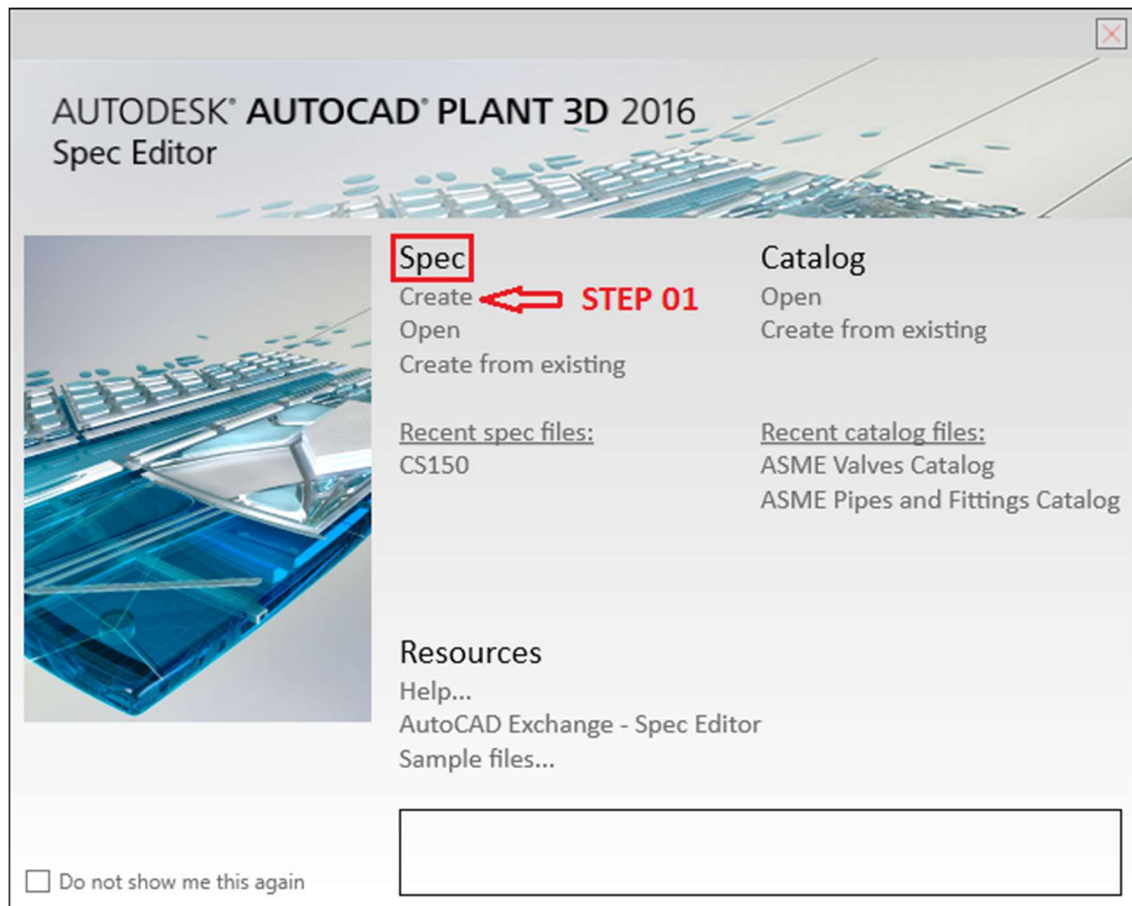


FIGURE 1: SPEC AND CATALOG MENU OPTIONS

1.2- Spec Dialog Box

In the “Create Spec” dialog box, you must fill the *Spec Name Box* (STEP 02). As you can see in STEP 03 there is an Optional Step (...), is possible change de location of your Customized Spec in the Project in a new folder if you think is if necessary (Figure 2).

In STEP 04 you need fill the *Description Box* with information like material, pressure class, etc. And finally (STEP 05), you can choice between many library components included in the Spec Editor software (ANSI, ASME, DIN, ISO, etc.)

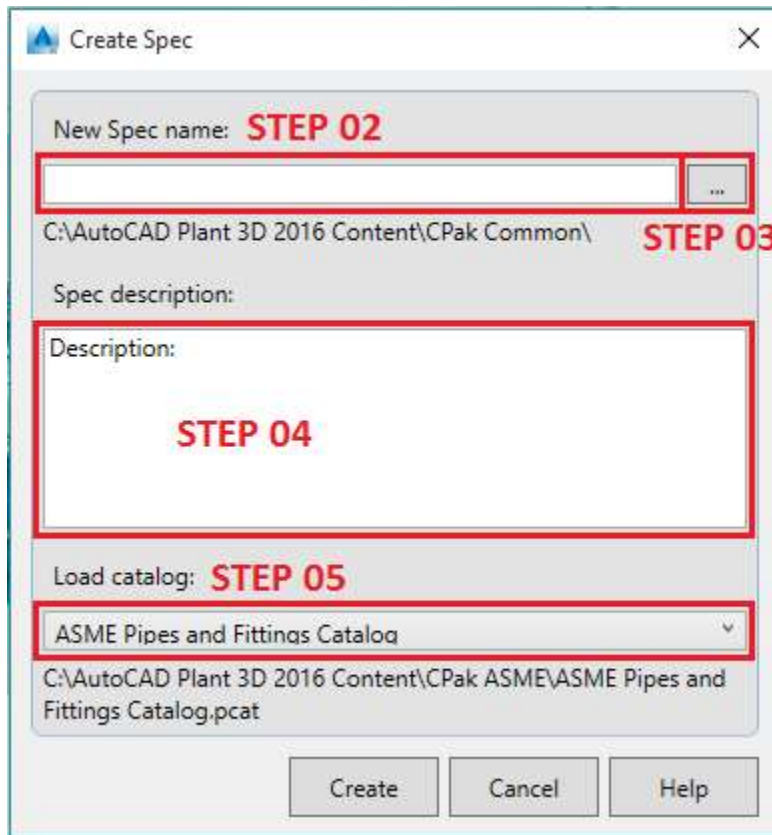


FIGURE 2: SPEC DIALOG BOX

1.3- Add components from the Catalog to a Spec Sheet

In STEP 06 you can browse and change the *Catalog* to add more components if you required.

The *Common Filters* (STEP 07) are used to search components more easily by Category, Size, Units, etc. Also you can use another filters like *Short Description* to reduce the list of components (STEP 08).

Sometimes the components in the Catalogs are not complete, so you complete this information in the *Property Overrides Panel* (STEP 09). Click “Save”

Finally, you click in the option *Add to Spec* to add the part selected from the Catalog. This is the procedure to build a Spec adding parts from the catalog to a Spec Sheet (Figure 3).



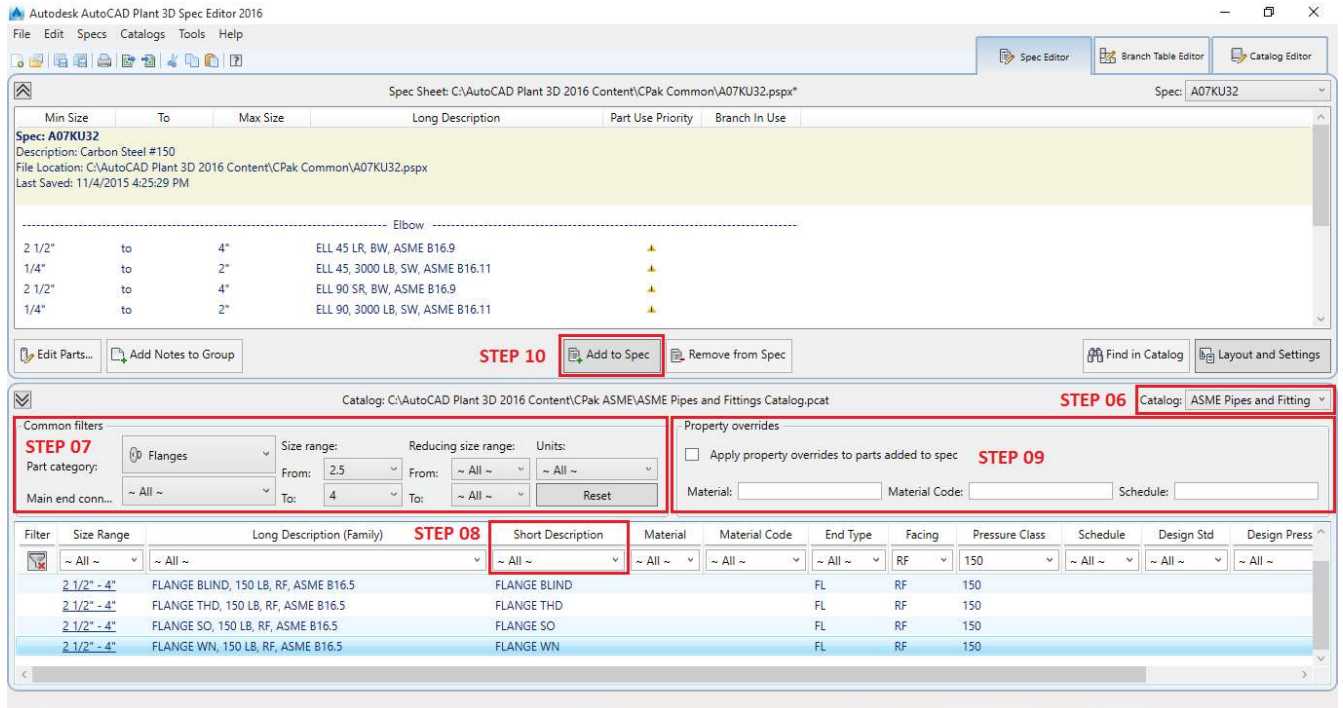


FIGURE 3: ADD COMPONENTS FROM THE CATALOG TO THE SPEC SHEET

The properties of any component from the Catalogs or from the Spec Sheet we are creating can be edit (size, description, etc). Also customize new components to be part of the Catalog if we need it (Figure 4).

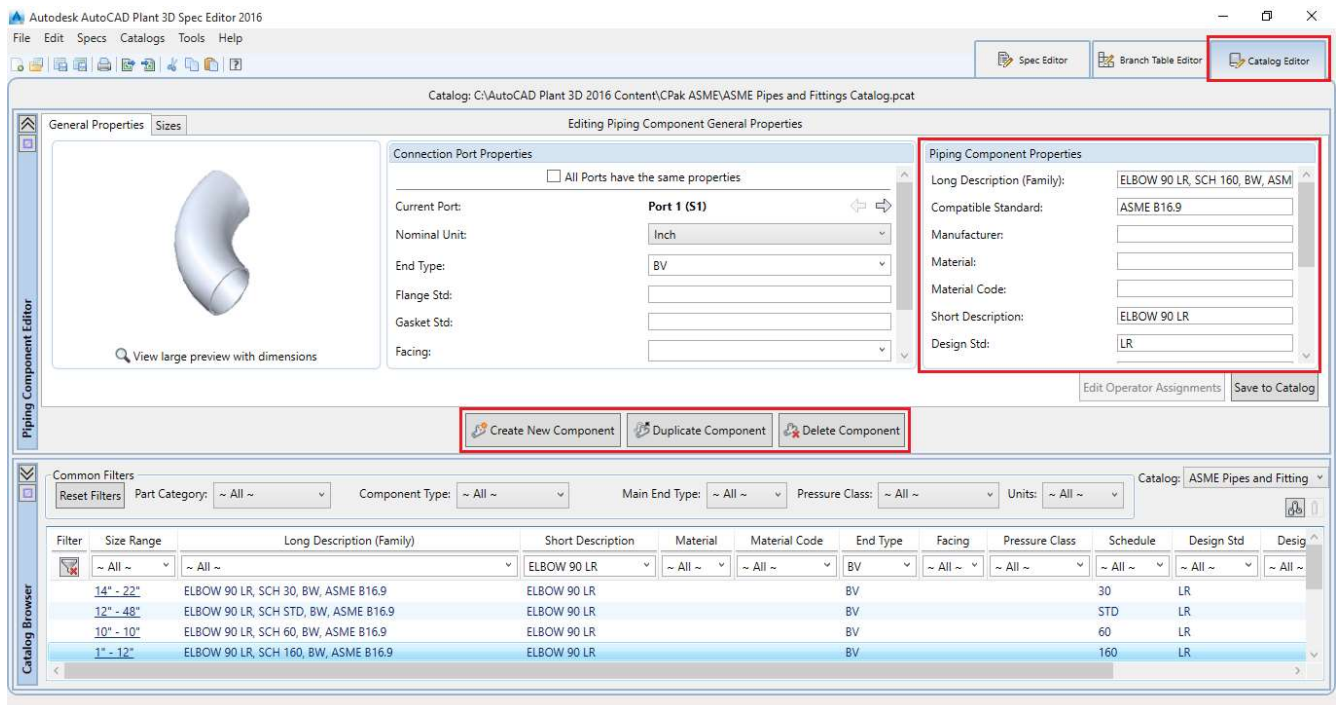


FIGURE 4: EDIT COMPONENT INFORMATION (SIZE, MANUFACTURE, MATERIAL, ETC.)



Place Custom Symbol Equipment, Design and TAG P&ID drawings.

2- Introduction to AutoCAD P&ID 2016 workspace and Tool Pallets

In AutoCAD P&ID (Figure 5) software we can create, edit, report and validate piping and instrumentation diagrams with a series of tools that help identify errors and inconsistencies in all the project drawings versus the 3D pipe lines in AutoCAD Plant 3D software.

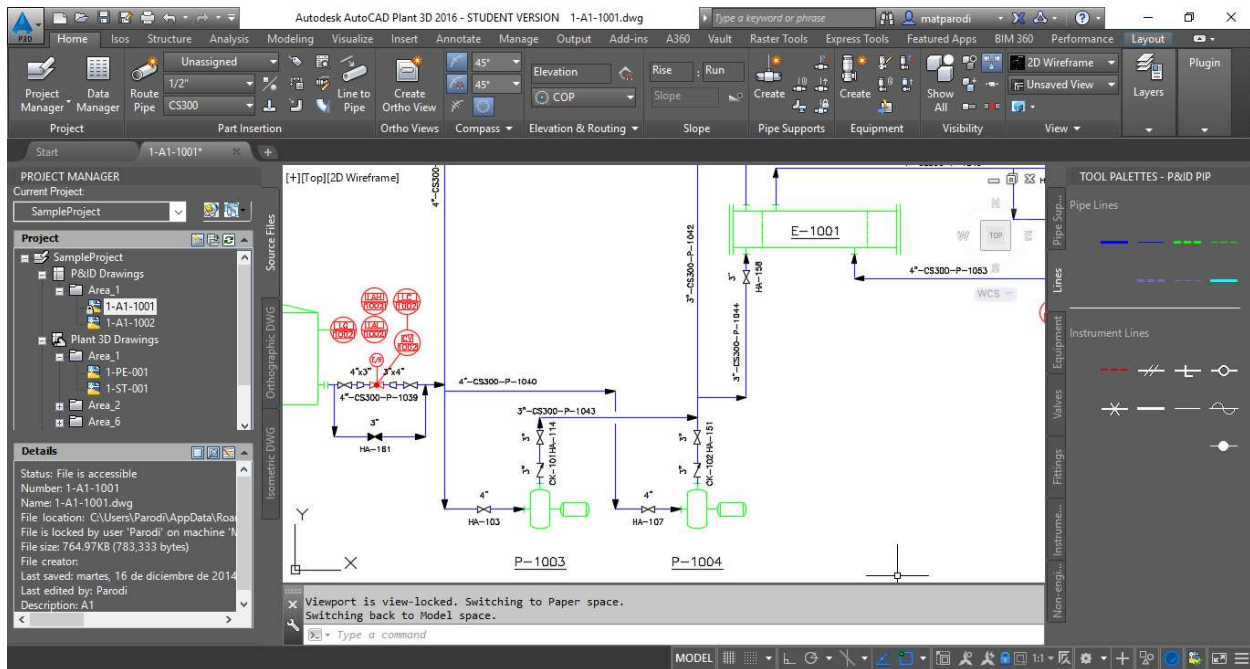


FIGURE 5: WORKSPACE AUTOCAD P&ID SOFTWARE

2.1- Tool Palettes, Custom components and equipment

When you start and configure a project in AutoCAD Plant 3D you will notice on your left side of the window the "Project Manager" explorer (Figure 6). In the "P&ID Drawings" folder you must click with the right button of the mouse to create a "New drawing" (Figure 6).

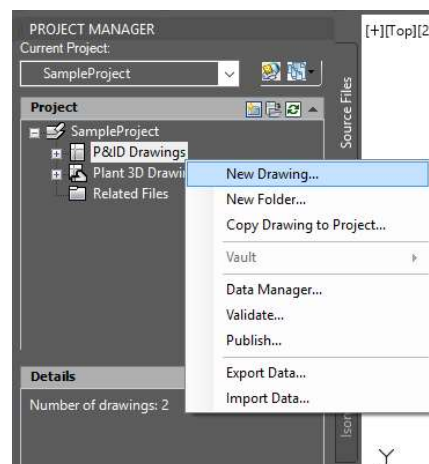


FIGURE 6: PROJECT MANAGER



In the “New DWG Window” (Figure 7) you can enter the file name, author and modify the location of the drawing if you require.

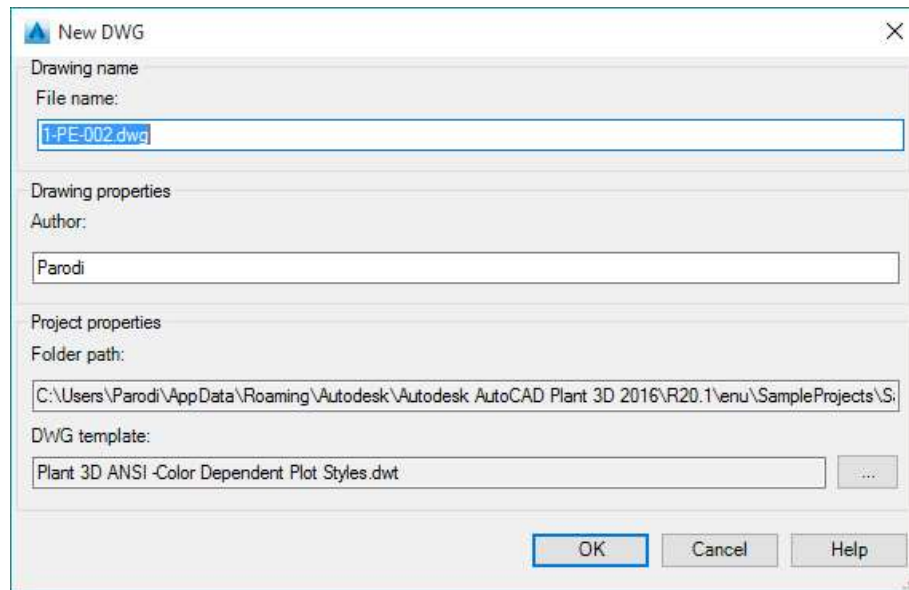


FIGURE 7: NEW DRAWING WINDOW

P&ID Designers could create, move and snap pipe lines, also place components, instruments and equipment keeping flow direction and TAG information. This platform contains Standard symbol libraries (PIP, ISO/DIN, JIS and ISA) to help boost the productivity like valves, elbows, pumps, tanks, etc. (Figure 8)

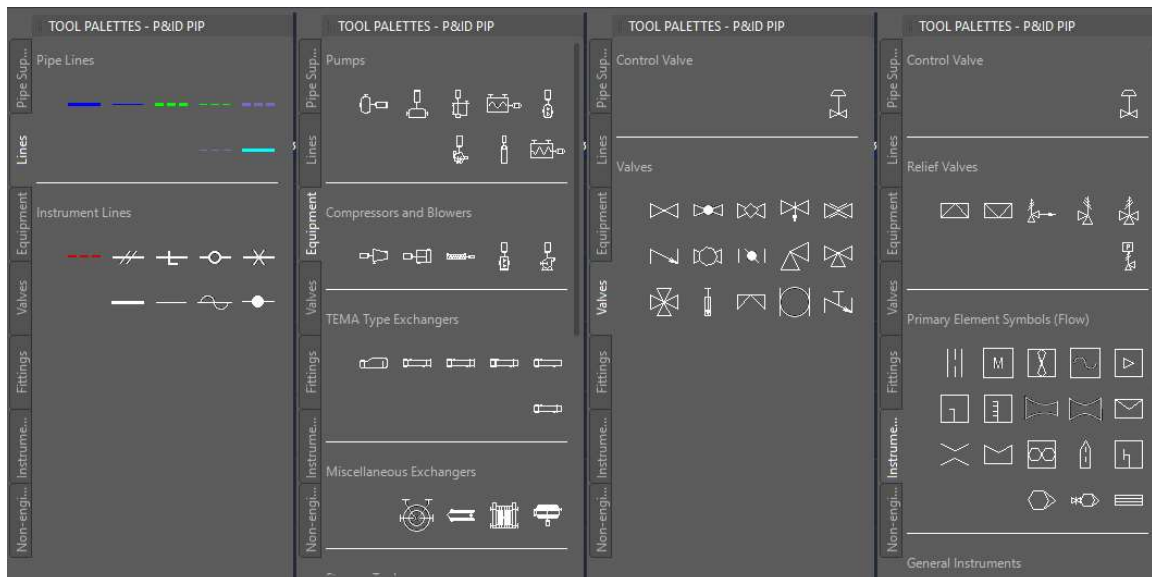
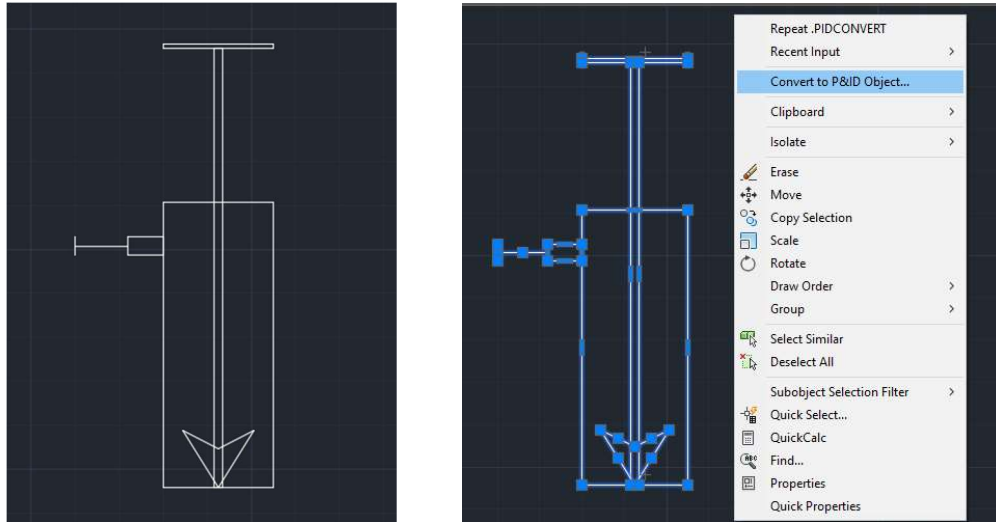


FIGURE 8: TOOL PALETTES – SYMBOL LIBRARIES



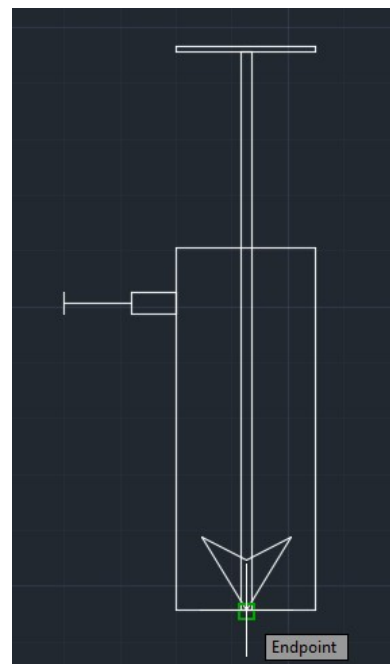
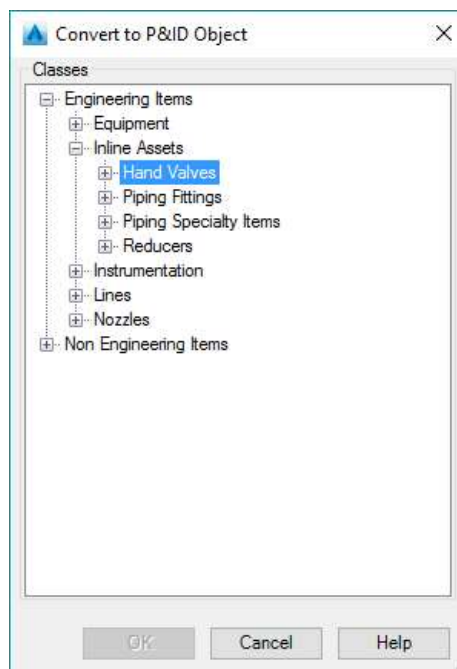
Sometimes the project requires customize some P&ID Symbols. The same procedure is used for fittings, valves, equipment and instruments.

First, using AutoCAD Tools geometry create your custom Symbol.



Select all the geometry, press right click with the button mouse and select “Convert to P&ID object...”

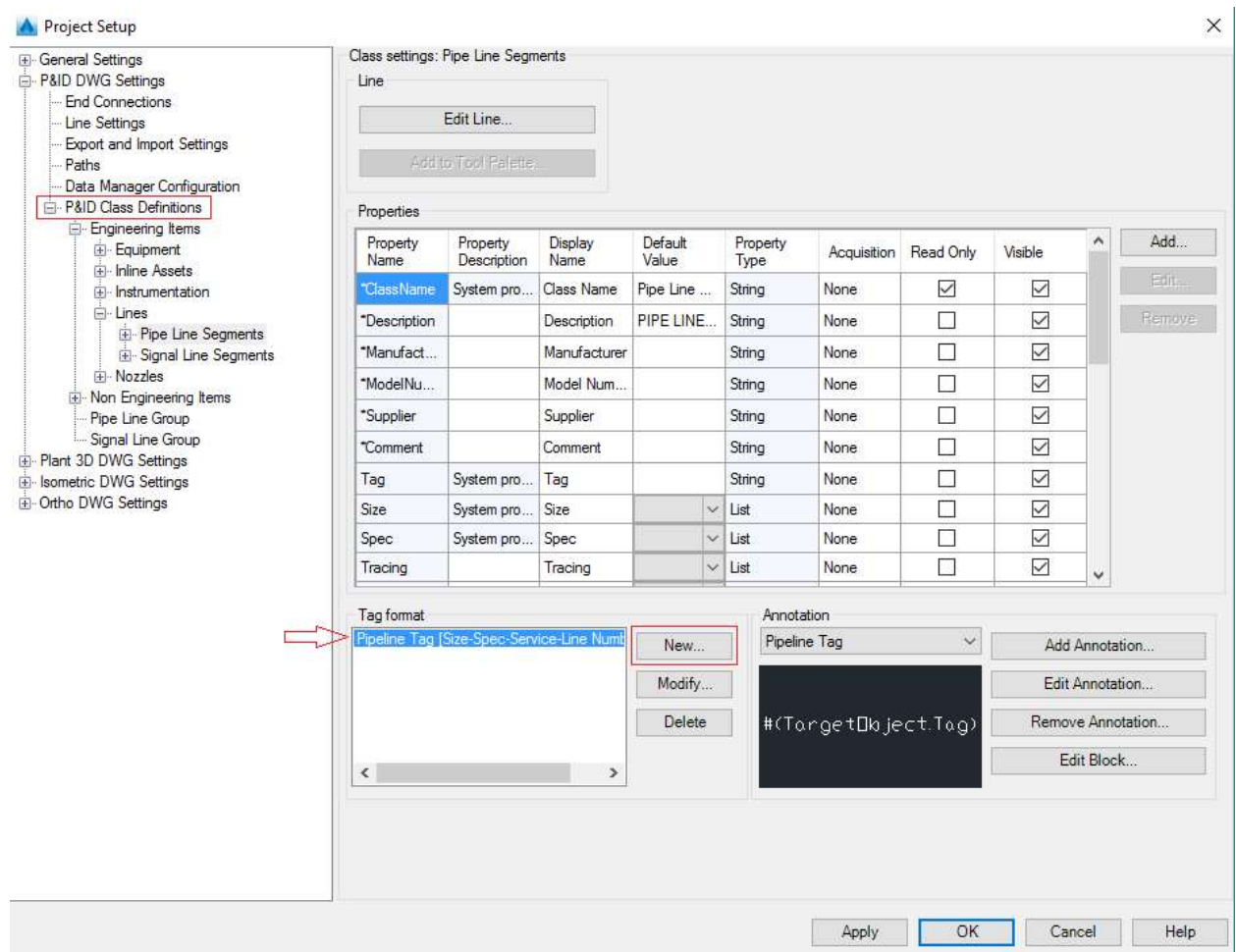
In the Convert to P&ID Dialog Box you must assign a Class to the Custom Symbol and select an insertion point. Now is ready to connect with pipe lines.



2.2- TAG Customization - Configuration

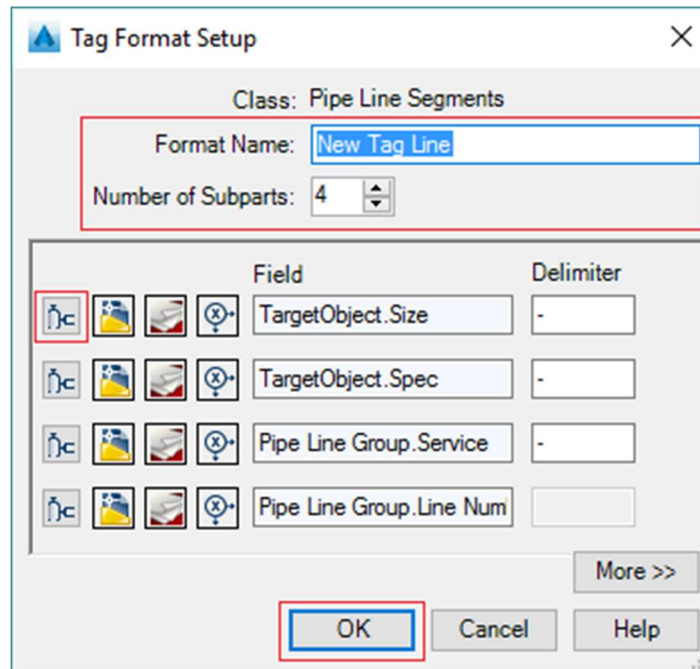
In the Project Manager right click on the Name of the project and select the *Properties* option. You can define a TAG Format for a family in the accessing to *Project Settings Dialog*, under the *P&ID Class Definitions* portion of the tree.


In this example we explain how to create a New Tag Format for pipe lines. In P&ID Class Definitions Tree, select *Lines > Pipe Line Segments*. In *Tag format* panel select *New*.



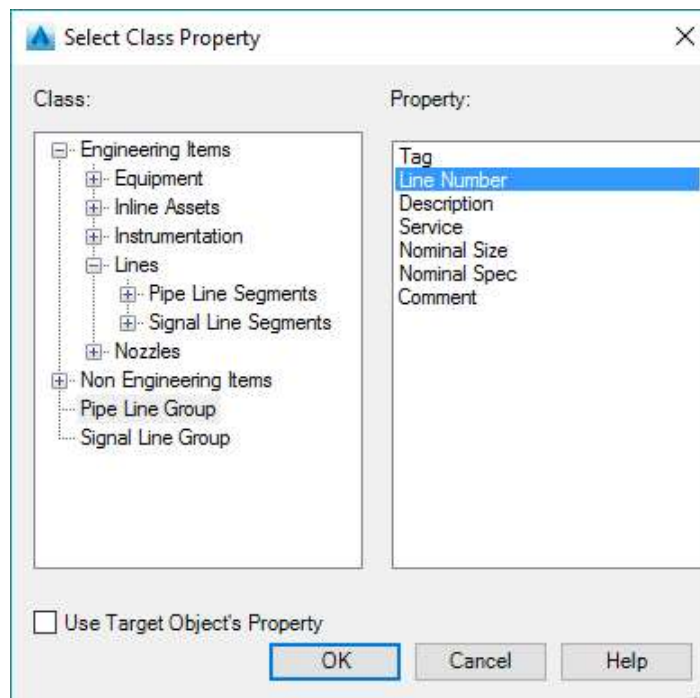
In *Tag Format Setup* dialog box fill the Format Name field and enter the Number of Subparts of your customized Tag, for example (NumberLine-Size-Service-Spec) = 4



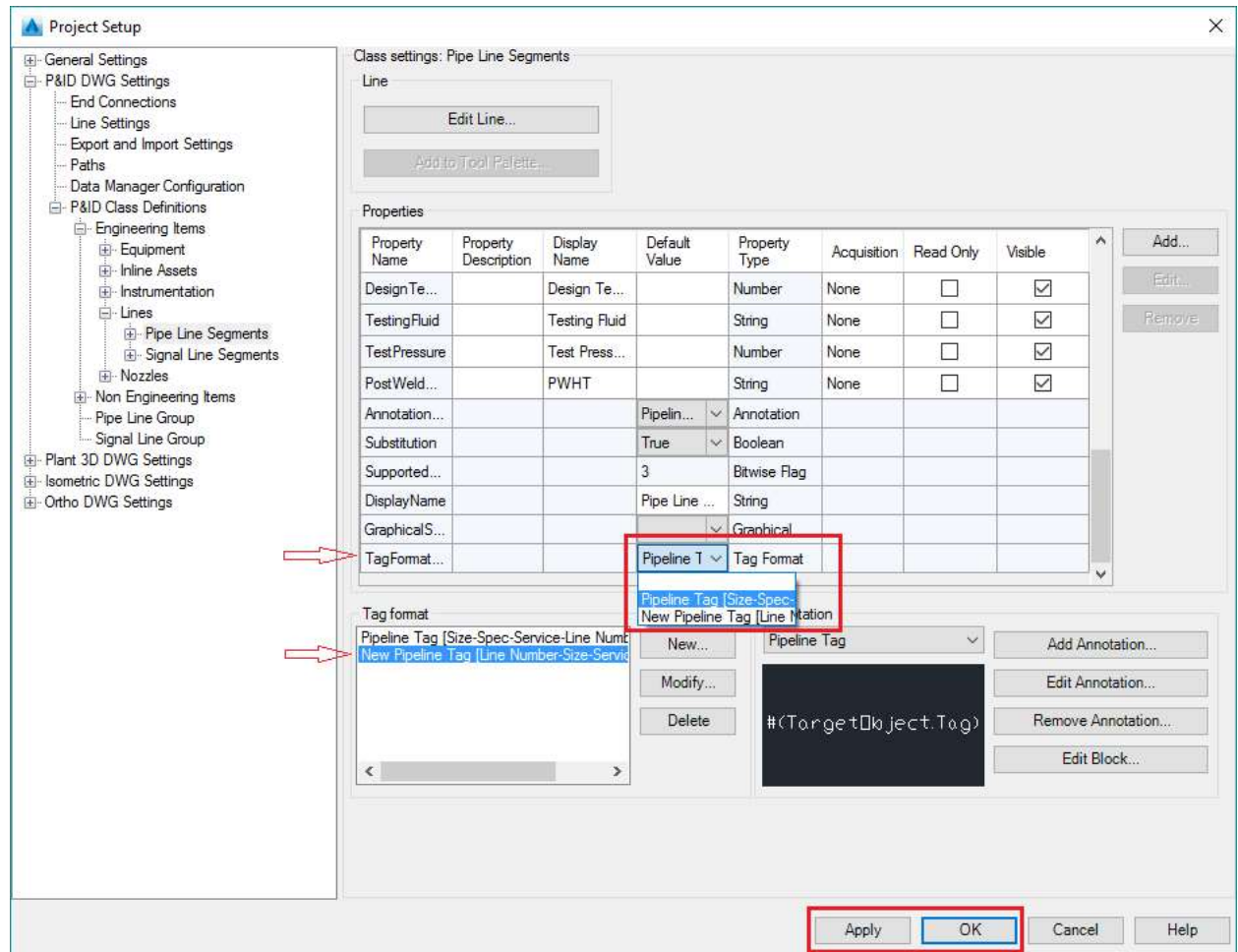


For each subpart click . In *Select Class Property* dialog box, you can select in the tree class category which property of the pipe line you want for your customized TAG.

Be careful selecting the Class Property and note that the subparts fields will be shown in descendent order in your customized TAG.



Finally, when you return to the Project Setup window, in the *Properties* panel look for *TagFormatName*. As you can see in the *Default Value* column, change the format Tag for your customized Tag in the option list, apply and accept.



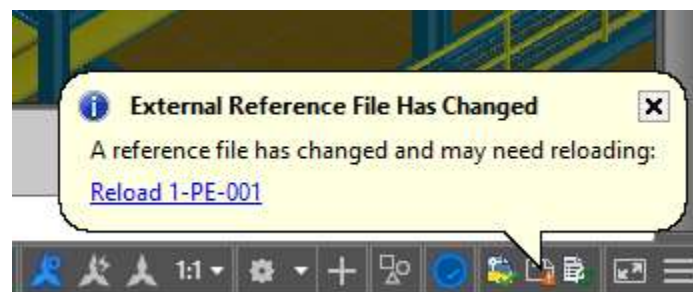
Work with references to place Equipment and Route pipe lines in AutoCAD Plant 3D

3- Improving Design Team Coordination.


In larger projects external references are used to separate the design geometry (Civil, Structure, Equipment and pipe lines, etc.) into multiple files, so multiple professionals can work on the same overall design at the same time. While everyone is working on the overall design, only one person is actively editing any one drawing.

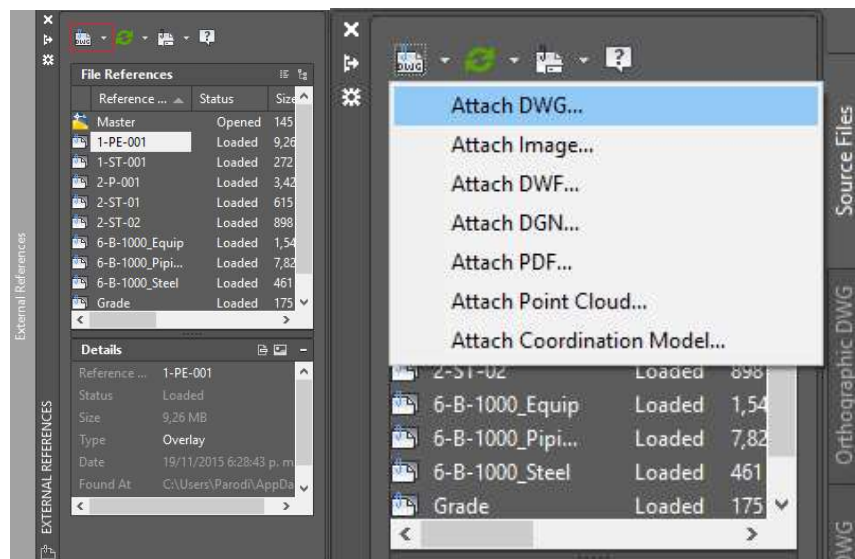
Different aspects of the design from an external file are viewed in another drawing by referencing the data from that external file.

To ensure that, each member of the team will be notified if any changes are made in the design through a pop-up balloon, indicating the name of the modified file and the option to refresh the file with the last design modifications.

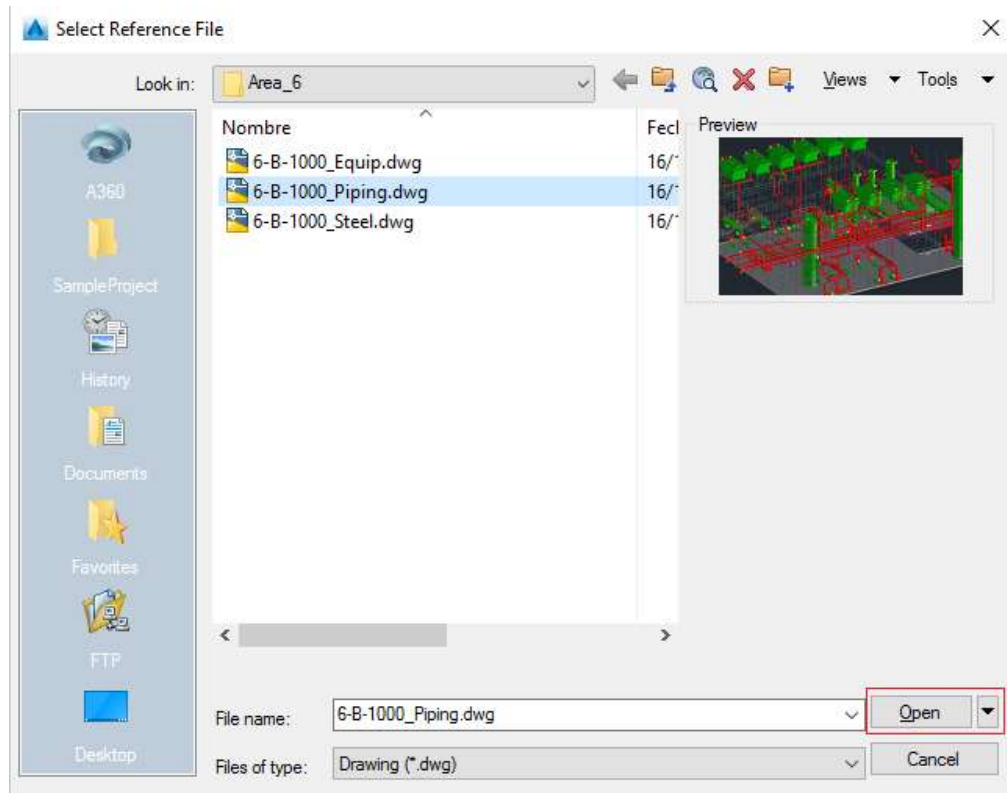


3.1- Types of External References

When you enter the command **XREF** the *External Reference* window will show, here you can see the list of attached files and the location of the files detailed. In the *Attach* option  you will have a list of different format of files you can attach to your design geometry.



DWG File: The most common example is attach an AutoCAD DWG File, when you select the type of file you want to attach a *Select Reference File* window shall open, browse the file you need it and click open (all the files you need to attach must be part of the project).



In the *Attach External Reference* window, you will find many options, *Reference Type*, *Scale*, *Insertion Point*, *Path Type*, *Rotation* and *Block Unit*.

Use the dynamic cube of the model space to locate your design geometry with the cardinal points (North, South, East and West) and the coordinate system x,y,z (0,0,0). It is important that these Xref's be loaded as **Attachments**. You should use a relative path as shown below. (As the files are part of a project using a **relative path** will make moving a project easier):

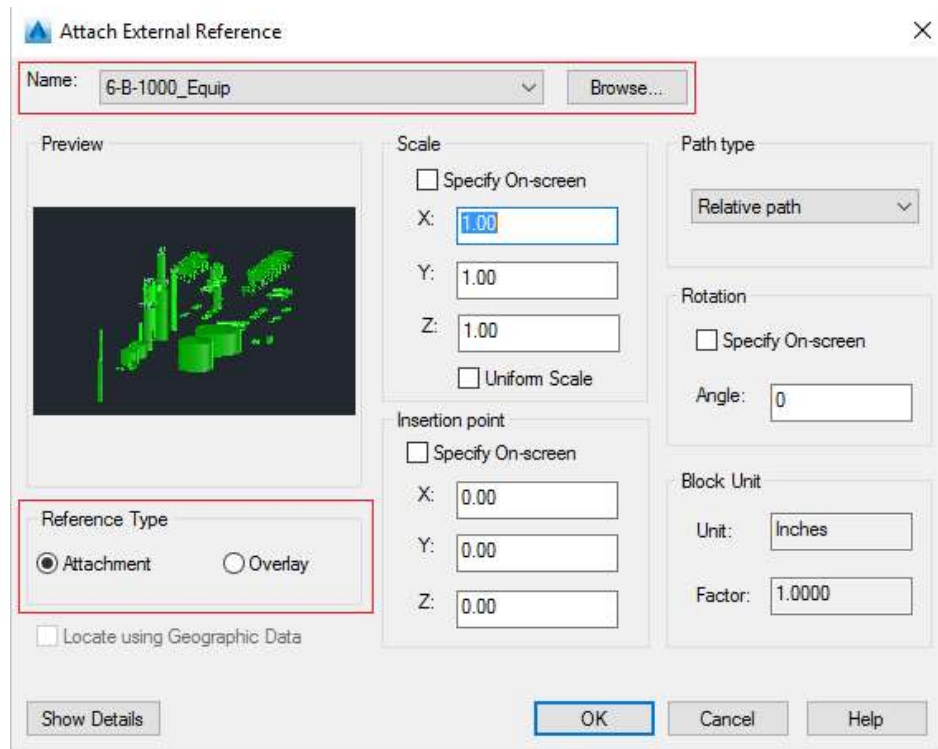
Overlaid xrefs

An overlaid xref does not load or bring with it any nested xrefs. For example, if you xref "A" into your parent drawing, which contains a nested xref, drawing "B", only drawing "A" will be referenced in. Drawing "B" will not be loaded into the parent drawing because it is a nested xref.

Attached xrefs

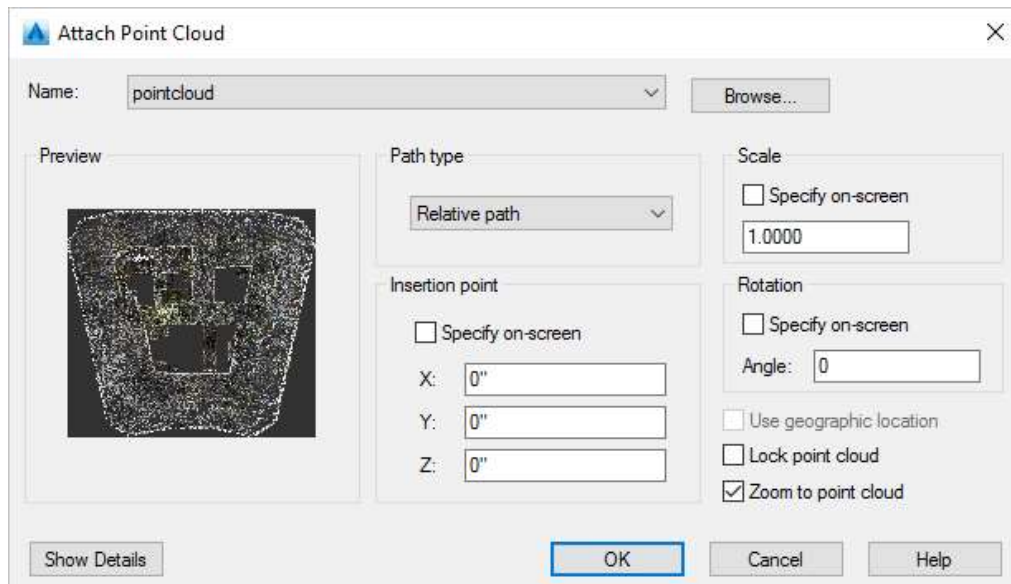
Attached xrefs, when referenced into a drawing, will include nested xrefs, which means if drawing "A" is referenced into your drawing and it has nested xrefs "B" and "C" in it, drawings "B" and "C" will be attached to the parent drawing along with drawing "A."





RCS/RCP File, Point Cloud: A point cloud is a large collection of points placed on a three-dimensional coordinate system. Collected by 3D laser scanner, millions of points create 3D representations of existing structures, buildings, equipment, pipe lines, etc. The use of this technology has increased in recent years, minimizing working hours in field reconnaissance and reducing the risks of accidents.

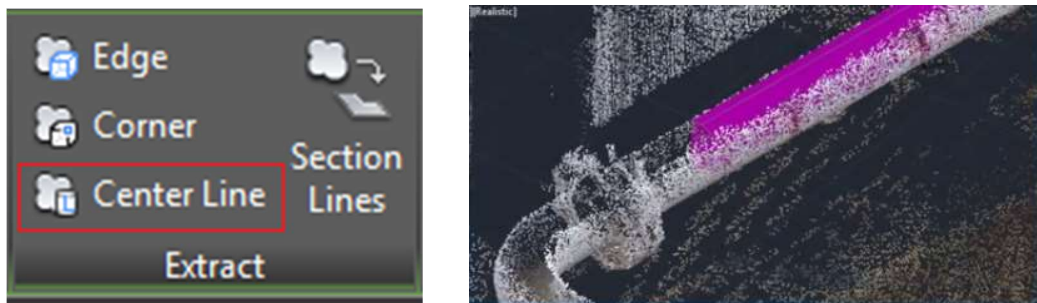
The procedure and options for attaching a point cloud file to the geometric model is the same.



AutoCAD Plant 3D 2016 contains a series of tools, like modify point cloud density and point size to visualize better our geometry design, as well as crop part of the point cloud to manage program performance.

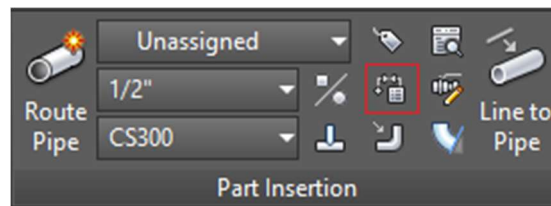


Another remarkable and very practical tool when you are working with point cloud and very useful to design pipe lines is the option *Extract Centerline*.



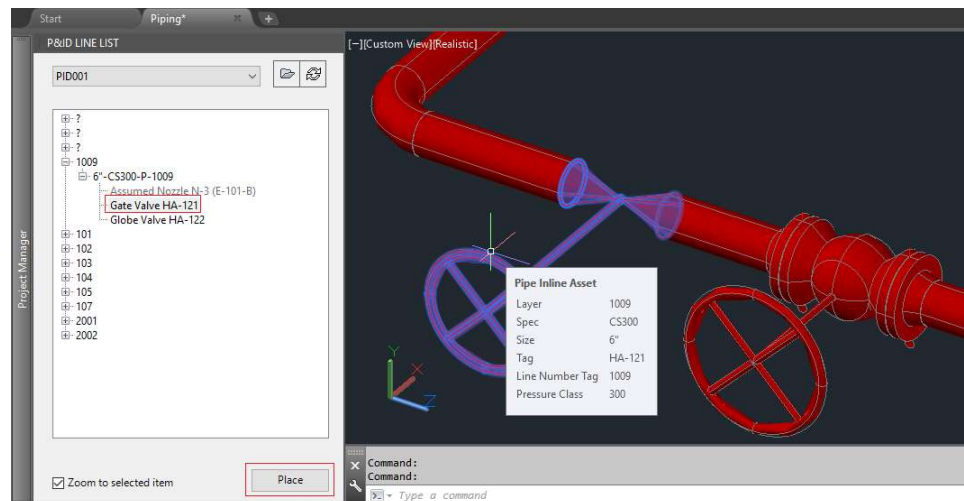
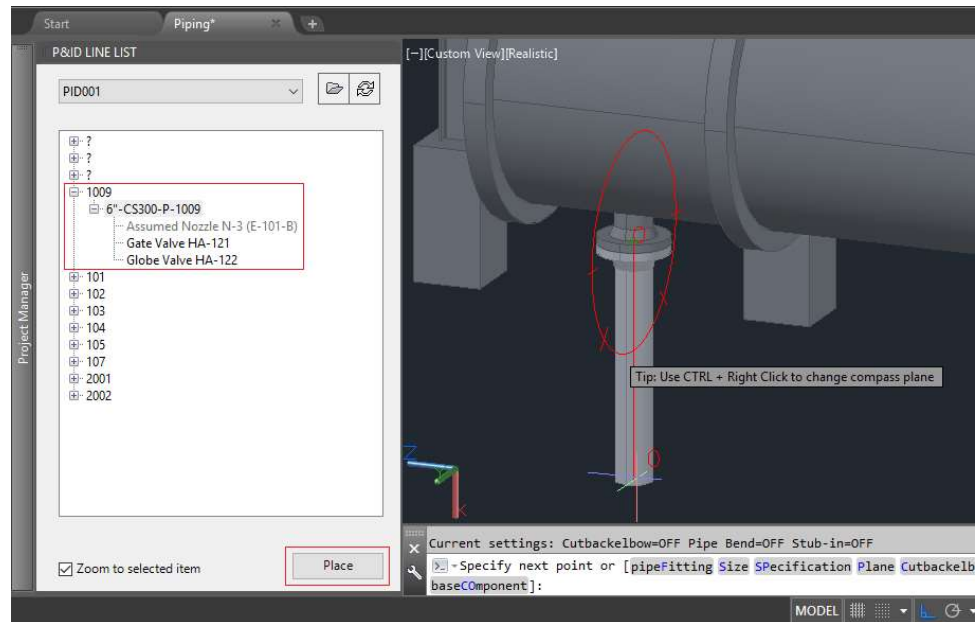
3.2- Route pipes lines minimizing design errors

You use the P&ID Line List palette to add 3D pipe lines or inline equipment into your 3D design. The line you select to start drawing has already been created in a P&ID drawing. The P&ID Line List palette is displayed when you click Home tab > Part Insertion panel, P&ID Line List.



After displaying the P&ID Line List palette, the process of placing 3D pipe lines and inline equipment into a Plant 3D drawing is very straightforward. The first thing you do is select from the drop-down list the P&ID drawing that you want to use. The next thing to do is select the line or inline equipment you want to add. For ease of creation, you will want to place the pipe lines before placing the inline equipment. By having the line exist first, placing the inline equipment is easier and quicker. After selecting what to place, you either click Place on the palette or click Place Item from the shortcut menu. You then create the 3D pipe line or place the inline equipment for which you selected to place.

In the following illustration, the P&ID Line List palette is shown with a list of pipe lines in the drawing PID001. The 6" line for 1009 is currently selected, click in the option *Place* to route the the pipe line. The 1009 line also contain two types of valves that can be easily placed.



When you start and finish a pipe your model geometry, or place a valve, the correct connectors are automatically established based on the specification settings that have been assigned to the items in the P&ID drawing with the corresponding identification for each component. Many hours of re-work and re-design errors can be saved with this procedure.



Generate List of Materials and Drawing Documentation.

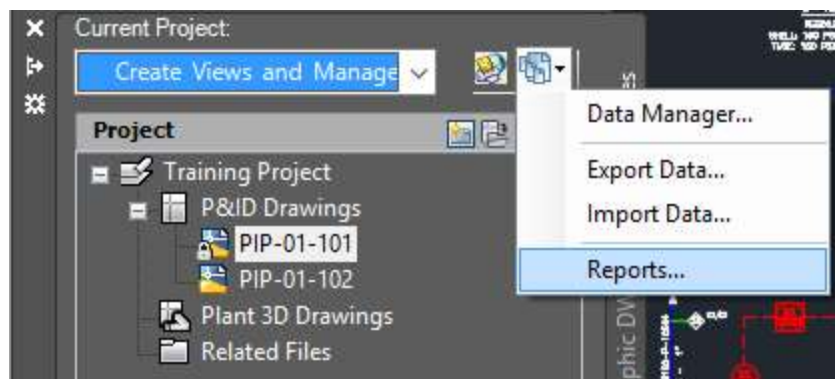
4- Estimating quantities and extract quickly sketch drawings.

Finally, this chapter describes how to manipulate views in the *Data Manager* and how to edit or create your own project reports, that could then be used to export data from the project.

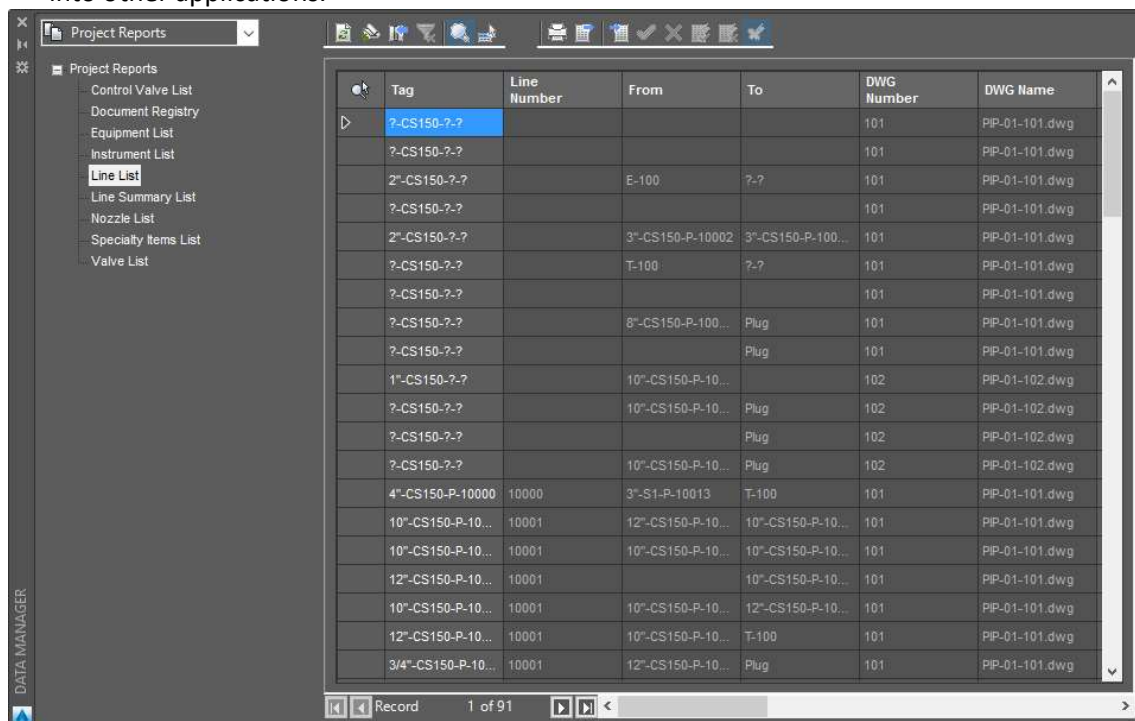
From the 3D model, you can more easily generate the construction documents. Information is directly exchanged with the 3D model, helping your construction documents to be more accurate, consistent, and up to date.

4.1- Generate Default reports from Project Manager

In the right corner of the Project Manager dialog box you will find the option menu for *Reports...*



In the next window, in the Project Reports tree you can select the type you need it to inform your project team. The data also can be exported to a variety of file formats for the integration into other applications.



Line list report in Microsoft Excel Format, also is possible edit the information of the file

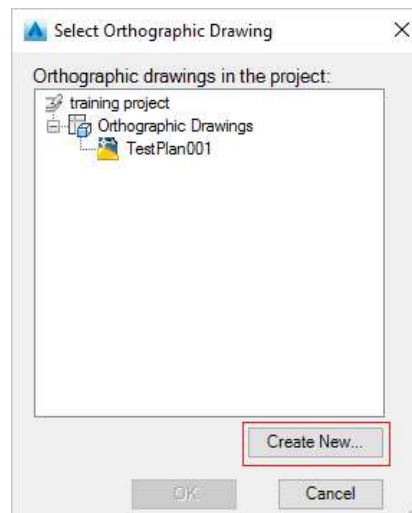
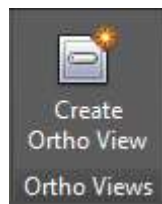
The screenshot shows a Microsoft Excel spreadsheet with the following data:

Tag	Line Number	From	To	DWG Numbr	DWG Name	Design Press	Design Temp	Operating Pr	Operating Te	Service	Size	Spec	Insulation Tr	Tracing	Pe
1	?	CS150-?-?		101	PIP-01-101.dwg							CS150			
2	?	CS150-?-?		101	PIP-01-101.dwg							CS150			
3	2"	CS150-?-?	E-100	?	PIP-01-101.dwg						2"	CS150			
4	?	CS150-?-?		101	PIP-01-101.dwg							CS150			
5	2"	CS150-?-?	3"-CS150-P-13"	CS150-P-1101	PIP-01-101.dwg						2"	CS150			
6	?	CS150-?-?	T-100	?	PIP-01-101.dwg							CS150			
7	?	CS150-?-?		101	PIP-01-101.dwg							CS150			
8	?	CS150-?-?	8"-CS150-P-1	Plug	PIP-01-101.dwg							CS150			
9	?	CS150-?-?		101	PIP-01-101.dwg							CS150			
10	?	CS150-?-?	10"-CS150-P-10010	102	PIP-01-102.dwg						1"	CS150			
11	?	CS150-?-?	10"-CS150-P-Plug	102	PIP-01-102.dwg							CS150			
12	?	CS150-?-?		102	PIP-01-102.dwg							CS150			
13	?	CS150-?-?	10"-CS150-P-Plug	102	PIP-01-102.dwg							CS150			
14	?	CS150-?-?		102	PIP-01-102.dwg							CS150			
15	4"	CS150-P-10000	10000	3"-S1-P-1001T-100	101	PIP-01-101.dwg				P	4"	CS150			
16	10"	CS150-P-10001	10001	12"-CS150-P-10"-CS150-P-101	101	PIP-01-101.dwg				P	10"	CS150			
17	10"	CS150-P-10001	10001	10"-CS150-P-10"-CS150-P-101	101	PIP-01-101.dwg				P	10"	CS150			
18	12"	CS150-P-10001	10001	10"-CS150-P-101	101	PIP-01-101.dwg				P	12"	CS150	1.5"		
19	10"	CS150-P-10001	10001	10"-CS150-P-12"-CS150-P-101	101	PIP-01-101.dwg				P	10"	CS150			
20	12"	CS150-P-10001	10001	10"-CS150-P-T-100	101	PIP-01-101.dwg				P	12"	CS150			
21	3/4"	CS150-P-10001	10001	12"-CS150-P-Plug	101	PIP-01-101.dwg				P	3/4"	CS150			
22	10"	CS150-P-10001	10001	10"-CS150-P-10"-CS150-P-101	101	PIP-01-101.dwg				P	10"	CS150			
23	6"	CS150-P-100012	100012	8"-CS150-P-18"-CS150-P-1101	101	PIP-01-101.dwg				P	6"	CS150	1.5"		

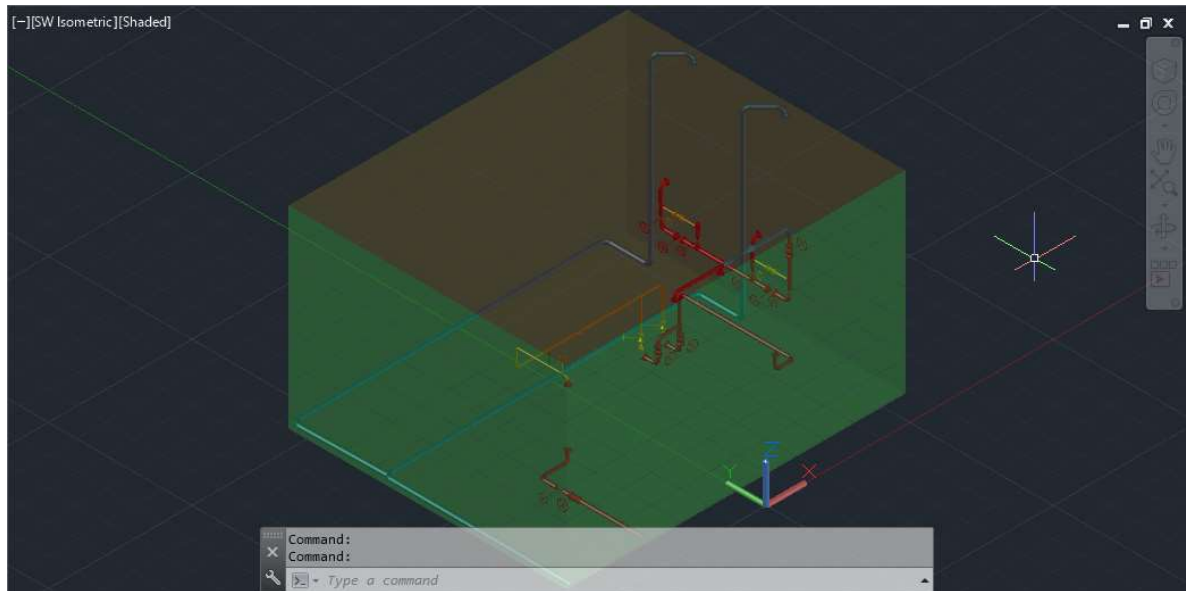
4.2- Construction document generation

After a plant design has been created and finalized, you can generate and share orthographic and other construction documents to build and install the piping lines and equipment. Information is directly exchanged with the 3D Model, so your construction documents are more accurate, consistent, and up to date.

In the option *Create Ortho View a Select Orthographic Drawing* window, click *Create New* option.



In the *New DWG* dialog box, fill the box name of the new orthographic drawing and click Ok.



There are many tools to create your orthographic drawings, *3D Model Selection* is for include other models from the project like civil or metallic structure, equipment, etc.

In ortho cube you can select the type of view (Top, Front, Left or Isometric View, etc.). Also you can select *Output Appearance* and *Output Size* like type of Scale, and the click OK.

Dimension and Tag, annotation options are available to complete your orthographic drawings.

