AUTODESK. UNIVERSITY

CI323187

Modeling Pressure Pipe Within Civil 3D: How to Coordinate Piping Runs Using BIM 360

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Learning Objectives

- Learn how to create a 3D model using pressure pipe with Civil 3D and various types of materials
- Learn how to modify your 3D model based on revisions to your design
- Learn how to collaborate with desktop connector and BIM 360, in a Civil 3D software environment
- Learn how to create a sheet set of your finished design for delivery to a client or municipality

Description

Civil 3D Pressure Pipe is not a topic covered in many books or online tutorials. It assumes a basic understanding of piping, but in order to fully utilize all the intricacies of the software, you need to dive in and explore. This class will help novice users avoid pitfalls the speaker experienced when first using the program. We'll also highlight many shortcuts you can use to help speed your model creation. We'll then explain how our group was able to coordinate other outside sources' piping, electrical, and/or public utility models with our pressure pipe models within BIM 360 software utilizing the Desktop Connector to find clashes and quickly deliver a final design to a client within very short deadlines. We were able to quickly create a site design for electrical conduits, underground gravity utilities and various obstructions.

Speaker(s)

I am a senior designer within the civil engineering group of Salas O'Brien. I have been using Civil3D, and Land Desktop software for 20+ years. I frequently utilize all the utilities Civil3D has to offer, including pressure pipe and gravity piping. Having experience in multiple software packages – such as Plant 3D, and Navisworks has helped further my understanding of how to push the limits of Civil3D. I attended my first AU in 2018. Previously I frequently taught in house classes on AutoCAD and Civil3D, updating co-workers on new workflows and how to better manage time and budgets with new software enhancements.

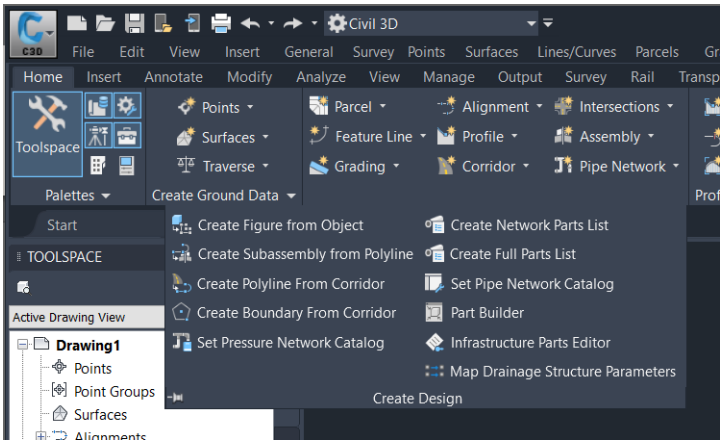
1. Creating 3D models and your available materials

One of the first things when starting any pressure pipe network is to make sure that you are using the materials and sizes you need for your design.

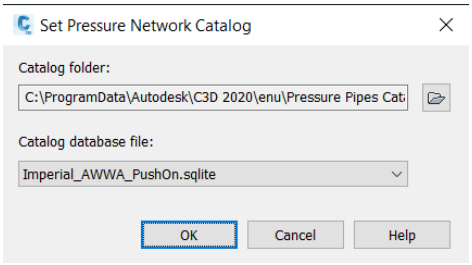
First Steps:

Setting up your Network Pipe Catalog:

Before you start your design, the user needs to point to the full catalog of materials and sizes. This is NOT what comes standard OOTB. You need go under the Home tab/Create Design and pull down the menu to see "**Set Pressure Network Catalog**" where it will open the following window:



Set your various pipe catalogs that are available:

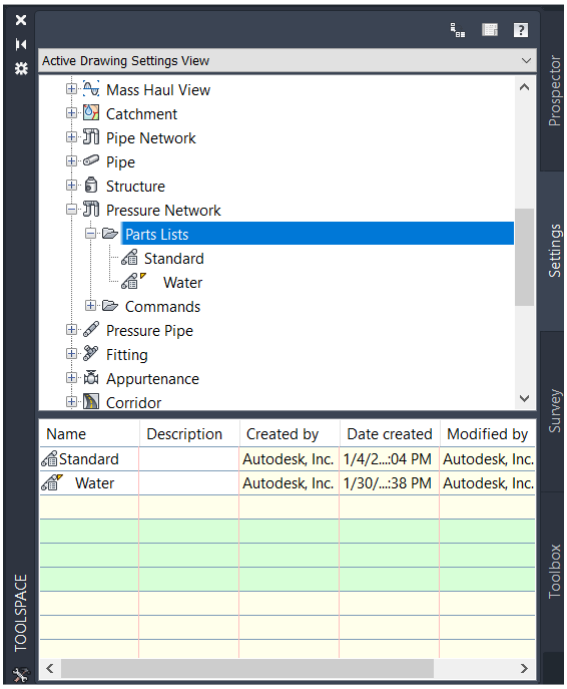


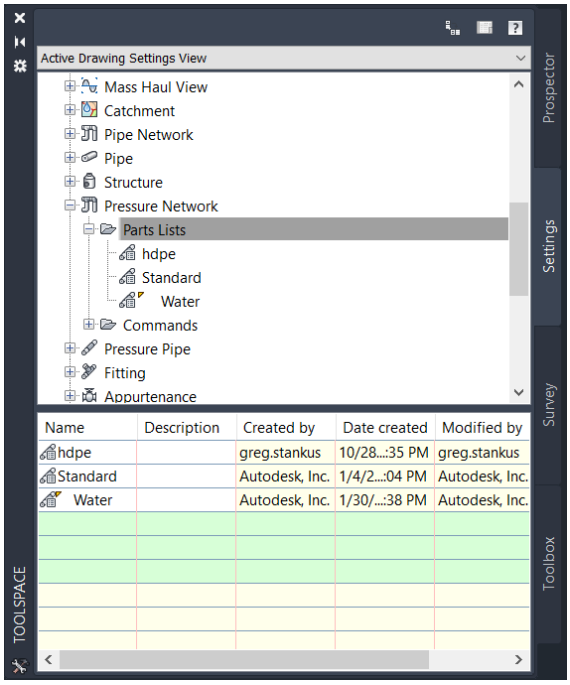
Types that are open to you: (Imperial)	Flanged	(Metric) Push ON
	HDPE	Ductile Iron
	Mechanical	PE
	Push On	PVC
	PVC	Steel
	Steel	

You can have various parts in your design, however, you cannot mix parts when trying to fit them together. i.e. PVC does not work with flanged, nor push-on doesn't work with Steel.

Create your parts list:

Now is the time to set your parts you will use for your design. You need to go to your Settings tab on your prospector tool palette.

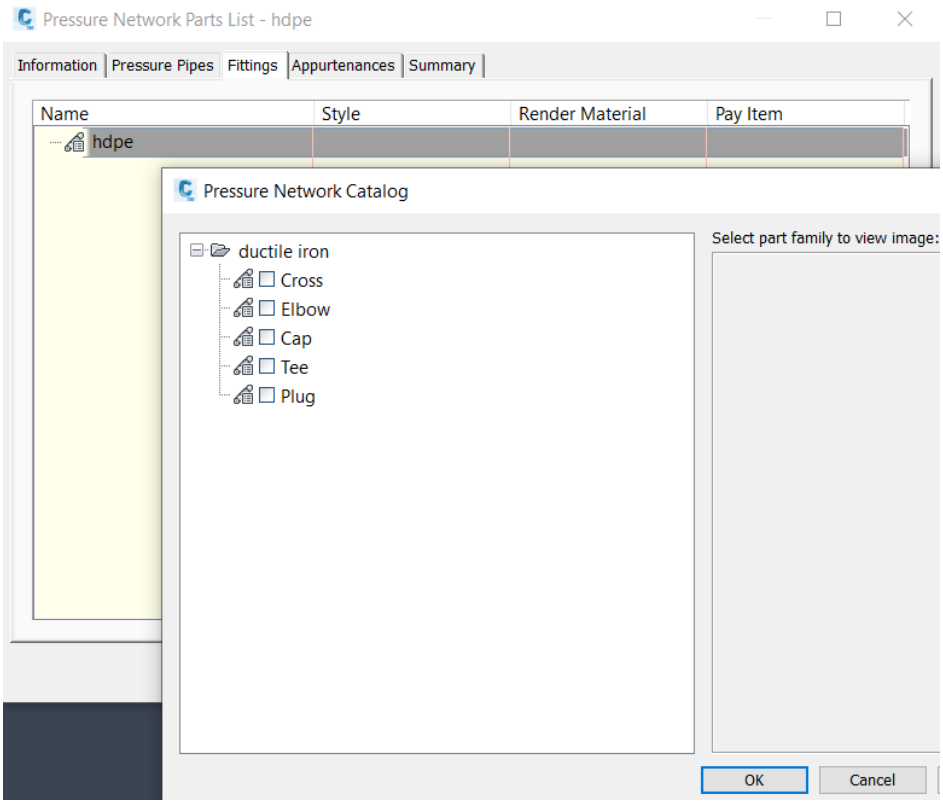




If you want more than one material for your project, you will need to right click on the parts list and create a 'new' list. Set a different catalog like we have done above, and then import those parts/fittings etc...

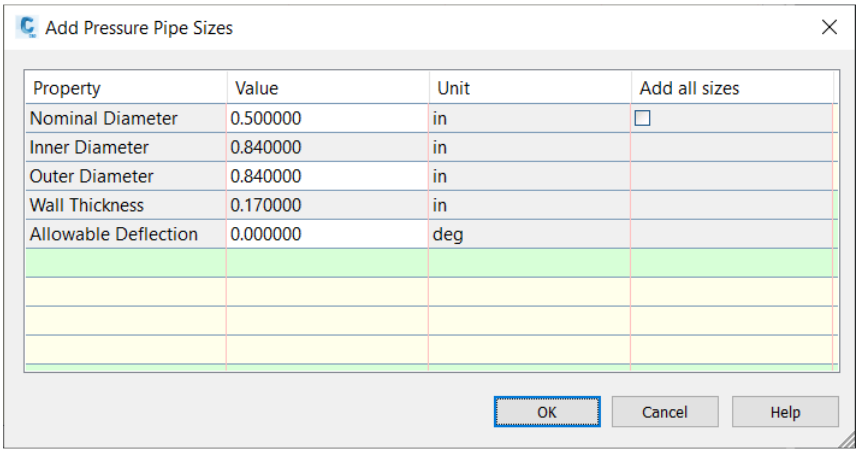
TIP: 'CreatePressurePartListFull' is a command that will pull in all the sizes and parts for that particular material

One note- even though the material you might have imported is something other than DI, your fittings will be labelled as DI..

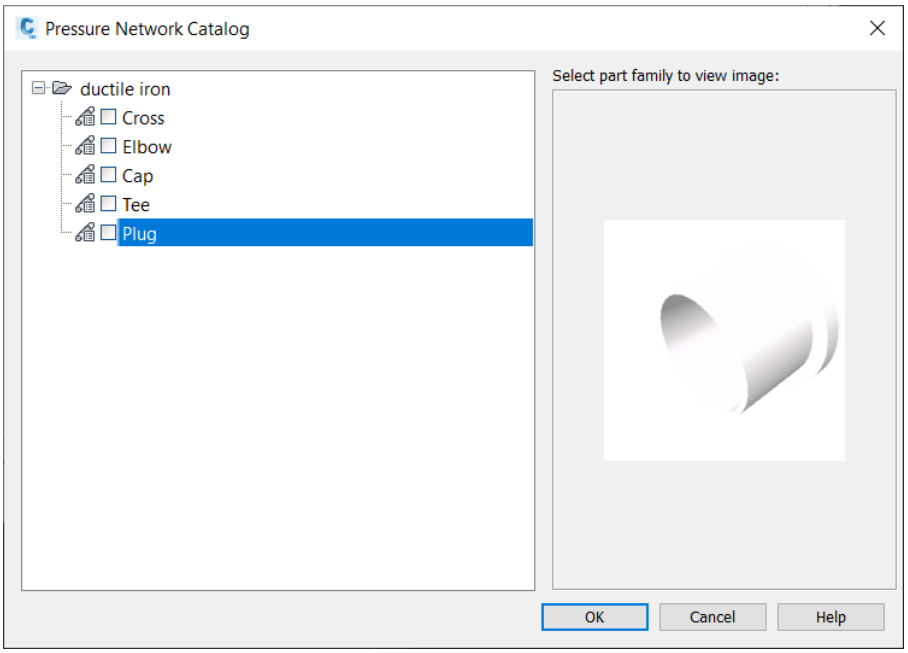


Click on the various tabs to include your:

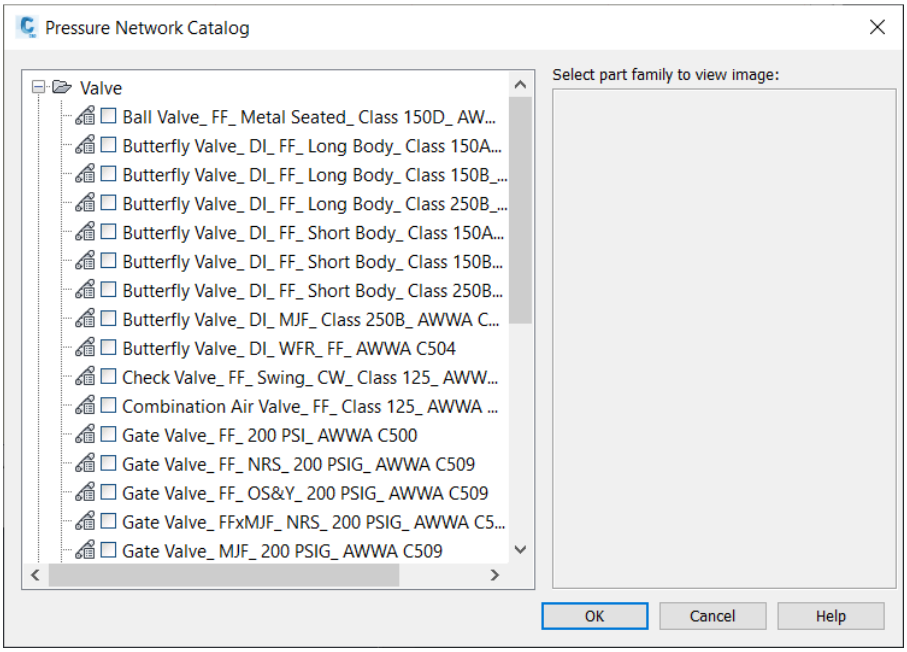
Sizes of pipes



Types of fittings



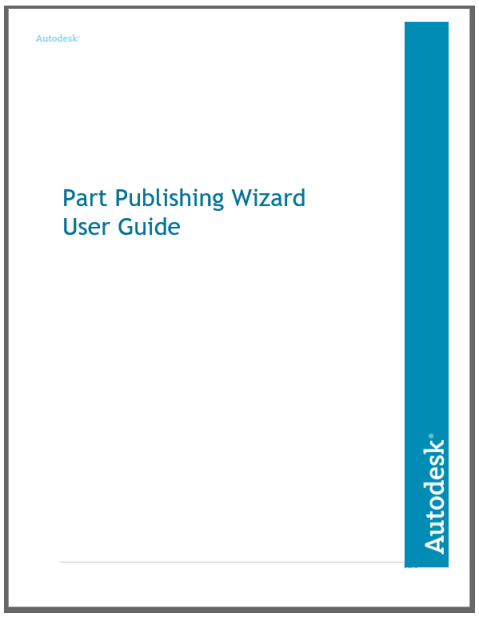
Various valves and appurtenances



Can you make your own parts?

Absolutely – use the Parts Publishing Wizard found: C:\Program Files\Autodesk\AutoCAD 2020\C3D\Sample\Civil 3D API\Part Publishing Wizard

This document is a simple 5-page guide to start making parts out of 3D models. This class will not cover this functionality.



2. Learn How to Modify your 3D model based on Revisions:

Creating your 3D model/network:

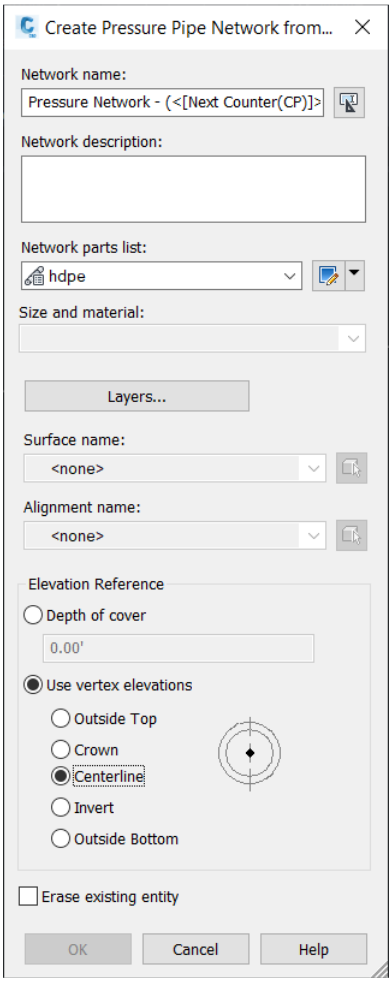
This step should be familiar to anyone who has ever made a pipe network of any kind in Civ3D.

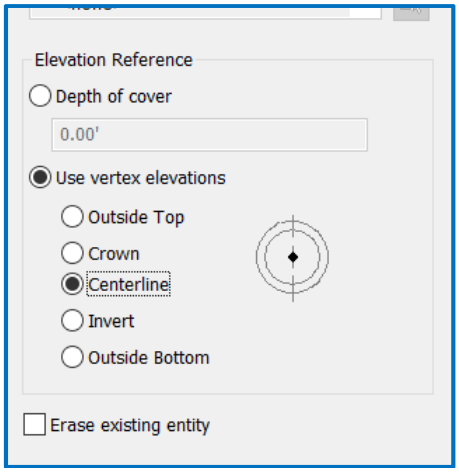
We could go ahead and create a network from a layout, or from objects. *However, this class is about teaching you how to do things faster and in less clicks*. This is also assuming we are creating a complex network. Simple networks typically don't take long, and you won't see much times savings in quick layouts. You can use various methods for these and get experience with the available tools. Before we do that – there are a few settings we need to check before proceeding.

Left – Right – Center! Centerline in your alignment.

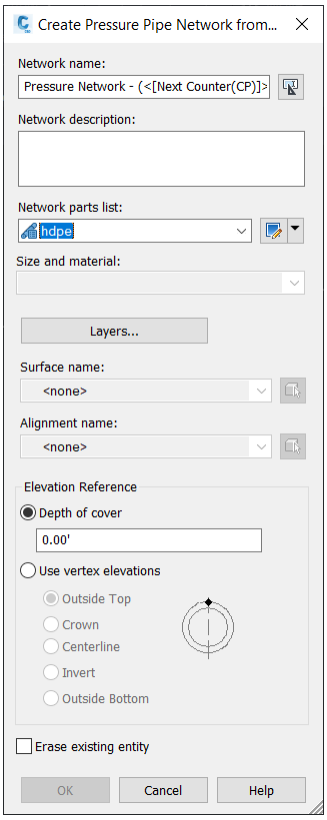
When you are starting to think about the path you need, the easiest way to complete a complex model is to begin with a polyline.

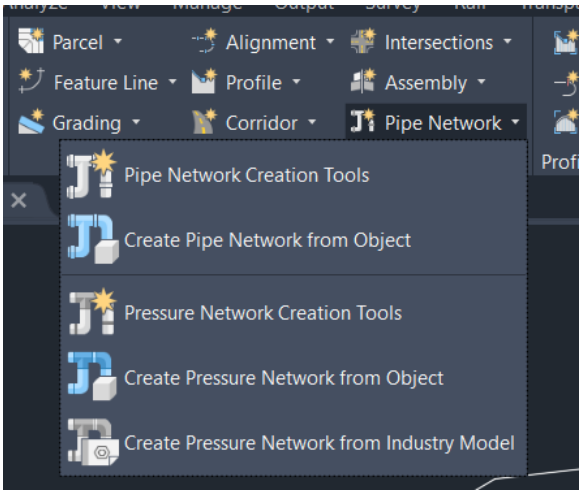
Begin with the idea of the polyline going through the center of the pipe and NOT the invert. Tees, Valves and appurtenances don't have grips for moving on their invert. So, if you want to snap to a location/elevation, it needs to be in the center.





Again - complex models are more easily completed when you start with a polyline, and pressure pipes allow you to create a pipe network from an alignment/object/polyline.





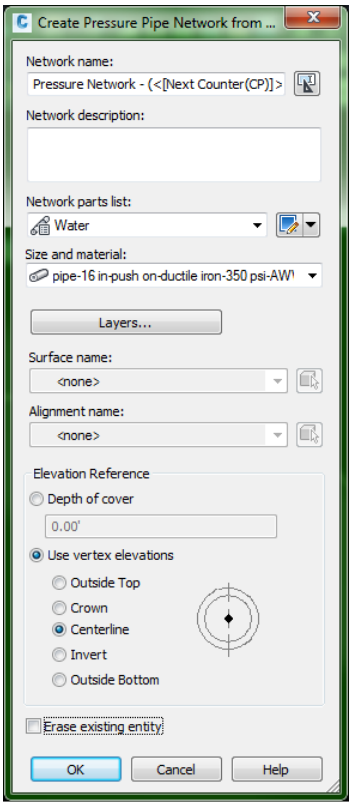
Begin with the preliminary centerline, create a rough path from 2d polyline, then modify it to 3D.

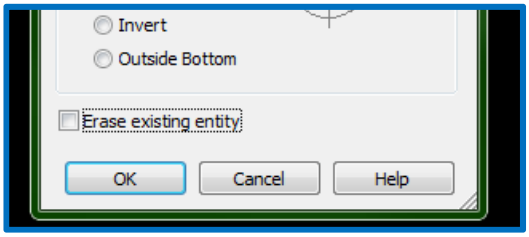
Use 3D tools to modify the elevations (such as modifying the z elevation of each of the vertices along the 3D Polyline). Bring in your other utilities and other places you need to avoid.

View them in multiple angles. 3D tools help move your view around. Be sure to save before moving your model too much as it can become CPU intensive and possibly crash.

'3D Navigation' toolbar

Create an alignment from the rough 3D poly – be sure NOT to delete the original polyline, giving the alignment a name that will help identify its location.





Create, Modify, Check and Modify if needed again. Modifying your initial network.

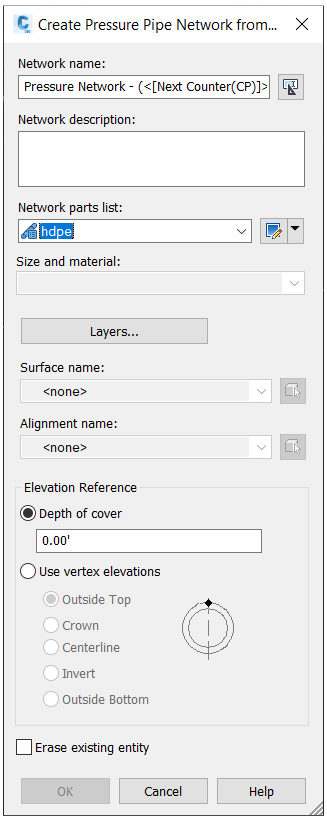
When you have created your initial pipe network, you may need to make a simple elevation change at several places. Using coordinates, you can move a point easily. If I want to move a point 3 feet lower, I would select the point, then move it from 0,0,0 to @0,0,-3. The other way to draw/modify a polyline is using the UCS. Modify and move the UCS to help 3D modelling of 3D polyline. I move the UCS via grips, but there are several ways to move you UCS. Another way to move it is to snap to 3 points. Using the toolbar allows several tools to move and rotate the UCS easily.

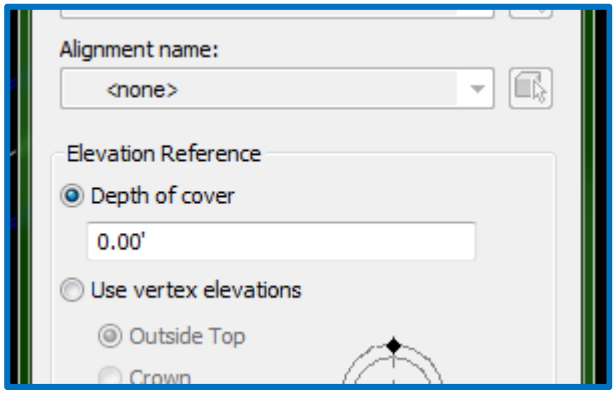
'UCS' toolbar

TIP: When having to modify an elevation, it's easier to modify the 3D poly and then snap the alignment to those new elevations once you have gotten your correct elevations.

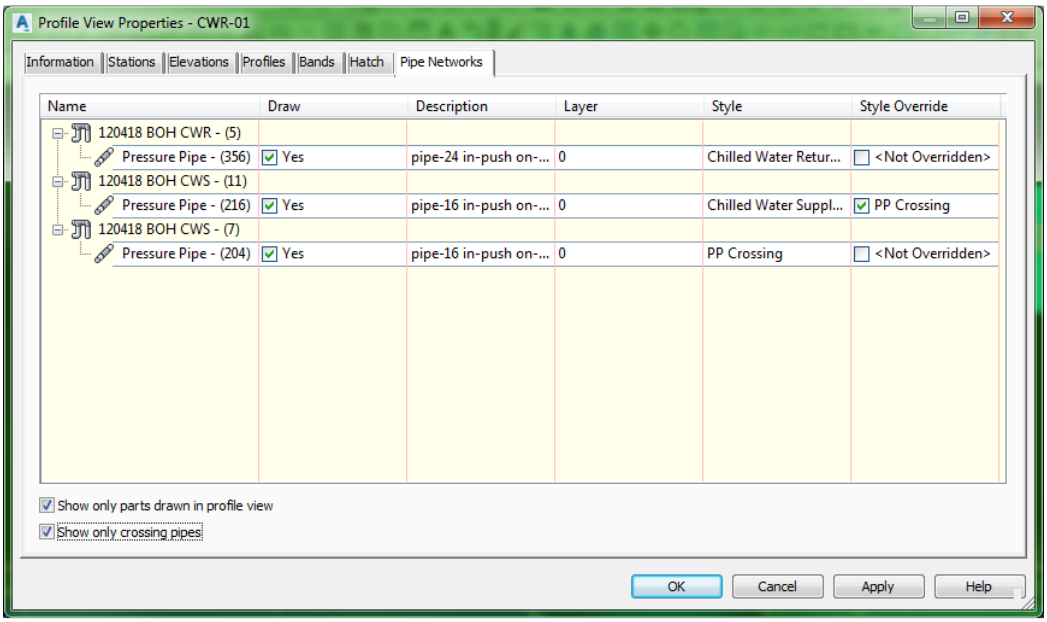
We don’t live on a flat earth; profiles help make things flow. Profile Views:

Another reason for creating an alignment is to help with the creation of a profile. Remember you need to have a surface, and usually early in a project all you have is the existing surface. Having something that resembles a final surface also helps. The reason for this is because you can set your profile to follow a set amount below the surface. Profiles help you design and find problems when you design in this manner.

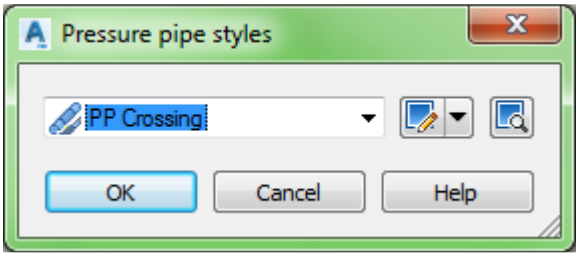


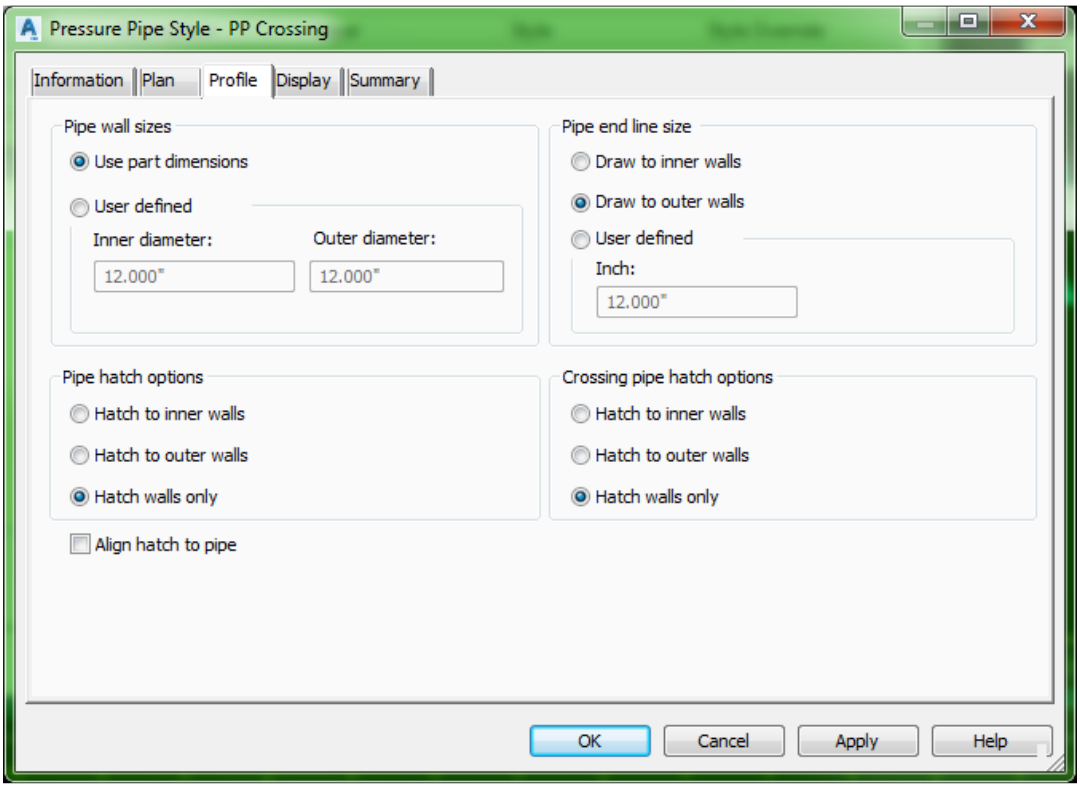


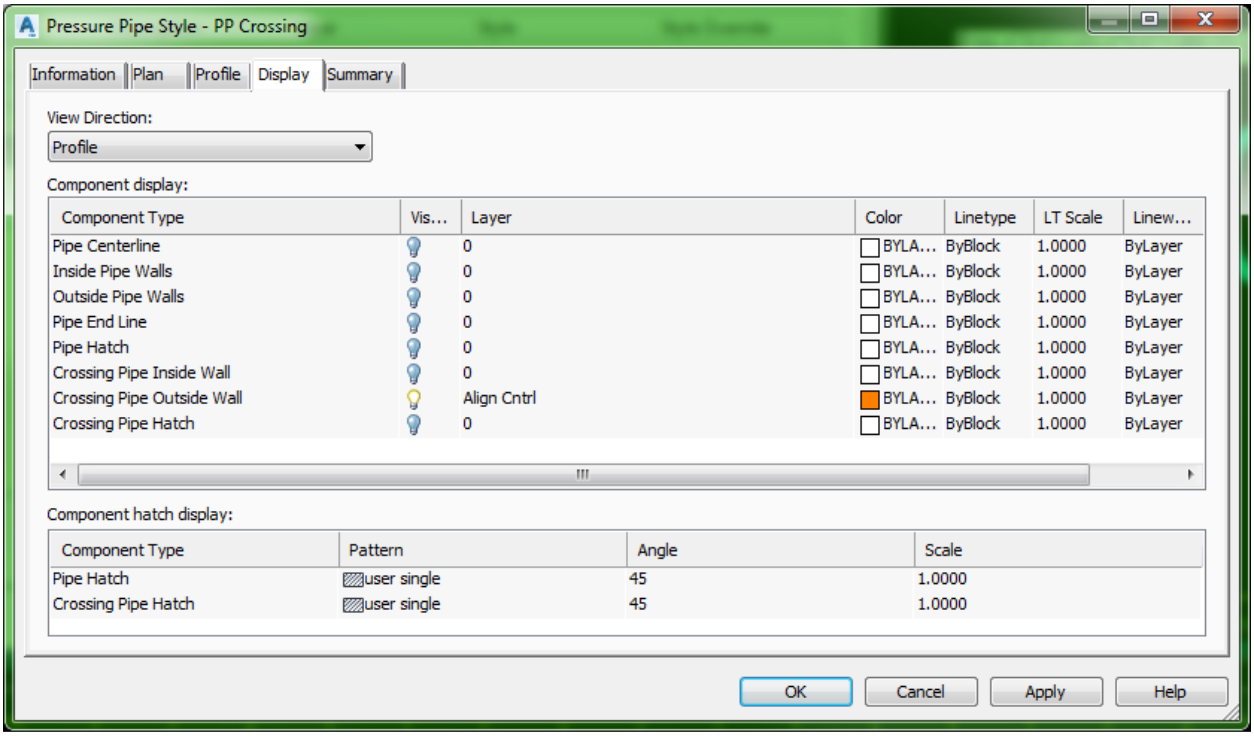
Profiles also help you avoid other utilities and other obstructions. The simplest way to find and fix crossing errors if from a profile. You will more than likely need to show a profile for any project. Showing Crossing pipes in profile is the same as gravity pipe networks. This is done through the creation of a style, that is selected within the properties of the profile.



TIP: Notice the options selected at the bottom of the properties window. This allows you to dramatically reduce the amount of clutter your have on large networks.




Pressure Pipe Style - PP Crossing
Information
Plan
Profile
Display
Summary
Pipe wall sizes
Use part dimensions
User defined
Inner diameter:
Outer diameter:
12.000"
12.000"
Pipe end line size
Draw to inner walls
Draw to outer walls
User defined
Inch:
12.000"
Pipe hatch options
Hatch to inner walls
Hatch to outer walls
Hatch walls only
Crossing pipe hatch options
Hatch to inner walls
Hatch to outer walls
Hatch walls only
Align hatch to pipe
OK
Cancel
Apply
Help


Pressure Pipe Style - PP Crossing
Information
Plan
Profile
Display
Summary
View Direction:
Profile
Component display:
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Inside Pipe Walls 0 BYLA... ByBlock 1.0000 ByLayer
Outside Pipe Walls 0 BYLA... ByBlock 1.0000 ByLayer
Pipe End Line 0 BYLA... ByBlock 1.0000 ByLayer
Pipe Hatch 0 BYLA... ByBlock 1.0000 ByLayer
Crossing Pipe Inside Wall 0 BYLA... ByBlock 1.0000 ByLayer
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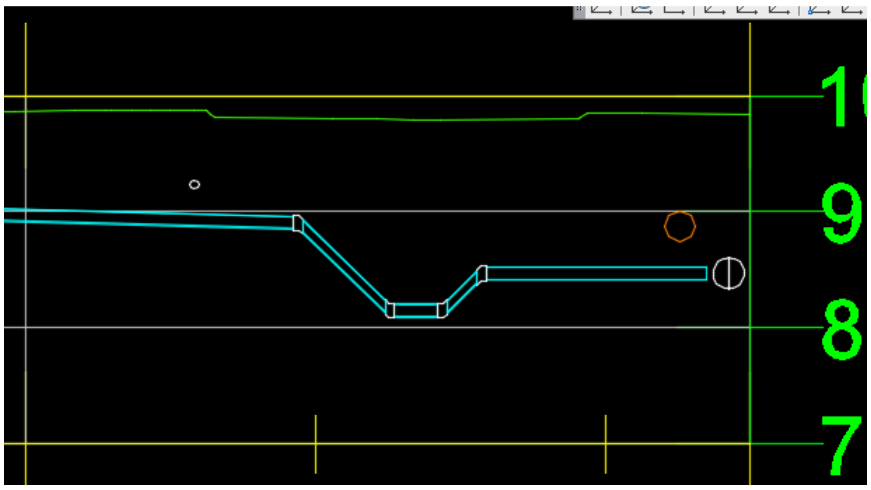
Component hatch display:
Component Type
Pattern
Angle
Scale
Pipe Hatch user single 45 1.0000
Crossing Pipe Hatch user single 45 1.0000
OK
Cancel
Apply
Help

TIP2: Set your profile to have no vertical exaggeration, you can then create a polyline for 30 deg or 45 deg bends to go under an obstruction. You can then insert your bends right inside of the profile! Then you could stretch the pipe to connect the two bends all within the profile. It is simpler when you don't have any vertical exaggeration. However, this is not a limitation, just an easier approach.



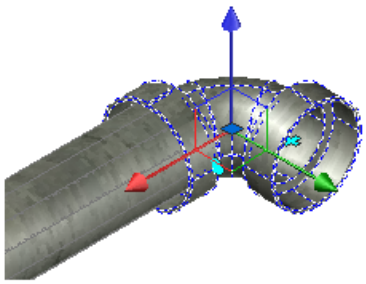
Adding, Change Fittings, Rotate and get Dizzy! Modifications!

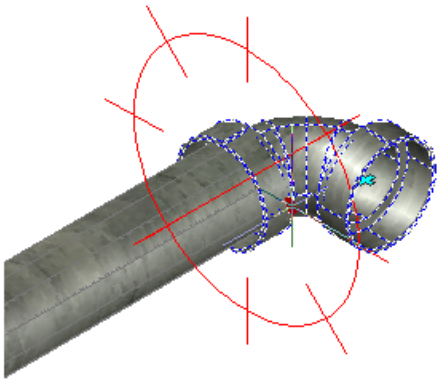
One of the other benefits of keeping the non-plottable centerline, is the ability to delete a fitting, and insert another by snapping to an endpoint along the polyline. This also allows you to rotate tees, and other fittings to their proper angles.

There are many different connections using grips. They are different depending on the fitting, appurtenance or pipe. These are just a few I am highlighting – which are the most basic.

TIP: Hover over a grip to find out what it represents.

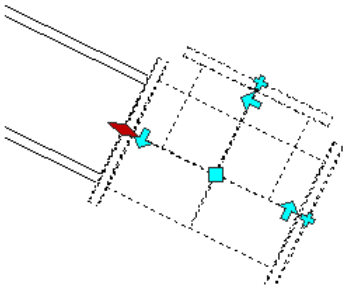
Use Shift+P to rotate the compass.



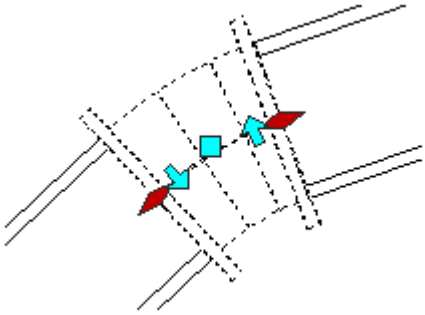


At intersections you can modify the elbow or tee via grips:

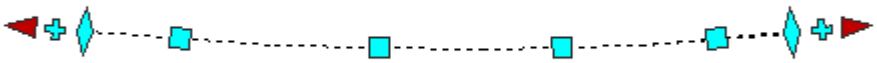
Slide the Tee along the pipe using the highlighted grip:



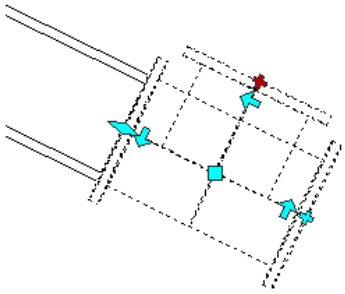
Lengthen or slide an elbow as well:



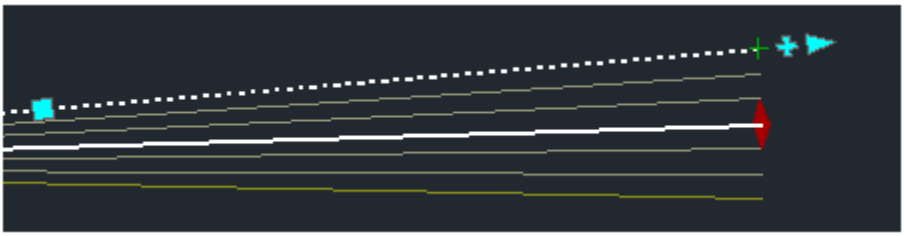
You can lengthen pipes via grips:



You can also continue your layout using the grips:



You can also use the grips to deflect a pipe a certain pre-set percentage (which is adjustable in your settings) in your plan view.



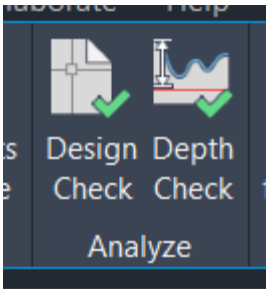
When you use grips, you want to look for the connection grip that shows you are connecting the parts together. It only shows when you are able to connect two pieces.

You can use grips on pressure pipes, fittings, and appurtenances to edit a pressure network in plan view.

When you use grips to move a pressure network part near another part's open connection, a glyph appears near the cursor when two parts are close enough to be connected. Releasing your cursor when this glyph is displayed connects the two pressure network parts. This behavior applies for any two parts of any type, as long as the two parts are in the same pressure network.

Check the entire network using the object viewer. Include other networks to check for interferences.

Design checks can also be run via the tab with variables set in the settings tab of toolspace menu.

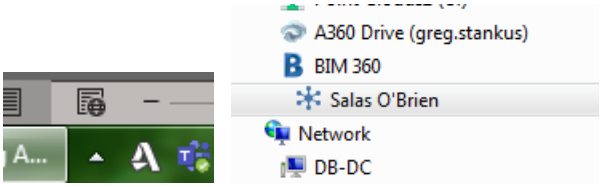


TIP: When drawing your 3D Polyline, drawing the polyline in the correct angles and acceptable possible angles helps the program create the fittings automatically when making a layout by object.

3. Learn how to collaborate with desktop connector and BIM 360, in a Civil 3D software environment

Desktop Connector:

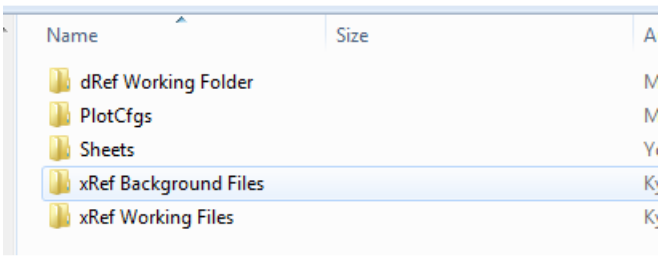
In order for Civil 3D to coordinate your work within a BIM environment, Desktop Connector must be used. It's a way to connect your local network with your BIM 360 local account. https://www.autodesk.com/bim-360/desktop-connector/

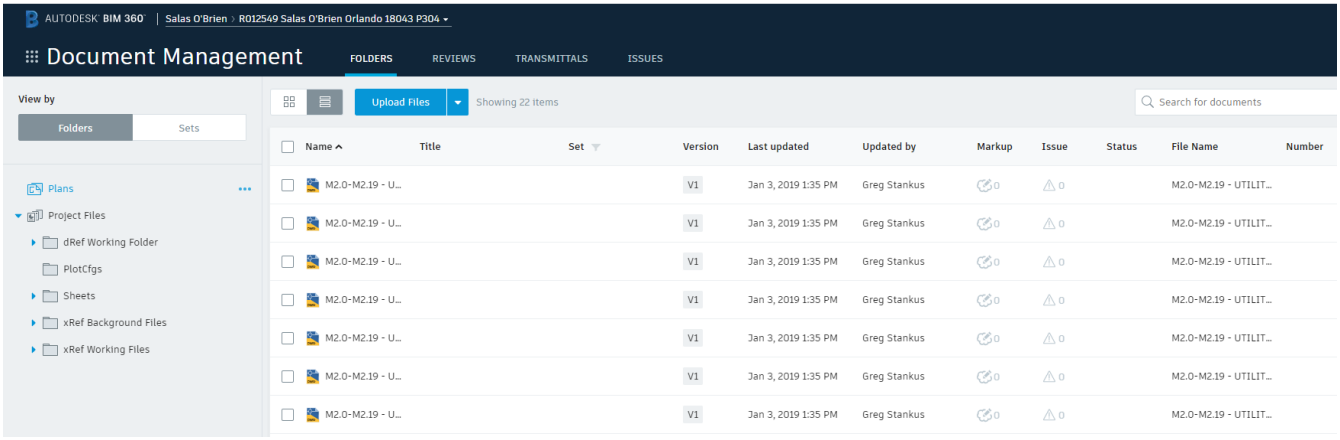


Using the Desktop Connector helps, however, there are some limitations. Which are discussed below.

TIP: Communication is the best method when using any of the new tools like BIM.

Civil3D does not have a native method for using BIM, however it is changing rapidly. One of the limitations is in the use of data references. Data references (DR) do not work outside of a local network. Steps must be taken to work around this problem – again communication. One method that our office employed was to keep our files on our local drive (like you would use DR normally) however, we had to be diligent in communication with our other offices. We would email, skype a new file, and let them know they had to reload that file.





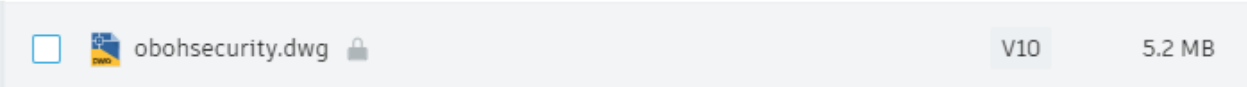
Tip: Desktop connector will update files, but those drawings are on your local BIM360 folder. When a DR file is updated, you can overwrite the one in the BIM folder (which is NOT updated automatically).

One positive for the Desktop Connector was with the traditional use of Xref files. BIM360 Docs will keep copies of reference files, allowing you to keep the background files updated. With the Desktop connector running, some files may take a while to reload when it is saved. This will also prohibit the announcement of an update on your screen.

Working on your local copy of the Xref file can be tricky when working on a cloud environment. Since we were using BIM360 DOCS for our file management, there are some other considerations when working on base files. One is where two people can open the same file at the same time.

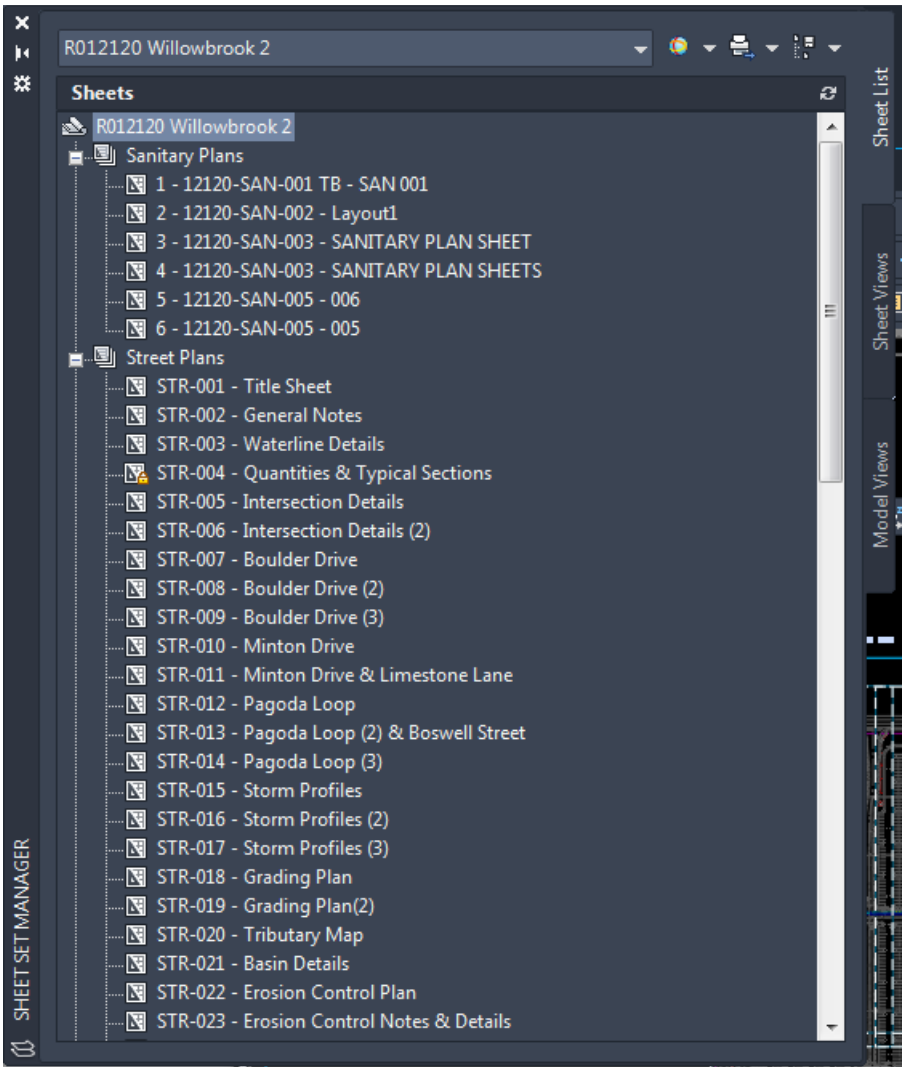
TIP: When working on a drawing – lock the file manually within BIM 360 docs since it can be overwritten by the last person saving.

Once again – communication helped this situation. We would lock the file within DOCS and work on that file. This would prohibit others from overwriting several of our base files. It wasn't very pretty but it was effective. We basically were doing what a vault system would do.



4. Learn how to create a sheet set of your finished design for delivery to a client or municipality

Sheet set manager is a great tool that you open using the command 'sheetset' – which then opens a separate window showing the manager.



Below are two links that will better explain the use and set-up of the sheet set manager (SSM).

https://blogs.autodesk.com/autocad/process-sheet-sets/

https://blogs.autodesk.com/autocad/tag/mastering-autocad-sheet-sets/

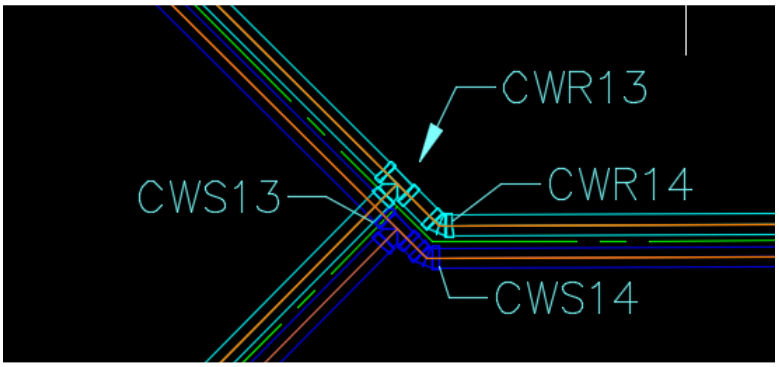
If you are unfamiliar with sheet sets, one of the advantages are using the manager for simple plotting of complete sets. The true advantage is the use of fields, and how sections; page labels and many others can be linked to pages that can be updated automatically, reducing the amount of rework as well as the possibility of errors.

Fields are shown in sheet sets as shaded areas. If your organization decides to use fields, and important note is to train everyone to recognize what a field represents, as it can easily be compromised by exploding – losing its linking ability.

TIP: Large datasets as well as small can benefit from sheet sets. Plotting a set of pdf files are easily done, as well as plotting to a printer.

Templates are a good way to create your sheets as well as a .dst (drawing sheet set file)

Labels can be placed on the pipes and fittings, a fast way is creating a table for each sheet, and then moving those labels off to the side of each sheet with a viewport.



5. Summary:

- Get your list of materials set up prior to starting, including sizes and pressures
- Use 3Dpolylines to set up and modify your design, it's the easiest and fastest way to create and modify a complex system of pressure pipes
- Start on small networks to learn the intricacies with each of the fittings and parts.
- Large complex networks don't lend itself to naming conventions of piping networks, like gravity pipes.
- Get to know how to modify the ucs to move and draw a 3D polyline easily.
- Use the object viewer to check your network, looking at various views.
- Create vertical profiles to check for depth allowances.
- Desktop Connector and BIM 360 are continually changing. Currently, it is not very easy to use with Civil3D without several workarounds.
- Use the sheet set manager to manage and plot your projects.

I hope you have enjoyed my class as much as I have enjoyed writing about this topic. Please see the speaker information for contact information.