



AutoCAD® Civil 3D® Pressure Networks: Building and Using Your Custom Parts Catalog

Shawn P. Choisser - SPEC Services, Inc., Senior Principal Designer - Pipeline
Stephen Avon - SPEC Services, Inc., Lead Engineer/Designer - Pipeline

CV6527

AutoCAD® Civil 3D® software's Pressure Networks is great out of the box if you use mechanical or push-on fittings, but what if you use welded or other fittings? Not to worry—you can build your own custom parts catalog. Learn how to create the 3D model needed for your custom part, how to export the data, and how to include it in your new catalog using Content Catalog Editor. Once your parts are in your catalog, we will learn how to create the pressure network parts list to create your pressure network. Finally, you will learn how to share your design with stakeholders using InfraWorks 360™ software.

Learning Objectives

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

- Learn how to create a 3D model for your custom pressure network part
- Create a new parts catalog using Content Catalog Editor
- Set the Pressure Network catalog and create a Pressure Network Parts List
- Share your pressure network using InfraWorks 360™

About the Speakers

Shawn Choisser received his AA from Orange Coast College in California in 2002, and he is currently a senior principal pipeline designer for SPEC Services, Inc., in Fountain Valley, California. Shawn has been a pipeline designer for SPEC since 1999, providing utility coordination and pipeline relocation services for oil and gas clients. He also continually works with users in SPEC's Pipeline Design Group to customize, implement, and train on workflows in order to integrate the multiple software platforms used. Shawn has been using AutoCAD® software since 1999 and he is an AutoCAD® Certified Professional. He started attending Autodesk University in 2002.

Stephen received his bachelor's degree in civil engineering and his master's degree in Transportation Engineering from CSU, Pomona. He is now a lead pipeline engineer and designer for SPEC Services where he primarily designs oil and gas pipelines for various clients. He started attending AU in 2012 where he has been continually inspired by the work of those around him. Stephen has brought back many concepts learned from others at AU and implemented them at SPEC Services. Such concepts include pressure pipe networks, Infraworks, and 3D printing to name a few. Stephen is currently studying for his PE examination which has been a lifelong dream to attain.

Introduction

Although Autodesk® AutoCAD® Civil 3D® comes pre-loaded with several pressure network part catalogs with a good selection of parts, they do not provide welded fittings used in the oil and gas industry. This leaves two options: use the preloaded parts that are similar, but not exact; or create your own parts library. The original Parts Builder tools that come with Civil 3D® are not very user friendly, but you are in luck. The new tools that were included with the introduction of Pressure Networks in Civil 3D® 2013 have given users a friendlier environment to expand their parts catalog.

The tools and commands in this presentation are, technically, undocumented commands. If you search for these commands in the “Help” that is in Civil 3D® you will not find them.

Documentation for using these tools can be found at “C:\Program Files\Autodesk...” This documentation, while a help to get going, does not cover some of the details we will discuss.

Learn how to create a 3D model for your custom pressure network part

The end goal of creating a 3D model is to create a .CONTENT file for importing your custom part into the catalog. The .CONTENT file is created from the drawing file of the custom part. There are three items the drawing file will need to complete the creation of the .CONTENT file: a 3D model, 2D line work representing the centerline of the part, and the connection points where other parts and pipes can connect to the part. The PUBLISHPARTCONTENT command is used to create the .CONTENT file from your completed drawing file.

TIP: Make a list of all the parts you need to make. This helps make sure you do not miss a part and gives you an easy way to let others know what parts are in the catalog.

Creating the 3D model

The first step in creating a custom part is to create a drawing containing a 3D model of the part. The 3D model can be as simple as a cone for a concentric reducer or as complex as showing the flanges, body and actuator for a valve assembly. It is entirely up to you. There are only a few conditions that need to be adhered to:

- Drawing units must be inches or millimeters
- Entire 3D model must be one solid (a mesh or surface will not work)

When creating more complex models utilize the UNION command to ensure all your components are included in your solid.

The following commands can be helpful while creating a 3D model: SWEEP, UNION and SUBTRACT. Switching to the ‘3D Modeling’ workspace will provide quick access to these and other helpful modeling commands.

Creating the part centerline

The centerline definition of the part must be created in order to create the .CONTENT file needed to import the part into the catalog. This feature is needed to show the centerline when the part style displays it. The centerline definition is usually a single line, but it can contain multiple centerlines (i.e., tee, concentric reducer, etc.).

When creating the centerline definition with multiple centerlines, create a block from the line work. The name of the block or insertion point is irrelevant, just be sure the line work is in the correct location and orientation relative to the 3D model.

Another item to consider is if you are planning on using the SWEEP command to create the 3D model, make a copy of your centerline before executing the command. The SWEEP command will remove the path from the drawing.

Creating the connection points

The next step in getting the 3D model ready is to define the connection points. The connection points define where the part will connect to other parts in the pressure network.

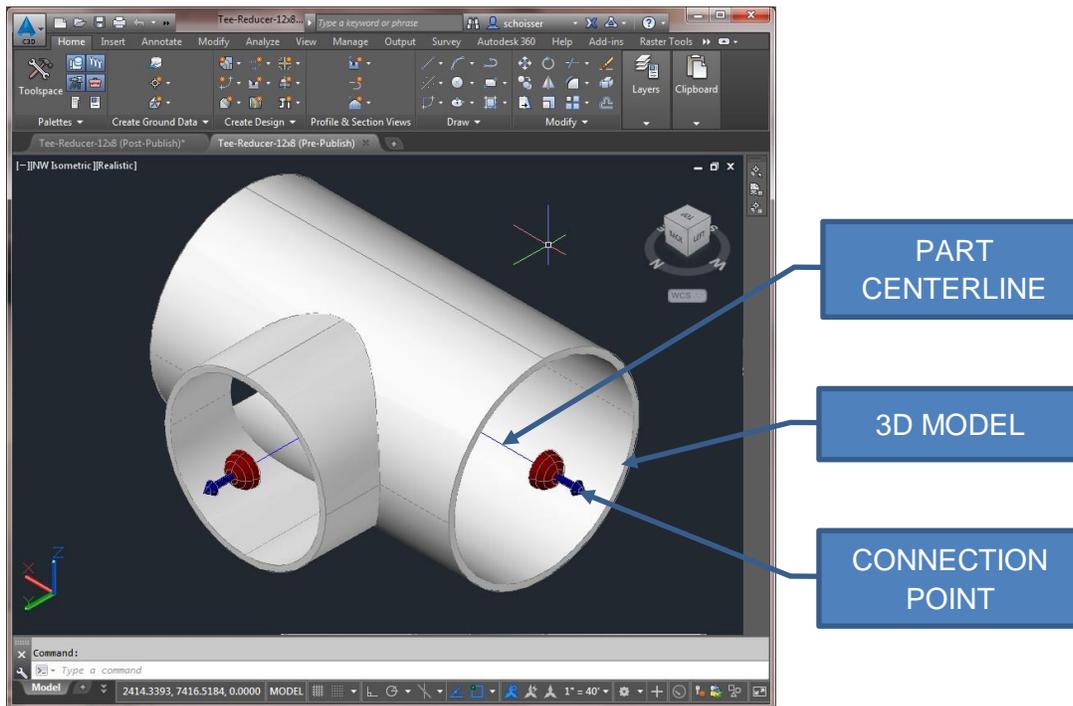
To create a connection point, use the INSERT command that is located on the Connection Point panel of the Insert tab of the ribbon (note: this is not the same command to insert a block). AUTODESKCONNECTIONPOINT is the command if you prefer to use the command line.

The two elements you need to define when inserting the connection point are the location of the connection point and the direction the pipe will be connecting to the part.

Creating a connection point:

- Start the AUTODESKCONNECTIONPOINT command
- Pick an object to add the connection point to
 - Select 3D solid
- Pick the insertion point on the object
 - Select where to insert the connection point (usually the end of the centerline of the part)
- Pick the 1st point for the direction
 - Select a point that is on the direction of the part (I use the nearest object snap and pick a point along the centerline near the connection point)
- Pick the 2nd point for the direction
 - Select an additional point that is on the direction of the part (I used the endpoint object snap and select the connection point insertion point)
- Add Engineering Data [Yes/No]
 - This may be an option for future development, but currently the command ends regardless of which option you choose

AutoCAD® Civil 3D® Pressure Networks: Building and Using Your Custom Parts Catalog



Continue this process until all connection points on the part have been defined.

Autodesk® AUTOCAD® CIVIL 3D® Help Definition

Autodesk® Connection Point (ACP):

You can connect pipes to objects created by other programs including AutoCAD® MEP® and AutoCAD® Plant 3D® using an Autodesk® Connector (ACP) object. You can also create an ACP object to allow other programs to connect to AutoCAD® Civil 3D® pipe networks.

You can connect to ACP objects that are attached as an external reference (Xref).

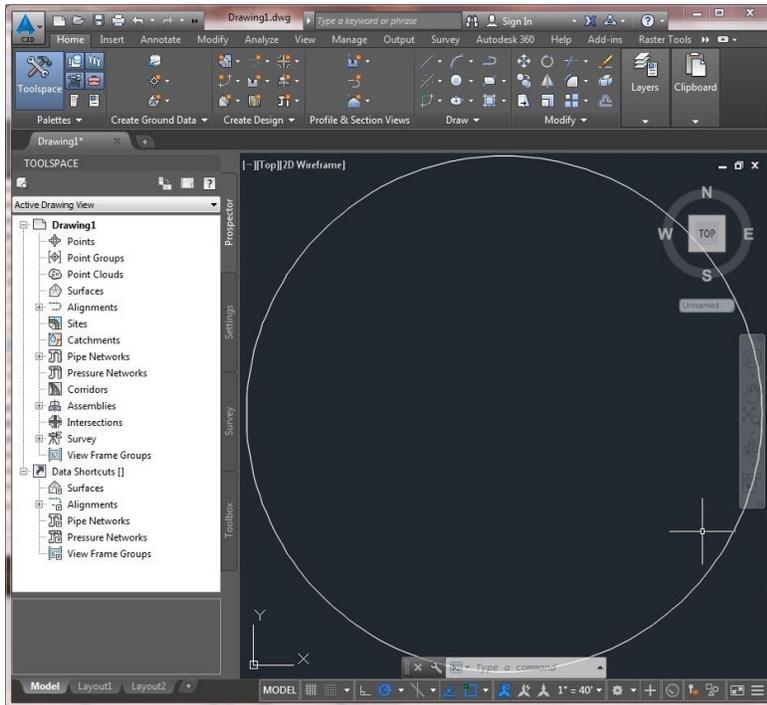
ACP connector objects do not require Object Enablers from the program that created them to be installed.

Publishing the part

The final step is to publish the part and create the .CONTENT file. This will be accomplished using the PUBLISHPARTCONTENT command.

Here are a few tips that I have learned from other classes that will help the part preview images in your catalog look great:

- Make the drawing area square. The drawing area will be used to create an image of the part; if the image isn't square it will be resized to be square, distorting the look of the part.
 - Create a new drawing, draw a circle (size doesn't matter), zoom extents and resize the AutoCAD window so all sides are touching the circle.
- Close the drawing with the circle and open the drawing with your part.
- Set an isometric view using the View Cube to give the parts a consistent look.



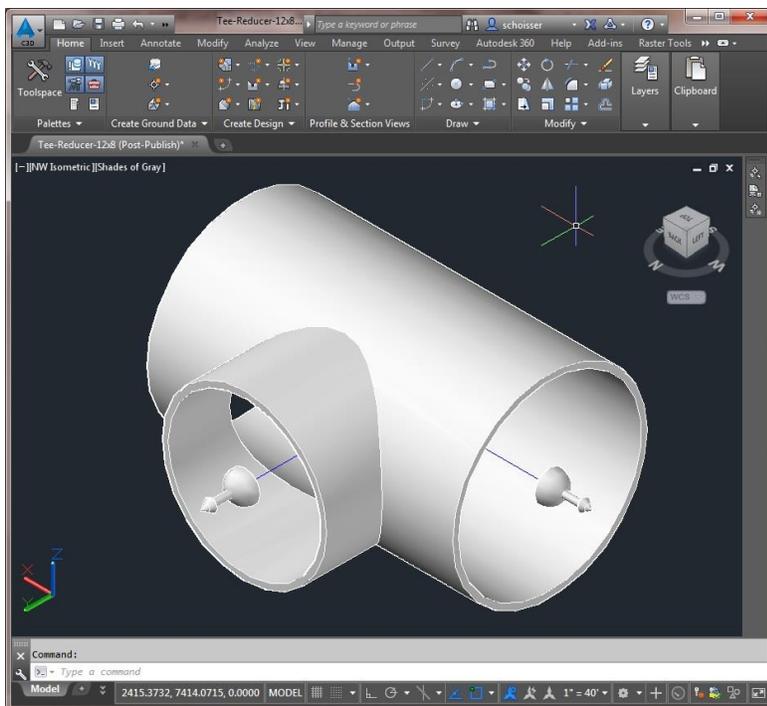
“Resize the workspace so the drawing area is square.”

Now with the drawing open and your workspace set, it is time to create your .CONTENT file.

Type PUBLISHPARTCONTENT on the command line and follow the command line, it will guide you through the process:

- Select the 3D solid representing the part
- Select the line work that represents the centerline of the part (the 3D solid will temporarily disappear)
- Specify the units of the model (drawing must be in inches or millimeters)
- Specify the part type (i.e., tee, reducer, elbow, etc.)

Once these steps have been completed the drawing will zoom extents, change the visualization style to Shades of Grey and have created an image of your part.



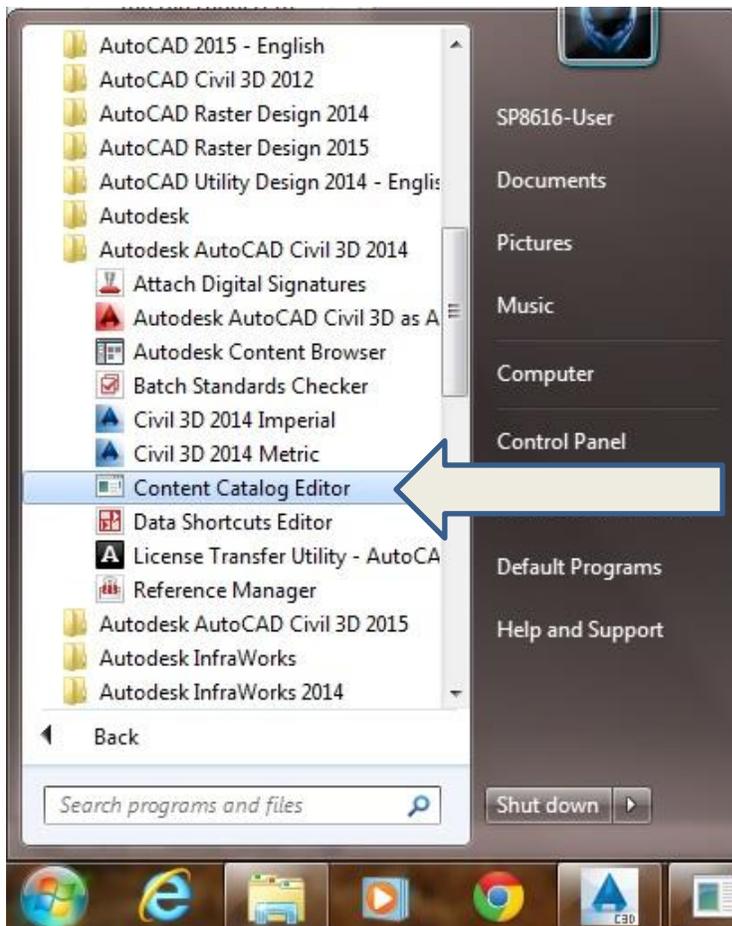
The Select location to save .CONTENT file dialog box will appear and ask for the name and location of the newly created .CONTENT file. Save the file and you are done.

Create a new parts catalog using Content Catalog Editor

Now that you have the .CONTENT file of the new part, it is time to populate a new part catalog with the part(s). This is done with an additional program that is installed with Civil 3D® called Content Catalog Editor.

NOTE: The Content Catalog Editor that is installed with Civil 3D® 2015 only works creating parts without a .CONTENT file, pipes only. Use the Content Catalog Editor from Civil 3D® 2014 to import the parts with a .CONTENT file into your catalog.

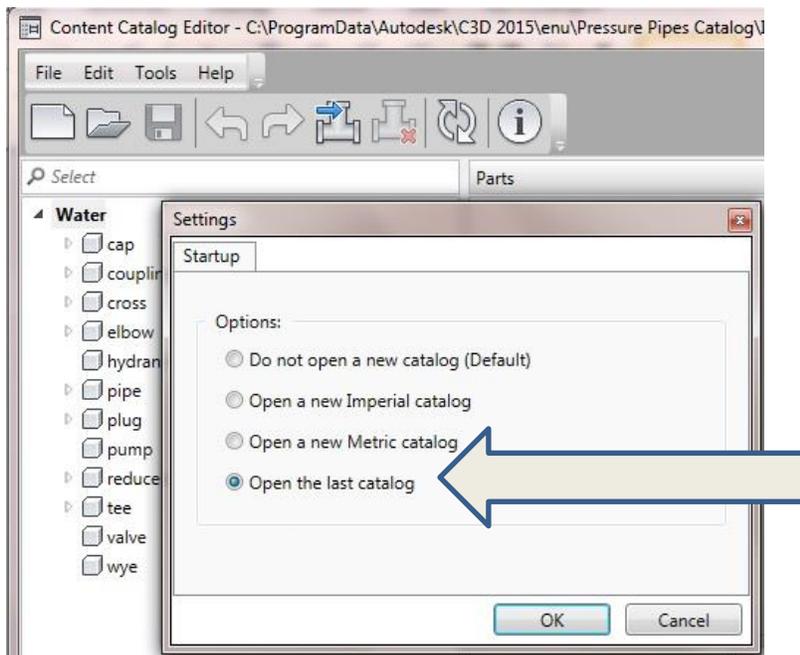
The Content Catalog Editor runs outside of Civil 3D®. To launch the program go to the Windows Start Menu -> All Programs -> Autodesk -> Autodesk Civil 3D 2014 -> Content Catalog Editor



Creating a New Pressure Network Catalog

Once you launch the Content Catalog Editor you have the option to open an existing catalog or create a new one. If you just need to add additional parts to an existing catalog, it is recommended to open the existing catalog and do a Save As on the catalog. This gives you a back-up in case anything goes wrong with the edited catalog. If you do not plan to use any of the parts in the existing catalog, creating a new one eliminates some clean-up later.

TIP: If you plan on using the Content Catalog Editor frequently, use the Tools->Options to set the Startup option to "Open the last catalog" setting. This will open the last catalog you were working on and save a few clicks.



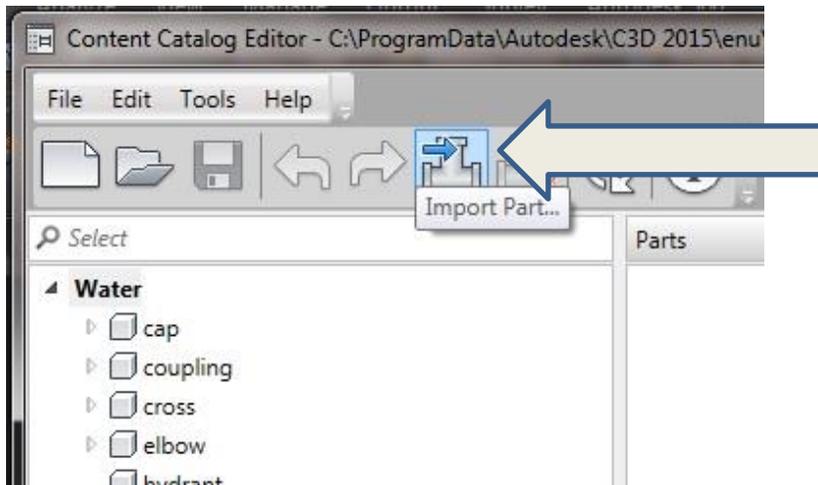
Importing Parts

Now that the new or existing catalog is open, it is time to import some parts. When importing parts there are two options available:

- With a .CONTENT file
 - Used to create new fittings or appurtenances
- Without a .CONTENT file
 - Used to create new pipe

Importing Fittings or Appurtenances – With .CONTENT file

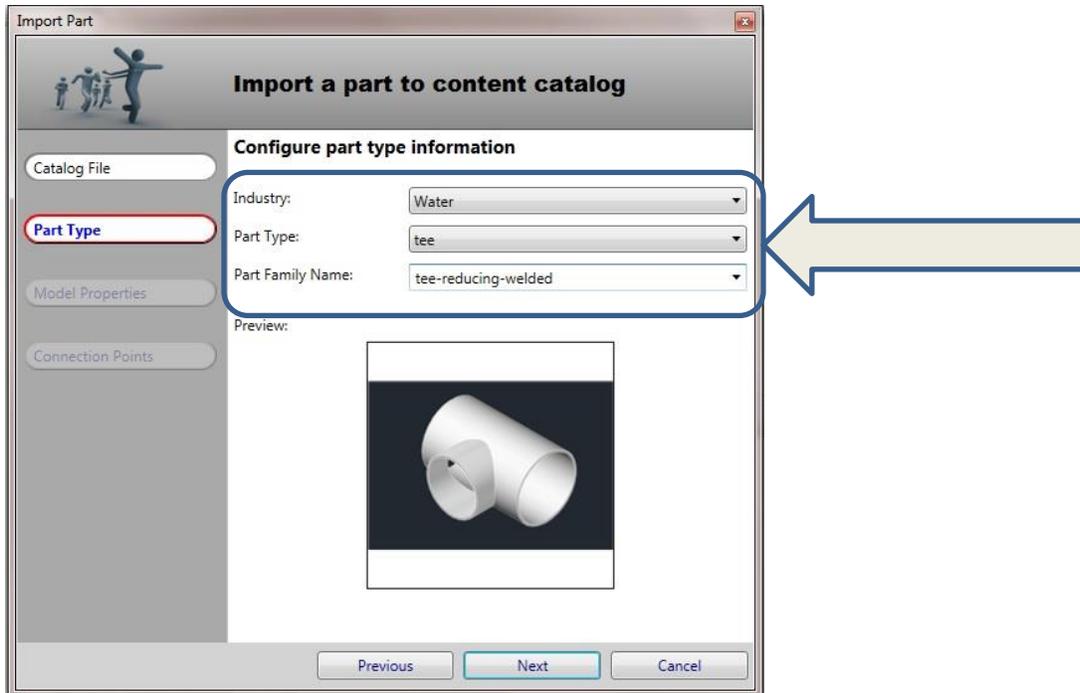
To add fittings or appurtenances to the catalog, launch Content Catalog Editor and open the catalog to which you want to add the part. Select the Import Part icon on the toolbar.



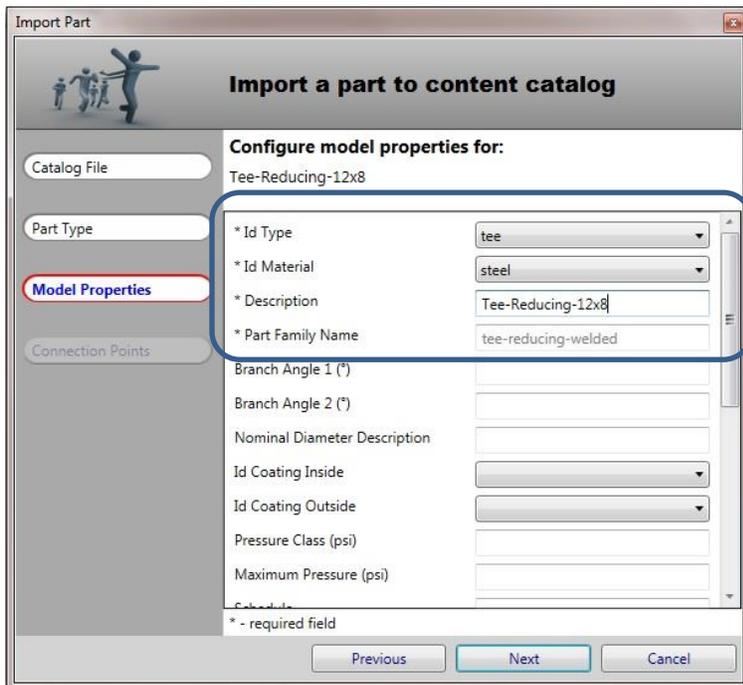
Within Catalog file section, select the “Import from .CONTENT file” option on the Import Part dialog box, browse to the location of the .CONTENT file you wish to import, select the file, and then choose Next.



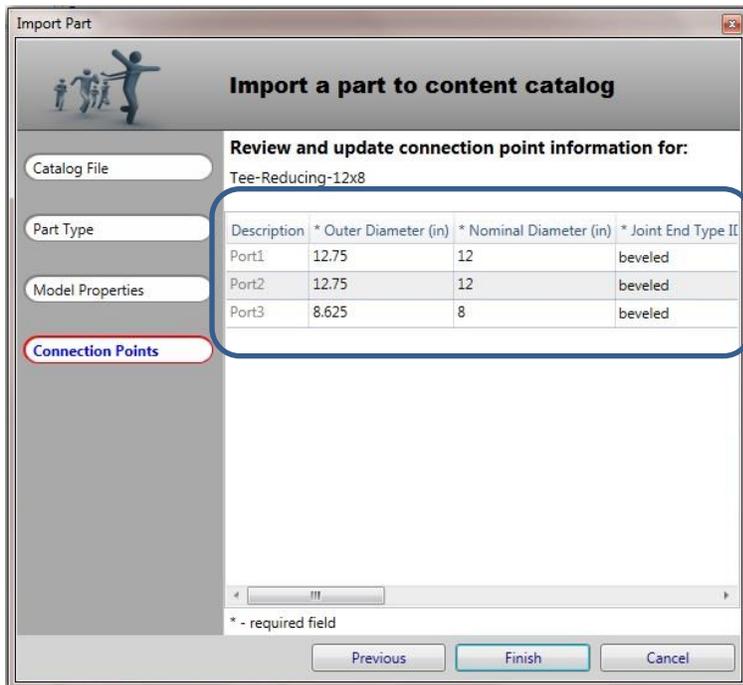
The next section is Part Type. Use the pull-down menus to select the correct values. Currently “Water” is the only industry available. The next field is the Part Type; choose the value from the available fields. These fields are pre-determined; if the part type is not available, choose the most appropriate type. Finally, select the Part Family Name. This field is customizable; if this is the first part for the Part Family Name, type the family name. If there have been similar parts added already, just select the appropriate family name.



The third section is Model Properties. Fill in as much information as you can. The items with an asterisk are required; everything else is optional. The description is the name that will be given to the part when adding it to the parts list.



The section is Connection Points. Fill in the required information and any other additional information you may have for the part. Pay attention to the nominal diameter field, this field must match with any other pipe or fittings this part is attached to for the design check to function properly.

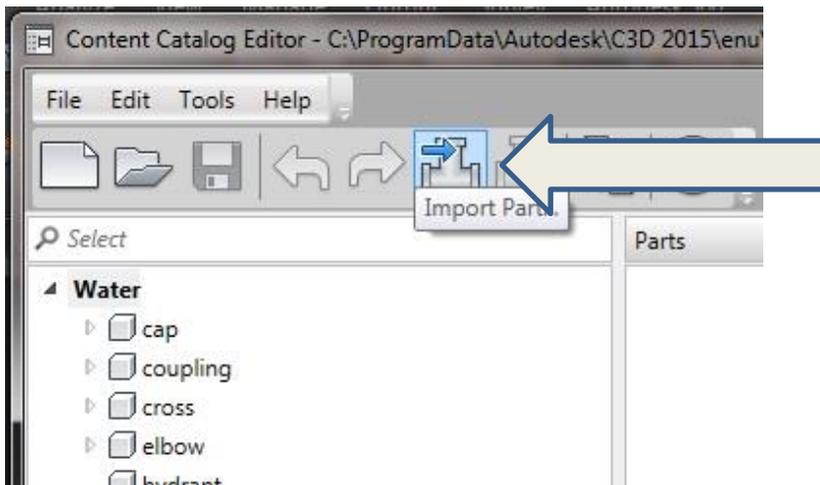


Once you have inputted all the required information select the Finish button and the part will be imported in the catalog.

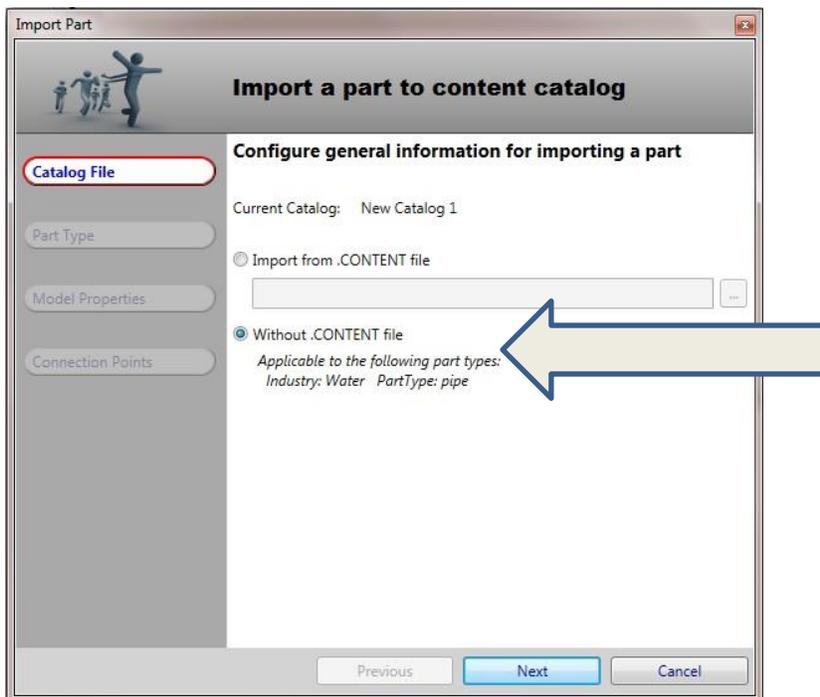
TIP: It is a good practice to save your catalog after you import a part. If you refresh the catalog, any parts that have been imported since your last save will be removed.

Importing Pipe – Without .CONTENT file

To add pipe to the catalog launch Content Catalog Editor and open the catalog to which you want to add your pipe. Select the Import Part icon on the toolbar.



Select the “Without .CONTENT file” option on the Import Part dialog box, and then choose Next



The following sections are similar to importing with a .CONTENT file. Fill in the required information and any additional information you may have.

Import Part

Import a part to content catalog

Catalog File

Part Type

Model Properties

Connection Points

Configure model properties for the part.

* Diameter Outside (in) 12.75

* Id Type standard

* Thickness (in) 0.375

* Id Material steel

* Description 12" Steel Pipe

* Part Family Name Steel - Std Wall

Cut Length (ft)

Diameter Inside (in)

Minimum Flex Radius (ft)

Nominal Diameter Description

Id Coating Inside

Id Coating Outside

* - required field

Previous Next Cancel

Import Part

Import a part to content catalog

Catalog File

Part Type

Model Properties

Connection Points

Review and update connection point information for the part.

* Outer Diameter (in)	* Nominal Diameter (in)	* Joint End Type ID	Rotation (°)
12.75	12	beveled	
12.75	12	beveled	

* - required field

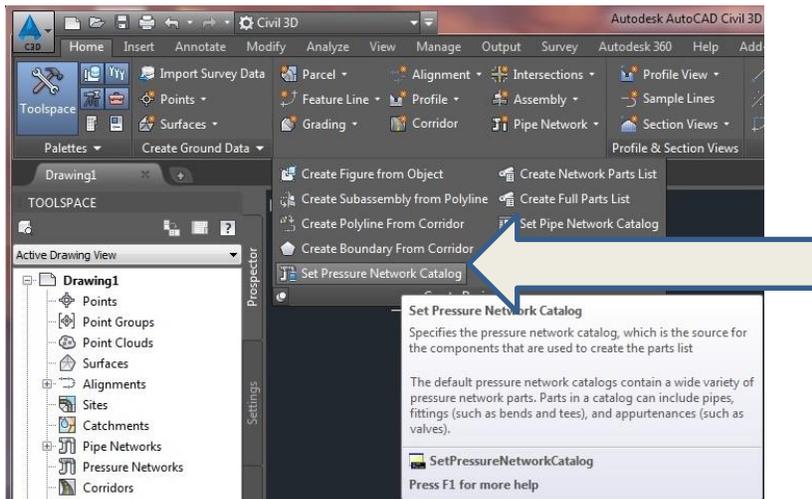
Previous Finish Cancel

Set the Pressure Network Catalog and Create a Pressure Network Parts List

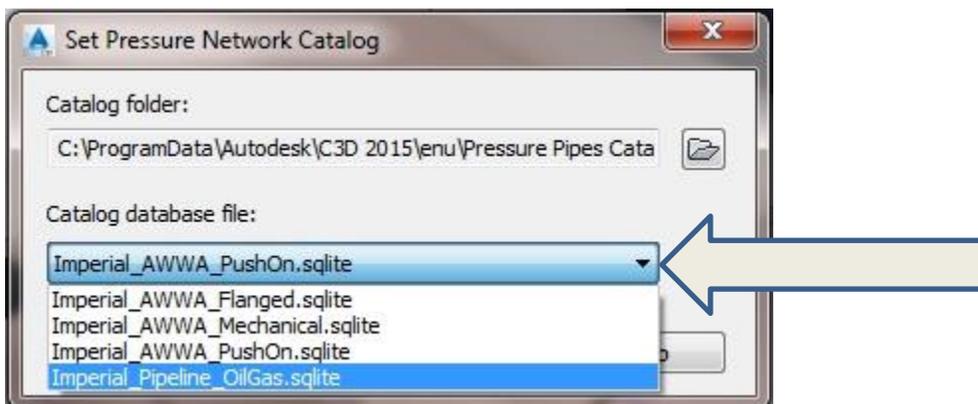
Now that you have the parts in your catalog, the final step before you can start using them is to set the pressure network catalog and create a parts list of the new parts. If you have a set of parts you commonly use, define the pressure network catalog and parts list in your template. This gets you off and running when creating a new drawing.

Setting the Pressure Network Catalog

To set the pressure network catalog, expand the Create Design panel of the Home tab of the ribbon and choose “Set Pressure Network Catalog”.

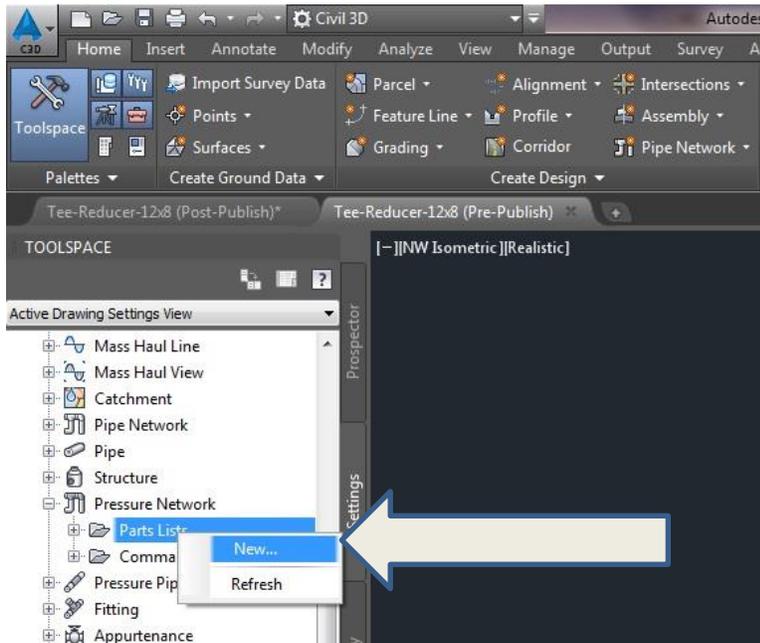


Once the Set Pressure Network Catalog dialog box appears, select the folder icon and navigate to the folder location where the .sqlite file is located. If there is more than one catalog in the folder, use the drop-down to select your catalog.

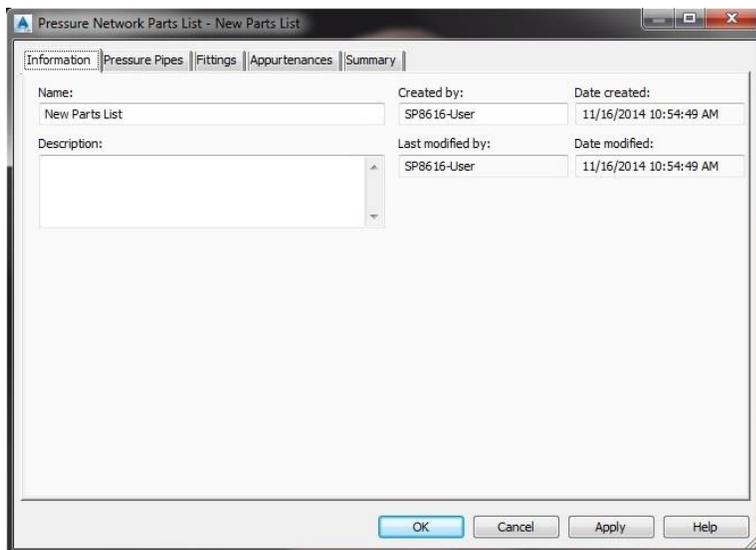


Creating the Pressure Network Parts List

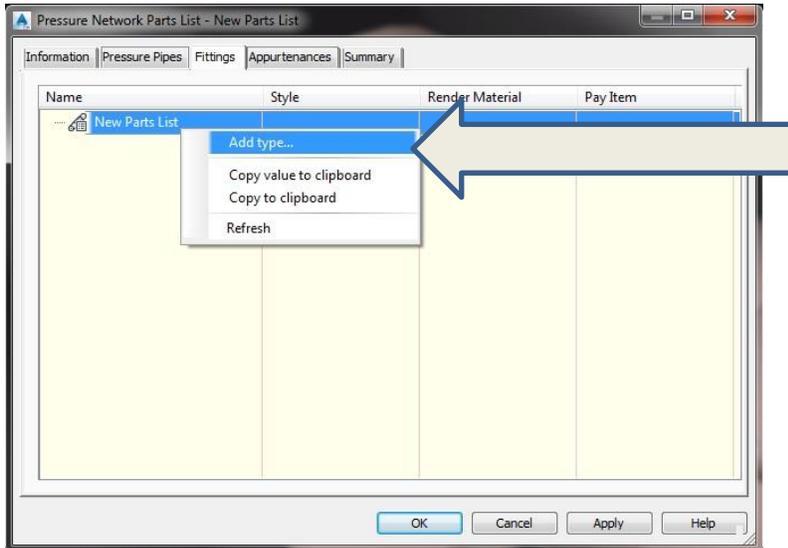
Now that the Pressure Network Catalog has been set, it is time to create the parts list. First, open Toolspace, if it is not already open. Go to the Settings Tab, about half-way down is Pressure Network. Expand this group, right-click on Parts List, and select New.



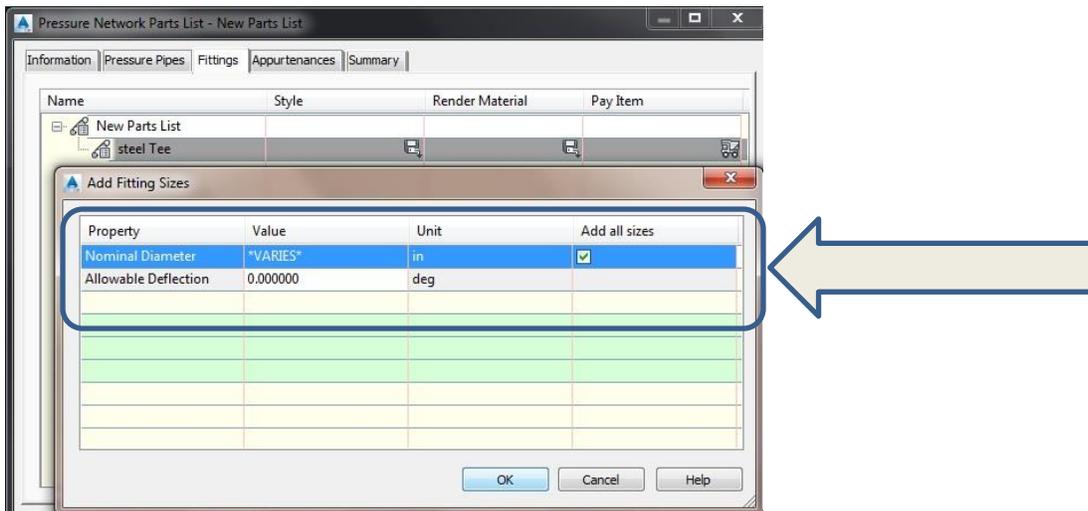
A dialog box will appear for the new parts list. The first tab is the Information tab: give the parts list a name and add additional information you need. The next three tabs will be used to add the parts.



To add a fitting select the Fittings tab (the Pressure Pipe and Appurtenances tab steps are similar), right click on the name of the parts list and choose “Add type...” Once you have selected the type, select the part from the type you wish to add to the parts list.



Now that the part has been added to the parts list, it is time to add the sizes you need. To do this right click on the part “Add Size...” Each slide you see listed represents a part that was imported into the parts list. In the Add Fitting Sizes dialog box, choose the size(s) you want and add in the allowable deflection (if applicable).



With the part now in the parts list, set the Style, Render Material and Pay Item for the part. You can set this globally for all sizes or you can manually set these settings for each size if desired.

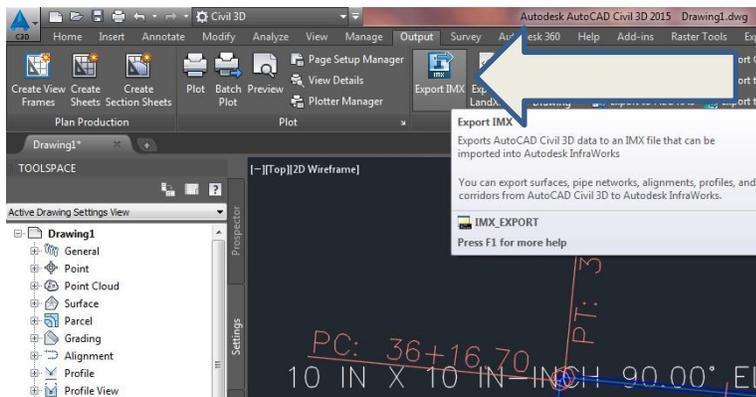
Save the parts list...the parts are now ready for use in your Pressure Network!

Share your Pressure Network using InfraWorks 360™

Now that you have finished the design it is time to share the Pressure Network with shareholders to get their buy-in. To share the design with users that do not use Civil 3D® or do not want to have to read complicated drawings we will use Autodesk® InfraWorks 360™.

Exporting the Pressure Network

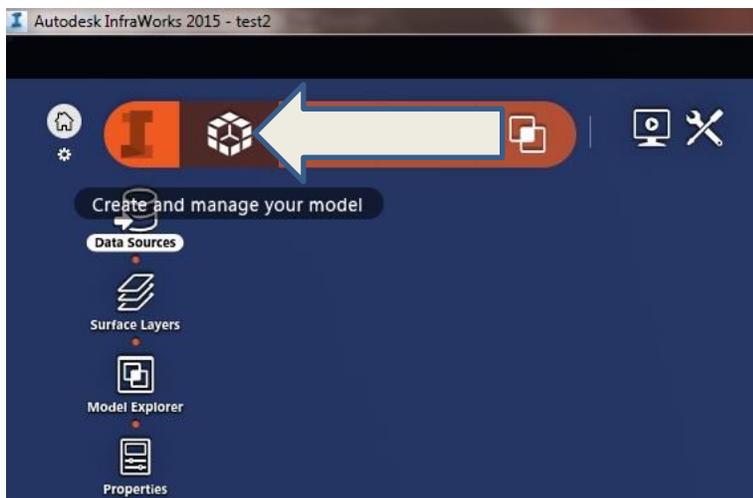
To create the .IMX file InfraWorks 360™ requires, we will use the Civil 3D® Export IMX command. This can be found on the Export panel of the Output tab of the ribbon. Civil 3D® will ask to save the file if you have not already. Civil 3D® will save the file with the same name and location as the original file.



Importing the Pressure Network into InfraWorks 360™

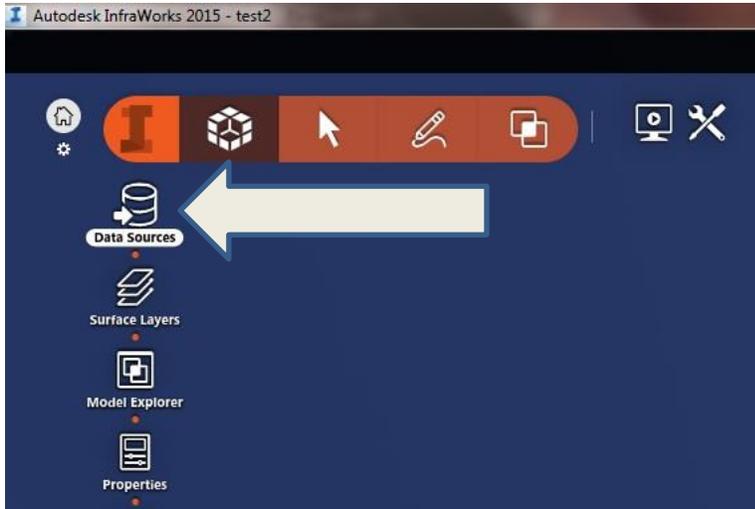
Now that you have created the .IMX file of your pressure network, it is time to import the design into InfraWorks 360™ to share with others.

Start InfraWorks 360™, create a new or open an existing model. Select the InfraWorks icon to expand the Build, manage, and analyze your infrastructure model” menu, select “Create and manage your model” button to expand its menu.

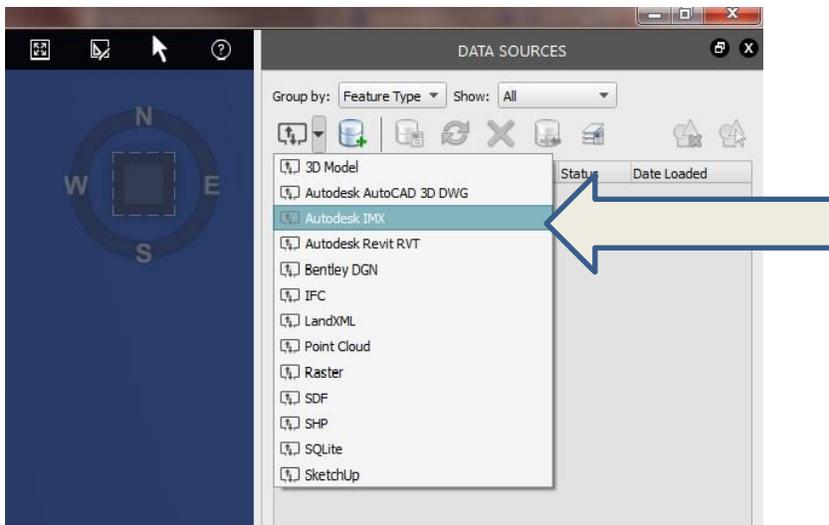


AutoCAD® Civil 3D® Pressure Networks: Building and Using Your Custom Parts Catalog

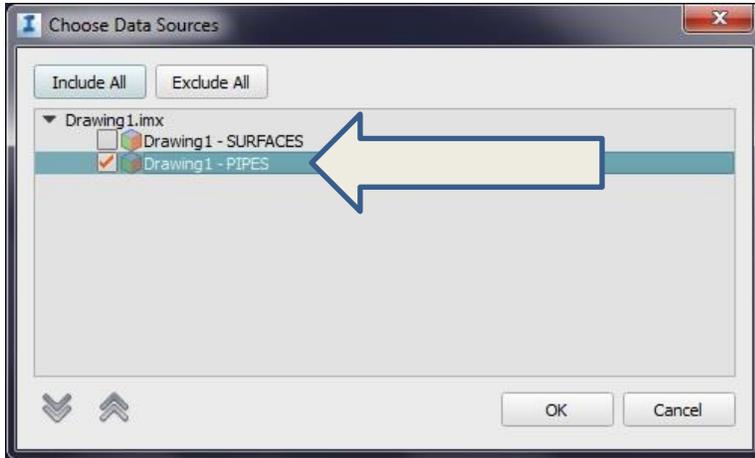
Once the menu has been expanded, select Data Sources to Import and configure data for the model.



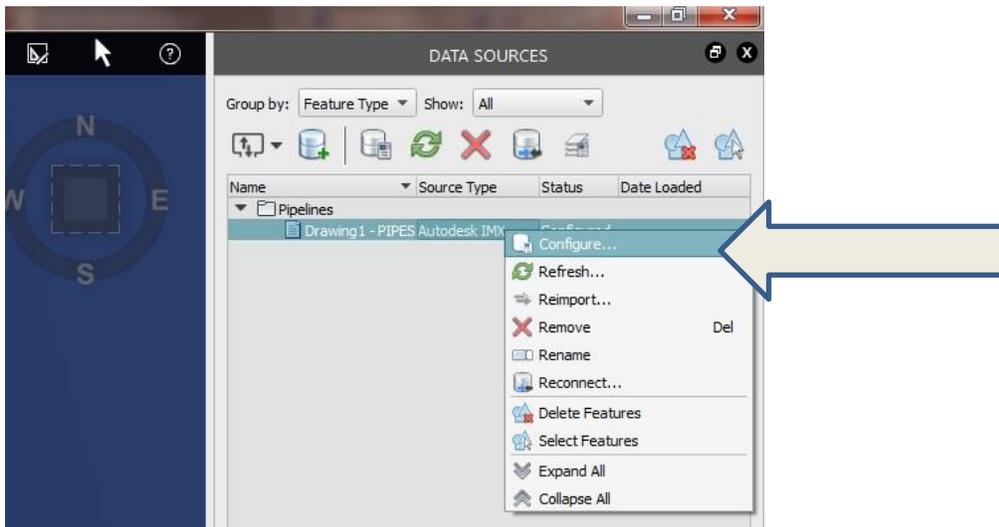
This will open the Data Sources panel; default location opens on the right side of the workspace. Use the Add Data Source pull down to select the Autodesk® IMX option. Navigate to the location of the .IMX file and select it.



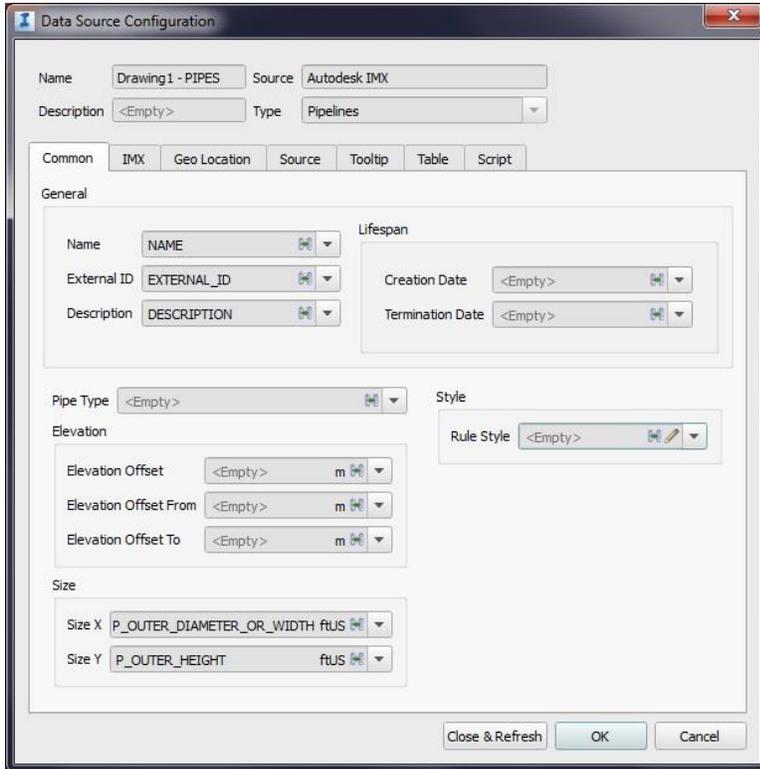
Once you select the file, the Choose Data Sources dialog box will appear. Select the PIPES data type and click “OK”.



InfraWorks 360™ will process the file. Once it has completed the file will show up in the Data Sources panel. Right-click on the file and select Configure, this will launch the Data Source Configuration window.



You can use the Data Source Configuration window to adjust how the data is represented in the model. See the Help menu in InfraWorks 360™ for more information on each tab.



Conclusion

Now you have the knowledge to create a Pressure Network Catalog with the parts that you use in your industry. We are not limited to the standard parts that ship with Civil 3D®. Once you have created the Pressure Network, the Civil 3D® IMX Export functionality allows you to share your design in a non-technical manner using Autodesk® InfraWorks 360™.