Appendix V – Examples of BIM Object Authoring and Importing Civil 3D BIM Objects into BIM Models

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1. Introduction

BIM object authoring and insertion methods into BIM models may vary between software. In this Appendix, Revit and Civil 3D are used as examples to outline the creation methods. If software other than the two software is adopted, the methods for creating BIM object should be properly documented in the BEP.

Irrespective of software used, built-in templates, functions and built-in attributes within the authoring software should be used as far as practicable.

2. Revit BIM Objects

2.1. Revit Family Templates for BIM Object

Revit provides family templates for creating BIM object. The table below shows the Revit family templates that would be used for the types of revamped BIM object.

Table 2-1 Revit Family Template to be Used for the Types of BIM Objects

Item No.	Type of BIM Object	Revit Family Template to be Used
1.	Electrical switch, socket outlet, control box, sensor	Electrical Fixture
2.	LV switch board, genset, motor	Electrical Equipment
3.	Lighting, lamp	Lighting Fixture
4.	Pump, air-conditioning	Mechanical Equipment
5.	Manhole, gully, U-channel	Plumbing Fixture
6.	Road sign, sign gantry, road furniture, noise barrier	Site
7.	Pipe accessories such as valve, water meter, fire hydrant	Pipe Accessories
8.	Louvre	Window
9.	Silencer, damper	Duct Accessories
10.	Diffuser	Air Terminal
11.	Sign, symbol	Detail Item

3. Civil 3D BIM Objects

3.1. Name of Civil 3D Tool for BIM Object

Civil 3D provides tools for creating BIM object. The table below shows the tools that would be used for the types of BIM objects.

Table 3-1 Civil 3D Tools to be Used for the Types of BIM Objects

Item No.	Type of BIM Object	Civil 3D Tool to be Used
1.	Manhole, gully, chamber, pit, outlet, etc.	Part Builder
2.	Gravity pipe and culvert	Part Builder
3.	Pressure pipe, fitting, valve, pipe accessory, etc.	Content Catalog Editor
4.	Channel, trench, pipe/culvert of irregular shape, etc.	Subassembly Composer
5.	Carriage way, footway, cycleway and other pavements	Subassembly Composer
6.	Kerb, edging, concrete backing, barrier, etc.	Subassembly Composer

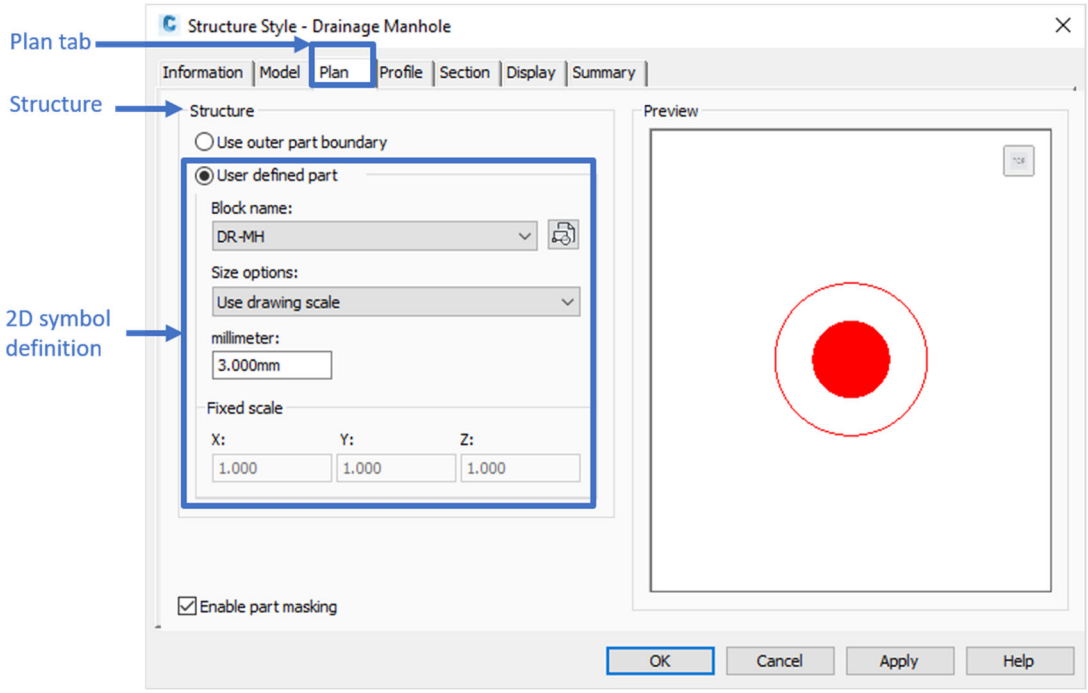
3.2. Use of Civil 3D Object Style for 2D Presentation

3.2.1. In Civil 3D, 2D symbols cannot be embedded in BIM objects. To handle 2D presentation, Civil 3D Object Style would be used for the types of Civil 3D BIM objects.

3.2.2. Civil 3D Object Style includes general attributes for handling 2D symbol for BIM object, object colour, visibility of object components, object fill patterns, etc. Below is an example of settings Object Style for a drainage manhole.

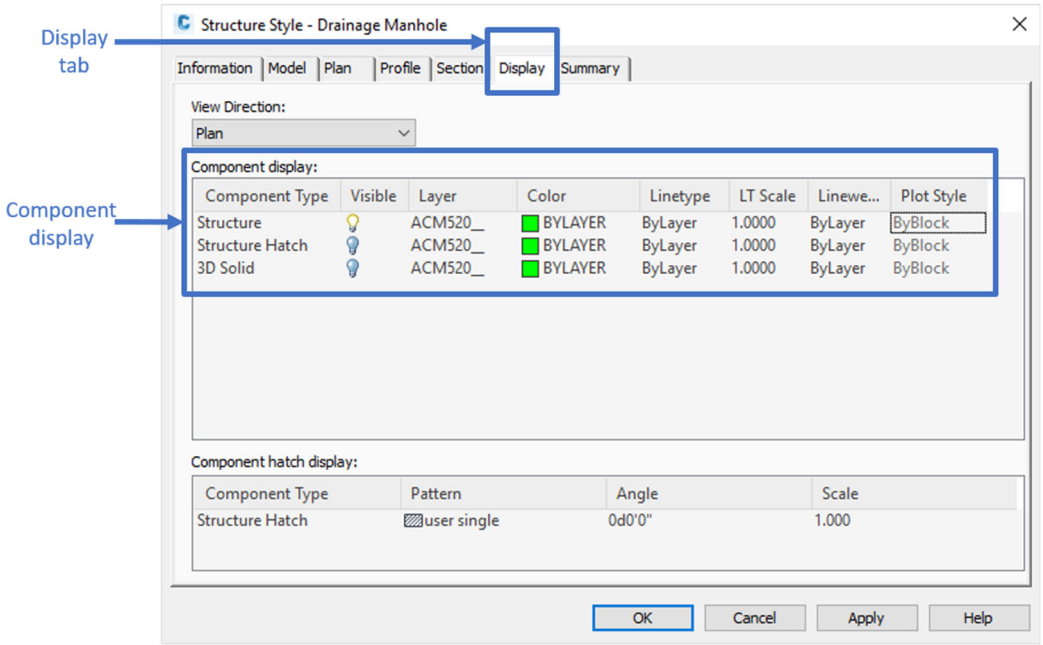
a) 2D presentation of drainage manhole could be set under tabs of "**Plan**", "**Profile**" and "**Section**". 2D symbol could be defined in the "**Structure**" under "**Plan**" tab as illustrated in the figure below.

Figure 3-1 Setting of Structure Style for 2D Symbol



b) Layer, color, line type, line scale, line weight and visibility of object components could be set in "**Component display**" under "**Display**" tab as illustrated in the figure below:

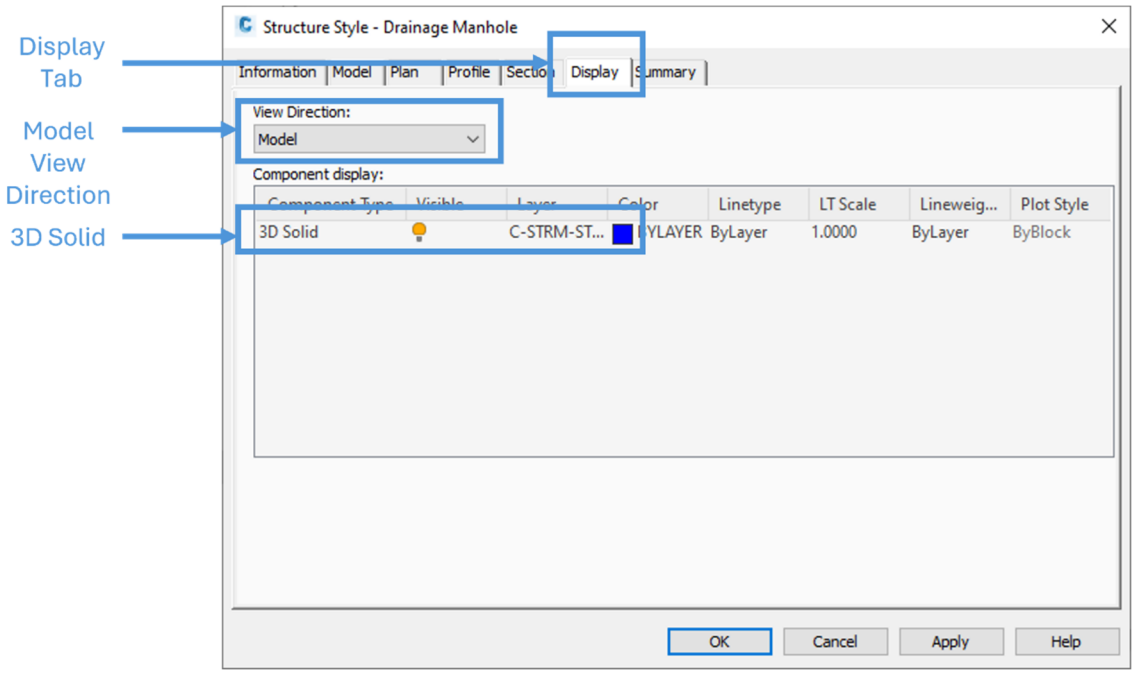
Figure 3-2 Setting of Component Display



3.3. Use of Civil 3D Object Style for 3D Presentation

3.3.1. In Civil 3D, Civil 3D Object Style would be used for setting the 3D presentation of Civil 3D BIM objects. To present the finalised 3D models, the visibility of finalised objects could be switched on. Reference data generated during modelling process could be switched off. Below is an example of switching on visibility for a drainage manhole.

Figure 3-3 Setting of Structure Style for 3D Presentation



4. Insertion of Civil 3D BIM Objects into BIM Models

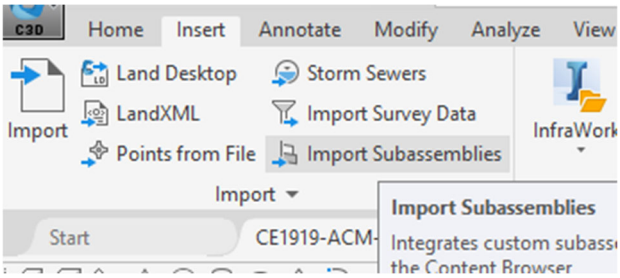
For the two types of Civil 3D BIM objects, subassemblies and pipes catalog, the steps for insertion of Civil 3D BIM objects into BIM model using the import function are described in the sections below.

4.1. Subassemblies

4.1.1. A .pkt file is a subassembly file for creating assemblies and corridor in Civil 3D. Autodesk Subassembly Composer should be used for creating subassemblies. Except the layout of the subassemblies, the super elevation, target and component parameters can be set when creating a subassembly. All parameters can be exported to Civil 3D.

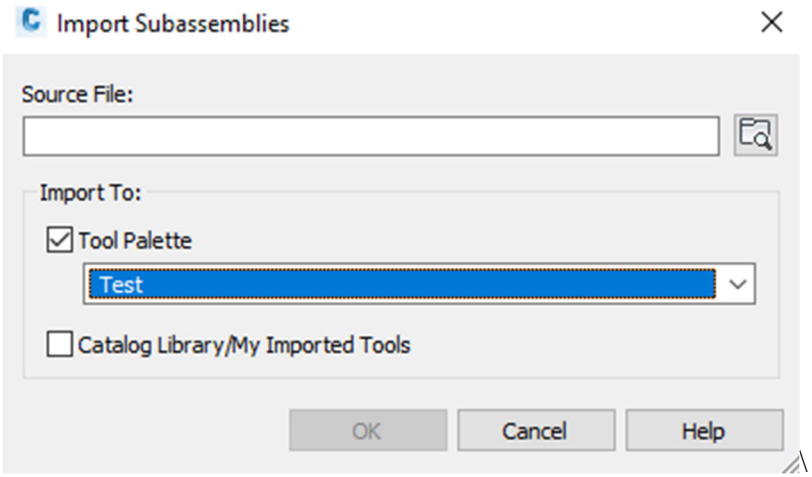
4.1.2. In Civil 3D, "Import Subassemblies" button can be found in "Insert" tab to import the .pkt file.

Figure 4-1 "Import Subassemblies" Panel



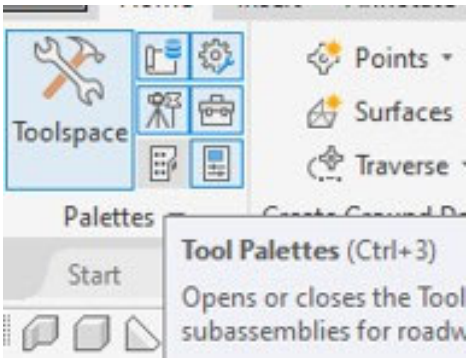
4.1.3. Search the .pkt file which needs to be imported via "Source File". New tool palette can be created in "Tool Palette" to organise those subassemblies by project.

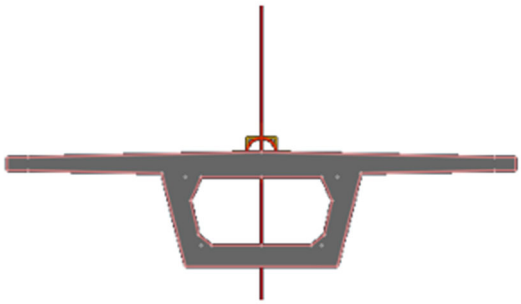
Figure 4-2 Input Source File for "Import Subassemblies"



4.1.4. To utilise the subassemblies file, turn on the “Tool Palettes” after creating an assembly. Drag the subassemblies into assembly. Then create a corridor by using the same assembly.

Figure 4-3 "Tool Palettes" Panel



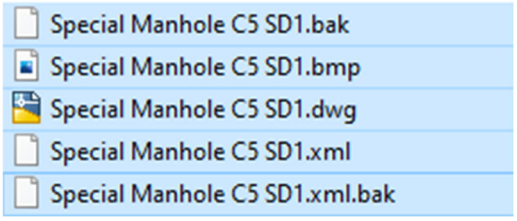


4.2. Pipes Catalog

4.2.1. "Pipes Catalog" is stored in a folder which contains all required structures and pipes. The required structures and pipes should be created by Part Builder, a built-in creator in Civil 3D that generates five types of file (.bak, .bmp, .xml, .dwg, .xml.bak) for one component. The component with all structure and pipes should be saved at the folder path below or (similar):

Figure 4-4 Files for "Pipes Catalog"

C:\ProgramData\Autodesk\C3D 20XX\enu\Pipes Catalog

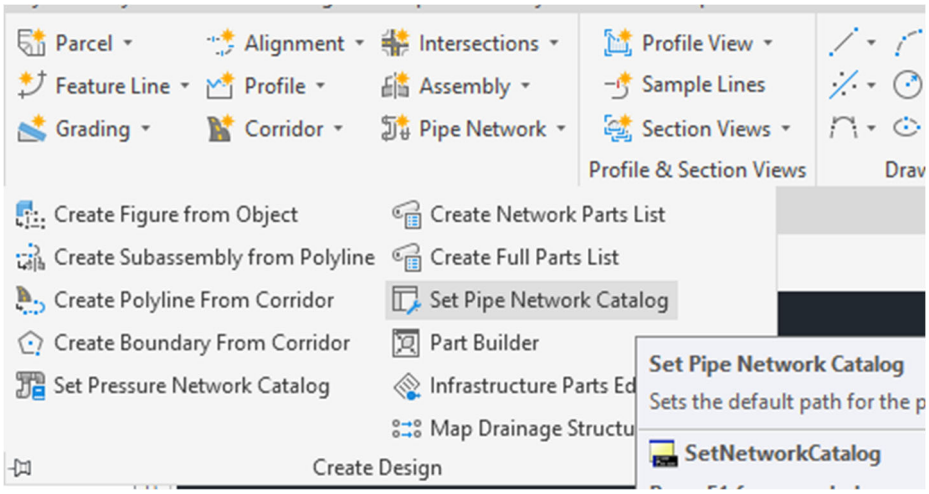


4.2.2. To importing pipes catalog into Civil 3D:

a) Move the customized pipe/structure folder into "Pipes Catalog" or into "Metric Pipe/Structure Catalog". The five file types should be moved into the same folder.

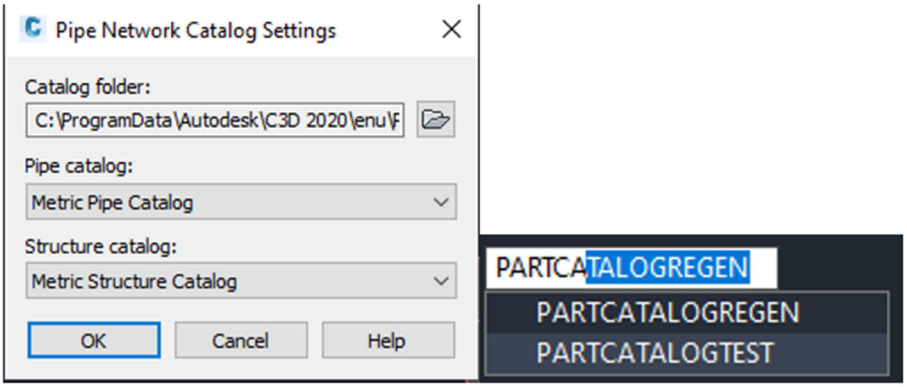
b) Set the "Pipe Network Catalog" to the folder which stored the five file types.

Figure 4-5 Set "Pipe Network Catalog"



c) Regenerate the pipes catalog by using the command "PARTCATALOGREGEN".

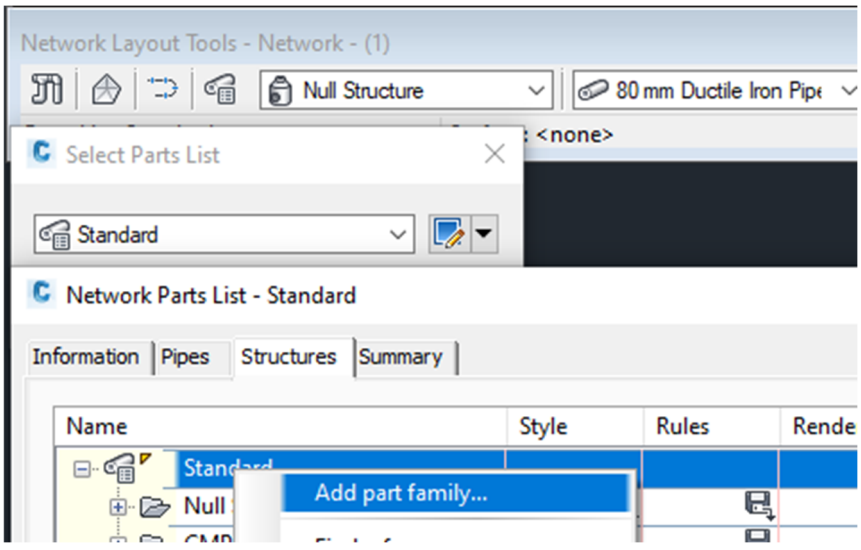
Figure 4-6 Pipe Network Catalog Settings



d) The structures and pipes should be added to Pipe Network after importing the pipe catalog using the following commands:

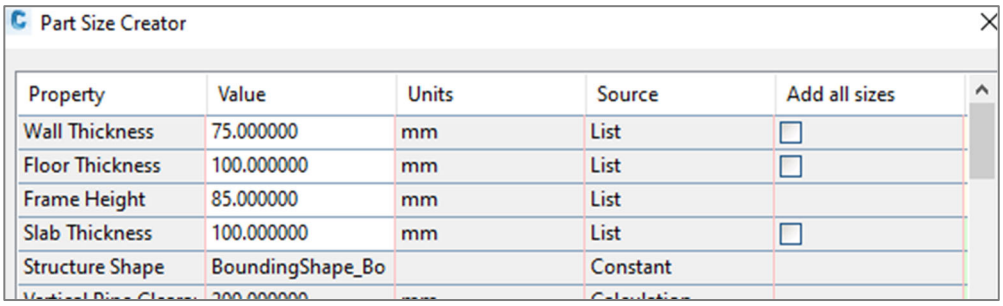
"Edit Network" > "Select Parts List" > "Add part family" in both Pipe and Structures tab. Right click the part just added into the list >"Add part size" > tick "Add all sizes".

Figure 4-7 Edit Network Parts List



e) The properties of Part Size Creator are as follows:

Figure 4-8 Properties of Part Size Creator



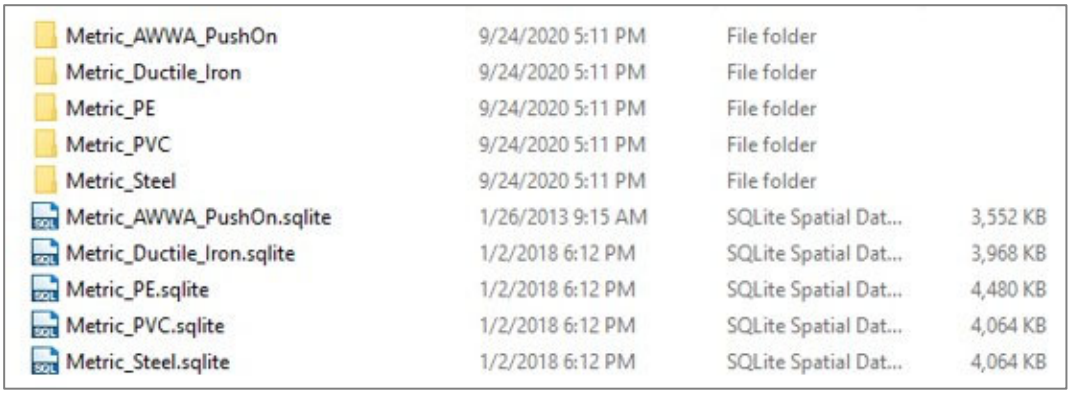
4.3. Pressure Pipes Catalog

4.3.1. Different from pipes catalog, pressure pipes catalog should be created using .sqlite format with different creation procedures.

4.3.2. The "Pressure Pipes Catalog" is stored in "C:\ProgramData\Autodesk\C3D 2020\enu\Pressure Pipes Catalog\Metric".

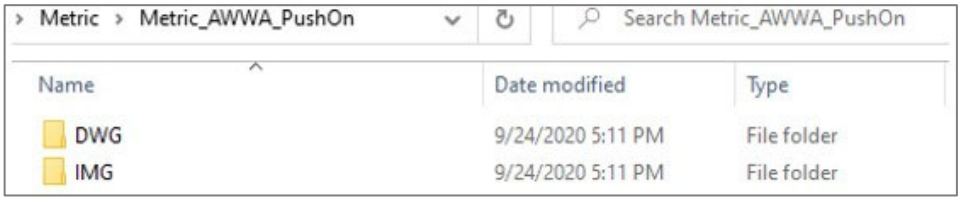
The default catalog includes:

Figure 4-9 Default Catalog



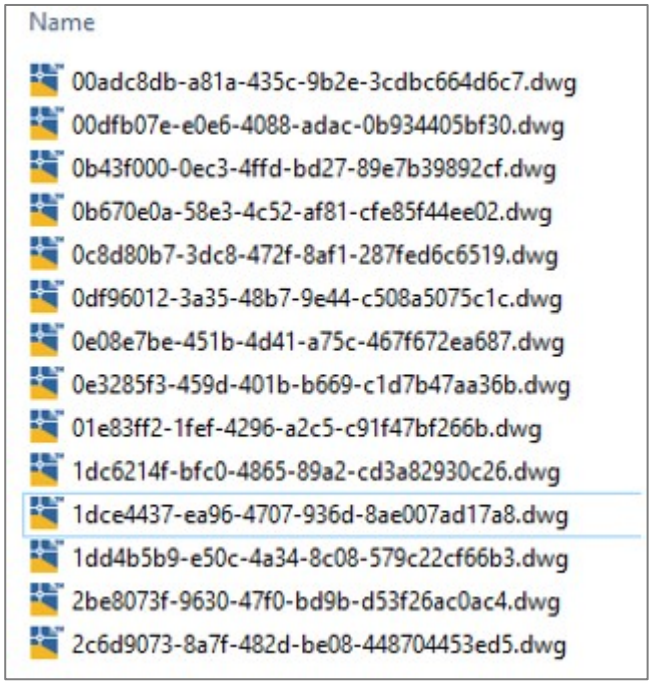
4.3.3. Inside a folder, the parts stored in two folders: DWG and IMG.

Figure 4-10 Each Folder stored with below Two Folders



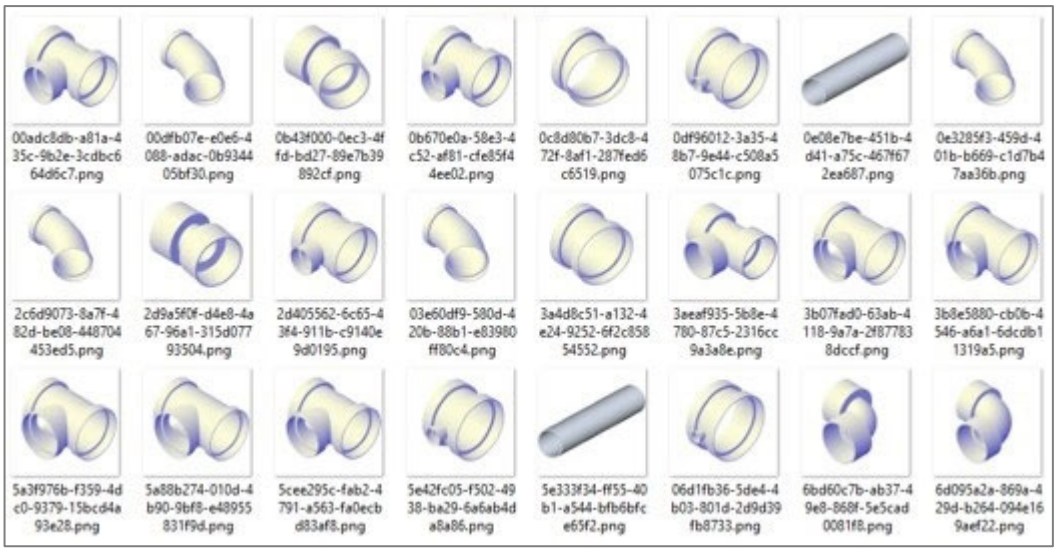
4.3.4. In DWG folder, the .dwg drawings are typically not identifiable by default names.

Figure 4-11 Default Names of the Drawings in the DWG Folder



4.3.5. The IMG folder contains images (in .png formats) whose names match the corresponding .dwg files.

Figure 4-12 Images in IMG Folder



4.3.6. Creating a Pressure Pipe Fitting in Civil 3D

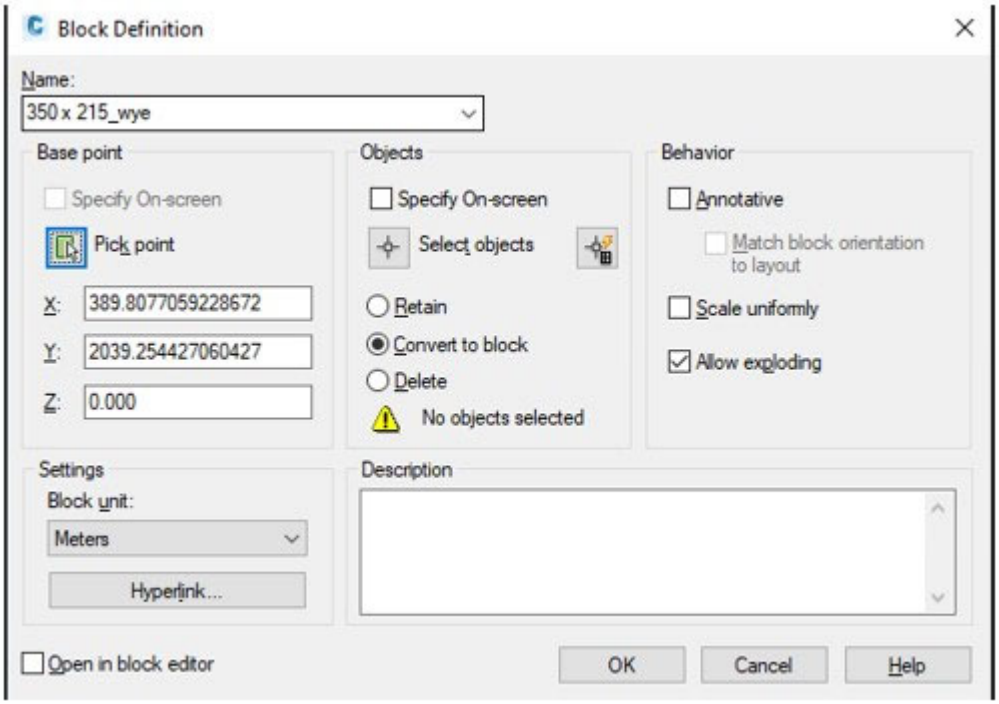
To create a new part, Civil 3D's "Content Catalog Editor" could be used to create a database. "Content Catalog Editor" is a plug-in for Civil 3D, it is not a function or a panel in Civil 3D. To open the "Content Catalog Editor", type "Content Catalog Editor" in the Window Search panel. Refer to below steps (a to p) for details.

a) Draw lines to represent the run and branch.

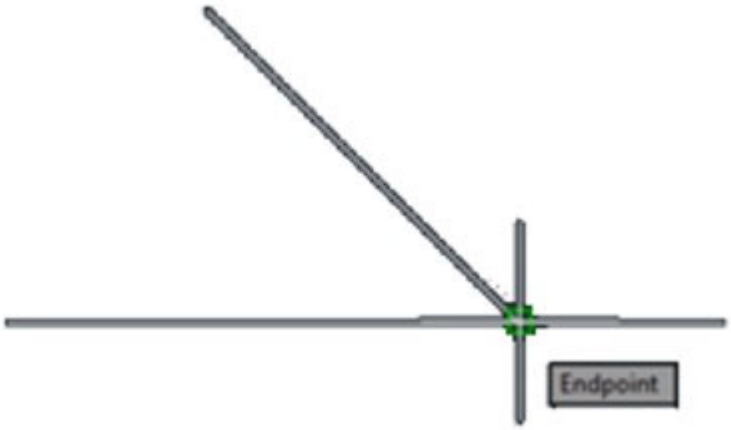
b) Copy lines to prepare for 3D model creation.

c) Convert the original lines into a block to display a single line fitting.

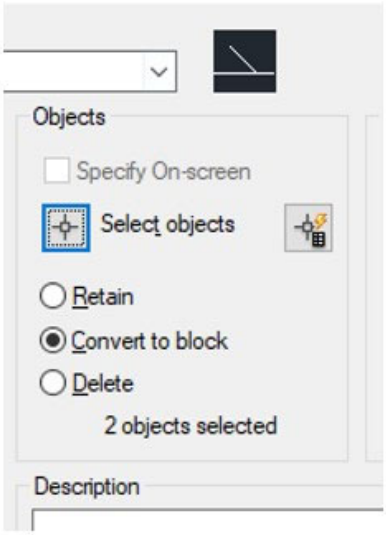
d) Type “BLOCK”. When block definition window pops up, define the part’s name.



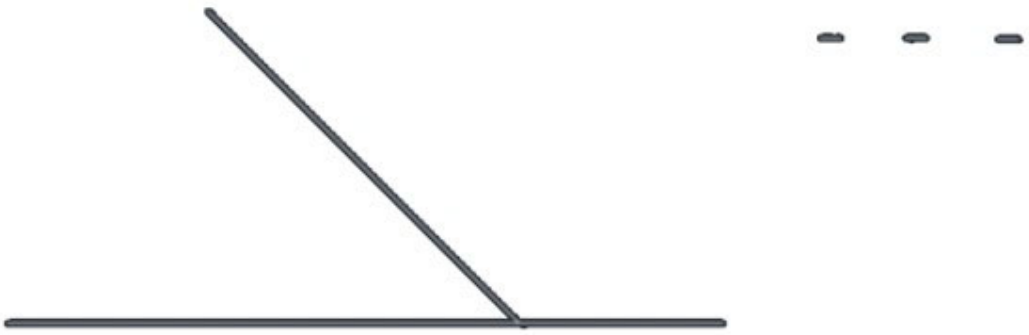
e) Pick the intersection point for the base point.



f) Select the original lines as Objects and click “convert to block”.

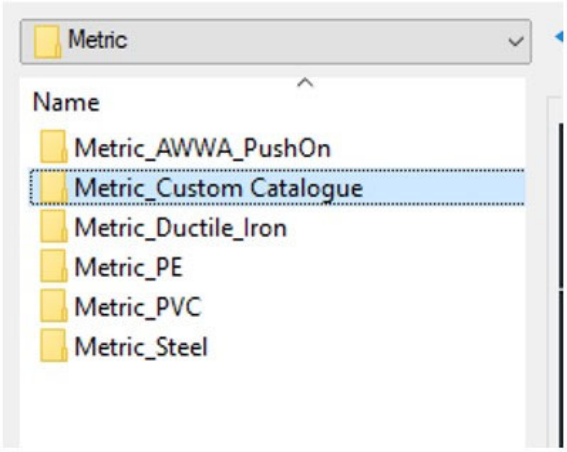


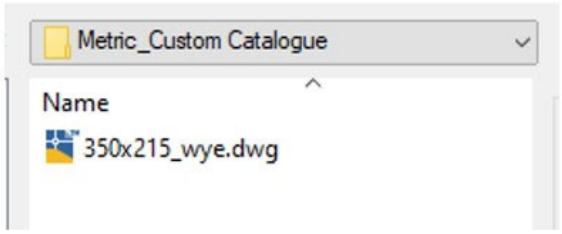
g) After the block is created, return to the copied lines and draw few lines to represent the thickness of the flanges.



h) Create circles with inner diameter and outer diameter for the body. Then, create three more circles for the flanges.

i) Before forming the model, save the drawing as a .dwg into the "Pressure Pipes Catalog" first. It is suggested to create a new custom catalog instead of saving into the default catalog.





j) Back in the drawing, right click on the panel (as shown in Figure j-1) to choose the "Modelling" function (Figure j-2), and use "Sweep" function (Figure j-3) to create the 3D model.

Figure j-1

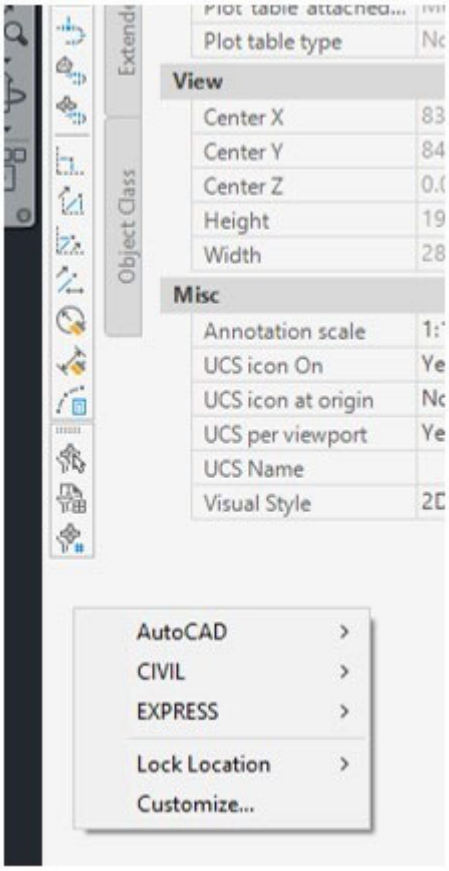


Figure j-2

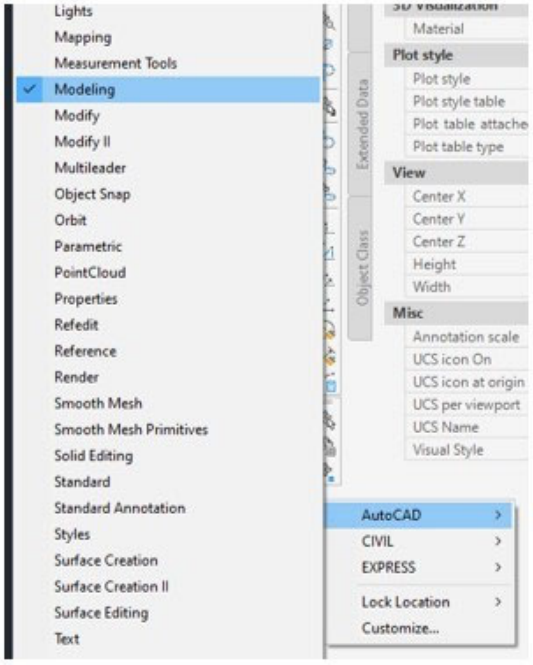
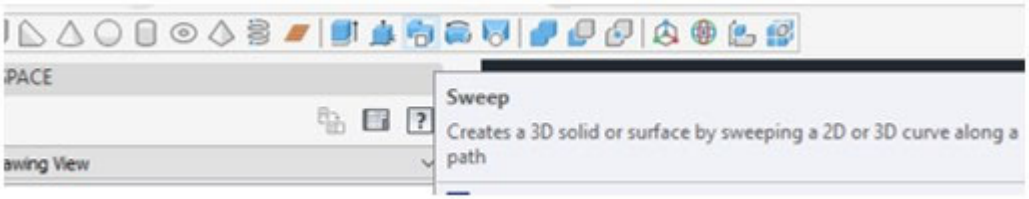
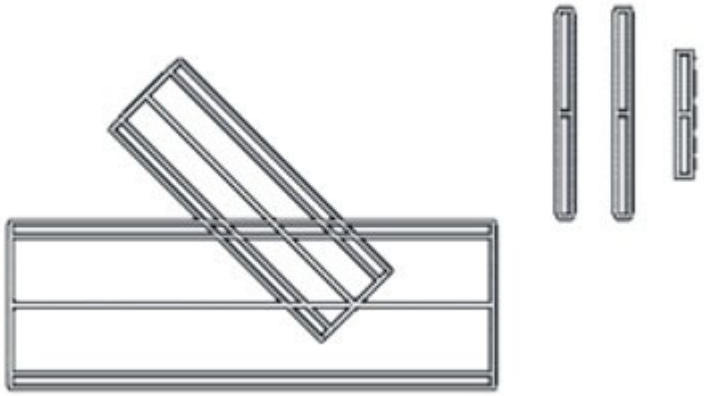


Figure j-3 for the Sweep function toolbar:

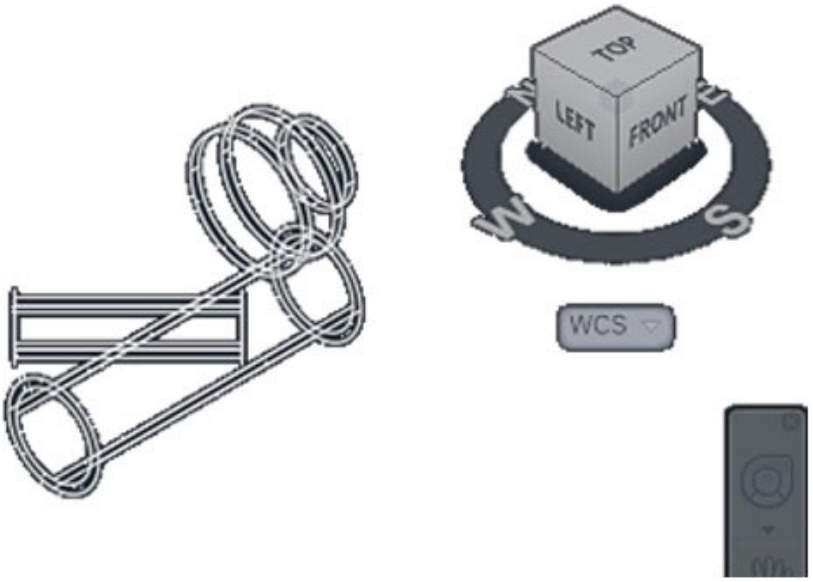


k) Select the sweep objects (circles) first; then select the sweep path (lines).

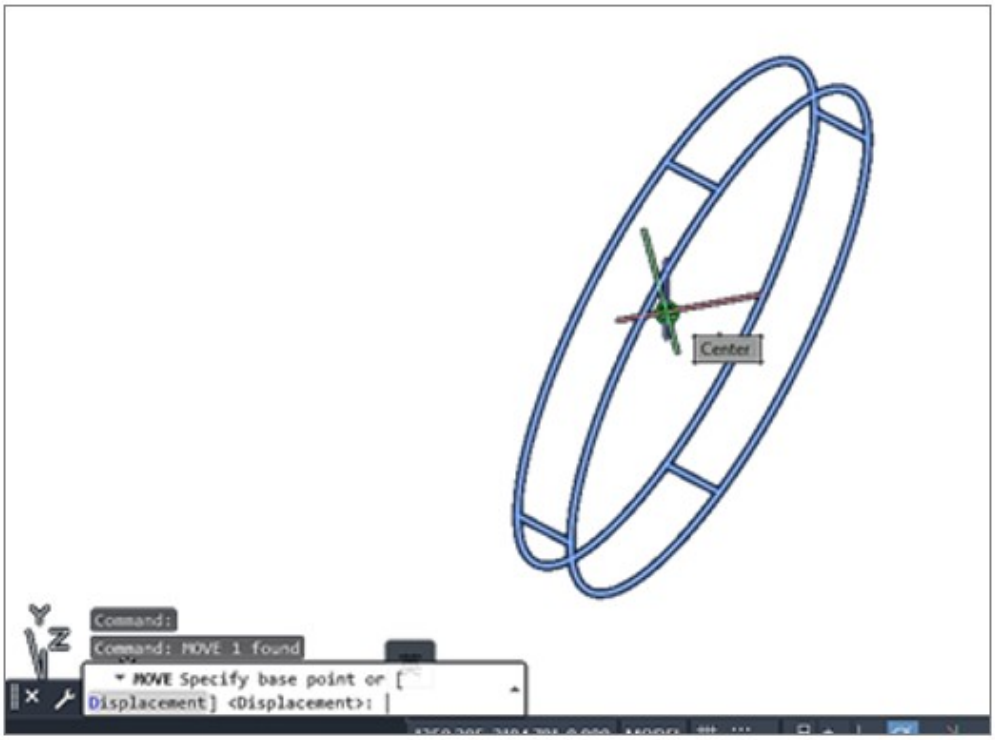


l) Change to 3D view (Screen l-1). For easier modelling, type “MOVE”, set the base point center to the flange object (Screen l-2), and move the flanges center to the end of the wye (Screen l-3).

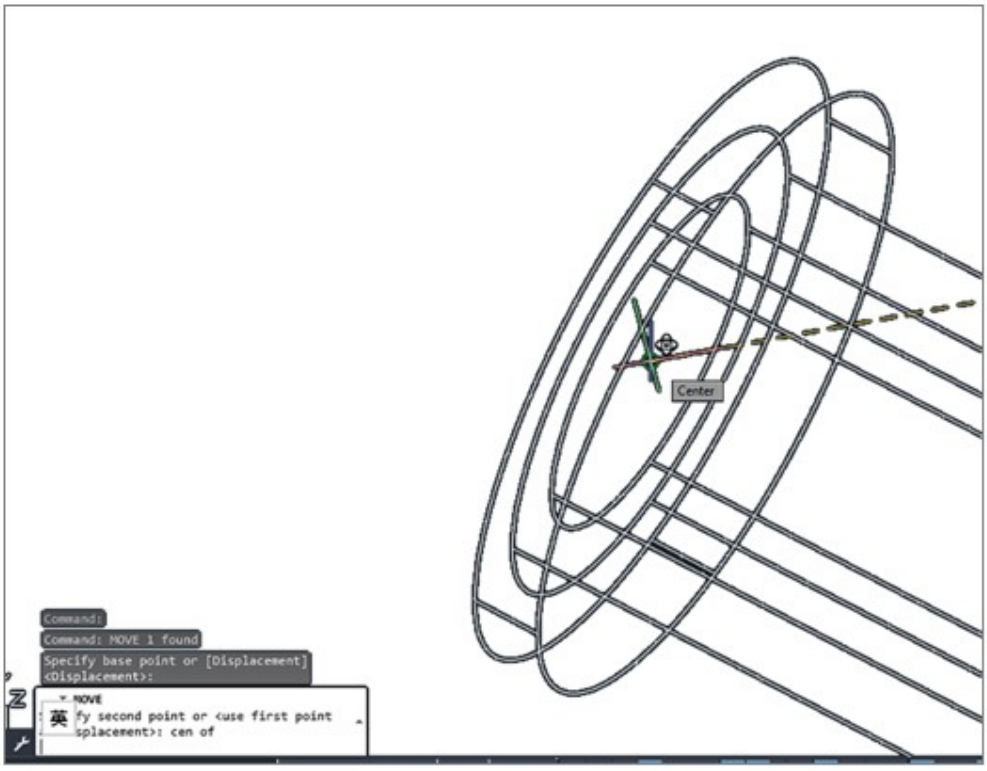
Screen l-1



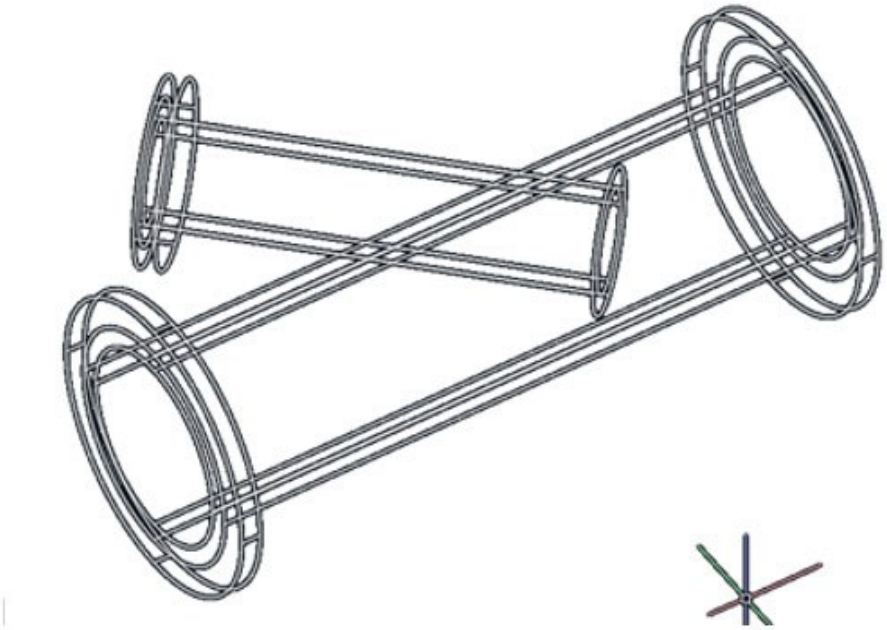
Screen l-2



Screen l-3

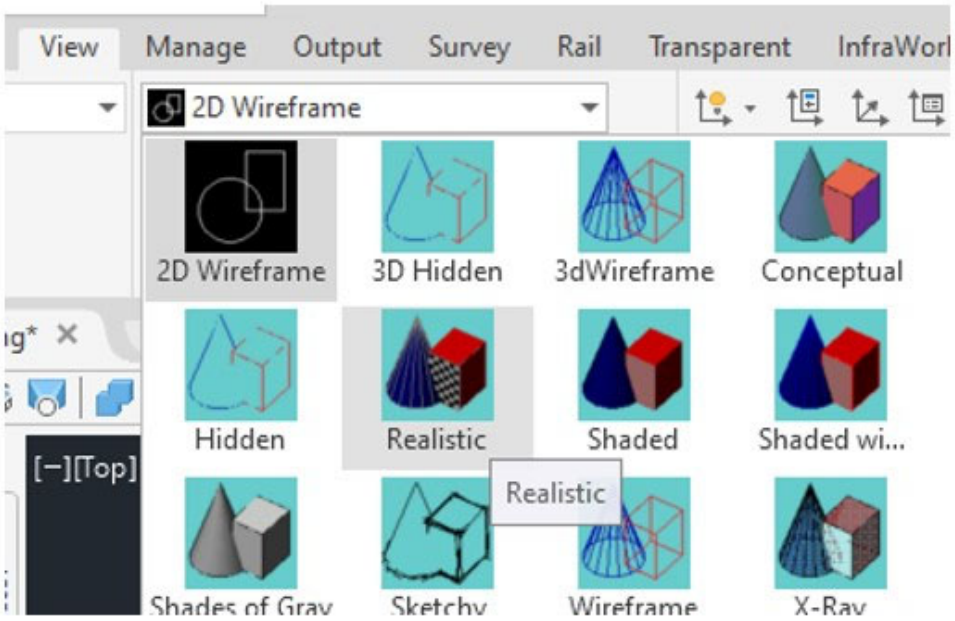


The result after moving the flanges to the object is as follows:

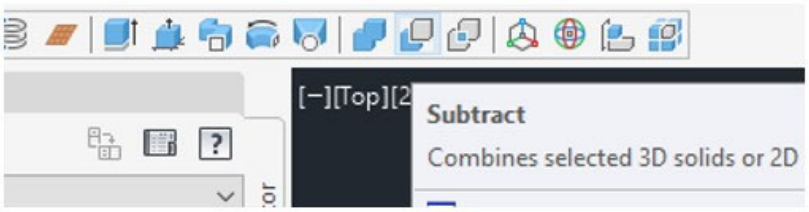


m) Change the view to "Realistic", and use the "Subtract" function to connect all the parts. Select all outer cylinder first (Figure m-1) then select the inner cylinder for subtraction (Figure m-2).

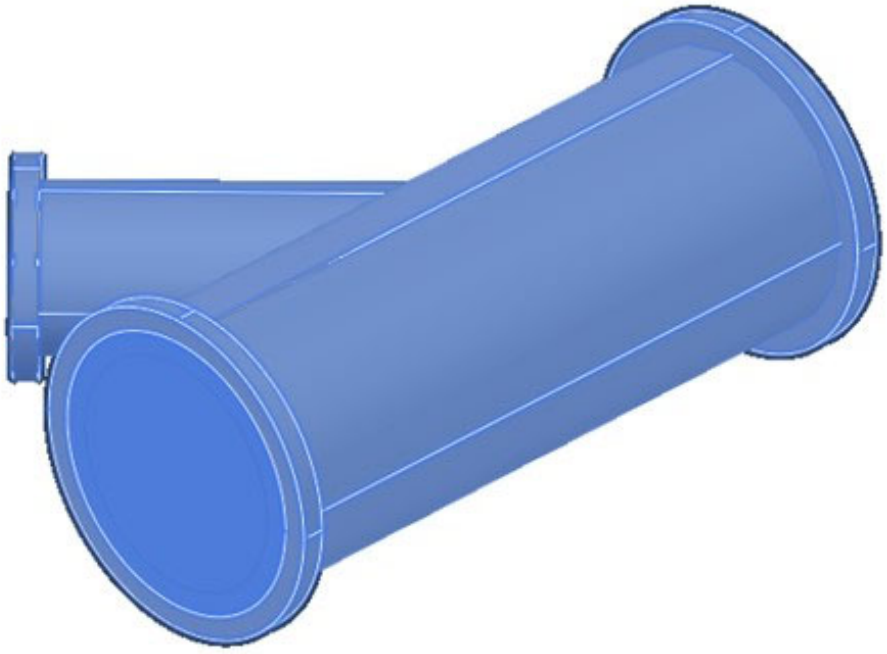
The display panel view is as follows:



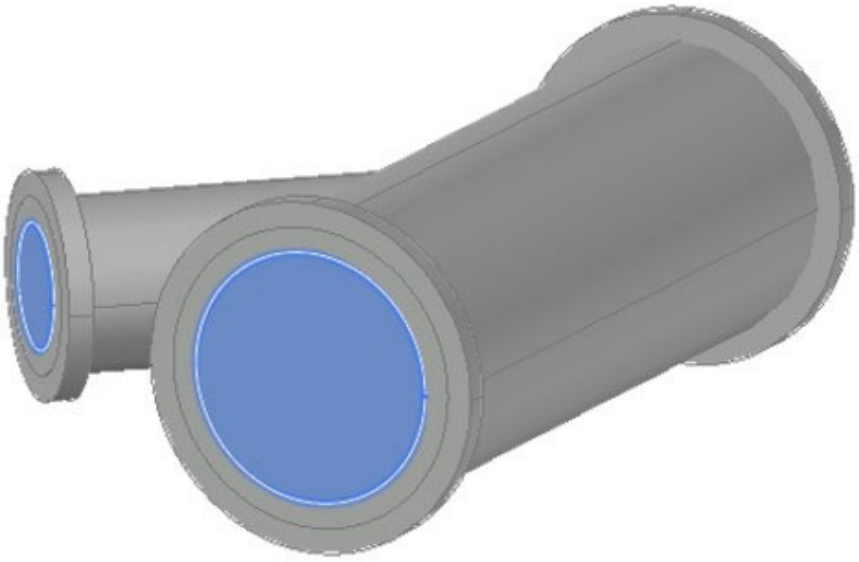
The subtract toolbar is as follows:



Screen m-1

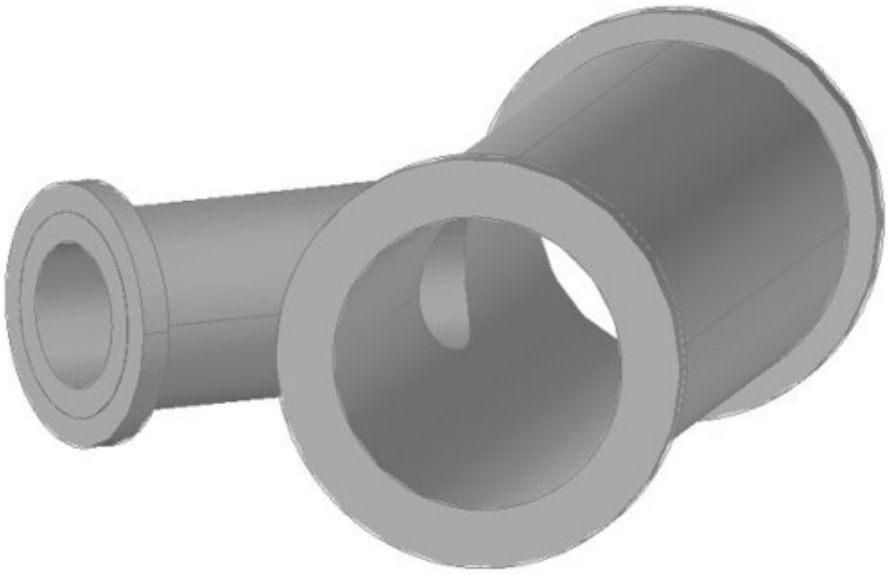


Screen m-2

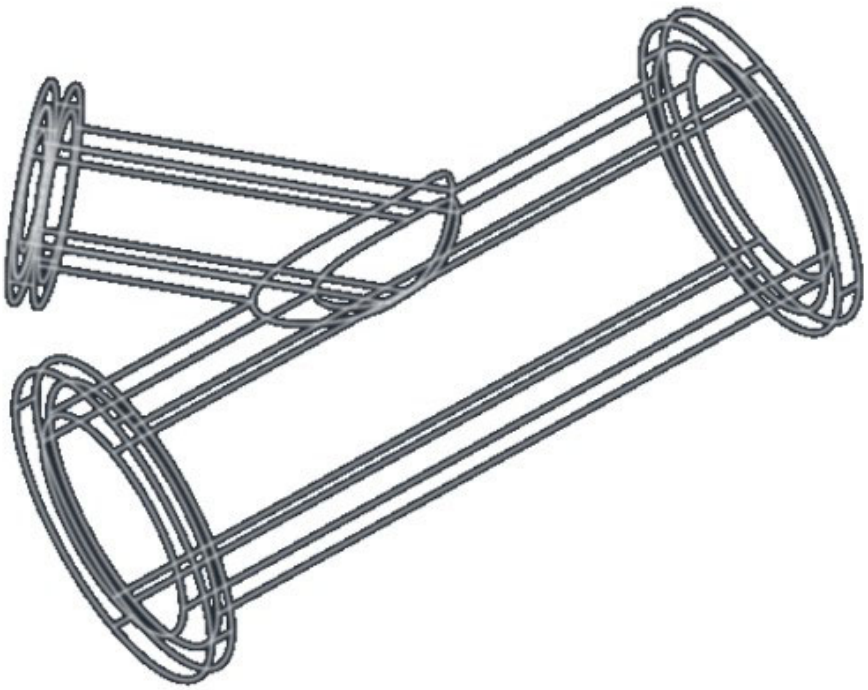


The result after subtracting the inner cylinder is as follows:

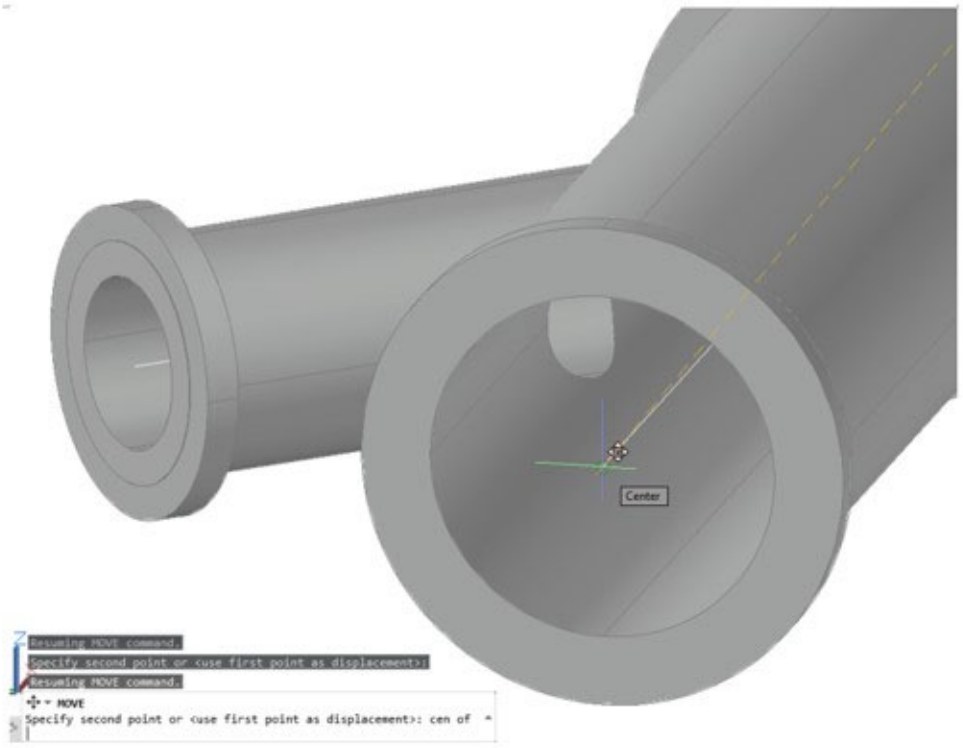
Realistic:



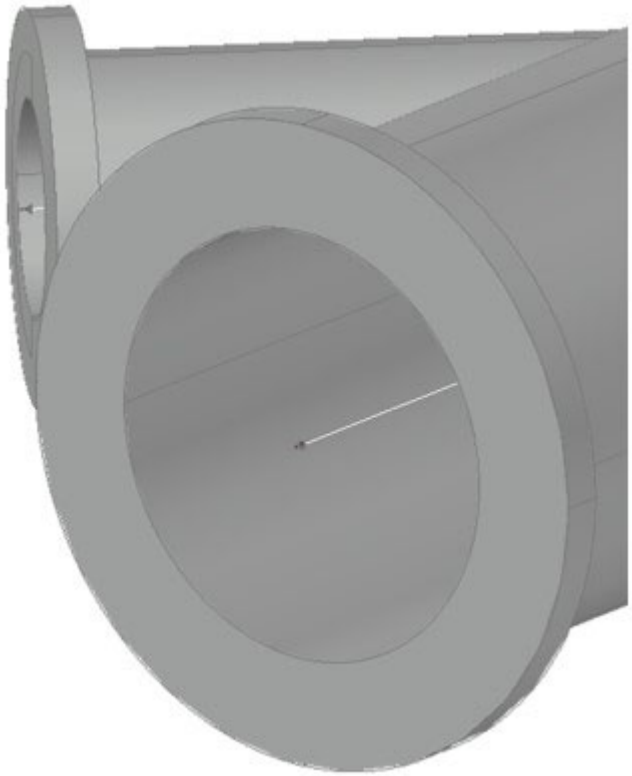
Wireframe:



n) Move the block (Created in Step f) center to the 3D object.

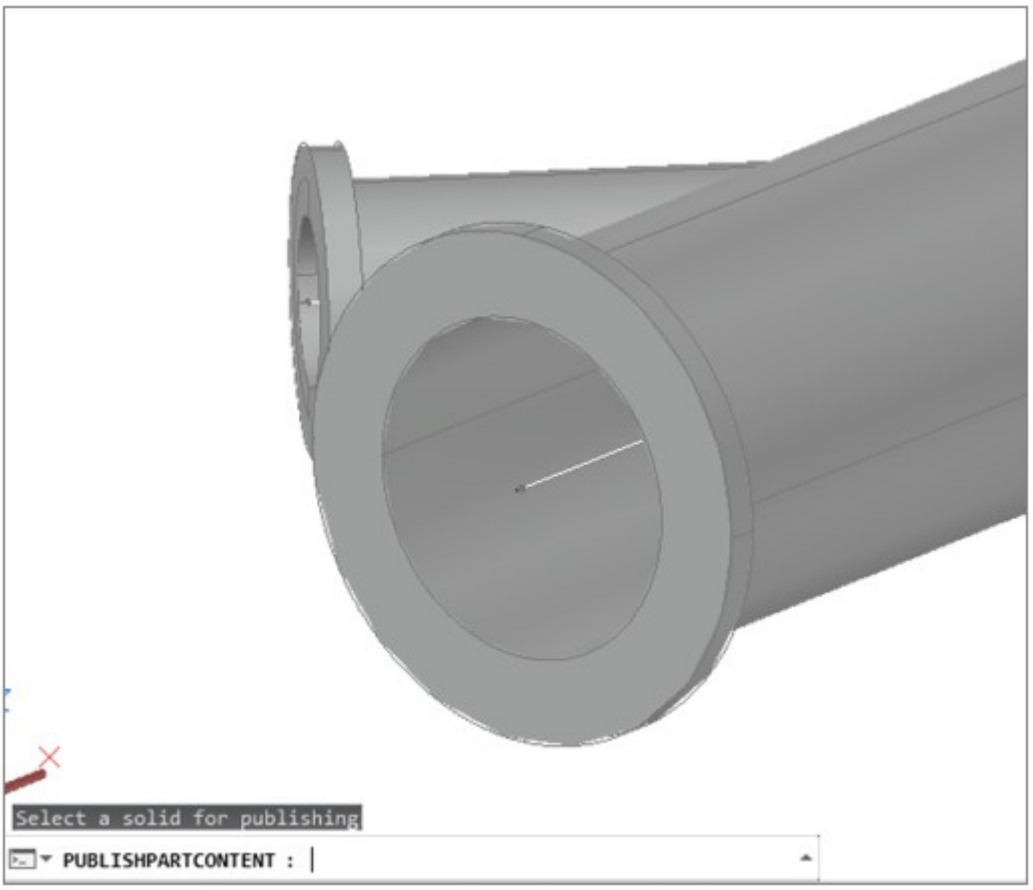


o) Under “Insert” Panel, select “Connection Point” tab, and insert the connection point into the objects.

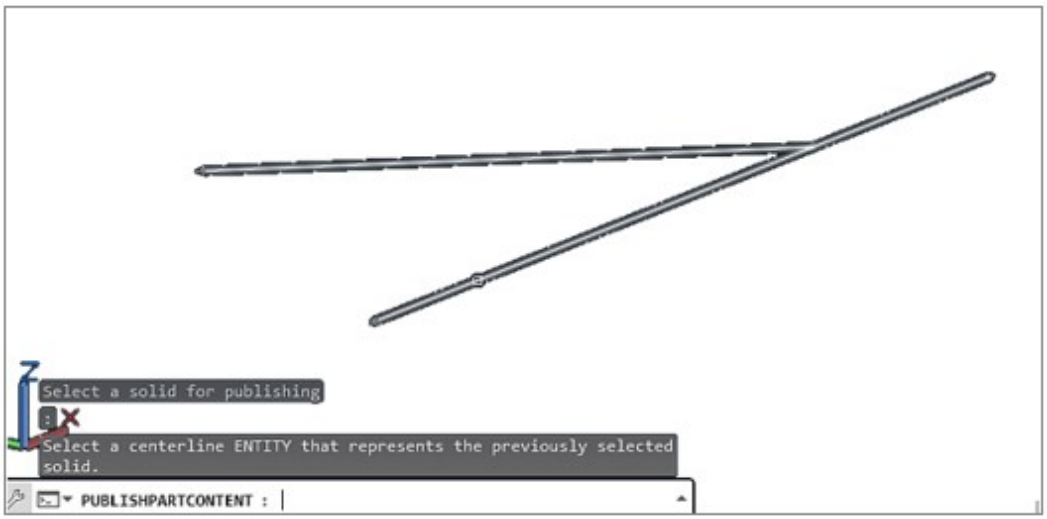


p) Type "PUBLISHPARTCONTENT" command and select the object (Figure p-1) and block (Figure p-2). Define the measuring unit (Figure p-3) and part type (Figure p-4). Save the content file in the same "Custom_Catalog" folder.

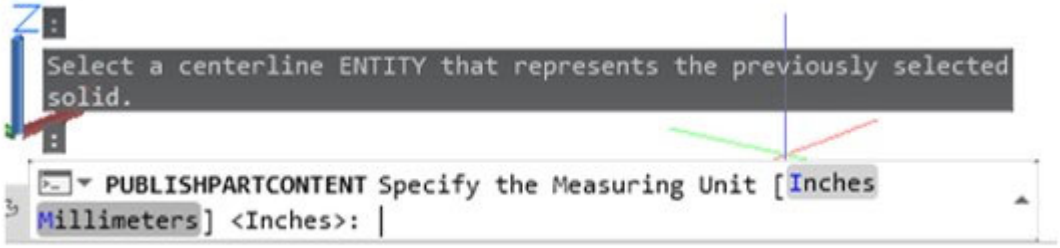
Screen p-1



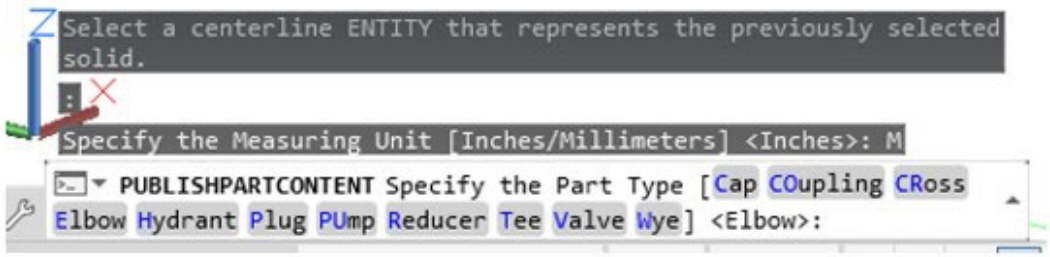
Screen p-2



Screen p-3



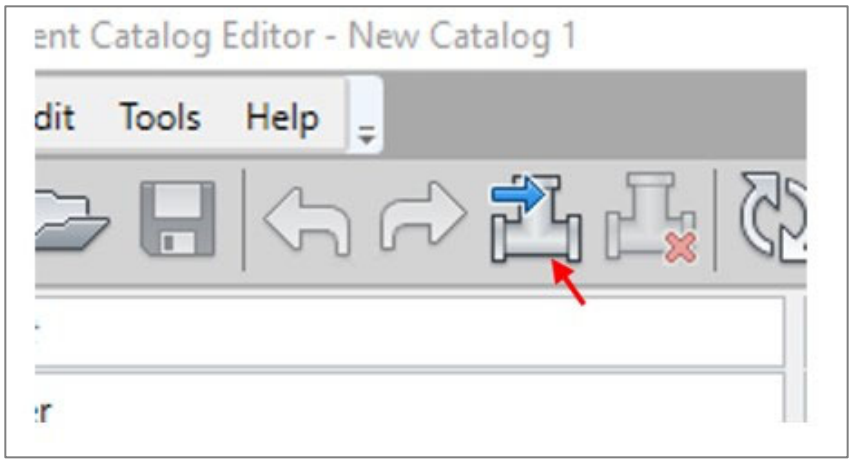
Screen p-4



4.3.7. Using “Content Catalog Editor” to Create .sqlite File.

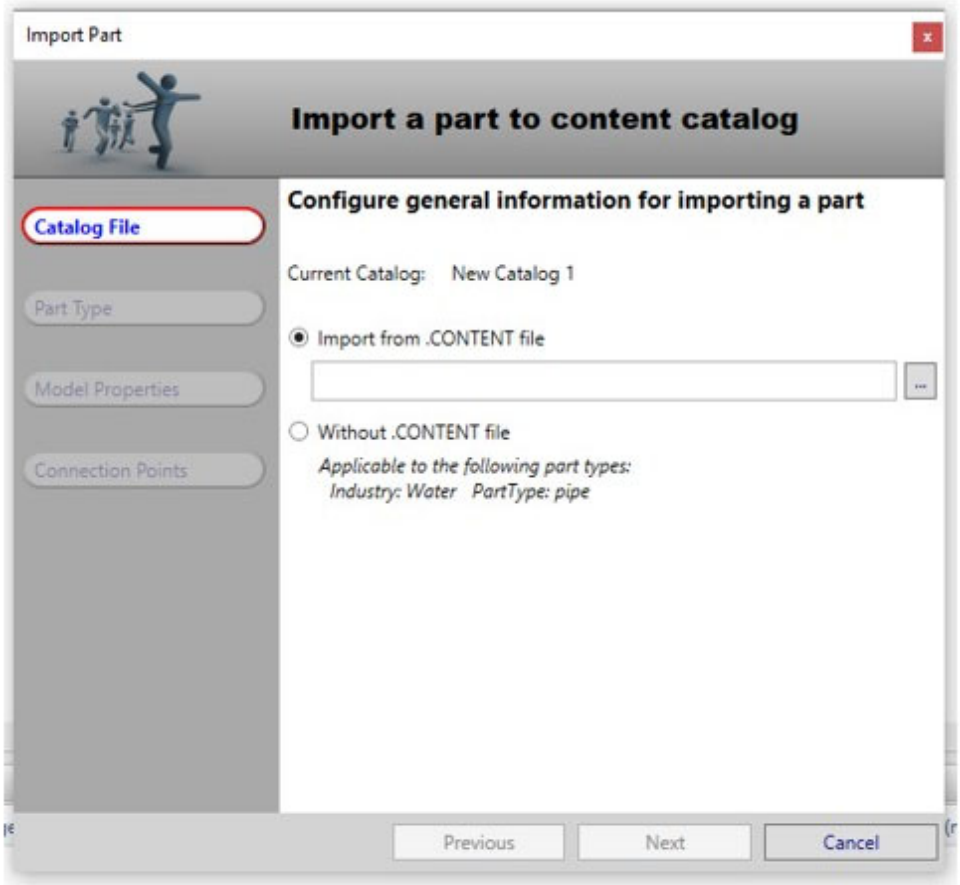
a) In “Content Catalog Editor”, create a new file and import the content file (Figure below). The attributes should be input properly to complete the importing.

Figure 4-13 Panel of “Content Catalog Editor”



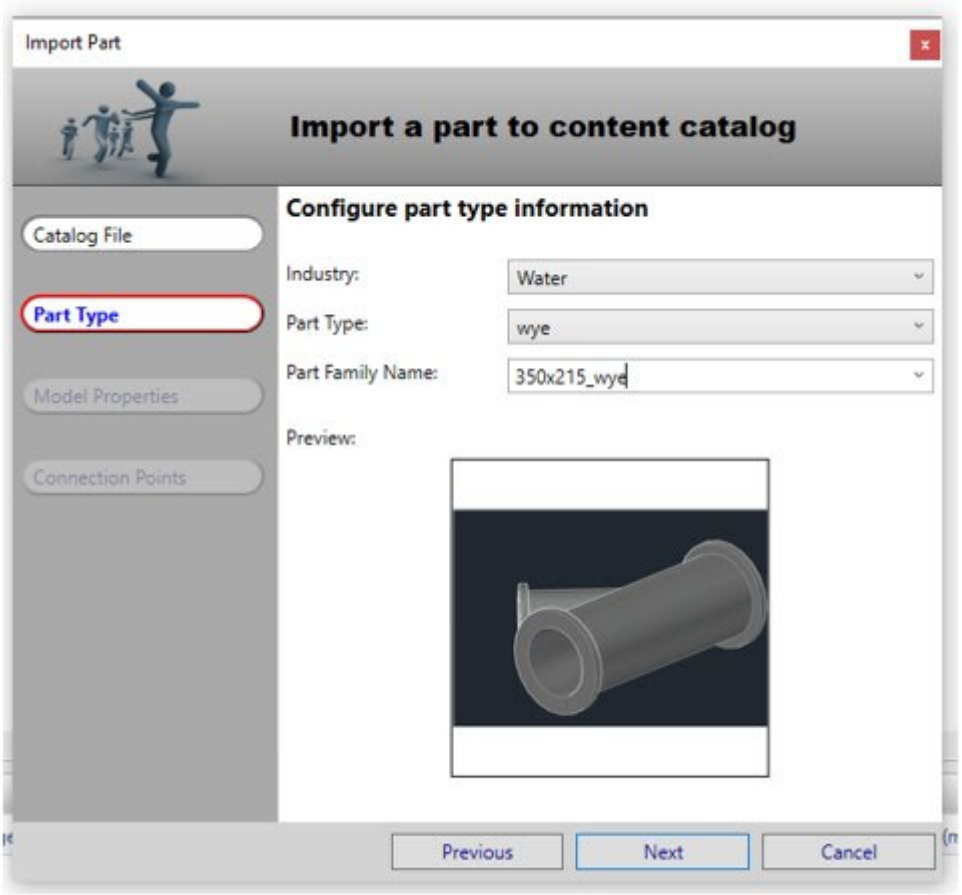
b) Import a part to content catalog under Catalog File:

Figure 4-14 Configure General Information for Importing a Part



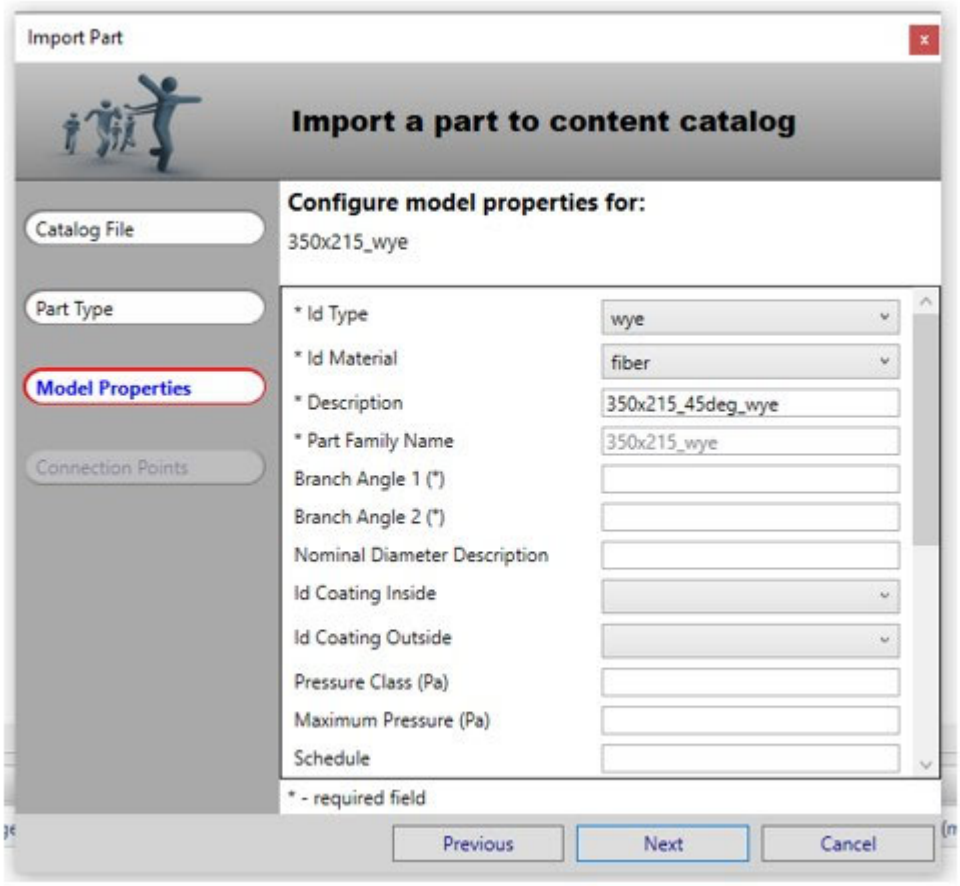
c) Configure part type information:

Figure 4-15 Configure Part Type Information



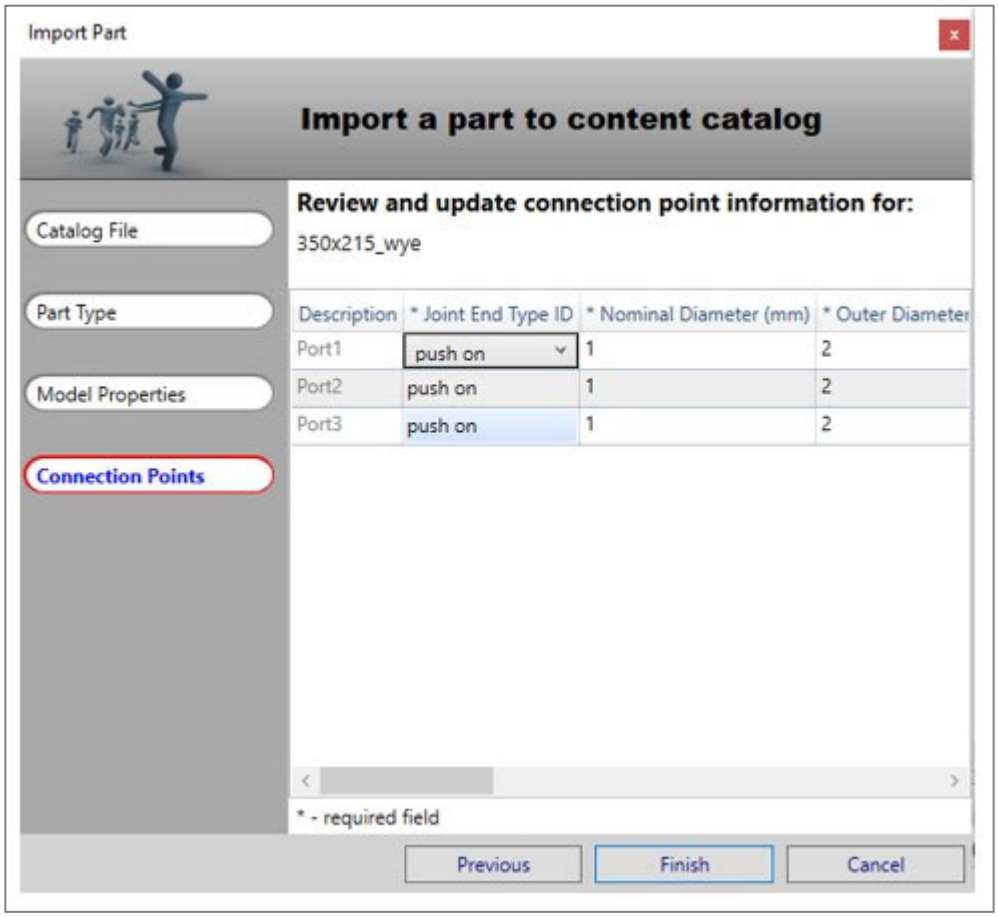
d) Configure model properties:

Figure 4-16 Configure Model Properties



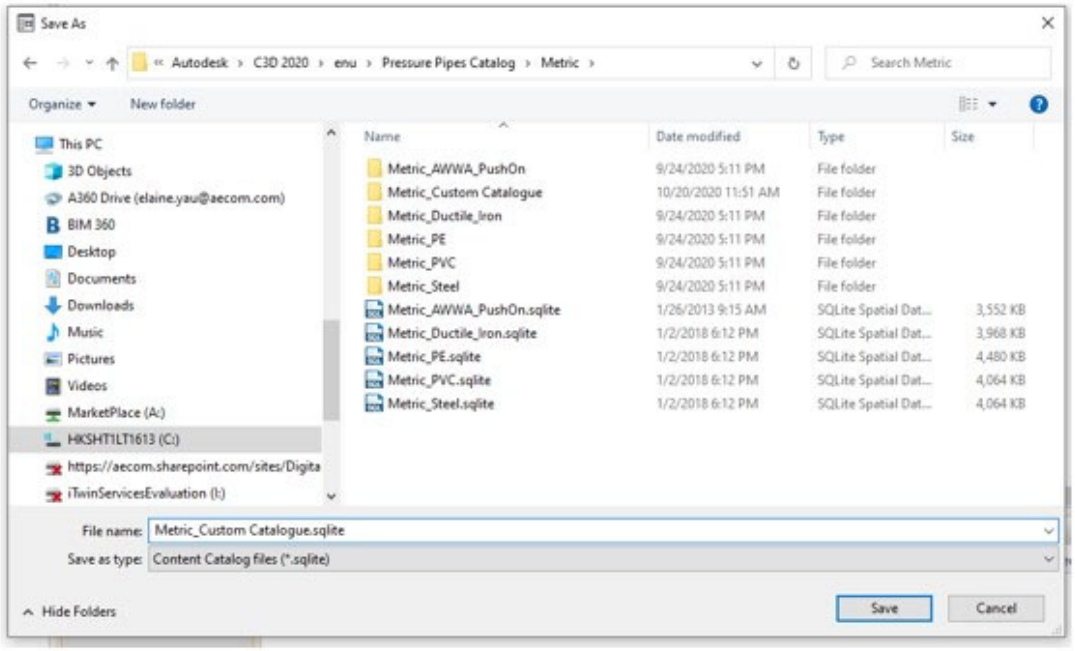
e) Review and update connection point information:

Figure 4-17 Review and Update Connection Point Information



f) After input the attributes, save as a new .sqlite file. The .sqlite file name should be same with the customed Catalog.

Figure 4-18 Save the Content Catalog file



g) This pressure pipe fitting can be reused for other projects by sharing the .sqlite, .dwg and Content Catalog File.

4.3.8. Incorporating the Revit BIM Model into Civil 3D

Revit BIM models could be incorporated into Civil 3D for authoring and coordination purposes. The steps are as follows:

a) Export Revit BIM models to *.dwg 3D solids.

b) In Civil 3D, open the *.dwg 3D solids and then insert Connection Points. “Connection Point” tab is under “Insert” Panel (refer to step o of Section 4.3.1).

c) Use command “PUBLISHPARTCONTENT” to publish a *.content file (refer to step p of Section 4.3.1).

d) In “Content Catalog Editor”, import the *.content file to “Pressure Network” content and customize the required attributes.