CS467191

Plant 3D: Overcoming the Challenges for Bringing in 3D Equip. from Other Sources

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Learning Objectives

- Explain the benefits and drawbacks to using AutoCAD Plant 3D's equipment
- Discover how to use AutoCAD's 3D solids or import models as Plant 3D equipment
- Create AutoCAD Plant 3D equipment from Inventor BIM Content
- Harness the power of AutoCAD's external references (Xref) with Plant 3D equipment

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Description

Go beyond the standard 'globular' shapes for equipment in Plant 3D and harness the alternative options to convey your piping design more accurately. We will work on understanding the ins-and-outs with using standard equipment, but also get in-depth with options of creating more complex 3D solids or bring in designs from outside sources. Finally, for equipment configurations that constantly change during the design of the project, use the power of AutoCAD's external references (Xref) to keep your designs up to date with the latest changes to the equipment.

Speaker

Jason Dillbeck
I am an Implementation Consultant at D3 Technologies and have been working with AutoCAD professionally since 1989, staring as a drafter for architects & engineers, and over 12 years with an Autodesk partner. I have worked in all aspects of construction services with many AutoCAD vertical products including AutoCAD's Plant 3D, Advance Steel, Architecture, & MEP, along with the Revit and Navisworks products. I have helped numerous customers set up and customize AutoCAD P&ID/Plant 3D, Advance Steel, and other products listed above.

Objective #1: Explain the benefits and drawbacks to using AutoCAD Plant 3D's parametric equipment

Our first objective will show us how to use Plant 3D's 'Create Equipment' dialog to help us create parametrically driven equipment. We can add components like platforms, skirts, etc. to add more detail. And finally, we will save our creation as a template to reuse over and over.

Dialog driven parametric equipment
To create equipment in a drawing, we can use the Create Equipment tool, in the Equipment Panel on the Home ribbon, which will open the Create Equipment dialog box. This will allow us to choose from an equipment type list.

CREATE EQUIPMENT ICON

CREATE EQUIPMENT DIALOG (SELECT EQUIPMENT TYPE)
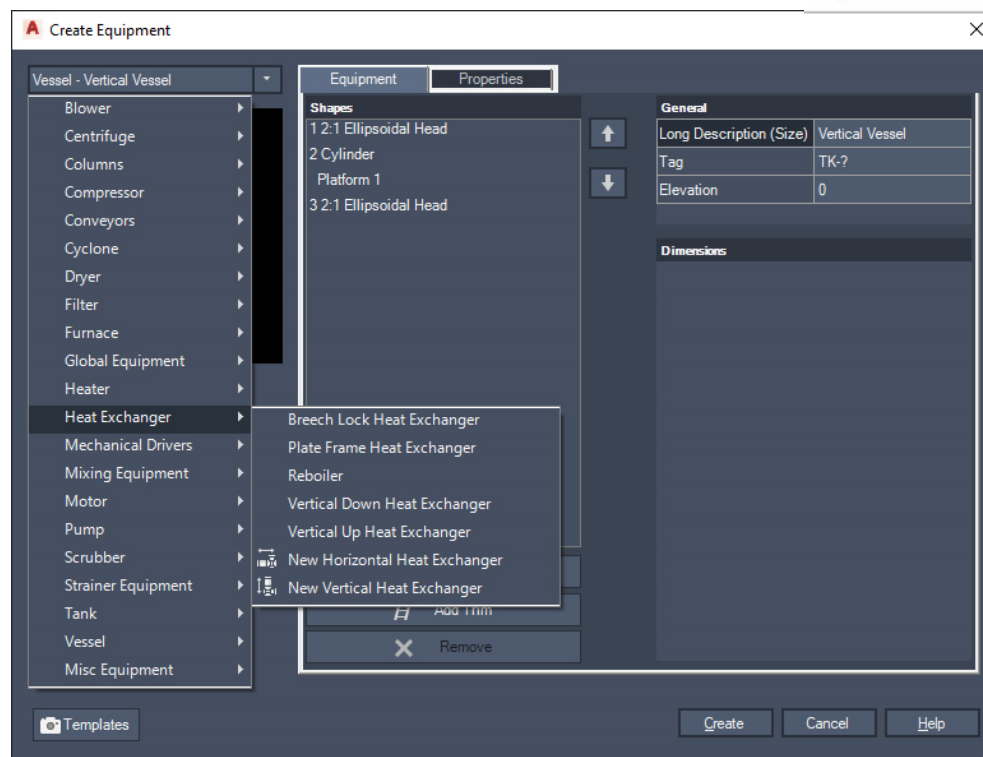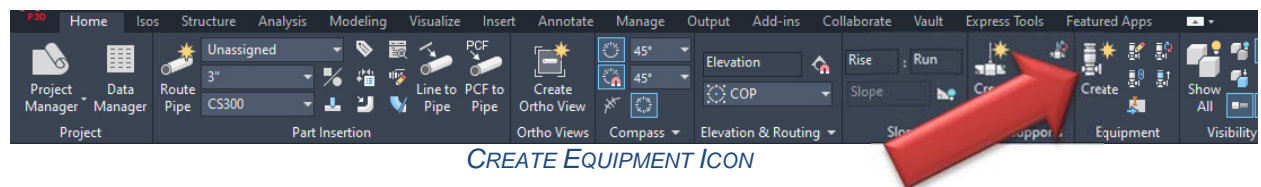
Building our equipment

To build an equipment model, we use the Add Shape or Add Trim buttons to add basic shapes in sequential order. Depending on the choice of horizontal or vertical equipment, the shapes added will build the model from top to bottom or left to right, respectively.

With shapes or trim items added to the equipment builder, their dimensions can be set in the panel to the right by highlighting each shape and entering its values. Fields with a lighting bolt indicate that they are linked to the corresponding dimension of any adjacent shapes.
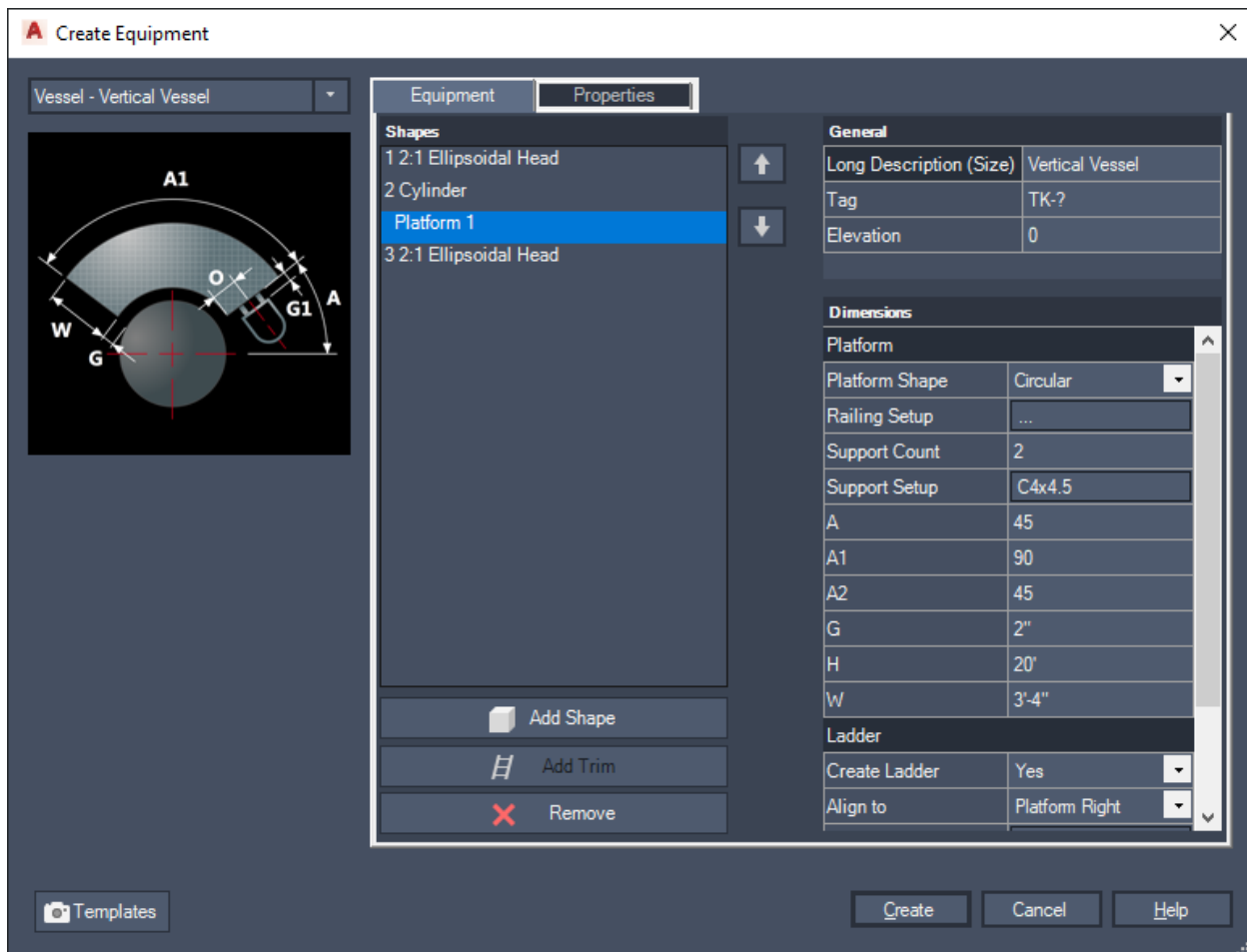
*CREATE EQUIPMENT DIALOG (ADD SHAPES/TRIM AND ADJUST DIMENSIONS)*

Add AutoCAD objects to our equipment

To further customize your equipment model, we will use the Attach Equipment command to add additional detail. This command will allow us to add any AutoCAD object to our equipment model. <u>Tip: Add more detail to any part of the model or add clearance areas with transparent 3D objects. Great for clash detection software like Navisworks Manage.</u>


ATTACH EQUIPMENT ICON
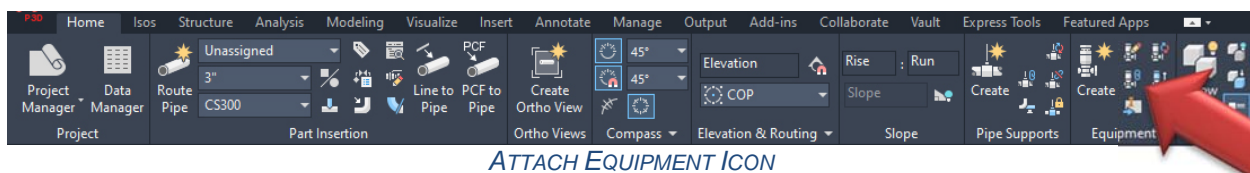
Save Equipment Templates

To use this equipment design in the future, we will use the 'Save current settings as a template…' option in the right mouse click menu after selecting the equipment.

SAVE SELECTED EQUIPMENT AS TEMPLATE…
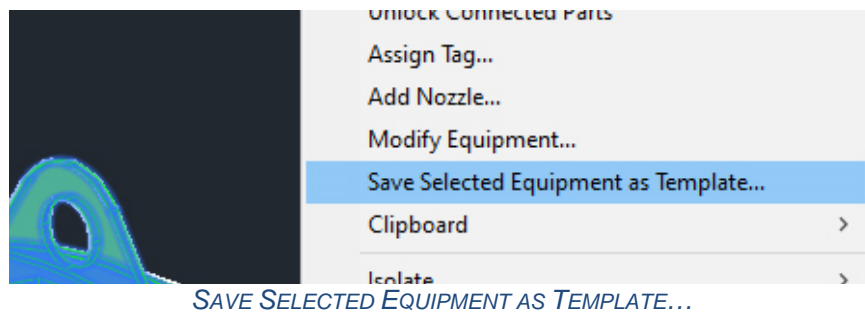
We can access these saved templates when creating new equipment later in the lower left corner of the Create Equipment dialog.

CREATE EQUIPMENT DIALOG – TEMPLATES
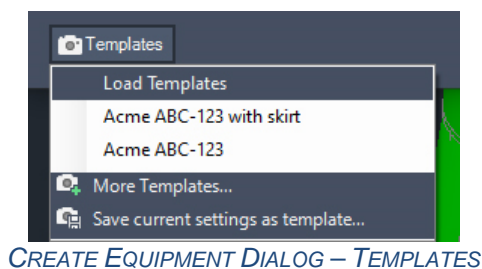
## Drawbacks to AutoCAD Plant 3D's parametric equipment

- Complex and detailed equipment with multiple surfaces within a large project could cause a burden on AutoCAD and your system. This might result in performance issues. So our equipment will be 'globular' in general when using the standard parametric equipment within AutoCAD Plant 3D.
- We can add more detail as needed with the Attach Equipment command.
- If your model has already been created within another software package, this method causes us to recreate the same equipment and revisions are on us to make.

Objective #2: Discover how to use AutoCAD's 3D solids or imported models as AutoCAD Plant 3D equipment.

Our second objective is to discover how to use AutoCAD's 3D solids or any imported models as AutoCAD Plant 3D equipment. We can make exact models or convert models directly from our vendors. We will then need to designate where piping connections will be on this new equipment.

### Convert equipment directly from vendors or other outside sources

There are a great many software products out there to create detailed models of our piping equipment. With the Import command within AutoCAD, we can bring in files from a varity of other software products.
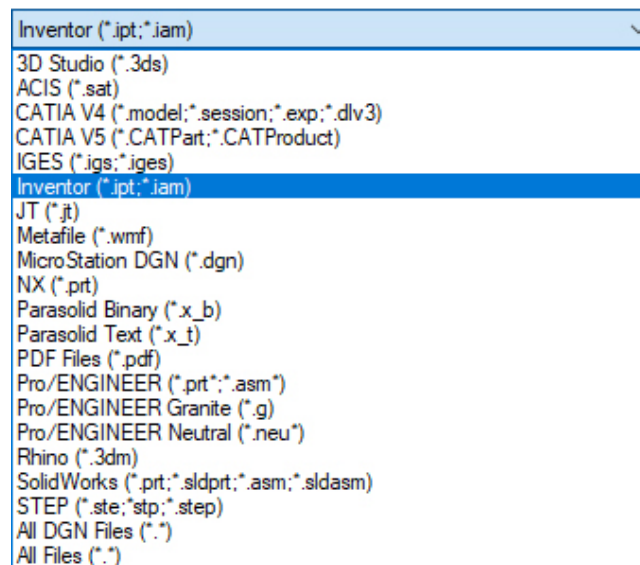
IMPORT CAD FILE TYPES

### Create equipment directly within Plant 3D as AutoCAD solids

As an alternative to bringing in a model from an outside source, we can model using AutoCAD solids to convey our equipments complexity. AutoCAD Plant 3D's 3D Piping workspace has a ribbon with all the creation and editing tools to build our equipment.
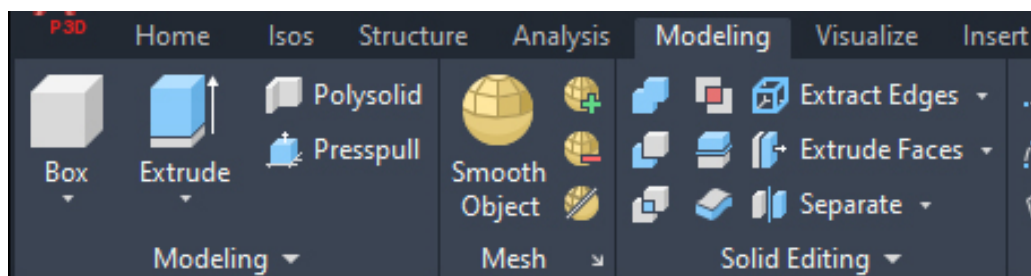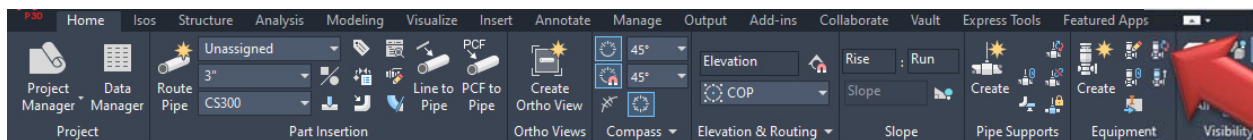

MODELING RIBBON TAB

Alternatively to bringing in a model from an outside source, we can model using AutoCAD solids to convey our equipments complexity.
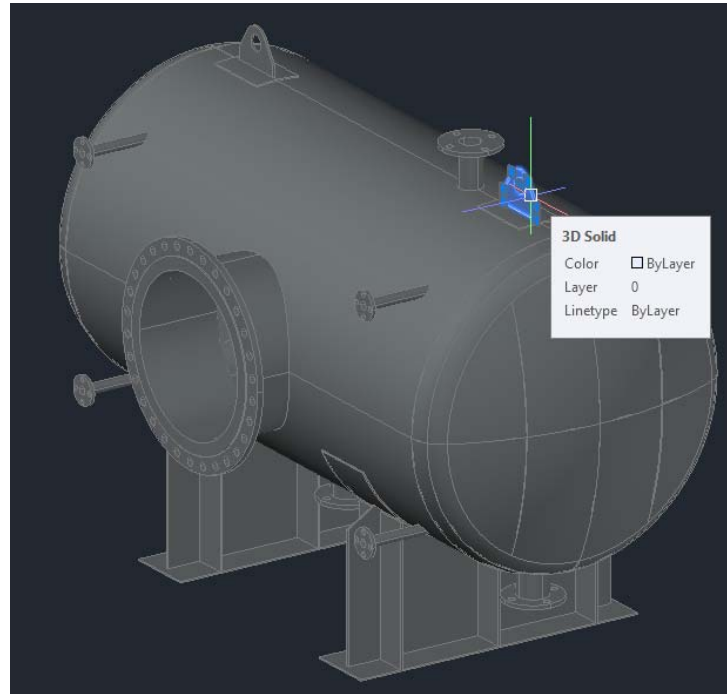

AUTOCAD SOLIDS EQUIPMENT MODEL

Once created, we can convert our AutoCAD solids equipment model in AutoCAD Plant 3D equipment with the Convert Equipment command.
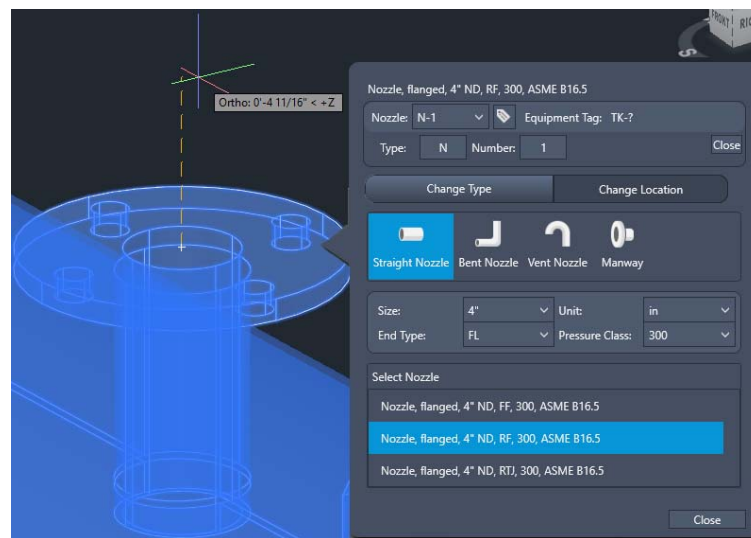

CONVERT EQUIPMENT ICON

Designate piping/nozzle connections for Plant 3D's pipe routing
After converting if our model requires them, we will need to specify the piping connections points or nozzles locations. Select the new equipment and, within the right-click menu, choose Add Nozzle…
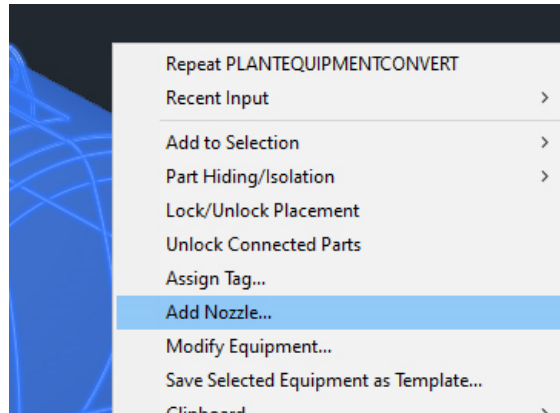
EQUIPMENT RIGHT MOUSE CLICK MENU (ADD NOZZLE..)

Nozzle location and piping direction will need to be specified on screen. Then, we will receive our nozzle property designator which will allow us to set type, size, pressure and additional important properties necessary for AutoCAD Plant 3D's pipe connection and routing of our connecting pipe.

ADD NOZZLE LOCATION AND PROPERTIES

**Drawbacks to converting AutoCAD solids into Plant 3D equipment**
- Once converted, these newly created AutoCAD Plant 3D equipment items will be 'static' models and any changes will require manual model editing or a reinsert of the vendor's model.
- Overly detailed models will slow the product and machine performance down.

Objective #3: Create AutoCAD Plant 3D equipment from Inventor BIM Content

Our third objective brings us to Autodesk Inventor and its capability to convert our Inventor model into Plant 3D using the BIM Content environment. Again, we can make more exact models of our equipment as well as designate those piping connections but within Inventor if we like. Additionally, Inventor has a great tool to help us simplify our model called 'Shrinkwrap'.

Inventor's BIM Content environment

Once our model has been created within Inventor, we are ready to convert this into something AutoCAD Plant 3D can use for equipment. First, we'll need to enter the BIM Content environment by selecting the ribbon icon.
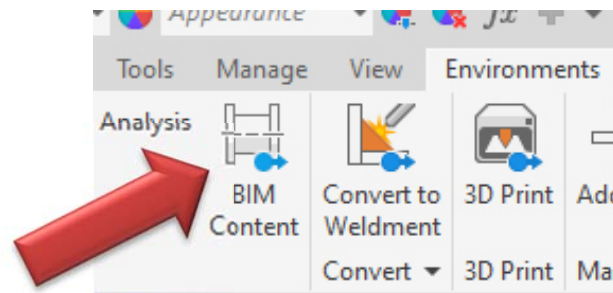
BIM CONTENT ICON WITHIN ENVIRONMENTS TAB

Next within the BIM Content environment, we will need to streamline our model for use within the AutoCAD Plant 3D software. Shrinkwrap Substitute command will many options to simplify our model into an exterior shell version with miniumal faces to increase performance within AutoCAD.
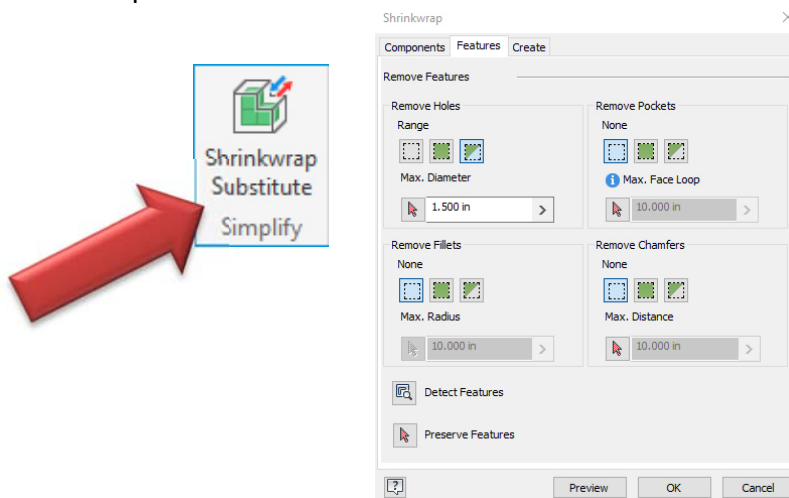

SHRINKWRAP SUBSTITUE ICON AND DIALOG

**Optional: Inventor BIM Content's pipe connection option**
Prior to exporting the model out of Inventor, pipe connections can be assigned in Inventor to identify the connection points. Once inside AutoCAD Plant 3D, these imported connection points must be edited to add required nozzle properties needed to make the appropriate piping connections, such as nozzle end-type, pressure, etc. Click the Pipe Connector icon and then configure the options in the dialog box, as desired. This step is optional as all nozzle properties can also be authored within AutoCAD Plant 3D.
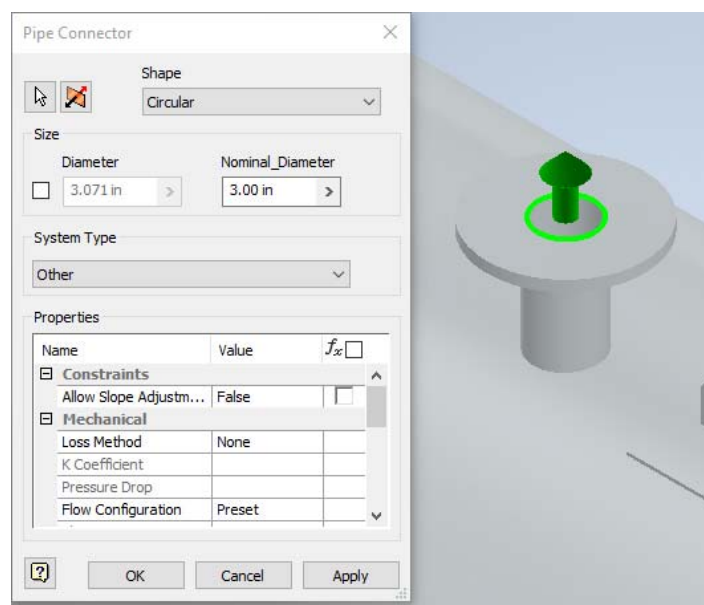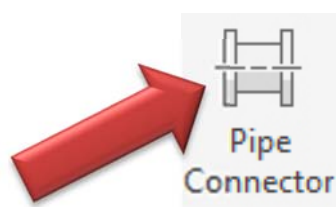
PIPE CONNECTOR DIALOG

**Export Building Components to .adsk file format**
After Shrinkwrapping our model and applying any pipe connections, we are ready to export to an Autodesk Exchange file format or .ADSK file.
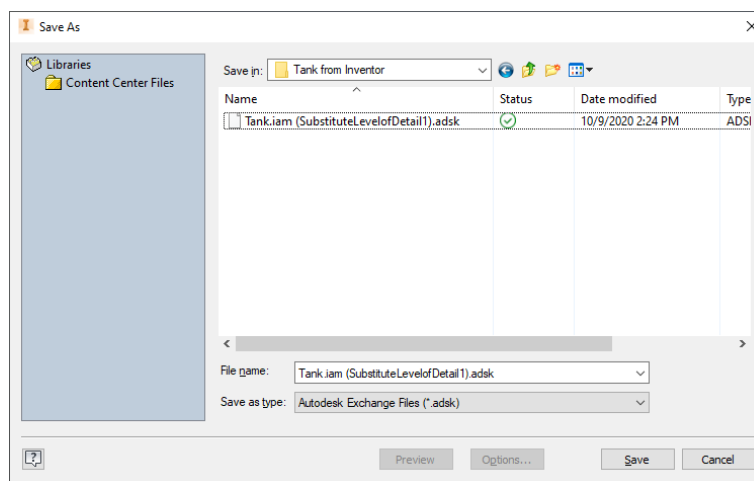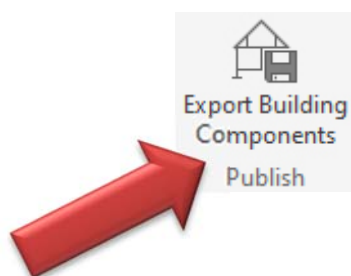
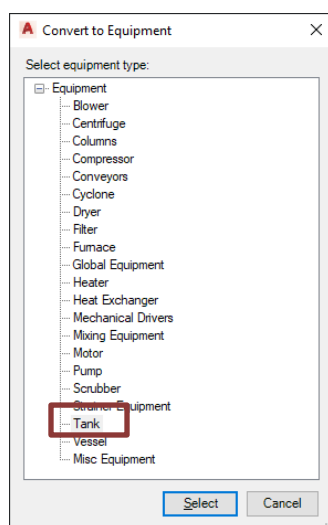*EXPORT BUILDING COMPONENTS DIALOG*

Convert Inventor equipment into AutoCAD Plant 3D equipment

Now back in AutoCAD Plant 3D, we will use Convert Inventor Equipment command to import the .ADSK file in as equipment.
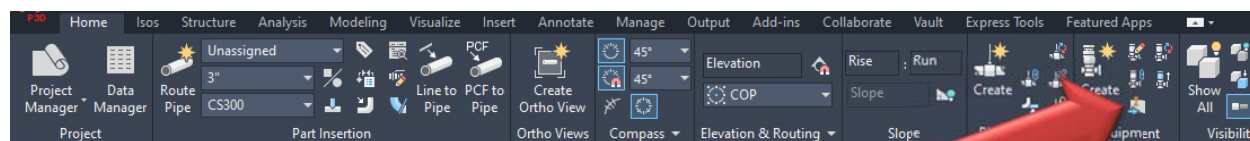
CONVERT INVENTOR EQUIPMENT ICON

Once an insertion point and rotation has been set, we will choose an equipment type to define our equipment.

CONVERT EQUIPMENT DIALOG

With our Inventor model now converted into an AutoCAD Plant 3D equipment object, we are able to adjust properties and apply any nozzles if we didn't do so within Inventor.

Drawbacks to using Inventor's BIM Content environment for AutoCAD Plant 3D's equipment

- If we choose not to use the Shrinkwrap Substitute option or do not apply enough level of detail settings, our detailed equipment model may cause performance issues once converted into AutoCAD Plant 3D equipment.
- Any revisions to the equipment model within Inventor will require a complete recreation in the BIM Content environment and a reinsertion within AutoCAD Plant 3D and all properties that were applied in Plant 3D will have to be reentered as well.

For additional instruction on exporting Inventor models out to Revit families, please review course FAB466294: Anybody Can Do It! Easily Build Revit Content in Inventor by Peter Strycharske.

Objective #4: Harness the power of AutoCAD's external references (XREF) with AutoCAD Plant 3D equipment.

Finally, let us use the power of AutoCAD's external reference (XREF) to aid in our Plant 3D equipment. This will help us keep our models up to date while retaining our assigned properties. No data reentry.

### AutoCAD's external reference (XREF) command
If we are not already familiar, AutoCAD's external reference command allows us to combine files and retain a link. This serves two main purposes: it controls the file size because objects in the referenced drawing do not become part of the host drawing, and objects modified in the reference file are automatically updated in the host drawing because the files are linked.

Within AutoCAD Plant 3D, we can use this function to add a referenced file of equipment to a Plant 3D equipment object that holds the property data. Then as design changes happen to the referenced equipment model, our AutoCAD Plant 3D project drawings will reflect those changes to the equipment automatically.

For best results, use the right mouse click 'Xref into current DWG' option within the Project Manager to reference the equipment model drawing to our current drawing.
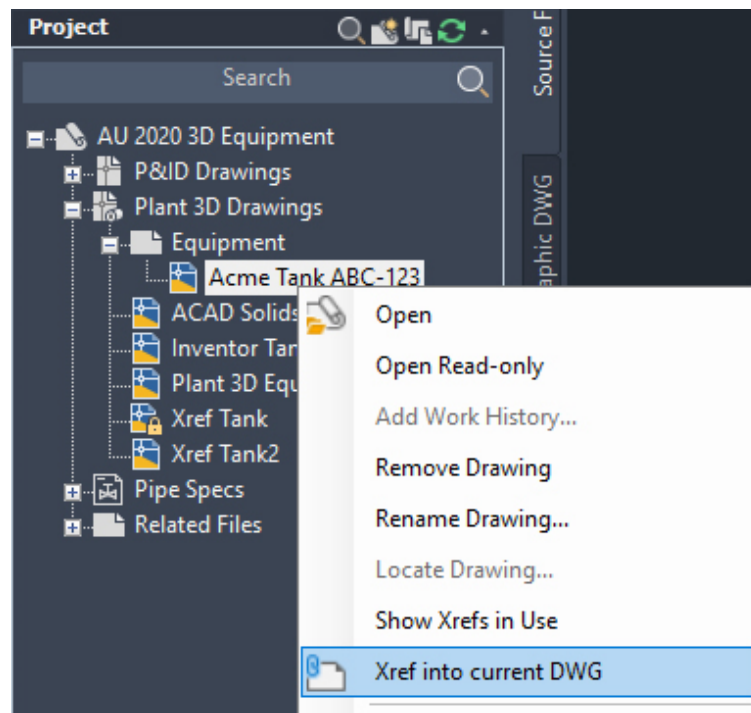

RIGHT-CLICK TO XREF INTO CURRENT DWG
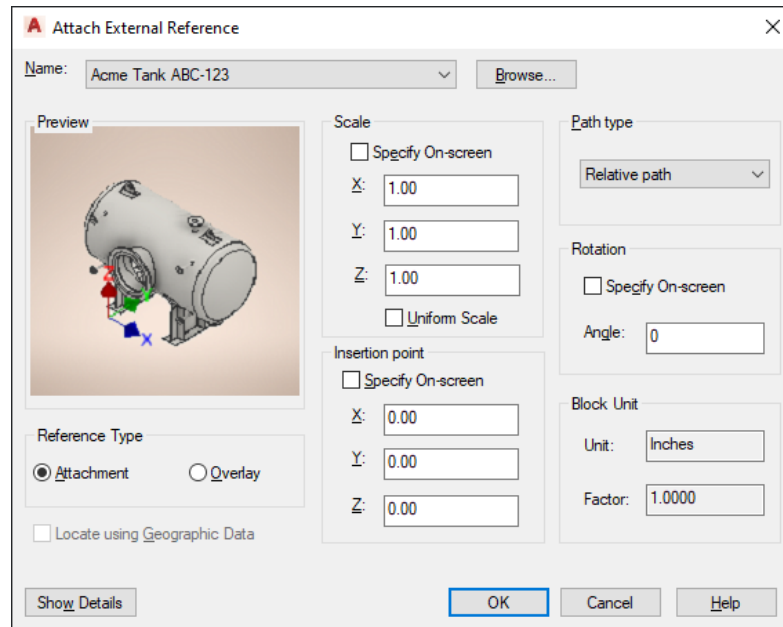
DEFINE PREFERENCES FOR ATTACHING THE XREF

Create an AutoCAD object to convert into Plant 3D equipment

With an additional object needed to hold property data, we will create an AutoCAD object somewhere near or on the referenced model. This can be a small barely noticeable element or a new detailed component of the equipment model.
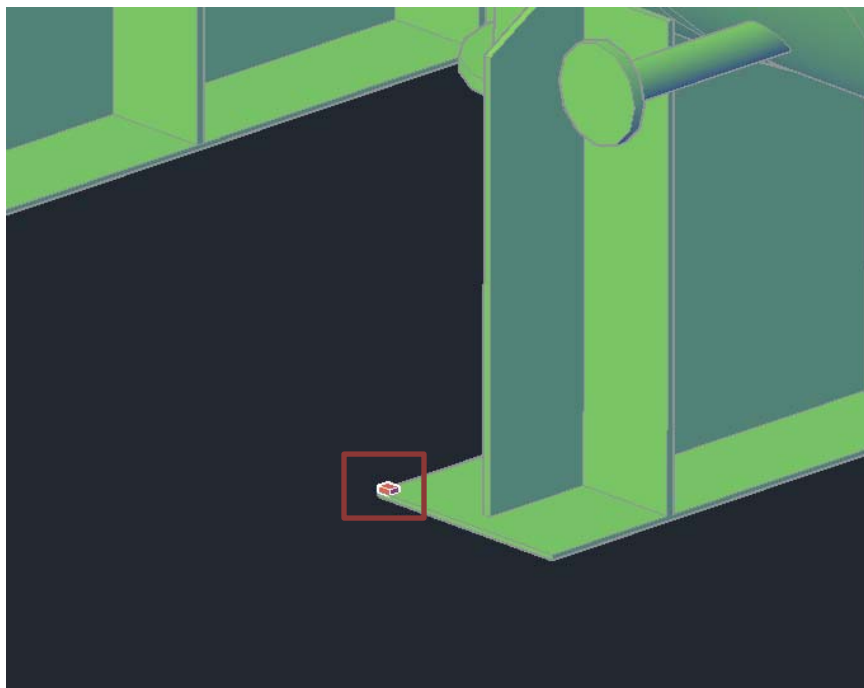
*SMALL AUTOCAD OBJECT ON THE REFERENCE MODEL*

Convert our AutoCAD object into an AutoCAD Plant 3D equipment with the Convert Equipment command and apply properties for the equipment.
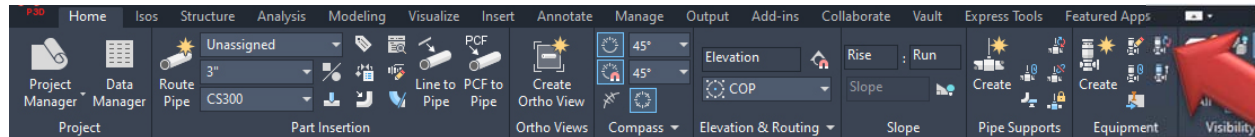

CONVERT EQUIPMENT ICON

Designate piping/nozzle connections for Plant 3D's pipe routing

After converting if our model requires them, we will need to specify the piping connections points or nozzles locations. Select the new equipment object and, within the right-click menu, choose Add Nozzle…
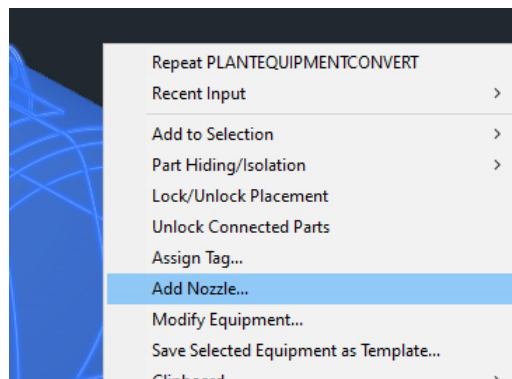
EQUIPMENT RIGHT MOUSE CLICK MENU (ADD NOZZLE..)

Nozzle location and piping direction will need to be specified on screen. Then, we will receive our nozzle property designator which will allow us to set type, size, pressure and additional important properties necessary for AutoCAD Plant 3D's pipe connection and routing of our connecting pipe.
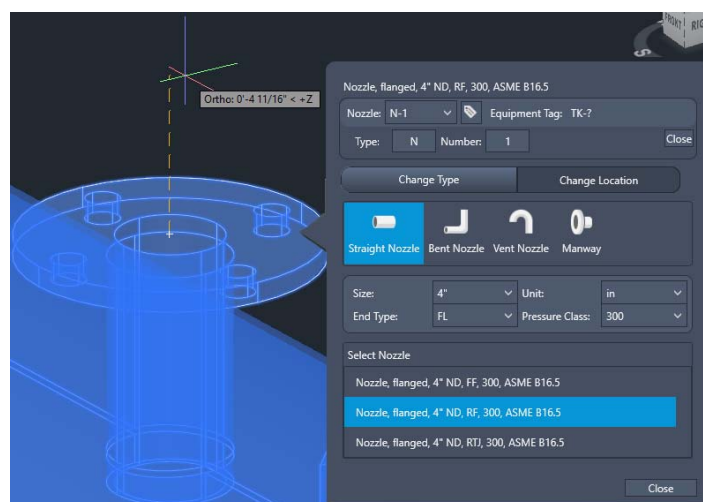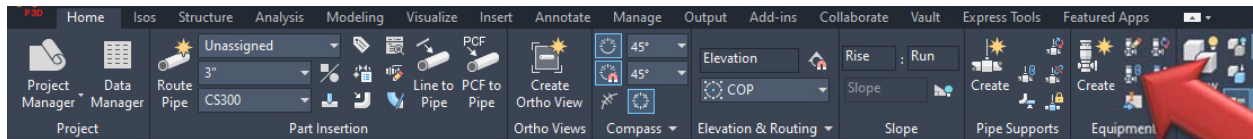

ADD NOZZLE LOCATION AND PROPERTIES

### Attach the reference model to AutoCAD Plant 3D equipment
With the Nozzel locations established, we will use the Attach Equipment command to add the reference model to our equipment. This command will allow us to add any AutoCAD objects, even XREFs.
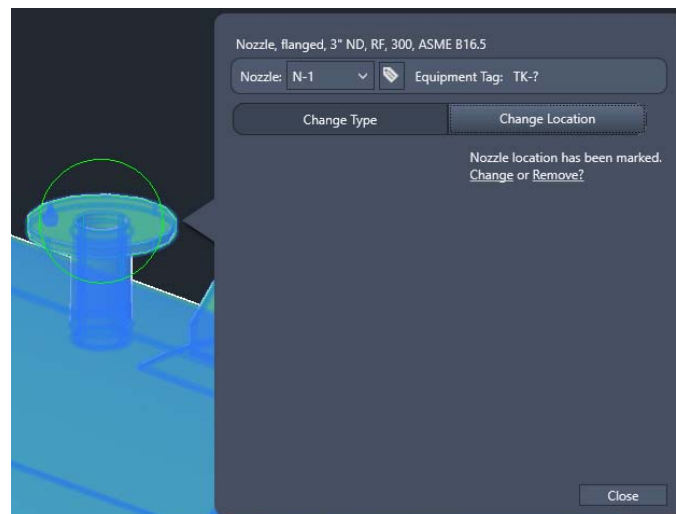

ATTACH EQUIPMENT ICON

Drawbacks to using AutoCAD's XREFs with AutoCAD Plant 3D's equipment
- If nozzle locations have changed in a revision to the referenced equipment model, we will need to use the Detach Equipment command to remove the referenced model from the Plant 3D equipment. We do this to allow us to reselect the new nozzle locations.
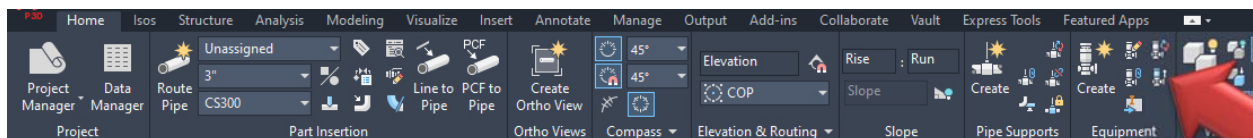
DETATCH EQUIPMENT ICON

Once removed, we will adjust the nozzle locations in the Change Location tab with the special nozzle property designator.

DETATCH EQUIPMENT ICON

A special thanks to Prashant Shekhar for the tank model.