



## PT21758

# 3D Model Collaboration with AutoCAD Plant 3D and Revit

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### Learning Objectives

- Learn how to export and import models using AutoCAD Plant 3D
- Learn how to export and import models using Revit
- Learn how to update models with design changes
- Learn about model optimization

### Description

Design collaboration between architecture, engineering, and construction disciplines using AutoCAD software, industry-specific products and Revit software is possible with the proper workflows. This class outlines best practices for exporting and importing models between AutoCAD Plant 3D software and Revit software, managing design changes, and optimizing models. This session features Revit and AutoCAD Plant 3D.

### Your AU Experts

#### Jason Drew

Jason Drew is a Premium Support Specialist with Enterprise Priority Support at Autodesk. He has been with Autodesk since 2011 working with AutoCAD Plant 3D and P&ID since the initial releases of the software. His previous experience outside of Autodesk include Intergraph SmartPlant P&ID (admin and designer roles), software training and support for AutoCAD Plant and P&ID as an Application Engineer at D3 Technologies, and IT Support at several engineering companies in Tulsa, Oklahoma.

#### Quentin Contreras

Quentin Contreras joined Autodesk in 2012 working with Frontline Customer Support and is currently a Premium Support Specialist working with Enterprise Priority Support focusing on customers with AutoCAD Plant Design software. Quentin has been involved with Autodesk technology for over 25 years (starting with release 10). He has worked with various companies as a CAD Manager and Designer with focus in the oil and gas industry and ammonia refrigeration. Prior to joining Autodesk, he primarily worked using AutoCAD P&ID to develop as-built drafting services for various industries. This required various levels of customization due to following set guidelines set up with each customer he worked with. He is also a contributor to the *In the Pipes* blog that provides helpful tips and tricks to AutoCAD Plant 3D and P&ID users.



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## Introduction

In the AEC industry, one software program cannot do it all. Separate applications are needed for structural, electrical, mechanical, architectural and civil infrastructure designs. The exchange of design data between the different programs is not seamless.

One of the most critical workflows is between Revit and AutoCAD vertical products. This document provides best practices for collaboration with 3D models and how to maximize performance. The information provided builds on basic knowledge of AutoCAD Plant 3D and Revit.

## AutoCAD Plant 3D to Revit

This section explains how to export models from Plant 3D for use with Revit projects. In order for Revit to process and properly display the geometry for objects in the DWG file, the drawings must be exported as 3D solids. Revit does not utilize Object Enablers. The “Export to AutoCAD” function of Plant 3D Project Manager is a special function that will process all of the Plant objects (equipment, pipe, valves, fittings, etc.) and convert them to ACIS solids during the export process.

## Exporting from Plant 3D

### Manual Export

This option allows the export of a single project drawing by using the “Export to AutoCAD” command within Plant 3D Project Manager.

### Batch Export

It is possible to export drawings in bulk or “batch” export with Plant 3D by using a custom .NET application.

We have provided a sample with this class. This is an example of what is possible using custom programming and scripting to help automate the export process. The sample Batch Export for AutoCAD application is available for download from the Autodesk University class page.

## Importing into Revit

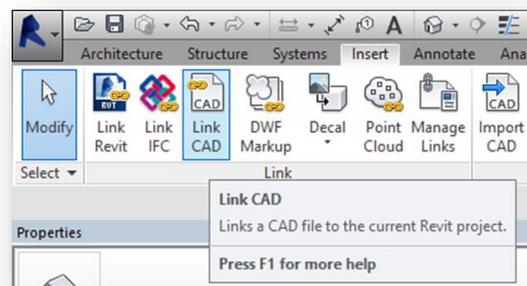
There are two methods outlined in this document for importing AutoCAD DWG files into Revit. The first method is very simple and automatically updates when the model changes, but does not give the best results in Revit. The second method requires more steps but allows AEC objects to be sectioned within views which then act more like other Revit objects. The choice then depends on a preference between ease of use and having complete visibility in Revit.

### Method 1 – Link a CAD Model

The simplest way to use AutoCAD Plant 3D models in Revit is to link them directly into the Revit model.

Note the following limitations with this method:

- Some of the AEC objects from the DWG will show up as wireframe regardless of the detail level setting as there are no object enablers inside of Revit to handle this geometry
- Section and elevation views will not clip the geometry properly
- This method is only recommended for 2D layouts such as plot plans



## Method 2 – Create and Insert a new part family

This method takes several steps, but gives better model visibility in Revit.

There are two options with this method. The first is creating a new part family, importing the CAD model (DWG file) into the part family, and placing an instance into the Revit model. The drawback to this option is the part family must be edited each time a revision is made to the exported DWG file from Plant 3D; erasing the existing imported model and replacing it with the updated model.

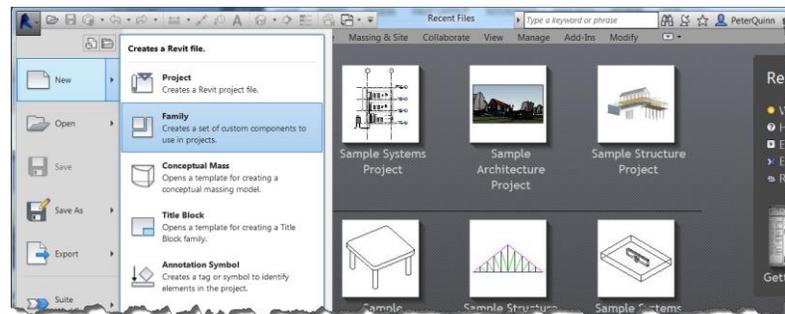
The second option uses an add-on for Revit (*DWG Sync*) to help automate the initial import of the CAD model into a new part family and updating it when revisions occur.

### First Option – Manual Part Family Creation and Update

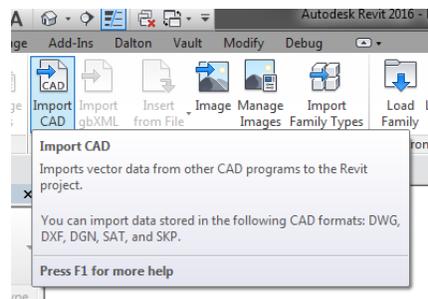
1. Launch AutoCAD Plant 3D
2. Open the drawing with the model to be exported in Plant 3D and use the **EXPORTTOAUTOCAD** command (or right-click on a drawing inside Project Manager and select *Export to AutoCAD*) to save a copy of the model with the Plant objects converted to AutoCAD 3D solids.
3. Select a folder outside of the Plant 3D project to store the exported drawings

If you want to include External References be sure to open the exported DWG files and use the **XREF** command to bind the references into a block.

4. In Revit, create a new empty Revit Family. Use *Generic Model.rft* for the template.



5. From the Insert ribbon click the Import CAD button to import the DWG:





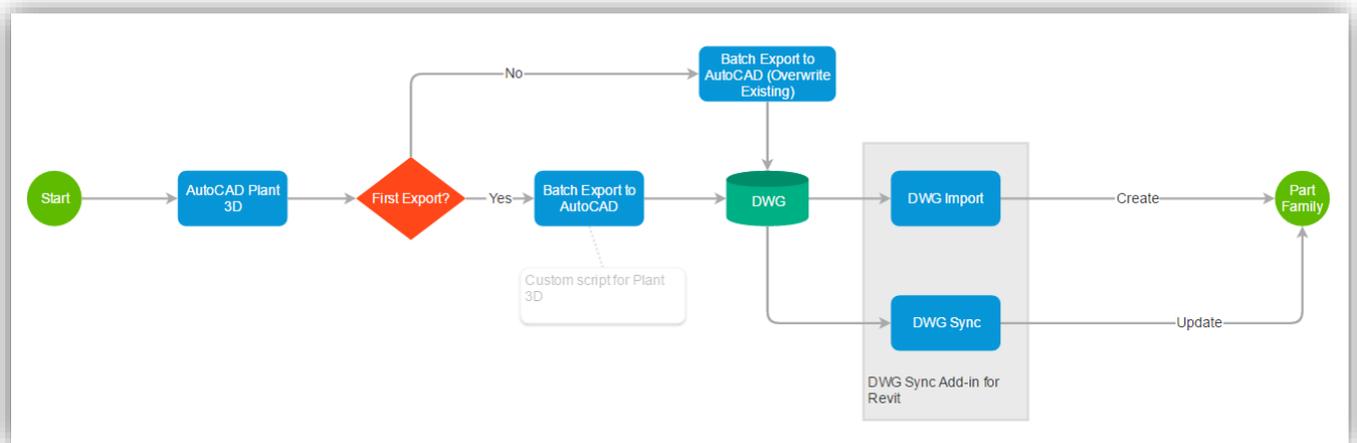
6. Click the Save button to save the part family
7. Use the Load into Project and Close button on the Insert on the ribbon
8. Click to select a location to place the new part family  
*If desired, press the V key, then the G key to bring up the Visibility / Graphics Overrides window and turn on the site Project Base Point or Survey Point for placement and alignment of the part family in*
9. The Part Family can be placed again by locating it in Project Browser under the Generic Models category and creating a new instance.

Note, when updates occur, an edit will be required to the part family; erase the existing DWG geometry, import the updated DWG file, save, and reload the family into the project.

### Second Option - DWG Sync Add-in for Revit

DWG Sync is an add-on for Revit that provides the following functions:

- Automatic creation of new Part Families for DWG files that have been exported from Plant 3D
- Batch update of the existing Part Families containing the imported Plant 3D models (DWG files)



Hyperlink to a web version of the diagram shown above:  
[Autodesk Praxis Workflow Diagram - DWG Sync Add-in for Revit](#)

As of November 10<sup>th</sup>, 2016, the DWG Sync for Revit add-in is available in the Autodesk Labs:

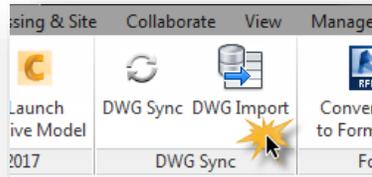
[It's Alive in the Labs: DWG Sync for Revit Tech Preview](#)

Please note, the labs project is scheduled to close on September 1<sup>st</sup>, 2017.



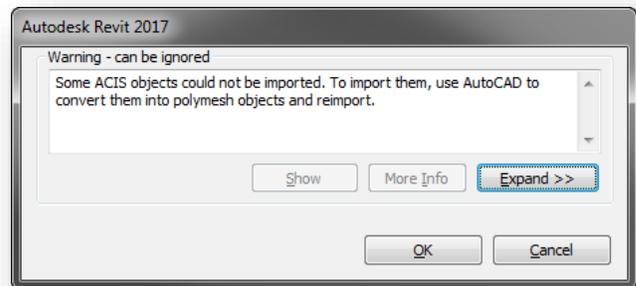
## Loading a new CAD model with DWG Sync – Import

1. Open the main Revit model for the project
2. Click the *DWG Import* button from the Add-Ins tab of the DWG Sync panel on the ribbon bar



3. Browse to the location of the DWG file to be imported and click OK to continue
4. The DWG import process will begin

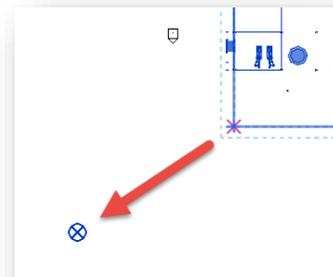
A new part family will be created using the *Generic Model* template. Note, this could take some time depending on the size and complexity of the Plant 3D model. After the import process is complete you may receive a warning that some ACIS objects could not be imported. Click OK to close out this message. All of the geometry should be properly processed if the drawing was properly exported from Plant 3D.



Note, DWG Sync will bring in any External References that are attached to the original DWG file, regardless of the attachment type (overlay vs. attach.) If the exclusion of External References is desired, they must be unloaded inside the original DWG file before using *DWG Import*.

5. Press the V key, then the G key to bring up the Visibility / Graphics Overrides window
6. Scroll down to the list, expand the list for Site, and click the check-box for Project Base Point
7. Move the base point of the imported CAD model (the AutoCAD 0,0 point) to the project base point as shown below

If the model needs to be removed from the view and placed again it can be accessed from the Families section of the Project Browser. Right-clicking on the name of the part family will allow placement of a new instance by selecting *Create Instance*.



For more information, please refer the following articles:

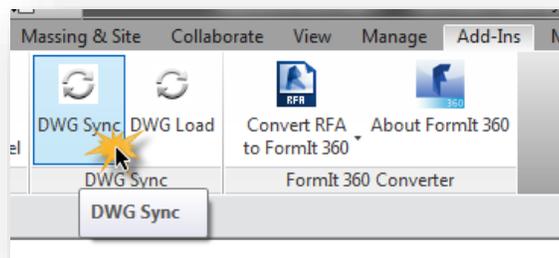
[Project Base Points and Survey Points](#)

[Tips for Working with Project Base Points and Survey Points](#)

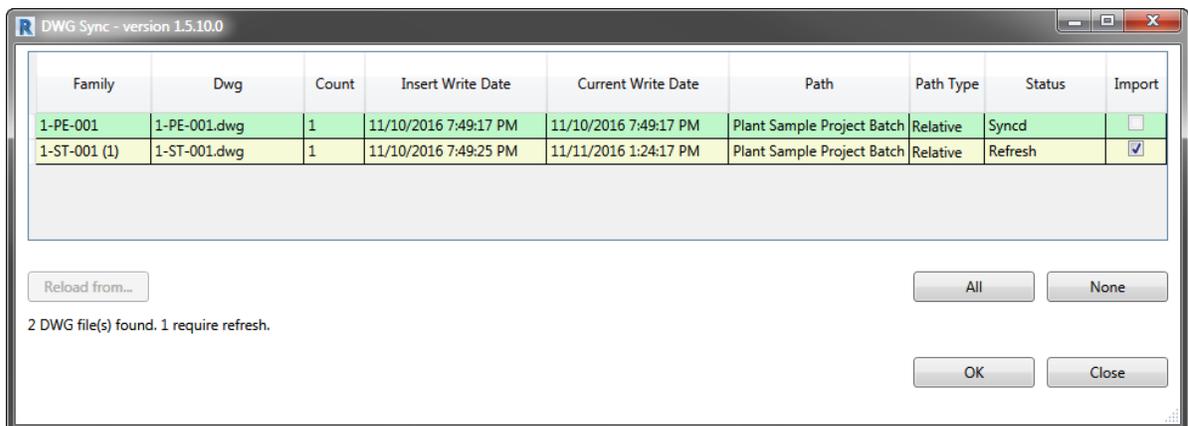
## Updating existing imported models

After changes have occurred within the Plant 3D project drawings, another export (Export to AutoCAD) will be required. The recommendation is to overwrite the existing drawings. DWG Sync will detect this change and the models within the Revit part families can be refreshed / re-imported using the steps shown below.

1. Click the *DWG Sync* button from the Add-Ins tab of the DWG Sync panel on the ribbon bar



2. The DWG files that have changed will show a status of *Refresh*. The check-box for these drawings under the Import column will be automatically selected.



3. Then click the *OK* button
4. The updated DWG will be imported, replacing the existing model inside the part family

## Model Management in Revit

With the Plant models inserted as part families, they can be used in a Revit project for creating section and plan views.

One recommended practice is to create a new Revit project model specifically for the imported Plant 3D DWG files. This allows the project to be linked into additional Revit projects and unloaded and re-loaded as needed. This will also avoid importing additional categories and elements into the main models.



## Revit to AutoCAD Plant 3D

In order to use the 3D models from Revit within Plant 3D, it is necessary to export the models to a DWG file format. This section covers the configuration options and steps to use for proper export.

### Exporting from Revit

#### Preparing 3D Views

While it is possible to use the default 3D View within Revit to export the models to DWG files, this may not be the desired option. The default 3D View will contain all Revit objects, including interior doors, furniture, etc.

#### Limiting Model Geometry Before Exporting

Before exporting a Revit model, limit model geometry to improve the performance of the export process.

In Revit, a view of the building model contains many objects. When exporting a model for use in AutoCAD, Revit exports only the objects that are visible in the view (or views).

If only a particular set of objects from Revit are needed for the export, customized 3D Views can be created specifically for exporting the DWG files. The *visibility / graphic overrides* and *view templates* applied to the views will control what is exported out of Revit.

Examples:

- Export all concrete slabs but exclude the rebar
- Export all structural steel beams and columns but exclude walls, ceilings, and floors
- Export the exterior of a building, but exclude all interior objects such as furniture

By reducing the amount of model geometry (and its underlying data) that is exported, the following is achieved:

- Improve performance of the export process
- Reduce the size of the exported file
- Improve performance of the importing application
- Reduce clutter (non-essential items) in the exported file, and hence the amount of work required to delete these objects from the file in the importing application
- Optimize the time it takes to generate orthographic views in Plant 3D

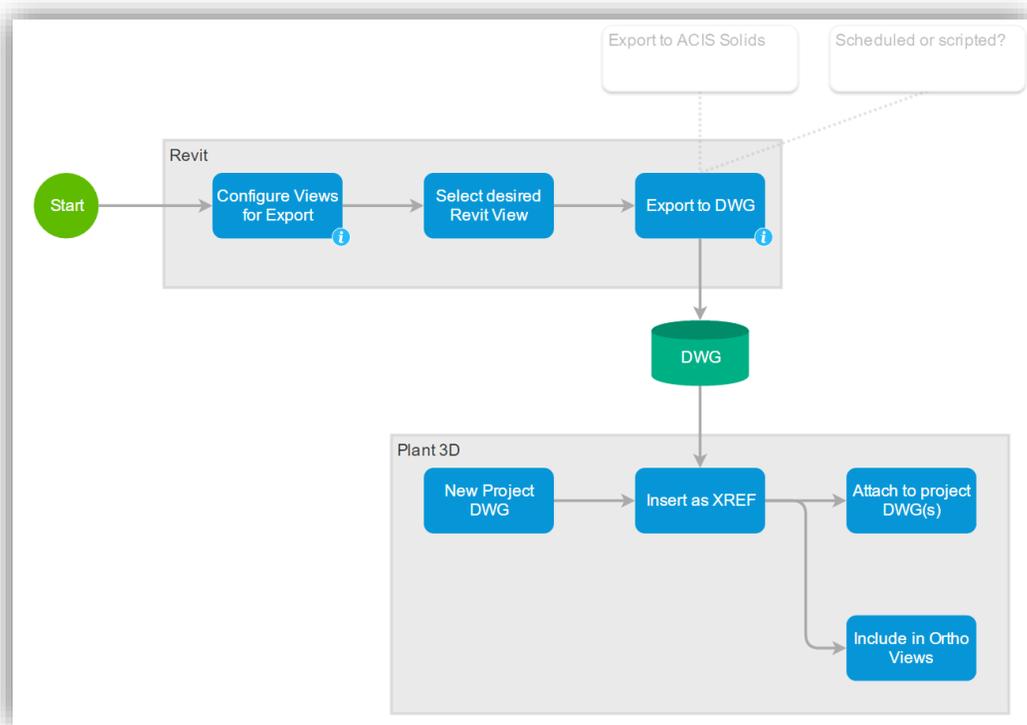
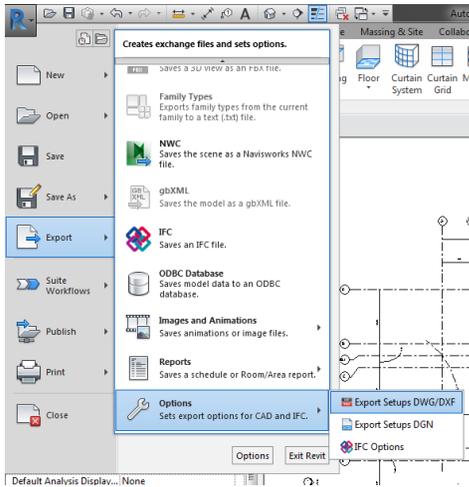
Use the following techniques in Revit to reduce the amount of geometry to be exported:

- Turn off visibility of graphics
- Use a section box or a crop region
- Specify the detail level (Course, Medium, Fine)

## Revit Export Settings

### Export as ACIS Solids

Before the models are exported be sure to check the export options for Revit to ensure that solids are set to ACIS solids versus Polymesh. The orthographic drawing view generation for Plant 3D will not properly process Polymesh surfaces.



Hyperlink to a web version of the diagram shown above:  
[Autodesk Praxis Workflow Diagram - Revit Export to AutoCAD Plant 3D](#)



## Importing into AutoCAD Plant 3D

### Attach as XREF

It is recommended to use “host” drawings or DWG files that will act as container drawings when importing the DWGs that have been exported out of Revit. This is accomplished by creating a new project drawing within Plant 3D Project Manager, opening the new drawing, then attaching the exported DWG from Revit. The main benefits of this practice:

- The exported DWGs from Revit do not need to be copied into the Plant 3D project. The host DWG belongs to the Plant project and contains the external reference (XREF) to these drawings which can be stored anywhere on the network.
- By avoiding the need to copy drawings into the Plant 3D project over and over (with each revision / export from Revit), the process of updating is simply opening the host DWG and allow it to reload the XREF.

### Generating Orthographic Views in Plant 3D

If the Revit models were exported to DWG format using ACIS solids, the orthographic view generation within Plant 3D should display all of the geometry properly in generated orthographic views. Note, the complexity of the exported Revit models will have an impact on the time it takes to generate orthographic views. Plant 3D uses the AutoCAD hidden line removal and it must process all of 3D solids in order to create orthographic views.



## Model Management and Optimization

### Coordinate Systems, Positioning, and Alignment

Keeping models positioned and aligned with various coordinate systems is an important aspect to keep in mind to avoid any undesired movement during re-export and re-import.

#### Coordinate systems with AutoCAD Plant 3D

For information about using state plane coordinates for positioning models within Plant 3D, please refer to this article on the Autodesk Knowledge Network:

[Using AutoCAD Plant 3D in a state plane coordinate project environment](#)

#### Shared Coordinates for Revit

For information about coordinate systems in Revit, please refer to this

[AB1412: Navigating Through the Storm Using Coordinate Systems in Revit](#)

[CI1599: Feeling Out of Sync? Get Your BIM Coordination On!](#)

### Model Complexity

Optimizing the Plant 3D models in preparation for export to DWG files will help general performance with pan, zoom, and 3D orbit view operations within Revit. It will also help speed up the reloading of the models with each model revision.

#### Plant 3D Model Optimization

When extremely complex models (such as those provided by vendors) are used for equipment, valves, in-line fittings, etc. the view performance of Revit can suffer when too many of these models are imported. Using simplified models for these objects is recommended as a best practice.

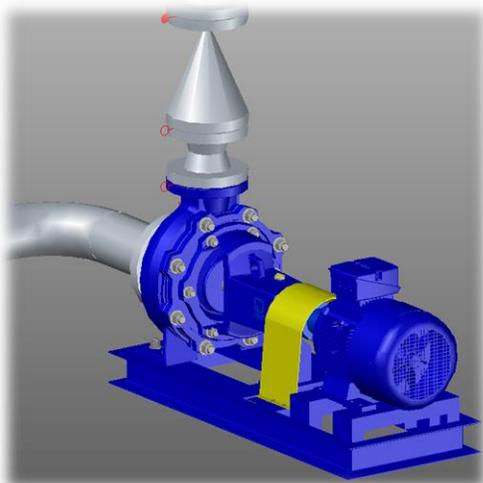


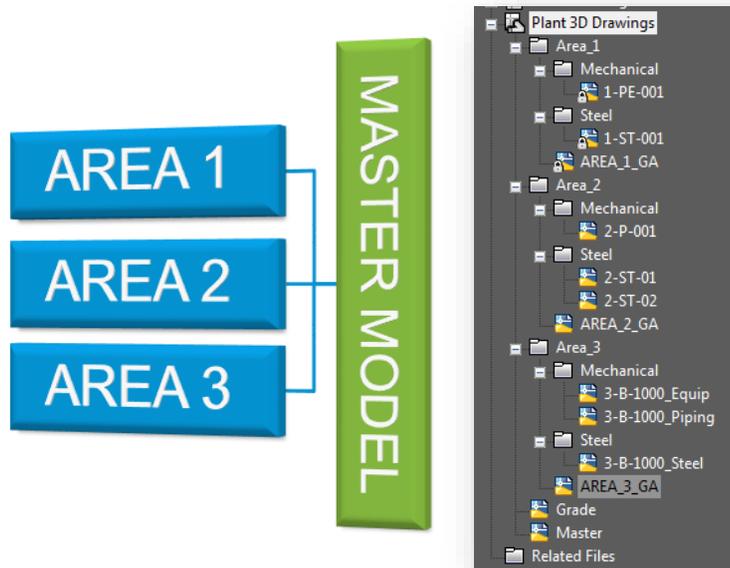
Figure 1. Detailed Vendor Equipment Model



Figure 2. Parametric Plant 3D Equipment

## Project Drawing Management

Organizing the Plant 3D project drawings into manageable process areas and units can help streamline the export process. Only the areas and units that have been updated will need to be exported after a model revision versus exporting the entire master model.



For additional information, refer to the [Managing large AutoCAD Plant 3D projects](#) technical article on Autodesk Knowledge Network.

## Revit Project Optimization for Plant 3D Performance

Optimizing the Revit models before exporting to DWG files as described in the article below will help with graphics performance with pan, zoom, and 3D orbit view operations within AutoCAD Plant 3D. It will also help speed up the orthographic view generation (hidden line removal) process.

[Autodesk® Revit 2017 Model Performance Technical Note](#)



## Conclusion

Now that you have an understanding of methods to share models from Plant 3D to Revit and Revit to Plant 3D, we hope these new workflows will expand your interoperability between engineering and design disciplines. If you have any questions, please feel free to reach out to us.

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