

MA30-1R: Digital Prototyping + BIM: Creating, Using, and Distributing Revit® Content from Inventor® Designs

Mark Flayler – IMAGINiT Technologies

MA30-1R Autodesk Inventor has the functionality to export assemblies and parts for mechanical, electrical, and plumbing connections directly into Autodesk Revit. This class focuses on the dynamic and logistics between the two programs. You will learn best practices for creating Autodesk Inventor AEC equipment and exporting it effectively to Autodesk Revit programs and how to best leverage their design intent. Share your designs with a new audience of BIM modelers with Autodesk Seek. Finally see how to track your ADSK files with Autodesk Vault for design tracking and revisions.

About the Speaker:

Mark has been using Autodesk® products since 1999 in many different manufacturing environments. He has implemented Autodesk products for many diverse industries. Autodesk® Inventor® has profoundly augmented Mark's abilities, allowing him to bring 3D digital prototyping to the forefront of the industries with which he has interacted. Mark has extensive experience and a comprehensive understanding of the technical and practical business and human dimensions of implementation. His expertise has helped his clients maximize their project's effectiveness and return on investment. He is an effective and skillful communicator, consulting with his clients to help achieve their business objectives. Mark provides training, support, and implementation on all Autodesk manufacturing solutions.

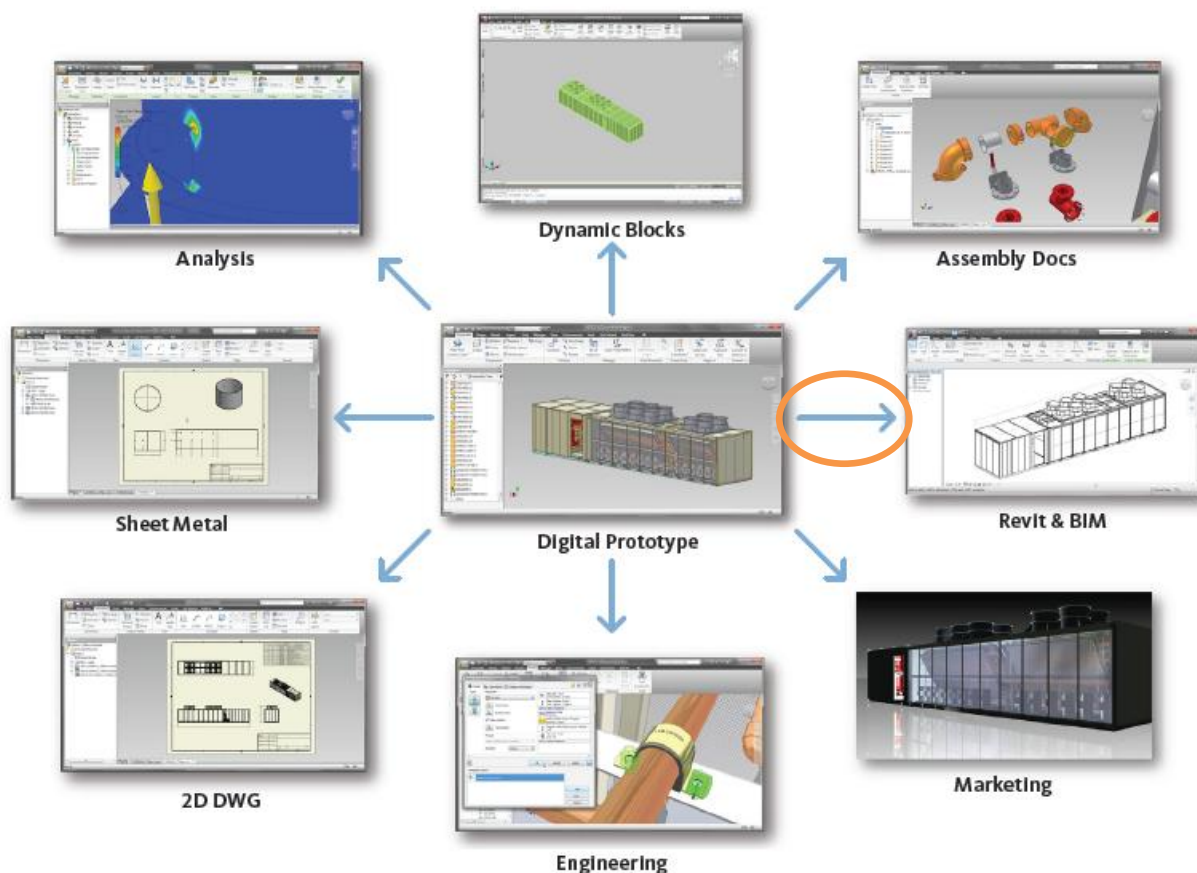
Blog: <http://blogs.rand.com/manufacturing/>

Introduction

Current trends in the building product manufacturing segment—including HVAC, lighting, plumbing, doors/windows, and furniture systems—require that building product manufacturers deliver very specific content to the AEC community. The process that drives the need for this type of content is known as Building Information Modeling (BIM) and is rapidly becoming the standard around the globe. This presents a significant challenge (but also new opportunities) for all building product manufacturers, and drives an immediate need for companies to develop strategies and workflows to deliver BIM-ready content for use by customers and distribution channels.

As the design and construction industry continues to adopt BIM, the building design process is requiring coordinated, reliable, and detailed information, from design through construction and into operations. As a result, building product manufacturers who can support this process are increasingly gaining a competitive advantage and becoming trusted partners by providing manufacturer-specific content to the BIM process.

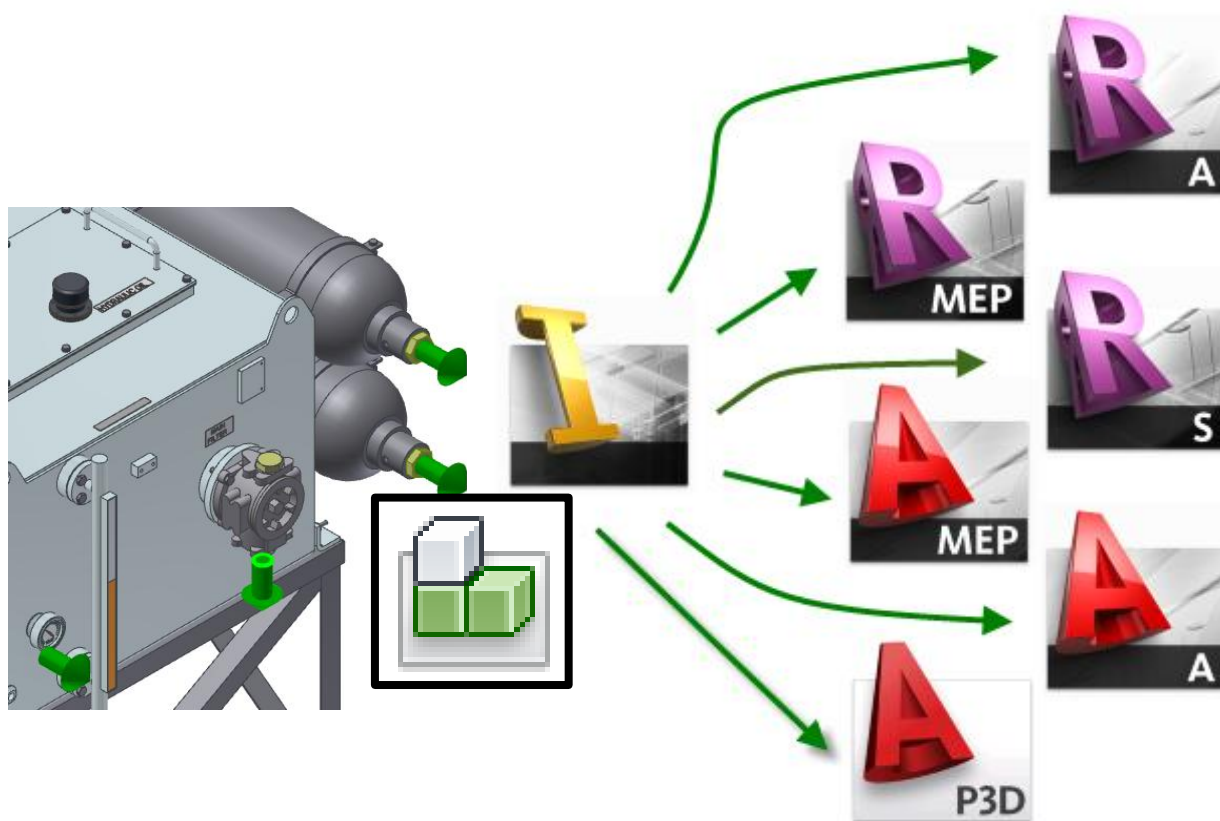
Autodesk's solutions for Digital Prototyping can help the various disciplines involved in BIM communicate and interpret design intent required to design, build, and operate a successful project. Through Digital Prototyping, project teams involved with BIM can better simulate performance and constructability of a project digitally before it's built to deliver projects faster, with fewer errors and coordination issues, and at less cost.



Autodesk Exchange Format (.ADSK)

Inventor creates BIM ready models by using AEC exchange to add BIM information to assemblies, weldments, and parts. AEC Exchange publishes 2D and 3D Autodesk Inventor part and assembly design data to an Autodesk Exchange File (.ADSK). Multiple Autodesk products can consume an Autodesk Exchange file type. AEC Exchange is Autodesk Inventor's data repository for MEP applications.

This BIM information is then leveraged in the Autodesk building and plant products. The Autodesk line of building and plant products are purpose-built applications for design and construction. Specialty products also exist for documenting Mechanical, Electrical, and Plumbing (MEP) information.



Autodesk products, such as AutoCAD MEP and Revit MEP, contain different tools for consuming data that the AEC Exchange creates. AEC Exchange has commands for defining connectors, simplifying model data, and exporting data to an ADSK file that MEP products will use for modeling.

There are three basic steps for ADSK file creation...

Simplify: Remove intellectual property from the model to protect investment and reduce loading time in AEC programs

Define: Add connectors and BIM metadata to the product and define default orientation.






























































Publish: Export results to the ADSK package file for consumption in other Autodesk products.

Where can I use an .ADSK file?

An Autodesk Exchange file can be used in several different programs. Since the Inventor AEC Exchange is designed for building products or plant assets, the programs the Inventor ADSK will read into are in that discipline.

The Revit line of Autodesk products will read in all connector information whether it is Revit Architecture, Revit Structure, or Revit MEP. Only MEP will actually work with the connections, but the other flavors of Revit will be able to orient the components where it makes sense for the MEP designer to take over.

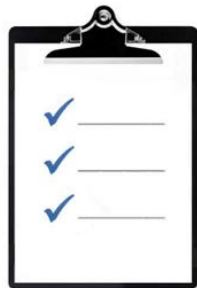
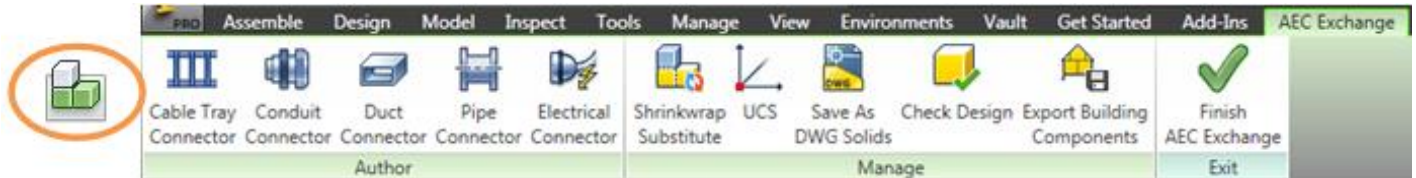
With AutoCAD based products such as Plant3D/P&ID, AutoCAD MEP, and AutoCAD Architecture, it is a little more variable depending on the product. AutoCAD MEP will bring them in with all connectors as long as it is imported by the user as a *MVPART*. Plant3D will only load the Pipe Connectors for plumbing with pipe specifications. AutoCAD Architecture will bring the component in but with no connectors and P&ID does not even have a command (since it is a component of the Plant3D product). Some programs work with each other a little differently such as Civil 3D and Revit (shown below). This table shows the commands for AEC programs with ADSK files and what information from the ADSK can be used.

Program (2011)	Import Command	iProperty Metadata Support	 Cable Tray Connector	 Conduit Connector	 Duct Connector	 Pipe Connector	 Electrical Connector
 A	 Building Component Opens a building component Autodesk Exchange (ADSK) file.	Yes					
 MEP	 Building Component Opens a building component Autodesk Exchange (ADSK) file.	Yes					
 S	 Building Component Opens a building component Autodesk Exchange (ADSK) file.	Yes					
 P3D	PLANTINVENTOREQUIPMENTCONVERT 	Yes: 2011 No: 2010					
 MEP	IMPORTBUILDINGCOMPONENT 	Must be MVPART					
 A	IMPORTBUILDINGCOMPONENT 	Manual Assign					
 P&ID	Not Currently Supported	N/A					
 3D	Revit:  Building Site Exports an ADSK exchange file. Civil: 	N/A					

NOTE: iProperty metadata, in some programs will not read the BIM data, it just reads the model geometry. This is version specific in some programs like Plant3D and completely unavailable in programs like AutoCAD Architecture.

Creating an .ADSK Package File

In the last few Autodesk Inventor releases, the AEC Exchange environment has been getting some much needed attention. Previously it was only able to export DWG Solids for full Inventor models. Now it has the capability to create the ADSK Exchange file, simplify the design (size and intellectual property protection), and assign data relevant to the design and BIM workflows.



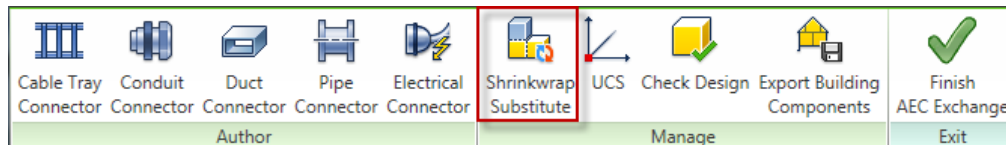
- Start AEC Exchange
- Simplify the Design
- Assign Connectors
- Adjust Orientation
- Check Design
- Export Building Components

Start AEC Exchange

To get started creating a BIM ready model, launch the AEC Exchange Environment (this can be done in either Part or Assembly modes). Items added in these environments, such as connectors, stay with the model and are accessible anytime the environment is started.

Environments Tab → Begin Panel → AEC Exchange

Simplify the Design



Shrinkwrap Substitute combines the Shrinkwrap command with Substitute Level of Detail (LOD) Representations. This command creates a Shrinkwrap part file and then uses it to create a Substitute LOD Representation. It is used to simplify assemblies before exporting to an Autodesk Exchange File for use by AEC consumers. It allows you to reduce model complexity, file size, and also protect intellectual property. This can be a big factor in whether your model is used by an AEC consumer.

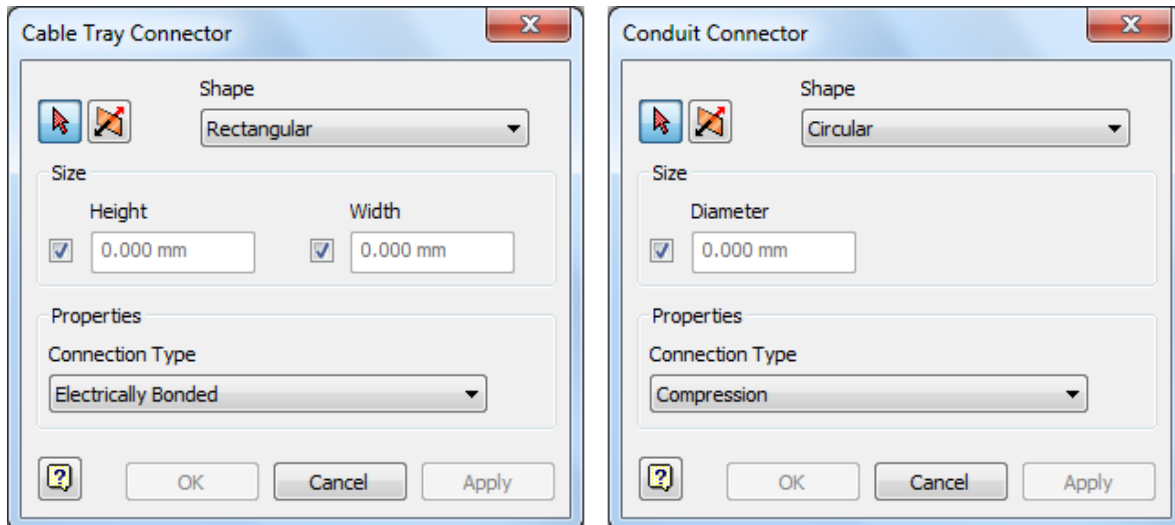
Hold Up! This may not be the best way to simplify.

While this command is helpful in situations where you have forgotten to simplify before the AEC Exchange process, it can also simplify too much. I recommend the simplification before getting into the AEC Exchange environment to facilitate good representation but be cautious to not sacrifice important components. For tips on model simplification see the **Appendix**.

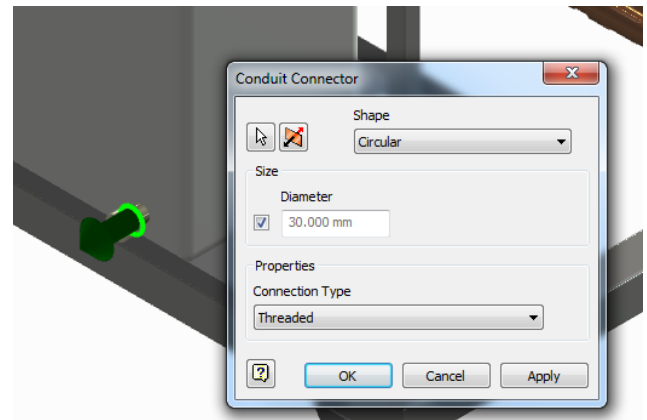
Assign Connectors

The connector tools are all similar in their dialog box structure. The Cable Tray and Conduit are simple selections while the Electrical, Pipe, and Duct can have additional property data assigned to them.

Cable Tray & Conduit Connectors

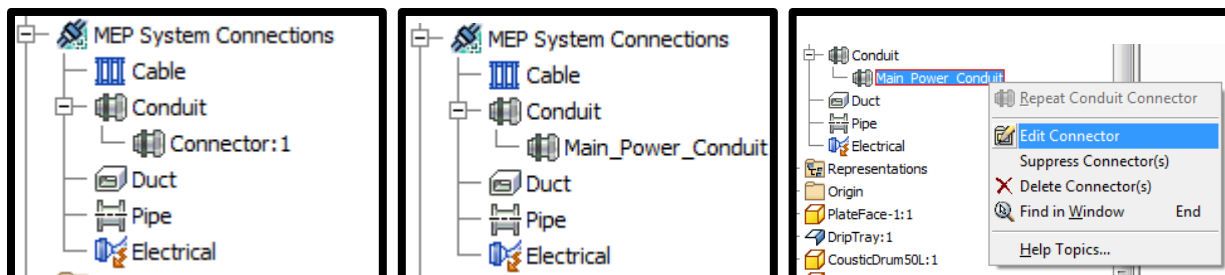


Setting	Cable Tray	Conduit
Shape	<i>Rectangular or Undefined</i>	<i>Circular or Undefined</i>
Size	Based on size of <i>Shape</i> selection or clear to define new	
Properties	<i>Electrically Bonded or Undefined</i>	<i>Compression, Glued, Set Screw, Threaded, or Undefined</i>



Note: If using Inventor 2010 and Revit 2010, Cable Tray connectors are not valid inside of Revit MEP.

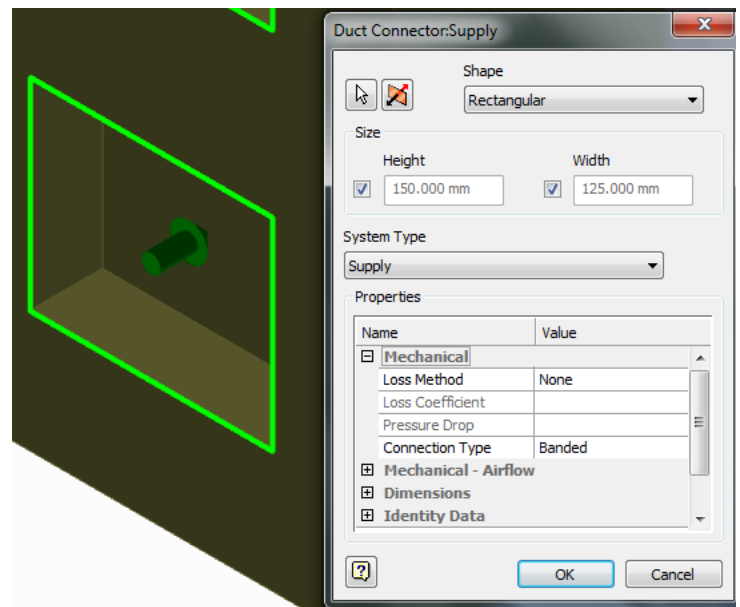
To rename a Connector, soft double click on it in the browser. (You cannot use spaces in the name). To modify an existing connector, right click on it in either the browser or the graphics window and select *Delete*, *Suppress*, or *Edit Connector*.



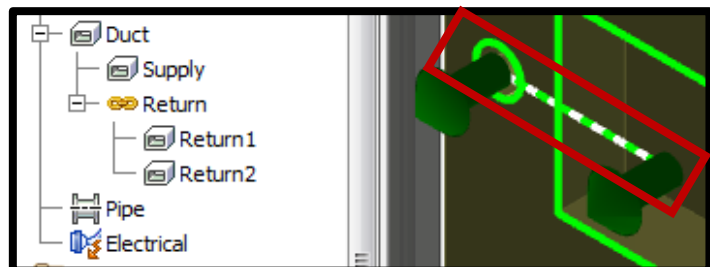
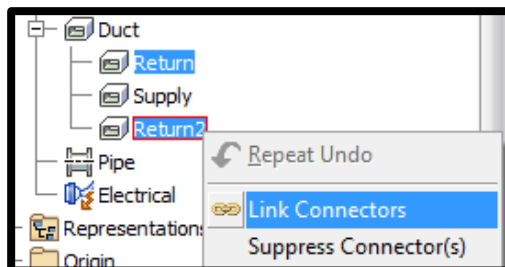
Duct Connectors

This type of connector is appropriate whenever you are trying to tie into HVAC systems or any other type of air based handling system. There are a few more types of shape selections here but more importantly, there are more BIM specifications for the AEC consumer (for example, Loss Methods, Flow Configuration and unique Identity Data).

Setting	Duct Connector
Shape	<i>Rectangular, Circular, Oval, or Undefined</i>
Size	Based on size of <i>Shape</i> selection or clear to define new
System Type	<i>Exhaust, Return, Supply, Other, or Undefined</i>
Mechanical Properties	<u>Loss Method</u> <i>Coefficient, Specific Loss, or None</i> <u>Connection Type</u> <i>Banded, Clipped, Flange, Mastic, Overcollar, Raw Edge, Slip Drive Slip Joint, Vanstone, or Undefined</i>
Mechanical Airflow	<u>Flow Configuration</u> <i>Calculated, Preset, or System</i> <u>Flow Direction</u> <i>In, Out, or Bidirectional</i>
Dimensions	Automatically filled out from <i>Size</i> area of the dialog box
Identity Data	Input unique identity information



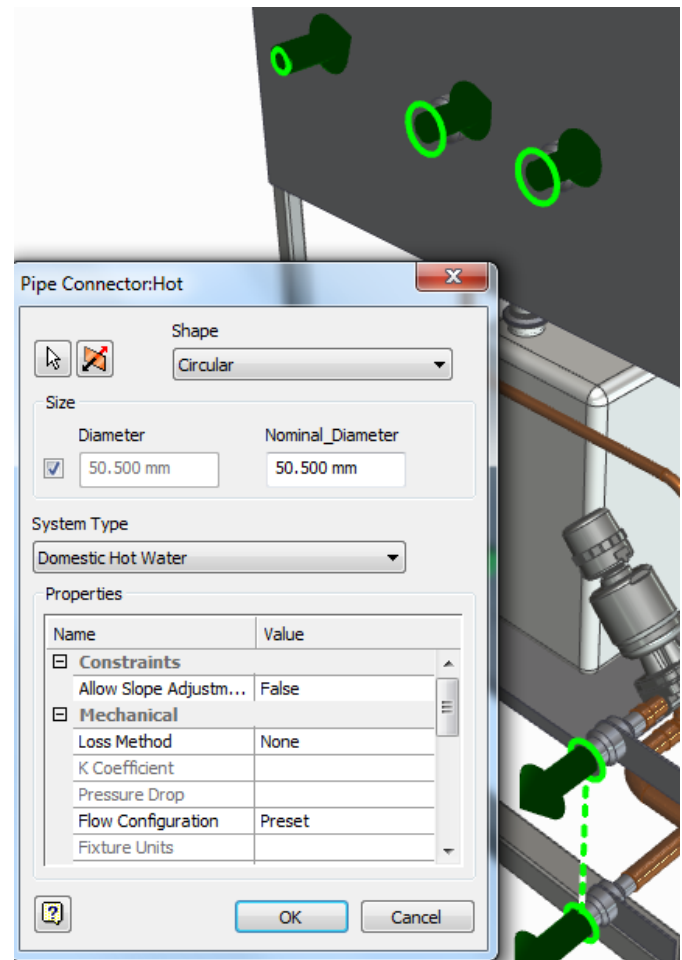
When two or more Duct connectors are placed, they can then be linked together to create a relationship between them. If the type properties do not match (for instance one is Supply and the other Return) then the link will force them to be the same. Pipe and Electrical connectors can also be linked together.



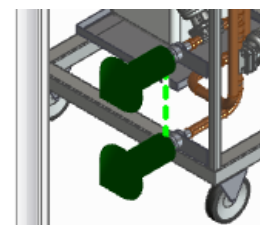
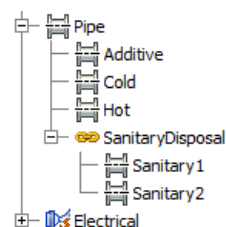
Pipe Connector

The connector is used for placement of pipes where fluid transmission takes place. Shape is limited here to *Circular* or *Undefined*, but *Sizing* can be the model selection or changed to a *Nominal_Diameter* value.

Setting	Pipe Connector
Shape	Circular or Undefined
Size	Based on size of <i>Shape</i> selection as well as <i>Nominal_Diameter</i> User input, or clear to define new values for both
System Type	<i>Domestic Cold Water, Domestic Hot Water, Fire Protection Dry, Fire Protection Other, Fire Protection Pre-Action, Fire Protection Wet, Hydronic Return, Hydronic Supply, Sanitary, Other, or Undefined</i>
Constraints	<u>Allow Slope Adjustment</u> <i>True or False</i>
Mechanical Properties	<u>Loss Method</u> <i>K Coefficient, Specific Loss, or None</i>
	<u>Flow Configuration</u> <i>Preset, Calculated, System, or Fixture Units (Sanitary, Domestic Hot or Cold Systems only)</i>
	<u>Flow Direction</u> <i>In, Out, or Bidirectional</i>
	<u>Connection Type</u> <i>Brazed, Butt Welded, Capillary, Compression, Coupling, Crimped, Flange, Fusion, Glued, Grooved, Slip Joint, Socket Welded Soldered, Soldered, Threaded, or Undefined</i>
Dimensions	Automatically filled out from Size area of the dialog box
Identity Data	Input unique identity information



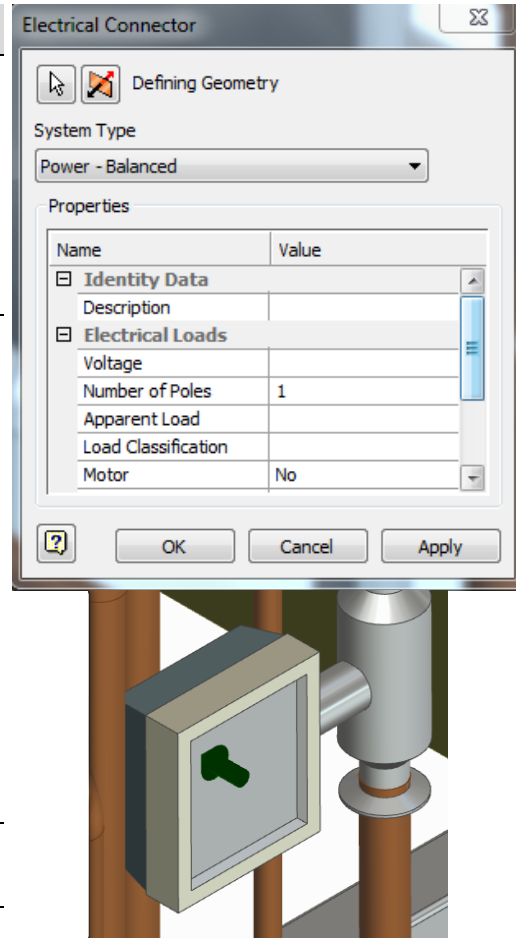
Just as Duct connectors can be linked, so can Pipe Connectors. The same rules for matching apply.



Electrical Connector

This type of connector is used for Electrical power distribution to the component. Some standard system types are available and in depth property assignment is available for single or three phase devices using the balanced or unbalanced system types.

Setting	Pipe Connector
System Type	<i>Communication, Controls, Data, Fire Alarm, Nurse Call, Power-Balanced, Power-Unbalanced, Security, or Telephone</i>
Electrical Loads (Only Available on Power-Balanced or Power-Unbalanced System Types)	Voltage Number of Poles (1, 2 or 3) <u>Apparent Load</u> (Balanced Systems Only) <u>Apparent Load Phase 1-3</u> (Unbalanced Systems Only) Load Classification <u>Motor</u> : Yes or No Power Factor <u>Power Factor State</u> <i>Lagging or Leading</i>
Identity Data	Input unique identity information



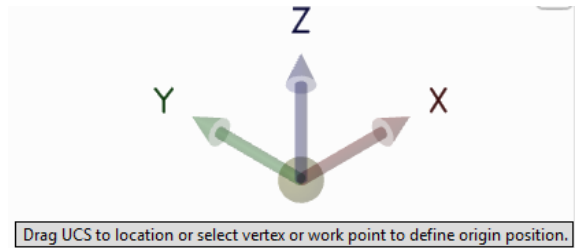
Electrical Connectors can be linked just like Duct and Pipe Connectors

Adjust Orientation

The orientation of Inventor's assembly environment is not the same as a Revit Project workspace. In Inventor when a new Assembly is started, the Y axis is going straight up. In a Revit project or family workspace the default axis going straight up is the Z axis. This difference can cause problems for the AEC consumer if not resolved in the Inventor workspace first.

To resolve the orientation adjust your base component placements before assembling other components to them. An easier way is to assign a new UCS in the AEC Exchange for export orientation. To create a new UCS start the command in the *AEC Exchange Tab* → *Manage Panel*.

To rotate the axis when placing this triad grab on the shaft on one of the colored axes and adjust the value. Linear placement of the UCS should be at 0,0,0 or a central part of the model where it would rest normally against another object. These nuances can be overcome in Revit, but it's just another precaution to take to make sure your content is the best it can be for AEC consumers.

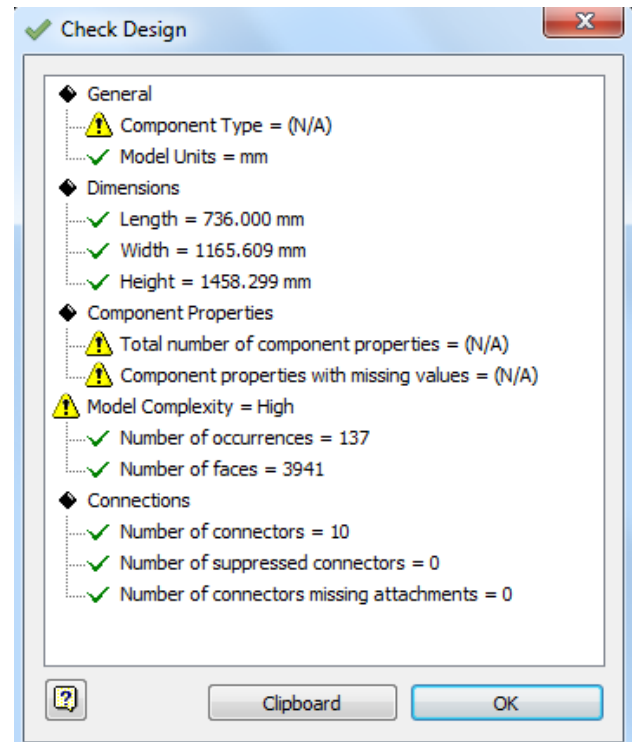


Check Design

The design check is used to provide a last look at the work done in the AEC Exchange environment and will inform the Inventor designer of any potential areas of lacking information or size issues with the expected output of the model.

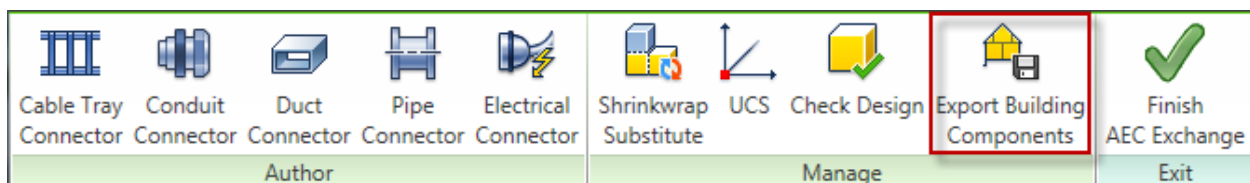
Model Complexity	
Low	# of occurrences < 25 # of faces < 500
Medium	# of occurrences > 24 and < 100 # of faces > 499 and < 2000
High	# of occurrences > 99 # of faces > 1999

Check Design can be done any time before the final publishing takes place and is also available on the *Export Building Components* command.

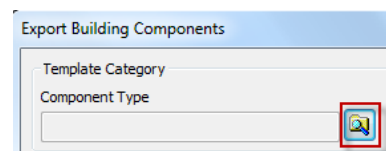


Export Building Components

The final step in publishing the BIM ready model from Inventor is the publishing of the content. At this point the model geometry is simplified and the geometry has the intelligent connectors needed to hook into an MEP design. Start the publish with the **Export Building Components** command.

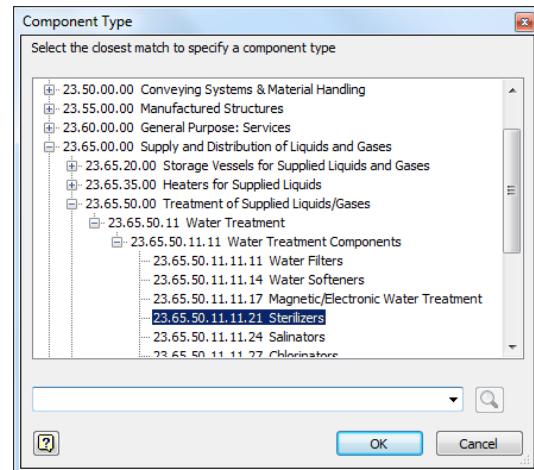


Once inside this command select the Component Type selection box. This sets up ideal parameters for the type of design you are creating and is directly relateable to the MEP products.



If your type of equipment is not similar to any listed it is not the end of the world, it just means that the MEP products do not have an EXACT match to your piece of equipment. This list is populated through an XML file that is not intended to be modified. Just pick something close in order to get the properties to finish mapping data to your design.

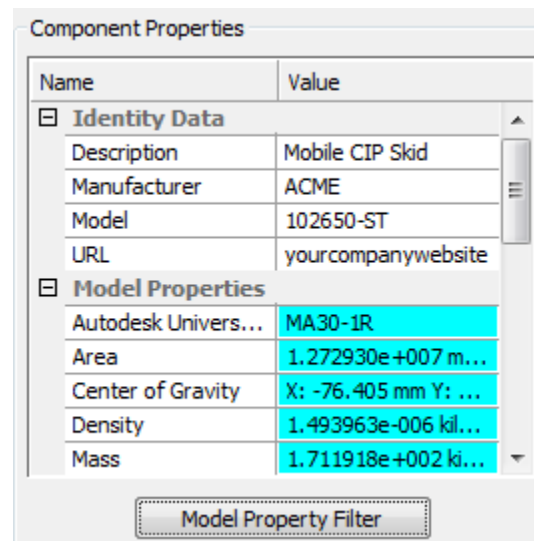
To aid in this process, there is a dynamic search tool built into the dialog box. Simply type and hit the return on the keyboard and it will highlight everywhere that work is used in categories.



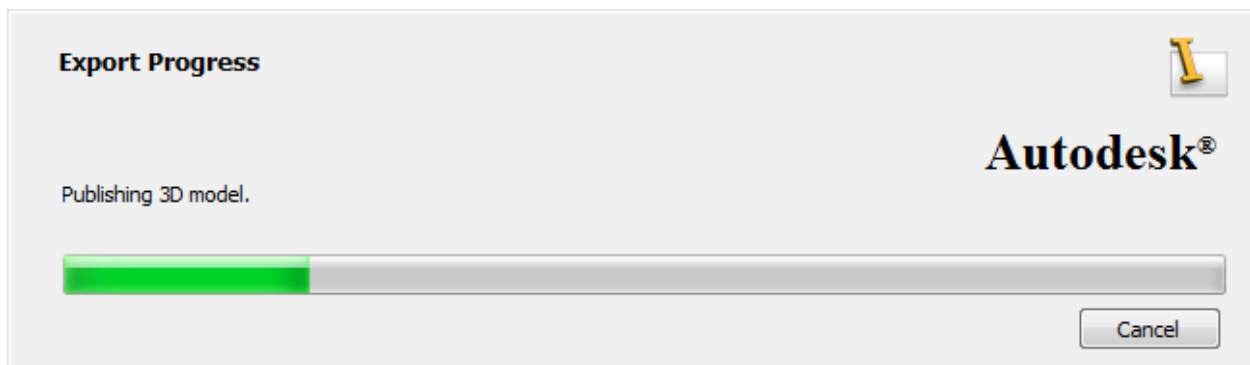
Once the Component Type is chosen you will need to fill out the rest of the data necessary for the model in the Component Properties area.

The Identity Data will be blank for you to fill out, but the Model Properties is assigned from the iProperties of the model. By default it will take anything with a value, including Custom iProperties.

Click Model Property Filter to alternatively pick and choose the values. For instance, Center of Gravity, Area, or Volume of the entire model are probably not necessary to the AEC consumer like overall Mass would be.



Finally, pick the desired orientation from the previous step or the default Model Origin, choose a Thumbnail Preview from the Inventor Automatic selection or a previously saved file like an actual product image. You can run Check Design again from here to make sure you have all your model information accurate before processing. Selecting OK will start the ADSK creation process.



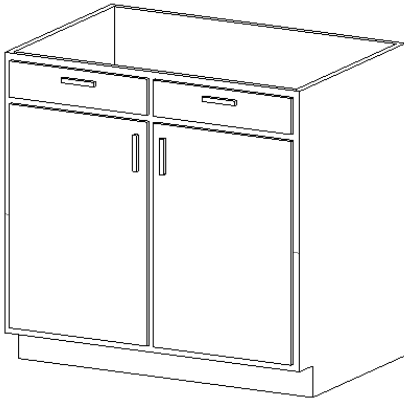
Once processed, you will have a new ADSK file and Inventor will ask if you would like to view the translation report. This report will include a large amount of data about your system like connector information, sending system, component type, and component properties. Consider printing this to PDF for further design tracking and collateral for your AEC consumers.

When Should I Create a Revit Family (.rfa)?

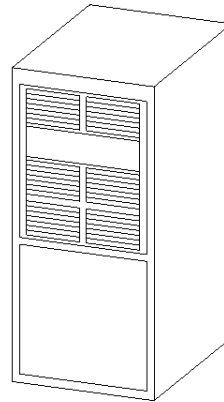
A Revit Family (.rfa) is similar in its design to an Inventor iPart or iAssembly where certain factors determine configurable sizing and type naming for the Revit asset.

A large misconception about the relationship between Inventor and the Autodesk Building Products is that an .ADSK file will be fully modifiable from Inventor. This is not the case. If a model needs to be scalable or configurable inside a building product like the Revit products or AutoCAD MEP then it needs to be created in that product. An .ADSK file is not the silver bullet for the data exchange between Inventor engineers and architectural modelers.

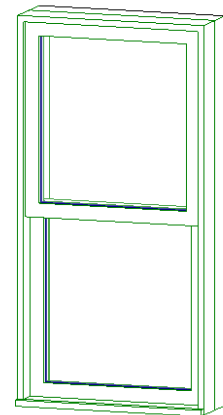
If you are in the business of making Curtain Walls, Cabinetry, or entire lines of mechanical equipment, then you will most likely have a configurable product that cannot be summed up in one Inventor model which is essentially what an .ADSK file sends.



Cabinets



Furnaces



Windows

So I have to buy a seat of Revit if I want parametric configured families? – The answer is yes, and you should get trained in it as well, since it is not the same as building those products in Inventor. Conversely, you could pay a Value Added Reseller or Professional Services company to create these for you.

You still need Inventor to create your manufacturing drawings since Revit does not do fabrication layout or detailed dimensions with the same power as Inventor. Here are some deciding factors that go into the decision to duplicate your Inventor work to create Revit families in a Revit product:

- Does your product have standard configurations of design?
- Do you constantly get asked for these types of configured files from AEC consumers?
- Do you want AEC content consumers to be able to pick any one of your products in your line?
- Do you want widespread adoption of your product line in the AEC chain?

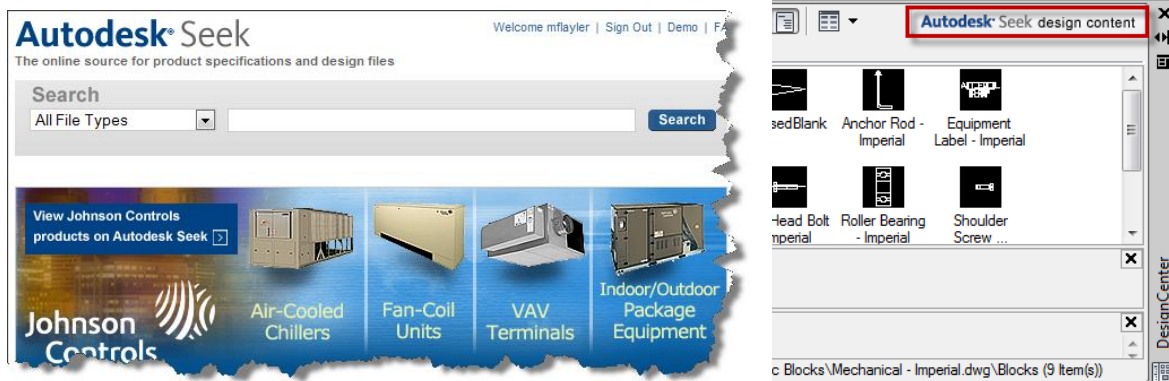
Yes, it's a necessary evil for a lot of businesses, but the payoff that architects know and use your product with all its categorical and costing information is quite beneficial to the adoption of your product in the market. Some architects will purposely NOT use a product because it adds time to their deadline to stop what they are doing and create a Revit family.

Online Distribution

Perhaps one of the biggest reasons manufacturers have started to create BIM models is to increase their products adoption and usage in the AEC market. The key is how to get visibility for your product. Designers may not even know your model or product exists if they were never told about it or never saw it in a model database. Here are some great resources to get your BIM models out there in the project directories of your potential clients and consumers.

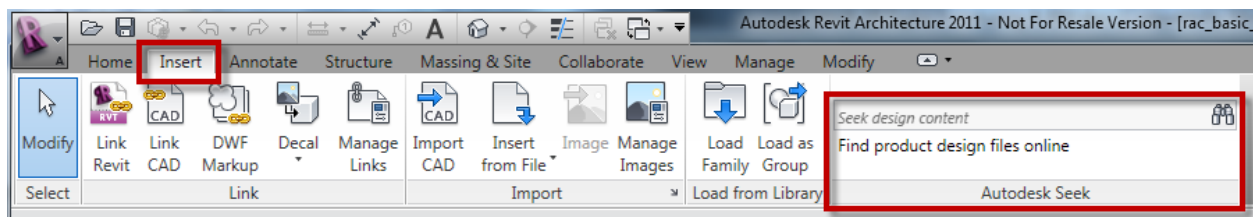
Autodesk Seek (<http://seek.autodesk.com>)

“Autodesk® Seek is the online source for building product information that allows designers to search, select and specify building products - your products! - along with associated design files such as 2D drawings, specifications, product descriptions, and 3D models. While working in their design applications such as AutoCAD® or Revit®, architects, engineers and designers can obtain accurate, information-rich results using the Autodesk Seek search functionality embedded within their applications.”



Autodesk Seek indexes and categorizes content from a wide variety of sources including data from content aggregator partners, your product libraries, and existing Revit and AutoCAD building product libraries. Once found, design files can be easily dropped directly into a building model or drawing, reducing the need to recreate individual components in the design. This embedded search functionality is now available in the 2009 U.S versions of Autodesk's Revit Architecture, Revit Structure, and Revit MEP, as well as AutoCAD, AutoCAD Architecture and AutoCAD MEP.

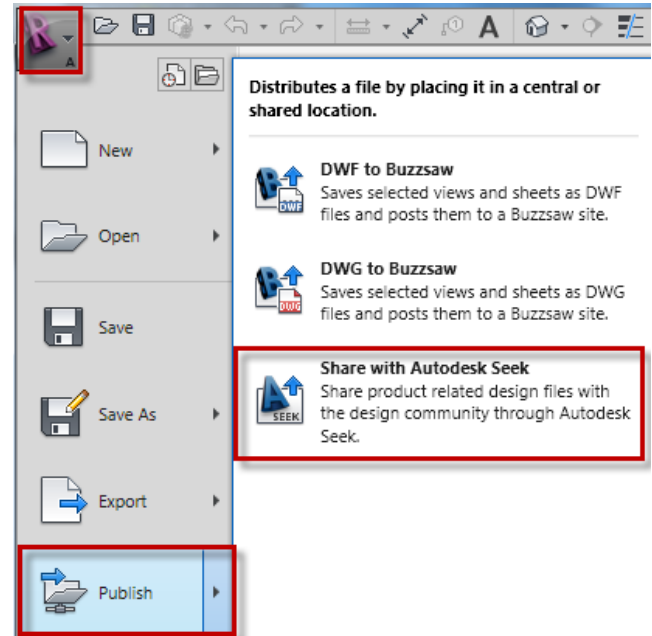
As a manufacturer of building products, you can become a valued participant in the Autodesk Seek community, which strives to provide a forum for designers to communicate with each other, share design files and take advantage of the wealth of product information consolidated from manufacturers in a single online source.”



The Revit products also have a Publishing option inside of them to *Share with Autodesk Seek*. So if you took the time to create your product line in a simplified yet intelligent Revit rfa, you can share that to the site directly for content consumers to download.

You can also become Seek certified by following the guidelines found on the site. This lets the consumer know that you put all the required information into the model to create a great BIM asset as well as get an icon for *Manufacturer Supplied* underneath your product so your consumers know it is you.

During the publishing process you are asked to fill in any extra information not already in the BIM model. This is where you can add product catalogs and other supporting files like Sketchup files (SKP) or DWG Solids.



Dyson Airblade Hand Dryer AB02 - wipes hands dry with a high-velocity sheet of air in just 12 seconds.

Provided by McGraw-Hill Sweets Network
Manufacturer Dyson Inc.

Manufacturer Supplied

1 RFA 4 DWG 4 DWF
4 DXF 1 SKP 12 PDF
1 ZIP

Autodesk Homestyler (www.homestyler.com)

“Autodesk Homestyler is free online home design software that brings your interior design plans and remodeling dreams to life. Easy drag and drop, brand name products, and 3D views make using Autodesk Homestyler the best way to start your next home design project. It's free, completely web-based, and instantly accessible online.”



Non-Autodesk Online Content Providers

“RevitCity.com was started with one simple goal, to aid Revit users around the world. Our aim is to give the Revit community a central place where you can get your questions answered, share your latest ideas or creations, and easily find the content you are looking for.”
































RevitCity

Other online resources: <http://www.revitcity.com/resources.php>

New BIM Programming Options

With the addition of the Inventor 2011 Subscription Advantage Pack new programming options have been added to the VBA and API interfaces. This opens the door for custom scripts, routines, and add-ins to increase the speed and accuracy in which BIM ready content can be produced by Inventor. Since programming is very much a custom conversation, I can tell you that the opportunities here are quite extensive based on your needs of model creation.

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-  BIMCableTrayConnectionTypeEnum
-  BIMCableTrayConnectorDefinition
-  BIMComponent
-  BIMComponentDescription
-  BIMComponentProperty
-  BIMComponentPropertySet
-  BIMComponentPropertySets
-  BIMConduitConnectionTypeEnum
-  BIMConduitConnectorDefinition
-  BIMConnector
-  BIMConnectorDefinition
-  BIMConnectorDefinitionTypeEnum
-  BIMConnectorLink
-  BIMConnectorLinks
-  BIMConnectors
-  BIMConnectorShapeEnum
-  BIMDuctConnectionTypeEnum
-  BIMDuctConnectorDefinition
-  BIMDuctFlowConfigurationEnum
-  BIMDuctLossMethodEnum
-  BIMDuctSystemTypeEnum
-  BIMElectricalConnectorDefinition
-  BIMElectricalPowerFactorStateEnum
-  BIMElectricalSystemTypeEnum
-  BIMExchangeServer
-  BIMFlowDirectionEnum
-  BIMPipeConnectionTypeEnum
-  BIMPipeConnectorDefinition
-  BIMPipeFlowConfigurationEnum
-  BIMPipeLossMethodEnum
-  BIMPipeSystemTypeEnum



With the right kind of programming, a company could create a web interface for clients to assign their own connectors and create their own ADSK files from the Inventor models with all the right connector information and data ready for their AEC models.

Tracking the .ADSK

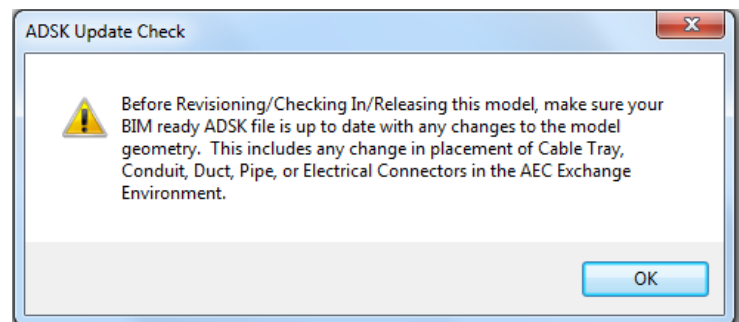
After an ADSK file is created it has no file relationship with any Autodesk Inventor part or assembly file. It is essentially an orphaned package of all your BIM ready data for use in the building and plant products. The advantage here is that consumers of this data do not have to have the originating Autodesk product that created the ADSK file. The disadvantage of this severed link is that when changes are made to the Inventor file, the .ADSK file does not know that a change has occurred.

While there are many ways to address this issue, let's look how the software can help us not only track, but also remind us that a change has occurred in the BIM ready model.

iLogic

Create an iLogic Rule to create a dialog box that will remind users to make sure the ADSK file is up to date with the current revision/release of the Inventor model.

This can be setup to trigger in numerous ways, but I prefer it to fire after a save takes place. The rule is remarkable simple to write with the iLogic wizard for Message Box creation.

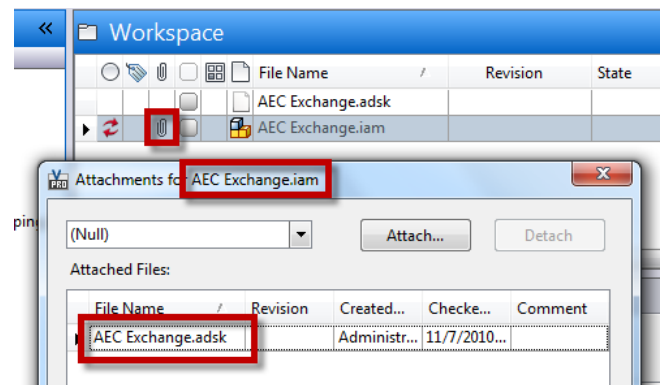
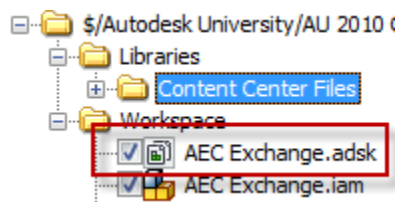


Vault

Autodesk Vault, like iLogic, is free with Inventor 2011. It allows tracking and versioning of the ADSK file but still does not update it without user interaction.

Once the ADSK file is created, it can be attached to an Inventor assembly or part file inside the Vault so that when the part or assembly is checked out, the ADSK file comes out with it. As long as the naming stays the same with the ADSK file output each time a new version of it is created, it will still go back in the Vault with the Check In operations.

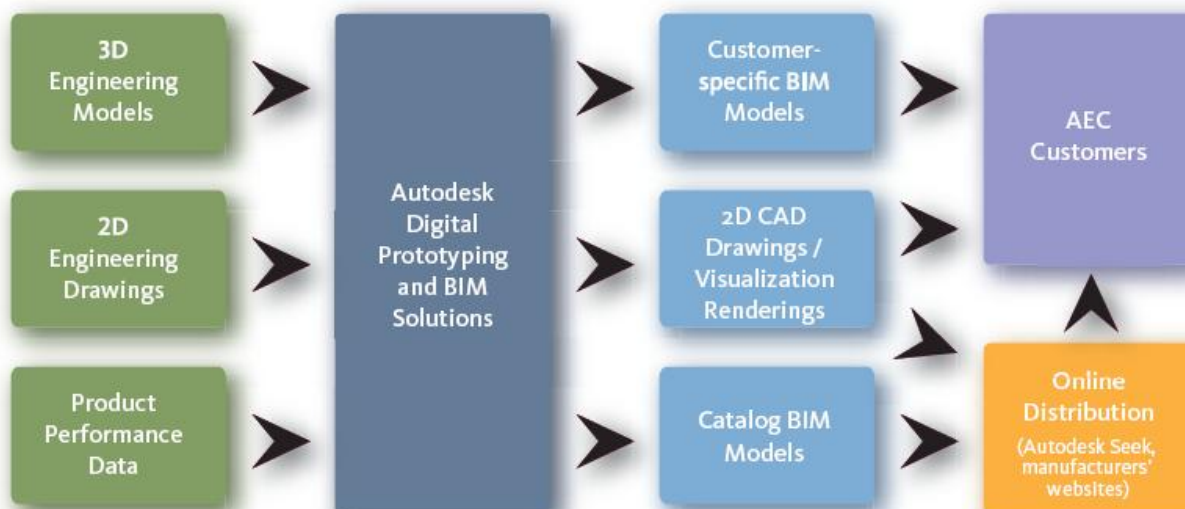
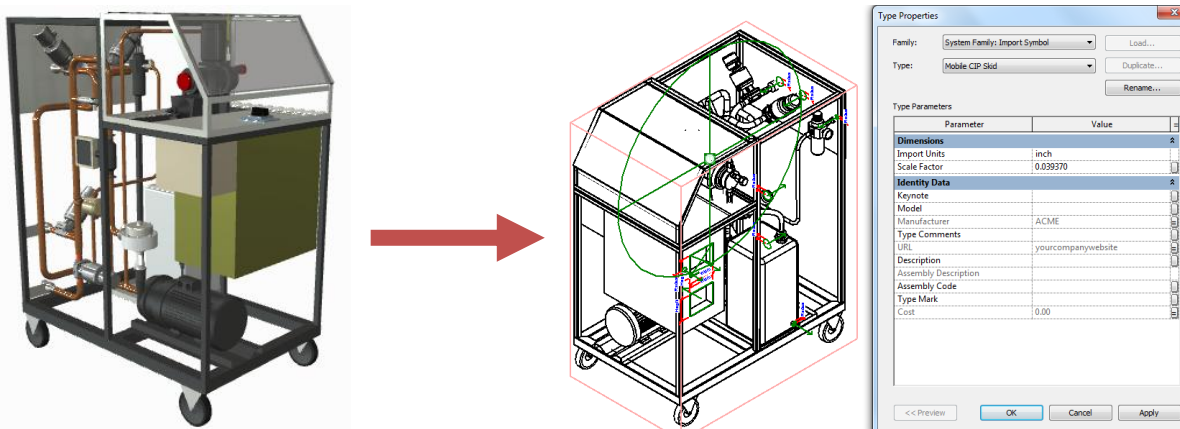
1. Check in all files
2. Add the ADSK by dragging and dropping it into Vault
3. Inside Vault attach the .ADSK file to the assembly
4. Open from Vault and "Check out All"
5. Make changes and update the ADSK
6. Check in the files



Note: When you add an attachment to a file in the vault, a new version of that file is generated. This ensures that all changes, even the addition/removal of file relationships, are tracked so that you can determine when those relationships were made (or so you can return to a version that existed before the relationship was made).

Summary

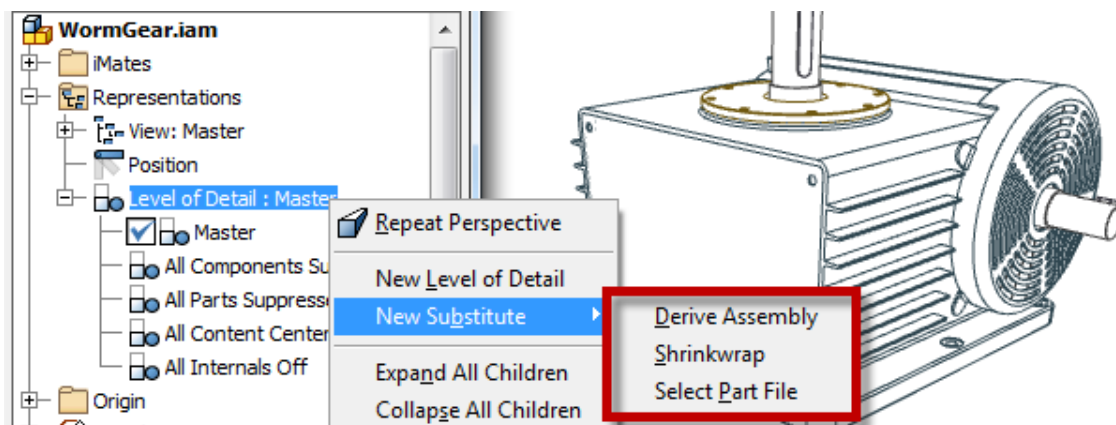
Using the tools introduced in this class, Autodesk Inventor can allow manufacturers of building and plant products to produce BIM ready models for AEC consumers. This methodology aims to increase accuracy of designs from product fabricators to BIM modelers, increase product adoption in the marketplace, and reduce costly placement and type errors associated with rework of an already existing model designed in another CAD package.



Class Summary: The Autodesk workflow encourages the reuse of critical engineering data to enable the provision of content in multiple formats as required by different customers and stakeholders. It eliminates the need to re-create content and the associated incremental cost, time, and inaccuracies from duplicate effort. Furthermore, the workflow contains best practices that will guarantee only the highest quality of content, and provides a new level of automation that further simplifies the dealer's ability to configure. By offering better, more reliable content faster than its competitors, Autodesk's workflow provides manufacturers with a competitive advantage.

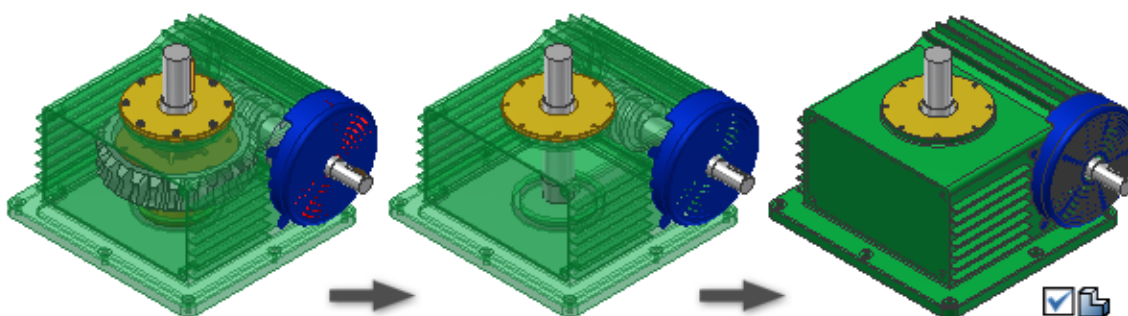
Appendix: Model Simplification

Model simplification is just as important to the BIM model creation process as the BIM information itself. Too large of an ADSK or RFA can and will bog Revit down. AutoCAD based products such as AutoCAD MEP and Plant3D do not suffer as much as the Revit products. The other important aspect of model simplification is the protection of your design intelligence and proprietary modeling information. The best practice is to keep your BIM models small, concise with connector information, and not too face and edge heavy.



One of the easiest ways to control this is through Substitute Level of Detail (LOD) representations. Below is a brief overview of the three methods:

Derive Assembly – Identical to the *Derive* command when used on an Assembly



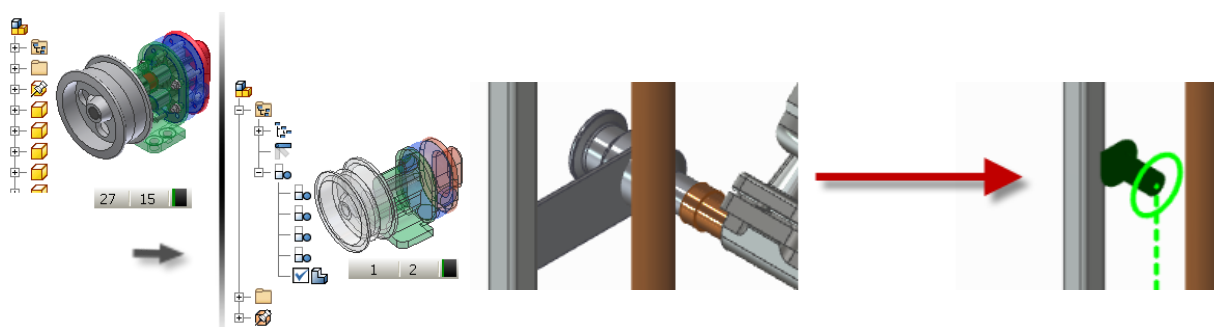
This method of creating an LOD allows you to remove data that is not important in the design and pull the remaining geometry into a single file which greatly reducing loading time. Derive Assembly also allows for removal of parts and bounding boxes for component rather than intense detail. Normally this simplification is used to help on very large assembly structures.

In regards to BIM ready models, it creates a simplification of the internal faces and edges as well as the option to remove non-essential parts completely.

Note: When Substitute parts are created for LODs, their references links are disabled and must be manually updated. *Assemble Tab → Productivity Panel → Update Substitutes.*

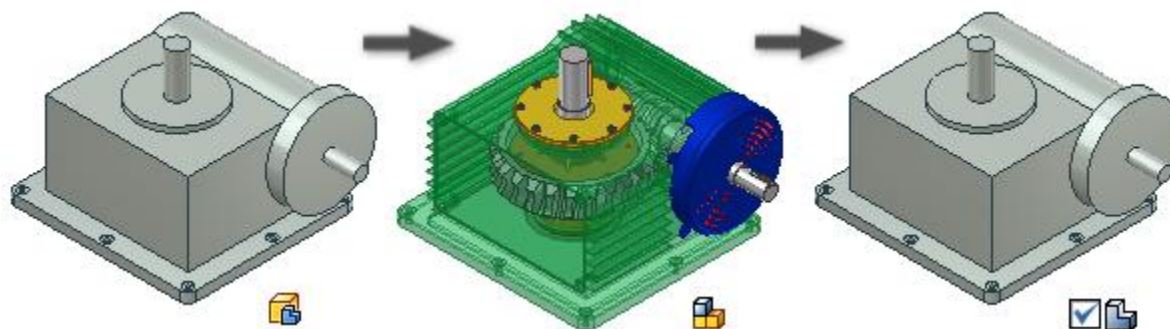
Shrinkwrap – Identical to the *Shrinkwrap Substitute* command in AEC Exchange.

Oddly enough, the Shrinkwrap method even though it is used in AEC Exchange is perhaps the worst one to use for BIM. Essentially, a Shrinkwrap will remove parts by size, by visibility, and patch holes by circumference. Although the connector objects stay after a Shrinkwrap takes place, they are usually floating geometry without a visual connector. This makes it hard for AEC consumers let alone another Inventor user to understand what it directly connects to.



Select Part File – Selects an existing reference part in the file store for graphical use.

This method basically uses a pre-defined part to represent the design. The disadvantage of using this method for BIM ready models is if a connector changes location, you now have to change that location in two separate areas rather than one derived assembly.



All methods shown here still contain the entire Bill of Material information and can all still be used on a drawing. In summary a simplified model could have a significant impact on the performance of another CAD system. A 3 MB file compared to a 26 MB file is quite a difference inside a large commercial building or plant layout.

Related Classes: Cheating Large Assemblies

Class ID: MA308-4

AU: 2009

Speaker: Andy Warren

Class Description: Do you have an assembly with a couple hundred parts but thousands of instances of those parts? If you do you may have noticed how it bogs your computer down when you start the drawing for it. In this class we will talk about shrink-wrapping parts, deriving assemblies, and LOD Part Substitutions to make the model much lighter. We will also talk about the tricks when checking in and out of the Vault and how to get more open faster. After this class you will be able to use those huge assemblies the same as a single part!