Don’t Let the Word “Factory” Get in the Way:
The Broader Uses of Autodesk® Factory Design Suite®

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MA 1883

Autodesk® Factory Design Suite® offers unique functionality that greatly simplifies the process of laying out and visualizing a factory design. However, don’t let the word "factory" get in the way or color your view of this application. Anyone who needs to lay out a confined space or a floor with common design assets can take advantage of the workflow offered by Autodesk Factory Design Suite. In this class, we will look at specific functionality available in Factory Design Suite and demonstrate how it can be used in other layout workflows.

Learning Objectives

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

- Describe the Broader Uses of Factory Design Suite
- Explain why Other Industries Would Consider the Factory Design Suite
- Identify Designs that Could Utilize Factory Design Suite – Other Than Factories
- Investigate Asset Publishing for Layout Design

About the Speaker

Rusty Belcher is a Manufacturing Application Expert working with IMAGINiT Technologies. Rusty provides implementation, training, and support services at every level for all Autodesk Manufacturing products. His specialty involves the integration of 3D design practices into manufacturing production environments. As an instructor and mentor, IMAGINiT regularly receives outstanding reviews of his impact to their organization.

Rusty started his career as a structural steel fitter at Newport News Shipbuilding. He is a graduate of the Newport News Shipbuilding Apprentice School and worked in the shipyard's Mold Loft engineering division.

Over the past several years Rusty has worked directly with Autodesk to develop and author the current Factory Design Suite training courseware and has also developed and recorded many of the tips and tutorial videos available on the Factory Design Suite YouTube Channel. He is currently working with Autodesk to develop the Factory Design Suite and Product Design Suite Test Drive for the 2014 release.

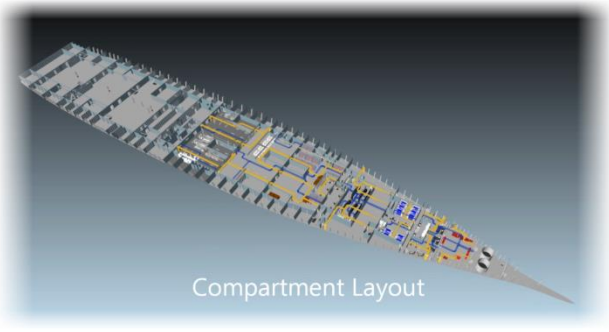
Section 1: Describe the Broader Uses of the Factory Design Suite®.

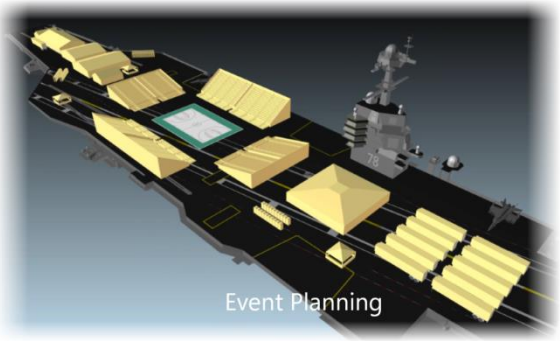
Backstory

I remember the first time I saw a demonstration of the Factory Design Suite. Prior to the initial release, Shibai Bagchi, the FDS product manager, demonstrated this amazing functionality to me as part of a project I would be working on. I could hardly believe what I was seeing. Autodesk Inventor® parts snapping together, automatically landing upright on a floor and an asset based workflow for authoring and publishing these designs. I was truly amazed at this new functionality and for a few moments at the end of the demo, I was speechless. Shibai asked me what I thought? The first words out of my mouth were "*This is amazing, but I think you misnamed the product. There are many other types of designs that can utilize this workflow beyond factories.*"

From that moment on, I have been a big fan and a major supporter of the Autodesk Factory Design Suite. I have had the opportunity to work with factory owners, machine designers and system integrators as they begin to adopt the FDS product into their workflows. But I never could forget my initial thoughts that many different design disciplines could take advantage of the workflows offered by the Factory Design Suite.

The goal of this presentation is to provide increased vision and exposure to the broader uses of the Factory Design Suite. We will demonstrate how FDS can be used in many designs other than Factories. As you go thru this presentation, I encourage you to keep an open mind and think outside the apparent uses of this application. Above all, please remember; **Don't Let the Word Factory Get in the Way!**



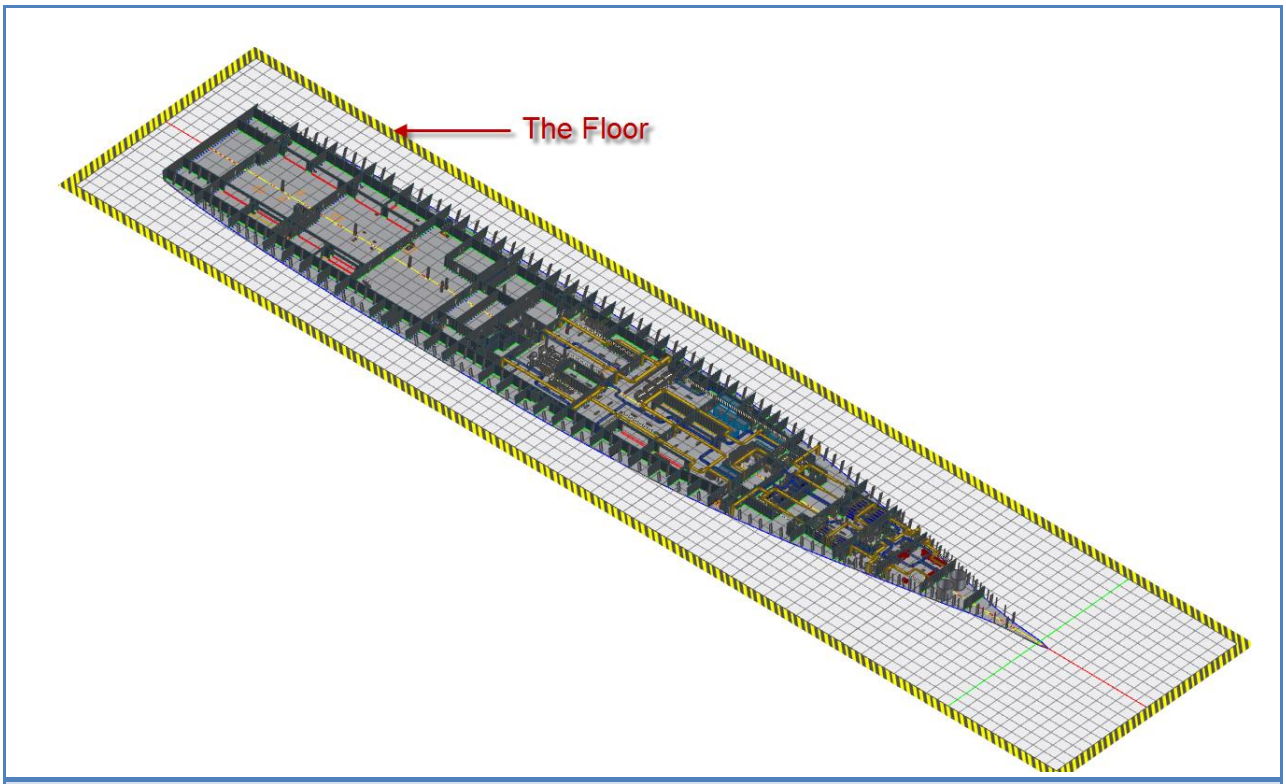


Section 2: Explain Why Other Industries Would Consider the Factory Design Suite.

So why would designers even consider the Factory Design Suite® instead of the Product Design Suite®? What features and workflows are offered by FDS that would appeal to engineers in other disciplines? In this section of the presentation, we will discuss the aspects of the Factory Design Suite that appeal to designers in any industry.

The Floor (Layout Based Design)

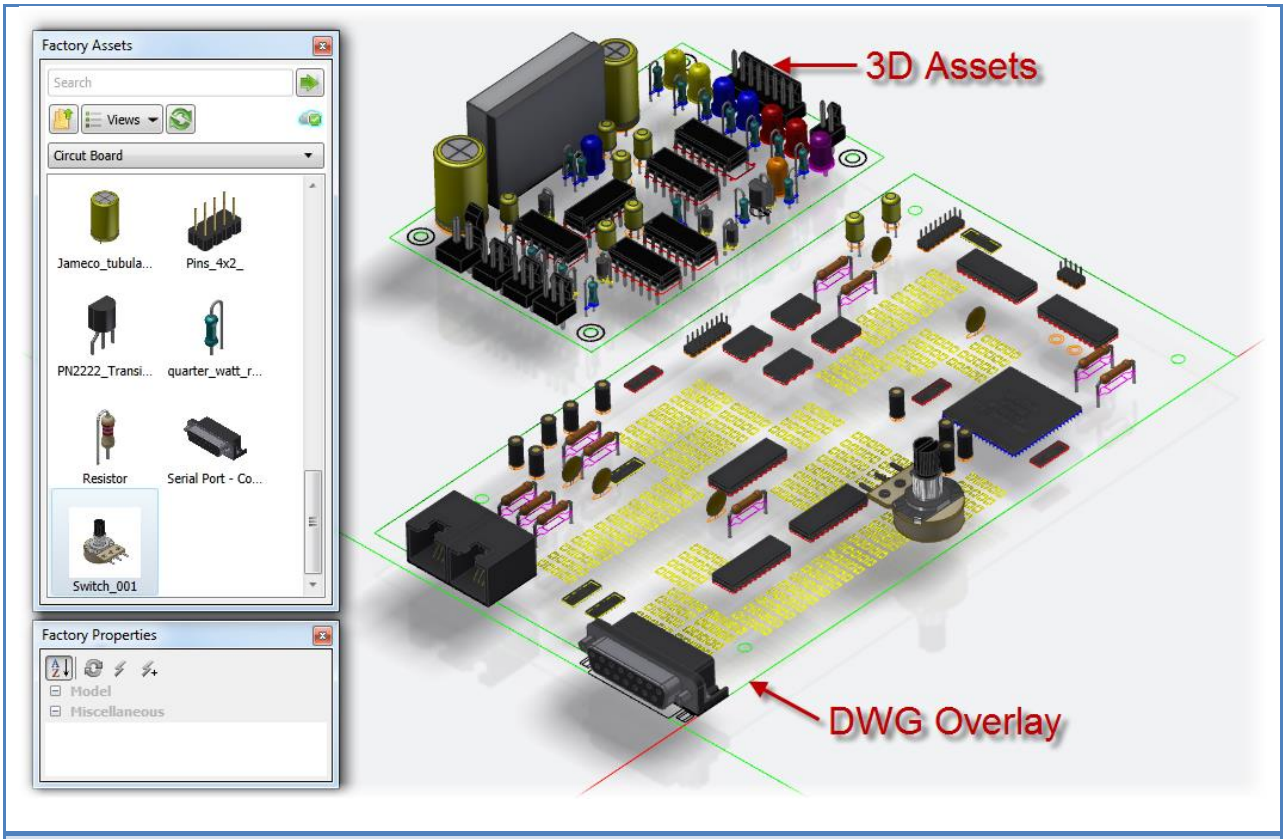
I know it sounds simple but it all starts with the floor. Whether it is a ship deck, or a circuit board schematic, many different design disciplines utilize a floor or base plane concept that aligns all assets to a common orientation. The Factory Design Suite offers a unique method to start a new assembly providing a floor where all assets land upright automatically. The Floor is customizable and can be resized to suit designs of any size. The elevation of the floor can also be modified to accommodate designs with multiple levels.



This image shows an entire ship deck developed from assets resting on the floor.

Working with AutoCAD® - DWG Overlay

There is no question that Autodesk Inventor® is the premier 3D modeling solution for manufacturing but many layout based designs are still developed from 2D AutoCAD footprints. The Factory Design Suite provides the ability to utilize existing AutoCAD drawings to paint reference lines on your layout floor. The DWG overlay command allows designers to place any existing AutoCAD drawing on the layout floor and snap to the 2D geometry while placing the 3D assets. This workflow unites the amazing 3D aspects of Inventor with the tried and true 2D practices of AutoCAD.



This image shows a 2D drawing of a circuit board used as the DWG Overlay. The electronic assets are placed from the Asset Browser and snapped to the 2D AutoCAD drawing.

Asset Based Design (Lego - CAD)

The primary feature of the Factory Design Suite that appeals to designers in other disciplines is the simple asset based design workflow. Many design disciplines center on an increasing set of basic components. These components join together in infinite combinations to form the final design. This process is very similar to the way our toy building blocks snapped together when we were kids. Many designers have spent years looking for, or developing their own version of, Lego – CAD. The asset based workflows offered in Factory Design Suite provide this highly desired functionality to all designers, regardless of discipline.

This image shows a computer desk being inserted into a command and control center. The assets placed by the Factory Design Suite automatically snap together like simple building blocks.

The Asset Browser

Placing all of your assets at your fingertips is the goal of the Asset Browser. The Asset Browser is a palette that provides you immediate access to your library of common assets. You place the assets into your assembly by utilizing simple drag and drop techniques. There is no reason to worry about a very large asset library, you can organize your assets with a simple windows based directory structure and the Asset Browser has a search window to help find a specific asset. You can also store your asset library on your network providing access to your entire design team.

1. The main pane of the Factory Asset Browser displays a folder structure of common and custom factory assets. This pane allows the users to manually navigate thru the directory structure to locate the desired factory asset.

2. The Search window allows users to easily find a factory asset by entering the full or partial name of the asset. A list of valid search terms is dynamically displayed. You can click one of the terms to populate the search field.

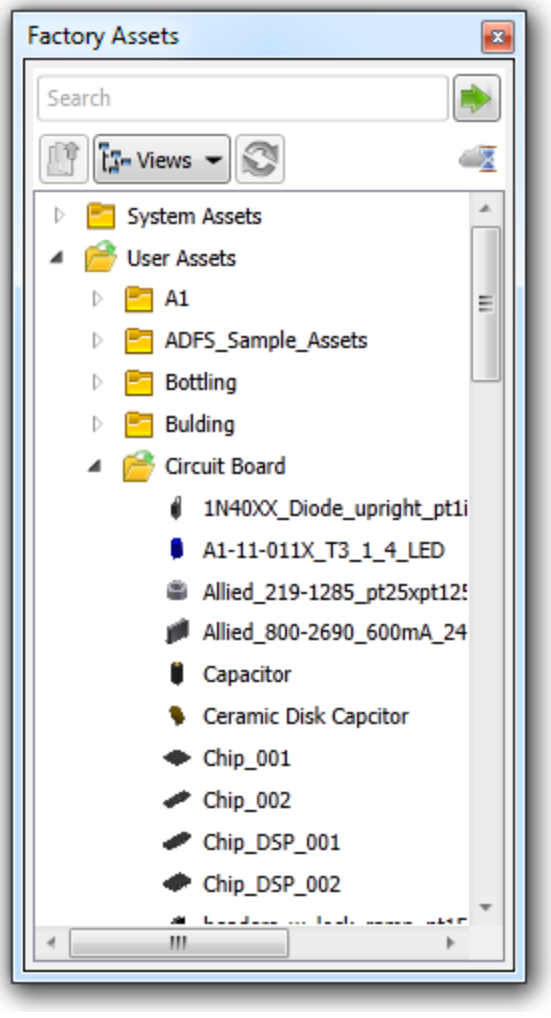
3. Common Directory Navigation tools are available at the top of the asset browser including the Up Level, Tree View, and Refresh buttons.

4. The Cloud Asset Enabled/Disabled icon displays whether the ability to download Cloud based assets is Enabled or Disabled. This functionality is controlled by the Factory Options.

The User Asset Library

The Factory Design Suite ships with a large library of factory specific assets. But the main benefit of the Asset Library is not the default content; it's the ability to easily create your own unique custom content. Any 3D model can be easily converted to an asset and be stored in the User Asset Library.

The User Asset Library is where you make FDS work for you. This is where you publish the assets unique to your specific design needs. The User Asset Library uses a simple directory structure so you can create as many asset categories as desired.

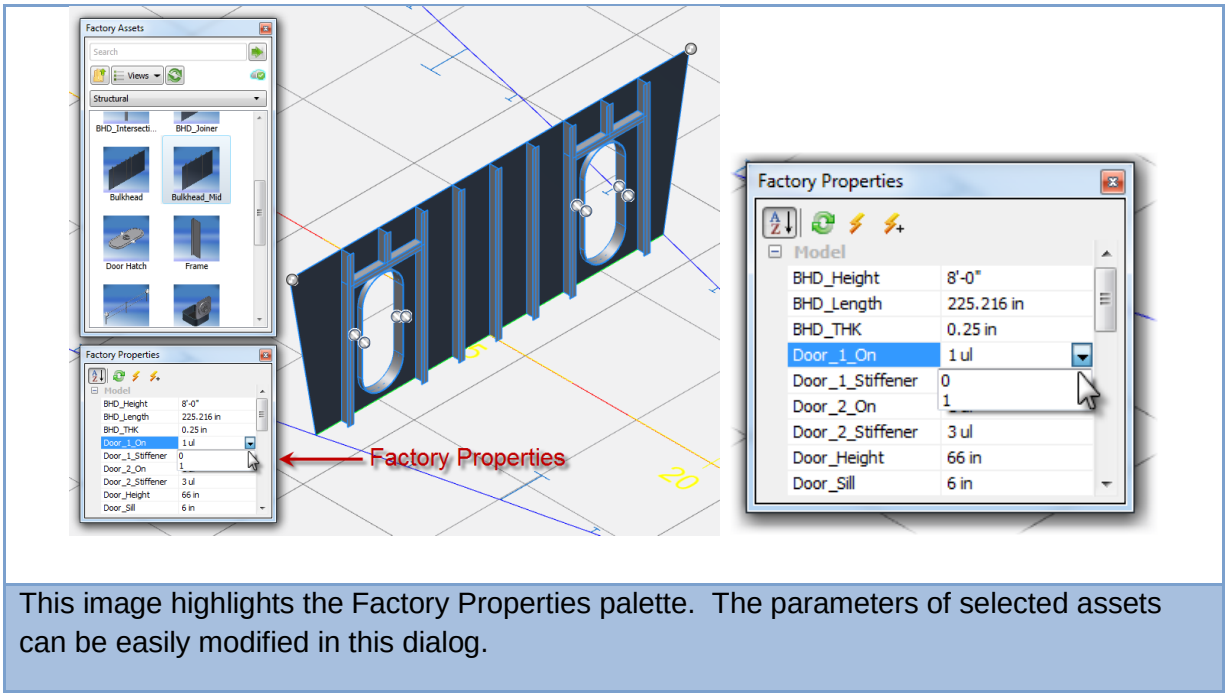


This image shows the User Asset folder located in the Asset Browser. You have complete control of the content published in this area. The image shows a Circuit Board folder directory expanded in the tree view.

Asset Parameters

FDS allows you to easily access and modify the driving parameters of your assets. When you select an asset, the key parameters are displayed in the Factory Properties palette. As you modify the parametric values, new instances of the asset are automatically added to the assembly replacing the original.

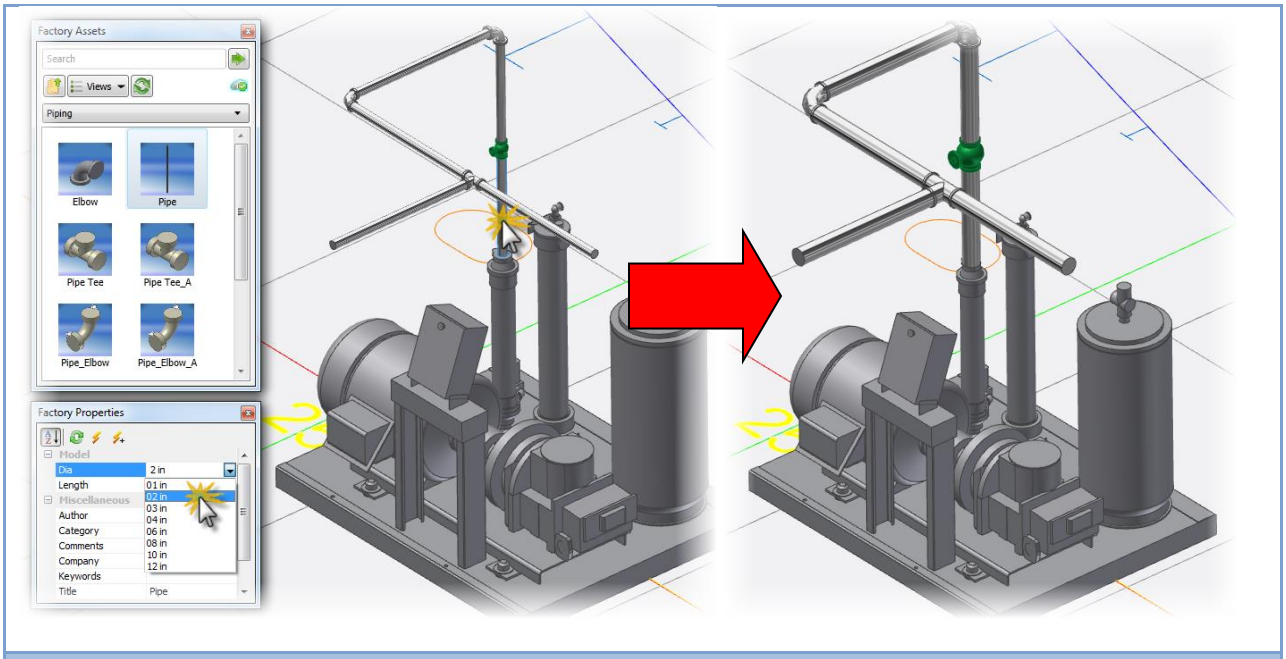
You can also utilize the DWG overlay while modifying your parameters. After selecting a Length parameter, you can right click and measure any line on the DWG overlay. The resulting measurement is placed in the parameter value for easy update.



This image highlights the Factory Properties palette. The parameters of selected assets can be easily modified in this dialog.

Parameter Propagation – Asset Relationships

Another amazing capability of FDS is the propagation of parameter values between similar assets. Simply put, if you change the size of one asset in a string of similar assets, that change will automatically be reflected by the other assets in the string. This ability to quickly and easily effect a major change to asset strings is very appealing to designers who focus on systems like Pipe, HVAC, and Electrical Wireways.

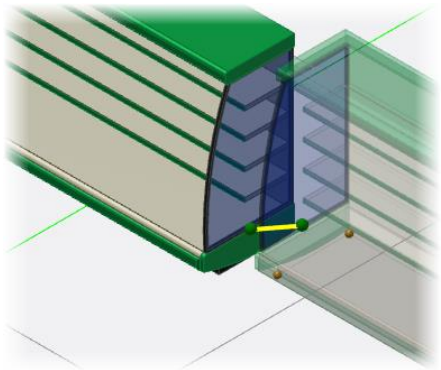
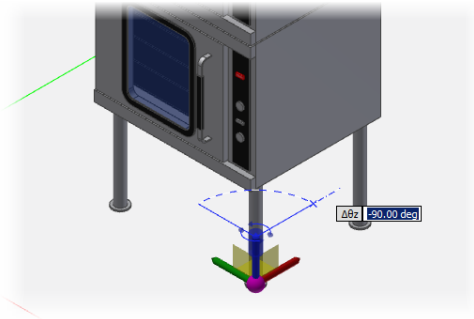
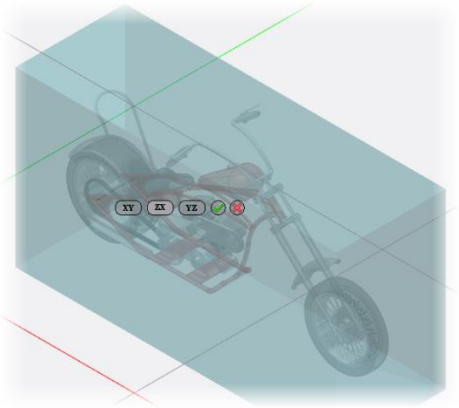


The image above shows the how easy it is to change the parameter values for a string of assets. If you change the size of one pipe, all the other pipes in the string will change as well.

Ease of Use – Simplified Inventor Processes

Many veteran Inventor users are surprised by the numerous enhancements offered by the Factory Design Suite. Many common Inventor modeling tasks have been greatly simplified by the Factory Design Suite. Traditional constraining processes have been replaced with simple pre-defined connector points that allow the assets to automatically snap together. Moving components in FDS is much easier because of the Reposition command which provides a graphic triad that allows you to easily move or rotate any component. Even inserting a conventional part or assembly has been enhanced with the Insert Model command. The Insert Model command places a bounding box around the inserted model and allows it to land on the floor. Users are then presented with orientation options to ensure that the inserted model is set upright regardless of the original coordinate system.

The following table includes just a few of the general “ease-of-use” enhancements offered by the Factory Design Suite.

	**Connector Points** Connector Points are placed on the asset during the publishing process. These points allow the assets to sense one another and snap together. The image to the left shows two supermarket freezers snapping together with the Connector Points.
	**Reposition** The Reposition command places a simple triad on any selected component. Designers can easily move or rotate the component by simply dragging on the axis or planes of the Triad. This image highlights the Reposition Triad being used to rotate an industrial oven.
	**Insert Model** The Insert Model command places a bounding box around the incoming component. The bounding box automatically lands upright on the floor allowing the users to manually define the upright orientation. This image shows the bounding box created by the Insert Model Command.

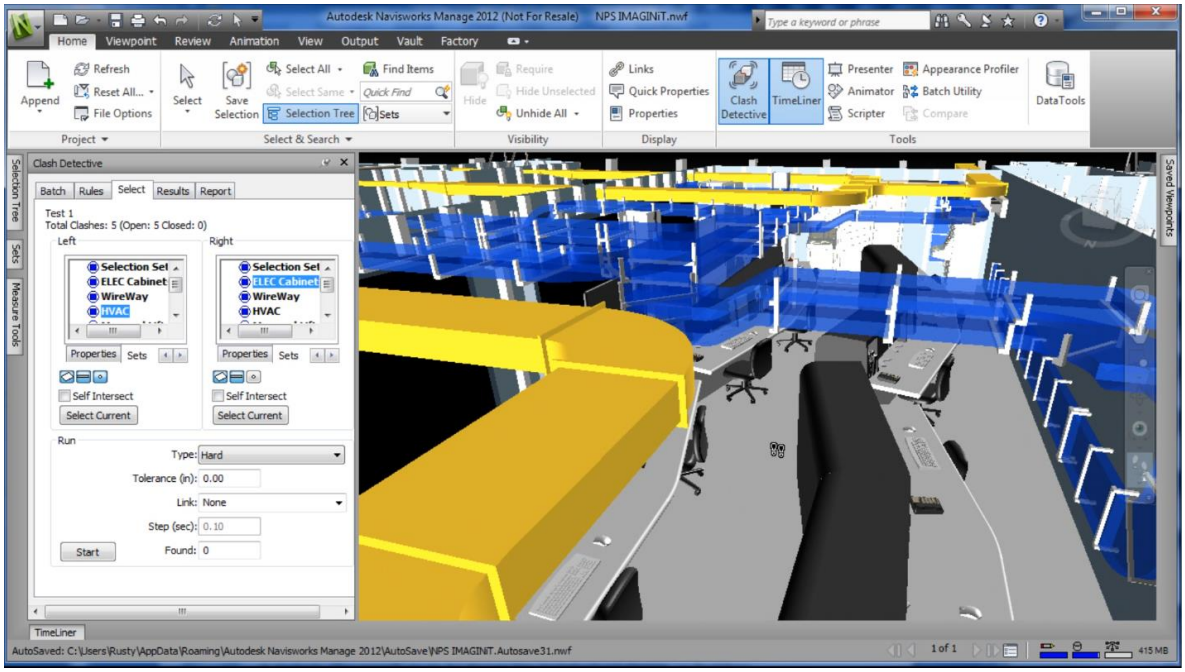
Extremely Large Layout Design – Navisworks®

Many layout designs are so large we cannot display them in our CAD systems. The word large is a relative term. Many small designs often require thousands of individual parts. Displaying all of the components required for these designs at the same time is often beyond the capability of most computers or CAD software. The Navisworks® component of the Factory Design Suite is the answer to this issue and the solution that many designers have been looking for.

Navisworks enables manufacturing companies to visualize large complex assemblies with thousands of components such as complete ship compartments, detailed circuit board designs, complex command centers, and entire supermarkets. All in a single digital model by means of real time fly-through and walk-through. Customers can combine together multi-CAD data from various design systems regardless of file format or size, for complete assembly visualization and analysis.

Navisworks is compatible with all major native design and laser scan file formats. This means that 3D design data from various CAD systems can be combined together to create a single digital model.

The ability to navigate the entire digital model is extremely important for quality assurance and the design review process. Navisworks' unique display ability allows models of any size to be loaded and combined with other models to create designs beyond the capability of most CAD systems.

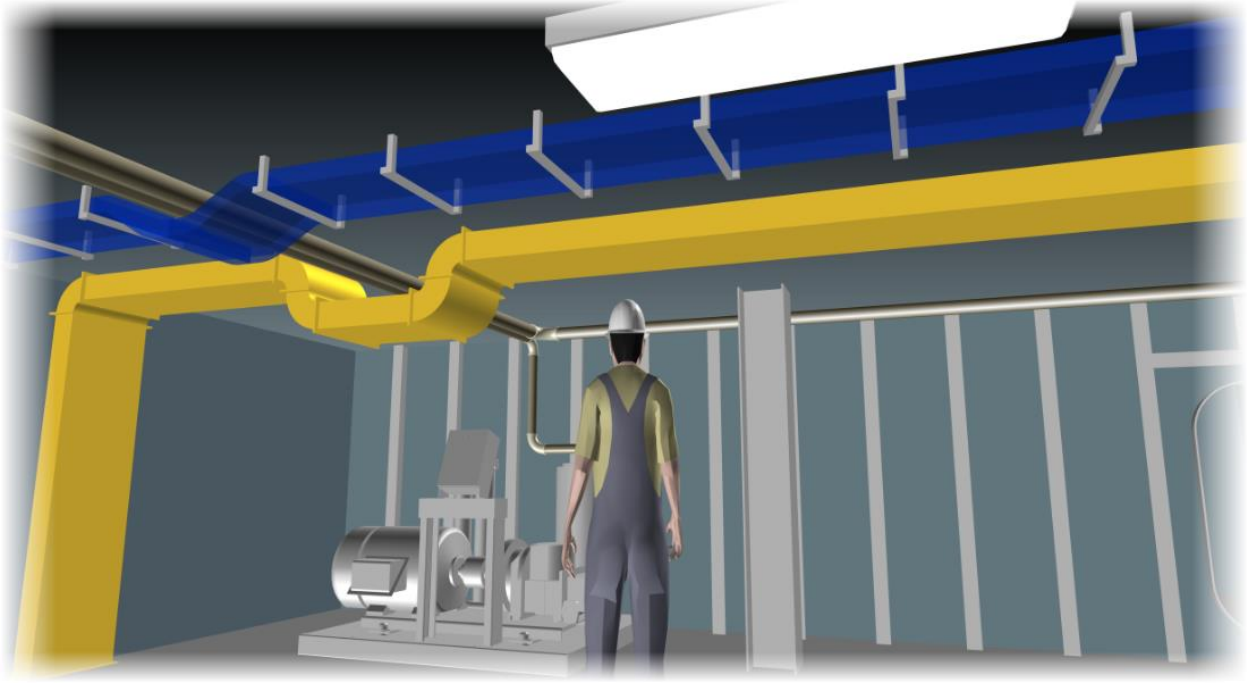


This image shows a complete Command and Control Center including all monitoring workstations and building infrastructure.

Ease of Use – Taking Advantage of Veteran Tradesmen

Many companies are facing the retirement of their senior design staff and are being forced to hire a younger and less experienced design staff. The Factory Design Suite is designed to be very easy to use. People with little CAD experience can take advantage of the simple, easy to understand, modeling techniques available in the Factory Design Suite. The routed asset workflow can be utilized for systems like Piping, HVAC, and Electrical Wireways. The drag and drop workflow utilized by the Factory Design Suite supports and enhances the "piece by piece" methodology that is instinctual to tradesmen. This means that companies can actually allow craftsmen to build system runs with FDS and take full advantage of the experience and expertise of their veteran tradesmen.

With computers and technology now part of everyone's daily life, companies now have new options for staffing their design team. It is often easier to teach a veteran tradesman how to use a computer, than to train a college graduate in the intricacies of your manufacturing rules and practices.



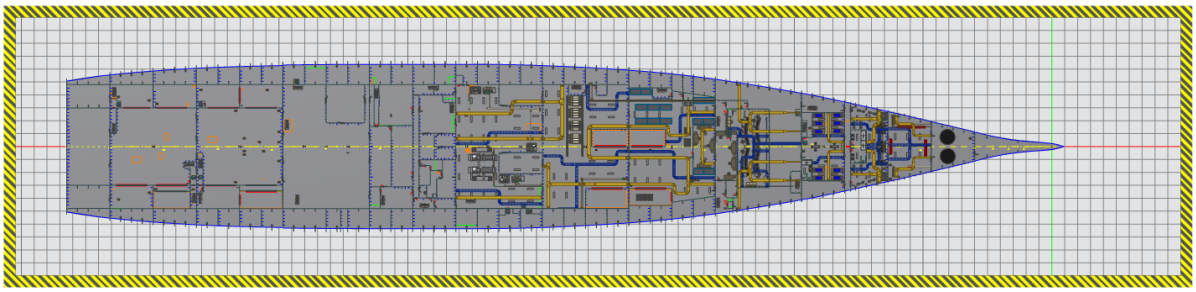
Anyone who has a mechanical background can use the Factory Design Suite. The simple "drag and drop" approach to 3D modeling and the "piece by piece" workflows appeal to tradesmen who are intimately familiar with the manufacturing and construction process.

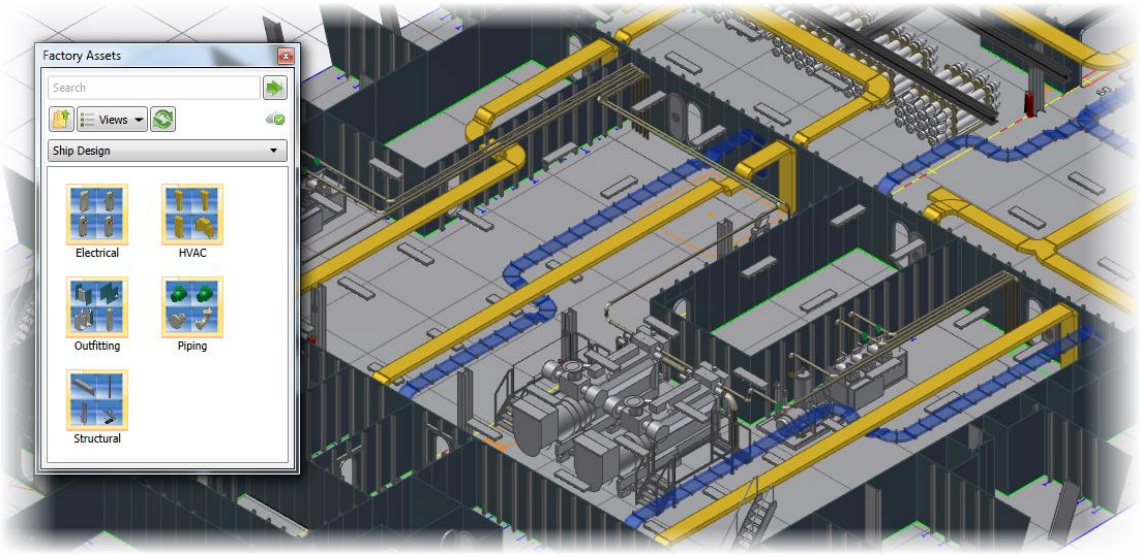
Section 3: Identify Designs that Could Utilize Factory Design Suite – Other than Factories

If you think the Factory Design Suite can only be used on Factories; Think Again! The Layout workflows that make up the Factory Design Suite can be used on many designs other than factories. If you need to create a layout based on common assets or if you have to place your assets on a floor making the most of available space, you should definitely look at the Factory Design Suite. If you create designs that are far larger than your CAD software can handle, then FDS may be a viable solution.

In this section we will outline different design disciplines and how they can benefit from using the Factory Design Suite.

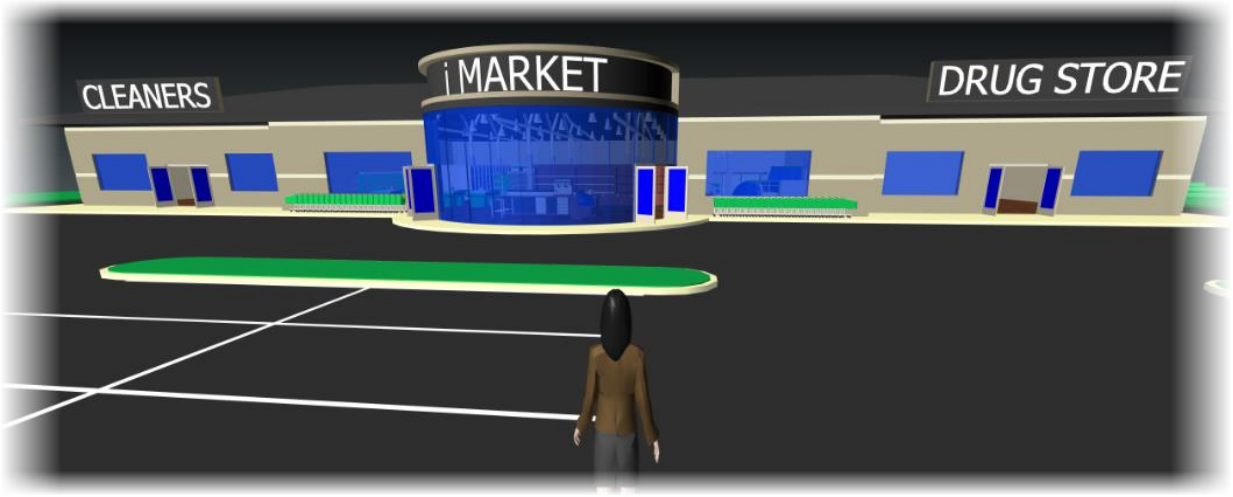
Shipbuilding Compartment Layout





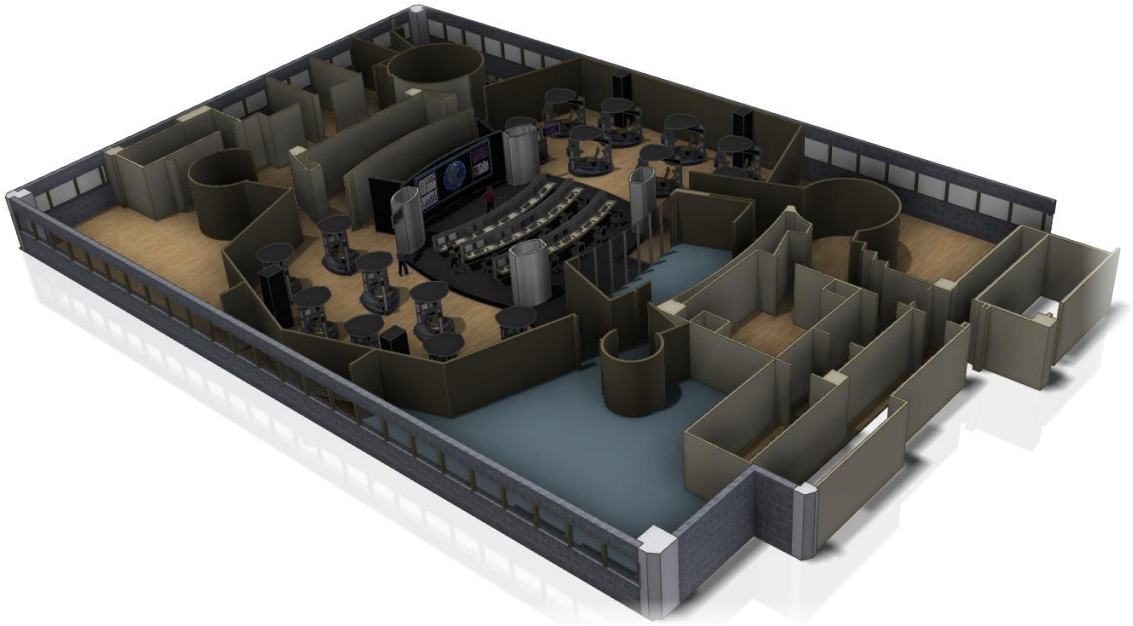
Shipboard Compartment Layout shares many similarities to factory design. Each discipline seeks to fill a limited space with common assets. There are few designs larger and more complex than a fully detailed ship compartment. The Navisworks component of the Factory Design Suite allows designers to handle models of any size.

Supermarket Layout



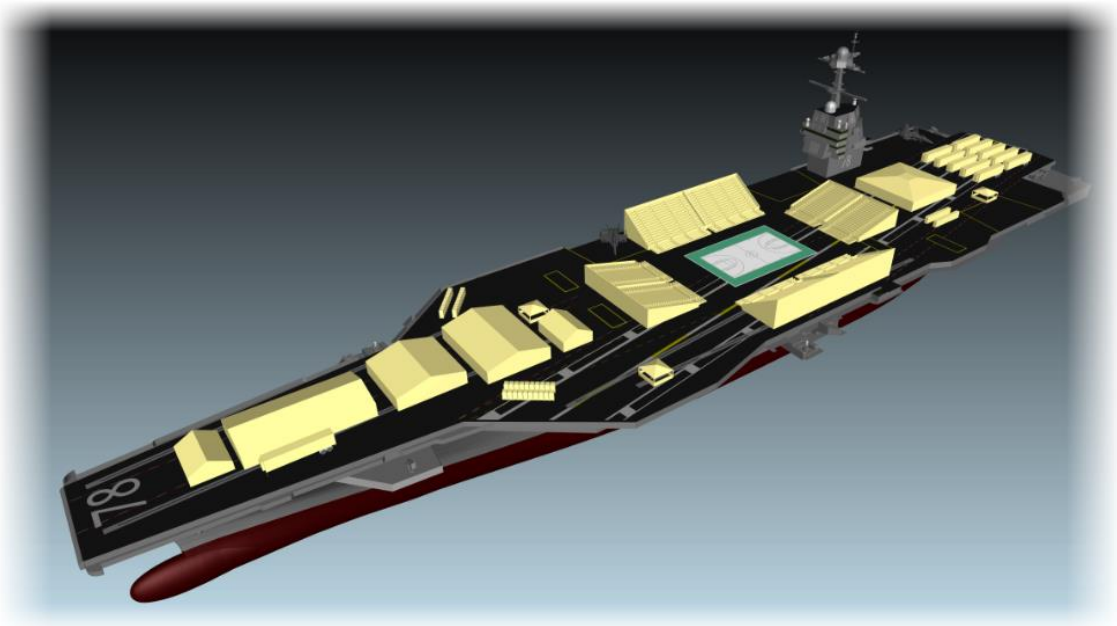
Supermarket layouts all consist of the same general assets but the arrangement is unique for each store. The shelves, freezers, and checkouts make perfect assets. The Factory Design Suite can easily assist supermarket designers or anyone in a similar field.

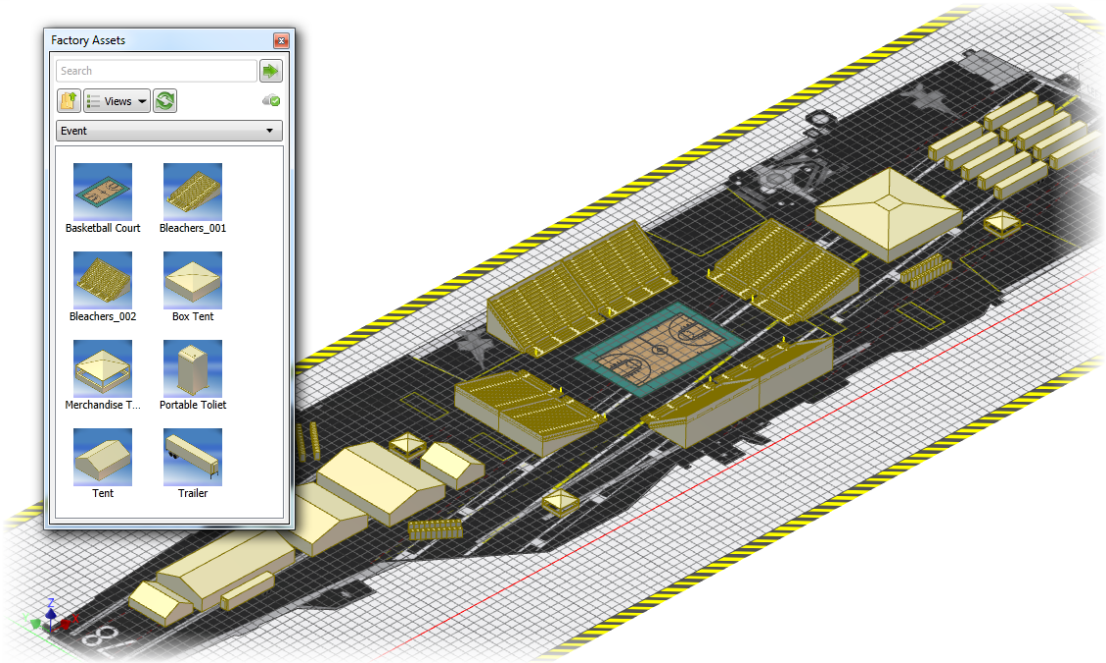
Command and Control Centers



Maybe you create designs like the monitoring workstations shown in this Command and Control Center. You need to show your design in context of your customer’s layout. The Factory Design Suite allows you to publish your assets to the Cloud where the entire FDS community can access them and include them in their designs.

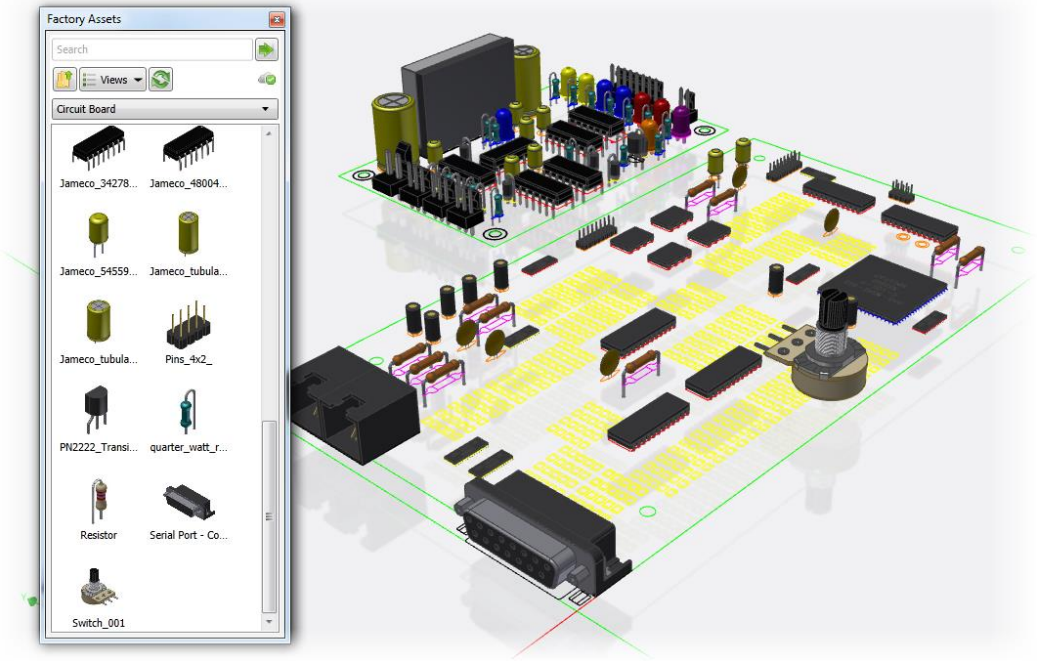
Large Scale Event Planning

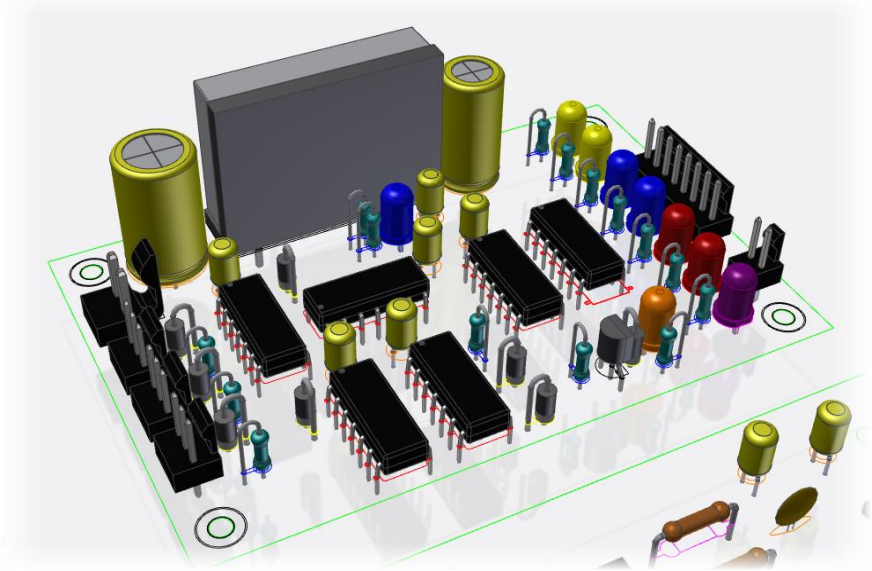




The Carrier Classic was held on the USS Carl Vinson 2 years ago. The organizers were challenged with converting the flight deck of an Aircraft Carrier into a functional basketball arena. The Factory Design Suite is a perfect solution for this type of design. The support trailers, hospitality tents, and bleachers are easily placed on the flight deck layout as assets.

Circuit Board Design





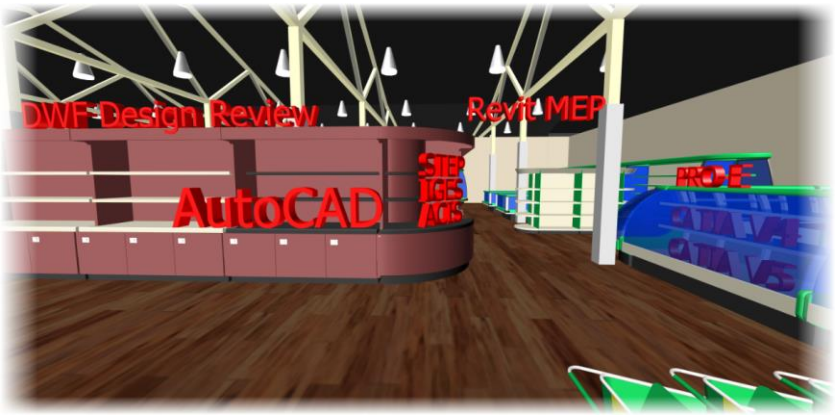
From a distance, a circuit board layout looks like a factory with buildings and tanks. Circuit board design is a perfect fit with Factory Design Suite. Assets can be created for all the chips, resistors, and capacitors needed for the circuit board model. The assets can be easily placed on a DWG overlay of the 2D circuit board footprint.

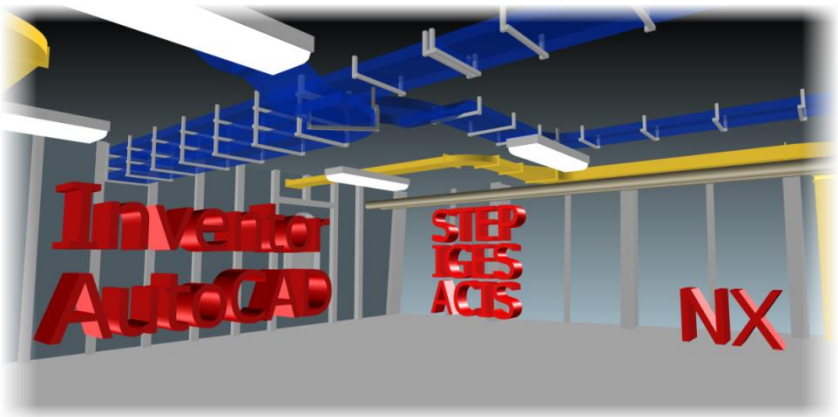
Section 4: Investigate Asset Publishing for Layout Design

Throughout this presentation we have highlighted the asset workflow available in Factory Design Suite. In this section of the presentation we will focus on the process of publishing an asset. We will discuss the basics of asset development and provide a checklist of things to remember while publishing your assets.

Asset Origins

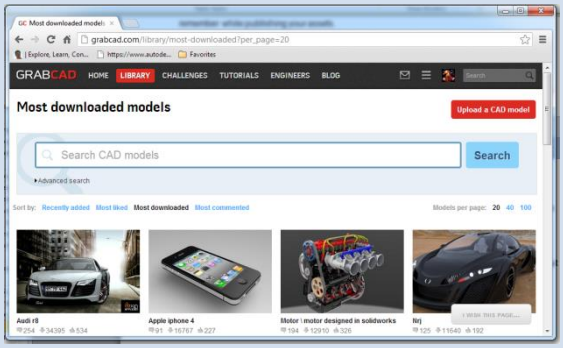
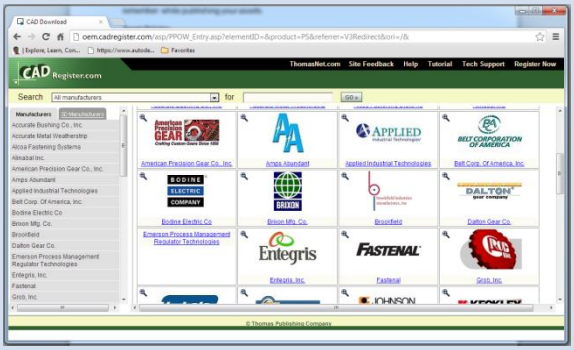
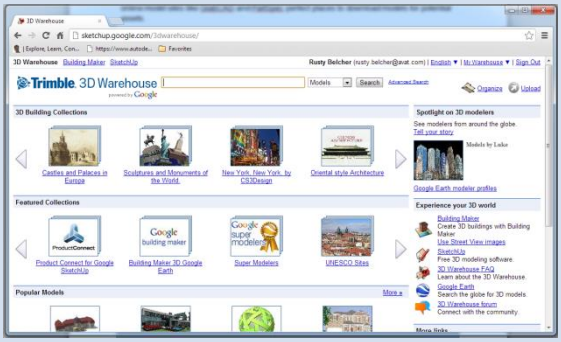
It's important to remember that just about any 3D model can become an asset. The Factory Design Suite allows you to open models from various CAD sources and add the necessary connector points and landing surfaces required to utilize the asset in your layout. This makes online model sites like GrabCAD and PartSpec perfect places to download models for potential assets.





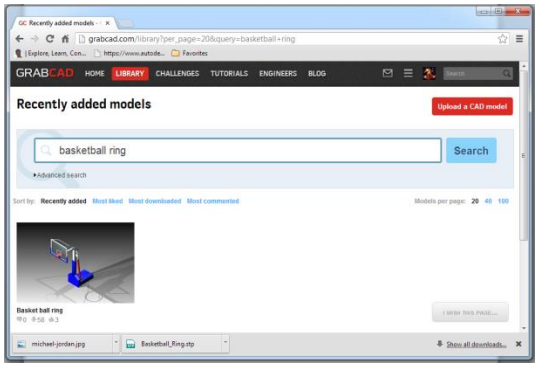
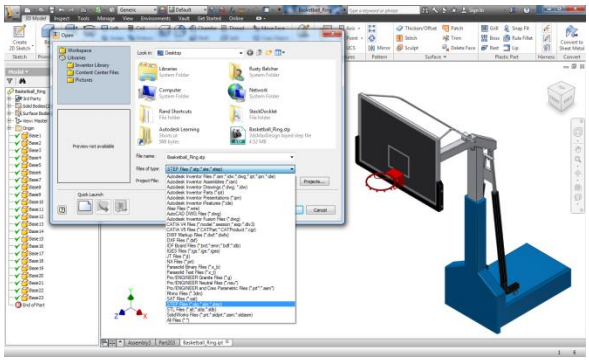
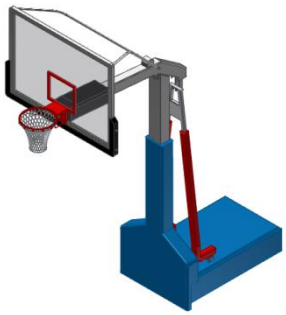
The Factory Design Suite can utilize almost any 3D model as an asset regardless of the authoring CAD system. The Navisworks component of FDS allows you to append CAD data from even more systems.

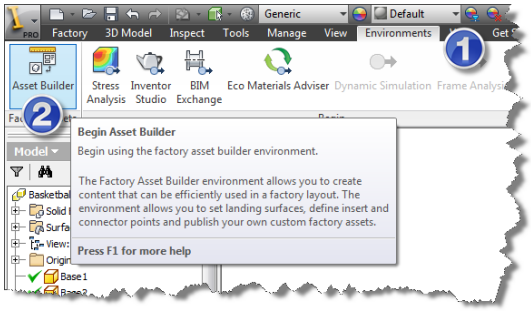
The table below offers a few online locations where 3D content is available for free download. Any typical solid model can be used for a FDS asset. Mesh models from tools like SketchUP can only be used in the Navisworks component of FDS.

	
GRABCAD is a great place to download models from various CAD sources.	**CAD Register.com** allows you to access thousands of vendor specific CAD designs.
	
CBLISS.com is a great place to download Inventor centric parts and iParts. Please remember that you cannot create an asset from an iPart, but you can utilize it as the basis of an FDS asset.	**Trimble 3D Warehouse** (formally Google 3D Warehouse) is a great place to download SketchUP files which **cannot** be used as assets but can be used in the Navisworks component of the Factory Design Suite.

Creating a Basic Asset - Downloaded Design

In this section we will outline the process of converting a downloaded model into a layout asset. The following table will show the steps necessary to convert a model, downloaded from GRABCAD, into a FDS asset.

	**Download the Model** The process begins with locating the desired design from one of the many internet locations that supply 3D models. In this example we will download a Basketball Hoop STEP file from GRABCAD.com
	**Open the Model with Inventor** Inventor allows you to open model files from various CAD sources including the many of the leading modeling products on the market today.
	**Make Adjustments** Use Inventor to make any necessary adjustments. In this example some of the original colors were updated to produce the desired result.

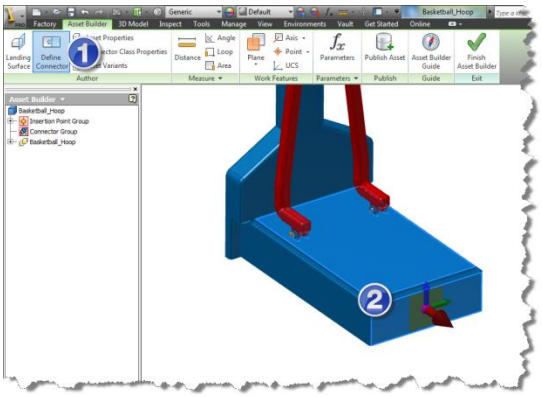


Open the Asset Builder

When the file is ready to be published, activate the Environments tab (1) and click the Asset Builder (2).

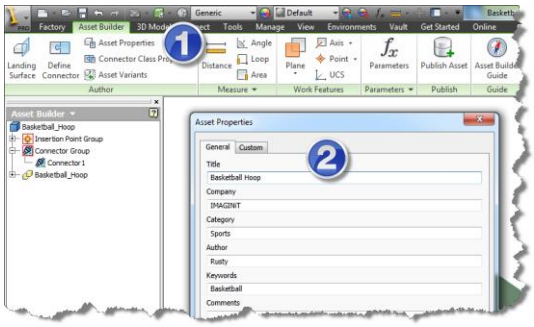
Set the Landing Surface

On the Asset Builder ribbon, click the Landing Surface command (1). Then select the face that will rest against the floor (2). If necessary, click the Insertion Point option (3) and click the desired point you wish to insert the asset by.



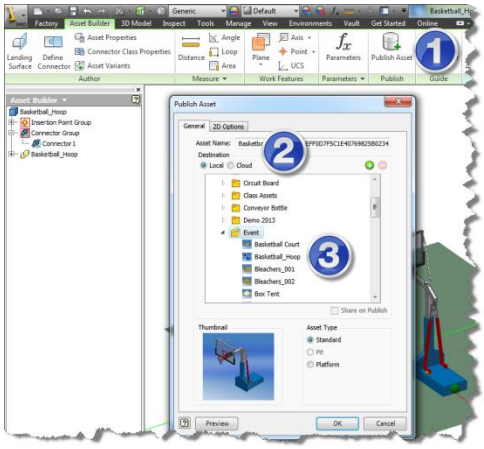
Define Connectors

On the Asset Builder ribbon, click the Define Connector command (1). Select a face or vertex to use as a connector point (2). Align the blue axis of the triad to the upward direction by selecting the axis and then selecting a face or edge. Right click and select OK to complete the command.



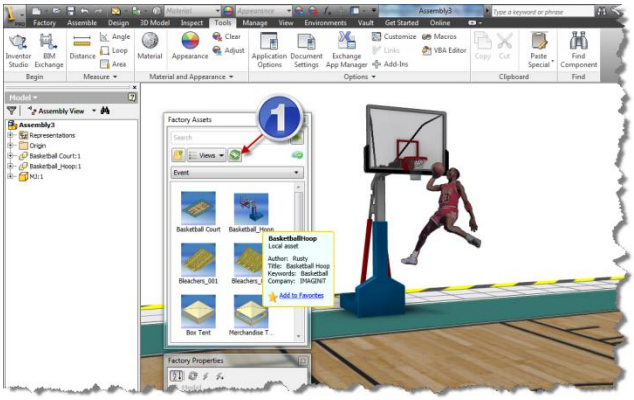
Define the Asset Properties

On the Asset Builder ribbon, click the Asset Properties command (1). Fill in the necessary file properties in the dialog (2). Click OK to complete the command.



Publish the Asset

On the Asset Builder ribbon, click the Publish Asset command (1) and save your model if prompted. In the Publish Asset dialog, select the Local option (2) to publish the asset to your local library or select the Cloud option to publish and share the asset in the Asset Warehouse. Then you will create or select the subdirectory to save the asset in (3). Click OK to publish the asset.



Test your Asset

Start a new layout and select the Refresh command on the Factory Asset browser (1). Then place your asset to test its functionality.

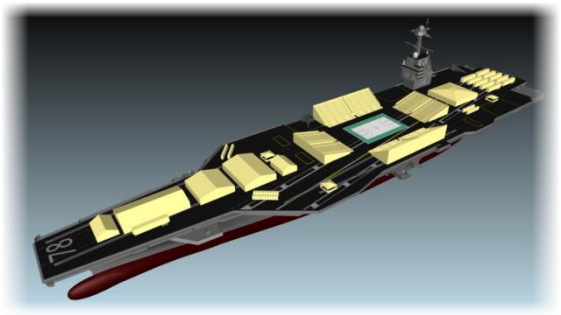
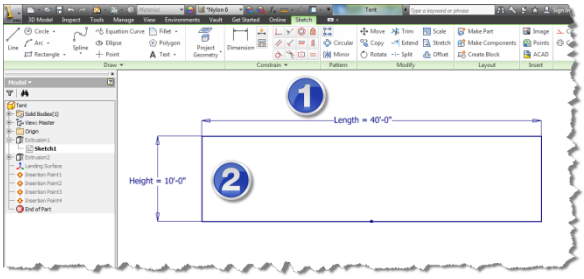
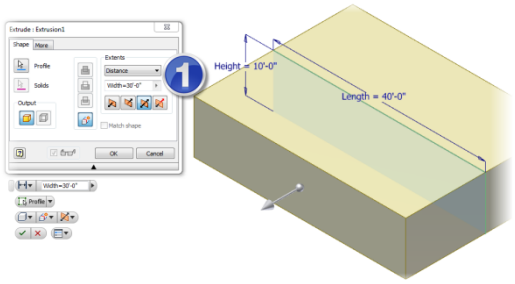
Inventor Based Assets - Parametric Design

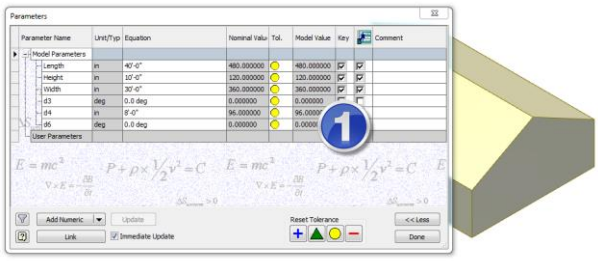
Creating assets from native Inventor models offers many additional advantages and functionalities. You can use named parameters to control key features. These parameters can by marked for use by FDS when the asset is placed in a layout. The factory properties palette allows you to easily modify any key parameter updating the asset automatically.

It's also important to note that typical Inventor parametric practices are all that is needed to create fully functional assets. iLogic can certainly be used to provide additional functionality, but it is not required by default. Anyone familiar with basic Inventor parametric modeling can easily produce layout assets.

Creating a Basic Asset - Parametric Design

In this section we will outline the process of developing assets for your layout design. In this example we will be creating an asset from scratch utilizing the full power of Inventor.

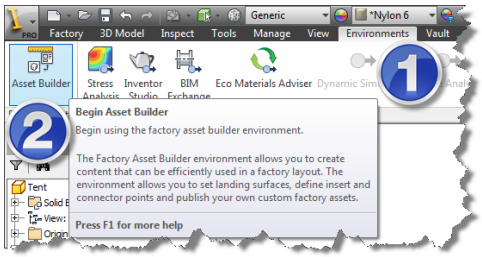
	**Example** In this example we will be creating an asset for one of the tents used for an Event Planning Layout. The asset will include parametric control over the Length, Width, and Height of the tent.
	**Include Parameters in Sketch** Parameters are included in the initial sketch to define the Length and Height of the tent. Instead of entering a static number for the dimension value, a simple equation is entered **ex. Length=40'.**
	**Include Parameters in Features** A parameter is also included in the extrusion feature. The distance of the extrusion is set to **Width=30'** (1).



Mark the Key Parameters

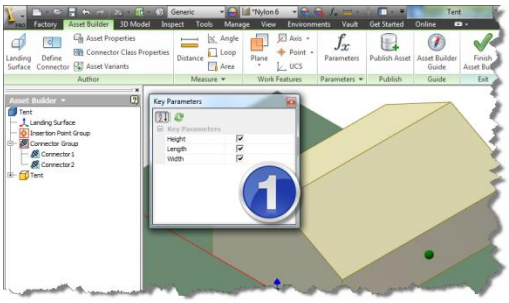
In the Parameters dialog, the Length, Width, and Height parameter are marked as Key (1).

Note: Test the Parameters to ensure proper functionality.



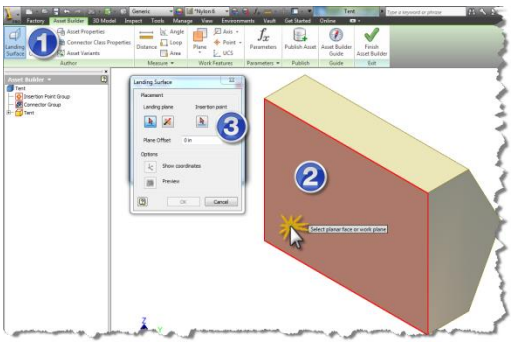
Open the Asset Builder

When the file is ready to be published, activate the Environments tab (1) and click the Asset Builder (2).



Check your Key Parameters

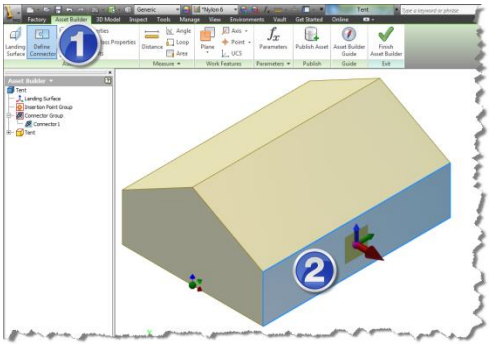
When you enter the Asset Builder, the Key Parameters dialog is displayed with your renamed parameters displayed. Make sure to check the parameters you wish to use to control the size of the final asset.



Set the Landing Surface

On the Asset Builder ribbon, click the Landing Surface command (1). Then select the face that will rest against the floor (2). If necessary, click the Insertion Point option (3) and click the desired points you wish to insert the asset by.

Note: you can have multiple Insertion Points.

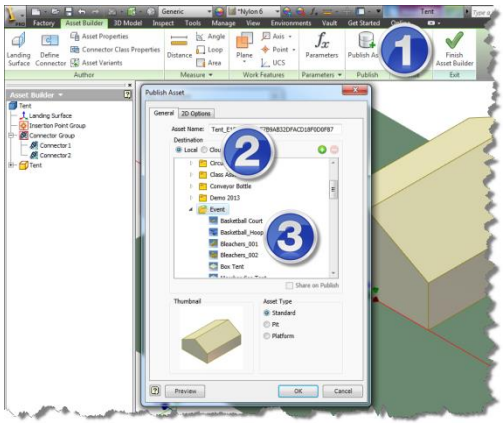


Define Connectors

On the Asset Builder ribbon, click the Define Connector command (1). Select a face or vertex to use as a connector point (2). Align the blue axis of the triad to the upward direction by selecting the axis and then selecting a face or edge. Right click and select OK to complete the command.

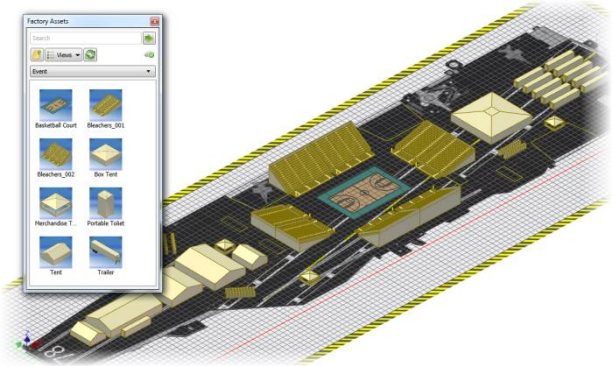
Define the Asset Properties

On the Asset Builder ribbon, click the Asset Properties command (1). Fill in the necessary file properties in the dialog (2). Click OK to complete the command.



Publish the Asset

On the Asset Builder ribbon, click the Publish Asset command (1) and save your model if prompted. In the Publish Asset dialog, select the Local option (2) to publish the asset to your local library or select the Cloud option to publish and share the asset in the Asset Warehouse. Then you will create or select the subdirectory to save the asset in (3). Click OK to publish the asset.



Test your Asset

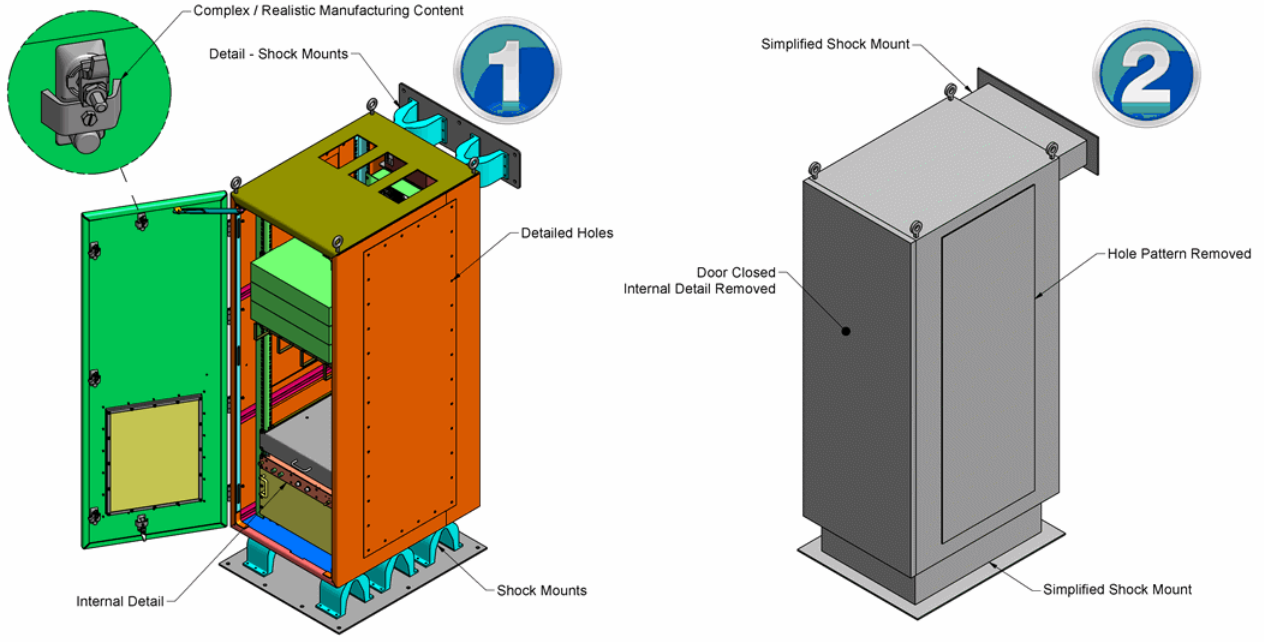
Start a new layout and select the Refresh command on the Factory Asset browser (1). Then place your asset to test its functionality.

Asset Creation – Best Practices

Assets can provide many valuable downstream benefits, but they must be published in a specific manner with the required settings and metadata in order to provide the maximum performance. This section serves as a recommended "best practice" checklist for publishing assets in the Autodesk Factory Design Suite.

Model Detail - Low

It is very important to remember that the factory layout process often requires the placement of hundreds or thousands of Assets. For this reason, it is necessary to publish assets with the simplest model detail possible.



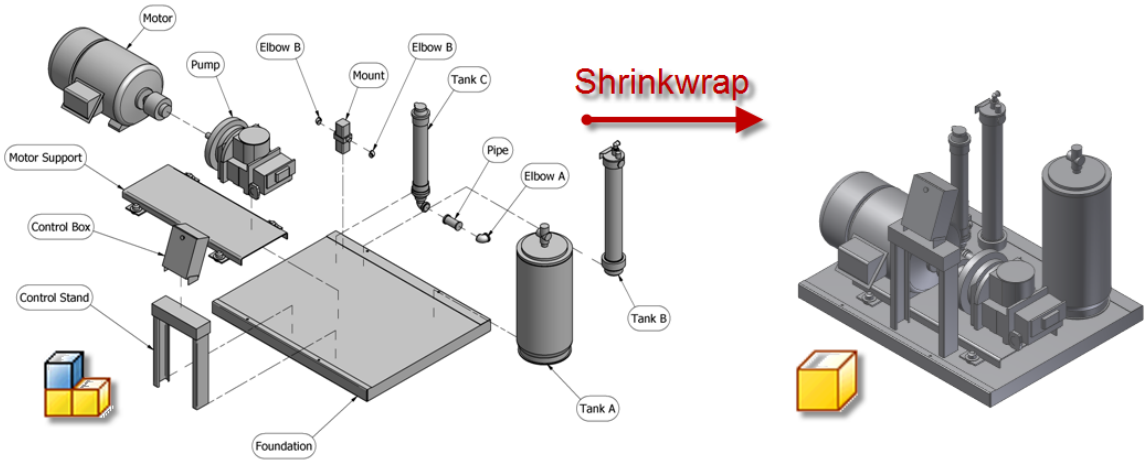
EX. 1	Single Part – Low Detail	Recommended
EX.2	700 Part Assembly – Production Detail	Not Recommended

Remove Model Detail

It is common for designers who are adopting FDS to create their first assets from Production Detailed models they have created in the past. While there are tools that allow you to remove or eliminate detail from an existing model, you must consider the time and effort required to complete this task and compare it to the time required to create a simple version of the asset from scratch. It is often quicker and easier to create a new version of the asset from scratch.

There are tools available that allow you to convert assemblies to single parts or remove voids and detail from existing models. A list of these commands and tools is provided below.

Tool	Function	Location
Shrinkwrap	Converts assembly to single part and removes voids and unnecessary detail.	Inventor Command Located on the Assembly Ribbon.
Multi-body Solid – Import Option	When you Open (import) a model from an external source, there is an import option that allows you to import assemblies as Multi-Body Parts.	Option in Open (Import) Dialog.
Inventor Simplification	Inventor Simplification is a new environment available in Inventor 2014. The workflows available allow you to generate a simplified version of your complex design from bounding boxes or bounding cylinders.	Available on the simplify tab.



Parameter Requirements

Parameters play a crucial role in the overall function and downstream benefit of factory assets. It is critical that the defining parameters of the asset follow the following guidelines.

Named Parameters	The parameter name should clearly indicate the design value it controls. It is important to note, that the name of the parameter is displayed in the Asset Properties dialog box and is will be utilized by all downstream users to update the asset as needed.
Key Parameters	Only Parameters marked as key are displayed in the Asset Properties dialog. You can mark key parameters in the Inventor Parameters dialog, or during the Asset Publishing Process.
Export Parameters	If you wish to utilize the parameter values in downstream parts lists, or titleblocks, it is necessary to mark the required parameters for export. This functionality is so important for downstream functionality that it is recommended to always mark your key parameters for export. **Note**: The Assets provided by Autodesk **DO NOT** have the key parameters marked for export.
Multi-Value Parameters	If you wish to restrict certain parameters to a limited number of specific values, convert them to Multi-Value parameters. Multi-Value Parameters were introduced as part of the iLogic integration and provide an easy an efficient method to enforce standard values on downstream users.
Testing Parameters	It is recommended to test all parameters prior to publishing to ensure model updates occur as desired.

iProperties

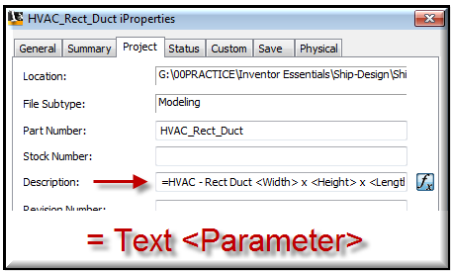
Each Inventor component is equipped with an extensive set of iProperties. The information contained in these properties is utilized in many downstream processes such as Bill of Material, Parts Lists, Balloons, and Titleblocks. For this reason, it is crucial that the required iProperty fields are filled out prior to asset publishing. The following table indicates the recommended iProperty fields that need to be filled out for each factory asset.

iProperty	Information
Title	Formal Name or Part Name
Part Number	Automatically set to the filename by default
Description	General description of the asset. Could be mapped to parameters like Length, Width, and Height.
Company	Very Helpful for Cloud Based Assets
Category	Your Cloud Based Assets are managed by Categories.
Author	That's You
Keywords	Very Useful for Searching Cloud Based Assets.
Comments	Useful Tips on using the Asset.

iProperties and Mapped Parameters

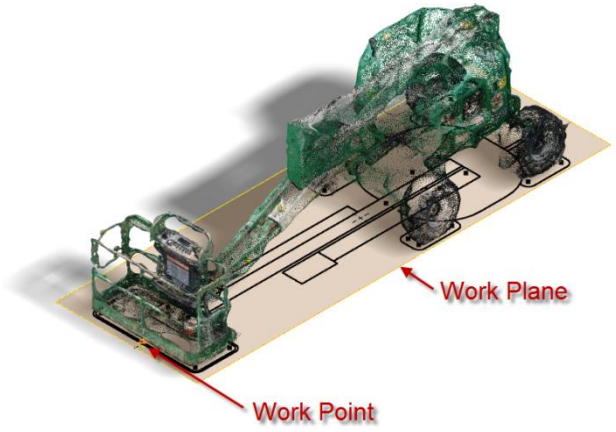
Some fields in the iProperties will contain information derived from the variable parameter values used to create the asset. It is possible to map parameter values to iProperty fields ensuring the iProperty information reflects the accurate settings for each iteration of the asset.

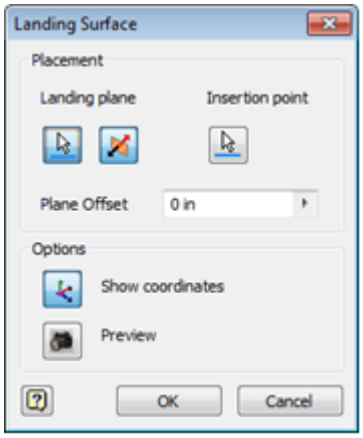
In a prior step the practice of marking key parameters for export was recommended. One major benefit of exporting parameters is that they can be mapped to various iProperty values such as Description. To map an exported parameter to an iProperty, you simply enter the parameter name in the formula as shown in the following image.



Work Features Required for Publishing - ON

It is occasionally necessary to establish Work Points to use as Insertion Points or Work Planes to use as Landing Surfaces. In these situations, the required work features should be visible (turned on) at the beginning of the publishing process. In the following image, a work point and work plane were established in order to use a point cloud as a factory asset.





Landing Surface

Components in a Factory Layout assembly design are usually placed onto the floor. For the component to orient itself properly relative to the floor, it requires a defined landing surface. The landing surface defines the plane on the component that is positioned relative to the floor. When authoring content, it is important to use the Landing Surface command to establish how the component is located relative to the factory floor.

Note: Establishing a landing surface on a component is not required for publishing to the Factory Assets library.

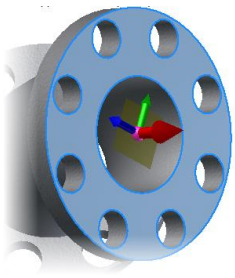
Insertion Point

When an asset is placed in a layout it is initially positioned on the cursor by the first insertion point defined during publishing. You can optionally select one or more insertion points to help you more accurately position the model on the factory floor. An insertion point may be a vertex, work point, or sketch point.

After creating one or more insertion points, the Insert Point Group node appears in the Asset Builder browser. Expand the node and right-click over an insertion point if you wish to edit its location or delete it.

Define Connectors – Connector Points

Connectors can be used to help assemble components on the factory floor. Connectors allow snapping between specific points on each component and aligning them based on the axes of the connector points. Connector points may be created on the following:



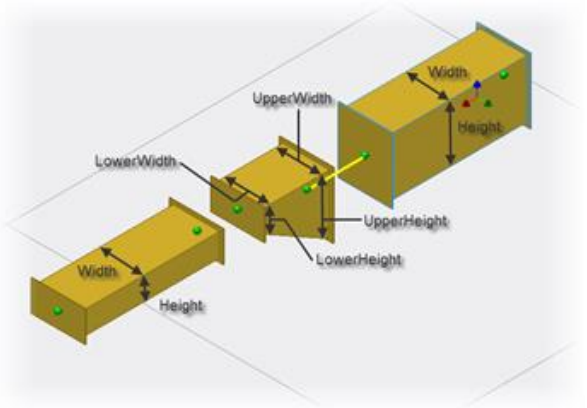
- **a planar face**
- **a vertex**
- **a midpoint**
- **an endpoint**
- **a hole center**
- **a work point**
- **a work plane**

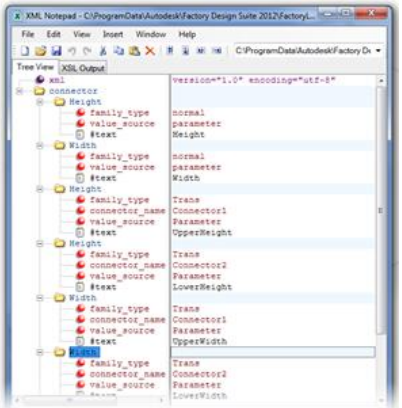
Connector Class Properties

When creating new assets, it is possible to have them interact, in terms of parameter propagation, with other similar assets by assigning connector class properties. These properties control the asset parameters that should be referenced to achieve the desired connection behavior

The Connector Class Properties command lets you choose the connector class to be used for the asset. It also lets you specify the connector class property values that are to be used. These connector class properties are defined in a separate connector class file in .xml format. A set of system connector classes is provided with the product and is used by both the System Assets and Cloud Assets. These connector class files are located on the local hard drive in the C:\ProgramData\Autodesk\Factory Design Suite(version)\FactoryLibrary folder

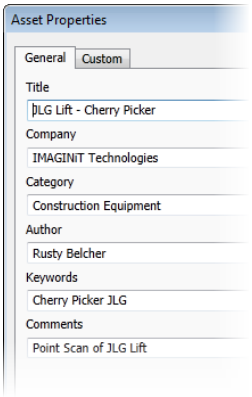
Tip: Use Microsoft XML Notepad to modify or create custom Connector Classes.





Asset Properties

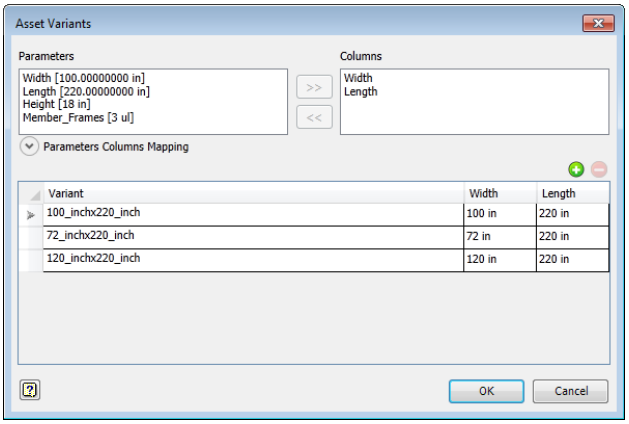
During the Asset Publishing process, you have a final chance to fill out or make adjustments to the iProperties of the asset. The Asset Properties command displays a select set of iProperty values.



Asset Variants

With all the parametric control you can establish over factory assets, it is inevitable that standard values will need to set or enforced. These values need to readily available in the Inventor and AutoCAD environments. Asset Variants can be set during the asset publishing process. Similar to the old iPart process, this command allows you to define a pre-defined set of values for a given parameter. These values are can be chosen prior to the asset placement or change the standard size of an existing asset.

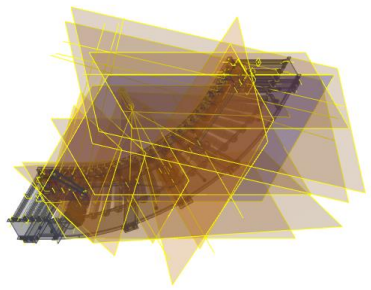
User assets published with the Publish 2D Asset option appear in the AutoCAD Factory Asset Browser ready for use in 2D factory floor layouts. However, these 2D assets are difficult to modify if variations are required. A very powerful solution is to create and publish the asset with the necessary dimensional variations that can easily be selected and placed on the AutoCAD factory floor.



All Work Features OFF

The nature of Factory Assets does not allow designers to make changes to the assets once they are published. Therefore it is important to make sure all parametric and aesthetic settings are precise, functional, and acceptable before publishing. It is quite annoying to use a part created by another designer and find that they failed to turn off all the work features. This issue is compounded by the fact that Work Features are often required to establish landing surfaces, insertion points, or connectors.

It is recommended that the last thing you do, before the final publish command, is to turn off all Work Features.



Publish – Local Testing

It is important to test the asset thoroughly before releasing it into the production environment. Publish the asset to your local workstation and put it thru its paces, testing all functionality. A checklist of common testing criteria is provided below.

Testing Checklist

Checklist for Asset Testing	
☐	Parameter Functions – Model Update
☐	iProperty Settings – In Way of Mapped Values.
☐	Connector Functionality
☐	Connector Class Parameter Propagation.
☐	Parameters - Key
☐	FDS General Layout Functionality - Inventor
☐	FDS General Layout Functionality - AutoCAD
☐	Inventor Sync - AutoCAD Sync
☐	Asset Variants

Modify Asset to Suit Testing Results

Based on your testing results you may need to make changes or updates to the Factory Asset before final publishing.

Tip: Keep the asset file open during the testing phase. If you find an issue, close all testing files except the actual asset. Make the modifications and republish. Keeping the asset file open saves you time and the extra steps of opening the asset and accessing the necessary dialogs. Also the publish dialog will "remember" your settings as long as the asset file remains open.

Publish to Cloud or Production Environment

Once you are completely satisfied with the performance of the asset, you can publish it to your Production Environment or to the Autodesk Cloud. Assets published to the cloud are available to the entire Factory Design Suite community. When any user of the Factory Design Suite executes a search in the Asset Browser, your cloud based asset will be included in the results.

Delete Local Asset

Once the asset is in service, you can delete the local copy you created for testing. Your factory layouts should only use production ready assets. Mixing Production and Testing assets together in a factory layout can cause a variety of issues in downstream data management processes.

Asset Publishing Checklist

Creating an FDS asset is fairly straightforward but there are many opportunities to include specific functionality and product information. There are so many options that a checklist is often needed to ensure that the critical information is included. The checklist shown on the following page is a good starting point for new users. Once you have the basics of asset development down you can add or remove points on your own checklist.

Checklist for Asset Publishing	
☐	Model Detail – Low
☐	Shrinkwrap if Necessary
☐	Multi-Body if Necessary
☐	Parameters - Named
☐	Parameters - Key
☐	Parameters - Exported
☐	Parameters – Multi-Value
☐	Parameters - Tested
☐	iProperties – Part Number
☐	iProperties – Description
☐	IProperties – Mapped Parameters
☐	Work Features for Publishing - On
☐	Landing Surface
☐	Insertion Point
☐	Define Connectors
☐	Connector Class Properties
☐	Asset Properties
☐	Asset Variants
☐	All Work Features Off
☐	Publish Local
☐	Test
☐	Modify to Suit Testing
☐	Publish Local - Final
☐	Publish to Cloud - Optional

Section 5: Conclusion

There’s Always More Than One Way to Do Any Job

During this presentation, we’ve demonstrated how the Autodesk Factory Design Suite can be utilized for Layout Designs other than Factories. We looked at specific workflows included in the Factory Design Suite that appeal to designers in a wide array of engineering disciplines. We also looked at the process of converting any 3D model to an FDS asset that can be used in your own specific layout workflow. Now you may ask, “Doesn’t Autodesk offer specific tools for things like Architectural design, or Building Infrastructure?” Sure they do. Autodesk offers state of the art, industry leading tools for these design disciplines, and if your job centers on these practices, you should definitely consider these tools. But, if you’re an equipment designer, a system integrator or a building owner who focuses on layout design using your own set of unique assets, then you should know that the Autodesk Factory Design Suite was built for you.

And please remember, **Don’t Let the Word “Factory” Get in the Way**.