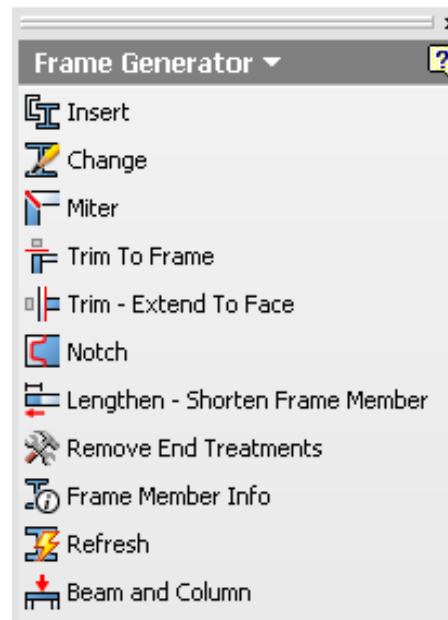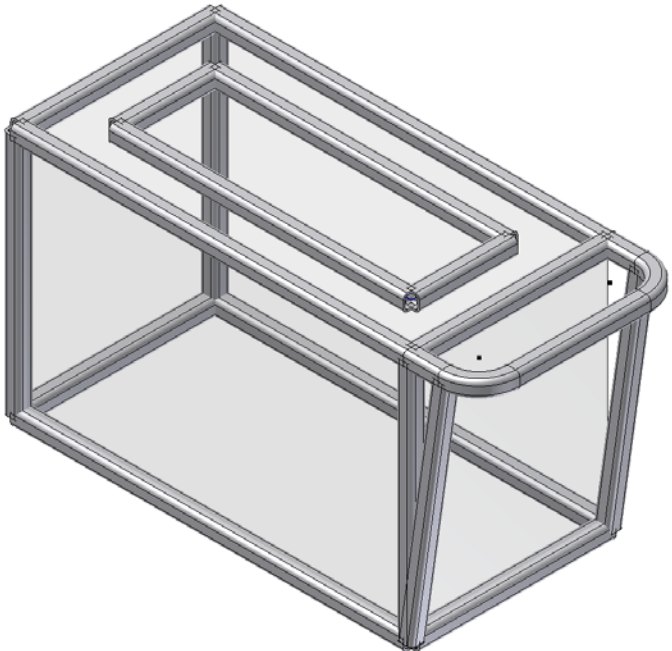# Frame Generator
Structural Shape Authoring

Autodesk Inventor's Frame Generator quickly and easily creates structural frames such as those used in machines, fixtures, platforms, access ways and stairwells. This is accomplished by using a skeletal wireframe part consisting of 2D sketches, 3D sketches, edges and vertices, to define the location of structural members. Any changes made to the skeletal wireframe part automatically update the associated frame members. Once the frame members are added, you can adjust the frame member's ends by using one or more of the available modification tools on the Frame Generator Panel.

In previous installments of Inventor the Frame Generator queried profiles from a styles library that was not easily editable for users which in turn limited the types of frames that could be created. Inventor 2009's enhancements to this technology allow users to quickly and easily publish their custom profiles to the Content Center of Inventor and give the data a more robust downstream results and greater administrative control over the content.

The purpose of this whitepaper is to show how to create these profiles and use them in your designs.

Don't Forget the Setup

Before we begin to create new structural shapes for our Frame Generator we need to create a Read/Write library in our Content Center and have it attached to our project. For more information about creating Content Center libraries and their configuration, reference the Inventor Help Topics and your local Administrative support.
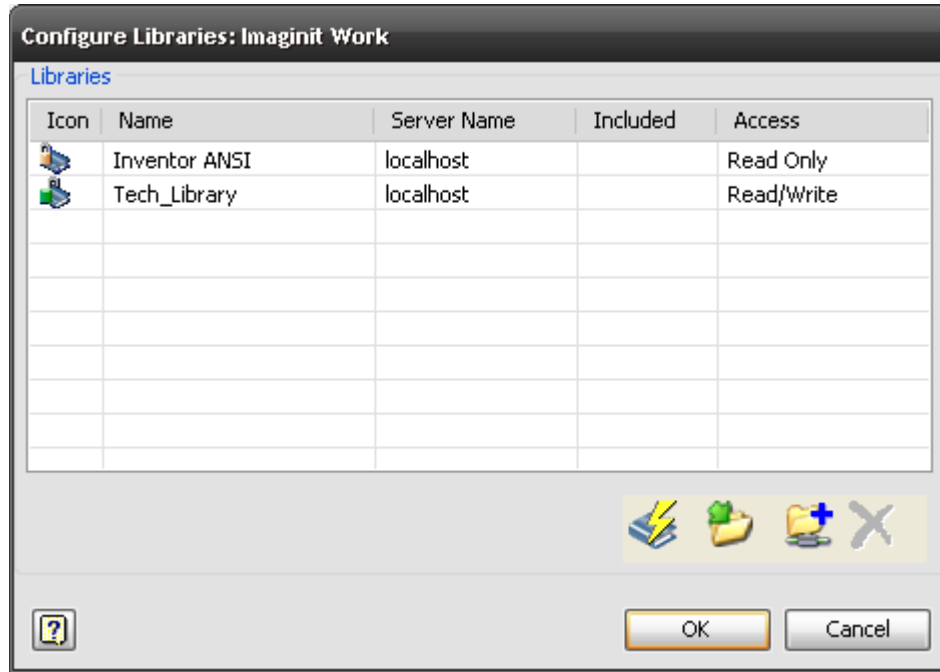

These are crucial steps in the process of creating valid Published Shapes as well as their organization and naming structure in your designs. You can create custom categories and bitmaps to represent your new structural shapes as well as custom Parameter mapping options for your Publishing output
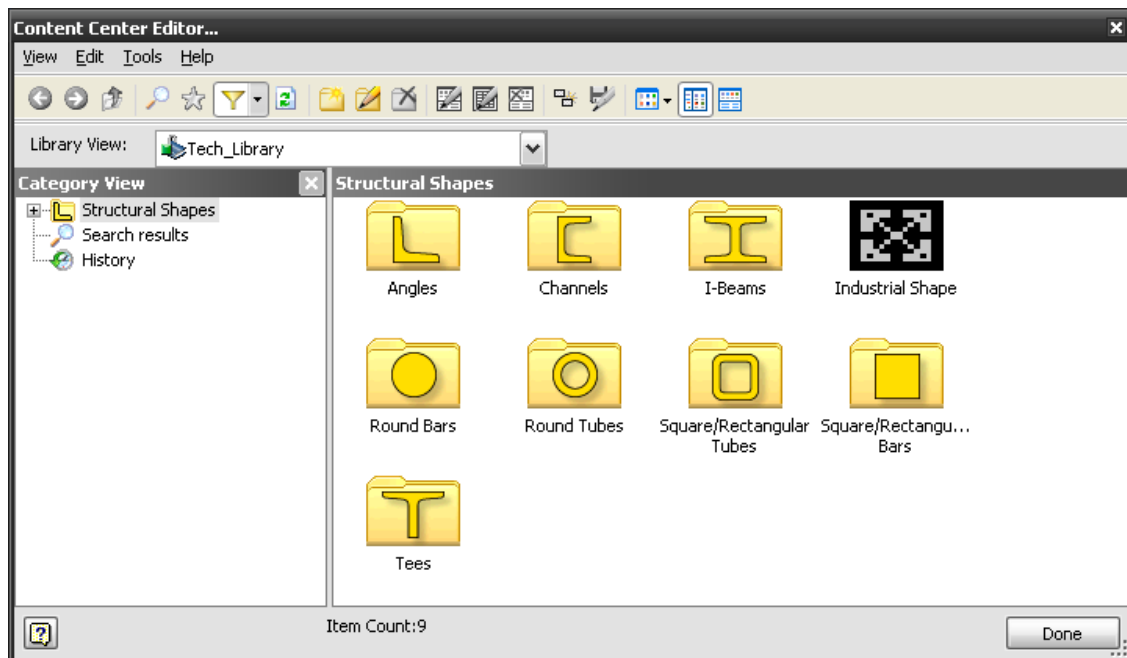
Preparing Your Structural Shape

When creating your own custom shapes the biggest thing in your customization is how accurate the shape is and how much detail to include. If you make a profile that is too detailed, then the overall look of the frame might be too busy as well as slow down your modeling. However you should always pay close attention to the critical dimensions for which the shape was chosen for in the first place.
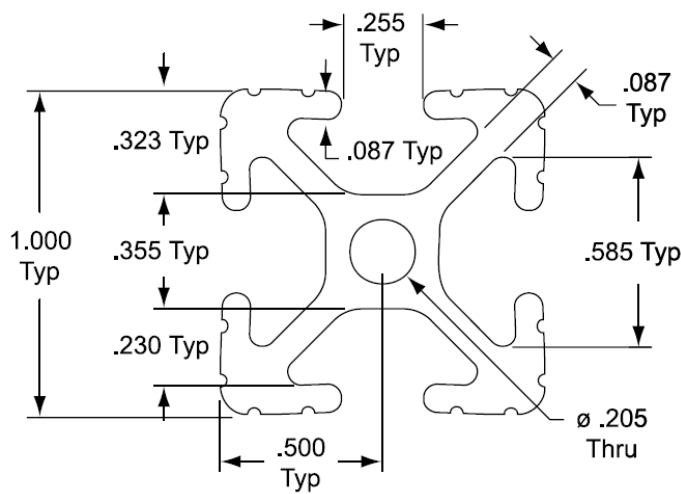
Manufacturer Data
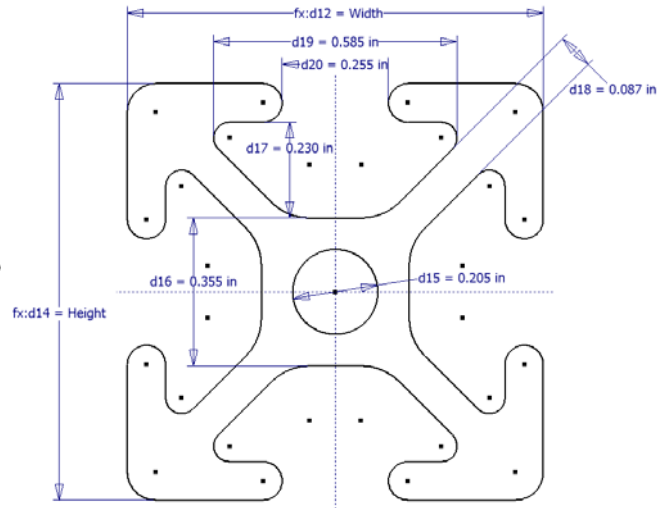
Inventor Sketch

Fully constrain and dimension your profile as necessary and make good use of parameters. Height, width, and wall thickness are the most common and known values. Make note of other important information from your supplier or company such as section area and moments of inertia as you may need them for more advanced options such as Beam and Column Calculator.

Parameters are also the driving force for iPart creation. Choose good names that are easily remembered during iPart creation and Structural Authoring.

Create a simple Extrusion to accommodate the Authoring Process. This method is the easy and recommended method. The more complex approach is a reminder of older functionality of the software to those who desire a challenge or more control. That method has the user create multiple work planes and parameters that complicate the workflow but yield a higher understanding of the Authoring process. For more information on this manual approach see the Help section.
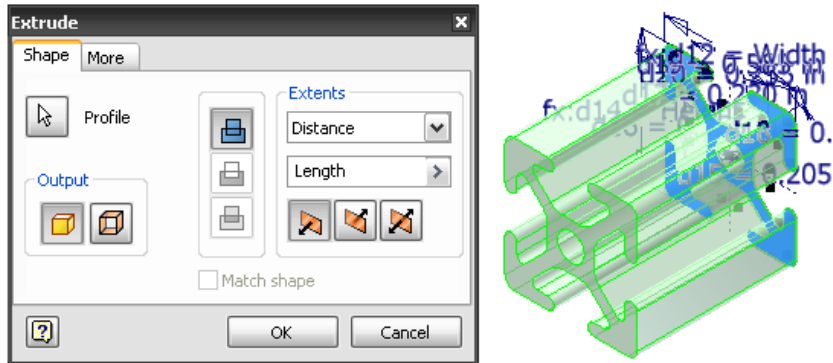
Make sure you have a Material for your new structural shape in your Styles and Standards. Your material should contain at least the correct value for density but can also contain more information about the materials properties such as Yield Strength [MPa], Ultimate Tensile Strength [MPa], and Young's Modulus [GPa]. If you have a new material not in the database simply add it through the Styles and Standards Editor from the Format pull down. (Note: Inventor 2009 SP1 fixed a bug that prevented correct selection of material in authored frame shapes.)
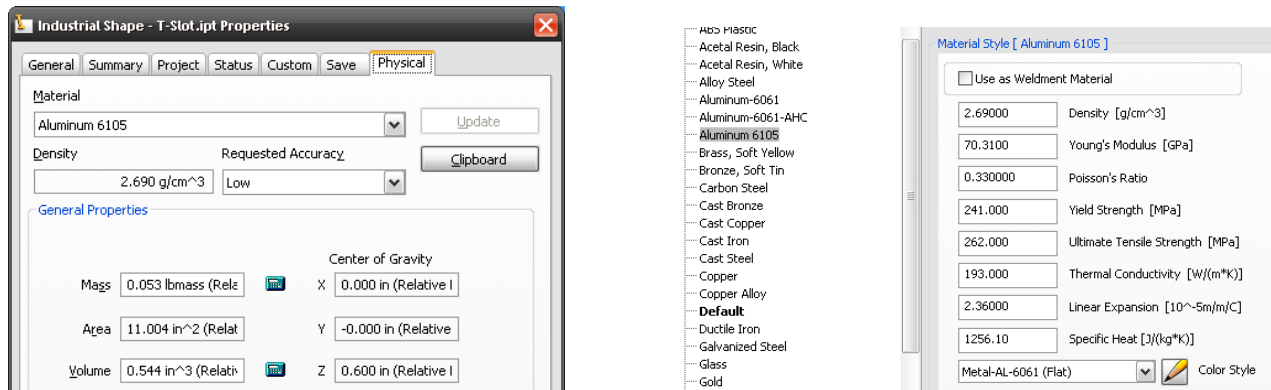
If an iPart is required for the Content Center, make sure the iPart is created and validated before the authoring process.
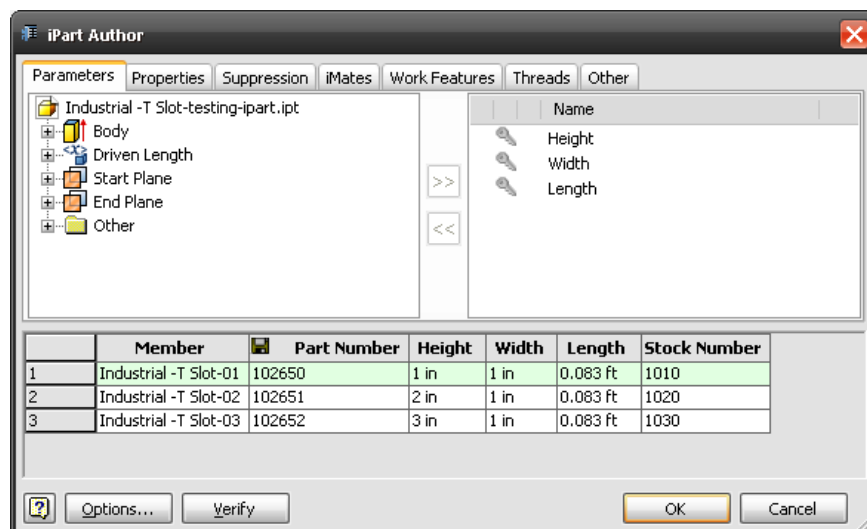
Authoring Your Structural Shape

Before authoring the Structural part you might want to review some iProperties and some Document Settings. A common iProperty to set up is a Stock Number or Sales and Purchasing (SAP) number which can be used in a Bill of Material or Parts List. Inventor 2009 allows the user to create expressions based on Exported Parameters and Existing iProperties.

The default naming scheme for Frame Generated Parts is → (Standard Organization)(Stock Number)(Unique Number)
Ie (T-Slot 1010 00000001), (T-Slot 1010 00000002)

**Standard Organization** is chosen from the Publishing process

Stock Number is taken from the iproperties of the part or ipart

Unique Number is a 8 digit number given during creation and can be modified during frame creation

The Structural Shape Authoring Tool can be found on the Part Features Panel in Part mode or under the Tools pull down.
This will take your basic Extrusion and convert it to a valid Frame Generator Profile through automatic feature modification.
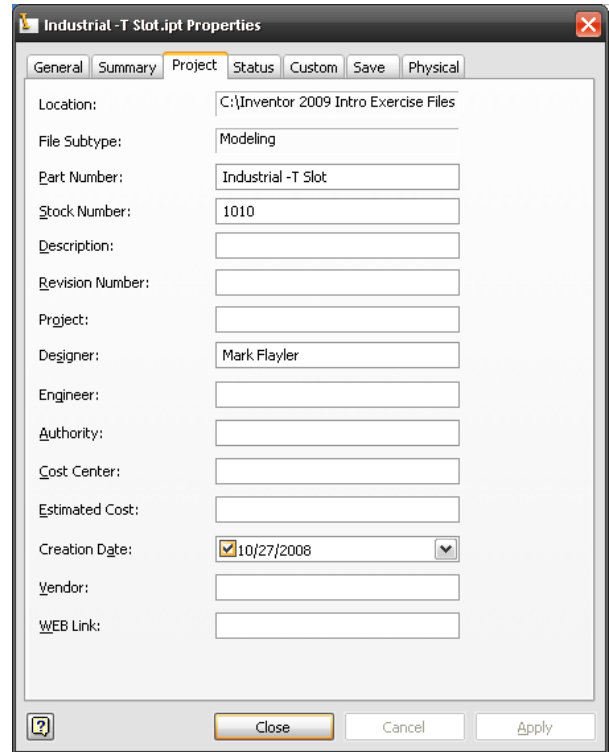

First select your Category in your Read/Write Content Center library to populate your shape to. Geometry Mapping automatically chooses Geometry if there is only one extrusion in the part along with the predefined point. The Default Base Point chooses a predefined point based on the chosen extrusion and is the geometric center of the profile. Conversely you can select from the pull down and select your own point for the center of the profile.
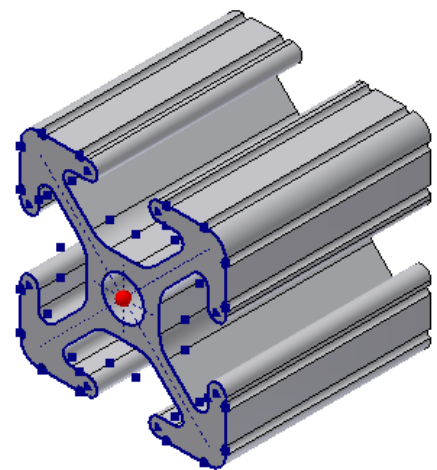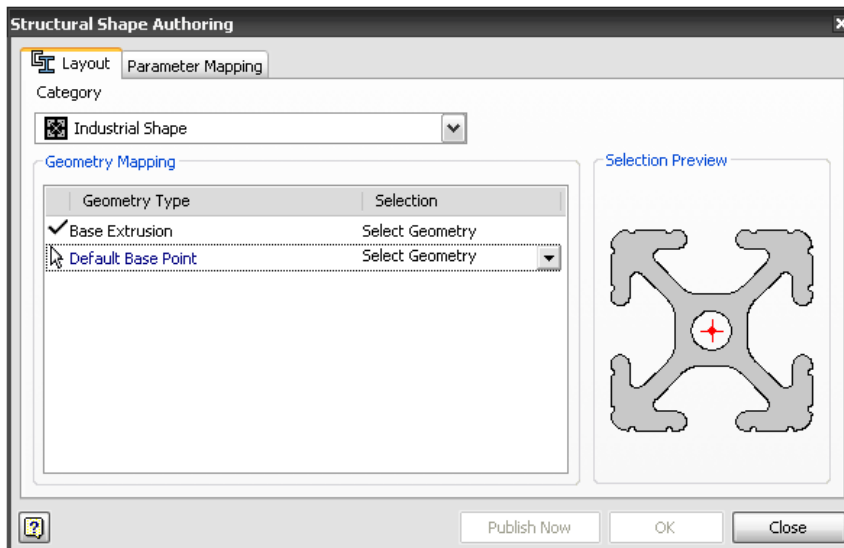
Select the second tab labeled Parameter Mapping. The fields with a yellow background are required fields determined by Category Properties from the Content Center. The fields in white are optional but that doesn't mean they are not important. They can be used for the key mapping in the Frame Generator such as Section Height and Width as they will be used as Size information during selection. Click the [....] (for normal parts; lower right graphic for selection) or [∨] (for iParts; pull down list for member info) in order to specify a Template Parameter to Map to a Content Center Category parameter.
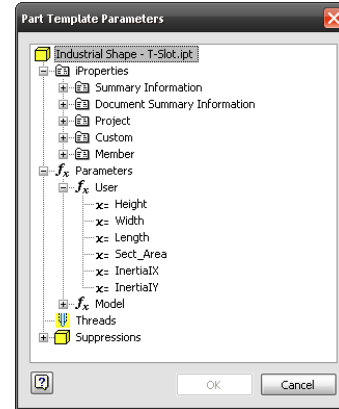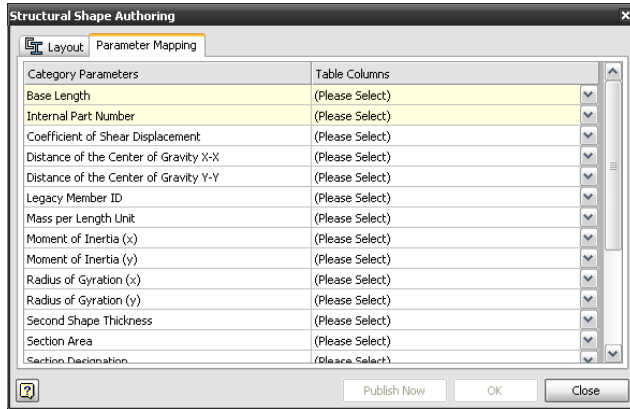
Once all the Parameters are mapped you have two options. Choosing Ok will simply Author the part by revising your model geometry and notify you of a log file that details the changes. This file is placed in the working directory of the part you are authoring. Choosing Publish will continue to process the structural shape for placement into Content Center. Before Publishing check some other settings to strengthen your documentation such as Base Quantity for Bill of Materials.
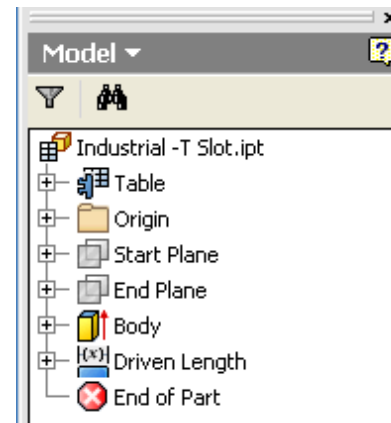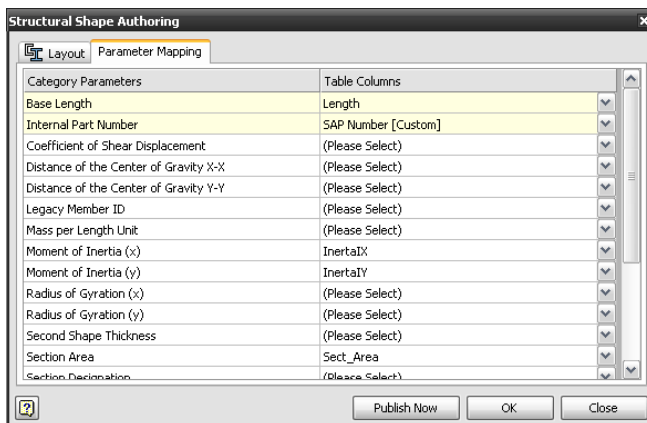
In Document Settings we can change our Base Quantity calculations. By default the Base Quantity is set to parameter G_L (current value) after authoring which will return individual line items in our parts list. By changing this parameter to the "Each" parameter (located at the top of the pull down) we can quantify like members into the same row in the Bill of Material and Parts List.
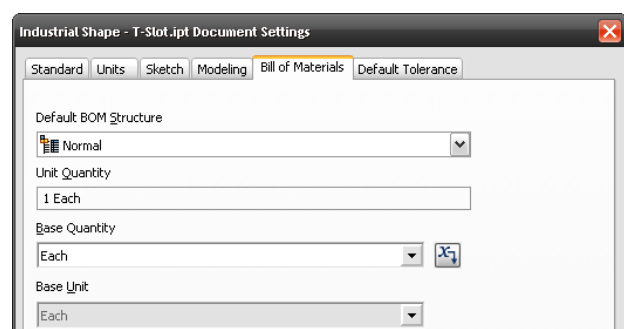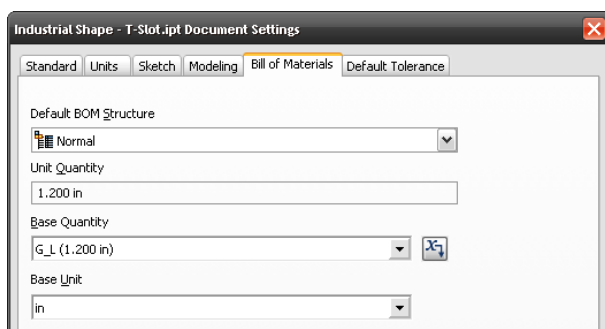
Publishing Your Structural Shape

Once the Structural Shape has been Authored and its design properties have been properly set up for documentation the shape can now be published to the Content Center for use in the Frame Generator. The two ways which this can be accomplished are from the ▦ Structural Shape Authoring tool Publish Now option or ▦ Publish Part… from the Tools pull down.
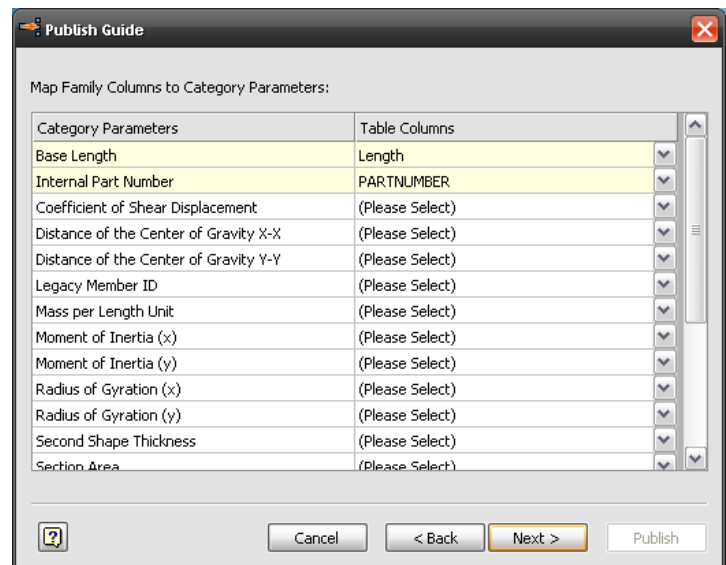
First Choose a Library (Read/Write) to Publish to and a language. Click Next.

Choose a Category/Sub-Category to Publish to. Click Next

Confirm or remap any properties and parameters you may have changed after your initial Authoring. This should already be done from when the part was Authored unless a different Category was chosen in the previous steps. Click Next.

On the Define Family Key Columns you must choose at least one column to continue the Publishing process. Choose a column or columns that best describe your Structural Shape. Click Next.
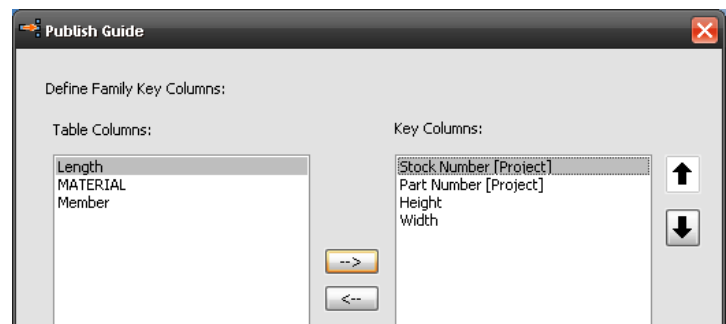
Enter a Name and Description that best describes the Family. Either choose or type a new Standard Organization, Standard, Manufacturer and Standard Revision. Click Next.

Choose or approve a thumbnail image for the reference in the Content Center as well as the Frame Generator. Click **Publish** to finalize the process. A box will appear confirming the completion.
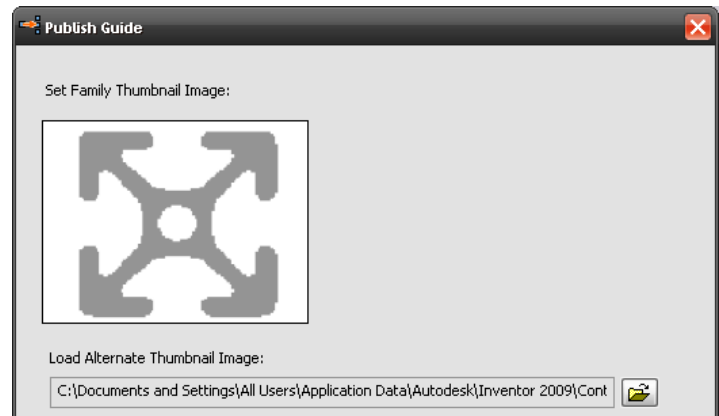
Using Your Structural Shape

Open a Frame Generator design and use the **Insert** command on the Frame Generator Panel. Examine the options:

Standard:
Standard Organization

Family:
Name – Description

Size:
Family Key Column selections are the order created during Publish

Here we see the members populated to the skeleton part and the corresponding drawing. This drawing has a predefined Parts List and the skeleton part does not populate because it is classified as a Reference Part in the Bill of Material.
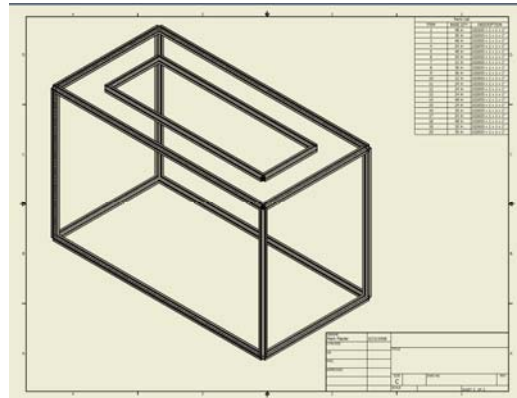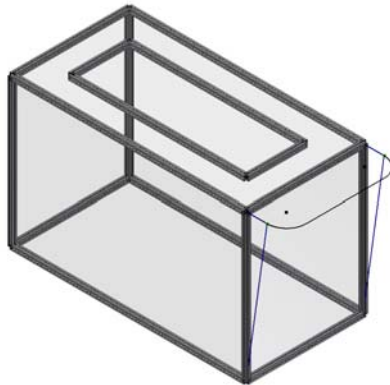
Two Part Lists are represented here before and after a Parts List grouping by Base Quantity. Consider adding more information in the Content Center Family Naming and Family Table to better facilitate a robust documentation.

About the Author: Mark Flayler

Mark is an Application Engineer with IMAGINiT Technologies, specializing in manufacturing environments. He has implemented the Autodesk Manufacturing products with several industries including the blow/injection molding, automotive, and custom machinery markets. Inventor has been a profound augmentation in his abilities allowing him to bring 3D digital prototyping to the forefront of the industries with which he has interacted. He has extensive experience and a comprehensive understanding of the technical, practical business and human dimensions of implementation. He is an effective and skillful communicator, consulting with his clients to help achieve their business objectives. Mark is an ATC certified instructor and he provides training, support, and implementation. Mark is PSE and ATC certified in AutoCAD, AutoCAD Mechanical, AutoCAD Electrical, Autodesk Data Management, and Autodesk® Inventor™.