

# Publishing Structural Components to Content Center

Publishing Structural components requires a different set of parameters than standard Content Center. Structural components are used in a dual mode, first as standard content, and second as Frame Generator components. Figure 1 illustrates the Structural Shapes Content Center category. Category properties determine the usefulness of the category. Specific parameters are required to publish as a Structural component.

Parameter Name	Data Type	Units	Category Path	Mapping
Custom Base Point	integer	ul	Structural S...	Optional
FG Authored	integer	ul	Structural S...	Optional
Legacy Member ID	string		Structural S...	Optional
Base Length	double	cm	Structural S...	Required
Distance of the Center of Gravity X-X	double	cm	Structural S...	Optional
Distance of the Center of Gravity Y-Y	double	cm	Structural S...	Optional
Torsional Rigidity Modulus	double	cm <sup>4</sup>	Structural S...	Optional
Torsional Section Modulus	double	cm <sup>3</sup>	Structural S...	Optional
Coefficient of Shear Displacement	double	ul	Structural S...	Optional
Section Area	double	cm <sup>2</sup>	Structural S...	Optional
Moment of Inertia (x)	double	cm <sup>4</sup>	Structural S...	Optional
Moment of Inertia (y)	double	cm <sup>4</sup>	Structural S...	Optional
Section Module (x)	double	cm <sup>3</sup>	Structural S...	Optional
Section Module (y)	double	cm <sup>3</sup>	Structural S...	Optional
Radius of Gyration (x)	double	cm	Structural S...	Optional
Radius of Gyration (y)	double	cm	Structural S...	Optional
Shape Thickness	double	cm	Structural S...	Optional
Second Shape Thickness	double	cm	Structural S...	Optional
Shape Width	double	cm	Structural S...	Optional
Shape Height	double	cm	Structural S...	Optional
Mass per Length Unit	double	g	Structural S...	Optional
Section Designation	string		Structural S...	Optional

**Figure 1 - Structural Shapes Category**

## Category Properties

A category is defined by Category Name, Category Image, and Category Properties. Part categories can also include Category Parameters. Category properties for existing categories can only be viewed by the user. Creating a new category allows user editing.

The Angle Category shown below contains certain properties required by Frame Generator. Comparing the table in Figure 1 with Figure 2, you will notice that the “Angle” category inherited all of the properties of the “Structural Shapes” category. This family resemblance is populated throughout all Structural Shapes sub-categories.

**Category Properties**

General Parameters

Parameter Name	Data Type	Units	Category Path	Mapping
Moment of Inertia (x)	double	cm <sup>4</sup>	Structural S...	Optional
Moment of Inertia (y)	double	cm <sup>4</sup>	Structural S...	Optional
Section Module (x)	double	cm <sup>3</sup>	Structural S...	Optional
Section Module (y)	double	cm <sup>3</sup>	Structural S...	Optional
Section Area	double	cm <sup>2</sup>	Structural S...	Optional
Radius of Gyration (x)	double	cm	Structural S...	Optional
Radius of Gyration (y)	double	cm	Structural S...	Optional
Shape Width	double	cm	Structural S...	Optional
Shape Thickness	double	cm	Structural S...	Optional
Second Shape Thickness	double	cm	Structural S...	Optional
Mass per Length Unit	double	g	Structural S...	Optional
Custom Base Point	integer	ul	Structural S...	Optional
FG Authored	integer	ul	Structural S...	Optional
Legacy Member ID	string		Structural S...	Optional
Base Length	double	cm	Structural S...	Required
Distance of the Center of Gravity X-X	double	cm	Structural S...	Optional
Distance of the Center of Gravity Y-Y	double	cm	Structural S...	Optional
Torsional Rigidity Modulus	double	cm <sup>4</sup>	Structural S...	Optional
Torsional Section Modulus	double	cm <sup>3</sup>	Structural S...	Optional
Coefficient of Shear Displacement	double	ul	Structural S...	Optional
Section Area	double	cm <sup>2</sup>	Structural S...	Optional
Moment of Inertia (x)	double	cm <sup>4</sup>	Structural S...	Optional
Moment of Inertia (y)	double	cm <sup>4</sup>	Structural S...	Optional
Section Module (x)	double	cm <sup>3</sup>	Structural S...	Optional
Section Module (y)	double	cm <sup>3</sup>	Structural S...	Optional
Radius of Gyration (x)	double	cm	Structural S...	Optional
Radius of Gyration (y)	double	cm	Structural S...	Optional
Shape Thickness	double	cm	Structural S...	Optional
Second Shape Thickness	double	cm	Structural S...	Optional
Shape Width	double	cm	Structural S...	Optional
Shape Height	double	cm	Structural S...	Optional
Mass per Length Unit	double	g	Structural S...	Optional
Section Designation	string		Structural S...	Optional

OK Cancel Apply

**Figure 2 - Angle Category Properties**

A Tube & Pipe category as shown in Figure 3 below shows a completely different list of parameters, and as such, will not be available for use with Frame Generator. Both the parent Tube & Pipe and all sub-categories possess a completely different set of parameters.

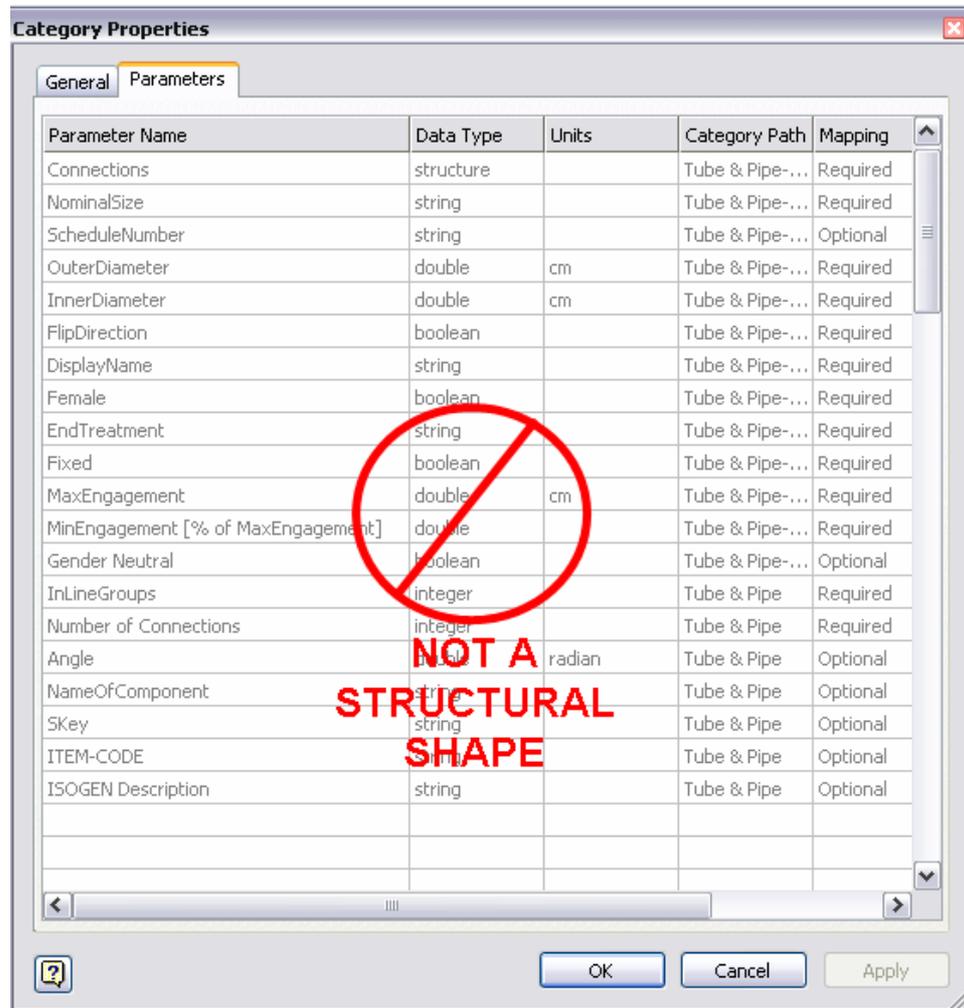


Figure 3 - Tube & Pipe - Pipes Category

### What we have learned so far:

- Structural shape authoring requires special category parameters.
- Copied categories may not be edited.
- New sub-categories created under Structural Shapes category will inherit the parent category properties, permitting use as a structural shape or with Frame Generator.

## Create a new subcategory

When a new subcategory is created under a main category such as Structural Shapes, the subcategory will inherit all of the category properties of the parent. This makes the job of creating a new subcategory much easier. In the following example, I will create a new subcategory under Structural Shapes called **AISC Beams**.

To create the category, right mouse click on Structural Shapes in your custom read/write library, and select **Create Category**.

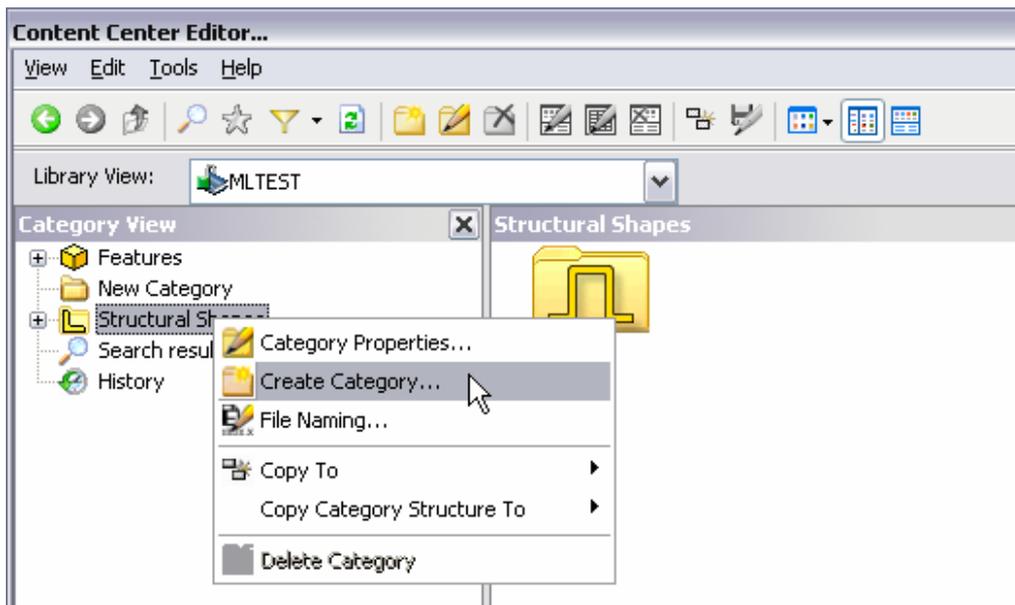
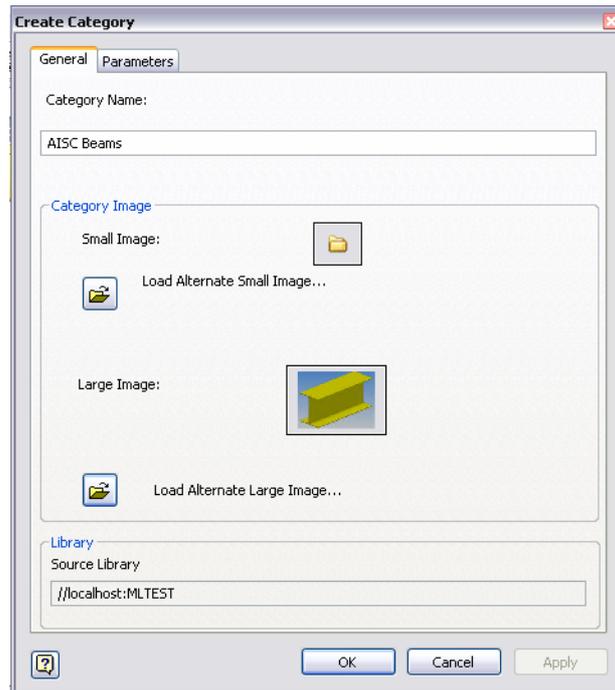


Figure 4 - Create Category

When the Create Category dialog box appears, in the General tab, enter **AISC Beams** for the category name. If you have a BMP image that you would like to illustrate the category, select the appropriate image from one of the two "browse buttons" shown in the dialog. For my example I have selected the "**load alternate large image**" button and browse to the *AISCwBeam.bmp* from the zip file provided for this lesson.

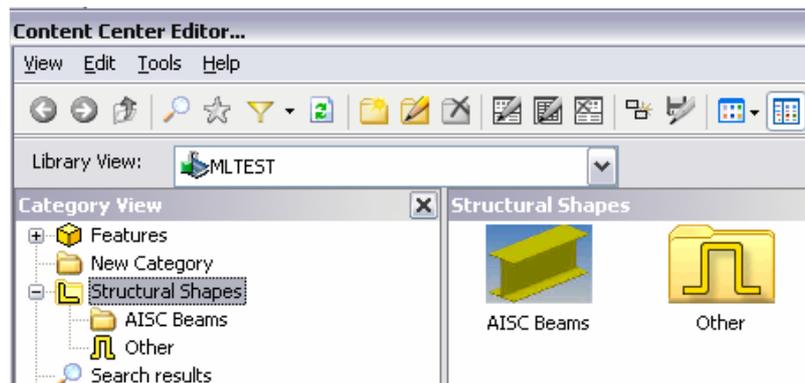
Once the image has been selected, it will appear in the image box to the right of the "Large Image:" label. Figure 5 shown on the next page illustrates the selection process.

Before you pick OK to create the category, pick on the Parameters tab at the top of the dialog box so that you may see that the parent parameters have been copied to the new category. The copied parameters will form the basis for adding specific family properties into each component that is authored.



**Figure 5 - Load Alternative Large Image**

After picking the OK to create the new subcategory, you will notice that the "AISC Beams" subcategory has joined the previously created "Other" subcategory in my custom content Center Library.



**Figure 6 - New Category under Structural Shapes**

Now that we have created the subcategory in the content Center editor, pick **Done** to exit the editor.

## Publishing a Part to the AISC Beams Category

For this exercise, we will utilize the “**Wide Flange Beam.ipt**” download that was created by Jeff Thompson (<http://cbliss.com>). If you have not checked out Charles’ site, then take the time to explore all of the great iParts, iFeatures and code that he is made available. Send him an e-mail and tell him how much his work is appreciated!

**Open** the **Wide Flange Beam.ipt** part, and drag the End of Part Marker to the bottom of the file, then **Save**.

The above referenced iPart has many named parameters. If you go to **Tools > Parameters**, you will see the list of named parameters. You should also notice that the length of the extrusion is controlled by a Parameter Name called **Extrude**.

Parameter Name	Unit	Equation	Nominal Value	Tol.	Model Value	Comment
<b>Model Parameters</b>						
d4	in	bf	3.940000	●	3.940000	<input type="checkbox"/>
d5	in	tw	0.170000	●	0.170000	<input type="checkbox"/>
d6	in	tw / 2 ul	0.085000	●	0.085000	<input type="checkbox"/>
d7	in	tf	0.205000	●	0.205000	<input type="checkbox"/>
d8	in	tf	0.205000	●	0.205000	<input type="checkbox"/>
d9	in	d	7.890000	●	7.890000	<input type="checkbox"/>
d10	in	k - tf	0.420000	●	0.420000	<input type="checkbox"/>
Length	in	12 in	12.000000	●	12.000000	<input checked="" type="checkbox"/>
d12	deg	0 deg	0.000000	●	0.000000	<input type="checkbox"/>
<b>User Parameters</b>						
d	in	7.89 in	7.890000	●	7.890000	<input type="checkbox"/>
tw	in	0.17 in	0.170000	●	0.170000	<input type="checkbox"/>
bf	in	3.94 in	3.940000	●	3.940000	<input type="checkbox"/>
tf	in	0.205 in	0.205000	●	0.205000	<input type="checkbox"/>
k	in	0.625 in	0.625000	●	0.625000	<input type="checkbox"/>
k1	in	0.4375 in	0.437500	●	0.437500	<input type="checkbox"/>

Figure 7 - Wide Flange Beam.ipt Parameters

## Adding Additional Properties

Before we look at publishing this part, we will need to add the Material Properties to the iPart. This will permit each member to have the proper mass properties upon creation. To add material properties to the iPart table, simply access the Properties tab In the IPart Author dialog box, browse to Physical, select the Material and transfer that property to the right side column. Once this is done, the Material column will appear in the iPart Author table. Figure 8 shows the end result. In addition, we will designate the “Weight” column as the File Name column by **Right Mouse Clicking** on the column header and selecting **File Name**.

Be sure to pick **OK** to exit the iPart author dialog, then **Save** the iPart file.

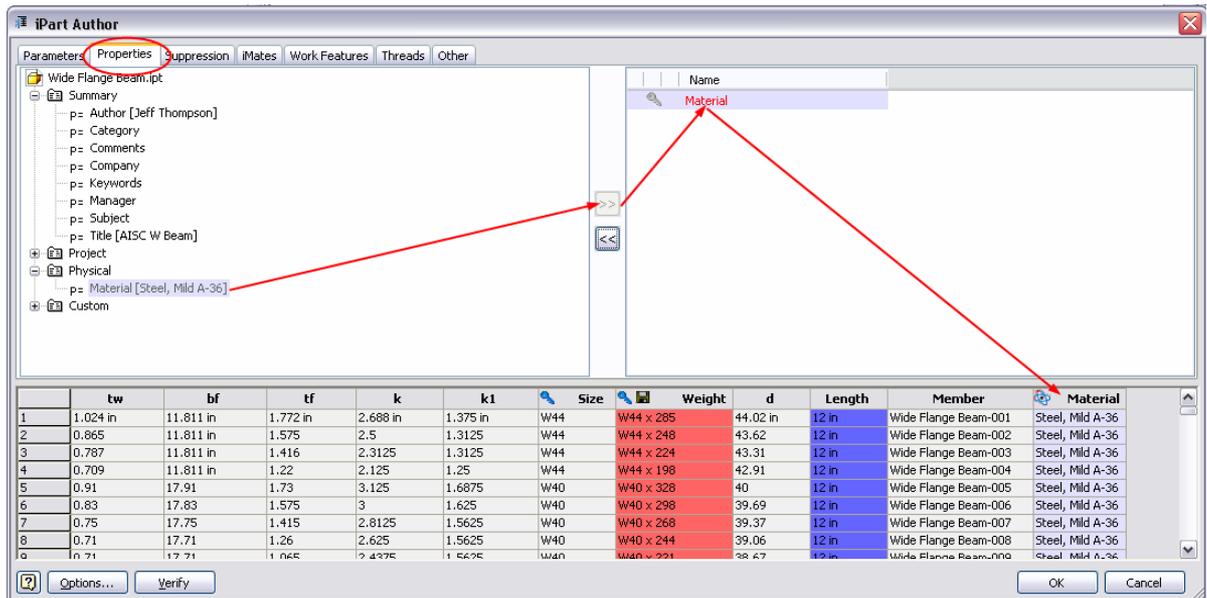


Figure 8 - Adding Material Properties to the iPart Table

## Testing the iPart

Before we make an attempt to publish this component into Content Center, we will want to first insert each variation of the part into a blank assembly file to verify proper creation of each member. If every variation of the part places accurately into the assembly, you can be very sure that this part should publish correctly.

## Publish the Part to Structural Shapes

Once testing is complete, you should be ready to publish this part into the AISC Beams category. Just to recap what we've done up to this point:

- We have created a new category under Structural Shapes called AISC Beams.
- We have modified the AISCPart file to include the Material property.
- We have tested the iPart to make sure that the table works correctly, and generates the proper sized and structured members. We have made corrections and additions to the original iPart to make sure that it behaves as expected.

## Structural Shape Authoring Specifics

There are several different ways to offer content Center components. Each method produces a different result. In the Tools pulldown, there are several different commands for authoring components, each giving a different result:

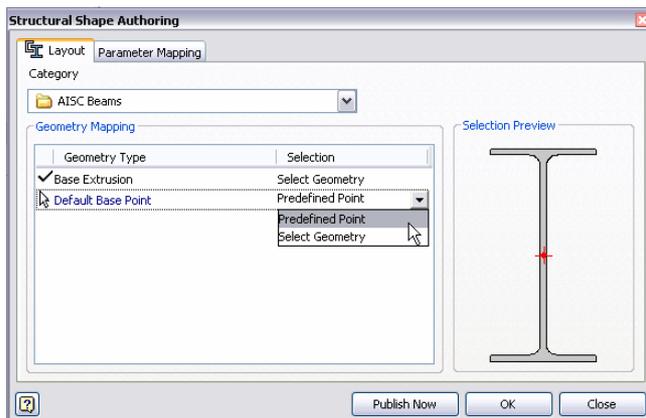
- **Publish Part** - This method is used to publish general Content Center components. Examples might be other hardware, and company specific components.
- **Component Authoring** - this method is used to publish components in the fastener category. Using this method permits additions to Design Accelerator in the areas of bolting connections, and other similar Design Accelerator options that utilize fastener components.
- **Tube and Pipe Authoring** - Use this method to create additional components that will be used in Tube and Pipe (Routed Systems) applications. Use of this method assures that the components will be authored in to the appropriate categories.
- **Structural Shape Authoring** - This is the method that we will use in this tutorial. Components authored using this option will be placed in the Structural Shapes category for use as structural components or as new options for Frame Generator.
- **Connector Authoring** - components authored through this method are then available in Routed Systems (Electrical) designs.

## Author the Part

We now understand that there are various ways to author any new component, therefore requiring us to select the structural shape authoring method for storing this component. With this knowledge, let's author the AISCPart.

With the *Wide Flange Beam.ipt* open in Inventor 2009, select the **Tools > Structural Shape Authoring** command. The structural shape authoring dialog will appear, with the required category highlighted in red. To author this part, **Select** the *AISC Beams* category.

Next, define the Base Extrusion by selecting the geometry. The entire part will be highlighted as shown in figure 9.



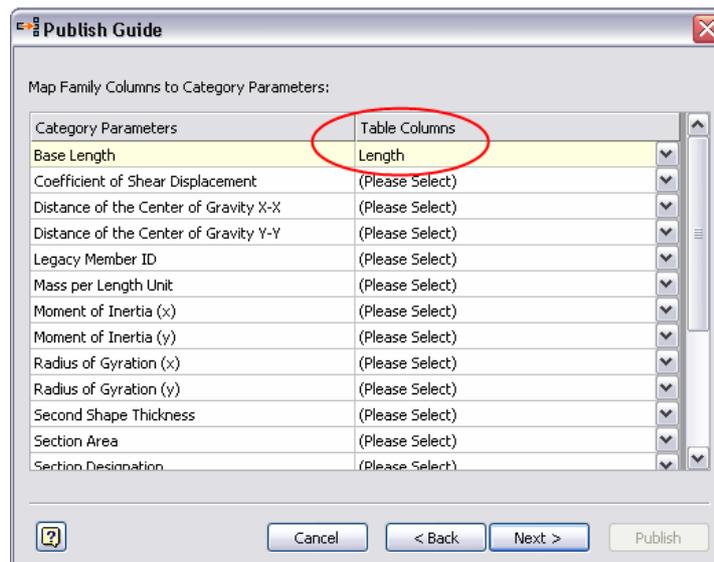
**Figure 9 - Selecting the Base Extrusion**

Once the base extrusion has been selected, you will need to select the default base point for this new component. Typically, the original part will have been created with a base point in the center of the original sketch. You have two options for selecting the base point - by **Predefined Point**, or by **Selecting** the *Sketch Geometry*.

You will notice that the **Publish Now** and **OK** buttons are grayed out after selecting the geometry. In order to complete the authoring workflow, you will need to select the parameter mapping tab and modify the relevant category parameters by selecting the appropriate matching iPart table columns. Figure 10 shows the matching of the *Base Length* to the iPart table column called *Length*. In many parts, you will want to match additional category parameters with their respective table columns. In the case of this part, we will want to select the **Base Length** category parameter and change the value of the table column to **Length**. Once this is accomplished, you will now be able to **Publish Now**.

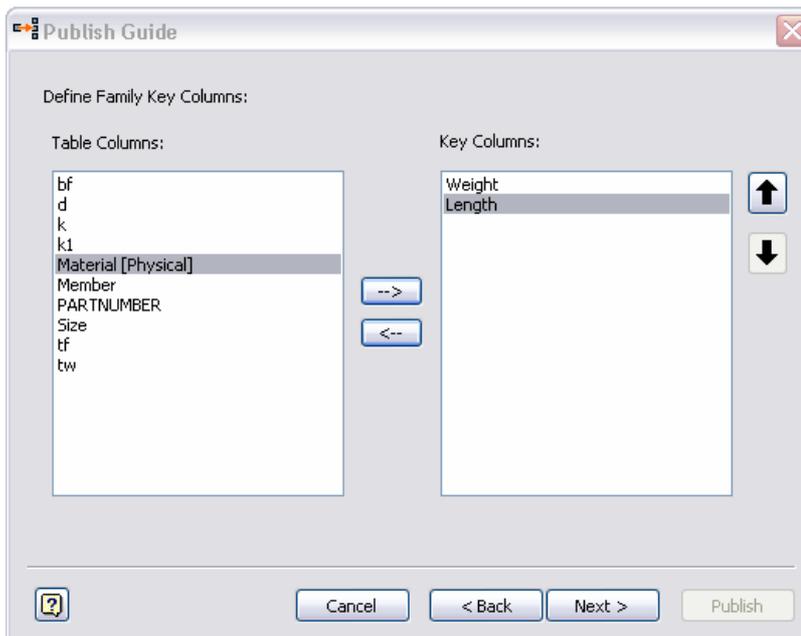
After selecting Publish Now, you will be directed to the **Publish Guide**, where you will select the custom library of your choice for publishing. I will publish this part to the MLTEST custom library database. Pick Next to advance to the following step where you will select the category under which this part will be published. Select the AISC Beams category for placing this new Family Table.

The next step will again bring up column mapping, this time for family table columns. You will note that since you already mapped the Base Length to the Length table column, it will already appear as default. Figure 11 shows the base length already mapped.



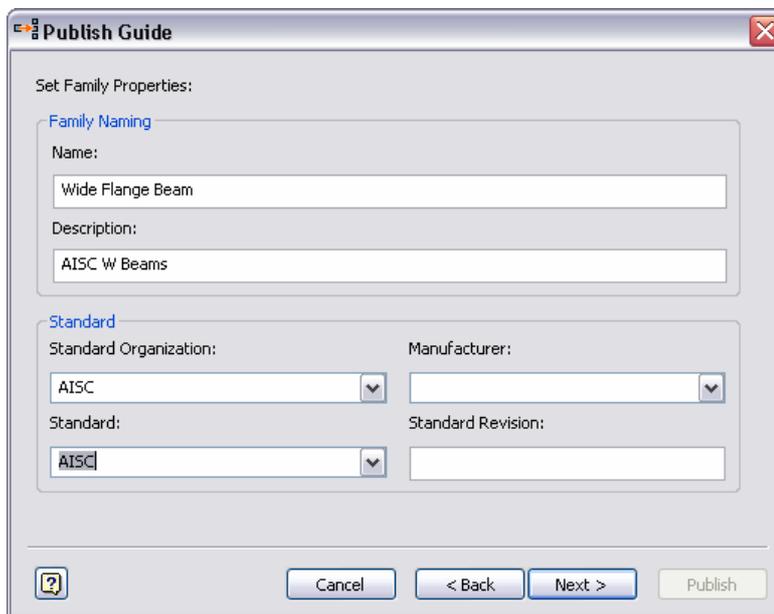
**Figure 11 - Family Table Mapping**

Picking **Next** in the publish guide will bring up the page where Family Key columns will be defined. A defined Key Column will appear in the finished dialog box that will be used when placing this component. Since this part is primarily table driven with only the Size Designator (Weight) and the Extrusion Length (Length) defined upon placement, these two columns are all that is needed. Figure 12 shows the two selected key columns in the desired placement order.



**Figure 12 - Key Column Configuration**

Picking the Next button will advance the Publish Guide to the next page where family properties may be set. Figure 13 shows that the Standards have been designated in the Family Properties.



Picking Next moves the publish guide to the next page where the family thumbnail image may be selected. Typically, the default part thumbnail will be displayed, however virtually any BMP image of reasonable size may be used. A browse button is available within this dialog page to browse to an appropriate image.



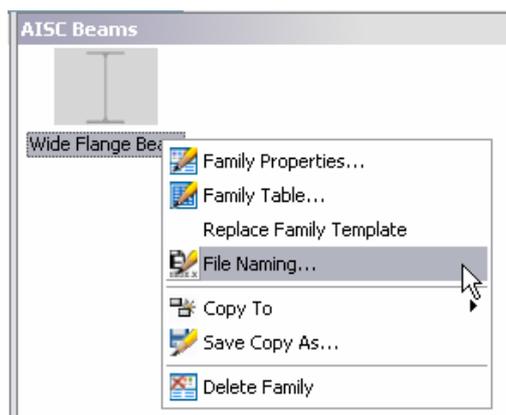
**Figure 14 - Select the Thumbnail Image**

Once the image has been selected, pick publish to generate the family component in the structural shapes category that has been selected.

### File Naming Options

General file naming conventions have been set inside the original iPart table by designating a specific column as a Filename Column. However, after publishing a part, you have additional controls over the format of the file name.

Inside Content Center Editor, you may Right Mouse Click on any specific part located in a Read/write library and select the "File Naming" option from the in-context menu shown in figure 15.



**Figure 15 - File Naming Option**

Selection of this option brings up the file naming options dialog. Picking on the browse button as highlighted in figure 16 allows utilizing a different parameter for the naming conventions. These additional parameters can either replace the existing naming convention, or be appended to the current naming convention.

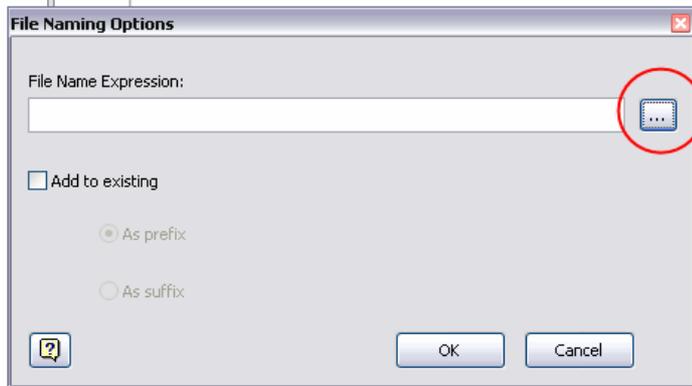


Figure 16 - File Naming Options Dialog

## Test the Content Center Component

Before we published this part to content Center, we tested every iteration of the original iPart. In order to assure that this new structural component has been published correctly, we want to test placement of each part number and an appropriate length into an assembly.

We will want to make two tests, one as a standard Content Center component, and another test to ensure that this part will function correctly in Frame Generator

## Test as a Standard Component

Open a new Inventor assembly file. Using Place from Content Center, select the AISC Beams category. If you have created the category correctly, it should appear similar to figure 15.

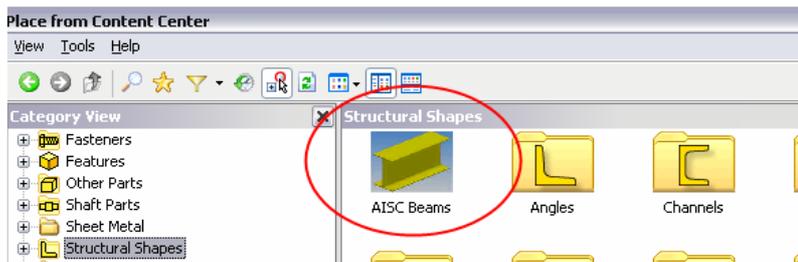
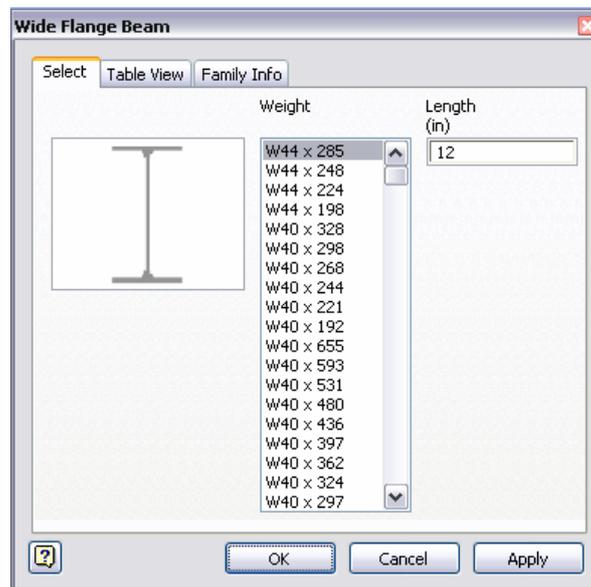


Figure 15 - Place from Content Center

Double picking on the AISC Beams category should produce a family table called "Wide Flange Beam". Double picking on the Wide Flange Beam designation will then produce a dialog box that should look like figure 16 below.



**Figure 16 - Place Beam Component**

In the provided example file, the part length will be a portion of the new file name upon placement. This will create unique custom length driven components.

### Using this component in frame generator

Assuming that you are successful in publishing a part to Structural Shapes, it should be available for use within Frame Generator. Keep in mind that frame generator creates the component length through the use of a master skeleton. File naming of frame generator components will be different than using the same component as a placed content center part.

### What we have learned:

- Structural components may be created from standard iParts.
- In order to utilize a component as a structural type component, it must be published differently than standard components.
- The process of publishing a structural component results in placing the family component into a Structural Shape category.
- Frame generator can only access components in the Structural Shape category.

### Questions?

Please e-mail all questions to [djeffrey@teknigroup.com](mailto:djeffrey@teknigroup.com). Additional resources and access to training courses are all available at the <http://teknigroup.com> website.