Session 5

Revit Families: The Good, The Bad and The Ugly.
Bruce Gow (BVN)

Class Description

This class covers some things that users may not know about creating families including:

- Cut Planes – When does this transfer to a project?
- Importing complex geometry – Good idea?
- Naming – Families.
- Using Complex Families
- Nested Families – Should you use them; Shared V Non Shared.
- Sharing Families
- Origin – Effect of not using a specific insertion point for families
- Reference Planes in Families.
- Shape Handles Should you use them?
- Curtain wall Louvres.
- Sweeps – Why do they break sometimes?
- Masking Regions – A bug uncovered and resolved.
- Reporting Parameters.
- Type and Instance - when to use one in preference.
- Type Catalogues v Type.
About the Speaker:

I have been using Revit since 2002, starting in my own architectural practice and then moving to a reseller and then to BVN Architecture. I have also been lucky enough to present at various conferences in Australia and in the US. I have worked with a wide range of architectural and engineering building organizations in that time, both in implementing Revit, training Revit and managing Revit Content.
Revit Families: The Good, the Bad and the Ugly:
Introduction.

About the Speaker: (Bruce Gow – BVN Architecture)

I have been using Revit since 2002, starting in my own architectural practice and then moving to a reseller and then to BVN Architecture. I have also been lucky enough to present at various conferences in Australia and in the US. I have worked with a wide range of architectural and engineering building organizations in that time, both in implementing Revit, training Revit and managing Revit Content.
Here's a scenario:-

You are faced with establishing content that meets Office standards, works for Concept and DD/CD, works in Codebook, suits Commercial and Health care etc programs, and is needed NOW

Your task is to get the “right” content quickly to assist teams designing and documenting projects.

Possible sources are: -
OOTB content.
Web based content (free and paid. I.e. SEEK, AUGI Forums, RevitCity, Design Content, Product Spec, All-In-One )
Content from JV firms (assuming that IP issues have been resolved)
BYO – really means Make Your Own.

If you are a reasonable sized firm, operating in the Commercial, Health, etc areas you will most likely find that the OOTB content does not generally cut it for you.

Web based content often has a predilection to specific manufacturers and again that may not work for your organization.

Content from JV firms could be a good solution, but in the end their standards probably won’t suit yours.

So that leaves you in the difficult situation of creating your own content.

Wouldn’t it be cool if we could instantly recognize the quality of a family ( obtained or made-in-house ) just from its appearance? A bit like we know who is who when we watch an old spaghetti western.
The Good.

What is a Good Family?

Revit often works so intuitively that we don’t realize the thought that has gone into it behind the scenes. No so much with Content as we quickly realize that the OOTB content may not suit our preferred office standards. Nevertheless, a Good Family is one that …

Works the way we expect it to.
Is not too large a file size.
Responds quickly to parametric changes.
Has the Types available that we require
Should have a different appearance in detail levels ( SD /DD and CD )
Is set up with your own office naming convention.
Utilizes your own Shared Parameters.
It suits your own office standards.
The Bad.

Obviously one that does not do what we just outlined. Bad families usually just don’t do what they are expected to do. They break, or they don’t have the right appearance or they are too large and unwieldy, or they have too much / too little detail, they don’t suit your standards etc.
The Ugly.

An ugly family may not be as obvious as you first think.

You may think in the beginning, that it is a good family, until it is used in some different or unexpected situation. Then all hell breaks loose and the family may :-

Fail completely
Produce unexpected results.
Keys to Good Content Creation:

- Anticipate the future. You are not just modeling something; you are trying to predict how that element may change in the future.
- How do you want the item to schedule?
- What parameters need to be scheduled?
- Show in Section
- Default Line weights
- Able to be utilized by other consultants.
- Insertion point has been thought about and relates to other content of that category.
- Create the bones, the muscles and the flesh in that order.
- Level of Detail is appropriate to the scale.
- Have the correct materials.
- Dimensions all placed outside sketch mode.
- Subcategories are properly defined.
- Masking regions are used for plan, elevation and section views.
Pointers to Creating Content.

The following pointers to creating “good” families have been gleaned from my nine (9) + years working in Revit.
Where I can remember, I have given credit to those that I believe were the authors of particular tips. (Apologies if I am incorrect).
Sometimes the points have no references – that just means that the author is lost in the sands of time or that there were in fact many authors standing on each other’s backs.
Again apologies if you are not named.
1. Create your own Family Template file.

Not all the OOTB template files may work the way you need them to. You may need to customise an existing template to suit your own particular needs.

But how?

Make the Family from the existing standard template and adjust as necessary.

Save the family. It will use the RFA extension.

In Windows Explorer, simply change the file extension to RFT.

You can delete family geometry prior to changing the file extension, if you wish.
2. Cut Planes –

Some Families display above the Cut Plane, others do not?

Some family categories will display if they are located above the Cut Plane and below the Top Plane.

These categories are:
- Casework
- Generic Model
- Structural Columns
- Windows
3. Cut Planes – Special Families have their own.

Doors, Windows and Structural Columns have their cut plane defined by their family, not by the project.

Actually Structural Columns have their own parameter – “Show Family Pre-Cut in Plan Views” which can be unchecked to show the structural column in the project view using either the project settings, or the family settings.
Note that the **Invisible Line Trick** can be used for those families that do not display. (Thanks Steve Stafford)
You may be aware that you cannot copy geometry from a model to annotation family. You may also be aware that you cannot copy geometry from a Project to a Family or vice versa. You can however copy most geometry from one similar family to another. Be careful not to copy reference planes or lines, unless they are new / user created reference planes/lines.

In the example blow, an extrusion has been copied from a furniture family to a Generic family. Note that the accompanying intelligence – the extrusion depth - is not transferred.

5. Importing complex geometry – Good Idea?
There are many forms that can be modeled in Revit. Sometimes it may be easy to copy a form that was created in another program. When doing this, ask yourself how much control you need over the content. Do you need it to flex? If so, you will need to create the form in Revit and add the appropriate parameters.

As a general rule, forms from other software should be imported and used as the basis of the Revit model and should then be deleted.

Maybe you have a concept that is difficult to model in Revit, like the pods below.
If you have the time and the knowledge, you model almost anything in Revit :-

These shapes were developed referencing the image above.

But, there will be times when it is advantageous to use imported geometry. ( e.g.: when the designer has a good grasp of “other software “ or when the form is difficult to model accurately in Revit ( i.e. nurb surfaces )

The thing to keep to mind is that using imported geometry is not an ideal situation in Revit, since the form created will lack “intelligence” and may also have unwanted side effects such as creating its own linestyles /textstyles when exploded.


Here, I am referring to families containing a large number of parameters and formulas. These families can be well made and well intended, but they will be slow to run ( i.e. change parameters. ) and they may require user education to correctly follow the processes that are required to change them.

As a general rule, it is better to make a few families than one large super family.
7. Nested Families – Should you use them?

Nested families are a quick and convenient way to utilize repeatable components. They are not always the best way however. Some considerations include:-

- **File Size:** Much lower for Non Nested.
- **Management:** Much easier to change a Non Nested Family in a project.
- **Tagging:** If you want to tag components separately use Nested and Shared.
- **Speed:** Nested families are quicker and easier to construct.

8. Shared v Non Shared.

If a family is shared, it allows the individual elements to be scheduled separately. IE if you have a door panel and you share it and load it into a casework family, you can schedule the casework and the door panel.

If a family is shared and nested into another family, you can only link to the nested families' instance parameters. You are expected to use a type parameter to allow the user to choose a different type of the nested family.

Nested type parameters cannot be shared in the host family. The only alternative is to change the parameters from Type to Instance in the nested family.
9. **Origin – Effect of not using a specific insertion point for families.**

The Origin is defined by two intersecting Reference Planes and determines the Insertion Point when the family is loaded into a project. It is important to have the same insertion point for specific families so that they all operate in the same manner. You don’t want Doors or Windows moving around as you change families for instance.

Set the Origin Point in the plan view and remember to also define it in an elevation view if the element may be elevated by an offset value from the floor or ceiling level.
10. **Shape Handles don’t always appear, or you want to hide them?**

Shape handles appear when you have the length parameter set to Instance and allow the element to be “stretched” in the project by selecting and dragging the blue grips that appear at each end of the element. To access it, you may need to hover over the end cap of a wall and use the TAB key, select the Shape Handle. Now you can just use the Move tool to define a distance, or just drag the grip in or out.

Sometimes the shape handles may not appear. This is because the dimensions may not reference a Reference Plane. Note: Some Families already have a reference plane hidden along the same line as the Reference Level so check first to see if one exists and then make sure you dimension to the Reference plane, not the reference level.

In the family file you can set the controlling reference plane's properties to "not a reference". This will remove the shape handles when loaded into a project but still allow control via instance parameters. There may be occasions where you do not want to display shape handles i.e. Using MEP, they will adversely affect geometry or placement particularly for ducts.
11. Sweeps – Why do they break sometimes?

Say you have a solid **sweep** form in a family. When attempting to cut the solid family with a void you receive an error “Can't keep elements joined“:

![Error message](image)

This could potentially occur when the **sweep** geometry and the void geometry both contain curved profiles over a specific length.

Depending on the point of intersection **Revit** may not be able to cut the geometry in one pass. This is usually magnified if the **sweep** geometry is joined to other geometry.

The alternate approach involves using more than 1 void extrusion to cut smaller segments out of the solid **sweep**. For example you would be cutting the same shape out of the **sweep**, but **break** it into smaller segments; for example use 3 voids instead of 1 large void.

This should avoid the error dialog and allow the same shape to be cut out of the solid extrusion.

You may also have an issue when you have specific curves and rising paths for sweeps. Depending on the geometry of the slope, a profile may not sweep along and maintain the same angle from start to finish.
12. **Un-masking masked regions.**

Thanks to Jose Fandos (Andekan).

As you know, best practice to improve performance in Revit is to use a masking region and symbolic lines to display plans and elevations rather than displaying the 3D geometry.

You may need to make some of the linework disappear in certain cases such as repeating units. There is a problem however, which prevent specific masking region lines being hidden in Revit. Assume that you have a family which you need to replicate and hide the joining boundary line.

In the Family, Edit Masking region boundary, there is a Visible parameter and it also may be associated with a “Yes/ No” parameter, however neither of these work in the project.
There is a solution though. First, edit the masking region boundary and change both the left and the right lines subcategory to an invisible line.

Now, draw symbolic lines over the masking region.

Set Yes / No parameters to control the visibility and associate them with the lines.

Another method of achieving this is to Edit the masking region boundary and change the right / left individual lines subcategory to Invisible lines. Then we would need to create parameter for the various conditions – Right Panel / Left Panel ( Yes/ No parameters ) and conditional formulas to turn on the 4 possible conditions – “No Right Panel”, “No Left Panel”, “Neither Panel” and “Both Panels” Then create 4 masking regions associated with each of the four conditions. If the top and bottom lines needed to be hidden, we would need to have lots more masking regions.
That is significantly more work than the method outlined earlier.
13. **Type and Instance – when to use one in preference.**

Thanks to Shawn Zirbes from CAD Technology Centre.

This was covered in your Essentials training – When a family is loaded into Revit, it automatically gets at least one type – a single variation of the main family. The Family Category describes what the family is … a door or a window etc. The type(s) that exist within the family define the parameters that are the same for every insertion of the family into the project. They are known as **Type Parameters.**

When a user places a type of a family in the project, an Instance is created. This new instance has parameters of its own called **Instance Parameters.**
These instance parameters can change their values at different times. So, what are the rules for when to use a Type or an Instance parameter?

There are no hard and fast rules, but there are guidelines for determining which one to use:

**How Frequently will the Model Change**: The more frequently a parameter’s value changes, the more likely it is that it should be an Instance Parameter.

**Reliance on other parameters in a formula**: If any parameter uses an Instance parameter in the construction of a formula, then both parameters must be Instance. A Type parameter can only reference other Type parameters in a formula, but an Instance parameter can reference both Type and Instance parameters.

**Model Parameter**: If parameter values are taken from the “Model” parameter, then those parameters must be Type Parameters since the Model parameter is always a Type parameter. This relates primarily to manufacturer’s content.

**If In Doubt**: Best choose “Type” parameters. This is because Type parameters assist in maintaining a Revit Model with the smallest possible file size.

### 14. Type Catalogs v Type.

You may know that the recommended practice is to use a Type catalog if the number of types in a family exceeds 6. Type Catalogs are also useful in an office as they can be created and maintained by non-technical staff (i.e. non Revit Trained staff).
Revit 2012 allows users to export a family’s types to a text file, manipulate the text file (i.e. add further information) and then to import those text file types and the text file back into the current family. This can be very useful for developing content “on-the-fly”.

Only family type parameters that are in use (the parameter has an assigned value or was added to the family by the user), are exported. Parameters added to the family by the user are exported even if they do not have an assigned value. Type parameters that were included as part of the family template and do not have a value, are not exported.

The import text file must be from a family of the same category as the family you are importing into. For example, you cannot import a text file with door types into a window family.

If types in the existing file have the same name as types in the import file, you are prompted to choose whether to overwrite or keep the existing types.
15. Profile Properties.

Generally create parameters in profile families as Types. This allows you to access them from the Project Browser>Profiles>Properties. You cannot directly access Instance Properties of a Profile, but you can create new types with different dimensions and use these to change the profiles.

An example may be slab edges. Let’s say you have a variety of hobs (upstands) of different heights and widths.

16. A Rose by any other name.

You most likely know that best practice requires geometry to be hosted by Reference Planes. I recommend that the Reference Plane be named, although this is not strictly necessary, but it will assist in the development and maintenance of the family. When a Reference Plane is named it can be selected by that name when changing or setting the Work Plane.

To avoid confusion, we will refer to these names as “Named Reference Planes.”

When you place a Reference Plane in a project, it is, by default, a Weak Reference and is unnamed. Weak References require you to tab to select a dimension. Strong References automatically pick up the dimensioning.

There is another parameter that use preset names in the family editor – called, prosaically, “Is Reference.” The Is reference settings determine how an object can be dimensioned. We will refer to these as “Labelled References.”
A reference plane can be set for Is Reference to one of the Labelled references (but only one per family):-

- Left
- Center (Left / Right)
- Right
- Front
- Center (Front / Back)
- Back
- Bottom
- Center (Elevation)
- Top

There are also settings for
- Not a Reference
- Strong Reference
- Weak Reference

Named Reference Planes are automatically strong references. They will appear when changing or referencing work planes in the family editor. Labeled reference planes have another aspect however.

Case 1.

You have Named Reference Planes which are not labelled.

Case 2

You have Labelled but not Named Reference Planes.
Both families have been placed in a project and dimensioned from walls.

If you select the dimensions for case 2 and click on the grip, the dimension will select, in turn, each of the Labelled Reference Planes. In Case 1, this does not happen. The Case 1 Reference Planes are Weak References and do not respond in the project.

Think about the points that users may want to dimension and make those reference planes strong. Most other reference points should be set to “Not a Reference “. Sometimes there may be points which are of secondary interest and those can be set to Weak. The named and the labelled reference planes are not exposed in a project. So I recommend that you set your office standard to add Named References to a Family. You will benefit down the line as your family grows.


You will most likely be using content that comes from different sources in your office environment.
   - Out of the Box
   - Modeled in-house
   - Purchased from an external provider
   - Obtained from SEEK, or other web based provider.
It can be important that you identify where these families are from. As well as identifying any problems that may not have been anticipated in use.

In some cases, the names may be determined by your client organization for use in BIM projects. The most important families to identify are those made within your own organization. This allows you to determine if the family is suitable for the intended use, has been QA’d as well as identifying any problems with the content. ANZRS has a family naming style that is a good start point for this. You may also choose to add other information, such as your company initials, the version of Revit that the family category that the element was created in, Level of Detail (BIM), etc.
## FILE NAMING

<table>
<thead>
<tr>
<th>Functional Type.</th>
<th>REQUIRED</th>
<th>Names the element category</th>
<th>DOR or WIN etc. Refer Appendix A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtype</td>
<td>REQUIRED</td>
<td>Names the subtype</td>
<td>For Window-Casement</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Optional</td>
<td>Manufacturers Name or Generic</td>
<td></td>
</tr>
<tr>
<td>Descriptor</td>
<td>Optional</td>
<td>Names other information</td>
<td>Ie 1200 x 1000</td>
</tr>
<tr>
<td>2D</td>
<td>Optional</td>
<td>Use only to ID 2D Families</td>
<td></td>
</tr>
<tr>
<td>LOD</td>
<td>REQUIRED</td>
<td>Name the Level of Development (Refer XXX)</td>
<td>L100, L200 or L300</td>
</tr>
<tr>
<td>BVN</td>
<td>REQUIRED</td>
<td>This identifies our own families as distinct from other content that may be used.</td>
<td></td>
</tr>
<tr>
<td>Version</td>
<td>REQUIRED</td>
<td>Identifies the Revit Version used</td>
<td>Ie 11</td>
</tr>
</tbody>
</table>

Separators should be hyphens “-“.
No spaces ie SteelFrame
Some examples:
  - DOR-Single-SteelFrame-2100x300-L200-BVN-11
  - PLU-WC-Caroma-Flex-2D-L300-BVN-12

**Note that File Naming may be controlled by the Revit Model Check Add-In.**
18. Drafting Pattern does not align with element.

You have a filled region in a detail component family containing a drafting fill pattern set to *Align with element* under the *Pattern Properties*.

You rotate the filled region but notice the pattern does not stay aligned with the element.

This is because drafting patterns **only align to element when they are used as a cut pattern in hosts such as walls, floors, roofs, and ceilings.**

19. Vertical, or not.

There are some families that you want to follow the topography, or similar surfaces e.g. Cars. For these, edit the family and uncheck the “Always Vertical” parameter.
20. **Ordering Revit Parameters.**

Back in 2006, Scott Hopkins posted this tip in AUGI, to allow you to order Revit parameters.

As you know, Revit places parameters in the order that they are created, not in alphabetical order. You can, however, adjust the parameters to your own order.

In this example we have a bunch of parameters – Dates, Coconuts, Bananas and Apples.

We want to add a new parameter – “Zebras” and locate it above the “Bananas” parameter.

**Step 1** – Rename the parameter that is currently directly below where you wish to add your new parameter. Add asterisk at the beginning of its name. Hit the Apply button.

**Step 2** – Add a new parameter with the same name as the one you just renamed, but with a number appended to it. In this case “*Bananas2”. Hit the Apply button.

**Step 3** – Rename the new parameter ("*Bananas2") to your desired name –“Zebras".
Step 4 – Remove the asterisks from the first parameter – “Bananas”. Hit the Apply button.

If you are working on a family in which no parameters have been renamed since they were originally created, you can dispense with adding the asterisks in Step 1.


A quick method to create a louvre curtain wall, without resorting to messy arrays. (Thanks to Phil Read originally and thanks to Steve Stafford for a clear description in his blog.)

Firstly define the curtain wall to use Empty System Panels and the frame as you like, in this case 150 x 50 rectangular mullions. Also change the Horizontal Grid pattern to 100 mm (or what you will.)
Select the Rectangular Mullion from the Project Browser, right click and select New Type. Rename the mullion as “Louvre”. Set the angle as 20 degrees (or whatever) and the thickness as 5 mm on each side and 150 thick (i.e. wide).

Now select the Curtain Wall, Property Type and change the Horizontal Mullions interior Type to “Louvre”.

Rename the Curtain Wall Type to “Louvre”.

In another curtain wall, select one of the curtain wall panels, and unpin it.

Replace that panel with a Louvre Curtain wall panel. Rinse as necessary.
22. **Reporting Parameters.**

Reporting parameters were introduced in Revit 2011. A reporting parameter is a parameter type that has its value driven by a particular dimension in the family model. Reporting parameters extract a value from a geometric condition and use it to report the data to a formula or as a schedulable parameter. They can be used to drive the dimensions of hosted family geometry. An example of this appears in the Revit Clinic blog by Ryan Duell. I will run through the process.

We start with a simple door family in which the frame has been set around the centre of the wall and equalised.

Add a dimension for the wall thickness (not the reference Planes) and label it as “Wall Thickness” and set it as an Instance and check the Reporting Parameter box.

Next add a dimension to the frame geometry (Frame Depth) also as an Instance parameter.

Now set the Frame Depth parameter to be driven by the Wall Thickness Reporting parameter – Frame Depth = Wall Thickness / 2. (Note that you can also add another parameter to set the frame in the wall – Frame Inset = Wall Thickness / 4)
If you wish to use the Wall Thickness in a schedule, you will have to use a Shared Parameter for Wall Thickness.


Firstly, a plug. You will see that this conference is promoting the ANZRS (Revit Family Standards). I recommend that you check these out, as I believe they are outstanding!

Some things you could look for when preparing your own in-house standards may include:

**DESIGN INTENT VS PERFORMANCE**

File size is important to performance in a family. Usually the larger a file size, the greater the impact on performance. There are two different areas to consider here – graphic regeneration and model regeneration.

So if the model is complex but does not contain a large number of faces (or the faces are not visible in a view) the performance hit is not as great as the alternative. (i.e. if there are a large number of faces and they are visible in the view) Regardless of this consideration we should try to keep family model sizes minimized.

The main considerations are:

**The design Intent of the Family.**

What representations must the family contain and how detailed should each representation be, (Masking regions and views used.)

**The Project Type and the frequency of use in the project,**
Will the family be used to create hundreds of elements on many levels in a large commercial model.

**PERFORMANCE CONSIDERATIONS.**

There are a number of areas to be aware of including:-
- Build only the parameters required so that the model is not over constrained.
- Use Symbolic linework in lieu of geometry to keep file size lower.
- Use mashing regions instead of geometry in plan views.
- Try not to use extensive Formulas, Voids and Arrays as they increase file size.
- Don’t use nested families, if possible.
- Use Type catalogs if the types exceed 6 in the family.

**PLANNING A REVIT MODEL FAMILY.**

It is important to fully consider the environment that a family will be used in prior to modelling it.

What Size is required.

Multiple preset?

Multi adjustable?

<table>
<thead>
<tr>
<th></th>
<th>SIMPLE</th>
<th>COMPLEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASEWORK</td>
<td>200 - 300K</td>
<td>500K</td>
</tr>
<tr>
<td>DOOR ( SINGLE PANEL)</td>
<td>300 - 400K</td>
<td>600K</td>
</tr>
<tr>
<td>FURNITURE SYSTEM</td>
<td>200 - 300K</td>
<td>500K</td>
</tr>
<tr>
<td>WINDOW ( SINGLE UNIT)</td>
<td>300 - 400K</td>
<td>600K</td>
</tr>
<tr>
<td>STRUCTURE - UB</td>
<td>180 - 200K</td>
<td>300K</td>
</tr>
<tr>
<td>SAN FIXTURE</td>
<td>300 - 400K</td>
<td>600K</td>
</tr>
</tbody>
</table>

What is needed to display the family?
This determines the 2D and 3D geometry that must be created, as well as the visibility settings.

Is a host required?

If hosted, the template needs to be considered. Maybe a face based family could be better employed.

How much detail is required?

Do you need 3D geometry?

Can you simplify the 3D geometry? (Consider the scale in which the element will be viewed)

Where should the Insertion point be for this family?
I recommend that you develop a checklist that needs sign-off for all content loaded into your Office Library. Once again, look to ANZRS as a great starting point for this.
Summary.

So we covered some aspects of what makes families good, bad or ugly, some keys to creating content and some points on issues that you may face when creating content.

I hope that has been of some help to you.

Thank you for taking the time to attend this session.