Using Revit® Structure to Document the Structural Model

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SE114-1   You've completed the structural model and now you have to document it with 2D drawings. You want your documents to look like they were produced from your office -- not from a box. In this session, you'll learn how Revit Structure can help you get dimensions and spot elevations to look the way you want. You'll see how to create additional annotations; create 2D model views and organize them in the browser; add to Revit's 2D component library and use type catalogs for additional content you can add to live views; and create standard details. You probably have hundreds of standard details that you can link in as AutoCAD files but you really want them to be Revit drafting views. This class will show you how to leverage your AutoCAD library to create a Revit library of standard details.

About the Speaker:
Nick works for McComas Engineering, a structural engineering firm in Carmel, Indiana. He has 22 years of experience in producing construction documents for a wide variety of projects and clients. An avid user, trainer, and supporter of AutoCAD, Nick has also added Revit Structure to his "must have" software list. Nick has an Associate's degree in Architectural Engineering Technology from ITT and is also a Microsoft Certified Systems Engineer.
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Autodesk®

No, Not the Box!

Every office produces their construction documents with certain characteristics. Several of Revit's system families are some of these office characteristics. If I can edit or create a system family to look like the way we've been producing our drawings for the last x number of years I'm going to do it. If I can't get a system family to look like I want it to then I will concede and edit that families properties the best I can.

Tweaking System Families

There are several system families that I've tweaked so they look like I want them to and also so I have more control when documenting the model.

- Grid Head
- Dimensions
- Spot Dimensions
- Level Head
- View Title
- Section Head
- Elevation Tag

Each is hardwired to Revit and you must use the provided annotation template to create your own of edit the shipped system family. I try to keep this simple, a couple of choices for different scenarios that will come up while documenting the model.

TIP: You won't find a template for the Elevation Tag. Your choices are a box or circle and whatever else you can tweak in its properties dialog box.
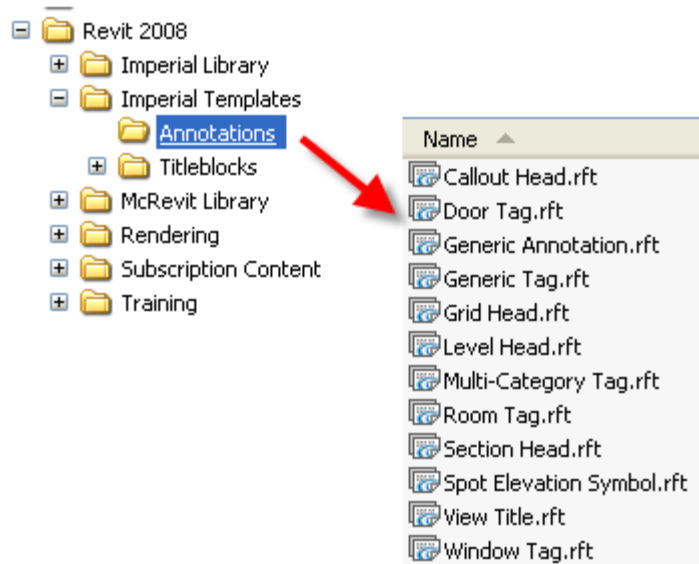
Typically after I've created a new annotation family, I'll make it part of my template and also save it in the **Imperial Library\Annotation** folder.

TIP:

Whenever I create a new family I always end the family name with **MEI.** This differentiates out of the box content to McComas Engineering Inc created content.

Grid Head MEI.rfa

Grid Head

I tweaked the typical bubble grid head by tightening it up, making the circle heavier, tuned the font and added addition types. I have also added a polygon grid to represent existing construction grids.

Shown below is:

- A type for up to three characters.
- A type with four characters or more using the opaque property option.
- A type without a bubble.
- A type for existing construction.
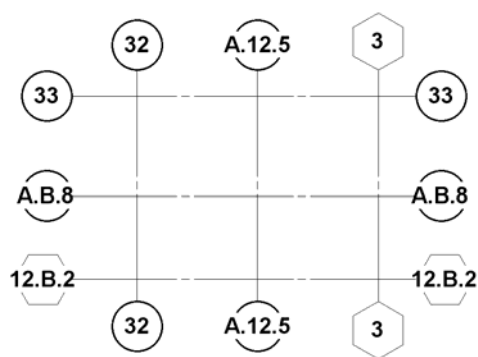
Remember these are hardwired so there is a path to follow so you can use the new grid head.

1. Create the grid head from a template or edit an existing grid head.
2. Save the family using the correct **Family Category**.
3. Load the family into the project.
4. Select the **Grid** command.
5. Now before placing the newly created grid you need to wire it in. Select the **Element Properties** button.
6. **Edit**
7. **Duplicate**, giving it a name.
8. Now select the **Type Parameter**, **Symbol** and from the drop down menu select the new grid head you just made.
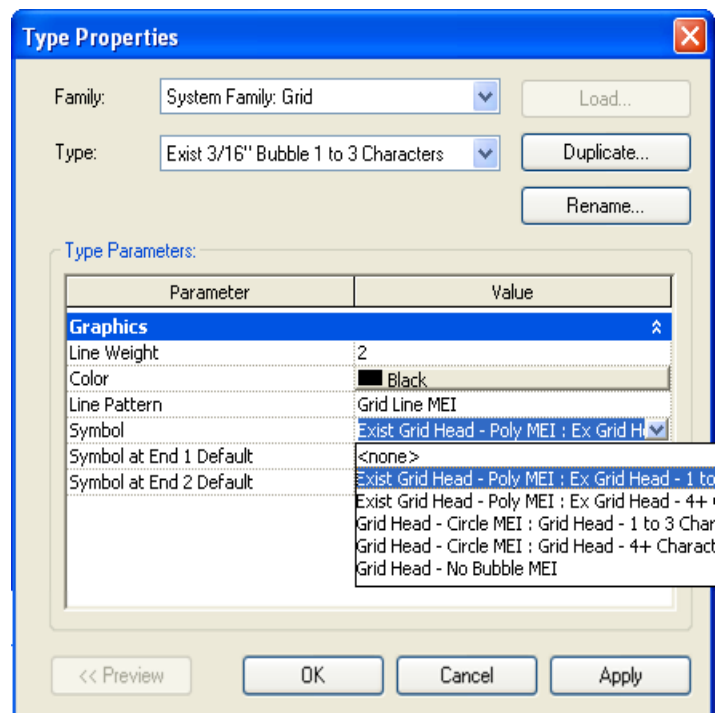
While you're in the **Type Parameters** dialog box you might want to change some of the properties to get the grids to look like you want. I have also created a new **Line Pattern** to use for grids and changed the **Line Weight**.

> TIP: You'll want to make a generic annotation symbol of the grid head that matches your system family grid head so that you'll have it to use in your standard details.

Level Head

I tweaked the level head by making it smaller and added additional types for different scenarios. There are not very many property choices for level heads.

Shown below are the six types I've created and have in our template.
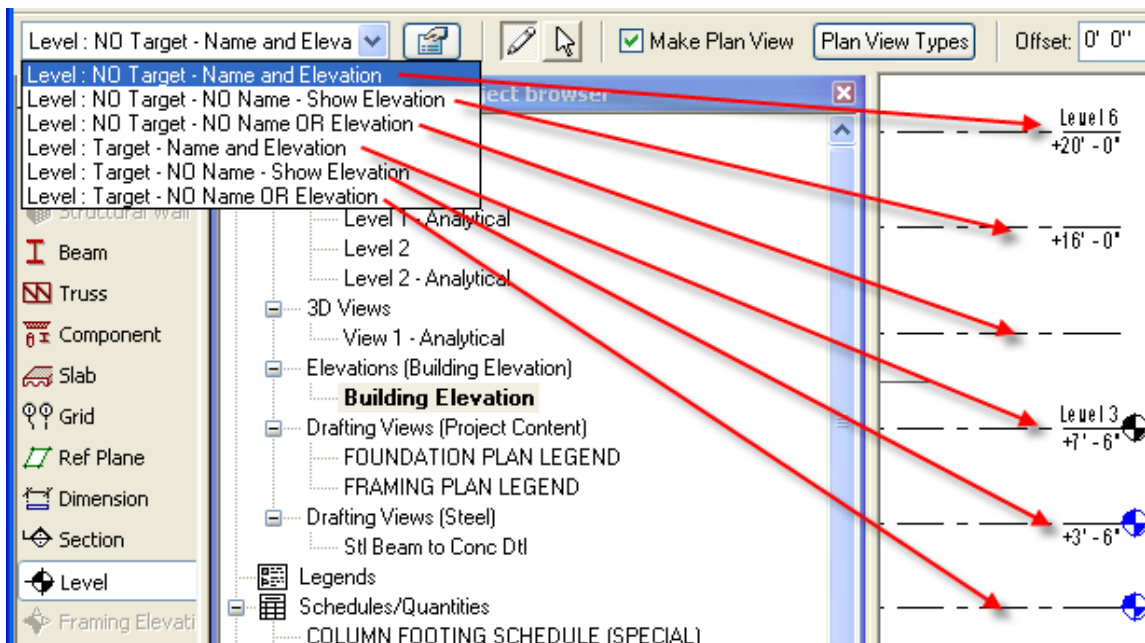
Again, these are hardwired so there is a path to follow. You can follow the same eight steps used for making Grid Heads.

> TIP: Again you'll want to make a generic annotation symbol of the level head that matches your system family level head so that you'll have it to use in your standard details.

View Title

Create this starting it from the view title template. You'll add Labels and select parameters from one of the six available which will populate your view title when you place the view on a sheet.

Additional text and lines can be added as desired.

Shown below is a view title using 4 the 6 available view parameters. I've added some detail lines and "Scale:" was added as text.
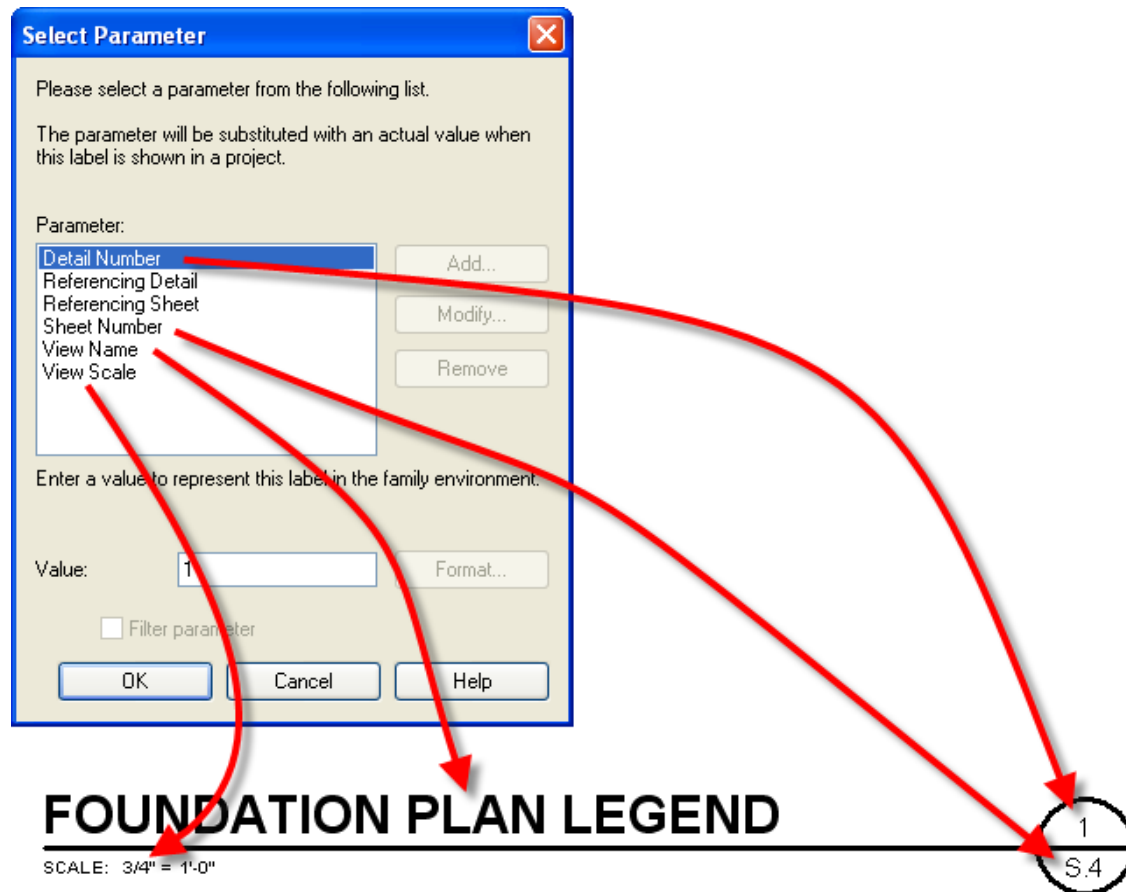
The path to follow in making additional view titles available for use is a little different than what's done for grids and levels.

1. Create the view title from a template.
2. Save the family. Using the correct **Family Category**.
3. Load the family into the project.
4. Now place the view on a sheet.
5. After the placing the view, select the view and from the shortcut menu select Element Properties.
6. **Edit**
7. **Duplicate**, giving it a name. Now select the **Type Parameter**, **Title** and from the drop down menu select the new view title you just made.
8. You're not done yet……………
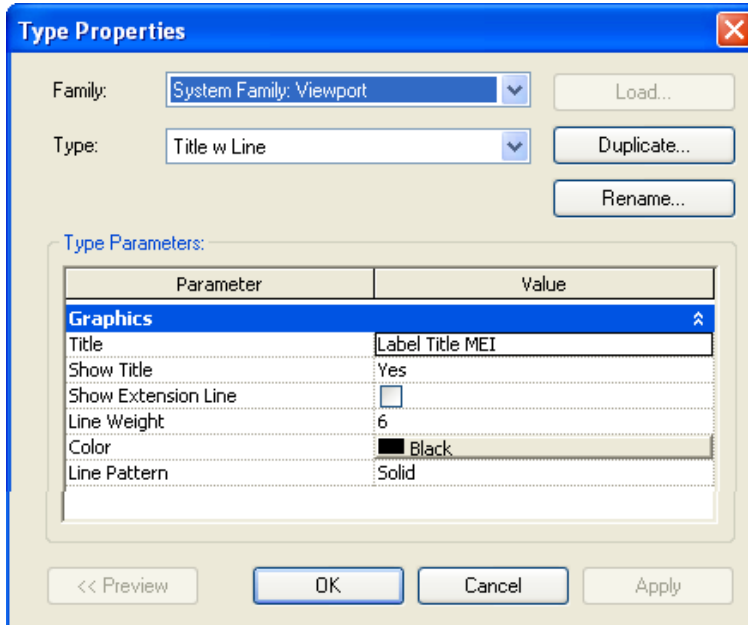
There are still a couple of parameters that need to be adjusted and these will depend on how you created your view title. **Show Extension Line**, if checked it will draw a line using the **Line Weight, Color** and **Pattern** values shown. If you use this **Extension Line** you can move and adjust the length after the view has been placed.

ROOF FRAMING PLAN
SCALE: 1/8" = 1'-0"

FOUNDATION PLAN LEGEND
SCALE: NTS

COLUMN BASE DETAIL   4
SCALE: 3/4" = 1'-0"   S403

SECTION NOT TO SCALE   2
SCALE: NTS   S403

SECTION A

TIPS:

- You'll want to make a type that has no title. Pretty simple duplicate any view and change the **Show Title** to **No**

- If you place a section or detail on a sheet that has a plan view and you don't use a detail or sheet number in the title for your plan views you'll have to change the plan views detail number to 0 (zero).

- To adjust the extension line you must select the view it's self, not the title, for the grips to highlight.

- You'll also want a type that is NTS, Not to Scale.

ELEVATION TAG

We're back to hardwired. The only options for the elevation tag are provided in its property dialog box and you can get to this from going to the pull down menu **Setting -> View Tags -> Elevation Tags**.

Building Elevation   Building Elevation1
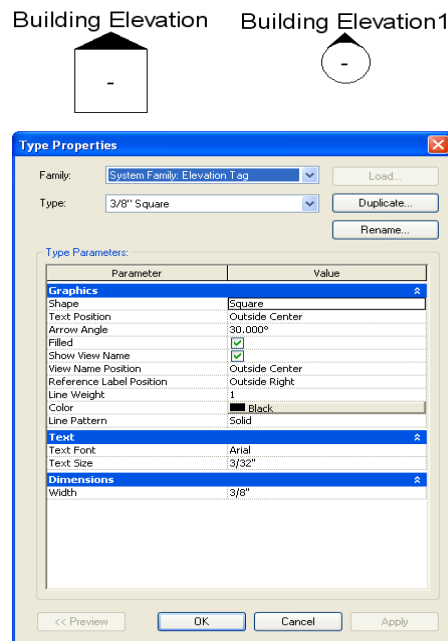
Dimensions

Similar to the Elevation tag, dimension options are limited to what's available in their properties dialog box. The best thing to do is create as many types as you need to cover the different dimensioning scenarios that you'll typically come across. I have several types that include both arrows and ticks, both opaque and transparent text.

FAQ's about Dimensions

- Revit wants to dimension something or it won't place a dimension. You cannot just place a dimension in a blank sheet.
- You can put a prefix or a suffix.
- You can't over write a dimension.
- You can't put text below the dimension as part of the dimension.
- You can't place a blank dimension.
- You can't place just a leader.
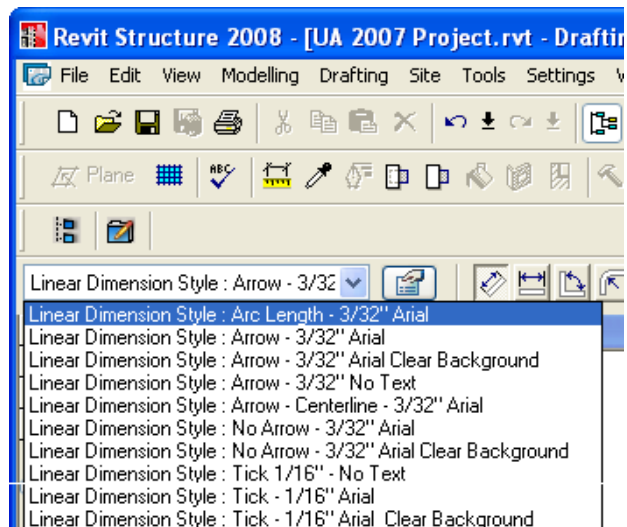
A must have item is some way to place a blank dimension. The best way to do this is create a dimension type and for the font use a true type (TT) font that doesn't have numbers.

SEE PLAN

LIMITS OF SOMETHING

0"
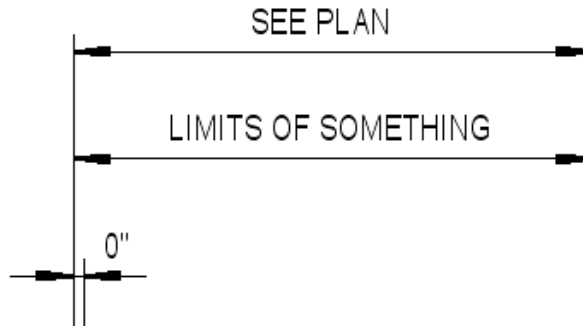
One thing to keep in mind whatever TT font you choose, when you export to AutoCAD you may get some garbled characters in the blank text's place.

SPOT DIMENSIONS

The spot elevation tool can help document the model in lot of different ways. I've made several different types to follow along with the different callouts made though out the documents. The standard abbreviations list shows our typical "top and bottom of" callouts.

I've matched the spot elevation symbol with the same symbol used for the level head.

T/F -3' - 6"
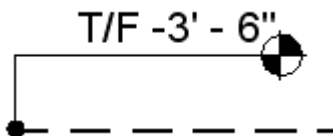
ELEVATION TOP AND BOTTOM OF LIST

T/	"ELEVATION, TOP OF"
B/	"ELEVATION, BOTTOM OF"
T/BB	TOP OF BOND BEAM
T/BM	TOP OF BEAM
T/CONC	TOP OF CONCRETE
T/F	TOP OF FOOTING
T/FTG	TOP OF FOOTING
T/LDG	TOP OF LEDGE
T/MAS	TOP OF MASONRY
T/P	TOP OF PIER
T/SLAB	TOP OF SLAB
T/STL	TOP OF STEEL
T/W	TOP OF WALL
T/WALL	TOP OF WALL
T/GB	TOP OF GRADE BEAM
T/CAIS	TOP OF CAISSON
B/PL	BOTTOM OF PLATE
B/F	BOTTOM OF FOOTING

The symbol can be tweaked or you can make a new one. The spot elevation is hardwired so again there is a path to follow similar to editing grid and level head.
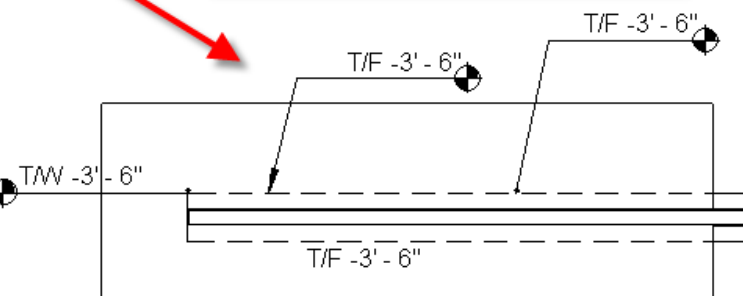
1. Create the spot elevation symbol from a template or edit an existing spot elevation symbol.
2. Save the family. Using the correct **Family Category**.
3. Load the family into the project.
4. Select the **Spot Dimension** command.
5. Now before placing the newly created symbol you need to wire it in. Select the **Element Properties** button.
6. **Edit**
7. **Duplicate**, giving it a name.
8. Now select the **Type Parameter**, **Symbol** and from the drop down menu select the new spot elevation symbol you just made.
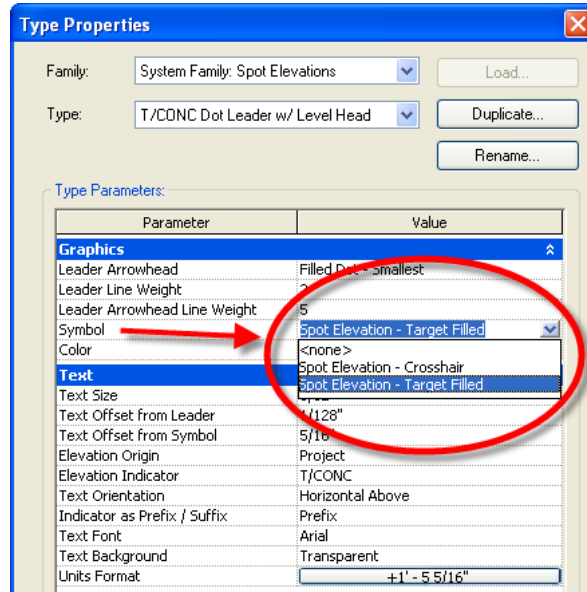
Once you get the symbol in you can begin to create the different types of callouts you want to use. I wanted four different callouts that use an **Elevation Indicator** as a **Prefix** to match my abbreviations list.

A top of footing called out (T/F) with each of the 4 different types created; arrow and dot leader, just a line and just text.

TIPS:

- When selecting the object that you want to use for spot dimensions you may have to change the detail level to fine.

- If you are trying to select the top of wall and the top is above the cutting plane you can adjust the cutting plane in the view range, place the spot dimension, and return the cutting plane back, the spot dimension will remain.
- If you don't already know this the spot dimension can only be placed horizontal. Yes that's correct. It's on the factory wish list!

TAGS

Tags are also hardwired and you'll need to use the correct template or start from an existing tag. For most structural tags you'll select an existing tag to start from. The category you select determines the parameters that are available.

- Leader or no leader, better under release 2008.
- You can add text as prefixes and suffixes. C= for camber or EX for Existing
- You can add line work.
- Use invisible lines as boundaries in tags to center the leader line.
- You cannot nest a tag into a "Detail Component line based" family and expect it to stretch (flex).
- I have made a tag at 45 degree angle and use horiz and vert to flip to opposite side.
- A beams start and end offset values are relative to the level it is placed on. I would be great if this could be adjusted to also be from the project, similar to the spot elevation.
- After using an analysis program, beam reactions are populated in the beam properties. You can pull reactions but which end is which?
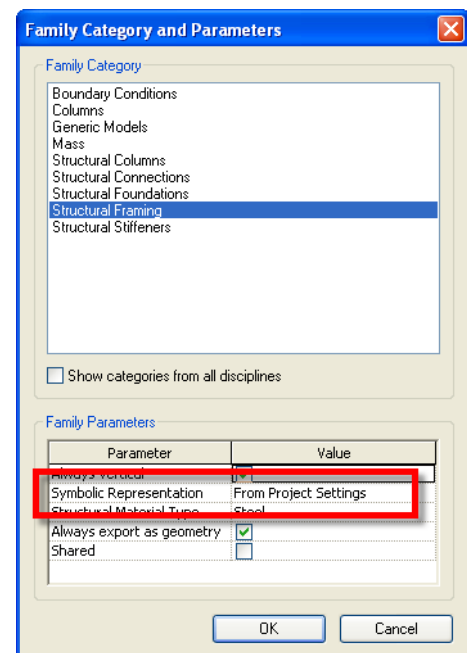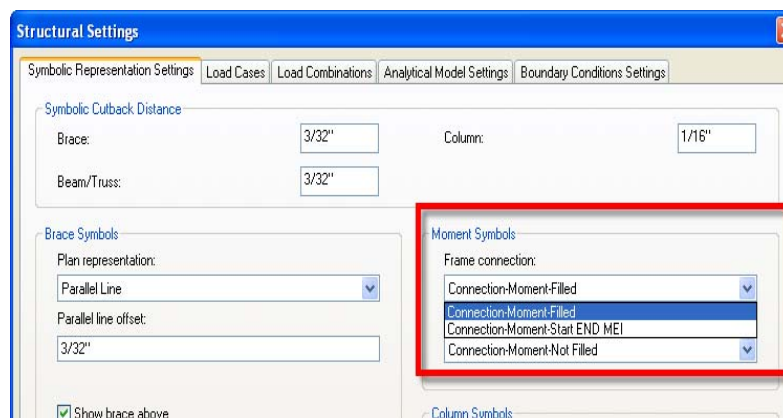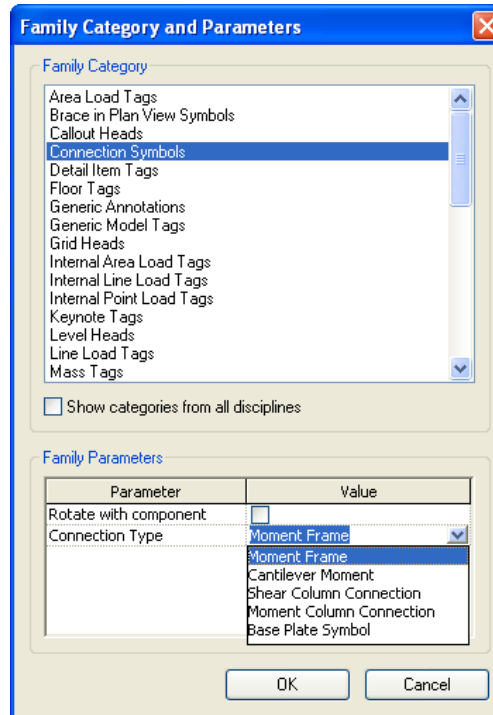
MOMENT SYMBOLS

You can have whatever symbol you want. But you can only use two at a time, moment frame or cantilever moment. Remember these are hardwired so there is a path to follow

1. Create the moment symbol from a template or edit an existing moment symbol.
2. Save the family using the correct **Family Category** and **Connection Type**.
3. Load the family into the project.
4. From the Settings pull down select **Structural Settings**.
5. Under **Moment Symbols** you can select the symbol you want from the drop down box.

What you set here is what populates the framing members properties dialog box.

TIP: If you need more than the two provided moment symbols you can nest a symbol into the framing members family and with a visibility setting turn on and off at which ever end.

Also for the moment symbol to appear at the end of a framing member the **Symbolic Representation** parameter in the <u>family</u> needs to be set to **From Project Settings**.

ANNOTATIONS AND NESTING ANNOTATIONS

Every office has a need for different kinds of annotations. Not everything can be Revit tagged in the model and standard details (drafting views) can't be Revit tagged because they are not part of the model.

You'll need to make additional drafting view annotations that match your system families and I'm sure there are plenty of annotations that you'll need to make to document your plans.

To the right you can see several annotations. None of these came out of the box.

Things you want to keep in mind when creating annotations:

- Use flip controls when you can.
- Use types.
- Use visibilities.
- Use a label so you can edit text.
- Nesting an annotation into a "Detail Component line based" family will allow you to stretch (flex) the annotation after its inserted.
- You can't nest label into a detail component and be able to edit the text.
- When you use a detail component with a nested annotation it will show up under details in the browser, in lieu of under annotation.

ORGANIZE THE BROWSER

When I mean organize the browser I don't just mean filtering its contents and looking at it different, I want to add content.

Why organize the browser?

- To find things!
- So someone has a clue to what you're doing.
- Model life cycle.
- Control your section cut reference label.

By adding types you can:

- Separate the views that you are placing on sheets from what you're using for modeling.
- Categorize your Sections. Foundation, Roof, Exterior, Interior etc……..
- Categorize your drafting views for standard details. Steel, Joist, CFS etc….

A project or shared parameter can be added for addition filtering/sorting.
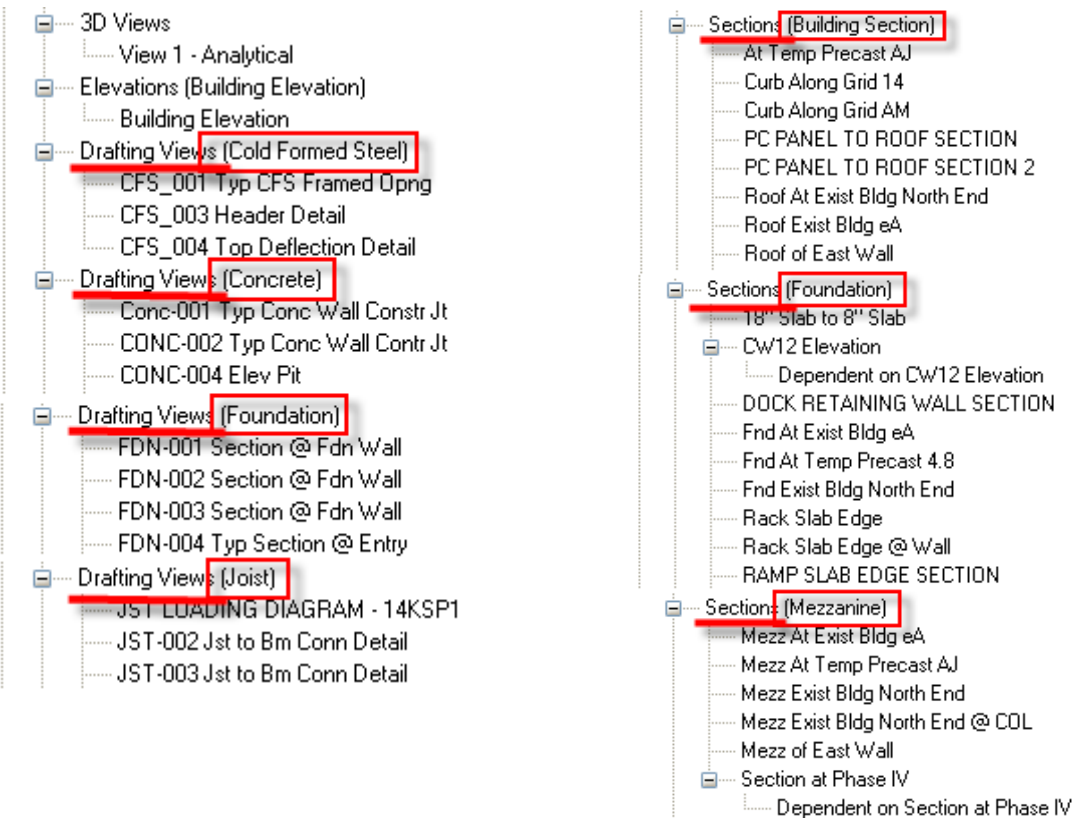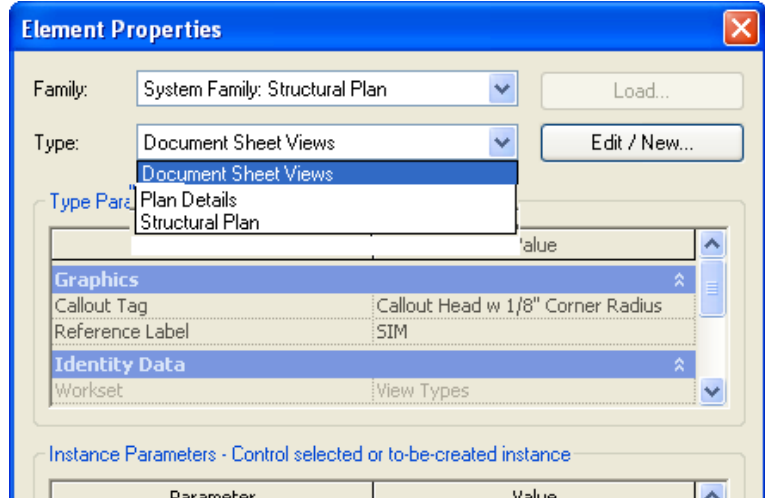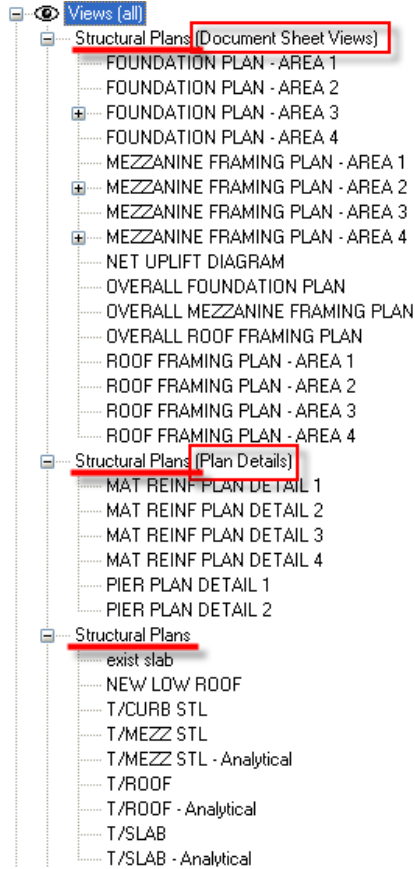
You can edit the views type and add types by right clicking on a view and selecting its properties.

You can change the type by selecting the pull down and highlighting a new type.

To add a new type:

1. Select Edit/New
2. Duplicate
3. Give it a name

This is also where you'll decide what callout tag you're going to use.

Let's digress for a moment and look at callout tags.
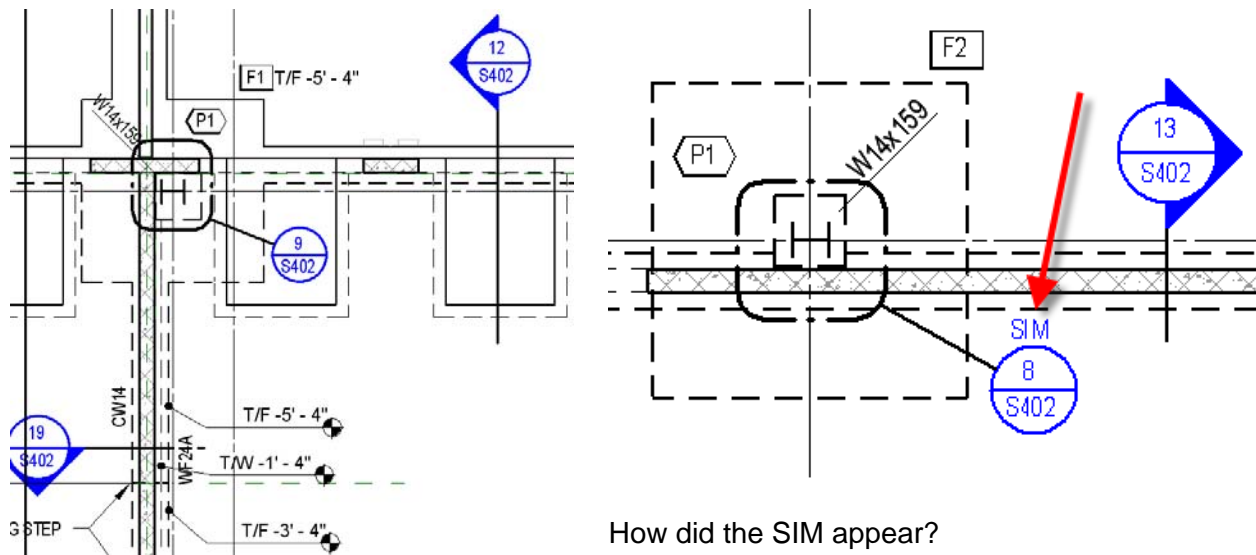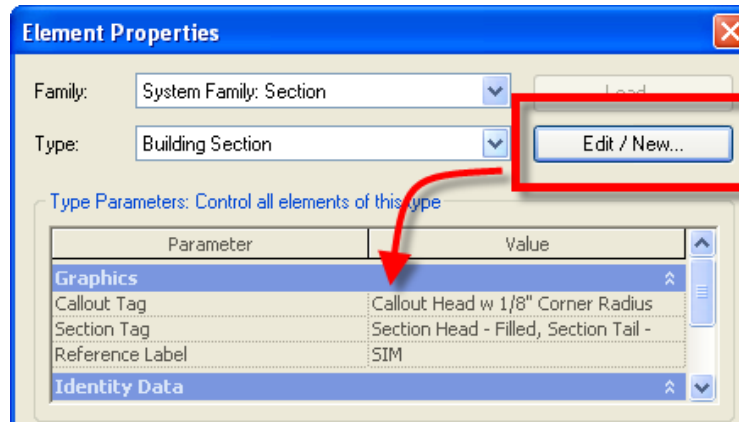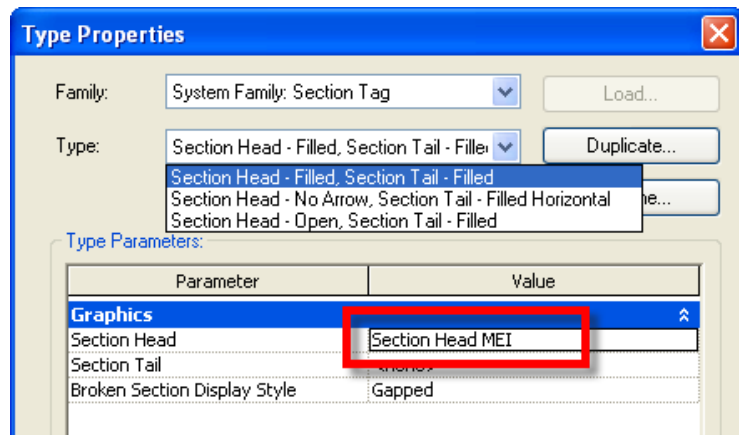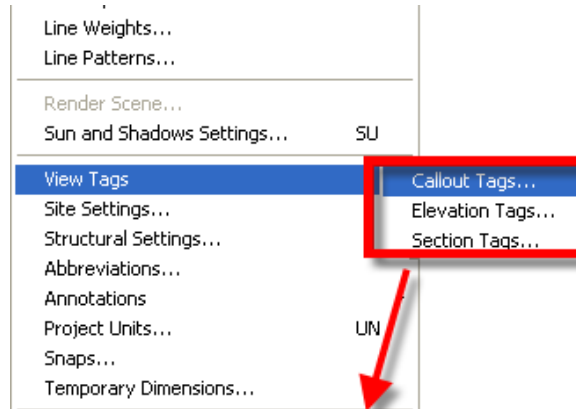

How did the SIM appear?

Callout Head

I tweaked the typical callout and section heads by tightening it up, making the circle heavier and tuned the font.

We're back to hardwired for callout and section tags so follow the path:

1. Create the section head from a template or edit an existing section head.
2. Save the family using the correct **Family Category**.
3. Load the family into the project.
4. From the **Settings** pull down, select **View Tags**, then **Section Tags**.
5. In the properties dialog box highlight the type and in the **Type Parameters** and from the drop down menu select the new Section Head you just created. Close the dialog box.
6. Now you need to wire this **Section Tag** to the Section View Type of your choice. So in the browser highlight a Section View. Right click and select properties.
7. In the **Element Properties** dialog box select the type from the drop down menu.
8. To edit the type and change the **Section Tag**, select the **Edit/New** button and change the Section Tag parameter value from the drop down menu.

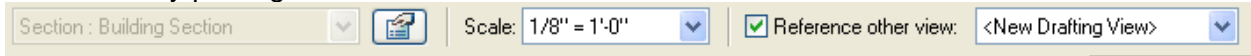This is also where you would populate the Reference Label value with a blank, SIM, TYP, OPP HAND etc…………

HOW DID SIM APPEAR?

SIM, TYP, OPP HAND etc appear whenever:

1. The value is populated.
2. By placing the section cut as a "Reference other view".

| Section : Building Section | ▾ | 🖼 | Scale: 1/8" = 1'-0" | ▾ | ☑ Reference other view: | ‹New Drafting View› | ▾ |

Things to keep in mind with placing section cuts:

- Revit will not place a reference label for live sections.
- Revit will not "**Reference other view**" with different reference labels. This is a type value not an instance value. Create a separate view type for each label.

In the words of HOK's Revit blog "Revit behavior is based on clear logic and traditional practice is sort of fuzzy."
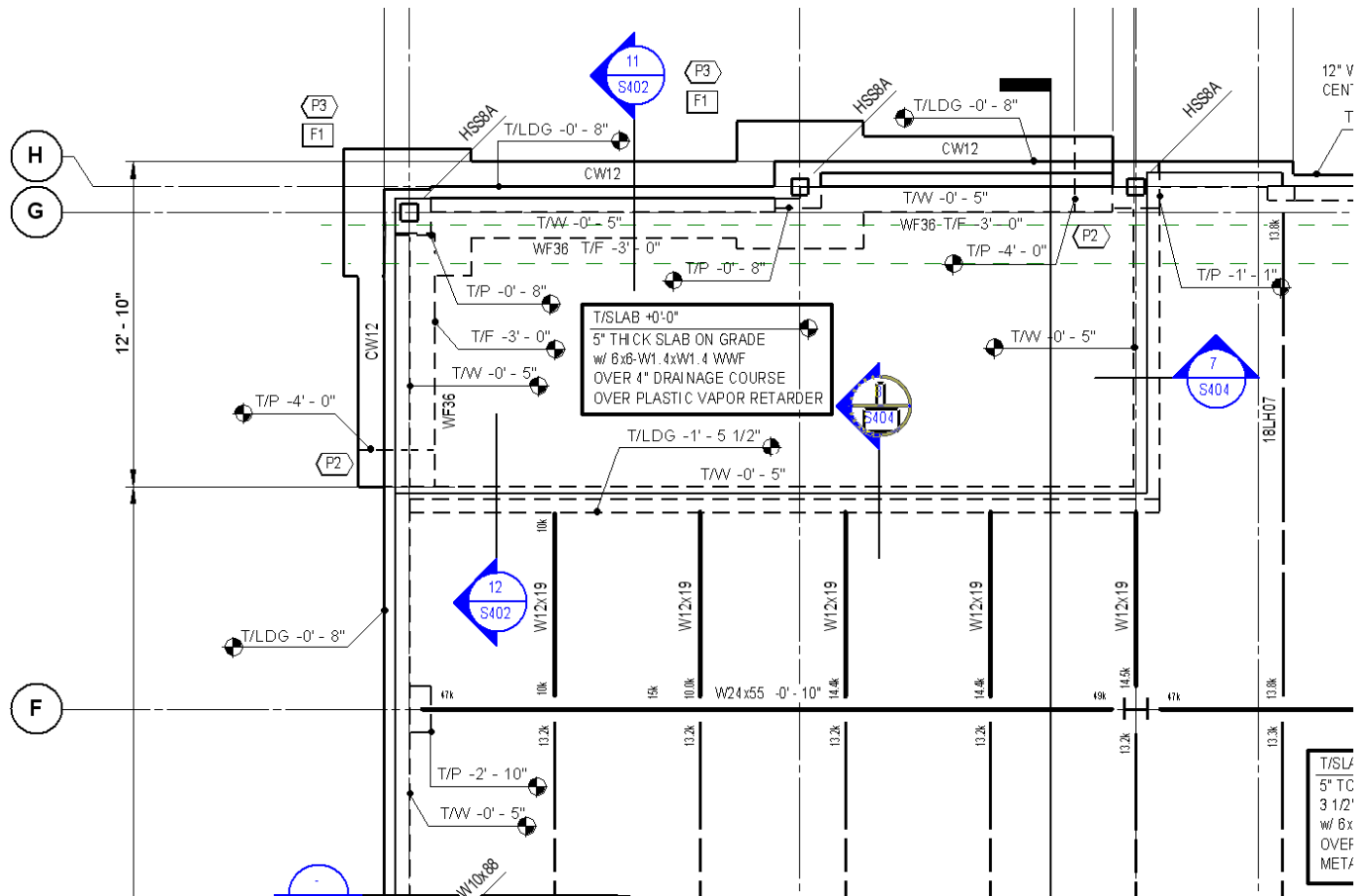
BACK TO THE BROWSER

You will want to organize the browsers sheet views. Using traditional thinking I wanted to organize the sheet views using SD, DD, and CD and post CD documents for us that are ESI's. This is where I added a shared parameter "Phase" to help organize the browsers sheet views.

After adding the "**Phase**" parameter I created the rules to view the sheets in Phases.

Let's go thru adding the "**Phase**" shared parameter.

1. From the **File** pull down, select **Share Parameters** and open the file.
2. I've created a "**Title Information**" group and added a **new** parameter "Phase" with the **Type of Parameter** as **Text**. Close the dialog box.
3. From the **Settings** pull down select the **Project Parameters**. Select **Add**. Now the **Parameters Properties** dialog will open.
4. Select **Shared Parameter**.
5. Select **Select**. Now the **Shared Parameters** dialog box opens.
6. From the **Parameter** group drop down box, select "**Title Information**"
7. Select the "**Phase**" parameter.
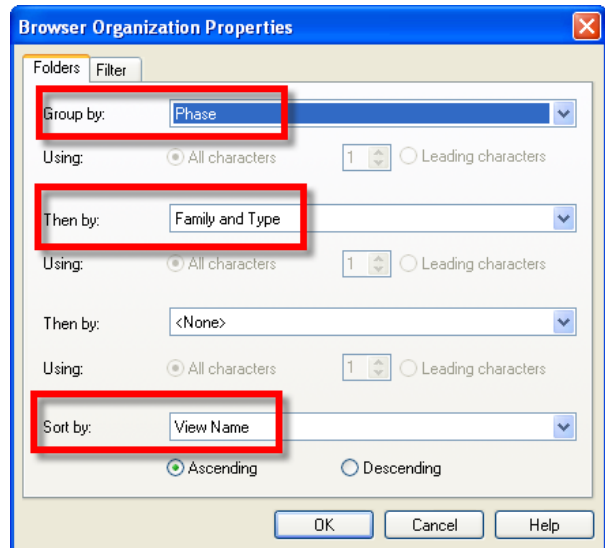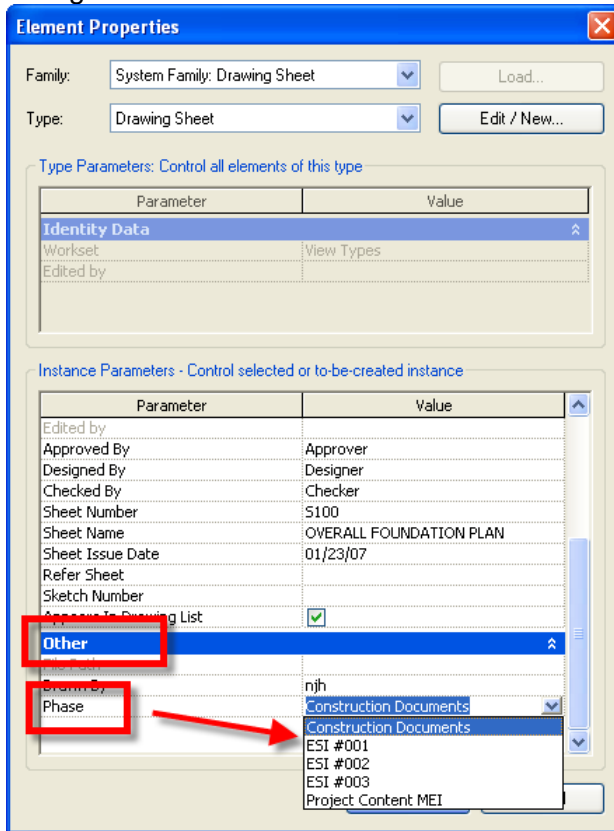8. Select **OK** to exit this dialog box.
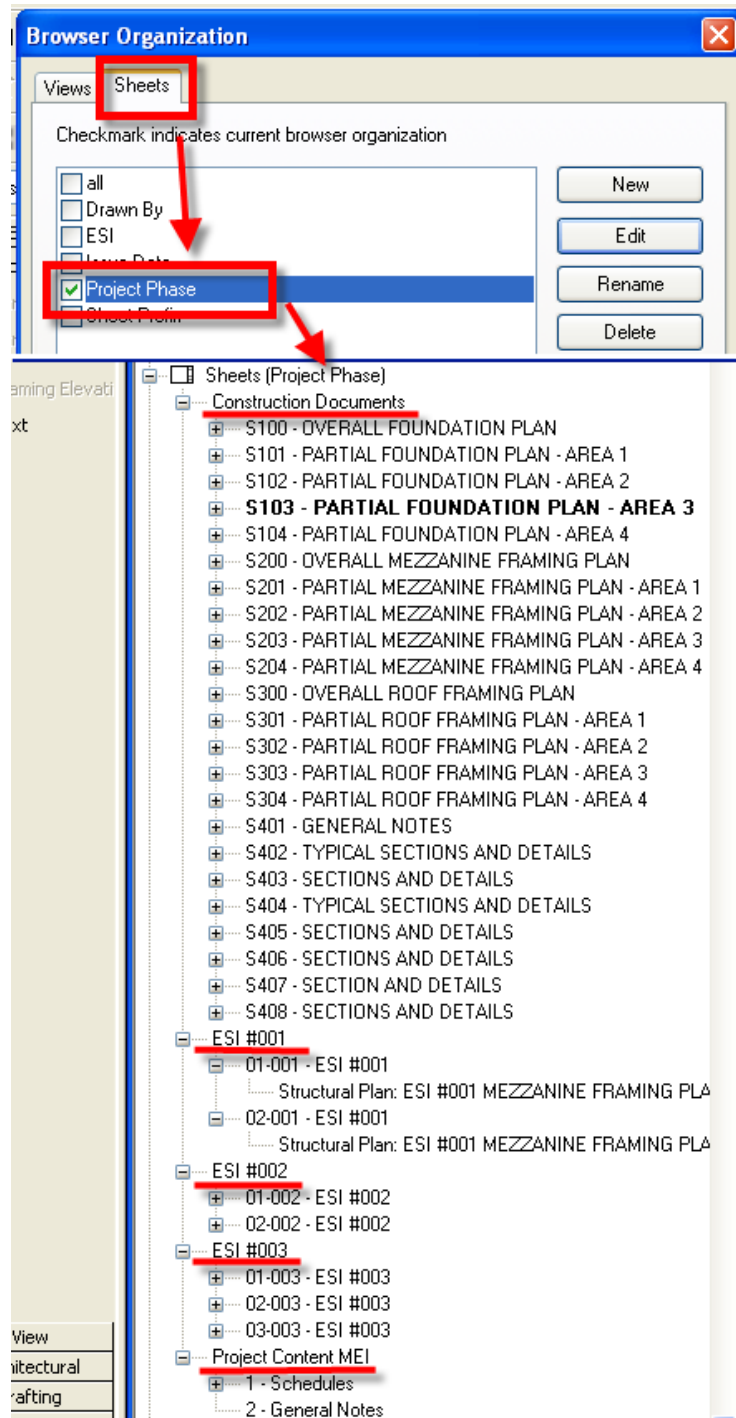
You're not done yet. You've returned to the **Parameter Properties** dialog box and you have a few items to set.

9. In **Categories**, select **Drawing Sheets**.
10. In the **Group parameter** under drop down, select **Other**.

11. Select **Instance**.
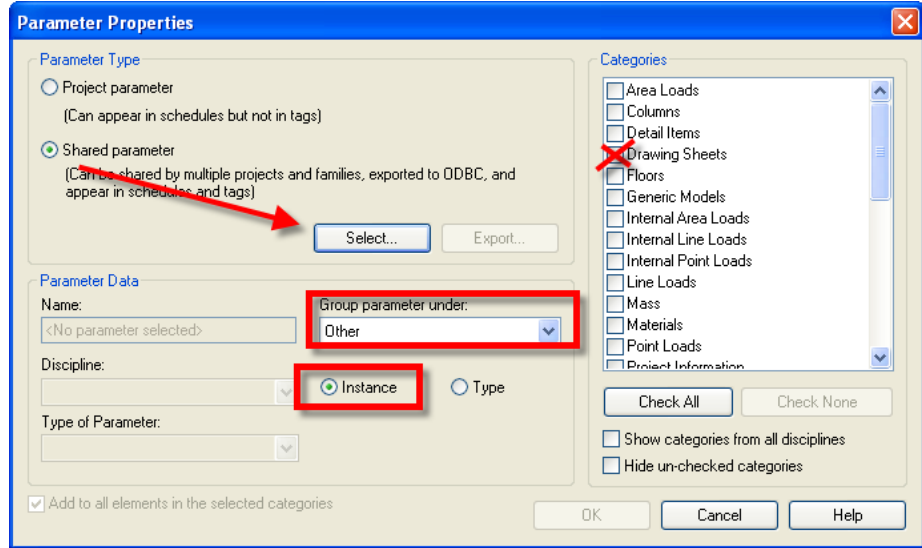
These last items will make the "Phase" parameter show up in the **Element properties** dialog box for the Sheet.

After all of that now you can filter the sheets using the **Browser Organization** dialog box.

1. From the **Settings** pull down select **Browser Organization**.
2. Select the **Sheets** tab.
3. Select **New**, give it a name.
4. From the **Folders** tab set the **Group by** to **Phase** , **Then by** to **Family and Type** and last **Sort by** to **View Name**
5. **OK**.

The sheets will now be sorted by **Phase**.

DETAIL COMPONENTS

Revit comes with a much larger selection of 2D detail components to add to live sections or create standard details.

Sometimes the out of the box details are just like you want but sometimes they're not. The box might not even come with a particular component.

Take some time and go thru the folders opening the components and see what items will work for you. You can adjust items or plan to make new ones.
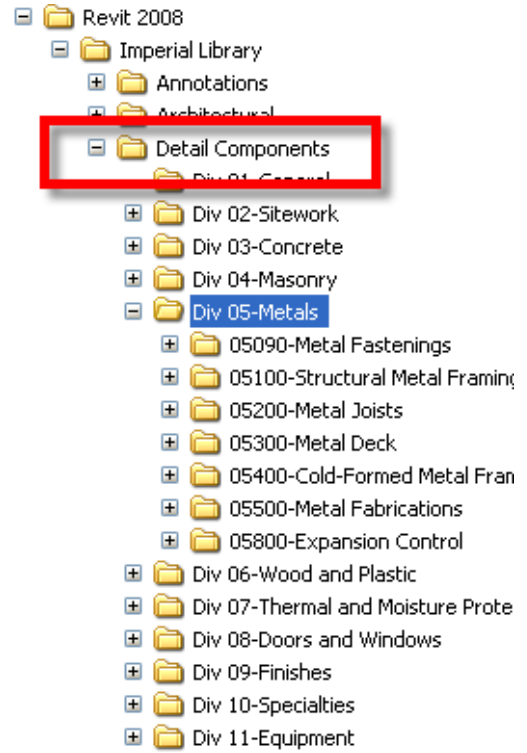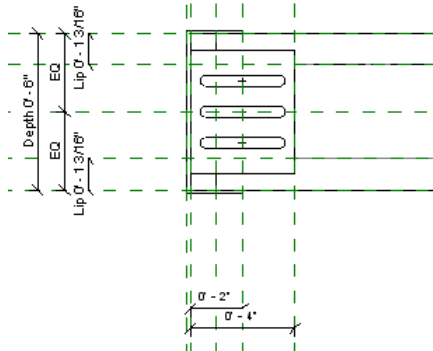
Revit uses type catalogs for creating families that have the same shape but at different sizes.

Examples of this is steel framing, wood member, CFS members etc

Type catalogs are .txt files which the file names match exactly except for the extensions.

You can re-use a Revit type catalog.

To the right you see a live section of a beam but I need to change this beam to a moment end condition.

I've created a 2d component detail of a beam moment end condition and created a type catalog from Revit's wide flange catalog.

This is where I'm going to refer you to Revit's help menu for the type catalog rules.
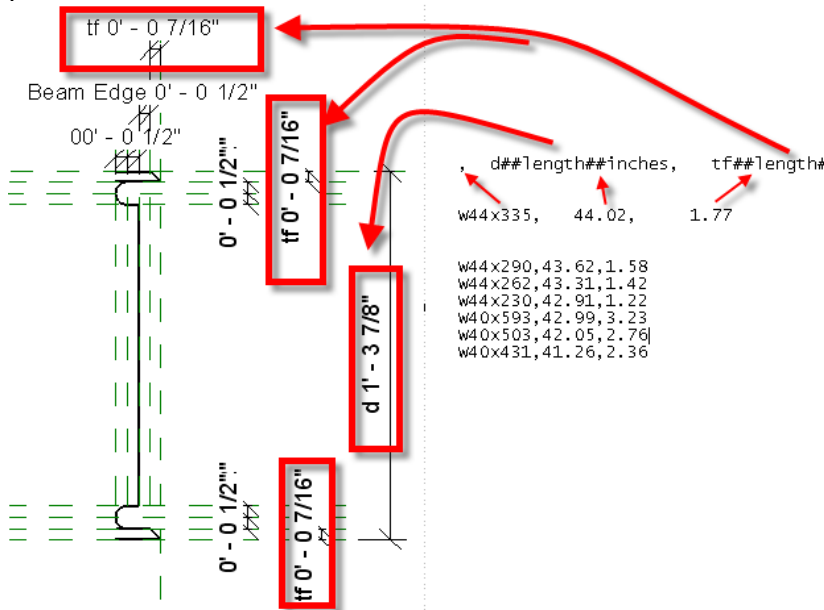
Ok know that you've reviewed the rules let's get started.

1. Find the type catalog file you want to copy and rename the file to match the detail family but with a .txt extension.
2. Edit the .txt file leaving only the columns with the parameters you are using.
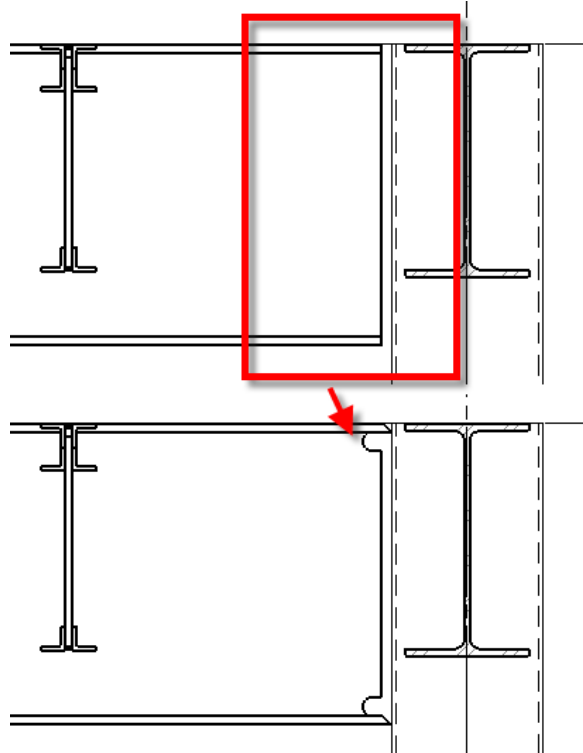
TIP
You can use Excel to edit the .txt file and save the file as a .csv file then cut and paste into the .txt file

I've pulled the text apart so you can see how the header line matches up with the property values and also you can see these values being pulled into the detail so it can adjust accordingly.
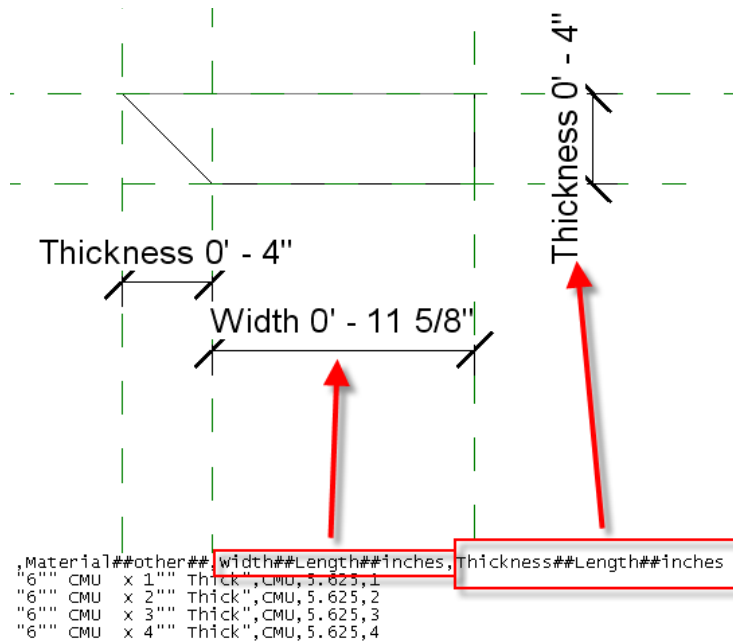
Keep the rules in mind….

Always starts with a , (comma)

d = parameter to be populated
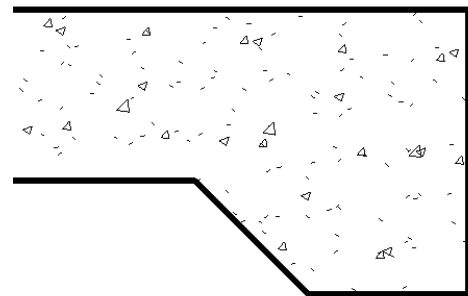
length = For length

##inches = Units

, (comma) to separate columns

d##length##inches

I have another example using a type catalog to change the geometry for a thickened slab profile that I will then use to create a type for the **Slab Edge** tool.

Thickness 0' - 4"

Thickness 0' - 4"

Width 0' - 11 5/8"

```
,Material##other##,width##Length##inches,Thickness##Length##inches
"6"" CMU  x 1"" Thick",CMU,5.625,1
"6"" CMU  x 2"" Thick",CMU,5.625,2
"6"" CMU  x 3"" Thick",CMU,5.625,3
"6"" CMU  x 4"" Thick",CMU,5.625,4
```

RANDOM THOUGHT ON TYPE CATALOGS

- Column and wall footings, using shared parameters to populate typical reinforcing.

- Bearing plates, base plates, headed studs just about anything that the shape doesn't change.

- You could use them on a per project basis

STANDARD DETAILS LIBRARY PROJECT

Every firm has a zillion standard details. I'm never going to disagree that starting your Revit library is a large task but you will have to start it. So how are you going to do this and what do you need to think about before your begin.

- Standard details will be drafting views in their own project file.

- You pull drafting views into your building projects these standard detail projects.

- Worksets should be turned on so several people can add to the library.

- Drafting views should be sorted by the type of detail and there should be a view naming system.

- What about your 2d components?

  o Have you looked at the out of the box components?

  o Do you need to make addition components, do they flex or can they have type catalogs.

- Make sure before you start your standard details you have enough annotation components …..

  o Match your system families, spot dimensions, grid bubbles, leaders etc

  o Have several dimension types and a way to override dimensions with annotations.

- Are you going to use AutoCAD details as linked files, if so then…….

  o How are you going to handle fractions? %% fraction come in as %%

  o Line weights, have you created your Import/Export file.

  o Have you edited your font mapping file

- More things to consider

  o What are you doing for filled regions?

  o Do you need more line types?

  o What is going to be your process for inserting general notes?

  o What about static schedules?

  o I don't want all of the loose types created when I bring in an AutoCAD detail !!!!!!

CREATING A STANDARD DETAIL

- Use as many components as possible in lieu of detail lines.

- Link in an AutoCAD detail to trace with the pick tool.

- I use a reference box to keep my details close to the same limits.
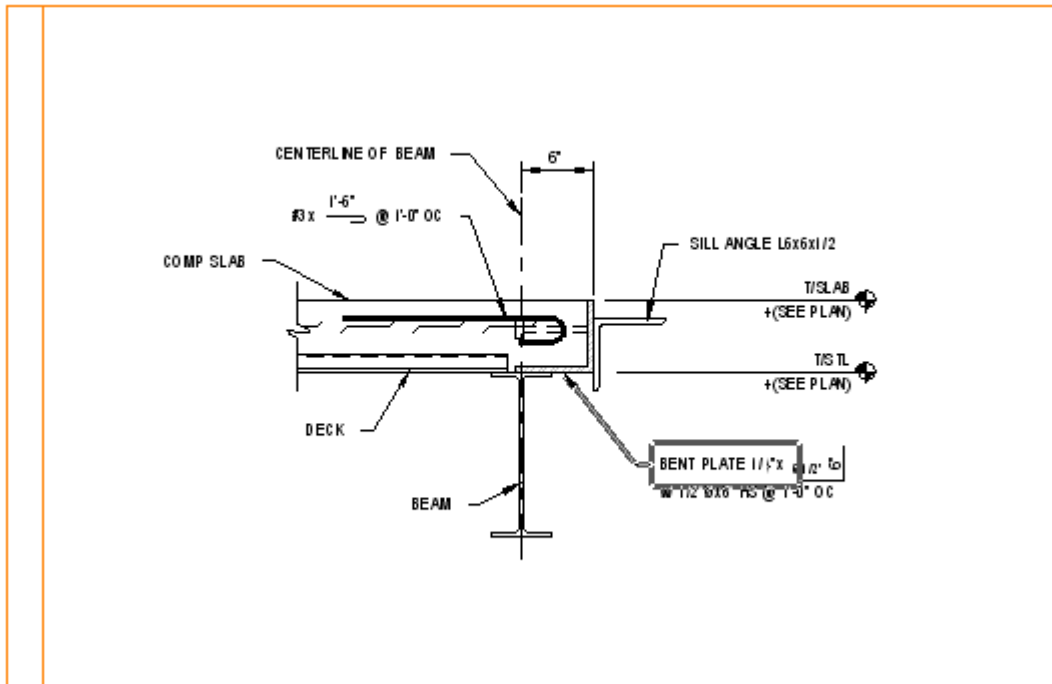
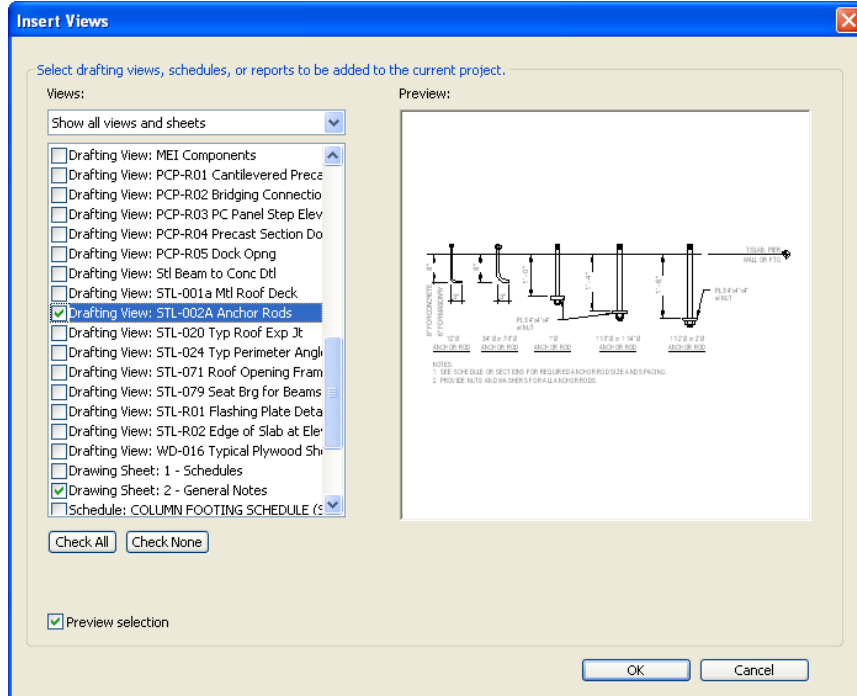## INSERTING VIEWS FROM THE STANDARD DETAILS PROJECT

It doesn't get much easier than this.

1. From File pull down select Insert from File.
2. Browse to the standard detail central file and select.
3. Start checking the details you want to insert and when you done select OK.

TIP

I typically save my project prior to importing details, just in case.
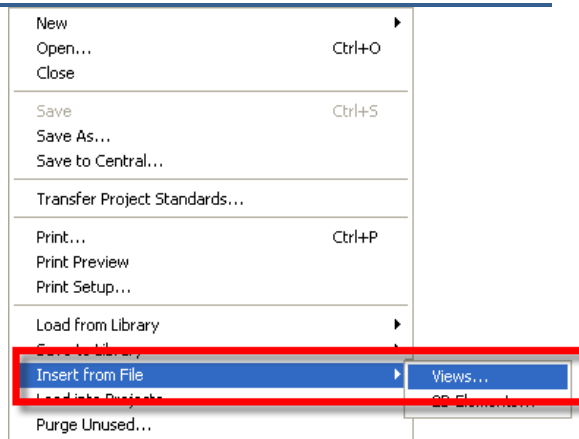
A nice feature in selecting details is that you get a preview of detail.

The inserted details will be sorted in the current building project.