



## Everything Electrical for Revit MEP®

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### MP6679

The title of this class speaks for itself. You will learn everything you need to know about Revit MEP software, focusing entirely on the electrical side. Topics will include managing your project template; creating 2D annotation symbols and electrical families; creating more efficient diagrams; using filters for your electrical systems; and laying out fixtures. We'll also look at devices and equipment, circuiting, and scheduling. We will cover techniques for achieving better coordination between disciplines (mechanical, electrical, and plumbing) and making the most out of Revit MEP software and we will discuss some best practices. We will also share with you an actual project that implemented items discussed during this lecture.

### Learning Objectives

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

- Learn different techniques for efficient diagrams and discover why it's better in Revit software, forget linked CAD files
- Learn how to create efficient 2D annotations and electrical families and discover that it's not always about how they look, but how they work
- Using filters for better workflow. You'll be surprise what filters can do for you
- Learn about coordination practices between electrical and mechanical, plumbing, and lighting, and discuss how we should we handle this

### About the Speakers

Don Sarmiento is a Senior CAD Technician at Arup, a multidiscipline engineering firm based in San Francisco, California, which has over 90 offices throughout the world. He has over 17 years of experience in electrical drafting, using AutoCAD® software, AutoCAD MEP® software, and Revit MEP® software. He also worked as an electrical designer for over 5 years. Currently he is involved in the implementation of Building Information Modeling (BIM) using Revit MEP® software for the Electrical Group within Arup's America's region. He also provides internal training of Revit software and often presents at internal and regional meetings.

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Geoff Gunn is a Senior Electrical Engineer based in the Boston, Massachusetts office of Arup, a multidiscipline engineering firm which has over 90 offices throughout the world. He has experience in electrical engineering for a wide range of project types from University labs, healthcare facilities, and data centers. Geoff has detailed hands-on experience producing electrical engineering designs using AutoCAD® software, AutoCAD MEP® software, and Revit MEP® software. Geoff is always looking for new ways to introduce Building Information Modeling techniques into the electrical engineering process in order to simplify drawing production, improve accuracy, and enhance communication with Architect's and facility Owners.

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## Techniques for Efficient Diagrams in Revit

Let's be honest. When we all transitioned from AutoCAD to Revit, the last thing that we probably did in Revit, was our diagrams and our details. Maybe because we were intimidated by change, and just not familiar with the commands in Revit. But working in a 2D environment in Revit is actually really easy and efficient, and it is just a matter of getting used to it.

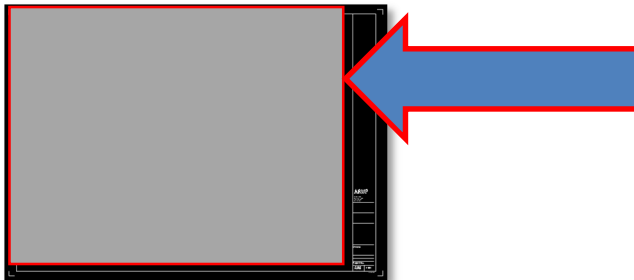
Here are some tips on how to create efficient diagrams in Revit.

### 1. Create all your content

If it's a symbol, create it! Consider using **masking region** in building your symbols. We'll discuss more about this later.

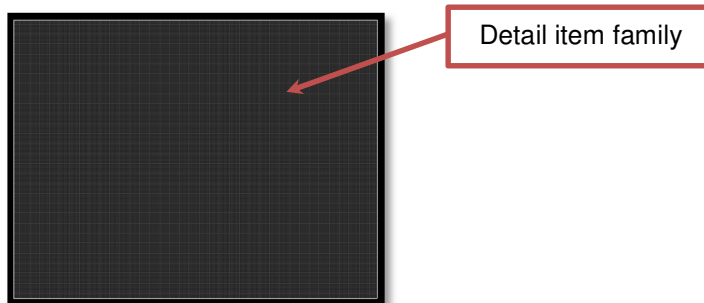
### 2. Determine your sheet limits

This should be the first thing you ever do when drafting. You don't want to keep drafting then realize you've drawn over your sheets as you finish. Check your border, and measure.

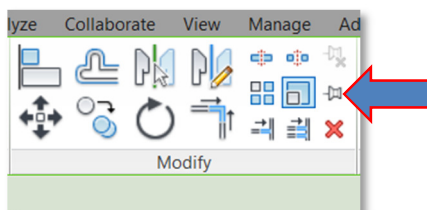


### 3. Create a grid guide in your drafting view or floor plan that matches your sheet limits

Creating a grid allows you work quicker, more efficient, and prevents you from "eye balling", when laying out your detail lines. This will also allow you to create a more presentable diagram. Creating a family would make this more efficient.

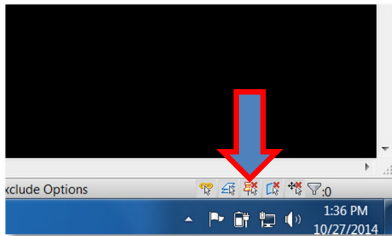


### 4. Pin the grid guide



**5. Click on the “Select Pinned Elements” icon**

By pinning the grid, then clicking on the “Select Pinned Elements” icon, this will allow you to hover over the grid, without selecting the grid. After these simple steps, you should be able to start on your diagram.

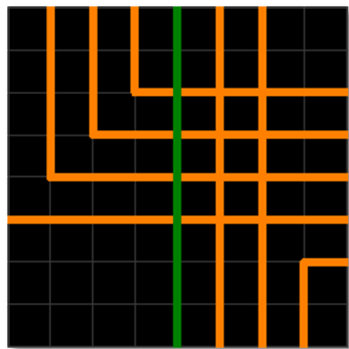


**6. Create different line styles for each distribution branch**

This allows for your too easily follow the connections.

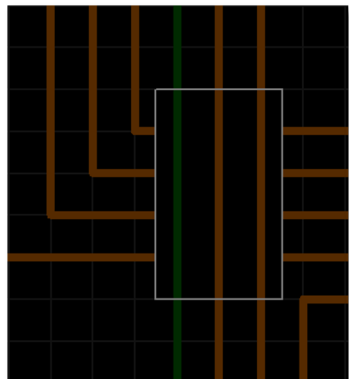
**7. Utilize the grid guide lines when drafting your detail lines**

**8. Consider using masking region, instead of splitting when lines intersect as below**

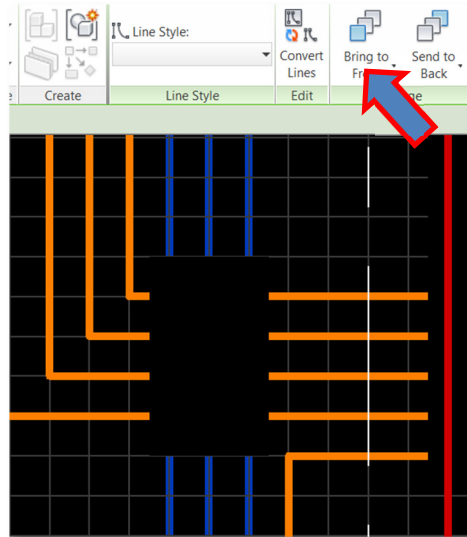


Here are the steps in using masking region:

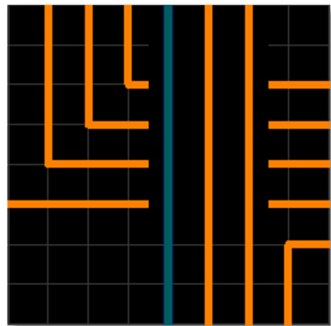
**a. Create a masking region.**



- b. Highlight the details lines that you do not want masked, then “bring to front”.

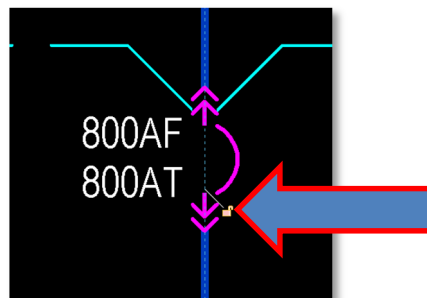


The image below is the result after masking.



**9. Lock generic annotations (symbols) onto the detail lines**

This allows the symbols to move with the detail lines as it moves.



**10. Turn off the grid guide before you print**

Tip: If your diagram is large enough to continue onto another sheet, you can also create your diagram in a floor plan so you could generate dependent views.

Figure 1.1 below is one of the most complex diagrams that I have ever worked on, created in a floor plan view, duplicated into 3 dependent views (Figure 1.2). Remember, all lines runs across continuously from sheet to sheet like the levels, and feeders. Lines are masked between sheets using masking region.

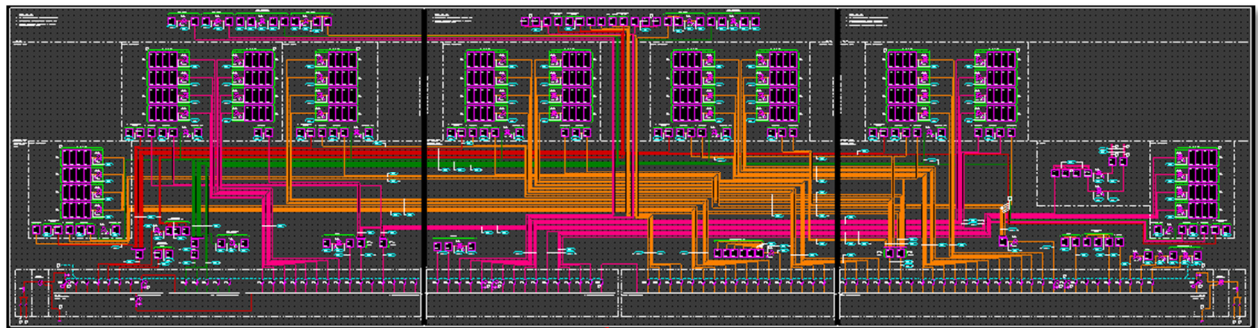


Figure 1.1

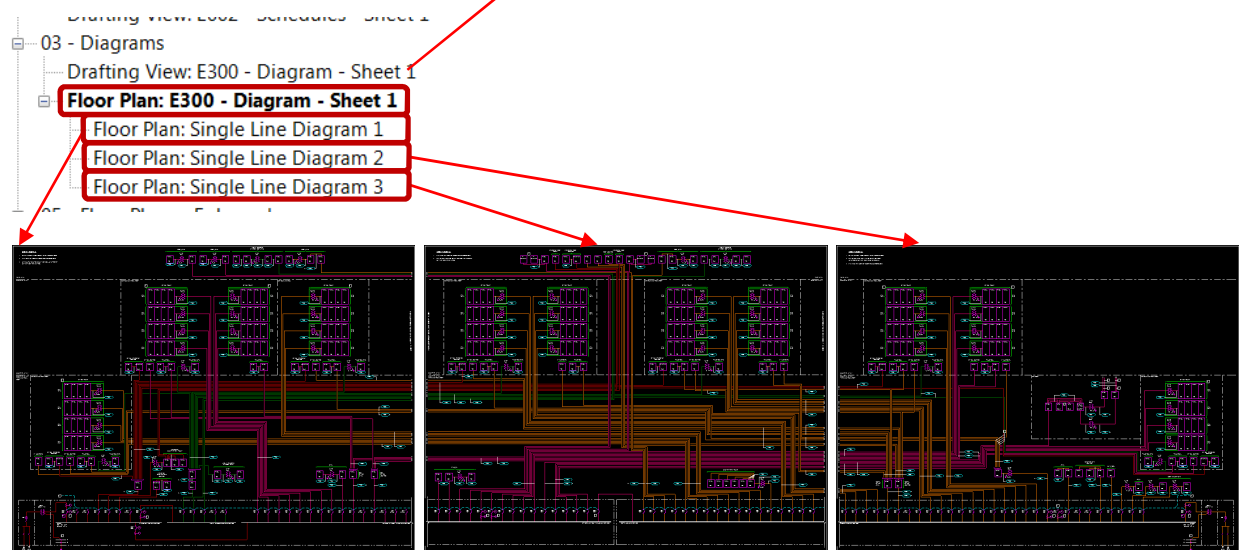


Figure 1.2

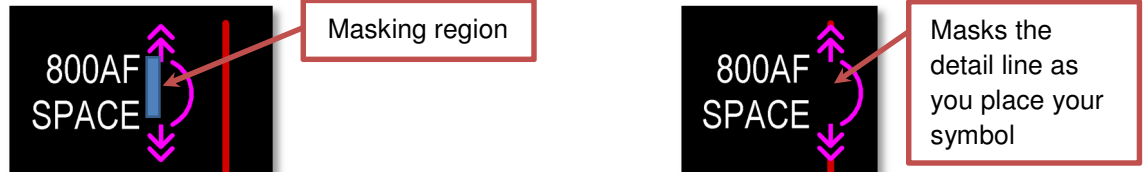
## Efficient 2D Symbols and Modeled families

Creating content could be lots of fun. Once you get into it, you will think of different ways to be creative with your content, and try to make them as efficient as possible.

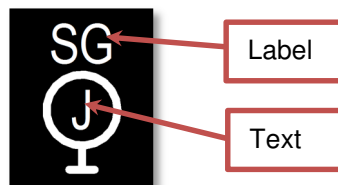
Here are some things to consider when building content.

### 1. For 2D Generic Annotation Families

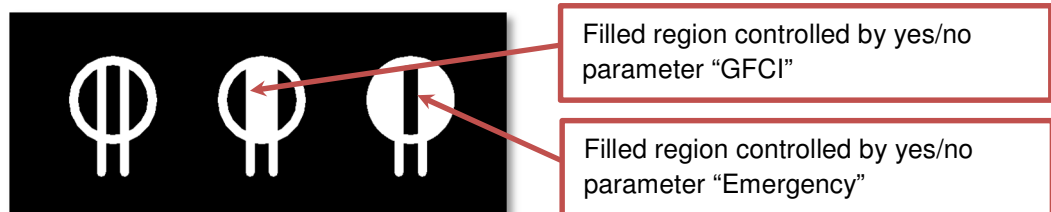
- a. Make good use of masking region.



- b. Create all the Labels and Text as needed. If it needs to change, use a Label and set it as an instance. If not, use a Text. Name the Label to be understandable.

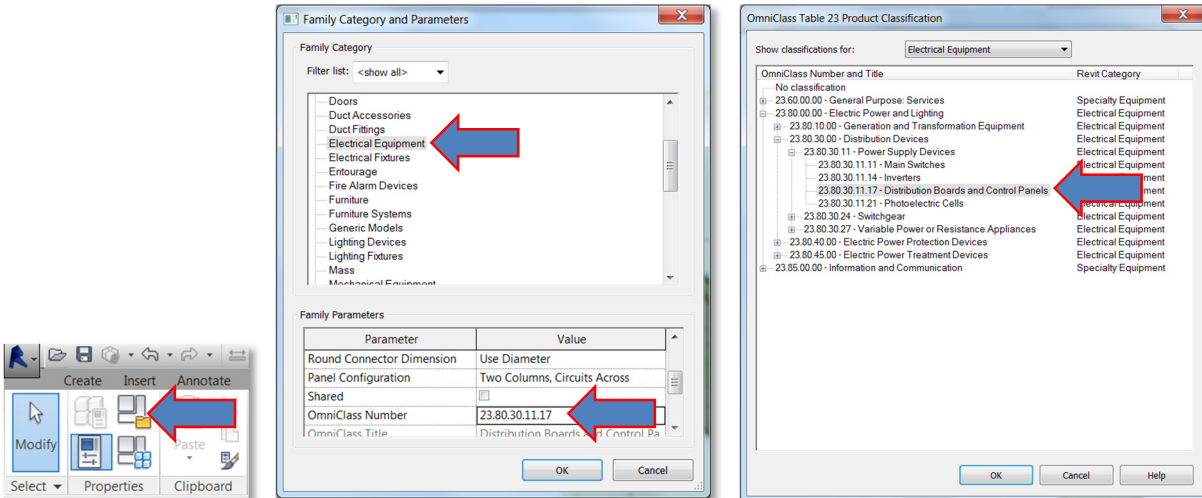


- c. Visibility. If there are multiple Symbols in your Family, make sure to set the visibility correctly with a Yes/No Parameter.

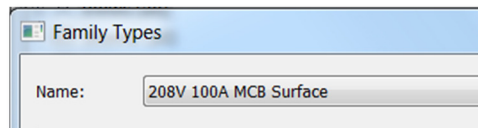


## 2. For Modeled Families

- Keep the 3D modeling simple. There is no need to show the nuts and bolts, every curve and angle of the device/fixture/equipment. As long as you show the overall dimensions, then that should be enough for coordination.
- Family Category and Parameters. Make sure these are set correctly. Check the OmniClass Number as well.



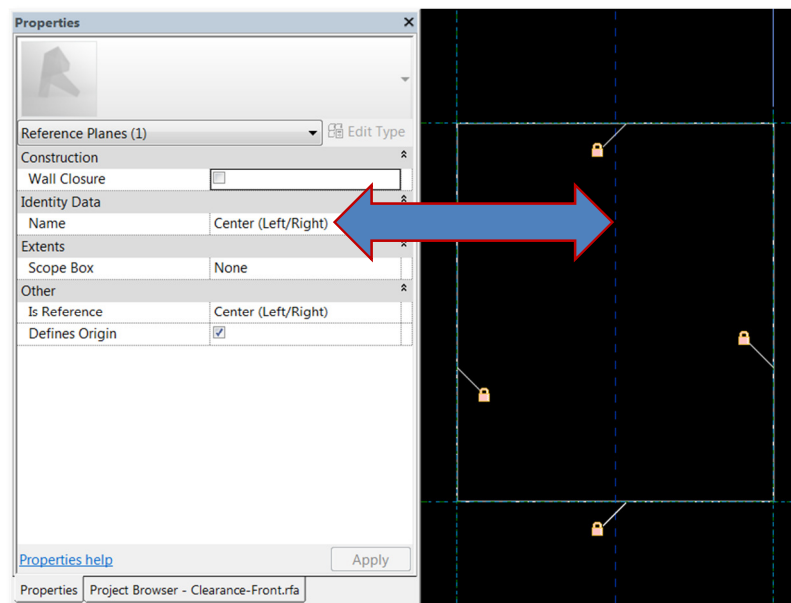
- Family Types. Do not use the Family Name in the Family Type Name. Name them to show the size or information specific to the Family Type.



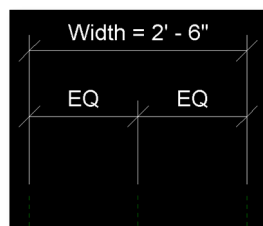
- Scheduling. If the Family is to be scheduled in Revit, make sure you have all necessary Shared Parameters set by your firm.

Electrical	
Phase	3.000000
Number of Poles	3
Load Classification	Motor
Equipment Control Type (default)	
Disconnect Type (default)	
Disconnect Rating Current	0.00 A
Control Combination (default)	<input checked="" type="checkbox"/>
Electrical Engineering	
Voltage	208.00 V
Full Load Current	10.00 A
Electrical - Loads	
Motor HP	0.000000
FLC FLA Given	10.00 A
Apparent Load	1000.00 VA
AL VA Given	1000.00 VA
Dimensions	
General	
Electrical - Circuiting	
Trip Rating Current	0.00 A
Ground Size	#12
Conductor Size	#12
Conductor Sets	1
Conduit Size	1/2"

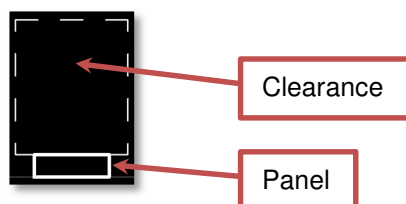
- e. Annotation Symbols. Families like electrical, ITC, fire alarm, lighting devices, some light fixtures like downlights, exit signs, do require Annotation Symbols. If the family uses the size of the model as its symbol, like 2x4 light fixtures, then use a Detail Item.
  - Nest the Annotation Symbol/Detail Item families.
  - Make sure Symbols are per your company standards.
  - Visibility. Determine if the Symbol(s) requires a Visibility option to display the Symbol or not and set the visibility correctly with a Yes/No Parameter.
  - Set the Symbol(s) "Visibility/Graphics Overrides" to show only in Coarse and Medium Detail Level.
- f. Name your Reference Planes/Lines correctly such as Front, Back, Center (Front/Back), etc. This will allow for users to figure out how the content was built, and allow for easy modifications to the family when required.



- g. Set Dimensions to Reference Planes/Lines, not Detail Lines or Modeled Elements.

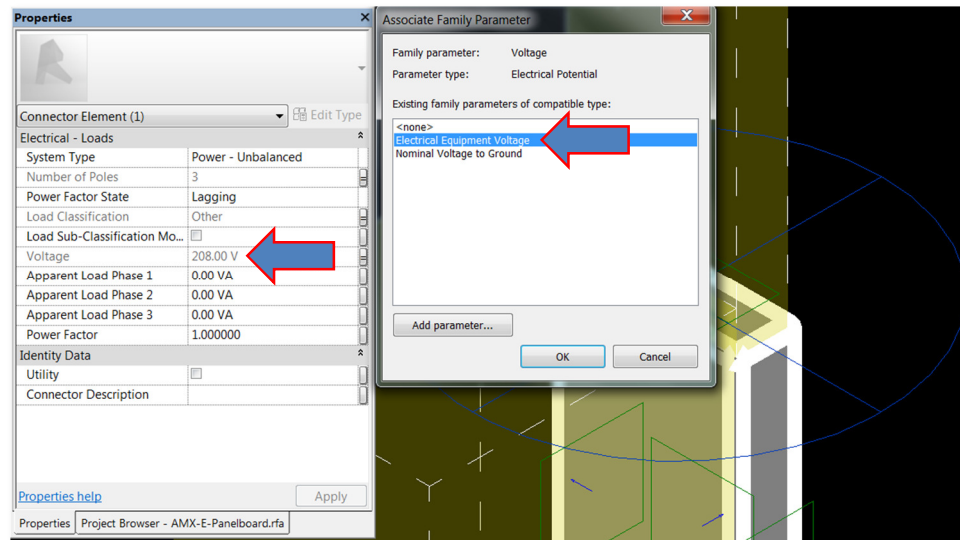


- h. If an equipment requires a clearance, show it. This would help in the design process. You can base the clearance per code, or from the manufacturer.





- i. Nest the different Components of the family, like the equipment, clearance, pads. These Nested Families can be created as Generic Models. This makes your family free of multiple reference planes, and makes each component easier to manage within the family.
- j. Electrical Connectors. Make sure that correct parameters are linked to the Connector Element. For conduit connectors, make sure they are facing the right direction.



- k. Test your Family. When the family is loaded into a project, does it do the necessary changes in size, movements and visibilities without errors? Make sure to test all parameters that are shown in the properties of the Family.

Figure 2.1 is an example of our Switchboard Family

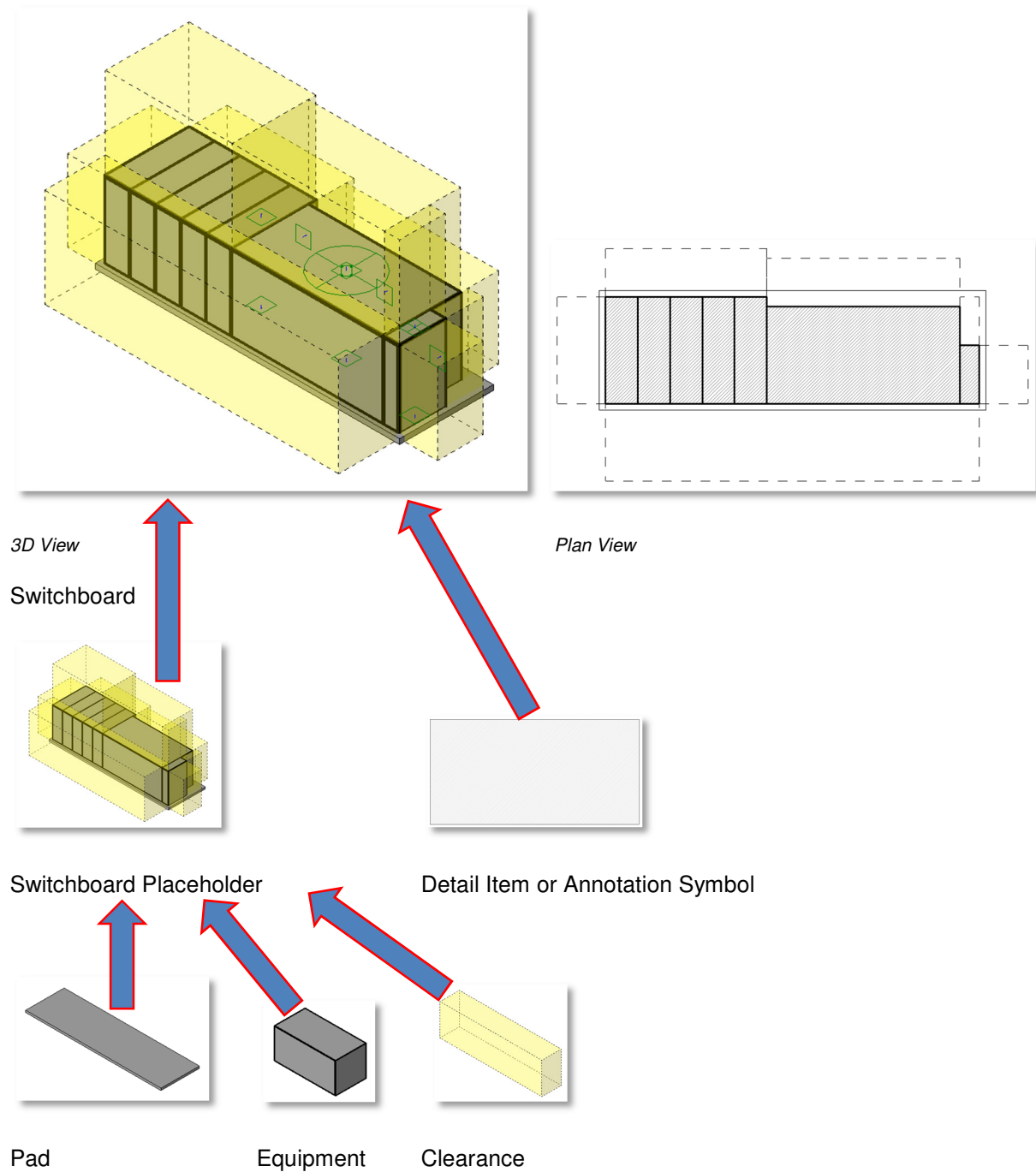


Figure 2.1

## Using Filters for Electrical Distribution Branch

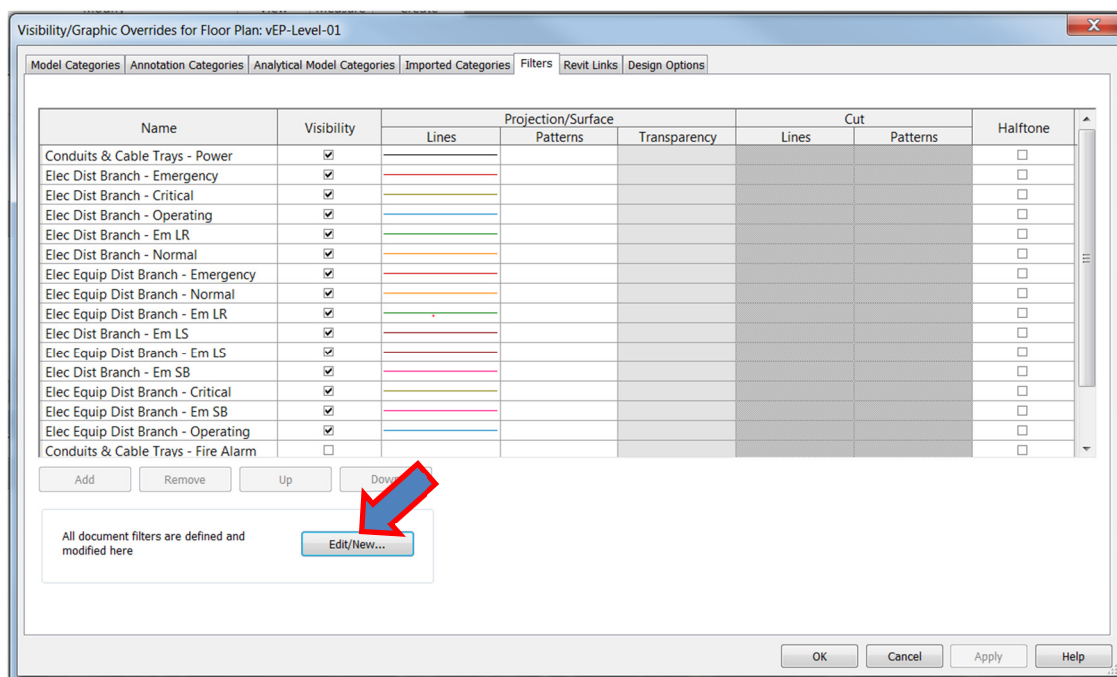
In this objective, we would like to share how we've used filters as a design tool by color coding the different electrical distribution branches. This is just one example of the countless possibilities where in you could use filters, and shows how powerful this is.

### 1. Items to consider when creating filters

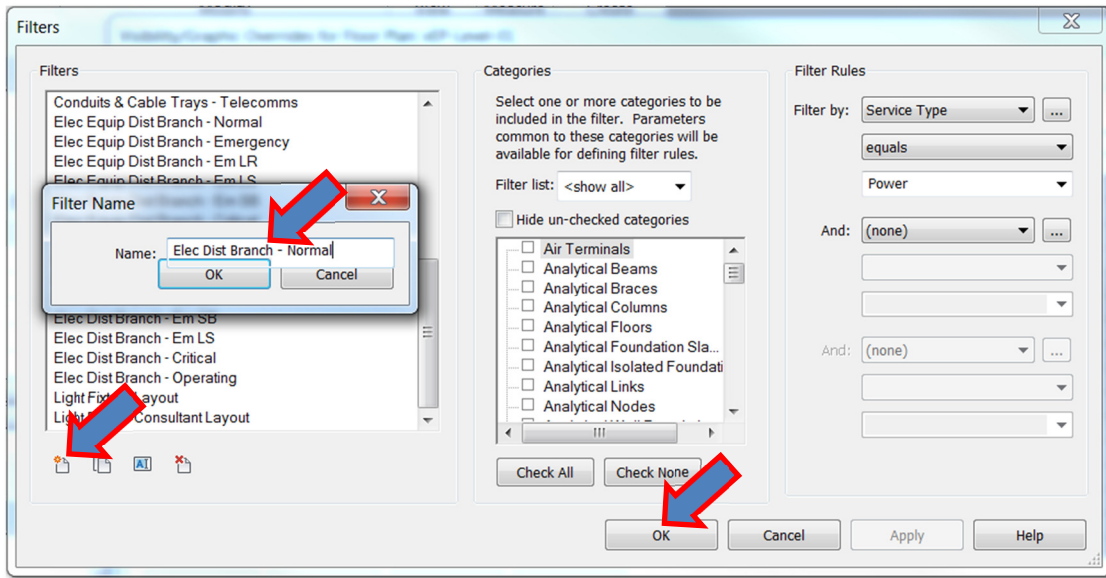
- Filter naming. Use a standard naming convention, and have this figured out before you start.
- Filter rules. Determine the necessary parameters you need for each filter.
- Visibility, Projection/Surface. How do you want represent these in your view? Determine these as well.
- Be creative!!!!!!!

### 2. How to set-up your filters

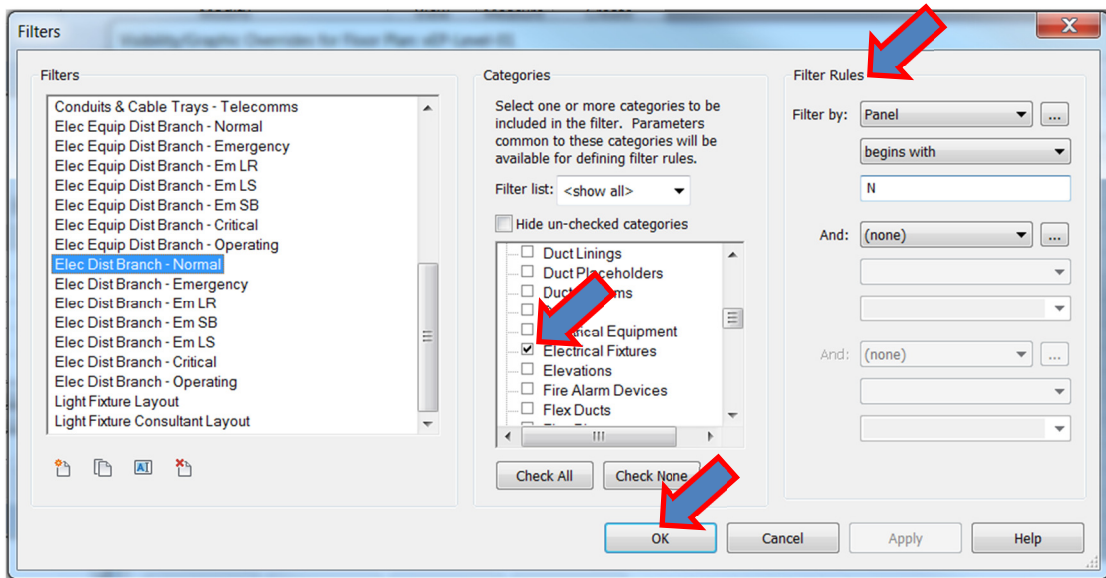
- Go to visibility graphics, then under the Filters tab, click on Edit/New...



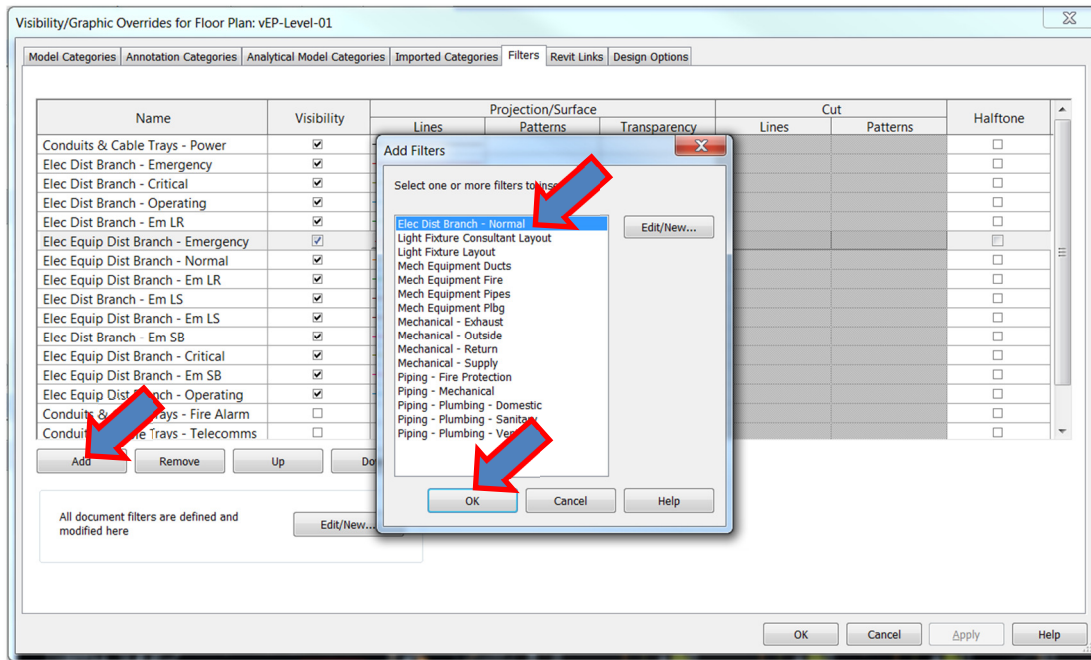
- b. Under Filters, click on Create New, assign the Filter Name, click OK...



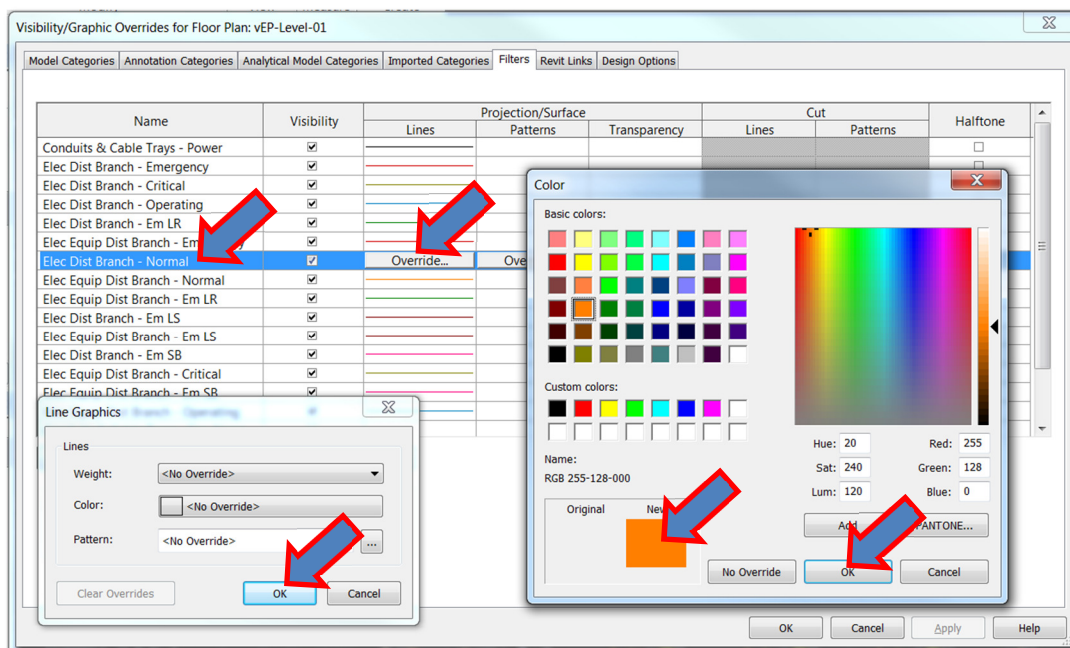
- c. Select the category you want to filter, then apply filter rules, click OK...



- d. Under Filters, click on Add, then under Add Filters, select the filter, click OK...



- e. Under Visibility Graphics, select the filter name, then override its visibility as you wish, which in this case we changed the color alone. Click OK under Color, then click OK under Line Graphics...



f. Under Visibility Graphics, click OK to finish.

Figure 3.1 below shows the different filters we've created based on the different distribution branches that we use. We created filters for equipment, and electrical devices/wires. We then matched the projection lines per the distribution branch. It is highly recommended to set these in your view templates.

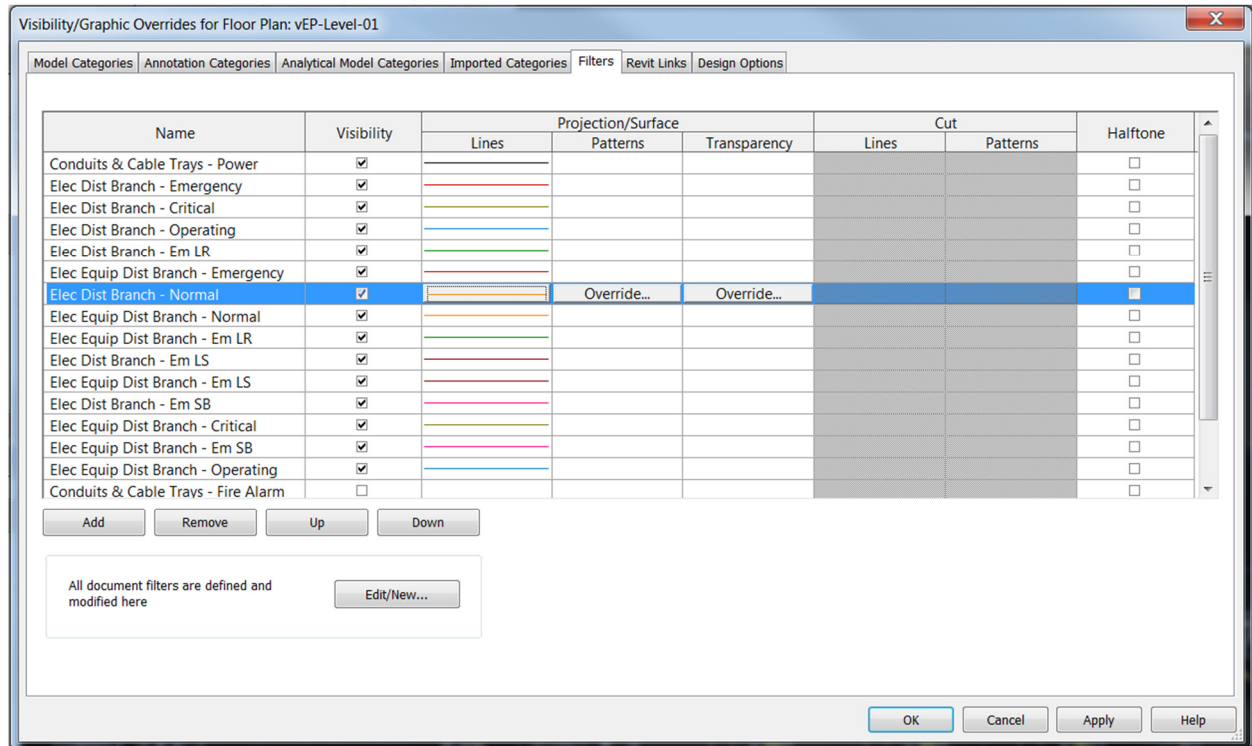


Figure 3.1



The beauty about filters, is that visually elements change their projection lines based on the rules that you have set. We matched the electrical distribution branch filters projection lines between equipment and devices/wires, so as you circuit your device to a panel, they would match colors.

Figure 3.2 below shows that as we layout our electrical equipment, they come in as a default color, white. As we named the panels (figure 3.3), they change colors based on how we name our panels. This also tells us, whether or not we have actually named our panels. The filter rule we applied here, is that an electrical equipment, is filtered by panel name, which begins with...

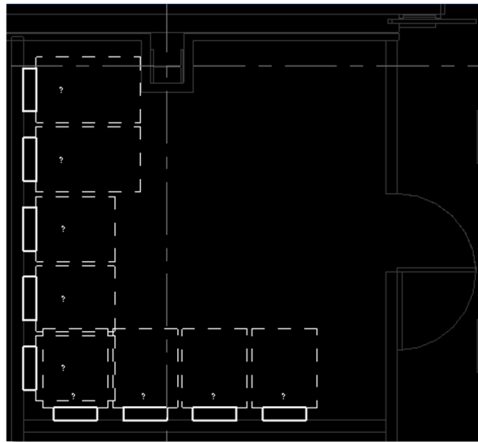


Figure 3.2

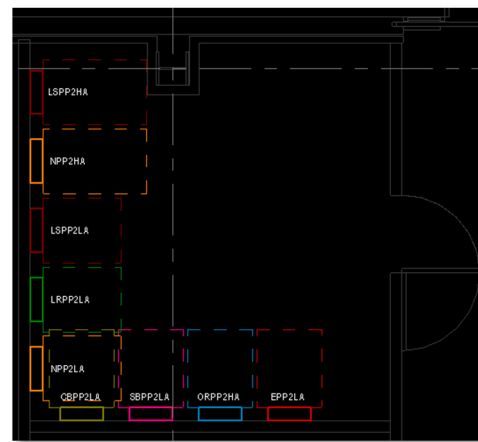


Figure 3.3

Figure 3.4 below tells us, whether or not we have circuited our device, and as you circuit (figure 3.5), the device and wire colors change to match the corresponding panels it's assigned to. The filter rule we applied here, is that an electrical device, is filtered by panel, which begins with...

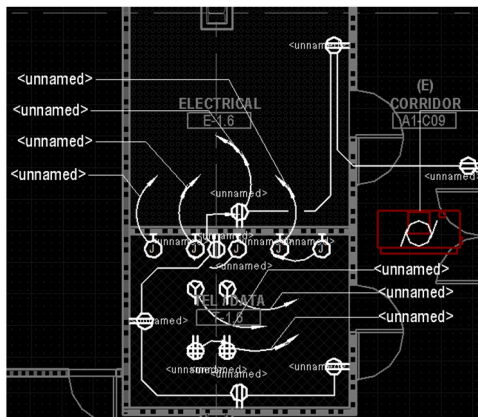


Figure 3.4

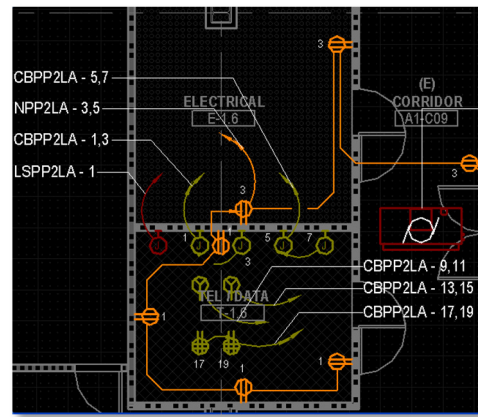


Figure 3.5

We also used filters for coordinating between electrical connectors and the architects/lighting designers lighting layout, and for the coordination between electrical and mechanical equipment, showing only mechanical equipment that have electrical power in our electrical plans. We will discuss more about these in the next objective.

## Coordination between Electrical and Other Disciplines

Revit is such a powerful software, and it's in coordinating the different disciplines where you could take full advantage of this. Coordination between architectural and structural, structural and mechanical/plumbing, and of course, electrical and everyone else! There's so many ways on how we can accomplish this in Revit, and we would like to share with you how we do it.

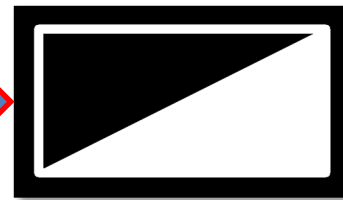
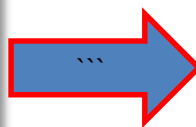
### 1. Lighting

In most cases, the architect and/or lighting designer usually models the light fixtures when you receive the architectural Revit model from them. So since it's been modeled already, then there's no need to redo the work. Since we cannot circuit between linked models, we decided to create light fixtures that act as connectors, which represents our symbols, for circuiting purposes only.

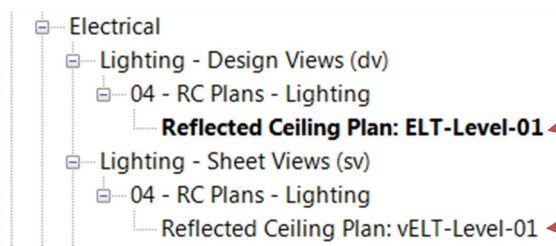
Here's our process:

- Create the light fixture families to match the architects and/or lighting designers schedule and/or specs focusing on dimensions, voltage, apparent load, and wattage. Dimensions are important to match, so as you overlay the fixtures, they line up. If your are creating a schedule yourself, then incorporate all the parameters needed as well like description, lamp type, number of lamps, and tag.

Model	Size	Power	Wattage	Color Temp	Beam Angle	Mounting	Notes
GT8 2'x4'	2' x 4'	150W	150W	4000K	30°	Recessed	See spec sheet for details



- Create a coordination view or design view rather than using your sheet view. Visually, it would be easier to coordinate the fixture locations here.



Coordination or design view

Sheet view



- c. Set-up your filters in your view templates. In figure 4.1 below, we created 2 filters. The first one for the architects/lighting designer's layout, and the other one for our light fixture connector. We filtered our light fixture connector simply by family name, changed our projection patterns, and modified the transparency on either one. On the model categories tab, we also turned off the visibility of all models except for the light fixtures.

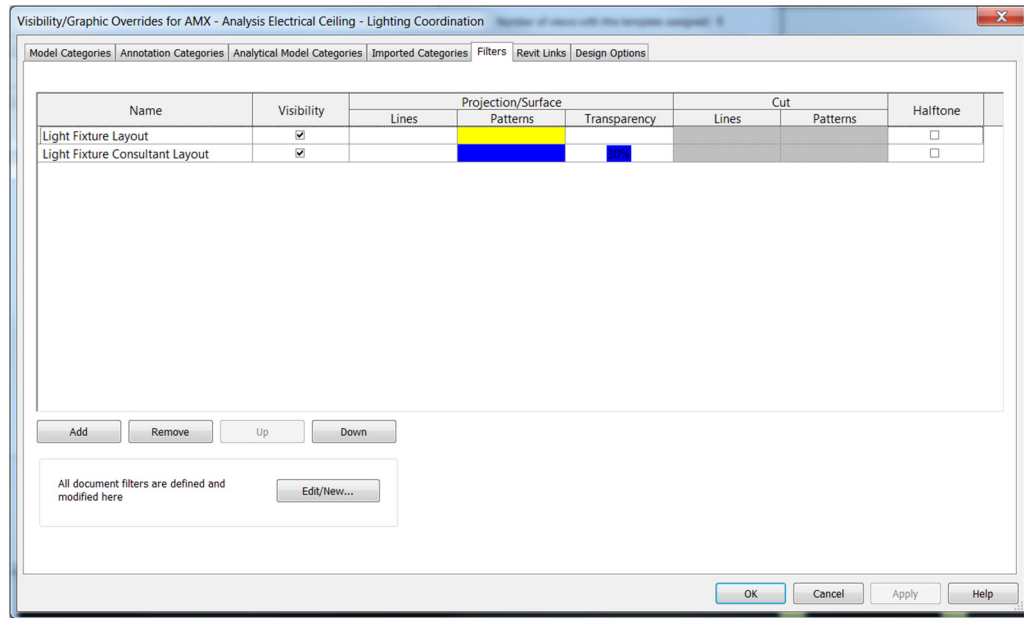


Figure 4.1

- d. In the coordination view, we overlaid our light fixtures on top of theirs. Figure 4.2 below shows that the blue fixture indicates the architect/lighting designer's light fixture layout, and yellow fixture indicates our light fixture connectors. Gray indicates we've overlaid the fixtures, and that the location is coordinated.

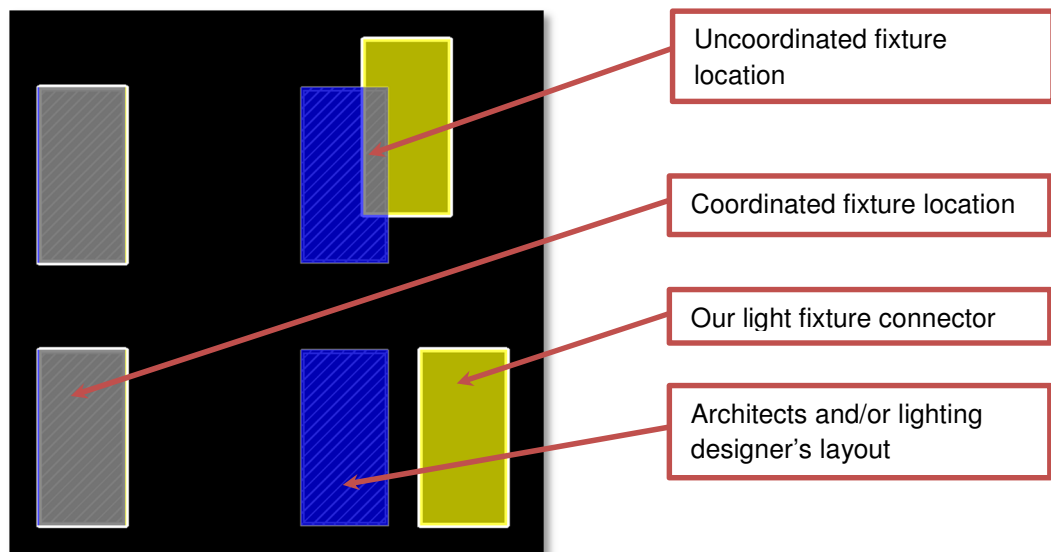


Figure 4.2

## 2. Mechanical/Plumbing Equipment

Ideally, you only want to show mechanical or plumbing equipment that has power on your electrical plans. We used filters to control which mechanical equipment to show, by adding a yes/no parameter “is Electrical Power” to the mechanical equipment. You can also coordinate your schedule with theirs, by creating a multi-category schedule, and comparing the mechanical equipment data, to your motor connector data.

Here’s our process:

- a. Create a motor connector family that contains common shared parameters that also exist in the mechanical equipment. These parameters will be used this to filter and sort out our schedule, and for visibility of our mechanical equipment on our electrical plans. We also created the different types of motor sizes based on voltage, phase and horsepower per NEC.

Figure 4.3 shows the parameters that we are sharing between electrical and mechanical families, which are:

- Is Electrical power      Yes/No parameter
- Equipment Type      Text parameter
- Equipment Number      Text parameter

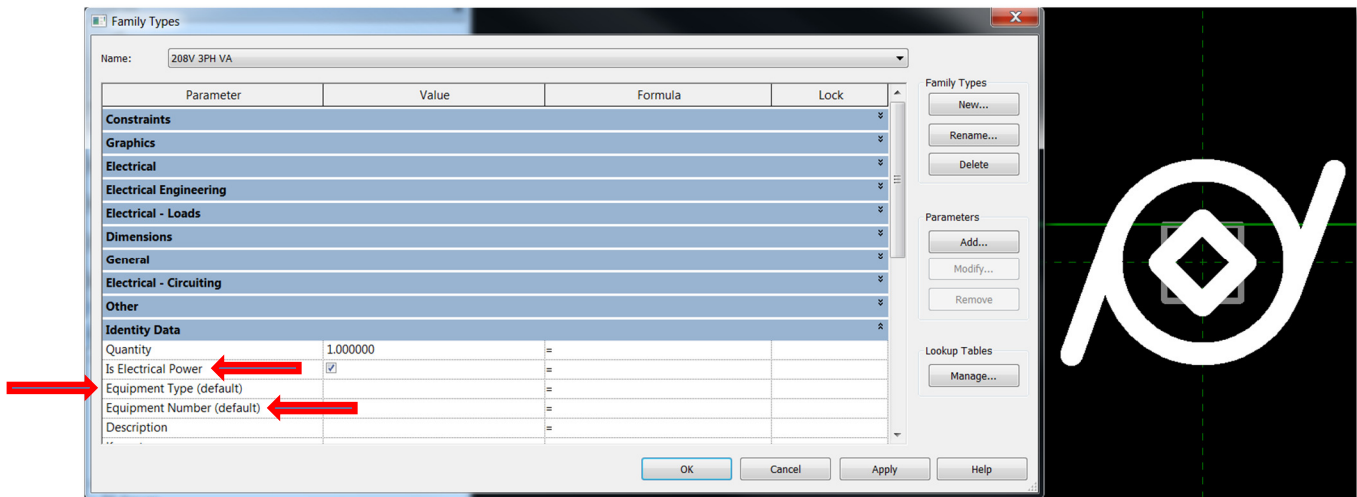


Figure 4.3

- b. Set-up your filter in your view templates. In figure 4.4, we created a “Mech Equipment Power” filter, which is filter by the “Is Electrical Power” parameter, equals “no”. In the filters tab, we then turned off the visibility. Make sure to turn on the visibility of the mechanical in the model categories tab, and change the projection lines of the mechanical equipment. This will then turn off all mechanical equipment that has no electrical power in your view.

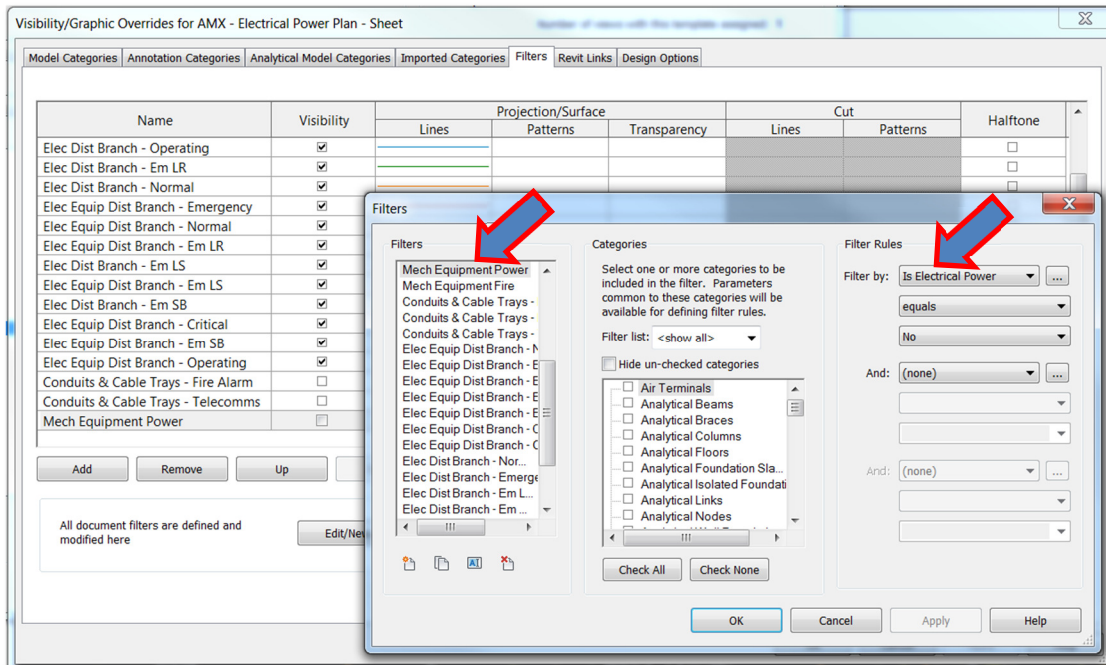
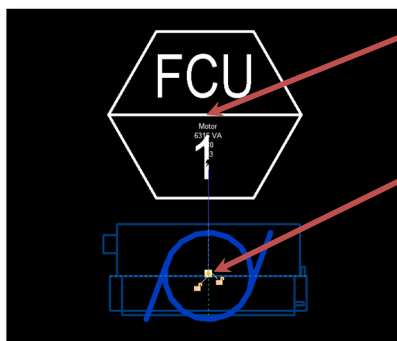


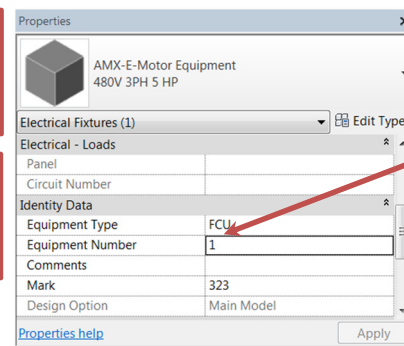
Figure 4.4

- c. Layout your motor connector to line up with the mechanical layout. You can lock the connector to the mechanical equipment (figure 4.5), so it moves with it. Consider tagging directly the mechanical equipment (figure 4.5), instead of your connector, so when mechanical changes the equipment name, it updates. Update the Equipment Type and Number parameters on your connector to match the mechanical (figure 4.6).



Tag directly the mechanical equipment

Lock the connector to the equipment



Update to match mechanical

Figure 4.5

Figure 4.6

- d. Create a multi-category schedule for electrical mechanical coordination. We then filtered this by the yes/no parameter “Is Electrical Power”, then sorted it out by Equipment Type, then Equipment Number, then Family. We then refer to the mechanical equipment voltage, phase and horse power, then select our family type to match.

<Electrical - Mechanical Coordination>								
A	B	C	D	E	F	G	H	I
Type	Equipment Type	Number	Is Electrical Power	Electrical Device Phase	HP	Voltage	Mechanical Phase	Equipment HP
480V 3PH 2 HP	FCU	1	<input checked="" type="checkbox"/>	3	2	480		
FCU Horiz. (350-750 CFM)	FCU	1	<input checked="" type="checkbox"/>			460	3	2.00
480V 3PH 5 HP	FCU	2	<input checked="" type="checkbox"/>	3	5	480		
FCU Horiz. (550-1000 CFM)	FCU	2	<input checked="" type="checkbox"/>			460	3	5.00

Change type to match mechanical

Shared parameters

From electrical connector

From mechanical equipment

Shared parameters

Figure 4.7

Figure 4.8 shows the layout of the mechanical engineer. Figure 4.9 shows the power plans, wherein the only mechanical equipment outline shown are the (2) FCU's, since these are motorized and are to be scheduled.

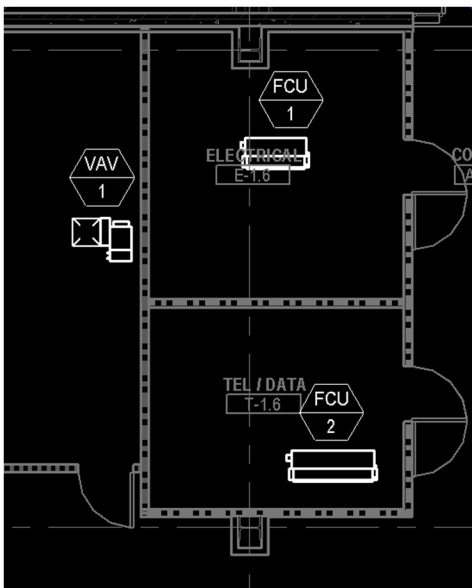


Figure 4.8

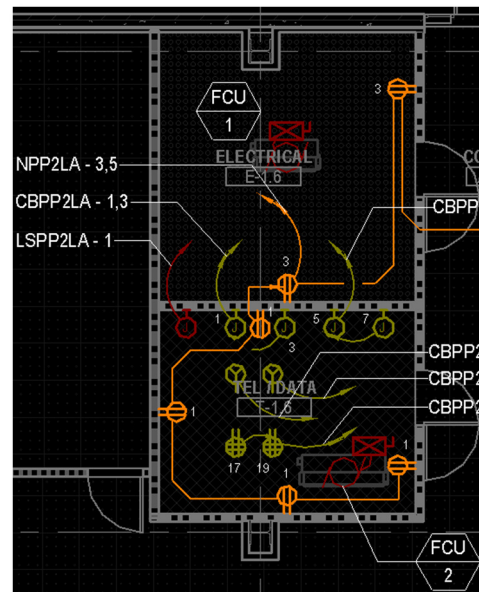


Figure 4.9

Thank you for attending AU 2014, and for joining us in our class today. We do hope that the objectives discussed in this class will be beneficial to you.