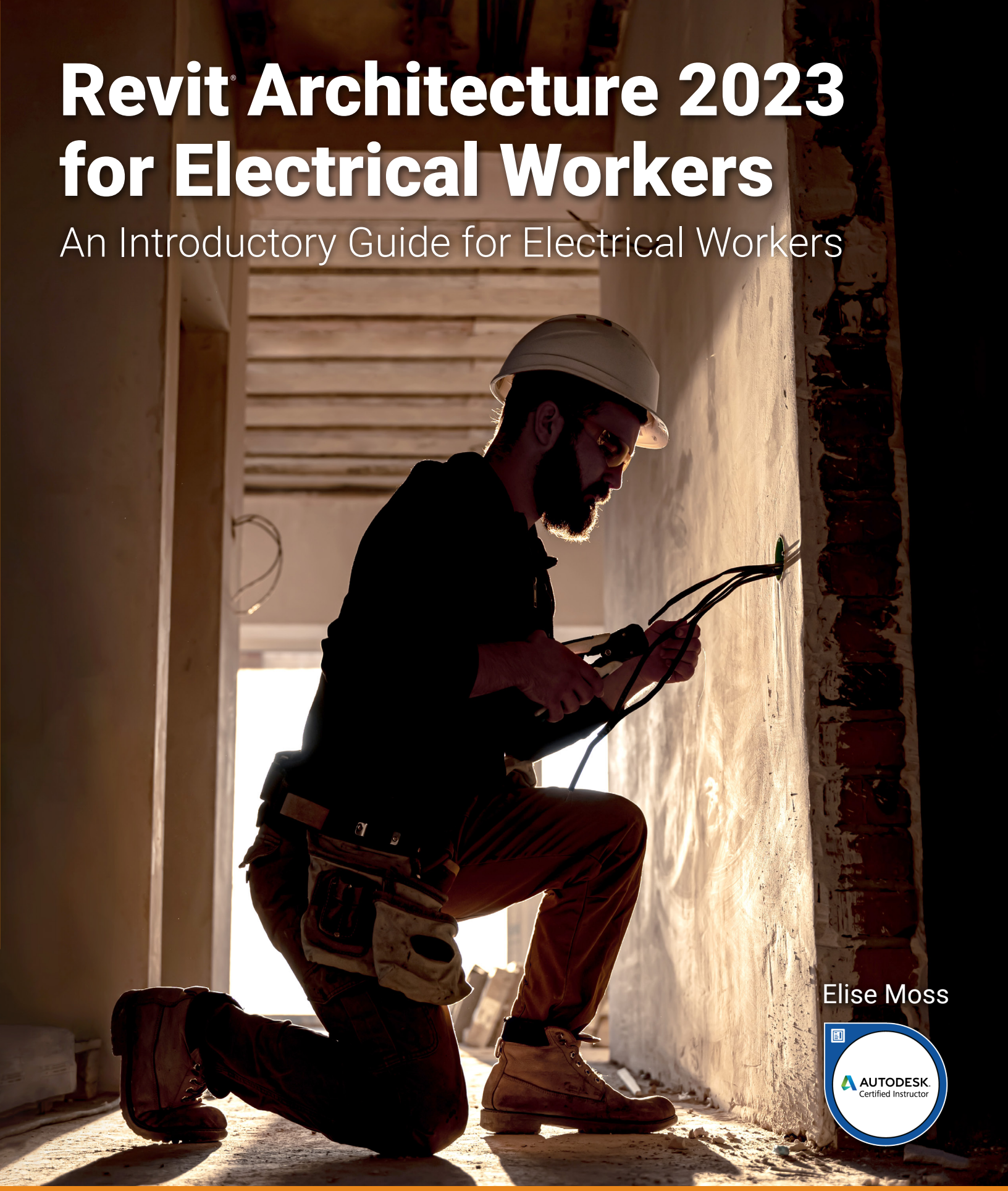
Revit® Architecture 2023 for Electrical Workers

An Introductory Guide for Electrical Workers



Elise Moss

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Lesson
02

Revit Families

Revit projects use Revit families.

There are three types of families:

- System
- In-Place
- Loadable

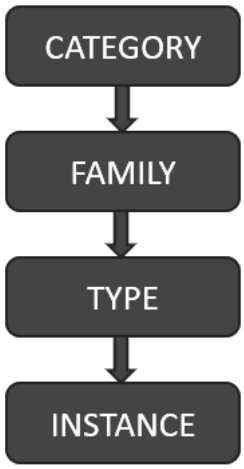
System families are specific to a project. You can copy system families from one project to another, but they are not stand-alone files, like loadable/model families. Examples of system families are walls, conduits, wires, and ceilings.

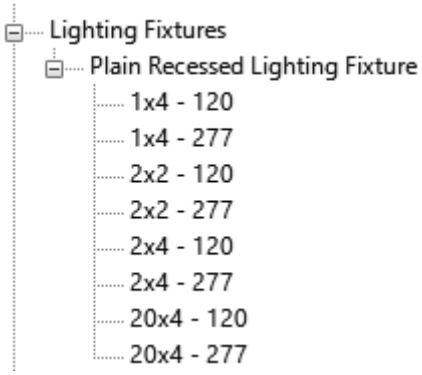
In-Place families are elements which are created “on the fly” using massing tools. Users often create an in-place family for a feature that is unique to a project. A generator or electrical equipment that is specialized may be created using massing tools, so that users can see the amount of space it takes up in a project.

Loadable families are the most common type of family. Examples include cable trays, power devices, and electrical equipment. These are external files which are inserted/loaded into a project and placed in the desired location. These families can be counted, and their properties can be organized in schedules. These elements can be created from scratch using the Family Editor using family templates. They can be created and loaded into a project, as well as deleted or saved from a project.

Revit families are defined using parameters. There are two types of parameters: Type and Instance.

Revit elements are defined by a hierarchy.



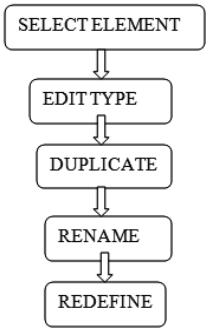


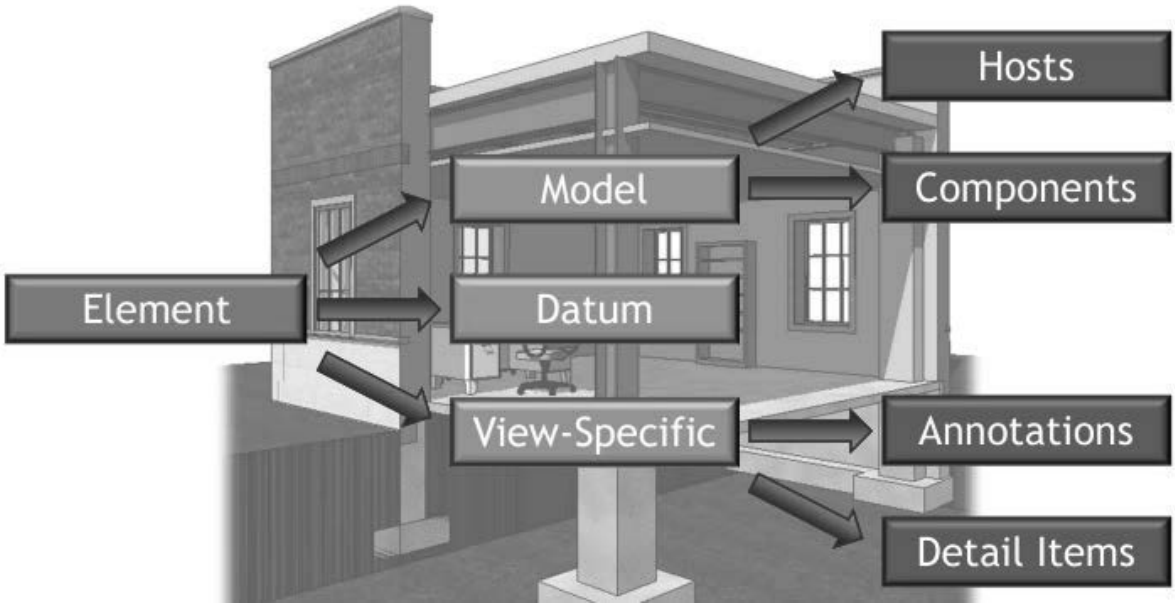
In the Revit Project Browser under the Families folder, you see the families organized into categories. Lighting Fixtures is a Category. The Plain Recessed Lighting Fixture is a Family. A family is an element that represents a specific component used in a project. Each Family can have several different types. This lighting fixture has different types which are defined by size and voltage. The family type doesn't change regardless of where it is placed in the project. If you place a 1x4 lighting fixture in the living room or the bedroom, it is still a 1x4 lighting fixture.

Every time you place or define a family in a project, you are creating an "instance" of that family. Location is an instance parameter. Hardware or finish can be unique to each family places, so these can also be instance properties. Type properties are properties that are common to all elements of that type. Instance properties are properties that are unique to each individual element.

Throughout the rest of the text, we will be creating new types of families.
Here are the basic steps to creating a new family.

1. Select the element you want to define (switch gear, receptacle, panel, etc.).
2. Select **Edit Type** from the Properties pane.
3. Select **Duplicate**.
4. Rename: Enter a new name for your family type.
5. Redefine: Edit the structure, assign new materials, and change the dimensions.
6. Reload or Reassign: Assign the new type to the element.





Elements are the building blocks of any Revit Project. Everything used in a Revit project is considered an element.

There are three classes of Revit families:

- Model
- Datum
- View-Specific

Model families are families which you can physically touch if you were walking through a building, such as walls or electrical panels. A host model family is an element which can be used to hold or place other components. For example, a wall can host a door, window, or electrical panel. An element which is placed on a host is considered a component. Datums are levels, grids, and survey points. They are used to constrain the project. View-specific families are annotations, like dimensions or text, and detail items, like filled regions

Non-hosted families can be placed anywhere in the view. They are typically placed aligned to the elevation of the view. If you need to offset them from the elevation, place the element in the view, then select it, then change the offset from elevation value in the Properties palette to the desired location.

Hosted families must be placed on a surface or work plane and the surface must be visible in the view. If a fixture needs to be placed on a ceiling, the view needs to be a ceiling plan. Check on the ribbon to specify the type of face to be used for placement. If the placement face is deleted, any elements hosted by the face will also be deleted. If the placement face is moved, then the elements will also move.

Electrical Devices

The workflow to add electrical devices.

1. Select a category of family to add to the model on the ribbon.
2. Use the Type selector to choose the exact type in the category.
3. Place it as required on a vertical, horizontal, or work plane face.
4. Adjust the instance properties of the family in the Properties palette.
5. Tag if needed.

Some guidelines when working with Revit families to help you work efficiently:

- Familiarize yourself with the content libraries which come with the software as well as the libraries used within your company. Then, when you are looking for a specific family, you might be able to use or modify an existing family.
- When you modify a Revit family or element, save the family under a new name and save it to a custom library location, preferably on your company's server. This will make the family type available across projects as well as to other users in your company.
- Avoid accidentally selecting elements in a view so they don't get modified.
- If you hover your cursor over an element, a small dialog will appear informing you of the family and type.

Lighting Fixtures

Lighting fixtures follow the same workflow as other electrical devices and are powered the same way. They also have the ability to calculate an average estimated illumination level for spaces.

When loading light fixture families, make sure to pull them from the MEP folder, not the Architectural folder.

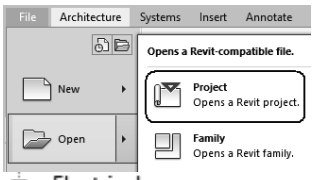
Exercise 2-1:

Working with Revit Families and Elements

Drawing Name: *elements.rvt*
Estimated Time: 20 minutes

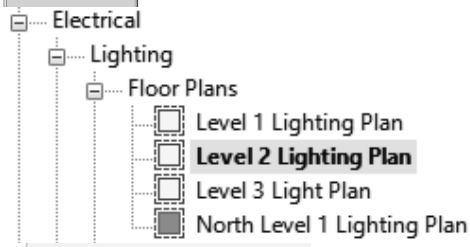
This exercise reinforces the following skills:

- Identifying elements and their families in a project
- Place a Component

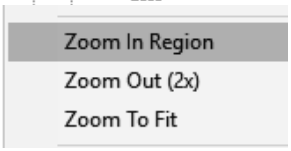
1. 

Open *elements.rvt.*

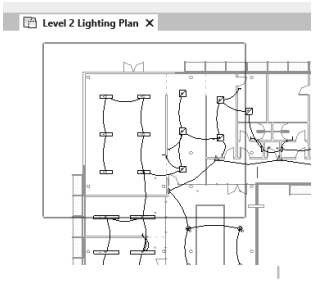
This file is downloaded from the publisher's website.

2. 

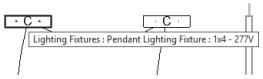
Open the **Level 2 Lighting Plan**.

3. 

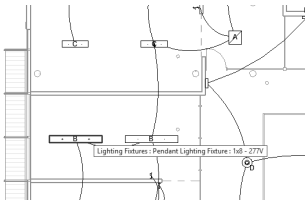
Right click and select **Zoom In Region**.

4. 

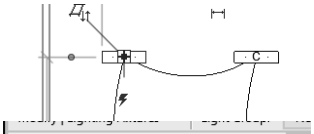
Draw a rectangle/region in the upper left corner of the building.

5. 

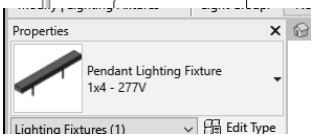
Hover the cursor over one of the lighting fixtures labeled 'C'.
Note that the family and type are displayed.

6. 

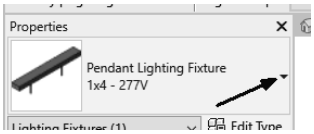
Pan down.
Hover the cursor over one of the lighting fixtures labeled 'B'.
Note that the family and type are displayed.
The 'B' and 'C' lighting fixtures are the same family, but different types.

7. 

Select the 'C' lighting fixture that is located on the upper left.

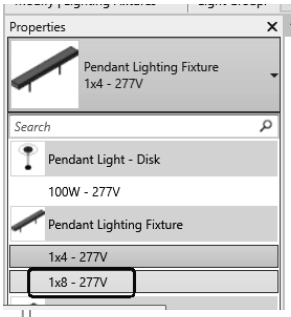
8. 

Note that the Family and Type are displayed in the Properties panel.

9. 

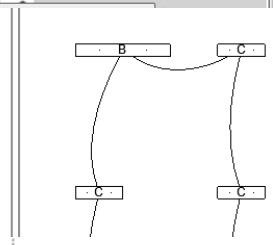
Select the small down arrow located at the top of the Properties panel.

This is called the Type Selector.

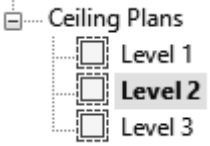
10. 

Select the **1x8-277v** from the Type Selector list.

Click **ESC** to release the selection.

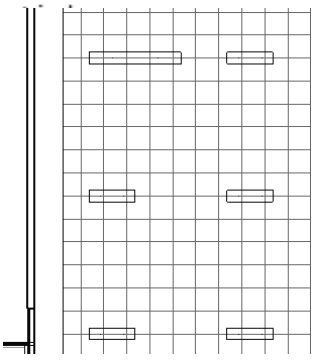
11. 

Notice that the element is updated to the new type which you selected.

12. 

Open the **Level 2** view under Ceiling Plans.

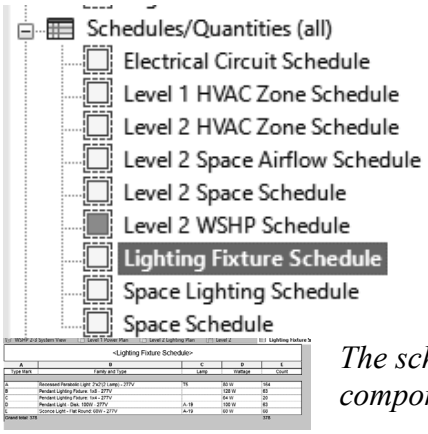
Look in the Coordination category.



Note that the lighting fixture which was changed in the previous view updated in this view.

Revit has bi-directional associativity. This means that if you make a change to a model element in one view, the change is propagated throughout the model. All the views update.

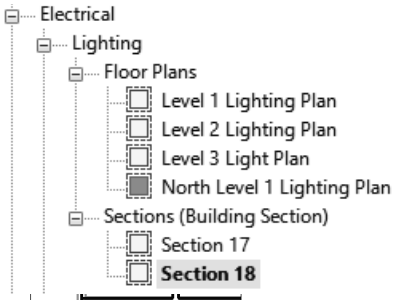
This only applies to model elements – NOT to annotation elements. Annotation elements, like dimensions and notes, are view-specific.

13. 

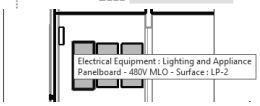
Open the **Lighting Fixture Schedule** view.

The schedule is a view-element. The light fixtures are a component/model element.

Notice the quantities for Type Mark A and Type Mark B. These quantities updated when the fixture was changed.

14. 

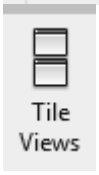
Open the **Section 18** view under Sections (Building Section).

15. 

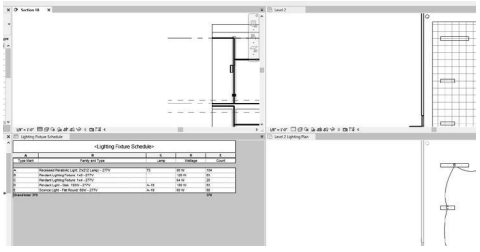
Hover your cursor over one of the electrical panels. *Note that the family and type are displayed.*

16. 

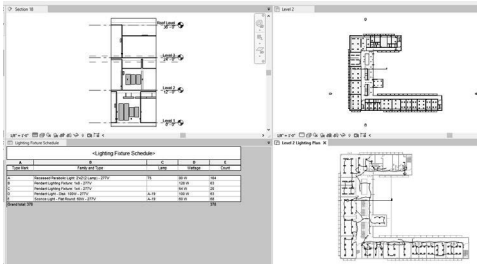
Select the **View** ribbon.

17. 

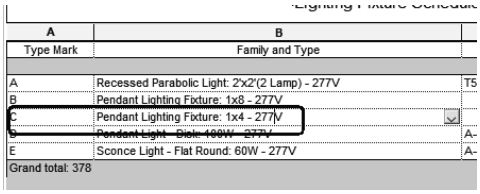
Select **Tile Views**.

18. 

The four open views are tiled.

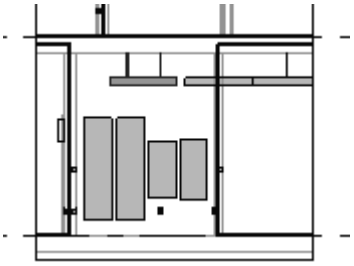
19. 

Click in the upper left window to activate it. Double click on the mouse wheel to Zoom All.
Repeat for the other windows.

20. 

In the window with the schedule:

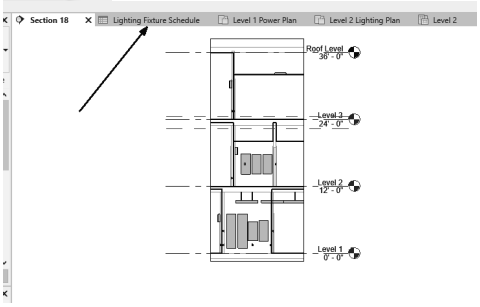
Put your mouse in the field for Family and Type for the 'C' type mark fixture.



Notice how the lighting fixture is highlighted in the other windows.

21. 

Click **Tab Views** on the View ribbon.

22. 

The windows close to a single active window. There are tabs that allow you to switch between the open windows.

23. Close without saving.

Many electricians need to determine the location of the stud framing in a wall as they are routing their wiring between the studs. Most Revit projects created by electrical workers are defined by using a host project which links to the files provided by the architect and the other sub-contractors. It is helpful to be able to select elements that reside in the linked file, so you can identify them and determine how they are defined.

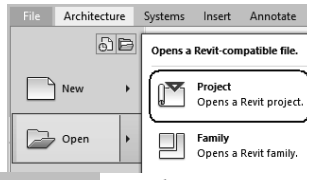
Exercise 2-2:

Identifying a Wall in a Linked File

Drawing Name: *simple-building.rvt*
Estimated Time: 10 minutes

This exercise reinforces the following skills:

- System Families
- Revit Links
- Walls

1. 

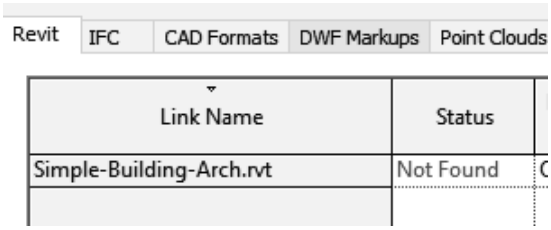
Open *simple-building.rvt.*

This file is downloaded from the publisher's website.

2. 

This project uses a Linked Revit project.
Open the **Insert** ribbon.

Select **Manage Links**.

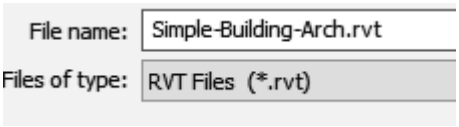
3. 

The linked file is named *Simple-Building-Arch.rvt.*

Because the files are now in a new location, the link has to be re-established.

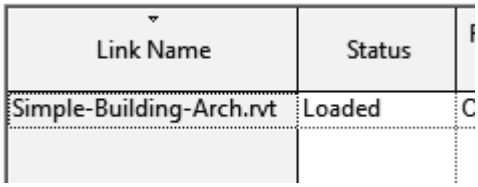
Highlight the file name.

Select **Reload From.**

4. 

Locate the file in the downloaded files from the publisher's website.

Select **Open**.
The file now shows as loaded.

5. 

Click **OK** to close the dialog.

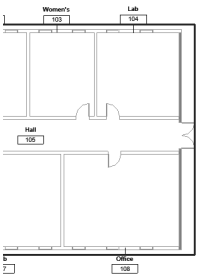
6. 

In the lower right hand corner of the display are selection tools.

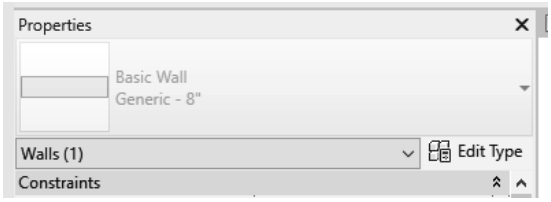
The link tool allows you to select elements which are linked to the host file.

The select underlay tool allows you to select elements which are part of the linked file.

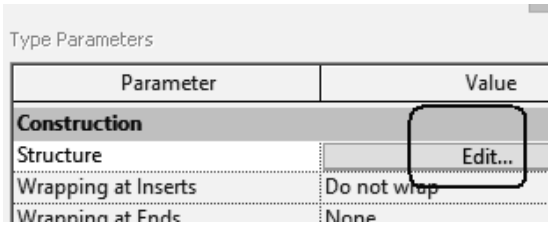
Click on these icons to enable.

7. 

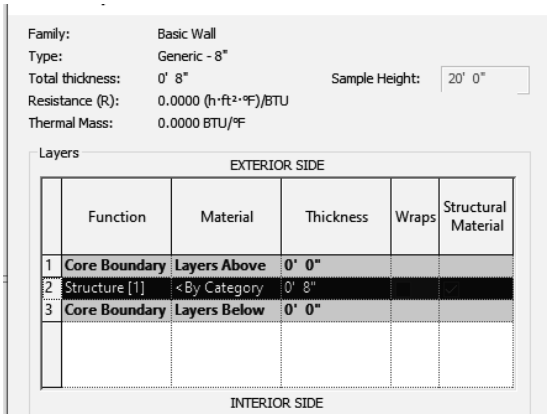
See if you can select the right vertical wall using the TAB key.

8. 

On the Properties palette, select **Edit Type**.

9. 

Select **Edit** next to Structure.

10. 

You see how the wall has been defined by the architect.

Notice that it has an exterior side and an interior side.

The Core boundary is the boundary around the stud or framing. Anything outside of the core boundary is considered a wrapped layer and is usually a finish, like gypsum board or siding.

11. Click **OK** twice to close the dialogs.
12. Left click in the window to release the selection.
13. Close the file without saving.

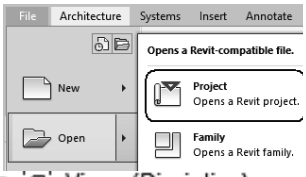
Exercise 2-3:

Place a Lighting Fixture and a Switch

Drawing Name: *simple-building.rvt*
Estimated Time: 10 minutes

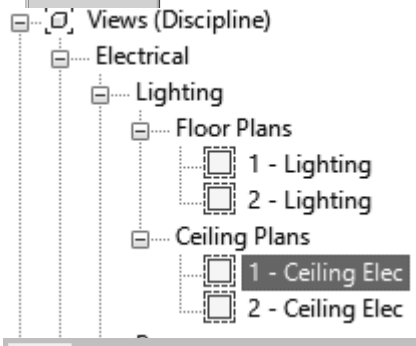
This exercise reinforces the following skills:

- System Families
- Revit Links
- Walls

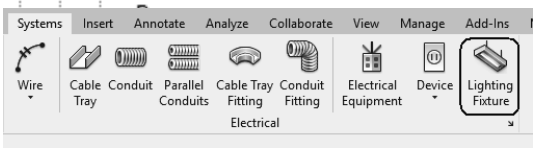
1. 

Open *simple-building.rvt.*

This file is downloaded from the publisher's website.

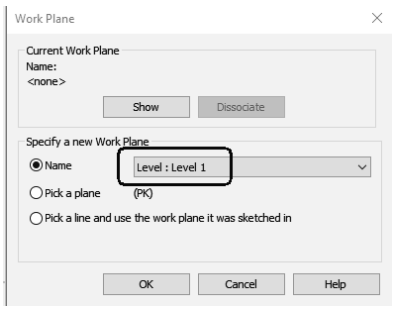
2. 

In the Project Browser, activate/open the **1-Ceiling Elec Ceiling Plan**.

3. 

Activate the Systems ribbon.

Select **Lighting Fixture**.

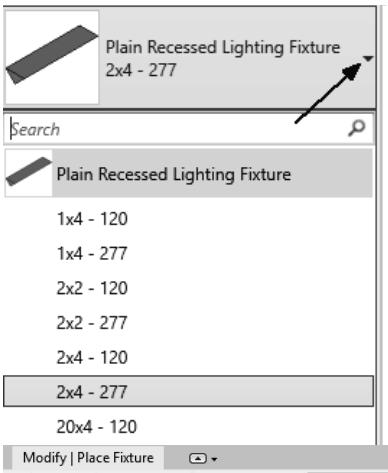
4. 

If the Work Plane dialog opens:

Enable **Name**.

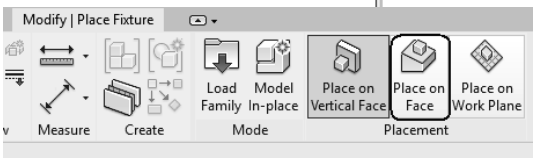
Select **Level 1**.

Click **OK**.

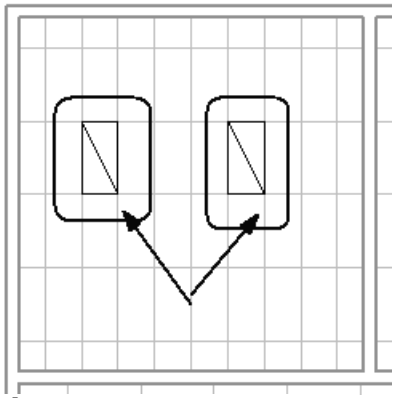
5. 

Use the Type Selector to select **Plain Recessed Lighting Fixture:2x4 – 277**.

The Type Selector is the small down arrow located to the right of the family name. The Type Selector is used when a family has more than one version available.

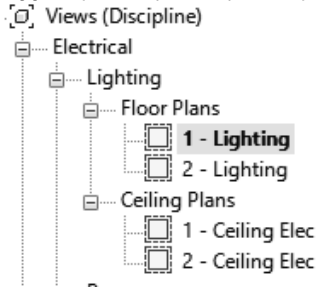
6. 

The ribbon has changed to a contextual style.
Enable **Place on Face.**
This means the fixture will be hosted by a work plane.

7. 

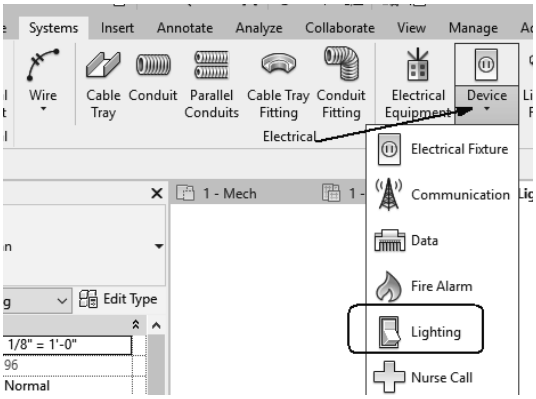
Use the SPACEBAR to rotate the light fixture.

Place two lighting fixtures in the upper left room.

8. 

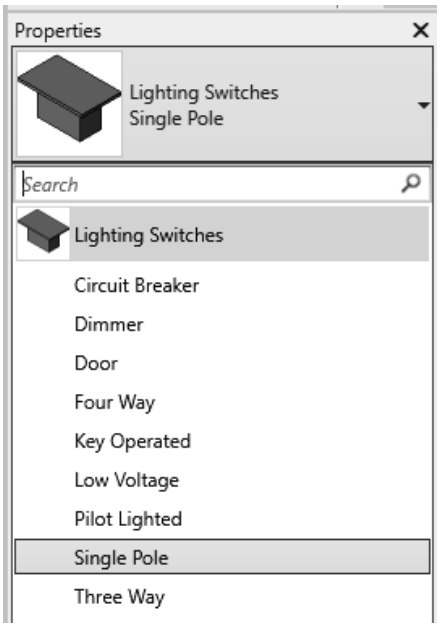
In the Project Browser, activate/open the **1-Lighting** floor plan.

Notice you see the lighting fixtures you placed in the ceiling plan. This is because Revit is a BIM software. If you make a change to the model, any relevant views will update.

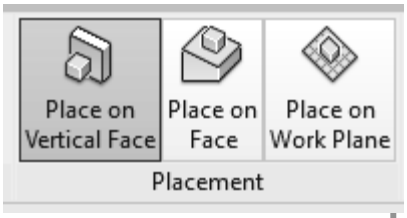
9. 

Activate the Systems ribbon.

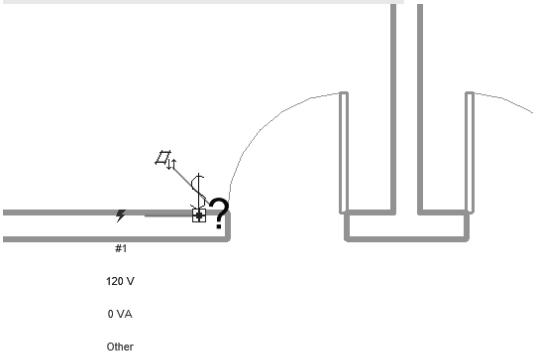
Select **Lighting** under the **Device** drop-down list.

10. 

Use the Type Selector to select **Lighting Switches – Single Pole**.

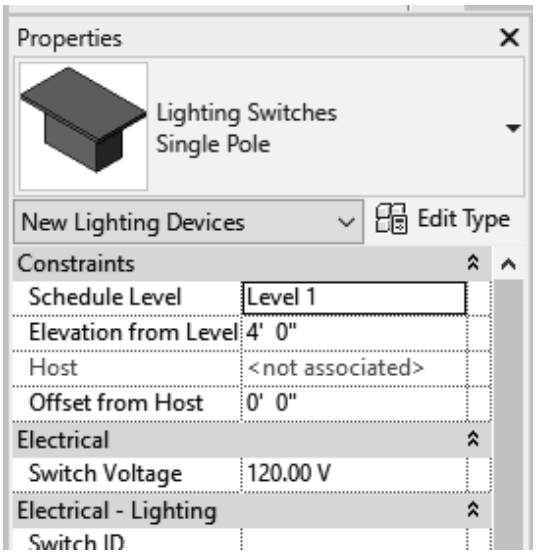
11. 

Enable **Place on Vertical Face** on the ribbon.

12. 

Place the switch to the left of the door in the upper left room where the lighting fixtures were placed.

Right click and select Cancel to exit the command.

13. 

Select the switch that was just placed.

Note that the Elevation from the Level is set to 4’-0”.

Save the project as *ex2-3.rvt.*

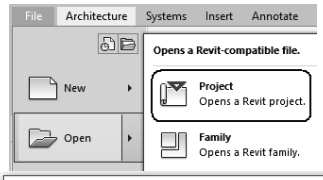
Exercise 2-4:

Select and Modify a Component

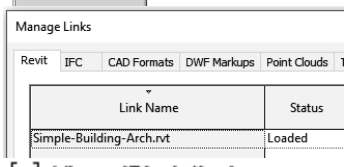
Drawing Name: *modify.rvt*
Estimated Time: 5 minutes

This exercise reinforces the following skills:

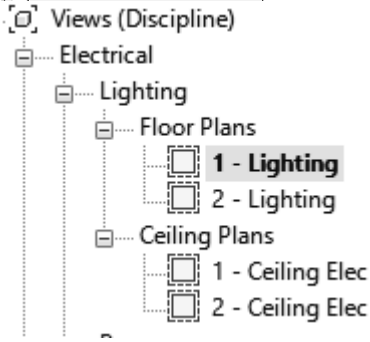
- Filter
- Type Selector

1. 

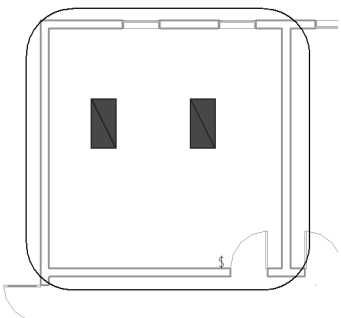
Open or continue working in *ex2-3.rvt.*

2. 

If you open the modify file, remember you have to reload the linked file.

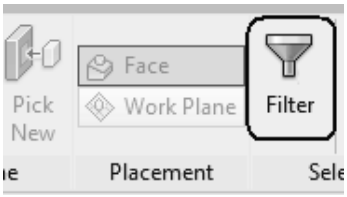
3. 

In the Project Browser, activate/open the **1-Lighting** floor plan.

4. 
Left click at the upper left corner of the room with the lighting fixtures. Hold down the left mouse button to create a window.

Left click at the lower right corner of the room with the lighting fixtures.

This creates a selection group using a window.

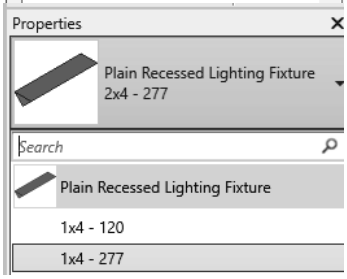
5. 

Select the **Filter** tool from the ribbon.

6. 

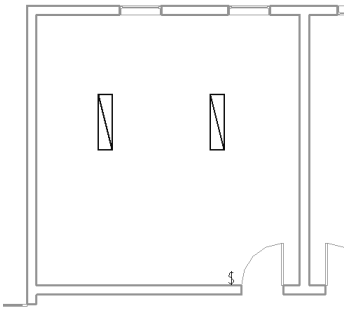
Uncheck any items in the list except for **Lighting Fixtures.**

Click **OK.**

7. 

Use the Type Selector to change the lighting fixtures to **1x4 – 277**.

Click **ESC** to release the selection.

8. 

The lighting fixtures update.

Save the project as *ex2-4.rvt.*

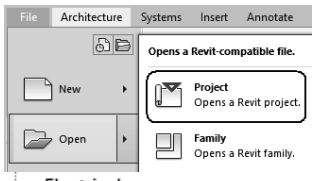
Exercise 2-5:

Copy a Component

Drawing Name: *copy.rvt*
Estimated Time: 5 minutes

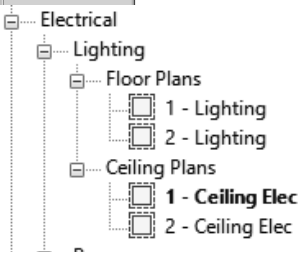
This exercise reinforces the following skills:

- Copy
- Type Selector

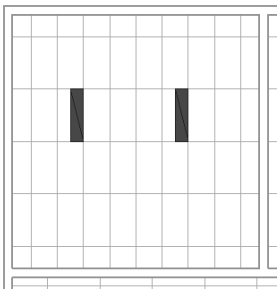
1. 

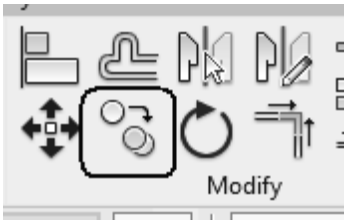
Open *copy.rvt.*

You may have to use Manage Links to reload the linked file.

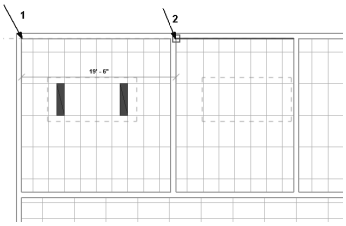
2. 

In the Project Browser, activate/open the **1-Ceiling Elec** Ceiling plan.

3. 
Window around the first room to select the two lighting fixtures.

4. 

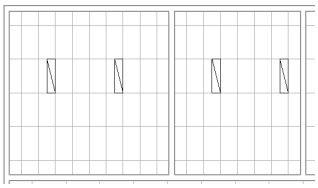
Select the **Copy** tool on the ribbon.

5. 

Select the top left corner of the first room as the base point.

Select the top left corner of the second room as the target point.

Right click and select Cancel to exit the command.

6. 

Save the file as *ex2-5.rvt*.

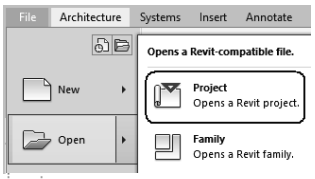
Exercise 2-6:

Mirror a Component

Drawing Name: *mirror.rvt*
Estimated Time: 5 minutes

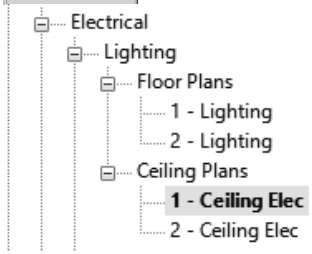
This exercise reinforces the following skills:

- Mirror→Draw Axis

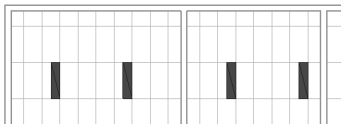
1. 

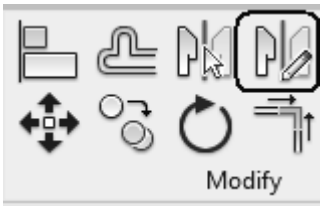
Open *mirror.rvt.*

You may have to use Manage Links to reload the linked file.

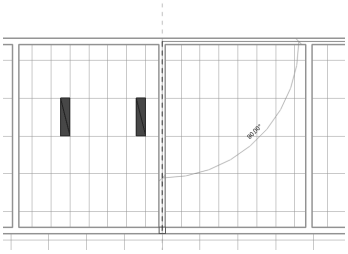
2. 

In the Project Browser, activate/open the **1-Ceiling Elec** Ceiling plan.

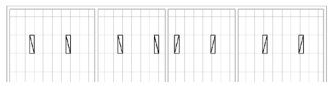
3. 
Window around the lighting fixtures to select them.

4. 

Select the **Mirror→Draw Axis** tool.

5. 
Select the top of the center line of the wall.

Select the bottom of the center line of the wall.

6. 
The light fixtures are mirrored to the other rooms.

Save as *ex2-6.rvt*.

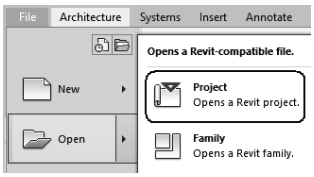
Exercise 2-7:

Align a Component

Drawing Name: *align.rvt*
Estimated Time: 5 minutes

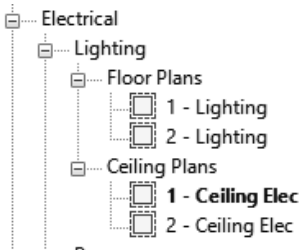
This exercise reinforces the following skills:

- Align

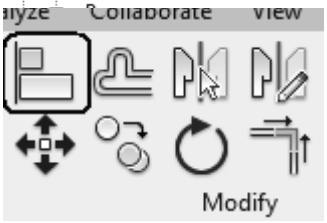
1. 

Open *align.rvt.*

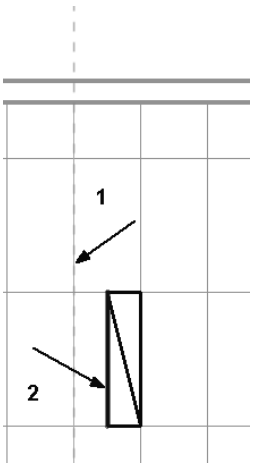
You may have to use Manage Links to reload the linked file.

2. 

In the Project Browser, activate/open the **1-Ceiling Elec** Ceiling plan.

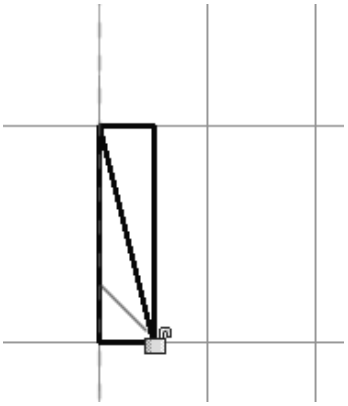
3. 

Select the **ALIGN** tool on the Modify ribbon.

4. 

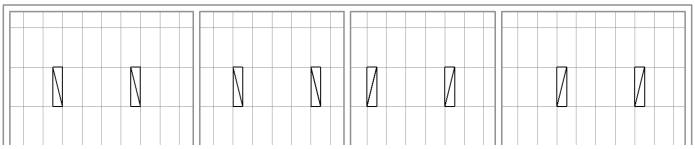
Select the ceiling grid line to the left of the lighting fixture.

Select the left edge of the lighting fixture.

5. 

The lighting fixture's position adjusts.

6. Use the ALIGN tool to adjust the position of the lighting fixtures so they are aligned to the ceiling grid.



Save as *ex2-7.rvt*.

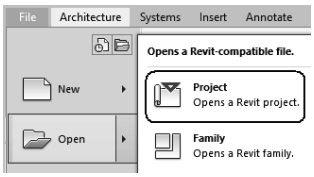
Exercise 2-8:

Draw, Modify, and Offset Cable Trays

Drawing Name: *cable_trays.rvt*
Estimated Time: 30 minutes

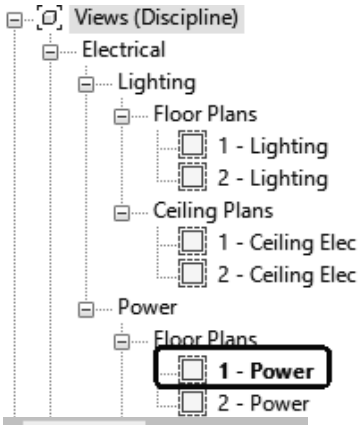
This exercise reinforces the following skills:

- Cable Trays
- Offset
- Trim
- Split
- Options Bar
- Properties

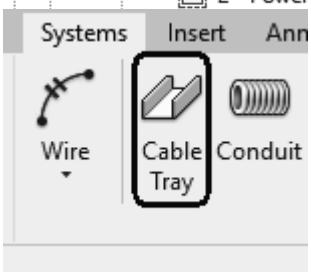
1. 

Open *cable_trays.rvt.*

You may have to use Manage Links to reload the linked file.

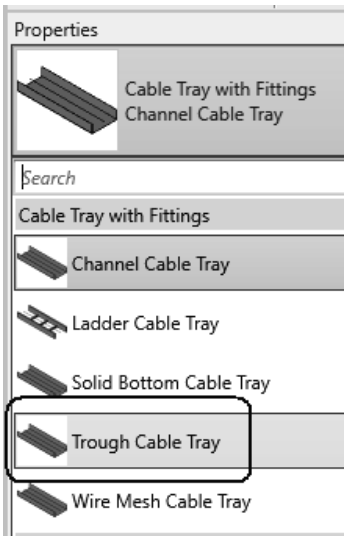
2. 

In the Project Browser, activate/open the **1-Power** floor plan.

3. 

Activate the Systems ribbon.

Select the **Cable Tray** tool.

4. 

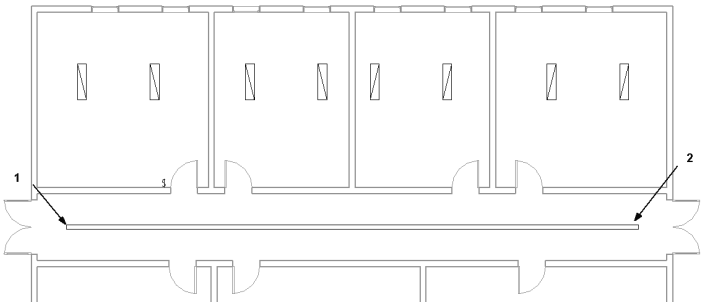
Select the **Trough Cable Tray** from the Type Selector.

5. On the Options bar:

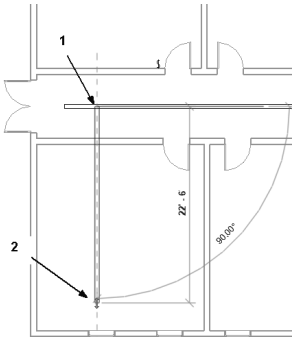
Set the Width to **6”**.
Set the Height to **2”.**
Set the Middle Elevation to **10’-0”**.

6. Left click to place the start of the cable tray at the left side of the corrider (indicated by 1).

Left click to place the end of the cable tray at the right side of the corrider (indicated by 2).



7. Click **ESC** to complete placing the tray but remain in the Cable Tray command.

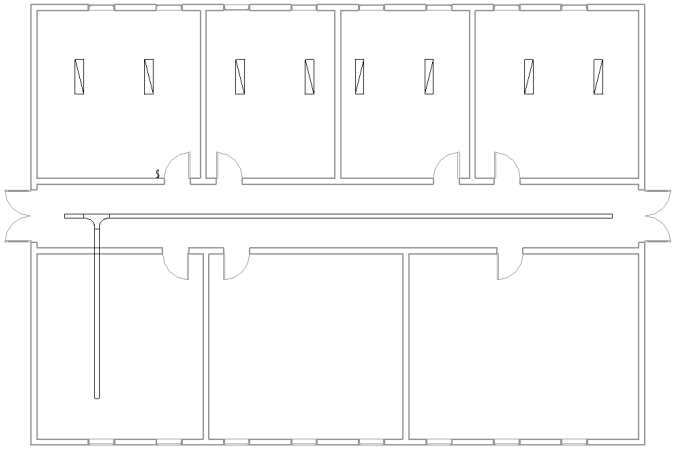
8. 

Place a second cable tray perpendicular to the first cable tray and into the Mech/Elec room (lower left).

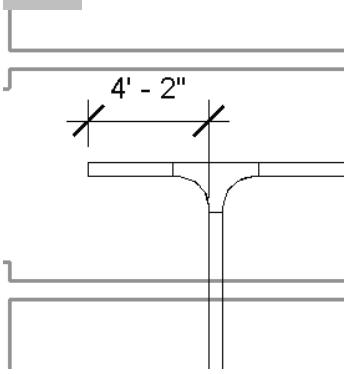
The new cable tray should be 22’ 6” long.

Right click and select **Cancel** to exit the command.

9. This is what the layout should look like.

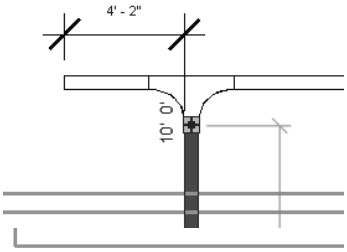


10.  Select the ALIGNED DIMENSION tool from the QAT.

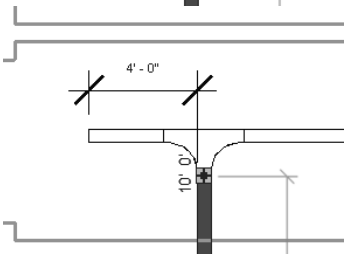
11. 

Place a dimension between the end of the horizontal cable tray and the right side of the perpendicular cable tray.

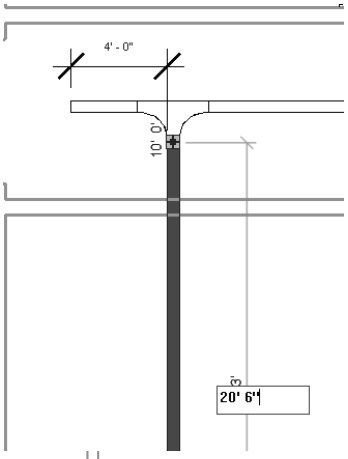
12. 
Select the vertical cable tray.



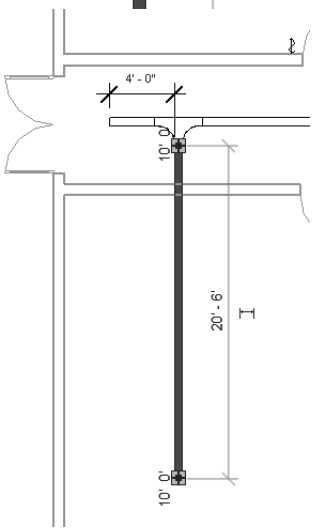
The temporary dimension appears.

13. 

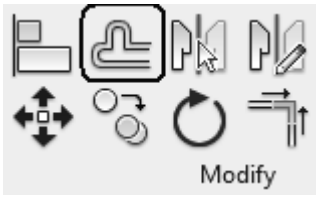
Change the horizontal dimension to **4’ 0”**.

14. 

Change the vertical dimension to **20’ 6”**.

15. 

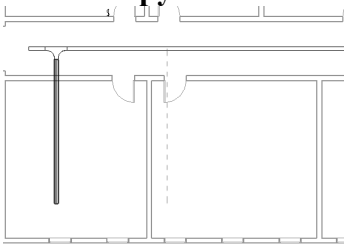
Select the vertical cable tray so it is highlighted.

16. 

Select the **Offset** tool.

17. On the Options bar:

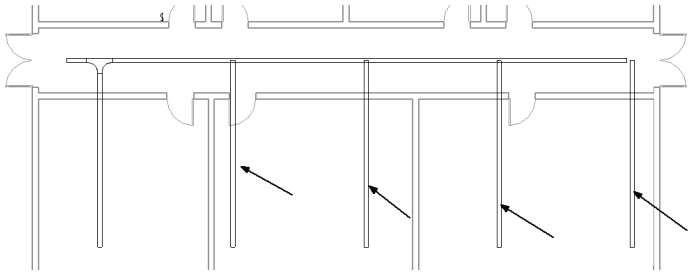
Enable **Numerical**.
Set the Offset to **15’-0”**.
Enable **Copy**.

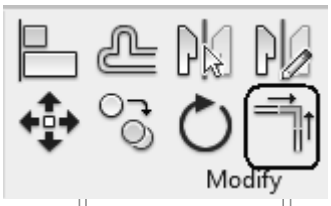
18. 

Left pick the cable tray.

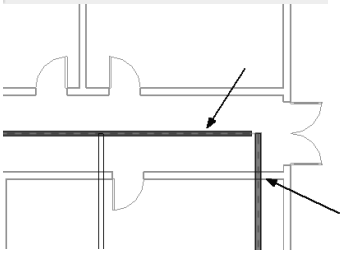
Use the Preview to determine the cable tray is placed to the right.

19. Repeat the Offset to place a total of five vertical cable trays.

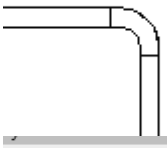


20. 

Select the **Trim to Corner** tool on the Modify ribbon.

21. 
Select the horizontal cable tray and the far right cable tray.

22. The two cable trays are joined.

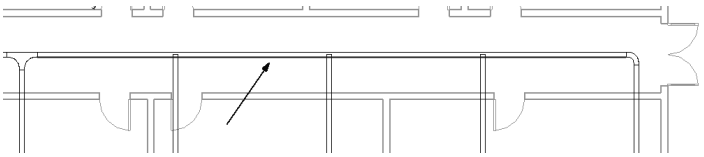


23. 

On the Modify ribbon:

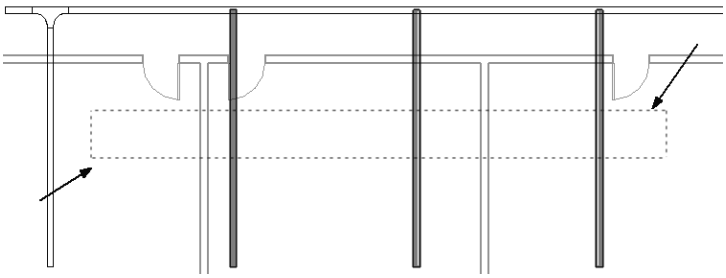
Select the **Trim/Extend Multiple** tool.

24. Select the lower line of the horizontal cable tray to define the boundary of the trim.

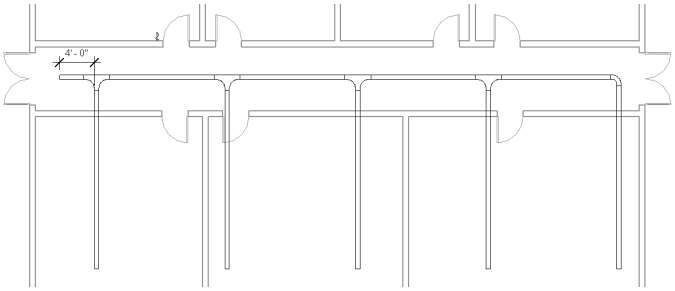


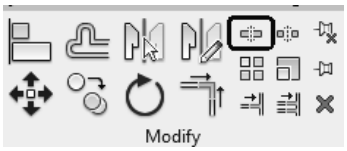
25. Left pick to the right of the fourth vertical cable tray to start the selection/crossing window.

    Left pick to the left of the second vertical cable tray to complete the selection/crossing window.

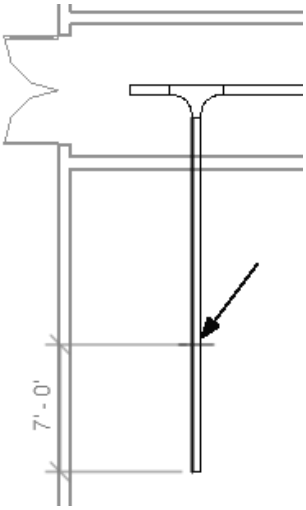


26. This is the cable tray layout so far.



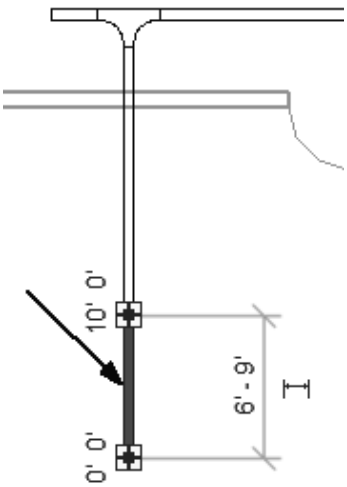
27. 

Select the **Split** tool on the Modify ribbon.

28. 

Use the temporary dimension to split the cable tray 7'-0" from the end.

Right click and select Cancel twice to exit the command.

29. 

Select the lower part of the cable tray.

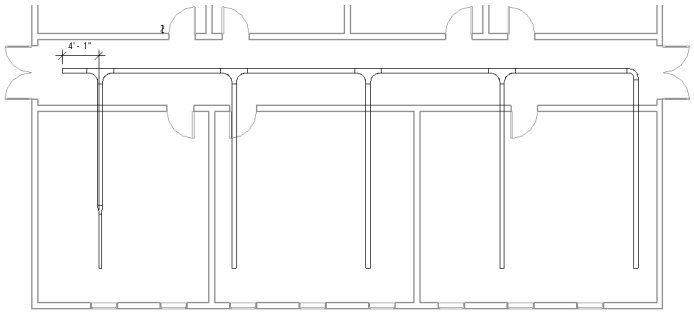
30. 

On the Options bar:

Set the Width to **4".**

Left click in the display window to release the selection.

31. Save as *ex2-8.rvt.*



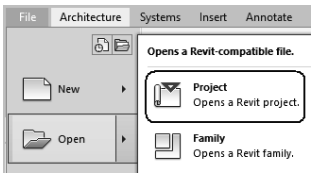
Exercise 2-9:

Place Light Fixtures and Switches (reprised)

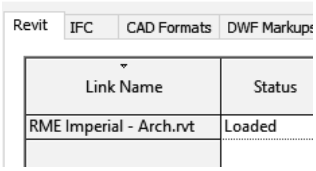
Drawing Name: *i_elec_circuits.rvt*
Estimated Time: 20 minutes

This exercise reinforces the following skills:

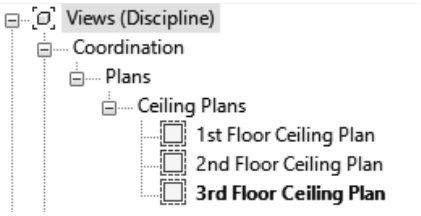
- Place Components
- Copy

1. 

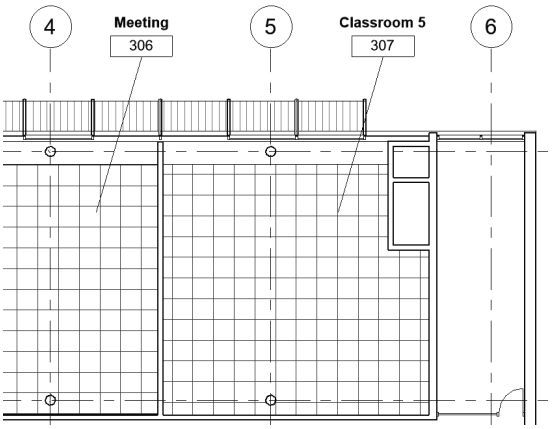
Open *i_elec_circuits.rvt.*

2. 

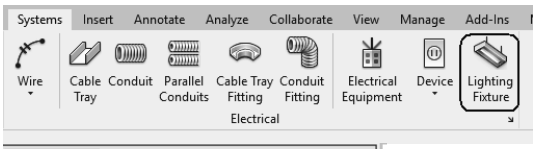
This file uses RME Imperial-Arch as the linked file. Use the Manage Links tool on the Insert tab to reload the file, if necessary.

3. 

Verify that you are in the **3rd Floor Ceiling Plan** view.

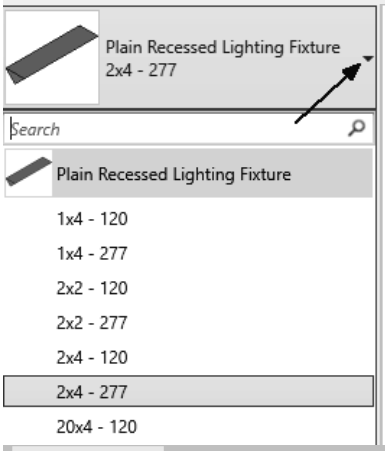
4. 

Use **Zoom In Region** to change the display to focus on Classroom 5 Room 307 between Grids 5 and 6.

5. 

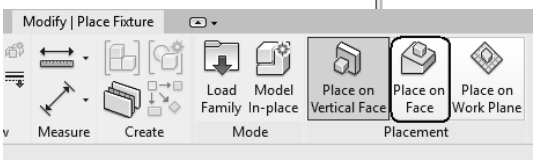
Activate the Systems tab of the ribbon.

Select **Lighting Fixture**.

6. 

Use the Type Selector to select **Plain Recessed Lighting Fixture:2x4 – 277**.

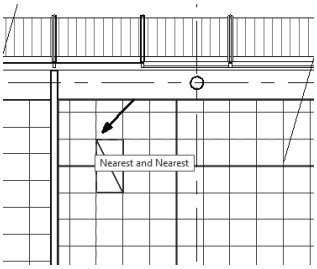
The Type Selector is the small down arrow located to the right of the family name. The Type Selector is used when a family has more than one version available.

7. 

The ribbon has changed to a contextual style.

Enable **Place on Face.**

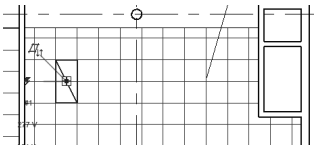
This means the fixture will be hosted by a work plane.

8. 

Use the SPACE BAR to rotate the component prior to placing.

Left click to place in the upper left area of the room.

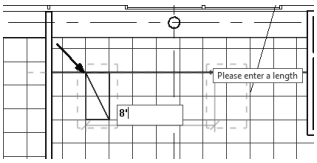
Right click and select Cancel to exit the command.

9. 

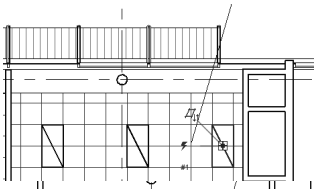
Select the light fixture you just placed.

10. 

Select the **Copy** tool from the ribbon.

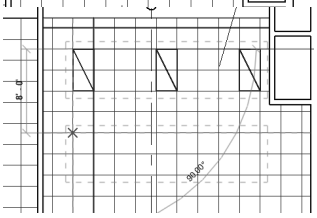
11. 

Left click to select the upper left corner of the light fixture as the base point.
Move the cursor to the right and type **8'** for the distance.
Click ENTER or left click to complete the copy.

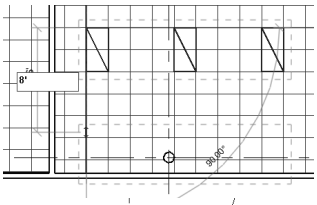
12. 

Repeat to place a third light fixture 8’ to the right of the copied/second light fixture.

Exit the COPY command.

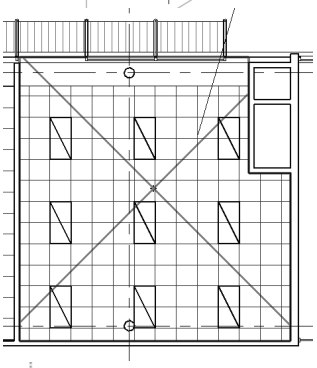
13. 

Use the CTL key to select the three light fixtures.
Use the COPY tool to place a copy of the three fixtures 8’ below them.

14. 

Repeat to place a third row of light fixtures 8’ below the second row.

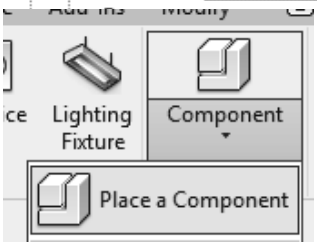
Exit the COPY command.

15. 

The room should show a total of nine light fixtures.

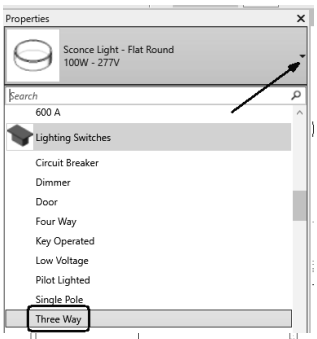
16. 

Open the **3rd Floor Lighting** floor plan.

17. 

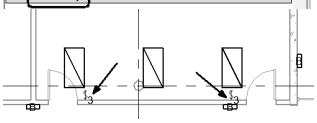
Switch to the Architecture ribbon.

Select **Component→Place a Component**.

18. 

Use the Type Selector to locate the **Lighting Switches→Three Way**.

Notice that the available components are sorted alphabetically.

19. 
Place a light switch next to each door located at the south wall of the room.

20. Save as *ex2-9.rvt*.

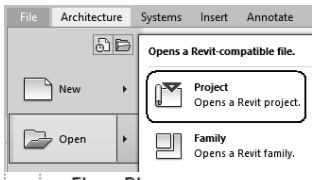
Exercise 2-10:

Adding and Modifying Equipment, Devices and Fixtures

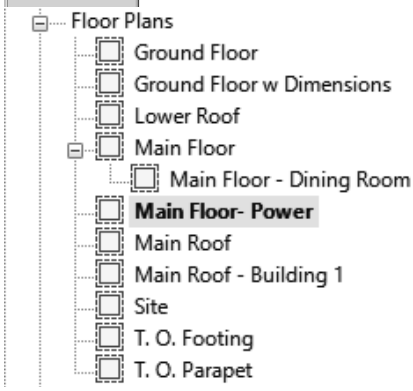
Drawing Name: *adding_elements.rvt*
Estimated Time: 20 minutes

This exercise reinforces the following skills:

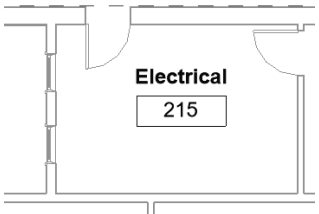
- Place Components
- Electrical Equipment
- Load Families
- Type Selector
- Naming Equipment

1. 

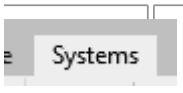
Open *adding_elements.rvt.*

2. 

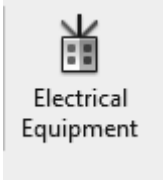
Verify that you are in the **Main Floor – Power** floor plan view.

3. 

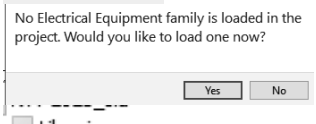
Zoom into the **Electrical Room: 215**.

4. 

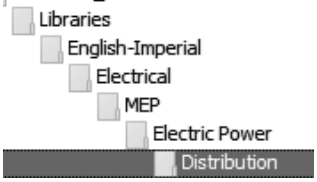
Activate the Systems ribbon.

5. 

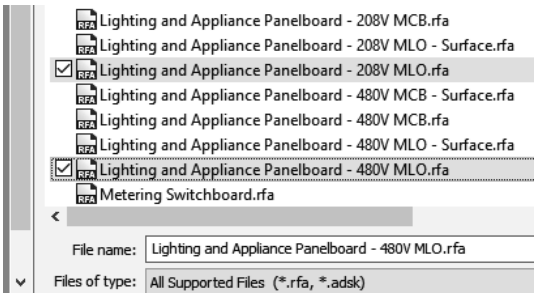
Select the **Electrical Equipment** tool.

6. 

Click **Yes**.

7. 

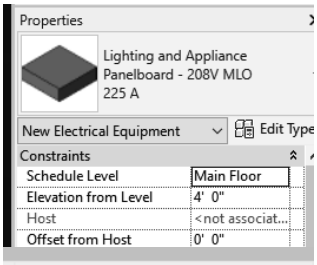
Browse to the *Distribution* folder under *US Imperial\Electrical\MEP\Electric Power.*

8. 

Hold down the CTL key to make a multiple selection.

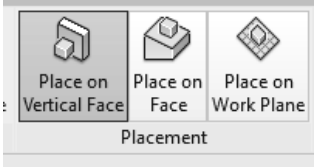
Select *Lighting and Appliance Panelboard – 208V MLO* and *Lighting and Appliance Panelboard – 480V* MLO.

Click **Open**.

9. 

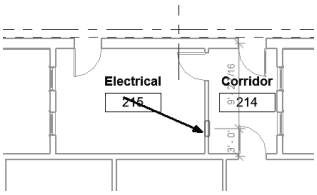
On the Properties palette:

Verify that the *Lighting and Appliance Panelboard – 208V MLO-225A* is active.

10. 

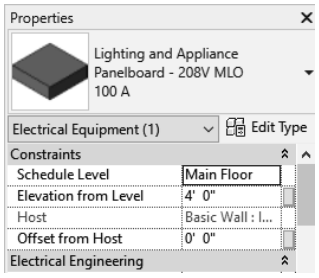
This is a face-based component, meaning it needs a vertical or horizontal face to be placed. Since it is a hosted component, if the wall where it is placed moves, it will also move.

Enable **Place on Vertical Face** on the ribbon.

11. 

Place it on the east wall of Room 215.

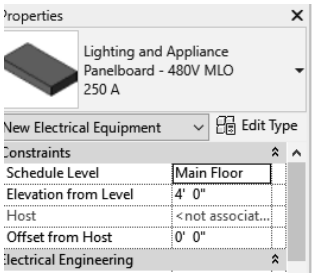
Type ESC out of the command.

12. 

Select the panel that was just placed.

On the Properties palette, note the elevation from the level.

Left click anywhere in the display window to release the selection.

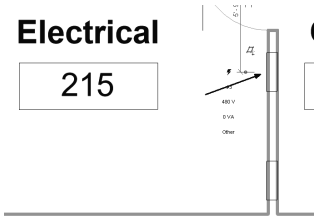
13. 

Return to the Systems ribbon.

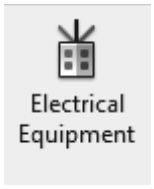
Select the **Electrical Equipment** tool.

Using the Type Selector:
Select *Lighting and Appliance Panelboard – 480V MLO 250A*.

Note that by default it is located at the same elevation as the other panelboard.

14. 

Place the *Lighting and Appliance Panelboard – 480V MLO 250A* above the other panelboard close to the door with a space between the two elements.

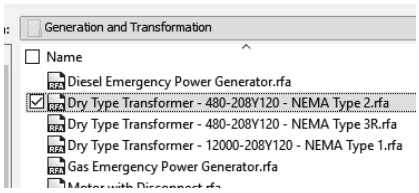
15. 

Return to the Systems ribbon.

Select the **Electrical Equipment** tool.

16. 

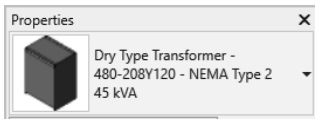
Select **Load Family**.

17. 

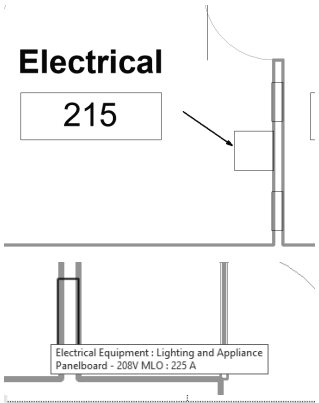
Browse to the *Generation and Transformation* folder.

Select the *Dry Type Transformer – 480-208Y120-NEMA Type 2*.

Click **Open**.

18. 

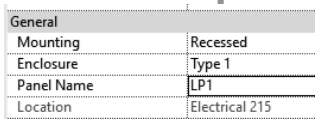
Use the Type Selector to select the **45 kVA** type.

19. 

Place the transformer next to the panelboards in Room 215.

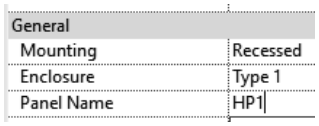
Use the SPACEBAR to rotate the element prior to placing.

Escape out of the command.
Remember that if you hover the cursor over an element a tooltip will appear showing you the element information.

20. 

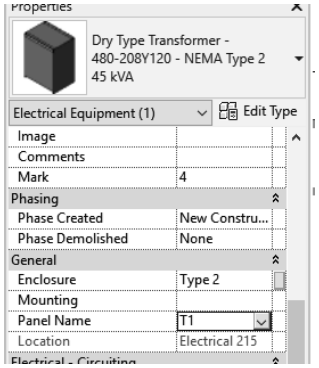
Select the 208V MLO panelboard.

In the Properties palette:
Scroll down to the General area.
Type **LP1** in the Panel Name.

21. 

Select the 480V MLO panelboard.

In the Properties palette:
Scroll down to the General area.
Type **HP1** in the Panel Name.

22. 

Select the Transformer.

In the Properties palette:
Scroll down to the General area.
Type **T1** in the Panel Name.

23. Save as *ex2-10.rvt*.

Room Aware

In most instances, families placed within a room are associated with the room in a schedule. There are a few circumstances in which a family instance does not report its room correctly. When families such as furniture, doors, windows, casework, specialty equipment and generic models are placed in a project, sometimes parts of their geometry are located outside a room, space, or within another family, which results in no calculable values being reported.

Room Calculation Points are used to make loadable families "room aware." Once you enable the room calculation point, the family will display the correct room in the project schedule.

To enable and modify the Room Calculation Point to reorient room aware families:

1. Select the family instance in the drawing area.
2. Click Modify | <Element> tab ➤ Mode panel ➤ Edit Family.
3. In the Family Editor, open a floor plan view of the family.
4. On the Properties palette, select the Room Calculation Point parameter in the Other section. The point is now visible in the drawing area as a green dot.
5. Select the Room Calculation Point and move it to a location that will not be obscured by geometry when placed in the project.
6. Click Modify tab ➤ Family Editor panel ➤ Load into Project.

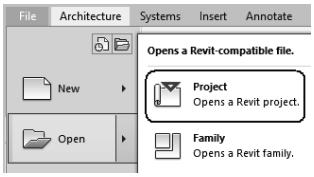
Exercise 2-11:

Making a Component Room Aware

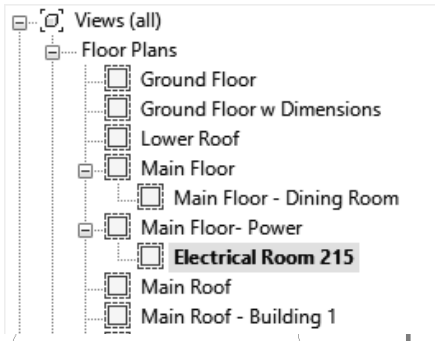
Drawing Name: *room aware.rvt*
Estimated Time: 15 minutes

This exercise reinforces the following skills:

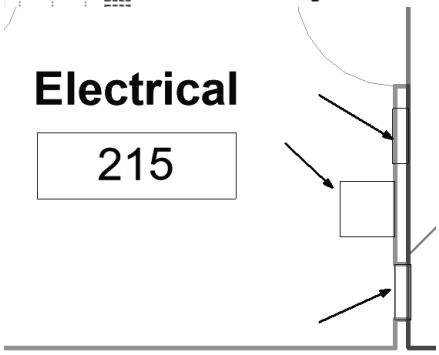
- Schedules
- Room Calculation Point
- Edit Family

1. 

Open *room aware.rvt.*

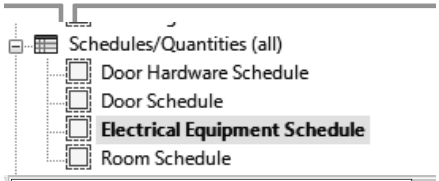
2. 

Open the **Electrical Room 215** floor plan.

3. 

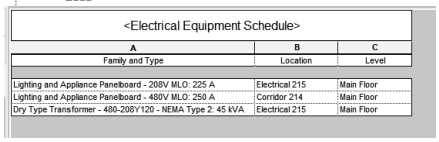
There are three different types of electrical equipment mounted on the east wall.

If you hover your mouse over each rectangle, you can identify the different equipment.

4. 

Scroll down the Project Browser.

Open the **Electrical Equipment Schedule**.

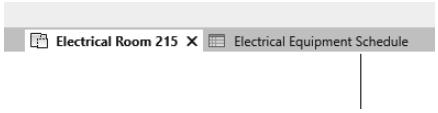
5. 

<Electrical Equipment Schedule>

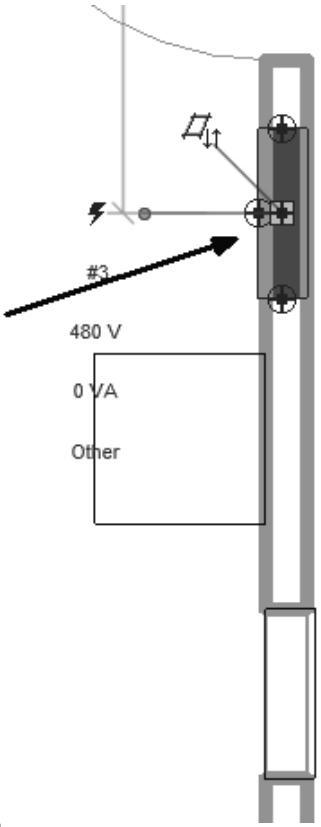
A	B	C
Family and Type	Location	Level
Lighting and Appliance Panelboard - 208V MLO: 225 A	Electrical 215	Main Floor
Lighting and Appliance Panelboard - 480V MLO: 250 A	Corridor 214	Main Floor
Dry Type Transformer - 480-208Y120 - NEMA Type 2: 45 kVA	Electrical 215	Main Floor

The three pieces of electrical equipment are listed, but one of the panelboards is listed as being in the corrider instead of the Electrical Room.

This can be fixed by changing the room calculation point in the family.

6. 

Use the tabs at the top of the display window to switch back to the Electrical Room 215 window.

7. 

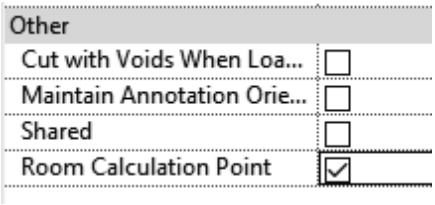
Select the 480V MLO panelboard.

Click **Edit Family** on the ribbon.

8. 

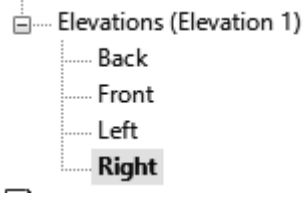
In the Project Browser:

Switch to the **Ref. Level** floor plan.

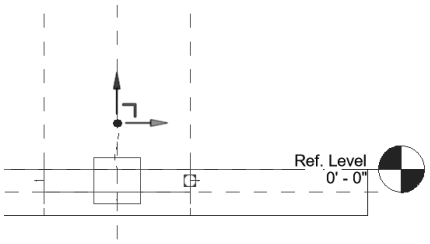
9. 

In the Properties palette:

Enable **Room Calculation Point**.

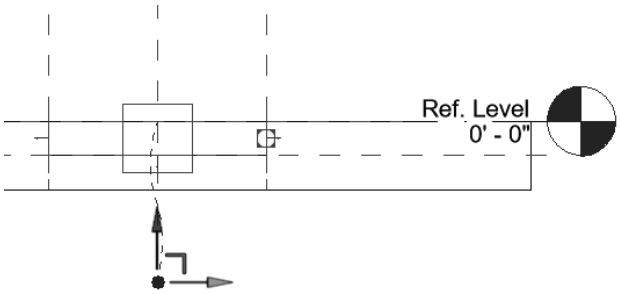
10. 

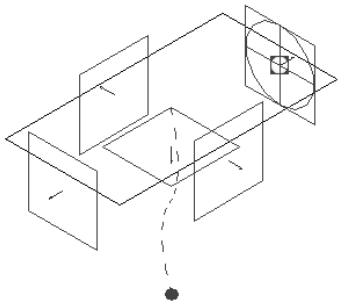
Switch to the **Right Elevation** view.

11. 

Select the Room Calculation Point in the view.

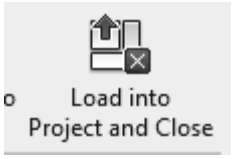
Use the MOVE tool to adjust the position of the Room Calculation Point to below the Ref Level.



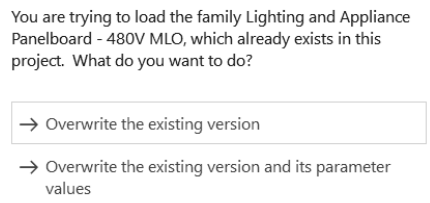
12. 

Switch to a 3D view.

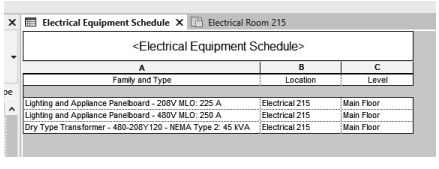
Save the family to your work folder.

13. 

Click **Load into Project and Close** on the ribbon.

14. 

Click **Overwrite the existing version and its parameter values**.

15. 

Click the tab for the Electrical Equipment Schedule.

The panelboard now is listed in the correct location.

16. Save as *ex2-11.rvt*.

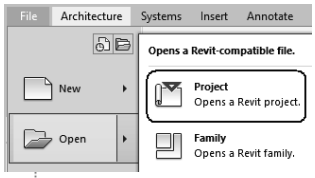
Exercise 2-12:

Adding Receptacles

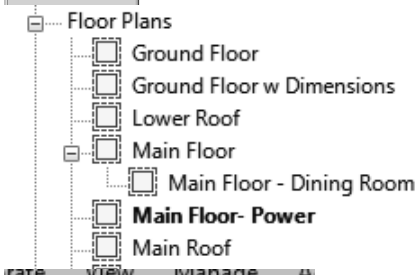
Drawing Name: *receptacles.rvt*
Estimated Time: 15 minutes

This exercise reinforces the following skills:

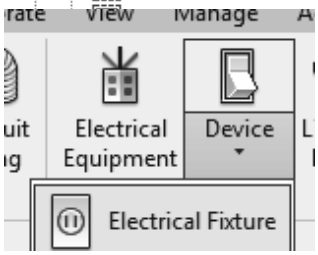
- Place Components
- Electrical Fixture
- Load Families
- Type Selector

1. 

Open *receptacles.rvt.*

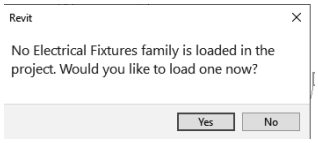
2. 

Verify that you are in the **Main Floor – Power** view.

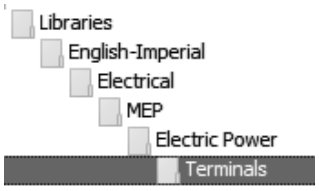
3. 

Activate the Systems ribbon.

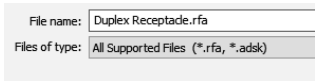
Select **Device→Electrical Fixture**.

4. 

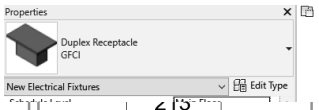
Click **Yes**.

5. 

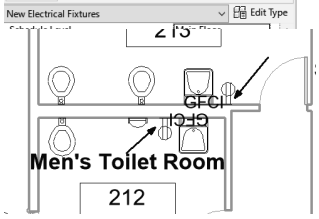
Browse to the *Terminals* folder under *Electric Power*.

6. 

Select the *Duplex Receptacle*.
Click **Open**.

7. 

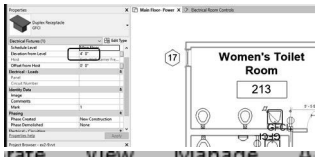
Select the **GFCI** type from the Properties palette.

8. 

Place a GFCI receptacle next to each of the sinks in the lavatories.

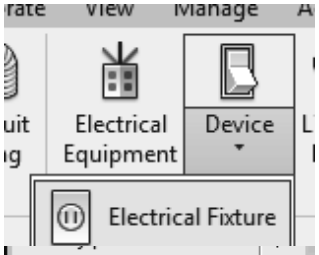
Note that the receptacles are hosted by walls. You do not see the models unless you hover over a wall.

Cancel out of the command.

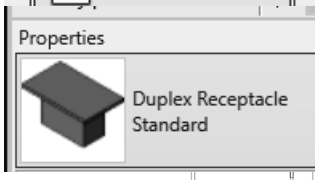
9. 

Select one of the receptacles that was placed.

Note the elevation of the receptacle in the Properties palette.

10. 

Select **Device→Electrical Fixture**.

11. 

Select the **Standard** type from the Properties palette.

Note the elevation of the receptacle in the Properties palette.

12. 

Place four receptacles in each of the sleeping quarters as shown.

13. Save as *ex2-12.rvt.*

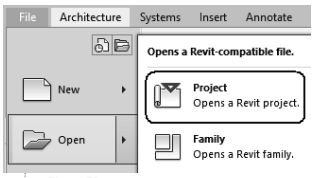
Exercise 2-13:

Create a New Family Type

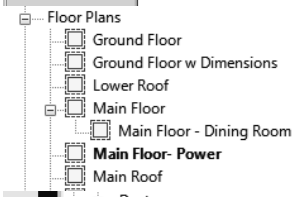
Drawing Name: *receptacle_family.rvt*
Estimated Time: 20 minutes

This exercise reinforces the following skills:

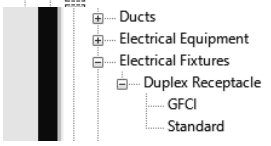
- Place Components
- Electrical Fixtures
- Load Families
- Type Selector
- Type Properties
- New Type

1. 

Open *receptacle_family.rvt.*

2. 

Open the **Main Floor – Power** floor plan.

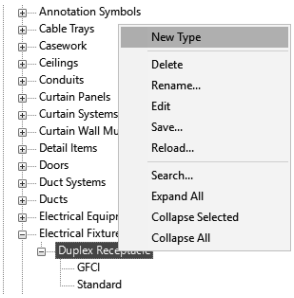
3. 

In the Project Browser:

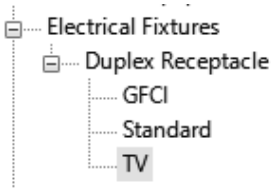
Scroll down to the *Families* category.
Locate the *Electrical Fixtures* folder.
Locate the **Duplex Receptacle** family.

There are currently two types:

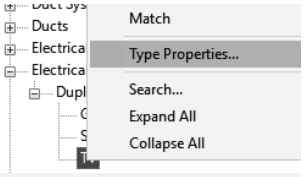
- GFCI
- Standard

4. 

Highlight the **Duplex Receptacle** family.
Right click and select **New Type**.

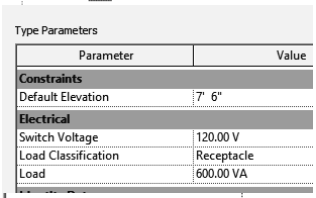
5. 

Name the new type **TV**.

6. 

Right click on the **TV** type.

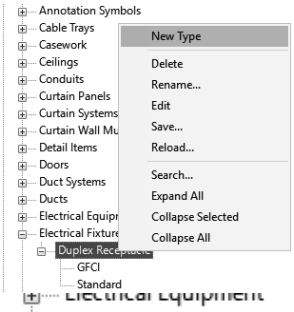
Select **Type Properties**.

7. 

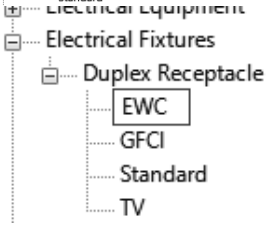
Set the Default Elevation to **7' 6"**.
Set the Load to **600.00 VA**.

8. 

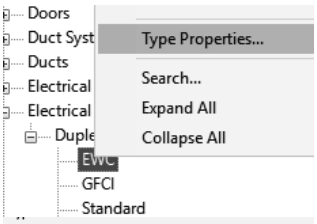
Scroll down to the Other category.
Locate the **Label** field.
Set the Value to **TV**.
Click **OK**.

9. 

Highlight the **Duplex Receptacle** family.
Right click and select **New Type**.

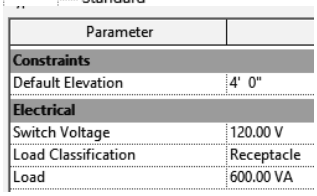
10. 

Name the new type **EWC**.

11. 

Right click on the **EWC** type.

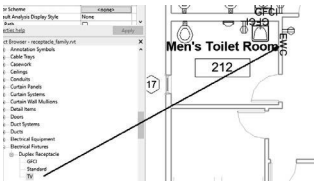
Select **Type Properties**.

12. 

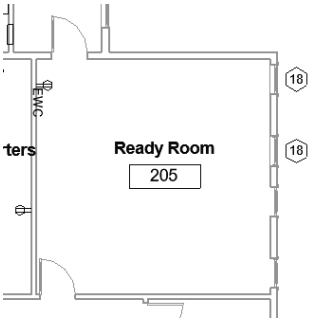
Set the Default Elevation to **4' 0"**.
Set the Load to **600.00 VA**.

13. 

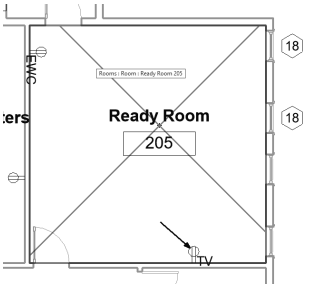
Scroll down to the Other category.
Locate the **Label** field.
Set the Value to **EWC**.
Click **OK**.

14. 

Using the left mouse button, drag and drop the EWC receptacle family to place it on the wall outside the **Room 212 - Men's Lavatory**.

15. 

Using the left mouse button, drag and drop the EWC receptacle family to place it on the west wall in **Room 205 – Ready Room**.

16. 

Using the left mouse button, drag and drop the TV receptacle family to place it on the south wall in **Room 205 – Ready Room**.

17. Save as *ex2-13.rvt.*

Revit doesn't have a lot of MEP families which work well with creating legends. In this exercise, we create a detail component family which can be used when creating an electrical symbol legend.

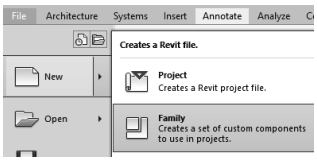
Exercise 2-14:

Create a Detail Component Family

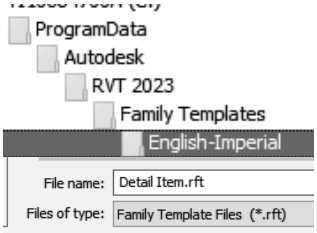
Drawing Name: none
Estimated Time: 10 minutes

This exercise reinforces the following skills:

- Families
- Detail Components
- Detail Lines
- Dimensions

1. 

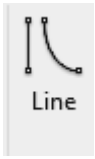
Go to **Files→New→Family**.

2. 

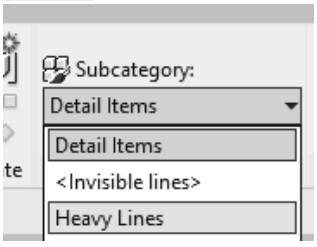
Browse to the *English-Imperial* folder under Family Templates.

3.

Select the *Detail Item.rft* template.
Click **Open**.

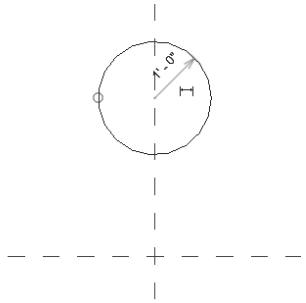
4. 

Select **Line** from the Create ribbon.

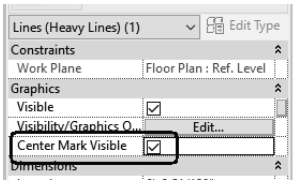
5. 

On the ribbon:

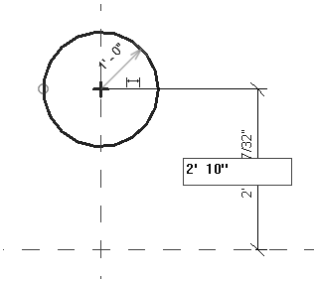
Set the line style to **Heavy Lines**.

6. 

Draw a 1’ radius circle above the horizontal reference plane.

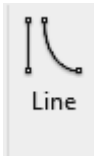
7. 

Select the Circle.
On the Properties palette:
Enable **Center Mark Visible**.

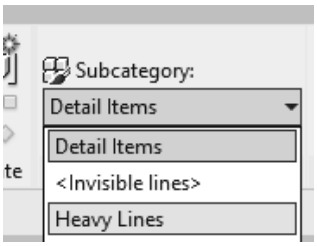
8. 

Use the **ALIGNED** dimension tool on the Create ribbon to position the circle 2’ 10” above the horizontal reference plane.

Place the dimension.
Select the circle.
Change the temporary dimension.
The aligned dimension will update.

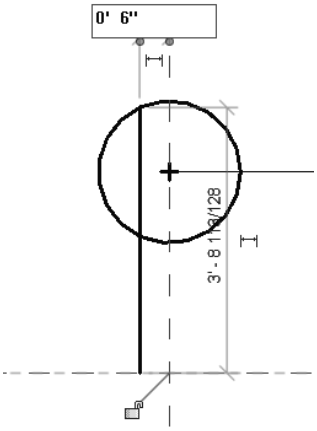
9. 

Select **Line** from the Create ribbon.

10. 

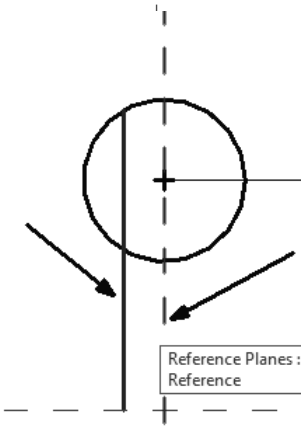
On the ribbon:

Set the line style to **Heavy Lines**.

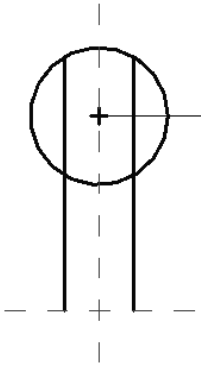
11. 

Draw a vertical line from the horizontal reference plane to intersect with the circle.

Use the temporary dimension to position the line 6” left of the circle’s center.

12. 

Select the vertical line.
Select Mirror →Pick Axis.
Select the vertical reference plane/dashed green line.

13. 

A second vertical line is placed.

14. Save as *receptacle_symbol.rfa*.

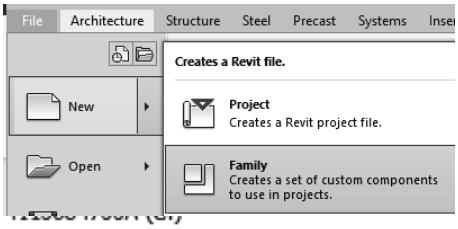
Exercise 2-15:

Create a Detail Item Family

Drawing Name: new family
Estimated Time: 20 minutes

This exercise reinforces the following skills:

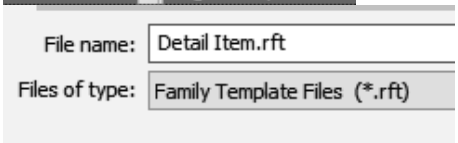
- Detail Component families

1. 

Go to **File→New→Family**.

2. 

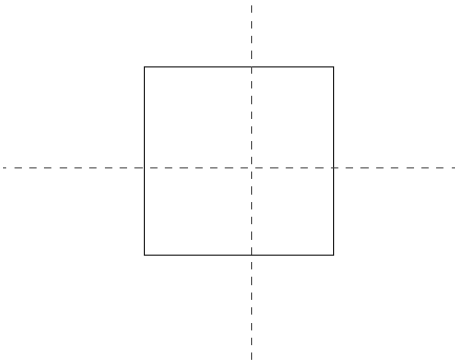
Browse to the *English-Imperial* folder under Family Templates.

3. 

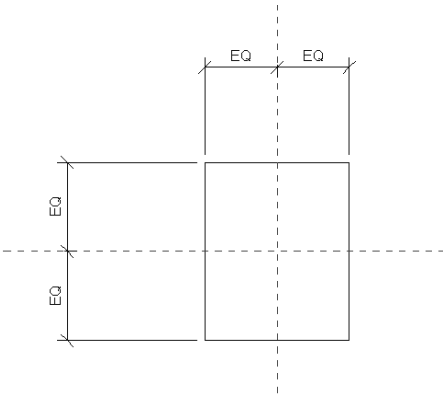
Select the *Detail Item* template.
Click **Open.**

4. 

Select **Line** on the Create tab.

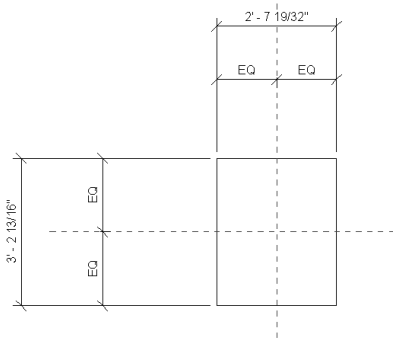
5. 
Draw a square.

6.



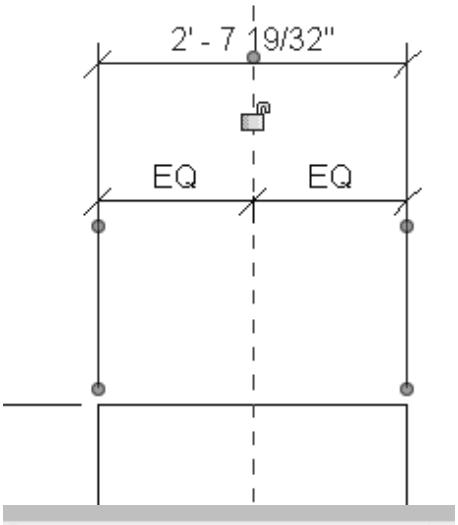
Place a continuous dimension in the vertical and horizontal direction to center the square on the insertion point.
To place the dimension, select one line, then the center reference plane, then the next line, then left click to place.
Left click on the EQ icon to set the dimension equal.

7.



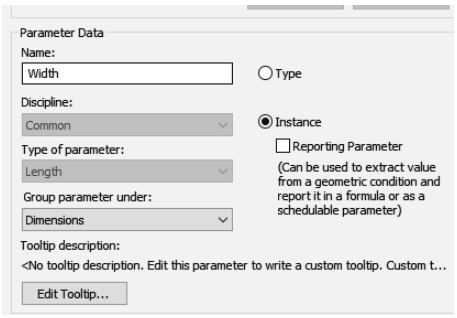
Place an overall horizontal dimension and an overall vertical dimension.
To place the dimensions, select the outside lines, then left click to add the dimension.

8. Select the horizontal dimension.



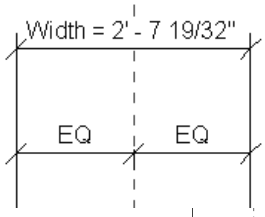
9.

On the ribbon:
Select **New** to add a label parameter to the dimension.

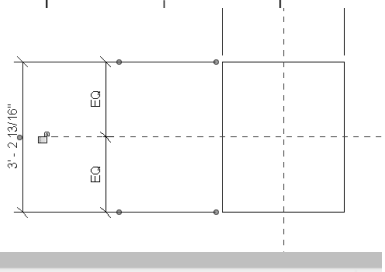
10. 

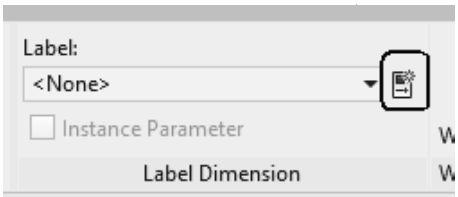
Type **Width** in the Name field.
Enable **Instance**.
Click **OK**.

11. You should see Width in front of the dimension value now.

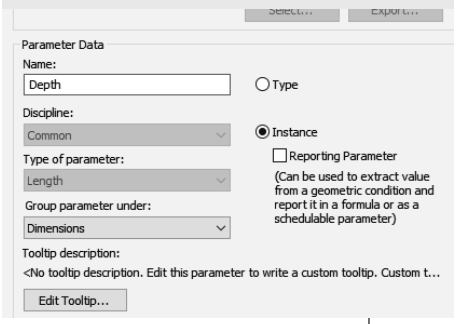


12. Select the vertical dimension.



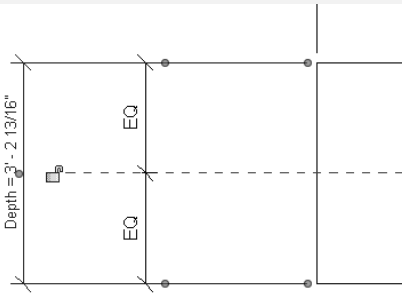
13. 

On the ribbon:
Select **New** to add a label parameter to the dimension.

14. 

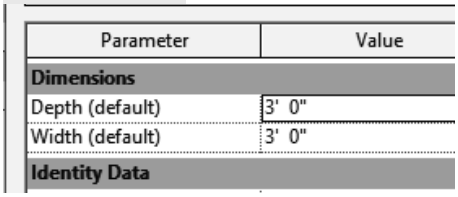
Type **Depth** in the Name field.
Enable **Instance**.
Click **OK**.

15. You should see Depth in front of the dimension value now.

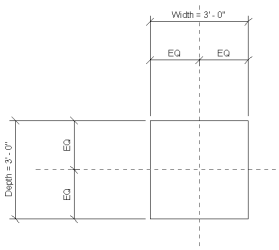


16. 

Select **Family Types** from the ribbon.

17. 

Set the Default values for the Depth and Width to **3' 0".**
Click **Apply.**

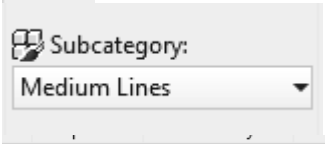
18. 

The values in the display window should update.
If the values do not update, you did not place the dimensions correctly. You will need to delete the dimensions and try again.

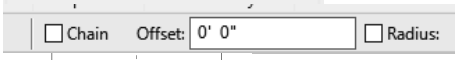
Close the Family Types dialog.

19. 

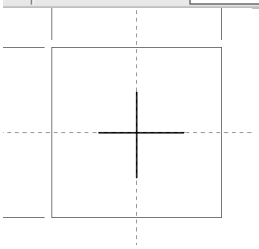
Select **Line** on the Create tab.

20. 

Set the line style to **Medium Lines**.

21. 

Disable **Chain** on the Options bar.

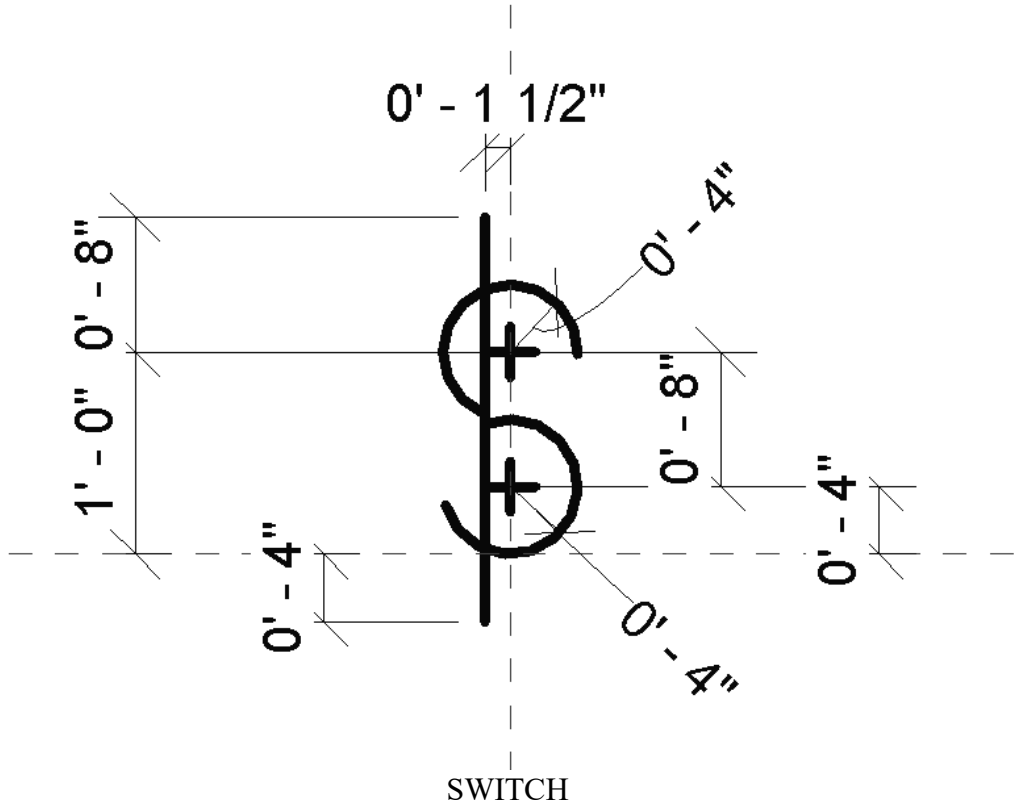
22. 
Draw two lines to indicate a center mark.

23. Save as *switchboard-section.rfa*.

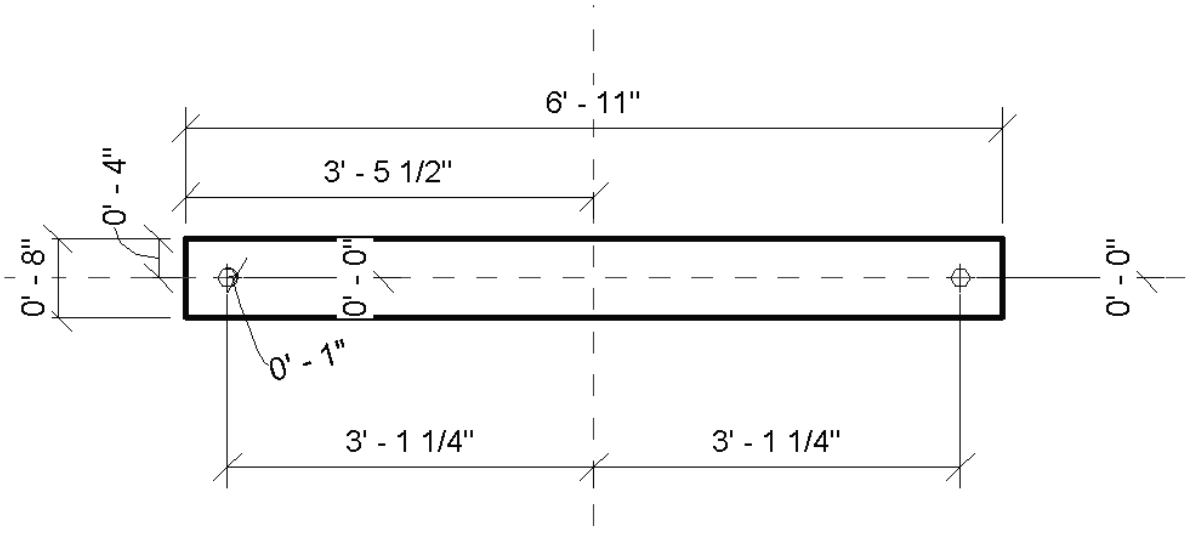
This family will be used in an exercise in Lesson 9.

Lab Exercises

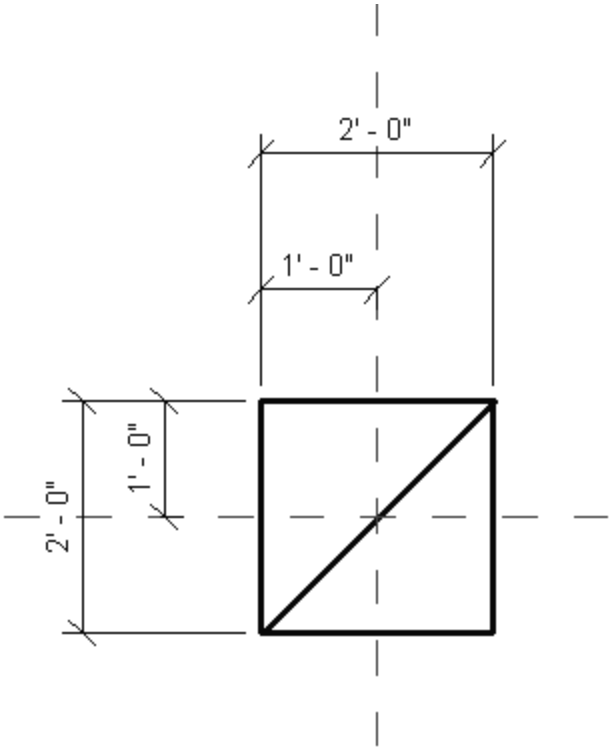
Create the following legend symbols:



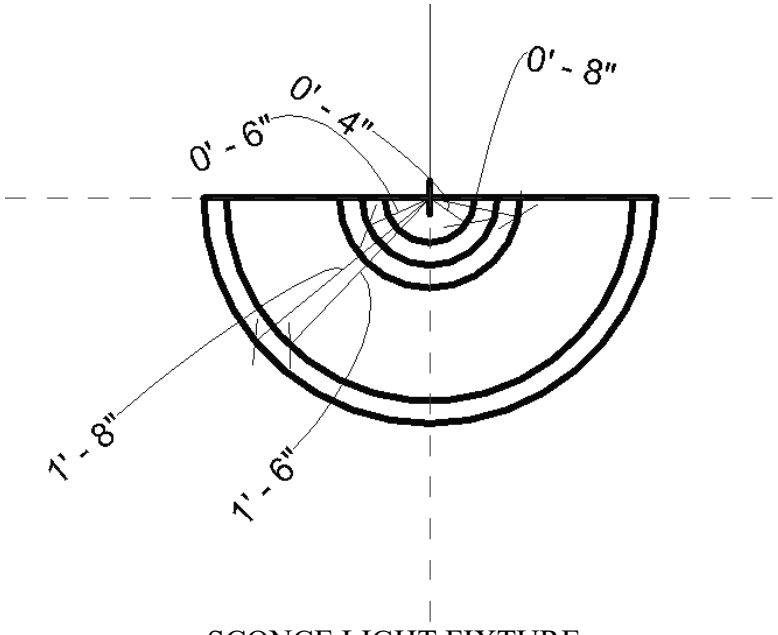
SWITCH



PENDANT LIGHT FIXTURE



RECESSED LIGHT



SCONCE LIGHT FIXTURE