BUILDING INFORMATION MODELLING
Training Materials

CEI, CEII - MEP (Revit)

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CHAPTER 12. CREATE ELECTRICAL SYSTEM

12.1 POWER DISTRIBUTION SYSTEM

It is importance to assigning a distribution system to electrical power equipment. We are able to work upstream only when building distribution systems in Revit MEP. With the equipment model in place, you can start at any component and connect to related equipment upstream. It is best to start at the branch circuit panels and work upstream through the system.
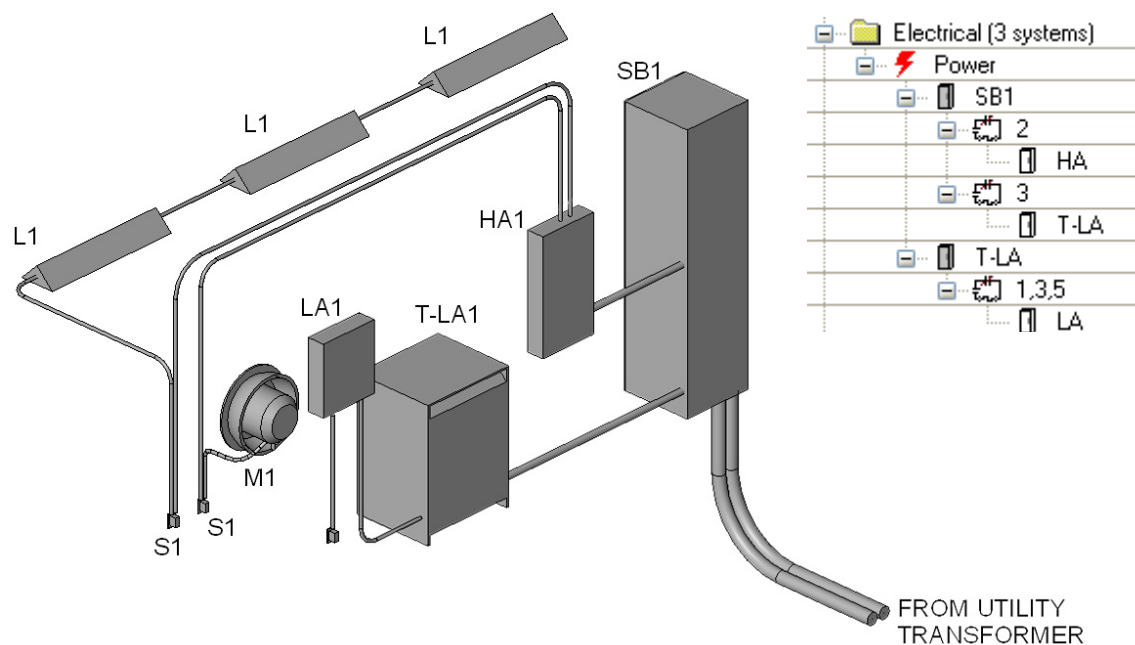
SB1:   High Voltage Switchboard
HA1:   High Voltage Panel
T-LA1: Low Voltage Transformer
LA1:   Low Voltage Panel

S1:   Power Socket
L1:   Lighting Fifting
M1:   Motor Fan

12.2 ELECTRICAL SETTING

Use this dialog to specify wiring parameters, voltages definitions, distribution systems, cable tray and conduit settings, and load calculation and circuit numbering settings.

To open electrical settings, click Manage tab ➤ Settings panel ➤ MEP Settings drop-down ➤ 🖳 Electrical Settings.
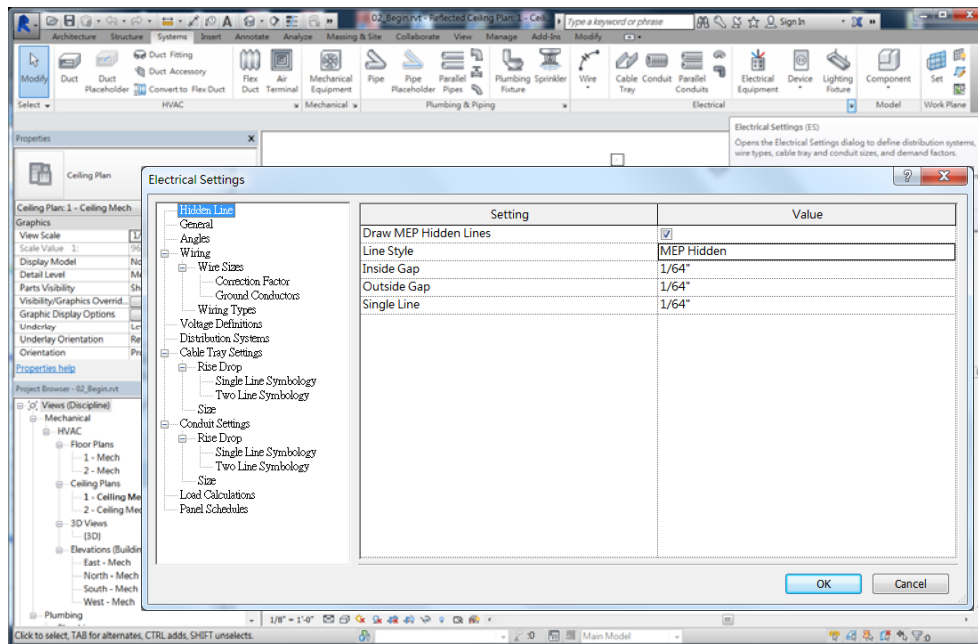
12.2.1   Electrical Setting: Hidden Line

Use the Hidden Line pane of the Electrical Settings dialog to specify how hidden lines are drawn in electrical systems.
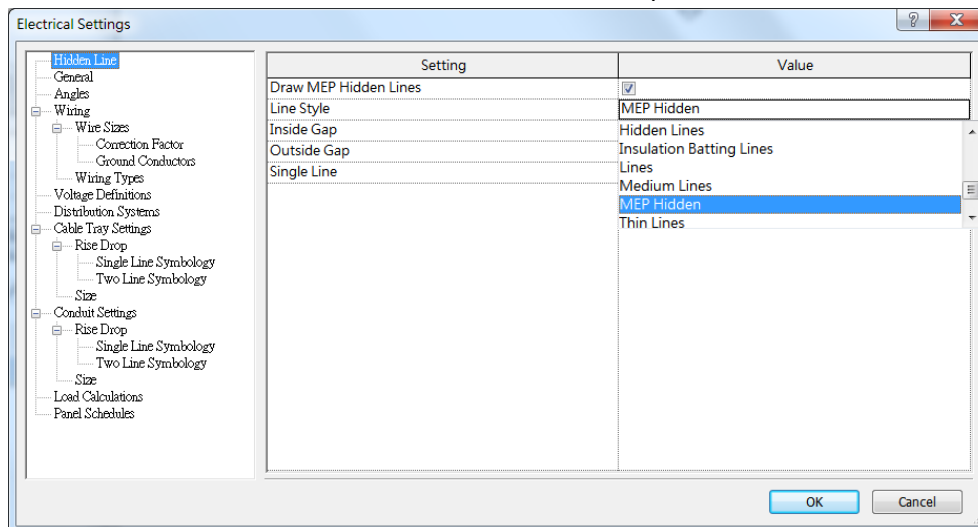
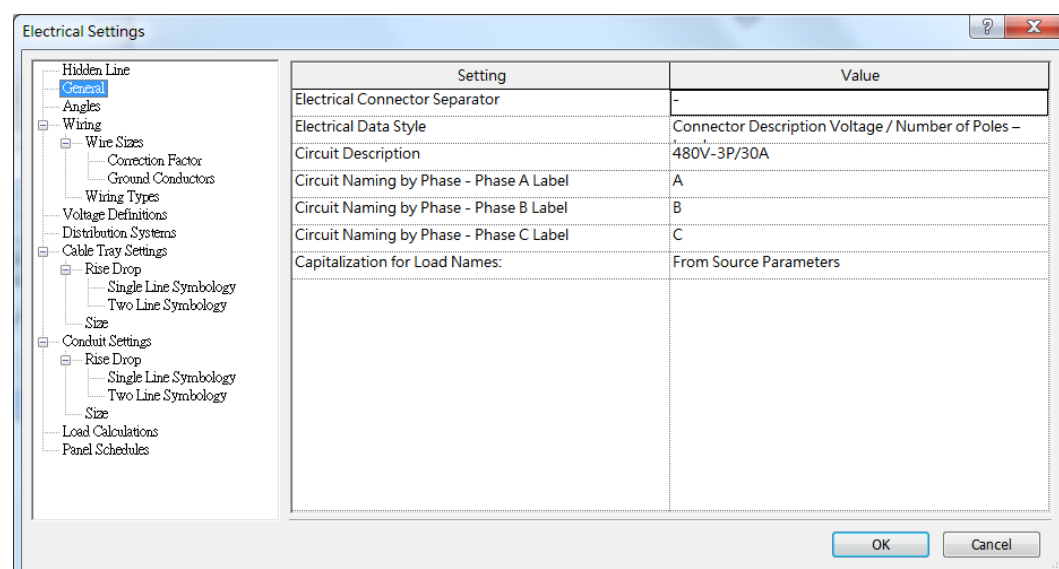The Hidden Line pane contains the following settings:

- **Draw MEP Hidden Lines** - Specifies whether to draw cable tray and conduit with the line style and gaps specified for hidden lines.
- **Line Style** - Specifies the line style for the hidden segment at the point where the segments cross.
- **Inside Gap** - Specifies the gap for the lines that appear within a crossing segment.
- **Outside Gap** - Specifies the gap for the lines that appear external to the crossing segments.
- **Single Line** - Specifies the gap for the single hidden lines where segments cross.

12.2.2   Electrical Setting: General

Use the General pane of the Electrical Settings dialog to define basic parameters and set default values for electrical systems.

This pane allows you to specify the following parameters:

- Electrical Connector Separator - Specifies the symbol used to separate rating values for the Electrical Data parameter for devices
- Electrical Data Style - Specifies the style for the Electrical Data parameter on the Properties palette for electrical components

Electrical Settings

	Setting	Value
	Electrical Connector Separator	-
	Electrical Data Style	Connector Description Voltage / Number of Poles –
	Circuit Description	480V-3P/30A
	Circuit Naming by Phase - Phase A Label	A
	Circuit Naming by Phase - Phase B Label	B
	Circuit Naming by Phase - Phase C Label	C
	Capitalization for Load Names:	From Source Parameters

Navigation tree:
- Hidden Line
- General
- Angles
- Wiring
  - Wire Sizes
    - Correction Factor
    - Ground Conductors
  - Wiring Types
- Voltage Definitions
- Distribution Systems
- Cable Tray Settings
  - Rise Drop
    - Single Line Symbology
    - Two Line Symbology
  - Size
- Conduit Settings
  - Rise Drop
    - Single Line Symbology
    - Two Line Symbology
  - Size
- Load Calculations
- Panel Schedules

[OK]   [Cancel]
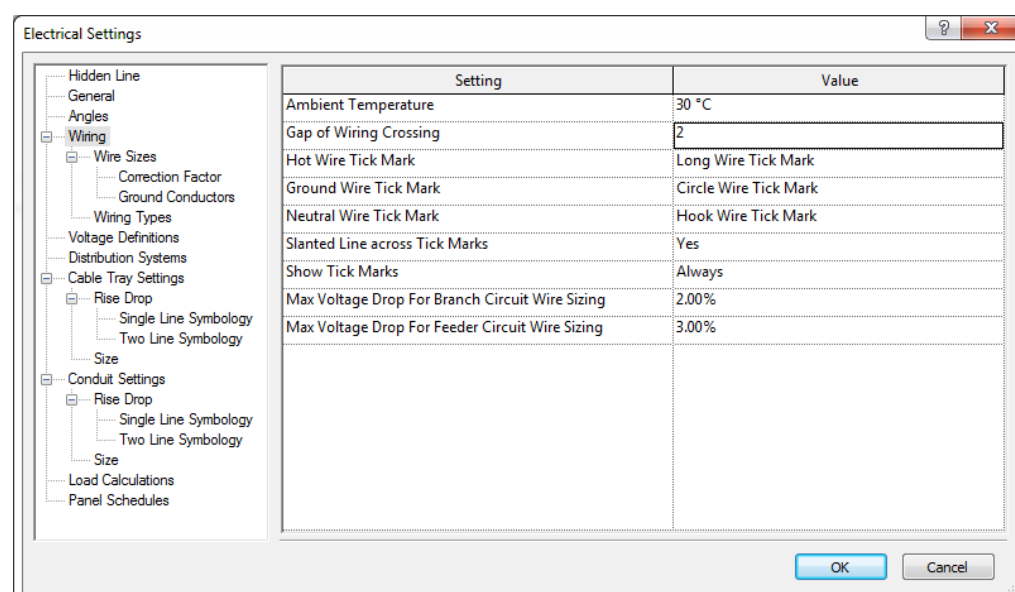
12.2.3 Electrical Setting: Angle

Use the Angles pane of the Electrical Settings dialog to specify the fitting angle to use when adding or modifying cable tray or conduit.

● Use any Angle - Revit will use any angle supported by the fitting content.

● Set an Angle Increment - Specifies the angle increment to use to determine the angle values.

● Use Specific Angles - Specifies the specific angles to use.
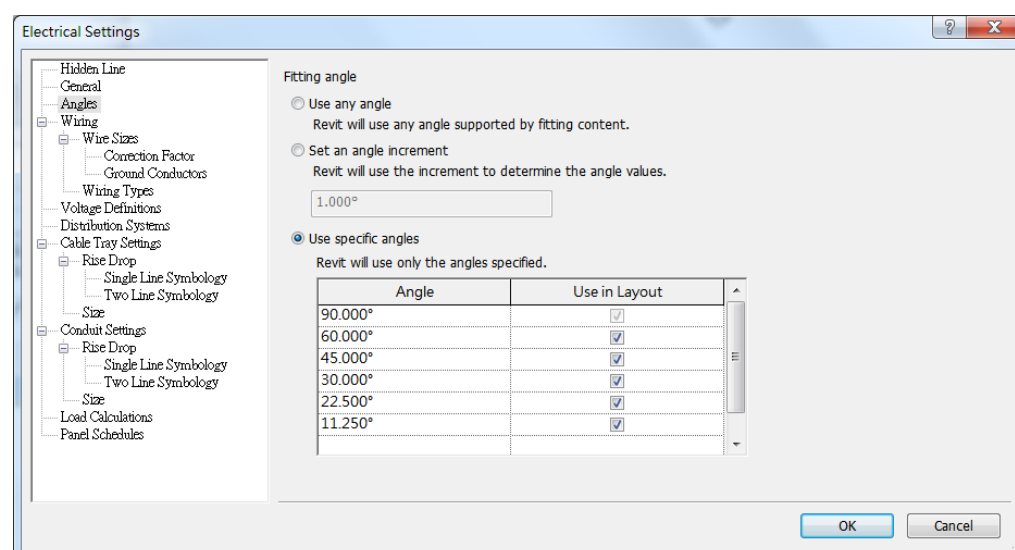
12.2.4 Electrical Setting: Wiring

Use the Wiring pane of the Electrical Setting dialog to create different types of wires for different uses.

12.2.5   Voltage Definitions and Deistribution Systems

Use those pane of the Electrical Settings dialog to establish the minimum and maximum valves for the voltage used in the project. The distribution systems for the project is defined to coincide with the systems that assign devices and equipment objects to a system .
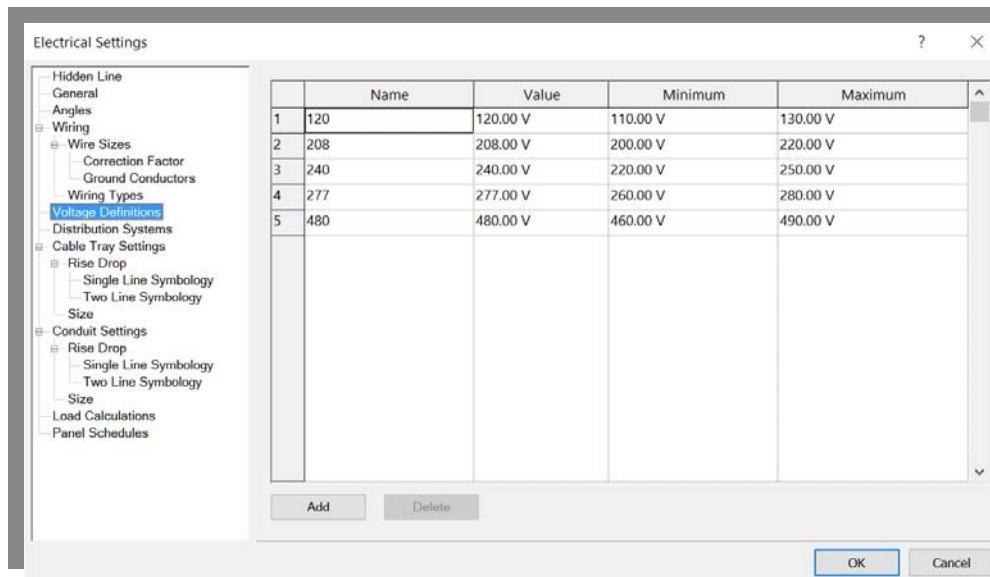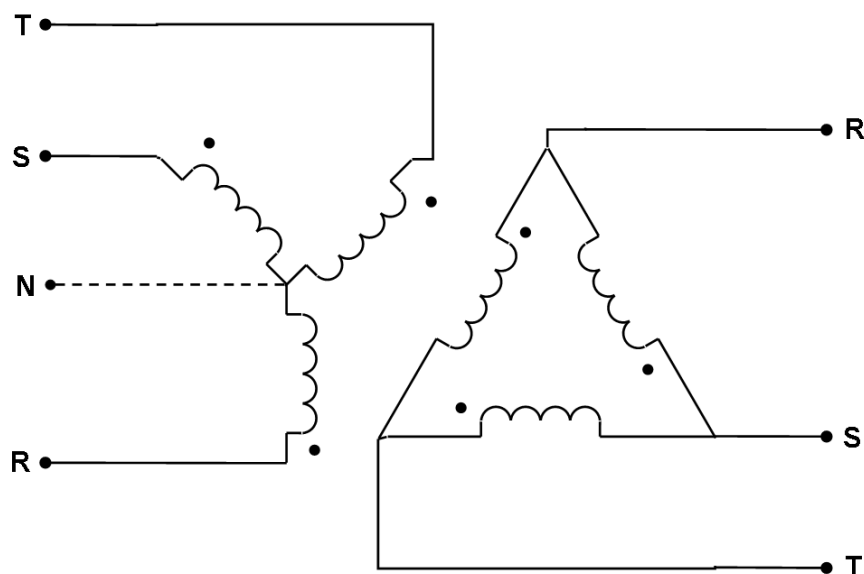

12.2.6   Wye – Delta

There are two basic schemes for connecting a load in a three-phase circuit.

The Y or "wye" , connection joins neutrals of each phase at a common junction.

The Δ or "delta" connection is a triangle and no neutral bus.

12.2.7   Cable Insulation

| Cable Type	Max Operating Temperatures (°C / °F)	Description	Application
FEP / FEPB	90 / 194 200 / 392	Fluorinated etyhlene propylene (FEP) Fluorinated etyhlene propylene with braid (FEPB)	FEP: dry and damp locations FEPB: dry locations
MI	90 / 194 250 / 482	Mineral insulated (metal sheathed)	90°C: dry and wet locations 250°C: special applications
MTW	60 / 140 90 / 194	Moisture, heat and oil resistant thermoplastic	60°C: machine tool wiring in wet locations 90°C: machine tool wiring in dry locations
PFA / PFAH	90 / 194 200 / 392 250 / 482	Perfluoro-alkoxy (PFA) Perfluoro-alkoxy, high temperature (PFAH)	90°C: dry and damp locations 200 and 250 °C: dry locations - special applications
RHH	90 / 194	Thermoset rubber, heat resistant	Dry and damp locations
RHW / RHW-2	75 / 167 90 / 194	Thermoset rubber, moisture resistant	Dry and wet locations
SA	90 / 194 200 / 392	Silicone rubber	90°C: dry and damp locations 200°C: special applications
SIS	90 / 194	Thermoset	Switchboard wiring only
TBS	90 / 194	Thermoplastic with outer braid	Switchboard wiring only
TFE	250 / 482	Extruded polytetrafluoroethylene	Dry locations only
THHN	90 / 194	Thermoplastic, heat resistant, nylon jacket outer sheath	Dry and damp locations
THHW	75 / 167 90 / 194	Thermoplastic, heat and moisture resistant	75°C: wet locations 90°C: dry locations
THW / THW-2	75 / 167 90 / 194	Thermoplastic, heat and moisture resistant	THW - 75°C: wet locations 90°C: special applications (electric discharge lighting) THW-2 - dry and wet locations
THWN / THWN-2	75 / 167 90 / 194	Thermoplastic, moisture and heat resistant, nylon jacket outer sheath	Dry and wet locations
TW	60 / 140	Thermoplastic, moisture resistant	Dry and wet locations
UF	60 / 140 75 / 167	Underground feeder and branch circuit	Dry and wet locations (see Article 340.10 for provisions)
USE / USE-2	75 / 167 90 / 194	Underground service entrance cable	Dry and wet locations (see Article 338 for provisions)
XHH	90 / 194	XLPE, heat resistant	Dry and damp locations
XHHW / XHHW-2	75 / 167 90 / 194	XLPE, heat and moisture resistant	XHHW - 75°C: wet locations, 90°C: dry and damp locations XHHW-2 - Dry and wet locations
Z	90 / 194 150 / 302	Modified ethylene tetrafluoroethylene	90°C: dry and damp locations 150°C: dry locations (special applications)
ZW / ZW-2	75 / 167 90 / 194 150 / 302	Modified ethylene tetrafluoroethylene, moisture resistant	ZW - 75°C: wet locations, 90°C: dry locations, 150°C: dry locations (special applications)

12.3 ADDING RECEPTACLES

Revit MEP comes with basic Electrical Device for creating electrical layouts. Receptacle is a kind of Electrical Devices. Receptacles are often hosed components which must be placed on a wall or work plane. This tool lets you place Electrical Fixture, such as Receptacles, Socket Outlet and Fused Spur Unit etc.

To place an Electrical Receptacle in a view:
1. In the Project Browser, expand Views (all) ➤Floor Plans, and double-click the view where you want to create electrical layout.
2. Click Systems tab ➤Electrical panel ➤Device drop-down, and click an Electrical Fixture.
3. In the Type Selector, select a specific Receptacle type.
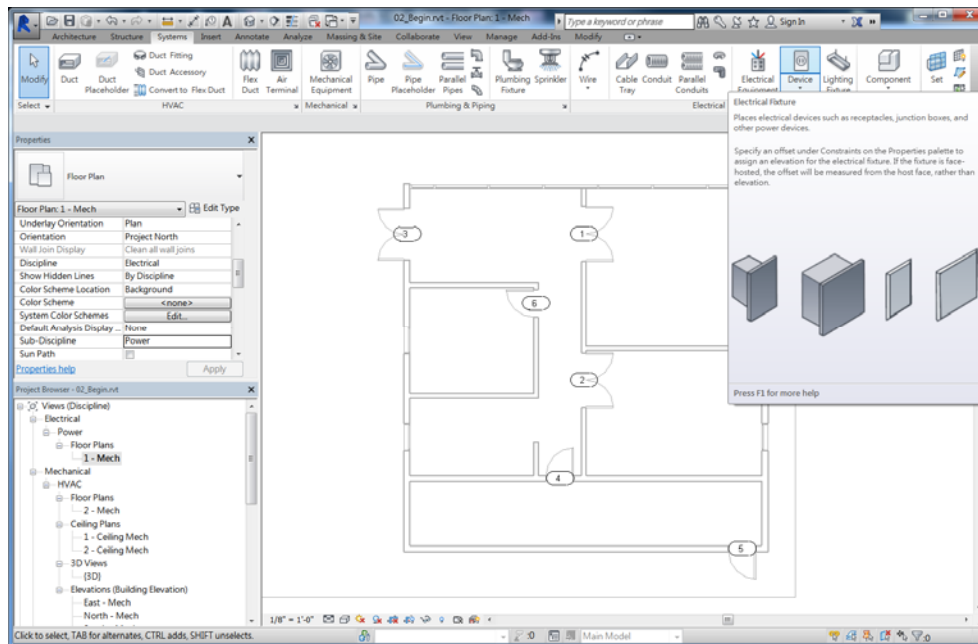
If there is no Electrical Fixture family loaded into your project, you are prompted to load one. The receptacle families are located in the Terminals subfolder of the Electrical Power folder under MEP.
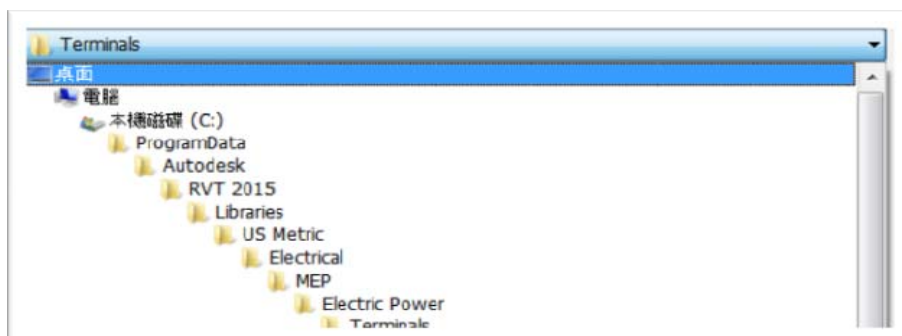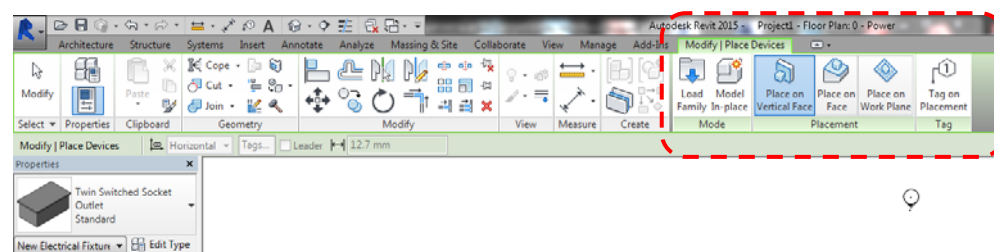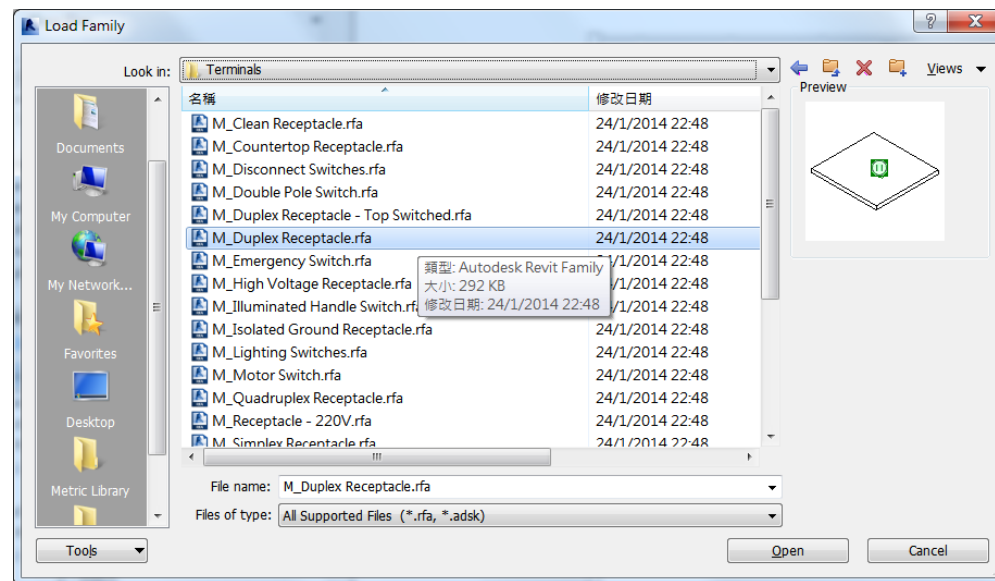
On the ribbon, specify mode options:

- **Load Family**. Loads component family.
- **Model in-place**. Let you create a new family of a specified component that will be available only in this project.

- **Place on Vertical Face**. This option is only available for some components and allows placement only on vertical faces.
- **Place on Face**. This option allows placement on faces regardless of orientation.
- **Place on Work Plan**. This option requires an active work plane to be defined in the view .You can place the component anywhere on the work plane.

In the drawing area, zoom in on the area where you want to place the receptacles for the electrical system.

1. Move the cursor over the drawing area.
   The device is previewed as you move the cursor over a valid host or location in the drawing area.
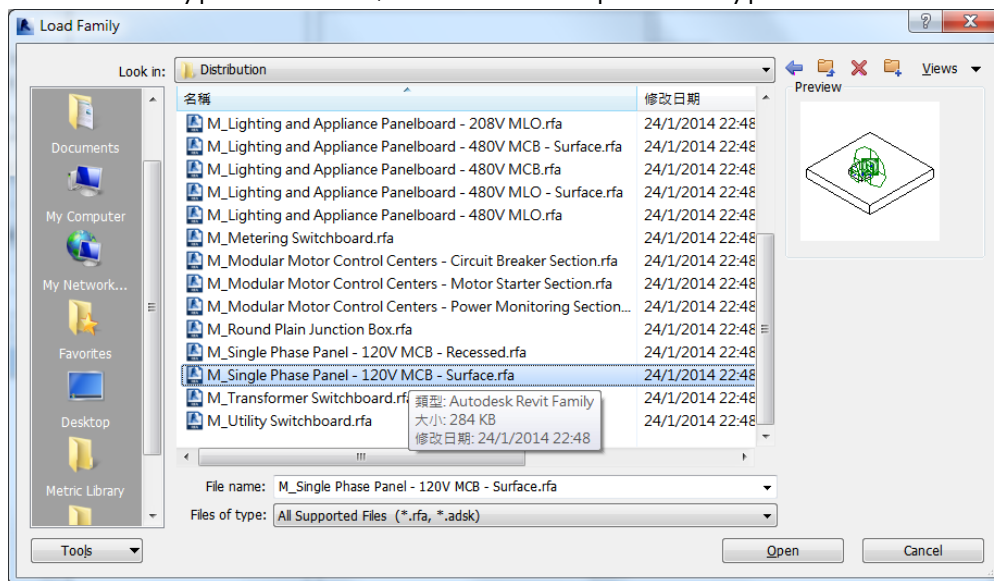2. Click to place the device.
3. Click Modify to release the tool.
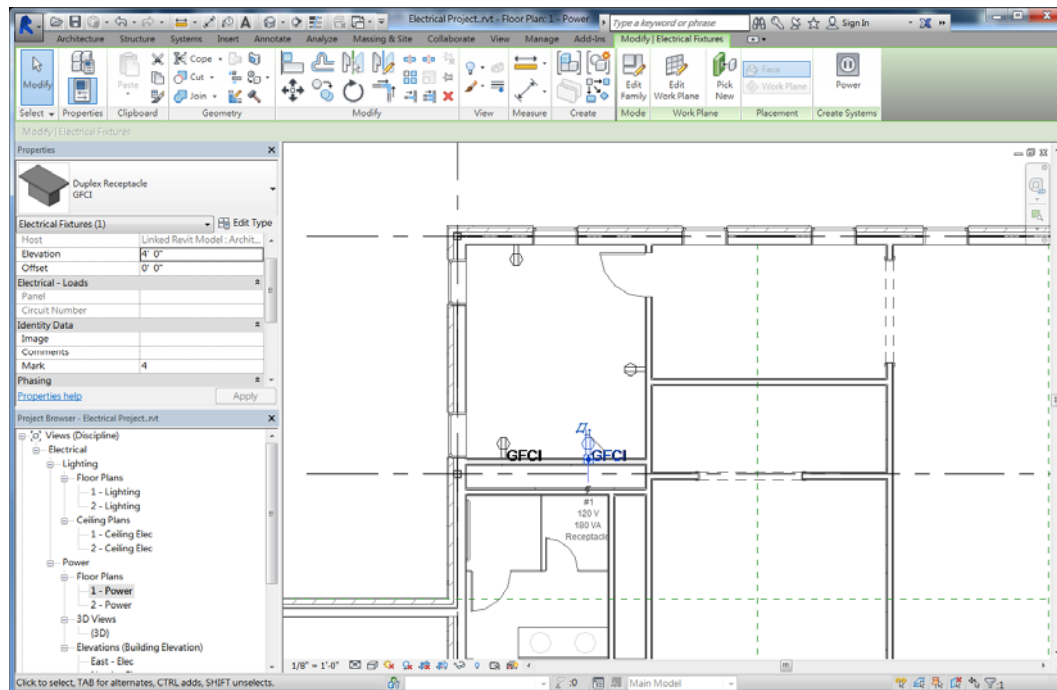
12.4 ADDING PANELS

Electrical equipment consists of panels and transformers. Electrical equipment can be hosted components (an electrical panel that must be placed on a wall), or unhosted (a transformer that can be placed anywhere in a view).

To place electrical equipment

1. In the Project Browser, expand Views (all) ➤ Floor Plans, and double-click the view where you want to place the equipment.
2. Click Systems tab ➤ Electrical panel ➤ 📶 Electrical Equipment.
3. In the Type Selector, select a component type.

4. Click to place the equipment
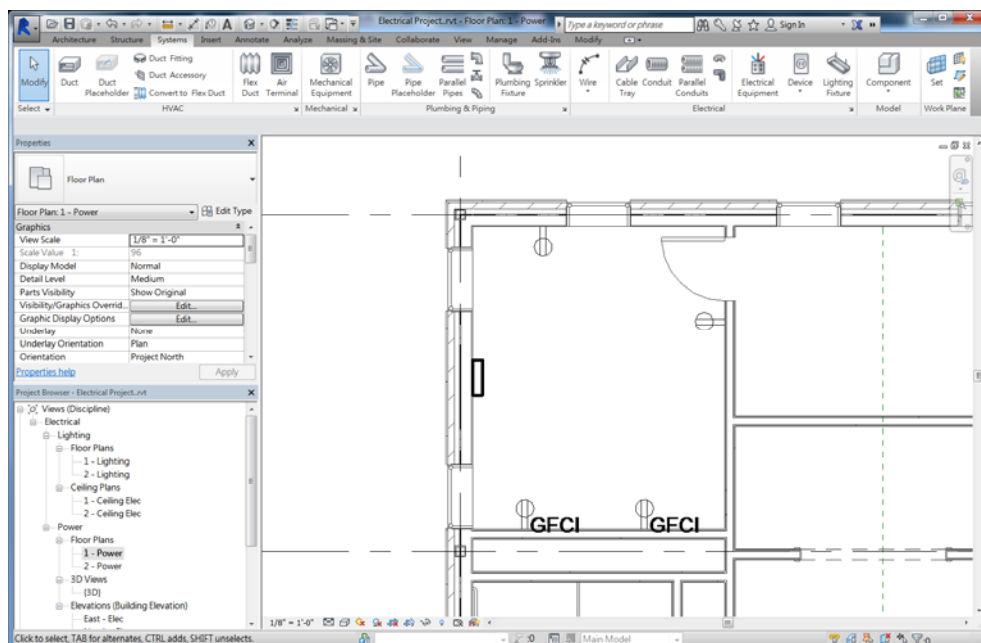
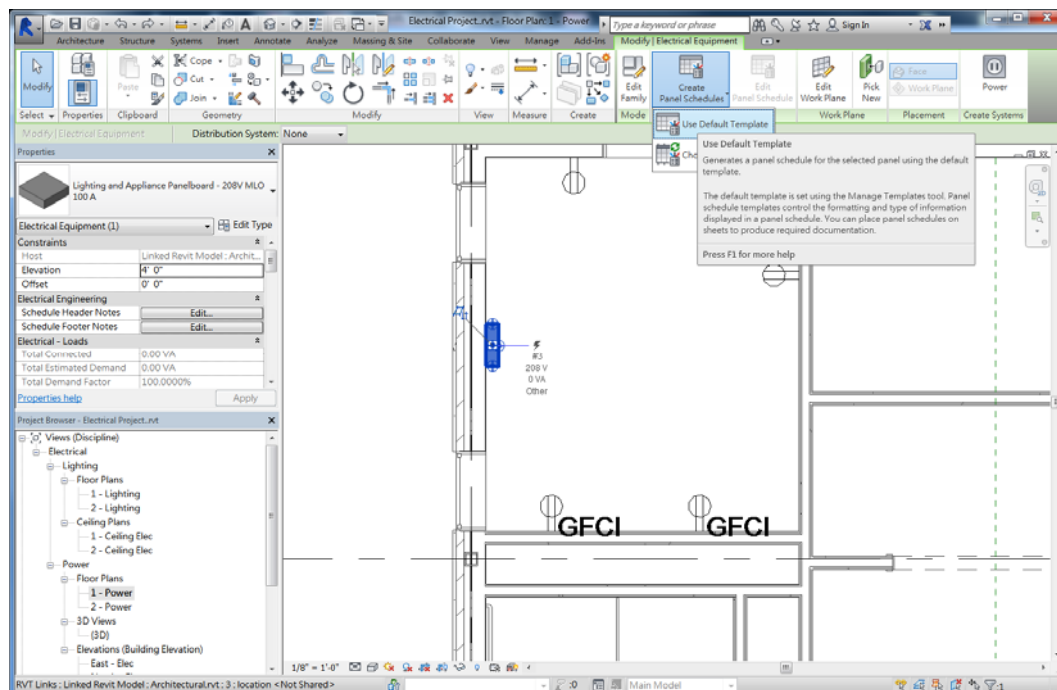Only distribution systems that match the connector voltage of the panel appear drop-down list on the Option Bar.
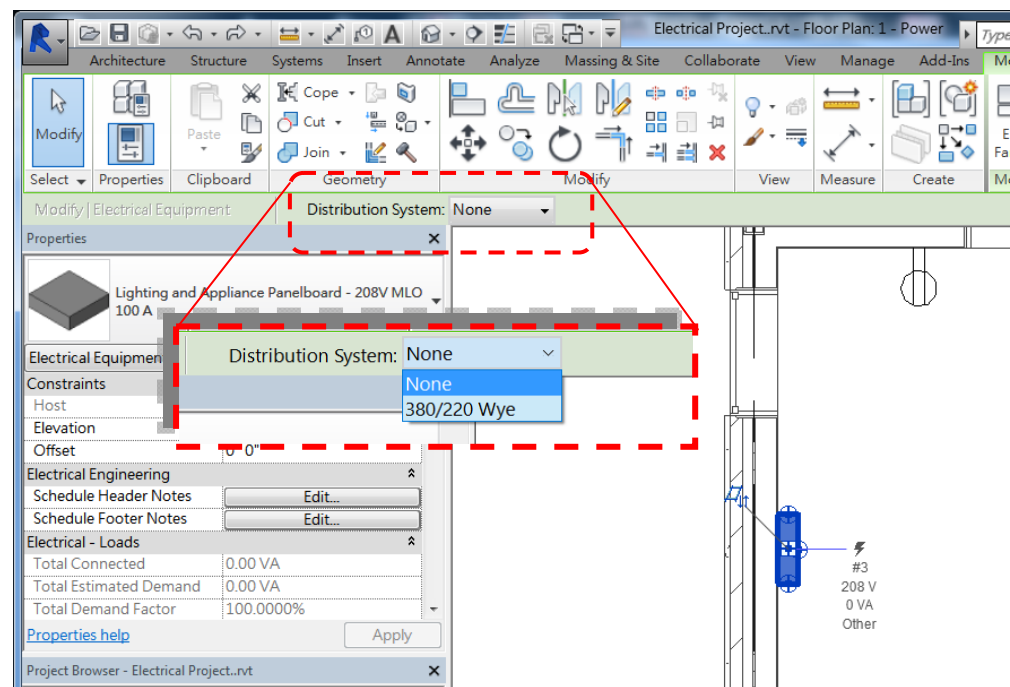
12.5 CREATE PANEL SCHEDULE

Panel schedules display information about the panel, the circuits connected to the panel, and their corresponding loads.

To create a single panel schedule

● In the drawing area, select one or more panels of the same type.
Note: If you select multiple panels of different types, for example branch panel and switchboard devices, this command is not available.

● Click Modify | Electrical Equipment tab ➤ Electrical panel ➤ Create Panel Schedules drop-down and select 🔲 (Use Default Template)/🔲 (Choose a Template).
If you select the default template, the panel schedule is created and displays. If you select to choose a template, the Change Template dialog displays.

A panel schedule has 4 parts:
① header, ② circuit table, ③ loads summary, and ④ footer.

Branch Panel: <Panel Name>

Location: «Location»	Volts: «Distribution System»
Supply From: «Supply From»	Phases: «Number of Phases»
Mounting: «Mounting»	Wires: «Number of Wires»
Enclosure: «Enclosure»	

A.I.C. Rating: «Short Circuit Rating»
Mains Type: «Mains Type»
Mains Rating: «Mains»
MCB Rating: «MCB Rating»

①

Notes:
«Schedule Header Notes»

		A		B		C	
		«Val»	«Val»				
				«Val»	«Val»		
						«Val»	«Val»
		«Val»	«Val»				
				«Val»	«Val»		
						«Val»	«Val»
		«Val»	«Val»				
				«Val»	«Val»		
						«Val»	«Val»
		«Val»	«Val»				
				«Val»	«Val»		
						«Val»	«Val»
		«Val»	«Val»				
				«Val»	«Val»		
						«Val»	«Val»
		«Val»	«Val»				
				«Val»	«Val»		
						«Val»	«Val»

②

Total Load: «Apparent Load» «Apparent Load» «Apparent Load»
Total Amps: «Current Phase» «Current Phase» «Current Phase»

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
«Load Classification»	«Connected Load (VA)»	«Demand Factor»	«Estimated Demand (VA)»	
«Load Classification»	«Connected Load (VA)»	«Demand Factor»	«Estimated Demand (VA)»	Total Conn. Load: «Total Connected»
«Load Classification»	«Connected Load (VA)»	«Demand Factor»	«Estimated Demand (VA)»	Total Est. Demand: «Total Estimated Demand»
«Load Classification»	«Connected Load (VA)»	«Demand Factor»	«Estimated Demand (VA)»	Total Conn. Current: «Total Connected Current»
«Load Classification»	«Connected Load (VA)»	«Demand Factor»	«Estimated Demand (VA)»	Total Est. Demand Current: «Total Estimated Demand Current»
«Load Classification»	«Connected Load (VA)»	«Demand Factor»	«Estimated Demand (VA)»	
«Load Classification»	«Connected Load (VA)»	«Demand Factor»	«Estimated Demand (VA)»	

Notes:
«Schedule Footer Notes»

④

12.6 CREATE A CIRCUIT

Circuits connect similar electrical components to form an electrical system. Once created, you can edit circuits to add or remove components, connect a circuit to a panel, add wiring circuits, and view circuit and panel properties.

Revit automatically calculates wire sizes for power and lighting circuits to maintain less than a 3% voltage drop. Wire size calculations are based on the circuit rating and the length of the wiring circuit .

1. Select one or more electrical devices or lighting fixtures.
2. Click Modify | Electrical Fixtures, or Modify | Lighting Fixtures tab ➤ Create Systems panel ➤ ⑩ Power.

If the devices for the circuit have their distribution system specified as instance parameters, the Specify Circuit Information dialog is displayed.

3. Specify voltage and number of poles for circuit and click OK.

The logical circuit that is created displays as dashed lines between the selected electrical components.
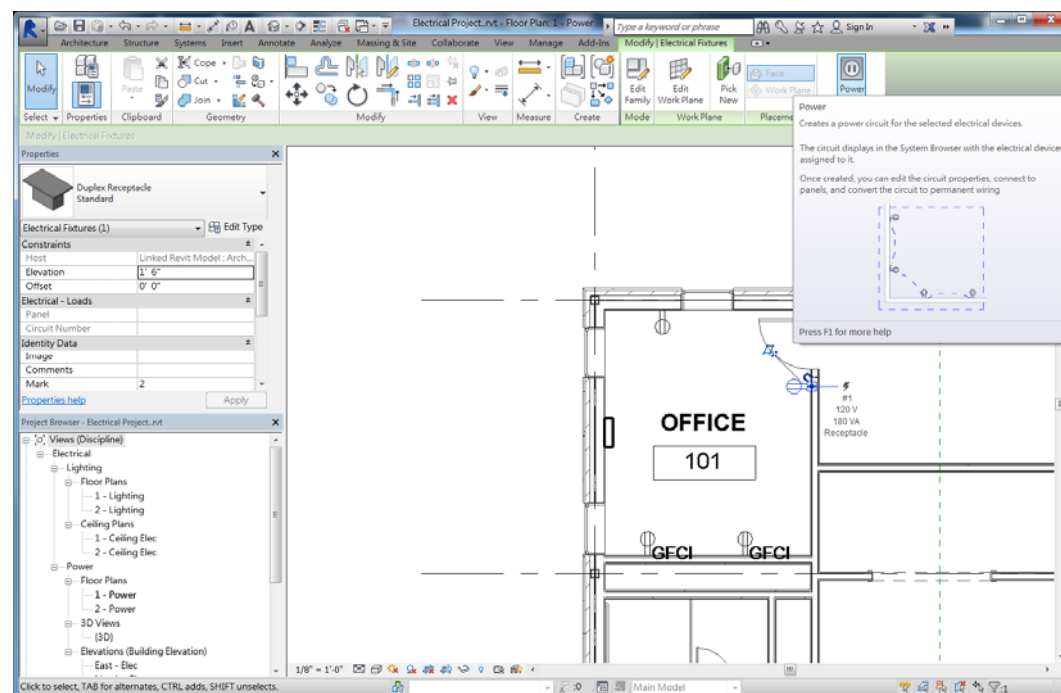
12.6.1   Edit Circuit

Use this tool to indicate the panel from which a circuit originates. Power circuits can only be connected to a compatible panel. The panel being selected must have a slot available, and must match the distribution system for the circuit being connected.

1.   Highlight a component in an existing circuit.
2.   Click Electrical Circuits tab ➤System Tools panel ➤ Edit Circuit.
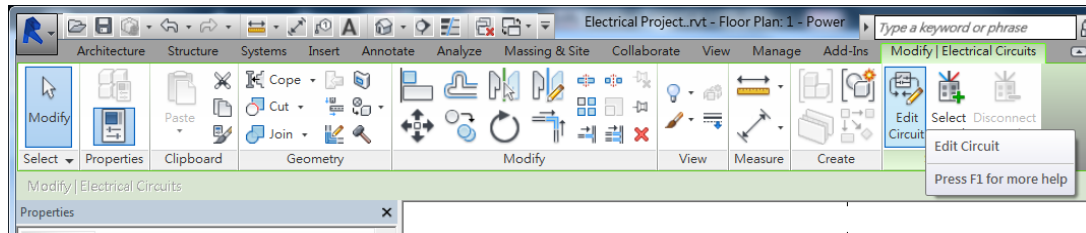
3.   Select a panel from the Panel drop-down list or click to use the Search box.

Panels are listed in alphabetical order with the current panel listed at the top. The three most recently used panels for the selected distribution system are listed at the bottom.

You can also select a panel by selecting it in the drawing area.
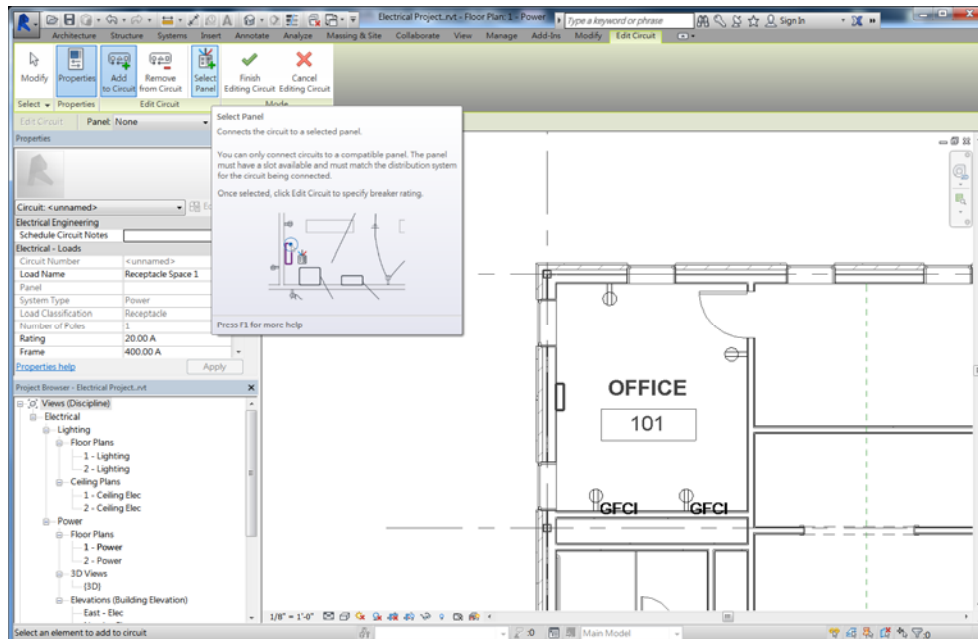
12.6.2   Create Permanent Wiring

Adding wiring runs between devices does not specify the sizes for wiring runs, nor does it create a circuit

Convert a temporary circuit to permanent wiring

- Highlight a component in the circuit, press Tab to highlight the circuit, and click to select the circuit.
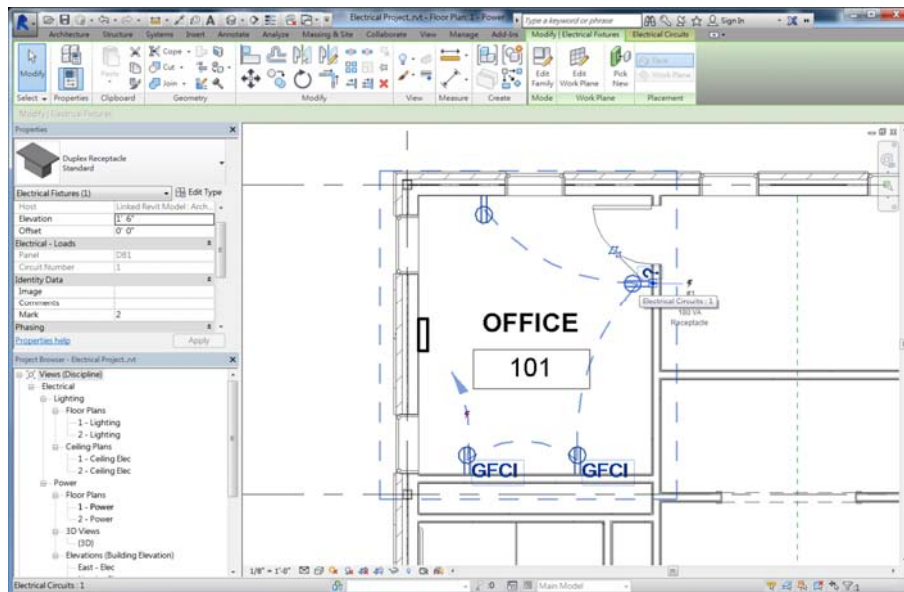
Select the type of wiring for the circuit

1. Click ⌐ or ⌒ to create arc wiring.
   Arced wiring is often used to represent wiring that is concealed within walls, ceilings, or floors.
2. Click ⌐ or ⌐ to create chamfered wiring.
   Chamfered wiring is often used to represent exposed wiring.
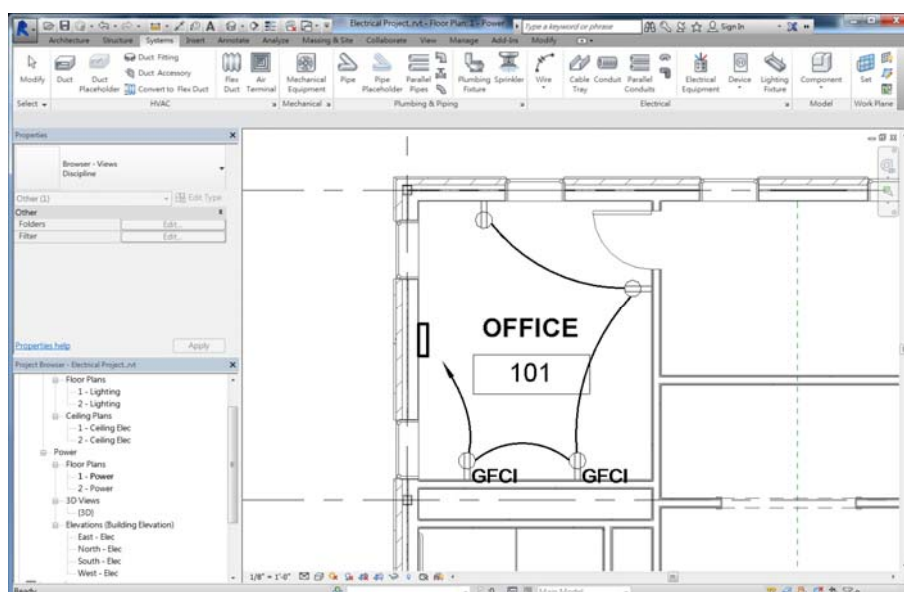
12.7 ADDING LIGHTING FIXTURES

Lighting fixture templates define the reference planes and light source for creating the fixture

To place a lighting fixture in a view

1. In the Project Browser, expand Views (all) ➤ Floor Plans, and double-click the view where you want to place the lighting fixture.
2. Click Systems tab ➤ Electrical panel ➤ 🖱 Lighting Fixture.
3. In the Type Selector, select a fixture type.
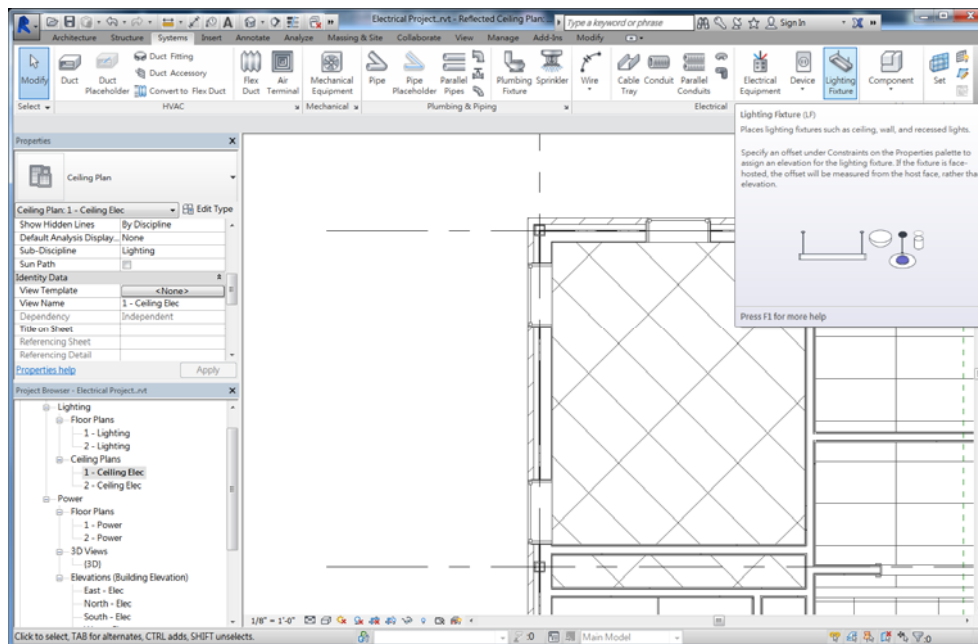
4. Click to place the lighting fixture
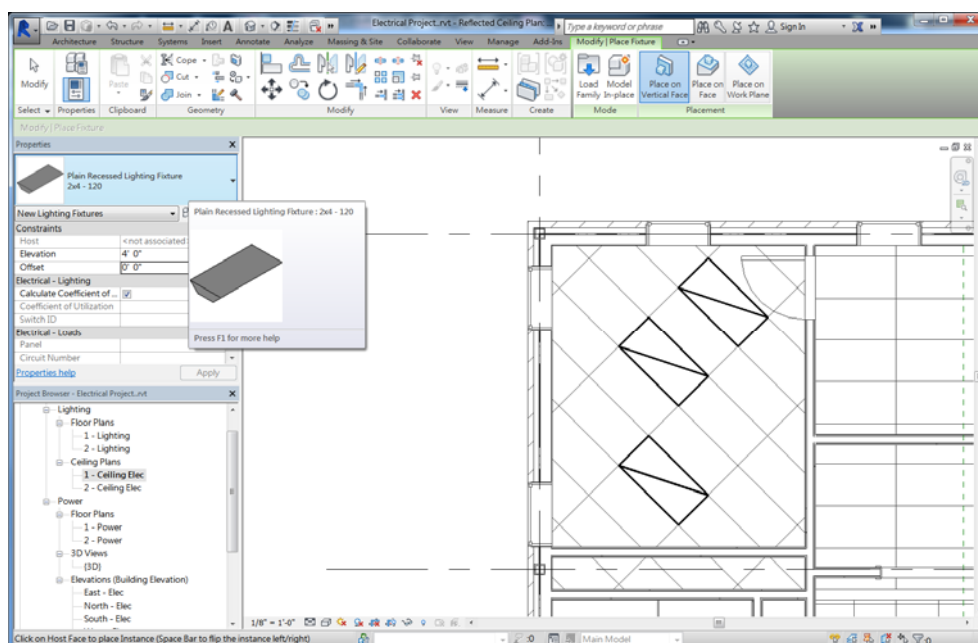
12.8 CREATE A SWITCH SYSTEM

You can assign lighting fixtures to specific switches in a project. The switch system is independent of lighting circuits and wiring.

1.   Select one or more lighting fixtures in a view, and click Modify | Lighting Fixture tab ▶ Create Systems panel ▶ 🔲 Switch.
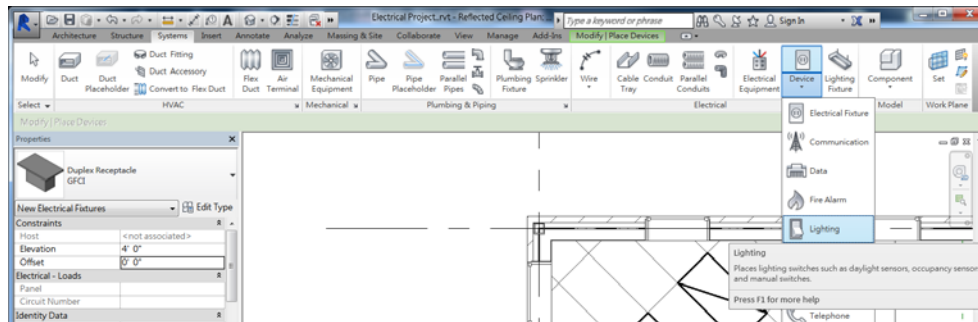
2.   Click Switch Systems tab ▶ System Tools panel ▶ 📇 Edit Switch System.

3.   Click Edit Switch System tab ▶ Edit Switch System panel ▶ 🔣 Add to System, and select one or more lighting fixtures in the view.
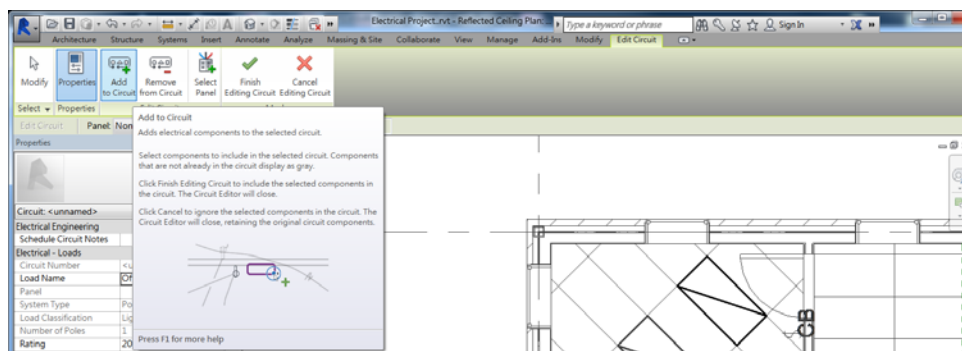
4.   Click 🔲 Select Switch, and select a switch in the drawing area.
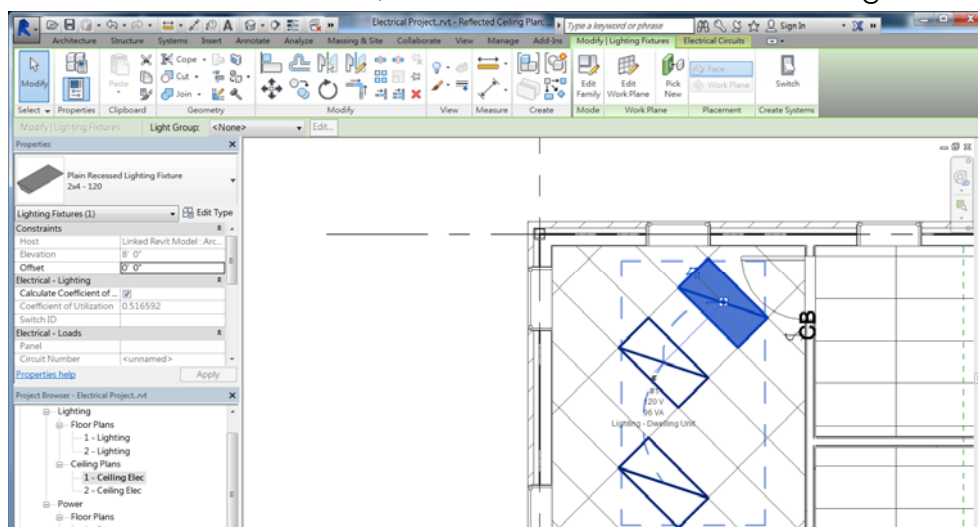
5.   Click ✔ Finish Editing System.

12.9 ADD WIRING TAG

A tag is an annotation for identifying elements in a drawing.
You can add tags to the wiring runs in your electrical systems to show the circuit number on the panel where the circuit is connected.

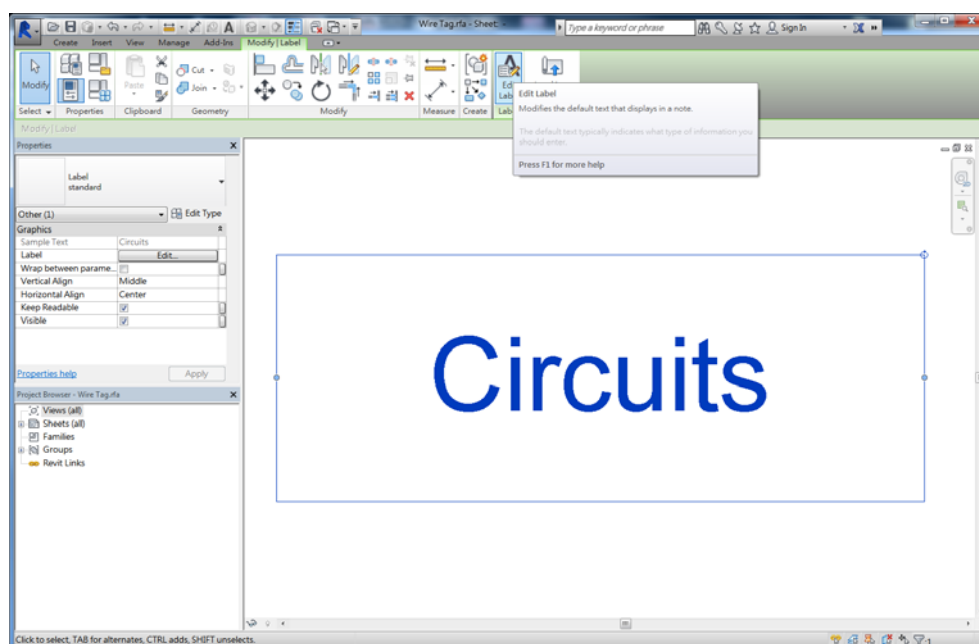Click Annotate tab ▶ Tag panel ▶Tag By Category, and on the Options Bar, specify tag options ▶Select a wiring run
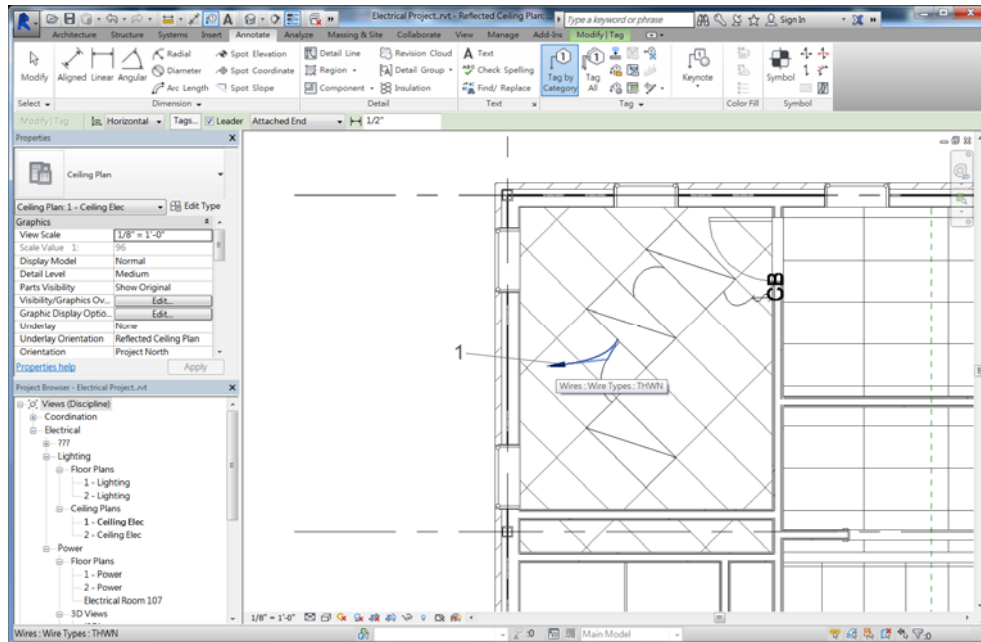
12.9.1   Tag Label

An annotation label is a text placeholder added to tags or title blocks
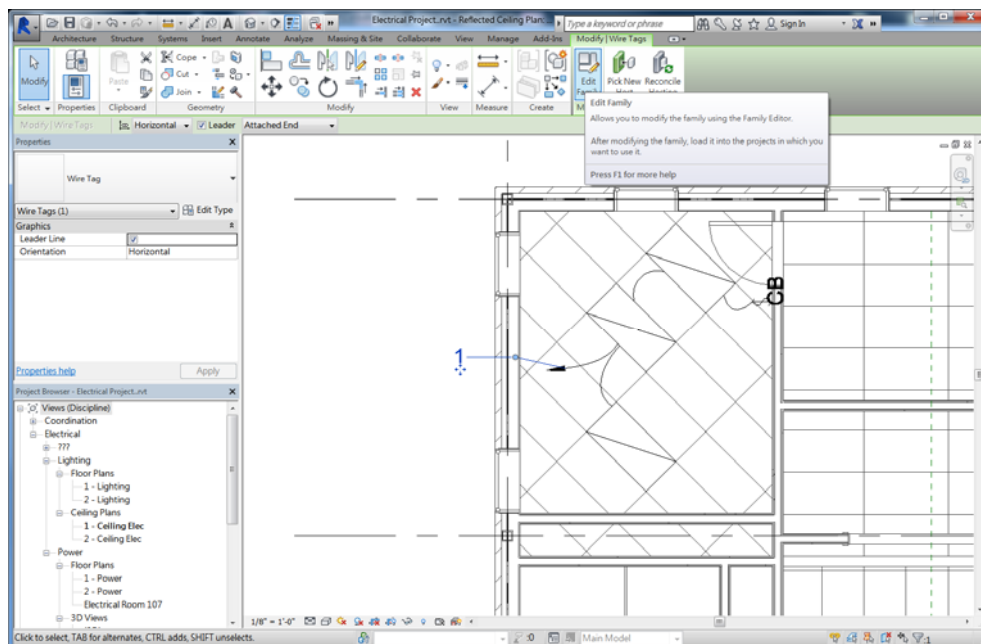
You assign single or multiple parameters to labels with the Edit Label dialog

In the Family Editor, click Create tab ▶ Text panel ▶ Edit Label.

You add and remove label parameters by moving them between the windows in the Edit Label dialog.

Click ▦ (Add Parameter) to move it into the Label Parameters window
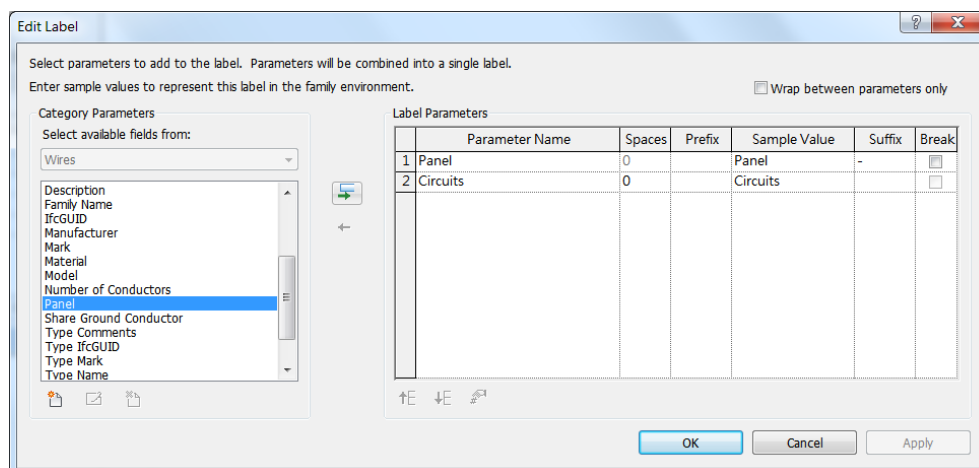
12.9.2 Load Into Project

After working in the Family Editor to create or modify a family, you can load the family into one or more open projects

In the Family Editor, click Create tab ▸ Family Editor panel ▸ 📥 (Load into Project).
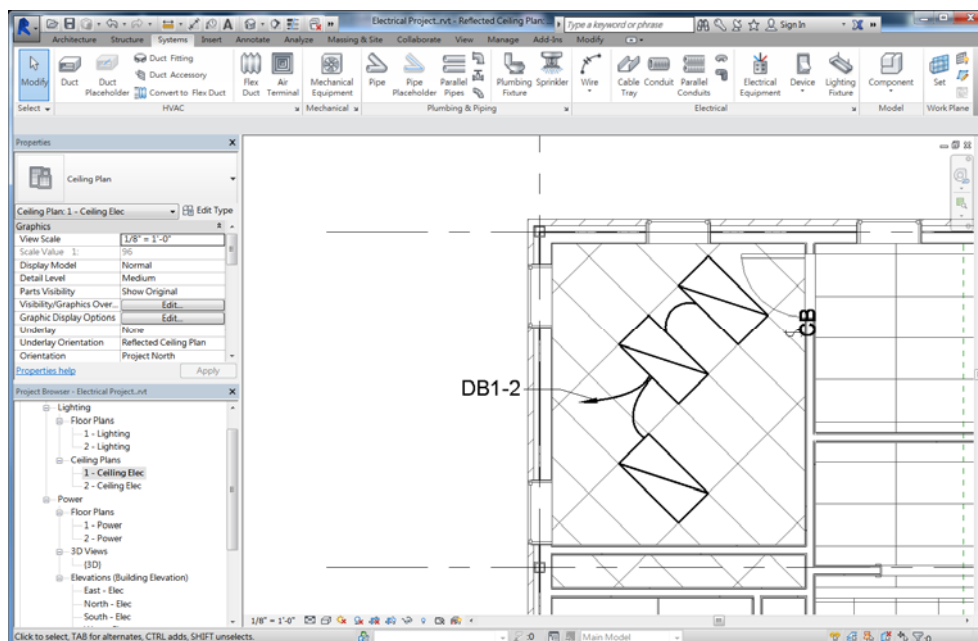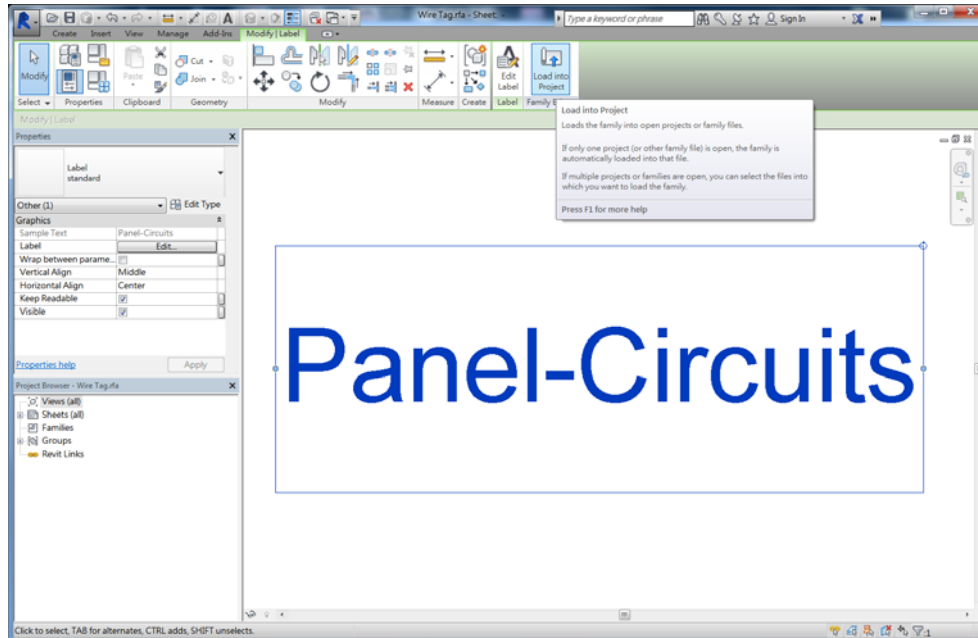
12.10   ADDING CONDUIT

You can connect conduit to electrical and mechanical equipment that has a connector available. Conduit connectors can be individual or surface connectors.

Note: For Conduit Run Schedule, the run of conduit by using the style without fittings (it does not mean that no fittings exist in the run) will be only counted. The length of the fittings will be included in the total length of the run.

You can connect conduit to equipment in plan view, elevation view, or 3D view.
1.   Click Systems tab ▸ Electrical panel ▸ Conduit.
2.   From the Type Selector, select the conduit type (with fittings or without) that you want to place.
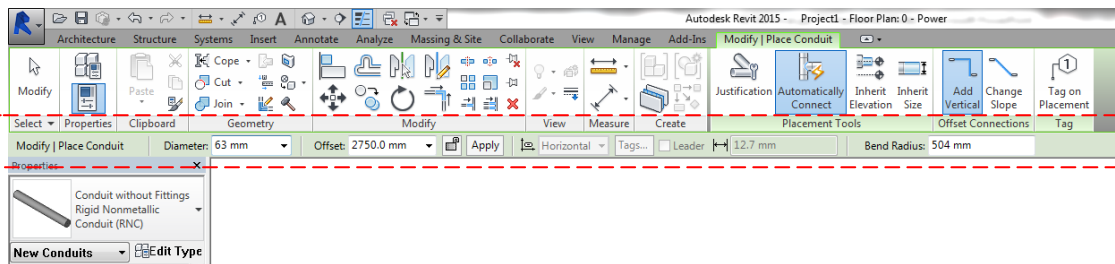

3.   On the Options Bar, specify the diameter, offset, or bend radius.
4.   In the drawing area, draw conduit and move the cursor to the equipment to highlight the surface to connect to.
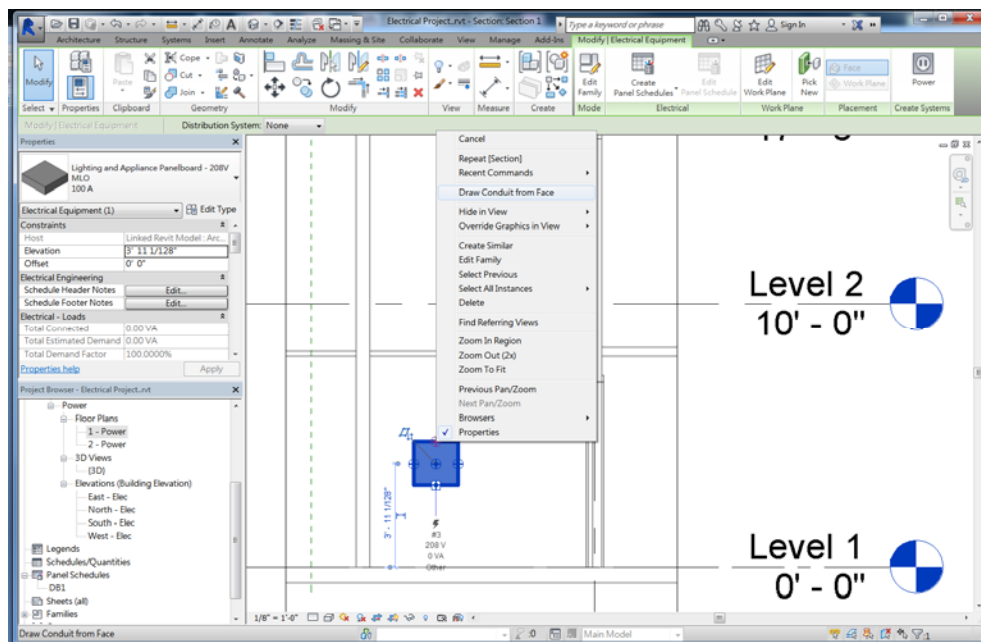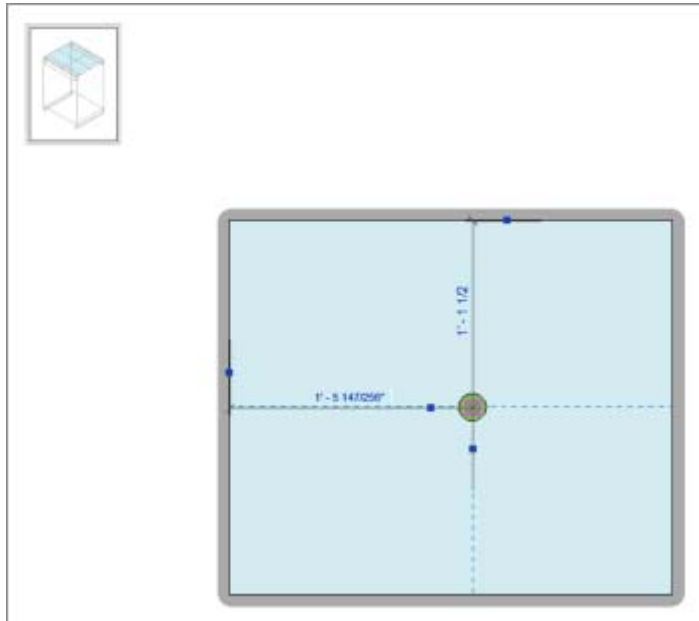
In surface connection mode, you can define the connection point for the surface connector by dragging it to a new position or by specifying temporary dimensions on the surface, complete the connection as is, or cancel the connection.

5. To move the connector, drag the connector snap to the desired location, or enter temporary dimensions for the desired location.
6. To complete the connection and exit surface connection mode, click Surface Connection tab ➤ Surface Connection panel ➤ Finish Connection.
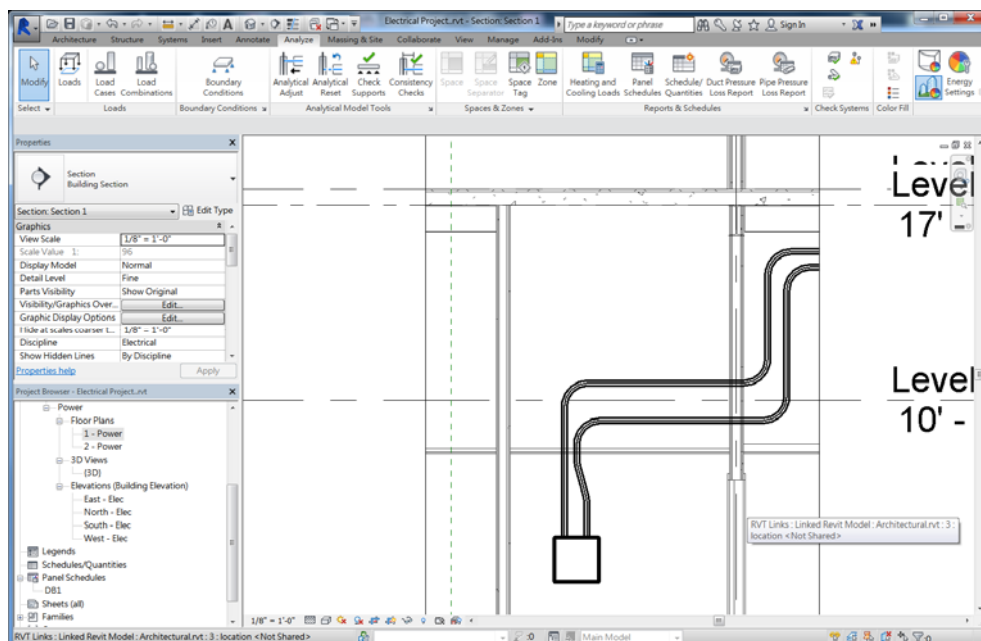

To add additional surface connectors, you must edit the family for the desired equipment.

12.10.1 Apply Difference Conduit Type

Conduit Type:

- Rigid metal conduit (RMC) is a thick-walled threaded tubing, usually made of coated steel, stainless steel or aluminum.

- Galvanized rigid conduit (GRC) is galvanized steel tubing, with a tubing wall that is thick enough to allow it to be threaded. Its common applications are in commercial and industrial construction.

- Intermediate metal conduit (IMC) is a steel tubing heavier than EMT but lighter than RMC. It may be threaded.

- Electrical metallic tubing (EMT), sometimes called thin-wall, is commonly used instead of galvanized rigid conduit (GRC), as it is less costly and lighter than GRC. EMT itself is not threaded, but can be used with threaded fittings that clamp to it. Lengths of conduit are connected to each other and to equipment with clamp-type fittings. Like GRC, EMT is more common in commercial and industrial buildings than in residential applications. EMT is generally made of coated steel, though it may be aluminum.
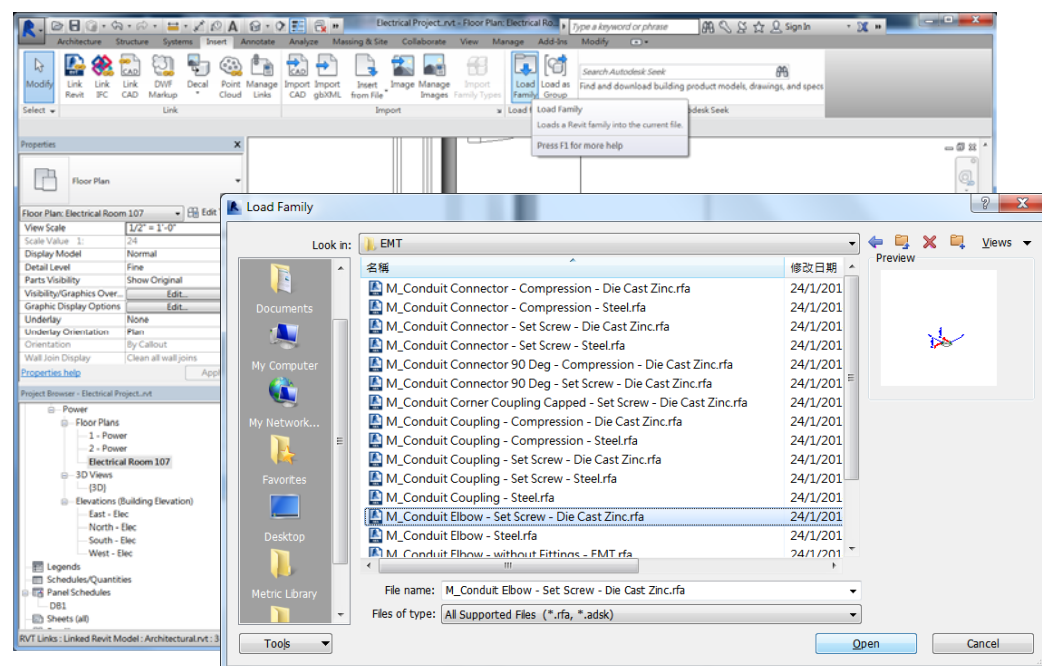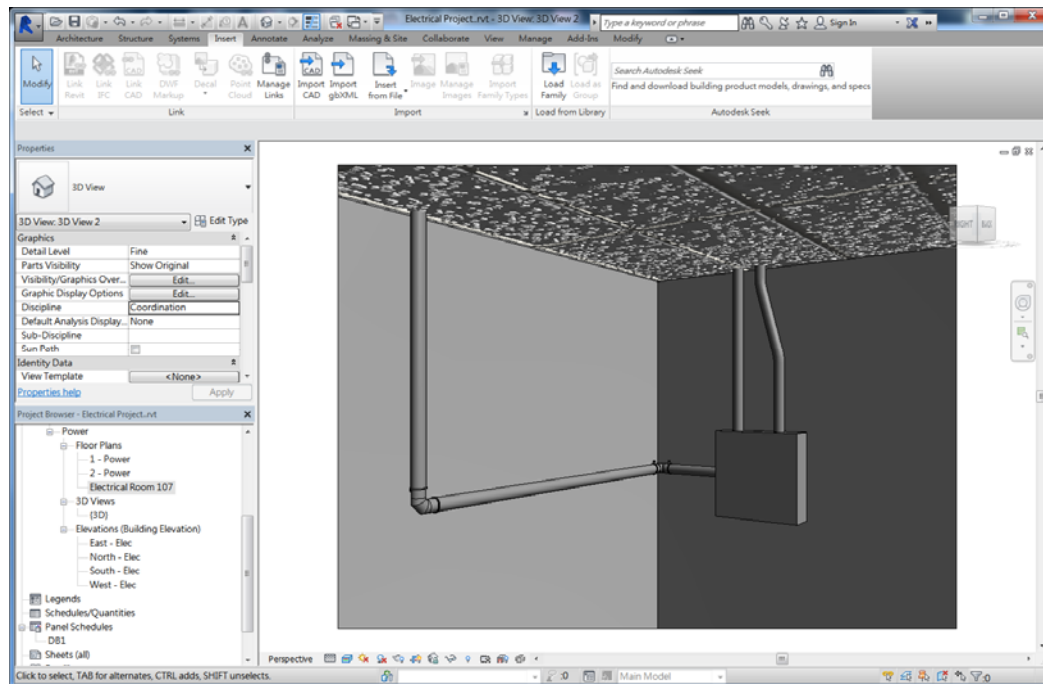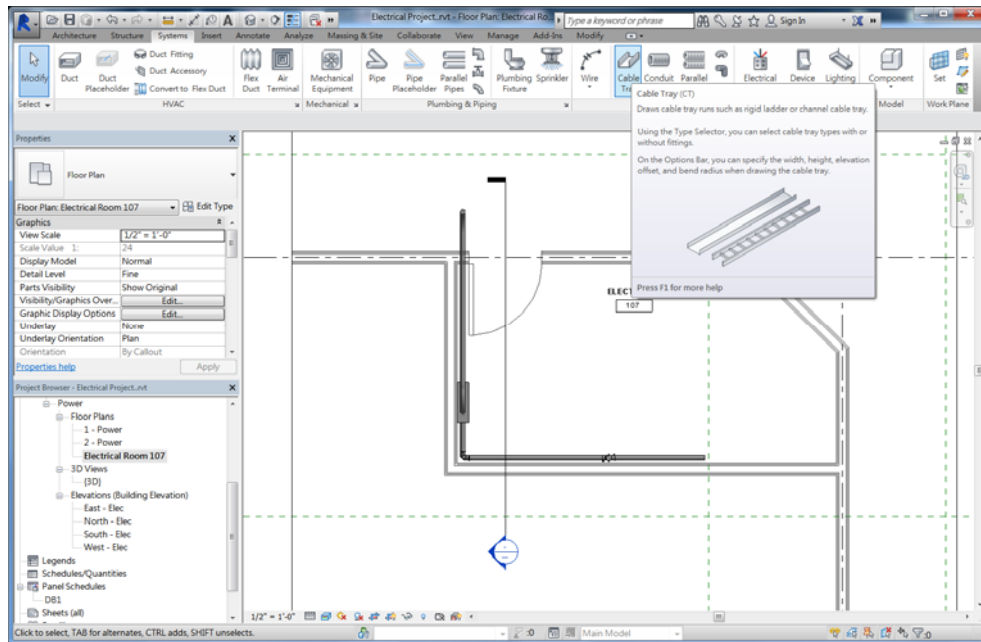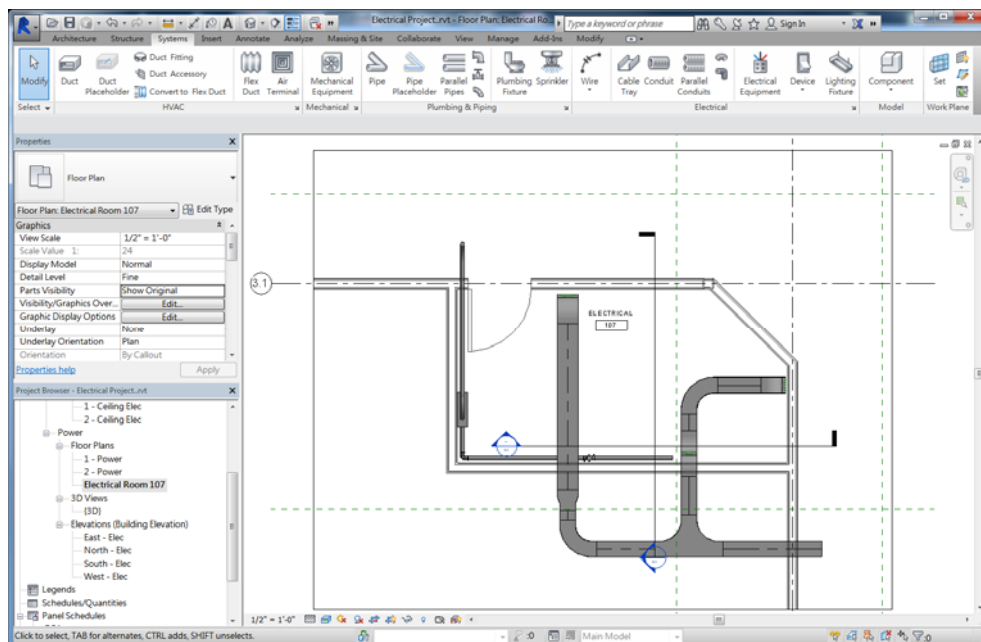
12.11 ADDING CABLE TRAY

The process for modeling cable tray is the same as for conduit. Cable Tray can be connected to equipment or devices that have cable tray connectors. Cable Tray connectors have a static location and cannot be moved along the face of the family without editing the family.

1.   Click Systems tab ➤Electrical panel ➤ 🖉 Cable Tray

2.   On the Options Bar, specify the width, height, offset, or bend radius
3.   In the drawing area, click to specify the start of the cable tray run, then move the cursor and click to specify points along the run

Draw the riser in section view