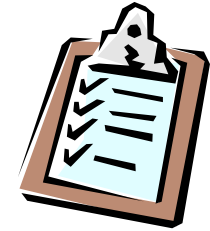# Revit Electrical

Ir. Dr. Sam C. M. Hui
Faculty of Science and Technology
E-mail: cmhui@vtc.edu.hk

Sep 2018

Contents

- Electrical systems

- Lighting systems

- Power and communications

- Circuiting and panels
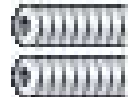
Electrical systems

- Use Revit MEP to create electrical systems (circuits) to place devices, lighting fixtures, and electrical equipment in a project*
  - Work with electrical components
  - Create & edit circuits
  - Create & edit switch systems
  - Electrical sizing & calculations
- Need to understand electrical services design requirements & process

(*See also: Electrical Systems http://help.autodesk.com/view/RVT/2018/ENU/?guid=GUID-8BB35A3A-475A-4FE0-99C0-B01054EE0F2A)

Typical components of electrical systems

- Systems tab ➤ Electrical panel ➤
  - ✎ (Wire)
  - ✎ (Cable Tray)
  - ▦ (Conduit)
  - ▦▦ (Parallel Conduits)
  - ◉ (Cable Tray Fitting)
  - ◥ (Conduit Fitting)
  - 🔲 (Electrical Equipment)
  - ◉ (Device)
  - ◢ (Lighting Fixture)

Power Switch

Create Systems
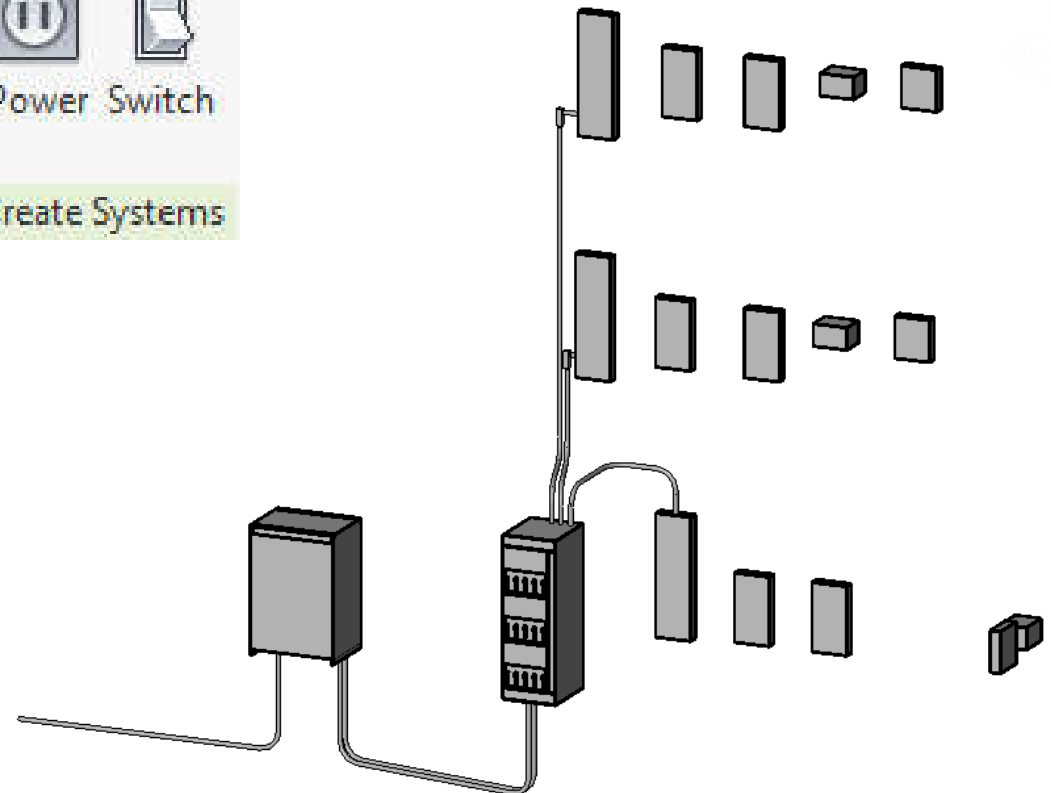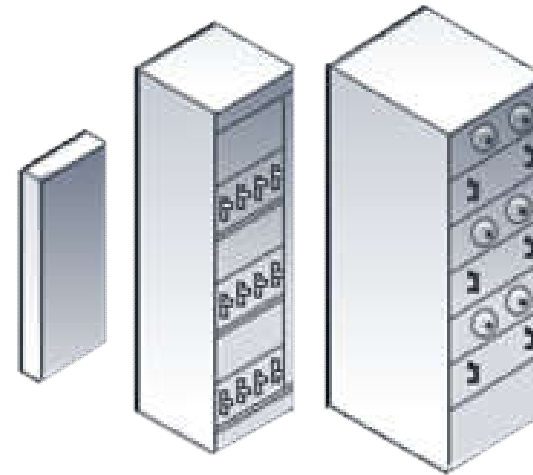
Electrical systems
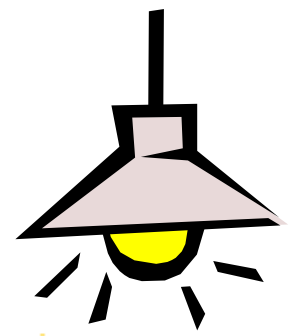
- Electrical loads
  - Lighting and power for a space
  - These loads affect the cooling & heating loads analysis according to the lighting & power schedules

- Electrical family parameters*
  - Specify the parameter type & properties
  - Customize electrical families
  - Facilitate productivity & improve accuracy

(*See also: Electrical Family Parameters http://help.autodesk.com/view/RVT/2018/ENU/?guid=GUID-4E5DD909-DD4C-41B9-83DB-37E9F7CA9639)

Electrical system design in Revit MEP
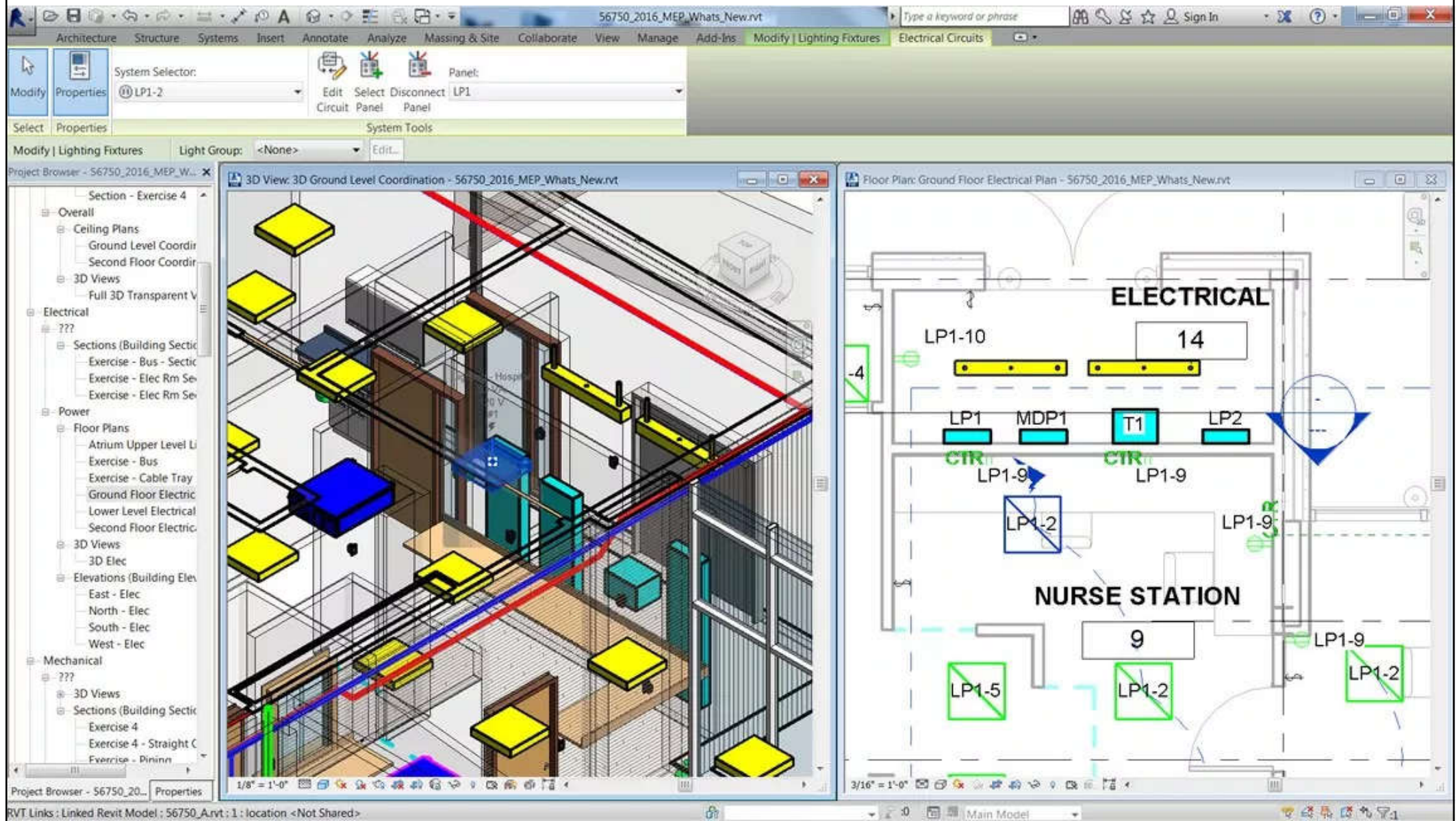
Lighting systems

- Design tasks for lighting systems
  - Select light fixtures & their associated devices
  - Coordinate with electrical design by providing electrical load information
  - Develop presentation imagery by generating realistic light in renderings
  - Coordination on the reflected ceiling plan
  - Check on the correct lighting level & quality
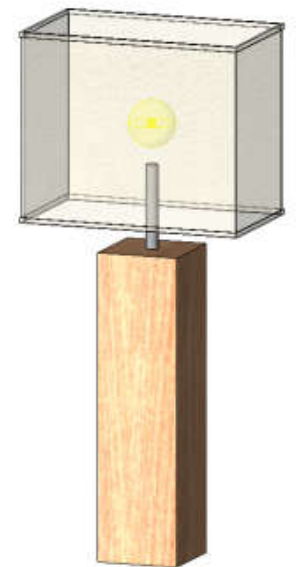
Space volume and ceiling relationship for lighting systems

(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)

Realistic light scenario in renderings

Lighting systems
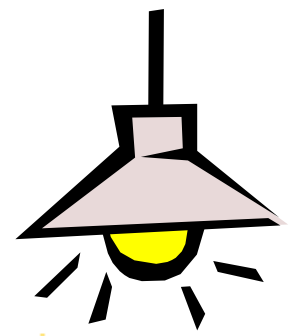
- Lighting analysis
  - Space lighting schedule (e.g. shows required & actual lighting levels, lighting electrical loads)
    - Assign target lighting levels to spaces easily
  - Revit MEP uses basic lighting calculation methods to provide an average estimated illumination*

- Hosting lighting fixtures & devices
  - Important for coordination with other model elements (e.g. ceiling- or wall-counted)

(*See also: About Lighting Calculations http://help.autodesk.com/view/RVT/2018/ENU/?guid=GUID-60EC93DB-5194-4334-9D61-B17850CE3BC1)

Lighting fixtures hosted by reference planes

SECOND FLOOR

15' - 0"

Fixture is upside down in relationship to the model

Reference plane drawn from right to left

Reference plane drawn from left to right

FIRST FLOOR

0' - 0"

(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)
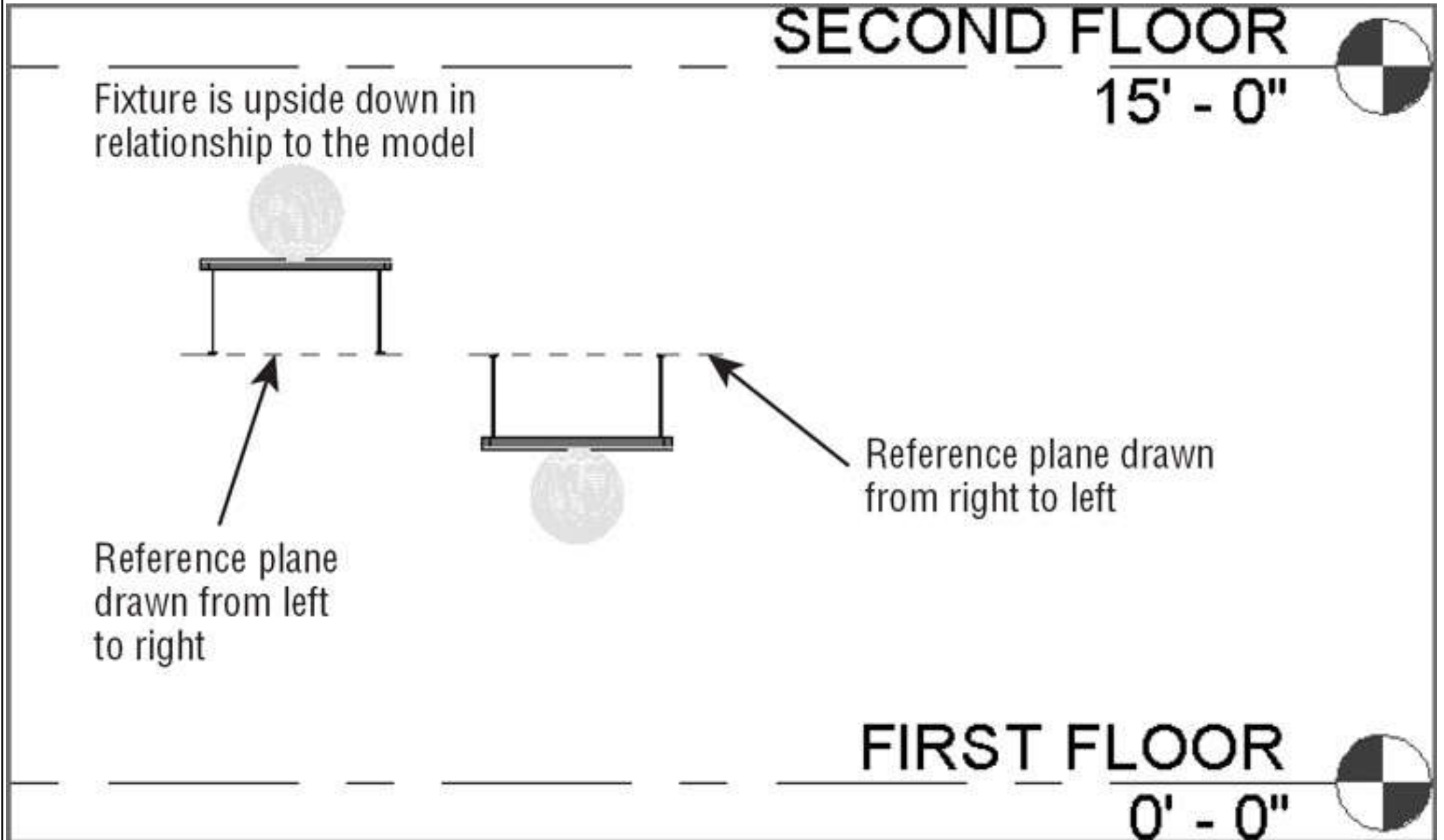
Pendant fixtures hosted by structural framing members
(spaces with no ceiling)

AUDITORIUM
ROOF
20' - 0"

FIRST FLOOR
0' - 0"
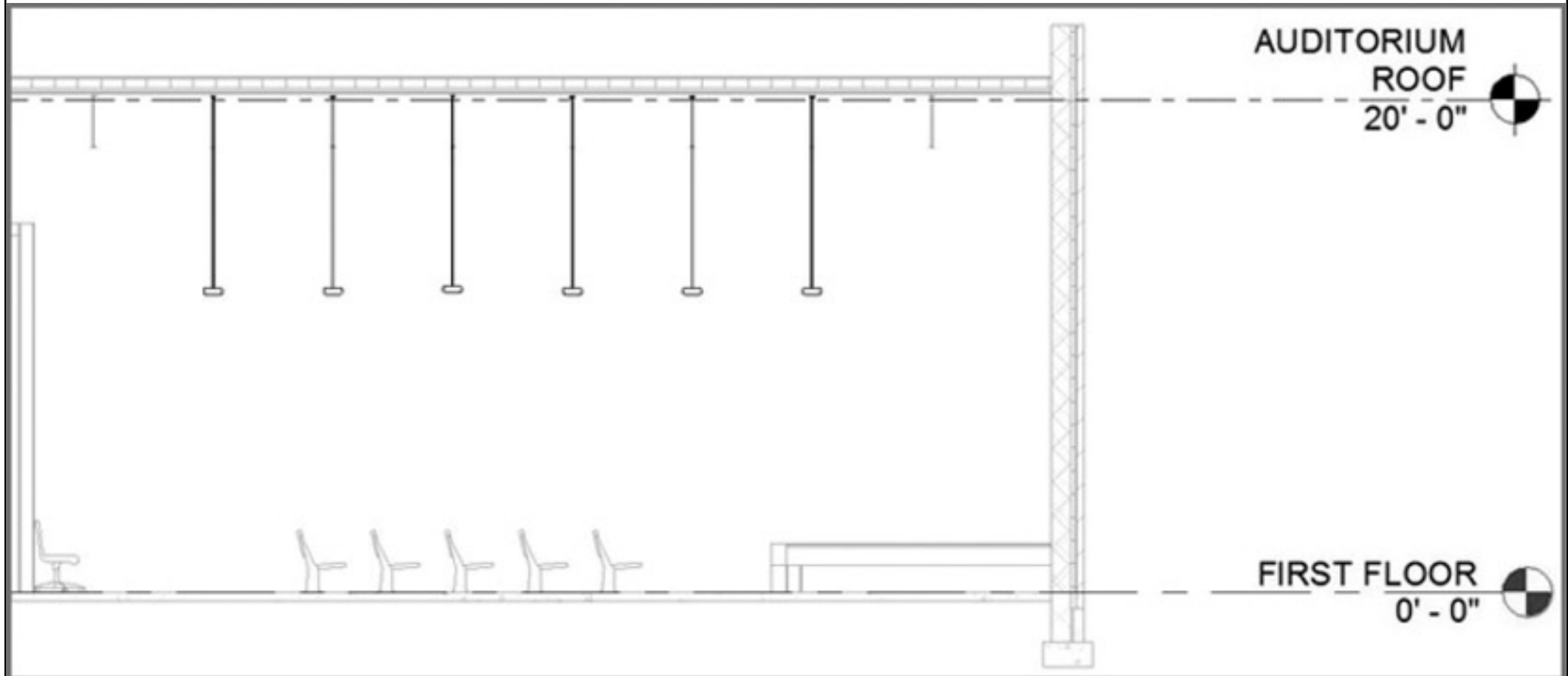
Light fixtures and switch system
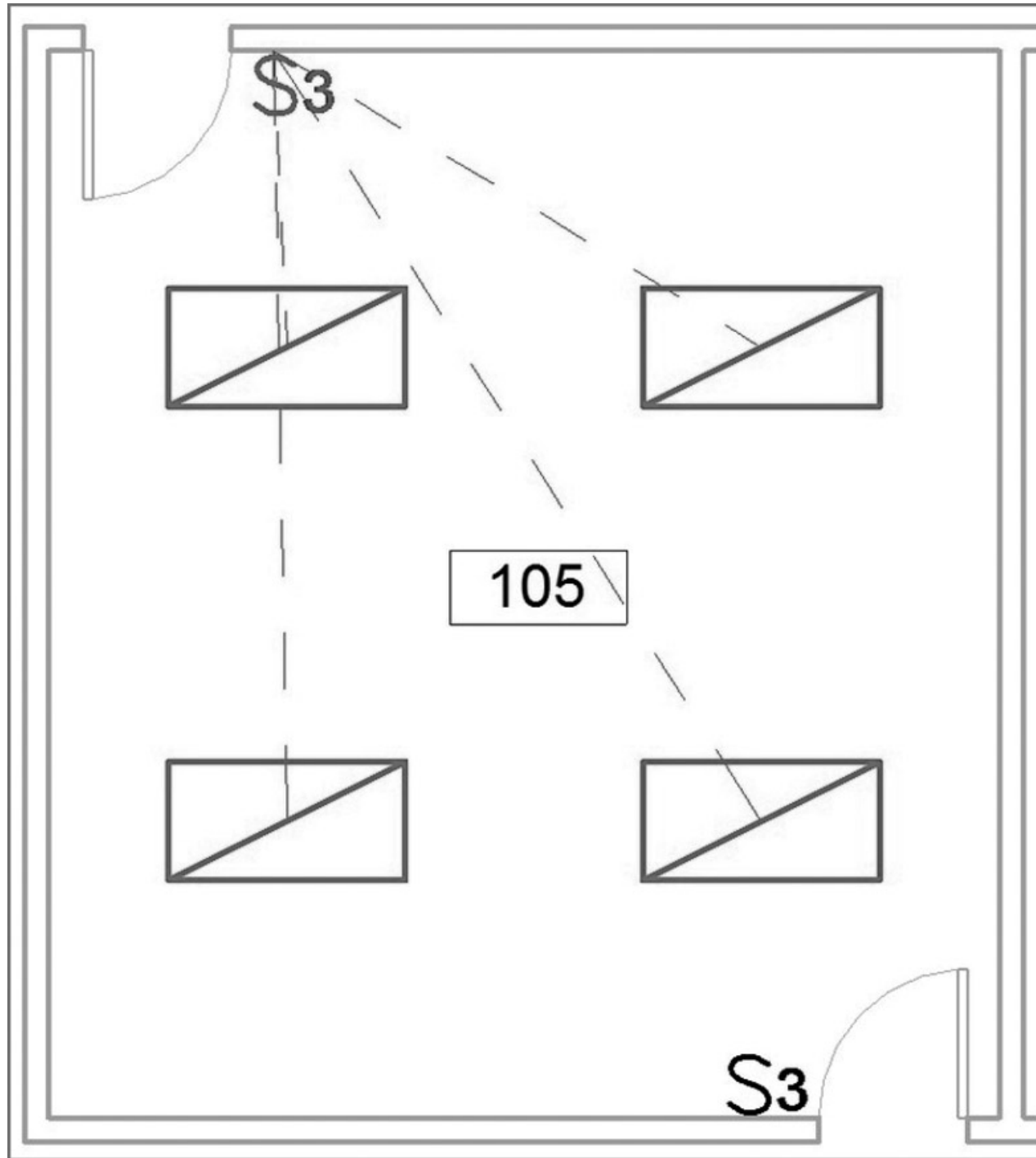
Examples of lighting layout & circuits in an office building
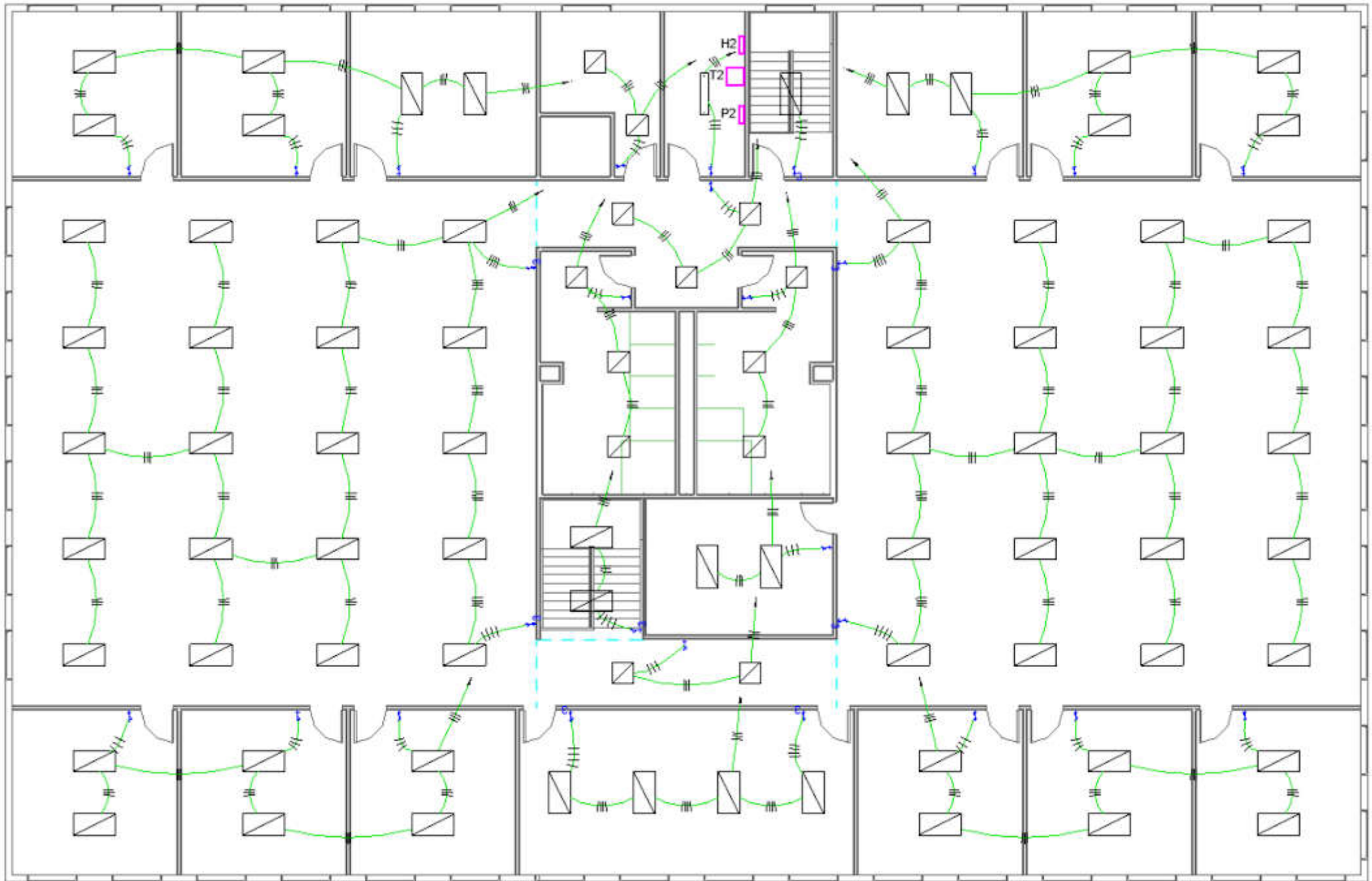
Lighting systems

- Exterior site lighting
    - Revit MEP cannot do analysis on exterior lights
    - Locations of poles, bollards, and other site lighting fixtures can be coordinated with other utilities within the project site
    - Create renderings to get an idea of the coverage of the lighting fixtures on the site
    - Can use the site plan or topography information from other consultants (Architect & Civil Engr.)

Site lighting fixtures in 2D (left) and 3D (right) views
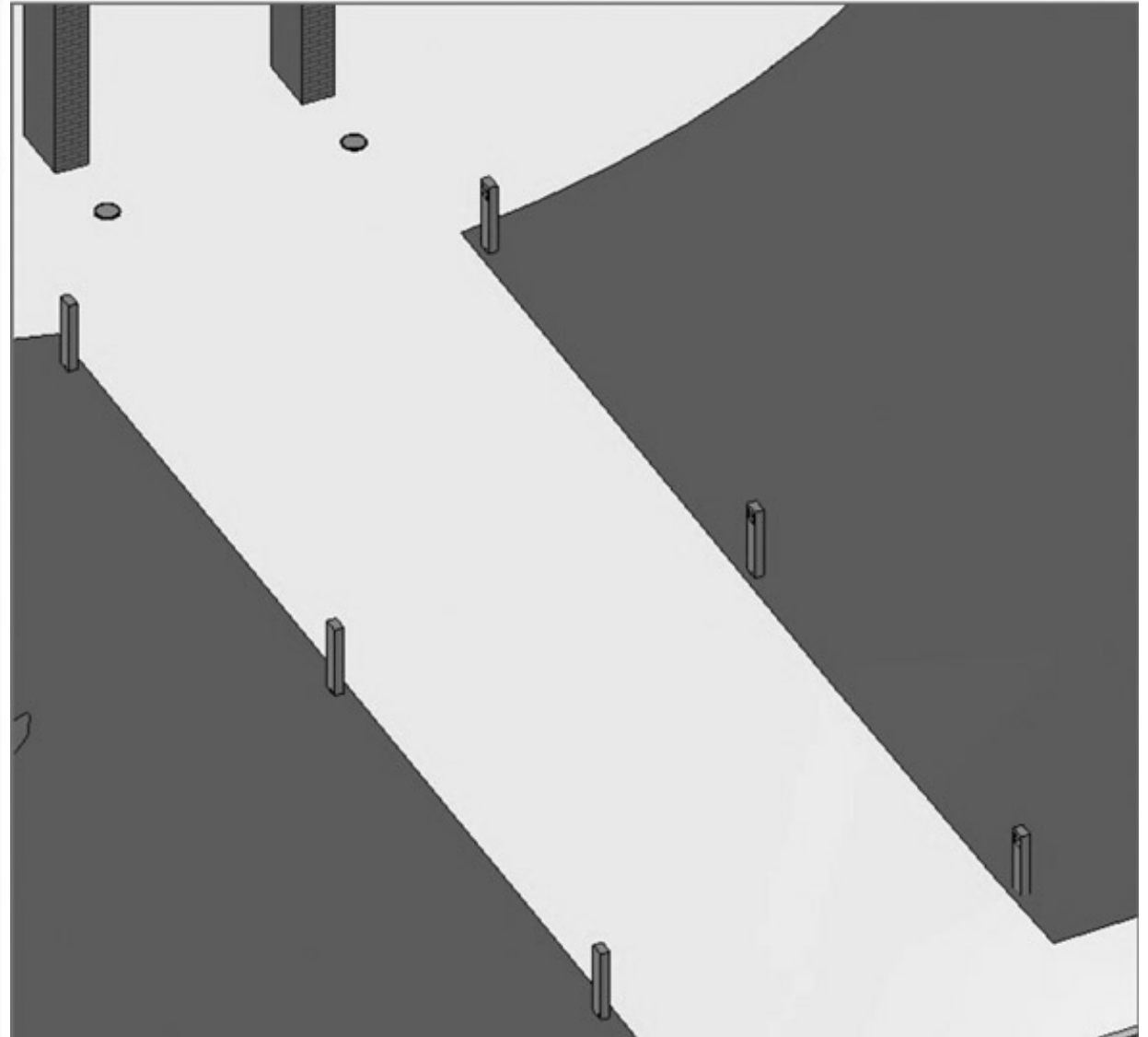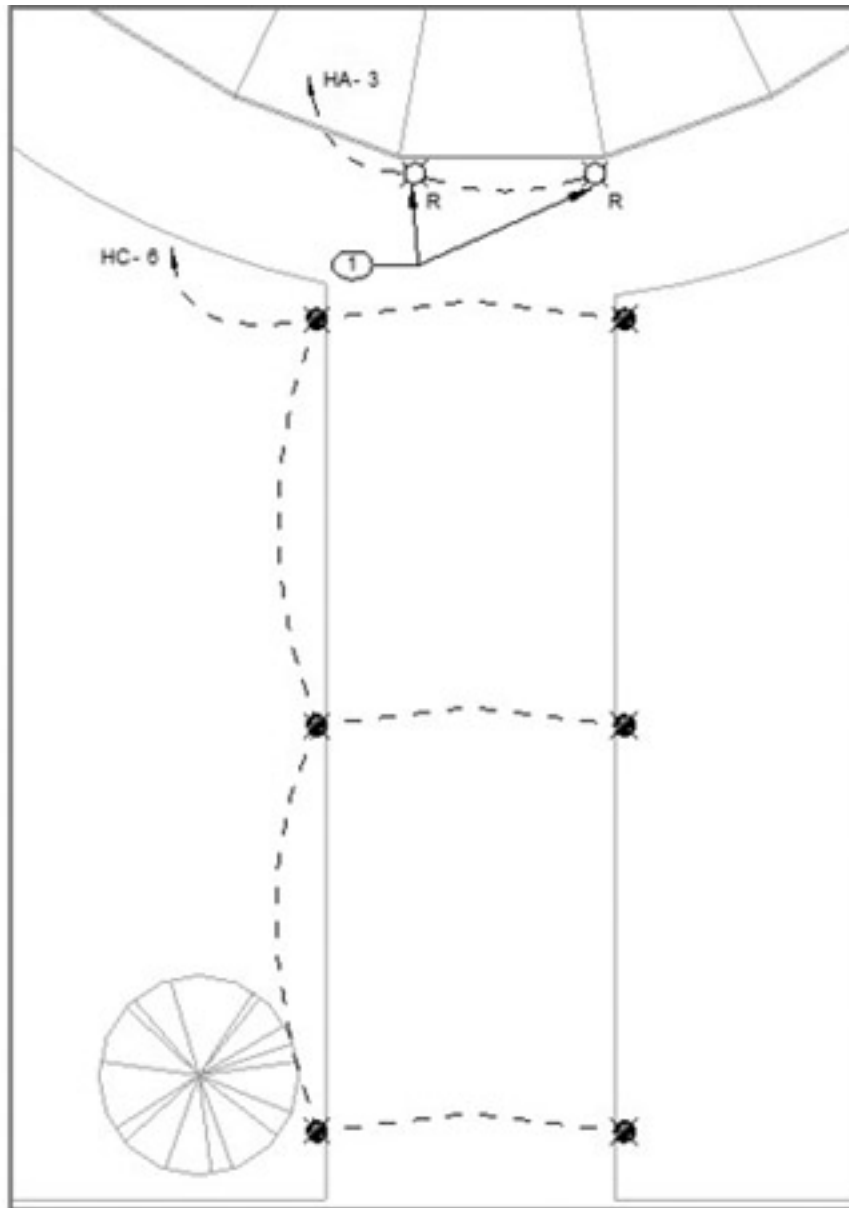
Sun path shown in a 3D view
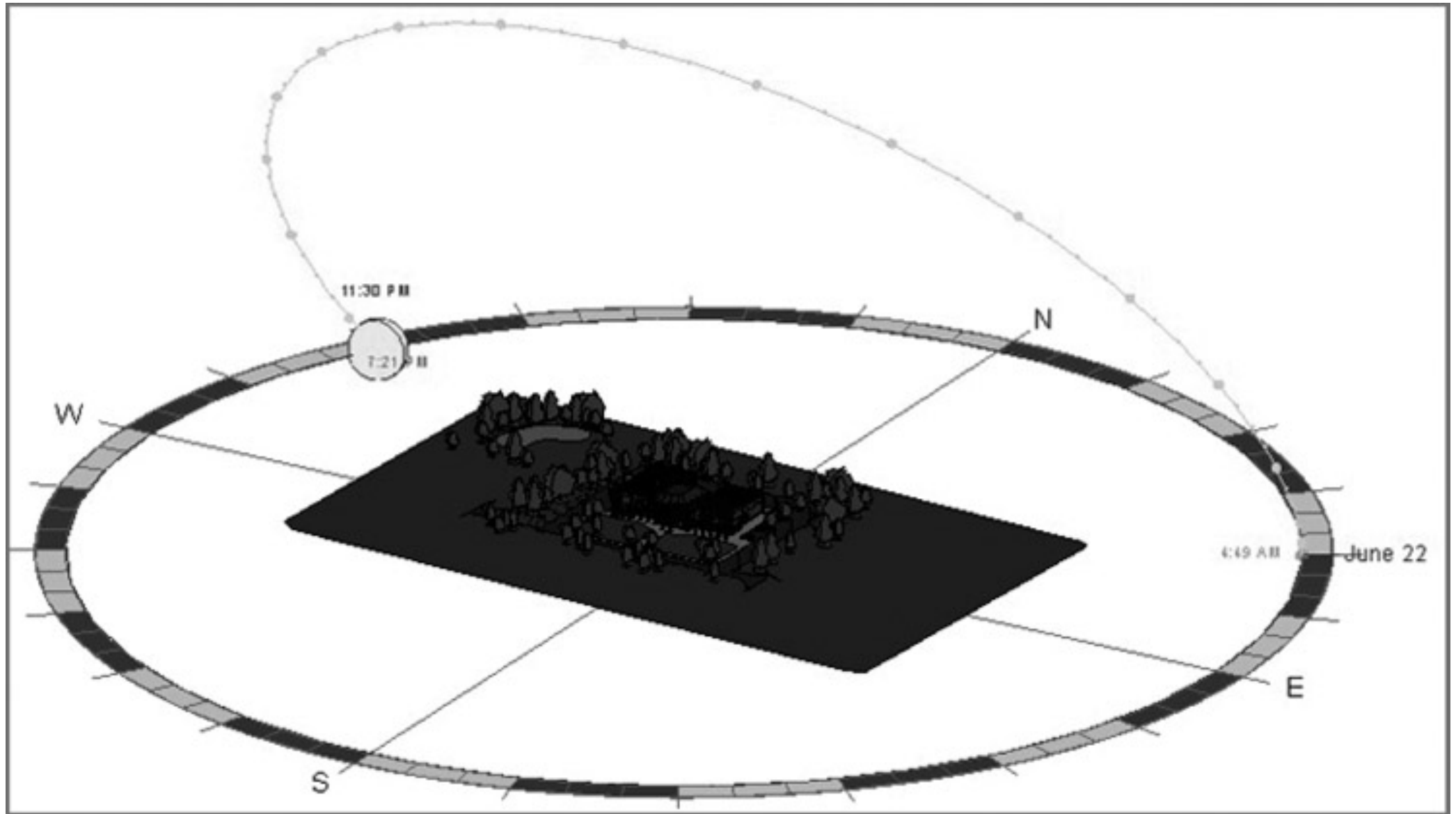
Power and communications
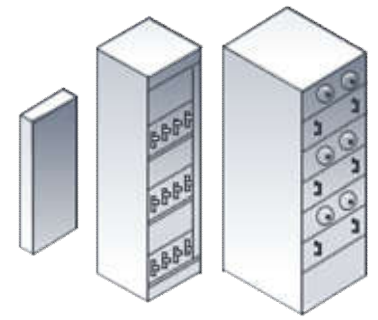
- Electrical systems & devices

  - Electrical equipment, conduit runs & cable trays, receptacles and junction boxes

  - Building comunication systems

  - Security & fire alarm systems

- Modelling methods

  - Can use symbols, model elements, or a combination of the two to represent the design electrical layout; then create a circuit for them

Device button & type selector
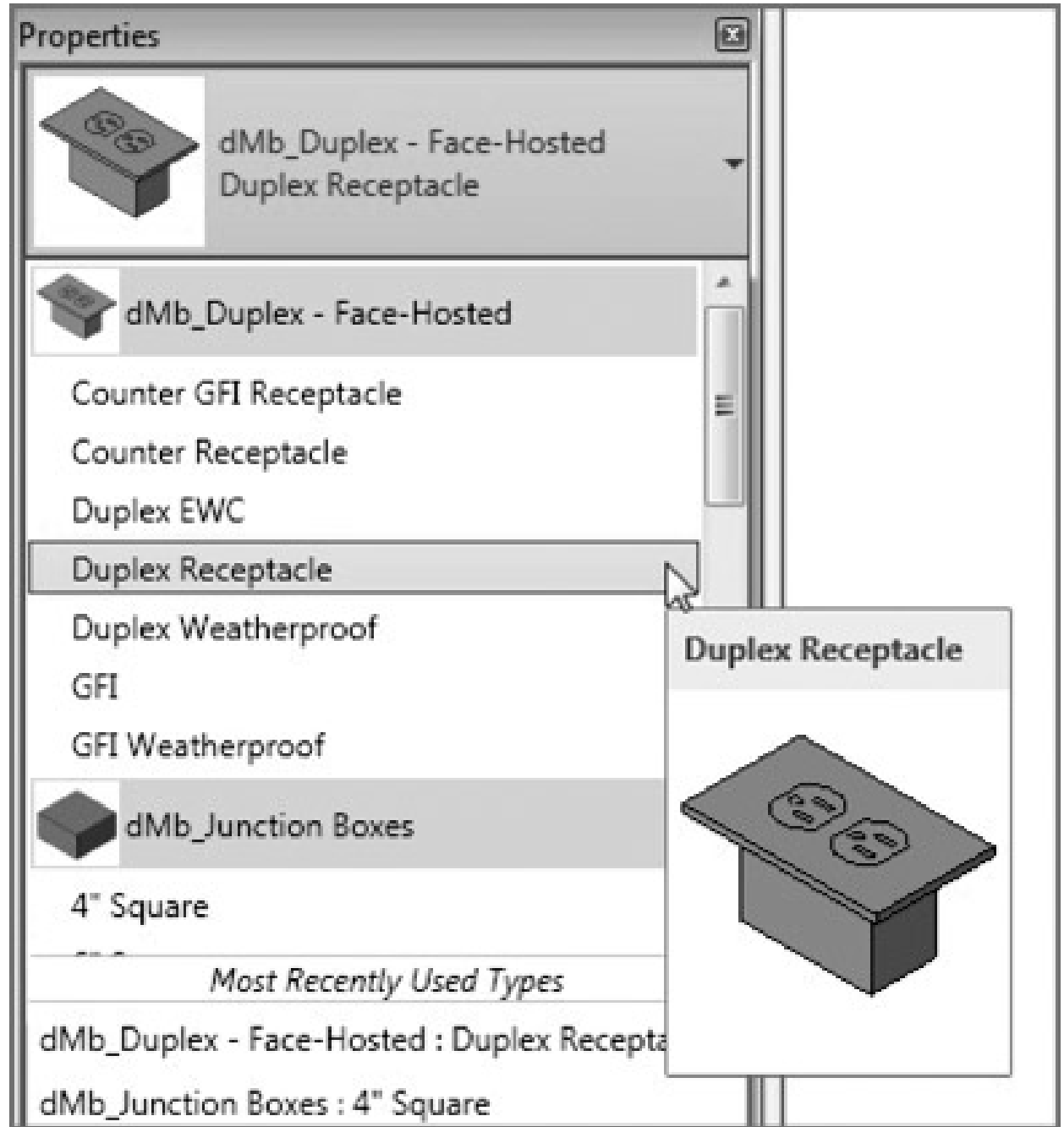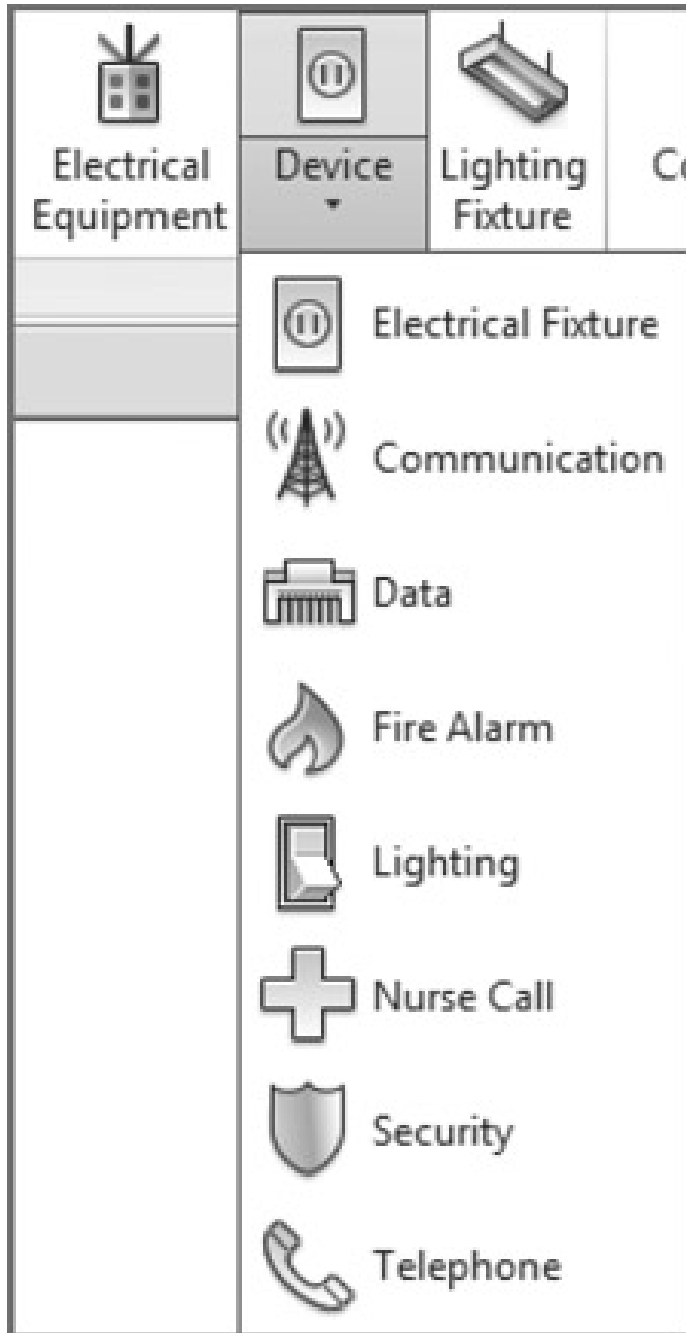
Multiple symbols in a device family
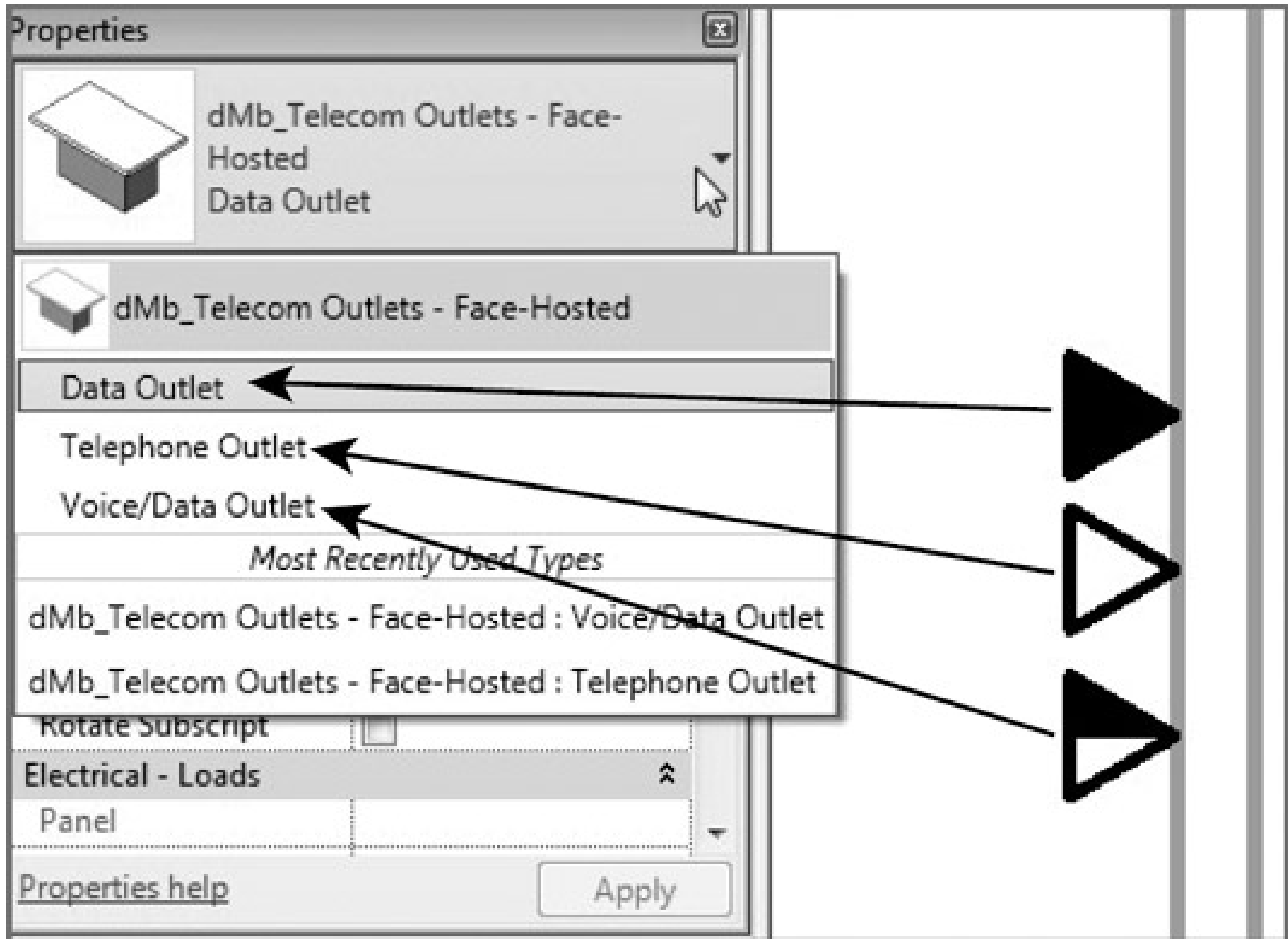
Power and communications
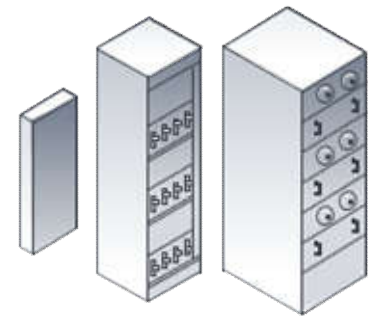
- Placing devices & equipment connections

  - Use symbols that contain connectors to account for the connections in the electrical model

  - Such as linking an HVAC equipment with electrical specifications to an electrical supply

- Disconnect or isolation switches

  - A point of disconnection is required

  - To coordinate location and space requirements

  - Attach wiring or drawn from the symbol

(See also: Design the Electrical Systems http://help.autodesk.com/view/RVT/2018/ENU/?guid=GUID-C1F0D828-6C41-45DF-A03E-C5B6DC64FA40)

Equipment connection with a connector, disconnect switches

Properties

dMb_3 PH Equip Connection
480V

Electrical Fixtures (1) · Edit Type

Constraints	
Level	FIRST FLOOR
Host	Level : FIRST FLOOR
Offset	0' 0"
Electrical	
Power Factor	0.900000
Load	22447.38 VA
Apparent Load Phase C	7482.46 VA
Apparent Load Phase B	7482.46 VA
Apparent Load Phase A	7482.46 VA
Electrical - Loads	
Panel	HA
Circuit Number	7,9,11
Identity Data	
Equipment Name	
Comments	
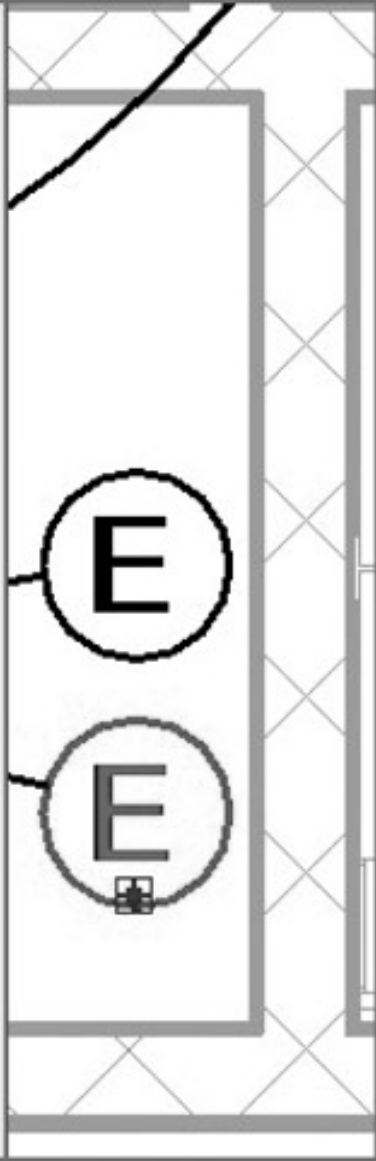
Properties help   Apply

E

E

60A

200A

600A

(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)
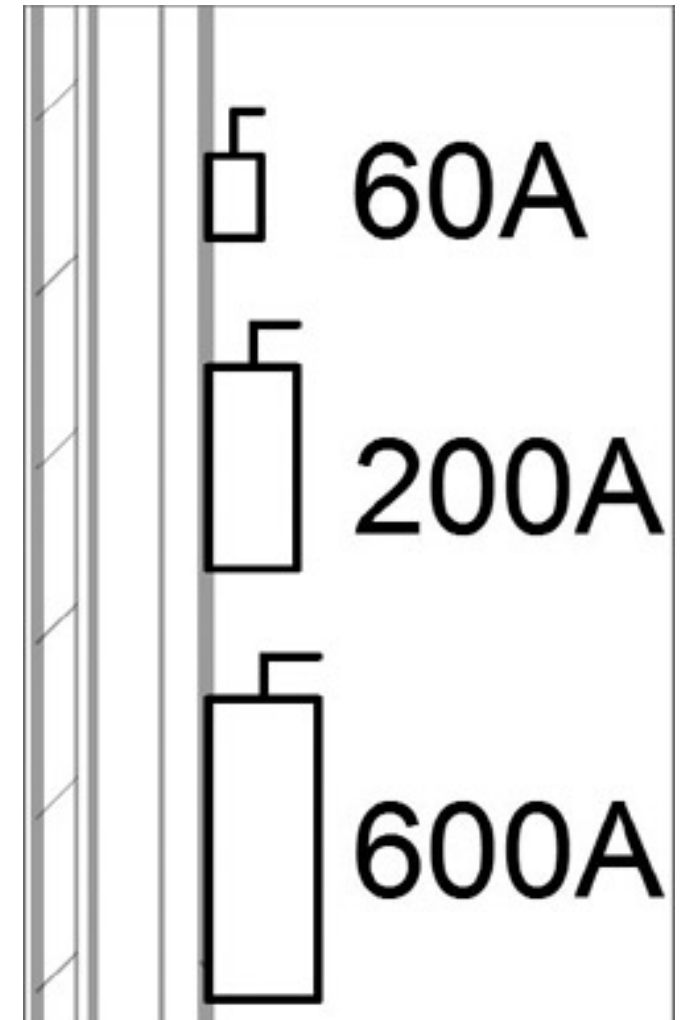
Power and communications
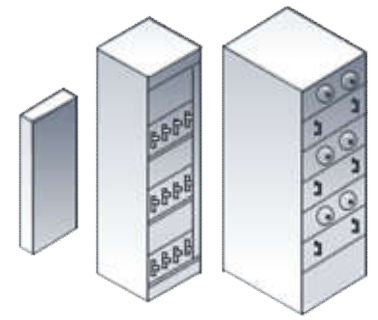
- Distribution equipment & transformers
    - They require space for accessibility
    - Using accurately sized model components for them allows you to coordinate early on with the architectural model for space requirements

- Switchboards
    - Various components e.g. metering, transformer, and circuit breaker sections
    - Define distribution system & switchboard layout

Transformer properties & switchboard layout

Properties

Dry Type Transformer - 480-208Y120 -
NEMA Type 2
30 kVA

Electrical Equipment (1) — Edit Type

Electrical Engineering

Schedule Header Notes	Edit...
Schedule Footer Notes	Edit...

Electrical - Loads

Secondary Distribution ...	120/208 Wye
Total Connected	None
Total Estimated Demand	Default
Total Demand Factor	480/277 Wye
Total Connected Current	120/240 Single
Total Estimated Deman...	120/208 Wye
Apparent Load Phase A	0.00 VA

Properties help — Apply

480 V
#3

109
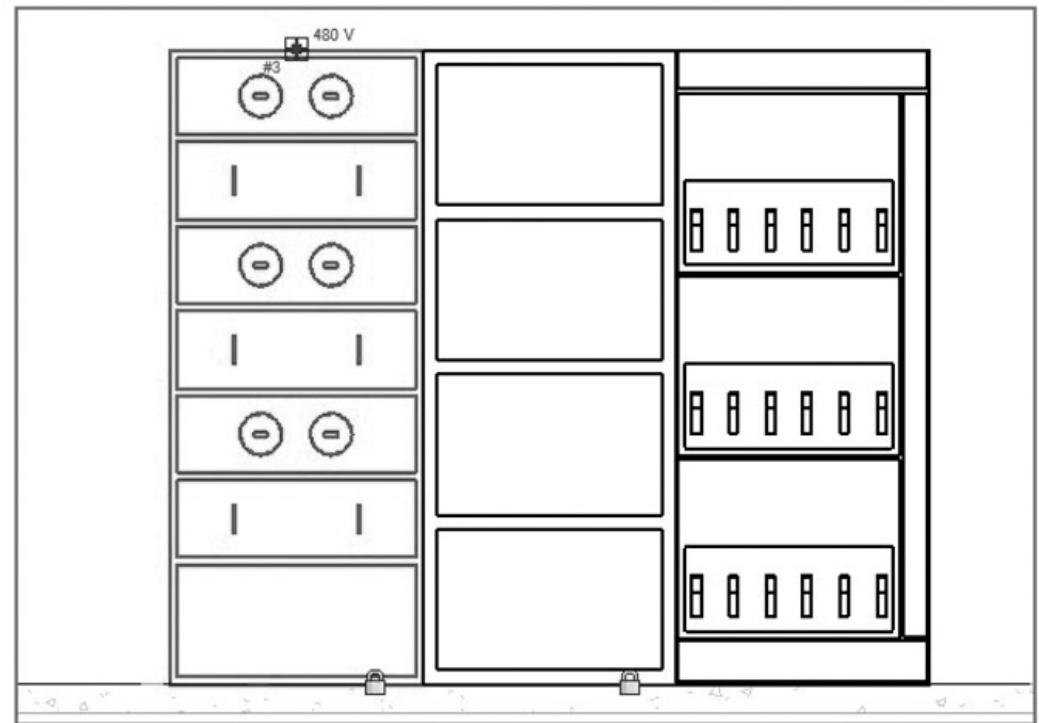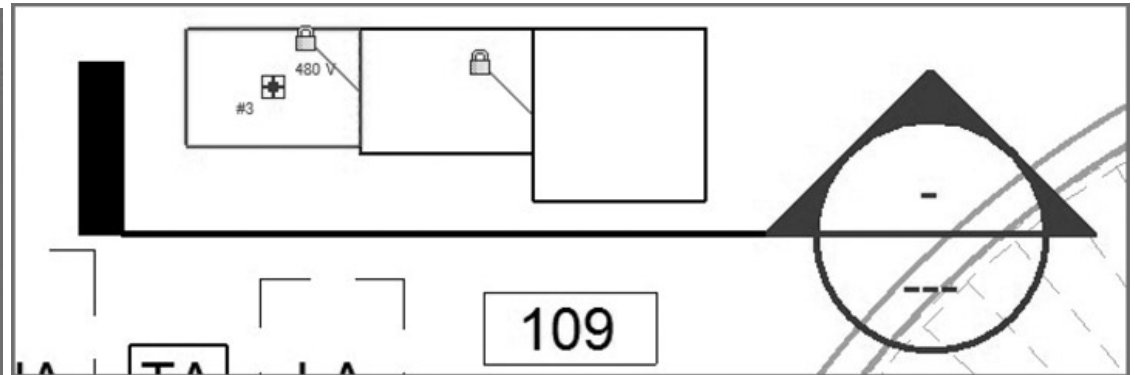
Section view & 3D view of electrical equipment
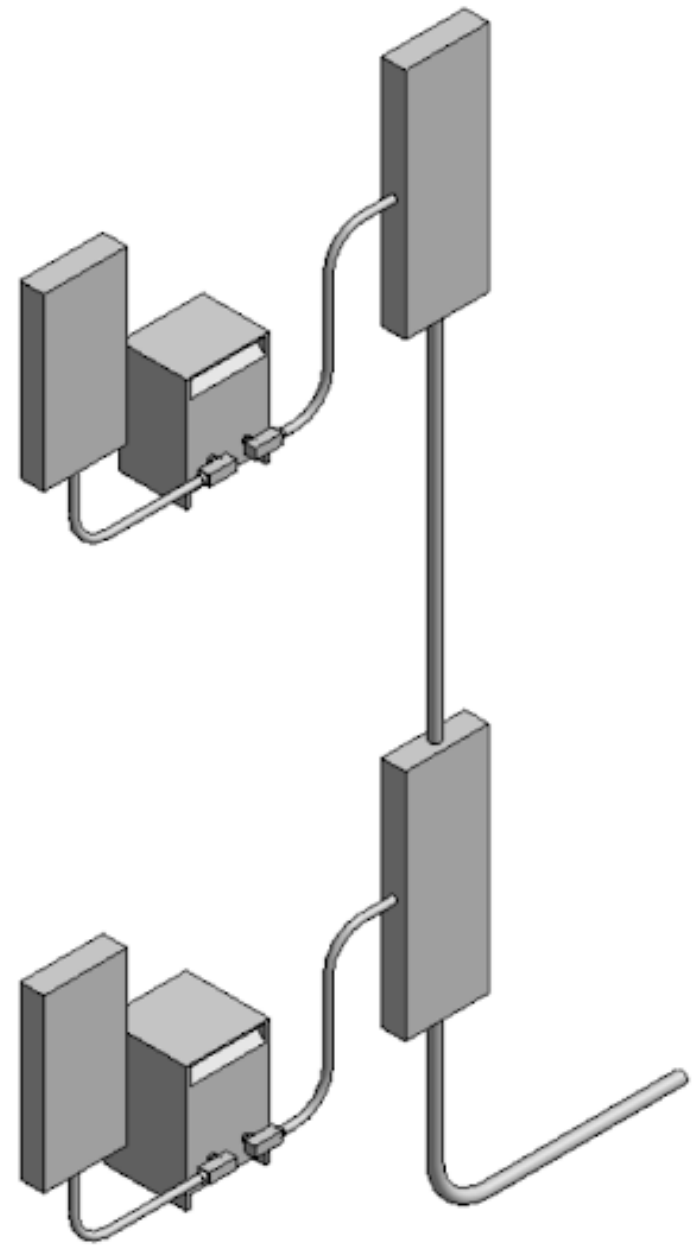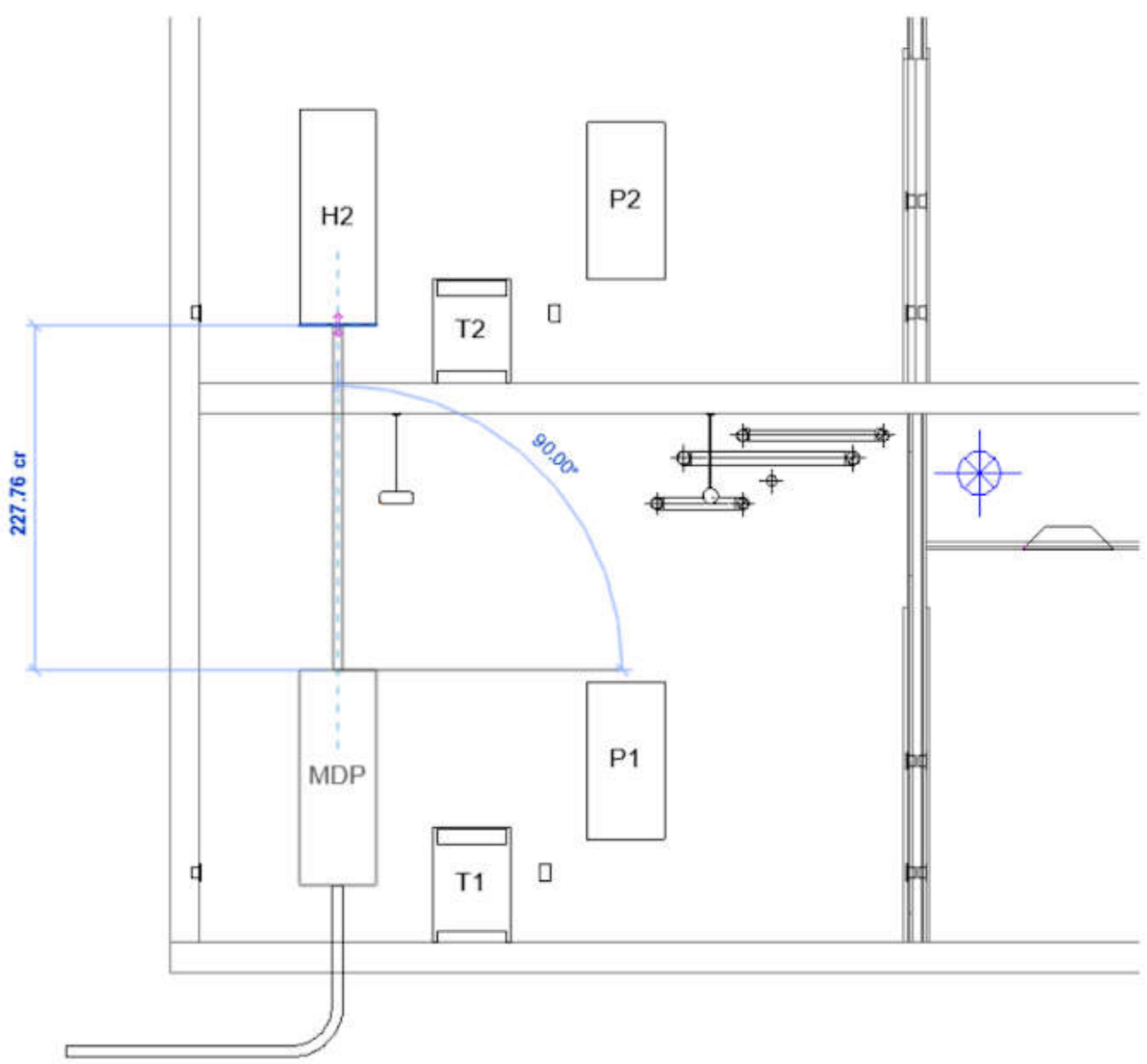
Power and communications
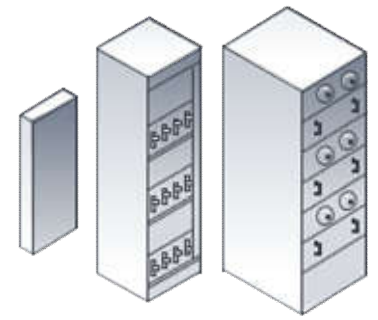
- [Electrical distribution panels](#)
  - Simply represent the size of the panel by displaying the box, or use a detail component
  - Clearance space is an important issue
    - Elements can be added to panel families to represent clearances & check for interferences
  - Assign a distribution system to the panels
    - Create circuits for devices & lighting fixtures as well as model the distribution system
  - Other electrical equipment can be represented

Electrical panel family with clearance elements

(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)
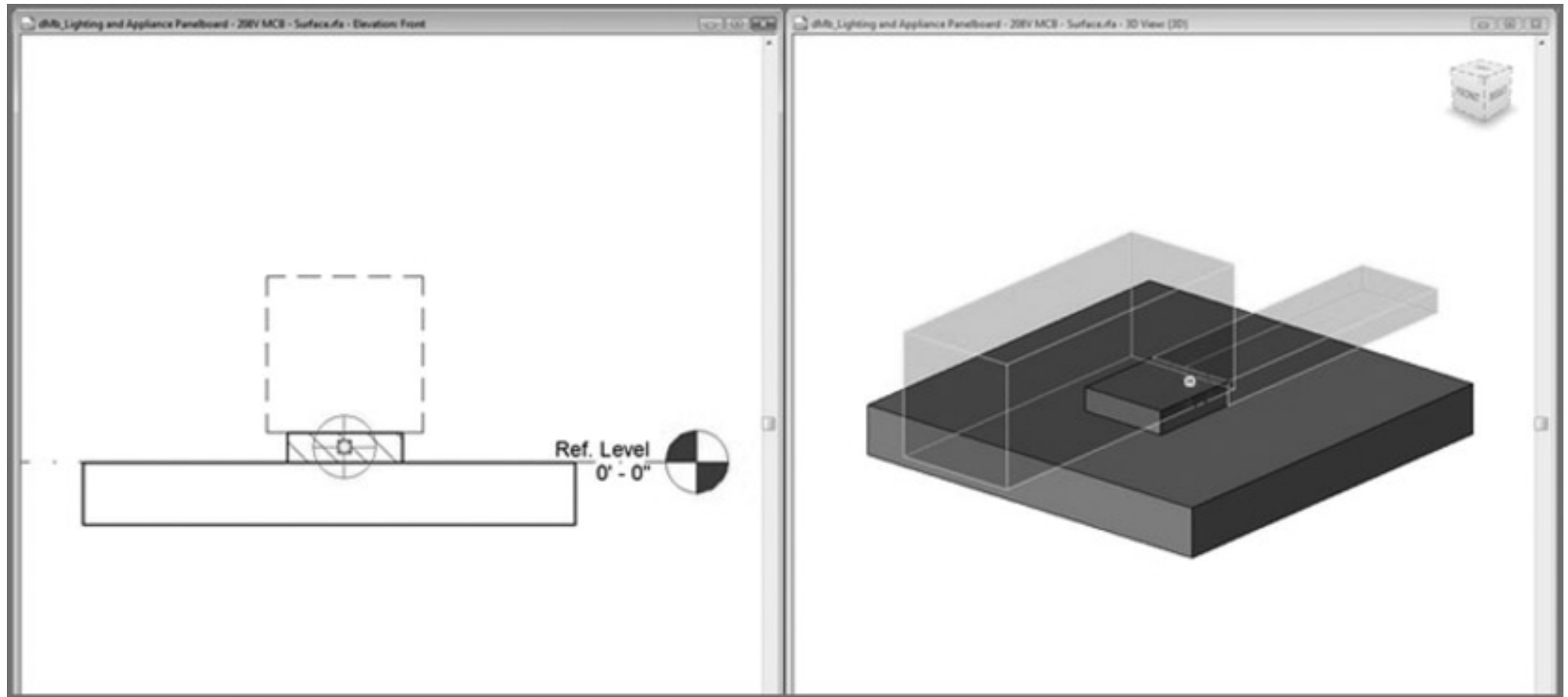
Power distribution diagram created in Revit MEP
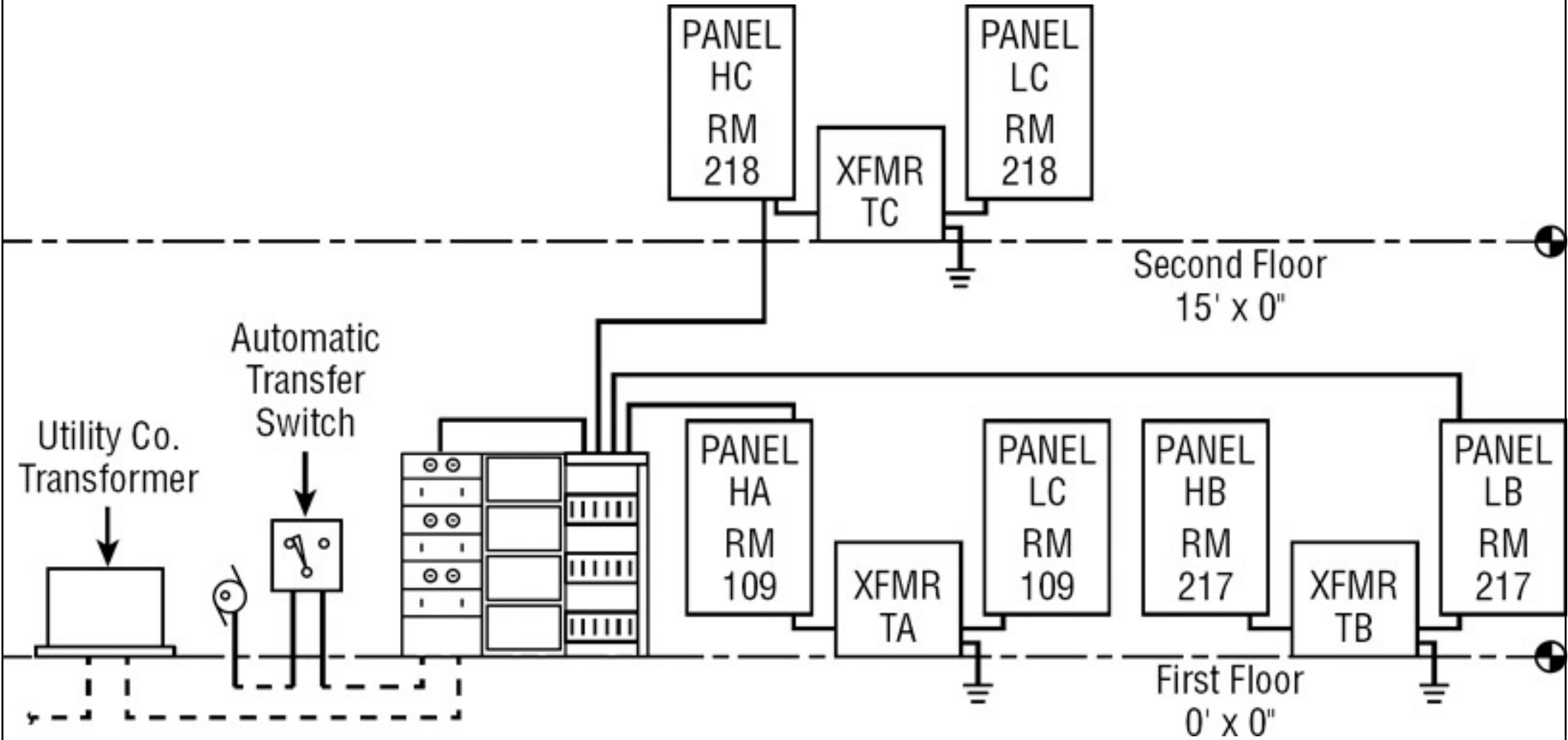
PANEL HC RM 218

XFMR TC

PANEL LC RM 218

Second Floor
15' x 0"

Automatic
Transfer
Switch

Utility Co.
Transformer

PANEL HA RM 109

XFMR TA

PANEL LC RM 109

PANEL HB RM 217

XFMR TB

PANEL LB RM 217

First Floor
0' x 0"

Power and communications
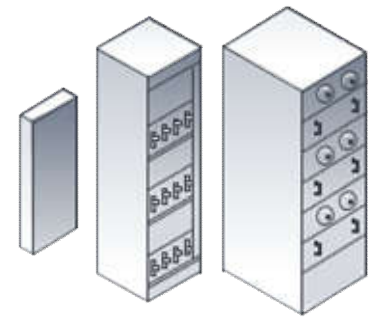
- [Fire alarm system](#)

  - Create a work-set for it to allow for multiple user access to the model

  - Fire alarm construction documents are usually schematic in nature

  - Wiring is typically not shown on fire alarm layout plan drawings for the connectivity of the system

  - Fire alarm riser diagram is an important information of the project

Sample fire alarm plan
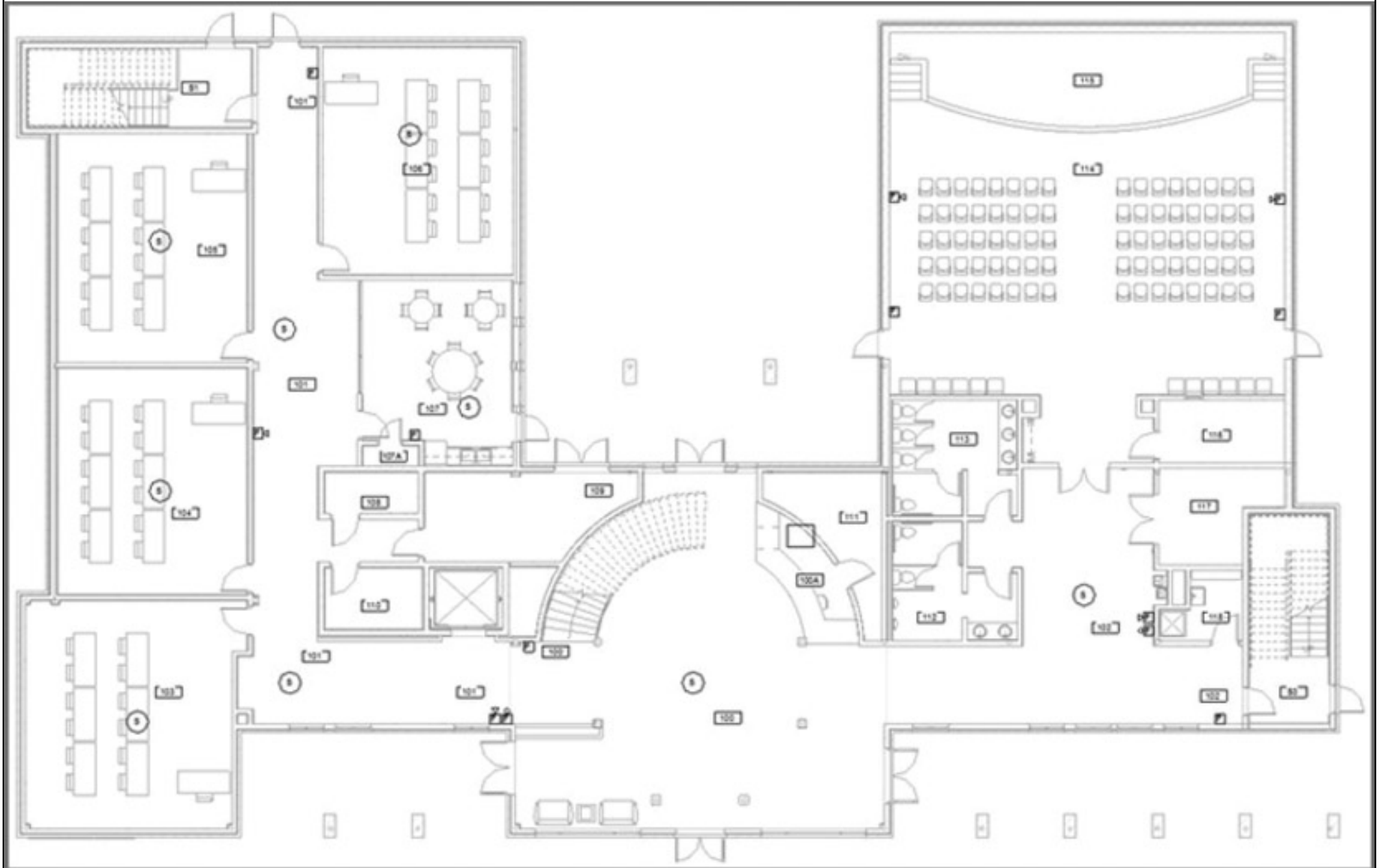
Sample fire alarm riser diagram using detail lines, text, and symbols

(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)
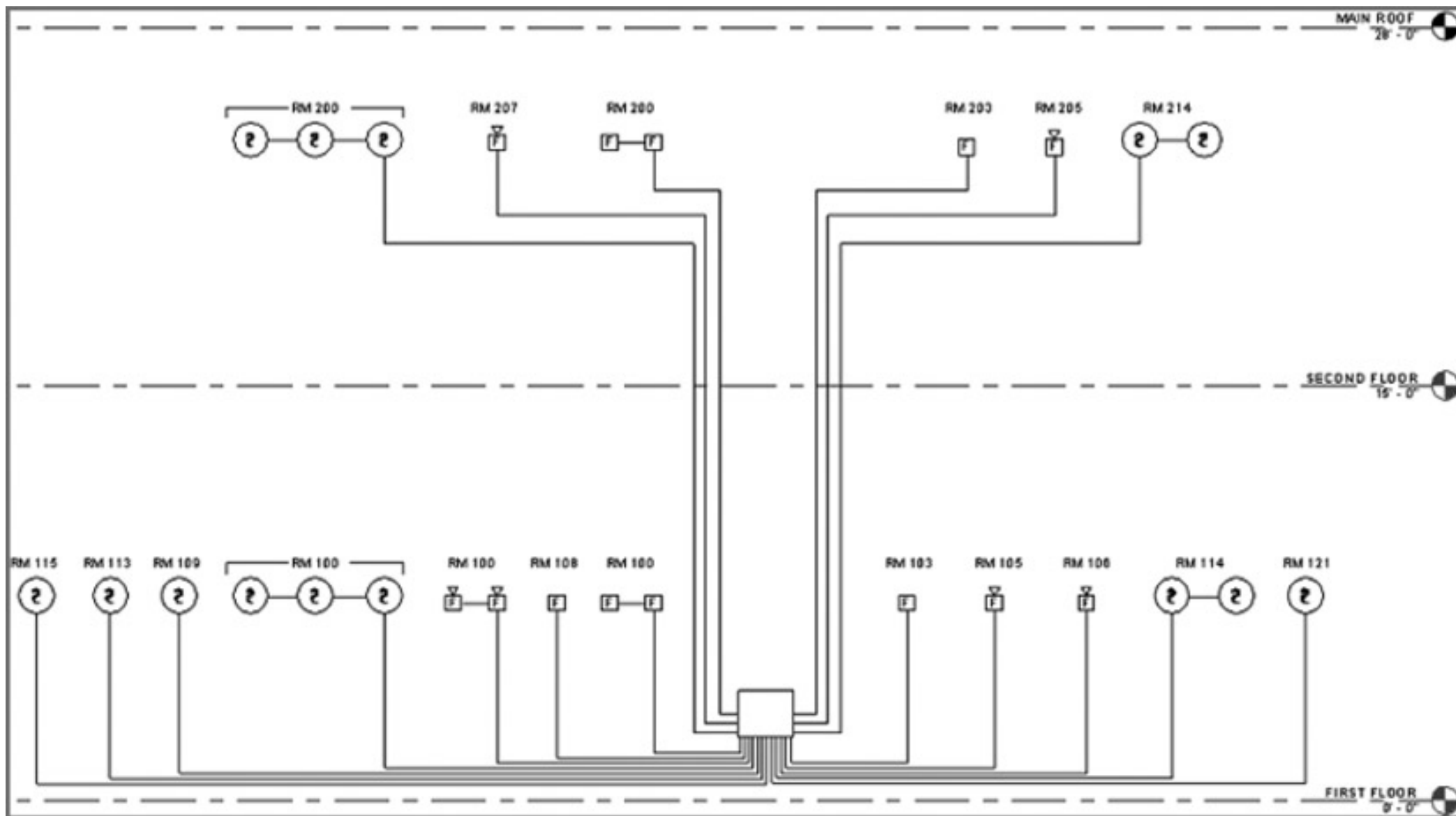
Power and communications
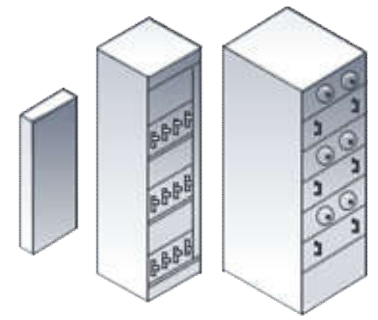
- [Modelling conduit & cable tray](#)
  - Model conduit only when it may present a coordination issue with other building components
  - Can create conduit or cable tray runs that utilize fittings or runs that do not
  - Conduit displays as a single line or showing fittings with bend radius for conduit elbows
  - Conduit and cable tray settings and sizes
  - Placing conduit or cable tray in a model

Modelling conduit & cable tray

(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)
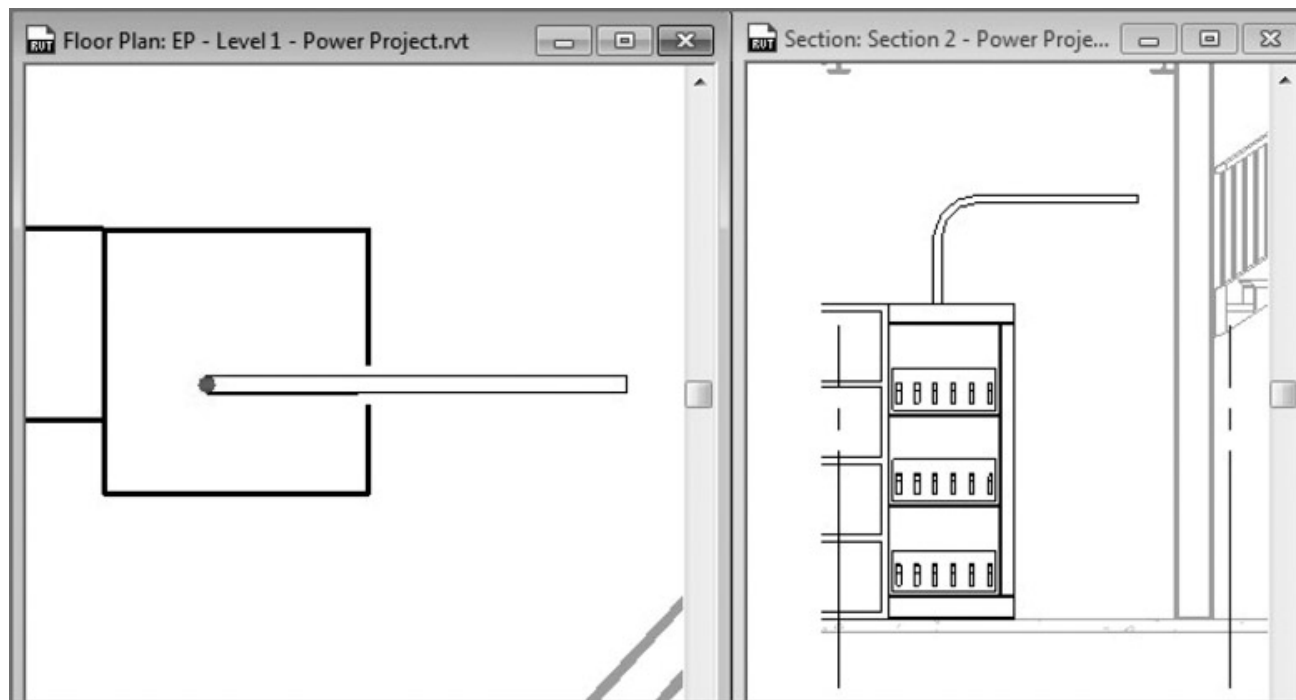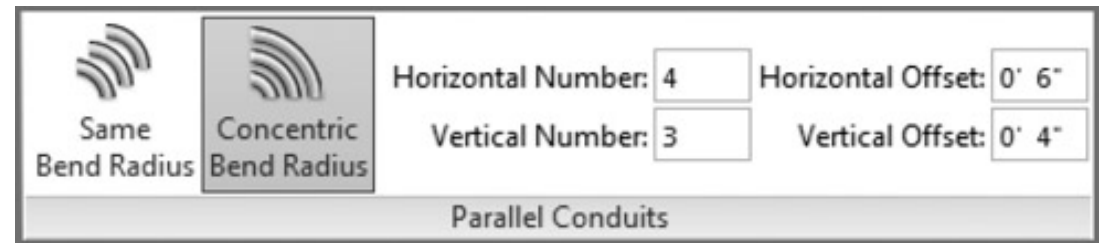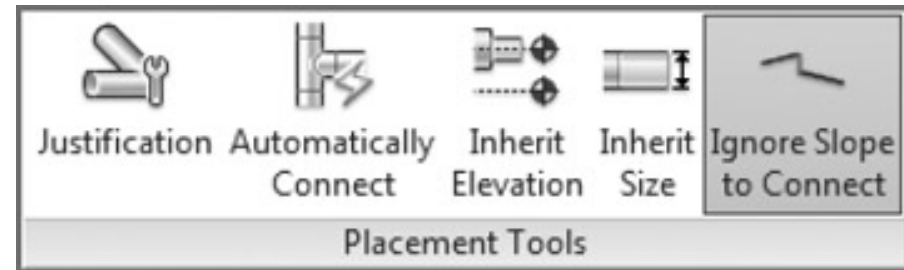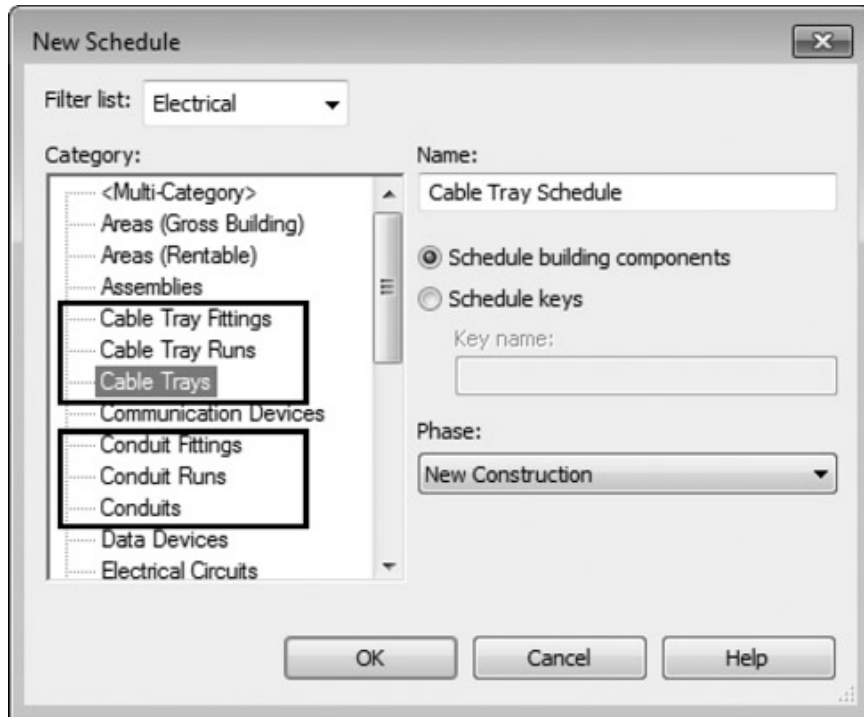
Circuiting and panels
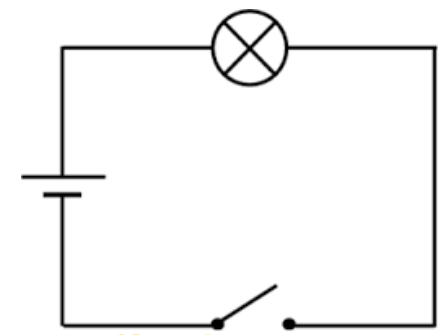
- [Electrical settings](#)
  - Circuit types: power, data, communications, security, and others
  - Relationship between model elements & the schematic wiring
  - Determine the ability to connect devices & equipment, and also define how wiring & electrical information is displayed
    - Wiring settings, voltage definitions, distribution systems, load calculations

Wiring section of electrical settings

Electrical Settings

Hidden Line	
General	
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	

Setting	Value
Ambient Temperature	86 °F
Gap of Wiring Crossing	0' - 0 1/32"
Hot Wire Tick Mark	Short Wire Tick Mark
Ground Wire Tick Mark	Long Wire Tick Mark
Neutral Wire Tick Mark	Short Wire Tick Mark
Slanted Line across Tick Marks	No
Show Tick Marks	Always
Max Voltage Drop For Branch Circuit Wire Sizing	Always
Max Voltage Drop For Feeder Circuit Wire Sizing	Never
	Home Runs

OK   Cancel   Help

Circuiting and panels

- Create circuits & wiring for devices & fixtures
  - To keep track of the loads within the panels*
  - Circuits are logical connection between elements
    - But they do not require physical connections as the other disciplines do
  - Wires are a schematic, annotative representation of the means to make the connection only
  - Editing wiring (e.g. change the arc & location)
  - Editing circuits (e.g. add or remove elements)

(*See also: Revit MEP Basic: Creating Electrical System https://www.cad-notes.com/revit-mep-basic-creating-electrical-system/)

Create circuit and wiring
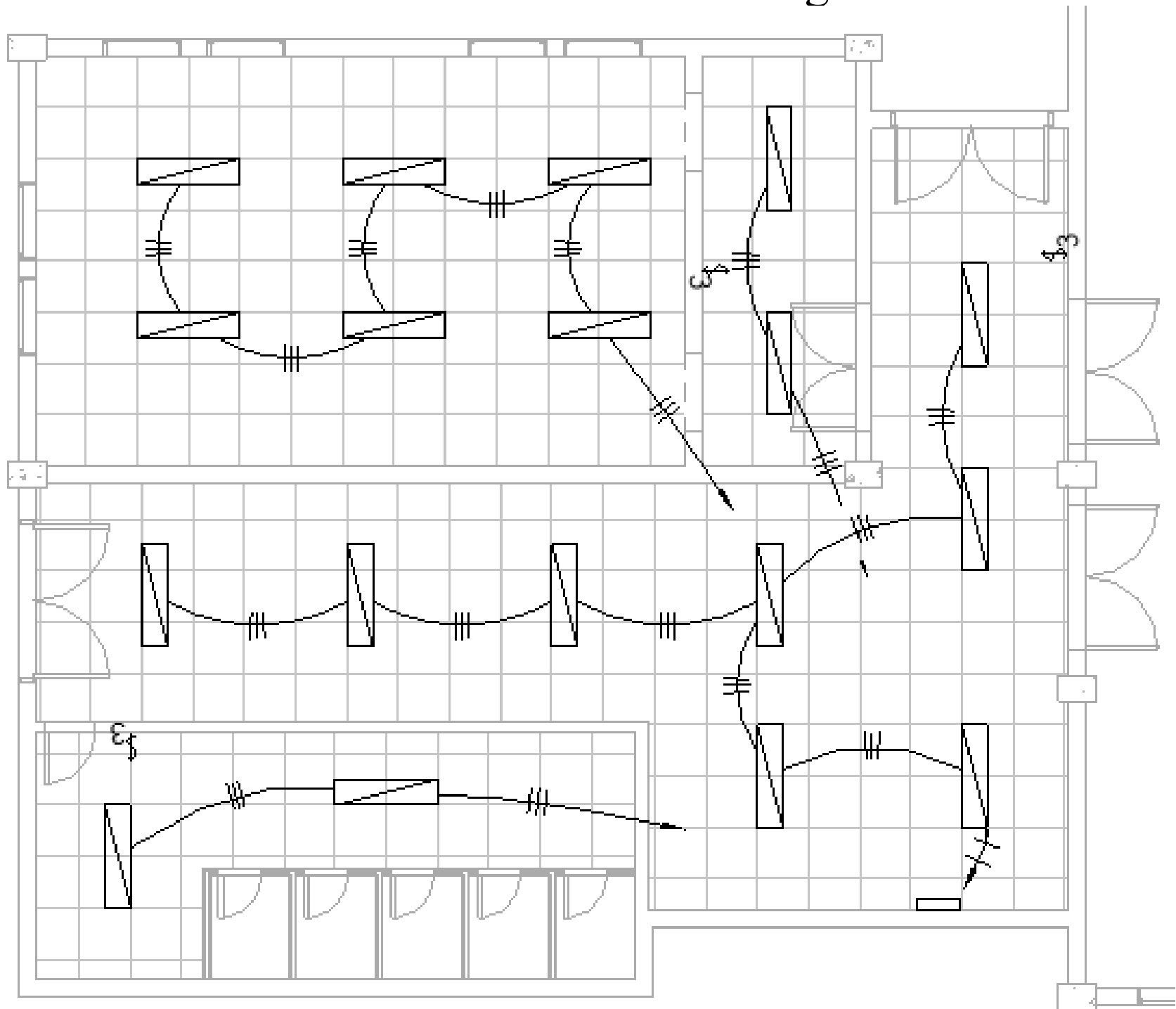
Edit circuit and wiring
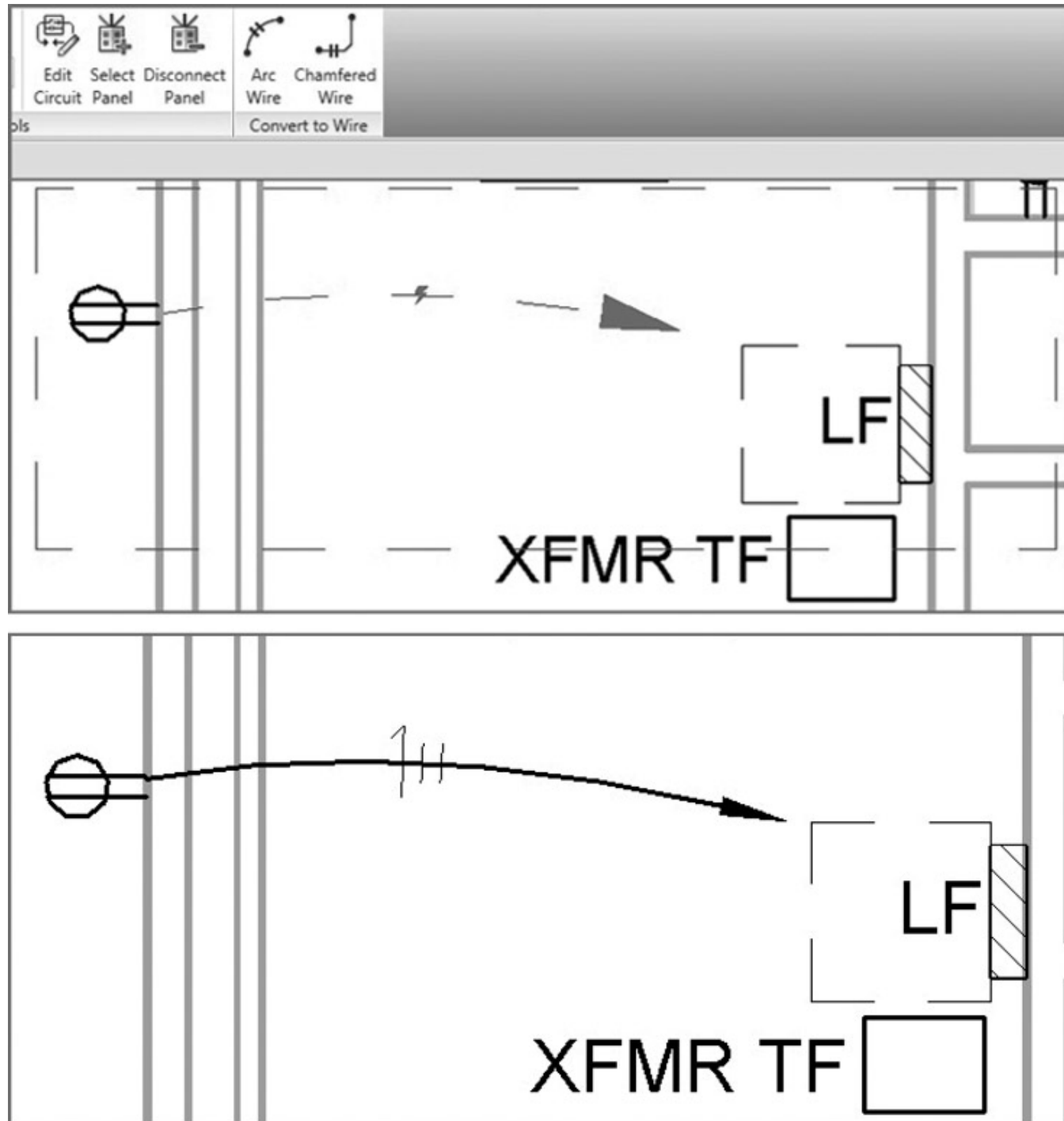
Wire connected between two fixtures (top); the result of dragging the connection point to another fixture (bottom)
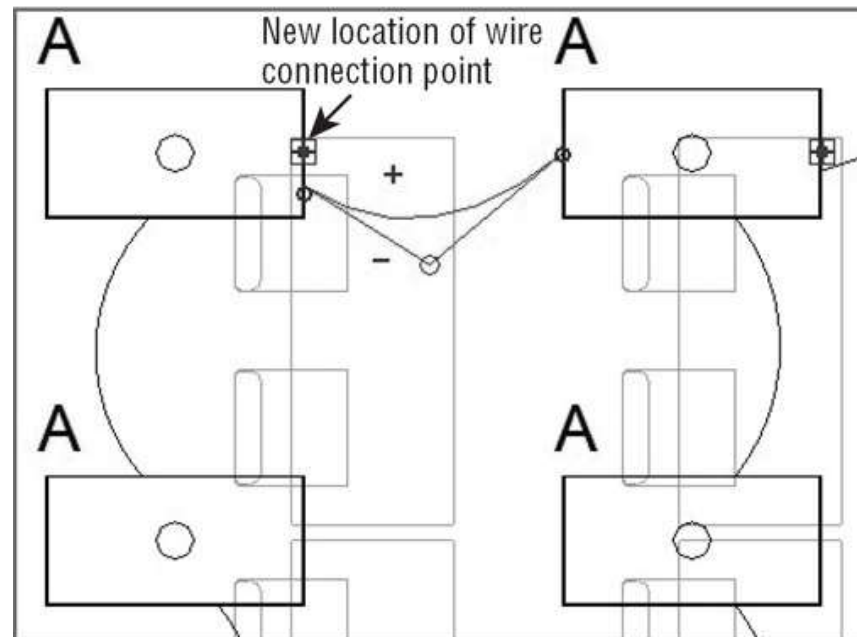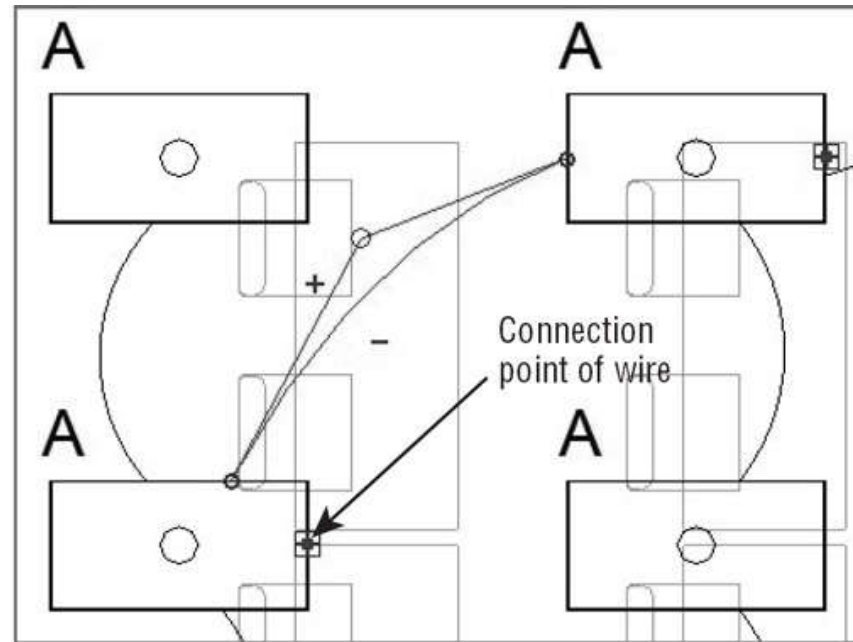
Circuiting and panels
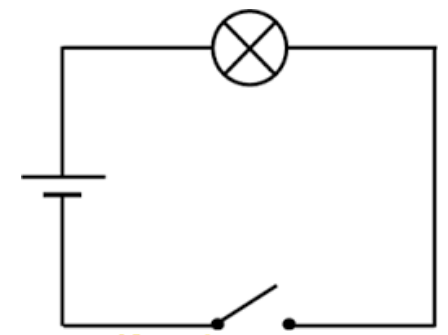
- Managing circuits & panels
  - Manage the properties:
    - Circuit properties (e.g. circuit-breaker rating)
    - Wire properties (e.g. wire type & number of conductors)
    - Panel properties
  - Manage the location of circuits within the panels to balance loads & track the total electrical load
  - Other panels & circuits (e.g. telephone wiring)
- Panel schedules & templates

An example of electrical circuit schedule

Electrical Circuit Schedule

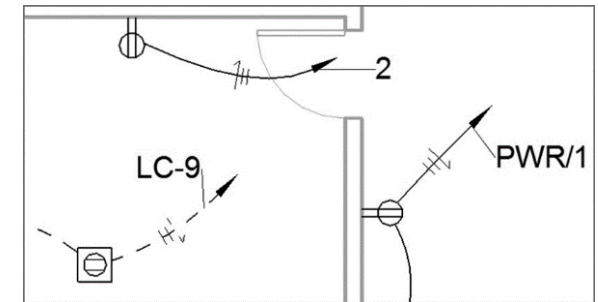| Circuit Number	Load Name	Voltage	Length	Voltage Drop	Breaker Size	Apparent Current	Wire Size
HA							
1	Lighting Room 103, 104, 105	277 V	288' - 5 3/4"	5 V	20 A	10 A	1-#8, 1-#8, 1-#8
2	Exterior Lighting - Entrance	277 V	311' - 3 5/32"	2 V	20 A	2 A	1-#12, 1-#12, 1-#12
3	Site Lighting	277 V	78' - 3 1/2"	0 V	20 A	1 A	1-#12, 1-#12, 1-#12
4	Site Lighting	277 V	57' - 8 5/8"	0 V	20 A	0 A	1-#12, 1-#12, 1-#12
5	SPARE	277 V	0' - 0"	0 V	20 A	0 A	1-#12, 1-#12, 1-#12
6	SPARE	277 V	0' - 0"	0 V	20 A	0 A	1-#12, 1-#12, 1-#12
7,9,11	ELEVATOR	480 V	28' - 11 1/16"	1 V	50 A	27 A	3-#6, 1-#6, 1-#10
8,10,12	TA	480 V	7' - 0 17/32"	0 V	50 A	14 A	3-#6, 1-#6, 1-#10
HB							
1	Lighting STAIR 3 S3	277 V	82' - 2 23/32"	0 V	20 A	1 A	1-#12, 1-#12, 1-#12
2	Lighting STAGE 115	277 V	103' - 1 7/32"	1 V	20 A	1 A	1-#12, 1-#12, 1-#12
3	Lighting AUDITORIUM/THEAT	277 V	232' - 9 3/16"	4 V	20 A	5 A	1-#12, 1-#12, 1-#12
4	Exterior Lighting	277 V	76' - 6 25/32"	0 V	20 A	0 A	1-#12, 1-#12, 1-#12
5	Lighting Room 102, 100, S3, 1	277 V	279' - 3 3/16"	5 V	20 A	5 A	1-#12, 1-#12, 1-#12
6	Site Lighting	277 V	101' - 3 27/32"	0 V	20 A	0 A	1-#12, 1-#12, 1-#12
7	Lighting Room 112, 113, 102,	277 V	131' - 6 7/16"	1 V	20 A	2 A	1-#12, 1-#12, 1-#12
8	Lighting Room 118, 117, 116	277 V	57' - 7 17/32"	0 V	20 A	2 A	1-#12, 1-#12, 1-#12
15	SPARE	277 V	0' - 0"	0 V	20 A	0 A	
17	SPARE	277 V	0' - 0"	0 V	20 A	0 A	
19,21,23	TB	480 V	6' - 6 1/8"	0 V	50 A	11 A	3-#6, 1-#6, 1-#10
20	SPARE	277 V	0' - 0"	0 V	20 A	0 A	

Further reading

- Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind. [TH 6010 .B65 2013 (ebook)]
  - Chapter 12 - Lighting
  - Chapter 13 - Power and Communications
  - Chapter 14 - Circuiting and Panels
- Chang, Lu-Yen, 2017. *Revit MEP Step by Step*, 2018 Metric Edition. (ebook) https://books.google.com.hk/books?id=tndJDwAAQBAJ
  - Chapter 4 Electrical Systems
- Videos: Electrical Engineering
  - http://help.autodesk.com/view/RVT/2018/ENU/?guid=GUID-3C209C9A-51FA-4F9A-8445-D493134DD444
  - Watch these videos to learn how to work with electrical engineering tools to build systems.