PLTW | Engineering

Activity 3.3.5 Commercial Electrical Systems (Optional)

Introduction

The design of power distribution, lighting, communication equipment and alarm systems for a commercial project is often performed by an electrical engineering consultant. However, architects and civil engineers involved in building and site design must be familiar with electrical system design and electrical construction drawings in order to understand the interaction of various building systems and interferences that my occur as a result of electrical components.

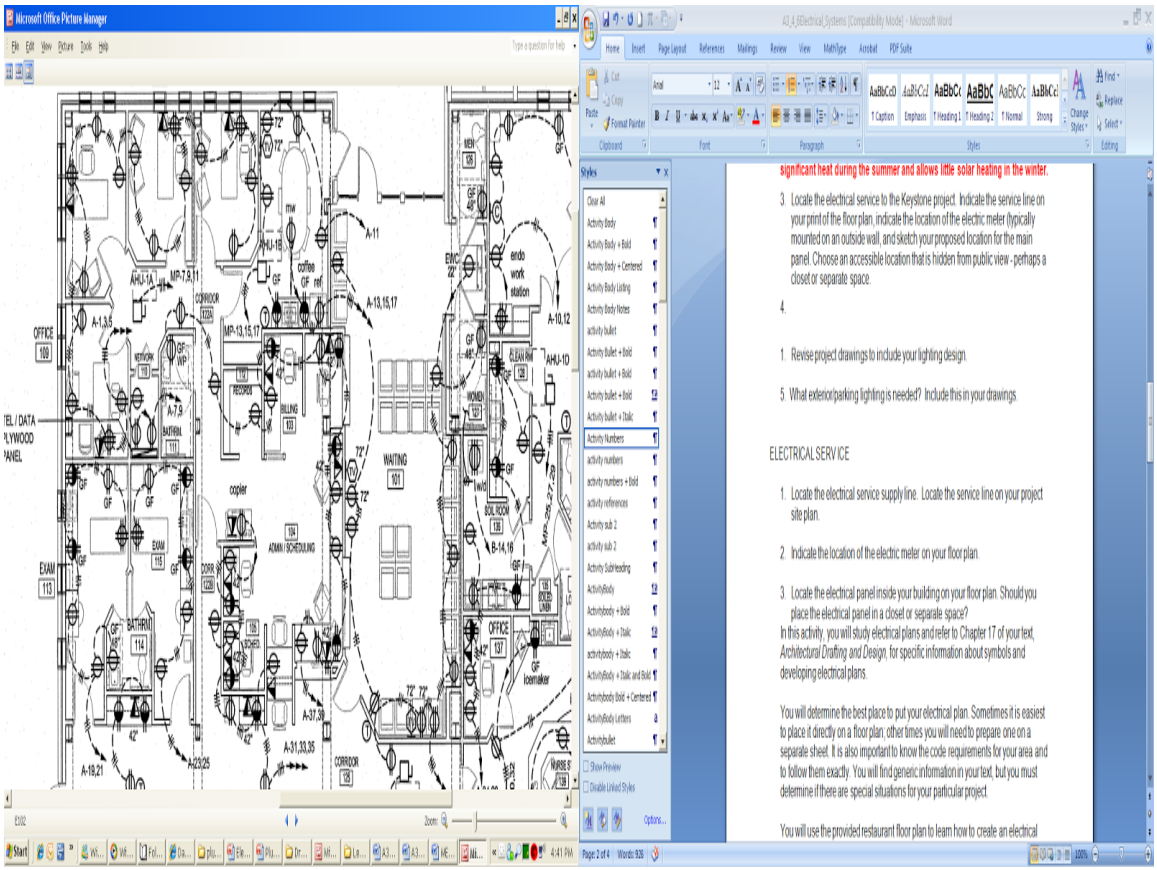
In this activity you will review a set of commercial electrical plans (power plan and lighting plan) and perform a quantity take-off of electrical components. Using the knowledge you gain, you will design part of the electrical system for the Keystone Library Renovation project.

Equipment

- Highlighters or colored pencils
- Access to electronic versions of Stuart Engals II – First Floor Medical Office Upfit
- Print of Keystone Library Renovation Floor plan

Procedure

1. Revisit your Keystone Library Renovation plan. Consider how you can better incorporate daylighting into your design. Make at least one change that will improve the energy efficiency of the building by increasing the daylighting in the building. Make the change on your 3D model and describe the change below.
2. Study the power plan (a partial electrical plan that includes outlets) below. This power plan shows only electrical outlets and circuits and does not include lighting fixtures and switches. Using the electrical legend on drawing E 101 – Electrical Legend, Notes, and Details for the Stuart Engals II Medical Upfit, highlight each different electrical symbol with a different color. Create a table to identify each electrical symbol, the highlight color, the type of electrical component, and the quantity included in the partial plan shown.



significant heat during the summer and allows little solar heating in the winter.

3. Locate the electrical service to the Keystone project. Indicate the service line on your print of the floor plan, indicate the location of the electric meter (typically mounted on an outside wall, and sketch your proposed location for the main panel. Choose an accessible location that is hidden from public view - perhaps a closet or separate space.

4.

1. Revise project drawings to include your lighting design.

5. What exterior/parking lighting is needed? Include this in your drawings.

ELECTRICAL SERVICE

1. Locate the electrical service supply line. Locate the service line on your project site plan.

2. Indicate the location of the electric meter on your floor plan.

3. Locate the electrical panel inside your building on your floor plan. Should you place the electrical panel in a closet or separate space?

In this activity, you will study electrical plans and refer to Chapter 17 of your text, *Architectural Drafting and Design*, for specific information about symbols and developing electrical plans.

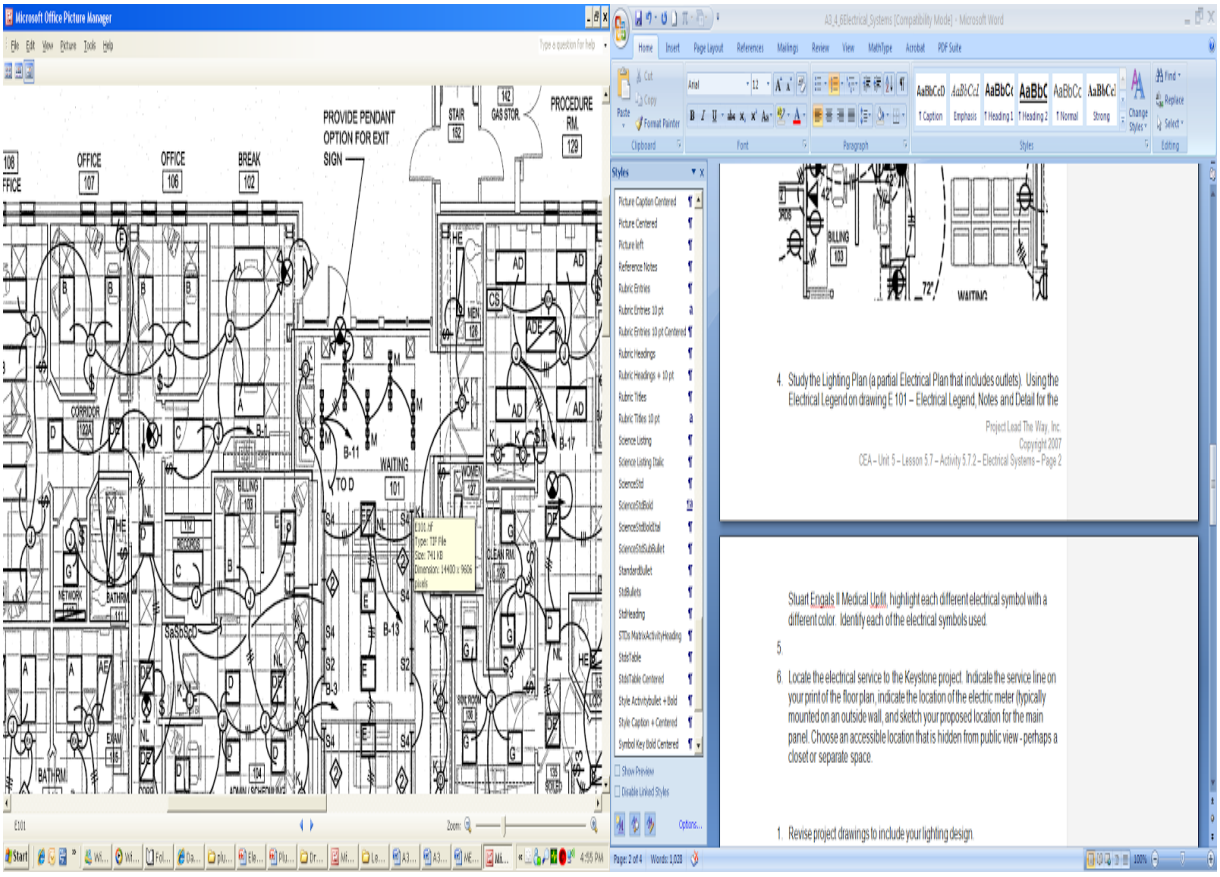
You will determine the best place to put your electrical plan. Sometimes it is easiest to place it directly on a floor plan; other times you will need to prepare one on a separate sheet. It is also important to know the code requirements for your area and to follow them exactly. You will find generic information in your text, but you must determine if there are special situations for your particular project.

You will use the provided restaurant floor plan to learn how to create an electrical

Symbol	Electrical Component	Color	Quantity
circle with two lines	Duplex Receptacle	B L	50
circle with 4 lines	Double Duplex Receptacle	A C	5
Circle with T	Thermostat	K A	1
GF half black	Ground fault	N D	20
/\	Telephone	W H	2
Circle with C	Counter Receptacle	I	1
hexagon	TV Outlet	T	1

Half black triangle	Safety Switches	E	10

3. Study the lighting plan for the same area of the Stuart Engals II – First Floor Medical Office Upfit building. Highlight or circle each of the following with the indicated color. You will need to refer to the electrical legend on drawing E001 and the lighting fixture schedule on drawing E101.
   - Yellow – Exit sign/emergency lights
   - Blue – Ambient lighting
   - Green – Task lighting
   - Pink – Accent or decorative lighting



4. Locate an electrical service for the Keystone Library Renovation project. Indicate the service line on your print of the floor plan. Locate an electric meter (typically mounted on the inside of an exterior wall), and sketch your proposed location for the main panel. Choose an accessible location for the panel that is hidden from public view – perhaps a closet or separate space.
5. Create a preliminary electrical plan for the staff workroom/kitchenette for your Keystone Library Renovation project.
   - Sketch the location of outlets, lighting, and switches on your Keystone floor plan using the appropriate symbols. Think about how the room will be used,

what appliances and equipment are needed, and where extra convenience outlets should be placed.
- Connect each lighting fixture to at least one switch using a switch leg (dashed line). Consider the need for three way switches.
- Note that you do not have to include junction boxes, emergency lights, or exit signs.

6. Revise your Keystone Library Renovation project drawings to include your electrical design. You must determine the best place to show your electrical plan. Sometimes it is easiest to place it directly on a floor plan; other times you will need to prepare a separate electrical plan.

Conclusion

1. How did you incorporate daylighting into your project?

2. Which of the three general classifications of lighting uses did you use in the electrical design of the staff workroom/kitchenette for your Keystone Library Renovation project? Explain

3. How is the design of the electrical system for a commercial facility different from the electrical design for a residence?