

Drawing an Electrical Plan

In this chapter, you will learn the following to World Class standards:

- **Drawing an Electrical Plan**
- **Adding a Light Switch**
- **Adding a Wall Mounted Light**
- **Adding a Ceiling Mounted Light**
- **Adding a Recessed Mounted Light**
- **Adding 120 VAC Duplex Receptacles**
- **Adding a Smoke Detector, Doorbell and Chimes**
- **Adding Telephone Jack, Computer and TV Cable Connectors**
- **Checking the Electrical Plan**

Drawing an Electrical Plan

The home designer shows where switches, permanently mounted lights, chimes, outlets, telephone jacks, smoke detectors, TV and computer cable connections and more on the electrical plan. The position of these modern conveniences depend on where the electrician can attach his or her outlet boxes to the wall studs, so the exact placement can vary a few inches left or right on the wall. The vertical location of the devices will be consistent throughout the home. So, the designer needs to think out the blueprint, since it will cost considerably more to the home owner to add more devices after the house is built.

The beginning of the electrical layout starts with a sketch. A designer needs to virtually walk through the house and turn on lights, answer the phone, use a computer and watch television. If we do not have a sense of where the customer who owns the house will want a convenience, we need to ask them. If we are designing a model home that will be built throughout a suburb, we need to add extra jacks so the homeowner can have choices when installing entertainment devices in their home.

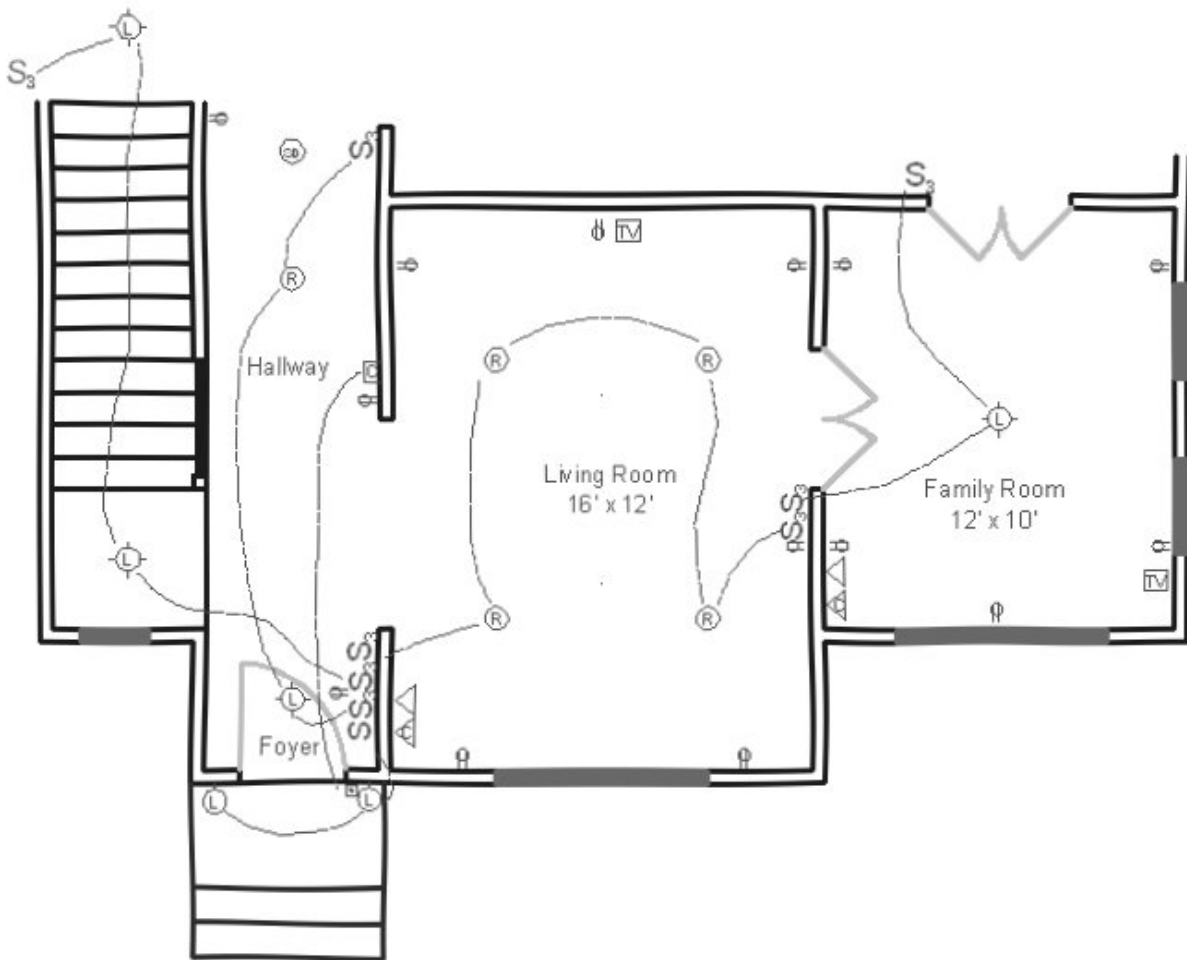
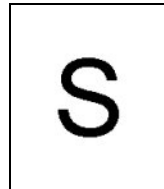


Figure I.1 – Sketch of the Electrical Plan

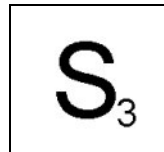
The home designer needs to be familiar with the standard symbols the industry uses to show the placement of electrical devices. The electricians study for years to recognize the different symbols, so the home designer needs to follow the code.

Adding a Light Switch

One of the ways to turn on a light in a house is to install a manual switch and the single pole switch is a very common solution to accomplishing this act. In the United States, the standard single pole switch closes the circuit to 120 nominal volts, which energizes the filament or activates the Compact Fluorescent Light (CFL) bulbs.



Have we every turned on a light on one end of the hallway and turned the light off at the other end? We utilize the three-way switch to accomplish this operation. The two switches are connected with a special electrical wire that has an extra conductor, so the three-pole actuator can turn on or off the light.



We can download the blocks we need to use on the World Class CAD website by visiting Residential online textbook and selecting the [Architectural Electrical Symbols Library](http://www.worldclasscad.com/architectural_electrical_symbols_library.htm) at http://www.worldclasscad.com/architectural_electrical_symbols_library.htm. When we pick a symbol, we are able to save our choice to a folder on our computer.

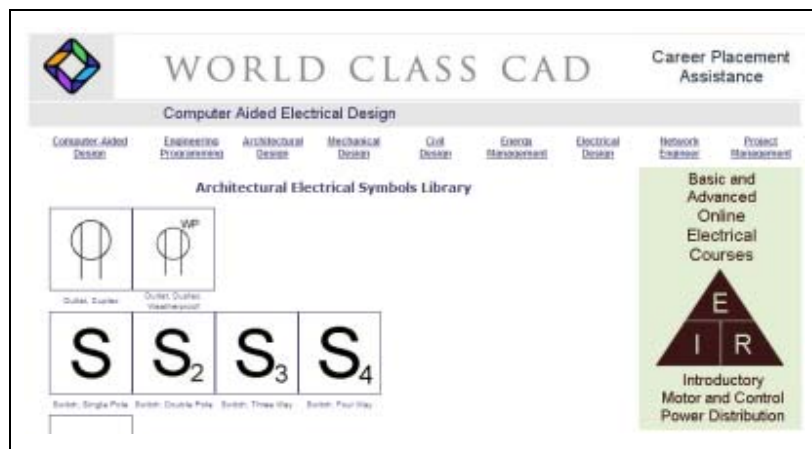


Figure I.2 – The Electrical Symbol Library

We open our Living Room plan that we drew previously and save the drawing as our Electrical Plan. We should remove the dimension, door, and window symbols. We will begin with adding switches by the front door. We create a layer called “Electrical” and we change the current layer to it.

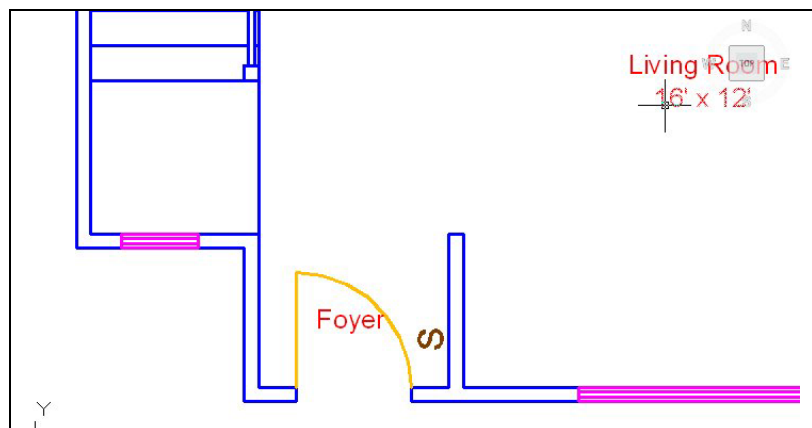


Figure I.3 – Single Pole Switch

We can insert the block to show a single pole switch to turn on the porch lights that are mounted on the exterior wall in front of the house. We choose Insert on the Menu bar and we pick Block from the list. We use the browse button to find the block library on our computer that we downloaded. When we insert the block, we can scale the entity and even rotate it. We will insert the switch right next to the door opening, so that when we greet a person at the front door at night, we can turn on the light when we are on the handle side of the door.

By the front door, we also have three more switches, all of which are the three-way type. One actuator controls the lights to the stairway, one to the first floor hallway and the last one to the lights illuminating the living room, which is adjacent to the hallway and the foyer. The electrician will purchase a electrical box and four-position wall plate and mount all four actuators in this station.

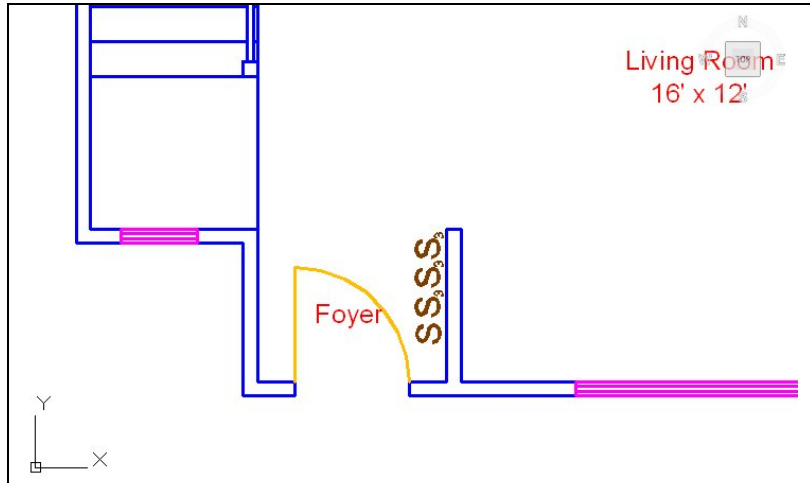
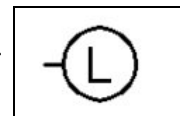


Figure I.4 – Three Way Switch

The technicians mount the switches 48 inches above the floor. The distance is from the top of the finished floor to the center of the switch.

Adding a Wall Mounted Light

One of the styles of lights we can turn on is the wall-mounted type. The symbol is a circle with an L in the center. There is a line coming off one of the quadrants of the light and it attaches to the interior or exterior wall.



Our design sketch calls for two wall mounted lights on either side of the front door. We can insert the block to show a wall mounted light by picking Insert on the Menu bar and Block from the list. We place the first light at the midpoint of the line that represents the left exterior wall. We copy the block to the other side of the door as shown.

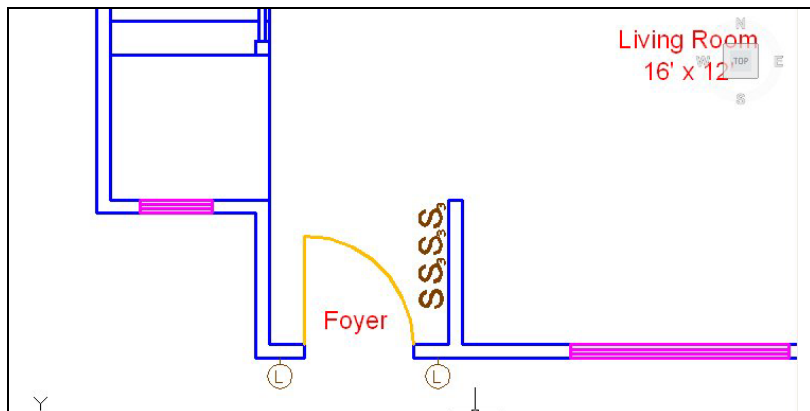


Figure I.5 – Adding Wall Mounted Lights

We use a dashed line that is drawn from the Single Pole Switch symbol to the wall mounted light. Since the switch turns on both lights, we continue to draw the dashed Polyline from the first porch light to the second porch light.

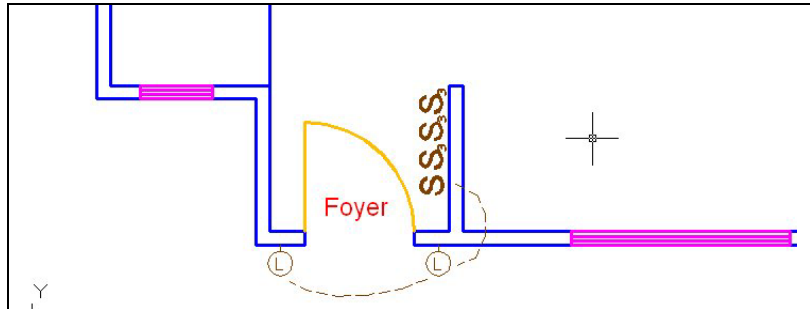
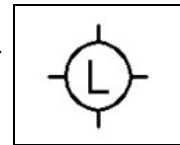


Figure I.6 – Showing the Control Lines

Adding a Ceiling Mounted Light

Next, we will have the electrician install a ceiling mounted lamp above the door in the foyer. The symbol is a circle with an L in the center. There is a line coming off each of the quadrants of the circle.



We can insert the block to show the ceiling mounted light by picking Insert on the Menu bar and Block from the list. We place the light in the exact center of the foyer.

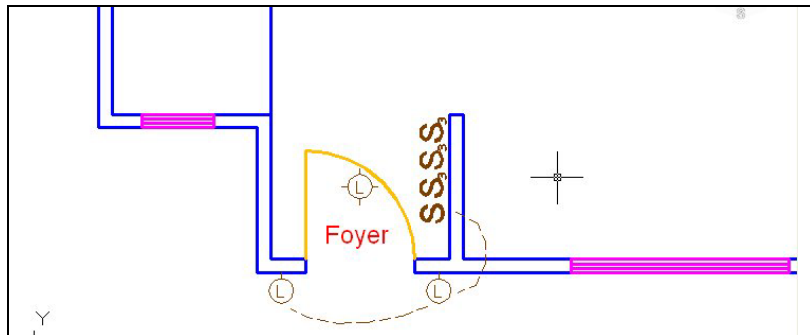


Figure I.7 – The Ceiling Mounted Light

We continue to add ceiling lamp fixtures in the center of the landing at the bottom of the stairs. We also have another unit at the top of the stairs along with a three-way switch. The two lights in the stairwell can be turned on or off from the top or bottom three-way switch.

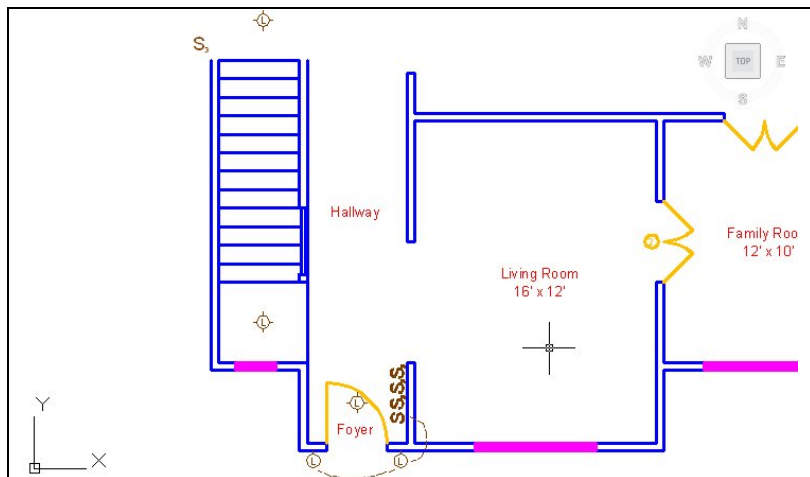


Figure I.8 – Adding Two More Ceiling Mounted Lights

We use a dashed line that is drawn from the Three-way Switch symbol to the ceiling mounted light at the bottom of the stairs. Since the switch turns on that light and the one at the top of the stairs, we continue to draw the dashed Polyline from the first light to the second light. We add a third segment from the light fixture at the top of the stairs to the second three-way switch.

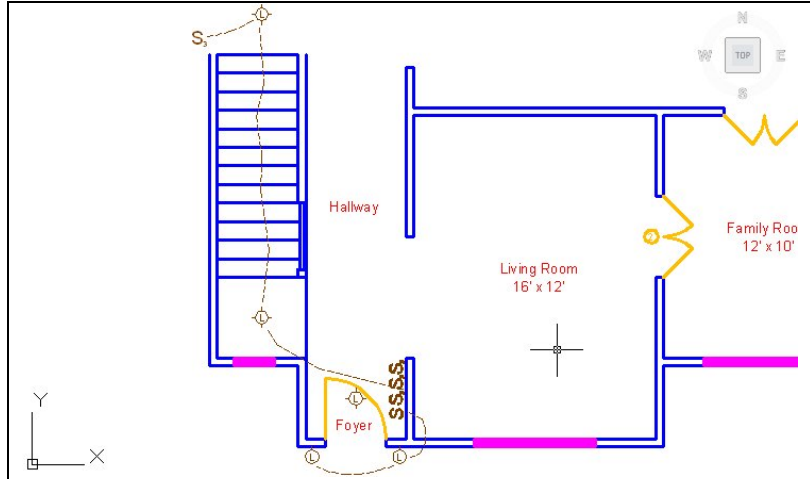


Figure I.9 – Showing the Control Lines

Adding a Recessed Ceiling Light

Now, we will have the electrician install a recessed mounted lamp in the hallway. The symbol is a circle with an R in the center. The canister light fixture mounts in a hole that is cut in the ceiling.



We can insert the block to show the recessed mounted light fixture by picking Insert on the Menu bar and Block from the list. We place the light in the center of the hallway, about halfway past the living room opening. We also have another three-way switch. The two lights in the hallway can be turned on or off from the three-way switches at the door or at the end of the hallway.

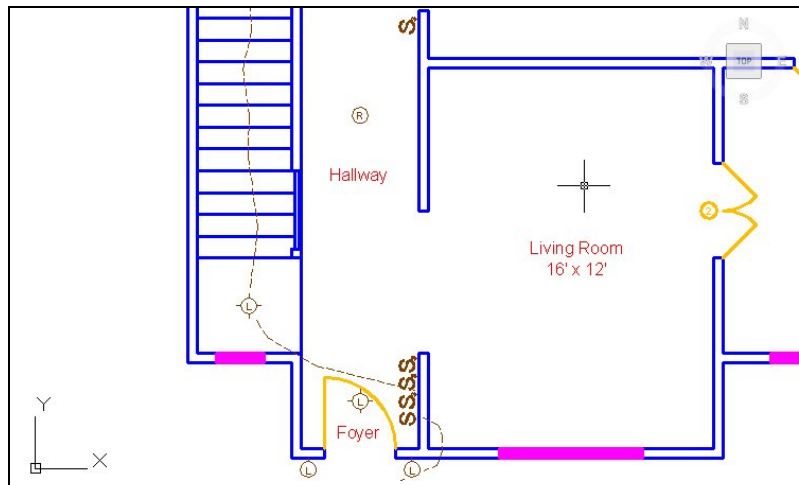


Figure I.10 – Adding the Recessed Lamp Symbol

We use a dashed line that is drawn from the Three-way Switch symbol to the ceiling mounted light in the foyer. Since the switch turns on that light and the one at the end of the hallway, we continue to draw the dashed Polyline from the first light to the recessed light fixture. We add a third segment from the recessed light fixture in the hallway to the second three-way switch.

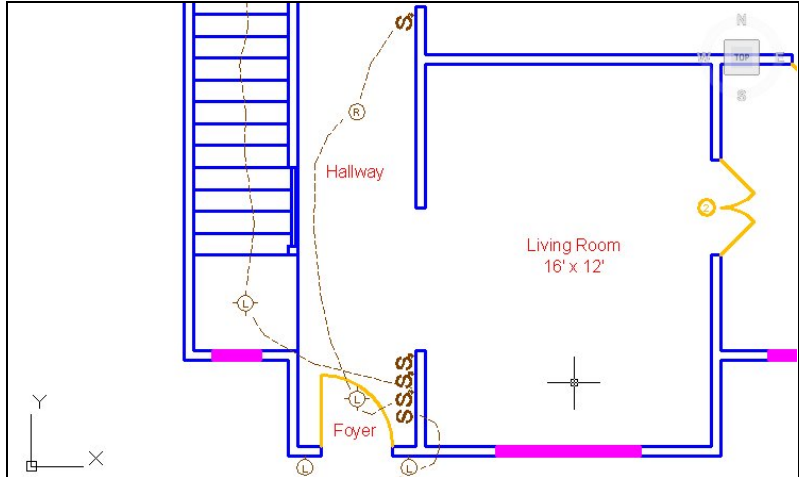


Figure I.11 – Showing the Control Lines

We insert four blocks of the recessed mounted light fixture in the living room. The pattern forms a rectangle that imitates the shape of the room. We also place two three-way switches on the right side of the opening to the family room.

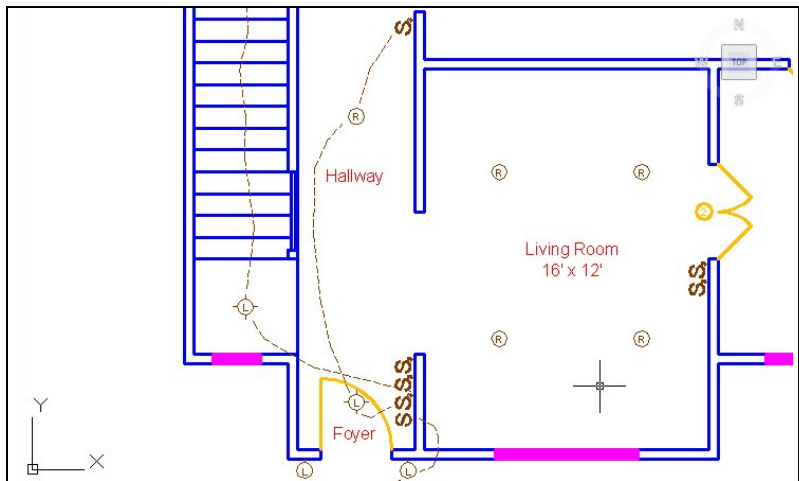


Figure I.12 – Recessed Lamps in the Living Room

We use a dashed line that is drawn from the last Three-way Switch symbol by the front door to the recessed ceiling light in the living room. We daisy chain the dashed Polyline from lamp to lamp with the last dashed section ending at the three-way switch by the door to the family room.

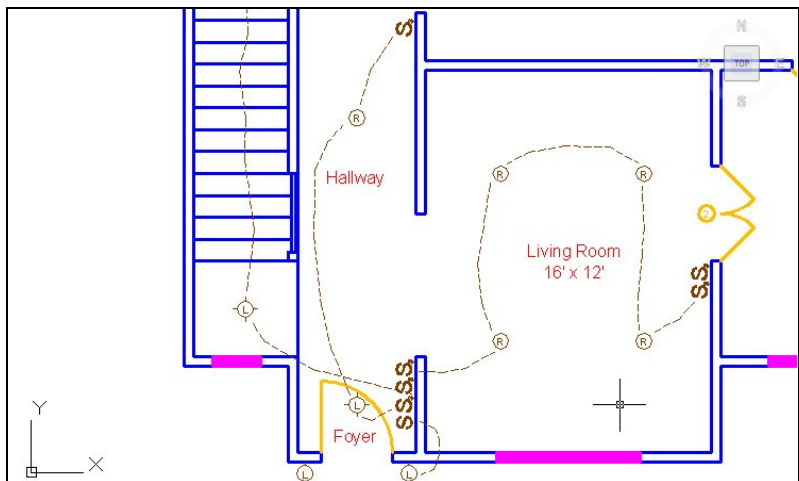


Figure I.13 – Control Lines

For the family room, we will place a ceiling mounted light in the center of the room. We put the second three-way light switch on the wall to the right of the door leading into the family room. We draw a dashed line from the switch to the light fixture and from the lamp to the second switch.

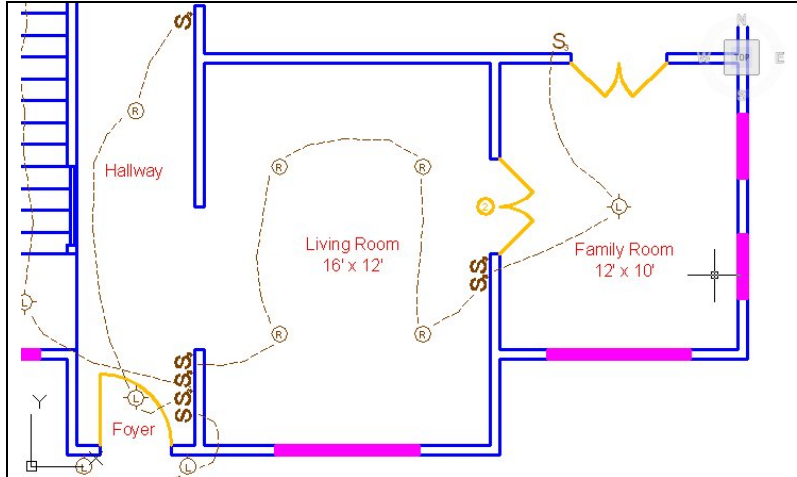
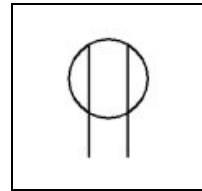


Figure I.14 – Lights and Switches in the Family Room

Adding 120 VAC Duplex Receptacles

In our homes, the designer needs to place 120-volt receptacles to power the conveniences we will use. The duplex receptacles have two positions to plug the power cables from television sets, floor lamps, and computers. The symbol is a circle with two lines that represent the phase and neutral wires. The actual power jack also contains a ground wire.



We will start to insert the power receptacles in the family room by picking Insert on the Menu bar and Block from the list. We place the duplex receptacles 8 feet apart in the room, so we can see five power jacks in the family room.

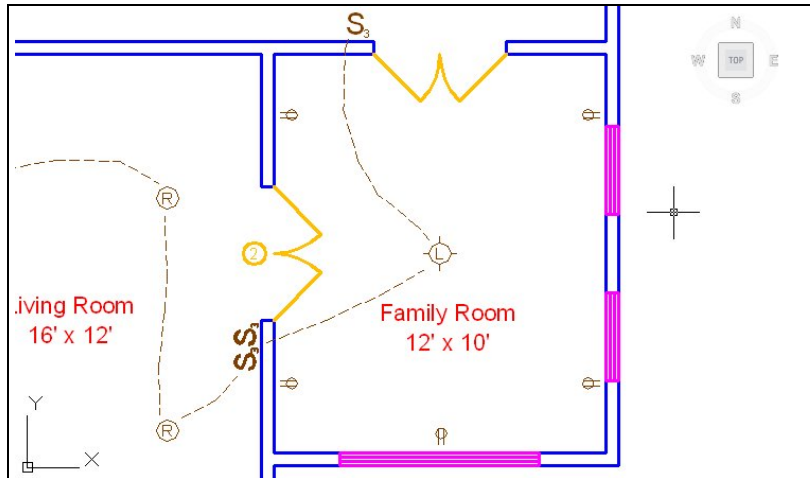


Figure I.15 – Adding the 120VAC Duplex Receptacles

In the living, we will place six duplex receptacles, continuing putting those electrical devices approximately 8 feet apart. The electrician will mount the receptacles 18 inches from the top of the finished floor to the middle of the unit.

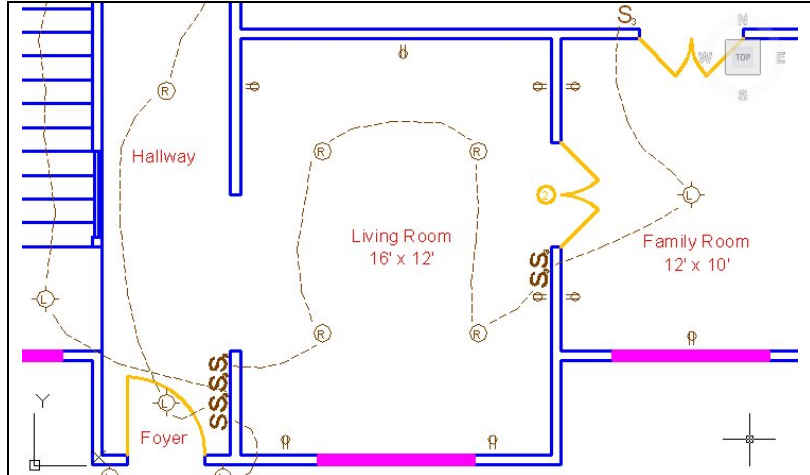


Figure I.16 – Adding more 120VAC Duplex Receptacles

In the hallway, we will put a power receptacle under the light switch in the foyer and we will position another one to the left side and end of the hallway.

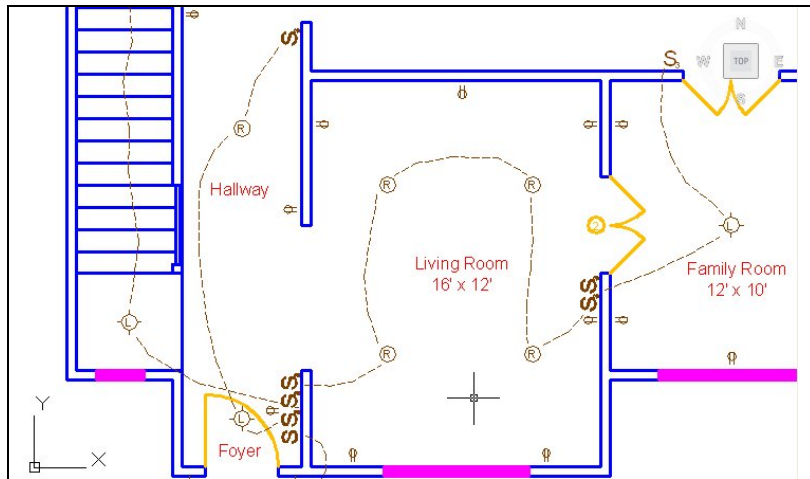


Figure I.17 – Adding more 120VAC Duplex Receptacles

Add Smoke Detector, Doorbell and Chimes

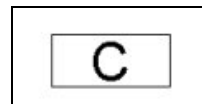
A smoke detector will sense for the presence of smoke and the pulsing alarm will go off to warn individuals in the home that there is a fire. We should place smoke detectors on every floor of the home. The symbol is a circle with the letters “SD” in the center.



At the front of the door, we will place a pushbutton doorbell. The door symbol is a square box with a heavy dot representing the actuator or pushbutton.



The door chime tells us that there is someone ringing the front door bell. The symbol is a rectangle box with the letter “C” in the middle.



We will place the smoke detector at the end of the hall, which in the bigger plan is close to the entrance of the kitchen. The unit is not close to the stove, so normal smoke from cooking would set off the device, but on the opposite side. The designer positions the unit, so the sound of the alarm echoes down the hall and the load-bearing wall in the middle of the home does not block the sound waves.

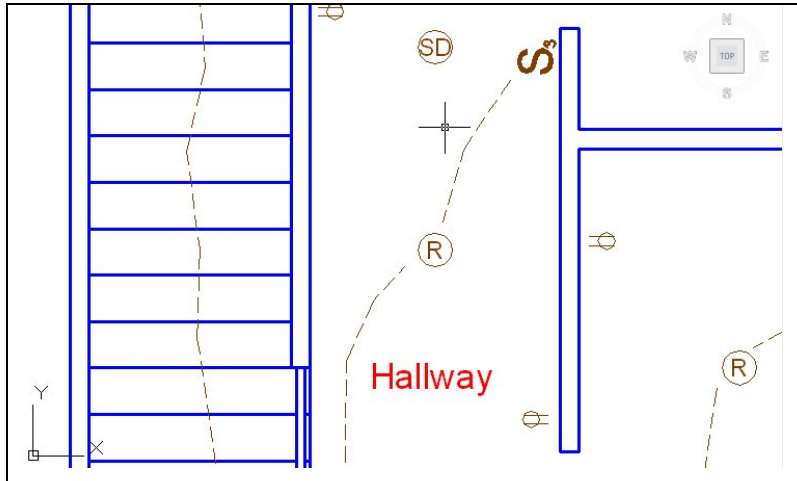


Figure I.18 – Adding the Smoke Detector

We put the door bell on the door handle side of the door and on the exterior wall. We put the door chime on the hallway wall. We draw a dashed Polyline from the pushbutton doorbell to the chimes.

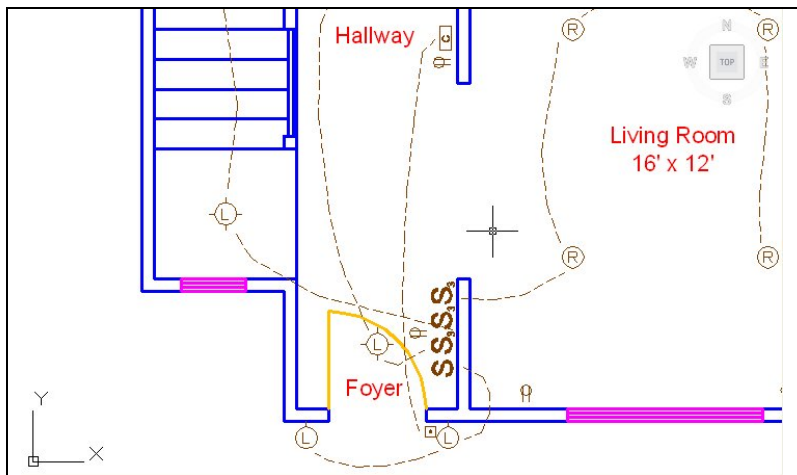


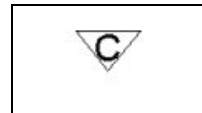
Figure I.19 – Adding the Doorbell and Chimes

Adding Telephone Jack, Computer and TV Cable Connectors

Although, the increase use of cell phones in homes, we still will place phone jacks on each floor and in each room. The symbol is a filled in triangle.



Just like the telephone jack, almost every room, such as the living room, family room, kitchen and bedrooms should have a computer jack for the homeowner's convenience. The symbol is a triangle with a "C" in the middle.



Televisions also can be in the family room, living rooms, bedrooms, and kitchens, so we can plan to have TV receptacles throughout the home. The symbol is a rectangle with "TV" in the middle.



In the living room, we will place a computer and a telephone jack as shown. The designer should have a duplex receptacle close by the computer jack, since the homeowner can place a desk with a computer on it in this corner.

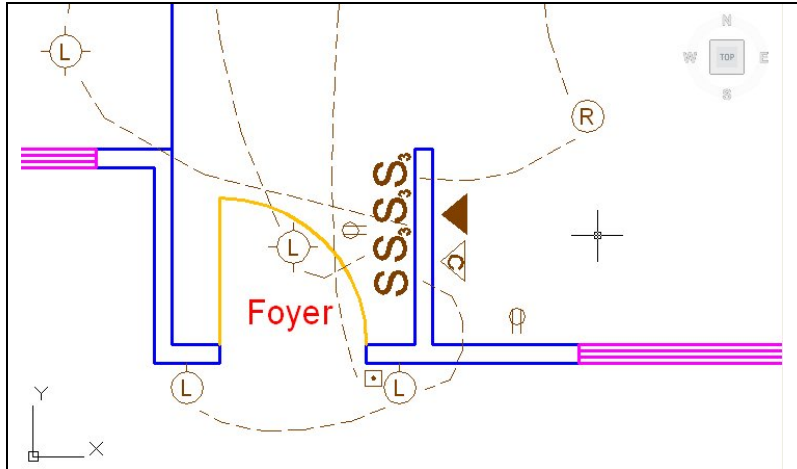


Figure I.20 – Add the Computer and Telephone Jacks

We will place a cable television receptacle in the middle of the wall opposite the front window. Again, there should be a duplex receptacle close by the television jack, since the TV unit will need power.

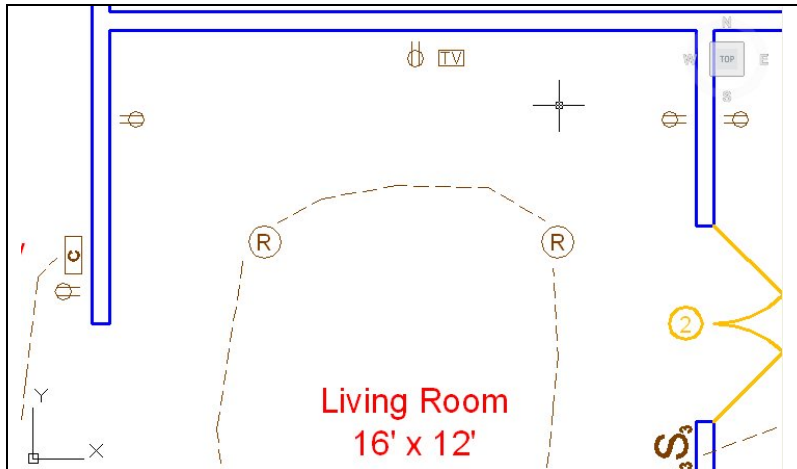


Figure I.21 – Adding the TV Receptacle

In the family room, we will place a computer and a telephone jack in the corner as shown. There is a duplex receptacle close by the communication jacks. We will place a cable television receptacle in the opposite corner with a duplex receptacle close by the television jack. The computer jack and television receptacle are opposite the two doors that enter into the family room.

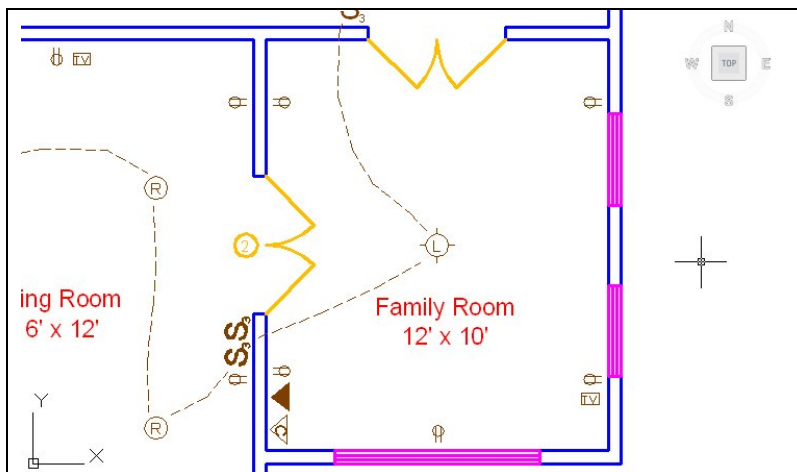


Figure I.22 – Adding the More Receptacles

Checking the Electrical Plan

When we have added the last of our electrical devices, we walk through the home in our imagination and we activate the switches and use the devices. If we see a place or an occurrence where our device does not make sense, we can change the plan. If we have forgotten a duplex receptacle, light, or switch, we can add the unit now, when it is easy to incorporate the change. If the customer has to remodel the home to add the convenience, the cost will be much higher than if we put the receptacle, switch or light in the initial design.

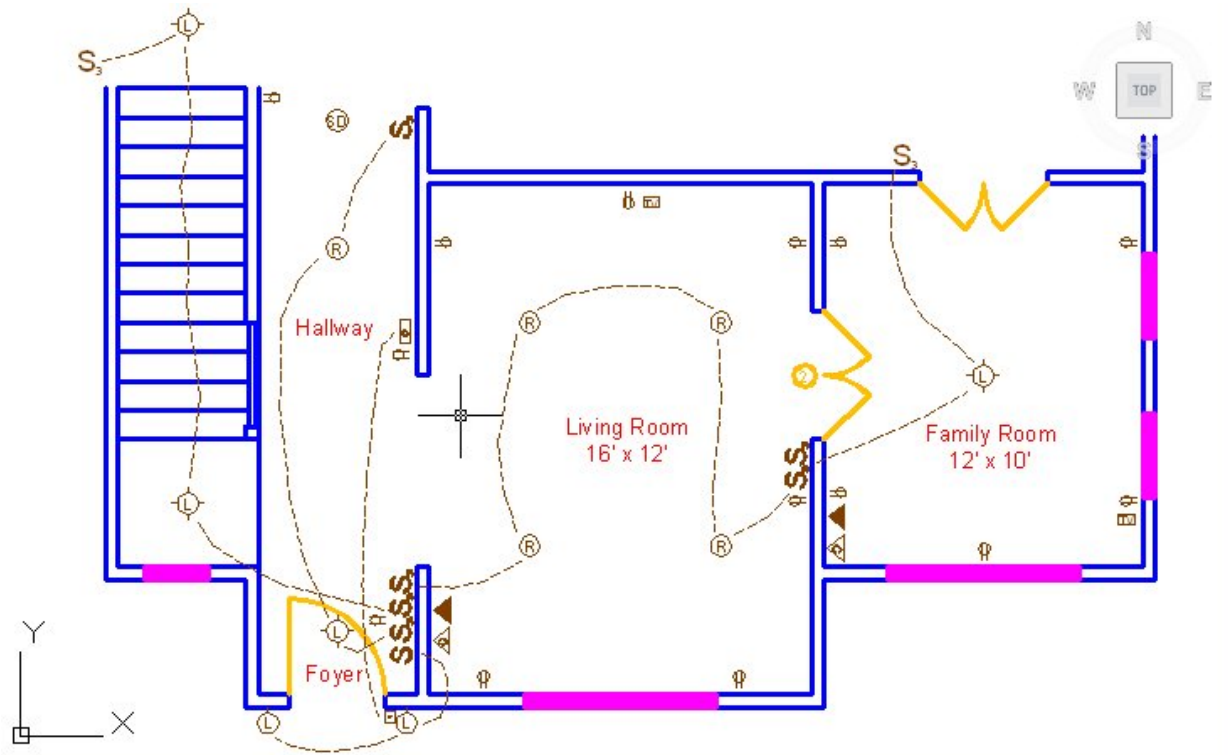


Figure I.23 – The Finished Electrical Plan

*** World Class CAD Challenge * - Open the living and family room file in your CAD program and save the file as electrical plan. Add blocks for switches, lights, receptacles, smoke detectors, and more as shown on the electrical sketch in 30 minutes.**

Continue this drill multiple times using the steps we have learned, each time completing the drawing under 15 minutes to maintain your World Class ranking