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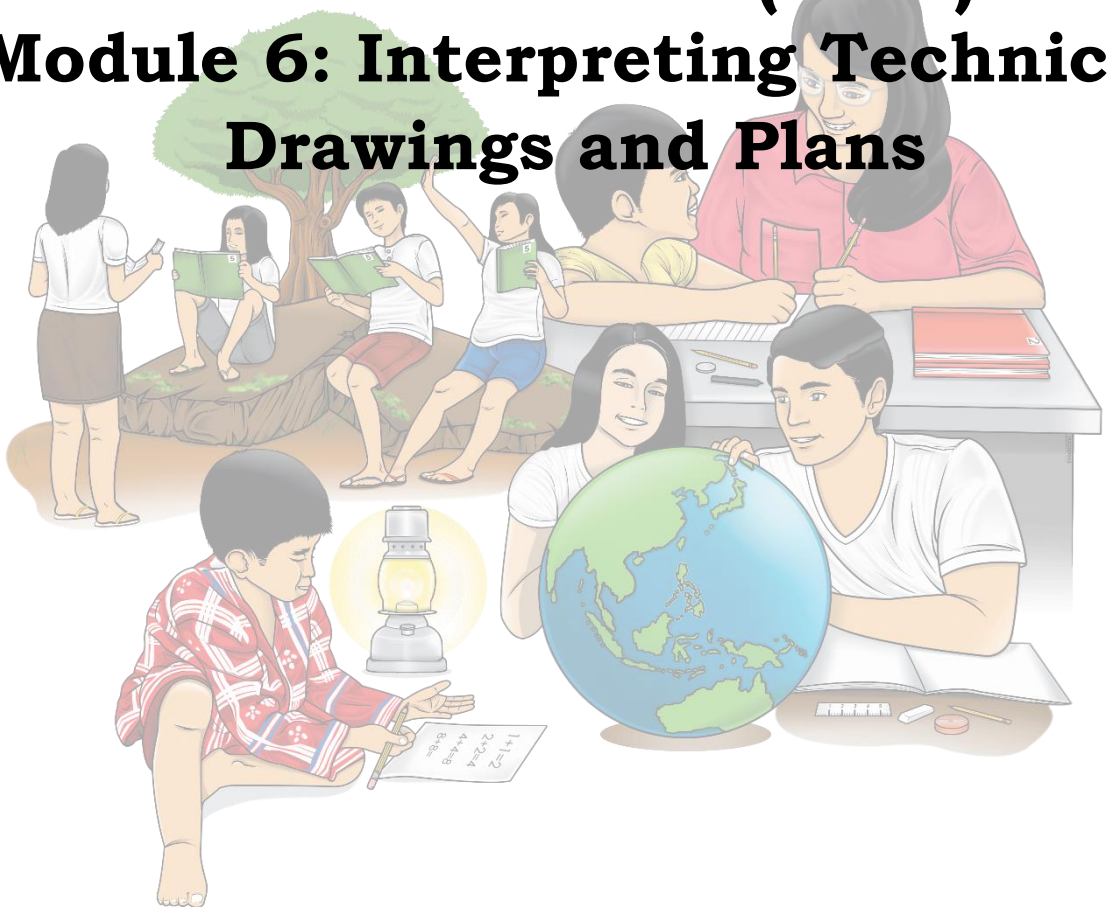
DEPARTMENT OF EDUCATION

# Technology and Livelihood Education

## Exploratory Course

# Electrical Installation and Maintenance (EIM)

## Module 6: Interpreting Technical Drawings and Plans



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**Development Team of the Module**

**Writer:** Romnick B. Oñate

**Editor:** Susan L. Fragio, Antonio A. Gaviola, Mikko Jay A. Henry

**Reviewers:** Mary Grace B. Leysa, Salvador F. Movilla, Mark Carlo D. Buyao

**Illustrator:** Garrie V. Dela Gracia

**Layout Artist:** Limwell R. Telmo, Joel F. Amerila

**Cover Art Designer:** Jason Villena

**Management Team:** Allan G. Farnazo, CESO IV
Gilbert B. Barrera
Arturo D. Tingson Jr.
Peter Van C. Ang-ug
Ismael M. Ambalgan
Sheryl L. Osano
Josevic F. Hurtada
Arnulfo D. Dinero

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Office Address: Regional Center, Brgy. Carpenter Hill, City of Koronadal
Telefax: (083) 2288825/ (083) 2281893
E-mail Address: region12@deped.gov.ph

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# Technology and Livelihood Education

## Exploratory Course

## Electrical Installation and Maintenance (EIM)

## Module 6: Interpreting Technical Drawings and Plans

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# Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

# *What I Need to Know*

Welcome to a new horizon of knowledge that you are about to undertake. I believe you are excited to study new lessons today! Surely you are excited to another day full of learning, fun and excitement. Let us start our learning journey as we reveal new things about our lessons.

Review your undertakings in this subject. You will remember the different tools and equipment, as well as the appropriate signs and symbols in a plan.

Now, you are to incorporate these learnings to this new topic and be able to move forward to a deeper adventure in your journey as an electrician.

After going through this module, you are expected to learn how to read blueprints of electrical plans, diagrams and circuits, and to be able to identify necessary tools materials and equipment according to blueprint of electrical plans, diagrams and circuits technical drawings and plans **(TLE_IAEI7/8ID-0e-2).**

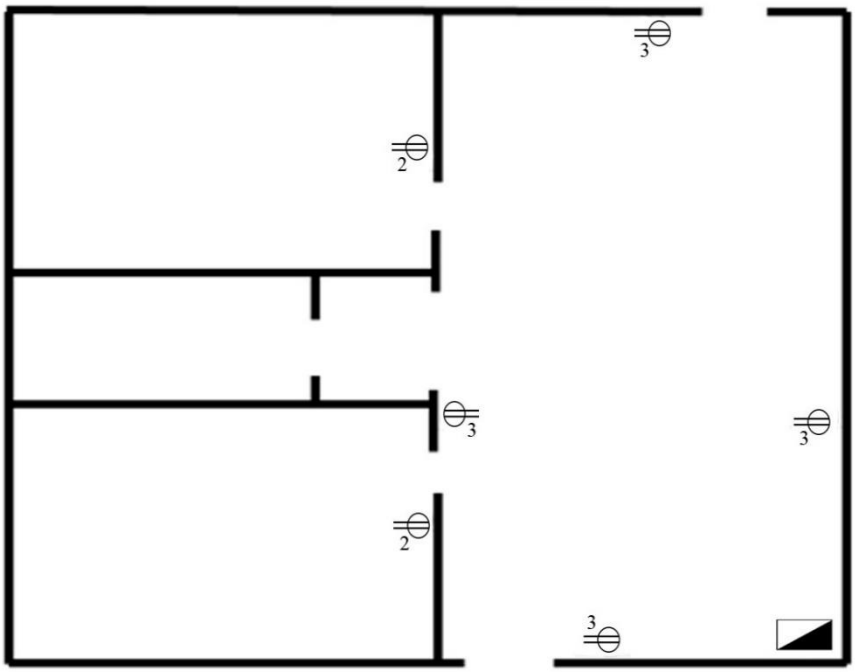
# *What I Know*

If you look around in the streets, you will probably notice lots of traffic signs and symbols. These signs and symbols provide data or information that promote safety and order and provide warning for potential hazards for drivers and pedestrians alike.

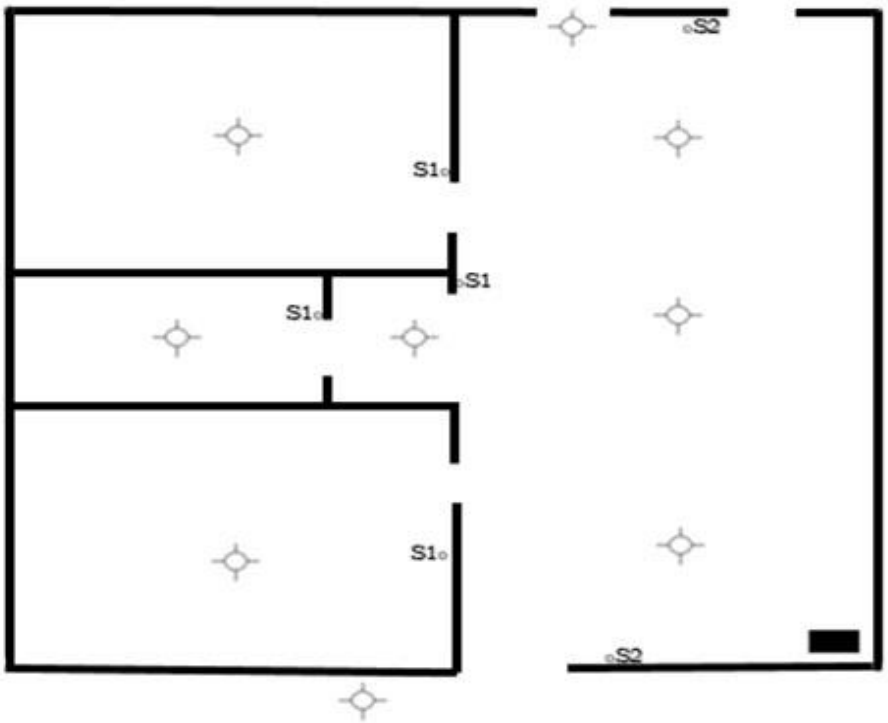
In *Electrical Installation*, we also use signs and symbols in creating lay-outs, schematics, specifications, and work plans. These signs and symbols have precise and specific meanings. You must learn all of these in order to understand drawings and plans. Knowing the appropriateness of each sign and symbol will also allow you to create your own designed plans, carry these out, and produce outputs. But before we learn about these, let's determine how much you already know about analyzing signs, symbols and data by doing the exercises below.

## Pretest

**Directions:** Identify the type of electrical lay-out. Determine whether it is a lighting or power circuit. Connect the electrical fixtures in the circuit. Copy and write your answers on your activity sheet.




_____ **Lay-out**




_____ Lay-out

Give the number of electrical fixtures in second lay-out.

| Quantity | Electrical Fixtures |
|---|---|
| | Incandescent Lamp |
| | Single Pole Switches |
| | Double Pole Switches |
| | Lighting Board Panel |

Now, check your answers using the Answer Key. If you got 90 - 100 % of the items correctly, continue to the next pages. If not, do the activity to increase knowledge and practice skills required for mastery.

# Lesson 1 Interpreting Technical Drawings and Plans

Be happy! You have gone this far with your exploration in EIM. You are expected to be applying your learnings in the previous lessons. Get ready!

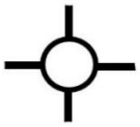
This is totally a new whole learning experience for you and a good opportunity to discover your potentials. This time, you will realize more about interpreting technical drawings and plans for specific tasks that will help you on the succeeding lessons with the use of variety of signs and symbols.

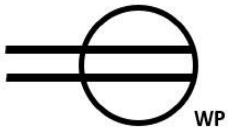
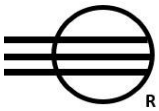
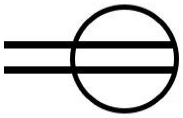
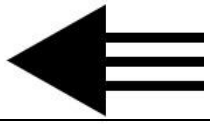
## *What's In*

In the previous lesson, you have studied about analyzing signs, symbols, and data. Let's see how well you've learned from the previous module. Answer the activity below.

### Activity 1. Remember Me!

**A.** Match the symbols in Column A with the description in Column B. Write the letter of your correct answer on your test sheet.

| **A** | **B** |
|---|---|
| SYMBOL | DESCRIPTION |
| 1.  | a. Connected Wires |
| 2.  | b. Circuit Breaker |
| 3.  | c. Service Entrance (3 Wires) |
| 4.  | d. Duplex Convenience Outlet |
| 5.  | e. Range Outlet |

| | |
|---|---|
| 6.  | f. Special Purpose Outlet |
| 7.   | g. Floor Outlet |
| 8.  | h. Weatherproof Outlet |
| 9.   | i. Single Pole Switch |
| 10.  | j. Fluorescent Lamp |
| 11.   | k. Incandescent Lamp |
| 12.  | l. Lighting Panel Board |
| 13.  | m. Power Panel Board |
| 14.  | n. Lightning Arrester |
| 15.  | o. Ground |

***Notes to the Teacher***

This lesson requires patience and guidance from the teacher and facilitator since this lesson is highly technical. Advise your learners to pay utmost attention to the topics. Encourage your learners to reach a higher goal by focusing a more comprehensive learning. After all, it is rewarding.

## *What's New*

Interpreting and reading blueprints and electrical work plans are important in making a successful electrical installation and maintenance. Making things accurately needs mastery of the skills and precision in understanding the data presented. Hence, being able to read and interpret a work plan is a must. Doing both means you are doing well.

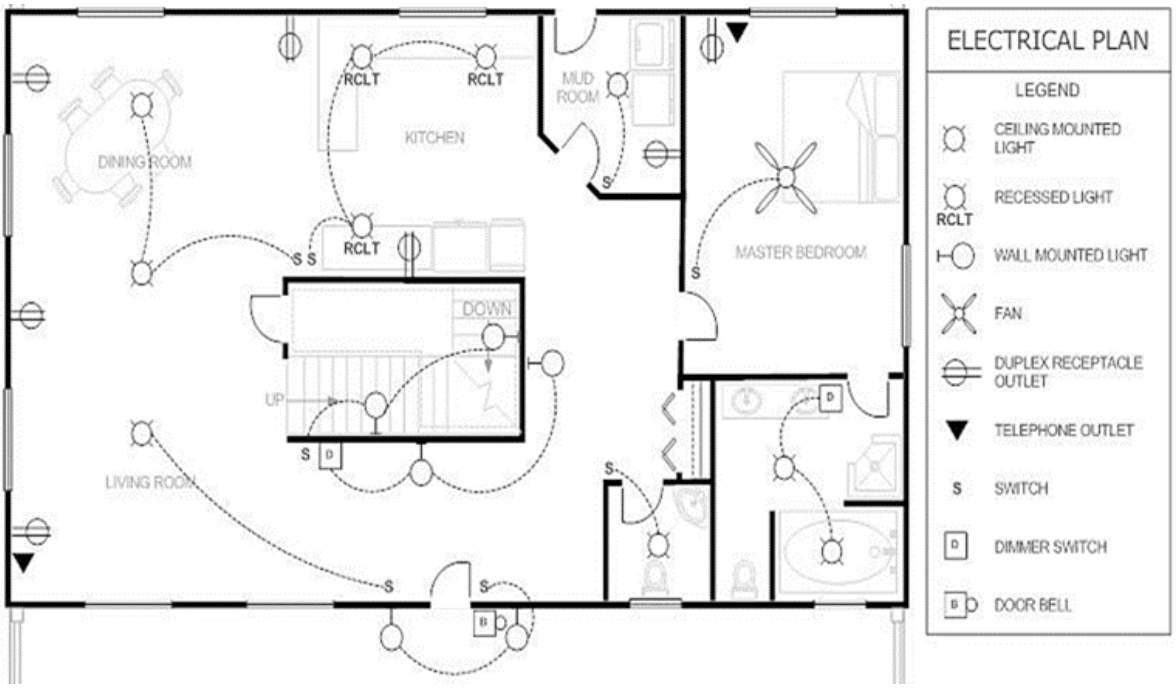
## Interpreting Working Plan

Before we go deeper in this topic, it is important that you know the following terms:

- **Electrical Fixtures –**electric consuming devices found in a house that has symbols laid out in an electrical wiring diagram or electrical plan.
- **Legend Specification –** a detailed description of an electrical plan containing specific details of all items in the drawing.
- **Battery –** composed of one or more cells producing electric current from chemical energy to electrical energy.
- **Control Panel –** a metal box which contains important electrical devices such as circuit breaker and fuse which control branches of house wiring lay outs.
- **Ampere**- the unit used on electrical flowing current.
- **Volt (E)** – the unit of electric pressure or electromotive force which will produce a current of 1 ampere through a resistance of 1 ohm watts (W) and kilowatts (KW).
- **Electric Current (I)-** a flow of **electric** charge in a circuit

- **Resistance (R)-** a measure of the opposition to current flow in an electrical circuit

**An example of a blueprint house plan**




The illustration shows you how electrical items and wires are connected and where the lights, light switches, outlets and other fixtures are located. A clear house electrical plan enables electrical engineers install electrical materials correctly.

## *What is It*

Hooray! You are really doing the right thing.

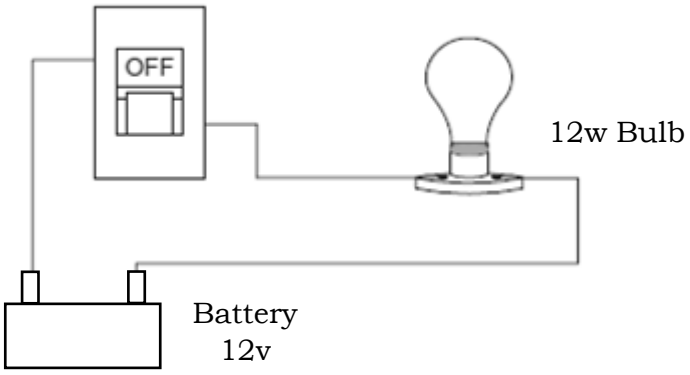
Now, different projects mean different considerations on the work plan needed. To understand the concepts, let's start with the different wiring that we need to understand and interpret when reading blueprints.

**Blueprint** is a detailed plan for doing something new, or something that is a model for how something should be done

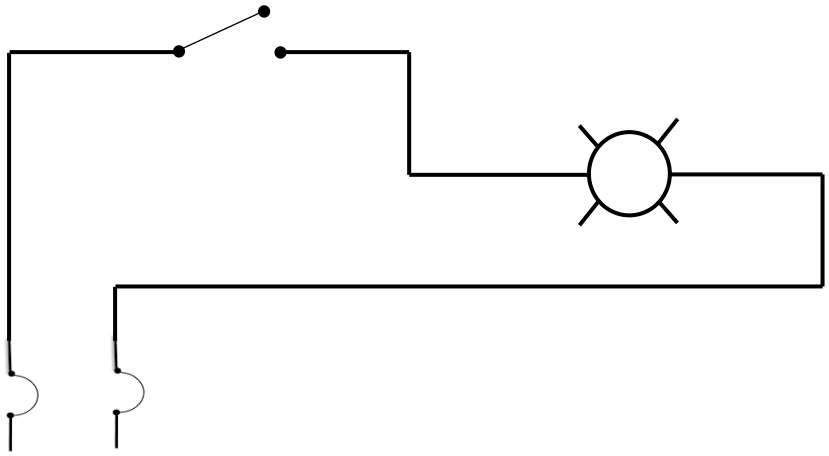
**Electrical Wiring Diagram.** The flow of current in a conductor or wire is represented by a diagram. There are different types of diagram: *pictorial, schematic, block, one line and wiring diagram.*

Let us define and illustrate each one of them to have a better understanding of the differences.

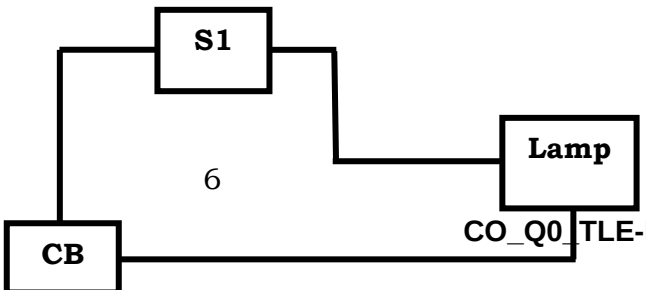
a. **Pictorial Diagram** is an electric circuit sketch showing the external appearance of every single component. It is more like a snapshot of the circuit and uses clear part images.



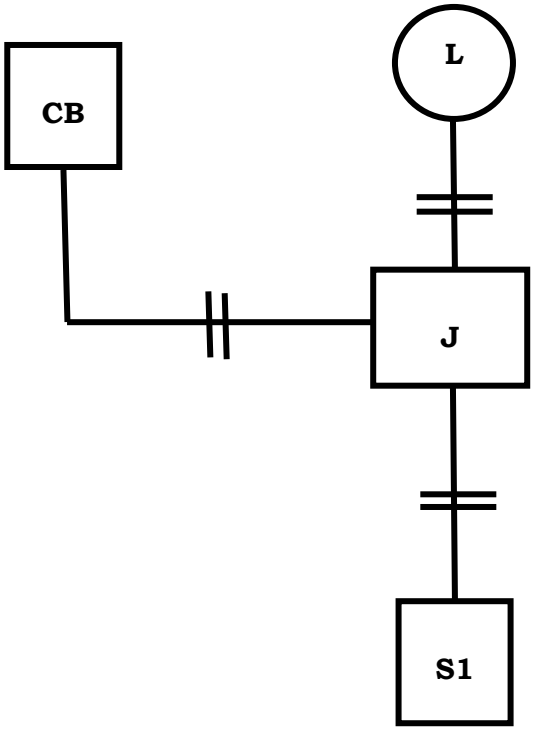

b. **Schematic Diagram** is a sketch which shows the circuit components using normal symbols of the circuits. This indicates the number of components currently in use and how will you route the wiring.



c. A **Block Diagram** is a diagram of a structure in which the principal components represented by blocks are linked by lines that display the relationships of the blocks.

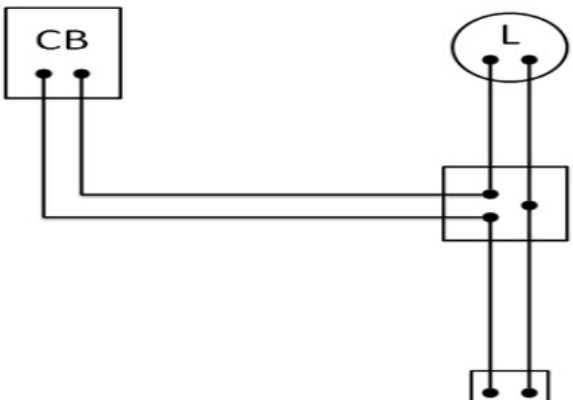


d. An electrical **One-line Drawing** is a representation into a simplified description of a complicated electrical distribution system using a single line, representing the conductors where components are attached.

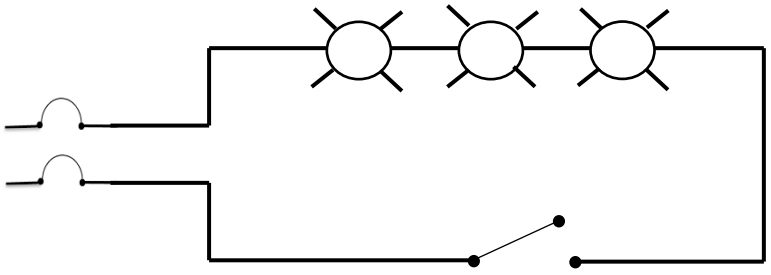



The electrical wiring drawings presented above show a sample circuit flow and control. That is from the battery (12v) as the power source to energize the bulb (12w) controlled by a single pole switch.

e. A **Wiring Drawing** is a simplified traditional representation of an electric circuit. It displays the circuit components in a more detailed drawing indicating wiring connections of terminals.

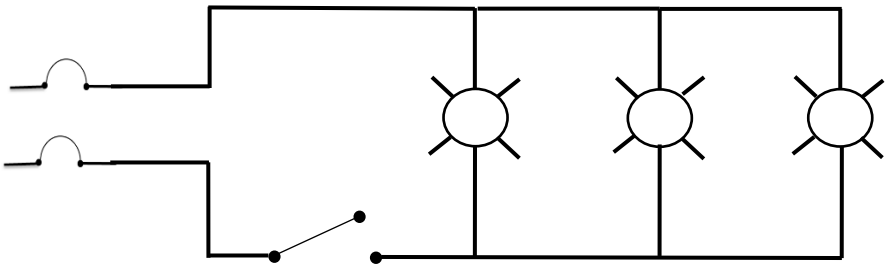


f. **Series Circuit** is a circuit diagram that arranges lamps in a series so that the current has only one direction of flow. The current that runs over each load is the same or equal.



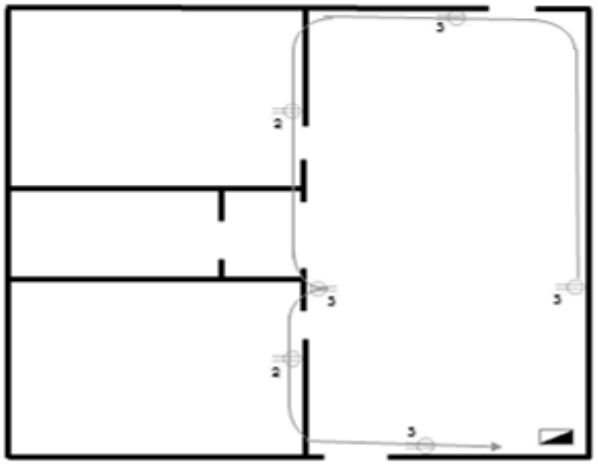
**Schematic diagram of three bulbs connected in series circuit controlled by a single pole switch**

g. **Parallel Circuit** is a circuit in which lamps are wired in parallel. The Voltage around each load on parallel circuit is the same. The benefit of using parallel circuit is that even if one of the lamps fails, the other lamps are still energized.



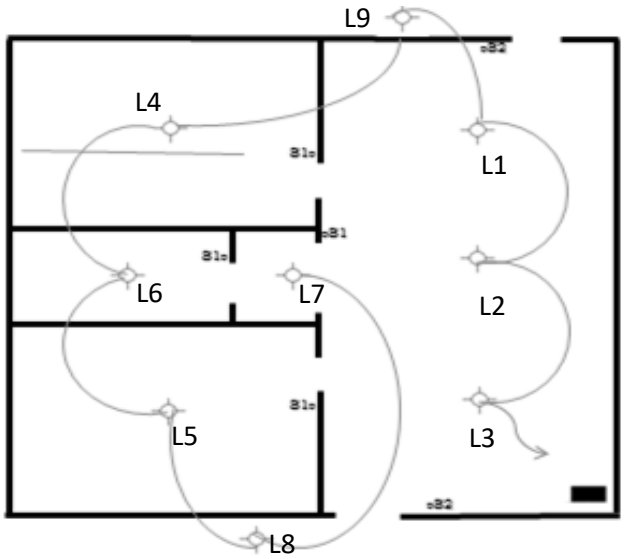
**Schematic diagram of three bulbs connected in parallel circuit controlled by a single pole switch**

**Electrical plan** is a graphical presentation of connections of electrical wiring for installation in a particular house or building. This indicates the location of the electrical fixtures to be mounted such as convenience outlets, switches, lightings,



Power Lay-out

door bells and others.



Lighting Lay-out

**Legend Specification:**

| | | |
|---|---|---|
| | Power Panel | 1 – 30A Circuit Breaker |
| | Incandescent Bulb | 4 – 15 watt Bulb ( L6, L7, L8, L9) |
| | Fluorescent Bulb | 5 – 20 watt Bulb ( L1, L2, L3, L4, L5) |
| | Duplex Convenience | 6 – 5A Outlet |
| | Lighting Panel | |

*Note:*

Tools and equipment to be used are on the list in Module 1 including the needed materials on specific electrical jobs.

**How to Read an Electrical Drawing**

1. Familiarize with Standardized Electrical Symbols.

2. Know the meanings of basic electrical symbols in your electrical drawing will help you quickly understand and troubleshooting the circuit.

3. Know or be oriented on the National Electric Code (NEC).

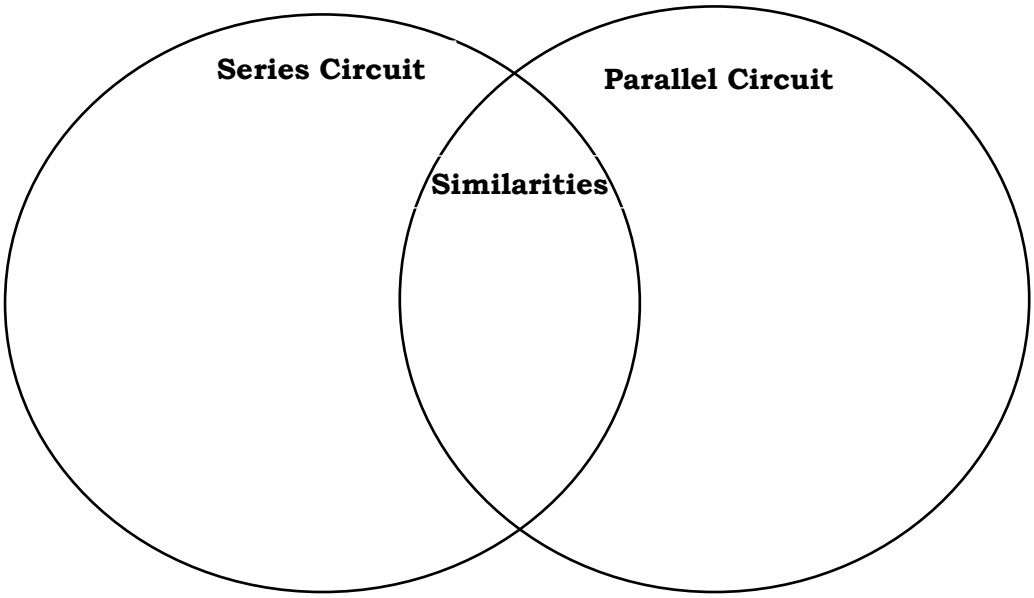
4. Be oriented on the distribution of materials along house floor plan, placement of materials like fixtures must be placed on specific location of the house plan considering also the dimension of the floor plan.

## *What's More*

Exciting! Now, follow through your newfound knowledge converting it to a skill. Give your best shot.

**Activity 2. What's the Difference?**

**A.** Give the similarities and differences of the Series and Parallel Circuit through a Venn Diagram. Do this on your activity sheet.




**B.** Tell the components of the Blueprint House Plan and List the Tools and Equipment Needed. Write your answers on the columns provided in your activity sheet.

| Blueprint House Plan | List of Tools and Equipment Needed |
|---|---|

| | |
|---|---|
| | |

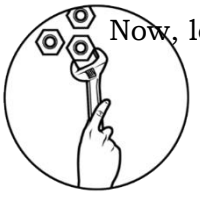
## *What I Have Learned*

Cheers! You did it again. You just hurdled challenging activities in EIM. Interpreting technical drawings and plans is never an easy task. Much more, you were also introduced to the two (2) kinds of electrical lay-outs. You have also learned how to interpret drawings, signs and symbols and specification of electrical materials.

Some of the important notable practices you must remember in this module are listed below.

1. Lighting and receptacles should not be combined on a single circuit.
2. All building lighting should not be connected on a single circuit.
3. Lighting and receptacles shall be supplied with current from at least two circuits so that if a single line is out, the entire area is not deprived of power.
4. Combination switch and receptacle outlets are not allowed.
5. There should be at least one receptacle in the bathroom and one outside the house. Both must be Ground Fault Circuit Interrupter (GFCI) type.
6. There should be a switch control for closet lights. Pull chain switch is a nuisance.
7. Convenience outlet though counted as part of the general lighting load shall be limited to 6 convenience outlets on a 15-ampere circuit and 8 convenience outlets on a 20-ampere circuit.
8. The code requires that at least one 20-ampere circuit supply shall be installed to the laundry outlets.
9. Convenience outlet shall be laid out in such a manner that no point on a wall is more than 2.00 meters from an outlet.
10. A grounding type receptacle shall only be used.

Learning things regarding technical drawing and plans is a whole lot of fun. I hope you have taken down all salient notes you have read in the lesson.



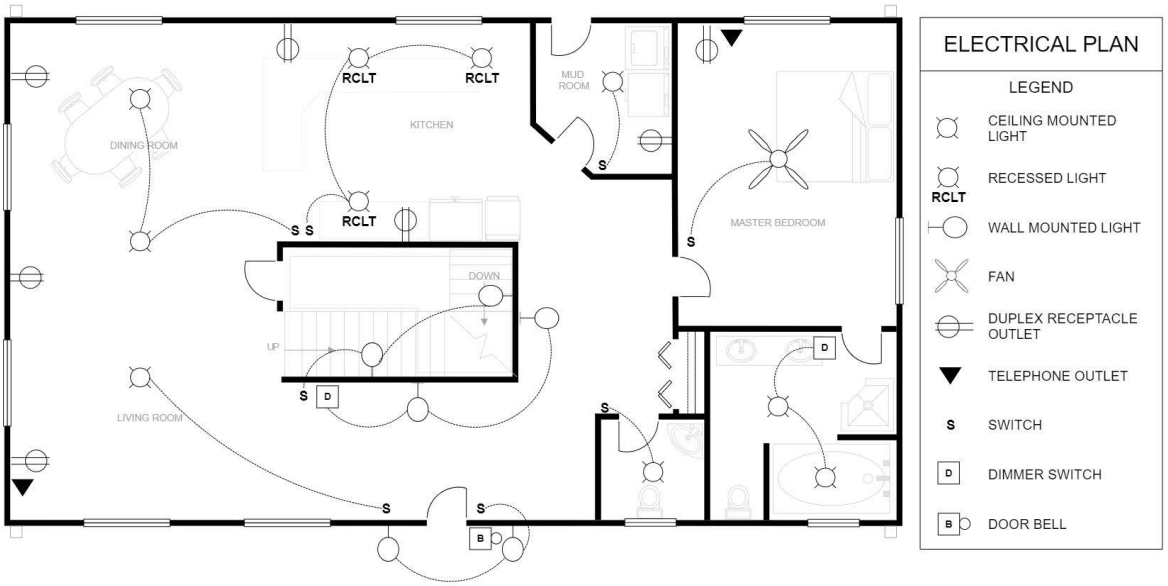
Now, let us have a review on how much you have learned from this lesson.

## *What I Can Do*

We will see if you can apply what you have learned in this module in your real-life situation.

**Activity 3: Read and Interpret**

**Direction:** Interpret the electrical plan by giving the list and number of fixtures that are present in the plan by completing the table below. Do this on your activity sheet.



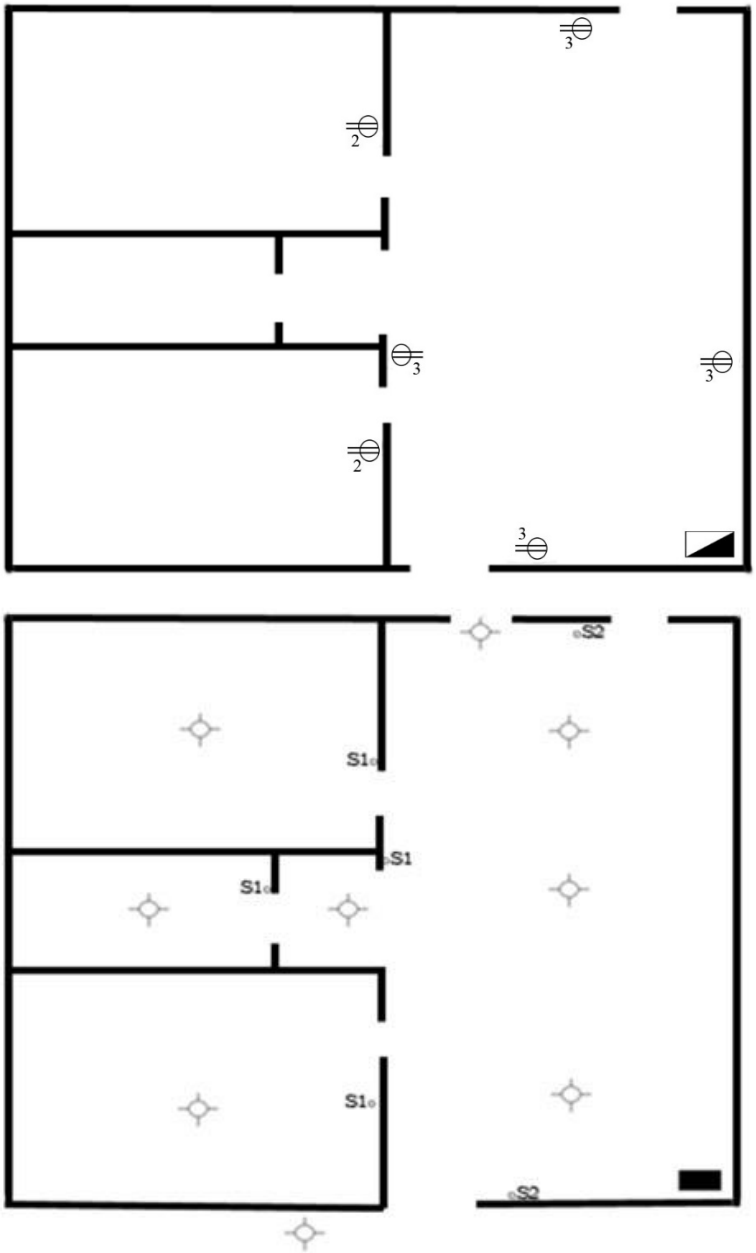

| Quantity | Materials and Equipment Needed |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

## *Assessment*

Smile! When you try to note all the details and information presented, you can be a good electrician someday.

I am happy that you have come this far. Now, we are down to the assessment process and I know you will be doing great on this matter for you have tried your best. Let's bring it on!

**A. Direction:** Assume that the drawing is a lighting or power circuit, connect the electrical fixtures on its respective connection per circuit. Copy and write your answers on your activity sheet. This is a total of seven (8) points.




**B. True or False.** Write <u>True</u> if the statement is correct and <u>False</u> if not on the space provided before the number.

_____ 1. Electrical Plan is the reproduction of a technical drawing.
_____ 2. One-line drawing is a representation into a simplified description using

a single line which represents the conductors.

_____ 3. Ground Fault Circuit Incorporation is the acronym for GFCI.

_____ 4. All building lighting should be connected in a single circuit.

_____ 5. Philippine Electrical Code requires at least one-20A circuit supply in a laundry outlet.

_____ 6. Parallel circuit carries the same load around each load.

_____ 7. The current that runs over each load is the same or equal is true in series connected circuit.

## *Additional Activities*

Building, planning, interpreting sign and drawing are only primary requirements. The standard guidelines must be observed and the provision must be a notable practice.

### Activity 5. I can Tell!

**Direction:** Your teacher will show you a blueprint of a house/residential plan. Look for the electrical layout and explain to the teacher your interpretation.

# *Answer Key*

**Assessment/Post-Test**

A.



Power Lay-out



Lightning Lay-out

B.

1. False
2. True
3. False
4. True
5. True
6. True
7. True

**Pretest – Identify Me!**



Power Lay-out



Lightning Lay-out

| Quantity | Electrical Fixtures |
|---|---|
| 9 | Incandescent Lamp |
| 4 | Single Pole Switches |
| 2 | Double Pole Switches |
| 1 | Lighting Board Panel |

***What I Can Do***

| Quantity | Materials and Equipment Needed |
|---|---|
| 7 | Duplex Receptacle |
| 7 | Ceiling Mounted Light |
| 6 | Wall Mounted Light |
| 3 | Recessed Light |
| 1 | Fan |
| 1 | Doorbell |
| 2 | Dimmer Switch |
| 8 | Switch |
| 1 | Telephone Outlet |

# *References*

Daniel Belisario. *How to Read Electrical Drawing*.March 26, 2020. https://www.edrawsoft.com/how-to-read-electrical-drawing.html.

Fely L. Manuel and Dr. Orlando E. Manuel, *K to 12 Basic Education Curriculum Technology and Livelihood Education Learning Module: Electrical Installation and Maintenance Exploratory Course Grade 7 and Grade 8* Pasig: Department of Education, 2016.

A.Panem,J.Gacula, J, Agustin,P.Lucas,F.Dilao,E, Alminiana,J.Lamug, *CBLM Competency Based Learning Modules Design & Develop Maintenance System*.NTTA-TESDA QA System:May 2-6, 2011.

**For inquiries or feedback, please write or call:**

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph