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TVL Industrial Arts:

Electrical Installation and Maintenance (EIM) NCII

Quarter 2 – Module 4:

**Basic Methods and
Requirements for Installation:
Wiring Installation Using
Polyvinyl Chloride (PVC) Conduit
(Week 4)**



What I Need to Know

In this module, you will be trained to install wiring devices using different types of conduit wiring in accordance with pipe installation, especially on **Non-metallic or Polyvinyl Chloride (PVC) conduit**. This includes the Philippine Electrical Code (PEC) provisions in installing PVC conduit.

In this module, you are expected to:

1. explain the PEC provisions in installing PVC Conduit;
2. appreciate the use of PVC conduit in wiring installations based on PEC provisions; and
3. install wiring devices using polyvinyl chloride (PVC) conduit.



What I Know

Name: _____ Grade and Section: _____ Quarter: ____
Module Number: _____ Lesson Title: _____

A. Multiple Choice. Choose the letter of your answer and write it on a separate sheet of paper.

1. A pipe or raceway which serves as passage of electrical conductors.
A. Conduit B. Concealed wiring C. Surface wiring D. Circuit
2. A safety device which automatically opens an electrical circuit if overloaded.
A. Short circuit B. Circuit breaker C. Male plug D. Outlet
3. It refers to tubing, piping or electrical wire installation that permits flow to and from the energy source.
A. Switch B. Circuit C. Outlet D. Circuit breaker
4. A contact device installed along a circuit for the connection of an attachment plug and flexible cord to supply power to portable equipment and electrical appliances.
A. Outlet B. Switch C. Circuit D. Circuit breaker
5. A partial or total failure in an electrical conductor or any electricity consuming device.
A. Short circuit B. Open circuit C. Electrical fault D. Grounding
6. A bend used to adopt the conduit from the surface to particular boxes or fittings.
A. Pipe bender B. Conduit pipe C. Electrical box D. Offset
7. It refers to the removal of sharp edges at the end of the pipe.
A. Cutting B. Splicing C. Reaming D. Cleaning

8. A faulty or accidental connection between two points of different potential in an electric circuit, bypassing the load and establishing a path of low resistance through which an excessive current can flow. It can cause damage to the components if the circuit is not protected by a fuse.
A. Short circuit B. Open circuit C. Grounding D. Electrical shock
9. A device for making, breaking, or rearranging the connections of an electric circuit
A. Switch B. Outlet C. Tester D. Circuit breaker
10. The electrical wiring system inside the wall, roof, or floor with the help of plastic or metallic piping.
A. Surface wiring B. Concealed wiring C. Grounding D. Open wiring
11. A process of connecting various accessories for distribution of electrical energy from supplier's meter board to home appliances.
A. Connecting B. Distributing C. Splicing D. Wiring
12. Wiring method using PVC conduits are installed on surface of the walls or roof.
A. Concealed wiring B. Grounding C. Open wiring D. Surface wiring
13. The minimum electrical trade size of rigid nonmetallic shall not be used in the electrical installation.
A. Smaller than 15mm (20mm) C. Smaller than 30mm
B. Smaller than 25mm D. Smaller than 40mm
14. Fitting for rigid nonmetallic conduit shall be provided to compensate for thermal growth and contraction.
A. Bushing C. Expansion fitting
B. Coupling D. Securing and support
15. The Philippine Electrical Code provides that rigid non-metallic conduit may be used under the following conditions. EXCEPT.
A. In dry and damp locations
B. Physically damaged location
C. Concealed in floors, walls, and ceilings
D. In wet locations, provided water is prevented from entering the conduit



What's New

Wiring is a process of connecting various accessories for distribution of electrical energy from supplier's meter board to home appliances such as lamps, fans and other domestic appliances that is known as Electrical Wiring. It can be done using two methods which are surface conduit wiring and concealed conduit wiring. **Surface conduit wiring** is applied if conduits installed on the roof or wall, known as surface conduit wiring. The wiring method should make holes on the surface of the wall on equal distances and the conduit is installed then with the help of plugs. On the other hand, **Concealed conduit wiring** is considered if the conduits are hidden inside the wall slots with the help of plastering, it is called concealed conduit wiring. In other words, the electrical wiring system inside the wall, roof, or floor with the help of plastic or metallic piping is called concealed conduit wiring. It is the most popular, beautiful, strong, and common electrical wiring system nowadays.

In conduit wiring, steel tubes known as conduits are installed on the surface of the walls by means of pipe hooks (surface conduit wiring) or buried in the walls under plaster and VIR or PVC cables are afterwards drawn by means of a GI wire of size if about 18SWG.

In a Conduit wiring system, the conduits should be electrically continuous and connected to earth at some suitable points in case of steel conduit. Conduit wiring is a professional way of wiring a building. Mostly PVC conduits are used in domestic wiring.

The conduit protects the cables from being damaged by rodents (when rodents bite the cables it will cause short circuit) that is why circuit breakers are in place though but hey! Prevention is better than cure. Lead conduits are used in factories or when the building is prone to fire accidents. Trunking is more like surface conduit wiring. It is gaining popularity too.

It is done by screwing a PVC trunking pipe to a wall then passing the cables through the pipe. The cables in conduit should not be too tight. Space factor must be put into consideration.



What is It

Non-metallic conduits are electrical materials which are manufactured to be resistant to moisture and chemical atmosphere. They are also manufactured to be flame retardant or not easily burned. They are resistant to impact and crushing. They do not easily get out of shape by the heat. These conduits are classified according to the materials they are made of. The most common ones are asbestos cement conduit, polyvinyl chloride, conduit, and high-density polyethylene conduit.

The Philippine Electrical Code provides that rigid non-metallic conduit may be used under the following conditions:

1. Concealed in floors, walls, and ceilings
2. Direct earth burial or underground
 - 300 mm in trench below
 - 50mm thick concrete or equivalent
 - 600 mm under streets, highways, roads, alleys, driveway, and parking lots
 - 460 mm under driveways and parking lots of single- and two-family dwelling units
 - 460 mm under airport runways, including adjacent areas where trespassing is prohibited
3. In locations subject to severe corrosive influences

4. In locations where subject chemicals for which the materials are specifically approved
5. Cinder fill
6. In wet locations, provided water is prevented from entering the conduit
7. In dry and damp locations

The Philippine Electrical Code prohibits the use of rigid non-metallic conduit under the following conditions:

1. Hazardous (Classified) locations
2. Support of fixtures
3. Physically damaged location
4. Ambient temperature. Where subject to ambient temperatures more than 50oC unless posted otherwise
5. Insulation temperature limitations. For conductors, whose insulation temperature limitations would exceed those for which the conduit is listed.
6. Theaters and similar locations.

INSTALLATION OF NON-METALLIC CONDUIT PEC REQUIREMENTS

1. **TRIMMING.** Rough edges or burrs on the cut ends of non-metallic conduit shall be trimmed inside and outside
2. **JOINTS.** Joints between lengths of conduit and between conduit couplings, fittings and boxes shall be made with approved coupling and adapter. For waterproofing, PVC cement should be spread around the surfaces to be joined.
3. **SECURING and SUPPORTS.** Rigid non-metallic conduit shall be rigidly supported as indicated below:

Support of Rigid Nonmetallic Conduit

Conduit Size [mm (mm)] *	Maximum Spacing Between Supports (mm)
15 (20) – 25 (32)	900
32 (40) – 50 (63)	1500
65 (75) – 80 (90)	1800
90 (100) – 125 (135)	2100
150 (160)	2400

4. **EXPANSION FITTINGS.** Expansion fitting for rigid nonmetallic conduit shall be provided to compensate for thermal expansion and contraction.
5. **MINIMUM SIZE.** Rigid nonmetallic conduit smaller than 15 mm (20 mm) electrical trade size shall not be used.
6. **MAXIMUM.** Rigid nonmetallic conduit larger than 150 mm (160 mm) electrical trade size shall not be used.
7. **BUSHING.** Where conduit enters a box, fitting or other enclosure, a bushing or adapter shall be provided to protect wires from abrasion unless the box, fitting or enclosure design provides equivalent protection.
8. **BENDS-HOW MADE.** Bends of rigid nonmetallic conduit shall be made so that the conduit will not be damaged and that the internal diameter of the conduit will not be effectively reduced.



What's More

Name: _____ Grade and Section: _____ Quarter: _____
Module Number: _____ Lesson Title: _____

Install Wiring Devices using Polyvinyl Chloride (PVC)

Instructions: Given the layout of the pictorial diagram of a GFCI outlet and a light switch connected to a circuit breaker. Draw a schematic diagram in figure B, line diagram in figure C and the actual wiring diagram in figure D on a long size bond paper. Then check your work by looking at the answer key at the end of this module.

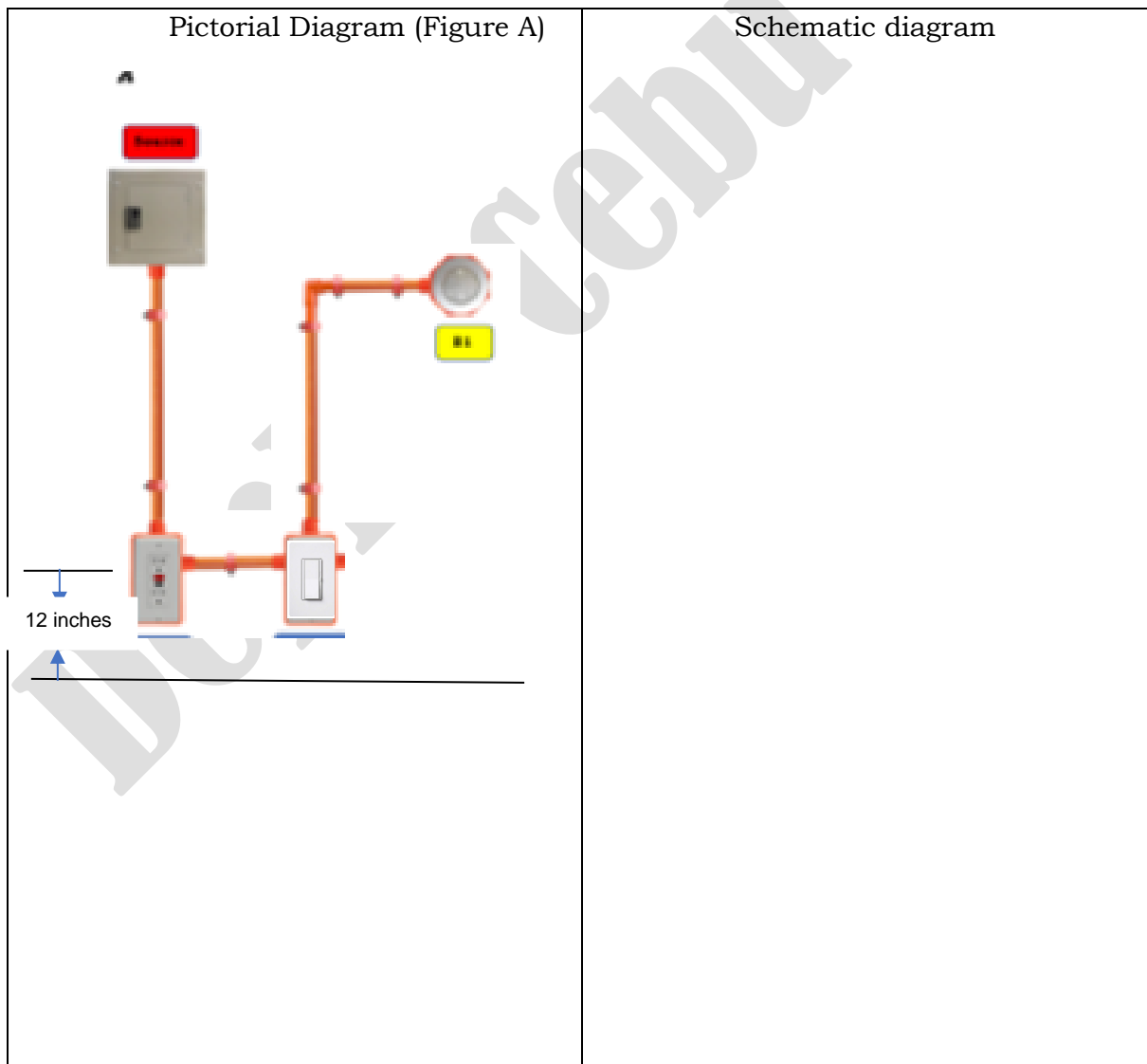
This diagram illustrates wiring a GFCI receptacle and light switch in the same outlet box, a common arrangement in a bathroom with limited space. The heat source is spliced to the LINE terminal on the receptacle and to one terminal on the light switch. The neutral and ground wires are spliced together and run to each device in the circuit. This wiring provides single-location GFCI protection. The light and switch are not protected by the GFCI.

Supplies and Materials:

- Serving cap/male plug
- Circuit breaker
- Utility boxes
- Octagonal boxes
- Switches flush type (single pole, 3-way, and 4-way)
- Convenience outlet (duplex)
- Incandescent bulbs
- Bulb/Lamp holders
- Connectors
- Metal straps
- Wiring plan

Tools and Equipment

- Try square
- Bench vise
- Hack saw / Pipe cutter
- Level
- Chalk line/pencil
- Screwdriver
- Pliers
- Wire stripper
- Hammer
- Personal Protective Equipment (PPE)
 - Gloves
 - Goggles
 - Hardhat
 - Tight clothes



	<p>Figure B</p>
<p>Line Diagram</p> <p>Figure C</p>	<p>Actual Wiring Diagram</p> <p>Figure D</p>



A. Multiple Choice. Choose the letter of your answer and write it on a separate sheet of paper.

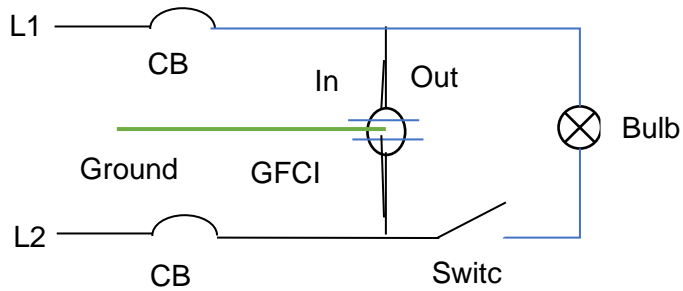
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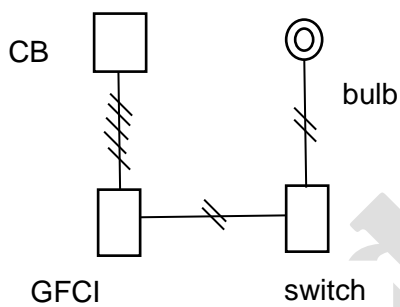
Answer Key

What's More

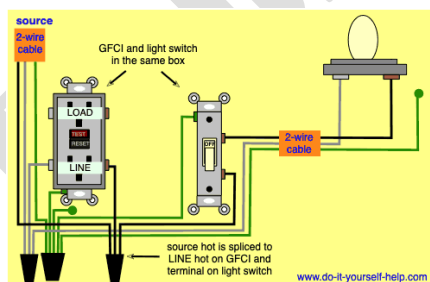
Schematic diagram (Figure B)



Line diagram (Figure C)



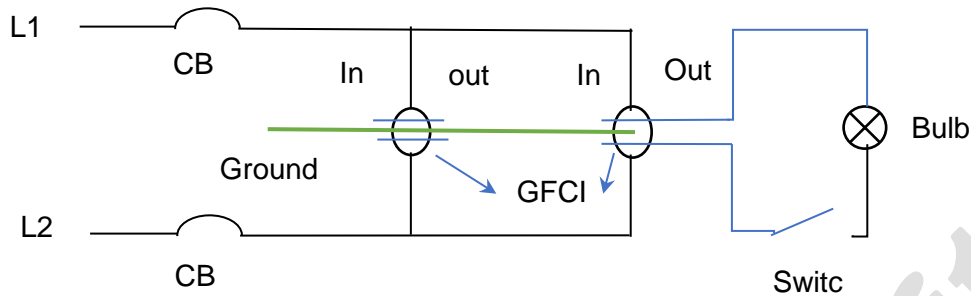
Actual Wiring Diagram (Figure D)



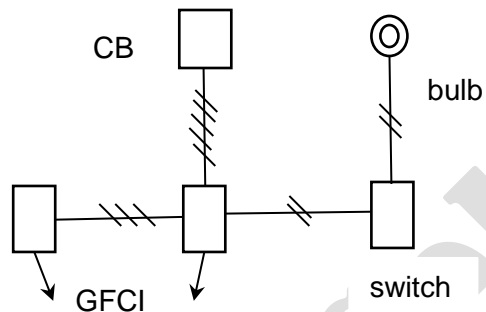
<https://www.do-it-yourself-help.com/gfci-outlet-wiring-diagrams.html>

Additional Activities

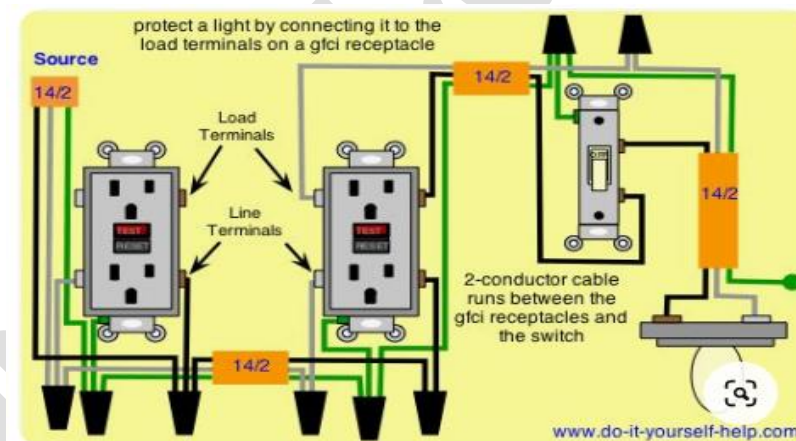
Schematic diagram (Figure B)



Line diagram (Figure C)



Actual wiring diagram



<https://www.do-it-yourself-help.com/gfci-outlet-wiring-diagrams.html>

References

Department of Education Learner's Material, first edition 2014
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<https://www.do-it-yourself-help.com/gfci-outlet-wiring-diagrams.html>, retrieved on October 19, 2020