10

TVL Industrial Arts:

Electrical Installation and Maintenance (EIM) NCII

Quarter 2 – Module 3:

Replacing and Installing Ground Fault Current Interrupter (GFCI) Devices

(Week 3)

DepED
DEPARTMENT OF EDUCATION

What I Need to Know

This portion of the module contains information about Replacing/ Installing Ground Fault Circuit Interrupter (GFCI). These include the procedures/ steps in installing GCFI and replacing these devices from ordinary electrical devices following the provision of the Philippine Electrical Code.

At the end of this module, you should be able to:

1. interpret plan or drawing based on the given requirements;
2. illustrate the electrical boxes in accordance with the PEC; and
3. install GFCI as a replacement for ordinary outlets.

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 colored wire which carries the electricity from the breaker panel into the switch or light source. It is also called as "hot" wire.
   A. White wire B. Black wire C. Yellow wire D. Green wire
2. A colored wire which takes any unused electricity and current and sends them back to the breaker panel. It is also called a "neutral wire".
   A. Black wire B. White wire C. Green wire D. Yellow wire
3. The source of power of an outlet where you connect the incoming source power.
   A. Outlet B. Load side C. Line side D. Male plug
4. It is where the power leaves the device (or electrical box) and travels down the circuit
   A. Load side B. Outlet C. Line side D. Male plug
5. This GFCI is used in place of a regular wall outlet or duplex receptacle. It is normally found throughout the house in places such as bathrooms, kitchens, garages, outdoor areas, and other locations where damp conditions do or could exist.
   A. Plastic box B. Portable type C. Gem box D. Receptacle type
6. This GFCI contains the GFCI circuitry in an enclosure with plug prongs at the back and receptacle plugs in front.
   A. Receptacle type B. Portable type C. Gem box D. Plastic box

7. GFCI receptacle outlets serving the countertop shall be located above the countertop, but not more than _____ above the countertop.
   A. 15 inches B. 18 inches C. 20 inches D. 25 inches
8. How many inches are required by the code in mounting boxes behind the surface of non-combustible materials?
   A. 1/2-inch B. 1/3-inch C.1/4-inch D. 1/5-inch
9. A device will de-energize a circuit when it senses a difference in the amount of electricity passing through the device and returning through the device, or a "leak" of current from the circuit.
   A. Outlet C. Fuse
   B. GFCI D. Circuit breaker
10. A conducting connection, whether intentional or accidental by which an electric circuit or equipment is connected to the earth.
   A. Ground B. Short circuit C. Electrical fault D. Splicing
11. A GFCI outlet, properly installed, will protect all the outlets on the _____.
   A. Line side B. Load side C. Power supply D. Fuse
12. Where to connect the power supply wire in the GFCI?
   A. Line side B. Load side D. Hot wire D. Neutral

For questions number 12-15
Ferdinand is an electrician who wants to install and replace a new outlet in his garage, bathroom, laundry area and kitchen countertop. How will you help him in the installation of the outlet?

13. What would Ferdinand do first?
   A. Prepare all tools and materials needed
   B. Turn off the power at the circuit-breaker box
   C. Wear appropriate Personal Protective Equipment.
   D. Remove the outlet cover plate and the screws holding the outlet in place.
14. If you are Ferdinand, how will you manage yourself for your safety in the installation of an outlet?
   A. Install the outlet even if it is risk
   B. Install an outlet even without PPE
   C. Install an outlet because you know the procedure
   D. Wear appropriate Personal Protective Equipment.
15. What type of electrical outlet that Ferdinand needs to use?
   A. Convenience outlet C. Switch outlet
   B. Ground Fault Current Interrupter D. USB and Smart outlet

What's New

GFCI outlets have been around since the 1970s and are typically found anywhere around the home that is a damp environment. Commonly they are located (or should be) at bathrooms, kitchen countertop, laundry areas, unfinished basements, crawl spaces, garages and at exterior outlets.

This picture shows how GFCI protection devices are installed and there is a certain requirement in installing the GCFI devices. This is just one common area where the GFCI outlet was located. The requirement of countertop sections that are 12 inches wide or wider are considered a "wall" and must have a ground fault current interrupter (GFCI) outlet. GFCI receptacle outlets serving the countertop shall be located above the countertop, but not more than 20 inches above the countertop. The reason why it should be required is because people do all sorts of things on tiny sections of countertop, including trying to cram in small appliances. This "12 inches" requirement ensures that whatever power-sucking appliance gets set there will have its own power source.

https://www.checkthishouse.com/2651/kitchen-gfci-receptacle-and-other-electrical-requirements.html

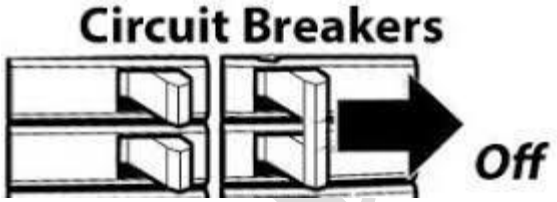
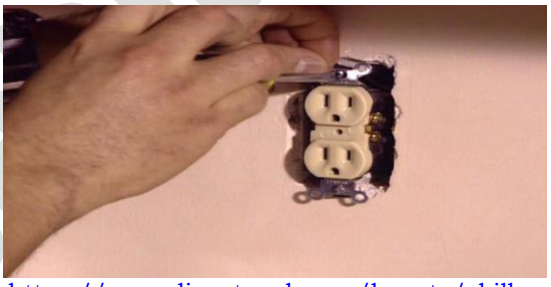
What is It

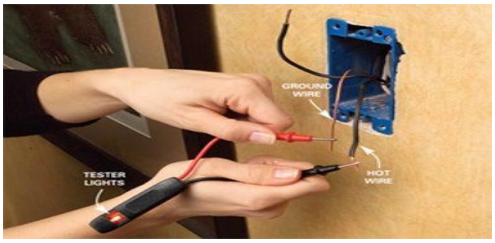
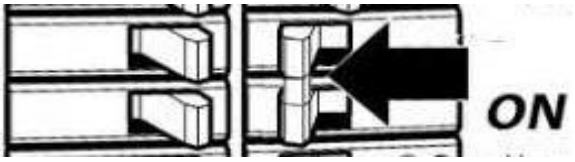
These are the procedures in replacement of regular convenience outlets with a ground fault current interrupter (GFCI) outlet. But before that, you must remember the following technical terms:

1. **Ground Fault Circuit Interrupter** is used against shock and electrocution. GFCI device will de-energize a circuit when it senses a difference in the amount of electricity passing through the device and returning through the device, or a "leak" of current from the circuit.
2. **Ground/grounding** is a conducting connection, whether intentional or accidental by which an electric circuit or equipment is connected to the earth, or to some conducting body of relatively large extent that serves in place of the earth.
3. Black **wire** is the "**hot**" **wire**, which carries the electricity from the breaker panel into the switch or light source.
4. White **wire** is the "neutral" **wire**, which takes any unused electricity and current and sends them back to the breaker panel. ... This is to prevent the electricity from running through you!
5. **Line side** of an outlet is where you connect the incoming source power.
6. **Load side** is where the power leaves the device (or electrical box) and travels down the circuit

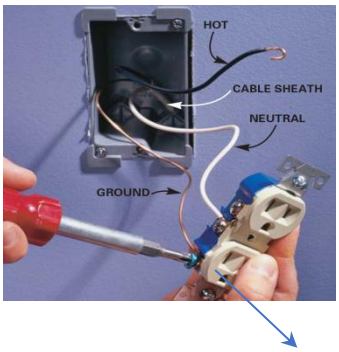
PROCEDURES IN INSTALLING/ REPLACING GCFI FROM ORDINARY ELECTRICAL DEVICES

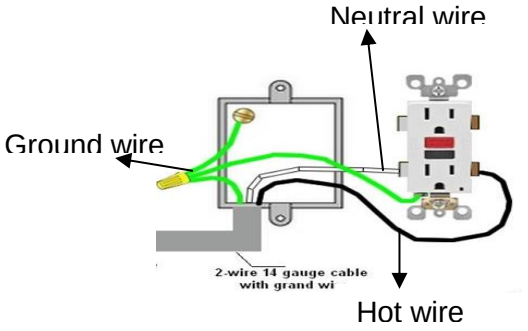
Procedure	**Illustration**
1. Prepare all tools and materials needed.	 https://www.ecmag.com/section/your-business/cool-tools-hand-tools

2. Wear appropriate PPE.	 https://www.csslng.com/safety/
3. Turn off the power at the circuit-breaker box.	 http://waterheatertimer.org/Circuit-breakers.html
4. Remove the outlet cover plate and the screws holding the outlet in place. 5. Test the outlet with the multi-tester to be sure the power is turned off. 6. Disconnect the wires from the outlet.	 https://www.diynetwork.com/how-to/skills-and-know-how/electrical-and-wiring/installing-a-gfci-outlet
7. Separate the wires from the box into two pairs. One set of wires will be the *line,* or power supply. The other set will be the *load*, which carries power to additional outlets on the same circuit. A GFCI outlet, properly installed, will protect all the outlets on the *load* side. 8. Make sure that the wires are completely separated from one another (*Figure B*), then turn on the power at the circuit-breaker box.	 https://www.diynetwork.com/how-to/skills-and-know-how/electrical-and-wiring/installing-a-gfci-outlet

9. Use the circuit tester to determine which set of wires carries the power. Turn off the power.	 https://www.instructables.com/id/How-to-Use-a-Circuit-Tester/
10. Connect the power-supply wires to the terminals marked *line* and the load wires to the terminals marked *load*. Connect the white wires to the silver screws and the black wires to the brass or gold screws (*Figure C).* The outlet may also indicate appropriate color connections. 11. Connect the bare ground wire to the green screw. 12.Put the outlet back into the box. Screw it into place, and then attach the cover plate.	 https://www.diynetwork.com/how-to/skills-and-know-how/electrical-and-wiring/installing-a-gfci-outlet
13. Turn the power back on at the circuit-breaker box.	 http://waterheatertimer.org/Circuit-breakers.html

ILLUSTRATION





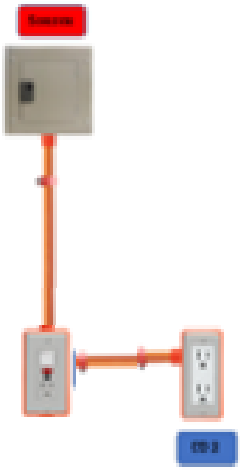
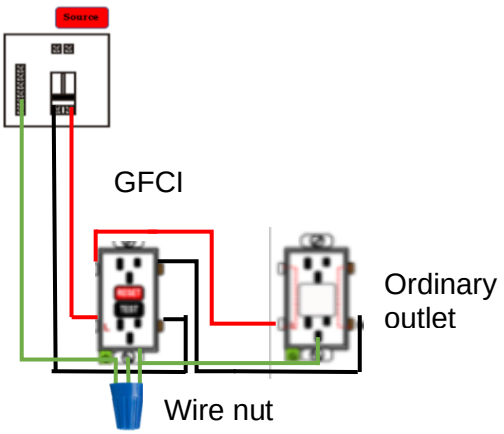
Ordinary outlet ⟹ **GFCI**

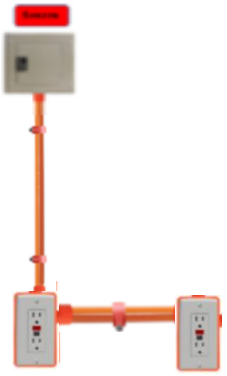
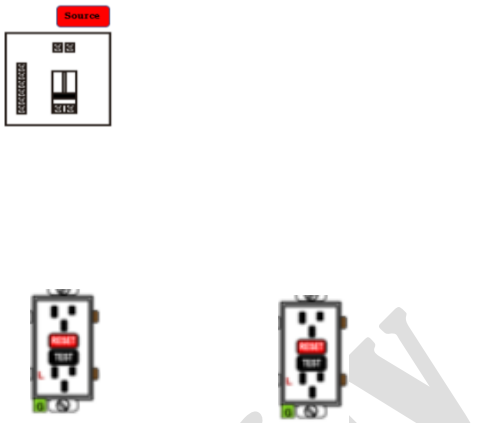
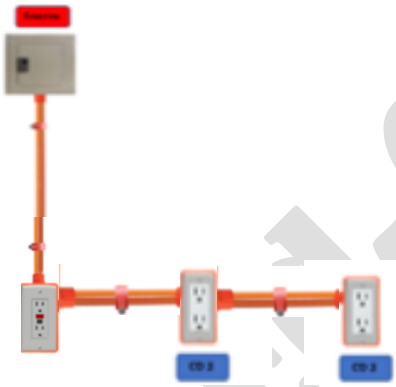
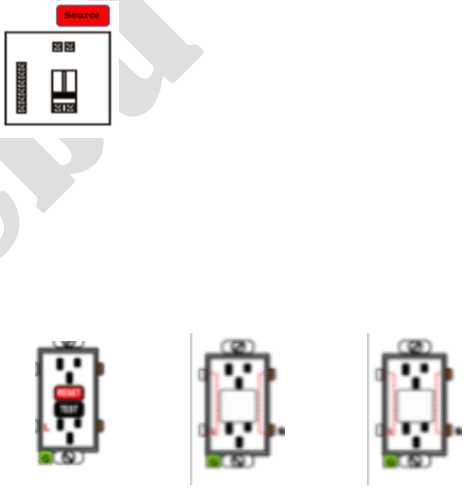
https://www.pinterest.ph/pin/298222806566492444/

What's More

Instructions: Given the illustration of a pictorial diagram. Make an actual wiring diagram. Use three colors of pens.

Legend:
- Hot
- Neutral
- Ground

Pictorial diagram	**Actual wiring diagram**
1. Ordinary outlet connected to ground fault current interrupter (GFCI) 	Example 

2. Pictorial diagram of multiple GFCI receptacle in a branch circuit 	
3. Pictorial diagram of multiple ordinary outlets connected to GFCI receptacle. 	

What I Have Learned

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

Instructions: Answer the following questions. Write your answers on a separate sheet of paper.

1. What is GFCI?

_____
_____

2. What is the procedure in the installation of GFCI?

_____
_____

3. Which areas in a house need the installation of a GFCI outlet?

_____
_____

Assessment

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

1. How many inches are required by the code in mounting boxes behind the surface of non-combustible materials?
   A. ¼ inch B. ½ inch C. ¾ inch D. 1 inch
2. A device will de-energize a circuit when it senses a difference in the amount of electricity passing through the device and returning through the device, or a "leak" of current from the circuit.
   A. outlet B. GFCI C. Fuse D. Circuit breaker
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For questions number 13-15

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13. What type of electrical outlet that Ferdinand needs to use?

A. Convenience outlet C. Switch outlet

B. Ground Fault Current Interrupter D. USB and Smart outlet

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A. Prepare all tools and materials needed
B. Turn off the power at the circuit-breaker box
C. Wear appropriate Personal Protective Equipment.
D. Remove the outlet cover plate and the screws holding the outlet in place.

15. If you are Ferdinand, how will you manage yourself for your safety in the installation of an outlet?

A. Install the outlet even if it is risk
B. Install an outlet even without PPE
C. Install an outlet because you know the procedure
D. Wear appropriate Personal Protective Equipment.

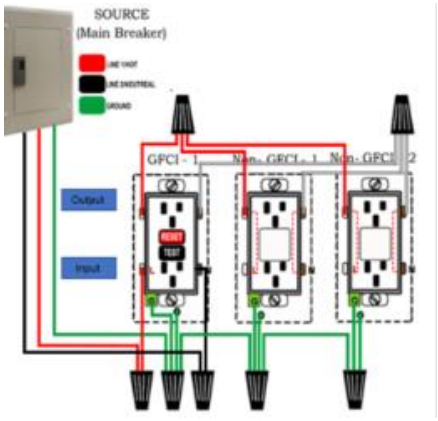
Additional Activities

Instructions: Watch a video related to installation of ground fault current interrupter (GFCI) outlet. Click the link to watch a video.https://www.youtube.com/watch?v=TqTNJUT_lKg

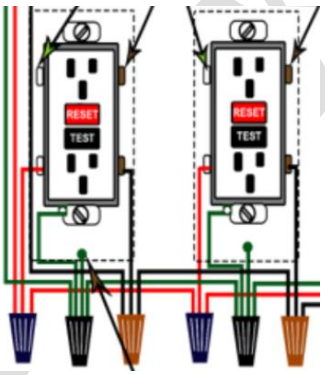
Answer Key

What's More

2.



3.



What I Have Learned

1. Receptacle GFCI**.** This is found in places like bathrooms, kitchens, garages, outdoor areas, and other locations where damp conditions may exist.

2. Procedures:

1.Prepare all tools and materials needed.
2. Wear appropriate PPE.
3. Turn off the power at the circuit-breaker box.
4. Remove the outlet cover plate and the screws holding the outlet in place.
5. Test the outlet with the multi-tester to be sure the power is turned off.
6. Disconnect the wires from the outlet.
7. Separate the wires from the box into two pairs. One set of wires will be the *line,* or power supply. The other set will be the *load*, which carries power to additional outlets on the same circuit. A GFCI outlet, properly installed, will protect all the outlets on the *load* side.
8. Make sure that the wires are completely separated from one another, then turn on the power at the circuit-breaker box.
9. Use the circuit tester to determine which set of wires carries the power. Turn off the power.
10. Connect the power-supply wires to the terminals marked *line* and the load wires to the terminals marked *load*. Connect the white wires to the silver screws and the black wires to the brass or gold screws. The outlet may also indicate appropriate color connections.
11. Connect the bare ground wire to the green screw.
12. Put the outlet back into the box. Screw it into place, and then attach the cover plate.
13. Turn the power back on at the circuit-breaker box.

3. Commonly they are located (or should be) at bathrooms, kitchen countertops, laundry areas, unfinished basements, crawl spaces, garages and at exterior outlets.

References

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