

# 10

## **TLE - Electrical Installation and Maintenance (EIM) Quarter 1 – Module 3 PEC Provisions on GFCI Installation (Week 3)**



## ***What I Need to Know***

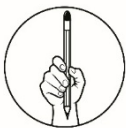
This module enables you to know the Philippine Electrical Code (PEC) provisions of installing GFCI devices. There are places in a house (especially dwelling houses) that need an installation of GFCIs. Here, you are going to learn the different locations in dwelling houses that PEC requires ground fault protection.

The lesson comprises the following:

- PEC provisions of GFCI installation and
- Different locations that require GFCI installation

After going through this module, you are expected to:

1. know the PEC provisions on GFCI installations in a single dwelling, other than single dwellings, and boat hoists,
2. identify different locations that needs GFCI installations, and
3. recognize and present other locations that need GFCI installation.



## ***What I Know***

Use a separate sheet in answering the test. Be sure to write the following:

Name: \_\_\_\_\_ Year & Section: \_\_\_\_\_  
Module Title: \_\_\_\_\_ Quarter: \_\_\_\_\_ Module #: \_\_\_\_\_ Week #: \_\_\_\_\_

**Directions:** Read each statement carefully and write the letter and word/s of your answer on a separate sheet.

1. This type of GFCI can be transferred anywhere and most of the time best used outdoors.  
A. GFCI breaker  
B. GFCI cord  
C. GFCI combo  
D. GFCI receptacle outlet
2. What article in PEC deals with the requirement of GFCI protection for personnel?  
A. PEC Article 2.10.1.7  
B. PEC Article 2.10.1.9  
C. PEC Article 2.10.1.8  
D. PEC Article 2.10.1.10
3. This type of GFCI can be used in the comfort room to protect receptacle outlets including lighting since it has a built-in switch.  
A. GFCI breaker  
B. GFCI cord  
C. GFCI combo  
D. GFCI receptacle outlet
4. All 125-volt and/or 250 volts, single-phase, 15- and 20-ampere receptacles installed in the following locations shall have ground-fault circuit-interrupter protection for personnel except  
A. Bathroom  
B. Living room  
C. Boat Hoists  
D. Laundry room
5. Which of the following situations is best for GFCI protection?  
A. A person inside a shop cutting metal using a grinder.  
B. A person welding a table inside a room  
C. A person operating a motor to be used in a swimming pool  
D. A person watching television inside his car

6. GFCI receptacle outlets serving the countertop shall be located above the countertop, but not more than \_\_\_\_\_ above the countertop.  
 A. 15 inches      B. 20 inches      C. 18 inches      D. 25 inches
7. Which of the following requires GFCI installation?  
 A. Living room      C. Dining room  
 B. Comfort room      D. Bedroom
8. In laundry, utility, and wet bar sinks, GFCI receptacle outlets are installed within \_\_\_\_\_ of the outside edge of the sink.  
 A. 1300 mm      B. 1500 mm      C. 1600 mm      D. 1800 mm
9. What is the minimum requirement for outlet receptacle in a bathroom?  
 A. 1      B. 2      C. 3      D. 4
10. All 125V/240V receptacles located within \_\_\_\_\_ of the walls of a pool or fountain must be protected by a GFCI.  
 A. 8 m      B. 6 m      C. 5 m      D. 4 m



### What's In

GFCI breakers or receptacles protect a person against shock that can be caused by moisture, faulty electrical equipment, and defective cords. Philippine Electrical Code (PEC) strictly sets requirements on where GFCIs must be installed.

The Philippine Electrical Code has specific GFCI requirements for dwelling units, areas other than dwelling units, and boat hoists.

This module will be dealing only in Dwelling Units. Dwelling units is defined as a structure or part of a structure that is used as a home, dwelling or sleeping area by a person who sustains a family or by two or more persons who maintain a joint family.

All 125-volt and/or 250 volts, single-phase, 15- and 20-ampere receptacles installed in the locations specified in (1) through (8) shall have ground-fault circuit-interrupter protection for personnel (2.10.1.8 Ground-Fault Circuit-Interrupter Protection for Personnel).



### What's New

The house locations below are specified in NEC Requirements for GFCI Protection: Section 210.8 (A).

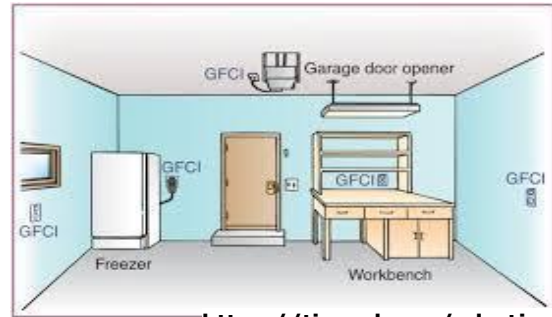
**1. Bathrooms** - GFCI protection for all 15A and 20A, 125V/240V receptacles located in bathrooms shall be installed. The minimum requirement for outlet receptacles in a bathroom is one GFCI protected receptacle served by a 20-amp circuit



<https://tinivurl.com/vcs8f58>

**Figure 2.1:** GFCI receptacle installed above the countertop of the bathroom

**2. Garages, accessory buildings, and unfinished basements** - GFCI protection devices are also required for all 15A and 20A, 125V receptacles located in garages and grade-level portions of unfinished or finished accessory buildings used for storage or work areas of a dwelling unit



<https://tinyurl.com/ydcctjrg>

**Figure 2.2:** GFCI receptacle installed in garages, accessory buildings, and unfinished basements

**3. Outdoors** - All 15 and 20 amperes, 125V/240V receptacles installed outdoors in a public space that is accessible to the public must be GFCI protected.



<https://tinyurl.com/y9qh2n3g>

**Figure 2.3:** GFCI receptacle located outdoor

**4. Crawl spaces or below grade level** - All 15 and 20 amperes, 125V receptacles installed in a crawl spaces must be GFCI protected



<https://tinyurl.com/ybz3dta>

**Figure 2.4:** GFCI receptacle in crawl spaces

**5. Unfinished basements** — portions or areas of the basement not intended as habitable rooms and limited to storage areas, work areas, and the like



**Figure 2.5:** GFCI receptacle in an unfinished basement <https://tinyurl.com/ya77ewec>

**6. Kitchens** — GFCI receptacle outlets serving the countertop shall be located above the countertop, but not more than 20 inches above the countertop



**Figure 2.6:** GFCI receptacle above kitchen countertop <https://tinyurl.com/y9evlvsq>

**7. Laundry, utility, and wet bar sinks** — where the receptacles are installed within 1 800 mm of the outside edge of the sink



**Figure 2.7:** GFCI receptacle installed in a laundry room <https://tinyurl.com/y73gy96m>

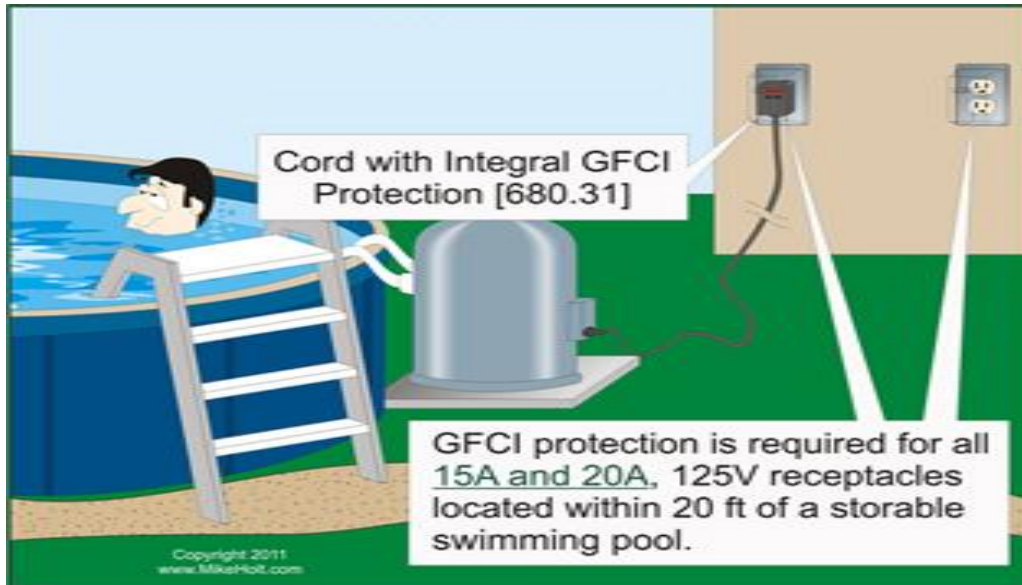
**8. Boathouses** – 15A and 20 A, 125V receptacles installed in the boathouses must be GFCI protected.



**Figure 2.8:** GFCI receptacle installed in boat houses <https://tinyurl.com/yauyzluz>

Additionally, GFCI protection is also required for luminaries, lighting outlets, circulation and sanitation system equipment, and pump motor receptacles located near swimming pools. All 125V/240V receptacles located within 6 m (20 ft) of the walls of a pool or fountain must be protected by a GFCI. In addition, receptacles that supply pool pump motors and that are rated 15A or 20A, 120V through 240V, single phase, must have GFCI protection. And you must install a GFCI in the branch circuit supplying luminaries operating at more than 15V. If the pool is equipped with an electrically operated pool cover, this too must be GFCI-protected.





**Figure 2.9:** GFCI receptacle installed in swimming pools <https://tinyurl.com/y7lb6w2h>



### What's More

Other than dwelling units: All 125-volt and/or 250 volts, single-phase, 15- and 20-ampere receptacles installed in the locations specified in (1) through (5) shall have ground-fault circuit-interrupter protection for personnel:

1. Bathrooms that is accessible to public



**Figure 2.10** GFCI receptacle installed in a public bathroom <https://tinyurl.com/yaepwskv>

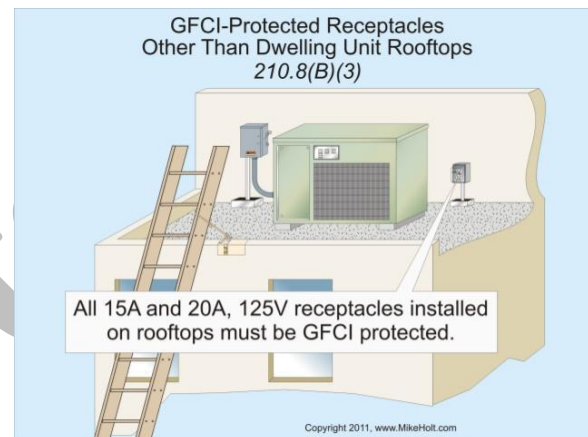
2. Commercial and institutional kitchens are found in restaurants, hotels, cafeterias, and workplace facilities in which permanent accommodations for food preparation and cooking are done.



<https://tinyurl.com/yxo6lfht>

**Figure 2.11:** GFCI receptacle installed in institutional kitchen

3. Rooftops – Receptacles from rooftops shall not be required to be readily accessible other than from the rooftop.



**Figure 2.12:** GFCI receptacle installed in rooftops <https://tinyurl.com/y9qh2n3g>

4. Outdoors in public spaces – GFCI is required in a public space. Public place is defined as any space that is for use by, or is accessible to, the public



**Figure 2.13:** GFCI receptacle outdoors in public spaces <https://hse.hypotheses.org/55>

Boat Hoists - Ground-fault circuit-interrupter protection for personnel shall be provided for outlets that supply boat hoists installed in dwelling unit locations and supplied by 125-volt and/or 250 volts, 15- and 20-ampere branch circuits

Boat hoists is defined as a place in which lifting and lowering of boats is done.



**Figure 2.14:** GFCI receptacle in boat hoist <https://tinyurl.com/y42esd7c>



### **What I Have Learned**

A. Enumeration: Enumerate the 8 locations of a dwelling place specified in PEC.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

B. Of all the places or locations required by PEC with GFCI installation, in your observation, what do you think are common characteristics of these areas that make them necessary for ground fault protection? Give at least two common characteristics and support your answer. Write your answer on a separate sheet of paper.

a. \_\_\_\_\_

Reason: \_\_\_\_\_

\_\_\_\_\_

b. \_\_\_\_\_

Reason: \_\_\_\_\_

\_\_\_\_\_

**C. True or False:** Write TRUE if the statement is correct otherwise write FALSE.

- \_\_\_\_ 1. The entire house wiring connections need not to be GFCI protected.
- \_\_\_\_ 2. GFCI receptacle is not required in the living room.
- \_\_\_\_ 3. Outdoors should be GFCI protected.
- \_\_\_\_ 4. GFCIs should be tested once a year only.
- \_\_\_\_ 5. GFCIs are expensive so it is okay to repair them.





## ***What I Can Do***

Aside from what is mentioned in the lesson, i.e., PEC provisions on GFCI installations, give at least 3 other locations in your own or neighbor's house, structure, or any places that you think need GFCI protection. Take a picture in each location and explain or support your answer by giving the importance of installing GFCI in the said location.

Note: You may draw or cut-out printed pictures and paste it to your paper.

Follow the sample format below.

Picture 1	Why does it need a GFCI?
Picture 2	Why does it need a GFCI?
Picture 3	Why does it need a GFCI?

<b>Rubric</b>				
	Excellent 5	Good 4	Fair 3	Poor 2
Clarity of print/drawing	Print/drawing is very clear and colored	Print/drawing is clear and colored	Print/drawing is not clear but colored	Print/drawing is not clear and uncolored
Neatness of print/drawing	Print/drawing is very neat	Print/drawing is neat	Print/drawing is not neat	Print/drawing is not neat and messy
Timeliness	Outputs submitted before deadline	Outputs submitted on the deadline	Outputs submitted 1-2 days after the deadline	Outputs submitted 3 days and beyond after the deadline
Quality	Reason given provides enough support	Reason given provides less support	Reason given provides no support	No support given



## Assessment

Use a separate sheet in answering the test. Be sure to write the following:

Name: \_\_\_\_\_ Year & Section: \_\_\_\_\_  
Module Title: \_\_\_\_\_ Quarter: \_\_\_\_\_ Module #: \_\_\_\_\_ Week #: \_\_\_\_\_

**Directions:** Read each statement carefully and write the letter and word/s of your answer on a separate sheet. GOOD LUCK!

- What article in PEC deals with the requirement of GFCI protection for personnel?  
A. PEC Article 2.10.1.10                      C. PEC Article 2.10.1.9  
B. PEC Article 2.10.1.8                      D. PEC Article 2.10.1.7
- All 125-volt and/or 250 volts, single-phase, 15- and 20-ampere receptacles installed in the following locations shall have ground-fault circuit-interrupter protection for personnel except  
A. Bedroom                      B. Kitchen                      C. Boat Hoists                      D. Laundry room
- 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
- In laundry, utility, and wet bar sinks, GFCI receptacle outlets are installed within \_\_\_\_\_ of the outside edge of the sink.  
A. 1800 mm                      B. 1600 mm                      C. 1500 mm                      D. 1300 mm
- All 125V/240V receptacles located within \_\_\_\_\_ of the walls of a pool or fountain must be protected by a GFCI.  
A. 4 m                      B. 5 m                      C. 6 m                      D. 8 m
- What is the minimum requirement for outlet receptacle in a bathroom?  
A. 4                      B. 3                      C. 2                      D. 1
- Which of the following requires GFCI installation?  
A. Living room                      B. Bedroom                      C. Dining room                      D. Comfort room

8. Which of the following situations is best for GFCI protection?
- A. A person welding a table inside a room
  - B. A person watching television inside his car
  - C. A person inside a shop cutting a metal using a grinder
  - D. A person operating a motor to be used in a swimming pool
9. This type of GFCI can be used in the comfort room to protect receptacle outlets including lighting since it has a built-in switch.
- A. GFCI breaker
  - B. GFCI combo
  - C. GFCI cord
  - D. GFCI receptacle outlet
10. This type of GFCI can be transferred anywhere and most of the time best used outdoors.
- A. GFCI breaker
  - B. GFCI cord
  - C. GFCI combo
  - D. GFCI receptacle outlet
11. Defined as a structure or part of a structure that is used as a home, or sleeping area by a person who sustains a family or by two or more persons who maintain a joint family.
- A. Dwelling units
  - B. Household
  - C. Institution
  - D. Infrastructure
12. Which of the following is best to use when installed outside a house?
- A. GFCI combo switch
  - B. GFCI breaker
  - C. GFCI receptacle outlet
  - D. GFCI adapter
13. Which of the following is best to install for luminaries located near the swimming pool?
- A. GFCI receptacle outlet
  - B. GFCI breaker
  - C. GFCI combo switch
  - D. GFCI adapter
14. Which of the following is best to use for a water pump that supplies water to a storable swimming pool within 20 feet?
- A. GFCI adapter
  - B. GFCI receptacle outlet
  - C. GFCI breaker
  - D. GFCI cord
15. Which of the following does necessarily need GFCI installation?
- A. Stage inside a gymnasium
  - B. Commercial kitchens
  - C. Bathrooms that is accessible to public
  - D. Rooftops



## ***Additional Activities***

For additional and advanced information, watch videos on how to Test and Reset GFCI devices. You may click the link of the suggested videos below.

1. GFCI outlet: How it works and how to test



<https://www.youtube.com/watch?v=Vkd43t2y2to>

2. Replacing a faulty GFCI receptacle



<https://www.youtube.com/watch?v=fkGWX6Ttyh8>

3. Installing a GFCI breaker



<https://www.youtube.com/watch?v=nGO67WLQ1nE>

4. How to Install a Ground Fault Circuit Breaker to Replace a GFCI Outlet or Receptacle



<https://www.youtube.com/watch?v=-yWdz7O6nyc>

5. Do-it-Yourself: GFCI receptacle installation



<https://tinyurl.com/ycwz3u3u>





## Answer Key

Answer key (What I Have Learned)	
A.	1. Bathroom
	2. Kitchen
	3. Garage
	4. Outdoors
	5. Crawl spaces
C.	6. Unfinished basements
	7. Laundry
	8. Boathouses
	1. T
	2. T
	3. T
	4. F
	5. F

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