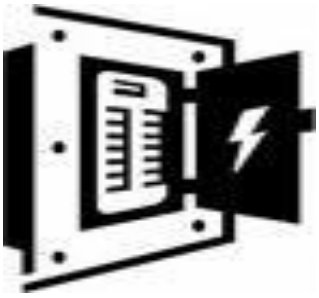
County of Marquette

RESOURCE MANAGEMENT/DEVELOPMENT DEPT.
County Courthouse
Marquette, MI 49855
WWW.CO.MARQUETTE.MI.US

Construction Codes 906/225-8180
FAX 906/225-8203

ELECTRICAL HANDOUT



This handout pertains to single family residence wiring only and is provided as a **guide**. This handout is not to be considered as a substitute for the **2015** Michigan Residential Code but as a guide to aid in installation. When questions arise call the Electrical Inspector for assistance at 906/225-8180. If you are inexperienced with electrical installations, you should consider hiring a Michigan Licensed Electrical Contractor. You may save yourself frustration, time and money in the long run. For additional service information, contact your local utility company for their specifications.

GENERAL INFORMATION

1. **Code's to Use:**
   - A) For one and two family dwellings and townhouses, Michigan Residential Code 2015 (MRC).
   - B) For all buildings, Michigan State Electrical Code which includes the National Electrical Code 2014 and the Michigan Part 8 Rules (NEC).

2. **An Electrical Permit is required before work begins.**
   - A) Permit applications may be attained on line at **www.co.marquette.mi.us**, at the Building Codes Department, in Marquette or at the Ishpeming Service Center; 215 W Hematite, Ishpeming.

3. **Persons who may obtain an Electrical Permit.**
   - A) State of Michigan Licensed Electrical Contractors.
   - B) Homeowners doing their own electrical work in their single family residence which they reside in or intend to reside in.

INSPECTIONS REQUIRED

1. **Temporary Power Poles and Services**
   Temporary power poles or service inspections are needed after installation is complete and will not be energized by the power company without first being inspected and approved by the electrical inspector.

2. **Rough-In**
Needed after interior wiring is complete but before any insulation or finished wall products are installed.

3. **Final**
Needed after all electrical work is completed and before occupying the building.

4. **Underground**
All underground wiring will need to be looked at before covering.

It is the responsibility of the permit holder to schedule inspections with the Building Codes Department. Call 906-225-8180 to schedule.

GENERAL INSTALLATION

1. All electrical materials and equipment must be new unless prior approval is obtained from the electrical inspector.
2. All wire splices and connections shall be made in a junction box.
3. All junction boxes must be accessible after installation without removing any part of the building.

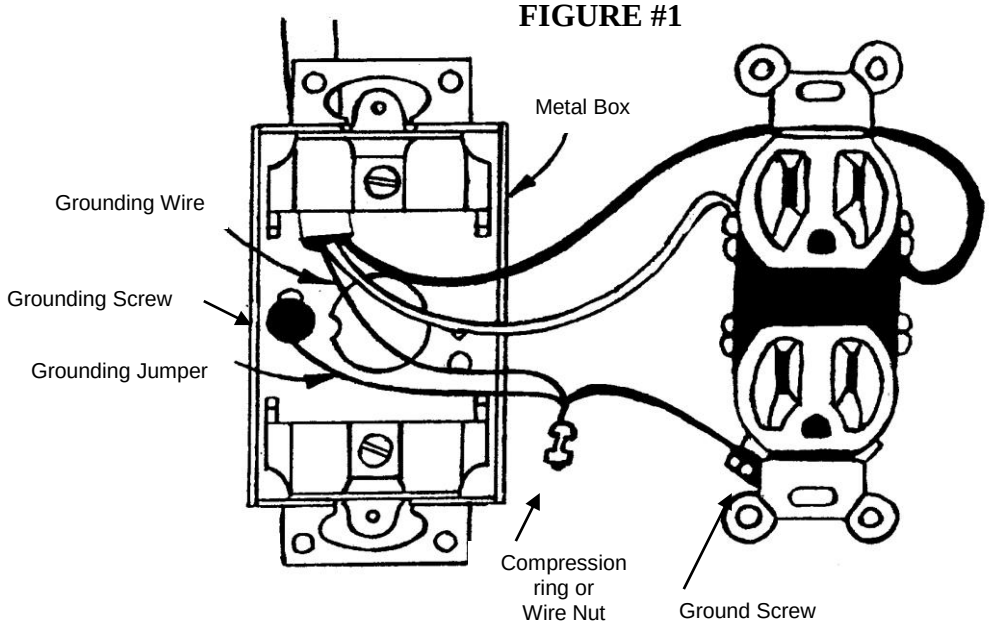
4. At least 6 inches of wire shall be left at each outlet and switch box for the connection of light fixtures, switches, or receptacle outlets.

5. All metallic boxes must be grounded (See Figure 1).

6. Ground wires must be mechanically connected with wire nuts or compression rings, **not just twisted together** (See Figure 1).

7. Receptacle outlet grounding: only one wire shall be installed on a ground screw (See Figure 1).

FIGURE #1



Tamper Resistant

8. The number of receptacle outlets which can be put on a circuit is determined by the load to be served. A **guide** maximum number to use is 8 receptacle outlets on 15 ampere circuit and 11 receptacle outlets on a 20 ampere circuit.

9. The maximum fusing or circuit breaker size of non-metallic sheathed cable (Romex) is 15 amperes for number 14 wire, 20 amperes for number 12 wire, and 30 amperes for number 10 wire, 40 amperes for number 8 and 50 amperes for number 6.

BRANCH CIRCUITS (DWELLINGS)

	Copper	Aluminum	SE Cable	Amps
Free Standing Range	8-3 w/gr.	6-3 w/gr,	No	40
Water Heater	10-2 w/gr.	8-2 w/gr.	Yes	25-30
Dryer (5Kw)	10-3 w/gr.	8-3 w/gr.	No	30
Double Oven/Self Cleaning	6-3 w/gr.	4-3 w/gr.	No	50
Range Top Combo	8-3 w/gr.	6-3 w/gr.	No	40
Single Oven	10-3 w/gr.	8-3 w/gr.	No	30
Range Top	10-3 w/gr.	8-3 w/gr.	No	30

10. **Smoke Detectors**

A. 120 volt smoke detectors are required to be installed in all bedrooms and in the immediate vicinity of all bedrooms and on every story of the dwelling unit including basement. Shall have smoke detector within 3ft of highest point of ceiling.

B. Where more than one detector is required to be installed, the detectors shall be wired in such a manner that the actuation of one alarm will actuate all alarms. (This can be achieved by running a 14-3 w/ground cable if fed from a 15 Amp circuit or a 12-3 with ground cable if fed from a 20 Amp circuit between all smoke detectors).

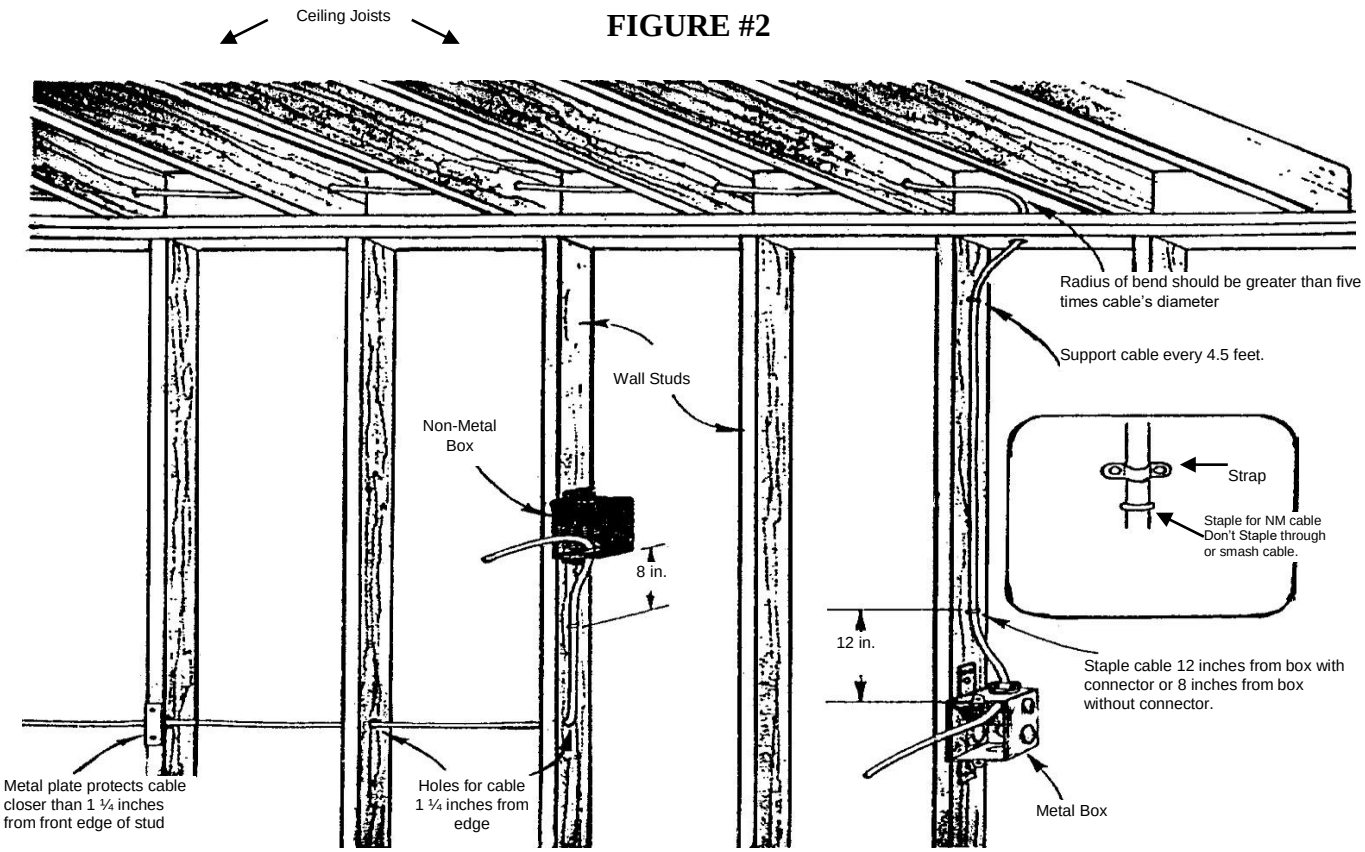
C. **Battery Back-up required.** In addition to the required 120 volt A.C. primary power source the detectors shall receive power from a battery when the A.C. power source is interrupted.

11. **Carbon Monoxide Alarms**

A 120 volt carbon monoxide alarm with battery back-up shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms, and on each floor of the dwelling, including basements.

12. See Figure #2 for support of and protection of nonmetallic sheathed cable (Romex).

FIGURE #2



13. **Ceiling Paddle Fans**

Boxes used as the sole support of ceiling paddle fans must be **listed** for this use.

SERVICE

1. Contact your local power company for meter location or special grounding requirements.

2. Minimum service size is 100 amperes. Service to electrically heated residences, in most cases, should be a minimum of 200 amperes.

3. If a service mast is used to support the service drop it must be a minimum of 2 inch rigid metal conduit. Mast that extends more than 3 feet above roof must have additional support.

4. The service disconnecting means (usually consisting of a main panel with a main circuit breaker) shall be installed at a readily accessible location nearest the point of entrance of the service entrance conductors.

5. Electrical panels **cannot** be installed in clothes closets, bathrooms or over steps of a stairway.

6. Service panel and meter location must have a working clearance of a minimum 6 ½ feet high, 30 inches wide and 3 feet in front of the panel. This space in front of the panel must remain clear after installation is complete. Placement of washers, dryers, hot water tanks, furnaces, etc. is prohibited in this area.

7. Minimum service entrance conductors for dwelling units are listed below (see Table #1):

8. Underground service and feeders need warning ribbon installed in trench 12 inches above the buried wire or conduit.

TABLE #1
SERVICE CONDUCTOR SIZES FOR DWELLING UNITS

Copper	Aluminum and Copper-Clad AL	Service Rating In Amps
AWG	AWG	
4	2	100
1	2/0	150
2/0	4/0	200

Service Grounding:

A) If available on the premises a metal underground water pipe must be used as the grounding source and supplemented by **two** additional grounding electrodes (usually ground rods).

B) The main service ground wire shall be connected to the metal underground water pipe within 5 feet of where the water pipe enters the building.

C) If rebar is present in the footing it must be connected to the service panel ground bar or ground lug in meter with a maximum #4 CU ground wire.

a) Preferably done by bending up the end of a rebar tied to pieces of other rebar to equal 20 feet, in the concrete footing, inside the building near an outside wall, if possible below the electrical panel.
b) Or by bending the end of a Ground rod tied to 20 feet of rebar in the footing on the outside of the building below or at grade where the proper electrical connection can be made with a minimum #4 AWG.

D) If no metal underground water pipe is present at the residence, then **two** grounding electrodes (usually ground rods) must be installed a minimum of 6 feet apart or connect to the rebar in footing (if present) with a minimum #4 CU ground wire. If footing rebar is used, ground rods are not necessary.

E) The interior metal water piping shall always be bonded to the service equipment ground (See Table #2 for size).

F) A bonding jumper must be installed around all water meters (See Table #2 for size).

G) Minimum size of service entrance grounding conductors (see Table #2).

TABLE #2

Service Entrance Ampacity	Ground Conductor Copper Only
100 Amp.	#6
150 Amp.	#4
200 Amp.	#4

H) An intersystem bonding termination for connecting other systems shall be made available by one of the following: (A Ground Bar with a minimum of 4 terminals) (See Figure #3)

a) A set of terminals securely mounted to the meter enclosure

b) A bonding bar near the service panel, meter enclosure connected to the equipment grounding conductor in the service panel with a minimum size of #6 AWG copper.

c) In both a) and b) the bonding termination shall have the capacity for connection of not less than three conductors.

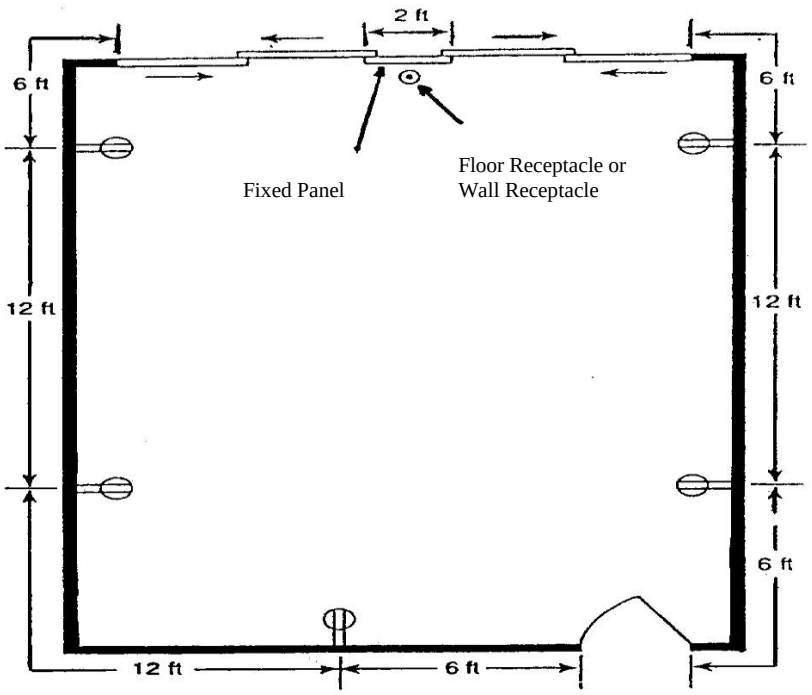
FIGURE #3

INTER SYSTEM BONDING BAR

RECEPTACLE OUTLET REQUIREMENTS

1. Receptacle outlets must be installed in every habitable room of the residence so that no point on any wall is over six feet from a receptacle outlet in the unbroken wall space of that room. In other words, you need a receptacle outlet within six feet of a doorway or fireplace, but in the rest of the room the receptacle outlets may be twelve feet apart if there is no break in the wall between them. It is permissible to measure around corners. Any wall space two feet wide or greater requires a receptacle outlet (See Figure #4). The purpose of this requirement is to minimize the use of cords across doorways, fireplaces, and similar openings.

FIGURE #4



2. All 120 volt, 15 and 20 ampere receptacle outlets installed less than 5.5 ft above the floor shall be listed tamper resistant.

3. You must install at least one receptacle outlet in any hallway of 10 feet or more in length.

4. Foyers that are greater than 100 square feet shall have a receptacle located in each wall space that is 3 feet or more in width.

5. You must install a receptacle outlet adjacent to and at countertop height and within 36" of the outside edge of all basin(s) (sinks) in bathroom(s). If there are more than 1 sinks installed an additional receptacle outlet may be required.

6. Bathroom receptacle outlets must be on a 20 ampere branch circuit and run #12 wire and cannot feed lights or receptacle outlets in other rooms, but can feed receptacle outlets in any or all bathrooms in the dwelling, or a 20 ampere circuit can feed a single bathroom including lights and receptacle outlets within the bathroom but cannot feed into other rooms.

7. You must install at least one receptacle outlet for every laundry facility. The laundry equipment receptacle outlets must be fed by a 20 ampere circuit and this circuit shall have no other receptacle outlets or lights run off of it. Receptacles must be GFCI protected.

8. At least two receptacle outlets must be installed outdoors (one in front and one in back) which is accessible while standing at grade level (6 feet 6 inches high or lower). These receptacle outlets cannot be fed off the kitchen countertop receptacle outlet circuits.

9. Receptacle outlets installed outdoors in wet locations shall have an enclosure that is weatherproof (and listed extra duty type) whether or not the attachment plug cap is inserted. All 15 and 20 ampere receptacle outlets shall be a listed weather resistant type. (WR)

10. Receptacle outlets installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure for the receptacle that is weatherproof when the receptacle cover is closed and an attachment plug cap is not inserted.

11. Outside AC Units shall have a receptacle outlet within 25 feet of unit.

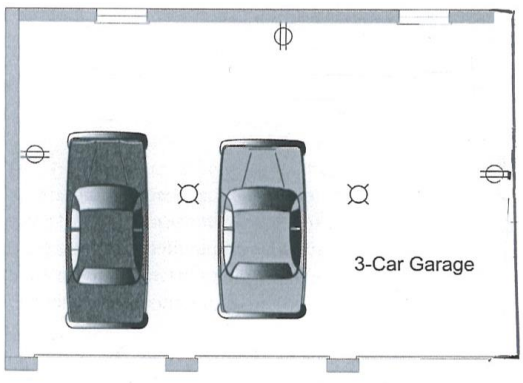
12. Balconies, decks, and porches that are accessible from inside the dwelling unit need at least one receptacle outlet within the perimeter not more than 6½ feet above the deck surface.

13. **Arc-Fault Circuit-Interrupter Protection. As of February 8, 2016, per the MRC 2015, AFCI is no longer required.**

14. At least one receptacle outlet in addition to any provided for laundry equipment must be installed in each separate, unfinished portion of a basement. These receptacle outlets must be protected by ground fault interrupter protection.

15. Garages. In each attached or detached garage with electrical power at least one receptacle outlet shall be installed for each vehicle space. The branch circuit supplying these receptacles shall not feed other circuits in the dwelling. (See Figure #5). Code does say you can wire outdoor receptacle on this circuit.

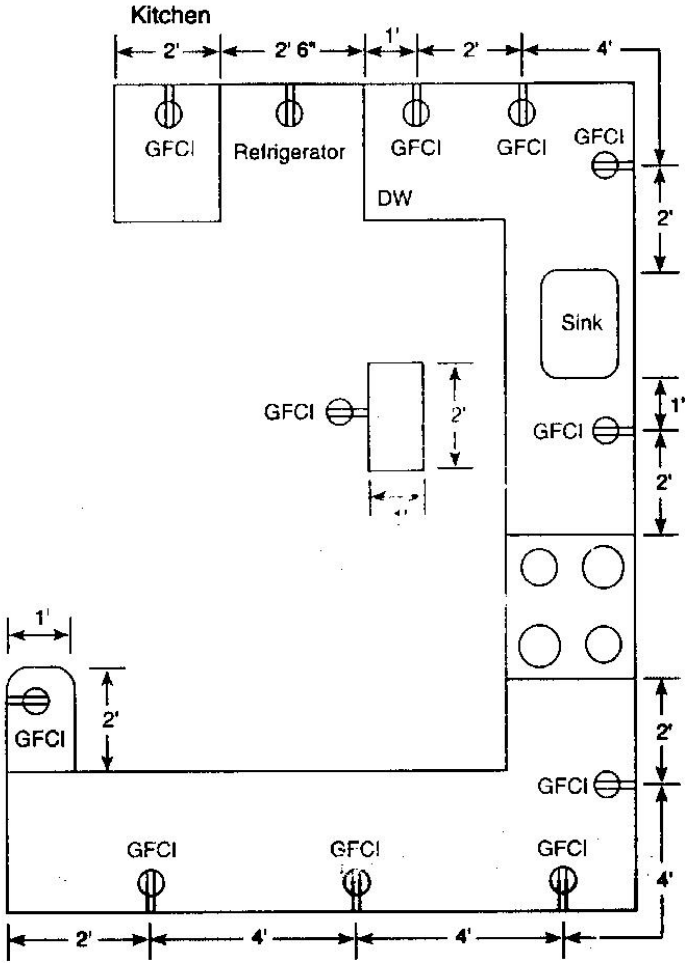
Figure #5



At least one receptacle outlet shall be installed for each car space.

16. In kitchens, a receptacle outlet must be installed at each counter space wider than 12 inches including islands and peninsulas. Receptacle outlets shall be installed so that no point along the counter is over 24 inches from an outlet. A counter top broken by a sink or other item leaves a new wall space. (See Figure # 6). Islands are required to have one receptacle, and with sink or stove in island and less than 12" behind will need receptacle on both sides.

FIGURE #6



17. The kitchen counter top area must have receptacle outlets supplied by at least two-20 ampere circuits and these circuits shall supply no other receptacle outlets or lights.

18. **Ground fault circuit interrupter protection must be provided for receptacle outlets installed in the following locations:**

A) All bathroom, garage, laundry area and outdoor receptacle outlets.
B) All receptacle outlets in crawl spaces.
C) All receptacle outlets in an unfinished accessory building.
D) All receptacle outlets in each separate portion of an unfinished basement.
E) All receptacle outlets in the kitchen installed to serve countertop surfaces.
F) Dishwasher receptacles.

G) All 120 volt 15 and 20 ampere receptacle outlets located within 6 feet of the outside edge of a laundry, utility or wet bar sink.

H) All 120 volt 15 and 20 ampere receptacle outlets installed on temporary power poles.

19. Receptacle outlets for ranges and clothes dryers must have 4 wire receptacle outlets and 4 wire cords in all new installation.

LIGHTING REQUIREMENTS

1. **All recessed lights installed in insulated areas need to be listed IC-rated and airtight.**

2. A wall switch-controlled light must be installed outside at each entrance or exits.

3. A wall switch-controlled light must be installed in every habitable room, in bathrooms, hallways, **stairways**, attached garages, and detached garages with electric power.

4. In habitable rooms other than kitchens, bathrooms, hallways, stairways, attached garages, and detached garages with electric power, a wall switched receptacle outlet shall be permitted in lieu of a lighting outlet.

5. A wall switched control light shall be installed in each basement.

6. The light(s) that are installed in interior stairways, shall have a wall switch at each floor level to control light(s) where there are **six** or more steps, including stairways that access basements.

7. Storage space and any space having equipment shall have light.

8. **Caution should be taken when installing light fixtures in clothes closets.**

A) There are clearance requirements from light fixtures to storage areas which must be maintained. Recessed incandescent light fixtures must have a completely enclosed lamp trim. Exposed or partially exposed incandescent fixtures are not permitted. Minimum clearance for light fixtures in clothes closets are illustrated in Figure #7.

FIGURE #7