Residential Electrical Inspection Checklist

Based on the 2015 Michigan Residential Code

When a homeowner applies for an electrical permit, the owner is signing an affidavit that they own and occupy the residence and that they will personally perform all of the electrical work described in the electrical permit.

A rough-in inspection must be made before insulation, sheet-rock, paneling, or other materials cover any electrical wiring. Underground wiring must be inspected before the trench is back-filled. Except for the final connection to switches, receptacles, and lighting fixtures, **all ground wires and other wires in boxes must be spliced and pigtailed for the *rough-in inspection*.** All wiring shall be inspected before it is concealed and the homeowner shall notify the inspector when the wiring is complete, before the wiring is utilized and the associated space occupied.

This brochure is only intended to be a general overview of residential electrical requirements. Reasonable efforts have been made to ensure that this information is current, complete and accurate, however no claim is made that this information is beyond question.

While there are many resources for do-it-yourself owners, please refer to accredited sources for the Michigan Electrical Code, The National Electrical Code and The Michigan Residential Code. Have your work inspected to assure your electrical installation will be free from fire and electrical shock hazard.

Note: MEC stands for Michigan Electrical Code 2014 edition
MRC stands for Michigan Residential Code 2015 edition

PLAN YOUR WIRING PROJECT

1 **MEC Part 8. 80.22.2** Where wiring is concealed before inspection, the homeowner shall be responsible for all costs resulting from uncovering and replacing the covering material.

2 **MEC Part 8. 80.22** The homeowner shall schedule a final inspection when the electrical work is completed prior to the wiring being energized and the space occupied.

GENERAL CIRCUIT REQUIREMENTS

1. **MRC4002.14 and MRC4002.12** All 125-volt, 15- and 20- amp receptacles installed or replaced in dwelling units shall *be listed tamper-resistant.* Exceptions include a receptacle located more than 66-inches above the floor, a receptacle in space dedicated for an appliance that is not readily moved and replacement non-grounding receptacles.

2 . MRC E3703.1, E3703.2, E3703.3, E3703.4and E4105.5 In addition to the branch circuits installed to supply general illumination and receptacle outlets in dwelling units, the following minimum requirements apply:

- Two 20-amp circuits for the kitchen and dining room receptacles
- One 20-amp circuit for the laundry receptacles
- One 20-amp circuit for the bathroom receptacle(s)
- An individual branch circuit for central heating equipment

3 MRC E4002.8, E4002.9 Receptacles installed in wet locations and receptacles in wet locations that are or replaced shall be listed as weather-resistant type.

4 MRC E3803.8 All conductors of the same circuit, including grounding and bonding conductors shall be contained in the same raceway, cable, or trench.

5 MRC E3706.2 Every circuit and circuit modification shall be legibly identified as to its clear, evident and specific purpose or use in sufficient detail on a directory located on the face or inside of the electrical panel doors

6 MRC E3705.1 Conductors shall be protected in accordance with their ampacity per **Table E3705.1, Table E3705.2 and Table E3705.3**

7 MRC E4002.2 Receptacle outlets shall be of the grounding type, be grounded, and have proper polarity.

Table E3705.5.3 Maximum Overcurrent Protection

Fuse or Circuit Breaker Size	Minimum Wire Size	
	Copper	Aluminum
15 amp	14	N/A
20 amp	12	N/A
30 amp	10	8
40 amp	8	6
50 amp	6	4

Note: Conductors that supply motors, air-conditioning units, and other equipment may have overcurrent protection that exceeds the limitations in the above chart.

8 MRC E3901.2.1 Receptacle outlets in habitable rooms shall be installed so that no point measured horizontally along the floor line in any wall space is more than 6-feet from a receptacle outlet. **MRC E3901.2.2** A receptacle shall be installed in each wall space 2-feet or more in width.

9 MRC E3901.4.2 At kitchen countertops, receptacle outlets shall be installed so that no point along the wall line is more than 24 inch measured horizontally from a receptacle outlet in that space. Countertop spaces separated by range tops, sinks or refrigerators are separate spaces.

10 MRC E3901.4.1 A receptacle outlet shall be installed at each counter space 12-inches or wider and at each island counter or peninsular space greater than 24-inches by 12- inches. Receptacles shall be located not more than 20- inches above the countertop, or not more than 12-inches below the countertop.

11 MRC E3901.7 At least one receptacle accessible at grade level shall be installed at the front and back of a dwelling. And shall have a cover that is weatherproof whether or not an attachment plug cap is inserted.

12 MRC E3901.7 Balconies, decks and porches, regardless of size, that are accessible from inside a dwelling unit shall have at least one receptacle installed within the perimeter.

GFCI PROTECTION

13 MRC E3902 Ground-fault circuit interrupter (GFCI) protection shall be provided for all 125-volt, 15 and 20 amp receptacle outlets installed outdoors E3902.3 , in boathouses E3902.11, garages E3902.2, unfinished accessory buildings E3902.2, crawl spaces at or below grade level E3902.5, unfinished basements E3902.5, bathrooms E3902.1, at kitchen countertops E3902.6 and within 6' of the outside edge of all other sinks E3902.7 .

14 MRC E4209.1 Hydro-massage bathtubs (a tub with a recirculating piping system designed to discharge water upon each use) and associated components shall be supplied by an individual branch circuit and shall have ground-fault circuit-interrupter protection.

15 MRC E4209.1 All 125-volt receptacles rated not more than 30 amps that are installed within 6 feet of the inside walls of a hydromassage bathtub shall be GFCI protected.

16 MRC E4209.3 Hydromassage bathtub equipment shall be accessible without damaging the building structure or finish. When cord connected and accessible through an access panel, the receptacle shall be within 1-foot of the opening and shall face the opening.

17 MRC E4203.1.3 All 15- and 20-amp, single-phase, 125- volt or 240-volt pool pump motors, whether cord connected or direct wired, shall be provided with GFCI protection.

> An equipotential bonding grid to mitigate step and touch voltage potential shall be installed at outdoor swimming pools, spas and hot tubs and at electrical equipment installed outdoors adjacent to natural and artificially made bodies of water.

WIRING METHODS

18 MRC E3404.8 All electrical boxes shall be rigidly secured to the building structure.

19 MRC E3905.9 Where spare conductors are installed to a location acceptable to a ceiling fan, a listed fan box shall be installed.

20 MRC Table E3802.1 Type NM (nonmetallic) cables shall be secured every 4.5 feet and within 12 inch of each box.

21 MRC E3905.3.1 The outer jacket of type NM cable shall be secured to the box and extend into the box at least ¼ inch.

22 E3406.11.3 The minimum length of conductors, including grounding conductors, at all boxes shall be 6 inches and extend at least 3 inches outside the box.

23 E3802.2.2 Cables and raceways shall be protected from damage. Where installed through bored holes in wood framing members, the holes shall be bored so that the edge of the hole is not less than 1¼ inch from the nearest edge of the wood member, or shall be protected by a 1/16 inch steel plate. NOTE: Local building codes will help you determine where holes or notches may be safely made in joists.

24 E3904.7 Type NM cable shall not be installed in plenum spaces, but in dwelling units may be installed perpendicular through joist or stud spaces used as such.

25 E3406.10 Only one conductor shall be installed under a terminal screw. In boxes with more than one grounding wire, the grounding wires shall be tied together with a "pigtail" attached to the grounding terminal of the device.

26 E3407.3 Where permanently re-identified at each location where it is visible and accessible, the conductor with white colored insulation in type NM cable may be used as an ungrounded conductor.

27 E3904.1 All electrical equipment, including raceways, metal boxes and equipment shall be connected to an equipment grounding conductor.

28 **E 3404.6 Unused** openings in boxes shall be effectively closed. A non-metallic box shall be replaced if cable openings are punched but not used.

29 **E3406.10** Each grounded circuit conductor within a panelboard shall terminate in an individual terminal.

30 **E4001.9, E3406.7 The** grounded conductor of lighting circuits shall be provided at each switch location, unless the wiring is installed in a raceway or the switch box remains accessible.

31 **E3905.10** Junction boxes shall be installed so that the wiring contained in them can be rendered accessible without removing any part of the building.

32 **E3905.12** The number of conductors and devices contained within electrical boxes determine the size. Nonmetallic boxes are marked with their cubic inch capacity.

Table E3905.13.2.1 Volume allowance required per conductor

	Conductor Size	
	14 AWG	**12 AWG**
Each insulated wire	2 in^3	2.25 in^3
All ground wires (combined)	2 in^3	2.25 in^3
Each device (switch/receptacle)	4 in^3	4.4 in^3
All internal cable clamps	2 in^3	2.25 in^3

Example: A box with four 14/2 w/ground type NMB cables:

8 insulated wires	= 16 cubic inches
All ground wires	= 2 cubic inches
1 switch	= 4 cubic inches
1 receptacle	= 4 cubic inches
All cable clamps (combined)	= 2 cubic inches
Minimum Box Volume	= 28 cubic inches

33 **E4003.12** Luminaires in clothes closets shall have the following minimum clearances from the storage space

- 12 inches for totally enclosed surface mounted incandescent or LED luminaires
- 6 inches for recessed totally enclosed incandescent, fluorescent or LED luminaires
- 6 inches for surface mounted or recessed fluorescent luminaires

Surface mounted fluorescent or LED Luminaires listed for installation within the defined storage space are permitted.

34 **E4003.6** Closet storage space is the area bounded by the sides and back closet walls extending from the closet floor to a height of 6-feet' or the highest clothes hanging rod and then out 24-inches from the sides and back of the closet walls respectively, and then continuing from there to the ceiling at a distance of 12-inches or the shelf width, whichever is greater.

35 **E4003.12** Incandescent Luminaires with open or partially enclosed lamps and pendant fixtures or lampholders are not permitted in clothes closets.

36 **E4003.9** Luminaires installed in wet or damp locations shall be marked as **suitable for use in wet or damp locations**, correspondingly.

The Michigan Energy Code requires that all penetrations through an air barrier be sealed. Sealing of the opening applies to all penetrations including the service entrance, conduit, cables, panels, recessed Luminaires and electrical boxes.

EQUIPMENT LISTING AND LABELING

37 E3403.3 All electrical equipment, including Luminaires, devices and appliances used as part of or in connection with an electrical installation shall be listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) as having been tested and found suitable for a specific purpose.

38 E3403.3 All electrical equipment shall be installed and used in accordance with the listing requirements and manufacturer's instructions.

ELECTRICAL SERVICES

39 E3601.6.2 The service disconnecting means shall be installed at a readily accessible location either outside a building or structure or inside nearest the point of entrance of the service-entrance conductors.

40 Table E3603.1 Conductor Sizes for 120/240-Volt 3-Wire, Single-Phase, Dwelling Services and Feeders

Copper	Aluminum	Service Rating
4 AWG	2 AWG	100 amps
1 AWG	2/0	150 amps
2/0	4/0	200 amps
400 kcmil	600 kcmil	400 amps

41 E3406.8 Conductors of dissimilar metals shall not be intermixed unless the device is identified for the purpose. Listed anti-oxidant compound shall be used on all aluminum conductor terminations, unless the device manufacturer states that it is not required.

42 E3802.6 Portions of raceways or sleeves subject to different temperatures (i.e. passing from the interior to the exterior of a building) shall be sealed with an approved material to prevent condensation from entering equipment.

43 E3605.9.6 Service entrance and overhead service conductors shall be arranged so that water will not enter the service enclosure.

44 E3802.7 The interior of raceways installed in wet locations above grade shall be considered wet locations.

45 E3906.1.1 Conductors 4 AWG or larger shall be protected by a bushing when entering an enclosure through a raceway.

46 E3601.6.2 Service disconnecting means shall be readily accessible and shall not be located in a bathroom

47 E3705.7 Overcurrent devices shall not be located in bathrooms or in the vicinity of easily ignitable materials such as clothes closets.

48 E3706.5 Plug-in type overcurrent devices that are back-fed shall be secured by an additional approved device.

49 E3405.2 Sufficient working space shall be provided around electrical equipment. The depth of that space in the direction of access to live parts shall be a minimum of 3 feet and the minimum width of that space shall be the width of the equipment or 30 inches whichever is greater. This workspace extends from the floor to 6.5' and shall not be used for storage.

50 E3405.7 Illumination shall be provided for all working spaces about service equipment and panelboards.

GROUNDING AND BONDING

51 E3704.6, E3607.3, E3607.3.1 Buildings supplied by a feeder or branch circuit shall have an equipment grounding conductor run with the supply conductors and connected to the grounding electrode system at the building.

52 E3608.1 All grounding electrodes that are present at each building or structure shall be bonded together to form the grounding electrode system.

53 E3608 Acceptable grounding electrodes include a metal underground water pipe in direct contact with earth for 10 feet or more, a metal frame of a building or structure that is directly connected to a grounding electrode, a concrete encased electrode or a ground ring.

54 E3608.1.1.2 A metal underground water pipe shall be supplemented by an additional electrode, such a s a rod, pipe or plate electrode.

55 E3608.4 Unless a rod, pipe and plate electrode has a resistance to ground of 25 ohms or less, it shall be supplemented with another acceptable electrode.

56 E3608.1.1.2 The conductor that is the sole connection to a rod, pipe or plate electrode is not required to be larger than #6 AWG copper.

57 E3610.1 The grounding electrode conductor shall be continuous, securely fastened and protected from physical damage.

Table E3603.1

Equivalent Size of Service Entrance Conductor		Size of the Grounding Electrode Conductor	
Copper	Aluminum	Copper	Aluminum
4 AWG	2	8*	6
1 AWG	2/0	6	4
2/0 or 3/0	4/0 or 250	4	2

58 E3609.2 The main bonding jumper - generally the green bonding screw provided by the panel manufacturer – shall be installed in the main service panel.

59 E3609.7 The interior metal water piping and other metal piping that may become energized shall be bonded to the service equipment with a bonding jumper sized the same as the grounding electrode conductor.

UNDERGROUND WIRING

60. Table E3803.1 Direct buried cable or conduit or other raceways shall meet the following minimum cover requirements:

Direct Burial Cable	Rigid or Intermediate Metal Conduit	Non Metallic Raceway (PVC)
24 inches	6 inches	18 inches
The minimum cover for 120-volt residential branch circuits rated 20 amps or less and provided with GFCI protection at their source is permitted to be 12 inches.		

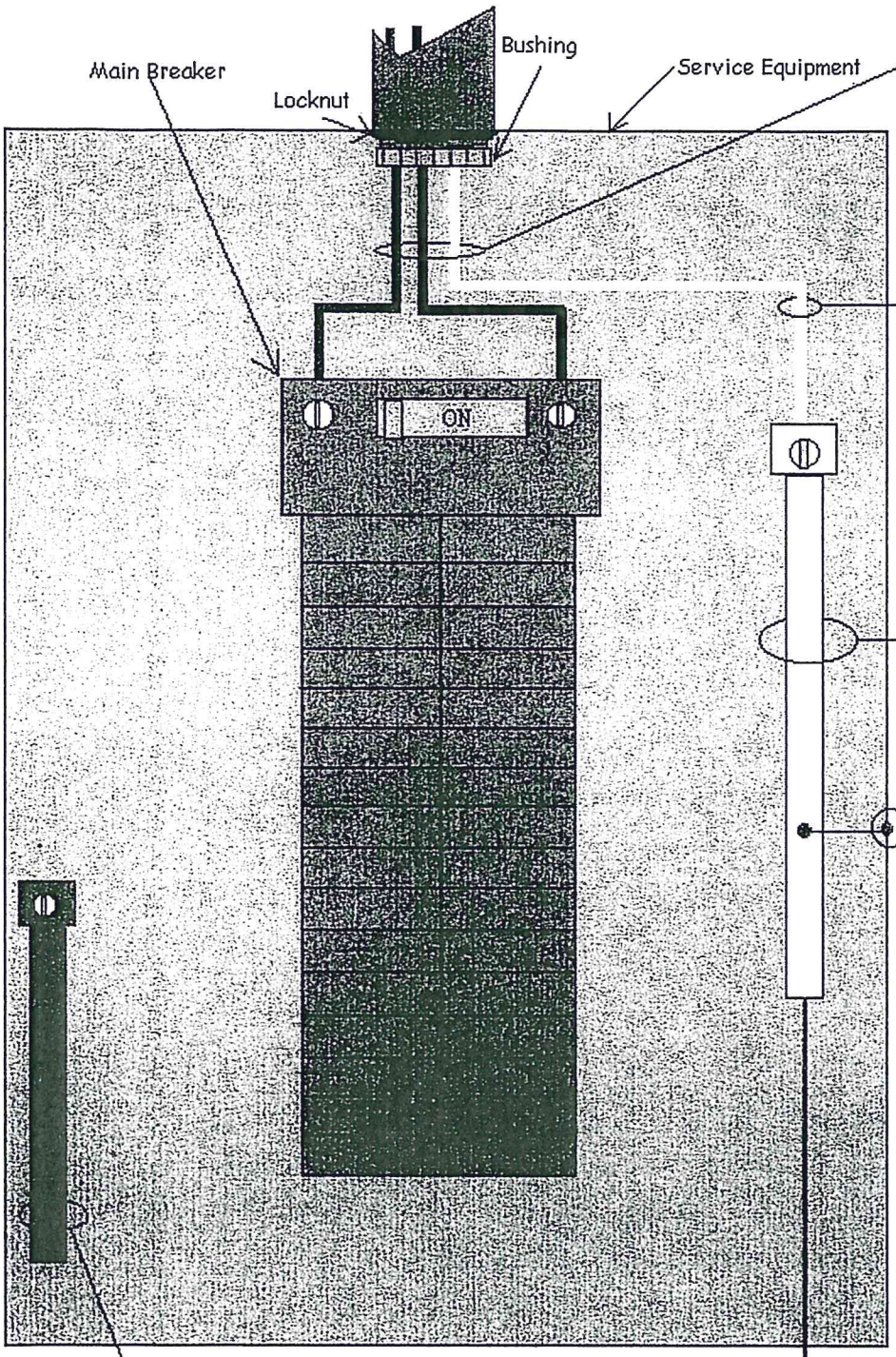
61. E4203.7 Underground wiring is not permitted under pools or within 5-feet horizontally from the walls of the pool, unless supplying permitted pool equipment.

62 **E3803.2** Underground service laterals shall have their location identified by a warning ribbon placed in the trench at least 12" above the underground installation.

63 **E3803.9** Where subject to ground movement, direct buried cables and raceways shall be installed with expansion capability to prevent damage to the enclosed conductors or to the connected equipment.

64. E3803.4 Wire splicing devices for direct burial conductors shall be listed for such use.

65. E3803.3 Conductors emerging from underground shall be installed in rigid metal conduit, intermediate metal conduit, or Schedule 80 rigid nonmetallic conduit from 18" below grade or the minimum cover distance up to the point of termination above ground.



Service conductors--#4 copper or #2 aluminum for 100 amp services, #1 copper or 2/0 aluminum for 150 amp services, 2/0 copper or 4/0 aluminum for 200 amp services. For Dwelling units only. Accessory buildings must use full size conductors.

Neutral Conductor
Must be white or marked white at each end

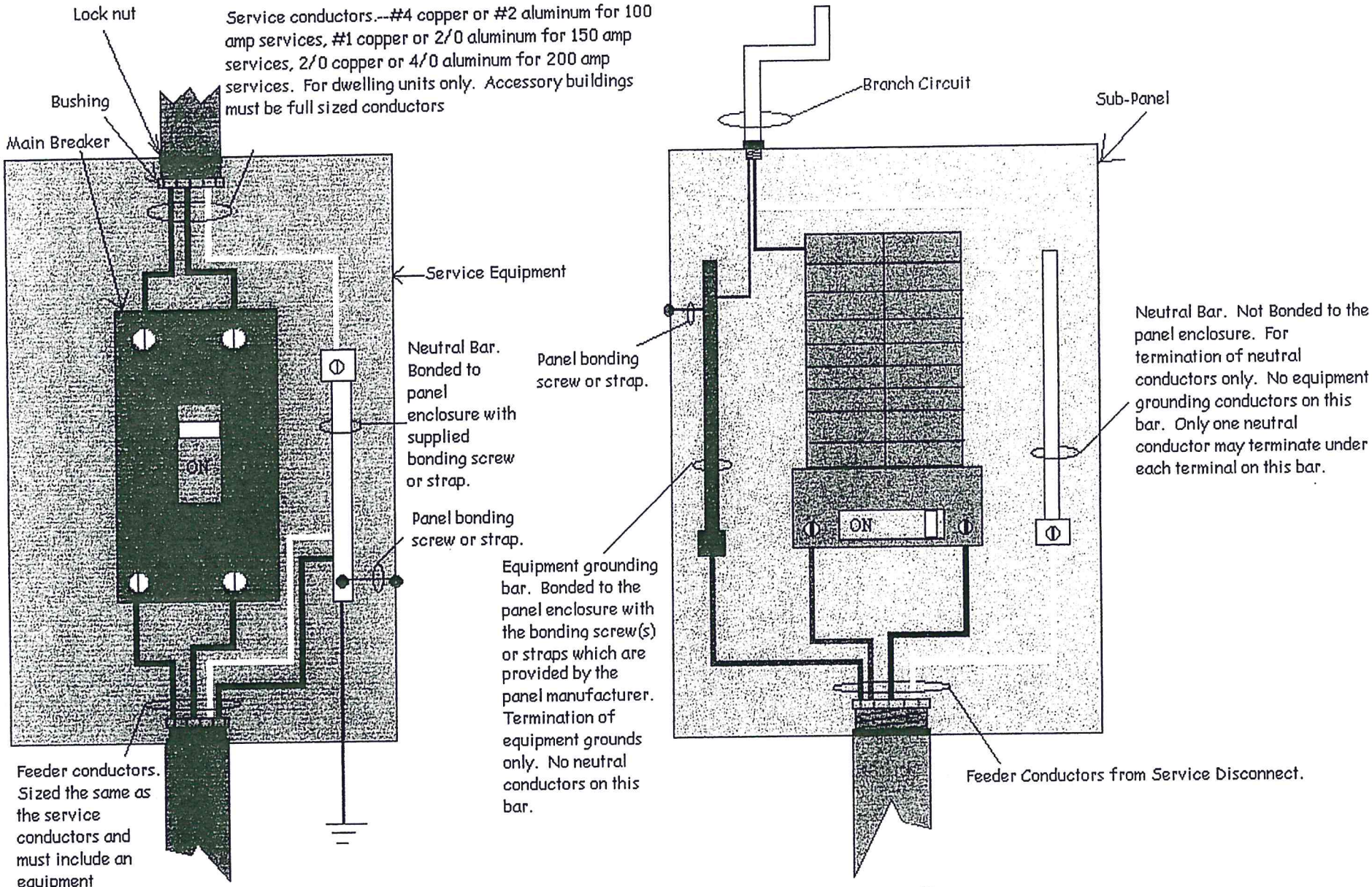
Neutral Bar
Only 1 neutral conductor may terminate under each terminal.

Panel bonding screw or strap. The green screw or bonding strap provided by the panel manufacturer must be used to bond the panel enclosure to the service neutral when the panel is used as service equipment.

Equipment grounding bar (if provided). Bonded to the panel enclosure by the mounting screws. May only be used to terminate equipment grounding conductors. Equipment grounding conductors may also terminate in any unused terminal in the neutral bar.

Grounding electrode conductor. Must terminate on the neutral bar. #6 copper for 100 amp services and 150 amp services, #4 copper for 200 amp services. Use #6 copper for the sole connection to a ground rod for 100, 150, and 200 amp services.

Typical Service Panel Installation
2009 Michigan Residential Code



Typical Service Disconnect and Sub-Panel Installation

ARTICLE 210—BRANCH CIRCUITS

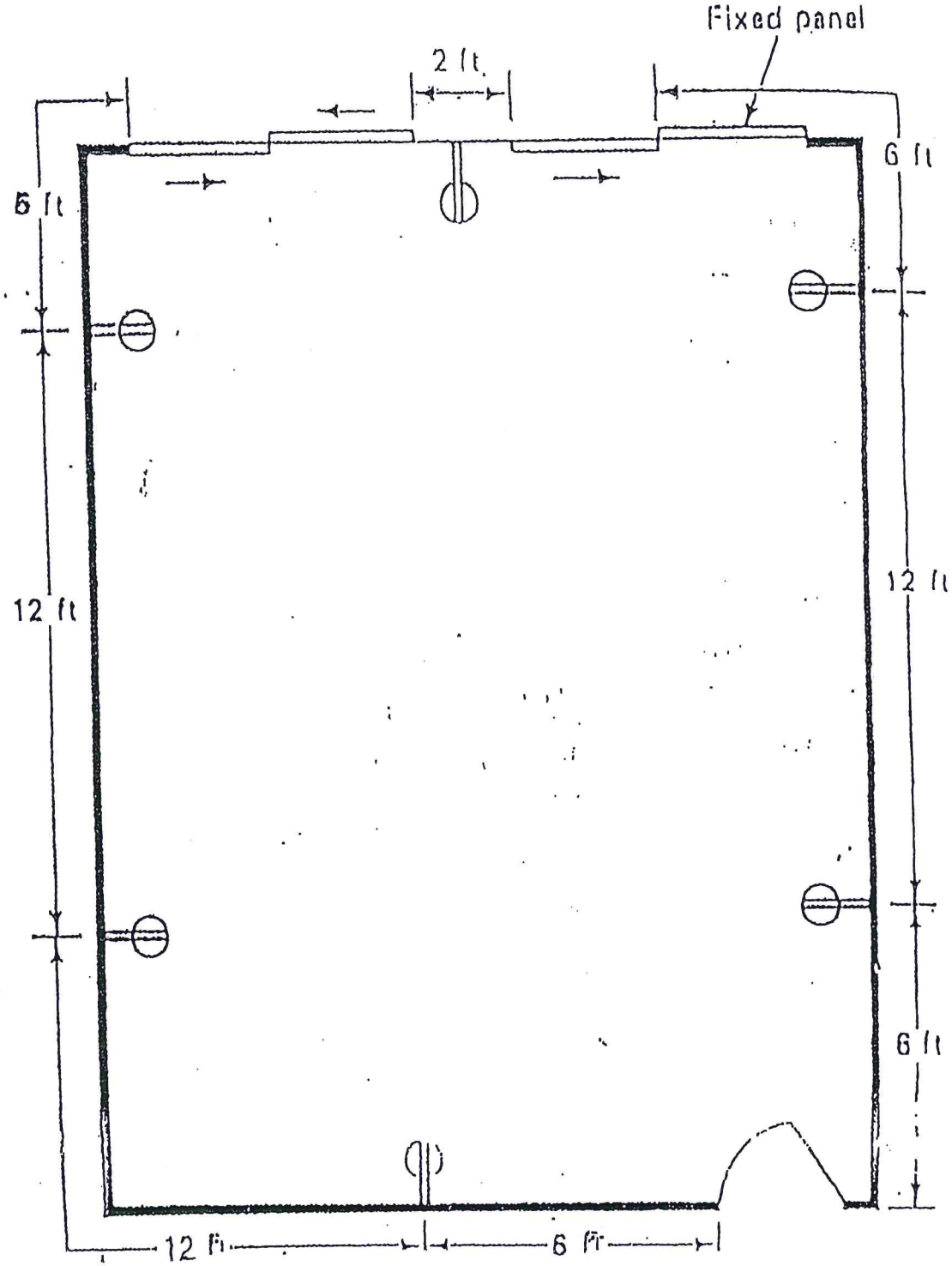
SPACING OF RECEPTACLES

The purpose of this requirement is to minimize the use of cords across doorways, fireplaces and similar openings.

The receptacle outlets required by this section shall be in addition to any receptacle that is part of any lighting fixture or appliance, located within cabinets or cupboards, or located over 5 1/2 feet above the floor.

This portion of the Code is concerned with the fact that, in most all cases, any electrical device to be plugged in shall be no more than 6 feet from any receptacle.

In bedrooms, for example, where there are closets with sliding doors, these doors do not count as wall space, but receptacles must be installed no more than 6 feet on either side of sliding doors.



KITCHEN RECEPTACLE SPACING REQUIREMENTS