

# **PARTIAL ELECTRICAL GUIDELINES**

## **2008 NEC, 2009 Michigan Residential Code**

Effective March 8, 2011, Newaygo County Department of Building Safety and Permits will be enforcing the 2008 National Electrical Code along with the 2011 Michigan Electrical Code Rules, Part 8, and the 2009 Michigan Residential Code.

**BEFORE ANY CONSTRUCTION IS STARTED**, check with the Power Company to make application for electric service and for proper location of the meter.

1. One family dwelling services shall be a minimum of 100 amperes. Article 230.79(C)
2. Conduit risers above the roof must be a minimum of 2" trade size rigid metallic conduit. Article 230.28.
3. Where the service mast penetrates the roof, it must be a minimum of 18". 230.24(A) Exception 3
4. Bonding bushings must be used on metal service entrance conduits. This bushing is to be installed in the service panel. If PVC conduit is used, then plastic bushings are acceptable. Article 250.92(A).
5. A grounding electrode system must be installed per Articles 250.50(A)(1 thru 5), and 250.53 (D)(2) Usually these will include the following: (2) 8 ft ground rods driven below grade level, and spaced 6 feet apart 250.53(B), a metal underground water pipe in direct contact with the Earth for 10 feet or more, and any concrete encased electrode installed in the foundation.
6. All interior metal water pipes must also be bonded to the grounding electrode system if pex water piping is not used. NEC 250-104(A)(1)
7. A single made electrode (ground rod) must have a resistance to ground of 25 ohms or less, or a second rod must be installed. The second rod must be a minimum of 6 feet from the first, and both rods must be bonded together with one continuous wire back to the service panel. Article 250.56.
8. The grounding electrode conductors must terminate on the neutral bar of the service disconnecting means, not the ground bar. Article 250.24(A) (1).
9. The service panel shall be located in a readily accessible location nearest the point of entrance of the service conductors. The power companies and inspectors have agreed that this shall not exceed 5 ft. from the point of entrance. Article 230.70(A) (1).
10. Service panels cannot be installed in clothes closets or bathrooms. Article 240.24 (D) & (E).

11. Illumination shall be provided for the working space at the service equipment. Article 110.26(D).
12. In ***dwelling units ONLY***, conductors as listed below shall be permitted to be utilized as three-wire, single-phase service entrance conductors or three-wire, single-phase feeder conductors that carry the total current supplied by the service. Table 310.15(B)(6)

CONDUCTOR TYPES AND SIZES  
RH, RHH, RHW, THW, THWN, THHN, XHHW

<u>Service amperage</u>	<u>Copper</u>	<u>Aluminum</u>
100	4 awg	2 awg
150	1/0 awg	2/0 awg
200	2/0 awg	4/0 awg

For all other structures such as storage bldgs, garages, sheds, barns and similar buildings, the values give in Table 310.16 must be used to size the service entrance conductors.

<u>Service amperage</u>	<u>Copper</u>	<u>Aluminum</u>
100	3 awg	1 awg – (2awg THHN)
150	1/0 awg – (#1THHN)	3/0 awg – (2/0 THHN)
200	3/0 awg	250 kcmil – (4/0 THHN)

13. All circuit breakers must be listed for use in the panels in which they are installed. Article 110.3(b)
14. Service panels installed on exterior concrete walls must have a minimum ¼ inch air space, or be installed on a backboard. Article 312.2(A).
15. The bonding screw supplied with the service panel must be installed when the panel is used as the service disconnecting means. Article 250.28
16. Boxes shall be of sufficient size to provide free space for all conductors enclosed within the box. Article 314.16
17. Junction boxes shall be accessible without removing any part of the building structure or wall covering. Article 314.29
18. Boxes must be installed so that the front edge of the box will be flush with, or extend out from, the finished wall surface. Article 314.20
19. Metal boxes must be grounded by means of a ground screw, which serves no other purpose, or other approved grounding devices or methods. Article 250.148(C)

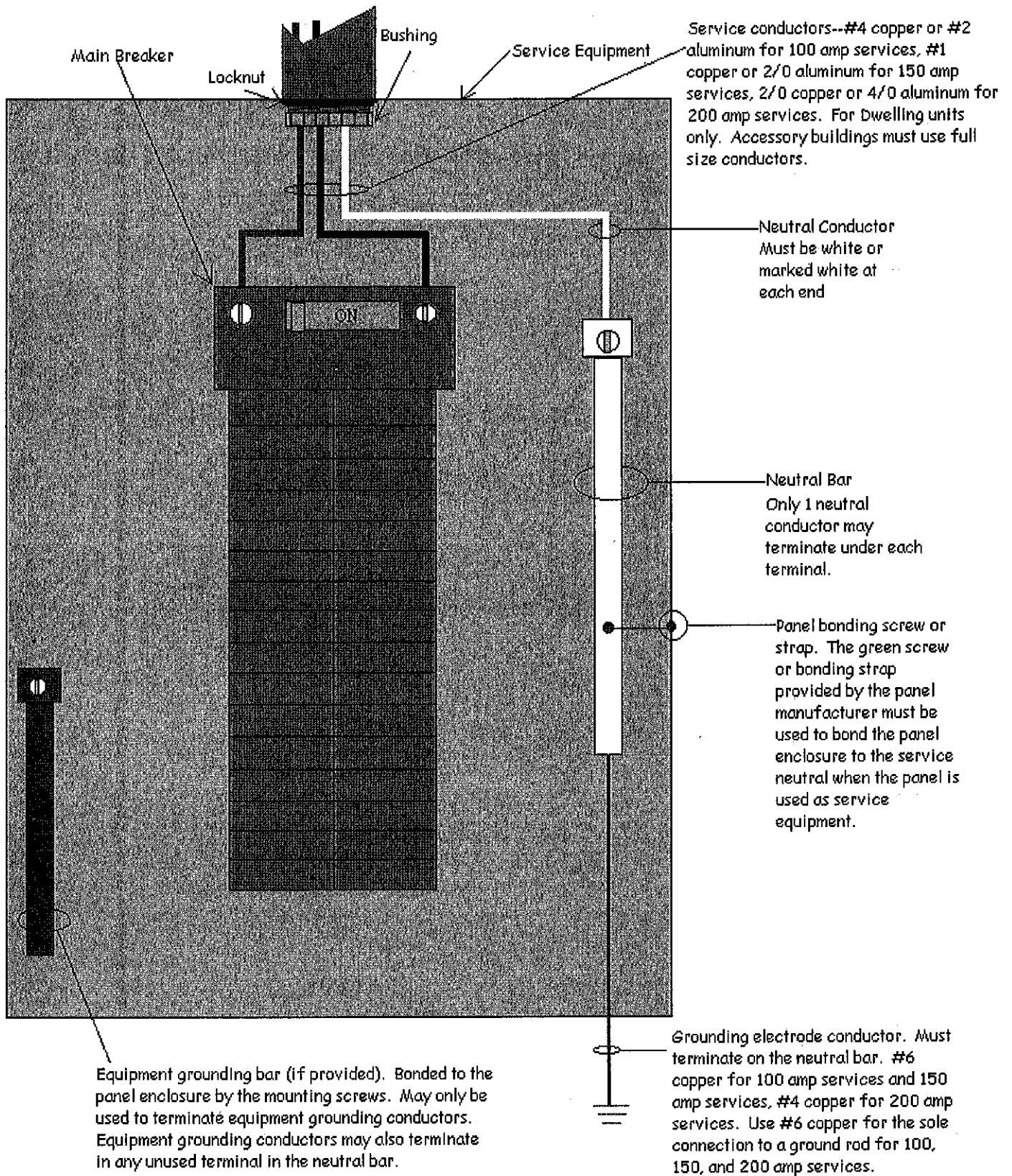
20. Through any holes that are fire caulked, if there are 3 or more NM wires in the hole, they must be de-rated as required by table 310.15.(B)(2)(a). NEC 334.80
21. Boxes shall be of sufficient size to provide free space for all conductors enclosed within the box. Article 314.16
22. Junction boxes shall be accessible without removing any part of the building structure or wall covering. Article 314.29
23. Boxes must be installed so that the front edge of the box will be flush with, or extend out from, the finished wall surface. Article 314.20
24. Metal boxes must be grounded by means of a ground screw, which serves no other purpose, or other approved grounding devices or methods. Article 250.148(C)
25. Where more than one equipment grounding conductor enters a box, all such conductors shall be spliced or joined within the box with devices suitable and listed for the use. Note: Grounds are not to be soldered. Article 250.148.  
**NOTE: This is required to be done at the time of rough-in inspection.**
26. Only listed fan boxes are approved as the sole means of support of a ceiling fan. Article 314.27(D).
27. Nonmetallic-sheathed cables shall be secured at intervals not exceeding 4 ½ feet. Cables must also be secured within 12 inches of all boxes, enclosures, or fittings. When single gang nonmetallic boxes are used, cables must be secured within 8 inches of the box. Articles 334.30, 314.17(C) exception.
28. Cables installed parallel to framing members must be installed so that the cable is not closer than 1 ¼ inches from the nearest edge of the framing member. Article 300.4(D).
29. Bored holes for the installation of cables shall not be closer than 1 ¼ inches from the nearest edge of a framing member. A steel plate a minimum of 1/16 inch thick must protect holes closer than this. Article 300.4(A)(1)
30. Cables installed through notches in framing members must be protected by steel plates a minimum of 1/16 inch thick. Article 300.4(A)(2)
31. At least 6 inches of free conductor must be left at each outlet, switch, and junction point. A minimum of 3 inches must extend outside of the box. Article 300.14.
32. Receptacle outlets shall be installed so that no point along the floor line in any wall space is more than 6 feet measured horizontally from an outlet in that space. This includes any wall space 2 feet or more in width. Article 210.52(A)(1)(2).

33. As of the adoption of the 2008 code, all receptacles in singles and multifamily dwellings must be tamper resistant. NEC 406.11
34. As of the adoption of the 2008 code, all outdoor receptacles in addition to being tamper resistant shall be weather resistant. NEC 406.8(B)(1)
35. Kitchen countertops must have receptacles installed at each counter space that is 12 inches or wider, and so that no point along the wall line is more than 2 feet from a receptacle in that space, except behind range & sink. Article 210.52(C) (1).
36. At least one receptacle is required for each island counter space 12 inches by 24 inches or larger. And it shall be GFI Protected. Article 210.52(C) (2).
37. At least one receptacle is required for peninsular counter spaces 12 inches by 24 inches or larger. Article 210.52(C) (3).
38. Kitchen countertop, island, peninsula, and dining room receptacles must be served by a minimum of 2, 20-ampere, small appliance branch circuits. These branch circuits, whether 2 or more must contain no other receptacles or lighting outlets. Article 210.52(B) (2).
39. All receptacles installed to serve kitchen countertops must be ground-fault circuit interrupter protected. Article 210.8(A) (6).
40. Dishwashers must either be cord and plug connected to an accessible receptacle, or have a breaker lock installed on the breaker supplying it if it's not within site of the service panel. 422.31,422.16(B)(2)
41. At least one receptacle outlet must be installed in bathrooms. The receptacle must be installed within 36 inches of the edge of the basin, and be on an adjacent wall or on the face or side of the basin cabinet. Article 210.52(D).
42. Bathroom receptacles must be served by a minimum of one 20-ampere branch circuit. This circuit may serve no other receptacles or lighting outlets. Exception: a single 20-ampere circuit may supply the receptacle(s) and lighting outlets within a single bathroom. This circuit may serve only one bathroom in this manner. Article 210.11(C) (3).
43. All receptacles installed in bathrooms shall have ground-fault circuit interrupter protection. Article 210.8(A) (1).
44. At least on 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s). This circuit shall serve no other receptacles or lighting outlets. Article 210.11(C) (2).
45. All branch circuits that supply 15 and 20-ampere outlets (receptacle, lighting, or smoke detector) in dwelling unit bedrooms must be protected by an arc-fault

circuit interrupter listed to provide protection for the entire branch circuit. Article 210.12(B).

46. At least one receptacle outlet shall be installed in the unfinished portion(s) of basements, in attached garages, and detached garages with electric power. Article 210.52(G).
47. All receptacles installed in unfinished portions of basements, crawlspaces, in attached garages, and detached garages with electric power must have ground-fault circuit interrupter protection. As of the adoption of the 2008 NEC this now includes garage door opener receptacles, freezer receptacles, and sump pump receptacles. Articles 210.8(A) (2), (4), and (5).
48. At least two outdoor receptacles, accessible at grade level, shall be installed at the front and rear of dwelling units. Article 210.52(E).
49. 15 and 20-ampere, 125 volt receptacles installed outdoors in wet locations must have covers which are weatherproof whether or not the attachment plug cap is inserted into the receptacle. Article 406.8(B)(1)
50. All 15 and 20-ampere, 125 volt receptacles installed outdoors must have ground-fault circuit interrupter protection. Article 210.8(A) (3).
51. The branch circuit supplying electric ranges and clothes dryers must include an equipment-grounding conductor. The neutral conductor shall not be used to ground the appliances. Articles 250.134, 250.138.
52. At least one wall switch controlled lighting outlet shall be installed in each habitable room, in bathrooms, hallways, stairways, attached garages, detached garages with electric power, and on the exterior side of outdoor entrances and exits. Article 210.70(A).
53. At least one lighting outlet, controlled by a light switch at the point of entry, shall be installed in an accessible attic, under floor space, utility room and basement where these spaces are used for storage or contain equipment requiring servicing. Article 210.70(A)(3).
54. Incandescent fixtures with open or partially enclosed lamps are not permitted to be installed in clothes closets. Article 410.8(C).
55. Totally enclosed, surface mounted incandescent fixtures must maintain a clearance of 12 inches from storage space in clothes closets and surface mounted fluorescent fixtures must maintain 6 inches of clearance from these areas. Article 410.8(D)
56. Smoke detectors are required to be installed inside each bedroom, outside of the bedrooms in the area adjacent to them, and on each floor level of the dwelling

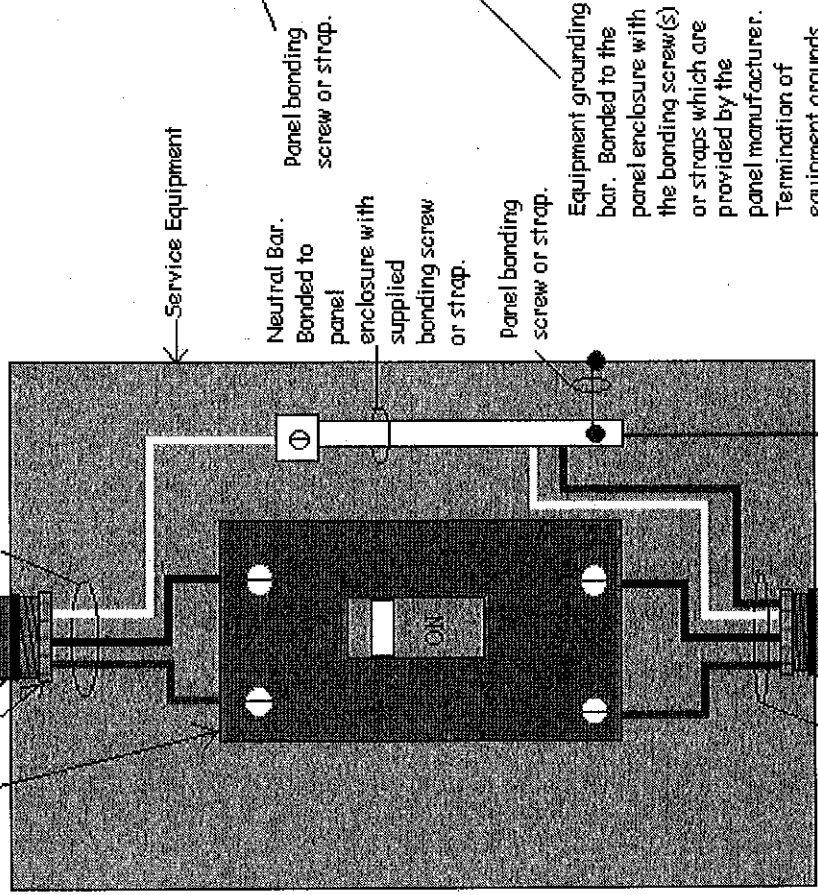




Typical Service Panel Installation  
2009 Michigan Residential Code

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 be full sized conductors

Lock nut  
Bushing  
Main Breaker



Service Equipment

Neutral Bar Bonded to panel enclosure with supplied bonding screw or strap.

Panel bonding screw or strap.

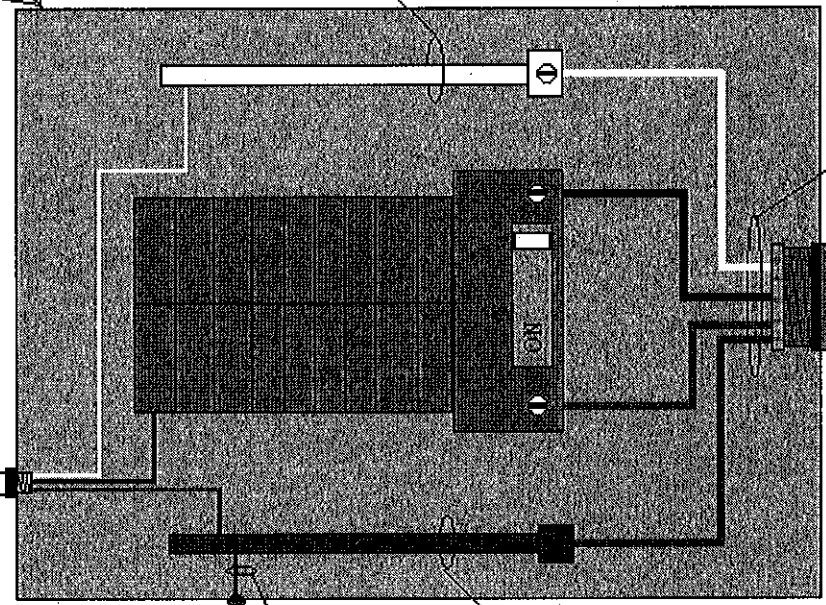
Panel bonding screw or strap.

Equipment grounding bar. Bonded to the panel enclosure with the bonding screw(s) or straps which are provided by the panel manufacturer. Termination of equipment grounds only. No neutral conductors on this bar.

Feeder conductors. Sized the same as the service conductors and must include an equipment grounding conductor

Branch Circuit

Sub-Panel



Neutral Bar. Not Bonded to the panel enclosure. For termination of neutral conductors only. No equipment grounding conductors on this bar. Only one neutral conductor may terminate under each terminal on this bar.

Feeder Conductors from Service Disconnect.

## Typical Service Disconnect and Sub-Panel Installation

## ARTICLE 210—BRANCH CIRCUITS

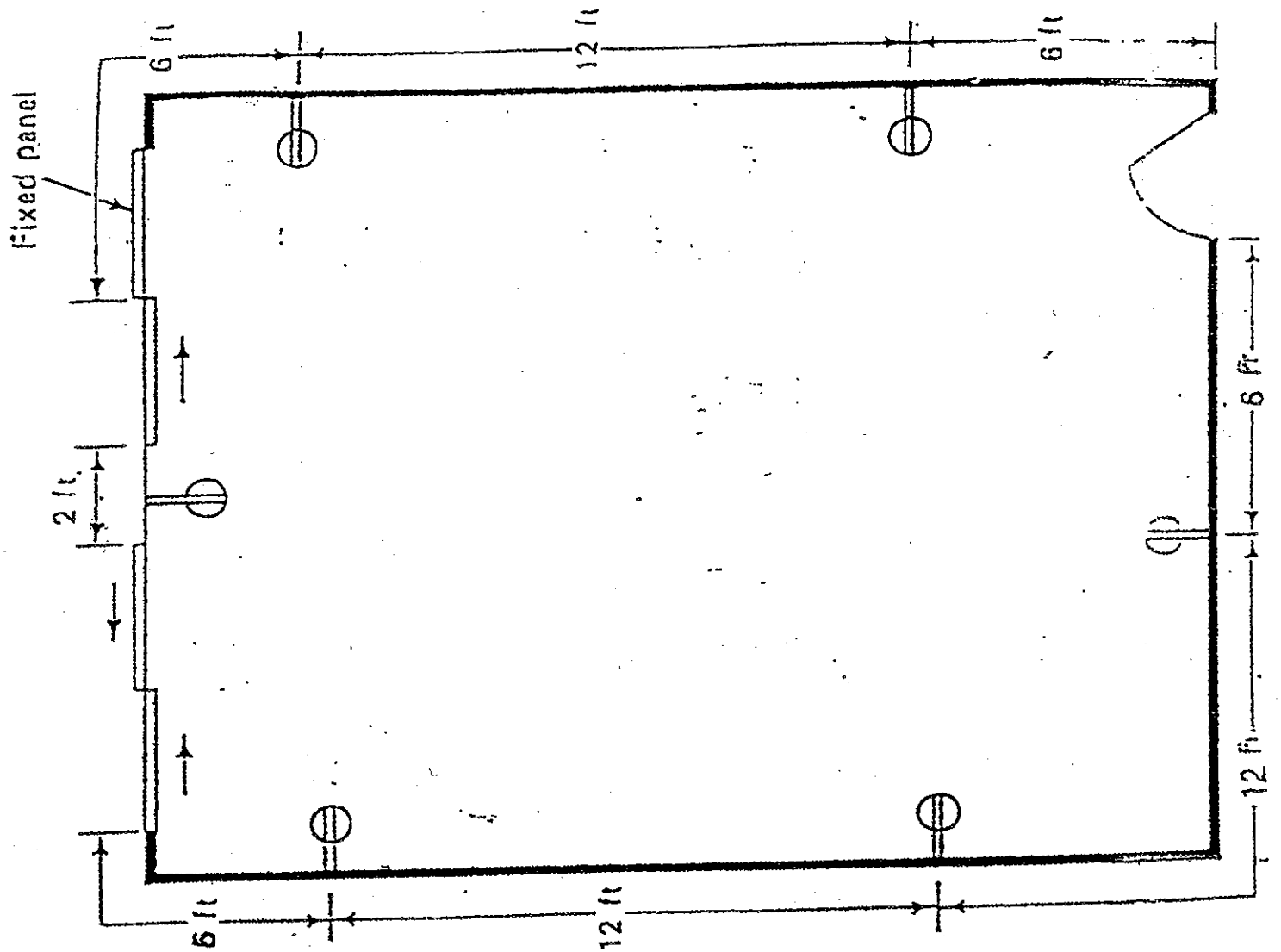
### SPACING OF RECEPTACLES

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

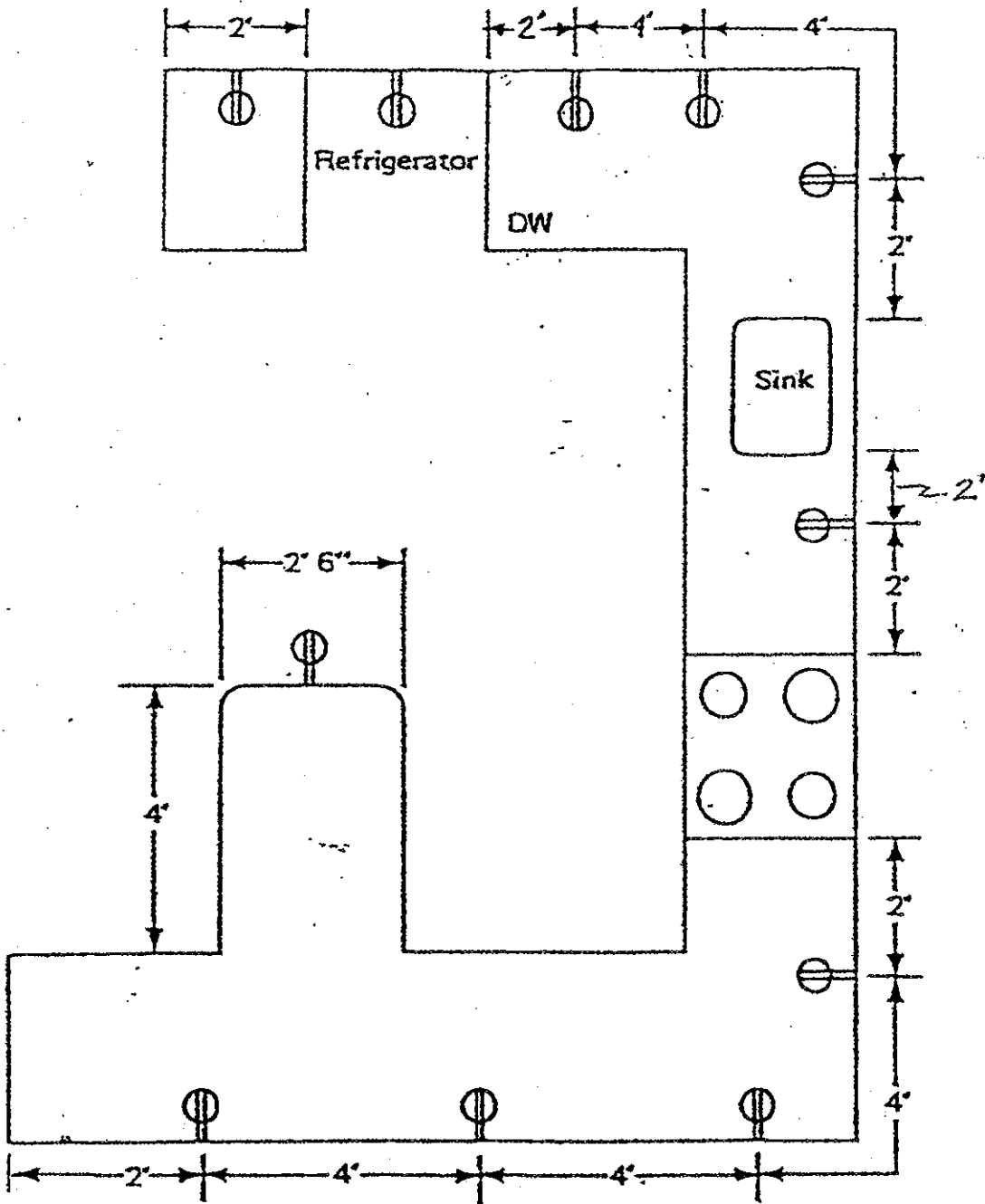
The receptacle outlets required by this section shall be in addition to any receptacle that is part of any lighting fixture or appliance, located within cabinets or cupboards, or located over 5 1/2 feet above the floor.

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



11. Clear working space 30 inches wide and 36 inches deep on both side of work space with minimum headroom of 6 ½ feet must be provided at the service panel location. Article 110.26(A) (2), 110-26(E).
12. The main breaker of the service panel and any branch circuit breakers cannot be located more than 6 feet 7 inches above the floor. Article 404.8(A).
13. Illumination shall be provided for the working space at the service equipment. Article 110.26(D).
14. In ***dwelling units ONLY***, conductors as listed below shall be permitted to be utilized as three-wire, single-phase service entrance conductors or three-wire, single-phase feeder conductors that carry the total current supplied by the service. Table 310.15(B)(6)

CONDUCTOR TYPES AND SIZES  
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For all other structures such as storage bldgs, garages, sheds, barns and similar buildings, the values give in Table 310.16 must be used to size the service entrance conductors.

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15. All circuit breakers must be listed for use in the panels in which they are installed. Article 110.3(b)
16. Service panels installed on exterior concrete walls must have a minimum ¼ inch air space, or be installed on a backboard. Article 312.2(A).
17. The bonding screw supplied with the service panel must be installed when the panel is used as the service disconnecting means. Article 250.28
18. Conduits connecting equipment between temperature extremes such as between the outside meter socket or service LB entering the house, shall be sufficiently caulked to prevent condensation on the wires. NEC 300.7
19. Electrical penetrations in floor and ceiling plates need to be fire caulked with caulk rated for the retention of fire spread. NEC 300.21