



Building Inspection Department

City of De Pere

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ELECTRICAL INFORMATION FOR ACCESSORY BUILDINGS

2017 NFPA 70 National Electrical Codes

- ❖ **Permits:** An electrical permit and inspection is required. An electrical permit may be issued to the owner of a single family dwelling and its accessory building as long as the owner occupies the structure.
- ❖ An electrical contractor is required to apply for a permit and perform all electrical work at the property if it is not owner occupied.
- ❖ **Burial Depth:** Direct buried cables have a minimum burial depth of twenty-four (24) inches. Conductors or cables installed in PVC are required to be buried a depth not less than eighteen (18) inches. This measurement is taken from the top of the conduit or cable to grade level. Minimum of eighteen (18) inches when located under two (2) inches of concrete.
- ❖ **Raceway:** Schedule 40 PVC may be used underground from the house to the structure. Schedule 80 PVC must be used where the conduit is exposed above grade at the dwelling or structure location.
- ❖ **Underground conductors:** Underground wiring must be approved for a wet location or approved for direct burial. A raceway underground is considered a wet location. Type NM or SE cable shall not be used.
- ❖ **Supply methods:** Underground raceways and individual conductors require protection from settling and frost heave damage.
- ❖ **Raceway sealing:** Requires the inside of underground raceways to be sealed where they enter the building. Requires the inside of raceways exposed to different temperatures to be sealed to prevent the flow of air.
- ❖ **Suitable for Service Equipment:** The disconnecting means shall be suitable for use as service equipment. However, snap switches are approved for a single or multiwire branch circuits rated 20 amps and less.
- ❖ **Multiwire branch circuit:** If a multiwire (two hots and one neutral) conductor is used to feed the structure, then a two-pole breaker is needed to simultaneously disconnect the circuit. This breaker must be installed in the panel where the circuit originates.
- ❖ **Disconnects:** Maximum number of six disconnects for each supply. Disconnects required to be grouped for each supply. No service rating when supplied by a feeder with an equipment grounding conductor and no "Main" disconnect required where there are not more than six disconnecting means present.
- ❖ **Disconnect location:** The disconnecting means shall be installed either inside or outside the building or structure served or where the conductors pass through the building or structure. **Disconnecting means "8-foot Rule"** All raceways containing service entrance conductors or cables, or service entrance conductors not contained in a raceway shall not extend longer than 8 feet into a building to the service disconnect. The raceways or conductors shall be considered to have entered the building at the point where they pass through the outer surface of the building exterior.
- ❖ **Disconnecting types:** The disconnecting means shall be suitable for use as service equipment. The disconnecting means shall be comprised of a circuit breaker, molded case switch, general use switch, snap switch.
- ❖ **Electrode system** (two ground rods) shall be established at a detached garage or auxiliary building being served by a feeder of thirty (30) amps or more. These ground rods need to be driven to a depth of not less than eight (8) feet and spaced not less than six (6) feet apart. A #6

AWG wire may be used to connect both ground rods to the equipment grounding bus located in the disconnect. If this wire is exposed to possible physical damage, then a #4 AWG wire should be used.

- ❖ **Minimum rating:** Minimum rating of building disconnecting means (1) One-circuit, Min. 15A; (2) Two-circuits, Min. 30A; (3) All others, Min. 60A.
- ❖ **Working Space:** Clear working space is required in front of meter sockets, pedestals and panelboards. (1) *Depth/front*, min. of thirty six (36) inches measured from the front of the enclosure. (2) *Width*, minimum thirty (30) inches wide, the equipment doors or panels capable of opening a minimum of 90 degrees. (3) *Height*, Minimum six-foot six inches (6' 6") above the floor or working platform or the top of the equipment, whichever is greater.
- ❖ **Illumination:** shall be provided at all working spaces about service equipment, switchboards, switchgear, panelboards or motor control centers installed indoors.
- ❖ **Labeling:** The building disconnect is required to be labeled indicating its purpose. Circuit breakers are required to be labeled indicating what they supply including spares. Where supplied by a feeder, panelboards are required to be labeled with their supply source disconnect location.
- ❖ **Equipment ground:** is required to be installed with the circuit conductors that feed the structure. These shall be no interconnection between the neutral conductor and the equipment-grounding conductor at the structure.
- ❖ **Intersystem bonding terminal:** Bonding for communication systems and bonding conductors of other systems must be provided external of the structure disconnect enclosure, and at the disconnecting means for additional buildings or structures. The termination must have a capacity for connecting no less than three intersystem bonding conductors. A six (6) AWG copper wire is needed to connect the intersystem-bonding terminal to the equipment grounding bus, which is located inside the structure, disconnect enclosure.
- ❖ **Interior wiring methods:** Cables, Types AC, MC, NM, SE/SER, and UF installed shall be properly secured and supported per their respective listing. Holes shall be bored so that the edge of the hole is not less than 1 ¼ inches from the nearest edge of the wood member. Protection (steel nail plate 1/16 inch thick and of appropriate length) shall be used to protect cable where the distance cannot be maintained.
- ❖ **Lighting outlet:** is required on the interior of a detached garage. A lighting outlet is also required on the exterior of a garage near any service door. A vehicle door shall not be considered as a service door, so an exterior light near that door is not mandatory.
- ❖ **GFCI protection:** At least one receptacle outlet in addition to those for specific equipment shall be installed. All 125-volt single phase fifteen and twenty amp receptacles shall have ground-fault circuit-interrupter protection.
- ❖ **Tamper-proof receptacles:** All 15 and 20-ampere, 125-volt and 250-volt non-locking-type receptacles. Tamper proof receptacles are not required in the following applications (1) Receptacles that are located more than 5 ½ feet above the floor. (2) Receptacles that are part of a luminaire or appliance. (3) A single receptacle or a duplex receptacle within the dedicated space for each appliance that, in normal use, is not easily moved from one place to another and that is cord-in-plug connected.
- ❖ **NM cable support:** Non-metallic sheathed cable (NM, Romex) must be stapled every four and a half feet (4 ½') and within eight (8) inches from every junction box. If the cable is secured to the box by a cable clamp, then the strapping may occur twelve (12) inches from the box.
- ❖ **NM Cable protection:** Wires which run horizontally through the garage walls and that are not covered by a finished wall covering will need to be protected from physical damage. Strips of sheetrock or plywood six (6) inches wide may be secured over the wires to give them protection. Wires that run vertically in the wall cavity and that are secured to the studs do not require any additional protection.
- ❖ **Central Heating Equipment:** Central heating equipment other than fixed electric space-heating equipment shall be supplied by an individual branch circuit.

NEC CODES FOR ACCESSORY BUILDINGS

Conductors and Feeders

1. 4 wire conductor required. A feeder is required to include an equipment grounding conductor. Typical feeder cable assemblies may include:

- a. **USE Conductors.** Limited to underground use only and is not permitted within buildings for use as feeders, and is also not permitted within raceways, such as for a service mast. (Can only be run out of grade to termination points in meter sockets.)
- b. **SE or SER.** Service entrance cable shall be permitted for use where the insulated conductors are used for circuit wiring and the uninsulated conductor is used only for equipment grounding purposes. (Fig. 1)
- c. **UF.** Underground feeder cable listed for direct burial and as single-conductor cable. Shall not be used for service entrance cable.
- d. **NM.** Non-metallic sheathed cable, in a dry location. Shall be properly supported, secured and protected.

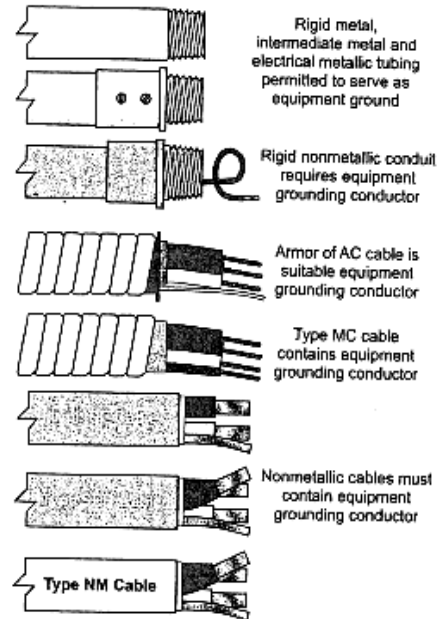


Fig. 1 Feeder is generally required to include an equipment grounding conductor.

2. **NEC 225.30 Number of Supplies.** Only one supply feeder or branch circuit allowed for an accessory building. (Multiwire branch circuit shall be considered a single circuit.)

3. 12 AWG copper or 10 AWG aluminum for single branch circuits.

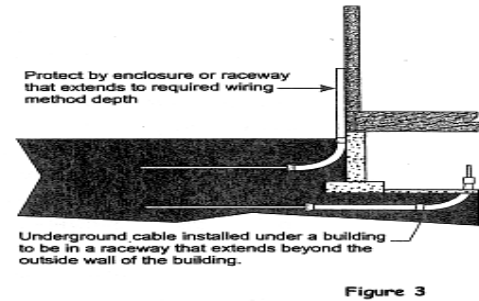
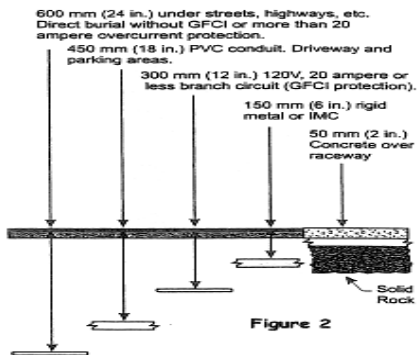
Load	Conductor (60C)
30 Amp	10
60 Amp	4
100 Amp	1

4. **NEC 230.7 Other Conductors in Raceway or Cable.** Conductors other than service conductors shall not be installed in the same service raceway or service cable in which the service conductors are installed. Grounding electrode

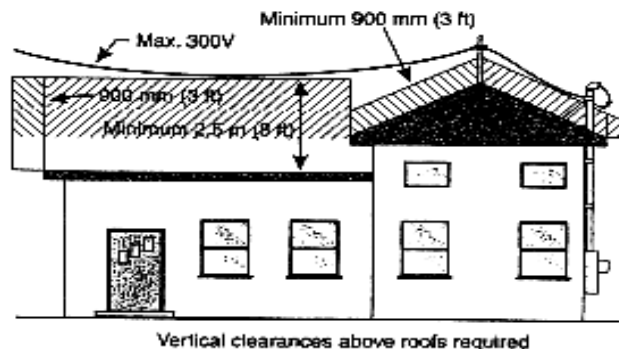
conductors or supply side jumpers or conductors are allowed in service raceways.

5. **NEC 300.5 Direct Burial** for underground conductors:

- a. Nonmetallic raceway listed for direct burial minimum of 18 inches.
- b. Rigid metal conduit or IMC conduit shall be a minimum of 6 inches.
- c. Direct burial cables or conductors shall be a minimum of 24 inches.
- d. Residential branch circuits maximum 20 amperes and GFCI protected shall be a minimum of 12 inches (Fig. 2 & 3).



6. All underground installations using metallic methods must be properly grounded and bonded. Where an underground cable is installed under a building, it must be installed in a raceway that extends beyond the outside walls of the building.
7. Where direct-buried conductors and cables emerge from the ground, they are required to be protected from physical damage by enclosures or raceways (schedule 80 PVC) that extend from the minimum cover distance (18 inches) to a point at least 8 feet above finished grade.
8. Conductors entering a building are required to be protected at the point of entrance.
9. **NEC 230.24 Clearances (A) Above Roofs.** Clearances from buildings for outside branch circuits and feeders:
 - a. A vertical clearance of not less than 8 feet is required to be maintained from the roof deck to the overhead conductor.
 - b. This clearance shall be maintained for a distance of not less than 3 feet in all directions from the edge of the roof.
 - c. Exception: Where voltage for the outside branch circuit and feeder conductor is less than 300 volts to ground and the roof slope is greater than a 4 inch and greater pitch, a reduction in clearance of 3 feet is permitted (Fig. 4).



Disconnect & Grounding

1. **NEC 225.31 NEC 230.70 (A).** Requires each building or other structure served be provided with a disconnecting means. The disconnecting means is permitted either inside or outside the building.
2. **SPS. 316.230 (3) (b).** “8 Foot Rule” Raceways containing service conductors or cables, or service entrance cable not contained within a raceway, shall not extend longer than 8 feet into a building to the service disconnect or the first service disconnect of a group of disconnects. .
3. Snap switch is allowed as a disconnect inside the accessory building if it is properly labeled.
4. Multi-wire two pole switch is allowed inside the accessory building if it is properly labeled. A two single pole switch can use two single pole breakers.
5. **NEC 230.70 (B)(C).** Panelboard labeled suitable for use as a service disconnect and securely fastened.
6. **NEC 110.26(A) Required Working Space.** A minimum width of 30 inches or the width of the equipment, whichever is wider. Workspace must allow the door on the equipment to open at least to a 90 degree angle. Working space must be clear to a height of 6.5 feet. A depth of 3 feet shall be maintained in front of the equipment.
7. Illumination is required in the vicinity of the equipment.
8. **NEC 250.58, 250.32 (A).** Two ground rods are required at separate buildings if more than one branch circuit and properly sized per NEC 250.66.
9. **NEC 250.32 (B) (1) (2) (D) (1) (2) (3).** Separating equipment grounding conductor and neutral conductor:
 - a. **4 Wire Conductor.** The feeder must include an equipment grounding conductor to the accessory building, separate the neutrals and equipment grounding conductors. Connect grounding electrode conductor at accessory building to feeder disconnect enclosure (equipment grounding bus bar). (Fig. 5)

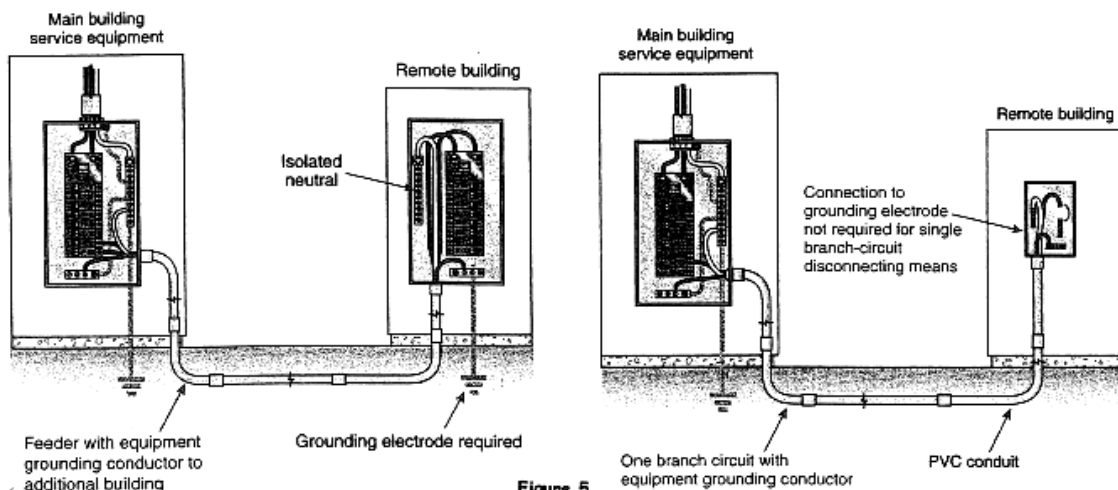


Figure 5

Receptacles and Lighting Circuits

1. **NEC 210.8 (A) (2) & NEC 210.52 (G).** At least one receptacle outlet is required in an accessory building that is supplied with electricity. At least one receptacle shall be installed in each vehicle bay and not more than 5 ½ feet above the floor.
2. Receptacles shall be 15 or 20 amp on a GFCI circuit.
3. One wall switch controlled lighting outlet must be installed in accessory buildings that are supplied with electricity. The exterior side of outdoor entrances or exits with grade level access must be illuminated. The vehicle door (overhead door) in a garage is not required to be illuminated per NEC 210.70 (A) (1).
4. **NEC 334.30 (B). NM Cable Protection and Securing.** Type NM cables are required to be secured in place at intervals not exceeding 4.5 feet and within 8 inches (12 inches with box clamp) from every box, fitting cabinet. Cables run through holes in wood joists, studs or rafters are considered to be supported and secured.
5. **NEC 300.4 (A) (1) Bored Holes.** Holes shall be bored so that the edge of the hole is not less than 1 ¼ inches from the nearest edge of the wood member. Protection (steel nail plate 1/16 inch thick and of appropriate length) shall be used to protect cable where the distance cannot be maintained.

