

## **ELECTRICAL GUIDELINES FOR SINGLE-FAMILY HOME OWNERS:**

Chapter 12 of the Burlington Code of ordinances allows owner occupants of single family homes to do their own wiring if they choose.

If you choose to do your own wiring you must:

- Obtain a permit before starting any work
- Have a licensed electrician do any work in the service panel (tying in the branch circuits) (Is your electrician licensed? Check here: [www.dps.state.vt.us/fire/licensing/elicenses.htm](http://www.dps.state.vt.us/fire/licensing/elicenses.htm))
- Call for a rough inspection before closing in any walls or ceilings
- Call for a final inspection when all electrical work is complete.

The term *owner occupant* means that you are currently living in the home and do not intend to sell the home in the immediate future.

A home that is under construction and is not habitable is not considered to be an owner occupied home.

If you are unfamiliar with the National Electrical Code (NEC) before you start the work you should reference authoritative publications that are based on, and refer to the National Electrical Code. Informational guidelines are available on-line, at bookstores and at the library.

This guideline is only intended to be a general overview of residential electrical requirements. It is not meant to be complete information or beyond question. You will need additional information and knowledge to install wiring that is essentially free from fire and shock hazards.

## **PLANNING YOUR PROJECT**

### **General Information on Circuits**

There are **minimum circuit requirements** for dwelling units. The NEC article that outlines these requirements is article 210. In a home, the minimum numbers of circuits you need are:

- Two 20 amp circuits for the kitchen receptacles
- One 20 amp circuit for the laundry receptacles
- One 20 amp circuit for the bathroom receptacles
- One separate, individual branch circuit for central heating equipment
- You will also need circuits to supply general illumination. The number of circuits depends on the size of the dwelling unit. (220.52)

**Panel labeling** for the circuits is important. NEC article 408.4 requires that each circuit be legibly marked to indicate its specific purpose. The circuit directory should be located on the face or inside the panel door. The labeling should be specific, but also understandable to future users (i.e.: “Susie’s bedroom” won’t mean anything to future users).

**Fuse and circuit breaker rating** generally determines the conductor (wire) size. Table 1 shows the appropriate fuse or breaker size for commonly used conductors.\* (240.4)

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

Table 1

\*Note: Conductors used for special equipment like air conditioners and motors may have overcurrent protection over what is noted in this table.

**Receptacle outlets must** be of the grounding type, must be tamper resistant and when installed in homes and must be located so that no point on the wall is greater than 6’ from an outlet and each wall space that is 2’ or more in width must have an outlet installed. (210.52)

**Receptacles replaced** in all living areas of the house including kitchens and laundry areas, must be AFCI type receptacles or must be protected upstream by an AFCI device or circuit breaker..

**Kitchen receptacle outlets** must be tamper resistant and AFCI protected. They must be GFCI protected when serving any counter spaces, dishwashers and any location within 6’ of the sink. Receptacles must be located so that no point on the countertop is more than 24” from a receptacle outlets. Receptacle outlets must be installed at each counter space that is wider than 12”, including any island or peninsula counter areas. Additional receptacle outlets are required in peninsulas that extend 24” beyond the adjoining wall. (210.52)

**Outdoor receptacle outlets** are required at the front and back of the dwelling unit, must be accessible from grade level, GFCI protected, tamper resistant and a weather resistant type if installed in a damp or wet location.

- If the outdoor receptacles are installed in a wet location, a weather proof. “extra-duty” “in use” cover must be installed. (210.52 & 406.8)
- All balconies, decks and porches, regardless of size, are required to have a receptacle outlet. (210.52)

**Ground fault protection** is required for all 15 and 20 amp, 120 volt receptacles in bathrooms, kitchen counter areas, laundry areas, basements, exterior locations, garages and any other locations within 6’ of sinks. (210.8). All GFCI devices must be readily accessible. (210.8)

**Arc Fault Circuit Interrupter (AFCI)** protection is required for all 120 volt, 15 and 20 amp branch circuits supplying all lighting, receptacle and any other outlets in all living, sleeping, storage areas as well as hallways, kitchens and laundry areas.. This protection must be provided by a listed, combination type device installed to protect the branch circuit. (210.12).

- If you are extending, replacing or modifying existing branch circuits in any of the locations listed above, you are required to install AFCI protection on the existing branch circuit.
- If you are replacing receptacles in any of the locations noted above, you must install and AFCI type receptacle or have AFCI protection upstream through an AFCI breaker or device.

**Hydromassage bathtubs** (a permanently installed bathtub with a recirculating piping system designed to accept, recalculate and discharge water upon each use) shall have ground fault protection that is readily accessible and motor rated. It is recommended that a readily accessible, motor rated, faceless GFCI be installed in the same room as the hydromassage bathtub because the GFCI must be tested monthly. All equipment, controls and motors must be accessible without damaging the building finish. (680.71 & 680.73).

All metal piping systems and metal parts in contact with the circulating water must be bonded with a solid conductor, 8 AWG or larger. (680.74)

## Wiring methods

**Outlet boxes** must be securely supported by the building structure and sized appropriately for the number of conductors. Junction and device boxes are limited in capacity. NEC section 314.16 provides detailed information on box and conductor volume. Some boxes are stamped with the cubic inch capacity and some are stamped with the number of conductors allowed. Metal boxes, plates and plaster rings must be bonded (attached through a ground screw to a grounding conductor).

- Unused openings in metal boxes and panel boxes must be closed with knockout seals. If openings in non metallic device boxes are broken out and not used the box must be replaced (110.12). In a completed electrical installation, all boxes must be covered. (314.28C)
- All splices, including ground wires must be made with an approved splice cap or “wire nut” and must be made in an approved electrical box or other approved enclosure. (110.14B & 300.15).
- DO NOT conceal junction boxes in ceilings, walls or other inaccessible areas. Boxes and the wiring within them must be accessible without removing or damaging the building finish. (314.29).
- Wiring for switches controlling lighting loads must include a grounded (“neutral”) wire in each switch box.(404.2)

**Lighting fixture boxes** installed in ceilings must rated to support a 50 lb. light fixture. Boxes for fixtures mounted on walls must be designed for the purpose and marked with the maximum allowable weight. However, if a wall mounted light weighs 6 lbs. or less, it is permitted to be

supported on other types of boxes or plaster rings as long as the yoke is secured to the box with no fewer than 2 no. 6 or larger screws. (314.27)

**Boxes for ceiling fans** must be listed and marked by the manufacturer as suitable for this purpose. If the fan weighs more than 35 lbs. the box must be marked with the maximum weight allowable. (314.27d)

**NM (non metallic sheathed cable)** must be secured every 4 ½ feet and within 8” of the box, unless the box has internal clamps, then it must be secured within 12” of the box.

- The outer jacket of the NM cable must extend ¼” into the box.
- There must be a minimum of 6” of conductor length in the box and the wires must extend at least 3” outside the box.
- Where NM cable is run through holes drilled in studs and joists, protection with a steel plate (at least 1/16 thick) must be provided if the edge of the hole is less than 1 ¼” from the surface of the stud or joist.
- NM cable cannot pass through cold air returns, but it may pass through perpendicular to the long dimension of these spaces. (334)

**Lighting fixtures** (luminaries) and all other electrical equipment must be listed and labeled by a national recognized testing laboratory, such as Underwriters Laboratories (UL).

- Closet lights must maintain spacing from combustible materials, shelving and hanging racks. Fixtures with incandescent bulbs must be enclosed and be a minimum of 12” from the defined storage area (see sec. 410.2). Fixtures with fluorescent lamps must be 6” from the defined storage area.
- Recessed lighting fixtures installed in insulated ceilings or within ½” from combustible material must be labeled “IC rated”. (410.116)
- Most existing NM (Romex) and MC type cables in houses wired prior to 1984 is not rated for a temperature higher than 60°. Many types of lighting fixtures cannot be installed on wiring rated 60° or less. Always read and follow manufacturers’ installation instructions.

**Underground wiring** must be inspected before backfilling, generally cables that are approved for direct burial must have a minimum of 24” of cover. If the conductors are enclosed in nonmetallic conduit the minimum cover is 18”. When a GFCI protected circuit is rated at 20 amps or less, the minimum cover requirement may be reduced to 12”. (300.4)

If you are building an addition, a concrete encased electrode (rebar) must be made available to include in the service grounding system. This must be inspected before the concrete is poured. For more details on this, follow this [link](#)

**Electrical panels** must be readily accessible and cannot be located in bathrooms or in closets. A working clearance of 3 feet in front of the panel and a minimum width of 30” must be maintained at all times. This area must not be used for storage and must have adequate illumination. (240.24 & 110.26)

If you are **replacing receptacles and there is no grounding means** in the existing circuit the replacement method must be one of the following:..

- A new *non-grounding* type receptacle may be installed
- A GFCI may be installed and labeled “No Equipment Ground” (DO NOT connect a grounding conductor to the GFCI receptacle or any receptacle attached to it.)
- A grounding type receptacle may be used to replace an ungrounded receptacle if it is supplied through a GFCI receptacle or a GFCI circuit breaker. It must be labeled “GFCI protected receptacle” and “No Equipment Ground”. (406.3).
- These three methods only apply to existing receptacle outlets. New outlets cannot be installed on existing ungrounded circuits

**Receptacles replaced in all living areas of the house including kitchens and laundry areas, must be AFCI type receptacles or must be protected upstream by an AFCI device or circuit breaker. This requires a permit.**

*Generally, the State of Vermont adopts a new version of the National Electrical Code every three years. These guidelines are based on the 2014 National Electrical Code which was adopted on July 1, 2014.*