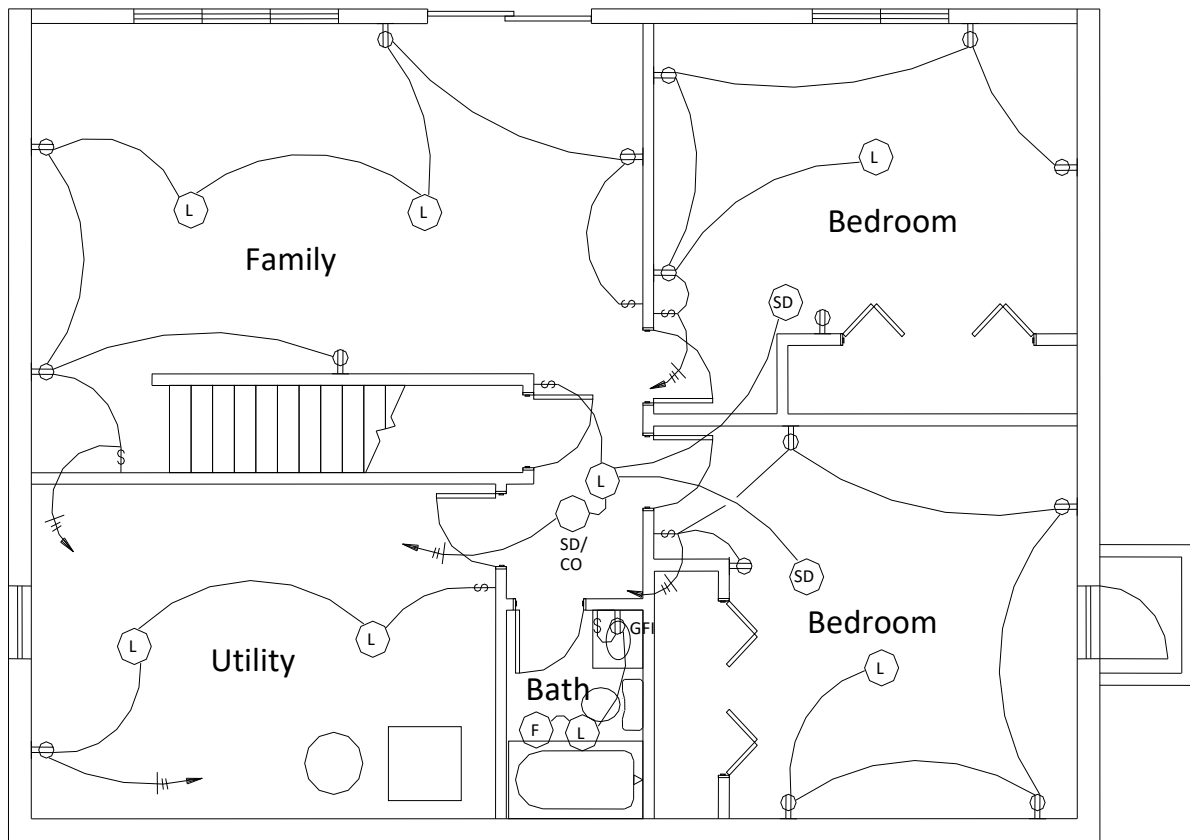


# Electrical Permits and Inspections

## For Homeowners

### 1 & 2 Family Dwellings and Associated Accessory Buildings

Based on the 2020 National Electrical Code



Abbreviations used in this brochure:

NEC = National Electrical Code

GFCI = Ground Fault Circuit Interrupter

AFCI = Arc-Fault Circuit Interrupter

**Electrical Plans MUST show the following:**

- ARC Fault Protection
- Wire Size
- Wire Routing
- Ground Fault Protection
- Smoke Detector(s) Location
- Circuit Breaker Sizes (sizes to circuits, switches, lights)
- Device Locations (locations of all switches & receptacles)

Generally, Minnesota law requires all electrical work to be performed by licensed electrical contractors and their employees, however; homeowners may perform electrical work on their own home under certain conditions. All work must be performed by the owner, the dwelling cannot contain more than two units, and all work must be inspected and conform to all relevant codes.

A building permit does not cover any electrical work. A separate electrical permit is required. The permit can be obtained by completing the application form online at: [www.rochestermn.gov/CitizenAccess](http://www.rochestermn.gov/CitizenAccess) and submitting the required fee, along with a drawing showing electrical work (*see inside of cover sheet*), to the Building Safety Department. A permit must be issued prior to beginning any work.

When an owner files an application for an electrical permit with Rochester Building Safety that person is signing an affidavit stating that they personally and physically will perform all of the electrical work, including the laying out of such work.

That person further certifies that they own and occupy the residence, or own and will occupy the residence upon completion of construction. Generally, this is limited to one-family dwellings and their detached accessory buildings.

It is illegal for an owner to install electrical wiring in mobile home parks, or recreational vehicle parks, or on property that is rented, leased, or occupied by others.

A **ROUGH-IN INSPECTION** *must* be made before any wiring is covered by insulation, sheetrock, paneling, or other materials. 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 conductors in boxes must be spliced and pigtailed for the rough-in inspection. Where wiring is concealed before inspection, the person responsible for concealing the wiring shall be responsible for all costs resulting from uncovering and replacing the covering material.

A **FINAL INSPECTION** is required when all wiring has been completed and all devices, lighting fixtures, and appliances have been installed and tested.

Every effort is made to perform all inspections the next business day following the request. Inspection requests must be received prior to 4:30 pm if the request is for next day service. Call 507-328-2600 to schedule an inspection or schedule on line at: [www.rochestermn.gov/CitizenAccess](http://www.rochestermn.gov/CitizenAccess). Please have your permit number available if you call. Inspectors work schedules fill up fast at certain times of the year, so if you can call or more than a day in advance you may avoid any potential delays in the progress of your project.

## **PLAN YOUR WIRING PROJECT**

This publication is only intended to be a general overview of residential electrical requirements. No claim is made that this information is complete or beyond question. Additional information and knowledge will be needed to properly install electrical wiring that is essentially free from fire and electric shock hazard. If you have questions after reading this publication please contact one of the Rochester electrical inspectors at 507-328-2600.

### **General Circuitry**

- 1) In addition to the branch circuits installed to supply general illumination and receptacle outlets in dwelling units, the following minimum requirements apply. NEC 210.11, 422.12
  - 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 20-amp circuit for the garage receptacles
  - One separate, individual branch circuit for central heating equipment
- 2) Receptacles installed in the kitchen to serve countertop surfaces shall be supplied by not less than two separate small appliance branch circuits. NEC 210.52(B)(3)
- 3) All conductors of the same circuit, including grounding conductors, shall be contained in the same raceway, cable, or trench. NEC 300.3(B)
- 4) All circuit overcurrent devices shall be legibly identified, as to purpose or use, on a directory located on the face or inside of the electrical panel door. NEC 408.4(A)
- 5) The rating of the fuse or circuit breaker generally determines the minimum size of the circuit conductor, per the following table. NEC 240.4

| 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 special equipment may have overcurrent protection that exceeds the general limitations in the above chart.

- 6) Receptacle outlets shall be of the grounding type, be effectively grounded, and have proper polarity. NEC 406.4

- 7) In all areas specified in 210.52, all non-locking type 125 volt; and 250 volt 15 and 20 amp receptacles, not more than 5 ½' above the floor, shall be listed tamper resistant. NEC 406.12
- 8) Generally, receptacle outlets in habitable rooms shall be installed so that no point along the floor line (measured horizontally) at any wall space is more than 6 feet from a receptacle outlet in that space. A receptacle outlet shall be installed in each wall space 2 feet or more in width. NEC 210.52
- 9) At kitchen, pantry, breakfast room, dining room, and similar area counter tops, receptacle outlets shall be installed so that no point along the wall line (measured horizontally) is more than 24 inches from a receptacle outlet in that space. NEC 210.52
- 10) A receptacle is required for each counter space 12 inches or wider, and at each island counter or peninsular space larger than 12 inches by 24 inches. NEC 210.52
- 11) Receptacles shall not be installed in a "face up" position on work surfaces or countertops, unless listed as receptacle assemblies for work surface or countertop applications. NEC 406.5(E)(F)(6)
- 12) At least one receptacle outlet readily accessible from grade and not more than 6 ½' above grade level shall be installed at the front and back of the dwelling. NEC 210.52
- 13) At least one wall switch-controlled lighting outlet shall be installed in hallways, stairways, attached garages and detached garages with electric power. NEC 210.70
- 14) Where switches control lighting loads supplied by a grounded general purpose branch circuit, the grounded conductor (neutral) for the controlled lighting circuit shall be provided at the switch location. NEC 404.2(C)
- 15) Balconies, decks, and porches that are attached to the dwelling unit and are accessible from inside the dwelling unit shall have at least one receptacle, accessible from, and not more than 6 ½' above, the balcony, deck or porch. NEC 210.52
- 16) Foyers that have an area that is greater than 60 square feet shall have a receptacle located in each wall space 3 foot or more in width that is unbroken by doorways, door-side windows that extend to the floor, and similar openings. NEC 210.52(I)
- 17) In dwellings, GFCI protection shall be provided for all receptacle outlets installed in bathrooms, garages, grade-level portions of unfinished accessory buildings, outdoors, crawl spaces (120 volt crawl space lighting shall be GFCI protected), unfinished basements, laundry areas, kitchen countertops, dishwashers and within 6' of all sinks. NEC 210.8(E)
- 18) All 120 volt, 15 and 20 amp branch circuits, supplying outlets or devices installed in kitchens, family rooms, dining rooms, living rooms, dens, bedrooms, sunrooms,

recreation rooms, closets, halls, laundry areas, or similar rooms or areas shall be protected by arc-fault circuit-interrupter protection. NEC 210.12

- 19) All 125-volt receptacles installed within 6 feet of the inside walls of bathtubs, shower stalls, and hydro massage tubs shall be GFCI protected. NEC 210.8, 680.71
- 20) All electrical equipment associated with a hydro massage bathtub shall be accessible without damaging the building structure or finish. NEC 680.73

The insulating value of human skin is drastically reduced when a person is wet. When installed in the water, in pool walls, on pool decks, or adjacent to swimming, wading, therapeutic, and decorative pools, fountains, hot tubs, spas and hydro massage bathtubs, all electrical wiring and equipment must comply with special requirements in NEC 680.

- 21) All electrical boxes shall be securely supported by the building structure. NEC 314.23
- 22) When boxes are used as the sole support for a ceiling paddle fan, they shall be listed for such use. NEC 314.27(C)
- 23) Type NM (non-metallic) cable shall be secured at intervals not exceeding 4 ½ feet and within 12 inches of each box. However, if a single gang non-metallic device box without a clamp is used, the cable shall be secured within 8 inches of the box. NEC 334.30, 314.17(C)
- 24) The outer jacket of NM cable shall extend into the box a minimum of ¼ inch. NEC 334.17(C)
- 25) At all boxes there shall be a minimum of 6" of free conductor, with at least 3" extending outside the front edge of the box. NEC 300.14
- 26) In both exposed and concealed locations, where cables are installed through bored holes in joists or 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. Where this distance cannot be maintained, the cable shall be protected, from penetration by screws or nails, by a steel plate at least 1/16 inch thick and of appropriate length and width. NEC 300.4
- 27) Metal boxes, cover plates, and plaster rings shall be grounded. Switches, including dimmer switches, shall be grounded and shall provide a means to ground metal plates. NEC 314.4, 404.9
- 28) Unused openings through, which conductors enter boxes, shall be closed in an approved manner. NEC 110.12, 314.17

- 29) Only one conductor shall be installed under a terminal screw of a device. In boxes with more than one grounding wire, the wires shall be spliced with a “wire tail” or “pig tail” and attached to the ground terminal screw of the device. NEC 250.148
- 30) All splices, including ground wires, shall be made with an approved splice cap or “wire nut” and shall be made in approved electrical boxes or enclosures. NEC 110.14, 300.15
- 31) In a completed installation, all outlet boxes shall have a cover, canopy for a light fixture, or device with an appropriate plate. NEC 314.25
- 32) The volume of electrical boxes shall be sufficient for the number of conductors, devices, and cable clamps contained within the box. Non-metallic boxes are marked with their cubic inch capacity. Use the following table to properly calculate box size: NEC 314.16

| <b>Conductor Size</b>                | <b>14 gauge</b> | <b>12 gauge</b> |
|--------------------------------------|-----------------|-----------------|
| For each separate insulated wire     | 2 cu in         | 2.25 cu in      |
| All ground wires (combined)          | 2 cu in         | 2.25 cu in      |
| For each device (switch/receptacle)  | 4 cu in         | 4.50 cu in      |
| All internal cable clamps (combined) | 2 cu in         | 2.25 cu in      |

**Sample Calculation:**

Four #14/2 w/ground cables with 1 switch and 1 receptacle:

|                                |                       |
|--------------------------------|-----------------------|
| Eight insulated wires.....     | 16 cubic inches       |
| All ground wires.....          | 2 cubic inches        |
| One switch.....                | 4 cubic inches        |
| One receptacle.....            | 4 cubic inches        |
| <u>One internal clamp.....</u> | <u>2 cubic inches</u> |
| Minimum box volume required    | 28 cubic inches       |

- 33) Do not conceal junction boxes in walls, ceilings, or non-accessible attics and under-floor areas. NEC 314.29
- 34) Luminaires installed in a clothes closet shall have the following clearances from the defined closet storage space (see the definition below): NEC 410.16
- 12 inches for surface incandescent or LED luminaires, with a completely enclosed light source.
  - 6 inches for recessed incandescent or LED luminaires, with a completely enclosed light source.
  - 6 inches for fluorescent fixture
- 35) Closet storage space, as applied to an electrical installation in a closet, is defined in the National Electrical Code as a volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height of 6 ft. or the highest clothes-hanging rod and parallel to the walls at a horizontal distance of 24 in. from the sides and back of the closet walls respectively, and continuing vertically to the closet ceiling parallel to the walls at a horizontal distance of 12 inches, or the width of the shelf, whichever is greater. NEC 410.2

- 36) Incandescent fixtures with open or partially enclosed lamps and pendant fixtures or lamp holders shall not permitted in clothes closets. NEC 410.16
- 37) Recessed lighting fixtures installed in insulated ceilings or installed within a ½ inch of combustible material shall be labeled as Type IC (insulation contact). In addition, the Minnesota Energy Code requires recessed lighting fixtures in insulated ceilings to be sealed to prevent leakage of airborne moisture. (air tight rating) NEC 410.116

### **Equipment Listing and Labeling**

- 38) All electrical equipment, including material, fittings, devices, apparatus, fixtures, appliances, and utilization equipment, used as part of, or in connection with, an electrical installation shall be LISTED AND LABELED by a nationally recognized testing laboratory (i.e. Underwriters Laboratories, ETL, Canadian Standards Association, etc.) as having been tested and found suitable for a specific purpose. All electrical equipment shall be installed and used in accordance with any instructions included in the listing or labeling. Minnesota Rules 3800.3620, NEC 110.3(B)

### **Underground Wiring**

- 39) Generally, cables approved for direct burial shall have a minimum cover of 24 inches. When wiring is installed at dwellings in approved non-metallic raceways, the minimum cover can be reduced to 18 inches. Clean backfill material shall cover the wiring method. NEC 300.5
- 40) When GFCI protected, a residential branch circuit rated 20 amps or less and 120 volts or less, the minimum cover can be reduced to 12 inches. NEC 300.5

### **Electrical Services**

- 41) Underground service laterals and service entrance conductors shall have their location identified by a ribbon that is placed in the trench at least 12 inches above the underground installation. NEC 300.5
- 42) Anti-oxidant compound shall be used on all aluminum conductor terminations. NEC 110.3 & 110.14
- 43) Service entrance conduits shall be suitable for use in wet locations, arranged to drain, and sealed to prevent moisture condensation. NEC 230.8, 230.54, 300.5(G)

### **Conductor Sizes for 120/240 Volt Single-Phase Dwelling Services / Feeders**

- 44) For service or feeder panel rated 100 through 400 amps, the conductors supplying the entire load associated with a one family dwelling shall be permitted to have an ampacity not less than 83% of the service or feeder rating. NEC 310.15(B)(7)
- 45) When raceways containing ungrounded conductors No. 4 or larger enter a cabinet, box or enclosure; the conductors shall be protected by a conduit bushing or identified fitting providing a smoothly rounded insulating surface. NEC 300.4 (G)



- 46) The electrical 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 conductors. NEC 230.70
- 47) Electrical panels shall be readily accessible and shall not be located in the bathrooms or in the vicinity of easily ignitable materials such as in clothes closets. NEC 230.70, 240.24
- 48) The depth of working space in the direction of access to live parts, when the voltage to ground does not exceed 150 volts, shall be a minimum of 3 feet; the minimum width of working space shall be clear and extend from the floor to a height of 6 ½ feet, or the height of equipment whichever is greater, and shall not be used for storage. All panel board locations shall be provided with illumination. NEC 110.26
- 49) The “footprint” of the panel board (width x depth) from floor to a height of 6 feet above the top of the panel board shall not contain piping or ductwork or any other component foreign to the electrical installation. NEC 110.26(E)

## **Grounding**

- 50) All grounding electrodes that are present at each building or structure served shall be bonded together to form the grounding electrode system. This might include: metallic water pipe, concrete encased electrode, 2 ground rods, etc. NEC 250.50

An additional electrode must supplement the metallic water pipe electrode.

- If reinforcing steel (rebar) is present in the footing of a new building or structure, it must be bonded to the service with a #4 copper maximum. NEC 250.50, 250.52

- 51) The size of the un-spliced grounding electrode conductor is determined by the equivalent size of the service-entrance conductors, per the following chart:  
NEC 250.66

| <b>Equivalent Size of Service Entrance Conductor</b> |          | <b>Size of the Grounding Electrode Conductor</b> |          |
|--|----------|--|----------|
| Copper   | Aluminum | Copper   | Aluminum |
| 4 AWG  | 2        | 8  | 6        |
| 1 AWG  | 2/0      | 6  | 4        |
| 2/0  | 4/0      | 4  | 2        |

- 52) A main bonding jumper (or the green bonding screw, wire or buss bar provided by the panel manufacturer) shall be installed in the service panel to electrically bond the grounded service conductor (neutral) and the equipment grounding conductors to the service enclosure. NEC 250.24

53) The interior metal water piping system must be bonded to the service equipment with a bonding jumper, sized the same as the grounding electrode conductor. (This would be required even if utility water was non-metallic and converted to copper within the dwelling) NEC 250.104

- The grounding electrode serves to route non-system induced current from an over voltage caused by an indirect lightning strike into earth, helping to reduce damage to the electrical system itself.

### **Replacement Receptacles**

54) Where grounding means does not exist in the receptacle enclosure; the installation must comply with 406.4(D) (1-3). (See #55)

- 1) A non-grounding type receptacle may be installed.
- 2) A ground-fault circuit interrupter receptacle may be installed and shall be marked "No Equipment Ground", an equipment grounding conductor shall not be connected from the GFCI receptacle to any outlet supplied from the GFCI.
- 3) A grounding type receptacle when supplied through a ground-fault circuit interrupter receptacle. Grounding type receptacles supplied by a GFCI shall be marked "GFCI Protected" and "No Equipment Ground".

55) Replacement of existing receptacles will need to comply with 406.4(D)(4-6). (See #54)

- 4) Arc-fault circuit interrupter protection shall be applied to the replacement receptacle where required by 210.12(A). (See #18)
- 5) Tamper resistant receptacles shall be provided where replacements are required by 406.12(A). (See #7)
- 6) Weather resistant receptacles shall be provided where required by NEC 406.9(B).