

State of Minnesota
Board of Electricity

Residential Electrical Inspection



Checklist

Generally, **Minnesota law** requires all electrical work to be performed by licensed, bonded and insured electrical contractors and their employees.

Homeowners, within strict limitations, are exempt from electrical licensing.

*An **owner** is a natural person who physically performs electrical work on premises the person owns and actually occupies as a residence or owns and will occupy as a residence upon completion of construction.*

Minnesota Statutes 326.01, Subd. 6e

A separate request for electrical inspection form with the required fees must be submitted to the Board of Electricity at or before commencement of any electrical installation that is required by law to be inspected.

All wiring shall be inspected before it is concealed and the installer shall notify the inspector when the wiring is complete, before the wiring is utilized and the associated space occupied.

When an owner files a Request for Electrical Inspection form and inspection fees with the Board of Electricity or other electrical inspection authority, that person is signing an affidavit that they own and occupy the residence and that they personally and physically will perform all of the electrical work, including the laying out of such work.

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

STATE ELECTRICAL INSPECTORS ARE AVAILABLE WEEKDAYS ONLY
Between 7:00 am and 8:30 am

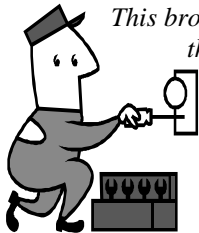
01 **Where wiring is concealed before inspection**, the person responsible for concealing the wiring shall be responsible for all costs resulting from uncovering and replacing the covering material.

Minnesota Rules part 3800.3770

02 Minnesota Rules 3800.3770 **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 wires in boxes must be spliced and pigtailed for the rough-in inspection.

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

PLAN YOUR WIRING PROJECT



This brochure 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 brochure, please reference authoritative publications based on the 2002 National Electrical Code (the NEC).

General Circuitry

03 **NEC 210.11 and 422.12** 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 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

04 **NEC 210.52** Receptacles installed in the kitchen to serve countertop surfaces shall be supplied by not less than two separate small appliance branch circuits.

05 **NEC 300.3** All conductors of the same circuit, including grounding and bonding conductors, shall be contained in the same raceway, cable, or trench.

06 **NEC 408.4** All circuits and circuit modifications shall be legibly identified as to purpose or use on a directory located on the face or inside of the electrical panel doors.

07 **NEC 240.3** The rating of the fuse or circuit breaker generally determines the minimum size of the circuit conductor, per the following table:

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.

08 NEC 406.3 Receptacle outlets shall be of the grounding type, be effectively grounded, and have proper polarity.

09 NEC 210.52 Generally, 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 1.8 m [6'] from a receptacle outlet. A receptacle shall be installed in each wall space 2 feet or more in width.

10 NEC 210.52 At kitchen countertops, receptacle outlets shall be installed so that no point along the wall line is more than 600 mm [24"] measured horizontally from a receptacle outlet in that space.

11 NEC 210.52 A receptacle outlet shall be installed at each counter space 300 mm [12"] or wider, and at each island counter or peninsular space 600 mm [24"] by 300 mm [12"] or larger. Countertop spaces separated by, range tops, sinks or refrigerators are separate spaces

12 NEC 210.52 Outdoor receptacles, accessible at grade level and no more than 2 m [6.5'] above grade, shall be installed at the front and back of a dwelling.



13 NEC 210.12 All branch circuits supplying 125-volt, 15 and 20 ampere outlets in dwelling unit bedrooms shall be protected by a listed arc-fault circuit interrupter device. Generally, these are circuit breaker type devices and cannot be installed on multi-wire branch circuits.



Ground-Fault Protection

14 NEC 210.8 At dwellings, ground-fault circuit-interrupter (GFCI) protection shall be provided for all receptacle outlets installed in bathrooms, garages, grade-level portions of unfinished accessory buildings, crawl spaces, unfinished basements, kitchen countertops, wet-bar sinks, boathouses and outdoors. Receptacles that are not readily accessible may be exempt from the GFCI requirement.



15 NEC 680.71 A hydromassage bathtub, (defined as a permanently installed bathtub with a re-circulating piping system, designed to discharge water upon each use, and its associated components] shall have ground-fault circuit-interrupter protection.

16 NEC 680.71 All 125 volt receptacles not exceeding 30 amperes installed within 5 feet of the inside walls of the hydromassage bathtub shall be GFCI protected.

17 NEC 680.71 All equipment associated with a hydromassage bathtub shall be accessible without damaging the building structure or finish.

NEC Article 680 contains the specific requirements for the installation of electrical wiring for, or adjacent to swimming pools, spas, hot tubs and fountains. These criteria were developed to help protect against the hazards of electricity and conductive pool water and **they exceed standard wiring requirements.**

Wiring Methods

18 NEC 314.23 All electrical boxes shall be securely supported by the building structure.

19 NEC 314.27 When boxes are used as the sole support for a ceiling paddle fan, they shall be listed and labeled for such use.

20 **NEC 334.30** Type NM (nonmetallic) cable shall be secured at intervals not exceeding 1.4 m [4.5'] and within 300 mm [12"] of each box.

21 **NEC 314.17** The outer jacket of NM cable shall extend into the box a minimum of ¼ inch.

22 **NEC 300.14** The minimum length of conductors, including grounding conductors, at all boxes shall be 150 mm [6"]. At least 75 mm [3"] shall extend outside the box.

23 **NEC 300.4** Where cables are installed through bored holes in joists, rafters, 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, or where screws or nails are likely to penetrate the cable, it shall be protected by a steel plate at least 1.6 mm [1/16"] thick and of appropriate length and width.



23 **NEC 300.22** Type NM cable shall not be installed in spaces used for environmental air, however NM is permitted to pass through perpendicular to the long dimension of such spaces.

25 **NEC 250.134; 314.4; 404.9** All electrical equipment, metal boxes, cover plates, and plaster rings shall be grounded. All switches, including dimmer switches, shall be grounded.

26 **NEC 110.12 & 314.17** Unused openings in boxes shall be effectively closed. When openings in non-metallic boxes are broken out and not used, the entire box must be replaced.

27 **NEC 110.14** Only one conductor shall be installed under a terminal screw. In boxes with more than one ground wire, the ground wires shall be spliced with a "wire tail" or "pig tail" attached to the grounding terminal screw of the device.

28 **NEC 110.14 & 300.15** Splices shall be made with an approved splice cap or "wire nut" and shall be made in approved electrical boxes or enclosures. Wire splicing means for direct burial shall be identified for such use.

29 **NEC 314.25 & 410.12** In a completed installation, all outlet boxes shall have a cover, lamp-holder, canopy for a luminaire, or device with an appropriate cover plate.

30 **NEC 314.19** Junction boxes shall be installed so that the wiring contained in them can be rendered accessible without removing any part of the building.

31 **NEC 314.16** The volume of electrical boxes shall be sufficient for the number of conductors, devices, and cable clamps contained within the box. Nonmetallic boxes are marked with their cubic inch capacity. Use the following table to properly calculate box size:

Conductor Size	14 gauge	12 gauge
For each separate insulated wire	32.8 cm ³ 2 in ³	36.9 cm ³ 2.25 in ³
All ground wires (combined)	32.8 cm ³ 2 in ³	36.9 cm ³ 2.25 in ³
For each device (switch/receptacle)	65.6 cm ³ 4 in ³	73.8 cm ³ 4.4 in ³
All internal cable clamps (combined)	32.8 cm ³ 2 in ³	36.9 cm ³ 2.25 in ³

Sample Calculation: Four 14/2 w/ground NMB cables

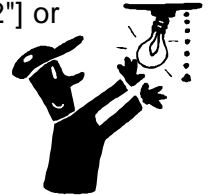
8 insulated wires	262.4 cm ³	16 in ³
All ground wires	32.8 cm ³	2 in ³
1 switch	65.6 cm ³	4 in ³
1 receptacle	65.6 cm ³	4 in ³
All clamps (combined)	32.8 cm ³	2 in ³
Total box volume required	426.4 cm ³	28 in ³

32 NEC 410.8 Luminaires (lighting fixtures) installed in clothes closets shall have the following minimum clearances from the defined storage area (see the definition below):

- 300 mm [12"] for surface incandescent fixtures
- 150 mm [6"] for recessed incandescent fixtures
- 150 mm [6"] for for fluorescent fixtures

33 NEC 410.8 Storage space, as applied to an electrical installation in a closet, is the volume bounded by the sides and back closet walls and planes extending from the closet floor vertically to a height of 1.8 m [6 ft] or the highest clothes-hanging rod and parallel to the walls at a horizontal distance of 600 mm [24"] 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 300 mm [12"] or the shelf width, whichever is greater.

34 NEC 410.8 Incandescent luminaires with open or partially enclosed lamps and pendant fixtures or lamp-holders are not permitted in clothes closets.

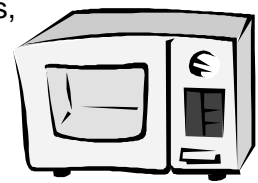


35 NEC 410-66 Recessed lighting fixtures installed in insulated ceilings or installed within 13 mm [1/2"] of combustible material shall be approved for insulation contact and labeled Type IC.

The Minnesota Energy Code, part of the State Building Code, requires penetrations into exterior walls and ceilings to be sealed to prevent the leakage of airborne moisture into unheated spaces.

Equipment Listing and Labeling

36 Minnesota Rules 3800.3620 All electrical equipment, including luminaires, devices, and appliances shall be LISTED AND LABELED by a nationally recognized testing laboratory (NRTL) as having been tested and found suitable for a specific purpose. Underwriters Laboratories (UL) and the Canadian Standards Association (CSA) are two of the recognized agencies.



37 NEC 110.3 All electrical equipment shall be installed and used in accordance with the listing requirements and manufacturer's instructions.

Electrical Services



38 **NEC 310-15** CONDUCTOR SIZES FOR 120/240 VOLT 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

39 **NEC 110.14** Conductors of dissimilar metals shall not be intermixed in a terminal or splicing device unless the device is listed for the purpose. Listed anti-oxidant compound shall be used on all aluminum conductor terminations, unless information from the device manufacturer specifically states that it is not required.

40 **NEC 300.7** Portions of raceways and sleeves subject to different temperatures (where passing from the interior to the exterior of a building) shall be sealed with an approved material to prevent condensation from entering the service equipment.

41 **NEC 230.54** Where exposed to weather, service entrance conductors shall be rain-tight and arranged to drain.

42 **NEC 300.4** Where raceways containing ungrounded conductors No. 4 or larger enter a cabinet, box, or enclosure, the conductors shall be protected by a conduit bushing providing a smoothly rounded insulating surface.

43 **NEC 230.70** 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-entrance conductors.

44 **NEC 230.70 & 240.24** Electrical panels shall be readily accessible and shall not be located in bathrooms or in the vicinity of easily ignitable materials such as clothes closets.

45 **NEC 110.26** Sufficient working space shall be provided around electrical equipment. When the voltage to ground does not exceed 150 volts, the depth of that space in the direction of access to live parts, shall be a minimum of 900 mm [3']. The minimum width of that space in front of electrical equipment shall be the width of the equipment or 750 mm [30"] whichever is greater. This workspace shall be clear and extend from the floor to a height of 2 m [6½ ']. This space shall not be used for storage.

46 **NEC 110.26** All work spaces shall be provided with illumination.

Grounding

47 **NEC 250.50** A premises electrical service shall be connected to a grounding electrode system consisting of a metal underground water pipe in direct contact with earth for 3.0 m [10'] or more, if available on the premises, and supplemented by a rod, pipe, or plate electrode.

An additional electrode must supplement the buried water pipe electrode.

48 **NEC 250.64 & 250.66** The grounding electrode conductor shall be unspliced. The size is determined by the size of the service-entrance conductors, per the following chart:

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

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

49 **NEC 250.28** A main bonding jumper or the green bonding screw provided by the panel manufacturer shall be installed in the service panel to electrically bond the grounded service conductor and the equipment grounding conductors to the service enclosure.

50 **NEC 250.104** 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

51 **NEC 300.5** 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)
600 mm [24"]	150 mm [6"]	450 mm [18"]
Residential branch circuits rated 20 amps or less at 120 volts or less and with GFCI protection at their source are allowed a minimum cover of 300 mm [12"]		

NOTE: *the above table does not apply to underground wiring supplying outdoor pools, spas, or hot tubs.*

52 **NEC 300.5** Underground service laterals shall have their location identified by a warning ribbon placed in the trench at least 300 mm [12"] above the underground installation.

53 **NEC 300.5** Where subject to movement, direct buried cables or raceways shall be arranged to prevent damage to the enclosed conductors or connected equipment.

54 **NEC 300.5** Conductors emerging from underground shall be installed in rigid metal conduit, intermediate metal conduit, or Schedule 80 rigid nonmetallic conduit to provide protection from physical damage. This protection shall extend from 450 mm [18"] below grade or the minimum cover distance to the point of termination above ground.

Board of Electricity Electrical Inspection Fees

per Minnesota Statutes 326.2441

The fee for each separate inspection of an installation, replacement, alteration, or repair is \$20.

The inspection fee for the installation, addition, alteration, or repair to a service, change of service, temporary service, generator or other power supply source or feeder shall be per the chart below.

	Each Service, Generator or Other Source of Supply	
	0 to and including 400 amps @ \$25	
	401 to 800 amps @ \$50	

The inspection fee for the installation, addition, alteration, or repair of each circuit or feeder, feeder tap, or set of transformer secondary conductors including the equipment served, shall be per the chart below:

	Each Circuit or Feeder	
	0 to and including 200 amps @ \$5	
	Over 200 amps @ \$10	

The TOTAL fee cannot be less than \$20 for each required inspection trip.

ONE & TWO FAMILY DWELLINGS, EACH UNIT Includes the Service / Power Supply up to 500 Amperes, All Circuits, and Two Inspection Trips		
	Each Dwelling Unit @ \$80	
	Additional Inspection Trips @ \$20	

- **Example 1:** For a residential air conditioner installation involving one circuit and one inspection trip the electrical inspection fee is \$20, the minimum fee.

For a project where more circuits or feeders (rated less than 200 amps) are involved, the fee is calculated by multiplying the number of circuits installed or altered by \$5.

- **Example 2:** For a detached structure that involves the installation of a feeder (\$25) and 2 circuits (\$10) requiring an inspection of the wiring to be concealed and a final inspection, the inspection fee is \$40, the cost of two inspection trips. The \$40 fee includes the \$10 fee for the circuits.

Whenever a re-inspection is necessary to determine whether unsafe conditions have been corrected, a re-inspection fee of \$20 will be assessed in writing by the inspector. The above fees apply generally. Fees for other specific types of installations apply as identified in Minnesota Statutes 326.2441

State of Minnesota Board of Electricity

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