

North Dakota State Electrical Board

Good morning, representing the North Dakota State Electrical Board this morning is myself, James Schmidt, executive director and Scott Halle, Training Compliance Administrator.

The NDSEB strives to operate in a cooperative, respectful, and safe work environment at all levels and we trust that your working relationship with NDSEB has been or will be positive, respectful, and satisfying experience.

At NDSEB, our mission is to ensure safety and protect life, health, and property in the daily use of electricity. We accomplish this mission by fulfilling three primary accountabilities:

1. Examine applicants and issue licenses to those individuals who have the necessary qualification and knowledge in the laws of electricity and electrical codes.
2. Inspect all electrical installations and take disciplinary action as required.
3. Offer electrical continuing education to licensees to promote quality electrical contracting.

Our office currently consists of 12 inspection districts across North Dakota with the board allowing 4 cities (Fargo, Grand Forks, Bismarck, Minot) to have their own city inspectors. As of December 1, 2021, we currently license 8,620 ND electricians and have 13,608 active electrical wiring certificates.

Two Legislative sessions ago the NDSEB persuaded the legislature to allow the board the ability to expend funds to educate and promote the electrical industry in ND. This legislation allowed the board to give each apprentice enrolled in an approved program \$500/semester each school year. The session also allowed the board to create an education committee to oversee electrical educational training for electricians to assure the educational materials contain valid useful materials.

Some items asked ahead of time:

1. Electrical Vehicles – Electrical must be installed according to the charging and capacity requirements of the system
2. Grounding v. bonding – Code has clarified definitions and requirements to make them easier to understand and properly apply to different installations.
3. Retrofitting older homes – Contact a licensed contracting electrician to assess the home before retrofit begins
4. Diversifying/increasing chargers relative to construction - ????
5. Trends and expectations in codes – Codes will be adapting to new and changing technology in the industry both from an efficiency and safety standpoint
6. Consistency in code enforcement - The 12 state & the 4 city inspectors meet bi-monthly to discuss code changes, how each inspector is to do an inspection so all electrical inspections across the state are consistent.

North Dakota State Electrical Board

7. Cost/risk of non-compliance – Call backs are always lost revenue so knowing and following applicable codes will reduce the frequency of those losses. If someone is injured due to a noncompliant installation, possible litigation expenses could result.
8. The most significant/profound changes that will likely catch builders and electricians off-guard – 2020 NEC has several new codes for residential installations such as.
 - a. Emergency disconnects for 1 & 2 family dwellings
 - b. Expansion of GFCI requirements
 - c. Single disconnect requirement for service enclosures
9. What's in-store for fleets/construction equipment etc., etc. – Not sure what the questions pertains too.

Laws, Rules & Wiring Standards of ND Amendments

Laws, Rules & Wiring North Dakota Standards that exempt or relax NEC requirements

- 1) 24.1-06-02-10(6) Fifteen and twenty ampere receptacles supplying sewer pumps and sump pumps shall not need arc fault circuit protection but shall be ground fault protected or a single receptacle on a dedicated circuit.
- 2) 24.1-06-02-10(7) Fifteen and twenty ampere receptacles supplying power for garage door openers located in attached or detached garages associated with dwelling units shall be ground fault protected or a single receptacle installed.
- 3) 24.1-06-02-10(9) 210.11(C)(4) requirements shall not include buildings 250 square feet or smaller.
- 4) 24.1-06-02-10(10) AFCI protection shall not be required for:
 - a. Refrigeration appliances if a single receptacle on a dedicated circuit is installed
 - b. Furnaces used for main heating source.
- 5) 24.1-06-02-30 230.67 Surge protection for dwelling unit services is not required.
- 6) 24.1-06-03-01 A site-isolating device shall be permitted to be installed at the distribution point where two or more agricultural building structures are supplied from the distribution point.
- 7) 24.1-06-04-22 Exception: 422.16 The use of not more than 6 feet of flexible appliance cord shall be permitted on permanently installed 120-volt 20 amp or less fuel fired furnaces in residential dwellings. The receptacle for this appliance shall be GFCI protected, or a single receptacle, with a lockable in-use cover, and the cord shall meet all requirements of NEC 422.16.
- 8) 24.1-06-06-25 Overcurrent protection for feeders and branch circuits supplying vehicle charging equipment shall have a rating of not less than 125 percent of the maximum load of the equipment. For these installations, maximum load of equipment means the setting the electrician adjusted the device to. The adjustment shall not be readily accessible or easily adjusted by the consumer and shall be labeled accordingly.

Laws, Rules & Wiring North Dakota Standards additional requirements to the NEC

- 1) 24.1-06-01-10(1) Wiring systems shall have sufficient capacity to not exceed a 5% voltage drop at the furthest outlet of power.
- 2) 24.1-06-01-10(2) All wiring materials and equipment shall be listed by nationally recognized testing laboratories to safeguard persons and property.
- 3) 24.1-06-01-10(4) Overhead conductors shall not cross over water wells or know sites where water wells may be drilled.
- 4) 24.1-06-01-10(6) Aluminum conductors in sizes smaller than #6 shall not be used.

Laws, Rules & Wiring Standards of ND Amendments

- 5) 24.1-06-01-10(7) All new construction shall follow the energy efficient related requirements for design and construction of buildings in accordance with the locally adopted codes or the North Dakota State Building Code. (Vapor Boxes)
- 6) 24.1-06-01-40(1)(b) An approved heat alarm shall be installed in the attached single tenant garage of a residence and interconnected with the smoke alarms within the residence.
- 7) 24.1-06-02-10(2) In a dwelling unit, a separate circuit with disconnect shall be provided for the purpose of operating or controlling electrical equipment for primary source heating units.
- 8) 24.1-06-02-10(3) A minimum of six 20-amp small appliance branch circuits shall be installed in kitchens that may be used for public gatherings at schools, churches, lodges, and similar buildings.
- 9) 24.1-06-02-10(4) In dwelling occupancies, a minimum of three (NEC requires two) 20-amp small appliance branch circuits shall be installed to supply receptacle outlets in kitchen, pantry, dining room, and breakfast room. Two of these circuits shall supply receptacle outlets on or near work counter area and so arranged that adjacent receptacles are not on the same circuit.
- 10) 24.1-06-02-10(5) In dwelling occupancies one 20-amp bathroom circuit for receptacles shall not feed more than two bathrooms.
- 11) 24.1-06-02-10(8) Portable cleaning equipment receptacles shall be installed in corridors and located so that no point in the corridor along the floor line is more than twenty-five feet from an outlet.
- 12) 24.1-06-02-30(1) Perpendicular mast used for support of a service shall not be less than 2-inch galvanized rigid steel conduit or intermediate metal conduit, fitted with storm collar flashing.
- 13) 24.1-06-02-30(2) Outside switch location, in no case shall the equipment be mounted lower than two feet above grade level.
- 14) 24.1-06-02-30(4)
 - a) A hundred ampere main house panel shall contain provisions for a minimum of twenty full sized branch circuit spaces.
 - b) A greater than one hundred ampere but less than two hundred ampere main house panel shall contain provisions for a minimum of thirty full sized branch circuit spaces.
 - c) A two hundred ampere or larger main house panel shall contain provisions for a minimum of forty full sized branch circuit spaces.
 - d) Service and feeder calculations for electric heating loads shall be sized to one hundred twenty five percent of the full load rating.
- 15) 24.1-06-02-40(1) Exterior overcurrent devices shall be located at a height of no less than two feet to the bottom of the enclosure.
- 16) 24.1-06-02-40(2) Switchboards and panelboards shall not be in bathrooms, clothes closets, stairways, or crawl space.

Laws, Rules & Wiring Standards of ND Amendments

- 17) 24.1-06-02-50(1) At motor connections, a bonding jumper sized in accordance with Table 250.122 shall be provided around all flexible conduit except where a separate grounding conductor is included.
- 18) 24.1-06-02-50(2) Metal lighting standards shall be connected to a one-half inch by ten-foot copperweld ground rod or twenty feet of electrically conductive coated steel reinforcing bars or rods.
- 19) 24.1-06-02-50(3) The grounding electrode conductor shall be connected to the grounded service conductor in the enclosure for the service disconnect.
- 20) 24.1-06-03-01(2) Electric metallic tubing shall not be used in concrete below grade, in concrete slab or masonry in direct contact with earth.
- 21) 24.1-06-03-01(7) Metal raceways or metal clad cable (type MC) rated for the environment shall be installed in:

d. Places of assembly

~~e. dormitories designed to house more than sixteen people. (requirement removed @ 1-27-21 board meeting)~~

- 22) 24.1-06-03-14(1) Not more than one extension ring may be used on outlet boxes without special permission from the electrical inspector having jurisdiction.
- 23) 24.1-06-03-14(2) Boxes or conduit bodies shall be installed at each opening, splice, or connection except as provided in Article 604, 2020 edition, NEC.
- 24) 24.1-06-05-01(3) Surge arrestors shall be provided for all services in grain elevators.
- 25) ~~Only electricians may be allowed to install class 2 or 3 communication control wiring (i.e. Cat 5, cat 6 or similar) for HVAC equipment. (by policy 1-27-21 board meeting).~~
- 26) ~~Only electricians may be allowed to install class 2 or 3 control wiring (i.e. 0 - 30 volts) for HVAC equipment. (by policy 1-27-21 board meeting).~~

Laws, Rules & Wiring North Dakota Standards clarification only, refer to other codes or standards for requirements

- 1) 24.1-06-01-10(3) When wiring in public school buildings, approval shall be received from the department of public instruction and the board.
- 2) 24.1-06-01-10(5) In the wiring of nursing homes and hospitals, reference shall be made to the state department of health for special requirements pertaining to operating rooms, delivery rooms, and emergency lighting.
- 3) 24.1-06-01-20 Water damaged electrical equipment wiring and equipment exposed to water damage shall comply with the following:
 - 1. Provides list of equipment that must be replaced when water damaged and provides a list of equipment that may be reconditioned by an approved agency or be replaced.

Laws, Rules & Wiring Standards of ND Amendments

2. Electrical wiring may require replacement depending on type and listing.
3. Splices and terminations shall be checked for compliance with NEC 110.14.
4. Submerged energized panels must be deenergized.

Other recommendations can be found in "Guidelines for Handling Water Damaged Electrical Equipment" published by the national electrical manufacturers association (NEMA).

- 4) 24.1-06-01-30 The purpose of this section is to provide marking of means of egress, illumination of means of egress, and emergency lighting of means of egress. Installations shall comply with the requirements of NFPA 101 Life Safety Code.
- 5) 24.1-06-01-40 Alarm systems stated in this section shall be installed in accordance with the locally adopted codes or the North Dakota State Building Code and state fire code under the supervision of a master or class B electrician.
 1. Reiterates the requirements for smoke alarms, where required and the locations they shall be installed to match requirements found in the residential building code.
 2. Apartment house, hotels and congregate residences shall be provided with a manual and automatic fire alarm system in accordance with the requirements of locally adopted codes or North Dakota State Building Code and state fire codes.
 3. An approved carbon monoxide alarm shall be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units within which fuel-fired appliances are installed and in dwelling units that have attached garages.
- 6) 24.1-06-02-10(1) The total connected load shall be divided as evenly as practicable between the two ungrounded conductors of a three-wire system and three conductors of a four-wire wye system.
- 7) 24.1-06-02-30(3) All services in one-family dwellings shall be located in a single accessible location.
- 8) 24.1-06-02-30(4) Any new or old single-family dwelling where the main house panel or service is altered or repaired, the dwelling is moved, or where the dwelling is rewired, a minimum one hundred ampere service rated panel shall be installed. Replacement of service mast or meter enclosure is an alteration of the service.
- 9) 24.1-06-02-30(5) For the purpose of separating services within one building, each portion of a building separated by one or more fire walls shall be considered a separate building as defined by current state or locally adopted building code.
- 10) 24.1-06-03-01(4) Installation of rigid nonmetallic conduit shall comply with the provision of Article 352, 2020 edition National Electrical Code. When installed outdoors and above grade, one hundred forty degrees Fahrenheit shall be considered the minimum change in degrees.

Laws, Rules & Wiring Standards of ND Amendments

- 11) 24.1-06-03-01(5) Fertilizer rooms, meatpacking plants, salt processing plants, and similar locations are judged to be occupancies where severe corrosive conditions are likely to be present.
- 12) 24.1-06-03-01(6) In any room where the sheetrock or wall covering has been removed from all walls, the electrical wiring requirements shall comply with the provision's of 2020 edition National Electrical code.
- 13) 24.1-06-05-01(1) Classification of hazardous locations is required to be completed by owner, representative or engineer that has the qualifications and shall provide documentation as required by Article 500.4 2020 National Electrical Code.
- 14) 24.1-06-05-01(2) For classification of oilfield installations refer to API RP 500 Classification of Locations for Electrical Installations at Petroleum Facilities.
- 15) 24.1-06-05-01(4) Hot bearing or other similar detection systems shall be installed in accordance with Articles 500-516, 2020 edition, National Electrical Code.
- 16) 24.1-06-05-50 Service equipment may be installed on manufactured homes as required in 550.32(B) if the following requirements are met:
 1. The mobile home is located on property owned by homeowner and not in a mobile home park.
 2. The mobile home is secured to a permanent foundation that complies with locally adopted codes or North Dakota State Building Code.



Minnesota's Electrical Licensing and Inspection Program

Minnesota Electrical Act

- A set of Statutes (Laws) pass by the MN Legislature to help ensure safe electrical installation within the State of Minnesota.

<u>326B.31</u>	DEFINITIONS.	<u>326B.36</u>	INSPECTION.
<u>326B.32</u>	BOARD OF ELECTRICITY.	<u>326B.37</u>	INSPECTION FEE SCHEDULE.
<u>326B.33</u>	LICENSES.	<u>326B.38</u>	MANUFACTURED ELECTRICAL PARTS; EXEMPTION.
<u>326B.34</u>	ALARM AND COMMUNICATION SYSTEMS.	<u>326B.399</u>	CITATION.
<u>326B.35</u>	SAFETY STANDARDS.		

- Also, a set rules put into place to help the Department enforce those statutes

Minnesota Rules Chapter 3800

Title: Licensing Rules

Authority: Board of Electricity

Minnesota Rules Chapter 3801

Title: Electrical Procedures and Training

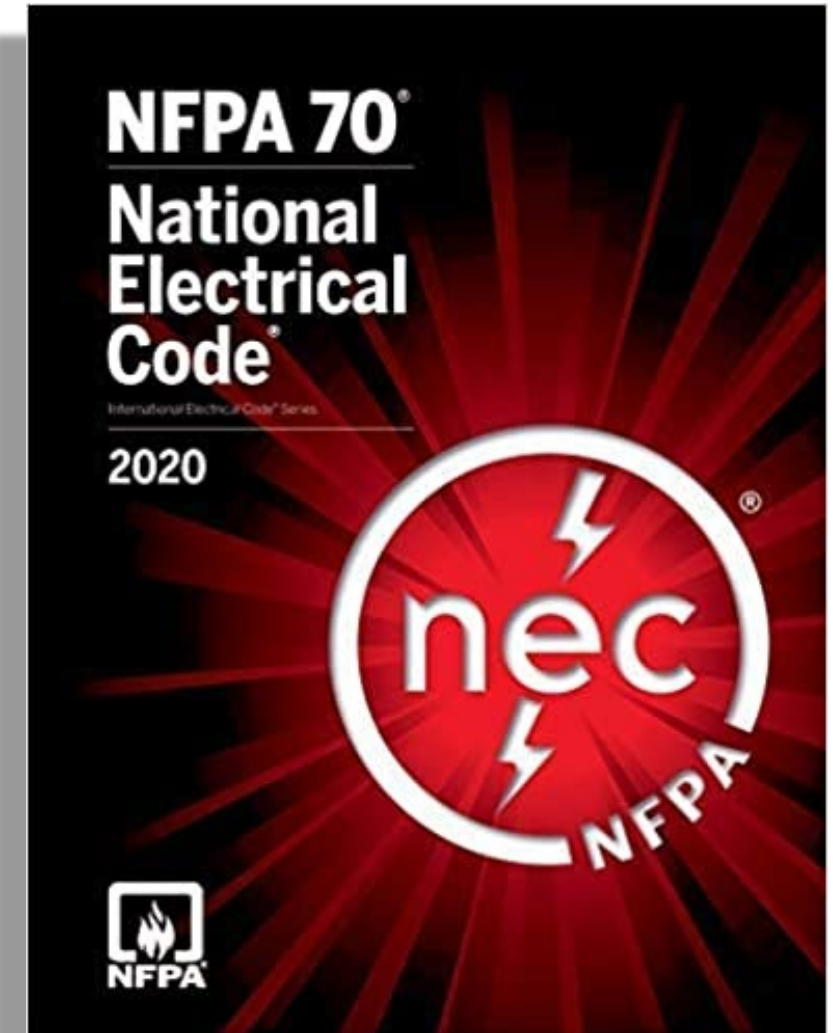
Authority: MN Department of Labor & Industry

<https://www.dli.mn.gov/business/electrical-contractors/electrical-laws-and-rules>

Regulate the Licensing and Inspection Laws...

Inspections: January 1 thru December 14, 2021.

- 126,469 state permits filed
- 170,604 state electrical inspections
- 22,849 corrections were issued
- 2,412 Solar permits (Approx. 100 MW)



Electrical Licensing:

- 2,400+ Electrical Contractors
- 1,200+ Technology System Contractors
- 6,000+ Master electrician licenses
- 10,000+ Journeyworker Licenses
- 5,000+ Power Limited Technician Licenses
- 15,000+ Registered Unlicensed Individuals
- ...in addition to hundreds of licenses in several other classifications



Board of Electricity

- Established by the legislature in 1899
- 12 members appointed by the Governor
 - 1 DLI Commissioner/Designee
 - 1 Electrical inspector
 - 2 Rural electric utility
 - 2 Master electrician/contactor
 - 2 Journeyworker electrician
 - 1 Electrical engineer
 - 2 Power limited technician/contractor
 - 1 General public
- Adopts the National Electrical Code (NEC) every 3 years



- Reviews formal interpretation requests
- Adopts rules related to licensing and continuing education
- Reviews and approves multi-state license reciprocity agreements
- Recommends fees for licenses and certifications

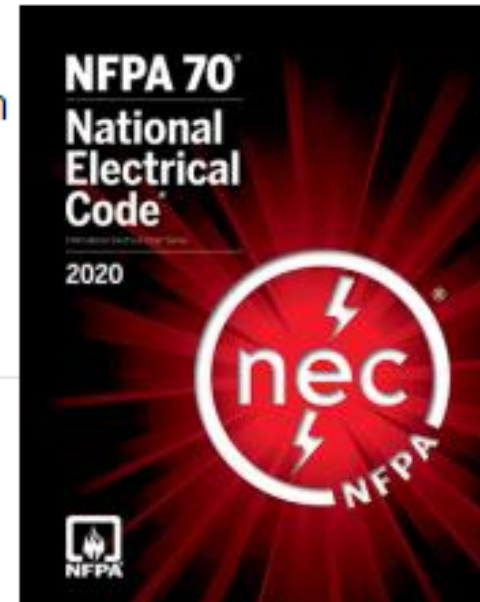
2020 NEC Adoption - November 17, 2020

ELECTRICAL CODES AND STANDARDS

2020 NEC update

The [Board of Electricity](#) adopted the 2020 National Electrical Code (NEC) with an effective date of Nov. 17, 2020. Accordingly, the Department of Labor and Industry began enforcing the 2020 NEC on Nov.17, 2020. Electrical work authorized by permits issued on or after this date must comply with the 2020 NEC. Electrical license examinations are based on the requirements of the 2020 NEC beginning Jan. 1, 2021.

Chapter 1315 of the Minnesota State Building Code adopts a national standard for the installation of electrical wiring, apparatus and equipment for electric light, heat, power, technology circuits and systems, and alarm and communication systems. Minnesota's electrical code consists of the National Electrical Code (NEC) as published by the National Fire Protection Association (NFPA). [View electrical laws and rules.](#)



2020 inspection data

Ranking	NEC Code Section	Topic	Reference No. of Times	Homeowner Percentage	Dwellings
1.	210.8	GFCI	1350	33%	95%
2.	210.52(A)	Receptacle Spacing	940	60%	All
3.	300.4	Cable Protection	880	60%	91%
4.	210.12	AFCI	797	54%	All
5.	110.3	Listing and Labeling	693	31%	66%
6.	250.53	Supplemental Grounding Electrode	642	42%	87%
7.	408.4	Panel Directory	540	25%	63%
8.	250.94	IBT	511	23%	80%
9.	406.4	Receptacle Replacements	483	70%	96%
10.	250.24	Service Bonding	459	24%	72% ⁸

Consistency.... 2020 NEC FAQ

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2020 NEC

- 2020 NEC Frequently Asked Questions
- [Chart of 2020 NEC Errata and Tentative Interim Amendments](#)
- [2020 Residential Inspection Checklist](#)
- [Free access to the 2020 National Electrical Code](#) (must create a free NFPA account for access)



2020 NEC Changes

Important: Please refer to the 2020 National Electrical Code for detailed information

1. 210.8(A) GFCI Protection for Personnel: Dwelling Units

The changes in 210.8(A) will result in all 125-volt through 250-volt receptacles installed at dwelling units supplied by single-phase branch circuits rated 150-volts or less to ground be provided with ground-fault circuit-interrupter (GFCI) protection for personnel. During the 2020 NEC cycle it was substantiated that 250-volt receptacle outlets present similar shock hazards as 125-volt receptacle outlets. This change will impact the typical 240-volt receptacle outlets for cord-and-plug connected dryers, ranges, ovens or similar appliances. This new addition of 250-volt receptacles, and the removal of any ampere limitation, will require GFCI protection for commonly used receptacle outlets in the specified areas of 210.8(A)(1) through (A)(11):

Bathrooms, Garages and Accessory Buildings, Outdoors, Crawl Spaces, Basements, Kitchens, Sinks, Boathouses, Bathtubs and Shower Stalls, Laundry Areas, Indoor Damp and Wet Locations.

Also, (A)(2) for basements previously only required GFCI protection in unfinished areas; (A)(2) requires all receptacle outlets in basements (area below grade level) to be GFCI protected, regardless if the basement is finished or unfinished. During the 2020 NEC code cycle it was substantiated that conductive floor surfaces prone to damp, wet or flooded conditions may exist in both finished and unfinished basements. The potential for electrical hazards and risk of a shock hazard exists regardless of unfinished or finished surfaces.

2. 210.8(B) Ground-Fault Circuit-Interrupter Protection for Personnel: Other than Dwelling Units

In 210.8(B)(2), a change to the way kitchen areas are viewed will further expand the requirements for ground-fault protection for personnel.

All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amps or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amps or less, shall have ground-fault circuit-interrupter protection when installed in kitchens or areas with a sink and permanent provisions for either food preparation or cooking.

As in other editions of the NEC, the kitchen area must include a sink; however, GFCI protection will be required where employees either cook or prepare food to serve customers.

This section **would** apply to:

- Coffee shops that serve food, candy, ice cream shops, and sandwich shops, etc. where the selling of the products and business services are regulated by the Department of Health or others.

Code

2020

Thank you!

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This section **would** apply to:

- Coffee shops that serve food, candy, ice cream shops, and sandwich shops, etc. where the selling of the products and business services are regulated by the Department of Health or others.

This section **would not** apply to:

- Convenience stores and other similar locations where customers are serving themselves or purchasing pre-packaged food for consumption. These facilities would generally not be considered permanent food preparation or cooking areas. Reheating or heating prepared foods or keeping cooked foods warm or hot with portable appliances will not be considered permanent provisions for cooking.

However, if there is a sink in close proximity of the various appliances, those receptacles mentioned above and within six feet of the top inside edge of the sink would require ground-fault circuit-interrupter protection per 210.8(B)(5).

3. 210.8(F) Ground-Fault Circuit-Interrupter Protection for Personnel: Outdoor Outlets

GFCI protection is required on dwelling unit outdoor outlets* supplied by single-phase branch circuits rated 150-volts or less to ground, and 50-amperes or less. NEC 210.8(F) is only applicable to readily accessible outdoor equipment outlets. The intent of the requirement is to protect individuals who may come into contact with outdoor equipment that is likely to become energized. This change will mostly impact outdoor heat pumps, air-conditioning units and similar equipment. There is an exception that excludes outdoor lighting outlets from having to be GFCI protected.

210.8(F) is **not applicable** to:

- Outdoor outlets that are not readily accessible such as a submersible well pumps, sewer lift pumps, load management controllers, surge protection devices, or similar equipment.
- Existing outdoor outlets and the supplied equipment:
 - Replacement or repair of existing outdoor readily accessible electrical equipment utilizing the same feeder or branch circuit conductors.
 - Replacement or repair of the existing outdoor disconnect, or the replacement of the electrical conductors and raceway (whip) from the disconnect to the electrical equipment.

Note: 240-volt, single phase, GFCI breakers must have a neutral extended to the circuit breaker for the breaker to operate properly.

The NEC has separate rules for fixed outdoor electric deicing and snow-melting equipment, and similarly for electric heat tracing equipment.

*Recall that NEC Article 100 defines an "Outlet" as a point on the wiring system at which current is taken to supply utilization equipment. The term "outlet" is often misused to refer to receptacles. Receptacle outlets are only one type of outlet. Other types of outlets include lighting outlets, appliance outlets, smoke alarm outlets, equipment outlets and so on.

4. 210.11(C)(4) Garage Branch Circuits

This rule was clarified to emphasize that the required 120-volt, 20-ampere branch circuit shall be installed to supply receptacle outlets required by 210.52(G)(1) for attached garages and in detached garages with electric power. In other words, garage receptacle outlets that are not required by 210.52(G)(1) do not have to be supplied by this dedicated 120-volt, 20-ampere branch circuit, or even be supplied by a 20-ampere rated branch circuit. Additional convenience receptacle outlets could be supplied by either a 15-ampere or 20-ampere rated branch circuit. Also, there is no prohibition to extend the required 20-ampere branch circuit to other receptacles in the garage (above 5.5-feet). The required 20-ampere branch circuit shall have no other outlets (such as lighting outlets). The exception also allows outdoor readily accessible receptacle(s) to be on the required garage 20-ampere branch circuit(s).

5. 210.52(C)(1-3) Receptacles in Wall Spaces, Island and Peninsular Countertops and Work Surfaces

During the 2020 NEC code cycle, a new method was introduced for determining the quantity of receptacle outlets for kitchen island or peninsular countertop work surfaces. The former horizontal measurement method has been changed to a square-foot calculation method. When determining the quantity of receptacles required, one receptacle outlet is required for the first 9 square feet of countertop work surface, or fraction thereof, and an additional receptacle outlet is required for each additional 18 square feet, or fraction thereof. See the examples in the table below.

Total Square Footage of Countertop (Examples)	Minimum Quantity of Receptacle Outlets
8 square feet At least one receptacle outlet for the first 9 square feet, or fraction thereof	One (1) receptacle outlet 8 sq. ft. is less than 9 sq. ft. (a fraction thereof)
9 square feet At least one receptacle outlet for the first 9 square feet, or fraction thereof	One (1) receptacle outlet 9 sq. ft.
27 square feet - At least one receptacle outlet for the first 9 square feet, or fraction thereof - An additional receptacle outlet for each 18 square feet, or fraction thereof	Two (2) receptacles outlets 9 sq. ft. <u>+ 18 sq. ft.</u> = 27 sq. ft.
28 square feet - At least one receptacle outlet for the first 9 square feet, or fraction thereof - An additional receptacle outlet for each 18 square feet, or fraction thereof	Three (3) receptacle outlets 9 sq. ft. <u>+ 18 sq. ft.</u> <u>+ 1 sq. ft.</u> = 28 sq. ft.
48 square feet - At least one receptacle outlet for the first 9 square feet, or fraction thereof - An additional receptacle outlet for each 18 square feet, or fraction thereof	Four (4) receptacle outlets 9 sq. ft. <u>+ 18 sq. ft.</u> <u>+ 18 sq. ft.</u> <u>+ 3 sq. ft.</u> = 48 sq. ft.

6. 230.67 Surge Protection

All services supplying dwelling units (including mobile or manufactured homes) are required to be provided with a Type 1 or Type 2 surge-protective device (SPD). The SPD must be an integral part of the service equipment or located immediately adjacent to the service equipment. This new requirement also applies to service upgrades or service replacements at dwelling units. It is applicable to all dwelling unit services for one-family, two-family and multifamily dwellings. During the 2020 NEC code cycle it was substantiated that surge protective devices are necessary to protect against home fires and personal injury. For the typical home, surge protective devices also provide protection for all the sensitive electronic systems, a variety of different equipment, appliances, lifesaving apparatus such as smoke alarms and carbon-monoxide detectors, overcurrent devices such as GFCIs, AFCIs, and much more. This requirement would also include any additional service(s) as defined in Article 100 and installed according to 230.2(A) and (D).

If an installation utilizes an existing electrical service that will supply a new dwelling unit(s), the SPD will be required to be installed at the existing service, or in the panelboard at the new dwelling unit(s), as allowed by the exception in 230.67. For example, it's common in many areas to establish an electrical service on a vacant parcel of land, or at an accessory building, often for temporary power and long before the dwelling is ever constructed on the parcel. The SPD protection will be required at such time that the dwelling is actually constructed.

7. 230.71 Maximum Number of Disconnects

The service disconnecting means for each service is still permitted to consist of not more than six switches or sets of circuit breakers, or a combination of not more than six switches and sets of circuit breakers, located in a group of separate enclosures, or in a switchboard or switchgear separated by barriers. The six means of disconnect can no longer be mounted in a single enclosure. This requirement is in collaboration with the new requirement for service barriers in 230.62(C) which was relocated from 408.3(A)(2) in the 2017 NEC. Now barrier(s) are required for all services that are installed in a panelboard, switchboard, and switchgear to hinder the exposure to "live parts". The idea is that when you use the six disconnect rule (six breakers in a single enclosure), it would be difficult to install barriers to isolate the busbars in the panelboard or switchboard to protect from a potential shock hazard without disconnecting from the utility.

This requirement will not apply to existing panelboards or switchboards currently utilizing up to six circuit breakers in a single enclosure as the service disconnect. Example: In a farmyard service that has three breakers in an existing switchboard that feeds various outbuildings, an installer could simply add one more breaker to feed a "new" building from the existing equipment as long as there are six or less breakers in the enclosure.

8. 230.85 Emergency Disconnects

In order to provide first responders with a safe method of disconnecting power from a structure, one-family and two-family dwellings are required to have an emergency disconnect installed outdoors at a readily accessible location. The emergency disconnect must be rated for the available fault current. Typically, in order to achieve a short circuit current rating, an unfused disconnect switch constructed to UL 98 would be required to contain overcurrent protection, or the installer must provide the overcurrent protection ahead of the electrical equipment.

Equipment labels and marking must comply with NEC 110.21. The NEC does not prohibit locking the disconnect in the "On" position. First responders are well equipped to cut off or remove any locking devices that impede the ability to operate the emergency disconnect. There are three options for the emergency disconnect:

1. A service disconnect switch or circuit breaker:
Labeled as ***Emergency Disconnect, Service Disconnect***
2. Certain approved meter disconnects:
Labeled as ***Emergency Disconnect, Meter Disconnect, Not Service Equipment***
3. Other listed disconnect switches or circuit breakers that are suitable for use as service equipment:
Labeled as ***Emergency Disconnect, Not Service Equipment***

The requirement for the emergency disconnect **would** apply to:

- The replacement of service equipment, service entrance conductors, service raceways, or meter enclosures - if the new installation increases the service ampacity.
- Any new additional service(s) equipment as defined in Article 100 installed according to 230.2(A) and (D).

The requirement for the emergency disconnect **would not** apply to:

- The routine replacement of existing service panelboards (e.g. from fuses to circuit breakers) with the same ampacity.
- The replacement or repair of the service entrance conductors, service raceways, or meter enclosures where service disconnect ampacity is not increased.
- Replacement or repair of an existing service riser, or service entrance conductors, service raceways, and/or meter enclosure that was the result of damage.

Note: Under certain conditions the Exception to NEC 250.121 allows the equipment grounding conductor (EGC) to also be used as the grounding electrode conductor (GEC). Where the EGC/GEC enters the panelboard, the EGC/GEC conductor must be sized to NEC table 250.102(C)(1). An EGC (sized to NEC table 250.122) must contain an irreversible crimp where attached to the larger EGC/GEC and it must be extended to the equipment grounding bar. The GEC must then be routed outside the panelboard and extended to the GEC system.

9. Article 310 Arrangements/Tables

The ampacity tables in Article 310 have been revised and will simply be titled as Table 310.16 through Table 310.21. As an example, former Table 310.15(B)(16) will revert to its original numbering and simply be known as Table 310.16. Also, the table of ampacities for medium voltage conductors were removed and relocated to the new Article 311 – Medium Voltage Conductors and Cables. During the 2020 NEC code cycle there was significant effort to improve the usability of the code.

10. 406.9(C) Receptacles in Damp or Wet Locations, Bathtub and Shower Space

Receptacles are prohibited from being installed within an area measured 3-feet horizontally and 8-feet vertically from the top of the bathtub rim or shower stall threshold, which includes the space directly over the tub or shower stall. In bathrooms with dimensions less than the required area, the receptacle(s) are permitted to be installed opposite the bathtub rim or shower stall threshold on the farthest wall within the room. During the 2020 NEC code cycle it was substantiated that restrictions for receptacle outlets should closely mirror the requirements for luminaires and ceiling fans that date back to 1984 and 1996, respectively.

11. 408.6 Short-Circuit Current Rating (Switchboards, Switchgear, and Panelboards)

A new rule was added at 408.6 requiring that the available fault current, and the date the calculation was performed, to be field marked on the enclosure at the point of supply for switchboards, switchgear and panelboards. Equipment shall have a short-circuit rating not less than the available fault current. The marking and labeling shall comply with 110.21(B)(3). This new rule is not applicable in one- or two-family dwelling units. During the 2020 NEC code cycle it was substantiated that field marking and proper enforcement will ensure that equipment is properly protected.

12. 422.5(A) Ground-Fault Circuit-Interrupter (GFCI) Protection for Personnel. (Appliances)

Revisions were made to the GFCI protection requirements for appliances at 422.5(A). The revised and expanded rules require protection for sump pumps and all dishwashers rated at 150 volts or less to ground and 60 amperes or less, single- or 3-phase, located at both dwelling unit and non-dwelling unit locations, hard-wired or cord and plug connected. Also, the "provided for public use" condition has been removed from GFCI requirements for both automotive vacuum machines and tire inflation machines.

13. 547.5(G) Wiring Methods (*Agricultural Buildings*), GFCI Protection for Receptacles

The requirements for ground-fault circuit-interrupter (GFCI) protection have been revised and clarified for agricultural buildings that are within the scope of Article 547 (buildings, or portions thereof, or areas with similar conditions or like nature, involving excessive dust, dust with water, or corrosive atmosphere). The 2020 NEC is very clear that GFCI protection is only required for 125-volt, 15- and 20-ampere receptacles in areas having an equipotential plane, in outdoor locations, in damp or wet locations, or in dirt confinement areas for livestock. The requirements for GFCI protection for receptacles of higher voltage and amperage classifications are not applicable for agricultural buildings. For example, GFCI protection is not required for single-phase or three-phase, 240-volt, 30- or 50-ampere receptacles, or similar. During the 2020 NEC code cycle it was substantiated that unintended tripping of GFCI protective devices often creates significant safety issues. Farming operations require an orderly shutdown to avoid significant hazards or property damage.

14. 551.71(F) GFCI Protection for Receptacles (Recreational Vehicle Parks)

All 125-volt, single-phase, 15- and 20-ampere receptacles at RV parks are required to have listed ground-fault circuit-interrupter (GFCI) protection for personnel. 30- and 50-ampere receptacles used in RV park supply equipment shall not be required to meet the requirements of 210.8(B).

The 30- or 50-ampere power cord for an RV is considered a feeder, not a branch circuit. GFCI protection is not appropriate on a feeder circuit in these situations. The internal wiring in an RV provides the necessary GFCI protection for branch circuits that are integral to the RV.

In the first printing of the 2020 NEC, this section was under appeal as result of a Certified Amending Motion (CAM) that was heard at the NFPA annual meeting. As a result of the action taken at the annual meeting, the language referenced back to the 2017 NEC text. CMP-7 submitted a Tentative Interim Amendment (TIA): TIA 20-8, Reference: 551.71(F), that was accepted and ultimately changed the text back to the initially proposed language forgoing the need for GFCI protection on the 30- and 50-ampere receptacle(s) in RV site equipment.

15. 555.35 Ground-Fault Protection of Equipment and Ground-Fault Circuit-Interrupter Protection (Marinas, Boatyards, Floating Buildings, and Commercial and Noncommercial Docking Facilities)

The ground-fault protection of equipment (GFPE) requirements for marinas, boatyards and docking facilities have been revised. The new GFPE requirements were divided into three parts to provide clarity and readability for these important ground-fault protection requirements.

1) 30 milliamperes

- Section 555.35(A)(1) addresses shore power receptacles with individual GFPE not to exceed 30 milliamperes (mA)

2) 4 to 6 milliamperes

- Section 555.35(A)(2) addresses 15- and 20-ampere receptacles for other than shore power with Class A GFCI protection (4 to 6 mA) being provided in accordance with 210.8 through a reference to 555.33(B)(1).

3) 100 milliamperes

- Section 555.35(A)(3) addresses feeder and branch-circuit conductors providing power to a dock or slip to have GFPE set to open at currents not exceeding 100 mA.

16. Revised Article 800 – General Requirements for Communication Systems

A new Article 800 will cover all “general” requirements and serve as a placeholder for redundant requirements throughout other communication articles.

- Article 800 – General Requirements for Communication Systems
- Article 805 – Communication Circuits
- Article 820 – Community Antenna Television and Radio Distribution Systems
- Article 830 – Network-Powered Broadband Communication Systems
- Article 840 – Premises-Powered Broadband Communication Systems

Article 810 for Radio and Television Equipment is not included in this list and is a standalone article.

Note: There are three rules in the 2017 NEC that were deferred to January 1, 2020 in order to give the industry time to comply. These new rules became enforceable on January 1, 2020 as part of the 2017 NEC. These same rules have been carried forward and are incorporated into the 2020 NEC.

- **240.67 Arc Energy Reduction.** Newly installed electrical equipment containing fuse(s) 1200 amps or greater must have Arc Energy Reduction to reduce the clearing time.
- **404.2(C) Switches Controlling Lighting Loads.** At replacement or retrofit switch locations where the grounded conductor can't be extended without removing finish materials, the installer shall not exceed 5 electronic lighting control switches on a branch circuit, and 25 electronic lighting control switches on the load side of any feeder installation.
- **404.22 Electronic Lighting Control Switches.** Electronic lighting control switches shall not introduce current on the equipment grounding conductor.



Electric Cars

HOW IT MAY AFFECT A HOME ELECTRICAL SERVICE



Types of Chargers

- ▶ Three levels of Electric Vehicle Charges

- ▶ Level 1

- ▶ 120 volt outlet
 - ▶ Every vehicle can use level 1
 - ▶ Slowest way

- ▶ Level 2

- ▶ 208 volt – 240 volt
 - ▶ Most commonly used for everyday charging
 - ▶ Needs to be installed

- ▶ Level 3

- ▶ 400 volt – 900 volt (fast chargers & super chargers)
 - ▶ Fastest type
 - ▶ Not used in a home



2020 NEC (NFPA 70) and ND Laws, Rules and Wiring Standards

- ▶ Article 625 - Electric Vehicle power Transfer Systems
- ▶ Article 220 - Branch-Circuit, Feeder, And Service Load Calculations
- ▶ Article 702 - Optional Standby Systems
- ▶ Article 705 – Interconnected Electrical Power Production Sources
- ▶ ND24.1-06-06-25. (NEC 625) – Electric vehicle charging system



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Article 625 - Electric Vehicle power Transfer Systems

- ▶ 625.1 Scope. The provisions of this article cover the electrical conductors and equipment external to an electric vehicle that connect an electric vehicle to a supply of electricity by conductive or inductive means, and the installation of equipment and devices related to electric vehicle charging.
 - ▶ Basic Rules
 - ▶ Construction
 - ▶ Installation
 - ▶ Wireless Power Transfer Equipment

Article 220 - Branch-Circuit, Feeder, And Service Load Calculations

- ▶ 220.1 Scope. This article provides requirements for calculating branch-circuit, feeder, and service loads. Part I provides for general requirements for calculation methods. Part II provides calculation methods for branch circuit loads. Parts III and IV provide calculation methods for feeders and services. Part V provides calculation methods for farms.
 - ▶ Basic rules
 - ▶ Size of service
 - ▶ Size of feeder – when needed
 - ▶ Size of branch circuit – when needed

Article 702 - Optional Standby Systems

- ▶ 702.1 Scope This article applies to the installation and operation of optional standby systems. The systems covered by this article consist of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a connection to a premises wiring system from a portable alternate power supply.
 - ▶ Basic rules
 - ▶ Some Electric Vehicles can be used
 - ▶ Treated like any other standby system
 - ▶ Capacity, Rating, Equipment, Wiring

Article 705 – Interconnected Electrical Power Production Sources

- ▶ 705.1 Scope This article covers installation of one or more electric power production sources operating in parallel with a primary source(s) of electricity.
 - ▶ Basic Rules
 - ▶ Size and output put of power production system
 - ▶ Installation
 - ▶ Conductor sizing
 - ▶ Identification of power source

ND24.1-06-06-25. (NEC 625) – Electric vehicle charging system

- ▶ Supplements Article 625 of NEC
 - ▶ “For these installations, “maximum load of equipment” means the setting the electrician adjusted the device to. The adjustment may not be readily accessible or cannot easily be adjusted by the consumer. The electrician shall label the device if set to a value less than the maximum nameplate rating. The contractor shall assure the size of the service feeding these devices is adequate. “
 - ▶ Basic meaning
 - ▶ Service must be able to accommodate the load
 - ▶ Installation must meet continuous duty (equipment running for 3+ hours)
 - ▶ Only electricians can set the rating of the equipment

Main Points

- ▶ Work with your electrician
- ▶ Pay attention to the type of equipment being installed
- ▶ Service, feeders, and branch circuits need to be appropriate size for the installation
- ▶ Install according to manufactures recommendations
- ▶ Keep documentation on hand and provide to inspector
- ▶ Codes are ever changing and more requirements may need to be met in the future



Questions?

