

ADVANCING ELECTRICAL SAFETY THROUGH THE NATIONAL ELECTRICAL CODE

Supplemental Outline

September 9, 2021

Keeping the regulatory document current with industry trends in new technology and delivery and generation of electric power.

NEC Edition/Section	Summary of Change	Fiscal Impact
2020 Section 230.67	A new requirement covering surge protection for dwelling units aligns with the everchanging electrical industry landscape to protect against surges that can damage sensitive electronics found in most modern appliances, safety devices, and other equipment used in dwellings. The expanded use of distributed energy resources can also contribute introduction of surges into the system.	Potential savings through protection of sensitive electronics during a surge event.
2020 Multiple Sections	New requirements throughout the Code address whether equipment is permitted to be reconditioned.	Improves product safety and increases design options.
2020 NEC Article 242	A new article addresses installation requirements for Surge-Protective Devices and Surge Arrestors used to achieve this protection.	Requirements for this equipment was previously located in two separate Articles. Consolidating into one Article enhances usability of the <i>Code</i> .
2020 Article 625	Sets requirements for electric vehicles (EVs) and supply equipment to encompass bidirectional current exchange.	Enhances safety and increases design options utilizing EVs for energy storage
2020 Articles 690, 691, 706, 710 & 712	Requirements supporting new and expanding technologies including Solar Photovoltaic (PV) Systems, Large-Scale Photovoltaic (PV), Electric Supply Stations, Energy Storage Systems, Standalone Systems and Direct-Current Micro-grids.	Immeasurable societal benefits at both the micro- and macro-economic levels.
2017 Article 425	New article addresses installation requirements for fixed industrial process heating employing electric resistance or electrode heating technology.	The previous code did not adequately address installation requirements for this type of equipment. Requirements will enhance safety and eliminate confusion that could impede cost-effective installation.

2017 Article 691	Large-Scale Photovoltaic (PV) Electric Supply Stations - new article addresses requirements for large scale PV systems of no less than 5000 kW that are used to deliver power back to the utility grid.	May contribute to stabilizing electric prices and keeping them low over time.
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2017 Article 706	New article to cover installation requirements for energy storage systems. The current state of energy storage technology, which includes batteries, and the anticipated evolution of energy storage supports the need for a singular set of requirements in the NEC covering such systems.	Can reduce electricity bills and provide for more robust and resilient electrical infrastructure.
2017 Article 710	New article to address requirements for electric power production sources operating in a stand-alone mode independent of an electrical production and distribution network.	Also, will help reduce electricity bills and promote robust and resilient electrical infrastructure.
2017 Article 712	New requirements to address micro-grids as they are becoming popular to increase energy efficiency, reduce costs, and maintain critical business continuity.	Powering utilization equipment directly from DC sources without intervening DC-AC and AC-DC conversion steps leads to higher efficiencies and potentially smaller, lower-cost equipment than AC-coupled methods.
2014/2017 Article 690	Requirements covering the expanding use of solar photovoltaic power. This enhances first responder safety when performing operations on a roof by establishing a boundary creating two areas of rapid shutdown protection, providing separate requirements for protection inside and outside of the boundary, and specifying performance requirements for the rapid shutdown equipment inside and outside the boundary.	Increased safety for fire fighters and first responders.
2017 Article 625	Amended requirements for including wireless charging technology installation requirements for electrical vehicles.	Increases design options and promotes safe implementation.
2014 Multiple Sections	Revisions that change the voltage thresholds from 600 to 1000 volts in recognition of commonly used alternative energy systems that operate at more than 600 volts.	Revised equipment voltage ratings within product standards that accommodate higher operating voltages of systems such as PV and wind power can lead to more cost-effective installation.

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2011/2014 Article 694	Introduced in the 2011 NEC for small wind electrical systems, the Article scope has been revised to apply to all wind systems, ensuring that regardless of size, minimum electrical safety requirements are in place.	May contribute to stabilizing electric prices and keeping them low over time.
2014 Article 646	A new article for Modular Data Centers. These new systems are becoming prominent in the demand for business systems to meet a 100% up-time-for-business continuity.	Provides for a more robust and resilient electrical infrastructure, producing cost savings by eliminating down-time.
2014 Article 393	New article and installation requirements for Low Voltage Suspended Ceiling Power Distribution Systems	Increases design options and promotes safe implementation.
2014 Articles 410 & 600	Extensive upgrades are underway to achieve greater energy efficiency in signs and luminaires by replacing in-place illumination systems with LEDs. New requirements ensure that “retro fit kits” employed meet minimum product safety standards through listing requirements.	Reduces lighting loads which may contribute to cost savings.
2014 Article 750	A new article that provides requirements to cover loads where continuity of power cannot be compromised or where automatic disconnection creates a hazard for the public such as shutting off emergency circuits.	Increases safety and design options.
2014 Article 625	New and revised requirements covering electric vehicle charging equipment that keeps the regulatory document in step with the increase in consumer demand for all-electric and hybrid- electric vehicles. New provisions that allow an automatic load management system.	Potential cost savings on sizing of service and feeders.
2011 Article 840	New Article includes requirements for equipment associated with premises-powered broadband communication systems.	Increases design options and promotes safe implementation.
2011 Article 399	With the advent of more customer owned medium and high voltage systems, revisions add requirements for outdoor overhead conductors over 600 volts.	Increases safety and design options.
2011 Article 645	Extensive revisions to provide greater flexibility with design for information technology equipment installations.	Increases design options and opportunity for reduced installation costs.

Examples of new and revised requirements that may reduce the overall cost of the electrical system.

NEC Edition/Section	Summary of Change	Fiscal Impact
2020 210.11(C)(3) & (4)	This revision specifies which receptacle outlets are required to be on the required 20 ampere circuit for bathrooms and garages, thus providing more flexibility with circuiting in those areas.	Provides additional design options that can reduce installation costs.
2014/2017/2020 Article 220	Several revisions to this article, including the modernization of the tables currently in use for calculations, which has been extensively revised to reflect improvements in energy efficiency.	May provide relief for sizing of service and feeder distribution systems.
2020 225.30(B)	Revised to permit multiple smaller feeders, with smaller conductors and lower rated overcurrent protective devices to allow more flexibility with the design.	Provides additional design options that can reduce installation costs.
2020 250.104(A)(1)	Revised to provide relief with the maximum sized bonding jumper for bonding metal water piping systems.	Reduced installation costs.
2017 Table 310.15(B)(3)(c)	This removes the required temperature adder for ambient temperature adjustment correction when calculating size of conductors installed on rooftops exposed to sunlight unless conductors are installed 7/8" or closer to the roof.	Reduced in installation costs.
2017 310.15(B)(7)	Expands the use of 83% reduction for 3-conductor feeders (2 ungrounded and a neutral) derived from either single or three phase supplies.	Potential reduction in cost due to sizing smaller feeders.
2017 338.10(B)(4)	Revised to only require cables with 10 AWG and smaller conductors to default to the 60 degree C ampacity when installed in insulation.	Potential reduction in cost due to sizing smaller conductors.
2017 210.8	New language covering all GFCI requirements that involve a measurement to determine receptacle proximity.	Prescriptive requirement provides clarity on how to determine applicability of the rule.
2017 210.52(B)(1)	Revision to expand permitted appliances in rooms or areas required to be supplied by a 20-ampere small appliance branch circuit to be supplied from an individual branch circuit rated 15 amperes or greater.	Provides greater design flexibility by permitting smaller rated circuits which may be a cost savings.
2017 210.64	Revised to only require a receptacle for service equipment located indoors and a new exception for services rated more than 120 volts-to-ground that supply certain types of equipment.	Eliminating receptacle for outdoor service equipment creates cost savings.

Protecting electrical workers who maintain or service electrical or electrically powered equipment.

NEC Edition/Section	Summary of Change	Fiscal Impact
2020 110.26(C)(3)	Changes to revise working space requirements for non-dwelling unit large electrical equipment installations.	Increased safety for electrical workers potentially avoids down-time due to injuries.
2020 230.62(C)	A new requirement that provides additional shock protection with barriers to be placed in service equipment to prevent inadvertent contact.	Increased safety for electrical workers potentially avoids down-time due to injuries.
2020 230.71(B)	Current requirements for service disconnecting means is revised by eliminating risk from the inability to establish electrically safe conditions for energized work that must be performed within service equipment enclosures with more than one service disconnect.	Increased safety for electrical workers potentially avoids down-time due to injuries.
2014/2017/2020 240.67 & 240.87	Requirements to provide a method for reducing incident energy circuit breakers and fuses rated 1200 amperes and greater. Revisions each cycle expanded and revised the arc energy reduction methods.	Increased safety for electrical workers potentially avoids down-time due to injuries.
2020 408.18(C)	New requirement for manufacturers to provide a label on the front of equipment when working space is required for rear or side access to the equipment.	Increased safety for electrical workers potentially avoids down-time due to injuries.
2017 110.16	Revision to require additional marking requirements for non-dwelling unit service equipment rated 1200 amperes or more	Increased safety for electrical workers potentially avoids down-time due to injuries.
2017 110.26	New requirements that include working space for equipment located in a space that has limited access.	Increases safety for electrical workers potentially avoids down-time by avoiding injuries. Provides flexibility in placement of equipment in these spaces.
2017 409.22, 620.51 & 670.5	New requirements for marking equipment with the short circuit current and maximum available fault current for elevators, industrial machinery, and industrial control panels.	Increases safety for electrical workers potentially avoids down-time by reducing injuries.
2017 404.22	New requirements for electronic lighting control switches to prohibit the introduction of current on the equipment grounding conductor during normal operation.	Increased safety for electrical workers potentially avoids down-time by reducing injuries.

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NEC Edition/Section	Summary of Change	Fiscal Impact
2017 408.3	New provision that requires barriers for panelboards to provide a measure of safety against inadvertent contact with line-energized parts during maintenance and installation of new feeders or branch circuits	Increased safety for electrical workers potentially avoids down-time by avoiding injuries.
2017 670.6 & 695.15	New requirement for surge protection for industrial machinery and fire pump controllers.	Increased safety for electrical workers potentially avoids down-time by reducing injuries.
2014 110.25	New requirement that provides uniform conditions for locking off switches that control power to equipment to ensure that electrical workers can service and maintain equipment safely. This correlates with federal occupational health and safety regulations covering safe work practices on and about electrical equipment.	Increased safety for electrical workers potentially avoiding down-time by preventing injuries.
2014 110.26	Revisions to egress door requirements to address worker safety in the event of an arc flash or arc blast incident.	Increased safety for electrical workers potentially avoids down-time by preventing injuries.
2014 110.21	Revised to provide uniform hazard marking where caution, warning, or danger signs or labels are required by this referenced standard.	Increased safety for electrical workers potentially avoids down-time by reducing injuries.
2011 404.2(C)	New requirement for installation of a grounded conductor at switch locations where lighting loads are controlled.	Increased safety for electrical workers potentially avoids down-time by preventing injuries.
2011 410.130	Requirement to install disconnecting means when ballasts are replaced in existing luminaires.	Increased safety for electrical workers potentially avoids down-time by reducing injuries.
2011 110.24	New labeling requirement for service equipment to identify the maximum available fault current.	Increases safety for electrical workers potentially avoids down-time by reducing injuries.

Protecting people from electric shock in homes, workplaces, and places of recreation.

NEC Edition/Section	Summary of Change	Fiscal Impact
2011/2014/2017/2020 210.8	New requirements applicable to ground-fault circuit interrupter (GFCIs) expand the protection across additional uses and occupancies not addressed in previous editions of the NEC. First introduced in the early 1970s, their continued expansion to areas in homes and workplaces where occupants are particularly susceptible to electric shock accidents is directly related to reductions in electrocutions and electric shock accidents. This further enhances public safety and protection of life.	The US Consumer Product Safety Commission (US CPSC) conducted a cost/benefit analysis of a proposal for additional GFCIs in new residential installations. ¹ As reflected in this study, the expected benefits would be a reduction of societal costs associated with residential electrocutions, which translates to the benefit of this life-saving technology being greater than the initial upfront cost.
2020 Article 555	Revision to add “floating buildings” (previously Article 553) to the scope of Article 555 and revised to provide greater flexibility regarding the application of ground-fault protection requirements.	Provides additional design options.
2017 Article 555	Revision to add boatyards and commercial and noncommercial docking facilities to the scope of Article 555 and to lower the ground-fault protection threshold to a maximum 30 mA.	Increases safety to prevent electric shock drowning.
2017 Article 680 Part VIII	New series of requirements covering the certification, marking, protection, and field installation of “electrically powered pool lifts.”	With the mandate to provide accessible entry for each public and common use swimming pool as prescribed by the <i>Americans with Disabilities Act (ADA)</i> , requirements are in place to ensure safe implementation thereof.
2011 555.3	New requirement to provide ground fault protection for the main overcurrent device supplying marinas and boatyards to help prevent electric shock drowning.	These requirements include upfront installation costs, but the benefit greatly exceeds the cost in the form of reduction of societal costs associated with electric shock drownings. This further enhances public safety and protection of life.
2011 406.12	Expands tamper-resistant receptacle requirements to guest rooms, guest suites, and childcare facilities.	Introduction of these safety devices are based on a 10-year study ² conducted by the CPSC of 1991 – 2001 National Electronic Injury Surveillance Systems (NEISS) data, which revealed 24,000+ children under 10 years old were treated in emergency rooms

		for incidents related to electrical receptacles – an average of about seven children per day. These findings demonstrate a clear need to protect children from hazards associated with electrical receptacle outlets. Safety far outweighs the initial installation costs.
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Protecting homes, dormitories, hotels, motels, patient sleeping rooms in nursing homes and limited-care facilities from fires of electrical origin.

NEC Edition/Section	Summary of Change	Fiscal Impact
2011/2014/2017/2020 210.12	Arc-fault circuit interrupters (AFCIs) are the most advanced technology currently recognized by the NEC for protecting premises against fires resulting from damaged wiring. Revisions to AFCI requirements expand this protection to these occupancies.	<p>The original call in the early 1990s for enhanced branch circuit and cord protection came from the CPSC based on fires attributed to electrical origin. Manufacturers, in concert with Underwriters Laboratories, worked to develop a product and a product standard to address the CPSC concern.</p> <p>The US Fire Administration published a report³ in May 2019 that shows a decline in the number of fires attributed to electrical malfunction. Data for the 10-year period of 2008 to 2017 reflected a 14% decrease in fires, 19% decrease in deaths, 34% decrease in injuries and 35% decrease in dollar loss.</p> <p>The benefit of reduced deaths and property damage far exceeds the initial minor installation costs.</p>

¹[Consumer Product Safety Commission – Economic Considerations – GFCIs](#)

²[Consumer Product Safety Commission Study](#)

³[US Fire Administration – Residential Building Electrical Malfunction Fire Trends \(2008-2017\)](#)

If you have questions or would like additional information, contact Mr. Tim McClintock, Midwest Field Representative for the National Electrical Manufacturers Association, at 330- 749-9782 or tim.mcclintock@nema.org.