



2020 NEC Changes for Backup Power

White Paper 124

Life Is On



2020 NEC Changes for Backup Power

The *National Electrical Code*® (NEC®) specifies requirements for safeguarding persons and property from electrical hazards, recently released as the 2020 Edition. This white paper summarizes select changes that are relevant to backup power systems.

ABOUT THE NEC

The NEC is published by the [National Fire Protection Agency](#), and forms the basis for enforcing electrical safety in the United States.¹ Updated every 3 years, the most recent edition became available for adoption by authorities on August 25, 2019. The new edition resulted from 18 separate code-making panels, 3,730 public inputs, and 1,930 comments on the initial draft. Available by subscription and other means, free access to a digital version of the document can be found on the [NEC website](#).²

Applicability

National Electrical Code requirements for backup power are primarily located in Chapter 7 – Special Conditions. There, Articles 700, 701, and 702 respectively specify requirements for Emergency Systems, Legally Required Standby Systems, and Optional Standby Systems. Section 708 addresses backup power requirements for systems in facilities that serve public security and public safety functions. The scope of the requirements is summarized in Table 1, and is further addressed in the ASCO Power Technologies document entitled [National Electrical Code Requirements for Emergency Power Transfer Switching](#).³

Table 1. NEC Article Summary								
Article	Focus	Type	Installation	Operation	Maintenance	Monitoring	Control	Systems Affected
700	Emergency Systems	Permanent	X	X	X			Lighting and power for human safety
701	Legally Required Standby Systems	Permanent	X	X	X			Power to eliminate hazards and aid rescue/firefighting
702	Optional Standby Systems	Temporary or Permanent	X	X				Power to eliminate discomfort or damage to product/process
708	Critical Operations Power Systems	Temporary or Permanent	X	X	X	X	X	Power for national security, economy, public health/safety

¹ *NFPA 70 - National Electrical Code*, 2020 Edition, National Fire Protection Agency, 2019. <https://nec2020.nfpa.org/code/eb61ef8f-b559-487b-8499-9f0b11e56c6d/b3facf69-215c-418b-9ea4-27760f5f6040/>, accessed November 10, 2020.

² *Free online access to the NEC® and other electrical standards*, National Fire Protection Agency. <https://www.nfpa.org/NEC/About-the-NEC/Free-online-access-to-the-NEC-and-other-electrical-standards>, accessed November 11, 2020.

³ *National Electrical Code Requirements for Emergency Power Transfer Switching*, ASCO Power Technologies, Inc., 2019. <https://www.ascopower.com/us/en/download/document/TS-WP-NECREQ/>, accessed November 11, 2020.

Adoption

Each edition of the NEC is enforced by authorities only after it is individually adopted by state or local governments in the USA. Figure 1 shows the status of adoption as of November 1, 2020.⁴ The NFPA updates this information on its website at <https://www.nfpa.org/NEC/NEC-adoption-and-use/NEC-adoption-maps>. As of November 2020, at least four different editions of the NEC were simultaneously enforced in the USA.

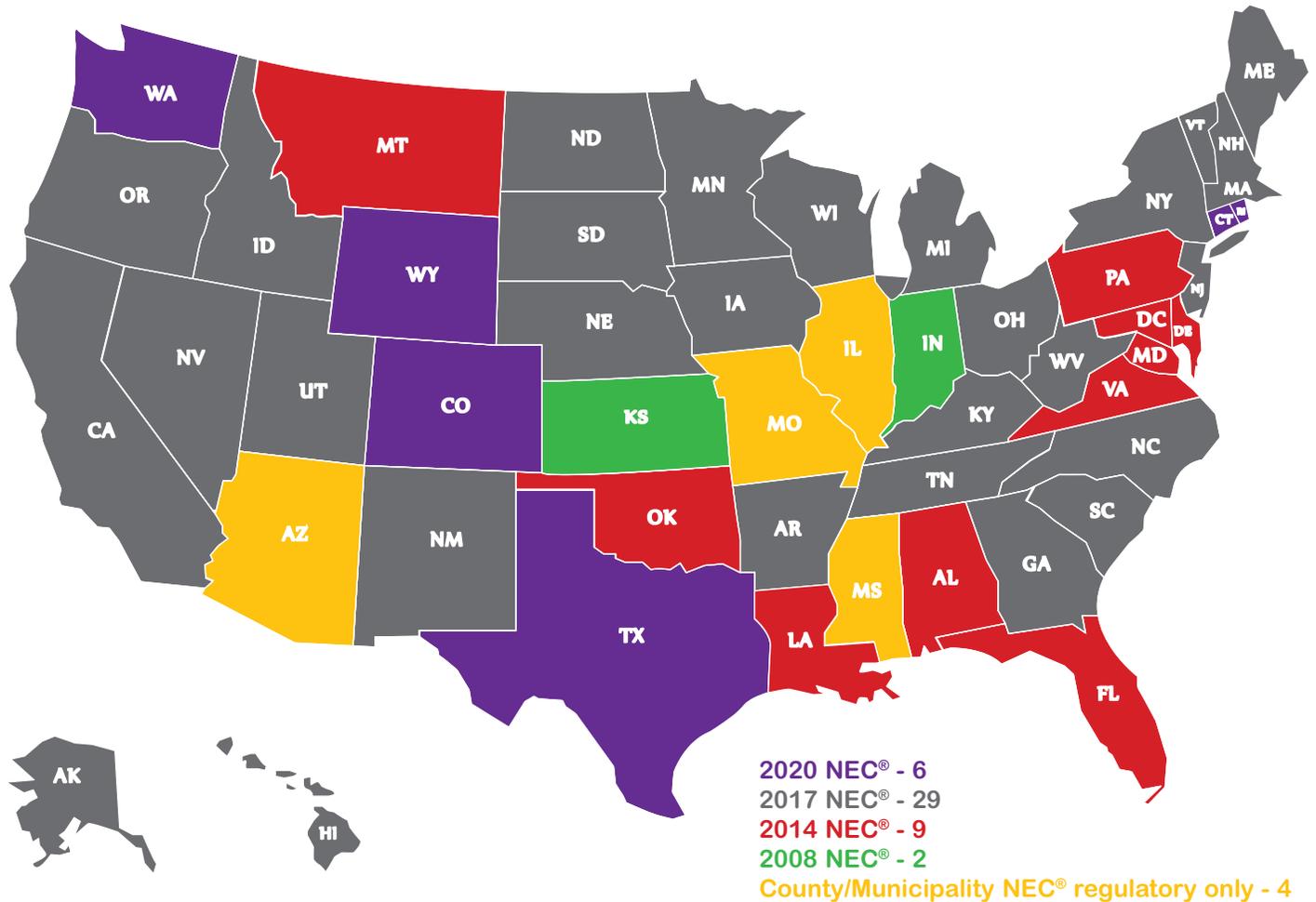


Figure 1: NEC Enforcement Map – November 2020

KEY 2020 CHANGES FOR BACKUP POWER

While changes across the NEC are wide-ranging, select changes that impact backup power systems are summarized in the following sections.

Reconditioned Equipment

The NEC has clarified and added language regarding the use of reconditioned power equipment. *Article 110.3(A)(3)* reads:⁵

⁴ *NEC Enforcement Map*, National Fire Protection Agency, November 1, 2020. <https://www.nfpa.org/NEC/NEC-adoption-and-use/NEC-adoption-maps>, accessed November 10, 2020.

⁵ *NFPA 70 - National Electrical Code, 2020 Edition, National Fire Protection Agency, 2019. Article 110.3-Examination, Identification, Installation, Use, and Listing (Product Certification) of Equipment.* <https://nec2020.nfpa.org/code/eb61ef8f-b559-487b-8499-9f0b11e56c6d/e075695c-442f-42a9-8ae0-406e5f796801/>, accessed November 10, 2020.



*In judging equipment, considerations such as the following shall be evaluated:
Suitability for installation and use in conformity with this Code
Informational Note No. 1: Equipment may be new, reconditioned, refurbished, or remanufactured.*

To clarify the requirement, a definition was added to *Article 100* of the Code. “Reconditioned” is defined as “*Electromechanical systems, equipment, apparatus, or components that are restored to operating conditions. This process differs from normal servicing of equipment that remains within a facility, or replacement of listed equipment on a one-to-one basis.*”⁶ An informational note clarifies that the term “*is frequently referred to as rebuilt, refurbished, or remanufactured.*”

In *Article 110.21(A)(2)*, corresponding wording requires that reconditioned equipment be identified accordingly, the original listing mark be removed, and that the equipment be marked with “*the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning.*”⁷ Refer to the standard for exceptions for certain industrial facilities.

The scope of reconditioning is defined in *Article 408* of the code, which states that the reconditioning process shall (1) use “design qualified parts” verified under applicable standards, and (2) be performed in accordance with manufacturer’s instructions, if any. This article also requires that fire, water, and smoke-damaged equipment be evaluated by the manufacturer or a qualified laboratory before return to service. *Article 408.8* permits reconditioning of switchboards and switchgear, but limits reconditioning of panel boards to replacement of their interior assemblies.⁸ Elsewhere, *Article 700.5(C) - Automatic Transfer Switches* prohibits reconditioning of Automatic Transfer Switches, which is also repeated in Articles 701, 702, and 708 of the standard.

For additional reference, the [National Electrical Manufacturers Association](#) provides further guidance on types of equipment that may or may not be suitable for reconditioning. Further details are available in its document entitled [NEMA Technical Position on Reconditioned Equipment](#).⁹

Protection for Energized Parts

The 2020 NEC introduced two requirements to reduce the risk of people and objects from inadvertently contacting energized parts. For service equipment, *Article 230.62(C)* states, “*Barriers shall be placed in service equipment such that no uninsulated, ungrounded service bus bar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations.*”¹⁰ This requirement was relocated from *Article 408 - Switchboards, Switchgear, and Panelboards* in the 2017 NEC. Its inclusion in *Article 230 – Services* of the 2020 NEC makes it applicable to all service entrance equipment.

⁶ Ibid. *Article 100 - Definitions*

⁷ Ibid. *Article 110.21 - Marking*

⁸ Ibid *Article 408, et seq. - Switchboards, Switchgear, and Panelboards*

⁹ *NEMA CS 100-2020 - NEMA Technical Position on Reconditioned Equipment*, National Electrical Manufacturers Association, 2020. <https://www.nema.org/standards/view/nema-technical-position-on-reconditioned-equipment>, accessed November 10, 2020.

¹⁰ *NFPA 70 - National Electrical Code, 2020 Edition* - National Fire Protection Agency, 2019. *Article 230.62 – Service Equipment – Closed or Guarded*. <https://nec2020.nfpa.org/code/eb61ef8f-b559-487b-8499-9f0b11e56c6d/463bba44-7758-420d-9060-6c7e40d0fd5a/8d5a6e98-0e30-487e-8747-46b9e5b67cae/>, accessed November 10, 2020.



For switchboards, *Article 408.13(C)(3)* specifies the arrangement of ungrounded conductive terminals as follows:

In judging equipment, considerations such as the following shall be evaluated:

Suitability for installation and use in conformity with this Code

Informational Note No. 1: Equipment may be new, reconditioned, refurbished, or remanufactured.

While these provisions are new to the NEC, they respectively reflect guidance already presented in [UL 67 – Panelboards](#) and [UL 891–Standard for Switchboards](#).

Arc Flash Mitigation

The potential for arc flashes to occur in power equipment is a serious safety topic, which is why the NEC requires clearing time reduction measures on circuit breakers rated 1200 Amps or more. *Article 240.87(B)* of the 2017 NEC requires one of the following means:¹¹

1. Zone-selective interlocking
2. Differential relaying
3. Energy-reducing maintenance switching with local status indicator
4. Energy-reducing active arc flash mitigation system
5. An instantaneous trip setting that is less than the available arcing current
6. An instantaneous override that is less than the available arcing current
7. An approved equivalent means

Potential issues with this wording include that (1) it could be read that temporary adjustment of an instantaneous trip setting is sufficient, and (2) only options 5 and 6 must limit the arcing current. The 2020 NEC clarifies this article as follows, where the underlined words show added text:

*One of the following means shall be provided and shall be set to operate at less than the available arcing current.*¹²

- (1) *Zone-selective interlocking*
- (2) *Differential relaying*
- (3) *Energy-reducing maintenance switching with local status indicator*
- (4) *Energy-reducing active arc flash mitigation system*
- (5) *An instantaneous trip setting. Temporary adjustment of the instantaneous trip setting to achieve arc energy reduction shall not be permitted.*
- (6) *An instantaneous override*
- (7) *An approved equivalent means*

The new language makes clear that whatever means employed must operate at less than the available arcing current. The 2020 Edition also added *Article 240.87(C) - Performance Testing*, which requires (1) documents showing that the implemented arc energy reduction measures operate below the arcing current, and (2) documented field tests that prove the installed measure performs as intended.

¹¹ *NFPA 70 - National Electrical Code, 2017 Edition*, National Fire Protection Agency, 2016. *Article 240.87 - Arc Energy Reduction*.

¹² *NFPA 70 - National Electrical Code, 2020 Edition*. National Fire Protection Agency, 2019. *Article 240.87 - Arc Energy Reduction*. <https://nec2020.nfpa.org/code/eb61ef8f-b559-487b-8499-9f0b11e56c6d/463bba44-7758-420d-9060-6c7e40d0fd5a/2380114f-8f40-44d8-85cb-eccb45b601e1/>, accessed November 10, 2020.



Transfer Equipment for Emergency Systems

Article 700.5(A) specifies general conditions regarding acceptable transfer devices. Changes to this requirement include:

1. The 2017 Edition required that the transfer equipment be identified for emergency use. The 2020 Edition states more specifically that the equipment shall be marked for emergency use.
2. The 2020 Edition requires that transfer switches be listed (by a ratings agency – for example, Under writer Laboratories).
3. The 2020 Edition adds a prohibition against meter-mounted transfer switches for emergency use.

Bypass-Isolation Transfer Switches for COPS Facilities

Article 708 of the NEC sets forth requirements for *Critical Operations Power Systems (COPS)*. These provide power to systems and facilities engaged in public safety or national security. In the 2017 NEC, *Article 708* permits the use of a bypass-isolation switch. Figure 2 illustrates an example. (For an interactive visualization, visit www.ascopower.com.)

The 2020 version of the NEC now requires the use of a bypass-isolation switch for facilities where COPS loads are fed through a single transfer switch. The 2020 NEC adds *Article 708.24(D)*, which reads:¹³

Where loads are supplied by only one automatic transfer switch, the automatic transfer switch shall include a bypass isolation switch to facilitate maintenance as required in 708.6(C) without jeopardizing continuity of power.

When the bypass isolation transfer switch is in the bypass mode, either it shall automatically initiate transfer between power sources upon loss of the connected power source or it shall remain actively supervised by a qualified person who can manually initiate a transfer between power sources.

To comply with the new requirement, facilities must use an automatic transfer switch that includes a bypass-isolation switch that transfers load automatically, or have someone qualified to operate the transfer switch manually.



Figure 2: A Bypass-Isolation Transfer Switch with draw-out transfer mechanism

¹³ Ibid. Article 708.24 – Transfer Equipment.



SUMMARY

The 2020 NEC introduced new requirements, some of which impact the design and/or operation of backup power systems and equipment. The select changes described in this document are summarized in Table 2.

Table 2. Summary of Select NEC 2020 Updates for Backup Power

Subject	Article	Impact
Reconditioned Equipment	110.3(A)(3)	Sets specific standards for allowable equipment types and practices
	110.21(A)(2)	
	100 Reconditioned	
	408.8	
Protective Barriers	230.62(C)	Requires measures to prevent people and objects for inadvertently contacting energized parts
	408.13(C)(3)	
Arc Flash Mitigation	240.87(B)	Clarifies allowable solutions, requires documented performance tests
Transfer Equipment for Emergency Systems	700.5(A)	Transfer equipment must be listed and marked for emergency use. Prohibits meter-mounted transfer switches.
Bypass-Isolation Transfer Switches for COPS Facilities	708.24(D)	Transfer switches must be able to transfer load in bypass mode -- OR -- Facilities must provide someone to manually transfer load if an outage occurs during switch service.



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