



## **NEMA CS 100-2020**

### *NEMA Technical Position on Reconditioned Equipment*

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## 1. Introduction

The U.S. electrical industry implements new technologies to enhance existing electrical infrastructure. Sustainability and safeguarding the environment are also growing in importance. Supporting these considerations is the option for reconditioning existing equipment. All electrical systems safeguard personnel and infrastructure from potential hazards (electrical, mechanical, fire), and these safeguards must be maintained when reconditioning equipment. This forms the basis for the NEMA technical position on reconditioning of equipment. Given that electrical systems are diverse in design, function, and application, not all components of the electrical infrastructure are candidates for reconditioning.

Properly reconditioned equipment provides a means to extend the life of the equipment. There are precautions that must be followed when reconditioning equipment to ensure that equipment will operate safely. Those precautions are discussed below and include the use of design qualified parts, testing to industry-recognized safety Standards, original manufacturer specifications and recommendations, and reconditioning performed by qualified personnel. The integrity of reconditioned equipment must be established by documenting and demonstrating that component replacement has not compromised the manufacturer's original specifications and accepted industry product safety and performance Standards.

Appendix A provides lists of components or assemblies deemed suitable and not suitable for reconditioning per the 2020 *National Electrical Code*<sup>®</sup> (NEC). The NEMA policy on the adoption of the NEC supports the direct adoption of the latest edition of the NEC. NEMA agrees with the list of components and assemblies, as included in Annex A. Annex B provides lists of components or assemblies that are considered by NEMA as suitable or unsuitable for reconditioning that have not been included in the 2020 NEC. Appendix C provides guidance on reconditioning motors. Medical imaging equipment is specifically not addressed by this policy (for additional guidance, see MITA 1 *Good Refurbishment Practices for Medical Imaging Equipment*).

## 2. Reconditioned Equipment in 2020 *National Electrical Code*<sup>®</sup> (NEC)

The following definition of "Reconditioned" was added to Article 100 of the 2020 edition of the NEC:

**Reconditioned:** 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. (CMP-10)

**Informational Note:** The term *reconditioned* is frequently referred to as *rebuilt*, *refurbished*, or *remanufactured*.

Article 100 also defines equipment as "a general term, including fittings, devices, appliances, luminaires, apparatus, machinery, and the like used as a part of, or in connection with, an electrical installation."

Additionally, 110.21(A)(2) of the 2020 NEC states: "Reconditioned equipment shall be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the equipment can be identified, along with the date of reconditioning. Reconditioned equipment shall be identified as "reconditioned," and the original listing mark should be removed. Approval of the reconditioned equipment shall not be based solely on the equipment's original listing."

110.21(A)(2) also includes an exception for industrial occupancies and three informative notes to provide additional guidance. Refer to this section of the 2020 NEC and 4.5 below for additional details.

### **3. Normal Servicing, Maintenance, and Repair**

Many authorities having jurisdiction (AHJ), design professionals, inspectors, and equipment owners have questions regarding the definition included in the NEC. Specifically, there are questions in the field related to what is meant by “normal servicing.”

Normal servicing is the process of following a manufacturer’s set of instructions to analyze, adjust, or perform prescribed actions upon equipment with the intention to preserve or restore the operational performance of the equipment. Servicing often encompasses maintenance and repair activities.

Maintenance is the process of reviewing the operational performance of equipment according to a time-based, use-based, or performance-based schedule and providing any service to the equipment.

Repair is the process of restoring the designed performance of non-functional equipment to operational conditions through the replacement of damaged integral components or service actions for use in the entity from which it was removed.

### **4. NEMA Guidance on Reconditioned Equipment**

The reconditioning process should follow the manufacturer’s recommendations—including any instructions—and use only design qualified parts. NEMA supports the reconditioning of some equipment. For electrical components suitable for reconditioning, please see the appropriate lists in Appendices A and B. Equipment that is generally considered suitable for reconditioning may not be suitable for reconditioning in a specific case or based on the specific design. When reconditioning equipment, the fundamental tenets included in Section 5 have been established.

In some cases, both the 2020 NEC and NEMA are silent on an equipment’s suitability for reconditioning. In these cases, the manufacturer should be contacted to obtain their position relative to reconditioning. Normal servicing of equipment that remains within a facility should not be considered for reconditioning or refurbishing.

Note: Some equipment may be subcontracted by the user to be serviced, maintained, repaired, or reconditioned to operating conditions by the original manufacturer or at specialized facilities that are authorized by the original manufacturer to provide such services for specific equipment. When the equipment owner subcontracts the work, the work may be considered as if done within the equipment owners’ facility. Ownership of the equipment should not change, and repair work should not exceed the parameters defined by the original manufacturer. Examples of these kinds of specialized facilities are authorized motor and switchgear repair or reconditioning facilities.

#### **4.1 Electrical Infrastructure and Worker Safety**

Reconditioning equipment requires that the electrical industry, in collaboration with manufacturers, establish performance specifications and accepted industry Standards to help ensure safe and reliable equipment that will help protect our electrical infrastructure, so workers and users can continue to benefit from a safe and effective electrical system. Reconditioning Standards must include prescriptive actions and performance requirements that result in equipment that complies with

relevant Standards developed by organizations such as NEMA, UL, CSA, IEC, IEEE, NEC, OSHA, NFPA, NETA, and EASA.

Qualified personnel must possess the knowledge to evaluate equipment condition, potential hazards, and specifications to accurately determine the suitability for reconditioning. Qualified personnel shall also be trained to recondition each different type and manufacturer of equipment that they recondition. A safe and reliable electrical infrastructure is dependent on compliance with manufacturers' instructions, qualified workers, proper maintenance, and accepted industry Standards for reconditioning activities.

#### **4.2 Equipment Reliability, Performance, and Safety**

Reconditioned equipment needs to be reliable, not only providing power but also safely performing its intended function as part of a safe operating electrical system. Understanding the environment, electrical load characteristics, any prior electrical stresses placed on the equipment (overload or overvoltage), and historical maintenance performed on equipment being considered for reconditioning are all important parts of reconditioning evaluation. No access to such information could have an adverse impact on the safety, reliability, and performance of reconditioned equipment. The equipment manufacturer is the foremost authority on the design, performance, and intended safe application of their equipment. Reconditioned equipment must not compromise the reliability, performance, safe operation, or maintainability of the electrical system.

#### **4.3 Integrity of Equipment**

At a minimum, reconditioned equipment must comply with all applicable Standards at the time the equipment was initially built but also include the original manufacturer's performance requirements in accordance with the nameplate markings and ratings. Reconditioned equipment must comply with current product performance Standards.

The reconditioning process shall use only design qualified parts. The term "design qualified" refers to manufacturer defined qualifications, specifications, and controls implemented during the design and manufacturing processes, which may or may not include testing using appropriate product Standards. A design qualified part is one that the manufacturer has invested time, money, and resources evaluating and qualifying. The qualification requirements come from an extensive knowledge of the technology and sciences involved in the equipment. Reverse engineered components (designs copied from existing components by other manufacturers) are not considered to be design qualified parts unless specifically verified using the manufacturer's qualification plan.

Replacement parts shall not include counterfeit parts (i.e., parts that have been misrepresented to be an authorized item of the legally authorized source). Equipment shall operate safely in its intended application after reconditioning occurs. Care must be taken to ensure specific operations such as timing, sequencing, control, and transfer continue to function in the manner originally intended unless changes are specified during the reconditioning process. The integrity of reconditioned equipment must be established by documenting and demonstrating that component replacement and performance changes have not compromised the manufacturer's specifications and accepted industry Standards.

#### 4.4 Use of Standards

Product Standards, while necessary to help ensure that equipment released into the stream of commerce, are held to an acceptable level of safety and performance. They are not a substitute for a manufacturer's design, verification, and validation specifications. Product Standards provide a uniform method for audit and validation of a specific subset of equipment performances deemed important by the industry for safety. They do not cover all possible design aspects of each manufacturer's equipment. The Standards are not intended to provide all the necessary information related to any specific manufacturer's safety-critical design requirements. In short, product Standards may not provide all the information necessary to recondition equipment safely.

#### 4.5 Listing or Certification Marks

NEMA Members manufacture equipment that has been, in many cases, evaluated as part of a third-party certification program to nationally recognized safety Standards. This equipment can be marked with a listing or certification mark when the equipment is manufactured and shipped from the factory. Section 110.21(A)(2) of the 2020 NEC requires that reconditioned equipment has the original listing mark from the listing or certification organizations removed or voided. Manufacturers may use marks that should remain on the equipment. Such marks cover installation requirements or other safety-related information. The marks that must be removed or voided are related to listing or certification organizations only.

The organization that reconditions the equipment is additionally responsible for identifying the reconditioned equipment as reconditioned—and marking the product with a name, trademark, or other descriptive marking to provide traceability to the reconditioning organization. These marking requirements provide assistance in determining the details of the equipment reconditioning provider and the report on what was completed by that provider during this process.

When the manufacturer places a listing or certification mark on the equipment at the factory, it is their attestation that the equipment complies with the applicable requirements. When equipment is reconditioned, and the listing or certification organization cannot ascertain that the equipment continues to comply with applicable product Standards, then further oversight or review/inspection (field evaluation) is needed. The listing or certification organization should be contacted on a case by case basis for guidance on their specific process in this situation. Some equipment is not eligible for field evaluation.

### 5. Fundamental Tenets for Reconditioning

The following fundamental tenets for reconditioning have been developed by NEMA to provide guidance for the use of reconditioned equipment.

- a. Reconditioning equipment may be a viable option for extending the operational lifetime of equipment.
- b. Equipment reconditioning activity must be based on available guidance documentation from the Original Equipment Manufacturer (OEM) and industry developed Standards. Where any conflict in guidance is noted between the OEM and industry Standards, the OEM guidance should take precedence. Where no guidance is available from the OEM or industry Standards, reconditioning is not recommended.
- c. Equipment deemed to be candidates for reconditioning must be reconditioned with guidance from the OEM, including critical design aspects and manufacturing specifications, and to the industry Standards containing the most relevant testing criteria at least equal when the item was built.
- d. Reconditioned equipment must be qualified for tests and evaluation criteria recommended by the manufacturer or appropriate industry Standards.

- e. Reconditioning work must be performed by qualified personnel.
- f. A comprehensive assessment of the equipment being considered for reconditioning with service records, application, environment, service life, and operating parameters is critical before deciding to pursue reconditioning of the equipment and system. Qualified personnel should be able to determine whether a device or system is suitable for reconditioning by consulting OEM documentation, physical inspection, and test.
- g. Reconditioned equipment must utilize electrical product safety Standards because they contain design aspects and testing criteria that ensure that equipment will function as intended. These requirements are established to deliver a usable and safe operating condition as a key component of intended equipment functionality.
- h. Equipment that has been exposed to adverse conditions, such as fire and water damage, may not be suitable for reconditioning. NEMA has developed a series of guides to provide additional information regarding evaluating equipment that may have been damaged by a natural disaster. NEMA GD 1-2019, *Evaluating Water-Damaged Electrical Equipment*, NEMA GD 2-2016, *Evaluating Fire- and Heat-Damaged Electrical Equipment* and NEMA GD 3-2019, *Evaluating Earthquake Damaged Electrical Equipment*. Always consult the OEM in these cases.

## 6. Determining if Equipment is Suitable for Reconditioning

When determining whether specific equipment is suitable for reconditioning, NEMA took into consideration the equipment design, use, and safety requirements. Appendix A provides information regarding components or assemblies that are or are not suitable for reconditioning per the 2020 NEC. Appendix B.1 provides information regarding the components or assemblies that are not suitable for reconditioning because they may pose a hazard, and Appendix B.2 provides information regarding the components or assemblies that are suitable for reconditioning according to subject matter experts within NEMA. Reasons why equipment might not be suitable for reconditioning include but are not limited to:

- a. Components or assemblies that contain semiconductors undergo comprehensive calibration in the factory that need to be maintained for safe operation
- b. Components or assemblies that contain solid-state contactors and starters undergo comprehensive calibration in the factory that need to be maintained for safe operation
- c. Life safety equipment with limited life requirements (e.g., 10 year maximum in service from date of manufacture for smoke alarms)
- d. Testing of reconditioned equipment to confirm that it maintains safety requirements is not possible
- e. A regular follow-up program to evaluate the safety performance requirements is required to maintain listing or certification. Testing to comply with these requirements is normally destructive.
- f. Some equipment is required to indicate when it has reached the end of life (e.g., GFCIs)
- g. Lack of serviceable parts
- h. Reconditioning would not return the equipment to original operational condition

## Appendix A.1 Components or Assemblies Not Suitable for Reconditioning Per The National Electrical Code

<b>Component or Assembly</b>	<b>NEC Reference</b>
Arc-Fault Circuit Interrupters	210.15
Attachment Plugs, Cord Connectors, and Flanged Surface Devices	406.7
Automatic Transfer Switches	700.5(C) & 701.5(C)
Fire Pump Controllers	695.10
Ground-Fault Circuit Interrupters	210.15
Ground-Fault Protection of Equipment	210.15
Listed Low-Voltage Lighting Systems	411.4
Lighting Systems Assembled from Listed Parts	411.4
Low-Voltage Fuseholders and Nonrenewable Fuses	240.62
Low-Voltage Power Circuit Breaker Electronic Trip Units	240.88(B)(1)
Luminaires, Lampholders, and Retrofit Kits	410.7
Medium-Voltage Fuseholders and Nonrenewable Fuses	240.102
Molded-Case Circuit Breakers	240.88(A)(1)
Panelboards	408.8(A)
Receptacles	406.3(A)
Transfer Switches and Equipment	702.5 & 708.24



## Appendix A.2 Components or Assemblies Suitable for Reconditioning Per The National Electrical Code

<b>Component or Assembly</b>	<b>NEC Reference</b>
Communications Equipment	880.3(G)
Electromechanical Protective Relays and Current Transformers	240.88(B)(2)
High-Voltage Circuit Breakers	240.88(A)(3)
Low- and Medium-Voltage Power Circuit Breakers	240.88(A)(2)
Switchgear or Sections of Switchgear	408.8(B) & 490.49
Switchboards or Sections of Switchboards	408.8(B)



## **Appendix B.1**

### **Additional Components or Assemblies Not Suitable for Reconditioning Per NEMA**

Note: The NEMA Policy on Adoption of the NEC supports the direct adoption of the latest edition of the NEC. NEMA agrees with the list of components and assemblies, as included in Annex A.1.

#### I. Wiring and Protection Equipment

- Surge Arresters, Over 1000 Volts
- Surge-Protective Devices (SPDs), 1000 Volts or Less

#### II. Wiring Methods and Materials

- Boxes (Outlet, Device, Pull, Junction, Conduit Bodies, and Handhole Enclosures)
- Busway – Mylar Wrapped and Powder Coated
- Cablebus
- Cable Assemblies (Types AC, FC, FCC, IGS, MC, MI, NM, P, SE, TC, UF, and USE)
- Cable Trays
- Concealed Knob-and-Tube Wiring
- Conductors for General Wiring
- Electrical Connectors
- Enclosures (Cabinets, Cutout Boxes, and Meter-Socket Enclosures)
- Fire-rated poke through assemblies
- Flexible Conduit and Tubing (Types FMC, LFMC, LFNMC, FMT, and ENT)
- Flexible Cords, Flexible Cables, and Fixture Wires
- Medium Voltage Conductors and Cable
- Metal and Nonmetallic Wireways
- Non-Metallic Raceways, Conduit, Tubing, and Fittings (Types PVC, HDPE, NUCC, and RTRC)
- Strut-Type Channel Raceways
- Surface Metal and Nonmetallic Raceways

#### III. Equipment for General Use

- Adjustable Speed Drives
- Capacitors
- Electric Welders
- Lamps
- Lighting Ballasts and Drivers
  
- Metering Equipment (Electromechanical, Electronic, Digital, Submeters, Meter Sockets<sup>1</sup>)
- Phase Converters
- Power resistors and associated control and monitoring equipment
- Relays (Overload, Protective, Electronic, and Digital)
- Resistors and Reactors
- Switchgear, sections of switchgear, and components, that are sealed for life
- Transformers (Cast Resin, Control, Dry-Type, and Liquid-Filled)
- Wiring Devices (Switches and Lighting Controls)

#### IV. Special Equipment

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<sup>1</sup> See EMS P1-2019, *Evaluating Meter Socket Life Span*

Alarm and Signaling Equipment (Fire Alarm Control Panels, Fire Alarm Systems, Smoke Alarms and Detectors, Carbon Monoxide (CO) Alarms and Detectors, Heat Alarms and Detectors, Initiating Devices, Notification Appliances)  
Classified (Hazardous) Motors identified for use in Class I, Division 1 (or Zone 0 or 1) areas  
Classified (Hazardous) Motors identified for use in Class I, Division 2 (or Zone 2)  
Electric Vehicle Power Transfer Equipment  
Electrical Energy Storage Systems  
Fuel Cell Systems



## **Appendix B.2**

### **Additional Components or Assemblies Suitable for Reconditioning per NEMA**

Note: The NEMA Policy on Adoption of the NEC supports direct adoption of the latest edition of the NEC. NEMA agrees with the list of components and assemblies, as included in Annex A.2.

#### I. Equipment for General Use

- Electric Generators
- Industrial Control Panels
- Motors
- Storage Batteries

#### II. Special Equipment

- Uninterruptible Power Supply Equipment



## Appendix C Reconditioning of Motors

### Introduction and Executive Summary

Section 110.21(A)(2) of the NEC requires the original listing mark to be removed. Removing this mark is not feasible for motors since the nameplate is a component of the listing mark and contains prudent information pertaining to the motor. These marking requirements are required by Section 430.7 of the NEC in accordance with NEMA MG 1.

Rewound and repaired motors do not directly comply with the definition of Reconditioned in Article 100. Associating rewind or repaired motors with the reconditioned definition in Article 100 can cause a long interruption of service. It is normal practice to rewind and repair motors by established refurbishing companies. Rewinding or repair of motors is necessary to keep facilities running without long downtimes. The nameplate information supplied on a motor is required to ensure the proper application. Certifying agency resources and infrastructure do not exist to address the impact of this requirement if left unchanged, due to the vast number of motors reconditioned each year.

### Motors

The following is the acceptable procedure for the reconditioning, rewinding, or repair of motors:

**1. Reconditioned.** Motors are reconditioned when they are rebuilt or serviced and then acquired by another owner. Motors are not considered reconditioned when they are repaired or rewind and retained by the same owner. When repaired or rewind, the following practices shall apply:

- A. Non-Classified (Ordinary Location) Motors.** Non-classified (ordinary location) motors shall be repaired or rewind in accordance with ANSI/EASA AR100, *Recommended Practice for the Repair of Rotating Electrical Apparatus*, per the following:
1. Motors shall be permitted to be repaired or rewind to their original ratings or specifications without the removal of the original nameplate. Such motors shall have a permanently affixed label that identifies the service center and date of service.
  2. Motors shall be permitted to be repaired or rewind with changes to the original rating or specifications. The original nameplate shall be removed or defaced, or re-affixed blank side out, along with any listing information. A new nameplate shall be permanently affixed to the motor that identifies the ratings or specifications in accordance with NEMA MG-1. The identification of the service center and date of service shall be provided on a permanently affixed label or nameplate.
- B. Classified (Hazardous) Motors Class I, Division 1 (Zone 0 or 1).** Classified (hazardous) motors identified for use in Class I, Division 1 (or Zone 0 or 1) areas shall not be reconditioned. Classified Motors Class I, Division 1 (Zone 0 or 1) shall be permitted to repaired or rewind in accordance with ANSI/EASA AR100, *Recommended Practice for the Repair of Rotating Electrical Apparatus*, per the following:
1. Class I, Division 1 (and Zone 0 or 1) motors are permitted to be repaired or rewind to their original ratings or specifications without the removal of the original nameplate. Such motors shall have a permanently affixed label that identifies the service center and date of service.
  2. Class I, Division 1 (and Zone 0 or 1) motors are permitted to be repaired or rewind with changes to the original rating or specifications when the original nameplate is removed or defaced along with any listing information. A new and separate nameplate (issued by the NRTL) shall be permanently affixed to the motor that identifies the ratings or specifications in accordance with NEMA MG 1. The identification of the service center and date of service shall be provided along with a newly issued NRTL mark.

**C. Classified (Hazardous) Motors Class I, Division 2 (Zone 2).** Classified (hazardous) motors identified for use in Class I, Division 2 (or Zone 2) shall not be reconditioned. Classified motors Class I, Division 2 (Zone 2) shall be permitted to be repaired or rewound in accordance with ANSI/EASA AR100, *Recommended Practice for the Repair of Rotating Electrical Apparatus*, per the following:

1. Class I, Division 2 (and Zone 2) motors are permitted to be repaired or rewound to their original ratings or specifications without the removal of the original nameplate. Such motors shall have a permanently affixed label that identifies the service center and date of service.
2. Class I, Division 2 (and Zone 2) motors are permitted to be repaired or rewound with changes to the original rating or specifications when the original nameplate is removed or defaced along with any listing information. A new and separate nameplate shall be permanently affixed to the motor that identifies the rating or specifications in accordance with NEMA MG 1. The identification of the service center and date of service shall be provided along with a newly issued NTRL mark.

Free download of ANSI/EASA AR100, *Recommended Practice for the Repair of Rotating Electrical Apparatus* is available at the following link:  
<https://easa.com/Resources/Resource-library/ansieasa-standard-ar100-2015-recommended-practice-for-the-repair-of-rotating-electrical-apparatus-1>

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