



Evaluating Water-Damaged Electrical Equipment

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Contents

- 1 Use of This Publication..... 4
 - 1.1 Methods for Evaluating Water-Damaged Electrical Equipment 4
- 2 Contact the Manufacturer 5
 - 2.1 Consult the Authority Having Jurisdiction..... 5
- 3 Electrical Equipment Replacement/Reconditioning Requirements 6
 - 3.1 Electrical Distribution Equipment..... 7
 - 3.2 Motor Control Equipment..... 8
 - 3.3 Power Equipment 10
 - 3.4 Transformers..... 11
 - 3.5 Raceways, Conduit, Tubing, Fittings, Enclosures, Outlet Boxes, and Junction Boxes 12
 - 3.6 Wire, Cable, and Flexible Cords 13
 - 3.7 AFCIs, GFCIs, GFPEs, Surge Protection Equipment, and Wiring Devices 13
 - 3.8 Other Devices..... 15
- Annex A Consolidated Table (Refer to Section 3 for Additional Information)..... 18

Evaluating Water-Damaged Electrical Equipment

1 Use of This Publication

This publication serves as a guide that represents the consensus of NEMA member companies and is not intended to override the recommendations of the specific equipment manufacturer. These guidelines provide information on how to evaluate electrical equipment¹ that has been exposed to water through flooding, firefighting activities, hurricanes, and other events involving large quantities of water. It is designed for use by suppliers, installers, inspectors, and users of electrical products. Where additional information is required, it is recommended that the specific electrical equipment manufacturers be consulted. Evaluation of electrical equipment should be conducted by qualified personnel.

Electrical equipment exposed to water can be extremely hazardous if reenergized without performing a proper evaluation and taking necessary actions. Reductions in the integrity of electrical equipment due to moisture can affect the ability of the equipment to perform its intended function. Damage to electrical equipment can also result from flood waters contaminated with chemicals, sewage, oil, and other debris, which will affect the integrity and performance of the equipment. Salt water exposure can be particularly damaging because of the corrosive and conductive nature of the salt water residue.

Distributors of electrical equipment should not supply any inventory that has been subjected to water damage. This can lead to the continued use of damaged equipment, creating a hazard to individuals or property.

1.1 Methods for Evaluating Water-Damaged Electrical Equipment

There are many methods for evaluating electrical equipment that has been exposed to water. This may include visual observations, operational tests, or performance tests. Equipment discoloration, rust or oxidation, water marks, deposits (debris, chemicals, minerals), and material fatigue are all examples of visual observations. Operational tests compare the manual functions of the equipment exposed to water to new, properly operating equipment. Operational tests may determine abnormal switch or disconnect operation by sound and feel, abnormal friction or resistance of rotating parts or motors, and abnormally tight or loose contact devices such as receptacles, knife blades, bus clips, racking systems, etc. Like operational tests, performance tests compare known data points of equipment that may have been damaged by water to new, properly performing equipment. Insulation resistance testing, dielectric absorption testing, and infrared thermographic imaging are a few examples of performance tests. The original manufacturer of the equipment should be contacted before performing any operational or performance testing to prevent further damage to the equipment. Equipment maintenance should also be considered during any evaluation regarding the equipment's ability to withstand exposure due to component performance, i.e., gasket replacement, or other components that provide environmental protection for the equipment.

¹ For the purposes of NEMA 70006, the term “electrical equipment” includes both the definition used by the National Fire Protection Association as well as wiring methods.

2 Contact the Manufacturer

Working knowledge of electrical systems and the equipment in question is required to evaluate damage due to contact with water. The original manufacturer of the equipment should be contacted if any questions arise or specific recommendations are needed. In many cases, a replacement will be necessary.

After consultation with the manufacturer, some larger types of electrical equipment may be reconditioned by properly trained personnel. The potential to recondition the equipment may vary with the nature of the electrical function, the degree of flooding, contaminants, the age of the equipment, and the length of time the equipment was exposed to water.

Attempts to recondition equipment without consulting the manufacturer can result in additional hazards due to the use of improper cleaning agents, which can further damage the equipment, or due to improper reconditioning techniques.

NEMA member companies are committed to safety. For specific contacts within these manufacturing firms, call or write:

National Electrical Manufacturers Association
1812 N Moore Street, 22nd Floor
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2.1 Consult the Authority Having Jurisdiction

When considering the replacement or reconditioning of water-damaged electrical equipment, the Authority Having Jurisdiction should be consulted to obtain additional rules and other guidance information impacting the installation. This may include licensing, permitting, and inspection requirements or other rules outlined in the locally adopted codes and standards. Where public safety is primary, the Authority Having Jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority.

For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the Authority Having Jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the Authority Having Jurisdiction; at government installations, the commanding officer or departmental official may be the Authority Having Jurisdiction.

During declared federal or state emergencies, the Federal Emergency Management Agency (FEMA) may assume the role of Authority Having Jurisdiction.

3 Electrical Equipment Replacement/Reconditioning Requirements

The table below provides the requirements and recommendations associated with various categories of electrical equipment that have been subjected to water damage. A consolidated table indicating whether particular equipment should be replaced or may be reconditioned is included as Annex A.

Following exposure to water, electrical equipment must be carefully inspected to determine its suitability for continued use. Based on the extent of damage and the type of equipment:

- Some equipment shall be replaced because of compromised safety or functionality
- Some equipment may be reconditioned if deemed safe and feasible (users are encouraged to reference NEMA 70011-2020 *Technical Position on Reconditioned Equipment*)
- Some equipment may be returned to use without reconditioning, depending on the extent of damage and type of water

In cases where reconditioning of equipment is being considered, it is critical that the manufacturer of the equipment be contacted for specific guidance. Additional information about hazards associated with specific electrical equipment is included below.

3.1 Electrical Distribution Equipment

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
Molded-case circuit breakers	X		ANSI/NEMA AB 4 <i>Guidelines for Inspection and Preventive Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications</i>
Low-voltage fuses	X		BI 50009 <i>Low Voltage Cartridge Fuses</i>
Switches	X		ANSI/NEMA KS 3 <i>Guidelines for Inspection and Preventive Maintenance of Switches Used in Commercial and Industrial Applications</i>
Busway (Mylar wrapped bars)	X		NEMA BS 31050 <i>General Instructions for Handling, Installation, Operation, and Maintenance of Busway Rated 600 Volts or Less</i> , par. 3.4.4, 9.2.4.2
Busway (powder-coated bars)		X	
Cablebus	X		NEMA BI 50052 <i>Metal Cable Bus Systems</i>
Flexible bus systems	X		
Insulated bus pipe (IBP) and tubular covered conductor (TCC) systems	X		
Panelboards		X	NEMA PB 1.1 <i>General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 1000 Volts or Less</i> , par. 10.3, 10.8, 10.8.3, 10.8.4, 10.9
Switchboards		X	NEMA PB 2.1 <i>General Instructions for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less</i> , par. 9.1, 9.8, 9.8.3, 9.8.4, 9.9

Electrical distribution equipment usually involves switches and low-voltage protective components such as molded-case circuit breakers and fuses within assemblies such as enclosures, panelboards, and switchboards. These assemblies can be connected to electrical distribution systems using various wiring methods.

The protective components are critical to the safe operation of distribution circuits. Their ability to protect these circuits is adversely affected by exposure to water and to the minerals, contaminants, and particles that may be present in the water. In molded-case circuit breakers and switches, such exposure can affect the overall operation of the mechanism through corrosion, through the presence of foreign particles, and through loss of lubrication. The condition of the contacts can be affected, and the dielectric insulation capabilities of internal materials can be reduced. Further, some molded-case circuit breakers are equipped with electronic trip units, and the functioning of these trip units can be impaired. Water may affect the filler material of fuses and will degrade the insulation and interruption capabilities.

Distribution assemblies contain protective components together with the necessary support structures, buswork, wiring, electromechanical or electronic relays, and meters. Exposure to water can cause corrosion and insulation damage to all of these areas. In the case of exposure of distribution assemblies to water, contact the manufacturer before further action is taken.

3.2 Motor Control Equipment

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
Adjustable speed drives	X		NEMA IS 10033 <i>Adjustable Speed Drives</i>
Components containing semiconductors and transistors	X		
Electronically controlled and solid-state contactors and starters	X		
Overload relays	X		
Manual and magnetic controllers		X	
Motor control centers (see 3.2.2)		X	

Motor circuits include motor control devices such as motor starters and contactors, which— together with overcurrent protection components such as overload relays, circuit breakers, and fuses—are often assembled into motor control panels and motor control centers, as well as individual enclosures. Motor control centers contain both control and protective components, together with support structures, buswork, and wiring.

The protective components are critical to the safe operation of motor circuits, and their ability to protect these circuits is adversely affected by exposure to water and to the minerals,

contaminants, and particles that may be present in the water. For molded-case circuit breakers, such exposure can affect the overall operation of the mechanism through corrosion, through the presence of foreign particles, and through loss of lubrication. The condition of the contacts can be affected, and the dielectric insulation capabilities of internal materials can be reduced. Further, some molded-case circuit breakers are equipped with electronic trip units, and the functioning of these trip units can be impaired. Water may affect the filler material of fuses and can degrade the insulation and interruption capabilities.

Corrosion, loss of lubrication, and insulation quality can also be expected in contactors and starters. Solid-state motor controllers, adjustable speed drives and those electromechanical contactors or starters with integral electronic circuitry will be more severely affected by water.

3.2.1 Adjustable Speed Drives

Adjustable speed drives generally contain electronic components. See Section 3.3 for information on equipment with electronic components. For other components of an adjustable speed drive, the ability to refurbish those components will depend on the type of component involved and the extent of the damage. The manufacturer of the drive must be consulted before any attempt to refurbish the equipment.

3.2.2 Motor Control Centers

Motor control centers contain many different components, including fuses, circuit breakers, controllers, overload relays, and adjustable speed drives, as well as components such as buswork, insulators, and enclosures. Many of these components are covered in other parts of this document and should be referenced for additional information on those components.

For the buswork and structural assembly, exposure to water can cause corrosion and insulation damage. For these assemblies, contact the manufacturer before further action is taken.

3.3 Power Equipment

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
Electrical connectors	X		
Electronic trip units of LV power circuit breakers	X		
High-voltage circuit breakers (AC) (as used in medium-voltage switchgear)		X	
Low-voltage power circuit breakers (AC)		X	
Electromechanical protective relays, meters, and current sensors (see Section 3.3 for devices that contain electronic components)		X	
Electronic protective relays, meters, and current transformers (see Section 3.3)	X		
Low-voltage switchgear		X	
Medium-voltage switchgear		X	
Medium-voltage fuses	X		

Power equipment involves low-voltage or medium-voltage protective devices within an overall switchgear assembly. The assembly may also contain cabling, buswork with appropriate insulators, current transformers, electromechanical or electronic relays, and metering.

Reliable operation of the protective devices is vital to system safety. These devices can be adversely affected by water. In the case of low-voltage power circuit breakers and medium-voltage circuit breakers and switches, the operation of the mechanism can be impaired by corrosion, the presence of particles such as silt, and the removal of lubricants. The dielectric properties of insulation materials and insulators will degrade, and, for air circuit breakers, the condition of the contacts can be affected.

Further, low-voltage power circuit breakers usually incorporate electronic trip units; the functioning of these units will be impaired. Similarly, the functionality of electronic protective relays and meters can be impaired. See Section 3.3 for additional information on electronic components.

Water may affect the filler material of fuses and will degrade the insulation and interruption capabilities.

Low-voltage power circuit breakers and medium-voltage breakers are designed to be maintainable with the possibility of replacing contacts in air circuit breakers. Therefore, it may be possible to reuse such circuit breakers provided the refurbishing is performed in close consultation with the manufacturer. This includes cleaning and drying techniques, lubrication advice, and thorough

testing before the reapplication of power. However, discard and replace the electronic trip units of low-voltage power circuit breakers, and electronic protective relays and meters in any power equipment.

Replace fusible units of fused equipment. The remainder of the apparatus may be suitable for refurbishing in close consultation with the manufacturer.

In all cases, attention must be paid to the thorough cleaning, drying, and testing of insulators and insulation material.

The power equipment can be expected to contain additional electronic units such as solid-state relays. These units can be vital to the correct functioning of the protective device, and great care is needed in the cleaning and testing of such units. A first recommendation is to return the devices to the manufacturer. If this is not possible, the manufacturer should be consulted on the correct selection of cleaning agents that remove impurities without damaging the conformal coating. The manufacturer shall also be contacted for the specific testing required for sophisticated electronic equipment containing, for example, microprocessors.

The overall power equipment assembly (switchgear) may be able to be reconditioned, provided careful steps are taken in the cleaning, drying, and testing of the equipment before applying power. This requires input and advice from the manufacturer. An area of particular concern is the maintenance of the dielectric properties of insulation. In the field application of medium-voltage equipment, standoff insulators are subjected to a wide variety of high-voltage surges. Such insulators may need replacement.

Electrical connectors, both mechanical and compression, should be replaced. Previously torque installed mechanical connectors will have taken permanent deformation to threaded fasteners and connector bodies and cannot be effectively cleaned and re-termination performed. New connectors are required. Compression connectors that are not in watertight sealed insulation may be subjected to unknown levels of corrosion from fresh or brackish water resulting both short- and long-term corrosion and must be removed and new connections made.

3.4 Transformers

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
All dry-type transformers regardless of kVA ratings	X		
All dry-type control power transformers	X		
Liquid-filled transformers	X (Analysis of the insulating medium is required for evaluation of this equipment.)		
Cast-resin transformers	X		

Exposure of transformers to water can cause corrosion and insulation damage to the transformer core and winding. The ability of the transformer to perform its intended function in a safe manner can also be impaired by debris and chemicals, which may be deposited inside the transformer during a flood. Water and contaminants will also damage the transformer fluids.

3.5 Raceways, Conduit, Tubing, Fittings, Enclosures, Outlet Boxes, and Junction Boxes

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
Fittings ¹			NEMA FB 1 <i>Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing (EMT) and Cable</i>
Outlet and junction boxes ¹			NEMA BI 50074 <i>Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports</i> NEMA BI 50075 <i>Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports</i>
Conduit and tubing ¹		See note 1	

¹These products may be reused under certain circumstances. Contact the manufacturer for specific information and instructions.

3.5.1 Enclosures, Outlet Boxes, and Fittings

Metallic and nonmetallic enclosures, outlet boxes, and fittings that are not listed for use in wet locations have not been evaluated for effects of exposure to conditions described in Section 1. The presence of known or unknown corrosive agents in flood water, in particular, can affect the physical properties of nonmetallic materials and the required corrosion protection for electrical equipment.

Therefore, the replacement of enclosures, outlet boxes, and fittings in accordance with original installation requirements is recommended.

3.5.2 Raceways, Conduit, and Tubing

In the case of flooding, firefighting activities, or other instances of unusual water exposure, raceways, conduit, and tubing must be carefully inspected to determine if the mechanical and electrical integrity of the raceway/conduit/tubing system has been compromised. Flood waters, in particular, may be contaminated with oil, chemicals, sewage, and other debris that could enter the raceway/conduit/tubing and prevent a clear path for the replacement of conductors or cables. As part of the inspection process, ensure that the interior of the raceway/conduit/tubing is clear. Also, contaminants may affect the physical properties of metallic and nonmetallic materials and the corrosion protection for electrical equipment. Since every situation has unique circumstances, the

services of an experienced evaluator should be used. The manufacturer can also be consulted for additional assistance.

3.6 Wire, Cable, and Flexible Cords

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
Wire or cable listed for dry locations (such as NM-B)	X		
Wire or cable that is suitable for wet locations (provided the ends of the wire or cable have not been exposed to water, and the wire is not damaged)		X	

When any wire or cable product is exposed to water, any metallic component (such as the conductor, metallic shield, or armor) is subject to corrosion that can damage the component itself and/or cause termination failures. If water remains in medium-voltage cable, it could accelerate insulation deterioration, causing premature failure. Wire and cable listed for only dry locations may become a shock hazard when energized after being exposed to water.

Any recommendations for reuse of wire and cable in Section 3 are based on the assumption that the water contains no high concentrations of chemicals, oils, etc. If it is suspected that the water has unusual contaminants, such as may be found in some flood water, the manufacturer should be consulted before any decision is made to continue using any wire or cable products.

3.7 AFCIs, GFCIs, GFPEs, Surge Protection Equipment, and Wiring Devices

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
Arc-fault circuit interrupters (AFCI), ground-fault circuit interrupters (GFCI), and ground-fault protection of equipment (GFPE)	X		
Surge-protective devices (surge arresters, and surge protectors)	X		
Wiring devices (switches, receptacles, dimmers, etc.)	X		

Sediments and contaminants contained in water may migrate into the internal components of installed electrical products and remain there even after the products have been dried or washed by the user. These may adversely affect the performance of those products without being readily apparent to the user community. Also, electrical products, such as AFCIs, GFCIs, GFPEs, and

surge protection equipment, contain electronic circuitry and other components, which can be adversely affected by water, resulting in the device becoming non-functional or a hazard to the user. Air drying and washing of water-damaged products of this type should not be attempted.

3.8 Other Devices

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
Batteries (refer to 3.8.5)	X		
Cable tray (refer to 3.8.1)		X (Replace damaged labels)	
Electric vehicle power transfer system equipment (EVPTSE) (refer to 4.13)		X	
Electric welders			
Energy management systems (EMS) and power control systems (PCS)	X		
Energy storage systems (ESS) (refer to 3.8.7)	X	X (Components in ESS)	
Electrical welders		X	
Fire pump controllers	X		NEMA ICS 15 <i>Instructions for the Handling, Installation, Operation, and Maintenance of Electric Fire Pump Controllers Rated Not More Than 600V</i>
Industrial control panels		X	UL 508A <i>Standard for Industrial Control Panels</i>
Industrial machinery		X	
Information technology equipment (ITE), modular data centers (MDC), and sensitive electronic equipment	X		
Lighting equipment	X		
Motors		X	ANSI/IEEE 43-2013, A2 and A3, ANSI/EASA AR100
Power resistors and related assemblies	X		
Signaling, protection, and communications systems	X		
Uninterruptible power supply (UPS)	X		

3.8.1 Cable Tray

Carefully inspect the cable tray system to determine if its mechanical and/or electrical integrity has been compromised. Repair or replace any damaged portions according to original installation requirements. Remove all debris from the cable tray. If any labels warning against the use of the cable tray as a walkway have been damaged, obtain new labels from the manufacturer and apply as required.

3.8.2 Luminaires (Lighting Fixtures), Ballasts, and LED Drivers

Fluorescent, high-intensity discharge, incandescent, induction, and LED lighting equipment such as lamps, control gear, and luminaires are not intended for submersion in water, except for those that are listed as submersible. Lighting equipment that has been flooded may be damaged by corrosive materials, sediment, or other debris in the water. Corrosion of metallic parts and contamination of internal circuitry may prevent the equipment from operating properly or in a safe manner.

Ballasts and drivers are not intended for submersion in water. Most general illumination ballasts and drivers are rated for damp and dry locations only. Ballasts and drivers that have been submerged in water are likely damaged by corrosive materials, sediment, or other debris in the water. Corrosion of metallic parts and contamination of internal circuitry will prevent the equipment from operating properly or in a safe manner.

3.8.3 Motors

Motors that have been flooded by water may be subjected to damage by debris or pollutants. This may result in damage to insulation, capacitors, and internal components. Corrosion of metallic parts and contamination of the lubricating means should be evaluated by qualified personnel.

3.8.4 Electronic Products, Including Signaling, Protection, Communication Systems, and Industrial Controls

Equipment used in signaling, protection, and communication systems generally contain electronic components, and the exposure of such equipment to water or corrosives can adversely affect the reliability of those systems. Contamination by pollutants or debris in flood waters may cause corrosion of components of the system, shorting or alteration of printed circuits, or alteration of circuit characteristics. Since some of these types of installations are classified as life safety systems, it is important that the reliability of those systems be maintained.

Where such systems are damaged by water, replace components of these systems or return the equipment to the manufacturer for appropriate cleaning, recalibration, and testing. Manufacturers of these systems should be contacted for information on specific equipment.

3.8.5 Batteries

When a battery is exposed to moisture, the external metallic components (for example, battery contacts and can) are subject to corrosion and rust. The rate of corrosion damage can be impacted by the type and amount of moisture. For example, salt water may increase the corrosion rate when compared to fresh water. When batteries are exposed to moisture for very long periods of time (for

example, months), the battery may rust through, allowing the internal active ingredients to be released into the outside environment.

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3.8.6 Electric Vehicle Power Transfer System Equipment

Electric vehicle power transfer system equipment (EVPTSE) covers a broad range of products including electric vehicle supply equipment (EVSE), electric vehicle charging system equipment (EVCSE), wireless power transfer equipment (WPTE), electric vehicle power export equipment (EVPE), and all supporting components.

EVPTSE can include a variety of AC and DC voltage components. Components within EVPTSE can include, but are not limited to, protective components (such as circuit breakers and fuses), bus bar and supporting insulators, cabling and wires, wire terminals and lugs, line conditioning equipment (such as surge suppressors and line filters), cooling equipment (e.g., fans), power modules, power electronics, inverters, networking devices, and control systems.

Depending on the configuration of the equipment, type of water exposure, and severity of water ingress, reconditioning is often not possible. As such, the original manufacturer of the equipment should be contacted if any questions arise, or specific recommendations are needed. In many cases, a replacement of the equipment will be necessary.

Components within EVPTSE may be required to be replaced where they have been identified as not being permitted to be reconditioned.

3.8.7 Energy Storage Systems (ESS)

In accordance with NFPA 70, section 706.3, "reconditioned energy storage systems shall not be installed." However, Section 4.6 of NFPA 855 does permit the repair, retrofit, replacement, and reuse of ESS under certain conditions. Section 4.6.5.1 states that: "materials, equipment, and devices shall not be reused or reinstalled unless such elements have been reconditioned, tested, and placed in proper working condition." Section 4.6.5.2 further adds: "repurposed, remanufactured, and refurbished batteries shall also comply with 9.3.4" (9.3.4.1 through 9.3.4.6).

Annex A Consolidated Table (Refer to Section 3 for Additional Information)

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
ELECTRICAL DISTRIBUTION EQUIPMENT (refer to 3.1)			
Molded-case circuit breakers	X		ANSI/NEMA AB 4 <i>Guidelines for Inspection and Preventive Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications</i>
Low-voltage fuses	X		BI 50009 <i>Low Voltage Cartridge Fuses</i>
Switches	X		ANSI/NEMA KS 3 <i>Guidelines for Inspection and Preventive Maintenance of Switches Used in Commercial and Industrial Applications</i>
Busway (Mylar wrapped bars)	X		NEMA BS 31050 <i>General Instructions for Handling, Installation, Operation, and Maintenance of Busway Rated 600 Volts or Less</i> , par. 3.4.4, 9.2.4.2
Busway (powder-coated bars)		X	
Cablebus	X		NEMA BI 50052 <i>Metal Cable Bus Systems</i>
Flexible bus systems	X		
Insulated bus pipe (IBP) and tubular covered conductor (TCC) systems	X		
Panelboards		X	NEMA PB 1.1 <i>General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 1000 Volts or Less</i> , par. 10.3, 10.8, 10.8.3, 10.8.4, 10.9
Switchboards		X	NEMA PB 2.1 <i>General Instructions for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less</i> , par. 9.1, 9.8, 9.8.3, 9.8.4, 9.9

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
MOTOR CONTROL EQUIPMENT (refer to 3.2)			
Adjustable speed drives	X		NEMA IS 10033 <i>Adjustable Speed Drives</i>
Components containing semiconductors and transistors	X		
Electronically controlled and solid-state contactors and Starters	X		
Overload relays	X		
Manual and magnetic controllers		X	
Motor control centers (see 3.2.2)		X	
POWER EQUIPMENT (refer to 3.3)			
Electrical connectors	X		
Electronic trip units of LV power circuit breakers	X		
High-voltage circuit breakers (AC) (as used in medium-voltage switchgear)		X	
Low-voltage power circuit breakers (AC)		X	
Electromechanical protective relays, meters, and current sensors (see Section 3.3 for devices that contain electronic components)		X	
Electronic protective relays, meters, and current transformers (see Section 3.3)	X		
Low-voltage switchgear		X	
Medium-voltage switchgear		X	
Medium-voltage fuses	X		

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
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TRANSFORMERS (refer to 3.4)

All dry-type transformers regardless of kVA ratings	X		
All dry-type control power transformers	X		
Liquid-filled transformers	X (Analysis of the insulating medium is required for evaluation of this equipment)		
Cast-resin transformers	X		

RACEWAYS, CONDUIT, TUBING, FITTINGS, ENCLOSURES, OUTLET BOXES, AND JUNCTION BOXES (refer to 3.5)

Fittings ¹			NEMA FB 1 <i>Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing (EMT) and Cable</i>
Outlet and junction boxes ¹			NEMA BI 50074 <i>Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports</i> NEMA BI 50075 <i>Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports</i>
Conduit and tubing ¹		See note 1	

¹These products may be reused under certain circumstances.
Contact the manufacturer for specific information and instructions.

WIRE, CABLE, AND FLEXIBLE CORDS (refer to 3.6)

Wire or cable listed for dry locations (such as NM-B)	X		
Wire or cable that is suitable for wet locations (provided the ends of the wire or cable have not been exposed to water, and the wire is not damaged)		X	

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
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AFCIs, GFCIs, GFPEs, SURGE PROTECTION EQUIPMENT, AND WIRING DEVICES (refer to 3.7)

Arc-fault circuit interrupters (AFCI), ground-fault circuit interrupters (GFCI), and ground-fault protection of equipment (GFPE)	X		
Surge-protective devices (surge arresters, and surge protectors)	X		
Wiring devices (switches, receptacles, dimmers, etc.)	X		

OTHER DEVICES (refer to 3.8)

Batteries (refer to 3.8.5)	X		
Cable tray (refer to 3.8.1)		X (Replace damaged labels)	
Electric vehicle power transfer system equipment (EVPTSE) (refer to 3.8.6)		X	
Electric welders			
Energy management systems (EMS) and power control systems (PCS)	X		
Energy storage systems (ESS) (refer to 4.14)	X	X (Components in ESS)	
Electrical welders		X	
Fire pump controllers	X		NEMA ICS 15 <i>Instructions for the Handling, Installation, Operation, and Maintenance of Electric Fire Pump Controllers Rated Not More Than 600V</i>
Industrial control panels		X	UL 508A <i>Standard for Industrial Control Panels</i>
Industrial machinery		X	

Equipment	Replace equipment	May be reconditioned (contact the manufacturer)	Additional standards reference (if available)
Information technology equipment (ITE), modular data centers (MDC), and sensitive electronic equipment	X		
Lighting equipment	X		
Motors		X	ANSI/IEEE 43-2013, A2 and A3, ANSI/EASA AR100
Power resistors and related assemblies	X		
Signaling, protection, and communications systems	X		
Uninterruptible power supply (UPS)	X		

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