Thought leadership
White paper

Understanding 2023 NFPA 70B:
Standard for electrical equipment maintenance

How to administer safer, more reliable and efficient electrical preventive maintenance programs

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I. Overview

In 2023, the National Fire Protection Association (NFPA) 70B will shift from a "Recommended Practice" to a "Standard" containing mandatory language for the development, implementation and operation of an electrical maintenance program Electrical Maintenance Program (EMP).

We believe this change will provide practical safeguards, helping protect people and support more reliable electrical systems. It closely aligns with NFPA 70E Standard for Electrical Safety in the Workplace, which indicates that even if equipment is installed properly, it may not be safe to work on unless it is "properly maintained" per the manufacturer's instructions or industry consensus standards.

The new standard will impact electrical infrastructure installed in industrial plants, institutional and commercial buildings, and large multifamily residential complexes. Unlike the state-adopted National Electric Code (NEC), NFPA 70B is not a code or directly mandated by law. However, much like NFPA 70E, NFPA 70B is considered the minimum consensus requirements for safe electrical work practices and the Occupational Safety and Health Administration (OSHA) can utilize the standard to issue citations.

This paper provides a practical guide to understanding and complying with the 2023 NFPA 70B requirements, including:

- **What is new in the standards**
- **Compliance requirements**
- **Maintenance implications to common electrical system components**
- **Strategies that simplify electrical maintenance programs**

II. Understanding 5 new requirements of NFPA 70B

For decades, the NFPA 70B, Recommended Practice for Electrical Equipment Maintenance, served to provide guidance to electrical maintenance managers on how to develop and implement an electrical maintenance program (EMP). It provides a framework to safeguard people, equipment and processes from electrical system failures.

The 2023 version of NFPA 70B, now a standard, shifts from recommendations to mandatory language surrounding the implementation of electrical maintenance programs. Earlier versions of NFPA 70B provide for what electrical maintenance practices "should" be, whereas the new version provides for what they "shall" be. Changes were made to incorporate the electrical equipment physical condition, criticality and operating environment when determining the frequency of maintenance. The failure of improperly maintained equipment could impact personnel or environmental safety.

Here are 5 requirements you should know:

1. Maintenance intervals are now a primary focus

Chapter 9 of NFPA 70B now provides mandatory scopes of work and maintenance intervals broken out by product type and based on an equipment condition assessment. These requirements can be referenced in Table 9.2.2, which is in alphabetical order and provides the corresponding reference chapter for maintenance procedures specifics.

It is important to note these maintenance intervals do not supersede manufacturer's guidelines; they provide guidance only in the absence of information from the manufacturer.

Frequency of maintenance for common electrical equipment

		Equipment condition assessment		
Product	**Scope of work**	**Condition 1**	**Condition 2**	**Condition 3**
All equipment	Infrared thermography	12 months	12 months	6 months
Busways	Visual inspection	60 months	60 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
	Special	60 months	36 months	12 months
Fuses	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Low-voltage ground-fault protection systems	Visual inspection	12 month	12 months	6 months
	Cleaning	60 months	36 months	12 months
	Lubrication		Reserved	
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Medium-voltage ground-fault protection systems	Visual inspection	12 months	12 months	6 months
	Cleaning	60 months	36 months	12 months
	Lubrication		Reserved	
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Medium-voltage power circuit breakers	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Molded-case/insulated-case/low-voltage power circuit breakers	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Motor control equipment	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months

NFPA 70B highlights the frequency of maintenance for various equipment types.
The table above show the frequency of maintenance of common power distribution equipment, as listed in NFPA 70B.

Frequency of maintenance for common electrical equipment continued

		Equipment condition assessment		
Product	**Scope of work**	**Condition 1**	**Condition 2**	**Condition 3**
Panelboards and switchboards	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical inspections	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Power and distribution transformers	Visual inspection	12 months	12 months	6 months
	Cleaning	60 months	36 months	12 months
	Lubrication		Reserved	
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Power cables	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Mechanical servicing	Reserved	Reserved	
	Electrical testing	60 months	36 months	12 months
Protective relays, electromechanical	Visual inspection	36 months	24 months	12 months
	Cleaning	36 months	24 months	12 months
	Lubrication		Reserved	
	Mechanical servicing	36 months	24 months	12 months
	Electrical testing	36 months	24 months	12 months
Protective relays, solid state and microprocessor	Visual inspection	60 mnths	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubricaion		Reserved	
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Substations	Visual inspection	12 months	12 months	6 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
	Special	60 months	36 months	12 months
	Mechanical checks	60 months	36 months	12 months
Switches	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Switchgear	Visual inspection	12 months	12 months	6 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
	Special	60 months	36 months	12 months
Uninterruptible power supplies	Visual inspection	6 months	3 months	1 month
	Cleaning	12 months	6 month	3 months
	Lubrication		Reserved	
	Mechanical servicing	12 months	6 month	3 months
	Electrical testing	12 months	6 month	3 months
	Special procedures	24 months	24 month	24 months

NFPA 70B highlights the frequency of maintenance for various equipment types.
The table above show the frequency of maintenance of common power distribution equipment, as listed in NFPA 70B.

2. Equipment condition assessment is key

NFPA 70B Chapter 9 prescribes maintenance intervals based on an equipment condition assessment, which depends on the following conditions:

1. **Equipment physical condition**
2. **Criticality**
3. **Operating environment**

The equipment condition assessment (ECA) is driven by the HIGHEST value of these three conditions. For example, if equipment is designated "Condition 1" for electrical equipment and criticality, but a "Condition 3" for operating environment, then the equipment would use "Condition 3" durations for the ECA maintenance intervals.

NFPA 70B also requires a decal system at the conclusion of maintenance to provide a visual indication for electrical workers of the electrical equipment condition of maintenance.

3. Electrical maintenance programs are now defined

NFPA 70B 4.2 provides clearly defined requirements for what elements the electrical maintenance program shall include:

- An electrical safety program that addresses the condition of maintenance
- Identification of personnel responsible for implementing each element of the program
- Survey and analysis of electrical equipment and systems to determine maintenance requirements and priorities
- Developed and documented maintenance procedures for equipment
- A plan of inspections, servicing, and suitable tests
- A maintenance, equipment, and personnel documentation and records-retention policy
- A process to prescribe, implement, and document corrective measures based on collected data
- A process for incorporating design for maintainability in electrical installations
- A program review and revision process that considers failures and findings for continuous improvement

Motor control centers (MCC) are included in Chapter 28 of NFPA 70B. Requirements for MCCs include visual inspections, lubrication, mechanical servicing, and electrical tests.

4. Field testing and test methods

The 2023 update to NFPA 70B now provides detailed, prescriptive scopes for preventive maintenance in Chapter 8: Field Testing and Test Methods.

Compared to previous versions of 70B, the update clearly defines testing category types in Section 8.3:

1 – Online standard test – Performed while the electrical equipment or device is connected to the source of supply.

1A – Online enhanced test – Not typically performed in normal electrical maintenance activities and provides additional diagnostic information.

2 – Offline standard test – Performed while the electrical equipment or device is disconnected from the source of supply or is connected to an external test voltage source of supply."

2A – Offline enhanced test – Typically not required testing that may be useful based on the application of the equipment or if there is a problem with the equipment. For example, a "rated hold-in" test in accordance with NEMA AB-4 might be performed on a molded case circuit breaker if the circuit breaker has been tripping under normal load conditions.

It is important to note that NFPA 70B provides the minimum requirements for preventive maintenance, which are superseded by manufacturer guidelines.

For instance, NFPA 70B states that testing trip functions is optional for circuit breakers 250A or less, and circuit breakers with electronic trip units, only require verification of the calibration of all the functions of the trip unit by means of the manufacturer's specified test sets.

At Eaton, we recognize the labor intensive and accuracy challenges of testing circuit breakers using primary injection current which facilitated the development of electronic trip units. Modern electronic trip units feature built-in communications via USB connection for verification of the calibration of the trip functions using, saving time and the cost of expensive test kits.

5. System study intervals are now defined

In alignment with the NEC and NFPA 70E, the 2023 NFPA 70B Chapter 6 provides detailed requirements for system studies, including up-to-date single-line diagrams and short-circuit studies.

Mandatory intervals for studies shall not exceed 5 years, including:

- **Section 6.3 – Short-circuit studies**
- **Section 6.4 – Coordination studies**
- **Section 6.7 – Incident Energy Analyses**

It is important to note that when each of these system studies are performed, the electrical system (including overcurrent protective devices and equipment ratings) may need to also be reviewed, verified and potentially modified to align with the scope of the standard.

Additionally, electricians and design professionals rely on accurate single-line diagrams to calculate the short-circuit values and protective device clearing time that ultimately determine incident energy and/or personal protective equipment. So, if you or the utility feeding your electrical infrastructure make electrical infrastructure changes, it is important to make sure drawings and studies are updated. For instance, if your utility installs new transformers feeding your facility, these devices will need to be incorporated into new system studies to properly apply the protective settings that help safeguard personnel and equipment.

III. Applying 2023 NFPA 70B to electrical system equipment

Periodic maintenance procedures

NFPA 70B Equipment Chapters 11–38 provide guidance on the periodic maintenance procedures for all equipment categories listed in Chapter 9. These include:

- **Visual inspection**
- **Lubrication (when applicable)**
- **Electrical tests**
- **Cleaning**
- **Mechanical servicing**

Protective devices, such as, circuit breakers and protective relays are an important use-case to understand this process, because their performance is dependent on proper maintenance and incident energy calculations are invalid per NFPA 70E if they are not properly maintained.

Mechanical servicing of Substations and switchgear (Chapter 12) include a verification of mechanical indicating devices, such as breaker status lights

NFPA 70B shows the visual inspection requirements for molded case circuit breakers (MCCBs), insulated -case circuit breakers (ICCBs), low voltage power circuit breakers (LVPCBs), and medium-voltage power circuit breakers (MVPCBs).

No.	Task	MCCB test type*	ICCB test type*	LVPCB test type*
1	Verify ratings for proper system application	1 or 2	1 or 2	1 or 2
2	nspect insulating materials and frame for evidence of physical damage, cracks from stresses of operation, or contamination	2	2	2
3	Inspect wiring, bus, cables, and connections for damaged insulation, broken leads, tightness of connections, proper crimping, and overall general condition, including corrosion [1]	2	2	2
4	Inspect visible current-carrying parts and control devices if applicable for signs of overheating or deterioratione [1]	2	2	2
5	Inspect arc chutes for cracks or excessive erosion if applicable	NA	2	2
6	Check for cracks or lack of visual indication for all associated indicating status devices	1 or 2	1 or 2	1 or 2
7	Check all markings on the circuit breaker are legible	1 or 2	1 or 2	1 or 2
8	Inspect operating mechanism	NA	2	2
9	Check main contact over travel and arcing contact engagement	NA	2	2
10	Check condition of main and arcing contacts	NA	2	2
11	Check insulating links/push rods and interphase barriers for cracks and defect	NA	2	2

1 = online standard test, 1A = online enhanced test,
2 = offline standard test, 2A = offline enhanced test;
NA: Not applicable.

To maintain these devices in accordance with NFPA 70B, you shall:

1. **Perform visual inspection in accordance with Table 15.3.1,** which includes a step-by-step guide that includes verifying ratings, inspecting insulation materials and operating mechanisms, and checking the overall condition of the device.
2. **Clean and lubricate (when applicable) the circuit breaker** and its components following instructions in Tables 15.3.2.2 and 15.3.3.
3. **Perform the mechanical service requirement**s outlined in Table 15.3.4, which include checking all accessible electrical hardware connections for proper torque , operating the circuit breaker in a test fashion three times and verifying operation and alignment of mechanical safety interlocks.
4. **Carry out electrical testing** as prescribed Table 15.3.5, which details testing requirements for different types of circuit breakers, and includes guidelines for:
   - **Infrared thermography**
   - **Insultation-resistance testing**
   - **Inverse time trip testing**
   - **Instantaneous overcurrent trip testing**
   - **Testing arc reduction technology in accordance with manufacturer instructions**

Similarly, the periodic maintenance procedures for protective relays are outlined in Chapter 35. These include:

1. **Performing visual inspections per the checklist** in Table 35.3.1 that includes verifying case condition and seal, proper operation of visual displays, integrity of wiring and connections, and verification that settings match the coordination study.
2. **The protective relay should then be cleaned** and mechanically serviced following instructions in Tables 35.3.2 and 35.3.4 respectively.
3. **Then, you shall perform the electrical testing requirements** outlined in Table 35.3.5, which includes the following tests depending upon the type of relay technology (electromechanical, solid-state and microprocessor):
   - **Pickup testing**
   - **Timing at three points on the time dial curve**
   - **Checking the operation of restraint, directional and other protective elements**
   - **Using the front panel or computer connections to perform relay checks**
   - **Testing arc reduction technology in accordance with manufacturer instructions**

Again, these maintenance practices are critical because they directly impact the accuracy of arc flash risk assessment. If a protective device is not properly lubricated or mechanically functioning, operating time can be delayed – which leads to higher incident energy levels than originally calculated in the analysis and can potentially put downstream workers and equipment at risk.

What you should know about the new NFPA 70B standard?

- NFPA 70B requirements are considered the minimum consensus requirements for safe electrical work procedures and OSHA may use them as the basis for issuing citations.
- NFPA 70B maintenance practices defers to manufacturers' published instruction manuals or data.
- Manufacturers are qualified to test their own equipment
- Facilities can outsource maintenance services
- Systems and equipment covered are typical of those installed for industrial plants, institutional and commercial buildings, and large multifamily residential complexes.

IV Now intelligence can help simplify electrical maintenance

In the 2023 NFPA 70B standard, language was added to allow continuous monitoring and predictive techniques to drive maintenance intervals compared to the tables provided.

For example, modern advancements in intelligent trip units are revolutionizing the ability to monitor overall circuit breaker health. These units dramatically streamline traditional breaker inspection procedures, with an at-a-glance health indicator and powerful data analytics that detail the condition of the breaker for easy predictive maintenance and enhancing system reliability, utilizing detailed reports on operations, short-circuits, overloads, temperature and more.

Similar capabilities can now also be found in modern transfer switch controllers. Many of these devices can perform remote load testing, time-stamped event summaries and high-speed event waveform captures with detailed event logging to simplify preventive maintenance.

Additionally, there are add-on devices you can implement to provide continuous, non-invasive online monitoring for generators, motors, switchgear, unit substation dry-type transformers, bus duct, and cable connections. These devices provide constant tracking of partial discharge activity and predictive monitoring to help users to make better safety and maintenance decisions.

Further, because manufacturer guidelines always take precedence, there are physical features you can look for in equipment to extend maintenance intervals. For example, Eaton's circuit breaker mechanism enhancement is factory-standard on many pieces of equipment or can be performed as a retrofit. This technology increases the life of Eaton VCP-W medium-voltage vacuum circuit breakers and Eaton medium-voltage vacuum replacement breakers breakers, significantly reducing costs and ongoing maintenance requirements. The maintenance interval of an enhanced VCP-W mechanism is 10,000 operations or 10 years, whichever comes first, if applied per usual service conditions as defined in IEEE Std C37.04™ 1999.

V. 5 ways Eaton can help you simplify new NFPA 70B compliance

We believe the new NFPA 70B standard is a step forward for electrical worker safety. As stated in NFPA 70E, electrical worker safety relies on properly maintained overcurrent protective devices and electrical equipment. Equipment that has not been properly maintained has a higher chance of failure, increasing incident energy, which could result in increased damage to property and jeopardize electrical worker safety.

For decades, we've helped customers develop and implement preventive maintenance strategies to improve safety, uptime and compliance with local, state and national requirements.

Here's how we can help you simplify compliance with the new NFPA 70B standard:

1. **Perform maintenance services –** regardless of electrical equipment manufacturer
2. **Create a customized electrical preventive maintenance program** for your organizational needs
3. **Implement continuous monitoring and predictive technologies** to support more efficient and effective electrical preventive maintenance
4. **Act as a single-source supplier for spare part kits, modifications and upgrades** for obsolete equipment increasing safety and uptime.
5. **Provide on-site training and technical support** to get your maintenance team the knowledge they need

To learn more, visit Eaton.com/NFPA70B

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