First Revision No. 155-NFPA 70B-2024 [Global Input]

Create new Chapter 39 as shown in attached file.

Supplemental Information

File Name	Description	Approved
FR_155_Chapter_39_Transfer_Switch_Equipment.docx	attachment for FR 155 new Chapter 39	
70B_Global_FR-155_Ch39_NEW.docx	for editorial use	
70B_Global_FR-155_Ch39_NEW.pdf	for balloting	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Apr 02 09:28:16 EDT 2024

Committee Statement

Committee Statement: A new equipment chapter, dedicated to transfer switches, has been added to distinguish them from other switches. Transfer switches serve specific purpose, are designed to different standards, and necessitate a different level and scope of maintenance than switches.

Response Message: FR-155-NFPA 70B-2024

Public Input No. 30-NFPA 70B-2023 [Global Input]

Chapter 39 Transfer Switch Equipment

39.1 Scope.

39.1.1

This chapter identifies maintenance requirements for the following:

(1) Enclosed automatic transfer switches, bypass-isolation switches, and other transfer switch equipment rated 1000 volts or less

(2) Enclosed automatic transfer switches, bypass-isolation switches, and other transfer switch equipment rated over 1000 volts

39.2* Frequency of Maintenance.

The periodic maintenance procedures specified in Section 39.3 shall be performed in accordance with the frequencies specified in Chapter 9, unless otherwise specified in this chapter.

A.39.2

Service interval requirements for transfer switch equipment intended for use in emergency systems are in NFPA 110. These intervals are shorter than those for switches in Chapter 17 to ensure that the transfer equipment is uniquely maintained to supply emergency power within 10 seconds of loss of normal power.

For regulated facilities (e.g., hospitals), 8.4.1 of NFPA 110 requires weekly operational status inspections of alarms, indicating lights, control device displays, control device factory settings, user settings, status of automatic transfer mode, delays, communications, engine-start settings, and cybersecurity settings.

Subsection 8.4.1 of NFPA 110 also requires regulated facilities to conduct a monthly EPS exercise under load to test the performance of the generator adequately, the engine start functions of the transfer switch, and the ability to transfer the load from one source to the other source. Additionally, The Joint Commission standard EC.02.05.07 EP7 requires monthly generator load tests to include complete simulated cold starts and automatic and manual transfers of all essential electrical system loads. Weekly inspections of emergency power supply systems (EPSSs) in accordance with EC.02.05.07 EP 4 includes all associated components and batteries, which includes all automatic transfer switches, battery chargers, radiators, and fuel pumps.

39.3 Periodic Maintenance Procedures.

39.3.1 Visual Inspection.

Transfer switch equipment shall be visually inspected in accordance with Table 39.3.1.

Table 39.3.1 Transfer Switch Equipment Visual Inspections

No.	Task	Test Type*		Notes
		1000 V or Less	Greater than 1000 V	
1	Inspect external physical condition	1	1	This includes condition and integrity of applied labels.
2	Inspect anchorage and grounding	1	1	
3	Verify circuit breakers, switches, fuses, and overload elements are the right sizes and types and correspond to the drawings and power system studies	1 or 2	1 or 2	
4	Inspect alarms, indicating lights, and/or control device display panel information, as applicable	1 or 2	1 or 2	
5	Review control device factory and user settings, automatic transfer mode, timings and delays,	1 or 2	1 or 2	

No.	Task	Test Type*		Notes
		1000 V or Less	Greater than 1000 V	
	features, communications, and engine-start setting to ensure they meet the desired sequence of operation of the transfer system			
6	Review passwords, access history, and event logs or download event logs from the control device and cybersecurity settings, as applicable	1 or 2	1 or 2	
7	For connected communicating addressable devices, verify the device addresses are set in accordance with documentation	1 or 2	1 or 2	Confirm addressing or correct device association where protective devices or the human machine interface (HMI) are connected to multiple devices via a communication network.
8	Inspect insulators for damage or contaminated surfaces	1 or 2	1 or 2	
9	Verify filters are clean and in place	1 or 2	1 or 2	
10	Inspect environmental controls, where provided	1 or 2	1 or 2	Includes, but is not limited to, fans, heaters, thermostats, and humidity control equipment and settings.
11	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	For switch-based automatic transfer switches, refer to Chapter 17. For circuit-breaker-based transfer switches, refer to Chapter 15.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

39.3.2 Cleaning.

Bus insulation, cable insulation, terminals or terminations, electrical equipment surfaces, enclosures, and insulating materials shall be kept clean to prevent a buildup of contaminants that negatively affect performance, reduce life expectancy, or create a safety hazard.

39.3.3 Lubrication.

Transfer switch equipment shall be lubricated in accordance with Table 39.3.3.

Table 39.3.3 Transfer Switch Equipment Lubrication

No.	Task	Test Type*		Notes
		1000 V or Less	Greater than 1000 V	
1	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	For switch-based automatic transfer switches, refer to Chapter 17. For circuit-breaker-based transfer switches, refer to Chapter 15.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

39.3.4 Mechanical Servicing.

Transfer switch equipment shall be mechanically serviced in accordance with Table 39.3.4.

Table 39.3.4 Transfer Switch Mechanical Servicing

No.	Task	Test Type*		Notes
		1000 V or Less	Greater than 1000 V	
1	Manually operate transfer switch	2	2	
2	Verify bolted connection integrity	2	2	
3	Verify operation of electromechanical and mechanical interlocks between normal and alternate sources	2A	2A	
4	For individual components, refer to the appropriate chapter(s) of this standard			For switch-based automatic transfer switches, refer to Chapter 17. For circuit-breaker-based transfer switches, refer to Chapter 15.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

39.3.5 Electrical Testing.

Transfer switch equipment shall be electrically tested in accordance with Table 39.3.5.

Table 39.3.5 Transfer Switch Equipment Electrical Tests

No.	Task	Test Type*		Notes
		1000 V or Less	Greater than 1000 V	
1	Check electrical hardware connections	NA	NA	See Chapter 7.
2	Test protective devices	1 or 2	1 or 2	
3	Test control power transformers, instrument transformers, and metering to ensure correct operation	2A	2A	
4	Measure insulation resistance of the main and alternative source(s) bus	2	2	
5	Verify control power for close and open functions for transfer switches with electrical operators	1A or 2A	1A or 2A	
6	Perform trip and close tests for transfer switches with electrical operators	1A or 2A	1A or 2A	
7	Perform trip and close tests for transfer switches with electrical operators	1A or 2A	1A or 2A	
8	Verify correct operation of the switch from local switches or terminal blocks, if applicable, for	1 or 2	1 or 2	

No.	Task	Test Type*		Notes
		1000 V or Less	Greater than 1000 V	
	switches with electrical operators			
9	Functional tests shunt trip, if applicable	1 or 2	1 or 2	
10	Verify operation of space heaters, if equipped	1 or 2	1 or 2	
11	Measure insulation resistance of control wiring	2A	2A	
12	Test arc reduction technology in accordance with the manufacturer's instructions	1 or 2	1 or 2	
13	Perform functional transfer tests in accordance with the sequence of operation or the manufacturer's instructions	1A	1A	These tests can include transfer on loss of power in open transition, closed transition, or delayed transition.
14	Perform functional tests of bypassing and isolating of the main transfer switch	1A	1A	Applicable to bypass/isolation switches and redundant transfer equipment.
15	Test under load in accordance with the sequence of operation or the manufacturer's instructions	1A	1A	Typically includes testing loss of power by opening utility breaker, testing generator engine start circuit, automatic transferring between normal and emergency sources, running equipment under load, and engine shutdown in accordance with the sequence of operation.
16	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	For switch-based automatic transfer switches, refer to Chapter 17. For circuit-breaker-based transfer switches, refer to Chapter 15.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

39.3.6 Special. (Reserved)

First Revision No. 156-NFPA 70B-2024 [Global Input]

Where different from the following: REVISE ALL CHAPTERS STARTING FROM CHAPTER 11 to match the following as section titles, and section sequence

X.3 Periodic Maintenance Procedures.
X.3.1 Visual Inspection.
X.3.2 Cleaning.
X.3.3 Lubrication.
X.3.4 Mechanical Servicing.
X.3.5 Electrical Testing.
X.3.6 Special.

Chapter 21 section sequence is OK as is. The only change necessary is the title from **Visual Inspections** to **Visual Inspection.**

Where chapters contain sections other than those above, those sections are to be moved after the X.6 section.

Where a chapter does not have the above sections, the sections are to be added as reserved.

Supplemental Information

File Name	Description	Approved
70B_Global_FR-156_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Apr 02 09:45:20 EDT 2024

Committee Statement

Committee Statement: This revision aligns the table and chapter section titles for consistency.
Response Message: FR-156-NFPA 70B-2024

Public Input No. 217-NFPA 70B-2023 [New Section after 24.3.5]
Public Input No. 13-NFPA 70B-2023 [Section No. 25.4]
Public Input No. 216-NFPA 70B-2023 [New Section after 22.3.4]
Public Input No. 114-NFPA 70B-2023 [Global Input]
Public Input No. 223-NFPA 70B-2023 [Sections 33.4.3, 33.4.4]
Public Input No. 218-NFPA 70B-2023 [Sections 34.3.2, 34.3.3]

First Revision No. 157-NFPA 70B-2024 [Global Input]

Change the scope sections of Chapters 11-39 to start with the following revised text:

This chapter identifies ~~electrical~~ maintenance requirements for…

This applies to the following sections:
11.1.1
12.1.1
13.1.1*
14.1*
15.1.1
16.1
17.1.1
18.1.1
19.1
20.1
21.1
22.1
24.1*
25.1.1*
27.1
28.1.1
29.1.1*
30.1*
31.1
32.1.1
33.1
34.1.1
35.1
36.1*

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Apr 02 09:49:17 EDT 2024

Committee Statement

Committee Statement: The word "electrical" was deleted because NFPA 70B applies to electrical, electronic and communication systems and equipment as indicated in Section 1.1.
Response Message: FR-157-NFPA 70B-2024

Public Input No. 124-NFPA 70B-2023 [Global Input]

First Revision No. 158-NFPA 70B-2024 [Global Input]

From Chapters 11 to 39 change the layout of the top of the tables to include “test type” to be consistent with other tables like 11.3.4.

Supplemental Information

File Name	Description	Approved
70B_Global_FR-158_legislative_changes.pdf	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Apr 03 10:32:57 EDT 2024

Committee Statement

Committee Statement: Changing the layout of the top of the table to include “test type” simplifies the column titles and is consistent with other tables like 11.3.4.

Response Message: FR-158-NFPA 70B-2024

First Revision No. 150-NFPA 70B-2024 [Detail]

See attached Word doc for changes to Table 11.2.

Supplemental Information

File Name	Description	Approved
FR_150_Table_11.2.docx	attachment for FR 150 Table 11.2	
70B_Detail_FR-150_legislative_changes.docx	for prod use	
70B_Detail_FR-150_Table_11.2_FINAL.docx	for balloting	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Fri Mar 22 13:49:20 EDT 2024

Committee Statement

Committee Statement: Rearrangement of the text provides clarity that the tests are on the fluid.

Adding the specific item number to the notes directs the reader where to find the associated content.

Response Message: FR-150-NFPA 70B-2024

Public Input No. 130-NFPA 70B-2023 [Section No. 11.2]

Public Input No. 128-NFPA 70B-2023 [Section No. 11.2]

[FR-150]

Table 11.2 Frequency of Maintenance

Scope of Work	Equipment Condition Assessment			Notes
	Condition 1	Condition 2	Condition 3	
~~Sample~~Sampling and testing of insulating fluid ~~and tests~~	12 months	12 months	6 months	See Table 11.3.5, Item 16.

First Revision No. 160-NFPA 70B-2024 [Detail]

[Reassociate A.17.3.5 to A.39.3.5 and make edits as shown:]

~~A.17.3.5~~ A.39.3.5

See NFPA 110 and NFPA 111 for further information on ~~Line 11 of Table 17.3.5,~~ performing functional tests for automatic transfer switches, bypass switches, and other transfer switch equipment.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Jun 12 17:11:57 EDT 2024

Committee Statement

Committee Statement: Line 11 of Table 17.3.5 was deleted so the annex text was reassociated to where the requirement was moved to in Chapter 39.

Response Message: FR-160-NFPA 70B-2024

First Revision No. 22-NFPA 70B-2024 [Detail]

[Add the following text under 8.6.1:]

8.6.1 Conditions of Maintenance.

Equipment shall be designated as serviceable, limited service, or nonserviceable.

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 10:28:31 EDT 2024

Committee Statement

Committee Statement: The requirement is modified to designate the condition of maintenance.
Response Message: FR-22-NFPA 70B-2024

First Revision No. 27-NFPA 70B-2024 [Detail]

REVISE TABLE 9.3.2 AS SHOWN IN ATTACHED FILE.

Supplemental Information

File Name	Description	Approved
FR_27_Table_9.2.2.docx	FR 27 Table 9.2.2	
70B_Detail_FR_27_legislative_changes.docx	for prod use	
70B_Detail_FR-27_Table_9.3.2_FINAL.docx	for balloting	

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 11:11:28 EDT 2024

Committee Statement

Committee Statement: First revision removes:

1) ‘reserved’ intervals to maintain consistency in the table.

2) ‘special’ since there are no special requirements for busway in Chapter 14.

3) ‘lubrication’ and ‘mechanical servicing’ since these are not required in Chapter 19 for cable trays.

4) “mechanical servicing and electrical testing requirements” since there are no mechanical servicing or electrical testing requirements in Chapter 33 for electric vehicle power systems.

5) the frequency of lubrication of GFCIs since there is no requirement to lubricate GFCIs.

6) cleaning, lubricating, or mechanical servicing of wind

power electric systems since there are no requirements in Chapter 31 for these procedures.

First revision replaces:

1) ‘reserved’ with intervals to align with requirements in Chapter 30 for photovoltaic systems.

2) “inspections” with “servicing” to match the requirements for panelboards and switchboards in Chapter 13.

3) Battery ESSs with Batteries for the interval to be applicable to batteries.

First revision incorporates ‘and conductors’ to align with the title of Chapter 18 for

power cables and conductors.

Response Message: FR-27-NFPA 70B-2024

Public Input No. 113-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Public Input No. 118-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Public Input No. 116-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Public Input No. 122-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Public Input No. 117-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Public Input No. 112-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Public Input No. 115-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Public Input No. 120-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Public Input No. 121-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

[Detail FR-27]

Table 9.3.2 Maintenance Intervals

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
All equipment	Infrared thermography	12 months	12 months	6 months
~~Battery ESSs~~Batteries	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	~~Lubrication~~		~~Reserved~~	
	~~Mechanical servicing~~		~~Reserved~~	
	Electrical testing	60 months	36 months	12 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~~
Cable trays	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
Electric vehicle power transfer systems	Visual inspection	60 months	36 months	12 months
	~~Mechanical inspection~~	~~60 months~~	~~36 months~~	~~12 months~~
	~~Electrical testing~~	~~60 months~~	~~36 months~~	~~12 months~~
~~Electronic equipment~~			~~Reserved~~	
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
GFCIs	Visual inspection	12 months	12 months	6 months
	Cleaning	60 months	36 months	12 months
	~~Lubrication~~	~~60 months~~	~~36 months~~	~~12 months~~
	~~Mechanical servicing~~		~~Reserved~~	
Grounding and bonding	Visual inspection	12 months	12 months	6 months
	~~Cleaning~~		~~Reserved~~	
	~~Lubrication~~		~~Reserved~~	
	~~Mechanical servicing~~		~~Reserved~~	

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
	Electrical testing	60 months	36 months	36 months
High-voltage substation insulators	Visual inspection	12 months	12 months	6 months
	Corona detection	12 months	6 months	4 months
	Maintenance and testing	60 months	36 months	12 months
Lighting	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Mechanical servicing~~Servicing~~	60 months	36 months	12 months
~~Lighting control systems~~			Reserved	
Low-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 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
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~~servicing	60 months	36 months	12 months

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
	Electrical testing	60 months	36 months	12 months
Photovoltaic systems	Visual inspection	60 months	36 months	12 months
	~~Cleaning~~		~~Reserved~~	
	~~Lubrication~~		~~Reserved~~	
	Mechanical servicing	36 months	~~Reserved~~24 months	12 months
	Electrical testing	60 months	36 months	12 months
Portable electrical tools and equipment	Visual inspection	Before each use	Before each use	Before each use
	Cleaning	Before each use	Before each use	Before each use
	Lubrication	In accordance with the manufacturer's instructions	In accordance with the manufacturer's instructions	In accordance with the manufacturer's instructions
	Mechanical servicing	In accordance with the manufacturer's instructions	In accordance with the manufacturer's instructions	In accordance with the manufacturer's instructions
	Electrical testing	3 months	3 months	3 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 and conductors	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
Power-factor correction capacitors	Visual inspection	60 months	36 months	12 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
	~~Special~~		~~Reserved~~	
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 months	36 months	12 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

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
~~Public pools, fountains, and similar installations~~			~~Reserved~~	
Rotating 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
Stationary standby batteries	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	~~Mechanical servicing~~		~~Reserved~~	
	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 months	3 months
	~~Lubrication~~		~~Reserved~~	
	Mechanical servicing	12 months	6 months	3 months
	Electrical testing	12 months	6 months	3 months
	Special ~~procedures~~	24 months	24 months	24 months
Wind power electric systems	Visual inspection	60 months	36 months	12 months
	~~Cleaning~~	~~60 months~~	~~36 months~~	~~12 months~~
	~~Lubrication~~		~~Reserved~~	
	~~Mechanical servicing~~	~~60 months~~	~~36 months~~	~~12 months~~

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
	Electrical testing	60 months	36 months	12 months
Wiring devices	Visual inspection	12 months	3 months	1 month
	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

First Revision No. 3-NFPA 70B-2024 [Detail]

[Revise title of 9.2.1 as shown below:]

9.2.1 Physical Condition~~of Electrical Equipment~~.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Mon Mar 11 10:03:46 EDT 2024

Committee Statement

Committee Statement: The title was simplified to address the variety of the content contained in Chapter 9.

Response Message: FR-3-NFPA 70B-2024

Public Input No. 106-NFPA 70B-2023 [Section No. 9.3.1]

First Revision No. 48-NFPA 70B-2024 [Detail]

Move existing Section 9.3 "Equipment Condition Assessment" immediately before existing Section 9.2 "Frequency of Maintenance".

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 16:10:39 EDT 2024

Committee Statement

Committee Statement: The equipment condition is used in the maintenance interval table to help the reader determine the specified maintenance interval. The existing equipment condition information appeared after the maintenance interval table, so the reader looked at a table with different intervals for different equipment conditions that have not yet been defined.

Response Message: FR-48-NFPA 70B-2024

Public Input No. 101-NFPA 70B-2023 [Section No. 9.3]

First Revision No. 50-NFPA 70B-2024 [Detail]

[Add following scope statement to Chapter 10:]

10.1 Scope.

This chapter identifies the maintenance requirements for power and distribution transformers.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 16:37:36 EDT 2024

Committee Statement

Committee Statement: First revision adds “scope” to Chapter 10.1 to be consistent with numbering in other chapters.

Response Message: FR-50-NFPA 70B-2024

Public Input No. 123-NFPA 70B-2023 [New Section after 10.1]

First Revision No. 53-NFPA 70B-2024 [Detail]

[ADD ANNEX TO 28.3 as shown below:]

28.3* Periodic Maintenance Procedures.

A.28.3

Maintenance considerations for motor control centers, in addition to those in Table 28.3.1 through Table 28.3.5, can be found in Sections 10 and 11 of NEMA ICS 2.3, *Instructions for the Handling, Installation, Operation and Maintenance of Motor Control Centers Rated Not More Than 600 V*.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 10:36:38 EDT 2024

Committee Statement

Committee Statement: There are additional maintenance aspects for motor control centers not addressed in NFPA 70B. The proposed annex text provides a reference to the NEMA resource covering such aspects as moisture detection, correct ampere and voltage ratings labeling, ground fault detection systems, verifying functioning of solid state components, switch operating mechanisms, external operators for circuit breakers, and maintenance after a fault has occurred.

Response Message: FR-53-NFPA 70B-2024

First Revision No. 92-NFPA 70B-2024 [Detail]

See attached Word doc for new row in Table 9.3.2.

Supplemental Information

File Name	Description	Approved
FR_92_Table_9.2.2_new_transfer_switch_row.docx	attachment for FR 92 Table 9.2.2 ballot detail for new row.	
70B_Detail_FR-92_legislative_changes.docx	for prod use	
70B_Detail_FR-92_Table_9.3.2_FINAL.docx	for balloting	

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Wed Mar 20 15:14:59 EDT 2024

Committee Statement

Committee Statement: Added maintenance intervals for the new chapter “transfer switch equipment”. Equipment maintenance intervals were adjusted to match requirements for similar equipment.

Response Message: FR-92-NFPA 70B-2024 The suggestion for an additional scope of work for “operational status inspection” was removed. The requirements for this scope is covered in the individual chapter.

Public Input No. 29-NFPA 70B-2023 [Section No. 9.2.2]

[FR-92]

Table 9.3.2 Maintenance Intervals

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
All equipment	Infrared thermography	12 months	12 months	6 months
Transfer switch equipment	Visual inspection	12 months	6 months	3 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

First Revision No. 20-NFPA 70B-2024 [Section No. 1.1]

1.1 Scope.

This standard covers the corrective, preventive, and predictive maintenance of electrical, electronic, and communications systems and equipment.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 09:59:58 EDT 2024

Committee Statement

Committee Statement: The addition of “predictive” and “corrective” are added to provide clarity that all types of maintenance are included in the scope of the standard.

Response Message: FR-20-NFPA 70B-2024

Public Input No. 42-NFPA 70B-2023 [Section No. 1.1]

First Revision No. 11-NFPA 70B-2024 [Section No. 2.4]

2.4 References for Extracts in Mandatory Sections.

NFPA 70®, *National Electrical Code®*, 2023 edition.

NFPA *70E®*, *Standard for Electrical Safety in the Workplace®*, ~~2021~~ 2024 edition.

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 08:25:07 EDT 2024

Committee Statement

Committee Statement: This updates extracts to the current edition of NFPA 70E.
Response Message: FR-11-NFPA 70B-2024

Public Input No. 43-NFPA 70B-2023 [Section No. 2.4]
Public Input No. 44-NFPA 70B-2023 [Section No. 3.3.3]
Public Input No. 45-NFPA 70B-2023 [Section No. 3.3.11]
Public Input No. 47-NFPA 70B-2023 [Section No. 3.3.17]
Public Input No. 50-NFPA 70B-2023 [Section No. 3.3.47]
Public Input No. 49-NFPA 70B-2023 [Section No. 3.3.49]
Public Input No. 51-NFPA 70B-2023 [Section No. 3.3.53]

First Revision No. 159-NFPA 70B-2024 [Section No. 3.3.17]

3.3.17 Electrically Safe Work Condition.

A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested ~~to verify~~ for the absence of voltage, and, if necessary, temporarily grounded for personnel protection. [***70E***,~~2021~~ 2024]

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu May 16 09:13:05 EDT 2024

Committee Statement

Committee Statement: This updates the extract to current NFPA 70E edition.

Response Message: FR-159-NFPA 70B-2024

First Revision No. 58-NFPA 70B-2024 [Section No. 3.3.18]

3.3.18 EMP Coordinator.

The individual responsible for ~~coordinating the~~ implementation and operation of the EMP.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:02:32 EDT 2024

Committee Statement

Committee Statement: The word "coordinating" was deleted to avoid using a word that is similar to the defined term.

Response Message: FR-58-NFPA 70B-2024

Public Input No. 48-NFPA 70B-2023 [Section No. 3.3.18]

First Revision No. 148-NFPA 70B-2024 [New Section after 3.3.19]

3.3.20 Equipment.

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. [**70**, 2023]

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 13:39:54 EDT 2024

Committee Statement

Committee Statement: Adding a definition of equipment to clarify types of devices associated with an electrical installation.

Response Message: FR-148-NFPA 70B-2024

First Revision No. 59-NFPA 70B-2024 [Section No. 3.3.64]

3.3.65 Unbalanced Voltages.

Unequal voltage values on 3-phase circuits ~~that can exist anywhere on the power distribution system~~ .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:13:45 EDT 2024

Committee Statement

Committee Statement: The phrase "that can exist anywhere on the power distribution system" was deleted because it is unnecessary and could be confusing.

Response Message: FR-59-NFPA 70B-2024

Public Input No. 53-NFPA 70B-2023 [Section No. 3.3.64]

First Revision No. 60-NFPA 70B-2024 [Section No. 4.1.2]

~~4.1.2~~

~~This standard is not intended to duplicate or supersede manufacturer's instructions.~~

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:30:33 EDT 2024

Committee Statement

Committee Statement: This requirement is already in 1.3.1 therefore does not need to be duplicated here.

Response Message: FR-60-NFPA 70B-2024

Public Input No. 54-NFPA 70B-2023 [Section No. 4.1.2]

First Revision No. 61-NFPA 70B-2024 [Section No. 4.1.3]

4.1.2

In the absence of manufacturer's instructions, equipment shall be maintained in accordance with this standard and applicable industry consensus standards.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:31:26 EDT 2024

Committee Statement

Committee Statement: Adding the words " this standard and applicable" makes it clear that NFPA 70B is one of the industry consensus standards.

Response Message: FR-61-NFPA 70B-2024

Public Input No. 55-NFPA 70B-2023 [Section No. 4.1.3]

First Revision No. 62-NFPA 70B-2024 [Section No. 4.2.1]

4.2.1 General.

The equipment owner shall implement and document an ~~overall~~ EMP that directs activity ~~appropriate to the safety and operational risks~~ for the maintenance of equipment included in the EMP .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:33:12 EDT 2024

Committee Statement

Committee Statement: The word "overall" was deleted because it is unnecessary. The phrase "appropriate to the safety and operational risks" was replaced with "for the maintenance of equipment included in the EMP because safety and operational risks related to this requirement are not described elsewhere.

Response Message: FR-62-NFPA 70B-2024

Public Input No. 56-NFPA 70B-2023 [Section No. 4.2.1]

First Revision No. 63-NFPA 70B-2024 [Section No. 4.2.4.2]

4.2.4.2*

The EMP shall include the following elements:

(1) Input addressing the condition of maintenance and impact on electrical safety.

(2) An electrical safety program that addresses the condition of maintenance

(3) Identification of personnel responsible for implementing each element of the program

(4) Survey and analysis of ~~electrical~~ equipment and systems included in the EMP to determine maintenance requirements and priorities

(5) Developed and documented maintenance procedures for equipment

(6) An inspection ~~plan of inspections~~ , servicing, and ~~suitable tests~~ testing plan

(7) A maintenance, equipment, and personnel documentation and records-retention policy

(8) A process to prescribe, implement, and document corrective measures based on collected data

(9) A process for incorporating design for maintainability in ~~electrical~~ installations included in the EMP

(10) A program review and revision process that considers failures and findings for continuous improvement

Supplemental Information

File Name	Description	Approved
70B_FR-63_4.2.4.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:35:13 EDT 2024

Committee Statement

Committee Statement: The requirement has been clarified to not require the electrical safety program as part of the EMP but for the electrical safety program to address the condition of maintenance and its impact on electrical safety.

The word "electrical" was deleted in list items 3 and 8 because NFPA 70B applies to electrical, electronic and communication systems and equipment as indicated in Section 1.1. The words " included in the EMP" were added in those two list items to include those types of systems and equipment.

Response Message: FR-63-NFPA 70B-2024

Public Input No. 57-NFPA 70B-2023 [Section No. 4.2.4.2]

Public Input No. 58-NFPA 70B-2023 [Section No. 4.2.4.2]

First Revision No. 64-NFPA 70B-2024 [Section No. 4.3.1]

4.3.1 EMP Coordinator.

The ~~EMP~~ equipment owner shall identify an EMP coordinator.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:37:23 EDT 2024

Committee Statement

Committee Statement: The equipment owner is responsible for identifying the EMP coordinator which is consistent with 4.2.1.

Response Message: FR-64-NFPA 70B-2024

Public Input No. 59-NFPA 70B-2023 [Section No. 4.3.1]

First Revision No. 65-NFPA 70B-2024 [Section No. 4.3.3]

4.3.3 ~~Electrical~~ Maintenance Training.

A qualified person responsible for conducting ~~electrical~~ maintenance shall be trained in the specific maintenance tasks, test methods, test equipment, PPE usage (as applicable), and hazards associated with the ~~electrical~~ equipment or systems being serviced.

4.3.3.1

A person ~~who is~~ undergoing on-the-job training, under the direct supervision of a qualified person, for the purpose of obtaining the skills and knowledge necessary to be considered a qualified person~~;~~ and who, in the course of such training, demonstrates an ability to perform specific duties safely at his or her level of training~~, and who is under the direct supervision of a qualified person~~ shall be considered ~~to be~~ a qualified person for the performance of those specific duties.

4.3.3.2

The employer shall determine through regular supervision or through inspections conducted on at least an annual basis that each employee is complying with the ~~electrical~~ maintenance procedures and testing required by this standard as appropriate for that employee's work tasks .

4.3.3.3

A person responsible for conducting ~~electrical~~ maintenance shall be provided ~~additional~~ training ~~(~~ or retraining~~)~~ if any of the following conditions exists:

(1) ~~The supervision~~ Supervision or annual inspections indicate the person is not complying with the maintenance procedures and testing requirements.

(2) New technology, new types of equipment, or changes in procedures necessitate the use of maintenance procedures and testing requirements different from those ~~that the person would~~ normally used by the person .

(3) The person needs to review ~~tasks~~ maintenance procedures and testing requirements that are performed less often than once per year.

~~The person needs to review maintenance procedures and testing requirements that they do not normally use during regular job duties.~~

(4) The person's job duties changed to include work not currently being performed .

(5) A new edition of this standard or the EMP is adopted that includes changes applicable to the person's job duties.

4.3.3.4

Training shall be documented in accordance with the following:

(1) Documentation shall be issued when the person demonstrates proficiency in the ~~electrical~~ maintenance procedures and testing requirements.

(2) Documentation shall be retained for the duration of the person's employment.

(3) Documentation shall specify the content of the training, the person's name, and the dates of training.

Supplemental Information

File Name	Description	Approved

70B_FR-65_4.3.3_legislative_changes.docx for prod use

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:39:46 EDT 2024

Committee Statement

Committee Statement: The word "electrical: was deleted four times in 4.3.3, once in 4.3.3.3, once in 4.3.3.2, and once in 4.3.3.4 because NFPA 70B applies to electrical, electronic and communication systems and equipment as indicated in Section 1.1. The word "system" was changed to "systems" in 4.3.3 to be grammatically correct.

A comma was editorially added to 4.3.3.1 to be grammatically correct.

The phrase " as appropriate for that employee's work tasks" was added to 4.3.3.2 to make it clear that employee compliance needs only to be determined based on tasks that employee does.

The word "additional" was deleted from the opening paragraph of 4.3.3.3 because it does not add anything. List items 3 and 4 were combined because they are similar in concept and to remove the vague wording "do not normally use".

The phrase " to include work not currently being performed by that person' was added to list item 5 because training is only needed if the person will be doing additional types of work.

The phrase " or the EMP" was added list item 6 because training is necessary if changes occur in the EMP that are applicable to the persons job duties.

Response Message: FR-65-NFPA 70B-2024

Public Input No. 63-NFPA 70B-2023 [Section No. 4.3.3.1]

Public Input No. 67-NFPA 70B-2023 [Section No. 4.3.3.3]

Public Input No. 65-NFPA 70B-2023 [Section No. 4.3.3.3]

Public Input No. 66-NFPA 70B-2023 [Section No. 4.3.3.3]

Public Input No. 62-NFPA 70B-2023 [Section No. 4.3.3]

Public Input No. 64-NFPA 70B-2023 [Section No. 4.3.3.2]

First Revision No. 54-NFPA 70B-2024 [Section No. 4.4.1]

4.4.1

The EMP coordinator shall determine the scope of the work to be performed and develop a prioritized plan for the ~~electrical~~ maintenance of ~~the electrical~~ the equipment or system.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 13:29:26 EDT 2024

Committee Statement

Committee Statement: The word "electrical" was deleted in two places because NFPA 70B applies to electrical, electronic and communication systems and equipment as indicated in Section 1.1.

Response Message: FR-54-NFPA 70B-2024

Public Input No. 68-NFPA 70B-2023 [Section No. 4.4.1]

First Revision No. 55-NFPA 70B-2024 [Section No. 4.4.2]

4.4.2

~~Electrical equipment~~ Equipment and systems shall be evaluated to determine the appropriate scope and frequency of maintenance.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 13:32:03 EDT 2024

Committee Statement

Committee Statement: The word "electrical" was deleted because NFPA 70B applies to electrical, electronic and communication systems and equipment as indicated in Section 1.1.

Response Message: FR-55-NFPA 70B-2024

Public Input No. 69-NFPA 70B-2023 [Section No. 4.4.2]

First Revision No. 56-NFPA 70B-2024 [Section No. 4.4.3]

4.4.3

Environmental, physical, ~~or~~ and operating conditions of a specific installation shall be considered in determining the frequency of ~~electrical~~ equipment and system maintenance.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 13:33:23 EDT 2024

Committee Statement

Committee Statement: The word "or" was changed to "and" because all three conditions need to be considered. The word "electrical" was deleted and replaced with "equipment and systems" because NFPA 70B applies to electrical, electronic and communication systems and equipment as indicated in Section 1.1.

Response Message: FR-56-NFPA 70B-2024

Public Input No. 70-NFPA 70B-2023 [Section No. 4.4.3]

First Revision No. 4-NFPA 70B-2024 [Section No. 4.6]

4.6 Acceptance Test Report.

A copy of the acceptance test reports~~, if available,~~ shall be included with the maintenance records.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Mon Mar 11 10:54:41 EDT 2024

Committee Statement

Committee Statement: If an acceptance test report is not available, it cannot be included in the maintenance record.

Response Message: FR-4-NFPA 70B-2024

Public Input No. 22-NFPA 70B-2023 [Section No. 4.6]

First Revision No. 66-NFPA 70B-2024 [Sections 4.7.1, 4.7.2]

~~**4.7.1***~~

~~Safety certifications shall be maintained for repaired or rebuilt equipment.~~

4.7.1*

When repairing, rebuilding, or remanufacturing equipment, the work shall be conducted by a qualified person or organization to assure that no changes are made to the equipment that ~~might~~ will prevent the equipment from meeting the applicable performance and safety requirements.

A.4.7.1

Rework, remanufacturing, or retrofitting of equipment typically involves replacement or refurbishing of major components of equipment or systems. Repairs or modifications not authorized by the original equipment manufacturer might void the equipment warranties and third-party certifications. Equipment can be reconditioned under rebuild programs ~~provided~~ if the reconditioning follows established guidelines. The AHJ can assess the acceptability of reconditioned equipment to determine if a re-evaluation of the modified product by the organization that listed the equipment is necessary.

See also NFPA 791 and OSHA Safety & Health Information Bulletin (SHIB), “Certification of Workplace Products by Nationally Recognized Testing Laboratories.”

Supplemental Information

File Name	Description	Approved
70B_FR-66_4.7.1_4.7.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:53:58 EDT 2024

Committee Statement

Committee Statement: This subsection has been deleted because it is already covered by 4.7.2. The annex material in A.4.7.1 has been retained and combined with A.4.7.2.

Response Message: FR-66-NFPA 70B-2024

Public Input No. 71-NFPA 70B-2023 [Section No. 4.7.1]

Public Input No. 72-NFPA 70B-2023 [Sections A.4.7.1, A.4.7.2]

First Revision No. 67-NFPA 70B-2024 [Section No. 4.8 [Excluding any Sub-Sections]]

~~Electrical equipment cleaning shall be a part of the EMP.~~ The EMP shall include the cleaning requirements for equipment covered by the EMP.

Supplemental Information

File Name	Description	Approved
70B_FR-67_4.8_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:56:37 EDT 2024

Committee Statement

Committee Statement: The requirement was reworded to be clear that cleaning information for the equipment in the EMP needs to be included.

Response Message: FR-67-NFPA 70B-2024

Public Input No. 73-NFPA 70B-2023 [Section No. 4.8 [Excluding any Sub-Sections]]

First Revision No. 57-NFPA 70B-2024 [Section No. 4.8.1]

4.8.1 Cleaning Personnel.

4.8.1.1

~~Electrical equipment~~ Equipment cleaning shall be performed by personnel ~~who are~~ familiar with the cleaning materials required and methodologies necessary for effective removal of contaminants, debris, and other foreign materials that compromise ~~electrical~~ equipment performance.

4.8.1.2

The persons assigned to ~~the task of electrical~~ equipment cleaning shall be trained in the following:

(1) Potential damage to the equipment from cleaning procedures

(2) Potential personal injury

(3) Specific cleaning procedures

(4) Equipment not to be cleaned

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 13:35:55 EDT 2024

Committee Statement

Committee Statement: The word "electrical" was deleted in three places because NFPA 70B applies to electrical, electronic and communication systems and equipment as indicated in Section 1.1.

Response Message: FR-57-NFPA 70B-2024

Public Input No. 74-NFPA 70B-2023 [Section No. 4.8.1]

First Revision No. 28-NFPA 70B-2024 [Section No. 5.1.1]

5.1.1

~~Electrical maintenance~~ Maintenance performed on electrical, electronic, and communication systems and equipment shall be performed ~~only~~ by qualified persons.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 12:39:13 EDT 2024

Committee Statement

Committee Statement: Section 1.1 identifies that the scope of this document covers the preventive maintenance of electrical, electronic, and communications systems.

Response Message: FR-28-NFPA 70B-2024

Public Input No. 61-NFPA 70B-2023 [Section No. 5.1.1]

First Revision No. 68-NFPA 70B-2024 [Section No. 5.1.2]

5.1.2*

~~Electrical safety~~ Safety -related work practices to identify hazards and reduce associated risks shall be instituted and followed~~,~~ in accordance with applicable state, federal, or local codes and standards~~, to identify the hazards and reduce the associated risks~~ .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 14:58:56 EDT 2024

Committee Statement

Committee Statement: There can be hazards that might need to be addressed by employers that are beyond electrical.

Response Message: FR-68-NFPA 70B-2024

Public Input No. 75-NFPA 70B-2023 [Section No. 5.1.2]

First Revision No. 5-NFPA 70B-2024 [Section No. 6.2.4]

6.2.4

When single-line diagrams are not available, the facility or equipment owner shall be responsible for providing an ~~equally~~ effective means of obtaining the necessary information.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Mon Mar 11 11:31:00 EDT 2024

Committee Statement

Committee Statement: First revision content is to remove ‘equally’ as ambiguous. “Equally effective” is redundant to “effective”.

Response Message: FR-5-NFPA 70B-2024 The proposed addition of “for system studies” is not necessary since this is the topic of the article.

Public Input No. 76-NFPA 70B-2023 [Section No. 6.2.4]

First Revision No. 69-NFPA 70B-2024 [Section No. 6.3.1]

6.3.1

Where a short-circuit study does not exist, one shall be created~~, as necessary~~ to support the arc-flash risk assessment and equipment evaluations.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 15:00:34 EDT 2024

Committee Statement

Committee Statement: A comma was editorially added after "necessary" in 6.3.1 to be grammatically correct.

Response Message: FR-69-NFPA 70B-2024

Public Input No. 77-NFPA 70B-2023 [Section No. 6.3.1]

First Revision No. 6-NFPA 70B-2024 [Section No. 6.5.2]

~~6.5.2~~

~~The load-flow study shall be reviewed for accuracy at intervals not to exceed 5 years.~~

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Mon Mar 11 12:44:11 EDT 2024

Committee Statement

Committee Statement: First revision removes 6.5.2 as 6.5.1 requires update of the load-flow study whenever changes occur.

Response Message: FR-6-NFPA 70B-2024

Public Input No. 80-NFPA 70B-2023 [Section No. 6.5.2]

First Revision No. 7-NFPA 70B-2024 [Section No. 6.6.3]

~~6.6.3~~

~~The reliability study shall be reviewed for accuracy at intervals not to exceed 5 years.~~

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Mon Mar 11 12:56:09 EDT 2024

Committee Statement

Committee Statement: Section 6.6.4 requires the study to be updated when changes occur in the system. Therefore, requiring the review of the study every five years is not required.

Response Message: FR-7-NFPA 70B-2024

Public Input No. 81-NFPA 70B-2023 [Section No. 6.6.3]

First Revision No. 8-NFPA 70B-2024 [Section No. 6.8]

6.8* Electrical Maintenance-Related Design.

Where a recognized hazard presents an increased risk during maintenance, a study ~~shall be conducted~~ to determine ~~develop~~ design options that ~~could be implemented~~ can eliminate exposure to hazards or reduce risk during maintenance-related activities shall be conducted .

A.6.8

~~This study should use input that can~~ Types of input that this study should use include the electrical system design, the equipment maintenance instructions, and the company's historical maintenance data, as well as results of other available studies such as reliability and risk assessment studies. The study should evaluate design and operational concepts for electrical equipment and installations that impact the safety of maintenance practices and then make recommendations for improvement. ~~Facilities~~ Facility management should use this study to make implementation decisions. Design considerations to enhance operations should include the entire life cycle cost of the building or system. The initial cost for efficient use of energy and for providing an efficient maintenance environment should be considered as valuable long-term investments that support daily operations. Workspaces and systems should be designed to allow safe maintenance or urgent repair while other operations continue. System-monitoring equipment can be used for planning predictive maintenance and ~~help~~ preventing unplanned outages.

A maintenance-related design study should include an evaluation of various maintenance-related design element options such as, but not limited to, the following:

(1) Sufficient clearances to remove and install drawout circuit breakers

(2) Remote operating controls and remote racking for circuit breakers

(3) Lift mechanisms ~~to allow~~ for safe removal of drawout circuit breakers

(4) Motor control centers having the capability to rack individual buckets in or out remotely

(5) Permanently mounted absence-of-voltage testers

(6) Performance of ~~an~~ incident energy ~~analysis~~ analyses in addition to short circuit and coordination studies

(7) ~~Design redundancy~~ Redundancy designed into the electrical power system to facilitate electrically safe work conditions for personnel ~~to~~ performing maintenance on equipment ~~in an electrically safe work condition and~~ while still powering the loads

(8) Motor overload relays that can be reset without exposing the worker to energized conductors or circuit parts

(9) Infrared windows ~~to allow~~ for testing and inspection without exposing workers to energized parts

(10) Thermal sensors for critical terminations, ultrasonic sensors in medium-voltage equipment, and partial discharge monitoring of critical cables and equipment

(11) Automatic transfer switches having maintenance bypass switches

(12) Redundant power sources for critical systems

(13) Permanently installed condition monitoring devices to eliminate exposure to shock and arc flash hazards

(14) Methods of electrical disconnecting to de-energize components and full barriers to isolate components or compartments from nearby energized exposed conductive parts for repair or replacement

After the risk assessment study in Section 6.6 is complete, Annex O of NFPA *70E* should be referenced for additional items that could be evaluated in the maintenance-related design study.

Supplemental Information

File Name	Description	Approved
70B_FR-8_6.8_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Mon Mar 11 12:59:17 EDT 2024

Committee Statement

Committee Statement: The requirement is clarified to state that eliminating exposures is an option to reducing risk. The annex revision expands design element options to be considered in a study to reduce hazards.

Response Message: FR-8-NFPA 70B-2024

Public Input No. 174-NFPA 70B-2023 [Section No. 6.8]

First Revision No. 83-NFPA 70B-2024 [Section No. 7.2.1.1]

7.2.1.1 Infrared Thermographic Inspection ~~of Electrical Connections~~ .

Infrared thermographic inspection of electrical connections and terminations shall be performed in accordance with Section 7.4.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:38:22 EDT 2024

Committee Statement

Committee Statement: The title has been updated to remove “of electrical connections” since terminations are not electrical connections but are included in the text below as part of the inspection.

Response Message: FR-83-NFPA 70B-2024

Public Input No. 82-NFPA 70B-2023 [Section No. 7.2.1.1]

First Revision No. 84-NFPA 70B-2024 [Section No. 7.2.1.4.1]

7.2.1.4.1

When ~~using a calibrated torque wrench to confirm~~ confirming the torque of previously installed threaded hardware, the retightening value shall not exceed 90 percent of the manufacturer's specified initial torque value.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:40:35 EDT 2024

Committee Statement

Committee Statement: The text concerning the use of the calibrated torque wrench is not needed for this requirement. The requirement is only about the allowed torque values. Calibration of tools is covered in Section 8.5.

Response Message: FR-84-NFPA 70B-2024

Public Input No. 85-NFPA 70B-2023 [Section No. 7.2.1.4.1]

First Revision No. 85-NFPA 70B-2024 [Section No. 7.2.1.4.2]

7.2.1.4.2

Where initial threaded hardware torque value data is not available, torque values for US standard fasteners shall ~~be in accordance~~ comply with Table 7.2.1.4.2(a), Table 7.2.1.4.2(b), or Table 7.2.1.4.2(c).

Table 7.2.1.4.2(a) Bolt-Torque Values for Electrical Connections, US Standard Fasteners — Cadmium or Zinc Plated

Bolt Diameter (in.)	Torque (Pound-Feet)
¼	6
5⁄16	11
⅜	20
7⁄16	32
½	48
9⁄16	70
⅝	96
¾	160
⅞	240
1.0	370

Notes:

~~(1) Consult the manufacturer for equipment supplied with metric fasteners.~~

(~~2~~ 1) ~~The~~ This table is based on national coarse thread pitch.

(~~3~~ 2) The fastener grade is SAE 5.

(~~4~~ 3) ~~The minimum tensile (strength) is~~ This table is based on bolts having a 105,000 lb~~f~~/in.^{2} tensile strength .

Table 7.2.1.4.2(b) Bolt-Torque Values for Electrical Connections, US Standard Fasteners — Silicon Bronze

Bolt Diameter (in.)	Torque (Pound-Feet)	
	Nonlubricated	Lubricated
5⁄16	15	10
⅜	20	15
½	40	25
⅝	55	40
¾	70	60

Notes:

~~(1) Consult the manufacturer for equipment supplied with metric fasteners.~~

(~~2~~ 1) This table is based on national coarse thread pitch.

(~~3~~ 2) This table is based on bronze alloy bolts having a minimum 70,000 lb/in.^{2} tensile strength.

Table 7.2.1.4.2(c) Bolt-Torque Values for Electrical Connections, US Standard Fasteners — Aluminum

Bolt Diameter (in.)	Torque (Pound-Feet), Lubricated
5⁄16	10
⅜	14
½	25

Bolt Diameter (in.)	Torque (Pound-Feet), Lubricated
⅝	40
¾	60

Notes:

~~(1) Consult the manufacturer for equipment supplied with metric fasteners.~~

(~~2~~ 1) This table is based on national coarse thread pitch.

(~~3~~ 2) This table is based on aluminum alloy bolts having a minimum 55,000 lb/in.^{2} tensile strength.

7.2.1.4.3

Torque values for metric fasteners shall comply with the manufacturer's instructions.

Supplemental Information

File Name	Description	Approved
FR_85_Section_7.2.1.4.2.docx	attachment for FR 85 Table 7.2.1.4.2	
70B_FR-85_7.2.1.4.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:41:50 EDT 2024

Committee Statement

Committee Statement: Tables Note 1: Each of the tables includes a statement about consulting the manufacturer for metric fastener torque requirements but is better clarified in the main paragraph of the section. This change allows the reader to quickly find the requirement for metric fasteners instead of having the find the requirement as a note to the table for US Standard fasteners.

Table 7.2.1.4.2(a) Note 3: Adding the word "fastener" clarifies to readers what the "grade" is applied to.

Table 7.2.1.4.2(a) Note 4: The parenthesis around "strength" is not needed and the unit of measure for tensile strength is corrected to be lb/in2.

Response Message: FR-85-NFPA 70B-2024

Public Input No. 87-NFPA 70B-2023 [Section No. 7.2.1.4.2]

Public Input No. 86-NFPA 70B-2023 [Section No. 7.2.1.4.2]

Public Input No. 88-NFPA 70B-2023 [Section No. 7.2.1.4.2]

First Revision No. 86-NFPA 70B-2024 [Sections 7.4.2, 7.4.3, 7.4.4, 7.4.5, 7.4.6]

7.4.2*

All accessible and necessary covers shall be removed prior to infrared thermography inspection to provide a clear line of sight to the equipment being scanned.

A.7.4.2

Infrared windows can provide line of sight from the infrared camera to the equipment being inspected without requiring the removal of covers or panels.

7.4.3

Temperature differences between the area of concern and the reference area shall be documented.

7.4.4*

Infrared thermography inspections shall be performed ~~at normal circuit loading~~ online with an operating load .

A.7.4.4

~~Where normal circuit~~ Circuit loading ~~is~~ should not ~~feasible, circuit loading of not~~ be less than 40 percent of nominal circuit loading ~~shall be permitted~~ .

7.4.5

~~Circuit loading characteristics shall be documented and retained for future reference.~~ Continuously monitoring, permanently installed temperature measurement devices shall be permitted to satisfy 7.4.1 through 7.4.4 .

Supplemental Information

File Name	Description	Approved
70B_FR-86_7.4.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:46:28 EDT 2024

Committee Statement

Committee Statement: Language added to annex describing how Infrared windows can provide line of sight without requiring covers to be removed.

Gathering “load” information when performing an infrared scan is not the “minimum” required maintenance activity required for NFPA 70B and can be impractical and dangerous. Performing infrared thermography at operating load or at 40% is a recommended practice and has been moved to the annex.

Continuously monitoring permanently installed temperature measurement devices provide an alternative technology of producing the same results as an infrared thermography. Adding language to require the operating temperature to have reached a steady-state temperature is a valid technical condition when performing infrared thermography. Recording circuit loading characteristics of areas of concern clarifies the requirement.

Response Message: FR-86-NFPA 70B-2024

Public Input No. 19-NFPA 70B-2023 [Section No. 7.4]

Public Input No. 91-NFPA 70B-2023 [New Section after 7.4.2]

Public Input No. 92-NFPA 70B-2023 [Sections 7.4.4, 7.4.5, 7.4.6]

First Revision No. 12-NFPA 70B-2024 [Section No. 8.2]

8.2 Risk Assessment Special Considerations.

Where the following special considerations are present, a risk assessment shall be performed to identify hazards and determine if additional protective measures are required prior to beginning work:

(1) Electrical, as follows:

(a) X-ray

(b) Overpotential

(2) Mechanical, as follows:

(a) Stored energy

(b) Mass energy

(3) Chemical, as follows:

(a) ~~SF_6~~ Insulating gas fault by-products

(b) Electrolytes

(4) Environmental, as follows:

(a) Asbestos

(b) ~~SF_6~~ Insulating gas

(c) Insulating fluids, as follows:

i. PCBs

ii. Tetrachloroethylene

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 09:20:14 EDT 2024

Committee Statement

Committee Statement: The term SF6 was removed and replaced with insulating gas to be more general.

Response Message: FR-12-NFPA 70B-2024

Public Input No. 93-NFPA 70B-2023 [Section No. 8.2]

First Revision No. 9-NFPA 70B-2024 [Section No. 8.3]

8.3* Testing Category Types.

~~Electrical maintenance~~ Maintenance testing tasks shall be identified as one of the following category types:

(1) Category 1 — Online standard test

(2) Category 1A — Online enhanced test

(3) Category 2 — Offline standard test

(4) Category 2A — Offline enhanced test

WARNING: Testing of ~~electrical~~ equipment while it is connected to the source of supply introduces additional hazards to the worker. Workers should understand the hazards and risks of the test being performed.

8.3.1 Category 1 — Online Standard Test.

Online standard tests shall include testing procedures performed while the ~~electrical~~ equipment or device is connected to the source of supply.

8.3.2 Category 1A — Online Enhanced Test.

Online enhanced tests shall include certain testing procedures performed while the ~~electrical~~ equipment or device is connected to the source of supply and that are not typically performed in ~~normal electrical~~ standard maintenance activities and that provide additional diagnostic information. *(See A.8.3.)*

8.3.3 Category 2 — Offline Standard Test.

Offline standard tests shall include testing procedures 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.

8.3.4 Category 2A — Offline Enhanced Test.

Offline enhanced tests shall include certain testing procedures 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 and that are not typically performed in ~~normal electrical~~ standard maintenance activities and that provide additional diagnostic information. *(See A.8.3.)*

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 08:17:41 EDT 2024

Committee Statement

Committee Statement: Removing the word “electrical” aligns with the scope statement in Section 1.1. Normal was changed to standard to align with the term used in Categories 1 and 2.

Response Message: FR-9-NFPA 70B-2024

Public Input No. 95-NFPA 70B-2023 [Section No. 8.3]

First Revision No. 29-NFPA 70B-2024 [Section No. 8.4]

~~**8.4** Qualifications of Testing Personnel.~~

~~**8.4.1**~~

~~Testing personnel shall be qualified to operate the test equipment used in the type of test to be performed.~~

~~**8.4.2**~~

~~Testing personnel shall be qualified to perform the test procedure on the specific equipment to be tested.~~

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 12:42:55 EDT 2024

Committee Statement

Committee Statement: The requirements are covered in 4.3.3.
Response Message: FR-29-NFPA 70B-2024

Public Input No. 96-NFPA 70B-2023 [Section No. 8.4]

First Revision No. 13-NFPA 70B-2024 [Section No. 8.5]

8.4 Test Equipment and Tools.

8.4.1

~~The test~~ Test equipment and tools shall be maintained in satisfactory mechanical and electrical condition.

8.4.2

~~The test~~ Test equipment and tools shall be applied in accordance with the manufacturer's ~~specifications~~ requirements .

8.4.3*

Test equipment and tools that ~~provides~~ provide measurements shall be calibrated.

8.4.4

Calibration information shall be readily available for all test equipment and tools .

8.4.5

Test equipment and tool calibration intervals shall be appropriate to ensure the accuracy of the test instrument or tool with consideration for the conditions of use.

8.4.6

Proper tools, instruments, and other test equipment shall be used when performing maintenance activities.

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 09:23:26 EDT 2024

Committee Statement

Committee Statement: Adding the term "and tools" clarifies the items to be included in this section.
Response Message: FR-13-NFPA 70B-2024

Public Input No. 94-NFPA 70B-2023 [Section No. 8.5.2]

First Revision No. 21-NFPA 70B-2024 [Sections 8.7.1.1, 8.7.1.2, 8.7.1.3]

3.3.11.1 Serviceable.

Equipment that passes all tests and is electrically and mechanically sound ~~shall be designated as serviceable~~ .

3.3.11.2* Limited Service.

Equipment that has a problem(s) that ~~are~~ is not detrimental to the protective operation or design characteristics of the equipment ~~shall be designated as limited service~~ .

A.3.3.11.2 Limited Service.

Examples of equipment that ~~has~~ have problems that are not detrimental to the protective operation or design characteristics of the equipment are trip targets that do not function properly, slightly lower than acceptable insulation resistance readings, and chipped arc chutes .

3.3.11.3* Nonserviceable.

Equipment that has a problem(s) that is detrimental to the proper electrical or mechanical operation of the equipment ~~shall be designated as nonserviceable~~ .

A.3.3.11.3 Nonserviceable.

Examples of equipment that ~~has a~~ have problems that ~~is~~ are detrimental to the proper electrical or mechanical operation of the equipment are no trip on one or more phases, low insulation resistance readings, mechanical trip problems, and high contact resistance readings.

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 10:17:50 EDT 2024

Committee Statement

Committee Statement: First revision relocates this content to Chapter 3 as definitions.
Response Message: FR-21-NFPA 70B-2024

Public Input No. 20-NFPA 70B-2023 [Section No. 8.7.1]

First Revision No. 1-NFPA 70B-2024 [Section No. 9.1 [Excluding any Sub-Sections]]

This chapter identifies the required frequency of maintenance ~~for electrical equipment~~ .

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Mon Mar 11 08:59:42 EDT 2024

Committee Statement

Committee Statement: The scope was simplified to address the variety of the content contained in Chapter 9.
Response Message: FR-1-NFPA 70B-2024

Public Input No. 98-NFPA 70B-2023 [Section No. 9.1 [Excluding any Sub-Sections]]

First Revision No. 23-NFPA 70B-2024 [New Section after 9.1.1.2]

9.1.1.3*

Use of the potential failure–functional failure (P–F) curve method shall be permitted to determine maximum maintenance intervals.

A.9.1.1.3

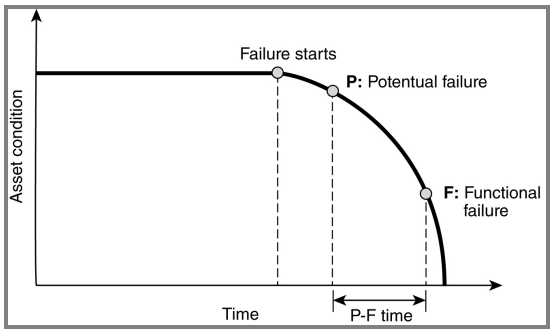
A P–F curve *(see Figure A.9.1.1.3)* is a graph that shows the health of equipment over time to identify the interval between potential failure and functional failure.

Potential failure indicates the detectable point at equipment is starting to deteriorate and fail.

Functional failure is the point at which equipment has reached its useful limit and is no longer operational.

Even though these failure points might take a very long time to occur, the P–F curve characterizes the behavior of failure and the time between the two points. The time between the two points is the P–F interval. To prevent a failure, the applicable time-based preventive maintenance interval needs to be half of the P–F interval or less. This method also allows for the maximum usage that can be gained from the equipment.

Figure A.9.1.1.3 P–F Curve.



Supplemental Information

File Name	Description	Approved
FR_23_Figure_A.9.1.1.13_P-F_Curve.docx	FR_23_Figure_A.9.1.1.13_P-F_Curve.docx	
70B_FR-23_9.1.1.3_NEW.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 10:41:52 EDT 2024

Committee Statement

Committee Statement:	The first revision adds the use of P-F curve as a method to assist with maintenance strategies in reducing unplanned equipment outages. First revision adds explanatory content for functional failure, P-F interval and potential failure to the new appendix for P-F curves and their application.
Response Message:	FR-23-NFPA 70B-2024

Public Input No. 200-NFPA 70B-2023 [New Section after 3.3.21]

Public Input No. 201-NFPA 70B-2023 [New Section after 3.3.42]

Public Input No. 199-NFPA 70B-2023 [New Section after 3.3.44]

First Revision No. 24-NFPA 70B-2024 [Section No. 9.1.2]

9.1.2 Maintenance Frequency Modifications.

9.1.2.1

Once the initial frequency for inspections and tests has been established based on the intervals listed in Table 9.3.2 and the equipment condition assessment, this frequency shall be ~~adhered to~~ followed for at least two maintenance ~~cycles~~ intervals unless unexpected failures occur.

9.1.2.1.1

For equipment that has unexpected failures, the cause of the failure shall be used to determine if the maintenance interval for the equipment needs to be reduced.

9.1.2.1.2*

If more than two ~~inspections~~ maintenance intervals are completed without requiring additional service, the equipment owner shall be permitted to resume the original ~~inspection~~ maintenance interval period.

9.1.2.2

If more than two ~~inspections~~ maintenance intervals are completed without detecting equipment problems, the maintenance cycle shall be permitted to be extended to longer intervals than listed in Table 9.3.2.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 10:55:25 EDT 2024

Committee Statement

Committee Statement: First revision replaces “inspection” with “maintenance interval” to align with definitions.

Response Message: FR-24-NFPA 70B-2024

Public Input No. 100-NFPA 70B-2023 [Section No. 9.1.2]

First Revision No. 153-NFPA 70B-2024 [Section No. 9.2.1]

9.3.1*

The manufacturer's ~~recommendations~~ instructions shall be followed for each of the maintenance scopes specified in this standard for the required intervals.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 26 09:34:11 EDT 2024

Committee Statement

Committee Statement: First revision replaces "inspection" with "maintenance interval" to align with definitions.

Response Message: FR-153-NFPA 70B-2024

First Revision No. 152-NFPA 70B-2024 [Section No. 9.2.2 [Excluding any Sub-Sections]]

Where the manufacturer's ~~recommendations~~ instructions are not provided or ~~available and failure, breakdown, or malfunction of the equipment will present an unacceptable risk for personnel or the environment, equipment~~ where predictive methods specified in 9.1.1 are not available, equipment maintenance shall be performed at not greater than the intervals specified in Table 9.3.2, in accordance with the equipment condition assessment in Section 9.3, and as modified by the other parts of this chapter.

Table 9.3.2 Maintenance Intervals

		Equipment Condition Assessment		
Product	**Scope of Work**	**Condition 1**	**Condition 2**	**Condition 3**
All equipment	Infrared thermography	12 months	12 months	6 months
~~Battery~~ ~~ESSs~~ Batteries	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	~~Lubrication~~		~~Reserved~~	
	~~Mechanical servicing~~		~~Reserved~~	
	Electrical testing	60 months	36 months	12 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~~
Cable trays	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
Electric vehicle power transfer systems	Visual inspection	60 months	36 months	12 months
	~~Mechanical inspection~~	~~60 months~~	~~36 months~~	~~12 months~~
	~~Electrical testing~~	~~60 months~~	~~36 months~~	~~12 months~~
~~Electronic equipment~~			~~Reserved~~	
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
GFCIs	Visual inspection	12 months	12 months	6 months
	Cleaning	60 months	36 months	12 months
	~~Lubrication~~	~~60 months~~	~~36 months~~	~~12 months~~
	~~Mechanical servicing~~		~~Reserved~~	
Grounding and bonding	Visual inspection	12 months	12 months	6 months
	~~Cleaning~~		~~Reserved~~	
	~~Lubrication~~		~~Reserved~~	
	~~Mechanical servicing~~		~~Reserved~~	

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
	Electrical testing	60 months	36 months	36 months
High-voltage substation insulators	Visual inspection	12 months	12 months	6 months
	Corona detection	12 months	6 months	4 months
	Maintenance and testing	60 months	36 months	12 months
Lighting	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Mechanical servicing ~~Servicing~~	60 months	36 months	12 months
~~Lighting control systems~~			Reserved	
Low-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 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
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~~ servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
Photovoltaic systems	Visual inspection	60 months	36 months	12 months
	~~Cleaning~~		~~Reserved~~	
	~~Lubrication~~		~~Reserved~~	
	Mechanical servicing	36 months	~~Reserved~~ 24 months	12 months
	Electrical testing	60 months	36 months	12 months
Portable electrical tools and equipment	Visual inspection	Before each use	Before each use	Before each use
	Cleaning	Before each use	Before each use	Before each use
	Lubrication	In accordance with the manufacturer's instructions	In accordance with the manufacturer's instructions	In accordance with the manufacturer's instructions
	Mechanical servicing	In accordance with the manufacturer's instructions	In accordance with the manufacturer's instructions	In accordance with the manufacturer's instructions
	Electrical testing	3 months	3 months	3 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 and conductors	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
Power-factor correction capacitors	Visual inspection	60 months	36 months	12 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
	~~Special~~		~~Reserved~~	
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 months	36 months	12 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

Product	Scope of Work	Equipment Condition Assessment		
		Condition 1	Condition 2	Condition 3
~~Public pools, fountains, and similar installations~~			~~Reserved~~	
Rotating 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
Stationary standby batteries	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	~~Mechanical servicing~~		~~Reserved~~	
	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
Transfer switch equipment	Visual inspection	12 months	6 months	3 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
Uninterruptible power supplies	Visual inspection	6 months	3 months	1 month
	Cleaning	12 months	6 months	3 months
	~~Lubrication~~		~~Reserved~~	
	Mechanical servicing	12 months	6 months	3 months
	Electrical testing	12 months	6 months	3 months
	Special ~~procedures~~	24 months	24 months	24 months
Wind power electric systems	Visual inspection	60 months	36 months	12 months
	~~Cleaning~~	~~60 months~~	~~36 months~~	~~12 months~~

		Equipment Condition Assessment		
Product	**Scope of Work**	**Condition 1**	**Condition 2**	**Condition 3**
	~~Lubrication~~		~~Reserved~~	
	~~Mechanical servicing~~	~~60 months~~	~~36 months~~	~~12 months~~
	Electrical testing	60 months	36 months	12 months
Wiring devices	Visual inspection	12 months	3 months	1 month
	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

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 26 09:32:08 EDT 2024

Committee Statement

Committee Statement: First revision clarifies predictive methods are acceptable for establishing intervals. Deleted content is redundant to Section 1.2.

Response Message: FR-152-NFPA 70B-2024

Public Input No. 198-NFPA 70B-2023 [Section No. 9.2.2 [Excluding any Sub-Sections]]

First Revision No. 43-NFPA 70B-2024 [New Section after 9.3]

9.4 Scheduling Repairs to Correct Defects.

9.4.1

The EMP shall include a timeline according to which repairs or corrections discovered during the inspection and testing phase are to be completed.

9.4.2

The severity of the defect and physical condition of the equipment shall be considered for the time interval that a required repair is to be scheduled.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 15:37:35 EDT 2024

Committee Statement

Committee Statement: This adds requirements to include a timeline for repairs to avoid excess delays or lack of action.

Response Message: FR-43-NFPA 70B-2024

Public Input No. 4-NFPA 70B-2023 [New Section after 9.3.3.2]

First Revision No. 2-NFPA 70B-2024 [Section No. 9.3.1 [Excluding any Sub-Sections]]

Equipment that is included in the ~~electrical~~ EMP shall be assessed for current ~~equipment~~ condition in accordance with 9.2.1.1 through 9.2.1.3.

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Mon Mar 11 10:02:41 EDT 2024

Committee Statement

Committee Statement: Electrical is redundant with EMP.
Response Message: FR-2-NFPA 70B-2024

First Revision No. 49-NFPA 70B-2024 [Sections 9.3.1.1, 9.3.1.2, 9.3.1.3]

9.2.1.1

Equipment Physical Condition 1 shall be assigned where all the following criteria apply:

(1) The equipment ~~appears~~ is in like new condition.

(2) The enclosure is clean, free from moisture intrusion, and tight.

(3) ~~No~~ There are no unaddressed notifications from the continuous monitoring system ~~has occurred~~ .

(4) There are no active recommendations from maintenance activities or predictive techniques.

(5) Previous maintenance has been performed in accordance with the EMP.

9.2.1.2

Equipment Physical Condition 2 shall be assigned where ~~all~~ both the criteria from 9.2.1.1(1) , 9.2.1.1(2) , and 9.2.1.1(5) ~~of 9.2.1.1 apply,~~ and ~~where~~ the criteria from any of the following ~~criteria~~ apply:

(1) Maintenance results deviate from past results or have indicated more frequent maintenance in accordance with manufacturer's published data.

(2) The previous maintenance cycle has revealed issues requiring the repair or replacement of major equipment components.

(3) There have been notifications from the continuous monitoring system since the prior assessment.

(4) There are active recommendations from maintenance activities or predictive techniques.

9.2.1.3

Equipment Physical Condition 3 shall be assigned where changes in operation are noted or where any of the following criteria applies:

(1) The equipment has missed the last two successive maintenance cycles in accordance with the EMP.

(2) The previous two maintenance cycles have revealed issues requiring the repair or replacement of major equipment components.

(3) There is an active or unaddressed notification from the continuous monitoring system.

(4) There are urgent actions identified from maintenance activities or predictive techniques.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 16:15:54 EDT 2024

Committee Statement

Committee Statement: Predictive techniques are utilized in decision making processes. Maintenance activities provide data for decision making.

	First revision removes the requirement to apply Conditions 3 and 4 in 9.3.1.1 as they were in conflict with the criteria in 9.3.1.2.
Response Message:	FR-49-NFPA 70B-2024

Public Input No. 104-NFPA 70B-2023 [Sections 9.3.1.1, 9.3.1.2, 9.3.1.3]

Public Input No. 105-NFPA 70B-2023 [Section No. 9.3.1.2]

First Revision No. 149-NFPA 70B-2024 [Sections 9.3.1.4, 9.3.1.5]

9.2.1.4 Management of Nonserviceable Equipment.

9.2.1.4.1

~~Equipment that poses an imminent risk of injury or negative health effects to personnel shall be designated as nonserviceable in accordance with 8.7.1.3 .~~ When there is evidence that equipment could fail such that it would lead to injury of personnel or pose an imminent risk to health or the environment, the equipment shall be de-energized and identified as nonserviceable.

9.2.1.4.2

~~Access to nonserviceable equipment by unqualified persons shall be restricted.~~ Paragraph 9.2.1.4.1 shall not be required if it can be demonstrated that de-energizing introduces additional hazards, increased risk or is infeasible because of equipment design or operational limitation.

9.2.1.4.3

Until the equipment is de-energized or repaired, personnel shall be protected from hazards associated with the impending failure of the equipment by suitable barricades and other alerting techniques necessary for safety of personnel.

~~9.3.1.5~~ ~~Nonconforming Equipment.~~

~~Equipment exhibiting characteristics that do not conform to any of the above conditions shall be identified as requiring corrective measures before returning it to a normal operating condition.~~

Supplemental Information

File Name	Description	Approved
FR_149_Section_9.3.1.4.docx	FR 149 attachment Section 9.3.1.4	
70B_FR-149_9.3.1.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Fri Mar 22 12:04:53 EDT 2024

Committee Statement

Committee Statement: The requirement has been revised to more closely align with 70E. It includes content regarding equipment failure and criticality of equipment to clarify that these are associated with frequency of maintenance activities in Section 9.2.

Response Message: FR-149-NFPA 70B-2024

Public Input No. 6-NFPA 70B-2023 [Sections 9.3.1.4, 9.3.1.5]

Public Input No. 21-NFPA 70B-2023 [Sections 9.3.1.4, 9.3.1.5]

First Revision No. 47-NFPA 70B-2024 [Section No. 9.3.2]

9.2.2* Criticality Condition of Equipment.

Criticality Condition 1, Criticality Condition 2, or Criticality Condition ~~2~~ 3 shall be permitted to be assigned ~~where the failure of the equipment or system will not endanger personnel~~ based on operational reliability or business continuity concern .

A.9.2.2

A criticality assessment team should be comprised of personnel who are familiar with the electrical equipment, safety requirements, operational capabilities, potential impact of downtime, required maintenance activities, and business priorities. The team can include external expertise when needed. Some examples of the type of personnel to include in a criticality assessment include the following:

(1) The electrical foreman or superintendent

(2) Production personnel thoroughly familiar with the operation capabilities of the equipment and the effect its loss will have on quality and productivity

(3) The senior maintenance individual who is generally familiar with the maintenance and repair history of the equipment or process

(4) A technical individual knowledgeable in the theoretical fundamentals of the process and its hazards (e.g., in a chemical plant, a chemist; in a mine, a geologist)

(5) A safety engineer or the individual responsible for the overall security of the plant and its personnel against fire and accidents of all kinds

The team should review the entire plant or each of its operating segments in detail, considering each unit of equipment as related to the entire operation and the effect of its loss on safety and production. The purpose of the review is to identify failure modes and their cause and effect.

There should be objective criteria consistently used to evaluate all equipment to make a clear determination in establishing whether a system is critical and in having the proper amount of emphasis placed on its maintenance. The determination of critical parts should be the responsibility of the electrical foreman or superintendent on the team.

The entire team should consider each alarm in the system with the same thoroughness with which they have considered the shutdown circuits. A critical alarm should be characterized by its separate sensing device, a separate readout device, and separate circuitry and power source. The maintenance department should thoroughly understand the critical level of each alarm. The critical alarms and their significance should be distinctly marked on drawings, in records, and on the operating unit. For an alarm to be critical does not necessarily mean that it is complex or related to complex action. A simple valve position indicator can be one of the most critical alarms in an operating unit.

The owner can also choose to assign criticality based on the threat to operational continuity. The criticality assessment should consider personnel exposure to electrical hazards. Electrical system criticality should be evaluated with consideration of the possible widespread effect of a fault in electrical equipment.

~~**9.2.2.2**~~

~~Criticality Condition 3 shall be assigned where the failure of the equipment or system will endanger personnel.~~

Supplemental Information

File Name	Description	Approved
70B_FR-47_9.3.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 16:02:37 EDT 2024

Committee Statement

Committee Statement: The first revision addresses a conflict between 9.2.2 and 9.3.2.2. Section 9.3.2.2 was forcing the application of Condition 3 column in all cases.

Response Message: FR-47-NFPA 70B-2024

Public Input No. 18-NFPA 70B-2023 [Section No. 9.3]

First Revision No. 10-NFPA 70B-2024 [Section No. 10.1.3]

10.2.3

~~Electrical maintenance~~ Maintenance documentation shall identify where the maintenance is to be performed and what precautions are necessary.

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 08:23:01 EDT 2024

Committee Statement

Committee Statement: Removing the word “electrical” aligns with the scope statement in Section 1.1
Response Message: FR-10-NFPA 70B-2024

Public Input No. 107-NFPA 70B-2023 [Section No. 10.1.3]

First Revision No. 14-NFPA 70B-2024 [Section No. 10.3]

10.4 Elimination of Hazardous Atmospheres.

For maintenance involving permanent ~~electrical~~ installations, the following procedures shall be followed:

(1) Hazardous vapors, dust, or fibers/flyings shall be removed from the area.

(2) Enclosed or trapped hazardous vapors shall be cleared.

(3) Atmosphere shall be tested to confirm it is within safe limits for the required maintenance.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 09:39:36 EDT 2024

Committee Statement

Committee Statement: The word “electrical” is not necessary and does not add clarity.

Response Message: FR-14-NFPA 70B-2024

Public Input No. 109-NFPA 70B-2023 [Section No. 10.3]

First Revision No. 15-NFPA 70B-2024 [Section No. 10.4.2]

10.5.2

Before opening any enclosure, time shall be allowed for parts internal to the enclosure to cool and for electrical charges to dissipate, as identified in the risk assessment or manufacturer's instructions.

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 09:40:49 EDT 2024

Committee Statement

Committee Statement: The addition of "…internal to the enclosure to…" provides clarity.
Response Message: FR-15-NFPA 70B-2024

Public Input No. 126-NFPA 70B-2023 [Section No. 10.4.2]

First Revision No. 16-NFPA 70B-2024 [Section No. 10.5.2.1]

10.6.2.1*

~~Prior to reinstalling covers, they~~ During the reinstallation process, covers shall be visually checked for proper closure of mating joints and seals.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 09:42:18 EDT 2024

Committee Statement

Committee Statement: The process of visually inspecting covers during the reinstallation process assures verification of proper mating of joints and seals.

Response Message: FR-16-NFPA 70B-2024

Public Input No. 110-NFPA 70B-2023 [Section No. 10.5.2.1]

First Revision No. 17-NFPA 70B-2024 [Section No. 10.8.1]

10.9.1

Where material such as grease, paint, or dirt must be cleaned from machined joints, a nonmetallic bristle brush, an acceptable noncorrosive solvent, or other methods recommended by the manufacturer shall be used.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 09:44:49 EDT 2024

Committee Statement

Committee Statement: The addition of “material such as” provides a generic descriptor to possible contaminates and adds clarity,

Response Message: FR-17-NFPA 70B-2024

Public Input No. 127-NFPA 70B-2023 [Section No. 10.8.1]

First Revision No. 87-NFPA 70B-2024 [Section No. 11.2]

Detail FR-150

11.2* Frequency of Maintenance.

The periodic maintenance procedures specified in Section 11.3 shall be performed in accordance with the frequencies specified in Chapter 9, unless otherwise specified in Table 11.2.

Table 11.2 Frequency of Maintenance

Scope of Work	Equipment Condition Assessment			Notes
	Condition 1	Condition 2	Condition 3	
~~Sample~~Sampling and testing of insulating fluid ~~and tests~~	12 months	12 months	6 months	See Table 11.3.5, Item 16.

A.11.2

Periodic testing of the insulating fluid in liquid-filled transformers is an example of how to gain insight on the health of a transformer. Test results can indicate problems such as internal arcing, high moisture content, degradation of transformer construction materials, and poor oil quality. For more information on insulating fluid testing, refer to IEEE C57.104, *Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers*, and IEEE C57.106, *Guide for Acceptance and Maintenance of Insulating Mineral Oil in Electrical Equipment*.

Supplemental Information

File Name	Description	Approved
70B_FR-87_11.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:51:37 EDT 2024

Committee Statement

Committee Statement: This annex material is added to provide additional information and references related to insulating fluid testing.

Response Message: FR-87-NFPA 70B-2024

Public Input No. 129-NFPA 70B-2023 [New Section after A.11.3.5]

First Revision No. 88-NFPA 70B-2024 [Section No. 11.3.1]

Global FR-158

Global FR-156

11.3.1 Visual Inspections.

Transformers shall be visually inspected in accordance with Table 11.3.1.

Table 11.3.1 Transformer Visual Inspections

		Test Type*			
		Dry Type, Air-Cooled			
No.	Task	Small, Windings, ≤600 Volts, ≤167 kVA 1-ph, ≤500 kVA 3-ph Test Type*	Large, Windings, >600 Volts, >167 kVA 1-ph, >500 kVA 3-ph Test Type*	Liquid-Filled Test Type*	Notes
1	Bolted connections	2	2	2	
2	Cooling devices	2	2	1 or 2	
3	Liquid level gauge(s) and alarm(s)	NA	NA	1 or 2	
4	Neutral grounding impedance devices	1 or 2	1 or 2	1 or 2	
5	Nitrogen bottle pressure systems	NA	NA	1 or 2	
6	Pressure relief device(s)	NA	NA	2	
7	Sudden pressure relay(s)	NA	NA	2	
8	Tank over/under pressure gauges and alarms	NA	NA	1 or 2	
9	Transformer enclosures	1 or 2	1 or 2	1 or 2	Ensure ventilation and equipment enclosure integrity has not been compromised.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test;Type 1A = online enhanced test;Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_88_Table_11.3.1.docx	attachment for FR 88 Table 11.3.1	
70B_FR-88_11.3.1_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:52:59 EDT 2024

Committee Statement

Committee Statement: Changing the layout of the top of the table to include “test type” simplifies the column titles and is consistent with other tables like 11.3.4.

Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline. The table is modified to allow online tests for some items since they can be inspected with the equipment online depending on installation or by continuous monitoring devices.

Response Message: FR-88-NFPA 70B-2024

Public Input No. 131-NFPA 70B-2023 [Section No. 11.3.1]

Public Input No. 134-NFPA 70B-2023 [Section No. 11.3.1]

First Revision No. 89-NFPA 70B-2024 [Section No. 11.3.4]

11.3.4 Mechanical Servicing.

Transformers shall be mechanically serviced in accordance with Table 11.3.4.

Table 11.3.4 Transformer Mechanical Servicing

No.	Task	Test Type*			Notes
		Dry Type, Air-Cooled			
		Small, Windings, ≤600 V, ≤167 kVA 1-ph, ≤500 kVA 3-ph	Large, Windings, >600 V, >167 kVA 1-ph, >500 kVA 3-ph	Liquid-Filled	
1	Bolted connections	~~2~~	~~2~~	~~2~~	
1A	Verify tightness of accessible bolted electrical connections	2	2	2	
1B	Verify as-left tap connections are as specified	2	2	2	
2	Inspect anchorage, alignment, and grounding	1 or 2	1 or 2	1 or 2	
3	Cooling devices	2	2	2	
4	Transformer enclosures, ventilation filters, and screens inspected and replaced or cleaned, as needed	1 or 2	1 or 2	NA	
5	Control cabinets connections and cleaning	2	2	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_89_Table_11.3.4.docx	attachment for FR 89 Table 11.3.4	
70B_FR-89_11.3.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:55:16 EDT 2024

Committee Statement

Committee Statement:	Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.
Response Message:	FR-89-NFPA 70B-2024

First Revision No. 90-NFPA 70B-2024 [Section No. 11.3.5]

Global FR-158

11.3.5* Electrical Testing.

Transformers shall be electrically tested in accordance with Table 11.3.5.

Table 11.3.5 Transformer Electrical Tests

		Test Type*			
		Dry Type, Air-Cooled			
No.	Task	Small, Windings, ≤600 ~~Volts~~, ≤167 kVA 1-ph, ≤500 kVA 3-ph ~~Test Type*~~	Large, Windings, >600 ~~Volts~~, >167 kVA 1-ph, >500 kVA 3-ph ~~Test Type*~~	Liquid-Filled ~~Test Type*~~	Notes
1	Core insulation resistance	NA	2A	2A	
2	Excitation current on each phase	NA	2	2	
3	Insulation power factor	NA	2	2	
4	Insulation power factor tip-up	NA	2A	NA	
5	Main insulation resistance	2	2	2	
6	Neutral grounding impedance devices	NA	2	2	
7	Online partial discharge on MV/HV windings	NA	1A	1A	
8	Insulation power factor on each bushing	NA	NA	2†	
9	Sweep frequency response analysis	NA	NA	2A	
10	Turns ratio on all load tap changer (LTC) taps	NA	NA	2A	
11	Turns ratio on all no-load tap changer (NLTC) taps	2A	2A	2A	
12	Turns ratio on designated tap	2	2	2	
13	Winding resistance at designated tap	2A	2A	2	
14	Bolted connection resistance	2	2	2	
15	Applied voltage test	NA	2A	NA	
16	Sample insulating fluid and test for:				
16A	Dielectric breakdown	NA	NA	1 or 2	
16B	Acid neutralization number	NA	NA	1 or 2	
16C	Specific gravity	NA	NA	1 or 2	
16D	Interfacial tension	NA	NA	1 or 2	
16E	Color	NA	NA	1 or 2	
16F	Visual condition	NA	NA	1 or 2	
16G	Water content	NA	NA	1 or 2	
16H	Power factor	NA	NA	1 or 2	
16I	Dissolved gas analysis	NA	NA	1~~,1A~~ or 2~~,2A~~	
16J	Furan analysis	NA	NA	~~1,~~ 1A or ~~2,~~ 2A	
17	Sweep frequency response analysis	NA	NA	2A	

No.	Task	Test Type*			Notes
		Dry Type, Air-Cooled			
		Small, Windings, ≤600 ~~Volts~~, ≤167 kVA 1-ph, ≤500 kVA 3-ph ~~Test Type*~~	Large, Windings, >600 ~~Volts~~, >167 kVA 1-ph, >500 kVA 3-ph ~~Test Type*~~	Liquid-Filled ~~Test Type*~~	
18	Percent oxygen in insulating blanket	NA	NA	2A	
19	Testing of transformer alarms, including temperature, liquid level, nitrogen bottle pressure, tank over/under pressure, sudden pressure	NA	~~NA~~2	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

†Transformers applied at voltages greater than 1000 volts.

Supplemental Information

File Name	Description	Approved
FR_90_Table_11.3.5.docx	attachment for FR 90 Table 11.3.5	
70B_FR-90_11.3.5_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 15:01:56 EDT 2024

Committee Statement

Committee Statement: Changing the layout of the top of the table to include “test type” simplifies the column titles and is consistent with other tables like 11.3.4.

The table shows a DGA and Furan analysis as a standard and enhanced test. The DGA should be a standard test, so the enhanced test indicators were removed. The Furan analysis is not done for some applications and does not have a direct effect on safety.

Response Message: FR-90-NFPA 70B-2024

Public Input No. 135-NFPA 70B-2023 [Section No. 11.3.5]

Public Input No. 133-NFPA 70B-2023 [Section No. 11.3.5]

First Revision No. 93-NFPA 70B-2024 [Section No. 12.3.1]

Global FR-158

12.3.1* Visual Inspection.

Substations and switchgear shall be visually inspected in accordance with Table 12.3.1.

Table 12.3.1 Substation and Switchgear Visual Inspections

No.	Task	Test Type*		Notes
		1000 ~~Volts~~ or Less ~~Below~~Test ~~Type*~~	Greater than 1000 ~~Volts~~ ~~Test Type*~~	
1	Inspect external physical condition	1 or 2	1 or 2	This includes condition and integrity of applied labels.
2	Inspect anchorage and grounding	1 or 2	1 or 2	Document if anchorage is not appropriate in accordance with current seismic requirements so improvements can be considered.
3	Ensure maintenance devices and tools are available for equipment servicing	1 or 2	1 or 2	
4	Verify circuit breakers, fuses, protective relays, and other types of overload elements are the right sizes and types and correspond to the drawings and the power system studies	1 or 2	1 or 2	~~Verify against plans, drawings, and pertinent records, as well as against evidence of current load levels.~~ Some devices might be able to be checked while panel doors are closed.
5	For connected communicating addressable devices, verify the device addresses are set in accordance with documentation	1 or 2	1 or 2	Confirm addressing or correct device association where protective devices or the human-machine interface (HMI) are connected to multiple devices via a communication network.
6	Verify instrument transformer ratios are correct as installed	2A	2A	
7	Inspect insulators for damage or contaminated surfaces	2	2	
8	Verify air filters or screens are clean and in place	1 or 2	1 or 2	
9	Check all ventilation openings for obstructions and correct operation of any flap or automatic cover intended to assist in ~~arc resistant~~arc-resistant ratings	2	2	
10	Inspect ~~arc resistant~~arc-resistant equipment to ensure all doors are secured and in place	1 or 2	1 or 2	
11	Verify switch phase barriers are in place and in good condition	2	2	
12	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	

No.	Task	Test Type*		Notes
		1000 ~~Volts~~ or Less ~~Below~~Test ~~Type~~*	Greater than 1000 ~~Volts~~ ~~Test Type~~*	
13	Visually inspect environmental controls, where provided	1 or 2	1 or 2	Includes, but is not limited to, fans, heaters, thermostats, and humidity control equipment and settings.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_93_Table_12.3.1.docx	attachment for Table 12.3.1	
70B_FR-93_12.3.1_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 15:19:54 EDT 2024

Committee Statement

Committee Statement: Tasks No. 1 and 2 can also be done de-energized so the table is updated. Unclear language was removed in the notes section that was restating the requirement.

Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.

Response Message: FR-93-NFPA 70B-2024

Public Input No. 136-NFPA 70B-2023 [Section No. 12.3.1]

First Revision No. 94-NFPA 70B-2024 [Section No. 12.3.4]

12.3.4* Mechanical Servicing.

Substation and switchgear shall be mechanically serviced in accordance with Table 12.3.4.

Table 12.3.4 Substation and Switchgear Mechanical Servicing

No.	Task	Test Type*		Notes
		1000 ~~Volts~~ ~~Below~~ Less ~~Test Type*~~ or	Greater than 1000 ~~Volts Test Type*~~	
1	Check circuit breakers and switches — mechanical operation	2	2	See manufacturer's instructions, Chapter 15, and Chapter 17.
2	Check bolted connection resistance	2	2	See Chapter 7.
3	Verify lubrication on moving current-carrying parts and sliding surfaces	2	2	See manufacturer's instructions.
4	Verify mechanical interlock systems for correct sequencing	2	2	
5	Verify mechanical systems for correct sequencing, including shutters, racking mechanisms, and similar	2	2	
6	Verify mechanical indicating devices are functional	2	2	
7	Verify filters or screens are clean and in place	1 or 2	1 or 2	Include filters and screens in the room related to the substation or switchgear.
8	Verify fuse holders provide mechanical support and contact integrity	2	2	See Chapter 16.
9	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_94_Table_12.3.4.docx	attachment for FR 94 Table 12.3.4	
70B_FR-94_12.3.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Wed Mar 20 15:21:16 EDT 2024

Committee Statement

Committee Statement: Task No. 8: Text was added to refer to the chapter on fuses.
Response Message: FR-94-NFPA 70B-2024

Public Input No. 137-NFPA 70B-2023 [Section No. 12.3.4]

First Revision No. 95-NFPA 70B-2024 [Section No. 12.3.5]

Global FR-158

12.3.5* Electrical Testing.

Substations and switchgear shall be electrically tested in accordance with Table 12.3.5.

Table 12.3.5 Substation and Switchgear Electrical Tests

No.	Task	Test Type*		Notes
		1000 ~~Volts~~ or Less ~~Below Test Type*~~	Greater than 1000 ~~Volts Test Type*~~	
1	Inspect electrical connections for high resistance	2	2	See Section 7.2.
2	Perform ground resistance test	2	2	See 20.3.5. Perform point-to-point test to determine the resistance between the main grounding system and substation/switchgear frames, system neutral, or derived neutral points. Perform fall-of-potential or alternative test on the grounding electrode system.
3	Measure insulation resistance	2	2	
4	Measure insulation resistance of control wiring	2A	2A	
5	Test protective devices and systems	2	2	For surge protective devices, surge arresters, and arc-energy reduction systems, see the manufacturer's instructions.
6	Perform system operational tests	1 or 2	1 or 2	Include emergency or standby sources of power systems to ensure they are available when needed, automatic throw-over~~s~~ schemes, paralleling controls, interlock systems, or any other operational or maintenance-related control that might be installed.
7	Perform dielectric withstand test	NA	2A	
8	Perform online partial discharge (PD) survey	NA	1A	
9	Where environmental controls are provided, check for correct operating condition	1 or 2	1 or 2	Includes, but is not limited to, fans, heaters, thermostats, and humidity control equipment and settings.
10	Test control power transformers, instrument transformers, and metering to ensure correct operation	1 or 2	1 or 2	
11	Verify operation of communications	1 or 2	1 or 2	

No.	Task	Test Type*		Notes
		1000 ~~Volts~~ or Less ~~Below Test Type*~~	Greater than 1000 ~~Volts Test Type*~~	
	systems			
12	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_95_Table_12.3.5.docx	attachment for FR 95 Table 12.3.5	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 09:52:29 EDT 2024

Committee Statement

Committee Statement: Task No. 6: Some operational tests must be performed with the equipment online so need to be a 1 or 2. Corrected “throw-over schemes” from “throw-overs” which did not describe the entire concept.

Response Message: FR-95-NFPA 70B-2024

First Revision No. 123-NFPA 70B-2024 [Section No. 13.1.1]

Global FR-157

13.1.1

This chapter identifies ~~electrical~~ maintenance requirements for panelboards and switchboards rated 1000 V or below.

~~**A.13.1.1**~~

~~Panelboards or switchboards are either fuse or circuit breaker type. Where critical circuits are involved, panelboards or switchboards should be appropriately identified by tags, labels, or color coding.~~

~~Seldom are panelboards or switchboards de-energized, and then only for circuit changes; it is for those times that electrical maintenance can be scheduled. There is always the possibility of an error or accidental tripping of a main circuit breaker causing an unscheduled shutdown. During operating periods, the panels can be checked only for hot spots or excessive heat. This electrical maintenance should be done at reasonable intervals in accordance with the importance of the circuit. A record should be made of areas that have given trouble; memory should not be relied on.~~

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:13:05 EDT 2024

Committee Statement

Committee Statement: Annex material is being deleted as it does not provide clarity to the application of the related requirements.

Response Message: FR-123-NFPA 70B-2024

Public Input No. 138-NFPA 70B-2023 [Section No. A.13.1.1]

First Revision No. 96-NFPA 70B-2024 [Section No. 13.3.1]

13.3.1 Visual Inspection.

Panelboards and switchboards shall be visually inspected in accordance with Table 13.3.1.

Table 13.3.1 Panelboard and Switchboard Visual Inspections

No.	Task	Test Type*	Notes
1	Inspect external physical condition	1 or 2	This includes condition and integrity of applied labels.
2	Inspect anchorage and grounding	1 or 2	
3	Verify circuit breakers, fuses, and overload elements are the right sizes and types and correspond to the drawings and power system studies	1 or 2	
4	For connected communicating addressable devices, verify the device addresses are set in accordance with documentation	1 or 2	Confirm addressing or correct device association where protective devices or the human machine interface (HMI) are connected to multiple devices via a communication network.
5	Verify instrument transformer ratios are correct	2A	
6	Inspect insulators for damage or contaminated surfaces	2	
7	Verify filters are clean and in place	1 or 2	
8	Ensure maintenance devices and tools are available for equipment servicing	1 or 2	
9	Verify phase barriers are in place	2	
10	Visually inspect environmental controls, where provided	1 or 2	Includes, but is not limited to, fans, heaters, thermostats, and humidity control equipment and settings.
11	For individual components, refer to the appropriate chapter(s) of this standard	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_96_Table_13.3.1.docx	attachment for FR 96 Table 13.3.1	
70B_FR-96_13.3.1_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 09:53:49 EDT 2024

Committee Statement

Committee Statement: Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.

Task No. 5: Instrument transformer ratios should be inspected only if there is a suspected issue so changed to an enhanced test.

Response Message: FR-96-NFPA 70B-2024

Public Input No. 140-NFPA 70B-2023 [Section No. 13.3.1]

First Revision No. 97-NFPA 70B-2024 [Section No. 13.3.2]

13.3.2 Cleaning.

Bus insulation, cable insulation, terminals or terminations, electrical equipment surfaces, enclosures, and insulating materials shall be kept ~~in a clean and contaminant-free state~~ clean to prevent a buildup of contaminants that negatively affect performance, reduce life expectancy, or create a safety hazard .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 09:56:27 EDT 2024

Committee Statement

Committee Statement: The language was modified to require cleaning and it is not possible to keep equipment “contaminant free” as a contaminant could be defined as dust. The language was updated to match the language used in Chapter 12.

Response Message: FR-97-NFPA 70B-2024

Public Input No. 141-NFPA 70B-2023 [Section No. 13.3.2]

First Revision No. 98-NFPA 70B-2024 [Section No. 13.3.4]

13.3.4 Mechanical Servicing.

Panelboards and switchboards shall be mechanically serviced in accordance with Table 13.3.4.

Table 13.3.4 Panelboard and Switchboard Mechanical Servicing

No.	Task	Test Type*	Notes
1	Inspect mechanical condition	2	
2	Ensure maintenance devices and tools are available for equipment servicing	1 or 2	
3	Inspect anchorage and grounding	1 or 2	
4	Mechanically operate circuit breakers and switches	2	
5	Inspect bolted connection integrity	2	See Chapter 7.
6	Verify lubrication on moving current-carrying parts and sliding surfaces	2	See the manufacturer's instructions.
7	Verify mechanical interlock systems for correct sequencing	2	
8	Verify mechanical indicating devices are functional	2	
9	Verify filters are clean and in place	1 or 2	
10	Verify fuse holders provide mechanical support and contact integrity	2	See Chapter 16.
11	For individual components, refer to the appropriate chapter(s) of this standard	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_98_Table_13.3.4.docx	attachment for Table 13.3.4	
70B_FR-98_13.3.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 09:58:17 EDT 2024

Committee Statement

Committee Statement: Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.

Task No. 10: Text was added to refer to the chapter on fuses.

Response Message: FR-98-NFPA 70B-2024

Public Input No. 142-NFPA 70B-2023 [Section No. 13.3.4]

First Revision No. 99-NFPA 70B-2024 [Section No. 13.3.5]

13.3.5 Electrical Testing.

Panelboards and switchboards shall be electrically tested in accordance with Table 13.3.5.

Table 13.3.5 Panelboard and Switchboard Electrical Testing

No.	Task	Test Type*	Notes
1	Check electrical hardware connections	NA	See Chapter 7.
2	Measure insulation resistance of the main bus	2	
3	Measure insulation resistance of control wiring	2A	
4	Test protective devices and systems	2	For surge protective devices, surge arresters, and arc-fault energy reduction systems, see the manufacturer's instructions.
5	Perform system operational tests	1 or 2	Includes emergency or standby power systems.
6	Test control power transformers, instrument transformers, and metering to ensure correct operation	2A	
7	For individual components, refer to the appropriate chapter(s) of this standard	NA	
8	Where environmental controls are provided, check for correct operating condition	1 or 2	Includes, but is not limited to, fans, heaters, thermostats, and humidity control equipment and settings.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_99_Table_13.3.5.docx	attachment for FR 99 Table 13.3.5	
70B_FR-99_13.3.5_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:00:13 EDT 2024

Committee Statement

Committee Statement:	Task 6 is changed to a 2A because it is not necessary to test control power transformers every maintenance outage.
Response Message:	FR-99-NFPA 70B-2024

Public Input No. 143-NFPA 70B-2023 [Section No. 13.3.5]

First Revision No. 100-NFPA 70B-2024 [Section No. 15.3.2.1]

15.3.2.1

Electrical equipment surfaces, enclosures, and insulating materials shall be kept ~~in a clean and contaminant-free state~~ clean to prevent a buildup of contaminants that negatively affect performance, reduce life expectancy, or create a safety hazard .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:02:24 EDT 2024

Committee Statement

Committee Statement: The language was modified to require cleaning and it is not possible to keep equipment “contaminant free” as a contaminant could be defined as dust. The language was updated to match the language used in Chapter 12.

Response Message: FR-100-NFPA 70B-2024

Public Input No. 146-NFPA 70B-2023 [Section No. 15.3.2.1]

First Revision No. 101-NFPA 70B-2024 [Section No. 15.3.4]

15.3.4 Mechanical Servicing.

Circuit breakers shall be mechanically serviced in accordance with Table 15.3.4.

Table 15.3.4 MCCB, ICCB, and LVPCB Mechanical Servicing

		Test Type*			
No.	Task	MCCB ~~Test Type*~~	ICCB ~~Test Type*~~	LVPCB ~~Test Type*~~	Notes
1	Check all accessible electrical hardware connections for correct torque	2	2	2	See Chapter 7.
2	Operate the circuit breaker at least three times	2	2	2	
3	Verify operation and alignment of mechanical safety interlocks, where applicable	2	2	2	
4	Verify correct operation of shutter assemblies on draw-out circuit breakers	2	2	2	
5	Measure and record trip bar force	NA	2A	2A	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_101_Table_15.3.4.docx	attachment for FR 101 Table 15.3.4	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:03:28 EDT 2024

Committee Statement

Committee Statement: Task No. 2: The existing requirement was restrictive and could have been interpreted that the circuit breaker could only be operated three times when in fact it can be operated more.

Response FR-101-NFPA 70B-2024

Message:

Public Input No. 147-NFPA 70B-2023 [Section No. 15.3.4]

First Revision No. 102-NFPA 70B-2024 [Section No. 15.3.5]

Global FR-158

15.3.5* Electrical Testing.

Circuit breakers shall be electrically tested in accordance with Table 15.3.5.

Table 15.3.5 MCCB, ICCB, and LVPCB Electrical Tests

		Test Type*				
		MCCB‡				
No.	Task	~~MCCB~~† ~~250~~225 Amperes and Less Frame ~~Test Type*~~	~~MCCB~~† ~~250~~225 Amperes Frame ~~Test Type*~~	ICCB ~~Test Type*~~	LVPCB ~~Test Type*~~	Notes
1	Perform infrared thermography	1	1	1	1	
2	Measure contact resistance of each switching pole	2A	2	2	2	
3	Perform insulation-resistance tests, phase-to-phase and phase-to-ground with circuit breaker closed and across each open pole	2A	2	2	2	
4	Operate circuit breaker auxiliary and control devices such as local and remote-control switches, shunt trips coils, close coils, motors, auxiliary switches, and under-voltage coils	2	2	2	2	
5	Verify the calibration of all functions of the trip unit by means of the manufacturer's specified test set or high current test set for circuit breakers equipped with electronic trip units	2A	2	2	2	
6	Perform inverse time trip test at 300% of rated continuous current of thermal magnetic circuit breakers	2A	2	NA	NA	
7	Perform inverse time trip test at 300% of rated continuous current of electronic trip circuit breakers	2A	2A	2A	2A	
8	Perform the instantaneous overcurrent trip test for thermal-magnetic circuit breakers by "run-up" or "pulse" method	2A	2	NA	2	
9	Perform the instantaneous overcurrent trip test for electronic trip breakers by "run-up" or "pulse" method	2A	2A	2A	2A	
10	Perform rated hold-in test	2A	2A	2A	2A	
11	Test current-limiter resistance, if applicable	2	2	2	2	
12	Check status of rating plug battery, if applicable	2	1 or 2	1 or 2	1 or 2	
13	Perform millivolt drop test	1A or 2A	1A or 2A	1A or 2A	1A or 2A	

		Test Type*				
		MCCB‡				
No.	Task	~~MCCB~~† ~~250~~225 Amperes and Less Frame ~~Test Type*~~	~~MCCB~~† ~~250~~225 Amperes Frame ~~Test Type*~~	ICCB ~~Test Type*~~	LVPCB ~~Test Type*~~	Notes
14	Test arc reduction technology in accordance with the manufacturer's instructions, if applicable	2	2	2	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

†The rating of adjustable-trip circuit breakers ~~shall~~is to be the maximum setting possible.

Supplemental Information

File Name	Description	Approved
FR_102_Table_15.3.5.docx	attachment for FR 102 Table 15.3.5	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:05:53 EDT 2024

Committee Statement

Committee Statement: The correct demarcation is 225 A per the circuit breaker standard so the table has been updated.

Some tasks were updated to "1 or 2" reflecting that the task can be performed online or offline.

Task No. 5: Circuit breakers with electronic trip units can be tested by use of a high current test set or by the manufacturer's specified test set.

Response Message: FR-102-NFPA 70B-2024

Public Input No. 148-NFPA 70B-2023 [Section No. 15.3.5]

First Revision No. 103-NFPA 70B-2024 [Section No. 15.4 [Excluding any Sub-Sections]]

~~Medium-voltage power circuit breakers shall be maintained in accordance with this section.~~

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Thu Mar 21 10:07:35 EDT 2024

Committee Statement

Committee Statement: Removing unnecessary language to make consistency between sections.
Response Message: FR-103-NFPA 70B-2024

Public Input No. 150-NFPA 70B-2023 [Section No. 15.4]

First Revision No. 151-NFPA 70B-2024 [Section No. 15.4.1]

Global FR-156

15.4.1 Visual Inspection.

Circuit breakers shall be visually inspected in accordance with Table 15.4.1.

Table 15.4.1 Medium-Voltage Power Circuit Breakers Visual Inspections

No.	Task	Test Type*				Notes
		Air Magnetic Circuit Breakers ~~Test Type*~~	Vacuum Circuit Breakers ~~Test Type*~~	Gas Insulated Circuit Breakers ~~Test Type*~~	Oil Circuit Breakers ~~Test Type*~~	
1	Verify ratings for proper system application	1 or 2	1 or 2	1 or 2	1 or 2	
2	Inspect insulating materials and frame for evidence of physical damage, cracks from stresses of operation, or contamination	2	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	2	2	2	2	
4	Inspect visible current-carrying parts and control devices, if applicable, for signs of overheating or deterioration	2	2	2	2	
5	Inspect each arc chute for cracks or excessive erosion	2	NA	NA	NA	
6	Inspect ground contact, secondary disconnect, close and trip interlocks, levering latch, mechanism-operated contact (MOC)~~,~~ and truck-operated contact (TOC) switches, and all other interlocks	2	2	2	2	
7	Check all markings on the circuit breaker are legible	1 or 2	1 or 2	1 or 2	1 or 2	
8	Inspect contact erosion indicator mark on vacuum interrupter moving stem	NA	2	NA	NA	Some manufacturers have visual inspections to determine contact erosion.

No.	Task	Test Type*				Notes
		Air Magnetic Circuit Breakers ~~Test Type*~~	Vacuum Circuit Breakers ~~Test Type*~~	Gas Insulated Circuit Breakers ~~Test Type*~~	Oil Circuit Breakers ~~Test Type*~~	
9	Inspect contact wipe	NA	2	NA	NA	Some manufacturers have visual inspections to determine contact wipe.
10	Verify correct oil level	NA	NA	NA	1 or 2	
11	Check for oil leaks	NA	NA	NA	1 or 2	
12	Visually inspect bushings for cracks, chips, loss of porcelain, evidence of corona damage, or other physical damage	2	2	2	2	
13	Check for low gas pressure	NA	NA	1A or 2A	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_151_Table_15.4.1.docx	attachment for FR 151 Table 15.4.1	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Fri Mar 22 14:11:04 EDT 2024

Committee Statement

Committee Statement: Task No. 9: Added the word “wipe” for clarification of the task requirement.

Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.

Response Message: FR-151-NFPA 70B-2024

Public Input No. 151-NFPA 70B-2023 [Section No. 15.4.1]

First Revision No. 105-NFPA 70B-2024 [Section No. 15.4.2]

Global FR-158

15.4.2 Cleaning.

Electrical equipment surfaces, enclosures, and insulating materials shall be kept ~~in a clean and contaminant-free state~~clean to prevent a buildup of contaminants that negatively affect performance, reduce life expectancy, or create a safety hazard in accordance with Table 15.4.2.

Table 15.4.2 Medium-Voltage Power Circuit Breakers Cleaning

No.	Task	Test Type*				Notes
		Air Magnetic Circuit Breakers ~~Test Type*~~	Vacuum Circuit Breakers ~~Test Type*~~	Gas Insulated Circuit Breakers ~~Test Type*~~	Oil Circuit Breakers ~~Test Type*~~	
1	Clean insulating surfaces of the circuit breaker using a lint-free dry cloth, brush, or vacuum cleaner (avoid blowing material into the circuit breaker or into surrounding equipment)	2	2	NA	NA	For vacuum circuit breakers, follow the manufacturer's instructions to avoid shock due to inherent capacitance from the technology used in the circuit breaker.
2	Clean contact surfaces	2	NA	NA	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:13:06 EDT 2024

Committee Statement

Committee Statement: The language was modified to require cleaning and it is not possible to keep equipment "contaminant free" as a contaminant could be defined as dust. The language was updated to match the language used in Chapter 12.

Response Message: FR-105-NFPA 70B-2024

Public Input No. 152-NFPA 70B-2023 [Section No. 15.4.2]

First Revision No. 106-NFPA 70B-2024 [Section No. 15.4.5]

Global FR-158

15.4.5 Electrical Testing.

Circuit breakers shall be electrically tested in accordance with Table 15.4.5.

Table 15.4.5 Medium-Voltage Power Circuit Breakers Electrical Tests

No.	Task	Test Type*				Notes
		Air Magnetic Circuit Breaker ~~Test Type*~~	Vacuum Circuit Breaker ~~Test Type*~~	Gas Insulated Circuit Breaker ~~Test Type*~~	Oil Insulated Circuit Breaker ~~Test Type*~~	
1	Inspect electrical connections for high resistance	1 or 2	1 or 2	1 or 2	1 or 2	See Section 7.2.
2	Measure contact resistance of each switching pole	2	2	2	2	
3	Perform insulation-resistance tests, phase-to-phase and phase-to-ground with circuit breaker closed and across each open pole	2	2	2	2	
~~4~~	~~Verify control power for close and trip functions~~	~~2~~	~~2~~	~~2~~	~~2~~	
~~5~~4	Perform trip and close tests with control switch	1 or 2	1 or 2	1 or 2	1 or 2	
~~6~~5	Verify operating mechanism charge, anti-pump, and trip-free functions	2	2	2	2	
~~7~~6	Perform vacuum integrity test by ac overpotential across each vacuum bottle	NA	2	NA	NA	
~~8~~7	Verify proper operation of space heaters, if equipped	2	2	2	2	
~~9~~8	Perform an ac overpotential test one pole at a time with the other poles and structure grounded	2A	2A	2A	2A	
~~10~~9	Perform an ac overpotential test on control wiring	2A	2A	2A	2A	**WARNING:** Do not perform this test on wiring connected to solid-state components.
~~11~~10	Verify blow-out coil continuity	2	NA	NA	NA	
~~12~~11	Perform circuit breaker motion analysis	2A	2A	2A	2	

No.	Task	Test Type*				Notes
		Air Magnetic Circuit Breaker ~~Test Type*~~	Vacuum Circuit Breaker ~~Test Type*~~	Gas Insulated Circuit Breaker ~~Test Type*~~	Oil Insulated Circuit Breaker ~~Test Type*~~	
~~13~~12	Perform circuit breaker contact timing test	2	2	2	2	
~~14~~13	Perform trip/close coil current signature analysis	2A	2A	2A	2A	
~~15~~14	Perform pickup test on trip and/or close coil	2A	2A	2A	2A	
~~16~~15	Measure power/dissipation factor	2A	NA	2A	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_106_Table_15.4.5.docx	attachment for FR 106 Table 15.4.5	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:15:01 EDT 2024

Committee Statement

Committee Statement: Task No. 4: The close and trip functions are tested in Task 5 which would verify control power.

Task No. 12: This test is not required for all voltage classes of gas insulated breakers so changed to an enhanced test.

Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.

Response Message: FR-106-NFPA 70B-2024

Public Input No. 153-NFPA 70B-2023 [Section No. 15.4.5]

Public Input No. 154-NFPA 70B-2023 [Section No. 15.4.5]

First Revision No. 70-NFPA 70B-2024 [Section No. 16.3.2]

16.3.2 Cleaning.

If contamination is present, fuses shall be cleaned in accordance with Table 16.3.2.

Table 16.3.2 Fuse Cleaning

		Test Type*		
No.	Task	1000 ~~Volts~~ or Less ~~Test Type*~~	Greater than 1000 ~~Volts Test Type*~~	Notes
1	Clean fuse, fuse terminals, and fuse clips that have become corroded or oxidized	2	2	
2	Clean fuses and insulators of accumulated dust and foreign matter	~~NA~~ 2A	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_70_Table_16.3.2.docx	attachment for FR 70 Table 16.3.2	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 15:06:38 EDT 2024

Committee Statement

Committee Statement: The word "fuse" was added in three locations to provide cleaning requirements for fuses in addition to fuse clips and fuse terminals.

Item 2 was changed to allow optional cleaning.

Response Message: FR-70-NFPA 70B-2024

Public Input No. 158-NFPA 70B-2023 [Section No. 16.3.2]

First Revision No. 30-NFPA 70B-2024 [Section No. 16.3.5]

Global FR-158

16.3.5* Electrical Testing.

Fuses shall be electrically tested in accordance with Table 16.3.5.

Table 16.3.5 Fuse Electrical Tests

		Test Type*		
No.	Task	1000 ~~Volts~~ or Less ~~Test Type*~~	Greater than 1000 ~~Volts Test Type*~~	Notes
1	Perform infrared thermography	1	1	When equipment has infrared viewing port or is accessible while in operation.
2	Perform insulation resistance test on fuse holder assembly	2A	2	Phase-to-phase and phase-to-ground.
3~~2~~	Measure fuse connection resistance	2A	2	
4~~3~~	Measure fuse resistance	2A	2	

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_30_Table_16.3.5.docx	FR 30 Table 16.3.5	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 12:47:15 EDT 2024

Committee Statement

Committee Statement: To verify insulation resistance integrity the fuse holder should have an insulation-resistance test performed, phase-to-phase and phase-to-ground as test type 2A for 1000 volts and less, and a test type 2 for greater than 1000 volts. Test type 2A is to allow the user flexibility in complex equipment arrangements to perform the task.

Response Message: FR-30-NFPA 70B-2024

Public Input No. 10-NFPA 70B-2023 [Section No. 16.3.5]

First Revision No. 107-NFPA 70B-2024 [Section No. 17.1.1]

Global FR-157

17.1.1

This chapter identifies ~~electrical~~ maintenance requirements for the following:

(1) Enclosed and dead-front (safety) switches, bolted-pressure switches (BPS), and high-pressure contact switches (HPC)~~, automatic transfer switches, bypass-isolation switches, and other transfer switch equipment~~ rated 1000 volts or less

(2) Switches used in metal-enclosed load interrupter switchgear ~~and automatic transfer switches, bypass-isolation switches, and other transfer switch equipment~~ rated over 1000 volts

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:16:42 EDT 2024

Committee Statement

Committee Statement: A new equipment chapter for transfer switch equipment has been created as they have different scope and application to other switches.

Response Message: FR-107-NFPA 70B-2024 Item 11 was deleted. The scope change is handled under a separate revision.

Public Input No. 28-NFPA 70B-2023 [Chapter 17]

First Revision No. 71-NFPA 70B-2024 [Section No. 17.3.1]

Global FR-158

17.3.1 Visual Inspection.

Switches shall be visually inspected in accordance with Table 17.3.1.

Table 17.3.1 Switch Visual Inspections

No.	Task	Test Type*		Notes
		1000 ~~Volts~~ or Less ~~Test Type*~~	Greater than 1000 ~~Volts~~ ~~Test Type*~~	
1	Inspect ~~doors and latches for fit, dents, corrosion, and missing hardware~~the switch enclosure for dents, deteriorated paint, missing or unreadable labels, corrosion, missing hardware, and doors and latches for improper fit	1 or 2	1 or 2	
2	Inspect insulating materials and switch base for evidence of physical damage, cracks from stresses of operation, or contamination	2	2	
3	Inspect wiring, bus, cables, and connections for damaged insulation, broken leads, tightness of connections, crimping, and overall general condition, including corrosion	2	2	
4	Check that exposed switch contacts, both moving and stationary, are free from environmental contamination	2	~~NA~~2	
5	Inspect visible current-carrying parts and control devices, if applicable, for signs of overheating or deterioration	2	2	
6	Check that fuses are secured	2	2	
7	Examine switches with exposed contacts for evidence of high short-circuit closing operation	2	~~NA~~2	
8	Check the main body of the switch blades and the arcing contacts for arc erosion	2	2	Mild pitting and burning is permitted.
9	Inspect each arc chute for cracks or excessive erosion	NA	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_71_Table_17.3.1.docx	attachment for FR 71 Table 17.3.1	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 15:08:19 EDT 2024

Committee Statement

Committee Statement: Item 1 was reworded to emphasize the inspection is focused on finding improper items. Missing and unreadable labels have been added because that information can be necessary for maintenance.

Item 4 and 7 were changed to Test Type 2 because the inspection should occur on all switches.

Response Message: FR-71-NFPA 70B-2024 Deleting the word "exposed" would expand the requirement to all switch contacts, even if they were not exposed.

Public Input No. 161-NFPA 70B-2023 [Section No. 17.3.1]

Public Input No. 160-NFPA 70B-2023 [Section No. 17.3.1]

First Revision No. 72-NFPA 70B-2024 [Section No. 17.3.4]

17.3.4 Mechanical Servicing.

Switches shall be mechanically serviced in accordance with Table 17.3.4.

Table 17.3.4 Switch Mechanical Servicing

No.	Task	Test Type*		Notes
		1000 ~~Volts~~ or Less ~~Test Type*~~	Greater than 1000 ~~Volts~~ ~~Test Type*~~	
1	If accessible, verify main blade alignment, penetration, travel stops, and mechanical operation	2	2	
2	Check all accessible electrical hardware connections	2	2	See Chapter 7.
3	Operate the switch at least three times to work the lubricant between the contacts	2	NA	
4	Verify operation and alignment of mechanical interlocks	2	2	
5	Verify the contact pressure is within specification using a force gauge or other device that measures forces	NA	2A	
6	With the door closed and latched, close and open the switch at least three times to confirm the switch and operator lever is operating; view switch position through the window after each operation, where available; when open, verify that switch blades have cleared the arc chutes; when closed, verify that the switch blades are inside the arc chutes and vertical; if they are not, perform alignment adjustments per the manufacturer's instructions	NA	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_72_Table_17.3.4.docx	attachment for FR 72 Table 17.3.4	
70B_FR-72_17.3.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 15:11:51 EDT 2024

Committee Statement

Committee Statement: The phrases under Item 4 were separated into subsets 4A, 4B, 4C, and 4D to clearly show what equipment needs those tests. This is consistent with Table 11.3.4.

Tests (Task 11) specific to transfer switch equipment is deleted and revised in new equipment chapter for transfer switch equipment.

Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline

Response Message: FR-72-NFPA 70B-2024

Public Input No. 162-NFPA 70B-2023 [Section No. 17.3.4]

Public Input No. 163-NFPA 70B-2023 [Section No. 17.3.4]

First Revision No. 73-NFPA 70B-2024 [Section No. 17.3.5]

Detail FR-160

Global FR-158

17.3.5 Electrical Testing.

Switches shall be electrically tested in accordance with Table 17.3.5.

Table 17.3.5 Switch Electrical Tests

No.	Task	Test Type*		Notes
		1000 ~~Volts~~ or Less ~~Test Type*~~	Greater than 1000 ~~Volts Test Type*~~V	
1	Perform infrared thermography	1A	1	
2	Measure contact resistance of each switching pole	2A	2	
3	Perform insulation-resistance tests, phase-to-phase and phase-to-ground with switch closed and across each open pole	2A	2	
4	Functional tests only for switches with motor operators:	~~2~~	~~2~~	
4A	Verify control power for close and trip functions	1 or 2	1 or 2	
4B	Verify the electrical operation of switch	1 or 2	1 or 2	
4C	Perform trip and close tests	1 or 2	1 or 2	
4D	Verify operation of the switch from local switches or terminal blocks	1 or 2	1 or 2	
5	Functional tests only for switches with shunt trip capabilities	1 or 2	1 or 2	
6	Measure the resistance between the line and load terminal pads on each phase	NA	2	
7	Verify operation of space heaters, if equipped	NA	2	
8	Perform overpotential test one pole at a time with the other poles and structure grounded	NA	2A	
9	Perform overpotential test on control wiring	NA	2A	**WARNING:** Do not perform this test on wiring connected to solid-state components.
10	Test arc reduction technology in accordance with the manufacturer's instructions	2	2	
~~11~~	~~Perform functional tests for automatic transfer switches, bypass switches, and other transfer switch equipment~~	~~1A or 2A~~	~~1A or 2A~~	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_73_Table_17.3.5.docx	attachment for FR 73 Table 17.3.5	
70B_FR-73_17.3.5_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 15:13:45 EDT 2024

Committee Statement

Committee Statement: Tests specific to transfer switch equipment is moved to a new equipment chapter for transfer switch equipment.

The phrases under Item 4 were separated into subsets 4A, 4B, 4C, and 4D to clearly show what equipment needs those tests. This is consistent with Table 11.3.4.

Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.

Response Message: FR-73-NFPA 70B-2024

Public Input No. 164-NFPA 70B-2023 [Section No. 17.3.5]

First Revision No. 81-NFPA 70B-2024 [Section No. 18.1.1 [Excluding any Sub-Sections]]

This chapter identifies ~~electrical~~ maintenance requirements for the following: ~~power cables and conductors operating at 1000 volts or less and those that are purpose-built, multilayered, and operating at greater than1000 volts to less than or equal to 69 kV.~~

(1) ~~power~~ Power cables and conductors operating at 1000 ~~volts~~ V or less

(2) Power cables and conductors that are purpose-built, multilayered, and operating at greater than 1000 ~~volts~~ V to less than or equal to 69 kV

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:34:10 EDT 2024

Committee Statement

Committee Statement: The phrase "greater than 1000 volts to less than or equal to 69 kV" replaced "over 1000 volts" to be consistent with the wording in Chapter 15 and elsewhere in this standard.

Response Message: FR-81-NFPA 70B-2024

Public Input No. 165-NFPA 70B-2023 [Section No. 18.1.1 [Excluding any Sub-Sections]]

First Revision No. 80-NFPA 70B-2024 [Section No. 18.3.5]

Global FR-158

18.3.5* Electrical Testing.

Power cables and conductors shall be electrically tested in accordance with Table 18.3.5.

Table 18.3.5 Power Cable and Conductor Electrical Tests

		Test Type*		
No.	Task	1000 ~~Volts~~ or Less ~~Test Type*~~	Over 1000 ~~Volts Test Type*~~	Notes
1	Airborne ultrasonic acoustic emissions	NA	1A	
2	Insulation resistance	2A	NA	~~For cables and conductors 1000 volts or less.~~
3	Insulation resistance:			For cables and conductors over 1000 volts choose at least one of the following tests as appropriate.
3A	Very low frequency (VLF <1 Hz)	NA	2	
3B	~~Overpotential~~DC overpotential test (hi-pot)	NA	2	
3C	~~Dissipation factor/tan delta~~AC insulation power factor/dissipation factor	NA	2	
3D	Partial discharge	NA	1 or 2	
3E	Power frequency	NA	2	
	~~Oscillating wave~~	~~NA~~	~~2~~	
4	Connection quality	1 or 2	1 or 2	Millivolt drop, digital low-resistance ohmmeter, infrared thermography. Circuits tested are based on criticality of the circuit.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_80_Table_18.3.5.docx	attachment for FR 80 Table 18.3.5	
70B_FR-80_18.3.5_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:31:45 EDT 2024

Committee Statement

Committee Statement: The notes for requirements Item 2 was removed because that is covered by the test type column headings.

Terms were changed to be consistent with 7.3.2.1. The phrases under Item 3 were separated into subsets 3A, 3B, 3C, 3D, and 3E to clearly show what equipment needs those tests. This is consistent with Table 11.3.4.

Response Message: FR-80-NFPA 70B-2024

Public Input No. 170-NFPA 70B-2023 [Section No. 18.3.5]

Public Input No. 171-NFPA 70B-2023 [Section No. 18.3.5]

First Revision No. 18-NFPA 70B-2024 [Section No. 21.3.2.2]

21.3.2.2 Cleaning.

If contamination is ~~found~~ present , low-voltage ground-fault protection systems shall be cleaned in accordance with Table 21.3.2.2.

Table 21.3.2.2 Low-Voltage Ground-Fault Protection System Cleaning

No.	Task	Test Type*		Notes
		Circuit Breaker Trip Units or Switches with Integral Ground-Fault Protection ~~Test Type*~~	Circuit-Breakers or Switches with External Ground-Fault Protection ~~Test Type*~~	
1	Clean the relay case and cover	NA	2	
2	Clean sensors and associated ground faults protection system components	NA	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 09:46:12 EDT 2024

Committee Statement

Committee Statement: Changing “found” to “present” provides consistency with Section 21.3.3.2.

Response Message: FR-18-NFPA 70B-2024

Public Input No. 175-NFPA 70B-2023 [Section No. 21.3.2.2]

First Revision No. 31-NFPA 70B-2024 [Section No. 21.3.3.2]

21.3.3.2 Cleaning.

If contamination is present, medium-voltage ground-fault protection systems shall be cleaned in accordance with Table 21.3.3.2.

Table 21.3.3.2 Medium-Voltage Ground-Fault Protection System Cleaning

No.	Task	Test Type*		Notes
		Circuit Breaker Trip Units or Switches with Integral Ground-Fault Protection ~~Test Type*~~	Circuit-Breakers or Switches with External Ground-Fault Protection ~~Test Type*~~	
1	Clean the relay case and cover	NA	2	
~~1~~ 2	Clean sensors and associated ground-fault protection system components	NA	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_31_Table_21.3.3..2.docx	FR 31 Table 21.3.3.2	
70B_FR-31_21.3.3.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 12:53:26 EDT 2024

Committee Statement

Committee Statement: Adding the task “clean the relay case and cover” is consistent with language in Table 21.3.2.1 and adds clarity.

Response Message: FR-31-NFPA 70B-2024

Public Input No. 176-NFPA 70B-2023 [Section No. 21.3.3.2]

First Revision No. 32-NFPA 70B-2024 [Section No. 21.3.3.5]

21.3.3.5 Electrical Testing.

~~Medium-voltage ground-fault protection systems shall be electrically tested in accordance with Chapter 35 .~~

21.3.3.5.1

Medium-voltage ground-fault protection systems utilizing protective relays shall be electrically tested in accordance with Chapter 35.

21.3.3.5.2

Medium-voltage ground-fault protection systems utilizing circuit breakers with integral trip units shall be electrically tested in accordance with the manufacturer's instructions or industry consensus standards.

Supplemental Information

File Name	Description	Approved
70B_FR-32_21.3.3.5_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 13:09:35 EDT 2024

Committee Statement

Committee Statement: Adding "utilizing protective relays" adds clarity.

The addition of 21.3.3.5.2 integral trip units electrical testing provides requirements for equipment not previously addressed.

Response Message: FR-32-NFPA 70B-2024

Public Input No. 177-NFPA 70B-2023 [Section No. 21.3.3.5]

First Revision No. 75-NFPA 70B-2024 [Section No. 22.3.3]

22.3.6.1* Maintenance Program.

~~A maintenance program for any lighting system~~ In addition to the required inspection, servicing, and testing requirements in this chapter, the EMP shall include the following elements:

~~Periodic inspections~~

(1) Criteria for determining group or spot replacement options to maintain the required illuminance levels

(2) Repair and replacement strategy

(3) Assessment of illuminance levels

Supplemental Information

File Name	Description	Approved
70B_FR-75_22.3.3_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 13:48:14 EDT 2024

Committee Statement

Committee Statement: The maintenance program information was added to clarify the requirements for lighting maintenance.

The order of the section was changed to match standard headings in other Chapters.

Response Message: FR-75-NFPA 70B-2024

Public Input No. 180-NFPA 70B-2023 [Section No. 22.3.3]

Public Input No. 178-NFPA 70B-2023 [Sections 22.3.3, 22.3.4]

Public Input No. 179-NFPA 70B-2023 [Section No. A.22.3.3]

First Revision No. 19-NFPA 70B-2024 [Section No. 24.1]

Global FR-157

24.1* Scope.

This chapter identifies ~~electrical~~ maintenance requirements for wiring devices such as general-use snap switches, receptacles and attachment plugs, pin-and-sleeve devices, heavy-duty industrial-type plugs, cord connectors, and receptacles rated not more than 600 volts.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 09:48:31 EDT 2024

Committee Statement

Committee Statement: The addition of “wiring devices such as” provides clarity.

Response Message: FR-19-NFPA 70B-2024

Public Input No. 181-NFPA 70B-2023 [Section No. 24.1]

First Revision No. 45-NFPA 70B-2024 [Section No. 24.3.4 [Excluding any Sub-Sections]]

Wiring devices shall be mechanically serviced in accordance with Table 24.3.4.

Table 24.3.4 Wiring Device ~~Cleaning~~ Mechanical Servicing

No.	Task	Test Type*	Notes
1	Confirm secure mating of plug and receptacle components	1A or 2A	Replace components with loose contact mating.
2	Confirm cable gland nut is secure and retains cable	1A or 2A	Tighten as needed, assuring no damage to the flexible cord jacket.
3	Confirm tightness of all wiring terminals	2A	Wiring terminal discoloration is indication of possible inadequate wire securement.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test~~,~~ ; Type 1A = online enhanced test~~,~~ ; Type 2 = offline standard test~~,~~ ; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_45_Table_24.3.4.docx	attachment FR 45 Table 24.3.4	
70B_FR-45_24.3.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 15:54:02 EDT 2024

Committee Statement

Committee Statement: First revision corrects table title to reflect the actions are related to mechanical servicing and not cleaning methods.

Due to the possible complexity and overall number of possible plug and receptacle components in a facility, Table 24.3.4.1 test type should be both “1A” online and “2A” offline enhanced test, not “2” standard test.

Due to the possible complexity and overall number of possible cable gland nuts in a facility, Table 24.3.4.2 test type should be both “1A” online and “2A” offline enhanced test, not “2” standard test.

Due to the possible complexity and overall number of possible wiring terminals in a facility, Table 24.3.4.3 test type should be “2A” enhanced test, not “2” standard test.

Response Message: FR-45-NFPA 70B-2024

Public Input No. 182-NFPA 70B-2023 [Section No. 24.3.4 [Excluding any Sub-Sections]]

Public Input No. 119-NFPA 70B-2023 [Section No. 24.3.4 [Excluding any Sub-Sections]]

Public Input No. 184-NFPA 70B-2023 [Section No. 24.3.4 [Excluding any Sub-Sections]]

Public Input No. 185-NFPA 70B-2023 [Section No. 24.3.4 [Excluding any Sub-Sections]]

Public Input No. 11-NFPA 70B-2023 [Section No. 24.3.4 [Excluding any Sub-Sections]]

First Revision No. 51-NFPA 70B-2024 [Section No. 24.3.4.1]

24.3.4.1

Cracked, bent, missing, or broken spring doors or covers ~~are to~~ shall be replaced.

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 17:23:33 EDT 2024

Committee Statement

Committee Statement: Adding the word “missing” provides the user additional guidance and clarity.
Response Message: FR-51-NFPA 70B-2024

Public Input No. 187-NFPA 70B-2023 [Section No. 24.3.4.1]

First Revision No. 46-NFPA 70B-2024 [Section No. 24.3.5]

24.3.5 Electrical Testing.

Wiring devices shall be electrically tested in accordance with Table 24.3.5.

Table 24.3.5 Wiring Device Electrical ~~Servicing~~ Tests

No.	Task	Test Type*	Notes
1	Confirm grounding and bonding for correct installation and secure connection	2A	
2	Confirm proper polarity of contacts	1A or 2A	
3	Conduct insulation resistance test	2A	
4	Conduct equipment grounding impedance test	1A or 2A	
5	Conduct voltage drop test	1A	

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_46_Table_24.3.5.docx	attachment for FR 46 Table 24.3.5	
70B_FR-46_24.3.5_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 15:55:50 EDT 2024

Committee Statement

Committee Statement: First revision adds tests to clarify the need to assess wiring devices with regard to insulation resistance, grounding impedance and voltage drop. Equipment grounding impedance tests, and voltage drop tests are also necessary to ensure that the electrical devices are in good condition to ensure safe operation.

Response Message: FR-46-NFPA 70B-2024 Test types 2A for grounding and bonding and 1A or 2A for polarity of contacts are retained.

Public Input No. 12-NFPA 70B-2023 [Section No. 24.3.5]

First Revision No. 34-NFPA 70B-2024 [Section No. 25.3.1]

Global FR-158

Global FR-156

25.3.1 Visual Inspections.

UPS shall be visually inspected in accordance with Table 25.3.1.

Table 25.3.1 UPS Visual Inspections

No.	Task	Test Type*		Notes
		Static ~~Test Type*~~	Rotary ~~Test Type*~~	
1	Inspect UPS enclosure for dents, deteriorated paint, missing or unreadable labels, missing hardware, and improperly fitting doors and latches ~~for fit, dents, corrosion, and missing hardware~~	1	1	
2	Check fans for operation	1	1	
3	Inspect wiring, bus, cables, and connections for damaged insulation, broken leads, tightness of connections, crimping, and overall general condition, including corrosion	2	2	
4	Inspect capacitors for swelling and discoloration	2	NA	
5	Check visible current-carrying parts and control devices, if applicable, for signs of overheating or deterioration	2	2	
6	Inspect rectifier and inverter assembly	2	NA	Inspect for signs of overheating or deterioration.
7	Inspect static switch module	2	NA	Inspect for signs of overheating or deterioration.
8	Inspect interface, control, I/O boards, and dc capacitor boards	2	2	Inspect for signs of overheating or deterioration.
9	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_34_Table_25.3.1.docx	attachment for FR 34 Table 25.3.1	

70B_FR-34_25.3.1_legislative_changes.docx for prod use

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 14:47:17 EDT 2024

Committee Statement

Committee Statement: Item 1 was modified to add clarity and address improper condition assessment visual inspection tasks with a specific focus on the UPS enclosure.

Response Message: FR-34-NFPA 70B-2024

Public Input No. 189-NFPA 70B-2023 [Section No. 25.3.1]

First Revision No. 35-NFPA 70B-2024 [Section No. 25.3.2]

25.3.2 Cleaning.

~~If contamination is present,~~ The UPS shall be cleaned in accordance with Table 25.3.2 to prevent a buildup of contaminants that negatively affect performance, reduce life expectancy, or create a safety hazard .

Table 25.3.2 UPS Cleaning

No.	Task	Test Type* Static ~~Test Type*~~	Test Type* Rotary ~~Test Type*~~	Notes
1	Replace the air filters and verify the vents are clear	2	2	
2	Vacuum enclosure	2	2	
3	Clean exposed switch contacts with a multipurpose precision lubricant ~~before lubricating~~	2	2	
4	Wipe contact surfaces with a lint-free cleaning cloth	2	2	
5	Wipe contact surfaces with a noncorrosive cleaning agent	2	2	
6	Clean insulators	2	~~NA~~ 2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_35_Table_25.3.2.docx	attachment FR 35 Table 25.3.2	
70B_FR-35_25.3.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 14:48:42 EDT 2024

Committee Statement

Committee Statement: The wording of 25.3.2 was modified for clarity and usability.

Item 3: Removed duplicative statement “before lubricating” for editorial clarity.

Rotary Test Type Item 6 was changed to “2” as these systems may have insulators that require cleaning.

Response Message: FR-35-NFPA 70B-2024

Public Input No. 190-NFPA 70B-2023 [Section No. 25.3.2]

Public Input No. 191-NFPA 70B-2023 [Section No. 25.3.2]

First Revision No. 36-NFPA 70B-2024 [Section No. 25.3.4]

25.3.4 Mechanical Servicing.

UPS shall be mechanically serviced in accordance with Table 25.3.4.

Table 25.3.4 UPS Mechanical Servicing

No.	Task	Test Type*		Notes
		Static ~~Test Type*~~	Rotary ~~Test Type*~~	
1	Verify operation and alignment of mechanical safety interlocks	2	2	
2	Check electrical hardware connections	2	2	
3	Perform mechanical servicing for system circuit breakers	2	2	
~~4~~	~~Transfer systems~~	~~2~~	~~2~~	
~~5~~ 4	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_36_Table_25.3.4.docx	attachment for FR 36 Table 25.3.4	
70B_FR-36_25.3.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 14:50:45 EDT 2024

Committee Statement

Committee Statement: There are no identified tasks for Item 4 “transfer systems,” therefore there are no test types to be identified and item 4 is to be deleted.

Response Message: FR-36-NFPA 70B-2024

Public Input No. 193-NFPA 70B-2023 [Section No. 25.3.4]

First Revision No. 37-NFPA 70B-2024 [Section No. 25.3.5]

Global FR-158

25.3.5 Electrical Testing.

UPS shall be electrically tested in accordance with Table 25.3.5.

Table 25.3.5 UPS Electrical Tests

No.	Task	Test Type*		Notes
		Static ~~Test Type*~~	Rotary ~~Test Type*~~	
1	Perform infrared thermography of UPS assembly~~lug terminals~~	1	1	~~Conduct on annual basis.~~
2	Measure the neutral output current during peak loads	1A	1A	Conduct ~~every 3 months or~~ when new ~~equipment is~~loads are added to the system and when neutral current could be a concern.
3	Record all operating parameters, such as frequency, voltage, and current, at the bypass switch, input, output, batteries, and modules, where applicable	1	1	
4	Test static transfer from normal to bypass and back to normal	1	1	
5	~~Electrical~~Test electrical interlock systems, alarms, and indicator circuits	2	2	
6	Perform operational test on all alarms and emergency shutdowns, where applicable	2	2	
7	For individual components, refer to the appropriate chapter(s) of this standard	NA	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_37_Table_25.3.5.docx	attachment for FR 37 Table 25.3.5	
70B_FR-37_25.3.5_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 14:52:28 EDT 2024

Committee Statement

Committee Statement: Item 1 was changed to “UPS assembly” for clarity. The notes section of Item 1 was removed as the EMP will determine frequency.

Item 2 was modified as the EMP will determine the requirement.

Item 5 added an action word to clarify the intent of the requirement.

Response Message: FR-37-NFPA 70B-2024

Public Input No. 194-NFPA 70B-2023 [Section No. 25.3.5]

First Revision No. 38-NFPA 70B-2024 [Section No. 25.4.2.2.2]

25.3.6.2.2.2

~~The voltage~~ Voltage regulation and frequency stability shall be ~~within~~ compared to the manufacturer's specifications ~~and any deviations from those specifications investigated~~ .

25.3.6.2.2.3

Any voltage regulation and frequency stability deviations from the manufacturer's specifications shall be investigated.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 14:54:49 EDT 2024

Committee Statement

Committee Statement: The wording was revised to provide additional clarity.

Response Message: FR-38-NFPA 70B-2024

Public Input No. 195-NFPA 70B-2023 [Section No. 25.4.2.2.2]

First Revision No. 39-NFPA 70B-2024 [Section No. 25.4.2.2.3.3]

(C)

Voltage, current, and frequency shall be recorded during ~~tests~~ the test .

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 14:56:22 EDT 2024

Committee Statement

Committee Statement: Wording was updated for clarity and editorial improvement.
Response Message: FR-39-NFPA 70B-2024

Public Input No. 196-NFPA 70B-2023 [Section No. 25.4.2.2.3.3]

First Revision No. 40-NFPA 70B-2024 [Section No. 27.3.1]

Global FR-156

27.3.1* Visual Inspections.

Rotating equipment shall be visually inspected in accordance with Table 27.3.1.

Table 27.3.1 Rotating Equipment Visual Inspections

		Test Type*					
		Low-Voltage Machines			Medium-Voltage Machines		
No.	Task	≤200 hp	>200 hp	dc Machines	Induction	Synchronous	Notes
1	~~Application~~ Review the equipment application	1A or 2A	1A or 2A	1A or 2A	1A or 2A	1A or 2A	Ensure the machinery is installed in accordance with the manufacturer's listing and labeling and applicable codes/standards.
2	~~Physical condition~~ Verify physical condition shows no deficiencies	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
3	~~Indicating device status~~ Observe indicating device status for correct function	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
4	~~Labeling~~ Check labeling for readability and condition	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
5	~~Grounding/bonding~~ Inspect grounding and bonding components for correct installation	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
6	~~Machinery alignment~~ Inspect machinery alignment for abnormalities	1A or 2A	1A or 2A	1A or 2A	1A or 2A	1A or 2A	Intended where signs of misalignment exist.

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved

FR_40_Table_27.3.1.docx	attachment fro FR 40 Table 27.3.1
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Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Tue Mar 12 14:57:33 EDT 2024

Committee Statement

Committee Statement: Test types in Items 1 and 6 are not a routine tests and should be “1A and 2A.”

Actionable text was added to tasks for useability and clarity.

Response Message: FR-40-NFPA 70B-2024

Public Input No. 202-NFPA 70B-2023 [Section No. 27.3.1]

Public Input No. 204-NFPA 70B-2023 [Section No. 27.3.1]

First Revision No. 41-NFPA 70B-2024 [Section No. 27.3.4]

27.3.4* Mechanical Servicing.

Rotating equipment shall be mechanically serviced in accordance with Table 27.3.4.

Table 27.3.4 Mechanical Servicing

		Test Type*					
		Low-Voltage Machines			Medium-Voltage Machines		
No.	Task	<= ≤ 200 hp	>200 hp	dc Machines	Induction	Synchronous	Notes
1	~~Integrity~~ Verify integrity of accessible bolted connections	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
2	~~Cooling~~ Verify cooling system ~~operation, as applicable~~ operates correctly	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
3	~~Mechanical~~ Verify correct mechanical operation	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
4	~~Machine~~ Inspect machine guards and assemblies for correct installation	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_41_Table_27.3.4.docx	attachment for FR 41 Table 27.3.4	
70B_FR-41_27.3.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 14:59:58 EDT 2024

Committee Statement

Committee Statement: Actionable text was added to tasks for useability and clarity. Due to the complexity of the tests, the actions are enhanced tests, not standard tests.

Response Message: FR-41-NFPA 70B-2024

Public Input No. 205-NFPA 70B-2023 [Section No. 27.3.4]

First Revision No. 42-NFPA 70B-2024 [Section No. 27.3.5]

Global FR-158

27.3.5* Electrical Testing.

Rotating equipment shall be electrically tested in accordance with Table 27.3.5.

Table 27.3.5 Rotating Equipment Electrical Tests

No.	Task	Test Type*					Notes
		Low-Voltage Machines			Medium-Voltage Machines		
		≤200 hp ~~Test Type*~~	>200 hp ~~Test Type*~~	dc Machines ~~Test Type*~~	Induction ~~Test Type*~~	Synchronous ~~Test Type*~~	
1	~~Bolted~~Measure bolted connection resistance	2A	2A	2A	2	2	
2	~~Stator~~Perform stator/armature winding dielectric absorption ratio (DAR) test	2A	2A	2A	2	2	ac stator or dc armature.
3	~~Wound~~Perform wound rotor/field winding DAR test	2A	2A	2A	2	2	ac wound rotor, synchronous dc rotor, dc fields.
4	~~Stator~~Perform stator/armature winding polarization index (PI) test	2A	2A	2A	2	2	
5	~~Wound~~Perform wound rotor/field winding PI test	2A	2A	2A	2A	NA	
6	~~Stator~~Perform stator winding dc dielectric withstand (overpotential) test	2A	2A	2A	2A	2A	
7	~~Wound~~Perform wound rotor/field winding dc dielectric withstand (overpotential) test	2A	2A	2A	2A	2A	
8	~~Stator~~Perform stator/armature winding resistance test	2A	2A	2A	2	2	
9	~~Wound~~Perform wound rotor/field winding resistance test	2A	2A	2A	2	2	
10	~~Stator~~Perform stator winding insulation power factor test	NA	NA	NA	2A	2A	Insulation power factor/dissipation factor.
11	~~Stator~~Perform stator winding insulation power factor tip-up test	NA	NA	NA	2A	2A	Insulation power factor/dissipation factor.
12	~~Stator~~Perform stator winding surge comparison test	2A	2A	2A	2A	2A	

No.	Task	Test Type*					Notes
		Low-Voltage Machines			Medium-Voltage Machines		
		≤200 hp ~~Test Type*~~	>200 hp ~~Test Type*~~	dc Machines ~~Test Type*~~	Induction ~~Test Type*~~	Synchronous ~~Test Type*~~	
13	~~Insulated~~Measure insulated bearing insulation resistance	2A	2A	2A	2	2	
14	~~Temperature~~Perform resistance temperature detection (RTD) device test	2A	2A	2A	2	2	
15	~~Machine~~sPerform machine pace heater test	1 or 2	1 or 2	1 or 2	1 or 2	1 or 2	
16	~~Vibration~~Perform vibration analysis	1A	1A	1A	1A	1A	
17	~~Current~~Perform current signature analysis	1A	1A	1A	1A	1A	
18	~~Partial~~Perform partial discharge analysis	NA	NA	NA	1A	1A	
19	~~Surge~~Perform test on surge protection device	2A	2A	NA	2	2	
~~20~~	~~Motor starter~~	~~2~~	~~2~~	~~2~~	~~2~~	~~2~~	
21	~~Current~~Perform tests of current transformers within rotating machinery enclosure	2A	2A	NA	2	2	
22	~~Potential~~Perform tests of potential transformers within rotating machinery enclosure	2A	2A	NA	2	2	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_42_Table_27.3.5.docx	attachment for FR 42 Table27.3.5	
70B_FR-42_27.3.5_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Tue Mar 12 15:03:06 EDT 2024

Committee Statement

Committee Statement: Actionable text was added to tasks for useability and clarity. Task 20 is addressed in Chapter 28 and not required in Table 27.3.5. Machine space heater tests (task 15) can be online or offline (1 or 2).

Response Message: FR-42-NFPA 70B-2024

Public Input No. 206-NFPA 70B-2023 [Section No. 27.3.5]

First Revision No. 52-NFPA 70B-2024 [Section No. 28.1.1]

Global FR-157

28.1.1

This chapter identifies ~~electrical~~ maintenance requirements for low-voltage single- and three-phase ac and dc motor control equipment ~~and~~, medium-voltage single- and three-phase motor control equipment, and motor control centers.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 13 09:53:06 EDT 2024

Committee Statement

Committee Statement: Motor control centers are added because they are commonly used to supply and control motors.

Response Message: FR-52-NFPA 70B-2024

First Revision No. 109-NFPA 70B-2024 [Section No. 28.3.1]

Global FR-158

Global FR-156

28.3.1 Visual Inspections.

Motor control equipment shall be visually inspected in accordance with Table 28.3.1.

Table 28.3.1 Motor Control Equipment Visual Inspections

No.	Task	Test Type*		Notes
		Low-Voltage ~~Test Type*~~	Medium-Voltage ~~Test Type*~~	
1	Inspect physical and mechanical condition	1 or 2	1 or 2	
2	Inspect anchorage and grounding	1 or 2	1 or 2	
3	~~Physical~~Check the physical integrity of contactors	1 or 2	~~1~~2	
4	Verify circuit breakers, fuses, and overload elements are the correct sizes and types and correspond to the drawings	1 or 2	1 or 2	EMP determines when these inspections can be done energized.
5	Verify instrument transformer ratios are correct	2A	2A	
6	Inspect insulators for damage, tracking, or contaminated surfaces	2	2	
7	Verify filters are clean and in place	1 or 2	1 or 2	
8	Ensure maintenance devices are available for servicing	NA	1	
9	Verify switch phase barriers are in place	2	2	
10	Verify fuse expulsion-limiting devices are in place	NA	2	
11	For individual components and exposed conductors, refer to the appropriate chapter(s) of this standard	NA	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_109_Table_28.3.1.docx	attachment for Table 28.3.1	

70B_FR-109_28.3.1_legislative_changes.docx for prod use

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:26:38 EDT 2024

Committee Statement

Committee Statement: Task No. 3: Wording is rearranged to provide greater clarity.

Task No. 5: Instrument transformer ratios should be inspected only if there is a suspected issue so changed to an enhanced test.

Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.

Response Message: FR-109-NFPA 70B-2024

Public Input No. 207-NFPA 70B-2023 [Section No. 28.3.1]

First Revision No. 110-NFPA 70B-2024 [Section No. 28.3.4]

28.3.4 Mechanical Servicing.

Motor control equipment shall be mechanically serviced in accordance with Table 28.3.4.

Table 28.3.4 Motor Control Equipment Mechanical Servicing

		Test Type*					
		Low-Voltage ~~Machines~~			Medium-Voltage ~~Machines~~		
No.	Task	~~≤200 hp~~	~~>200 hp~~	~~dc Machines~~	~~Induction~~	~~Synchronous~~	Notes
1	~~Integrity~~ Check the integrity of accessible bolted connections	~~2~~	~~2~~	2	~~2~~	2	
2	~~Cooling~~ Check the cooling system operation, as applicable	~~2~~	~~2~~	2	~~2~~	2	
3	~~Mechanical~~ Check the mechanical operation	~~2~~	~~2~~	2	~~2~~	2	
~~4~~	~~Machine guards and assemblies~~	~~2~~	~~2~~	~~2~~	~~2~~	~~2~~	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_110_Table_28.3.4.docx	attachment for FR 110 Table 28.3.4	
70B_FR-110_28.3.4_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:28:09 EDT 2024

Committee Statement

Committee Statement: Columns were consolidated for consistency with other tables in this Chapter.

Action words are added to the task text to provide clarity of the requirement.

Task No. 4: Task is deleted since machine guards and assemblies are not part of

	motor control equipment.
Response Message:	FR-110-NFPA 70B-2024

Public Input No. 209-NFPA 70B-2023 [Section No. 28.3.4]

First Revision No. 111-NFPA 70B-2024 [Section No. 29.1.1]

Global FR-157

29.1.1*

This chapter identifies ~~electrical~~ maintenance requirements for cord- and plug-connected portable electrical tools and equipment~~, both cord and plug connected and temporarily hard-wired~~.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:29:32 EDT 2024

Committee Statement

Committee Statement: There is no definition of “temporary hard-wired” and “hard-wired” equipment is covered in Chapter 18 (Wiring).

Response Message: FR-111-NFPA 70B-2024

Public Input No. 210-NFPA 70B-2023 [Section No. 29.1.1]

First Revision No. 82-NFPA 70B-2024 [Section No. 30.2.2]

30.2.1*

The periodic maintenance procedures in Section 30.3 shall be performed in accordance with the frequencies in Chapter 9, unless otherwise specified in this chapter.

A.30.2.1

A maintenance program helps to ensure the greatest level of safety to the maintenance worker and that the highest level of efficiency and reliability can be obtained from the operation of the system. The system owner or maintenance personnel should consider performing maintenance during the nighttime, during periods of low moonlight and with minimal artificial light illuminating the array. This helps to reduce electrical hazards and lost production.

Significant weather, such as hail, heavy snow, high winds, driving rain, or lightning, can adversely impact PV systems and their associated equipment. The priority is to render the site physically and electrically safe by tying down loose items and disconnecting exposed circuits and ground faults.

~~**30.2.2**~~

~~The EMP shall identify events that trigger more frequent inspections or maintenance activities.~~

Supplemental Information

File Name	Description	Approved
70B_FR-82_30.2.2_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 14:36:12 EDT 2024

Committee Statement

Committee Statement: This subdivision has been deleted because the requirements are already covered by Section 4.2. Annex A.30.2.2 information is amended to A.30.2.1.

Response Message: FR-82-NFPA 70B-2024

Public Input No. 212-NFPA 70B-2023 [Section No. 30.2.2]

Public Input No. 213-NFPA 70B-2023 [Sections A.30.2.1, A.30.2.2]

First Revision No. 112-NFPA 70B-2024 [Section No. 31.3.1]

31.3.1* Visual Inspection and Mechanical Testing.

Wind power electric systems and associated equipment shall be visually inspected and mechanically tested in accordance with Table 31.3.1.

Table 31.3.1 Wind Power Electric Systems and Associated Equipment Visual Inspections and Mechanical Tests

No.	Task	Test Type*	Notes
1	Check towers and foundations for:		
1A	Grounding and bonding	1 or 2	
1B	Functional navigational warning lights	1 or 2	
1C	Weather measurement devices	1 or 2	
1D	Lightning protection	1 or 2	
2	Check yaw systems for damage, wear, and signs of overheating	1 or 2	
3	Check pitch systems for damage, wear, and signs of overheating	1 or 2	
4	Check cables, terminations, and cable support systems for:		
4A	Structural integrity	1 or 2	
4B	Signs of vibration damage or abrasion	1 or 2	
4C	Overheating	1 or 2	
5	~~In~~ Verify in -tower emergency lighting is functioning	1	
6	For other individual components, refer to the appropriate chapter(s) of this standard or manufacturer's instructions	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_112_Table_31.3.1.docx	attachment for FR 112 Table 31.3.1	
70B_FR-112_31.3.1_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:32:03 EDT 2024

Committee Statement

Committee Statement:	Task No. 5: Action words are added to the task text to provide clarity of the requirement.
Response Message:	FR-112-NFPA 70B-2024

Public Input No. 219-NFPA 70B-2023 [Section No. 31.3.1]

First Revision No. 113-NFPA 70B-2024 [Section No. 32.4.2]

32.3.2 Cleaning.

Electrical equipment surfaces, enclosures, insulating materials, terminals, ~~or~~ and terminations shall be kept ~~in a clean and contaminant-free state~~ clean to prevent a buildup of contaminants that negatively affect performance, reduce life expectancy, or create a safety hazard .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:34:16 EDT 2024

Committee Statement

Committee Statement: The language was modified to require cleaning and it is not possible to keep equipment “contaminant free” as a contaminant could be defined as dust. The language was updated to match the language used in Chapter 12.

Response Message: FR-113-NFPA 70B-2024

Public Input No. 221-NFPA 70B-2023 [Section No. 32.4.2]

First Revision No. 114-NFPA 70B-2024 [Section No. 33.4.1.2]

33.3.1.2

The following inspections shall be performed annually:

(1) The cord and cord connector shall be inspected to verify that the strain relief is intact, stress is not placed on the cord terminations, and the pins are not damaged.

(2) The equipment mounting means shall be inspected to ~~ensure~~ determine the integrity ~~of the mounting means~~ .

(3) The physical protection for the equipment shall be inspected to ~~ensure~~ determine its integrity.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:35:36 EDT 2024

Committee Statement

Committee Statement: The language is updated as the inspection will determine the equipment integrity.

Response Message: FR-114-NFPA 70B-2024

Public Input No. 225-NFPA 70B-2024 [Section No. 33.4.1.2]

First Revision No. 115-NFPA 70B-2024 [Section No. 34.3.3]

Global FR-158

34.3.5 Electrical Testing.

Public pools, fountains, and similar installations shall be electrically tested in accordance with Table 34.3.5.

Table 34.3.5 Public Pools, Fountains, and Similar Installation Electrical Tests

No.	Task	Test Type*			Notes
		GFCI Components ~~Test Type*~~	Electric Motors and Valves ~~Test Type*~~	System Grounding and Bonding ~~Test Type*~~	
1	Test electrically operated valves for correct operation	NA	1	NA	~~Test for correct operation.~~
2	For individual components, refer to the appropriate chapter(s) of this standard.	NA	NA	NA	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_115_Table_34.3.3.docx	attachment for FR 115 Table 34.3.3	
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Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:49:15 EDT 2024

Committee Statement

Committee Statement: The note should be part of the requirement.

Response Message: FR-115-NFPA 70B-2024

Public Input No. 227-NFPA 70B-2024 [Section No. 34.3.3]

First Revision No. 116-NFPA 70B-2024 [Section No. 35.3.1]

Global FR-156

Global FR-158

35.3.1 Visual Inspections.

Protective relays shall be visually inspected in accordance with Table 35.3.1.

Table 35.3.1 Protective Relay Visual Inspections

No.	Task	Test Type* Electromechanical Test Type*	Solid-State Test Type*	Microprocessor Test Type*	Notes
1	Inspect case and windows for cracks and proper seal	1 or 2	1 or 2	1 or 2	
2	Inspect current transformer shorting blocks and voltage disconnects for correct operation.	2	2	2	
3	Check for ~~proper~~correct operation of LEDs, targets, and visual displays	2	2	2	
4	Inspect wiring and connections for damaged insulation, broken leads, tightness of connections, ~~proper~~correct crimping, and overall general condition including corrosion	2	2	2	
5	Inspect clearances, mechanical freedom, and condition of contacts and control springs	2	NA	NA	
6	Inspect contact bearing clearances and freedom of movement	2	NA	NA	
7	Check that settings are in accordance with coordination study	1 or 2	1 or 2	1 or 2	
8	Download or document events, oscillographs, and maintenance and statistical data	NA	NA	2A	

NA: Not applicable.

*Types specified in accordance with Section 8.3, as follows: Type 1 = online standard test; Type 1A = online enhanced test; Type 2 = offline standard test; Type 2A = offline enhanced test.

Supplemental Information

File Name	Description	Approved
FR_116_Table_35.3.1.docx	attachment for FR 116 Table 35.3.1	
70B_FR-116_35.3.1_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:50:41 EDT 2024

Committee Statement

Committee Statement: Some tasks were updated to “1 or 2” reflecting that the task can be performed online or offline.

Task No. 2: The revised language clarifies “what” needs to be checked for the task.

Response Message: FR-116-NFPA 70B-2024

Public Input No. 229-NFPA 70B-2024 [Section No. 35.3.1]

First Revision No. 118-NFPA 70B-2024 [Section No. A.3.3.9]

A.3.3.9 Circuit Breaker.

One example of a listing standard for circuit breakers is UL 489, *Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures*.

Molded-Case Circuit Breaker (MCCB). MCCBs are most often available in one-, two-, three-, or four-pole versions and are available in 120 V to 1000 V ratings. All MCCBs, including ICCBs, will include some sort of instantaneous protection, which might be adjustable but cannot be ~~completely~~ disabled.

Insulated-Case Circuit Breaker (ICCB). There is no specific definition or mention of ICCBs within the MCCB standard. However, their stated ratings will be those of MCCBs ~~but~~ and they can operate like LVPCBs. ICCBs can either include a two-step stored energy operating mechanism that will require manual charging of closing and opening springs when the circuit breaker is manually operated or include internal charging motors for closing and opening springs. ICCBs are normally housed in a case of dielectric materials providing a layer of insulation between its exterior and internal mechanisms. The characteristics of ICCBs vary widely between models and manufacturers.

Low-Voltage Power Circuit Breaker (LVPCB). LVPCBs are mechanical switching devices consisting of a frame that contains some number of field replaceable component parts or subassemblies capable of making, carrying, interrupting, and breaking currents. Modern LVPCBs are rated 1000 V ac or less, or 1500 V dc or less, and do not include MCCBs. They are typically larger circuit breakers with frames rated at 600 A or ~~more~~ greater that have a significant degree of maintainability, such as the ability to replace contact structures, arc chutes, and other parts subject to wear. Modern versions are listed to UL 1066, ~~*Low-Voltage AC and DC Power Circuit Breakers*~~ *Power Circuit Breakers up to 1000 V AC and 1500 V DC Used in Enclosures*, and are commonly installed in switchgear as draw-out devices. More rarely, they might be installed as fixed mounted devices in older equipment. LVPCBs manufactured prior to 2000 generally had metal frames; those manufactured after 2000 tend to use frames made from nonconductive materials. LVPCBs are sometimes also referred to as metal frame or air frame breakers.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:56:17 EDT 2024

Committee Statement

Committee Statement: This revision adds a missing space before MCCB's and removes unnecessary wording for clarity.

Response Message: FR-118-NFPA 70B-2024

Public Input No. 46-NFPA 70B-2023 [Section No. A.3.3.9]

First Revision No. 119-NFPA 70B-2024 [Section No. A.3.3.26]

A.3.3.27 Ground-Fault Circuit Interrupter (GFCI).

See UL 943, *Standard for Ground-Fault Circuit Interrupters,* for further information. Class A ground-fault circuit interrupters trip when the ground-fault current is 6 mA or higher and do not trip when the ground-fault current is less than 4 mA. [**70,** 2023]

~~A GFCI does not eliminate the electric shock sensation since normal perception level is approximately 0.5 mA; nor does it protect from electric shock hazard from line-to-line contact.~~

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:57:35 EDT 2024

Committee Statement

Committee Statement: This annex material is being modified to align with informational note in NFPA 70 and remove extraneous information.

Response Message: FR-119-NFPA 70B-2024

Public Input No. 52-NFPA 70B-2023 [Section No. A.3.3.26]

First Revision No. 120-NFPA 70B-2024 [Section No. A.5.1.2]

A.5.1.2

~~In addition to~~ ~~*NFPA 70E*~~ ~~, IEEE C2,~~ ~~*National Electrical Safety Code*~~ ~~;~~ Examples of applicable legal ~~requirements~~ regulations ~~(~~ include 29 CFR 1926, "Safety and Health Regulations for Construction ~~Occupational Safety and Health Standards~~ ," and 29 CFR 1910, "Occupational Safety and Health Standards ~~Safety and Health Regulations for Construction~~ . " Use of such regulations ~~); and~~ ~~*NFPA 70*~~ ~~are among the references that should be utilized~~ for the development of programs and procedures associated with electrical maintenance activities ~~and~~ are necessary ~~to be used~~ in conjunction with this document.

Equipment should be placed in an electrically safe work condition for inspections, tests, repairs, and other servicing. Where electrical maintenance tasks must be performed when the equipment is energized, provisions for safety are to be made ~~to allow electrical maintenance to be performed safely~~ . See NFPA *70E* for information related to establishing an electrically safe work condition; see both OSHA regulations and NFPA *70E* for rules addressing justification for energized work.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 10:58:41 EDT 2024

Committee Statement

Committee Statement: This revision is being made in recognition that NFPA 70E, IEEE C2 and NESC are not necessarily examples of applicable legal requirements.

Response Message: FR-120-NFPA 70B-2024

Public Input No. 3-NFPA 70B-2023 [Sections A.5.1.2, A.6.1.1]

First Revision No. 121-NFPA 70B-2024 [Section No. A.6.1.1]

A.6.1.1

Engineering studies generally cover the following areas:

(1) Short-circuit studies

(2) Coordination studies

(3) Load-flow studies

(4) Reliability studies

(5) Incident energy analysis (arc-flash hazard calculations)

(6) Maintenance-related design studies

In order to conduct ~~short-circuit, coordination, and arc flash~~ engineering studies, specific data should be collected. Data that should be included on a single-line diagram are utility company points of contact and data records for equipment such as transformers, cables, overhead lines, fuses, medium-voltage breakers, reclosers, capacitor banks, low-voltage breakers, disconnects, generators, and motors. This information should be developed for each type of operating condition. Examples of data collection forms are included in Annex E.

Utility information should at least include the minimum and maximum ~~short circuit~~ short-circuit megavolt-amperes (MVA) and the X/R ratio at the service point; point of contact name, address, and telephone number; and facility point of contact, address, and telephone number.

Transformer data records should include location, rated kilovolt-amperes (kVA), maximum kVA, primary voltage, secondary voltage, impedance in percent, type of primary and secondary connection, ground impedance, and, if appropriate, the voltage tap.

Cable data should include "to" and "from," rated ~~volts~~ voltage , nominal ~~volts, single-conductor or three-conductor cable~~ voltage, number of conductors , ~~the~~ number of conductors per phase, ~~the~~ neutral size, whether copper or aluminum, and length in feet.

Raceway material (i.e., magnetic or nonmagnetic) should be noted.

Overhead line information should include "to" and "from," connection configuration, nominal ~~volts~~ voltage , number of lines, lines per phase, ground size, type of cable (material), and length in feet.

Medium-voltage breaker information should include location~~,~~ ; manufacturer~~,~~ ; type~~,~~ ; rated volts~~,~~ ; interrupting current~~,~~ ; interrupting time (cycles)~~,~~ ; close/latch amps; and, for the associated relays, the manufacturer/type, time delay range and existing tap, time dial, instantaneous range and existing tap, and CT ratio.

Recloser information should include location, CT ratio, nominal volts, manufacturer, type, BIL, continuous current rating, interrupting rating, minimum trip, operational sequence, reclosing times (if available), and tripping curves (if available).

Low-voltage information for the breaker should include location~~,~~ ; manufacturer~~,~~ ; type~~,~~ ; rated volts~~,~~ ; frame rating; ~~and~~ interrupting rating; and, for the trip device, ~~should include~~ manufacturer, type, long time delay range and bands available, short time delay range and bands available, instantaneous range, and ground range and bands available.

Generator information should include location, type, kVA rating, ~~generated volts~~ rated voltage , rated current, rpm, wiring connection (e.g., delta~~-or~~ , wye), system ground, subtransient impedance, ground impedance, and power factor.

Motor information should include location, type, horsepower, rated ~~volts~~ voltage , full load amps, rpm, code letter, locked rotor amps, power factor, and starter type.

Capacitor bank information should include location, kVAR rating, rated volts, and wiring connection (e.g., delta~~-or~~ , wye).

Fuse information should include location, rated voltage~~-rating~~ , interruption rating, fuse type or class, manufacturer, and manufacturer's part number.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:01:32 EDT 2024

Committee Statement

Committee Statement: This revision is being made to better align with other standards and for consistency with the remainder of the section.

Response Message: FR-121-NFPA 70B-2024

Public Input No. 35-NFPA 70B-2023 [Section No. A.6.1.1]

Public Input No. 36-NFPA 70B-2023 [Section No. A.6.1.1]

Public Input No. 37-NFPA 70B-2023 [Section No. A.6.1.1]

First Revision No. 122-NFPA 70B-2024 [Section No. A.10.2.2]

A.10.3.2

~~Ignition sources can include~~ Examples of ignition sources are high surface temperatures, stored electrical energy, and the buildup of static charges.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:06:47 EDT 2024

Committee Statement

Committee Statement: This revision is being made to clarify that the list is just an example and is not exhaustive of all potential ignition sources.

Response Message: FR-122-NFPA 70B-2024

Public Input No. 108-NFPA 70B-2023 [Section No. A.10.2.2]

First Revision No. 124-NFPA 70B-2024 [Section No. A.16.3.5]

A.16.3.5

Fuses can be tested with a continuity tester to verify that the fuse is not open. Resistance readings ~~can~~ should be taken using a sensitive 4-wire instrument such as a Kelvin bridge or micro-ohmmeter. Fuse resistance values should be compared against values recommended by the manufacturer. Where the manufacturer's data is not readily available, resistance deviations of more than 15 percent for identical fuses in the same circuit should be investigated.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:14:28 EDT 2024

Committee Statement

Committee Statement: This revision is made to clarify that this is a recommendation rather than an option.

Response Message: FR-124-NFPA 70B-2024

Public Input No. 159-NFPA 70B-2023 [Section No. A.16.3.5]

First Revision No. 125-NFPA 70B-2024 [Section No. A.18.1]

~~A.18.1~~

~~Electrical maintenance is the one of best ways to ensure continued reliable service from electrical cable installations. Visual inspection and electrical testing of the cable insulation are the major maintenance procedures. However, it should be stressed that no amount of maintenance can correct improper application or physical damage done during installation.~~

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:16:14 EDT 2024

Committee Statement

Committee Statement: This revision removes A.18.1 as the information is not necessary to apply the related requirements of Section 18.1 addressing electrical maintenance requirements for power cables and conductors covered by Chapter 18, per Section 18.1.

Response Message: FR-125-NFPA 70B-2024

Public Input No. 166-NFPA 70B-2023 [Section No. A.18.1]

First Revision No. 126-NFPA 70B-2024 [Section No. A.18.3.1]

A.18.3.1

Cable identification tags or markings should be checked.

If, in addition to the visual inspection, cables are to be touched or moved, they should be in an electrically safe work condition.

Cables in vaults should be inspected for sharp bends, physical damage, excessive tension, oil leaks, pits, cable movement, insulation swelling, soft spots, cracked jackets in nonlead cables, damaged fireproofing, poor ground connections, deterioration of metallic sheath bonding, ~~as well as~~ and corroded and weakened cable supports, as well as ~~and~~ the continuity of any main grounding system. Terminations and splices of nonlead cables should be inspected for tracking or signs of corona. The ground braid should be inspected for corrosion and tight connections. The bottom surface of the cable should be inspected for wear or scraping, due to movement, at the point of entrance into the vault and where it rests on the cable supports.

Vault Installations. The vault should be inspected for deterioration of the concrete, both internal and above ground. In some instances, the vault ~~can~~ might be equipped with drains that ~~might~~ require cleaning. ~~In some instances, it~~ It might be necessary to pump water from the vault prior to entrance. A vault should not be entered unless a test for dangerous gas has been ~~made~~ conducted and adequate ventilation is provided. The inspection crew should always consist of two or more persons with at least one remaining outside the vault, and the rules and regulations for confined space entry should be followed. [See OSHA requirements in 29 CFR 1910.146, “Permit-Required Confined Spaces,” for practices and procedures to protect employees from the hazards of entry into permit-required confined spaces, and 29 CFR 1910.269(e), “Electric Power Generation, Transmission, and Distribution~~,~~ — Enclosed Spaces,” for enclosed space entry.]

Potheads. ~~,~~ A pothead is a type of insulator with a bell or pot-like shape, typically used to connect underground electrical cables to overhead lines~~,~~. Potheads should be inspected for oil or compound leaks and cracked or chipped porcelain. The porcelain surfaces should be cleaned, and if the connections are exposed, their tightness should be checked.

~~Cable identification tags or markings should be checked.~~

Aerial Installations. Aerial cable installations should be inspected for mechanical damage due to vibration, deteriorating supports, or suspension systems. Special attention should be given to the dead-end supports to ensure that the cable insulation is not abraded, pinched, or bent too sharply. Aerial cable installations should be inspected for animal and bird infestation. Terminations should be inspected as covered in Chapter 7.

Raceway Installations. Because the raceway is the primary mechanical support for the cable, it should be inspected for signs of deterioration or mechanical damage or to check if the cable jacket is being abraded or mechanically damaged. In many installations, the raceway serves as a part of the ground-fault current circuit. Joints should be inspected for signs of looseness or corrosion that could result in a high resistance. Splices and terminations should be verified as covered in Chapter 7.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:17:21 EDT 2024

Committee Statement

Committee Statement:	The sentence “cable identification tags or markings should be checked” is relocated as a first sentence so that it is more likely to be noticed by the user of this recommendation. Headings are added to portions of this annex information so that the content contained is more readily apparent.
Response Message:	FR-126-NFPA 70B-2024 The definition of readily accessible is not necessary here since it’s a definition and not a recommendation.

Public Input No. 167-NFPA 70B-2023 [Section No. A.18.3.1]

First Revision No. 127-NFPA 70B-2024 [Section No. A.18.3.5]

A.18.3.5

A preferred testing method should be selected only after all circuit parameters have been analyzed.

~~*Electrical Testing* .~~ When performing electrical testing of cables, there are many factors that need to be considered before applying a specific test methodology. The two most commonly used tests for cable insulation are insulation resistance testing and dc over-potential testing. Other tests are listed in ANSI/IEEE 400, *Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5 kV and Above*. In many instances it can be desired to achieve a more comprehensive analysis of cable condition, doing so with techniques and methods other than insulation resistance.

~~*Inspection and Testing Records* . Because inspection intervals normally are 1 year or more, comprehensive records are an important part of any maintenance program. Comprehensive records should be arranged to facilitate comparison from year to year.~~

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:20:31 EDT 2024

Committee Statement

Committee Statement: This first revision deletes unnecessary and redundant information.

Response Message: FR-127-NFPA 70B-2024

Public Input No. 168-NFPA 70B-2023 [Section No. A.18.3.5]

First Revision No. 91-NFPA 70B-2024 [Section No. A.24.1]

A.24.1

The use of wiring devices for the connection of equipment provides for rapid removal and replacement and facilitates relocation of electrical equipment.

Devices used in hazardous (classified) locations require some additional inspections. Flame paths should be inspected to ensure that safe gaps are not exceeded and that no scratches are on the ground joints. All screws holding the receptacle to the body should be installed and tight. Covers and threaded openings should be properly tightened. These devices should be checked to make sure that the plug and receptacle marking agree with the present classification of the area regarding class, group, and division.

The connection of equipment to supplies of incorrect electrical ratings of current, voltage, phase, or frequency can be dangerous or can cause damage to equipment. Therefore, attachment plugs, cord connectors, and equipment are provided with appropriate ratings and configurations to prevent interconnection that could create hazards. See ANSI/NEMA WD 6, *Wiring Devices — Dimensional Specifications*, for configurations. See Annex F for typical configurations of plugs and receptacles.

Use of some of these devices to disconnect some equipment under load conditions, such as welders, and running or stalled motors can be hazardous. Other load-interrupting means intended for this purpose should be used prior to disconnecting the wiring device.

If there is abnormal heating of the receptacle, plug, or connector insulation, the device should be checked for loose terminations or insufficient pressure between contacts and terminations should be corrected or the device replaced. If there is arc tracking or evidence of burning of the insulation or other damage, the insulation should be replaced.

Plugs should fit firmly when inserted into the mating connector or receptacle. Insufficient mating force can result in contact erosion caused by arcing of the contacts or accidental disengagement. The connector or receptacle should be checked to ensure that adequate contact pressure is present. The complete interior should be replaced if there is discoloration of the housing or severe erosion of the contact.

Receptacle contacts should retain inserted plugs firmly. Corroded, deformed, or mechanically damaged contacts should be replaced.

All mounting and assembly screws must be present and ~~checked to ensure that they are~~ confirmed to be tight to ensure proper grounding, prevent the entrance of adverse environmental products, and provide cable retention.

Proper wire connections on receptacles and proper polarity of power connection, including the integrity of the equipment grounding conductor, should be confirmed.

The equipment grounding conductor (green insulation) of the cord must be attached to the grounding terminal of the device, thereby ensuring grounding continuity.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Wed Mar 20 15:07:36 EDT 2024

Committee Statement

Committee Statement: The additional language directs the user to Annex F for typical NEMA configurations of plugs and receptacles.

Response Message:	FR-91-NFPA 70B-2024

First Revision No. 128-NFPA 70B-2024 [Section No. A.25.1.1]

A.25.1.1

There are two basic types of UPS systems: static and rotary. Some systems are hybrid versions that incorporate some features of both.

A static unit rectifies incoming ac power to dc power and then inverts the dc power into ac power of the proper voltage and frequency as input power to the load. A battery bank connected between the rectifier and inverter sections ensures an uninterrupted supply of dc power to the inverter section based on the designed ride-through time, which is dependent on system load and battery bank sizing .

A basic rotary system is essentially a motor-generator set that provides isolation between the incoming power supply and the load and stabilizes power supply aberrations by flywheel mechanical inertia effect.

In the UPS industry, the term *module* refers to a single self-contained enclosure containing the power and control elements needed to achieve uninterrupted operation. These components include transformers, the rectifier, the inverter, and protective devices.

UPS systems can comprise one or more UPS modules connected in parallel either to increase the capacity of the system power rating or to provide redundancy in the event of a module malfunction or failure. Figure A.25.1.1(a) illustrates a typical single-module static 3-phase UPS configuration. Note that in this configuration, the solid-state switch (SSS) is internal to the UPS module.

Figure A.25.1.1(a) Typical Single-Module Static 3-Phase UPS Configuration.

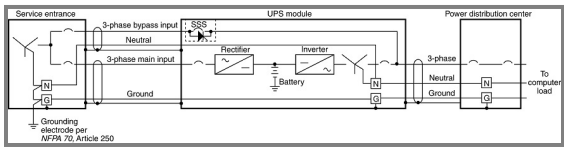
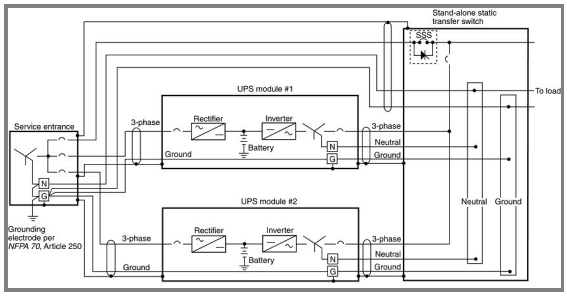


Figure A.25.1.1(b) illustrates a typical multimodule static 3-phase UPS configuration. Note that in this configuration, the SSS is in the stand-alone static transfer switch (STC) control cabinet.

Figure A.25.1.1(b) Typical Multimodule Static 3-Phase UPS Configuration.



Almost all UPS systems comprise these common elements: disconnecting means, bypass and transfer switches, protective devices and power switchgear, molded-case circuit breakers, and fuses. Depending on the type of UPS (static, rotary, or hybrid), the system might also include transformers, batteries, a battery charger, a rectifier/inverter unit (static system), and a motor-generator set (rotary system). The system might also be supported by a standby generating unit to permit operations to continue during sustained power outages.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:22:01 EDT 2024

Committee Statement

Committee Statement: This first revision provides the additional clarity that a UPS system has a defined ride through time and will not necessarily supply power indefinitely.

Response Message: FR-128-NFPA 70B-2024

Public Input No. 188-NFPA 70B-2023 [Section No. A.25.1.1]

First Revision No. 129-NFPA 70B-2024 [Section No. A.34.3.1]

A.34.3.1

Any components found to be excessively corroded should be repaired or replaced. Leaks should be mitigated, or ventilation should be added or corrected as needed. Missing motor nameplates should be replaced. Electrically operated pool pumps should be listed and labeled. Overhead conductor clearances should be in accordance with 680.9(A) of *NFPA 70*. ~~Any components found to be excessively corroded should be repaired or replaced. Leaks should be mitigated, or ventilation shall be added or corrected as needed. Missing motor nameplates should be replaced. Electrically operated pool pumps should be listed and labeled. Overhead conductor clearances should be in accordance with 680.9(A) of *NFPA 70* .~~

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:24:00 EDT 2024

Committee Statement

Committee Statement: This first revision removes redundant text.

Response Message: FR-129-NFPA 70B-2024

Public Input No. 226-NFPA 70B-2024 [Section No. A.34.3.1]

First Revision No. 130-NFPA 70B-2024 [Section No. A.34.3.2.3]

A.34.3.4.3

The ~~maximum~~ resistance value ~~permitted~~ between the luminaire and niche ~~is~~ should be less than 0.0003 ohms.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:25:01 EDT 2024

Committee Statement

Committee Statement: This revision provides guidance to support the application of its related requirement in 34.3.2.3.

Response Message: FR-130-NFPA 70B-2024

Public Input No. 228-NFPA 70B-2024 [Section No. A.34.3.2.3]

First Revision No. 131-NFPA 70B-2024 [Sections B.1.3, B.1.4]

B.1.3 Extension Cords.

~~Are extension~~ Extension cords should not be used in place of permanent wiring~~,~~ and ~~are they of excessive length and of proper type? They~~ should not pass through walls, partitions, or doors.

B.1.4 Multiple Current Taps.

~~Are multiple~~ Multiple current taps from extension cords should not be used because of too few receptacles~~? In particular, are they used in areas such as canteens, lunchrooms, and offices?~~ in an area.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:26:52 EDT 2024

Committee Statement

Committee Statement: This revision revises the questions posed into statements and removes vague wording.

Response Message: FR-131-NFPA 70B-2024

Public Input No. 233-NFPA 70B-2024 [Sections B.1.3, B.1.4]

First Revision No. 132-NFPA 70B-2024 [Section No. B.1.7]

B.1.7 Receptacle Outlets.

Grounding-type receptacles are generally required. ~~Are~~ Any special receptacle configurations used for those supplying unusual voltages~~, frequencies, and so on? Are they~~ or frequencies should be well marked or identified~~?~~ . In particular, missing faceplates, receptacles showing signs of severe arcing, and loose mounting~~, and so on~~ should be noted.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:30:30 EDT 2024

Committee Statement

Committee Statement: This revision revises the questions posed into statements and removes vague wording.

Response Message: FR-132-NFPA 70B-2024

Public Input No. 234-NFPA 70B-2024 [Section No. B.1.7]

First Revision No. 133-NFPA 70B-2024 [Sections B.1.12, B.1.13, B.1.14]

B.1.12 Services.

The condition of weatherheads and weatherhoods should be visually checked to determine that they remain in good condition. Nests, such as rodent, insect, and bird nests, should be documented. At the same time, the apparent condition of lightning arresters, surge capacitors, grounding conductors, and grounds should be determined. ~~Are switches~~ Switches should be safely and readily accessible~~?~~ .

B.1.13 Electrical Equipment Rooms and Motor Control Centers.

Electrical equipment rooms and motor control centers should be clean, used for no other purpose, and free of storage of any kind, especially combustible material. Ventilation equipment should be in working condition and unobstructed. Any unusual noises or odors should be noticed and reported promptly. Metering equipment should be checked for high or low voltage and current and any indication of accidental grounding (ungrounded systems). ~~Are switches~~ Functions of switches , disconnects, and motor controllers should be properly identified ~~as to function? Are fire extinguishers~~ . Fire extinguishers should be in place, of suitable type, and charged~~?~~ .

B.1.14 Grouped Electrical Control Equipment (Such as Might Be Mounted on Walls).

~~Is grouped~~ Grouped electrical control equipment should be protected from physical damage and readily accessible~~? Are any equipment enclosures damaged, or do any~~ . Equipment enclosures should not be damaged or have missing or open covers~~? Are any live parts exposed?~~ . Live parts should not be exposed. Any condition that prevents quick or ready access should be reported.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:32:18 EDT 2024

Committee Statement

Committee Statement: This revision revises the questions posed into statements and removes vague wording.

Response Message: FR-133-NFPA 70B-2024

Public Input No. 235-NFPA 70B-2024 [Sections B.1.12, B.1.13, B.1.14]

First Revision No. 134-NFPA 70B-2024 [Section No. B.1.17.3]

B.1.17.3

Emergency power supplies, such as batteries and engine-driven generators, normally receive scheduled tests. Records of periodic tests should be checked. ~~Are fuel~~ Fuel and cooling supplies for engine drives ~~adequate? Are fire extinguishers~~ should be verified as adequate. Fire extinguishers should be in place, of proper type, and charged~~?~~ .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:36:45 EDT 2024

Committee Statement

Committee Statement: This revision revises the questions posed into statements and removes vague wording.

Response Message: FR-134-NFPA 70B-2024

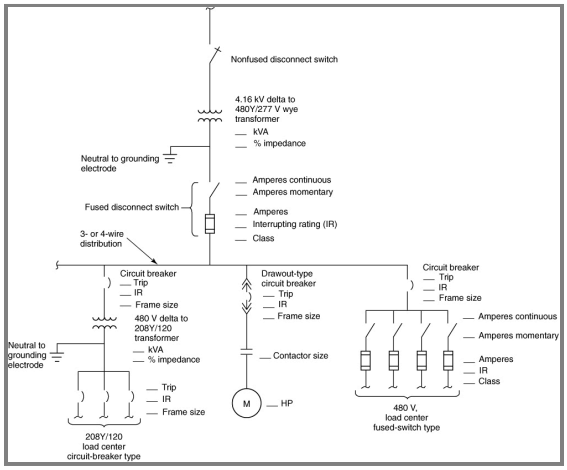
Public Input No. 236-NFPA 70B-2024 [Section No. B.1.17.3]

First Revision No. 135-NFPA 70B-2024 [Section No. D.1]

D.1

~~Note that Annex~~ ~~D~~ ~~is presented to show use of symbols and should not be construed to indicate recommendations.~~ Figure D.1 shows the typical use of ~~some typical~~ symbols in a single-line power distribution program.

Figure D.1 Typical Use of Symbols in a Single-Line Power Distribution Program.



Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:38:21 EDT 2024

Committee Statement

Committee Statement: The deleted text is not necessary for the application and understanding of Figure D.1.

Response Message: FR-135-NFPA 70B-2024

Public Input No. 237-NFPA 70B-2024 [Section No. D.1]

First Revision No. 136-NFPA 70B-2024 [Section No. H.1 [Excluding any Sub-Sections]]

Preferably, all types of electrical equipment should be stored in a clean, ~~heated building~~ climate-controlled facility affording good physical protection and providing controlled access to prevent unauthorized tampering with the equipment. However, equipment can be stored in other inside and outside environments with proper provisions to satisfy the general recommendations of this section and the ~~recommendations~~ requirements specified in the particular equipment sections. The manufacturer's instructions for the specific equipment and environment should be followed.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:40:46 EDT 2024

Committee Statement

Committee Statement: This first revision recognizes that there are environmental conditions other than heat that should be considered and clarifies that "requirements", not recommendations, are specified in the particular equipment sections.

Response Message: FR-136-NFPA 70B-2024

Public Input No. 241-NFPA 70B-2024 [Section No. H.1]

Public Input No. 239-NFPA 70B-2024 [Section No. H.1 [Excluding any Sub-Sections]]

First Revision No. 137-NFPA 70B-2024 [Section No. H.1.2]

~~**H.1.2**~~

~~Covers are recommended unless storage conditions specified in Section~~ H.1 ~~exist. Canvas tarpaulins or the equivalent are preferred over other coverings because they provide better humidity control and enclosure scuff protection.~~

Submitter Information Verification

Committee: EEM-AAA
Submittal Date: Thu Mar 21 11:42:46 EDT 2024

Committee Statement

Committee Statement: Covers, canvases, tarps do not provide enough protection for the equipment.
Response Message: FR-137-NFPA 70B-2024

Public Input No. 240-NFPA 70B-2024 [Section No. H.1.2]

First Revision No. 138-NFPA 70B-2024 [Section No. H.2 [Excluding any Sub-Sections]]

~~Where storage conditions specified in Section~~ ~~H.1~~ ~~are not available, indoor or outdoor storage~~ Equipment storage should comply with the ~~following paragraphs~~ equipment-specific recommendations in this section .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:43:52 EDT 2024

Committee Statement

Committee Statement: This first revision removes unnecessary text while retaining informative recommendations.

Response Message: FR-138-NFPA 70B-2024

Public Input No. 242-NFPA 70B-2024 [Section No. H.2 [Excluding any Sub-Sections]]

First Revision No. 139-NFPA 70B-2024 [Section No. H.2.1.3]

H.2.1.3

When the equipment is not furnished with space heaters and condensation is a concern, then temporary heaters or lamp banks should be used to avoid condensation. ~~Temporary heaters or lamp banks should be used where space heaters are not furnished to maintain temperature at a level approximately 12°C (22°F) above ambient.~~

Supplemental Information

File Name	Description	Approved
70B_FR-139_H.2.1.3_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 11:45:08 EDT 2024

Committee Statement

Committee Statement: This first revision clarifies the information provided in the recommendation in this section in recognition for electrical equipment to include electronics.

Response Message: FR-139-NFPA 70B-2024

Public Input No. 243-NFPA 70B-2024 [Section No. H.2.1.3]

First Revision No. 140-NFPA 70B-2024 [Section No. M.1.2.1]

M.1.2.1 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D923, *Standard Practices for Sampling Electrical Insulating Liquids*, 2015, reapproved ~~2015~~ 2023 .

ASTM D924, *Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids*, 2015.

ASTM D971, *Standard Test Method for Interfacial Tension of Insulating Liquids Against Water by the Ring Method*, 2020.

ASTM D974, *Standard Test Method for Acid and Base Number by Color-Indicator Titration*, ~~2014e2~~ 2022 .

ASTM D1298, *Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method*, 2012b, reapproved 2017.

ASTM D1500, *Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)*, 2012, reapproved 2017.

ASTM D1524, *Standard Test Method for Visual Examination of Used Electrical Insulating Liquids in the Field*, 2015, reapproved 2022 .

ASTM D1533, *Standard Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration*, 2020.

ASTM D1816, *Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes*, 2012, reapproved 2019.

ASTM D1933, *Standard Specification for Nitrogen Gas as an Electrical Insulating Material*, 2003, reapproved 2017.

ASTM D5837, *Standard Test Method for Furanic Compounds in Electrical Insulating Liquids by High-Performance Liquid Chromatography (HPLC)*, 2015.

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 13:17:57 EDT 2024

Committee Statement

Committee Statement: This first revision updates the revision dates of the referenced ASTM standards.

Response Message: FR-140-NFPA 70B-2024

Public Input No. 245-NFPA 70B-2024 [Section No. M.1.2.1]

Public Input No. 253-NFPA 70B-2024 [Global Input]

First Revision No. 141-NFPA 70B-2024 [Section No. M.1.2.2]

M.1.2.2 EASA Publications.

Electrical Apparatus Service Association, Inc., 1331 Baur Blvd, St. Louis, MO 63132.

ANSI/EASA AR100, *Recommended Practice for the Repair of Rotating Electrical Apparatus*, ~~2015~~ 2020 .

Submitter Information Verification

Committee: EEM-AAA

Submittal Date: Thu Mar 21 13:20:42 EDT 2024

Committee Statement

Committee Statement: This first revision updates the revision date of the referenced standard.

Response Message: FR-141-NFPA 70B-2024

Public Input No. 246-NFPA 70B-2024 [Section No. M.1.2.2]

First Revision No. 142-NFPA 70B-2024 [Section No. M.1.2.5]

M.1.2.5 IEEE Publications.

~~IEEE ; 3 Park Avenue, 17th Floor, New York, NY 10016-5997~~ IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854 .

~~IEEE C2, *National Electrical Safety Code* ® *(NESC* ® *)* , 2017.~~

ANSI/IEEE C37.20.7, *Guide for Testing Switchgear Rated Up to 52 kV for Internal Arcing Faults*, 2017.

IEEE C37.23, *Standard for Metal-Enclosed Bus*, 2015.

ANSI/IEEE 43, *Recommended Practice for Testing Insulation Resistance of ~~Rotating~~ Electric Machinery,* 2013.

IEEE C57.12.91, *Standard Test Code for Dry-Type Distribution and Power Transformers*, 2020.

IEEE C57.104, *Guide for the Interpretation of Gases Generated in Mineral Oil-Immersed Transformers*, 2019.

IEEE C57.106, *Guide for Acceptance and Maintenance of Insulating Mineral Oil in Electrical Equipment* , 2019.

ANSI/IEEE C57.110, *Recommended Practice for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Nonsinusoidal Load Currents*, 2018.

ANSI/IEEE C62.41, *Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits*, 1991.

IEEE 80, *Guide for Safety in AC Substation Grounding*, 2013.

IEEE 100, *Authoritative Dictionary of IEEE Standards Terms*, 2000 (withdrawn).

ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book)*, 1993.

ANSI/IEEE 142, *Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)*, 2007.

ANSI/IEEE 241, *Recommended Practice for Electric Power Systems in Commercial Buildings (IEEE Gray Book)*, 1990.

ANSI/IEEE 242, *Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)*, 2001.

IEEE 315, *Graphic Symbols for Electrical and Electronics Diagrams,* 1975, reaffirmed ~~(~~ 1993~~)~~ .

ANSI/IEEE 399, *Recommended Practice for Industrial and Commercial Power Systems Analysis (IEEE Brown Book)*, 1997.

ANSI/IEEE 400, *Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5 kV and Above*, ~~2012~~ 2023 .

IEEE 450, *Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications*, ~~2010~~ 2020 .

ANSI/IEEE 493, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems (IEEE Gold Book)*, 2007.

ANSI/IEEE 519, ~~*Recommended Practice and Requirements*~~ *Standard for Harmonic Control in ~~Electrical~~ Electric Power Systems*, ~~2014~~ 2022 .

ANSI/IEEE 1100, *Recommended Practice for Powering and Grounding Electronic Equipment (IEEE Emerald Book),* 2005.

IEEE 1106, *Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications*, 2015.

IEEE 1159, *Recommended Practice for Monitoring Electric Power Quality*, 2019.

IEEE 1188, *Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications*, 2005, reaffirmed ~~(~~ 2010, ~~with 2014~~ amendment~~)~~ 2014 .

IEEE 1584™, *Guide for Performing Arc-Flash Hazards Calculations*, 2018.

IEEE 1578, *Recommended Practice for Stationary Battery Electrolyte Spill Containment and Management*, 2018.

IEEE 1657, *Recommended Practice for Personnel Qualifications for Installation and Maintenance of Stationary Batteries*, 2018.

~~IEEE 3000 Standards: *Fundamentals.*~~

IEEE 3001™ Standards: *Power Systems Design.*

IEEE 3002™ Standards: *Power Systems Analysis.*

IEEE 3002.8, *Recommended Practice for Conducting Harmonic Studies and Analysis of Industrial and Commercial Power Systems*, 2018.

IEEE 3003™ Standards: *Power Systems Grounding.*

IEEE 3004™ Standards: *Protection & Coordination.*

IEEE 3005™ Standards: *Energy & Standby Power Systems.*

IEEE 3006™ Standards: *Power Systems Reliability.*

IEEE 3007™ Standards: *Maintenance, Operations & Safety.*

IEEE 3007.1, *Recommended Practice for the Operation and Management of Industrial and Commercial Power Systems*, 2010.

IEEE 3007.2, *Recommended Practice for the Maintenance of Industrial and Commercial Power Systems*, 2010.

IEEE 3007.3, *Recommended Practice for Electrical Safety in Industrial and Commercial Power Systems*, 2012.

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First Revision No. 143-NFPA 70B-2024 [Section No. M.1.2.6]

M.1.2.6 NEMA Publications.

National Electrical Manufacturers Association, 1300 North 17th Street, Suite 900, Arlington, VA 22209.

NEMA AB-4, *Guidelines for Inspection and Preventive Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications*, ~~2017~~ 2023 .

NEMA BU1.1, *General Instructions for Handling, Installation, Operation~~,~~ and Maintenance of Busway Rated 600 ~~Volts~~ V or Less*, 2010.

ANSI/NEMA C84.1, *American National Standard for Electric Power Systems and Equipment — Voltage Ratings (60 Hz)*, 2020.

NEMA GD 1, *Evaluating Water-Damaged Electrical Equipment,* 2019.

NEMA GD 2, *Evaluating Fire- and Heat-Damaged Electrical Equipment*, 2016.

NEMA ICS 2.3, *Instructions for the Handling, Installation, Operation and Maintenance of Motor Control Centers Rated Not More Than 600 V* , 2019.

NEMA KS-3, *Guidelines for Inspection and Preventive Maintenance of Switches Used in Commercial and Industrial Applications*, ~~2010~~ 2023 .

ANSI/NEMA WD 6, *Wiring Devices — Dimensional Specifications*, ~~2016~~ 2021 .

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First Revision No. 144-NFPA 70B-2024 [Section No. M.1.2.7]

M.1.2.7 NETA Publications.

InterNational Electrical Testing Association, 3050 Old Centre ~~Ave~~ Road ~~.~~ , Suite 101, Portage, MI 49024.

ANSI/NETA ATS, *Standard for Acceptance Testing Specifications for Electrical Power ~~Distribution~~ Equipment and Systems*, 2021.

ANSI/NETA MTS, *Standard for Maintenance Testing Specifications for Electrical Power ~~Distribution~~ Equipment and Systems,~~2019~~ 2023* .

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First Revision No. 145-NFPA 70B-2024 [Section No. M.1.2.8]

M.1.2.8 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 489, *Molded-Case Circuit Breakers, Molded-Case Switches, and ~~Circuit Breaker~~ Circuit-Breaker Enclosures*, ~~2016~~ 2019 .

UL 857, *Busways*, ~~2009~~ 2021 .

UL 943, *Ground-Fault Circuit-Interrupters*, ~~2016~~ 2023 .

UL 943C, *Outline of Investigation for Special Purpose Ground-Fault Circuit-Interrupters*, 2012.

UL 1053, *Ground-Fault Sensing and Relaying Equipment*, ~~2015~~ 2020 .

UL 1066, ~~*Low-Voltage AC and DC*~~ *Power Circuit Breakers up to 1000 V AC and 1500 V DC Used in Enclosures*, ~~2017~~ 2022 .

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Public Input No. 250-NFPA 70B-2024 [Section No. M.1.2.8]

First Revision No. 146-NFPA 70B-2024 [Section No. M.2.4]

M.2.4 IEEE Publications.

~~IEEE, 3 Park Avenue, 17th Floor, New York, NY 10016-5997.~~ IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854.

ANSI/IEEE 67, *Guide for Operation and Maintenance of Turbine Generators,* 2005.

ANSI/IEEE 315 (ANSI Y32.2-75), *Graphic Symbols for Electrical and Electronics Diagrams,* 1975, reaffirmed 1993.

ANSI/IEEE 432, *Guide for Insulation Maintenance for Rotating ~~Electrical~~ Electric Machinery (5 HP to less than 10,000 HP),* 1992 (withdrawn).

IEEE 1250, *~~IEEE~~ Guide for Identifying and Improving Voltage Quality in Power Systems,*~~2011~~ 2018 .

IEEE 1409, *Guide for Application of Power Electronics for Power Quality Improvement on Distribution Systems Rated 1 kV Through 38 kV,* 2012.

~~IEEE 1453, *IEEE Recommended Practice — Adoption of IEC 61000-4-15:2010, Electromagnetic compatibility (EMC) — Testing and measurement techniques — Flickermeter — Functional and design specifications,* 2015.~~

IEEE 1453, *Standard for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems* , 2022.

IEEE 1458, *Recommended Practice for the Selection, Field Testing, and Life Expectancy of ~~Molded Case~~ Molded-Case Circuit Breakers for Industrial Applications,* 2017.

IEEE 1564, *Guide for Voltage Sag Indices,* 2014.

IEEE C37.41, *Standard Design Tests for High-Voltage (>1000 V) Fuses and Accessories,* 2016.

ANSI/IEEE C37.95, *Guide for Protective Relaying of Utility-Consumer Interconnections,* 2014.

IEEE C37.96, *Guide for AC Motor Protection,* 2012.

IEEE C57.94, *Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers,* 2015.

~~ANSI/IEEE C57.106, *Guide for Acceptance and Maintenance of Insulating Oil in Equipment,* 2006.~~

IEEE C57.111, *Guide for Acceptance and Maintenance of Silicone Insulating Fluid and Its Maintenance in Transformers,* 2009.

ANSI/IEEE C57.121, *Guide for Acceptance and Maintenance of Less Flammable Hydrocarbon Fluid in Transformers,* 1998, reaffirmed 2009.

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M.2.7 NEMA Publications.

National Electrical Manufacturers Association, 1300 North 17th Street, Suite 900, Arlington, VA 22209.

NEMA 280, *Application Guide for Ground-Fault Circuit Interrupters* (see Section 7, Field Test Devices, and Section 8, Field Troubleshooting), 1990.

NEMA AB 3, ~~*Molded Case*~~ *Molded-Case* *Circuit Breakers and Their Application*, 2013.

~~NEMA GD 1, *Evaluating Water-Damaged Electrical Equipment,* 2016.~~

NEMA ICS 1.3, *Preventive Maintenance of Industrial Control and Systems Equipment*, 1986, reaffirmed 2015.

NEMA ICS 2.3, *Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers Rated Not More Than 600 ~~Volts~~ V ,~~1995, reaffirmed 2008~~* 2019 .

NEMA ICS 7, *Adjustable — Speed Drives,~~2014~~* 2023 .

ANSI/NEMA MG 2, *Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators ~~(see Section 8.3, Maintenance), 2014~~* , 2023 .

NEMA PB 1.1, *General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated ~~600~~ 1000 V or Less,~~2013~~* 2023 .

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