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Electrical Safety in the Workplace: NFPA 70B the Standard

What Does This Mean for Safety?


e-Hazard Derek Vigstol

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Today's Discussion

- What is NFPA 70B?
- What regulations apply to maintenance?
- Will NFPA 70B becoming a Standard have an impact?
- How does maintenance improve electrical safety?
- How can maintenance improve customer service?



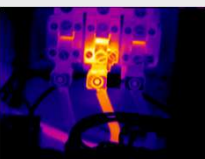
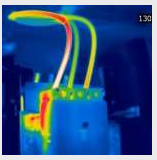

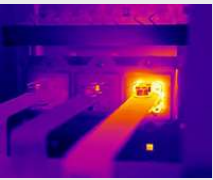
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To Maintain or Not?

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Why Do Electrical Maintenance?




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OSHA Requirements

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WHAT  *The general duty clause... requires workplaces to be free from recognized hazards*

Specific duty clauses require employers to comply with OSHA standards

Examples

Subpart I: PPE
132(a) *General Requirements.*
... Protective equipment ... shall be provided, used, and maintained ... wherever it is necessary...


Subpart S: Electrical
333(a)(1) *Deenergized Parts.* Live parts to which an employee may be exposed shall be deenergized before the employee works on or near them...
335(a)(1)(i) Employees working ... where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment...


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Applicable Regulations and Standards for Electrical Industry

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WHAT  **OSHA (CFR, Title 29)**
1910, **Subpart S**
1926, **Subpart K**

HOW  **NFPA 70E**
National Electrical Code (NFPA 70 – NEC)
NFPA 70B

Support Standards

- NETA MTS
- IEEE
- ASTM
- ANSI
- IEC

Comparable Canadian Standards

- OH&S
- CSA: Z462, CEC, Z463

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What is NFPA 70B?

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- What is NFPA 70B?
 - NEC requests for maintenance
 - Committee formed in 1968
 - Recommended practice for electrical equipment maintenance
- Existed in a space that is 100% optional
- Was not ready for primetime

NFPA 70B
Standard for Electrical Equipment Maintenance
2023



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NFPA Approach to Electrical Safety

How to...

NFPA 70
National Electrical Code
2023
BUILD it safely

NFPA 70E
Standard for Electrical Safety in the Workplace
Standard 2024
WORK on it safely

NFPA 70B
Standard for Electrical Equipment Maintenance
2023
MAINTAIN it properly

Upgrade/replace
(latest NEC applies)

Maintain/repair
(latest 70E applies)

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NFPA 70B as a Standard

- Mandatory language
 - “Should” becomes “shall”
 - Drives compliance and enforcement
- Prescriptive requirements
 - Provides a blueprint to owners
 - Details the what and when
 - Fills in many informational gaps

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70B Standard Overview

NFPA Manual of Style format

Chapters

1	Administration
2	Referenced Publications
3	Definitions
4	General
5	Personnel Safety
6	Single-Line Diagrams and System Studies
7	Fundamental Tests
8	Field Testing and Test Methods
9	Maintenance Intervals
10-38	Equipment Specific
Annexes	Informative Annexes A-M


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Early Chapters

1. Administration
 - Scope
 - Application
2. Referenced Pubs
3. Definitions




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Developing Maintenance Strategies

4. General
 - Electrical Preventive Maintenance Program (EMP)
 - Personnel roles
 - Equipment cleaning



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What to Include in Your Maintenance Program

The EMP shall include the following elements:

- An electrical safety program that addresses the condition of maintenance
- Identification of personnel responsible for implementing each element of the program
- Survey and analysis of electrical equipment and systems to determine maintenance requirements and priorities
- Developed and documented maintenance procedures for equipment

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What to Include in Your Maintenance Program **e-Hazard**

- A plan of inspections, servicing, and suitable tests
- A maintenance, equipment, and personnel documentation and records-retention policy
- A process to prescribe, implement, and document corrective measures based on collected data
- A process for incorporating design for maintainability in electrical installations
- A program review and revision process that considers failures and findings for continuous improvement

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Maintenance Program General Requirements **e-Hazard**

General Requirements of a Maintenance Program

- Electrical equipment shall be maintained in accordance with the **manufacturer's instructions** and applicable codes and standards.
- In the absence of manufacturer's instructions, equipment shall be maintained in accordance with industry consensus standards.

NFPA 70B 4.1.1, 4.1.3

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Developing Maintenance Strategies **e-Hazard**

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4. General
 - Electrical Preventive Maintenance Program (EMP)
 - Personnel roles
 - Equipment cleaning
5. Personnel Safety
 - Qualified Persons
 - Refers to applicable laws, codes, and standards (OSHA & 70E)

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Equipment Information

- 6. Single line diagrams and system studies
 - Up-to-date drawings
 - Requires short-circuit study
 - Maintenance by design
- 7. Fundamental tests
 - Bolted bus connections
 - Insulation resistance
 - Infrared thermography




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Chapter 8 – Field Testing and Test Methods

- Special hazards risk assessment
- Testing category types
- Testing personnel qualifications
- Condition of maintenance
 - Serviceable
 - Limited Service
 - Non-serviceable




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Chapter 9 – Maintenance Intervals

- Table 9.2.2
 - Referenced by other Chapters
 - Can be altered if documented in EMP
- Details frequency of maintenance based on the condition of equipment



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Maintenance Types

- Preventive Maintenance (PM)
 - Relies on average or expected end-of-life statistics to base maintenance schedules on
- Predictive Maintenance (PdM)
 - Cousin to Preventive Maintenance, but relies on actual equipment condition to predict required maintenance
- RCM
 - Based on SAE JA1011 “Evaluation Criteria for RCM Processes” and the 7-Question Model

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<https://link.nfpa.org/publications/70B/2023/chapters/9>

Table 9.2.2 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	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
Cable trays	Special	60 months	36 months	12 months
	Visual inspection	12 months	12 months	6 months

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Chapter 9 – Maintenance Intervals (cont)

- Equipment Condition Assessment
 - Physical Condition
 - Criticality Condition
 - Operating Environment Condition




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Physical Condition

- Condition 1
 - Appears in like new condition
 - Enclosure is clean, dry, and tight
 - No notifications or unaddressed issues
 - Previous maintenance in accordance with EMP
- Condition 2
 - Deviation from previous results indicate higher frequency
 - Active recommendations or notifications
- Condition 3
 - Missed two previous cycles
 - Urgent actions required
- Non-Serviceable Equipment




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Criticality Condition

- Condition 1 or 2 can be assigned if failure will not endanger personnel
- Condition 3 must be applied if failure can cause injury to workers




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Operating Environment Condition

- Condition 1 or 2 can be assigned if the equipment is rated for the environment in which it is installed
 - NEMA 4 enclosure where subject to hose down conditions
- Condition 3 must be assigned when equipment is in a harsh environment for which it is not rated




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Preventive Maintenance Examples

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A maintenance manager has historical information that shows a particular drive motor is most likely to fail after operating for 1,000 hours. The manager schedules a work order, either on a calendar or in the CMMS, to be generated just before the motor has run for 1,000 hour to intervene prior to expected failure.

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Chapters 10 - 38 Specific to Certain Equipment

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CH.

- 12 Substations and Switchgear
- 15 Circuit Breakers
- 32 Battery Energy Storage Systems

Reserved chapters



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NFPA 70B Examples

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Item/Equipment	Task/Function	Reference
Molded-case Circuit Breakers	Visual Inspection/clean	15.3.1
	Cleaning	15.3.2
	Mechanical Test	15.3.4
	Electrical Test	15.3.5

Note: Table 15.3.5 gives entire procedure for electrical testing including insulation resistance test, contact/pole resistance tests, thermal-magnetic trip tests, etc.



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Maintenance Reduces Risk

- Proper maintenance ensures that equipment will operate as advertised
 - Normal operation
 - Circuit breakers
 - Switches
- EPM provides documentation for service work


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Maintenance Improves Serviceability

- One-line diagrams are kept up-to-date
- Known issues are documented
- Cuts down on time to troubleshoot




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Questions? Want More Information



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