

BUILDING
CODES & PERMITS
HAWAII EDITION

Implementing the New Electrical Safety Requirement

Embracing Change for 2027 & Beyond

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Zoubek Consulting, LLC
Workplace Safety Solutions

Objectives

- Identify overlapping components in NFPA standards as pertains to:
  - Electrical installations
  - Maintenance requirements of electrical systems
  - Personnel protection during preventative maintenance activities.
- Provide updates on 2026 National Electrical Code applicability to **Hawaii** Electrical Code.
- Merge code updates with
  - 2026 edition of NFPA 70B (Electrical Equipment Maintenance)
  - 2027 edition of NFPA 70E (Electrical Safety in the Workplace).

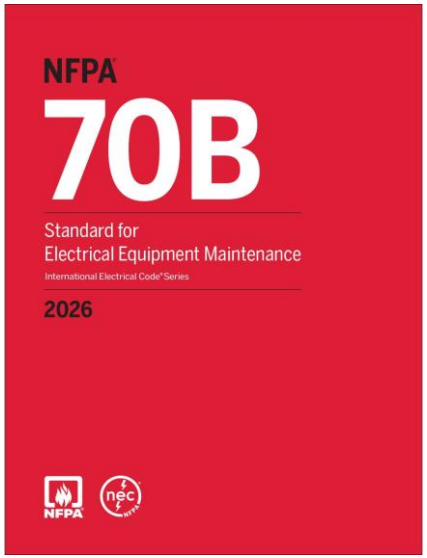
Don’t judge a book by its cover!

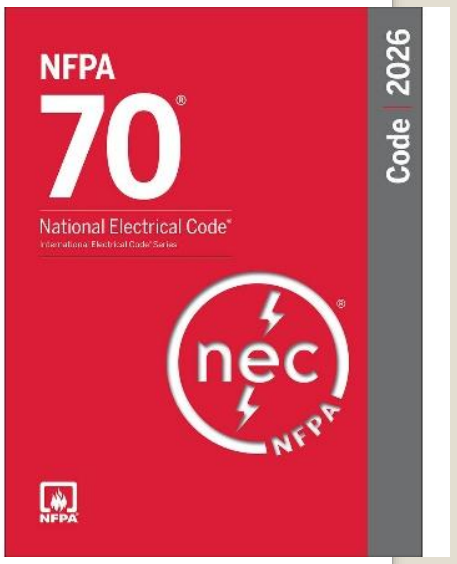


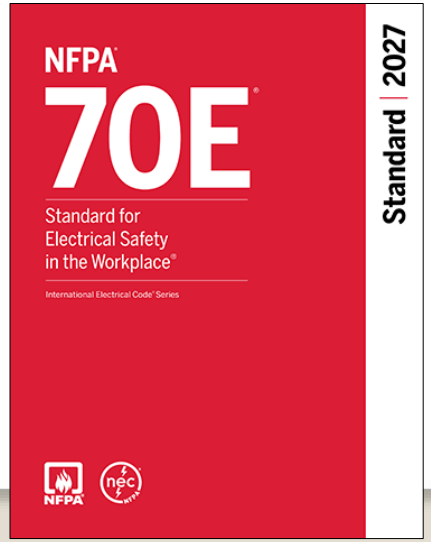


Overlapping Components

- Code
  - Set of Rules.
  - Not law but can be adopted into law.
- Standard
  - Detailed elaboration of code.
  - The nuts and bolts of meeting code requirements.
  - *AHJ* Responsible for enforcing requirements of code/standard.







Q: An organization can have a(n) AHJ.

Yes, No, Trick Question?

Authority Having Jurisdiction (AHJ)

An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

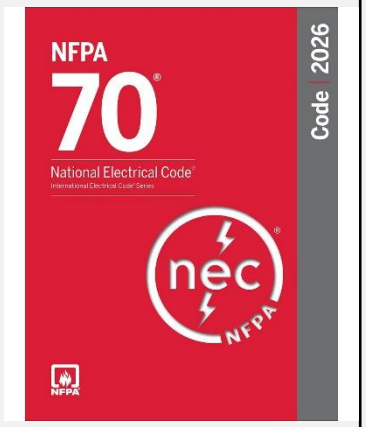
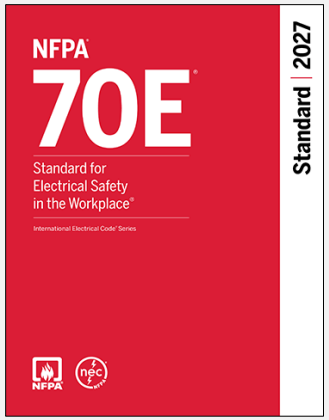
Q: Is NFPA 70E/70B are voluntary standards and not something OSHA enforces?

Yes, No, Trick Question?

A: From an enforcement perspective, OSHA does not enforce NFPA 70E, however, use NFPA 70E to support citations for violations relating to certain OSHA standards

From code prospective states will typically adopt codes related to fire protection with respect to building codes (such as NFPA 1 (fire)/NFPA 101 (life safety)/NFPA 70 (electrical).

Overlapping Components

		
Electrical design & Installation	**Electrical preventive maintenance programs**	**Safe work practices when working on electrical systems**

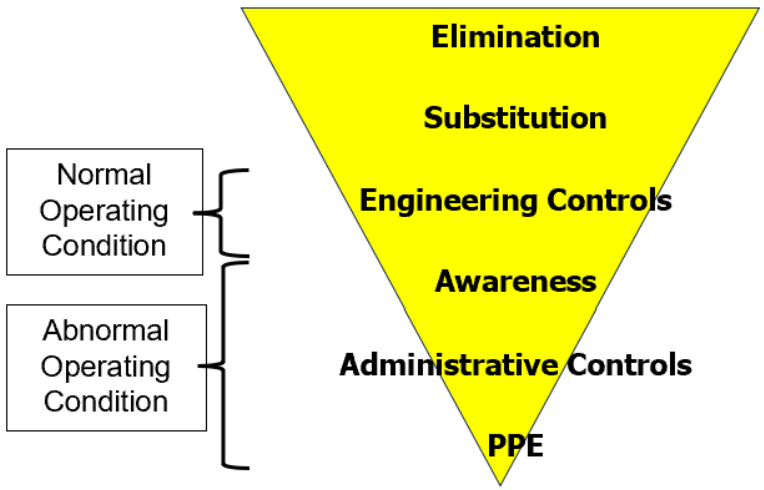
Overlapping Components

- Normal operating condition
  - Discussed in several NFPA standards (70E & 70B)
  - Refers to equipment or systems functioning as intended.
  - Interacting with it as intended.
  - Normal operation does not require a qualified person and is *considered low risk* if performed as designed.
    - Engineering controls

Overlapping Components

- Normal operating condition (Summary)
  - **Equipment is properly installed**.
  - Equipment is rated for available fault current.
  - Equipment is used in accordance with instructions included in listing and labeling.
  - **Equipment is properly maintained.**
  - Equipment doors are closed and secure.
  - Equipment covers are secure and in place.
  - No evidence of failure.

Overlapping Components





Hierarchy of Controls

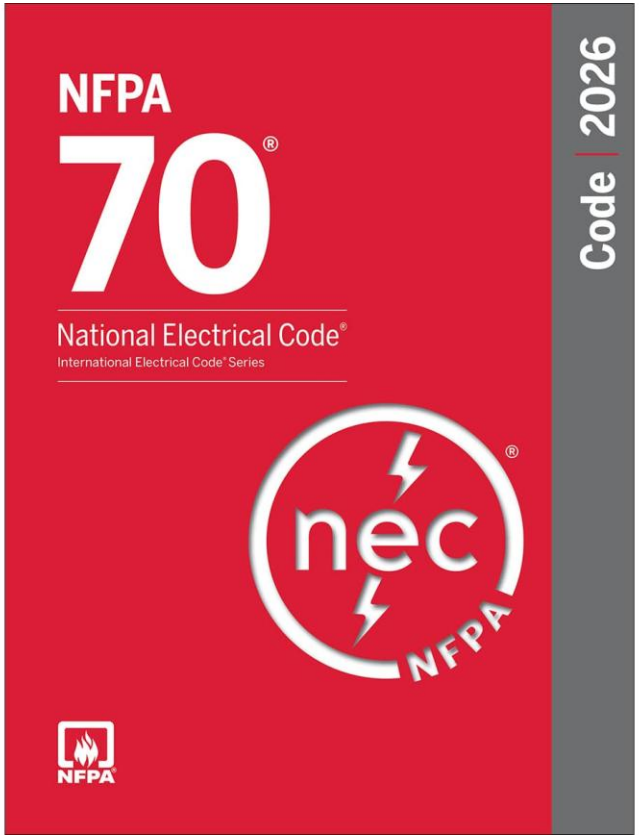
Q: This operation here is a **normal operating condition**.

Yes, No, Trick Question?



NEC (NFPA 70)/HI Electrical Code

- Authoritative document addressing electrical installations.
- Revised every 3 years to stay in sync with industry practices, emerging trends, and introduction of technologies.
- Provide comprehensive rules for designers, installers, inspectors, engineers, electricians, and anyone else who works in the electrical industry.



NEC (NFPA 70)/HI Electrical Code

- Example: Panelboards.
- NEC/CEC will give construction requirements.
- Equipment properly installed.

Article 408 Switchboards, Switchgear, and Panelboards

Part I. General

408.1 Scope.

This article covers switchboards, switchgear, and panelboards. It does not apply to equipment operating at over 1000 volts ac, 1500 volts dc, nominal, except as specifically referenced elsewhere in this code.

408.3 Reconditioned Equipment.

(A) Permitted.

The following reconditioned equipment shall be permitted:

(1) Switchboards
(2) Switchgear
(3) Sections of switchboards
(4) Sections of switchgear

If equipment has been damaged by fire, products of combustion, corrosive influences, or water, it shall be specifically evaluated by its manufacturer or a qualified testing laboratory prior to being returned to service.

(B) Not Permitted.

Reconditioned panelboards shall not be permitted.

408.4 Descriptions Required.

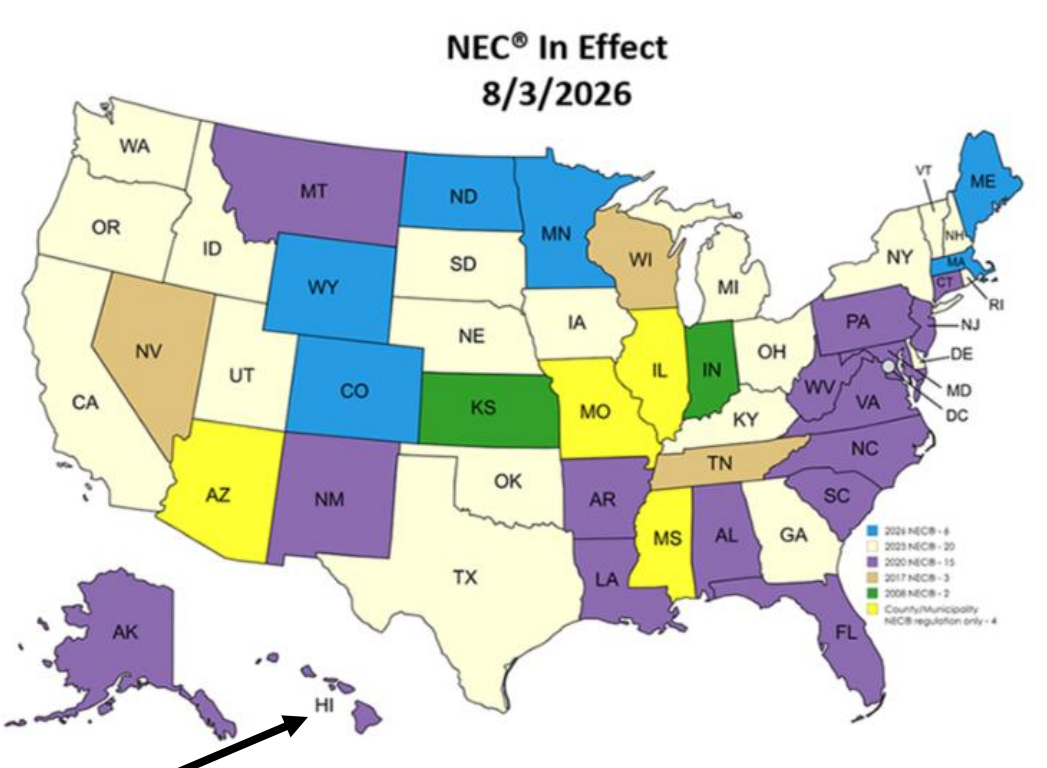
(A) Circuit Directory or Circuit Description.

Every circuit and circuit modification shall be provided with a legible and permanent description that complies with all of the following conditions as applicable:

(1) Located at each switch or circuit breaker in a switchboard or switchgear
(2) Included in a circuit directory that is located on the face of, inside of, or in an approved location adjacent to the panel door in the case of a panelboard
(3) Clear, evident, and specific to the purpose or use of each circuit including spare positions with an unused OCPD
(4) Described with a degree of detail and clarity that is unlikely to result in confusion between circuits
(5) Not dependent on transient conditions of occupancy
(6) Clear in explaining abbreviations and symbols when used



NEC (NFPA 70)/HI Electrical Code



2020 Edition

Source: nfpa.com

Hawaii Electrical Code & NEC Adoption

- Part of State Building Code.
- Incorporates 2020 Edition of NEC.
- Cities may also apply local amendments and administrative requirements
- All electrical work must pass the local AHJ.

NEC (NFPA 70)/HI Electrical Code



- City of Honolulu adopts the HI-EC with local amendments and enforces via Department of Planning and Permitting.
- https://www.honolulu.gov/dpp

NEC (NFPA 70)/HI Electrical Code

- **Current code**:
  - **Effective Date**: 2020 NEC was effective in 2023.
- **Next cycle**: Current update cycle (2026) in progress with no confirmed statewide effective date.



26 NEC/HI-EC

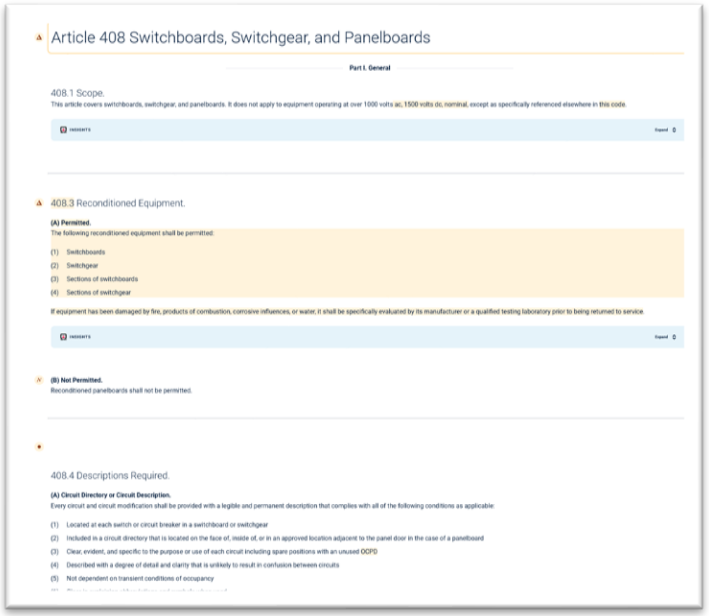
- **Arc Flash Labeling**
- Previous Code only required arc flash warning labeling of service and feeder equipment of 1,000A or more.
- Now required for all non-dwelling distribution equipment, and the arc flash label must include specific information
  - Date the arc flash assessment was completed.
  - Reference to NFPA 70E for worker protection.



Date completed

26 NEC/HI-EC

- **Installation Instructions**
  - A manufacturer's installation instructions cannot conflict with NEC requirements.



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NF/NFOM Panelboards

Class 1670

Instruction Bulletin

80043-741-03, Rev. 06
02/2023

SQUARE D™

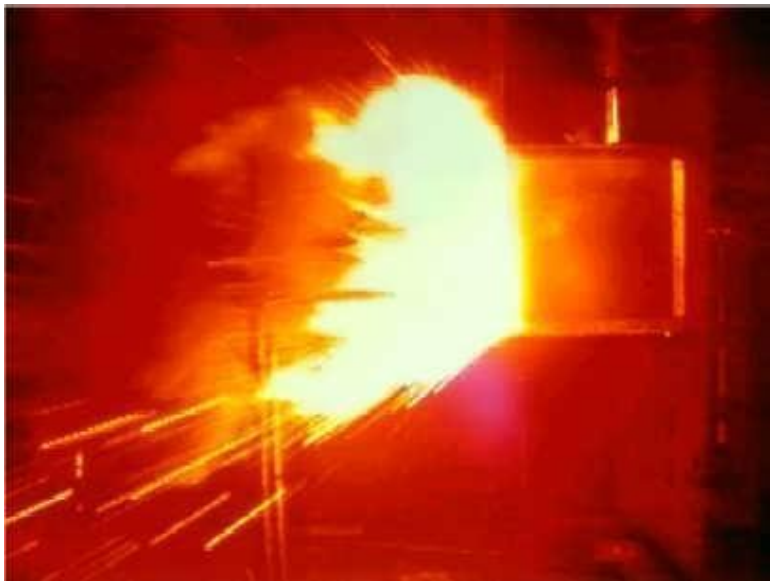
26 NEC/HI-EC

- **Other Changes**
  - **New Energy Technology:** Includes updated code provisions for:
    - Integration of energy storage systems,
    - Photovoltaic (PV) installations,
    - Electric vehicle power transfer systems
  - **Grounding and Bonding Safety:**
    - Detailed grounding, bonding, and load calculation requirements



26 NEC/HI-EC

- **Case Study**
  - A worker was injured from arc flash upon closing the main circuit breaker during commissioning operations on a 480-VAC Panelboard.
  - The root cause of the arc flash incident was attributed to improper installation of wiring on the panelboard.



Equipment not properly installed

= Abnormal Operating Condition

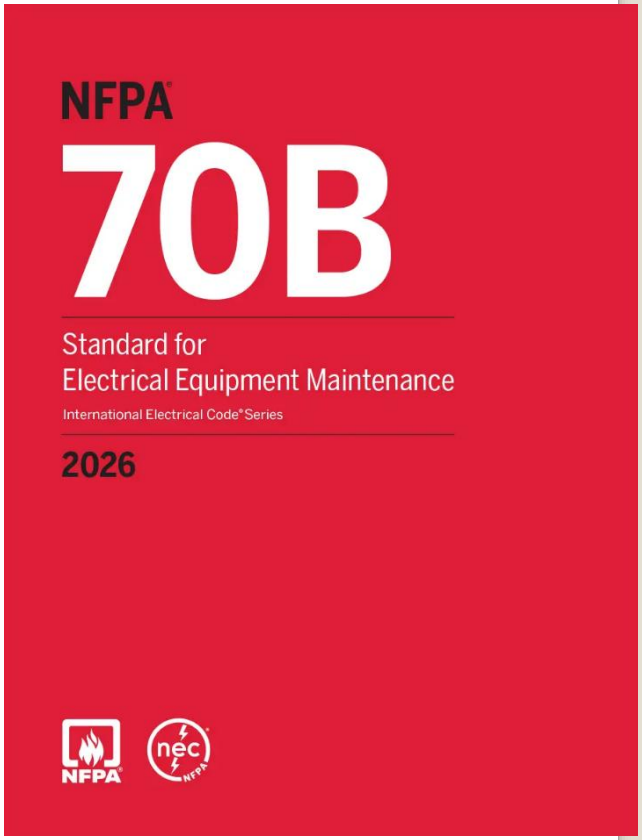
Maintenance (NFPA 70B)

Q: An effective electrical equipment maintenance program is essential in ensuring engineering controls properly protect the worker.

Yes No, Trick Question?

Maintenance (NFPA 70B)

- Details preventive maintenance for electrical equipment.
- NFPA 70B helps users develop and carry out an effective Electrical Maintenance Program (EMP)
  - Prevent equipment failures and incidents.
  - Establish "condition of maintenance" for equipment that is required to be compliant when assessing risk in accordance with NFPA 70E®, Standard for Electrical Safety in the Workplace®.



Steps in establishing EMP

1

Survey Equipment

Equipment	Definition	NFPA 70B (2026)Reference Chapter	Equipment Present in facility?	Inventory?	Maint Pro in place?
Battery ESSs	Battery energy storage systems (ESS) having a capacity greater than 3.6 MJ (1 kWh) that could be stand-alone or interactive with other electric power production sources.	32			
Busways	A raceway consisting of a metal enclosure containing factory-mounted, bare or insulated conductors, which are usually copper or aluminum bars, rods, or tubes.				
Cable trays	A unit or assembly of units or sections and associated fittings forming a structural system used to securely fasten or support cables and raceways.				
Electric vehicle power transfer systems	Electric vehicle power transfer systems and associated equipment.				
Fuses	Fuses to protect branch, feeder and service conductors.				
GFCIs	A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a ground-fault current exceeds the values established for a Class A device.				
Grounding and bonding	Requirements for grounding and bonding of electrical systems				
Lighting	Luminaires and lighting systems				
Medium-voltage power circuit breakers	Circuit breakers and their enclosures:				
Molded-case/insulated-case/low-voltage power circuit breakers	(1) Molded-case circuit breakers (MCCBs) rated less than or equal to 1000 V ac (2) Insulated-case circuit breakers (ICCBs) rated less than or equal to 1000 V ac (3) Low-voltage power circuit breakers (LVPCBs) rated less than or equal to 1000 V ac (4) Medium-voltage power circuit breakers (MVPCBs) rated greater than 1000 V ac to less than or equal to 69 kV ac				
Motor control equipment	An assembly of one or more enclosed sections having a common power bus and principally containing motor control units.	28			
Panelboards	A single panel or group of panel units designed for assembly in the form of a single panel, including buses and automatic overcurrent devices, and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet, enclosure, or cutout box placed in or against a wall, partition, or other support; and accessible only from the front.	13			
Switchboards	A large single panel, frame, or assembly of panels on which are mounted on the face, back, or both, switches, overcurrent and other protective devices, buses, and usually instruments.	13			
Photovoltaic systems	Solar photovoltaic (PV) systems and its associated equipment.	30			
Portable electrical tools and equipment	Portable electrical tools and equipment, both cord and plug connected and temporarily hard-wired.	29			
Power and distribution transformers	Power and distribution transformers.	11			



Steps in establishing EMP

2

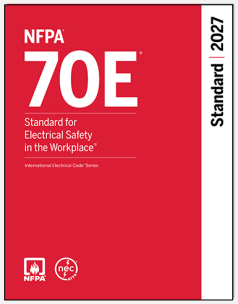
Procedures/ Plan of Servicing

- NFPA 70B provides maintenance intervals by equipment type and condition.



Example: **Panelboards**

Steps in establishing EMP

 Table 9.2.2	 Article 120 (LOTO) Chapter 1 (Safety Related Work Practices)
Visual inspection	May/may not be done energized.
Cleaning	Done de-energized.
Lubrication	Done de-energized.
Mechanical inspections	Energized or de-energized.
Electrical testing	Done Energized.

Steps in establishing EMP

Unpin Header

Table 9.2.2 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

Table 9.2.2	Table 130.5(C)
IR Thermography	Done Energized.

***Example:* Panelboards**



Estimate Likelihood of arc flash: NFPA 70E-Table 130.5(C)



TASK	Equipment Condition	Likelihood of Occurrence of arc flash
Opening of hinged doors or covers or removal of bolted covers to exposed electrical conductors.	*Any*	*Yes*

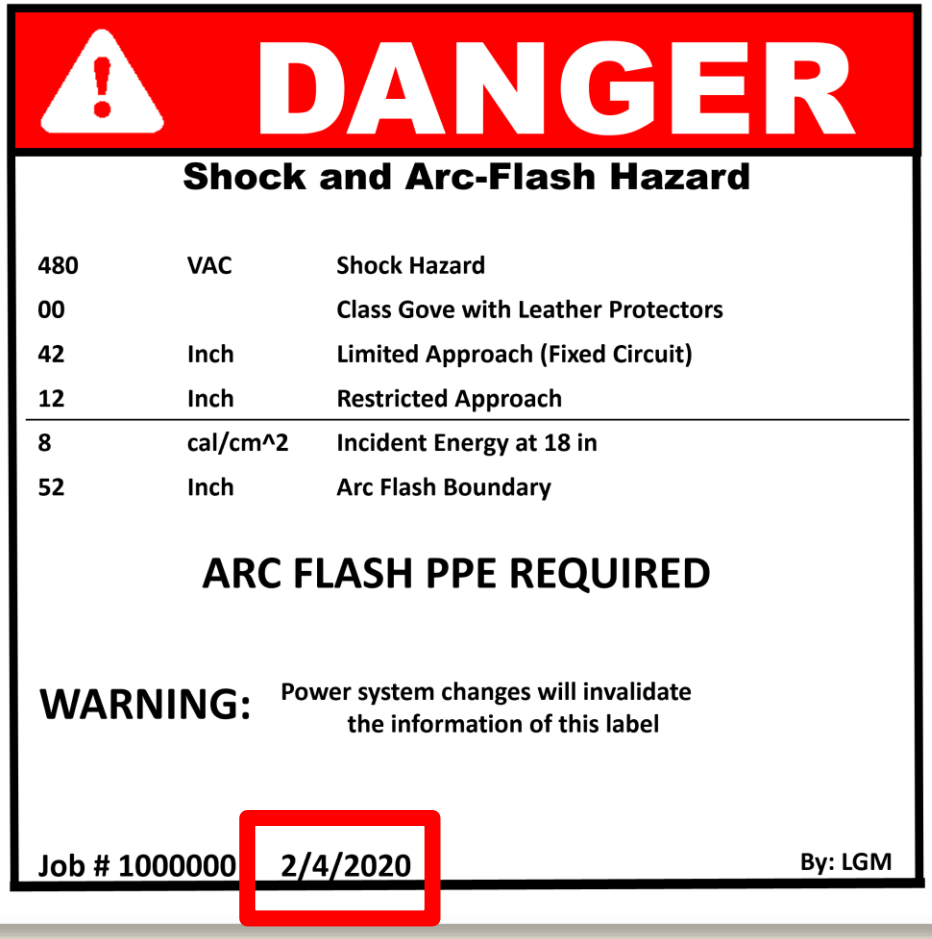
Applicable Standards

Job Safety Planning & Job Briefing (**NFPA 70E-Article 110.5(I)**)
Risk Assessment Procedure **(NFPA 70E-Article 110.5(H)(1))**
Arc Flash Boundaries **(NFPA 70E, Article 130.5)**
Shock Boundaries **(NFPA 70E, Article 130.4)**
PPE **(NFPA 70E, Article 130.7)**
Training **(NFPA 70E-Article 110.6(A)(1))**

Frequency of maintenance is based on condition of equipment (panelboard example).

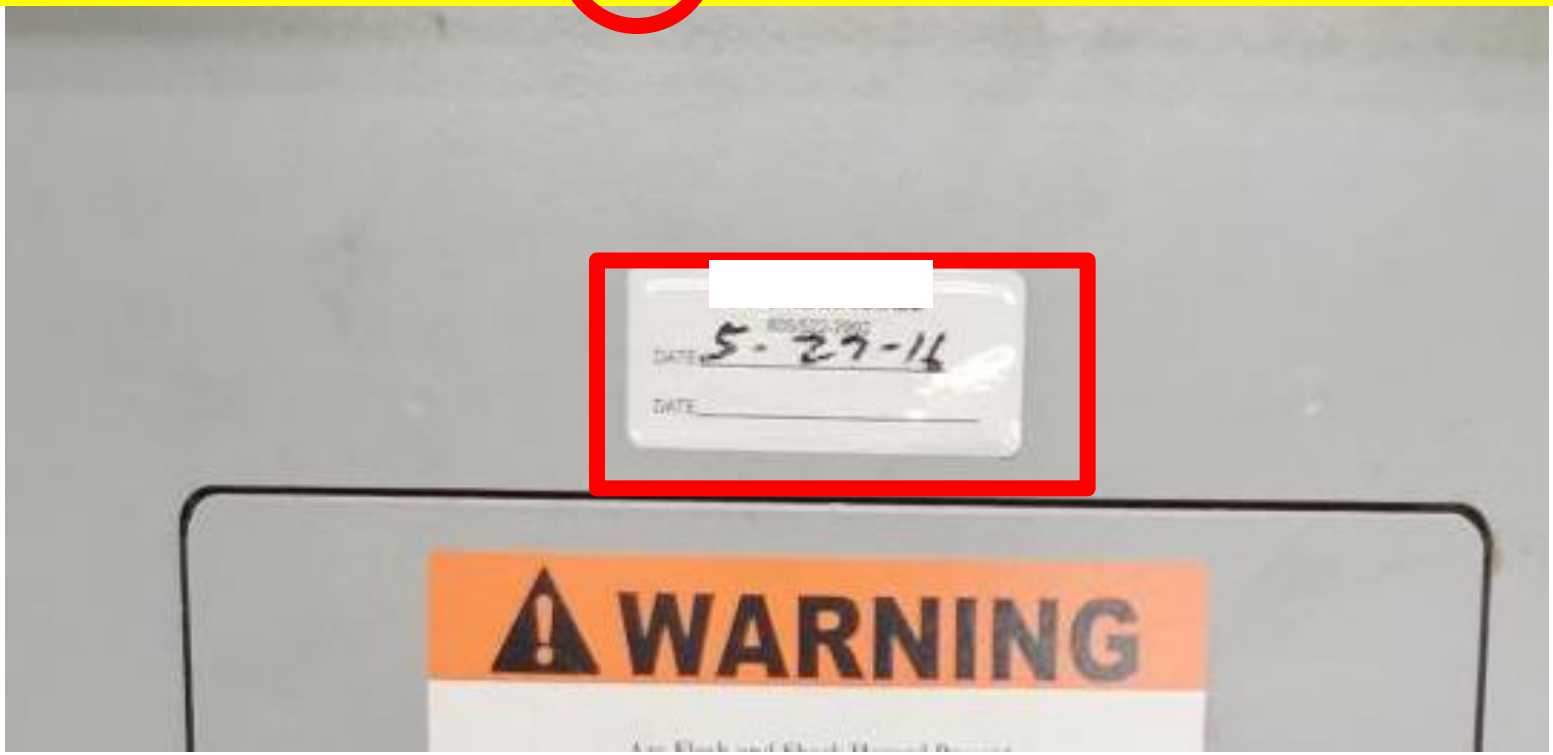
Condition	Assessment Results	Maintenance Frequency
1	Maintained at required intervals.	60 months
2	Previous maintenance cycle revealed issues requiring the repair or replacement of major equipment components.	36 months
3	Equipment has missed the last two successive maintenance cycles.	12 months

Concerns?


DANGER
Shock and Arc-Flash Hazard
480 VAC Shock Hazard
00 Class Gove with Leather Protectors
42 Inch Limited Approach (Fixed Circuit)
12 Inch Restricted Approach
8 cal/cm^2 Incident Energy at 18 in
52 Inch Arc Flash Boundary
ARC FLASH PPE REQUIRED
WARNING: Power system changes will invalidate the information of this label
Job # 1000000
2/4/2020
By: LGM

Q: **This indicates a normal operating condition**.

Yes No, Trick Question?



Maintenance (NFPA 70B)

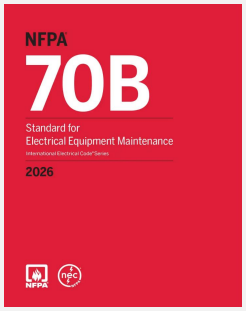
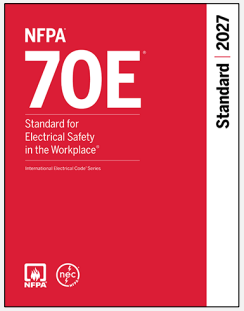
3

Inspections/ Testing

	Table 13.3.5 Panelboard and Switchboard Electrical Testing	
No.	**Task**	**Test Type***
1.	Check Electrical Hardware Connections	NA
2.	Measure insulation resistance of the main bus	2
3.	Masure insulation resistance of control wiring	2A
4.	Test protective devices and systems	2
5.	Perform system operational tests	1 or 2

Some testing operations my need to be performed with equipment energized.

Maintenance (NFPA 70B)

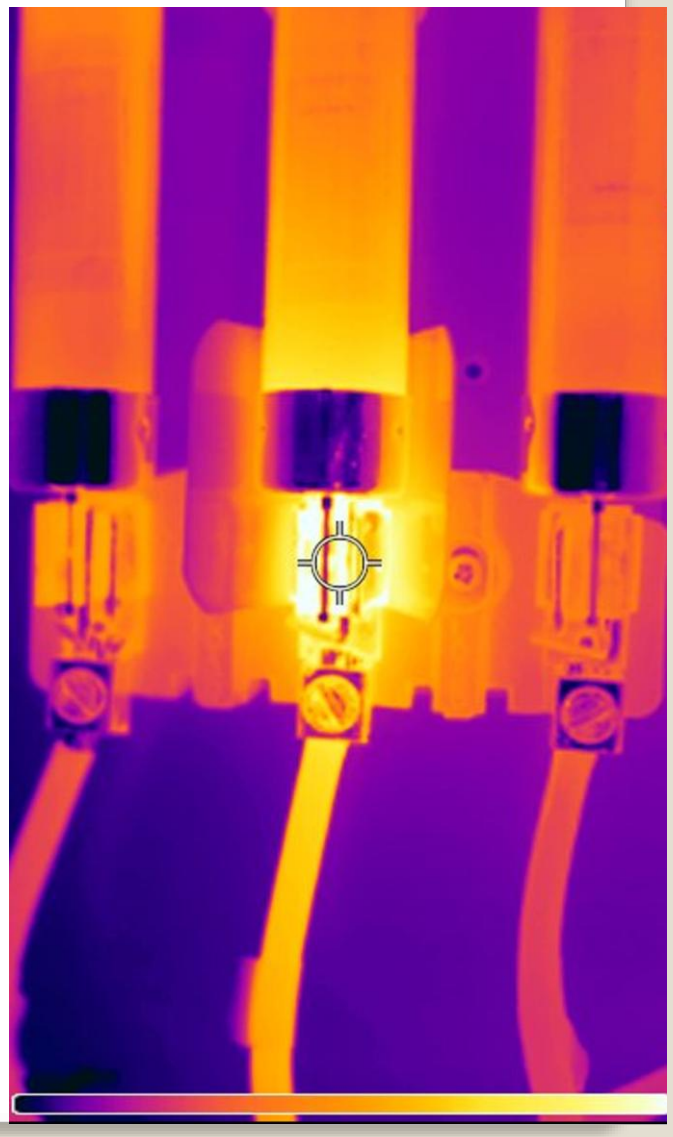
 **Article 6.3, 6.4, 6.7**	 **Article 130.5(E)(1)** **Article 130.5(F)** **Article 130.5(G)/(H)**
• Short-circuit studies • Coordination studies • Incident Energy Analyses	Requires incident energy analysis be performed for administrative and PPE controls.
Performed every 5-years	

4

Plan of Service

Q: What is going on here? Did we identify risk? Was there risk involved in identifying?

Yes, No, Trick Question?

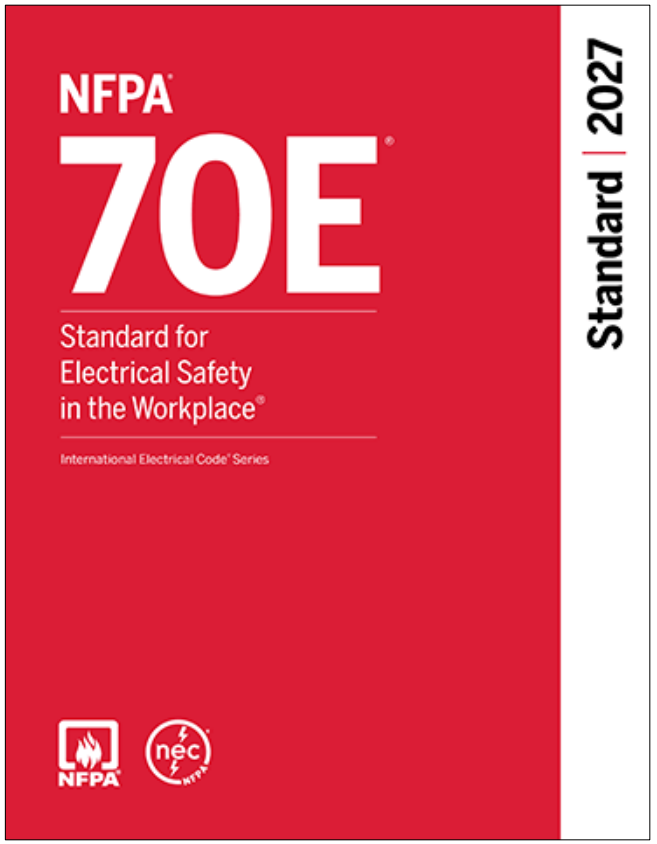


Maintenance (NFPA 70B)

- NFPA 70B Changes in 2026
  - Detailed guidance on how that EMP must be structured, documented, and maintained over time.
  - System studies must be performed at mandatory intervals of no more than five years.
  - Three-tier condition assessment system (Levels 1, 2, and 3).

Work Practices (NFPA 70E)

- NFPA 70E's purpose
  - Protect workers from electrical hazards—such as electric shock, arc flash, and arc blast.
  - Establishing a structured, set of safe work practices for electrical maintenance, troubleshooting, and energized work.



Work Practices (NFPA 70E)

- Before starting each job that involves exposure to electrical hazards:
  - Complete a job safety plan in accordance with the following
    - Completed by a qualified person (one who performs energized work).
    - Documented.

Work Practices (NFPA 70E)

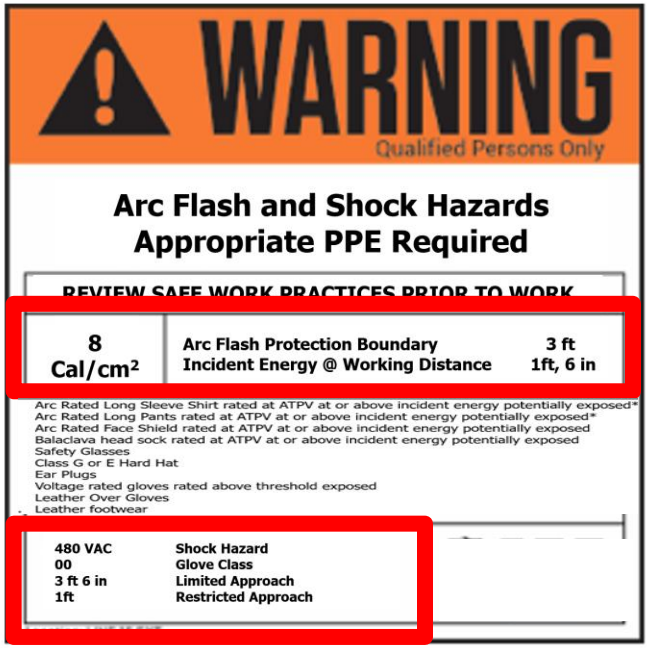
- Job Safety Plan includes the following:
  - Description of job & tasks.
  - Hazards associated with tasks.
  - Shock risk assessment.
  - Arc flash risk assessment.
  - Work procedures.



TASK=NFPA 70E-Table 130.5(C)

TASK	Equipment Condition	Likelihood of Occurrence
Operation of a CB or switch	*Normal*	*No*
Work on energized electrical conductors, including voltage testing	*Any*	*Yes*

VOLTAGE + ARC FLASH=Arc Flash Label

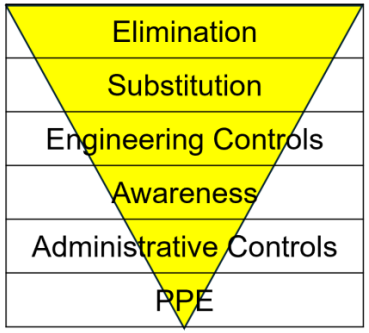


Risk Assessment

Arc flash label indicated energy levels above thresholds.

Likelihood of Occurrence of Harm	Severity of Harm	
	Energy ≤ 1.2 cal/cm2 ≤50 V	Energy > 1.2 cal/cm2 >50 V
No	Low	Medium
Yes	Medium	High

Task table 130.5(C) in NFPA 70E indicated arc flash occurrence is likely.



Work Practices (NFPA 70E)

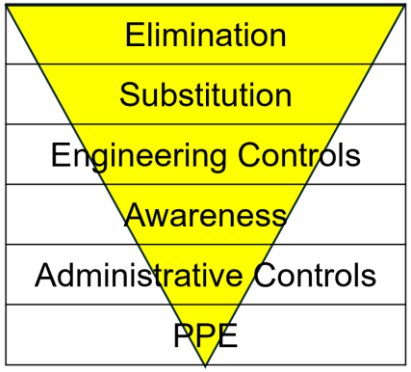
- Acceptable risk for lower level controls include
  - Job safety plan
  - Work permit (if required)
  - PPE
  - Training
  - Programs/SOPs/ECPs







Swiss Cheese Model



- NFPA 70E Changes in 2027
  - Additional Personnel
    - If energized work permit is required.
    - 1 additional person must be present outside arc flash or limited approach boundary, whichever is furthest.
    - **NFPA 70E, Article 130.2(A)(2), page 25**
    - Trained in contact release (emergency response)
    - **NFPA 70E, Article 110.4(C)(1), page 19**

- NFPA 70E Changes in 2027
  - **Expanded Chapter 3 (Safety Requirements for Special Equipment.**
  - **DC and Battery Safety Guidance:** Direct-current (dc) and battery-related requirements.
  - **Hazard Application:** Chapter 3 has been reorganized to better group general hazards, dc hazards, and ac hazards; ac hazards are further separated into sub-RF, RF, and mixed frequencies.

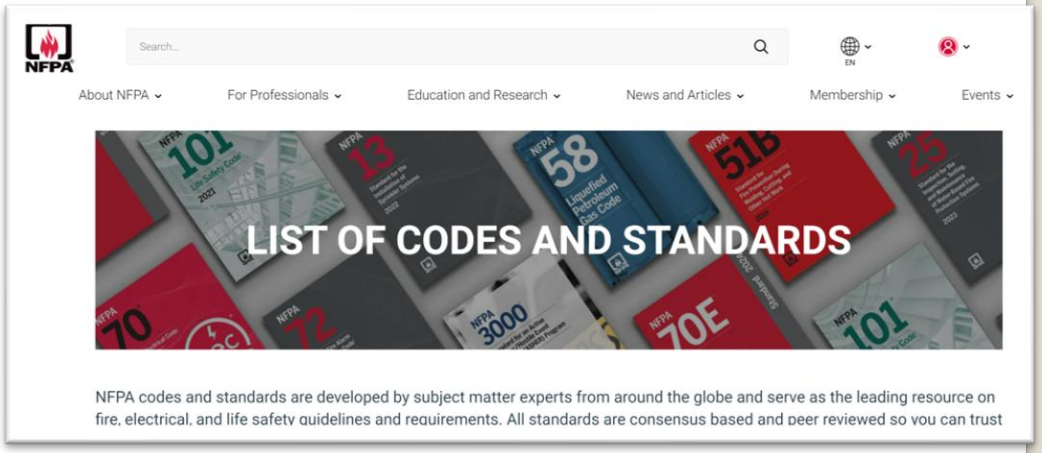
Business Case for Safety

- An effective electrical safety program, along with an electrical maintenance program, will lead to:
  - Higher reliability
  - Longer life of equipment
  - Lower cost than repair
  - Lower insurance costs

Accessing NFPA Codes & Standards

- NFPA standards may be viewed on-line for free, but free access limits download or print of NFPA documents.

  Yes No, Trick Question?



- Answer: There are 3 options for access to NFPA standards. Free access only allows you to view standard.

Accessing NFPA Codes & Standards

