

# NFPA 70B 2023 Edition Key Takeaways

## 4.2 Electrical Maintenance Program (EMP)

NFPA has now stated that organizations **shall implement, inspect, and document** an electrical maintenance program.

### 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 system being serviced.

## 6.8 Electrical Maintenance-Related Design

Where a recognized hazard presents an increased risk during maintenance, **a study shall be conducted** to develop **design options** that could be implemented to reduce risk.

### 7.2.1

The quality of undisturbed bolted electrical bus connections, conductor terminations, and conductor connectors **shall be verified** using one or more of the methods described in 7.2.1.1 through 7.2.1.4.

#### 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.

#### 7.2.1.2 Thermal Sensors

Permanently mounted thermal sensors **shall be permitted** to monitor the temperature of electrical connections and terminations.

### 7.3.2

For equipment rated in excess of 1000 volts, the electrical insulation quality test method **shall be determined** by the EMP.

#### 7.3.2.1 (Highlights the use of Ultrasound and Partial Discharge Testing).

The test method **shall be** one or more of the following:

1. DC insulation resistance.
2. AC or DC dielectric withstand testing.
3. DC overpotential (hipot) testing
4. AC insulation power factor/dissipation factor testing.
5. Very low frequency (VLF) testing.



6. Damped alternating current (DAC) voltage test.
7. Acoustical **ultrasonic testing**.
8. **Partial discharge (PD) testing**.

## 7.4 INFRARED THERMOGRAPHY

### 7.4.1

Infrared thermography **shall be used** when required to verify temperature differences ( $\Delta T$ ) of the following:

- (1) Similar electrical components under similar loading.
- (2) Comparison between electrical components and ambient air temperatures.

### 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. This is not necessary if your equipment is fitted with the appropriate IR windows.

### 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**.

### 7.4.5

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

### 7.4.6

Circuit loading characteristics **shall be documented and retained** for future reference.

## CHAPTER 8 FIELD TESTING AND TEST METHODS

### 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.

**(Infrared, Ultrasound, and Partial Discharge are these types of tests).**

**8.4 Qualifications of Testing Personnel. (Indicates that proper training for specific test procedures/equipment is now a mandate)**



#### 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.

### 8.6 Test Records

#### 8.6.1

A test record **shall be created** for all field tests of electrical equipment.

#### 8.6.2

Test records **shall contain** the following minimum information:

1. Identification of the testing person and organization.
2. Identification of the equipment under test.
3. Nameplate or label data from the equipment under test.
4. Environmental conditions, such as humidity and temperature, could affect the results of the tests or calibrations.
5. Date of the test.
6. Indication of test performed.
7. Indication of pass/fail criteria, where applicable.
8. Indication of as-found and as-left test results, where applicable.
9. Test operator's comments or recommendations, where applicable.

### Equipment Condition Assessment

Product	Scope of Work	Condition 1	Condition 2	Condition 3
All Equipment	Infrared Thermography	12 months	12 months	6 months

## CHAPTER 9 MAINTENANCE INTERVALS

**9.2.2** Highlights the maintenance intervals recommended. Infrared inspection on all equipment is a standalone recommendation, an inspection schedule is set out for different risk categories below

(Condition 1 = least critical, Condition 3 = most critical).



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## CHAPTER 11 – POWER AND DISTRIBUTION TRANSFORMERS

### 11.3.1

Visual inspections **shall be conducted**.

## CHAPTER 12 – SUBSTATIONS AND SWITCHGEAR

### 12.3.1

Visual inspections **shall be conducted**.

### 12.3.5 Electrical Testing

Requires online **Partial Discharge testing**, also requires inspecting electrical connections for high resistance, which **infrared** can assist to detect.

## CHAPTER 13 – PANELBOARDS AND SWITCHBOARDS

### 13.3.1

Visual inspections **shall be conducted**.

### 13.3.5 Electrical Testing

Checking electrical hardware connections **shall be completed**, which Infrared testing can help with.

## CHAPTER 14 – BUSWAYS

### 14.3.1

Visual inspections **shall be conducted**.

### 14.3.5 Electrical Testing

Online Partial Discharge testing **shall be conducted**.

## CHAPTER 15 – CIRCUIT BREAKERS

### 15.3.1 (low voltage)

Visual inspections **shall be conducted**.

### 15.3.5 Electrical Testing (low voltage)

Infrared inspection **shall be conducted**.



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#### **15.4.1 (medium voltage)**

Visual inspections **shall be conducted**.

#### **15.4.5 Electrical Testing (medium voltage)**

Infrared inspections **shall be conducted**.

### **CHAPTER 16 – FUSES**

#### **16.3.1**

Visual inspections **shall be conducted**.

#### **16.3.5 Electrical Testing**

Infrared inspections **shall be conducted**.

### **CHAPTER 17 – SWITCHES**

#### **17.3.1**

Visual inspections **shall be conducted**.

#### **17.3.5 Electrical Testing**

Infrared inspections **shall be conducted**.

### **CHAPTER 18 – POWER CABLES**

#### **18.3.1**

Visual inspections **shall be conducted**.

#### **18.3.5 Electrical Testing**

Airborne Ultrasound inspection **shall be conducted**.

### **CHAPTER 19 – CABLE TRAY**

#### **19.3.1**

Visual inspections **shall be conducted**.



### 19.3.5 Electrical Testing

Infrared inspections **shall be conducted**.

## CHAPTER 20 – GROUNDING AND BONDING

### 20.3.1

Visual inspections **shall be conducted**.

## CHAPTER 25 – UNINTERRUPTIBLE POWER SUPPLIES (UPS)

### 25.3.1

Visual inspections must be conducted.

### 25.3.5 Electrical Testing

Infrared thermography inspections of lug terminal **shall be conducted**.

## CHAPTER 27 - ROTATING EQUIPMENT

### 27.3.5 Electrical Testing

Online Partial Discharge testing and Vibration analysis **shall be conducted**.

## CHAPTER 28 – MOTOR CONTROL EQUIPMENT

### 28.3.1

Visual inspections **shall be conducted**.

### 28.3.5 Electrical Testing

Inspections of electrical connections for high resistance **shall be conducted**. Infrared inspections can help with this.

## CHAPTER 32 – BATTERY ENERGY STORAGE SYSTEMS

### 32.4.1

Visual inspections **shall be conducted**.



### **32.4.5 Electrical Testing**

Infrared inspections **shall be performed.**

## **CHAPTER 36 – STATIONARY STANDBY BATTERIES**

### **36.4.1**

Visual inspections **shall be conducted.**

### **36.4.5 Electrical Testing**

Infrared inspections **shall be conducted.**



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## KEY TAKEAWAYS

- This is the first year that the NFPA 70B has gone from recommended practice to a **standard**.
- NFPA now requires companies to have an **electrical maintenance plan**.
- NFPA now requires **individuals to be trained** in the specific task they are completing / tool they are using.
- Even though in 7.4.2 it says that all available panels must be removed for clearer infrared images in the inspection process, 6.8 says that **dangerous tasks shall be evaluated and designed to make them safer**, which is where IR windows come back into the conversation. **IR Windows are considerably safer than open panel inspections**.
- NFPA now requires **infrared inspections** on all electrical equipment on a minimum of an **annual basis**, if not more frequently depending on the category of hazard that they fall into (1-3).
- NFPA also requires **Ultrasound, Vibration and PD testing**.
- NFPA goes through the different categories of electrical assets and recommends **visual, infrared, PD and ultrasound testing** across asset types.

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