



NFPA 70E[®] Standard - 2024 Edition

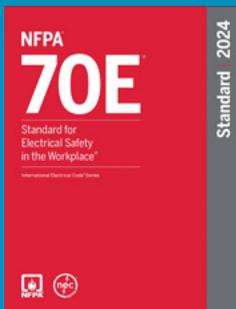
The *Standard for Electrical Safety in the Workplace*[®] Clarifies Provisions for Absence of Voltage Testers

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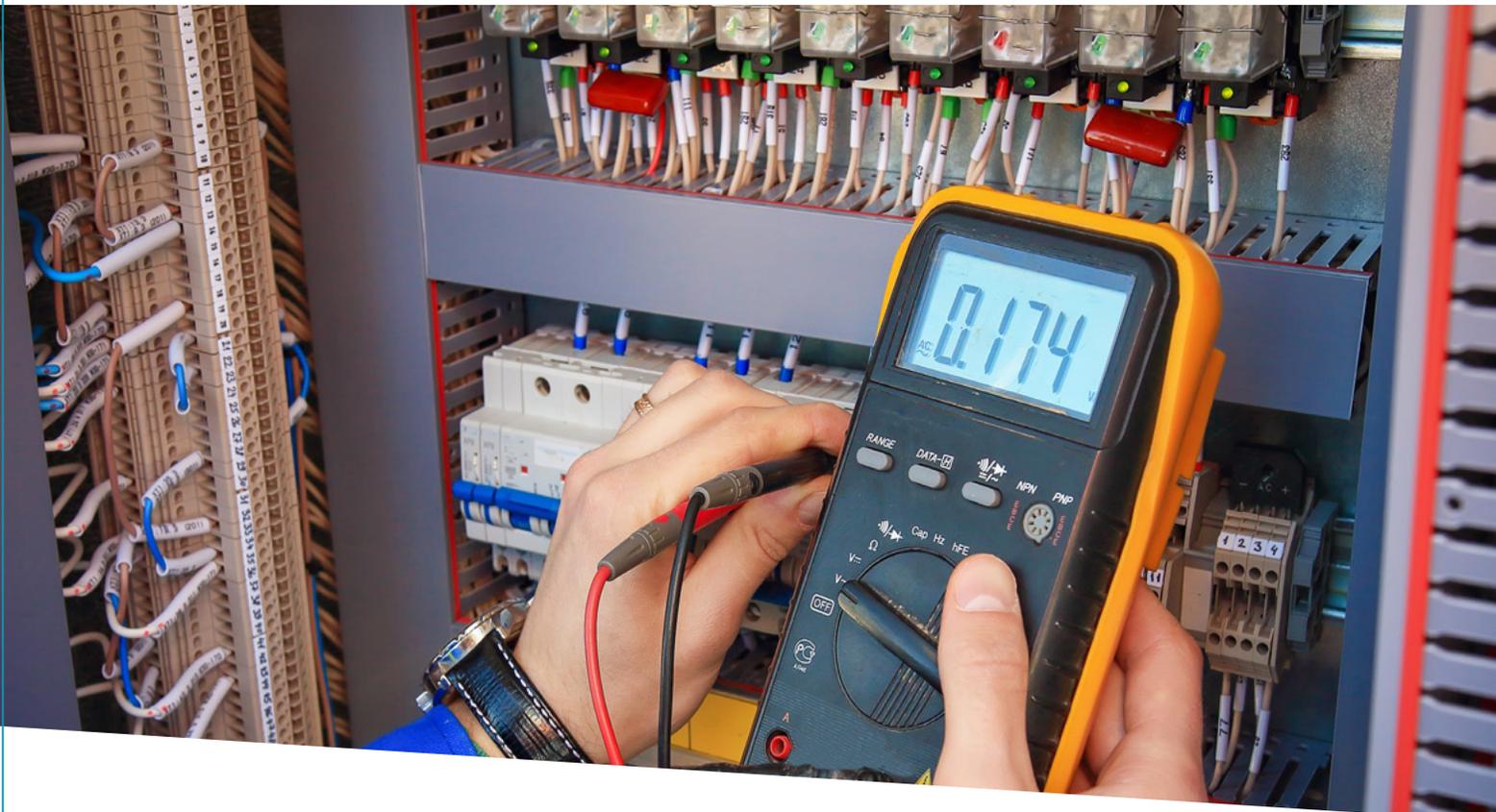


Introduction



NFPA 70E 2024 Standard for Electrical Safety in the Workplace.

The National Fire Protection Association (NFPA) is a trade association that develops and maintains various standards and codes designed to prevent injury and economic loss caused by fire and electrical related hazards. The organization publishes NFPA 70E®, the Standard for Electrical Safety in the Workplace® and updates the standard every three years. One change in the latest version, NFPA 70E 2024, includes new language in the now Article 120.6 (7), providing clarity regarding the requirements for the location an absence of voltage test is conducted. This white paper examines options for absence of voltage testing, the new language, how different types of products compare, and explains how the VeriSafe Absence of Voltage Tester (AVT) continues to comply with the changes to NFPA 70E.



Method for Verifying the Absence of Voltage

NFPA 70E-2024, Article 120.6, Process for Establishing and Verifying an Electrically Safe Work Condition, describes a series of steps to verify the absence of voltage after equipment has been de-energized with lockout/tagout equipment applied.

Prior to 2018, the process electrical workers would use to verify the absence of voltage in a panel or other electrical equipment required the use of an “...adequately rated test instrument...”, which was not very specific.

In 2018 a distinction was made between portable and permanently mounted testers. An exception was added that included specific requirements for permanently mounted absence of voltage testers (AVT). In NFPA standards, an exception is an alternate method to comply with a mandatory requirement. This means that personnel can choose to use either a portable test instrument or a permanently mounted absence of voltage tester to verify the absence of voltage, but both methods are not required.

In the 2021 edition, Step (7) and the Exception were modified to improve the clarity of the requirements. In the 2024 edition, Step (7) was aligned to Exception number 1 (the alternative method utilizing an AVT), by including “at each point of work”. Emphasizing that measurements for verifying the absence of voltage should be taken at the point of work.

Changes in the 2024 edition are underlined below:

NFPA 70E 2024 120.6

“(7) Use an adequately rated portable test instrument to test each phase conductor or circuit part at each point of work to test for the absence of voltage. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the test instrument is operating satisfactorily through verification on any known voltage source.

Exception No. 1 to (7): An adequately rated permanently mounted absence of voltage tester shall be permitted to be used to test for the absence of voltage of the conductors or circuit parts at the work location, provided it meets the all following requirements:

1. It is permanently mounted and installed in accordance with the manufacturer’s instructions and tests the conductors and circuit parts at the point of work;
2. It is listed and labeled for the purpose of testing for the absence of voltage;
3. It tests each phase conductor or circuit part both phase-to-phase and phase-to-ground;
4. The test device is verified as operating satisfactorily on any known voltage source before and after testing for the absence of voltage.

Informational Note No. 2: For additional information on rating and design requirements for permanently mounted absence of voltage testers, refer to UL 1436, Outlet Circuit Testers and Other Similar Indicating Devices.”

Although Exception No. 1 has been in NFPA 70E since the 2018 edition, recent updates in 2024 add clarity to where the testing for the absence of voltage should be measured.

Absence of voltage testers were required to test at the point of work since they were first introduced to the standard in the 2018 edition. It is great to see the requirement that portable test instruments also test at the point of work.



Meeting Exception 1 of NFPA 70E 2024, Section 120.6 (7)

While several devices on the market seem to meet the requirements detailed in Exception 1, it is important to thoroughly examine each of these devices to determine if they sufficiently satisfy the criteria set forth.

Voltage Test Portals with a Hand-held Voltage Tester

Test portals are permanently mounted devices that can be used with a portable tester, such as a digital multimeter, to measure voltage. These devices are an excellent tool for troubleshooting and determining the magnitude or value of any voltage that is present.

Adding “at each point of work”, further emphasizes the concern with utilizing a test portal and a portable test instrument. Using this combination does not satisfy “at each point of work.” You are not testing at the point of work, you are testing at a remote point.

Additionally, the same concern with using test portals with a portable test instrument can lead to unreliable results when testing for the absence of voltage and is not recommended. For example, test portals do not meet the requirements of part (2) of Exception 1—there is no way to confirm that the probes of the hand-held tester are in direct contact with the electrical conductors inside the enclosure at the time of test. If the leads from a voltage

portal are not properly terminated or disconnected, voltage will not be detected, regardless of whether or not the conductor is energized. Often the leads of test portals are fused, resulting in a measurement at the load side of the fuse, not the source conductor. An open fuse will lead to a de-energized measurement, even when voltage is present. Further, although some test portals may be UL listed, they are not listed for the purpose of verifying the absence of voltage and do not meet part (2) of Exception 1.

Test portals are permanently mounted but rely on a portable tester. As a hybrid, test portals would have to meet the requirements of both Step 7 and Exception No. 1 to ensure a reliable result. The test portal can be thought of as an extension of the circuit part or source conductor — not the actual circuit part. Portals are okay to do a preliminary verification check at the portal. However, before removing PPE or performing any work, best practice is to perform an additional test with the portable test instrument directly at the source conductor (or, “at each point of work”) or actual circuit part to conclusively prove a de-energized condition exists.

Test portals are a great tool to reduce risk when troubleshooting and measuring voltage presence. However, proving absence of voltage through a permanently mounted device has additional requirements that test portals do not meet.

Panel Meter

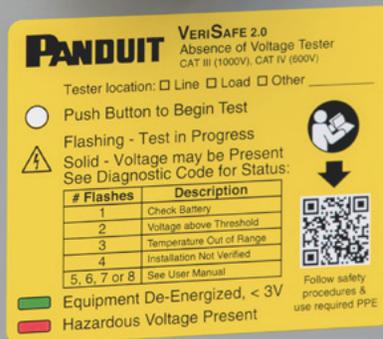
Although it may appear that a panel meter would meet the requirements of Exception 1, the problems lie with part (2), (3), and (4). These do not meet part (2) without a listing for verifying the absence of voltage, such as UL 1436. Part (3) dictates that the tester analyzes each phase from phase-to-ground and phase-to-phase. In-panel voltage meters are hard wired but typically only measure phase-to-ground voltage.

A panel meter does not have a self-test function to verify proper operation, required in part (4). A panel meter checking for voltage may be defective and therefore may not indicate that voltage is present when equipment is energized. Another failure case can occur if one of the sensing leads has dislodged and is no longer connected to the source. Panel meters can warn of voltage presence, but any indication of absence of voltage is not guaranteed.

Voltage Indicator

A voltage indicator is an installed device that illuminates when voltage is present; however, a voltage indicator can be unreliable. When lights on the indicator are off, there could still be voltage if there is a hardware failure, such as the indicator functioning abnormally or if the LEDs fail. Improper installation of a voltage indicator or loose leads can cause the voltage indicator to become disconnected from its source, resulting in false or unreliable indications. These are some of the reasons why OSHA stated in an Interpretation Letter¹ that voltage indicators are not allowed to be used to verify the isolation or to verify the absence of voltage of a machine or equipment. Regardless of whether electrical or mechanical work will be performed, voltage indicators are not a test instrument and should not be used when verifying the absence of voltage. Ultimately, voltage indicators do not meet the requirements for part (2), (3), and (4) of Exception 1





Absence of Voltage Tester (AVT)

An AVT differs from other permanently mounted electrical safety products because it is designed specifically to prove the absence of voltage exists. The traditional method of using a portable voltage tester to check for an absence of voltage requires equipment doors to be open to conduct the test. This exposes the electrical worker to potentially lethal voltages. However, AVTs allow the worker to verify the absence of voltage prior to opening the panel which reduces the risk of an electrical incident.

To operate an AVT, a user pushes a button to initiate the test sequence. The test sequence is performed automatically and includes verifying the tester is functioning with a known voltage source, ensuring the tester is properly installed and in direct contact with the circuit at the time of testing, and testing for absence of AC and DC voltage phase-to-phase and phase-to-ground. If all requirements in the test sequence are satisfied, a green indicator will illuminate to visually convey that the absence of voltage has been confirmed.

All AVTs use active indicators to visually convey that voltage is not present. As an additional safety feature, some testers such as the VeriSafe AVT incorporate voltage indicators to show when voltage is present, similar to a voltage indicator. Requirements in UL 1436 for AVTs are very extensive and include a variety of features to ensure the absence of voltage test function is fail-safe and reliable. Active indicators, built-in overcurrent protection, and SIL 3 reliability for all safety functions are some of the important features. In addition, AVTs are designed to keep hazardous voltage away from the door and user interface.

Key features of an AVT

- Tests without exposure to harmful voltages
- Self-contained; no need for additional meters or tools
- Built-in pre-/post-verification test
- Verification that the tester is in contact with the circuit before and after every test
- Tests for absence of AC and DC voltage
- Tests phase-to-phase and phase-to-ground
- Automated test sequence
- Active indication for absence of voltage
- Safety functions meet safety integrity level (SIL) 3 per IEC 61508²

¹Galassi, T. (2012, December 12). Whether an LED type device can be used for the isolation and deenergization verification requirements of 1910.147 and 1910.333 Retrieved from <https://www.osha.gov/laws-regs/standardinterpretations/2012-12-12www.osha.gov/laws-regs/standardinterpretations/2012-12-12>.

²IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems.

Product Comparison

Table 1 shows a side-by-side comparison on how permanently mounted products including voltage meters, voltage indicators, test portals, and the VeriSafe AVT perform with respect to the requirements in Exception 1. Only the VeriSafe AVT meets all of the requirements for verifying the absence of voltage.

Table 1. Side-by-Side Comparison of Devices and Capabilities.

NFPA 70E-2024 120.6 (7) Exception No. 1		 Voltage Meter	 Voltage Indicator	 Voltage Test Portals	 VeriSafe AVT
(1)	It is permanently mounted and installed in accordance with the manufacturer's instructions.	Yes	Yes	Yes	Yes
(1)	It tests the conductors and circuit parts at the point of work.	N/A (no test function)	N/A (no test function)	No (no guarantee hand-held tester is in contact with circuit)	Yes
(2)	It is listed and labeled for the purpose of testing for the absence of voltage	No	No	No	Yes
(3)	It tests each phase conductor or circuit part both phase-to-phase and phase-to-ground	Only phase-to-ground	Only phase-to-ground	Yes, with hand-held tester	Yes
(4)	The test device is verified as operating satisfactorily on any known voltage source before and after testing for the absence of voltage	No	No	No (hand-held tester requires access to a known voltage source)	Yes
Note 1	Meets rating and design requirements for absence of voltage testers described in UL 1436	No	No	No	Yes

VeriSafe AVT – The Safe, Efficient, Accurate Way to Verify

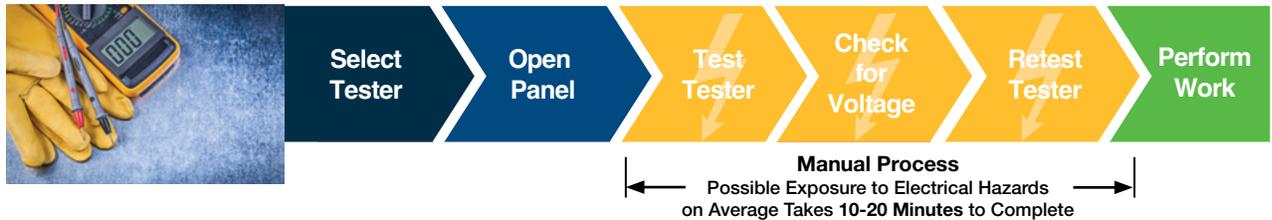
When servicing electrical equipment, workers must comply with safety regulations that require a test to confirm the absence of voltage. Prior to performing de-energized work on electrical equipment, NFPA 70E requires that workers verify equipment is in an electrically safe work condition. Permanently mounted testers, like the VeriSafe AVT make testing for absence of voltage safer and more efficient. The VeriSafe AVT is the first absence of voltage tester listed to UL 1436 designed specifically for the requirements of NFPA 70E-2024, Section 120.6 (7), Exception 1.



The VeriSafe AVT tests for absence of voltage in electrical enclosures with 1,000 volts or less helps reduce electrical hazards and the complexity of testing with a hand-held tester, and is more reliable than a simple voltage indicator or meter.

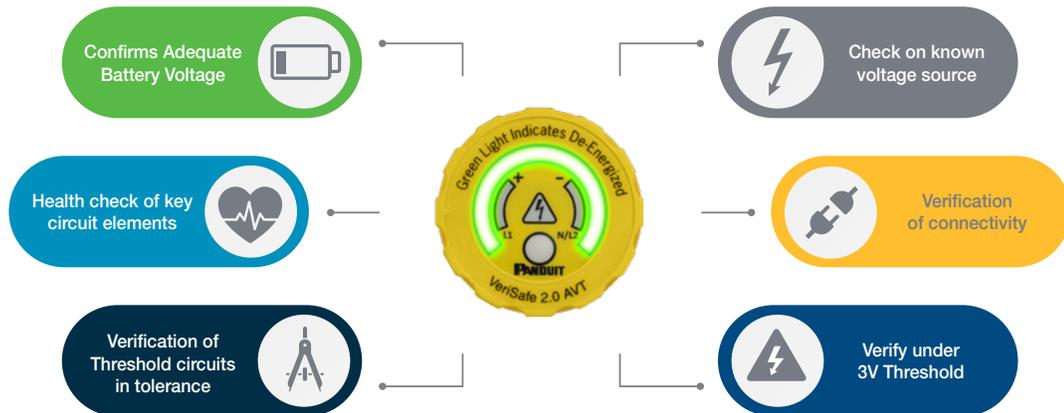
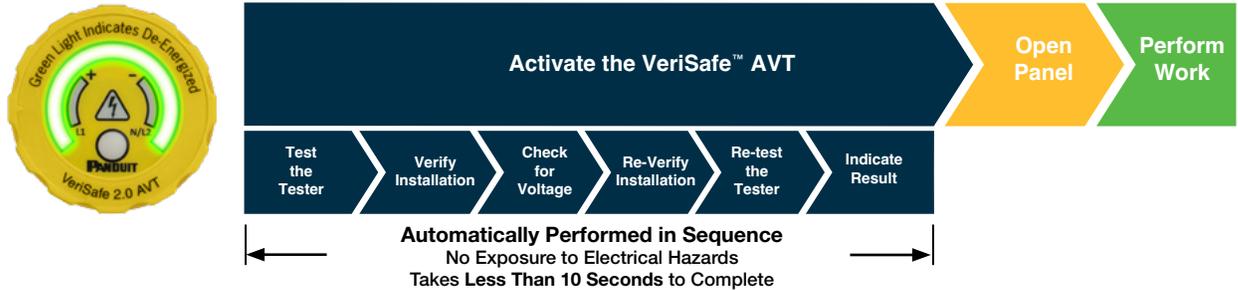
Visit www.panduit.com/verisafe for more information.

Portable Testers



VS.

VeriSafe™ Absence of Voltage Testers





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