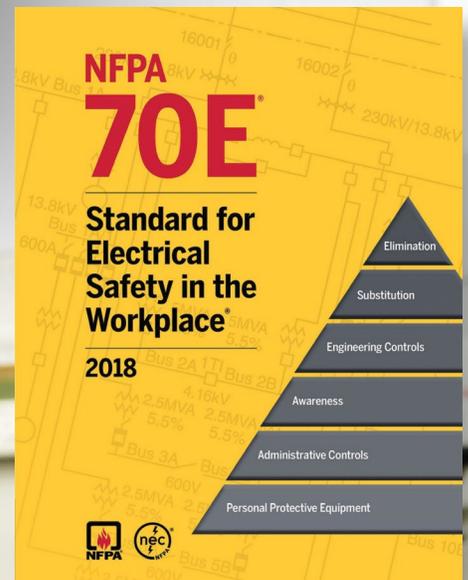


Update To The NFPA 70E Standard

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

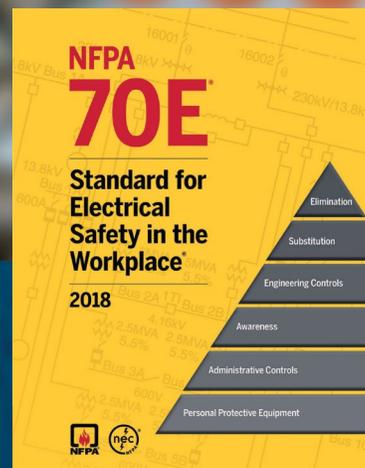


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The National Fire Protection Association (NFPA) is a trade association that develops and maintains various standards and codes designed to prevent injury and economic loss caused by fire and electrical related hazards. The organization published NFPA 70E, the *Standard for Electrical Safety in the Workplace* and updates the standard every three years. One change in the latest version, NFPA 70E 2018, includes new language in Article 120.5 (7) about absence of voltage verification. This white paper examines the new NFPA 70E options for absence of voltage testing, reviews the advantages and limitations of various voltage testing and voltage indicator products, and explains how the VeriSafe™ Absence of Voltage Tester (AVT) complies with the new NFPA 70E requirements.



NFPA 70E 2018 Standard for Electrical Safety in the Workplace.



Updated Method of Checking for Absence of Voltage

Prior to NFPA 70E 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...”,¹ which was typically interpreted as a hand-held voltage tester.

NFPA 70E, Article 120.5, *Process for Establishing and Verifying an Electrically Safe Work Condition*, has always contained a step to verify the absence of voltage.

The 2018 edition includes an exception, also known as an approved alternative, to using a hand-held test instrument. The new exception describes an absence of voltage tester (AVT).

The new language in NFPA 70E-2018, Article 120.5 (7) states:

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

- A. 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
- B. It is listed and labeled for the purpose of verifying absence of voltage
- C. It tests each phase conductor or circuit part both phase-to-phase and phase-to-ground
- D. The test device is verified as operating satisfactorily on any known voltage source before and after verifying the absence of voltage

For the remainder of this paper, NFPA 70E-2018, Article 120.5 (7), Exception 1 will be referred to as *Exception 1*.

¹Standard for Electrical Safety in the Workplace 2015 Edition, NFPA 70E, 2014.

More Meaningful Connections ■■■

Part of the motivation for including Exception 1 was to stimulate original solutions and development of new technology for safety applications and make testing for an absence of voltage safer and more efficient. For example, when performing the traditional method of using a hand-held voltage tester to check for an absence of voltage in a control panel, the door must be open to conduct the test. This exposes the electrical worker to potentially lethal voltages. However, implementing AVT devices allows the worker to verify the absence of voltage prior to opening the panel which reduces the risk of an electrical incident.

Meeting Exception 1 of NFPA 70E-2018, Section 120.5 (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

Voltage test portals are sometimes installed on equipment so workers can use hand-held voltage testers before opening the enclosure. However, this combination does not meet the requirements of Subsection C since 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.

Additionally, the use of a hand-held tester requires access to a known voltage source to verify the tester is functioning.

Panel Meter

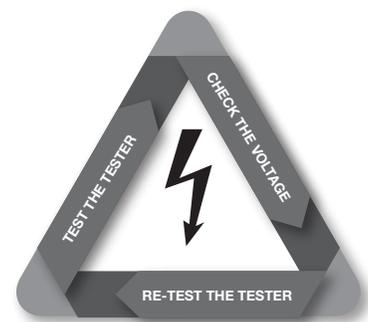
Although it may appear that a panel meter would meet the requirements of Exception 1, the problems lie with Subsections B, C, and D. Subsection C dictates that the tester analyzes each phase from phase-to-ground and phase-to-phase. In-panel voltage meters are hard wired and are installed only to measure phase-to-ground voltage.

A panel meter cannot self-test and determine proper operation. A panel meter checking for voltage may be defective and therefore may not indicate that voltage is present and that the panel is energized. Another cause for mis-indicating that a voltage is not present is if one of the sensing leads has dislodged and is no longer connected to the line.

Because of these limitations, panel meters cannot be listed for verifying the absence of voltage and do not meet the requirement in Subsection B.



Risky Business: Potential Electrical Hazards Exist When Performing Absence of Voltage Testing





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. Ultimately, voltage indicators do not meet the requirements for Sections B, C, and D.

Absence of Voltage Tester (AVT)

An AVT differs from the previous devices discussed because it is a reliable test device that uses active indicators. 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. Before the absence of voltage indicator illuminates, the AVT verifies that it is installed properly, the tester is installed properly, the tester is functioning properly, and neither AC nor DC voltage is detected.

Table 1 is a side-by-side comparison on how well hand-held testers, installed voltage meters, voltage indicators, and the VeriSafe AVT comply with the requirements dictated in Exception 1.

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

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

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

Exception 1, Subsection:		Voltage Meter	Voltage Indicator	Voltage Test Portals	VeriSafe AVT
A	It is permanently mounted and installed in accordance with the manufacturer's instructions.	Yes	Yes	Yes	Yes
	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
B	It is listed and labeled for verifying the absence of voltage	No	No	No	Yes
C	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
D	The test device is verified as operating satisfactorily on any known voltage source before and after verifying the absence of voltage	No	No	No (hand-held tester requires access to a known voltage source)	Yes

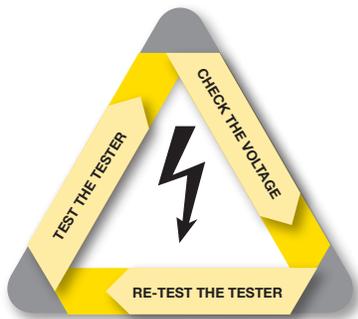
As shown in Table 1, the VeriSafe AVT performs all the steps for verifying the absence of voltage as outlined in Exception 1.

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

When servicing electrical equipment, workers must comply with safety regulations that require a voltage verification test to validate 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. The VeriSafe AVT is the first absence of voltage tester listed to UL 1436 designed specifically for the requirements of NFPA 70E-2018, Section 120.5 (7), Exception 1.

The VeriSafe AVT tests for absence of voltage in low voltage electrical enclosures, 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.

Minimize Your Risk: VeriSafe™ AVT Verifies Absence of Voltage Before Equipment is Accessed



Visit <http://www.panduit.com/verisafe> for more information.



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