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Thorne & Derrick
+44 (0) 191 410 4292
www.powerandcables.com

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NEW VeriSafe™ Absence Of Voltage Tester– Improving Efficiency And Reducing Costs

New Technology For The Factory Floor That Automates Absence Of Voltage Testing- Reducing Time, Complexity, And Costs

WHITE PAPER

When servicing electrical equipment, workers must comply with safety regulations that require a voltage verification test to validate the absence of voltage. This process requires strict adherence to prevent accidents and bodily injury, but includes many stages that can be complex and time-consuming when using hand-held portable test instruments. This paper examines the costs and limitations involved with using a manual absence of voltage tester. It also describes a new technology for the factory floor that automates the process, reducing time, complexity, and costs.

Historical Costs of Checking for Absence of Voltage

Numerous studies exist pertaining to injuries resulting from electric shock and arc flash events. These studies recognize that establishing the economic payoffs of prevention is a critical factor in promoting workplace safety. Besides personal injury, the costs of property and equipment damage need to be considered. Although estimates vary, studies have shown that the average direct cost of an electrical injury ranges from about US $50,000 to US $80,000[1], while the indirect cost can exceed the direct cost by a factor of nearly four[2]. Direct costs include lost wages or workers' compensation payments, medical expenditures, and legal expenses. Indirect costs include:

- wages paid during work stoppage
- administrative costs related to injury
- property damage and repair
- training and compensation for replacement workers
- lost productivity with less experienced workers
- fines related to workplace safety violations
- potential increase in absenteeism
- decrease in morale

Electrical injuries have one of the highest average workers' compensation costs, second only to motor vehicle accidents[3].

Injuries from contact with exposed wiring, transformers, or other electrical components frequently occur in the workplace and involve construction, installation, maintenance, and repair workers. These injuries are often costly and serious, as demonstrated by the number of days away from work; 51% of workers missed over one week of work due to these injuries, with 40% missing two weeks or more[4,5].

Limitations of Using a Hand-held Tester

Verifying the absence of voltage is part of the process to establish an electrically safe work condition. Step 5 of NFPA 70E-2015 Article 120.5[6] describes this process:

Use an adequately rated test instrument to test each phase conductor or circuit part to verify it is de-energized. 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 a known voltage source.

This process usually involves a portable, hand-held voltage test instrument. To be effective, it is critical to perform each step of the process in sequence, and it requires taking the necessary precautions, such as the proper use of personal protective equipment (PPE) (Figure 1).

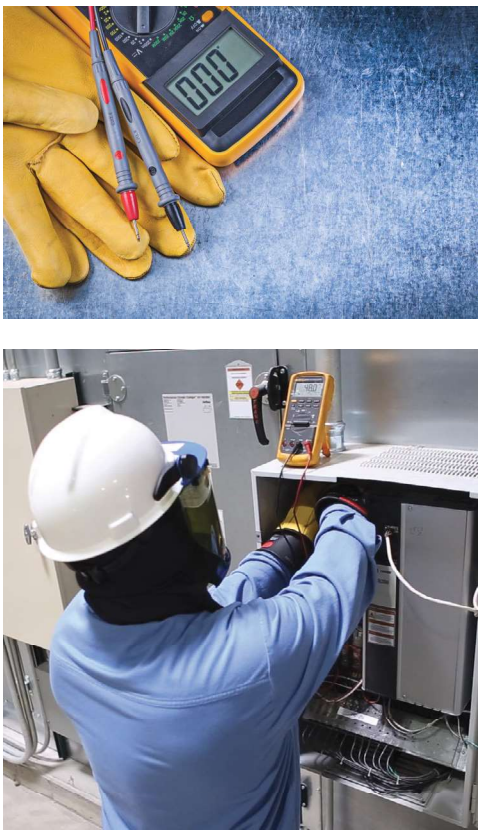


Figure 1. Absence of voltage test using a hand-held voltage test instrument.

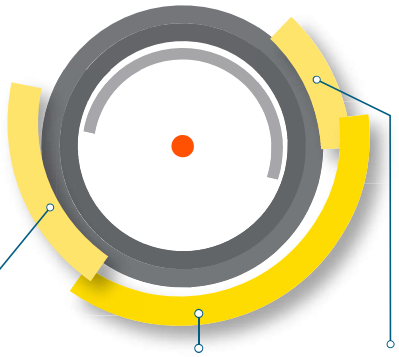
Complexity

Adhering to this process prevents electrical injuries, but the process is complex and time consuming. Portable instruments are susceptible to mechanical and electrical failure and misuse by the person using the device. In addition, because the process of using a hand-held tester is dependent on human input, interaction, and interpretation, it is vulnerable to mistakes and errors.

Training Costs

Training on the selection, maintenance, and use of test instruments is crucial as are systems for inspecting and maintaining voltage test instruments. However, training and maintaining the test equipment incur the additional expenses of time and cost.

Safety Is In Your Hands: The Risks of Voltage Testing



18.3%[7]
Facilities experienced a personal injury when using hand-held voltage test instruments

36.7%
Reported near misses of personal injury

11.7%
Facilities experienced interruptions to plant operations due to voltage testing incidents

Electrical Safety

A disadvantage of implementing a voltage verification test with a hand-held tester is that the person performing it may be exposed to electrical hazards while verifying that the tester is working prior to and after the test, and during the test if the equipment was not de-energized. With such a significant emphasis on performing work only on de-energized equipment, it is ironic that best practice relies on PPE and exposure to hazards before de-energized work begins. The need for PPE is a significant contributor to the overall time to carry out this process because the worker must first determine the required PPE, then obtain, inspect, dress, and properly store it after use. Additionally, PPE can be misused or not used at all, especially when there are time constraints.

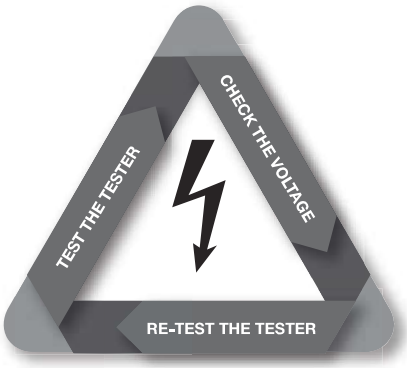
When processes are overly complex or time-consuming, workers tend to become complacent and develop shortcuts as practices become routine. A normalization of deviance—small, gradual deviations from an established practice—may occur over time. With the lack of negative consequences, the lower standard eventually becomes the norm[8,9].

Even when hazards are part of the everyday routine, deviations from a safety procedure can slowly become accepted practice. These deviations are particularly evident when there are time pressures, which is often the case when electrical maintenance causes unplanned or excessive downtime. If either training or enforcement of administrative procedures is lacking, the effectiveness of the procedures will diminish.

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

TRADITIONAL METHOD

Determining absence of voltage with hand-held testers presents a risk of exposure to electrical hazards



A More Efficient Way to Test for Voltage– VeriSafe™ Absence of Voltage Tester (AVT)

The VeriSafe AVT automates the voltage verification process and is the first AVT tailored for electrical enclosures (Figure 2). By automating this process, the VeriSafe AVT features the following:

- Tests without exposure to harmful voltages/currents
- Self-contained; no additional meters or tools are needed
- Built-in pre-/post-verification test
- Tests phase-to-phase and phase-to-ground
- Automated test sequence
- Active indication for absence of voltage
- Supports compliance with NFPA 70E-2018 Article 120.5
- Rated safety integrity level (SIL) 3 per IEC 61508

The VeriSafe AVT is applicable for several applications:

- Equipment with a single source of incoming power
- High risk associated with access
- Equipment with high incident energy
- Remote or difficult to access locations – Outdoor, mezzanine, catwalk
- Sites with temporary or intermittent power
- Equipment with stored electrical energy – VFDs, capacitors, etc.
- Equipment frequently serviced by third-party technicians or contractors

Minimize Your Risk

VERISAFE™ AVT

Prevents direct exposure to electrical hazards and determines voltage status **before** equipment is accessed.

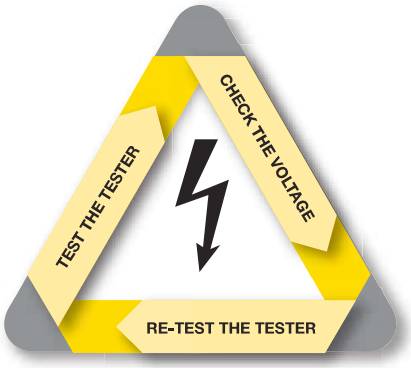


Figure 2. VeriSafe AVT.

NFPA 70E

One of the major changes to the 2018 edition of NFPA 70E involves the new requirements that allow an installed AVT to be used instead of a hand-held voltage tester. When the VeriSafe™ AVT is used in conjunction with a Lockout/Tagout Program, it meets the requirements for the process described in NFPA 70E-2018 Article 120.5:

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 the following requirements:

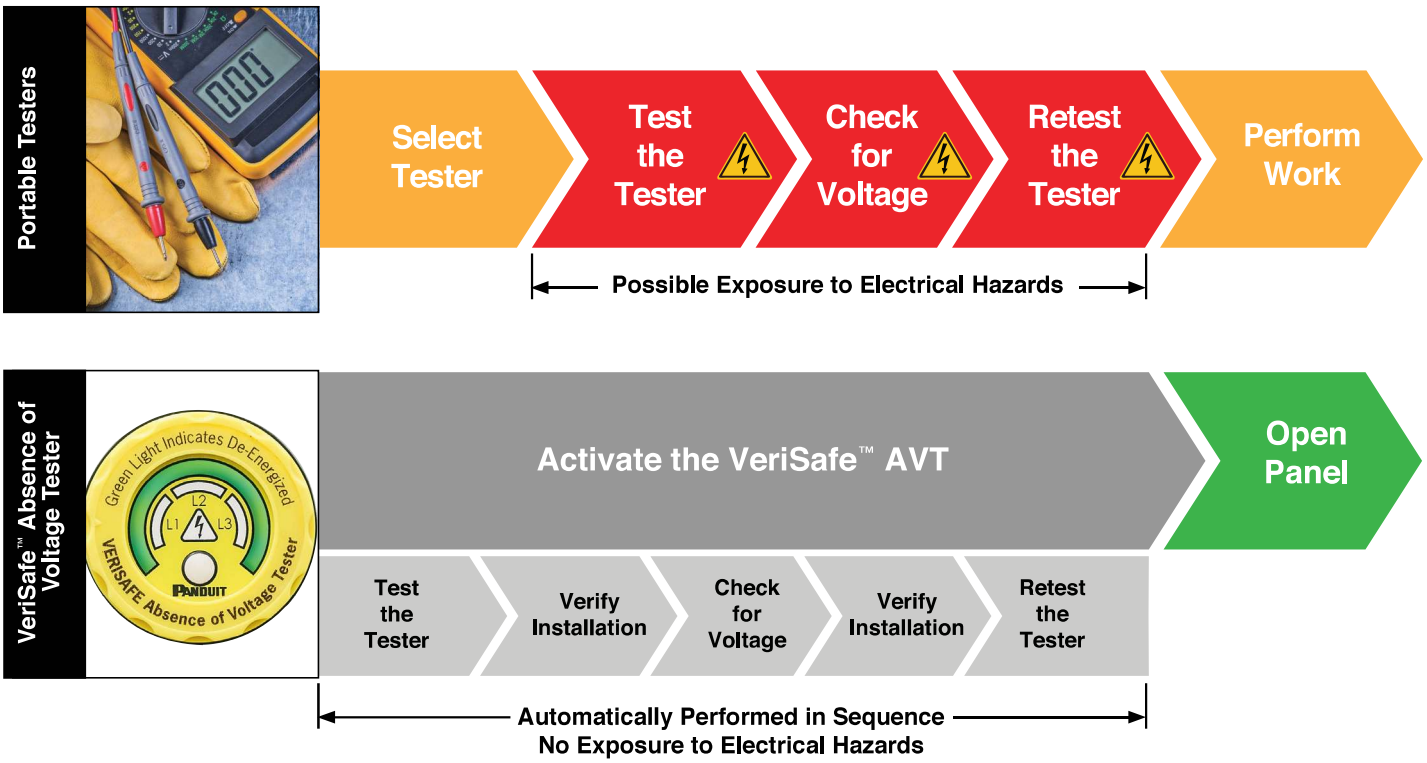
a) It is permanently mounted and installed in accordance with the manufacturer's instructions and tests the conductors and circuit parts at the point of work

b) It is listed and labeled to verify the absence of voltage[10]

c) It tests each phase conductor or circuit part both phase-to-phase and phase-to-ground

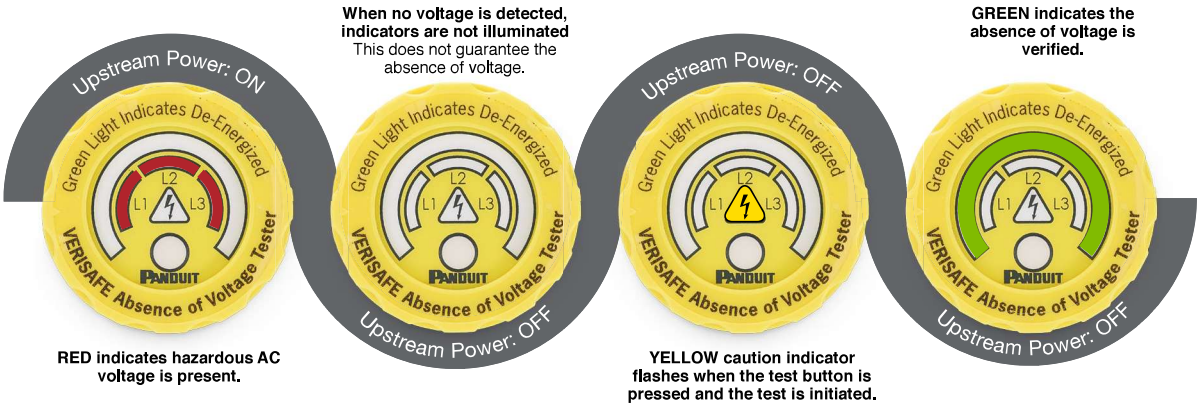
d) The test device is verified as operating satisfactorily on any known voltage source before and after verifying the absence of voltage

Figure 3. Comparison of the VeriSafe AVT and portable device testing methods.



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

Integrating the VeriSafe™ AVT is a vital improvement to absence of voltage testing. A solid testing method helps create a reliable, safe, cost-effective system that workers can use as needed. The VeriSafe™ AVT verifies the absence of voltage before equipment is accessed, making it easier for qualified electrical workers to determine an electrically safe environment in a fraction of the time required by hand-held portable test instruments.



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

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[4] Bureau of Labor Statistics. Injuries, illnesses, and fatalities. [Online]. Available: http://www.bls.gov/iif/data.htm
[5] U.S. Department of Labor. Bureau of Labor Statistics census of fatal occupational injuries. [Online]. Available: http://www.bls.gov/iif/oshcfoi1 .htm
[6] Standard for Electrical Safety in the Workplace 2015 Edition, NFPA 70E, 2015.
[7] H. L. Floyd and B. J. Nenninger, "Personnel Safety and Plant Reliability Considerations in the Selection and Use of Voltage Test Instruments," IEEE Transactions on Industry Applications, vol. 33, no. 2, pp. 367-373, 1997.
[8] A. Johnson. (2011, Nov. 1). Not an easy task. Safety+Health. [Online]. Available: http://www.safetyandhealthmagazine.com/articles/not-an-easytask-2
[9] J. Wettstein. (2013, Oct. 24). When safety shortcuts become the norm. [Online]. Available: http://www.safetyrisk.net/when-safety-shortcutsbecome-the-norm/
[10] Only AVTs listed to UL 1436 as an AVT meet this requirement.

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+44 (0) 191 410 4292
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PANDUIT US/CANADA
Phone: 800.777.3300

PANDUIT EUROPE LTD.
London, UK
cs-emea@panduit.com
Phone: 44.20.8601.7200

PANDUIT SINGAPORE PTE. LTD.
Republic of Singapore
cs-ap@panduit.com
Phone: 65.6305.7575

PANDUIT JAPAN
Tokyo, Japan
cs-japan@panduit.com
Phone: 81.3.6863.6000

PANDUIT LATIN AMERICA
Guadalajara, Mexico
cs-la@panduit.com
Phone: 52.33.3777.6000

PANDUIT AUSTRALIA PTY. LTD.
Victoria, Australia
cs-aus@panduit.com
Phone: 61.3.9794.9020

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