

NECA Guide

to Test Instruments



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NECA
NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION

NECA Guide to Test Instruments

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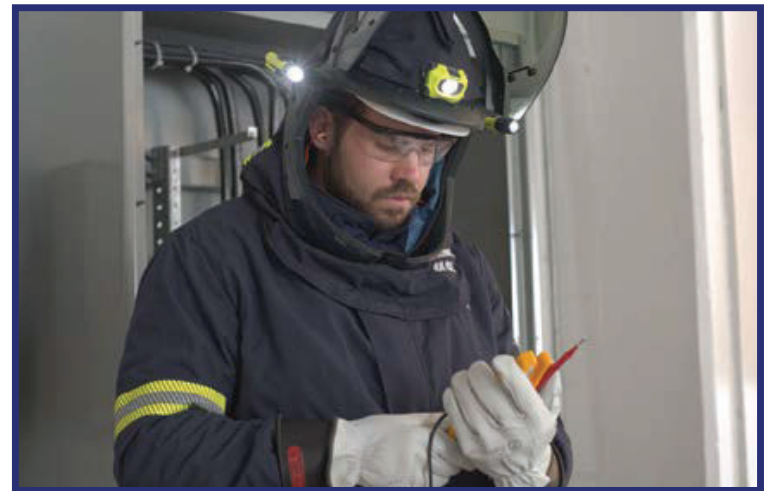
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NECA Guide to Test Instruments

Foreword

Electrical workers engaged in the process of troubleshooting electrical equipment or testing for the absence of voltage when creating an Electrically Safe Work Condition (ESWC), must use test instruments and equipment in order to complete their task. Product standards for these devices and requirements in NFPA 70E for test instruments, have changed significantly to provide safer working conditions for the electrical worker. One example is older style digital multimeters and other test instruments that used metal banana plugs. These banana plugs were easily pulled out of the test instrument. This resulted in many incidents where voltage tests were being performed and the metal banana clip was inadvertently pulled from the test instrument during the task. Due to the handheld test probe still in contact with an energized conductor or circuit part, the bare energized banana plug would then fall into grounded objects creating an arc flash resulting in serious injury and death. One improvement

in the product standards is to require test probe plugs to be fully insulated and difficult to remove inadvertently. Requirements in NFPA 70E to address the safe use of test instruments have evolved significantly as well and are reviewed in this guide.



NECA Guide to Test Instruments

Overview

This guide focuses on test instruments used by electrical workers and requirements for the safe use and application of these devices as addressed in NFPA 70E, the Standard for Electrical Safety in the Workplace. Additional detailed information is available in the NECA Guide to Decision Making: Energized vs. Deenergized Work, NECA Guide to Shock and Arc Flash Risk Assessments, NECA Guide to NFPA 70E Employer (Contractor) Responsibilities, NECA NFPA 70E Personal Protective Equipment (PPE) Selector Guide, NECA NFPA 70E Lockout/Tagout Guide, and the NECA Guide to NFPA 70E Policies and Best Practices.

There are many different types of test instruments and test equipment used by electrical workers. NFPA 70E does not identify all the different types of test instruments and equipment. The requirements for test instruments apply to all of these devices including but not limited to instruments for measuring voltage, current and phase rotation. The requirements in NFPA 70E apply without regard to the type of test being performed. This guide will address test instrument training, design, ratings, capabilities, limitations,

care, operation verification, manufacturers' instructions and more. NFPA 70E permits only qualified persons to use test instruments for tasks such as testing, troubleshooting, and voltage measuring on electrical equipment where an electrical hazard exists. In addition to the required training for qualified persons in NFPA 70E, this requires the employer to document that the qualified person has been trained to select the appropriate test instrument for the task. This training must include how to properly test for the absence of voltage, interpret indications provided by the device and very importantly an understanding of the limitations of the specific test instrument that might be used. This guide is designed as a tool for employers and qualified persons to properly apply the requirements for test instruments, developing a company policy on the use of test instruments and equipment, and provide recommended safety talks related to this subject. Additionally, this guide will assist employers with their responsibility to provide a safe and healthful workplace that is free from recognized hazards.

Employer/Employee Responsibilities

Safety in general is a shared responsibility, both the employer and employee play significant roles. This is covered in detail in NECA Standing Policy 19 on Safety and Health. The use of test instruments generally exposes an employee(s) to energized conductors and circuit parts. This requires that qualified persons, trained in the proper use of the test instrument to be used, perform the necessary job safety planning. This will include the identification of electrical hazards, an estimation of the associated risk, and the application of risk control methods that are applicable to the potential exposure, task and equipment involved.

When test instruments are used in the workplace, the priority is to ensure the safety of all persons involved in the task. The employer is responsible to establish, document, and

implement safety-related work practices and procedures that must include the use of test instruments. This includes providing employees with training in the employer's safety-related work practices and procedures. Employees are responsible to comply with the safety-related work practices and procedures provided by the employer including the specific training and procedures for the use of test instruments.



Answers to quiz:

1. C) Permanently mounted test portals
2. D) Taken out of service
3. D) All of the above
4. A) Will provide superior protection over a test instrument rated at CAT III 600 volts
5. C) Momentary contact type testers
6. B) Qualified person

Justified Energized Work

The general rule in NFPA 70E requires that an ESWC be created and maintained if: (1) an employee is within the limited approach boundary (LAB) or, (2) where conductors or circuit parts are not exposed but the employee interacts with equipment in a manner that increases the likelihood of exposure to an arc flash.

Energized work is only permitted where the employer can demonstrate justification thresholds have been met. NFPA 70E provides four specific categories of justified energized work. They are: (1) Additional Hazards or Increased Risk (situational), (2) Infeasibility (task driven), (3) Equipment Operating at Less Than 50 volts and (4) Normal Operating Condition. The infeasibility justification threshold is task-driven. This means that in order to perform the task at hand, the equipment must be in an energized state. NFPA 70E provides examples of the infeasibility threshold in an informational note, including the performance of diagnostic tests, voltage testing and troubleshooting of electric circuits. These types of tests are prime examples of the infeasibility justification threshold as they will be performed with test instruments on energized conductors and circuit parts.

Additionally, the process of creating an ESWC includes justified energized work. Consider the creation of an ESWC to perform tasks in a panelboard. For example, after opening a disconnecting means supplying a panelboard and applying lockout/tagout devices, the actions to remove the dead-front and the use of a test instrument to test for absence of voltage are considered to be energized work. This task requires qualified persons additionally trained in the selection, use and limitations of the test instrument used to test for absence of voltage. Safe work practices must be applied. This includes performing shock and arc flash risk assessments, the establishment of shock and arc flash boundaries and qualified persons wearing all required PPE. The qualified person must be trained in the use of the specific test instrument used to test for the absence of voltage.



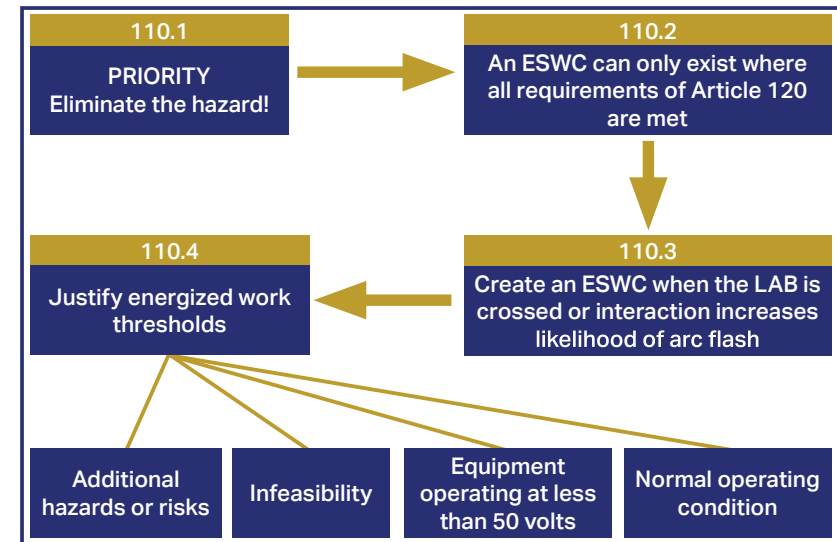
Justified Energized Work

Energized Electrical Work Permits

In general, NFPA 70E requires that an energized electrical work permit (EEWP) be applied and must be documented when an employee: (1) works within the restricted approach boundary (RAB) or, (2) where conductors or circuit parts are not exposed but the employee interacts with equipment in a manner that increases the likelihood of exposure to an arc flash. The use of hand-held test instruments, requires that the employee perform work within the RAB. Additionally, accessing energized conductors and circuit parts means the employee will be interacting with the equipment in a manner that increases the likelihood of an arc flash occurrence. There are multiple exemptions to the EEWP. When the task to be performed by the employee is testing, troubleshooting, and voltage measuring, an EEWP is not required.

It is extremely important to note that while an EEWP is not required for testing, troubleshooting, and voltage measuring, NFPA 70E requires that only qualified persons perform such a task. These qualified persons must be provided with and must use appropriate safe work practices and PPE in accordance with Chapter 1 of NFPA 70E. Additionally, while an EEWP is not required, the employer must document the

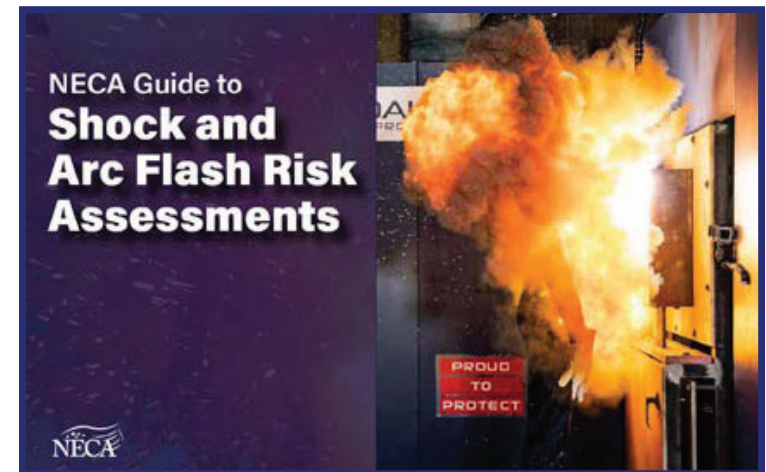
results of both the shock and arc flash risk assessments. See, the NECA Guide to Shock and Arc Flash Risk Assessments and the associated app. Additionally, in order to document the shock and arc flash risk assessments, the structured energized electrical work permit can be filled out and stored in the cloud on the NECA Safety Meeting App.



Justified Energized Work

Shock and Arc Flash Risk Assessments

When energized conductors or circuit parts are exposed to facilitate the use of test instruments and the RAB will be crossed, both a shock and arc flash risk assessment must be performed. See the definition of Arc Flash Hazard and the associated informational notes. Additionally, see the table in NFPA 70E to estimate the likelihood of an arc flash incident. For example, this table recognizes that the individual tasks of; (1) removing covers or deadfronts to expose energized conductors or circuit parts and, (2) electrical testing of any kind, both introduce a likelihood of an arc flash occurrence. The results of both the shock and arc flash risk assessments must be documented. See, the NECA Guide to Shock and Arc Flash Risk Assessments and the associated app. Additionally, in order to document the shock and arc flash risk assessments, the structured energized electrical work permit can be filled out and stored in the cloud on the NECA Safety Meeting App.



General Training

NFPA 70E mandates that all employees that may be exposed to an electrical hazard when the risk associated with that hazard is not reduced to a safe level by the applicable electrical installation requirements be trained and qualified for the task. Additionally, when energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts are not put into an ESWC, NFPA 70E mandates that only qualified persons are permitted to work on energized equipment. In order to be considered as qualified, a person must be trained and knowledgeable in the construction and operation of the equipment involved or the specific work method, and must be trained to identify and avoid electrical hazards that might be present with respect to that equipment or work method. See the NFPA 70E definition of Qualified Person. Qualified persons must also be trained to: perform the required job safety planning, identify electrical hazards, assess the associated risk, perform and document shock and arc flash risk assessments, and select and apply the applicable risk control methods

from the hierarchy of risk control including any necessary PPE. It is extremely important to understand that in many cases more than one risk control method can be applied at the same time.



Test Instrument Training

When an electrical test instrument is used where an electrical hazard exists, only qualified persons, trained in the use of the specific electrical test instrument may perform the task. An electrical hazard is defined as a dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or arc blast injury. When work is performed on systems such as Class 2 power supplies, listed low voltage lighting systems, and similar sources, an electrical hazard is not considered to exist.

NFPA 70E requires that all qualified persons be trained to select an appropriate test instrument for the task to be performed. As part of the training the employee must demonstrate how to use the specific device to test for the absence of voltage, including interpreting indications provided by the device. An extremely important part of this required training is to ensure that the employee understands all limitations of each test instrument that might be used.

Additional training on the use of electrical test instruments is required when new technologies or new/different types of test instruments will be used by the employee. All qualified persons are required to be retrained in the employers' safety related work practices and applicable

changes in NFPA 70E at intervals not to exceed three years.

Permitted types of training for test instruments include classroom, on-the-job, or a combination of the two. NFPA 70E clarifies that classroom training can include interactive electronic or interactive web-

based training components. It is important to note that test instrument training must provide employees with the ability to: (1) select an appropriate test instrument for the task, (2) demonstrate the use of a specific device to test for the absence of voltage, (3) interpret indications provided by the device and, (4) understand all limitations of each test instrument that might be used.

Employers can meet the training requirements through onsite training by field representatives from the test instrument manufacturer and through training materials provided by the manufacturer.



Requirements for Test Instruments

Use

Tasks such as testing, troubleshooting, and voltage measuring on energized electrical equipment may only be performed by qualified persons trained in the selection, use and limitations of the specific device(s) used.

Ratings and Design

Test instruments, associated equipment, and all accessories must be rated for the circuits and equipment on which they will be used. Ratings include but are not limited to: voltage, current and overvoltage category ratings. This guide is focused primarily on utilization voltages and test instruments with ratings of typically 600 volts and 1000 volts. Every year, unqualified persons, not properly trained as a qualified person and not trained in the use and application of test instruments, place test instruments rated at 600 volts on equipment rated over 1000 volts resulting in serious injury and death. Test instruments must be rated for the circuits and equipment where they will be utilized. Test instruments have overvoltage ratings that are identified by categories based upon the potential overvoltage the test instrument may be exposed to within an electrical distribution system.



Requirements for Test Instruments

Ratings and Design (Cont.)

These categories are: CAT I, CAT II, CAT III and CAT IV. The qualified person must be trained to understand the application of overvoltage ratings on test instruments. This is extremely important to protect employees from serious transient voltage spikes that can be generated by motors, capacitors, variable speed drives, power conversion equipment and lightning on outdoor transmission and distribution conductors. These transients can reach peak values high enough to destroy a test instrument with the potential to severely injure the employee. A higher category (CAT #) number addresses the use of test instruments on energized conductors and circuit parts where higher values of available fault current and higher values of transient energy are known to exist. It is important to note that a test instrument rated at 1000 volts will provide superior protection to one rated at 600 volts. For example, a test instrument rated CAT III at 1000 volts will provide superior protection over a test instrument rated at CAT III 600 volts. These categories are separated into areas of use within a power distribution

system understanding that the most dangerous high energy transients may occur at the service equipment due to a lightning strike. The energy from these transient voltages will be reduced as it travels through the electrical distribution system by the impedance created through smaller conductors and distance.



Requirements for Test Instruments

Ratings and Design (Cont.)

It is well understood that using the proper tools for the job can help keep electrical workers safe. For example, insulated tools are required inside the RAB as they will help prevent an arc flash incident. Test instruments are tools. In fact, choosing the proper test instrument is just as important as choosing the proper personal protective equipment (PPE).

Forensic investigations have determined that older or inferior test equipment without an overvoltage category rating or with a rating that does not match the task, can actually explode if used improperly. Examples of the where test instruments with different overvoltage categories are intended to be applied are:

Overvoltage Category	In Brief
CAT I	Protected electronic equipment.
CAT II	Single-phase receptacle connected loads such as appliances and portable tools.
CAT III	3-phase distribution including single-phase commercial lighting and equipment in fixed locations such as switchgear and polyphase motors.
CAT IV	3-phase at the utility connection, outdoor conductors, electricity meters, and service entrances.

Requirements for Test Instruments

Ratings and Design (Cont.)

It is important to note that test instrument category (CAT) ratings as marked on test and measurement equipment have no relation to the Arc Flash PPE Categories listed in NFPA 70E.

Test instruments, equipment and associated accessories must also be designed for the environment in which they will be utilized, approved for the purpose and used in accordance with any instructions provided by the manufacturer.



Requirements for Test Instruments

Ratings and Design (Cont.)

Overvoltage Category	In Brief	Examples
CAT I	Electronic	- Protected electronic equipment - Equipment connected to (source) circuits in which measures are taken to limit transient overvoltages to an appropriately low level. - Any high-voltage, low-energy source derived from a high-winding resistance transformer, such as the high-voltage section of a copier
CAT II	Single-phase receptacle connected loads	- Appliance, portable tools, and other household and similar loads - Outlet and long branch circuits - Outlets at more than 10 meters (30 feet) from CAT III source - Outlets at more than 20 meters (60 feet) from CAT IV source
CAT III	Three-phase distribution, including single -phase commercial lighting	- Equipment in fixed installations, such as switchgear and polyphase motors - Bus and feeder in industrial plants - Feeders and short branch circuits, distribution panel devices - Lighting systems in larger buildings - Appliance outlets with short connections to service entrance
CAT IV	Three-phase at utility connection, any outdoor conductors	- Refers to the "origin of installation," i.e., where low-voltage connection is made to utility power - Electricity meters, primary overcurrent protection equipment - Outside and service entrance, service drop from pole to building, run between meter and panel - Overhead line to detached building, underground line to well pump

Requirements for Test Instruments

Inspection and Repair of Test Instruments

Employees must be trained to visually inspect test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors for external defects and damage before each use. Where a defect is identified or where there is evidence of damage that could expose an employee to injury, the defective or damaged item must be removed from service. No employee may be permitted to use the defective or damaged item until it is repaired, rendering the equipment safe for use. All repairs must be performed by a person(s) qualified to perform the repairs. Tests are necessary to ensure that the equipment operating and is safe to use. In many cases, the test instrument or damaged item can only be repaired by the equipment manufacturer. Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors must be cared for properly and not exposed to damage.



Requirements for Test Instruments

Operation Verification

Testing for the absence of voltage is a critical step in the creation of an ESWC. This step is critical due to the possibility of failure within a disconnecting means (situations where all ungrounded conductors do not open due to the failure of a single pole), mislabeled disconnects, lookalike disconnects and the possibility of multiple or unknown sources of voltage. It is important to understand that the creation of an ESWC includes energized work. When an employee removes covers and uses a contact test instrument to test for the absence of voltage, they are performing energized work. NFPA 70E requires in all cases when test instruments are used for testing the absence of voltage on conductors or circuit parts operating at voltages equal to or greater than 50 volts, the operation of the test instrument must be verified on any known voltage source before and after an absence of voltage test is performed. The term “any known voltage” is specifically used here to provide clarity. This requirement mandates that the user simply verify proper operation of the test instrument on any known voltage. The test instrument does not need to be verified at the

same voltage of the equipment being placed into an ESWC. For example, when testing for the absence of voltage in a panelboard rated at 480/277 volts, verification of operation could be performed by testing for voltage in a female cord cap on an extension cord at 120 volts.



Requirements for Test Instruments

Operation Verification (Cont.)

NFPA 70E provides prescriptive direction on how to test for the absence of voltage in the process provided for establishing and verifying an ESWC. An adequately rated portable test instrument must be used to test each phase conductor or circuit part for the absence of voltage. Prescriptive steps include testing each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test the qualified person must determine that the test instrument is operating satisfactorily through verification on any known voltage source as previously described. Non-contact test devices are not permitted to be used for testing for the absence of voltage.

NFPA 70E permits permanently mounted absence of voltage testers (AVTs) in lieu of having an employee perform justified energized work to test for the absence of

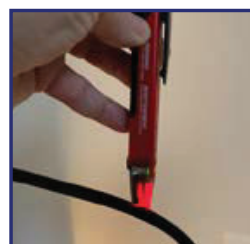
voltage with a portable test instrument. These AVTs must: be permanently mounted in accordance with the manufacturers' instructions, test the conductors and circuit parts at the point of work, be listed and labeled for the purpose of absence of voltage testing, test each phase conductor or circuit part both phase-to-phase and phase-to-ground and must verify operation on a known voltage source (inside of the AVT) before and after the absence of voltage tests.

Absence of voltage testing on electrical systems over 1000 volts, is permitted to be performed with a noncontact capacitive test instrument to test each phase conductor.

Requirements for Test Instruments

Non-contact (Voltage Detection)

Non-contact test devices very simply detect the presence of voltage. These devices have gained popularity in the electrical construction industry as they are easily carried in a pocket or clipped to a shirt. These devices may be used as an indication of the presence of voltage but are not permitted when testing for voltage and testing for the absence of voltage when creating an ESWC. When testing for the absence of voltage, a contact type test instrument must be used. Non-contact voltage testing devices work by sensing a very small amount of current that is capacitively coupled from the live circuit to the tester and back to ground. Non-contact voltage test devices light up and may be audible when they detect this current without needing to make direct contact. A built-in sensor at the tip of the tester detects the presence of voltage when touching or near a conductor, outlet, or supply cord. When the tip glows red and/or the device provides a signal such as a beeping sound, you know voltage is present. By holding the tool, the employee is the ground reference through a capacitive coupling. If an employee is not grounded, such as when wearing an insulating glove or standing on a non-conductive ladder, the ground reference through capacitive



coupling is gone and the test device may not indicate the presence of voltage. These devices will not detect voltage in conductors that are shielded, meaning for example they cannot detect through the jacket of a metal clad (Type MC) cable. Additionally other limitations exist with cable types such as Type NM cable. The paper wrap inside of this plastic jacketed cable assembly can absorb moisture in damp areas. This moisture is in direct contact with an uninsulated equipment grounding conductor resulting in a shield over the energized conductors within. While a non-contact test device will provide an indication of voltage in dry Type NM cable, where it is damp, such as temporary wiring, the test device may not provide an indication of the voltage present. Non-contact test devices may be useful as an indicator but may never be used to test for the absence of voltage.

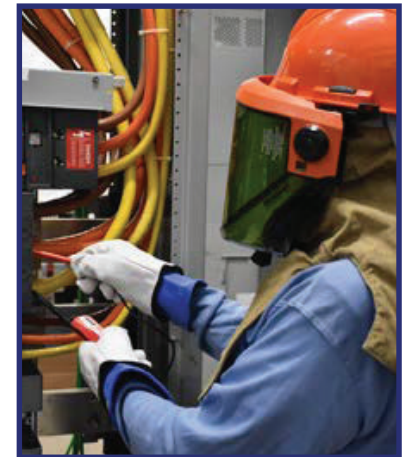
Requirements for Test Instruments

Types of Test Instruments

There are many types of test instruments used by electrical workers. NFPA 70E contains general requirements for all test instruments but does not identify them by the type of device. The most common use of test instruments for electrical workers is testing for the absence of voltage and troubleshooting. The most common types of test instruments used for these tasks include but are not limited to solenoid-based voltage testers and electronic voltage testers (similar in size and shape to a solenoid-based voltage tester) with digital multimeters used in some cases.

Training must be on the specific test instrument and must include how to test for the absence of voltage, interpret indications provided by the device and most importantly an understanding of the limitations of each test instrument that might be used.

Solenoid based voltage tester are very popular and most electrical workers use them regularly to get a contact indication of voltage. These devices operate by energizing and deenergizing an electromagnetic coil to move a ferrite core



against a spring and are commonly used up to 480 volts. These devices are momentary contact type testers. They cannot be held in place on an energized circuit. These devices have limitations on the lower voltage range. In many cases these devices will not get enough current flow to move the ferrite core below 100 volts.

Requirements for Test Instruments

Types of Test Instruments (Cont.)

Electronic voltage testers are similar in size, shape and design to a solenoid-based voltage tester. These devices are electronic and do not incorporate an electromagnetic coil. They are typically capable of measuring voltage from 12 to 600 volts. Electronic voltage testers have a much higher input impedance limiting the amount of current flow through the device. This can result in a false positive (ghost voltage) created through induction from an energized conductor.

Digital multimeters are commonly used for testing for the absence of voltage and troubleshooting but do much more than measure voltage. They are used to measure voltage, current, and resistance. These devices are a diagnostic tool for used by electricians, technicians and others in electrical/electronic industries. These devices can measure precise values of voltage typically from millivolts through 1000 volts ac.

Phase rotation instruments are commonly applied where modifications to electrical distribution systems are performed, such as the installation of a standby generator for an emergency or optional standby system. Phase rotation is the order in which the voltage waveforms of a polyphase



AC source reach their respective peaks. This impacts the direction of a three-phase motor. Phase rotation is reversed by swapping any two phases in a three-phase system. Electrical workers must determine the phase rotation to ensure proper operation of three phase motor loads. While contact type devices are still in use, non-contact phase rotation instruments are readily available and significantly reduce the likelihood of an incident. Contact type phase rotation instruments should be removed from service and replaced with noncontact devices.

Requirements for Test Instruments

Permanently Mounted Absence of Voltage Testers

The general rule in NFPA 70E is that a qualified person, use an adequately rated portable test instrument to test each phase conductor or circuit part for the absence of voltage. An exception to this rule prescriptively permits an adequately rated permanently mounted test device to test for the absence of voltage of the conductors or circuit parts at the work location, provided it meets the criteria provided. It is extremely important to understand that this exception applies only to listed Absence of Voltage Testers (AVTs) meeting the requirements in NFPA 70E. There are other permanently mounted devices that the electrical worker may encounter and must understand the differences between these devices and most importantly their limitations.

Voltage Indicators

These are permanently mounted devices that use an LED style indicators to illuminate when voltage is present. These devices are not permitted to be used to test for the absence of voltage. These devices are not self-monitoring, and are not a test instrument, they are used for indication only.

Test Portals

Test portals are permanently mounted devices that can be used with a portable test instrument such as an electronic voltage tester or a digital multimeter. Test portals are commonly used to troubleshoot or as a preliminary test when creating an ESWC. It is extremely important to note that due to the high impedance introduced into the test portal limiting current flow to the test points to less than 5 milliamps, that a solenoid type voltage tester cannot be used on the test portal, there will not be enough current flow for operation. Test portals are not permitted to be used to test for the absence of voltage. Unlike AVTs, these devices do not perform all of the functions required by NFPA 70E to test for the absence of voltage.

Requirements for Test Instruments

Absence of Voltage Testers (AVT)

An adequately rated permanently mounted test device (an AVT) is permitted to test for the absence of voltage of the conductors or circuit parts at the work location, provided it meets the following criteria:

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



Requirements for Test Instruments

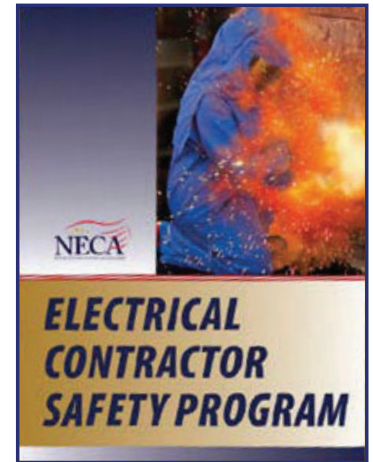
Developing a Company Policy Training and Use of Test Instruments

NFPA 70E Standard for Electrical Safety in the Workplace provides the guidelines and requirements by which employers can provide a safe work environment for their employees relative to the hazards associated with electrical energy. But the existence of guidelines or rules alone will not prevent injury. There must be an understanding of the requirements and comprehensive compliance. This comes with management commitment and effectively communicating employee expectations. Employers must make employees aware of the company's commitment to the rules, their obligation as part of that and the practices to be used. To do this a company must establish written policies and best practices.

The following reviews the elements of policy and best practice development using NFPA 70E as an example. The basic policies and practices needed for NFPA 70E compliance are outlined here in the print version of this manual. The digital version of this manual includes the outline format as seen here, as well as a copy of the complete policy or best practice. This will enable companies to use the printed

manual to effectively communicate NFPA 70E policies and procedures, then build upon them to create custom or additional safety policies and practices to establish a comprehensive program.

Policies are clear, simple statements of how a company will conduct its services, actions or business. They don't need to be long or complicated – a couple of sentences may be all that is needed for some policy areas. They reflect the values, approaches and commitments of the company and its culture. Typically, there will be an overarching policy then separate policies for different aspects of your program. For example, this manual begins with a policy on NFPA 70E compliance then address each of the aspects of the standard.



Requirements for Test Instruments

To Develop Effective Policies Use the Following Guidelines:

Include key stakeholders, management, employees and customers,

- Organize by brainstorming or small work group discussions
- Identify policies needed (Compare to templates available and what similar organizations have)
- Identify any unique elements of your company that need to be included in the policy
- Draft, refine and write the policies. Include a: Title (name, version number and/or dates, and who authorized it)
- Purpose statement (why the policy exists and what is to be achieved)
- Description/Responsibilities (One or two sections outlining the details of the policy and what each needs to do)
- Have policies approved and endorsed by leadership (i.e. a Board, President or CEO)
- Promote policies, look for feedback and refine your policies as needed
- Ensure all employees sign off on policies when hired and any changes are made to a policy

Sample/Basic Policy on the use of Test Instruments

Purpose

This policy is written to outline requirements for the use of test instruments for all XXXXX employees. Only qualified persons, trained in the use of the specific test instrument are permitted to use a test instrument where electrical hazards exist. Front line foreman shall be responsible for enforcing this policy of all jobsites.

Description

- All employees trained in electrical safe work practices must be trained in the use of a XXX model XXX solenoid type tester and a XXX model XXX electronic type voltage tester for troubleshooting and for testing for the absence of voltage
- Additional training on digital multimeters, ammeters, phase rotation instruments and others shall be performed as needed
- All training shall be documented and on file before work is performed
- Each use of test instruments inside of the RAB shall have a shock and arc flash risk assessment performed before the task using the NECA shock and arc flash risk assessment app
- Each shock and arc flash risk assessment app shall be documented using the NECA EEWP app
- PPE rated for the exposure and voltage rated tool as needed shall be identified before the task
- Employees shall not use noncontact type devices to test for absence of voltage. They may be used for an indication only
- All test instruments shall be in good working order, inspected and free of defects
- All test instruments shall have a CAT III or CAT IV rating as needed
- Only noncontact phase rotation instruments shall be used
- All test instruments shall have their operation verified before and after a test for absence of voltage
- Manufacturer's instruction shall be followed
- Employees using AVT's for testing for the absence of voltage shall be additionally trained.
- Permanently mounted test portals and voltage indicators shall not be used for testing for absence of voltage

Sample/Basic Policy on the use of Test Instruments

Developing and Establishing Best Practices on Use of Test Instruments

Practices or procedures go hand-in-hand with policies. They are the detailed steps by which compliance is achieved. They should be “Best Practices” for your company. Typically, a “Best Practice” is considered to be a technique or method that has proven to be more effective at delivering a particular outcome than any other. They must take into consideration the nuances individual company cultures can have on the implementation of a practice. Each company must decide the specific elements of a practice which work best for it.

The Steps for Developing a Best Practice are as Follows:

1. Identify problem areas
2. Identify other companies or industries that have similar processes
3. Identify the leaders in these areas
4. Survey companies for measures and practices and/or review accepted industry standards.
5. Determine which practices have proven results.
6. Implement the practices

Sample/Basic Policy on the use of Test Instruments

A Best Practice Should Include:

- Title (name, version number and/or dates, and who authorized it)
- Statement (Identifies what the practice addresses)
- Description (Offers detailed procedures of the practice)
- Benefits (Identifies the positive outcomes of the practice)
- References (lists any references used in development of the practice or that offer additional information on the practice)

Sample/Basic Policy on the use of Test Instruments

TITLE: USE OF TEST INSTRUMENTS (SUCH AS VOLTAGE TESTING)

STATEMENT: Provide a concise approach that outlines the key steps involved with the use of test instruments such as voltage testing and other types of testing.

DESCRIPTION: Any employee that is to use test instruments must be qualified and trained on the test instrument to be used. The qualified employee shall follow the accepted procedure for testing for the presence of voltage and the steps necessary for the verification for the absence of voltage. The employee shall be familiar with the maximum voltage potential and wear all necessary PPE determined in the shock and arc flash risk assessment.

1. Identify the circuit(s) to be tested
2. Determine the source of the circuit(s)
3. Determine the maximum nominal voltage that could be present.
4. Perform a shock risk assessment
5. Perform an arc flash risk assessment
6. Select the appropriate Personal Protective Equipment for use
7. Review the procedures for proper test instrument operation.
 - A. Verify proper operation of the test instrument.
 - B. Test to determine if voltage is present.
8. Verify proper operation of test instrument.
9. Implement Lockout/Tagout requirements.

Sample/Basic Policy on the use of Test Instruments

ANY EMPLOYEE USING TEST INSTRUMENTS TO MEASURE VOLTAGE MUST:

- Be a qualified person, trained in the use of the test instrument to be used
- Be able to demonstrate knowledge related to the construction and operation of the test instrument being used
- Have received safety training to identify and avoid the hazards associated with the procedure.
- Be familiar with the appropriate rating of rubber protective goods, their use and limitations.
- Be aware of arc rating of garments and choose appropriate ppe.
- Know proper working clearances around electrical equipment.
- Ensure proper illumination around equipment
- Not engage work where there is blind reaching or poor visibility.

BENEFITS:

- Ensures qualified workers will be performing required tasks.
- Provides compliance with NFPA 70E Standard and OSHA Regulations.
- Incorporates risk management procedures.
- Follows proper rules for establishing an electrically safe working condition.
- Demonstrates compliance with all applicable OSHA and NFPA 70E requirements.

REFERENCES:

- NFPA 70E – THE STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE
- OSHA 29 CFR 1926 CONSTRUCTION INDUSTRY STANDARD

IMPORTANT: This practice was intentionally limited to the use of test instruments used for voltage testing. A Best Practices should be developed for each test instrument used to detect or measure for electrical energy (amp probe, phase rotation, phasing stick, etc.). These practices should provide detailed procedures and limit use of the test instrument to qualified persons.

Tool Box Talk

Only qualified persons, trained in the use of the specific test instrument are permitted to use a test instrument where electrical hazards exist. Front line foreman shall be responsible for enforcing this policy of all jobsites.

- All employees trained in electrical safe work practices must be trained in the use of a XXX model XXX solenoid type tester and a XXX model XXX electronic type voltage tester for troubleshooting and for testing for the absence of voltage
- Additional training on digital multimeters, ammeters, phase rotation instruments and others shall be performed as needed
- All training shall be documented and on file before work is performed
- Each use of test instruments inside of the RAB shall have a shock and arc flash risk assessment performed before the task using the NECA shock and arc flash risk assessment app
- Each shock and arc flash risk assessment app shall be documented using the NECA EEWP app
- PPE rated for the exposure and voltage rated tool as needed shall be identified before the task
- Employees shall not use noncontact type devices to test for absence of voltage. They may be used for an indication only
- All test instruments shall be in good working order, inspected and free of defects
- All test instruments shall have a CAT III or CAT IV rating as needed
- Only noncontact phase rotation instruments shall be used
- All test instruments shall have their operation verified before and after a test for absence of voltage
- Manufacturer's instruction shall be followed
- Employees using AVT's for testing for the absence of voltage shall be additionally trained.
- Permanently mounted test portals and voltage indicators shall not be used for testing for absence of voltage

Questions

1. A solenoid type voltage tester cannot be used to test for voltage on:
 - A) Receptacles
 - B) Circuit breaker terminals
 - C) Permanently mounted test portals
 - D) Terminals in a fused disconnect
2. Older test instruments without a CAT rating must be
 - A) Used only by a qualified person
 - B) Used only where a CAT II device is permitted
 - C) Used only on the load side of a current limiting OCPD
 - D) Taken out of service
3. Tasks such as testing, troubleshooting, and voltage measuring on energized electrical equipment require:
 - A) Documentation of shock and arc flash risk assessments
 - B) Shock and arc flash risk assessments
 - C) Qualified persons trained in the use of the specific test instrument
 - D) All of the above
4. A test instrument rated CAT III at 1000 volts:
 - A) Will provide superior protection over a test instrument rated at CAT III 600 volts
 - B) Can be used up to 1500 volts
 - C) Cannot be used below 300 volts
 - D) Is equivalent to a CAT IV instrument

Questions

5. Solenoid type voltage testers are:
 - A) Always Cat IV rated
 - B) Not required to be CAT rated
 - C) Momentary contact type testers
 - D) Not rated for DC voltages
6. When an electrical test instrument is used where an electrical hazard exists, only _____, trained in the use of the specific electrical test instrument may perform the task.
 - A) Journeyman wiremen
 - B) Qualified person
 - C) Apprentices under the supervision of a journeyman
 - D) Foreman

Answers on page 7-5.

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