Permanent Electrical Safety Devices (PESDs)

PESDs and NFPA 70E

The NFPA 70E states that the following principles are foundational to ensuring a zero energy state:

- **Locate all sources of electrical energy.** Voltage portals and voltage indicators installed will locate each source.
- **Physically contact voltage detector to the electrical energy.** Voltage indicators are hardwired to the source.
- **Test between each phase and phase to ground.** Voltage indicators check voltage between phase-phase-ground.
- **Verify voltage detector before and after use.** A non-contact voltage detector (NCVD) can be verified before and after use.

**Please note:** Employers are responsible to train employees in selecting and properly using a voltage detector. It is also the responsibility of employers to provide a written lock-out/tag-out procedure and train employees on those procedures. Follow manufacturer’s instructions when using a non-contact voltage detector. All other safety procedures apply.

**NFPA 70 References:**

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**Warning:** Verify an electrical conductor has been de-energized using an adequately rated voltage detector before working on it. Follow appropriate Energy Control (Lockout/Tagout) procedures as per OSHA Subpart: the current edition of NFPA 70E; and the current edition of CSA Z462.

Non-Contact Voltage Detectors (NCVD) require solidly grounded power systems for proper operation. Using NCVDs and/or SafeSide voltage portals on power systems with a floating, isolated grounds, or other ungrounded systems will result in false-negative voltage indication (voltage present, but not indicated by the NCVD).

Follow the NCVDs’ manufacturer operating instructions for proper procedures and operation of the NCVD. Follow all Local, State, and national Electrical Codes when installing this equipment. Overcurrent protection of the supply leads may be necessary. The installation of overcurrent protection shall be in accordance with the requirements in the NEC (NFPA 70) or end product standard(s) when used in the final installation.
More on Voltage Indicators

SafeSide® voltage indicators help keep workers safe during lock-out/tag-out by giving them valuable information about the state of voltage within the panel. Here are some key benefits and features about voltage indicators:

- **Reduced Voltage Exposure and Arc Flash Risk** - While performing electrical LOTO with a SafeSide® voltage indicator installed, the electrician can pre-check the internal voltage state without opening the enclosure.

- **Safer Lock-Out Tag-Out (LOTO)** - Keeping personnel away from live voltage is foundational to electrical safety. Electrical safety demands a precise answer to the question ‘Is voltage present?’ SafeSide® voltage indicators provide visibility of voltage from outside the enclosure without exposing personnel to voltage.

- **More Productivity in Mechanical LOTO** - Workers performing mechanical LOTO must isolate electrical energy. Without a SafeSide® voltage indicator, a mechanic performing mechanical LOTO would be required to work in tandem with an electrician using a voltmeter to physically verify voltage inside an electrical panel. In this case, the electrician is exposed to voltage, but with SafeSide® voltage indicator, the mechanic can verify zero electrical energy without any exposure to voltage.

**Optical Cable Voltage Indicator**

The SafeSide® R-3F optical cable voltage indicator is a permanent electrical safety device (PESD) built to keep workers on the safe side of electrical panels by providing them with a no-voltage-at-the-door option when it comes to thru-door electrical safety. Global electrical designs specify panel-mount devices that operate at low voltage levels; the R-3F provides voltage indication with zero voltage on the outside of the panel.

The R-3F uses an optical cable bundle to illuminate the LEDs on a thru-panel adaptor mounted to the outside of an electrical enclosure. The optical cable bundle allows users to see the voltage status of L1, L2, L3 and GRD with the energized conductors safely kept away from the enclosure exterior.

The potted R-3F LED base unit with integral lead wires and flexible mounting options allow users to reliably locate it close to 3-phase voltage sources. The availability of different cable lengths lets users mount the fiber optic thru-panel adaptor at the best location on the enclosure.

**FEATURES for the R-3F:**

- 20-600VAC / 20-1000VDC (Max 750VAC non-UL)
- CAT III/IV Electrical Rating (pending)
- UL Type 4X, 12, 13
- Potted Construction with 6’ Lead

**BENEFITS of the R-3F:**

- Stored Energy Detector (120.1(6))**
- Visible Blades Disconnect (120.1(3))**
- Permanent Devices is Less Prone to Damage
- Voltage Source Labels (120.2(F)(1)(a))**

**FEATURES for R-3W, R-3W-SR, R-3W2:**

- 40-750VAC / 30-1000VDC
- 35-600VAC 1Ø - R-3W and R-3W-SR only
- Potted Construction with 6’ Leads
- Phase Insensitive
- 30mm Pushbutton or Pilot Hole

**OTHER BENEFITS:**

- Stored Energy Detector (120.1(6))**
- Visible Blades Disconnect (120.1(3))**
- Permanent Devices are Less Prone to Damage
- Voltage Source Labels (120.2(F)(1)(a))**

**APPLICATIONS:**

- Circuit Breaker Disconnects - No Visible Blades
- High Energy Panels (NFPA 70E Category 3 or 4)
- Frequently Accessed Panels
- Mechanical LOTO: Indicating Zero Energy
- Panels with Multiple Power Sources

**FEATURES for R-3W, R-3W-SR, R-3W2:**

- High Surge Immunity
- UL Listed Type 4X, 12 & 13
- Redundant Circuitry/ Long Life LEDs
- UL Hazardous Location / Class 1 Div 2 Group A, B, C, & D (R-3W2 only)
  - CAT III/IV Electrical Rating* (R-3W2 only)

**APPLICATIONS:**

- Circuit Breaker Disconnects - No Visible Blades
- High Energy Panels (NFPA 70E Category 3 or 4)
- Frequently Accessed Panels
- Mechanical LOTO: Indicating Zero Energy
- Panels with Multiple Power Sources

**FEATURES for R-3W, R-3W-SR, R-3W2:**

- Stored Energy Detector (120.1(6))**
- Visible Blades Disconnect (120.1(3))**
- Permanent Devices are Less Prone to Damage
- Voltage Source Labels (120.2(F)(1)(a))**

**APPLICATIONS:**

- Circuit Breaker Disconnects - No Visible Blades
- High Energy Panels (NFPA 70E Category 3 or 4)
- Frequently Accessed Panels
- Mechanical LOTO: Indicating Zero Energy
- Panels with Multiple Power Sources
Medium Voltage Indicator

The R-1VH/R-1VL Medium Voltage Indicator mounts to a medium voltage bus and flashes when voltage is present on the bus. This product is designed to provide sufficient illumination to be easily seen through IR or viewing windows on a medium voltage starter, transformer, switchgear and other power distribution equipment.

The R-1VH/R-1VL is built for long life and reliability with solid-state LEDs and flame-rated material. Because the R-1VH/R-1VL capacitively couples to ground, it provides high surge immunity and has electrical-installation integrity.

**FEATURES for R-1VH/R-1VL:**
- Qty. (3) Long Life LEDs per Unit
- 2KV to 43KV Operating Range
- ½” bolt hole mounting
- Viewing Angle Adjustability

**APPLICATIONS for R-1VH/R-1VL:**
- Medium Voltage Starters
- Switchgear
- Power Distribution Systems

More on Voltage Portals

SafeSide® voltage portals avoids voltage exposure for workers by extending the voltage source points to the outside of electrical enclosures. Each voltage point resides in an encapsulated non-conductive housing designed to insure that a NCVD senses voltage if placed into the voltage portal. Because voltage portals contain live voltage and mount on the outside of enclosures, a robust design and UL certification avoids any long term safety concerns. Here are some key benefits and features about voltage indicators:

- **Reduced Voltage Exposure and Arc Flash Risk** - While performing electrical LOTO with a SafeSide® voltage portal installed, the electrician can pre-check the internal voltage state without opening the enclosure.
- **Safer Lock-Out Tag-Out (LOTO)** - Keeping personnel away from live voltage is foundational to electrical safety. Electrical safety demands a precise answer to the question ‘Is voltage present?’. SafeSide® voltage portal provide visibility of voltage from outside the enclosure without exposing personnel to voltage.
- **More Productivity in Mechanical LOTO** - Workers performing mechanical LOTO must isolate electrical energy. Without a SafeSide® voltage portal, a mechanic performing mechanical LOTO would be required to work in tandem with an electrician using a voltmeter to physically verify voltage inside an electrical panel. In this case, the electrician is exposed to voltage, but with SafeSide® voltage indicator, the mechanic can verify zero electrical energy without any exposure to voltage.

**FEATURES for R-T3 Voltage Portal:**
- Single-point, three-phase
- Integral 6’ #12 AWG lead wire
- Installs in a 30mm hole for easy installation
- Rugged polycarbonate construction for safety
- UV outdoor rated so you can mount it anywhere
- UL Type 4, 4X, 12 Rated

**FEATURES for R-1A003 Voltage Portal:**
- Single-point, single phase
- Integral 6’ lead wire
- Installs in a ½” hole for easy installation
- Rugged polycarbonate construction for safety
- UV outdoor rated so you can mount it anywhere
- UL Type 4, 4X, 12 Rated
**Combo Units**

SafeSide® Combo Units combine two complementary technologies – voltage indicators and voltage portals. When used together, the Combo Units meet the validation requirement of NFPA 70E 120.1. Voltage indicators and voltage portals are a great match because their features compliment each other. Here’s how:

- the SafeSide® voltage indicator is the primary voltage testing instrument because it provides the hardwired connection to the voltage source as required by NFPA 70E 120.1(5).
- the SafeSide® voltage portal (and the non-contact voltage detector pen) becomes the testing device for the voltage indicator.
- both devices can be checked before a LOTO procedure while the control panel is energized to ensure proper operation.
- the traditional method of validating the voltage indicator to an independent voltage source is met with the NCVD/voltage portal combination (as seen in Figure 1).

**Some PESDs**

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<tr>
<th>Part Number (Unit and Label)</th>
<th>Label</th>
<th>Size in inches [mm]</th>
<th>Mounting D-Door/Side F-Flange</th>
<th>Includes Qty Voltage Indicator</th>
<th>Voltage Portal</th>
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*Labels Sold Separately.*