Chapter 51: Control of Hazardous Energy

Zero Voltage Verification Procedure

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URL: https://www-group.slac.stanford.edu/esh/eshmanual/references/coheProcedZVV.pdf

1 Purpose

The purpose of this procedure is to place equipment in an electrically safe work condition in accordance with National Fire Protection Association (NFPA) 70E, “Standard for Electrical Safety in the Workplace” (NFPA 70E). It covers zero voltage verification (ZVV) when a lockout is being performed; it must be followed in all cases in which an electrical hazard exists and the equipment or system must be de-energized and locked out before work is performed. It applies to authorized workers and qualified electrical workers.

Workers who perform ZVV must have met the training requirements in Chapter 51, “Control of Hazardous Energy”, and be able to

- Distinguish exposed live parts of electrical equipment
- Determine the nominal voltage of exposed live parts
- Know the approach boundaries specified in NFPA 70E
- Identify and avoid electrical hazards associated with electrical equipment and work methods

In most instances, verifying zero voltage/energy involves crossing the arc flash protection boundary and limited approach boundary of exposed electrical parts. A special work plan or an energized electrical work permit is not required as long as proper safe work practices and personnel protective equipment (PPE) are used and no physical work is performed. (See Chapter 8, “Electrical Safety”.)

2 Procedure

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<tr>
<th>Step</th>
<th>Person</th>
<th>Action</th>
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<tbody>
<tr>
<td>1.</td>
<td>Authorized worker</td>
<td>Before beginning service and maintenance tasks under a lockout procedure, requests zero voltage verification</td>
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<td>2.</td>
<td>Qualified electrical worker</td>
<td>Identifies electrical hazards and required controls</td>
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<td>- Determines all electrical energy sources</td>
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<td>- If non-electrical hazardous energies are present, coordinates with an authorized worker to ensure they are identified</td>
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<td>- Conducts a field survey to verify the accuracy of the documentation and correct any discrepancies</td>
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<td>- Reads all arc flash and other warning labels posted on the equipment</td>
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<td>- Gathers all test meters and test voltage sources</td>
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Step | Person | Action
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|  |  | Dons the personal protective equipment (PPE) stipulated on the arc flash hazard label and any additional required PPE
3. | Authorized worker | Notifies all affected workers of the intent to de-energize the equipment
4. | Authorized worker and qualified electrical worker | De-energizes the equipment

**Important:** only SLAC qualified electrical workers may perform switching of electrical equipment.

- Electrical worker: wears appropriate PPE for the arc flash and voltage hazards as indicated on the warning and danger labels
- Electrical worker: turns equipment off. Opens the energy disconnect / isolation device. Attempts to operate the equipment and verifies it does not operate.

**For equipment with viewing window,** verifies all blades are fully open. Switchgear-type breakers must be opened and racked out to the fully disconnected position. Rackable motor control center (MCC) buckets must be fully withdrawn with the breaker open. Multiple locks may be necessary to lock the both the breaker/bucket and the racking mechanism.

- Authorized worker: once it is determined that equipment will not operate, locks and tags energy isolating / disconnect devices following the appropriate lockout/tagout procedure
- Electrical worker: discharges and grounds all energy storage components

The equipment is now de-energized but not yet in an electrically safe condition.

5. | Qualified electrical worker | Performs zero voltage verification of all circuit elements and electrical parts to which workers may be exposed using appropriately rated test meter(s)

- If not already locked on, apply a personal lockout lock(s) to the energy isolation device(s) or group lockout device
- With a known good voltage source ensures the test meter is working
- Tests all phase conductors or exposed circuit parts from phase to ground and then from phase to phase
- Retests the test meter with the voltage source
- If the electrical worker will not perform work under the lockout, then remove any personal lockout locks that were applied in the first bullet of this step. All energy isolation locks must remain in place.

The equipment is now in an electrically safe condition.

**For an AC circuit** perform an AC pre-test and post-test; for a DC circuit perform a DC pre-test and DC post-test.

**Important:** if the lockout is modified the original lockout and original zero voltage verifications are no longer valid. A new lockout is required and new zero voltage verifications must be performed when establishing the new lockout.

**Note:** electrical workers should use a proximity tester or other voltage testing device to periodically confirm absence of voltage at the work location (liberal use of “test before touch”) including after pauses in work or if the work site has be left unattended.
3 Forms

The following forms are required by this procedure:

- None

4 Recordkeeping

The following recordkeeping requirements apply for this procedure:

- None

5 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 51, “Control of Hazardous Energy”
  - Control of Hazardous Energy: General Requirements (SLAC-I-730-0A10S-004)
  - Control of Hazardous Energy: Simple Lockout Procedure (SLAC-I-730-0A10C-003)
  - Control of Hazardous Energy: Group Lockout Procedure (SLAC-I-730-0A10C-006)

- Chapter 8, “Electrical Safety”

Other Documents

- National Fire Protection Association (NFPA) 70E, “Standard for Electrical Safety in the Workplace” (NFPA 70E)