

**ESS D2006-5 03-Apr-2006****Use of Installed Voltage Monitoring Devices for Verification**

The use of installed voltage monitoring devices such as panel meters at electrical equipment is a viable method for reducing the hazards of electrical shock and arc-flash during the Lockout/Tagout verification step associated with achieving an electrically safe work condition. However, such use of an installed voltage monitoring device or “metering circuit” must meet certain criteria as described hereafter. This ESS Determination is similar to ESS D2006-4 that discusses and accepts the use of test points for the Lockout/Tagout verification step. It is considered appropriate that the installed voltage monitoring device would make use of one or more meters in likely combination with one or more selector switches in a metering circuit to perform all of the necessary tests that assure an electrically safe work condition.

- The installed voltage monitoring device shall be mounted at a readily discernable position on the equipment.
- The metering circuit shall connect to the incoming phases (ungrounded conductors) of the equipment’s power source at the equipment’s incoming terminal point prior to any circuit breaker, fuse, switch or disconnecting means that is furnished with or part of the equipment
- The metering circuit shall have a connection to ground
- The metering circuit shall also be connected to the neutral (grounded conductor) of the power source if the neutral is utilized for current return
- The metering circuit shall accommodate phase-to-phase and phase-to-ground voltage detection
- For equipment powered by a single phase, the metering circuit shall accommodate phase-to-neutral and phase-to-ground voltage detection
- The exterior of the installed voltage monitoring device shall be isolated, guarded and/or grounded to avoid any reasonable possibility of electrical shock
- The metering circuit shall be protected for fault conditions and for transients on the conductors of the power source
- The metering circuit shall be capable of functional testing after removal of the incoming source of power that the metering circuit has tested

Valid use of the installed voltage monitoring device as described for verification purposes requires the following procedure.

- Before the equipment is isolated from the electrical power source, use installed voltage monitoring device to verify the presence of voltage at each of the incoming phases. (This test assures the integrity and proper operation of the metering circuitry.)
- Best practice would include witnessing the removal of electrical energy with the installed voltage monitoring device upon opening of the isolation device external to the equipment
- After isolation, use the installed voltage monitoring device to test that power has been isolated by testing phase-to-phase and phase-to-ground for the absence of voltage,

thereby assuring that the electrical power source has been removed

- For equipment powered by only one phase or if the neutral is utilized for current return, also test phase to neutral for the absence of voltage
- After the testing activity, the installed voltage monitoring device must be functionally tested to insure that it is working correctly.