

Definitions

100% Rule – Work on or near energized parts must be performed only after all participating qualified electrical workers are in 100% agreement on the work to be completed, on the sequence in which it should be performed, and that the hazards are fully controlled or mitigated.

Alternate Method – A deviation from an electrical requirements document or sub-tier document that includes compensatory measures that ensure equivalent objectives can be achieved by establishing and maintaining effective safety.

Arc Blast – A release of mechanical, acoustical, thermal, and optical energy from an electric arc.

Arc Flash – A release of thermal energy from an electric arc by the vaporization and ionization of materials, reaching temperatures up to 35,000 °F. Exposure to these extreme temperatures both burns the skin directly and causes ignition of clothing. (2004 NFPA 70E)

Approved – Acceptable to the AHJ. (2004 NFPA 70E)

Approved Equipment – (1) NRTL-listed equipment being used in accordance with its listing or labeling for the manufacturer's intended purpose; or (2) electrical equipment that is approved by the AHJ as safe for its intended purpose. (based on OSHA)

Authority Having Jurisdiction (AHJ) – The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure. (2005 NEC)

Authorized Work – Electrical work that requires a combination of RLM and FOD approvals of the activity, accepting that the necessary conditions for the activity to be released and executed are clearly established (LANL). Subsequently, the qualified electrical worker(s) can perform the authorized work based on an approved safe work procedure and appropriate work practices.

Bare Hand Work – A technique of performing work on live parts, after the employee has been raised to the potential of the live part. (2004 NFPA 70E)

Barricade – A physical obstruction such as tapes, cones, or A-frame-type wood or metal structures intended to provide a warning about and to limit access to a hazardous area. (2004 NFPA 70E)

Barrier – A physical obstruction that is intended to prevent contact with equipment or live parts or to prevent unauthorized access to a work area. (2004 NFPA 70E)

Clarify – To make codes, standards, and regulations understandable and free from confusion through an oral or written process.

Compelling Reason – The reason for authorizing workers to perform electrical work on or near exposed hazardous energized electrical circuit parts. The reasons include two types:

- Increased or additional hazards of de-energizing critical systems
- Infeasibility due to equipment design or operational limitations (e.g., testing of electric circuits that can only be performed with the circuit energized).

Conductive – The ability of any material to carry electrical current.

Controls – Preventative measures, administrative and engineered features, and PPE applied to work for the purpose of protecting people, the environment, property, and/or national security.

Critical Systems – Those systems that would result in increased or additional hazards if de-energized (e.g., life support equipment, emergency alarm systems, hazardous location ventilation equipment, area lighting, systems maintaining national security).

De-energized – Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of earth. (De-energized does not describe an electrically safe work condition, e.g., a circuit that has been disconnected but not controlled and verified.) (2004 NFPA 70E)

Electrical Components – A general term that includes electrical conductors, circuit parts, and antennas where an *electrical hazard* may exist.

Electrical Hazard – A dangerous condition such that contact or equipment failure can result in electric shock, arc-flash burn, thermal burn, or blast. (2004 NFPA 70E)

Note: Electrical hazards are associated with utility and facility components, R&D components, and RFMW components. RFMW electrical hazards include both those associated with direct contact and also those associated with electromagnetic fields and induced currents in conductive objects immersed in RF fields. Note that the definition of electrical hazard includes ‘dangerous’ meaning ‘able or likely to inflict injury’; there are high voltage, low current sources that are not intrinsically dangerous (e.g., photomultiplier tube power supplies), and there are low-voltage, high-current sources that are not ‘safe’ (e.g., car batteries). A ‘harmless’ static electricity shock could cause sufficient startle reaction to make a worker fall off a ladder. A hazard analysis is necessary to identify electrical hazards and determine the degree of risk.

Electrical Safety – Recognizing hazards associated with the use of electrical energy and taking precautions so that hazards do not cause injury or death. (2004 NFPA 70E)

Electrical Single-Line Diagram – A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used in the circuit or system. (2004 NFPA 70E)

Electrical Work – (1) working on or near energized electrical parts; (2) assembly or fabrication of potentially hazardous electrical equipment; (3) working with unlisted or unapproved electrical equipment; and/or (4) using listed or approved equipment in a manner not consistent with the listing or approval.

Electrically Safe Work Condition – A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, locked/tagged out (or equivalent) in accordance with established standards, tested to ensure the absence of voltage, and grounded if determined necessary. (2004 NFPA 70E)

Energized – Electrically connected to or having a source of voltage (2004 NFPA 70E), or electrically charged to have a potential significantly different from that of earth in the vicinity.

Note: ‘De-energized’ parts that have not been verified and locked out and tagged in accordance with established standards are considered energized.

Engineering Supervision – The involvement of a qualified engineer to make hazard analysis determinations, based on the engineer’s knowledge of the design and operation of the system, and knowledge and ability to perform the required analysis of the system.

Note: An example would be a facility engineer’s determination of the arc-flash boundary based on knowledge and calculation of the available short circuit current and fault clearing times.

Exposed (as applied to live parts) – Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts that are not suitably guarded, isolated, or insulated. (2004 NFPA 70E)

Flash Hazard – A dangerous condition associated with the release of energy caused by an arc. (2004 NFPA 70E)

Note: An arc with sufficient energy will suddenly and violently change material(s) into hot and ionized gases, resulting in thermal hazards.

Flash Hazard Analysis – A study investigating a worker’s potential exposure to arc-flash energy, conducted for the purpose of injury prevention and the determination of safe work practices and the appropriate levels of PPE. (2004 NFPA 70E)

Flash Protection Boundary – An approach limit at a distance from exposed live parts within which a person could receive a second-degree burn if an electrical arc flash were to occur. (2004 NFPA 70E)

Ground Hook - also known as Personnel Safety Ground (DOE Electrical Safety Handbook) and Ground Cluster (term used in the utility industry) - A manually applied device to ensure that a previously energized conductor is free from potential relative to ground. The ground hook is placed on the conductor as a part of a Mode 1 procedure to ensure that the conductor is at zero voltage relative to ground, and to ensure that any capacitively stored energy is discharged. If there is a possibility that potential could reappear, the ground hook must be left on the conductor during all work procedures exposing the worker to the conductor. If properly designed, and if proper PPE is worn, the ground hook may be used to discharge capacitively stored energy up to a limited value.

Ground Hook, Hard - A ground hook that has a robust conductor straight to ground without any series resistance.

Ground Hook, Soft - A ground hook that has a series resistance to limit the discharge current while discharging capacitors. The resistor must be properly chosen to limit the discharge current to a safe level, remove the stored energy in a reasonable time, and handle the power during dissipation.

Hazard Classification – A system developed for categorizing *electrical hazards* based on the voltage, current, power, energy, and waveform present on *electrical components*.

Hazardous Electrical Work – All electrical operations in which workers may be exposed to an electrical hazard.

Incident Energy – The amount of energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. One of the units used to measure incident energy is calories per centimeter squared (cal/cm^2). (2004 NFPA 70E)

Note: Although the proper SI units for incident energy is J/m^2 , PPE is rated in terms of cal/cm^2 .

In-House Built Equipment – Electrical equipment designed and/or fabricated by employees of a site to include employees and any employees of subcontractors. This term may similarly be applied to any equipment design and/or fabricated by research institutions, including universities and other R&D labs.

Insulated – Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current. (2004 NFPA 70E)

Note: When an object is said to be insulated, it is understood to be insulated for the conditions to which it is normally subject. Otherwise, it is uninsulated.

Limited Approach Boundary – An approach limit at a distance from an exposed live part within which a shock hazard exists. (2004 NFPA 70E)

Live Parts – Energized conductive components. (2004 NFPA 70E)

Modified NRTL-Listed Equipment – NRTL-listed electrical equipment that has been modified or is being used for a purpose other than intended by the manufacturer. Modification means that a change has been made that affects the safety of the equipment or is not in accordance with the manufacturer’s installation or maintenance instructions.

Multi-Employer Worksite – A workplace where more than one employer is working, primarily under a host employer/contractor relationship. (based on 2004 NFPA 70E)

Nationally Recognized Testing Laboratory (NRTL) – An organization (e.g., UL, CSA):

- That is recognized by OSHA in accordance with Appendix A of 29 CFR 1910.7
- That tests for safety
- That lists, labels, or accepts equipment or materials that meet all of the criteria in 29 CFR 1910.7(b)(1)-(b)(4)
- That is concerned with evaluation of products or services
- That maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services
- Whose listing states that the equipment, material, or services either meet appropriate designated standards or have been tested and found suitable for a specified purpose. (based on OSHA)

NRTL Listed Equipment – Equipment, materials, or services included in a list published by an NRTL and used in accordance with any instructions included in the listing or labeling for its intended purpose by the manufacturer based on NEC and OSHA)

Other Manufacturer – A manufacturer that has not yet met the criteria for Reputable Manufacturer as defined in this document. By going through the required process, a manufacturer may be added to the reputable manufacturer list.

Personal Protective Equipment (PPE) – Clothing and equipment that is designed and constructed to protect workers from electrical shock or to reduce the burns that would be sustained from an electrical arc flash.

Plug Control – Controlling the hazard of unexpected energization or start up by unplugging cord and plug connected electrical equipment from the energy source and then keeping the plug under the exclusive control of the employee performing the work.

Pre-job Brief – Review by the PIC and workers of a work activity immediately prior to release to ensure understanding of the IWD and agreement on how to execute the work.

Prohibited Approach Boundary – An approach limit at a distance from an exposed live part within which work is considered the same as making contact with the live part. (2004 NFPA 70E)

Qualified Electrical Worker - see Electrically Qualified Worker.

Qualified Person – One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved. (2004 NFPA 70E)

Reputable Manufacturer – Manufacturers that meet the following criteria and process:

- At least two pieces of unlisted electrical equipment from the manufacturer have been examined and approved by an ESO. Examination must be done according to the requirements for in-house built/modified equipment as required in this document.
- The manufacturer has a North American office/distributor (e.g., Thomas Register®. <http://www.thomasnet.com/>).
- The manufacturer services their products and can provide technical support.
- The manufacturer provides adequate documentation in English (acceptable to the approving ESO).

Restricted Approach Boundary – An approach limit at a distance from an exposed live part within which there is an increased risk of shock due to electrical arc over combined with inadvertent movement for personnel working in close proximity to the live part. (2004 NFPA 70E)

Safety Watch – A safety watch is a more stringent hazard control measure than the two-person rule and must be implemented when there are grave consequences from a failure to follow safe-work procedures. The safety watch must be a qualified electrical worker who must be responsible for monitoring qualified worker(s) performing high-hazard electrical work. In addition to the two-person Rule requirements, a safety watch must:

1. Have no other duties that preclude continually observing, coaching, and monitoring for potential mistakes
2. Be less than 50 ft from the worker performing the work (where practicable)
3. Have a thorough knowledge of the specific working procedures to be followed and the work to be done
4. Ensure that no unqualified persons enter barricaded areas
5. Wear the appropriate PPE.

Shock Hazard – A dangerous condition associated with the release of energy caused by contact or approach to live parts. (2004 NFPA 70E)

Note: Approach by body part or any conductive object nearer than the minimum air insulation distance at a specific voltage can result in shock without direct contact.

Shock Hazard Analysis – A study to determine the voltage(s) to which a worker will be exposed, boundary requirements, and the PPE necessary to minimize the possibility of electrical shock to personnel.

Special Permission – The written consent of the authority having jurisdiction. (2004 NFPA 70E)

System – A combination of components integrated into a unit to perform a specific task that is unlikely to change.

Two-Person Rule – The requirement for two qualified electrical workers to be present in the workplace and to be aware of the other worker's task while performing electrically hazardous work. Under the Two-Person Rule, each worker must:

1. Be a qualified person (qualified electrical worker)
2. Remain in visual and audible contact with the other worker(s) performing the work
3. Have a thorough knowledge of the location and operation of disconnects and shut-down controls
4. Have ready means to alert emergency-rescue personnel
5. Be able to safely disengage an injured worker from the hazard
6. Be trained and certified in CPR and AED and know the location of the nearest AED, except for work in battery Classes 4.2 and 4.3 below 100 V.

Unqualified Person – A person who is not a qualified person. (2004 NFPA 70E)

Unlisted Equipment – Equipment that has not been listed by a NRTL.

Utilization Equipment – Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes. (NEC)

Working Near (live parts) – Any activity inside a limited approach boundary (2004 NFPA 70E), a flash protection boundary, or the outer boundary of an RFMW controlled environment.

Note: Working near applies to live parts or exposed energized electrical conductors or circuit parts that are not put into an electrically safe work condition.

Working On (live parts) – Coming in contact with live parts with the hands, feet, or other body parts with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing. (2004 NFPA 70E) Also, any activity inside the prohibited approach boundary.