


PPPL	PRINCETON PLASMA PHYSICS LABORATORY ES&H DIRECTIVES		
	ES&HD 5008 SECTION 2, CHAPTER 2 Definitions & Responsibilities		
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CHAPTER 2 DEFINITIONS & RESPONSIBILITIES

Terms defined in Webster’s New Collegiate Dictionary or in IEEE Standard 100 are not included in this Chapter 2. Terms defined and used within a single Chapter or paragraph of this Section 2.0 are not included in this Section 2. Other terms are defined below. Abbreviations of professional organizations are spelled out in ES&HD 5008, Section 2 Chapter.

2.1 DEFINITIONS

- 2.1.1 Authorized Person – a Qualified Person who is directed to work on a task by a Supervisor having the responsibility and authority to do so.
- 2.1.2 Emergency-Shutdown Pushbutton (E-Stop) – A control device designed to initiate removal of energy to experimental devices in the area during an emergency.
- 2.1.3 Energy Barrier – Restricts or shunts an energy source from a worker. See ES&HD 5008, Section 2 Chapter 4, paragraph 4.3.1 for description.
- 2.1.4 General-Access areas – Areas that do not present hazards to personnel while equipment and systems are functioning normally. These areas are accessible to all personnel. See ES&HD 5008, Section 2 Chapter 4, paragraph 4.12.1 for details.
- 2.1.5 Grounding Stick (Hook) – An insulating device used for discharging and/or temporarily shorting and grounding de-energized high-energy-storage systems and electrical circuits. See ES&HD 5008, Section 2 Chapter 15, paragraph 15.2 for requirements.
- 2.1.6 Insulated Hand Tools- Industrial-grade hand-tools hot-dipped with insulating material in order to protect the user from electric shock and to minimize the risk of short circuits between live parts operating at different potentials. The insulation on all such tools shall have a durable second or “tell-tale” coating of contrasting color to evidence potential damage. Insulated tools shall comply with the requirements of IEC Standard 900 and ASTM F1505. Use is limited to circuits of 600 v and less and when used in accordance with ES&HD 5008, Section 2 Chapter 3, paragraph 3.3. Use of insulated tools satisfies the

requirements of OSHA, Part 29 CFR 1910.335(a)(2). Insulated hand tools do not include:

- A. Tools and equipment supplied from an external energy source, such as portable hand-held electric drills, grinders, or saws,
- B. Insulating rods and poles used for working at a distance.

2.1.7 Labeling – Labeling of electrical equipment and panels will follow or exceed the requirements found in NFPA 70E Section 130.5.D.

2.1.8 Interlocked-Access areas – Areas in which the sources of power must be interlocked with the access doors because of the hazards contained inside. See ES&HD 5008, Section 2 Chapter 4, paragraph 4.12.3 for details.

2.1.9 Life Cycle – Phases of work performed on the facilities, plant, and projects of this Laboratory. The phases include designing, fabricating, installing, testing, operating, maintaining, and decommissioning.

2.1.10 Limited-Access areas – Areas that are kept locked and are accessible only to authorized personnel because of the hazards contained inside. See also ES&HD 5008, Section 2 Chapter 4, paragraph 4.12.2 for details.

2.1.11 Live Part(s) – Energized conductive components.

2.1.12 Positively De-energized – See ES&HD 5008, Section 2 Chapter 3, paragraph 3.3.2 (A) for details.

2.1.13 Personnel-Safety-Interlocked Systems – Includes one or more of the emergency-shutdown systems and/or personnel-access-control systems described in Chapter 5.

2.1.14 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. (See table 3.3 for minimum training requirements).

2.1.15 Safing- The act of making safe an area or component that is to be worked on by performing a hazard analysis and taking the necessary steps to mitigate the hazards prior to the start of work.

2.1.16 Safety Barrier – A barrier that separates a worker from an energy source by time and distance. It is a physical obstruction that is intended to prevent contact with equipment or live parts or to prevent unauthorized access to a work area. For detailed criteria, see ES&HD 5008, Section 2 Chapter 4, paragraph 4.3.4. For guarding of live parts operated over 50 volts and below 600 volts, see NEC

article 110.27. See NEC articles 110.30 thru 110.34 for live parts above 600 volts.

- 2.1.17 Safety Interlock – An electrical and/or mechanical device provided to prevent hazardous operation of equipment or to inhibit unsafe access to areas, enclosures, or equipment. See ES&HD 5008, Section 2 Chapter 5 for detailed criteria.
- 2.1.18 Safety-Interlock-Coordinator – Provides oversight on the PPPL Personnel Safety Interlock systems and their components. See ES&HD 5008, Section 2 Chapter 2, paragraph 2.2.4 for details.
- 2.1.19 Safety Watch – Monitors the work process of authorized personnel, when they are engaged in potentially hazardous activities, to help prevent unsafe acts. See ES&HD 5008, Section 2 Chapter 2, paragraph 2.2.6 for details.
- 2.1.20 Temporary wiring – may consist of extension cords, flexible cords, multiple outlet boxes, and power strips. Temporary wiring is installed during periods of construction, emergencies, testing, experiments, and developmental work and is not to be used in place of permanent wiring. Temporary wiring shall be removed upon completion of construction or purpose for which the wiring was installed. See ES&HD 5008, Section 2 Chapter 3, paragraph 3.3.9 for details and permitted use of temporary wiring..
- 2.1.21 Voltages (High and Low)
- A. High Voltage – circuits designed to operate above 600 V.
(Class E circuits...Nominal operating voltage above 600V)
 - B. Low Voltage – circuits designed to operate at 600 V and below.
(Class A circuits...Nominal operating voltage below 50V)
(Class B circuits...Nominal operating voltage 120/208 V)
(Class C circuits...Nominal operating voltage 240V)
(Class D circuits...Nominal operating voltage 480/277V)
- 2.1.22 Work – Electrical work performed on or near live circuits is divided into three risk-categories which are :
- A. **High-risk** tasks include performing electrical connections or equipment alterations or adjustments to live parts. High risk tasks require an “Energized Work Permit” (see ES&HD 5008, Section 2 Chapter 3, paragraph 3.3.3 B).
 - B. **Moderate risk** tasks include monitoring or testing on live parts, troubleshooting, voltage measurements, or diagnostic testing equivalent to attaching suitably insulated probes or using Class 0 protective gloves, attaching un-insulated clip-on test leads to energized conductors.

- C. **Low risk** tasks include observing or visually inspecting live parts from a safe distance to locate malfunctions such as arcs, overheating and excessive noise.

2.2.23 Testing/Troubleshooting, Diagnostic and Voltage Measurements

A work routine designed to locate malfunctions, to determine performance characteristics, and to perform acceptance tests. A person is considered working at a moderate risk when performing these routines and shall have performed a job hazard analysis and determined the proper personal protective equipment (PPE) required for the task as required per approved procedures prior to the start of work. See ES&HD 5008, Section 2 chapter 3, paragraph 3.3.3 A & B for more information.

- 2.1.24 **Working Alone** - A person is considered working alone when not within earshot or visual contact with another employee for more than a few minutes at a time. PPPL Policy P017 provides guidelines for when a person may be allowed to work alone and/or when working alone is prohibited. See ES&HD 5008, Section 2 Chapter 3, paragraph 3.3.2(B) of Section 2 for General Electrical requirements.

- 2.1.25 **Work on Energized Electrical Equipment** – Installation, maintenance, and repair work activities on or in close proximity to unguarded electrically energized Components of such systems, which have a significant potential for injury due to shock, arcing, or joule heating. [Note: Although, inspection, troubleshooting, and testing activities are not included in this definition of work, the worker must follow the same safety procedures until such time that the system is demonstrated to be de-energized.]

2.2 RESPONSIBILITIES

2.2.1 Managers and Supervisors

All Department Heads, Division Heads, Branch Heads, Section Heads, cognizant engineers, and supervisors are responsible for implementing Section 2. (Electrical Safety) within their organization. Supervisors must:

- A. Assure that all employees, under their supervision, whose duties require them to work with electrical equipment, are qualified to the appropriate level and as a minimum are trained to:
1. Recognize and report hazards and violations of this Section 2.0.
 2. Assure the use of appropriate facility safety signs, warning lights, and barricades where required by PPPL ESH-002 and this Section 2.0.
 3. Observe safe operating procedures and practices.
 4. Use approved Lockout/Tagout and safety-tagging procedures where required by PPPL ESH-016, PPPL ESH-001, and this Section 2.0.

- B. Implement properly approved and authorized variances from this Section 2.0.
- C. Ensure that safety guards, barriers or protective measures are satisfactory for the work conditions.

2.2.2 Design Engineers and their Supervisors

To help assure that the design provides all of the necessary safety features and meets all of the safety requirements, standards, and codes, design engineers and their supervisors shall review and approve single-line drawings, electrical-arrangement drawings, and schematic/elementary diagrams associated with:

- A. Capacitive or inductive devices that are capable of storing energy of 10J or more.
- B. Systems operating at or producing 250 V nominal or greater.
- C. Systems that are adjacent to other systems, where faults or arcs can result in producing voltages of 250 V nominal or greater.

2.2.3 Electrical Safety - Interlock Coordinator

The responsibilities of the Electrical Safety-Interlock Coordinator include:

- A. Reviewing the design of new personnel-safety-interlock systems and modifications to existing systems in light of existing and new standards for such systems.
- B. Verifying the initial-installation, modification, and testing of every new Personnel Safety Interlock System (P.S.I.) at PPPL. After initial verification, the systems revert to the Project / Operations personnel for routine maintenance testing at a frequency specified in ES&HD 5008, Section 2 Chapter 5, paragraphs 5.8.4.B and 5.8.4.C. Maintain copies of PSI test data when received from Project Safety Interlock coordinator.
- C. Encouraging standardization and uniformity in the design or modification of personnel-safety-interlock systems.

2.2.4 Project-Interlock Coordinator

The responsibilities of the Project-Interlock Coordinator include:

- A. Reviewing the design of new personnel-safety-interlock systems and modifications to existing systems for their Projects.
- B. Coordinates initial-installation, modifications, and testing of all their Projects Personnel Safety Interlock System (P.S.I.).

- C. Coordinates routine maintenance testing at a frequency specified in ES&HD 5008, Section 2 Chapter 5, paragraphs 5.8.4 (B) & (C). Using the due dates on the Preventative Maintenance data base cards (if used) or a maintenance log ensures that the testing is completed in a timely fashion.
- D. Maintains the original P.S.I. test data files or sends original test procedures to Central Files and forwards a copy to Electrical Safety.

2.2.5 Key Custodian (KC)

The Key Custodian is a PPPL employee with technical knowledge of the Lab-wide interlock key system who keeps all the spare interlock keys secure and issues keys upon receipt of an approved request form. (See PPPL Procedure ENG-011.)

2.2.6 Safety Watch

A Safety Watch serves the minimum requirements that are specified in OSHA, 29 CFR 1910.335(b)(3), for an “Attendant.”

A. The qualifications of a Safety Watch shall be:

1. Thorough instruction in the locations and the operating sequences of emergency-shutdown pushbuttons and power disconnecting means.
2. Thorough instruction in the specific working procedures to be followed and the work to be completed.

B. Safety Watch is the designated person who must have no other tasks to perform other than being the Safety Watch. Under normal conditions, the primary responsibilities of the Safety Watch must be to:

1. Attempt to prevent careless acts by observing workers and operations being performed and stopping any unsafe activities. A Safety Watch shall be provided with the personal protective equipment necessary for the potential hazards that are coincident with the task(s). A Safety Watch may initial check-list steps during the execution of a procedure if the primary responsibilities are not jeopardized.
2. Maintain visual and audible contact with the person performing safing functions that are generically described in ES&HD 5008, Section 2 Chapter 3, paragraph 3.3.2 (B).
3. Establish emergency communication plan for notifying ESU when their assistance is necessary.
4. Have a plan in place for emergency situations to quickly de-energize equipment and energy sources, then alert personnel from the Emergency Services Unit (ESU) Ext.3333.

5. When possible, perform the removal of an injured person (except in confined space) from any hazards without becoming the second victim.
6. Verify that all workers are wearing the appropriate protective equipment when they are working under the minimum requirements for hands-on work as defined in ES&HD 5008 Section 2 Chapter 3, paragraph 3.3 and NFPA 70E.
 - a) 70E, 130.4 for shock protection approach boundaries tables 130.4(D)(a) for alternating current (AC) systems.
 - b) 70E, 130.5 for arc flash risk assessment.
7. In the event of an accident, advise the arriving ESU first responders of all the potential hazards present.

C. Safety Watch Actions for an Electrical Fire

1. Contact ESU (ext, 3333) or by radio. Stay on line until ESU terminates contact.
2. Evacuate area by word of mouth and/or fire alarm.
3. If safe to do so de-energize circuit or cut power off to area.
4. Exit area and notify ESU if any known hazards are present.
5. Remove flammables from area if safe to do so.

D. Safety Watch Actions for Electric shock

1. Remove victim from the electrical source by shutting down power if possible or by using a non-conductive pole (tested fiber glass).
2. Contact ESU (ext. 3333) regardless of severity of the shock. Give name and location.
3. Keep victim calm, sitting or laying down.
4. If victim has apparent injuries, keep still to prevent further injury.
5. Keep other personnel out of the area to avoid additional victims.
6. If first aid or CPR is indicated, treat victim appropriately.
7. Notify ESU of any known hazards that may be present.

Note: There is a high success rate when applying CPR to shock victims in respiratory arrest.

2.2.7 All electrical equipment and electrical installations, additions, alterations, and repairs rated at 50 volts or higher or 1000 watts or higher shall: (1.) be approved prior to installation and/or use by the Authority Having Jurisdiction (AHJ) at PPPL, (2.) undergo a safety review/inspection performed by the PPPL Electrical Safety Specialist.

Is responsible for ensuring that labeling of all electrical work labeling meets or exceeds the labeling requirements found in NFPA 70E Article 130.5.D.

2.2.8 All Employees

All employees are responsible for performing tasks in accordance with established safety rules and procedures. They shall not act in any manner that exposes them or their fellow employees to health hazards or to the risk of injury. Additionally, they shall report all observed unsafe conditions to their supervisor or to others per procedure GEN-011, "ES&H Deficiency Reporting".