

Do You Have An R&D Lab?

Electrical safety in an R&D facility or laboratory can be challenging. The rules for R&D labs have been broadened in the 2018 edition of NFPA 70E. R&D labs face special challenges due to one-of-a-kind equipment and the need to do things that are sometimes out of the ordinary. The lab must follow all requirements of 70E except as amended by article 350. Let's look at how article 350 changes things for areas designated for research and development or laboratories.

Electrical Safety Authority (ESA)

To ensure proper safe work practices and controls each lab is permitted to assign an Electrical Safety Authority or ESA. The ESA could be an electrical safety committee, engineer or equivalent qualified individual. The ESA is permitted to delegate authority to individuals or organizations within their control.

ESA Responsibility

The ESA has the responsibility to act in a manner similar to an Authority Having Jurisdiction (AHJ). NFPA defines an AHJ as an individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure. AHJ's are referenced throughout many NFPA documents and could be a fire marshal, building inspector, insurance inspector, commanding officer, etc.

ESA Qualifications

The ESA must be competent in the requirements of NFPA 70E and the electrical system requirements of the lab.

Specific Measures And Controls For Personnel Safety.

A competent person is still required for the lab as in years past. The standard change calls for the lab to designate a competent person rather than having one assigned. The standard defines a competent person as someone who meets all the requirements of qualified person and who, in addition, is responsible for all work activities or safety procedures related to custom or special equipment and has detailed knowledge regarding the exposure to electrical hazards, the appropriate control methods to reduce the risk associated with those hazards, and the implementation of those methods.

Job Briefings

Job briefings must be conducted as required by chapter 1 of 70E with an exception: Prior to starting work, a brief discussion shall be permitted if the task and hazards are documented and the employee has reviewed applicable documentation and is qualified for the task.

Personnel Protection

As elsewhere in 70E it is necessary to use safety-related work practices for employees exposed to electrical hazards. For special lab equipment where the personnel need to calibrate and adjust sensors,

motor controllers, control hardware and other devices that are installed inside equipment or control cabinets the ESA shall define the required PPE based on the risk and exposure. Insulating blankets, covers, or barriers are permitted and insulated tools are required where feasible.

Approval Requirements

Field evaluation is required of all equipment that is not labeled as listed by a listing organization such Underwriters Laboratories. Because in a lab setting one-of-kind equipment may be built for a one-time use it being listed is not likely or practical.

Custom Built Non-Listed Research Equipment, 1000 Volts or Less AC Or DC

Equipment markings, documentation, shutdown procedure, specific hazards, and approvals are required for custom built equipment. They are normally provided with equipment that is purchased off the shelf but for custom equipment, it has to be created on-site.

Equipment Marking

Voltages entering and leaving the control cabinets of the equipment are required to be marked on the exterior of the equipment. Caution, Warning, or Danger labels shall be affixed to the exterior describing specific hazards and safety concerns. ANSI Z535 is a good reference for safety signage.

Equipment Documentation

Sufficient documentation must be provided for the installation, maintenance, and operation of custom built equipment that also describes any safety concerns, shutdown procedure, and non-standard installations. Schematics, drawings, and description of power feeds, voltages, currents, and parts used for construction, maintenance, and operation shall be provided.

Shutdown Procedures

A simple on/off switch doesn't work for a shutdown procedure for much of the equipment in a laboratory. A detailed shutdown procedure and emergency shutdown procedure that allows for a safe shutdown are required. If equipment-specific lockout/tagout is required, these procedures shall be readily available.

Specific Hazards

Hazards other than electrical shall be documented and readily available.

Approvals: Drawings, Procedures & Equipment

Drawings, procedures, and equipment shall be approved by the ESA prior to startup. The equipment must comply with national standards unless research requires exceptions. Proper shutdown procedures and PPE requirements shall be considered in the absence of grounding and bonding.

Tools, Training, & Maintenance

Sometimes it may be necessary to use special tools and unusual PPE. Documentation is required in such cases and the ESA will determine appropriate training and qualifications required.

Custom Built Non-Listed Research Equipment, > 1000 Volts AC Or DC

Shall comply with everything required for under 1000 volt equipment. If the equipment requires PPE beyond what is commercially available the ESA will determine safe work practices and PPE to be used.

Energy Thresholds

If the energy exposure levels exceed those below, the ESA shall determine appropriate controls.

1. AC: 50-Volts and 5 Milliamps
2. DC: 100-Volts and 40 Milliamps
3. Capacitive Systems:
 1. 100-Volts and 100 Joules Of Stored Energy
 2. 400-Volts and 1.0 Joules Of Stored Energy
 3. 0.245 Joules Of Stored Energy

Taken from the Department Of Energy *Electrical Safety Handbook*.

Establishing an Electrically Safe Work Condition

Just like elsewhere in 70E a circuit needs to be de-energized prior to work being performed. In the lab there are exceptions:

The ESA is permitted to determine alternative methods of ensuring worker safety for the following conditions.

1. *Minor tool changes and adjustments, and other normal production operations that are routine, repetitive, or sequential and integral to the use of the equipment for production*
2. *Minor changes to the unit under test and other minor servicing activities, to include the activities listed under 350.10 Exception condition (1), that take place during research and development*
3. *Work on cord-and-plug-connected equipment for which exposure to the hazards of unexpected energization or startup is controlled by the following:*
 1. *Unplugging the equipment from the energy source*
 2. *The employee performing the work maintaining exclusive control of the plug*

Conclusion: Electrical Safety In An R&D Facility or Laboratory

Electrical safety in an r&d facility or laboratory has special challenges that are caused by special equipment and people performing work that goes beyond what the original creators of 70E had in mind. Article 350 does a great job in providing guidance by allowing for an Electrical Safety Authority working with the designated competent person(s) to provide the safest environment for these very challenging areas.



Daryn Lewellyn

daryn@electricaltrainingpro.com

877.393.9901