

ELECTRICAL SAFETY in RESEARCH LABORATORIES and SUPPORT SHOPS

This excerpt (Section 11) from Penn's Electrical Safety Program defines practices and procedures to be implemented for electrical equipment that is not listed or labeled by a nationally-recognized testing laboratory (NRTL). Typically, this will include research related equipment that is custom built in-house or NRTL-listed or labeled equipment that has been modified which invalidates the listing or labeling.

A) General

- 1) Equipment and installations that bear the seal of a NRTL are considered approved as long as they are installed and used in accordance with any instructions included in the listing or labeling.
- 2) NRTL-listed or labeled equipment must be acquired/used whenever it is available, even if similar unlisted or labeled equipment can be used. OSHA allows for approval of custom-made equipment or related installations if the equipment is determined to be safe for its intended use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection.
- 3) Electrical equipment fabrication, modification or installations shall be completed by or under the direct supervision of a Competent Person.
- 4) A Competent Person is person who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify and avoid the hazards involved. The Competent Person 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.
- 5) Where electrical equipment must be custom fabricated because listed or labeled equipment is not available or there is a case where foreign equipment is acquired to perform a unique experimental function in support of the laboratory's scientific mission or there is a need for continued use of legacy equipment, the equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees. The equipment must be Field Evaluated and approved by a Competent Person and documented on the form included in Appendix 11.

B) Equipment Examination - In judging equipment, considerations such as the following shall be evaluated:

- 1) Suitability of equipment for an identified purpose may be evidenced by listing or labeling for that identified purpose.
- 2) Electrical equipment must be enclosed to protect personnel from the hazards of electrical shock and arc flash and to contain fire or pieces that could be violently expelled.
- 3) Exposed metal parts of the enclosure are bonded and grounded.
- 4) Appropriate overcurrent protection is installed.

- 5) Mechanical strength and durability, including, for parts designed to enclose and protect other equipment, the adequacy of the protection thus provided.
- 6) Wire-bending and connection space.
- 7) Electrical insulation.
- 8) Heating effects under normal conditions of use and also under abnormal conditions likely to arise in service.
- 9) Arcing effects.
- 10) Classification by type, size, voltage, current capacity, and specific use.
- 11) Openings through which conductors enter shall be adequately closed and strain relief provided.
- 12) Other factors that contribute to the practical safeguarding of persons using or likely to come in contact with the equipment.

C) Approval Process

- 1) The fabricator must arrange for Field Evaluation of the fabricated or modified electrical equipment. The equipment must be inspected and approved by a Competent Person.
- 2) Documentation: The following documents must be maintained by the equipment fabricator:
 - a) Justification for in-house modifications of NRTL listed or labeled equipment or need for in-house fabrication of equipment.
 - b) Design information and a schematic line drawing of the electrical work.
 - c) Qualifications of the fabricator. Qualifications include adequate technical electrical/electronic and electrical safety knowledge.
 - d) Completed Custom Built or Modified Equipment Inspection & Approval Form (Appendix 13). The form must be maintained for the life of the equipment.



CUSTOM BUILT OR MODIFIED EQUIPMENT INSPECTION & APPROVAL FORM

Equipment Identification	
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Equipment Name	
Equipment Fabricator	
Department	
Competent Person/Inspector	

Refer to Guidance Document for inspection criteria. Inspection Satisfactory: (Check Box)

1	Equipment examination	
2	Execution of work	
3	Exposed metal parts grounded	
4	Electrically conductive material likely to become energized is bonded	
5	Strength	
6	Electrical spacing	
7	Overcurrent protection appropriate for intended use	

NOTE: Approved equipment must be installed and used in accordance with the instructions provided by the designer/builder and the Inspector.

Comments: Include all designer/builder instructions, restrictions on use, drawings or information that is relevant to the safe installation and use of this equipment. Attach additional sheets as necessary.

Equipment status following review (indicate status);

- Approved
- Conditional Approval (as documented above)
- NRTL (for items approved by an NRTL)
- Rejected

Once approved for use, if this equipment is modified, relocated, damaged, repaired or utilized for other than the intended use stated above, this approval is void pending re-examination

Date:		
	Inspector - Print Name	Inspector - Signature