

PPPL	Princeton Plasma Physics Laboratory	PROCEDURE	ENG-023 Rev 1 page 1 of 6
	Subject: Electrical Equipment Approval	Effective Date: June 2, 2016	Initiated by: Head, Engineering and Infrastructure
Supersedes: Revision 0, dated May 2, 2014		Approved: Director	

Management System: 03.00 Engineering
Management System Owner: Head, Engineering & Infrastructure
Management Process: 03.04 Engineering Programs and Processes
Process Owner: Head, Engineering & Infrastructure
Subprocess: 03.04.09 Approval of Electrical Equipment/Installations
Subprocess Owner: Head, Electrical Engineering and Head, AC Power (AHJ)
Subject Matter Experts (SMEs): Head, AC Power (AHJ), Head Electrical Engineering; Head, Safety Division; Electrical Safety Specialist of Safety Division (ESS); Head, Project Management Office

APPLICABILITY

This procedure applies to all PPPL electrical equipment and electrical installations rated at 50 Volts or higher or 1000 Watts or higher including lab built equipment.

SCOPE

The procedure provides the criteria and the process for a third party evaluation, review, and acceptance of electrical equipment and installations at PPPL and its collaborations where applicable.

Electrical equipment and electrical installations rated at 50 Volts or higher or 1000 Watts or higher shall be approved prior to use at PPPL or on PPPL fabricated equipment for use at outside facilities per Nationally Recognized Testing Laboratory labels or listings, or by the approval of the Authority Having Jurisdiction (AHJ) at PPPL.

For NRTL electrical equipment using wall plug power, no other approval is needed. NRTL equipment that has been altered or is used in ways not intended by the manufacturer is no longer considered NRTL approved and must be approved by the AHJ per this procedure.

For NRTL equipment requiring electrical installations other than plug-in devices, the installation shall comply with NEC and PPPL approved drawings. The installation must be reviewed by the Electrical Safety Specialist and inspected per normal QC process per QA-004. If the installation does not comply with NEC it must be evaluated and approved by the AHJ.

This procedure includes inspection, approval, and labeling steps and documentation for electrical equipment and installations that must be inspected prior to use by a third party Electrical Equipment Inspector approved by the AHJ.

INTRODUCTION

In accordance with OSHA Safety 1910.303(b)(2), ES&H Directive 5008 Section 2 – Electrical Safety Program, and DOE Electrical Safety Handbook, electrical products used in the workplace must be approved by a Nationally Recognized Testing Laboratory (NRTL) when available. This standard is used to ensure that electrical products can be used and operated safely.

The OSHA web page <<https://www.osha.gov/dts/otpca/nrtl/nrtlmrk.html>> contains [certification marks](#) generally used by each NRTL. The use of the NRTL mark shows that the product has been tested against a specific safety standard and the equipment conforms to that standard. See Attachment 1 for examples.

For new or replacement equipment, a NRTL-listed product must be purchased instead of an unlisted product if both exist. All NRTL-listed equipment must be used for its intended purpose in accordance with the manufacturer's instructions, otherwise the equipment must be treated as unlisted and needs to be accepted prior to use at PPPL in accordance with the Electrical Equipment Approval Procedure (EEAP) specified in this document.

For existing experimental, facility, and power systems, the PPPL System Engineer is responsible for maintaining the system integrity with respect to worker safety and health. The System Engineer list is posted on the Engineering Department web page. PPPL System Engineers are designated and approved by the Head of Engineering and Infrastructure. PPPL System Engineers serve as a point of contact for the AHJ, EEI and ESS for electrical equipment and installations. If a System Engineer has not yet been assigned, then the appropriate Responsible Line Manager is responsible for the equipment or installation.

REFERENCES

P-107 Approval of Electrical Equipment and Electrical Installations
OSHA 29CFR1910.303 Electrical/General
DOE 10CFR851.23 Worker Safety and Health Program
National Electrical Code Article 110.2 and 110.3
NFPA 70E Standard for Electrical Safety in the Workplace Article 400.2 and 400.3
NFPA 791 Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation
NECA 1 Standard Practice of Good Workmanship in Electrical Construction
ES&H Directive 5008 - Section 2 - Chapter 4.5
DOE-HDBK-1092-2013, Electrical Safety, Chapter 12 and Annex C

DEFINITIONS & ACRONYMS

Acceptable- Equipment that is accepted, approved, documented and recorded by the Authority Having Jurisdiction (AHJ) or the EEI. This includes:

- If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a NRTL pursuant to OSHA.
- With respect to an installation or equipment of a kind that no NRTL accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested and accepted by the EEI.
- With respect to custom-made equipment or related installations that are designed, fabricated for, and intended for use within the Lab, if it is determined to be safe for its intended use by its manufacturer on the basis of test data that must be made available for inspection and is

inspected by the Electrical Equipment Inspector (EEI) and approved by the Authority Having Jurisdiction (AHJ).

Authority Having Jurisdiction (AHJ) – A PPPL Subject Matter Expert who has been formally delegated AHJ status for NFPA 70 (National Electric Code, NEC) and NFPA 70E (Standard for Electrical Safety in the Workplace) by the Laboratory Director.

Cognizant Individual (COG) – The Cognizant engineer, physicist, or staff who has responsibility for any electrical equipment covered in this procedure.

Electrical Equipment Inspector (EEI)- A qualified electrical worker who has been determined by the AHJ Electrical to have the skill, knowledge, and abilities to approve and deem acceptable non-NRTL listed electrical equipment installations and work.

Electrical Facility Equipment – Electrical equipment that is considered an integral part of a facility or building. Examples include: building pumps; compressors; HVAC equipment; fixed general lighting fixtures that are permanently attached to the building structure; and facility power distribution equipment, such as transformers, panels, motor control centers.

Electrical Utilization Equipment – ‘User’ type equipment that uses electrical energy for power supplies, electronic, electromechanical, chemical operations, heating, lighting, or similar purposes. Most are cord and cap connected some may be hardwired. Electrical Utilization Equipment includes equipment used in laboratory research and development (R&D) as well as utility, facility, and shop equipment.

Electrical Safety Specialist (ESS) – The PPPL ES&H individual whose responsibility is to assure that PPPL follows required electrical codes and best electrical safety practices.

In-House-Built Equipment – Electrical utilization equipment designed and/or fabricated by PPPL employees, PPPL subcontractor employees, or other research organizations.

Labeled- Equipment is "labeled" if there is attached to it a label, symbol, or other identifying mark of a Nationally Recognized Testing Laboratory (NRTL):

- That makes periodic inspections of the production of such equipment, and
- Whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

NRTL Listed- Equipment is "listed" if it is of a kind mentioned in a list that:

- Is published by a Nationally Recognized Testing Laboratory (NRTL) that makes periodic inspection of the production of such equipment, and
- States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

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

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 the evaluation of products or services;
- That maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services; and
- Whose listing states that the equipment, material, or services either meets appropriate designated standards or have been tested and found suitable for a specified purpose.

PPPL System Engineer – Approved individual assigned a particular system by the Head of Engineering and Infrastructure. (See System Engineer list on ENGR Dept. web page.) The System Engineer maintains a list of equipment for Preventive Maintenance per ENG-016 and the system design status per ENG-033 using PPPL Drawings per ENG-010.)

Qualified Person - A qualified person shall be trained and knowledgeable of the construction, operation of equipment, or a specific work method and be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method. Such a person may be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment.

Rejected - This electrical component has been inspected by the EEI and found to be out of compliance with codes, standards or manufacturer’s instructions.

Reciprocity Program – A DOE sanctioned National Training Center share point site to aid all laboratories with sharing utilization equipment.

Third Party Inspector – An inspector approved by the AHJ that is not involved in the design, construction and assembly of electrical equipment. An individual outside of the department involved.

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

PROCEDURE

Responsibility

Action

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| Cognizant Individual or System Engineer | <ol style="list-style-type: none"> 1. Surveys all electrical utilization equipment or systems for which they are responsible; identifies each piece of electrical equipment or an electrical system that is rated at 50 volts or higher <u>or</u> 1000 watts or higher; has a valid NRTL label (see Attachment 2) or has a third party NRTL approval. <ol style="list-style-type: none"> a. If the electrical utilization equipment or systems have a valid NRTL label or NRTL approval, no further action is needed. b. If the equipment or system has been through design verification, then the System Engineer will confer with the Electrical Equipment Inspector or AHJ to provide information indicating the system safety integrity (Drawings, Preventive Maintenance lists, walkdowns, Design Review results, preoperational test results, etc.) |
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and request the equipment/system be inspected and entered on the list of approved electrical equipment.

If the equipment or system needs PPPL AHJ approval, contact the Electrical Equipment inspector for inspection and approval.

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| Authority Having Jurisdiction (AHJ) | 2. Assigns an appropriate Electrical Equipment Inspector to perform the PPPL approval process on a piece of equipment that does not have a NRTL label. |
| Electrical Equipment Inspector (EEI) | 3. Inspects the assigned equipment/system using the Electrical Equipment Approval Form (Sample in Attachment 4), ensuring that the safety integrity is Acceptable or that sufficient information exists in order to make the equipment Acceptable. The EEI may check with the ESS and /or the AHJ if needed. |
| | 4. Completes the Electrical Equipment Approval Form for the equipment being reviewed. <ul style="list-style-type: none"> a. If the equipment passed all of the inspection points or has sufficient test data to be found Acceptable, the EEI attaches an "Accepted" for use tag. b. If the equipment failed any inspection point or has insufficient test data, the EEI attaches a Rejected for use tag to the equipment and tags out the equipment per Procedure ESH-001 with a Caution Tag. |
| AHJ | 5. Transfers information from form into Equipment Inspection File database. |
| AHJ or EEI | 6. Reviews the Electrical Equipment Approval Form if a conflict arises. |
| Electrical Safety Specialist | 7. Informs the Cognizant Individual or System Engineer of the inspection outcome and provides a copy of the completed Electrical Equipment Approval Form. Informs ESS of Electrical Equipment Approval results. |
| | 8. Reviews all electrical installations and electrical Installation Procedures (per ENG-030 Technical Procedures). Reviews all areas for compliance by job reviews, Management Safety Walkthroughs, spot checks, and other means. Reviews approval records for compliance. |

TRAINING (SECTION REQUIRED FOR ALL PROCEDURES)

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| Head of Electrical Engineering/
designee | 1. Ensures the training methods and means (below) are provided. <ul style="list-style-type: none"> A. Target Audience: <u>Electrical Equipment Inspectors</u> Instructor: <u>Electrical Safety Specialist (ESS), Authority Having Jurisdiction (AHJ);</u> Training Method:
<u>X Classroom</u> Frequency: |
|---|---|

X every 3 years coordinated with the NEC code cycle

B. Target Audience: RLM’s, Cognizant Individuals, System Engineers

Instructor: ESS; AHJ; Head, Project Management Office

Training Method:

X Briefing

Frequency:

X Upon Initial Issuance of this procedure and major revision

C. Target Audience: Council

Instructor: Head Engineering & Infrastructure/ designee

Training Method:

X Briefing at Lab Management Meeting

Frequency:

X Upon Initial Issue and major revision of this procedure

Head of Electrical
Engineering/
designee

2. Notifies the Human Resources Training Office of the training so that they will be aware of the training requirements and be able to provide assistance and guidance in the course development, implementation, tracking, and maintenance.

RECORDS REQUIREMENTS SPECIFIC TO THIS PROCEDURE

Records Custodians must assure records are maintained as follows:

Record	Record Custodian	Location	Retention Time
Electrical Equipment Inspection/Approval Form	Electrical Safety Specialist	Electrical Safety Specialist and Departmental Files	Range of 1 to 3 years for destruction, Destroy when equipment is removed from service (PPPL Policy) <i>Reference: Admin 17 Cartographic, Aerial Photography, Architectural and Engineering Records (20)</i>

ATTACHMENTS

- 1 Examples of Unacceptable Markings
- 2 Examples of Acceptable NRTL Marks
- 3 PPPL labels to be applied to electrical equipment
- 4 Electrical Equipment Inspection/Approval Form (sample - contact the Electrical Safety Specialist for the current form)

- *CE Marking*

CE Marking is a European marking of conformity that indicates a product complies with the essential requirements of the applicable European laws or directives with respect to safety, health, environment, and consumer protection

Unlike NRTL Markings, the CE Marking is not a US safety certification mark.



If a product displays only the CE mark, it must be evaluated by an EEI under this procedure.

- **Recognized Component Mark**

UL's functional safety component recognition service covers the evaluation of components or materials intended for use in an end product functional safety certification.

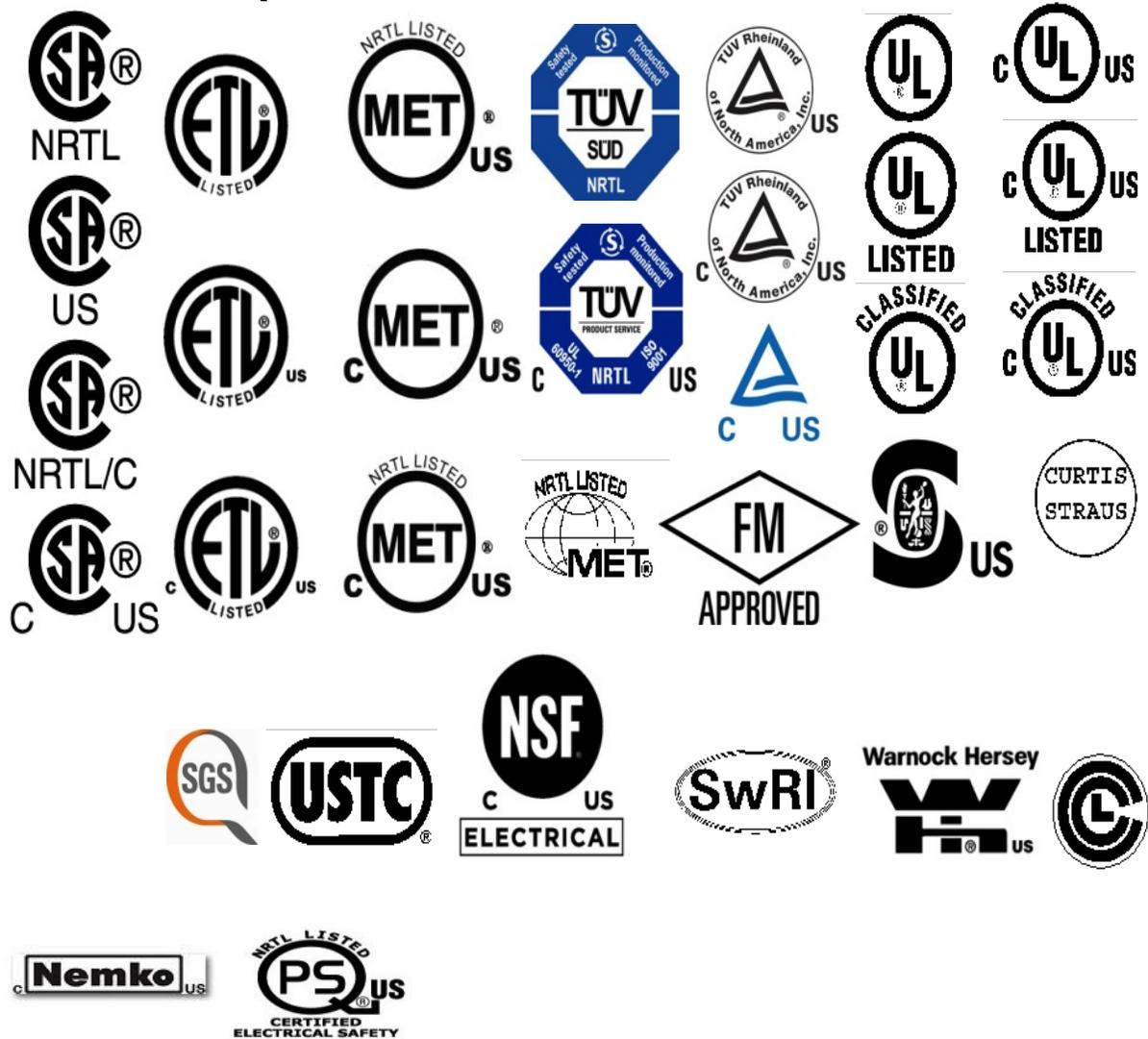


If a product displays only the mark, it must be evaluated by an EEI under this procedure.

EXAMPLES OF NRTL MARKS

(refer to OSHA website <<https://www.osha.gov/dts/otpca/nrtl/nrtlmrk.html>> for currently acceptable NRTL markings.

Acceptable NRTL Marks Jan 2014



Labels applied to equipment:

 **ACCEPTED.** This component has been inspected, approved, and is in compliance with the National Electric Code, NFPA 70 and the Standard for Electrical Safety in the Workplace, NFPA 70E and OSHA.

 **REJECTED.** This component has been inspected and found to be out of compliance with codes, standards or manufactures instructions. A list will be provided of discrepancies for repair or replacement.

 **NRTL LISTED.** This component has been tested by a Nationally Recognized Testing Laboratory (UL, CSA, TUV, etc.) and has been listed, labeled and approved for use. No further inspection is required unless the component has been altered or used other than intended as per manufactures instructions.

 **OUT OF SERVICE.** This component is abandoned in place or mothballed for future use shall not require inspections until re-activation.

 **RACK INSPECTED.** This equipment rack (only) has been inspected and found to be in compliance with applicable codes and standards.

Questions and/or comments to be directed to Glenn Anderson at ganderson@pppl.gov

(This is a Sample form - contact the Electrical Safety Specialist for the current form)

Electrical Equipment Inspection Form

Cognizant Person ERIK GILSON	Phone 2681	Building Lab Building	Room L131/132	System EXCIMER LASER
Equipment Name COLD CATHODE PRESSURE METER		Equipment Function PSI METER		Survey Date 8/6/2014
Manufacturer MKS-HPS-PROD	Model 943	Serial 0309965613	Property Number	Priority Medium
Equipment Type Commercial Product	NRTL Listed? Not Listed	Operating Environment		

Surveyor
Comment

SAMPLE

Inspection Results	
Enclosure <input type="radio"/> N/A <input checked="" type="radio"/> Pass <input type="radio"/> Fail	Internal Wiring <input type="radio"/> N/A <input checked="" type="radio"/> Pass <input type="radio"/> Fail
Marking Requirements <input type="radio"/> N/A <input checked="" type="radio"/> Pass <input type="radio"/> Fail	Other Hazards <input type="radio"/> N/A <input checked="" type="radio"/> Pass <input type="radio"/> Fail
Power <input type="radio"/> N/A <input checked="" type="radio"/> Pass <input type="radio"/> Fail	Tests Performed <input type="radio"/> N/A <input checked="" type="radio"/> Pass <input type="radio"/> Fail
Other Requirements <input type="radio"/> N/A <input checked="" type="radio"/> Pass <input type="radio"/> Fail	Failure Analysis <input type="radio"/> N/A <input checked="" type="radio"/> Pass <input type="radio"/> Fail
Overall Pass/Fail: PASS	

Conditions/Limitations of Use or Failure Information:
PRE INSPECTED BY LBNL 034170

Approved? Approved	Inspector Glenn Anderson	Date 07/23/2014	Approval/Rejection Number A50050
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