



Update on Electrical Safety for Users

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Areas Affected in Electrical Safety

- **Training, qualifications**
- **Inspection of non-listed, non-commercial electrical equipment**
- **ANL Energized Electrical Work Permit & APS Energized Electrical Testing and Measurement Authorization**



Training & Qualification

- **Electrical workers minimal training requirements:**
 - NFPA 70E training or equivalent
(ANL is presently putting together applicable courses)
 - Electrical Safety Awareness training (ESH377)
 - Other training may be required depending upon the nature of the electrical work
(Requirements as indicated by your Job Hazard Analysis)

- **Qualified electrical worker –**
 - Worker who has skills and knowledge related to the electrical equipment to be worked on,
 - is authorized to perform the task by line management, and
 - has met all training requirements.

ANL Electrical Policy on Non-listed Electrical Equipment is being Revised

- **ANL electrical policy is presently being revised and **MAY** require formal inspection of ALL non-listed electrical equipment [i.e., labeled or listed by a Nationally Recognized Testing Laboratory (NRTL), such as UL approval]. “Home Made” non-listed electrical equipment **SHALL** be examined and approved by designated electrical equipment design inspector personnel prior to use. This would require an ANL inspection form to be completed and placement of equipment sticker noting inspection. ***
- **APS currently supports users with inspection of non-commercial equipment via Experimental Safety Approval Form (ESAF) and will continue to do so.**
- **APS will formalize this process when the ANL policy is finalized.**

ESAF Section Pertaining to Equipment

- For equipment brought to the APS for use in experiments, a section indicating the use of non-commercial “home made” equipment must be completed

The screenshot shows the 'Equipment' tab of the ESAF form. The 'Equipment Information' section contains a 'New to APS' checkbox and a grid of equipment categories, each with a checkbox. A red arrow points to the 'Non-Commercial Electronics' checkbox. Below the grid are 'Previous', 'Generate Report', and 'Next' buttons. At the bottom, there are instructions for 'Save' and 'Submit' buttons.

Equipment Information					
<input type="checkbox"/> New to APS					
<input type="checkbox"/> Cryogenics (system or cryogen not normally a part of the beamline operation)					
<input type="checkbox"/> High Temperature	<input type="checkbox"/> Electric Furnace	<input type="checkbox"/> Optical Furnace	<input type="checkbox"/> Other High Temp.		
<input type="checkbox"/> High Pressure	<input type="checkbox"/> Diamond Anvil Cell	<input type="checkbox"/> Large Volume Press	<input type="checkbox"/> High Pressure Vessel	<input type="checkbox"/> Gas Manifold	
<input type="checkbox"/> Laser	<input type="checkbox"/> Class 2	<input type="checkbox"/> Class 3a	<input type="checkbox"/> Class 3b	<input type="checkbox"/> Class 4	
<input type="checkbox"/> High Voltage					
<input type="checkbox"/> Magnetic Field					
<input type="checkbox"/> RF or Microwave					
<input type="checkbox"/> X-Ray Generator (does not include the APS Storage Ring)					
<input type="checkbox"/> Non-Commercial Electronics					
<input type="checkbox"/> Other Specify					

Previous Generate Report Next

Pressing SAVE will allow you to save this form and continue to make changes. Notifications will not be sent. Save

Pressing SUBMIT will save this form AND notifications will be sent to the APS. Submit

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When this box is checked, equipment brought on-site for experiment use is reviewed by safety personnel.

A summary of these results become part of the posted Experimental Hazard Control Plan that is posted at the beamline Safety Information area.

APS ESC Web Page

- **Regarding energized electrical work, the APS Electrical Safety Committee invites you to visit the APS Electrical Safety Committee web site**

http://www.aps.anl.gov/About/Committees/safety_committees.htm



Navigation to ESC Home Page

The screenshot shows a Netscape browser window displaying the APS Home Page. The address bar shows <http://aps.anl.gov/>. The page header includes the APS logo and the text: "Advanced Photon Source, A U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences national synchrotron x-ray research facility". The ARGONNE NATIONAL LABORATORY logo is also present. A navigation menu is open, showing options like "About", "News", "Science", "User Information", "Education", and "Facility". The "User Information" menu is expanded, listing "Beamline Committees", "Safety Committees", "User Committees", "User Plan Committees", and "General APS Committees". The main content area features a large aerial image of the APS facility, a "Highlights" section with articles such as "Lighter Filling in Earth's Core" and "APS Aids UIC in Developing Drug for SARS", and an "APS News" section with an article titled "\$50 million grant will aid studies of protein structures". A search bar is located in the top right corner.

Navigation to ESC Home Page (contd.)

The screenshot shows a Netscape browser window with the URL http://aps.anl.gov/About/Committees/safety_committees.htm. The page header includes the APS logo and the text "Advanced Photon Source, A U.S. Department of Energy, Office of Science, Office of Basic Energy Sciences national synchrotron x-ray research facility". A navigation menu contains links for "About", "News", "Science", "User Information", "Education", and "Facility". A search box is labeled "Search APS...". The breadcrumb trail reads "Argonne Home > Research Facilities > Advanced Photon Source Home > About > Committees >".

Committees

Safety Committees

Those working at the APS are expected to assure that their work is free of recognized hazards. As such they are expected take the initiative to arrange for assistance in evaluating their work as needed. The following safety committees are one resource for meeting these evaluation needs. The committee membership includes division ES&H coordinators and a broad spectrum of individuals from all APS organization levels. A staggered turnover of members maintains continuity.

[Safety Overview Committee \(SOC\)](#)
Coordinates and oversees the activities of the APS ESH committees.

[Safety Committee for Design Reviews](#)
Evaluate the designs of new or modified facilities/components to help to ensure that designs meet APS and ANL standards for safety.

[Radiation Safety Policy and Procedures Committee](#)
Advises APS management on radiation safety matters, reviews projects, recommends radiation safety policy, evaluates accident investigation conclusions, and recommends plans to protect personnel in the area of radiation safety. The committee reviews functional changes

[Radiation Safety Shielding Committee for Design Reviews](#)
Evaluates the design of radiation shielding systems that are used for personnel protection for all aspects of radiation safety. The committee provides the APS and the APS User Community with technical advice on radiation safety and shielding issues.

[Chemical Safety Committee](#)
Advises APS Management on chemical safety matters, participates in reviews as requested, recommends chemical safety policy, reviews accident investigation conclusions, and evaluates plans to protect personnel where activities involving chemicals are expected to take place. The committee chair will define the membership for review of matters brought to his attention.

[Electrical Safety Committee](#)
Advises APS Management on electrical safety matters and promotes electrical safety at the APS. The committee chair will define the membership for review of matters brought to his attention.

[Laser Safety Committee](#)
Advises APS Management on laser safety matters, participates in project reviews as requested, recommends laser safety policy, reviews accident investigation



APS ESC Home Page

Electrical Safety Committee Charter
(July 6, 2005)

1. Purpose

The Electrical Safety Committee advises APS Management on electrical safety matters and promotes electrical safety at the APS. The Committee Chair will define the membership for review of matters brought to his attention.

2. Membership

B. Deriy	ASD – Chair
K. Bailey	PHY
J. Carwardine	ASD
C. Doose	XFD
D. Horan	ASD
G. Kailus	PFS
J. Lang	ASD/ESH
G. Markovich	ASD
G. Pile	ASD
L. Ribaud	XFD
V. Stipp	IPNS
J. Wang	ASD
W. Wesolowski	AOD

3. Method

The Committee will:

- Act as an advisory group on electrical safety matters at APS.
- Review the results of facility inspections for electrical safety compliance.
- Participate in the review of new facility designs or where changes are made to past electrical design philosophy.
- Address electrical issues brought to the attention of the committee.
- Recommend safety measures for eliminating or reducing electrical hazards.
- Interpret, review, and publicize new or revised information, regulations, and standards for electrical safety.

Left Sidebar Navigation:

- ANL Electrical Safety Page
- DOE Electrical Safety Handbook
- General Statement
 - ◆ APS Policy on Energized Electrical (Hot) Work, including Test & Measurement of Energized Circuits
 - ◆ APS Energized Electrical Test & Measurement Authorization (form)
 - ◆ ANL Energized Electrical Work Permit (form)
- Home & Office Equipment Statement
- APS Electrical Safety Update
- Flowchart for Working on or Near Live Parts
- Electrical Safe Work Practices
- Reviews, Meetings, and Workshops
- Frequently Asked Questions
- Disclaimer
- Contact the APS ESC



ANL Energized Electrical Work Permit

- **Examples of tasks which would require an ANL Energized Electrical Work Permit include:**
 - pulling and/or terminating cables inside exposed energized distribution panels;
 - pulling/replacing fuses on exposed energized circuits;
 - replacing circuit breakers on exposed energized panels.
- **At the APS – energized electrical work is “limited” to testing and measuring which requires an APS Energized Electrical Test & Measurement Authorization**

Key Elements of the APS Policy on Energized Electrical Systems Work

- Working on electrically energized equipment must be considered a **last resort** after all other opportunities for establishing an electrically safe work condition have been exhausted.
- Energized Electrical work is defined as “Working on or near exposed conducting parts that are or might become energized at 50V or more.”
- All energized electrical work above 50V requires formal review and approval via a completed “ANL Electrical Hot Work Permit.” Test & Measurements on energized circuits at 50V or more, where it can be justified - NFPA-70E permits such tasks without an ANL Energized Electrical Work permit, but does require formal steps to insure safe working conditions.
- All test & measurement activities above 50V other than for LOTO require formal review and authorization via a completed “APS Energized Electrical Test & Measurement Authorization” form. Proper completion of this form satisfies the requirement of NFPA 70E.

APS ENERGIZED ELECTRICAL TEST & MEASUREMENT AUTHORIZATION

Extended Duration

One-time Use Only

Division/CAT:	Building:	Room/Area:	Authorization #
Job Supervisor/Responsible Engineer:		Date Start:	Expiration Date:
Description of work to be done:			
Description of Circuit/Equipment:			
Justification for why equipment cannot be de-energized:			

Results of Shock Hazard Analysis (NFPA-70E 2004 130.2)

Maximum Voltage:	Glove Voltage Rating: (Inspect gloves before use, check certification date)		
Limited Approach Boundary: (ft.)	Restricted Approach Boundary: (ft.)	Prohibited Approach Boundary: (ft.)	

Results of Arc Flash Hazard Analysis (NFPA-70E 2004 130.3)

Risk Category:	Flash Protection Boundary: (ft.)		
<input type="checkbox"/> All Natural Fiber Outerwear			
<input type="checkbox"/> Fire Retardant Clothing	Cal/cm ²	ATPV Rating:	
<input type="checkbox"/> Required Additional PPE:			

Safety Checklist (Verify that proper controls are in place):

<input type="checkbox"/> Workers must be trained (ESH 114, 375), qualified, and have full knowledge of equipment.
<input type="checkbox"/> Safe work practices to be followed (see APS Safe Work Practices Document).
<input type="checkbox"/> Safety watch is required. This person must be trained (CPR, ESH 114, 371), qualified, be able to cut off all power sources, and have immediate access to a telephone or radio to call 911 in case of emergency.
<input type="checkbox"/> Insulated tools and equipment required.
<input type="checkbox"/> Remove all jewelry and metal apparel.
<input type="checkbox"/> Use barricades and warning signs.
<input type="checkbox"/> Documented job briefing including discussion of any job-specific hazards (e.g., NFPA-70E 2004 Annex I).
<input type="checkbox"/> See attachment for added information, special requirements, procedures, or written work plans.

APPROVALS

Hazard analysis performed by:	Date:
Group Leader/CAT Director:	Date:
APS ESH Coordinator:	Date:
APS Electrical Safety Committee Representative:	Date:
APS Electrical Safety Committee Representative:	Date:
Division Director (extended duration authorization only):	Date:

AUTHORIZED WORKERS that understand and agree to the above:

Printed or typed name(s):	Signature(s) & Date(s):	Printed or typed name(s):	Signature(s) & Date(s):

Electrical Safe Work Practices

NOTE: **Working on energized electrical equipment is a last alternative.**

All activities on or near electrically energized systems having “live” parts shall be conducted in accordance with the limitations and procedures specified in the latest version of NFPA 70E and with the safe work practices and conditions that follow.

Only qualified personnel {as defined in NFPA 70E Article 110.6(D)} as authorized by supervisor can perform such work.

Safe Work Practices:

- Know the equipment and potential hazards - Define the scope of work.
- Submit the scope of work to your supervisor for approval.
- Analyze the hazards – use engineered methods to mitigate hazards.
- Establish procedures as necessary.
- Use barricades or other means to prevent unqualified persons crossing approach boundaries.
- Personnel shall employ insulating barriers to prevent themselves and others from leaning into or falling into live parts and to prevent live parts that might become loose from contacting personnel.
- Personnel shall wear safety glasses.
- Personnel shall **not** wear metallic personal items (e.g., jewelry, glasses, watches) while working on or near live parts.
- Personnel shall use non-conducting ladders when needed.
- Always assume a conductor is energized until proven otherwise.
- Personnel shall wear voltage rated gloves when using tools on or near live parts.
- Personnel shall use only personal protective equipment that is designed [approved, certified] for the hazard.
- Personnel shall use only insulated tools when working on or near live parts.
- Personnel shall use only tools and instruments that are designed for the system voltage.
- Personnel shall **not** bypass interlocks or safety devices that protect persons against electrical shock—except when absolutely necessary and then only with written approval from your supervisor
- Whenever possible, do not work alone.
- Safety Watch is required when deemed so by your supervisor. This person shall be CPR trained and be familiar with removing all sources of power to the device being worked upon and have ready access to a phone in order to call 911 in case of emergency.
- When operating circuit breakers or fused switches. ALWAYS stand to the side – NEVER directly in front of the device being operated.

Work Conditions:

- Personnel should inspect electrical equipment for defective parts, faulty insulation, improper grounding, loose connections, ground faults, and unguarded live parts and should take appropriate remedial action before working on or near live parts.
- Personnel should work only where there is adequate clearance.
- Personnel should not work on or near live parts that are in a hazardous location (e.g., in wet or damp areas, where there are corrosive or flammable atmospheres).
- Restrict non-participants from the work area.

Supervisor