APS Experiment Safety Reviews

Changes made in this revision:

- Removed AES-Technical Operations Specialist as an author; added L. Schmidt as a reviewer

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APS Experiment Safety Reviews

1. INTRODUCTION

1.1. Summary

Using the Advanced Photon Source (APS) web-based system, researchers are required to define the scope of their experimental activities at the APS by preparing and submitting an Experiment Safety Assessment Form (ESAF). A submitted ESAF will generate an Experiment Hazard Control Plan (EHCP). The ESAF identifies the materials, equipment, processes, and hazards associated with the experiment. The EHCP identifies all controls required to mitigate hazards to an acceptable risk level and defines the scope of work for the ESAF.

APS Staff and Non-APS researchers must follow the experiment assessment and approval process described in this Policy and Procedure for experiments performed on x-ray beamlines and in other experimental facilities at the APS (e.g., laboratories).

For the purposes of this Policy and Procedure, the organization responsible for the day-to-day operations of the facility where the experiment is referred to as the *Experiment Operations Management.* Experiment Operations Management include Collaborative Access Teams (CATs) and APS XSD Groups.

Experiment Operations Management and the APS Experiment Safety Review Board (ESRB) work together as partners in the review process to ensure maintenance of a safe working environment at the APS.

An Experiment Cannot Begin Without:

1) Completion and submission of the ESAF by the experimenters (submission of the ESAF generates the EHCP)
2) Review and approval of the ESAF by both the APS Experiment Safety Review Board/ESH Coordinator AND Experiment Operations Management
3) Completion and endorsement of the Authorization Checklist by the APS Floor Coordinator
4) Completion of the Experiment Authorization (EA) Form (all required endorsements must be present on the EA Form)
5) Posting the EHCP at the experiment station or work area (i.e. laboratory entrance) and posting the endorsed EA Form in the beamline end cabinet or work area (i.e. laboratory entrance)

The PSC Safety Manager has ESH Coordinator responsibilities for experiments conducted by non-APS employees and the respective Divisional ESH Coordinator has responsibilities for experiments conducted by APS personnel.

The EA Form and EHCP generate automatically from the ESAF system. The approval of the experiment and the EHCP is valid until the end date noted in the ESAF. Resubmission of the ESAF is required if the experiment is to be conducted beyond the end date noted in the ESAF. The Floor Coordinator posts the EA Form in the beamline end cabinet and posts the EHCP at the experiment station for experiments conducted on a beamline. The Floor Coordinator posts the EA Form and EHCP near the work area (e.g., at the lab entrance) for experiments not conducted on a beamline.

1.2. Responsibilities

Researchers wishing to conduct experiments at the APS are responsible for the following:

- Completing an electronic ESAF on the APS web page that:
  - Defines the scope of the experiment, discloses all materials (samples, reagents, equipment, etc.) used in the experiment, APS facility needs (i.e. laboratory use, etc.), and processes that will be used at the APS - see Appendix for Sample Identification Policy
  - Identifies hazards associated with the experimenter's activities
  - Defines the safeguards utilized in the experiment (these must be consistent with ANL and APS standards)
  - Lists the experimenters involved with the experiment, including those that are working onsite, remotely, mail-in or are co-proposers
  - Lists the start and end date of the experiment (this includes any preparatory time needed for sample preparation, equipment setup, etc.)
- Submitting the ESAF (which generates the EHCP) to the APS far enough in advance of the experiment start date to ensure the APS can verify the proposed controls are adequate and consistent with applicable requirements
- Identifying at least one member of the experiment team as the spokesperson (SP) who will sign the Experiment Authorization (EA) Form upon confirming the accuracy and completeness of the EHCP and affirming all safeguards are in place (this confirmation will be conducted with an APS Floor Coordinator prior to the start of the experiment)
- Completing all required training prior to the start of experimental work
- Working within the scope of and in conformance with the EHCP
- Sharing opportunities for improvement on the experiment safety process with the APS and beamline personnel
- Ensure that all co-sponsors are checked on the ESAF who funded any samples being investigated at the APS. All co investigators should also be listed on the ESAF with the correct User Type.

Experiment Operations Management is responsible for:

- Assisting experimenters in identification of safeguards
- Reviewing EHCPs in a timely manner
- Informing the APS of plans that are beyond Experiment Operations Management expertise to evaluate and for which APS and/or ANL support is sought
- Approving EHCPs after determining the following requirements are met:
  - All significant risks to personnel and the environment are identified
  - A hazard control strategy capable of reducing risks to acceptable levels is defined
  - Adequate hazard control verification requirements are included
- Designating individuals who can approve EHCPs
- Verifying safeguards and all required training are in place and endorsing the EA Form

APS-AES Experimental Facility Operation Group (EFOG) is responsible for:

- Administrating the APS Experiment Safety Review Program; the APS/PSC Deputy ALD for Operations has line responsibility for the program
- Maintaining web-based systems for creating and submitting ESAFs, experiment safety reviews, and the generation of EHCPs
- Reviewing the ESAF hazard categories and control sets at a minimum of every three years to ensure consistency with the Argonne Work Planning and Control process and to incorporate applicable lessons learned
- Assisting experimenters in identification of safeguards and training required by ANL or APS policies
- Appointing the APS Experiment Safety Review Board (ESRB) whose members, or designees, review and approve EHCPs
- Verifying and documenting the implementation of hazard controls where required
- Posting EA Forms and EHCPs and completion of the Authorization Checklist

APS Experiment Safety Review Board (ESRB) is responsible for:

- Reviewing and approving EHCPs
- Approving EHCPs after determining the following requirements are met:
  - The experiment is adequately described
  - All significant risks to personnel and the environment are identified
  - A hazard control strategy satisfying ANL requirements and capable of reducing risks to acceptable levels is defined
- Reviewing EHCPs in a timely manner including adequate hazard control verification requirements if needed

1.3. Applicability

The use of this procedure is applicable to all experimental work at the APS

1.4. References

LMS-MNL-10 "Work Planning and Control Manual"

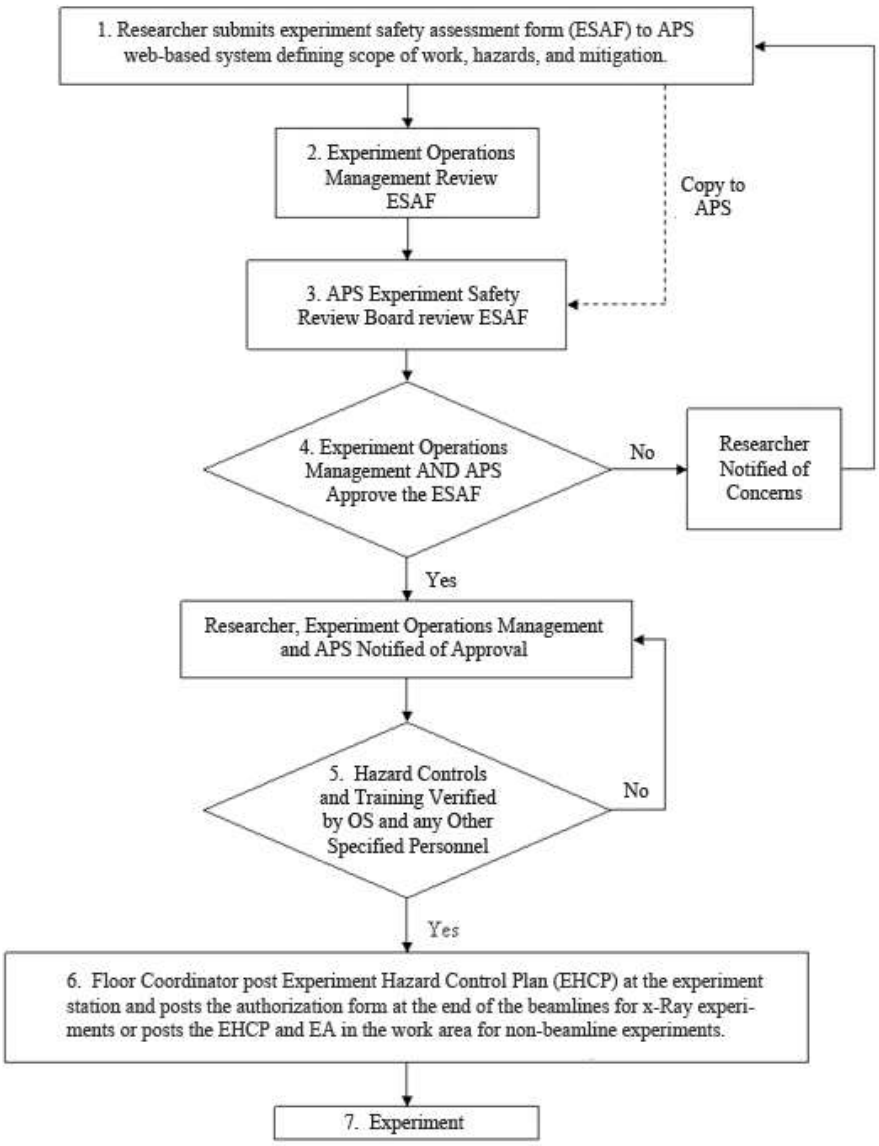
2. PROCEDURE

Step	Person taking the action	Action
1	Spokesperson for the research group	Submit an ESAF. Using the APS web-based Experiment Safety Review System, submit information to Experiment Operations Management and the APS characterizing the experiment. Submission of this information must meet the lead-time requirements as defined on the APS Experiment Safety web page. Submission of beamline experiments that present minimal hazards common to all beamlines at least 14 days prior to the scheduled start date of the experiment. Additional time is required for higher levels of risk and for safety protocols new to the APS. If circumstances do not allow for the full 14 days for review, the APS will consider the request for expedited review on a case-by-case basis. [Steps 2 and 3 can take place in any order but typically, Experiment Operations Management will review the experiment plan before the APS review of the experiment. Completion of both steps is required for experiment authorization.]
2	Experiment Operations Management (for the beamline or laboratory where the experiment is to be conducted)	Review the submitted EHCP for consistency with anticipated hazards associated with the experiment and for consistency with facility safeguards. If the EHCP is acceptable, the Experiment Operations Management designated representative approves the plan using the APS web-based Experiment Safety Review (ESAF) System.

3	APS Experiment Safety Review Board or ESH Coordinator	The APS Experiment Safety Review Board (ESRB) or ESH Coordinator reviews the EHCP for consistency with anticipated hazards associated with the experiment and for consistency with ANL/APS standards. If the EHCP is acceptable, a member of the ESRB or ESH Coordinator approves the plan using the APS web-based Experiment Safety Review (ESAF) System.
4	APS	Advise the submitter of one of the following conditions: • The EHCP has been approved by both Experiment Operations Management and the APS Experiment Safety Review Board, and the experiment may run after required training is completed and specified hazard controls have been verified to be in place, or • The EHCP contains safety concerns that need to be addressed and that the plan needs to be revised and resubmitted after those safety concerns are addressed, or • The proposed experiment falls outside the scope of activity the APS can safely accommodate. [Note: Experimental approval is valid until the end date of the experiment noted in the ESAF. Resubmission of the ESAF is required if the experiment is to be conducted beyond the end date noted in the ESAF.]

5	Experiment Spokesperson and other personnel designated in the EHCP	Experiment Spokesperson and other personnel designated in the EHCP (The EHCP is printed by beamline personnel): • Verify that the EHCP accurately identifies all materials, equipment, and activities of the experiment and lists all users that are part of the experiment (i.e. confirms the statements listed in the Authorization Checklist) and • Endorses the EA form Personnel designated in the EHCP must: • Verify that the EHCP has been reviewed and approved • Verify that the specified controls, training, and safeguards are in place Verification via the Authorization Checklist and endorsement of the EA Form are required before the experiment can begin. Addition of materials or equipment beyond the original scope of the ESAF will require a new review and approval by the APS ESRB and Experiment Operations Management before the experiment may begin.
6	APS Floor Coordinator	Authorize the experiment to proceed. An APS Floor Coordinator posts the endorsed Experiment Authorization (EA) Form in the cabinet at the end of the beamline and posts a copy of the EHCP at the experiment station for beamline experiments or posts the EA Form and EHCP near the work area (i.e. laboratory entrance) for non-beamline experiments. The ESAF is posted electronically via an entry in the APS Floor Coordinator Shift Log. This posting automatically copies the final version of the ESAF to the Experiments Database. A copy of the signed EA Form and completed Authorization Checklist are delivered by the Floor Coordinator to the User Experiment Oversight for records retention. Records are stored per requirements in LMS-MNL-10 in the designated APS digital system (ICMS).
7	Experimenters	Conduct the experiment in compliance with the EHCP and upon completion submit an APS End of Experiment Form.

APS User Experiment Safety Review Process



3. DOCUMENTS/RECORDS CREATED BY THIS PROCEDURE

The documents/records listed below are created in the execution of this procedure and must be retained as indicated.

Description of Document/Record (include ID number, if applicable)	Custodian	Storage Location and Medium	Retention Requirement
ESAF	APS User Safety Officer	Electronic record in Oracle Database	Destroy 75 years after end of experiment
EA Form and Authorization Checklist	APS User Safety Officer	Electronic record in APS ICMS	Destroy 75 years after end of experiment

4. TRAINING AND ADDITIONAL REQUIREMENTS

Minimum APS core training to be completed by all users:

- ESH100U, Argonne National Laboratory User Facility Orientation (required)
- APS101, APS User Orientation (required)
- ESH738, General Employee Radiation Training (GERT) (required)
- ESH223 or ESH223U, Cybersecurity Training (required)
- ESH408, Basic Electrical Safety Awareness (required for APS Resident Users and Argonne employees)
- Sector Orientation (required for work at beamlines or laboratory facilities)

5. FEEDBACK AND IMPROVEMENT

If you are using this procedure and have comments or suggested improvements, please go to the APS Policies and Procedures Comment Form* to submit your input to a Procedure Administrator. If you are reviewing this procedure in workflow, your input must be entered in the comment box when you approve or reject the procedure.

Instructions for execution-time modifications to a policy/procedure can be found in the following document: Field Modification of APS Policy/Procedure (APS_1408152).

* https://www.aps.anl.gov/Document-Central/APS-Policies-and-Procedures-Comment-Form

APPENDIX: SAMPLE IDENTIFICATION POLICY

Formerly: User policy, ICMS Content ID: APS_1412805
DNS #: APS-PPR-ADM-BL-A020-000015
(Revision #: 2, Issue Date: 10/6/19, Last Reviewed: 10/1/20)

As part of the experiment safety review process, users are required to identify materials brought to the APS and the hazards associated with the materials.

All materials to be used as part of experiments at the APS shall be identified using proper scientific nomenclature. Generic names, abbreviations, and acronyms should be included to clarify the nature of the material. Names that hide or obscure the nature of the material shall not be used.

Example 1:

Not acceptable: Sample A
Not acceptable: liquid crystal sample
Not acceptable: 65OBC

Acceptable: liquid crystal n-hexyl-4n'-n'pentyloxybiphenyl-4-carboxylate (65OBC)

Example 2:

Not acceptable: protein B

Acceptable: parainfluenza virus 5 F protein in its metastable, profusion conformation

Example 3:

Not acceptable: Sample 121
Not acceptable: SARS

Acceptable: main protease from the coronavirus that causes Severe Acute Respiratory Syndrome (SARS)

Confidential Materials

The APS understands that in some cases users seek to keep the identity of the samples/materials nonpublic. As part of the APS experiment safety review system, the users seeking sample confidentiality can, on a sample-by-sample basis, check the

material as confidential on the Experiment Safety Assessment Form (ESAF) and the specific names of the materials will not be listed on the publicly posted Experiment Authorization Form (EA) and Experiment Hazard Control Plan (EHCP). Only the ESAF reviewers and the experimenters listed on the ESAF will be able to view the names of the materials.

Nonproprietary Experiments

For nonproprietary experiments, the sample identification shall be entered into the ESAF.

Proprietary Experiments

For proprietary experiments (declared proprietary and user pays the APS for the beam time) the experimenter has two options:

1. Enter the sample identification into the ESAF (the confidentiality tools described above may be used) or

2. If the experimenter seeks to not name the materials in the ESAF, the sample identification information must be provided to the beamline management; for example, the information may be provided in a sealed envelope. This information must be available at the beamline while the samples are at the APS. In all circumstances the hazards associated with the material must be entered into the ESAF and an appropriate EHCP shall be developed. To fulfill its oversight responsibilities and ensure that materials and hazards have been properly identified and mitigated, the APS reserves the right to verify the information. The verification is intended only for the validation of the safety review process.