

Sanford

Underground Research Facility



SCIENCE

EXPERIMENT IMPLEMENTATION PROGRAM

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Jaret Heise	Document-34478	1	08/22/2010	Initial release.
Jaret Heise	Document-34478	2	07/30/2016	Update categories and descriptions based on current practices and terminology, also update formatting.
Jaret Heise	Document-34478	3	12/11/2016	Further clarification of process, including experiment phase and associated implementation requirements as well as further clarification of Sanford Laboratory department responsibilities.
Jaret Heise	Document-34478	4 (CCR-446)	06/06/2017	Configuration Control Starts: Various refinements, including ESH review of all experiment proposals. Clarification on ESH and Science roles regarding Experiment Hazard Assessment Summary. Add integration section: Prioritizing Resources and Managing Conflict. Additional details on pressure vessel documentation and hoisting and rigging.

1.0 PURPOSE

This document describes the framework for implementing a research project or for otherwise conducting technical activities (collectively referred to as an experiment) at the Sanford Laboratory.

2.0 SCOPE

The Experiment Implementation Program applies to all groups seeking to perform experiment activities at the Sanford Laboratory in the following broad categories:

- Basic research groups (including partnerships with industry);
- Commercial groups;
- Groups proposing technical activities (may not strictly be research or an experiment).

There are different requirements for various phases of an experiment, and experiment activities may only be conducted with authorization from Sanford Laboratory. While the level of review and extent of documentation is intended to be commensurate with the scope and complexity of a given experiment, the same process applies regardless of discipline or location (either surface or underground).

3.0 EXPERIMENT PHASES

In general terms, an experiment has the following phases: conception, proposal, installation, commissioning, operation and decommissioning.

3.1. Conception: Experiment representatives are encouraged to contact the Sanford Laboratory Science Liaison Director as early as possible as conceptual plans are developing for projects envisioned for the Sanford Laboratory. Ideally, communication would begin in the planning stages when projects are seeking funding to ensure that the experiment is possible and that expectations can be met, including access to specific areas.

3.2. Proposal: In addition to understanding experiment and facility requirements, documentation reviewed during the Proposal phase is used to determine the feasibility of an experiment for implementation at the Sanford Laboratory. Space is allocated for a fixed period in this phase, subject to the availability of funding for both the facility and the experiment.

3.3. Installation: Experiment activities onsite at Sanford Laboratory begin at the start of the Installation phase. Many of the documents developed during the Proposal phase are required for authorization during the Installation phase.

3.4. Commissioning: After the Installation phase, some activities may be performed and some equipment may be operated in order to test and otherwise commission aspects of an experiment. It is possible that the full set of hazards described in various project documents will be exercised during this phase.

3.5. Operation: In this phase, the experiment is aiming to meet its primary scientific goals, with activities involving the full set of hazards described in various project documents. If

applicable, a Certificate of Occupancy is necessary by this stage of the experiment (note that it may be required for prior phases based on assessment).

3.6. Decommissioning: The experiment needs to plan for the complete removal of all equipment and restoration of the site to its initial condition unless agreement is reached on certain specific exceptions.

4.0 PROJECT DOCUMENTATION

Specific documentation is required in order to identify interfaces with the facility and address any hazards within an approval framework. The documents that establish and define a relationship between an experiment and Sanford Laboratory are outlined below:

4.1. Expression of Interest (optional for some): While encouraged for all groups, for experiments with modest hazards and facility requirements this step is optional. An Expression of Interest (EOI) describes scientific merit, facility requirements, hazards and funding status. In some cases, the experiment funding proposal narrative is sufficient; otherwise the Experiment Planning Statement (see Section 4.2) may be required for Sanford Laboratory assessment. Groups requesting significant Sanford Laboratory resources or significant changes to the capacities and/or capabilities of the facility may be subject to an External Review and Evaluation.

4.1.1. Support Letter: If Sanford Laboratory determines that an experiment can be performed both technically and safely at the facility, the Laboratory Director will issue a formal letter to support a funding request; in return Sanford Laboratory requests a copy of the final proposal narrative for our records. Experiments are welcome at Sanford Laboratory even without prior interactions or a prior support letter.

4.1.2. Cost Estimate (Initial): In order to meet project goals, initial site-preparation details should be discussed, and there may be associated costs that need to be reflected in any funding proposal. As resources are available, Sanford Laboratory personnel may be able to assist with the development of cost estimates for performing work at the facility (including nominal estimates for contracted services).

4.2. Experiment Planning Statement: The Experiment Planning Statement (EPS) is intended to allow Sanford Laboratory to understand whether an experiment is feasible based on experiment requirements as well as critical interfaces between the experiment and the facility. EPS elements include project summary, list of equipment, space and infrastructure needs, description of the hazards, personnel access requirements, project schedule and an initial decommissioning plan. The EPS will be reviewed by the Operations (Underground Access and/or Facility Infrastructure) and Engineering Directors (or designates). Environment, Safety and Health (ESH) personnel will also review all EPS documents to provide assurance that the scope and scale of hazards and appropriate corresponding control measures and mitigation strategies have been identified. Based on scope and scale of hazards identified in the EPS, ESH with concurrence from the Science Director (or designate) may request a separate Experiment Hazard Assessment Summary document (see Section 5.1.1). The Science Liaison Director (or designate) may request that other departments review the EPS based on specific interfaces (e.g., Information Technology). Once iterations on content converge, the Science Liaison Director (or designate) will sign for the receipt of the completed document. The EPS document will be updated if significant changes are proposed to the baseline scope, with formal reviews commensurate with the scope of the changes as determined by the

Science Liaison Director (or designate). Sanford Laboratory maintains a template for the EPS (see References section).

4.2.1. Experiment/Facility Requirements: It is also important to understand an experiment's dependency on facility infrastructure and services. To that end, an Experiment/Facility Requirements "What-If" Questionnaire is also available (see References section).

4.3. Memorandum of Understanding: The Memorandum of Understanding (MOU) establishes an initial baseline relationship between the South Dakota Science and Technology Authority (Operator of the Sanford Underground Research Facility) and the experiment and outlines general expectations of both the Sanford Laboratory and the experiment, including insurance requirements, adherence to the applicable requirements defined in the ESH Manual, and a nominal decommissioning plan. Expectations relating to environment, safety & health (also waste handling), site access, material handling and operations, and physical infrastructure are also addressed. Expectations regarding documentation and publications are also included in the MOU; a separate document is required for specific intellectual property agreements. The MOU is not legally binding and may be signed by experiment representatives or institutional administrators. The MOU document will be updated as necessary if significant changes are proposed to the baseline or to capture significant expectations. The MOU specifies particular location(s) for experiment activities (both surface and underground), and any change in that scope requires an update to the MOU. Sanford Laboratory maintains a template for the MOU (see References section). The MOU is signed by the Sanford Laboratory Director, and the fully executed MOU document is the formal approval of space at the Sanford Laboratory for the duration described in the MOU. Occupancy of shared laboratory space(s) is coordinated by Sanford Laboratory and any conflicts will be resolved by the SDSTA.

4.4. Insurance: Evidence of both Workers' Compensation and general liability coverage are required from each institution with personnel performing work at the Sanford Laboratory. Coverage is reviewed by the Contracts and Business Services Manager. The Sanford Laboratory risk manager will assess liability requirements (and provide any waivers as appropriate). Sanford Laboratory will deny site access to individuals who do not have current and acceptable insurance coverage. A Sanford Laboratory memo is available that covers details of the insurance requirements (see References section). Experiment representatives are also asked to provide Human Resource contacts to expedite any emergency communication.

4.5. Decommissioning Plan: A plan for how the experiment will be decommissioned is required prior to commencement of activities at Sanford Laboratory. General decommissioning requirements are outlined in the MOU and an initial decommissioning plan can be added by the experiment to the MOU document (as appropriate) and/or in the EPS document. Prior to the end of a project a more detailed and formal description of decommissioning is required per the Sanford Laboratory Decommissioning Plan template (see References section). The final Decommissioning Plan is reviewed by the Operations (Underground Access and/or Facility Infrastructure) and Engineering Directors (or designates) and formally received by the Science Liaison Director (or designate). As the final step, an "authorization for completion" is issued by the Laboratory Director (per the authorization process described in

Section 8.0) based on the completion of decommissioning per the formally-received Decommissioning Plan.

4.6. Services Agreement(s) (if applicable): The Sanford Laboratory offers a basic level of support to all experiments, which is often sufficient for most smaller experiment groups with modest requirements (see Experiment Support in References section). Requirements beyond the general level of support are specified in separate services agreements.

A General Services Agreement (GSA) outlines obligations and associated costs for each party (Sanford Laboratory and experiment) per occupied space. GSA documentation is updated annually aligning with Sanford Laboratory fiscal year (Oct 1 – Sep 30) and includes that standard SDSTA overhead rate. Some charges (e.g., significant utility usage) may be billed for non-DOE experiment groups. Commercial entities are charged fees based on space occupancy and operations as well as for project personnel access and for any Sanford Laboratory personnel acting on behalf of the project.

Contracts may be needed for specific labor or non-labor arrangements (e.g., labor requiring Sanford Laboratory to backfill capacity, site-preparation activities and materials, etc.) based on cost estimates provided by the Operations and/or Engineering departments.

Services agreements (GSA and/or contracts) are reviewed by the Science Liaison Director (or designate) and the Contracts and Business Services Manager; the agreements are signed by the Laboratory Director.

5.0 ENVIRONMENT, SAFETY AND HEALTH

All activities performed at Sanford Laboratory must be conducted in a manner that ensures protection of the workers, the public and the environment. Project goals will be accomplished safely by following a process of integrated safety management.

5.1. Hazard Analysis: Per the Sanford Laboratory Work Action Planning policy, work planning and hazard analysis are required for all work at the facility, including experiment activities.

5.1.1. Experiment Hazard Assessment Summary (if applicable): For projects with significant hazards, a detailed Experiment Hazard Assessment Summary (EHAS) is required, in which a complete list of experiment hazards is provided with associated control measures and mitigation strategies identified for each hazard. Sanford Laboratory maintains a template for the EHAS (see References section); similar reports required by other external agencies may be acceptable such as the DOE Hazard Analysis Report (HAR). The EHAS document is reviewed by ESH personnel (nominally the Experiment Health & Safety Manager) as well as subject matter experts (such as appropriate Engineering personnel and/or other ESH personnel). The final reviewed version of the EHAS is formally received by the Science Liaison Director (or designate).

5.1.2. Procedures: Experiments are required to document work steps, hazards and associated mitigations (precautions, procedures, controls and safe work practices) in a procedure or job hazard analysis (JHA). A JHA template is available (see References section), but other formats are acceptable provided the above elements are sufficiently addressed. Experiments are responsible for developing and performing an internal review of their procedures. Procedures are reviewed in an

oversight capacity by appropriate Sanford Laboratory representatives, including ESH personnel, subject matter experts (such as appropriate Engineering personnel). As the final step, procedures are reviewed and approved by the Science Liaison Director (or designate).

5.1.3. Quantitative Analysis (if applicable): Some Sanford Laboratory policies and procedures relevant to experiment activities require quantitative analysis for hazards such as oxygen deficiency hazards (ODH). Quantitative analyses are reviewed by ESH personnel (nominally the Experiment Health & Safety Manager) as well as subject matter experts (such as appropriate Engineering personnel and/or other ESH personnel). The final reviewed version of any quantitative analysis is formally received by the Science Liaison Director (or designate).

5.1.4. Certifications (if applicable): Engineering documentation is required for some equipment such as pressure systems or hoisting & rigging equipment.

5.2. Inventories: Experiments are required to maintain inventories of items that may require inspections and potentially hazardous items, including chemicals, electrical equipment, radioactive materials, pressure vessels and hoisting & rigging equipment. The Science department ensures relevant details are communicated as necessary and provides oversight to ensure the inventories are maintained. Specific additional considerations are addressed below:

5.2.1. Chemicals: All chemicals (including compressed gases and cryogenic materials) must be approved by ESH (Environmental Manager and Industrial Hygienist) and added to a chemical inventory before they can be brought onto Sanford Laboratory property. The inventory shall include the name of the responsible person, arrival date at Sanford Laboratory, storage information (quantities, locations and containment descriptions) and an indication of whether the chemical is considered hazardous waste. Approved chemicals must have a Safety Data Sheet (SDS) on file. Sanford Laboratory maintains an inventory template for chemicals (see References section). Personnel with experiments using chemicals should be familiar with the Hazard Communication policy in the Sanford Laboratory ESH Manual. Other relevant Sanford Laboratory ESH Manual policies may include the Lead (Pb) Program policy, the Compressed Gases policy, the Cryogenic System policy and the Oxygen Deficiency Hazards (ODH) policy.

5.2.2. Electrical Equipment: All electrical equipment requires an inspection (nominally Operations or Engineering) prior to use on Sanford Laboratory property. The inventory shall include information such as the model and serial number of equipment as well as power consumption, the location of use and the equipment owner. Sanford Laboratory maintains an inventory template for electrical equipment (see References section). Personnel with experiments using electrical equipment should be familiar with the Electrical Safety and the Lockout/Tagout policies in the Sanford Laboratory ESH Manual.

5.2.3. Radioactive Materials: All radioactive materials (including NRC-exempt sources) need to be approved by the Radiation Safety Officer (RSO) and included on an inventory. The inventory shall include the isotope, physical description, activity, owner, primary emission, arrival date and storage location. Sanford Laboratory maintains an inventory template for radioactive materials (see References section).

Personnel with experiments using radioactive materials should be familiar with the Radiation Safety policy in the Sanford Laboratory ESH Manual. In particular, only individuals approved by the Sanford Laboratory RSO are authorized to handle radioactive sources (including NRC-exempt sources) on Sanford Laboratory property. Note that new radioactive sources may need to be added to the SDSTA NRC license, and license amendments can take up to 90 days.

5.2.4. Pressure Vessels: Pressure vessels (including owned, leased and/or rented units) need to be inspected regularly. The Sanford Laboratory Operations (Facility Infrastructure) department coordinates inspections and requires that an inventory of equipment be maintained for each experiment. The inventory shall include information such as a description of the equipment, including manufacturer, model, serial number, manufacture/purchase date, institution owner, certificate of authorization number, national board number and any supporting documentation, including a copy of the ASME certificate. Items entered in the SURF database will be assigned a SURF asset ID. Sanford Laboratory maintains an inventory template for pressure vessels (see References section). Personnel with experiments using pressure vessels may need to be familiar with the Compressed Gases policy and the Cryogenic System policy in the Sanford Laboratory ESH Manual.

5.2.5. Hoisting & Rigging Equipment: Experiment-owned hoisting and rigging equipment may need to be inspected on a regular basis. The Sanford Laboratory Operations (Facility Infrastructure) department coordinates inspections and requires that an inventory of equipment be maintained for each experiment. Personnel with experiments using hoisting & rigging equipment may need to be familiar with the Overhead Cranes and Hoists policy and the Slings, Rigging Hardware and Below-The-Hook Devices policy in the Sanford Laboratory ESH Manual.

5.3. Training: Some ESH hazards identified in the experiment hazard analysis may be mitigated through training. The experiment is required to identify, manage and track training for individual workers, including task-specific training.

5.3.1. Sanford Laboratory Training: Sanford Laboratory provides some general safety and awareness training (“General Safety – Basic” and associated Annual Refresher Training for those individuals onsite for 40 hours or more per year) as well as site-specific training for laboratories and other areas accessed by experiment personnel. Full waivers for general safety training are not given for MSHA or OSHA certification. Sanford Laboratory also provides some oxygen deficiency hazard and chemical awareness training (including lead) and some on-the-job training related to topics such as fall protection and hoist operation.

5.3.2. Experiment Training & Equivalences: For some topics (e.g., radiation safety), the experiment must arrange to provide training for its personnel and manage equivalences if there are various options to receive the training; such training must be acceptable to Sanford Laboratory (reviewed by ESH department, formal receipt by Science department).

5.3.3. Recordkeeping: Sanford Laboratory tracks training that it provides. However, since additional experiment resources may be needed in order to provide some required training, Sanford Laboratory training records may not be complete. Experiment representatives must be able to provide proof of training if requested by Sanford

Laboratory and ensure that onsite experiment personnel are current on all required training. An example of a matrix used for tracking personnel training is maintained by the Sanford Laboratory (see References section).

5.4. Waivers: Prior to undertaking any experiment activities at Sanford Laboratory, any person associated with the experiment is required to sign the “Acknowledgement of Risk” and “Release, Agreement Not to Sue and Waiver” documents (see References section).

6.0 REVIEW PROCESS

Considerations for safety reviews are outlined in the Sanford Laboratory ESH Manual (Chapter 8000). Generally, experiment reviews are commensurate with the associated hazards. All hazards are reviewed by appropriate ESH and Science personnel, with other Sanford Laboratory resources identified as appropriate (e.g., Engineering). The Science Liaison Director (or designate) may coordinate a walk-through inspection prior to one or more phases of an experiment’s implementation. The Science Liaison Director (or designate) may also coordinate to have specific Sanford Laboratory experts present to monitor activities during particular steps.

The Science Liaison Director may convene a Safety Readiness Review Committee for complex projects or those with significant hazards. One or more reviews may be held for a given experiment and may align with specific stages or locations. Recommendations or action items resulting from reviews are tracked using Sanford Laboratory database tools. As necessary, the Science Liaison and ESH Directors determine which recommendations need to be closed to support authorization for a specific phase of experiment implementation; review recommendations are closed with concurrence by both the Science Liaison and ESH Directors.

7.0 INTEGRATION

A number of resources are involved in integrating an experiment and its associated personnel into Sanford Laboratory operations and for maintaining and sustaining a strong relationship throughout the lifetime of the experiment.

7.1. Facility Access

7.1.1. General: Forms are available in order to gather basic personal information, sign-up for scheduled training classes and to receive IT accounts. Once experiment personnel complete the “General Safety – Basic” training class, they are eligible to be issued a personal facility access badge with appropriate access permissions (approval by Science Liaison Director or designate).

7.1.2. Underground Access: The Sanford Laboratory currently offers a 4-day work week (alternating Mon-Thu and Tue-Fri) and can accommodate 24-hour access as requested. Cage schedules are maintained indicating specific times when experiment personnel can go down or up (see References section). Currently, personnel and materials are transported via the Yates Shaft.

7.1.3. Facility Guides: Enhanced emergency response training is available to enable experiment personnel to be authorized as a Facility Guide (see the Facility Guide

policy in the Sanford Laboratory ESH Manual), which allows groups additional scheduling flexibility, especially for facility holidays or non-standard shifts.

7.1.4. Emergency Access: Sanford Laboratory recognizes that conditions may arise requiring emergency access to experiment equipment, and processes have been developed to accommodate experiment personnel (see References section).

7.2. Planning and Communication

7.2.1. Shipping and Transport: The Sanford Laboratory receives materials for many groups from many vendors. Guidelines for shipping materials to the Sanford Laboratory are available (see Shipping Instructions in References section) and an online tool is available for scheduling transport underground (see Yates Manifest in References section). For experiments with a significant amount of equipment (several pallets or more), a manifest is required with detailed information on equipment arriving at the Sanford Laboratory including a description of items, including manufacturer/supplier information, as well as quantities, masses and dimensions of items and transport containers (pallet, crate, etc); a manifest template is available (see References section). A dedicated form has been developed for high-value items to ensure expectations for both experiment and facility personnel are identified (see References section). Manuals for equipment used onsite are expected to be available.

7.2.2. Work Planning: Details of experiment activities need to be communicated to Sanford Laboratory, including the proposed location(s) and cage times, personnel, work procedures, materials and any facility support that is required to accomplish the work. A work plan template is maintained (see References section), which is used by Sanford Laboratory personnel to approve a trip and to enter the relevant details in the Sanford Laboratory Trip Plan database; specific representatives from some experiment groups may interact directly with the Trip Plan database.

7.2.3. Shift Reports: Each experiment group is expected to document their activities after completion of a shift according to the shift report template (see References section). In particular, the shift report includes a summary of the experiment activities as well as any comments, recommendations, irregularities, near-misses or incidents. Recording acts of safety is also strongly encouraged. The personnel hours recorded in the experiment shift reports are compiled by the Sanford Laboratory and serve a number of purposes including safety statistics.

7.2.4. Incident Reports: Injuries or significant operational upsets qualify as an incident and must be reported to the Sanford Laboratory (see ESH Manual). Sanford Laboratory personnel can assist with investigations as necessary. Relevant facility incidents will be shared with experiment personnel.

7.2.5. Evacuation Drills: The Sanford Laboratory is committed to conducting regular evacuation drills that involve facility staff as well as experiment personnel. Sanford Laboratory recognizes that it is important to minimize the impact these drills have on experiment activities and in particular the Laboratory does not want to

compromise valuable progress and/or equipment. Guidelines for conducting evacuation drills are available (see References section).

7.3. Science Integration

- 7.3.1. Project Mailing List:** A project mailing list called “Project Team” is intended as a way of communicating information on various general topics to all Sanford Laboratory stakeholders, including experiment personnel who register.
- 7.3.2. Science Integration Meeting:** Regular meetings are held between facility representatives (including representatives from Science, Operations, ESH and management) and representatives from the main experiment groups to discuss both facility and experiment logistics items. Key elements from recent shift reports are shared with the group; the experiment representatives are expected to communicate important items with their respective collaborations.
- 7.3.3. Laboratory Coordinator:** Sanford Lab personnel are designated by the Science Liaison Director to act in a coordination role to facilitate access to facility resources as well as perform safety oversight for experiment activities. Laboratory Coordinators are present on a regular basis at facilities where the activities of one group may impact another group such as at the main underground campuses. To that end, the Laboratory Coordinator facilitates a daily coordination meeting to discuss activities and logistics for the day, including identifying requests for specific resources (e.g., common space, staff such as Facilities Technicians, etc).
- 7.3.4. Experiment Point of Contact:** Individuals within the Sanford Lab Science Liaison department are designated by the Science Liaison Director to act as a point-of-contact with experiment groups to assist in navigating the experiment implementation process (see References section). The Experiment Point of Contact can help identify points of contact within other Sanford Lab departments as needed. The nominal ESH point of contact for experiment groups is the Radiation/Experiment Health & Safety Manager; however other ESH resources may be required.
- 7.3.5. Management Meetings:** Regular meetings are held between facility management (including the Science Liaison, Laboratory and Executive Directors) and experiment management/Pis for the main experiment groups to identify and resolve any critical issues that arise.

7.4. Prioritizing Resources and Managing Conflict: A number of documents and other tools exist for identifying needs for limited resources at Sanford Laboratory:

- **Memorandum of Understanding:** As noted in Section 4.3, the MOU includes a statement that occupancy of shared laboratory space(s) is coordinated by Sanford Laboratory and any conflicts will be resolved by the SDSTA. An MOU is signed by all experiments.
- **Science Integration:** As noted in Section 7.3, a number of forums exist to promote discussion at various levels, including electronic mailing lists and regular scheduled meetings. In particular, discussion of issues related to conflicts for resources is encouraged.
- **Coordination:** As noted in Sections 7.3.3 and 7.3.4, members of the Sanford Laboratory staff (typically members of the Science department) are assigned to

act in a coordination role either as the Laboratory Coordinator or as the Experiment Point of Contact. In both cases, the individuals in those roles manage resources and the potential for conflict.

- Online databases: Online tools have been developed to manage the transportation of personnel and materials. Noted in Section 7.2.2, the Trip Plan database is used to manage cage occupancy (currently limited to 28 people) as well as the total underground population (currently limited to 72 people). The Underground Access Director has indicated the following priorities: Sanford Lab personnel responsible for operations/maintenance/safety, science collaborations, new construction, and finally optional trips such as tours. The Yates Manifest database (Section 7.2.1) is used to manage the transportation of materials, especially limited opportunities for using the main access shaft.

The Science Director (or designates) will endeavor to manage conflicts with experiment groups. The Sanford Laboratory Director has oversight responsibility for all facility resources and will adjudicate issues that cannot otherwise be resolved.

7.5. External Review and Evaluation: A Sanford Laboratory scientific program advisory committee may review/evaluate experiments when appropriate.

8.0 AUTHORIZATION

Following identification of the hazards for an experiment (nominally once the Experiment Hazard Assessment Summary document has been finalized) and in conjunction with the review process as appropriate, a list of authorization steps will be formally developed by the Science Liaison Director with input from experiment representatives.

Experiments request authorization for specific activities or phases of their project, including initial installation, key phases with significant hazards (e.g., cryogenics, lead, use of radioactive materials) as well as decommissioning. Sanford Laboratory maintains a template of the generic authorization request memo (see References section). The experiment request is evaluated by the Science and ESH points of contact. It is not necessary that all work planning elements be complete to receive over-arching authorization. For instance, some procedures may still be under review at the time of authorization with the expectation that work steps for those procedures are not authorized until the procedures are approved using the standard work planning approval process that includes Science and ESH personnel as well as subject matter experts as appropriate.

Based on the status of various implementation elements the Science Liaison Director submits a recommendation memo with concurrence of the ESH Director to the Sanford Laboratory Director for formal authorization approval.

9.0 EXPERIMENT PHASES AND IMPLEMENTATION REQUIREMENTS

Different elements of the implementation documentation described above serve as the basis for authorization at different phases of an experiment's activities: conception, proposal, installation, commissioning, operation and decommissioning. Documentation related to activities and hazards associated with a given experiment phase is reviewed by various Sanford Laboratory resources as described through this document (also see Section 10 for a summary). In addition,

for each phase and for authorization step(s) associated with significant hazard(s) within phases, the main project documentation as well as ongoing operational documentation (such as training documents and various inventories) is reviewed to verify that information is complete and up-to-date.

In order to determine that facilities are ready to support experiment activities, occupancy is managed by the Sanford Laboratory Facility Transition Management Plan (see References section). Experiments may propose activities prior to the formal Certificate of Occupancy being issued by the Authority Having Jurisdiction (AHJ), which for Sanford Laboratory is the City of Lead. The Facility Transition Manager coordinates with the AHJ to determine authorization parameters for phased occupancy, which is reflected in any associated Authorization To Proceed. The formal Certificate of Occupancy is required by the Operation phase (and possibly sooner based on assessment).

A summary of implementation requirements for each experiment phase is presented in Table 1.

Experiment Phase	Implementation Elements		Timeline Comments
	Development/Review	Authorization	
0. Conception	<i>Optional:</i> Expression of Interest, Experiment Planning Statement (draft)	<i>Optional:</i> Support Letter, Cost Estimate for funding proposal. Requests incl significant resources may require External Review and Evaluation	Varies by experiment (1 to months)
1. Proposal	Experiment Planning Statement (EPS), also Experiment/Facility Requirements		1 to several weeks; expect iterations during review
	Memorandum of Understanding (MOU)	MOU (space allocation for fixed period)	Within 1 week; expect a few iterations during review
	Insurance		Within 1 week (often iterations to include additional insureds language)
	Decommissioning Plan (incl in MOU, EPS)		See MOU/EPS
	Services Agreement(s), if applicable	Contract (for site preparation, etc.)	1-2 weeks for contract Cost Estimates
	Experiment Hazard Assessment Summary (EHAS), if applicable		1 to several weeks; expect iterations
	Safety Readiness Review, if applicable		Varies by experiment (months to years)

2. Installation	Renewals: Insurance, Services Agreement(s), if applicable; other updates as necessary (ongoing)	Project documentation: EPS (also Experiment/Facility Requirements), MOU, Insurance, Decommissioning Plan; Services Agreement(s), if applicable	See above for development (often updates are straightforward, but may take days to weeks depending on significance of changes)
	Manifest, if applicable	Manifest, if applicable	1 to a few days
		EHAS, if applicable	See above for development
	Procedures (ongoing)	Procedures	Days to several weeks each
	Quantitative analyses, if applicable	Quantitative analyses, if applicable	1 to several weeks each
	Certifications, if applicable (ongoing)	Certifications, if applicable	Weeks if inspection required
	Shipping form, applicable inventory (ongoing)	Chemical approvals prior to arriving onsite	1 to a few days
		Electrical inspections prior to use onsite	1 to a few days
		Radioactive material approval prior to arriving onsite	Up to 90 days if NRC license update required
	Training: equivalence, personnel records, manage onsite compliance (ongoing)	Training	Depends on status; equivalence may require iterations
	Characterize and quantify hazards for staged facility use prior to Occupancy Certificate, if applicable	Occupancy per Facility Transition Management Plan, if applicable	A few days to a week (coordination with AHJ)
		Walk-through inspection(s) and/or monitoring; if applicable	A few days
Safety Readiness Review prior to installation at specific facility	Readiness Review recommendations; if applicable	Days to weeks	
3. Commissioning	Renewals: Insurance, Services Agreement(s), if applicable; other updates as necessary (ongoing)	Project documentation: EPS (also Experiment/Facility Requirements), MOU, Insurance, Decommissioning Plan; Services Agreement(s), if applicable	See above for development (often updates are straightforward, but may take days to weeks)

			depending on significance of changes)
	Procedures (ongoing)	Procedures	Days to several weeks each
	Quantitative analyses, if applicable	Quantitative analyses, if applicable	1 to several weeks each
	Certifications, if applicable (ongoing)	Certifications, if applicable	Weeks if inspection required
	Shipping form, applicable inventory (ongoing)	Chemical approvals prior to arriving onsite	1 to a few days
		Electrical inspections prior to use onsite	1 to a few days
		Radioactive material approval prior to arriving onsite	Up to 90 days if NRC license update required
	Training: equivalence, personnel records, manage onsite compliance (ongoing)	Training	Depends on status; equivalence may require iterations
	Characterize and quantify hazards for staged facility use prior to Occupancy Certificate, if applicable	Occupancy per Facility Transition Management Plan, if applicable	A few days to a week (coordination with AHJ)
		Walk-through inspection(s) and/or monitoring; if applicable	A few days
	Safety Readiness Review prior to commissioning at specific facility	Readiness Review recommendations; if applicable	Days to weeks
4. Operation	Renewals: Insurance, Services Agreement(s), if applicable; other updates as necessary (ongoing)	Project documentation: EPS (also Experiment/Facility Requirements), MOU, Insurance, Decommissioning Plan; Services Agreement(s), if applicable	See above for development (often updates are straightforward, but may take days to weeks depending on significance of changes)
	Procedures (ongoing)	Procedures	Days to several weeks each
	Certifications, if applicable (ongoing)	Certifications, if applicable	Weeks if inspection required
		Chemical approvals prior to arriving onsite	1 to a few days

	Shipping form, applicable inventory (ongoing)	Electrical inspections prior to use onsite	1 to a few days
		Radioactive material approval prior to arriving onsite	Up to 90 days if NRC license update required
	Training: equivalence, personnel records, manage onsite compliance (ongoing)	Training	Depends on status; equivalence may require iterations
		Walk-through inspection(s) and/or monitoring; if applicable	A few days
	Safety Readiness Review prior to full operation at specific facility	Readiness Review recommendations; if applicable	Days to weeks
	Commissioning Review: procedures, incidents, lessons learned, etc from Commissioning phase	Commissioning Review: procedures, incidents, lessons learned, etc from Commissioning phase	Days
5. Decommissioning	Renewals: Insurance, Services Agreement(s), if applicable; other updates as necessary (ongoing)	Project documentation: EPS (also Experiment/Facility Requirements), MOU, Insurance, Decommissioning Plan; Services Agreement(s), if applicable	See above for development (often updates are straightforward, but may take days to weeks depending on significance of changes)
	Procedures (ongoing)	Procedures	Days to several weeks each
	Certifications, if applicable (ongoing)	Certifications, if applicable	Weeks if inspection required
	Shipping form, applicable inventory (ongoing)	Chemical approvals prior to arriving onsite	1 to a few days
		Electrical inspections prior to use onsite	1 to a few days
		Radioactive material approval prior to arriving onsite	Up to 90 days if NRC license update required
	Training: personnel records, manage onsite compliance (ongoing)	Training	Depends on status
	Walk-through inspection(s) and/or monitoring; if applicable	A few days	

	Safety Readiness Review prior to decommissioning at specific facility	Readiness Review recommendations; if applicable	Days to weeks
	Decommissioning Plan	Decommissioning Plan (for authorization for completion)	Days to weeks, expect iterations

Table 1. Summary of Sanford Laboratory implementation requirements for each experiment phase.

10.0 SUMMARY OF IMPLEMENTATION RESPONSIBILITIES

A summary of experiment implementation program elements and associated Sanford Laboratory responsibilities is included in Table 2.

Implementation Element	Department Responsibility	
	Review	Receipt/Approval
Project Documentation		
1. Expression of Interest , also support letter and initial cost estimate	Science, Operations, Engineering, Contracts & Business Services	Lab Director (support letter), Operations/Engineering (cost estimate)
2. Experiment Planning Statement (EPS) , also Experiment/Facility Requirements	Operations, Engineering, Science, ESH; others as appropriate	Science
3. Memorandum of Understanding (MOU)	Science	Lab Director
4. Services Agreements (incl GSA, contracts)	Science, Contracts & Business Services, Operations/Engineering (cost estimates); others as appropriate	Lab Director
5. Insurance	Contracts & Business Services, Science	Lab Director (Risk Manager)
6. Decommissioning Plan	Operations, Engineering	Science (receipt), Lab Director (authorization for completion)
Environment, Safety & Health		
1. Hazard Analysis (incl procedures/JHAs; Experiment Hazard Assessment Summary as appropriate)	ESH, Science, Subject Matter Experts (incl ESH, Operations, Engineering)	Science (oversight); ESH with Science concurrence for EHAS (both for requirement as well as for receipt/approval)
2. Chemical Inventory	Science (communication), ESH (review)	ESH (approval), Science (oversight)
3. Electrical Inventory	Science (communication), Operations/Engineering (inspection)	Operations/Engineering (approval), Science (oversight)
4. Radioactive Materials Inventory	Science (communication), Radiation Safety Officer (review), Science (review)	Radiation Safety Officer (approval), Science (oversight)

5. Pressure Vessel Inventory	Science (communication), Operations (inspection)	Science (oversight)
6. Hoisting & Rigging Equipment	Science (communication), Operations (inspection)	Science (oversight)
7. Training	ESH (equivalence)	Science (equivalence, oversight for records, management)
Review Process		
1. Walk-Through Inspection(s) and/or Monitoring	ESH, Subject Matter Experts (incl Science, ESH, Operations, Engineering)	Science (coordination/oversight)
2. Safety Readiness Review Committee		Science
3. Review Recommendation Closure		Science, ESH
Integration		
1. Facility Access (Badge)		Science
2. Prioritizing Resources and Managing Conflict	Science (incl others as necessary)	Science (Lab Director as necessary)
Authorization		
1. Authorization Steps		Science
2. Authorization	Science, ESH (concurrence)	Lab Director

Table 2. Summary of Sanford Laboratory department formal responsibilities for the experiment implementation program.

11.0 REFERENCE AND RELATED DOCUMENTS

11.1. References

- Experiment Implementation Program (this document, Document-34478); also <http://sanfordlab.org/researchers/proposal-guidelines>
- Experiment Planning Statement Template (Document-34460); also <http://www.sanfordlab.org/researchers/proposal-guidelines>
- Experiment/Facility Requirements What-If Questionnaire (Document-99303)
- Experiment Memorandum of Understanding Template (Document-69417)
- Sanford Laboratory ESH Manual (Collection-15104); also <http://www.sanfordlab.org/esh>
- Experiment Support (Document-135416)
- Experiment Insurance Requirements (Document-60095)
- Experiment Decommissioning Plan Template (Document-125942)
- Work Action Planning (Document-73320)
- Job Hazard Analysis Form (Document-71800)
- Experiment Hazard Assessment Summary Template (Including Worksheet) (Document-98635)
- Chemical Inventory Template (Document-58346)
- Electrical Equipment Inventory Template (Document-82383)

- Radioactive Materials Inventory Template (Document-82391)
- Pressure Vessel Inventory Template (Document-138142)
- Experiment Training Matrix Example (Document-98644)
- Acknowledgement of Risk and Waiver: <http://www.sanfordlab.org/contract/state-and-federal-purchasing-regulation-forms>
- Yates Shaft Cage Schedule (Document-85910)
- Experiment Access Instructions (Document-118029)
- Shipping Instructions (Including Forms) (Document-116863)
- Yates Manifest: https://docs.sanfordlab.org/cfide/mtl_view.cfm
- Manifest Template (Document-127051)
- High-Value Equipment Handling Form (Document-82438)
- Work Plan Template (Document-69078)
- Trip Plan: https://docs.sanfordlab.org/cfide/ta_view.cfm
- Shift Report Template (Document-69079)
- Science Evacuation Drill Memo (Document-133579)
- Experiment Authorization To Proceed Request Memo Template (Document-127061)
- Facility Transition Management Plan (Document-98261)

11.2. Related Documents

Appendix

Schematic showing routes for communication and authorization. Solid lines indicate formal responsibility, dashed lines informal routes.

