NATIONAL ACCELERATOR LABORATORY

ENVIRONMENT, SAFETY & HEALTH DIVISION

Chapter 1: General Policy and Responsibilities

Quick Start Summary

Product ID: 479 | Revision ID: 1743 | Date published: 27 May 2015 | Date effective: 27 May 2015
URL: http://www-group.slac.stanford.edu/esh/eshmanual/references/eshQuickstart.pdf

1 Who needs to know about these requirements

The environment, safety, and health (ESH) policy information in this chapter applies to all personnel working at SLAC and, in particular, those with management authority for ESH.

2 Why

To ensure ESH concerns are appropriately addressed in all activities at the SLAC National Accelerator Laboratory so as to protect workers, the public, and the environment.

3 What do I need to know

All work at SLAC must comply with applicable ESH requirements, which flow from the Environment, Safety and Health Policy. The ESH Project Review Procedure is provided to ensure the environment, safety, and health (ESH) aspects are adequately identified and mitigated before authorization and release of experimental and conventional project activities. The Hazard Control Selection and Management Requirements are provided to define how a risk-based approach is used to determine the need for controls on facilities, systems, or components to protect the public, workers, and the environment. Program- and process-level requirements are contained in the hazard-specific chapters of the ESH Manual.

4 When

These requirements take effect 27 May 2015.

5 Where do I find more information

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 1, “General Policy and Responsibilities”

Or contact the program manager.

Chapter 1

General Policy and Responsibilities

Product ID: 2 | Revision ID: 1740 | Date published: 27 May 2015 | Date effective: 27 May 2015
URL: http://www-group.slac.stanford.edu/esh/eshmanual/pdfs/ESHch01.pdf

1 Purpose

The purpose of this program is to implement SLAC's Environment, Safety and Health Policy, which states:

> SLAC is committed to protecting the health and safety of on-site personnel, the public, and the environment as it carries out its scientific mission. Each of the laboratory's directorates is responsible for implementing the Environment, Safety and Health (ES&H) Program through line management. In addition, management at all levels is expected to ensure that all employees understand the content and importance of this ES&H Policy. In turn, employees are responsible for integrating ES&H considerations into their own work activities. The SLAC Director has ultimate responsibility for ES&H at the laboratory. (For the full text of this policy, see Environment, Safety and Health Policy.)

The ESH program applies to all SLAC management and workers (employees, subcontractors, and users), and all SLAC work activities, and covers the overall ESH framework, including defining roles and responsibilities, setting and implementing requirements, and providing resources. By so doing, SLAC meets the Department of Energy (DOE) standards for having an integrated safety and environmental management system (ISEMS) and worker safety and health program (WSHP).

1.1 Integration of Environment, Safety, and Health

Adequately protecting workers, the public, and the environment, like research integrity, scientific discipline, and fiscal responsibility, is a product of culture and sound management. To support the ESH policy, SLAC uses the seven guiding principles (GPs) and five core functions (CFs) of integrated safety management (ISM). All are reflected in the detailed policies and procedures of the laboratory. Managers and workers are expected to incorporate these principles into the management of their work activities, largely through work planning and control processes. While these principles apply to all work, their implementation is tailored to the complexity of the work and the probability and severity of the hazards.

That means that ESH considerations are addressed at every stage of a project, experiment, construction of a new facility, modification of an existing facility, or decommissioning of an existing facility, from conception through planning and execution. In fact, ESH is integrated with business processes for work planning, budgeting, authorization, execution, and change control. Line management is responsible for this integration and ensuring work is done safely. But it takes the commitment of each individual at SLAC, so individuals as well have very specific obligations under ISEMS.

The principles of ISEMS are infused in every SLAC program and policy. The following processes/programs enable implementation of ISEMS at the project/activity/worker level:

- ESH Project Review Process. Enables systematic and consistent review of proposed experimental and conventional projects (see General Policy and Responsibilities: ESH Project Review Procedure)

- Selection and Management of Hazard Controls. Controls are used to mitigate hazards to a level of risk that is acceptable to management. Controls must be selected and managed properly at the project level (see General Policy and Responsibilities: Hazard Control Selection and Management Requirements).
- Work Planning and Control. Enables the assessment of hazards and planning and implementation of hazard controls at a task level (see Chapter 2, "Work Planning and Control")
- Activity and Training Authorization. Defines specific activities that a worker is qualified and authorized to perform in his or her resident work area (see Chapter 2, "Work Planning and Control")
- SLAC Training Assessment. Defines and documents the required training for an individual worker (Chapter 24, "Training")
- Subcontractor Management. Ensures that SLAC ESH expectations and requirements are communicated to subcontractors (Chapter 42, "Subcontractor Safety")
- Lessons Learned. Collects feedback and directs specific actions that enable a continuous improvement

The ESH Manual compiles program- and process-level information into a series of "chapters" that each deals with a specific hazard, program area, or business process and communicates requirements and applicable procedures. (The manual and the process for developing requirements are described in About This Manual.)

Assessments of ESH activities are covered under the SLAC assessment program, which is detailed in the Assessment Program Description.

The process for determining what external requirements apply at SLAC, including ESH, is handled by Contract Management.

2 Roles and Responsibilities

Functional roles and general responsibilities for each are listed below. More detailed responsibilities and when they apply are provided in the procedures and requirements.

The roles may be performed by one or more individuals and one individual may play more than one role, depending on the structure of the organizations involved. Responsibilities may be delegated.

2.1 Everyone

Every individual working at SLAC is accountable for

- Protecting the public, workers, and the environment
- Integrating ESH concerns into his or her work
- Communicating actively on ESH and ISEMS

2.2 Laboratory Director

- Has the ultimate responsibility for safety at the laboratory and is responsible for the implementation of the SLAC Integrated Safety and Environmental Management System

- Delegates to the chief safety officer responsibility and authority for ESH policy implementation and operation of the ESH program
- Appoints safety officers for selected hazard categories

2.3 Associate Laboratory Director

- Ensures ESH requirements are implemented within his or her organization
- Ensures all incidents and imminent danger situations are investigated to ensure that appropriate corrective actions and lessons learned are developed, implemented, and disseminated
- Concurs with the chief safety officer on appointment of advisory committee chairs

2.4 ESH Division Director / Chief Safety Officer

- Coordinates technical/subject-matter expert (SME) support from within the laboratory to ensure consistent implementation of ESH requirements
- Oversees operation of the Environment, Safety, and Health, (ESH) Division
- Staffs the ESH Division with qualified staff to perform the mission expected by SLAC's ISEMS
- Ensures that ESH staff with program responsibilities receive appropriate training, development, and information for them to carry out their responsibilities
- Works with Contract Management to maintain a current list of external ESH requirements that apply to SLAC
- Establishes a rigorous incident and close-call analysis process that enables line management to identify root causes, puts in place corrective actions to prevent a recurrence, and informs the SLAC community at large
- Ensures SLAC is adequately represented during ESH-related external inspections and reviews
- Ensures the SLAC Worker Safety and Health Program Description is updated annually, as required by 10 CFR 851
- Ensures ESH Manual is up to date through routine and interim/urgent changes as needed
- Is the final authority for interpretation of ESH requirements and the application of alternative methods
- Reviews and monitors the status of the ESH program, especially the results of the annual Appendix B (of the DOE-SLAC contract) ESH performance assessment, input from line management self-assessments, results of external reviews, audits, and inspections, and input the Stanford University SLAC Policy Committee (SPC)
- Establishes ESH performance measures (for use in Appendix B) and ESH goals and indicators (for internal use)
- Approves charters of ESH advisory committees, appoints advisory committee chairs (with concurrence of the chair's associate laboratory director), and appoints committee members based on recommendations by the chair

2.5 ESH Program Manager

- Is accountable to department head and ultimately the ESH division director for the assigned ESH program (see Programs and Program Managers List)
- Keeps assigned program current and accurate
- Reviews program and related documentation for currency at least every three years
- Attains and maintains relevant ESH certifications and awareness of specific technical and administrative aspects of the program
- Manages assigned ESH program and assists line organization with implementation
- Supports the ESH project review process
- Formulates program requirements (see About This Manual), provides guidance on all ESH issues within program area, and interprets requirements
- Conducts periodic assessments of assigned programs in accordance with the Assessment Program Description
- Approves certain high-hazard work where the laboratory director requires special assurance as to the safety of line management operations. This approval authority is limited to those high-hazard activities described in the relevant chapters of the ESH Manual.
- May serve as ex officio chairperson of the advisory committee related to his or her ESH program

2.6 ESH Subject Matter Expert

- Reviews and analyzes hazards and specifies safety and environmental controls, in accordance with review processes
- Reviews and analyzes hazards and recommends and reviews safety and environmental controls, as needed

2.7 Safety Officer

Where required by regulation or DOE contract order, or if the laboratory director has special concerns with a particular set of hazards, he/she may appoint a SLAC employee who possesses special expertise to be a laboratory safety officer. (For a current list of safety officers, see Safety Officers). The ESH division director is the chief safety officer. In addition to the responsibilities of an ESH program manager, a safety officer:

- Is accountable directly to the chief safety officer
- Approves certain high-hazard work where the laboratory director requires special assurance as to the safety of line management operations. This approval authority is limited to those high-hazard activities described in the appointment letter and the ESH requirements of the relevant chapter in this manual. The safety officer approval is one of the necessary inputs for line management to authorize work.

2.8 ESH Advisory Committee

When required by regulation or DOE contract order, or if the chief safety officer has special concerns with a particular set of hazards, he or she may appoint an ESH advisory committee, consisting of SLAC personnel possessing special expertise in those hazards. Each such committee recommends and interprets standards, policies, and implementing measures. (For a list of committees, see ESH Committees.)

On occasion, new construction or new experimental processes may be proposed that present unusual hazards, for which SLAC may not have the necessary expertise on staff. During the Threshold Review and Applicability Determination (see Section 3.1 of the General Policy and Responsibilities: ESH Project Review Procedure), the ESH coordinator and applicable ESH program manager may recommend that an independent review committee be established to assess the project hazards and make recommendations for mitigation of those hazards. The chief safety officer and project *responsible person* (for example, the principal investigator or project manager) will develop and issue a charge letter to the chair of the project committee.

2.9 ESH Advisory Committee Chair

- Is appointed by the chief safety officer with concurrence of associate laboratory director
- Works with the chief safety officer to appoint members
- Ensures that the committee develops and maintains a current charter

2.10 Local Health and Safety Committee

The union/management local health and safety committee is established by the labor agreement between Stanford University and the SEIU Higher Education Workers (HEW) Local 2007. In accordance with the agreement, the committee is charged with the following responsibilities:

- Reviews and analyzes the reports on injuries and accidents involving HEW workers. The reports are produced on a quarterly basis by the Environmental Health and Safety Department (ESH Division at SLAC).
- Makes recommendations to management for modifications of unsafe or hazardous conditions affecting HEW workers. This includes investigating situations when workers refuse to perform assigned work because they have a good faith belief due to ascertainable, objective evidence that abnormally dangerous conditions exist. This includes recommendations concerning the need to curtail operations until such conditions are corrected.
- Accompanies federal or state safety inspectors on walkthroughs, if the inspector has no objections
- Recommends appropriate recognition of HEW workers who advance the goal of a safe and healthful work environment. Membership is as specified in the Collective Bargaining Agreement between: SEIU Higher Education Workers Local 2007 and the Board of Trustees of the Leland Stanford Junior University.
- Reviews and makes decisions concerning worker requests for protective garments or protective equipment
- Reports and recommends preventative measures and general training programs

2.11 Line Management

- Fully implements ISEMS and authorizes projects and other work in accordance with Chapter 2, "Work Planning and Control", and hazard-specific ESH requirements
- Provides all employees and non-employees (visiting scientists, subcontractors, students, and guests) a safe workplace and the necessary tools, equipment, other resources, training and time to work safely
- Performs ESH management walkarounds, addresses deficiencies, supports improvements, and communicates ESH expectations to workers (see Chapter 33, "Management Walkthroughs")
- Regularly communicates ESH performance requirements and solicits and provides feedback from/to workers over whom he or she has functional or administrative supervisory responsibility
- Holds workers accountable for meeting ESH performance requirements
- Ensures workers who are not SLAC employees have a supervisor or point of contact who is competent to authorize work in accordance with Chapter 2, "Work Planning and Control"

2.12 Project Manager

- Is responsible and accountable for all ESH aspects of projects
- Collaborates with field construction managers and service managers to ensure ESH performance expectations are communicated and implemented for subcontracted work, following Chapter 42, "Subcontractor Safety"
- Initiates project work following Chapter 2, "Work Planning and Control"
- Documents and implements technical and safety requirements
- Controls change processes and ensure ESH considerations are reassessed when work scope changes

2.13 Building / Area Manager

- Releases work in accordance with Chapter 2, "Work Planning and Control", and hazard-specific ESH requirements

2.14 Directorate ESH Coordinator

- Reports to his or her associate laboratory director with dotted line reporting to the ESH division director
- Serves as primary point of contact and associate laboratory director's personal representative within directorate for all matters concerning the implementation of ISEMS and ESH requirements
- Supports line management to meet responsibilities under institutional and directorate policy, plans and procedures
- Working with line management and at times work approval bodies facilitates and resolves ESH issues
- Helps maintain documentation required by the directorate-specific ISEMS plan
- Ensures proposed ESH requirements are reviewed by key staff members within directorate and comments are provided to the author

- Maintains an awareness of project and program status within the directorate so as to support line management as early as possible when work scope changes
- Supports line management in identification, analysis, and control of hazards
- Supports directorate self-assessments and external reviews and supports correction of identified deficiencies
- With the associate laboratory director, helps define roles of department and lower-level ESH coordinators
- Meets periodically with the ESH Division managers

2.15 Worker

- Completes required training (see Chapter 24, "Training")
- Follows the requirements for planning, authorizing, releasing, and stopping work (see Chapter 2, "Work Planning and Control"):
  - Proceeds only after work has been authorized and released
  - Works within controls specified by the work authorization and release
  - Stops work if necessary
- Makes recommendations about ESH concerns, especially on the appropriate ways to control hazards
- Promptly reports incidents in the workplace (for example, injuries, illnesses, incidents, near misses, hazards, and other off-normal conditions)

3 Procedures, Processes, and Requirements

These documents list the core requirements for this program and describe how to implement them:

- General Policy and Responsibilities: ESH Project Review Procedure (SLAC-I-720-0A24C-001). Describes process for ESH review of conventional and experimental projects
- General Policy and Responsibilities: Hazard Control Selection and Management Requirements (SLAC-I-720-0A24S-001). Describes how engineered, administrative, and personal protective equipment controls are designated non-credited or credited, and selected and managed based upon that designation

These documents provide useful guidance; their use is not mandatory:

- None

4 Training

All workers at SLAC are required to complete safety orientation training. Based on the tasks and hazards identified during planning, staff and non-employees may be required to complete additional SLAC ESH training courses as determined by line management. (See Chapter 24, "Training", and Training: Minimum Training Requirements.)

5 Definitions

Activity, work. As related to ESH project review, the term refers to any activity that falls below the thresholds defined within the ESH project review process

Coordinator, ESH. An individual charged with helping line management implement the SLAC Integrated Safety and Environmental Management System (ISEMS) in an organizational element of SLAC, chiefly one of the directorates

Expert, subject matter (SME). Individual possessing special expertise in a subject, for example, industrial hygiene, confined space entry, or lead abatement. Some SMEs may be outside of the ESH Division, for example, hoisting and rigging SMEs reside within the Facilities Division.

Management, line. Officially designated managers and supervisors who have been entrusted with traditional authorities to make hiring decisions, manage employee performance, and provide a safe and environmentally sound workplace. Scientific programs are often built on people matrixed to a team. This creates shared responsibility for individuals by the supervisor of record and the matrixed supervisor that must be addressed through consultation between the two supervisors. Line management also includes other persons such as area and facility managers, responsible for administration of the line functions in both science and operations programs. Line management may designate another qualified person to perform specific duties, but remains responsible for that person's conduct.

Manager, ESH program. A staff member assigned responsibility for a specific ESH program

Officer, safety. Subject matter expert in a hazard of special concern, appointed by the laboratory director

Person, responsible. The principal investigator, project manager, or other individual with overall responsibility for an experimental or conventional project

System, integrated safety and environmental management (ISEMS). The system wherein environment, safety, and health considerations are integrated into plans for meeting scientific and support program objectives

Worker. Individual performing work at SLAC, including SLAC employees, subcontractors, and users

6 References

6.1 External Requirements

The following are the external requirements that apply to this program:

- The contract (DE-AC02-76SF00515) between the US Department of Energy and Stanford University for operation of SLAC, in particular clauses I.106, "DEAR 970.5204-2 – Laws, Regulations, and DOE Directives", and I.115, "DEAR 970.5223-1 – Integration of Environment, Safety and Health into Work Planning and Execution"
- Collective Bargaining Agreement between: SEIU Higher Education Workers Local 2007 and the Board of Trustees of the Leland Stanford Junior University

- Title 10, *Code of Federal Regulations*, "Energy", Part 851, "Worker Safety and Health Program" (10 CFR 851)
- Department of Energy directives
  - Department of Energy Order 227.1, "Independent Oversight Program" (DOE O 227.1)
  - Department of Energy Order 436.1, "Departmental Sustainability" (DOE O 436.1)
  - Department of Energy Policy 450.4A, "Integrated Safety Management Policy" (DOE P 450.4A)

6.2 Related Documents

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- About This Manual
- Chapter 2, "Work Planning and Control"
- Chapter 24, "Training"
  - Training: Minimum Training Requirements (SLAC-I-720-0A04S-001)
- Chapter 33, "Management Walkthroughs"
- Chapter 42, "Subcontractor Safety"

Other SLAC Documents

- Environment, Safety and Health Policy (SLAC-I-701-A02-001-00)
- SLAC Worker Safety and Health Program Description (SLAC-I-720-0A21B-001)
- Environmental Management System Description (SLAC-I-750-0A03H-002)
- Assessment Program Description (SLAC-I-701-O03-001-00)
- Contract Management
- Lessons Learned
- Safety Officers
- ESH Committees
- Programs and Program Managers List
- Safety Coordinators

Other Documents

- Department of Energy Guide 450.4-1C, "Integrated Safety Management System Guide" (DOE G 450.4-1C)

Chapter 1: General Policy and Responsibilities

ESH Project Review Procedure

Product ID: 476 | Revision ID: 1741 | Date published: 27 May 2015 | Date effective: 27 May 2015
URL: http://www-group.slac.stanford.edu/esh/eshmanual/references/eshProcedProjectReview.pdf

1 Purpose

The purpose of this procedure is to ensure that the environment, safety, and health (ESH) aspects of project activities are adequately identified and mitigated before projects are authorized and released. The goals of this procedure are to

1. Establish a uniform process of project reviews
2. Establish consistent thresholds for a graded approach
3. Clarify and streamline the structure and process of reviews
4. Provide a framework that fosters timely and adequate planning and support to project sponsors

This procedure covers the three main elements of the review process:

1. Threshold and applicability determination
2. Experimental project review
3. Conventional project review

This procedure applies to line management, responsible persons, ESH coordinators, and reviewers involved in the proposal, review, and approval of project (experimental and conventional) activities at SLAC.

2 Roles and Responsibilities

2.1 Line Management

- Supports the implementation of this procedure throughout the organization
- Ensures that adequate resources are allocated to supporting projects
- Sets the tone to enable/promote self-policing of process/voluntary compliance/self-governance

2.2 Responsible Person

- Develops a comprehensive scope of work
- For construction projects, teams with ESH and Facilities Construction Management to perform a project risk analysis

- Teams with the ESH coordinator and other resources to perform an effective and accurate threshold review and applicability determination
- Develops applicable submittals to review entities, for example, the Building Inspection Office (BIO)
- Teams with engineers to ensure SLAC Conduct of Engineering Policy requirements are met
- Teams with ESH coordinator to execute experimental and conventional project review processes, as appropriate
- Ensures adequate staffing and timelines
- Fosters and ensures adequate communication to stakeholders
- Is responsible for the overall ESH performance of the project

2.3 ESH Coordinator

- Provides input to review statement of work (SOW) against the lower limit thresholds
- Identifies, solicits input from, and liaises with subject-matter experts (SME) who can assist in the threshold review
- Teams with the responsible person (the principal investigator [PI] / project manager [PM]) to
  - Perform formal review of the activity/project in the context of the broad thresholds
  - Document the rationale for designation as a work activity or a project activity, including hazard identification/analysis
  - Assist in the execution of experimental and conventional project review processes, as appropriate

2.4 Reviewer

The following responsibilities apply to everyone involved in project review:

- Provides thorough and timely review guidance to the project team
- Communicates early and often with the project team to ensure comments are addressed both in letter and intent, keeping the “One Lab” perspective in mind

2.5 Chief Safety Officer, Associate Laboratory Director, Laboratory Director

- Hears appeals for unresolved issues with experimental review. Final appeal is to the SLAC laboratory director

3 Procedures

The three elements of the process are summarized below; the steps are illustrated in the following process flow charts.

3.1 Threshold Review and Applicability Determination

The *responsible person* (for example, principal investigator, researcher, or project manager) and ESH coordinators (with input from subject matter experts as required) will determine whether a proposed activity/experiment can be categorized as a *work activity* or a *project activity* that needs to be reviewed through one/both of the experimental project review and conventional project review processes. All steps reside within the requester's line organization and include two levels of thresholds: lower limit thresholds and broad thresholds. The rationale for the eventual determination is documented via the threshold review form and retained by the responsible person. An ESH Threshold Review Form must be completed if the activity exceeds any of the lower limit thresholds.

The lower limit thresholds help determine if the proposed activity is within the "standard model" for the researcher/principal investigator and immediate team, while the broad thresholds help to determine whether all ESH aspects of the proposed activity can/will be adequately addressed within the requester's line organization.

The responsible person is responsible for safety of the work being performed in accordance with integrated safety management guiding principles.

3.2 Experimental Project Review Process

All equipment and operational aspects of proposed experimental projects are to be reviewed through this process. The key organizational stakeholders include the requester's line organization, the ESH coordinator, and safety officers/subject matter experts. There are two areas that need to be considered by the line organization:

1. Experiments that meet the lower limit thresholds and need to be discussed with the ESH coordinator
2. Experiments that involve working with various groups, for example coordinating among various laboratory groups for logistics, starting an already approved project in a new laboratory, et cetera. In such situations, line organizations need to appoint an experimental project manager who is responsible for coordination between the groups and to ensure that the project moves along smoothly.

The process includes specific provisions for the line organization to review and approve scope changes driven by reviewer comments and includes an appeal mechanism – to the SLAC chief safety officer and the SLAC laboratory director. Specific "go forward" authorization/approval is provided via an acceptance/commissioning step. The threshold review form provides summary level documentation into this process.

3.2.1 Biohazardous Materials and Animal Research

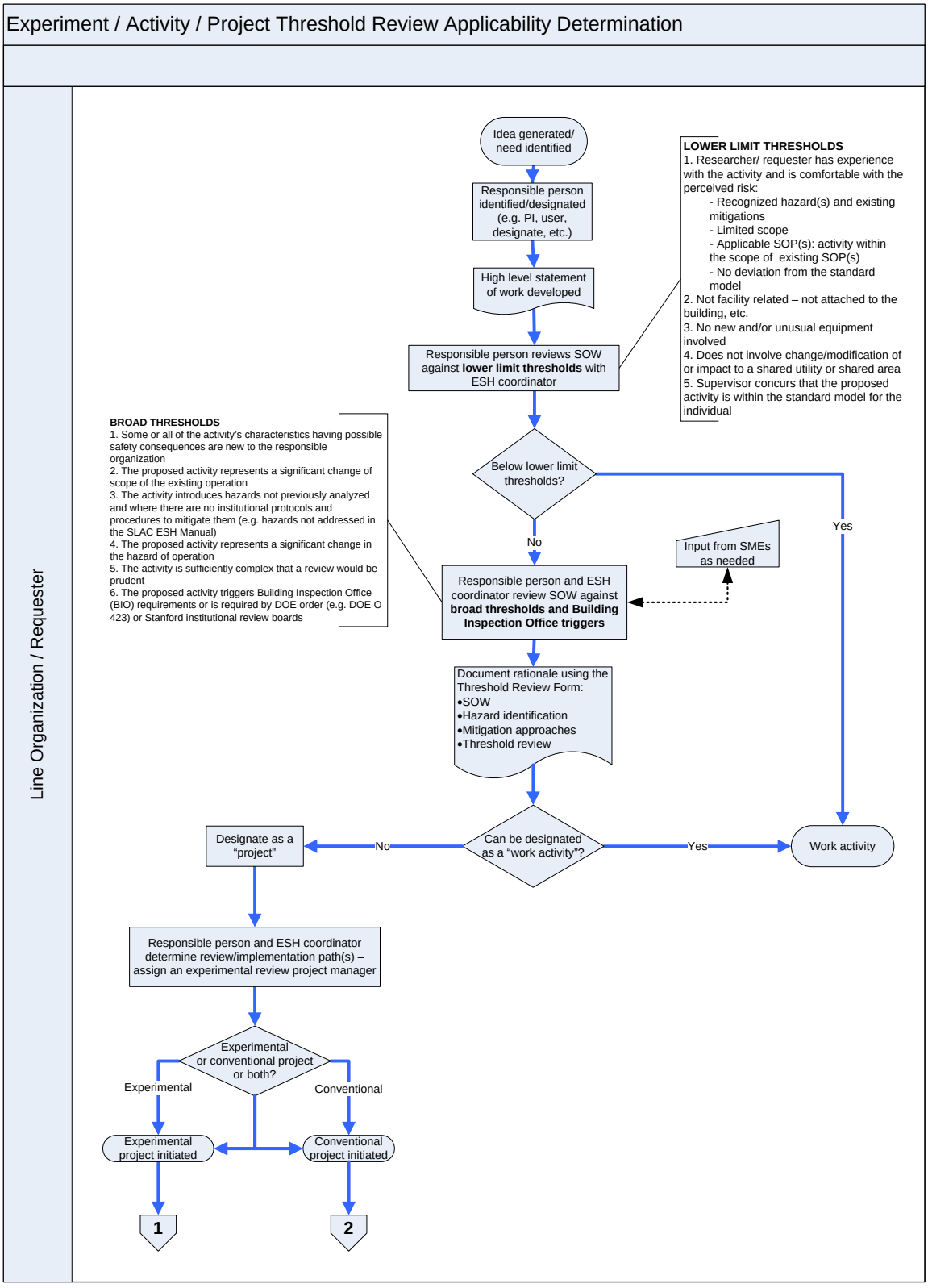
All work at SLAC involving potentially biohazardous materials or animal research must be conducted under the policies and procedures set forth by Stanford University. Work covered under the biosafety requirements must go through the university's Administrative Panel on Biosafety (APB). (See Stanford University Biosafety Program.)

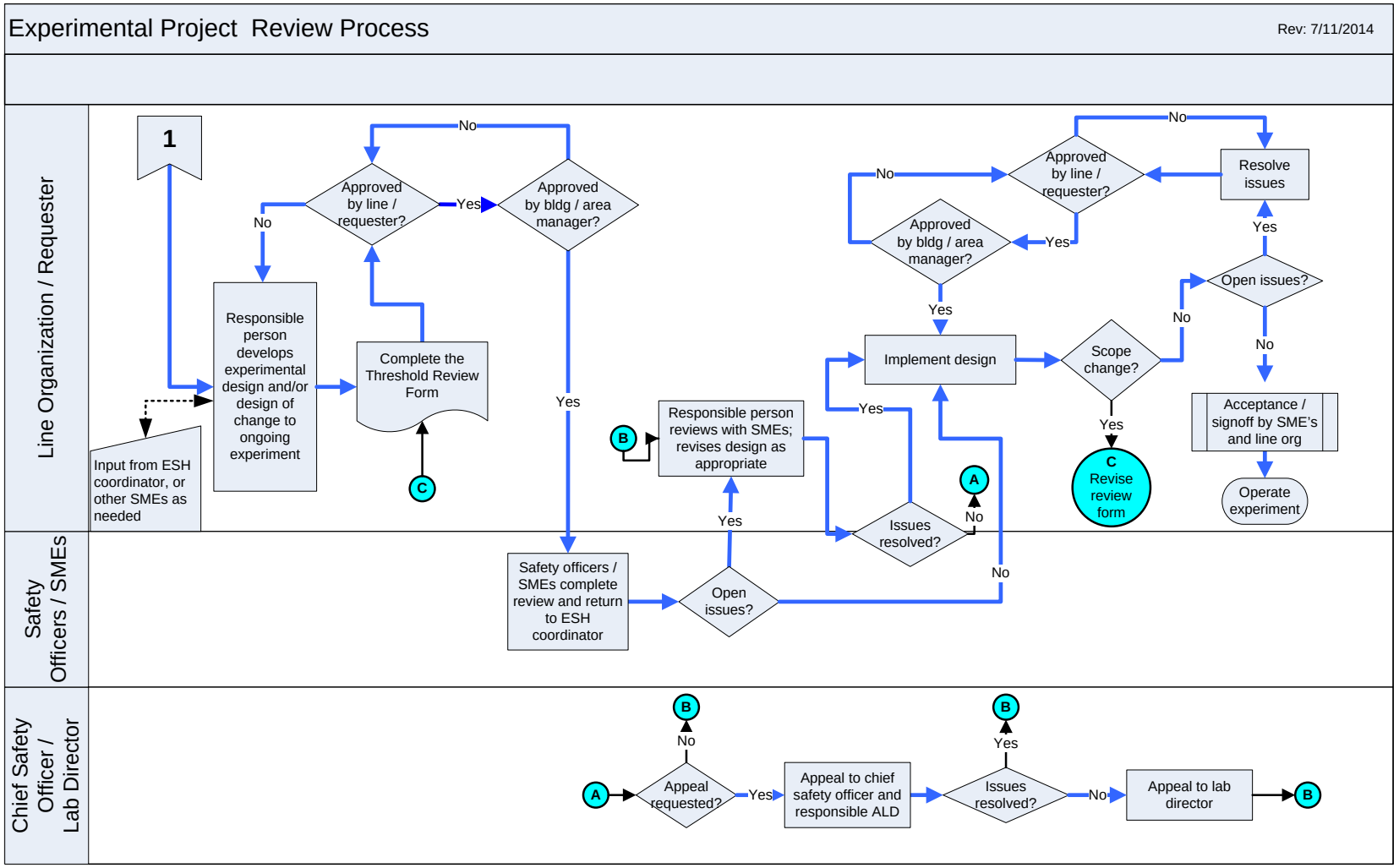
Any work involving laboratory animals must go through the university's Administrative Panel on Laboratory Animal Care (APLAC). Approval must also be obtained from the DOE SLAC Site Office (SSO).

Principal investigators planning on such work must first meet with their directorate ESH coordinator and the SLAC biosafety program manager to review these requirements and develop the necessary submittals for review by the appropriate university panel.

3.3 Conventional Project Review Process

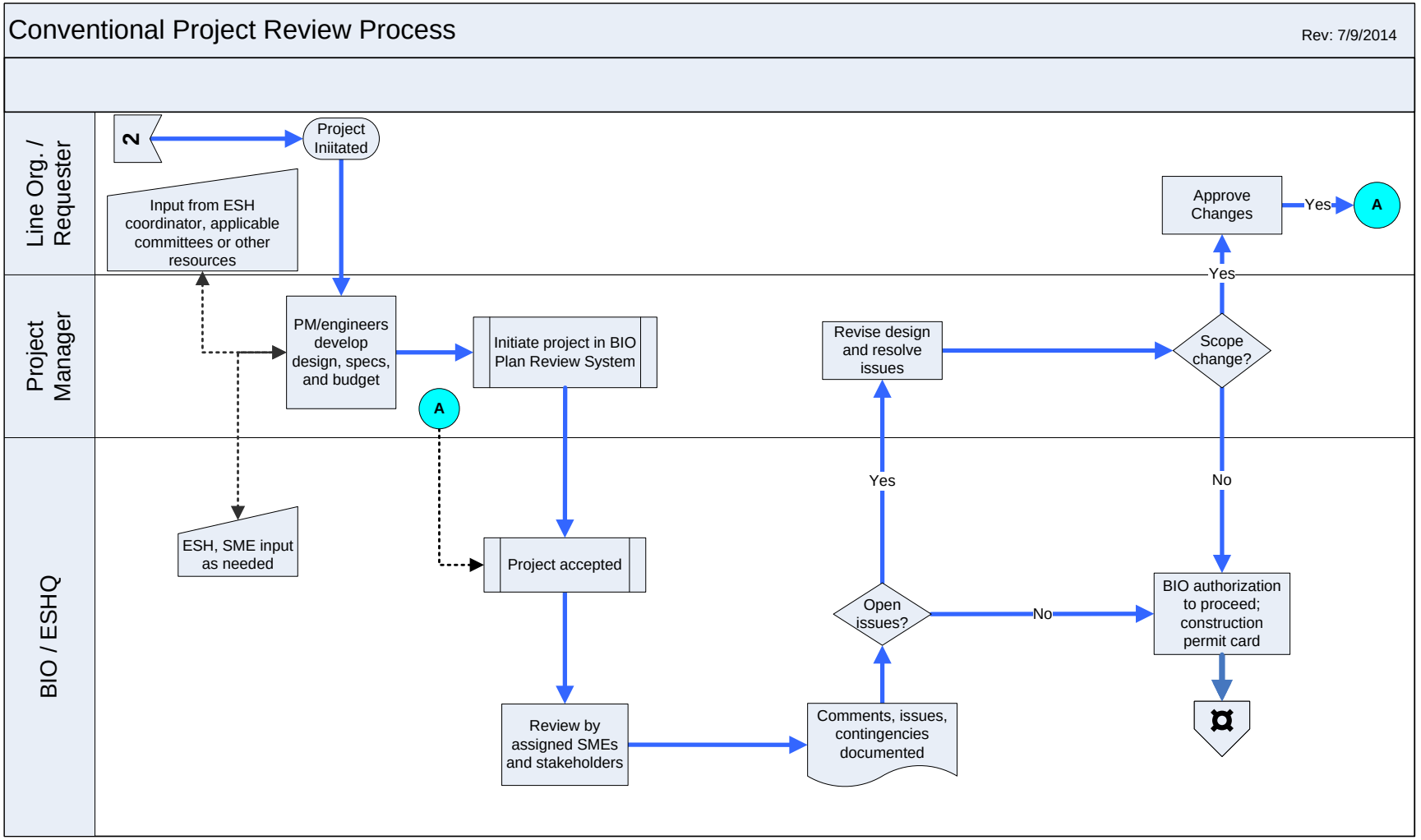
All equipment and operational aspects of proposed conventional projects that trigger external mandates (for example, Building Inspection Office requirements) and/or impact a shared area or resource are reviewed through this process. The key organizational stakeholders include the project manager, requester's line organization, Building Inspection Office (BIO), Environment, Safety, and Health (ESH), Purchasing, and Facilities/subcontractors. The BIO Plan Review System is the on-line tool used to manage this business process.

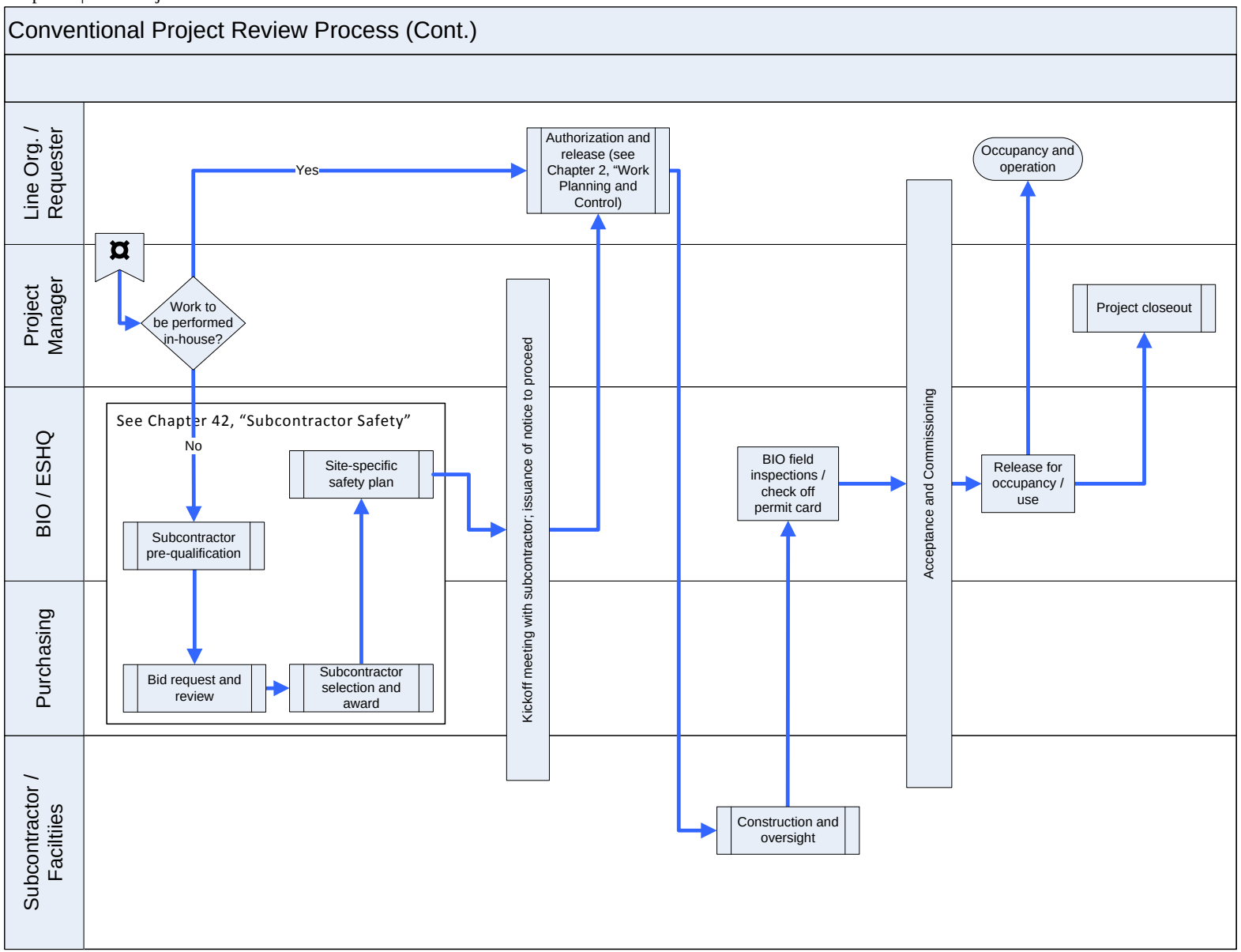

Experiment / Activity / Project Threshold Review Applicability Determination
Line Organization / Requester
Idea generated/ need identified
Responsible person identified/designated (e.g. PI, user, designate, etc.)
High level statement of work developed
Responsible person reviews SOW against lower limit thresholds with ESH coordinator
LOWER LIMIT THRESHOLDS
1. Researcher/ requester has experience with the activity and is comfortable with the perceived risk:
- Recognized hazard(s) and existing mitigations
- Limited scope
- Applicable SOP(s): activity within the scope of existing SOP(s)
- No deviation from the standard model
2. Not facility related – not attached to the building, etc.
3. No new and/or unusual equipment involved
4. Does not involve change/modification of or impact to a shared utility or shared area
5. Supervisor concurs that the proposed activity is within the standard model for the individual
Below lower limit thresholds?
Yes
No
Input from SMEs as needed
BROAD THRESHOLDS
1. Some or all of the activity's characteristics having possible safety consequences are new to the responsible organization
2. The proposed activity represents a significant change of scope of the existing operation
3. The activity introduces hazards not previously analyzed and where there are no institutional protocols and procedures to mitigate them (e.g. hazards not addressed in the SLAC ESH Manual)
4. The proposed activity represents a significant change in the hazard of operation
5. The activity is sufficiently complex that a review would be prudent
6. The proposed activity triggers Building Inspection Office (BIO) requirements or is required by DOE order (e.g. DOE O 423) or Stanford institutional review boards
Responsible person and ESH coordinator review SOW against broad thresholds and Building Inspection Office triggers
Document rationale using the Threshold Review Form:
•SOW
•Hazard identification
•Mitigation approaches
•Threshold review
Can be designated as a "work activity"?
No
Yes
Designate as a "project"
Work activity
Responsible person and ESH coordinator determine review/implementation path(s) – assign an experimental review project manager
Experimental or conventional project or both?
Experimental
Conventional
Experimental project initiated
Conventional project initiated
1
2



* For work activities above the lower threshold, the following project requirements must be addressed:

- Designation of a project manager by line management
- Project manager, together with directorate ESH coordinator and other SMEs as needed, to determine what project reviews are needed. The directorate ESH coordinator will make sure that the line understands all of the risks associated with the project and determine which ESH program managers need to review the project.
- Project reviews may include requirements/specification review, engineering review, and committee reviews.
- Requirements/specification must be documented. Existing SLAC documentation methods are acceptable for gathering this information.
- Project completion document. This may be satisfied by an acceptance/certification test or by an approval-to-operate form.


Conventional Project Review Process
Rev: 7/9/2014
Line Org. / Requester
Project Manager
BIO / ESHQ
2
Project Iniitated
Input from ESH coordinator, applicable committees or other resources
PM/engineers develop design, specs, and budget
Initiate project in BIO Plan Review System
A
ESH, SME input as needed
Project accepted
Review by assigned SMEs and stakeholders
Comments, issues, contingencies documented
Open issues?
Yes
No
Revise design and resolve issues
Scope change?
Yes
No
Approve Changes
Yes
A
BIO authorization to proceed; construction permit card


Conventional Project Review Process (Cont.)
Line Org. / Requester
Project Manager
BIO / ESHQ
Purchasing
Subcontractor / Facilities
Yes
Authorization and release (see Chapter 2, "Work Planning and Control)
Occupancy and operation
Work to be performed in-house?
Project closeout
See Chapter 42, "Subcontractor Safety"
No
Site-specific safety plan
Subcontractor pre-qualification
Kickoff meeting with subcontractor; issuance of notice to proceed
BIO field inspections / check off permit card
Acceptance and Commissioning
Release for occupancy / use
Bid request and review
Subcontractor selection and award
Construction and oversight

4 Forms

The following forms are required by this procedure:

- General Policy and Responsibilities: ESH Threshold Review Form (SLAC-I-720-0A24J-001). Form for documenting whether work exceeds lower limit thresholds and requires ESH project review
- BIO Plan Review System. System for performing and documenting conventional project reviews

5 Recordkeeping

This procedure includes the following recordkeeping requirements:

- The responsible person must retain documentation and submittals.

6 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 1, "General Policy and Responsibilities"

Other SLAC Documents

- SLAC Conduct of Engineering Policy (SLAC-I-701-701-001-00)
- BIO Project Review and Authorization Manual (SLAC-I-730-2A24Z-001)

Other Documents

- Stanford University, Department of Environmental Health and Safety. Research and Laboratory Safety: Biosafety
- Stanford University, Research Compliance Office, Administrative Panel on Laboratory Animal Care (APLAC)

Chapter 1: General Policy and Responsibilities

ESH Threshold Review Form

Product ID: 477 | Revision ID: 1800 | Date Published: 29 February 2016 | Date Effective: 29 February 2016
URL: http://www-group.slac.stanford.edu/esh/eshmanual/references/eshFormThresholdReview.pdf | .docx

This form is used to document whether a proposed activity can be categorized as a "work activity" or a "project activity" that needs to be reviewed through one or both of the experimental and conventional project review processes. The form is to be completed by the responsible person for the activity, with assistance from his or her ESH coordinator; approved by the building/area manager and requester's department head; and maintained by the responsible person. (See General Policy and Responsibilities: ESH Project Review Procedure [SLAC-I-720-0A24C-001].)

Note this form is to be completed only if the activity exceeds one or more of the lower limit thresholds below.

1 Lower Limit Thresholds

1. Researcher/requester has experience with the activity and is comfortable with the perceived risk
   - Recognized hazard(s) and existing mitigations
   - Limited scope
   - Applicable standard operating procedures (SOPs): activity within the scope of existing SOPs
   - No deviation from the standard model
2. Not facility related: not attached to the building, et cetera
3. No new and/or unusual equipment involved
4. Does not involve change/modification of or impact to a shared utility or shared area
5. Supervisor concurs that the proposed activity is within the standard model for the individual

2 Project Information

Project / experiment name		Location / bldg	
Requester		Phone	
Responsible person		Phone	
Requester's department head		Phone	
ESH coordinator		Phone	

3 Statement of Work

The statement of work (SOW) must provide a general description of the project in sufficient detail to include all of the major elements and systems of the experiment/project. This SOW should also include any significant hazards associated with the experiment/project (examples are radiation, laser, pressure, cryogenic, and hazardous materials). Provide supporting documentation as applicable/available, including drawings and specifications, equipment layout, cut-sheets, etc. Please include projected starting and ending dates for the each phase of the project/experiment.

4 Threshold Review

If, based on review, the determination is yes on one or more of the broad thresholds below then the experiment/project must be referred to one or both of the external review processes (conventional and experimental).

Broad Thresholds	Determination	Comments / Clarification / Qualifiers
1. Some or all of the activity's characteristics having possible safety consequences are new to the responsible organization.	☐ Yes ☐ No	
2. The proposed activity represents a significant change of scope of the existing operation.	☐ Yes ☐ No	
3. The proposed activity introduces hazards not previously analyzed and for which there are no institutional protocols and procedures to mitigate them (e.g. hazards not addressed in the ESH Manual).	☐ Yes ☐ No	
4. The proposed activity represents a significant change in the hazard of operation.	☐ Yes ☐ No	
5. The proposed activity is sufficiently complex that a review would be prudent.	☐ Yes ☐ No	
6. The proposed activity triggers Building Inspection Office (BIO) requirements* or is required by DOE directive or Stanford institutional review boards. *BIO Review triggers are listed at the end of this form.	☐ Yes ☐ No	

5 Hazard Characterization and Mitigation Approach

Item	Experiment / Project Aspect	Hazard Description	Mitigation Approach
Example	Liquid nitrogen directly plumbed to instrument from adjacent supply line.	*Potential direct exposure to liquid nitrogen due to line failure or incorrect install → Contact of liquid nitrogen by skin or clothes may result in severe burns and permanent tissue damage* *Oxygen displacement due to leaking Nitrogen gas → asphyxiation*	*Adjacent instrument has liquid nitrogen plumbed to it with ventilation, SOP, training, PPE, etc.* *New install will implement all specifications from adjacent instrument including area ventilation and oxygen monitoring.* *Personnel will adopt SOP and PPE protocols and be trained to the same.*
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			

6 Applicability Determination

	Determination	Comments / Clarification / Qualifiers
Experiment/project can be designated a work activity? (Note: if no then please indicate below which (or both) review process applies)	☐ Yes ☐ No	
Conventional construction project review process applicable?	☐ Yes ☐ No	
Experimental review process applicable?	☐ Yes ☐ No	

Preparers

Responsible person		Signature		Date	
ESH coordinator		Signature		Date	

Approvers

Building or area manager		Signature		Date	
Requester's department head		Signature		Date	

7 Building Inspection Office Review Triggers

The triggers below are intended for quick reference. Modifications to science or experimental equipment, devices, or systems do not require Building Inspection Office (BIO) review and authorization, except that attachment/support and interface of the equipment and devices to building structures and building systems. For additional guidance, see the *BIO Project Review and Authorization Manual* (SLAC-I-730-2A24Z-001) and/or contact BIO (ext. 4113).

General Aspects of a Project That Trigger BIO Review

1. Construction, enlargement, alteration, moving, or demolishing a building or structure
2. Any element under review that has a known code violation (as an existing condition)
3. A change of character, use or occupancy of a space, building, parking lot, road, or structure
4. Tents, temporary structures, and membrane structures, including construction trailers and fences
5. Excavations, grading, and fill, or other earth moving activities
6. Partitions greater than 5'9"
7. Installations or modifications of science and experimental equipment as follows: BIO review and authorization required for the attachment/support/interface of the equipment and devices to building structures and building systems
8. Installation or alteration of a chemical or biological laboratory
9. Installation, alteration, repair, or replacement of pressure vessel, cryogenic, vacuum, or compressed gas systems
10. Initial installation or modification of piping or tubing used to deliver highly toxic or reactive (for example, unstable, pyrophoric, water reactive) fluids (gaseous or liquid) from a source container to the process/research equipment

    Depending on the specific hazards, ESH may request that a formal process hazard analysis be conducted on the design of the system, before acquisition and installation of the hardware. During the initial installation, a procedure must be developed with BIO input for further modification and testing (for example, pressure testing, leak checking). Subsequent modifications falling within the scope of this procedure may be carried out and documented by the line organization without further review by ESH.
11. Installation, alteration, repair, relocation, or replacement of a hazardous materials storage, delivery, or use system
12. Work in or adjacent to a vehicular way

Structural Aspects of a Project That Trigger BIO Review

13. Installation, alteration, repair, or replacement of a structural element; any change that would affect loading or seismic resistance of a structure
14. Equipment/objects weighing 400 lbs or more will require engineered seismic restraints and consequent BIO review
15. Equipment/objects less than 400 lbs attached to the walls, ceilings, or floors may require seismic restraints and therefore BIO review. Please contact BIO for determination.

Electrical Aspects of a Project That Trigger BIO Review

16. Installation, alteration, relocation, or replacement of conventional facilities electrical distribution or utilization equipment (except cord-and-plug connected equipment)
17. Any change that would affect the electrical loading of the conventional facilities power distribution system

Applicability: applies to conventional facilities electrical distribution systems (premises wiring), both permanent and temporary, or standalone electrical distribution systems powered by a generator, UPS, photovoltaics, or similar (includes construction temporary power)

Exception: installation or relocation of 120/208 VAC receptacle outlets and replacement of like-for-like utilization devices such as light fixtures and receptacles does not require BIO review.

Mechanical (Piping, Plumbing, HVAC) Aspects of a Project That Trigger BIO Review

18. Installation, alteration, repair, relocation, or replacement of a mechanical element; any change that would affect loads on a system
19. Any facilities equipment change affecting quantities of air flow or a reduction in outside air

20. Repair or alteration of facilities piping, (e.g. steam, air, water, sewer, storm, process piping, process effluent, etc.) exceeding a materials value of $500

Exception: equipment maintenance or replacement of like-for-like does not require BIO review.

Fire Aspects of a Project That Trigger BIO Review

21. Installation, alteration, repair, relocation, or replacement of
    - Fire-resisting building elements (fire barrier walls)
    - Egress system components (aisle ways, corridors, exit doors, exit signs, emergency lighting, etc.)
    - Fire suppression, alarm, detection or reporting systems
22. Increases in fire loading beyond that typical for the existing building, structure, or area in question
23. Changes to fire department access (examples include narrowing of roads; alteration of trestles; installation of bollards; placement of anything that may block fixed fire response equipment such as fire hydrants, sprinkler risers or fire department connections)

Exception: equipment maintenance or replacement of like-for-like does not require BIO review

Environmental Aspects of a Project That Trigger BIO Review

24. Generation of significant and large quantities of hazardous waste that will have an immediate effect on fees/taxes imposed by the state and county and/or impact Waste Management labor and resources (such as waste drums and bins), or requires special disposal/treatment
25. Installation of equipment/containers that hold 55 gallons or more of oil
26. Removal of asbestos-containing material, and/or working where asbestos-containing material is, or may become, friable
27. Use of hazardous materials on a project during construction or operation
28. Proposed operations/experiments that may result in airborne emissions and/or liquid effluents
29. Operation of portable equipment powered by fossil fuel (for example, a standby generator)

Americans with Disabilities Act Aspects That Trigger BIO Review

30. Additions to or alteration of any accessible element, including paths of travel, ramps, walkways, doors, restroom facilities, exit paths, parking lots, sidewalks, stairs, required signage, elevators, break rooms, kitchenettes, or new elements

Chapter 1: General Policy and Responsibilities

Hazard Control Selection and Management Requirements

Product ID: 671 | Revision ID: 1744 | Date published: 27 May 2015 | Date effective: 27 May 2015
URL: http://www-group.slac.stanford.edu/esh/eshmanual/references/eshReqControls.pdf

1 Purpose

This document defines how a risk-based approach is used to determine the need for controls on facilities, systems, or components to protect the public, workers, and the environment. For controls necessary to prevent or mitigate serious events, specific devices and procedures will be formally credited as part of the approved safety envelope. How these controls are selected, evaluated, and approved, and the process for maintaining and modifying controls, are described in these requirements[1].

As used here, *controls* and *hazard controls* mean those engineered, administrative, or personal protective elements that are used to protect against a hazard. Normal process or operational controls are not included in these requirements except to the extent that their use is directly tied to safety.

The concept of *credited control* is well established in the accelerator safety community. The concept of credited control is borrowed from DOE Order 420.2C, "Safety of Accelerator Facilities" (DOE O 420.2C), but this document neither extends the requirements of DOE O 420.2C to non-accelerator hazards nor modifies those requirements for accelerator hazards. The intent is to extend those robust principles to management of controls for non-accelerator hazards of similar risk.

2 Roles and Responsibilities

2.1 Associate Laboratory Director

- Ensures that technical systems under his or her directorate's management are properly analyzed to determine the type and level of controls necessary to control risk to an acceptable level
- Maintains an inventory of credited control systems managed by his or her directorate, and owners responsible for these systems

2.2 ESH Program Manager

- Ensures that hazard controls prescribed by specific environment, safety, and health (ESH) programs are consistently applied and risk-based in accordance with these requirements

1 Specific technical programs have controls and control thresholds specified. This document does not supersede these specific requirements but outlines the framework for performing risk assessments, developing controls hierarchies, and managing controls.

- Reviews hazard analyses and advises line managers and responsible system owners on selection of controls to meet these requirements
- Commensurate with technical program requirements, performs hazard analyses and specifies safety credited and non-credited controls
- Performs periodic assessments of installed credited control systems to ensure control system integrity
- Approves changes to credited control systems as maintaining equivalent safety as the initial configuration

2.3 Technical System Owner

- Ensures that hazards inherent in the operation of his or her technical system have been properly analyzed, and that risk-based controls have been specified in accordance with these requirements to mitigate those hazards
- Ensures the integrity of hazard control systems supporting his or her technical system
- Approves credited control systems and their management plans and interface control documents for her technical systems
- Designates, as appropriate, hazard control system owners to assist in discharging this responsibility

2.4 Hazard Control System Owner

- Manages the hazard control systems under his or her authority in accordance with these requirements
- Develops and ensures conformance with, as appropriate, the credited controls management plan for each credited control system for which he is responsible
- Develops interface control documents for the hazard control systems under his or her authority and concurs with those for systems on all sides of that interface
- Ensures that comments received during credited control systems reviews are addressed and resolved before putting the credited control system into service
- Maintains records of design, approval, acceptance, testing and verification for credited control systems

3 Requirements

3.1 Risk-based Selection of Hazard Controls

Controls must be specified using a risk-based approach in which ongoing operations and credible upsets are listed, the probability and consequences are predicted, and a resulting risk is found. Controls are used to mitigate risks. Risks may be personal (for example, injury or illness), environmental (for example, spill, contamination, release to the environment), regulatory (for example, exceedance of a published standard), programmatic (for example, interruption of a user program), financial, reputational, or a number of other potential negative consequences.

This document does not mandate a specific hazard analysis process, but rather specifies hazard analysis as the basis of selection of controls. Appendix A gives an example risk matrix; the specifics may vary

according to the specific situation, but the important point is that the process must be defined, systematic, and documented[2].

When a review process identifies unacceptable risks, the hazards causing those risks must be eliminated or substituted to the extent feasible. If elimination and substitution are not sufficient to reduce the risk to an acceptable level, additional controls must be applied. The diagram below illustrates this hierarchy.

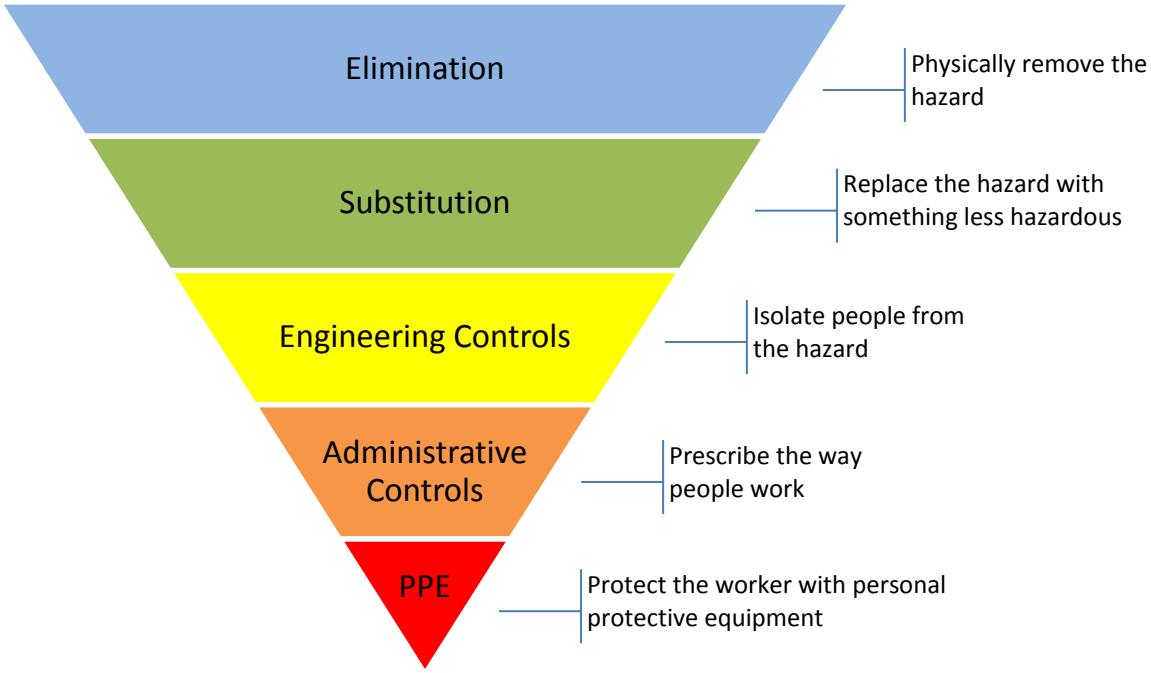


Figure 1 Hazard Control Hierarchy

The selection of engineering, administrative, and personal protective controls depends upon the risk to workers, the public or the environment from the unmitigated hazard (that is, from failure of the controls). Controls must be assigned to reduce risk to an acceptable level at a minimum, with the desired point to drive the risk to a level that is *as low as reasonably practicable (ALARP)*[3]. In general, unacceptable risks (for example, high and medium as outlined in Appendix A) require the use of credited controls to reduce risks to an acceptable level, while acceptable risks (for example, low and extremely low) use non-credited controls per the ALARP principle.

2 Controls for some hazards are specified in the applicable institutional program requirements for managing that hazard. Use of the risk-based approach outlined may not result in selection of controls that are less rigorous than those prescribed by other requirements in the ESH Manual.

3 *As low as reasonably practicable (ALARP)* is a general concept that is analogous to the term *as low as reasonably achievable (ALARA)* (widely used in radiation protection). It is a concept of driving safety beyond minimal protection. Although ALARA is not strictly used in reference to upset conditions, ALARP is applied to credible upset conditions and should serve as the management goal.

Categorization of risk (for example, as high, medium, low, or extremely low) is made through a hazard analysis process (for example, Appendix A).

- High risks generally require at a minimum multiple, independent, credited control systems ("defense in depth") to protect workers or the public from the risk.
- Medium risks should be mitigated using at least one credited (engineering and/or administrative) control system, supplemented by non-credited controls, basic safety management programs and inherent robust design.
- Low risks may be further reduced using a combination of engineering, administrative, and personal protective non-credited controls.
- If the unmitigated risk is extremely low then no additional controls are required, but may be applied as best practice.

Selected credited and non-credited controls must be approved by the line manager and, commensurate with technical program requirements and Chapter 1, "General Policy and Responsibilities", Section 2, the appropriate ESH safety officer.

Refer to other chapters in this ESH Manual and the SLAC Conduct of Engineering Policy or consult directorate safety coordinators or subject matter experts for additional guidance.

3.1.1 Selection of Non-credited Controls

Non-credited engineered, administrative, and personal protective equipment controls must be selected based upon the specific hazards being protected against.

1. Engineered controls are preferred and must be implemented unless infeasible.
2. Administrative controls are the next most preferable level of control.
3. Personal protective equipment controls may only be used to supplement engineering and administrative controls, or used temporarily during the period when engineering and/or administrative controls are being implemented.

3.1.2 Selection of Credited Controls

Once the need for a level of credited control is determined, it necessitates following a disciplined process to select the set of equipment items (*credited engineered controls*), administrative controls (*credited administrative controls*) and/or personal protective equipment (*credited PPE controls*) needed to accomplish the required safety function. The selection of credited controls often involves choices between multiple items that could function to control a particular hazard.

When selecting credited engineered controls it is necessary to identify any dependencies for each system being considered. For example, if a given system is a credited engineered control but it depends on another system to enable it to function as required, then at least some aspect of that other system becomes a part of the credited engineered control. Structures, systems, and components that directly support the function of credited engineered controls (or credited administrative controls) need to be identified and their safety functions defined in the hazard analysis.

The selection criteria listed below must be followed to the greatest extent practical when designating credited controls. There will be situations where some of the criteria may not be appropriate for a given situation. Engineering judgment must be applied in these cases to determine the best items for selection.

1. Engineered controls are preferred and must be implemented unless infeasible.
2. Administrative controls are the next most preferable level of control.
3. Personal protective equipment controls may only be used to supplement engineering and administrative controls, or used temporarily during the period when engineering and/or administrative controls are being implemented.
4. When either an active or passive device can be credited to ensure the safety function, the passive device should be selected. *This selection is based on the inherently higher reliability of passive devices.*
5. When a choice exists between controls that would prevent an event and controls that could mitigate the consequences of the event, the preventive controls should be selected. *This selection is based on the inherent value of preventing accidents as opposed to mitigating their effects.*
6. Only those items essential to mitigate risk to an acceptable level should be selected as credited controls. The number of credited controls should, in general, be minimized and include only a limited subset of the total number of controls employed for overall facility operation. *This guidance allows a high degree of operational attention (for example, monitoring, surveillance, maintenance, control of documentation) to be devoted to the credited controls.* To support this selection criterion, credited controls that protect against multiple events or receptors are preferred.
7. Where two levels of control are selected, the controls should be independent such that the failure of one level of control does not cause failure of the other. *This "defense in depth" criterion ensures that multiple levels of control are not compromised by a single point failure.*

3.2 Management of Controls

Credited and non-credited engineering, administrative, and personal protective equipment controls must be managed per best practice (for example, manufacturer recommendations) and requirements given elsewhere in this manual. The technical system owner is responsible for the integrity of hazard controls necessary to safely operate the system.

3.2.1 Management of Non-credited Controls

At a minimum, non-credited controls should be managed to include the following elements:

1. **Competence.** Individuals who analyze, specify, design, operate, and maintain non-credited controls must be competent in the tasks they perform.
2. **Configuration management.** Changes to non-credited controls may only be made after assurance that the level of safety required is maintained by the change.

   Whenever a non-credited control system interacts (for example, signals, dependencies) with a credited control system, or interacts with any system such that the interaction crosses system boundaries or technical system ownership, that interaction must be documented[4]. The documentation must specify

4 This document is the *interface control document* when the interface is with a credited control system, see Section 3.2.2.

the information that each system is receiving from the other, what the expected actions of each system in relation to that information are, and who is responsible for maintaining each side of that interface. The documentation is approved by the owner of the technical system having the hazards being controlled and contains concurring signatures of the hazard control system owners of the systems on all sides of that interface. That interface becomes a configuration controlled element.

3. **Verification.** Non-credited controls must be periodically evaluated to ensure that they continue to be effective. This evaluation may be through inspection, measurement, or other means.

4. **Recordkeeping.** When required, records of design, approval, acceptance, testing, and verification of non-credited controls must be maintained in a retrievable fashion. Who maintains these records is generally specified in the institutional program managing the specific hazard for which the non-credited control is used.

3.2.2 Management of Credited Controls

The technical system owner must ensure that the credited control system, whether engineering, administrative, personal protective equipment, or a combination, is managed to include the following elements[5]. To accomplish this, a credited control system management plan specifying procedures for fulfilling these elements should be established.

1. **Competence.** Individuals who analyze, specify, design, operate, and maintain credited control systems must be competent in the tasks they perform.

2. **Specificity.** The elements that collectively make up the credited control system must be specified.

3. **Monitoring.** When credited controls provide feedback (for example, alarm status) indicating that the specified protection is being provided, the status of that feedback must be monitored to detect out-of-tolerance conditions and to direct appropriate responses.

4. **Fail-safe.** Credited controls must be configured, when practical, so that in the event of component failure due to internal or external events (including loss of power), the action is to maintain the protective nature of the control. Some credited controls may not be configured to be fail-safe. In these cases there must be sufficient redundancy of protection (“defense in depth”) that a single failure will not lead to unacceptable risk.

5. **Responsibility.** Each credited control system must have a specified responsible owner who has the authority and responsibility for assuring that the system is managed per these requirements.

6. **Configuration management.** Before being placed into service, each new credited control system must be reviewed independently from the line organization responsible for it. All review comments must be addressed and resolved[6]. Once all comments have been resolved, the credited control system must be formally accepted by the hazard control system owner, and this acceptance concurred with by line management. For some credited control systems, approval by the appropriate ESH safety officer is also required (see Chapter 1, “General Policy and Responsibilities”, Section 2).

---

5 These requirements are specified here at the highest level. The intent of these requirements is to ensure that controls are managed equivalently, not identically. The credited controls specified for different hazards may have different specific ways of addressing these fundamental requirements. Thresholds applicable to different hazards are specified in the institutional program for managing those hazards, and the credited control system management plan is reviewed and approved according to the processes outlined in that institutional program.

6 The control system responsible owner ensures that the comments have been resolved satisfactorily.

Changes to a credited control system may only be made after a thorough review process to ensure that the level of safety required is maintained by the change. Changes may only be made after approval by the responsible owner or designee. There may be separate configuration management processes for permanent changes and for temporary changes. Compensatory actions that ensure maintenance of safety must be specified and concurred with by line management and appropriate ESH program manager.

Whenever a credited control system interacts (for example, signals, dependencies) with another credited or non-credited control system, an *interface control document (ICD)* must be prepared detailing that interaction. The ICD specifies the information that each system is receiving from the other, what the expected actions of each system in relation to that information are, and who is responsible for maintaining all sides of that interface. The ICD is approved by the owner of the technical system having the hazards being controlled and contains concurring signatures of the hazard control system owners of the systems on all sides of that interface. That interface becomes a configuration controlled element.

7. **Testing and Verification.** Credited control systems must be initially, and periodically thereafter, tested and verified to be operating properly. Testing intervals are specified in the credited controls system management plan. Procedures for the initial and periodic test and verification procedures must be specified and managed through a formal change control process.
8. **Recordkeeping.** Records of design, approval, acceptance, testing and verification must be maintained in a retrievable fashion. The hazard control system owner ensures that these records are maintained.

4 Training

Minimum training requirements are as dictated by the hazard that the control system addresses. Additional training may be specified by the credited control system management plan.

5 Definitions

Analysis, hazard. A rigorous process of analyzing the probability and consequences from a condition or event, and determining the potential impact. There are a number of formalized and well documented hazard analysis processes. This standard does not mandate a specific hazard analysis process, but rather specifies hazard analysis as the basis of selection of controls.

Competent. Possessing qualifications (for example, education, training, certification/licensing) and demonstrated ability to successfully perform the assigned task

Envelope, safety. The set of engineered and administrative bounding conditions within which a system or process may be safely operated with acceptable risk. The safety envelope is comprised of control systems (non-credited and credited) and operating parameters. The safety envelope is generally established through a hazard analysis process. For accelerators, the term *accelerator safety envelope* has a specific meaning and specific requirements imposed by DOE O 420.2C. The accelerator safety envelope is a special case of safety envelope.

Risk. The combination of the probability of an event and the consequence from that event that determines the potential impact of the event. Risk is determined from analysis of the probability and consequence using some rigorous and defined hazard analysis process.

- *High risk.* The combination of event probability and unmitigated consequences warrants special design and operational consideration.
- *Medium risk.* A level of control is expected or addressed with the inherent robustness of the design. The unmitigated impact is credibly above acceptable limits for normal operation.
- *Low risk.* Regulatory limits are met, but risks could be reasonably reduced further.
- *Extremely low risk.* Probability and/or consequence are such that the impact is acceptable without further controls.

System, control. A collection of controls that together provide the specified protection from a given hazard. Control systems may be non-credited or credited.

- *Credited control.* An *engineered*, *administrative*, or *personal protective equipment control* that has been formally designated through hazard analysis to be essential for providing protection of the public, workers, or the environment from unacceptable risk. Failure of a credited control may result in death, major (unrecoverable) injury, illness, or impact to the environment, or may have off-site consequences. Generally speaking, credited controls are the primary protection between the hazard and the unacceptable risk.
- *Non-credited control.* An *engineered*, *administrative*, or *personal protective equipment control* that has been designated for providing protection of the public, workers, or the environment from acceptable risk. Failure of a non-credited control may result in minor (recoverable) injury, illness, or impact to the environment, and is unlikely to have off-site consequences.
- *Engineered control.* Hardware or structural items (for example, structures, systems, and/or components) that are required to ensure a required safety function is accomplished. They are characterized by not requiring cooperation from the workers to be effective. Common engineering controls include protective ventilation systems, shielding, interlocks, gas detection systems, and secondary containment.
- *Administrative control.* A procedure or other requirement that specifies certain human action(s) take place that ensure the safe operation of the facility for workers and the public. They include training, procedures, maintenance activities, work scheduling, and work rules. Workers must properly execute administrative controls for them to be effective.
- *Personal protective equipment control.* Personal protective equipment such as gloves, hearing protectors, protective clothing, and respirators. These do not remove the hazard, but rather separate the worker from it. Effectiveness of personal protective equipment relies wholly on the workers' proper use of it.

6 Forms

The following forms are required by this procedure:

- None

7 Recordkeeping

This procedure includes the following recordkeeping requirements:

- Associate laboratory directors maintain an inventory of credited control systems managed by their directorates, and owners responsible for these systems
- Technical system owners are responsible for credited control systems and their management plans and interface control documents
- Hazard control system owners maintain records of design, approval, acceptance, testing and verification for credited control systems; for non-credited controls who maintains these records is generally specified in the institutional program managing the specific hazard for which the non-credited control is used

8 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 1, "General Policy and Responsibilities"

Other SLAC Documents

- SLAC Conduct of Engineering Policy (SLAC-I-701-701-001-00)

Other Documents

- Department of Energy Order 420.2C, "Safety of Accelerator Facilities" (DOE O 420.2C)

Appendix A: Example Hazard Analysis

Table 1 Hazard Probability of Occurrence Levels

Category	Description
High	Event is likely to occur several times in a year
Medium	Event is likely to occur annually
Low	Event is likely to occur during the life of the facility or operation
Extremely low	Occurrence is unlikely or the event is not expected to occur during the life of the facility or operation
Incredible	Probability of occurrence is so small that a reasonable scenario is inconceivable. These events are not analyzed further.

Table 2 Hazard Consequence Rating Levels

Consequence Level	Maximum Consequence*
High	Serious impact on-site or off-site. May cause deaths or loss of the facility/operation. Major impact on the environment. Significant regulatory or contractual violation.
Medium	Major impact on-site or off-site. May cause severe injuries or severe occupational illness to personnel or major damage to a facility or moderate impact on the environment. Capable of returning to operation. May result in regulatory or contractual violation.
Low	Minor on-site with negligible off-site impact. May cause minor injury or minor occupational illness or minor impact on the environment. De minimus regulatory or contractual violation.
Extremely low	Will not result in a significant injury or occupation illness or provide a significant impact on the environment

**The consequences listed are examples. Depending upon the hazard analyzed there may be other consequences (for example, financial or reputational) that should also be considered.*

Table 3 Risk Matrix

Probability / Consequence	Extremely Low	Low	Medium	High
High				
Medium				
Low				
Extremely low				

Risk Level		
	High	Unacceptable
	Medium	Unacceptable
	Low	Acceptable
	Extremely low	Acceptable