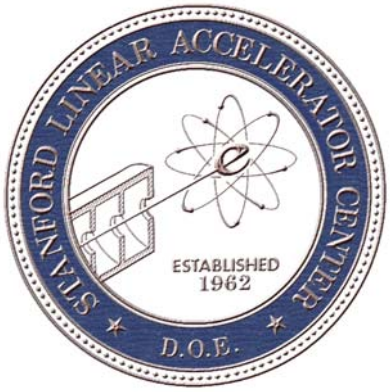


Linac Coherent Light Source Directorate
Integrated Safety Management (ISM) Plan

This Plan was reviewed and approved by:

_____ _____

Jonathan Dorfan, Laboratory Director Date

_____ _____

John Galayda, Director – Linac Coherent Light Source Date

Annual Review and Update

Linac Coherent Light Source Directorate
Integrated Safety Management (ISM) Plan

The Linac Coherent Light Source Directorate ISM Plan was reviewed with no substantive changes in either content and/or ES&H resource commitment.

_____ _____
John Galayda, Director - LCLS Date

_____ _____
Michael Scharfenstein Directorate ES&H Coordinator Date

The Directorate ISM Plan was reviewed and has the following substantive changes in either content and/or ES&H resource commitment:

•

_____ _____
John Galayda, Director - LCLS Date

_____ _____
Michael Scharfenstein Directorate ES&H Coordinator Date

1. Introduction:

This plan is implemented as part of SLAC's overall Integrated Safety Management (ISM) System. It supports two key SLAC Environment, Safety and Health (ES&H) Policy Documents:

- SLAC's institutional ISM System Plan
- SLAC's ES&H Manual, including Chapter 1 – Policy and General Responsibility and Chapter 2 – Work Authorization

We follow ISM principles and core functions because they have proven effective in protecting workers, the public, and the environment. Purposes of this plan are to describe how:

- We integrate ES&H considerations into the planning and work of the LCLS Directorate
- Our operations meet ES&H Policy requirements in the ES&H Manual and other relevant safety policy documents
- We reinforce responsibility and accountability for safety by line management and each individual
- The work of our Directorate is authorized per Chapter 2 of the ES&H Manual
- Activities are analyzed for potential hazards.
- Hazards are controlled through the use of tailored controls:
  - Engineering controls
  - Administrative controls
  - Personal Protective Equipment
  - Training and oversight
- Controls are implemented and work is done only within controls
- We implement effective self-assessment and continuous improvement programs (see Chapter 33 of the ES&H Manual)
- Staff competency is assessed and documented
- The Directorate, Division and Department ES&H Coordinators support the Directorate program and interrelate.
- Requests for programmatic funding include adequate resources to assure safety is integrated with Project objectives and for ES&H support program implementation

2. Institutional Policies and Organization

2.1 SLAC Mission and ES&H Policy

2.1.1 SLAC Mission[1]

Photon Science Discoveries

– To make discoveries in photon science at the frontiers of the ultrasmall and ultrafast in a wide spectrum of physical and life sciences

Particle and Particle Astrophysics Discoveries

– To make discoveries in particle and astroparticle physics to redefine humanity's understanding of what the universe is made of and the forces that control it

Operate Safely; Train the Best

– To operate a safe laboratory that employs and trains the best and brightest, helping to ensure the future economic strength and security of the nation

2.1.2 Linac Coherent Light Source Directorate Mission

The Mission of the Directorate for LCLS Construction at the Stanford Linear Accelerator Center is to serve as a research and development center for XFEL physics in the hard x-ray regime and as a scientific user facility for the application of XFEL radiation to experimental science.

The LCLS, which is an organizational element of the Stanford Linear Accelerator Center (SLAC), has been created to lead a multi-institutional collaboration executing the Linac to:

- achieve the technical, cost and schedule requirements for the Project;
- lead the orderly integration of the LCLS Facility into SLAC operations;
- achieve these goals while meeting the highest standards for environment, safety and health of LCLS Project participants, LCLS users, SLAC personnel and the community surrounding the LCLS.

1 SLAC Mission: http://home.slac.stanford.edu/welcome/mission.html

It is the intention of the LCLS management to achieve the aforementioned goals through the application of Integrated Safety Management System (ISMS) principles. LCLS management is also committed to assure that, as a multi-Laboratory collaboration that, this philosophy is extended to all partner Laboratory groups participating in the LCLS construction.

2.2 SLAC ES&H Policy[2]

SLAC has committed itself to achieving its mission in the context of a respectful workplace that supports the value of each individual and that persistently strives for excellence in health, safety and environmental matters.

SLAC is committed to protecting the health and safety of those working at SLAC, the public and the environment as it carries out its scientific mission.

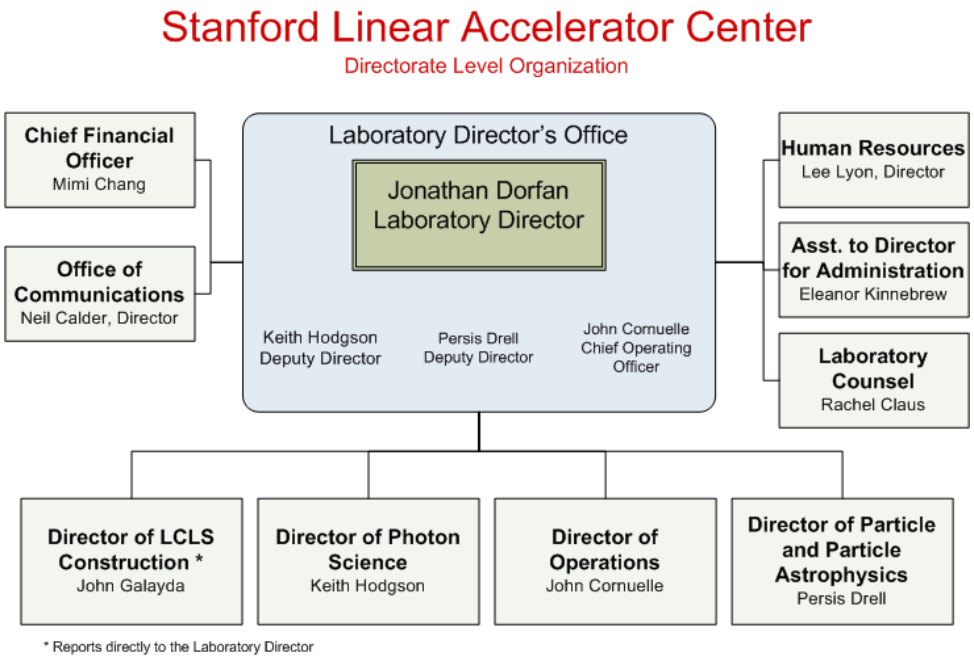
Through employee involvement and management commitment, SLAC will:

- Seek to protect human health, prevent pollution, and strive to eliminate negative ES&H impacts associated with our facilities and activities throughout their life cycles
- Exercise vigilance to ensure compliance with all applicable, laws, regulations, and best management practices
- Seek to maintain a healthful and safe workplace, free of occupational injury and illness
- Conduct sustainable programs to minimize pollution to environmental media, to protect our material resources, cultural resources, and biota
- Conserve natural resources and minimize our environmental footprint by evaluating the impact of products, services and their providers, by reducing energy and water usage, by reusing and recycling materials, by purchasing and using recyclable materials and energy-efficient devices, and by exercising pollution prevention measures, whenever technically feasible and economically justifiable
- Conduct operations such that workers' exposure to radiation and the production of radioactive materials is as low as reasonably achievable
- Integrate ES&H into project planning, design, construction, use and decommissioning of facilities to minimize ES&H impacts associated with the project

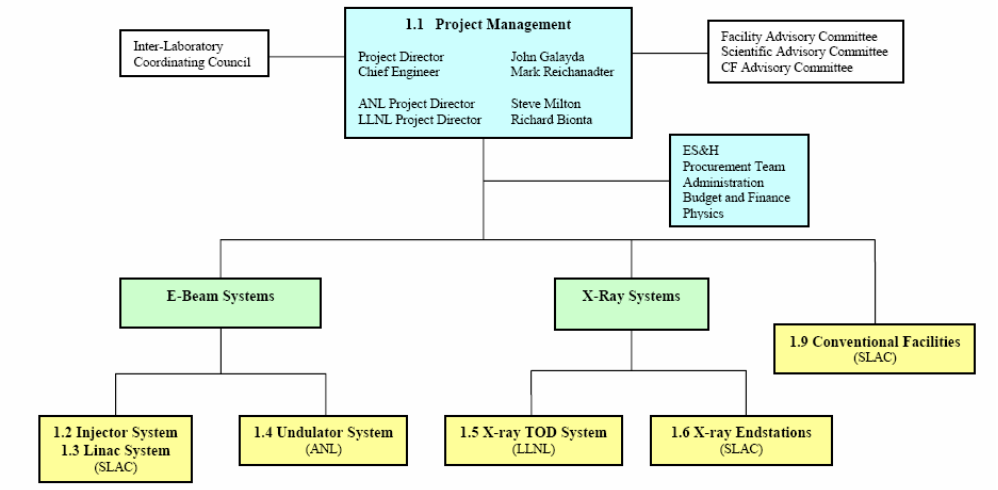
2 SLAC ES&H Policy: http://www-group.slac.stanford.edu/esh/isms/eshpolicy.html

- Conduct our activities in a sustainable manner and partner with businesses that offer sustainable practices, strengthening this commitment through contract language, where practical

SLAC Organization[3]



Linac Coherent Light Source Organization



[3]SLAC Organization http://www-group.slac.stanford.edu/do/org/default.htm

2.3 LCLS Management Roles, Responsibilities and Authorities

Project management responsibilities for safety are defined in the SLAC ES&H Manual and LCLS project guidance documents. The LCLS organization is defined in the LCLS Organization Chart, which will be updated at least quarterly.

2.3.1 Project Management Responsibilities

LCLS managers and supervisors are expected to conduct regular observations of employee work practices and behavior in the workplace. This observation process has been proven to be very effective in achieving extended periods of work without injuries or equipment damage in active work environments. This is to be done on a weekly basis, at a minimum, by each line manager.

Brief summaries of line management responsibilities for LCLS organizational elements are listed below.

2.3.1.1 LCLS Director

- Manage the LCLS Project as a whole, and ensure that ES&H policy is implemented within the LCLS Project in compliance with DOE and SLAC requirements
- Communicate safety expectations to LCLS organizational elements at SLAC and elsewhere
- Allocate Project resources as necessary to execute the Project safely
- Implement procedures to confirm compliance with LCLS and SLAC safety policy
- Evaluate the safety performance of the LCLS Project and remediate as necessary
- Participate in safety inspections and investigations as necessary

2.3.1.2 LCLS Chief Engineer

- Serve as executive deputy Project Director as necessary to implement Project Director's safety responsibilities
- Set up Project management systems (controls for cost, schedule, safety management and work authorization) as necessary to implement ISMS within the LCLS Project

2.3.1.3 Electron Beam System Manager, Photon Beam System Manager

- Provide safety oversight for activities of LCLS organizational elements (groups in the LCLS as well as elements at the partner institutions) within his/her line responsibility
- Ensure that partner laboratories participating in the LCLS Project are in compliance with SLAC and LCLS safety standards by means of review/approval of specifications, review by SLAC safety committees, etc.
- Participate in safety inspections and investigations as necessary

2.3.1.4 ANL-LCLS Project Director, LLNL-LCLS Project Director

- Ensure that LCLS activities carried out at partner labs are in compliance with partner lab policy
- Design and construct hardware and systems that comply with SLAC and LCLS safety requirements
- Submit designs and other necessary information to LCLS Project Management and SLAC citizens' committees for review, and respond to recommendations as necessary
- Ensure that partner lab personnel comply with SLAC requirements for training, area access and work authorization

2.3.1.5 LCLS Group Leaders

The LCLS at SLAC includes Groups reporting to the Project Office, such as the Injector/Linac Group, the Laser Group, the Controls Group, the End-station Systems Group and the Conventional Facilities Group. The current LCLS Organization Chart illustrates these groups and designates the supervisors of all LCLS members. Group Leaders:

- Ensure that group members have proper safety training to carry out their work
- Review hardware and system design and construction for proper incorporation of safety considerations
- Ensure that job hazard analyses are completed and approved for all work
- Ensure compliance with controls specified in job hazard analyses, including training requirements

- Implement work authorization controls permitting confirmation that requirements listed above have been met
- Observe and evaluate the safety performance of direct reports

2.3.1.6 LCLS ES&H Coordinators

- Report to the Project Director, and serve as the primary point of contact within their Directorate for all matters concerning the implementation of ISM and the Lab's ES&H policies
- Oversee Directorate ISMS program compliance as described in the Directorate's ISM Plan
- Help maintain documentation required by the Directorate-specific ISM Plan and the SLAC Self-Assessment and Assurance Program
- Ensure proposed ES&H Policy is reviewed by key staff members within their directorate and comments are provided to the Policy's author
- Support line management in identification, analysis, and control of hazards and stay abreast of changes within the Directorate
- Schedule Directorate self-assessments, constitute peer review teams and track deficiencies until closed out
- With the Project Director, help define roles of department and lower level ES&H Coordinators
- Provide advice to the Project Office as to effectiveness, compliance and areas needing improvement within LCLS safety management
- Provide advice to members of the LCLS Project regarding issues of safety, including SLAC and LCLS policy
- Develop detailed safety policies and procedures for approval and enforcement by Project Management
- Participate in safety inspections and safety investigations
- Provide Information to SLAC and DOE management regarding LCLS safety

3. Integration of Environment, Safety, and Health into the Linac Coherent Light Source

Safety within the LCLS is understood to include Environment, Safety and Health considerations. Like research integrity, scientific discipline, and fiscal responsibility, Safety is a product of culture and sound management. To achieve a truly integrated systems approach to doing work safely, ES&H is included as an integral part of work from initial planning through final execution. SLAC applies the seven guiding principles and five core functions to achieve an integrated safety management system. All are reflected in the detailed policies and procedures of the Laboratory. The key ES&H policies for our Directorate and to which we are committed include:

- SLAC ISM Plan
- ES&H Manual
- Radiation Control Manual
- Guidelines for Operations

Line Management (to include Principal investigators, managers, and supervisors) are responsible and held accountable for incorporating these principles and ES&H Policy into the management of our work. Working safely is a condition of employment and we cannot sustain our success unless all are committed to this end. Only in so doing will we ensure adequate protection of workers, the public, and the environment.

ES&H considerations must be part of all planning processes, commencing with identification of work scope, identification of hazards, what standards apply, what controls are to be implemented, the competencies required to work safely, and finally the assurance that each of these elements are in place before work is authorized to proceed.

SLAC's line management focuses on safe accomplishment of mission, understanding assignments, and carrying out the core safety management functions correctly and efficiently. These principles are dependent both upon management commitment and employee/individual involvement and accountability. Management commitment is demonstrated by:

- The documented ISM and ES&H policy statements that are communicated throughout the organization
- Managers' accountability for safe work performance,
- The visible presence of managers addressing safety issues.
- Fostering employee involvement in development and implementation of the ISMS,

- Emphasizing the importance of individual accountability for performing work safely through goal setting, accountability in the personnel evaluation system and ES&H training.

Employees/workers must be actively and continually involved in the development and deployment of the ISM processes that execute the ISM function. As individuals and as work teams, employees/workers actively participate in the activities of the ISM processes that address workplace safety, public safety, and environmental protection. Employees/workers continually examine the ISM management processes used to conduct their individual work efforts for continual improvement and actively pursue these improvements with contractor management. Individual accountability for performing work safely is emphasized.

The following sections describe key ISM issues unique to our Directorate

3.1 Description of the LCLS- Directorate's Work Activities

The Linac Coherent Light Source (LCLS) Directorate was created in August 2004 for the purpose of executing the LCLS Project. The objective of the LCLS Project is to provide laser radiation in the x-ray region of the spectrum that is 10 billion times greater in peak power and peak brightness than any existing x-ray light source. This advance in brightness is similar to that of a synchrotron over a 1960's laboratory x-ray tube. Synchrotron light sources have revolutionized science across disciplines ranging from atomic physics to structural biology. Advances from the LCLS are expected to be equally dramatic. The LCLS will provide the world's first demonstration of an x-ray free-electron-laser (XFEL) in the 1.5 – 15 Å range and will apply these extraordinary, high-brightness x-rays to a unique set of scientific problems. The LCLS Project is organized as a three-laboratory partnership, led by SLAC, which includes Argonne and Lawrence Livermore National Laboratories (ANL and LLNL). This will exploit each laboratory's technical strengths: SLAC – accelerators; ANL – undulators; and LLNL – high-power optics and lasers.

The specific operational goal for the LCLS Project is to produce coherent x-ray pulses with 1.5 - 0.15 nm wavelength and less than 230 femtosecond pulse length. The Project team will design, construct and commission this facility, which is described in detail in the Conceptual Design Report and other technical design reports. Scheduling and budgetary goals are to complete construction and commissioning by the end of March 2009 for a Total

Estimated Cost (TEC) of $315 million and a Total Project Cost (TPC) of $379 million.

The project requires a new 135 MeV injector to be built at Sector 20 of the 30-sector SLAC linac to create the high brightness electron beam required for the XFEL. The last one-third of the linac will be modified by adding two magnetic bunch compressors. Most of the linac, and its infrastructure, will not be changed. The existing components in the Final Focus Test Beam tunnel will be removed and replaced by a beam transfer hall. The undulator system will be installed in a below grade tunnel with associated equipment. Provision will be made for x-ray endstation enclosures, as well as instrumentation and controls for identifying and characterizing the x-ray beam. Two experimental halls will be constructed. A Near Hall will be located near the PEP ring road and a Far Hall will be constructed further east. A Central Laboratory and Office Complex will be constructed at the Near Hall site. The LCLS Project scope includes startup/commissioning activities for the accelerator systems and endstation systems. The end of commissioning will coincide with the completion of an orderly transfer of responsibility for maintenance and operation of LCLS systems from the LCLS to other SLAC organizational elements.

3.2 Work Authorization is Granted following SLAC Protocols

The LCLS Directorate recognizes that Safety must be an integral part of LCLS work planning during construction, installation, commissioning and operation. Hazard controls for construction and operations will be developed to be compatible ISMS policies.

Argonne National Laboratory (ANL), Lawrence Livermore National Laboratory (LLNL), and SLAC, which are collaborating on this project, shall conduct their work according to their respective ISMS policies.

LCLS will establish protocols and safe working procedures for the conduct of work performed at SLAC. These will be followed by all personnel conducting work for the LCLS project. This is consistent with the approach adopted on the National Ignition Facility project at LLNL and at the Spallation Neutron Source at ORNL. Project management and personnel will ensure that LCLS requirements (both technical- and safety-related) are at least as rigorous as those of the supporting SLAC organizations.

LCLS Project management oversight of conventional construction will be proactive, preemptive and consistent. Construction activities will be carried out in accordance with "Best-Practices" that have been demonstrated to be effective on other DOE construction sites.

The LCLS Project Office has dedicated safety professionals on staff to assist in oversight and to advise management on implementation and improvement of safety management.

Authorization of all Project and commissioning activities will comply with SLAC policy and SLAC management assignments.

The readiness review process for the LCLS will consist of:

- The review of the Safety Assessment Document by DOE
- DOE approval of the LCLS Safety Envelope
- DOE Operational Readiness Review; and
- SLAC Director authorization to start commissioning

3.3 Inventory of Work Activities and Associated Hazards

As Project activity and the LCLS Directorate evolve, personnel and contractors will encounter a wide range of working environments with widely varying potential hazards: high energy accelerators, experimental halls and beamlines, tunnels, manufacturing facilities, machine shops, electrical hazards, chemical labs, construction sites, and offices.

The work processes being established will require that line managers systematically identify the hazards in their respective work areas and develop appropriate controls applying ISMS principles as defined in this ISMS implementation plan, appropriate Work Smart Standards (laws and standards), the SLAC ES&H Manual, other established ES&H policies and procedures, departmental directives and procedures in carrying out their programs. Each line manager will further develop specific operating procedures in tailoring their implementation of ISM for the safe operation of their activities.

In accordance with the SLAC ISMS, hazards are identified and evaluated for all equipment and activities in the LCLS Directorate. The scope and formality of this effort will be dependent on the size and complexity of the project and

the potential for: injury to personnel, damage to the environment, and damage to equipment and facilities.

The types of elements that may be included in the safety effort for a project are listed below.

1. Safety Assessment Document (SAD) DOE
2. Accelerator Safety Envelope (ASE) DOE
3. Accelerator Readiness Review (ARR) DOE
4. Fire Hazard Analysis (FHA) DOE
5. Environmental Assessment (EA)
6. Citizen Committee Reviews SLAC
7. Bay Area Air Quality Management District (BAAQMD) Permit- analysis
8. Project Safety Reviews - internal and external
9. Outside expert consultant participation when necessary
10. Safety participation in Project Design Reviews
11. Subject Matter Expert participation
12. Project Safety Plans
13. Project Safety Teams
14. Safety Oversight – up to 100% coverage when necessary
15. Job Hazard Analysis
16. Area Hazard Analysis

Understanding and categorizing the risk for large projects is necessary to efficiently manage that risk. Major modification and upgrades to projects may introduce new hazards or compromise established safety systems. Significant changes to the design or operation of projects necessitate reviewing the hazard analysis for currency. All projects are reviewed when significant change in the design or operation occurs or approximately annually.

The LCLS Directorate has an ES&H coordinator on staff and numerous subject matter experts. The purpose of these individuals is to provide technical ES&H support to line management. The responsibility of these safety subject matter experts could be summarized as follows: acts as the point of contact for

safety issues, acts as a resource and facilitator, provides oversight and promotes safety.

3.4 Hazard Control Development and Implementation

Hazards associated with operation of the LCLS, including those posed by the x-ray laser beam, are very similar to existing systems that have been effectively controlled in other SLAC accelerators.

The construction of the LCLS Project will include activities and associated hazards that have not been dealt with for some time at SLAC, such as the management of large scale construction services and the excavation of 800 meters of underground tunnels and a cavern.

The analysis of environmental, safety and health considerations specific to the LCLS have been identified and evaluated in:

Preliminary Safety Assessment Document

http://www-ssrl.slac.stanford.edu/lcls/eir/documents/hazards_analysis/PSAD.pdf

Preliminary Hazard Analysis

http://www-ssrl.slac.stanford.edu/lcls/eir/documents/hazards_analysis/PrelimHazardAnalysis.pdf

LCLS Environmental Assessment

http://www-ssrl.slac.stanford.edu/lcls/documents/final-lcls-ea-report_2-6-03.pdf

3.5 How We Ensure Our Work Is Performed Within Controls

LCLS construction and commissioning will be conducted in compliance with DOE O 420.2B Accelerator Safety Order which was developed to:

> "establish accelerator-specific safety requirements which, when supplemented by other applicable safety and health requirements, will serve to prevent injuries and illnesses associated with Department of Energy (DOE) or National Nuclear Security Administration (NNSA) accelerator operations."

This Order establishes the requirement for the development of a Safety Assessment Document, implementing a Commissioning Readiness Review process and an Operational Readiness Review. These documents and processes will be used to assure all identified hazards have been effectively mitigated or eliminated where possible.

LCLS Project personnel following ISMS principles will:

- Systematically evaluate all equipment and operations introduced by the LCLS;
- Identify hazards, if any;
- Develop appropriate controls and safe operating procedures; and
- Develop training protocols for the operators of LCLS systems.

Safety Assessment Document

The development of the Safety Assessment Document for the LCLS Project will be conducted through a process that will:

- Systematically identify the hazards associated with LCLS equipment and systems;
- Assess the severity of those hazards;
- Define controls that will be compliant with projected safety expectations at that point in time when the machine is being operated after the Project is completed.

  Envisioned controls include remotely actuated high current breaker switches, covered bus bar, high voltage interlocks, pinch prevention for mechanical actuators, Personnel Protection Systems for control of access to radiation enclosures, etc.

Commissioning Readiness Process

The commissioning readiness process required by the Accelerator Safety Order will be employed to verify that:

- Controls identified in the Safety Assessment Document have been implemented;

- Procedures and other documentation required for safe commissioning of the LCLS have been written and approved;
- Commissioning operators and maintenance personnel have been trained appropriately;
- Responsibilities for operation and maintenance has been assigned; and
- Commencement of commissioning activities has been authorized.

Operational Readiness Review

An Operational Readiness Review will be conducted to verify that:

- Project completion goals have been met;
- Lessons learned in commissioning have been incorporated into operations plans;
- Requirements of DOE O 420.2B Accelerator Safety Order have been met.

3.6 Continuous Feedback and Improvement

The development of the project technical systems and associated hardware will be subject to rigorous peer reviews. Included in the review process will be the SLAC Citizens' Committees. The reviews will address the full spectrum of construction and LCLS operations. Other sources of feedback specific to the LCLS are the:

- LCLS Facilities Advisory Committee
- LCLS Conventional Facilities Advisory Committee
- Office of Science Project Reviews

Feedback from these reviews is an important component of the development of the facility operating procedures and hardware protection.

The LCLS Project Director will assign an LCLS line manager and an LCLS ES&H coordinator to the investigation of incidents and safety concerns. Unless other SLAC policy is applicable, investigation reports will be submitted to the LCLS Project Director within two weeks of assignment. The report and recommended corrective actions will be presented to LCLS management for approval of a corrective action within four weeks of assignment.

Lessons learned in the course of executing the LCLS Project will be communicated to LCLS personnel and management at partner laboratories through monthly Project Reports and other means of communication used at partner laboratories.

3.7 Specific Roles and Responsibilities

3.7.1 Line Management

- Implement ISM as described within this Directorate-specific ISM Plan and provide all employees and non-employees (i.e., guests, sub-contractors, users and students) a safe workplace.
- Authorize projects and other work only in accordance with SLAC ES&H Policy, especially Chapter 2 – Work Authorization.
- Supervisors will create and communicate ES&H expectations (see http://www-group.slac.stanford.edu/esh/eshvalues.html) for each employee and:
  - Complete JHAMs and review AHAs pertaining to their work area (see Chapter 2 –Work Authorization). Note: These must be done jointly with employees as their involvement in safety integration and work planning is key.
  - Specify training and hold employees accountable for completion of required training and safe work performance
  - Make safety a prominent topic at "all hands" and staff meetings
  - Ensure safety aspects of each job are evaluated and that positions are filled only with candidates having requisite competence
- "SLAC contacts" and UTRs assigned to non-employees generally have the same obligations as a supervisor:
  - Require training for guests or sub-contractors appropriate to the hazards they will encounter. A graded and reasonable approach will be used.
  - UTRs will always oversee sub-contractors and require training sufficient to assure safe operations and compliance with SLAC ES&H Policy. (See Chapter 42 – Sub-Contractor Safety)

3.7.2 Employees, Users and Guests

- Thoroughly understand and competently perform the five ISM Core Functions as steps to sustained safe work performance.

1. Define work scope
2. Analyze work for hazards
3. Put in place controls that mitigate or eliminate hazards
4. Do work within controls
5. Continuous feedback and improvement of work practices to improve safety.

No amount of safety documentation, work authorization, PPE, or controls can ever assure worker safety without each individual being personally responsible for safety. Workers must always keep the ISM Core Function five-step approach to working safely foremost in their minds as they conduct daily work at SLAC.

- Be knowledgeable of the Lab "Stop Unsafe Work Policy" (See Chapter 2 – Work Authorization)
- Attend new-employee safety orientation training (see Chapter 24 – Training). Additionally:
  - Employees, in consultation with their supervisors, must complete a Job Hazards Analysis and Mitigation form (JHAM) and conduct a SLAC Training Analysis (STA) within 30 days of employment and fulfill all training requirements identified in their SLAC Training Analysis. (See Chapter 24 – Training.) They must also demonstrate an understanding of the requirements of the ES&H Manual chapters applicable to the work they will perform.
  - Sub-contractors must complete contractor-specific safety orientation and training (if required) before they perform any work.
  - Users must complete the facility-specific safety orientation and training before beginning the "hands-on" portion of their experiment.
- Proceed with work only after line management has authorized work. Work only within controls specified by the JHAM or other work authorizations.

3.8 Balanced Priorities

LCLS management clearly understands that ISMS principles are a "Value" to be incorporated throughout the entire project. Although, due consideration is given to balancing the priorities of project elements such as cost and schedule, there is no question that safety is to be an integral aspect of all work associated with the execution of this project.

The engineers designing LCLS hardware have extensive experience in maintaining technical equipment and systems and are qualified to take maintainability and operational safety into account during design, construction and installation. LCLS management has been very clear during its hiring process to stress the importance they place on safety.

3.9 Competence Commensurate with Responsibilities

Responsibilities for the development of LCLS systems have been assigned based on demonstrated institutional capabilities.

Argonne National Lab has clearly demonstrated its competence to design and manufacture undulators and electron beam transport lines that can be operated safely.

Lawrence Livermore National Laboratory has demonstrated its competency in the development of x-ray optics with extraordinary power handling capability.

Stanford Linear Accelerator Center has assembled a team of project personnel with the technical expertise and management skills necessary to safely manage the modification and operation of the Two Mile Accelerator. These competencies include radiation shielding design, management of general user programs for synchrotron science and all work processes relevant to operating the highest energy linac in the world.

3.10 Safety Standards and Requirements

LCLS construction and operation will be conducted following criteria in the:

- Stanford University and Department of Energy contract
- SLAC Work Smart Standards
- Cal/OSHA standards
- NEC standards
- NFPA
- DOE Orders
- SLAC ES&H Manual