Lawrence Berkeley National Laboratory

Integrated Safety Management (ISM) Plan at the ALS

September 15, 2007

Submitted by: _____ Date_____
Roger Falcone, ALS Division Director

EHSD Concurrence: _____ Date_____
Howard Hatayama, EHSD Director

Accepted by: _____ Date_____
Steve Chu, LBNL Director

This work was supported by the Director, Office of Science, Office of Basic Energy Sciences, of the U.S. Department of Energy under Contract DE-AC02-05CH11231.

Integrated Safety Management (ISM) Plan at the ALS
September 15, 2007

Written by:

_____

Jim Floyd, ES&H Program Manager

Reviewed by:

_____

Ben Feinberg, Deputy Division Director and Division Deputy for Planning & Administration

_____

Peter Denes, Division Deputy for Engineering

_____

Zahid Hussain, Division Deputy for Scientific Support

_____

Howard Padmore, Division Deputy for Experimental Systems

_____

David Robin, Division Deputy for Operations & Accelerator Development

TABLE OF CONTENTS

Page

TITLE PAGE WITH SIGNATURES.....i

INTERNAL REVIEW SIGNATURE PAGE.....ii

LIST OF ABBREVIATIONS.....iv

1.0 INTRODUCTION 1

2.0 LINE MANAGEMENT RESPONSIBILITY.....2

3.0 SAFETY ORGANIZATION 5

4.0 ISM FUNCTIONS 8

5.0 TRAINING 11

6.0 ASSURANCE.....12

LIST OF ABBREVIATIONS

AHD	Activity Hazard Document
ASE	Accelerator Safety Envelope
BRC	Beamline Review Committee
CSEE	Center for Science and Engineering Education
ESS	Experiment Safety Sheet
GERT	General Employee Radiation Training
ISM	Integrated Safety Management
JHA	Job Hazard Analysis
JHQ	Job Hazard Questionnaire
MESH	Management of Environment, Safety, and Health Assessment
MOU	Memorandum of Understanding
PRD	Performance review document
PRT	Participating research team
QUEST	Quality ES&H Self-Assessment Teamwork
RSS	Radiation Safety System
RWA	Radiological Work Authorization
SAA	Satellite Accumulation Area
SAD	Safety Analysis Document
TSC	Technical Safety Committee

1.0 INTRODUCTION

Integrated Safety Management (ISM) constitutes one of the core premises for the organization and operation of the Advanced Light Source. The ALS has integrated each of the five functions and seven principles of ISM from the institutional LBNL Integrated Safety Plan into its on-going management of the facility. The five functions are: (1) Define the scope of work; (2) Identify the hazards of the work; (3) Develop and implement controls for the hazards; (4) Perform the work as authorized; and (5) Maintain continuous improvement from regular feedback. These five ISM core functions are sustained by applying the seven guiding principles of the ISM: (1) Line management responsibility and accountability for ES&H; (2) Clear ES&H roles and responsibilities for managers and staff; (3) Competency commensurate with responsibilities; (4) An on-going balance between safety on one hand and research and operational priorities on the other; (5) Working within standards and requirements; (6) Hazard controls tailored to the work; and (7) Authorization basis established for the work.

The articulation of this responsibility begins with the ALS Mission Statement: 'Support users in doing outstanding science in a safe environment.'

As a national user facility, the basic premise is to provide scientific service, so all of its functions are organized along service lines. As the last part of the mission statement makes clear, these services are all organized within the constraint of being performed safely. This is understood to be part of management's stewardship responsibilities for a national user facility.

As a large user facility, the organization and implementation of integrated safety management is relatively larger and more complex when compared to other research divisions at Berkeley Lab (LBNL). The purpose of this plan is to describe this logic and implementation.

2.0 LINE MANAGEMENT RESPONSIBILITY

Clear delineation of line management responsibility for safety is critical at the ALS. Characteristics that make this especially challenging for the ALS are:

- Over 50% of the staff who routinely work at the ALS are matrixed from other divisions
- In addition to ALS, four different divisions operate beamlines at the facility
- Each year 2000+ users conduct research at the ALS

An outline of the organization chart is shown in Figure 1 below. Note that a significant part of the ALS organization is comprised of staff from AFRD and Engineering. Because of their significance, they are incorporated directly into the line management of the ALS at the Division Deputy level. In addition to ensuring integration of technical and strategic goals between the divisions, this also ensures coherence of safety responsibilities. Examples of this integration include the implementation of the ALS interlock program (Engineering and ALS), the ALS Safety Analysis Document (AFRD and ALS), and the Beamline Review Committee (Engineering, AFRD, and ALS). At a more detailed level, Memoranda of Understanding (MOUs) have been signed by the respective division directors that address specific responsibilities for staff safety at the ALS.

Formal MOUs have also been established with each of the beamlines operated by other entities. General safety responsibilities between the ALS and individual participating research teams (PRTs) are identified and agreed upon through this process. In order to ensure continuing integration, these PRTs are considered to have a 'dotted line' to the Deputy Division Director for safety oversight.

Line management safety responsibilities for the ALS users are implemented through individual Experiment Safety Sheets (ESS). The ESS describes the standard functions of ISM with signature blocks indicating respective responsibilities of both the user and the ALS staff. All users at the ALS utilize some form of the ESS process. The Beamline Scientists, as hosts, are considered to be the line management for users with respect to safety. Table 1 presents a more thorough description of the relative roles and responsibilities between users and beamline scientists. It should be noted that because users may work at many different beamlines in a year, sometimes simultaneously, the formal Human Resources designation of Supervisor is not useful in describing this responsibility.

Safety line management for ALS staff follows standard LBNL practices flowing from the Division Director to his direct reports and from them, down to first line supervisors. In cases where formal authorizations are required, work leads are clearly identified for individual scope of work. Safety accountability is implemented through standard PUB-3000 methods, and ALS has instituted language in its annual performance review documents (PRDs) to ensure accountability.

Figure 1. ALS Organization Overview

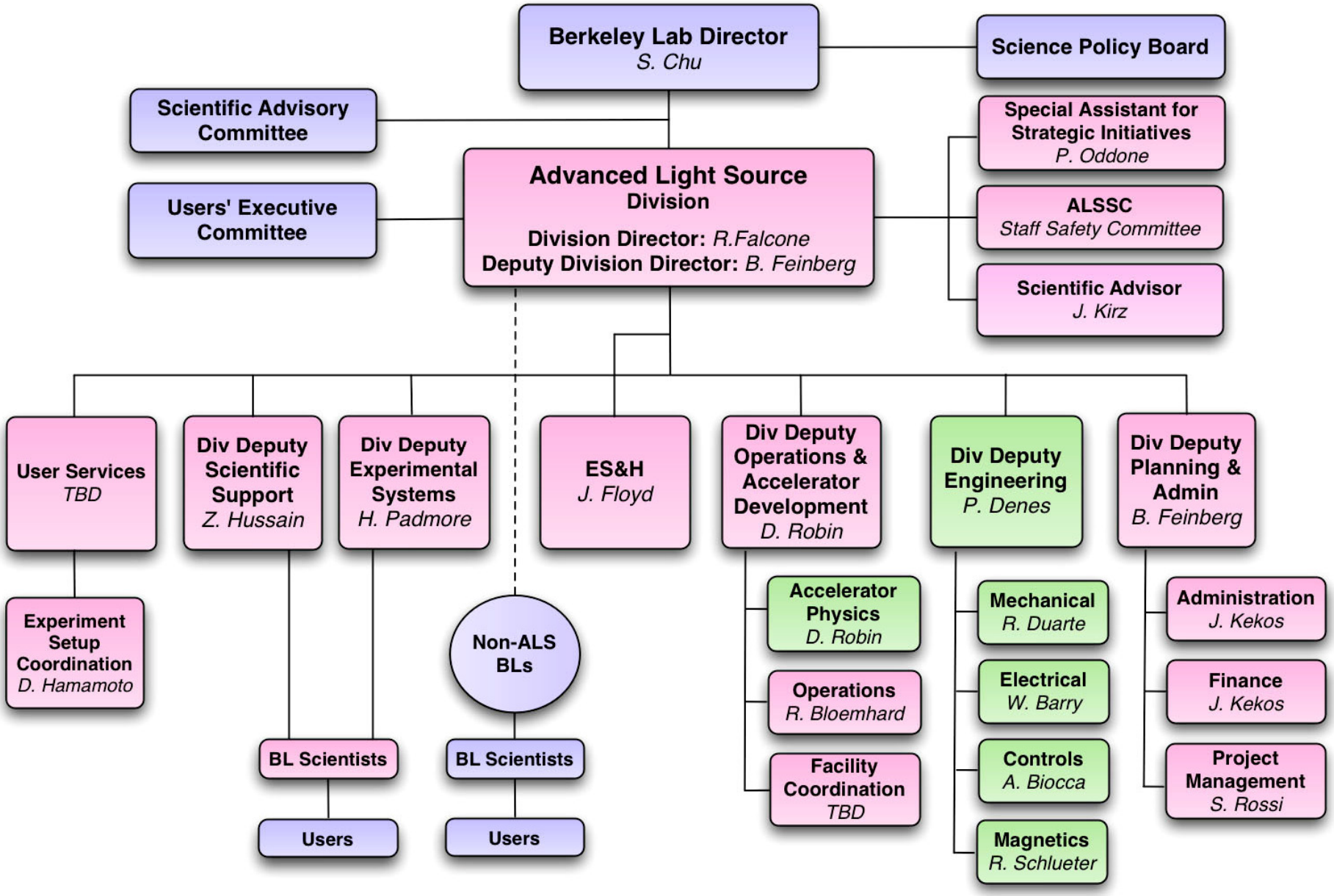


Table 1. Roles and Responsibilities for Users and Beamline Scientists

BEAMLINE SCIENTISTIS
• **Ultimate responsibility for safety at the beamline.** • **Assure that:**
➢ Users submit proper information and that work has been reviewed. ➢ Users are qualified to perform work. ➢ Proper support and oversight is approved.
EXPERIMENTERS-IN-CHARGE
• **Responsibility for safety of the experiment.** • Assure that: ➢ Information submitted about the work and hazards is accurate. ➢ All Users on the team understand and follow the requirements. ➢ Be present or designate an alternate to respond to safety issues.
USERS
• **Personal responsibility for safe conduct of work on an experiment.**

3.0 SAFETY ORGANIZATION

To implement ISM, the ALS devotes a significant part of the organization to safety. Many different organizational units and their staff have explicit safety responsibilities. These consist of both committees and operational functions. Figure 2 shows the organization of these functions. Also included in that chart are the individuals from the EH&S division who provide significant, though independent, support to the ALS.

A list of the operational safety functions and resource allocation is as follows:

Function	**FTE**
Interlocks	1
Facility Management	1
Work Planning	1
Procedures	1
ESH Program	2
Experiment Coordination	2
Floor Operations	3
Electronics Maintenance	2
Total	**13**

In addition, a significant part of Accelerator Operations, Electronic Installation, and Mechanical Engineering units perform important safety functions as part of experiment and beamline reviews as well as accelerator operations.

Important Committees include:

- Division Safety Committee
- Beamline Review Committee (BRC)
- Staff Safety Committee

The charter for the Division Safety Committee (chaired by the Deputy Division Director) is to provide an on-going forum for communicating safety issues and status. Additionally, its members perform the annual QUEST inspections in support of the Division Self Assessment. It contains members from each organizational unit in ALS including Engineering and AFRD functions. These members also chair individual unit safety circles each month so that all staff are apprised of safety issues and status and can bring issues up for discussion on a regular basis.

The BRC provides a mechanism to evaluate proposed new beamlines or modifications to existing beamlines to ensure that all technical and safety considerations are addressed before operation. Its processes are organized along project management principles with a conceptual design review, a beamline design review, and a beamline readiness review and walkthrough. This process is discussed in more detail in later sections. It has 15 designated members from

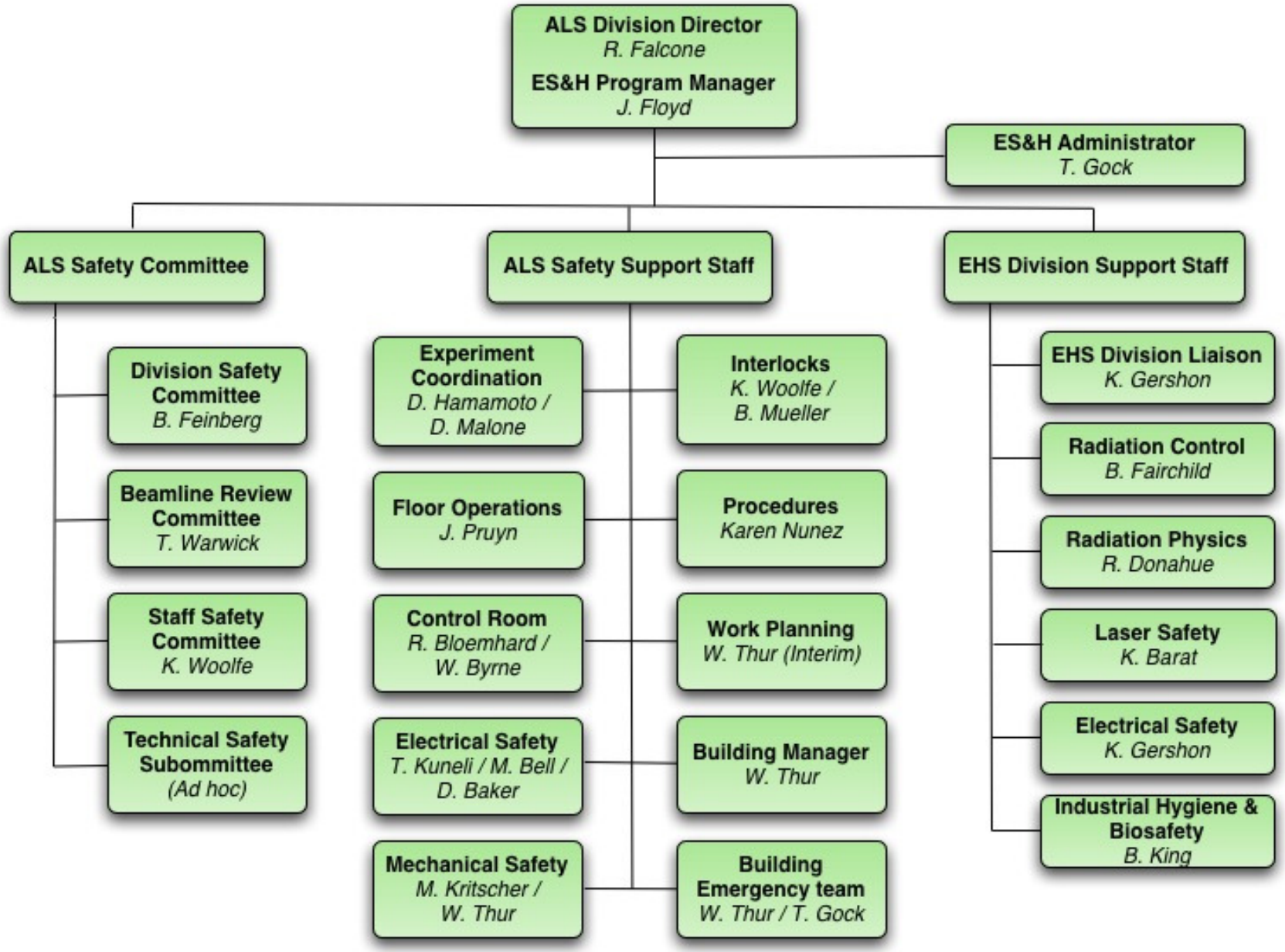
selected disciplines and several ex-officio members, comprising several different divisions. Its charter is described explicitly in ALS procedure BL 08-16.

The Staff Safety Committee members are appointed by management and are broadly representative of the ALS. Upon request, it can create ad hoc Technical Safety Committees (TSC) to investigate complex technical safety issues and make recommendations to management. It also performs investigations of incidents when appropriate. Its specific charter is described in procedure ALS 08-03.

Lastly, all staff and managers have on-going safety responsibilities and devote a fraction of their time to safety. Examples include monthly safety circle meetings, time spent on the annual self assessment inspections, supervisor walk-arounds, etc.

Commensurate with its commitment of staff time, the ALS also commits significant funding to safety projects. Each year, funding is set aside to meet these needs. A central "safety first" project ID is maintained to deal with issues on the accelerator floor that might otherwise not be addressed. Examples of procurements in FY07 include fall protection gear, oxygen deficiency monitoring equipment, upgrades of interlocks. Additionally, accounts are set up to track internal division spending on safety. An example for FY07 was the commitment of $40k to upgrade workstations for ergonomics.

Figure 2. ALS Safety Organization Chart



4.0 ISM FUNCTIONS

This section documents how ALS performs the five functions of Integrated Safety Management. Because of the nature of the facility, these functions are all implemented in a tiered fashion. ISM of the accelerator facility is primarily implemented via high level systems that meet Accelerator Safety Order and 10 CFR 835 requirements; safety of the ALS and matrixed staff is through standard LBNL PUB-3000 mechanisms; and safety of the users is through ALS-specific tools developed especially for users at a large user facility.

Accelerator

Work involving the accelerator has been comprehensively evaluated through a Safety Analysis Document (SAD). The SAD and the process by which it is developed, reviewed and maintained are governed by the Accelerator Safety Order, DOE 420.2. It incorporates, at a high level, the ISM functions for the accelerator facility as a whole. Through the SAD process, a detailed catalog of ES&H risks associated with running the ALS is developed and evaluated. The mitigations to control those risks are identified and, in particular, a safety envelope is developed that defines the parameters of safe operation. Internal procedures have been developed, as appropriate, to implement these requirements.

The Safety Analysis Document (SAD), Accelerator Safety Envelope (ASE), and implementing procedures have been internally generated by the ALS. Review and update occurs when changes to the ASE or SAD have been needed. All reviews are performed by *ad hoc* committees of subject matter experts from similar institutions.

Beamlines

A significant component of the ALS facility is its beamlines. To date, 40+ beamlines (including branches) have been installed. All beamlines undergo a thorough ES&H evaluation at significant stages in their design, installation, and operation, which exactly reflect the ISM functions. At conceptual design, the fundamental scientific rational and design is proposed ('define the work'); at beamline design review, all of the hazards have been identified – in particular radiation safety – and requirements to build specified ('identify hazards and controls'). Throughout installation, project staff work with subject matter experts to assure that build-out conforms to the beamline design requirements. This is verified before the beam is allowed to receive first light in a beamline readiness review and associated walkthrough ('perform work'). Annual beamline readiness reviews are performed to verify that the controls are adequate ('feedback and improvement'). This process is proceduralized (BL 08-16) and overseen by a standing technical committee composed primarily of ALS and Engineering staff.

Users

More than 2000 users each year come to the ALS for periods ranging from a day to months. Special ES&H systems have been instituted to assure that their work receives proper review and oversight. The process begins at the time prospective researchers apply for beamline time through a scientific peer review procedure. When they submit the proposals, hazard information is also identified. When their proposals are accepted and time is allotted, the Experiment Setup Coordination unit contacts the principal investigators to verify this hazard information, who will be on the user team, and follow up on non-routine hazards that require EH&S Division or other subject matter expert review. By the time users arrive, most hazard and hazard control information would have already been reviewed. Before work begins, a physical inspection is conducted. This process is implemented through Experiment Safety Sheets (ESS) and procedure US 02-05.

Long-term Guests

As part of its scientific mission, the ALS hosts many intermediate to long-term guest researchers including visiting faculty, graduate students, etc. If these individuals are staying on-site continuously for 3 months or more they will be treated as regular staff, given JHQs, and incorporated into one of the LBNL scientific organizations. Their work will receive the same review and authorization as staff (see below).

Staff Work

Routine staff work is reviewed and authorized through a combination of worker qualification, procedures, EHS training, and hazard analysis. Currently, this is being consolidated into the Job Hazard Analysis (JHA) process, and pilot programs, both formal with EH&S Division and informal within the ALS, have been done for most groups within the Division.

A key component of this is the ALS Procedures Center. Much of the work is proceduralized and a controlled procedure system has been implemented. ALS has instituted an analog to the JHQ to ensure that all staff members who utilize these procedures are trained to the current revisions.

When work exceeds the routinely authorized boundaries, an ALS Work Permit is instituted. These correlate to the 'Task-specific JHAs' the Lab is developing per DOE 10 CFR 851. The proposed work is reviewed by an inter-disciplinary team to identify any ES&H, scheduling, technical, or quality issues. As a result of this, a Work Permit is written that specifically addresses any issue that was discovered. This is reviewed and signed off by the work team and the safety line management before the job begins.

Vendors

All vendors who propose to perform work on the floor have the work reviewed to determine whether a Work Permit is required or not. In the majority of cases, a Permit is instituted. In the other cases, a Permit may not be required and proper controls will be insured by direct oversight. Part of the evaluation includes an analysis of training requirements. Most vendors will go through the User Office and receive the standard General Employee Radiation Training (GERT), ALS 1001 (Hazard Communication at ALS) and ALS 5001 (Radiation Awareness Training).

Visitors

As part of its mission, the ALS makes itself available for public tours and several tours each week are given. Most are either through internal ALS staff or the Public Affairs Office (and CSEE). All LBNL staff giving the tours are trained in an ALS procedure and understand their roles and responsibilities to provide for safety of guests at the ALS. Occasionally, during periods of particularly intense work, these tours are accompanied by ALS safety support staff.

5.0 TRAINING

All staff and long-term guests must complete a Job Hazard Questionnaire (JHQ) within 30 days of their start date at the ALS. All training is tracked through the EH&S Division training database and evaluation of this training completion is a part of the PRD process.

Additionally, all staff who require unescorted access to the ALS experimental hall (Building 6, room 1000), are required to take GERT, ALS1001 (Hazard Communication at ALS), and ALS 5001 (Radiation Awareness Training). Presently, GERT and ALS 5001 are required to be renewed. Both are made available through the Internet. Card-key access to the floor is contingent upon maintaining currency in these three courses.

Users must also take these three courses. This is administered by the User Services Office at the time they are registered on-site. Since users must re-register annually, training status is updated annually also through this process. Users are not individually required to take a JHQ. As part of the registration process, they are automatically put into an 'ALS User' training group, which specifies these three courses. Some users may perform work that exceeds this typical bound. In those cases, additional training is identified and implemented via the Experiment Safety Sheets.

On-the-job training is also provided to users. General beamline orientation and technical/safety issues are covered by the Beamline Scientists. In cases where procedural requirements must be met (e.g., on handling hazard gases), this training is typically performed by other ALS operational staff.

Because a significant component of work at the ALS is performed through procedures, the ALS has established a tracking system (based on the JHQ) to identify and track training on procedures.

6.0 ASSURANCE

To assure that the overall ES&H systems at the ALS are robust and effective, the ALS has implemented a systematic assessment approach that is matched to the needs of a large-scale user facility. For convenience, we group the assessments into categories. Process-driven assessments are those required by higher tier documents and are proceduralized to some extent. Operational assessments derive directly from the mission statement in trying to help the user staff perform their science in a safe manner. They have both an assistance and an oversight function. As with other divisions, supervisor walkthroughs are an integral component as is the annual self-assessment. These two are designed to be complementary with supervisor walkthroughs concentrated on work practices and the self-assessments concentrated on work environment.

Following is a list and short discussion of these assessment functions:

Process-driven assessment

Due to the nature of work at the ALS, assessment is an on-going function. Process-driven assessments are those performed by procedure as part of facility-based or institutional requirements. Examples are interlocks tests, projects that might extend beyond the Accelerator Safety Envelope, and Beamline reviews. Other examples are AHD or RWA-driven inspections. Examples are:

- Experiment Safety Sheets. Each experiment requires an inspection and verification before work can begin. Additionally, annual renewals are conducted for long-term projects. These are described in procedure US 02-05.

- Beamline Review. Assessments are performed at each stage in the development and installation of a beamline (and modification of a current beamline). Annual walkthroughs are conducted to assess on-going safety. These are described in procedure BL 08-16 Appendix IVc.

- Interlocks. Design, installation, and modification of personnel safety interlocks undergo a thorough evaluation by an ad hoc technical safety committee before they are implemented. This is described in procedure EC 02-01. All personnel safety interlocks (Radiation Safety System—RSS) undergo either six month or annual inspection and verification.

- Accelerator Projects. In order to assure that accelerator projects stay within the bounds of the SAD and the ASE, reviews are conducted. These assessments are described in procedure ALS 08-01.

- Other more standard LBNL examples include formal authorizations such as AHDs, RWAs, lead compliance plans, drill permits, etc. that all have assessment and evaluation components in them.

Operational Assessment

Another type of assessment can be categorized as operational. Examples of these are the function of the Floor Operators. Their positions implement radiation safety for the beamlines. They are radiological workers on the ALS RWA and are charged with maintaining configuration control of the beamlines. They spend a large part of each shift walking by each beamline as a part of this verification.

Another example is the Experiment Setup Coordination unit. As part of their function, they also walk the floor and interact with the users and beamline scientists to verify the accuracy and effectiveness of the ESS.

The ES&H Program Manager performs risk- or compliance-based walkthroughs that focus on high hazard or high compliance risk functions. These include biweekly walkthroughs of the division's SAAs, inspection of any on-going ALS Work Permits, lead compliance plans, etc.

Supervisor Assessment

At the ALS, first-line supervisors spend a significant part of each day in the field working with their staff and evaluation of safety is integrated into this process.

Second-level and higher supervisors have gone through ALS specific training in performing effective safety walkthroughs. These are focused on work activities of their staff as opposed to physical inspections of the space. The goal is to develop the same rapport and relationship between supervisor and individual in safety as exists in the technical realm. Division management expects each of these supervisors to perform two of these walkthroughs each month and to document them in an on-line system that allows for tracking/trending.

Annual Self Assessment

All staff members participate in the annual self assessment. The first component is a survey. Each year a survey is composed that identifies the priority issues for ALS and asks for confirmation from each individual that he/she understands the policy. These are done concurrently with the annual PRD process. Supervisors review the information with their staff and then pass on to the ES&H Program Manager for review.

Second, the safety circle teams form QUEST inspection teams and perform a full walkthrough of all physical space. The purpose of this inspection is to identify safety issues associated with space. Their checklists are based on the LBNL self assessment criteria.

The third component of the self assessment is evaluation of the institutional criteria. Along with this is an evaluation of the goals from the previous year's self assessment.

A report is drafted and circulated first to the ALS Division Safety Committee and then to management for review and approval.

Independent Assessment

In addition to internal assurance functions, ALS participates fully in independent institutional assurance activities. These are identified below.

- Triennial Management of Environment, Safety and Health Assessment (MESH)

As required by the SRC, the Division will participate in the MESH review that evaluates management systems and implementation of ISM requirements. This review is run by the Safety Review Committee and typically includes representatives from the Office of Contract Assurance (OCA) and EH&S Division.

- Program Reviews

The EH&S Division is developing a program review process to examine specific safety topics in details. Examples would be laser safety, electrical safety and crane safety.