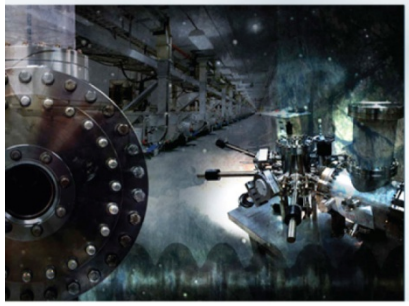
Thomas Jefferson National Accelerator Facility

Integrated Safety Management System Program Description

Revision 11
March 2008



Jefferson Lab
Thomas Jefferson National Accelerator Facility

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Revision and Approval

The Thomas Jefferson National Accelerator Facility Integrated Safety Management System (TJNAF ISMS) Program Description, Revision 11 (March 2008) is effective upon approval and issuance. It supersedes and replaces the previous TJNAF ISMS Program Description, Revision 10, dated December 2006.

Submitted by

Robert May
Acting, Associate Director, ESH&Q Division

Approved by

Christoph W. Leemann,
Director

Mike Dallas
Chief Operating Officer

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Acronyms and Abbreviations

AOD	Accelerator Operations Directives
ASE	Accelerator Safety Envelope
CATS	Corrective Action Tracking System
COO	Conduct of Operations
CFR	Code of Federal Regulations
DEAR	Department of Energy Acquisition Regulation
DOE	Department of Energy
DOE G	Department of Energy Guide
DOE M	Department of Energy Manual
DOE O	Department of Energy Order
DOE P	Department of Energy Policy
EA	Environmental Assessment
EMP	Environmental Management Procedures
EMS	Environmental Management System
ES&H	Environment, Safety and Health
ESAD	Experimental Safety Assessment Document
ESAF	Experiment Safety Approval Form
ESH&Q	Environment, Safety, Health and Quality
FEL	Free Electron Laser
FSAD	Final Safety Assessment Document
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
ISO	International Standards Organization
JSA	Jefferson Science Associates
LOD	Laser Operations Directives
MCC	Machine Control Center
NEPA	National Environmental Policy Act
ORPS	Occurrence Reporting and Processing System
OSP	Operational Safety Procedures
QA	Quality Assurance
RSAD	Radiological Safety Analysis Document
SOP	Standard Operating Procedures
SSP	Subcontractor Safety Plan
STOP	Safety Training Observation Program
TJNAF	Thomas Jefferson National Accelerator Facility
TJSO	Thomas Jefferson Site Office
TOSP	Temporary Operational Safety Procedures

Jefferson Lab Policy Statement
on
Environment, Safety, Health and Quality (ESH&Q)

Jefferson Lab considers no activity to be so urgent or important that we will compromise our standards for environmental protection, safety, or health. It is Jefferson Lab's policy to identify and meet all applicable ES&H laws, regulations, standards, and our contractual commitments to the Department of Energy.

Jefferson Lab performs these obligations by:

- Protecting the environment, preventing pollution, and ensuring the safety and health of staff, users, visitors and the surrounding community.

- Integrating safety management (ISM) principles in the planning and execution of all work including:

    - Defining the scope of work
    - Analyzing the hazards
    - Developing and implementing hazard controls
    - Performing work within controls
    - Providing feedback and continuous improvement

- Empowering JSA employees, subcontractors, and users with the responsibility and expectation - without reprisal - to stop work that endangers people, environment, property, or quality.

- Involving all levels of the organization in establishing ES&H objectives and targets.

- Integrate quality in all that we do and self-assess for continuous improvement.

Jefferson Lab makes this ESH&Q policy available to all stakeholders including JLab employees, subcontract employees, scientific users, other visitors, regulatory agencies, and members of the surrounding community.

7/14/06

Christoph W. Leeman — Date
President and Laboratory Director

Jefferson Lab

Introduction

In accordance with the Thomas Jefferson National Accelerator Facility (Jefferson Lab) operating Contract DE-AC05-06OR23177, clause I-100 implementing DEAR Clause 970.5223-1 -- Integration of Environment, Safety, and Health Into Work Planning and Execution (DEC 2000), this document describes the Integrated Safety Management System (ISMS), providing a formal, organized process to plan, perform, assess, and improve the safe conduct of work. Effective implementation of the ISMS will result in complete integration of safety, health, and environmental protection elements into all management and work practices.

This document satisfies the intent of Department of Energy (DOE) Policy 450.4, "Safety Management System Policy" and the Safety Management System requirements found in the documents identified in Figure 1, *Sources of Relevant Integrated Safety Management System Requirements,* below:

Document Number	Title
DOE O 226.1	*Implementation of Department of Energy Oversight Policy*
DOE O 414.1C	*Quality Assurance*
DOE G 414.1-2A	*Quality Assurance Management System Guide*
DOE O 450.1, Chg. 2	*Environmental Protection Program*
DOE G 450.3-2	*Attributes of Effective Implementation*
DOE G 450.3-3	*Tailoring for Integrated Safety Management Applications*
DOE M 450.4-1	*Integrated Safety Management Manual*
DOE P 450.4	*Safety Management System Policy*
DOE P 450.7	*Department of Energy Environment, Safety and Health (ES&H) Goals*
DEAR 970.5204-2	*Laws, Regulations, and DOE Directives*
DEAR 970.5223-1	*Integration of Environment, Safety and Health into Work Planning and Execution*
10 CFR 851	*Worker Safety and Health Program*

Figure 1 identifies the sources of relevant Integrated Safety Management System requirements.

More detailed information on how our contract obligations are related to Integrated Safety Management (ISM) can be found in Appendix A. Links to these documents and other references can be found in Appendix B.

Section 1 - Jefferson Lab Operating Framework

The Jefferson Lab operating Contract establishes the expectations that Jefferson Science Associates (JSA) will provide the scientific leadership needed to conduct world class science and technological innovation in support of the research program of the Office of Nuclear Physics and other research programs and missions authorized by DOE.

Meeting the responsibilities and accountabilities assigned to management based on the organizational hierarchy of JSA (Figure 2 –*Jefferson Lab Management Organization Chart*) assures the protection and proper maintenance of DOE research and information assets, the health and safety of workers, the public, and the environment. Line organizations, support organizations, and employees are responsible and accountable for focusing Jefferson Lab resources to achieve DOE's strategic goals and providing objective evidence of performance and continual improvement as work is executed.

Jefferson Lab's approach to ISM is to integrate key concepts and requirements into the programmatic infrastructure and then to reinforce these concepts and requirements with site personnel during the conduct of day-to-day activities until it becomes a transparent part of the operating culture. This in turn will provide a day-to-day safety, health, and environmental awareness into the working environment and provide for the continuous input to improve the conduct of work activities. This strategy involves key management systems translating the full set of relevant external requirements into policies, procedures, and plans for staff to follow to perform their work combined with consistent reinforcement by management. Appendix C documents Jefferson Lab management systems comprising the ISMS Program.

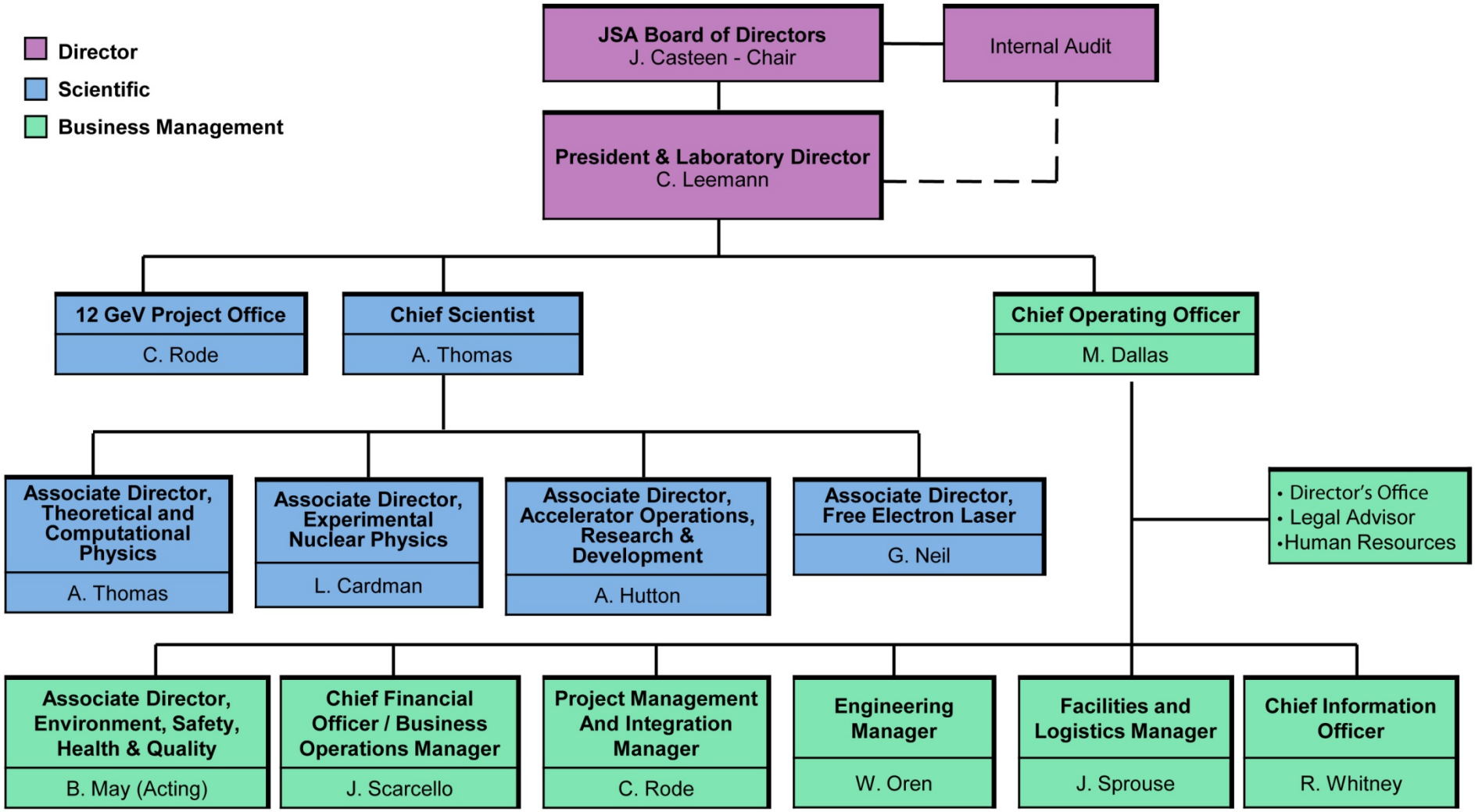

Figure 2 represents the Jefferson Lab Management Organization Chart

Section 2 - Mapping Jefferson Lab's Operating Framework to DOE's Integrated Safety Management System

The DOE Safety Management System establishes a hierarchy of components to facilitate the orderly development and implementation of safety management throughout the DOE complex. The safety management system consists of six components: 1) the objective, 2) guiding principles, 3) core functions, 4) mechanisms, 5) responsibilities, and 6) implementation. The objective, guiding principles, and core functions of safety management are used consistently in implementing safety management throughout the DOE complex. The mechanisms, responsibilities, and implementation components are established for all work and will vary based on the nature and hazard of the work being performed. This section discusses each component and provides roadmaps and examples of how each component is built into how work is planned and executed at Jefferson Lab.

2.1 Component 1: Objective

DOE Policy 450.4 provides the overall objective of an Integrated Safety Management System:

The Department and Contractors must systematically integrate safety into management and work practices at all levels so that missions are accomplished while protecting the public, the worker, and the environment. This is to be accomplished through effective integration of safety management into all facets of work planning and execution. In other words, the overall management of safety functions and activities becomes an integral part of mission accomplishment.

Jefferson Lab fully endorses the components of the DOE Policy as a sound methodology for effectively attaining integrated safety management. The goal of the Jefferson Lab ES&H program is to full satisfy this objective.

2.2 Component 2: Guiding Principles

In order to accomplish the ISMS Objective as stated in Component 1, DOE has articulated seven principles to be followed as the components of the system are designed and implemented. These guiding principles are reflected in the Laboratory's programmatic infrastructure that workers utilize in fulfilling environment, safety and health responsibilities. Figure 3 summarizes these "Guiding Principles" and provides examples of how they are translated throughout Jefferson Lab's policies and activities. This figure is not intended to show every link between ISM Guiding Principles and our activities, only to demonstrate that the Guiding Principles are reflected in various ways.

Guiding Principles	Example Implementation Methods
(1) Line Management Responsibility for Safety Line management is directly responsible for the protection of the public, workers, and the environment.	➢ Responsibilities are articulated in the *ES&H Manual Section 2210*[2]*, ESH&Q Rights and Responsibilities of Individuals*[3]. ➢ Expectations for safety program implementation are incorporated into all Line Management's individual performance objectives.
(2) Clear Roles and Responsibilities Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels.	➢ Roles and responsibilities are articulated in the *ES&H Manual Section 2210, ESH&Q Rights and Responsibilities of Individuals*. ➢ Roles and responsibilities for scope of work development, hazard analysis, and control implementation and work authorization are outlined in our various work planning and execution tools such as the electronic work authorization protocols (ATLis, FEList, TATLs, etc.) and the Experiment Review Process.
(3) Competence Commensurate with Responsibilities Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.	➢ Minimum competence is identified in position descriptions and additional competence is determined as responsibilities are assigned. ➢ Individual training records are centrally located. ➢ Automatic reminders are provided to line management when assigned personnel's training has elapsed. ➢ Standard Operating Procedures (SOPs), Temporary Operational Safety Procedures (TOSPs), and other guidance documents require specific training prior to work initiation.
(4) Balanced Priorities Resources shall be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers, and the environment shall be a priority whenever activities are planned and performed.	➢ ESH&Q Division budgets installation-wide activities based on contractual requirements, lessons learned, and industry best-practices. ➢ Line organizations develop an independent safety budget reflecting their activities. ➢ Annual Work Planning process ensures proper resources will be available.
(5) Identification of Safety Standards and Requirements Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards and requirements shall be established which, when properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences.	➢ All safety standards and requirements are identified in *Contract DE-AC05-06OR23177*[4]. ➢ "Flow Down" of all contractual requirements occurs during all procurement activities. ➢ All work planning and authorization processes include a safety requirements identification step.

Guiding Principles	Example Implementation Methods
(6) Hazard Controls Tailored to Work Being Performed Administrative and engineering controls to prevent and mitigate hazards shall be tailored to the work being performed and associated hazards.	➢ The Final Safety Assessment Document (FSAD) analyzes hazards and establishes safety envelopes for the accelerator, FEL and associated research. This document informs all lower level operational procedures. ➢ Jefferson Lab work planning and execution processes and tools governing activities of Jefferson Lab employees, subcontractors, and the user community (ATLis, TATLs, FEList, Experiment Review Process, subcontract specifications) all require appropriate hazard prevention and mitigation measures be designed into all work activities.
(7) Operations Authorization The conditions and requirements to be satisfied for operations to be initiated and conducted shall be clearly established and agreed-upon.	➢ Authorization documents such as the ASE and the FSAD outline conditions for safe operations of our major systems. Other activities, governed by work planning and execution mechanisms, such as ATLis, also require that hazard controls have been designed and placed prior to initiation of activities.

Figure 3 summarizes the guiding principles that guide ISMS activities and examples of how these principles are reflected in Jefferson Lab programmatic infrastructure.

2.3 Component 3: Core Functions

The DOE's expectation is to apply an Integrated Safety Management System that is implemented throughout the cycle of translating broad Jefferson Lab missions into specific items of work conducted throughout the laboratory. Five areas of emphasis, termed "core functions", have been developed as the building blocks of a successful ISMS. The activities described in each core function are integrated into the planning and execution of all work activity that could potentially adversely affect the workers, the public, or the environment.

Individual organizations within Jefferson Lab have developed mission translation, work planning and work execution practices and tools that are tailored to their activities and structure. Despite the differences in tools and terminology, the five core functions are represented in each specific process.

Figure 4 summarizes the various work planning and execution tools utilized at Jefferson Lab and where each of the core functions are executed within each tool.

CORE FUNCTION 1, DEFINE SCOPE OF WORK
Each work planning and execution tool, regardless of the implementing organization, has a well-defined process to identify the nature of the required work, the schedule, and the costs of the activities. The level of detail of the scope of work varies in relation to its complexity and

potential risks. In all cases, multi-disciplined teams are used to create, or review, the scope of work documents and workers are involved in the planning processes.

CORE FUNCTION 2, ANALYZE THE HAZARDS

The second grouping of activities depicted in Figure 4 is the mechanisms used within each process to identify and categorize work-related hazards and develop an understanding of the potential for the hazard to adversely affect the health and safety of the worker, public, or the environment. This hazard analysis process can vary in complexity based on activity type, hazard type, and hazard parameters; and builds upon previous analyses conducted on tasks ranging from routine facility maintenance to accelerator and laser operations. Multi-disciplined teams are used with emphasis on identifying subject matter experts with significant Jefferson Lab experience.

CORE FUNCTION 3, DEVELOP AND IMPLEMENT HAZARD CONTROLS

During this next step of each process, parameters of the identified hazards are used to select or design engineering, administrative, and personal protective equipment controls and pollution prevention/waste minimization options to be integrated with the work activity. The type of control to be specified is tailored to the work activity and the associated hazards. In most cases, the controls are based on best practices and lessons learned gained from previous, similar activities as captured in the *Jefferson Lab's ES&H Manual* and Jefferson Lab Standard Operating Procedures. Some work activities may require unique controls, which are typically documented in Temporary Standard Operating Procedures, activity-specific safety plans, and/or delivered to workers through specific training activities. In all cases, site-wide ES&H requirements and industry standards are identified; mechanisms are put in place to satisfy the requirements; and the controls are documented in work authorization documents.

CORE FUNCTION 4, PERFORM WORK WITHIN CONTROLS

Each work process has a defined authorization protocol for concluding that Core Functions 1-3 have been satisfied, and establishes defined roles and responsibilities for authorizing work to proceed in accordance with identified controls. Additionally, each work planning and execution tool assures that the hazards and controls are discussed with all workers prior to commencing work; that the controls will remain in place for the duration of the activity; and that all workers are qualified to participate in the activity.

CORE FUNCTION 5, PROVIDE FEEDBACK AND CONTINUOUS IMPROVEMENT

Lessons learned are collected and shared to improve the performance of the ISMS. Jefferson Lab has established lessons learned collection, evaluation, and communication tools which are available to all site organizations and employees. The routine activities of the Worker's Safety Committee are one example of a lab-wide mechanism. Organizations or groups within organizations have additional tools and meetings that best support their activities and work tempo. In all cases, routine and non-routine events and ISMS performance is discussed and documented so the results are available for future planning activities.

Organization	FEL		ACCELERATOR			PHYSICS	F&L	
Activity / Work Planning Process	***FEList***	***Experiment Review Process (ES&H Manual Chapter 3130)***	***Operations***	***Maintenance (ATLis)***	***SRF (TATLs)***	***Experiment Review Process (ES&H Manual Chapter 3120)***	***Subcontractor / Materials Procurement***	***Balance of Lab***
(1) Define the Scope of Work	FEList Task Description	Independent Investigator Proposal	Program Advisory Committee / Experimental Schedule	ATLis Task Entry	TATLs Task Description	Program Advisory Committee / Experimental Schedule	Work Order or Subcontractor Specifications	Worker Health and Safety Protection Program, Radiation Protection Program, Contractual Compliance Documents, Subcontractor Specifications
(2) Analyze the Hazard	FEList Hazard ID Checklist / ES&H 3210	Laser Operations Directives, Experiment Safety Approval Form	Accelerator Operations Directives (AOD)	ATLis Hazard ID Checklist / ES&H 3210	TATLs Hazard ID Checklist / ES&H 3210	Conduct of Operations, Experiment Safety Assessment Document, Radiation Safety Assessment Document	ES&H 3410 and 3420	ES&H 3210, 3410 and 3420
(3) Develop and Implement Hazard Controls	*Develop Controls* - *ES&H 3210* *Implement Controls* - SOPs, OSPs, TOSPs, training	*Develop Controls* - *LOD, ESAF, ES&H 3210* *Implement Controls* - *ESAF,* SOPs, OSPs, TOSPs, training	*Develop Controls* - AOD *Implement Controls* - SOPs, training	*Develop Controls* - *ES&H 3210* *Implement Controls* - SOPs, OSPs, TOSPs, training	*Develop Controls* - *ES&H 3210* *Implement Controls* - SOPs, OSPs, TOSPs, training	*Develop Controls* - COO, ESAD, RSAD, ES&H 3210 *Implement Controls* - SOPs, OSPs, TOSPs, training	*Develop Controls* - Subcontractor Safety Plan (SSP) *Implement Controls* - SSP, SOPs, OSPs, TOSPs	*Develop Controls* - ES&H 3210, Subcontractor Safety Plan *Implement Controls* - SSP, SOPs, OSPs, TOSPs
(4) Perform Work Within Controls	FEList File Approval and Implementation;	FEL Operation Plan Approval and Implementation	Shift Plan Approval and SOP Implementation	ATLis File Approval and Implementation	TATLs File Approval and Implementation	Experiment Readiness Clearance and SOP Implementation	Task Hazard Analysis/SSP Approval and Implementation	Daily Work Plan Approval
(5) Provide Feedback and Continuous Improvement (Activity Level)	Daily Planning Meeting, Peer Reviews, FEList Comments, FLOG	Daily Planning Meeting, Peer Reviews, FEList Comments, FLOG	Daily Planning Meeting, Weekly Meeting, On-line Forum, Various e-logs	Daily Planning Meeting, Weekly Meeting, On-line Forum, Various e-logs	Daily Planning Meeting, Weekly Meeting, On-line Forum, Various e-logs	Daily Planning Meeting, Weekly Meeting, On-line Forum, Various e-logs	Pre-job Meetings, Daily Planning Meetings, Post-job Closeout	Pre-job Meetings, Daily Planning Meetings, Post-job Closeout
(5) Provide Feedback and Continuous Improvement (Lab Wide)	Safety Warden Area Inspections, ESH&Q self-assessments, STOP, CATS, ORPS, Work Observations, Workers Safety Committee, Director's Safety Council, INSIGHT Webpage, DOE Corporate Lessons Learned Database	Safety Warden Area Inspections, ESH&Q self-assessments, STOP, CATS, ORPS, Work Observations, Workers Safety Committee, Director's Safety Council, INSIGHT Webpage, DOE Corporate Lessons Learned Database	Safety Warden Area Inspections, ESH&Q self-assessments, STOP, CATS, ORPS, Work Observations, Workers Safety Committee, Director's Safety Council, INSIGHT Webpage, DOE Corporate Lessons Learned Database	Safety Warden Area Inspections, ESH&Q self-assessments, STOP, CATS, ORPS, Work Observations, Workers Safety Committee, Director's Safety Council, INSIGHT Webpage, DOE Corporate Lessons Learned Database	Safety Warden Area Inspections, ESH&Q self-assessments, STOP, CATS, ORPS, Work Observations, Workers Safety Committee, Director's Safety Council, INSIGHT Webpage, DOE Corporate Lessons Learned Database	Safety Warden Area Inspections, ESH&Q self-assessments, STOP, CATS, ORPS, Work Observations, Workers Safety Committee, Director's Safety Council, INSIGHT Webpage, DOE Corporate Lessons Learned Database	Safety Warden Area Inspections, ESH&Q self-assessments, STOP, CATS, ORPS, Work Observations, Workers Safety Committee, Director's Safety Council, INSIGHT Webpage, DOE Corporate Lessons Learned Database	Safety Warden Area Inspections, ESH&Q self-assessments, STOP, CATS, ORPS, Work Observations, Workers Safety Committee, Director's Safety Council, INSIGHT Webpage, DOE Corporate Lessons Learned Database

Figure 4 summarizes the work initiation/planning/execution process used by the various work initiators at Jefferson Lab. Each individual step is correlated to an ISMS Core Function.

2.4 Component 4: Integrated Safety Management Mechanisms

Safety management mechanisms define how the core safety management functions are applied at Jefferson Lab based on the specific activities being performed, the associated hazards and work, and performance expectations.

- DOE expectations for how the core functions are to be performed are conveyed to Jefferson Lab through DOE Directives and contract clauses:

  DOE Policy 450.4 (1996) Safety Management System Policy
  Describes the components of a Safety Management System that will be implemented from DOE Headquarters down to every day work elements.

  DOE Policy 226.1 (2005) Department of Energy Oversight Policy
  Describes the components of an oversight system that ensures compliance, identifies and corrects deficiencies, and tracks corrective actions associated with Integrated Safety Management Systems.

  Other key ES&H requirements:
  10 CFR 851 (Worker Safety and Health), 10 CFR 835 (Radiation Protection for Occupational Workers), 29 CFR 1910 (Occupational Safety and Health Standards), etc.

  Department of Energy Acquisition Regulation (DEAR) Clauses:
  DEAR 970.5204-2 Laws, Regulations and DOE Directives; DEAR 970.5223-1 Integration of Environmental Safety and Health Into Work Planning and Execution.

- Policies, procedures and other documents in the programmatic infrastructure contain the expectations for how site personnel are to implement the ISM core functions and principles, fulfill commitments made to DOE, and meet DOE expectations. Figure 4 summarizes many of the ISMS mechanisms that are relied upon to ensure that work is properly described, hazards are identified and controlled, and feedback is collected. Each individual step of the various work planning and authorization tracks depicted in Figure 4 represent a prescribed action, process, or activity that supports the overall system. For example, the FEL Experiment Review Process ensures that work hazards are identified by correctly utilizing the Environmental Safety Approval Form (the mechanism).

Other mechanisms are routinely relied upon to support the ISMS but do not appear in Figure 4. Examples of these include individual training plans, which specify and track completion of required training site access and work authority, and the annual work planning process, which ensures proper resources are assigned to ISMS implementation functions. Together, this inter-related set of mechanisms work to ensure the core functions are applied to all work activities.

2.5 Component 5: Responsibilities for Integrated Safety Management

In order to be successful, the ISMS must have clear and unambiguous lines of authority and responsibility for ensuring that safety, environmental, and health protection shall be established and maintained at all organizational levels. These roles and responsibilities are defined in several ways.

- Jefferson Lab roles and responsibilities for the overall ISMS are defined in our contract, regulations, and Jefferson Lab programmatic infrastructure documents.

- Work planning and authorization protocols are established from the Lab Director down to the most basic work activities. These protocols are established in Jefferson Lab policies and procedures, applying a risk-based graded approach.

2.6 Component 6: Implementation of Integrated Safety Management

The ISMS mechanisms are implemented at Jefferson Lab, beginning with the Annual Work Plan and ending with individual work activities through existing procedures, plans, and policies on a risk-based graded approach. Implementation of ISM at Jefferson Lab begins at the lab-wide level by:

- Identifying the governing requirements, customer expectations, and responsibilities that must be fulfilled in the management and operation of laboratory activities. This step results in the "umbrella" of standards encompassing Jefferson Lab activities that include applicable DOE Directives, laws, regulations, contractual requirements, and industry standards.

- Developing Jefferson Lab programmatic infrastructure based on the "umbrella" of governing requirements and expectations, to guide work activities and ensure responsibilities and commitments are established.

These two steps, performed on a continuous cycle, form the foundation of the ISMS at the institutional, facility and activity level.

Section 3 – Supplemental Safety Culture Elements

The DOE has identified for use and Jefferson Lab has incorporated into its ISMS the following four supplemental safety culture elements to be used, along with the existing ISM guiding principles, to help develop the appropriate context or environment for effective implementation of ISM systems.

- Individual Attitude and Responsibility for Safety
- Operational Excellence

- Oversight for Performance Assurance
- Organizational Learning for Performance Improvement

3.1 Individual Attitude and Responsibility for Safety

Each Jefferson Lab employee is expected to accept personal responsibility and accountability for safe operations. Individuals are encouraged to demonstrate a questioning attitude by challenging assumptions, finding the facts for themselves, and considering potential adverse consequences of planned activities. The ISMS is enhanced by employees at all levels actively participating in the decisions that affect personnel health, safety, and impacts on the environment.

As is described in more detail within this document, and as specifically discussed in the *Jefferson Lab Worker Safety and Health Protection Program*[5] *and Jefferson Lab ES&H Manual*, strong worker involvement is a key element in the implementation of the Jefferson Lab safety and health program. The *Jefferson Lab ES&H Manual* defines the processes and establishes the management support systems necessary to incorporate significant worker involvement.

Other areas where worker involvement and individual attitude and responsibility for safety are key aspects of the Jefferson Lab ISMS are in the identification of hazards associated with work activities and during the performance of basic and applied research. Jefferson Lab processes for work planning and control rely on active worker involvement (including pre-job walk downs, hazard identification and assessment of work, and identification of mitigation measures) to ensure that the staff involved with the activities understand the hazards, the specified controls, and management expectations for working safely. By rewarding worker involvement, employees are mindful of work conditions that may affect safety and are encouraged to assist a fellow worker in preventing an unsafe behavior.

3.2 Operational Excellence

Jefferson Lab sustains high levels of operational performance in science and technology, safety, quality, and environmental protection. This performance posture is achieved through open communication, deference to expertise, and a systematic approach to eliminating unsafe conditions, accidents, injuries, and errors.

Typical tools used to support this performance include tool box meetings, electronic log books (maintained for ES&H issues and Accelerator operational issues), the Machine Control Center (MCC) Scheduling Whiteboard, Run Coordinators Weekly Summary, run plans, Interlock Inhibit Log, Program Deputy Shift Plans, and the Hall A/B/C and Accelerator Operability report.

3.3 Oversight for Performance Assurance

Competent and independent oversight is an essential source of feedback to management. This oversight verifies that expectations are being met and the resultant feedback identifies opportunities for improvement. Some examples of how Jefferson Lab meets this expectation include:

- Self-assessment plans are prepared to ensure a base level of relevant management processes are reviewed.
- Line managers throughout Jefferson Lab participate in oversight activities and associated performance improvement through the self-assessment process, work activity safety observations, and workplace inspections.
- Senior management personnel participate in Director's Safety Council meetings during which oversight activities are addressed to gain insight into organizational performance and to determine needed corrective action.
- Internal and independent assessments of the ISM Program are used to identify opportunities for improvement.

The *Self and Independent Assessment Schedule*[6]*, 2006 Independent ISM Assessments*[7]*, Safety Training Observation Program (STOP) data analyses*[8], and the *data analyses from the Safety Behavior Observation Program*[9] are discrete examples of Jefferson Lab programmatic mechanisms for management feedback and opportunities for improvement.

3.4 Organizational Learning for Performance Improvement

Jefferson Lab demonstrates excellence in performance monitoring, problem analysis, and solution implementation. Management personnel encourage openness and trust and cultivate a continuous learning environment. Jefferson Lab organizations actively and systematically monitor performance and identify opportunities for improvement through:

- Management and Safety Warden inspections,
- Issue reporting,
- Performance indicators,
- Trend analysis,
- Self-assessments, and
- Lessons learned process.

Corrective and improvement action programs are in place to solve safety issues identified during performance monitoring and problem analyses. The *Corrective Action Tracking System*[10] used to facilitate this activity can readily track action items that result from the performance of inspections, assessments, and audits.

Section 4 – Integration of Other Jefferson Lab ESH&Q Programs with ISM

4.1 Quality Assurance

The Jefferson Lab Quality Assurance (QA) Program is implemented through the same management systems that support the ISMS Program deployment. Therefore, quality applicable aspects and requirements are seamlessly integrated into Jefferson Lab's work practices common

to both the Quality and ISMS programmatic expectations. Risk is the fundamental consideration in determining to what extent the Jefferson Lab Quality Assurance Program will apply to mission and financial management. Through planned and periodic administrative and/or performance-based management assessments, the Quality Assurance and Continuous Improvement organization has the freedom necessary to identify problems, to conduct objective evaluations of adequacy and effectiveness, and to recommend solutions. The relationship between *the Jefferson Lab Quality Assurance Program Plan*[11] and the ISM core functions and guiding principles is depicted in Appendix D.

4.2 Environmental Management System

The purpose of the Jefferson Lab Environmental Management System (EMS) is to achieve, maintain, and demonstrate environmental excellence by assessing and controlling the impact of Jefferson Lab experiments, facilities, and operations on the environment. The Jefferson Lab EMS described in the *Environmental Management System Plan*[12] (Rev 4, February 2007) defines the management process used to assist employees in complying with environmental requirements, preventing pollution, minimizing waste, and continually improving environmental performance through all facets of Laboratory operations. The EMS is based on the continuous improvement model of plan-do-check-act. Appendix D schematically depicts the relationship of the Jefferson Lab's EMS Program and the Jefferson Laboratory's QA Program with relation to the ISM Core Functions and Guiding Principles.

The ISO 14001 compliant Jefferson Lab EMS is comprised of a four tier hierarchy of documents:

- Level I EMS Plan – Describes the core elements of the Jefferson Lab's EMS and broadly states how Jefferson Lab will meet the EMS requirements.
- Level II Environmental Management Procedures (EMPs) – Relatively brief procedures that describe how Jefferson Lab management will meet the EMS requirements.
- Level III Standard Operating Procedures (SOPs) – *ES&H Manual* documents to include Lab-wide procedures as well as Division and Department SOPs being managed under their respective organizational issuer. These documents include specific how-to instructions that inform an operational-level person how to perform a specific task associated with the EMS.
- Level IV – Related documents and records that support the EMS (e.g., topic specific plans, training records, and inspection certifications).

Implementation of the management processes defined within the EMS, Jefferson Lab's environmental protection program ensures that lab operations comply with environmental regulations and contract commitments.

Section 5 – 12GeV Road Map for ISM Implementation

The 12GeV upgrade project is a significant effort involving major Jefferson Lab infrastructure and systems but is in the design phase. The 12GeV Project Team is applying the Guiding

Principles and Core Functions to design activities (such as analyzing hazards and designing hazard controls), where applicable. The table in Appendix E summarizes this relationship. Project construction and operations will follow established work planning and control paths as described in Section 2 of this document.

Section 6 - ISM Performance Measurement System Description Maintenance and Continuous Improvement

6.1 ISM Annual Safety Performance Objectives, Measures and Commitments Process

Performance measures are established through the performance evaluation measurement program (PEMP.) The PEMP is monitored regularly and formal reports are provided to TJSO quarterly with an annual review. PEMP metrics are monitored through electronic mechanisms, where available, and results and progress posted to JLab Insight. Performance is also evaluated through the Assessment Program, Work Observation Program, and incorporating Lessons Learned into Work Planning.

In addition performance is measured and evaluated by periodic trend analysis using data and information from the site AQIS/CATS system, Work Observation Database, and monitoring of Lessons Learned. Trends and Performance status are shared with the senior lab organization as part of the Director Safety Council and Senior Leadership Council meetings.

6.2 ISM System Description Maintenance and Continuous Improvement

Jefferson Lab's Associate Director for Environment Safety, Health and Quality (ESH&Q) has been assigned responsibility for providing leadership for implementation and constant improvement of JLab's Integrated Safety Management System. This responsibility is considered when developing the organizations mission, goals and budget during JLab's Annual Work Planning (AWP) process.

JLab conducts an Annual Effectiveness Review on the ISMS. During this review, our ISM and ESH&Q subject matter experts review and consider the following:

- Mission or operational changes – any changes to our mission(s), operations or special research activities are evaluated with respect to impacts on the ISMS.
- Organizational changes – changes are evaluated with respect to ISM roles and responsibilities.
- ES&H trends – our performance with respect to protecting the public, workers and environment is analyzed and improvements are identified.
- Internal and external assessment results – JLab conducts numerous assessments, including hundreds of work observations throughout the year and uses these assessments to identify improvements to how we do work.

- Internal and external lessons learned – lessons learned and best practices, collected internally through our various feedback mechanisms, as well as lessons learned and best practices collected from numerous sources outside the laboratory.
- Revisions to safety measures and goals – a detailed review of our performance against internal measures and goals and industry standards and best practices is conducted.
- Best practices – we review other ISM Program Descriptions to identify improvements to ours and collect information at industry and DOE conferences.

This information is then used to improve our ISMS, and the Program Description is revised to address identified weaknesses and reflect changes. The Program Description revision (draft) is then distributed to senior JLab management, the Director's Safety Council, and various committees made up of JLab employees such as the Workers Safety Committee and the Environmental Management System Committee. Feedback from all of these groups is used to develop the next revision for Site office review.

Although we strive to continuously improve our safety culture and implementation of ISM through our Annual Effectiveness Review, JLab has made a significant investment in our ISMS since the last revision of this document. We have made the use of independent and management self assessments to take a critical look at how we plan, execute and control work throughout the lab and identified numerous ways to improve our practices. These programmatic improvements, reflecting in revised policies, manuals and procedures, are on-going. We have also focused on increased communication of ISM to our employees. ISM specific training is being developed and an ISM specific webpage has been developed to share information, answer questions and collect lesson learned.

Section 7 - Conclusion

Jefferson Lab has developed and implemented an Integrated Safety Management System that effectively weaves safety into the fabric of daily operations; thereby ensuring the safety and health of all employees as well as the user community, and protection of the public and environment. In our quest for continuous improvement in all aspects of work, Jefferson Lab will continue to identify safer and more efficient ways to conduct business. Consequently, changes in work processes, equipment, and training will continue to emerge; and modifications to this document will reflect those methods that evolve to improve the Jefferson Lab ESH&Q Program.

Appendix A - DOE Integrated Safety Management Contract Obligations

Approval of this document by DOE Thomas Jefferson Site Office (TJSO) indicates that the DOE agrees with Jefferson Lab's institutional methods and processes to meet the requirements of DEAR 970.5223-1 Integration of Environment, Safety, and Health into Work Planning and Execution (DEC 2000), in accordance with the operating Contract. Where Jefferson Lab states that it directs, runs, controls, coordinates, supports, or otherwise participates in an activity, it is understood that the participation is in accordance with and at the level authorized by the operating Contract.

It is incumbent on Jefferson Lab to demonstrate continuous improvement of the ISMS program and to comply with contract requirements DEAR 970.5223-1. Specifically, the current contract clause states:

- DEAR 970.5223-1 Integration of Environment, Safety and Health into Work Planning and Execution (e): *"The contractor shall submit to the contracting officer documentation of its System for review and approval. Dates for submittal, discussions, and revisions to the System will be established by the contracting officer. Guidance on the preparation, content, review, and approval of the System will be provided by the contracting officer. On an annual basis, the contractor shall review and update, for DOE approval, its safety performance objectives, performance measures, and commitments consistent with and in response to DOE's program and budget execution guidance and direction. Resources shall be identified and allocated to meet the safety objectives and performance commitments as well as maintain the integrity of the entire System. Accordingly, the System shall be integrated with the contractor's business processes for work planning, budgeting, authorization, execution, and change control."*

The Laboratory meets the DEAR 970.5223-1 Integration of Environment, Safety and Health into Work Planning and Execution (e) requirement through the ISMS Program Description which serves as the DOE-approved Safety Management System. The program description is reviewed annually and updated as needed when program elements or the operating environment of the Laboratory change. Interim modifications will be coordinated with the signatories of the document. Editorial changes will be made when necessary, an updated copy of the document will be transmitted to the signatories, and the revision maintained on the Jefferson Lab web site.

Appendix B - References

Reference #	Reference	Internet Web Address
1	Jefferson Lab Policy Statement on Environment, Safety, Health and Quality	http://www.jlab.org/div_dept/dir_off/oa/QAMP.pdf
2	Jefferson Lab Environment, Safety and Health Manual	http://www.jlab.org/ehs/manual/EHSbook.html
3	Jefferson Lab ES&H Division Roles and Responsibilities	(http://www.jlab.org/ehs/ehs_roles.pdf)
4	Thomas Jefferson National Accelerator Facility Contract	http://www.jlab.org/intralab/contracts/index.html
5	TJNAF 10 CFR 851 Worker Safety and Health Protection Program (WSHPP)	http://www.jlab.org/ehs/WSHPProgramFinal0507.pdf
6	Self and Independent Assessment Schedule	https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-14952/FY07%20Assess%20Sched%20FINAL%20R13.pdf
7	2006 Independent ISM Assessment	http://www.jlab.org/div_dept/dir_off/oa/IA_ISMS_Nov06.pdf,
8	STOP Data Analysis Results	https://jlabdoc.jlab.org/docushare/dsweb/View/Collection-1424
9	Safety Behavior Observation Program	https://www1.jlab.org/mis/apps/ehs/safety_observations/
10	Corrective Action Tracking System	https://mis.jlab.org/ehs/index.php
11	Jefferson Lab Quality Assurance Program Plan	http://www.jlab.org/div_dept/dir_off/oa/QAMP.pdf
12	Environmental Management System Plan	https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-13107/EMSPlanMarch06.pdf
13	Jefferson Lab Contractor Assurance System Program Description	https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-17443/DOE226.1.pdf,

Appendix C- Jefferson Lab Management Systems Comprising the ISMS Program

Management System Activity	Organizational Participant (* Lead)
Acquisition and Property *Maintains the processes for the purchase and delivery of services, materials, equipment, and supplies as well as lifecycle property management for Jefferson Lab operation.*	Facilities and Logistics* Chief Operating Office - Contracts - Procurement
Environmental *Maintains and supports an Environmental Protection Program to demonstrate environmental excellence by assessing, minimizing, and controlling the impact of Laboratory activities; research and development (R&D) projects; and facility operations on the environment, public, and employee health and safety.*	ESH&Q Division - Environmental*
Facility Management *Supports the work of the Laboratory by: planning and forecasting facility needs; acquiring and constructing new facilities to meet emerging needs; operating, maintaining, and renewing the facility portfolio; disposing of facility and land assets that are excess to need; and providing a set of core and purchased staff services.*	Facilities and Logistics* Accelerator Operations*
Facility Safety *Management systems and technical support services that are provided to technical group, technical resource, facility, and project managers, as well as research and support staff of the Laboratory. Facility Safety encompasses the development, maintenance, and operation of systems designed to support the effective and efficient implementation of facility safety requirements. The technical support service is executed by a staff of fire protection, mechanical, electrical, and chemical engineers who provide assistance to the organizations they support.*	Engineering Division* Accelerator Division
Financial Management *Supports the life cycle of a project and the business management process while meeting external requirements of DOE, and taxing and regulatory entities.*	Financial and Business Operations* Chief Operating Office - Internal Audit
Human Resources *Supports the Lab by developing and implementing programs, processes, and policies that enable the Lab to attract, hire, develop, compensate, and reward highly qualified human assets within the guidelines of applicable labor agreements and federal and state laws and/or guidelines. The Human Resource Management System has six components: workforce planning; benefits administration; employee programs, training, development, and education; performance management and rewards; labor relations; and Human Resources Information Resource.*	Chief Operating Office - Human Resources*

Management System Activity	Organizational Participant (* Lead)
Quality *Maintains the Jefferson Lab Quality Assurance Program, identifies processes and tools for self- assessment evaluations (e.g., critiques, peer reviews, staff concerns, independent oversight, internal audit), and supports effective and efficient continuous improvement (e.g., Assessment Closure [Corrective Action Management], Lessons Learned and Best Practices, Price-Anderson Amendment Act, Suspending Work Activities).*	ESH&Q Division - Quality Assurance and Continuous Improvement*
Project Management *Supports the Laboratory's project management requirements by providing applicable processes and tools for meeting established project goals in terms of technical scope, schedule, and budget. The Project Management System provides staff with the tools needed to plan, organize, manage, and control projects to meet schedule and budgetary constraints.*	Project Management and Integration*
Radiological Control *Maintains a Radiological Control Program to protect staff from unnecessary exposure to ionizing radiation, protect facilities and equipment from contamination with radioactive materials, and promote compliance with applicable regulatory and contractual requirements.*	ESH&Q Division - Radiological Control* - Radiological Protection Program
Safeguards, Security and Emergency Preparedness *Maintains preparedness and serves as a resource to line management for emergency and security preparedness activities.*	ESH&Q Division Chief Information Office Facilities and Logistics
Training and Qualification *Maintains an integrated and effective training system that supports Laboratory managers and management system owners with training and qualification activities needed for staff, visitors, and contractors to perform their assigned work.*	Chief Operating Office Experimental Nuclear Physics Theoretical Computational Physics Accelerator Operations Free Electron Laser Facility
Worker Safety and Health *Supports line and operations management in providing a safe and healthful workplace for all employees, visitors, vendors, and subcontractors. The management system addresses the identification, evaluation, and control of hazards in the workplace by providing direct technical assistance to those conducting work. This includes line, facility, and project managers as well as all staff.*	ESH&Q Division - Health and Safety Programs* - Occupational Medicine*
Science and Technology *Researchers performing research at Jefferson Lab carry out basic and applied research, develop advanced technologies, and disseminate technical knowledge.*	Experimental Nuclear Physics Theoretical Computational Physics Accelerator Operations Free Electron Laser Facility

Appendix D – Integration of ISM with other Jefferson Lab ESH&Q Programs

ISM Guiding Principle/ Core Function	Jefferson Lab Quality Assurance Program Plan Criteria	Jefferson Lab Environmental Management System Elements (ISO 14001)
Guiding Principle 1 **Line Management Responsibility for Safety; and** ***Guiding Principle 2*** **Clear Roles and Responsibilities**	Management Program Personal Qualification and Certification Training Quality Improvement Documents and Records Work Processes Control of Purchased Items and Services Inspection & Acceptance Testing Management Assessment Independent Assessment	General Requirements Environmental Policy Organizational Planning - Environmental Aspects - Legal and other Requirements Implementation and Operation - Resources, Roles, Responsibilities, Authorities, and Accountabilities
Guiding Principle 3 **Competence Commensurate with Responsibilities**	Management Program Personal Qualification and Training Quality Improvement Documents and Records Work Processes Control of Purchased Items and Services Inspection & Acceptance Testing Management Assessment	Implementation and Operation - Resources, Roles, Responsibilities and Authorities - Competence, Training, and Awareness
Core Function 1 **Define the Scope of Work; and** ***Guiding Principle 4*** **Balanced Priorities**	Management Program Personal Qualification and Training Quality Improvement Documents and Records Work Processes Control of Purchased Items and Services Inspection & Acceptance Testing Independent Assessment	Organizational Planning - Environmental Aspects - Legal and other Requirements - Objectives, Targets, and Programs Implementation and Operation - Communication - Documentation - Control of Documents
Core Function 2 **Analyze the Hazard**	Management Program Personal Qualification and Training Documents and Records Design	Implementation and Operation - Documentation - Control of Documents
Core Function 3 **Develop and Implement Hazard Controls;** ***Guiding Principle 5*** **Identification of Safety Standards and Requirements, and** ***Guiding Principle 6*** **Hazard Controls Tailored to Work Being Performed**	Management Program Personal Qualification and Training Quality Improvement Documents and Records Work Processes Design Control of Purchased Items and Services Inspection & Acceptance Testing	Organizational Planning - Environmental Aspects - Legal and other Requirements - Objectives, Targets, and Programs Implementation and Operation - Documentation - Control of Documentation - Operation Control - Emergency Response

ISM Guiding Principle/ Core Function	Jefferson Lab Quality Assurance Program Plan Criteria	Jefferson Lab Environmental Management System Elements (ISO 14001)
Core Function 4 **Perform Work Within Controls and** ***Guiding Principle 7*** **Operations Authorization**	Management Program Personal Qualification and Certification Training Documents and Records Work Processes Design Control of Purchased Items and Services Inspection & Acceptance Testing Independent Assessment	Checking and Corrective Action - Monitoring and Measurement - Evaluation of Compliance - Nonconformity, Corrective Action, and Preventive Action - Control of Records - Internal Audit
Core Function 5 **Provide Feedback and Continuous Improvement**	Management Program Personal Qualification and Training Quality Improvement Documents and Records Work Processes Design Inspection & Acceptance Testing Management Assessment Independent Assessment	Checking and Corrective Action - Monitoring and Measurement - Evaluation of Compliance - Internal Audit Management Review

Appendix E – 12GeV ISM Implementation

ISM Guiding Principle/ Core Function	Physics/Accelerator/Civil	ESH&Q Support
Guiding Principle 1 **Line Management Responsibility for Safety** ***Guiding Principle 2*** **Clear Roles and Responsibilities**	- Mission Need Statement (DOE) - Acquisition Strategy (DOE) - Project Execution Plan (DOE) - Supplemental QA Plan - Contract Performance Assessment	- Mission Need Statement (DOE) - Project Execution Plan (DOE) - Supplemental QA Plan - Jefferson Lab ES&H Roles and Responsibilities
Guiding Principle 3 **Competence Commensurate with Responsibilities**	- Project Execution Plan (DOE) - Supplemental QA Plan - Contract Performance Assessment	- Project Execution Plan (DOE) - Supplemental QA Plan - Jefferson Lab ES&H Roles and Responsibilities
Core Function 1 **Define the Scope of Work** ***Guiding Principle 4*** **Balanced Priorities**	- Mission Need Statement (DOE) - Acquisition Strategy (DOE) - Project Execution Plan (DOE) - Conceptual Design Report - System Requirements Documents - Design Solution Document - Contract Performance Assessment - Earned Value Management System - Project Baseline - Supplemental QA Plan	- Mission Need Statement (DOE) - Acquisition Strategy (DOE) - Project Execution Plan (DOE) - Conceptual Design Report - Supplemental QA Plan
Core Function 2 **Analyze the Hazard**	- Project Execution Plan (DOE) - Conceptual Design Report - Risk Management Plan - Space Program and Design Criteria Document - Design Criteria Documents - Supplemental QA Plan	- Project Execution Plan (DOE) - Conceptual Design Report - Risk Management Plan - 12 GeV Preliminary Hazard Assessment - 12 GeV CEBAF Upgrade Hazard Assessment - Jefferson Lab ES&H Manual - Environmental Assessment (DOE/EA-1534) - National Environmental Policy Act (NEPA) – Categorical Exclusions - Storm Water Pollution Prevention Plan - Spill Prevention Control and Countermeasure Plan - Supplemental QA Plan

ISM Guiding Principle/ Core Function	Physics/Accelerator/Civil	ESH&Q Support
Core Function 3 **Develop and Implement Hazard Controls** ***Guiding Principle 5*** **Identification of Safety Standards and Requirements** ***Guiding Principle 6*** **Hazard Controls Tailored to Work Being Performed**	- Project Execution Plan (DOE) - Conceptual Design Report - Jefferson Lab Contract Requirements - Design Criteria Documents - System Requirements Documents - Jefferson Lab EH&S Manual - Space Program and Design Criteria Document - System Hazard Profiles - Supplemental QA Plan	- Project Execution Plan (DOE) - Conceptual Design Report - Jefferson Lab Work Smart Standards - Jefferson Lab ES&H Manual - Environmental Assessment (DOE/EA-1534) - NEPA – Categorical Exclusions - Storm Water Pollution Prevention Plan - Spill Prevention Control and Countermeasure Plan - Supplemental QA Plan
Core Function 4 **Perform Work Within Controls** ***Guiding Principle 7*** **Operations Authorization**	- Conceptual Design Report - Preliminary Hazard Assessment - Final Safety Assessment Document - Supplemental QA Plan - Startup Test Plan	- Conceptual Design Report - Preliminary Hazard Assessment - Jefferson Lab ES&H Manual - Final Safety Assessment Document - Environmental Assessment (DOE/EA-1534) - NEPA Categorical Exclusions - Storm Water Pollution Prevention Plan - Spill Prevention Control and Countermeasure Plan - Supplemental QA Plan
Core Function 5 **Provide Feedback and Continuous Improvement**	- Supplemental QA Plan - Jefferson Lab/DOE Lessons Learned - Jefferson Lab Internal Audit and Independent Oversight - Internal System Design Reviews - External Peer Design Reviews - Integrated Project Management Team Reviews - Jefferson Lab Corrective Action Tracking System	- Supplemental QA Plan - Jefferson Lab/DOE Lessons Learned - Jefferson Lab Internal Audit and Independent Oversight - Internal System Design Reviews - External Peer Design Reviews - Jefferson Lab Corrective Action Tracking System

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