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INTEGRATED SAFETY MANAGEMENT SYSTEM GUIDE

[This Guide describes acceptable, non-mandatory means for meeting requirements. Guides are not requirements documents and are not to be construed as requirements in any audit or appraisal for compliance with associated rules or directives.]

U.S. DEPARTMENT OF ENERGY

Office of Health, Safety and Security

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FOREWORD

This Guide is approved for use by all Department of Energy (DOE) and National Nuclear Security Administration (NNSA) components and contractors. Beneficial comments (recommendations, additions, deletions, and any pertinent data) that may improve this document should be sent to:

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DOE guides are part of the DOE directives system and are issued to provide supplemental information regarding the Department's expectations for its requirements as contained in rules, Orders, Notices, and regulatory standards. This Guide does not establish or invoke any new requirements.

This Guide was developed in support of DOE Policy 450.4A, *Integrated Safety Management Policy*, and DOE Order 450.2, *Integrated Safety Management*. It provides guidance that may be useful to DOE line management organizations for meeting the provisions of that order and to DOE contractors for meeting the provisions of DOE Acquisition Regulations (DEAR), 48 CFR 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution*.

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Acronyms

CCE	Continuing Core Expectation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRAD	Criteria and Review Approach Document
CY	Calendar Year
D&D	Decontamination and Decommissioning
DEAR	Department of Energy Acquisition Regulations
DOE	U.S. Department of Energy
EFCOG	Energy Facility Contractors Group
EMS	Environmental Management System
EPA	Environmental Protection Agency
ES&H	Environment, Safety, and Health
FRA	Functions, Responsibilities, and Authorities
G	Guide
GOGO	Government Owned, Government Operated
HEPA	High Efficiency Particulate Air
HPI	Human Performance Improvement
HSS	Office of Health, Safety and Security
IAEA	International Atomic Energy Agency
ISM	Integrated Safety Management
ISO	International Organization for Standardization
M	Manual
NNSA	National Nuclear Security Administration
O	Order
OSHA	Occupational Safety and Health Administration
P	Policy
PPE	Personal Protective Equipment
QA	Quality Assurance
QAP	Quality Assurance Program
RCRA	Resource Conservation and Recovery Act
SSP	Safeguards and Security Program

Glossary

ADMINISTRATIVE CONTROLS. Work procedures such as written safety policies, rules, supervision, schedules, and training with the goal of reducing the duration, frequency, and severity of exposure to workplace hazards.

COGNIZANT SECRETARIAL OFFICER. The first-tier Headquarters office with responsibility and authority for the particular activity under consideration.

CONTRACTING OFFICER. A DOE official with the authority to purchase or contract for goods and services in excess of $25,000. Contracting officers are appointed according to DOE directives.

CONTRACTOR. Any entity, including affiliated entities, such as a parent corporation, under contract with DOE, or a subcontractor at any tier, that has responsibilities for performing work at a DOE sit in furtherance of a DOE mission.

DEFENSE IN DEPTH. An approach to facility safety that builds in layers of defense against hazards so that no one layer by itself, no matter how good, is completely relied upon. To compensate for potential human and mechanical failures, defense in depth is based on several layers of protection with successive barriers to prevent the hazard from becoming actualized. This approach includes protection of the barriers and further measures to protect the public, workers, and the environment from harm in case these barriers are not fully effective.

DIRECTIVES. Includes Policies, Regulations, Orders, Notices, Guides, and Technical Standards, as defined in DOE O 251.1C Departmental Directives Program.

ENGINEERED CONTROLS. Controls that eliminate or reduce exposure to a hazard through the use or substitution of engineered machinery or equipment. Examples include self-capping syringe needles, ventilation systems such as a fume hood, sound-dampening materials to reduce noise levels, safety interlocks, radiation shielding, process set points, and operating limits.

ENHANCED WORK PLANNING. A process that evaluates and improves the program by which work is identified, planned, approved, controlled, and executed. The key elements of enhanced work planning are line management ownership; a graded approach to work management based on risk and complexity; worker involvement beginning at the earliest phases of work management; organizationally diverse teams; and organized, institutionalized communication.

ENVIRONMENTAL MANAGEMENT SYSTEM. The part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy.

FACILITY. The buildings, utilities, structures, and other land improvements associated with an

operation or service and dedicated to a common function.

FIELD ELEMENT. A non-Headquarters DOE organization that is geographically distinct. Field elements can be area offices; support offices; operations offices; field offices; regional offices; or offices located at environmental restoration, construction, or disposition sites.

HAZARD. A source of danger (i.e., material, energy source, or operation) with the potential to cause illness, injury, or death to personnel or damage to a facility or to the environment (without regard to the likelihood or credibility of accident scenarios or consequence mitigation).

HAZARD ANALYSIS. The determination of material, system, process, and plant characteristics that can produce undesirable consequences, followed by the assessment of hazardous situations associated with a process, activity, or condition.

HAZARDS CONTROLS. Design features; operating limits; and administrative or safety practices, processes, or procedures to prevent, control, or mitigate hazards.

IMPLEMENTATION PLAN. A document prepared by a contractor that sets forth (1) when and how the actions appropriate to comply with DOE or other regulatory requirements, including the requirements of a plan or program committed to by the contractor, shall be taken, and (2) what relief will be sought if a contractor cannot attain full compliance with a requirement in a reasonable manner.

LIFE CYCLE. The life of an asset from planning through acquisition, maintenance, operation, and disposition.

LINE MANAGEMENT. Any management level within the line organization, including contractor management, that is responsible and accountable for directing and conducting work.

LINE ORGANIZATION. DOE line management refers to the unbroken chain of responsibility that extends from the Secretary of Energy to the Deputy Secretary, to the Secretarial Officers who set program policy and plans and develop assigned programs, and to the program and Field Element Managers who are responsible for execution of these programs.

MANAGEMENT CONTROLS (INTERNAL CONTROLS). The organization, procedures, and methods managers use to achieve their goals, including processes for planning, organizing, directing, and controlling operations. Management controls are designed to provide reasonable assurance that (1) programs achieve intended results; (2) resource use is consistent with DOE's mission and resources are protected from waste, loss, unauthorized use, and misappropriation; (3) laws and regulations are followed; and (4) decisions are based on reliable data. Management controls apply to all programs and administrative functions.

MANUALS/CODES OF PRACTICE. As applied to integrated safety management, documented instructions that define methods, processes, and procedures for DOE and the contractor to use in implementing safety requirements and guidelines. These manuals/codes of

practice document the safety infrastructure of an ISM system and provide the basis for work planning, authorization protocols, formality of operations, and feedback and improvement processes.

NUCLEAR SAFETY. Aspects of safety that encompass activities and systems that present the potential for (1) uncontrolled releases of fission products or other radioactive materials to the environment or (2) inadvertent criticality.

OCCURRENCE REPORT. A documented evaluation of an event or condition that is prepared in sufficient detail to enable the reader to assess its significance, consequences, or implications and to evaluate the actions being proposed or employed to correct the condition or to avoid recurrence.

OPERATIONAL READINESS REVIEW/ASSESSMENT. A disciplined, systematic, documented, performance-based examination of facilities, equipment, personnel, procedures, and management control systems to ensure that a facility will be operated safely within its approved safety envelope as defined by the facility safety basis.

OVERSIGHT. Assessment of the adequacy of DOE and contractor performance of their ES&H programs. Under DOE P 450.4A, DOE line management has the responsibility to hold itself accountable for safety for performance.

PERFORMANCE INDICATOR. Operational information indicative of the performance or condition of a facility, group of facilities, or site.

Personal Protective Equipment (PPE) includes all clothing and other work accessories designed to create a barrier against workplace hazards. Examples include safety goggles, blast shields, hard hats, hearing protectors, gloves, respirators, aprons, and work boots.

PROCEDURE. A document that prescribes a process (a sequence of actions) to be performed to achieve a desired outcome.

PROCESS. A series of actions that achieves an end or result.

PROGRAM OFFICE. A Headquarters organization responsible for executing program management functions and for assisting and supporting field elements in safety and health, administrative, management, and technical areas.

PROGRAM SECRETARIAL OFFICERS (PSO). See SECRETARIAL OFFICER.

RISK. The quantitative or qualitative expression of the possibility of an event occurring that considers both the probability that a hazard will cause harm and the consequences of that event.

RISK-INFORMED. Using knowledge of the risk.

SAFETY ANALYSIS. A documented process to (1) provide systematic identification of hazards within a given DOE operation; (2) describe and analyze the adequacy of the measures taken to eliminate, control, or mitigate identified hazards; and (3) analyze and evaluate potential undesirable events and their associated risks.

SAFETY DOCUMENTATION. Reports, memorandums, and other signed and dated documents that identify the hazards of a process or facility, and describe the measures for their control.

SAFETY PROGRAMS. Programs, required by DOE or other regulatory authority or committed to in an ISM system description, intended to be adhered to for a scope of work by a facility or site in support of the work.

SECRETARIAL OFFICER. The head of a first-tier organization; a DOE Headquarters employee reporting directly to the Secretary, the Under Secretary, or the Deputy Secretary.

STANDARD. A generic, all-encompassing term used to describe documents that provide a specified set of mandatory or discretionary rules, requirements, or conditions concerned with performance, design, operation, or measurements of quality to accomplish a specific task. Standards may include Federal laws, regulations, State laws, Federal agency directives, national and internal technical standards, codes of conduct, or even organizational "internal use only" documents.

SURVEILLANCE. Any periodic monitoring of conditions.

TAILORING. Adapting something, such as a safety program, practice, or requirement, within the ISM system to suit the need or purposes of a particular operation/activity, taking into account the type of work and associated hazards.

TECHNICAL SAFETY REQUIREMENTS (TSRs). Those requirements that define the conditions, safe boundaries, and management or administrative controls necessary to ensure the safe operation of a nuclear facility and to reduce the potential risk to the public and facility workers from uncontrolled releases of radioactive materials or from radiation exposures due to inadvertent criticality. TSRs consist of safety limits, operating limits, surveillance requirements, administrative controls, use and application instructions, and the basis thereof.

TECHNICAL STANDARD. A document that sets down a discretionary set of actions that must be accomplished to meet the purpose of the encompassing document. These actions are generally concerned with descriptions or steps that must be met to accomplish a specific task, such as classification of components, operation of equipment, enhancement of quality, or protection of personnel. They may also be used for procurement activities, such as specification of materials, products, or services in accordance with a specific set of conditions for delivery. Technical standards may only be made mandatory by direct reference in a requirements-type document, such as a contract, law, rule, or Federal agency directive.

UNREVIEWED SAFETY QUESTION (USQ).
a. A USQ exists if one or more of the following conditions is identified:
(1) the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety as previously evaluated in the facility safety analyses could be increased;
(2) the possibility for an accident or malfunction of a different type than any evaluated previously in the facility safety analyses could be created; or
(3) any margin of safety as defined in the bases of the TSRs could be reduced.

b. A USQ determination is made when one of the following circumstances occurs:
(1) temporary or permanent changes in the facility as described in existing safety analyses;
(2) temporary or permanent changes in the procedures as derived from existing safety analyses; and
(3) tests or experiments not described in existing safety analyses.

VOLUNTARY PROTECTION PROGRAM. The Department of Energy Voluntary Protection Program (DOE-VPP), which promotes safety and health excellence through cooperative efforts among labor, management, and government at DOE contractor sites.

WORK. Process of performing a defined task or activity; for example, research and development, operations, maintenance and repair, administration, software development and use, inspection, safeguards and security, data collection, and analysis.

WORK AUTHORIZATION. The process used by line management to permit a task or activity to be initiated as planned, having determined that it can be performed safely.

WORK PLANNING. The process of planning a defined task or activity**.** Addressing safety as an integral part of work planning includes execution of the safety-related functions in preparation for performance of a scope of work.

INTEGRATED SAFETY MANAGEMENT SYSTEM GUIDE

1.0 PURPOSE

The purpose of this Guide is to:

- Provide U.S. Department of Energy (DOE) line management with information that may be useful to them in effectively and efficiently implementing the provisions of DOE P 450.4A, *Integrated Safety Management Policy*, and the requirements and responsibilities of DOE O 450.2, *Integrated Safety Management.*

- Provide DOE contractor management with information that may be useful to them in effectively and efficiently implementing the integrated safety management (ISM) contract requirements specified by the Department of Energy Acquisition Regulation (DEAR) clause at 48 CFR 970.5223-1, *Integration of Environment, Safety, and Health into Work Planning and Execution* (DEAR ISM clause).

This Guide does not establish requirements, nor does it alter or override the requirements of the DOE regulations and requirements or the DEAR ISM clause. This Guide provides flexible guidance that may help DOE organizations and contractors in their efforts to meet applicable requirements. DOE line organizations and contractors may identify and implement other mechanisms to meet those requirements.

2.0 CANCELLATION

With the issuance of this guide, the following DOE guides are cancelled:

- DOE G 450.4-1B, *Integrated Safety Management System Guide, Volumes 1 and 2*, 3-1-01

- DOE G 450.3-3, *Tailoring for Integrated Safety Management Applications*, February 1997.

Cancellation of a directive does not, by itself, modify or otherwise affect any contractual or regulatory obligation to comply with the directive.

3.0 BACKGROUND

This guide was developed as part of DOE's ongoing efforts to continuously improve DOE safety management programs and directives. As one part of the continuous improvement effort, in calendar year (CY) 2009, DOE made a decision to phase out manuals as part of the revised directives system. Beginning in CY 2010, DOE undertook an effort to reform various DOE directives. As one part of this effort, DOE cancelled DOE M 450.4-1, *Integrated Safety Management System Manual*, 11-1-06, and DOE M 411.1-1C, *Safety Management Functions, Responsibilities, and Authorities Manual*, 12-31-03. In accordance with the revised DOE approach to orders, the new ISM order contains only the essential safety requirements and thus

includes fewer details on approaches for implementing the essential requirements. Therefore, many of the implementing details and lessons learned from the previous manuals are captured in this Guide for consideration by DOE line management as they implement the requirements of the new ISM order and by contractors as they continue to implement the DEAR ISM clause.

In addition, relevant information on functions, responsibilities, and authorities (FRAs) for safety previously displayed in DOE M 411.1-1C and not captured in DOE O 450.2 is now being updated and will be maintained online at:

- http://www.hss.doe.gov/HealthSafety/wshp/frams.html/

For simplicity, "DOE," as used throughout this Guide, includes the National Nuclear Security Administration (NNSA). In this Guide, the term "safety" is used to encompass environment, safety, and health (ES&H).

4.0 INTEGRATED SAFETY MANAGEMENT OBJECTIVE

The objective of ISM is to integrate safety into management and work practices at all levels, addressing all types of work and all types of hazards to ensure safety for workers, the public, and the environment. To achieve this objective, DOE has established guiding principles and core safety management functions. An effective ISM system addresses these DOE-wide principles and core functions while also considering site-specific factors, conditions, analyses, and processes, including:

- The types of potentially hazardous work at the site, including but not limited to operations, maintenance, construction, decontamination and decommissioning, laboratory activities, and research and development.

- Results of design and conceptual studies, environmental analyses, safety analyses, hazard reduction analyses, pollution prevention/waste minimization, and risk analyses.

- All types of hazards at the site, including chemical, physical, biological, ergonomic, environmental, nuclear, and transportation.

Management and workers should understand that safety is an integral part of each work activity. Accordingly, safety should be a prime consideration in the work practices of all personnel from the Secretary and contractor senior official, through all management levels, to the worker performing the activity.

5.0 APPLICATION

This Guide provides information that will help DOE line management organizations meet the requirements of DOE O 450.2 and help DOE contractors meet the provisions of the DEAR ISM clause.

DOE line management organizations and contractors may apply the information in this Guide in various ways, including:

- Developing, verifying, and maintaining ISM system descriptions.
- Evaluating and improving the effectiveness of existing ISM systems and the strength of the existing safety culture.
- Developing site-specific criteria for ISM systems effectiveness and verification reviews, and reviews of ISM declarations.
- Developing performance objectives, measures, and commitments that define expectations for implementation of ISM systems.
- Developing materials to support training programs for personnel with responsibilities for implementing or overseeing ISM systems.

6.0 GUIDANCE FOR DOE LINE MANAGEMENT AND CONTRACTOR ORGANIZATIONS WITH RESPONSIBILITIES FOR ISM SYSTEMS

DOE P 450.4A establishes DOE's expectation for ISM that will enable the Department's mission goals to be accomplished efficiently while ensuring safe operations at all Departmental facilities and activities. DOE P 450.4A recognizes that there is a wide range of DOE sites and that each site has a unique set of hazards, facilities, and activities, so a one-size-fits-all approach to ISM is not practical. Accordingly, the ISM policy calls for a site-specific, documented description of the ISM system that is tailored to the hazards and risks associated with the facilities and work activities at that site. DOE O 450.2 establishes requirements that DOE organizations must meet; and associated responsibilities including developing and implementing ISM systems for their activities, reviewing and approving contractor ISM systems, and overseeing implementation of ISM systems; at their sites. The DEAR ISM clause establishes requirements that contractors must meet; these include developing and implementing ISM systems for the facilities and activities at their sites including activities performed by their subcontractors. Because DOE sites are unique and ISM systems must be tailored to the hazards and site conditions, the Order requires DOE organizations to document their approach for ensuring that both their DOE offices and their contractors establish effective and efficient ISM systems that are appropriate for site hazards, and the DEAR ISM clause establishes a similar requirement for contractors.

This guidance focuses on information related to development, implementation, approval, monitoring, evaluation, and improvement of ISM systems. The guidance in this section is organized around the key topic areas identified in DOE O 450.2 and/or the DEAR ISM clause. These include: general ISM information (including discussion of the guiding principles and core functions of ISM); developing ISM system descriptions; monitoring, evaluating, and improving ISM implementation; safety culture; safety goals, objectives, and measures; safety management FRAs; and the ISM Champions Council. The remainder of this section provides guidance

related to these topics and broadly identifies the potential uses of the information by DOE organizations and/or contractors.

6.1 GENERAL ISM GUIDANCE

ISM systems are built and developed around seven guiding principles and five core functions as defined in DOE P 450.4A and the DEAR ISM clause. Effective ISM systems encompass and integrate the key attributes associated with each guiding principle and core function at all levels of the organization. The following attachments may be useful to DOE and contractor organizations that are responsible for developing, implementing, and maintaining ISM systems.

- **Attachment 1,** *Guiding Principles*. This attachment provides an overview and description of the guiding principles of ISM and the basic attributes of each.

- **Attachment 2,** *Core Functions*. This attachment provides an overview and description of the core functions of ISM and the basic attributes of each.

- **Attachment 3,** *ISM Overview*. This attachment provides an overview and current information on the applicability of DOE policy, orders, and DEAR ISM clauses. It describes the relationship between ISM principles, functions, operational work, and performance results, and discusses the focus of ISM principles and functions at different organizational levels.

- **Attachment 4,** *Work Planning and Execution*. This attachment provides guidance for the planning and executing of work at the activity level.

- **Attachment 5,** *Relationship of Major Improvement Initiatives to ISM*. This attachment describes the relationship of major improvement initiatives to ISM.

- **Attachment 6,** *Tailoring for Integrated Safety Management Applications*. This attachment describes approaches for tailoring ISM systems to the risk, hazards, and work activities at DOE sites.

6.2 DEVELOPING ISM SYSTEM DESCRIPTIONS

DOE O 450.2 requires that DOE line management organizations document their approach for ensuring the establishment of ISM systems for both their DOE offices and their contractors, including mechanisms, processes, and methods, in ISM system description documents. The following attachment may be useful to DOE line management and site operating contractors in establishing appropriate ISM system descriptions consistent with DOE directives and DEAR ISM clauses.

- **Attachment 7,** *Development of ISM System Descriptions*. This attachment identifies factors that should be considered when developing and maintaining ISM system descriptions.

6.3 EVALUATING AND IMPROVING ISM IMPLEMENTATION

DOE O 450.2 requires DOE organizations to perform various actions to ensure adequate safety in contractor management of DOE facilities while meeting mission goals. These include ensuring that appropriate requirements are incorporated into contracts, overseeing compliance, assessing contractor performance against established performance measures, analyzing relevant trends, and obtaining relevant operational information for use as feedback to improve safety. In addition, the DEAR ISM clause requires contractors to establish and maintain a documented ISM system that includes feedback and improvement processes. Requirements and guidance for performing these functions also are provided in various other DOE directives, such as the DOE orders addressing oversight and operational experience.

As one part of a broad range of oversight responsibilities, DOE O 450.2 requires DOE line management organizations to determine the need for and frequency of ISM declarations that describe the status and effectiveness of ISM system implementation. ISM declarations are typically based on ISM effectiveness reviews and, when needed, comprehensive verification reviews. DOE line management should periodically provide direction for performing ISM effectiveness reviews based on risks, hazards, and safety performance; and site activities and conditions. When performed, ISM reviews typically encompass a review of the content and results of relevant self-assessments, line oversight activities, lower-level ISM reviews, and the collective review of the individual reviews; a review of performance against safety performance objectives, measures, and commitments; and pertinent feedback data from a variety of relevant mechanisms. ISM verification reviews typically are performed when DOE determines a need to perform a more comprehensive and in-depth review of ISM system implementation (e.g., after a new contractor assumes responsibility for a site).

The following attachments may be useful to DOE line managers in determining the need for, and frequency of, ISM declarations and performing effectiveness reviews and verification reviews of contractor ISM processes and implementation. The information may also be useful to contractors in preparing for ISM effectiveness or verification reviews and for performing reviews of subcontractor ISM implementation.

- **Attachment 8,** *ISM Effectiveness Reviews, Declarations, and Verifications*. This attachment provides guidelines on a process for performing ISM effectiveness reviews, declarations, and verifications.

- **Attachment 9,** *Continuing Core Expectations*. This attachment provides continuing core expectations that may be useful for maintaining and evaluating the effectiveness of ISM systems.

6.4 SAFETY CULTURE

A positive safety culture is an integral aspect of an effective ISM system. DOE's commitment to a positive safety culture is expressed in DOE P 450.4A:

> *…the Department expects all organizations to embrace a strong safety culture where safe performance of work and involvement of workers in all aspects of work performance are core values of managers and workers. The Department encourages a questioning attitude by all employees and a work environment that fosters such attitude.*

In addition, DOE O 450.2 assigns to DOE line management, including the ISM Champions Council, the responsibilities for evaluating and developing strategies for improving DOE's safety culture.

DOE and the Energy Facility Contractors Group (EFCOG) have collaborated to develop guidance for achieving a strong safety culture. That guidance includes the following definition of safety culture:

> *Safety culture is an organization's values and behaviors modeled by its leaders and internalized by its members, which serve to make safe performance of work the overriding priority to protect the workers, public, and the environment.*

That guidance also includes the following three key safety culture focus areas and their associated attributes:

- Leadership
- Employee/Worker Engagement
- Organizational Learning

These safety culture focus areas and associated attributes are elaborated upon in Attachment 10 of this Guide:

- **Attachment 10,** *Safety Culture Focus Areas and Associated Attributes*. This attachment provides three safety culture focus areas, and several attributes associated with each one, that are useful for attaining a strong safety culture that supports achieving excellence in both safety and mission performance.

DOE and EFCOG also collaborated to publish content and links on an EFCOG website that provides information and resource documents related to safety culture. The EFCOG website identifies a wide range of resources that can be useful to DOE line managers and site operating contractors in establishing and sustaining a positive safety culture or evaluating an existing safety culture. The following links are particularly pertinent to attaining a positive safety culture:

- http://efcog.org/wg/ism_pmi/index.htm. This page provides links to a wide range of information that the EFCOG ISM and Safety Culture Work Groups have identified as potentially useful, including links to documents developed by various organizations with expertise in safety culture development and evaluation.

- http://efcog.org/wg/ism_sctt/index.htm. This page provides links to a variety of documents developed by the DOE/EFCOG Safety Culture Task Team, including the following:

    - http://efcog.org/wg/ism_sctt/docs/EFCOG_Safety%20Culture_Task_Team_Final_Report_2010-2_revised.pdf. EFCOG/DOE ISMS Safety Culture Task Team Final Report, 6/4/10. This document discusses various products developed by the DOE/EFCOG ISM Safety Culture Task Force and identifies a consensus set of safety culture principles and implementation practices. It is useful for organizations that are striving to establish a positive safety culture.

    - http://efcog.org/wg/ism_sctt/docs/safety_culture_assessment_012309_final.pdf. Assessing Safety Culture in DOE Facilities, 1/26/09. This document describes methods for evaluating an existing safety culture.

In addition, the following attachments may be useful to DOE line managers and site operating contractors in integrating and enhancing important aspects of safety culture in their ISM systems.

- **Attachment 11,** *IAEA Capability Maturity Model*. This attachment provides an overview and description of the stages an organization may go though in achieving a mature safety culture, based on the International Atomic Energy Agency (IAEA) model.

- **Attachment 12,** *Changing Behaviors and Values*. This attachment provides an overview of ways to effect change in values and behavior within an organization.

6.5 SAFETY GOALS, OBJECTIVES, AND MEASURES

DOE O 450.2 requires DOE line management to establish and implement ISM safety goals/objectives and monitor their ISM system. DOE O 450.2 also requires DOE line management to assess contractors' ISM performance against established commitments and performance measures. The following attachment may be useful to DOE line management and site operating contractors in meeting requirements related to safety performance objectives, measures, and commitments.

- **Attachment 13,** *Safety Performance Objectives, Measures, and Commitments*. This attachment provides an overview and examples of safety performance objectives, measures, and commitments.

6.6 SAFETY MANAGEMENT FUNCTIONS, RESPONSIBILITIES, AND AUTHORITIES

Each DOE line management and support organization with safety management responsibility is responsible for developing, issuing, and maintaining an organizational FRA document separately or as part of their ISM system description document. The following attachment may be useful to

DOE organizations in developing FRA documents and ensuring appropriate delegation of authority consistent with DOE O 450.2.

- **Attachment 14,** *Safety Management Functions, Responsibilities, and Authorities.* This attachment provides general information and guidance for development of FRA documents and delegation of authority.

6.7 ISM CHAMPIONS COUNCIL

The ISM Champions Council supports line management in developing and sustaining vital, mature ISM systems throughout the Department. It is also responsible for preparing a report on the status of ISM across the complex on an annual basis. The following webpage provides information about the ISM Champions Council, including a link to the Council's Charter .

http://www.hss.doe.gov/HealthSafety/ism/champions.html

Guiding Principles

The ISM principles describe the environment or context for work activities. Most ISM principles apply to each and every ISM function. Experience and research with safety cultures and high-reliability organizations over the past ten or more years have provided new insights and deeper understanding of the relevant guiding principles and associated attributes for attaining the desired work environment for effective safety management. The guiding principles associated attributes are identified and described below.

1. Line Management Responsibility for Safety

Line management is directly responsible for the protection of the public, workers, and the environment.

Basic Attributes

- Line management personnel (from the Secretary to the DOE cognizant Secretarial officer to the DOE field office manager and from the contractor senior manager to the front-line worker) understand and accept their safety responsibilities inherent in mission accomplishment. Line managers do not depend on supporting organizations to build safety into line management work activities.

- Line managers have a clear understanding of their work activities and their performance objectives, and how they will conduct their work activities safely to accomplish their performance objectives.

- Line managers demonstrate their commitment to safety. Top-level line managers are the leading advocates of safety and demonstrate their commitment in both word and action. Line managers periodically take steps to reinforce safety, including personal visits and walkthroughs to verify that their expectations are being met.

- Line managers spend time on the floor. Line managers practice visible leadership in the field by placing "eyes on the problem," coaching, mentoring, and reinforcing standards and positive behaviors. Deviations from expectations are corrected promptly and, when appropriate, analyzed to understand why the behaviors occurred.

- Line managers maintain a strong focus on the safe conduct of work activities. Line managers maintain awareness of key performance indicators related to safe work accomplishment, watch carefully for adverse trends or indications, and take prompt action to understand adverse trends and anomalies.

- Line managers throughout the organization set an example for safety through their direct involvement in continuous learning by themselves and their staffs on topics related to technical understanding and safety improvement.

- Line managers are skilled in responding to employee questions in an open, honest manner. They encourage and appreciate the reporting of safety issues and errors. They do not discipline employees for reporting errors. They encourage a vigorous questioning attitude toward safety, as well as constructive dialogues and discussions on safety matters.

- Credibility and trust are present and continuously nurtured. Line managers reinforce perishable values of trust, credibility, and attentiveness. The organization is just – that is, the line managers demonstrate an understanding that humans are fallible and when mistakes are made, the organization seeks first to learn rather than to blame. The system of rewards and sanctions is aligned with strong safety policies and reinforces the desired behaviors and outcomes.

2. Clear Roles and Responsibilities

Clear and unambiguous lines of authority and responsibility for ensuring safety are established and maintained at all organizational levels within the Department and its contractors.

Basic Attributes

- Responsibility and authority for safety are well defined and clearly understood as an integral part of performing work.

- Organizational safety responsibilities are sufficiently comprehensive to address the work activities and hazards involved.

- The line of authority and responsibility for safety is defined from the Secretary and contractor senior executive to the individual contributor. Each of these positions has clearly defined roles, responsibilities, and authorities, designated in writing and understood by the incumbent.

- Ownership boundaries and authorities are clearly defined at the institutional, facility, and activity levels, and interface issues are actively managed.

- Organizational FRA documents are maintained current and accurate.

- Reporting relationships, positional authority, staffing levels and capability, organizational processes and infrastructure, and financial resources are commensurate with and support fulfillment of assigned or delegated safety responsibilities.

- All personnel understand the importance of adherence to standards.

- Line managers provide ongoing reviews of performance of assigned roles and responsibilities to reinforce expectations and ensure that key safety responsibilities and expectations are being met.

- Personnel at all levels of the organization are held accountable for shortfalls in meeting standards and expectations related to fulfilling safety responsibilities. Accountability is demonstrated both by recognition of excellent safety performers and by identification of less-than-adequate performers. In holding people accountable, in the context of a just culture, managers consider individual intentions and the organizational factors that may have contributed.

3. Competence Commensurate with Responsibilities

Personnel possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.

Basic Attributes

- People and their professional capabilities, experiences, and values are regarded as the organization's most valuable assets. Organizational leaders place a high personal priority and time commitment on recruiting, selecting, and retaining an excellent technical staff.

- The organization maintains a highly knowledgeable workforce to support a broad spectrum of operational and technical decisions. Technical and safety expertise is embedded in the organization. Outside expertise is employed when necessary.

- Individuals have an in-depth understanding of the safety and technical aspects of their jobs. Technical qualification standards are defined and personnel are trained accordingly. Technical support personnel have expert-level technical understanding. Managers have strong technical backgrounds in their area of responsibility.

- Assignments of safety responsibilities and delegations of associated authorities are made to individuals with the necessary technical experience and expertise. In rare cases, if this is not possible, corrective and compensatory actions are taken.

- The organization values and practices continuous learning, requires employees to participate in recurrent and relevant training, and encourages educational experiences to improve knowledge, skills, and abilities. Professional and technical growth is formally supported and tracked to build organizational capability.

- Training to broaden individual capabilities and to support organizational learning is available and encouraged in order to appreciate the potential for unexpected conditions; to recognize and respond to a variety of problems and anomalies; to understand complex technologies and develop capabilities to respond to complex events; to develop flexibility in applying existing knowledge and skills in new situations; to improve communications; and to learn from significant industry and DOE events.

- Models, practices, and procedures are updated and refreshed based on new information and new understanding.

- Training effectively upholds management's standards and expectations. Beyond teaching knowledge and skills, trainers are adept at reinforcing requisite safety values and beliefs.

- Managers set an example for safety by their personal commitment to continuous learning and by their direct involvement in high-quality training that consistently reinforces expected worker behaviors.

- Managers encourage informal opinion leaders in the organization to model safe behavior and influence peers to meet high standards.

4. Balanced Priorities

Resources are effectively allocated to address safety, programmatic, and operational considerations. Protecting the workers, the public, and the environment is a priority whenever activities are planned and performed.

Basic Attributes

- Organization managers frequently and consistently communicate the safety message, both as an integral part of the mission and as a stand-alone theme.

- Managers recognize that aggressive mission and production goals can appear to send mixed signals on the importance of safety. Managers are sensitive to detect and avoid these misunderstandings, or to deal with them effectively if they arise.

- The organization demonstrates a strong sense of mission and operational goals, including a commitment to highly reliable operations, both in production and safety. Safety and productivity are both highly valued.

- Safety and productivity concerns both receive balanced consideration in funding allocations and schedule decisions. Resource allocations are adequate to address safety. If funding is not adequate to ensure safety, operations are discontinued.

- Staffing levels and capabilities are consistent with the expectation of maintaining safe and reliable operations.

- The organizational staffing provides sufficient depth and redundancy to ensure that all important safety functions are adequately performed.

- The organization is able to build and sustain a flexible, robust technical staff and staffing capacity. Pockets of resilience are established through redundant resources so that resources remain adequate to address emergent issues. The organization

develops sufficient resources to rapidly cope with and respond to unexpected changes.

- Key technical officials are assigned for long terms of service to provide institutional continuity and consistency regarding safety requirements and expectations. Organizational knowledge is valued, and efforts are made to preserve it when key players move on.

- Systems of checks and balances are in place and effective at all levels of the organization to make sure that safety considerations are adequately weighed and prioritized.

- Safety and quality assurance (QA) positions have adequate organizational influence.

- Adequate resources are allocated for safety upgrades and repairs to aging infrastructure. Modern infrastructure and new facility construction are pursued to improve safety and performance over the long term.

5. Identification of Safety Standards and Requirements

Before work is performed, the associated hazards are evaluated and an agreed-upon set of safety standards and requirements is established which, if properly implemented, will provide adequate assurance that the workers, the public, and the environment are protected from adverse consequences.

Basic Attributes

- Facilities are designed, constructed, operated, maintained, and decommissioned using consensus industry codes and standards, where available and applicable, to protect workers, the public, and the environment.

- Applicable requirements from laws, statutes, rules, and regulations are identified and captured so that compliance can be planned, expected, demonstrated, and verified.

- Clear, concise technical safety directives are centrally developed, where necessary, and are based on sound engineering judgment and data. DOE directives and technical standards are actively maintained up to date and accurate.

- A clearly defined set of safety requirements and standards is invoked in management contracts or similar agreements. An accepted process is used to identify the appropriate set of requirements and standards. This set of requirements is comprehensive and includes robust QA, safety, and radiological and environmental protection requirements.

- Implementing plans, procedures, and protocols are in place to translate requirements into action by the implementing organization.

- Technical and operational safety requirements clearly control the safe operating envelope. The safety envelope is clearly specified and communicated to individuals performing operational activitiesactivities.

- Exemptions from applicable safety requirements are both rare and specific, provide an equivalent level of safety, have a compelling technical basis, and are approved at an appropriate organizational level.

- Compliance with applicable safety and technical requirements is expected and verified.

- Willful violations of requirements are rare, and personnel and organizations are held strictly accountable in the context of a just culture. Unintended failures to follow requirements are promptly reported, and personnel and organizations are given credit for self-identification and reporting of errors.

- The organization actively seeks continuous improvement in safety standards and requirements through identification and sharing of effective practices, lessons learned, and applicable safety research. The organization is committed to continuously rising standards of excellence.

6. Hazard Controls Tailored to Work Being Performed

Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards.

Basic Attributes

- Work hazards are identified and controlled to prevent or mitigate accidents, with particular attention to high-consequence events with unacceptable consequences. Workers understand hazards and controls before beginning work activities.

- The selection of hazard controls considers the type of hazard, the magnitude of the hazard, the type of work being performed, and the life cycle of the facility. Controls are designed and implemented commensurate with the inherent level and type of hazard.

- Safety analyses identifying work hazards are comprehensive and based on sound engineering judgment and data.

- Defense in depth is designed into highly hazardous operations and activities and includes independent, redundant, and diverse safety systems that are not overly complex. Defense-in-depth controls include engineering controls, administrative processes, and personnel staffing and capabilities.

- Emphasis is placed on designing the work and/or controls to reduce or eliminate the hazards and to prevent accidents and unplanned releases and exposures.

- The following hierarchy of defense in depth is recognized and applied: (1) elimination or substitution of the hazards, (2) engineering controls, (3) work practices and administrative controls, and (4) personal protective equipment (PPE). Inherently safe designs are preferred over ones requiring engineering controls. Prevention is emphasized in design and operations to minimize the use of, and thereby possible exposure to, toxic or hazardous substances.

- Equipment is consistently maintained so that it meets design requirements.

- Safety margins are rigorously maintained. Design and operating margins are carefully guarded and are changed only with great thought and care. Special attention is placed on maintaining defense in depth.

- Organizations implement hazard controls in a consistent and reliable manner. Safety is embedded in processes and procedures through a functioning, formal ISM system. Facility activities are governed by comprehensive, efficient, high-quality processes and procedures.

- Hazard controls are designed with an understanding of the potential for human error. Error-likely situations are identified, eliminated, or mitigated. The existence of known error-likely situations is communicated to workers prior to commencing work, along with planned mechanisms to assure worker safety.

7. Operations Authorization

The conditions and requirements to be satisfied for operations to be initiated and conducted are clearly established and agreed upon.

Basic Attributes

- Formal facility authorization agreements are in place and maintained between owner and operator.

- Readiness at the facility level is verified before hazardous operations commence. Pre-operational reviews confirm that controls are in place for known hazards.

- Facility operations personnel maintain awareness of all facility activities to ensure compliance with the established safety envelope.

- Work authorization is defined at the activity level. The work authorization process verifies that adequate preparations have been completed so that work can be performed safely. These preparations include verifying that work methods and

requirements are understood; that work conditions will be as expected and will not introduce unexpected hazards; and that necessary controls are implemented.

- The extent of documentation and the level of authority for work authorization are based on the complexity and hazards associated with the work.

Core Functions

The five core functions provide the necessary structure for any work activity that could potentially affect the public, workers, or the environment. The core functions are applied as a continuous cycle. These elements are identified and described below.

Figure 1 illustrates the conceptual relationship among the core safety functions. These functions are not independent, sequential functions but instead, a linked, interdependent collection of functions that often occur concurrently. The output of each function can affect the results of each of the other functions and, potentially, the whole system. Work planning processes, for example, affect multiple functions on an iterative basis before a plan is approved and work is performed (See Attachment 4).

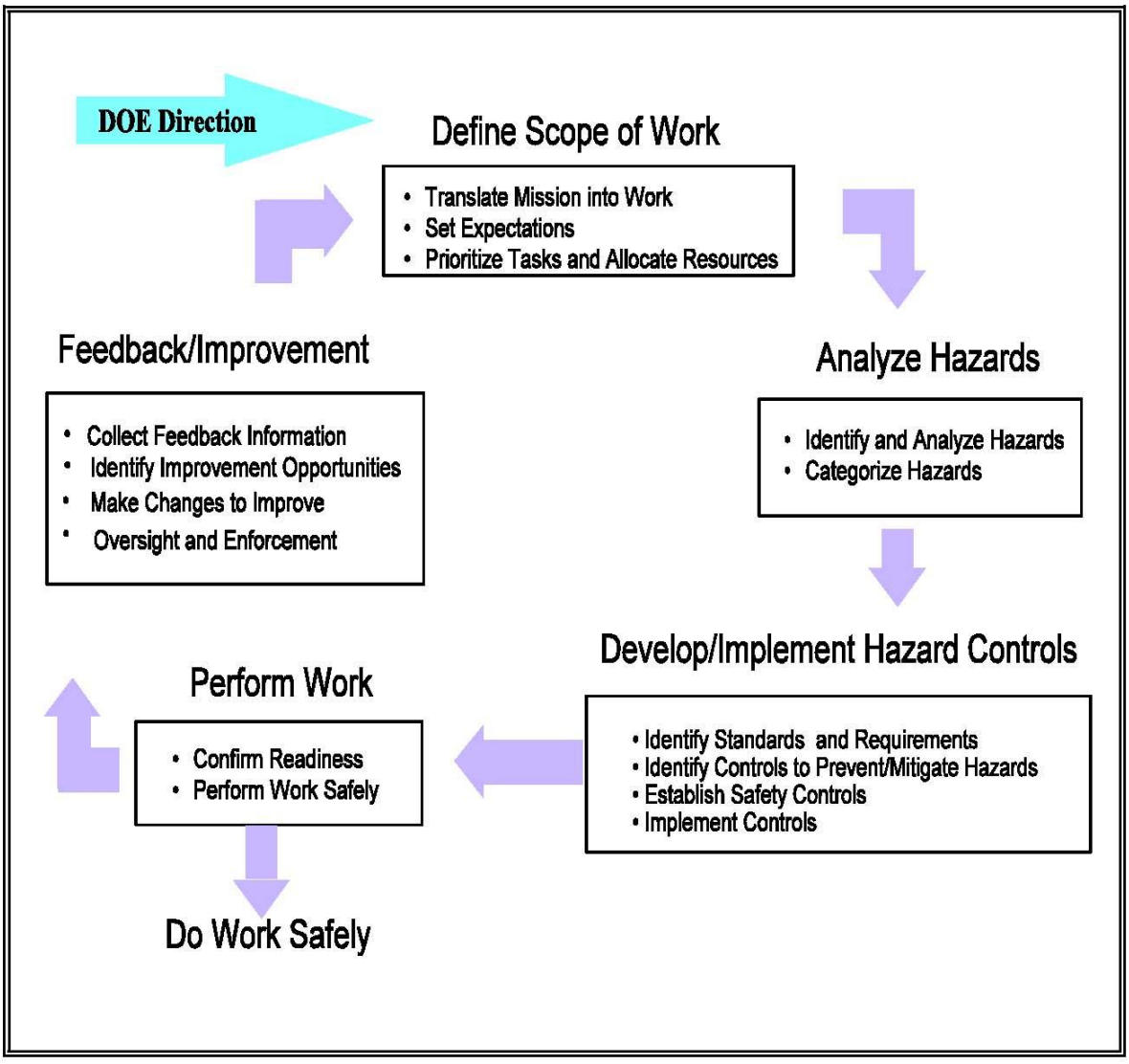


Figure 1. Relationship of the ISM Core Functions.

1. Core Function 1, Define the Scope of Work

Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.

An ISM system should include a process to identify the activities necessary to accomplish the assigned mission and a process to develop these activities into discrete tasks. DOE uses strategic plans, goals, objectives, and mission statements to define the contractor's broad work assignments; the contractor in turn uses these assignments to prepare its work proposals.

Basic Attributes

- Expectations that DOE Headquarters elements receive from DOE field elements as part of the annual budget development process are translated by the Headquarters elements into activities that permit identification of resource requirements, priorities, and performance metrics.

- Scopes of programs, projects, and work activities are defined with sufficient specificity to enable the identification of hazards and implementation of hazard controls.

- DOE budget and work expectations and priorities are authorized and communicated to the contractor via authorization documents.

- Expectations for activities flow from DOE to the contractors and from the contractors to subcontractors, the individual facility, the process, or the work task, as appropriate.

- ISM is applied to all types of work and addresses all types of hazards.

- DOE's approval of the contractor's proposed activities and expectations for prioritization of the mission are transmitted to the contractor in correspondence from the DOE contract officer to the contractor.

- The approved task identification, prioritization, and funding are subject to configuration management processes to ensure formal change control.

- Task prioritization and funding allocation clearly address both ES&H and programmatic needs.

- Line management provides input and approval of task prioritization and funding allocation.

- Task prioritization and funding allocation clearly address commitments to and agreements with DOE and stakeholders.

- Funding allocation provides resources to adequately analyze hazards associated with the work.

- Funding allocation provides resources for implementation of hazard controls for activities being funded.

2. Core Function 2, Analyze the Hazards

Hazards associated with the work are identified, analyzed, and categorized.

Sites identify and categorize the hazards, then develop an understanding of the potential for each hazard to affect the health and safety of workers, the public, and the environment. The level of line management involvement in reviewing and approving hazard analyses should be commensurate with the complexity of the work and the hazards involved. Regulatory and contractual requirements applicable to the work and the complexity and hazards of the work dictate the methods used to identify and analyze hazards. These standards also establish the expectations for the contractor's conduct of hazard analyses, how hazard analysis is to be integrated into work processes, and how activity-specific hazard analyses are to be integrated with sitewide and facility hazard analyses.

Basic Attributes

- All types of hazards (e.g., nuclear, chemical, industrial, fire, external events, construction, environmental impact) are addressed.

- The identification process is tailored to the type of hazard (e.g., walkthroughs for industrial hazards), the type of work (e.g., design, construction, operation, maintenance, decontamination and decommissioning [D&D]), and the magnitude of the hazard's risk.

- DOE and other regulatory requirements are implemented as appropriate to the work, the type of hazard identified, and the magnitude of its risk.

- Hazard analysis methods are applied to all types and stages of work (e.g., design, construction, normal operations, surveillance, deactivation, maintenance, facility modification, D&D).

- The hazard analysis method, level of detail, and resultant controls are appropriate to the hazard category.

3. Core Function 3, Develop and Implement Hazard Controls

Applicable safety standards and requirements are identified and agreed-upon, controls to prevent/mitigate hazards are identified, the safety envelope is established, and controls are implemented.

Hazard controls include engineered controls (e.g., buildings, enclosures, safety systems, controls, and instrumentation), administrative measures (limits, safety requirements embedded in procedures, warning signs, environmental monitoring, and associated training), and PPE (e.g., protective clothing, respirators). The established level of controls protects workers, the public, and the environment from all hazards associated with work activities. A strong linkage is needed between project, facility, and activity-level hazard analyses and the established controls as part of a defined ISM work planning process.

Basic Attributes

- The contractor identifies, selects, and approves ES&H standards and requirements by means of a process that provides adequate protection to the public, the workers, and the environment.

- DOE concurs with the identified ES&H standards and requirements, or the work scope is verified to fall within previous approval, before operations commence or work is authorized.

- The identified ES&H standards conform to applicable laws, statutes, Federal rules, and DOE directives.

- DOE reviews, verifies, and approves the ES&H standards and requirements in the contractor's ISM System Description.

- Controls are tailored to the hazards associated with the work or operations to be authorized.

- Hazard prevention programs appropriate to the facility's life cycle are implemented.

- Controls are addressed for the hazards of all activities (e.g., construction, normal operations, surveillance, maintenance work, facility modifications).

- Controls are addressed for all aspects of the work (e.g., initiation, review, authorization, and execution).

- Controls for all applicable hazards and requirements (e.g., radiation protection, pollution prevention, the Resource Conservation and Recovery Act (RCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)) are addressed.

- A process or mechanism should be provided that recognizes the control hierarchy and integrates those controls.

- Identified controls are agreed upon and approved before operations commence or work is authorized.

- Hazard controls are reviewed and approved by DOE as appropriate to the work.

- Safety boundaries for the work are established and maintained.

- Appropriate controls, conditions, and requirements (e.g., technical safety requirements, operational safety requirements, Occupational Safety and Health Administration [OSHA] and Environmental Protection Agency [EPA] regulations) that constitute the safety boundaries are identified.

- Contractor and DOE procedures define the processes for development, approval, and maintenance of work authorization documentation, including authorization agreements.

- Safety controls are established using the control hierarchy (engineered controls, administrative controls, PPE).

- Engineered controls, administrative controls, safety controls, safety programs, and other conditions that affect the work to be performed are implemented.

- Personnel are trained on the purpose and use of the controls and are qualified (e.g., by means of a personnel training and qualification program) to discharge their responsibilities satisfactorily.

4. Core Function 4, Perform Work within Controls

Readiness is confirmed and work is performed safely.

There is a process to confirm adequate preparation and readiness to begin work prior to authorizing the performance of work at the facility, project, or activity level. The formality and rigor of the process and the extent of documentation and level of approval is based on the hazards and complexity of work. Agreed-upon safety control measures are a discernable part of the work plan and integrated into the work. Personnel are responsible and accountable for working in accordance with the controls. These controls are adequate to ensure safe work performance and to prevent accidents, uncontrolled releases, or unacceptable exposures to hazardous materials. Safety support functions and required interfaces, (e.g., training, maintenance, radiological protection) are established and effectively maintained. There is a process to ensure that the safety envelope is continually maintained.

Basic Attributes

- Readiness is assured by verifying that controls are adequate to mitigate the identified hazards and that the controls are implemented prior to commencement of work.

- Personnel qualifications and training are verified prior to performing work.

- Implementation of controls is verified adequate to ensure safe work performance and to prevent accidents, uncontrolled releases, or unacceptable exposures to hazardous materials.

- The necessary safety support functions and interfaces (e.g., training, maintenance, radiological protection) are established.

- The operability of the necessary facility or process systems required for safe operation is verified in accordance with the bases established in appropriate authorization agreements.

- Operations at the individual facility or process level are authorized by means of a conduct of operations process appropriate to the work.

- DOE verifies and authorizes work as appropriate before work commences.

- Work control processes during the performance of work include continuous identification of hazards, stopping work to re-evaluate hazards and controls, and work package changes in the field.

- Personnel are responsible and accountable for performing work in accordance with the established controls.

- Performance measures and indicators are in place to evaluate how safely the work is being performed.

- Performance measures and indicators are clearly linked to performance objectives and expectations.

5. Core Function 5, Provide Feedback and Continuous Improvement

Feedback information on the adequacy of controls is gathered; opportunities for improving the definition and planning of work are identified and implemented.

The concept of continuous improvement implies that line management establishes formalized mechanisms and processes for identifying and capturing ES&H-related deficiencies, as well as for tracking the implementation and effectiveness of associated corrective actions. The process of ensuring that corrective actions are timely, complete, and effective is founded on firm technical basis and clearly identified responsibility for timely implementation. To avoid recurrence of events having ES&H implications, line management establishes a process for disseminating lessons learned to affected personnel, both internally and across the DOE complex.

Basic Attributes

- Feedback on the effectiveness of the ISM and the adequacy of controls is gathered.
- Extent-of-condition reviews are conducted using a graded approach.
- Opportunities for improving work execution and planning are identified and implemented.
- Line and independent oversight is conducted.
- If necessary, regulatory enforcement actions occur.
- Line and independent oversight or assessment is conducted at all levels by DOE and the contractor.
- Oversight and assessment activities verify that work is performed within adequate and agreed-upon controls.
- Performance measures or indicators and performance objectives are developed in coordination with DOE.
- Line managers use performance measures and indicators as part of the self-assessment process.
- Feedback (including worker input) and lessons learned are managed to improve safety and work performance.
- Oversight or assessment results are managed to ensure that lessons are learned and applied throughout the site.
- Issues are identified (including worker input) and managed to resolution.
- Fundamental causes are determined, and effective corrective action plans are developed and implemented.
- Corrective action effectiveness reviews are conducted using a graded approach.
- Regulatory compliance and enforcement as required by rules, laws, and permits, such as the Price-Anderson Amendments Act, the National Environmental Policy Act, RCRA, CERCLA, the Federal Facility Compliance Act, and 10 CFR 851 *Worker Safety and Health Program*, are ensured.

ISM Overview

General

The objective of ISM within DOE is to incorporate safety into management and work practices at all levels, addressing all types of work and all types of hazards to ensure safety for the workers, the public, and the environment. To achieve this objective, DOE has established guiding principles and core safety management functions. The objectives, principles, and functions are set forth in DOE P 450.4A, DOE O 450.2, and the following DEAR clauses:

- 48 CFR 970.5223-1, which requires integration of ES&H into work planning and execution
- 48 CFR 970.5204-2, which deals with laws, regulations, and DOE directives
- 48 CFR 970.1100-1, which requires performance-based contracting.

The DOE policy and order apply to DOE organizations, while the DEAR clauses apply to contractors. Effective ISM systems address the guiding principles and core functions while also considering the following:

- The planning and performance of all types of work, including but not limited to construction, operations, maintenance, and decommissioning, as well as design, conceptual studies, environmental analyses, safety analyses, hazard reduction analyses, pollution prevention/waste minimization, and risk analyses
- All types of hazards, including but not limited to chemical, physical, biological, ergonomic, environmental, nuclear, electrical, and transportation
- The identification, analysis, and control of hazards and the use of feedback for continuous improvement in defining, planning, and performing work.

Relationship between ISM Principles, Functions, Operational Work, and Performance Results

Figure 2 below depicts various levels within the organizational culture. The outer level represents the environment within which the work takes place. The outer level is most influenced by the ISM principles (and the supplemental safety culture elements). The next level is the process level, where management systems are defined to direct behaviors. This level is most influenced by the ISM functions. The innermost level is the activity-level work itself, where operational work is performed. This work represents the direct interaction between people and the physical facility and is mostly performed by DOE contractors (except at government-owned, government-operated facilities [GOGOs]). This is the level at which organizations can measure ultimate performance results and determine whether the ISM system objectives have

been realized. Performance measures at other levels can show how effectively the process and culture support the desired safety objectives. Showing work at the innermost level does not mean that work is not required at the other levels; indeed, work activities are required at the other levels to develop work processes and highly reliable, error-tolerant work environments.

Organizations are systems, and it is important that the organization be measured at all three levels and that their alignment be routinely assessed. Understanding the performance and perceptions at each level is essential to the development of integrated organizational, process, and work activity improvements that are likely to be effective and sustaining.

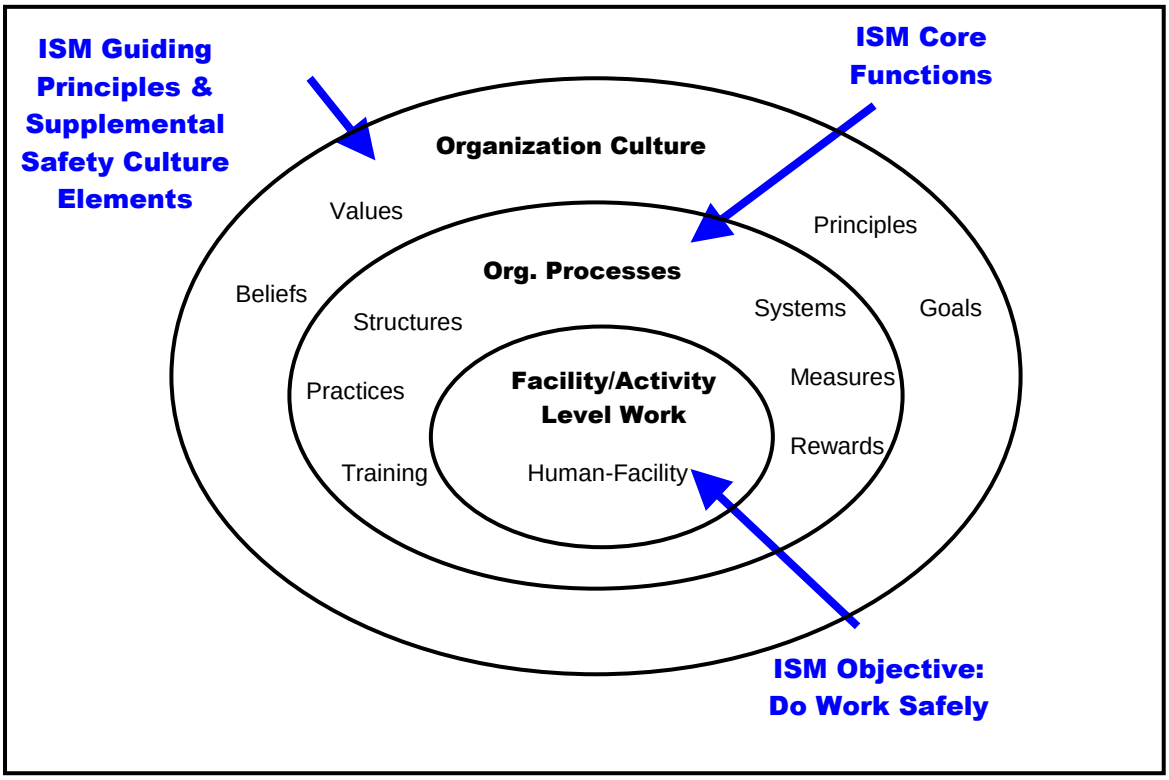


Figure 2. Relative Focus of Attention by Organization Level

Different levels of the organization (institutional, site, facility, and activity-level work) provide different levels of attention to implementing the ISM principles and ISM functions. Because the ISM principles relate more to establishing the desired environment and the desired culture, more attention to implementing the ISM principles is expected at higher levels of the organization (such as the institutional and site level). At the lower levels, attention to the ISM principles does not need to be as focused, since many of the principles should be effectively built into work procedures and practices. ISM functions are the primary focus of the lower levels of the organization and warrant the most attention at the activity level. For the higher levels of the organization, management involvement and attention will also be needed to facilitate accomplishment of the ISM functions, although at a lower percentage than attention to ISM principles. Figure 3 below illustrates this concept.

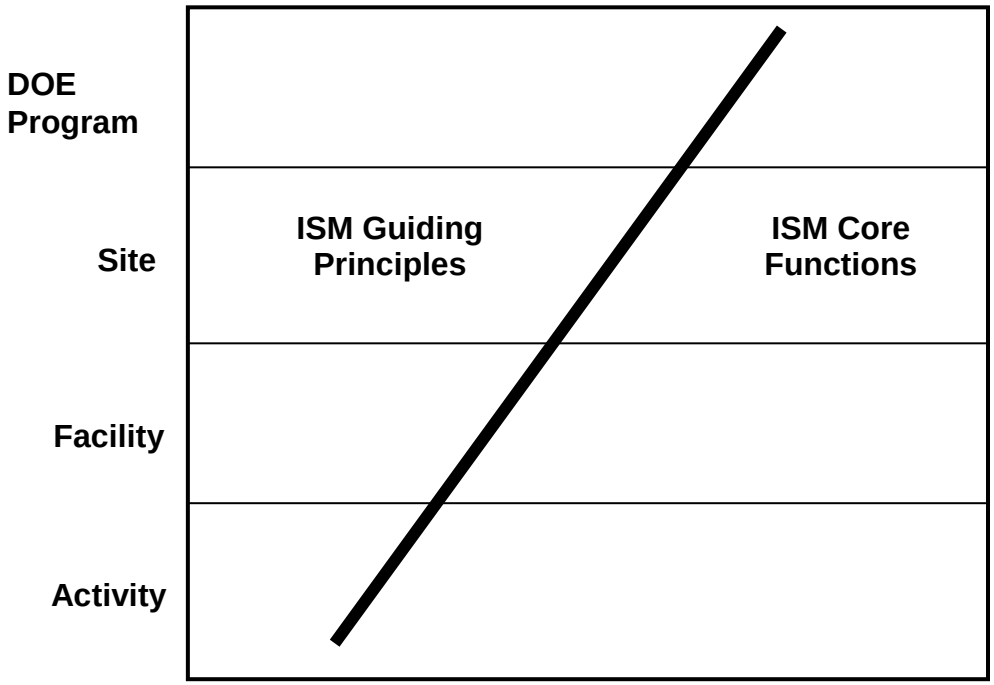


Figure 3. Relative Focus of Attention by Level

Work Planning and Execution

Integration by Site, Facility, and Activity.

In general, operating organizations perform work using both site-wide safety programs (e.g., fire protection and emergency planning) as well as facility- and activity-specific safety processes. Some of these programs are established at the site level to address, for example, radiation protection, environmental protection, industrial hygiene, industrial safety, and emergency planning. Other programs, such as those for configuration management and conduct of operations, are more appropriately specified at the facility or project level. And some processes, such as quality inspection, or those used for task level work planning and control, can be specified at the activity level.

All safety control measures, programs, and processes, regardless of the level at which they are specified, and regardless of whether they are mandatory or voluntary, flow down and should be implemented at the appropriate work level to achieve adequate safety. Both DOE and the operating organization should review existing processes and programs to ensure they are integrated, flow down to the task/activity work level, and adequately address ISM system requirements. For these reasons, an ISM system should include processes for selecting and applying site and facility processes or procedures to use in developing work-specific control measures.

Managers and workers at all organizational levels should be involved in developing, maintaining, and improving the controls that should be applied to work at the task/activity level.

Safety must be given high priority and the workplace should be as free as possible of recognized hazards that might endanger workers, the public, or the environment.

Figure 4 illustrates the layered structure that characterizes an ISM system. Each circle represents a single organizational level; that is, the institution or site level, the facility level, and the activity level. Individuals at each level of the organization play a role in work and safety planning. As illustrated in Figure 4, the core safety functions are integrated at each level.

- The institutional level-the DOE regulatory and program organizations. This level has responsibility for setting standards and expectations, as well as overseeing the implementation of ISM by contractors. The institutional level also encompasses contractor management of the laboratories and production sites. The seven guiding principles of ISM are basically management requirements for its implementation at the facility and institutional levels.

- The facility level-the safe and compliant operation of facilities that house hazardous activities. The primary goal of implementing ISM at the facility level is to provide an approved safety basis for both production and research activities. Properly applied at the facility level, ISM is designed to protect workers from system-level accidents (a facility fire,

for example) and the public from the release of hazardous materials and chemicals (plutonium, for example). The five core functions of ISM provide the fundamental logic for developing a compliant facility safety basis; the details are embodied in DOE directives.

The activity level-the safe execution of hazardous work needed to accomplish DOE's national security, environmental cleanup, energy, and science missions. The five core functions of ISM provide the fundamental logic for developing procedures and work controls that protect the technologists, scientists, and engineers working with hazardous materials and energetic processes. EFCOG is developing a *Work Planning and Control Guidelines* document with its member contractors and in collaboration with DOE. The EFCOG website is http://efcog.org/index.htm for further details.

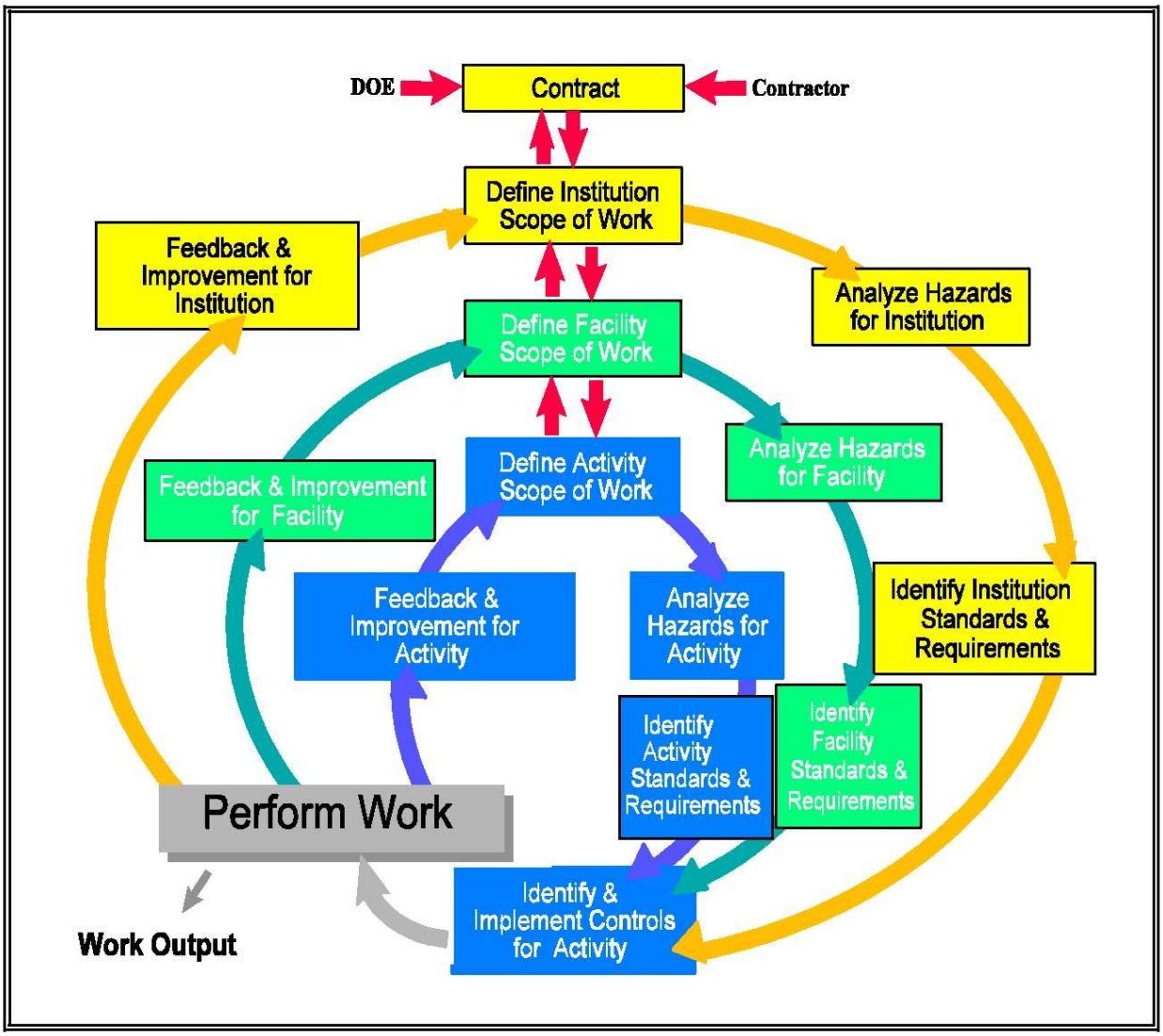
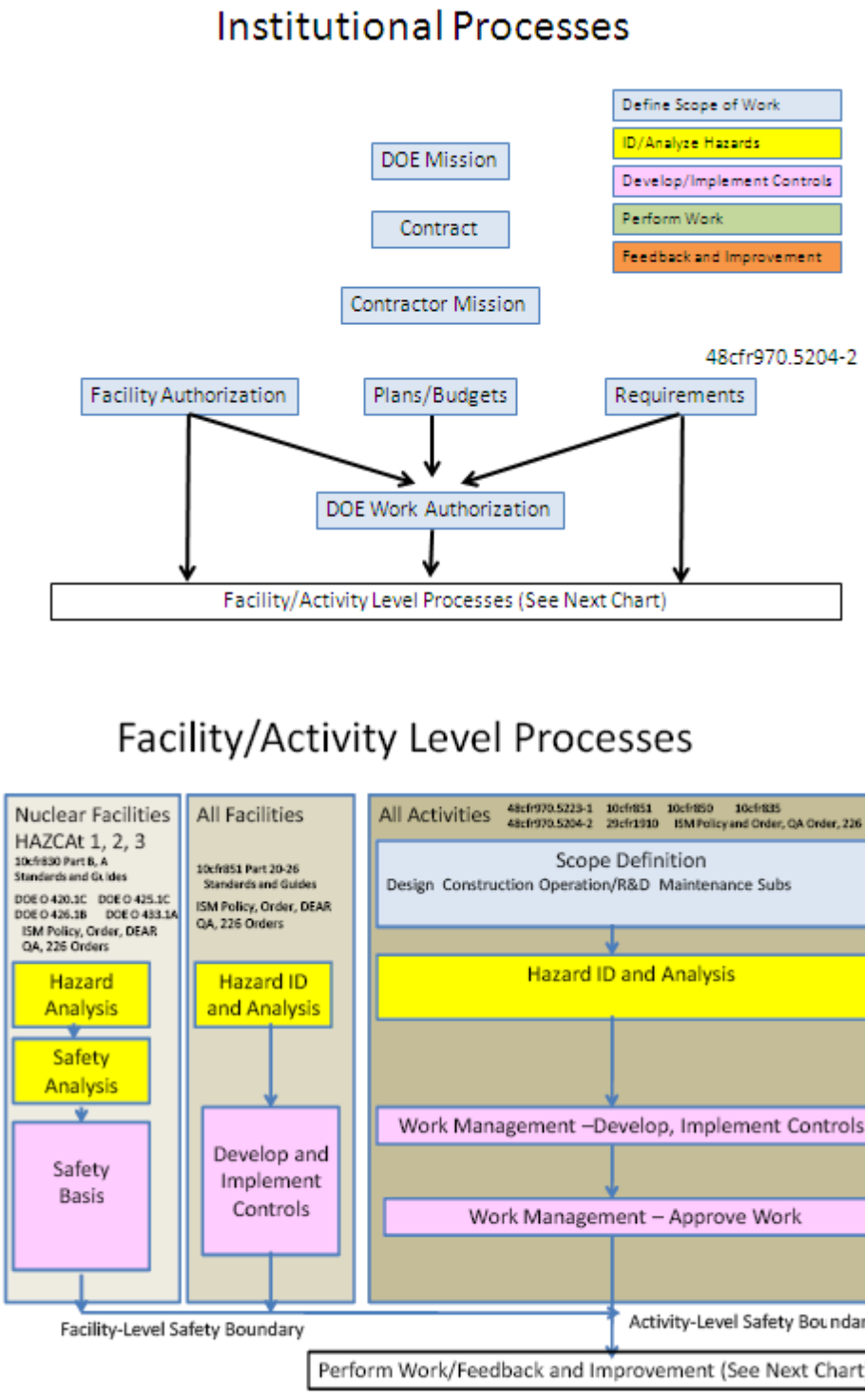


Figure 4. An illustration of major interactions between organizational levels for the five ISM core functions.

Figure 5 shows how work is processed from the institutional level, through the facility/activity level, and finally to the work performance level including feedback and improvement. All steps should be processed within the ISM system.



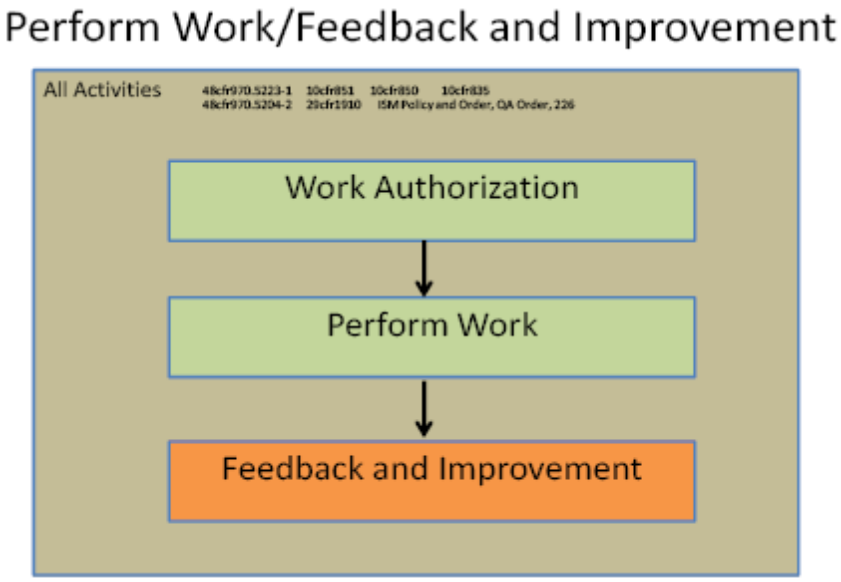


Figure 5: (3 figures above) Work is processed from the institutional level, through the facility/activity level, to the work performance level including feedback and improvement.

Although the same DOE ISM policy applies to all facilities and activities, the contractor's safety control measures are tailored to the site, facility, and activity based on the hazards and work being performed.

Relationship of Major Improvement Initiatives to ISM

The Department adopts and encourages DOE Secretarial offices, field offices, and contractors to implement the principles and functions of a variety of processes and initiatives aimed at improving organizational and individual performance. Many tools and mechanisms are available, and most have been or are being used in one form or another in DOE and contractor organizations. A non-inclusive list of performance improvement programs or processes follows:

- Human performance improvement (HPI)
- Voluntary Protection Program (VPP)
- Behavior Based Safety (BBS)
- Enhanced Work Planning (EWP)
- Safety conscious work environment
- Conservative decision making
- Nuclear Regulatory Commission risk-informed inspection and decision making
- International Organization for Standardization (ISO) Standard 9001, Quality Management System
- Total Quality Management (TQM)
- Six Sigma quality programs
- ISO Standard 14001, Environmental Management System.

All of these tools, processes, or approaches can be an integral aspect of ISM or can be adapted to complement ISM. They share many common principles that affect organizational and individual worker, supervisor, and management behavior and performance.

A number of safety culture initiatives are particularly relevant to attaining successful ISM performance. This guide addresses safety culture in § 6.4 and in more detail in Attachments 10-12.

It is important to implement these tools, processes, and approaches consistent with an ISM framework, not as stand-alone programs independent of the ISM framework. These tools support ISM and should not compete with ISM. To the extent that these tools help clarify and improve implementation of the ISM system, their use is strongly encouraged. The relationship between these tools and the ISM principles and functions needs to be clearly understood and articulated in ISM system descriptions if these tools affect ISM implementation. It is also critical that the vocabulary and terminology used to apply these tools be aligned with that of ISM. Learning organizations borrow best practices whenever possible, but translate them into terms that are consistent and in alignment with existing frameworks.

Tailoring for Integrated Safety Management Applications

1. Introduction

DOE ISM systems often support many different kinds of work, from the operation of nuclear and non-nuclear facilities to laboratory experimentation to environmental restoration activities. To accomplish the work safely and to protect workers, the public, and the environment, the system should function to identify and control all types of hazards, from commonly encountered workplace hazards to rare or one-of-a kind process hazards, in existing, newly designed, and old, nonoperating facilities. The system should also function to deal flexibly with the uncertainties associated with natural phenomena, uncharacterized wastes, and experiments involving emergent technologies, as well as those associated with new missions and new designs. Further, the system should be able to accommodate existing methods, processes, and infrastructures from a variety of domains within and outside of DOE, including standards and requirements, nuclear safety authorization bases (based on documented safety analyses, technical safety requirements, and unreviewed safety questions), OSHA standards, and EPA CERCLA/Superfund requirements.

Contractor and DOE budget processes should ensure that safety and mission priorities are balanced. The safety management system should enable appropriate tailoring of levels of effort such that hazards are adequately identified and controlled yet work is not burdened with prescriptive requirements that inflate costs without enhancing safety. Thus, tailoring within work management functions (planning work, analyzing hazards, establishing controls, performing work, and assessing work and providing feedback) should enable work to be managed at the appropriate levels, so that operational design and system requirements imposed at each level will not unnecessarily constrain management decisions at lower levels where more detailed information on work and hazards is available. In effect, work management systems function to optimize work planning and work performance to enable those closest to the work—those who perform the work and those who manage or supervise it—to consistently perform work safely, effectively, and efficiently.

Within the five core functions of ISM, standards and requirements play a vital role. DOE O 450.2 recognizes this and allows for tailoring of the implementation of DOE directive requirements for facilities and operations as appropriate to the risk and need for corporate consistency. Suggested approaches and applications of tailoring are presented below.

2. Tailoring

Tailoring is planning and applying work management functions to accomplish the work at hand within the established contract and project agreements. It ensures adequate protection for workers, the public, and the environment and optimizes the use of available resources.

When applied to the five core functions of ISM, tailoring allows for a work management system that handles all types of work and performs efficiently, effectively, and seamlessly. For example, as applied to hazards analysis, tailoring includes selecting hazards analysis teams that are familiar

with the work and the hazards, selecting appropriate hazards analysis methods, and assuring a robust analysis. Applied to controls, tailoring ensures selection of controls that are appropriate for the work and the hazards. Thus, tailoring implies attaining defined expectations and needs.

Tailoring allows choices to be made from among a variety of engineering and administrative controls that provide reasonable assurance that workers, the public, and the environment are adequately protected during the performance of work. Moreover, tailoring can work in a "top down" or "bottom up" manner. As a flow-down approach, tailoring of higher-level agreements and contractual and project agreements between DOE and its contractors enables contractors to establish general standards for work that encompass pertinent statutory and regulatory requirements and reflect DOE missions and resources. As a flow-up approach, individual tasks are tailored so that each task has controls that fit the specific work and the hazards associated with it and that are consistent with higher-level performance expectations. Many work controls are derived from regulatory requirements; some have no regulatory basis but can be derived from consensus standards or industry best practices, and some should be developed to fit the work.

Thus, tailoring is essentially a systems adaptation that operates at all levels and on all functions of work planning and performance. It encompasses the three core functions of work planning (define work, analyze hazards, establish controls) and the two core functions of work implementation (perform work, assess and provide feedback), and it occurs at all levels of work.

3. Expectations For Tailoring

DOE Headquarters and field offices have two primary roles in the tailoring process: (1) defining mission goals and desired work outcomes, and (2) working with contractors to establish resource parameters and technical approaches for work to safely and effectively carry out mission goals; to identify statutory, regulatory, and contractual requirements that apply to the work; and to evaluate the progress and success of the work. These roles are realized, in part, through contract negotiations and through DOE approval of contractors' safety management systems, as required by the DEAR ES&H clause. Contractors, in addition to working with DOE, have the added roles in tailoring of (1) determining "how" work is actually conducted at all levels (site, project, activity, task); (2) selecting and implementing work controls to fit the work; (3) meeting requirements; and (4) optimizing the use of their resources. Both DOE and site contractor staff at all levels are expected to tailor their ISM functions.

Given effective tailoring of work management, DOE can expect site operators and contractors to have work management systems that ensure safe and effective management of work in fulfillment of the Department's missions. Meeting this expectation may sometimes entail removing encumbrances that were placed on missions in the name of safety but that are not required and do not provide intended safety benefits, especially at the contractors' project and activity levels.

Likewise, given effective tailoring of work management, contractors can expect that, so long as they meet statutory, regulatory, and contractual requirements, DOE Headquarters and field personnel will allow them flexibility to manage the accomplishment of work to fulfill DOE missions. Fulfilling this expectation also may sometimes entail removing encumbrances that were placed on missions in the name of safety but that are not required and do not provide

intended safety benefits especially at higher levels.

4. Standards, Requirements, and Work Controls

Within DOE, missions are translated into work designs and objectives at the highest agreement levels between DOE and site contractors. At this level work designs and objectives are defined and hazards are identified in broad terms. The nature of the work and the hazards determine which statutes and regulations apply.

Performance expectations can be defined as required conditions or required outcomes. Regulatory requirements often prescribe performance expectations but are silent on the processes used to meet the expectations. Such performance- or outcome-based regulations allow greater flexibility of response, so that the most efficient method of compliance can be implemented. Tailoring includes selecting and implementing effective methods for compliance with performance-based regulations. Providing flexibility to contractors in complying with requirements allows them to select cost-effective methods for compliance.

Many DOE contractors currently have sitewide performance standards specific to the work done at their sites. These standards ensure adherence to appropriate regulatory and contractual requirements and adequate protection of workers, the public, and the environment. They also reflect expectations for the performance of work consistent with the identification and management of hazards specific to site facilities, projects, activities, and tasks. In addition, sitewide performance standards are generally supported by institutional systems and procedures that help identify hazards, select and implement controls, and provide feedback.

For site contractors, tailoring is most effective at the task level and in the management of tasks as activities. The effectiveness of tailoring at this level is evidenced when the workers who perform the activities and the supervisors who provide the resources to those workers actually plan the performance of the work to meet higher-level expectations. All five core functions are applied at this level, and real hazards identification and application of controls occur here. It is the responsibility of the workers and their supervisors to provide assurance that the performance of the work meets the work controls.

5. Tailoring Within Core Functions

Tailoring within the ISM core functions relies on making informed decisions at all management and performance levels, based on the knowledge of the work to be accomplished and the barriers that may prevent achieving the objectives of the work. It is important to recognize that the individual functions cannot be tailored readily without affecting other functions and, potentially, the entire system. Defining work scope, for example, may involve several excursions into the other core functions before a final work plan is implemented. If, for instance, hazards are identified during the work planning stages, then opportunities may arise at this stage to redesign the work to eliminate the hazards or to reduce the potential for accidents arising from them. Further, during work performance, assessment and feedback at any time can and should affect future execution of work plans.

Core Function 1, Define Scope

Work scope definition is, inherently, a tailoring function. Defining work entails making decisions about a continuous variety of options and tradeoffs. It is the balance of these options and tradeoffs that determine whether a work design will be successful. Many of these tradeoffs are integrally related to tailoring the other elements. They include developing and resolving the work scope, establishing a technical approach, adjusting resources, adapting personnel (experience and expertise), adjusting schedule, and performing activities sequentially or in parallel to minimize hazards or to optimize the critical work path.

For example, work design considers the life cycle of the work and the ultimate fate of the systems, processes, and/or facilities used to accomplish the work. Thus, the use or addition of any feature, function, or structure is weighed not just against its safety benefits and implementation costs, but also in terms of the hazards it may pose in decontamination and disassembly.

Tailoring can also be applied to the formality and documentation associated with a work plan. Too often, formality and documentation are associated, or equated, with budget or cost, even when the work and the hazards are of a routine nature. A better gauge of the need for formal documentation is the complexity of the work, the hazards associated with it, and, in some cases, the regulatory requirements for documentation. Thus, if the hazards are of such type and magnitude that multiple layers of controls or complex systems are required, then greater formality within the planning process can help ensure completeness of hazards identification and implementation of controls. Tailoring at any level under this function may include adjusting work scope and schedule to higher-level constraints, for example by:

- Resolving budgets and resources to work scope and schedule
- Identifying and selecting personnel according to experience, expertise, and training
- Adapting the formality of documentation of the work plan and work performance to complexity of the work and the types and magnitude of hazards

- Considering alternative technical approaches to performing work
- Planning/replanning work to eliminate or reduce hazards
- Redesigning work based on assessment and feedback.

Core Function 2, Analyze Hazards

Work hazards are addressed at all stages of work planning and work performance. For example, in the early stages of work planning, or during design, hazards are often identified and evaluated using only a checklist of hazard types. That is, hazards are identified as nuclear, chemical, thermal, electrical, kinetic (movement), etc. At this time, the hazards may also be assessed as to the magnitude of the harm that accidents involving them could cause. For example, the consequences or impacts of accidents could be evaluated as harm to the immediate worker only, harm to workers on adjacent processes or activities, or harm to the public or to public resources. Thus, at this stage, the identification and assessment of hazards represent a tool for design evaluation and design improvement. Later, to manage work performance, more detailed hazards analyses are needed to select appropriate types and numbers of controls to prevent accidents or to mitigate their consequences. Even later, as a cyclic part of routine work performance, these analyses are reviewed and updated to ensure that a process or facility that has been in operation for a long time continues to maintain adequate controls to prevent accidents or to mitigate their consequences. At this stage, the analysis of hazards is a tool for evaluating whether safe operations are being maintained as the process or facility deviates from original design or purpose.

Just as work hazards are addressed at all stages of work design and work performance, work hazards are also addressed at all levels of work. For example, at the task or job level, job hazards analyses are performed to identify hazards to the worker or workers performing a job. For simple, routine jobs, these analyses can be simple checklists and can often be proceduralized. For jobs in which hazards are not well understood, they can be thorough, systematic examinations by multidisciplinary teams that include workers, their supervisors, and engineering and safety staff.

Hazard analyses also should include all states that occur during the performance of the work. For example, if the work involves performing hydrostatic tests, then analysis of hazards should include the installation of the test equipment, pressurization during the test, and the subsequent removal of the test equipment.

For existing facilities and projects; all types and levels of hazards evaluations, analyses, and assessments should begin with a walkdown of the work, equipment, and facilities; interviews with staff; and reviews of existing information/documents about the work. This review encompasses more than just safety documents. For example, engineering drawings, work or process flow diagrams, materials inventory lists, operating and emergency procedures, and accident/incident reports all should be reviewed.

Tailoring the analysis of hazards encompasses selecting appropriate levels of hazards

evaluations, appropriate hazards evaluation methods, and appropriate teams of individuals to accomplish the hazards evaluations. Eliminating hazards is also an integral part of work definition and work planning processes; that is, where practical and effective, it is preferable to eliminate hazards rather than to control them. For example, the first step in decommissioning a chemical laboratory is usually to remove any jars or bottles of leftover chemicals. The place in the life cycle of a project or process where hazards elimination can be most effective is in the work design stage. In fact, all project or process design work should consider not only elimination of hazards, but also larger, life-cycle issues, such as waste minimization and D&D.

Substitution of materials can eliminate hazards in some cases, such as substituting non-flammable solvents for kerosene for metal parts cleaning. When the potential consequences of accidents are sufficiently serious that controls and mitigators do not provide adequate protection, elimination of hazards is important. For example, accidents, analyses, and tests showed that exposing nuclear weapons to high velocity impacts caused detonation of their high explosives, leading to dispersal of radioactive material. Thus, new high explosives were developed that are very difficult to detonate by impact.

However, "inherently safer" work does not always mean "safer" work, and early elimination of hazards does not always make work safer. For example, asbestos is a hazardous material, and many older DOE facilities have asbestos-insulated piping. As part of D&D operations, this piping will need to be removed. However, removal of asbestos early in the D&D process can actually lead to greater disruption of work and greater exposure potential. If examination of the piping shows that outer coatings are intact (that is, that the asbestos is sealed and not friable), then it may be safer to leave the asbestos in place, and routinely inspect it, than to remove it early. In this example, it is better to initially manage hazards in place and to sequence work to minimize exposures, rather than removing the asbestos early. Thus, although early elimination of hazards may be a practical and effective way to make work safer, controlling hazards in place is sometimes equally or more practical and effective.

Tailoring at any level under the hazards analysis function may include:

- Performing hazards evaluations or assessments (preliminary hazards analyses) before proceeding with detailed analyses
- Selecting hazards evaluation methods commensurate with the level of work – task, activity, project, site, or DOE-wide
- Evaluating and refining work designs for safety and for inherent safety
- Identifying hazards elimination potentials
- Identifying and resolving hazards interface problems.

Tailoring at the project level or lower may include:

- Selecting hazards analysis methods commensurate with the level of work

- Selecting hazards analysis methods commensurate with the life cycle of the process or facility
- Selecting hazards analysis methods commensurate with the complexity of the work and the types and magnitude of the hazards
- Identifying hazards analysis teams considering staff experience and expertise with the work and the hazards
- Adapting analysis processes to ensure interface reviews
- Identifying multiple uses of hazards analysis information
- Coordinating multiple analyses for quality and efficiency.

Core Function 3, Identify and Implement Controls

Many work hazards can be controlled by either engineering or administrative methods. For example, pressure vessels, relief valves, contamination containment equipment, high efficiency particulate air (HEPA) filters, and spill dikes are types of engineering controls. Operating procedures and hazardous materials limits are types of administrative controls. Both types of controls can be voluntary or mandated by regulation. Inherent in the tailoring process, however, is the selection of controls to adequately protect against the identified types and severity of potential accident consequences, without over-constraining the work process and potentially even making it less safe. For example, for high-hazard processes and activities, establishing and working within well-defined and controlled operating limits may be necessary to ensure that safe process parameters are maintained. For low-hazard processes and activities, only general operating parameters may be needed.

Tailoring work with engineering controls assumes that the controls are practical and readily available, thus enabling work to proceed in a safe and timely manner. For example, using contamination control equipment, such as glove bags, may enable work to be completed safely without hindering workers with individual respiratory protection equipment. Similarly, containment tents and portable HEPA filter units may allow radiological decontamination work to be conducted in isolation from uncontrolled areas. In addition, controls should be evaluated for their simplicity. Complex controls that require special skills or training for use or maintenance may be less desirable than simpler controls, especially for short-term operations.

Tailoring work with administrative controls includes maintaining clear and effective operating procedures for equipment and processes, an effective work authorization process, and a work control process that ensures timely and effective training. For example, skilled craftsmen such as electricians, who have been apprenticed, trained, and/or certified in their crafts, typically do not need written procedures to perform the work for which they have been trained. However, the work of all craftspersons is controlled by work authorization processes. In addition, if craftspersons perform their work in environments whose hazards are unfamiliar to them, the authorizations and training specific to the work environment are applied to ensure safe

performance. Thus, administrative controls, including procedures, work authorizations, and training, may be tailored to fit the work, the work environment, and the workers. Conversely, assuring that workers are qualified to perform work requires maintaining a balance of training, experience, and written procedures tailored to the work and the hazards.

Most training programs can be tailored so that workers whose tasks are more difficult and workers whose tasks are more important to successful operations receive more extensive or intensive training. Likewise, safety training should be provided specific to the task and the work. Workers engaged in low-hazard tasks may receive only general or site occupational safety and health training.

Establishing effective controls for hazards involves interactions between management levels. For example, a hazards analysis team can recommend that particular hazards have enhanced protection. Experienced teams may even suggest specific control measures. However, it is a management decision as to what or even whether controls are implemented. That is, management uses a variety of criteria to select and prioritize corrective actions and safety improvements. These include costs, other competing priorities, implementation schedules, the effectiveness of risk reduction, and technical feasibility.

In terms of reliability, engineering controls are usually preferred over administrative controls. Also, process controls are usually preferred over PPE. However, for short-duration, non-routine processes and activities, management may opt for administrative instead of engineering controls, or PPE instead of process controls, because of cost, schedule, or other priorities.

Management makes decisions and accepts responsibility for the sufficiency of work controls. They also approve controls as sufficient to perform work. However, the expectations for sufficiency of controls should be defined early, during work design and work planning, and agreed to by all responsible parties. In some cases, an operational safety management system may suffice to ensure adequacy of controls. When work deals with highly hazardous materials for work environments, however, further objective evidence may be expected. In all cases, sufficiency expectations should he defined up front.

Tailoring at any level under Core Function 3 may include:

- Adjusting work controls to lower or higher level constraints
- Resolving budgets and resource allocations to meet work control needs
- Selecting the level of experience, expertise, or training of personnel
- Adapting the formality of work control documentation to the complexity of work and the types and magnitudes of hazards.

Tailoring at the project level or lower may include:

- Resolving the detail of operating procedures to the training and skill of the workforce

- Adjusting employee training and refresher training programs to work and hazards
- Selecting standard industrial practices consistent with work and hazards
- Selecting engineering and/or administrative controls to prevent, protect against, or mitigate accidents
- Adjusting change-control programs to the needs of the work and significance of the hazards.

Core Function 4, Perform Work

Aspects of work performance that can be tailored include readiness or "pre-startup" reviews; mechanical integrity and maintenance programs; work authorizations; and surveillance, inspection, and testing programs. For example, readiness or pre-startup reviews, usually performed at the project level, can be made more or less rigorous, depending upon the hazards of the work. Testing and maintenance, usually performed at the task or activity level, can vary in frequency as well as procedural rigor, again usually depending upon knowledge of the hazards and the reliability needs for the equipment examined.

For example, for equally important processes, operation and maintenance of high-hazard processes are usually governed by more formal conduct of operations than operation and maintenance of low-hazard processes.

Surveillance and maintenance programs are particularly important for aging facilities within the DOE complex because these facilities often have not been refurbished and continue to operate using outdated and fatigued equipment. Past surveillance and maintenance practices may be inadequate to ensure the safe operation of the facilities. Increased surveillance and maintenance activities are examples of tailoring for aged equipment that continues to operate.

For example, an overhead crane that was originally specified for occasional use in an active facility may, during D&D, encounter far more frequent use. The inspection and maintenance of the crane should be tailored to the new operations and conditions.

Tailoring at any level under this function may include:

- Adjusting work performance schedules to lower or higher level constraints, including budgets and resources
- Adjusting the depth and rigor of operational readiness or pre-startup reviews to the significance of the work and hazards

- Resolving the level of comprehensiveness of mechanical integrity programs
- Selecting the level of experience, expertise, or training of personnel.

Tailoring at the project level or lower may include:

- Aligning the degree of detail in maintenance procedures to the training and skill of the workforce
- Adjusting the level of proceduralization of work authorizations to the level of the workforce
- Adapting preventive maintenance frequency to needed equipment reliability
- Adjusting surveillance and maintenance programs to the age of the process, facility, and/or equipment
- Adapting inspection and testing programs to equipment reliability.

Core Function 5, Feedback and Improvement

Self-assessments and management assessments are done to determine whether work is properly scoped and whether work controls and work performance adequately meet agreed-upon standards. The criteria, indicators, and measures used in assessments are best developed at the time the work and the ES&H expectations are agreed upon. Such up-front work ensures that the criteria, indicators, and measures are developed using the same factors that were used to develop the work expectations.

Contractors should develop assessment programs and protocols that are tailored to the details of their safety management systems to meet agreed-upon expectations. DOE assessment programs and protocols should ensure that contractors' self-assessment programs are effective and produce valid results. A history of effective self-assessment and continuous performance improvement by contractors can be a basis for decreased DOE assessment efforts.

Conducting good assessments requires knowledge of the work, the work environment, and the agreed-upon expectations for performance of the work. It also requires inquisitive minds and an understanding of the assessment methods that are effective. Thus, workers should be trained in self-assessment, and outside assessors should be trained or informed about the work, the work environment, and the agreed-upon expectations pertinent to the facility, activity, or operation being assessed.

DOE and contractor assessments improve when their respective methods and results are shared openly and constructively for continuous improvement. Open and constructive sharing requires a DOE-contractor relationship based on trust. Such trust should be fostered by focusing on the use of assessment results for continuous improvement, rather than for punitive actions.

Tailoring of assessments within Core Function 5 may include:

- Developing performance criteria, indicators, and measures that are specific to the work, the work environment, and the agreed-upon expectations
- Using methods that are keyed to each contractor's safety management system
- Providing feedback of assessment results into the safety management system where it will be most useful.

Development of ISM System Descriptions

The following guidance outlines important considerations and suggested approaches for development of ISM system descriptions intended to meet the applicable requirements of DOE O 450.2 and the DEAR ISM clause.

DOE Headquarters Secretarial and field offices (including NNSA site offices and EM project offices) are required by the ISM order to develop and implement ISM systems and document them in ISM system descriptions. The DEAR ISM clause requires contractors to manage and perform work in accordance with a documented Safety Management System. (The DEAR ISM clause use of the term "Safety Management System" is equivalent to the O 450.2 use of the term "ISM system.")

Important Considerations for both DOE Offices and Contractors

1. In developing these system descriptions, the following should be considered:

    - How each organization defines its work activities related to achieving the ISM objective of safe mission accomplishment

    - The implementing mechanisms, processes, and methods by which each organization implements the ISM guiding principles to create an effective environment for ISM implementation

    - The implementing mechanisms, processes, and methods by which each office implements the ISM core functions

    - How environmental management systems (EMSs), quality assurance programs (QAPs), and other management processes and systems are integrated with the ISM system

    - How each organization will measure ISM effectiveness, perform ISM effectiveness reviews, prepare ISM declarations, and continuously improve the effectiveness of the ISM system

    - How each organization will establish, document, and implement relevant safety goals, performance objectives, measures, and commitments in response to Secretarial and DOE office direction and budget execution guidance while maintaining the integrity of the system

    - How each organization will maintain its ISM system description so that it is accurate and up to date, and demonstrates continuous ISM improvement in its performance of safe work activities

2. Each ISM system description is a primary management system description for the particular office for accomplishing work in a safe and environmentally sound manner, and should be integrated with other relevant safety and management systems, such as quality assurance, and EMSs. ISM systems are most effective when integrated with the office business processes for work definition and planning, budgeting, authorization, execution, financial management and control, change control, performance measurement and evaluation, incorporation of lessons learned, and continuous improvement. For example, ISM accountabilities and performance should be reflected in personnel performance objectives and evaluations. ISM system descriptions may be combined into a single document or a set of documents.

3. ISM system descriptions should be reviewed at an appropriate frequency to determine whether updates are needed. A statement to this effect should be included in a periodic ISM declaration.

4. Organizations with safety management responsibilities should establish and maintain implementing mechanisms, including processes, policies, protocols, procedures, documentation, and training, to translate ISM system expectations into implementation activities and desired human behaviors. These mechanisms need to consider all active and applicable program and facility life-cycle phases, including design, construction, operation, maintenance, research and development, and D&D.

5. The level of rigor in the ISM system descriptions should be consistent with the hazards and complexity of the applicable facilities and activities.

Additional Important Considerations for DOE Offices Only

System descriptions for DOE offices should include the ISM implementing mechanisms and processes, including specific means and methods, that will be used to meet the Secretarial and field office responsibilities. DOE offices' ISM system descriptions may also include the associated Secretarial office's FRA document and the line oversight program description. Approved changes to ISM system descriptions should be provided for information to the affected DOE officials.

Additional Important Considerations for Contractors Only

The existing ISM systems used by DOE contractors include a number of sound procedures and manuals of practice that have been proven over many years. It is not the intention of this Guide to suggest changing these proven safety practices. The objective instead is to improve the integration of these practices and ensure that the ISM seven principles and five core functions provide the foundation for safety management practices. The following should be considered:

1. Review existing systems. Experience has demonstrated the value of reviewing the existing procedures and manuals of practice prior to instituting any changes or attempting to describe how the existing ISM system description satisfies the DEAR requirements.

The contractor should first identify the complete set of safety programs at the facility or site. These programs are typically described in facility- or site-wide policy statements and are implemented through the use of facility- or site-wide procedures and/or manuals of practice. Procedures and programs for the following should be identified as part of this initial effort:

- work definition and planning;
- hazards identification and analysis;
- definition and implementation of hazards controls;
- development and implementation of operating procedures;
- performance of work; and
- monitoring and assessment of performance for improvement.

Subsequently, the facility- or operation-specific manuals of practice should also be identified for major facilities with procedures and practices unique to their operations and evaluated to determine how well these programs meet the functions and principles of ISM.

2. Gap analysis. It is necessary to objectively analyze the complete set of procedures and programs to determine which, if any, of the seven guiding principles and five core functions are not adequately addressed by the various procedures and manuals of practice. When a core function or guiding principle is not addressed or is judged deficient, a gap in the ISM system for the facility, activity, or site being analyzed has been identified. Accordingly, ISM system developers use this "gap analysis" to ensure integration and to identify missing or weak elements. A gap analysis can be completed in conjunction with a review of the existing ISM system. For some types of facilities, one or more missing elements may be appropriate and acceptable. However, if the missing or weak element is deemed to be important, corrective action should be taken to provide revised documentation that will permit implementation of the necessary ISM system element.

Suggested Development Guidelines

1. Introduction and General Approach

The Department views the ISM system description as the primary, all-encompassing roadmap for accomplishing work in a safe and environmentally sound manner within the

organization. The ISM system description defines the integral role of safety in the Department's business approach, processes, and financial management control system.

The objective of developing and maintaining ISM system descriptions is much more than a simple paper or documentation exercise, where DOE organizations identify activities and processes being accomplished to fulfill ISM principles and functions. Rather, it is expected to spur real and ongoing dialogue and exploration of areas needing attention for ISM implementation and improvement. Senior leadership commitment to ISM should be visible and clear at all levels (that is, the DOE Department level, the DOE Secretarial office level, the DOE field office level, and the contractor level). This commitment is borne out of an understanding of intended safety management values and processes, and personal engagement in developing and sustaining the ISM system. The ISM system is documented for stability and continuity, for communicating to existing organization members and others the office's approach to safety management, and for new members to become oriented and informed.

Development of ISM systems and implementation of identified improvements and commitments is expected to have a significant impact on DOE attitudes and behaviors related to safety. These desired changes should be managed consciously and vigorously. The following change management steps (see John P. Kotter, 1996, *Leading Change*, Boston: Harvard Business School Press) are valid and relevant to this effort, both in development and in implementation of ISM systems:

- Develop a sense of urgency.
- Establish a coalition of involved organizations to guide ISM efforts.
- Develop the vision and strategy.
- Communicate the change vision.
- Empower employees for broad-based action.
- Generate short-term wins.
- Consolidate gains and produce more change.
- Anchor new approaches in the culture (institutionalize the new approaches).

2. Developing the ISM System Description

The format of the ISM system description is left up to the developing organizations, but the following approach is recommended:

a. Develop a full understanding of the ISM system:

- Review ISM objective, principles, functions and associated DOE directives and guidance.

- Develop leadership goals, emphasis areas, and top-level commitments, if desired.

- Determine outcomes and results to be achieved through ISM.

- Establish key roles and responsibilities for implementation.

b. Define the management processes and systems that will be used to achieve the ISM principles and functions. For example, an organization may use its FRA document as the implementing mechanism for Guiding Principle #2, Clear Roles and Responsibilities. Describe the management systems needed to execute each ISM principle (including the three supplemental safety culture elements, if desired) and each ISM function:

- Describe the work activities relevant to each ISM principle and function to ensure that it is effectively executed.

- Define the management systems and processes needed for each principle and function. Management systems are the primary implementing mechanisms for ensuring implementation of ISM.

- Align the management systems with each ISM principle and function and with each other.

- Integrate ISM with other management systems, such as QAPs, EMSs, and the safeguards and security program (SSP). Describe linkages, interfaces, and coordinating mechanisms.

- Examine the condition of the management systems (gap analysis) to determine whether they effectively execute ISM principles. Identify gaps. Identify strengths and weaknesses.

- Identify the management systems that need to be established or strengthened. Identify specific actions (with end-state deliverables, responsible managers, and completion schedules) to establish and improve needed management processes and systems.

- Describe the communications and training plan that ensures that all members of the organization will be familiar with the organization's ISM system and will be familiar with their safety roles and responsibilities.

- Identify those outside the organization that contribute work activities to fulfilling its ISM responsibilities. Establish mechanisms to ensure that those identified are familiar with the ISM system and perform their work activities consistent with the ISM system. Identify and control the interfaces between organizations.

c. Identify other actions/initiatives taken to improve safety (supplemental to the management systems) and promote a positive safety culture. These can most

likely be associated with implementation of specific ISM functions and principles. Examples of other DOE initiatives are:

- Holding monthly all-hands meetings with a safety focus
- Developing a safety brochure explaining the manager's safety values
- Establishing teams to develop improvement initiatives

d. Define the expected attributes and results of the ISM system. Describe how ISM system effectiveness will be demonstrated. Describe how continuous improvement will be demonstrated. Determine how the organization will measure progress (performance measures):

- Quantify specific safety objectives for tracking.
- Consider measures for each individual ISM principle and function.
- Relate the measures directly to work activities.

e. Determine how the organization will maintain and improve its ISM system and document the basis for performing these elements, including the frequency, as appropriate:

- ISM system description changes
- ISM system effectiveness reviews
- ISM declarations
- ISM safety performance objectives, measures, and commitments updates
- ISM summary evaluations.

f. Confirm that implementation mechanisms (processes, policies, protocols, procedures, training, etc.) are adequate to implement and integrate the ISM objective, principles, and functions. Prepare a cross-walk to communicate implementation mechanisms and demonstrate coverage of ISM objectives, principles, and functions.

g. Describe how the principles, management systems, other implementing mechanisms, and performance measures integrate to achieve ISM attributes and objectives.

h. Confirm that there are no duplicate or conflicting mechanisms in use for other management systems

i. Prepare a summary of actions to implement the ISM system description and/or its update, and to address known weaknesses and opportunities for improvement. For example, identify schedule and responsibility for revision to the office FRA document, if necessary. This summary of actions should address necessary resources and staffing.

3. Preparing ISM System Documentation

DOE O 450.2 and the DEAR require that the ISM system be documented. To a large extent, the required documentation may consist of office or corporate procedures and manuals of practice used to perform work. In addition, a database may be compiled based on information from the existing procedures and manuals of practice and an analysis of those documents to determine which, if any, elements of a complete ISM system document are not yet included. The ISM system description can serve as a "road map" explaining the relationship of these documents to the activities being performed, assuming these documents exist and are complete in their coverage of the DOE requirements. If this is not the case, deficiencies in the documentation should be identified and scheduled for correction prior to completion of the review and approval of the system.

Generally, the ISM system description identifies existing policies, procedures, manuals of practice, and other ISM system mechanisms. Additionally, many organizations have found it beneficial to provide details on the overall ISM system philosophy or vision, the implementation mechanisms, and the integrating mechanisms. Most organizations have organized their ISM system descriptions to reflect the core functions and guiding principles.

a. Identifying and Describing Procedures and Manuals of Practice.

As part of the ISM system implementation process, the organization should review and evaluate existing policy manuals, procedure manuals, and workplace instructions. Some of these will be site-wide documents while others will be specific to a facility or work activity, including activities performed by subcontractors. The documentation of interest includes business procedures and practices that allocate resources and prioritize work, as well as work instructions intended to protect the public, worker, and environment. This set of documentation currently exists at most sites and facilities, but may not be readily identified with the DOE functions and principles required in an ISM system. Organizations may find it appropriate to evaluate how these manuals form an integrated system.

b. Describing Integrating Mechanisms.

Documented procedures and practices do not inherently produce the integration that is expected by DOE directives and the DEAR ISM clauses. This is particularly true for sites that have many diverse facilities performing work for several DOE program offices. It is also true that site-wide programs usually exist to address safety, environmental, and waste minimization activities that need to be integrated with specific programmatic work. A number of mechanisms may be incorporated into the ISM system to encourage integration. Specific business and work procedures may be used to support the integration. Some organizations use regularly scheduled subject area meetings (e.g., engineering councils) at various levels of the organization to encourage integration and information exchange. Such councils can be part of the documented business practices in

the ISM system. Other integration mechanisms may include site-wide maintenance manuals, site-wide safety meetings, and safety boards. Reviews and assessments, both programmatic and site-wide, and feedback of lessons learned to all programs are mechanisms that also contribute to integration. For example, although DOE-STD-1120 *Integration of Environment, Safety, and Health into Facility Disposition Activities* is specifically written for disposition activities, it provides guidance and examples for integrating planning, hazards analysis, and controls, and the methodology is generally applicable to other parts of the facility life cycle.

Typical site-wide programs that should be integrated into work activities include engineering support, fire protection, emergency preparedness, maintenance, environmental protection, waste management, industrial hygiene, occupational safety, chemical safety, radiological protection, training, and conduct of operations (including procedures).

An ISM system description should identify the integration of environment, safety, and health into the contractor's business processes for work planning, budgeting, authorization, execution, and change control. This requires integration within the line organizations and integration with the organizations supporting the line. The ISM system description should address the flow-down of safety management to subcontractors. The development of procedures and practices for prioritization of both programmatic and site wide work activities important to safety is an important integration activity that should be documented and integrated with interfacing DOE procedures and practices.

4. Sample Table of Contents for ISM System Description

The following is a sample Table of Contents.

Executive Summary

Definitions and Acronyms

1.0 Purpose and Objectives

2.0 Overview of the ISM System

3.0 Management Expectations

4.0 Roles and Responsibilities

- 4.1 Federal Responsibilities
- 4.2 Contractor Expectations

5.0 Implementation of ISM

5.1 Implementation of ISM Guiding Principles (including three supplemental safety culture elements)
5.2 Implementation of the Five Core Functions
5.3 Integration with QA, EMS, and SSP
5.4 Communications and Training Plan

6.0 Other Safety-Related Initiatives

7.0 ISM Maintenance and Continuous Improvement Processes

7.1 ISM System Description Maintenance and Continuous Improvement
7.2 ISM Oversight, Self-Assessments, Effectiveness Reviews, and Declarations
7.3 ISM Safety Performance Objectives, Measures and Commitments Process
7.4 ISM Effectiveness Review and Declaration Process

8.0 Conclusions

Attachment 1: Cross-Walk to Implementing Mechanisms
Attachment 2: Update to Safety Performance Objectives, Measures, and Commitments
Attachment 3: Summary of Implementation Actions

5. Integration of Management Systems

The Department has established requirements for multiple management systems, including:

- ISM system
- EMS
- QA, including oversight programs and assurance systems
- Worker safety and health program (as required by 10 CFR 851, *Worker Safety and Health Program*, and DOE O 440.1C, *Federal Employee Safety and Health*)
- Emergency management system
- Project management system
- Financial management system
- Integrated safeguards and security management system.

Both the EMS and the QAP are expected to be consistent with the ISM system. It is advantageous to discuss and integrate the EMS and QAP with the ISM system to

eliminate redundancy and strengthen the overall implementation of the three related systems as an integrated management system. Secretarial offices should provide further direction and guidance to field offices on how to integrate management systems effectively.

Line safety oversight and contractor assurance system programs should also be integrated into ISM system descriptions. In many cases, the ongoing line management oversight reviews will meet the requirements for ISM self-assessments and ISM oversight reviews. A well-crafted line oversight review program will feed naturally into the ISM effectiveness review, so that the ISM effectiveness review merely rolls up the results of a number of other reviews that were conducted during the year. Line programs will need to consider which option is most effective for its use:

- Packaging all line oversight programs into one document
- Packaging the safety oversight program with the ISM system description
- Having multiple stand-alone documents that are appropriately integrated and cross-referenced
- Some combination of the above.

Contractors and DOE offices are required to establish worker safety and health programs pursuant to 10 CFR 851, *Worker Safety and Health Program*, and DOE O 440.1C, *Federal Employee Safety and Health.* Contractors and DOE offices may use their ISM system description as the required description of their worker safety and health program, provided that that the document identifies specific portions of the ISM system description that satisfy the 10 CFR 851 and DOE O 440.1C requirements, and that they obtain the approval of the appropriate approval authority. DOE offices should encourage integration of contractor worker safety and health programs into ISM system descriptions.

These multiple systems should be coordinated, linked, and integrated to the maximum extent possible. If one integrated system description can be achieved, which effectively communicates to its multiple intended audiences, this is desirable. If one integrated system description cannot be achieved, then, at the least, the interfaces of the various systems need to be identified, acknowledged, and articulated. The feasibility of successfully integrating these various systems into one document has not been fully determined. It is important that the main purpose and functions of each system are not lost or subsumed.

6. Federal and Contractor Non-operational Work Activities

DOE and contractors perform myriad non-operational work activities that are essential for ensuring safety during the conduct of operational work activities. These non-operational work activities include defining work scopes, allocating resources, designing safety controls, developing safety analyses, conducting assessments, developing corrective action plans, and integrating feedback sources to identify

opportunities for improvement. Non-operational work occurs away from the human-facility interface. Non-operational work activities encompass the vast majority of DOE and contractor work related to effectively implementing the ISM principles to create the requisite environment and culture that supports effective ISM implementation. Non-operational work activities encompass most DOE and contractor work related to effectively implementing four of the five core ISM functions (all but the fourth one, which is the point at which people directly and physically interact with the facility). Non-operational work activities encompass the vast majority of DOE and contractor work at the organizational and institutional levels. Inapproprite non-operational work activities may become the source of latent conditions that enable active errors during operational work activities that can lead to undesirable consequences. Planning, performing, and reviewing the effectiveness of non-operational work activities should focus on the effect of these activities on safe performance of associated operational work activities. The reviews should normally not focus on the physical work involved in non-operational work activities, such as turning on the computer, performing a calculation, participating in a meeting, or printing a document.

The Department's role is different from the contractor role, but it is important for assuring safety that the roles are clearly articulated in the respective ISM system descriptions. DOE has work activities related to every ISM principle and function.

Except for GOGO facilities, DOE Federal organizations do not perform "operational work activities" involving physical, hands-on work, such as turning knobs in a production line or a control room, processing or transferring environmental waste, performing maintenance on a pump or valve, disassembling weapons, or re-packaging pits. Contractors perform most of operational work activities that take place in DOE sites. Operational work activities are an important focus of ISM in that physical work activities are a significant source of occurrences and accidents. Some occurrences are initiated by equipment failures, such as tank failures; in these cases, an operational work activity usually exists to monitor the performance of equipment that controls hazards. Operational work activities are concentrated within ISM Core Function #4, Perform Work Safely within Controls. They are also concentrated at the activity level, rather than the organizational or institutional level. Examples of Federal non-operational work activities that are required for the overall Department-wide ISM system to be effective and for effective integration of safety into operational work in the Department's facilities include:

- Providing clear and visible DOE leadership vision on ISM systems
- Establishing a positive DOE environment for effective ISM system implementation
- Establishing missions
- Translating the missions into meaningful scopes of work

- Establishing annual budgets, including making decisions on mission-safety tradeoffs
- Prioritizing major projects and work scopes, and allocating resources to ensure that work and safety are integrated and sufficient resources are available to conduct work safely
- Evaluating resource shortfalls and identifying safety problems to ensure that adequate resources are applied to resolve safety problems and secure safety improvements
- Developing DOE safety rules, directives and standards
- Establishing DOE contracts, including delineation of safety requirements
- Approving exemptions to safety requirements
- Assigning DOE safety management roles and responsibilities
- Recruiting highly qualified, technical Federal personnel
- Reviewing and approving contractor safety documentation, such as documented safety analyses, technical safety requirements, ISM systems, QAPs, worker safety and health programs, and contractor assurance systems
- Determining when authorization agreements are needed and approving authorization agreements
- Maintaining Federal awareness of contractor work activities, including implementation of hazard controls
- Performing operational readiness reviews
- Maintaining operational awareness
- Establishing and implementing feedback and improvement programs and processes to facilitate a culture that promotes ongoing examination and learning
- Monitoring various sources of feedback information
- Developing and implementing corrective actions and improvement actions
- Monitoring performance of corrective action and improvement action subsystems
- Managing the DOE operational experience program
- Planning and performing self-assessments of assigned Federal work activities

- Planning and performing oversight of contractor work activities
- Providing clear expectations for the conduct of DOE line management oversight reviews and self-assessment activities, including direction on criteria and review approach documents (CRADs)
- Planning and performing DOE line management oversight of DOE activities, as appropriate
- Performing independent oversight of DOE and contractor activities
- Identifying and acting on ISM weaknesses and opportunities for improvement
- Reviewing ISM declarations by contractors
- Performing ISM effectiveness and verification reviews
- Providing direction, establishing schedules, and approving performance objectives, performance measures, and commitments for contractors
- Integrating management systems and processes for safety, quality, environmental protection, and security
- Determining when full ISM verification reviews are necessary
- Enforcing DOE safety regulations.

Safety improvement comes when each of these functions is performed in an integrated, effective manner. Therefore, the ISM system descriptions serve to facilitate and focus thinking and planning for an appropriate approach to safety management, and organizing and implementing the necessary follow-through activities. These descriptions are also expected to capture and institutionalize future changes and improvements in the approach during updates, thus providing new organization members with a roadmap to see the fully integrated vision.

ISM is applicable to all facility life-cycle phases, including design, construction, operation, and D&D. DOE is in the unique position of being involved with projects in all phases, whereas contractors often change, both from phase to phase and within a given phase, over time. Thus, DOE work activities need to provide the continuity throughout the life cycle of a mission, making sure that requirements are met and necessary information is available for future phases.

ISM Effectiveness Reviews, Declarations, and Verifications

This attachment provides guidance for improving ISM implementation through use of ISM effectiveness reviews and declarations.

An ISM declaration is a determination by an organization regarding whether it is in full conformance with the requirements and expectations for an effective ISM system and its bases for this determination. An ISM declaration should be based on an ISM effectiveness review.

An ISM effectiveness review is a review conducted by an organization for determining whether its ISM system is in full conformance with the requirements and expectations for effective implementation. The ISM effectiveness review is a qualitative review that encompasses multiple elements, including review of self-assessments; oversight review results; integrated reviews across multiple reporting elements; performance against established performance objectives, measures, and commitments; and other feedback and performance information.

DOE's oversight program is one of the key management systems supporting ISM. DOE O 226.1B *Implementation of Department of Energy Oversight Policy* includes the requirement that oversight processes implemented by applicable DOE line management organizations must evaluate contractor and DOE programs and management systems, including site assurance systems, for effectiveness of performance (including compliance with requirements). DOE's management systems include providing guidance for implementing oversight requirements and specifically include providing sample criteria review and approach documents (CRADS) for use in performing oversight processes. In addition, DOE G 414.1-1B, *Management and Independent Assessments Guide for Use with 10 CFR Part 830, Subpart A, and DOE O 414.1C, Quality Assurance; DOE M 450.4 -1, Integrated Safety Management System Manual; and DOE O 226.1A, Implementation of DOE Oversight Policy* provides information on establishing processes for performing effective assessments.

Guidelines for ISM Declarations

DOE Order 450.2 requires DOE line management to determine the need for, and frequency of, contractors' ISM declarations (i.e., the status and effectiveness of ISM system implementation, including planning and execution of work) for facilities and activities based on hazards, risks, and contractor performance history and document their decisions concerning high consequence activities, such as high-hazard nuclear operations. Configurations of facilities and activities vary considerably within DOE. Some large, multi-purpose facilities contain several discrete activities and some large, complex activities take place in multiple facilities. In making such decisions, DOE line management should consider various factors including:

- Appropriate groupings of facilities and activities that optimize both the effort expended to prepare the declarations and the continuous improvement benefits derived therein.

- Risks and hazards presented by the facilities/activities covered by the ISM system.

- Safety performance, including consideration of past events and accidents and results of past appraisals by the contractor, DOE line management, independent oversight organizations, external reviewers and DOE's regulatory enforcement office.

- Effectiveness of the contractor assurance system and issues management processes.

- Significant changes in operations for the facilities/activities covered by the ISM system, such as new facilities, new mission/operational activities, major modifications to facilities or activities, changes in level of activity (e.g., significant increase in production or workload), or major changes in procedures controlling potentially hazardous work.

- Significant changes in management and organizations for the facilities/activities covered by the ISM system, such as a new contractor or major subcontractor, reorganizations or multiple new personnel in key management positions, or large influxes of new personnel.

- Significant changes in safety management programs and processes for the facilities/activities covered by the ISM system, such as a new or significantly revised contractor ISM system, a major revision to the contractor assurance system, major revisions to safety bases for nuclear facilities, or other major changes to work planning and control processes.

DOE line management should periodically issue a declaration report on the status of implementation of ISM within that office both for the DOE office and its contractors, including applicable site and contractor operations. DOE Secretarial offices typically evaluate applicable DOE Headquarters and field office activities and applicable contractor activities, and DOE field offices typically evaluate applicable DOE field office activities and applicable contractor activities. The report generally includes:

- A summary of relevant activities and assessments that were completed during the report period and provide the basis for the determination of overall ISM effectiveness, such as ISM effectiveness reviews, self-assessments, line oversight reviews, lower-level ISM reviews (e.g., reviews of specific functional areas , facilities, activities, processes that provide information about selected safety elements), integrated ISM reviews (e.g., coordinated or concurrent reviews of multiple ISM elements), pertinent feedback data from a variety of mechanisms, and corrective or compensatory actions to address weaknesses and opportunities to enhance ISM effectiveness

- A determination of the overall effectiveness of implementation of ISM

- A discussion of potential site vulnerabilities to provide an opportunity to develop and implement risk management options and strategies, including re-scoping activities, re-allocating funds and resources to address the vulnerabilities, or identifying the consequences of proceeding without addressing them

- Any safety-significant related directive exemptions or changes in the contract during the report period.

- DOE regulatory enforcement activities history.

Guidelines for Performing ISM Effectiveness Reviews

The following guidance outlines a suggested approach to performing ISM effectiveness reviews.

ISM effectiveness reviews are an important tool of ISM implementation that allow for evaluating implementation and making necessary adjustments. Elements of this review should be ongoing and culminate in a review report that contributes to a summary evaluation. The purposes of an ISM effectiveness review are to:

- Determine the effectiveness of the implementation of the ISM system in integrating safety into work performance, in supporting the safe performance of work, and in improving safety performance.

- Identify strengths of ISM system implementation for sharing with other DOE elements to aid improvements at other locations.

- Identify weaknesses of ISM system implementation to focus attention on corrective and improvement actions.

- Identify opportunities for improvement in the efficiency or effectiveness of the ISM system, and identify actions for continuous improvement.

The following steps are recommended for ISM effectiveness reviews:

- Review Contractor Performance and ISM System Effectiveness

    - Review ISM review(s) and summary evaluation(s) if performed by the contractor(s).

    - Review the safety performance of the contractor(s) against recent safety performance objectives, measures, and commitments.

    - Review the overall safety performance of the contractor(s), including results from various streams of feedback and improvement information. Attachment 13 of this Guide provides safety performance objectives, measures, and commitments that are useful for reviewing safety performance.

    - Review results of line oversight of the contractor(s).

    - Review the completeness and accuracy of the ISM system description for the contractor(s) and the flow down of the site ISM system description to the site and facility procedures.

- Determine whether a full ISM verification of the contractor(s) is needed.
- Perform a full ISM verification when needed.
- If a full ISM verification is not needed, document the review and conclusions regarding effectiveness of the ISM system implementation by the contractor(s), basis for conclusions, strengths and weaknesses, and areas for improvement.
- If there is more than one contractor, look at ISM system performance across all the contractors to identify and document any generic or broad-based strengths or weaknesses or areas for improvement.

- Review DOE Field Office Performance and ISM System Effectiveness
  - On the DOE side, review self-assessment results regarding DOE ISM performance.
  - Review DOE field office performance against recent safety performance objectives, measures, and commitments.
  - Review the completeness and accuracy of the ISM system description for the DOE field office, and make necessary changes. Determine whether an update is necessary. If an update is made, prepare a summary of changes.
  - Review integrated DOE/contractor safety performance; include results from various sources of feedback and improvement information, including external and independent oversight findings.

- Determine ISM Effectiveness and Prepare Summary Report
  - Based on all the prior reviews, reach an overall conclusion regarding the state of ISM effectiveness.
  - Prepare a summary evaluation report that documents the overall review process and conclusions regarding the effectiveness of the ISM system for the DOE office, basis for conclusions, strengths and weaknesses, areas for improvement, and corrective and improvement actions, with schedules for completion.

In judging effectiveness, both process measures and outcome measures should be considered. Examples of process measures include:

- Implementation of each ISM function and each ISM principle
- Integration of ISM with other management systems
- Completion of ISM commitments

- Identification of weaknesses and improvement activities
- Satisfactory performance on process-based performance measures
- Feedback from oversight reviews.

Examples of outcome measures include satisfactory performance on outcome-based performance measures, including those related to safe performance of work activities.

In approaching ISM effectiveness reviews, DOE offices need to guard against complacency and "by rote" compliance. For the ISM effectiveness reviews to add value, DOE offices should periodically take a fresh approach or use different personnel to perform the review. DOE offices may want to periodically focus more intensely on a specific area within ISM in their review and declaration.

It is recommended that DOE field offices determine and provide the criteria they will use to judge effectiveness to their contractors as early as possible, and preferably well in advance, so that contractors can effectively focus their resources and efforts to meet expectations. Similarly, DOE field offices would benefit from early identification of effectiveness criteria in planning self-assessments and line oversight reviews. The criteria for determining effectiveness should be included in the ISM system description and updated as needed, if changes are made. Attachment 9, *Continuing Core Expectations*, of this Guide describes criteria that can be used to judge effective implementation of ISM year after year.

DOE-HDBK-3027-99, *Integrated Safety Management Systems Verification Team Leader's Handbook*, June 1999, provides additional information relevant to DOE ISM verifications.

Guidelines for Performing Full ISM Verifications

The following guidance outlines a suggested approach to performing full ISM verifications.

DOE-HDBK-3027-99, *Integrated Safety Management Systems Verification Team Leader's Handbook*, provides extensive guidance on how to conduct full ISM verifications. DOE offices may use this guidance in the conduct of full ISM verifications.

Full ISM verifications should be conducted at each site as needed. Some sites may decide to conduct full ISM verifications periodically or as appropriate where significant system or performance weaknesses are identified. In general, full verifications differ from periodic reviews as follows:

- Full verifications are led by a team leader who is not from the organization being reviewed.
- Full verifications have several team members who are not from the organization being reviewed.

- Teams for full verifications are typically at least six to eight members, whereas other reviews can be done with smaller teams.

- Full verifications are more intensive and more comprehensive, covering ISM system implementation in more depth than other reviews.

The scope of these full ISM verifications is both the DOE site office and the associated site contractors. A representative of the DOE Secretarial office should be part of the team, looking at the DOE site office ISM system. It is a good practice to include team members from other Secretarial offices to foster shared learning.

The field office manager may appoint a qualified team leader for regularly-scheduled full ISM verifications. The Secretarial office would appoint the team leader, if the Secretarial office determined that a "for-cause" ISM verification was necessary.

Under certain conditions, DOE may determine that one or more of its contractors need a full or partial ISM verification, with a scope well beyond the typical ISM effectiveness review. Similarly, under certain circumstances, DOE Secretarial offices may determine that one or more of its field offices need a full or partial ISM verification, with a scope well beyond the typical ISM effectiveness review, and direct the field office to conduct a verification. Alternatively, the Secretarial office might decide to lead the ISM verification itself. Once the need is identified, ISM verifications should be conducted within a year.

Conditions and considerations that could lead to some portion of or a complete ISM verification include:

- Significant changes in leadership personnel, such as a new site contractor or several changes in the DOE management team

- Significant changes in safety management approach, or significant revisions in the ISM system description

- Loss of confidence in the existing ISM system description or its implementation

- Significant safety problem or deterioration in safety performance

- Significant findings from independent oversight (such as those conducted by the DOE Office of Health, Safety and Security [HSS]) or external reviews (such as those conducted by the Defense Nuclear Facilities Safety Board) that call into question the adequacy of the existing ISM system and implementation

- Significant changes in mission, such as a change from design/construction to operations or a change from operations to D&D.

ISM declarations should provide useful feedback for determining whether significant ISM performance problems exist. DOE field offices are encouraged to conduct full ISM verifications

on a fixed periodicity to promote organizational learning and continuous improvement. Field offices should consider the scope and periodicity of assessment activities by outside groups in determining whether a full verification is needed. Tailoring the scope of the verification to focus on areas that have not received recent attention is a good practice.

ISM System Verification Core Expectations.

The following core expectations for ISM system verifications reflect information taken from HDBK-3027-99, *Integrated Safety Management Systems (ISMS) Verification Team Leader's Handbook,* in the section *Guidelines for Performing ISM Effectiveness Reviews*:

Phase I ISM System Core Expectations.

Nine core expectations are recommended for conducting the Phase I review. To be fully effective, the Phase I review should evaluate whether safety management programs and institutional processes have been implemented at the site or corporate level.

1. The ISM system documentation is consistent with DOE P 450.4A, the DEAR ISM clause, and the guidance provided to the contractor by the approval authority.

2. DOE and the contractor effectively translate mission into work, set expectations, provide for integration, and prioritize and allocate resources.

3. An ISM system should include methods for identifying, analyzing, and categorizing hazards.

4. The ISM system should include methods for establishing and maintaining an agreed-upon set of safety standards before work is performed.

5. Contractor policies, procedures, and documents are established and are adequate for the work or process to be performed safely.

6. The ISM system should be continuously improved through an assessment and feedback process, which should be established at each level of work and at every stage in the work process.

7. The ISM system should establish that at every level of control, line management must be responsible for safety. Clear and unambiguous roles and responsibilities should be defined and maintained at all levels within the organization.

8. The ISM system should ensure that personnel are competent commensurate with their responsibility for safety.

9. The DOE approval authority should have a set of processes that interface efficiently and effectively with the contractor organization.

Phase II Core Expectations.

The following eight core expectations should be considered during a Phase II assessment of ISM system implementation following the approval of the ISM system description. Performance of a Phase II assessments assumes that the approval authority has formally approved the ISM system description or has approved it with comments. This action acknowledges that contractor ISM system programs are satisfactory at the corporate or site level. Any comments that affect the adequacy of the safety management programs should be resolved and incorporated before the Phase II review occurs.

1. An integrated process has been established and is utilized to identify and prioritize specific mission discrete activities, mission process operations, modifications and work items.

2. The full spectrum of hazards associated with the scope of work is identified, analyzed, and categorized. Those individuals responsible for the analysis of the environmental, health and safety, and worker protection hazards are integrated with those personnel assigned to analyze the processes.

3. An integrated process has been established and is utilized to develop controls that mitigate the identified hazards present within a facility or activity. The set of controls ensure adequate protection of the public, worker, and the environment and are established as agreed upon by DOE. These mechanisms provide integration, which merge together at the workplace.

4. An integrated process has been established and is utilized to effectively plan, authorize and execute the identified work for the facility or activity. Both workers and management demonstrate a commitment to ISM. These mechanisms demonstrate effective integration.

5. A process has been established and is utilized which ensures that mechanisms are in place to ensure continuous improvements are implemented through an assessment and feedback process, which functions at each level of work and at every stage in the work process.

6. Clear and unambiguous roles and responsibilities are defined and maintained at all levels within the facility or activity. Facility or activity line managers are responsible and accountable for safety. Facility or activity personnel are competent commensurate with their responsibility for safety.

7. DOE ISM system procedures and mechanisms should ensure that work is formally and appropriately authorized and performed safely. DOE line managers should be involved in the review of safety issues and concerns and should have an active role in authorizing and approving work and operations.

8. DOE ISM system procedures and mechanisms ensure that hazards are analyzed, controls are developed, and that feedback and improvement programs are in place and effective. DOE line managers are using these processes effectively, consistent with FRA requirements.

Continuing Core Expectations

The following guidance details DOE's continuing core expectations (CCEs), which have proven useful in maintaining ISM systems and in developing an evaluation of the effectiveness of the ISM system.

These can be used to guide effectiveness reviews or ISM verification reviews. This listing may be used by both contractors and DOE.

- CCE-1. Organizations update their safety performance goals, objectives, performance measures, and commitments, in response to DOE senior level direction and guidance, so that they reflect and promote continual improvement and address major mission changes, as required. Contractors update their safety performance objectives, performance measures, and commitments annually as required by the DEAR ISM clause. The ISM system description is updated and submitted for approval as scheduled by the contracting officer.

- CCE-2. System effectiveness, evaluated as described in the contractor's ISM system description, is satisfactory. Safety performance objectives, measures, and commitments are met or exceeded, and they are revised as appropriate for the next year.

- CCE-3. Work activities reflect effective implementation of the functions of ISM system. Work scope is clearly defined. Hazards are identified and analyzed. Actions to prevent or eliminate the hazards are taken. Controls are developed and effectively translated into work instructions or procedures and implemented. Work is properly authorized. Work is accomplished within controls. Appropriate worker involvement is a priority.

- CCE-4. Organizational implementing mechanisms are established and implemented to provide an effective environment for ISM implementation, as embodied in the ISM guiding principles and supplemental safety culture elements. Roles and responsibilities are clear. Line management is responsible for safety. Required competence is commensurate with responsibilities, and the technical and safety system knowledge of managers and staff continues to improve.

- CCE-5. Contractor and DOE budget processes ensure that priorities are balanced. Budget development and change control processes ensure that safety is balanced with production. Facility procedures ensure that production is balanced with safety.

- CCE-6. An effective feedback and improvement process, using progressively more demanding criteria, is functioning at each level of the organization from the worker and individual activities through the facilities and the site, including the ISM feedback and improvement process used by and within DOE. The requirements of DOE O 226.1B, *Implementation of Department of Energy Oversight Policy*, are implemented. Issues management is effective so that issues are identified, evaluated, and closed. Issues

identified during ISM effectiveness reviews and ISM system verifications are effectively addressed.

- CCE-7. List A/List B in contracts is reviewed and updated, as necessary, and concurrent with the budget cycle. The process for effecting changes to the standards and requirements identified in the contract per DEAR List A and List B (48 CFR 970.5204-2 *Laws, regulations, and DOE directives*) is utilized and is effective. Authorization agreements and authorization basis documents are maintained current. Changes in agreed-upon standards and requirements are included to reflect mission changes. An effective, dynamic process to keep standards and requirements current is apparent.

- CCE-8. Relevant performance records reflect an improving ISM system. Records include routine DOE and contractor self-assessment reports, independent and focused assessment reports, incident investigations, occurrence reports, DOE enforcement action reports, reports of enforcement activity conducted by external state and Federal safety agencies, and other relevant documentation that provides evidence on the status of implementation, integration, and effectiveness of the ISM system. Feedback, improvement, and change control processes cited in the contractor ISM system description are in place and effective.

- CCE-9. DOE ISM system procedures and mechanisms are in place to ensure that work is formally and appropriately authorized and performed safely in a manner that protects the public, workers, and the environment. DOE line managers are involved in the review of safety issues and concerns and have an active role in authorizing operations.

- CCE-10. DOE ISM system procedures and mechanisms are in place to ensure that hazards are analyzed, actions to prevent or eliminate the hazards are taken, controls are developed, and feedback and improvement programs are in place and effective. DOE line managers use these processes effectively, consistent with the DOE field office FRA and DOE FRA requirements. DOE ISM system procedures and mechanisms integrate ISM with QA, EMS, and other management systems.

Safety Culture Focus Areas and Associated Attributes

Experience from the commercial nuclear industry, including the Institute for Nuclear Power Operations, has been reviewed for relevant lessons. An analysis of this experience and research over the past decade has identified supplemental safety culture elements that may be helpful to focus attention and action in the right areas to create the desired ISM environments. These elements also promote a shift from mere compliance toward excellence. They emphasize continuous improvement and long-term performance, and they are entirely consistent with the original intents of ISM.

DOE and the Energy Facility Contractors Group (EFCOG) have collaborated to develop guidance for achieving a strong safety culture. They identified the following three safety culture focus areas and several attributes associated with each one, that they felt offered the greatest potential for achieving excellence in both safety and production performance.

- Leadership
  - Demonstrated safety leadership
  - Risk-informed, conservative decision making
  - Management engagement and time in field
  - Staff recruitment, selection, retention, and development
  - Open communication and fostering an environment free from retribution
  - Clear expectations and accountability

- Employee/Worker Engagement
  - Personal commitment to everyone's safety
  - Teamwork and mutual respect
  - Participation in work planning and improvement
  - Mindful of hazards and controls

- Organizational Learning
  - Credibility, trust and reporting errors and problems
  - Effective resolution of reported problems
  - Performance monitoring through multiple means
  - Use of operational experience
  - Questioning attitude

LEADERSHIP

Demonstrated safety leadership

- Line managers (from the Secretary to the DOE Cognizant Secretarial Officer to the DOE Field Office Manager, and from the contractor senior manager, to the front-line employee) understand and accept their safety responsibilities as integral to mission accomplishment.

- Line managers enhance work activities, procedures and process with safety practices and policies.
- Leaders acknowledge and address external influences that may impose changes that could result in safety concerns.
- Line managers clearly understand their work activities and performance objectives, and how to safely conduct their work activities to accomplish their performance objectives.
- Line managers demonstrate their commitment to safety through their actions and behaviors, and support the organization in successfully implementing safety culture attributes, by conducting walk-throughs, personal visits, and verifying that their expectations are met.
- The organizational mission and operational goals clearly identify that production and safety goals are intertwined, demonstrating commitments consistent with highly reliable organizations.

Risk-informed, conservative decision making

- Line managers support and reinforce conservative decisions based on available information and risks. Managers and employees are systematic and rigorous in making informed decisions that support safe, reliable operations. Employees are expected, authorized and supported by managers to take conservative actions when faced with unexpected or uncertain conditions.
- Managers and employees are intolerant of conditions or behaviors that have the potential to reduce operating or design margins. Anomalies are thoroughly investigated, promptly mitigated, and periodically analyzed. The bias is set on proving that work activities are safe before proceeding, rather than proving them unsafe before halting. Personnel do not proceed, and do not allow others to proceed, when safety is uncertain and management is supportive of these decisions.

Management engagement and time in field

- Maintaining operational awareness is a priority. Line managers are in close contact with the front-line employees. Line managers listen and act on real-time operational information. Line managers identify critical performance elements and monitor them closely.
- Line managers spend time on the floor and in employee work areas. Line managers practice visible leadership by placing “eyes on the work,” asking questions, coaching, mentoring, and reinforcing standards and positive behaviors. Deviations from expectations are corrected promptly and, when appropriate, collectively analyzed to understand why the behaviors occurred.
- Managers set an example for safety through their personal commitment to continuous learning and by direct involvement in high-quality training that consistently reinforces expected employee behaviors.

Staff recruitment, selection, retention, and development

- People and their professional capabilities, experiences, and values are regarded as the organization's most valuable assets. Organizational leaders place a high personal priority and time commitment on recruiting, selecting, and retaining an excellent technical staff.
- The organization maintains a highly knowledgeable workforce to support a broad spectrum of operational and technical decisions. Technical and safety expertise is embedded in the organization. Outside expertise is employed when necessary.
- The organization is able to build and sustain a flexible, resilient, robust technical staff and staffing capacity. Staffing is sufficient to ensure adequate resources exist to ensure redundancy in coverage as well as cope with and respond to unexpected changes in a timely manner.
- The organization values and practices continuous learning. Professional and technical growth is formally supported and tracked to build organizational capability. Employees are required to improve knowledge, skills, and abilities by participating in recurrent and relevant training and strongly encouraged to pursue educational opportunities.
- Line managers encourage and make training available to broaden individual skills and improve organizational performance. Training should include the ability to appreciate the potential for unexpected conditions; to recognize and respond to a variety of problems and anomalies; to understand complex technologies and capabilities to respond to complex events; to develop flexibility at applying existing knowledge and skills in new situations; to improve communications; and to learn from significant industry and DOE events.

Open communication and fostering an environment free from retribution

- A high level of trust is established in the organization.
- Reporting individual errors is encouraged and valued. Individuals feel safe from reprisal when reporting errors and incidents.
- Individuals at all levels of the organization promptly report errors and incidents and offer suggestions for improvements.
- A variety of methods are available for personnel to raise safety issues and line managers promptly and effectively respond to personnel who raise safety issues.
- Leaders proactively detect situations that could result in retaliation and take effective action to prevent a chilling effect.
- The organization addresses disciplinary actions in a consistent manner; disciplinary actions are reviewed to ensure fair and consistent treatment of employees at all levels of the organization.

Clear expectations and accountability

- Line managers provide ongoing performance reviews of assigned roles and responsibilities reinforcing expectations and ensuring key safety responsibilities and expectations are being met.
- Personnel at all organizational levels are held accountable for standards and expectations. Accountability is demonstrated both by recognizing excellent performance as well as identifying less-than-adequate performance. Accountability considers intent and organizational factors that may contribute to undesirable outcomes.

- Willful violations of requirements and performance norms are rare. Individuals and organizations are held accountable in the context of a just culture. Unintended failures to follow requirements are promptly reported, and personnel and organizations are acknowledged for self-identification and reporting errors.

EMPLOYEE/WORKER ENGAGEMENT

Personal commitment to everyone's safety

- Responsibility and authority for safety are well defined and clearly understood as an integral part of performing work.
- The line of authority and responsibility for safety is defined from the Secretary and contractor senior manager to the individual contributor. Roles and responsibilities, authorities and accountabilities are clearly defined in writing and are understood by each individual.
- Individuals understand and demonstrate responsibility for safety. Safety and its ownership are apparent in everyone's actions and deeds.
- Individuals outside of the organization (including subcontractors, temporary employees, visiting researchers, vendor representatives, etc.) understand their safety responsibilities.
- The organization knows the expertise of its personnel. Line managers defer to qualified individuals with relevant expertise during operational upset conditions. Qualified and capable people closest to operational upsets are empowered to make important decisions, and are held accountable justly.

Teamwork and mutual respect

- Open communications and teamwork are the norm.
- Individuals at all levels of the organization listen to each other and effectively engage in crucial conversations to ensure meaning, intent and viewpoints are understood; and that differing points of view are acknowledged.
- Discussion on issues focus on problem solving rather than on individuals.
- Good news and bad news are both valued and shared.

Participation in work planning and improvement

- Individuals are actively involved in identification, planning, and improvement of work and work practices.
- Individuals follow approved work practices and procedures.
- Individuals at all levels can stop unsafe work or work during unexpected conditions.
- Design, analysis and continuous improvement of work practices and processes are valued as core organizational competencies; expertise in these competencies is evaluated and rewarded.

Mindful of hazards and controls

- Organizational safety responsibilities are sufficiently comprehensive to address the work activities and hazards involved.

- Work hazards are identified and controlled to prevent or mitigate accidents, with particular attention to high consequence events with unacceptable consequences.
- Individuals understand and proactively identify hazards and controls before beginning work activities.
- Individuals are mindful of the potential impact of equipment and process failures, demonstrate constructive skepticism and are sensitive to the potential of faulty assumptions and errors. They appreciate that mindfulness requires effort.

ORGANIZATIONAL LEARNING

Credibility, trust and reporting errors and problems

- Credibility and trust are present and continuously nurtured so that a high level of trust is established in the organization.
- Organizations, managers and line supervisors provide accurate, relevant and timely information to employees. Line managers are skilled in responding to employee questions in an open, honest manner.
- Reporting individual errors is encouraged and valued. Individuals are recognized and rewarded for self-identification of errors.
- Line managers encourage and appreciate safety issue and error reporting.
- Managers and line supervisors demonstrate integrity and adhere to ethical values and practices to foster trust.
- Managers and line supervisors demonstrate consistency in approach and a commitment to the vision, mission, values and success of the organization as well as the individuals (people).
- Mistakes are used for opportunities to learn rather than blame.
- Individuals are recognized and rewarded for demonstrating behaviors consistent with the safety culture principles.

Effective resolution of reported problems

- Vigorous corrective and improvement action programs are established and effectively implemented, providing both transparency and traceability of all corrective actions. Corrective action programs effectively prioritize issues, enabling rapid response to imminent problems while closing minor issues in a timely manner to prevent them from escalating into major issues.
- Results from performance assurance activities are effectively integrated into the performance improvement processes, such that they receive adequate and timely attention. Linkages with other performance monitoring inputs are examined, high-quality causal analyses are conducted, as needed, and corrective actions are tracked to closure with effectiveness verified to prevent future occurrences.
- Processes identify, examine and communicate latent organizational weaknesses that can aggravate relatively minor events if not corrected. Organizational trends are examined and communicated.

- Organizational systems and processes are designed to provide layers of defenses, recognizing that people are fallible. Lessons learned are shared frequently; prevention and mitigation measures are used to preclude errors from occurring or propagating. Error-likely situations are sought out and corrected, and recurrent errors are carefully examined as indicators of latent organizational weaknesses.
- Incident reviews are conducted promptly after an incident to ensure data quality and to identify improvement opportunities. Causal analysis expertise is applied effectively to examine events and improve safe work performance. High-quality causal analysis using multi-discipline analytical perspectives is the norm. Causal analysis is performed on a graded approach for major and minor incidents, and near-misses, to identify causes and follow-up actions. Even small failures are viewed as windows into the system that can spur learning.
- Performance improvement processes require direct worker participation. Individuals are encouraged, recognized and rewarded for offering innovative ideas to improve performance and to solve problems.

Performance monitoring through multiple means

- Line managers maintain a strong focus on the safe conduct of work activities. Line managers maintain awareness of key performance indicators related to safe work accomplishment, watch carefully for adverse trends or indications, and take prompt action to understand adverse trends and anomalies. Management employs processes and special expertise to be vigilant for organizational drift.
- Performance assurance consists of robust, frequent, and independent oversight conducted at all levels of the organization. Performance assurance includes independent evaluation of performance indicators and trend analysis.
- Line managers throughout the organization set an example for safety through their direct involvement in oversight activities and associated performance improvement.
- The organization actively and systematically monitors performance through multiple means, including leader walkarounds, issue reporting, performance indicators, trend analysis, benchmarking, industry experience reviews, self-assessments, peer reviews, and performance assessments.
- The organization demonstrates continuous improvement by integrating the information obtained from performance monitoring to improve systems, structures, processes, and procedures.
- Line managers are actively involved in all phases of performance monitoring, problem analysis, solution planning, and solution implementation to resolve safety issues.
- The organization maintains an awareness of its safety culture maturity. It actively and formally monitors and assesses its safety culture on a periodic basis.

Use of operational experience

- Operating experience is highly valued and the capacity to learn from experience is well developed. The organization regularly examines and learns from operating experiences, both internal and in related industries.

- Organization members convene to swiftly uncover lessons and learn from mistakes and successes.
- The organization embraces feedback from peer reviews, independent oversight, and other external sources.
- The organization documents and shares operating experiences (lessons learned and best practices) within the organization and with industry.

Questioning attitude

- Line managers encourage a vigorous questioning attitude toward safety, and foster constructive dialogues and discussions on safety matters.
- Individuals cultivate a constructive, questioning attitude and healthy skepticism when it comes to safety. Individuals question deviations, and avoid complacency or arrogance based on past successes. Team members support one another through both awareness of each other's actions and constructive feedback when necessary.
- Individuals pay keen attention to current operations and focus on identifying situations where conditions and/or actions are diverging from what was assumed, expected, or planned. Individuals and leaders act to resolve these deviations early before issues escalate and consequences become large.

IAEA Capability Maturity Model

The International Atomic Energy Agency (IAEA) developed a capability maturity model that illustrates the stages that an organization goes though in achieving a mature safety culture. These stages are described below.

Stage I. The organization sees safety as an external requirement and not as an aspect of conduct that will help the organization to succeed. The external requirements are those of national governments, regional authorities, or regulatory bodies. There is little awareness of behavioral and attitudinal aspects of safety performance, and no willingness to consider such issues. Safety is seen very much as a technical issue. Mere compliance with rules and regulations is considered adequate.

Stage II. An organization at Stage II has a management that perceives safety performance as important even in the absence of regulatory pressure. Although there is growing awareness of behavioral issues, this aspect is largely missing from safety management methods, which comprise technical and procedural solutions. Safety performance is dealt with, along with other aspects of the business, in terms of targets or goals. The organization begins to look at the reasons why safety performance reaches a plateau and is willing to seek the advice of other organizations.

Stage III. An organization at Stage III has adopted the idea of continuous improvement and applies the concept to safety performance. There is a strong emphasis on communications, training, management style, and improving efficiency and effectiveness. Everyone in the organization can contribute. Some behaviors are seen within the organization that enable improvements to take place, and on the other hand, there are behaviors that act as a barrier to further improvement. Consequently, people also understand the impact of behavioral issues on safety. The level of awareness of behavioral and attitudinal issues is high, and measures are taken to improve behavior. Progress is made one step at a time and never stops. The organization asks how it might help other companies.

A successful ISM system can take the Department to IAEA Stage III performance, a fully developed safety culture. On the path to achieving a fully developed safety culture, the culture is likely to be at different stages of development in various parts of an organization. Thus, until a fully mature culture is achieved, organizations will likely exhibit the characteristics of more than one stage at any given time.

Changing Values and Behaviors

In many cases, implementing organizations will find that the desired ISM system requires changes in existing employee values and behaviors. Desired ISM values and behaviors are driven by the ISM principles and functions. Changes in values cannot be dictated and, if possible, can only be brought about by a concerted effort directed toward changing behaviors. In some cases, changes in personnel or leaders may be needed to achieve the desired changes. To the extent possible, leaders should involve workers in both formulation and implementation of the desired changes. To change behaviors, and ultimately values, it is necessary to:

- Clearly define the desired behaviors in terms that the target audience can fully understand and appreciate.

- Establish consensus among the senior leadership regarding the desired behaviors, and obtain their commitment to support the desired changes.

- Identify any actions or changes on the part of senior leadership to achieve the desired behaviors, and obtain their buy-in to these actions.

- Identify existing organizational processes and behaviors that may be counter to the desired behaviors, and develop actions to align existing processes and behaviors with new desired behaviors; take actions to eliminate or minimize the influence of forces that may be restraining achievement of the desired behaviors.

- Clearly communicate the desired behaviors to the target audience, and provide training as needed for the audience to master the desired behaviors.

- Encourage employees to ask questions to clarify intentions, and provide feedback and suggestions on achieving the desired behaviors. Be open to potential adjustments in expectations as a result of employee involvement and feedback.

- Working with members of the target audience, develop the necessary tools and supporting structures and processes so that the desired behaviors can be consistently performed.

- Provide consistent, visible senior leadership attention and focus on new desired behaviors.

- Align rewards and incentives programs with desired behaviors.

- Provide positive reinforcement to employees performing desired behaviors, and not to employees who are not performing the desired behaviors.

- Monitor performance and continue to provide direct, timely, and specific feedback to employees regarding their behaviors.

- Periodically evaluate progress toward institutionalizing the desired behaviors, and take actions necessary to continue progress.

- Communicate and train all new members, especially new leaders, on the desired behaviors, their objectives, and bases.

- Reiterate and repeat the steps above, as needed, for at least five to seven years until the newly desired behaviors are well ingrained and institutionalized.

Figure 6 below depicts the process of changing behaviors to achieve the desired culture changes.

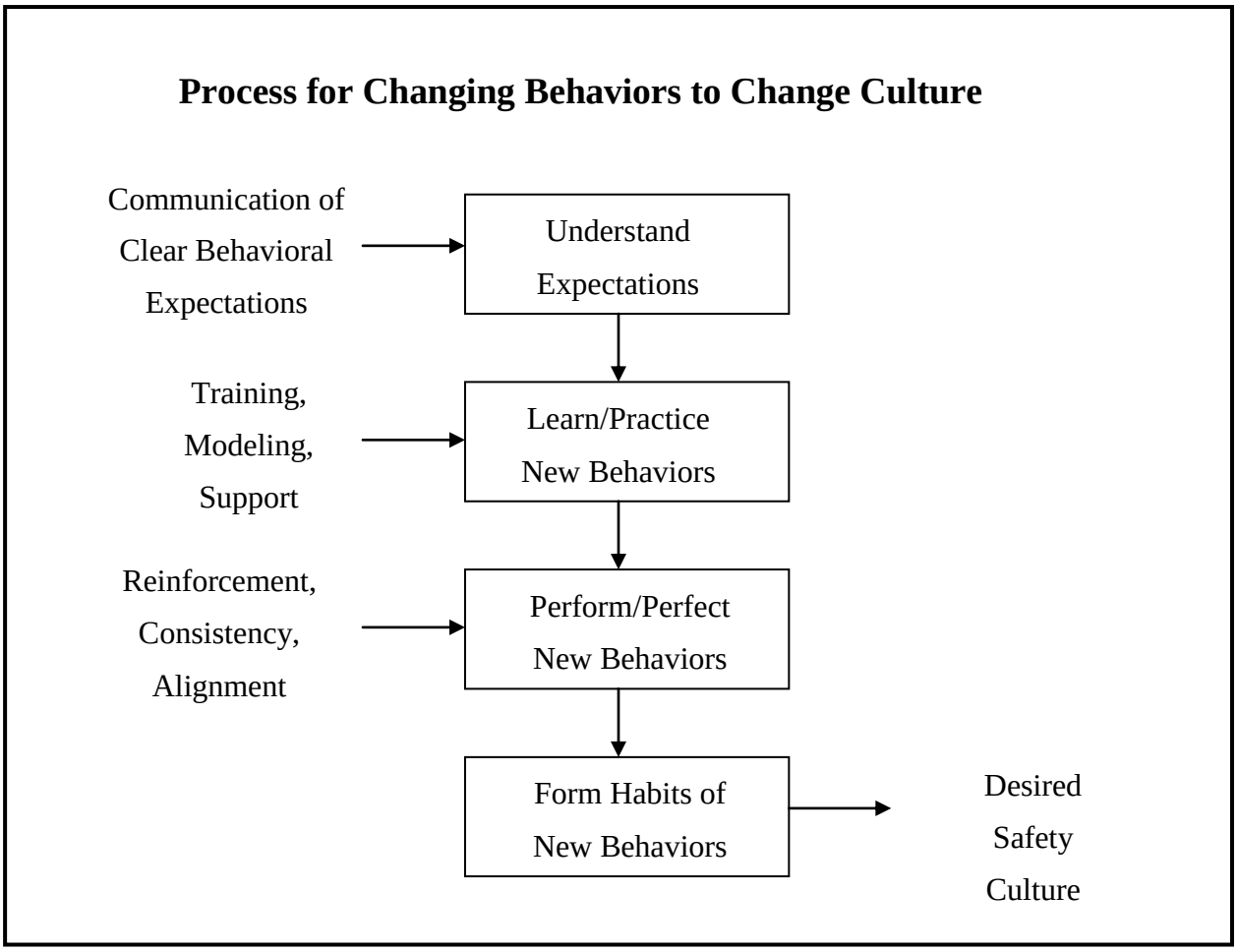


Figure 6. Process for Changing Behaviors to Change Culture

Safety Performance Objectives, Measures, and Commitments

DOE O 450.2 establishes requirements that safety goals for DOE offices and contractors will be established and monitored by DOE offices to drive performance improvement or maintain excellent performance. DEAR 970.5223-1(e) states "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." Continuing core expectation CCE-2 in this Guide addresses continuing safety performance objectives, measures, and commitments.

The DOE's ultimate safety goal is zero accidents, work-related injuries and illnesses, regulatory enforcement actions, and reportable environmental releases. This goal is to be pursued through a systematic and concerted process of continuous performance improvements using performance measurement. Safety goals and metrics, established in accordance with DOE O 450.2 should be fully integrated with the ISM safety performance objectives, measures, and commitments. The goals and metrics should incentivize true improvement and avoid superficial reliance on numbers alone. For example, an increase in the number of reported hazardous conditions could be the result of more aggressive monitoring, which is a positive metric, rather than a deteriorating safety condition.

The purpose of safety performance objectives, measures, and commitments is to drive improvement in safety performance and ISM system effectiveness.

Performance objectives can be long-term management system goals or specific management objectives or deficiencies that need to be addressed. They may be driven by strategic planning processes or safety goals processes. Performance objectives are expected to remain relatively unchanged over multiple years, with a bias toward continuously rising standards of performance. Improving performance is expected over the long term.

Performance commitments are specific actions that will be taken during a specific year to further achievement of long-term performance objectives. Commitments are steps that will be funded to move toward accomplishment of the performance objectives. Performance commitments would be expected to address significant identified weaknesses or areas of improvement. These may include either major corrective actions or major improvement actions.

Performance measures are used to track progress and monitor achievement of performance objectives and commitments. The most useful performance measures provide information that directly reflects how safely the operational work is being performed. A combination of leading (process or behavioral) and lagging (outcome or results) indicators is desirable. The measures are changed as necessary to address the performance objectives, significant identified weaknesses, and areas for improvement. Annual performance expectations should be established for most of these measures.

Performance objectives, measures, and commitments are developed based upon numerous considerations, including the budget process. This approach to continuous improvement recognizes the need for investment in improvement. The ISM guiding principle of Balanced

Priorities should be considered in developing appropriate performance objectives, measures, and commitments. One of the most effective methods to drive DOE contractor safety performance is by tying incentive fees to safety performance.

Secretarial office ISM system descriptions should describe how ISM performance is measured and may provide a standard set of ISM performance indicators. These should be included in the section on ISM system performance objectives, measures, and commitments, and should be updated annually.

The following are sample topic areas for consideration as DOE performance objectives, measures, and commitments if problems exist or if emphasis needs to be placed; this list should not be considered all-inclusive or mandatory:

- ISM system effectiveness
- Management systems
- Regulatory performance
- Quality assurance program implementation
- Safety culture
- Authorization bases
- Stakeholder relations
- Operational performance
- Environmental protection
- Waste management
- Emergency preparedness
- Safeguards and security
- Fire protection
- Transportation management
- Near-misses
- Work planning and control
- Feedback and improvement
- Effectiveness reviews of completed corrective actions
- Safety issue reporting
- Management walk-through program
- Assessment and oversight program
- Self-assessment
- Vital safety system assessments
- Clear roles and responsibilities
- Human resource management
- Employee training and development
- Minority/differing professional opinion
- Subcontractor safety performance
- Electrical safety
- Criticality safety

- Nuclear safety basis document updates
- Project controls and baseline management
- Project management
- Workforce management
- Occupational safety and health (industrial safety and health)
- Radiological safety
- Infrastructure and facility management
- Systems and equipment essential to safety
- Construction management
- Decontamination and decommissioning
- Maintenance
- Configuration management
- Environmental restoration
- Risk reduction
- Pollution prevention/sustainable environmental stewardship
- National ambient air quality standards attainment
- Watershed approach for surface water protection
- Sitewide approach for ground water protection
- Protection of natural resources
- Protection of cultural resources.

The following are sample performance objectives:

- Achieve zero organizational accidents.
- Perform work so that personnel hazards are anticipated, identified, evaluated, and controlled.
- Perform work in a manner that does not present a threat of harm to the public or the environment and that will identify, control, and respond to environmental hazards.
- Be recognized for operational excellence.
- Be recognized for excellent personnel.
- Be recognized for excellent safety culture.
- Be recognized for sound environmental management practices.
- Senior leadership commitment to safety is clear and visible.
- Establish and sustain a robust safety culture, consistent with ISM principles.
- Fully integrate HPI initiatives into ISM systems.
- Demonstrate sound stewardship of the site through safe and effective hazardous and radioactive waste minimization and management through restoration of the site where degradation has occurred.

The following are sample performance measures:

- Exposures of personnel to chemical, physical, and biological hazards are adequately controlled.
- Accident and injury rates, lost workday case rates, and the DOE injury cost index are adequately controlled. Perform better than comparable industry statistics and exhibit a downward trend.
- Exposures of personnel to ionizing radiation are adequately controlled.
- Reportable occurrences are managed with effective corrective actions and are minimized.
- Radioactive material is adequately controlled.
- The Fire Department response time and the rate of completion of required fire protection actions are adequately controlled and accomplished.
- Environmental violations and releases are adequately controlled.
- The amount of waste generated and the amount of pollutants emitted are reduced.
- Hazardous and radioactive wastes are managed in a manner that meets regulatory requirements and is cost effective.
- Error-likely situations are identified and controlled.
- Corrective actions are timely.
- Corrective actions are effective at resolving originally-identified causes.
- The number of repeat occurrences is minimized through effective corrective actions.
- Employee concerns are tracked and resolved in a timely manner.
- Employee concerns are effectively addressed to resolve the identified concerns.
- Self-assessments effectively identify issues raised by independent organizations when systemic issues are identified.
- The quality of safety basis documents, as measured by defects identified by assessments or occurrences, is excellent.
- The Assessment and Oversight Schedule is issued by September 30th.
- At least 95% of annually planned assessments are completed.
- At least 90% of identified employee qualifications are completed on time.
- A line manager walk-around program is implemented such that line managers spend at least 100 hours individually in the field each year.
- Work scope priorities are defined and communicated to contractors by July 31st of each year to guide annual work planning.
- Corrective actions are reviewed monthly with the contractor for any cost or schedule variance that is greater than a negative 10%.
- Monthly all-employees meetings are conducted, with an emphasis on safety.
- A Differing Professional Opinion procedure is implemented, and employees are trained on it.
- Performance improvement is evident in environmental compliance and pollution prevention.

Performance measures can also be developed to address various parameters such as:

- Behavioral and process measures such as the number of near-misses, the number of error reports, the number of behavioral observations, the number of safe acts, etc.

- Events – Number of first aid cases, occurrences, near misses.
- Safety inspections - number and score.
- Employee input – safety concerns and survey responses.
- Management assessment results.
- Housekeeping inspection results.
- Safety related work package cycle time.
- Procedure compliance rates.

The following are sample performance commitments:

- Develop performance evaluation standards to ensure greater line management responsibility and accountability for safety.
- Develop and implement processes for work planning and control that fulfill the attributes of best practice processes.
- Develop a robust and comprehensive line organization self-assessment program to assess overall safety performance and ISM effectiveness.
- Achieve pollution prevention and sustainable environmental stewardship goals.
- Implement DOE ISM supplemental safety culture elements.
- Initiate two HPI projects.
- Achieve pollution prevention and sustainable environmental stewardship goals.
- Train employees on ISM system revisions.
- Conduct two safety system assessments.
- Maintain voluntary protection program Star status.
- Improve total recordable case rate by implementing DuPont STOP program.
- Achieve pollution prevention and sustainable environmental stewardship goals.

Safety Management Functions, Responsibilities, and Authorities

Introduction

In accordance with DOE O 450.2, each Departmental line management and support organization with safety management responsibility must develop, issue, and maintain, separately or as part of their ISM system description document, an organizational FRA document that:

1. Describes the organization and management structure

2. Identifies the safety management functions applicable to the organization

3. Identifies the organization's functions and authorities that have been transferred to or from another organization or derived from a DOE safety directive or applicable governmental agency regulation

4. Identifies who within the organization has the responsibility and authority to perform those functions

5. Lists the delegated authorities

6. Explains the general process for control and revision of the FRA document and the process used for delegations of authority

7. Is readily accessible to all organizational employees

8. Is approved by the head of the DOE organization to which the FRA document applies

9. Is reviewed annually and updated, if needed, to reflect changes in the delegations of authority and changes in responsibilities and authorizations as specified in DOE safety directives, applicable governmental agency regulations, and Secretarial memoranda.

To support DOE management, HSS has developed and will maintain a website (http://www.hss.energy.gov/HealthSafety/wshp/frams.html/) to manage top level FRAs (e.g., for the Secretary, Deputy Secretary, and Under Secretary of Energy).

Organizational Functions, Responsibilities, and Authorities Documents

Line, support, oversight, and enforcement organizations within DOE are required to develop and issue documents that define how their assigned safety management functions and responsibilities are properly discharged and the authority for carrying out these safety management responsibilities. These documents are referred to as FRA documents. FRA documents should clearly specify the organization's functions and responsibilities related to safety management. They should also specify who in the organization has the documented authority to carry out the safety management responsibility. FRA documents should clearly define "who is authorized to do what" in an organization, including any delegations of authority. If the FRA documents fail to document or clearly communicate an authorized function or responsibility, an important safety or environmental protection function or responsibility might not be carried out. Consequently, DOE management should clearly communicate delegated actions and assignments to their subordinate managers, supervisors, and staff.

Each organizational FRA document should define the safety management functions for the organization, determine the responsibilities under each safety management function, and clearly identify who within the organization has the responsibility and authority to perform those functions. Delegations of authority to subordinate managers and staff should be clearly listed and complete. Field office organizations with missions that affect the safety of work performed at DOE facilities should also develop and implement FRA documents.

The FRA document should describe the safety management functions and responsibilities necessary to accomplish the intent of DOE P 450.4A and DOE O 450.2, as well as other DOE directives, other applicable government agency regulations, and appropriate programs related to safety. It typically also describes the respective organizations and their line management. Each organization can develop a format for its FRA documents that is most suitable and effective for its specific needs. In addition, FRA documents should clearly identify any authority that has been transferred to or from another organization. Delegations of any authorities listed in an organizational FRA document should be clearly delineated in FRA documents of subordinate organizations. The FRA document should be updated to reflect any changes in delegations of the authority and generally describe the process for control and revision of the document.

The FRA document should be easily accessible to all employees by webpage or assigned copies. Copies of current documents of delegation or rescission of delegation that have not yet been incorporated into the FRA document should be provided along with the copy of the FRA document (electronic or hardcopy).

Delegation of Authority

As stated in the DOE Organization Act, except as otherwise prohibited by law, the Secretary may delegate the functions of the Secretary to officers and employees of the Department and may authorize successive re-delegations.

Some authorities within the Department are assigned directly to specific offices or positions within the Department through laws. For example, the NNSA Act assigns authorities directly to the Under Secretary for Nuclear Security/Administrator for NNSA, and 10 CFR Part 820 assigns certain responsibilities and authorities to the director of the Office of Enforcement (through a subsequent reorganization, this office is now called the Office of Enforcement and Oversight). In addition, some authorities specifically limit or prohibit delegations. An example of an authorizing document that limits delegation is the NNSA Act, which limits the delegation of the authority, direction, and control of the Under Secretary for Nuclear Security/Administrator for NNSA only to the Deputy Secretary, without further delegation. An example of an authorizing document that prohibits delegation is 10 CFR 820.61, which assigns the authority for granting exemptions to nuclear safety requirements to specified Secretarial officers, but prohibits delegation.

DOE officials may delegate the authority to perform certain actions to other officials where it is not prohibited. However, the delegating officials remain accountable for the outcome of the action, even if the function and authority is delegated to an individual or an organization that is not subordinate to the delegating official. Functions can be delegated, but the responsibility for the outcome of that function can never be delegated.

DOE managers should clearly define the responsibilities of subordinate managers and staff. For example, if a Secretarial officer expects a subordinate manager or supervisor to review and approve an annual report on environmental consequences that is assigned to the Secretarial officer, that action (including any delegated authorities) should be clearly delineated in the Secretarial officer's FRA document under the responsibilities of that manager or supervisor. If the delegation of authority is not listed, the Secretarial officer is expected to perform the action.

Delegation of approval authority or other assignment of responsibility does not preclude program offices from issuing requirements, expectations, and guidance affecting that authority or from participating in field element interactions with the contractor. Program offices coordinate interactions with a contractor through the DOE contracting officer.

The following is one acceptable approach to the delegation of authority:

1. The delegator (individual delegating the authority) documents all delegations of authority in writing and provides them to the delegate (official or office to whom the authority is delegated). The document delegating the authority clearly defines the authority that is delegated, the delegate, and all circumstances under which the authority may be exercised, including any restrictions or prohibitions related to further delegation and conditions or qualifications that relate to the delegation.

2. Unless otherwise stated, the delegation remains in effect until it is rescinded or modified or there is a personnel change. The delegator may rescind or modify the delegation in writing at any time. A copy of the rescission/modification should be provided to the delegate who previously had the delegated authority so the delegate is aware of the rescission and can document the revised delegation in the appropriate FRA documents.

3. Secretarial officers, field offices, and HSS list delegations of authorities that apply to their organizations in their FRA documents.

4. Secretarial officers, field offices, and HSS should update their FRA documents at least annually to document the current delegations of authority.

5. If the delegator delegates the authority for a function listed in the FRA document to another office, the delegator asks the delegate to review and comment on that aspect of the delegator's FRA document and work with the delegator to resolve the delegate's comments. In addition, the delegate's FRA document, if applicable, documents the delegation.