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Volume 1 of 2

# DOE STANDARD

# INTEGRATION OF ENVIRONMENT, SAFETY, AND HEALTH INTO FACILITY DISPOSITION ACTIVITIES

## Volume 1 of 2: Technical Standard



U.S. Department of Energy
Washington, D.C. 20585

## DISCLAIMER

# FOREWORD

The Department of Energy (DOE) is experiencing a rapid transition from a weapons-production mission to a strong focus on an environmental management mission that includes excess facility disposition (long-term surveillance and maintenance, deactivation, and decommissioning); site remediation; and management of radioactive, hazardous, and mixed waste. This mission transition and the enormous environmental management task coincides with a significant reduction in the Department's Federal and contractor workforce. Safe and efficient environmental management activities require addressing and overcoming these and many other challenges, including technological limitations, regulatory compliance, stakeholder and local community needs and priorities, and workforce retraining.

**Facility Disposition: Environment, Safety, and Health Challenges**

The Department's facility disposition experience over the past few years indicates that there are several key factors impacting the effectiveness of environment, safety, and health (ES&H) programs. Principal among these challenges are the following:

1. The existing set of ES&H directives were promulgated primarily for the design and operation of DOE facilities and are not always suitable for facility disposition activities. Although fundamental ES&H principles and objectives remain similar for both, facility disposition activities entail unique work, hazard, and programmatic characteristics that differ from facility operation and, consequently, require clarification or modification of existing directives and requirements. Because of the unique nature of facility disposition (i.e., dynamic, requiring a more flexible and systematic approach to hazard identification and control), inappropriate application of operation-oriented directives, as well as imposition of external regulations, has often produced gaps and redundant, overlapping requirements, creating a confusing regulatory environment.

2. Facility disposition activities involve unique work activities that have introduced hazards and programmatic challenges seldom encountered by DOE and its contractors during facility operations. These activities present the potential for exposure to multiple hazards, many of which are initially unknown or unforeseen. The uncharacterized nature of hazards and other uncertainties represents a dangerous aspect of this work. During a typical facility disposition activity, workers can be exposed to hazardous substances (including radioactive material), physical hazards, or other unknown hazards. Effectively addressing these predominately work-related hazards requires

strong management commitment and worker involvement to: (1) increase worker awareness through training to enhance hazard recognition skills; and (2) implement an effective and integrated hazards management system to identify, analyze, and establish controls for all hazards.

3. The DOE's contracting approach to performing facility disposition activities—reliance on multiple subcontractors responsible for defined, often short-term, tasks and scopes of work (e.g., Management and Integration contracts)—coupled with increased reliance on privatization and fixed-cost type contracts, introduces unique challenges for ensuring the safety and health of short-term or transient workers, managing subcontractor activities, and effectively integrating and blending diverse corporate safety cultures.

The following table summarizes and compares facility disposition and operation characteristics.

| | Disposition | Operation |
|---|---|---|
| **ES&H Regulatory Framework** | Impacted by existing operation-oriented DOE directives and external regulations, many of which are clarified by this technical standard | Established by existing DOE directives and external regulations |
| **Hazard Profile** | Frequently changing; not well-characterized; more unrecognized hazards | Stable; well-characterized |
| **Work Planning** | Task- or job-oriented; frequently performing new, first-of-a-kind tasks; one-time and short-duration tasks | Routine; focused on operation and maintenance |
| **Hazard Analysis** | Dynamic; mainly task-oriented | Operation-oriented; generally stable |
| **Workforce Experience** | New mission; limited experience; subcontractors may not have process knowledge of facility operations | Familiar with facility operation and routine work |
| **Contract Management** | More short-term subcontractor involvement | Contractor managed and operated |

**Addressing Challenges: Objectives of the Technical Standard**

With these challenges ahead, this technical standard focuses on facility disposition activities, providing guidance and recommending cost-effective approaches, as demonstrated, by disposition activities such as the Hanford PUREX deactivation project. It also aims to ensure that all DOE facility disposition activities consider as an integral and visible element the health and safety of the workforce, public, and environment.

This technical standard is approved for use by all DOE components and their contractors.

Beneficial comments (e.g., recommendations, additions, or deletions) and any pertinent data that may improve the document should be sent to either P. K. Niyogi, Office of Nuclear and Facility Safety (EH-3) or Tony Eng, Office of Worker Health and Safety (EH-5) by using the self-addressed Document Improvement Proposal form, DOE F 1300.3, appearing at the end of this document.

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# GLOSSARY

These definitions are based on existing DOE or other external agency (e.g., EPA) directives. Also, this glossary includes the terms developed for the purposes of this technical standard (referred to as the *Standard)*.

**Biological hazards**—Infectious agents presenting a risk of death, injury, or illness to employees. Hazards include exposures to toxic plants (e.g., poison ivy and poison oak), harmful animals and insects (e.g., bee stings and snake bites), and viruses or bacteria carried by animals or insects (e.g., Lyme disease).

**Characterization**—The process of identifying hazards through the collection and evaluation of facility data. Characterization activities should be considered if knowledge of hazards is insufficient to understand hazardous substance types, quantities, forms, potential exposures, and locations.

**Chemical hazards**—Hazardous material (i.e., solids, liquids, or gases) with the potential for causing harm to people, the environment, or property.

**Contractor (subcontractor)**—Any person under contract with DOE with the responsibility to perform disposition activities. This includes individuals or organizations subcontracted to a DOE contractor.

**Deactivation**—The process of placing a facility in a safe and stable condition including the removal of readily removable hazardous and radioactive materials to minimize the long-term cost of a surveillance and maintenance program that is protective of workers, the public, and the environment.

As further explained in the *Standard*, deactivation activities can include one-of-a-kind and first-of-a-kind tasks, such as removal of radioactive materials in ventilation duct work. It also includes routine surveillance and maintenance tasks that are typically part of facility operation.

**Decommissioning**—Takes place after deactivation and includes surveillance and maintenance, decontamination, or dismantlement. These actions are taken at the end of the life of a facility to retire it from service, with adequate regard for the health and safety of workers and the public and protection of the environment. The ultimate goal of decommissioning is unrestricted release or restricted use of the site.

As further explained in the *Standard*, surveillance and maintenance tasks conducted during decommissioning are typically routine activities that are similar to any other life cycle phase. A disposition

project or activity can also be in a long-term surveillance and maintenance (e.g., quiescent state) if no deactivation, decontamination, or dismantlement activities are conducted. This definition is not meant to imply that the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is the controlling regulation for long-term surveillance and maintenance when decommissioning is not immediately undertaken.

**Decontamination**—The removal or reduction of residual radioactive and hazardous materials by mechanical, chemical, or other techniques to achieve a stated objective or condition. Decontamination may occur during all phases of facility disposition; however, the greatest decontamination activity usually occurs during decommissioning.

**Facility disposition**—Those activities that follow completion of program mission, including, but not limited to, surveillance and maintenance, deactivation, and decommissioning.

**Facility hazard analysis**—Analysis of identified hazards that arise within a facility and which may be encountered during disposition activities. This includes the type, form, quantity, concentration, and locations of radioactive, chemically hazardous, and biological substances and materials within a facility; the hazardous substance's inherent harmful characteristics and conditions under which exposure may occur; and the physical hazards related to the performance of activities.

**Hazard**—A chemical property, energy source, or physical condition that has the potential to cause illness, injury, death to personnel, or damage to property or the environment, without regard for the likelihood or credibility of potential accidents or the mitigation of consequences.

**Hazard baseline documentation**—A formal record of a facility disposition's safety basis, which includes all identified hazards and the controls established to support safe work execution. The type and extent of hazard baseline documents will vary depending on the disposition activity's work scope and hazards, but typically include a combination of either a Safety Analysis Report (SAR), Health and Safety Plan (HASP), Basis for Interim Operation (BIO), Technical Safety Requirements (TSR), or other types of documented analysis (e.g., Auditable Safety Analysis) and work packages used to plan and control work tasks.

**Hazardous substance**—Used synonymously with the term "hazardous material," this includes any substance designated or reflected in 29 CFR 1910.120, to which exposure may result in adverse affects to the worker, public, or environment including : (1) any substance defined under section 101(14) of CERCLA; (2) any biological agent and other disease-causing agent that after release into the environment

and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformations in such persons or their offspring; (3) any substance listed by the U.S. Department of Transportation (DOT) as hazardous materials under 49 CFR 172.101 and appendices; and (4) hazardous waste (i.e., a waste or combination of wastes as defined in 40 CFR 261.3 or substances defined as hazardous waste in 49 CFR 171.8).

**Hold point**—A predetermined step, specified in work planning documents, that requires specific actions or hazard controls prior to continuing work (e.g., characterization activities or radiological controls).

**Integrated hazard analysis**—A hazard analysis performed by a multidisciplined team that includes an evaluation of all types of hazards.

**Low level residual fixed radioactivity**—Remaining radioactivity following reasonable efforts to remove radioactive systems, components, and stored materials that is comprised of either: (1) surface contamination that is truly fixed following chemical cleaning or some similar process; (2) a component of surface contamination that can be picked up by smears; or (3) activated materials within structures. These components can be characterized as low level if the smearable radioactivity is less than the levels defined by 10 CFR 835, Appendix D, *Surface Contamination Values*, and hazard analysis results show that no credible accident scenario or work practice(s) would release the fixed or activation components of radioactivity remaining at levels that would prudently require the use of existing active safety systems, structures, or components to prevent or mitigate a release of radioactive materials.

**Management of change**—A process that evaluates all proposed activities, changes, and discoveries that may affect facility or worker safety. The management of change process defines a mechanism for evaluating the significance of any change, the need for additional analysis and safety controls, the documentation affected or required by the change, and the approval and training requirements for implementing the change.

**Non-nuclear facility**—Those activities, processes, or operations that may involve hazardous substances in such forms or concentration that a potential danger exists to cause illness, injury, or death to personnel within the facility site boundary or members of the public.

**Non-time-critical removal action**—This is a type of response action recognized by the Environmental

Protection Agency (EPA) appropriate for addressing hazardous substance threats where a planning horizon of six months or more is appropriate. Removal responses, including non-time-critical removals, are the subject of 40 CFR 300.410 and 300.415. Under a signed agreement with EPA, the Department uses a non-time-critical removal approach tailored for DOE's decommissioning of contaminated facilities. That approach comprises threat assessment; identification, analysis, and documentation of decommissioning alternatives; opportunities for public participation in the decommissioning decision; and planning and performance of decommissioning activities. Under the DOE/EPA agreement, regulatory involvement in decommissioning is determined locally.

**Nuclear facility**—Those activities, processes, or operations that involve radioactive materials or fissionable materials in such form, quantity, or concentration that a nuclear hazard potentially exists to the employees or general public. Included are activities or operations that: (1) produce process or store radioactive liquid, solid waste, fissionable materials, or tritium; (2) conduct separations operations; (3) conduct irradiated materials inspection, fuel fabrication, decontamination, or recovery operations; (4) conduct fuel enrichment operations; or (5) perform environmental remediation or waste management activities involving radioactive materials.

Incidental use and generation of radioactive materials in a facility operation (e.g., check and calibration sources and use of radioactive sources in research, experimental and analytical laboratory activities, electron microscopes, and x-ray machines) would not ordinarily require the facility to be included in this definition. Accelerators and their operations are not included.

**Physical hazards**—Hazards that are routinely encountered in general industry and construction, and for which national consensus codes or standards (e.g., Occupational Safety and Health Administration [OSHA] or Department of Transportation [DOT]) exist to guide safe design and operation without the need for special analysis to define safe design or operational parameters. Physical hazards include those encountered during routine work and construction including: excavation, electrical, hoisting and rigging, noise, and slips, trips, and falls.

**Pre-transfer review**—Serves to provide the safety basis and physical and administrative characteristics of the facility subsequent to the cessation of operations, and prior to transferring the facility for the disposition phase. The objective of the review is to identify and evaluate, using a graded approach, the explicit boundaries of the facility(ies) being transferred; their physical condition; extent, nature, and level of contamination (as appropriate on a case-by-case basis); inventories/estimates of types and quantities of

special nuclear, fissionable, toxic, hazardous, and radioactive materials; summary and evaluation of the safety basis and surveillance and maintenance requirements; and other elements to ensure that sufficient information is provided to facilitate an understanding of the facility and its surveillance and maintenance requirements. Documentation is generally expected to be provided from the analysis of available information, without extensive or new characterization work.

**Radiological facility**—Nuclear facilities that do not meet or exceed the hazard category 3 thresholds published in DOE-STD-1027-92 but still contain some quantity of radioactive material (see DOE-EM-STD-5502-94).

**Radiological hazards**—Hazards that contain radioactive isotopes that have the potential to cause harm from ionizing radiation.

**Readiness evaluation process**—A systematic examination of facilities, equipment, personnel, procedures and management control systems, performed prior to initiating a facility disposition project, to ensure that disposition activities will be conducted within its approved safety basis.

**Safety basis**—The combination of information relating to the identification, analysis, and control of facility disposition hazards (including engineering design and administrative controls) upon which DOE depends for its conclusion that activities at the facility can be conducted safely. For the purposes of this *Standard*, the concept of "safety basis," which has been used in DOE 5480.23 for nuclear facilities, has been extended to radiological and non-nuclear facilities. This does not imply that specific nuclear safety requirements of DOE 5480.23 are applicable to these types of facilities.

**Surveillance and maintenance**—These activities are conducted throughout the facility life-cycle phase including when a facility is not operating and is not expected to operate again and continues until phased out during decommissioning. Activities include providing in a cost effective manner periodic inspections and maintenance of structures, systems, or components necessary for the satisfactory containment of contamination and the protection of workers, the public, and the environment.

As further explained in the *Standard*, a disposition project can be in a quiescent state of long-term surveillance and maintenance prior to deactivation or prior to decommissioning.

**Task hazard analysis**—An analysis of individual facility disposition tasks (i.e., discrete units of work that comprise a project) to understand hazards that may be introduced during the conduct of work activities.

This analysis supports the establishment of worker safety controls and development of work packages or other methods used to plan tasks.

**Work Smart Standards process**—The Work Smart Standards (WSS) process is used to reach agreement between DOE and its contractors with regard to the applicable standards to be followed for safe work. WSS was approved for use in January 1996 and issued as policy in DOE P 450.3, *Authorizing the Use of Necessary and Sufficient for Standards-Based Environmental, Safety and Health Management.* The process for applying the WSS is described in DOE M 450.3-1, *The Department of Energy Closure Process for Necessary and Sufficient Sets of Standards.*

# ACRONYMS

| | |
|---|---|
| ARAR | Applicable or Relevant and Appropriate Requirement (as used in CERCLA) |
| ASA | Auditable Safety Analysis |
| BIO | Basis for Interim Operation |
| CAA | Clean Air Act |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CSO | Cognizant Secretarial Officer |
| CWA | Clean Water Act |
| DEAR | Department of Energy Acquisition Regulations |
| D&D | Deactivation and Decommissioning |
| DOE | Department of Energy |
| EA | Environmental Assessment |
| EH | DOE Office of Environment, Safety and Health |
| EIS | Environmental Impact Statement |
| EM | DOE Office of Environmental Management |
| ES&H | Environment, Safety, and Health |
| HASP | Health and Safety Plan |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| ISMS | Integrated Safety Management System |
| LCAM | Life-Cycle Asset Management |

| | |
|---|---|
| MOC | Management of Change |
| NEPA | National Environmental Policy Act |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| NPH | National Phenomena Hazards |
| ORR | Operational Readiness Review |
| OSHA | Occupational Safety and Health Administration (U.S. Department of Labor) |
| PPE | Personal Protective Equipment |
| QA | Quality Assurance |
| RCRA | Resource Conservation and Recovery Act |
| S&H | Safety and Health |
| S&M | Surveillance and Maintenance |
| SAR | Safety Analysis Report |
| S/RID | Standards/Requirements Identification Document |
| SSC | Structures, Systems, or Components |
| TSD | Treatment, Storage, or Disposal |
| TSR | Technical Safety Requirement |
| USQ | Unreviewed Safety Question |
| WSS | Work Smart Standards |

# 1.0 INTRODUCTION

This Department of Energy (DOE) technical standard (referred to as the *Standard*) provides guidance for integrating and enhancing worker, public, and environmental protection during facility disposition activities. It provides environment, safety, and health (ES&H) guidance to supplement the project management requirements and associated guidelines contained within DOE O 430.1A, *Life-Cycle Asset Management* (LCAM)[1], and amplified within the corresponding implementation guides.

In addition, the *Standard* is designed to support an Integrated Safety Management System (ISMS), consistent with the guiding principles and core functions contained in DOE P 450.4, *Safety Management System Policy*, and discussed in DOE G 450.4-1, *Integrated Safety Management System Guide*. The ISMS guiding principles represent the fundamental policies that guide the safe accomplishment of work and include: (1) line management responsibility for safety; (2) clear roles and responsibilities; (3) competence commensurate with responsibilities; (4) balanced priorities; (5) identification of safety standards and requirements; (6) hazard controls tailored to work being performed; and (7) operations authorization. This *Standard* specifically addresses the implementation of the above ISMS principles four through seven[2], as applied to facility disposition activities, and contains the following:

- Directives implementation guidance to help clarify, integrate, and reduce overlapping and operationally-oriented ES&H requirements applicable to facility disposition activities.
- Safety management guidance that provides an integrated and balanced approach to identification, analysis, and control of all types of hazards.
- ES&H performance expectations recommended for implementing an effective ISMS for facility disposition, including those expectations related to subcontractor and transient workers.
- A compilation of existing ES&H directives (organized by hazard types), potentially applicable to facility disposition activities.

Table 1 provides a convenient reference for locating selected topics contained within the *Standard*.

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[1] At the time of publication of this *Standard*, DOE 430.1A was in draft form and in the process of approval.

[2] The guiding principles that are not specifically addressed in this *Standard* (i.e., line management responsibility for safety, clear roles and responsibilities, competence commensurate with responsibilities) are discussed in DOE G 450.4-1, *Integrated Safety Management System Guide,* and DOE M 411.1, *The Manual of Functions, Responsibilities, and Authorities.*

**Table 1. Key DOE-STD-1120-98 Topics**

| ES&H-RELATED TOPICS | SECTION |
|---|---|
| CERCLA/ES&H Integration | 3.1.1, Appendix D |
| Environmental Permits | 3.3.6 |
| Facility Disposition Phases | 2.0 |
| ES&H Requirements Identification | 3.1.4, Appendix A |
| ISMS Performance Expectations | Appendix C |
| Facility Hazard Analysis | 3.2.1 |
| Feedback and Evaluation | 3.5 |
| Hazard Analysis Techniques | Appendix H |
| Hazard Baseline Documentation | 3.3.4, Appendix G, Appendix I |
| Hazard Categorization | 3.1.4, 3.3.4, 3.4.1 |
| Hazard Identification and Characterization | 3.1.3 |
| Health and Safety Plans | 3.1.3, 3.3.4, Appendix I |
| Integrated Hazard Analysis | 3.2 |
| Management of Change | 3.4.2 |
| Management Plans | 3.1.1 |
| Multidisciplined Work Teams (Worker Involvement) | 3.1.3, 3.2.1, 3.2.2 |
| National Environmental Policy Act (NEPA) | 3.2.1 |
| Natural Phenomena Hazards (NPH) | 3.2.1, 3.3.2, Appendix G |
| Privatization | Appendix E |
| Evaluating Readiness | 3.4.1 |
| Resource Planning | 3.1.2 |
| Facility Safety Controls | 3.3.2 |
| Safety Analysis Reports | 3.1.4, 3.3.4, Appendix I |
| Subcontractor ES&H Activities | 3.1.1 |
| Task Hazard Analysis | 3.2.2 |
| Use of Existing Hazard Baseline Documentation | 3.3.5 |
| Work Smart Standards Process | Appendix F |
| Work Packages | 3.2.2, 3.3.4 |
| Worker Safety Controls | 3.3.1 |

## 1.1 Applicability

The ES&H principles presented in this *Standard* apply to all phases of facility disposition[3]. These phases comprise deactivation (including material stabilization campaigns performed during deactivation such as processing of reactive liquids), decommissioning, and any long-term surveillance and maintenance (S&M) activities that are conducted prior to each of these phases. The guidance contained within this *Standard* is not intended for non-facility environmental restoration activities (e.g., remediation of a burial ground or other activities that require earth moving) or for material stabilization activities conducted as part of the operations phase of the facility life-cycle.

This *Standard* is intended for use by facility disposition project teams consisting of project managers; ES&H professionals; engineers; supervisors; and workers and may prove useful to teams implementing the DOE Work Smart Standards (WSS) process, as well as to those teams following a compliance-based approach using a Standards/Requirements Identification Document (S/RID) process. Additionally, throughout the *Standard* many clarifications are provided of operational-oriented requirements.

## 1.2 Organization

The *Standard* consists of two volumes. Volume 1: *Technical Standard,* has three sections, including this introductory section. Section 2 provides an overview of specific facility disposition phases, a typical hazard profile for each phase, and associated regulatory considerations. Section 3 is organized around the five ISMS core functions described in DOE P 450.4 as implemented at both the facility and the task level[4]. Figure 1 provides an illustration of these core functions. Section 3 also provides guidance for addressing major implementation issues related to existing ES&H directives.

Volume 2: *Appendices,* complements other sections of the *Standard* with additional ES&H information. Appendix A provides a set of candidate DOE ES&H directives and external regulations, organized by hazard types that may be used to identify potentially applicable directives to a specific facility disposition activity. Appendix B offers examples and lessons learned that illustrate implementation of ES&H approaches discussed in Section 3 of Volume 1. Appendix C contains ISMS performance expectations to

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[3] Dispositioning of nuclear reactor facilities that still contain fuel in either the core or facility, as well as Hazard Category 1 nuclear facilities, should rely on existing nuclear safety requirements. For these cases, application of the guidance contained in this *Standard* should be discussed with the CSO on a case-by-case basis.

[4] An effective ISMS, as defined in DOE G 450.4-1, is comprised of three management levels: institution or site level; facility level; and task level. These three levels function together as an integrated system. This *Standard* primarily focuses on the facility and task level ISMS, but draws information from the site level.

guide a project team in developing and implementing an effective ISMS and in developing specific performance criteria for use in facility disposition. Appendix D provides guidance for identifying potential Applicable or Relevant and Appropriate Requirements (ARARs) when decommissioning facilities fall under the Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) process. Appendix E discusses ES&H considerations for dispositioning facilities by privatization. Appendix F is an overview of the WSS process. Appendix G provides a copy of two DOE Office of Nuclear Safety Policy and Standards memoranda that form the bases for some of the guidance discussed within the *Standard.* Appendix H gives information on available hazard analysis techniques and references. Appendix I provides a supplemental discussion to Sections 3.3.4, *Hazard Baseline Documentation*, and 3.3.6, *Environmental Permits*. Appendix J presents a sample readiness evaluation checklist.

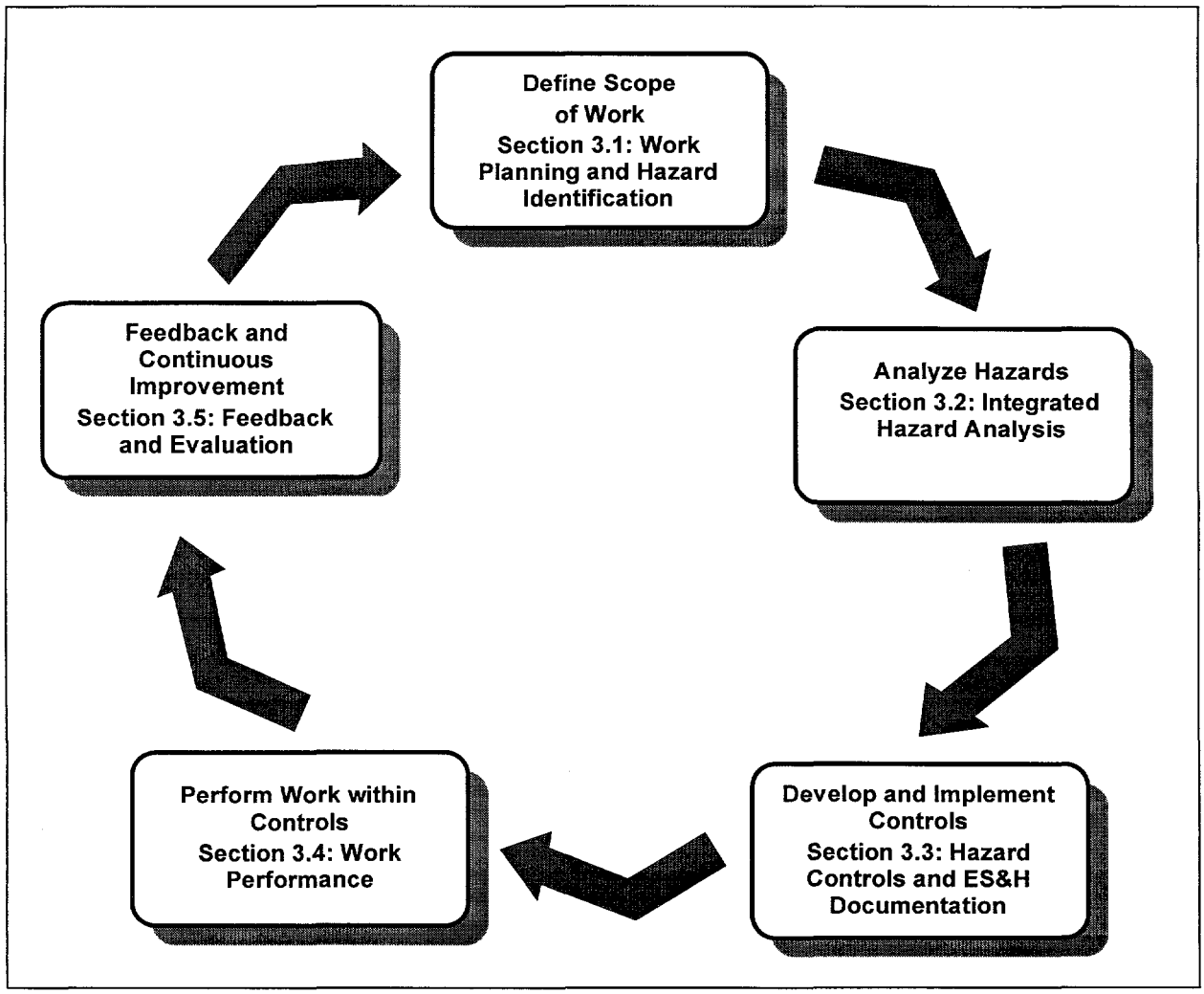


**Figure 1. Integrated Safety Management System (ISMS)**

## 2.0 FACILITY DISPOSITION PHASES

The phases of facility disposition (i.e., deactivation, decommissioning, and long-term S&M) encompass differing work objectives, desired end-points, and associated hazards that determine the set of requirements necessary to protect the safety and health (S&H) of the workers and the public and the protection of the environment. Ideally, facility disposition activities begin with deactivation immediately after operation, entailing stabilization and removal of an excess facility's hazardous substances (see Scenario 1, Figure 2). Decommissioning activities follow deactivation and include removal of contamination and residual hazardous substances and reuse or dismantling of facility systems and physical structures. Both deactivation and decommissioning (D&D) may also include routine S&M tasks as part of the overall project activities. However, not all facility disposition activities follow Scenario 1. Often, a period of

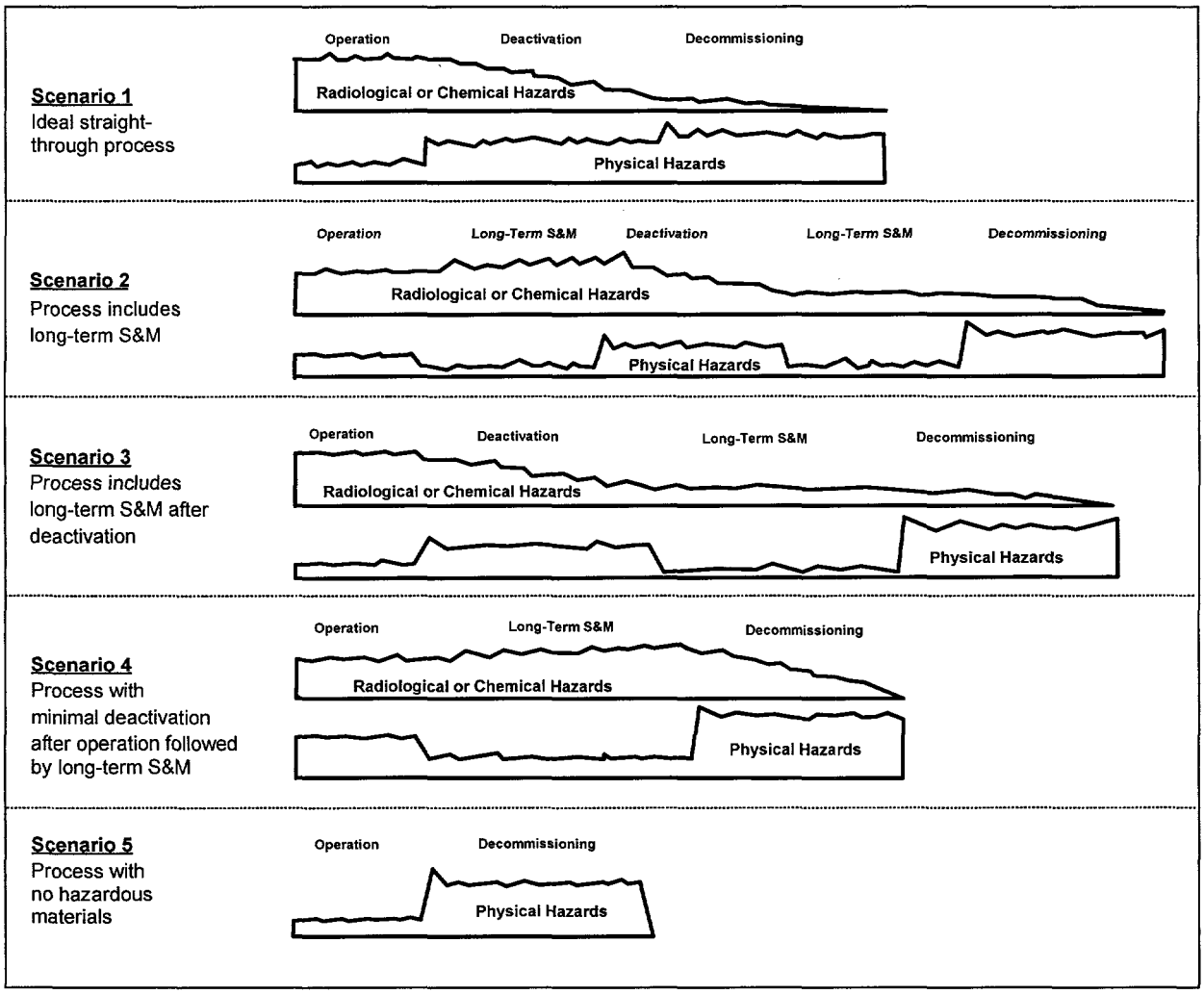


**Figure 2. Facility Disposition Scenarios and Associated Hazard Profiles**

long-term S&M is conducted between facility operation, deactivation, and decommissioning. These activities focus on monitoring and controlling any remaining hazardous substances or contamination and maintaining the structural integrity of the facility. In some cases, operations at a facility may be temporarily suspended, followed by an indefinite shutdown, resulting in the facility effectively entering an S&M phase by default. Several realistic facility disposition scenarios are presented in Scenarios 2 through 5 in Figure 2. More detailed descriptions of facility disposition phases can be found in the implementation guides to DOE O 430.1A, *Life-Cycle Asset Management.*

The duration of each facility disposition phase generally depends on the magnitude of the hazards, the complexity of the project, and the availability of project funding. As radiological or hazardous material inventories get removed, potential risks to the public and the environment eventually lessen. However, the potential worker risk of exposure to both radiological and hazardous materials during removal increases. Workers become exposed to more physical hazards, similar to those encountered during typical construction activities, as indicated by the disposition hazard profiles in Figure 2. It is important to note that chemical substances may become unstable, increasing the hazard profile, during extended periods of storage often associated with facility disposition activities, such as long-term S&M.

Typical attributes of disposition activities, associated ES&H implications and regulatory impacts are partly driven by the types of hazards depicted qualitatively in Figure 2 (i.e., radiological, chemical, and physical). A summary of these considerations is presented in Table 2. While these considerations may vary, it should be noted that ISMS follows the same basic approach during any phase of facility disposition. That is, the elements of hazard identification, analysis, and control are conducted regardless of the phase. An approach for managing facility disposition hazards is presented in Section 3 of this *Standard.*

**Table 2. General Attributes, ES&H Implications, and Regulatory Considerations for Facility Disposition Phases**

| | Deactivation | Long-Term Surveillance and Maintenance (Quiescent State) | Decommissioning |
|---|---|---|---|
| **Typical Attributes** | • Dynamic work environment | • Steady-state work environment | • Dynamic work environment |
| | • High worker activity—handling and packaging of hazardous materials/contamination | • Minimal worker activity—monitoring and control of hazardous materials/ contamination | • High worker activity—handling and packaging of hazardous materials/contamination |
| | • Potentially large quantities of radiological and chemical hazards, moderate physical hazards | • Moderate to minor quantities of radiological and chemical hazards, potentially increasing physical hazards | • Increased physical hazards with potential for moderate radiological and chemical hazards |
| | • Typically stable contractor workforce | • Stable contractor workforce; however, can change if post-deactivation S&M spans an extended period of time | • Rapidly changing workforce with greater subcontractor presence |
| **ES&H Implications** | • Public and environmental risks from radiological and chemical hazards | • Public and environmental risks from radiological and chemical hazards | • Public and environmental risks from radiological and chemical hazards |
| | • Worker risks from radiological, chemical, and physical hazards | • Worker risks from radiological, chemical, and physical hazards, but typically lower than deactivation or decommissioning because of limited activity | • Presents highest risk to workers from radiological, chemical, and physical hazards |
| | • Unknown or uncertain radiological and chemical inventories | • Unknown or uncertain radiological and chemical inventories as well as physical hazards | • Unknown or uncertain radiological and chemical inventories as well as physical hazards |
| **Regulatory Considerations** | • All directives contained within Appendix A of this *Standard* except those specifically for decommissioning | • All directives contained within Appendix A of this *Standard*, except those specifically for decommissioning | • 29 CFR 1910.120 (HAZWOPER) applicable for facilities decommissioning under CERCLA<br>• Applicable industrial standards and construction regulations<br>• Potential applicability of radiological and chemical hazard directives<br>• Potential applicability of environmental laws and regulations when identifying potential ARARs |

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# 3.0 INTEGRATED SAFETY MANAGEMENT SYSTEM

This section describes an ISMS with applicability to facility disposition activities to achieve cost-effective identification, analysis, and control of all identified hazards. As discussed in this *Standard*, the word *integrated* connotes the incorporation of worker, public, and environmental protection considerations into facility disposition work planning and execution, as well as the consolidation of ES&H activities to address multiple directives with similar intent.

To aid in cost-effective implementation of the ISMS principles, this *Standard* clarifies existing DOE ES&H directives and external regulations. It also discusses ES&H linkage to project management activities required by DOE O 430.1A which are to be implemented in accordance with its corresponding implementation guides (e.g., deactivation or decommissioning).

Sections 3.1 through 3.5, as depicted in Figure 1, provide guidance on ISMS implementation for facility disposition activities for each of the ISMS core functions. DOE expectations are provided in these sections and include:

- Cost-effective implementation of multiple hazard analysis requirements while ensuring that analyses address the dynamic nature of facility disposition activities.
- Implementation of a hazard control strategy that meets ES&H requirements, including appropriate retirement of facility safety controls during the life of the disposition activity and measures to ensure that controls adequately address hazard uncertainties.
- Hazard baseline documentation that applies to facility disposition activities at the facility and task levels.

Although the following sections present ISMS activities in a sequential order, it should be noted that many of these activities are iterative in nature. For example, project managers may be required to conduct certain actions, such as planning of disposition tasks or evaluation and control of hazards, throughout the duration of a disposition project.

## 3.1 Work Planning and Hazard Identification (Core Function: Define Work Scope)

Effective work planning and hazard identification are two important factors influencing ES&H and cost-effective implementation of facility disposition activities. During planning, overall project management systems are developed and put in place, and a disposition project's goals and objectives are translated into

facility disposition tasks (see Appendix B, Examples 1 through 9, related to work planning and hazard identification). Although the project management requirements provided in DOE O 430.1A, and its implementation guides, address many aspects of planning, this section focuses on the following ES&H considerations important to planning:

- Integrating ES&H considerations into work planning activities (Section 3.1.1).
- ES&H considerations associated with resource allocation (Section 3.1.2).
- Hazard identification and characterization (Section 3.1.3).
- ES&H requirements identification (Section 3.1.4).

### 3.1.1 Integrating Environment, Safety, and Health Considerations into Work Planning Activities

DOE O 430.1A and its implementation guides recommend preparing a project plan for each distinct phase of facility disposition (i.e., Deactivation Plan, S&M Plan, and Decommissioning Plan) prior to the execution of work. The purpose of these plans is to describe the work that will be performed and the methods that will be used to accomplish it. In general, these plans should discuss the intended ISMS approach and methods for implementation, including: (1) hazard identification, analysis, and control strategy; (2) ES&H requirements identification; (3) ES&H performance measures and progress metrics to be used; (4) description of ES&H organizational responsibilities; (5) discussion of waste management considerations, such as minimization and pollution prevention measures; (6) discussion of the facility safety basis and potential impacts during disposition; and (7) discussion of environmental permits and methods for achieving compliance with permit conditions for deactivation and long-term S&M activities.

ES&H considerations associated with the use and management of subcontractors should also be considered in the ISMS approach discussed in project plans. This includes ensuring that subcontractor ES&H programs are in place, adequate, and monitored. The following elements of subcontractor ES&H programs should be evaluated, where applicable, based on hazards present: (1) respiratory protection; (2) medical monitoring; (3) hazard communication; (4) employee orientation and training; (5) confined spaces; (6) hearing protection; (7) fall protection; (8) excavation and trenching; (9) health physics; (10) hazardous material control programs (e.g., asbestos and lead abatement); (11) spark/flame-producing operations; (12) lockout/tagout; (13) accident investigation, injury/illness reporting, and recordkeeping; (14) use of personal protective equipment (PPE); and (15) emergency response.

For the specific case of decommissioning projects, DOE O 430.1A specifies that decommissioning be conducted as CERCLA non-time-critical removal actions. The decommissioning implementation guide associated with DOE O 430.1A provides additional guidance for the planning of decommissioning projects. ES&H activities and documentation required by the CERCLA process bear similarity to many DOE ES&H requirements. CERCLA and DOE requirements should be integrated where possible. This includes planning, analysis, and hazard baseline documentation. Planned integration of these requirements, including rationale for how DOE and CERCLA requirements will be met and the set of agreed-upon ARARs, should be documented, provided in project plans, and approved at the management level established by the Cognizant Secretarial Officer (CSO) or delegated in accordance with authority protocols.

Appendix C provides information on ISMS performance expectations that can be used during planning and development of project-specific performance measures. Appendix D provides guidance on identifying ARARs under CERCLA and Appendix E discusses ES&H considerations when DOE disposes of facilities through privatization. Subsequent sections of Section 3 cover other topics related to planning.

### 3.1.2 Resource Planning

ES&H is an integral part of planning and performing work. Though each contractor's planning system may vary, all of these systems should ensure the planning and budgeting of adequate resources to address the protection of workers, the public, and the environment. This should be accomplished in accordance with paragraph (b) of 48 CFR 970.5204-2, *Integrating Environment, Safety and Health into Work Planning and Execution* (Department of Energy Acquisition Regulations [DEAR] ES&H clause), that states: "The contractor shall ensure that management of ES&H functions and activities become an integral but visible part of the contractor's work planning and execution processes." Further, paragraph (b)(4) requires the contractor to ensure that "resources are effectively allocated to address ES&H, programmatic, and operational considerations. Protecting employees, the public, and the environment is a priority whenever activities are planned and performed." Thus, the resource implications associated with integrating ES&H into all aspects of work planning, work execution, and performance monitoring must be considered in accordance with the DEAR ES&H clause. Resource planning should provide information to ensure that resources (i.e., funds and number of personnel and their skill mix) are sufficient for disposition planning, hazard identification, characterization, hazard analysis, controls, and feedback and evaluation activities. The process should also identify and communicate any projected ES&H vulnerabilities and risks not addressed within the projected budget. This ensures that DOE is aware of any potential site ES&H

vulnerabilities and provides an opportunity to identify and enforce risk management strategies, including re-scoping activities or re-allocating funds and resources to address these vulnerabilities and the consequences of proceeding without addressing them.

Paragraph (e) of the DEAR ES&H clause (48 CFR 970.5204-2) requires the following: "On an annual basis, the contractor shall review and update, for DOE approval, its safety performance objectives, performance measures, and commitments consistent with and in response to DOE's program and budget execution guidance and direction. Resources shall be identified and allocated to meet the safety objectives and performance commitments as well as maintain the integrity of the entire System." The site's process also supports the ISMS framework by assuring that adequate planning and budgeting of ES&H resources, including personnel skill mix, training requirements, etc., address project hazards and manage ES&H vulnerabilities. DOE O 130.1, *Budget Formulation Process*, and the accompanying *Annual DOE Field Budget Call,* provide more specific information regarding the Department's budget planning and formulation process.

### 3.1.3 Hazard Identification and Characterization

One of the first steps in integrating ES&H into facility disposition activities is early identification of the hazards that can affect workers, public, and the environment. All phases of facility disposition, including transitions from one phase to another, should incorporate the following hazard identification activities:

- Assess existing facility status by collecting and reviewing available facility operating records and existing hazard baseline documentation.
- Interview past and present employees, as necessary, to supplement information on past facility operations, including mishaps and incidents.
- Assess existing facility conditions and identify inherent hazards by performing a detailed facility walkdown, including radiological and toxicological surveys, using a multidisciplined team that includes the project manager, engineering representatives, ES&H personnel, and workers.
- Review and consider applicable lessons learned reports and DOE Occurrence Reporting and Processing System database events for the facility, as well as for similar facilities.
- Document the hazards associated with planned work activities.

It is important to place particular emphasis on identifying hazards that are created or exacerbated due to transition from one disposition phase to another (e.g., deactivation to long-term S&M). This applies to unplanned facility transitions, such as a temporary cessation of operations that may turn into a long-term or permanent shutdown. In such cases, precautions should be taken to ensure that unanalyzed or uncontrolled hazards are not created. For example, facility structures may deteriorate creating additional physical hazards to workers and chemical hazards may increase during long-term S&M or any extended period in which chemicals are stored. This is because chemicals left in process lines or storage tanks may be subject to radiolysis, container corrosion, concentration due to evaporation, decomposition reactions, or other hazardous conditions that may lead to decreasing the chemical's stability.

The need for intrusive characterization activities (e.g., sampling and analysis) should be determined based on the collection and evaluation of facility information, the remaining level of uncertainty regarding existing hazardous substances (i.e., radiological materials, hazardous chemicals, or hazardous wastes), and the existing facility condition. Consider characterization activities if there is insufficient knowledge of hazards to understand the hazardous substance types, quantities, forms, potential exposures, and locations.

In cases where characterization activities are conducted, it is important to provide an adequate level of protection to workers, the public and the environment when performing these activities. Furthermore, these activities should be planned, analyzed, controlled, and executed in accordance with ISMS and DOE O 440.1, *Worker Protection Management for DOE Federal and Contractor Employees* For decommissioning activities subject to 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER), preparation of a Health and Safety Plan (HASP) is required to ensure adequate controls for worker safety during the conduct of characterization activities. Additionally, before any characterization activity, daily pre-job briefings should be conducted to discuss specific controls for the activity with workers, thus helping to increase hazard awareness. Although typically not subject to HAZWOPER, deactivation and other disposition activities should still meet the intent of the hazard characterization requirements, including documentation and communication to workers of the following: (1) potential hazards that may be encountered during characterization (including special hazardous substances such as beryllium); (2) appropriate training and certification; (3) hazard controls and requirements, including engineering/administrative controls and PPE; (4) work procedures; and (5) an emergency response plan.

### 3.1.4 ES&H Requirements Identification

As directed by DOE P 450.2A, *Identifying, Implementing and Complying with Environment, Safety and Health Requirements,* and 48 CFR 970.5204-78 (DEAR clause on laws, regulations, and DOE directives), information resulting from planning and hazard identification activities should be used to determine the set of ES&H directives applicable to the planned facility disposition activity. The list of directives in Appendix A of this *Standard* can be used to support this assessment This Appendix may also assist in determining a candidate set of potential Federal ARARs for decommissioning projects; however, it should not be considered an exhaustive list of all possible potential ARARs. These directives are organized by hazard type (i.e., hazardous substances and physical hazards) and a "crosscutting" category that references directives applicable to all missions and hazard types. Additionally, Appendix F of this *Standard* discusses identifying ES&H requirements when using the WSS process.

Depending on the quantities and physical forms of radiological hazards, facilities containing such hazards may be subject to nuclear safety requirements. For the specific case of decommissioning activities involving only low level residual fixed radioactivity that remains following removal of radioactive systems, components, and stored materials, alternative requirements may be applied in lieu of the safety management requirements contained within the orders applicable to nuclear safety (e.g., DOE 5480.23, *Nuclear Safety Analysis Reports*, DOE 5480.22, *Technical Safety Requirements*, DOE 5480.21, *Unreviewed Safety Questions*, DOE 5480.19, *Conduct of Operations*, DOE 4330.4B, *Maintenance Management Programs*, and DOE 5480.20A, *Personnel Selection, Qualification, and Training Requirements for Nuclear Facilities*). The conditions for when this is appropriate are discussed in a June 9, 1997, memorandum prepared by the Office of Nuclear Safety Policy and Standards (EH-31) entitled, *Hazard Categorization for Environmental Management Activities Related to Stabilization, Deactivation, Decontamination and Decommissioning, and Environmental Restoration,* which is provided in Appendix G.

As discussed in the EH-31 memorandum, 29 CFR 1910.120 and 29 CFR 1926.65, *Hazardous Waste Operations and Emergency Response,* may be applied in lieu of the above mentioned nuclear safety Order requirements provided that quality assurance (QA) requirements of 10 CFR 830.120, *Quality Assurance*, and occurrence reporting requirements of DOE O 232.1, *Occurrence Reporting and Processing of Operations Information*, are still applied. Although not discussed in the memorandum, radiation protection requirements of 10 CFR 835, *Occupational Radiation Protection*, and DOE 5400.5, *Radiation Protection of the Public and Environment*, are also still required.

Low level residual fixed radioactivity is discussed in the EH-31 memorandum refers to radioactive material that is either: (1) surface contamination that is truly fixed following chemical cleaning or some similar process; (2) a component of surface contamination that can be picked up by smears; or (3) activated materials within structures. These components can be characterized as low level if the smearable radioactivity is less than the levels defined by 10 CFR 835, Appendix D, *Surface Contamination Values*, and hazards analysis results show that no credible accident scenario or work activity would release the fixed radioactive or activation components remaining at levels that would prudently require the use of existing active safety structures, systems, or components (SSCs) to prevent or mitigate a release of radioactive materials.

## 3.2 Integrated Hazard Analysis (Core Function: Analyze Hazards)

Several DOE directives and external regulations require hazard analysis. Table 3 identifies the hazard analysis requirements[5] that may apply to facility disposition projects (DOE 5480.23 and parts of DOE O 420.1 are applicable only to nuclear facilities). Some of these requirements are primarily oriented toward facility safety, that is, assurance that facility structure and associated safety features are adequate to protect workers, the public, and the environment from hazardous substance inventories (chemicals and/or radiological materials). However, other hazard analysis requirements (e.g., DOE O 440.1, HAZWOPER) primarily target worker protection and emphasize an analysis of the impact to workers from hazardous substances as well as physical or biological hazards.

All hazard analysis requirements share the same basic intent: to identify and analyze hazards so that a sound technical basis can be established for their control. Thus, there is an opportunity to satisfy multiple requirements (i.e., facility and worker safety, and environmental protection) through an integrated hazard analysis. Sections 3.2.1 and 3.2.2 discuss this concept by addressing facility and task level components of an integrated hazard analysis, respectively.

Typically, hazard analysis is performed during the planning phases of a project when a general outline of the work scope is known, but the details of individual disposition tasks have yet to be fully determined. Thus, a task-specific analysis of hazards is needed during the planning of individual tasks using a job

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[5] It is expected that most DOE facilities being dispositioned will not be affected by 29 CFR 1910.119, *Process Safety Management,* or 40 CFR 68, *Accidental Release Prevention Provisions* (i.e., threshold quantities of listed hazardous chemicals will not be exceeded). However, the safety management principles of these regulations are considered good practice for all facilities. Although this *Standard* addresses these principles, readers may wish to review these regulations further.

hazard analysis, or other suitable technique. This activity, which complements an integrated hazard analysis, is discussed in Section 3.2.2 (see Appendix B, examples 10 through 12, related to hazard analysis).

### 3.2.1 Facility Hazard Analysis

A facility hazard analysis aims to provide a "baseline" of anticipated facility hazards and their potential consequences based on available information from hazard identification and characterization activities, as well as existing knowledge of the disposition work scope. The facility level analysis should be performed for all types of facilities and all phases of facility disposition, subject to the guidelines below:

- The analysis should evaluate radiological, chemical, biological, and physical hazards as applicable, using an experienced multidisciplined team. Although the team composition will vary depending on the hazards present, the team should include project management and engineering personnel who are knowledgeable of the facility's past operations, ES&H professionals who are dedicated to the effort and technically qualified to perform hazard analysis and workers who are familiar with the facility and experienced in facility disposition activities. Clear roles and responsibilities, authorities, and a chain of command should be established and communicated to each team member Furthermore, in accordance with the concepts of DOE-STD-1104-95, *Review and Approval of Non-reactor Nuclear Facility Safety Analysis Reports*, reviewers should be involved in the early phases of analysis. (Note: Although originally intended for Hazard Category 2 or 3 nuclear facilities, these concepts are applicable to all facility types.)

## Table 3. Hazard Analyses Required by Directives

| Directive | Hazard Analysis Required | Documentation Required |
|---|---|---|
| 29 CFR 1910.120<br>29 CFR 1926.65<br>*Hazardous Waste Operations and Emergency Response (HAZWOPER)* | For decommissioning activities conducted under CERCLA, requires hazard analysis and control of change for all potential worker hazards.<br>(There are other OSHA regulations that require hazard assessments [e.g., lead and asbestos] that may be applicable to disposition activities.) | • Health and Safety Plan<br>• (Documentation of these other assessments as required by OSHA.) |
| DOE O 420.1<br>*Facility Safety* | Requires fire hazard analysis and natural phenomena analysis for all facilities. For Hazard Category 2 or 3 nuclear facilities only, requires a criticality safety evaluation. | • Criticality Safety Analysis<br>• Fire Hazard Analysis<br>• Effects of natural phenomena hazards on facility systems, structures, or components (SSCs) included as part of safety analysis documented in the Safety Analysis Report (SAR), Basis for Interim Operation (BIO), or Auditable Safety Analysis (ASA). |
| DOE O 440.1<br>*Worker Protection Management for DOE Federal and Contractor Employees* | Requires the identification, evaluation, and control of all workplace hazards. | • Worker protection programs (including analysis of worker hazards, as needed) to implement applicable requirements. |
| DOE 5480.23<br>*Nuclear Safety Analysis Reports* | For nuclear facilities only (Hazard Category 3 or above), requires preliminary and final hazard categorization and comprehensive hazard/safety analysis to support the conclusion that nuclear facility activities can be conducted without causing unacceptable health or safety impacts to workers, public, or environment. | • SAR prepared in accordance with DOE-STD-3009 or a BIO prepared in accordance with DOE-STD-3011.<br>• Annual updates to either SAR or BIO for those changes that affect the safety basis.<br>• Preliminary and final hazard categorization prepared in accordance with DOE-STD-1027. |
| DOE O 151.1<br>*Emergency Management* | Identification of hazards and threats for emergency planning purposes. | • Emergency Management Plan |
| DOE O 451.1A<br>*National Environmental Policy Act Compliance Program* | Consideration of potential environmental impact from proposed actions. | • For proposed activities with potentially significant impacts, Environmental Impact Statement (EIS); or where significance of potential impact is unclear, Environmental Assessment (EA); unless the proposed action may be categorically excluded; or for the specific case of decommissioning, NEPA values may be integrated with CERCLA documentation. |

- In cases where hazardous substances are present, analyses should evaluate: (1) the type, form, quantity, and concentrations; (2) location; (3) conditions under which exposure may occur; and (4) the inherent harmful characteristics of the hazardous substance (e.g., toxicity or decomposition by-products).

- The analysis should be reviewed and updated to assure that: (1) new hazards or energy sources have not been introduced; and (2) assumptions and commitments associated with the analysis remain valid. If either condition is untrue, the analysis should be updated, and all of the subsequent hazard controls should be examined and modified to assure that they still provide an adequate and effective level of worker, public, and environmental protection. See Section 3.4.2 for criteria to evaluate safety basis changes and associated actions. These reevaluations should be performed as needed to maintain the currency of the hazard baseline document as described in Section 3.3.4.

- The analysis should rely on any existing documented hazard analysis (including safety analysis performed for Hazard Category 2 or 3 nuclear facilities) from the previous phase of a facility's life-cycle as a "baseline" for the new disposition activity when: (1) the analysis was previously approved by the required level of management; (2) the analysis bounds potential impacts (e.g., consequences) from hazards expected during the planned disposition activity; (3) no update of the analysis is needed; that is, it is applicable to the planned activities; (4) task hazard analyses are performed for disposition tasks as described in Section 3.2.2; and (5) planned disposition tasks and associated hazards are screened against the existing hazard analysis to ensure that the existing safety basis and the associated controls are applicable and bounding.

- The analysis should be used as the basis for emergency planning activities conducted in accordance with HAZWOPER (when applicable) and DOE O 151.1, *Comprehensive Emergency Management System*, including determination of necessary personnel, resources, and equipment for effective emergency preparedness.

- The analysis should include consideration of natural phenomena hazards (NPH) and should identify safety SSCs[6] that are needed to prevent or mitigate hazardous material releases due to NPH events. The scope and formality of the NPH analysis should be discussed on a case-by-case basis with the CSO using the following guidelines:

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[6] Safety SSCs are defined for Hazard Category 2 and 3 nuclear facilities within DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Non-reactor Nuclear Facility Safety Analysis Reports*. For non-nuclear facilities, SSCs that prevent or mitigate releases of hazardous substances may be considered safety SSCs.

(1) Facilities which are expected to remain in a disposition state for an extended period of time and depend on safety SSCs to prevent the release of hazardous materials, should meet the requirements of DOE O 420.1, Section 4.4, *Natural Phenomena Hazards Mitigation*, unless justified otherwise.

(2) Facilities undergoing disposition that depend on safety SSCs to prevent the release of hazardous substances, may not need the detailed NPH evaluation of safety SSCs as defined by DOE O 420.1 and associated NPH analysis standards. For example, safety SSC NPH design loads could be taken from generic site NPH design loads (e.g., wind loads from the January 22, 1998, EH to Distribution memorandum, *Interim Advisory on Straight Winds and Tornados*). Detailed dynamic analyses and stress evaluations for safety SSCs, prescribed by DOE-STD-1020, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities,* might be substituted by facility walkdowns and simplified equipment evaluation procedures (e.g., DOE EH-0545, *Seismic Evaluation Procedures for Equipment in U.S. Department of Energy Facilities*), and static analyses and building structural evaluations[7].

(3) Facilities that contain hazardous substances which do not meet the conditions of (1) or (2), need to take compensatory measures such as removing or reducing quantities of hazardous substances and upgrading emergency plans. If these measures are not enough to meet the requirements of (1) and (2), upgrading of safety SSCs should be considered. The facility's remaining life and provisions for life safety of facility occupants should be factored into consideration for level of upgrades.

(4) Facilities that contain hazardous substances, but do not depend on safety SSCs to prevent the release of hazardous substances because the hazard analysis demonstrates that the physical form[8] and quantities of hazardous substances preclude significant release under any direct (e.g., building collapse) or indirect (NPH-caused fires, explosions and floods) NPH effects, do not have to meet the requirements of DOE O 420.1, Section 4.4, *Natural Phenomena Hazards Mitigation*, except as needed for life safety protection.

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[7] Refer to the September 7, 1997, EH to Distribution memorandum, *General DOE Information about Natural Phenomena Hazard Development and Implementation of Executive Order 12941*, which is included in Appendix G.

[8] Low level residual fixed radioactivity is a physical form of hazardous substances that may fall within this category.

(5) Facilities that contain no hazardous substances and have less than 5 years remaining life or are occupied for less than two hours per day do not have to meet DOE O 420.1 NPH requirements. This is based upon the discussions within the National Institute of Science and Technology report NISTR 5770, *How to Suggestions for Implementing Executive Order 12941 on Seismic Safety of Existing Federal Buildings, A Handbook.*

- The results of the analysis should be used as input into the analysis required by the National Environmental Policy Act (NEPA) process. For decommissioning activities, NEPA values should be integrated with CERCLA analysis in accordance with the June 13, 1994, Memorandum for Secretarial Officers and Heads of Field Elements, *Secretarial Policy Statement on the Natural Environmental Policy Act.* Furthermore, 40 CFR 1021, Appendix B, Subpart D, *Categorical Exclusions Applicable to Specific Agency Actions,* provides information that should be used to determine if a categorical exclusion to NEPA is given for a specific disposition project under consideration.

- The analysis should be documented consistent with the hazards baseline documentation guidelines provided in Section 3.3.4.

The level of effort and techniques used to perform a facility hazard analysis will vary depending upon the complexity of the disposition project work scope and the hazards present. See Appendix H for a list of hazard analysis techniques, their appropriate use, and references.

### 3.2.2 Task Hazard Analysis

An analysis of individual facility disposition tasks or jobs (i.e., discrete units of work that when combined comprise a project) should be conducted to understand the impact from workers' interactions with hazards that may be introduced as a result of specific work tasks. This analysis supports the development of work packages or other methods used in planning tasks.

Task hazard analyses should be conducted throughout the life of the project as disposition tasks are planned and scheduled. The following guidelines should be used when conducting a task hazard analysis:

- The analysis should evaluate each step in the task's work instruction for hazards in the workplace and those introduced from chosen work methods. This process is accomplished most effectively by performing a walkdown of the work area, as needed, feasible, and permissible, based on existing facility hazards (e.g., high radiation areas), using the workers who will perform the task. The analysis should

review task steps and evaluate hazardous substances and physical hazards. DOE 440.1 and its implementation guide DOE G 440.1-1, *Worker Protection Management for DOE Federal and Contractor Employees Guide*, provides further guidance on evaluation of worker hazards.

- The analysis should involve project managers, engineering representatives, S&H personnel, and workers.
- The facility level analysis, as discussed in Section 3.2.1, should be used as the basis and an input for performing a task hazard analysis.
- Tasks should be screened against approved hazard baseline documentation (e.g., hazardous substance quantities, facility requirements, structural hazards) to ensure planned work is within the analyzed safety basis and to determine whether updates to documentation are necessary. This screening is accomplished consistent with the management of change (MOC) process discussed in Section 3.4.2. Additional information for these types of analyses can be found in the Attachment to DOE 5480.21, *Unreviewed Safety Questions*.

The extent of task hazard analysis will vary depending on experience and familiarity in conducting the task. For example, a work task, such as a previously conducted maintenance activity that is documented in current procedures and well understood, may rely on a review of task steps and a simple hazard checklist. Whereas, a task that is new and unfamiliar to workers may warrant a more detailed task hazard analysis. Furthermore, for those activities that involve multiple tasks, the analysis should also include discussion of the sequencing of these tasks to: (1) minimize worker exposures; (2) mitigate urgent risks or threats; and (3) attain maximum reduction of radiological or chemical materials within the facility.

## 3.3 Hazard Controls and ES&H Documentation (Core Function: Develop and Implement Controls)

Several DOE directives and external regulations specify that hazard controls be established for protection of the worker including, DOE O 440.1, 10 CFR 835, and 29 CFR 1910.120 (HAZWOPER). Additionally, numerous Occupational Safety and Health Administration (OSHA) regulations require controls for specific hazards (e.g., asbestos and lead). A listing of these hazard-specific regulations can be found in Appendix A.

DOE also requires the establishment of facility safety controls as specified in DOE O 420.1, DOE 5480.23, and DOE 5480.22, *Technical Safety Requirements*. These directives, together with the

referenced worker safety directives require the establishment of controls needed to protect workers, the public, and the environment from physical hazards and hazardous substances.

Although all of these directives provide valid expectations for operating facilities, the derivation, documentation, and implementation of safety controls for facility disposition activities can be complicated because of a dynamic environment where hazards and work environment are changing frequently. Furthermore, a potential for uncertainty may exist in hazardous substance forms and quantities. These directives fail to recognize that reliance on engineering safety controls is reduced as facility systems are removed from the facility (see Appendix B, Examples 13 through 19, related to hazard controls and baseline documentation).

In addressing these issues, this section neither gives prescriptive guidance on how to establish and document controls nor does it outline the numerous types of controls that should be in place for specific hazards; rather, performance expectations are provided on the following topics:

- Establishment of worker safety controls (Section 3.3.1).
- Maintaining facility safety controls in a frequently changing work environment, including phasing out controls during the life of a facility disposition project (Section 3.3.2).
- Managing uncertainties in hazardous substance inventory or facility physical conditions (Section 3.3.3).
- Documentation of hazards and their associated controls (Section 3.3.4).
- Assessing the adequacy of existing hazard baseline documentation (Section 3.3.5).

### 3.3.1 Worker Safety Controls

Controls necessary for the protection of facility disposition workers should be developed using a multidisciplined team, based on the below strategy that is consistent with the hierarchy of controls required by DOE O 440.1 and integrates various aspects of facility safety controls.

**Hazard Elimination**—Avoid or minimize hazards by designing them out of chosen work methods or selecting alternative methods. For example, substitute less hazardous or nonhazardous substances or use the smallest possible quantities of hazardous substances when performing chemical decontamination of systems and building structures.

**Hardware Controls**—Establish engineering controls to prevent unacceptable exposures to or contact with hazards or to mitigate the consequences of mishaps and accidental occurrences. Maintain safety SSCs for worker protection until the hazardous condition that necessitated the safety SSC has been removed (see Section 3.3.2). Examples of other engineering features that should be implemented as needed include shoring for excavation, local exhaust ventilation systems, alarms, redundant control devices (e.g., valves), and barriers (e.g., temporary shielding).

**Administrative Controls**—Use administrative controls that include limits on activities, ES&H procedures, and work instructions to complement the above activities. These controls should also include inventory limits to prevent unauthorized consolidation of hazardous substances in a given facility area or the introduction of new hazardous substances into the facility.

**Personal Protective**—PPE may be necessary, but it should not be used, without justification, in lieu of the more reliable control strategies mentioned above. Use of PPE should be based on the hazard, used in accordance with established procedures and training, and periodically evaluated for effectiveness. Selection of PPE should take into account uncertainties in hazardous substance quantities and form (i.e, conservative assumptions to account for unknowns).

**Occupational Medical Program**—Establish and maintain an occupational medical program, including access to a board certified occupational physician. Workers should be qualified physically based on expected hazards and stresses associated with planned facility disposition tasks. Medical surveillance may be a necessary component of the occupational medical program to ensure the control of certain hazards, such as radiological, chemical, biological, and ergonomic hazards. If the disposition activity is performed at a site that is a "Superfund" site, the occupational medical program must comply with the requirements of 29 CFR 1910.120, Section F.

**Monitoring**—Monitor air in the workplace during facility disposition activities to verify adequate control of airborne hazards. Exposure limits provided in the source documents referenced in DOE O 440.1, paragraph 4(L) should be maintained. Personnel exposure monitoring equipment, including equipment for monitoring physical agents, such as noise as well as equipment for monitoring radiological exposures, should be used as part of an overall industrial hygiene and radiological protection program. Additional guidance for implementing and specifying monitoring equipment and programs may be found in DOE G-10 CFR 835/E2, *Workplace Air Monitoring,* and DOE G 440.1-1.

**Training**—Define the requirements pertaining to worker qualification associated with the planned work task. Training and qualification should ensure that workers can recognize any potential hazard that may be encountered. Specific worker training should be determined based on the type of work activities to be performed and the hazards identified. Numerous OSHA regulations provide training requirements that are specific to hazard types (e.g., asbestos, lead, and radiation), work activities (e.g., construction and demolition) and job classifications. HAZWOPER, for example, prescribes different levels of training depending on employee responsibility. Training programs are required to comply with the applicable requirements of 10 CFR 835, Subpart J (when radiological hazards are present), DOE O 440.1, and DOE 5480.20A. Additional guidance may be found in DOE G 440.1-1.

Finally, anticipated hazards and their controls should be clearly communicated to workers in HASPs (where required by HAZWOPER) or through other equivalent means (see Section 3.3.4), and in pre-job briefings before work begins.

### 3.3.2 Facility Safety Controls

Due to changing hazardous substance inventories, uncertainties, and discoveries, facility disposition activities present situations in which facility safety controls can be expected to change throughout the lifetime of the project. These changes can range from modifying or eliminating existing controls to implementing new, more restrictive, or modified safety controls. However, care should be taken to ensure that safety controls are not retired prematurely. Such a situation could compromise worker, public, and environmental protection (e.g., removal of fire protection systems when combustible materials are still present in the facility).

It is expected that there will be less reliance on facility design and administrative features as the project progresses and as hazardous substances are removed. For example, the operational limits imposed on a processing vessel to prevent a release of hazardous substance are no longer valid if the material has been removed.

The following criteria should be used when determining if it is appropriate to retire a control:

- Hazardous condition being controlled is no longer present.
- Hazardous substance's physical form has changed to a less dispersible form.
- Hazardous substance quantities are no longer present or have been reduced to the point where the

consequences of releases are no longer a concern.

There may be unanticipated situations in which a retired facility safety control is needed to perform its past safety function. For example, if unknown dispersible radiological materials are discovered during the course of a decommissioning activity, it may be necessary to reactivate the building ventilation system to provide a confinement function. In these cases, the operability, maintainability, reliability and availability of the reactivated control should be verified prior to placing the control back into service. For Hazard Category 2 or 3 nuclear facilities, provisions of past Technical Safety Requirements (TSRs) or development of new TSRs may be needed in accordance with DOE 5480.22.

For some facilities entering a disposition phase, new safety controls may need to be developed to fully comply with DOE O 420.1 requirements regarding natural phenomena and fire protection. Specifying controls for these types of events should emphasize mitigating vulnerabilities and should be implemented in the following order of priority (or combination thereof): (1) modifying operations and enhancing emergency planning and other contingencies, rather than dedicating resources for enhancing facility structures or (2) enhancing confinement integrity. For example, dispersible materials should be removed and contained, to the extent practical, and the containers physically separated (if possible) and secured to structures that provide enhanced stability or resistance to natural phenomena or fires. Finally, it may be useful to re-evaluate the planned work scope and consider accelerated removal of releasable hazardous substances when the above controls cannot be practically achieved. DOE G-420/G-440.1, *Implementation Guide for DOE O 420.1, and DOE O 440.1, Fire Safety Program*, provides additional guidance on fire protection considerations for facilities undergoing disposition.

### 3.3.3 Uncertainties in Material Inventory Estimates or Facility Conditions

Uncertainties in material inventories or hazardous conditions need to be reflected in safety controls. Such a situation can be encountered if intrusive characterization is needed to confirm material inventories (e.g., obtaining samples of materials in locations or vessels that are not readily accessible). When uncertainties exist, conservative assumptions may be made when specifying safety controls provided that: (1) hold points are established for conducting characterization or additional analysis to determine if the condition warrants establishing or changing a safety control; and (2) assumptions are sufficiently conservative to ensure that safety is not compromised before or during characterization activities. For example, if trace quantities of beryllium are suspected of being in an abandoned laboratory, it is prudent to assume a larger quantity than expected until the actual quantity can be verified.

### 3.3.4 Hazard Baseline Documentation

Hazard baseline documentation provides a formal record of all identified hazards, including those that workers may encounter during disposition work activities, and the controls that are established to support safe work execution. The type and extent of hazard baseline documentation should be commensurate with the scope of activities to be performed, the hazards associated with the activities, and the controls necessary to do the work safely. This *Standard* provides criteria, organized primarily around facility types, that may be used in grading these considerations. For purposes of determining hazard baseline documentation, facilities should be designated as either nuclear, radiological (i.e., below Hazard Category 3 nuclear facility definitions provided in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with 5480.23* and DOE-EM-STD-5502-94, *Hazard Baseline Documentation*), or non-nuclear. For convenience, this *Standard* consolidates the designations of non-nuclear and industrial, as defined in accordance with DOE-EM-STD-5502-94, into the non-nuclear facility type. Sites that have previously implemented DOE-EM-STD-5502-94 facility designations may continue to use them for their intended purposes.

Appendix I recommends examples of hazard baseline documents for each disposition phase. The types of hazard baseline documents that support safe facility disposition activities typically are a Work Package, a HASP (for the specific case of decommissioning), a documented hazard analysis, a BIO, or a Safety Analysis Report (SAR). The following is a brief discussion for each of these document types.

**Work Packages**—Work Packages should be prepared for individual disposition tasks or jobs prior to their execution[9]. They typically include work instructions, information pertaining to the type of qualifications the worker needs to perform the job, and specification of task hazard controls (e.g., radiological work permits). To be effective, work packages should be prepared with input from workers involved in the disposition task and should include: (1) a description of the task to be performed; (2) verification that an analysis of task hazards has been performed; (3) necessary work permits specifying hazard controls; (4) training requirements for the job; (5) equipment and materials to be used in performing the task; (6) needed PPE; (7) emergency response actions; and (8) expected results at completion of the task.

**HASP**—A HASP is required for decommissioning activities by 29 CFR 1910.120 and 29 CFR

[9] Additional information on preparing work packages can be found in the discussion of "work control packages" contained in the attachment to DOE 4330.4B, *Maintenance Management Program.*

1926.65. The HASP primarily emphasizes worker safety. It should be updated in a timely manner to reflect newly identified job hazards and worksite conditions, as needed, to verify that work can be conducted safely. Guidance for preparing HASPs may be found in DOE-EM-STD-5503-94, *EM Health and Safety Plan Guidelines.*

**Documented Hazard Analysis**—Documented hazard analyses are prepared for radiological facilities as well as non-nuclear facilities. The intent of the documented hazard analysis is to issue formal documentation of the integrated hazard analysis and specified controls[10]. The documented hazard analysis should contain: (1) a facility description; (2) a description of disposition activities, hazards, and normal operating and emergency procedures; (3) a hazard analysis; (4) a description of physical design features; (5) administrative and engineering controls; and (6) a description of applicable site-generic health and safety programs.

**SAR/BIO**—SARs or BIOs normally serve as the hazard baseline document for Hazard Category 2 or 3 nuclear facilities as required by DOE 5480.23. Typically, when an existing DOE facility SAR does not meet the requirements of this Order, a BIO is prepared as an interim hazard baseline document until the SAR can be upgraded. DOE-STD-3011-94, *Guidance for Preparation of DOE 5480.22 (TSR)* and *DOE 5480.23 (SAR), Implementation Plans,* provides guidance for preparing a BIO.

A BIO may be used as a hazard baseline document for the duration of a facility disposition activity because these activities often comprise short durations and the time and expense of upgrading a SAR cannot be justified. The BIO needs to be maintained and updated in accordance with the requirements of DOE 5480.23, paragraph 9(c). However, the basis for using a BIO and the justification for not upgrading the SAR should be provided in the Implementation Plan to DOE 5480.23 and approved at the level of management consistent with defined CSO delegation of authority protocols.

BIOs should document the methodology used to identify and analyze hazards and associated controls, including specification and implementation of safety class and safety-significant controls, as well as the facility specific application of site-generic health and safety programs. The BIO needs to identify facility vulnerabilities and provide either commitments for their resolution or operational restrictions necessary to prevent identified vulnerabilities from causing undue consequences.

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[10] An Auditable Safety Analysis (ASA), is an example of a type of documented hazard analysis that was originally required by DOE 5481.1B, *Safety Analysis Review System.* Although this Order has been canceled, it may still be in the contract between DOE and its facility operator.

For the case of decommissioning of a Hazard Category 2 or 3 nuclear facility whose material inventory is in the form of low level residual fixed radioactivity, the intended function of a SAR or BIO may be accomplished by complying with the requirements of 29 CFR 1910.120 or 29 CFR 1926.65 (HAZWOPER), subject to the conditions discussed in Section 3.1.4 and the June 9, 1997, EH-31 memorandum. These conditions also address decommissioning of Hazard Category 2 or 3 nuclear facilities with radiological inventory *not* in the above mentioned form. As stated in the memorandum, "compliance with DOE 5480.23 may be achieved for work associated with decommissioning, after deactivation, and excluding Treatment, Storage, or Disposal (TSD), by the following: (1) complying with 29 CFR 1910.120 and 29 CFR 1926.65 requirements for S&H Programs, Work Plans, HASPs and Emergency Response Plans; (2) deriving TSRs in accordance with DOE 5480.22; and (3) addressing public safety in accordance with DOE 5480.23, as well as worker safety, in the S&H Program, Work Plans, HASPs, and Emergency Response Plans." Pertinent information contained in the approved authorization basis (i.e., SAR or BIO) may be integrated as an addendum to the HASP to provide a complete and applicable authorization basis document. The memorandum further states that, "when this alternative is chosen, the documents discussed above shall be submitted to DOE for review and approval in lieu of and on the same schedule as required for the SAR." The provisions of DOE 5480.21, should also be used to ensure that information is kept up to date. Finally, QA considerations per 10 CFR 830.120 above and beyond those implemented during the preparation of a typical HASP should be applied as required (e.g., enhanced recordkeeping).

Hazard baseline documentation should be reviewed and updated, as necessary, each time a facility transitions into a new facility disposition phase (e.g., long-term S&M to deactivation) or when a significant change occurs to the safety basis. (A discussion of evaluating changes to the hazard baseline documentation is provided in Section 3.4.2.) Further, in those instances when safety controls are retired because they are no longer necessary (see Section 3.3.2), the hazard baseline document may need to be updated to reflect the current facility configuration. This is particularly important as a disposition phase nears completion, since the final facility end-state should be reflected in the hazard baseline documentation used to support transition to the next disposition phase. At a minimum, re-evaluation of documentation should be performed annually.

### 3.3.5 Assessing the Adequacy of Existing Hazard Baseline Documentation

In many cases, hazard baseline documents may already exist from the prior facility operations or previous disposition phases. Such documents may be a meaningful starting point when developing new hazard

baseline documentation. For example, information in a previously prepared SAR can be used as the starting point for a non-nuclear facility's documented hazard analysis. Furthermore, appropriately approved existing hazard baseline documents may be used for facility disposition if the guidelines in Section 3.2.1, for use of existing hazards analysis, are met and the following information is provided:

- A description of the site and location, including current facility and site boundaries.
- Design criteria for those safety SSCs needed to support safe facility disposition work at Hazard Category 2 or 3 nuclear facilities.
- Normal and emergency operating procedures based on a hazard analysis representative of any planned disposition work.
- Operational limitations due to existing facility vulnerabilities.

### 3.3.6 Environmental Permits

Many environmental laws and regulations require a permit, typically by a State or locality, that allows for activities to take place as long as they are conducted in accordance with their stated provisions. Provisions may be in the form of reporting requirements, documentation that must be maintained current, or discharge limits that may not be exceeded. In some cases, violation of permit provisions may lead to the imposition of fines by the State or locality, while in other cases it may lead to cessation of work activities. Specifically, the following laws usually require the issuance of a permit:

- **Resource Conservation and Recovery Act (RCRA)** -TSD facilities require a permit prior to introduction of hazardous wastes.
- **Clean Air Act (CAA)** - Airborne effluents are to be controlled in accordance with applicable National Ambient Air Quality Standards (NAAQSs) and National Emission Standards for Hazardous Air Pollutants (NESHAPs).
- **Clean Water Act (CWA)** - Liquid discharges into surface waters must be controlled in accordance with National Pollutant Discharge Elimination System permits.

Appendix I specifies the environmental permits that may be required to support facility disposition.

## 3.4 Work Performance (Core Function: Perform Work within Controls)

This section discusses two important ES&H considerations related to work performance. First is a discussion of evaluating project "readiness" prior to initiating disposition work and the second is a discussion of change control and worker safety considerations necessary to maintain a disposition project's safety basis once work has begun (see Appendix B, Examples 20 through 24, on work performance).

### 3.4.1 Evaluating Readiness

An evaluation of readiness should be completed before beginning work to ensure that all hazards have been identified, appropriate ES&H requirements have been met, and safety systems and controls (e.g., procedures and training) are in place and capable of performing their intended function. The scope and rigor of activities necessary to determine the "readiness" of a facility disposition activity will vary depending on the type and magnitude of hazards present, the complexity of the work to be performed, and the extent to which previous readiness evaluations addressed planned disposition work activities and hazards. Figure 3 provides a decision logic flow diagram for determining readiness of a disposition activity.

As reflected in the diagram, an evaluation of readiness should be performed when there is a: (1) transition from the operations phase to facility disposition (e.g., to long term S&M or deactivation); (2) transition between disposition phases (e.g., deactivation to decommissioning); (3) change in the contractor responsible for managing the disposition activity; (4) significant change that affects the established safety basis, as discussed in Section 3.4.2, or work scope (e.g., change in task); or (5) a positive Unreviewed Safety Question (USQ) determination as defined in DOE 5480.21 for Hazard Category 2 or 3 nuclear facilities.

Requirements and guidance for performing readiness evaluations are provided in DOE O 425.1, *Startup and Restart of Nuclear Facilities*[11], and DOE-STD-3006-95, *Planning and Conduct of Operational Readiness Reviews*, respectively. In addition, DOE 430.1A requires the performance of a Pre-Transfer Review which is further described within its associated deactivation implementation guide.

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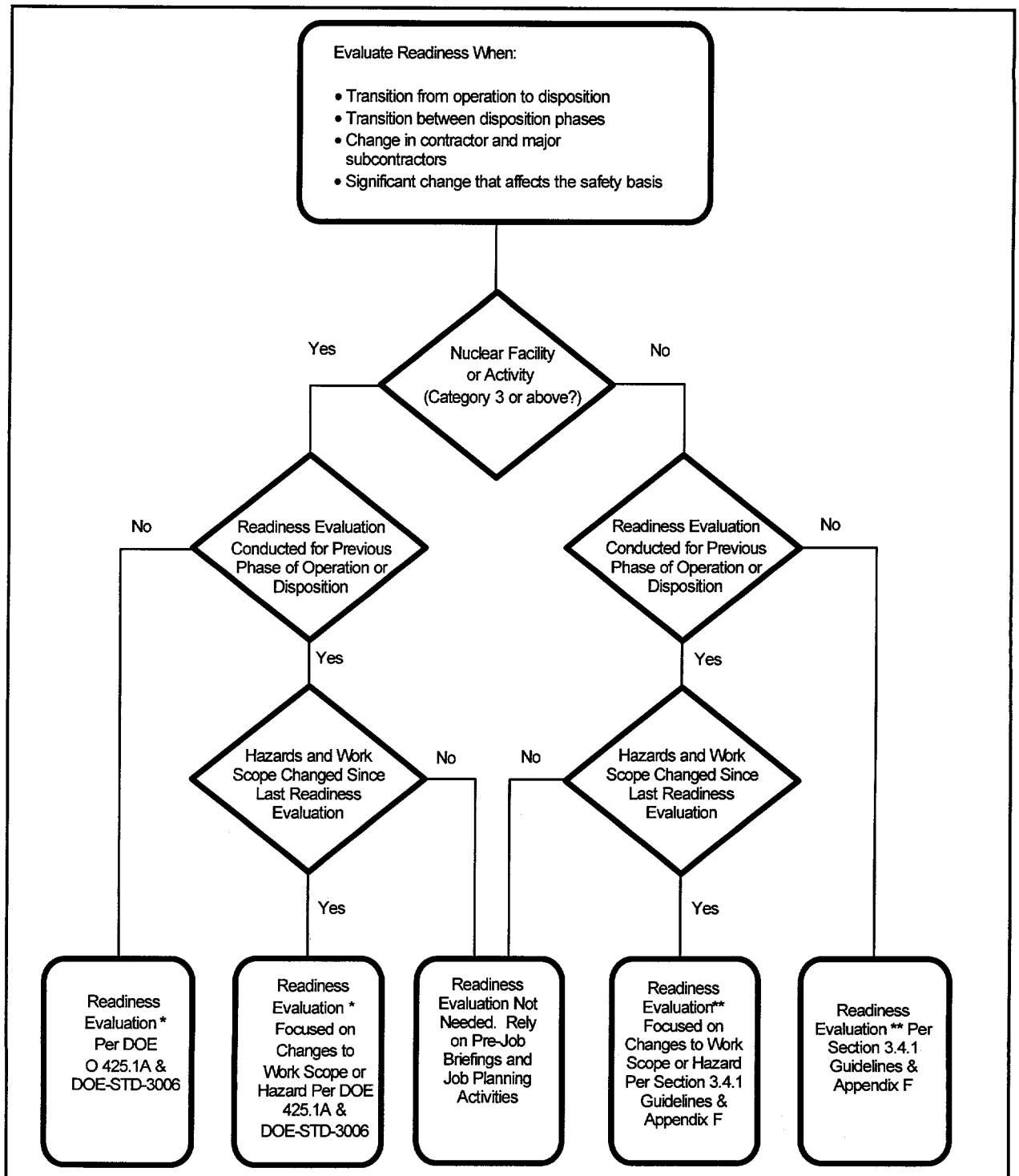
[11] It is important to note that for facility disposition purposes, the terms *startup* and *restart* refer to projects or activities, rather than to the "startup" or "restart" of a facility.




* 1. Determine the need for an Operational Readiness Review on a case-by-case basis with the CSO for Category 2 nuclear facilities.
2. For specific case of deactivation, "Pre-Transfer Review" criteria provided in DOE 430.1A should also be followed.

** DOE-STD-3006-95 may also be used to organize readiness evaluations for radiological or non-nuclear activities.

**Figure 3. Readiness Evaluation Determination**

The scope of a readiness evaluation effort should focus on changes since the last detailed assessment (including external assessments that were performed on the facility), including: (1) operations; (2) quantities and physical forms of hazardous substances; (3) facility structure or configuration; (4) personnel. Although not subject to DOE O 425.1A requirements, some form of a readiness evaluation should also be conducted on radiological and non-nuclear facilities before beginning work. The readiness evaluation should provide evidence that the following elements have been accomplished: (1) all identified hazards have been adequately characterized to the extent practicable; (2) appropriate ES&H requirements have been identified and met; (3) an integrated hazard analysis has been performed and controls established for protection of workers, the public, and the environment; (4) adequate safety and emergency response procedures, and work instructions have been developed and are in place; (5) personnel are knowledgeable of the work scope to be performed and of the associated hazards; (6) personnel have the training and qualifications necessary for the work to be performed; (7) safety systems are operable and maintained according to design specifications; and (8) mechanisms for compliance with the provisions of all applicable environmental permits are in place. Simple checklists, as presented in Appendix J, may be used to conduct the readiness evaluation. In all cases, readiness evaluations should be conducted by an organization that is not directly involved with the day-to-day management of the facility disposition activity.

### 3.4.2 Management of Change

One of the purposes of facility disposition activities is to remove hazards and, subsequently, the facility's safety SSCs no longer needed for control and confinement of hazardous substances. During the performance of this work, hazardous substances or facility physical conditions may be discovered that have not been analyzed previously. Therefore, work may be necessary that has not been planned for or included in existing safety documents. In order to ensure that the safety basis is current, adequate, and documented, it is important that a MOC process be developed. An MOC process should evaluate all proposed activities, changes, and discoveries (referred to collectively as "change" for the remainder of this section) that may affect facility or worker safety The MOC process should be developed for all facility classifications and should establish a mechanism for evaluating the significance of any change, the need for additional analysis and safety controls, the documentation affected or required by the change, and the approval and training requirements for implementing the change. An MOC screening and evaluation methodology should be developed for the following types of change:

- Minor changes that may impact job controls, or instructions specified in work plans that should be implemented with minimal review (e.g., typographical errors, administrative details, or insignificant

changes that have no potential to impact health and safety).

- Changes that may impact the original work plans and may require worker or facility safety evaluation, but do not require changes to existing safety documentation or work permits (e.g., hazardous substance in quantities or locations different than assumed).

- Changes that may impact the safety basis and require changes and approvals to the current facility safety documentation or work permits (e.g., unanalyzed hazards that require new analysis or safety controls or changes that affect performance of safety SSCs). For Hazard Category 2 or 3 nuclear facilities, the evaluation of changing facility conditions or proposed disposition activities should be performed using the USQ process required by DOE 5480.21. A determination should be made as to whether the proposed work, or changing facility conditions (as disposition activities proceed) will be within the safety basis defined in the facility's hazard baseline documentation. The USQ considerations, as described in DOE 5480.21, establish a screening process to evaluate worker and public safety along with protection of the environment. For example, using the USQ process during a deactivation project allows the DOE contractor to proceed expeditiously, without prior DOE approval, as long as the changes from planned disposition work do not affect the safety basis documented in the hazard baseline documentation. If a USQ exists, it does not necessarily mean that the activity is unsafe. Rather, identifying a USQ serves to alert DOE and facility management to potential conditions that could potentially affect the facility's safety basis.

As required by DOE 5480.21, worker safety considerations are to be included in the MOC process and applied to each specific disposition work task. Screening and evaluation criteria should be developed and implemented that can provide answers to the following questions:

- Is there an unanalyzed hazard, change, or increase in uncertainty in analyzed hazards or a change in hazardous substance type, form, or quantity, as a result of the proposed activity, or a discovery that could affect (directly or indirectly) the health and safety of workers at or around the job site?

- Are prescribed safety controls (including PPE) adequate to protect the worker, as established by approved hazard baseline documentation and have the safety controls been reviewed and approved?

Although not required to comply with the provisions of DOE 5480.21, radiological and non-nuclear facilities should implement these same concepts provided in DOE 5480.21 and the worker safety considerations described above. In addition, the MOC processes should address hazardous substance

inventory maintenance to ensure the rigor of hazards analysis and associated safety controls are commensurate with the inventory changes.

### 3.5 Feedback and Evaluation (Core Function: Feedback and Continuous Improvement)

Because of the dynamic nature of facility disposition activities, work monitoring and periodic self-assessments are a particularly important aspect of a properly functioning facility disposition ISMS. As stated in Section 3.1, it is useful to develop project-specific performance indicators and measures to monitor ES&H performance while conducting work tasks. Through self-assessments, as required by DOE O 210.1, *Performance Indicators and Analysis of Operations*, Attachment 1, and DOE O 440.1, Attachment 2, data regarding project, activity, and task performance can be gathered. Insights gleaned from this information should be integrated into project planning and work execution as quickly as practical, so that good practices and lessons learned from previous work can be used for the next project task (see Appendix B, Example 25, on feedback and evaluation).

Lessons learned from performance measures should also be shared across the DOE complex. DOE O 225.1, *Accident Investigations*, DOE O 231.1, *Environment, Safety and Health Reporting,* and DOE O 232.1, *Occurrence Reporting and Processing of Operations Information,* require that information related to accidents, mishaps, and near-misses be reported and disseminated throughout the DOE complex to help prevent similar situations from being repeated.

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