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DOE-STD-1120-98
May 1998
Volume 2 of 2

DOE STANDARD

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

Volume 2 of 2: Appendices

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

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DISCLAIMER

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Volume 2

Appendices

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INTRODUCTION

This volume contains the appendices that provide additional environment, safety, and health (ES&H) information to complement Volume 1 of this *Standard*. 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 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.

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Appendix A

Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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ENVIRONMENT, SAFETY, AND HEALTH DIRECTIVES APPLICABLE TO FACILITY DISPOSITION ACTIVITIES

This appendix provides a compilation of potentially applicable DOE, Occupational Safety and Health Administration (OSHA), and Environmental Protection Agency (EPA) ES&H requirements for disposition activities. This compilation will assist DOE project managers, contractors, and subcontractors in identifying the applicable ES&H requirements that must be considered to ensure the protection of workers, the public, and the environment during facility disposition activities.

Table A-1 lists mandatory and nonmandatory ES&H directives and briefly summarizes the intent for each directive. This list is not intended to represent the set of directives that should be applied to all disposition activities and situations. The specific directives applicable to a facility or work activity depend upon the facility's and activity's work scope and associated hazards. For example, the set of directives applicable to deactivating a plutonium processing facility may differ entirely from the set for decommissioning a guard house containing asbestos.

As shown in Figure A-1, the list of directives is organized by type of hazard. This is intended to facilitate the identification of hazard-specific requirements. Directives that are not strictly driven by type of hazard are identified as crosscutting directives which are applicable regardless of the hazards and work scope.

This list is a reference tool to facilitate the identification of applicable directives for a facility disposition activity; for example, if the work involves interaction with lead and radiological materials, the table provides reference(s) to the specific directive(s) that need to be considered for each of these hazards. Section 3 of Volume 1 discusses the strategy for managing and controlling facility disposition activity hazards, including the identification of applicable directives using a team approach with direct worker involvement.

Figure A-1. Organization of ES&H Directives Applicable to Facility Disposition

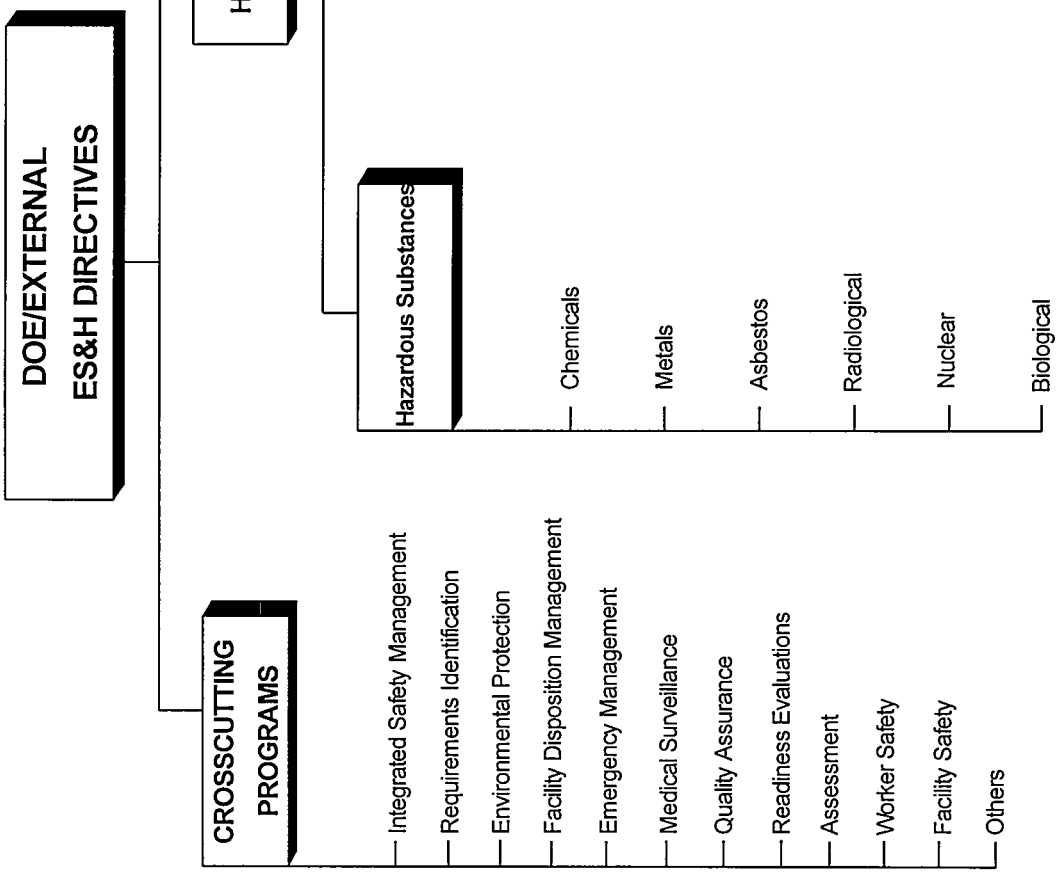

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

(Directives with an asterisk (*) are mandatory when the disposition activity's work scope and hazards are subject to the directive. DOE Orders are also mandatory when listed in a contract that has been negotiated with DOE to address the disposition activity.)

Category	Directive	Intent
CROSSCUTTING PROGRAMS		
Integrated Safety Management	DOE P 450.4 * Safety Management System Policy	Establishes the components necessary for a Safety Management System to provide a formal, organized process whereby people plan, perform, and improve the safe conduct of work. The system encompasses all levels of activities and documentation related to safety management throughout the DOE complex.
	DOE G 450.4-1 Integrated Safety Management System Guide (ISMS)	Provides guidance to meet the tenets of P 450.4, Safety Management System Policy.
Requirements Identification	DOE P 450.1 ES&H * Policy for DOE Complex	Specifies the goals and guiding principles for the DOE ES&H policy.
	DOE P 450.2A * Identification, Implementation, and Compliance with ES&H Requirements	Sets forth the framework for identifying, implementing, and complying with ES&H requirements so that work is performed in the DOE complex in a manner that ensures adequate protection of workers, the public, and the environment. This framework is an integral part of the Department's commitment to a standards-based management system.
	DOE P 450.3 * Authorizing the Use of the Necessary and Sufficient Process for Standard-Based ES&H Management	Sets forth the framework for the Necessary and Sufficient Process. The process can be applied at any organizational level and by any organization within the DOE complex, and can be used to establish contractual commitments between the Department and its contractors.
	DOE M 450.3-1 Necessary and Sufficient Closure Process	Describes the six elements established for the "Closure Process for Necessary and Sufficient Sets of Standards," and summarizes lessons learned from the pilots. The process can be applied at any organizational level and by any organization within the DOE complex, and can be used to establish contractual commitments between the Department and its contractors.

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Category	Directive	Intent
Environmental Protection	DOE 5400.1 * General Environmental Protection Program	Establishes environmental protection program requirements, authorities, and responsibilities for DOE operations for assuring compliance with applicable Federal, State, local, environmental protection laws and regulations, Executive Orders, and internal Departmental policies.
	Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA) *	Sets forth requirements for protecting human health and the environment where releases or threats of releases of hazardous substances, pollutants, or contaminants have been identified. CERCLA is legislated by Title 42 USC 9601, et seq. and implemented by 40 CFR 300, 302, 305, and 306. In accordance with the DOE policy, decommissioning actions will be implemented as CERCLA Non-Time-Critical Removal Actions, unless the circumstances at a facility make it inappropriate.
	Clean Air Act (CAA) *	Sets forth requirements for regulating emissions into the air from stationary and mobile sources. Controls are implemented through combined Federal, State, and local programs. EPA has promulgated National Ambient Air Quality Standards (NAAQS) and National Emission Standards for Hazardous Air Pollutants (NESHAPs). The CAA is legislated by Title 42 USC 7401, et seq. and implemented by 40 CFR 50, 52, 53, 58, 60, 61, 65, 66, 68, 69, and 81.
	Clean Water Act (CWA) *	Sets forth requirements for regulating point source and nonpoint source discharges into surface waters and requires the establishment of criteria and standards to protect water quality and achieve national performance standards as well as establishment of a regulatory permitting program (i.e., National Pollutant Discharge Elimination System [NPDES] permits) to enforce CWA standards. The CWA is legislated by Title 33 USC 1251, et seq. and implemented by 33 CFR 153—157, 159, 320, and 322—329 as well as 40 CFR 109, 110, 112—114, 116, 117, 121, 122, 125, 129, 131, 133, 136, 140, 220—225, 227—229, 230, 231, 401, 403, 413, 423, 457, and 459.
	Safe Drinking Water Act * (SDWA)	Sets forth requirements for EPA to establish regulations to protect human health from contaminants in drinking water through the establishment of maximum contaminant levels (MCLs) and secondary maximum contaminant levels (SMCLs). The SDWA is legislated by Title 42 USC 300, et seq. and implemented by 40 CFR 141—144, 146, 147, and 149.

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Category	Directive	Intent
Environmental Protection	Toxic Substances Control Act (TSCA) * (Polychlorinated Biphenyls and asbestos)	Sets forth requirements for the establishment of specific regulations for existing and new chemical substances and mixtures. TSCA is legislated by Title 15 USC 2647, et seq. and implemented by 40 CFR 61 and 761.
	Resource Conservation and Recovery Act (RCRA) *	Sets forth standards and requirements for ensuring that solid wastes are managed in a manner protective of human health and the environment and conserving of energy and natural resources. RCRA addresses the management of hazardous wastes through a program of standards and requirements for the generation, transport, treatment, and disposal of hazardous wastes and through a corrective action program to address releases of hazardous wastes and hazardous waste constituents. RCRA authorizes the U.S. EPA to delegate the program and enforcement responsibilities under the Federal statute to the States. RCRA is legislated by 42 USC 6901, et seq. and implemented by 40 CFR 240, 241, 243—247, 256, 257, 260—268, 270, 272, 279, and 280.
	DOE O 451.1A * National Environmental Policy Act (NEPA) Compliance Program	Sets forth responsibilities for the DOE implementation of NEPA. The purpose of NEPA is to provide a valuable planning tool to improve the quality of decision-making for government-sponsored proposed actions. NEPA ensures that environmental information is available to public officials and citizens before decisions are made or actions taken. The NEPA process at DOE must be implemented in accordance with DOE's NEPA regulations (i.e., 10 CFR 1021) and the Secretarial Policy statement of July 3, 1994. NEPA is legislated by Title 42 USC 4321, et seq. and implemented by 40 CFR 1500—1508 pertaining to all Federal agencies.
	American Indian Religious Freedom Act (AIRFA)	AIRFA clarifies U.S. policy pertaining to the protection of Native Americans' religious freedom. The act established a policy of protecting and preserving the inherent right of individual Native Americans (including American Indians, Eskimos, Aleuts, and Native Hawaiians) to express and exercise their traditional religious beliefs.

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Category	Directive	Intent
Environmental Protection	Pollution Prevention Act of 1990 (PPA)	The PPA of 1990 institutionalizes pollution prevention practices by encouraging voluntary reduction of hazardous waste and other pollutants resulting from industrial operations. The bill instructs EPA to undertake a multimedia program of information collection and technology transfer to promote source reduction techniques. The PPA of 1990 is legislated by Public Law 101—158.
	Emergency Planning and Community Right to Know Act (EPCRA)	The EPCRA requires facility operators to notify the local emergency planning districts regarding substances stored at and released from sites. The emergency planning aspect requires local communities to prepare plans to deal with emergencies relating to hazardous substances, including: Emergency Planning and Notification, Reporting Requirements, and General Provisions. Appendix A of 40 CFR 355 defines extremely hazardous substances. Any DOE facility that manages any such substances in quantities exceeding the Threshold Planning Quantities noted in the appendix must comply with EPCRA. EPCRA is legislated by Title III, of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and implemented by 40 CFR 350, 355, 370, and 372.
	Endangered Species Act (ESA) and the Fish and Wildlife Coordination Act (FWCA)	The ESA provides for designation and protection of invertebrates, wildlife, fish, and plant species in danger of becoming extinct and conserves the ecosystems on which such species depend. The act mandates cooperation between Federal and State governments, especially concerning land acquisitions and management. DOE should consult with the FWS and/or NMFS before engaging in activities that might disrupt any endangered species. The FWCA assures that fish and wildlife resources receive equal consideration with other values during the planning of development projects that affect water resources. The act requires all Federal agencies to consult with the U.S. Fish and Wildlife Service whenever an agency plans to conduct, license, or permit an activity involving impoundment, diversion, deepening, control, or modification of a stream or body of water. The ESA and FWCA are implemented by 50 CFR Chapters I, II, and IV.

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Category	Directive	Intent
Environmental Protection	National Historic Preservation Act (NHPA)	The Antiquities Act of 1906 protects historic and prehistoric remains on Federal lands. The Historic Sites Act of 1935 preserves for public use sites, buildings, and objects of national significance, extending this protection to Federal and non-Federal lands. The Archeological Recovery Act of 1960 protects archeological data from Federal dam construction; this act was amended in 1974 to protect same from any Federally related land modification activities. The NHPA includes the protection, rehabilitation, restoration, and reconstruction of districts, sites, buildings, etc. NHPA requires Federal agencies to consider the effect of their projects on historical and archeological resources and allows the Council on Historical Preservation to comment on such effects. The NHPA is implemented by 36 CFR and 43 CFR.
	Executive Order 11988 Flood Plains Management	Directs Federal agencies to provide leadership and take action to minimize the risk of flood loss, and to restore and preserve the natural and beneficial values served by flood plains when carrying out its responsibilities for: (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use.
	Executive Order 11990 Protection of Wetlands	Directs Federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands when carrying out its responsibilities for: (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use.

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Category	Directive	Intent
Environmental Protection	Executive Order 12586 Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements	Directs Federal agencies and their facilities to comply with the provisions of EPCRA as well as the Pollution Prevention Act of 1990. Specifically, requires Federal agencies to develop and implement pollution prevention strategies and Federal facilities to develop and implement pollution prevention plans. The goal of these efforts is to ensure that Federal agencies conduct their facility management and acquisition activities so that the quantities of toxic chemicals that may potentially enter a waste stream are reduced through source reduction; any waste that is generated is recycled and that any remaining waste is stored, treated, and disposed of in a manner protective of public health and the environment.
	Executive Order 12843 Procurement Requirements and Policies for Federal Agencies for Ozone Depleting Substances	Directs Federal agencies to minimize the use and procurement of ozone-depleting substances by conforming their regulations and procurement practices to Title VI of the CAA, maximizing the use of safe alternatives to ozone-depleting substances, and evaluating present and future needs of ozone-depleting substances. For DOE, this Executive Order is implemented by DOE/EH - 0511, *Guidance on the DOE Facility Phaseout of Ozone Depleting Substances.*
	Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Directs Federal agencies to create an Interagency Working Group on Environmental Justice to provide guidance to Federal agencies on criteria for identifying disproportionately high and adverse human health or environmental effects on minority and low-income populations, as well as developing interagency model projects on environmental justice.
Facility Disposition Management	DOE O 430.1A and Associated DOE Guides Life-Cycle Asset Management	Provides requirements for the control (planning, acquiring, maintaining, leasing, and disposal) of the Department's physical assets, implemented through a graded approach to life-cycle asset management and referenced guidance and technical standards.
Emergency Management	DOE O 151.1 * Comprehensive Emergency Management System	Provides requirements for the establishment of an Operational Emergency Base Program that provides the framework for response to serious events involving health and safety, the environment, safeguards, and security. Also requires an operational emergency hazardous material program to supplement the Base Program.

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Category	Directive	Intent
Emergency Management	DOE G 151.1-1 Emergency Management Guide	Provides guidance for the establishment of an Operational Emergency Base Program that meets the requirements of DOE O 151.1.
	DOE-HDBK-5504-95 Guidance for Evaluation of Operational Emergency Plans	Provides guidance for evaluating emergency plans.
Medical Surveillance	DOE 3790.1B-Ch.VIII * Federal Employee Occupational Medical Program	Applies to Federal employees not covered under the occupational medical program requirements for contractors in DOE O 440.1. This standard requires Heads of DOE Field Elements with Delegated Personnel Authority to develop, establish, provide, and maintain a Federal Employee Occupational Medical Program.
	29 CFR 1910.120(f) or (q)(9)* Medical Surveillance for Hazardous Waste Operations and Emergency Response	Paragraph (f) contains specific medical surveillance program requirements for employees conducting hazardous waste operations and whose potential exposure levels exceed specified limits. Paragraph (q)(9) requires a medical surveillance program for members of organized and designated HAZMAT teams and for hazardous materials specialists, as defined in this regulation. This may apply to designated HAZMAT team members for any facility disposition activity. See OSHA's 29 CFR 1910 Subpart Z and 129 CFR 1926.62 for substance-specific medical surveillance requirements.
	DOE G 440.1-4 Contractor Occupational Medical Program Guide	Provides guidelines for establishing an occupational medical program which meets the requirements of DOE O 440.1.
Quality Assurance	DOE 5700.6C * Quality Assurance	Provides requirements for the development of a quality assurance program for radiological and non-nuclear facilities.

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Category	Directive	Intent
Quality Assurance	DOE G 414.1-1 Implementation Guide for Use with Independent and Management Assessment Requirements of 10 CFR 830.120 and DOE 5700.6C, Quality Assurance	Provides guidance on performing management assessments in accordance with the requirements of 10 CFR 830.120 and DOE 5700.6C. Also provides guidance on retaining information from canceled orders and conveying current trends in assessment methodology to ensure assessments are performed efficiently.
Readiness Evaluations	DOE O 425.1 * Startup and Restart of Nuclear Facilities	Provides requirements for startup of new nuclear facilities and for the restart of nuclear facilities that have been shutdown.
	DOE-STD-3006-95 Planning and Conduct of Operational Readiness Reviews	Provides guidance on the planning and conduct of Operational Readiness Reviews (ORRs). This standard also provides guidance for requesting exemptions. The requirements for ORRs and readiness assessments (RAs) apply both to responsible contractors and to DOE. This standard addresses the requirements and suggests methods and approaches for ORRs and RAs.
Assessment	DOE 5482.1B * ES&H Appraisal Program	Establishes the ES&H Appraisal Program for the DOE. It requires the following appraisals; management, technical safety, functional, internal, environmental survey.
	DOE O 210.1 * Performance Indicators and Analysis of Operations Information	Provides requirements to identify, monitor, and analyze data that measures the ES&H performance of facilities, programs, and organizations.
	DOE-STD-1010-92 Incorporating Operating Experiences	Contains methods for incorporating operating experience into facility programs. Experience from facilities or industry should be incorporated in a manner that is systematic and timely in conveying useful information.

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Assessment	DOE-STD-7501-95 Development of DOE Lessons Learned Programs	Defines the framework for development of a lessons learned program. When specifically referenced and required to be implemented, this technical standard applies to all DOE Headquarters and field organizations, management and operating contractors, and laboratories establishing a lessons learned program. For organizations with existing lessons learned programs, this technical standard will facilitate self-assessment to determine whether existing structures contain the essential elements for consistency and compatibility.
	DOE O 225.1 * Accident Investigations	Prescribes requirements for investigating certain accidents occurring at DOE operations and sites to improve ES&H for DOE, contractors, and the public and to prevent the recurrence of such accidents.
	DOE G 225.1A-1 Guide for DOE O 225.1 Accident Investigations	Explains the requirements addressed in DOE O 225.1 and provides guidance regarding acceptable methods for implementing those requirements. The approach to investigations described in the guide is similar to, and consistent with, methods used by other government agencies and private industry.
Worker Safety	DOE O 440.1 * Worker Protection Management for DOE Federal and Contractor Employees	Establishes the framework for an effective worker protection program that will reduce or prevent accidental losses, injuries, and illnesses by providing DOE Federal and contractor workers with a safe and healthy workplace.
	DOE G 440.1-1 Worker Protection Management for DOE Federal and Contractor Employees	Provides implementing guidance in support of DOE O 440.1, covering topics such as management commitment, employee involvement, hazard identification, evaluation and control, and worker protection training. Pertinent guidelines are provided that support DOE-1120-98 discussions regarding task-level hazard analysis activities and worker controls.
	DOE G 440.1-2 Construction Safety Management Guide	Provides S&H guidelines pertinent to construction activities. Since some disposition activities, such as demolition, have similar hazards to construction, this guide may be useful in obtaining further S&H guidance on topics such as task-level hazard analysis and health and safety plans.

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Category	Directive	Intent
Worker Safety	DOE G 440.1-3 Occupational Exposure Assessment	Provides implementing guidance in support of DOE O 440.1, covering the topic of occupational exposure assessment. The guidance states that exposure assessment should be included in the DOE and contractor written worker protection program and that the exposure assessment documentation should describe the methods and rationale a site uses to characterize and monitor worker's potential and actual exposures to hazardous agents.
	29 CFR 1910.120(l) or (q) * Hazardous Waste Operations and Emergency Response	Paragraph (l) contains requirements to ensure worker health and safety during emergency response for hazardous waste operations, including projects conducted under CERCLA. Paragraph (q) contains requirements to ensure worker health and safety during emergency release of hazardous substances wherever they occur. This section may apply to any facility disposition activity where onsite emergency responders are used. Potentially addressed by DOE O 151.1.
	DOE-EM-STD-5503-94 EM Health and Safety Plan (HASP) Guidelines	Provides guidance for developing "site-specific HASPs" for EM-40 facilities that meet or exceed the requirements of 29 CFR 1910.120. Guidance may be used in developing HASPs as discussed in Section 3.3.4 of DOE-STD-1120-98.
	29 CFR 1910 Subpart I * Personal Protective Equipment	*General Industry* Provides requirements for the selection, use, and maintenance of eye and face protection, respiratory protection, head protection, foot protection, and electrical protective equipment.
	29 CFR 1926 Subpart E * Personal Protective and Life- Saving Equipment	*Construction* Provides requirements for construction operations for the selection, use, and maintenance of foot protection, protective clothing; respiratory protection for fire brigades; head, hearing, eye, and face protection; respiratory protection; and detailed requirements for working over or near water.
	29 CFR 1910 * S&H Regulations for General Industry	*General Industry* Sets forth the S&H standards promulgated by OSHA for general industry.

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Category	Directive	Intent
Worker Safety	29 CFR 1926 * S&H Regulations for Construction	*Construction* Sets forth the S&H standards promulgated by OSHA for construction, alteration, and/or repair, including painting and decorating.
Facility Safety	DOE O 420.1 * Facility Safety	Establishes facility safety requirements related to fire protection and natural phenomena hazards mitigation.
Other Crosscutting Programs	DOE 4330.4B * Maintenance Management Program	Provides general policy and objectives for the establishment of programs for the management and performance of cost-effective maintenance and repair of DOE property. Contains guidelines for establishing and conducting a maintenance program.
	DOE O 231.1 * ES&H Reporting	Ensures the collection and reporting of information on ES&H required by law or regulation to be collected, or that is essential for evaluating DOE operations and identifying opportunities for improvement needed for planning purposes within the DOE. Requires compliance with OSHA record keeping requirements in 29 CFR 1904, 29 CFR 1926.33, and the recently finalized 29 CFR 1910.1020.
	DOE M 231.1-1 ES&H Reporting Manual	Provides detailed requirements to supplement DOE O 231.1, *Environment, Safety, and Health Reporting*, which establishes management objectives and requirements for reporting ES&H information.
	DOE O 232.1 * Occurrence Reporting and Processing of Operations Information	Ensures that DOE and DOE contractor management are informed on a timely basis of events that could adversely affect national security or the safeguards and security interests of DOE; the health and safety of the public, workers, and the environment; the intended purpose of DOE facilities; or the credibility of the Department.
	DOE M 232.1-1 Occurrence Reporting and Processing of Operations Information	Provides detailed information for categorizing and reporting occurrences at DOE facilities. It complements DOE O 232.1, and its use is required by that Order.

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Category		Directive	Intent
HAZARD TYPES			
Hazardous Substances	Chemicals	29 CFR 1910.120 * Hazardous Waste Operations and Emergency Response (HAZWOPER)	*General Industry* Requires a S&H program and site-specific S&H plan for cleanup operations involving hazardous substances; operations involving hazardous wastes conducted at treatment, storage, and disposal (TSD) facilities; and emergency response operations for releases of, or substantial threats of release of, hazardous substances.
		29 CFR 1926.65 * HAZWOPER	*Construction* Requires a S&H program and site-specific S&H plan for cleanup operations involving hazardous substances; operations involving hazardous wastes conducted at TSD facilities; and emergency response operations for releases of, or substantial threats of release of, hazardous substances.
		DOE/EH-0535 Handbook for Occupational Safety and Health During Hazardous Waste Activities	Provides guidance for establishing and implementing comprehensive, cost-effective, hazard-based worker health and safety programs that meet the requirements of DOE and DOE-adopted OSHA health and safety directives for hazardous waste activities.
		29 CFR 1910.1000 * OSHA "Z Tables" within Subpart Z	*General Industry* Provides permissible exposure limits (PELs) for most air contaminants regulated by OSHA and stipulates a hierarchy of controls to achieve compliance. (See description of 29 CFR 1910.1001—1050.)
		29 CFR 1926.55 * Gases, Vapors, Fumes, Dusts, and Mists (comparable to "Z Tables")	*Construction* Provides PELs for most air contaminants regulated by OSHA and stipulates a hierarchy of controls to achieve compliance. (See description of 29 CFR 1926 Subpart Z and 29 CFR 1926.62.)

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Category		Directive	Intent
Hazardous Substances	Chemicals	29 CFR 1910.1001—1050 * Substance-Specific Standards within Subpart Z	*General Industry* Provides worker S&H requirements for exposures to specific chemicals, primarily carcinogens. Includes requirements such as exposure monitoring, worker training, exposure controls, regulated areas, and medical surveillance of workers who are potentially exposed to specific hazardous substances. Includes standards for substances often involved in facility disposition activities such as asbestos, lead, and cadmium.
		29 CFR 1926 Subpart Z * Substance-Specific Standards	*Construction* Contains worker S&H requirements for exposures to specific chemicals, primarily carcinogens. Includes requirements such as exposure monitoring, worker training, exposure controls, regulated areas, and medical surveillance of workers who are potentially exposed to the specific hazardous substances. Includes standards for substances often involved in facility disposition activities such as asbestos, lead, and cadmium.
		DOE-HDBK-1100-96 Chemical Process Hazard Analysis	Provides guidance for performing the process hazards analysis required by 29 CFR 1910.119.
		DOE-HDBK-1101-96 Process Safety Management for Highly Hazardous Chemicals	Provides guidance for implementing 29 CFR 1910.119 for DOE facilities.
		29 CFR 1910.1200 * Hazard Communication	*General Industry* As it applies to facility disposition, requires that information concerning hazards and appropriate protective measures for chemical substances in the workplace are transmitted to personnel through appropriate labeling, Material Safety Data Sheets (MSDSs), signs, and training. A written hazard communication program is required. (Note: This section does not apply to substances that are the focus of remediation under CERCLA or to RCRA hazardous waste.)

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Category		Directive	Intent
Hazardous Substances	Chemicals	29 CFR 1926.59 * Hazard Communication	*Construction* As it applies to facility disposition, requires that information concerning hazards and appropriate protective measures for chemical substances in the workplace are transmitted to personnel through appropriate labeling, MSDSs, signs, and training. A written hazard communication program is required. (Note: This section does not apply to substances that are the focus of remediation under CERCLA or to RCRA hazardous waste.)
		29 CFR 1910.1450 * Occupational Exposure to Hazardous Chemicals in Laboratories	*General Industry* Potentially applicable during deactivation and surveillance & maintenance. If laboratory use of hazardous chemicals is occurring during facility disposition activities, this standard may apply. Where it applies, it generally supersedes OSHA's Subpart Z health standards. Refer to this standard for specific qualifications on scope and applicability.
Hazardous Substances	Metals	29 CFR 1910.1025 * Lead	*General Industry* Contains requirements for employee exposure to lead including PELs, exposure monitoring, hazard controls and protective equipment, medical surveillance, worker training, and record keeping. It does not cover construction workplaces.
		29 CFR 1926.62 * Lead	*Construction* Contains requirements for employee exposure to lead in construction workplaces including PELs, exposure monitoring, hazard controls and protective equipment, medical surveillance, worker training, and record keeping.
		29 CFR 1910.1027 * Cadmium	*General Industry* Contains requirements for employee exposure to cadmium including PELs, exposure monitoring, regulated area establishment, hazard controls and protective equipment, written emergency plan, medical surveillance, worker training, and record keeping. It does not apply to construction workplaces.

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Category		Directive	Intent
Hazardous Substances	Metals	29 CFR 1926.1127 * Cadmium	*Construction* Sets requirements for employee exposure to cadmium in construction workplaces including PELs, exposure monitoring, regulated area establishment, hazard controls and protective equipment, written emergency plan, medical surveillance, worker training, and record keeping.
Hazardous Substances	Asbestos	29 CFR 1910.1001 * Asbestos	*General Industry* Applies to all occupational exposures to asbestos in all industries covered by OSHA, except for construction work, and includes requirements for PELs, exposure monitoring, methods of compliance, regulated areas, respiratory protection, protective work clothing and equipment, hygiene facilities and practices, communication of hazards to employees, housekeeping, medical surveillance, record keeping, and observation of monitoring practices.
		29 CFR 1926.1101 * Asbestos	*Construction* Applies to all construction work and includes requirements for PELs, exposure monitoring, regulated areas, methods of compliance, respiratory protection, protective clothing and equipment, hygiene facilities and practices, communication of hazards to employees, housekeeping, medical surveillance, and record keeping.
Hazardous Substances	Radiological	10 CFR 820 * Procedural Rules for DOE Nuclear Activities	Provides procedures to govern the conduct of persons involved in DOE nuclear activities and, in particular, to achieve compliance with DOE nuclear safety requirements by all persons subject to those requirements. This part sets forth the procedures to implement the provisions of the Price-Anderson Amendments Act of 1988, which subjects DOE contractors to potential civil and criminal penalties for violations of DOE rules, regulations, and Orders relating to nuclear safety.
		DOE-STD-1083-95 Requesting and Granting Exemptions to Nuclear Safety Rules	Provides guidance for requesting exemptions to nuclear safety rules

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

(Directives with an asterisk (*) are mandatory when the disposition activity's work scope and hazards are subject to the directive. DOE Orders are also mandatory when listed in a contract that has been negotiated with DOE to address the disposition activity.)

Category		Directive	Intent
Hazardous Substances	Radiological	DOE P 441.1 * DOE Radiological Health and Safety Policy	Sets forth DOE's approach to radiological health and safety.
		10 CFR 835 * Occupational Radiation Protection	Provides the regulations for occupational radiation protection of workers at DOE facilities. The provisions of 10 CFR 835 provide nuclear safety requirements, which, if violated, will provide the basis for the assessment of civil and criminal penalties under the Price-Anderson Amendments Act of 1988.
		DOE G 441.1-1 Radiation Protection Program	Provides an acceptable methodology for documenting the development of an occupational radiation protection program that will comply with DOE requirements.
		DOE G 441.2-1 Occupational ALARA Program	Provides an acceptable methodology for establishing and operating an occupational ALARA (as low as reasonably achievable) program that will comply with DOE requirements.
		DOE G 441.3-1 Internal Dosimetry Program	Provides an acceptable methodology for establishing and operating an internal dosimetry program that will comply with DOE requirements.
		DOE G 441.4-1 External Dosimetry Program	Provides an acceptable methodology for establishing and operating an external dosimetry program that will comply with DOE requirements.
		DOE G 441.5-1 Radiation-Generating Devices (RGD)	Provides an acceptable methodology for establishing and operating a RGD control program that will comply with DOE requirements. This also applies to radiography sources. Section IV.B.8 covers RGD decommissioning.
		DOE G 441.6-1 Evaluation and Control of Fetal Exposure	Provides an acceptable methodology for establishing and operating a program to evaluate and control radiation exposure to the embryo/fetus of pregnant female workers that will comply with DOE requirements.

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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Category		Directive	Intent
Hazardous Substances	Radiological	DOE G 441.7-1 Instrument Calibration for Portable Instruments	Provides an acceptable methodology for establishing and operating a program for calibrating portable radiological survey instruments that will comply with DOE requirements.
		DOE G 441.8-1 Workplace Air Monitoring	Provides an acceptable methodology for establishing and operating a workplace air monitoring program that will comply with DOE requirements.
		DOE G 441.10-1 Posting and Labeling for Radiological Control	Provides an acceptable methodology for establishing and operating a radiological posting and labeling program compliant with DOE requirements.
		DOE G 441.11-1 Occupational Radiation Protection Record Keeping and Reporting	Provides an acceptable methodology for establishing and operating an occupational radiation protection record keeping and reporting program compliant with DOE requirements.
		DOE G 441.12-1 Radiation Safety Training	Provides an acceptable methodology for establishing and operating a radiation safety training program compliant with DOE requirements.
		DOE 5400.5 * Radiation Protection of the Public and Environment	Establishes radiation standards and requirements to be met by DOE facilities and operations in order to protect the environment and members of the public.
		DOE 5820.2A * Radioactive Waste Management	Provides DOE policies, guidelines, and requirements for the management of DOE radioactive waste, mixed waste, and contaminated facilities.
		DOE G 441.13-1 Sealed Radioactive Source Accountability and Control	Provides an acceptable methodology for establishing and operating a sealed radioactive source accountability and control program compliant with DOE requirements, applicable also to radiography sources.

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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Category		Directive	Intent
Hazardous Substances	Radiological	DOE-STD-1107-97 Knowledge, Skills, and Abilities for Key Radiation Protection Positions at DOE Facilities	Provides guidance on the knowledge, skills, and abilities of personnel who implement DOE radiation protection programs.
Hazardous Substances	Nuclear (Hazard Category 3 or above)	10 CFR 830 * Nuclear Safety Management	Provides requirements for the conduct of the DOE management and operating contractors and other persons at DOE nuclear facilities. This part establishes requirements for the safe management of DOE contractor and subcontractor work at the Department's nuclear facilities. The current rule adopts the sections that make up the general applicable provisions and also adopts the specific section on provisions for developing and implementing a formalized quality assurance program.
		10 CFR 830.120 * Quality Assurance Requirements	Provides requirements for the development of a quality assurance program for nuclear facilities.
		DOE 5480.19 * Conduct of Operations Requirements for Nuclear Facilities	Provides requirements for establishing and implementing a conduct of operations program.
		DOE 5480.20A * Personnel Selection, Qualification, and Training Requirements for Nuclear Facilities	Provides requirements for establishing and implementing personnel selection, qualification, and training requirements.
		DOE 5480.21 * Unreviewed Safety Questions (USQ)	Provides requirements for performing USQ determinations.
		DOE 5480.22 * Technical Safety Requirements (TSR)	Establishes the requirement to have TSRs prepared for DOE nuclear facilities and delineates the criteria, content, scope, format, approval process, reporting, and revision requirements of these TSRs.

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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Category		Directive	Intent
Hazardous Substances	Nuclear (Hazard Category 3 or above)	DOE 5480.23 * Nuclear Safety Analysis Reports (SAR)	Establishes requirements for developing safety analyses that establish and evaluate the adequacy of the safety basis of the facilities. The SAR required by this order documents the results of the nuclear safety analysis.
		DOE-STD-1104-96 Review and Approval of Non-Reactor Nuclear Facility Safety Analysis Reports	Provides guidelines for conducting reviews of DOE 5480.23 SARs.
		DOE-STD-1027-92 Hazard Categorization and Accident Analysis Techniques for Compliance with 5480.23	Provides guidance for the preparation and review of hazard categorization and accident analyses techniques as required by DOE 5480.23.
		DOE-STD-3009-94 Preparation Guide for U.S. Department of Energy Non-Reactor Nuclear Facility Safety Analysis Reports	Provides format and content of SARs for non-reactor nuclear facilities. Chapter 3 provides specific guidance for hazards analysis.
		DOE-STD-3011-94 Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans	Specifies format and content for developing bases of interim operation (BIOs).
		DOE-HDBK-3010-94 Release Fractions and Respirable Fractions for Nuclear Facilities	Provides airborne release fraction (ARF) and respirable fraction (RF) values for use when performing hazard/safety analysis.
		DOE-EM-STD-5502-94 Hazard Baseline Documentation	Provides a methodology for classifying facilities under EM's purview.
		DOE O 420.1 * Facility Safety	Establishes facility safety requirements related to nuclear safety design and criticality safety.

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Category		Directive	Intent
Hazardous Substances	Nuclear (Hazard Category 3 or above)	DOE-STD-3007-93 Guidelines for Preparing Criticality Safety Evaluations at DOE Non-Reactor Nuclear Facilities	Provides guidance for preparing nuclear criticality safety analysis of DOE operations.
		DOE O 425.1 * Startup and Restart of Nuclear Facilities	Provides requirements for startup of new nuclear facilities and for the restart of nuclear facilities that have been shutdown.
		DOE-STD-101-92 Nuclear Safety Criteria for Potential Application to Non-Reactor Nuclear Facilities	Provides a listing of nuclear safety criteria that may be applicable to non-reactor nuclear facilities.
		DOE-STD-3013-96 Criteria for Preparing and Packaging Plutonium Metals and Oxides for Long-Term Storage	Provides guidance for assuring safe storage of plutonium metals and oxides for 50 years or final disposition.
Hazardous Substances	Biological	29 CFR 1910.1030 * Bloodborne Pathogens	*General Industry* Contains requirements to control occupational exposure to blood and other potentially infectious substances. Stipulates methods to comply with exposure control, hazard communication procedures, and record keeping requirements.
		29 CFR 1910.141 * Sanitation	*General Industry* Includes requirements for water supply, housekeeping, waste disposal, insect and vermin control, and other provisions that reduce the potential spread of infectious agents, including rodent- and insect-borne hazards.

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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Category		Directive	Intent
Physical	Fire	29 CFR 1926.51 * Sanitation	*Construction* Includes requirements for water supply, housekeeping, waste disposal, insect and vermin control, and other provisions that reduce the potential spread of infectious agents, including rodent- and insect-borne hazards.
		29 CFR 1910 Subpart L * Fire Protection	*General Industry* Contains requirements for fire brigades; all portable and fixed fire suppression equipment; fire detection systems; and fire or employee alarm systems installed to meet the fire protection requirements of 29 CFR 1910.
		29 CFR 1926 Subpart F * Fire Protection	*Construction* Contains requirements for fire protection, including a fire protection program, flammable and combustible liquids, LP-gas, heating devices, fire suppression equipment, and employee alarm systems.
		29 CFR 1910 Subpart Q * Welding, Cutting, and Brazing	*General Industry* Provides requirements for gas welding and cutting, arc welding and cutting, fire prevention and ventilation, and protection for welding operations.
		29 CFR 1926 Subpart J * Welding and Cutting	*Construction* Provides requirements for construction operations for gas welding and cutting, arc welding and cutting, fire prevention and ventilation, and protection for welding operations. This subpart would typically apply only during decommissioning.
		DOE G-420/G-440.1 Implementation Guidance (IG) for DOE 420.1 and 440.1 Fire Safety Program	Provides guidance to facilitate the development, implementation, and maintenance of a comprehensive fire protection program that meets the requirements of DOE 0 420.1 and DOE O 440.1.
		DOE-HDBK-1062-96 DOE Fire Protection Handbook	Provides guidance on how to achieve the fire protection requirements of DOE 5480.7A (DOE 5480.7A was canceled by DOE O 420.1).

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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Category		Directive	Intent
Physical	Fire	DOE-STD-1088-95 Fire Protection for Relocatable Structures	Provides guidance on meeting fire protection requirements for relocatable structures.
		DOE/EH-0196 Bulletin 91-3 (Revised) Fire Prevention Measures for Cutting, Welding, and Related Activities	Contains requirements, standards, and guidelines governing fire safety for "hot work" activities. Among other things, requires task hazard analysis for Deactivation and Decommissioning (D&D) work, fire retardant clothing, and fire watch to protect personnel.
Physical	Explosion	DOE M 440.1-1 DOE Explosives Safety Manual	Primarily applicable only during decommissioning. Provides safety standards and procedures used to implement the requirements of DOE O 440.1 for operations involving explosives, pyrotechnics, and propellants, or assemblies containing these materials. With the exception of onsite explosives storage and transportation, this manual does not apply to commercial activities such as routine construction or routine tunnel blasting.
		29 CFR 1910.109 * Explosives and Blasting Agents	*General Industry* Primarily applicable only during decommissioning. This regulation contains requirements for handling, storing, transporting, and using explosives and blasting agents in general industry operations.
		29 CFR 1926 Subpart U * Blasting and the Use of Explosives	*Construction* Primarily applicable only during decommissioning. This section contains requirements for the use, transportation, and storage of explosives, blasting agents, and equipment in construction operations.
Physical	Elevation	29 CFR 1926 Subpart L * Scaffolding	*Construction* Provides requirements for the construction and use of various types of scaffolds for construction.
		29 CFR 1926 Subpart M * Fall Protection	*Construction* Sets forth requirements and criteria for fall protection in construction workplaces covered under 29 CFR 1926.

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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Category		Directive	Intent
Physical	Elevation	29 CFR 1926 Subpart N * Cranes, Derricks, Hoists, Elevators, and Conveyors	*Construction* Covers the use, employee protection and hazard control, maintenance, testing, and equipment associated with cranes, derricks, hoists, elevators, and conveyors used for construction.
		DOE-STD-1090-96 Hoisting and Rigging	Provides guidance for safely performing hoisting and rigging activities.
Physical	Electrical	29 CFR 1910 Subpart S * Electrical	*General Industry* Addresses electrical safety requirements necessary for the practical safeguarding of employees in their workplaces. Includes design safety standards for electrical systems, safety-related work practices and maintenance requirements, and safety requirements for special equipment.
		29 CFR 1926 Subpart K * Electrical	*Construction* Addresses electrical safety requirements necessary for the practical safeguarding of employees involved in construction work. Includes installation safety requirements, safety-related work practices, safety-related maintenance and environmental considerations, and safety requirements for special equipment.
		29 CFR 1910.333 * Selection and Use of Work Practices	*General Industry* Details requirements to prevent electric shock or other injuries from work on or near electrical equipment. Includes provisions for locking and tagging out circuits.
		29 CFR 1926.417 * Lockout and Tagging of Circuits	*Construction* Provides requirements and procedures for locking and tagging controls and circuits when an employee is exposed to contact with deactivated electric equipment or circuits.

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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Category		Directive	Intent
Physical	Electrical	DOE-STD-1030-96 Guide to Good Practices for Lockouts and Tagouts	Provides guidance on good practices associated with lockouts and tagouts.
Physical	Confined Space	29 CFR 1910.146 * Permit-required Confined Spaces	*General Industry* Contains requirements for practices and procedures to protect employees in general industry (excluding construction) from the hazards of entry into permit-required confined spaces. Requirements include a Permit Space Program.
		29 CFR 1926 Subpart P * Excavations	*Construction* Primarily applicable only during decommissioning. Contains requirements for the protection of employees working in and around all open excavations (including trenches) and requirements for protective systems (e.g., sloping, shield systems, etc.).
Physical	Other Physical Hazards	29 CFR 1910 Subpart Q * Welding, Cutting, and Brazing	*General Industry* Provides requirements for gas welding and cutting, arc welding and cutting, fire prevention and ventilation, and protection for welding operations.
		29 CFR 1926 Subpart J * Welding and Cutting	*Construction* Provides requirements for construction operations for gas welding and cutting, arc welding and cutting, fire prevention and ventilation, and protection for welding operations.
		29 CFR 1910.94 * Ventilation	*General Industry* Provides requirements for ventilation for abrasive blasting, grinding, polishing and buffing operations, spray finishing operations, and open surface tanks.

Table A-1, Environment, Safety, and Health Directives Applicable to Facility Disposition Activities

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Category		Directive	Intent
Physical	Other Physical Hazards	29 CFR 1926.57 * Ventilation	*Construction* Provides requirements for ventilation for abrasive blasting, grinding, polishing and buffing operations, spray finishing operations, and open surface tanks.
		29 CFR 1910.95 * Occupational Noise Exposure	*General Industry* Establishes allowable noise levels and the protection requirements when those levels are exceeded.
		29 CFR 1926.53 * Occupational Noise Exposure	*Construction* Establishes allowable noise levels and the protection requirements when those levels are exceeded.
		29 CFR 1910 Subpart O * Machinery and Machine Guarding	*General Industry* Details requirements for the use, maintenance, and guarding of machinery, including mechanical power-transmission apparatus.
		29 CFR 1926 Subpart I * Tools—Hand and Power	*Construction* Provides requirements for the use, maintenance, and guarding of hand and power tools, including mechanical power-transmission apparatus.
		29 CFR 1910.147 * Control of Hazardous Energy (Lockout/Tagout)	*General Industry* Covers the servicing and maintenance of machines and equipment in which the unexpected energization or startup of the machines or equipment or the release of stored energy could cause injury to employees. Minimum performance requirements for the control of such hazardous energy are established. It does not cover construction employment or exposure to electrical hazards in electric utilization installations.
		29 CFR 1910 Subpart N * Materials Handling and Storage	*General Industry* Contains safety requirements for mechanized materials handling and storage.

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Category		Directive	Intent
Physical	Other Physical Hazards	29 CFR 1926 Subpart N * Cranes, Derricks, Hoists, Elevators, and Conveyors	*Construction* Covers the use, employee protection and hazard control, maintenance, testing, and equipment associated with cranes, derricks, hoists, elevators, and conveyors used for construction.
		DOE-STD-1090-96 Hoisting and Rigging	Provides guidance for safely performing hoisting and rigging activities.
		29 CFR 1926 Subpart O * Motor Vehicles, Mechanized Equipment, and Marine Operations	*Construction* Addresses safety requirements related to off-highway motor vehicles, earthmoving equipment, excavating and other equipment, pile driving equipment, site clearing, and marine operations and equipment.
		29 CFR 1926 Subpart P * Excavations	*Construction* Primarily applicable only during decommissioning. Contains requirements for the protection of employees working in and around all open excavations (including trenches) and requirements for protective systems (e.g., sloping, shield systems, etc.).
		29 CFR 1926 Subpart T * Demolition	*Construction* Primarily applicable only during decommissioning. Contains requirements for demolition preparatory operations, floor, wall, material, and steel construction removal, waste transport, and storage. It does not include demolition by explosives, which is in Subpart U.

Appendix B

Examples of Applying DOE-STD-1120-98 Concepts

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EXAMPLES OF APPLYING DOE-STD-1120-98 CONCEPTS

The purpose of this appendix is to provide demonstrative examples of the concepts discussed in Volume 1 of this *Standard*. The following examples represent a wide diversity of facility disposition experience that includes both good practices and lessons learned. Each example illustrates implementation of ISMS core functions discussed in Volume 1 (e.g., work planning and hazards identification, hazard analysis, hazard controls and baseline documentation, and work execution). These examples reflect actual Field and Headquarters experience. Each example contains a statement of the concepts discussed in Section 3, associated key topics, and references to the applicable section in Volume 1. Examples are organized as shown in Table B-1.

Note, these examples are provided to enhance the reader's understanding of concepts presented in this *Standard*. Actual field implementation of these concepts may involve work or hazards that deviate from individual examples. Therefore, it should not be assumed that examples are entirely representative of all aspects of an actual disposition activity.

Table B-1. Organization of Examples

NO.	VOLUME 1 SECTION	EXAMPLE TITLE	KEY TOPICS
WORK PLANNING/HAZARD IDENTIFICATION			
1	3.1.1	Assuring Accurate Identification of Credible Hazards During Activity Planning	Hazards identification, planning
2	3.1.1	Incorporating Waste Minimization and Pollution Prevention into Pre-job Planning	Pre-job planning, waste minimization, pollution prevention
3	3.1.1	Determining ARARs for Decommissioning of a Surplus Facility	Pre-job planning, ARAR determination
4	3.1.2	Allocating Sufficient S&H Resources During Planning	S&H resources, planning
5	3.1.3	Utilizing a Multidisciplined Team to Identify Hazards During Job Planning to Support Characterization	Characterization, team, planning
6	3.1.3	Identifying and Characterizing Unknown Hazards to Protect Workers During Decommissioning	Characterization HASP, hazard identification, planning
7	3.1.3	Using Historical Information and Experience to Identify Hazards During Facility Characterization	Characterization, historical information, employee experience
8	3.1.3	Utilizing Historical Knowledge to Increase Efficiency of Site Characterization Activities	Historical information, site characterization
9	3.1.3	Using a Multidisciplined Team for Hazard Identification	Hazard Identification, planning
INTEGRATED HAZARD ANALYSIS			
10	3.2.1 and 3.2.2	Ensuring that the Hazard Analysis Reflects Facility and Task Hazards	Safety controls, hazard analysis
11	3.2.2	Hazard Screening Tools used to Support Graded Task Hazard Analysis	Preliminary Hazard Screening and Assessment, Task Hazard Analysis
12	3.2.2	Screening Task Hazard Analysis Against Existing Safety Basis	Task hazard analysis, worker safety, hazard analysis
HAZARD CONTROL AND HAZARD BASELINE DOCUMENTATION			
13	3.3.1	Administrative Controls for a Non-nuclear Facility	Administrative controls

NO.	VOLUME 1 SECTION	EXAMPLE TITLE	KEY TOPICS
14	3.3.2	Mitigating the Effects of an Earthquake	Administrative controls, safety controls, hazard analysis
15	3.3.2	Ensuring that Changes in Safety Controls, Removal of a Safety System, and Changes in Hazard Baseline Documentation Are Communicated to Workers	Hazard baseline documentation, safety controls
16	3.3.3	Applying Hold Points in TSRs During Decommissioning	TSRs, hold points
17	3.3.4	Preparing Decommissioning Plans that Include Nuclear Safety Requirements	CERCLA, decommissioning
18	3.3.5	Using a Health and Safety Plan for Decommissioning a Radiological Facility	Safety Basis, decommissioning
19	3.3.5	Using Facility Walkdowns to Assess the Current Authorization Basis and Provide a Facility Baseline	SAR, hazard baseline documentation
PERFORM WORK			
20	3.4.1	Pre-job Briefing Identifies Unanalyzed Hazard	Pre-job briefing, hazard analysis
21	3.4.1	Lessons Learned from a Readiness Evaluation Process	ORR, readiness evaluation
22	3.4.1	Ensuring Adequate Task Hazard Analysis and Pre-Job Briefings to Fully Identify Hazards	Task hazard analysis, lessons learned
23	3.4.2	Using the Change Control Process to Assure Safe Demolition	Management of Change (MOC)
24	3.4.2	Revision of Work Control Procedures to Address Unforeseen Hazards	MOC
FEEDBACK AND EVALUATION			
25	3.5	Self-Assessments Lead to Discovery of Deficiency	Self-assessment, worker safety controls

EXAMPLES OF APPLYING DOE-STD-1120-98 CONCEPTS

WORK PLANNING/HAZARD IDENTIFICATION

Example 1: Assuring Accurate Identification of Credible Hazards During Activity Planning

As part of the task to remove useable process equipment during a facility decommissioning, a welder was using a cutting torch to cut out large cylindrical sections. The work was similar in many ways to work performed in another building at the site during the past year, as well as to extensive equipment replacement activities necessary to support operations in the past. Because of these similarities, the operating contractor classified the work as routine maintenance, thereby eliminating the requirement for a task-specific work plan.

Concept: Importance of identifying all credible worker and facility hazards during work planning.

Key Topics: Hazards identification, planning

Reference: Volume 1, Section 3.1.1

During the cutting operation, a spark or piece of hot metal ignited the welder's coveralls below the left knee. The welder was wearing multiple layers of clothing, radiological protective equipment, and a welder's mask that severely limited his ability to detect and extinguish the flames. Since the welder was working alone, the flames spread undetected until they were beyond his ability to extinguish them without assistance. By the time a co-worker responded to the emergency, the flames had totally engulfed the welder's body. He received third-degree burns on more than 95 percent of his body and died the following day.

The Type A Accident Investigation Board Report notes several deficiencies that contributed to the fatality—failure to identify a fire watch with appropriate personnel safety responsibilities and training; failure to plan the work adequately; failure to react to numerous clothing fires during welding prior to the accident because of a failure to foster an atmosphere that encouraged reporting of incidents; use of protective equipment that exacerbated the fire hazard; disregard of a formal lessons-learned report from an identical activity the prior year; inadequate provisions for emergency egress; and failure to notify the Industrial Hygiene (IH) Department for surveying the working conditions/controls as required by the work permit. None of these activities required the elaborate or extensive analysis usually associated with a SAR—just adherence to normal industrial safety practices, plant procedures, and the presence of an effective safety culture emphasized by management.

Example 2: Incorporating Waste Minimization and Pollution Prevention into Pre-job Planning

The alternatives for decontaminating a powder metallurgy facility were under consideration. Of all the proposed alternatives discussed in the Engineering Evaluation/Cost Analysis (EE/CA), two were determined the most cost effective with the least environmental impact. One of the alternatives involved wetting down the walls and all remaining process equipment and then wiping the wet residues down and collecting the runoff. The other alternative involved the use of compressed air to physically remove the surface contamination. Although both alternatives provided adequate protection of the worker, the latter alternative was chosen because less waste was created by the scaling process as opposed to the wet process. This approach was determined to be in concert with the requirements of Executive Order 12856, *Federal Compliance with Right-To-Know Laws and Pollution Prevention.*

Concept: Incorporating waste minimization and pollution prevention considerations as part of pre-job planning activities ensures creation of lesser quantities of hazardous waste.

Key Topics: Pre-job planning, waste minimization, pollution prevention

Reference: Volume 1, Section 3.1.1

Example 3: Determining Applicable or Relevant and Appropriate Requirements for Decommissioning of a Surplus Facility

A complex facility that used to process scrap plutonium metal was to be decommissioned. The facility bordered a small pond containing protected species. In addition, two underground storage tanks (USTs) were within the facility boundary. The land contiguous to the tanks was suspected of containing Indian artifacts. Prior to the selection of potential remediation alternatives, a multidisciplined group was assembled to determine the scope of potential ARARs. Included in this group were representatives of the local Indian tribe. The set of potential ARARs included substantive aspects of the American Indian Religious Freedom Act, Endangered Species and Fish and Wildlife Coordination Act, and the CWA. By utilizing stakeholders early in the ARAR selection process, all potential stakeholder concerns were addressed and became an integral part of the project work scope.

Concept: Determine the set of ARARs for a decommissioning project utilizing early stakeholder involvement.

Key Topics: Pre-job planning, ARAR determination

Reference: Volume 1, Section 3.1.1

Example 4: Allocating Sufficient S&H Resources During Planning

Concept: Develop S&H resource requirements for ISMS core safety functions when planning facility disposition activities.

Key Topics: S&H resources, planning

Reference: Volume 1, Section 3.1.2.

A facility disposition project was unable to meet the work performance schedule because a supporting criticality analysis could not be done. The project manager was informed that a site criticality engineer was not available. To obtain the criticality expertise, the project manager could either establish a contract for these services with outside consulting companies or wait until the site's existing criticality staff could perform the analysis. The site severely reduced the criticality staff as part of a site reduction-in-force (RIF), carried out without considering the minimum skill mix requirements of the site's mission and planned work scope, including maintaining adequate criticality expertise. This caused a shortage of criticality experts in the ensuing year, which resulted in site projects being delayed. It also resulted in the hiring of new staff and, in some cases, the rehire of staff at higher consulting rates to obtain the needed criticality expertise. This meant that projects were delayed, the cost of the criticality analysis support was greater than anticipated, and worker safety could have been compromised without the availability of these services. To avoid this inefficient and costly situation, the site ES&H Management Planning Process should have been used to identify the proper skill mix required for the planned work scope to ensure that the site maintained the required ES&H capabilities, even during the RIF. Using the ES&H Management Planning Process, the projects at the site and their associated S&H funding and resource requirements would have been identified. Furthermore, this process would have identified the vulnerability associated with a severe reduction in criticality expertise.

Example 5: Utilizing a Multidisciplined Team to Identify Hazards During Job Planning to Support Characterization

Concept: Use an integrated team of personnel comprising all the technical disciplines expected to be required to identify hazards during planning.

Key Topics: Characterization, team, planning

Reference: Volume 1, Section 3.1.3

A project involved decontamination and demolition of a manufacturing facility with a floor space of 120,000 ft^2 that included metallurgical processing and fabrication of uranium metal components. An initial inspection showed the potential for chemical, radiological, and asbestos contamination

throughout the building where the structural integrity was suspect. Of major importance for decontamination within the structure and the eventual demolition of the structure was the condition of the roof.

For decommissioning planning purposes it was necessary to characterize the roof and associated support structures, particularly for radiological contamination and asbestos composition of insulation. This would require access to the roof. Before initiating characterization activities, a licensed structural engineer completed a structural inspection and evaluation. This evaluation determined that 70 percent of the roof area and associated structures were not sufficient to support personnel egress. The evaluation identified pathways that were sound and structural supports that could be used to attach personnel fall protection. Access control was established for entry onto the roof. This was coordinated with the radiation protection and industrial hygiene specialist to ensure that adequate access would be available to complete the additional characterization activities necessary to support decommissioning planning.

As a result of the integrated approach, with an emphasis on structural integrity as being significant to worker safety, the characterization and subsequent decontamination and structural demolition activities were planned and executed with no worker injuries or lost time accidents and without releases of hazardous substances into the environment.

Example 6: Identifying and Characterizing Unknown Hazards to Protect Workers During Decommissioning

A former chemical processing facility was to be decommissioned. Because insufficient facility and material inventory information existed, extensive facility and hazard characterization efforts were needed. It was determined that to comply with HAZWOPER, a characterization HASP was required to support this work.

Concept: Ensure that characterization adequately identifies the type and extent of hazards to protect workers during decommissioning.

Key Topics: Characterization HASP, hazard identification, planning

Reference: Volume 1, Section 3.1.3

First, a search of available facility information was conducted. This included a review of floor plans, process flow diagrams (including engineering controls), environmental permits, notifications and release reports, ES&H reports (e.g., correspondence, studies, analyses, and reports), chemical and toxic release inventory reports, hazardous waste manifests and annual summary reports,

utility plans, and regulatory citations.

A sampling plan was then developed, and the facility was physically inspected to determine the level of protection required for the personnel performing the sampling activities. An inspection of the process areas was completed to determine the present status of the facility, operations, and systems. One key aspect of the sampling focused on process residues and stains that needed to be sampled and other potential contamination pathways, such as ventilation systems and air movement pathways. The HASP developers inventoried the building materials and inspected the types of surfaces for the presence of asbestos or lead-based paint. They inventoried the utilities to identify any lockout/tagout issues and to locate piping and ventilation systems and PCB reservoirs. Personnel protective measures selected were commensurate with the hazards and activity to be performed as defined by 29 CFR 1910.120.

The chemical inventories were assessed to determine the present condition of the materials that were to be sampled. During one activity, it was determined that mercury in an assembly had been chemically altered over the past 25 years. HASP developers evaluated the interactions of such materials that were left in place and ensured that these materials were sampled and analyzed.

Furthermore, task-specific HASPs were prepared for all work involving hazardous substances during this phase of decommissioning. Detailed requirements were not specified in the HASP because the requirements could be found in site S&H program documents. The emphasis placed on elements of the HASP were commensurate with the hazards and activity to be performed and the need for protection. Training of the employees constituted an important, continual activity that was planned for in the HASP during characterization activities.

Example 7: Using Historical Information and Experience to Identify Hazards During Facility Characterization

Facility characterization has been a critical element to the success of facility disposition projects. During the planning of characterization activities for the decommissioning of a surplus test reactor building, a historical research effort into past hot cell programmatic operations revealed the following key information:

Concept: Use historical information and personnel experience whenever possible to develop a comprehensive profile of hazards.

Key Topics: Characterization, historical information, employee experience

Reference: Volume 1, Section 3.1.3

(1) Inspections and handling of nuclear fuel containing significant quantities of fission products and loose alpha contamination were of major concern. Historical reports provided information on the nature of the materials inspected in the hot cells.

(2) Facility descriptions and operational procedures highlighted the use of an underground hot waste catch tank fed from hot cell drains.

(3) Interviews with programmatic personnel who had worked in the area more than 10 years ago identified the use of hazardous cleaning solvents on hot cell materials and the routine practice of flushing liquids and debris down the hot cell drains to the hot waste catch tank.

This information was critical in the planning and execution of the survey and sampling activities. It ensured that the difficult sampling of the catch tank was sufficient to support the waste disposal issues of remote-handled, transuranic-mixed waste and ensured adequate planning and preparation for the health and safety of the workers performing characterization. Without the historical information, it is likely that a limited survey and sampling effort would have missed the mixed waste issue initially and failed to quantify the significant quantities of transuranic materials in the underground storage tank. This would have resulted in a schedule delay of at least 3 months to re-plan, re-sample, and analyze the catch tank inventory, as well as additional costs and increased potential for worker risk.

Example 8: Utilizing Historical Knowledge to Increase Efficiency of Site Characterization Activities

During the deactivation of a chemical tank farm, up-to-date facility records were unavailable. This is a generic problem facing many DOE sites. In addition, institutional knowledge of DOE operations is being lost due to retirement of aging facility workers and reduction of the workforce at surplus facilities. Given this situation and the inadequate operating records at many DOE sites, extensive site characterization sampling activities are often necessary before initiating cleanup activities. A notable cost-reduction S&H activity, which many DOE sites are performing, is to capture process knowledge from former employees. The mechanisms for this activity include producing plant historical documents by sponsoring reunions of former employees and by individually interviewing former

Concept: Use of historical knowledge to increase efficiency during site characterization activities.

Key Topics: Historical information, site characterization

Reference: Volume 1, Section 3.1.3

employees. The cost of using former employees was more than compensated for by the savings associated with avoiding having to analyze a large number of environmental samples.

Example 9: Using a Multidisciplined Team for Hazard Identification

A project team was assembled to address the removal of enriched uranium deposits in shutdown process equipment. An initial hazard analysis had been performed to identify the generic hazards associated with these activities. Further planning and hazard identification were to be conducted for each task associated with specific equipment and material removal activities.

Concept: Use a multidisciplined team to increase the effectiveness of hazard identification.

Key Topics: Hazard identification, planning

Reference: Volume 1, Section 3.1.3

The tasks that were identified included the saw-cutting of pipe sections, scraping, vacuuming and collecting uranium in geometrically safe containers, and welding seals in process openings. A multidisciplined team, comprising craft personnel, supervisors, health and safety representatives, and project personnel, was assembled. The team discussed a detailed draft work plan, line-by-line, to determine its adequacy. Workers suggested modifications to ease or clarify the tasks discussed, and health and safety personnel provided recommendations on worker protection or removal of unnecessary requirements. As a result of these discussions, the project had a completed work plan in a minimal amount of time. Additional hazards were identified and addressed based on facility walkdowns and subsequent changes were made to the work plan. This information was then used to incorporate health and safety requirements into the work scope, perform the task hazard analysis, and prepare the subsequent special permits (i.e., safety work permits, radiological work permits, hot work permits, etc.).

INTEGRATED HAZARD ANALYSIS

Example 10: Ensuring that the Hazard Analysis Reflects Facility and Task Hazards

A retired tritium facility had a 200-ft.-high, 10-ft.-diameter, reinforced brick-lined concrete stack that was to be demolished using explosives. A hazard analysis was performed to identify the hazards and requisite controls related to the demolition activities. The hazard analysis also examined the stack's close proximity

to several operating nuclear facilities (some of these facilities' safety class equipment was less than 300 feet away from the stack). The hazard analysis considered hazards related to stack materials and hazards introduced from the chosen work method. These hazards included seismic effects, tritium release from the stack materials on impact, propagation of pressure waves, and projectiles. Additionally, the analysis was benchmarked with another similar activity at a commercial reactor site and related lessons learned from other DOE sites were reviewed.

Concept: Ensure that a hazard analysis is based on the inherent hazards associated with a facility and the work methods of choice.

Key Topics: Safety controls, hazard analysis

Reference: Volume 1, Section 3.2.1 and 3.2.2

The hazard analysis identified safety controls, including the use of mobile SeaLand containers, as an additional measure to protect critical equipment within adjacent nuclear facilities from blast damage and potential projectiles. The stack was demolished well within the expected fall zone. Except for the estimate of the pressure wave from the base of the stack, all assumptions and designated controls in the hazard analysis were adequate and realistic, based on post-demolition monitoring data. As the stack struck the ground and collapsed, the pressure wave was larger than expected and moved two large metal SeaLand containers several feet. The containers were also damaged from small projectiles. However, the containers successfully performed their pressure-wave barrier function and prevented damage to the adjacent facilities and components.

Example 11: Hazard Screening Tools used to Support Graded Task Hazard Analysis

To support the deactivation of a plutonium processing facility, a task-based hazard analysis process was implemented. Over the course of the project, two different hazard screening tools were used to assist in grading hazard analysis activities. The first tool, which was the Preliminary Hazard Screening and Assessment (PHSA), aided the project team in selecting the appropriate level of analysis based on the team's experience in conducting the task, the complexity of task activities and overall perceived risk. A PHSA checklist was organized to elicit these project characteristics and completed by the cognizant engineer and safety analyst for each major deactivation task. For example, a PHSA was completed for the task of

Concept: Utilize a PHSA to determine the extent of hazard analysis required.

Key Words: PHSA, task hazard analysis

Reference: Volume 1, Section 3.2.2

transferring contaminated nitric acid from large tanks to tanker trucks for shipment. The results of the screening indicated that the task was complex; involved chemical, radiological, and physical hazards; and had not been conducted previously. Additionally, since the task involved handling of 48 weight percent nitric acid with uranium contamination and failure of the coupling equipment could result in severe consequences to workers, facility management concluded that a more detailed hazard analysis was warranted.

As the project progressed, the PHSA was expanded to a computerized task hazard screening tool that accommodated self-directed work teams. The newly expanded tool served three main functions: (1) to assist work teams in identification of hazards and appropriate controls; (2) to identify the need for involvement of safety professionals to ensure that appropriate controls are established; and (3) to identify tasks that require additional analysis, such as Job Safety Analysis or Hazard and Operability Study. The computerized screening tool consisted of several screens, each addressing separate task hazards (e.g., nuclear safety, industrial safety, industrial hygiene, and radiological protection). In cases where the hazards were well known and evaluated, and work was routine (i.e., skill of the craft with approved radiological controls and no permits required, such as cutting and welding), a simple hazards checklist was all that was required.

One key to this process was the fact that the workers involved in task activities participated in the hazard screening process. Resulting information was used in the pre-job briefing to ensure that all workers were aware of the hazards and controls. Using this process, the incidents of lost work day injuries decreased significantly during the project.

Example 12: Screening Task Hazard Analysis Against Existing Safety Basis

A plutonium processing facility was entering deactivation. Although many of the activities were closely related to the operations activities, the deactivation included many one-time tasks performed under varying facility conditions that could have led to new or increased worker safety hazards. The work team's planned work task was to remove residual plutonium material from gloveboxes. As part of this process, a task hazard analysis was drafted. In order to verify that job hazards were not outside the previously identified safety envelope,

Concept: Screen the task hazard analysis against the current safety basis to determine the changes required to existing baseline analysis.

Key Topics: Task hazard analysis, worker safety, hazard analysis

Reference: Volume 1, Section 3.2.2

the task hazard analysis results were screened against the existing hazard baseline document (e.g., facility SAR). The task hazard analysis identified potential hazards that included personnel radiological exposure, criticality considerations, and physical hazards including punctures and pinch points. Since these hazards were consistent with those encountered during glovebox operations, and the controls were identified in both training and current procedures, no additional hazard analysis was warranted for the planned activity. However, to ensure that the appropriate controls were included in the work process, the evaluation was reviewed and approved by the criticality safety representative, industrial safety representative, and radiological personnel. The work plan and final task hazard analysis were completed and used in the pre-job briefing to ensure that personnel understood the hazards and controls associated with the activity prior to beginning work.

HAZARD CONTROL AND HAZARD BASELINE DOCUMENTATION

Example 13: Administrative Controls for a Non-nuclear Facility

A non-nuclear laboratory facility with gloveboxes was to be deactivated in preparation for long-term S&M. An integrated hazard analysis was performed to identify the hazards and the requisite controls. The analysis considered hazards related to the storage of chemicals, as well as those hazards introduced from the chosen work methods.

Concept: Use administrative controls to control the inventory of hazardous substances.

Key Topics: Administrative controls

Reference: Volume 1, Section 3.3.1

The analysis identified three administrative controls that supported and enhanced existing programmatic health and safety controls. These controls specify that: (1) all hazardous substances be inventoried and a "living" inventory be maintained and updated on a weekly basis; (2) all hazardous substances to be brought into the facility, proposed activities, new (or changes to) procedures, and discoveries be screened and hazards analyzed as necessary, using a management of change process; and (3) all tasks have an initial hazard analysis performed the first time the activity is completed. In addition, industrial safety, IH, and health protection personnel; workers; and the facility supervisor reviewed and approved identified worker safety controls. In order to ensure proper implementation of these controls, all facility workers involved in the activity were trained (i.e., procedure review and pre-job briefing) on these safety control requirements.

Example 14: Mitigating the Effects of an Earthquake

Concept: Consider operational modifications in lieu of expensive structural modifications to mitigate the effects of natural phenomena hazards

Key Topics: Administrative controls, safety controls, hazard analysis

Reference: Volume 1, Section 3.3.2

A plutonium facility scheduled to be decommissioned within the next 10 years was to be analyzed for the effects and consequences of earthquakes. As part of the integrated hazard analysis, a seismic assessment revealed a potential for structural failure of the building during a credible seismic event. The facility was in long-term S&M, awaiting deactivation, and contained a large inventory of releasable radioactive material in its processing cells. The hazard analysis indicated that with more than two cell cover blocks removed the consequences of the seismic event would be unacceptable. The facility walkdown indicated that six cells were found without cover blocks in place.

Rather than instituting facility structural upgrades or modifying the facility to prevent or mitigate the additional release of material that could occur with numerous cover blocks out of place, a simple, cost-effective, solution involved reinstalling the cell cover blocks on these six cells. This action allowed for the facility to remain within its analyzed safety envelope. Once the cover blocks were reinstalled, administrative controls (i.e., TSR) were developed and implemented to ensure that cells are always covered with a cover block. This simple and practical approach avoided the potentially large costs associated with seismically upgrading the equipment and/or facility to address the discovered vulnerability.

This approach promoted: (1) modifying operations (i.e., no cover blocks off at any time) and (2) enhancing confinement integrity (i.e., reinstalling cover blocks), instead of requiring the facility to be structurally upgraded to meet the seismic requirements.

Example 15: Ensuring That Changes in Safety Controls, Removal of a Safety System, and Changes in Hazard Baseline Documentation are Communicated to Workers

A Hazard Category 2 plutonium processing facility was being deactivated. One of the objectives for deactivation was appropriate and timely removal of unnecessary facility controls and associated administrative limits applied during operation of the facility. This was accomplished by assessing the present facility configuration to determine if the original hazards still existed or if changes to the material resulted in a less dispersable or hazardous form.

Specifically, because all fissionable material had been removed except for fixed contamination on building surfaces, the nuclear criticality alarms were no longer fulfilling a safety function and were taken out of service. Furthermore, when the plutonium reduction furnace, which uses hydrogen, was taken out of service, the instrumentation that monitored hydrogen levels in the immediate work area and the associated automatic safety controls were no longer needed. Once limits or safety systems were determined to be no longer necessary based on the facility or system conditions, this determination was documented through the management of change process as an update to the hazard baseline documentation and the limit and corresponding safety systems were "retired." This documentation ensured that operations personnel were aware of the current status of all limits associated with the deactivation facility project and that resources were not expended on systems and controls that no longer served a safety function.

Concept: Ensure that changes in safety controls and safety systems are reflected in the hazard baseline documentation and are clearly communicated to workers.

Key Topics: Hazard baseline documentation, safety controls

Reference: Volume 1, Section 3.3.2

Example 16: Applying Hold Points in TSRs During Decommissioning

A Hazard Category 2 plutonium processing facility had been retired for more than 30 years and was being prepared for final decommissioning. The facility process systems had been flushed and deactivated to its current inventory of about 2 kg of Pu-239, much of which was determined to be held up in process systems (i.e, approximately 1.5 kg was contained within six small process vessels). The potential existed for significant uncertainty in total inventory, due to the inability to assay structure, systems, or components (e.g., the pipe trench) beyond the pipes and vessels immediately accessible.

Concept: Use hold points in TSRs to facilitate additional assay and/or analyses to confirm assumptions and to verify inventory uncertainties.

Key Topics: TSRs, hold points

Reference: Volume 1, Section 3.3.3

The existing TSRs for inventory and criticality control were designed to be applied to facility modes of operation. Imbedded within the TSRs were several "hold" points that facilitated additional assays or analyses to confirm assumptions used in the derivation of TSRs and to verify inventory certainties. Once the six process vessels were removed and all required confirmations and approvals completed, the limiting conditions of operations (LCOs) contained within the TSRs that were associated only with this "mode"

were no longer applicable. Additional TSRs were applicable during the subsequent "mode," including more detailed characterization of the pipe trench. Hold points were used throughout the activities to ensure that assumptions, laboratory data, analyses, and approvals were obtained prior to authorizing work.

Example 17: Preparing Decommissioning Plans that Include Nuclear Safety Requirements

A retired plutonium concentration facility was decommissioned under CERCLA The requirements of nuclear safety authorization documentation were integrated with the decommissioning plan. Nuclear safety documentation requirements were addressed in two phases of the decommissioning removal action process: (1) the EE/CA; and (2) the Decommissioning Plan.

Concept: Streamline decommissioning documentation by combining the Decommissioning Plan with nuclear safety requirements.

Key Topics: CERCLA, decommissioning

Reference: Volume 1, Section 3.3.4

Nuclear safety objectives for the EE/CA focused on hazard identification, hazard analysis, and requirements identification. Characterization requirements were heavily influenced by the needs for criticality and accident analysis. The evaluation provided a basis to define the preferred work scope; select standards and requirements, which were incorporated into the ARARs evaluation; and determine the impact to facility hazard category.

A preliminary hazard analysis was necessary for each action alternative to demonstrate equal consideration in the EE/CA. The hazard identification and evaluation, which addressed physical hazards as well as hazardous substances, was used to aid in the determination of nuclear facility and worker safety requirements. An initial list of safety-significant structures, systems, or components, subject to existing or new TSRs, were provided during this process, as were design basis commitments, necessary programmatic controls, and specific worker safety requirements.

Example 18: Using a Health and Safety Plan for Decommissioning a Radiological Facility

A 50-MW test reactor, which was thoroughly flushed in the post-operations shutdown, had been characterized and final preparations for decommissioning the main reactor building were in progress. The reactor was given a Hazard Category designation of Radiological, in accordance with DOE-STD-1027-92.

The original hazard baseline documentation was reviewed for applicability in the characterization and decommissioning activities. The previous operations safety analysis documents provided information and a basis for some of the characterization tasks; however, these documents were not directly pertinent for supporting the current work. A comprehensive hazards assessment was documented, including initial hazard categorization, assumptions, controls, and safety documentation requirements for routine S&M of the facility. The hazards assessment recognized that a HASP would be developed. The primary hazardous activity in this facility phase, asbestos removal, was covered in the HASP and conducted in accordance with plant procedures and programs. The HASP was developed and implemented to ensure that worker safety and programmatic functions were adequately addressed and that planned non-invasive activities were analyzed and controlled.

Concept: Use a HASP as the hazard baseline documentation for radiological facilities.

Key Topics: Safety basis, decommissioning

Reference: Volume 1, Section 3.3.5

Example 19: Using Facility Walkdowns to Assess the Current Authorization Basis and Provide a Facility Baseline

As part of the overall safety strategy developed for deactivation of a plutonium processing facility, it was determined that the existing SAR, which supported prior facility operations, would be used to establish an authorization basis for deactivation. The time estimated for removal of the remaining radiological inventory was 14 months, which was less time than required to prepare and approve a SAR. Although a recent preliminary hazard analysis was performed on the standby configuration of the facility, this analysis and the existing SAR were inadequate for addressing worker safety issues and concerns. Therefore, as a condition of approving this strategy, DOE determined that a baseline assessment of worker hazards should be performed.

Concept: Use facility walkdowns in combination with authorization basis documents to develop a facility baseline and inputs for establishing controls.

Key Topics: SAR, hazard baseline documentation

Reference: Volume 1, Section 3.3.5

To achieve the baseline assessment, a facility walkdown was performed to identify worker hazards present in the current facility configuration. The walkdown was performed by a team including IH and industrial safety personnel with worker input and assistance. Hazards were identified and documented for each

facility area. During the walkdown, any transient hazards (e.g., ladders needing inspection) were communicated to facility management for immediate resolution and other non-transient hazards, such as poor egress, were documented in a report identifying the differences between the current documented hazard analysis and the established baseline.

The hazard mapping report was used in conjunction with hazard baseline documents to provide a facility baseline and input for establishing controls. Resulting data also supported planning and analysis of specific deactivation tasks and provided a basis for training workers on recognition of hazards during work execution.

PERFORM WORK

Example 20: Pre-job Briefing Identifies Unanalyzed Hazard

Concept: Use a pre-job briefing to identify additional hazards and develop appropriate controls.

Key Topics: Pre-job briefing, hazard analysis

Reference: Volume 1, Section 3.4.1

During the pre-job briefing, prior to a 47,000-pound lift of a gas heater, the crane operator expressed a concern for the lateral stability of the lift. A welder would have to perform the cutting of the last support to free the heater. Based on pre-job briefing discussions, a concern was raised that if the heater moved toward the welder after being cut, it could pin him against the side wall of the heater cell. The crane operator was aware of the potential shifts and their impact to the welder involved in the activity. As a result, this hazard was evaluated by the multidisciplined team and resolved successfully. Though the process was performed informally, the team successfully identified and controlled this hazard. The lifting was delayed an hour and bracing was installed to protect the welder. Although the heater did not physically impact the welder, the importance of this type of input from all crew members was significant.

Example 21: Lessons Learned from a Readiness Evaluation Process

A Hazard Category 2 nuclear facility was shutdown in 1992 and is currently planned for deactivation. The facility still contains significant quantities of uranium hexaflouride in process lines and various degraded containers. Adjoining the facility is a metal recovery operation, which is to be retained to support recycling of weapons parts. Both facilities share a common ventilation system that is contaminated with various uranium isotopes, including U-233. The facility has no approved hazard baseline documentation that meets

the requirements of DOE 5480.23 and has no record of a formal ORR conducted in accordance with DOE O 425.1A.

Concept: Considerations for grading a readiness evaluation.

Key Topics: Readiness assessment, readiness evaluation

Reference: Volume 1, Section 3.4.1

After consultation with the DOE field office, it was determined that the appropriate level of readiness evaluation appropriate for the facility deactivation was an ORR. This level of readiness evaluation was selected for the following reasons:

- The facility did not have an approved safety basis, including the derivation of TSRs and administrative controls (e.g., training), that demonstrated consequences from potential accidents had been evaluated and appropriate controls established.
- The facility contained significant quantities of dispersible hazardous substances, including radioactive materials, contained in aged, degraded, and non-criticality-safe containers.
- The process of removing materials from the facility was complex, since much of the material was contained in numerous process lines and in a ventilation system.
- The facility undergoing deactivation, as well as the adjoining metal recovery operation, contained classified quantities and configurations of materials.
- The deactivation project represented the first major disposition project at the site.

Once the hazard baseline documentation for the facility had been prepared and approved, and the workers trained to these provisions, the ORR was initiated.

Example 22: Ensuring Adequate Task Hazard Analysis and Pre-Job Briefings to Fully Identify Hazards

A work task involved the installation of a temporary enclosure for asbestos abatement consisting of double plastic attached to wooden 2 inch x 4 inch framing. The enclosure consisted of panels that were glued together to form a seamless barrier. This glue produced a volatile

Concept: Ensure that task hazard analyses completely identify all hazards and the pre-job briefing reflects these hazards so that measures can be taken to implement controls prior to the performance of work.

Key Topics: Task hazard analysis, lessons learned

Reference: Volume 1, Section 3.4.1

off-gas during drying. This volatile off-gas was to be controlled by the operation of the temporary exhaust system, which was attached to the enclosure.

During the installation, the workers inside the enclosure noted that the temporary exhaust separated the plastic panel seams before the glue dried. To prevent this, the temporary exhaust was shut off. During a routine inspection, a safety technician noted that the exhaust was not operating, but worker activities were continuing, including the use of unshielded electric drills to attach wooden framing. A portable explosive gas monitor was used by the technician to determine the presence of volatile gases. The measurement was off-scale. The technician ordered an immediate cessation of activities and evacuation of the area. The temporary exhaust was restarted and the plastic seams began to separate again. A review of this event revealed the following:

(1) The task hazard analysis had addressed the volatile off-gas condition and the temporary exhaust was provided to mitigate this condition. However, the use of unshielded electric motors in this environment had not been identified.

(2) The workers had not been briefed adequately on the hazards presented by the volatile off-gas nor on the importance of maintaining adequate ventilation during the drying of the glue, resulting in a potentially explosive atmosphere.

Example 23: Using the Change Control Process to Ensure Safe Demolition

Concept: Controlling and documenting changes is key to maintaining a safe work environment

Key Topics: MOC

Reference: Volume 1, Section 3.4.2

A work task involved demolition and removal of laboratory support systems, including removal of a subsurface floor drain system. During removal of components within the floor drain, a vertical pipe of the same diameter as the floor drain was observed. The pipe traversed from a baseplate on the floor through a false ceiling. The work supervisor assumed that the pipe was a vent for the drain and ordered its removal. No one verified that the vent line penetrated through the roof.

The pipe was cut at the floor and at the false ceiling, within the contamination control tent. When the pipe was removed, a sag was noted in the ceiling. Further inspection revealed that the upper end of the pipe terminated against a roof support beam. It was then realized that the vertical pipe was a roof support, not a

drain vent as originally believed. Temporary bracing was installed until a permanent vertical support was installed. No injuries or permanent damage were sustained by the roof and associated structure. Removal of this support could have resulted in a partial roof collapse. This situation could have been prevented if: (1) the discovered vertical pipe was identified as a discrepant "as found condition" under a management of change (MOC) system or (2) the proposal to remove the pipe was evaluated for potential hazards under a MOC system.

Example 24: Revision of Work Control Procedures to Address Unforeseen Hazards

Concept: Controlling and documenting changes is key to maintaining a safe work environment.

Key Topics: MOC

Reference: Volume 1, Section 3.4.2

A surplus reactor, with fuel removed, was to be decontaminated and decommissioned. The work included removal of all underground utilities, including the removal of a septic tank. The facility drawings were reviewed to determine if there was any possibility for a source of contamination to enter the septic tank. The drawings indicated that the only source was domestic sanitary waste. Initial samples were taken from the tank and the results showed no radionuclides present. Based on this conclusion, a "No-Further Action" determination was made by the Environmental Restoration Program.

Work commenced by pumping the contents of the tank to a private tanker truck and then discharging the septic tank's contents to an active onsite septic system located elsewhere at the site. The concrete septic tank was then raised to the surface where it could be sized and disposed. The site work procedures required monitoring by a full-time Radiological Control Technician during raising and sizing of the tank. The top of the tank was cut away using a large track excavator-mounted shear. As the sides were being broken, a large crack formed at the bottom of the tank and sludge started to flow out. As required by procedure, the Radiological Control Technician monitored the sludge and determined that there was some radiological contamination present. The work was stopped, a new Work Permit was prepared, and the work package was modified to reflect the newly identified hazard. The contents of the septic tank were mixed with "Aquaset" to solidify it and placed in double-lined boxes. After additional sampling and characterization, the boxes were then placed into a controlled area. These new sampling results indicated the presence of tetrachloroethylene and trichloroethylene. Without reanalysis of the work hazards, the development of a new set of work instructions, and the proper procedures implemented, the residual sludge material could have been improperly disposed.

The lessons learned from this incident are twofold: (1) often historical information may not convey an accurate representation of actual "field" conditions and (2) the proper environmental sampling protocols must be utilized to ensure accurate characterization of wastes stored in surplus facilities.

FEEDBACK AND EVALUATION

Example 25: Self-Assessments Lead to Discovery of Deficiency

Concept: Use the results of self-assessments to reduce the risk to workers from facility disposition hazards.

Key Topics: Self-assessment, worker safety controls

Reference: Volume 1, Section 3.5

A quarterly self-assessment indicated that workers were being exposed to higher than expected levels of airborne contamination when performing apparently routine decontamination of an area within a surplus plutonium facility. As part of the self-assessment, the readings from building constant air monitors (CAMs) were reviewed and the information was analyzed for trends. Although no worker had been exposed to levels above DOE limits contained within 10 CFR 835, it became apparent that the levels from this area were consistently higher than any other area within the building. Accordingly, an investigation team, comprised of the cognizant engineer, a health physicist, and a worker, assembled to determine the cause and develop an approach to bring the exposures to ALARA. The results of the investigation indicated that the building HVAC system contributed to the formation of fugitive dust by allowing contamination to be continually resuspended. Three alternatives were proposed to correct this situation: (1) discontinue activities within the area; (2) have workers wear respiratory protection equipment while performing work within the area; and (3) the preferred alternative of reducing the forced air into the area by installing an in-line damper. Option three was implemented and the CAM within the area was monitored closely for the next two weeks and was found to be within expected acceptable values.

Appendix C

ISMS Performance Expectations

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ISMS PERFORMANCE EXPECTATIONS

The performance expectations provided herein are derived from the guidance contained within Volume 1 of this *Standard* and are organized according to Section 3 topics that which follow the five ISMS core functions. Project managers, as well as their teams, may use these performance expectations to develop a tailored set of project-specific procedures and performance measures as a simple checklist for verifying effective implementation of integrated safety management concepts.

Action Completed (Yes/No)	ISMS PERFORMANCE EXPECTATIONS
3.1.1 Integrating ES&H Considerations into Work Planning Activities	
	A multidisciplined project team, including Project Management, IH, Industrial Safety, Construction Safety, Health Physics, Facility Safety, Emergency Preparedness, Fire Protection, Waste Management, Environmental Protection, regulators, and workers, as appropriate, evaluates available facility data (e.g., budget, schedule, existing ES&H documents, and ORPS data) and provides input to the development of a project plan.
	The project plan defines ES&H requirements and standards, performance measures and metrics, ISMS approach, ES&H authorities and responsibilities, and safety management strategy.
	Stakeholder's issues/expectations are identified, clearly understood, and reflected in project planning activities.
	The project plan specifies an approach for ensuring that subcontractor ES&H programs are adequate, in place, and monitored.
	For decommissioning projects, an evaluation is made of the CERCLA non-time-critical removal action provisions and a strategy is developed for integrating ES&H activities, documentation, and review and approval required by DOE directives.
	Work packages are prepared during the planning of specific work tasks, using first-line supervisors, workers, and safety personnel. Work packages provide: the task description; identification of task hazard analysis required, information developed from task hazard analysis, and verification that required steps have been performed; required training; necessary work permits; equipment and materials to be used; facility areas where task will be performed; and appropriate emergency response actions. Also, work packages should be evaluated against an established facility hazard analysis using the MOC process.
3.1.2 Resource Planning	
	Resources are effectively allocated to address ES&H, programmatic, and operational considerations. Protecting the public, workers, and environment is a priority when activities are planned and performed (i.e., S&H risk of the workers, public, and the environment will not be compromised, with a high priority placed on managing and reducing risks in the workplace, as well as reducing risks to the public and the environment).
	ES&H support required for the project work scope and the associated skill mix and funding required to adequately provide this support is identified.
	Site/project ES&H issues and vulnerabilities, including personnel, skill mix, and funding issues, are identified and strategies for addressing these issues are presented.

3.1.3 Hazard Identification and Characterization	
	All relevant information describing the facility and hazards is collected. Valuable sources include hazard baseline documents, such as: SARs, TSRs, HASPs, Environmental Impact Statements (EISs), Environmental Assessments (EAs), design documents, operational records, purchasing records, MSDSs, medical and environmental reporting data, and Unusual Occurrence Reports (UORs).
	Current and past facility employees are interviewed, as appropriate, to gather information not evident from document reviews.
	Walkdowns are performed using a multidisciplined project team to assess and confirm existing facility conditions and inherent hazards.
	A determination is made on the need for additional characterization based on the level of uncertainty regarding knowledge of hazards (e.g. hazardous substance type, form, quantity, and locations) and data quality objectives.
	Planning assumptions, such as planned work scope and end-points, are confirmed or modified as appropriate, based on the additional information gained from facility hazard identification and characterization.
	Intrusive characterization activities are performed, as necessary.
	Provisions are in place to protect workers performing facility walkdowns and characterization activities. For decommissioning projects, a characterization HASP is prepared where required by 29 CFR 1910.120.
3.1.4 ES&H Requirements Identification	
	Applicable ES&H requirements are identified according to work scope and hazards and are reflected in work procedures.
	A hazard categorization is performed in accordance with DOE 5480.23 and DOE-STD-1027-92 for facilities with radiological hazards.
3.2.1 Facility Hazard Analysis	
	A determination is made on whether existing hazard analyses can be used for current disposition activities based on the current scope of activities and the past safety basis.
	A hazard analysis is performed by a multidisciplined team comprising (on an as-needed basis) specialists in radiological, chemical, biological, and physical hazards, as well as facility management, safety specialists, engineers, environmental protection specialists, and facility disposition workers.
	The analysis evaluates the hazardous substance types and their related inherent harmful characteristics, quantities and concentrations, form, location, and exposure mechanisms.
	The safety basis is updated and kept current. The need for updates should be triggered by changes in facility disposition phases, new hazards or changes to energy sources, and changes to assumptions or commitments related to the safety basis. Previously conducted hazard analyses should be made available for project team use.

	The analysis is used as the common starting point for development of the appropriate hazard baseline document (e.g., SAR, BIO, or HASP), as well as emergency planning strategies.
	The results of the integrated hazard analysis should be used as one of the inputs to the analysis required by the NEPA process.
3.2.2 Task Hazard Analysis	
	A task hazard analysis is conducted for specific disposition work tasks and uses the facility analysis information as the starting point, as well as an evaluation basis for the MOC process.
	Workers, first-line supervisors, and safety personnel are involved in walkdowns of the work on an as-needed basis to review the steps associated with a task and to identify the hazards associated with the workplace and the chosen work methods.
3.3.1 Worker Safety Controls	
	ES&H requirements/standards, including controls stemming from baseline documentation and commitments, are effectively translated into work procedures and instructions. The strategy for establishing safety controls for facility disposition workers is consistent with the hierarchy specified in DOE O 440.1.
	Operational safety commitments for each work method are clearly identified and reflected in the task work plan or package.
	Personnel qualifications and training requirements are derived from the hazard analyses and are clearly specified in work packages.
	Task sequences, prerequisites, and hold points related to ES&H are documented in the work package.
3.3.2 Facility Safety Controls	
	An evaluation is made based on the hazard analysis results and planning data for the facility safety controls needed during disposition activities. Existing safety controls may be retired during the course of a disposition activity when the hazardous condition being controlled is no longer present, the hazardous substances are no longer present, the substance's form has changed to a less dispersible form, or the quantity of substance has been reduced to a level where the consequences of potential exposure no longer present a concern.
	Establishment of safety controls considers uncertainties in material inventories or hazardous conditions and uses conservative assumptions in designating controls.
3.3.3 Uncertainties in Material Inventory Estimates or Facility Conditions	
	Hold points are established for conducting characterization or additional analysis to determine if the condition warrants establishing or changing a safety control.

	Assumptions pertaining to location, forms, or quantities of hazardous substances are sufficiently conservative to ensure that safety is not compromised before or during characterization activities.
3.3.4 Hazard Baseline Documentation	
	Hazard baseline documentation is prepared in accordance with the *Standard's* expectations for nuclear, radiological, and non-nuclear facilities and is used in conjunction with the project plan to authorize disposition activities.
	Hazard baseline documentation clearly reflects disposition work scope and anticipated hazards and their associated controls, including safety equipment functional and performance requirements, as well as administrative controls and programmatic commitments.
	For decommissioning projects, hazard baseline documentation is integrated with CERCLA non-time-critical removal action documentation, where applicable, and is used as the basis for satisfying both sets of safety requirements.
	Approval of the hazard baseline documents has been secured consistent with designated Program Secretarial Officer's delegation of authority protocols as well as site protocols.
	The hazard baseline documents clearly identify stakeholder and regulatory commitments.
	Information needed to be included in worker training related to controls, commitments, or operating limits has been clearly documented and transferred to the person or organization responsible for creating the training module(s).
	Changes and revisions to task scope or hazard baseline documents are documented and approved by appropriate levels of contractor and DOE management and reflected in the integrated hazard analysis.
3.3.5 Assessing the Adequacy of Existing Hazard Baseline Documentation	
	Hazard baseline documentation that exists from facility operations or previous disposition phase is evaluated and can be used only when the following information is provided: (1) a description of the site and location, including current facility and site boundaries; (2) design criteria for those safety structures, systems, or components (for nuclear facilities, safety class and safety-significant equipment are defined by DOE-STD-3009-94) needed to support safe facility disposition work; (3) normal and emergency operating procedures based on a hazard analysis that is still representative of planned future work; and (4) operational limitations to address existing facility vulnerabilities.
3.3.6 Environmental Permits	
	For deactivation or long-term S&M projects, the need for required environmental permits (e.g., RCRA and CAA) has been determined and the needed permits have been obtained and mechanisms are in place to ensure that the work complies with the permit provisions.

	For decommissioning projects, the need for required environmental permits (e.g., RCRA and CAA) has been determined and the substantiative aspects of applicable permits have been incorporated into the set of ARARs that are determined for the project.
3.4.1 Evaluating Readiness	
	A readiness evaluation is conducted that ensures all hazards have been identified, S&H requirements have been met, and safety systems and controls are in place and functional.
	Workers are qualified to perform the required task(s) and understand the associated hazards and controls.
	Applicable environmental permits and procedures are in place and controls are operable.
	Work authorization is obtained.
	Verification of the resolution of applicable readiness assessment findings is completed.
3.4.2 Management of Change	
	A change control process should be employed that evaluates changes to work plans, procedures, and effects from unforseen hazards. The process should encompass screening all changes, the evaluation of changes to hazards and controls, verification that the changes are within the existing safety basis, and specification of actions necessary if a change is outside of the safety basis.
	For category 2 or 3 nuclear facilities, tasks are screened against the seven questions defined in DOE 5480.21, Section I.V.2.b, to determine whether they represent a potential USQ.
3.5 Feedback and Evaluation	
	Feedback mechanisms are in place and include monitoring and self-assessment.
	Performance monitoring reflects appropriate and measurable ES&H indicators and measures that encompass integrated safety management activities.
	Self-assessment of the ES&H program is performed periodically and includes an evaluation of both management commitments and worker involvement.
	Procedures, processes, and items that do not meet established requirements are identified, controlled, and corrected. Corrective actions include identifying the causes of problems and preventing recurrences.

Appendix D

Identification of ARARs for Decommissioning Activities

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IDENTIFICATION OF ARARs FOR DECOMMISSIONING ACTIVITIES

Introduction

This appendix provides guidance on how potential ARARs are identified for decommissioning projects. Decommissioning is the last phase of a facility undergoing disposition.

DOE policy specifies performance of decommissioning activities as CERCLA non-time-critical removal actions unless doing so would be inappropriate[1]. One key aspect of the CERCLA[2] process is the identification of potential ARARs. Although compliance with ARARs is a statutory requirement for remedial actions, the National Contingency Policy (NCP) specifies that removal actions will, to the extent practicable, also meet ARARs. This is implemented within DOE in accordance with the DOE/EPA MOU addressing CERCLA (ref. footnote 1) by an Office of Environmental Management Information Sheet entitled, "Decommissioning Under CERCLA."

An ARAR is any standard, requirement, criteria, or limitation (hereinafter referred to as a "requirement") under any Federal environmental law, or any more stringent State requirement under an environmental or facility siting law, that provides protection of human health and of the environment. The identification of ARARs can encompass all aspects of a CERCLA removal action, including the "end state" residual contamination levels, the manner in which the work will be performed, and the wastes generated during the removal action.

Process for Identifying Potential ARARs

When evaluating whether a requirement should be considered as a potential ARAR, the following criteria should be considered:

- The requirement must be promulgated (i.e., put into effect by a formal legal process) under Federal environmental law, or a more stringent State environmental or facility siting law.

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[1] According to a joint U.S. DOE Office of Environmental Management and U.S. EPA policy memorandum,"Policy on Decommissioning Department of Energy Facilities Under CERCLA," May 22, 1995, joint memorandum from Steven A. Herman (EPA), Ellitot P. Laws (EPA), and Thomas P. Grumbly (DOE), to U.S. EPA Regional Offices and U.S. DOE Operations Offices.

[2] The National Oil and Hazardous Substances Pollution Contingency Plan, or NCP (40 CFR 300), is the primary Federal regulation governing the performance of remedial and removal actions under CERCLA.

- The requirement must apply to: (1) the substances that have been or threaten to be released; (2) the action that is to be implemented; or (3) the location of the release or threat of a release into the environment, or the location where the response actions will be taken.

- Any "applicable" requirement must be enforceable, (i.e., DOE or its contractors are subject to some type of enforcement action by not meeting the requirement).

When a promulgated requirement is not "applicable," it may still be a potential ARAR if it is both "relevant and appropriate." A requirement is relevant and appropriate if the following applies:

- The requirement addresses problems or situations that are sufficiently similar (i.e., relevant) to those encountered at the release or potential release site.

- The requirement is well suited (appropriate) to the particular problems or situations presented by the circumstances of the release or potential release.

In order to be considered an ARAR, a requirement must meet both criteria. In general, the potential ARAR status of a particular requirement must be assessed against a number of site-specific factors, including the characteristics of the action, the hazardous substances present at the site, or the physical circumstances of the site. It is possible for only part of a requirement to be both relevant and appropriate in a given case.

Obtaining Permits and Compliance with Other Administrative Requirements of ARARs

The onsite[3] portions of a decommissioning project conducted as a CERCLA Non-Time-Critical Removal Action need only comply with the substantive requirements of ARARs identified for that project. Although there is a waiver of requirements to obtain a permit or to meet other administrative protocols of any

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[3] The *NCP* defines "onsite" as "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action" [*40 CFR* 300.5; 40 *CFR* 400(e)(1)]. In this definition, EPA includes both the surface area and the air above the site, as well as the hydrogeologic contamination beneath the surface, including any groundwater plume. "Areal extent of contamination" or "area of contamination" (AOC) is not the same as "onsite." AOC refers to the areal extent of contiguous contamination. Surrounding contaminated soil and sediments in a stream contaminated by the source, where the contamination is continuous from the source to the sediment, may be considered part of an AOC. However, an AOC does not include any contaminated groundwater or surface water that may be associated with the land-based source nor does the AOC include any adjacent areas necessary for implementation of response activities (55 *FR* 8689, March 8, 1990). Thus, the "onsite" definition is broader than the AOC definition, providing flexibility in situations where implementation of a response action necessitates conducting activities outside of the AOC itself and/or in areas not contiguous to the site [EPA Memorandum, "ARARs Explained in Twelve Pages," Office of Solid Waste and Emergency Response (July 29, 1992)].

ARARs identified for onsite portions of CERCLA projects, these actions must still meet the substantive aspects that such an environmental permit or an administrative protocol may impose. Examples of substantive requirements include incinerator standards; emissions limits (e.g., radionuclide NESHAP); design standards (e.g., RCRA minimum technology requirements for double liners and leachate collection systems).[4]

Compliance with DOE Orders for Decommissioning Actions Performed Under CERCLA: Are DOE Orders "ARARs" Or Are They "To Be Considered"?

Nonpromulgated advisories, criteria, guidance, or proposed standards issued by Federal or State government are generally referred to as "To Be Considered (TBC) information" for CERCLA actions. So-called TBCs are not ARAR because they are not promulgated under Federal or State law. TBCs usually fall into one of three categories:

- Health-effects information with a high degree of credibility (e.g., SDWA Health Advisories, Reference Doses, and Potency Factors).
- Technical information on how to perform or evaluate response actions (e.g., RCRA guidance on designing caps for closure).
- Policy documents (e.g., Groundwater Classification Guidelines).

Decommissioning project managers should note that the DOE Orders are not ARARs because the Orders themselves are not promulgated. However, DOE Orders are specified as contractual commitments and as such are contractually binding. The distinction between substantive and administrative requirements, for ARAR identification purposes, does not apply to DOE requirements (i.e., if a set of DOE Orders are part of the contract, then all aspects of the DOE Orders must be complied with, including administrative requirements, unless waivers and/or exemptions are granted by DOE).[5]

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[4] For determination of administrative versus substantive ARARs, reporting of environmental monitoring requirements that are normally considered "administrative" are not waived. This is because such requirements pertain to the facility where the CERCLA removal action takes place rather than to the specific CERCLA action itself.

[5] It is important to note that from the perspective of stakeholders and regulators the DOE Orders may be considered as TBC information. Further, a regulator may have come to regard DOE Orders as TBC because an EPA guidance document (Ref. 2) identifies DOE Orders as TBC. This EPA guide also contains a standard disclaimer stating that the document is guidance for EPA personnel.

Additional Information

Additional information relating to the identification of ARARs for decommissioning activities can be found in the following :

- DOE/OEG (CERCLA)-005/1091, "Compendium of CERCLA ARARs Fact Sheets and Directives," October 1991.
- EPA/540/G-89/006, "CERCLA Compliance with Other Environmental Laws Manual" (Interim Final), August 1988.

Appendix E

ES&H Considerations for Facility Disposition by Privatization

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ES&H CONSIDERATIONS FOR FACILITY DISPOSITION BY PRIVATIZATION

Introduction

The purpose of this appendix is to discuss the ES&H considerations when DOE determines that it is in their best interest to dispose of facilities through privatization.

Overview of Privatization Process

The importance of ES&H considerations when privatizing DOE facilities is stated within Principle 6 of the DOE Privatization Working Group report, "Harnessing the Market: The Opportunities and Challenges of Privatization" as follows:

"Environment, safety, and health responsibilities must be addressed. The Department must ensure that the safety and health of workers and the public, as well as the protection and restoration of the environment, are fully addressed when it undertakes privatization efforts."

The goal of privatization is to remove DOE from those activities that are not inherently governmental functions or core business lines, improve the management of remaining activities, reduce the cost of DOE doing business, and shift greater performance and financial risk to the private sector. Privatization initiatives can be divided into the following categories:

- Divestiture of functions (eliminating from the Department those functions that do not require a Federal role).
- Contracting out (M&O contractors subcontracting out specific tasks or the Department directly contracting for services previously provided by Federal employees or M&O contractors).
- Asset transfers (the sale or other transfer of real property or personal property, such as the sale of precious metals in DOE's inventory).

ES&H Considerations

A safe and effective privatization depends on a thorough characterization of hazards and the communication of this information to private sector companies being considered for the privatization effort. Prior to transitioning a facility to the private sector, DOE should ensure that: (1) any remaining hazards are identified through radiological and industrial hygiene surveys (chemical, physical, and biological) on

residual hazardous substance contamination; (2) their risks are well understood, including both prompt and latent consequences; (3) the technical basis of safety systems relied on to prevent or mitigate consequences from hazards are well understood and documented; (4) the vulnerabilities from remaining hazards as well as the potential risks from these hazards are identified; and (5) the above information as well as site emergency response information is communicated to the private sector management and workers.

Furthermore, DOE must identify the roles, jurisdiction, and relationships of both DOE, external regulators (e.g., EPA, OSHA), State and local governments, and private sector occupants (including subcontractors), as well as those of external regulators. The following checklist provides a quick reference of minimum considerations that should be integrated into privatization activities:

- Leases and subleases adequately define DOE, external regulators (e.g., EPA, OSHA), State and local governments, responsibilities and authorities, specific ES&H requirements, line management oversight authorities, and accountability for lessee ES&H performance.

- Mechanisms are in place to maintain current hazard controls when lessees use hazardous substances and chemicals. Mechanisms are in place to communicate to facilities or spaces within a shared facility any changes to hazardous substance inventories and physical forms that may impact these facilities or spaces.

- Legacy hazards are identified, controlled, and monitored in facilities or spaces within a facility that are being turned over for private sector use. The private sector occupants understand the risks of these legacy hazards prior to assuming management or ownership of these facilities or spaces.

- Mechanisms are in place (e.g, training, postings, etc.) to identify to private sector workers buildings that are not released for unrestricted use.

- If private sector workers are subject to DOE ES&H requirements, mechanisms are in place to ensure adequate training and verification of compliance with these requirements.

- Determine whether private sector workers are collocated workers or members of the public when they occupy facilities or spaces within facilities.

- Determine whether only private sector workers are allowed access to spaces that have been adequately deactivated and decontaminated for unrestricted use.

- Lessees are required to report incidents or accidents on the DOE Occurrence Reporting and Processing System (ORPS).

- Mechanisms are in place to assign responsibility for cleanup of materials, such as hazardous solvents and chemicals, that are used in conjunction with commercial activities conducted on government property.

- Mechanisms are in place to monitor products produced by lessees in facilities that have not been fully decontaminated to ensure that potentially contaminated materials do not leave the facility.

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Appendix F

Overview of the Work Smart Standards (WSS) Process

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THE WORK SMART STANDARDS APPROACH TO FACILITY DISPOSITION

Introduction

The purpose of this Appendix is to provide an overview of the Work Smart Standards (WSS) process for developing a necessary and sufficient set of standards. The WSS approach is used to reach agreement between the DOE and its contractors pertaining to the standards to be followed for performing 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.* It is important to note that the Work Smart process does not provide for exemption from statutory requirements.

"Work Smart" is consistent with the seven principles of Integrated Safety Management (ISM) and includes the first three ISM functions—define work, analyze hazards, and develop/implement controls. At a number of DOE sites, Work Smart has been chosen as the preferred approach to identifying standards and initiating ISM implementation. It is a bottom-up approach that involves DOE and the contractor personnel who actually perform the work, along with relevant stakeholders, as members of multidisciplined teams. These teams, with guidance and direction from management, perform the technical analysis of the work and hazards, then select the standards needed to control the work. These standards are then confirmed by an independent group (often including external experts from industry and academia) and approved by DOE and contractor management.

The process objectives discussed below include: (1) defining the work and hazards; (2) creating the team(s); (3) defining and agreeing to protocols and documentation for the team(s); (4) identifying the necessary and sufficient set of standards; (5) confirming the set of standards; and (6) approving the standards and authorizing their use.

Objective: Define the Work and Hazards to Which the Standards Apply

Clearly defining the work performance expectations, work environment, and associated hazards (with the corresponding uncertainties) is critical to identifying the applicable set of standards. Defining the work and hazards involved provides an opportunity to determine if the hazards can be reduced or eliminated by using alternate approaches or work methods. Tailoring the set of standards to the work and hazards ensures that the desired level of protection is efficiently achieved.

Implementation of this objective is achieved through the use of a Convened Group, a multidisciplined group of individuals and stakeholders, and a process leader. The Convened Group serves as the steering group for the performance of the process and is selected from the lowest level of management responsible for managing the resources and the work affected by the set of standards. Members must be empowered to make the necessary commitments for the organizations that they represent. The Convened Group is responsible for designating the Identification Team, the Conformation Team, and the Approval Authority. The process leader is responsible for acquiring information related to the work, organizing the information on an initial basis, and reevaluating the work definition (on the basis of feedback received during the process).

Objective: Create Team(s) to Identify a Set of Standards and Confirm Both the Set's Adequacy and Feasibility

The identification of the set of standards and its confirmation for use are based on the judgement of subject matter experts and stakeholders. Teams are formed to establish that the set of standards are adequate and the set provides a basis for adequate protection. The level of formality and independence of the confirmation process depend on the nature, complexity, hazards, and uncertainties involved with performing work activities. Criteria for selecting team members and the specific qualification for members of both the Identification and Confirmation Teams also relate to the nature, complexity, hazards, and uncertainties involved with performing work activities. Due to statutory limitations, only DOE/Federal employees and DOE contractor and subcontractor employees may be used on the Identification and Confirmation teams.

The Convened Group is responsible for implementing this objective by developing the specifications and specific qualifications of the Identification and Confirmation teams and by assuring the availability of identified personnel.

Objective: Establish Protocols, Agreements, and Documents for a Credible and Efficient Process

To a great extent, the formality and extent of documentation depend on the nature and complexity of the work activities to be performed, the potential impact of the identified hazards and related uncertainties potentially encountered during the performance of the work, and the quality and rigor to ensure that the identified standards will meet the performance expectations and successfully accomplish the work to be performed.

The Convened Group is responsible both for establishing the process protocols and agreements and the required level of documentation. The process leader is responsible for establishing the detailed team protocols, including the roles and responsibilities of team members; orienting the team members on the process; developing procedures and management plans; resolving team comments; and acting as the point-of-contact with organizations outside of the process.

Objective: Identify and Reach Consensus on the Proposed Set of Standards

The Identification Team is responsible for identifying a set of standards necessary for the work and sufficient to protect the public, workers, and the environment based on the team's collective experience. The primary responsibilities of the team include identifying any additional information needed to define the work, evaluating sources of standards, and determining which standards constitute a necessary and sufficient set. The team is also responsible for identifying team assumptions used in identifying the set, identifying statutes and implementation regulations that are required to be included (but do not add value), providing a justification for the development of future exemptions, and reaching consensus on the proposed set of standards. Where it is not possible to agree upon a set of standards, the team must recommend changes to the work or standards that would allow a necessary and sufficient set to be identified. The Identification Team is also responsible for documenting the agreed-upon set of standards, supplying justification for their choices, identifying and implementing assumptions, and providing justifications to support exemptions, where appropriate.

Objective: Confirm the Adequacy and Sufficiency of the Proposed Set of Standards

The Confirmation Team is responsible for reviewing the set of standards and other supporting documentation, determining if the proposed set of standards is both adequate and feasible and the requisite documentation is sufficient, and documenting the confirmation activities and the results.

Objective: To Accept the Level of Protection Provided by Implementation of the Set of Standards and to Authorize the Use of the Set of Standards, Subject to Implementation Assumptions

Approval constitutes both agreement with the set of standards proposed and acceptance of the level of protection provided by the standards. The approval also signifies that there is an organizational commitment to provide or seek the requisite resources to implement the proposed set of standards. The Approval Authority previously identified by the Convened Group is responsible for determining whether the process was correctly implemented and documented (in accordance with established protocols), whether

the Identification Team has chosen and justified a sufficient set of standards, and whether the Confirmation Team has confirmed the feasibility and adequacy of the standards. The Approval Authority then determines the adequacy of the standards and informs the Convened Group of its decision.

Appendix G

DOE Office of Nuclear Safety Policy and Standards Guidance Memoranda

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Introduction

The purpose of this Appendix is to provide copies of DOE Office of Nuclear Safety Policy and Standards Memoranda that support some of the information contained in Volume 1. The following memoranda are included:

- EH to EM memorandum, *Hazard Categorization for Environmental Management Activities Related to Stabilization, Deactivation, Decontamination and Decommissioning, and Environmental Restoration,* June 9, 1997.

- EH to Distribution memorandum, *General DOE Information about Natural Phenomena Hazard Development and Implementation of Executive Order 12941*, September 7, 1997.

DOE F 1325.8
(08-93)

United States Government **Department of Energy**

memorandum

DATE: June 9, 1997

REPLY TO
ATTN OF: Office of Nuclear Safety Policy and Standards:R. Englehart:301-903-3718

SUBJECT: Hazard Categorization for Environmental Management Activities Related to Stabilization, Deactivation, Decontamination and Decommissioning, and Environmental Restoration

TO: John Psaras, EM-4

On April 24, 1997, at a meeting on the subject item, it was agreed that EH would prepare a paper that defines nuclear safety authorization basis requirements for environmental restoration-type activities. The attached Interpretation was prepared in response to that commitment. It was reviewed by members of your staff and clarification have been included in response to those comments.

Original signed by:

Richard L. Black, Director
Office of Nuclear Safety
Policy and Standards

Attachment

cc: J. Tseng, EM-4

I. Spickler, EM-4

R. Stark, EH-31

Attachment

1. Alternatives for Decommissioning Authorization Basis

Many facilities undergoing the decommissioning phase of facility disposition may have radionuclide inventories that exceed the DOE-STD-1027-92 threshold quantities for Category 3 nuclear facilities. However, the form of the radionuclide material inventories is either activated metals or fixed contamination (i.e., non-dispersible and hazardous only to workers). 29 CFR 1910.120, HAZWOPER, is applicable to these situations and requires a hazards management process (identification, analysis and establishment of controls) and preparation of a Health and Safety Plan for worker protection. For this type of facility disposition condition, are DOE Order 5480.23 requirements applicable for establishing an acceptable authorization basis? What are the criteria that would permit this approach?

DOE has decided that certain Environmental Restoration Activities which involve quantities of nuclear materials that meet or exceed the threshold for Category 3 hazard nuclear facilities as determined in accordance with DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," may use alternative requirements in lieu of the safety management requirements of the nuclear safety Orders (SAR, TSR, USQ, Training and Certification, Conduct of Operations, and Maintenance Management). However, the alternative requirements only apply to Environmental Restoration Activities that either (1) do not involve work within permanent structures, or (2) involve decommissioning activities on facilities with only low level residual fixed radioactivity that remains following reasonable removal of radioactive systems, components, and stored materials and which do not require the use of existing, operating, mechanically-driven, safety systems or components designed to prevent or mitigate the accidental release of hazardous radioactive materials.

Provided the activities meet either of the above two criteria, contractors may follow requirements in 29 CFR 1910.120 and 29 CFR 1926.65 to develop and implement a Safety and Health Program and a site-specific Safety and Health Plan which include elements for emergency response plans, conduct of operations, training and qualifications, and maintenance management in lieu of the above mentioned nuclear safety Order requirements (or as superseded by rules). If a contractor chooses this alternative, it must also implement:

(1) the Quality Assurance requirements of 10 CFR 830.120; and

(2) the Occurrence Reporting and Processing of Operations Management requirements of DOE Order 232.1 (or as superseded by the ORPS rule).

If this alternative is chosen, the documents required under the aforementioned regulations shall be submitted to the Department for review and approval before such work can begin.

For decommissioning projects which do not meet the criteria in the first paragraph, full compliance with DOE Order 5480.23 may be achieved for work associated with decommissioning, after deactivation, and excluding treatment, storage, or disposal, by the following: (1) complying with 29

CFR 1910.120 and 29 CFR 1926.65 requirements for Safety and Health Programs, Work Plans, Health and Safety Plans (HASPs) and Emergency Response Plans; (2) deriving Technical Safety Requirements (TSRs); and (3) addressing public safety, as well as worker safety, in the Safety and Health Program, Work Plans, HASPs, and Emergency Response Plans. 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 documents discussed above shall also be used in lieu of the SAR when meeting other requirements. The TSR, USQ, Training and Certification, Conduct of Operations, and Maintenance Management Orders are not modified by this paragraph.

2. Use of BIOs for Life of Facility Disposition Project

At present, Basis for Interim Operation (BIO) documentation may be used as sufficient documentation as the authorization basis for nuclear facilities for a period of two years. (Ref: Memorandum: Black to Scott, 1/9/94). Can a BIO be used for the duration of the facility disposition project? A project can consist of deactivation, long-term surveillance and maintenance, or decommissioning phases. Some projects may go directly from deactivation to decommissioning. If so, what are the criteria that need to be met, so that a BIO can be used for longer periods of time?

A Cognizant Secretarial Officer (CSO) has the authority to approve an Implementation Plan for DOE Order 5480.23 that includes a provision for not proceeding to an upgraded SAR for a facility in its current operating mode on the basis that the facility will be shut down or the operational mode changed within a short time. The BIO provided with the Implementation Plan should be applicable to the operational mode the facility will be in over the remaining time it is expected to be effective. The rationale for such an approval would be that completing a SAR and the review and approval process would take a significant portion of the remaining life of the current facility operating mode and that upgrade efforts would be better focused on the next planned operating mode. The referenced memorandum was not intended to limit the life of a BIO to two years, but the basis for not proceeding to an upgraded SAR should be presented in the Implementation Plan and it should reflect a plan for developing the Authorization Basis for the follow-on mode of operation.

The SAR for a facility going directly from the production mode of operation to the deactivation mode may be applicable to deactivation activities. This is because operations typical of deactivation, such as draining tanks and pipes, can also be expected to have been accomplished during maintenance activities during production mode operations, and therefore within the production mode authorization basis. Activities outside the authorization basis involved with deactivation could be handled using the USQ process.

However, a nuclear facility entering into an extended period of surveillance and maintenance mode of operations (without accomplishing deactivation to the degree that the alternatives for an authorization basis discussed in issue #1 would be applicable) should enter into a SAR upgrade effort for that mode. A production mode SAR or BIO would not be appropriate for the surveillance and maintenance mode. Because the surveillance and maintenance mode or operations would normally be expected to be much less complex than the production mode, application of the graded approach would permit a fairly easy to accomplish SAR, especially for a facility that could be justified to be a Category 3

nuclear facility upon final categorization. A Category 3 SAR consists of 1) description of facility and safety systems, 2) hazard analysis, and 3) derivation of TSRs. In addition to providing assurance that surveillance and maintenance activities are conducted safely, other objectives of the SAR should be to document the status of the facility as it enters the S&M mode and to provide the controls which would assure that the status would not degrade over time, that materials are safely stored, and new hazards are not introduced. These objectives are for the purpose of preserving the information on facility hazards that eventual decontamination and decommissioning will need to address and to prevent new hazards from arising which might complicate ultimate D&D.

3. Inactivation of SARs/BIOs During Facility Deactivation

Facility disposition of a nuclear facility may involve rapid reductions in dispersible radiological inventory, especially in the deactivation phase. In many cases, dispersible materials are reduced below DOE-STD-1027-92 threshold quantities well before the project is completed. Since the authorization basis documentation required by DOE 5480.23 would no longer be applicable in this situation, there is an opportunity to adjust the facility hazard categorization and authorization basis documentation to more represent the revised inventory. This adjustment presently would entail the use of annual updates which may not provide the most expeditious and cost-effective manner for inactivating the SAR/BIO. It would be preferable to permit the use of project hold point negotiated with DOE that allow adjustments to occur as material reduction milestones are achieved. Such milestones would still require verification, but would provide an option to formal review and approval process. Is such a method considered acceptable under DOE 5480.23?

Deactivation plans and the Authorization Basis for deactivation operations should identify the milestone to be reached when removal of inventory would result in a below Category 3 designation. The plan should also show that a request for recategorization would be submitted to DOE at that time. Such a request should provide the information detailing the current inventory and specifying the safety management plan for continuing operations, in the absence of SAR, TSR, and USQ Order applicability. Approval of the plan by the CSO would indicate that the method outlined would be acceptable to DOE. Recategorization, based on inventory alone (compared to DOE-STD-1027 Category 3 thresholds), need not be delayed to an annual update of the nuclear safety authorization basis.

4. Alternatives to SAR Preparation for Transmitting Final Hazard Categorization

DOE-STD-1027-92 refers to the use of both preliminary and final hazard categorization. Consistent with DOE 5480.23, a final hazard categorization is transmitted as a component of a SAR, and therefore could conceivably involve preparation of a SAR for a facility whose final hazard categorization is below Hazard Category 3. In cases where a facility's final hazard categorization is below Category

3 based on the performance of a hazards analysis, are there mechanisms other than a SAR that are acceptable for transmitting and approving a final hazard categorization?

A SAR is the appropriate vehicle for providing the basis that a facility is below Category 3 thresholds where the recategorization is based on safety analyses rather than radionuclide inventory. Once it becomes apparent that the safety analysis will support such a recategorization, the SAR would be essentially the same information that would be required to substantiate any other method which would result in DOE's approval. That is, the SAR would contain 1) a description of the facility and safety systems, 2) the hazards analysis, and 3) a derivation of TSRs. The derivation of TSRs in accordance with DOE Order 5480.22 would be an empty set for a below Category 3 facility. Upon approval by DOE, the SAR would be redesignated as an auditable safety analysis and would support a replacement safety management system (under DOE P 450.4, Safety Management System Policy, and 48 CFR 970.5204-2 which is found in the Department of Energy's Acquisition Regulations) that could be expected to implement control requirements for non-nuclear hazards as well as assuring inventory control on nuclear materials.

5. Final Hazard Categorization Determination

Can a facility-specific accident analysis be used for the purpose of final hazard categorization showing a less than Category 3 Category?

Attachment 1 to DOE Order 5480.23, on page 46 in paragraph (6)(b), provides that "A conservative, deterministic accident analysis must be performed for hazard classification purposes. It need be no more sophisticated and cover no more scenarios than necessary to identify the hazard classification of the facility." For an analysis intended to demonstrate that a final categorization for the facility would be below Category 3, the analysis would be for an unmitigated release, with consequences determined that could be compared to the Category 3 threshold of "The hazard analysis shows the potential for only significant localized consequences." This should be interpreted to mean in-facility personnel as the potentially affected population.

DOE F 1325.8
(08-93)

United States Government **Department of Energy**

memorandum

DATE: September 2, 1997

REPLY TO
ATTN OF: Office of Nuclear Safety Policy and Standards:H. Chander:301-903-6681

SUBJECT: General DOE Information About Natural Phenomena Hazards Development and Implementation of Executive Order 12941

TO: Distribution

This update is about recent developments in the field of Natural Phenomena Hazards at the Department of Energy. Some items are for action and others are of particular interest as discussed below:

I. GENERAL

Status of DOE Orders, Implementation Guides, and Standards

DOE O 420.1 has replaced DOE Order 5480.28 unless the requirements of the preceding Order are to be met contractually.

DOE 420.1G-Y is still a draft guide but it is approved for interim use. As per DOE O 420.1 alternate methodologies are acceptable if fully justified. This guide can be downloaded through the EH-home page/services/draft directives 400 series.

The associated DOE-STDs 1020, 1021, 1022, and 1023 were updated (change Notice #1) in 1996 though the covers still show the original date. These are also available on the internet (http://www.doe.gov/html/techstds/standard/standard.html).

An effort is underway to get these standards converted to national consensus standards but this will take two to three years.

Tornado Hazards Assessment

A workshop of experts in the field of tornado hazard assessment was conducted in Gaithersburg, Maryland in May 1997 under the aegis of the Defense Program. The DOE tornado hazard assessment criteria were reviewed and compared with other models available in the industry. Lawrence Livermore National Laboratory is reviewing the recommendations of the experts to assess whether any changes are necessary in DOE criteria.

Seismic Instrumentation

U.S. Geological Survey has been strongly advocating to FEMA and NIST about the need for seismic instrumentation at all federal buildings. DOE O 420.1 requires such instrumentation in all DOE facilities with hazardous materials. It is also recommended for high occupancy areas in high seismic zones. DOE presently lacks an inventory of all DOE buildings that do have seismic instrumentation. I will appreciate hearing from you with this information about the DOE buildings and the number, location, and type of seismic instrumentation. Please e-mail the information to me at harish.chander@eh.doe.gov.

Sixth U.S. National Conference on Earthquake Engineering

This conference will be held in Seattle, Washington from May 31 to June 4, 1998 under the aegis of EERI. DOE is co-sponsoring and you are requested to give your support by participating, if possible.

Existing Facilities Pilot Project

A task force consisting of participants from various laboratories and DOE sites is reviewing DOE seismic evaluation procedures for existing DOE facilities. This effort is currently in progress and recommendations are expected in 1998, barring any funding constraints.

1997 NEHRP Provisions and Rehabilitation Guidelines

These are still undergoing balloting and the documents are due to be published by the end of this year, with the new design maps. Rehabilitation guidelines will address existing buildings in accordance with the new FEMA 273/274.

FEMA has undertaken a case studies project to review seismic designs of selected existing buildings. DOE has nominated five buildings for this project and the evaluations will be done by FEMA at no cost to DOE.

U.S./Japan Panel on Wind and Seismic Effects

The next meeting of the Panel will be held in May 1998 in Gaithersburg, Maryland. If you have a paper to submit or any unique information, please inform me at your earliest convenience.

Certification of Leased Buildings

NIST is preparing a certification form for use by owners of buildings leased to DOE to provide information that certifies seismic safety of buildings to be leased (or lease renewals). As soon as this is finalized, it will be transmitted.

II. IMPLEMENTATION OF EXECUTIVE ORDER 12941

INVENTORY PHASE

- Thanks to cooperation from headquarters and all DOE sites, inventory phase is 95 percent complete and the interim report transmitted to NIST and FEMA. Bonneville Power Administration, Fluor Daniel Hanford and Bechtel Hanford, "that are not parts of FIMS," created their own separate databases using Microsoft Access.
- The most recent summary report, dated August 22, 1997, on the completed inventory is enclosed for your review (Attachment A). Please note the various columns in the summary report show a number of entries in the FIMS database in those fields. Some may find this summary report confusing. If sites need further information in this matter, please call me at (301) 903-6681. There are still some stragglers and a few isolated cases that need additional work. Everyone concerned is requested to put forth their best effort to achieve completion.
- In many cases the model building codes and exemption codes are missing and need to be completed.
- Please review your categorization. We have noticed that in one case a telephone booth has been assigned PC4 categorization. Unexpectedly, there are more than 50 PC4s in the DOE complex. This needs further review by all concerned.

Evaluation Phase

- Many sites have started evaluating samples of their nonexempt buildings and some other sites are just starting the effort.
- In case of low seismic areas, inordinate effort does not need to be spent unless the buildings have "high occupancy" or have "hazardous material" including exceptionally high risk buildings and are of model building types MB11, MB12, and MB15. The graded approach may be used for evaluating samples of such buildings.
- LANL methodology of evaluation is on the DP home page (http://www.dp.doe.gov/ctg/seismic/seismic.htm). If there are any questions, please contact Khawaja Akhtar at (301) 903-4452.
- Evaluation of PC3 and PC4 facilities may already have taken place for the SAR upgrade process. If such an evaluation has not taken place, then dynamic analysis need not be done for purposes of this effort. Equivalent static analysis will be acceptable if all variables from PC-1 to PC3/PC4 are accounted for. Please refer to Attachment B for additional guidance in this matter.
- For nonexempt buildings, sample evaluations need to be conducted for each model building types.

- Where site specific seismic hazard information is available, please use site specific values instead of NEHRP values.
- If a building qualifies for seismic adequacy, seismic evaluation of non-structural components can be waived.

Cost Estimation Phase

Please follow FEMA 156 and 157 unless sites have more reliable site specific information. NIST is conducting a workshop on this subject in Gaithersburg on September 11, 1997, and any additional guidance will be transmitted to you.

Individuals are requested not to go through inordinate expense of travel for this workshop as generally the use of FEMA 156 and 157 are going to be stressed.

Changes in Schedule

We have slipped in the optimistic schedule given in the Management Plan. It is anticipated that with inventory phase nearing completion, the evaluation phase can be completed by December 1997 and the cost estimation phase by April 1998. Please note these revised dates, everyone concerned is requested to complete this effort on time.

I would like to hear from you if you have any comments or information needing wider distribution. I can be reached at (301)903-6681 (e-mail: harish.chander@eh.doe.gov).

Harish Chander
Seismic Safety Coordinator
Office of Nuclear Safety
Policy and Standards

Attachment B

Analyses for Implementation of E.O. 12941

The DOE management plan indicates that for PC2 and greater facilities, DOE-STD-1020 should be used for determining acceptance criteria for seismic adequacy. Inherent in STD-1020 is the provision for dynamic analysis for PC3 and greater structures. For the purpose of evaluation and cost estimation of E.O. 12941, the provision for dynamic analysis is not necessary unless the information is being developed for other reasons, such as SAR updating.

Use of Equivalent Static Analysis for E.O. Screening

DOE-STD-1020 Methodology

If STD-1020 methods are followed, the only changes needed are as follows:

Use site-specific seismic hazard data, if available. For UBC, Z_1 = PGA for 10% in 50 years (or 500 yr.), Z_2 = PGA for 1000 year return period, Z_3 = PGA for 1000 or 2000 year return period, and Z_4 = PGA for 5000 or 10,000 year return period. The C factor is just the normalized spectral ordinate.

Demand Calculation		Capacity Calculation
Category	UBC Equation	
PC2	$V=Z_2ICW/R_w$	Load factors or code allowable stresses
PC3	$V=Z_3CW/F_\mu$	Load factor = 1
PC4	$V=1.25Z_4CW/F_\mu$	Load factor = 1

The equations can be applied in a straightforward manner, the PGAs are known and the R_w and F_μ factors are tabulated in STD-1020. The demand and capacities are then compared to determine adequacy.

Subtlety #1 - For existing structures, FEMA 178 allows a reduction in demand depending on the frequency range of the structure. A simple, conservative value would be to use 0.85 times the Z factor.

Subtlety #2 - For sites without site-specific hazard data, an estimate will be needed for the longer return period motions. For PC2, factors are given in STD-1023 to estimate the PGAs (i.e., $Z_2=1.5Z_1$ for Eastern US and $Z_2=1.25Z_1$ for Western US) or the new NEHRP maps may be used to estimate the PGAs. The new NEHRP maps have values for 5% in 50 years (1000 yr return period) and 2% in 50 years (2500 yr. return period)

FEMA 178 Methodology

The equivalent methodology for FEMA 178 would be to substitute the appropriate site-specific A_a values and use the site-specific F_a (soil amplification) values. For Performance Category 2, use an importance factor of 1.25. For higher performance Categories substitute F_μ for R. Since the load factors are close to one, no differentiation is needed for different Pcs.

Use of the LANL Method

Essentially, the LANL Method just simplifies the above by giving across-the-board estimates of F_a and R. However, it should be noted that the R and F_μ values are easily obtained since the building type should be known and it's a direct table look-up. As a default, the following tabular values may be used:

Seismic Demand for DOE Sites with no recent Site-Specific Seismic Hazard Studies available

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
Aa	< 0.05	0.05	0.10	0.15	0.20	0.30	0.40
Fa	1.0	1.6	1.6	1.4	1.4	1.2	1.1
Rd	1.25	1.25	2.0	2.0	2.5	2.5	2.5
PC-1 Cs	0.09	0.14	0.17	0.22	0.24	0.31	0.37
PC-2 Cs	0.13	0.21	0.26	0.33	0.36	0.39	0.47
PC-3 Cs	0.24	0.38	0.46	0.60	0.65	0.62	0.74

NOTES: 1) While using "LANL Method" to evaluate buildings for compliance with the E. O. 12941, the Cs values for PC-1, PC-2, PC-3 shown above are to be used to compute the seismic base shear demand **V= Cs Wi** --where

Cs = $0.85 \left[\frac{2.5\ Ca}{Rd}\right] = 2.125 \frac{Aa \times Fa}{Rd}$ And **Wi** = Total Building Weight at the base

2) The values of Fa are based on FEMA 222A (assuming NEHRP Soil Profile Type D). For Soil Profile Types E and F, the Fa values need to be determined based on site-specific investigations.

3) The dynamic analysis as required by the DOE-STD-1020-94 (Change Notice # 1) for PC-3 structures can be waived, if the Cs values as shown above for PC-3 are used to compute seismic base shear demand.

4) The Cs values for PC-2 are 1.5 x PC-1 values for NEHRP Zones 1 through 5 and are 1.25 x PC-1 values for NEHRP Zones 6 and 7. This is consistent with guidance available in DOE-STD-1023-95 (Change Notice # 1).

5) The Cs values for PC-3 are 2.7 x PC-1 values for NEHRP Zones 1 through 5 and are 2 x PC-1 values for NEHRP Zones 6 and 7 [For justification of these values see below].

6) Although, Rw varies from 4 to 12, and F varies from 1 to 3, it is very important to remember that a default value of Rd ranging from 1.25 for NEHRP Zones 1 and 2, to a value of 2.5 for NEHRP Zones 5, 6 and 7 has been used.

Justification

- For the **West Coast** where the input ground motions are same for both PC-2 and PC-3 categories, the relative difference in design is as illustrated below:

  PC-2 — 1.25 greater load, divided by Rd of 2.5 = relative demand = 1.25/2.5 = 0.5

  With conservatism in capacity of 0.8. Relative reliability = 0.5/ 0.8 = 0.625

  PC-3 — Load divided by F of 1.25 (conservatively used for Zones 1 thru 7), no conservatism in capacity,

  Relative reliability = 1/1.25 = 0.8

  DIFFERENCE IN DESIGN = 0.8/0.625 = 1.28

  Therefore PC-3 structure is designed to the equivalent of 1.28 times the load for a PC-2

  However PC-2 = 1.5 x PC1. Therefore **PC-3** = 1.28 x 1.5 PC-1 = **1.92 PC -1**

  CONCLUSION: The Cs values shown in Table -1 for PC-3 are 2 x PC-1, which is > 1.92 PC-1 --- **Therefore OK**

- For the **East Coast** the input ground motions for PC-3 are 1.4 x PC-2 {Maximum at Paducah based on previous version of DOE-STD-1020}

  Therefore PC-3 = (1.28 x 1.4) times the load for PC-2

  However, PC-2 = 1.5 PC-1. Therefore **PC-3** = [1.28 x 1.4 x 1.5] PC-1 = **2.7 PC-1**

Summary Recommendations

a) Compute demand/capacity ratio preferably by using DOE-1020 method (dynamic analysis not mandatory), especially for PC-2, PC-3, and PC-4 structures.

b) The hierarchy for choosing Peak Ground Acceleration values should be as follows:

Recent site-specific PGA values.
Site-specific PGA values, even if these are not recently computed.
Most recent NEHRP mapping
Existing Code zone values
Estimated values based on hazard curve slope

c) The LANL method is most appropriate for PC-1 and -2 buildings, and when soil and building type data are not readily available. However, it can be used for PC3 by using values in the above table if the field offices want to use LANL method.

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Appendix H

Hazard Analysis Techniques

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HAZARD ANALYSIS TECHNIQUES

This appendix provides a listing of hazard analysis techniques that may be used to support facility disposition activities. For each technique listed, the purpose and application, as well as a reference to additional information for each technique, are provided. The techniques referenced in this appendix should be selected based on the hazards and work scope of the disposition activity.

Hazard Analysis Technique	Purpose/Application	Ref.
Change Analysis	The identification and evaluation of hazards that may result from changes made in the workplace. Usually undertaken whenever a change in facilities, processes, procedures, or staff is proposed. This method is often combined with a variant of task hazard analysis to assess hazards for preparation of work packages.	All
Failure Modes and Effect Analysis (FMEA)	An analysis of each component for its potential modes of failure, effects of failure, and detection methods. May be undertaken before initiating operations or during operations.	1, 2, 10
Fault Tree Analysis (FTA)	An analysis tool that uses deductive reasoning and graphical diagrams showing logic of the deductive reasoning process to understand how a particular failure can occur.	1, 2, 4, 10
Event Tree Analysis	An analysis tool that uses inductive logic, depicted graphically, to show the potential sequences of events that follow the initiation of an accident. This sequence includes both successes and failures of functions and/or systems.	1
Hazard and Operability Study (HAZOP)	A critical assessment of component capabilities and system configurations. Used in the chemical industry, rigor and formality based upon the level of risk of the operation.	1, 2
Task Hazard Analysis	An analysis of each step in a job activity that is undertaken before initiating work activities to identify needed controls or after incidents to identify needed improvements in controls. Variants of this technique are often used in evaluating hazards associated with work packages or for walkthroughs of facility to identify conditions or faulty procedure that could lead to accidents, injuries, property damage, or adverse environmental impact.	2, 3, 5, 6, 8, 10
Phase Hazard Analysis	An analysis of potential new hazards because of a new phase of operation or a change in work crew or subcontractor personnel on existing operations. Usually undertaken at the beginning of major phases of work. This is critical for disposition projects.	All
Target-Barrier-Hazard Analysis	An effective technique for assessing the performance capabilities of barriers that are used to control hazards.	7, 9, 10
What-If Checklist Analysis	Involves the development and evaluation of checklists designed to identify hazards quickly and assess their controls. These may be administered to ensure that hazards are identified on tasks that are familiar to workers and previously analyzed.	1, 2

References on Hazard Analysis Techniques

1. Center for Chemical Process Safety of the American Institute of Chemical Engineers, *Guidelines for Hazard Evaluation Procedure,* 1992.
2. System Safety Society, *System Safety Analysis Handbook: A Source Book for Safety Practitioners*, 1993.
3. Occupational Safety and Health Administration, U.S. Department of Labor, *Job Hazard Analysis: A Tool to a Safer, More Healthful Workplace*, 1981.
4. W. Vesely, et al., U.S. Nuclear Regulatory Commission, *Fault Tree Handbook*, NUREG-0492, January 1981.
5. Flour Daniel Hanford, Job Hazard Analysis Computer Software (JHA21), 1997.
6. EG&G Idaho, DOE-76-45/29 (SSDC-19), *Job Safety Analysis*, November 1979.
7. EG&G Idaho, DOE-76-45/29 (SSDC-29), *Barrier Analysis*, July 1985.
8. Occupational Safety and Health Administration, U.S. Department of Labor, *Job Hazard Analysis,* OSHA 3071, 1988 (reprint).
9. Hazard and Barrier Analysis Guidance Document, U.S. Department of Energy, Rev. 0, November, 1996.
10. Worker Protection Management for DOE Federal and Contractor Employees Guide for use with DOE Order 440.1, DOE G 440.1-1, U.S. Department of Energy, July 1997.

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Appendix I

Facility Disposition ES&H Documentation

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FACILITY DISPOSITION ES&H DOCUMENTATION

The purpose of this appendix is to provide a discussion of the ES&H documentation that may be needed for a facility disposition activity. This information is summarized below. A more detailed discussion is provided in sections 3.3.4 and 3.3.6 of Volume 1.

ES&H Documentation

Types of Work	Hazard Baseline Document				Environmental Permits		
	SAR[a]	BIO[b]	HASP[c]	Other[d]	RCRA Permit	CAA Permit	CWA Permit
Deactivation of a category 2 or 3 nuclear facility (Note: Use existing facility SAR or BIO if it adequately addresses deactivation hazards and work activities)	X	X			X	X	X
Deactivation of non-nuclear or radiological facility				X	X	X	X
Long-term S&M of category 2 or 3 nuclear facility	X[e]	X			X	X	X
Long-term S&M of non-nuclear or radiological facility				X	X	X	X
Decommissioning of category 2 or 3 nuclear facility (low level residual fixed radioactivity)			X[f]				
Decommissioning of category 2 or 3 nuclear facility (inventory is not low level residual fixed radioactivity)			X[g]				
Decommissioning of non-nuclear or radiological facility			X				

Note: Work package preparation applies to all types of facility disposition work. RCRA permits, or permits related to the CAA or CWA, may not always be required to perform work. Applicability of these permits need to be considered on a case-by-case basis. Decommissioning activities performed as non-time-critical removal actions need only comply with the substantive aspects of an ARAR, including any applicable permits (see Appendix D).

---

[a] SAR as defined by DOE 5480.23 and DOE-STD-3009-94. For the WSS approach, a suitable equivalent may be substituted for a SAR.

[b] BIO as defined by DOE 5480.23 and DOE-STD-3011-95. For the WSS approach, a suitable equivalent may be substituted for a BIO.

[c] HASP in accordance with 29 CFR 1910.120 or 29 CFR 1926.65.

[d] May range from auditable safety analysis as described in DOE 5481.1B to a simplified hazard checklist.

[e] The SAR should be upgraded for extended periods of S&M (including pre-and-post deactivation). See Section 3.3.4 and Appendix G for further details.

[f] Applicable requirements of 10 CFR 830.120 and DOE O 232.1 should be met as well as the establishment of an inventory control administrative TSR.

[g] HASP with addendum of SAR/BIO information needed to demonstrate that releasable materials have been adequately confined or the consequences adequately mitigated. See Section 3.3.4 and Appendix G for further details.

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Appendix J

Readiness Evaluation Checklist

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READINESS EVALUATION CHECKLIST

This appendix provides a readiness evaluation checklist that can be used to support facility disposition activities and may be used as a starting point for developing a project-specific readiness checklist. The checklist is organized according to the following categories:

- Safety Basis
- Project Plans
- Project Procedures Manuals
- Work Package
- Facility Preparation
- Support Facilities
- Support Equipment Preparation
- Traffic Control
- Industrial Safety and Hygiene
- Radiation Protection
- Environmental Protection
- Emergency Preparedness
- Worker Training, Testing, and Qualification
- Subcontractors
- Management of Change

READINESS CHECKLIST

PROJECT: _____ PROJECT MGR:_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
I. Safety Basis: Confirm that Hazard Baseline Documents are Appropriate, Complete, Reviewed, and Approved by Appropriate Parties			
1. Hazard characterization report			
2. Hazard baseline document (e.g., SAR, BIO, or ASA)			
3. NEPA process (e.g., EIS, EA, or categorical exclusion)			
4. TSRs			
5. Environmental permits (e.g., NPDES/SPDES, NESHAPS, or NAAQS)			
II. Project Plans: Confirm that the Following Project Plans have been Developed, Reviewed, and Approved by Appropriate Parties and are in Place			
1. Project management plan (including project organization with responsibilities, budgets and schedules, project controls program, and reporting requirements)			
2. Health and safety plan (including asbestos abatement)			
3. Quality assurance plan (including records management and retention requirements)			
4. Procurement plan			
5. Waste management plan			
6. Emergency plan (e.g., for fires, releases or injuries)			
7. Final verification plan			
III. Project Procedures Manuals: Confirm that the Following Procedures Manuals have been Developed, Reviewed, and Approved by Appropriate Parties			
1. Engineering procedures manual			
2. Procurement procedures manual			
3. ES&H procedures manual			
a. Personnel exposure control procedures			

READINESS CHECKLIST

PROJECT: _____ **PROJECT MGR:**_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
b. Sampling and monitoring procedures			
c. Instrument calibration procedures			
d. Hazardous substance control (including asbestos controls) procedures			
4. Emergency procedures manual			
a. Evacuation, assembly, and personnel accounting procedures			
b. Medical emergency procedures			
c. Spill and release control procedures			
d. Decontamination procedures			
5. Material control manual (e.g., procured items)			
a. Material inspection and inventory procedures			
b. Material packaging and transport procedures			
c. Material storage and retrieval procedures			
IV. Work Package: Confirm that the Following Documents have been Developed, Reviewed, and Approved by Appropriate Parties. Confirm Support Activities have been Completed and Documented			
1. Work instructions detailing sequence of work			
a. Supporting drawings and specifications			
b. Inspection hold points			
c. Data forms			
d. Task hazard analysis of each work step in instructions			
2. Work permits			
a. Radiological work permits (with current radiological surveys)			
b. Hazardous work permits			
c. Confined space entry permits			

READINESS CHECKLIST

PROJECT: _____ PROJECT MGR:_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
d. Cutting, burning, and welding permits			
e. Excavation and trenching permits			
f. Scaffolding permits			
g. Lifting and rigging permits			
h. Special equipment operating permits			
3. Material safety data sheets for all hazardous substances to be used			
V. Facility Preparation: Confirm the Existence and Adequacy of Facility Support Features (Inspect)			
1. Space requirements			
a. Office space			
b. Restrooms			
c. Change rooms			
d. "Break" facilities			
e. Material laydown and storage space			
f. Packaged waste storage			
g. Flammable material storage			
h. Hazardous chemical storage			
I. Equipment maintenance and storage			
2. Postings			
a. Warning signs per DOE and OSHA requirements (e.g., restricted area, radiological control area, or high voltage)			
b. Evacuation routes			
c. "No smoking" signs			
3. Custodial service (e.g., cleaning and janitorial)			
4. Support utilities			
a. HVAC test complete and results documented			

READINESS CHECKLIST

PROJECT: _____ PROJECT MGR:_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
b. HEPA filter DOP test complete and results documented			
c. Installed lighting			
d. Noise control and abatement			
e. Physical barriers to separate project work from other operations			
f. Utility air			
g. Electrical power			
h. Potable water			
I. Fire water			
j. Sewer			
k. Disposal system for radioactive contaminated fluids			
5. Systems and components to be removed are tagged or identified			
6. Lock and tag requirements are completed and documented in accordance with approved procedures			
7. Breathing air system			
a. Adequate volume			
b. Equipment tested			
c. Air certified			
VI. Support Facilities			
1. Waste processing			
2. Waste packaging			
3. Decontamination (including equipment and personnel)			
4. Medical			
VII. Support Equipment Preparation: Verify the Readiness of Support Equipment (e.g., Inspections, Maintenance, and Testing Logs and Documentation Completed)			
1. Heavy equipment test, inspection, and certification			

READINESS CHECKLIST

PROJECT: _____ **PROJECT MGR:**_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
a. Trucks			
b. Cranes			
c. Bulldozers			
d. Backhoes			
e. Forklifts			
f. Front-end loaders			
2. Waste solidification systems			
3. Volume-reduction equipment			
a. Shredders			
b. Compactors			
4. Decontamination equipment			
a. High-pressure liquid			
b. Liquid abrasive			
c. Dry abrasive			
d. Scabbling, grinding, and chipping			
e. Chemical decontamination equipment or system			
5. Hand and power tools inspect and test			
a. Proper guards			
b. Proper grounding			
6. Lifting and rigging tested and certified			
a. Wire rope			
b. Slings (including rope)			
c. Come-alongs (including block and tackle assemblies)			
d. Shackles			
e. Hooks			
7. Preventive maintenance program in place			

READINESS CHECKLIST

PROJECT: _____ **PROJECT MGR:**_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
VIII. Traffic Control			
1. Loading, unloading, and staging zones designated and posted			
2. Traffic flow patterns established and marked			
a. Equipment			
b. Personnel			
3. Roadways, gates, doors, hallways, corridors, etc. evaluated for heavy or oversized equipment and material movement			
4. Hazardous material transport routing established			
a. Onsite			
b. Offsite			
5. Waste disposal routing established (offsite)			
a. Routing capable of supporting loads			
b. Local officials along the route are involved			
c. Permits obtained			
d. Transport routing, system upgrades, and modifications completed and approved			
6. Onsite escort requirements available (e.g., security and radiation control)			
7. Approved waste packages for radioactive or hazardous substances available			
a. Properly specified			
b. Proper and approved labeling			
IX. Industrial Safety and Hygiene: Ensure the Availability of Adequate Quantities and Functional Adequacy of Worker Protective Equipment and Materials			
1. Personnel protective equipment (PPE)			
a. Hard hats or other head covering			
b. Safety glasses or goggles			

READINESS CHECKLIST

PROJECT: _____ PROJECT MGR:_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
c. Gloves (specific to task)			
d. Safety shoes			
e. Hearing protection			
f. Special PPE for hazardous substance handling			
g. Respirators			
h. Heat stress protection (e.g., air suits and ice vests)			
I Lifting supports			
j. Fall protection devices			
2. First-aid kits			
3. Herbicide and pesticide spray			
4. Air monitors and samplers (with alarms)			
a. Explosive gas			
b. Hazardous chemicals			
c. Asbestos			
X. Radiation Protection: Ensure Availability of Adequate Quantities and Functional Adequacy of Worker Protective Equipment and Materials			
1. Personnel protective equipment (PPE)			
a. Respirators			
b. Breathing air support			
2. Portable radiation detectors			
3. Decontamination supplies			
4. Fixed or stationary monitoring equipment			
a. High-volume air samplers			
b. Constant air monitors (CAM) with alarms			
c. Area radiation monitors (ARM)			
d. Sample counting systems			

READINESS CHECKLIST

PROJECT: _____ **PROJECT MGR:**_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
e. Personnel and equipment frisking stations			
f. Portal monitors			
5. If fissionable material is present, criticality detection and alarm systems are in place, tested, and results documented			
6. Contamination controls in place			
a. Containments			
b. Tents			
c. Barriers			
d. Step-off pads			
e. Laundry hampers			
f. Proper postings			
g. Fixatives			
7. Temporary shielding in place			
XI. Environmental Protection			
1. Environmental surveillance program - required documents are in place with proper approvals			
2. Effluent control (e.g., filtration and water treatment)			
a. All potential effluent discharges identified			
b. Control system(s) adequate for effluent contaminant control			
c. Control system installed and tested with results documented			
3. Effluent monitoring			
a. All potential effluent discharge points identified			
b. Effluent monitors installed and tested with results documented			
c. Sample locations identified and sample systems installed and functionally verified			

READINESS CHECKLIST

PROJECT: _____ PROJECT MGR:_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
XII. Emergency Preparedness: Confirm the Availability and Functioning of the Emergency Preparedness System			
1. Communications			
a. Two-way radios			
b. Pagers			
c. Telephones			
d. Public address (PA) system			
e. Alarms (e.g., fire, radiation, chemical, and criticality)			
2. Fire equipment - in place, functional, and properly labeled			
a. Sprinkler system			
b. Pull boxes			
c. Fire and smoke detectors			
d. Fire extinguishers			
e. Hydrants			
f. Stand pipes			
3. Fire exits clearly marked and unobstructed			
4. Unique fire suppression material (e.g., halon, sand, and foam)			
5. Safety showers, eye wash, and decontamination facilities in place and functional			
6. Emergency breathing air supply (e.g., SCBA)			
7. Emergency supply cabinet fully equipped and readily accessible			
8. Emergency lighting available and operable			
9. Emergency power or UPS available and operable			
XIII. Worker Training, Testing, and Qualification: Verify that Each Worker Has Completed the Following, Been Successfully Tested When Required, and a Record is Available Verifying the Worker's Qualification			

READINESS CHECKLIST

PROJECT: _____ **PROJECT MGR:**_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
1. Basic training completed - all workers			
a. HAZWOPER			
b. Radiological			
2. Supervisor advanced training			
a. Radioactive waste supervisor			
b. HAZWOPER supervisor			
3. Specialized worker training			
a. Heavy equipment operator			
b. Welder			
c. Health physics technician (including radiological controls)			
d. Special D&D equipment operator			
e. Radioactive waste operations			
f. Waste process equipment operator			
g. Plutonium handling			
4. Site-specific hazards indoctrination			
5. Emergency response drills conducted and documented			
6. Medical examination (including fitness requirements)			
7. Respirator and breathing air testing and qualification			
8. Special PPE training and qualification			
9. "Dry-run" or demonstration successfully conducted and documented for any new technology or equipment to be utilized			
10. Mockup training is completed and documented			
11. Work package indoctrination with the workers and walkdowns are completed			
12. Other training as needed (e.g., fire watch, gas-free inspector, and rigger)			

READINESS CHECKLIST

PROJECT: _____ **PROJECT MGR:**_____

	ACTION ASSIGNEE	ACCEPTABLE?	
		Yes	No
XIV. Subcontractors: Ensure that All Subcontractors are Mobilized as Required and All Pre-Job and Mobilization Requirements are Completed			
1. Pre-job deliverables are received and accepted by the project			
a. Health and safety programs and plans			
b. QA plan/program			
c. Worker certifications (e.g., training, medical, special equipment, operator, and resume)			
d. Equipment certifications			
e. Special operating procedures			
2. Subcontractor resources			
a. All required subcontract personnel are onsite and have successfully completed site-specific qualification requirements			
b. All required subcontractor equipment is onsite and has been successfully tested			
c. All required support materials and consumables are staged onsite and available			
XV. Management of Change: Ensure that a Change Control System is in Place and Workers are Familiar with the Requirements			
1. Pre-job meetings to discuss anticipated hazards and hazards controls conducted daily			
2. Lessons learned from work completed			
3. Response to unanticipated conditions of workplace			

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