US ARMY ENVIRONMENTAL CENTER

GUIDE TO ENVIRONMENT, SAFETY, AND OCCUPATIONAL HEALTH COMPLIANCE FOR ARMY WEAPON SYSTEM ACQUISITION

US Army Environmental Center

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The purpose of the guide is to assist Army acquisition managers, support staff, and other program personnel in the identification of ESOH-related regulatory requirements that may potentially affect acquisition programs. Included in the guide are: (1) a review of typical ESOH issues often associated with each of the Army's major categories of weapon systems; (2) a comprehensive summary of those federal, DoD, and Army ESOH-related regulatory requirements common to most acquisition programs, along with those requirements unique to specific weapon system categories; and (3) a list of ESOH-related activities and documentation requirements normally associated with each acquisition life-cycle phase.

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PREFACE

This guide is a living document that is modified, as necessary, to incorporate changes in Federal Legislation, Executive Orders, and DoD and Army policy and guidance. Users are advised to periodically visit the US Army Environmental Center (USAEC) acquisition document website at http://aec.army.mil/usaec/acquisition/documents00.html to determine if a more current version exists.

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ACRONYMS AND ABBREVIATIONS

AAPPSO	US Army Acquisition Pollution Prevention Support Office
ACAT	Acquisition Category
ACC	Acquisition Community Connection
ACSIM	Assistant Chief of Staff for Installation Management
AKSS	AT&L Knowledge Sharing System
AoA	Analysis of Alternatives
AR	Army Regulation
AS	Acquisition Strategy
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics and Technology
ASARC	Army Systems Acquisition Review Council
ATZ	Acceptable Threshold Quantity
CAA	Clean Air Act
CAM	Cost Analysis Manual
CARC	Chemical Agent Resistant Coating
CARD	Cost Analysis Requirements Description
CDD	Capability Development Document
CEQ	Council on Environmental Quality
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
C^3I	Command, Control, Communications, and Information
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPD	Capability Production Document
CPI	Critical Program Information
CRB	Cost Review Board
CRT	Cathode Ray Tube
CWA	Clean Water Act
CX	Categorical Exclusion
DA PAM	Department of the Army Pamphlet
DASA-CE	Deputy Assistant Secretary of the Army for Cost and Economics
DASA (ESOH)	Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health
DAU	Defense Acquisition University
DCMA	Defense Contract Management Agency
DDESB	Department of Defense Explosives Safety Board
DENIX	Defense Environmental Network and Information Exchange
DEW	Directed Energy Weapon
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DOPAA	Description of Proposed Action and Alternatives
DRMS	Defense Reutilization and Marketing Service
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESO	Environmental Support Office
ESOH	Environment, Safety, and Occupational Health
EU	European Union
FAA	Federal Aviation Administration
FGS	Final Governing Standards
FOC	Full Operational Capability
FRP	Full Rate Production
GHz	Gigahertz
HAP	Hazardous Air Pollutant
HC	Hydrocarbon
HHA	Health Hazard Assessment
HHAR	Health Hazard Assessment Report
HMMP	Hazardous Material Management Program
HQDA	Headquarters Department of the Army
HIS	Human Systems Integration
ICAO	International Civil Aviation Organization
ICD	Initial Capabilities Document
IOC	Initial Operational Capability

IOT&E	Initial Operational Test and Evaluation
IPPD	Integrated Product and Process Development
IPT	Integrated Product Team
JG-PP	Joint Group on Pollution Prevention
LCCE	Life-Cycle Cost Estimate
Li/MnO_2	Lithium Manganese Dioxide
LRIP	Low-Rate Initial Production
MACOM	Major Army Command
MANPRINT	Manpower and Personnel Integration
MDA	Missile Defense Authority Milestone Decision Authority
MIL-STD	Military Standard
NAAQS	National Ambient Air Quality Standards
NAS	National Aerospace Standard
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NOV	Notice of Violation
NO_X	Nitrogen Oxide
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
ODASA-CE	Office of the Deputy Assistant Secretary of the Army-Cost and Economics
ODC	Ozone Depleting Chemical
OEBGD	Overseas Environmental Baseline Guidance Document
OEM	Original Equipment Manufacturer
OT&E	Operational Test and Evaluation
Pb	Lead
PESHE	Programmatic Environment, Safety, and Occupational Health Evaluation
PFC	Perfluorocarbon
PM	Program/Project/Product Manager; Particulate Matter
POM	Program Objective Memorandum
PWB	Printed Wiring Board
RCRA	Resource Conservation and Recovery Act
REC	Record of Environmental Consideration
RFP	Request for Proposal
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
SF_6	Sulfur Hexafluoride
SIP	State Implementation Plan
SMMP	System Manpower and Personnel Integration Management Plan
SO_2	Sulfur Dioxide
SO_X	Sulfur Oxide
SOFA	Status-of-Forces Agreement
SSL	Solid-State Laser
SSMP	System Safety Management Plan
TB	Technical Bulletin
TDS	Technology Development Strategy
TEMP	Test and Evaluation Master Plan
USACECOM	US Army Communications–Electronics Command
USACHPPM	US Army Center for Health Promotion and Preventive Medicine
USAEC	US Army Environmental Center
USASMDC	US Army Space and Missile Defense Command
USATCES	US Army Technical Center for Explosives Safety
USC	United States Code
USEPA	US Environmental Protection Agency
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WS	Weapon System

CHAPTER 1.0: INTRODUCTION

Environmental compliance requirements contained in statutes, standards, regulations, and executive orders are an external constraint beyond the control of the Program/Project/Product Manager (PM). Because the materials, processes, and uses of a weapon system may affect the environment, these environmental constraints and requirements may influence system design, modification, testing, production, operation, maintenance, repair, demilitarization, and disposal.

The Department of Defense (DoD) 5000 Series requires PMs and other acquisition managers to identify and consider environment, safety, and occupational health (ESOH) issues early in the acquisition process. The recent update to DoD Instruction 5000.2 *(Operation of the Defense Acquisition System)* specifies that "the PM shall prevent ESOH hazards where possible, and shall manage ESOH hazards where they cannot be avoided."

As with any other system requirement, ESOH requirements and constraints must be identified and communicated to all program activities over the full program life-cycle, from concept refinement to disposal. If ESOH requirements are not integrated into this overall life cycle, the weapon system design will not result in a successful product/system for the Army. Often, ESOH requirements specify actions for the PM: avoiding use of ozone depleting chemicals (ODCs); consultation requirements regarding endangered species or historic properties; requirements for the proper management and disposal of hazardous materials and waste; air and water permits; and a myriad of other requirements. Although such requirements may initially appear costly or difficult early in a program, they can become critical during subsequent operations and maintenance (O&M) and support of the system. Unexpected and often exorbitant disposal costs are common for system issues that could have been better addressed early in the system life cycle (usually in system design). To facilitate compliance and better system decisions, ESOH requirements should be fully evaluated early in the program, and then periodically reevaluated to keep them up to date. In accordance with Department of Defense Instruction (DoDI) 5000.2, the PM must regularly review ESOH compliance requirements and evaluate their impact on the program.

1.1 PURPOSE OF THE GUIDE

This guide can assist Army acquisition managers, support staff, and other program personnel in identifying ESOH-related regulatory requirements relevant to acquisition programs. Guidance on specific ESOH requirements, across the various life-cycle phases, is also included. By identifying those ESOH compliance requirements that will most likely affect the Army acquisition community, and increasing general awareness and understanding of these requirements, this guide will assist PMs and their staffs throughout the acquisition life cycle.

1.2 USE AND ORGANIZATION OF THE GUIDE

This guide applies to all Army acquisition programs and should be used by the program office and ESOH support personnel who plan, manage, and monitor program ESOH compliance efforts. In addition, the program office should use it during the development and update of programmatic ESOH evaluations (PESHEs).[1]

[1] For specific instructions on the preparation of PESHEs, refer to the Army's *Guide to Development of the Programmatic Environmental, Safety, and Occupational Health Evaluation (PESHE)*, which can be accessed at the following US Army Environmental Center (USAEC) web site: http://aec.army.mil/usaec/acquisition/documents00.html .

The guide is organized into six chapters, as follows:

- Chapter 1 provides an introduction to the guide, and lists sources for additional ESOH-related assistance, guidance, and information.
- Chapter 2 provides an overview of the acquisition life cycle.
- Chapter 3 describes typical ESOH issues often associated with each of the Army's major categories of weapon systems. A brief description of each weapon system category (commodity) is also provided.
- Chapter 4 provides a comprehensive summary of those federal, DoD, and Army ESOH-related regulatory requirements common to most acquisition programs, along with those requirements unique to specific weapon system categories. A brief overview of state and local agency, and foreign nation, regulatory requirements is also provided.
- Chapter 5 identifies ESOH-related activities and documentation requirements normally associated with each life cycle phase.
- Chapter 6 lists the references used in the preparation of this guide.

This information is guidance only as the presented regulatory information is not all-inclusive. Consequently, users must refer to identified source documents to obtain detailed explanations of compliance requirements and procedures. In unusual program situations, PMs and ESOH support personnel may be required to address other regulatory requirements that are not covered in this guide.

1.3 SOURCES FOR ADDITIONAL ASSISTANCE, GUIDANCE, AND INFORMATION

Because many acquisition efforts can be complex, identifying and addressing all applicable ESOH regulatory requirements can similarly be difficult. While significant expertise is available to the PM and to members of his/her office from local support organizations [e.g., Major Army Command (MACOM) environmental and safety offices], host installation environmental and safety offices, and systems engineering/technical assistance contractors, further assistance or guidance may become necessary. This section provides a list of sources for additional assistance, guidance, and information in identifying and addressing regulatory compliance requirements and procedures.

Sources for Assistance

- **Environmental Support Office (ESO) of Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA (ALT)), formerly known as AAPPSO.** The mission of the Army Acquisition Pollution Prevention is to promote stewardship within Army weapon system and industrial base. The Environmental Support Office (ESO) (AMCOPS-IEI/SAAL-PE) oversees the A2P3 by reducing constraints on Army operational readiness through integrating environmental considerations into the materiel life cycle. Through policy development, direct acquisition and logistics support, and encouraging technology exploitation, the ESO helps to resolve environmental issues through pollution prevention solutions that protect the soldier and civilian workforce, enables training, and sustains mission readiness.

  Telephone: (703) 806-9242, DSN 656-9242
  Web Information: http://www.environmentalsupportoffice.com/

- **US Army Environmental Center (USAEC).** In helping to implement the Army's Environmental Programs, the USAEC provides a broad range of environmental services (e.g., cleanup, NEPA compliance, and pollution prevention) and products to Headquarters Department of the Army (HQDA), MACOMs, and commanders worldwide. For acquisition programs, the USAEC provides support in several areas, including: (1) support to the Assistant Chief of Staff for Installation Management (ACSIM) and the Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health (DASA (ESOH)) for the ASARC and the Cost Review Boards (CRB); (2) membership on the IPTs of pertinent PMs whose systems or commodities have the potential to significantly impact Army installations and/or the environment; (3) support to Program Management Offices in the review of PESHEs for the purpose of assisting the PM in integrating ESOH requirements into their system engineering process; and (4) support to Program Offices in the review of their NEPA analyses and in the development of NEPA strategies.

  Telephone: (410) 436-6854, DSN 584-6854
  Web Information: http://aec.army.mil/

- **US Army Center for Health Promotion and Preventive Medicine (USACHPPM).** The USACHPPM's mission is to provide worldwide technical support for implementing preventive medicine, public health, and health promotion/wellness services into all aspects of the Army community. The USACHPPM's support to acquisition programs includes: (1) responsibility for the preparation of the required Health Hazard Assessments (HHAs) for Army systems undergoing development or improvement; (2) evaluation of laser and optical radiation hazards to soldiers, aviators, and other Army personnel and civilians; (3) health risk assessments for soldiers and the general public exposed to ionizing radiation; (4) source emission (stack) testing and air pollution health impact assessments; (5) noise monitoring and modeling; (6) evaluation of hazardous waste management procedures; (7) pollution prevention opportunity assessments; and (8) industrial wastewater analyses.

  Telephone: (800) 222-9698
  Web Information: http://chppm-www.apgea.army.mil/

- **US Army Safety Center.** The US Army Safety Center is responsible for administering the Army Safety Program. The program is designed to create safe air and ground operations, and promote safe practices by military and civilian personnel both on and off duty. The Center synchronizes efforts across the Army's MACOMS and the Army staff during the development and day-to-day management of safety policies, while commanders execute those policies and procedures at the unit level. Major responsibilities of the Army Safety Center include: (1) conducting independent system safety assessments for ACAT I programs; (2) assisting with on-site internal evaluations of risk management and command safety programs; (3) conducting safety training for military and civilian safety professionals; (4) developing, coordinating, and disseminating Army Safety Program policy, direction, and guidance; and (5) conducting accident investigations for aviation and certain ground accidents.

  Telephone: (334) 255-1390, DSN 558-1390
  Web Information: http://safety.army.mil/home.html

- **US Army Technical Center for Explosives Safety (USATCES).** The USATCES is an element of the Defense Ammunition Center, established to review the Army's explosives safety program and implement sound, vigilant explosives/chemical agent/ordnance and explosives safety principles. Some of the USATCES responsibilities include: (1) providing toxic chemical agent safety technical

information and assistance to support and enhance the Army Chemical Agent Safety Program; (2) developing HQDA policies, procedures, and regulations addressing safety controls used during cleanup of ammunition and explosives; (3) providing on-site explosives mishap technical assistance in support of the US Army Safety Center; (4) tracking DoD Explosives Safety Board (DDESB) surveys to assist and support MACOMS in accomplishing corrective measures; and (5) maintaining and updating the DoD Joint Hazard Classification System database of final hazard classification data for the military services' ammunition and explosives.

Telephone: (918) 420-8919, DSN 956-8919
Web Information: http://www.dac.army.mil/es/default.htm (NOTE: This site is restricted for OPSEC purposes, and access requires a user name and password.)

- **Office of the Deputy Assistant Secretary of the Army-Cost and Economics (ODASA-CE) (formerly known as the US Army Cost and Economic Analysis Center (USACEAC)) .** As a subdivision of the Office of the Assistant Secretary of the Army for Financial Management and Comptroller (ASA (FM&C)), the ODASA-CE provides independent cost estimating support to the Army's resource management and acquisition process. ODASA-CE mission responsibilities include: (1) preparing Statutory Independent Cost Estimates and Component Cost Analyses for weapons and command, control, communications, and computer systems, as required; (2) managing the CRB and Army Cost Position Process for ACAT I and II programs, as required; and (3) developing and promulgating cost and economic analysis policy, cost-estimating models, and cost databases for Army wide use.

  Telephone: (703) 601-4187, DSN 329-4187
  Web Information: http://www.ceac.army.mil/default.asp

- **Joint Group on Pollution Prevention (JG-PP).** The JG-PP is a partnership between the military services, the National Aeronautics and Space Administration (NASA), and the Defense Contract Management Agency (DCMA), chartered by the Joint Logistics Commanders to reduce or eliminate hazardous materials or processes within the acquisition and sustainment communities. The JG-PP can assist PMs with the following: (1) identifying pollution prevention opportunities that can be undertaken jointly by multiple system managers in concert with one or more original equipment manufacturers (OEMs) or OEM facilities; (2) ensuring critical system performance requirements are addressed; (3) identifying environmentally acceptable alternatives that have the potential to replace hazardous materials; (4) identifying testing costs, testing locations, sources of funding, and contract vehicles; (5) conducting or overseeing validation testing; and (6) using the Single Process Initiative to implement validated alternatives on systems.

  Telephone: (703) 617-9651 (for the Army point of contact on the JG-PP)
  Web information: http://www.jgpp.com/

- **Department of Defense Explosives Safety Board (DDESB).** The DDESB was established to provide oversight of the development, manufacture, testing, maintenance, demilitarization, handling, transportation, and storage of explosives, including chemical agents, on DoD facilities worldwide. The DDESB mission is to provide objective advice to the Secretary of Defense and Service Secretaries on matters concerning explosives safety, and to prevent hazardous conditions to life and property on and off DoD installations from the explosive and environmental effects of DoD titled munitions. Some of the DDESB's responsibilities include: (1) developing and promulgating explosives safety policies, regulations, and criteria that comply with federal, state, and local legislative requirements; (2) facilitating reporting of explosives safety mishaps; (3) supporting

research, development, testing, and evaluation of explosion effects; (4) reviewing and approving site plans for storage of ammunition and explosives; and (5) establishing standards for the clearance of unexploded ordnance (UXO) from contaminated lands.

Telephone: (703) 325-0891, DSN 221-0891
Web Information: http://www.ddesb.pentagon.mil/

Sources for Additional Guidance and Information

- **ASA(ALT) Digital Library.** Ms. Tina Ballard, ASA(ALT) recently signed out a policy memorandum reminding Army ACAT III Program Managers that DoDI 5000.2 ESOH requirements apply to all Acquisition Category programs. ASA(ALT) has been participating with a DoD ESOH integrated process team to develop these requirements and guidance for Program Executive Offices (PEOs) and Program Managers (PMs) of all services. As the Army acquisition community awaits the fruition of the Acquisition Community Connection and final revision of DA Pamphlet 70-1, approved guidance from the DoD ESOH IPT has been placed in the ASA (ALT) digital library.

  Web Access: http://library.saalt.army.mil

- **AT&L Knowledge Sharing System (AKSS).** The AKSS is a web-based and compact disc automated reference tool sponsored by the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. AKSS provides acquisition information for all DoD service components and across all functional disciplines. The web site includes direct access to policy and guidance documents (mandatory and discretionary), templates, training, news and other publications.

  Web Access: http://akss.dau.mil/jsp/default.jsp

- **Acquisition Community Connection (ACC).** Sponsored by the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, the ACC offers authoritative acquisition, technology, and logistics information, and access to experts and peers working on critical AT&L processes. As part of recent updates to the ACC, PMs can now access applicable ESOH information including: (1) summaries of ESOH statutory and regulatory requirements, (2) a review of DoD 5000 Series requirements and ESOH-related documents (e.g., PESHE and Acquisition Strategy), (3) guidance for integrating ESOH into the Integrated Product and Process Development (IPPD) Process, (4) a listing of ESOH review considerations, (5) ESOH checklists by acquisition phase, and (6) a variety of lessons learned.

  Web Access: http://acc.dau.mil/simplify/ev_en.php

- **Defense Environmental Network and Information Exchange (DENIX).** DENIX provides DoD personnel in the ESOH arena with timely access to relevant legislative, compliance, restoration, cleanup, and DoD guidance information. It is intended to serve as a central electronic "meeting place" where information can be exchanged among environmental professionals worldwide.[2]

  Web Access: https://www.denix.osd.mil/

- **Risk Management Guide for DoD Acquisition 2003 (Fifth Edition, Version 2).** This document provides risk management guidance for the program management practitioner and is the product of a

[2] Because DENIX is a controlled web site, a user name and password is required for access to the DoD menu. To set up an account, contact the DENIX Account Manager via e-mail at acctmgr@www.denix.osd.mil.

joint effort among the Defense Acquisition University (DAU), the USD (AT&L), and acquisition management organizations throughout DoD. It is based on materials developed by the DoD Risk Management Working Group.

Web Access: http://www.dau.mil/pubs/gdbks/risk_management.asp

- **Rules of the Road—A Guide for Leading Successful Integrated Product Teams (Revision 1, October 1999).** This guide is designed to assist the PM and supporting acquisition community in developing and executing high-performance IPTs.

  Web Access: http://www.acq.osd.mil/ap/

- **Guide to Environment, Safety, and Occupational Health Compliance for Army Weapon System Acquisition (February 2004).** The purpose of this guide is to assist Army acquisition managers, ESOH support staff, and other program personnel in the identification of ESOH-related regulatory compliance requirements that may potentially affect acquisition programs.

  Web Access: *(USAEC website access pending)*

- **NEPA Manual for Materiel Acquisition (February 2004).** This detailed manual is a "how-to" covering the integration of the NEPA into Army materiel acquisition programs.

  Web Access: http://aec.army.mil/usaec/acquisition/documents02.html

- **Guide to Development of the Description of Proposed Action and Alternatives (DOPAA)—A Supplement to the US Army NEPA Manual Series (July 2003).** This guide provides Army proponents, preparers, and other NEPA analysis participants with a more structured and effective approach to creating DOPAAs for Army EAs and EISs.

  Web Access: http://aec.army.mil/usaec/acquisition/documents00.html

- **Guide to Environmental Impact Analysis—A Supplement to the US Army NEPA Manual Series (February 2004).** This guide provides guidance, recommendations, and suggestions for producing succinct, tightly focused, issue-driven NEPA analyses that can be used to support better decisions.

  Web Access: *(USAEC website access pending)*

- **US Army Space and Missile Defense Command (USASMDC)—Explosives Safety.** This USASMDC web page provides links to various DoD and Army explosives safety directives, regulations, standards, and other pertinent documents.

  Web Access: http://www.smdc.army.mil/SAFETY/explosiv.html

- **Army Cost Analysis Manual (CAM) (May 2002).** The Army CAM provides the basic methodologies and procedures for implementing cost analysis policies. The recently revised Chapter 6 provides an overview of topics on environmental quality costing for any weapon system.

  Web Access: http://www.ceac.army.mil/pubs/default.asp

- **Methodology for Developing Environmental Requirements for a Cost Analysis Requirements Description (CARD) (November 2001).** In support of developing the CARD, this methodology provides a suggested approach for identifying life-cycle environmental requirements for acquisition programs, so that their cost can be estimated.

  Web Access: http://aec.army.mil/usaec/acquisition/card01.pdf

CHAPTER 2.0:
OVERVIEW OF THE DoD 5000 SERIES ACQUISITION LIFE-CYCLE PROCESS

The Defense Acquisition System establishes a management process to translate mission needs and technology opportunities into stable and affordable military systems. The acquisition life cycle consists of all system acquisition activities prior to program initiation, through to eventual system disposal. Figure 2-1 shows the program phases, program activities, and major milestones of the Defense Acquisition Management Framework of the acquisition life-cycle process, as defined in DoDI 5000.2 (*Operation of the Defense Acquisition System*).

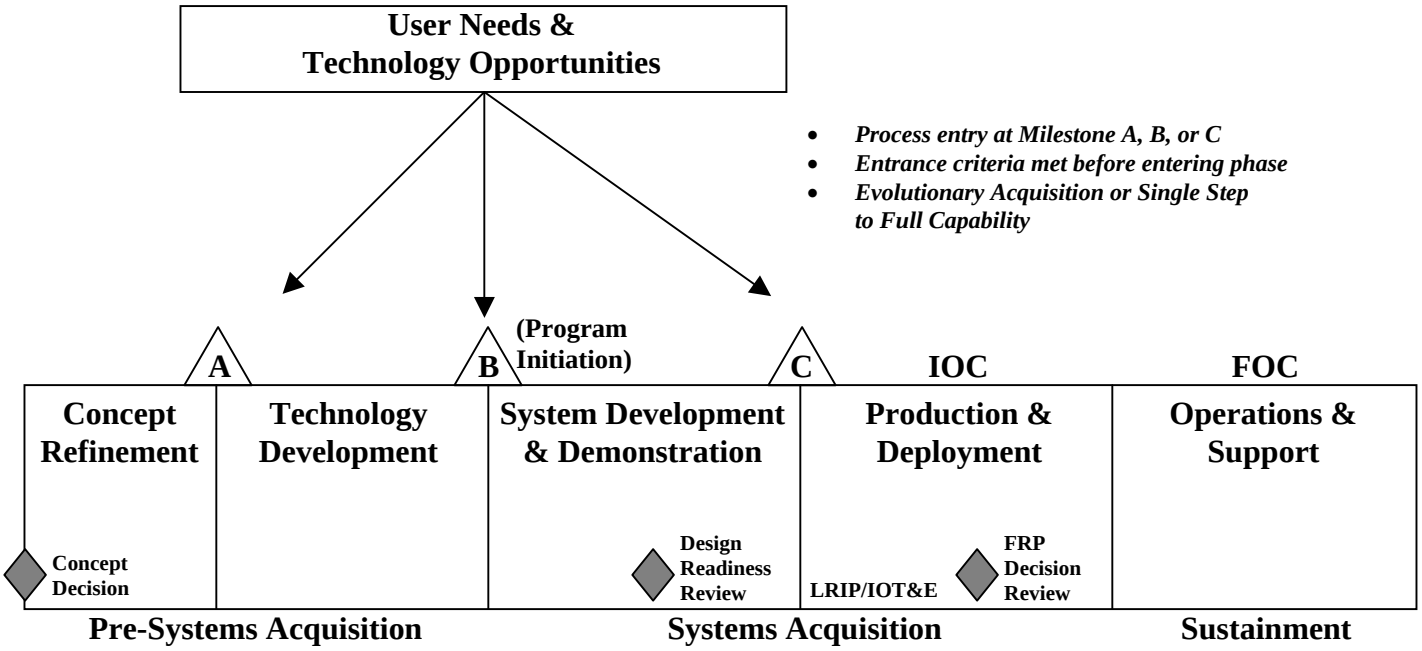

Figure 2-1. Defense Acquisition Management Framework

An overview of the activities for each of the life-cycle phases and subphases, associated with most weapon system acquisition programs, is provided in the following paragraphs.

Concept Refinement Phase

The purpose of this phase is to refine the initial concept and develop a Technology Development Strategy (TDS). Entrance into this phase depends upon an approved Initial Capabilities Document (ICD). The ICD results from the analysis of potential concepts across the DoD Components, international systems from Allies, and cooperative opportunities. Further, entrance depends upon an approved plan for conducting an analysis of alternatives (AoA) for the selected concept, documented in the approved ICD.

Concept Refinement begins with the Concept Decision. The Milestone Decision Authority (MDA) designates the lead DoD component, approves the AoA plan, and establishes a date for a Milestone A Review.

The ICD and the AoA plan guide Concept Refinement. The results of the AoA provide the basis for the TDS. The TDS documents the rationale for adopting either an evolutionary acquisition strategy or a single-step-to-full-capability acquisition strategy. Additionally, the TDS includes program strategy, including overall cost, schedule, and performance goals. Concept Refinement ends when the MDA approves the preferred solution resulting from the AoA and approves the associated TDS.

Technology Development Phase

The purpose of this phase is to reduce technology risk and to determine the appropriate set of technologies to be integrated into a full system. A project enters this phase at Milestone A when the MDA has approved the TDS. A favorable Milestone A decision does not mean that a new acquisition program has been initiated.

The project exits Technology Development when an affordable increment of militarily-useful capability has been identified; the technology for that increment has been demonstrated, and a system can be developed for production within a short timeframe (normally less than 5 years); or, when the MDA decides to terminate the effort.

System Development and Demonstration Phase

The purpose of this phase is to develop a system or an increment of capability; reduce integration and manufacturing risk (technology risk reduction having already occurred during Technology Development); ensure operational supportability with particular attention to reducing the logistics footprint; implement human systems integration (HSI); design for producibility; ensure affordability and the protection of critical program information (CPI) by implementing appropriate techniques such as anti-tamper; and demonstrate system integration, interoperability, safety, and utility. The entrance point for this phase is Milestone B, which is also the initiation of an acquisition program.

- **System Integration** involves the integration of subsystems and components and completion of detailed design. It consists of steps to resolve or minimize problems identified during Technology Development, the verification of preliminary designs and engineering, prototype building, support planning, analysis of trade-off proposals, and continuation of system simulation efforts.

- **System Demonstration** involves complete development and demonstration of engineering models to demonstrate system integration, interoperability, and utility. Program activities must demonstrate the system in its intended environment using engineering development models or integrated commercial items. Other activities to be completed are showing that the system meets validation requirements, industrial capabilities for production are reasonably available, and the system meets or exceeds exit criteria and Milestone C entrance requirements.

Production and Deployment Phase

The Production and Deployment Phase occurs when an operational capability that satisfies the mission need (defined during earlier phases) is achieved. The system must be successfully demonstrated prior to production and deployment. A key to system demonstration is the implementation and certification of the system's Operational Test and Evaluation (OT&E). The demonstrated capabilities must include affordability, producibility, and operational effectiveness. Additionally, the means to effectively sustain the system must be developed and in place prior to any system deployments.

- **Low-Rate Initial Production (LRIP)** involves the completion of system manufacturing development and the production of a minimum quantity of representative articles for Initial Operational Test and Evaluation (IOT&E), plus Live Fire Test and Evaluation (LFT&E), where applicable. Any deficiencies encountered in the previous phase are resolved and fixes are verified.
- **Full-Rate Production and Deployment** involves the full-scale production of the weapon system, often utilizing fully automated manufacturing processes (e.g., robotic and sensory technologies) after a successful Full-Rate Production Decision Review is completed. Deployment or fielding of the finished weapon system involves packaging and transporting the finished weapon system to the receiving or gaining Army units in the United States and/or abroad. Spare and repair part provisioning and training packages are also completed.

Operations and Support Phase

The Operations and Support Phase includes all the elements necessary to sustain the operational readiness and effectiveness of the deployed system in the most cost-effective manner over its remaining life cycle. The phase also includes plans and actions for demilitarization and disposal at the end of its useful life.

- **Sustainment** involves the execution of a support program that meets the threshold values of all support performance requirements and sustains them in the most cost-effective manner for the life of the system. Activities include supply, maintenance, transportation, readiness reporting, closure of production facilities, sustainment engineering, training (simulation, embedded, and field), and environmental management. Follow-on operational testing programs are conducted to assess performance and quality, compatibility, and interoperability, along with the identification of any deficiencies. It also includes follow-on OT&E program modifications, upgrades, and re-procurement.

- **Disposal** occurs at the end of a system's useful life, and often requires a system to be demilitarized first. Demilitarization activities involve the process of converting a weapon system and its components into a state where they can no longer be used for the original intended military purpose. Following demilitarization, the excess, surplus, scrap, or salvage weapon system components and/or waste are disposed of. Disposal may be accomplished by, but not be limited to, transfer; donation; sale; declaration; abandonment, or destruction.

CHAPTER 3.0:

IDENTIFICATION OF TYPICAL ESOH ISSUES ASSOCIATED WITH ARMY WEAPON SYSTEM LIFE-CYCLE ACTIVITIES

A detailed understanding of all phases in a weapon system's acquisition life cycle is required to ensure thorough and timely ESOH compliance. Along the life cycle, there are numerous inputs (e.g., materials, energy sources, and human resources) and outputs (e.g., system hardware/software, land use/landscape modifications, emissions, and waste products) for each phase and process, including unplanned outputs (e.g., the accidental release of pollutants). A comprehensive approach to the management of these systems phases and processes, particularly those that affect hazardous material applications, emissions, and waste streams, can reduce the uncertainty (risk).

To define and understand a program's life cycle, the constituent activities of each system phase (manufacturing facility requirements; test and evaluation; training activities; fielding locations; and disposal) must be identified and their ESOH implications must be understood. This must include support equipment requirements; storage, maintenance, and transportation requirements; and other logistical needs of the program. To the extent possible, these ESOH considerations should be incorporated into existing requirements documents normally developed during the acquisition process, including the program's ICD, Capability Development Document (CDD), Capability Production Document (CPD), Test and Evaluation Master Plan (TEMP), and Acquisition Strategy (AS). The integrated use of these documents can facilitate better understanding of the program, its life cycle, and associated ESOH impacts.

Once the nature of program actions and activities is understood, and the locations for their use have been selected, potential impacts can be identified within affected environmental settings; this information can then be evaluated in light of the applicable regulatory requirements identified in this guide and elsewhere.

For each of the Army's major categories of weapon systems, "typical" and specific ESOH issues should be considered during design and acquisition, often improving the cost effectiveness of environmental compliance. Because several categories share similar issues, such as coatings, emissions, etc., a few subsections of this chapter contain some overlapping.[3] A brief description of each weapon system category is also included in the subsections that follow.

3.1 AIRCRAFT SYSTEMS

Army aircraft systems include manned or unmanned air vehicles employing fixed, movable, rotary, or compound wings for powered or unpowered (glider) flight. The entire aircraft system, in addition to the air vehicle, consists of equipment (hardware and software), data, facilities, and services. System hardware typically consists of the air vehicle (including airframe, propulsion, landing gear, applications software, navigation/guidance, fire control, communications, and weapons delivery subsystems); common and peculiar ground support equipment; training equipment; and auxiliary equipment such as external pods, ejection systems, etc. System software, in addition to operational mode and application mode software, can include communications, installation and test, self-diagnostic, and training (simulation) software.

[3] Much of the discussion in the chapter on weapon system-unique environmental issues was obtained from the publication *Environmental Considerations in the Systems Acquisition Process—A Handbook for Program Managers* (dated May 1999), a joint publication of the US Department of Defense and the Armed Forces of the Kingdom of Sweden.

Environmental issues associated with aircraft systems range from operational emissions—such as air and noise—to maintenance and support issues, including material and processes used to paint/de-paint, plate, clean, and refuel the aircraft. A summary list of typical components, materials, waste streams, and emissions for aircraft systems is provided below:

- Plastics
- Paints
- Hazardous Materials
- Chlorofluorocarbon (CFC) Refrigerants
- Halon/Fire Suppression Agents
- Industrial Workshop Waste
- Refueling Operations
- Noise
- Sealants
- Inorganic Coatings
- Engine Air Emissions
- Fuel Tanks/Fueling
- Solvents/Cleaning Materials
- Corrosion Control

The following paragraphs summarize ESOH issues often associated with aircraft programs.

Cleaning

Cleaning is the most prevalent maintenance process associated with aircraft systems, typically required before and after numerous other maintenance processes (e.g., composite repair, painting, plating, bonding, sealing, and inspection). Depending on the specific requirements, the cleaning compound can be solvent-based or water-based. While solvent-based compounds commonly perform better, they create more environmental concerns because of high concentrations of volatile organic compounds (VOCs). Further, they may have requirements for use and disposal, as they may also contain other hazardous air pollutants, may be flammable, and are likely to be hazardous during disposal. If practical, systems should be designed to avoid the use of hazardous cleaning compounds. Systems can be designed to avoid the cleaning of precision-designed components. When appropriate, specify removal and replacement, rather than repair.

Aircraft and engine "wash-down" can create additional concerns beyond typical cleaning issues. Aircraft and their engines must be regularly cleaned to remove soil, leaking fluids, and salt spray (to prevent corrosion). Although mild detergents are often used for this purpose, generated wastewater is commonly contaminated with oils, fluids, and particulates from paints, coatings, plating, and metals. Such water must be collected and treated, depending on the contaminants associated with the aircraft. The increased use of solvents (for heavily soiled areas) can significantly exacerbate this problem; and the use of heavy metals and other hazardous substances should be minimized in the design of engines, to avoid wastewater treatment issues during maintenance.

Painting and De-painting

Aircraft maintenance typically requires the use of numerous paint systems. In addition to exterior surface primers and topcoats, there are internal surface paint systems and coatings for special requirements, such as increased erosion or temperature protection. The hazardous materials associated with the paint systems can vary, but they often contain heavy metals, VOCs (in the uncured state), and chemicals such as xylene and benzene, both regulated by environmental and occupational health agencies. Given the amount of painting required for aircraft maintenance, and the strict regulations of paint application processes, painting costs are often significant.

The costs associated with paint removal are even more significant. Current mechanical and chemical paint-stripping practices often involve the use of hazardous materials, which combined with the hazardous paint waste, result in significant residue disposal costs. Strict regulations currently guide the removal

process, and even more severe restrictions can be foreseen in the near future. Increased regulatory compliance requirements can translate directly into higher costs and increased maintenance timelines, as the exposure of operators and surrounding personnel must be avoided, and effluents must be captured and treated before disposal. While efficient and effective process design can reduce these costs and timelines; failure in such efforts may produce unsatisfactory results, including higher costs and legal liabilities.

Paint should be specified only when required for system performance and not for cosmetic reasons. In addition, paint systems should be selected to minimize environmental impacts during application, removal, and disposal. Several efforts are currently underway to produce less environmentally harmful paints and safer paint application and removal procedures, and other efforts are being expended to eliminate or reduce paint requirements for aircraft.

Inorganic Coatings

Other common Army aircraft materials include inorganic coatings, such as cadmium, chromium, nickel, and zinc—all having potentially adverse health and environmental effects. Substitutions for cadmium and hexavalent chromium have been researched extensively and may be available, depending on the specific application. Although the use of such coatings should be minimized, many coating applications produce no life-cycle issues beyond those associated with initial application. Therefore, the life cycle of system components should be evaluated to determine if coating maintenance will be required, and if any disposal concerns, such as leaching, are expected.

Hazardous Materials

In addition to organic and inorganic coatings, aircraft systems utilize substantial quantities of other hazardous materials, commonly found in sealants; adhesives; petroleum products, synthetic lubricants, fuels, cooling and deicing fluids; and batteries.

Sealants and adhesives are generally regulated because of their VOC content and their corrosion-inhibiting compounds. Appropriate design alternatives can often minimize these requirements; in addition, new formulations commonly have reduced VOC levels and less hazardous constituents.

Petroleum products and synthetic oils are generally treated as hazardous waste during disposal, depending on applicable regulations. Fortunately, these products can often be reused or recycled. Some solid-film lubricants contain lead and should be avoided whenever possible. Because diesel fuels often have high sulfur content; diesel-powered ground support equipment should be designed to use low-sulfur fuel, the preferred alternative.

Ethylene glycol products are frequently used as coolants and in deicing applications. In cooling applications, environmental impacts are generally small, because recovery and recycling are possible. Unfortunately, deicing applications can release these substances, which are highly toxic to aquatic organisms and mammals, into the environment. Such discharges can be controlled through the control and capture of surface runoff; using-structures, treatment facilities, detention basins, underground storage tanks, and subsequent recycling of the glycol fluids. No readily available technologies can currently replace these materials and processes. Propylene glycol, a preferred and less toxic substance, has disadvantages (e.g., it degrades at a slower rate and consumes more oxygen while it is being broken down), and current research and testing is underway to develop better alternatives. One option involves the design of on-board surface-heating systems for aircraft, eliminating the need for deicers. As this alternative cannot address the needs of all aircraft systems, other deicing procedures or materials will still be required.

Hazardous Waste

Many aircraft production and maintenance processes create hazardous waste streams that must be separately stored, treated, or disposed of. Much of an aircraft's solid waste is paint-removal waste and used solvents. These solvents should be reused or recycled, when possible, and the least hazardous solvents that can accomplish the task should be used. For paint removal, alternate technologies such as media blasting, high pressure low volume water, or flashjet should be investigated and used, where feasible. Some media, such as blasting pellets, can be reused and recycled, reducing waste generation. New appliqué technologies for aircraft coatings are also being investigated, and may eventually replace paints, resolving many of these issues. New aircraft programs should investigate this option as the technology continues to evolve.

Noise

Aircraft noise can adversely and significantly affect the relationship between the Army and affected populations, impacting the surrounding communities, livestock, and wildlife. While some countries specifically regulate military aircraft noise, some regulations or policies usually related to aircraft noise in general. Regional and local laws may establish maximum noise levels across property lines; and the location, duration, and time of flight operations may be restricted. In general, low-noise-emission products should be procured whenever feasible. Noise mitigations often include sound-suppression equipment and sound barriers for new aircraft-related systems, such as engine test stands, or the procurement of quiet ground support equipment (e.g., starters and hush houses) for aircraft systems.

The deep roar of high powered aircraft can also disrupt both internal and external verbal communications among crew members, and contribute to hearing loss for both pilots and ground support personnel. Such disruptions place commanders and crews in great peril. Research has also shown that poor communication increases fatigue, reduces alertness, decreases combat performance, and (most importantly), can contribute to the loss of life and equipment. Excessive platform noise can be reduced by incorporating into the design of aircraft systems passive noise protection and active noise-reduction features [e.g., advanced (low acoustic) rotor-blades and vibration dampening systems for helicopters], and personnel helmets and headsets (e.g., hearing protectors and electronic noise cancellation systems).

Engine Air Emissions

While no specific international restrictions exist for military aircraft-engine air emissions, PMs should recognize the impacts that military aircraft can have on local air quality.

Engine performance influences pollutant emissions. Unlike sulfur oxide (SO_X) emissions, which are mostly affected by levels of sulfur in fuel, nitrogen oxide (NO_X) emissions are directly increased when engine performance levels rise. Such effects should be considered when establishing aircraft engine performance and design requirements, perhaps specifying emissions goals for different engine power settings.

Aircraft engines also emit carbon dioxide (CO_2), a greenhouse gas associated with global climatic change, and thus subject to increased regulation in the future. In the Kyoto Protocol (negotiated in December 1997), the International Civil Aviation Organization (ICAO) was assigned the responsibility to reduce greenhouse gas emissions from aircraft operations. The ICAO will also pursue new engine technologies for civil aviation, along with improvements in operational procedures and air traffic control systems.

Ozone-Depleting Chemicals

ODCs were used in virtually every weapon system until 1996, when the 1987 Montreal Protocol became effective and banned production of ODCs by all industrialized nations. Weapon systems use ODCs in three primary applications: air conditioning and refrigeration (CFC-11, CFC-12, CFC-114); fire suppression (halon 1211, halon 1301, halon 2402); and cleaning solvents (CFC-113, methyl chloroform (1,1,1-trichloroethane)). Most cleaning/solvent and air conditioning/refrigeration applications have identified substitutes for ODCs, but aircraft weight and space limitations have made replacement of halon fire-suppressants difficult. Alternatives, in the form of inert gas generation systems and non-ozone-depleting fluorocarbon suppressants, are under development for new aircraft and should eventually eliminate from these systems the need for Class I ODCs.

3.2 MISSILE SYSTEMS

Army missile systems (either air or surface based), are a unique complex of equipment (hardware and software), data, services, and facilities. System hardware usually consists of the air vehicle, including propulsion (solid, liquid, or air breathing), guidance and control subsystems, sensor subsystems, and payloads; common and peculiar support equipment; command and launch equipment; training equipment; and transport (mobility) equipment. System software, in addition to operational mode guidance and control software, can include installation and test, self-diagnostic, and training (simulation) software.

While generally less complex than other weapon system platforms, missile systems must address distinct environmental issues. Given the variety of existing missile systems, environmental impacts can vary widely, depending on how systems are used, and the types of propellants, payloads, sensors, batteries, and other materials that accompany this use. Environmental impacts can occur throughout the system life cycle, from testing and manufacturing, through to demilitarization and disposal. A summary of typical missile system components, materials, waste streams and emissions is provided in the following list:

- Hazardous Materials
- Noise
- Particulates
- Electromagnetic Radiation (mostly from ground radar systems)
- Ozone-Depleting Substances
- Solvents
- Propellant Fuels

The following paragraphs discuss the ESOH issues typically associated with the various stages of the missile system's life cycle.

Manufacturing

During manufacturing, hazardous materials are used and air emissions are produced through various processes. Typical hazardous materials include perchlorates, beryllium, antimony, methyl ethyl ketone, toluene, xylene, and other regulated substances. Where solvents are used, air pollutants are normally released into the atmosphere, though closed-loop solvent processing can eliminate these emissions in many cases. Other techniques, such as solvent recycling, can significantly reduce the generation of hazardous waste during manufacturing.

Operations

During testing, evaluation, and training operations, potential environmental impacts include the release of hazardous wastes into the environment, increased noise levels, mobile air emissions, and contamination of soil and groundwater. During missile launches, hot exhausts from solid and liquid propellants react in the atmosphere to form NO_X, and may also contain hydrogen chloride gas, alumina particles, carbon monoxide (CO), and CO_2.

The remaining fragments of fired missiles become embedded in host ranges, contaminating the soil and possibly contaminating groundwater and surface waters through subsequent leaching. Soil residues can include perchlorates, carbon and metals, such as iron, aluminum, copper, tungsten, depleted uranium, and lead. While circuits and printed wiring boards (PWBs) in missile guidance and control subsystems can introduce some plastics, lead solder, and other metals into the environment, the primary issue of these components is usually the batteries, which can introduce acids and various heavy metals. Testing of missiles that contain cadmium batteries is prohibited over some open-water ranges in sensitive marine areas, and this situation is likely to become commonplace over open water in the future. To minimize these impacts and disposal requirements, PMs should develop test plans that require minimal use of test items. They should also coordinate with host test organizations and range management to ensure that all testing and training activities can be conducted in compliance with applicable regulatory requirements; otherwise, program schedules and milestone requirements could be adversely affected.

3.3 RADAR SYSTEMS

Radar systems are commonly used to detect and track objects within and outside the earth's atmosphere, track weather phenomena, and, in the case of aircraft, observe terrain conditions and objects on the ground, by transmitting electromagnetic radiation and detecting reflections off an object or the earth's surface. Radars can use a wide range of frequencies, but most systems use microwave frequencies between 1 and 40 Gigahertz (GHz). In terms of weapon system applications, the Army uses a variety of specific- and multi-function radar systems for space, air, and ground surveillance and reconnaissance, and to detect, acquire, and discriminate potential targets (e.g., enemy aircraft, cruise missiles and theater ballistic missiles, and fixed or mobile ground forces).

Army radar systems can either stand alone or be integrated into other systems. They are often developed in association with aircraft and surface vehicle platforms, or with air and missile defense systems, and should be evaluated as a subset of the overall system. Depending on the size and application of the radar system, the antenna or emitter can be mounted in the nose or belly of airplanes, in the rotodomes on helicopters, on aerostats, and on self-propelled surface vehicles. Larger, ground mobile systems may include several trailer-mounted units for the antenna array, power generators, cooling system equipment, and operational control equipment. Ground-based, facility-mounted radar systems have similar equipment requirements housed in one or more buildings or other structures.

The environmental issues associated with radar systems focus primarily on the health risks of microwave radiation and the use of hazardous materials. A summary list of typical waste streams and emissions for radar systems is provided below:

- Hazardous Materials
- Ozone-Depleting Substances
- Noise (from power generators)
- Engine Air Emissions (power generators)
- Electromagnetic Radiation
- Solvents

The following paragraphs summarize some of the ESOH issues often associated with radar systems.

Electromagnetic Radiation Hazards

The electromagnetic (microwave) radiation emitted by radar systems is non-ionizing, in that there is insufficient energy to ionize biologically important atoms. The primary health effects of microwaves are considered to be thermal. The depth of human tissue heating caused by exposure to microwave radiation depends upon the frequency of the incident energy. For radiation frequencies above 10 GHz, heating occurs mainly in the superficial tissues (outer skin surface). From 10 GHz to 3 GHz, the penetration and heating is deeper; and below 1.2 GHz, penetration and absorption are sufficient to cause heating of internal body tissues. Such effects can result in increased metabolic rates and potential tissue damage. For comparison purposes, commonly used microwave ovens operate at a frequency of 2.45 GHz, somewhat lower in frequency than most radar systems.

Depending on the power densities produced by a radar system, the potential for other biological and nonbiological impacts should also be considered. These may include thermal effects on migrant birds passing through the radar beam, electromagnetic interference with aircraft avionic systems and communications equipment, the inadvertent detonation of electro-explosive devices or ordnance, and ignition during fuel handling operations.

To avoid such impacts, programs involving radar systems should establish radiation exposure criteria. In addition, designated hazard areas should be clear of personnel and high-risk activities and equipment.

Hazardous Materials

Radars, in general, typically involve hazardous materials considerations similar to those for electronic/ automated software systems described later in this chapter. Large array radars, however, may also require separate cooling systems to maintain the radar's operating temperature. Such systems can contain up to several thousand gallons of coolant, a 50/50 mixture of water and antifreeze (propylene glycol or ethylene glycol), for normal operation. Although such systems operate within a closed loop, the potential for leaks or spills can occur during system hook-ups, if hoses were to rupture, and during periodic maintenance for coolant replacement. Ensuring spill prevention and clean-up procedures are in place can help reduce the potential for environmental impacts. Recovery and recycling programs can also reduce maintenance and disposal costs.

3.4 SURFACE VEHICLE SYSTEMS

Army surface systems constitute a broad assortment of Army materiel. Combat, service/work-unit, and transport vehicles are the three basic types of surface vehicle systems. Transport vehicles, composed of a variety of prime movers and trailers, are used for the movement of personnel and cargo. Service/work-unit vehicles are non-combat vehicles used for logistics/service activities and construction. Combat vehicles serve as armored weapons platforms, reconnaissance vehicles, and amphibious vehicles.

System hardware may include the hull and/or frame; suspension/steering; power package/drive train; auxiliary automotive; turret assembly; fire control; armament; body/cab; automatic loading; automatic/remote piloting; nuclear, biological, and chemical defensive systems; specialized equipment; navigation; communications; and secondary vehicles.

Although some surface vehicles are amphibious in nature, the majority of environmental impacts occur from operations over training grounds and scheduled maintenance at military facilities. Like aircraft systems, surface vehicle systems must address environmental issues resulting from the use and disposal of the hazardous materials associated with fueling, painting, fire suppression, etc. However, the operation of these vehicles can create significant environmental impacts and land management issues through land

degradation, fluid leaks, and noise. A summary list of typical components, materials, waste streams and emissions for surface vehicle systems is provided below:

- Paints
- Hazardous Materials
- Refueling Operations
- Noise
- Batteries
- Corrosion Control
- Glycol Coolants
- Petroleum Oils
- Chemical Agent Resistant Coatings
- Engine Air Emissions

The following paragraphs summarize ESOH issues often associated with surface vehicle programs.

Hazardous Materials

Surface vehicle systems typically involve the use of primers, paints, adhesives, sealants, solvents, petroleum products, chromium, and cadmium. Although most of these hazardous materials are also used in aircraft systems, their use in surface vehicle systems often poses more potential risk to the environment. When not in use, aircraft are usually parked in paved areas, where oil or fuel leaks can be readily contained. Surface vehicles are often used and parked directly over natural media, and the same leaks can directly contaminate the natural environment. The severity of such impacts depends on the extent of leakage, the number of vehicles, the underlying soil characteristics, and the risk to sensitive environmental assets (endangered species, aquifers, etc.).

While surface vehicles are operated and maintained as flexible, transportable resources; continuous operation requires the on-site availability of petroleum fuel storage and fuel farms, introducing additional risk of hazardous materials leaks and spills. Ethylene glycol products, frequently used in equipment cooling subsystems, can also be potential environmental contaminants. Although the less toxic propylene glycol is a preferred alternative to ethylene glycol, it has some disadvantages as it degrades at a slower rate and consumes more oxygen during decomposition. Coolant recovery and recycling equipment can significantly reduce the environmental impact of these chemicals while also reducing maintenance supply costs. Scheduled maintenance, such as changing motor oil and coolants every 4,800 to 8,000 kilometers on a fleet of surface vehicles, can generate large quantities of used oil and ethylene or propylene glycol. These volumes can often be recycled and reused, as opposed to being disposed of as waste.

Land Management

Testing and training with surface vehicles can produce significant environmental impacts on land areas and natural resources. Heavier and faster vehicles, longer combat engagement distances, and increased mechanized and combined arms exercises all require realistic training ranges and maneuver areas, and their maintenance is a crucial installation land management issue. Once over-utilized or poorly managed lands degrade, becoming barren and gullied, they can no longer support the realistic training required to sustain the mission. With these issues in mind, PMs should coordinate with installation land management, operations, and training personnel to ensure that vehicle testing and training requirements can be implemented without jeopardizing the sustainability of installation operations and that any impacts are minimized.

Paints/Coatings

In addition to exterior surface primers and topcoats, internal surface paint systems and coatings address special requirements, such as increased protection from erosion or temperature extremes. While hazardous materials associated with the paint systems can vary, they often contain heavy metals, VOCs,

and chemicals such as xylene and benzene. Both environmental and occupational health agencies regulate such constituents, and can increase painting costs. As a result, paint should be specified only to address performance requirements, and not for cosmetic purposes. Paint systems should be selected to produce minimal environmental impact during application, removal, and disposal.

The maintenance of surface vehicle systems can be more complicated than that of other systems. Surface vehicles are often supported with specific maintenance and repair facilities, such as motor pools and paint shops, for better control of waste materials and emissions (e.g., VOCs and other air emissions). During field operations of surface vehicles, such facilities are seldom available, requiring some spot repair of paints and coatings and thus creating potential environmental contamination issues. Delayed repairs can increase the risk of vehicle corrosion or other damage.

Many surface vehicles require Chemical Agent Resistant Coating (CARC). Such coatings must meet rigorous performance standards to protect soldiers in wartime, meet camouflage requirements, and comply with various air pollution regulations. Several research projects have developed water-based, low-VOC CARC coatings that can be more safely used and maintained. These new products are currently being tested in the field and should be considered in the acquisition process.

Noise

Combined with the vast array of battlefield sounds, the deep roar of high powered armored vehicles can significantly interfere with both internal and external verbal communications among crew members, and can contribute to hearing loss. Without the ability to hear communications clearly, commanders and crews are put into great peril. Research has shown that poor communications increase fatigue, reduce alertness, decrease combat performance, and (most importantly) can contribute to loss of life and equipment. Excessive platform noise can be reduced by incorporating passive noise protection and active noise-reduction features into the design of vehicles (e.g., engine vibration dampening and noise absorption materials), and personnel helmets and headsets (e.g., hearing protectors and electronic noise cancellation systems).

The noise produced by combat vehicles during training exercises can also create issues for surrounding communities, the installation command, and master planning and environmental offices at the installation. Community response and concern over noise issues can significantly impact Army use of training facilities, alter schedules for this training, and alter the operation of test ranges. Entire missions have been curtailed or moved because of noise impacts on the surrounding community, and such community concerns must be addressed. PMs should coordinate with installation land management, operations, and training personnel to ensure that vehicle testing and training requirements can be implemented without creating community concerns.

Engine Air Emissions

Most modern diesel engines are turbocharged and intercooled to maintain good fuel consumption and low-exhaust gas emissions. However, some air emissions issues must still be addressed. The five main emissions from diesel engines include: NO_X, hydrocarbons (HC), CO, particulate matter, and sulfur dioxide (SO_2), emitted in the form of black smoke.

Unlike SO_X emissions, most affected by sulfur levels in fuel, NO_X and CO emissions are directly proportional to increased performance levels. Particulate matter is a particular problem for diesel engines, as emitted particulates are coated with condensed HC. All fossil fuel powered engines also emit CO_2, a greenhouse gas associated with global climate change. The emissions of such greenhouse gases will be

increasingly regulated in the future. Research in the area of diesel engine technology is currently being focused on both increased performance and reduced air emissions.

Because of these pollutant issues, PMs must fully understand and address the impacts of their systems on local and regional air quality.

Ozone-Depleting Chemicals

The 1987 Montreal Protocol banned ODC production by industrialized nations starting in January 1996. At that time, ODCs were used in virtually every Army weapon system. This use was for three primary applications: air conditioning and refrigeration (CFC-11, CFC-12, CFC-114); fire suppression (halon 1211, halon 1301, halon 2402); and cleaning solvents (CFC-113, methyl chloroform (1,1,1-trichloroethane)). While substitutes have been identified for most solvents and cooling system applications, many current and future surface vehicle systems still require halons for fire and explosion suppression. Substitutes are actively being investigated for such systems.

Batteries

Land vehicles and associated equipment require various types of batteries containing toxic substances and other environmentally hazardous materials. When exhausted, many batteries are no longer hazardous, as only a small concentration of toxic material remains. Federal regulatory agencies have simplified battery handling (previously disposal) by advocating the use of batteries or materials that can be recycled through use, reuse, or reclamation. Some examples include the following:

- Use of rechargeable batteries
- Reclaiming spent lead-acid batteries
- Recovering precious metals (e.g., silver) in batteries
- Returning used batteries to the manufacturer for regeneration
- Phasing out mercury-containing batteries
- Developing efficient and cost-effective means of collecting and recycling cadmium-containing batteries
- Implementing national and uniform systems for labeling batteries.

3.5 ORDNANCE SYSTEMS

Army ordnance systems represent a wide and complex range of equipment (hardware/software), data, services, and facilities for delivering munitions to a target (excluding guided missiles and land, sea, or air delivery vehicles). System hardware can include a munitions round, and a launch or firing system. A complete munitions round consists of structural elements, payload, guidance and control, fuze, safety/arm device, and a propulsion capability. The launch system consists of the equipment (hardware/software) for controlling or sending forth the munitions on a desired course or trajectory. For example, this includes bombs, warheads, mortars, artillery pieces, various small arms and ammunition, grenades, mines, and their components.

The use (operation) of ordnance systems is inherently destructive. However, the environmental impacts over the life cycle can be lessened during the manufacturing, testing, training, and eventual disposal of the system. These impacts must be minimized, as the use and cleanup of military ranges are becoming critical to sustaining the Army mission.

Since there are numerous types of ordnance systems, potential environmental impacts can vary widely. Munitions held in proper storage, or placed in a maintained weapons platform, pose minimal threat to the environment, because they require little, if any, maintenance. The life-cycle environmental impacts of ordnance occur mostly during manufacturing, testing, evaluation and training operations, and from eventual demilitarization and disposal. A summary list of typical components, materials, waste streams and emissions for ordnance systems is provided below:

- Hazardous Materials
- Ozone-Depleting Substances
- Solvents
- Noise
- Particulates
- Lead
- Unexploded Ordnance (UXO) and Waste Munitions

In the following paragraphs, ESOH issues typically associated with the various stages of the ordnance system life cycle are discussed.

Manufacturing

During manufacturing, hazardous materials are used and air emissions are often produced. Hazardous materials include lead, antimony, barium nitrate, methyl ethyl ketone, toluene, xylene, perchlorates, and other regulated substances. When solvents are used, air pollutants can be released into the atmosphere. Closed-loop solvent processing can eliminate these emissions in some cases, and solvent recycling can reduce the generation of hazardous wastes during manufacture.

Operations

During testing, evaluation, and training operations, potential environmental impacts include hazardous waste generation, increased noise levels, mobile air emissions, and contamination of soil and groundwater. Gaseous emissions are often released when a weapon is fired and as the munitions explode, and soil particles can be ejected into the atmosphere in the form of particulates from the impact of munitions. Released muzzle gases can include CO, CO_2, NO_X, and, in some cases, hydrogen chloride. Similar gases are released through the impact of various munitions, in addition to methane, ammonia, aluminum oxides, and carbon particles.

Remaining fragments of fired munitions are scattered about range impact areas, contaminating the soil and potentially leaching into the groundwater or surface waters. Soil residues include carbon and metals, such as iron, aluminum, copper, tungsten, depleted uranium, and lead. Such contamination will increase as the Army increasingly relies on "smart" weapons, which add electronic components and pollutants to the process. While circuits and PWBs introduce some plastics, lead solder, and other metals, the primary issues stem from batteries, introducing acids and various other heavy metals to the soil. Testing of munitions with cadmium batteries is prohibited over some open-water ranges in sensitive marine areas, and similar prohibitions are likely to increase in the future. PMs should develop test plans that require minimal use of test items and that minimize disposal requirements. They should also coordinate with host test organizations and range management to ensure that all testing and training requirements can be conducted in compliance with applicable regulatory requirements; otherwise, program schedules and milestone requirements could be adversely affected.

Range management is becoming increasingly important as environmental issues and restrictions can determine how testing will be done, to minimize impacts to the soil, surface waters, and groundwater. The introduction of lead into the topsoil is increasingly an issue, through the cumulative impacts of various munitions in a concentrated area. If lead enters the groundwater and surface runoff, local water

supplies can be contaminated. On small arms ranges, such impacts can be reduced through the use of bullet traps, with accompanying recycling opportunities for spent ammunition. Several research and development projects are underway to reduce or eliminate lead and other hazardous substances from artillery and small arms ammunition.

Noise

The noise produced by guns, artillery, and other ordnance during training exercises can create issues among groups in the surrounding community, installation command, and master planning and environmental offices at the installation. Community response and concern over noise issues can significantly impact Army use of training facilities, alter schedules for this training, and alter the operation of test ranges. Entire missions have been curtailed or moved because of noise impacts on the surrounding community, and such concerns must be addressed. Accurate assessment and response to these community concerns will permit optimal use of training and testing facilities, and increase the overall utility of the system to the Army. Predictive noise models for blast noise and sonic booms are being refined to better predict and address community response to a combination of military noises. This will allow the military to maximize the use of training and testing facilities.

Demilitarization and Disposal

At the end of the product life cycle, most munitions enter the demilitarization and disposal process because of damage, failure, high repair costs, excess surplus, or obsolescence. Demilitarization can include disassembly of munitions for recycling, reclamation, or reuse of their components. Composition, size, weight, and geometry of the munitions determine the viability of component recycling or reclamation, as opposed to disposal as a waste.

During the demilitarization/disposal of munitions, potential environmental impacts can include mobile air emissions, soil or groundwater contamination, and wastewater or sludge generation. Historically, open burning and open detonation have been the primary means of munitions disposal, but recent environmental concerns now limit or prohibit their use. Alternative disposal technologies, designed to minimize environmental impacts, are under investigation. When designing and developing new munitions, PMs should evaluate the use of alternative materials and technologies that produce fewer impacts during demilitarization and disposal. Ideally, new munitions should be designed to minimize impacts and maximize the recycling or reuse of components at the end the munitions life cycle.

3.6 LASER SYSTEMS

A relatively new technology application in the military, laser systems come in various forms and sizes, and can have a wide variety of equipment and facility requirements. A laser is a device that emits a high-intensity, narrow-spectral-width, highly directional or near-zero-divergence beam of light. In terms of weapon system applications, various types of laser systems are currently in use or under development. These include gun-mounted laser sights for illuminating targets, laser rangefinders for sensing distance, laser guidance systems for smart bombs and missiles, and directed energy weapons (DEWs) for defending against a variety of threats (e.g., cruise missiles and theater ballistic missiles, rockets, artillery shells, and mortars). Lasers are basically of the following three types:

- **Semiconductor Lasers.** Semiconductor lasers use a semiconductor material (e.g., silicon or gallium arsenide) to provide the excitation for generating light. These lasers are typically small, use relatively small amounts of power (often from batteries), and are generally used in less energetic applications.

- **Solid-State Lasers.** Solid-state lasers (SSLs) use a crystalline or glass material doped with an ion, which is the lasing species. Flashlamps or diodes are used to "pump" the ions to excited levels; the ions then emit radiation. Compared to other types of lasers, SSLs typically require high amounts of electrical power to operate.

- **Chemical Lasers.** Chemical lasers derive their light energy from interactions within large vats of chemicals. Several forms of chemical lasers are under development, including hydrogen fluoride/deuterium fluoride lasers and chemical oxygen-iodine lasers.

Although some laser systems can be independent systems, most are integrated into other systems. They are often developed in association with weapon system platforms or ordnance systems, and should be evaluated as a subset of the overall system. The DEWs now under development represent larger, fixed or mobile systems that could eventually be mounted on warships, large aircraft, helicopters, tanks, and other surface vehicles. Such systems may include a high-power laser/fluid supply assembly; the pointer/tracker; a command, control, communications and fire control system; radar interface; and other support equipment.

As there are numerous types of laser systems, potential environmental impacts can vary widely. A summary list of typical components, materials, waste streams and emissions for laser systems is provided below:

- Hazardous Materials
- Ozone-Depleting Substances
- High-Intensity Optical Radiation
- Solvents
- Disposable/Rechargeable Batteries

The following paragraphs summarize some of the ESOH issues often associated with laser systems.

Optical Radiation Hazards

Since 1995, the United States has agreed to the Blinding Laser Protocol of the Convention on Conventional Weapons, prohibiting the development of blinding or other anti-personnel lasers. Nonetheless, many of the military laser devices currently in use and under development can seriously injure the unprotected eyes of individuals within the hazard zone of the laser beam. Viewing either the direct beam, or a beam inadvertently reflected off a mirror-like surface, may expose unprotected eyes to potential injury and, thus, must be avoided.

Because laser beams can have extremely long ranges, buffer zones must be established during their use or the laser radiation level must be attenuated below harmful levels, particularly when beams are expected to leave controlled ranges and airspace.

Hazardous Materials

Lasers, in general, typically involve hazardous materials requirements similar to those for electronic/ automated software systems described later in this chapter. Chemical lasers, however, introduce an additional concern during their storage, operation, and maintenance, because of the large amounts of hazardous materials used in generating their light source. Chemical recycling systems must be integrated into laser systems to minimize these concerns.

3.7 ELECTRONIC / AUTOMATED SOFTWARE SYSTEMS

Army electronic/automated software systems represent the data, services, and facilities required to produce electronic/automated capabilities for command, control, communications, and information (C^3I) systems; radar and other sensor systems; navigation and guidance systems; electronics warfare systems; support systems, etc. These systems often integrate PWBs, cathode ray tubes (CRTs), flat panel displays, disposable/rechargeable batteries (e.g., Li/MnO_2, lithium-ion, and nickel-metal hydride) other power supply and distribution systems, various software system drivers, and other computer-related components. These systems may stand alone or may be integrated into other systems, and are often developed along with other weapon system platforms. While they should be evaluated as a subset of the overall system, they produce unique environmental impacts, especially during manufacturing and disposal. A summary list of typical components, materials, waste streams and emissions is provided below:

- Hazardous Materials
- Lead
- Solvents
- Photographic/Imaging Chemicals
- Acid Etchants
- Heavy Metals
- Plastics
- CFC Refrigerants
- Disposable/Rechargeable Batteries

The following paragraphs summarize some of the ESOH life-cycle issues often associated with electronic/automated software systems.

Packaging

Plastics are the most common form of packaging for integrated circuits and the outer shells of electronic systems. While plastic packaging creates relatively less waste, it often requires epoxies, heavy metals, and flame-retardants; all hazardous materials that complicate recycling. Ceramics are the next popular form of packaging. While they require much less set-up for the circuit manufacturer, they are heavier, more expensive, and generate more waste than plastics. The manufacture of ceramic packages requires more chemicals, more energy, and the use of carcinogenic materials, thereby increasing environmental risks for the manufacturer.

Printed Wiring Boards (PWBs)

PWBs require a number of hazardous materials during their manufacture, including plating chemicals, lead solder, etching solutions, imaging chemicals, and solvent cleaners. Many of these chemicals can be replaced by less hazardous substitutes. Aqueous developers can replace solvent developers, and cleaning processes can be eliminated or supported through the use of less hazardous cleaners. Plating and etching solvents can be recycled, although technologies must be developed to support such changes. While no acceptable alternative currently exists for lead solder, research programs are underway to address the problem.

Displays

Displays can be either CRTs or flat panels. CRTs are generally less expensive to produce, while flat panel displays are more suited to those applications that face space and weight limitations.

The manufacture of CRTs involves issues similar to the packaging concerns previously described, including plastics, solvents, and other hazardous materials; as well as unique environmental issues, such as leaded glass components. Leaded glass can become a disposal problem, complicating recycling

because lead can leach from components as the glass is crushed. This same crushing process produces lead-contaminated dust, which can endanger the safety of workers. Alternatives to leaded glass , as well as better methods to recycle such materials, must eventually be developed.

Flat panel display technologies have been slow to design and incorporate environmentally friendly products. While eliminating the leaded glass problems of CRTs, flat panels involve several hazardous materials during processing, including photolithography chemicals, acid etchants, cleaning solvents, and heavy metals. Efforts have been made to eliminate and recycle the solvents used in such processing, thereby reducing air emissions. Research is underway to find more environmentally friendly processes for etching, lithography, and cleaning.

Fully Fluorinated Compounds

Fully fluorinated compounds, such as perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6), are used in a variety of military electronic applications. While some 80 percent of SF_6 is used, worldwide, as an insulator in electrical transmission and distribution systems, the military also uses it as a radar waveguide pressurization gas in military air station traffic control radars. In addition to waveguide pressurization uses, PFCs have been used (since the 1960's) as direct contact cooling fluids in high power electronic components, or as heat transfer fluids in re-circulating electronic component coolers. PFCs are also commonly used during vapor phase re-flow soldering in electronics manufacturing. PFCs are thus used in many military radar transmitters, electronic power supplies, lasers, and supercomputers.

Both PFCs and SF_6 are greenhouse gases with long atmospheric lifetimes, and potential irreversible accumulation in the atmosphere. PMs should recognize these adverse environmental impacts and minimize the use of such chemicals, when possible.

Software System Safety

Software systems are being used more and more to control real-time safety-critical processes such as C^3I, electronic warfare, avionics, and missile and fire support systems. Digital information systems must provide correct data to the soldier in order to make safe and accurate decisions. A software specification error, design flaw, or the lack of generic safety-critical requirements, however, can contribute to or cause a system failure or erroneous human decision. Unfortunately, on multiple occasions it has been proven that if there had been a systematic approach to developing system software, mistakes could have been detected beforehand. For instance, there have been cases where the pilot found out too late that there was not a failsafe mode for the engine that failed; and where there were insufficient setup procedures for a missile battery, leading to the crew's unexpected activation of the erector/launcher.

To achieve an acceptable level of safety for software used in critical applications, software system safety engineering must be given primary emphasis early in the requirements definition and system conceptual design process. Safety-critical software must then receive continuous management emphasis and engineering analysis throughout the development and operational life of the system.

CHAPTER 4.0:
REVIEW OF ESOH REGULATORY REQUIREMENTS

ESOH compliance requires continual evaluation throughout a weapon system's life cycle, rather than a single, discrete assessment, often completed and forgotten.

The Army must comply with a host of laws and regulations devised to protect human health, ensure safety, and prevent damage to the environment. Public laws, such as the Clean Air Act (CAA), Clean Water Act (CWA), Resource Conservation and Recovery Act (RCRA), and equally stringent state and local regulations, all mandate protection of the environment and safeguarding of human safety and health.

Regulatory compliance for materiel acquisition programs is achieved through several proactive mechanisms. Program oversight, at both Army and contractor levels, is necessary in order to ensure effective ESOH management. Environment, safety, and health evaluations (including PESHEs, NEPA analyses, mitigation monitoring, environmental audits, and program reviews), coupled with the swift correction of any deficiencies, are a continuous process, crucial to environmental protection and human health and safety. This compliance is enhanced by ESOH awareness and training, which is key to a successful program.

This chapter provides guidance and information to simplify the identification of ESOH regulatory requirements applicable to Army weapons system programs.

ESOH Laws and Regulations

Federal ESOH regulations respond to legislation passed by Congress, or in some cases, by Executive Orders. These regulations frequently promulgated by the Environmental Protection Agency (EPA) may also be promulgated by other agencies, such as the U. S, Fish and Wildlife Service, the Advisory Council on Historic Preservation, and the Occupational Safety and Health Administration, (to protect endangered species, historic/archaeological resources, and workplace safety, respectively), as well as by numerous other agencies defining compliance requirements. Mostly in response to federal laws and regulations, DoD Directives and Army Regulations establish specific and military-unique requirements, including those applicable to the development and operation of Army materiel systems.

This chapter identifies ESOH requirements specified in federal laws and regulations, and in DoD and Army regulations, directives, and other sources. Though not specifically detailed in this guide, a brief overview of state and local agency, and foreign nation, regulatory requirements is provided in the following discussions. Future and other potential regulatory requirements likely to affect weapons programs are also discussed.

- **State Regulations.** State-level legislation governs such issues as air pollution, water pollution, hazardous waste management, and wildlife protection. In most cases, state environmental laws and regulations mirror the structure of federal laws and regulations; though these state standards are similar to, or even stricter than (but never weaker than), the federal standards. In some cases, states simply enforce the federal regulations. In many cases, these requirements are delegated to states to enforce, when the US Environmental Protection Agency (USEPA) agrees that state programs are adequate to meet (or exceed) federal requirements. Examples of frequently delegated federal programs include RCRA and CAA programs. Several more stringent, but common, state requirements are as follows:

- Regulation of a larger set of chemical compounds or waste products
- Tighter emission levels, or more stringent performance levels
- Permits that the federal Government does not require
- Regulation of certain activities not addressed by the federal Government, particularly regarding land use.

Because regulations can vary widely from state to state, it is important to know, early in acquisition program planning, the locations where a weapon system will be produced, tested, and operated. For example, a system designed and fabricated in Louisiana may require very different maintenance procedures if operated and maintained in California. To help ensure full environmental compliance with applicable state, regional, and other site-specific regulatory requirements, Materiel Developers should coordinate the overall system development process with installation Environmental Office staffs (at testing/gaining installations) as early as possible.

Some important and relevant state-level environmental regulatory issues can include the following:

- *Air Quality*. Regulation of air quality is largely established by the federal CAA. However, states play a key role in this area by developing and enforcing State Implementation Plans (SIPs) to ensure statewide ambient air quality. Among other things, the SIP-based "new source" review can often affect siting, construction, testing and deployment activities.

- *Surface Water and Groundwater*. States often have significant responsibilities for groundwater protection. States often enforce Safe Drinking Water Act (SDWA) regulations that control underground injection, as well as RCRA requirements for the management of underground storage tanks. States may also regulate other well construction and require permits for well drilling. In addition, many states regulate the discharge of water directly onto the ground (rather than to surface waters, as covered by the CWA) and, thus, structures such as catch basins, septic systems, or leaching fields, may be regulated. State regulations that protect drinking water sources (both groundwater and surface water supplies) may restrict land use, affecting facility siting, construction activities, or test and operational practices. States also promulgate water quality-based National Pollutant Discharge Elimination System (NPDES) standards through the CWA.

- *Solid Waste Management*. RCRA implementation encourages the management of non-hazardous solid waste management through state and local authorities. Such authorities may impose special requirements on solid waste disposal from Army facilities, including chemical facilities.

- *Pollution Prevention.* Although the federal Pollution Prevention Act provisions are largely voluntary, many states have passed more substantive pollution prevention legislation and regulations. While these laws vary among the states, they commonly require annual pollution prevention planning and reporting by industry.

- *NEPA.* Several states have NEPA-like legislation, or State Environmental Policy Act (SEPA) requirements. These requirements are established by state agencies, and local governments in a few states, which approve permits for construction or other activities. Currently, 15 states, along

with the District of Columbia and Puerto Rico, have environmental planning requirements similar to those of NEPA.[4]

- *Emergency Planning and Community Right-to-Know Act (EPCRA)*. Many states have enacted "right-to-know" laws, similar to EPCRA. In some cases, these laws require additional disclosure information beyond that required by federal requirements.

- **Local and Regional Regulations.** Regional and metropolitan agencies commonly enforce such environmental regulations as air quality, sewer, and solid waste management, issues that span a regional area rather than a statewide area. City and county agencies normally address issues such as land use regulation and public health (e.g., the County Health Department).

- **Foreign Nation Regulatory Requirements.** DoD's ESOH management responsibilities overseas are established by Executive Orders, DoD policy, U. S. law, host nation law, and international agreements. International agreements often regulate the actions of visiting forces in a host nation. Agreements affecting military activities may be broad in scope, such as Status-of-Forces Agreements (SOFAs), or narrowly-drafted basing agreements; both often requiring compliance with host-nation ESOH requirements.

  Although most agreements have no specific ESOH provisions, general obligations or commitments are often sufficiently broad to include them. For example, the North Atlantic Treaty Organization (NATO) SOFA obligates United States forces to "respect the law of the receiving State." The Supplementary Agreement with Germany also specifically obligates visiting forces (in Germany) to cooperate with German authorities when seeking permits for an installation, use low-pollutant fuels, comply with emission regulations, comply with regulations regarding transportation of hazardous materials, and pay the costs of assessing and remediating environmental contamination resulting from their actions.

  Army actions conducted at DoD installations overseas are subject to the minimum standards for ESOH compliance in DoDI 4715.5 *(Management of Environmental Compliance at Overseas Installations*), which directs compliance with Final Governing Standards (FGSs) when established for a particular foreign country.[5] Since these FGSs are developed for each country, it is difficult to identify which requirements stem from United States law or the host-nation law. Therefore, unless each FGS is reviewed against United States law, the *unique* regulatory requirements for the host nation are often difficult to determine; complicating the consideration of life-cycle environmental, safety, and health impacts for those weapon systems to be deployed or stationed overseas.

  In countries where FGSs have *not* been established, standards have been developed from a comparative analysis of environmental compliance obligations under applicable international agreements, host nation "pollution control standards of general applicability," and those standards presented in DoD 4715.5-G [*Overseas Environmental Baseline Guidance Document* (OEBGD)]. When requirements differ or conflict, the installation must comply with the standard that is more protective of human health or the environment.

[4] For a list of states and state laws implementing SEPA requirements, go to the Council on Environmental Quality web page at: http://ceq.eh.doe.gov/nepa/regs/states/states.cfm .

[5] For a list of foreign countries where FGSs have been established, go to the following DENIX web site: https://www.denix.osd.mil/denix/DOD/Library/Intl/FGS/final-gov-stds-dod.html.

The Army's responsibility to comply with environmental standards in foreign nations, as defined in international agreements, the FGSs, and the OEBGD, is also described in Chapter 14 of AR 200-1 (*Environmental Protection and Enhancement*).

- **Future Regulatory Requirements.** Over the next few years, the European Union (EU) and Japan are expected to ban the use of lead (Pb) in electronics, although use by the military and the use of solder may be exempted. Within the United States, there currently is no legislation on the horizon for banning lead or lead-containing solder. Industry, however, is poised to eliminate the use of lead in all or most electronics to avoid higher costs and stricter requirements for recycling and disposal, and to stay competitive in current world markets. Lead and other heavy metals will require substitutions in new electrical and electronic equipment, some of which may raise performance or reliability concerns, particularly if used in military applications. For example, the use of tin coatings on electronic leads has, in some cases, been shown to develop tin "whiskers" or growths, leading to shorts in micro-circuits. This particular problem has reportedly caused system failures in earth- and space-based applications affecting the military, medical, and communications industries.

  Another example of future regulatory requirements involves changes to the CAA national emission standards for hazardous air pollutants (NESHAP). In a recent proposed ruling, which would implement Section 112(d) of the CAA, the EPA has identified new NESHAP standards for miscellaneous metal parts and products from surface coating operations. This includes protective and decorative coatings, as well as adhesives, applied to aircraft, vehicles, and other equipment. Army facilities supporting production and maintenance of military commodities are currently not set up for full compliance with these proposed standards, which go into affect in the year 2006. In order to conform to these new requirements, the Army will most likely implement a pollution prevention approach that includes development of hazardous air pollutant (HAP) free materials and processes, and limiting HAP applications.

  Changes to the National Ambient Air Quality Standards (NAAQS) for Particulate Matter (PM) is another example of future regulatory requirements. The Army generates PM as products of combustions and vehicle use. PM is generated through the use of smokes and obscurants, vehicle engine emissions, smoke from prescribed burns, open burning/open detonation, and through lofting of dust during vehicle maneuvers along unpaved roads. In 1997, the EPA revised the standards to continue to focus on PM 10 while PM 2.5 was to be regulated separately. The regulation of PM 2.5 has been delayed due to legal challenges, although PM 2.5 standards remain in place. EPA and the States will soon be writing further rules to limit emission of PM 2.5. Before the EPA and the States begin to write the rules, identification of the part of the country whose outdoor air violates the new standards for PM 2.5 will have to be completed. Because this monitoring and classification is still ongoing, the issue for the military becomes conformity. Army vehicles that emit more than the standards allow, will have to conform to meet these standards. Currently, the Army has yet to complete any conformity determinations, however, future actions may require the Army to perform one.

The following sections provide a comprehensive summary of federal, DoD, and Army ESOH regulatory compliance requirements common to most acquisition programs, along with those requirements unique to specific weapons system categories or commodities (described earlier in Section 3).
Within these sections, specific compliance requirements applicable to Army systems, operations, and facilities are listed in respective tables (Tables 4-1 through 4-6) by topic, issue, and regulatory source columns. A fourth column, labeled "WS" for weapons system, designates which weapons system categories are most likely to be affected by a particular requirement. In most cases, the regulatory requirements are applicable to *all* weapons system categories. In some cases, however, only certain

categories are designated. Under unusual circumstances, these requirements may apply to other non-designated weapon systems. To conserve space in the tables, weapons system categories under the "WS" column are abbreviated as follows:

A = Aircraft Systems
M = Missile Systems
R = Radar Systems
S = Surface Vehicle Systems
O = Ordnance Systems
L = Laser Systems
E = Electronic / Automated Software Systems
All = Applicable to all seven weapons system categories

Additional explanations for all new acronyms and abbreviations used in the tables are provided at the end of each table.

It is important to note that although the PM is not directly responsible for all applicable ESOH compliance at a system development contractor's facility, non-compliance could still place a program at substantial risk. For example, if a contractor interrupts operations to incorporate capital improvements to meet compliance requirements, the program might risk schedule delays and cost impacts. Furthermore, a DoD contractor or subcontractor that is cited for environmental violations can generate adverse publicity reflecting poorly on the Army.

4.1 ESOH COMPLIANCE

Acquisition programs must comply with all applicable laws, codes, statutes, orders, directives, and regulations.[6] These represent external constraints that must be identified, evaluated, and integrated into program execution over the system life cycle, in order to minimize the cost and schedule risks such changing requirements often represent.

This section focuses on ESOH compliance-related requirements not addressed in Subsections 4.2 through 4.6 of this guide. Many of these requirements are promulgated by the federal agencies that provide clarifying guidance in accordance with specific federal laws and requirements; such as the EPA, US Fish and Wildlife Service, Advisory Council on Historic Preservation, and Federal Aviation Administration. These compliance topics and issues include air quality, surface water and groundwater resources, threatened and endangered species, wetlands habitat, historic properties and archaeological resources, noise issues, land use and conservation, and airspace use.

A summary of the ESOH Compliance requirements applicable to Army acquisition programs is presented in Table 4-1.

[6] A list of federal, DoD, and Army laws and regulations, applicable to acquisition program ESOH, is provided in the Appendix of this guide.

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Air Quality	Air Emissions	AR 200-1, DA PAM 200-1	All	Identification of the sources of air emissions to determine the type and amount of air pollutants being emitted, and monitoring sources of regulated pollutants to ensure compliance with applicable standards when required by statute or regulation. (AR 200-1, 6-3a(1),(2)).
	Air Pollution Sources	AR 200-1, DA PAM 200-1	All	Operators of air pollution sources should obtain training and/or certification in order to meet statutory and regulatory requirements and minimize emissions from those sources. (AR 200-1, 6-3a(6)).
	Hazardous Air Pollutants (HAPs)	CAA, Title III, DA PAM 200-1	All	Application of MACT standards are required for NESHAP compliance. Federal emission limitations are required for 189 substances, including hazardous organic chemicals and metals. Pollution control standards applied to HAPs are technology-based. Major sources emit more than 10 tpy of a listed substance or more than 25 tpy of any combination of HAPs. USAEC has identified 26 categories (12 of which have been promulgated) as emission sources located at some Army installations. These will primarily affect vehicle maintenance, fuel combustion, and equipment painting activities. Note, GACT compliance is required for area sources of HAPs (not major sources).
	HAPs Accidental Releases	CAA, Title III, DA PAM 200-1	All	Mitigation measures are mandatory for the accidental releases of a HAP in excess of the acceptable threshold quantity (ATQ).
	Ozone-Depleting Chemicals	AR 200-1, DA PAM 200-1	All	All Army activities are required to establish, fund, and implement projects to meet the goal of eliminating ODCs altogether from the Army inventory. (AR 200-1, 6-2(a)). Note: see also "Stratospheric Ozone Protection" below.
	Permits	CAA, Title V, DA PAM 200-1	All	All major sources of air pollutants are covered by the Title V "generic permit program". This includes all covered sources under the NSPS standards, PSD area, nonattainment areas, HAPs, acid deposition, etc. Section 504 authorizes states to issue individual, general, and temporary source permits. A state may generate a list of "insignificant activities" and emission levels that may be excluded from the state's permit program. All permits issued under Title V have a built-in expiration date. Permit expiration terminates the source's right to operate unless a timely and complete renewal application is submitted consistent with EPA regulations.
Air Quality (cont'd)	Regulation of Individual Emitters-General	CAA	All	Installation of the "best available control technology" (BACT) for any new major source of criteria pollutant within 70+ source categories is required for NSPS compliance. However, most weapon system actions are not likely to involve these specific designated industries, identified in 40 CFR 60.

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
	Regulation of Individual Emitters-Nonattainment Areas	CAA	All	A New Source Review (NSR) permit is required for the construction of new or modified major stationary sources of pollution that would exacerbate conditions in nonattainment areas. Utilization of LAER technology, an approved SIP, compliance with the SIP for any existing pollution sources owned or controlled by the owner of the proposed action (project), offset requirements, and in some cases a cost-benefit analysis is required. Existing major stationary sources are required to utilize RACT, defined by individual States in their SIPs.
	Regulation of Individual Emitters-Attainment Areas	CAA	All	PSD plans and permits are required for major new or modified stationary sources (40 CFR 51.166 (b)(i)) that will emit pollutants for which the region is in attainment. BACT pollution control technology is required, but is determined on a case-by-case basis. Different amounts of degradation of existing air quality are allowed in different class regions for SO_2 and PM_{10}. In addition, consumption of remaining regional increment of clean air is regulated. However, most weapon system actions are not likely to fall under the listed categories of PSD facilities.
	State Implementation Plans	CAA §110	All	Compliance with the host State's SIP is required. SIPs identify how individual states will attain the NAAQS by the applicable attainment deadlines. Once approved by the EPA, the state and local regulations in the SIP are enforceable as Federal law, and only an agreement with or variance granted by the EPA will allow noncompliance with the provisions of the SIP. Continuous emission controls, rather than intermittent or temporary controls, are required for SIP compliance.
	Stratospheric Ozone Protection	CAA, Title VI	All	Class I ozone-depleting substances (40 CFR 602 (a)) are now banned. Certain exceptions and extensions are created for CFCs used for "essential applications" pertaining to metals testing procedures, and substances required to ensure national security and utilized in the development of fire suppression systems. Class II substances (40 CFR 602 (b)), mostly HCFCs, are scheduled for phase out from 2002 through 2030. The knowing release of any refrigerant into the environment during repair or disposal is banned.
	Vehicle Emission Controls	CAA, Title II	S	DoD vehicles, which are exempt for national security reasons, and all heavy-duty vehicles above 26,000 pounds are exempt from Vehicle Fleet programs. Heavy off-road vehicles and construction equipment are also exempted.
Airspace Use	Airspace Use Procedures	FAA Order 7400.2E	A, M	Contains FAA's procedures for handling airspace matters, including Part 1 – General Procedures; Part 2 – Objects Affecting Navigable Airspace; Part 3 – Airport Airspace Analysis (such as military support proposals); Part 4 – Terminal and En Route Airspace; Part 5 – Special Use Airspace; Part 6 – Miscellaneous Airspace

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Airspace Use (cont'd)	DoD Responsibilities	DoDD 5030.19	A, M, L	The Directive implements the following: 1. Reissues DoD Directive 5030.19, June 22, 1989 to update policy and responsibilities for peacetime and wartime relationships between the DoD, DOT, FAA, and other government agencies [including the Department of State for Interagency Group on International Aviation matters] for areas specified in number 2. 2. Outline the DoD organizational structure for interface with the DOT, FAA, and other agencies on air traffic control and airspace management, National Airspace System (NAS) matters, and joint system acquisitions. 3. Provides DoD policy and planning guidance for comprehensive airspace planning between the DoD, the DOT, FAA, other government agencies, state governments, and civil communities. 4. Designates the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD(C3I)), acting for the Secretary of Defense, to provide policy and oversight of DoD interface with the FAA on all NAS matters. 5. Establishes the DoD Policy Board on Federal Aviation and designates ASD(C3I) as the Chair. 6. Establishes and assigns responsibilities for a DoD NAS Requirements Office. 7. Assigns responsibility to the ASD(C3I) as the Chair of the Overarching IPT under the Defense Acquisition Board for providing acquisition guidance related to all NAS acquisition activities. 8. Provides policy and guidelines for the use of military facilities affecting the use of airspace. 9. Is not intended to restrict the Military Departments' authority or responsibilities under 10 U.S.C. Policies, procedures, instructions, and responsibilities for the secure control of civil and military navigational aids, under emergency conditions are contained in DoDI 5030.36 which implements Executive Order 11161..
	Over the High Seas	DoDD 4540.1	A, M, L	Directive outlines policy and operating procedures for operating U. S. military aircraft and for firings into airspace over the high seas. It also serves as background for discussions on the question of control of U. S. military operations in international airspace.
	Special Military Operations	FAA Order 7610.4J	A, M, L	Specifies procedures for air traffic control planning, coordination, and services during defense activities and special military operations. Applies to all activities conducted in airspace controlled by or under the jurisdiction of the FAA. Procedures should be used as a planning guide by DoD personnel for operations in all areas.
Biological Resources	Coastal Ecosystem Protection	CZMA	A, M, O, S, L	Sustaining coastal ecosystems is one of the CZMP Strategic Framework's major themes. §307 requires that all actions within coastal zones must be consistent with the state's approved CMP. Certification of consistency with state CMPs must be submitted with a federal permit application.
	Coral Reefs	EO 13089	M, O, L	Federal agencies whose action may affect US coral reef ecosystems shall identify their actions that may affect US. coral reef ecosystems, utilize their programs and authorities to protect and enhance the conditions of such ecosystems and to the extent possible permitted by law, ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems.
	Critical Habitat	ESA	A, M, O, S, L	See discussion on Threatened and Endangered Species. Note, while most federal listed species do not have a critical habitat listed for them, most states require a designation of critical habitat.
	Essential Fish Habitat	Magnuson-Stevens Act	A, M, O, L	The Magnuson-Stevens Act requires all Federal agencies to consult with NMFS on all actions, or proposed actions, permitted, funded, or undertaken by the agency, that may adversely affect Essential Fish Habitat.

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Biological Resources (cont'd)	Incidental Takes	ESA	A, M, O, S, L	A §10 permit, which grants "incidental take" exemptions, is required if unavoidable impacts to threatened and endangered species and their critical habitat are likely to occur pursuant to an otherwise lawful activity. An incidental take permit may be granted as long as the action does not jeopardize the species as a whole. A Habitat Conservation Plan must accompany the request for an incidental take permit.
	Migratory Birds	EO 13186	A, M, R, O, S, L	Each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, within 2 years (from Jan. 10, 2001), a Memorandum of Understanding with the USFWS that shall promote the conservation of migratory bird populations.
	Threatened & Endangered Species	ESA	A, M, R, O, S, L	A §7 Consultation with the USFWS is required to ensure interagency cooperation and consultation to prevent any federal action, including federal permits or funding, from placing a species and or its critical habitat in jeopardy. A species does not have to occupy the critical habitat in question as long as the habitat satisfies fundamental behavioral needs (breeding, feeding or sheltering). Most consultations are informal, unless questions arise as to the potential for direct and indirect impacts on a listed or candidate species or its critical habitat, when a formal consultation is necessary. A positive finding triggers the need for a Biological Assessment. Note: most states have the equivalent of the Federal ESA which serve to protect species and habitats at the state level, including species that do not qualify for Federal endangered or threatened status.
	Wetlands	EO 11990	M, O, S	Federal agencies shall take action to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance the natural and beneficial values of wetland in carrying out the agency's responsibilities. New construction in wetlands must be avoided.
Cultural Resources	Archaeological Sites	ARPA	A, M, O, S	Access to archaeological resources on Federal and Indian lands is regulated by DOI (43 CFR 7) and DoD (32 CFR 229). Excavation or removal of archaeological resources is prohibited without a permit from the responsible land management agency.
	Cultural Resource Management	AR 200-4, DA PAM 200-4	A, M, R, O, S, L	Compliance requirements associated with major Federal cultural resource laws and regulations, as they apply to Army activities, are identified and described in AR 200-4. DA PAM 200-4 provides detailed guidance for implementing AR 200-4. Includes the protection of archaeological sites, historic properties, and American Indian sacred places.
	Exercise of Traditional Religions	AIRFA	A, M, R, O, S, L	Consultation with Native American tribes about any actions that might affect their religious practices.

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Cultural Resources (cont'd)	Historic Properties	NHPA	A, M, R, O, S, L	§106 requires agencies to consider the effects of their actions on registered and eligible historic properties and consult with the SHPO and, where significant historic properties subject to adverse effect are identified, with the ACHP. MOAs are usually prepared by the consulting parties when mutually agreeable solutions for problems of adverse effect are identified. If Indian tribal lands are involved, consultation with the THPO is required. Under §110, Federal property managers must establish programs to identify and preserve significant historic properties and special consideration must be applied to National Historic Landmarks.
	Native American Graves	NAGPRA	A, M, O, S	Consultation with relevant tribes is required if human remains or a Native American cultural item, associated with burials is discovered or encountered during actions on Federal or Indian land (40 CFR 10). §3(d) stipulates that: the action or activity should cease and reasonable effort made to protect the items recovered; the head of the agency having primary management authority should be notified in writing; and upon certification that notification has been received, the activity may resume after 30 days of such notification. Pre-project POAs for managing Native American items can be prepared beforehand for projects on Federal or tribal lands (40 CFR 10.3). Note, a project that requires a POA will also require a NHPA §106 review, usually resulting in a MOA.
	Sacred Places	EO 13007	A, M, R, O, S, L	Requires the management of sacred sites, including provisions for providing notice to Indian tribes of actions that might affect sacred sites.
General Compliance	Compliance with Environmental Requirements	DoDI 4715.6	All	DoD policy requires compliance with all applicable Executive Orders and Federal, state, interstate, regional, and local statutory and regulatory environmental requirements, both substantive and procedural (Section 4.1).
	ESOH Review	DoDI 5000.2	All	PMs shall regularly review ESOH regulatory requirements and evaluate their impact on life cycle cost, schedule, and performance to minimize the cost and schedule risks. (Section E7.7).
	Environmental Accountability	EO 13148	All	Federal agencies are responsible for ensuring that all necessary actions are taken to integrate environmental accountability into agency day-to-day decision-making and long-term planning processes for all missions, activities, and functions. This includes developing a environmental management systems, regulatory compliance, audit programs, pollution prevention and life-cycle assessment.
	Environmental Goals	EO 11514	All	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. The heads of federal agencies shall monitor, evaluate and control on a continuing basis their agencies' activities so as to protect and enhance the quality of the environment.

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
General Compliance (cont'd)	Environmental Security	DoDD 4715.1	All	Environmental factors are to be integrated into DoD decision-making processes that may have an impact on the environment. Activities must comply with all applicable statutes, reduce risk to human health, prevent pollution, provide necessary training, and develop the applicable plans that will implement these requirements.
	Planning	DoDI 4715.9	All	Incorporate environmental considerations early into activities and operational planning. Inform decision-makers of environmental impacts, constraints by environmental regulations, and potential delays due to these constraints. Consult with local governments and the public on environmental impacts of proposed activities. (Section 6.2)
	Programmatic Environment, Safety and Health Evaluation (PESHE)	DoDI 5000.2	All	PMs shall prepare a PESHE document early in the program life cycle (usually Milestone B). The PESHE shall identify ESOH risks, contain a National Environmental Policy Act (NEPA) compliance schedule. The PM shall keep the PESHE updated over the system life cycle. (Table E3, T1, Statutory Information Requirements).
	Prevention and Management of ESOH Hazards	DoDI 5000.2	All	As part of risk reduction, the PM shall prevent ESOH hazards, where possible, and shall manage ESOH hazards where they cannot be avoided. (Section E7.7)
	Test and Evaluation	DoDI 5000.2	All	Test and Evaluation planning shall consider the potential testing impacts on the environment (Section E5.4.5).
Land Use and Land Conserva-tion	Airfield Compatibility	DoDI 4165.57	A, M	The Instruction: (1) sets forth DoD policy on achieving compatible use of public and private lands in the vicinity of military airfields; (2) defines (a) required restrictions on the uses and heights of natural and man-made objects in the vicinity of air installations to provide for safety of flight and to assure that people and facilities are not concentrated in areas susceptible to aircraft accidents; and (b) desirable restrictions on land use to assure its compatibility with the characteristics, including noise, of air installations operations; (3) describes the procedures by which Air Installations Compatible Use Zones may be defined; and (4) provides policy on the extent of Government interest in real property within these zones which may be retained or acquired to protect the operational capability of active military airfields (subject in each case to the availability of required authorizations and appropriations).
	Coastal Barrier Resources	CBRA	M, R, O	Directs that no new federal expenditures or financial assistance will be made available for development activities within the Coastal Barrier Resources System (undeveloped coastal barriers such as bay barriers, barrier islands, and other geological features that protect mainland aquatic habitats from direct winds and waves). Essential military operations are, however, exempt.
	Coastal Zones	CZMA, AR 200-3	All	CZMA §307 requires that all Federal activities and projects affecting the state's coastal zone must be consistent with the state's approved Coastal Management Program. These are varied and flexible. The CZMA gives states the authority to review Federal projects, and projects receiving federal licenses and permits, to ensure that they abide by state laws, regulations, and policies. Note, depending on the state, Federal consistency documents required include a Consistency Determination for federal activities and development projects, a Consistency Certification for Federal permits and licenses and Federal support to state and local agencies.

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Land Use and Land Conserva-tion	Fire Hazards	AR 200-3	All	Installation activities making use of the land (e.g., testing, training, and maneuvers) will be aware of fire hazards and adjust their programs, including suspension of activities, to avoid high fire hazard areas and/or periods (AR 200-3, 2-17).
	Floodplains	EO 11988	All	Federal agencies shall evaluate the potential effects of any actions it may take in a floodplain by completing an evaluation prepared under Section 102(2)(C) of NEPA for major actions, consider alternatives for projects located in a floodplain, allow for public review and send notice to area-wide A-95 clearinghouses for the geographic area affected.
	Prime or Unique Farmland	FPPA	All	Section 4201(b) of the FPPA states that the purpose of the act is to "minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of (prime or unique) farmland to nonagricultural uses and to assure that Federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland." Section 4208(b) of the act also states that none of the provisions or other requirements of the act shall apply to "the acquisition or use of (prime or unique) farmland for national defense purposes during a national emergency."
	Soil Erosion and Sedimentation Control	AR 200-3	All	Sources of dust, runoff, silt, and erosion debris will be controlled to prevent damage to land, water resources, equipment, and facilities, including adjacent properties. An erosion and sediment control plan must be implemented where appropriate. (AR 200-3, 2-15)
Noise	Land Use Compatibility	AR 200-1, DA PAM 200-1	All	Army action/activity noise levels of less than 65 dBA from transportation sources, such as vehicles and aircraft, are compatible with noise-sensitive land uses (housing, schools, and medical facilities); normally incompatible with noise levels between 65 and 75 dBA; and incompatible with noise levels greater than 75 dBA (DA PAM 200-1, 7-5). Army action/activity noise levels of less than 62 dBC from impulsive sources, such as armor, artillery and demolition, are compatible with noise-sensitive land uses (housing, schools, and medical facilities); normally incompatible with noise levels between 62 and 70 dBC; and incompatible with noise levels greater than 70 dBC (DA PAM 200-1, 7-5). Army action/activity noise levels of less than 65 dBA from small arms sources (ranges) are compatible with noise-sensitive land uses (housing, schools, and medical facilities); normally incompatible with noise levels between 65 and 75 dBA, and incompatible with noise levels greater than 75 dBA (DA PAM 200-1, 7-5).
	Noise Exposure Limits for Army Materiel	MIL-STD-1474D	All	This standard establishes acoustical noise limits for Army and other DoD materiel, and prescribes the testing requirements and measurement techniques for determining conformance to the noise limits.

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Noise (cont'd)	Noise Exposure Limits in the Workplace	AR 40-5, DA PAM 40-501	All	AR 40-5 (Section 5-16) describes the Army's Hearing Conservation Program (HCP), which is designed to protect the employee from hearing loss due to occupational noise exposure. DA PAM 40-501 provides guidance and requirements for implementing the Army's HCP; includes noise exposure limits and hearing protector requirements for industrial type operations and for soldiers in training, non-combat, and non-industrial scenarios.
	Monitoring for Environmental Noise	AR 200-1	A, M, O, S	The impact of noise that may be produced by ongoing and proposed Army actions/activities will be continually evaluated, and noise impacts and annoyance will be minimized to the greatest extent practicable (AR 200-1, 7-2(a)). The Army will also monitor the noise environment to verify levels that have produced major public and/or political controversy (AR 200-1, 7-2(g)).
	Procurements for Quieter Equipment	AR 200-1	All	It is Army policy to: (a) develop and procure weapon systems and other military combat equipment that produce less noise, when consistent with operational requirements; and (b) procure commercially manufactured products, or those adapted for general military use, that produce less noise and comply with regulatory noise emission standards (AR 200-1, 7-2(h,i)).
Social Issues	Environmental Justice	EO 12898	All	Disproportionately high and adverse human health or environmental effects of programs, policies, and activities on minority and low-income populations should be identified and addressed to achieve environmental justice. Note, a Presidential Memorandum accompanying EO 12898 directs agencies to analyze environmental effects on minority and low-income communities as part of their NEPA analyses.
Water-Surface Waters	Dredged or Fill Material Discharge	AR 200-1	M, R	Proposed military activities involving the discharge of dredged or fill material into waters of the US, including wetlands, must be coordinated with the local USACE district and comply with the 404 permit program (AR 200-1, 2-4(j)).
	Existing Industrial Pollutant Sources	CWA, AR 200-1	All	BPT standards apply to all industry sources for all pollutants. However, FDF variances are available for addressing plant-specific variations through a separate administrative process. Conventional pollutants, including BOD, TSS, coliform, pH, and oil and grease must meet the BCT standards. Nontoxic and non-conventional pollutant dischargers must meet BAT standards for WQA compliance. Operators of industrial treatment plants will receive necessary training and meet applicable certification requirements (AR 200-1, 2-7(a)).
	Point Source Pollutant Discharges	CWA, AR 200-1	All	NPDES permits are required for any discharge of a pollutant from a point source in accordance with the §402 permit procedure. §401 requires state certification of the potential discharger that it will comply with all the provisions of Title III. The discharger must comply with the standard conditions placed in all NPDES permits, including the requirement for discharge monitoring reports (40 CFR 122.41(j) and 122.41(l). EPA and states generally cooperate in the permit issuance process, but there may be differences in monitoring requirements and the number of pollutants limited. The CWA allows variances from the requirements of the NPDES permit system. Note, pretreatment requirements for industrial facilities discharging into POTWs exempts them from needing individual NPDES permits.

Table 4-1. ESOH Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Water – Surface Waters (cont'd)	Spill Prevention	CWA, AR 200-1	All	Army activities will develop a Spill Prevention Control and Countermeasures Plan in accordance with §311(j). (AR 200-1, 2-4(h)).
	Stormwater Discharge	CWA	All	NPDES permits for stormwater discharges (defined in §402(p)(2)) are required. Regulatory requirements are different for industrial, construction, and municipal facilities. Industrial facilities must comply with §301 and §402 requiring BAT and BCT standards, and where necessary, water-quality-based controls. Industries may submit individual or group applications, or a notice of intent to comply with a general permit. Stormwater construction general permits are required for stormwater discharges from construction activities that disturb more than 5 acres of land. BMPs stated in the pollution prevention plan must be implemented.
	Stormwater Discharge Prevention	AR 200-1	All	A Stormwater Discharge Prevention Plan must be developed for Army activities in accordance with 40 CFR Part 125. (AR 200-1, 2-4(g)).
	Toxic Pollutants	CWA	All	Compliance with the effluent guidelines, discharge thresholds, and BAT standards for all the categories of "priority" pollutant discharges (§307).
Water-Ground-water	Contaminant Leaching	RCRA	All	Addresses contaminant leaching from surface impoundments, de-icing salts, and other sources.
		TSCA	All	Addresses contaminant leaching from the manufacture, use, storage, distribution, or disposal of toxic chemicals.
		CERCLA	All	Addresses contaminant leaching from hazardous waste sites.
	Underground Storage Tanks	RCRA	All	Compliance with Subtitle I of the 1984 Amendments to RCRA. Spill and overflow prevention devices, corrosion protection systems, and procedures for detecting leaks must be in place.

Table 4-1. ESOH Compliance Requirements

Explanation:

ACHP	Advisory Council on Historic Preservation
AIRFA	American Indian Religious Freedom Act
ARPA	Archaeological Resources Protection Act
ASD(C3I)	Assistant Secretary of Defense for Command, Control, Communications, and Intelligence
ATQ	Acceptable Threshold Quantity
BACT	Best Available Control Technology
BAT	Best Available Technology
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practices
BOD	Biological Oxygen Demand
BPT	Best Practicable Control Technology
CAA	Clean Air Act
CBRA	Coastal Barrier Resources Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFC	Chlorofluorocarbons
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dBA	A-weighted decibel scale
dBC	C-weighted decibel scale
DOI	US Department of the Interior
DOT	US Department of Transportation
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDF	Fundamentally Different Factor
FPPA	Farmland Protection Policy Act
GACT	Generally Available Control Technology
HAPs	Hazardous Air Pollutants
HCFC	Hydrochlorofluorocarbons
HCP	Hearing Conservation Program
IPT	Integrated Product Team
LAER	Lowest Achievable Emission Rate
MACT	Maximum Achievable Control Technology
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	National Airspace System
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
NSR	New Source Review
ODC	Ozone Depleting Chemical
OSHA	Occupational Safety and Health Administration
PESHE	Programmatic Environment, Safety, and Occupational Health Evaluation
PM_{10}	Inhalable Particulate Matter
POA	Plan of Action
POTW	Publicly Owned Treatment Works
PSD	Prevention of Significant Deterioration
RACT	Reasonable Available Control Technology
RCRA	Resource Conservation and Recovery Act
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
THPO	Tribal Historic Preservation Officer
tpy	Tons Per Year
TSCA	Toxic Substances Control Act
TSS	Total Dissolved Solids
USACE	US Army Corps of Engineers
USC	United States Code
USFWS	US Fish and Wildlife Service
WQA	Water Quality Act of 1987 amendments

4.2 NEPA AND EXECUTIVE ORDER 12114 COMPLIANCE

The National Environmental Policy Act of 1969, as amended, requires federal agencies to consider and document the potential environmental effects of any actions (plans, programs, and policies) that can affect the human environment. NEPA simply requires that environmental issues be included at the same time that technological, economic, and mission-related issues are incorporated in the decision making process; and that the public is informed and involved, when appropriate, in this process.

In accordance with DODI 5000.2, system acquisition programs must comply with NEPA, its implementing regulations [40 Code of Federal Regulations (CFR) Parts 1500-1508], and EO 12114, as applicable. The Army's implementing regulation for NEPA, AR 200-2, has recently been superseded by 32 CFR Part 651 (*Environmental Analysis of Army Actions*). The recently revised regulation delineates responsibilities and provides guidance for NEPA compliance within the Army guidance that incorporates recommendations of the President's Council on Environmental Quality (CEQ) to reduce NEPA costs and increase the value of NEPA analyses to better, informed decision making (CEQ, 1997). As for the implementation of EO 12114 requirements, 32 CFR Part 651 refers to DoD Directive 6050.7 (*Environmental Effects Abroad of Major Department of Defense Actions*). As part of the CEQ recommendations, shorter, more-focused, and concise NEPA documents are encouraged. As systems proceed along their life cycle phases, this streamlining can best be accomplished through the appropriate use of "programmatic" documents, the efficient "tiering" of documents to eliminate needless duplication of issues, and "incorporation by reference" (referencing or summarizing pertinent documents as opposed to duplicating their content). In addition, NEPA documents should address minor issues in summary form and detail only those that are important to the decision at hand. Unresolved or significant issues should be clearly identified for consideration by the system decision makers. When viewed as decision documents, NEPA analysis and documentation can serve to succinctly summarize environmental issues for the decision maker; and they can become much smaller and more focused.

A summary of the NEPA and EO 12114 implementing requirements is presented in Table 4-2. These requirements are generally applicable to *all* weapon system categories.

Table 4-2. NEPA and EO 12114 Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Army Actions within the US, its territories, and possessions	Emergency Actions	32 CFR Part 651	All	Emergency actions (e.g., necessary for national defense, security, or preservation of human life and property) do not require NEPA compliance documentation (CX, REC, EA, or EIS). Notification of the ODEP, which will in turn notify the ASA(I&E), is required. However, this notification applies only to actions necessary to control the immediate effects of the emergency. Other actions remain subject to NEPA. (32 CFR 651.11(b))
	Classified Actions	32 CFR Part 651, AR 380-5	All	Classification does not relieve a proponent from NEPA analysis. Either classified portions will be kept separate and provided to reviewers and decision-makers in accordance with AR 380-5, or the proponent, in consultation with the appropriate security and environmental offices, will form a team to review a classified NEPA analysis. (32 CFR 651.13)
	Actions Exempt By Law	32 CFR Part 651	All	Some aspects of Army decision-making may be exempted from NEPA compliance, the law must apply to DoD and/or the Army and must prohibit, exempt, or make impossible full compliance with the procedures of NEPA. The fact that Congress has directed the Army to take an action does not constitute an exemption. (32 CFR 651.11(a))
	When to apply a CX	32 CFR Part 651	All	A CX satisfies NEPA compliance requirements if the action meets the screening criteria for CXs (32 CFR 651.29(a)), is covered by one or more of the actions that normally qualify for a CX (§ Appendix B), and no extraordinary circumstances exist (§ 651.29(b) and (c)). Some CXs require a REC (§ Appendix B).
	When to prepare a REC	32 CFR Part 651	All	A REC is applicable to those actions that either: (a) qualify for a CX and require a REC, or (b) are adequately covered in an existing EA or EIS. (32 CFR 651.19)
	When to prepare an EA	32 CFR Part 651, 40 CFR 1500-1508	All	An EA is applicable if the action: (a) does not qualify as an emergency action, (b) is not exempt, (c) does not meet the criteria for a CX, (d) is not adequately covered in existing NEPA analyses, and (e) does not normally require an EIS (32 CFR 651.32). Army actions normally requiring an EA are identified in § 651.33. An EA on any action may be prepared at any time in order to assist in planning and decision-making (40 CFR 1501.3(b)).
	When to prepare an EIS	32 CFR Part 651	All	An EIS is applicable when an action clearly has significant impacts or when an EA cannot support a FNSI. Conditions requiring an EIS are identified in 32 CFR 651.41. Army actions normally requiring an EIS are identified in § 651.42.

Table 4-2. NEPA and EO 12114 Compliance Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Army Actions Within Foreign Nations, and those Affecting Protected Global Resources [1,2]	Emergency Actions, National Security Operations, and Armed Conflict, etc.	EO 12114, DoDD 6050.7	All	Actions taken by the President, taken in the course of armed conflict, supporting the national security or national interest, arms transfers, disaster and emergency relief actions, actions involving export licenses, export permits, or export approvals, emergencies, and actions determined not to have significant environmental harm outside the US or to a designated resource of global importance are exempt from EO 12114 compliance.
	When to apply a CX	EO 12114, DoDD 6050.7, 32 CFR Part 651	All	In reviewing potential environmental impacts, the list of Army CXs in 32 CFR Appendix B to Part 651 may be used in accordance with DoDD 6050.7 and EO 12114. (32 CFR 651.55)
	When to prepare an ES	EO 12114, DoDD 6050.7	All	A cooperative bilateral or multilateral ES is applicable for Army actions that significantly harm the environment of a foreign nation when an action is proposed by the US and one or more foreign nations, or by an international body or organization in which the US is a member or participant. An ES is also applicable for major actions outside the US that significantly harm natural or ecological resources of global importance.
	When to prepare an ER	EO 12114, DoDD 6050.7	All	A unilaterally prepared ER is applicable for Army actions that significantly harm the environment of a foreign nation. An ER is also applicable for major actions outside the US that significantly harm natural or ecological resources of global importance.
	When to prepare an EA	EO 12114, DoDD 6050.7	All	An EA is applicable in determining whether an EIS is required for a particular action.
	When to prepare an EIS	EO 12114, DoDD 6050.7	All	An EIS is applicable for major Army actions, which significantly affect the environment of the global commons outside the jurisdiction of any nation.

Table 4-2. NEPA and EO 12114 Compliance Requirements

[1] Through an agreement with the Marshallese Government, Army actions at US Army Kwajalein Atoll are subject to NEPA compliance in accordance with 32 CFR 651 and 40 CFR 1500-1508. In such cases, refer to the NEPA compliance requirement for Army actions within the United States.

[2] Note, the focus is not the place of the action, but the location of the environment with respect to which there is significant harm.

Explanation:

ASA(I&E)	Assistant Secretary of the Army for Installations and Environment
CX	Categorical Exclusion
EA	Environmental Assessment
EIS	Environmental Impact Statement
ER	Environmental Review
ES	Environmental Study
NEPA	National Environmental Policy Act
ODEP	Office of the Director of Environmental Programs
REC	Record of Environmental Consideration

4.3 SAFETY AND HEALTH

System safety engineering and management policies at the DoD level are closely tied to the DoD health and hazard assessment program policies and objectives. This close safety and health program focus is promulgated directly to the Military Services in DoDI 5000.2. At the Service level, the programs, although closely integrated, are often covered by separate procedures and regulations, more clearly identifying staff responsibilities and reporting procedures.

AR 385-16 (*System Safety Engineering and Management*) describes system safety program activities and responsibilities. PMs are responsible for developing and using three primary management tools in implementing the safety program: the System Safety Management Plan (SSMP), the System Safety Working Group, and the Hazard Tracking System. PMs must ensure that the SSMP is developed and updated as part of the acquisition strategy, and that safety and health issues are identified in all TEMPs. The focus of the safety program should be on early hazard identification and elimination, risk assessment, and risk management. Military Standard (MIL-STD)-882D (*Department of Defense Standard Practice for System Safety*) also provides guidance for risk management, and the inclusion of system safety into the development and evaluation process. It provides both general and detailed DoD-wide guidance for PMs to develop and implement an acceptable system safety program.

AR 40-10 (*Health Hazard Assessment Program in Support of Army Materiel Acquisition Decision Process*) provides guidance on integration of health issues into all phases of the acquisition process. Health hazards must be considered in the AS and in the System Manpower and Personnel Integration (MANPRINT) Management Plan (SMMP). Initial HHAs provide input into the front-end of the acquisition decision process. An HHA Report (HHAR) is prepared based on input from materiel developers, testers, and independent evaluators in the development phase. It provides a standard structure and approach for assessing system-generated threats to the health of soldiers and DoD personnel.

Table 4-3 provides an overview of pertinent federal, DoD, and Army safety and health requirements for the acquisition community. These requirements are generally applicable to *all* weapons systems; however, select system requirements are identified, where appropriate.

Table 4-3. Safety and Health Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Safety and Health	Army's Occupational Health Program	AR 40-5	All	AR 40-5 establishes the Army's Occupational Health Program to protect employees against adverse effects of health and safety hazards in the work environment, which includes field operations as well as the industrial workplace. As part of the Program, military occupational and environmental health standards are identified.
	Chemical Agents	AR 385-61, DA PAM 385-61	M, O	The Army will provide policies, program direction and oversight for the Army Chemical Agent Safety Program for all aspects of environment, safety, and occupational health statutory compliance. This includes safe and efficient handling and disposal of chemical agents, stockpile and non-stockpile. Chemical agent events will be reported. Safety studies and reviews are conducted to assure the incorporation of maximum safety and to prevent inadvertent release of chemical agents in any amount, or under any conditions that may cause the incapacitation, illness, or death of any person, or adversely effect the public or environment. Minimal safety criteria and standards are provided in the Pamphlet.
	Design Criteria for System Safety	MIL-STD-1472F	All	Design shall reflect applicable system and personnel safety factors, including minimizing potential human error in the operation and maintenance of the system, particularly under the conditions of alert, battle stress, or other emergency or non-routine conditions. Design of non-military-unique workplaces and equipment shall conform to OSHA standards unless military applications require more stringent limits (e.g., maximum steady-state noise in personnel-occupied areas). This Military Standard specifies human engineering design criteria applicable to the design of all systems, subsystems, equipment, and facilities; except where provisions relating to aircraft design conflict with crew system design requirements or guidelines of JSSG-2010.
	Hazard Tracking System	AR 385-16	All	PMs are responsible for developing and using the Hazard Tracking System as a management tool in implementing a safety program required by AR 385-16. A Hazard Tracking System provides a total life-cycle record of the disposition of all system hazards (Section 4.q). Note, hazard risk acceptance level should be determined for each individual program using AR 385-16 as a guide.
	Health Hazard Assessment	AR 40-10	All	AR 40-10 provides guidance on the integration of health issues into all phases of the acquisition process. Health hazards must be considered in the acquisition strategy and in the SMMP that supports the program requirements documents. A Health Hazard Assessment Report should be prepared based on input from materiel developers, testers, and independent evaluators in the in the development phase. The document should provide a standard structure and approach for assessing system-generated threats to the health of soldiers and DoD personnel.
	Health Hazards	AR 602-2	All	Health Hazards is one of the MANPRINT process domains, and should be applied and tailored to all Army systems in the System Acquisition Process and integrated into other MANPRINT concerns. While MANPRINT does not replace other Army safety and health programs, information developed during the process should be used in fulfilling health hazard evaluation requirements, and vice-versa. MANPRINT assessments must be conducted prior to milestone decision reviews on all acquisition programs.
	Human System Integration (HSI)	DoDI 5000.2	All	PMs must pursue HSI initiatives to optimize total system performance and minimize total ownership cost. PMs shall integrate safety and occupational health considerations early in the acquisition process (Section E3.7.1.1).

Table 4-3. Safety and Health Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Safety and Health (cont'd)	Noise Exposure Limits	AR 40-5, DA PAM 40-501	All	AR 40-5 (Section 5-16) describes the Army's Hearing Conservation Program (HCP), which is designed to protect the employee from hearing loss due to occupational noise exposure. DA PAM 40-501 provides guidance and requirements for implementing the Army's HCP; includes noise exposure limits and hearing protector requirements for industrial type operations and for soldiers in training, non-combat, and non-industrial scenarios.
	Noise Exposure Limits for Army Materiel	MIL-STD-1474D	All	This standard establishes acoustical noise limits for Army and other DoD materiel, and prescribes the testing requirements and measurement techniques for determining conformance to the noise limits. The noise limits take into consideration risk to hearing loss, community annoyance issues, and aural detection concerns.
	Respirator Use	AR 11-34	All	Respirators are an acceptable method of protecting personnel only for intermittent, non-routine operations, interim periods, emergencies or when engineering controls are insufficient. The goal is to eliminate workplace hazards and the need for respiratory protective equipment. If work requires a respirator, an industrial respirator program must be established including responsibilities, respirator selection, and conditions for respirator use.
	Risk Management	DoDI 6055.1, DoDI 5000.2 AR 70-1 AR 385-10, MIL-STD-882D	All	DoDI 6055.1 requires the use of a risk management process to implement safety and health occupational health policies (Section E3.1). This process includes identifying hazards, assessing hazards, developing controls, making risk decisions, implementing controls and making adjustments (Section E2.1.27). The Design Readiness Review must assess design maturity including ESOH risks and a completed failure modes and effect analysis (Section E3.7.4). Per AR 70-1, Army policy requires that safety, health and environmental risk management (identify hazards, assess risk, make risk decision, implement, and supervise) shall be integrated into the acquisition process to allow for timely and informed risk decisions and provide a means to inform users of residual hazards, ultimately protecting the force (Section 1-4(n)). AR 385-10 requires managers to integrate risk management into all Army processes and operations. This includes ensuring safe facilities, implementing accident prevention plans, and providing health and safety training (Section 2-2). MIL-STD-882D provides guidance for risk management, and the inclusion of system safety into the development and acquisition process. It provides both general and detailed DoD-wide guidance for PMs to develop and implement an acceptable system safety program.
	Risks to Children	EO 13045	All	Federal agencies shall identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health and safety risks.

Table 4-3. Safety and Health Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Safety and Health (cont'd)	Safety and Health Policy for Weapons	DoDI 6055.1	All	New and modernized weapons systems and construction projects must meet applicable safety, life-safety, fire protection, and health standards.
	Safety Hazards	AR 70-1	All	The PM or Materiel Developer will be responsible for identifying all hazards, eliminating or mitigating when possible, and providing an assessment of hazards that are not eliminated.
	Safety Release for Testing	AR 70-1, AR 385-16	All	Developmental and operational tests using troops cannot occur until after a Safety Release for such tests has been issued by TECOM.
	System Safety	DoDI 5000.2	All	Safety shall be addressed throughout the acquisition process (Section E1.23)
	System Safety	AR 602-2	All	System safety is one of the MANPRINT process domains, and should be applied and tailored to all Army systems in the System Acquisition Process and integrated into other MANPRINT concerns. While MANPRINT does not replace other Army safety and health programs, information developed during the process should be used in fulfilling safety evaluation requirements, and vice-versa. MANPRINT assessments must be conducted prior to milestone decision reviews on all acquisition programs. EM 385-1-1 implements safety and health standards and requirements contained in 29 CFR 1910, 29 CFR 1926, 29 CFR 1960, 30 CFR 56, EO 12196, DoDI 6055.1, AR 40-5, AR 385-10, and AR 385-40.
	System Safety Management Plan	AR 385-16 DA PAM 385-16	All	A tailored safety program must be implemented for all systems. Safety criteria shall be included in design and equipment specifications. PMs are responsible for developing and using the SSMP as a management tool in implementing a safety program required by AR 385-16. PMs must ensure that the SSMP is developed and updated as part of the acquisition strategy and that safety and health issues are identified in all TEMPs.
	System Safety Working Group	AR 385-16	All	PMs are responsible for developing and using the SSWG as a management tool in implementing a safety program.
Radiation Safety and Health	Army Radiation Safety Policy	AR 11-9, AR 40-5	All	These regulations establish Army policies and procedures for the use of, licensing, disposal, transportation, safety design, and inventory control of ionizing and non-ionizing radiation sources. Radiation exposure standards, and dosimetry and accident reporting instructions are also included
	NRC License Standards	10 CFR Part 20	All	The regulations establish standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC. These regulations include agency requirements for dose limits for radiation workers and members of the public, monitoring and labeling radioactive materials, and posting radiation areas.

Table 4-3. Safety and Health Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Radiation Safety and Health (cont'd)	Radiation Protection Program	DoDI 6055.8	All	A radiation protection program must be established and maintained for those operations involving occupational (ionizing) radiation exposure. Exposures to radiation associated with DoD operations shall be as low as reasonably achievable.
	RF and Laser Protection Program	DoDI 6055.11	R, L, E	A RF and laser protection program must be established if applicable (Section 5.2). RF, EMF, and other dangers associated with DoD electronic equipment should be identified, attenuated, or controlled by engineering design (Section 4.1). RF exposure must be limited to within the permissible exposure limit (Section 4.2).

Explanation:

EM	Engineer Manual
EMF	Electromagnetic fields
EO	Executive Order
HSI	Health System Integration
JSSG	Joint Service Specification Guide
MANPRINT	Manpower and Personnel Integration
OSHA	Occupational Safety and Health Act
RF	Radio Frequency
SSMP	System Safety Management Plan
SSWG	System Safety Working Group
TECOM	Test and Evaluation Command

4.4 HAZARDOUS MATERIALS MANAGEMENT

The Occupational Safety and Health Act of 1979, the Hazardous Materials Transportation Authorization Act of 1994, the RCRA, and the EPCRA of 1986 set the policy and national direction for hazardous materials management, which is defined here as including hazardous waste management. More definitive requirements for hazardous material management and minimization are contained in DoD- and Army-level documents.

In accordance with National Aerospace Standard (NAS) 411 and AR 40-10, the PM is required to establish a hazardous material management program (HMMP) to consider eliminating or reducing the use of hazardous materials in processes and products. When the use of hazardous materials cannot be avoided, the PM must develop and implement plans and procedures for identifying, minimizing use of, tracking, storing, handling, packaging, transporting, and disposing of such materials. NAS 411 (*Hazardous Material Management Program*) is the current DoD-wide guidance for the development of an HMMP. The Under Secretary of Defense for Acquisition and Technology endorsed NAS 411 in January 1995, promoting its use throughout the DoD.

The principal hazardous materials management compliance requirements (including those for hazardous waste) that are applicable to system acquisition programs are identified in Table 4-4.

Table 4-4. Hazardous Materials Management Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Hazardous Materials & Waste	Chemical Hazards Training	DoD 6050.5-G-1	All	Series of lessons on the federal hazard communication, exposure hazards, controlling chemical hazards, MSDS use, chemical labeling and inventory.
	Chemical Warfare Agents	AR 200-1	O, M	Handling, use, and disposal of chemical warfare agents and ammunition-related materials will be done in a manner which will protect the environment and in accordance with AR 50-6, AR 385-61, and DA PAM 50-6. Waste chemical warfare agents or agent contaminated media are subject to the requirements of RCRA and may meet the definition of a hazardous waste. (AR 200-1, 5-6(a,b)).
	Communica-tion of Hazards	DoDI 6050.5 DoD 6050.5-H	All	Establish a HMIS that provides policy for MSDS, labeling and a written hazardous communications plan. Suppliers must provide MSDS and compliant warning labels. This information must be readily available to personnel. DoD 6050.5-H provides a method for labeling unlabeled hazardous materials, hazardous chemicals manufactured within DoD, repackaged containers of hazardous materials, tanks, vats or similar vessels of hazardous chemicals.
	Demilitariza-tion & Disposal Planning	DoDI 5000.2	All	During the design process, PMs shall document hazardous materials contained in the system, and shall estimate and plan for the system's demilitarization and safe disposal (Section 3.9.3)
	Hazardous Materials Information System (HMIS)	AR 700-141 DoD 6050.5-G DoD 6050.5-M	All	The HMIS is a DoD database to assist personnel who manage or use hazardous materials. It contains safety, health, packaging, labeling, transportation, and disposal information concerning materiel used by DoD activities. The DoD HMIS is administered by the DLA and data is input by DoD components. Per AR 700-141, all hazardous materials managed, procured, or manufactured by the DA must use the DoD HMIS. DoD 6050.5-G is a guide to assist users of the system to locate and utilize data on hazardous materials. DoD 6050.5-M contains procedures for operation of the HMIS.
	Hazardous Materials Inventory	AR 200-1	All	Maintenance of a current inventory of hazardous materials is required to comply with community notifications required by EPCRA; spill reporting required by the CWA; and OSHA hazard communication requirements (20 CFR Part 1910.1200). (AR 200-1, 4-3(b) and 5-3(b))
	Hazardous Material Management Program (HMMP)	NAS 411	All	NAS 411 is the current DoD-wide guidance for the development of a HMMP. The Under Secretary of Defense for Acquisition and Technology endorsed NAS 411 in January 1995, promoting its use throughout the DoD.

Table 4-4. Hazardous Materials Management Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Hazardous Materials & Waste (cont'd)	Hazardous Materials Storage	AR 200-1	All	USACE Facilities Standardization mandates that new construction of hazardous materials storage facilities conform to the US Army Standard Design for Hazardous Material Storage Facilities (AR 200-1, 4-3(d)). Note, hazardous or toxic material that is not owned by DoD may not be stored, disposed, or treated at industrial type facilities on Army owned property except as authorized under 10 USC 2692 (AR 200-1, 4-3(g)).
	Hazardous Waste Disposal	AR 200-1	All	Waste generating activities, including tenants, are responsible for characterizing waste to determine if it is hazardous. Evidence for the basis of waste characterization will be maintained and available for regulatory review. (AR 200-1, 5-3(e)(2)).
	Hazardous Waste Leaks	RCRA	All	Clean-up requirements for waste leaks are identified in §3004(u)
	Hazardous Waste Manifests	RCRA, AR 200-1	All	LQGs and SQGs must manifest their hazardous wastes in accordance with §§262.20-23. CESQGs are exempt. LQGs are also required to certify that a program to reduce the volume and toxicity of waster generated is in place. Note, the Installation Commander may delegate signatory authority for hazardous waste manifest signature and responsibility for manifest record keeping and documentation requirements for all tenants and activities covered under the Installation EPA Generator Identification Number (AR 200-1, 5-3(c)(2)).
	Hazardous Waste Minimiza-tion	AR 200-1	All	Army policy is to reduce the quantity or volume and toxicity of hazardous wastes generated by Army operations and activities, where ever it's economically feasible or environmentally sound. Emphasis will be placed on source reduction and materials substitution methods. Army installations will prepare waste minimization plans as required by Federal, state, and local laws and regulations (AR 200-1, 5-4). See also Section 4.5 of this guide on Pollution Prevention.
	Hazardous Waste Storage	RCRA	All	LQGs must clearly and legibly label storage containers and satisfy the requirements of §265 Subpart I. Storage in tanks is permissible under §265, Subpart J. Design and inspection provisions are contained in §§265.191 and 192. Secondary containment and leak detection devices are required (except for §265.193 exemptions). Storage on drip pads must comply with §265 Subpart W. Storage in containment buildings that meet design standards outline in §265.1109 is also allowed. In addition to the various storage requirements, LQGs must have contingency plans to address releases (§265 Subpart D). SQGs must clearly and legibly label storage containers and satisfy the requirements of §265 Subpart I. The mixing of incompatible wastes is prohibited by §265.201. An accessible emergency coordinator must be identified (§262.35(d)(5)).

Table 4-4. Hazardous Materials Management Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Hazardous Materials & Waste (cont'd)	Large Quantity Generator	RCRA	All	LQGs (more that 1,000 kg in one or more months during the year) must obtain EPA Identification numbers in accordance with §262.12. May store hazardous wastes on site for up to 90 days without obtaining a TSDF permit. Storage safety requirements set out in §262 Subparts C and D must be followed, in addition to labeling, dating and training regulations. Ninety day storage is only allowed at the waste generation site (§270.1(c)(2)(i)). Note: listed hazardous wastes are identified in §261 Subpart D.
	Material Safety Data Sheet (MSDS)	AR 700-141	All	An MSDS and hazard warning label is required for all hazardous materials.
	Oil and Hazardous Substance Spills	AR 200-1	All	Major program requirements for oil and hazardous substances spills are given in AR 200-1, 3-3. Hazardous materials, PCBs, and hazardous waste should be included in spill prevention, control, and countermeasures planning. (AR 200-1, 3-3(b)(1)).
	RCRA Permits	AR 200-1	All	Requests for RCRA permits to treat, store, and dispose of solid and hazardous waste must include NEPA analysis (as required), needs analysis, and appropriate MACOM approval. (AR 200-1, 5-3(d)(1)).
	Small Quantity Generator	RCRA	All	SQGs (between 100 and 1,000 kg per month of total hazardous waste). Regulated under §262, but may store hazardous wastes on site for up to 180 days, or up to 270 days if the nearest TSDF is more than 200 miles away, without a TSDF permit as long as total accumulated waste does not exceed 6,000 kg of waste on site. Note, listed hazardous wastes are identified in §261 Subpart D. CESQGs (less than 100 kg of hazardous waste in any month, and less than 1 kg of acute waste(§261.33)) are exempt from §§262-266, 268, 270, and 124, in addition to RCRA notification requirements of 42 USC §6930. CESQGs may send their hazardous waste to non-TSDF facilities and are not limited by the RCRA storage regulations or time limits (§261.5(g)(3).
	Spill Contingency Planning	AR 200-1	All	Spill contingency planning should be accomplished for field exercises and training activities (AR 200-1, 3-3(b)(4)).
	Spill Reporting	AR 200-1	All	The spill or release of oil or hazardous substances must be immediately reported to the on-scene coordinator. Take reasonable actions to eliminate the source and contain the spill in accordance with the Spill Contingency Plan and the Spill Prevention, Control and Countermeasures Plan (AR 200-1, 3-3(c)(2)).

Table 4-4. Hazardous Materials Management Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Hazardous Materials & Waste (cont'd)	Tracking Hazardous Materials and Waste	AR 200-1	All	A Hazardous Substance Management System (HSMS) should be developed to track hazardous materials and hazardous wastes from "cradle to grave" (AR 200-1, 4-3(k)).
	Transporting Hazardous Materials	AR 200-1	All	Transportation of hazardous materials over public highways and onsite areas accessible to the general public must be done in accordance with HMTUSA, AR 55-355, and applicable and appropriate Federal, state and local regulations (AR 200-1, 4-3(c)). See also AR 200-1, 5-3(c)).
	Treatment, Storage, and Disposal Facility (TSDF)	RCRA	All	Operating requirements are identified in §264 for fully permitted TSDFs. Permit requirements are given in §270. Primary requirements include: EPA identification number; written notice of waste acceptance from treatment, storage, and disposal; analysis of waste samples; prevention of contact with wastes; inspections, monitoring, emergency equipment; operator personnel training, and completion and retention of waste manifest. All TSDFs must have a preparedness and prevention program, a contingency plan, and designated emergency procedures (§264 Subparts C and D). Operating requirements for interim status TSDFs are identified in §265.
	Used Oil	RCRA	All	Regulations for the management of used oil and materials contaminated with used oil are covered in §279. Used oil may be considered a hazardous waste under certain circumstances (§279.10),
	Waste Stream Evaluation	AR 200-1	All	Waste streams must be systematically evaluated, before treatment or disposal, to determine if they require special handling or disposal methods (AR 200-1, 5-3(2)).
Radioactive Waste	Low-Level Radioactive Waste	DoD 4715.6-R	All	Disposal of DoD low-level radioactive waste, mixed waste, and NORM/NARM waste must be coordinated with the Executive Agent prior to taking disposal actions (Section C1.2.2).

Table 4-4. Hazardous Materials Management Requirements

Explanation:

CESQG	Conditionally Exempt Small Quantity Generators
CWA	Clean Water Act
DLA	Defense Logistics Agency
EPA	US Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
HMIS	Hazardous Materials Information System
HMMP	Hazardous Material Management Program
HMTUSA	Hazardous Materials Transportation Uniform Safety Act
HSMS	Hazardous Substance Management System
kg	Kilogram
LQG	Large Quantity Generator
MSDS	Material Safety Data Sheet
NAS	National Aerospace Standard
NORM/NARM	Naturally Occurring Radioactive Material or Accelerator Produced Radioactive Material
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
RCRA	Resource Conservation and Recovery Act
SQG	Small Quantity Generator
TSDF	Treatment, Storage and Disposal Facility
USC	United States Code

4.5 POLLUTION PREVENTION

The Pollution Prevention Act of 1990 designates pollution prevention as the primary means of environmental stewardship. Pollution prevention is identified as any practice that reduces the amount of hazardous substances, pollutants, or contaminants entering into any waste stream, or otherwise being released into the environment. Pollution prevention in weapon systems acquisition requires coordination efforts throughout the design, testing, production, maintenance, operational, and demilitarization and disposal processes.

The PM is encouraged to establish a pollution prevention program. The PM shall identify the impacts of the system on the environment during its life (including disposal), the types and amounts of pollutants that will be released into the environment (air, water, soil, and noise), actions needed to prevent or control the pollutant impacts, ESOH risks associated with using the new system, and other information needed to identify source reduction, alternative technologies, and recycling opportunities. The pollution prevention program shall serve to minimize system impacts on the environment and human health, as well as environmental compliance impacts on program costs.

The Pollution Prevention Act provides a national policy. The bulk of pollution prevention requirements, however, are defined in various EOs, DoDIs, and Army regulations. A summary of the pollution prevention requirements applicable to Army acquisition programs is presented in Table 4-5.

Table 4-5. Pollution Prevention Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Pollution Prevention	Army Policy	AR 200-1	All	The Army's primary pollution prevention goal is to reduce reliance on products or processes that generate environmentally degrading impacts. Specific objectives include minimizing the use of environmentally degrading materials and processes in: (a) all life-cycle phases of new weapon system acquisition programs; (b) in management, logistics support, and modification of existing weapons systems; and (c) throughout installation facility management (AR 200-1, 10-1(d)). The Army will, at the earliest possible stage, incorporate cost-effective pollution prevention principles and planning into operations, training, doctrine and plan development, logistical activities, infrastructure management, base operations, health and medical activities, contingency operations, industrial operations, and research, development, test and evaluation activities (AR 200-1, 10-3(b)).
		AR 70-1	All	Pollution prevention is the Army's preferred approach to maintaining compliance with environmental laws and regulations. When both preventive and control approaches are available to deal with an environmentally degrading activity, preventive measures are preferred. Use of hazardous materials will be minimized and all alternative options will be considered before using any hazardous material. Pollution will be eliminated or reduced at the source. Wastes and by products that cannot be eliminated will be recycled. Pollutants that cannot be recycled will be treated to minimize environmental hazards. Disposal or other release to the environment will be employed only as a last resort and will be conducted in an environmentally safe manner. All Army acquisition organizations will incorporate pollution prevention throughout the acquisition process. (Section 1.4.o)
	Energy Management Policy	EO 13123	All	The Federal Government shall significantly improve its energy management by reducing greenhouse gas emissions, energy consumption, expanding use of renewable energy within facilities by using renewable energy products, reduce use of petroleum, undertake life-cycle cost effective projects, and reduce water consumption.
	Hazardous Materials	AR 70-1	All	Use of hazardous materials will be minimized and all alternative options will be considered before using any hazardous materials. (Section 1.4.o).
	Pollution Prevention Options	PPA	All	§6602(b) declared it a national policy to prevent or reduce pollution at the source whenever feasible. Companies are required to report their pollution prevention practices under EPCRA (SARA Title III). Waste management options, in descending order of preference, are: prevention/source reduction, environmentally sound recycling, environmentally sound treatment, and environmentally sound disposal.
	Pollution Prevention Plan	AR 200-1	All	All MACOMs, Army installations, National Guard state commands, Army Reserve commands and civil works facilities will conduct a Pollution Prevention Opportunity Assessment and establish a Pollution Prevention Plan and Pollution Prevention Program to implement the Pollution Prevention Plan (AR 200-1, 10-3(a)(1) and (2)).

Table 4-5. Pollution Prevention Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Pollution Prevention (cont'd)	Pollution Prevention Program	DoDI 4715.4	All	The Instruction implements policy, assigns responsibility, and prescribes procedures for implementation of pollution prevention programs throughout the DoD. Designates Executive Agents to lead DoD implementation of key pollution prevention programs. Weapons systems must reduce life-cycle costs by avoiding the use of hazardous materials (Section 4.2.4). Pollution prevention must be incorporated into all acquisition phases and across the entire life cycle (Section 5.6.2). Fielded weapons systems must maintain a pollution prevention program (Section 6.1).
	Toxic Chemicals Reduction	PPA	All	EPA's Industrial Toxics Project (56 FR 7849) targets 17 high-volume EPCRA §313 toxic chemicals for source reduction. Included are: benzene, cadmium and cadmium compounds, carbon tetrachloride, chloroform (trichloromethane), chromium and chromium compounds, cyanide and cyanide compounds, lead and lead compounds, mercury and mercury compounds, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride (dichloromethane), nickel and nickel compounds, tetrachloroethylene (perchloroethylene), toluene, 1,1,1-trichloroethane (methyl chloroform), trichloroetyhlene, and all xylenes. Note, all 17 chemicals are subject to MACT standards of the CAA Amendments.
	Waste Minimization	RCRA, HSWA	All	§3002(b) requires hazardous waste generators who transport their wastes off-site to certify on their manifests that programs are in place to reduce the volume or quantity and toxicity of hazardous waster generated to the extent economically practicable. Certification of waste minimization is also required as a condition of any permit issued under §3005(h) for the treatment, storage, or disposal of hazardous waste at facilities that generate and manage hazardous wastes on-site.

Explanation:

CAA	Clean Air Act	MACT	Maximum Achievable Control Technology
CWA	Clean Water Act	PPA	Pollution Prevention Act
EPA	US Environmental Protection Agency	RCRA	Resource Conservation and Recovery Act
EPCRA	Emergency Planning and Community Right-To-Know Act	SARA	Superfund Amendments Reauthorization Act
HSWA	Hazardous and Solid Waste Amendments		

4.6 EXPLOSIVES SAFETY

Regulation of explosives safety normally begins at the DoD level with the issuance of directives, regulations, instructions, manuals, and standards, such as DoD 6055.9-STD (*Ammunition and Explosives Safety Standards*). These normally implement other federal agency regulations, such as the Occupational Safety and Health Administration's 29 CFR series covering workplace safety, the EPA's 40 CFR series covering management of waste military munitions and other hazardous waste, and the Department of Transportation's 49 CFR series covering transportation of hazardous materials. The Military Services then normally issue separate implementing regulations, instructions, and manuals, such as AR 385-64 (*United States Army Explosives Safety Program*). In some instances, certain implementing documents are issued for multi-Service use. For example, the *Department of Defense Ammunition and Explosives Hazard Classification Procedures* is labeled as Army Technical Bulletin (TB) 700-2, Naval Sea Systems Command Instruction 8020.8, Air Force Technical Order 11A-1-47, and Defense Logistics Agency Regulation 8220.1. Regardless of the end user of the ammunition or explosives (e.g., Army, Navy, Air Force, or Marine Corps), the Military Service or other federal organization having custody during shipment (transportation), handling, and/or storage utilizes that organization's or specific Military Service's implementing documentation for guidance regarding explosives safety matters.

Table 4-6 provides a top-level overview of pertinent DoD and Army explosives safety requirements documents for use by Army PMs and program support personnel. Addressed are requirements for ammunition and explosives facility planning, siting, construction, and management; the transportation of ammunition and explosives; live fire applications; and accident and emergency planning and reporting. Regulations pertaining to waivers and exemptions to explosives safety requirements are also discussed.

These requirements are generally applicable to all missile and ordnance system acquisition programs. In many instances, they will also apply to combat aircraft and surface vehicle systems when munitions are being loaded and carried on board, and fired for system testing or training purposes.

Table 4-6. Explosives Safety Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Explosives Safety	Accident Reporting	AR 385-40	A, M, S, O	Prescribes policy on accident reporting and record keeping procedures for the Army. Explosive accidents must be reported according to Chapter 3 of the regulation. In addition, certain incidents require immediate telephonic report to the AOC and the USASC (Section 9-2). Additional technical data must be provided in the accident report (Section 9-4).
	Classification of Explosives	DoD 6055.9-STD	A, M, S, O	To ease identification of hazard characteristics and thus promote safe storage and transport of ammunition and explosives, DoD shall use the international system of classification devised by the United Nations Organization (Section C3.1).
	Contractor Safety Standards	DoDI 4145.26 DoD 4145.26-M	A, M, S, O	Instruction: (1) Reissues DoD Instruction 4145.26, July 19, 1985 (hereby canceled), and updates policy and responsibilities. (2) Authorizes the publication of DoD 4145.26-M, "DoD contractors' Safety Manual for Ammunition and Explosives," consistent with DoD 5025.1-M, August 1994, to provide uniform baseline safety standards for DoD contractors performing contractual work involving ammunition and explosives. The use of the DoD 4145.26-M is a mandatory as specified in Defense Federal Acquisition Regulation Supplement, Subparts 223.3(a) and 252.223-7002/252.223-7003. (3) Authorizes the Military Departments, when contractual work is to be performed at DoD owned facilities, to apply their own selected ammunition and explosives and other safety standards and procedures to DoD contractors by inclusion within contracts.
	Demil and Disposal Planning	DoDI 5000.2	M, O	At the end of a systems useful life, the PM shall plan for a system to be demilitarized and disposed in accordance with all legal and regulatory requirements and policy relating to safety (including explosives safety). Section (3.9.3)
	Disposal of Waste Munitions	AR 200-1 DA PAM 200-1	M, O	Section 5-4 of the Pamphlet specifies when conventional and chemical waste munitions become hazardous wastes, subject to regulation under RCRA. These requirements are in accordance with EPA's final Military Munitions Rule (62 FR 6621).
	Explosive Safety Quantity-Distance	DA PAM 385-64 DoD 6055.9-STD	A, M, S, O	Minimum standards for separating a potential explosion site from an exposed site which determine the damage or injury potential of explosions.

Table 4-6. Explosives Safety Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Explosives Safety (cont'd)	Facility Siting and Construction	AR 385-64 DA PAM 385-64 DoD 6055.9-STD	A, M, S, O	Requires approval of site plans by engineering and safety channels and licensing by the MACOM. DoD 6055.9-STD includes siting and construction standards including electrical standards and lightning protection for facilities that are to be a potential explosion site or exposed to the damaging effects of explosions.
	Fire Fighting and Emergency Planning	DA PAM 385-64 DoD 6055.9-STD	A, M, S, O	Stipulates standard firefighting hazard identification measures to minimize risk in fighting fires involving ammunition and explosives. Contains minimum guidelines for development of emergency plans, including safety, security, and environmental protection.
	Hazard Assessment	DA PAM 385-64 DoD 6055.9-STD	A, M, S, O	Assessment of risk shall be performed on all new or modified industrial operations and facilities involving ammunition or explosives. Appropriate equipment, shielding, engineering controls and PPE will be selected based on this assessment.
	Range Safety	DoDD 4715.11	A, M, S, O	Establishes policy for sustainable use and management of DoD's active and inactive ranges in the US, and the protection of DoD personnel and the public from explosives hazards on active and inactive ranges. Applies to Office of the Secretary of Defense, the Military Departments, the Chairman of the Joint Chiefs of Staff, the Office of the Inspector General of the DoD, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD. DoD must ensure long-term viability of DoD ranges while protecting human health and environment. In addition, limit the potential for explosive mishaps and damaging effects by restricting access to DoD ranges. DoD Components have various responsibilities, which contribute to the safety management.
	Reporting of Explosive Malfunctions	AR 75-1	A, M, S, O	Sets policy, procedures, and responsibilities for reporting malfunctions involving ammunition and explosives. Applies to the Active Army, members and organizations of the Army National Guard, and the Army Reserve. Specific procedures must be followed in the event of a malfunction with explosives (Section 2-1), this includes contacting designated individuals and preliminary and detailed reports (forms provided). Specific individuals must be notified regarding defects in explosives as specified in Section 2-3, the defect investigated and a report completed.

Table 4-6. Explosives Safety Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Explosives Safety (cont'd)	Safety Standards	DoD 6055.9-STD	A, M, S, O	Establishes uniform safety standards applicable to ammunition and explosives, to associated personnel and property, and to unrelated personnel and property exposed to the potential damaging effects of an accident involving ammunition and explosives during their development, manufacturing, testing, transportation, handling, storage, maintenance, demilitarization, and disposal.
		AR 385-64 DA PAM 385-64	A, M, S, O	Sets explosives safety standards to protect soldiers, civilian employees, family members, contractors, the general public, and the environment. This regulation and pamphlet prescribe Department of the Army safety policy, standards, responsibilities, and procedures for implementing and maintaining the US Army Explosives Safety Program.
	Storage of Explosives and Ammunition	DoD 6055.9-STD	A, M, S, O	Explosives will be stored according to compatibility group (Section C3.2.3).
		DA PAM 385-64	A, M, S, O	A site/storage plan will be prepared and maintained on a current basis by each establishment storing ammunition. The plan should include a minimum of the quantity and kinds of buildings in which ammunition and explosives are stored. The quantity distance restrictions on each storage building, storage site, loading dock, holding yard, installation rail classification yard, ammunition workshops, and operating sites.
	Transportation Accident Prevention and Emergency Response	AR 385-14	A, M, S, O	Establishes emergency reporting and response requirements for accidents involving conventional DoD munitions and explosives. Implements DoD Directive 6055.13. Applies to the Active Army, the Army National Guard, and the Army Reserve. It is Army policy to maintain an aggressive safety program to prevent accidents involving the transportation of munitions and explosives, and minimize damaging effects of such accidents. Various Army officials have specific duties in order to prevent accidents involving munitions and explosives. Such accidents must be reported to the AOC, and a military representative (major or above) will be dispatched to the scene in uniform (Chapter 2). Technical data must be provided in the accident report (section 2-7).
	Transportation of Explosives and Ammunition	AR 385-64	A, M, S, O	A hazard classification must be assigned to explosives and ammunition prior to transportation.
	Transportation of Explosives and Hazardous Cargo by Water	AR 55-228	A, M, S, O	Establishes policy and procedures and direction governing Army-sponsored shipments of explosives and hazardous cargo aboard vessels (including barges) and applies to ships engaged in commerce on the navigable waters of the US, its territories, and possessions. Written permits required from the Captain of the Port, US Coast Guard, for loading or discharging explosives. Loading plan required for military explosives and lethal military chemicals. Safe handling includes fire prevention, use of authorized personnel, contingency planning. Additional requirements in 46 CFR 146.

Table 4-6. Explosives Safety Requirements

TOPIC	ISSUE	SOURCE	WS	COMPLIANCE REQUIREMENTS
Explosives Safety (cont'd)	Waivers and Exemptions	AR 385-64 DoD 6055.9-STD	A, M, S, O	The goal is to eliminate all waivers and exemptions and to adhere to all safety standards. When this cannot be done, a waiver (temporary deviation from standards for strategic or other compelling reasons), or an exemption (long-term non-compliance with standards for strategic or other compelling reasons) may be granted. Approval authority rests with Commander for ASA (IL&E), Commander for MACOM, or Commander for Major Subordinate Command depending on the risk level identified.

Explanation:

ASA(IL&E)	Assistant Secretary of the Army for Installations, Logistics, and Environment
AOC	Army Operations Center
CFR	Code of Federal Regulations
DDESB	Department of Defense Explosive Safety Board
EPA	US Environmental Protection Agency
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
USASC	US Army Safety Center

CHAPTER 5.0:
ACQUISITION ESOH REQUIREMENTS BY LIFE-CYCLE PHASE

Managing acquisition ESOH requirements is a process that starts early and continues throughout the entire life of the program. Regardless of the starting point within the life-cycle process (described earlier in Section 2.0), every program must meet certain requirements. For each life-cycle phase, this chapter lists the key actions and documentation requirements that should be accomplished as part of an acquisition program ESOH strategy. For a particular program, the actual ESOH activities might overlap or occur in different phases than listed, depending on the current phase of the program, the phase in which ESOH-relevant activities were first initiated, or the phase in which impacts can adequately be addressed. These lists cannot contain every required ESOH activity or document, but it is a good, comprehensive start. These requirements are recommendations for PMs to consider, particularly when developing or updating their program PESHE.

5.1 CONCEPT REFINEMENT AND TECHNOLOGY DEVELOPMENT (Pre-Systems Acquisition)

Many of the decisions made during the Concept Refinement and Technology Development Phases will have a profound and lasting impact for the life of the system. Program attributes and characteristics can often become "fixed" at these early stages of a system's life. As a program matures, the costs to modify the system and incorporate changes, such as those dictated by unidentified ESOH requirements, can rise exponentially. These exponential cost increases have historically established the value of early and informed decision making regarding ESOH requirements.

Early integration of ESOH compliance ensures better program planning, more lead time to address compliance requirements, and wiser decisions being made, thus avoiding program delays and unnecessary costs. Through such efforts, PMs or other responsible Army managers can identify ESOH requirements for budget formulations, trade-off analyses, risk assessments, life-cycle cost evaluations, and scheduled planning. PMs can review material choices, testing activities, training plans, maintenance processes, and development specifications. In addition, they can establish baselines or thresholds for toxic or hazardous materials and processes, measures to achieve pollution prevention, or source selection objectives.

Such planning provides focus for pollution source reduction, eliminating unnecessary hazardous materials or processes prior to system development. ESOH studies, assessments, actions, and documents can also facilitate coordination of compliance issues with Army installations, depots, and other Government or contractor facilities that will participate in the testing, operations and maintenance, and training functions of the weapon systems.

During the Concept Refinement Phase, prior to Milestone A, ESOH studies and actions should include supporting the AoA plan development, determining top priorities for pollution prevention efforts among selected alternatives, identifying chemical compounds and materials proposed for use to investigate substitutes, and analyzing ESOH objectives and requirements in the ICD.

Table 5-1 identifies key ESOH actions and documents that should be initiated and/or completed after Milestone A during the Technology Development phase. Many of these actions will likely continue into follow-on phases.

Table 5-1. ESOH Actions and Documents Supporting the Technology Development Phase

Actions	Documents
• Establish an ESOH Management Team and an ESOH Manager • Establish Government/Contractor ESOH responsibilities • Identify relevant ESOH laws, regulations, and directives • Identify future environmental permits, and Government agency consultation requirements • Initiate preparation of the PESHE • Identify and schedule NEPA/EO 12114 documentation requirements • Implement mitigation monitoring • Conduct health hazard assessment of materials and processes • Establish a System Safety Working Group • Establish a Hazard Tracking System • Establish a Hazardous Material Tracking System • Initiate an HMMP • Identify and quantify pollution sources and emissions • Actively pursue source reduction design efforts • Initiate an Explosives Safety Program • Project ESOH resource requirements and include in the budget and Program Objective Memorandum (POM) cycle • Include ESOH cost drivers in the CARD • Include ESOH objectives and requirements in the AS and the CDD	• Site-specific NEPA/EO 12114 documentation (as necessary) • ESOH provisions in Request for Proposal (RFP) and system support contracts • HHAR • SSMP • Safety Assessment Report • Hazardous Materials Management Plan • Pollution Prevention Program Plan • Explosives Safety Program Plan • CARD

5.2 SYSTEM DEVELOPMENT AND DEMONSTRATION (Systems Acquisition)

During System Development and Demonstration, the system proponent (normally the PM) uses the systems engineering process to define subsystem requirements; develop prototypes; explore alternative designs; evaluate cost, schedule, and performance risks; and develop system specifications. The system design specifications must take into consideration ESOH requirements.

Following program initiation, Milestone B, the PM must complete the initial PESHE document, which describes the overall program ESOH strategy. At this early stage of system development, it is critical to identify and consider the potential effects of fielding, operation, and ultimate disposal, because (as previously stated) opportunities for adjusting the system design to accommodate ESOH concerns become more and more limited as the programs matures.

Also, during this phase, a number of lower-level system design alternatives may be evaluated and long-lasting decisions may be made. Such decisions will eliminate many alternative future system options; a programmatic life-cycle NEPA analysis of the system alternatives considered should be performed to support these decisions.[7]

Table 5-2 identifies key ESOH actions and documents that should be initiated and/or updated during the System Development and Demonstration phase.

Table 5-2. ESOH Actions and Documents Supporting the System Development and Demonstration Phase

Actions	Documents
• Review ESOH objectives according to the ICD, CDD , and AS • Develop ESOH Strategy as part of PESHE development • Continue to identify the chemical compounds and materials proposed and investigate alternatives • Ensure that all required environmental permits are in place • Conduct required NEPA/EO 12114 analyses • Implement mitigation monitoring • Ensure System Safety Management Plan requirements are met • Ensure the Hazard Tracking System is current • Ensure the Hazardous Material Tracking System is operational and current • Ensure Safety and Health Hazard Management Plan requirements are met • Update process hazard assessment of manufacturing and maintenance facilities/activities • Implement HMMP • Make adjustments to system design in response to pollution prevention efforts • Perform analyses for materiel demilitarization and disposal requirements • Ensure Explosives Safety Program is functioning • Integrate ESOH considerations in updated program master plans (AS, TEMP, deployment planning, demilitarization and disposal)	• PESHE • NEPA Programmatic Life-Cycle EA or EIS, supplemented with site-specific CX, REC, EA, EIS, or EO 12114 documentation, as necessary • Updated HHAR • Updated SSMP • Updated Safety Assessment Report • Updated CARD • Updated Hazardous Material Management Plan • Updated Pollution Prevention Program Plan • Updated Explosives Safety Program Plan • ESOH provisions in production contracts • Demilitarization and Disposal Plan • Updated ESOH portion of the Life-Cycle Cost Estimate (LCCE)

[7] For specific instructions on NEPA analysis requirements, refer to the Army's *NEPA Manual for Materiel Acquisition* described in Section 1.3 of this guide.

5.3 PRODUCTION AND DEPLOYMENT (Systems Acquisition)

The nature of ESOH activities shifts during the Production and Deployment phase, from planning to management and monitoring. PMs should pay particular attention to the compliance status of contractor production facilities, and compliance requirements associated with future operations, maintenance, and training. The implementation of environmental audits and corrective responses also become important activities. As weapon system units are introduced to receiving/gaining installations, in the United States or abroad, unforeseen ESOH issues may arise which will require additional actions. Close and continued coordination with system contractors, Army operational and support units, supporting installations/ranges, and depots is necessary.

Table 5-3 identifies key ESOH actions and documents that should be initiated and/or updated during the Production and Deployment phase.

Table 5-3. ESOH Actions and Documents Supporting the Production and Deployment Phase

Actions	Documents
• Review of any Notices of Violation (NOVs) • Ensure that all required environmental permits are in place and current • Conduct required NEPA/EO 12114 analyses • Implement mitigation monitoring • Ensure System Safety Management Plan requirements are met • Ensure the Hazard Tracking System is current • Ensure the Hazardous Material Tracking System is operational and current • Make final adjustments to system design in response to pollution prevention efforts • Ensure Explosives Safety Program is functioning • Conduct environment, safety, and health audits; and implement corrective actions	• Updated PESHE • Updated (supplement) existing NEPA/EO 12114 documentation, and/or complete new documentation, as necessary • Updated HHAR • Updated SSMP • Updated Safety Assessment Report • Updated CARD • Updated Hazardous Material Management Plan • Updated Pollution Prevention Program Plan • Updated Explosives Safety Program Plan • ESOH provisions in production contracts • Updated Demilitarization and Disposal Plan • Updated ESOH portion of LCCE

5.4 OPERATIONS AND SUPPORT (Sustainment)

Entering into the Operations and Support phase, the geographical focus of the program shifts from production facilities to fielding and training installations, and depots. As with the prior phase, ESOH compliance activities for this phase focus heavily on management and monitoring. PMs should continue tracking environmental, safety, and health compliance, including the status of permits, reviews by federal and state regulatory agencies, and responses to any NOVs. New or unforeseen ESOH compliance issues may arise, particularly with respect to maintenance operations and/or extended training.

Late in the life of the system, the focus of ESOH actions shifts more as sustainment activities near completion and disposal activities come into play. Well before this phase, however, coordination with the Defense Reutilization and Marketing Service (DRMS) for demilitarization and disposal requirements should begin.

Table 5-4 identifies key ESOH actions and documents that should be initiated and/or updated during the Operations and Support phase.

Table 5-4. ESOH Actions and Documents Supporting the Operations and Support Phase

Actions	Documents
• Ensure that all required environmental permits are in place and current • Conduct required NEPA/EO 12114 analyses • Implement mitigation monitoring • Ensure System Safety Management Plan requirements are met • Ensure Hazard Tracking System is current • Implement HMMP • Ensure Explosives Safety Program is functioning • Ensure that ESOH considerations are addressed in demilitarization and disposal plans	• Updated PESHE • Updated (supplement) existing NEPA/EO 12114 documentation, and/or complete new documentation, as necessary • Updated HHAR • Updated SSMP • Updated Safety Assessment Report • Updated CARD • Updated Hazardous Material Management Plan • Updated Pollution Prevention Program Plan • Updated Explosives Safety Program Plan • Updated Demilitarization and Disposal Plan • Updated ESOH portion of LCCE

CHAPTER 6.0: REFERENCES

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Note: The various laws and regulations cited in this guide are listed in the Appendix.

APPENDIX

LIST OF FEDERAL, DoD, AND ARMY LAWS AND REGULATIONS

List of Federal, DoD, and Army Laws and Regulations

FEDERAL LAWS

7 USC 4201, et seq.	Farmland Protection Policy Act
15 USC 2601-2671	Toxic Substances Control Act of 1976 (TSCA)
16 USC 470 et seq.	National Historic Preservation Act of 1966
16 USC 470aa, et seq.	Archaeological Resources Protection Act of 1979
16 USC 661 et seq.	Fish and Wildlife Coordination Act
16 USC 670a-670o	Sikes Act of 1960
16 USC 703-712	Migratory Bird Treaty Act of 1918
16 USC 1361-1407	Marine Mammal Protection Act of 1972
16 USC 1001 et seq.	Watershed Protection and Flood Prevention Act (WPFPA)
16 USC 1451-1464	Coastal Zone Management Act of 1972 (CZMA)
16 USC 1531 et seq.	Endangered Species Act of 1973
16 USC 3101-3233	Alaska National Interest Lands Conservation Act of 1980
16 USC 3501 et seq.	Coastal Barrier Resources Act (1988), reauthorized as Coastal Barrier Improvement Act of 1990
16 USC 3501 et seq.	Coastal Wetlands Planning, Protection, and Restoration Act (1988)
16 USC 4401-4412	North American Wetlands Conservation Act (1989)
16 USC 4901 et seq.	Wild Bird Conservation Act of 1992
25 USC 3001- 3013	Native American Grave Protection & Repatriation Act of 1990
29 USC 651-678	Occupational Safety and Health Act of 1970
33 USC 1251-1376	Clean Water Act of 1977, as amended (CWA)
33 USC 2702 to 2761	Oil Pollution Act of 1990 (OPA)
42 USC 134	Energy Policy Act
42 USC 300f et seq.	Safe Drinking Water act of 1974 (SDWA) 6939b: 15 USC 1261 et seq.
42 USC 1996	American Indian Religious Freedom Act
42 USC 4321-4347	National Environmental Policy Act of 1969, as amended (NEPA)
42 USC 4901	Noise Control Act of 1972
42 USC 4913	Quiet Communities Act of 1978
42 USC 6961, 6927(c)	Federal Facilities Compliance Act of 1992
42 USC 6901 et seq.	Resources Conservation and Recovery Act of 1976 (RCRA)
42 USC 7401-7671g	Clean Air Act of 1970 (CAA), as amended by the Clean Air Act Amendments of 1990 (CAAA)
42 USC 7412 (r)	Chemical Safety Information, Site Security and Fuels Regulatory Relief Act (Public Law 106-40, amendment to Section 112 (r) of the CAA)
42 USC 9620	Community Environmental Response Facilitation Act of 1992 (CERFA)

42 USC 9601-9675	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments Reauthorization Act of 1986 (SARA)
42 USC 11001-11050	Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA)
42 USC 13101-13109	Pollution Prevention Act of 1990
49 USC 5101 et seq.	Hazardous Materials Transportation Authorization Act of 1994
Public Law 94-265	Magnuson-Stevens Fishery Conservation and Management Act
Public Law 98-616	Hazardous and Solid Waste Amendments of 1984
Public Law 101-615	Hazardous Materials Transportation Uniform Safety Act of 1990

FEDERAL REGULATIONS

10 CFR 20	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Occupational Safety and Health Standards for Construction
29 CFR 1960	Department of Labor Regulations on Federal Employee Occupational Safety and Health Programs
32 CFR 651	Environmental Analysis of Army Actions
40 CFR	Protection of Environment (Various Sections)
49 CFR	Transportation (Various Sections)

EXECUTIVE ORDERS

EO 11514	Protection and Enhancement of Environmental Quality, as amended by EO 11541 and EO 11991
EO 11593	Protection and Enhancement of the Cultural Environment
EO 11738	Providing for Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contract, Grants, or Loans
EO 11988	Floodplain Management, as amended by EO 12148
EO 11990	Protection of Wetlands, as amended by EO 12608
EO 12114	Environmental Effects Abroad of Major Federal Actions
EO 12196	Occupational Safety and Health Programs for Federal Employees, as amended
EO 12777	Implementation of Section 311 of the Federal Water Pollution Control Act of October 18, 1972, as amended, and the Oil Pollution Act of 1990
EO 12898	Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, as amended by EO 12948
EO 13007	Indian Sacred Sites
EO 13045	Protection of Children from Environmental Health Risks and Safety Risks
EO 13089	Coral Reef Protection

EO 13101	Greening the Government through Waste Prevention, Recycling, and Federal Acquisition
EO 13123	Greening the Government through Efficient Energy Management
EO 13148	Greening the Government through Leadership in Environmental Management
EO 13158	Marine Protected Areas
EO 13175	Consultation and Coordination with Indian Tribal Governments
EO 13186	Responsibilities of Federal Agencies to Protect Migratory Birds

DoD DIRECTIVES, INSTRUCTIONS, REGULATIONS, MANUALS, GUIDANCE, HANDBOOKS, & STANDARDS

CJCSI 3170.01C	Joint Capabilities Integration and Development System
DoD 4140.1-R	Department of Defense Materiel Management Regulation
DoD 4145.26-M	Department of Defense Contractor's Safety Manual for Ammunition and Explosives
DoD 4160.21-M	Defense Reutilization and Marketing Manual
DoD 4160.21-M-1	Defense Demilitarization Manual
DoD 4715.5-G	Overseas Environmental Baseline Guidance Document (OEBGD)
DoD 4715.6-R	Low-Level Radioactive Waste Disposal Program
DoD 5000.4-M	Cost Analysis Guidance and Procedures
DoD 6050.5-G	Hazardous Materials Information System Users Guide
DoD 6050.5-G-1	DoD Federal Hazard Communication Training Program Trainer's Guide
DoD 6050.5-H	DoD Hazardous Chemical Warning Labeling System
DoD 6050.5-M	DoD Hazardous Materials Information System Procedures
DoD 6055.9-STD	DoD Ammunition and Explosives Safety Standards
DoDD 4540.1	Use of Airspace by US Military Aircraft and Firings Over the High Seas
DoDD 4700.4	Natural Resource Management Program
DoDD 4710.1	Archaeological and Historic Resources Management
DoDD 4715.1	Environmental Security
DoDD 4715.11	Environmental and Explosive Safety Management of Department of Defense Active and Inactive Ranges within the United States
DoDD 5000.1	The Defense Acquisition System
DoDD 5030.19	DoD Responsibilities on Federal Aviation and National Airspace System Matters
DoDD 5030.41	Oil and Hazardous Substances Pollution Prevention and Contingency Program
DoDD 6050.7	Environmental Effects Abroad of Major Department of Defense Actions
DoDD 6055.9	DoD Explosive Safety Board (DDESB) and DoD Component Explosives Safety Responsibilities

DoDD 6055.11	Protection of DoD Personnel from Exposure to Radio-Frequency Radiation and Military Exempt Lasers
DoDD 6230.1	Safe Drinking Water
DoDI 3030.2	Community Planning and Impact Assistance
DoDI 4145.26	Department of Defense Contractor's Safety Requirements for Ammunition and Explosives
DoDI 4150.7	DoD Pest Management Program
DoDI 4165.57	Air Installations Compatible Use Zones
DoDI 4170.10	Energy Management Policy
DoDI 4715.2	DoD Regional Environmental Coordination
DoDI 4715.3	Environmental Conservation Program
DoDI 4715.4	Pollution Prevention
DoDI 4715.5	Management of Environmental Compliance at Overseas Installations
DoDI 4715.6	Environmental Compliance
DoDI 4715.7	Environmental Restoration Program
DoDI 4715.9	Environmental Planning and Analysis
DoDI 4715.10	Environmental Education, Training, and Career Development
DoDI 5000.2	Operation of the Defense Acquisition System
DoDI 6050.5	DoD Hazard Communication Program
DoDI 6055.1	DoD Safety & Occupational Health (SOH) Program
DoDI 6055.5	Industrial Hygiene and Occupational Health
DoDI 6055.7	Mishap Investigation, Reporting, and Record Keeping
DoDI 6055.8	Occupational Radiation Protection Program
DoDI 6055.11	Protection of DoD Personnel from Exposure to Radio Frequency (RF) Radiation and Military Exempt Lasers
MIL-STD-882D	Department of Defense Standard Practice for System Safety
MIL-STD-1472F	Department of Defense Design Criteria Standard—Human Engineering
MIL-STD-1474D	Department of Defense Design Criteria Standard—Noise Limits

ARMY REGULATIONS & PAMPHLETS

AR 11-9	The Army Radiation Safety Program
AR 11-34	The Army Respiratory Protection Program
AR 40-5	Preventive Medicine
AR 40-10	Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process
AR 50-6	Chemical Surety
AR 50-7	Army Reactor Program
AR 55-228	Transportation by Water of Explosives and Hazardous Cargo
AR 70-1	Army Acquisition Policy

AR 75-1	Malfunctions Involving Ammunition and Explosives (RCS CSGLD-1961(MI))
AR 200-1	Environmental Protection and Enhancement
AR 200-2 (Deleted)	Superseded by 32 CFR Part 651, Environmental Analysis of Army Actions (see 67 FR 15290)
AR 200-3	Natural Resources—Land, Forest, and Wildlife Management
AR 200-4	Cultural Resources Management
AR 200-5	Pest Management
AR 380-5	Department of the Army Information Security Program
AR 385-10	The Army Safety Program
AR 385-14	Transportation Accident Prevention and Emergency Response Involving Conventional Munitions and Explosives
AR 385-16	System Safety Engineering and Management
AR 385-40	Accident Reporting and Records
AR 385-61	The Army Chemical Agent Safety Program
AR 385-64	US Army Explosives Safety Program
AR 602-2	Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process
AR 700-141	Hazardous Materials Information System (HMIS) (RCS DD-FM&P (A,Q,&AR) 1486)
AR 700-143	Packaging of Hazardous Material
AR 740-32	Responsibilities for Technical Escort of Dangerous Materials
DA PAM 40-501	Hearing Conservation Program
DA PAM 40-503	Industrial Hygiene Program
DA PAM 70-3	Army Acquisition Procedures
DA PAM 200-1	Environmental Protection and Enhancement
DA PAM 200-4	Cultural Resources Management
DA PAM 385-16	System Safety Management Guide
DA PAM 385-61	Toxic Chemical Agent Safety Standards
DA PAM 385-64	Ammunition and Explosives Safety Standards

OTHER FEDERAL AGENCY REQUIRMENTS

FAA Order 7400.2C	Procedures for Handling Airspace Matters
FAA Order 7610.4J	Special Military Operations