



## Department of Energy

Washington, DC 20585

JUN 5 1998

The Honorable John T. Conway  
Chairman  
Defense Nuclear Facilities Safety Board  
625 Indiana Avenue, NW  
Suite 700  
Washington, DC 20004

Dear Mr. Chairman:

Enclosed is Department of Energy document, "System Requirements Document for the U-233 Safe Storage System, Revision 0." It represents the deliverable for Commitment 15 of the Department's Implementation Plan for addressing the Defense Nuclear Facilities Safety Board's Recommendation 97-1 concerning the safe storage of Uranium-233 material.

The Board was briefed on this document by members of the DOE 97-1 Technical Team on May 13, 1998.

If you have any questions, please contact me, or have your staff contact Hoyt Johnson of my staff at (202) 586-0191.

Sincerely,

A handwritten signature in black ink that reads "James M. Owendoff".

James M. Owendoff  
Acting Assistant Secretary for  
Environmental Management

Enclosure

cc w/enclosure:  
M. Whitaker, S-3.1



Revision 1  
May 199

# *System Requirements Document*

*for the*

*$^{233}\text{U}$  Safe Storage System*



*U.S. Department of Energy*

*97-1  $^{233}\text{U}$  Safe Storage Program*

**SYSTEM REQUIREMENTS DOCUMENT**  
for the  
**<sup>233</sup>U SAFE STORAGE SYSTEM**

Revision 0

**May 1998**

U.S. Department of Energy  
DOE Idaho Operations Office  
Idaho National Engineering and Environmental Laboratory  
Idaho Falls, Idaho

## **FOREWORD**

Uranium-233 (<sup>233</sup>U) is a man-made uranium isotope primarily formed as a result of neutron irradiation of thorium-232 (<sup>232</sup>Th). Because <sup>233</sup>U is fissile, its potential use as fuel for nuclear reactors and as nuclear weapons material was researched extensively by the Department of Energy (DOE) beginning in the 1950s. Since the completion of these research programs, various feasibility studies have been undertaken, but no major <sup>233</sup>U programs have been funded. Thus, the bulk of the <sup>233</sup>U have remained in different physical forms, which are contained by various storage packages and systems. Due to the lack of funding and facilities to handle the significant radiation emissions from these materials, many of these packages have not been inspected for years, and their condition is unconfirmed.

The DOE has an inventory of approximately two metric tons of <sup>233</sup>U in many different forms stored under a variety of conditions throughout the complex. The majority is located at the Oak Ridge National Laboratory (ORNL) and the Idaho National Engineering and Environmental Laboratory (INEEL), with significantly lesser quantities at Los Alamos National Laboratory (LANL). Even smaller quantities of material exist at numerous other sites. The material exists as oxides, metal, solutions, and fluorides. Some of this material is also being managed under the Department's National Spent Nuclear Fuel Program and under the Implementation Plan (IP) for Board Recommendation 94-1 (i.e., the Oak Ridge Molten Salt Reactor Experiment [MSRE]).

DNFSB Recommendation 97-1 added <sup>233</sup>U material that is not covered by other programs to its area of safety concern. 97-1 is detailed in the DNFSB Recommendation, which is available at the DNFSB web site at [www.dnfsb.gov](http://www.dnfsb.gov). The 97-1 Program is detailed in DOE Implementation Plan for DNFSB Recommendation 97-1

Another driver for this program is the Department of Energy (DOE) Highly Enriched Uranium (HEU) Vulnerability Assessment (VA) that previously identified some of the concerns regarding the state of the 97-1 <sup>233</sup>U inventory for protection of workers and the environment. The HEU VA is detailed more extensively in DOE EH-0525, December 1996.

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## ABBREVIATIONS AND ACRONYMS

ALARA	as low as reasonably achievable
ANL	Argonne National Laboratory
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ATMS	Automated Transportation Management System
CCB	Change Control Board
CFR	Code of Federal Regulations
DBA	design basis accident
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOE-EM	DOE Office of Environmental Management
DOE-MD	DOE Office of Materials Disposition
DOT	Department of Transportation
DU	depleted uranium
EIS	Environmental Impact Statement
ES&H	Environment, Safety, and Health
HEPA	high-efficiency particulate air (filter)
HEU	highly enriched uranium
IAEA	International Atomic Energy Agency
IEEE	Institute of Electrical and Electronics Engineers
ICD	Interface Control Document
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LANL	Los Alamos National Laboratory
LCAM	Life Cycle Asset Management
LLNL	Lawrence Livermore National Laboratory
MC&A	Materials Control and Accountability
MSRE	Molten Salt Reactor Experiment
NDA	Non-Destructive Assay
NDE	Non-Destructive Examination
NEPA	National Environmental Policy Act
NMC	nuclear materials courier
NPH	natural phenomenon hazard
NRC	Nuclear Regulatory Commission





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OPSEC	operations security
ORNL	Oak Ridge National Laboratory
PEP	Program Execution Plan
ppm	parts per million (grams of designated material per megagram [metric ton] of net representative sample)
Pu	plutonium
PSM	Prospective Shipments Module
Rn	Radon
ROD	Record of Decision
SAR	Safety Analysis Report
SNM	special nuclear material
SRD	System Requirements Document
SRR	System Requirements Review
SSC	structure, system, or component
STL	Safeguards Termination Limit
TBD	to be determined
TBR	to be resolved
Th	Thorium
TIN	Transportation Information Network
Tl	Thallium
TRANSCOM	Transportation Tracking and Communications
TSD	Transportation Safeguards Division
TSS	Transportation Safeguards System
U	Uranium
U <sub>3</sub> O <sub>8</sub>	Triuranium Octoxide
UO <sub>2</sub>	Uranium Dioxide

## 1.0 INTRODUCTION

This document defines the system requirements for the <sup>233</sup>U Safe Storage System. These requirements are extracted from those documents listed in Section 2 and derived from the mission, as defined in the original Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 97-1; the Implementation Plan provided by the Department of Energy (DOE); and from analysis of the problem by the <sup>233</sup>U Safe Storage Technical Team, as established by the DOE for the purpose of determining the Department response to this recommendation. [DNFSB Recommendation 97-1, DNFSB TECH 13, DOE Implementation Plan for DNFSB Recommendation 97-1]

As used in this document, the terms "shall", "should", and "may" are defined as follows:

"Shall" denotes actions that are mandatory

"Should" denotes recommended actions

"May" denotes that something is permitted or likely to occur

The requirements contained herein apply to the design, construction and operation of the <sup>233</sup>U Safe Storage System. This document will be followed by a succession of system engineering, design engineering, construction and operations documents that result in the design, construction, operation, and decontamination and decommissioning (D&D) of a facility or facilities that place and maintain the inventory of Uranium-233 (<sup>233</sup>U) materials into safe long-term storage. The full set of engineering documents that will be developed for this program will be defined in the Program Execution Plan.

The 97-1 Safe Storage program recognizes that a graded approach (per 10 CFR 830) is being applied at DOE field sites. Variations of this graded approach include "Work Smart," "Necessary and Sufficient," or "S/RIDS." At the program level it is not practical to reflect the specific approaches to be implemented at each site. However, since the program and field sites are basically driven by a common set of Laws, Regulations, Policies, DOE and Executive Orders, and other Directives, the concept of setting forth program-level requirements in this document combined with a graded approach on a site basis provides a means to transition from a complex-wide program to individual field sites. This will be accomplished through a reconciliation team that will be established once specific implementing sites are selected. This team will identify those System Requirements Document (SRD) requirements not being implemented as a result of implementing a graded approach and document the rationale. Site-specific reconciliation will be based on the tenets of DNFSB Recommendation 95-2, which starts with identification of the hazards and application of the appropriate requirements and controls to address those hazards.

While this document is based on the new series DOE Orders where they exist, it is also recognized that not all of the sites may have transitioned to the new series Orders. Any concerns resulting from an incomplete transition will also be resolved during reconciliation efforts.

Conventions followed in this document are as follows:

- References contained in brackets [ ] invoke the requirements contained in that document or document section
- References followed by {TBR} indicate that the preceding item or value is not final and shall be reviewed and approved prior to use in design but may be temporarily used in studies or analyses and that any results of such work will also be identified as {TBR} status as well.
- References followed by {TBD} indicate that the preceding item or value is still to be determined.

This document, once approved, will be placed under program change control and the program Change Control Board (CCB) shall approve any subsequent changes before the changes can be used in design documents. A Change Control process and the charter of the CCB will be established for the program at the time of issuance of this document and will be extended in the Program Execution Plan (PEP).

## 1.1 Purpose

The <sup>233</sup>U Safe Storage Program has been undertaken by the DOE to implement the long-term storage mission (see Section 1.3.1). A program team involving all affected components of the DOE has been assembled to implement this mission. This program team will coordinate the interim response by the affected field sites to ensure that the present inventory of <sup>233</sup>U materials is adequately safe while concurrently managing the development of a long-term <sup>233</sup>U Safe Storage System and planning for the eventual disposition of the <sup>233</sup>U materials.

The purpose of this document is to establish the basic system requirements that the <sup>233</sup>U Safe Storage System shall meet in the long term. Interim storage issues will be addressed in a separate Interim Technical Baseline, which will accompany the Program Execution Plan. SRD requirements will be considered in developing near-term responses to assessments of the current state of 97-1 materials at each site to ensure that near-term actions do not preclude compatible long-term activities.

System Requirements will include the specific technical requirements (capacity, throughput, form, processes, etc.) for a system that meets the long-term storage and disposition objectives for <sup>233</sup>U, as well as the regulatory and institutional requirements specified by Federal, State, Tribal, and Local laws and Regulatory agencies or Boards. These requirements are intended to ensure that <sup>233</sup>U-bearing materials at DOE facilities are converted to safe and stable forms and placed into low-maintenance storage in packages designed to maintain their integrity under anticipated handling, shipping, and storage conditions until disposition of the materials is implemented.

## 1.2 Scope

This requirements document identifies the requirements for the long-term safe storage of <sup>233</sup>U bearing materials. The requirements define a system for the processing, storage, and transport of

materials containing <sup>233</sup>U. These requirements also address the processing and interface with the EM Waste Management program for disposition of wastes generated by the activities associated with this system and those 97-1 materials that may be classified as wastes per the Safeguard Termination Limits (STLs) {TBD}. It is recognized the <sup>233</sup>U is not considered transuranic waste and, as such, its disposition is {TBD}.

These requirements are applicable to <sup>233</sup>U in unirradiated forms in storage at the Idaho National Engineering and Environmental Laboratory (INEEL), Oak Ridge National Laboratory (ORNL) and Los Alamos National Laboratory (LANL), as well as at the sites designated herein as "small holdings sites." These small holdings sites include New Brunswick Laboratory, Argonne National Laboratory (ANL)-East and West, Brookhaven National Laboratory, the Oak Ridge Y-12 Plant, Hanford Site, Lawrence Livermore National Laboratory (LLNL), and Rocky Flats Environmental Technology Site.

Material at Nuclear Regulatory Commission (NRC)-licensed facilities is not included in the initial scope. However, this potential interface is acknowledged, and should any of this material be transferred to DOE, the program scope will be flexible enough to include this inventory.

Spent fuel containing <sup>233</sup>U, located at INEEL, Savannah River Site, and other sites, is considered out of scope, since these materials are managed under the National Spent Nuclear Fuel Program. Should any of this material be identified for integration with the <sup>233</sup>U safe storage program, it will then be within scope for this program.

Similarly, the <sup>233</sup>U fuel associated with the Molten Salt Reactor Experiment (MSRE) is addressed under the Implementation Plan for Board Recommendation 94-1, and is, therefore, an identified integration issue for the scope of this program. Once the <sup>233</sup>U material is removed from MSRE and stabilized (converted to oxide form), it will enter the scope of the <sup>233</sup>U Safe Storage Program.

Several sites have stored potential wastes containing <sup>233</sup>U. Once the waste threshold criteria have been established it will be possible to determine whether any of this material comes under the scope of this program or whether the materials will be determined to be waste and disposed under the EM waste management programs. It must be recognized that disposition options may not exist for <sup>233</sup>U-bearing materials in the near future. <sup>233</sup>U in use at the various sites for on-going programs is identified as potential future inventory. Should any of this material be declared surplus, it will be included within the scope of this program.

## **1.3 System Overview**

### **1.3.1 <sup>233</sup>U Safe Storage System Mission**

The Mission of the <sup>233</sup>U Safe Storage System is to safely manage 97-1 inventories of <sup>233</sup>U material until disposition or use.

### **1.3.2 Background**

On March 3, 1997, the DNFSB issued Recommendation 97-1 that deals with the safe storage of unirradiated <sup>233</sup>U-bearing material. On April 25, 1997, the Secretary of Energy accepted the DNFSB's Recommendation.

The Recommendation describes actions that the DNFSB considers necessary to improve the safe storage of <sup>233</sup>U bearing materials in the interim and the longer term. Eight sub-recommendations detail those actions:

1. Establish a single line project to deal with issues attached to safe storage of <sup>233</sup>U
2. Develop the standards to be used for packaging, transportation, and interim and long-term storage
3. Characterize the items of <sup>233</sup>U presently in storage in the DOE's defense nuclear facilities as to material, quantity, type and condition of storage container;
4. Evaluate the conditions and appropriateness of the vaults and other storage systems used for the <sup>233</sup>U at the DOE's defense nuclear facilities
5. Assess the state of storage of the items of <sup>233</sup>U in light of the standards mentioned in sub-recommendation 2 above
6. Initiate a program to remedy any observed shortfalls in ability to maintain the items of <sup>233</sup>U in acceptable interim storage
7. Establish a plan for the measures that can eventually be used to place the <sup>233</sup>U in safe permanent storage; and
8. Until these ultimate measures are taken, ensure that the DOE's complex retains the residue of technical knowledge and competence needed to carry through all of the measures needed to ensure safe storage of the <sup>233</sup>U bearing material in the short and the long-term.

The Recommendation was preceded in February 1997, by a Board technical report entitled "Uranium-233 Storage Safety at Department of Energy Facilities" [DNFSB TECH 13]. The report described the Board's perspective of the safety of <sup>233</sup>U stored at various sites in the Department's complex. This formed the basis for the Board's sub-recommendations. DOE accepted these recommendations and an Implementation Plan was transmitted to the DNFSB and has been accepted [Implementation Plan for <sup>233</sup>U Safe Storage]. Collectively, these documents are the mission drivers for the <sup>233</sup>U Safe Storage System.

The report also acknowledged the DOE's Highly Enriched Uranium (HEU)-Vulnerability Assessment (VA), completed in August 1996. As a result of that assessment, the DOE was made aware of the legacy issues surrounding the storage of <sup>233</sup>U bearing material, and the HEU-VA findings were subsequently incorporated into DNFSB TECH 13. At the time of issuance of

Recommendation 97-1, the Office of Defense Programs had undertaken the development of a plan describing the necessary corrective actions for the most significant vulnerabilities identified in the HEU-VA. The HEU Vulnerability Corrective Action Plan was subsequently issued on June 13, 1997.

## **1.4 Document Overview**

This SRD for the <sup>233</sup>U Safe Storage System consists of five major sections and four appendices. Detailed descriptions of each SRD section are as follows:

- Section 1. Section 1 provides introductory and historical information regarding DNFSB Recommendation 97-1 and the mission of the <sup>233</sup>U Safe Storage Program, organized to address issues stemming from the DNFSB recommendation.
- Section 2. Section 2 lists the document number and title for those government and non-government documents from which system requirements were extracted. Documents identified in Section 2 include: Laws and Acts; DNFSB Documents; DOE Order, Standards, Manuals and Guides, Notices, and Policy Documents; Executive Orders; State and Tribal Laws, Local Ordinances; and Non-Government Standards.
- Section 3. Section 3 contains the specific system-level and subsystem-level requirements for the <sup>233</sup>U Safe Storage System. Section 3.1 provides system description and identifies 97-1 <sup>233</sup>U inventories at ORNL, INEEL, LANL, and Miscellaneous Universities and DOE sites. Section 3.2 identifies the system-level requirements imposed on the <sup>233</sup>U Safe Storage System, as a whole, and on each of the associated subsystem. Sections 3.3 through 3.6 identify subsystem-specific requirements for the Processing Subsystem, Storage Subsystem, Transportation Subsystem, and Waste Management Subsystem, respectively.
- Section 4. Section 4 contains the requirements for the <sup>233</sup>U Safe Storage System Quality Assurance Program, as well as requirements regarding system verification.
- Section 5. Section 5 lists those items to be determined (TBD) or to be resolved (TBR) by the <sup>233</sup>U Safe Storage Program. The resolution of TBD/TBR items listed herein will be addressed in a separate TBD/TBR Resolution Plan, to be published under separate cover.
- Appendix A. Appendix A contains the Requirements Traceability Matrix for each requirement identified in this SRD. In the matrix, each requirement is identified by number and title and traced directly to its source document applicable paragraph or subsection.
- Appendix B. Appendix B contains the Requirements Verification Matrix for each requirement identified in this SRD. In the matrix, the verification method for each requirement is identified as either Not Applicable (N/A), Test (T), Demonstration (D), Analysis (A), Inspection (I), or Similarity (S). The Requirements Verification Matrix will be used at a later stage of the program life-cycle to formulate a formal Test and Verification Plan for the <sup>233</sup>U Safe Storage System.

- Appendix C. Appendix C lists the related documents (e.g., guides, manuals, standards, etc.) that provide additional information on how to carry out many of the requirements identified herein. These documents contain “how to” information rather than explicit requirements; as such, they are listed in Appendix C rather than in the list of Applicable Document appearing in Section 2.
- Appendix D. Appendix D contains additional information (i.e., requirement justification, Law and Policy descriptions, facility/site descriptions, etc.) associated with many of the requirements.

This SRD, along with its supporting appendices, constitutes the system-level requirements set for the <sup>233</sup>U Safe Storage System and forms the basis for all subsequent program activities.



## 2.0 APPLICABLE DOCUMENTS

Section 2 identifies applicable laws, regulations, orders, and other requirement source documents cited within this SRD. The following documents form a part of this SRD to the extent specified herein. In the event of conflict between the requirements of this SRD and any referenced document, the requirements of the referenced document shall take precedence.

### 2.1 Government Documents

#### 2.1.1 Laws, Regulations, and Acts

42 USC 6901 et seq.	RESOURCE CONSERVATION AND RECOVERY ACT (P.L. 94-550)
10 CFR 830.120	QUALITY ASSURANCE REQUIREMENTS
10 CFR 835	OCCUPATIONAL RADIATION PROTECTION, SURFACE RADIOACTIVITY VALUES
29 CFR 1910	OCCUPATIONAL SAFETY AND HEALTH STANDARDS
29 CFR 1926	SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION
40 CFR 260-268	HAZARDOUS WASTE SYSTEM, ET AL
49 CFR 106-180	
49 CFR 173.7(b)	SHIPPERS – GENERAL REQUIREMENTS FOR SHIPMENT AND PACKAGING
49 CFR 175	CARRIAGE BY AIRCRAFT

#### 2.1.2 DNFSB Documents

DNFSB RECOMMENDATION 97-1	URANIUM-233 STORAGE SAFETY AT DEPARTMENT OF ENERGY FACILITIES
IMPLEMENTATION PLAN FOR DNFSB RECOMMENDATION 97-1	IMPLEMENTATION PLAN FOR DEFENSE NUCLEAR FACILITIES SAFETY BOARD RECOMMENDATION 97-1, SAFE STORAGE OF URANIUM-233

#### 2.1.3 Department of Energy Documents

##### 2.1.3.1 Orders.

DOE AL 5610.14	TRANSPORTATION SAFEGUARDS SYSTEM PROGRAM OPERATIONS
DOE C 231.1	CONTRACTOR REQUIREMENTS DOCUMENT
DOE C 420.1	CONTRACTOR REQUIREMENTS DOCUMENT
DOE C 425.1	CONTRACTOR REQUIREMENTS DOCUMENT
DOE C 460.2	CONTRACTOR REQUIREMENTS DOCUMENT
DOE C 470.1	CONTRACTOR REQUIREMENTS DOCUMENT
DOE C 471.2A	CONTRACTOR REQUIREMENTS DOCUMENT
DOE C 5480.20A	CONTRACTOR REQUIREMENTS DOCUMENT
DOE O 151.1 CHG. 2	COMPREHENSIVE EMERGENCY MANAGEMENT SYSTEM
DOE O 210.1	PERFORMANCE INDICATORS AND ANALYSIS OF OPERATIONS INFORMATION
DOE O 225.1A	ACCIDENT INVESTIGATIONS
DOE O 231.1 CHG. 2	ENVIRONMENT, SAFETY, AND HEALTH REPORTING

DOE O 232.1A	OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION
DOE O 414.1	QUALITY ASSURANCE
DOE O 420.1 CHG. 2	FACILITY SAFETY
DOE O 425.1 CHG. 2	STARTUP AND RESTART OF NUCLEAR FACILITIES
DOE O 430.1 CHG. 1	LIFE CYCLE ASSET MANAGEMENT
DOE O 440.1A	WORKER PROTECTION MANUAL FOR FEDERAL FACILITIES
DOE O 440.2	AVIATION
DOE O 451.1A	NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE
DOE O 460.1A	PACKAGING AND TRANSPORTATION SAFETY
DOE O 460.2 CHG. 1	DEPARTMENTAL MATERIALS TRANSPORTATION AND PACKAGING MANAGEMENT
DOE O 470.1 CHG. 1	SAFEGUARDS AND SECURITY
DOE O 471.1	IDENTIFICATION AND PROTECTION OF UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION
DOE O 471.2A	INFORMATION SECURITY PROGRAM
DOE O 472.1B	PERSONNEL SECURITY ACITIVITES
DOE 1360.2B	UNCLASSIFIED COMPUTER SECURITY PROGRAM
DOE 5400.1 CHG. 1	GENERAL ENVIRONMENTAL PROTECTION PROGRAM
DOE 5400.5 CHG. 2	RADIATION PROTECTION OF THE PUBLIC AND THE ENVIRONMENT
DOE 5480.8A	CONTRACTOR OCCUPATIONAL MEDICAL PROGRAM
DOE 5480.19	CONDUCT OF OPERATIONS REQUIREMENTS FOR DOE FACILITIES
DOE 5480.20A	PERSONNEL SELECTION, QUALIFICATION AND TRAINING REQUIREMENTS FOR DOE NUCLEAR FACILITIES
DOE 5480.21	UNREVIEWED SAFETY QUESTIONS
DOE 5480.22	TECHNICAL SAFETY REQUIREMENTS
DOE 5480.23 CHG1	NUCLEAR SAFETY ANALYSIS REPORTS
DOE 5480.4	ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION STANDARDS
DOE 5481.1B	SAFETY ANALYSIS AND REVIEW SYSTEMS (FOR NUCLEAR FACILITIES)
DOE 5632.7A	PROTECTIVE FORCE PROGRAM
DOE 5633.3B	CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS
DOE 5650.2B CHG.2	IDENTIFICATION OF CLASSIFIED INFORMATION
DOE 5820.2A	RADIOACTIVE WASTE MANAGEMENT

**2.1.3.2 Standards.**

DOE-SAFT-0067	CRITERIA FOR PREPARING AND PACKAGING URANIUM-233-BEARING METALS AND OXIDES FOR LONG-TERM SAFE STORAGE
DOE-STD-1020-94(CH-1)	NATURAL PHENOMENA HAZARDS DESIGN AND EVALUATION CRITERIA FOR DEPARTMENT OF ENERGY FACILITIES

Refer to DOE O 231.1 CHG. 2 for paragraph deletions.

DOE-STD-1021-93(CH-1)	NATURAL PHENOMENA HAZARDS PERFORMANCE CATEGORIZATION GUIDELINES FOR STRUCTURES, SYSTEMS, AND COMPONENTS
DOE-STD-1022-94(CH-1)	NATURAL PHENOMENA HAZARDS CHARACTERIZATION CRITERIA
DOE-STD-1023-95(CH-1)	NATURAL PHENOMENA HAZARDS ASSESSMENT CRITERIA
DOE-STD-1024-92(CH-1)	GUIDELINES FOR USE OF PROBABILISTIC SEISMIC HAZARD CURVES AT DEPARTMENT OF ENERGY SITES FOR DEPARTMENT OF ENERGY FACILITIES
DOE-STD-1027-92	HAZARD CATEGORIZATION AND ACCIDENT ANALYSIS TECHNIQUES FOR COMPLIANCE WITH DOE ORDER 5480.23, NUCLEAR SAFETY ANALYSIS REPORTS
DOE-STD-1066-97	FIRE PROTECTION DESIGN CRITERIA
DOE-STD-1082-94	PREPARATION, REVIEW, AND APPROVAL OF IMPLEMENTATION PLANS FOR NUCLEAR SAFETY REQUIREMENTS
DOE-STD-1083-95	REQUESTING AND GRANTING EXEMPTIONS TO NUCLEAR SAFETY RULES
DOE-STD-1107-97	KNOWLEDGE, SKILLS, AND ABILITIES FOR KEY RADIATION PROTECTION POSITIONS AT DOE FACILITIES
DOE-STD-3003-94	BACKUP POWER SOURCES FOR DOE FACILITIES
DOE-STD-3006-95	PLANNING AND CONDUCT OF OPERATIONAL READINESS REVIEWS (ORR)
DOE-STD-3009-94	PREPARATION GUIDE FOR U.S. DOE NONREACTOR NUCLEAR FACILITY SAFETY ANALYSIS REPORTS
DOE-STD-3020-97	SPECIFICATION FOR HEPA FILTERS USED BY DOE CONTRACTORS

**2.1.3.3 Manuals and Guides.**

DOE M 232.1-1A	OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION
DOE M 471.2-1	MANUAL FOR CLASSIFIED MATTER PROTECTION AND CONTROL
DOE M 5639.6A-1	MANUAL OF SECURITY REQUIREMENTS FOR THE CLASSIFIED AUTOMATED INFORMATION SYSTEM SECURITY PROGRAM
WHC-EP-0558	TEST AND EVALUATION DOCUMENT FOR DOT SPECIFICATION 7A TYPE A PACKAGING
DOE G 420.1-X	IMPLEMENTATION GUIDE FOR NON-REACTOR NUCLEAR FACILITY SAFETY

**2.1.3.4 Notices.**

DOE N 441.1	RADIOLOGICAL PROTECTION FOR DOE ACTIVITIES
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### 2.1.3.5 Policy Documents.

DOE P 441.1	DEPARTMENT OF ENERGY RADIOLOGICAL HEALTH AND SAFETY POLICY
DOE P 450.2A	IDENTIFYING, IMPLEMENTING, AND COMPLYING WITH ENVIRONMENT, SAFETY, AND HEALTH REQUIREMENTS
DOE P 450.4	SAFETY MANAGEMENT SYSTEM POLICY

### 2.1.4 Executive Orders

Executive Order 12856	FEDERAL COMPLIANCE WITH RIGHT-TO-KNOW LAWS AND POLLUTION PREVENTION REQUIREMENTS
Executive Order 12873	FEDERAL ACQUISITION, RECYCLING, AND WASTE PREVENTION

### 2.1.5 State and Tribal Laws and Agreements

This program will comply with all applicable State and Tribal laws, regulations, and agreements. State and Tribal law, regulation, and agreement applicability is site specific.

### 2.1.6 Local Ordinances

This program will comply with all applicable local laws and regulations. Local law and regulation applicability is site specific.

## 2.2 Non-Government Documents

### 2.2.1 Standards

ANSI/ANS N13.1	GUIDE TO SAMPLING AIRBORNE RADIOACTIVE MATERIALS IN NUCLEAR FACILITIES
ANSI/ANS-8.10-1983, R88	CRITERIA FOR NUCLEAR CRITICALITY SAFETY CONTROLS IN OPERATIONS WITH SHIELDING AND CONFINEMENT
ANSI/ANS-8.1-1983, R88	NUCLEAR CRITICALITY SAFETY IN OPERATIONS WITH FISSIONABLE MATERIALS OUTSIDE REACTORS
ANSI/ANS-8.20-1991	NUCLEAR CRITICALITY SAFETY TRAINING
ANSI/ANS-8.3-1986	CRITICALITY ACCIDENT ALARM SYSTEMS
ANSI/ANS-8.7-1975, R87	GUIDE FOR NUCLEAR CRITICALITY SAFETY IN THE STORAGE OF FISSIONABLE MATERIALS
ANSI/IEEE C2	NATIONAL ELECTRICAL SAFETY CODE
NFPA 70	NATIONAL ELECTRICAL CODE
ASME NQA-1	QUALITY ASSURANCE PROGRAM REQUIREMENTS FOR NUCLEAR FACILITIES
ASME NQA-2	QUALITY ASSURANCE REQUIREMENTS FOR NUCLEAR FACILITY APPLICATIONS

### 3.0 SYSTEM REQUIREMENTS

#### 3.1 System Description

The purpose of the <sup>233</sup>U Safe Storage System is to provide safe long-term storage of the existing and future 97-1 <sup>233</sup>U materials that are the responsibility of DOE. The <sup>233</sup>U Safe Storage System will modify or replace the existing systems used to process and store <sup>233</sup>U material as necessary. A basic system concept has been developed based on analysis by the 97-1 Technical Team of the issues associated with accomplishing this mission and the assessment of the existing facilities and the state of the material stored in those facilities. This <sup>233</sup>U Safe Storage System specifically addresses the DNFSB recommendations as well as the needs of DOE in its larger role of managing the complete life cycle of the <sup>233</sup>U material. This system specifically addresses the issues associated with the long-term storage and interfaces with disposition alternatives of <sup>233</sup>U.

This SRD does not address the interim storage of this material up to the time that the long-term storage begins. Interim storage is based on existing capabilities and facilities and the resolution of issues related to interim storage requirements is specifically addressed in the 97-1 Implementation Plan. An interim storage strategy and plan will be developed from the characterization effort reports that are specified by the Implementation Plan. Incomplete actions remaining from the interim actions contained in the 97-1 Implementation Plan or resulting from the characterization efforts will be incorporated into the long-term storage PEP at the time that document is issued.

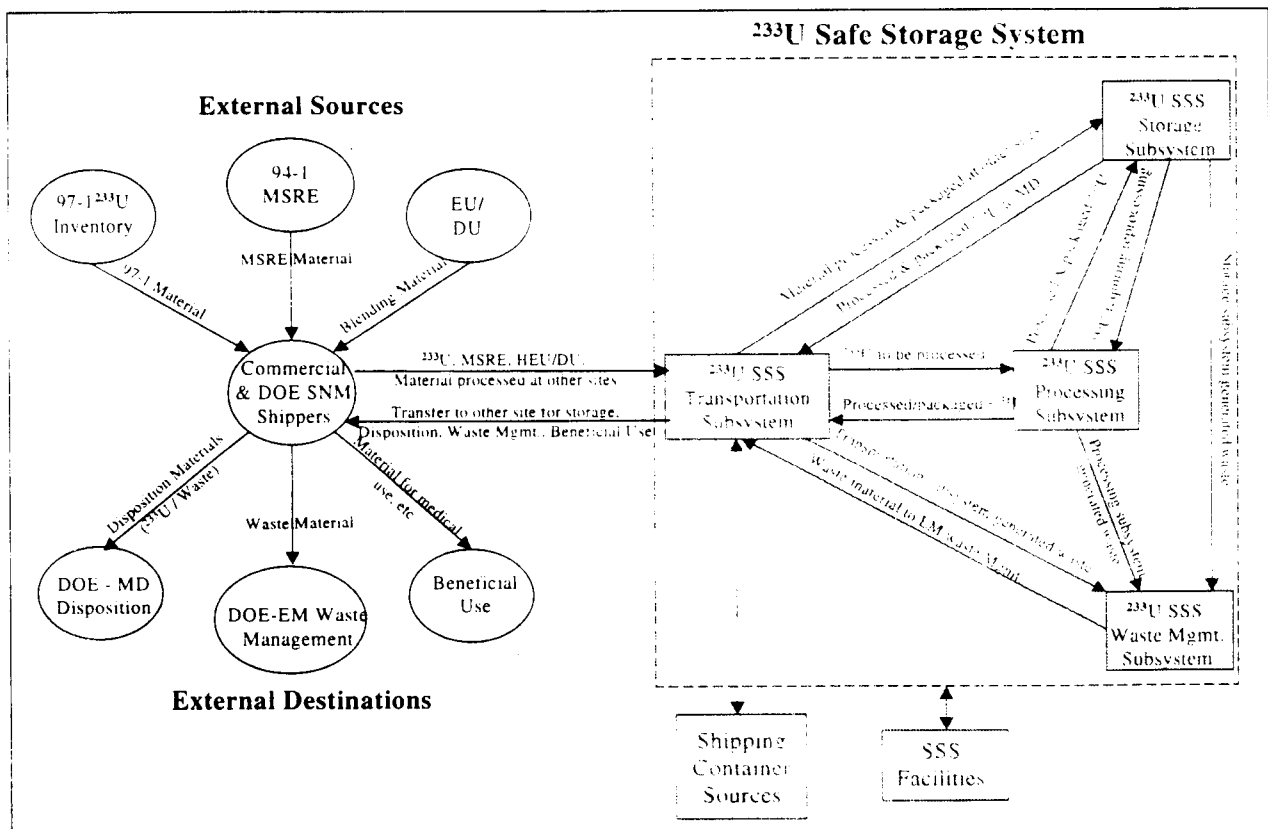


Figure 3-1. <sup>233</sup>U Safe Storage System Components and Interfaces

### **3.1.1 System Components**

The <sup>233</sup>U Safe Storage System consists of four major subsystems, as depicted in Figure 3-1. These are:

**3.1.1.1 Processing Subsystem.** Where required to meet the <sup>233</sup>U Safe Storage Standard [DOE-SAFT-0067], the Processing Subsystem will convert the existing material forms to the chosen long-term storage form(s), stabilize, and place the stabilized material in storage containers meeting the requirements of the <sup>233</sup>U Safe Storage Standard for long-term storage. This subsystem may also generate radioactive wastes containing <sup>233</sup>U that will be transferred to the Waste Management Subsystem for temporary storage and dispositioning. The specific materials to be processed will be determined by analyses and trade studies as part of the conceptual engineering for this program.

**3.1.1.2 Storage Subsystem.** The Storage Subsystem will safely store <sup>233</sup>U material for an indefinite period, with a minimum design life of 50 years. The Storage Subsystem will monitor the status of the material and provide the capability to place the material into and withdraw the material from storage. Additionally, the subsystem will be capable of handling damaged containers and safely transferring them to the Transportation Subsystem for transport to a Processing Subsystem for restabilization and repackaging. The capability to remove selected containers for visual and other non-destructive examination within the Storage Subsystem facilities will also be provided.

Because of the potential for beneficial uses of the <sup>233</sup>U material, it will be possible to repeatedly withdraw the material for removal of selected isotopes for medical or other beneficial use and to place processed and packaged material back into storage. This subsystem may also generate some <sup>233</sup>U-bearing or other hazardous wastes as a by-product of handling <sup>233</sup>U storage containers or from damage to such containers. This waste would require processing by the Waste Management Subsystem.

**3.1.1.3 Transportation Subsystem.** The Transportation Subsystem will ensure that material is safely transported between the Storage, Processing, and Waste Management Subsystems. Responsibilities include the placement in and removal of material packages from appropriate shipping containers, all necessary shipping and receiving facilities, supplying requirements to and coordinating with external supplier systems for needed shipping services and shipping containers, and the necessary logistics functions to ensure safe, orderly and efficient transportation operations in support of the other subsystems. The Transportation Subsystem will also interface with and manage on-site transportation of <sup>233</sup>U materials and waste materials.

**3.1.1.4 Waste Management Subsystem.** The Waste Management Subsystem will receive waste materials from processing operations and any other <sup>233</sup>U Safe Storage System activities that generate waste material. This will include any of the 97-1 inventory of materials that may be subsequently designated as waste (i.e., those materials below the STLs as defined in DOE 5633.3B and subsequent revisions, such as that proposed in the Memo of July 22, 1996 from Edward J. McCallum and in ORNL/TM-13591). Where appropriate and economical, the Waste Management Subsystem will also

recover and return <sup>233</sup>U material to the Processing Subsystem. The Waste Management subsystem will package and temporarily store the waste material as required, and handle the transfer of the material to the DOE-Office of Environmental Management (-EM) for dispositioning.

The capacity of the Waste Management Subsystem at the facility designated to process these materials will be sized to provide the capability to process these materials in the time frame stated in EM program requirements.

### **3.1.2 System Interfaces**

The <sup>233</sup>U Safe Storage System includes a number of interfaces between its subsystems as well as to external systems. Figure 3-1 (above) graphically illustrates the components of the <sup>233</sup>U Safe Storage System and identifies those internal and external interfaces.

**3.1.2.1 External Interfaces.** The primary external interfaces to the <sup>233</sup>U Safe Storage System are through the Transportation Subsystem with Commercial or DOE Special Nuclear Materials (SNM) Shippers (see Figure 3-1). As shown, Commercial or DOE SNM shippers will receive and transport <sup>233</sup>U materials from existing <sup>233</sup>U storage facilities: the MSRE at Oak Ridge; and, potentially, from natural and depleted uranium storage locations to the <sup>233</sup>U Safe Storage System for processing and long-term storage. Additionally, Commercial and DOE SNM shippers will provide the primary interface for transporting <sup>233</sup>U and waste materials from the <sup>233</sup>U Safe Storage System to applicable DOE-Materials Disposition (-MD) and beneficial use programs and facilities. This will be accomplished using shipping containers supplied by the designated shipping container supply source or the shipper as appropriate. Specific requirements for each external interface appear in Section 3.2.3.1 of this SRD.

**3.1.2.2 Internal Interfaces.** Interfaces internal to the <sup>233</sup>U Safe Storage System exist between each major subsystem, namely Transportation, Processing, Storage, and Waste Management. As shown in Figure 3-1, these interfaces involve the transfer of <sup>233</sup>U materials and associated waste byproducts from one subsystem to another via the Transportation Subsystem. In instances where Processing, Storage, and Waste Management Subsystems are co-located, material transfers will be made directly from one subsystem to another without the aid of the Transportation Subsystem. Specific requirements for each internal system interface appear in Section 3.2.3.2 of this SRD.

### **3.1.3 97-1 <sup>233</sup>U Materials Inventories**

Most <sup>233</sup>U materials under the scope of the 97-1 program are located at three DOE facilities: ORNL, INEEL, and LANL. Additionally, small quantities of DOE <sup>233</sup>U material can be found at various small sites and Universities throughout the nation. Tables 3-1 through 3-4 identify the unirradiated <sup>233</sup>U material inventories (as of May 1998) at various sites throughout the DOE complex. Each of these materials will be evaluated against the Waste Threshold Criteria, when established, to identify which of these materials are within the scope of the <sup>233</sup>U Safe Storage Program. Consolidation of those materials within scope may reduce risk and cost. For complete inventory information refer to ORNL/TM-13551, *Strategy of the Future Use and Disposition of*

<sup>233</sup>U: History, Inventories, Storage Facilities, and Potential Uses. For <sup>233</sup>U characterization information refer to ORNL/TM-13552, *Strategy of the Future Use and Disposition of <sup>233</sup>U: Technical Information*.

**Table 3-1.** Unirradiated <sup>233</sup>U Inventory at ORNL (as of May 1998)

Location	Chemical/Physical Form	<sup>233</sup> U (kg)	<sup>232</sup> U content (ppm <sup>232</sup> U)	Total Qty. U (kg)	Number of Packages
Bldg. 3019	UO <sub>x</sub> Powder (RCP-03)	61.6	220	67.4	140
	UF <sub>4</sub> with LiF	2.9	220	3.2	4
	U <sub>3</sub> O <sub>8</sub> Monolith (75% <sup>235</sup> U)	101.1	140	1042.6	403
	UO <sub>x</sub> powder (Mound)	3.5	2-16	3.6	20
	U-metal & alloys	17.0	1-70	17.3	31
	U <sub>3</sub> O <sub>8</sub> Monolith	60.3	20	65.2	27
	UO <sub>2</sub> Powder	15.0	6	15.4	27
	U <sub>3</sub> O <sub>8</sub> Powder (RCP-02)	10.7	38	11.1	27
	U <sub>3</sub> O <sub>8</sub> powder (RDF-OX)	91.2	5-10	96.5	142
	ZPR packets (U <sub>3</sub> O <sub>8</sub> powder)	44.8	7	45.7	128
	Misc. oxide powders	10.2	1-42	10.4	44
	other miscellaneous forms	8.4	1-42	8.5	22

**Table 3-2.** Unirradiated <sup>233</sup>U Inventory at INEEL (as of May 1998)

Location	Chemical/Physical Form	<sup>233</sup> U, (kg)	<sup>232</sup> U content (ppm <sup>232</sup> U)	Total Qty. U (kg)	Number of Packages
CPP-749	Containers - Fuel and blanket rods containing UO <sub>2</sub> /ThO <sub>2</sub> pellets	300.80	TBD	306.64	40
CPP-749	Complete assembled seed module	16.56	TBD	16.84	1
RWMC	55 gal & 110 gal 6M Containers - Fuel and blanket rods containing UO <sub>2</sub> /ThO <sub>2</sub> pellets	34	TBD	TBD	172
RWMC	Fabrication scrap – anti C clothing, grinding sludge, polyethylene material, rags, gloves, processing equipment components	60	TBD	TBD	1697



Table 3-3. Unirradiated <sup>233</sup>U Inventory at LANL (as of May 1998)

Location	Chemical/Physical Form	<sup>233</sup> U, (kg)	<sup>232</sup> U content (ppm <sup>232</sup> U)	Total Qty. U, (kg)	Number of Packages
C13P	Compound/carbide/ plutonium 239	0.048	5 <-10	0.049	3
C211	Compound/dioxide/high purity	0.509	5 <-10	0.522	3
C213	Oxide	0.001	5 <-10	0.001	1
C214	Compound/source	0.230	5 <-10	0.234	7
C217	Compound/dioxide/impure/ no major contaminant	1.573	5 <-10	1.604	29
C21P	Compound/dioxide/ plutonium 239	0.451	5 <-10	0.463	8
C527	Compound/nitrate/impure/no major contaminant	0.265	5 <-10	0.271	2
C807	Compound/tetrafluoride/ impure/no major contaminant	0.001	5 <-10	0.001	1
C862	Compound/trioxide/multiple contaminants/see remark	0.236	5 <-10	0.240	3
C881	Compound/U3O8/high purity	0.004	5 <-10	0.004	2
C887	Compound/U3O8/impure/no major contaminant	0.686	5 <-10	0.700	3
C88H	Compound/U3O8/History/ archival sample	0.001	5 <-10	0.001	1
K150	Combustible/cellulose rag(s)/nonspecific	0.006	5 <-10	0.006	2
L523	Nitrate solution/standard	0.001	5 <-10	0.001	1
M011	Metal/high purity/high purity	0.165	5 <-10	0.165	20
M01E	Metal/high purity/ encapsulated	0.003	5 <-10	0.003	1
M391	Metal/high purity turnings/ high purity	0.006	5 <-10	0.006	1
M447	Metal/impure/impure/no major contaminant	2.270	5 <-10	2.309	30
M44P	Metal/impure/plutonium 239	0.015	5 <-10	0.015	2
M467	Metal/impure turnings/ impure/no major contaminants	0.005	5 <-10	0.005	1
M46P	Metal/impure turnings/plutonium 239	0.002	5 <-10	0.002	1
M745	Metal/spec alloy/part	0.183	5 <-10	0.188	1

M74E	Metal/spec alloy/ encapsulated	0.061	5 -<10	0.062	1
M74H	Metal/spec alloy/ history/archival sample	0.067	5 -<10	0.068	7
N310	Noncombustible/graphite/ nonspecific	0.115	5 -<10	0.118	1
N550	Noncombustible/ non- actinide/nonspecific	0.011	5 -<10	0.011	1
N67W	Non combustible/plastics/ kim wipes/approved designated waste	0	5 -<10	0	1
R410	Process Residue/hydroxide precipitate/non-specific	0.179	5 -<10	0.183	2
R412	Process Residue/hydroxide precipitate /multi- contaminant/remarks	0.004	5 -<10	0.004	1
R780	Process residue/sweepings/ screenings/non-specific	0.007	5 -<10	0.007	3
R78P	Process residue/sweepings/ screenings/plutonium 239	0.002	5 -<10	0.002	1

**Table 3-4. Unirradiated <sup>233</sup>U Inventory at Small Sites and External Systems (as of May 1998)**

<b>Location</b>	<b>Chemical/Physical Form</b>	<b><sup>233</sup>U, (kg)</b>	<b><sup>232</sup>U content (ppm <sup>232</sup>U)</b>	<b>Total Qty. U (kg)</b>	<b>Number of Packages</b>
Argonne East	TBD	TBD	TBD	0.036	TBD
Argonne West	TBD	TBD	TBD	0.15433	TBD
Brook- haven	TBD	TBD	TBD	0.0022	TBD
Bettis Atomic Power Laboratory	TBD	TBD	TBD	0.412	TBD
General Atomics	TBD	TBD	TBD	0.172	2
Hanford	TBD	TBD	TBD	0.079	3
LLNL	TBD	TBD	TBD	3.321	50
PNNL	TBD	TBD	TBD	0.048	15
Rocky Flats	TBD	TBD	TBD	0.008	8
Oak Ridge Y-12	TBD	TBD	TBD	0.881	TBD
Mound	TBD	TBD	TBD	<0.005	TBD

Knolls Atomic	TBD	TBD	TBD	<0.010	TBD
MSRE Fuel	TBD	TBD	TBD	37.000	TBD
Savannah River	TBD	TBD	TBD	N/A	TBD
Boston College	TBD	TBD	TBD	0.001	TBD
Fort St. Vrain	TBD	TBD	TBD	N/A	TBD
Lawrence Berkeley	TBD	TBD	TBD	0.031	TBD
San Diego State University	TBD	TBD	TBD	0.001	TBD
San Francisco State Univ.	TBD	TBD	TBD	0.001	TBD

## 3.2 System Level Requirements

### 3.2.1 Performance

Long-term storage capacity of the entire <sup>233</sup>U Safe Storage System shall accommodate {TBD}kg of <sup>233</sup>U material as specified in the <sup>233</sup>U *Disposition Environmental Impact Statement (EIS) Record of Decision (ROD)*, with {TBD}% margin to accommodate future <sup>233</sup>U materials. [Derived].

### 3.2.2 Functional

**3.2.2.1 Compatibility with 94-1 Systems.** The <sup>233</sup>U Safe Storage System should be compatible with and utilize to the extent possible the systems being developed for the 94-1 Program. [Derived]

**3.2.2.2 General Functionality.** The system shall process, transport, and store <sup>233</sup>U material, and interface with the disposition system for final disposition of the material. [Derived]

**3.2.2.3 Transfer to Waste Disposal Programs.** The system shall manage the <sup>233</sup>U bearing wastes generated by these activities and prepare those wastes for transfer to the appropriate DOE-EM waste disposal program. [Derived]

**3.2.2.4 Monitor Materials and System Processes.** The <sup>233</sup>U Safe Storage System shall monitor the material and subsystem processes for that material under any postulated operating conditions, including postulated design basis accidents (DBAs), to ensure quality and safe status of the product, protect against diversion of the material, and to

protect workers from potentially harmful products used by, or produced by, the operation of the facilities. [Derived]

**3.2.2.5 Assure Safe Operating Conditions.** Conditions to be monitored shall be those that provide assurance of the safe condition of the stored material and those parameters that are necessary to indicate when automated or operator actions are required to respond to off-normal conditions. [Derived]

**3.2.2.6 Provide Package Surveillance Capability.** In accordance with DOE-SAFT-0067, Criteria for Preparing and Packaging Uranium-233-Bearing Materials for Safe Long-term Storage and Section 3.2.7.4, a package surveillance program shall be provided to assess the on-going condition of the packages against the mission requirements, including integrity and Materials Control and Accountability (MC&A) requirements. [DOE-SAFT-0067, DOE 5633.3B, Ch. III, 3]

**3.2.2.7 Contain Material.** The <sup>233</sup>U Safe Storage System shall safely contain stored material under all postulated design conditions. [Derived]

**3.2.2.8 Retrieve Material.** The <sup>233</sup>U Safe Storage System shall be capable of retrieving material following any DBA event. [Derived]

**3.2.2.9 Provide Contamination Detection Capability.** The <sup>233</sup>U Safe Storage System shall provide capability to detect contamination. [Derived]

**3.2.2.9.1 Contamination Control**—In the event of contamination, the <sup>233</sup>U Safe Storage System shall be capable of collecting samples for analysis. [Derived]

**3.2.2.9.2 Transfer Provisions**—The <sup>233</sup>U Safe Storage System shall include provision for the transfer of samples for analysis, as necessary. [Derived]

### 3.2.3 Integration and Interface Control

#### 3.2.3.1 External Interfaces.

**3.2.3.1.1 97-1 <sup>233</sup>U Inventory / Commercial or DOE SNM Shippers Interface**—That portion of the 97-1 <sup>233</sup>U material at existing DOE storage sites (see Section 3.1.3) not designated as waste or designated to be transferred for disposition, in accordance with {TBD}, shall be transferred to commercial or DOE SNM shippers for transport to the <sup>233</sup>U Safe Storage System for processing and storage as appropriate. [Derived]

- (1) **Early Disposition.** 97-1 material that is determined to be excess shall be transferred to shippers for transport to DOE-MD for early disposition. [Derived]

- (2) **Transport Requirements.** The <sup>233</sup>U Safe Storage System shall provide schedules and requirements to existing sites for the transport of 97-1 materials. [Derived]
- (3) **Interface Requirements.** Requirements for the 97-1 <sup>233</sup>U Inventory to commercial or DOE SNM shippers interface shall be defined in {TBD} Interface Control Document (ICD). [Derived]

**3.2.3.1.2 Oak Ridge Molten Salt Reactor Experiment / Commercial or DOE SNM Shippers Interface**—Stabilized and packaged <sup>233</sup>U materials from the 94-1 Program's MSRE shall be transferred to commercial or DOE SNM shippers for transport to the <sup>233</sup>U Safe Storage System. [Derived]

- (1) **Material and Packaging Requirements.** The <sup>233</sup>U Safe Storage System shall provide material and packaging requirements to the 94-1 Program for the MSRE materials. [Derived]
- (2) **Interface Requirements.** Requirements for the Oak Ridge Molten Salt Reactor Experiment to commercial or DOE SNM shippers interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.1.3 Natural and Depleted Uranium / Commercial or DOE SNM Shippers Interface**—Natural and/or depleted uranium at {TBD} existing storage sites shall be transferred to commercial or DOE SNM shippers for transport to the <sup>233</sup>U Safe Storage System for blending with <sup>233</sup>U materials as required. [Derived]

- (1) **Required Materials.** The <sup>233</sup>U Safe Storage System shall provide the required material quantities, schedules and specifications to the natural and depleted uranium storage sites. [Derived]
- (2) **Material Specifications.** The natural and depleted uranium storage sites shall provide materials quantities and specifications for available materials to the <sup>233</sup>U Safe Storage System. [Derived]
- (3) **Interface Requirements.** Requirements for the natural and depleted uranium storage sites to commercial or DOE SNM shippers interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.1.4 Commercial or DOE SNM Shippers / <sup>233</sup>U Safe Storage System Interface**—Commercial or DOE SNM shippers shall transport 97-1 <sup>233</sup>U materials from existing storage sites and stabilized <sup>233</sup>U from the MSRE to the <sup>233</sup>U Safe Storage System for processing and long-term storage. [Derived]

- (1) **Transport Requirements.** The <sup>233</sup>U Safe Storage System shall provide schedules and material quantities to the commercial and DOE SNM shippers as required to arrange for transport. [Derived]

- (2) Transfer of <sup>233</sup>U Materials to DOE-MD. The <sup>233</sup>U Safe Storage System shall transfer packaged <sup>233</sup>U materials to commercial or DOE SNM shippers for transport to DOE-MD or beneficial use facilities.
- (3) Transfer of <sup>233</sup>U Waste to DOE-EM. The <sup>233</sup>U Safe Storage System shall transfer waste materials to the shippers for transport to EM Waste Management facilities. [Derived]
- (4) Natural and Depleted Uranium. Commercial or DOE SNM shippers shall transport natural and depleted uranium from {TBD} sites to the <sup>233</sup>U Safe Storage System for processing. [Derived]
- (5) Detailed Interface Requirements. Detailed requirements for the commercial and DOE SNM shippers to <sup>233</sup>U Safe Storage System interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.1.5 Commercial or DOE SNM Shippers / DOE-MD Interface—**

Commercial or DOE SNM shippers shall transport packaged <sup>233</sup>U materials from the <sup>233</sup>U Safe Storage System to {TBD} DOE-MD for final disposition. [Derived]

- (1) MD Materials and Packaging Acceptance Criteria. DOE-MD shall provide materials and packaging acceptance criteria to the <sup>233</sup>U Safe Storage System. [Derived]
- (2) Interface Requirements. Requirements for the commercial or DOE SNM shippers to DOE-MD interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.1.6 Commercial or DOE SNM Shippers / DOE-EM Waste Management Interface—**

Commercial or DOE SNM shippers shall transport waste materials, packaged to meet EM Waste Acceptance Criteria, from the <sup>233</sup>U Safe Storage System to {TBD} DOE-EM Waste Management facilities for disposition. [Derived]

- (1) DOE-EM Waste Acceptance Criteria. DOE-EM shall provide waste acceptance criteria, including waste form and packaging criteria and sources, for waste materials to the <sup>233</sup>U Safe Storage System. [Derived]
- (2) Interface Requirements. Requirements for the commercial or DOE SNM shippers to DOE-EM Waste Management interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.1.7 Commercial or DOE SNM Shippers / Beneficial Use Interface—**

Commercial or DOE SNM shippers shall transport packaged <sup>233</sup>U materials between the <sup>233</sup>U Safe Storage System and {TBD} beneficial use facilities and programs. [Derived]

- (1) Interface Requirements. Requirements for the commercial or DOE SNM shippers to beneficial use program interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.1.8 Sites and Facilities /<sup>233</sup>U Safe Storage System Interface**—The <sup>233</sup>U Safe Storage System shall be located at {TBD} sites and facilities.

- (1) Site and Facility Services. These sites and facilities shall provide {TBD} services to the <sup>233</sup>U Safe Storage System. [Derived]
- (2) Interface Requirements. Requirements for the sites and facilities to <sup>233</sup>U Safe Storage System interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.1.9 <sup>233</sup>U Safe Storage System / External Shipping Container Source Interface**—The <sup>233</sup>U Safe Storage System Transportation Subsystem shall acquire certified shipping containers from external sources in quantities that ensure program schedules. [Derived]

- (1) Interface Requirements. Requirements for the <sup>233</sup>U Safe Storage System to external shipping container source interface shall be defined in {TBD} ICD. [Derived]

### **3.2.3.2 Internal Interfaces.**

**3.2.3.2.1 Transportation Subsystem / Processing Subsystem Interface**—The Transportation Subsystem shall transfer 97-1 <sup>233</sup>U and blending materialsto and from the Processing Subsystem. [Derived]

- (1) Transfer of <sup>233</sup>U Materials. The Processing Subsystem shall provide processed and packaged <sup>233</sup>U materials to the Transportation Subsystem for transport to the Storage Subsystem. [Derived]
- (2) Transfer of Waste. The Processing Subsystem shall provide subsystem-generated waste for transport to the Waste Management Subsystem for processing and packagingg for transfer to EM Waste Management. [Derived]
- (3) Interface Requirements. Requirements for the Transportation Subsystem/Processing Subsystem interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.2.2 Transportation Subsystem / Storage Subsystem Interface**— The Transportation Subsystem shall transfer 97-1 <sup>233</sup>U materials to and from the Storage Subsystem. [Derived]

- (1) Transfer of <sup>233</sup>U Materials. The Storage Subsystem shall provide processed and packaged <sup>233</sup>U materials to the Transportation Subsystem. [Derived]
- (2) Transfer of Waste. The Storage Subsystem shall provide Storage Subsystem-generated waste for transport to the Waste Management Subsystem. [Derived]
- (3) Transfer of Damaged Packages. The Storage Subsystem shall transfer damaged packages, or packages opened as a result of on-going verification of package integrity, to the transportation subsystem for transport to the processing subsystem for packaging. [Derived]
- (4) Interface Requirements. Requirements for the Transportation Subsystem/Storage Subsystem interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.2.3 Transportation Subsystem / Waste Management Subsystem**

**Interface**—The Transportation Subsystem shall transfer waste from the Storage and Processing Subsystems to the Waste Management Subsystem, if these subsystems are not co-located. [Derived]

- (1) Transfer of Waste. The Waste Management Subsystem shall provide packaged waste to the Transportation Subsystem for transfer to EM Waste Management. [Derived]
- (2) Internal Waste Transfer Criteria. The Waste Management Subsystem shall provide internal waste transfer criteria to the Transportation Subsystem. [Derived]
- (3) Interface Requirements. Requirements for the Transportation Subsystem/Waste Management Subsystem interface shall be defined in {TBD} ICD. [Derived]

**3.2.3.2.4 Processing Subsystem / Storage Subsystem Interface {TBR}**—For co-located Processing and Storage Subsystems, the Subsystems shall transfer packaged 97-1 <sup>233</sup>U materials directly between the two subsystems. [Derived]

- (1) Transfer of Processed Materials. When co-located, the Processing Subsystem shall transfer packaged 97-1 <sup>233</sup>U materials directly to the Storage Subsystem. [Derived]
- (2) Transfer of Packages Requiring Additional Processing and/or Packaging. When co-located, the Storage Subsystem shall transfer <sup>233</sup>U packages requiring additional processing and/or packaging directly to the Processing Subsystem. [Derived]



- (3) Packaging and Material Acceptance Criteria. The Storage Subsystem shall provide packaging and material acceptance criteria to the Processing Subsystem. [Derived]
- (4) Transfer of Damaged or Opened Packages. When co-located, the Storage Subsystem shall transfer damaged packages, or packages opened due to on-going verification of package integrity, to the Processing Subsystem. [Derived]
- (5) Interface Requirements. Requirements for the co-located Processing Subsystem/Storage Subsystem interface shall be defined in {TBD} ICD. [Derived]

#### **3.2.3.2.5 Processing Subsystem / Waste Management Subsystem**

**Interface**—For co-located Processing and Waste Management Subsystems, the Processing Subsystem shall transfer subsystem-generated wastes directly to the Waste Management Subsystem. [Derived]

- (1) Waste Acceptance Criteria. The Waste Management Subsystem shall provide waste acceptance criteria to the Processing Subsystem. [Derived]
- (2) Interface Requirements. Requirements for the co-located Processing Subsystem to Waste Management Subsystem interface shall be defined in {TBD} ICD. [Derived]

#### **3.2.3.2.6 Storage Subsystem / Waste Management Subsystem Interface**

For co-located Storage and Waste Management Subsystems, the Storage Subsystem shall transfer subsystem-generated waste directly to the Waste Management Subsystem. [Derived]

- (1) Waste Acceptance Criteria. The Waste Management Subsystem shall provide waste acceptance criteria to the Storage Subsystem. [Derived]
- (2) Interface Requirements. Requirements for the co-located Storage Subsystem to Waste Management Subsystem interface shall be defined in {TBD} ICD. [Derived]

### **3.2.4 Information Systems**

<sup>233</sup>U Safe Storage System shall include a comprehensive information management system to ensure rapid access to procedures, hazards information, and process status and provide a comprehensive material control and accountability record keeping, as specified in Section 3.2.7.4. [Derived]

### 3.2.4.1 General.

**3.2.4.1.1 Database**—A database shall be maintained to serve as a source of relevant information about stored materials and containers. For completeness, MC&A documentation should be coordinated with the database. [DOE-SAFT-0067, 4.5.1]

- (1) **Classified Data Separation.** A separate database that contains all classified data or data that when combined is classified shall be provided and maintained. [Derived]
  - (a) **Classification Guide.** The <sup>233</sup>U Safe Storage System classified database shall be classified in accordance with CG-SS-3, Classification Guide for Safeguards and Security Information. [Derived]
- (2) **Compatibility.** Data stored in the electronic database shall be in a form that is directly shareable between DOE sites. [Derived]
- (3) **Data Architecture.** The database shall employ an open systems architecture that does not employ vendor specific interfaces or system software. [Derived]
- (4) **Transferability.** The implementation of the <sup>233</sup>U Safe Storage System and its database shall employ an architecture that permits the transfer of <sup>233</sup>U Safe Storage System data to DOE complex-wide users. [Derived]

**3.2.4.1.2 Data Access Control**—For each facility, management shall establish controls that limit access to the MC&A accounting system and nuclear materials accounting data. [DOE 5633.3B]

### 3.2.4.2 Data Storage. {TBR}

**3.2.4.2.1 Material Transfer**—The database shall include MC&A material transfer data in accordance with DOE 5633.3B, Chapter II, Section 5. [DOE 5633.3B, Ch. II, 5]

**3.2.4.2.2 Material Location**—The database shall include locations of stored materials. [DOE-SAFT-0067, 4.5.2.d]

**3.2.4.2.3 Analysis and Separation**—The database shall include dates of analysis and/or separation for isotopes, if available, to allow calculation of future composition. [Derived]

**3.2.4.2.4 Material Physical Form**—The database shall include description of material physical form (e.g., <sup>233</sup>U metal, oxide powder, or ceramic monolith), if available. [DOE-SAFT-0067, 4.5.2.a.2]

**3.2.4.2.5 Moisture Content**—The database shall include moisture content and conditions of the tests. [Derived from DOE-SAFT-0067, 4.5.2.a.7]

**3.2.4.2.6 Stabilization Test**—The database shall include all stabilization testing results. [Derived]

**3.2.4.2.7 Processing Conditions**—The database shall include specific processing condition(s). [DOE-SAFT-0067, 4.5.2.a.6]

- (1) Processing. Process conditions shall include, but are not limited to, stabilization temperature and atmosphere. [Derived]

**3.2.4.2.8 Package Configuration**—The database shall include package configuration and number (and type) of containers in package. DOE-SAFT-0067, 4.5.2.b.2]

**3.2.4.2.9 Packaging Date**—The database shall include the date of packaging. [DOE-SAFT-0067, 4.5.2.b.3]

**3.2.4.2.10 Initial Radiation Field**—The database shall include initial radiation field (gamma and neutron at contact and 30 cm. (12 in.)). [DOE-SAFT-0067, 4.5.2.b.4]

**3.2.4.2.11 Chemical Composition**—The database shall include chemical composition, if available. [DOE-SAFT-0067, 4.5.2.a.1]

**3.2.4.2.12 Isotopic Fraction**—The database shall include the fissile isotope fraction or <sup>233</sup>U fraction (in ppm), if available. [DOE-SAFT-0067, 4.5.2.a.4]

**3.2.4.2.13 Material Source**—The database shall include the source of the stored material (facility that prepared the material) in its current form. [DOE-SAFT-0067, 4.5.2.a.5]

**3.2.4.2.14 Package Identification Number**—The database shall include the unique package identification number associated with each container data record. [Derived]

**3.2.4.2.15 Surveillance Results**—The database shall include surveillance results for a {TBD} period. [Derived]

**3.2.4.2.16 Inspection Tests Performed**—The database shall include records of the inspection tests performed. [DOE-SAFT-0067, 4.5.2.c]

**3.2.4.2.17 Individuals Performing Inspections**—The database shall include records of the names of individuals performing inspections. [DOE-SAFT-0067, 4.5.2.c]

**3.2.4.2.18 Inspection Dates**—The database shall include records of the dates of inspections for a {TBD} period. [Derived from DOE-SAFT-0067, 4.5.2.c]

**3.2.4.2.19 Fill Gas**—The data base shall include fill gas composition and pressure {TBR} on sealing. [Derived from DOE-SAFT-0067, 4.5.2.b.1]

**3.2.4.2.20 Elemental Concentration or Mass**—The database shall include the quantity (mass) of material contents. [DOE-SAFT-0067, 4.5.2.a.3]

**3.2.4.2.21 Baseline Package**—The database shall include baseline package (gross) weight and dimensions. [DOE-SAFT-0067, 4.5.2.b.5]

**3.2.4.2.22 Container Lot Identification Number**—The database shall include the manufacturer lot identification number for each container. [Derived]

**3.2.4.2.23 Other Relevant Information**—The database shall include other available information relevant to the material contents (e.g., major impurities, radiation level, etc.). [DOE-SAFT-0067, 4.5.2.a.8]

**3.2.4.3 Historical Records**—Historical records on packages shall be maintained for the life of the packages. [DOE-SAFT-0067, 4.5.2.c]

### 3.2.5 Emergency Response Systems

**3.2.5.1 Communications.** <sup>233</sup>U Safe Storage System sites/facilities shall comply with the general, planning phase, preparedness phase, and response phase requirements for notification and reporting of Operational Emergencies, Energy Emergencies, and Emergency Assistance in accordance with DOE O 151.1, Chapter VIII. [DOE O 151.1 (chg. 2), Ch. VIII]

**3.2.5.2 Emergency Management System.** <sup>233</sup>U Safe Storage System sites/facilities shall develop and maintain an integrated and comprehensive Emergency Management System IAW DOE O 151.1 Section 4. [DOE O 151.1 (chg. 2), Sect. 4a.]

**3.2.5.3 Emergency Planning and Preparedness.** <sup>233</sup>U Safe Storage System sites/facilities shall assess their emergency management needs to plan and implement a comprehensive emergency management program commensurate with the hazards present (i.e. consistent with a graded approach). [DOE O 151.1 (chg. 2), Sect. 4b.]

**3.2.5.4 Emergency Response.** <sup>233</sup>U Safe Storage System sites/facilities shall direct appropriate emergency response actions within the area under their control and at the scene of any emergency and promptly notify local, State, Tribal, DOE and other regional Federal agencies when events categorized as Operational Emergencies occur. [DOE O 151.1 (chg. 2), Sect. 4c.]

**3.2.5.5 Medical Support.** Medical support shall be planned in accordance with DOE 5480.8A, Contractor Occupational Medical Program. (or replacement directive) for workers contaminated by hazardous material. [DOE 5480.8A]

**3.2.5.6 Emergency Transition.** System operation shall transition to a safe condition upon emergency or serious off-normal events. [Derived]

**3.2.5.6.1 Operator Intervention—**Transition of system operation to a safe condition under emergency or off-normal events should require little or no operator intervention. [Derived]

**3.2.5.6.2 Economic Loss—**System design should be such that material or economic loss is minimized as a result of emergency automated or manual transition of process operations. [Derived]

**3.2.5.7 Emergency Recovery.** <sup>233</sup>U Safe Storage System site/facility mitigative, cleanup, and restoration activities may begin prior to response termination [DOE O 151.1 (chg. 2), Sect. 4d.]

**3.2.5.7.1 Recovery Procedures—**Specific recovery requirements and procedures shall be established on a case-by-case basis. [DOE O 151.1 (chg. 2), Sect. 4d.]

**3.2.5.8 Implementation.** <sup>233</sup>U Safe Storage System sites/facilities shall develop implementation schedules for full compliance with DOE O 151.1 that shall be submitted to the Operations/Field Office Manager for approval with the next annual Emergency Readiness Assurance Plan. [DOE O 151.1 (chg. 2), Sect. 6.]

**3.2.5.9 Operations/Field Office Manager Responsibilities.** <sup>233</sup>U Safe Storage System Operations/Field Office managers shall implement emergency management policy and requirements, and maintain programs and systems consistent with policy and requirements. [DOE O 151.1 (chg. 2), Ch. I, para.8.]

**3.2.5.10 Site/Facility Manager Responsibilities.** <sup>233</sup>U Safe Storage System Site/Facility managers shall develop, implement, maintain, and update, as necessary, an emergency management program commensurate with the facility specific hazards and consistent with DOE directives and standards of performance. [DOE O 151.1 (chg. 2), Ch. I, para.9.]

**3.2.5.11 Operational Emergency Base—General.** <sup>233</sup>U Safe Storage System sites/facilities shall have an Operational Emergency Base Program that provides the framework for response to serious events involving health and safety, the environment, safeguards, and security. [DOE O 151.1 (chg. 2), Ch. II, para.1.]

**3.2.5.12 Operational Emergency Base Related Regulations and Plans.** The Operational Emergency Base Program shall provide for compliance with the regulations cited in DOE O 151.1, Chapter III. [DOE O 151.1 (chg. 2), Ch. III, para.2.]

**3.2.5.13 Operational Emergency Base Planning.** <sup>233</sup>U Safe Storage System site/facility Operational Emergency Base planning shall be integrated, incorporate existing plans, and address those areas identified in DOE O 151.1, Ch. III. [DOE O 151.1 (chg. 2), Ch. III, para.3.]

**3.2.5.14 Operational Emergency Base Preparedness.** <sup>233</sup>U Safe Storage System site/facility Operational Emergency Base preparedness shall be assured through training, drills, and exercises as detailed in DOE 151.1, Chapter III. [DOE O 151.1 (chg. 2), Ch. III, para.4]

**3.2.5.15 Operational Emergency Base Response.** <sup>233</sup>U Safe Storage System site/facility re-entry planning shall include contingency planning to ensure safety of re-entry personnel, such as planning for the rescue of re-entry teams, in accordance with DOE 151.1, Chapter III. [DOE 151.1 (chg. 2), Ch. III, para.5.]

**3.2.5.16 Operational Emergency Hazardous Material Program.** <sup>233</sup>U Safe Storage System sites/facilities may be required to establish and maintain a quantitative hazards assessment, to be used to define the provisions of the Operational Emergency Hazardous Material Program to ensure the program is commensurate with the hazards identified. [DOE O 151.1 (chg. 2), Ch. IV]

**3.2.5.17 Operational Emergency Events and Conditions.** <sup>233</sup>U Safe Storage System site/facility initiating events that warrant categorization as Operational Emergencies shall be included in the site/facility specific procedures. [DOE O 151.1 (chg. 2), Ch. V]

**3.2.5.18 Public Affairs Policy and Planning.** <sup>233</sup>U Safe Storage System sites/facilities shall comply with the general, planning phase, preparedness phase, and response phase requirements for providing accurate, candid, and timely information to site workers and the public during all emergencies in accordance with DOE O 151.1, Chapter IX. [DOE O 151.1 (chg. 2), Ch. IX]

**3.2.5.19 Evaluations and Readiness Assurance.** <sup>233</sup>U Safe Storage System sites/facilities shall prepare Emergency Readiness Assurance Plans (ERAPS) to document emergency planning and preparedness activities and develop needed resources and improvements. [DOE O 151.1 (chg. 2), Ch. X, para.3.]

**3.2.5.20 Emergency Readiness Assurance Appraisals and Assessments.** <sup>233</sup>U Safe Storage System sites/facilities shall conduct an annual internal readiness assurance assessment of their emergency management programs at least once every three years. [DOE O 151.1 (chg. 2), Ch. X, para.4.]

**3.2.5.21 Contractor Requirements.** <sup>233</sup>U Safe Storage System site/facility contractors shall comply with all Comprehensive Emergency Management System requirements identified in DOE O 151.1, Attachment 1. [DOE O 151.1 (chg. 2), Att. 1]

### 3.2.6 Environment, Safety and Health

**3.2.6.1 General Directives.** The design, construction, and operation of all <sup>233</sup>U Safe Storage System subsystems and facilities shall, at a minimum, comply with the following directives:

- A. DOE P 450.2A, Identifying, implementing, and complying with environmental, safety and health requirements [DOE P 450.2A]
- B. DOE 5400.1, DOE Environmental Protection Program [DOE 5400.1 (chg. 1)]
- C. DOE 5480.4, Environmental protection, safety, and health protection standards [DOE 5480.4]
- D. DOE O 451.1A, National Environmental Policy Act Compliance Program [DOE O 451.1A]
- E. DOE O 460.1A, Packaging and transportation safety [DOE O 460.1A]
- F. DOE O 440.1A, Worker protection management for DOE federal and contractor employees [DOE O 440.1A]
- G. DOE 5480.22, Technical safety requirements [DOE 5480.22]
- H. DOE 5480.23, Nuclear Safety Analysis Reports [DOE 5480.23 (chg. 1)]
- I. DOE 5481.1B, Safety analysis and review systems [DOE 5481.1B]
- J. DOE 5480.21, Unreviewed Safety Questions [DOE 5480.21]
- K. DOE 5820.2A, Radioactive Waste Management , [DOE 5820.2A]

**3.2.6.2 Fire Protection.** The <sup>233</sup>U Safe Storage System shall have a comprehensive fire and related hazards protection program that is sufficient to minimize the potential for:

- A. the occurrence of a fire or related event [DOE O 420.1 (chg. 2)]
- B. a fire that causes an unacceptable on-site or off-site release of hazardous or radiological material that will threaten the health and safety of employees, the public or the environment [DOE O 420.1 (chg. 2)]
- C. vital DOE programs suffering unacceptable interruptions as a result of fire and related hazards [DOE O 420.1 (chg. 2)]
- D. property losses from a fire and related events exceeding defined limits established by the DOE [DOE O 420.1 (chg. 2)]

- E. critical process controls and safety class systems being damaged as a result of a fire and related events. [DOE O 420.1 chg. 2]
- F. loss through structural considerations and fire suppression systems in accordance with DOE-STD-1066-97. [DOE-STD-1066-97]

**3.2.6.3 Radiological Protection.** Facility operations shall be conducted in accordance with DOE P 441.1 (Sec. 3), DOE N 441.1 (Sec. 6), DOE 5400.5 (Sec 10), and 10 CFR 835. [DOE P 441.1, DOE N 441.1, DOE 5400.5 (chg. 2), 10 CFR 835]

**3.2.6.3.1 Sampling Airborne Radioactive Materials—**<sup>233</sup>U Safe Storage System sites/facilities shall perform sampling for the presence of airborne radioactive materials in accordance with the procedures specified in American National Standards Institute (ANSI) N-13.1-1969. [Derived]

**3.2.6.3.2 Radiation Shielding.** The <sup>233</sup>U Safe Storage System shall provide sufficient radiation shielding to ensure the continued safety of workers in the facility under all design conditions, consistent with "as-low-as-reasonably-achievable" (ALARA) objectives. [Derived]

**3.2.6.3.3 ALARA—**The content of each RPP shall be commensurate with the nature of the activities performed and shall include formal plans and measures for applying the ALARA process to occupational exposure in accordance with DOE 5400.5, Subsection 10.a. [DOE 5400.5 (chg. 2), Subsec. 10.a]

**3.2.6.3.4 Key Radiation Protection Positions—**<sup>233</sup>U Site/Facility contractors shall comply with the detailed qualification criteria for key radiation protection personnel in accordance with DOE-STD-1107-97. [DOE-STD-1107-97]

**3.2.6.4 Worker Protection.** In addition to 29 CFR 1910 and 1926, all <sup>233</sup>U Safe Storage System subsystems shall comply with worker protection requirements specified in DOE P 450.4 (components 2 and 4) and as amplified in DOE P 450.2A (Implementation Plans). [29 CFR 1910, 29 CFR 1926, DOE P 450.4, DOE P 450.2A]

**3.2.6.4.1 Worker Protection Program—**All <sup>233</sup>U Safe Storage System subsystems shall implement a written worker protection program that:

- A. provides a place of employment free from recognized hazards that are causing or are likely to cause death or serious physical harm to employees [DOE O 440.1A]
- B. integrates all requirements contained in paragraphs 4a through 4l of DOE O 440.1A [DOE O 440.1A]
- C. ensures a comprehensive, construction, fire, firearms, and explosive protection program exists or is implemented with the objective of



providing an acceptable level of safety from fire and related hazards for DOE Federal personnel, contractors, and for the public. [DOE 440.1A (Att. 1, Sect. 1-4)]

**3.2.6.4.2 Industrial Hygiene Program**—All <sup>233</sup>U Safe Storage System subsystems shall implement a comprehensive and effective industrial hygiene program to reduce the risk of work-related disease or illness at affected facilities. [DOE O 440.1A (Att. 1, Sect. 5)].

**3.2.6.5 Material Handling.** The addition or removal of material from <sup>233</sup>U Safe Storage System equipment and storage facilities shall be accomplished using handling equipment that minimizes the radiation exposure (internal and external) of operating personnel consistent with ALARA. [DOE 5400.5 (chg. 2), Subsec. 10.a]

**3.2.6.6 Comprehensive Monitoring.** All <sup>233</sup>U Safe Storage System subsystems and facilities shall provide a comprehensive monitoring and surveillance capability for the in-process material and the containment systems for that material under any postulated operating conditions, including postulated accidents. [DOE 5400.5 (chg. 2), Ch. II, Sect. 6 and 7]

**3.2.6.6.1 Safety and Operating Status**—Conditions monitored shall include parameters that provide an indication of safety status as well as operating status. [DOE 5400.5 (chg. 2), Ch. II, Sect. 6 and 7].

**3.2.6.7 Nuclear Criticality Safety.** All <sup>233</sup>U Safe Storage System facilities shall have a nuclear criticality safety program in accordance with the requirements of DOE O 420.1 (chg.2) (Subsec. 4.3.2 and 4.3.3). The program shall include the following, as a minimum: [DOE O 420.1 (chg. 2)]

- A. nuclear criticality safety evaluations for normal and credible abnormal conditions that document the parameters, limits, and controls required to ensure that the analyzed conditions are sub-critical. [DOE O 420.1 (chg. 2)]
- B. implementation of limits and physical and administrative controls identified by the nuclear criticality safety evaluations. [DOE 5480.22 (Subsec. 9.b)]
- C. reviews of operations to ascertain that limits and controls are being followed and that process conditions have not been altered such that the applicability of the nuclear criticality safety evaluation has been compromised. [DOE 5480.23 (chg. 2), Subsecs. 8.a, 8.b, and 8.c; and DOE 5481.1B]
- D. assessment of the need for criticality accident detection devices and alarm systems, and installation of such equipment where total risk to personnel will be reduced. [DOE 5480.23 (chg. 2), Subsec. 8.a; and DOE O 420.1 (chg. 2), Subsec. 4.3.2]

**3.2.6.7.1 Nuclear Criticality Alarms**—Existing <sup>233</sup>U Safe Storage System site/facility criticality alarm systems shall comply with existing ANSI requirements. [DOE O 420.1 (chg. 2)]

**3.2.6.7.2 New Facilities Design**—New facilities to be used for <sup>233</sup>U Safe Storage System shall be designed and tested in accordance with ANSI requirements. [DOE O 420.1 (chg. 2)]

**3.2.6.7.3 Nuclear Criticality Safety in Operations**—<sup>233</sup>U Safe Storage System sites/facilities shall conduct operations with fissile materials in compliance with the criticality safety requirements of ANSI/American Nuclear Society (ANS) 8.1-1983 [DOE O 420.1 (chg. 2)]

**3.2.6.7.4 Nuclear Criticality Safety Training**—<sup>233</sup>U Safe Storage System sites/facilities shall plan, conduct, and document Nuclear Criticality Safety Training in compliance with the requirements of ANSI/ANS-8.20-1991. [DOE O 420.1 (chg. 2)]

**3.2.6.8 Pressure Safety.** The <sup>233</sup>U Safe Storage System shall comply with the requirements of DOE O 440.2 chg.2 regarding pressure safety requirements. [DOE 440.1A, Att. 1 (Sect. 6)]

**3.2.6.9 Hazard Prevention.** The constructors and operators of the <sup>233</sup>U Safe Storage System shall, in accordance with DOE O 440.1A implement a hazard prevention/abatement process to ensure that all identified hazards are managed through final abatement or control. [DOE O 440.1A].

**3.2.6.10 Performance Indicators and Analysis of Operations Information.**

**3.2.6.10.1 Performance Indicator Program**—<sup>233</sup>U Safe Storage System sites/facilities shall establish a program that identifies, gathers, verifies, analyzes, trends, disseminates, and makes use of environment, safety, and health (ES&H) performance indicators to improve the performance of DOE facilities, programs, and organizations. [DOE O 210.1]

**3.2.6.10.2 Root Cause Analyses**—<sup>233</sup>U Safe Storage System sites/facilities shall gather, verify, analyze, trend, and disseminate ES&H performance indicator data, including narrative data that can help assess performance, and where appropriate perform root cause analyses. [DOE O 210.1]

**3.2.6.10.3 Feedback Mechanisms**—<sup>233</sup>U Safe Storage System sites/facilities shall implement feedback mechanisms for identification and communication of ES&H good practices, lessons learned, and corrective actions. [DOE O 210.1]

**3.2.6.10.4 Management Information System**—<sup>233</sup>U Safe Storage System sites/facilities shall maintain a management information system containing

appropriate ES&H performance indicator data for historical reference. [DOE O 210.1]

**3.2.6.10.5 Program Assessments**—<sup>233</sup>U Safe Storage System sites/facilities shall periodically assess ES&H performance indicator programs to verify that indicators are accurately measuring performance and are resulting in improved performance. [DOE O 210.1]

**3.2.6.10.6 Analytical Data**—<sup>233</sup>U Safe Storage System site/facility contractors shall comply with all of the above and use analytical ES&H data to base decisions, establish goals, identify performance trends, provide early identification of potential problems, and apply lessons learned and good practices. [DOE O 210.1]

### **3.2.6.11 Accident Investigations.**

**3.2.6.11.1 Investigation Procedures**—<sup>233</sup>U Safe Storage System sites/facilities shall conduct accident investigations in accordance with the practices and procedures prescribed in DOE O 225.1A [DOE O 225.1A]

**3.2.6.11.2 Type A / Type B Investigations**—<sup>233</sup>U Safe Storage System site/facility contractors shall support Type A and Type B investigations of accidents at sites under their cognizance in accordance with DOE O 225.1A, Attachment 1. [DOE O 225.1A, Att. 1]

**3.2.6.12 Nuclear Safety Implementation Plan.** Any determination by the <sup>233</sup>U Safe Storage System implementing organization that a specific requirement is not applicable to the facilities or activities addressed in the implementation plan for nuclear safety requirements shall be documented in the Nuclear Safety Implementation Plan to ensure that the determination is clearly communicated. [DOE-STD-1082-94]

**3.2.6.12.1 Relief from Nuclear Safety Requirements**—Relief from requirements that are clearly applicable shall be granted by an approved exemption as discussed in Section 3.11 of DOE-STD-1082-94. [DOE-STD-1082-94]

**3.2.6.12.2 Exemptions**—The Nuclear Safety Implementation plan shall clearly identify any exemptions that have been approved or are being requested from the subject requirements. [DOE-STD-1082-94]

- (1) Requesting and Granting DOE Nuclear Safety Rules Exemptions. Requesting and granting exemptions to DOE nuclear safety rules shall be accomplished in accordance with the procedures of DOE-STD-1083-95. [DOE-STD-1083-95]

**3.2.6.13 National Environmental Policy Act (NEPA) Implementing Procedures.**

Exemptions to environmental regulations shall be evaluated in accordance with the DOE NEPA Implementing Procedures (10 CFR Part 1021) whenever they will have a significant environmental impact that has not been previously considered in a NEPA analysis. [DOE-STD-1083-95]

**3.2.6.14 Planning and Conduct of Operational Readiness Reviews.** <sup>233</sup>U

Sites/Facilities shall implement the planning and conduct of Operational Readiness Reviews in accordance with DOE-STD-3006-93. [DOE-STD-3006-93]

**3.2.6.15 Safety Analysis Reporting Implementation.** <sup>233</sup>U Sites/Facilities shall implement the Safety Analysis Reporting requirements of DOE 5480.23 in accordance with DOE-STD-3009-94. [DOE-STD-3003-94]

**3.2.7 Safeguards and Security**

**3.2.7.1 Safeguards and Security Program.** The <sup>233</sup>U Safe Storage System safeguards and security program shall deter, prevent, detect, and respond to unauthorized possession, use, or sabotage of special nuclear materials transported, processed, or stored by the system in accordance with DOE O 470.1. This <sup>233</sup>U Safeguards and Security Program may be part of the overall site Safeguards and Security Program. [DOE O 470.1 (chg. 1), Sect. 1]

**3.2.7.2 Personnel Security.** <sup>233</sup>U Safe Storage System sites/facilities shall ensure that individuals are processed for, granted, and retain a DOE access authorization only when their official duties require such access and that facility designs and procedures comply with the personnel security activity requirements of DOE O 472.1B. [DOE O 472.1B]

**3.2.7.3 Review of Sensitive Activities.** All <sup>233</sup>U Safe Storage System facilities shall conduct an Operations Security (OPSEC) review of sensitive activities and facilities whenever new construction is planned. [DOE O 470.1 (chg. 1), DOE O 471.2A]

**3.2.7.4 Materials Control and Accountability.** All <sup>233</sup>U Safe Storage System subsystems shall include a materials control and accountability system to manage the inventory of <sup>233</sup>U material in accordance with the requirements of DOE 5633.3B. [DOE 5633.3B]

**3.2.7.4.1 Basic Requirements—**

(1) General.

- (a) Materials Control and Accountability Plan. A Materials Control and Accountability (MC&A) Plan shall be developed in accordance with the requirements of DOE 5633.3B, Chapter I, Section 1 for each <sup>233</sup>U Safe Storage System facility possessing nuclear materials [DOE 5633.3B, Ch. I, 1.e]]

- (b) Management Approval. The MC&A Plan, which includes the <sup>233</sup>U Safe Storage System, shall be approved by the cognizant Manager/Operations Office. [DOE 5633.3B, Ch. I, 1.e.]
  - (c) Minimum Requirements. The MC&A system for each <sup>233</sup>U Safe Storage System facility shall comply with the minimum requirements for the control and accountability of nuclear materials as specified in DOE 5633.3B, Chapter I, Section 1. [DOE 5633.3B, Ch. I, 1]
  - (d) International Atomic Energy Agency (IAEA) and NRC Standards. When appropriate and consistent with DOE regulatory goals, the <sup>233</sup>U Safe Storage System shall use procedures, techniques, and standards as promulgated by the IAEA and the NRC, in developing the basis for nuclear material control, measurements, and measurement control, accounting, and statistical methods. [DOE 5633.3B, Ch. I, 1.o]
  - (e) American Society for Testing and Measures (ASTM) and ANSI Standards. The <sup>233</sup>U Safe Storage System shall use procedures, techniques, and standards as promulgated by ASTM and ANSI, when such standards exist, in developing the basis for nuclear material control, measurements, and measurement control, accounting, and statistical methods that are employed for safeguarding of nuclear materials, unless otherwise directed by DOE directives. [DOE 5633.3B, Ch. I, 1.o]
- (2) Graded Safeguards. Each <sup>233</sup>U Safe Storage System facility shall have a graded safeguards program in accordance with the requirements of DOE 5633.3B, Chapter I, Section 2. . [DOE 5633.3B, Ch. I, 2.]
  - (3) Materials Control and Accountability Requirements for Source and Other Nuclear Materials. The materials control and accountability requirements for depleted uranium, source and other nuclear materials shall be as specified in DOE 5633.3B, Chapter I, Section 3. [DOE 5633.3B, Ch. I, 3.]
  - (4) Loss Detection Element Evaluation.
    - (a) Vulnerability Assessment. A vulnerability assessment shall be performed for each <sup>233</sup>U Safe Storage System facility in accordance with DOE 5633.3B, Chapter I, Section 4.a. [DOE 5633.3B, Ch. I, 4.a.]
    - (b) Performance Testing. Each <sup>233</sup>U Safe Storage System facility shall establish and implement a documented testing program to verify materials control and accountability procedures and practices and to demonstrate that material controls are effective as specified in

DOE 5633.3B, Chapter I, sections 4.b.-4.d . [DOE 5633.3B, Ch. I, 4.b.-4.d.]

- (5) **Monitoring Program.** Each <sup>233</sup>U Safe Storage System facility shall establish a monitoring program to determine the status of nuclear material inventories in accordance with the occurrence investigation and reporting requirements specified in DOE 5633.3B, Chapter I, Section 5. [DOE 5633.3B, Ch. I, 5.]
- (6) **Administrative Controls.** For each <sup>233</sup>U Safe Storage System facility, management shall establish a graded program to ensure the integrity and quality of materials control and accountability systems and procedures, and to periodically review and evaluate these systems as specified in DOE 5633.3B, Chapter I, Section 6. [DOE 5633.3B, Ch. I 6.]

#### **3.2.7.4.2 Materials Accountability—**

- (1) **Accounting Systems.** Each <sup>233</sup>U Safe Storage System facility shall establish an accounting system in accordance with the requirements of DOE 5633.3B, Chapter II, Section 2. [DOE 5633.3B, Ch. II, 2.]
  - (a) **Material Inventories and Data.** The accounting system shall track nuclear material inventories, document nuclear material transactions, issue periodic reports, and assist with the detection of unauthorized system access, data falsification, and material gains or losses. [DOE 5633.3B, Ch. II, 2.]
- (2) **Physical Inventories.** Each <sup>233</sup>U Safe Storage System facility shall establish a physical inventory program for nuclear materials in accordance with DOE 5633.3B, Chapter II, Section 3. [DOE 5633.3B, Ch. II 3.]
  - (a) **Program Compliance.** Stored materials shall be inventoried in accordance with the facility physical inventory program as specified in DOE 5633.3B, Chapter II Section 3. [DOE 5633.3B, Ch. II, 3.]
  - (b) **Responsibilities.** For each facility, there shall be documented plans and procedures defining responsibilities for performing inventories and specifying criteria for conducting, verifying, and reconciling inventories of nuclear material, as specified in DOE 5633.3B, Chapter II, Section 3.a.(2). [DOE 5633.3B, Ch. II, 3.a.2]
  - (c) **Frequency.** For each facility, the frequency of physical inventories for Category I and II Materials Balance Areas shall be in accordance with DOE 5633.3B, Chapter II, Section 3.a.4 and 3.a.5. The inventory frequency may be reduced in accordance with the

guidance in DOE G 5633.3B, Chapter VI. [DOE 5633.3B, Ch. II, 3.a.4 and 3.a.5.]

- (3) **Measurements and Measurement Control.** Each <sup>233</sup>U Safe Storage System facility shall implement a measurement and measurement control program for nuclear materials in accordance with DOE 5633.3B, Chapter II, Section 4. [DOE 5633.3B, Ch. II, 4.]
- (4) **Material Transfers.** Each <sup>233</sup>U Safe Storage System facility shall establish a program to account for internal and external facility transfers of nuclear materials in accordance with DOE 5633.3B, Chapter II, Section 5. [DOE 5633.3B, Ch. II, 5.]
- (5) **Material Control Indicators.** Each <sup>233</sup>U Safe Storage System facility shall establish a program to assess the material control indicators, as specified in DOE 5633.3B, Chapter II, Section 6, to assure detection of losses and unauthorized removals of nuclear materials. [DOE 5633.3B, Ch. II, 6.]
- (6) **Documentation and Reporting.** Each <sup>233</sup>U Safe Storage System facility shall comply with the documentation and reporting requirements for nuclear materials as specified in DOE 5633.3B, Chapter II, Section 7. [DOE 5633.3B, Ch. II, 7.]

#### **3.2.7.4.3 Materials Control—**

- (1) **General.** Each <sup>233</sup>U Safe Storage System facility shall establish a graded materials control program for access controls, material surveillance, material containment and detection in accordance with the requirements of DOE 5633.3B, Chapter III. [DOE 5633.3B, Ch. III, 1.]
- (2) **Plan Documentation.** The materials control program shall be formally documented in the MC&A Plan. [DOE 5633.3B, Ch III, 1.]
- (3) **Access.** Each <sup>233</sup>U Safe Storage System facility shall establish a graded program for controlling personnel access to SNM areas and materials in accordance with the requirements of DOE 5633.3B, Chapter III, Section 2. [DOE 5633.3B, Ch. III, 2.]
- (4) **Surveillance.** Each <sup>233</sup>U Safe Storage System facility shall establish a graded surveillance program for monitoring nuclear materials and detecting unauthorized activities or anomalous conditions and for reporting material and facility status in accordance with the requirements of DOE 5633.3B, Chapter III, Section 3. [DOE 5633.3B, Ch. III, 3.]
- (5) **Controls Program.** Each <sup>233</sup>U Safe Storage System facility shall have a documented program to provide controls for nuclear materials operations relative to Materials Access Areas, Protected Areas, Materials Balance

Areas, other authorized storage repositories, and processing areas in accordance with the requirements of DOE 5633.3B, Chapter III, Section 4. [DOE 5633.3B, Ch. III 4.]

- (6) **Detection/Assessment.** Each <sup>233</sup>U Safe Storage System facility shall have the capability to detect and assess the unauthorized removal of nuclear materials in accordance with the requirements of DOE 5633.3B, Chapter III, Section 5. [DOE 5633.3B, Ch. III 5.]

**3.2.7.5 Information Security.** Each <sup>233</sup>U Safe Storage System site/facility shall establish an Information Security Program for the protection and control of classified and sensitive information in accordance with DOE O 471.2A, and its associated "need-to-know" policy. [DOE O 471.2A]

**3.2.7.5.1 Access to Classified and Sensitive Unclassified Information—**Each <sup>233</sup>U Safe Storage System site/facility shall comply with the requirements of DOE O 471.2A, Section 4.a for access to classified and sensitive unclassified information. [DOE O 471.2A, Sect. 4.a.]

**3.2.7.5.2 Classified Information Systems—**Classified information systems shall comply with the requirements of DOE O 471.2A and DOE M 5639.6A-1. [DOE O 471.2A, Sect. 4.b.]

**3.2.7.5.3 Deviations—**Unless otherwise stated in DOE O 471.2A, deviations from the requirements in DOE O 471.2A shall be processed according to DOE O 470.1, Safeguards and Security Program. [DOE O 471.2A, Sect. 4.d.]

**3.2.7.5.4 Supplementary Directives—**The following Manuals supplement DOE O 471.2A and contain non-discretionary, mandatory Information Security Program requirements, standards, and procedures:

- A. DOE M 471.2-1, Classified Matter Protection And Control [DOE O 471.2A, Sect. 4.e]
- B. DOE M 5639.6A-1, Manual Of Security Requirements For The Classified Automated Information System Security Program [DOE O 471.2A, Sect. 4.e]
- C. DOE "Technical Surveillance Countermeasures Procedural Manual," (classified). [DOE O 471.2A, Sect. 4.e]

**3.2.7.5.5 Guides—**The following Guides shall be used for discretionary, non-mandatory assistance in implementing the requirements of the above Manuals and DOE O 471.2A.

- A. DOE G 471.2-1, Classified Matter Protection And Control [DOE O 471.2A, Sect. 4.f]



B. "DOE OPSEC Procedural Guide." [DOE O 471.2A, Sect. 4.f]

**3.2.7.5.6 Responsibilities and Authorities**— Each <sup>233</sup>U Safe Storage System Information Security Program shall comply with the responsibility and authority requirements of DOE O 471.2A, Section 5. [DOE O 471.2A, Sect. 5.]

**3.2.7.5.7 Program Management**— Each <sup>233</sup>U Safe Storage System Information Security Program shall comply with the program management requirements of DOE O 471.2A, Chapter I. [DOE O 471.2A, Ch. I]

**3.2.7.5.8 Operations Security Program**—Each <sup>233</sup>U Safe Storage System shall establish an Operations Security (OPSEC) Program in accordance with the requirements of DOE O 471.2A, Chapter II. [DOE O 471.2A, Ch. II]

**3.2.7.5.9 Classified Information Systems Security**—Each <sup>233</sup>U Safe Storage System Information Security Program shall protect classified information and unclassified information processed on classified systems against unauthorized disclosure or compromise in accordance with the requirements of DOE O 471.2A, Chapter III and DOE M 5639.6A-1. [DOE O 471.2A, Ch. III]

**3.2.7.5.10 Protection and Control of Classified Matter**—Each <sup>233</sup>U Safe Storage System Information Security Program shall include procedures, facilities, and equipment to protect and control classified matter that is being generated, received, transmitted, used, stored, reproduced, or destroyed in accordance with the requirements of DOE O 471.2A, Chapter IV and DOE M 471.2-1. [DOE O 471.2A, Ch. IV]

**3.2.7.5.11 Identification of Classified Information.** Each <sup>233</sup>U Safe Storage System site/facility contractor shall identify classified information, documents or material in accordance with the policy, responsibilities, authorities and procedures specified in DOE 5650.2B. [DOE 5650.2B (chg. 2), Section 3.]

**3.2.7.5.12 Contractor Information Security Program**—Each <sup>233</sup>U Safe Storage System site/facility contractor shall comply with the above information security requirements and the Contractor Requirements Document, Attachment 1 to DOE O 471.2A. [DOE O 471.2A, Att. I]

**3.2.7.6 Unclassified Computer Security Program.** Each <sup>233</sup>U Safe Storage System site/facility shall establish an Unclassified Computer Security Program to protect unclassified computer systems and sensitive unclassified automated information in accordance with the requirements of DOE 1360.2B. [DOE 1360.2B]

**3.2.7.7 Risk Management.** <sup>233</sup>U Safe Storage System sites/facilities shall base their safeguards and security programs on vulnerability/risk analyses designed to provide graded protection in accordance with the asset's importance or the impact of its loss,

destruction, or misuse. Risks to be accepted shall be identified and documented. [DOE O 470.1 (chg. 1)]

**3.2.7.8 Site Specific Characteristics.** <sup>233</sup>U Safe Storage System site/facility safeguards and security protection programs shall be tailored to address site-specific characteristics and requirements, current technology, ongoing programs, and operational needs, and to achieve protection levels that reduce inherent risk on a cost-effective basis. [DOE O 470.1 (chg. 1), Ch. 1, para. 3]

**3.2.7.9 Deviations Requirements.** <sup>233</sup>U Safe Storage System sites/facilities shall follow the procedures of DOE O 470.0, Section 4f for all deviations from Safeguards and Security Program directives. [DOE O 470.1 (chg. 1), Sect. 4f]

**3.2.7.10 Standardization.** New <sup>233</sup>U Safe Storage System facility designs shall incorporate the use of standardized safeguards and security equipment and systems where possible without compromising design flexibility or adherence to performance criteria. [DOE O 470.1 (chg. 1), Sect. 4g]

**3.2.7.11 Threat.** <sup>233</sup>U Safe Storage System sites/facilities shall use the "Design Basis Threat Policy for the Department of Energy Programs and Facilities" with local threat guidance and vulnerability assessments for protection and control program planning. [DOE O 470.1 (chg. 1), Ch.1, para. 3]

**3.2.7.12 Site Safeguards and Security Plan.** <sup>233</sup>U Safe Storage System Site Safeguards and Security Plan(s) shall depict the existing condition of safeguards and security sitewide and by facility, establishing improvement priorities and resource requirements for necessary improvements. [DOE O 470.1 (chg. 1), Ch. 1, para. 4]

**3.2.7.12.1 Plan Contents**—Plans shall contain, as a minimum, the items outlined in DOE O 470.1, Chapter. 1, para.4. [DOE O 470.1 (chg. 1), Ch. 1, para. 4]

**3.2.7.13 Security Plan.** <sup>233</sup>U Safe Storage System sites not requiring a Safeguards and security Plan due to the limited scope of safeguards and security interests shall develop a security plan to describe the protection program in place. [DOE O 470.1 (chg. 1), Ch. 1, para. 4]

**3.2.7.14 Plan Review.** <sup>233</sup>U Safe Storage System site Safeguards and Security plans shall be reviewed and updated annually. [DOE O 470.1 (chg. 1), Ch. 1, para. 4]

**3.2.7.15 Training Program.** <sup>233</sup>U Safe Storage System site/facility Safeguards and security Training Programs shall encompass training in (1) Program Management, (2) Personnel security, (3) Protection Operations, (4) Materials Control and Accountability, and (5) Information Security. [DOE O 470.1 (chg. 1), Ch. 2, para. 3]

**3.2.7.16 Training Standardization.** <sup>233</sup>U Safe Storage System site/facility training methodology and courses shall be standardized with the scope and level of training

provided to individuals tailored to their assigned duties and responsibilities and based upon their prior safeguards and security experience and training. [DOE O 470.1 (chg. 1), Ch. 2, para. 3]

**3.2.7.17 Unclassified Controlled Nuclear Information.** <sup>233</sup>U Safe Storage System sites/facilities shall ensure that unclassified controlled nuclear information is reviewed, marked, and protected, and that violations and infractions are identified and processed in accordance with DOE O 471.1. [DOE O 471.1]

**3.2.7.18 Training Records.** <sup>233</sup>U Safe Storage System sites/facilities shall implement a standardized training records management system for Safeguards and Security as described in DOE O 470.1, Section 2, paragraph 3l. [DOE O 470.1 (chg. 1), Ch. 2, para. 3l]

**3.2.7.19 Safeguards and Security Awareness.** <sup>233</sup>U Safe Storage System site/facility safeguards and security awareness programs shall incorporate site-specific safeguards and security policies, procedures, and requirements. [DOE O 470.1 (chg. 1), Ch. 4]

**3.2.7.20 Self-Assessment.** <sup>233</sup>U Safe Storage System sites/facilities shall perform safeguards and security self-assessments in accordance with DOE O 470.1, Chapter 10. [DOE O 470.1 (chg. 1), Ch. 10]

**3.2.7.21 Performance Assurance.** <sup>233</sup>U Safe Storage System sites/facilities shall assure performance of safeguards and security systems and/or system components for those systems providing essential protection for Category I and Category II special nuclear material through performance assurance programs that provide for operability and effectiveness tests. [DOE O 470.1 (chg. 1), Ch. 3, para. 3]

**3.2.7.22 Documentation.** <sup>233</sup>U Safe Storage System sites/facilities shall document safeguards and security performance assurance through plans and Performance Assurance Reports in accordance with DOE O.470.1, Chapter 3, paragraph 4. [DOE O 470.1 (chg. 1), Ch. 3, para. 4]

**3.2.7.23 Contractor Requirements.** <sup>233</sup>U Safe Storage System site/facility contractors adhere to the same standards for protection of materials, information, and other property of interest to the DOE Safeguards and security Program against loss, theft, sabotage, or other hostile acts, as those required of DOE elements and their personnel. [DOE O 470.1 (chg. 1), Att. 1]

**3.2.7.24 Protective Force Program.** Each <sup>233</sup>U Safe Storage System site/facility shall establish and implement a Protective Force Program in accordance with the policy, responsibilities and requirements specified in DOE 5632.7A. [DOE 5632.7A, Section 3.]

### **3.2.8 Reliability, Availability, and Maintainability**

**3.2.8.1 Reliability.** All <sup>233</sup>U Safe Storage System subsystems shall be designed with {TBD}% reliability to ensure the safe operation of all facilities and equipment. [Derived]

**3.2.8.1.1 Reliability Allocations**—Reliability allocations shall be distributed to system elements. [Derived]

**3.2.8.2 Availability.** All <sup>233</sup>U Safe Storage System subsystems shall be designed to ensure {TBD}% availability of equipment, replacements, and upgrades throughout all phases of the life cycle. [Derived]

**3.2.8.3 Maintainability.** The <sup>233</sup>U Safe Storage System shall be designed to ensure maintainability of facilities and equipment throughout all phases of the life cycle. [Derived]

### **3.2.9 Human Factors**

Operating facility, equipment control systems and emergency systems should be designed to current human factors industry standards that have been approved by human factors specialists. [Derived]

### **3.2.10 Training and Qualifications**

**3.2.10.1 Organization.** Each <sup>233</sup>U Safe Storage System operating contractor shall establish one or more organizations to be responsible for the training of operating organization personnel. [DOE 5480.20A, Ch. I, 2]

**3.2.10.2 Organizational Responsibilities.** The training organization(s) shall be responsible for providing facility line management with the support necessary to ensure that personnel in the operating organization are qualified to safely and effectively meet job requirements. [DOE 5480.20A, Ch. I, 2]

**3.2.10.2.1 Documentation**—The responsibilities, qualifications, and authority of training organization personnel shall be documented, and managerial responsibilities and authority clearly defined as specified in DOE 5480.20A, Chapter I, Section 2. [DOE 5480.20A, Ch. I, 2.]

**3.2.10.3 Subcontractor Personnel.** Subcontractor personnel shall meet the qualification requirements for the job function to be performed as defined in DOE 5480.20A, Chapter I, Section 3. [DOE 5480.20A, Ch. I, 3.]

**3.2.10.4 Personnel Selection.** Each <sup>233</sup>U Safe Storage System operating organization shall establish a process for selection and assignment of personnel into the operating organization in accordance with the requirements of DOE 5480.20A, Chapter I and Chapter IV. [DOE 5480.20A, Ch. I, 4., Ch. IV]

**3.2.10.5 Process.** Each <sup>233</sup>U Safe Storage System operating organization shall define qualification requirements for personnel in each functional level based on the criteria contained in DOE 5480.20A, Chapter I and Chapter IV. [DOE 5480.20A, Ch. I, 5.]

**3.2.10.6 Certification.** Each <sup>233</sup>U Safe Storage System operating contractor shall establish a certification program whereby contractor nuclear facility management endorses and documents, in writing, the satisfactory achievement of qualification of personnel for key operations positions as specified in DOE 5480.20A, Chapter I, Section 6. [DOE 5480.20A, Ch. I, 6.]

**3.2.10.7 Training.** Each <sup>233</sup>U Safe Storage System operating contractor shall provide training to support qualification and certification programs in accordance with the requirements of DOE 5480.20A, Chapter I, Section 7. [DOE 5480.20A, Ch. I, 7.]

**3.2.10.7.1 Graded Approach—**A graded approach shall be used to establish the systematic approach to training for operations personnel, maintenance personnel, technicians, and the technical staff. [DOE 5480.20A, Ch. I, 7.]

**3.2.10.7.2 Implementation Matrix—**A Training Implementation Matrix which defines and describes the application of the selection, qualification, certification and training requirements of DOE 5480.20A shall be prepared by the contractor operating organization. [DOE 5480.20A, Ch. I, 7.a.(1)]

- (1) **Training Responsibility.** The Matrix shall clearly define the organization, planning, and administration of the qualification program and set forth the responsibility, authority, and methods for conducting training. [DOE 5480.20A Ch. I, 7.a.(1)]
- (2) **Justification for Exceptions.** Suitable justification for exceptions shall be included in the Matrix for any requirement not implemented. [DOE 5480.20A Ch. I, 7.a.(1)]
- (3) **Matrix Substitution.** At some sites with several facilities, a combined Training Implementation Matrix may be submitted. [DOE 5480.20A, Ch. I, 7.a.(1)]

**3.2.10.7.3 Program Basis—**The training and qualification program for nuclear facilities should be developed on the basis of the hazards involved and risk associated with the operation of the facility or activity. [DOE 5480.20A, Ch. I 7.a.(2)]

**3.2.10.7.4 Training and Qualification Needs—**The level of detail of and content of the Training Implementation Matrix and content of the training programs should reflect the training and qualification needs of these facilities to assure personnel are qualified to carry out their assigned responsibilities. [DOE 5480.20A, Ch. I 7.a.(2)]

**3.2.10.8 Operator and Supervisor Examination.** Comprehensive written and oral examinations and operational evaluations shall be prepared and administered, as specified in DOE 5480.20A, Chapter I, Section 8, to demonstrate that certified operator and certified supervisor candidates possess the required knowledge and skills. [DOE 5480.20A, Ch. I 8.]

**3.2.10.9 Operator and Supervisor Reexamination.** Each <sup>233</sup>U Safe Storage System operating contractor shall administer reexaminations of certified and qualified operators and supervisors in accordance with the requirements of DOE 5480.20A, Chapter I, Section 9. [DOE 5480.20A, Ch. I 9.]

**3.2.10.10 Requalification.** Operators and their immediate supervisors shall not be allowed to continue to function in qualified or certified positions if they have not completed all of the requalification or recertification program elements within the two-year continuing training cycle. [DOE 5480.20A, Ch. I. 10]

**3.2.10.10.1 Administration—**Regaining qualification or certification shall be administered in accordance with the requirements of DOE 5480.20A, Chapter I, Section 10. [DOE 5480.20A, Ch. I 10.]

**3.2.10.11 Exceptions to Training Requirements.** Exceptions to the training requirements of DOE 5480.20A shall be permitted as defined in DOE 5480.20A, Chapter I, Section 11. [DOE 5480.20A, Ch. I 11.]

**3.2.10.12 Extensions.** An extension of qualification or certification may be granted to persons on a case-by-case basis in order to support operational and schedule commitments in accordance with DOE 5480.20A, Chapter I, Section 12. [DOE 5480.20A, Ch. I 12.]

**3.2.10.13 Alternatives to Education and Experience Requirements.** Work experience may be substituted for education requirements and education and training may be substituted for experience requirements in specific cases as defined in DOE 5480.20A, Chapter I, Section 13. [DOE 5480.20A, Ch. I 13.]

**3.2.10.14 Record Requirements.** Each <sup>233</sup>U Safe Storage System operating contractor shall develop and implement administrative procedures that specify requirements for the maintenance of training, qualification, and certification records for operating organization personnel. [DOE 5480.20A, Ch. I. 15]

**3.2.10.14.1 Standardization of Training Records—**The guidance in the *Nuclear Information and Records Management Association Guidelines for Management of Nuclear Related Training Records*, TG-17 should be used to help standardize identification, handling, and storage of training records. [DOE 5480.20A, Ch. I 15.]

**3.2.10.14.2 Personnel Qualification and Certification Records—**Qualification and certification of personnel shall be documented in an easily auditable format.

At a minimum, individual record documentation shall include the data specified in DOE 5480.20A, Chapter I, Section 15 a. [DOE 5480.20A, Ch. I 15 a.]

**3.2.10.15 Worker Protection Training.** The constructors and operators of the <sup>233</sup>U Safe Storage System shall, in accordance with DOE O 440.1A, provide workers, supervisors, managers, visitors, and worker protection professionals with worker protection training. [DOE O 440.1A]

**3.2.10.16 Measurement Training Plan.** Each facility shall have a documented plan for the training of personnel who perform <sup>233</sup>U Safe Storage System measurements. [DOE 5633.3B, Ch. II 4.c.(1)]

**3.2.10.16.1 Measurement—**Each <sup>233</sup>U Safe Storage System facility training plan shall specify training, qualification, and requalification requirements for each measurement method. [DOE 5633.3B, Ch. II 4.c.(1)]

**3.2.10.16.2 Proficiency Demonstration—**Each <sup>233</sup>U Safe Storage System facility shall have a documented qualification program that ensures that measurement personnel demonstrate acceptable levels of proficiency before performing measurements. [DOE 5633.3B, Ch. II 4.c.(2)]

**3.2.10.16.3 Requalification—**Each <sup>233</sup>U Safe Storage System facility qualification program shall ensure that measurement personnel are requalified according to the requirements of the facility training plan. [DOE 5633.3B, Ch. II 4.c.(2)]

**3.2.10.17 Contractor Requirements Document.** In addition to complying with the above training requirements, each <sup>233</sup>U Safe Storage System management and operating contractor shall:

- A. Implement the requirements of DOE 5480.20A as they apply to the facility and the position [DOE 5480.20A, Att. I.]
- B. Prepare and submit a Training Implementation Matrix to the Operations Office Manager for review and approval [DOE 5480.20A, Att. I.]
- C. Prepare and submit procedures that establish the requirements for granting exceptions to specific training or qualification requirements for an individual to the Operations Office Manager for review and approval [DOE 5480.20A, Att. I.]
- D. Provide written requests for certification extensions to the Operations Office Manager for approval [DOE 5480.20A, Att. I.]
- E. Perform periodic systematic evaluations of training and qualification programs. [DOE 5480.20A, Att. I.]

### 3.2.11 Design and Construction

**3.2.11.1 Operations Design.** The <sup>233</sup>U Safe Storage System shall be designed to operate in a manner coincident with the number of hours per day that the equipment is to be used and to ensure that unattended equipment and any associated materials are maintained in a safe and secure condition. [Derived]

**3.2.11.2 Design Modifications.** Modifications to facility design and construction during the design and construction phase shall conform to the requirements for new DOE facilities in accordance with DOE O 420.1. [DOE O 420.1 (chg. 2)]

**3.2.11.2.1 Design and Analysis—**Facility and component design and associated safety analysis shall be conducted according to the requirements of the current release of DOE O 420.1. [DOE O 420.1 (chg. 2)]

**3.2.11.3 Natural Phenomena Hazards Mitigation.** <sup>233</sup>U Safe Storage System facilities shall be designed, constructed, and operated in accordance with DOE O 420.1 so that the general public, workers, and the environment are protected from the impact of Natural Phenomena Hazards (NPHs), including hazards such as seismic, wind, flood, and lightning. [DOE O 420.1 (chg. 2)].

**3.2.11.3.1 Natural Phenomena Hazards Approach—**The overall <sup>233</sup>U Safe Storage System approach for NPH mitigation shall be consistent with the graded approach embodied in the Safety Analysis Reports (SARs). [DOE-STD-1020-94 (CH-1)]

**3.2.11.3.2 Safety Classifications—**The application of NPH design requirements to <sup>233</sup>U Safe Storage System structures, systems, and components (SSCs) shall be based on the life-safety or the safety classifications for the SSCs as established by safety analysis. [DOE-STD-1020-94 (CH-1)]

**3.2.11.3.3 Safety Class SSCs—**A <sup>233</sup>U Safe Storage System site/facility SSC, failure of which may impair or adversely affect an operator action that is required for safety during and following an NPH event, shall also be stabilized as a Safety-Class or Safety-Significant SSC for the purpose of selecting performance category in accordance with DOE-STD-1021.93 [DOE-STD-1021-93]

**3.2.11.3.4 Wind/Tornado Hazard Data—**<sup>233</sup>U Safe Storage System site/facility wind/tornado hazard data shall be determined in accordance with DOE-STD-1023. [DOE-STD-1020-94 (CH-1)]

**3.2.11.3.5 Flood Protection and Emergency Operations Plans—**The design of <sup>233</sup>U Safe Storage System site/facility structural systems (i.e. exterior building walls) shall be developed in accordance with DOE-STD-1020-94 and other applicable regulations. [DOE-STD-1020-94 (CH-1)]



**3.2.11.3.6 Site Investigations**—The meteorologic, hydrologic, geologic, seismological and geotechnical characteristics of a <sup>233</sup>U Safe Storage System site/facility and its environs shall be investigated in sufficient scope and detail to provide reasonable assurance that they are sufficiently well understood to permit an adequate evaluation of the proposed or existing site, and to provide sufficient information to support the evaluations required by other DOE standards (e.g. DOE-STD-1023 and DOE-STD-1020, etc.,) for implementation of NPH mitigation requirements specified in DOE 5480.28. [DOE-STD-1022-94]

**3.2.11.3.7 Other Considerations**—Mission importance and economic considerations should also be used to categorize <sup>233</sup>U Safe Storage System site/facility SSCs which require NPH. [DOE-STD-1020-94 (CH-1)]

**3.2.11.4 Industry Codes and Standards.** Where no specific requirements are specified, model building codes or national consensus industry standards shall be used. [DOE O 420.1 (chg. 2)]

**3.2.11.5 Minimization of Economic Loss.** System design should be such that material or economic loss should be minimal as a result of automated or manual termination of process operations. [Derived]

**3.2.11.6 Construction Materials.** The <sup>233</sup>U Safe Storage System should be constructed of materials that retain their design performance for the life of the system. [Derived]

**3.2.11.6.1 Work Area Coatings**—Work area coatings should be designed to facilitate decontamination. [Derived]

**3.2.11.6.2 Industry Standards**—Accepted industry design standards {TBD} should be followed in facility design. [Derived]

**3.2.11.7 Design Requirements Application.** The application of the most rigorous design requirements should be limited to those SSCs classified by safety analysis as Safety-Class or Safety-Significant consistent with DOE-STD-3009-94. [DOE-STD-1021-93]

**3.2.11.8 Applicability.** The safety classification should be applied to specific <sup>233</sup>U Safe Storage System site/facility SSCs on a case-by-case basis and need not apply to an entire facility. [DOE-STD-1020-94 (CH-1)]

**3.2.11.9 Existing Facilities.** For existing facilities to be used for the <sup>233</sup>U Safe Storage System, evaluations (including aging assessments) of existing SSCs shall follow, or at least be measured against the criteria provided in DOE-STD-1010-94 and DOE-STD-1073-93, Chapter 4. [DOE-STD-1020-94 (CH-1), DOE-STD-1073-93 (Ch. 4)]

**3.2.11.10 Site Investigation Program.** An appropriate site investigation program shall be developed in consultation with the geotechnical engineering representative of the project team. [DOE-STD-1022-94]

**3.2.11.11 Analysis Techniques.** <sup>233</sup>U Safe Storage System sites/facilities shall follow the guidelines for a graded approach proportional to the complexity of the facility and the safety systems relied on to maintain an acceptable level of risk in accordance with DOE-STD-1027-92. [DOE-STD-1027-92]

**3.2.11.12 Part-time Inventory.** <sup>233</sup>U Safe Storage System sites/facilities that are involved with an inventory of hazardous materials that varies with time shall be categorized on the basis of their maximum inventory of hazardous materials. [DOE-STD-1027-92]

**3.2.11.13 Electrical Design.** <sup>233</sup>U Safe Storage System site/facility designs shall comply with ANSI/IEEE C2, National Electric Safety Code, and NFPA 70, National Electrical Code, as appropriate. [Derived from DOE O 420.1 (chg. 2)].

**3.2.11.13.1 Facility Safety Class Electrical Systems—**Facility safety class electrical systems shall be designed to the basic approach outlined in Section 5.2.3 (Electrical) of DOE G 420.1-X, Implementation Guide for Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria. [DOE O 420.1 (chg. 2), 4.1.1.2]

**3.2.11.14 Backup Power Sources.** <sup>233</sup>U Sites/Facilities shall determine the requirements for, justify, acquire, and maintain backup power sources for Safe Storage System components and subsystems, where necessary, in accordance with DOE-STD-3003-94. [DOE-STD-3003-94]

**3.2.11.15 Ventilation Systems.** All <sup>233</sup>U Safe Storage System facility ventilation systems shall address control of <sup>220</sup>Rn to allow sufficient time for its decay to a filterable isotope to prevent release to the environment. [Derived]

**3.2.11.15.1 Procurement and Testing of HEPA Filters—**Procurement and Testing of HEPA Filters for <sup>233</sup>U Sites/Facilities shall be accomplished in accordance with DOE-STD-3020-97. [DOE-STD-3020-97]

### **3.2.12 Life Cycle Asset Management (LCAM)**

**3.2.12.1 LCAM Approach.** <sup>233</sup>U Safe Storage System sites/facilities shall use a value-added, quality driven, graded approach to life cycle asset management. [DOE O 430.1 (chg. 1)]

**3.2.12.2 LCAM Practice(s).** <sup>233</sup>U Safe Storage System site/facility assets management shall be based upon best industry practice and shall be commensurate with the value and importance of the asset using a graded approach. [DOE O 430.1 (chg. 1)]

**3.2.12.3 Performance Measures.** <sup>233</sup>U Safe Storage System site/facility asset management performance measures shall ensure formal, comprehensive, integrated, documented planning and control methods for the acquisition, use, maintenance, and disposal of physical assets, including real estate, energy, and utilities. [DOE O 430.1 (chg. 1)]

**3.2.12.4 Acquisition Approach.** <sup>233</sup>U Safe Storage System sites/facilities shall utilize an integrated, systematic approach to physical asset acquisition. [DOE O 430.1 (chg. 1)]

**3.2.12.5 Project Management System.** <sup>233</sup>U Safe Storage System sites/facilities shall use a project management system based on effective management practices that is sufficiently flexible to allow for the size and complexity of the project. [DOE O 430.1 (chg. 1)]

**3.2.12.5.1 Conceptual Design—**<sup>233</sup>U Safe Storage System site/facility project management shall, prior to the commencement of conceptual design, include the following in project planning for approval:

- A. mission need [DOE O 430.1 (chg. 1)]
- B. minimum technical functional requirements [DOE O 430.1 (chg. 1)]
- C. proposed cost and schedule ranges [DOE O 430.1 (chg. 1)]
- D. preliminary environmental strategy [DOE O 430.1 (chg. 1)]
- E. identification of project technical and organizational interfaces [DOE O 430.1 (chg. 1)]
- F. integration with other projects and agencies. [DOE O 430.1 (chg. 1)]

**3.2.12.5.2 Execution—**<sup>233</sup>U Safe Storage System site/facility project management shall, prior to the commencement of execution, include the following in project planning for approval:

- A. project objectives [DOE O 430.1 (chg. 1)]
- B. scope, schedule, and cost baselines, including contingencies [DOE O 430.1 (chg. 1)]
- C. life cycle cost analysis [DOE O 430.1 (chg. 1)]
- D. preliminary safety assessment [DOE O 430.1 (chg. 1)]
- E. project controls, including baseline change control, change control thresholds, and statusing [DOE O 430.1 (chg. 1)]

- F. completion of National Environmental Protection Act documentation prior to final commitment to an alternative [DOE O 430.1 (chg. 1)]
- G. verification of performance criteria through test and evaluation [DOE O 430.1 (chg. 1)]
- H. design alternatives. [DOE O 430.1 (chg. 1)]

**3.2.12.5.3 Operation**—<sup>233</sup>U Safe Storage System site/facility project management shall, prior to operation:

- A. prepare a plan for turnover of a facility [DOE O 430.1 (chg. 1)]
- B. accomplish verification of performance criteria through test and evaluation [DOE O 430.1 (chg. 1)]
- C. verify operational readiness [DOE O 430.1 (chg. 1)]

**3.2.12.5.4 Conduct of Operations**—Directives, plans, and/or procedures relating to the conduct of operations at DOE facilities shall be developed in accordance with DOE 5480.19. [DOE 5480.19]

**3.2.12.6 Operation and Maintenance Process.** <sup>233</sup>U Safe Storage System site/facility project management shall ensure that the process for the operation and maintenance of physical assets meets the minimum requirements of DOE O 430.1, para. f. [DOE O 430.1 (chg. 1), para. f]

**3.2.12.7 Disposition Process.** <sup>233</sup>U Safe Storage System site/facility project management shall ensure that the process for the disposition of physical assets meets the minimum requirements of DOE O 430.1, para. g. [DOE O 430.1 (chg. 1), para. g]

**3.2.12.8 Utility Services.** <sup>233</sup>U Safe Storage System site/facility project management shall ensure that utility services are acquired and disposed of through a DOE prime contract. [DOE O 430.1 (chg. 1), para. H]

**3.2.12.9 Asset Database.** <sup>233</sup>U Safe Storage System site/facility project management shall ensure that the corporate physical assets database is maintained as a complete inventory of DOE physical assets at the site/facility. [DOE O 430.1 (chg. 1), para. i]

**3.2.12.10 Compliance.** <sup>233</sup>U Safe Storage System site/facility project management shall ensure that all applicable Federal, state, and local laws and regulations are followed in the acquisition, operation, maintenance, and disposition of physical assets at the site/facility. [DOE O 430.1 (chg. 1), para. j]

**3.2.12.11 Logistics.** Each <sup>233</sup>U Safe Storage System site/facility shall provide logistics support for its respective operations. [Derived].

### **3.2.12.12 Decontamination and Decommissioning.**

**3.2.12.12.1 Component Decontamination**—System components should be designed to be decontaminated with minimal generation of hazardous and radioactive wastes. [Derived]

**3.2.12.12.2 Decontamination Solutions**—Decontamination solutions should be recycled to reduce waste generation. [Derived]

**3.2.12.12.3 Minimal Effort to D&D**—The <sup>233</sup>U Safe Storage System should be designed to be decontaminated and decommissioned with the least possible effort and cost at the end of its operational life. [Derived]

**3.2.12.12.4 Federal Requirements and Orders**—Any planned action of decontamination and decommissioning shall adhere, if applicable, to requirements of the Part B Permit issued by the host state under provisions of 40 CFR 260-268 and Executive Orders—especially 12856, Federal Compliance with Right-to-Know-Laws and Pollution Prevention Requirements (3 August 1993), and 12873, Acquisition, Recycling, and Waste Prevention (20 October 1993). [40 CFR 260-268, Executive Order 12856, Executive Order 12873]

### **3.2.13 Non-Federal Laws, Agreements, and Ordinances**

**3.2.13.1 State and Tribal Laws and Agreements.** The <sup>233</sup>U Safe Storage System shall comply with all applicable State and Tribal laws, regulations, and agreements. [Derived]

**3.2.13.2 Local Ordinances.** The <sup>233</sup>U Safe Storage System shall comply with all applicable local laws and regulations.

## **3.3 <sup>233</sup>U Processing Subsystem Requirements**

### **3.3.1 Performance**

**3.3.1.1 Processing Capacity and Capability.** The Processing Subsystem shall process the 97-1 material at a rate of {TBD} to the final form while ensuring that personnel and public safety are not compromised. [Derived]

**3.3.1.1.1 Isotope Separation for Beneficial Use.** The <sup>233</sup>U Safe Storage System shall have {TBD} capability for isotope separation for beneficial use. [Derived]

**3.3.1.1.2 Duration of Processing Capability**—The capability to process material that is not in a form compatible with the <sup>233</sup>U Safe Storage Standard shall be required only until the material is processed and may be decommissioned once processing is complete. [Derived]

**3.3.1.2 Stabilization Capability.** The Processing Subsystem shall be capable of stabilizing stored materials and repackaging damaged or opened storage containers during the entire <sup>233</sup>U Safe Storage System 50 year operating life. [Derived]

**3.3.1.3 Variant Materials Processing.** The Processing Subsystem shall process material variants as defined in Section 3.1. [Derived]

### **3.3.2 Functional**

**3.3.2.1 Receive Materials.** Materials shall be received from existing interim storage for processing via the Transportation Subsystem. [Derived]

**3.3.2.2 Transfer to External Systems.** Upon completion of processing damaged materials shall be transferred to the Transportation Subsystem for transport to one of the external systems identified in Section 3.1. [Derived]

**3.3.2.3 Remove from Packaging Containers.** The Processing Subsystem shall open the packaging containers that do not meet the requirements of the Storage Standard [SAFT-0067] and place the material contents into suitable containers. [Derived]

**3.3.2.4 Convert to Stable Long-term Forms.** Where the material does not meet the requirements of the <sup>233</sup>U Storage Standard (DOE-SAFT-0067), the Processing Subsystem shall convert 97-1 material from its present form to a stable form that meets the criteria of the Storage Standard. [DOE-SAFT-0067]

**3.3.2.5 Stabilize for Packaging.** The Processing Subsystem shall perform any necessary stabilization for the pre-treatment of material prior to packaging to ensure that the material meets DOE-SAFT-0067. [Derived from DOE-SAFT-0067]

**3.3.2.6 Package to <sup>233</sup>U Safe Storage Standard.** Packaging shall comply with the requirements specified in DOE-SAFT-0067. [Derived]

**3.3.2.6.1 Package Labeling**—Each storage container shall be permanently and uniquely labeled in accordance with DOE-SAFT-0067. [Derived]

**3.3.2.7 Handle Packages.** The Processing Subsystem shall handle material packages as received from the 97-1 inventory, and the packaging resulting from processing activities. [Derived]

**3.3.2.8 Stage Material.** The Processing Subsystem shall provide temporary storage for received materials, in-process materials, and products of the process. [Derived]

**3.3.2.9 Collect Waste Byproducts.** The Processing Subsystem shall collect byproducts from waste processing. [Derived]

**3.3.2.9.1 Segregate, Pretreat, and Transfer Wastes**—The Processing Subsystem should segregate hazardous and radioactive wastes received from

waste processing by type, pre-treat as necessary, and transfer these wastes to a co-located Waste Management Subsystem or to the Transportation Subsystem for transport to the Waste Management Subsystem. [Derived]

**3.3.2.10 Characterize Materials.** The Processing Subsystem shall examine material documentation to confirm that materials received from existing storage facilities meet material acceptance criteria. [Derived]

**3.3.2.10.1 Sampling Capability**—Processing and characterization activities shall include sampling capabilities to verify the state of materials, as required. [Derived]

**3.3.2.10.2 Non-Destructive Assay (NDA) Capabilities**—NDA capabilities shall be provided to verify the integrity of the packaged materials. [Derived]

**3.3.2.10.3 Transfer Provisions**—Provisions shall be made to transfer samples for additional analyses, as necessary. [Derived]

**3.3.2.11 Open Containers.** The Processing Subsystem shall open container packages when warranted, as specified in DOE-SAFT-0067. [Derived]

**3.3.2.12 Provide Blending Capabilities.** The Processing Subsystem should include the capability to blend materials, as required. {TBR} [Derived]

### **3.3.3 Integration and Interface Control**

See System-level Requirements (Section 3.2.3).

### **3.3.4 Information Systems**

See System-level Requirements (Section 3.2.4).

### **3.3.5 Emergency Response Systems**

See System-Level Requirements (Section 3.2.5).

### **3.3.6 Environment, Safety, and Health**

See System-level Requirements (Section 3.2.6).

### **3.3.7 Safeguards and Security**

See System-level Requirements (Section 3.2.7).

### **3.3.8 Reliability, Availability, and Maintainability**

See System-level Requirements (Section 3.2.8).

### **3.3.9 Human Factors**

See System-Level Requirements (Section 3.2.9)

### **3.3.10 Training and Qualification**

See System-level Requirements (Section 3.2.10).

### **3.3.11 Design and Construction**

In addition to System-level Requirements identified in Section 3.2.11, the following Design and Construction requirements apply to the Processing Subsystem.

**3.3.11.1 Design Life.** The design life of the storage containers to be used by the <sup>233</sup>U Processing Subsystem shall meet the requirements of the DOE-SAFT-0067. [Derived]

### **3.3.12 Life Cycle Asset Management (LCAM)**

See System-level Requirements (Section 3.2.12).

### **3.3.13 Non-Federal Laws, Agreements, and Ordinances**

See System Level Requirements (Section 3.2.13).

## **3.4 Storage Subsystem Requirements**

### **3.4.1 Performance**

**3.4.1.1 50 Year Storage Capability.** The Storage Subsystem shall place {TBD quantity} of DOE-SAFT-0067 compliant <sup>233</sup>U storage packages into safe storage for a period of at least 50 years. [DOE-SAFT-0067]

**3.4.1.2 Temporary Storage Capacity.** The Storage Subsystem shall have {TBD}% capacity for temporary storage. [Derived]

**3.4.1.3 Package Handling Throughput.** The <sup>233</sup>U Storage Subsystem shall be capable of emplacing and retrieving {TBD} packages of materials within {TBD timeframe}. [Derived]

### **3.4.2 Functional**

**3.4.2.1 Receive Packaged Materials.** The Storage Subsystem shall receive <sup>233</sup>U packages for storage from the Transportation Subsystem or a co-located processing subsystem. [Derived]



**3.4.2.2 Identify Packaged Materials.** The Storage Subsystem shall identify <sup>233</sup>U packages that are permanently and uniquely labeled in accordance with DOE-SAFT-0067. [Derived]

**3.4.2.3 Transfer Packaged Materials.** The Storage Subsystem shall be capable of transferring packaged materials to the Transportation Subsystem. [Derived]

**3.4.2.4 Safely Store Packaged <sup>233</sup>U Materials.** The Storage Subsystem shall ensure the safe condition of the materials in accordance with the surveillance requirements of Section 3.2.2. [Derived]

**3.4.2.5 Retrieve <sup>233</sup>U Packages from Storage.** The Storage Subsystem shall remove <sup>233</sup>U storage packages from storage for periodic inspection, transfer to beneficial use or disposition or return to a processing facility. [Derived]

**3.4.2.6 Collect, Segregate, Package, and Transfer Waste.** The Storage Subsystem should collect, segregate, and package wastes generated from storage operations and transfer these wastes to a co-located Waste Management Subsystem or to the Transportation Subsystem for transport to the Waste Management Subsystem. [Derived]

**3.4.2.7 Handle Damaged Packages.** The Storage Subsystem shall be capable of handling (including overpacking and decontaminating) damaged or leaking packages. [Derived]

**3.4.2.8 Provide Surveillance Capability.** The Storage Subsystem shall provide a package surveillance program in accordance with the requirements of Section 3.2.2.6. [DOE-SAFT-0067]

**3.4.2.9 Transfer of Materials to Staging Area.** The Storage Subsystem shall transfer <sup>233</sup>U containers from the transportation shipping receiving area to a staging area, as necessary. [Derived]

### **3.4.3 Integration and Interface Control**

See System-level Requirements (Section 3.2.3).

### **3.4.4 Information Systems**

See System-level Requirements (Section 3.2.4).

### **3.4.5 Emergency Response Systems**

See System-level Requirements (Section 3.2.5).

### **3.4.6 Environment, Safety, and Health**

In addition to System-level Requirements identified in Section 3.2.6, the following requirements apply to the <sup>233</sup>U Storage Subsystem.

**3.4.6.1 Critically Safe Storage Arrays.** <sup>233</sup>U Safe Storage System sites/facilities shall store fissile materials in critically safe storage arrays, in accordance with the requirements of ANSI N16.5-1987. [DOE O 420.1 (chg. 2)]

**3.4.6.2 Radiation Shielding.** The effects of radiation shielding within the critically safe storage arrays shall be considered. [DOE O 420.1 (chg. 2)]

### **3.4.7 Safeguards and Security**

See System-level Requirements (Section 3.2.7).

### **3.4.8 Reliability, Availability, and Maintainability**

See System-level Requirements (Section 3.2.8).

### **3.4.9 Human Factors**

In addition to System-level Requirements identified in Section 3.2.9, the following Human Factors requirements apply to the Storage Subsystem.

**3.4.9.1 Operator Intervention.** The Storage Subsystem should require no operator intervention during normal operation other than routine monitoring, except when adding or removing material from storage or when maintaining storage system equipment. [Derived]

### **3.4.10 Training and Qualification**

See System-level Requirements (Section 3.2.10).

### **3.4.11 Design and Construction**

See System-level Requirements (Section 3.2.11).

### **3.4.11 Life Cycle Asset Management (LCAM)**

See System-level Requirements (Section 3.2.12).

### **3.4.13 Non-Federal Laws, Agreements, and Ordinances**

See System-level Requirements (Section 3.2.13).

## **3.5 Transportation Subsystem Requirements**

### **3.5.1 Performance**

The Transportation Subsystem shall have an operating life of not less than 50 years. [Derived]

### **3.5.2 Functional**

**3.5.2.1 Receive Materials.** The Transportation Subsystem shall receive materials packages from external shippers and internal <sup>233</sup>U Safe Storage System subsystems. [Derived]

**3.5.2.2 Identify Materials.** The Transportation Subsystem shall identify <sup>233</sup>U packages that are permanently and uniquely labeled in accordance with DOE-SAFT-0067. [Derived]

**3.5.2.3 Transfer Materials between Subsystems.** The Transportation Subsystem shall transfer materials between subsystems, including handling and logistics, except when external transfer is required. [Derived]

**3.5.2.4 Coordinate External Shipping.** The Transportation Subsystem shall coordinate external shipping and ensure that packages meet all regulatory requirements. [Derived]

**3.5.2.5 Overpack for Shipment.** The Transportation Subsystem shall place material containers received from other subsystems into proper transport overpacks for shipment and remove these overpacks at the destination, as necessary. [Derived]

**3.5.2.6 Provide Temporary Storage.** The Transportation Subsystem shall provide the capability to temporarily store material packages prior to shipping and on receipt. [Derived]

**3.5.2.7 Acquire Shipping Containers.** The Transportation Subsystem shall acquire needed shipping containers that meet all requirements for shipping 97-1 materials. [Derived]

### **3.5.3 Integration and Interface Control**

See System-level Requirements (Section 3.2.3)

### **3.5.4 Information Systems**

See System-level Requirements (Section 3.2.4).

### **3.5.5 Emergency Response Systems**

In addition to System-level requirements identified in Section 3.2.5, the following Emergency Response requirements apply to the Transportation Subsystem.

**3.5.5.1 Regulatory Compliance.** <sup>233</sup>U Safe Storage transportation systems shall be designed to facilitate the implementation of the objectives of DOE O 151.1 chg.2 regarding DOE transportation systems emergency response capabilities. [DOE O 151.1 (chg. 2) chg.2]

**3.5.5.2 Medical Resources.** The Transportation Subsystem shall have access to medical resources to support regular physicals and drug testing for DOT drivers. [Derived from DOE O 151.1 (chg. 2)]

### 3.5.6 Environment, Safety, and Health

In addition to System-level requirements (see Section 3.2.6), the following Safety and Health requirements apply to the <sup>233</sup>U Transportation Subsystem.

**3.5.6.1 Confinement.** Placement or removal of <sup>233</sup>U storage canisters into and from transport containers should be accomplished in a controlled environment to limit the release of material. [Derived]

**3.5.6.2 Off-site Transfers.** Each off-site package and shipment of hazardous materials shall be prepared in compliance with DOE O 460.1A [Subsecs. 4.a. (1) and (4)] and applicable tribal, state, and local regulations not otherwise preempted by DOT. [DOE O 460.1A. 4.a.(1)]

**3.5.6.3 Type A Radioactive Material Packaging.** In addition to packaging authorized by the Hazardous Materials Regulations, each person who offers for transportation a Type A quantity of radioactive materials also may use a commercially procured Type A packaging, a package qualified as a general Type A and listed in WHC-EP-0558 ('Test and evaluation of document for DOT Specification 7A Type A Packaging'), or a Type B packaging certified by the Headquarters Certifying Official or NRC. [DOE O 460.1A. 4.a.(4)(a); WHC-EP-0558, Att. 1 (Subsec. 3.a)]

**3.5.6.3.1 Retesting—**Packaging tested by and purchased from commercial sources do not require re-testing by DOE contractors; however, the required documentation on design, testing, and use shall be in the possession of the user. [DOE O 460.1A. 4.a.(4)(a); WHC-EP-0558, Att. 1 (Subsec. 3.a)]

**3.5.6.4 Type B or Fissile Radioactive Material Packaging.** In addition to packaging authorized by the Hazardous Materials Regulations, each person who offers for transportation a Type B and/or fissile quantity of radioactive materials also may use a packaging certified by Headquarters Certifying Official or NRC. [DOE O 460.1A. 4.a.(4)(b); WHC-EP-0558, Att. 1 (Subsec. 3.b)]

**3.5.6.4.1 Use of NRC-Certified Packaging—**NRC-certified Type B and fissile packaging that have a current Certificate of Compliance may be used by DOE and DOE contractors only under the conditions specified in the Certificate, and only after DOE is registered with NRC as a user. [DOE O 460.1A. 4.a.(4)(b); WHC-EP-0558, Att. 1 (Subsec. 3.b)]

**3.5.6.4.2 Use of DOE-HQ Certified Packaging**—Packaging that have a current DOE Certificate of Compliance issued by the Headquarters Certifying Official may be used by DOE and DOE contractors only under the conditions specified in the Certificate. [DOE O 460.1A, 4.a.(4)(b); WHC-EP-0558, Att. 1 (Subsec. 3.b)]

**3.5.6.5 On-site Transfers.** On-site transfers of hazardous materials shall comply with Transportation Safety Document approved by the cognizant Operations or Field Office. [DOE O 460.1A, 4.b]

**3.5.6.5.1 Methodology and Compliance Process**—The Transportation Safety Document shall describe the methodology and compliance process to meet equivalent safety for any deviation from the Hazardous Materials Regulations. [DOE O 460.1A, 4.b]

**3.5.6.6 Safety Documents.** For multiple-tenant DOE sites, safety documents for several contractor organizations may be combined into a single document. DOE-operated sites may approve their own Transportation Safety Documents. [DOE O 460.1A, 4.b]

**3.5.6.6.1 Effective Date**—Approved Transportation Safety Documents shall be in effect no later than 1 year from incorporation of this Order into the contractor's contracts. [DOE O 460.1A, 4.b]

**3.5.6.7 Contractor Motor Carrier Safety Regulations.** Each contractor who is a DOT-registered carrier and who operates a Government-owned or commercial motor vehicle offsite shall comply with Federal Motor Carrier Safety Regulations (49 CFR Parts 350-399) and applicable tribal, State, and local regulations not otherwise preempted by DOT. [DOE O 460.1A, Att. 1 (Sect. 5)]

**3.5.6.8 DOE Employee Motor Carrier Safety Regulations.** DOE employees and employees of DOE contractors that are State agencies (not otherwise subject to DOT jurisdiction) shall also comply with Federal Motor Carrier Safety Regulations (49 CFR Parts 350-399) and applicable tribal, State, and local regulations not otherwise preempted by the Department of Transportation [DOE O 460.1A, Att. 1 (Sect. 6)]

**3.5.6.9 Transportation by Aircraft.** In addition to the Hazardous Materials Regulations for "Carriage by Aircraft," 49 CFR Part 175, all DOE transportation operations by aircraft shall follow the requirements of DOE O 440.2, Aviation. [DOE O 460.1A, 4.d]

### 3.5.7 Safeguards and Security

In addition to System-level Requirements (see Section 3.2.7), the following Safeguards and Security requirements apply to the <sup>233</sup>U Transportation Subsystem.

**3.5.7.1 Safeguard Termination Limits.** It should be possible to transport <sup>233</sup>U materials below STLs using normal truck or rail equipment without modification. [Derived]

**3.5.7.2 Materials in Excess of STLs.** Material that exceeds the STLs shall require transport by approved DOE shippers for SNM class materials. [Derived]

**3.5.6.3 Use of Transportation Safeguards System (TSS) Services—**<sup>233</sup>U in quantities of 2 kg or more shall be transported by Transportation Safeguards Division (TSD) Nuclear Materials Couriers (NMCs) in the TSS in accordance with the requirements of DOE AL 5610.14, Chapter III. [DOE AL 5610.14, Ch. III, 1.a.]

**3.5.6.3.1 Request for TSS Services—**Requests for TSS services shall be submitted in accordance with the requirements of DOE AL 5610.14, Chapter III, Section 2. [DOE AL 5610.14, Ch. III, 2.]

**3.5.6.3.2 TSS Packaging Requirements and Criteria—**Each <sup>233</sup>U Safe Storage System contractor shall ensure that appropriate packaging and tie-downs are utilized for the shipment as specified in DOE AL 5610.14, Chapter III, Section 4. [DOE AL 5610.14, Ch. III, 4.]

### **3.5.8 Reliability, Availability, and Maintainability**

In addition to System-level Requirements identified in Section 3.2.8, the following Reliability, Availability, and Maintainability requirements apply to the Transportation Subsystem.

**3.5.8.1 Subsystem Reliability.** {TBD}

**3.5.8.2 Reuse and Availability.** Transportation packages should be reusable and have {TBD}% availability, including turnaround time after each use. [Derived]

**3.5.8.3 Impact on Shipping Schedules.** Sufficient shipping containers should be available at <sup>233</sup>U shipping and receiving sites such that material can be stored temporarily. [Derived]

**3.5.8.4 System Capacity.** The subsystem should handle required transfers without undue delays due to lack of subsystem capacity. [Derived]

### **3.5.9 Human Factors**

See System-level Requirements (Section 3.2.9).

### **3.5.10 Training and Qualification**

See System-level Requirements (Section 3.2.10).

### **3.5.11 Design and Construction (Facilities)**

See System-level Requirements (Section 3.2.11).

### 3.5.12 Life Cycle Asset Management (LCAM)

In addition to System-level Requirements identified in Section 3.2.12, the following management and planning requirements apply to the Transportation Subsystem.

**3.5.12.1 Departmental Materials Transportation and Packaging Management.** Each <sup>233</sup>U Safe Storage System contractor shall conduct its operations in compliance with all applicable international, Federal, State, local, and tribal requirements governing materials transportation unless exemptions or alternatives are approved in accordance with DOE O 460.1. Notwithstanding the exemption available through the National Security Provision, 49 CFR 173.7(b), shipments under this provision will comply with the 49 CFR 106-180 requirements except those that infringe upon maintenance of classified information. [DOE C 460.2, 1]

**3.5.12.2 Materials Transportation Plan.** A Transportation Plan shall be prepared by each <sup>233</sup>U Safe Storage System contractor and submitted to the appropriate Field Element with information on shipments of spent nuclear fuel, high-level waste, and high-visibility shipments and campaigns as determined by the cognizant Program Office (PO). [DOE C 460.2, 2.]

**3.5.12.2.1 Materials Transportation Plan Content—**The plan shall consist of information describing material type, shipping dates, estimated number and weight of shipments, mode of transport, carrier proposed route, packaging description, and cargo security arrangements, if required. [DOE C 460.2, 2.]

**3.5.12.2.2 Transportation Information Network (TIN) —**The contractor, when preparing a Transportation Plan, shall use the Prospective Shipments Module (PSM) of the Transportation Information Network (TIN) in the development of the Plan. [DOE C 460.2, 2.]

**3.5.12.3 Transportation Tracking and Communications (TRANSCOM) System.** The DOE Transportation Tracking and Communications (TRANSCOM) System shall be used by the contractor, in accordance with the TRANSCOM operations system manuals (controlled documents) for tracking and monitoring the following categories of shipments [DOE C 460.2, 3.]:

- A. Spent nuclear fuel (Reference DOE M S632.1C-1, Chapter IV) [DOE C 460.2, 3]
- B. High-level waste [DOE C 460.2, 3]
- C. High-visibility shipments and campaigns as determined by the cognizant DOE POs. [DOE C 460.2, 3]

**3.5.12.4 Automated Transportation Management System (ATMS).** To the maximum extent practicable, the contractor shall utilize the Automated Transportation Management System (ATMS) to perform transportation tasks. [DOE C 460.2, 4.a.]

**3.5.12.5 Contractor Requirements Document for Departmental Materials Transportation and Packaging Management.** In addition to the above requirements, each <sup>233</sup>U Safe Storage System contractor shall comply with the requirements of DOE O 460.2, Contractor Requirements Document, Attachment I. [DOE C 460.2]

### **3.5.13 Non-Federal Laws, Agreements, and Ordinances**

See System-level Requirements (Section 3.2.13).

## **3.6 Waste Management Subsystem**

### **3.6.1 Performance**

**3.6.1.1 Receipt Capacity.** The Waste Management Subsystem shall have {TBD}% capacity to receive wastes from other subsystem operations. [Derived]

**3.6.1.2 Waste Handling.** The Waste Management Subsystem shall perform any necessary treatment in accordance with the EM Waste Management acceptance standards. [Derived]

**3.6.1.3 Operating Life.** The Waste Management Subsystem shall be designed for an operating life of not less than 50 years. [Derived]

### **3.6.2 Functional**

**3.6.2.1 Receive Waste.** The Waste Management Subsystem shall receive waste from <sup>233</sup>U Safe Storage System subsystems and from existing storage. [Derived]

**3.6.2.2 Recover Waste.** The system should recover and return <sup>233</sup>U material to the Processing Subsystem. [Derived]

**3.6.2.3 Collect Waste.** The Waste Management Subsystem shall collect designated wastes according to type.

**3.6.2.4 Segregate and Treat Waste.** The Waste Management Subsystem should provide any necessary segregation and treatment to stabilize the waste material in a form acceptable to EM waste disposition operations. [Derived]

**3.6.2.5 Package Waste.** The Waste Management Subsystem shall have the capability to package waste in accordance with EM waste acceptance criteria. [Derived]

**3.6.2.6 Provide Temporary Storage.** The Waste Management Subsystem should place received materials into temporary storage until sufficient material is accumulated that it can be transferred to the responsibility of EM Waste Management Operations. [Derived]

**3.6.2.7 Transfer Materials.** The Waste Management Subsystem shall transfer material to DOE-EM via the Transportation Subsystem. [Derived]



### **3.6.3 Integration and Interface Control**

See System-level Requirements (Section 3.2.3).

### **3.6.4 Information Systems**

See System-level Requirements (Section 3.2.4).

### **3.6.5 Emergency Response Systems**

See System-level Requirements (Section 3.2.5).

### **3.6.6 Environment, Safety, and Health**

See System-level Requirements (Section 3.2.6).

### **3.6.7 Safeguards and Security**

See System-level Requirements (Section 3.2.7).

### **3.6.8 Reliability, Availability, and Maintainability**

See System-level Requirements (Section 3.2.8).

### **3.6.9 Human Factors**

See System-level Requirements (Section 3.2.9).

### **3.6.10 Training and Qualification**

See System-level Requirements (Section 3.2.10).

### **3.6.11 Design and Construction (Facilities)**

See System-level Requirements (Section 3.2.11).

### **3.6.12 Life Cycle Asset Management (LCAM)**

See System-level Requirements (Section 3.2.12).

### **3.6.13 Non-Federal Laws, Agreements, and Ordinances**

See System-level Requirements (Section 3.2.13).

## 4.0 QUALITY ASSURANCE PROVISIONS

### 4.1 Quality Requirements

The design and development process for the <sup>233</sup>U Safe Storage System shall incorporate a quality assurance program which complies with DOE O 414.1 (Sect. 2, 3, and 6) and complies with the definition of 'graded approach' in Subsection 5.b. [DOE O 414.1]

#### 4.1.1 Quality Assurance Program

**4.1.1.1 General Rule.** Contractors responsible for DOE nuclear facilities shall:

- A. Develop and submit for approval by DOE a Quality Assurance Program (QAP) for the work in accordance with 10 CFR 830.120. [10 CFR 830.120, DOE O 414.1 (Sect. 2)]
- B. Implement the QAP, as approved and modified by DOE [DOE O 414.1 (Sect. 2)].

#### 4.1.1.2 Quality Assurance Program (QAP).

**4.1.1.2.1 Quality Assurance Criteria—**A contractor shall develop a QAP in accordance with DOE O 414.1 and the quality assurance criteria specified in paragraph 4.1.2 of this Section. [DOE O 414.1]

- (1) Criteria Satisfaction. The QAP shall include a discussion of how criteria shall be satisfied. [DOE O 414.1 (Subsec. 5.b)].
- (2) Graded Approach. Criteria shall be applied using a graded approach [DOE O 414.1 (Subsec. 5.b)].

**4.1.1.2.2 Quality Assurance Program Implementation—**The contractor shall use ASME NQA-1 to develop and implement the QAP. [DOE O 414.1 (Sect. 2)]

#### 4.1.1.2.3 QAP Modifications—

- (1) Contractor Changes. A contractor may, at any time, make changes to an approved QAP. [10 CFR 830.120]
- (2) Change Submittal. Changes shall be submitted annually to DOE for review. [10 CFR 830.120]
- (3) Submittal Contents. A submittal shall identify changes, pages affected, reason for changes, and basis for revisions. [10 CFR 830.120]
- (4) Editorial Changes. Changes made to correct spelling, punctuation, or other editorial items do not require explanation. [10 CFR 830.120]

**4.1.1.2.4 DOE Approval**—Implementation plans and QAPs shall be regarded as approved by DOE 90 days after submittal, unless approved or rejected by DOE at an earlier date, and shall include any modification made or directed by DOE [10 CFR 830.120].

## 4.1.2 Quality Assurance Criteria

### 4.1.2.1 Management.

#### 4.1.2.1.1 Program—

- (1) Program Development. Contractor and DOE organizations shall develop, implement, and maintain a written Quality Assurance Program. [Derived]
- (2) Organizational Structure and Responsibilities. The QAP shall describe the organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing adequacy of work. [Derived]
- (3) Management System. The QAP shall describe the management system, including planning, scheduling, and cost control considerations. [Derived]

#### 4.1.2.1.2 Quality Improvement—

- (1) Quality Improvement Processes. Contractor and DOE organizations shall establish and implement processes to detect and prevent quality problems and ensure quality improvement. [Derived]
- (2) Identification and Control of Problems. Items and processes that do not meet established requirements shall be identified, controlled, and corrected. [Derived]
- (3) Corrective Action. Correction shall include identifying the causes of problems and preventing recurrence. [Derived]
- (4) Review and Analysis. Item reliability, process implementation, and other quality-related information shall be reviewed and the data analyzed to identify items and processes needing improvement. [Derived]

#### 4.1.2.1.3 Documents and Records—

- (1) Document Preparation and Approval. Documents shall be prepared, reviewed, approved, issued, used, and revised to prescribe processes, specify requirements, or establish design. [Derived]
- (2) Record Maintenance. Records shall be specified, prepared, reviewed, approved, and maintained. [Derived]

#### 4.1.2.2 Performance.

##### 4.1.2.2.1 Standards and Administrative Controls—

- (1) Controlled Conditions. Work shall be performed under controlled conditions using approved instructions, procedures, or other appropriate means. [Derived]
- (2) Identification and Control. Items shall be identified and controlled to ensure their proper use. [Derived]
- (3) Maintenance. Items shall be maintained to prevent their damage, unavailability, or deterioration. [Derived]
- (4) Monitoring and Data Collection Equipment. Equipment used for process monitoring or data collection shall be calibrated and maintained. [Derived]
- (5) Property Control. Items shall be controlled to prevent their loss. [Derived]

##### 4.1.2.2.2 Design—

- (1) Principles and Standards. Items and processes shall be designed using sound engineering/scientific principles and appropriate standards. [Derived]
- (2) Incorporation of Design Bases. Design work, including changes, shall incorporate applicable requirements and design bases. [Derived]
- (3) Design Interfaces. Design interfaces shall be identified and controlled. [Derived]
- (4) Verification and Validation. The adequacy of design products shall be verified or validated by individuals or groups other than those who performed the work. [Derived]
- (5) Verification Timing. Verification and validation of design work shall be completed before approval and implementation of the design. [Derived]

##### 4.1.2.2.3 Procurement—

- (1) Performance Quality. Contractor and DOE organizations shall ensure that procured items and services meet established requirements and perform as specified. [Derived]
- (2) Evaluation of Suppliers. Prospective suppliers shall be evaluated and selected on the basis of specified criteria. [Derived]

- (3) Supplier Reliability. Contractor and DOE organizations should ensure that approved suppliers can continue to provide acceptable items and services. [Derived]
- (4) Suspect/Counterfeit Items (S/CI) Controls. Suspect/Counterfeit Items (S/CI) controls shall be in accordance with DOE O 440.1A. [DOE O 440.1A]

#### **4.1.2.2.4 Inspection and Acceptance Testing—**

- (1) Acceptance and Performance Criteria. Inspection and acceptance testing of specified items and processes shall be conducted using established acceptance and performance criteria. [Derived]
- (2) Equipment Maintenance. Equipment used for inspections and tests shall be calibrated and maintained. [Derived]

#### **4.1.2.3 Assessment.**

##### **4.1.2.3.1 Management Assessment—**

- (1) QAP Assessments. Management shall periodically assess the integrated quality assurance program and its performance. [Derived]
- (2) Corrective Action. Problems that hinder contractor and DOE organizations from achieving their objectives shall be identified and corrected. [Derived]

##### **4.1.2.3.2 Independent Assessment—**

- (1) Conduct of Assessments. Planned and periodic independent assessments shall be conducted to measure item quality and process effectiveness and to promote improvement. [Derived]
- (2) Assessment Authority. Personnel performing independent assessments shall have the authority and freedom from the line organization to carry out their responsibilities. [Derived]
- (3) Technical Qualification. Personnel performing independent assessments shall be technically qualified and knowledgeable in the areas assessed per NQA-1 and applicable ANSI standards. [Derived]

## 4.2 Verification

### 4.2.1 Program

**4.2.1.1 Conformance.** <sup>233</sup>U Safe Storage System contractors shall verify conformance with the requirements of Section 3 of this SRD at appropriate locations and levels of assembly up to and including the total system. [Derived]

**4.2.1.2 Resources and Personnel.** The contractors shall provide all personnel, facilities, test equipment, spares and expendables required for the verification program. [Derived]

### 4.2.2 Interfaces

**4.2.2.1 Interface Verification.** The verification program shall incorporate interface verification as part of the design and development process. [Derived]

**4.2.2.2 Functionality and Performance.** The verification program shall incorporate tests or other verification methods that specifically verify the functionality and performance of the internal and external interfaces. [Derived]

### 4.2.3 Methods

To verify compliance with the requirements of Section 3, the <sup>233</sup>U Safe Storage System shall be subjected to verification as defined in Section 4.2.4. [Derived] The methods of verification are defined as follows:

- A. **Test.** An action by which the operability, supportability, performance capability or other specified qualities of an item are verified when subjected to controlled conditions that are real or simulated. These verifications may require use of special test equipment and instrumentation to obtain quantitative data for analysis as well as qualitative data derived from displays and indicators inherent in the item(s) for monitor and control.
- B. **Demonstration.** An exhibition of the operability or supportability of an item under intended service/use conditions. These verifications are usually non-repetitive and are oriented almost exclusively toward acquiring qualitative data. Demonstrations may be accomplished by computer simulation.
- C. **Analysis.** A process used in lieu of or in addition to other verification methods to verify compliance with requirements. The techniques typically include an interpretation or interpolation/extrapolation of analytical or empirical data under defined conditions or reasoning to show theoretical compliance with stated requirements. Analysis may include computer modeling or simulation.
- D. **Inspection.** An observation or examination of the product characteristics, or the review of applicable documentation to determine compliance with requirements.

- E. Similarity. The process of comparing a current item with a previously verified item, taking into consideration configuration, test data, application and/or environment. The evaluation must be documented and shall include: the test procedures/reports of the item to which similarity is claimed; a description of the difference(s) between the items; and the rationale for verification by similarity.

#### **4.2.4 Requirements Matrix**

Requirements of Section 3 shall be verified using the method specified for each requirement as shown in Appendix B, Requirements Verification Matrix. [Derived]

## 5.0 NOTES

### 5.1 TBD/TBR Summary listing

Table 5-1. TBD Listing

TBD Number	Source Paragraph	Requirement/Title Text
TBD-1	1.2, para. 1	These requirements also address the processing and interface with the EM Waste Management program for disposition of wastes generated by the activities associated with this system and those 97-1 materials that may be classified as wastes per the Safeguard Termination Limits (STLs) <b>{TBD}</b> .
TBD-2	1.2, para. 1	It is recognized the <sup>233</sup> U is not considered transuranic waste and, as such, its disposition is <b>{TBD}</b> .
TBD-3	Table 3-2	Various Fields
TBD-4	Table 3-4	Various Fields
TBD-5	3.2.1	Long-term storage capacity of the entire <sup>233</sup> U Safe Storage System shall accommodate <b>{TBD}</b> kg of <sup>233</sup> U material as specified in the <sup>233</sup> U Disposition Environmental Impact Statement (EIS) Record of Decision (ROD), with <b>{TBD}</b> % margin to accommodate future <sup>233</sup> U materials.
TBD-6	3.2.3.1.1	That portion of the 97-1 <sup>233</sup> U material at existing DOE storage sites (see Section 3.1.3) not designated as waste or designated to be transferred for disposition, in accordance with <b>{TBD}</b> , shall be transferred to commercial or DOE SNM shippers for transport to the <sup>233</sup> U Safe Storage System for processing and storage as appropriate.
TBD-7	3.2.3.1.1 (3)	Requirements for the 97-1 <sup>233</sup> U Inventory to commercial or DOE SNM shippers interface shall be defined in <b>{TBD}</b> Interface Control Document (ICD).
TBD-8	3.2.3.1.2 (2)	Requirements for the Oak Ridge Molten Salt Reactor Experiment to commercial or DOE SNM shippers interface shall be defined in <b>{TBD}</b> ICD.
TBD-9	3.2.3.1.3	Natural and/or depleted uranium at <b>{TBD}</b> existing storage sites shall be transferred to commercial or DOE SNM shippers for transport to the <sup>233</sup> U Safe Storage System for blending with <sup>233</sup> U materials as required.
TBD-10	3.2.3.1.3 (3)	Requirements for the natural and depleted uranium storage sites to commercial or DOE SNM shippers interface shall be defined in <b>{TBD}</b> ICD.
TBD-11	3.2.3.1.4 (4)	Commercial or DOE SNM shippers shall transport natural and depleted uranium from <b>{TBD}</b> sites to the <sup>233</sup> U Safe Storage System for processing.
TBD-12	3.2.3.1.4 (5)	Requirements for the commercial and DOE SNM shippers to <sup>233</sup> U Safe Storage System interface shall be defined in <b>{TBD}</b> ICD.
TBD-13	3.2.3.1.5	Commercial or DOE SNM shippers shall transport packaged <sup>233</sup> U materials from the <sup>233</sup> U Safe Storage System to <b>{TBD}</b> DOE-MC for final disposition.
TBD-14	3.2.3.1.5 (2)	Requirements for the commercial or DOE SNM shippers to DOE-MD interface shall be defined in <b>{TBD}</b> ICD.
TBD-15	3.2.3.1.6	Commercial or DOE SNM shippers shall transport waste materials, packaged to meet EM Waste Acceptance Criteria, from the <sup>233</sup> U Safe Storage System to <b>{TBD}</b> DOE-EM Waste Management facilities for disposition.



TBD-16	3.2.3.1.6 (2)	Requirements for the commercial or DOE SNM shippers to DOE-EM Waste Management interface shall be defined in {TBD} ICD.
TBD-17	3.2.3.1.7	Commercial or DOE SNM shippers shall transport packaged <sup>233</sup> U materials between the <sup>233</sup> U Safe Storage System and {TBD} beneficial use facilities and programs.
TBD-18	3.2.3.1.7 (1)	Requirements for the commercial or DOE SNM shippers to beneficial use program interface shall be defined in {TBD} ICD.
TBD-19	3.2.3.1.8	The <sup>233</sup> U Safe Storage System shall be located at {TBD} sites and facilities.
TBD-20	3.2.3.1.8 (2)	Requirements for the sites and facilities to <sup>233</sup> U Safe Storage System interface shall be defined in {TBD} ICD.
TBD-21	3.2.3.1.9 (1)	Requirements for the <sup>233</sup> U Safe Storage System to external shipping container source interface shall be defined in {TBD} ICD.
TBD-22	3.2.3.2.1 (3)	Requirements for the Transportation Subsystem/Processing Subsystem interface shall be defined in {TBD} ICD.
TBD-23	3.2.3.2.2 (4)	Requirements for the Transportation Subsystem/Storage Subsystem interface shall be defined in {TBD} ICD.
TBD-24	3.2.3.2.3 (3)	Requirements for the Transportation Subsystem/Waste Management Subsystem interface shall be defined in {TBD} ICD.
TBD-25	3.2.3.2.4 (5)	Requirements for the co-located Processing Subsystem/Storage Subsystem interface shall be defined in {TBD} ICD.
TBD-26	3.2.3.2.5 (2)	Requirements for the co-located Processing Subsystem to Waste Management Subsystem interface shall be defined in {TBD} ICD.
TBD-27	3.2.3.2.6 (2)	Requirements for the co-located Storage Subsystem to Waste Management Subsystem interface shall be defined in {TBD} ICD.
TBD-28	3.2.4.2.15	The database shall include surveillance results for a {TBD} period.
TBD-29	3.2.4.2.18	The database shall include records of the dates of inspections for a {TBD} period.
TBD-30	3.2.8.1	All <sup>233</sup> U Safe Storage System subsystems shall be designed with {TBD}% reliability to ensure the safe operation of all facilities and equipment.
TBD-31	3.2.8.2	All <sup>233</sup> U Safe Storage System subsystems shall be designed to ensure {TBD}% availability of equipment, replacements, and upgrades throughout all phases of the life cycle.
TBD-32	3.2.11.6.2	Accepted industry design standards {TBD} should be followed in facility design.
TBD-33	3.3.1.1	The Processing Subsystem shall process the 97-1 material at a rate of {TBD} to the final form while ensuring that personnel and public safety are not compromised.
TBD-34	3.3.1.1.1	The <sup>233</sup> U Safe Storage System shall have {TBD} capability for isotope separation for beneficial use.
TBD-35	3.4.1.1	The Storage Subsystem shall place {TBD quantity} of DOE-SAFT-0067 compliant <sup>233</sup> U storage packages into safe storage for a period of at least 50 years.
TBD-36	3.4.1.2	The Storage Subsystem shall have {TBD}% capacity for temporary storage.
TBD-37	3.4.1.3	The <sup>233</sup> U Storage Subsystem shall be capable of emplacing and retrieving {TBD} packages of materials within {TBD timeframe}.
TBD-38	3.5.8.1	Subsystem Reliability. {TBD}
TBD-39	3.5.8.2	Transportation packages should be reusable and have {TBD}% availability, including turnaround time after each use.
TBD-40	3.6.1.1	The Waste Management Subsystem shall have {TBD}% capacity to receive wastes from other subsystem operations.

**Table 5-2. TBR Listing**

<b>TBR Number</b>	<b>Source Paragraph</b>	<b>Requirement/Title Test</b>
TBR-1	3.2.3.2.4	Processing Subsystem / Storage Subsystem Interface {TBR}
TBR-2	3.2.4.2	Data Storage. {TBR}
TBR-3	3.2.4.2.19	The data base shall include fill gas composition and pressure {TBR} on sealing.
TBR-4	3.3.2.12	The Processing Subsystem should include the capability to blend materials, as required. {TBR}

## **GLOSSARY**

<i>Acceptable</i>	Conforming with requirements, directives, or regulations.
<i>Accounting</i>	That part of Safeguards and Materials Management that encompasses the management system and records and reports to account for source and special nuclear material to minimize the possibility of diversion and to detect diversion promptly should it occur. Accounting does not include physical protection.
<i>ALARA (As low as reasonably achievable)</i>	The implementation of good radiation-protection programs and practices that traditionally have been effective in keeping the average and individual exposures for monitored workers well below the limits.
<i>Alloy</i>	A solid solution of two or more metals united by being fused together and dissolving in each other when molten.
<i>Application of Safeguards (to Materials or Facilities)</i>	The implementation of appropriate safeguards system under the Nonproliferation Treaty with a view of preventing diversion of nuclear energy from peaceful use to nuclear weapons or other explosive devices.
<i>Approved</i>	Acceptable to the "authority having jurisdiction."
<i>Authority Having Jurisdiction</i>	The organization, office, or individual responsible for approving equipment, installation, or procedure.
<i>Barrier</i>	A protective system that prevents undesired reactions or containment.
<i>Blending</i>	See Dilution.
<i>Ceramic</i>	A class of inorganic, nonmetallic solids that are subjected to high temperature (>1000°C) during manufacture or use.
<i>Certification</i>	The process by which contractor nuclear facility management provides written endorsement of the satisfactory achievement of qualification of a person for a position.
<i>Combustible</i>	In the form used and under the conditions anticipated, will ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.
<i>Conversion</i>	An operation for changing from one material form, use, or purpose to another.

<i>Database</i>	A large collection of data in a computer, organized so that it can be expanded, updated, and reviewed rapidly for various uses.
<i>Dilution</i>	In general the addition of inert material or solvent with the result that the concentration of the material of interest is reduced.
<i>Effective Neutron Multiplication Factor (<math>k_{eff}</math>)</i>	The ratio of the total number of neutrons produced during a time interval (excluding neutrons produced by sources whose strengths are not a function of fission rate) to the total number of neutrons lost by absorption and leakage during the same time interval.
<i>Enclosure</i>	A physical structure that provides a barrier between the internally contaminated package and the worker, facility, and environment.
<i>Engineered Safety Feature</i>	Systems, components, or structures that prevent and/or mitigate the consequences of potential accidents including the bounding design basis accidents.
<i>Graded Approach</i>	A process by which the level of analysis, documentation, and actions necessary to comply with a requirement are commensurate with: (1) the relative importance to safety, safeguards, and security; (2) the magnitude of any hazard involved; (3) the life cycle stage of a facility; (4) the programmatic mission of a facility; (5) the particular characteristics of a facility; and (6) any other relevant factor.
<i>Handling Enclosure</i>	A glove box line or similar equipment that isolates <sup>233</sup> U-bearing materials from the worker's environment while allowing the material to be handled or processed.
<i>Hazard Categories</i>	The consequences of unmitigated releases of radioactive and/or hazardous material are evaluated as required by DOE 5480.23 and classified by the following hazard categories: Category 1. The hazard analysis shows the potential for significant offsite consequences. Category 2. The hazard analysis shows the potential for significant onsite consequences. Category 3. The hazard analysis shows the potential for only significant
<i>Hot Cell</i>	A heavily shielded enclosure in which radioactive materials can be handled by persons using remotely operated manipulators while viewing the materials through shielded windows or periscopes.
<i>Inert Gas</i>	A non-reactive gas or combination of gases appropriate to the material being stored that will not support corrosion of the container or oxidation of its contents.

<i>Material Container</i>	The container that is in contact with the uranium material being stored. If structurally adequate and sealed, the material container provides one barrier.
<i>Non-Destructive Assay (NDA)</i>	A procedure (e.g., calorimetric or radiometric measurement) for determining the amount of fissionable uranium in a container without physically sampling the material.
<i>Non-Destructive Examination (NDE)</i>	A procedure (e.g., radiography) for examining the contents of a container without opening the container.
<i>Nuclear Criticality Safety</i>	A method used to prevent nuclear criticality and protection against injury or damage due to an accidental nuclear criticality.
<i>Packaging</i>	The assembly of materials and components in compliance with storage/shipment requirements.
<i>Process</i>	To extract, separate, purify, or fabricate a material by physical, chemical, or mechanical means.
<i>Pyrophoric</i>	Capable of igniting spontaneously when exposed to air.
<i>Qualification</i>	Education, experience, training, examination, and any special requirements necessary for performance of assigned responsibilities.
<i>Quality Assurance (QA)</i>	All planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service.
<i>Residue</i>	Process-generated uranium-bearing materials not classified as storable metal or stabilized oxide that contain a non-discardable quantity of uranium.
<i>Sealed</i>	Sealed means that a container has been closed (e.g., welded) and certified to be leak-tight in accordance with ANSI Ni4.5-1987 standard.
<i>Shall, Should, and May</i>	“Shall” denotes that something is required. “Should” denotes that something is recommended but is not required. “May” denotes that something is permitted but is neither a requirement nor a recommendation.
<i>Storage</i>	Any method for safely maintaining items in a retrievable form for subsequent use or disposition.
<i>Storage Facility</i>	The building structure and other confinement systems that house storage containers.

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<i>Storage Package</i>	A configuration of nested containers including package content.
<i>Thermal Stabilization</i>	A process that exposes a uranium-bearing material in air to an elevated temperature for the duration required to convert reactive constituents present to an oxide (usually U <sub>3</sub> O <sub>8</sub> ) and to remove adsorbed moisture and other volatile species.
<i>Tube Vaults</i>	Tubular storage devices (steel lined and encased in concrete) used for the storage of packages containing <sup>233</sup> U.
<i>Unirradiated Material</i>	Material that does not contain fission products or undesired activation products resulting from residence in a nuclear reactor core.

## APPENDIX A: REQUIREMENTS TRACEABILITY MATRIX

Requirement No.	Requirement Title	Requirement Source	Source Paragraph
3.2.1	Performance	Derived	
3.2.2.1	Compatibility with 94-1 Systems	Derived	
3.2.2.2	General Functionality	Derived	
3.2.2.3	Transfer to Waste Disposal Programs	Derived	
3.2.2.4	Monitor Materials and System Processes	Derived	
3.2.2.5	Assure Safe Operating Conditions	Derived	
3.2.2.6	Provide Package Surveillance Capability	DOE-SAFT-0067 DOE 5633.3B	Ch. III, 3
3.2.2.7	Contain Material	Derived	
3.2.2.8	Retrieve Material	Derived	
3.2.2.9	Provide Containment Detection Capability	Derived	
3.2.2.9.1	Containment Control	Derived	
3.2.2.9.2	Transfer Provisions	Derived	
3.2.3.1.1	97-1 <sup>233</sup> U Storage / Commercial or DOE SNM Shippers Interface	Derived	
3.2.3.1.1 (1)	Early Disposition	Derived	
3.2.3.1.1 (2)	Transport Requirements	Derived	
3.2.3.1.1 (3)	Interface Requirements	Derived	
3.2.3.1.2	Oak Ridge Molten Salt Reactor Experiment / Commercial or DOE SNM Shippers Interface	Derived	
3.2.3.1.2 (1)	Material and Packaging Requirements	Derived	
3.2.3.1.2 (2)	Interface Requirements	Derived	
3.2.3.1.3	Natural and Depleted Uranium / Commercial or DOE SNM Shippers Interface	Derived	
3.2.3.1.3 (1)	Required Materials	Derived	
3.2.3.1.3 (2)	Material Specifications	Derived	
3.2.3.1.3 (3)	Interface Requirements	Derived	
3.2.3.1.4	Commercial or DOE SNM Shippers / <sup>233</sup> U Safe Storage System Interface	Derived	
3.2.3.1.4 (1)	Transport Requirements	Derived	
3.2.3.1.4 (2)	Transfer of <sup>233</sup> U Materials to DOE-MD	Derived	
3.2.3.1.4 (3)	Transfer of <sup>233</sup> U Materials to DOE-EM	Derived	
3.2.3.1.4 (4)	Natural and Depleted Uranium	Derived	
3.2.3.1.4 (5)	Interface Requirements	Derived	
3.2.3.1.5	Commercial or DOE SNM Shippers / DOE-MD Interface	Derived	
3.2.3.1.5 (1)	MD Materials and Packaging Acceptance Criteria	Derived	

Requirement No.	Requirement Title	Requirement Source	Source Paragraph
3.2.3.1.5 (2)	Interface Requirements	Derived	
3.2.3.1.6	Commercial or DOE SNM Shippers / DOE-EM Waste Management Interface	Derived	
3.2.3.1.6 (1)	DOE-EM Waste Acceptance Criteria	Derived	
3.2.3.1.6 (2)	Interface Requirements	Derived	
3.2.3.1.7	Commercial or DOE SNM Shippers / Beneficial Use Interface	Derived	
3.2.3.1.7 (1)	Interface Requirements	Derived	
3.2.3.1.8	Sites and Facilities / <sup>233</sup> U Safe Storage System Interface	Derived	
3.2.3.1.8 (1)	Site and Facility Requirements	Derived	
3.2.3.1.8 (2)	Interface Requirements	Derived	
3.2.3.1.9	<sup>233</sup> U Safe Storage System / External Shipping Container Source Interface	Derived	
3.2.3.1.9 (1)	Interface Requirements	Derived	
3.2.3.2.1	Transportation Subsystem / Processing Subsystem Interface	Derived	
3.2.3.2.1 (1)	Transfer of <sup>233</sup> U Materials	Derived	
3.2.3.2.1 (2)	Transfer of Waste	Derived	
3.2.3.2.1 (3)	Interface Requirements	Derived	
3.2.3.2.2	Transportation Subsystem / Storage Subsystem Interface	Derived	
3.2.3.2.2 (1)	Transfer of <sup>233</sup> U materials	Derived	
3.2.3.2.2 (2)	Transfer of Waste	Derived	
3.2.3.2.2 (3)	Transfer of Damaged Packages	Derived	
3.2.3.2.2 (4)	Interface Requirements	Derived	
3.2.3.2.3	Transportation Subsystem / Waste Management Subsystem Interface	Derived	
3.2.3.2.3 (1)	Transfer of Waste	Derived	
3.2.3.2.3 (2)	Internal Waste Acceptance Criteria	Derived	
3.2.3.2.3 (3)	Interface Requirements	Derived	
3.2.3.2.4	Processing Subsystem / Storage Subsystem Interface {TBR}	Derived	
3.2.3.2.4 (1)	Transfer of Processed Materials	Derived	
3.2.3.2.4 (2)	Transfer of Packages Requiring Additional Processing and/or Packaging	Derived	
3.2.3.2.4 (3)	Packaging and Acceptance Criteria	Derived	
3.2.3.2.4 (4)	Transfer of Damaged or Opened Packages	Derived	
3.2.3.2.4 (5)	Interface Requirements	Derived	



Requirement No.	Requirement Title	Requirement Source	Source Paragraph
3.2.3.2.5	Processing Subsystem / Waste Management Subsystem Interface	Derived	
3.2.3.2.5 (1)	Waste Acceptance Criteria	Derived	
3.2.3.2.5 (2)	Interface Requirements	Derived	
3.2.3.2.6	Storage Subsystem / Waste Management Subsystem Interface	Derived	
3.2.3.2.6 (1)	Waste Acceptance Criteria	Derived	
3.2.3.2.6 (2)	Interface Requirements	Derived	
3.2.4	Information Systems	Derived	
3.2.4.1.1	Database	DOE-SAFT-0067	4.5.1
3.2.4.1.1 (1)	Classified Data Separation	Derived	
3.2.4.1.1 (1)(a)	Classification Guide	Derived	
3.2.4.1.2 (2)	Compatibility	Derived	
3.2.4.1.1 (3)	Data Architecture	Derived	
3.2.4.1.1 (4)	Transferability	Derived	
3.2.4.1.2	Data Access Control	DOE 5633.3B	
3.2.4.2.1	Material Transfer	DOE 5633.3B	Ch. II. 5
3.2.4.2.2	Material Location	DOE-SAFT-0067	4.5.2.d
3.2.4.2.3	Analysis and Separation	Derived	
3.2.4.2.4	Material Physical Form	DOE-SAFT-0067	4.5.2.a.2
3.2.4.2.5	Moisture Content	DOE-SAFT-0067	4.5.2.a.7
3.2.4.2.6	Stabilization Test	Derived	
3.2.4.2.7	Processing Conditions	DOE-SAFT-0067	4.5.2.a.6
3.2.4.2.7 (1)	Processing	Derived	
3.2.4.2.8	Package Configuration	DOE-SAFT-0067	4.5.2.b.2
3.2.4.2.9	Packaging Date	DOE-SAFT-0067	4.5.2.b.3
3.2.4.2.10	Initial Radiation Field	DOE-SAFT-0067	4.5.2.b.4
3.2.4.2.11	Chemical Composition	DOE-SAFT-0067	4.5.2.a.1
3.2.4.2.12	Isotopic Fraction	DOE-SAFT-0067	4.5.2.a.4
3.2.4.2.13	Material Source	DOE-SAFT-0067	4.5.2.a.5
3.2.4.2.14	Package Identification Number	Derived	
3.2.4.2.15	Surveillance Results	Derived	
3.2.4.2.16	Inspection Tests Performed	DOE-SAFT-0067	4.5.2.c
3.2.4.2.17	Individuals Performing Inspections	DOE-SAFT-0067	4.5.2.c
3.2.4.2.18	Inspection Dates	Derived from DOE-SAFT-0067	4.5.2.c
3.2.4.2.19	Fill Gas	Derived from DOE-SAFT-0067	4.5.2.b.1
3.2.4.2.20	Elemental Concentration or Mass	DOE-SAFT-0067	4.5.2.a.3
3.2.4.2.21	Baseline Package	DOE-SAFT-0067	4.5.2.b.5
3.2.4.2.22	Container Lot Identification Number	Derived	
3.2.4.2.23	Other Relevant Information	DOE-SAFT-0067	4.5.2.a.8
3.2.4.3	Historical Records	DOE-SAFT-0067	4.5.2.c
3.2.5.1	Communications	DOE O 151.1 (chg. 2)	Ch. VIII
3.2.5.2	Emergency Management System	DOE O 151.1 (chg. 2)	Sect. 4a.
3.2.5.3	Emergency Planning and Preparedness	DOE O 151.1 (chg. 2)	Sect. 4b.

Requirement No.	Requirement Title	Requirement Source	Source Paragraph
3.2.5.4	Emergency Response	DOE O 151.1 (chg. 2)	Sect. 4c.
3.2.5.5	Medical Support	DOE 5480.8A	
3.2.5.6	Emergency Transition	Derived	
3.2.5.6.1	Operator Intervention	Derived	
3.2.5.6.2	Economic Loss	Derived	
3.2.5.7	Emergency Recovery	DOE O 151.1 (chg. 2)	Sect. 4d.
3.2.5.7.1	Recovery Procedures	DOE O 151.1 (chg. 2)	Sect. 4d.
3.2.5.8	Implementation	DOE O 151.1 (chg. 2)	Sect. 6.
3.2.5.9	Operations/Field Office Manager Responsibilities	DOE O 151.1 (chg. 2)	Ch. I, para.8.
3.2.5.10	Site/Facility Manager Responsibilities	DOE O 151.1 (chg. 2)	Ch I, para.9.
3.2.5.11	Operational Emergency Base—General	DOE O 151.1 (chg. 2)	Ch. II, para.1.
3.2.5.12	Operational Emergency Base Related Regulations and Plans	DOE O 151.1 (chg. 2)	Ch. III, para.2.
3.2.5.13	Operational Emergency Base Planning	DOE O 151.1 (chg. 2)	Ch. III, para.3.
3.2.5.14	Operational Emergency Base Preparedness	DOE O 151.1 (chg. 2)	Ch. III, para.4
3.2.5.15	Operational Emergency Base Response	DOE O 151.1 (chg. 2)	Ch. III, para.5.
3.2.5.16	Operational Emergency Hazardous Material Program	DOE O 151.1 (chg. 2)	Ch. IV
3.2.5.17	Operational Emergency Events and Conditions	DOE O 151.1 (chg. 2)	Ch. V
3.2.5.18	Public Affairs Policy and Planning	DOE O 151.1 (chg. 2)	Ch. IX
3.2.5.19	Evaluations and Readiness Assurance	DOE O 151.1 (chg. 2)	Ch. X, para.3.
3.2.5.20	Emergency Readiness Assurance Appraisals and Assessments	DOE O 151.1 (chg. 2)	Ch. X, para.4.
3.2.5.21	Contractor Requirements	DOE O 151.1 (chg. 2)	Att. 1
3.2.6.1, Item A	Regulatory Compliance	DOE P 450.2A	
3.2.6.1, Item B	Regulatory Compliance	DOE 5400.1 (chg. 1)	
3.2.6.1, Item C	Regulatory Compliance	DOE 5480.4	
3.2.6.1, Item D	Regulatory Compliance	DOE O 451.1A	
3.2.6.1, Item E	Regulatory Compliance	DOE O 460.1A	
3.2.6.1, Item F	Regulatory Compliance	DOE O 440.1A	
3.2.6.1, Item G	Regulatory Compliance	DOE 5480.22	
3.2.6.1, Item H	Regulatory Compliance	DOE 5480.23 (chg. 1)	
3.2.6.1, Item I	Regulatory Compliance	DOE 5481.1B	
3.2.6.1, Item J	Regulatory Compliance	DOE 5480.21	
3.2.6.1, Item K	Regulatory Compliance	DOE 5820.2A	
3.2.6.2	Fire Protection	DOE O 420.1 (chg. 2)	
3.2.6.2, Item A	Fire Protection	DOE O 420.1 (chg. 2)	
3.2.6.2, Item B	Fire Protection	DOE O 420.1 (chg. 2)	
3.2.6.2, Item C	Fire Protection	DOE O 420.1 (chg. 2)	
3.2.6.2, Item D	Fire Protection	DOE O 420.1 (chg. 2)	
3.2.6.2, Item E	Fire Protection	DOE O 420.1 (chg. 2)	
3.2.6.2, Item F	Fire Protection	DOE-STD-1066-97	

<b>Requirement No.</b>	<b>Requirement Title</b>	<b>Requirement Source</b>	<b>Source Paragraph</b>
3.2.6.3	Radiological Protection	DOE P 441.1 DOE N 441.1 DOE 5400.5 (chg. 2)	Sect. 3 Sect. 6 Sect. 10
3.2.6.3.1	Sampling Airborne Radioactive Materials	Derived	
3.2.6.3.2	Radiation Shielding	Derived	
3.2.6.3.3	ALARA	DOE 5400.5 (chg. 2)	Subsec. 10.a
3.2.6.3.4	Key Radiation Protection Positions	DOE-STD-1107-97	
3.2.6.4	Worker Protection	29 CFR 1910 29 CFR 1926 DOE P 450.4 DOE P 450.2A	Comp. 2 and 4
3.2.6.4.1, Item A	Worker Protection Program	DOE O 440.1A	
3.2.6.4.1, Item B	Worker Protection Program	DOE O 440.1A	
3.2.6.4.1, Item C	Worker Protection Program	DOE 440.1A	Att. 1, Sect. 1-4
3.2.6.4.2	Industrial Hygiene Program	DOE O 440.1A	Att. 1, Sect. 5
3.2.6.5	Material Handling	DOE 5400.5 (chg. 2)	Subsec. 10.a0
3.2.6.6	Comprehensive Monitoring	DOE 5400.5 (chg. 2) Derived	Ch. II, Sect. 6 and 7
3.2.6.6.1	Safety and Operating Status	DOE 5400.5 (chg. 2)	Ch. II, Sect. 6 and 7
3.2.6.7	Nuclear Criticality Safety	DOE O 420.1 (chg.2)	Subsec. 4.3.2 - 4.3.3.
3.2.6.7, Item A	Nuclear Criticality Safety	DOE O 420.1 (chg. 2)	
3.2.6.7, Item B	Nuclear Criticality Safety	DOE 5480.22	Subsec. 9.b
3.2.6.7, Item C	Nuclear Criticality Safety	DOE 5480.23 (chg. 1) DOE 5481.1B	Subsecs. 8.a, 8.b, 8.c
3.2.6.7, Item D	Nuclear Criticality Safety	DOE 5480.23 (chg. 1) DOE O 420.1 (chg. 2)	Subsec. 8.a Subsec. 4.3.2
3.2.6.7.1	Nuclear Criticality Alarms	DOE O 420.1 (chg. 2)	
3.2.6.7.2	New Facilities Design	DOE O 420.1 (chg. 2)	
3.2.6.7.3	Nuclear Criticality Safety in Operations	DOE O 420.1 (chg. 2)	
3.2.6.7.4	Nuclear Criticality Safety Training	DOE O 420.1 (chg. 2)	
3.2.6.8	Pressure Safety	DOE O 440.1A	Att. 1, Sect. 6
3.2.6.9	Hazard Prevention	DOE O 440.1A	
3.2.6.10.1	Performance Indicator Program	DOE O 210.1	
3.2.6.10.2	Root Cause Analyses	DOE O 210.1	
3.2.6.10.3	Feedback Mechanisms	DOE O 210.1	
3.2.6.10.4	Management Information System	DOE O 210.1	
3.2.6.10.5	Program Assessments	DOE O 210.1	
3.2.6.10.6	Analytical Data	DOE O 210.1	
3.2.6.11.1	Investigation Procedures	DOE O 225.1A	
3.2.6.11.2	Type A / Type B Investigations	DOE O 225.1A	Att. 1
3.2.6.12	Nuclear Safety Implementation Plan	DOE-STD-1082-94	
3.2.6.12.1	Relief from Nuclear Safety Requirements	DOE-STD-1082-94	
3.2.6.12.2	Exemptions	DOE-STD-1082-94	

Requirement No.	Requirement Title	Requirement Source	Source Paragraph
3.2.6.12.2 (1)	Requesting and Granting DOE Nuclear Safety Exemptions	DOE-STD-1083-95	
3.2.6.13	National Environmental Policy Act (NEPA) Implementing Procedures	DOE-STD-1083-95	
3.2.6.14	Planning and Conduct of Operational Readiness Reviews	DOE-STD-3006-93	
3.2.6.15	Safety Analysis Reporting Implementation	DOE-STD-3003-94	
3.2.7.1	Safeguards and Security Program	DOE O 470.1 (chg. 1)	Sect. 1
3.2.7.2	Personnel Security	DOE O 472.1B	
3.2.7.3	Review of Sensitive Activities	DOE O 470.1 (chg. 1) DOE O 471.2A	
3.2.7.4	Materials Control and Accountability	DOE 5633.3B	
3.2.7.4.1 (1)(a)	Materials Control and Accountability Plan	DOE 5633.3B	Ch. I, 1.e
3.2.7.4.1 (1) (b)	Management Approval	DOE 5633.3B	Ch. I 1.e.
3.2.7.4.1 (1)(c)	Minimum Requirements	DOE 5633.3B	Ch. I, 1
3.2.7.4.1 (1)(d)	International Atomic Energy Agency (IAEA) and NRC Standards	DOE 5633.3B	Ch. I, 1.o
3.2.7.4.1 (1)(e)	American Society for Testing and Measures (ASTM) and ANSI Standards	DOE 5633.3B	Ch. I, 1.o
3.2.7.4.1 (2)	Graded Safeguards	DOE 5633.3B	Ch. I, 2
3.2.7.4.1 (3)	Materials Control and Accountability Requirements for Source and Other Nuclear Materials	DOE 5633.3B	Ch. I, 3
3.2.7.4.1 (4)(a)	Vulnerability Assessment	DOE 5633.3B	Ch. I, 4.a
3.2.7.4.1 (4)(b)	Performance Testing	DOE 5633.3B	Ch. I, 4.b - 4.d
3.2.7.4.1 (5)	Monitoring Programs	DOE 5633.3B	Ch. I, 5
3.2.7.4.1 (6)	Administrative Controls	DOE 5633.3B	Ch. I, 6
3.2.7.4.2 (1)	Accounting Systems	DOE 5633.3B	Ch. II, 2
3.2.7.4.2 (1) (a)	Material Inventories and Data	DOE 5633.3B	Ch. II, 2.
3.2.7.4.2 (2)	Physical Inventories	DOE 5633.3B	Ch. II, 3.
3.2.7.4.2 (2)(a)	Program Compliance	DOE 5633.3B	Ch. II, 3.
3.2.7.4.2 (2)(b)	Responsibilities	DOE 5633.3B	Ch. II, 3.a.2
3.2.7.4.2 (2)(c)	Frequency	DOE 5633.3B	Ch. II, 3.a.4 - 3.a.5.
3.2.7.4.2 (3)	Measurements and Measurement Control	DOE 5633.3B	Ch. II, 4
3.2.7.4.2 (4)	Material Transfers	DOE 5633.3B	Ch. II, 5
3.2.7.4.2 (5)	Material Control Indicators	DOE 5633.3B	Ch. II, 6
3.2.7.4.2 (6)	Documentation and Reporting	DOE 5633.3B	Ch. II, 7
3.2.7.4.3 (1)	General	DOE 5633.3B	Ch. III, 1
3.2.7.4.3 (2)	Plan Documentation	DOE 5633.3B	Ch III, 1.
3.2.7.4.3 (3)	Access	DOE 5633.3B	Ch. III, 2
3.2.7.4.3 (4)	Surveillance	DOE 5633.3B	Ch. III, 3
3.2.7.4.3 (5)	Containment	DOE 5633.3B	Ch. III, 4
3.2.7.4.3 (6)	Detection/Assessment	DOE 5633.3B	Ch. III, 5

<b>Requirement No.</b>	<b>Requirement Title</b>	<b>Requirement Source</b>	<b>Source Paragraph</b>
3.2.7.5	Information Security	DOE O 471.2A	
3.2.7.5.1	Access to Classified and Sensitive Unclassified Information	DOE O 471.2A	Sect. 4.a
3.2.7.5.2	Classified Information Systems	DOE O 471.2A	Sect. 4.b
3.2.7.5.3	Deviations	DOE O 471.2A	Sect. 4.d
3.2.7.5.4, Item A	Supplementary Directives	DOE O 471.2A	Sect. 4.e
3.2.7.5.4, Item B	Supplementary Directives	DOE O 471.2A	Sect. 4.e
3.2.7.5.4, Item C	Supplementary Directives	DOE O 471.2A	Sect. 4.e
3.2.7.5.5, Item A	Guides	DOE O 471.2A	Sect. 4.f
3.2.7.5.5, Item B	Guides	DOE O 471.2A	Sect. 4.f
3.2.7.5.6	Responsibilities and Authorities	DOE O 471.2A	Sect. 5
3.2.7.5.7	Program Management	DOE O 471.2A	Ch. I
3.2.7.5.8	Operations Security Program	DOE O 471.2A	Ch. II
3.2.7.5.9	Classified Information Systems Security	DOE O 471.2A	Ch. III
3.2.7.5.10	Protection and Control of Classified Matter	DOE O 471.2A	Ch. IV
3.2.7.5.11	Identification of Classified Information	DOE 5650.2B (chg. 2)	Sect. 3
3.2.7.5.12	Contractor Information Security Program	DOE O 471.2A	Att. 1
3.2.7.6	Unclassified Computer Security Program	DOE 1360.2B	
3.2.7.7	Risk Management	DOE O 470.1 (chg. 1)	
3.2.7.8	Site Specific Characteristics	DOE O 470.1 (chg. 1)	Ch. 1, para. 3
3.2.7.9	Deviations Requirements	DOE O 470.1 (chg. 1)	Sect. 4 f
3.2.7.10	Standardization	DOE O 470.1 (chg. 1)	Sect. 4g
3.2.7.11	Threat	DOE O 470.1 (chg. 1)	Ch. 1, para 3
3.2.7.12	Site Safeguards and Security Plan	DOE O 470.1 (chg. 1)	Ch. 1, para. 4
3.2.7.12.1	Plan Contents	DOE O 470.1 (chg. 1)	Ch. 1, para. 4
3.2.7.13	Security Plan	DOE O 470.1 (chg. 1)	Ch. 1, para. 4
3.2.7.14	Plan Review	DOE O 470.1 (chg. 1)	Ch. 1, para. 4
3.2.7.15	Training Program	DOE O 470.1 (chg. 1)	Ch. 2, para. 3
3.2.7.16	Training Standardization	DOE O 470.1 (chg. 1)	Ch. 2, para. 3
3.2.7.17	Unclassified Controlled Nuclear Information	DOE O 471.1	
3.2.7.18	Training Records	DOE O 470.1 (chg. 1)	Ch. 2, para. 3l
3.2.7.19	Safeguards and Security Awareness	DOE O 470.1 (chg. 1)	Ch. 4
3.2.7.20	Self-Assessment	DOE O 470.1 (chg. 1)	Ch. 10
3.2.7.21	Performance Assurance	DOE O 470.1 (chg. 1)	Ch. 3, para. 3
3.2.7.22	Documentation	DOE O 470.1 (chg. 1)	Ch. 3, para. 4
3.2.7.23	Contractor Requirements	DOE O 470.1 (chg. 1)	Att. 1
3.2.7.24	Protective Force Program	DOE 5632.7A	Sect. 3.
3.2.8.1	Reliability	Derived	
3.2.8.2	Availability	Derived	
3.2.8.3	Maintainability	Derived	
3.2.9	Human Factors	Derived	
3.2.10.1	Organization	Derived	
3.2.10.2	Organizational Responsibilities	DOE 5480.20A	Ch. I, 2.

<b>Requirement No.</b>	<b>Requirement Title</b>	<b>Requirement Source</b>	<b>Source Paragraph</b>
3.2.10.2.1	Documentation	DOE 5480.20A	Ch. I, 2.
3.2.10.3	Subcontractor Personnel	DOE 5480.20A	Ch. I, 3.
3.2.10.4	Personnel Selection	DOE 5480.20A	Ch. I, 4.; Ch. IV
3.2.10.5	Process	DOE 5480.20A	Ch. I, 5.
3.2.10.6	Certification	DOE 5480.20A	Ch. I, 6.
3.2.10.7	Training	DOE 5480.20A	Ch. I, 7.
3.2.10.7.1	Graded Approach	DOE 5480.20A	Ch. I, 7.
3.2.10.7.2	Implementation Matrix	DOE 5480.20A	Ch. I, 7.a.(1)
3.2.10.7.2 (1)	Training Responsibility	DOE 5480.20A	Ch. I, 7.a.(1)
3.2.10.7.2 (2)	Justification for Exceptions	DOE 5480.20A	Ch. I, 7.a.(1)
3.2.10.7.2 (3)	Matrix Substitution	DOE 5480.20A	Ch. I, 7.a.(1)
3.2.10.7.3	Program Basis	DOE 5480.20A	Ch. I, 7.a.(2)
3.2.10.7.4	Training and Qualification Needs	DOE 5480.20A	Ch. I 7.a.(2)
3.2.10.8	Operator and Supervisor Examination	DOE 5480.20A	Ch. I, 8.
3.2.10.9	Operator and Supervisor Reexamination	DOE 5480.20A	Ch. I, 9.
3.2.10.10	Requalification	DOE 5480.20A	Ch. I, 10.
3.2.10.10.1	Administration	DOE 5480.20A	Ch. I 10.
3.2.10.11	Exceptions to Training Requirements	DOE 5480.20A	Ch. I, 11.
3.2.10.12	Extensions	DOE 5480.20A	Ch. I, 12.
3.2.10.13	Alternatives to Education and Experience Requirements	DOE 5480.20A	Ch. I, 13.
3.2.10.14	Record Requirements	DOE 5480.20A	Ch. I, 15.
3.2.10.14.1	Standardization of Training Records	DOE 5480.20A	Ch. I 15.
3.2.10.14.2	Personnel Qualification and Certification Records	DOE 5480.20A	Ch. I, 15 a.
3.2.10.15	Worker Protection Training	DOE O 440.1A	
3.2.10.16	Measurement Training Plan	DOE 5633.3B	Ch. II, 4.c.(1)
3.2.10.16.1	Measurement	DOE 5633.3B	Ch. II, 4.c.(1)
3.2.10.16.2	Proficiency Demonstration	DOE 5633.3B	Ch. II, 4.c.(2)
3.2.10.16.3	Requalification	DOE 5633.3B	Ch. II, 4.c.(2)
3.2.10.17	Contractor Requirements Document	DOE 5480.20A	Att. I.
3.2.10.17, Item A	Contractor Requirements Document	DOE 5480.20A	Att. I.
3.2.10.17, Item B	Contractor Requirements Document	DOE 5480.20A	Att. I.
3.2.10.17, Item C	Contractor Requirements Document	DOE 5480.20A	Att. I.
3.2.10.17, Item D	Contractor Requirements Document	DOE 5480.20A	Att. I.
3.2.10.17, Item E	Contractor Requirements Document	DOE 5480.20A	Att. I.
3.2.11.1	Operations Design	Derived	
3.2.11.2	Design Modifications	DOE O 420.1 (chg. 2)	
3.2.11.2.1	Design and Analysis	DOE O 420.1 (chg. 2)	
3.2.11.3	Natural Phenomena Hazards Mitigation	DOE O 420.1 (chg. 2).	

<b>Requirement No.</b>	<b>Requirement Title</b>	<b>Requirement Source</b>	<b>Source Paragraph</b>
3.2.11.3.1	Natural Phenomena Hazards Approach	DOE-STD-1020-94 (CH-1)	
3.2.11.3.2	Safety Classifications	DOE-STD-1020-94 (CH-1)	
3.2.11.3.3	Safety Class SSCs	DOE-STD-1021-93	
3.2.11.3.4	Wind/Tornado Hazard Data	DOE-STD-1020-94 (CH-1)	
3.2.11.3.5	Flood Protection and Emergency Operations Plans	DOE-STD-1020-94 (CH-1)	
3.2.11.3.6	Site Investigations	DOE-STD-1022-94	
3.2.11.3.7	Other Considerations	DOE-STD-1020-94 (CH-1)	
3.2.11.4	Industry Codes and Standards	DOE O 420.1 (chg. 2)	
3.2.11.5	Minimization of Economic Loss.	Derived	
3.2.11.6	Construction Materials	Derived	
3.2.11.6.1	Work Area Coatings	Derived	
3.2.11.6.2	Industry Standards	Derived	
3.2.11.7	Design Requirements Application	DOE-STD-1021-93	
3.2.11.8	Applicability	DOE-STD-1020-94 (CH-1)	
3.2.11.9	Existing Facilities	DOE-STD-1020-94 (CH-1)	
3.2.11.10	Site Investigation Program	DOE-STD-1022-94	
3.2.11.11	Analysis Techniques	DOE-STD-1027-92	
3.2.11.12	Part-time Inventory	DOE-STD-1027-92	
3.2.11.13	Electrical Design	ANSI/IEEE C2 NFPA 70	
3.2.11.13.1	Facility Safety Class Electrical Systems	DOE O 420.1 (chg. 2)	4.1.1.2.
3.2.11.14	Backup Power Sources	DOE-STD-3003-94	
3.2.11.15	Ventilation Systems	Derived	
3.2.11.15.1	Procurement and Testing of HEPA Filters	DOE-STD-3020-97	
3.2.12.1	LCAM Approach	DOE O 430.1 (chg. 1)	
3.2.12.2	LCAM Practice(s)	DOE O 430.1 (chg. 1)	
3.2.12.3	Performance Measures	DOE O 430.1 (chg. 1)	
3.2.12.4	Acquisition Approach	DOE O 430.1 (chg. 1)	
3.2.12.5	Project Management System	DOE O 430.1 (chg. 1)	
3.2.12.5.1	Conceptual Design	DOE O 430.1 (chg. 1)	
3.2.12.5.1, Item A	Mission Need	DOE O 430.1 (chg. 1)	
3.2.12.5.1, Item B	Minimum Technical Functional Requirements	DOE O 430.1 (chg. 1)	
3.2.12.5.1, Item C	Proposed Cost and Schedule Ranges	DOE O 430.1 (chg. 1)	
3.2.12.5.1, Item D	Preliminary Environmental Strategy	DOE O 430.1 (chg. 1)	
3.2.12.5.1, Item E	Project Technical and Organizational Interfaces	DOE O 430.1 (chg. 1)	
3.2.12.5.1, Item F	Integration With Other Projects and Agencies	DOE O 430.1 (chg. 1)	
3.2.12.5.2	Execution	DOE O 430.1 (chg. 1)	
3.2.12.5.2, Item A	Project Objectives	DOE O 430.1 (chg. 1)	
3.2.12.5.2, Item B	Scope, Schedule, and Cost Baselines	DOE O 430.1 (chg. 1)	
3.2.12.5.2, Item C	Life Cycle Cost Analysis	DOE O 430.1 (chg. 1)	

Requirement No.	Requirement Title	Requirement Source	Source Paragraph
3.2.12.5.2, Item D	Preliminary Safety Assessment	DOE O 430.1 (chg. 1)	1
3.2.12.5.2, Item E	Project Controls	DOE O 430.1 (chg. 1)	
3.2.12.5.2, Item F	NEPA Documentation	DOE O 430.1 (chg. 1)	
3.2.12.5.2, Item G	Verification Of Performance Criteria	DOE O 430.1 (chg. 1)	
3.2.12.5.2, Item H	Design Alternatives	DOE O 430.1 (chg. 1)	
3.2.12.5.3	Operation	DOE O 430.1 (chg. 1)	
3.2.12.5.3, Item A	Turnover Plan	DOE O 430.1 (chg. 1)	
3.2.12.5.3, Item B	Verification Of Performance Criteria	DOE O 430.1 (chg. 1)	
3.2.12.5.3, Item C	Operational Readiness	DOE O 430.1 (chg. 1)	
3.2.12.5.4	Conduct of Operations	DOE-5480.19	
3.2.12.6	Operation and Maintenance Process	DOE O 430.1 (chg. 1)	para. f
3.2.12.7	Disposition Process	DOE O 430.1 (chg. 1)	para. g
3.2.12.8	Utility Services	DOE O 430.1 (chg. 1)	para. H
3.2.12.9	Asset Database	DOE O 430.1 (chg. 1)	para. i
3.2.12.10	Compliance	DOE O 430.1 (chg. 1)	para. j
3.2.12.11	Logistics	Derived	
3.2.12.12.1	Component Decontamination	Derived	
3.2.12.12.2	Decontamination Solutions	Derived	
3.2.12.12.3	Minimal Effort to D&D	Derived	
3.2.12.12.4	Federal Requirements and Orders	RCRA Part C Executive Order 12856 Executive Order 12873	Sect. 3005
3.2.13.1	State and Tribal Laws and Agreements	Derived	
3.2.13.2	Local Ordinances	Derived	
3.3.1.1	Processing Capacity and Capability	Derived	
3.3.1.1.1	Isotope Separation for Beneficial Use	Derived	
3.3.1.1.2	Duration of Processing Capability	Derived	
3.3.1.2	Stabilization Capability	Derived	
3.3.1.3	Variant Materials Processing	Derived	
3.3.2.1	Receive Materials	Derived	
3.3.2.2	Transfer to External Systems	Derived	
3.3.2.3	Remove from Packaging Containers	Derived	
3.3.2.4	Convert to Stable Long-term Forms	Derived	
3.3.2.5	Stabilize for Packaging	Derived DOE-SAFT-0067	
3.3.2.6	Package to <sup>233</sup> U Safe Storage Standard	Derived	
3.3.2.6.1	Package Labeling	Derived	
3.3.2.7	Handle Packages	Derived	
3.3.2.8	Stage Materials	Derived	
3.3.2.9	Collect Waste Byproducts	Derived	
3.3.2.9.1	Segregate, Pretreat, and Transfer Wastes	Derived	



Requirement No.	Requirement Title	Requirement Source	Source Paragraph
3.3.2.10	Characterize Materials	Derived	
3.3.2.10.1	Sampling Capability	Derived	
3.3.2.10.2	Non-Destructive Assay (NDA) Capabilities	Derived	
3.3.2.10.3	Transfer Provisions	Derived	
3.3.2.11	Open Containers	Derived	
3.3.2.12	Provide Blending Capabilities	Derived	
3.3.11.1	Design Life	Derived	
3.3.11.2	Housing Facility	Derived	
3.4.1.1	50 Year Storage Capability	Derived	
3.4.1.2	Temporary Storage Capacity	Derived	
3.4.1.3	Package Handling Throughput	Derived	
3.4.2.1	Receive Packaged Materials	Derived	
3.4.2.2	Identify Package Materials	Derived	
3.4.2.3	Transfer Packaged Materials	Derived	
3.4.2.4	Safely Store Packaged <sup>233</sup> U Materials	Derived	
3.4.2.5	Retrieve <sup>233</sup> U Packages from Storage	Derived	
3.4.2.6	Collect, Segregate, Package, and Transfer Waste	Derived	
3.4.2.7	Handle Damaged Packages	Derived	
3.4.2.8	Provide Surveillance Capability	SAFT-0067	
3.4.2.9	Transfer Materials to Staging Area	Derived	
3.4.6.1	Critically Safe Storage Arrays	DOE O 420.1 (chg. 2)	
3.4.6.2	Radiation Shielding	DOE O 420.1 (chg. 2)	
3.4.9.1	Operator Intervention	Derived	
3.5.1	Performance	Derived	
3.5.2.1	Receive Materials	Derived	
3.5.2.2	Identify Materials	Derived	
3.5.2.3	Transfer Materials Between Subsystems	Derived	
3.5.2.4	Coordinate External Shipping	Derived	
3.5.2.5	Overpack for Shipment	Derived	
3.5.2.6	Provide Temporary Storage	Derived	
3.5.2.7	Acquire Shipping Containers	Derived	
3.5.5.1	Regulatory Compliance	DOE O 151.1 (chg.2)	
3.5.5.2	Medical Resources	Derived from DOE O 151.1 (chg. 2)	
3.5.6.1	Confinement	Derived	
3.5.6.2	Off-site Transfers	DOE O 460.1A	4.a.(1)
3.5.6.3	Type A Radioactive Material Packaging	DOE O 460.1A WHC-EP-0558	Sect. 4.a.(4)(a) Att. 1 (Subsec. 3.a)
3.5.6.3.1	Retesting	DOE O 460.1A WHC-EP-0558	4.a.(4)(a) Att. 1, Subsec. 3.a
3.5.6.4	Type B or Fissile Radioactive Material Packaging	DOE O 460.1A WHC-EP-0558	Sect. 4.a.(4)(b) Att. 1 (Subsec. 3.b)
3.5.6.4.1	Use of NRC-Certified Packaging	DOE O 460.1A WHC-EP-0558	4.a.(4)(b) Att. 1, Subsec. 3.b
3.5.6.4.2	Use of DOE-HQ Certified Packaging	DOE O 460.1A WHC-EP-0558)	4.a.(4)(b) Att. 1, Subsec. 3.b

Requirement No.	Requirement Title	Requirement Source	Source Paragraph
3.5.6.5	On-site Transfers	DOE O 460.1A	Sect. 4.b
3.5.6.5.1	Methodology and Compliance Process	DOE O 460.1A	Sect. 4.b
3.5.6.6	Safety Documents	DOE O 460.1A	Sect. 4.b
3.5.6.6.1	Effective Date	DOE O 460.1A	Sect. 4.b
3.5.6.7	Contractor Motor Carrier Safety Regulations	DOE O 460.1A	Att. 1 (Sect. 5)
3.5.6.8	DOE Employee Motor Carrier Safety Regulations	DOE O 460.1A	Att. 1 (Sect. 6)
3.5.6.9	Transportation by Aircraft	DOE O 460.1A	Sect. 4.d
3.5.7.1	Safeguard Termination Limits	Derived	
3.5.7.2	Materials in Excess of STLs	Derived	
3.5.7.3	Use of Transportation Safeguards System (TSS) Services	DOE AL 5610.14	Ch. III, 1.a
3.5.7.3.1	Request for TSS Services	DOE AL 5610.14	Ch. III. 2
3.5.7.3.2	TSS Packaging Requirements and Criteria	DOE AL 5610.14	Ch. III, 4
3.5.8.1	Subsystem Reliability	{TBD}	
3.5.8.2	Reuse and Availability	Derived	
3.5.8.3	Impact on Shipping Schedules	Derived	
3.5.8.4	System Capacity	Derived	
3.5.12.1	Departmental Materials Transportation and Packaging Management	DOE C 460.2	Sect. 1
3.5.12.2	Materials Transportation Plan	DOE C 460.2	Sect. 2
3.5.12.2.1	Materials Transportation Plan Content	DOE C 460.2	Sect. 2
3.5.12.2.2	Transportation Information Network (TIN)	DOE C 460.2	Sect. 2
3.5.12.3	Transportation Tracking and Communications (TRANSCOM) System	DOE C 460.2	Sect.3
3.5.12.3. Item A	Spent nuclear fuel	DOE C 460.2	Sect. 3
3.5.12.3. Item B	High-level waste	DOE C 460.2	Sect. 3
3.5.12.3. Item C	High-visibility shipments and campaigns	DOE C 460.2	Sect. 3
3.5.12.4	Shipment Procedures	DOE C 460.2	Sect. 4.a
3.5.12.5	Contractor Requirements Document for Departmental Materials Transportation and Packaging Management	DOE C 460.2	
3.6.1.1	Receipt Capacity	Derived	
3.6.1.2	Waste Handling	Derived	
3.6.1.3	Operating Life	Derived	
3.6.2.1	Receive Waste	Derived	
3.6.2.2	Recover Waste	Derived	
3.6.2.3	Collect Wastes	Derived	
3.6.2.4	Segregate and Treat Waste	Derived	
3.6.2.5	Package Waste	Derived	
3.6.2.6	Provide Temporary Storage	Derived	
3.6.2.7	Transfer Materials	Derived	
4.1	Quality Requirements	DOE O 414.1	

Requirement No.	Requirement Title	Requirement Source	Source Paragraph
4.1.1.1, Item A	General Rule	DOE O 414.1	Sect. 2
4.1.1.1, Item B	Implement the QAP	DOE O 414.1	Sect. 2
4.1.1.2.1	Quality Assurance Criteria	DOE O 414.1	
4.1.1.2.1 (1)	Criteria Satisfaction	DOE O 414.1	Subsec. 5.b
4.1.1.2.1 (2)	Graded Approach	DOE O 414.1	Subsec. 5.b
4.1.1.2.2	Quality Assurance Program Implementation	DOE O 414.1	Sect. 2
4.1.1.2.3 (1)	Contractor Changes	10 CFR 830.120	
4.1.1.2.3 (2)	Change Submittal	10 CFR 830.120	
4.1.1.2.3 (3)	Submittal Contents	10 CFR 830.120	
4.1.1.2.3 (4)	Editorial Changes	10 CFR 830.120	
4.1.1.2.4	DOE Approval	10 CFR 830.120	
4.1.2.1.1 (1)	Program Development	Derived	
4.1.2.1.1 (2)	Organizational Structure and Responsibilities	Derived	
4.1.2.1.1 (3)	Management System	Derived	
4.1.2.1.2 (1)	Quality Improvement Processes	Derived	
4.1.2.1.2 (2)	Identification and Control of Problems	Derived	
4.1.2.1.2 (3)	Corrective Action	Derived	
4.1.2.1.2 (4)	Review and Analysis	Derived	
4.1.2.1.3 (1)	Document Preparation and Approval	Derived	
4.1.2.1.3 (2)	Record Maintenance	Derived	
4.1.2.2.1 (1)	Controlled Conditions	Derived	
4.1.2.2.1 (2)	Identification and Control	Derived	
4.1.2.2.1 (3)	Maintenance	Derived	
4.1.2.2.1 (4)	Monitoring and Data Collection Equipment	Derived	
4.1.2.2.1 (5)	Property Control	Derived	
4.1.2.2.2 (1)	Principles and Standards	Derived	
4.1.2.2.2 (2)	Incorporation of Design Bases	Derived	
4.1.2.2.2 (3)	Design Interfaces	Derived	
4.1.2.2.2 (4)	Verification and Validation	Derived	
4.1.2.2.2 (5)	Verification Timing	Derived	
4.1.2.2.3 (1)	Performance Quality	Derived	
4.1.2.2.3 (2)	Evaluation of Suppliers	Derived	
4.1.2.2.3 (3)	Supplier Reliability	Derived	
4.1.2.2.3 (4)	Suspect/Counterfeit Items (S/CI) Controls	DOE O 440.1A	
4.1.2.2.4 (1)	Acceptance and Performance Criteria	Derived	
4.1.2.2.4 (2)	Equipment Maintenance	Derived	
4.1.2.3.1 (1)	QAP Assessments	Derived	
4.1.2.3.1 (2)	Corrective Action	Derived	
4.1.2.3.2 (1)	Conduct of Assessments	Derived	
4.1.2.3.2 (2)	Assessment Authority	Derived	
4.1.2.3.2 (3)	Technical Qualification	Derived	
4.2.1.1	Conformance	Derived	
4.2.1.2	Resources and Personnel	Derived	
4.2.2.1	Interface Verification	Derived	
4.2.2.2	Functionality and Performance	Derived	

Requirement No.	Requirement Title	Requirement Source	Source Paragraph
4.2.3	Methods	Derived	
4.2.4	Requirements Matrix	Derived	

## APPENDIX B: REQUIREMENTS VERIFICATION MATRIX

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.2.1	Performance		X				
3.2.2.1	Compatibility with 94-1 Systems				X		
3.2.2.2	General Functionality			X			
3.2.2.3	Transfer to Waste Disposal Programs			X			
3.2.2.4	Monitor Materials and System Processes		X				
3.2.2.5	Assure Safe Operating Conditions				X		
3.2.2.6	Provide Package Surveillance Capability		X				
3.2.2.7	Contain Material		X				
3.2.2.8	Retrieve Material		X		X		
3.2.2.9	Provide Containment Detection Capability			X			
3.2.2.9.1	Containment Control			X			
3.2.2.9.2	Transfer Provisions			X			
3.2.3.1.1	97-1 <sup>233</sup> U Storage / Commercial or DOE SNM Shippers Interface			X			
3.2.3.1.1 (1)	Early Disposition			X			
3.2.3.1.1 (2)	Transport Requirements					X	
3.2.3.1.1 (3)	Interface Requirements					X	
3.2.3.1.2	Oak Ridge Molten Salt Reactor Experiment / Commercial or DOE SNM Shippers Interface			X			
3.2.3.1.2 (1)	Material and Packaging Requirements					X	
3.2.3.1.2 (2)	Interface Requirements					X	
3.2.3.1.3	Natural and Depleted Uranium / Commercial or DOE SNM Shippers Interface			X			
3.2.3.1.3 (1)	Required Materials					X	
3.2.3.1.3 (2)	Material Specifications					X	
3.2.3.1.3 (3)	Interface Requirements					X	
3.2.3.1.4	Commercial or DOE SNM Shippers / <sup>233</sup> U Safe Storage System Interface			X			
3.2.3.1.4 (1)	Transport Requirements					X	
3.2.3.1.4 (2)	Transfer of <sup>233</sup> U Materials to DOE-MD			X			
3.2.3.1.4 (3)	Transfer of <sup>233</sup> U Materials to DOE-EM			X			
3.2.3.1.4 (4)	Natural and Depleted Uranium			X			
3.2.3.1.4 (5)	Interface Requirements					X	
3.2.3.1.5	Commercial or DOE SNM Shippers / DOE-MD Interface			X			
3.2.3.1.5 (1)	MD Materials and Packaging Acceptance Criteria					X	
3.2.3.1.5 (2)	Interface Requirements					X	
3.2.3.1.6	Commercial or DOE SNM Shippers / DOE-EM Waste Management Interface			X			
3.2.3.1.6 (1)	DOE-EM Waste Acceptance Criteria					X	
3.2.3.1.6 (2)	Interface Requirements					X	
3.2.3.1.7	Commercial or DOE SNM Shippers / Beneficial Use Interface			X			
3.2.3.1.7 (1)	Interface Requirements					X	
3.2.3.1.8	Sites and Facilities / <sup>233</sup> U Safe Storage System Interface					X	

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.2.3.1.8 (1)	Site and Facility Requirements		X				
3.2.3.1.8 (2)	Interface Requirements					X	
3.2.3.1.9	<sup>233</sup> U Safe Storage System / External Shipping Container Source Interface			X			
3.2.3.1.9 (1)	Interface Requirements					X	
3.2.3.2.1	Transportation Subsystem / Processing Subsystem Interface			X			
3.2.3.2.1 (1)	Transfer of <sup>233</sup> U Materials			X			
3.2.3.2.1 (2)	Transfer of Waste			X			
3.2.3.2.1 (3)	Interface Requirements					X	
3.2.3.2.2	Transportation Subsystem / Storage Subsystem Interface			X			
3.2.3.2.2 (1)	Transfer of <sup>233</sup> U materials			X			
3.2.3.2.2 (2)	Transfer of Waste			X			
3.2.3.2.2 (3)	Transfer of Damaged Packages			X			
3.2.3.2.2 (4)	Interface Requirements					X	
3.2.3.2.3	Transportation Subsystem / Waste Management Subsystem Interface			X			
3.2.3.2.3 (1)	Transfer of Waste			X			
3.2.3.2.3 (2)	Internal Waste Acceptance Criteria					X	
3.2.3.2.3 (3)	Interface Requirements					X	
3.2.3.2.4	Processing Subsystem / Storage Subsystem Interface (TBR)			X			
3.2.3.2.4 (1)	Transfer of Processed Materials			X			
3.2.3.2.4 (2)	Transfer of Packages Requiring Additional Processing and/or Packaging			X			
3.2.3.2.4 (3)	Packaging and Acceptance Criteria					X	
3.2.3.2.4 (4)	Transfer of Damaged or Opened Packages			X			
3.2.3.2.4 (5)	Interface Requirements					X	
3.2.3.2.5	Processing Subsystem / Waste Management Subsystem Interface			X			
3.2.3.2.5 (1)	Waste Acceptance Criteria					X	
3.2.3.2.5 (2)	Interface Requirements					X	
3.2.3.2.6	Storage Subsystem / Waste Management Subsystem Interface			X			
3.2.3.2.6 (1)	Waste Acceptance Criteria					X	
3.2.3.2.6 (2)	Interface Requirements					X	
3.2.4	Information Systems					X	
3.2.4.1.1	Database					X	
3.2.4.1.1 (1)	Classified Data Separation					X	
3.2.4.1.1 (1)(a)	Classification Guide					X	
3.2.4.1.2 (2)	Compatibility			X			
3.2.4.1.1 (3)	Data Architecture					X	
3.2.4.1.1 (4)	Transferability			X			
3.2.4.1.2	Data Access Control			X			
3.2.4.2.1	Material Transfer					X	
3.2.4.2.2	Material Location					X	
3.2.4.2.3	Analysis and Separation					X	
3.2.4.2.4	Material Physical Form					X	
3.2.4.2.5	Moisture Content					X	
3.2.4.2.6	Stabilization Test					X	

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.2.4.2.7	Processing Conditions					X	
3.2.4.2.7 (1)	Processing					X	
3.2.4.2.8	Package Configuration					X	
3.2.4.2.9	Packaging Date					X	
3.2.4.2.10	Initial Radiation Field					X	
3.2.4.2.11	Chemical Composition					X	
3.2.4.2.12	Isotopic Fraction					X	
3.2.4.2.13	Material Source					X	
3.2.4.2.14	Package Identification Number					X	
3.2.4.2.15	Surveillance Results					X	
3.2.4.2.16	Inspection Tests Performed					X	
3.2.4.2.17	Individuals Performing Inspections					X	
3.2.4.2.18	Inspection Dates					X	
3.2.4.2.19	Fill Gas					X	
3.2.4.2.20	Elemental Concentration or Mass					X	
3.2.4.2.21	Baseline Package					X	
3.2.4.2.22	Container Lot Identification Number					X	
3.2.4.2.23	Other Relevant Information					X	
3.2.4.3	Historical Records					X	
3.2.5.1	Communications		X				
3.2.5.2	Emergency Management System		X				
3.2.5.3	Emergency Planning and Preparedness		X				
3.2.5.4	Emergency Response		X				
3.2.5.5	Medical Support					X	
3.2.5.6	Emergency Transition		X				
3.2.5.6.1	Operator Intervention			X			
3.2.5.6.2	Economic Loss				X		
3.2.5.7	Emergency Recovery	X					
3.2.5.7.1	Recovery Procedures					X	
3.2.5.8	Implementation					X	
3.2.5.9	Operations/Field Office Manager Responsibilities					X	
3.2.5.10	Site/Facility Manager Responsibilities					X	
3.2.5.11	Operational Emergency Base—General		X				
3.2.5.12	Operational Emergency Base Related Regulations and Plans					X	
3.2.5.13	Operational Emergency Base Planning					X	
3.2.5.14	Operational Emergency Base Preparedness		X				
3.2.5.15	Operational Emergency Base Response					X	
3.2.5.16	Operational Emergency Hazardous Material Program					X	
3.2.5.17	Operational Emergency Events and Conditions					X	
3.2.5.18	Public Affairs Policy and Planning			X			
3.2.5.19	Evaluations and Readiness Assurance					X	
3.2.5.20	Emergency Readiness Assurance Appraisals and Assessments					X	
3.2.5.21	Contractor Requirements					X	
3.2.6.1, Item A	Regulatory Compliance					X	
3.2.6.1, Item B	Regulatory Compliance					X	
3.2.6.1, Item C	Regulatory Compliance					X	

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.2.6.1, Item D	Regulatory Compliance					X	
3.2.6.1, Item E	Regulatory Compliance					X	
3.2.6.1, Item F	Regulatory Compliance					X	
3.2.6.1, Item G	Regulatory Compliance					X	
3.2.6.1, Item H	Regulatory Compliance					X	
3.2.6.1, Item I	Regulatory Compliance					X	
3.2.6.1, Item J	Regulatory Compliance					X	
3.2.6.1, Item K	Regulatory Compliance					X	
3.2.6.2	Fire Protection	X					
3.2.6.2, Item A	Fire Protection					X	
3.2.6.2, Item B	Fire Protection					X	
3.2.6.2, Item C	Fire Protection					X	
3.2.6.2, Item D	Fire Protection					X	
3.2.6.2, Item E	Fire Protection					X	
3.2.6.2, Item F	Fire Protection					X	
3.2.6.3	Radiological Protection					X	
3.2.6.3.1	Sampling Airborne Radioactive Materials		X				
3.2.6.3.2	Radiation Shielding		X				
3.2.6.3.3	ALARA					X	
3.2.6.3.4	Key Radiation Protection Positions					X	
3.2.6.4	Worker Protection					X	
3.2.6.4.1, Item A	Worker Protection Program					X	
3.2.6.4.1, Item B	Worker Protection Program					X	
3.2.6.4.1, Item C	Worker Protection Program					X	
3.2.6.4.2	Industrial Hygiene Program					X	
3.2.6.5	Material Handling		X				
3.2.6.6	Comprehensive Monitoring		X				
3.2.6.6.1	Safety and Operating Status					X	
3.2.6.7	Nuclear Criticality Safety					X	
3.2.6.7, Item A	Nuclear Criticality Safety					X	
3.2.6.7, Item B	Nuclear Criticality Safety					X	
3.2.6.7, Item C	Nuclear Criticality Safety					X	
3.2.6.7, Item D	Nuclear Criticality Safety					X	
3.2.6.7.1	Nuclear Criticality Alarms		X				
3.2.6.7.2	New Facilities Design		X				
3.2.6.7.3	Nuclear Criticality Safety in Operations		X				
3.2.6.7.4	Nuclear Criticality Safety Training					X	
3.2.6.8	Pressure Safety		X				
3.2.6.9	Hazard Prevention					X	
3.2.6.10.1	Performance Indicator Program					X	
3.2.6.10.2	Root Cause Analyses				X		
3.2.6.10.3	Feedback Mechanisms					X	
3.2.6.10.4	Management Information System					X	
3.2.6.10.5	Program Assessments					X	
3.2.6.10.6	Analytical Data				X		
3.2.6.11.1	Investigation Procedures					X	
3.2.6.11.2	Type A / Type B Investigations					X	
3.2.6.12	Nuclear Safety Implementation Plan					X	
3.2.6.12.1	Relief from Nuclear Safety Requirements					X	
3.2.6.12.2	Exemptions					X	
3.2.6.12.2 (1)	Requesting and Granting DOE Nuclear Safety Exemptions					X	



Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.2.6.13	NEPA Implementing Procedures					X	
3.2.6.14	Planning and Conduct of Operational Readiness Reviews			X		X	
3.2.6.15	Safety Analysis Reporting Implementation					X	
3.2.7.1	Safeguards and Security Program		X				
3.2.7.2	Personnel Security					X	
3.2.7.3	Review of Sensitive Activities					X	
3.2.7.4	Materials Control and Accountability					X	
3.2.7.4.1 (1)(a)	Materials Control and Accountability Plan					X	
3.2.7.4.1 (1) (b)	Management Approval					X	
3.2.7.4.1 (1)(c)	Minimum Requirements		X			X	
3.2.7.4.1 (1)(d)	International Atomic Energy Agency (IAEA) and NRC Standards					X	
3.2.7.4.1 (1)(e)	ASTM and ANSI Standards					X	
3.2.7.4.1 (2)	Graded Safeguards					X	
3.2.7.4.1 (3)	Materials Control and Accountability Requirements for Source and Other Nuclear Materials					X	
3.2.7.4.1 (4)(a)	Vulnerability Assessment				X		
3.2.7.4.1 (4)(b)	Performance Testing		X				
3.2.7.4.1 (5)	Monitoring Programs		X				
3.2.7.4.1 (6)	Administrative Controls					X	
3.2.7.4.2 (1)	Accounting Systems					X	
3.2.7.4.2 (1) (a)	Material Inventories and Data			X			
3.2.7.4.2 (2)	Physical Inventories					X	
3.2.7.4.2 (2)(a)	Program Compliance		X				
3.2.7.4.2 (2)(b)	Responsibilities					X	
3.2.7.4.2 (2)(c)	Frequency					X	
3.2.7.4.2 (3)	Measurements and Measurement Control		X				
3.2.7.4.2 (4)	Material Transfers			X			
3.2.7.4.2 (5)	Material Control Indicators		X				
3.2.7.4.2 (6)	Documentation and Reporting					X	
3.2.7.4.3 (1)	General					X	
3.2.7.4.3 (2)	Plan Documentation					X	
3.2.7.4.3 (3)	Access					X	
3.2.7.4.3 (4)	Surveillance			X			
3.2.7.4.3 (5)	Controls Program			X			
3.2.7.4.3 (6)	Detection/Assessment		X				
3.2.7.5	Information Security					X	
3.2.7.5.1	Access to Classified and Sensitive Unclassified Information					X	
3.2.7.5.2	Classified Information Systems					X	
3.2.7.5.3	Deviations					X	
3.2.7.5.4, Item A	Supplementary Directives					X	
3.2.7.5.4, Item B	Supplementary Directives					X	
3.2.7.5.4, Item C	Supplementary Directives					X	
3.2.7.5.5, Item A	Guides					X	
3.2.7.5.5, Item B	Guides					X	
3.2.7.5.6	Responsibilities and Authorities					X	
3.2.7.5.7	Program Management					X	
3.2.7.5.8	Operations Security Program					X	
3.2.7.5.9	Classified Information Systems Security					X	

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.2.7.5.10	Protection and Control of Classified Matter					X	
3.2.7.5.11	Identification of Classified Information					X	
3.2.7.5.12	Contractor Information Security Program					X	
3.2.7.6	Unclassified Computer Security Program					X	
3.2.7.7	Risk Management				X		
3.2.7.8	Site Specific Characteristics					X	
3.2.7.9	Deviations Requirements					X	
3.2.7.10	Standardization					X	
3.2.7.11	Threat					X	
3.2.7.12	Site Safeguards and Security Plan					X	
3.2.7.12.1	Plan Contents					X	
3.2.7.13	Security Plan					X	
3.2.7.14	Plan Review					X	
3.2.7.15	Training Program					X	
3.2.7.16	Training Standardization					X	
3.2.7.17	Unclassified Controlled Nuclear Information					X	
3.2.7.18	Training Records					X	
3.2.7.19	Safeguards and Security Awareness					X	
3.2.7.20	Self-Assessment					X	
3.2.7.21	Performance Assurance		X				
3.2.7.22	Documentation					X	
3.2.7.23	Contractor Requirements					X	
3.2.7.24	Protective Force Program					X	
3.2.8.1	Reliability				X		
3.2.8.1.1	Reliability Allocations				X		
3.2.8.2	Availability				X		
3.2.8.3	Maintainability				X		
3.2.9	Human Factors					X	
3.2.10.1	Organization					X	
3.2.10.2	Organizational Responsibilities					X	
3.2.10.2.1	Documentation					X	
3.2.10.3	Subcontractor Personnel					X	
3.2.10.4	Personnel Selection					X	
3.2.10.5	Process					X	
3.2.10.6	Certification					X	
3.2.10.7	Training					X	
3.2.10.7.1	Graded Approach					X	
3.2.10.7.2	Implementation Matrix					X	
3.2.10.7.2 (1)	Training Responsibility					X	
3.2.10.7.2 (2)	Justification for Exceptions					X	
3.2.10.7.2 (3)	Matrix Substitution					X	
3.2.10.7.3	Program Basis	X					
3.2.10.7.4	Training and Qualification Needs	X					
3.2.10.8	Operator and Supervisor Examination					X	
3.2.10.9	Operator and Supervisor Reexamination					X	
3.2.10.10	Requalification					X	
3.2.10.10.1	Administration					X	
3.2.10.11	Exceptions to Training Requirements					X	
3.2.10.12	Extensions	X					

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.2.10.13	Alternatives to Education and Experience Requirements	X					
3.2.10.14	Record Requirements					X	
3.2.10.14.1	Standardization of Training Records	X					
3.2.10.14.2	Personnel Qualification and Certification Records					X	
3.2.10.15	Worker Protection Training					X	
3.2.10.16	Measurement Training Plan					X	
3.2.10.16.1	Measurement					X	
3.2.10.16.2	Proficiency Demonstration					X	
3.2.10.16.3	Requalification			X			
3.2.10.17	Contractor Requirements Document					X	
3.2.10.17, Item A	Contractor Requirements Document					X	
3.2.10.17, Item B	Contractor Requirements Document					X	
3.2.10.17, Item C	Contractor Requirements Document					X	
3.2.10.17, Item D	Contractor Requirements Document					X	
3.2.10.17, Item E	Contractor Requirements Document					X	
3.2.11.1	Operations Design				X		
3.2.11.2	Design Modifications					X	
3.2.11.2.1	Design and Analysis					X	
3.2.11.3	Natural Phenomena Hazards Mitigation				X		
3.2.11.3.1	Natural Phenomena Hazards Approach					X	
3.2.11.3.2	Safety Classifications					X	
3.2.11.3.3	Safety Class SSCs					X	
3.2.11.3.4	Wind/Tornado Hazard Data				X		
3.2.11.3.5	Flood Protection and Emergency Operations Plans					X	
3.2.11.3.6	Site Investigations				X		
3.2.11.3.7	Other Considerations	X					
3.2.11.4	Industry Codes and Standards					X	
3.2.11.5	Minimization of Economic Loss.	X					
3.2.11.6	Construction Materials	X					
3.2.11.6.1	Work Area Coatings	X					
3.2.11.6.2	Industry Standards	X					
3.2.11.7	Design Requirements Application	X					
3.2.11.8	Applicability	X					
3.2.11.9	Existing Facilities				X		
3.2.11.10	Site Investigation Program					X	
3.2.11.11	Analysis Techniques					X	
3.2.11.12	Part-time Inventory					X	
3.2.11.13	Electrical Design					X	
3.2.11.13.1	Facility Safety Class Electrical Systems					X	
3.2.11.14	Backup Power Sources				X		
3.2.11.15	Ventilation Systems					X	
3.2.11.15.1	Procurement and Testing of HEPA Filters					X	
3.2.12.1	LCAM Approach					X	
3.2.12.2	LCAM Practice(s)					X	
3.2.12.3	Performance Measures					X	
3.2.12.4	Acquisition Approach					X	
3.2.12.5	Project Management System					X	
3.2.12.5.1	Conceptual Design					X	
3.2.12.5.1, Item A	Mission Need					X	

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.2.12.5.1, Item B	Minimum Technical Functional Requirements					X	
3.2.12.5.1, Item C	Proposed Cost and Schedule Ranges					X	
3.2.12.5.1, Item D	Preliminary Environmental Strategy					X	
3.2.12.5.1, Item E	Project Technical and Organizational Interfaces					X	
3.2.12.5.1, Item F	Integration With Other Projects and Agencies					X	
3.2.12.5.2	Execution					X	
3.2.12.5.2, Item A	Project Objectives					X	
3.2.12.5.2, Item B	Scope, Schedule, and Cost Baselines					X	
3.2.12.5.2, Item C	Life Cycle Cost Analysis					X	
3.2.12.5.2, Item D	Preliminary Safety Assessment					X	
3.2.12.5.2, Item E	Project Controls					X	
3.2.12.5.2, Item F	NEPA Documentation					X	
3.2.12.5.2, Item G	Verification Of Performance Criteria					X	
3.2.12.5.2, Item H	Design Alternatives					X	
3.2.12.5.3	Operation					X	
3.2.12.5.3, Item A	Turnover Plan					X	
3.2.12.5.3, Item B	Verification Of Performance Criteria					X	
3.2.12.5.3, Item C	Operational Readiness					X	
3.2.12.5.4	Conduct of Operations					X	
3.2.12.6	Operation and Maintenance Process					X	
3.2.12.7	Disposition Process					X	
3.2.12.8	Utility Services					X	
3.2.12.9	Asset Database					X	
3.2.12.10	Compliance					X	
3.2.12.11	Logistics					X	
3.2.12.12.1	Component Decontamination	X					
3.2.12.12.2	Decontamination Solutions	X					
3.2.12.12.3	Minimal Effort to D&D	X					
3.2.12.12.4	Federal Requirements and Orders					X	
3.2.13.1	State and Tribal Laws and Agreements					X	
3.2.13.2	Local Ordinances					X	
3.3.1.1	Processing Capacity and Capability		X				
3.3.1.1.1	Isotope Separation for Beneficial Use		X				
3.3.1.1.2	Duration of Processing Capability					X	
3.3.1.2	Stabilization Capability				X		
3.3.1.3	Variant Materials Processing		X				
3.3.2.1	Receive Materials			X			
3.3.2.2	Transfer to External Systems			X			
3.3.2.3	Remove from Packaging Containers			X			
3.3.2.4	Convert to Stable Long-term Forms		X				
3.3.2.5	Stabilize for Packaging		X				
3.3.2.6	Package to <sup>233</sup> U Safe Storage Standard					X	
3.3.2.6.1	Package Labeling					X	
3.3.2.7	Handle Packages			X			
3.3.2.8	Stage Materials			X			
3.3.2.9	Collect Waste Byproducts			X			
3.3.2.9.1	Segregate, Pretreat, and Transfer Wastes	X					
3.3.2.10	Characterize Materials					X	
3.3.2.10.1	Sampling Capability			X			

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.3.2.10.2	Non-Destructive Assay (NDA) Capabilities		X				
3.3.2.10.3	Transfer Provisions			X			
3.3.2.11	Open Containers			X			
3.3.2.12	Provide Blending Capabilities	X					
3.3.11.1	Design Life				X		
3.4.1.1	50 Year Storage Capability		X				
3.4.1.2	Temporary Storage Capacity		X				
3.4.1.3	Package Handling Throughput		X				
3.4.2.1	Receive Packaged Materials			X			
3.4.2.2	Identify Package Materials		X				
3.4.2.3	Transfer Packaged Materials			X			
3.4.2.4	Safely Store Packaged <sup>233</sup> U Materials		X				
3.4.2.5	Retrieve <sup>233</sup> U Packages from Storage			X			
3.4.2.6	Collect, Segregate, Package, and Transfer Waste	X					
3.4.2.7	Handle Damaged Packages			X			
3.4.2.8	Provide Surveillance Capability		X				
3.4.2.9	Transfer Materials to Staging Area			X			
3.4.6.1	Critically Safe Storage Arrays				X		
3.4.6.2	Radiation Shielding					X	
3.4.9.1	Operator Intervention	X					
3.5.1	Performance				X		
3.5.2.1	Receive Materials			X			
3.5.2.2	Identify Materials		X				
3.5.2.3	Transfer Materials Between Subsystems			X			
3.5.2.4	Coordinate External Shipping			X			
3.5.2.5	Overpack for Shipment			X			
3.5.2.6	Provide Temporary Storage			X			
3.5.2.7	Acquire Shipping Containers			X			
3.5.5.1	Regulatory Compliance					X	
3.5.5.2	Medical Resources					X	
3.5.6.1	Confinement	X					
3.5.6.2	Off-site Transfers					X	
3.5.6.3	Type A Radioactive Material Packaging	X					
3.5.6.3.1	Retesting					X	
3.5.6.4	Type B or Fissile Radioactive Material Packaging	X					
3.5.6.4.1	Use of NRC-Certified Packaging	X					
3.5.6.4.2	Use of DOE-HQ Certified Packaging	X					
3.5.6.5	On-site Transfers					X	
3.5.6.5.1	Methodology and Compliance Process					X	
3.5.6.6	Safety Documents	X					
3.5.6.6.1	Effective Date					X	
3.5.6.7	Contractor Motor Carrier Safety Regulations					X	
3.5.6.8	DOE Employee Motor Carrier Safety Regulations					X	
3.5.6.9	Transportation by Aircraft					X	
3.5.7.1	Safeguard Termination Limits	X					
3.5.7.2	Materials in Excess of STLs					X	
3.5.7.3	Use of Transportation Safeguards System (TSS) Services					X	

Requirement	Requirement Title	Verification Method					
		N/A	T	D	A	I	S
3.5.7.3.1	Request for TSS Services					X	
3.5.7.3.2	TSS Packaging Requirements and Criteria					X	
3.5.8.1	Subsystem Reliability				X		
3.5.8.2	Reuse and Availability	X					
3.5.8.3	Impact on Shipping Schedules	X					
3.5.8.4	System Capacity	X					
3.5.12.1	Departmental Materials Transportation and Packaging Management					X	
3.5.12.2	Materials Transportation Plan					X	
3.5.12.2.1	Materials Transportation Plan Content					X	
3.5.12.2.2	Transportation Information Network (TIN)					X	
3.5.12.3	Transportation Tracking and Communications(TRANSCOM) System					X	
3.5.12.3. Item A	Spent nuclear fuel					X	
3.5.12.3. Item B	High-level waste					X	
3.5.12.3. Item C	High-visibility shipments and campaigns					X	
3.5.12.4	Shipment Procedures					X	
3.5.12.5	Contractor Requirements Document for Departmental Materials Transportation and Packaging Management					X	
3.6.1.1	Receipt Capacity		X				
3.6.1.2	Waste Handling		X				
3.6.1.3	Operating Life				X		
3.6.2.1	Receive Waste			X			
3.6.2.2	Recover Waste	X					
3.6.2.3	Collect Wastes			X			
3.6.2.4	Segregate and Treat Waste	X					
3.6.2.5	Package Waste			X			
3.6.2.6	Provide Temporary Storage	X					
3.6.2.7	Transfer Materials			X			

## APPENDIX C: RELATED DOCUMENTS

The following related documents provided additional guidance on how to carry out the requirements and operations of the <sup>233</sup>U Safe Storage Program.

DOE G 420.1-X (DRAFT)	IMPLEMENTATION GUIDE FOR NON-REACTOR NUCLEAR FACILITY SAFETY
DOE G 420.1-Y(DRAFT)	GUIDE FOR MITIGATION OF NATURAL PHENOMENA
DOE G 440.1-5	FIRE SAFETY GUIDE
DOE G 441.1-1	
DOE G 460.1-1	IMPLEMENTATION GUIDE FOR PACKAGING AND TRANSPORTATION SAFETY
DOE G 460.2-1	IMPLEMENTATION GUIDE FOR DEPARTMENTAL MATERIALS TRANSPORTATION AND PACKAGING MANAGEMENT
DOE G 5633.3A	GUIDE FOR IMPLEMENTATION OF DOE 5633.3A (2/93)
DOE GPG-FM-01 through 33	(SERIES) GOOD PRACTICES GUIDES FOR IMPLEMENTATION OF DOE ORDER 430.1
DOE M 430.1 (Draft)	DIRECTIVES MANAGEMENT DOCUMENT FOR DOE O 430.1
DOE/EM-40	DECONTAMINATION AND DECOMMISSIONING GUIDANCE DOCUMENT, DRAFT 3
DOE-EM-STD-5505-96	OPERATIONS ASSESSMENTS
DOE-HDBK-1002-96	GUIDE TO GOOD PRACTICES FOR TRAINING AND QUALIFICATION OF CHEMICAL OPERATORS
DOE-HDBK-1003-96	GUIDE TO GOOD PRACTICES FOR TRAINING AND QUALIFICATION OF MAINTENANCE PERSONNEL
DOE-HDBK-1062-96	DOE FIRE PROTECTION HANDBOOK
DOE-HDBK-1081-94	PRIMER ON SPONTANEOUS HEATING AND PYROPHORICITY
DOE-HDBK-1085-95	DOE ENFORCEMENT PROGRAM ROLES AND RESPONSIBILITIES
DOE-HDBK-1087-95	ENFORCEMENT HANDBOOK: ENFORCEMENT OF DOE NUCLEAR SAFETY REQUIREMENTS
DOE-HDBK-1089-95	GUIDANCE FOR IDENTIFYING, REPORTING AND TRACKING NUCLEAR SAFETY NONCOMPLIANCES
DOE-HDBK-1099-96	ESTABLISHING NUCLEAR FACILITY DRILL PROGRAMS
DOE-HDBK-1100-96	CHEMICAL PROCESS HAZARDS ANALYSIS
DOE-HDBK-1101-96	PROCESS SAFETY MANAGEMENT FOR HIGHLY HAZARDOUS CHEMICALS
DOE-HDBK-1106-97	RADIOLOGICAL CONTAMINATION CONTROL TRAINING FOR LABORATORY RESEARCH
DOE-HDBK-1204-97	GUIDE TO GOOD PRACTICES FOR THE DEVELOPMENT OF TEST ITEMS

DOE-HDBK-3012-96	GUIDE TO GOOD PRACTICES FOR OPERATIONAL READINESS REVIEWS (ORR), TEAM LEADER'S GUIDE
DOE-HDBK-5504-95	GUIDANCE FOR EVALUATION OF OPERATIONAL EMERGENCY PLANS
DOE-NE-STD-1004-92	ROOT CAUSE ANALYSIS GUIDANCE DOCUMENT
DOE-STD-1009-92	GUIDE TO GOOD PRACTICES FOR THE DEVELOPMENT OF TEST ITEMS
DOE-STD-1010-92	GUIDE TO GOOD PRACTICES FOR INCORPORATING OPERATING EXPERIENCES
DOE-STD-101-92	COMPILATION OF NUCLEAR SAFETY CRITERIA FOR POTENTIAL APPLICATION TO DOE NONREACTOR NUCLEAR FACILITIES
DOE-STD-1030-96	GUIDE TO GOOD PRACTICES FOR LOCKOUTS AND TAGOUTS
DOE-STD-1031-92	GUIDE TO GOOD PRACTICES FOR COMMUNICATIONS
DOE-STD-1032-92	GUIDE TO GOOD PRACTICES FOR OPERATIONS ORGANIZATION AND ADMINISTRATION
DOE-STD-1034-93	GUIDE TO GOOD PRACTICES FOR TIMELY ORDERS TO OPERATORS
DOE-STD-1035-93	GUIDE TO GOOD PRACTICES FOR LOGKEEPING
DOE-STD-1036-93	GUIDE TO GOOD PRACTICES FOR INDEPENDENT VERIFICATION
DOE-STD-1037-93	GUIDE TO GOOD PRACTICES FOR OPERATIONS ASPECTS OF UNIQUE PROCESSES
DOE-STD-1038-93	GUIDE TO GOOD PRACTICES FOR OPERATIONS TURNOVER
DOE-STD-1039-93	GUIDE TO GOOD PRACTICES FOR CONTROL OF EQUIPMENT AND SYSTEM STATUS
DOE-STD-1040-93	GUIDE TO GOOD PRACTICES FOR CONTROL OF ON-SHIFT TRAINING
DOE-STD-1041-93	GUIDE TO GOOD PRACTICES FOR SHIFT ROUTINES AND OPERATING PRACTICES
DOE-STD-1042-93	GUIDE TO GOOD PRACTICES FOR CONTROL AREA ACTIVITIES
DOE-STD-1043-93	GUIDE TO GOOD PRACTICES FOR OPERATOR AID POSTINGS
DOE-STD-1044-93	GUIDE TO GOOD PRACTICES FOR EQUIPMENT AND PIPING LABELING
DOE-STD-1045-93	GUIDE TO GOOD PRACTICES FOR NOTIFICATIONS AND INVESTIGATION OF ABNORMAL EVENTS
DOE-STD-1050-93	GUIDELINE TO GOOD PRACTICES FOR PLANNING, SCHEDULING, AND COORDINATION OF MAINTENANCE AT DOE NUCLEAR FACILITIES



DOE-STD-1051-93	GUIDELINE TO GOOD PRACTICES FOR MAINTENANCE ORGANIZATION AND ADMINISTRATION AT DOE NUCLEAR FACILITIES
DOE-STD-1052-93	GUIDELINE TO GOOD PRACTICES FOR TYPES OF MAINTENANCE ACTIVITIES AT DOE NUCLEAR FACILITIES
DOE-STD-1053-93	GUIDELINE TO GOOD PRACTICES FOR CONTROL OF MAINTENANCE ACTIVITIES AT DOE NUCLEAR FACILITIES
DOE-STD-1054-93	GUIDELINE TO GOOD PRACTICES FOR CONTROL AND CALIBRATION OF MEASURING AND TEST EQUIPMENT (M&TE) AT DOE NUCLEAR FACILITIES
DOE-STD-1055-93	GUIDELINE TO GOOD PRACTICES FOR MAINTENANCE MANAGEMENT INVOLVEMENT AT DOE NUCLEAR FACILITIES
DOE-STD-1056-93	GUIDE TO GOOD PRACTICES FOR LINE AND TRAINING MANAGER ACTIVITIES RELATED TO TRAINING
DOE-STD-1057-93	GUIDE TO GOOD PRACTICES FOR THE SELECTION, TRAINING, AND QUALIFICATION OF SHIFT TECHNICAL ADVISORS
DOE-STD-1058-93	GUIDE TO GOOD PRACTICES FOR DEVELOPING AND CONDUCTING CASE STUDIES
DOE-STD-1059-93	GUIDE TO GOOD PRACTICES FOR MAINTENANCE SUPERVISOR SELECTION AND DEVELOPMENT
DOE-STD-1060-93	GUIDE TO GOOD PRACTICES FOR CONTINUING TRAINING
DOE-STD-1061-93	GUIDE TO GOOD PRACTICES FOR THE SELECTION, TRAINING, AND QUALIFICATION OF SHIFT SUPERVISORS
DOE-STD-1063-93	ESTABLISHING AND MAINTAINING A FACILITY REPRESENTATIVE PROGRAM AT DOE NUCLEAR FACILITIES
DOE-STD-1064-94	GUIDELINE TO GOOD PRACTICES FOR SEASONAL FACILITY PRESERVATION AT DOE NUCLEAR FACILITIES
DOE-STD-1065-94	GUIDELINE TO GOOD PRACTICES FOR POST-MAINTENANCE TESTING AT DOE NUCLEAR FACILITIES
DOE-STD-1067-94	GUIDE TO GOOD PRACTICES FOR MAINTENANCE FACILITIES, EQUIPMENT, AND TOOLS AT DOE NUCLEAR FACILITIES
DOE-STD-1068-94	GUIDE TO GOOD PRACTICES FOR MAINTENANCE HISTORY AT DOE NUCLEAR FACILITIES
DOE-STD-1069-94	GUIDELINE TO GOOD PRACTICES FOR MAINTENANCE TOOLS AND EQUIPMENT CONTROL AT DOE NUCLEAR FACILITIES
DOE-STD-1070-94	GUIDELINES FOR EVALUATION OF NUCLEAR FACILITY TRAINING PROGRAMS

DOE-STD-1071-94	GUIDELINE TO GOOD PRACTICES FOR MATERIAL RECEIPT, INSPECTION, HANDLING, STORAGE, RETRIEVAL, AND ISSUANCE AT DOE NUCLEAR FACILITIES
DOE-STD-1072-94	GUIDELINE TO GOOD PRACTICES FOR FACILITY CONDITION INSPECTIONS AT DOE NUCLEAR FACILITIES
DOE-STD-1073-93-PT.1	GUIDE FOR OPERATIONAL CONFIGURATION MANAGEMENT PROGRAM, PART I
DOE-STD-1073-93-PT.2	GUIDE FOR OPERATIONAL CONFIGURATION MANAGEMENT PROGRAM, PART II
CG-SS-3,E.O. UPDATE	CLASSIFICATION GUIDE FOR SAFEGUARDS AND SECURITY INFORMATION
ORNL/MD/LTR-60	STRATEGY FOR THE FUTURE USE AND DISPOSITION OF <sup>233</sup> U OVERVIEW

## APPENDIX D: BASES AND ADDITIONAL INFORMATION FOR <sup>233</sup>U SAFE STORAGE SYSTEM REQUIREMENTS

### D-1 Requirements Bases and Additional Information

**Note:** The following section numbers refer to the sections of the main body of the SRD.

#### 3.1 System Description

The system description is based on the results of the analysis by the 97-1 Team assigned by DOE to respond to the DNFSB Recommendation 97-1. The Team analyzed the recommendation and determined that the Program should focus on two initial efforts, along with recognizing that disposition and beneficial uses must be addressed in the future:

- An interim effort to respond to DNFSB concerns as to the safety of the current inventory and to take whatever steps are necessary to stabilize this material in an acceptable condition until a long-term solution is in place
- Develop and implement a long-term solution for the storage of <sup>233</sup>U.
- Assess the potential disposition options to try to minimize the rework required in the future
- Retain the option for future beneficial uses of the material

This SRD defines the requirements for the long-term storage solution. The interim concerns are addressed in the site characterization efforts and the potential disposition options have been addressed in an ORNL report ORNL/TM-13550. A transition from the interim storage status to the availability of the long-term safe storage system will be addressed in {TBD}. System analysis indicated that the system has the following four subsystem functions:

- Processing - this includes the chemical conversion of any materials that do not meet the safe storage specification [SAFT-0067], stabilization of all of the materials to remove volatile impurities and moisture, and packaging into a container that meets the storage standard.
- Storage - this includes the operation, placement and retrieval of materials at the long-term storage facility
- Waste Management - this includes the storage, packaging and handoff to EM for all waste materials. It may also include the processing of any existing materials determined to be wastes (i.e., below the Safeguards Termination Limits).

- Transportation - this includes the logistics, packaging, unpacking and associated facilities for the transportation of materials and wastes. Off-site transportation is to be handled by external systems.

In addition to these four subsystems, six external systems have been identified that have interfaces with one or more of the subsystems of the long-term storage system. These are:

- Current <sup>233</sup>U storage systems containing material that must be accommodated by the long-term storage system - this is the inventory of materials as currently stored. Materials will be withdrawn, processed as required, and stored in the long-term storage system facility. There are multiple sites and at least two basic forms of the materials (unused <sup>233</sup>U reactor fuel mixed with Thorium, and pure, or near pure, <sup>233</sup>U compounds or metals).
- 94-1 MSRE - this is the inventory of <sup>233</sup>U currently in the MSRE facility that is being processed under the 94-1 program. Once converted, and as soon as the long-term storage facility is available, it will be transferred to the <sup>233</sup>U long-term storage system facilities.
- Natural and depleted uranium - this system represents a potential source of blending materials if the decision is made to blend the <sup>233</sup>U materials with natural and depleted uranium for storage. This would possibly be a consequence of potential disposition options.
- Potential beneficial uses (nominally via DOE-Nuclear Energy) - this is a potential end use that could take multiple forms. The option that is currently being considered is the extraction of selected daughter isotopes for use in cancer treatment.
- DOE-EM Waste Management - EM is the internal DOE organization chartered to handle the disposition of nuclear and hazardous waste materials. This interface includes transfer of waste materials from the <sup>233</sup>U Safe Storage System to EM Waste Management. It may also include receipt of specialized storage or transport packaging from EM or its designated agents.
- DOE-MD Disposition - this system is external to the <sup>233</sup>U Safe Storage System, but is a participating component of the overall 97-1 program. This interface will occur when a decision is made regarding disposition options for the program. This may occur early in the program if some of the <sup>233</sup>U material is sent to MD sites for early disposition and again later (possibly multiple times) for the remaining materials.

This analysis of the DNFSB concerns established the "context" for the long-term <sup>233</sup>U Safe Storage System (see Figure 3-1).

### 3.1.1 System Components

The <sup>233</sup>U long-term storage system consists of four major subsystems:

- A processing subsystem to convert the material to a suitable form for long-term storage
- A Storage subsystem with a design life of at least 50 years
- A waste management subsystem to treat, collect and transfer waste material to waste disposition agencies (DOE-EM)
- A Transportation subsystem to manage the shipping and receiving for each of the subsystems

These components interact with external systems through shipping agencies, both DOE and commercial.

### 3.1.2 System Interfaces

The system interfaces represent all of the transactions that the system will be required to perform between both internal and external components. These interfaces are key elements of the process of managing the long-term storage program as these interfaces represent "contracts" between the organizations that are responsible for each component that must be actively managed or the system will not perform as needed. The external systems are particularly important because they involve organizations that are not directly responsible for implementing the long-term storage solution. Some of these external systems will require information generated by the design and implementation of the 97-1 program (the Storage Standard for example)

#### Supporting Information:

The current inventory of <sup>233</sup>U materials is undergoing changes in parallel with the long-term storage system development. Some material may be processed to put it in a safer form and, where possible, <sup>233</sup>U material may be consolidated into fewer facilities or locations during the interim storage program, thereby reducing the number of sites and increasing the amounts of <sup>233</sup>U material in interim storage at the major sites (primarily INEEL and ORNL).

The interface with the external DOE uranium materials system is necessary in the event that a beneficial use is identified that requires blending or that the Long-term Storage form is determined to require blending with Uranium (natural or depleted). Processing of <sup>233</sup>U material to remove decay products may be required for material with higher <sup>232</sup>U content for some applications. This changing situation will be addressed in an interim storage strategy and planning document.

The Current <sup>233</sup>U storage systems, which contain the material that must be accommodated by the long-term storage system interface with the 94-1 program, represent approximately 37 Kg of <sup>233</sup>U material. This material will be received from the 94-1 program as a result of the processing of MSRE fuel under that program.

The <sup>233</sup>U Safe Storage System will interface with the DOE disposition system for Plutonium, spent fuel, or high level waste to allow processing of <sup>233</sup>U with other DOE excess or waste materials if it is determined that disposition of <sup>233</sup>U material is appropriate.

There are potential beneficial uses for <sup>233</sup>U and it is assumed that any potential beneficial use or disposition would happen as a part of the beneficial use action after it is withdrawn from long-term storage. Beneficial use material could be either permanently transferred to a beneficial use program or returned to the safe storage system after use (removal of radioisotopes for example). Beneficial use is treated as an external system for the purposes of this program. Once beneficial use actions are complete, the material may return to the <sup>233</sup>U Safe Storage System or may be retained by the beneficial use system.

It is assumed that existing DOE mechanisms for the transport of nuclear materials will be used for the transport of <sup>233</sup>U. Some modification of shipping containers could be required because of the higher radiation levels associated with <sup>233</sup>U.

## **3.2 System Level Requirements**

The requirements for the long-term <sup>233</sup>U Safe Storage System are derived from two sources: derived and externally imposed requirements. This document includes both. Each requirement will have the source of the requirement identified in brackets ] at the end of the paragraph. The system level requirements are those which apply to the system as a whole and potentially to individual subsystems. These requirements are primarily externally driven requirements from DOE Orders, Federal Laws and regulations derived from these laws.

### **3.2.1 Performance**

System performance requirements are derived from the DNFSB recommendation and from the program technical and schedule objectives developed by DOE. Key requirements are contained in the safe storage standard [DOE-SAFT-0067]. Other performance requirements will be derived from schedule milestone objectives as they are established by the program.

The amount of material to be processed is that shown in Tables 3-1 through 3-4 less any material that is transferred to an early disposition processor site as is being considered for the U<sub>3</sub>O<sub>8</sub> Monolith material at ORNL.

### **3.2.2 Functional**

System and subsystem functions were derived from the basic system level requirements and mission statement by the 97-1 Team.

### **3.2.3 Integration and Interface Control**

System and subsystem interfaces were identified by the 97-1 Team from analyses of the functions to be performed and identified external dependencies.

An interface control document (ICD) will be prepared to define all of the interface requirements for each interface. Each ICD will be prepared by and agreed to by all parties associated with the interface.

### **3.2.4 Information Systems**

The referenced directives establish minimum requirements for the design, procurement, and implementation of information systems that process, store, transfer, or provide access to classified information.

### **3.2.6 Environmental Safety and Health**

The design and construction of the safe storage system must comply with the requirements of the numerous laws and regulations:

- The DOE Environmental Protection Program is established in DOE O 5400.1, which provides environmental program requirements DOE-wide. DOE O 5400.1 establishes the driver laws and regulations that require implementation of measures to ensure that the environment is protected from unacceptable damage by its actions.
- Additional policy has been issued regarding ES&H requirements in DOE P 450.2A and DOE P 450.1.

The National Environmental Policy Act of 1969 (NEPA) [40 CFR Parts 1500-1508] requires that all agencies of the Federal Government utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment. Because this program will potentially require construction or modification of a facility or facilities for processing of <sup>233</sup>U, the requirements of NEPA may apply.

- DOE Order 451.1A establishes DOE internal requirements and responsibilities for implementing the National Environmental Policy Act of 1969 [NEPA], the Council on Environmental Quality Regulations implementing the procedural provisions of NEPA, and the DOE NEPA implementing procedures

- The Resource Conservation and Recovery Act (RCRA) regulates solid waste, which includes both the ordinary garbage generated in our households and offices and the more hazardous chemical wastes produced by industrial processes. RCRA also regulates medical wastes and underground storage tanks containing hazardous substances. Because some of the processing subsystem activities may utilize hazardous materials and generate waste regulated under RCRA, processing facilities under this program may be required to comply with RCRA. DOE Order 5480.3 establishes internal requirements and responsibilities implementing RCRA.
- The Clean Water Act (CWA) was enacted in 1972 and established a federal/state scheme for controlling the introduction of pollutants into the nation's navigable surface water. Any processing facilities that discharge waste waters to either a surface water body (i.e., not ground water) or a publicly-owned treatment system must ensure compliance with CWA. Facilities that directly discharge waste waters must obtain a National Pollutant Discharge Elimination System permit. This permit specifies the discharge standards and monitoring requirements that the facility must achieve. To the extent that this applies, the processing and storage facilities must comply with this law.
- The Clean Air Act (CAA) was enacted in 1963 and last amended in 1990. The objective of CAA is to protect and enhance the quality of the nation's air resource and protect public health and welfare, while fostering a beneficial productive capacity. Under CAA, standards are set for air pollutants. Facilities that generate and release pollutants to the air are required to obtain an operating permit and comply with these standards. For the <sup>233</sup>U facilities, this may require process modification or some form of treatment before emissions are released to the environment such as for <sup>220</sup>Rn]
- The Safe Drinking Water Act (SDWA) was enacted in 1974 with the primary purpose of protecting drinking water resources. Primary drinking water standards set by the SDWA apply to drinking water "at the tap" as delivered by public water supply systems. Of equal significance, drinking water standards are used to determine ground water protection regulations under a number of other statutes, including CERCLA. SDWA states each federal agency having jurisdiction over a federally-owned or operated public water system must comply with all federal, state, local requirements for the provision of safe drinking water. To the extent that a water system is required for the safe storage system, this Act applies to this program.
- The discharge of dredged or fill material into waters of the United States is controlled by 33CFR323 and permitting is the responsibility of the Corps of Engineers. To the extent that construction work on facilities associated with this program may require such measures, the requirements of these regulations apply.



- The Toxic Substances Control Act (TSCA) was enacted in 1976 and is enforced by EPA. It requires that specific chemicals be tested and their processing and use restricted to protect human health and the environment from unreasonable risk from exposure. TSCA specifically regulates the control of any waste materials that contain more than 50 parts per million of polychlorinated biphenyls (PCBs). To the extent that such regulated chemicals are used, this program must comply with this act.
- Section 4.2 of DOE O 420.1 (chg. 2) has primacy over all other DOE Orders with respect to matters concerning fire protection for facilities (refer to DOE 440.1A for worker protection requirements). To the extent that potential conflicts may arise resulting from the implementation of these requirements in relation to other DOE Orders or Directives, the cognizant fire protection Authority Having Jurisdiction (AHJ) within the Office of the Assistant Secretary for Environment, Safety and Health is responsible for resolving the issue in concert with the other AHJs.
- The <sup>233</sup>U processing facilities, sites and activities (including design and construction) must be characterized by a level of fire protection that is sufficient to fulfill the requirements of the best protected class of industrial risks ("Highly Protected Risk" or "Improved Risk") and be provided protection to achieve "defense-in-depth." This includes meeting the applicable building code and National Fire Protection Association Codes and Standards, or exceeding them (when necessary to meet safety objectives), unless an exemption is granted.
- The applicable codes and standards are those in effect when facility design commences ("code of record"). In the event that some or all of the processing facilities result in significant modifications to a facility, the current edition of the code or standard applies to the modification.

Other Supporting Information:

<sup>233</sup>U has a gaseous daughter product <sup>220</sup>Rn. In addition to an off-gas system to remove radioactive particles, a system should be provided to control <sup>220</sup>Rn migration and prevent releases of the gaseous product to the environment above acceptable levels.

DOE has instituted a policy that radiation exposure resulting from its operations be maintained below regulatory limits and that deliberate efforts be taken to further reduce exposures as low as reasonably achievable (ALARA).

<sup>233</sup>U material exhibits higher gamma radiation fields than other uranium materials and will require additional protection for workers than for traditional methods of handling uranium. A specific concern of this program is a high energy [2.6 million electron volts (MeV)] gamma ray is emitted from thallium-208 (<sup>208</sup>Tl), a

daughter nuclide of <sup>232</sup>U decay. Depending on the amount of <sup>232</sup>U present in the <sup>233</sup>U, the surrounding radiation field can range up to tens of rem/hr. This radiation field causes handling for visual inspection, repackaging, or any similar form of processing to be difficult from an As Low As Reasonably Achievable (ALARA) standpoint (exposure to ionizing radiation).

Implementation Guide DOE G 441.2-1, Occupational ALARA Program (DOE, 1997c), provides detailed guidance on the essential elements of an ALARA program.

The safe storage system may also utilize other hazardous materials and system design will provide adequate protection from these hazards.

### **3.2.7 Safeguards and Security**

Note that terms commonly used in the Safeguards and Security Program are defined in the "Safeguards and Security Definitions Guide," which is maintained by the Office of Safeguards and Security.

### **3.2.8 Reliability, Availability, and Maintainability**

The subsystems will be designed with maintainability a key consideration in selection of components and layout. Maintainability includes the ability to maintain the components with minimal occupational exposure and minimal time required to perform maintenance tasks. The cost and quantity of spare parts inventory will be considered as well.

### **3.2.9 Human Factors**

Human factors specialists will review and approve designs.

### **3.2.10 Training and Personnel**

It has been some time since any significant amount of <sup>233</sup>U has been handled in the DOE complex. The DNFSB recognized that retention of key skills will be important to the successful execution of the 97-1 program. Actions have been taken to compile the experience with <sup>233</sup>U materials and identify the available staff. It will be a specific objective to incorporate this experience base into training efforts for the personnel who will operate this system once implemented.

### **3.2.11 Design and Construction**

The requirements of Section 3.2.11 apply to the activities of design and construction of new Hazard Category 1, 2, and 3 DOE non-reactor nuclear facilities and to the design and construction of modifications to existing DOE Hazard Category 1, 2, and 3 non-reactor nuclear facilities when the proposed modifications significantly degrades the approved safety basis for the facility.

Draft guidance has been developed and provided in DOE G 420.1-X (Draft) and DOE G 420.1-Y (Draft) and it is assumed that this guidance will be formally approved and released before implementation of this subsystem is begun and will be applicable.

### **3.2.12 Life Cycle Asset Management (LCAM)**

The design, construction, and operation of the <sup>233</sup>U Safe Storage System will require the participation of organizations external to the program. A logistics plan to identify those activities and the responsible parties will be developed as an action item identified in the Program Execution Plan (PEP). The Transportation subsystem will play a key role in operational logistics for the operational system.

Decontamination and decommissioning (D&D) planning is necessary in the analysis of life cycle costs and will be addressed during the design of any facilities for the <sup>233</sup>U Safe Storage System. The D&D concerns and costs of any existing facilities to be utilized or modified under the 97-1 program will be considered in any analysis of alternatives.

## **3.3 <sup>233</sup>U Processing Subsystem Requirements**

The processing subsystem will process all materials in current inventory (less any sent for early disposition) that do not meet the requirements of the storage standard. It is expected that the near term characterization efforts underway concurrent with the planning and implementation of the long-term safe storage system will provide much of the information to determine the scale of the processing effort. However, due to the plan to avoid unnecessary worker exposures in the near term by not opening every can, there will be uncertainties remaining in the amount of material that must be processed that can only be resolved at the time processing begins and physical inspection of the material can occur.

Processing includes the chemical conversion of materials not in the form prescribed by the standard to an acceptable form, stabilization of the material as required by the standard, and packaging of the material into storage canisters that meet the requirements of the standard.

### **3.3.1 Performance**

There are several specific concerns related to the processing of <sup>233</sup>U materials that the processing system design must address. Specifically,

- The subsystem must be designed to contain <sup>220</sup>Rn.
- The design of the processing system must be such that the need to accommodate the radiation fields associated with <sup>233</sup>U materials, especially the 2.6 Mev gamma from <sup>208</sup>Tl does not compromise the schedule objectives.

- The system must be capable of removing the <sup>233</sup>U packages from storage for transfer to a beneficial use facility, and receiving returned material in packages that meet the storage standard.

### **3.3.2 Functional**

Not all of the functions identified in Section 3.3.2 apply to every item currently in inventory. Which functions apply are affected by the status and condition of the material.

### **3.3.3 Integration and Interface Control**

An interface control document (ICD) will be prepared to define all of the interface requirements for each interface. Each ICD will be prepared by and agreed to by all parties associated with the interface. It is intended that as the decomposition of the functions proceeds, additional lower level interfaces will be identified and documented in a similar manner.

### **3.3.7 Safeguards and Security**

Because highly-enriched <sup>233</sup>U material has potential uses as a weapons material, the safe storage system for such material must be designed to provide adequate safeguards for the material while in-process. Access controls for processing areas and in-line secure storage may be required to adequately protect this material during processing and when the process equipment may be unattended.

### **3.3.8 Reliability, Availability, and Maintainability**

The reliability of the processing subsystem equipment must be designed to meet the throughput requirements for the system and to minimize personnel exposures resulting from maintenance of the equipment.

## **3.4 Storage Subsystem Requirements**

The storage subsystem is the component of the <sup>233</sup>U Safe Storage System that will ensure that the material is safely maintained for a period of at least 50 years. It is an objective that this system function with a minimum of required operating staff and be of sufficiently robust design that the systems will require minimum maintenance over its life cycle. The balancing of these objectives will be accomplished in the design to minimize life cycle costs. These objectives will be considered in the trade studies conducted to select among the alternatives available to accomplish the program.

### **3.4.1 Performance**

The storage subsystem must be able to receive and insert material canisters into storage with minimal delay

### **3.4.3 Integration and Interface Control**

Material may come to the storage subsystem from two other subsystems. Material processed by the processing subsystem and material currently in interim storage that already meets the safe storage standards may be transferred to the long-term storage subsystem. In some cases the transfer could be from a co-located processing or interim storage subsystem. It is also conceivable that interim storage facilities may be satisfactory for long-term storage and no relocation will be required.

### **3.4.6 Environmental Safety and Health**

In the event a material storage container is breached <sup>220</sup>Rn may be released as a gas which must be contained within facility systems to prevent releases to the environment above acceptable levels.

### **3.4.7 Safeguards and Security**

Safeguards will be required for all materials above STLs. If <sup>233</sup>U is blended with depleted or natural uranium from the EU/DEU system it may be possible to reduce the cost of storing the material even though the quantity of material is substantially increased. The decision to do so will require trade studies that balance processing costs, storage costs, impact on beneficial uses, and disposition impacts.

## **3.5 Transportation Subsystem Requirements**

The transportation subsystem as defined for this system refers to the facilities to receive and ship material for any of the other subsystems. This includes the capability to receive the material from a co-located process, place the material into appropriate, approved shipping containers, remove received material from such containers, order and coordinate the required shipping services, and operate the shipping facilities.

Transportation facilities will be co-located with storage, processing, or waste management facilities associated with the <sup>233</sup>U Safe Storage System. Transportation facilities include all equipment necessary to perform the above functions, including the shipping containers.

### **3.5.1 Performance**

It is intended that the transportation subsystem be able to handle all required transfers without undue delays due to lack of subsystem capacity. Subsystem capacity will be determined by analysis during the conceptual design phase of this program.]

Some portions of this subsystem may not be required in the case of co-location of other subsystems (co-located processing and storage for example could share a single transportation subsystem).]

### **3.5.3 Integration and Interface Control**

The transportation subsystem will manage the movement of materials to and from <sup>233</sup>U Safe Storage System facilities. Each facility will have a shipping and receiving component with the capability to package and remove packaging for transport. The subsystem will also be responsible for acquiring and maintaining transportation packaging that meets all DOE and DOT requirements. Facilities will include equipment to handle material and transportation packaging.

## **3.6 Waste Management Subsystem Requirements**

The waste management subsystem will receive and store all of the wastes produced by the other subsystems. The generating subsystem will be required to provide the material in a disposable form and with required documentation. Waste management will store the material and eventually ensure that the material is shipped to appropriate disposal sites.

There are some existing materials in storage that may be reclassified as wastes. If this is the case, the waste management subsystem will be responsible for retrieving it and transmitting it to the appropriate DOE EM organization for treatment and disposal.

### **3.6.1 Performance**

The waste management subsystem will be capable of receiving and storing all materials that are produced by the other subsystems of the <sup>233</sup>U safe storage subsystem without impacting the performance of those subsystems.

### **3.6.2 Functional**

Because the waste management facilities are expected to be co-located in processing and storage facilities, security and access control must be governed primarily by the requirements of those subsystems.

### **3.6.3 Integration and Interface Control**

The waste management subsystem will support the other three <sup>233</sup>U Safe Storage System components by receiving wastes and managing those wastes until transfer to EM for disposition. If it is economical, some recovery of nuclear materials from the wastes to reduce waste volumes could be performed resulting in some material being returned for transfer to processing and/or storage and a modified form for waste disposition. Some of the wastes may already exist and some may be existing materials that are reclassified as waste as a result of the effort under this program resulting in an interface with existing site stored materials. [

## D-2 Site Descriptions and Capabilities.

### D-2.1 Oak Ridge National Laboratory

#### *D-2.1.1 ORNL Existing Processing Capability.*

ORNL Building 3019 processing systems were utilized in the past for a variety of programs (including the Manhattan Project) involving handling and (re)processing <sup>233</sup>U, <sup>235</sup>U, <sup>239</sup>Pu and a variety of other radionuclides. These formerly used systems exist but have not been utilized since operations were discontinued.

Building 3019 has existing capabilities that broadly address the required <sup>233</sup>U processing subsystem capabilities. These capabilities currently exist primarily in unshielded glove-box enclosures that provide for the handling, characterizing, conversion to a stable chemical form, and repackaging of high grade <sup>233</sup>U materials. Shielded, remote capabilities are currently being established to perform these activities for lower quality (higher gamma hazard) <sup>233</sup>U materials.

#### *D-2.1.2 ORNL Existing Storage Capability.*

The Radiochemical Development Facility (RDF, Building 3019) is the national repository for over half of the <sup>233</sup>U inventory. It currently holds over 1000 canisters with over 3,000 containers of <sup>233</sup>U in the form of pure and impure metals, oxides, and salts. This material has a total uranium mass of 1,382 kg, including 427 kg of <sup>233</sup>U and 796.4 kg of <sup>235</sup>U. The facility capacity is approximate 80% utilized (volumetric). Receipt of materials containing predominately <sup>233</sup>U from other DOE sites has begun and is planned to continue in the near term.

Building 3019 activities involve the safe storage of <sup>233</sup>U; receiving, storing and dispensing materials containing <sup>233</sup>U; maintaining <sup>233</sup>U processing systems, liquid storage tankage, process boxes, remotely operated cells and ancillary support equipment; surveillance and technical management support systems including training, configuration management, and conduct of operations and maintenance. The principal features of the building are its storage wells, laboratories (equipped with radiochemical hoods and glove boxes) and shielded cells. Nuclear criticality safety of material stored in the wells is maintained by a combination of mass, geometry and concentration controls. A Vessel Off Gas (VOG) system is connected to the wells to control potential releases of <sup>233</sup>U from storage containers in the wells. Effluent from the VOG system is routed to an off-gas treatment system where it is scrubbed to remove acidic vapors (from other processes at ORNL) and filtered through roughing and HEPA filters. This effluent is then exhausted to the 3039 stack. In the event of an interruption of the off-gas treatment system the VOG is also routed to the main Building 3019 ventilation system which provides HEPA filtration prior to discharge via the 3020 stack.

The Radiochemical Development Facility (RDF, Building 3019) is a facility originally built in 1942 (TBR) to demonstrate chemical separation processes for irradiated nuclear reactor fuels.

### **D-2.1.3 ORNL Existing Waste Management Capability.**

ORNL radioactive waste management activities primarily involve transuranic waste (TRU) and low-level waste (LLW). Small quantities of naturally occurring and accelerator-produced radioactive material are generated and managed as LLW.

Radioactive waste management operations include solid, liquid, and gaseous waste activities. Each of these areas is summarized below.

- ORNL has the capability for handling of both CH-TRU and RH-TRU wastes.
- Solid Low-level Waste – Since January 1994, ORNL solid low-level waste is disposed of in the above grade tumulus Interim Waste Management Facility.
- Liquid Low-level Waste (LLLW) – ORNL employs two systems for handling and processing liquids that contain radioactive constituents: the LLLW System and the Process Waste System (PWS).
- Process Waste – The process waste system handles all liquid aqueous waste that contains trace amounts of radioactivity, heavy metals, and organics or has the potential to be contaminated with these constituents.
- Gaseous Waste – The bulk of gaseous waste that is contaminated or potentially contaminated with radionuclides is collected and discharged through existing major stacks. Where conditions dictate chemical scrubbers are used in the process off-gas streams to remove reactive gases such as halogens and acidic vapors prior to discharge to the ventilation system.
- Mixed Waste Management – Mixed waste contains both hazardous (RCRA and or TSCA) and radioactive components. Mixed waste is stored pending available treatment and disposal at offsite facilities such as the Envirocare facility in Clive, Utah.

## **D-2.2 Idaho National Engineering and Environmental Laboratory**

### **D-2.2.1 INEEL Existing Processing Capability.**

The Idaho Nuclear Technology and Engineering Center (INTEC), formerly the Idaho Chemical Processing Plant, still has significant processing capability, although most of it has not run since prior to April 1992. This capability includes dissolution capability for aluminum-clad fuel material, stainless steel-clad material, and zirconium-clad material. One cycle of solvent extraction using tributylphosphate and two cycles of methylisobutyl ketone are still in existence. A fluidized bed denitration process still exists to convert uranyl nitrate to uranium trioxide. In addition, the support functions for the storage of spent fuel, liquid and solid waste management, and the capability to convert high-level liquid waste to calcined oxides still exists.



Small-scale processing includes the Remote Analytical Laboratory, which has hot cell space with centrifugal contactors for solvent extraction. Unshielded pilot plants provide the experimental-scale capability for most types of nuclear-related capability. All of these facilities could be used to process <sup>233</sup>U.

#### ***D-2.2.2 INEEL Existing Storage Capability.***

Storage for radioactive materials is extensive at INTEC and includes basin storage and dry vault storage in either the underground vaults or the Irradiated Fuel Storage Facility for highly-radioactive materials. Standard vault storage is also available in CPP-651. At the present time, this storage meets the requirements for Category II storage and is large enough to store the entire inventory of <sup>233</sup>U in the United States.

#### ***D-2.2.3 INEEL Existing Waste management Capability.***

Until April 1992, INTEC's primary mission was to process HEU from highly irradiated spent nuclear fuel. As a result, a waste system was put in place to deal with all kinds of wastes generated during the recovery of HEU. The wastes included low-level and high-level liquid wastes, gaseous waste (including the recovery of krypton and xenon), and solid wastes, including the high-level calcine and low-level solid waste that was sent to the Radioactive Waste Management Complex.

Because of this extensive experience, no waste generated during any processing operations for <sup>233</sup>U would be expected to present a problem.

### **D-2.3 Los Alamos National Laboratory**

#### ***D-2.3.1 LANL Existing Processing Capability.***

Los Alamos currently has minimal processing capability for <sup>233</sup>U. Glove boxes do exist in which <sup>233</sup>U items have been repackaged and consolidated and there are hot cells that are currently used to store some <sup>233</sup>U. There is space available to reconfigure for handling all <sup>233</sup>U at Los Alamos to meet the requirements of The Defense Nuclear Facility Safety Board Recommendation 97-1 for interim storage of <sup>233</sup>U until a long-term facility is available.

#### ***D-2.3.2 LANL Existing Storage Capability.***

Los Alamos has 364 floor hole storage units located in Wing 9 of the Chemistry and Metallurgy Research Building. These units are made of massive concrete are ventilated and have capability of cooling. There is the possibility of using approximately 100 of these floor hole locations for storing <sup>233</sup>U.

### D-2.3.3 LANL Existing Waste management Capability.

Los Alamos has a large waste management capability. This operation is capable of dealing with a variety of waste issues that may arise at the Laboratory

### D-2.4 Miscellaneous University and Smaller Laboratory Sites

The inventory and status of the small sites is not fully documented at this point. Continuing effort to determine quantities and status of these materials will continue. Only the materials at DOE laboratories are well documented

## D-3 Disposition System Considerations

The <sup>233</sup>U Safe Storage System will be designed to be compatible with the projected disposition options being planned by DOE to the extent practicable within Life Cycle Cost constraints as determined by trade studies. These options are presented in ORNL/TM-13550.

The Disposition alternatives under consideration by DOE are summarized in Table D-1.

**Table D-1.** Disposition Alternatives

<i>Option</i>	<i>Description</i>	<i>Disposition Form</i>
A	Dispose as High Level Waste (HLW) in the planned SNF HLW repository by mixing with HLW sludge containing depleted uranium (DU) and vitrify in a glass log.	Vitrified (glass)
B	Mix with DU and convert to a uranium oxide for disposal in the planned SNF HLW repository.	Oxide
C	Mix with DU and convert to a uranium oxide for disposal at WIPP.	Oxide
D	Mix with DU as an oxide, fabricate as LWR fuel and use it in a commercial nuclear reactor	UO <sub>2</sub>
E	Direct disposal of LWBR fuel in WIPP or the SNF HLW repository.	Clad UO <sub>2</sub> /ThO <sub>2</sub> Fuel
F	Package the <sup>233</sup> U in aluminum cans, press the <sup>233</sup> U cans into sheets and intermix with DU sheets, then melting the combination to create a semi-homogeneous solution. Dispose in repository.	Metal in Al can
G	Treat as remote handled or contact handled TRU waste by co-processing with TRU wastes.	?
H	Dispose in a Greater Confinement Disposal facility (none exist today).	?

The disposition subsystem may require that material be processed into a form suitable for final disposition prior to placing the material in its final location. This would require transfer of

material from the transportation subsystem to a disposition processing facility and then to the disposition facility or facilities.

It is possible that some material may be disposed prior to going to long-term storage. In this event, it will be necessary to be able to segregate selected material, place it in appropriate containers, and ship it to the designated disposition processing site.