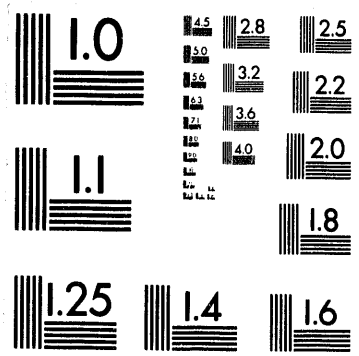
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DOE/RW-0425

Office of Civilian Radioactive Waste Management

Transportation System Requirements Document

Revision 0

(D00000000-00811-1708-00002)

September 1993

U.S. Department of Energy
Office Of Civilian Radioactive Waste Management
Washington, DC 20585

MASTER

Office of Civilian Radioactive Waste Management

WBS:
QA:
Page: 1 Of: 2

BCCB CHANGE DISPOSITION SUMMARY RECORD

1. BCP NUMBER	3. ORIGINATOR'S NAME	5. CHANGE LEVEL	6. PRIORITY LEVEL	7. DISPOSITION DATE
BCP-00-93-0001	W. Lemeshewsky	☐ 0 ☑ 1 ☐ 2 ☐ 3	☑ ROUTINE ☐ FIELD ☐ PRIORITY ☐ EMERGENCY ☐ URGENT	
2. DATE REC'D	4. ORIGINATOR'S ORGANIZATION			8. BCP TYPE ☑ TECHNICAL ☐ MANAGEMENT
	RW-321			

9. BCP DESCRIPTION/TITLE

Initial issuance of the TRANSPORTATION SYSTEM REQUIREMENTS DOCUMENT (TRANS-SRD).

10. DISPOSITION RECOMMENDATION: ☐ ESAAB ☑ PROGRAM ☐ PO YMP ☐ PO MRS PROJECT ☐ FIELD ☐ CONTRACTOR _____

BOARD MEMBER SIGNATURE		RECOMMENDATIONS (See Block 10 Instructions)
T. Saltzman, RW-2	See attached Request for Disposition.	Approve
D. Horton, RW-3	See attached Request for Disposition.	Approve
C. Kouts, RW-4	See attached Request for Disposition.	Approve with conditions [RESOLVED]
A. Benson, RW-5	See attached Request for Disposition.	Approve
S. Rousso, RW-10	See attached Request for Disposition	Approve with conditions [[RESOLVED]
L. Smith, RW-20	See attached Request for Disposition	Approve with conditions [RESOLVED]
D. Shelor, RW-30	See attached Request for Disposition	Approve
R. Milner, RW-40	See attached Request for Disposition	Approve with conditions [RESOLVED]
S. Rousso, RW-50	See attached Request for Disposition	Approve

DIRECTIVE

11. CHANGE DISPOSITION: * SEE BLOCK 13

☑ APPROVE ☐ DEFER*

☐ APPROVE WITH CONDITIONS*

☐ DISAPPROVE* ☐ CANCEL*

12. BCCB CHAIRMAN SIGNOFF:

PRINT Lake H. Barrett

SIGN for Lake H. Barrett DATE 9/13/93

13. CHAIRMAN'S JUSTIFICATION/CONDITIONS/LIMITATIONS

☐ See Continuation Page ____

14. BCCB DIRECTIVE/IMPLEMENTING INSTRUCTIONS FOR DOCUMENT(s)

☑ See Continuation Page 2

15. BCCB DIRECTIVE/IMPLEMENTING INSTRUCTIONS FOR AFFECTED CONFIGURATION ITEM(s)

☐ See Continuation Page ____

14. BCCB Directive/Implementing Instructions for Documents

A. The Trans-SRD is effective upon issuance and supersedes the Physical System Requirements - Transport Waste document as the technical baseline for the Transportation System.

B. All portions of the CRWMS Requirements document (CRD) are in effect and binding and the Physical System Requirements - Overall System thereby superseded in its entirety upon issuance of the Trans-SRD.

The following additional required implementing actions may be completed after the Trans-SRD is in effect.

C. RW-30 shall:
   1. Establish a Trans-SRD Issues List to assist in tracking and resolving all items identified as <TBR> (to be resolved) or <TBD> (to be determined) to distinguish issues that remain unresolved following the review and approval process.
   2. In preparation for the next general revision of the CRWMS Requirements document (CRD) and System Requirements documents (SRDs), evaluate the content/information for section 5 of these documents and identify potential deletions and/or additions thereto.
   3. In preparation for the next general revision of the CRD, determine potential changes to the CRD with regard to issues identified in the comments column of "CRD Requirements Cross-Reference to Trans-SRD", as submitted with BCP-00-93-0001.
   4. In preparation for next general revision of the CRD, evaluate CRD allocation of each of the following source documents to the Trans-SRD to determine deletion from the CRD or addition to the Trans-SRD: 33CFR323, 40CFR61, 41CFR109-40, 49CFR175, DOE Order 1324.2A, DOE Order 3790.1A
   5. Incorporate changes in text during the next revision of the OCRWM Systems Engineering Management Plan and Program Management System Manual to reflect the CRD and SRDs as the current program-level technical baseline.

D. RW-10 shall incorporate a change in text during the next revision of the Program Cost and Schedule Baseline to reflect the CRD and SRDs as the current program-level technical baseline.

E. RW-40 shall establish the means to ensure that the requirements in the Trans-SRD will be properly reflected in the Transportation System Design Requirements Document.

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1. SCOPE

1.1 IDENTIFICATION

This Transportation System Requirements Document (Trans-SRD) describes the functions to be performed by and the technical requirements for the Transportation System to transport spent nuclear fuel (SNF) and high-level radioactive waste (HLW) from Purchaser and Producer sites to a Civilian Radioactive Waste Management System (CRWMS) site, and between CRWMS sites.

The development and control of the Trans-SRD is quality-affecting work and is subject to the requirements of the Department of Energy (DOE) Office of Civilian Radioactive Waste Management (OCRWM) Quality Assurance Requirements and Description (QARD) [DOE/RW-0333P]. As part of the technical requirements baseline, it is also subject to OCRWM Baseline Management Plan (BMP) [DOE/RW-0381P] controls. The Trans-SRD has been prepared and managed in accordance with the *CRWMS M&O Technical Document Preparation Plan (TDPP) for the Transportation System Requirements Document.*

1.2 PURPOSE OF CRWMS REQUIREMENTS DOCUMENTS

1.2.1 CRWMS Requirements Hierarchy

The OCRWM Systems Engineering Management Plan (SEMP) [DOE/RW-0051P] establishes the technical document hierarchy (hierarchy of technical requirements and baseline documents) for the CRWMS program. Figure 1-1 illustrates the program-level technical requirements documents in this hierarchy. This set of documents establishes the system requirements to be addressed in the design of the system elements, one of which is Transportation.

Many of the technical requirements for the CRWMS are documented in the Nuclear Waste Policy Act of 1982 (NWPA) and in a variety of Federal regulations, DOE directives and orders, and other Government documents. The CRWMS Requirements Document (CRD) [DOE/RW-0406P] establishes the top-level technical requirements for the entire program by summarizing source documentation that must be addressed, and by deriving requirements not covered in the regulations but necessary to accomplish the CRWMS mission. The CRD also identifies top-level functions for each element, defines the top-level system architecture of the CRWMS, and allocates the functions and requirements to the architectural elements of the system, including Transportation. In doing so, the CRD establishes the basis for the requirements to be addressed and expanded in the Trans-SRD and in the system requirements documents for the other elements. Additionally, the CRD establishes the basis for the identification of interfaces in the CRWMS Interface Specification (IFS).

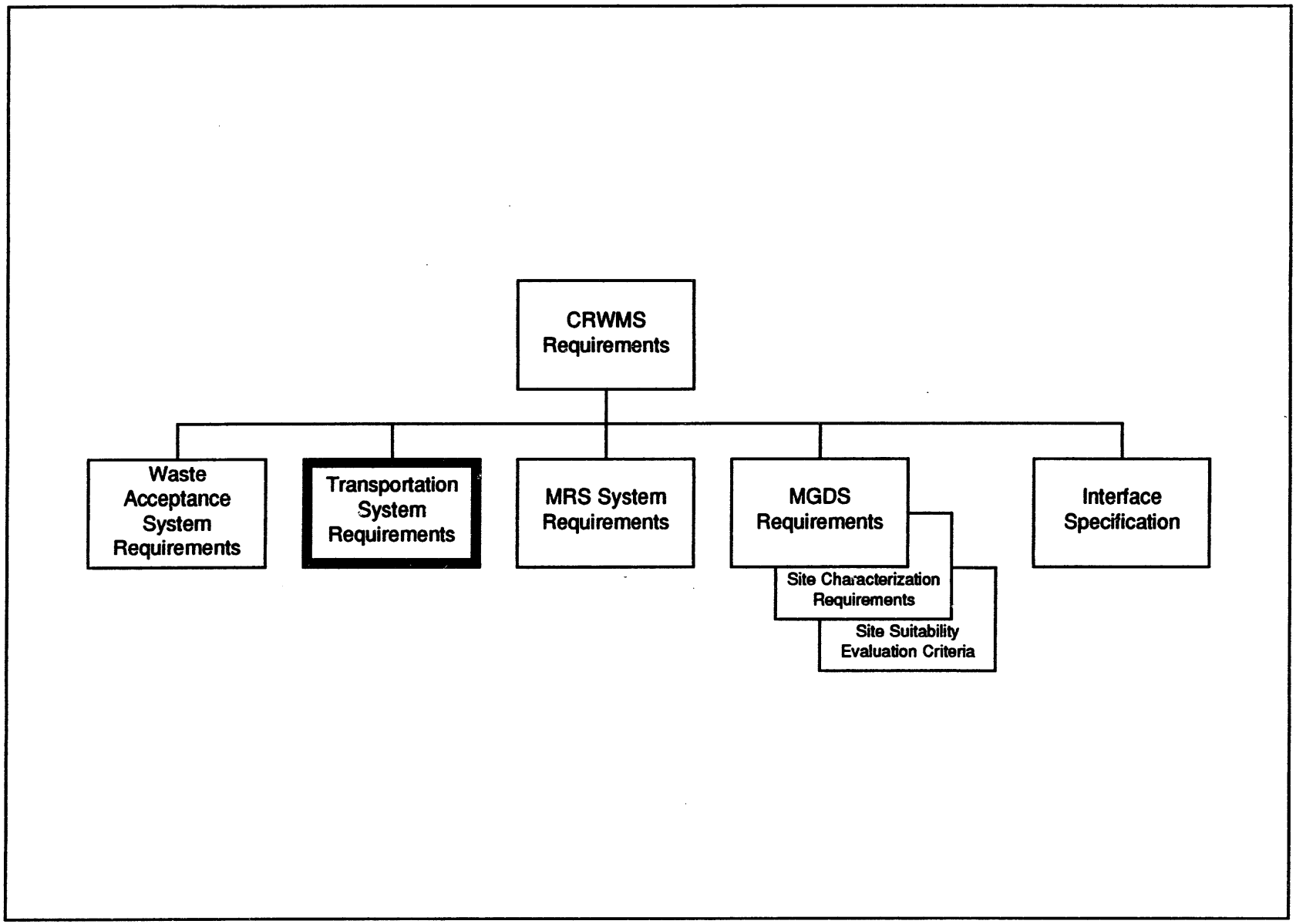

Figure 1-1. Program-level System Requirements Documents

1.2.2 Purpose of Trans-SRD

The purpose of this document is to define the system-level requirements for Transportation consistent with the CRD. These requirements include design and operations requirements to the extent they impact on the development of the physical segments of Transportation. The document also presents an overall description of Transportation, its functions, its segments, and the requirements allocated to the segments and the system-level interfaces with Transportation. The interface identification and description are published in the CRWMS IFS.

1.3 CRWMS/TRANSPORTATION OVERVIEW

The following section provides a brief overview of the CRWMS and the Transportation System.

1.3.1 Transportation Mission

The mission of Transportation is to transport:

- SNF from Purchaser[1] sites to the Monitored Retrievable Storage (MRS) facility or Mined Geologic Disposal System (MGDS),
- SNF from the MRS facility to the MGDS,
- HLW from Producer[2] sites to the MGDS, and
- SNF and HLW from the MGDS during the retrievability period, as required

in a safe and economic manner while maintaining the quality of the environment and using the private sector to the fullest extent possible. The mission must be accomplished in accordance with Nuclear Regulatory Commission (NRC), Department of Transportation (DOT), and Environmental Protection Agency (EPA) regulations and appropriate State, local, and Tribal regulations governing the transportation of radioactive materials.

1.3.2 CRWMS Background

The NWPA assigned DOE the responsibility for managing the disposal of SNF and HLW of domestic origin. The process and the schedule for this program were specified initially in the NWPA. Additionally, a Presidential Memorandum dated April 30, 1985, stated that there was no compelling reason to build a separate repository for defense HLW; therefore, the waste will be emplaced in a civilian geologic repository. In the Nuclear Waste Policy Amendments Act

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[1] A Purchaser is an owner or generator of SNF from civilian reactors.

[2] A Producer is an owner or generator of HLW.

(1987) (NWPAA), Yucca Mountain, Nevada, was designated for characterization as the candidate site for a geologic repository.

The CRWMS will accept SNF and solidified HLW. The NWPA defines SNF as the fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing. As used in this document, SNF is defined to include nonfuel components and hardware as identified in 10CFR961. HLW is defined as the highly radioactive material resulting from the reprocessing of SNF. This includes liquid waste produced directly in reprocessing, any solid material derived from such liquid waste that contains fission products in sufficient concentrations, and other highly radioactive material that has been determined by the NRC, consistent with the law, to require permanent isolation. As used in this document, HLW is defined as solidified HLW resulting from commercial and defense operations. Note that the 10CFR60 definition of HLW includes SNF.

In the NWPA, Congress identified that storage of SNF in MRS facilities is a safe and reliable option for management of SNF. In the NWPAA, Congress authorized the Secretary of Energy to site, construct, and operate one MRS. As stated in 10CFR72, the MRS will have an initial 40-year license term with the option for renewal by the NRC. The MRS is to provide temporary storage of SNF until the SNF is shipped to the MGDS for permanent disposal. Additionally, SNF can pass-through or flow-through the MRS to the MGDS. HLW will be shipped from the Producer sites directly to the MGDS.

1.3.3 Transportation System Concept

The top-level CRWMS function, "Manage Waste Disposal," means to direct or control any physical activity, operation, or process conducted to accept, and after acceptance, transport, store, or dispose of SNF or HLW. For planning, systems analysis, and conceptual design purposes, Manage Waste Disposal is broken down into four subfunctions that the CRWMS must perform; these are Accept Waste, Transport Waste, Store Waste, and Dispose of Waste. The four corresponding system elements of the CRWMS that have been identified to implement these functions are Waste Acceptance, Transportation, MRS, and MGDS.

Figure 1-2 provides a pictorial description of the CRWMS; the Transportation System element, herein referred to as Transportation, is described in the following paragraphs.

Transportation is responsible for transporting the waste to the MRS and/or to the MGDS, as appropriate, once the waste has been accepted by Waste Acceptance. Transportation is responsible for developing, purchasing, operating, and maintaining the transportation cask systems. The transportation casks must be certified by the NRC. In addition, Transportation is responsible for contracts with highway and rail carriers, for maintaining transportation schedules, and for tracking waste shipments, all of which must meet necessary transportation regulatory requirements.

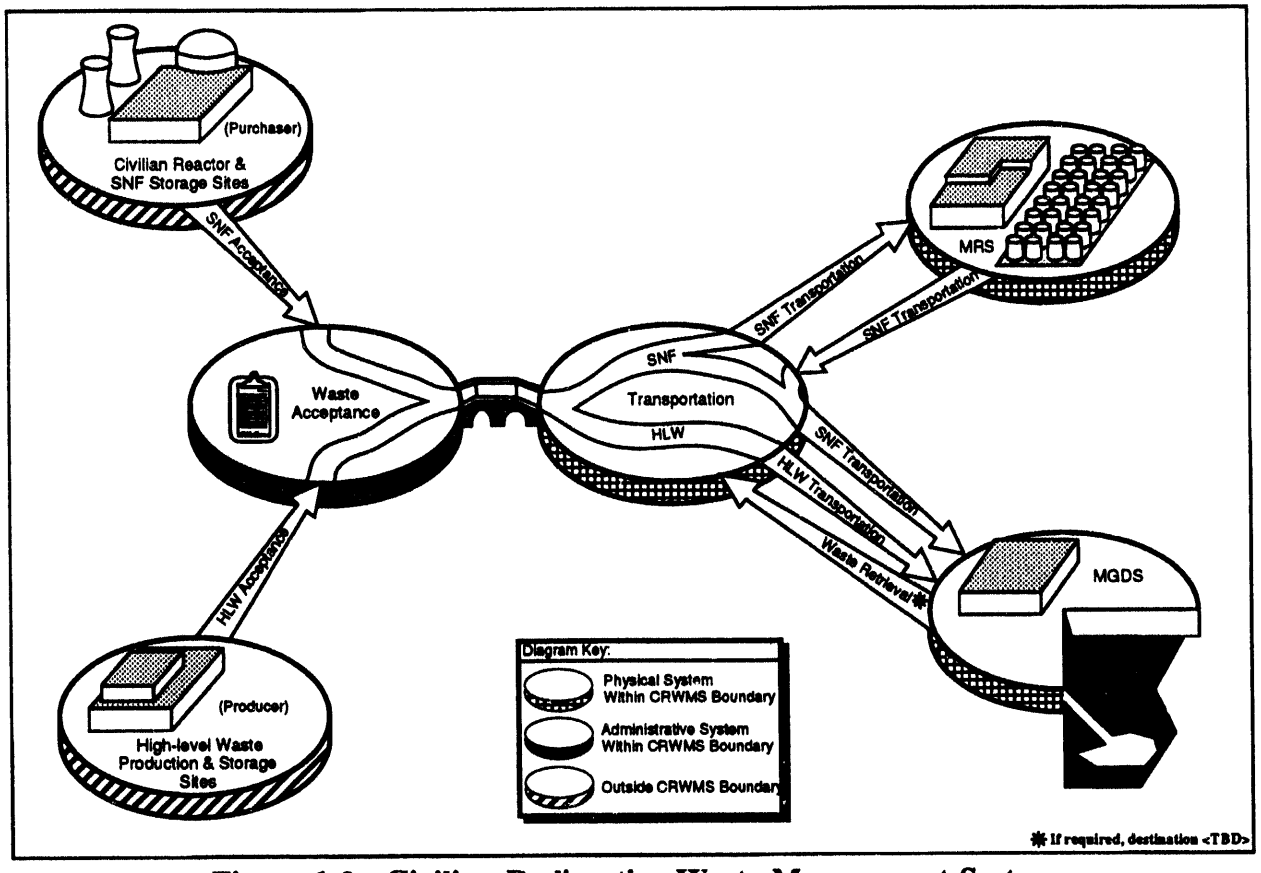

Figure 1-2. Civilian Radioactive Waste Management System

SNF will be shipped by both truck and rail to the MRS. Intermodal transfer from barge or heavy-haul to rail may occur during transport in some shipments. SNF will be shipped only by rail from the MRS to the MGDS. Once the MGDS begins accepting waste, SNF may be shipped from Purchaser sites that are in close proximity to the MGDS directly to the MGDS by truck or rail. HLW will be shipped by rail from the Producer sites to the MGDS.

Transportation will include at least one Cask Maintenance Facility (CMF) to support the maintenance of the transportation cask systems. While programmatically and operationally part of Transportation, the initial CMF is to be collocated with the MRS and may be integrated with that system element. A second CMF is assumed to be located at the MGDS. **<MGDS: TBR>**

1.3.4 Transportation Functions

The following list represents the decomposition of the primary function of Transportation, which is to Transport Waste. These functions are further decomposed in Section 3.1 and described in Appendix A. The Physical System Requirements-Transport Waste document [DOE/RW-0352] served as a reference for establishing these functions:

A. **Manage Transportation System.** This function receives information from Accept Waste, Store Waste, and Dispose of Waste functions (1.1, 1.3, and 1.4, respectively). This information is used to plan and direct the operation of Transportation. Additionally, this function includes managing CRWMS traffic, conducting field operations, and ensuring regulatory compliance.

B. **Ship Cask System.** In this function, the loaded, unloaded, or new cask on the transporter is prepared for shipment (and delivery to the carrier). The loaded cask system is transported from the Purchaser/Producer site to a CRWMS site (or between CRWMS sites). The unloaded cask system is transported to a Purchaser/Producer site or a CRWMS site. The new cask system is transported to a CRWMS site. Delivery of the cask system to its designated location terminates this function.

C. **Support Transportation System.** This function assists the Manage Transportation System function and the Ship Cask System function by inspecting and maintaining transportation cask systems, keeping inventory of transportation cask systems, providing training and outreach support, and other administrative support efforts.

1.4 DOCUMENT ORGANIZATION AND DESCRIPTION

1.4.1 Document Organization

The Trans-SRD is organized as follows:

A. **Section 1: Scope.** This section presents the system overview including the Transportation mission and system concept.

B. **Section 2: Applicable Documents.** This section identifies documents that are specifically related to various requirements of Transportation. The documents are included to provide requirement traceability to the source documents and are not to be incorporated as requirements themselves.

C. **Section 3: Requirements.** This section begins with a system definition and contains requirements of Transportation at the system-level except for the preparation for operation requirements in Section 5. Performance characteristics and interface requirements are presented. Specialty engineering and logistics requirements are addressed along with requirements for documentation, personnel, and training. A breakout of requirements for each segment follows these requirements. Quality assurance requirements are also provided.

D. **Section 4: Conformance Verification.** This section addresses conformance verification and includes a cross-reference matrix to define how conformance with each requirement of Sections 3 and 5 is to be verified.

E. **Section 5: Preparation for Operations.** This section contains requirements for preparation of the system for operations.

F. **Section 6: Notes.** This section contains material that is explanatory in nature and that is nonbinding on Transportation development.

G. **Appendices:** Data included in the appendices are binding with regard to Transportation requirements and may be changed only through the formal document change procedures. This document includes two appendices:
Appendix A: Transportation Function Descriptions
Appendix B: Allocation of Functions to Architecture

1.4.2 Document Description

The Trans-SRD establishes the system-level requirements baseline for Transportation. As indicated in the outline in Section 1.4.1, Section 3 of the document is the primary location of the requirements, although some appear in Section 5. The requirements and source documents allocated to Transportation by the CRD are addressed in expanded form. Requirements are included that have been derived to meet the system mission. Requirements that are regulatory requirements for another system element (e.g., MRS) have also been included when it has been determined that they are applicable to Transportation. The applicability of these requirements is derived. Section 3.1 establishes the description of the system in terms of functions and architectural segments and the relationship between the two. Sections 3.2 to 3.6 address interface and specialty engineering requirements applicable to Transportation. Specialty engineering disciplines include safety, human factors, value engineering, logistics and security. Section 3.7 contains requirements associated with specific Transportation segments.

The statement of a requirement is followed by the identification, in square brackets, of the original source document from which the requirement is traced. When no source document is identified, the Trans-SRD is the authority for the requirement, and the identification and determination of the requirement is documented on Issue Clarification and Derived Requirements Documentation Forms in the Quality Assurance (QA) record for the Trans-SRD. In these instances, the requirement is labeled [Derived]. Additionally, the legal or regulatory basis for requirements is documented on Requirements Backup Sheets in the QA record for the Trans-SRD; these records are not included within the Trans-SRD. These sheets provide a statement of the requirement as it appears in the Trans-SRD and, where applicable, provide a rationale for any interpretation of the basic requirement.

A fundamental approach of the Trans-SRD is to provide statements of the requirements that give clear engineering direction that are verifiable and that do not depend upon the context in which they were originally presented. Inasmuch as Transportation is evolving, some of this can only

be done on an iterative basis. As a result, some requirements in early versions of requirements documents contain specifics that are still to be determined and are labeled **<TBD>**. These statements provide a place holder and ensure that the requirements are developed and traceable through the requirements documents. In other instances, engineering judgement and currently available information may permit a value to be stated for use in design. Because these values are based on assumed operations, they are subject to change as the total system becomes more well defined, and are labeled **<TBR>**. These requirements were coordinated with the Transportation design organization and other affected organizations to ensure a consistent approach was followed. The values are to be used by the design organization for the design. The **<TBR>** serves as a flag to indicate that these requirements impact other elements and may change based on CRWMS decisions. Therefore, the design should allow for as much flexibility for change as is practical. **<TBP>**, or "to be published," is used to identify documents that are yet to be developed.

2. APPLICABLE DOCUMENTS

The documents identified in Sections 2.1 - 2.4 are specifically referred to or have provided the basis for requirements contained in the Trans-SRD. These documents are not to be incorporated as requirements themselves.

For each document, the issue in effect on the date of the approval of this requirements document forms a part of the requirements to the degree specified herein. The lower level Design Requirements Document (DRD) and procurement specifications are to use revisions and issues of source documents that reflect the date of approval of those documents.

Section 2.5 identifies reference materials that have not been used as sources of requirements, but have contributed to the development of the Trans-SRD in other ways.

2.1 FEDERAL LAWS AND DOCUMENTS

The following are used as sources of requirements in the Trans-SRD.

2.1.1 Federal Laws

A.	7USC136 et seq.	Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1988 (P.L. 100-532)
B.	15USC2601 et seq.	Toxic Substances Control Act (P.L. 99-519)
C.	29USC651 et seq.	Occupational Safety and Health Act (P.L. 91-596)
D.	33USC1251 et seq.	Clean Water Act of 1977 (P.L. 95-217)
E.	42USC300f et seq.	Safe Drinking Water Act (SDWA) (P.L. 93-523)
F.	42USC4321 et seq.[1]	National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190)
G.	42USC6901 et seq.	Resource Conservation and Recovery Act (RCRA) (P.L. 94-580)
H.	42USC7401 et seq.	Clean Air Act (CAA) (P.L. 91-604)

[1] This document is identified in Trans-SRD Requirement 3.4.1.1.B. It must be reviewed for design impact and for inclusion of requirements into the Transportation System DRD.

I.	42USC9601 et seq.[1]	Comprehensive Environmental Response, Compensation and Liability Act (SuperFund) as amended by the SuperFund Amendments and Reauthorization Act (SARA) of 1986 (P.L. 99-499)
J.	42USC10101 et seq.	Nuclear Waste Policy Act of 1982 (NWPA) (P.L. 97-425)
K.	42USC10101 et seq.	Nuclear Waste Policy Amendments Act of 1987 (NWPAA) (P.L. 100-203)

2.1.2 Federal Regulations

A.	10CFR19	Notices, Instructions and Reports to Workers: Inspection and Investigations
B.	10CFR20	Standards for Protection Against Radiation
C.	10CFR21	Reporting of Defects and Noncompliance
D.	10CFR51[1]	Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions
E.	10CFR60	Disposal of High-Level Radioactive Waste in Geologic Repositories
F.	10CFR71	Packaging and Transportation of Radioactive Material
G.	10CFR72	Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste
H.	10CFR73	Physical Protection of Plants and Materials
I.	10CFR75	Safeguards on Nuclear Material-Implementation of US/IAEA Agreement
J.	10CFR961	Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste

[1] This document is identified in Trans-SRD Requirement 3.4.1.1.B. It must be reviewed for design impact and for inclusion of requirements into the Transportation System DRD.

K.	10CFR1021[1]	National Environmental Policy Act Implementing Procedures
L.	29CFR1910	Occupational Safety and Health Standards
M.	29CFR1926	Safety and Health Regulations for Construction Work
N.	33CFR1 - 199[1]	Coast Guard Department of Transportation
O.	40CFR50	National Primary and Secondary Ambient Air Quality Standards
P.	40CFR60	Standards of Performance for New Stationary Sources
Q.	40CFR110 - 136	Environmental Protection Agency Water Programs
R.	40CFR141	National Primary Drinking Water Regulations
S.	40CFR143	National Secondary Drinking Water Regulations
T.	40CFR165	Regulations for the Acceptance of Certain Pesticides and Recommended Procedures for the Disposal and Storage of Pesticides and Pesticide Containers
U.	40CFR240 - 272	Environmental Protection Agency Solid Wastes
V.	40CFR261	Identification and Listing of Hazardous Waste
W.	40CFR262	Standards Applicable to Generators of Hazardous Waste
X.	40CFR263	Standards Applicable to Transporters of Hazardous Waste
Y.	40CFR270	EPA Administered Permit Programs; The Hazardous Waste Permit Program
Z.	40CFR747	Metalworking Fluids

[1] This document is identified in Trans-SRD Requirement 3.4.1.1.B. It must be reviewed for design impact and for inclusion of requirements into the Transportation System DRD.

AA.	40CFR761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
BB.	41CFR101	Federal Property Management and Regulations
CC.	49CFR171	General Information, Regulations and Definitions
DD.	49CFR172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information and Training Requirements
EE.	49CFR173	Shippers--General Requirements for Shipments and Packagings
FF.	49CFR174	Carriage by Rail
GG.	49CFR176	Carriage by Vessel
HH.	49CFR177	Carriage by Public Highway
II.	49CFR178	Shipping Container Specifications
JJ.	49CFR180	Continuing Qualification and Maintenance of Packagings
KK.	49CFR200 - 236[1]	Federal Railroad Administration
LL.	49CFR350 - 399[1]	Federal Motor Carrier Safety Regulations

2.1.3 Other Documents, Orders, and Directives

A.	DOD-HDBK-743A	Anthropometry of U.S. Military Personnel
B.	DOE Order 1332.1A[1]	Uniform Reporting System
C.	DOE Order 1540.1A	Materials Transportation and Traffic Management
D.	DOE Order 1540.2[1]	Hazardous Materials Packaging for Transport - Administrative Procedures

[1] This document is identified in Trans-SRD Requirement 3.4.1.1.B. It must be reviewed for design impact and for inclusion of requirements into the Transportation System DRD.

E.	DOE Order 1540.3A[1]	Base Technology for Radioactive Material Transportation Packaging Systems
F.	DOE Order 4330.4A	Maintenance Management Program
G.	DOE Order 4700.1	Project Management System
H.	DOE Order 5000.3B	Occurrence Reporting and Processing of Operations Information
I.	DOE Order 5480.3	Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes
J.	DOE Order 5500.1B[1]	Emergency Management System
K.	DOE Order 5500.4A[1]	Public Affairs Policy and Planning Requirements for Emergencies
L.	DOE Order 5900.2A[1]	Use of Metric System of Measurement
M.	DOE Order 6430.1A	General Design Criteria
N.	DOE-STD-HFAC	Human Factors Engineering Design Criteria, Draft January, 1993
O.	DOE/RW-0005	Mission Plan for the Civilian Radioactive Waste Management Program
P.	DOE/RW-0187	Draft 1988 Mission Plan Amendment
Q.	DOE/RW-0194P	Records Management Policies and Requirements
R.	DOE/RW-0239	DOE Position on the MRS Facility
S.	DOE/RW-0247	Report to Congress on Reassessment of the CRWM Program
T.	DOE/RW-0270P	Waste Management System Description Document

[1] This document is identified in Trans-SRD Requirement 3.4.1.1.B. It must be reviewed for design impact and for inclusion of requirements into the Transportation System DRD.

U.	DOE/RW-0316P	Draft Mission Plan Amendment
V.	DOE/RW-0331P	Annual Capacity Report December 1991
W.	DOE/RW-0333P	OCRWM Quality Assurance Requirements and Description
X.	DOE/RW-0406P	CRWMS Requirements Document (CRD)
Y.	MIL-STD-882B	System Safety Program Requirements
Z.	MIL-STD-1388 Series	Logistics Support Analysis
AA.	MIL-STD-1472D	Human Engineering Design Criteria for Military Systems, Equipment, and Facilities
BB.	NRC RG 8.8	NRC Regulatory Guide - Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable
CC.	NRC RG 8.10	NRC Regulatory Guide - Operating Philosophy for Maintaining Occupational Radiation Exposure As Low As Is Reasonably Achievable
DD.	NUREG-0700	Guidelines for Control Room Design Reviews
EE.	MOA DP/RW	Memorandum of Agreement between DOE Office of Defense Programs and DOE OCRWM: Policy for Shipping Defense High-Level Waste (DHLW) to a Civilian Radioactive Waste Repository (07/14/86)
FF.	MOA NS/RW	Memorandum of Agreement between DOE Office of Nuclear Safety and DOE OCRWM: Nuclear Safety Requirements (04/16/92)
GG.	Presidential Memo	Disposal of Defense Waste in a Commercial Repository (04/30/85)

2.2 [Reserved]

2.3 [Reserved]

2.4 NON-GOVERNMENT DOCUMENTS

The following are used as sources of requirements in the Trans-SRD.

2.4.1 National and International Standards

A.	ANSI/ASA-38	Evaluation of Human Exposure to Whole Body Vibration
B.	ANSI C2	National Electric Safety Code
C.	ANSI/HFS 100-1988	American National Standard for Human Factors Engineering of Visual Display Terminal Workstations
D.	ANSI/NFPA 70	National Electric Code
E.	ANSI N14.6-1986	For Radioactive Materials - Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4,500 kg) or More
F.	ANSI N14.19-1986	For Nuclear Materials - Irradiated Fuel Shipping Casks - Ancillary Features
G.	ANSI N14.24-1985[1]	For Highway Route Controlled Quantities of Radioactive Material - Domestic Barge Transport
H.	ASTM D4256	Standard Test Method for Determination of the Decontaminability of Coating Used in Light Water Nuclear Power Plants
I.	ASTM D5144	Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants

2.4.2 Other Publications

A. A00000000-01717-0200-00002 CRWMS Throughput Analysis - May 15, 1993 (Draft)

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[1] This document is identified in Trans-SRD Requirement 3.4.1.1.B. It must be reviewed for design impact and for inclusion of requirements into the Transportation System DRD.

B. C00000000-AA-08-00001-00 System Impacts on MRS Operations - March 31, 1993

C. MTR 10090, Guidelines for Designing User Interface Software

D. ORNL/Sub/89-SD841/2, Acceptance of Canisters of High-Level Waste by the Federal Waste Management System

2.5 OTHER REFERENCES

In addition to the above source documents, the following documents were used as reference material for the initial development of this document. These documents have not been used as sources of requirements.

A.	45USC421 et seq.	Federal Railroad Safety Act (P.L. 100-342)
B.	49USC1808 et seq.	Hazardous Materials Transportation Act (P.L. 93-633)
C.	49USC1808 et seq.	Hazardous Materials Transportation Uniform Safety Act (P.L. 101-615)
D.	ANSI N14.5-1987	American National Standard for Leakage Tests on Packages for Shipment of Radioactive Materials
E.	DOE/RW-0253	Program Cost and Schedule Baseline, Revision 3, September 1992
F.	DOE/RW-0352	Physical System Requirements - Transport Waste, Revision 0, April, 1992
G.	DOE/RW-0381P	OCRWM Baseline Management Plan, Revision 0, November 1992
H.	DOE/RW-0051P	OCRWM Systems Engineering Management Plan, Revision 2, January 1993
I.	TDPP for Trans-SRD	Technical Document Preparation Plan (TDPP) for the Transportation System Requirements Document
J.	ORNL/SUB/86-02217/1	Preliminary Description of the Transportation Operations System, March 1988
K.	ORNL/TM-11232	Transportation Functions of the Federal Waste Management System, March 1992

3. REQUIREMENTS

3.1 SYSTEM DEFINITION

Consistent with the requirement of Section 180(a) of the NWPAA, the Transportation System will be designed and operated to safely transport SNF and HLW in packages that have been certified for such purpose by the NRC.

This section defines the Transportation System, herein referred to as Transportation, in terms of the functions it must perform and the physical segments that will perform the functions. The functions are listed in Table 3-1, and are depicted in a function hierarchy in Figure 3-1 and function flow diagrams in Section 3 and Appendix A. The internal interfaces of the functions are depicted through the use of N-Square diagrams. The architecture is presented in a hierarchial diagram and the functions cross-referenced to the architecture in Appendix B.

This section additionally provides a summary of assumptions that are fundamental to the development of this document and, thus, to the design of Transportation.

3.1.1 Transportation System Functions - Transport Waste

The mission of Transportation has been identified as transporting:

- SNF from Purchaser sites to the MRS facility or MGDS,
- SNF from the MRS facility to the MGDS,
- HLW from Producer sites to the MGDS, and
- SNF and HLW from the MGDS during the retrievability period, as required

in a safe and economic manner while maintaining the quality of the environment and using the private sector to the fullest extent possible. A functional analysis activity was performed to identify the essential functions that the system must perform to accomplish the mission. Physical System Requirements - Transport Waste documented the first iteration of that functional analysis and was used as the primary reference source for Transportation functions identified in this document.

The overall function of Transportation is to Transport Waste. This function includes the activities necessary to meet the requirements for transporting SNF and HLW, for operating the Transportation System in a manner that protects the health and safety of the public and workers, and for maintaining the quality of the environment.

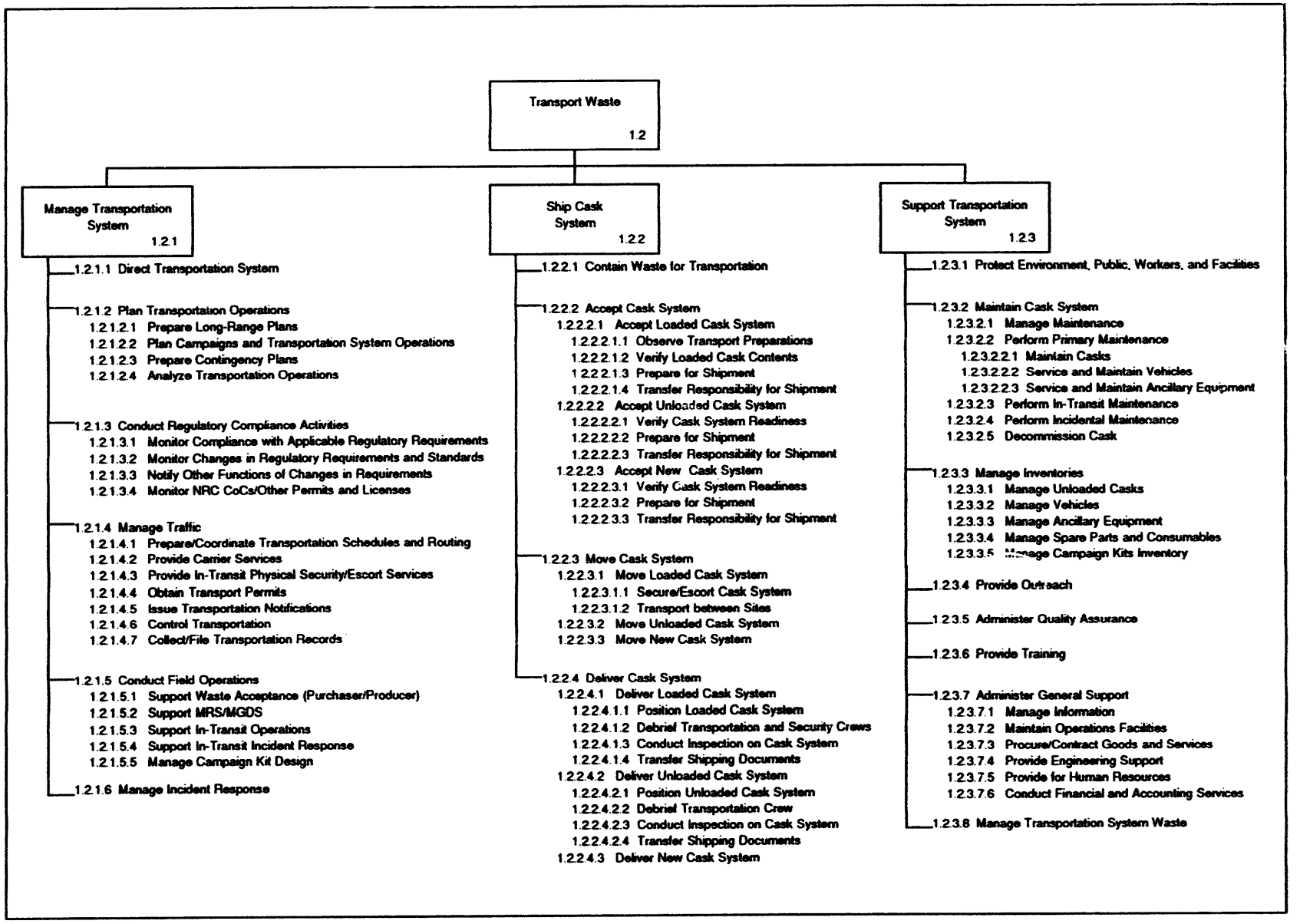

Figure 3-1. Transport Waste 1.2 Function Hierarchy

Table 3-1. Transportation Function List

Function Title	Reference Number
Transport Waste	1.2
Manage Transportation System	1.2.1
Direct Transportation System	1.2.1.1
Plan Transportation Operations	1.2.1.2
Prepare Long-Range Plans	1.2.1.2.1
Plan Campaigns and Transportation System Operations	1.2.1.2.2
Prepare Contingency Plans	1.2.1.2.3
Analyze Transportation Operations	1.2.1.2.4
Conduct Regulatory Compliance Activities	1.2.1.3
Monitor Compliance with Applicable Regulatory Requirements	1.2.1.3.1
Monitor Changes in Regulatory Requirements and Standards	1.2.1.3.2
Notify Other Functions of Changes in Requirements	1.2.1.3.3
Monitor NRC CoCs/Other Permits and Licenses	1.2.1.3.4
Manage Traffic	1.2.1.4
Prepare/Coordinate Transportation Schedule and Routing	1.2.1.4.1
Provide Carrier Services	1.2.1.4.2
Provide In-Transit Physical Security/Escort Services	1.2.1.4.3
Obtain Transport Permits	1.2.1.4.4
Issue Transportation Notifications	1.2.1.4.5
Control Transportation	1.2.1.4.6
Collect/File Transportation Records	1.2.1.4.7
Conduct Field Operations	1.2.1.5
Support Waste Acceptance (Purchaser/Producer)	1.2.1.5.1
Support MRS / MGDS	1.2.1.5.2
Support In-Transit Operations	1.2.1.5.3

Table 3-1. Transportation Function List (Continued)

Function Title	Reference Number
Support In-Transit Incident Response	1.2.1.5.4
Manage Campaign Kit Design	1.2.1.5.5
Manage Incident Response	1.2.1.6
Ship Cask System	1.2.2
Contain Waste for Transportation	1.2.2.1
Accept Cask System	1.2.2.2
Accept Loaded Cask System	1.2.2.2.1
Observe Transport Preparations	1.2.2.2.1.1
Verify Loaded Cask Contents	1.2.2.2.1.2
Prepare for Shipment	1.2.2.2.1.3
Inspect Vehicles	1.2.2.2.1.3.1
Prepare Shipping Documents	1.2.2.2.1.3.2
Brief Transportation and Security Crews	1.2.2.2.1.3.3
Transfer Responsibility for Shipment	1.2.2.2.1.4
Accept Unloaded Cask System	1.2.2.2.2
Verify Cask System Readiness	1.2.2.2.2.1
Prepare for Shipment	1.2.2.2.2.2
Inspect Vehicles	1.2.2.2.2.2.1
Prepare Shipping Documents	1.2.2.2.2.2.2
Transfer Responsibility for Shipment	1.2.2.2.2.3
Accept New Cask System	1.2.2.2.3
Verify Cask System Readiness	1.2.2.2.3.1
Prepare for Shipment	1.2.2.2.3.2
Inspect Vehicles	1.2.2.2.3.2.1
Prepare Shipping Documents	1.2.2.2.3.2.2

Table 3-1. Transportation Function List (Continued)

Function Title	Reference Number
Transfer Responsibility for Shipment	1.2.2.2.3.3
Move Cask System	1.2.2.3
Move Loaded Cask System	1.2.2.3.1
Secure/Escort Cask System	1.2.2.3.1.1
Transport between Sites	1.2.2.3.1.2
Move Unloaded Cask System	1.2.2.3.2
Move New Cask System	1.2.2.3.3
Deliver Cask System	1.2.2.4
Deliver Loaded Cask System	1.2.2.4.1
Position Loaded Cask System	1.2.2.4.1.1
Debrief Transportation and Security Crews	1.2.2.4.1.2
Conduct Inspection on Cask System	1.2.2.4.1.3
Transfer Shipping Documents	1.2.2.4.1.4
Deliver Unloaded Cask System	1.2.2.4.2
Position Unloaded Cask System	1.2.2.4.2.1
Debrief Transportation Crew	1.2.2.4.2.2
Conduct Inspection on Cask System	1.2.2.4.2.3
Transfer Shipping Documents	1.2.2.4.2.4
Deliver New Cask System	1.2.2.4.3
Support Transportation System	1.2.3
Protect Environment, Public, Workers, and Facilities	1.2.3.1
Maintain Cask System	1.2.3.2
Manage Maintenance	1.2.3.2.1
Perform Primary Maintenance	1.2.3.2.2
Maintain Casks	1.2.3.2.2.1

Table 3-1. Transportation Function List (Continued)

Function Title	Reference Number
Service and Maintain Vehicles	1.2.3.2.2.2
Service and Maintain Ancillary Equipment	1.2.3.2.2.3
Perform In-Transit Maintenance	1.2.3.2.3
Perform Incidental Maintenance	1.2.3.2.4
Decommission Cask	1.2.3.2 5
Manage Inventories	1.2.3.3
Manage Unloaded Casks	1.2.3.3.1
Manage Vehicles	1.2.3.3.2
Manage Ancillary Equipment	1.2.3.3.3
Manage Spare Parts and Consumables	1.2.3.3.4
Manage Campaign Kit Inventory	1.2.3.3.5
Provide Outreach	1.2.3.4
Administer Quality Assurance	1.2.3.5
Provide Training	1.2.3.6
Administer General Support	1.2.3.7
Manage Information	1.2.3.7.1
Maintain Operations Facilities	1.2.3.7.2
Procure/Contract Goods and Services	1.2.3.7.3
Provide Engineering Support	1.2.3.7.4
Provide for Human Resources	1.2.3.7.5
Conduct Financial and Accounting Services	1.2.3.7.6
Manage Transportation System Waste	1.2.3.8

Functions flowing from the Transport Waste function are listed in Table 3-1. The reference numbers following the function titles are the function numbers used with the function descriptions contained in Appendix A, Transportation Function Descriptions. The reference numbers are provided for identification of level of indenture and are not intended to prescribe a sequencing of the identified functions.

3.1.2 Transportation Functional Relationships

Functional identification is accomplished in this document by the use of function flow diagrams to depict functional relationships, and by the use of N-Square diagrams to identify inputs to and outputs from a function. Throughout the iterative system engineering process, each design phase involves a progressively more detailed functional analyses. The functions identified in this document are the system-level functions that are required to meet the mission.

Figure 3-2 shows the function flow diagram for the primary functions of the CRWMS. SNF and HLW are accepted into the CRWMS by the Accept Waste function (1.1). This function transfers custody of the waste to the Transport Waste function (1.2), which moves the waste either to the Store Waste function (1.3) or the Dispose of Waste function (1.4). Additionally, the Store Waste function (1.3) will transfer custody of its SNF to the Transport Waste function (1.2), which moves the waste to the Dispose of Waste function (1.4).

Figure 3-3 shows the function flow diagram for the third level indenture, which identifies the top-level Transportation functions. The Manage Transportation System function (1.2.1) receives information from the Accept Waste, Store Waste, and Dispose of Waste functions (1.1, 1.3, and 1.4, respectively). This information is used to plan and direct the operation of Transportation. This function directs the Ship Cask System function (1.2.2) to accept, move, and deliver transportation cask systems (loaded, unloaded and new). The Support Transportation System function (1.2.3) assists the Manage Transportation System function (1.2.1) and the Ship Cask System function (1.2.2) by maintaining transportation cask systems and transportation inventory, providing training and outreach support, and performing other administrative support efforts.

Figures 3-4 and 3-5 show the N-Square diagrams for the functions illustrated in Figures 3-2 and 3-3, respectively. Numbers in each function block correspond to appropriate function numbers as identified in Table 3-1. Additional function flow diagrams and N-Square diagrams are contained in Appendix A.

The function diagrams identify the primary interactions between the functions in shipping loaded and unloaded transportation cask systems. Additional function interactions are identified on the N-Square diagrams. On the N-Square diagrams, the Transportation functions appear in the bold outlined boxes on the diagonal. The double-lined boxes on the diagonal identify an interface with a function external to Transportation. Inputs to a function appear in the column above and below the function. Outputs from a function appear in the row to the left and right of a function. Figure 3-6 provides a pictorial explanation of N-Square diagrams.

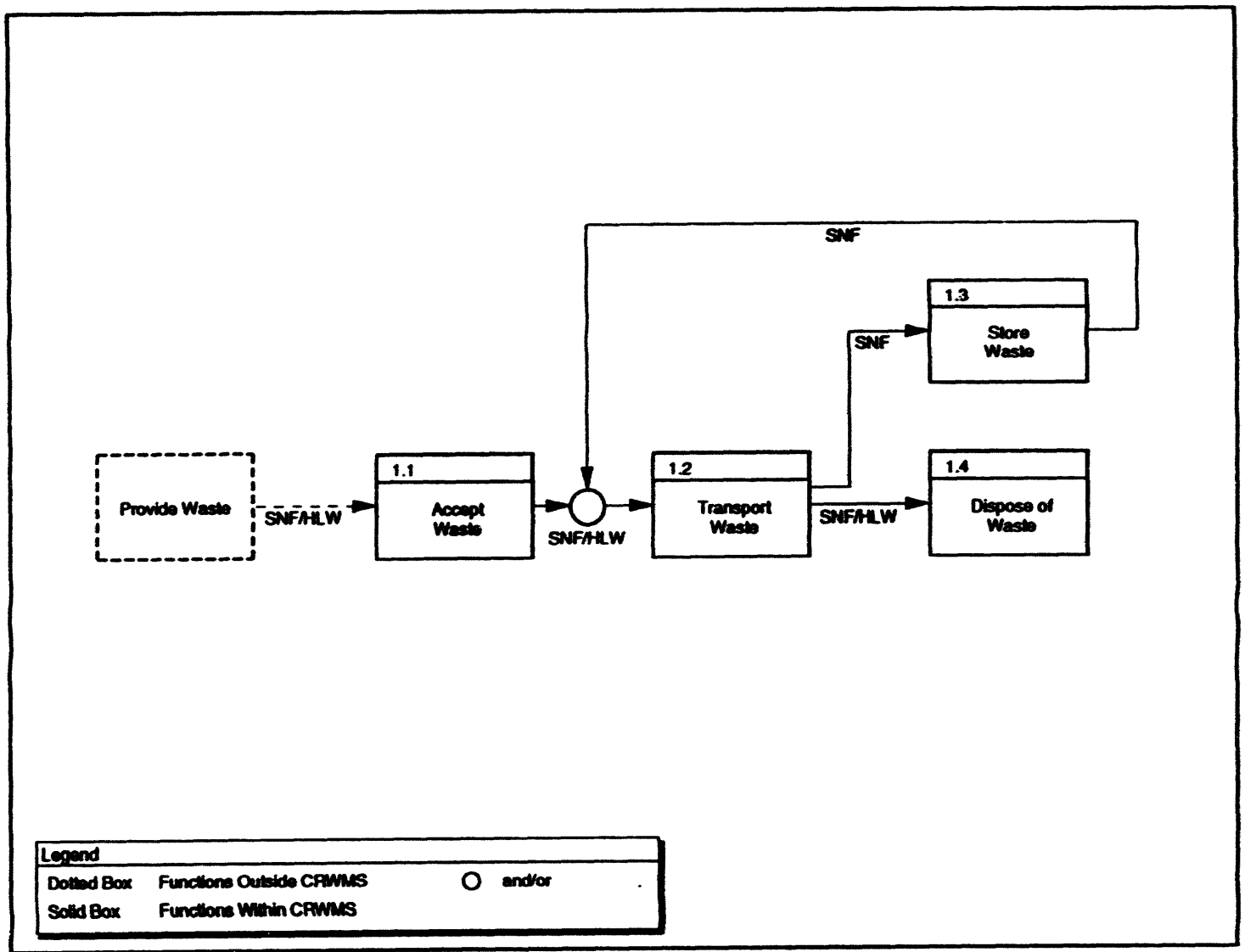

Figure 3-2. 1. Manage Waste Disposal Function Flow Diagram

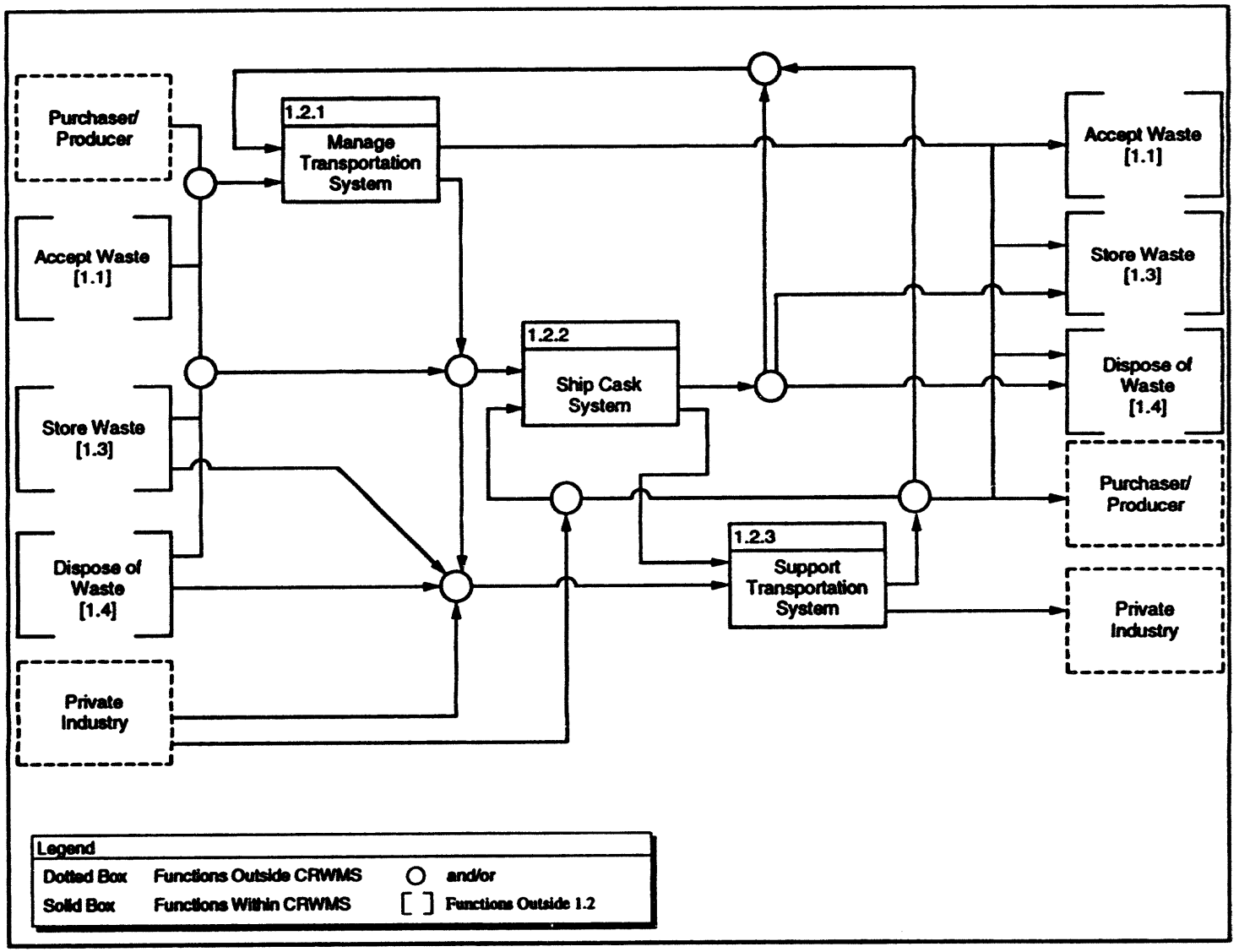

Figure 3-3. 1.2 Transport Waste Function Flow Diagram

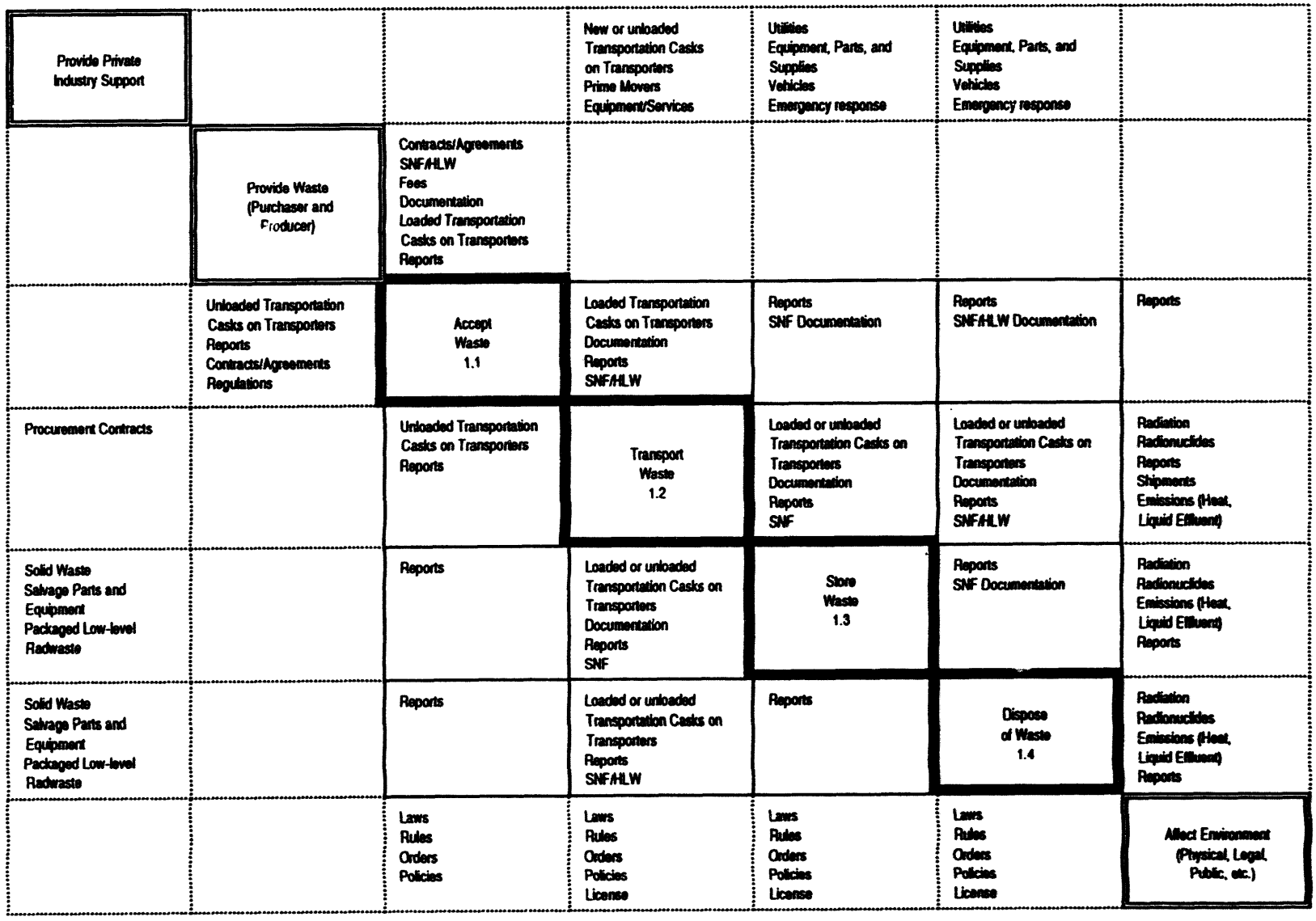

Figure 3-4. N-Square Chart for 1. Manage Waste Disposal

Provide Private Industry Support			- Carrier Services - Security Services	- New or unloaded Cask Systems	- Campaign Kits - Proposals			
	Provide Waste (Purchaser and Producer)	- Plans/Info - SNF/HLW - Loaded Cask System						
	- Plans/Info - Field Ops Resources - Unloaded Cask Systems	1.1 Accept Waste	- Plans/Info - Reports	- SNF/HLW - Loaded Cask Systems - Documents				
- Dispatch Orders		- Plans/Info - Field Ops Resources - Campaign Kits	1.2.1 Manage Transportation System	- Plans/Schedules - Carrier Services - Security Services - Documents	- Plans/Schedules - Campaign Kits - Reports - Policy	- Plans/Schedules - Reports	- Plans/Schedules - Reports	
- Carrier Services - Security Services		- Unloaded Cask Systems - Documents	- Documents	1.2.2 Ship Cask System	- Unloaded or new Cask Systems - Documents	- SNF - Loaded or unloaded Cask Systems - Documents	- SNF/HLW - Loaded or unloaded Cask Systems - Document	- Emissions, Radiation, Radionuclides
- RFPs, Orders, Contracts			- Documents - Campaign Kits	- Unloaded or new Cask Systems	1.2.3 Support Transportation System			- Waste
			- Documents - Reports	- SNF - Loaded or unloaded Cask Systems - Documents		1.3 Store Waste		
			- Documents - Reports	- SNF/HLW - Loaded or unloaded Cask Systems - Documents			1.4 Dispose of Waste	
			- Legal Constraints	- Legal Constraints	- Legal Constraints			Affect Environment

Legend:

Double Line Box - Function is External to CRWMS
Dashed Line Box - Function is Internal to CRWMS and External to Transportation System
Thick Line Box - Function is Internal to Transportation System
Single Line Box - Interface between Functions Internal to the CRWMS
Dotted Line Box - Interface with Functions External to the CRWMS

Figure 3-5. N-Square Chart for 1.2 Transport Waste

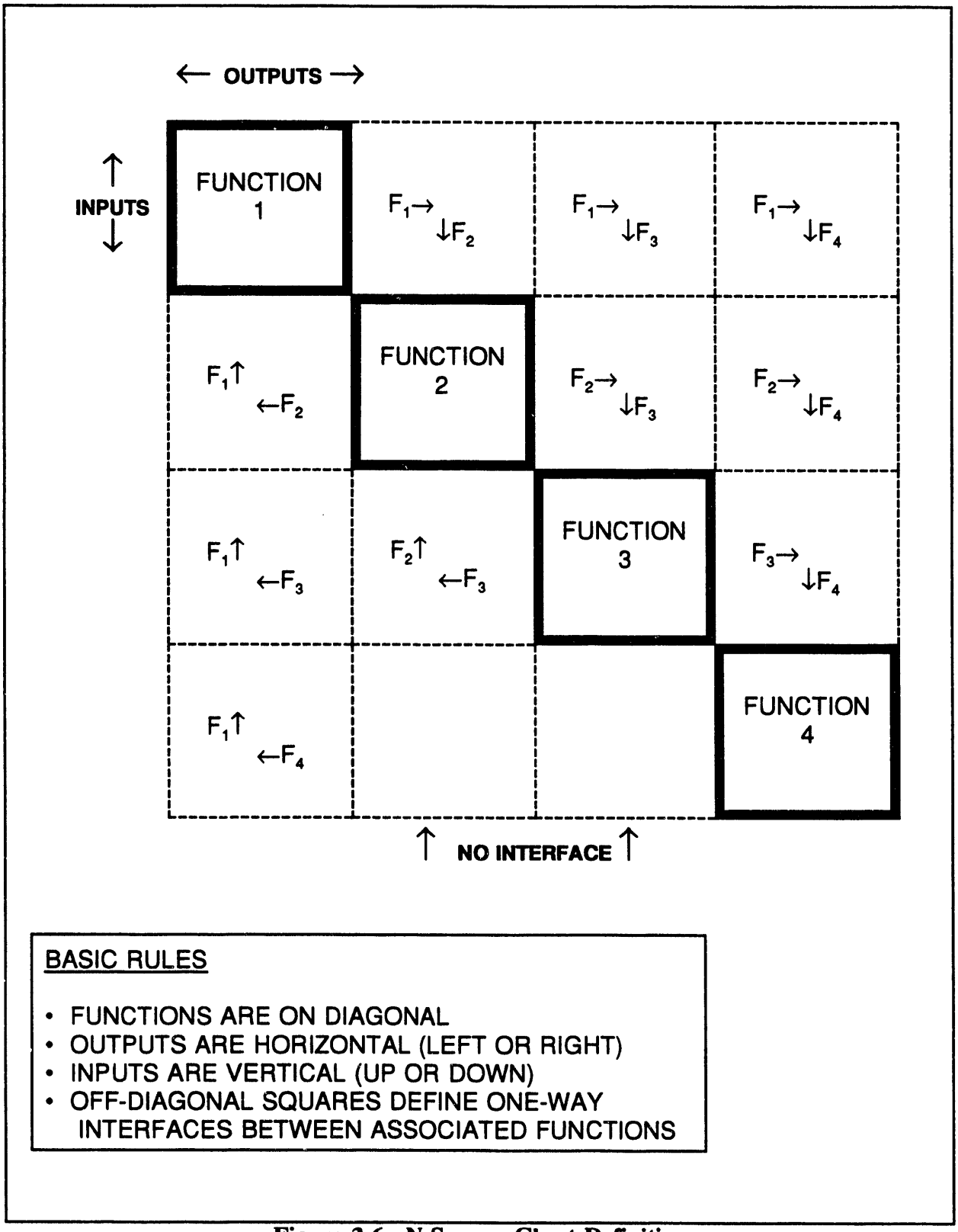

Figure 3-6. N-Square Chart Definition

The function flow diagrams are used in allocating functions to appropriate segments described in Section 3.1.3. Section 3.1.4 summarizes this allocation process.

3.1.3 System Description

Transportation is an integral part of the total CRWMS in which all system elements, segments, subsystems, and facilities are optimized as parts of a single system. Transportation will accept SNF and HLW for transportation, ship the waste to the appropriate CRWMS facility, and operate the Transportation System; this includes managing and monitoring traffic, maintaining cask systems, and performing other functions if determined necessary or desirable by future Federal mandates, studies, analyses, operational requirements, etc. Figure 3-7 shows the relationship of Transportation to the CRWMS. The top-level architecture for Transportation is depicted in Figure 3-8. Transportation is composed of the following segments:

A. Transportation Cask Systems
B. Service and Maintenance Support
C. Field Operations
D. Planning and Control.

The segments are described in Section 3.7 of this document.

3.1.4 Function to Architecture Cross-Reference

The function flow diagrams are used in defining the segments identified in Section 3.1.3. A segment is a grouping of items that can accomplish similar functions. The requirements for the functions are reviewed and the segments are defined to meet the requirements. Section 3.7 and Appendix B show the allocation of the functions to the segments of Transportation that perform them.

3.1.5 Major Considerations and Assumptions

The following assumptions are intended to provide guidance to proceed with Transportation activities, and are based on informed technical opinion, preliminary study results, and accumulated institutional experience.

A. Transportation will interface with the Purchasers/Producers through Waste Acceptance, which is responsible for the functional interfaces with the Purchasers/Producers.

B. Transportation will ship SNF loaded in transportation casks to the MRS for storage and SNF and HLW loaded in transportation casks to the MGDS for disposal.

C. Acceptance of SNF at the MRS will commence in 1998.

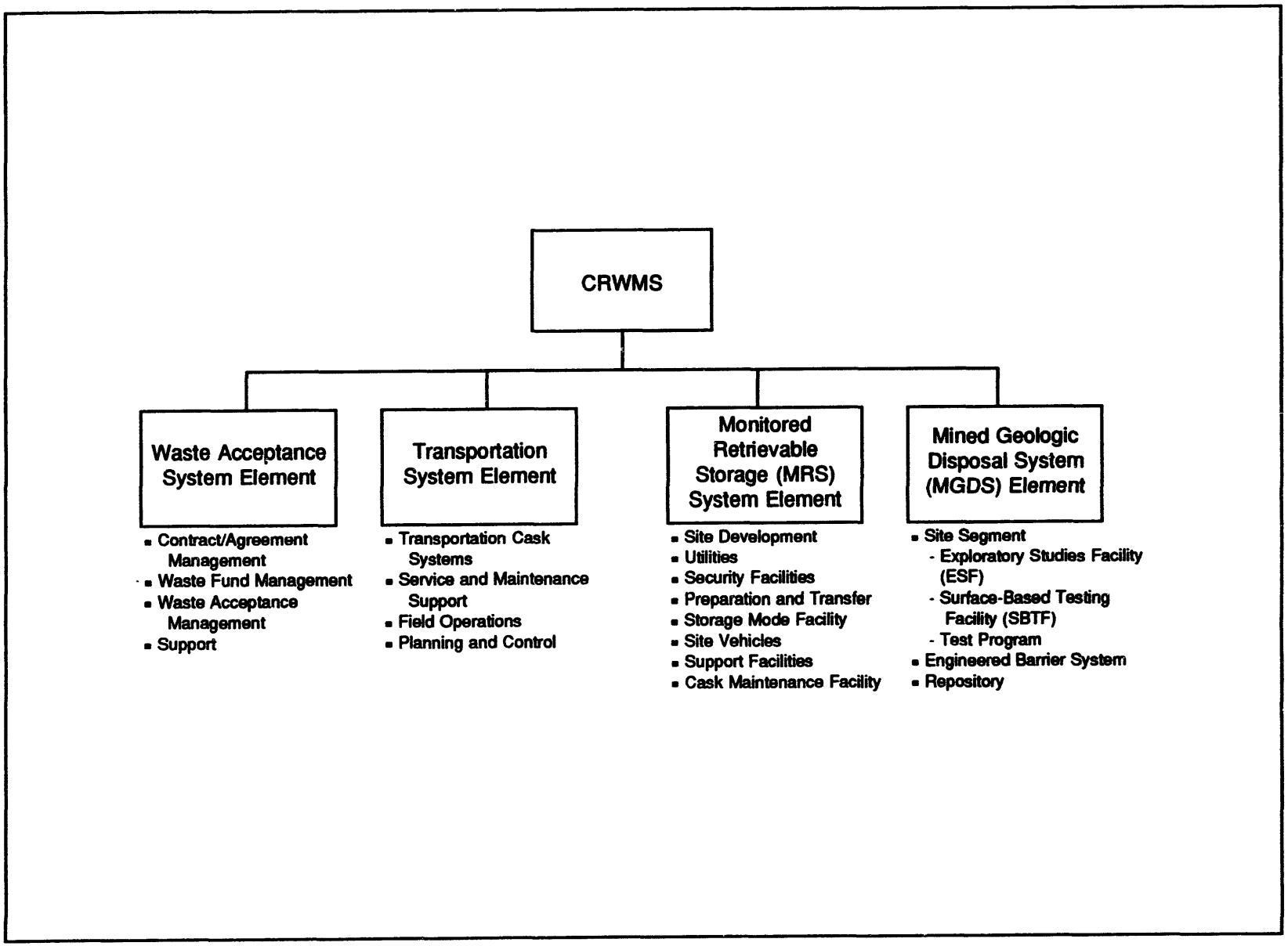

Figure 3-7. CRWMS Architecture

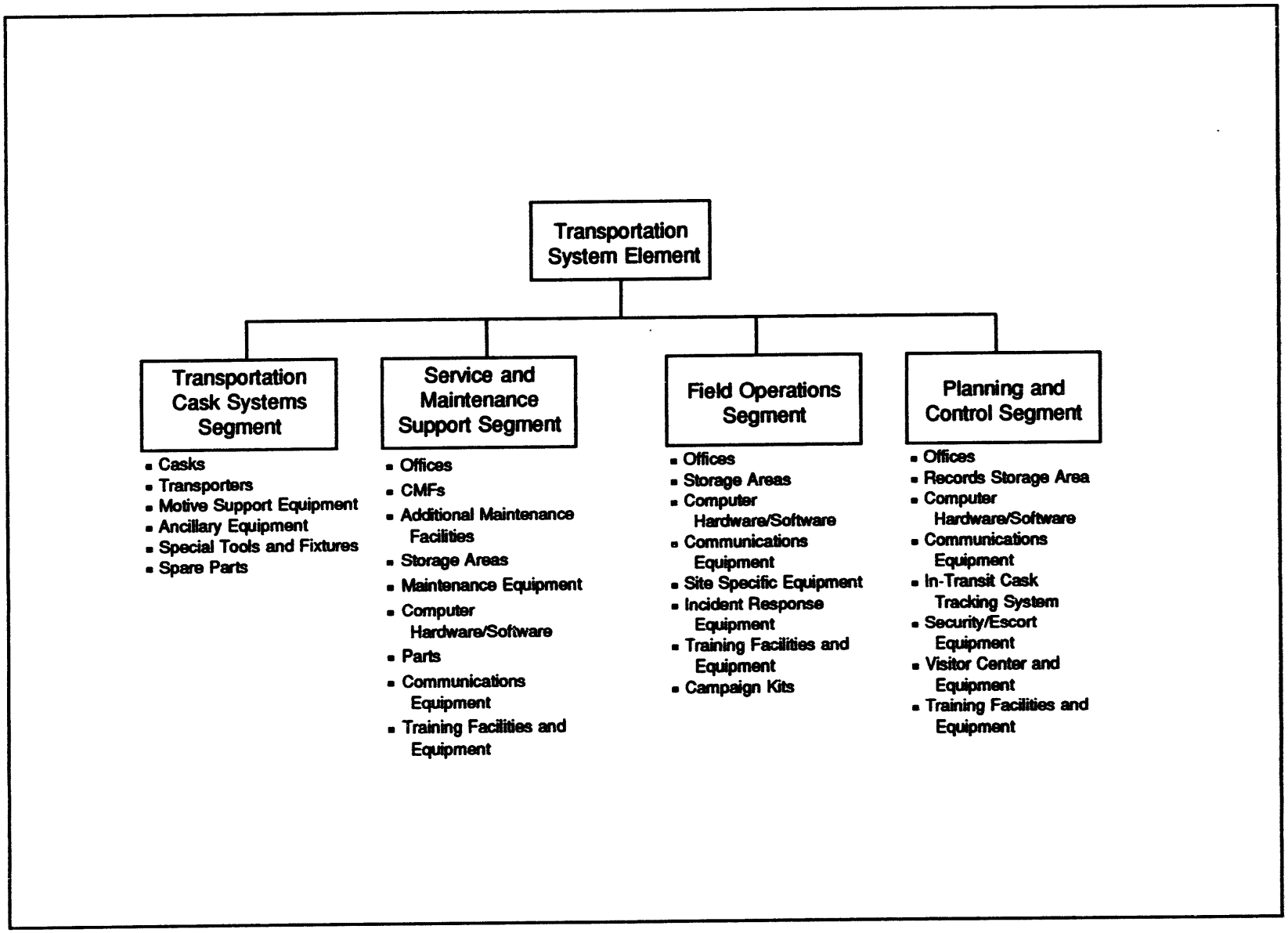

Figure 3-8. Transportation Architecture

D. Acceptance of SNF at the MGDS will commence in 2010.

E. The Transportation requirements associated with the MGDS are only valid for the first repository.

F. CMFs will be collocated with the MRS facility and with the MGDS.[1] The requirements for the facilities will be integrated between Transportation and these system elements to optimize CRWMS operations. The facilities will be designed and constructed to meet these requirements. **<MGDS: TBR>**

G. The functions, requirements, and location of the Central Management and Operations Control Center (CMOCC), as discussed in the CRD, are **<TBD>**. The Trans-SRD will define the functions and requirements necessary to fulfill the Transportation mission. Some of these functions and requirements may be re-allocated to the CMOCC upon OCRWM decision.

H. The MRS facility and MGDS are responsible for shipping their site-generated low-level radioactive waste to an appropriate disposal facility.

3.2 CHARACTERISTICS

3.2.1 Performance Characteristics

Transportation is expected to operate in the following phases and conditions:

A. **Normal Operations.** This phase is subdivided into three subphases:

(1) **Initial Operation.** In this phase, SNF is being accepted and shipped to the MRS. The shipment rate of SNF is ramping up to full operations.

(2) **Steady State Operation.** In this phase, SNF is being shipped from reactors and storage sites to both the MRS and MGDS, and from the MRS to the MGDS. Commercial and defense HLW is being shipped to the MGDS.

(3) **End of Life Cycle.** In this phase, SNF and HLW are no longer being shipped on a regular basis to the MGDS. However, Transportation must remain capable of shipping any waste that may need to be retrieved from the repository until closure.

B. **Off-Normal Conditions.** In this phase, the system is operating under one or more accident or off-normal event(s).

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[1] A CMF at the MGDS is the subject of a system study.

Transportation casks have an additional operating phase:

C. **Cask Decommissioning.** Transportation casks that have reached the end of their life cycle are decontaminated to the maximum extent practicable and disposed of. This phase occurs throughout the operation of Transportation.

3.2.1.1 Normal Operations

A. Transportation shall provide transport of SNF and HLW in a manner that protects the health and safety of the public and the environment. [NWPA 111(a)(4)] [CRD 3.2.1.A]

B. Transportation shall provide for the transport of SNF to the MRS for storage and SNF and HLW to the MGDS for disposal. All of the SNF and HLW must be of domestic origin, generated by civilian nuclear power reactor(s) and specified in the standard contracts or agreements. [10CFR961.11 Art IV.B.1] [CRD 3.2.1.B]

C. Transportation shall provide for the transport of defense HLW that the CRWMS is designed to accept and dispose of. [Presidential Memo 1985] [CRD 3.2.1.1.D]

D. Transportation shall be operational with the commencement of CRWMS facilities operations, and must continue until such time as all SNF, as specified in standard contracts, and HLW, as specified in the MOA between EM and RW **<TBP>**, has been disposed of. [NWPA 302(a)(5)] [10CFR961.11 Art II] [DOE/RW-0247] [CRD 3.2.1.1.E] **<TBR>**

E. Transportation shall be capable of shipping SNF and HLW on the nominal schedule shown in Table 3-2. [HLW: DOE/RW-0316P, ORNL/Sub/89-SD841/2] [SNF 1998-2008: DOE/RW-0331P] [SNF 1998-2034: C00000000-AA-08-00001-00, A00000000-01717-0200-00002] [CRD 3.2.1] [CRD 3.7.2.2.E]

F. Shipments of loaded and unloaded transportation casks shall be as exclusive use. [Derived]

G. Transportation cask systems shall be provided to each Purchaser/Producer site sufficiently in advance to accommodate scheduled deliveries and transported from the site. [10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F]

H. Transportation shall maintain **<TBD>** operational transportation cask systems until repository closure. [10CFR60.111(b)(1)]

Table 3-2. Transportation Shipping Capability <TBR>
(In Metric Tons of Initial Uranium or Equivalent)

Year	Shipment Destination: MRS	Shipment Destination: MGDS	
	SNF	SNF[1]	HLW
INITIAL OPERATION			
1998	400	0	0
1999	600	0	0
2000	900	0	0
2001	900	0	0
2002	900	0	0
2003	900	0	0
2004	900	0	0
2005	900	0	0
2006	900	0	0
2007	900	0	0
2008	900	0	0
2009	900[2]	0	0
2010	1,400	300	0
2011	2,000	600	0
2012	2,600	1,200	0
2013	3,000	2,000	0
2014	3,000	3,000	0
STEADY STATE OPERATIONS			
2015	3,000	3,000	400

[1] In years when SNF is shipped directly from the Purchasers to the MGDS, the sum of the waste shipped directly and waste shipped from the MRS will be as stated in this column.

[2] The current legal limit at MRS is 10,000 MTU prior to operation of the MGDS.

Table 3-2. Transportation Shipping Capability <TBR> (Continued)
(In Metric Tons of Initial Uranium or Equivalent)

Year	Shipment Destination: MRS	Shipment Destination: MGDS	
	SNF	SNF[1]	HLW
2016	3,000	3,000	400
2017	3,000	3,000	400
2018	3,000	3,000	400
2019	3,000	3,000	400
2020	3,000	3,000	400
2021	3,000	3,000	400
2022	3,000	3,000	400
2023	3,000	3,000	400
2024	3,000	3,000	400
2025	3,000	3,000	400
2026	3,000	3,000	400
2027	3,000	3,000	400
2028	2,000	3,000	400
2029	0	3,000	400
2030	0	3,000	400
2031	0	3,000	400
2032	0	3,000	200
2033	0	1,900	0
END OF LIFE			
2034	0	0	0
2035	0	0	0
2036	0	0	0

[1] In years when SNF is shipped directly from the Purchasers to the MGDS, the sum of the waste shipped directly and waste shipped from the MRS will be as stated in this column.

3.2.1.2 Decommissioning

A. The design, fabrication, and operating practices of transportation casks shall, to the extent practical, facilitate decommissioning without endangering the health and safety of the public. [10CFR60.132(e)] [10CFR72.130] [CRD 3.2.1.2.D]

B. Transportation casks and their support equipment shall, to the extent practical, include features that will facilitate decontamination for future decommissioning, increase the potential for other uses, or both. [DOE Order 6430.1A 1300-11.2] [CRD 3.2.1.2.E]

3.2.1.3 Off-Normal Operations

Transportation shall comply with the requirements in 49CFR172 Subpart G (172.600-172.604) for providing and maintaining emergency response information for off-normal events. [49CFR172.600, .602, .604)] [CRD 3.2.1.3]

3.2.2 Radiological Protection

3.2.2.1 General Requirement

Transportation shall make provision for design and operation to ensure that occupational and public doses are maintained ALARA within the regulatory limits. These exposure dose limits are specified in 10CFR20.1201 for occupational doses and 10CFR20.1301 for public doses. NRC Regulatory Guides 8.8 and 8.10 provide guidance for the implementation of ALARA principles. [10CFR20.1101(b)] [10CFR20.1201] [10CFR20.1301] [CRD 3.2.2.1.C] [CRD 3.2.2.1.D]

3.2.2.2 Personnel Protection

The positions normally occupied by personnel in the vehicle or carrier shall not exceed radiation levels of 2 millirem/hour. [10CFR71.47(d)] [49CFR177.842(g)] [CRD 3.2.1.1.G]

3.2.2.3 Airborne Radioactive Material Control

No requirements have been allocated at this time.

3.2.2.4 Radiation Monitoring

A. Transportation shall be equipped to monitor the external surfaces of transportation cask systems and support equipment for radioactive contamination and radiation levels

in compliance with 10CFR71.47, 10CFR71.87(i), and 49CFR173.443(a). [10CFR71.47] [10CFR71.87(i)] [49CFR173.443(a)] [CRD 3.2.2.4.B]

B. Transportation shall be capable of surveying each vehicle transporting casks with radiation equipment after each use to confirm that the limits of 49CFR177.843 for highway transport, 49CFR174.715 for railway transport, and 49CFR176.715 for transport by vessel are not exceeded. [10CFR71.5(a)(2)] [49CFR177.843(a)] [49CFR174.715(a)] [49CFR176.715(a)] [CRD 3.7.2.2.I]

3.2.2.5 Transportation Protection

A. Transportation shall comply with the guidelines for the packaging and transportation of radioactive material contained in 10CFR71 and 49CFR173. [10CFR71.0(c)] [49CFR173.3(a)] [CRD 3.2.2.7]

B. Transport of SNF shall be in compliance with applicable DOT regulations. [NWPA 137(a)(1)] [CRD 3.7.2.2.A]

3.2.3 Interface Requirements

3.2.3.1 External to CRWMS

Interfaces to Federal agencies, States, and local governments, Indian Tribes, law enforcement agencies, emergency response organizations, private industry, and each individual Purchaser/Producer facility will be developed and requirements shall be included in the Transportation Design Requirements Document. [Derived by CRD] [CRD 3.2.3.1]

3.2.3.2 Internal to CRWMS

Interface requirements between Transportation and other elements of the CRWMS (Waste Acceptance, MRS, and MGDS) are included in this section.

3.2.3.2.1 Waste Acceptance-Transportation Interface Requirements

Waste Acceptance has the responsibility of interfacing the CRWMS with the "Purchasers" (owners and generators of SNF from civilian reactors) and "Producers" (owners and generators of HLW).

The types of interfaces between these two elements reflect transfer of loaded, unloaded, or new transportation cask systems and the documentation, reports and communications regarding transportation cask systems.

A. In support of the following requirements, Transportation shall provide an appropriately configured transportation cask system(s) (including an NRC-certified cask) and necessary services to move the SNF and/or HLW from the Purchaser's/Producer's site to the CRWMS facility. [10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F]

(1) Purchasers shall be provided with a truck or rail cask system for delivery of SNF to the MRS or MGDS. [DOE/RW-0005] [CRD 3.2.1.1.F]

(2) Producers shall be provided with a rail cask system for delivery of defense HLW to the MGDS. [DOE/RW-0005] [DOE/RW-0187] [DOE/RW-0270P] [CRD 3.2.1.1.F]

(3) Producers shall be provided with a rail cask system for delivery of commercial HLW to the MGDS. [DOE/RW-0005] [DOE/RW-0187] [DOE/RW-0270P] [CRD 3.2.1.1.F] **<TBR>**

B. Transportation shall be capable of receiving and shipping SNF and HLW loaded in transportation cask systems from Purchasers/Producers, after title has been accepted by Waste Acceptance, at the nominal shipping rate shown in Table 3-2. [HLW: DOE/RW-0316P] [SNF 1998-2008: DOE/RW-0331P] [SNF 1998-2034: C00000000-AA-08-00001-00, A00000000-01717-0200-00002] [CRD 3.2.1] [CRD 3.7.2.2.E]

C. Transportation shall establish cleanliness requirements for the interior of the transportation cask for the beginning of each shipping campaign. Negotiations with each Purchaser/Producer through Waste Acceptance may be necessary. [10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F]

D. Transportation shall work with Waste Acceptance to identify, document, and plan the site interface capabilities. Negotiations with each Purchaser/Producer will be necessary to determine if special equipment or facility modifications are needed to satisfy the site interface constraints. Initial site interface capabilities are documented in Facility Interface Capability Assessment (FICA) and Services Planning Documents (SPDs). [10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F]

E. The outside of the transportation cask shall incorporate a feature, such as a seal, which is not readily breakable, and which, while intact would be evidence that the cask has not been opened by unauthorized persons. This sealing feature will be inspected by Waste Acceptance and Transportation prior to acceptance of loaded transportation casks from each Purchaser/Producer and upon arrival at its destination. [10CFR71.43(b)] [CRD 3.7.2.2.K]

F. Transportation shall provide pertinent information on transportation cask systems to the Purchaser/Producer in sufficient time prior to a shipping campaign for the development of site-specific procedures, including, but not limited to, the following:

(1) Generic written procedures that can be tailored for each site for cask handling, inspection, loading, decontamination, and incidental maintenance, including specifications on Purchaser/Producer-furnished canisters for containment of failed fuel.

(2) Training material for Purchaser's/Producer's personnel in cask handling and loading, as may be necessary.

(3) Technical information and sufficient documentation on the equipment supplied by CRWMS.

(4) Campaign details.

[10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F] [CRD 3.5.1.4] [CRD 3.7.2.2.J]

G. Prior to accepting the loaded or unloaded transportation cask system from each Purchaser or Producer, Transportation shall ensure that surface contamination does not exceed the NRC and DOT specified limits of 2200 dpm/100 cm^2 for beta and gamma emitting radionuclides and 220 dpm/100 cm^2 for alpha emitting radionuclides. [10CFR71.87(i)] [49CFR173.443(a)] [CRD Appendix A (10CFR71)(49CFR173)]

H. Transportation shall procure or contract for a prime mover equipped with communication equipment to ensure compatibility with Waste Acceptance and Purchaser/Producer sites to allow communication for shipments to provide advance notice of their arrival. [10CFR73.37(c)(3), (d)(3)] [CRD 3.2.4.3.1.B]

I. The design of computer systems shall provide for the intercompatibility of computer resources, including hardware and software, with all other CRWMS elements. The design goal is to allow for the common use of databases and information by all system elements. [Derived by CRD] [CRD 3.3.10.B]

J. The capability shall be provided for the visual inspection and testing of loaded and unloaded cask(s) as necessary and appropriate to show compliance with 10CFR71 and DOE Order 5480.3 Section 10.d. [10CFR71.93(b)] [10CFR71.87] [DOE Order 5480.3 9.b(7)] [DOE Order 5480.3 10.d] [CRD 3.5.1.4]

K. During cask loading and prior to acceptance for transportation to a CRWMS facility, Transportation shall verify that the Purchaser's SNF or the Producer's HLW is properly loaded and packaged in accordance with the transportation cask certificate of compliance and is properly marked, labeled, and ready for transportation (including appropriate shipping documents) in accordance with applicable DOT regulations and OCRWM-established procedures. [10CFR961.11 Art VI.B.2] [MOA DP/RW, 1986] [CRD Appendix A (10CFR961)(MOA DP/RW)]

L. When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known by the Purchaser/Producer, Transportation shall assure that the Purchaser/Producer packages the fissile material as if the unknown properties have credible values that will cause the maximum nuclear reactivity. [10CFR71.83] [CRD Appendix A (10CFR71)]

3.2.3.2.2 Transportation-MRS Interface Requirements

The types of interfaces between these two elements reflect transfer of loaded, unloaded, or new transportation cask systems and the documentation, reports, and communications regarding these transportation cask systems.

A. Transportation shall procure or contract for a prime mover equipped with communication equipment to ensure compatibility with the MRS to allow communication for shipments to provide advance notice of their arrival. [10CFR73.37(c)(3), (d)(3)] [CRD 3.2.4.3.1.B]

B. Transportation shall procure or contract transportation cask systems, which allow for inspection upon receipt at the MRS to ensure that external radiation levels and surface contamination levels can be measured. [Derived] [CRD 3.2.1.1.F]

C. All shipments from the MRS to the MGDS shall be made by rail in dedicated trains. [DOE/RW-0239] [CRD 3.7.2.2.G]

D. Transportation shall be capable of delivering SNF to the MRS at the nominal shipping rate shown in Table 3-2. [SNF 1998-2008: DOE/RW-0331P] [SNF 1998-2034: C00000000-AA-08-00001-00, A00000000-01717-0200-00002] [CRD 3.2.1] [CRD 3.7.2.2.E]

E. Transportation shall deliver compatible transportation cask systems (including an NRC-certified cask) to the MRS for loading and/or unloading operations. The types of cask systems that presently exist or are anticipated to be available are shown in Table 3-3. [10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F]

F. Transportation shall provide pertinent information on transportation cask systems to the MRS in sufficient time prior to loading and/or unloading operations for the development of site-specific procedures, including, but not limited to, the following:

(1) Written procedures for cask handling, inspection, loading, cleaning, decontamination, and incidental maintenance.

(2) Training material for MRS personnel in cask handling and loading, as may be necessary.

Table 3-3. Types of Transportation Cask Systems <TBR>

Category	NRC Docket No.	Type	Capacity		Loaded Weight (lbs)	Cask Dimensions	
			PWR	BWR*		Length (in.)	Diameter (in.)
From-Reactor							
Existing							
NLI 1/2	71-9010	LWT	1	2	49,500	195.2	47.125
NAC-LWT	71-9225	LWT	1	2	49,000	214	50
TN-8	71-9015	OWT	3	-	79,400	218	68
TN-9	71-9016	OWT	-	7	79,400	227	68
IF-300**	71-9001	Rail	7	17	140,000	210	64
NLI 10/24	71-9023	Rail	10	24	194,000	204.5	96
Proven Technology							
<TBD>	<TBD>	LWT	2	5	A	<TBD>	<TBD>
<TBD>	<TBD>	LAR LWT	4	12	A	<TBD>	<TBD>
<TBD>	<TBD>	Rail	10	21	B	<TBD>	<TBD>
<TBD>	<TBD>	Rail	12	24	B	<TBD>	<TBD>
Innovative Technology							
GA-4	<TBD>	LWT	4	-	52,600	187.5	48
GA-9	<TBD>	LWT	-	9	52,900	198.0	47.73
BR-100	71-9230	Rail	21	37	200,000	202	102
Extra Long**	<TBD>	<TBD>	<TBD>	<TBD>	<TBD>	<TBD>	<TBD>
From-MRS							
<TBD>	<TBD>	Rail	<TBD>	<TBD>	332,000	205	104
Transportable Storage Casks							
<TBD>	<TBD>	Rail	26	52	250,000	202	102
HLW**							
<TBD>**	<TBD>	Rail	<TBD>	<TBD>	<TBD>	<TBD>	<TBD>
Multi-Purpose Canister							
<TBD>	<TBD>	<TBD>	<TBD>	<TBD>	<TBD>	<TBD>	<TBD>

* Capacity of BWR fuel assembly with channels.
** Cask will not be used at MRS, only at MGDS.
A Weights of these casks are expected to be approximately equal to other LWT casks.
B Weights of these casks are expected to be approximately equal to other rail casks.

(3) Technical information and sufficient documentation on the equipment supplied by Transportation.

(4) Campaign details.

[10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F] [CRD 3.5.1.4]

G. Prior to accepting the loaded or unloaded transportation cask systems from the MRS, Transportation shall ensure that surface contamination does not exceed the NRC and DOT specified limits of 2200 dpm/100 cm^2 for beta and gamma emitting radionuclides and 220 dpm/100 cm^2 for alpha emitting radionuclides. [10CFR71.87(i)] [49CFR173.443(a)] [CRD Appendix A (10CFR71)(49CFR173)]

H. The design of computer systems shall provide for the intercompatibility of computer resources, including hardware and software, with all other CRWMS elements. The design goal is to allow for the common use of databases and information by all system elements. [Derived by CRD] [CRD 3.3.10.B]

I. The capability shall be provided for the visual inspection and testing of loaded and unloaded cask(s) as necessary and appropriate to show compliance with 10CFR71 and DOE Order 5480.3 Section 10.d. [10CFR71.93(b)] [10CFR71.87] [DOE Order 5480.3 9.b(7)] [DOE Order 5480.3 10.d] [CRD 3.5.1.4]

J. Requirements for the design of the CMF collocated with the MRS shall be defined in the MRS System Requirements document. [Derived by CRD] [CRD 3.1.6.B]

3.2.3.2.3 Transportation-MGDS Interface Requirements

The types of interfaces between these two elements reflect transfer of loaded, unloaded, or new transportation cask systems and the documentation, reports, and communications regarding these transportation cask systems.

A. Transportation shall procure or contract for a prime mover equipped with communication equipment to ensure compatibility with the MGDS to allow communication for shipments to provide advance notice of their arrival. [10CFR73.37(c)(3), (d)(3)] [CRD 3.2.4.3.1.B]

B. Transportation shall procure or contract transportation cask systems to allow for inspection upon receipt to ensure that external radiation levels and surface contamination levels can be measured. [Derived] [CRD 3.2.1.1.F]

C. Shipments from Purchaser facilities shall be made by truck or rail. [DOE/RW-0005] [CRD 3.2.1.1.F]

D. All shipments from the MRS to the MGDS shall be made by rail in dedicated trains. [DOE/RW-0239] [CRD 3.7.2.2.G]

E. All shipments from Producer sites (for commercial and defense HLW) to the MGDS shall be made by rail in dedicated trains. [DOE/RW-0316P] [CRD 3.2.1.1.F]

F. Transportation shall be capable of delivering SNF and HLW to the MGDS at the nominal shipping rate shown in Table 3-2. [HLW: DOE/RW-0316P] [SNF 1998-2008: DOE/RW-0331P] [SNF 1998-2034: C00000000-AA-08-00001-00, A00000000-01717-0200-00002] [CRD 3.2.1] [CRD 3.7.2.2.E]

G. Transportation shall deliver compatible transportation cask systems (including an NRC-certified cask) to the MGDS for loading and/or unloading operations. The types of cask systems that presently exist or are anticipated to be available are shown in Table 3-3. [10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F]

H. Transportation shall provide pertinent information on transportation cask systems to the MGDS in sufficient time prior to loading and/or unloading operations for the development of site-specific procedures, including, but not limited to, the following:

(1) Written procedures for cask handling, inspection, loading, cleaning, decontamination, and incidental maintenance.

(2) Training material for MGDS personnel in cask handling and loading, as may be necessary.

(3) Technical information and sufficient documentation on the equipment supplied by Transportation.

(4) Campaign details.

[10CFR961.11 Art IV.B.2] [CRD 3.2.1.1.F] [CRD 3.5.1.4]

I. Prior to accepting the loaded or unloaded transportation cask system from the MGDS, Transportation shall ensure that surface contamination does not exceed the NRC and DOT specified limits of 2200 dpm/100 cm^2 for beta and gamma emitting radionuclides and 220 dpm/100 cm^2 for alpha emitting radionuclides. [10CFR71.87(i)] [49CFR173.443(a)] [CRD Appendix A (10CFR71)(49CFR173)]

J. The design of computer systems shall provide for the intercompatibility of computer resources, including hardware and software, with all other CRWMS elements. The design goal is to allow for the common use of databases and information by all system elements. [Derived by CRD] [CRD 3.3.10.B]

K. The capability shall be provided for the visual inspection and testing of loaded and unloaded cask(s) as necessary and appropriate to show compliance with 10CFR71 and DOE Order 5480.3 Section 10.d. [10CFR71.93(b)] [10CFR71.87] [DOE Order 5480.3 9.b(7)] [DOE Order 5480.3 10.d] [CRD 3.5.1.4]

L. Requirements for the design of the CMF collocated with the MGDS shall be defined in the MGDS System Requirements document. [Derived by CRD] [CRD 3.1.6.B] **<TBR>**

3.2.4 Physical Characteristics

Selection of additional standards or guidelines to meet the requirements specified in this section shall be by engineering analysis and documented in accordance with appropriate QA procedures. [Derived by CRD] [CRD 3.2.4]

3.2.4.1 Protective Coatings and Materials

A. Protective coatings for facilities and equipment shall be in accordance with DOE Order 6430.1A Section 0900-99.0. [DOE Order 6430.1A 0900-99.0] [CRD 3.2.4.1]

B. For Transportation facilities and equipment that require coatings to enhance decontamination of surfaces, the coatings shall conform to ASTM D4256 and ASTM D5144-91. [DOE Order 6430.1A 0900-99.0] [CRD 3.2.4.1]

C. The design of facilities and equipment shall comply with the requirements of 29CFR1926, 29CFR1910, and DOE Order 6430.1A Section 0950. [DOE Order 6430.1A 0950-1] [CRD 3.2.4.1]

3.2.4.2 Habitability

3.2.4.2.1 Environmental Controls

Environmental controls for facilities shall be capable of maintaining an environment that provides comfortable and appropriate workplace temperature, humidity in accordance with DOE Order 6430.1A Section 1300-12.4.3. [DOE Order 6430.1A 1300-12.4.3] [CRD 3.2.4.2.1]

3.2.4.2.2 Heating, Ventilation, and Air Conditioning

HVAC equipment for facilities shall be sized to conform with the guidelines in NUREG-0700 Section 6.1.5. MIL-STD-1472D Section 5.8.1 and the applicable ASHRAE Standard may be used for guidance. [DOE Order 6430.1A 1300-12.4.3] [CRD 3.2.4.2.2]

3.2.4.2.3 Illumination

Lighting in Transportation facility working areas and other enclosures shall conform with the guidelines in NUREG-0700 Section 6.1.5. MIL-STD-1472D Section 5.8.2 and applicable recommended practice of the Illumination Engineering Society may be used for guidance. [DOE Order 6430.1A 1300-12.4.3] [CRD 3.2.4.2.3]

3.2.4.2.4 Acoustical Noise

Work spaces shall be provided with an acoustical environment that conforms to the requirements of 29CFR1910.95. MIL-STD-1472D Section 5.8.3 and NUREG-0700 Section 6.1.5 may be used for guidance. [DOE Order 6430.1A 1300-12.4.3] [CRD 3.2.4.2.4]

3.2.4.2.5 Vibration

Facilities, buildings, personnel enclosures, and vehicles shall be designed, located, or modified to conform to the requirements for vibration control specified in appropriate standards, such as MIL-STD-1472D Section 5.8.4 and ANSI/ASA 38. [DOE Order 6430.1A 1300-12.4.3] [CRD 3.2.4.2.5]

3.2.4.3 Security

Requirements for security provision pertaining to escort equipment are contained in Section 3.7.4.

3.2.4.3.1 Physical Security

A. Transportation design shall incorporate physical protection facilities, equipment, and personnel to ensure compliance with 10CFR73.37. [10CFR73.37] [10CFR71.0(b)] [CRD 3.2.4.3.1.B]

B. Transportation design shall incorporate security facilities, equipment, and personnel to facilitate compliance with the security requirements of applicable DOE Orders including DOE Order 6430.1A that do not conflict with 10CFR73. [DOE Order 6430.1A 0110-13.1] [CRD 3.2.4.3.1.C]

3.2.4.3.2 Computer Systems

Computer systems that process safeguards information shall be self contained within the facility and require the use of entry code for access to stored information. Other systems may be used if approved for security by the NRC. [10CFR73.21(h)] [CRD 3.2.4.3.1.B]

3.2.5 System Quality Factors

3.2.5.1 Reliability

Transportation reliability requirements are driven by the necessity to provide a fault tolerant system that allows for the transportation of SNF and HLW in a safe manner. Nothing in this section shall be construed to indicate that NRC mandated redundancy of systems may be neglected. [Derived by CRD] [CRD 3.2.5.1.A]

3.2.5.1.1 Reliability Program Requirements

All design organizations shall establish and execute a reliability, availability, maintainability (RAM) program to support Integrated Logistic Support and the general engineering program for the CRWMS. Reliability shall be addressed as an element of design reviews. [Derived by CRD] [CRD 3.2.5.1.B]

3.2.5.1.2 Reliability of Equipment

A. A failure mode and effects analysis shall be performed for all major equipment whose failure can result in personnel injury or illness. Based on this analysis, designs must be developed to ensure reliability that minimizes safety hazards to the extent practical. Under such design conditions, failures shall not result in personal injury or occupational illness. If designs cannot be developed to these requirements, then the reliability of systems will be shown by analysis to be such as to minimize the probability of injury or illness to personnel. In demonstrating system reliability, MIL-STD-882B should be considered in the design, where applicable. (These criteria do not supplant radiological standards contained in NRC or EPA requirements, e.g., the radiological standards of 10CFR20.) [Derived by CRD] [CRD 3.2.5.1.D]

B. Provisions shall be made to make reliable and timely emergency power available to systems, structures, and components (SSCs), e.g., instruments, utility service systems and operating systems, central security system, and alarm systems important to safety, in the event of a loss of primary power. (Backup power requirements for items not identified as important to safety are covered by design analysis during the design development process.) [10CFR60.131(b)(5)(iii)] [10CFR72.122(k)(3)] [CRD 3.3.6.10.C]

3.2.5.1.3 Mission Reliability

All equipment shall be shown by analysis to have adequate reliability to allow Transportation to meet its mission and the throughput requirements identified in Table 3-2. [Derived by CRD] [CRD 3.2.5.1.E]

3.2.5.2 Maintainability/Inspectability

A. The structures, systems, and components important to safety shall be designed to permit periodic inspection, testing, and maintenance, as necessary, to ensure their continued functioning and readiness. [10CFR60.131(b)(6)] [10CFR72.122(f)] [CRD 3.2.5.2.A]

B. The design of equipment and systems shall conform to the maintainability requirements specified in applicable regulatory guidance and standards. [Derived by CRD] [CRD 3.2.5.2.B] [CRD 3.2.5.2.D]

C. The design of facilities and equipment shall minimize time required to perform work in the vicinity of radioactive components to facilitate compliance with ALARA requirements (e.g., by providing sufficient space for ease of operation and designing equipment for ease of repair and replacement). [DOE Order 6430.1A 1300-12.4.10] [10CFR60.131(a)(2)] [10CFR72.126(a)(5)] [CRD 3.2.5.2.E]

3.2.5.3 Availability

Availability for designs of Transportation segments shall be addressed in the Design Requirements Document. [Derived by CRD] [CRD 3.2.5.3.A]

3.2.5.4 Service Life

The service life requirements of SSCs shall be specified in the Transportation DRD and derivative specifications. Service life values will normally be determined by logistic support analysis, and other engineering and cost studies with appropriate consideration to the terms of the license or certificate. [Derived by CRD] [CRD 3.2.5.4]

3.2.5.5 Overall Utilization

Overall utilization is the product of scheduled utilization (the ratio of operating hours per year to total hours per year), availability, and worker productivity (the average fraction of a work period that workers perform work; nonproductive time excluded).

A. Overall utilization of the system elements shall be a subject addressed at design reviews. [Derived by CRD] [CRD 3.2.5.5.A]

B. The overall utilization for Transportation shall be **<TBD>**. The design of Transportation segments must consider the overall utilization in the design of the system to meet the applicable portions of the shipping schedule of Table 3-2. [Derived by CRD] [CRD 3.2.5.5.B]

3.2.6 Environmental Requirements

The natural and induced environments to constrain the design of an operational transportation cask system shall be **<TBD>**. As a minimum, these environments must bound the NRC limits specified in 10CFR71.71 and 10CFR71.73. [10CFR71.71(a)] [10CFR71.73(a)] [CRD 3.2.6.2.C] [CRD 3.2.6.2.D]

3.2.7 Transportability/Modularity

3.2.7.1 Transportability

Transportation cask systems (cask, transporter, and motive support equipment) shall conform to State and local laws, regulations, and ordinances and approved rail carrier operating rules relating to weight and size limitations. [DOE Order 1540.1A Ch I 4.c] [CRD Appendix A (DOE Order 1540.1A)]

3.2.7.2 Modularity

Specific requirements for temporary/modular facilities shall be addressed in the DRD as appropriate. [Derived by CRD] [CRD 3.2.7]

3.2.8 Flexibility, Expansion, and Integration

Facilities shall be designed and constructed so as not to preclude the later addition, where appropriate, of facilities for offices and laboratories, or expansion of a facility's basic mission. [Derived by CRD] [CRD 3.2.8]

3.2.9 Portability and Load Carrying

Equipment, tools, and components that must be moved over short distances for maintenance or other purposes shall:

A. Not exceed 35 pounds in weight, if to be moved by one person and moved without mechanical or lifting devices

B. Have suitable handgrips or lifting aids

C. Have mechanical lifting and handling devices provided, if heavier than 70 pounds or impractical for 2-person carry.

[MIL-STD-1472D 5.9.11.3.1] [CRD 3.2.9] [CRD 3.2.5.2.B]

3.3 DESIGN AND CONSTRUCTION

3.3.1 General Design Criteria

A. The design of Transportation facilities and equipment shall meet the requirements of regulations as prescribed by, but not limited to, the NRC and DOT. [NWPA 9] [10CFR71.0(a), (b)] [10CFR71.5(a)] [CRD 3.3.1.B] [CRD 3.7.2.2.C]

B. National standards (i.e., ASME, ANSI, ASTM, etc.), NRC guidance (i.e., NUREGs, Regulatory Guides, etc.), and other DOE accepted documents, identified as sufficient or more appropriate for the support of design shall be used at the discretion of the designers, providing there are no conflicts with the identified requirements of Transportation or the CRWMS. [QARD(DOE/RW-0333P) 3.2.1] [CRD 3.3.1.C]

3.3.2 Electromagnetic Radiation

A. Critical communications circuits shall be protected or shielded from electromagnetic interference, to include ionizing radiation, from sources to the extent specified by manufacturers of sensitive communications equipment used in the system. [DOE Order 6430.1A 0200-99.8.1] [CRD 3.3.2.A]

B. Lighting fixture types, location, and illumination levels shall be coordinated with the equipment and functions of telecommunication, alarm, and automated data processing (ADP) centers to provide the required illumination without creating electrical or electromagnetic interference detrimental to proper operation of equipment. [DOE Order 6430.1A 1655-99.8] [CRD 3.3.2.B]

C. Shielding shall be provided to protect magnetic recording equipment, magnetic tapes, and disk packs where an electromagnetic field of 10 microvolts per meter or 50 Oersteds or greater can be expected. [DOE Order 6430.1A 0110-99.8.4] [CRD 3.3.2.C]

3.3.3 Nameplates and Markings

A. Equipment and any parts of that equipment to be used by personnel shall be identified with appropriate labels. Equipment and equipment parts include, but are not limited to, system and subsystem component groupings, individual components, control positions or modes, display markings, instructions, procedure manuals, storage spaces, access panels, and tools. [DOE Order 6430.1A 1300-12.4.11] [CRD 3.3.3]

B. The label shall indicate clearly and concisely the function and purpose of the item being labeled. Unnecessary information (e.g., information used only for manufacturing purposes) must not be included. Hierarchial labeling also must be used to facilitate component location on control panels. [DOE Order 6430.1A 1300-12.4.11] [CRD 3.3.3]

C. The label information shall be easy to understand. Words, symbols, and other markings in a label or instruction must be unambiguous and accurate. The terminology used must have commonly accepted meaning for all users. [DOE Order 6430.1A 1300-12.4.11] [CRD 3.3.3]

D. Label design shall be consistent and the use of abbreviations and acronyms must be minimized. Various equipment labels placed on the same or similar pieces of equipment and serving similar functions must use the same material, color, font type, relative location to component, general format, and other configuration features to promote simplicity and avoid clutter. The terminology used for equipment, procedures, and training materials must be the same for each case. [DOE Order 6430.1A 1300-12.4.11] [CRD 3.3.3]

E. Permanent labels shall be attached to the specific component or equipment in such a manner that environmental conditions or usage by personnel will not make the label illegible or remove or destroy the label. [DOE Order 6430.1A 1300-12.4.11] [CRD 3.3.3]

F. Pipe, hose, and tube-line identification for liquids, gas, and steam shall be clearly and unambiguously labeled or coded as to contents, pressure, heat, cold, direction of flow, or other specific hazard information. [MIL-STD-1472D 5.13.3] [DOE STD-HFAC 10.3] [CRD 3.3.6.6.B]

G. Transportation shall provide marking and labeling in accordance with 49CFR172, Subpart D, 172.400 through 172.407, and 172.436 through 172.440. [10CFR71.5(a)(1)(ii)] [CRD 3.7.2.2.H(2)]

H. Transportation shall provide placarding in accordance with 49CFR172, 172.500 through 172.519, 172.556 and Appendices B and C. [10CFR71.5(a)(1)(iii)] [CRD 3.7.2.2.H(3)]

I. Each transportation cask shall be conspicuously and durably marked with its model and serial number, gross weight, and package identification number assigned by the NRC. [10CFR71.85(c)] [CRD Appendix A (10CFR71)]

3.3.4 Workmanship

3.3.4.1 Special Process

Special processes, including welding, heat treating, and nondestructive testing, shall be controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements. [10CFR71.119] [CRD 3.3.4.A] [CRD 3.6.1.B]

3.3.4.2 Criteria

The workmanship criteria shall reflect the currently applicable codes, standards, regulations, architectural, engineering principles and practices specified in the CRD and DOE 6430.1A (General Design Criteria) - 0109 Reference Standards and Guides, including but not limited to:

-AASHTO	American Association of State Highway and Transportation Officials
-ACI	American Concrete Institute
-AISC	American Institute of Steel Construction
-AISI	American Iron and Steel Institute
-ANS	American Nuclear Society
-ANSI	American National Standards Institute
-AREA	American Railway Engineering Association
-ARI	Air Conditioning and Refrigeration Institute
-ASCE	American Society of Civil Engineers
-ASHRAE	American Society of Heating Refrigerating and Air-Conditioning Engineers
-ASME	American Society of Mechanical Engineers
-AWS	American Welding Society
-ASTM	American Society for Testing and Materials
-IEEE	Institute of Electrical and Electronics Engineers
-MBMA	Metal Building Manufacturers Association
-NAAMM	National Association of Architectural Metal Manufacturers

-NAPHCC	National Association of Plumbing-Heating-Cooling Contractors
-NCMA	National Concrete Masonry Association
-NEMA	National Electrical Manufacturers Association
-NFPA	National Fire Protection Association
-NIST	National Institute of Standards and Technology (formerly National Bureau of Standards)
-PCA	Portland Cement Association
-PCI	Prestressed Concrete Institute

[DOE Order 6430.1A 0109] [CRD 3.3.4.B] [CRD 3.3.1.C]

3.3.5 Interchangeability/Standardization

A. To the extent practicable, components such as seals, valves, pumps, motors, fans, video monitors, cranes, lifting yokes, hoists, transportation cask motive support equipment, etc. used for similar functions shall be of identical manufacture and model, in order to promote the interchangeability of components. The objective is to simplify logistical support, such as repair parts supply, training and documentation. [Derived by CRD] [CRD 3.3.5]

B. Standardized parts, fittings, hardware, and modules shall be specified for Transportation to simplify stocking and ensure reliability and supportability. As a minimum, spare parts for primary and incidental repairs must be maintained by Transportation. [DOE Order 4700.1 Att III-1 1.a, 1.c(6)(b)3] [CRD 3.3.8.1.D]

3.3.6 Safety

3.3.6.1 General Requirements

In compliance with occupational safety and health standards promulgated under 29USC651 et seq., Transportation work places shall be free from recognized hazards that are causing or likely to cause death or serious physical harm to employees. [29USC651 654(a)(1)] [29USC651 654(a)(2), (b)] [CRD 3.3.6.1.A] [CRD 3.3.6.1.B]

3.3.6.2 System Safety Precedence

A. The objective is to design an inherently safe system. If an identified hazard cannot be eliminated, the associated risk shall be reduced to an acceptable level through design selection that emphasizes passive safety features including but not limited to redundant systems. [Derived by CRD] [CRD 3.3.6.2.A]

B. If identified hazards cannot be eliminated or their associated risk adequately reduced through equipment design or selection, those risks shall be reduced through the use

of fixed, automatic, or other protective safety design features or devices. Provisions must be made for periodic functional checks of safety devices when applicable. [Derived by CRD] [CRD 3.3.6.2.B]

C. When neither design nor safety devices can effectively eliminate identified hazards in a prompt and readily distinguishable fashion or adequately reduce associated risk, devices shall be used to detect the condition and to produce an adequate warning signal to alert personnel of any hazards. Warning signals and their application must be designed to minimize the probability of incorrect personnel reaction to the signal and must be standardized within like types of systems. (Reference Section 3.3.7.3 of this document) [Derived by CRD] [CRD 3.3.6.2.C]

D. Only where it is impractical to eliminate hazards through equipment design selection or adequately reduce the associated risks with safety and warning devices, procedures and training shall be used as the only protection. [Derived by CRD] [CRD 3.3.6.2.D]

3.3.6.3 Facilities, Equipment and Materials Protective Measures

A. Ventilation meeting the standards of 29CFR1910.94 shall be provided as applicable in surface areas where hazardous atmospheres are generated by construction, testing, normal, or maintenance operations. [29CFR1910.94] [CRD 3.3.6.3.E]

B. Protection against electrical, mechanical, machinery, fluid, and toxic hazards shall be in accordance with the requirements of 29CFR1910, Subpart H and Subpart O. [29CFR1910 Subparts H and O] [CRD 3.3.6.3.G]

3.3.6.4 Personnel Protective Equipment

A. Protective equipment such as helmets, face shields, safety shoes, and respiratory protectors shall be selected in accordance with applicable requirements of 10CFR20.1703 (respiratory protectors only), 29CFR1910 Subpart I, 29CFR1926 Subpart E, and DOE Order 6430.1A Section 12.4.5. [10CFR20.1703] [29CFR1910 Subpart I] [29CFR1926 Subpart E] [DOE Order 6430.1A 1300-12.4.5] [CRD 3.3.6.4.A]

B. Hearing protection devices shall be provided as required by 29CFR1910.95. [29CFR1910.95] [CRD 3.3.6.4.B]

C. Appropriate facilities, including compartments in prime movers and transporters, that provide convenient storage and emergency issue shall be provided for personal protective equipment. [29CFR1910.132] [CRD 3.3.6.4.C]

3.3.6.5 Safety Labels

A. Safety labels shall be designed and displayed as required in 29CFR1910 Subpart J. [29CFR1910 Subpart J] [CRD 3.3.6.6.A]

B. Alerting devices, emergency doors and exits, and equipment provided for use in hazard areas and the environment around surface workspaces shall be designed in accordance with the requirements of 29CFR1910 Subpart E. [29CFR1910.36(a)] [CRD 3.3.6.6.C]

3.3.6.6 Emergency Lighting

A. Failure of the normal lighting systems shall not inhibit or degrade the operation of emergency lighting in accordance with NUREG-0700 Section 6.1.5.4.b. [DOE Order 6430.1A 1300-12.4.3] [CRD 3.3.6.7.A]

B. The emergency lighting system shall be designed to automatically actuate in accordance with NUREG-0700 Section 6.1.5.4.a. Emergency lighting must be powered by batteries that are continuously charged and easily monitored. [DOE Orders 6430.1A 1300-12.4.3] [CRD 3.3.6.7.B]

C. Lighting levels shall comply with the guidelines of NUREG-0700 Section 6.1.5.4.c. [DOE Order 6430.1A 1300-12.4.3] [CRD 3.3.6.7.C]

3.3.6.7 Equipment Related Hazards

A. Interlocks, alarms, access, hazard access, and edge-rounding shall be provided and designed in accordance with the requirements of:

(1) 29CFR1910 Subpart N for material handling equipment

(2) 29CFR1910 Subpart O for machinery

(3) 29CFR1910 Subpart P for tools

(4) 29CFR1926 Subparts H, I, O for construction applications.

MIL-STD-1472D Section 5.13.5 may be used for guidance.

[29CFR1910.179(i)] [29CFR1910.212(a)(1)] [29CFR1910.242(a)] [29CFR1926 Subparts H, I, O] [CRD 3.3.6.8.A] [CRD 3.3.6.8.C] [CRD 3.3.6.8.D]

B. Tag-out and lock-out fixtures shall be provided to protect servicing and maintenance personnel from unexpected energization or startup of machines or equipment, as required by 29CFR1910.147. [29CFR1910.147(a)(1)(i)] [CRD 3.3.6.8.B]

C. Welding equipment and areas where welding operations will be performed shall meet the requirements specified by 29CFR1910 Subpart Q. [29CFR1910.252(a), (b), (c)] [CRD 3.3.6.8.E]

D. Where the possibility exists for the eyes or body of any person to be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the immediate work area for emergency use. [29CFR1910.151(c)] [CRD 3.3.6.8.F]

E. Machines designed for fixed location shall be securely anchored to prevent walking or moving. [29CFR1910.212(b)] [CRD 3.3.6.8.C]

F. Hand and portable power tools shall meet the applicable requirements specified by 29CFR1910 Subpart P. [29CFR1910.242(a)] [CRD 3.3.6.8.D]

3.3.6.8 Work Platforms

A. Any powered platforms, manlifts, and vehicle-mounted work platforms shall be designed and constructed to comply with 29CFR1910 Subpart F. [29CFR1910.66(a)] [CRD 3.3.6.9.A]

B. Scaffolds, ladders, work platforms, stands, and bridges shall be provided with safety devices in accordance with the requirements of 29CFR1910 Subparts D and F. [29CFR1910 Subpart D] [29CFR1910.66(a)] [CRD 3.3.6.9.B]

3.3.6.9 Electrical Safety

A. Electrical systems and components shall be selected, designed, and installed as required by 29CFR1910 Subpart S. [29CFR1910.301] [CRD 3.3.6.10.A]

B. Electrical power systems shall be designed in accordance with DOE Order 6430.1A, Division 16 Electrical. [DOE Order 6430.1A 1605-1] [CRD 3.3.6.10.B]

C. Protection against electrical hazards shall also conform to the requirements in 29CFR1910 Subpart S. The National Electric Code (ANSI/NFPA 70), the National Electric Safety Code (ANSI Standard C2), and MIL-STD-1472D Section 5.13.7.1 may be used for guidance. [29CFR1910.301] [CRD 3.3.6.10.D]

3.3.7 Human Factors Engineering

3.3.7.1 Workstation and Control Rooms

Control rooms include rooms, areas, and personnel enclosures for personnel who operate equipment or monitor the operations of Transportation. Workstations contain workspace and associated equipment for performing those functions. Design and layout of control rooms and workstations shall consider the requirements and guidelines identified in NUREG-0700 Section 6.1. [Derived by CRD] [CRD 3.3.7.1]

3.3.7.2 Voice Communication Equipment

Design and selection of voice communications equipment shall consider the human factors engineering requirements and guidelines identified in NUREG-0700 Section 6.2.1 and appropriate standards, such as MIL-STD-1472D Section 5.3.10 for operating controls for voice communications equipment. [DOE Order 6430.1A 1300-12.4.9] [CRD 3.3.7.2]

3.3.7.3 Alarms and Warning Systems

Auditory and visual alarm systems alert personnel to out of tolerance conditions that, if overlooked, may lead to personnel injury, equipment damage, or loss of system capability. Alarms and warning systems shall be designed or procured to meet the requirements and guidelines identified in NUREG-0700 Section 6.3 for alarms and operator response systems, and in Section 6.2.2 for audio displays and alerts. [DOE Order 6430.1A 1300-12.4.8] [CRD 3.3.7.3]

3.3.7.4 Controls

Controls include operator activated switches, valves, and similar mechanisms or devices used to regulate or guide operations of a machine, apparatus, or system. Human factors engineering design of controls shall follow the requirements and guidelines identified in NUREG-0700 Section 6.4 for selection of controls and design principles of controls. [DOE Order 6430.1A 1300-12.4.7] [CRD 3.3.7.4]

3.3.7.5 Visual Displays

Visual displays include meters, colored lights, graphic devices, and numerical readouts. Design or acquisition of visual displays shall consider the requirements and guidelines identified in NUREG-0700 Section 6.5. [DOE Order 6430.1A 1300-12.4.6] [CRD 3.3.7.5]

3.3.7.6 Control Panel Layout

Design and layout of control panels shall conform to the requirements and guidelines identified in NUREG-0700 Section 6.8 for control groupings, layout arrangement, and location aids. [DOE Order 6430.1A 1300-12.4.4] [CRD 3.3.7.6]

3.3.7.7 Control Display Integration

Design and integration of controls with associated displays shall incorporate the requirements and guidelines provided in NUREG-0700 Section 6.9 for single and multiple controls with single and multiple displays, control and display groups, and dynamic controls and display relationships. [Derived by CRD] [CRD 3.3.7.7]

3.3.7.8 Signs and Location Aids

Labeling and marking equipment, signs, and location aids shall consider the requirements and guidelines provided in NUREG-0700 Section 6.6 for general labeling principles. This requirement does not replace or provide design alternatives to the labeling and placarding requirements of 10CFR71 and 49CFR172. [DOE Order 6430.1A 1300-12.4.11] [CRD 3.3.7.8]

3.3.7.9 Visual Display Terminal (VDT) Workstation

Design, selection, and integration of VDT workstations shall consider the requirements and guidelines specified in appropriate standards, such as ANSI/HFS Std No 100-1988 for VDT workstation environment. [Derived by CRD] [CRD 3.3.7.9]

3.3.7.10 Anthropometry

Sizing and layout dimensions for equipment and facilities, and the selection of personnel equipment and clothing to provide compatibility with personnel shall consider the anthropometric guidelines identified in appropriate standards, such as MIL-STD-1472D Section 5.6.3 for clearance dimensions, limiting dimensions, adjustable dimensions, and clothing and personnel equipment, and DOD-HDBK-743A for special populations. [DOE Order 6430.1A 1300-12.4.2] [CRD 3.3.7.10]

3.3.7.11 Remote Handling and Operation

The design, selection, and integration of equipment, controls, and indicators for remotely operated systems shall consider the requirements and guidelines identified in appropriate standards, such as MIL-STD-1472D Section 5.10. [Derived by CRD] [CRD 3.3.7.11]

3.3.7.12 Vehicles and Material Handling

The human factors engineering, design, selection, and acquisition of operational vehicles, transportational vehicles, and material handling equipment shall consider the requirements for human interface as specified in appropriate standards, such as MIL-STD-1472D Section 5.12 for seating, controls, operating instruments, visibility, heating and ventilation, trailers and vans, cranes, materials handling equipment, construction equipment, and automotive systems, and Section 5.14.1 for head-up displays. [Derived by CRD] [CRD 3.3.7.12]

3.3.7.13 Accessibility and Useability by the Physically Handicapped

A. Buildings at Transportation facilities shall be designed and constructed to accommodate the physically handicapped as required by General Services Administration (GSA) Uniform Federal Accessibility Standards. [41CFR101-19.603] [CRD 3.3.7.13]

B. The design, selection, and construction of Transportation facilities shall consider accessibility and useability of facilities and equipment by physically handicapped personnel, both visitors and employees. As a minimum, the guidance and requirements specified in DOE Order 6430.1A Section 1300-13 shall be considered for all facility and equipment designs. [Derived by CRD] [CRD 3.3.7.13]

3.3.7.14 User-Computer Software Interface

Design of computer software that provides an interface between users and computers shall consider the guidelines and requirements identified in appropriate standards, such as Guidelines for Designing User Interface Software MTR 10090 for data entry and user inputs, data display, sequence control, user guidance and prompts, data transmission, and data protection. [Derived by CRD] [CRD 3.3.7.14]

3.3.8 Methods and Controls

3.3.8.1 Material Management

3.3.8.1.1 Identification and Control

Transportation shall develop and implement a system (preferably automated) to provide identification and control of materials, parts, and components, including the use of heat numbers, part numbers, serial numbers, or other means, either on the item or on records traceable to the item as required, throughout fabrication, installation, and use of the item. The identification and control must be designated to prevent the use of incorrect or defective materials, parts, and components. The material management system must enable location and removal of such items. [10CFR71.117] [QARD (DOE/RW-0333P)] [CRD 3.3.8.1.A] [CRD 3.3.8.2.B]

3.3.8.1.2 Nonconforming Items

Materials, parts, or components that do not conform to requirements shall not be used or installed. This must include procedures for identification, documentation, segregation, disposition, and notification to affected organizations. Nonconforming items must be reviewed and accepted, rejected, repaired, or reworked in accordance with documented procedures. [10CFR71.131] [QARD (DOE/RW-0333P)] [CRD 3.3.8.1.B]

3.3.8.2 Inventory Control

3.3.8.2.1 SNF and HLW Inventory Control

A. Transportation shall use hardware and software systems for maintaining an inventory of all in-transit SNF and HLW. [Derived by CRD] [CRD 3.3.8.2.A]

B. Inventory accounting and control systems for in-transit SNF and HLW shall comply with the requirements of 10CFR75, in compliance with the US/IAEA agreement. [10CFR75.1] [CRD 3.3.8.2.C]

3.3.8.2.2 Parts and Equipment Inventory Control

The storage of parts and material used in packaging shall provide for the control of these parts and material, to prevent damage and deterioration, and to maintain tracking of parts with documentary evidence. [10CFR71.115(b)] [10CFR71.127] [CRD 3.5.3.C]

3.3.9 Government Furnished Property

A. Transportation DRD shall identify, as appropriate, any property to be furnished by the U.S. Government. [Derived by CRD] [CRD 3.3.9.B]

B. Requirements pertaining to the maintenance, operation, and disposition of Government furnished property shall be specified in Transportation DRD as appropriate. [Derived by CRD] [CRD 3.3.9.C]

3.3.10 Computer Resources

Computer resources shall be addressed in the Transportation DRD. [Derived by CRD] [CRD 3.3.10.A]

3.3.11 Environmental Protection

A. Transportation shall comply with applicable Federal, State, local, and Tribal environmental regulations that are in compliance with Department of Transportation regulations for hazardous materials. [NWPA 9] [CRD 3.3.11.A] [CRD 3.7.2.2.C]

B. The control of air emissions shall comply with the Clean Air Act (42USC7401 et seq.) as amended and adhere to applicable Federal regulations including 40CFR50 and 40CFR60. [40CFR50.6(a)] [40CFR60.13(a)] [CRD 3.3.11.B]

C. Activities impacting drinking water shall comply with the Safe Drinking Water Act (42USC300f et seq.), as amended, and adhere to applicable Federal regulations including 40CFR141 and 40CFR143. [42USC300f] [40CFR141.3] [40CFR143] [CRD 3.3.11.D]

D. The handling, use, and disposal of any toxic substances shall comply with the requirements of the Toxic Substances Control Act (TSCA) (15USC2601 et seq.), as amended, and its implementing regulations, which include 40CFR747 and 40CFR761. [15USC2601 2605(a)] [CRD 3.3.11.E]

E. The use of pesticides shall comply with the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7USC136 et seq.), as amended, and its implementing regulations, which include 40CFR165. [40CFR165.2(a)] [CRD 3.3.11.F]

F. The management, transport, and disposal of any solid and hazardous wastes shall be conducted in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA) (42USC6901 et seq.), as amended, which could include RCRA permitting for the hazardous wastes. Applicable Federal regulations include

40CFR261, 40CFR262, 40CFR263 and 40CFR270. The RCRA program is partially administered by an authorized State agency. [40CFR261.1(a)] [40CFR262.11] [40CFR263.10(a)] [40CFR270.1(a)(2)] [CRD 3.3.11.G]

3.4 DOCUMENTATION

3.4.1 Required Documents and Specification

3.4.1.1 Presentation of Design Basis

A. Transportation shall ensure that applicable requirements and the design basis for structures, systems and components important to safety are correctly translated into specifications, including ensuring that appropriate quality standards are included in design documents. [QARD (DOE/RW-0333P)] [10CFR71.107] [CRD 3.4.1.A]

B. Transportation shall review for design impact, and for inclusion of requirements into the DRD, the following documents:

(1)	42USC4321 et seq.	National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190)
(2)	42USC9601 et seq.	Comprehensive Environmental Response, Compensation and Liability Act (SuperFund) as amended by the SuperFund Amendments and Reauthorization Act (SARA) of 1986 (P.L. 99-499)
(3)	10CFR51	Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions
(4)	10CFR1021	National Environmental Policy Act Implementing Procedures
(5)	33CFR1-199	Coast Guard Department of Transportation
(6)	49CFR200-236	Federal Railroad Administration
(7)	49CFR350-399	Federal Motor Carrier Safety Regulations
(8)	DOE Order 1332.1A	Uniform Reporting System
(9)	DOE Order 1540.2	Hazardous Materials Packaging for Transport - Administrative Procedures

(10)	DOE Order 1540.3A	Base Technology for Radioactive Material Transportation Packaging Systems
(11)	DOE Order 5500.1B	Emergency Management System
(12)	DOE Order 5500.4A	Public Affairs Policy and Planning Requirements for Emergencies
(13)	DOE Order 5900.2A	Use of the Metric System of Measurement
(14)	ANSI N14.24-1985	For Highway Route Controlled Quantities of Radioactive Material - Domestic Barge Transport

[Derived]

3.4.1.2 Interface Control

Transportation shall ensure that segment design interfaces within their system element are identified, controlled, and coordinated among participating organizations, including writing procedures for review, approval, release, distribution, and revision of documents involving design interfaces. [QARD (DOE/RW-0333P)] [10CFR71.107] [CRD 3.4.1.A]

3.4.1.3 Quality Affecting Specifications

Transportation shall prescribe activities and items (e.g., facilities and equipment) affecting quality by documented specifications. The specifications must include appropriate acceptance criteria for determining that important activities have been satisfactorily accomplished and items fulfill all appropriate requirements. [QARD (DOE/RW-0333P)] [10CFR71.111] [CRD 3.4.1.B]

3.4.2 Drawings

Measures and procedures shall be established to ensure that applicable regulatory requirements, design basis requirements, and other requirements as specified herein are correctly translated into drawings. These measures and procedures must ensure that appropriate quality standards are specified and included in design documents and that deviations from these standards are properly controlled. [QARD (DOE/RW-0333P)] [10CFR71.107] [CRD 3.4.2.A]

3.4.3 Maintenance, Operators, and Technical Manuals

Measures and procedures shall be established to ensure that applicable regulatory requirements, design basis requirements, and other requirements as specified herein are correctly translated into procedures and instructions, including training, operator, maintenance, and other technical manuals. These measures and procedures must ensure that appropriate quality standards are specified and included in design documents and that deviations from these standards are properly controlled. [QARD (DOE/RW-0333P)] [10CFR71.107] [CRD 3.4.3]

3.4.4 Test Plans and Procedures

A. Transportation shall establish a test program and procedures to assure testing is performed to demonstrate that the packaging equipment and components will perform satisfactorily in service. [10CFR71.123] [CRD Appendix A (10CFR71)]

B. Transportation shall, through tests and evaluations, demonstrate the conformance of the design to the system requirements as required in the verification cross-reference table of Section 4.3 (Table 4-1). [Derived by CRD] [CRD 3.4.4]

3.4.5 Quality Assurance Documentation

3.4.5.1 Material and Equipment Conformance

Transportation shall have available documentary evidence that material and equipment conform to the procurement specifications prior to their installation or use and must ensure that the evidence is sufficient to identify the specific requirements met by the purchased material and equipment. [10CFR71.115(a)] [QARD (DOE/RW-0333P)] [CRD 3.3.8.1.C]

3.4.5.2 Records Maintenance

A. Quality Assurance documents shall be prepared, maintained, and stored in accordance with the requirements specified in OCRWM QARD or equivalent OCRWM approved QA program. [QARD (DOE/RW-0333P)] [CRD 3.4.5]

B. Transportation shall establish measures to control the issuance of documents affecting quality in accordance with 10CFR71.113. [10CFR71.113] [CRD Appendix A (10CFR71)]

C. Transportation shall maintain sufficient written records to describe the activities affecting quality. The records must include the instructions, procedures, and drawings required by 10CFR71.111 to prescribe quality assurance activities and must include closely related specifications such as required qualifications of personnel, procedures,

and equipment. The records must include instructions or procedures that establish a records retention program that is consistent with applicable regulations and designates factors such as duration, location, and assigned responsibility. [10CFR71.135] [CRD 3.4.5]

D. Transportation shall retain records for three years beyond the last shipment date. If any portion of the written procedures or instructions is superseded, Transportation must retain the superseded material for three years after it is superseded. [10CFR71.135] [CRD 3.4.5]

E. Transportation shall maintain records for the activities affecting quality as described in 10CFR71.135. [10CFR71.135] [DOE/RW-0194P Sect. 6.1-6.4b] [CRD 3.4.8]

3.4.6 Construction Records

Construction/fabrication records requirements for Transportation, including as-built documentation requirements, shall be specified in the DRD. [Derived by CRD] [CRD 3.4.6.A]

3.4.7 Computer Documentation Standard Usage and Practice

Analytical models, computational models, and software user documentation developed for Transportation that are considered to be quality affecting, shall be prepared in accordance with the OCRWM QARD. [QARD (DOE/RW-0333P)] [CRD 3.4.7]

3.4.8 Records Management

The records management facility shall maintain all records in a legible condition throughout the retention period. Records retained on magnetic media must be capable of producing legible, accurate, and complete records during the required retention period. Records must retain all pertinent information such as stamps, initials, and signatures. Adequate safeguards must be provided against tampering and loss of records. [10CFR71.1(b)] [CRD 3.4.8]

3.5 LOGISTICS

3.5.1 Maintenance

The basic premise of the Program maintenance concept is to minimize the likelihood of, and mitigate the effects of, SSC failures using preventive maintenance and inspection. When failures do occur, the goal is to provide a capability to restore full operational capability as quickly as possible through a proactive corrective maintenance program. SSCs shall be designed to permit

periodic testing, inspection, and maintenance, as necessary, to ensure their continued functioning and readiness. [10CFR60.131(b)(6)] [10CFR72.122(f)] [CRD 3.5.1]

3.5.1.1 Equipment Maintenance

A. Transportation maintenance shall be equipment intensive rather than personnel intensive. Emphasis will be placed on the detection of faults and failures through remote monitoring equipment. [10CFR60.131(b)(8)] [10CFR72.122(i)] [CRD 3.5.1.1.A]

B. Built-in-test equipment (BITE) and automatic-test-equipment (ATE) shall be used where they are already incorporated into the design of a system or equipment, but existing equipment will not be redesigned to accommodate BITE or ATE without specific authorization. Newly designed equipment or systems must incorporate BITE and/or ATE only where it can be demonstrated to significantly reduce the on-site maintenance workload. [DOE Order 4700.1 Att III-1 1.a, 1.c(6)(b)3] [CRD 3.5.1.1.B]

C. Maintenance facilities, equipment, and tools shall be provided based on the criteria specified by DOE Order 4330.4A Ch I 3.5. [DOE Order 4330.4A Ch I 3.5] [CRD 3.5.1.1.C]

3.5.1.2 Calibration Maintenance

Tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality shall be properly controlled, calibrated, and adjusted in accordance with applicable portions of the quality assurance program, the manufacturer's standards/requirements, and industry standards to maintain accuracy within necessary limits. [10CFR71.125] [CRD 3.5.1.2]

3.5.1.3 Radiological Equipment Maintenance

Requirements for radiological equipment maintenance will be addressed under the requirements for the CMF.

3.5.2 Supply

3.5.2.1 Logistics Support Analysis

As the maintenance concept influences the design it also affects the type and quantity of supply support that will be required to support Transportation. Based on projected logistics support requirements for design considerations, an analysis shall be conducted to assess the capability of support available to Transportation. This analysis, Logistic Support Analysis (LSA), must be

conducted on an iterative basis through all phases of the system or equipment life cycle to satisfy supportability and maintainability objectives. The level of detail of the analyses and the timing of the task performance must be tailored to each system/equipment and must be responsive to program schedules and milestones. An LSA Program, in accordance with MIL-STD-1388 series, or equivalent, must be established for Transportation. [DOE Order 4700.1 Att III-1 1.a, 1.c(6)(b)3] [CRD 3.5.2] [CRD 3.5.4]

3.5.3 Facilities

A. Facilities and equipment shall be provided to collect, store, and maintain QA records in accordance with the requirements of the OCRWM QARD. [QARD (DOE/RW-0333P)] [10CFR71.135] [CRD 3.5.3.A]

B. Facilities shall be provided to manage and dispose of site-generated sludge, solid, and hazardous wastes (excluding radioactive wastes) in accordance with the requirements of the Clean Water Act as implemented in 40CFR110-136 and RCRA as implemented in 40CFR240-272. [33USC1251 et seq.] [42USC6901 et seq.] [CRD 3.5.3.B]

C. Warehouse space shall be provided for the storage of all spare parts, replaceable equipment, and consumable material in an environment conducive to their safe keeping and protection. [10CFR71.127] [CRD 3.5.3.C]

D. Facilities shall be provided to support training required by DOE Order 4330.4A Ch I 3.1.4. [DOE Order 4330.4A Ch I 3.1.4] [CRD 3.5.3.D]

E. Facilities and equipment shall be provided to implement support functions, such as administration (security, visitor center, etc.) and logistics (maintenance, utilities, etc.) not specified in 3.5.3 A-C above. [DOE Order 4700.1 Att III-1 1.a, 1.c(6)(b)3] [CRD 3.5.3.E]

3.6 PERSONNEL AND TRAINING

3.6.1 Personnel

A. Operations of systems and components that have been identified as quality affecting in a Safety Analysis Report or in a license or certificate shall be performed only by trained and certified personnel or by personnel under the direct visual supervision of an individual with training and certification in such operation. Supervisory personnel who direct operations that are important to safety must also be certified in such operations. [10CFR71.105(d)] [CRD 3.6.1.A]

B. The physical condition and general health of personnel certified in the operation of equipment and controls that are important to safety shall not be such as might cause operational errors that could endanger other in-plant personnel or the public health and safety. Any condition that might cause impaired judgement or motor coordination must be considered in the selection of personnel for activities that are important to safety. These conditions need not categorically disqualify a person, if appropriate provisions are made to accommodate such condition. [10CFR60.162] [10CFR72.194] [CRD 3.6.1.C]

3.6.2 Training

3.6.2.1 General Requirement

A. Transportation shall provide facilities and equipment necessary to support or conduct training for the operation and maintenance of facilities, hardware and software procured or developed for Transportation. [Derived by CRD] [CRD 3.6.2.1.A]

B. Transportation equipment maintenance training shall be provided based on the criteria specified by DOE Order 4330.4A Ch I 3.1.4. [DOE Order 4330.4A Ch I 3.1.4] [CRD 3.6.2.1.C]

C. Transportation shall provide a training requirements document to identify requirements of operator and maintenance training for facilities, hardware, and software procured or constructed for Transportation. The document must address the following subjects:

(1) The contractor and government responsibility for training must be defined. This will include the concept of how training will be accomplished (e.g., school, contractor training, refresher courses).

(2) Equipment required for training purposes must be identified.

(3) Training devices to be developed, characteristics of the training devices, and training and skills to be developed through the use of training devices must be identified.

(4) Training time and locations available for training must be identified.

(5) Source material and training aids to support the specified training must be identified.

[Derived by CRD] [CRD 3.6.2.1.D]

D. Programs and facilities for training, proficiency testing, certification and recertification of personnel shall be established. [10CFR71.105(d)] [CRD 3.6.2.1.E]

E. Transportation shall require that any person (including drivers, train crews, and other carrier personnel) who in the course of employment directly affects hazardous materials transportation safety is fully trained in accordance with the requirements of 49CFR172 Subpart H and 49CFR177.816. [49CFR172.702(b)] [49CFR177.825(d)(1)] [CRD 3.6.2.1.F] [CRD 3.7.2.2.B]

3.6.2.2 Health Physics Training

Transportation shall provide a program for training, proficiency testing, and certification of personnel in radiation protection (health physics) and ALARA. [Derived by CRD] [CRD 3.6.2.2]

3.6.2.3 Public Safety Official Training

Transportation shall provide technical assistance and funding for training public safety officials of local governments and Indian Tribes through whose jurisdiction SNF and HLW will be shipped. Training must cover procedures required for safe routine transportation of SNF and HLW and procedures for dealing with incident response situations. [NWPAA 180(c)] [CRD Appendix A (NWPAA)]

3.7 SEGMENT REQUIREMENTS

This section provides a synopsis of the description, functions and interfaces of each segment of Transportation, and specifies the mission requirements that will govern the design and construction of each segment.

3.7.1 Transportation Cask Systems Segment

3.7.1.1 Transportation Cask Systems Segment Description

This segment includes the transportation cask systems that are necessary to move SNF and HLW from Purchaser/Producer sites to CRWMS sites and between CRWMS sites.

There are several general types of transportation cask systems being considered:

1. **From Reactor Cask Systems** - These transportation cask systems are primarily intended for transporting standard and nonstandard SNF from Purchaser sites to a CRWMS site. However, they could also be used between CRWMS sites or between

CRWMS and other sites. These cask systems may be transported by truck, rail and/or barge.

2. **From MRS Cask Systems** - These transportation cask systems are primarily for transporting SNF from the MRS to the MGDS. These are for rail transport and may be an adaption of the From Reactor Rail Cask System or a totally different transportation cask system.

3. **Transportable Storage Cask (TSC) Systems** - These transportation cask systems are for transporting and storing SNF. These are for rail transport between Purchaser sites and a CRWMS site and between CRWMS sites.

4. **Specialty Cask Systems** - These transportation cask systems are for transporting nonstandard SNF and/or fuel related hardware from Purchaser/Producer sites to the MGDS. These cask systems may be transported by truck, rail and/or barge.

5. **HLW Cask Systems** - These transportation cask systems are for transporting commercial and defense HLW from Producer sites to the MGDS. These are for rail transport.

6. **Multi-Purpose Canister (MPC) Cask Systems** - These transportation cask systems are for transporting the MPCs containing SNF from Purchaser sites to CRWMS sites and between CRWMS sites. The MPC transportation cask includes a cask body that serves as an overpack and an internal MPC that serves as a basket to structurally support the SNF.

Each transportation cask system includes the following:

A. **Cask** - The transportation cask is a Type B packaging[1] for shipping SNF/HLW and/or nonfuel components. The transportation cask will meet all applicable regulatory requirements. The transportation cask consists of various hardware items, including baskets for different types of waste configurations.

B. **Transporter** - The transporter is a cargo-carrying vehicle used for transportation of cargo. It includes semitrailers, rail cars, intermodal transportation skids and equipment such as tie-down components, personnel barriers, etc. needed to make the loaded transporter transport-ready. Also, due to the need to tightly integrate the cask-transporter-tractor combination to meet weight requirements for the legal-weight truck cask system, it may include the tractor.

C. **Motive Support Equipment** - Motive support equipment consists of the vehicle providing motive power to the transporter (with exception of the legal-weight truck)

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[1] Reference glossary for definitions of packaging and Type B package.

and other equipment needed to support movement of the transportation cask. Examples are locomotives, rail buffer cars, barges, cranes and heavy lift/haul tractors (trucks) with trailers.

D. **Ancillary Equipment** - Ancillary equipment consists of equipment, fixtures and tools needed for loading, closing, preparing, and verifying that a transportation cask is ready for transport. It includes shipping and storage containers for the ancillary equipment.

E. **Special Tools and Fixtures** - Special tools and fixtures include items such as protective covers for cask flanges and bottoms when in spent fuel or other pools; special stud or bolt torquing/tensioner systems; tools and lifting devices for removal and installation of transportation cask from and onto transporter and in and out of pools; tools, fasteners, and lifting devices for removal and installation of transportation cask components (e.g. baskets, lids, impact limiter, etc); tilting frame, in-plant seismic restraint; contamination barriers; and shipping and storage containers for special tools and fixtures and transportation cask components (e.g. baskets).

F. **Spare Parts** - Spare parts consist of parts that are likely to be consumed and/or damaged. Examples are valves, fittings, connectors, plugs, penetration covers and seals, o-ring seals, bolts, fasteners, etc. This also includes suitable shipping and storage containers for the spare parts.

3.7.1.1.1 Transportation Cask Systems Segment Functions

This segment shall be capable of performing all functions allocated to it in Table B-1 in Appendix B. These functions are:

A. Transport Waste (1.2)
B. Ship Cask System (1.2.2)
C. Contain Waste for Transportation (1.2.2.1)
D. Move Cask System (1.2.2.3)
E. Move Loaded Cask System (1.2.2.3.1)
F. Move Unloaded Cask System (1.2.2.3.2)
G. Move New Cask System (1.2.2.3.3)
H. Deliver Cask System (1.2.2.4)
I. Deliver Loaded Cask System (1.2.2.4.1)
J. Position Loaded Cask System (1.2.2.4.1.1.1)
K. Deliver Unloaded Cask System (1.2.2.4.2)
L. Position Unloaded Cask System (1.2.2.4.2.1.2)
M. Deliver New Cask System (1.2.2.4.3)
N. Support Transportation System (1.2.3)
O. Protect Environment, Public, Workers, and Facilities (1.2.3.1)

Descriptions for these functions are stated in Appendix A.

3.7.1.1.2 Transportation Cask System Segment Interfaces

The lower level Design Requirements Document shall identify, describe, and specify interface requirements between Transportation segments and corresponding interface requirements external to the CRWMS. [CRD 3.2.3.2] [CRD 3.7.2.1.2]

3.7.1.2 Transportation Cask Systems Segment Requirements

3.7.1.2.1 Casks

A. All transportation casks shall be certified by the NRC. [NWPA 137(a)(1)] [NWPAA 180(a)] [CRD 3.7.2.2A]

B. A transportation cask that is transported as an exclusive use shipment shall be designed, fabricated, and prepared for shipment so that the radiation level does not exceed the following:

(1) 200 millirem/hour (2 millisievert/hour) on the external surface of the package unless the following conditions are met, in which case the limit is 1000 millirem/hour (10 millisievert/hour):

(a) The shipment is made in a closed transport vehicle;

(b) Provisions are made to secure the package so that its position within the vehicle remains fixed during transportation; and

(c) There are no loading or unloading operations between the beginning and end of the transportation;

(2) 200 millirem/hour (2 millisievert/hour) at any point on the outer surface of the vehicle, including the upper and lower surfaces, or, in the case of an open (flat-bed style) vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load (or enclosure), and on the lower external surface of the vehicle;

(3) 10 millirem/hour (0.1 millisievert/hour) at any point two meters (6.6 feet) from the vertical planes represented by the outer lateral surfaces of the vehicle (excluding the top and underside of the vehicle), or, in the case of an open (flat-bed style) vehicle, at any point two meters (6.6 feet) from the vertical planes projected from the outer edges of the conveyance (excluding the top and underside of the vehicle); and

(4) 2 millirem/hour (0.02 millisievert/hour) in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when persons occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and training in accordance with 10CFR19.12 (i.e., operate under provisions of a State or Federally regulated radiation protection program).
[10CFR71.47] [49CFR173.441(b)] [CRD 3.2.2.7] [CRD 3.7.2.2.F]

C. The transportation cask shall be designed, fabricated, and loaded so that the following thermal limitations are not exceeded:

(1) The heat generated within the package because of the radioactive contents must not, at any time during transportation, affect the integrity of the package under conditions normally incident to transportation. [49CFR173.442(a)] [10CFR71.43(f)] [CRD 3.2.2.7] [CRD 3.3.6.3.H(1)]

(2) The temperature of the accessible external surfaces of the loaded package must not, assuming still air in the shade at an ambient temperature of 38°C (100°F), exceed 82°C (180°F) in an exclusive use shipment. [49CFR173.442(b)(2)] [10CFR71.43(g)] [CRD 3.2.2.7] [CRD 3.3.6.3.H(2)]

D. A transportation cask previously approved by the NRC, but not designated as B(U) or B(M) in the NRC Certificate of Compliance, shall only be used under the general license of 10CFR71.12 if fabrication of the packaging was satisfactorily completed before August 31, 1986, as demonstrated by application of its model number in accordance with 10CFR71.85(c). [10CFR71.13(a)] [CRD 3.2.2.7]

E. A transportation cask, in addition to satisfying the requirements of 10CFR71.41 through 71.47, shall be designed, constructed, and prepared for shipment so that under the tests specified below the associated performance criteria can be met (without depending upon filters or a mechanical cooling system):

(1) Normal Condition Test (10CFR71.71): There would be no loss or dispersal of radioactive contents, as demonstrated to a sensitivity of 10^{-6} x A_2 per hour, no significant increase in external radiation levels, and no substantial reduction in the effectiveness of the packaging. (A_2 values are found in Table A-1 of 10CFR71.)

(2) Hypothetical Accident Conditions (10CFR71.73): There would be no escape of krypton-85 exceeding 10,000 curies in one week, no escape of other radioactive material exceeding a total amount A_2 in one week, and no external radiation dose rate exceeding one rem per hour at one meter from the external surface of the package.
[10CFR71.51] [CRD 3.2.2.7] [CRD 3.2.1.3]

F. The transportation cask shall be designed and constructed and its contents so limited that:

(1) It would be subcritical if water were to leak into the containment system so that, under the following conditions, maximum reactivity of the fissile material would be attained:
   (a) The most reactive credible configuration consistent with the chemical and physical form of the material
   (b) Moderation by water to the most reactive credible extent
   (c) Close reflection by water on all sides.

(2) Under the tests specified in 10CFR71.71 (Normal Conditions of Transport):
   (a) The contents would be subcritical
   (b) The geometric form of the package contents would not be substantially altered
   (c) There would be no leakage of water into the containment system unless, in the evaluation of undamaged packages under 10CFR71.57(a), 10CFR71.59(b)(1), and 10CFR71.61(a), it has been assumed that moderation is present to such an extent as to cause maximum reactivity consistent with the chemical and physical form of the material
   (d) There will be no substantial reduction in the effectiveness of the packaging, including:
      (i) No more than five percent reduction in the total effective volume of the packaging on which nuclear safety is assessed
      (ii) No more than five percent reduction in the effective spacing between the fissile contents and the outer surface of the packaging
      (iii) No occurrence of an aperture in the outer surface of the packaging large enough to permit the entry of a 10 cm (four inches) cube.

(3) Under the tests specified in 10CFR71.73 (Hypothetical Accident Conditions), the package would be subcritical. For this determination, it must be assumed that:
   (a) The fissile material is in the most reactive credible configuration consistent with the damaged condition of the package and the chemical and physical form of the contents
   (b) Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents
   (c) There is reflection by water on all sides, as close as is consistent with the damaged condition of the package.

[10CFR71.55(b), (d), (e)] [CRD 3.2.5.1.C] [CRD 3.2.2.5] [CRD 3.2.2.7]

G. Plutonium in excess of 20 curies per package shall be shipped as a solid. If the plutonium is not in a reactor fuel element, metal or metal alloy, then its container and cask must meet the requirements of 10CFR71.63(b) unless it is in another plutonium bearing solid that has been specifically exempt by the NRC. [10CFR71.63] [CRD 3.2.2.7]

H. General standards for all packages are as follows:

(1) The smallest overall dimension of a package shall not be less than 10 cm (four inches). [10CFR71.43(a)] [CRD 3.2.2.7]

(2) The outside of a package shall incorporate a feature, such as a seal, which is not readily breakable, and which, while intact, would be evidence that the package has not been opened by unauthorized persons. [10CFR71.43(b)] [CRD 3.2.2.7] [CRD 3.7.2.2.K]

(3) Each package shall include a containment system securely closed by a positive fastening device that cannot be opened unintentionally. [10CFR71.43(c)] [CRD 3.2.2.7]

(4) A package shall be of materials and construction that ensures that there will be no significant chemical, galvanic, or other reaction among the packaging components or between the packaging components and the package contents, including possible reaction resulting from in leakage of water to the maximum credible extent. [10CFR71.43(d)] [CRD 3.2.2.7]

(5) A package valve or other device, the failure of which would allow radioactive contents to escape, shall be protected against unauthorized operation and, except for a pressure relief device, must be provided with an enclosure to retain any leakage. [10CFR71.43(e)] [CRD 3.2.2.7]

(6) A package shall be designed, constructed, and prepared for shipment so that under the tests specified in 10CFR71.71 (Normal Conditions of Transport) there would be no loss or dispersal of radioactive contents, no significant increase in external radiation levels, and no substantial reduction in the effectiveness of the packaging. [10CFR71.43(f)] [CRD 3.2.2.7]

(7) A package shall not incorporate a feature that is intended to allow continuous venting during transport. [10CFR71.43(h)] [CRD 3.2.2.7]

I. Any lifting attachment that is a structural part of a package shall be designed with a minimum safety factor of three against yielding when used to lift the package in the intended manner, and must be designed so that failure of any lifting device under excessive load would not impair the ability of the package to meet other requirements of Subpart E of 10CFR71. Any other structural part of the package that could be used to lift the package must be capable of being rendered inoperable for lifting the package during transport or must be designed with strength equivalent to that required for lifting attachments. [10CFR71.45(a)] [CRD 3.2.2.7]

J. Tie-down devices for all packages are as follows:

(1) If there is a system of tie-down devices that is a structural part of the package, the system shall be capable of withstanding, without generating stress in any material of the package in excess of its yield strength, the following: a static force applied to the center of gravity of the package having a vertical component of two times the weight of the package with its contents, a horizontal component along the direction in which the vehicle travels of 10 times the weight of the package with its contents, and a horizontal component in the transverse direction of five times the weight of the package with its contents. [10CFR71.45(b)(1)] [CRD 3.2.2.7]

(2) Any other structural part of the package that could be used to tie down the package shall be capable of being rendered inoperable for tying down the package during transport, or must be designed with strength equivalent to that required for tie-down devices. [10CFR71.45(b)(2)] [CRD 3.2.2.7]

(3) Each tie-down device that is a structural part of a package shall be designed so that failure of the device under excessive load would not impair the ability of the package to meet other requirements of this part. [10CFR71.45(b)(3)] [CRD 3.2.2.7]

K. Prior to the first use of any packaging for the shipment of licensed material:

(1) Transportation shall ascertain that there are no cracks, pinholes, uncontrolled voids, or other defects in the packaging that could significantly reduce the effectiveness of the packaging. [10CFR71.85(a)] [DOE Order 5480.3 10.c] [CRD 3.2.2.7]

(2) Where the maximum normal operating pressure will exceed 34.3 kilopascal (5 psi) gauge, Transportation shall test the containment system at an internal pressure at least 50% higher than the maximum normal operating pressure to verify the capability of that system to maintain its structural integrity at that pressure. [10CFR71.85(b)] [DOE Order 5480.3 10.c] [CRD 3.2.2.7]

(3) Transportation shall conspicuously and durably mark the packaging with its model number, gross weight, and a package identification number assigned by the Nuclear Regulatory Commission. Prior to applying the model number, it must be determined that the packaging has been fabricated in accordance with the design approved by the Commission. [10CFR71.85(c)] [DOE Order 5480.3 10.c] [CRD 3.2.2.7]

L. Transportation cask systems shall be designed so that the SNF and HLW can be handled and transported in accordance with 49CFR171-174, 49CFR176-178, and 49CFR180, as applicable. [10CFR71.5] [49CFR171.2(b)] [CRD 3.7.2.2.H] [CRD 3.7.2.2.I]

3.7.1.2.2 Transporters

Requirements are to be identified.

3.7.1.2.3 Motive Support Equipment

A. For shipments by road, in addition to the provisions of paragraph (b) of 10CFR73.37, the transport shall be equipped with NRC-approved features that permit immobilization of the cab or cargo-carrying portion of the vehicle. [10CFR73.37(c)(4)] [CRD 3.2.4.3.1.B]

B. Unless specifically provided in 49CFR171-177, each carrier by rail, including a connecting carrier, shall perform the duties specified and comply with each applicable requirement of 49CFR174, and must instruct its employees in these requirements. [49CFR174.7] [CRD Appendix A (49CFR174)]

C. When carriage is by rail, each SNF and HLW shipment in loading and storage areas shall be segregated by a distance of at least 6 meters (20 feet) from other packages labelled "Radioactive" as described in 49CFR172.403. [49CFR174.700(d)] [CRD Appendix A (49CFR174)]

D. Unless specifically provided in 49CFR171-177, each carrier by vessel, including a connecting carrier, shall perform the duties specified and comply with each applicable requirement of 49CFR176, and must instruct its employees in these requirements. [49CFR176.13] [CRD Appendix A (49CFR176)]

E. Motor carriers and other persons subject to 49CFR177 shall comply with 49 CFR Parts 390 through 397 (excluding Sections 397.3 and 397.9) to the extent those rules apply. [49CFR177.804] [CRD Appendix A (49CFR177)]

F. When carriage is by public highway, each SNF and HLW shipment in loading and storage areas shall be segregated by a distance of at least 6 meters (20 feet) from other packages labelled "Radioactive" as described in 49CFR172.403. [49CFR177.842(f)] [CRD Appendix A (49CFR177)]

G. No truck or hauling vehicle shall be driven unless the following parts and accessories are in good working order:
Service brakes, including trailer brake connections
Parking (hand) brake
Steering mechanism
Lighting devices and reflectors
Tires
Horn
Windshield wiper or wipers
Rear-vision mirror or mirrors
Coupling devices.
[49CFR392.7] [CRD Appendix A (49CFR392)]

H. No truck or hauling vehicle shall be driven unless the emergency equipment required by 49CFR393.95 is in place and ready for use. [49CFR392.8] [CRD Appendix A (49CFR392)]

3.7.1.2.4 Ancillary Equipment

Ancillary equipment shall be designed, fabricated, tested, and inspected considering the requirements of applicable national standards, such as ANSI N14.19 to ensure containment integrity during normal and accident conditions as defined in 10CFR71.71 and 10CFR71.73. [10CFR71.71] [10CFR71.73] [CRD 3.3.1.C]

3.7.1.2.5 Special Tools and Fixtures

Special tools and fixtures shall be designed, fabricated, tested, and inspected considering the requirements of applicable national standards, such as ANSI N14.6 for lifting/handling devices. [QARD (DOE/RW-0333P) 3.2.1] [CRD 3.3.1.C]

3.7.1.2.6 Spare Parts

Ancillary equipment shall be designed, fabricated, tested, and inspected considering the requirements of applicable national standards, such as ANSI N14.19 for spare part shipping containers. [QARD (DOE/RW-0333P) 3.2.1] [CRD 3.3.1.C]

3.7.2 Service and Maintenance Support Segment

3.7.2.1 Service and Maintenance Support Segment Description

This segment includes facilities, equipment, materials, systems, and personnel for transportation cask system equipment maintenance, inspection, repair, inventory, regulatory compliance, and decommissioning. These may be provided at CRWMS sites (e.g. a CMF at either the MRS or MGDS or both), at contractor sites, at Purchaser/Producer sites, or in-transit.

This segment includes the following:

A. **Offices** - Offices include the normal buildings, furnishings, and supporting systems (lighting, heating, etc.) needed to provide personnel a place for executing their duties.

B. **Cask Maintenance Facilities** - The transportation cask systems maintenance facilities (CMFs) are facilities to maintain the transportation casks and support equipment. The specific mission of the CMFs is to provide for the servicing, testing, maintenance, repair, modification, storage and configuration control of the transportation casks and support equipment.

C. **Additional Maintenance Facilities** - Additional maintenance facilities such as machine and electrical shops are needed to support the CMFs and other parts of the Service and Maintenance Segment.

D. **Storage Areas** - Storage areas include the warehouses, parking pads, etc. needed to store and control transportation cask systems and the inventory needed to support them (spare parts, etc.).

E. **Maintenance Equipment** - Maintenance equipment consists of the equipment that potentially must be deployed to support incidental in-transit maintenance or maintenance at Purchaser/Producer sites.

F. **Computer Hardware/Software** - Computer hardware and software supports general office work and provides inventory records, maintenance records, test results, compliance records, etc. needed to service and maintain the transportation casks systems.

G. **Parts** - An inventory of replacement and consumable parts is needed to support the CMFs operation, and in-transit and Purchaser/Producer site operations.

H. **Communications Equipment** - Standard telephone, mobile radio, facsimile, and computer modem equipment are needed for communications between Transportation and CRWMS sites, Transportation and Purchaser/Producer sites, and Transportation and in-transit operations.

I. **Training Facilities and Equipment** - Facilities and equipment are needed for training and qualification of Transportation personnel in the use of equipment and procedures related to the service and maintenance of the transportation cask systems.

3.7.2.1.1 Service and Maintenance Support Segment Functions

This segment shall be capable of performing all functions allocated to it in Table B-1 in Appendix B. These functions are:

A. Transport Waste (1.2)
B. Ship Cask System (1.2.2)
C. Contain Waste for Transportation (1.2.2.1)
D. Accept Cask System (1.2.2.2)
E. Accept Unloaded Cask System (1.2.2.2.2)
F. Verify Cask System Readiness (1.2.2.2.2.1)
G. Prepare for Shipment (1.2.2.2.2.2)
H. Inspect Vehicles (1.2.2.2.2.2.1)
I. Prepare Shipping Documents (1.2.2.2.2.2.2)
J. Transfer Responsibility for Shipment (1.2.2.2.2.3)
K. Accept New Cask System (1.2.2.2.3)
L. Verify Cask System Readiness (1.2.2.2.3.1)
M. Prepare for Shipment (1.2.2.2.3.2)
N. Inspect Vehicles (1.2.2.2.3.2.1)
O. Prepare Shipping Documents (1.2.2.2.3.2.2)
P. Transfer Responsibility for Shipment (1.2.2.2.3.3)
Q. Support Transportation System (1.2.3)
R. Protect Environment, Public, Workers, and Facilities (1.2.3.1)
S. Maintain Cask System (1.2.3.2)
T. Manage Maintenance (1.2.3.2.1)
U. Perform Primary Maintenance (1.2.3.2.2)
V. Maintain Casks (1.2.3.2.2.1)
W. Service and Maintain Vehicles (1.2.3.2.2.2)
X. Service and Maintain Ancillary Equipment (1.2.3.2.2.3)
Y. Perform In-Transit Maintenance (1.2.3.2.3)
Z. Perform Incidental Maintenance (1.2.3.2.4)
AA. Decommission Cask (1.2.3.2.5)
AB. Manage Inventories (1.2.3.3)
AC. Manage Unloaded Casks (1.2.3.3.1)
AD. Manage Vehicles (1.2.3.3.2)
AE. Manage Ancillary Equipment (1.2.3.3.3)
AF. Manage Spare Parts and Consumables (1.2.3.3.4)
AG. Manage Campaign Kit Inventory (1.2.3.3.5)
AH. Provide Outreach (1.2.3.4)
AI. Administer Quality Assurance (1.2.3.5)

AJ. Provide Training (1.2.3.6)
AK. Manage Transportation System Waste (1.2.3.8)

Descriptions for these functions are stated in Appendix A.

3.7.2.1.2 Service and Maintenance Support Segment Interfaces

The lower level Design Requirements Document shall identify, describe, and specify interface requirements) between Transportation segments and corresponding interface requirements external to the CRWMS. [CRD 3.2.3.2] [CRD 3.7.2.1.2]

3.7.2.2 Service and Maintenance Support Segment Requirements

3.7.2.2.1 Offices

Requirements to be identified.

3.7.2.2.2 CMFs

Design requirements for the CMF are located in the MRS-SRD and MGDS-RD. **<MGDS:TBR>**

3.7.2.2.3 Additional Maintenance Facilities

Requirements to be identified.

3.7.2.2.4 Storage Areas

A. Storage areas shall control handling, storage, shipping, cleaning, and preservation of materials to be used in packaging to prevent damage or deterioration. [10CFR71.127] [CRD 3.5.3.C]

B. Storage areas shall control handling, storage, shipping, cleaning, and preservation of equipment to be used in packaging to prevent damage or deterioration. [10CFR71.127] [CRD 3.5.3.C]

C. When necessary, storage areas shall provide special protective environments (e.g., inert gas atmosphere, specific moisture content, temperature). [10CFR71.127] [CRD 3.5.3.C]

3.7.2.2.5 Maintenance Equipment

Technical information, special tools, equipment, and spare parts shall be provided to perform incidental maintenance on the transportation cask(s).
[10CFR961.11 Art IV.B.2(c)] [CRD 3.5.1.4]

3.7.2.2.6 Computer Hardware/Software

Requirements to be identified.

3.7.2.2.7 Parts

Requirements to be identified.

3.7.2.2.8 Communications Equipment

Requirements to be identified.

3.7.2.2.9 Training Facilities and Equipment

Requirements to be identified.

3.7.3 Field Operations Segment

3.7.3.1 Field Operations Segment Description

This segment primarily includes facilities, equipment, materials, systems, and personnel that support the provision of support to Purchasers/Producers regarding receipt, handling, loading, and shipping preparations for transportation cask systems for both normal and incident response operations. This includes obtaining detailed site-specific data and developing site-specific equipment. It may also be in the form of training Purchaser/Producer supplied personnel and/or supplying trained personnel. Training may occur at Purchaser/Producer facilities or at CRWMS facilities. Also included are support for normal and incident response for in-transit operations and support for other CRWMS elements for transportation cask system related operations.

This segment includes the following:

A. **Offices** - Offices include the normal buildings, furnishings, and supporting system (lighting, heating, etc.) needed to provide personnel a place for executing their duties.

B. **Storage Areas** - Storage areas include the warehouses, parking pads, etc. needed to store and control site-specific and other equipment and parts needed for Field Operations.

C. **Computer Hardware/Software** - Computer hardware and software support general office work and provide inventory records, training records, etc. needed to manage and control Field Operations

D. **Communications Equipment** - Standard telephone, mobile radio, remote audio/video systems, facsimile, and computer modem equipment are needed for communications at and with Purchaser/Producer sites, with other parts of Transportation, with CRWMS sites, and with in-transit operations.

E. **Site-Specific Equipment** - Equipment that is needed at a site due to the specific requirements of that site must be obtained, maintained, and stored. This may include items such as special fixtures and adapters.

F. **Incident Response Equipment** - Equipment that is needed to respond to off-normal occurrences must be obtained, maintained, and stored.

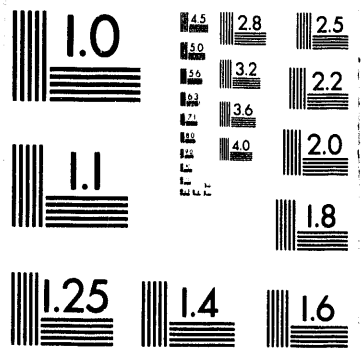
G. **Training Facilities and Equipment** - Facilities and equipment are needed for training of Transportation personnel in use of equipment and procedures related to the handling, loading, and unloading of transportation cask systems. Since these facilities are not radioactively contaminated, they will be used to check out new tools, fixtures, procedures, etc.

H. **Campaign Kits** - Campaign kits include ancillary equipment, special tools and fixtures, spare parts and other hardware normally needed to accompany transportation cask systems during a campaign.

3.7.3.1.1 Field Operations Segment Functions

This segment shall be capable of performing all functions allocated to it in Table B-1 in Appendix B. These functions are:

A. Transport Waste (1.2)
B. Manage Transportation System (1.2.1)
C. Conduct Field Operations (1.2.1.5)
D. Support Waste Acceptance (Purchaser/Producer) (1.2.1.5.1)
E. Support MRS/MGDS (1.2.1.5.2)
F. Support In-Transit Operations (1.2.1.5.3)
G. Support In-Transit Incident Response (1.2.1.5.4)
H. Manage Campaign Kit Design (1.2.1.5.5)
I. Ship Cask System (1.2.2)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J. Accept Cask System (1.2.2.2)
K. Accept Loaded Cask System (1.2.2.2.1)
L. Observe Transport Preparations (1.2.2.2.1.1)
M. Verify Loaded Cask Contents (1.2.2.2.1.2)
N. Prepare for Shipment (1.2.2.2.1.3)
O. Inspect Vehicles (1.2.2.2.1.3.1)
P. Prepare Shipping Documents (1.2.2.2.1.3.2)
Q. Brief Transportation and Security Crews (1.2.2.2.1.3.3)
R. Transfer Responsibility for Shipment (1.2.2.2.1.4)
S. Accept Unloaded Cask System (1.2.2.2.2)
T. Verify Cask System Readiness (1.2.2.2.2.1)
U. Prepare for Shipment (1.2.2.2.2.2)
V. Inspect Vehicles (1.2.2.2.2.2.1)
W. Prepare Shipping Documents (1.2.2.2.2.2.2)
X. Transfer Responsibility for Shipment (1.2.2.2.2.3)
Y. Deliver Cask System (1.2.2.4)
Z. Deliver Unloaded Cask System (1.2.2.4.2)
AA. Debrief Transportation Crew (1.2.2.4.2.2)
AB. Conduct Inspection on Cask System (1.2.2.4.2.3)
AC. Transfer Shipping Documents (1.2.2.4.2.4)
AD. Support Transportation System (1.2.3)
AE. Protect Environment, Public, Workers, and Facilities (1.2.3.1)
AF. Provide Outreach (1.2.3.4)
AG. Administer Quality Assurance (1.2.3.5)
AH. Provide Training (1.2.3.6)

Descriptions for these functions are stated in Appendix A.

3.7.3.1.2 Field Operations Segment Interfaces

The lower level Design Requirements Document shall identify, describe, and specify interface requirements between Transportation segments and corresponding interface requirements external to the CRWMS. [CRD 3.2.3.2] [CRD 3.7.2.1.2]

3.7.3.2 Field Operations Segment Requirements

3.7.3.2.1 Offices

Requirements to be identified.

3.7.3.2.2 Storage Areas

Requirements to be identified.

3.7.3.2.3 Computer Hardware/Software

Requirements to be identified.

3.7.3.2.4 Communications Equipment

Requirements to be identified.

3.7.3.2.5 Site-Specific Equipment

Requirements to be identified.

3.7.3.2.6 Incident Response Equipment

A. No SNF and HLW shipments shall be made or accepted unless:
   (1) Emergency response information conforming to 49CFR172 Subpart G (Sections 172.600-604) is immediately available for use at all times with the SNF and HLW; and
   (2) Emergency response information, including the emergency response telephone number, required by this 49CFR172 Subpart G (Sections 172.600-604) is immediately available to any person who, as a representative of a Federal, State or local government agency, responds to an incident involving SNF/HLW, or is conducting an investigation that involves SNF/HLW.

   [49CFR172.600(c)] [CRD Appendix A (49CFR172)]

B. Emergency response information (i.e. information that can be used in the mitigation of an incident involving SNF and HLW) that accompanies each SNF and HLW shipment shall conform in content and form to 49CFR172.602(a) and (b).

   As a minimum it will contain the following information:
   (1) The basic description and technical name of the SNF or HLW
   (2) Immediate hazards to health
   (3) Risks of fire or explosion
   (4) Immediate precautions to be taken in the event of an accident or incident
   (5) Immediate methods for handling fires

(6) Initial methods for handling spills or leaks in the absence of fire
(7) Preliminary first aid measures.

The information required must be:
(1) Printed legibly in English
(2) Available for use away from the package containing the hazardous material
(3) Presented--
(i) On a shipping paper
(ii) In a document, other than a shipping paper, that includes both the basic description and technical name of the SNF or HLW, and the emergency response information required (e.g., a material safety data sheet)
(iii) Related to the information on a shipping paper, a written notification to pilot-in-command, or a dangerous cargo manifest, in a separate document (e.g., an emergency response guidance document), in a manner that cross-references the description of the SNF or HLW on the shipping paper with the emergency response information contained in the document. Aboard vessels, the International Maritime Organization "Emergency Procedures for Ships Carrying Dangerous Goods," or equivalent documents, may be used to satisfy the requirements of this section for a separate document.
[49CFR172.602(a), (b)] [CRD Appendix A (49CFR172)]

C. Each carrier who transports SNF and HLW shall be provided and maintain the information specified in 49CFR172.602(a) in the same manner as prescribed for shipping papers, except that the information must be maintained in the same manner aboard vessels as the dangerous cargo manifest. This information must be immediately accessible to drivers of motor vehicles, crews on trains, and bridge personnel on vessels for use in the event of incidents involving hazardous materials. [49CFR172.602(c)(1)] [CRD Appendix A (49CFR172)]

D. A 24-hour emergency response telephone number which is monitored at all times shall be provided with all SNF and HLW shipments. The telephone number will be of a person who is either knowledgeable of the hazards and characteristics of the SNF and HLW being shipped and has comprehensive emergency response and incident mitigation information for that material, or has immediate access to a person who possesses such knowledge and information. [49CFR172.604(a)(1), (a)(2)] [CRD Appendix A (49CFR172)]

3.7.3.2.7 Training Facilities and Equipment

Transportation cask systems and equipment shall be provided as necessary for training Purchaser/Producer personnel in cask handling and loading prior to each shipping campaign. [10CFR961.11 Art IV.B.2(b)] [CRD 3.6.2.1A]

3.7.3.2.8 Campaign Kits

Requirements to be identified.

3.7.4 Planning and Control Segment

3.7.4.1 Planning and Control Segment Description

This segment includes the facilities, equipment, materials, systems, and personnel for general management and support normally associated with most organizations plus some that are unique to transporting SNF and/or HLW. General activities supported include planning, directing, controlling, facility (or site) security and maintenance, training, quality assurance, and outreach. An example of a unique activity is the real-time management of in-transit SNF and HLW with its related security, escort and incident response requirements.

This segment includes the following:

A. **Offices** - Offices include the normal buildings, furnishings, and supporting system (lighting, heating, etc.) needed to provide personnel a place for executing their duties.

B. **Records Storage Area** - The area for storing records will be the central location for maintaining Transportation records including all transportation cask system recording for maintaining the CoC (maintenance, licensing, and fabrication) and other records for operation of Transportation.

C. **Computer Hardware/Software** - Computer hardware and software support general office work and provide planning, control, record keeping, etc. needed to manage and operate Transportation and maintain it in regulatory compliance.

D. **Communications Equipment** - Standard telephone, mobile radio, facsimile, and computer modem equipment are needed for communications within Transportation, with other CRWMS sites, with Purchaser/Producer sites, and with affected federal, tribal, state and local authorities.

E. **In-Transit Cask Tracking System** - A real-time system is needed for communicating with and knowing the location of in-transit loaded transportation casks. This

communication may occur not only between in-transit shipments and Transportation, but may also be shared with affected federal, state, and local authorities.

F. **Security/Escort Equipment** - Specific communication and/or security equipment is needed to carry out responsibilities related to escorting in-transit shipments.

G. **Visitor Center and Equipment** - The Visitor Center (and its models, equipment, displays, etc.) provides public education and information regarding Transportation operations, facilities, waste protection, etc. This center may be an independent facility, or an integral part of a Visitor Center provided by other CRWMS elements.

H. **Training Facilities and Equipment** - Facilities and equipment are needed for training of Transportation personnel in use of equipment and procedures related to planning and control activities.

3.7.4.1.1 Planning and Control Segment Functions

This segment shall be capable of performing all functions allocated to it in Table B-1 in Appendix B. These functions are:

A. Transport Waste (1.2)
B. Manage Transportation System (1.2.1)
C. Direct Transportation System (1.2.1.1)
D. Plan Transportation Operations (1.2.1.2)
E. Prepare Long Range Plans (1.2.1.2.1)
F. Plan Campaigns and Transportation System Operations (1.2.1.2.2)
G. Prepare Contingency Plans (1.2.1.2.3)
H. Analyze Transportation Operations (1.2.1.2.4)
I. Conduct Regulatory Compliance Activities (1.2.1.3)
J. Monitor Compliance with Applicable Regulatory Requirements (1.2.1.3.1)
K. Monitor Changes in Regulatory Requirements and Standards (1.2.1.3.2)
L. Notify Other Functions of Changes in Requirements (1.2.1.3.3)
M. Monitor NRC CoCs/Other Permits and Licenses (1.2.1.3.4)
N. Manage Traffic (1.2.1.4)
O. Prepare/Coordinate Transportation Schedule and Routing (1.2.1.4.1)
P. Provide Carrier Services (1.2.1.4.2)
Q. Provide In-Transit Physical Security/Escort Services (1.2.1.4.3)
R. Obtain Transport Permits (1.2.1.4.4)
S. Issue Transportation Notifications (1.2.1.4.5)
T. Control Transportation (1.2.1.4.6)
U. Collect/File Transportation Records (1.2.1.4.7)
V. Manage Incident Response (1.2.1.6)
W. Ship Cask System (1.2.2)
X. Accept Cask System (1.2.2.2)

Y. Accept Loaded Cask System (1.2.2.2.1)
Z. Prepare for Shipment (1.2.2.2.1.3)
AA. Prepare Shipping Documents (1.2.2.2.1.3.2)
AB. Accept Unloaded Cask System (1.2.2.2.2)
AC. Prepare for Shipment (1.2.2.2.2.2)
AD. Prepare Shipping Documents (1.2.2.2.2.2.2)
AE. Move Cask System (1.2.2.3)
AF. Move Loaded Cask System (1.2.2.3.1)
AG. Secure/Escort Cask System (1.2.2.3.1.1)
AH. Transport between Sites (1.2.2.3.1.2)
AI. Move Unloaded Cask System (1.2.2.3.2)
AJ. Deliver Cask System (1.2.2.4)
AK. Deliver Loaded Cask System (1.2.2.4.1)
AL. Position Loaded Cask System (1.2.2.4.1.1)
AM. Debrief Transportation and Security Crews (1.2.2.4.1.2)
AN. Conduct Inspection on Cask System (1.2.2.4.1.3)
AO. Transfer Shipping Documents (1.2.2.4.1.4)
AP. Deliver Unloaded Cask System (1.2.2.4.2)
AQ. Position Unloaded Cask System (1.2.2.4.2.1)
AR. Debrief Transportation Crew (1.2.2.4.2.2)
AS. Conduct Inspection on Cask System (1.2.2.4.2.3)
AT. Transfer Shipping Documents (1.2.2.4.2.4)
AU. Deliver New Cask System (1.2.2.4.3)
AV. Support Transportation System (1.2.3)
AW. Protect Environment, Public, Workers, and Facilities (1.2.3.1)
AX. Provide Outreach (1.2.3.4)
AY. Administer Quality Assurance (1.2.3.5)
AZ. Provide Training (1.2.3.6)
BA. Administer General Support (1.2.3.7)
BB. Manage Information (1.2.3.7.1)
BC. Maintain Operations Facilities (1.2.3.7.2)
BD. Procure/Contract Goods and Services (1.2.3.7.3)
BE. Provide Engineering Support (1.2.3.7.4)
BF. Provide for Human Resources (1.2.3.7.5)
BG. Conduct Financial and Accounting Services (1.2.3.7.6)

Descriptions for these functions are stated in Appendix A.

3.7.4.1.2 Planning and Control Segment Interfaces

The lower level Design Requirements Document shall identify, describe, and specify interface requirements between Transportation segments and corresponding interface requirements external to the CRWMS. [CRD 3.2.3.2] [CRD 3.7.2.1.2]

3.7.4.2 Planning and Control Segment Requirements

3.7.4.2.1 Offices

A. Transportation shall provide office space for DOE Secretarial Officers. [DOE Order 5000.3B 9.d] [CRD Appendix A (DOE Order 5000.3B)]

B. Transportation shall provide office space for DOE program managers and facility representatives or their designees. [DOE Order 5000.3B 9.f, h] [CRD Appendix A (DOE Order 5000.3B)]

3.7.4.2.2 Records Storage Area

A. A storage area shall be provided that permits storage in a reasonably retrievable manner for:

(1) Records of SNF and HLW shipments (for 3 years after shipment) not exempt under 10CFR71.10

(2) Evidence of the quality of packaging (for 3 years after the life of the packaging) including results of the determinations required by 10CFR71.85; design, fabrication, and assembly records; results of reviews, inspections, tests, and audits; results monitoring work performance and materials analyses; and results of maintenance, modification, and repair activities. Inspection, test, and audit records must identify the inspector or data recorder, the type of observation, the results, the acceptability and the action taken in connection with any deficiencies noted.
[10CFR71.91(a), (b), (c)] [CRD Appendix A (10CFR71)]

B. A secure storage area shall be provided to store:

(1) A copy of current procedures for coping with circumstances that threaten deliberate damage to a SNF or HLW shipment and with other safeguards emergencies as a record for three years after the close of period for which the licensee possesses the SNF and HLW under each license for which the procedures were developed and, if any portion of the procedures is superseded, retain the superseded material for three years after each change.

(2) Instructions for each escort and the current instructions as a record for three years after the close of period for which the licensee possesses the SNF or HLW under each license that authorizes the activity that requires the instruction and retain any superseded material for three years after each change.

(3) The escort and communications center personnel written logs for each SNF and HLW shipment and will be available for review by authorized NRC personnel for a period of at least three years following completion of the shipment.

[10CFR73.37(b)(2), (b)(3), (b)(5)] [CRD 3.2.4.3.1.B]

C. A storage area shall be provided to store for 2 years or more a record of each shipment of SNF or HLW. [DOE Order 5480.3 10.e] [CRD Appendix A (DOE Order 5480.3)]

D. Records maintenance facilities shall provide for the storage of records of basic components for 10 years after delivery or service and record of deviations and notifications for 5 years. [10CFR21.51(a)] [CRD Appendix A (10CFR21)]

E. Records maintenance facilities shall allow the retrieval of records for inspection, evaluation, and discovery. [10CFR21.51(b)] [CRD Appendix A (10CFR21)]

3.7.4.2.3 Computer Hardware/Software

A. Software shall be provided that identifies each point of origin to each final destination, preferred routes, and alternate routes approved by the affected States and the NRC. [49CFR177.825(a), (b), (c)] [10CFR73.37(b)(7)] [CRD Appendix A (10CFR73) (49CFR177)]

B. The computer hardware/software shall be capable of interfacing directly with the computerized DOE Occurrence Reporting and Processing System. [DOE Order 5000.3B 8.a(10), b(3), b(6), b(9), c(1), c(2), e(3)] [CRD Appendix A (DOE Order 5000.3B)]

3.7.4.2.4 Communications Equipment

A. Transportation shall provide communication equipment to notify the appropriate governor(s) (or designee(s)) prior to transporting SNF/HLW within or through the State(s), in accordance with 10CFR73.37, which includes the following:

(1) Notification delivered by mail must be postmarked at least 7 days prior to transporting the SNF/HLW shipment through the State

(2) Notification delivered by messenger must be delivered to the office of the governor(s) (or designee(s)) at least 4 days prior to shipment through the State(s)

(3) Notification of schedule changes of more than 6 hours from the previously furnished information must be made by telephone or other means to the governor(s) (or designee(s)) office.

[NWPAA 180(b)] [10CFR73.37(f)(1), (2), (3), (4)] [CRD 3.2.4.3.1.B]

B. Transportation shall be equipped to report a loss of any shipment of SNF/HLW to the NRC Operations Center Emergency Notification System or to the NRC Operations Center via commercial telephone ((301)951-0550) within one hour after the loss, and within one hour after the recovery or accounting for the loss. [10CFR73.71(a)(1), (2)] [CRD 3.2.4.3.1.B]

3.7.4.2.5 In-Transit Cask Tracking System

An in-transit cask tracking system shall provide monitoring of waste shipments. The tracking system must be capable of notifying the continuously staffed transportation operations control center within a time frame that permits it to orally notify appropriate Federal, State, Tribal, and local authorities as follows:

1) Emergencies	Within 15 minutes
2) Unusual occurrences	Within 2 hours

[10CFR73.37(b)(4)] [49CFR172.604] [DOE Order 5000.3B 7] [CRD Appendix A (10CFR73)(49CFR172)(DOE Order 5000.3B)]

3.7.4.2.6 Security/Escort Equipment

A. Transportation shall establish, implement, and maintain a physical protection system for shipments of SNF/HLW that will:

(1) Minimize the potential for radiological sabotage by providing early detection and assessment of attempts to gain unauthorized access

(2) Facilitate location and recovery of shipments that may have come under the control of unauthorized persons

(3) Provide rapid notification to emergency response authorities in the event of sabotage attempts

(4) Impede sabotage attempts until response forces arrive.

[10CFR73.37(a)(1), (2)] [CRD 3.2.4.3.1.B]

B. The physical protection system shall be capable of notifying the NRC prior to each shipment of SNF/HLW, and arranging with local law enforcement agencies along the shipping routes for emergency response assistance. [10CFR73.37(b)(1), (6)] [CRD 3.2.4.3.1.B]

C. Escort equipment shall be provided that:

(1) Ensures at least one escort maintains visual surveillance of the SNF/HLW shipment when the shipment vehicle is stopped, or the shipment vessel is docked and

(2) Permits shipment escorts to make calls to Transportation's in-transit status center.

[10CFR73.37(b)(9), (11)] [CRD 3.2.4.3.1.B]

D. Escort equipment shall be provided that permits the escort(s) to cope with circumstances that threaten deliberate damage to a SNF/HLW shipment or other safeguards emergencies. As a minimum this includes communications equipment for communicating with local law enforcement agencies and Transportation's in-transit status center. [10CFR73.37(b)(3)] [CRD 3.2.4.3.1.B]

E. When SNF/HLW shipments by rail are in motion, escort equipment shall be provided that ensures observation of the shipment. [10CFR73.37(d)(1), (2)] [CRD 3.2.4.3.1.B]

F. When SNF/HLW shipments by vessel are in motion, escort equipment shall be provided that ensures observation of the shipment. [10CFR73.37(e)(1), (2)] [CRD 3.2.4.3.1.B]

G. Escorts shall be provided with equipment that permits the earliest practical notification to Transportation's in-transit status center and to appropriate Federal authorities of off-normal incidents involving SNF/HLW shipments. [49CFR171.15(a), (b)] [CRD Appendix A (49CFR171)]

H. Escort equipment shall be provided with each SNF/HLW shipment as required by the NRC-approved physical security plan. [49CFR177.825(e)] [CRD Appendix A (49CFR177)]

I. For shipments by road, escort communication equipment shall provide the capability of two-way communication between the following parties: truck driver, communications center, local law enforcement agencies, and other escort(s). [10CFR73.37(c)(3)] [CRD 3.2.4.3.1.B]

J. For shipment by road, the following types of two-way communication equipment shall be used: citizens band (CB) radio, radiotelephone, and other equivalent equipment approved by the NRC. [10CFR73.37(c)(3)] [CRD 3.2.4.3.1.B]

K. For SNF/HLW shipments by rail, a radiotelephone or other NRC-approved equivalent means of two-way voice communication shall be available on the train. [10CFR73.37(d)(3)] [CRD 3.2.4.3.1.B]

L. For SNF shipments by vessel, a radiotelephone or other NRC-approved equivalent means of two-way voice communication shall be available on the vessel. [10CFR73.37(e)(3)] [CRD 3.2.4.3.1.B]

3.7.4.2.7 Visitor Center and Equipment

Requirements to be identified.

3.7.4.2.8 Training Facilities and Equipment

A. Transportation shall provide the training and equipment necessary for any driver of radioactive material on vehicle immobilization, communications, and security procedures. [10CFR73.37(c)(5)] [CRD 3.2.4.3.1.B]

B. Transportation shall provide the equipment necessary to train Transportation personnel in the requirements of DOE Order 5000.3B for facilities. These training programs will include:

1. Indoctrination in DOE's philosophy of occurrence reporting, specifically to ensure:
   (a) Timely identification, categorization, notification, and reporting to DOE and contractor management of all Reportable Occurrences at DOE-owned or operated facilities
   (b) Timely evaluation of and implementation of appropriate corrective actions
   (c) Maintenance of a central DOE Occurrence Reporting and Processing System data base containing all unclassified Occurrence Reports
   (d) Review of Reportable Occurrences to assess significance, root causes, generic implications, and the need for corrective action
   (e) Dissemination of Occurrence Reports to DOE operations and facilities to prevent similar occurrences.

2. Identification of Reportable Occurrences; their categorization, notification, and associated reporting requirements; analysis, determination of root causes and generic implications; and implementation, tracking and close-out of correction actions.

3. Utilization of the DOE Occurrence Reporting and Processing System, including the input of occurrence reports and obtaining information from the data base.

[DOE Order 5000.3B 8.e] [CRD Appendix A (DOE Order 5000.3B)]

C. Transportation shall provide the training and equipment necessary to certify maintenance and inspection personnel within the Transportation System. [DOE Order 5480.3 9.b(8)] [CRD Appendix A (DOE Order 5480.3)]

3.8 PRECEDENCE

A. The general order of precedence for CRWMS requirements is:

(1) Federal Law
  (a) Statutes and Treaties
  (b) Regulations and Executive Orders
  (c) Other (e.g., DOE Orders)
(2) State Law and Tribal Law
(3) Local Ordinances
(4) National and International Standards

[Derived by CRD] [CRD 3.8.A]

B. In resolving questions of precedence involving DOE Orders or CFRs that address nuclear safety requirements covered by the CFRs issued by the NRC, the NRC requirements shall take precedence. [MOA NS/RW, 04/16/92] [CRD 3.8.B]

3.9 QUALIFICATION/QUALITY ASSURANCE

A. Transportation shall have a quality assurance program approved by the NRC as required by applicable licensing requirements. [10CFR71.12] [10CFR71.101] [CRD 3.9.A]

B. Transportation shall apply the QARD to all activities affecting quality performed by Transportation. [QARD (DOE/RW-0333P)] [CRD 3.9.A]

4. CONFORMANCE VERIFICATION

4.1 RESPONSIBILITIES

This section relates the requirements of this document to the compliance methods of Section 4.2 that shall be used to verify the requirements. The CRWMS projects shall establish test and evaluation programs to demonstrate their conformance of the design to the system requirements as required in the verification cross-reference table of Section 4.3. The test and evaluation programs and the conformance verification activities are not intended to replace activities associated with NRC-license application or the satisfaction of that license.

4.2 METHODS

The methods of compliance to be used are:

A. **Analysis.** Analysis is the process needed to verify a requirement by rational thinking, tradeoff studies, modeling, and processing test data and accumulated results to reach a conclusion. Analysis involves the processing of accumulated results and conclusions, intended to provide proof that verification of a requirement has been accomplished. The analytical results may be comprised of a compilation or interpretation of existing information or derived from lower level examinations, tests, demonstrations, or analyses.

B. **Examination.** Examination is the process of investigating a product to verify that required features are incorporated. Examination consists of investigation, without the use of special laboratory appliances, procedures, supplies, or services, to determine conformance to those specified requirements which can be determined by such investigations. Examination is generally nondestructive and includes, but is not limited to, visual, auditory, olfactory, tactile, and other investigations; simple physical manipulation; gauging; and measurement.

C. **Test.** Test is the quantitative process whereby data is collected over a specified time period, under controlled conditions, in order to document the as-built performance of a product. A test denotes the determination of the properties or elements of items (or components thereof) by technical means, including functional operation, the application of established principles and procedures and the collection of quantitative data. The analysis of data derived from testing is an integral part of the method.

D. **Demonstration.** Demonstration is the qualitative process of exercising a product to verify its operability, where data may or may not be collected. Demonstration differs from test by directness of approach in the verification of a requirement and is accomplished without the use of instrumentation or special equipment. Thus, operation of a representative item in or near its use environment would be defined as a Demonstration rather than a Test. Demonstration attempts to verify, qualitatively,

the performance of a function, where as Test involves verifying performance within a specific range of measurement.

4.3 CROSS-REFERENCE

Table 4-1 correlates the requirements of Sections 3 and 5 with the method to be used to comply with the requirements. The purpose of this table is to provide verification methods that are to be used, at the system-element level, to determine if the requirements have been properly interpreted and implemented in the design. Documentation of compliance will be accomplished through the use of detailed procedures to be developed and performed on all procured, constructed, and developed equipment, structures, and software.

In the following table, items marked "N/A" (not applicable) have no verification required. These items are titles or explanatory materials. The other columns "Analysis", "Exam", "Test", and "Demo" refer to the verification methods identified in Section 4.2.

When more than one method of compliance is marked in Table 4-1, compliance must be verified by one or more of the methods marked.

Table 4-1. Conformance Verification Matrix

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.1	SYSTEM DEFINITION	X				
3.1.1	Transportation System Functions - Transport Waste	X				
3.1.2	Transportation Functional Relationships	X				
3.1.3	System Description	X				
3.1.4	Function to Architecture Cross-Reference	X				
3.1.5	Major Considerations and Assumptions	X				
3.2	CHARACTERISTICS	X				
3.2.1	Performance Characteristics	X				
3.2.1.1	Operations	X				
3.2.1.1.A			X			
3.2.1.1.B			X			
3.2.1.1.C			X			
3.2.1.1.D			X			X
3.2.1.1.E			X			
3.2.1.1.F				X		
3.2.1.1.G			X			

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.2.1.1.H				X		
3.2.1.2	Decommissioning	X				
3.2.1.2.A			X	X		
3.2.1.2.B			X	X		
3.2.1.3	Off-Normal Conditions		X	X		
3.2.2	Radiological Protection	X				
3.2.2.1	General Requirements		X		X	
3.2.2.2	Personnel Protection				X	
3.2.2.3	Airborne Radioactive Material Control	X				
3.2.2.4	Radiation Monitoring	X				
3.2.2.4.A			X	X		
3.2.2.4.B				X	X	
3.2.2.5	Transportation Protection	X				
3.2.2.5.A				X		
3.2.2.5.B				X		
3.2.3	Interface Requirements	X				
3.2.3.1	External Transportation Interfaces			X		
3.2.3.2	Interfaces with Other CRWMS Elements	X				
3.2.3.2.1	WA-Transportation Interface Requirements	X				
3.2.3.2.1.A				X		
3.2.3.2.1.A.1				X		
3.2.3.2.1.A.2				X		
3.2.3.2.1.A.3				X		
3.2.3.2.1.B			X			
3.2.3.2.1.C			X			
3.2.3.2.1.D			X	X		
3.2.3.2.1.E			X	X		
3.2.3.2.1.F				X		
3.2.3.2.1.G				X	X	
3.2.3.2.1.H				X		
3.2.3.2.1.I				X		
3.2.3.2.1.J				X		
3.2.3.2.1.K				X		

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.2.3.2.1.L				X		
3.2.3.2.2	Transportation-MRS Interface Requirements	X				
3.2.3.2.2.A				X		
3.2.3.2.2.B				X		
3.2.3.2.2.C				X		
3.2.3.2.2.D			X			
3.2.3.2.2.E				X		
3.2.3.2.2.F				X		
3.2.3.2.2.G				X	X	
3.2.3.2.2.H				X		
3.2.3.2.2.I				X		
3.2.3.2.2.J				X		
3.2.3.2.3	Transportation-MGDS Interface Requirements	X				
3.2.3.2.3.A				X		
3.2.3.2.3.B				X		
3.2.3.2.3.C				X		
3.2.3.2.3.D				X		
3.2.3.2.3.E				X		
3.2.3.2.3.F			X			
3.2.3.2.3.G				X		
3.2.3.2.3.H				X		
3.2.3.2.3.I				X	X	
3.2.3.2.3.J				X		
3.2.3.2.3.K				X		
3.2.3.2.3.L				X		
3.2.4	Physical Characteristics			X		
3.2.4.1	Protective Coatings and Materials	X				
3.2.4.1.A			X	X		
3.2.4.1.B			X	X		
3.2.4.1.C			X	X		
3.2.4.2	Habitability	X				
3.2.4.2.1	Environment Controls		X			
3.2.4.2.2	Heating, Ventilation, and Air Conditioning		X		X	

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.2.4.2.3	Illumination		X		X	
3.2.4.2.4	Acoustical Noise		X		X	
3.2.4.2.5	Vibration		X		X	
3.2.4.3	Security	X				
3.2.4.3.1	Physical Security	X				
3.2.4.3.1.A			X	X		
3.2.4.3.1.B			X	X		
3.2.4.3.2	Computer Systems		X	X		
3.2.5	System Quality Factors	X				
3.2.5.1	Reliability		X			
3.2.5.1.1	Reliability Program Requirements		X	X		
3.2.5.1.2	Reliability of Equipment	X				
3.2.5.1.2.A			X			
3.2.5.1.2.B			X	X		X
3.2.5.1.3	Mission Reliability			X		
3.2.5.2	Maintainability/Inspectability	X				
3.2.5.2.A			X	X		
3.2.5.2.B			X	X		
3.2.5.2.C			X			
3.2.5.3	Availability			X		
3.2.5.4	Service Life			X		
3.2.5.5	Overall Utilization	X				
3.2.5.5.A				X		
3.2.5.5.B				X		
3.2.6	Environmental Requirements			X		
3.2.7	Transportability/Modularity	X				
3.2.7.1	Transportability			X		
3.2.7.2	Modularity			X		
3.2.8	Flexibility, Expansion, and Integration			X		
3.2.9	Portability and Load Carrying			X		
3.3	DESIGN AND CONSTRUCTION	X				
3.3.1	General Design Criteria	X				
3.3.1.A			X	X		

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.3.1.B			X	X		
3.3.2	Electromagnetic Radiation	X				
3.3.2.A			X	X		
3.3.2.B			X	X		X
3.3.2.C			X	X		
3.3.3	Nameplates and Markings	X				
3.3.3.A				X		
3.3.3.B				X		
3.3.3.C				X		
3.3.3.D				X		
3.3.3.E				X		
3.3.3.F				X		
3.3.3.G				X		
3.3.3.H				X		
3.3.3.I				X		
3.3.4	Workmanship	X				
3.3.4.1	Special Processes		X	X		
3.3.4.2	Criteria			X		
3.3.5	Interchangeability	X				
3.3.5.A				X		
3.3.5.B				X		
3.3.6	Safety	X				
3.3.6.1	General Requirements		X	X		
3.3.6.2	System Safety Precedence	X				
3.3.6.2.A			X			
3.3.6.2.B			X			X
3.3.6.2.C			X	X		
3.3.6.2.D			X	X		
3.3.6.3	Facilities, Equipment and Materials Protective Measures	X				
3.3.6.3.A				X		
3.3.6.3.B				X		
3.3.6.4	Personnel Protective Equipment	X				

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.3.6.4.A				X		
3.3.6.4.B				X		
3.3.6.4.C			X	X		
3.3.6.5	Safety Labels	X				
3.3.6.5.A				X		
3.3.6.5.B				X		
3.3.6.6	Emergency Lighting	X				
3.3.6.6.A				X		X
3.3.6.6.B				X		X
3.3.6.6.C				X	X	
3.3.6.7	Equipment Related Hazards	X				
3.3.6.7.A				X		
3.3.6.7.B				X		
3.3.6.7.C				X		
3.3.6.7.D			X	X		
3.3.6.7.E				X		
3.3.6.7.F				X		
3.3.6.8	Work Platforms	X				
3.3.6.8.A				X		
3.3.6.8.B				X		
3.3.6.9	Electrical Safety	X				
3.3.6.9.A				X		
3.3.6.9.B				X		
3.3.6.9.C				X		
3.3.7	Human Factors Engineering	X				
3.3.7.1	Workstation and Control Rooms			X		
3.3.7.2	Voice Communication Equipment			X		
3.3.7.3	Alarms and Warning Systems			X		
3.3.7.4	Controls			X		
3.3.7.5	Visual Displays			X		
3.3.7.6	Control Panel Layout			X		
3.3.7.7	Control Display Integration			X		
3.3.7.8	Signs and Location Aids			X		

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.3.7.9	Visual Display Terminal (VDT) Workstation			X		
3.3.7.10	Anthropometry			X		
3.3.7.11	Remote Handling and Operation			X		
3.3.7.12	Vehicles and Material Handling			X		
3.3.7.13	Accessibility and Useability by the Physically Handicapped	X				
3.3.7.13.A				X		
3.3.7.13.B				X		
3.3.7.14	User-Computer Software Interface			X		
3.3.8	Methods and Controls	X				
3.3.8.1	Material Management	X				
3.3.8.1.1	Identification and Control		X	X		
3.3.8.1.2	Nonconforming Items			X		
3.3.8.2	Inventory Control	X				
3.3.8.2.1	SNF and HLW Inventory Control	X				
3.3.8.2.1.A				X		
3.3.8.2.1.B				X		
3.3.8.2.2	Parts and Equipment Inventory Control			X		
3.3.9	Government Furnished Property	X				
3.3.9.A				X		
3.3.9.B				X		
3.3.10	Computer Resources			X		
3.3.11	Environmental Protection	X				
3.3.11.A				X		
3.3.11.B				X	X	
3.3.11.C				X	X	
3.3.11.D				X	X	
3.3.11.E				X		
3.3.11.F			X	X		
3.4	DOCUMENTATION	X				
3.4.1	Required Documents and Specifications	X				
3.4.1.1	Presentation of Design Basis	X				
3.4.1.1.A				X		

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.4.1.1.B				X		
3.4.1.2	Interface Control			X		
3.4.1.3	Quality Affecting Specifications			X		
3.4.2	Drawings		X	X		
3.4.3	Maintenance, Operators, and Technical Manuals		X	X		
3.4.4	Test Plans and Procedures	X				
3.4.4.A			X	X	X	X
3.4.4.B			X	X	X	X
3.4.5	Quality Assurance Document	X				
3.4.5.1	Material and Equipment Conformance			X		
3.4.5.2	Records Maintenance	X				
3.4.5.2.A				X		
3.4.5.2.B			X	X		
3.4.5.2.C				X		
3.4.5.2.D				X		
3.4.5.2.E				X		
3.4.6	Construction Records			X		
3.4.7	Computer Documentation Standard Usage and Practice			X		
3.4.8	Records Management			X		
3.5	LOGISTICS	X				
3.5.1	Maintenance		X	X		
3.5.1.1	Equipment Maintenance	X				
3.5.1.1.A			X	X		
3.5.1.1.B				X	X	
3.5.1.1.C				X		
3.5.1.2	Calibration Maintenance			X		
3.5.1.3	Radiological Equipment Maintenance	X				
3.5.2	Supply	X				
3.5.2.1	Logistics Support Analysis		X	X		
3.5.3	Facilities and Facility Equipment	X				
3.5.3.A				X		

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.5.3.B			X	X		
3.5.3.C				X		
3.5.3.D				X		
3.5.3.E				X		
3.6	PERSONNEL AND TRAINING	X				
3.6.1	Personnel	X				
3.6.1.A			X			
3.6.1.B			X			
3.6.2	Training	X				
3.6.2.1	General Requirements	X				
3.6.2.1.A				X		
3.6.2.1.B				X		
3.6.2.1.C				X		
3.6.2.1.D				X		
3.6.2.1.E				X		
3.6.2.2	Health Physics and Training			X		
3.6.2.3	Public Safety Official Training			X		
3.7	SEGMENT REQUIREMENTS	X				
3.7.1	Transportation Cask Systems Segment	X				
3.7.1.1	Transportation Cask Systems Segment Description	X				
3.7.1.1.1	Transportation Cask Systems Segment Functions		X	X		
3.7.1.1.2	Transportation Cask Systems Segment Interfaces			X		
3.7.1.2	Transportation Cask Systems Requirements	X				
3.7.1.2.1	Cask	X				
3.7.1.2.1.A				X		
3.7.1.2.1.B			X	X		
3.7.1.2.1.C			X	X		
3.7.1.2.1.D				X		
3.7.1.2.1.E			X	X		
3.7.1.2.1.F			X	X		
3.7.1.2.1.G			X	X		

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.7.1.2.1.H		X				
3.7.1.2.1.H.1				X		
3.7.1.2.1.H.2				X		
3.7.1.2.1.H.3				X		
3.7.1.2.1.H.4			X	X		
3.7.1.2.1.H.5				X		
3.7.1.2.1.H.6			X	X		
3.7.1.2.1.H.7				X		
3.7.1.2.1.I			X	X		
3.7.1.2.1.J		X				
3.7.1.2.1.J.1			X	X		
3.7.1.2.1.J.2			X	X		
3.7.1.2.1.J.3			X	X		
3.7.1.2.1.K		X				
3.7.1.2.1.K.1				X		
3.7.1.2.1.K.2			X		X	
3.7.1.2.1.K.3				X		
3.7.1.2.1.L				X		
3.7.1.2.2	Transporter	X				
3.7.1.2.3	Motive Support Equipment	X				
3.7.1.2.3.A				X		
3.7.1.2.3.B				X		
3.7.1.2.3.C				X		
3.7.1.2.3.D				X		
3.7.1.2.3.E				X		
3.7.1.2.3.F				X		
3.7.1.2.3.G				X		
3.7.1.2.3.H				X		
3.7.1.2.4	Ancillary Equipment			X		
3.7.1.2.5	Special Tools and Fixtures			X		
3.7.1.2.6	Spare Parts			X		
3.7.2	Service Maintenance Support Segment	X				

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.7.2.1	Service Maintenance Support Segment Description	X				
3.7.2.1.1	Service Maintenance Support Segment Functions		X	X		
3.7.2.1.2	Service Maintenance Support Segment Interfaces			X		
3.7.2.2	Service Maintenance Support Segment Requirements	X				
3.7.2.2.1	Offices	X				
3.7.2.2.2	CMFs	X				
3.7.2.2.3	Additional Maintenance Facilities	X				
3.7.2.2.4	Storage Areas	X				
3.7.2.2.4.A				X		
3.7.2.2.4.B				X		
3.7.2.2.4.C				X		
3.7.2.2.5	Maintenance Equipment			X		
3.7.2.2.6	Computer Hardware/Software	X				
3.7.2.2.7	Parts	X				
3.7.2.2.8	Communications Equipment	X				
3.7.2.2.9	Training Facilities and Equipment	X				
3.7.3	Field Operations Segment	X				
3.7.3.1	Field Operations Segment Description	X				
3.7.3.1.1	Field Operations Segment Functions		X	X		
3.7.3.1.2	Field Operations Segment Interfaces			X		
3.7.3.2	Field Operations Segment Requirements	X				
3.7.3.2.1	Offices	X				
3.7.3.2.2	Storage Areas	X				
3.7.3.2.3	Computer Hardware/Software	X				
3.7.3.2.4	Communications Equipment	X				
3.7.3.2.5	Site-Specific Equipment	X				
3.7.3.2.6	Incident Response Equipment	X				
3.7.3.2.6.A				X		X
3.7.3.2.6.B				X		
3.7.3.2.6.C				X		

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.7.3.2.6.D				X		
3.7.3.2.7	Training Facilities and Equipment			X		
3.7.3.2.8	Campaign Kits	X				
3.7.4	Planning and Control Segment	X				
3.7.4.1	Planning and Control Segment Description	X				
3.7.4.1.1	Planning and Control Segment Functions		X	X		
3.7.4.1.2	Planning and Control Segment Interfaces			X		
3.7.4.2	Planning and Control Segment Requirements	X				
3.7.4.2.1	Offices	X				
3.7.4.2.1.A				X		
3.7.4.2.1.B				X		
3.7.4.2.2	Records Storage Area	X				
3.7.4.2.2.A				X		
3.7.4.2.2.B				X		
3.7.4.2.2.C				X		
3.7.4.2.2.D				X		
3.7.4.2.2.E				X		
3.7.4.2.3	Computer Hardware/Software	X				
3.7.4.2.3.A				X		X
3.7.4.2.3.B				X		X
3.7.4.2.4	Communications Equipment	X				
3.7.4.2.4.A				X		
3.7.4.2.4.B				X		
3.7.4.2.5	In-Transit Cask Tracking System		X			X
3.7.4.2.6	Escort Equipment	X				
3.7.4.2.6.A				X		
3.7.4.2.6.B				X		X
3.7.4.2.6.C				X		
3.7.4.2.6.D				X		
3.7.4.2.6.E				X		
3.7.4.2.6.F				X		
3.7.4.2.6.G				X		
3.7.4.2.6.H				X		

Table 4-1. Conformance Verification Matrix (Continued)

Requirement		Verification Method				
Number	Title	N/A	Analysis	Exam	Test	Demo
3.7.4.2.6.I				X		
3.7.4.2.6.J				X		
3.7.4.2.6.K				X		
3.7.4.2.6.L				X		
3.7.4.2.7	Visitor Center Equipment	X				
3.7.4.2.8	Training Facilities and Equipment	X				
3.7.4.2.8.A				X		
3.7.4.2.8.B				X		
3.7.4.2.8.C				X		
3.8	PRECEDENCE	X				
3.8.A		X				
3.8.B				X		
3.9	QUALIFICATION/QUALITY ASSURANCE	X				
3.9.A				X		
3.9.B				X		
5.1	KEY DECISIONS	X				
5.1.A				X		
5.1.B				X		
5.2	REQUIREMENTS	X				
5.2.A				X		
5.2.B				X		
5.2.C				X		

5. PREPARATION FOR OPERATIONS

5.1 KEY DECISIONS

A. The development of the CRWMS is currently being pursued by OCRWM under two active major system acquisitions (MSAs): the Yucca Mountain Site Characterization Project, and the MRS Project, which includes the MRS facility, Transportation and Waste Acceptance. Preparation for operations is governed by a series of Key Decision (KD) points in the MSA process. The Energy System Acquisition Advisory Board (ESAAB) supports the DOE Acquisition Executive by providing advice and assistance at those points. A KD for approval to commence operation, is scheduled prior to transition from acquisition and construction to operation for applicable CRWMS elements. Prior to this KD, a readiness review will be conducted. Preparation of applications for the licenses, certificates, and permits (e.g., required by the NRC, EPA and other government agencies) that must be issued prior to commencement of operations shall be undertaken in a timely manner to ensure their review, approval and issuance prior to this KD. Transition to the operations phase is not formally made until demonstrated capability to meet technical performance goals specified in CRWMS requirements documents and specifications are achieved, and required licenses, certificates, and permits have been issued. These conditions are confirmed by the ESAAB. [DOE Order 4700.1 Chg 1 Ch I.D.2] [CRD 5.1]

B. In accordance with DOE Order 4700.1, a presentation package shall be developed to support ESAAB determination of the readiness of each element of CRWMS to proceed with operations. As a minimum, the presentation packages to support the ESAAB shall contain: a description of the project; background data; major technical and performance requirements; licenses, certificates and permits; readiness to proceed with operations; and problems, issues, or items of concern. [DOE Order 4700.1 Chg 1 Att I-2] [CRD 5.1]

5.2 REQUIREMENTS

A. In addition to satisfying the requirements of the specifications, Transportation shall establish programs to ensure, at the commencement of operations, the availability of a sufficient number of trained personnel to operate the segments and validated documentation to support the operations. [10CFR71.105(d)] [CRD 5.2]

B. Transportation shall additionally establish logistics support systems, to include ensuring the availability of sufficient spares to support the element maintenance concept and the design availability factors used in the design. [DOE Order 4700.1 Att III-1 1.C(6)(b)3] [CRD 5.2]

C. Specific plans and procedures for acceptance, operational, and integrated testing, as well as preparation of test documentation, shall be governed by test and evaluation plans. [DOE Order 4700.1 Chg 1 Att II-4 2.s] [CRD 5.2]

6. NOTES

6.1 GLOSSARY

A_1 is the maximum activity of special form radioactive material permitted in a Type A package. This value is listed in Table A-1 of 10CFR71. [10CFR71.4]

A_2 is the maximum activity of radioactive material, other than special form radioactive material, permitted in a Type A package. This value is listed in Table A-1 of 10CFR71. [10CFR71.4]

Accessible Environment means: (1) the atmosphere, (2) the land surface, (3) surface water, (4) oceans, and (5) the portion of the lithosphere that is outside the controlled area. [10CFR60.2]

Architecture is that part of the physical system to be built, found, or selected to perform a function subject to its stated requirements.

As low as is reasonably achievable (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in 10CFR20 as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest. [10CFR20.1003]

B(M) is defined with the definition of "Type B package" in this section.

B(U) is defined with the definition of "Type B package" in this section.

Campaign is defined as the activities required to prepare for and execute a consecutive set of shipments from a given shipping (originating) site over a fixed period of time.

Canister is the structure surrounding the waste form (e.g., high-level waste immobilized in borosilicate glass) that facilitates handling, storage, transportation, and/or disposal [NWTRB Fifth Report]. A canister is a metal receptacle with the following purpose: (1) for solidified HLW, its purpose is a pour mold and (2) for spent fuel, it may provide structural support for loose rods, nonfuel components or containment of radionuclides.

Cask is a container for shipping or storing spent nuclear fuel and/or high-level waste which meets all applicable regulatory requirements.

Cask maintenance means those functions necessary to keep a transportation cask in working order (i.e., keep cask in accordance with certification).

Cask Maintenance Facility (CMF) is a facility to maintain the transportation cask systems. The specific mission of the CMF is to provide for the servicing, testing, maintenance, repair, modification, storage and configuration control of transportation cask system elements.

Cask system as a minimum, shall include the complete cask, truck trailer or rail car (defined as the transporter), a tiedown system, special tools and ancillary equipment.

Certificate of Compliance (CoC) is a certificate approving for use, with identified limitations, a specific packaging for quantities of radioactive materials exceeding A1/A2 quantities as defined in 10CFR71 and 49CFR173. A CoC may be issued by the NRC, DOT, or DOE. As used in this document, CoC refers to a certificate issued by the NRC. [DOE Order 1540.3 Section 4.a]

Civilian Radioactive Waste Management System (CRWMS) is the composite of sites, facilities, systems, equipment, materials, information, activities, and personnel required to perform those activities necessary to manage spent nuclear fuel and high-level radioactive waste disposal.

Commercial High-Level Radioactive Waste is the high-level radioactive waste, as defined by NWPA Section 2(12), resulting from reprocessing spent nuclear fuel in a commercial facility.

Conveyance means any vehicle, rail car, vessel, freight container, or hold, compartment, or defined deck area of an inland waterway craft or seagoing vessel. [10CFR71.4]

Custody denotes the point at which OCRWM assumes responsibility and control of SNF from the Purchaser [10CFR961]. License accountability for the SNF remains with the Purchaser until the SNF is received and accepted at a CRWMS facility. For HLW, custody will be defined in an MOA between OCRWM and the Producers.

Decommission means to remove safely from service and reduce residual radioactivity to a level that permits: for land, release of the property for unrestricted use and termination of license, and for casks, release of the cask for appropriate disposal and termination of certificate.

Dedicated train is a train that is dedicated to transporting loaded transportation casks during a shipment.

Defense High-Level Radioactive Waste is the high-level radioactive waste, as defined by NWPA Section 2(12), resulting from reprocessing spent nuclear fuel in a defense facility.

Disposal is the isolation of radioactive wastes from the accessible environment. [10CFR60.2]. Disposal means the emplacement in a repository of high-level radioactive waste, spent nuclear fuel, or other highly radioactive material with no foreseeable intent of recovery, whether or not such emplacement permits the recovery of such waste. [10CFR961.11] [NWPA Section 2(9)]

Disposal package or waste package is the primary container that holds, and is in contact with, solidified high-level radioactive waste, spent nuclear fuel, or other radioactive materials, and any overpacks that are emplaced at a repository. [NWPA Section 2(10)]

Disposal system is any combination of engineered and natural barriers that isolate spent nuclear fuel or radioactive waste after disposal. [40CFR191.12(a)]

Exclusive Use is the sole use of a conveyance by a single consignor and for which all initial, intermediate, and final loading and unloading are carried out in accordance with the direction of the consignor or consignee. [10CFR71.4]

Flow-through occurs at the MRS when a from-reactor transportation cask is connected directly to the from-MRS dedicated train without being opened in the MRS transfer facility and in effect becomes a from-MRS cask for shipment to the MGDS.

Function is a primary statement of purpose; it defines what a system or subsystem must accomplish to meet the system mission.

Functional analysis is the first step in the Systems Engineering process that defines a baseline of functions and function performance requirements that must be met in order to adequately accomplish the operation, support, test, and production requirements of a system.

Functional interface is the interaction between functions, as in the flow of material or information between a sequence of activities.

Geologic repository is a system that is intended to be used for, or may be used for, the disposal of radioactive wastes in excavated geologic media. A geologic repository includes: (1) the geologic repository operations area, and (2) the portion of the geologic setting that provides isolation of the radioactive waste. [10CFR60.2]

High-level Radioactive Waste (HLW) means (1) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (2) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation. The CRWMS will only accept solidified HLW. For the purposes of this document, HLW is vitrified borosilicate glass cast in a stainless steel canister.

[NWPA Section 2(12)] [10CFR72.3] [10CFR960.2] [10CFR961.11]

Input is anything that is acted upon by a function to produce desired outputs. Inputs can be classified as either internal or external. Inputs that originate from outside a particular system are considered to be external. Inputs that are outputs from functions within a particular system are considered to be internal.

Interface requirement means a requirement that applies to the inputs to, or outputs from, the function or the physical connection or dependence between architectural items.

Intermodal Transfer is the physical transfer of a piece of cargo from one mode of transportation (e.g., highway, rail, barge) to another. When the term is used to describe transfer of a cask, it will normally imply transferring from heavy-haul truck to rail or barge or the reverse. The cask is not opened during intermodal transfers.

Legal-Weight Truck (LWT) is a truck cask system, consisting of a tractor, semitrailer, and loaded cask, with a maximum gross weight of 80,000 pounds. Special permits are not required for LWT shipments.

Licensee is a person who is authorized to conduct activities under a license or construction permit issued by the NRC. [10CFR2.4]

Licensed Material means source material, special nuclear material, or byproduct material received, possessed, used, transferred or disposed of under a general or specific license issued by the Commission. [10CFR20.1003]

Monitored Retrievable Storage Installation (MRS) is a complex designed, constructed, and operated for the receipt, transfer, handling, packaging, possession, safeguarding, and storage of SNF pending shipment to the MGDS for disposal. [10CFR72.3]

Multi-Purpose Canister (MPC) - refers to sealed, metallic containers maintaining multiple SNF assemblies in a dry, inert environment and overpacked separately and uniquely for the various system elements of storage, transportation, and disposal.

Off-normal Occurrences are abnormal or unplanned events or conditions that adversely affect, potentially affect, or are indicative of degradation in, the safety, security, environmental or health protection performance or operation of a facility.

Output is anything that leaves the system or function after it has been acted upon by that function.

Overweight Truck (OWT) is a truck cask system, consisting of a tractor, semitrailer, and loaded cask, with a gross vehicle weight in excess of 80,000 pounds, but not more than 90,000 to 105,000 pounds depending on the particular state transited. Each state will issue a permit based on individual weight computation formulas.

Owner is any person who has title to spent nuclear fuel or high-level radioactive waste. [10CFR961.3]

Package is the packaging together with its radioactive contents as presented for transport. [10CFR71.4]

Packaging is the assembly of components necessary to ensure compliance with packaging requirements. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie-down system, and auxiliary equipment may be designated as part of the packaging. [10CFR71.4]

Pass-through occurs at the MRS when the spent fuel assemblies sealed in a from-reactor transportation cask are unloaded and transferred directly into a from-MRS transportation cask for shipment to the MGDS, thereby bypassing the MRS storage mode.

Physical interface is the boundary at which physical systems interact, as in a necessary fit between elements, segments, subsystems, etc.

Physical system means the Civilian Radioactive Waste Management System (CRWMS) consisting of the composite of the sites, and all facilities, systems, equipment, materials, information, activities, and the personnel required to perform those activities necessary to manage waste disposal.

Possession means the authority by a general NRC-issued license (e.g., carrier) to have or possess special nuclear material only, or the authority by a specific NRC-issued license (e.g., Purchaser, MRS, MGDS) to have and to be held accountable for special nuclear material. Accountability transfers only between specific NRC licensees.

Prime mover is the vehicle providing motive power to the transporter.

Producer is any generator of high-level radioactive waste resulting from atomic energy defense activities or any producer of vitrified commercial HLW.

Protected area is any area encompassed by physical barriers and to which access is controlled. [10CFR73.2]

Purchaser is any person, other than a Federal agency, who is licensed by the Nuclear Regulatory Commission to use a utilization or production facility under the authority of Sections 103 or 104 of the Atomic Energy Act of 1954 (42USC2133, 2134) or who has title to SNF or HLW and who has executed a contract or other contractual agreement with DOE. Purchaser's SNF includes Government-owned SNF from commercial industry and civilian development programs. For the purposes of this document, West Valley Demonstration Project (WVDP), which has commercial HLW, is considered a "Purchaser" only for contract/agreement requirements; otherwise WVDP is considered a "Producer".

Radiological sabotage is any deliberate act directed against a site or transport in which an activity licensed pursuant to the regulations in 10CFR0-171 is conducted, or against a component of such a site or transport which could directly or indirectly endanger the public health and safety by exposure to radiation.

Repository is synonymous with geologic repository.

Requirement is a qualitative or quantitative statement of how well a function must be performed.

Requirements allocation is the assignment of requirements to a specific hardware item or software routine that can fulfill the needed functional/performance requirements.

Safeguards information means information which specifically identifies measures taken for the physical protection of special nuclear material (SNF and HLW) or measures taken for the physical protection of equipment vital to the safety of operations at fixed sites and in transit. Specifically (but not all inclusive) for SNF and HLW in transit, safeguards information includes: the composite transportation physical security plan; schedules and itineraries for specific shipments (routes and quantities for shipments of SNF are not included and schedules may be released after 10 days); details of vehicle immobilization features, intrusion alarms devices, and communication systems; arrangements with and capabilities of local police response forces, and locations of safe havens; details regarding limitations of radio-telephone communications; and procedures for response to safeguards emergencies.

Safeguards system means an integrated system of physical protection, material accountability, and material control measures which will have capabilities for the protection (deter, prevent, detect, and respond) of special nuclear material (SNF and HLW) at fixed sites and in transit. In particular, it is a system designed to protect against acts of radiological sabotage and to prevent the theft of special nuclear material (SNF and HLW).

Shipment is the movement of the properly prepared [loaded, unloaded, or empty] cask from one site to another and all associated regulatory activities.

Site Characterization means the program of exploration and research, both in the laboratory and in the field, undertaken to establish the geologic conditions and the ranges of those parameters of a particular site relevant to the procedures under this part. Site characterization includes borings, surface excavations, excavation of exploratory shafts, limited subsurface lateral excavations and borings, and in situ testing at depth needed to determine the suitability of the site for a geologic repository, but does not include preliminary borings and geophysical testing needed to decide whether site characterization should be undertaken. [10CFR60.2]

Source Material means: (1) Uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) Uranium, (ii) thorium or (iii) any combination thereof. Source material does not include special nuclear material. [10CFR40.4]

Specialty Engineering encompasses those disciplines that support the design process by applying knowledge from a specific area to ensure system operability in its operational environment. They include reliability, availability, maintainability, human factors engineering, safeguards and security, transportability, safety, electromagnetic compatibility, parts/materials/processes and other specialist areas involved in development of a general class of

system. These specialties are integrated into the development effort through the System Engineering Process.

Special nuclear material means (1) plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the NRC, pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954 as amended, determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing but does not include source material. [10CFR70.4]

Spent Nuclear Fuel (SNF) is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not separated by reprocessing [NWPA Section 2(23)] [10CFR961.11]. {Specifically in this document, SNF includes (1) intact, non-defective fuel assemblies; (2) failed fuel assemblies in canisters; (3) fuel assemblies in canisters; (4) consolidated fuel rods in canisters; (5) nonfuel components inserted in PWR fuel assemblies, including, but not limited to, control rod assemblies, burnable poison assemblies, thimble plug assemblies, neutron source assemblies, instrumentation assemblies; (6) fuel channels attached to BWR fuel assemblies; and (7) nonfuel components and structural parts of assemblies in canisters.}

System Element is one of the elements of the CRWMS (e.g., Waste Acceptance, Transportation, MRS, MGDS). This differs from the "project" that may be initiated by DOE to manage and control development of one or more system element (e.g., the MRS Project).

Transportable Storage Cask (TSC) is any cask certified by the NRC for the purposes of transporting SNF as described in 10CFR71, and storing SNF as described in 10CFR72, Subpart L.

Transportation Cask is a container for shipping spent nuclear fuel and/or high-level radioactive waste that meets all applicable regulatory requirements.

Transporter is a cargo-carrying vehicle such as a semi-trailer or rail car used for transportation of cargo by any mode.

Transport Index is the dimensionless number (rounded up to the first decimal place) placed on the label of a package to designate the degree of control to be exercised by the carrier during transportation. The transport index is determined as follows:

(1) The number expressing the maximum radiation level in millirem per hour at 1 meter from the external surface of the package; or

(2) For Fissile Class II packages, the number expressing the maximum radiation level in millirem per hour at 1 meter from the external surface of the package, or the number obtained by dividing 50 by the allowable number of the packages which may be transported together as determined under 10CFR71.59, whichever is larger. [10CFR71.4]

Type B package is a Type B packaging together with it radioactive contents. On approval, a Type B package design is designated by NRC as B(U) unless the package has a maximum normal operating pressure of more than 700 kilopascal (100 psi) gauge or a pressure relief device which would allow the release of radioactive material to the environment under the test specified in 10CFR71.73 (hypothetical accident conditions), in which case it will receive a designation B(M). B(U) refers to the need for unilateral approval of international shipments; B(M) refers to the need for multilateral approval. There is no distinction made in how packages with these designations may be used in domestic transportation. To determine their distinction for international transportation, see DOE regulations in 49CFR173. A Type B package approved prior to September 6, 1983, was designated only as Type B. [10CFR71.4]

Unloaded Transportation Cask is a cask that has been used for transporting waste, but does not physically contain SNF or HLW. This term normally describes a cask that has had the waste removed and may either be in contaminated or decontaminated condition. Decontaminated casks will still have residual contamination present.

Waste Form is the radioactive waste material and any encapsulating or stabilizing matrix. [10CFR60.2]

Waste Handling Activities include receipt of waste, preparation of waste for storage or disposal, transfer of waste from one cask to another or to its place of emplacement, emplacement of waste, and retrieval of waste.

Waste Package is the waste form and any containers, shielding, packing and other absorbent materials immediately surrounding an individual waste container. [10CFR60.2]

6.2 ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADP	Automated Data Processing
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALARA	As low as is reasonably achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATE	Automatic-Test-Equipment
AWS	American Welding Society
BITE	Built-in-Test Equipment
BMP	Baseline Management Plan
BWR	Boiling Water Reactor
CFR	Code of Federal Regulations
CHLW	Commercial High-Level Radioactive Waste
CMF	Cask Maintenance Facility
CMOCC	Central Management and Operations Control Center
CoC	Certificate of Compliance
CRD	CRWMS Requirements Document
CRWMS	Civilian Radioactive Waste Management System
CWA	The Clean Water Act
DCS	Delivery Commitment Schedule
deg C (°C)	degrees Celsius
deg F (°F)	degrees Fahrenheit
DHLW	Defense High-Level Radioactive Waste
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DP	Office of Defense Programs (DOE)
DRD	Design Requirements Document
EM	Office of Environmental Restoration and Waste Management (DOE)
EPA	U.S. Environmental Protection Agency
ESAAB	Energy System Acquisition Advisory Board
f.o.b.	Free on Board
FDS	Final Delivery Schedule
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year

HDBK	Handbook
HFS	Human Factors Society
HLW	High-Level Radioactive Waste
HVAC	Heating, Ventilation, and Air-Conditioning
IAEA	International Atomic Energy Agency
IEEE	Institute of Electrical and Electronics Engineers
IFS	Interface Specification
KD	Key Decision
LAR	Low Aspect Ratio (a.k.a. short LWT)
LSA	Logistics Support Analysis
LWT	Legal-Weight Truck
M & O	Management and Operating Contractor
MBMA	Metal Building Manufacturers Association
MESC	Multiple Element Sealed Canister
MGDS	Mined Geologic Disposal System
MIL	Military
MOA	Memorandum of Agreement
MPC	Multi-Purpose Canister
mrem	millirem
MRS	Monitored Retrievable Storage Installation
mSv	millisievert
MTU	Metric Ton(s) of Initial Uranium
NAAMM	National Association of Architectural Metal Manufacturers
NAPHCC	National Association of Plumbing-Heating-Cooling Contractors
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
NUREG	Nuclear Regulatory Guideline
NWPA	Nuclear Waste Policy Act of 1982
NWPAA	Nuclear Waste Policy Amendments Act of 1987
OCRWM	Office of Civilian Radioactive Waste Management
OSHA	Occupational Safety and Health Act
OWT	Overweight Truck
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PL	Public Law
psi	Pounds per Square Inch
PSTN	Public Switched Telephone Network
PWR	Pressurized Water Reactor
QA	Quality Assurance
QAAP	Quality Assurance Administrative Procedure (OCRWM)
QAP	Quality Administrative Procedure (M&O)
QARD	Quality Assurance Requirements and Description

QC	Quality Control
RBS	Requirements Backup Sheet
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposals
RW	Office of Civilian Radioactive Waste Management (DOE)
SAR	Safety Analysis Report
SEMP	Systems Engineering Management Plan
SLWT	Short Legal-Weight Truck
SNF	Spent Nuclear Fuel
SRD	System Requirements Document
SSC	Structure, System, and Component
STD	Standard
Sv	Sievert
TBD	To Be Determined
TBP	To Be Published
TBR	To Be Resolved
TDPP	Technical Document Preparation Plan
Trans	Transportation
Trans-SRD	Transportation System Requirements document
TSC	Transportable Storage Cask
TSCA	Toxic Substances Control Act
UCRL	University of California Research Laboratory
USC	United States Code
VDT	Video Display Terminal
vs	versus
WVDP	West Valley Demonstration Project

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6.3 REQUIREMENTS CROSS-REFERENCE

The following table identifies how the Trans-SRD responds to the applicable source documents and the applicable requirements of the CRD. In all cases, the "Source Document" is the document containing the source of the requirement in the Trans-SRD. When a source document is enclosed in parentheses, the document identified is referenced by the requirement, but is not the literal source of the requirement. A source document entry of "Derived" identifies a derived requirement. The heading "Trans-SRD Paragraph" identifies the requirement number in this document. The heading "CRD Paragraph" identifies the CRD requirement that is addressed by the identified Trans-SRD requirement.

Table 6-1. Requirements Cross-Reference

Source Document	CRD Paragraph	Trans-SRD Paragraph
15USC2601 2605(a)	3.3.11.E	3.3.11.D
29USC651 654(a)(1)	3.3.6.1.A	3.3.6.1
29USC651 654(a)(2), (b)	3.3.6.1.B	3.3.6.1
33USC1251 et seq.	3.5.3.B	3.5.3.B
42USC300f	3.3.11.D	3.3.11.C
42USC6901 et seq.	3.5.3.B	3.5.3.B
10CFR20.1101(b)	3.2.2.1.C	3.2.2.1
10CFR20.1201	3.2.2.1.D	3.2.2.1
10CFR20.1301	3.2.2.1.D	3.2.2.1
10CFR20.1703	3.3.6.4.A	3.3.6.4.A
10CFR21.51(a)	Appendix A	3.7.4.2.2.D
10CFR21.51(b)	Appendix A	3.7.4.2.2.E
10CFR60.111(b)(1)	Derived	3.2.1.1.H
10CFR60.131(a)(2)	3.2.5.2.E	3.2.5.2.C
10CFR60.131(b)(5)(iii)	3.3.6.10.C	3.2.5.1.2.B
10CFR60.131(b)(6)	3.2.5.2.A	3.2.5.2.A
10CFR60.131(b)(6)	3.5.1	3.5.1

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
10CFR60.131(b)(8)	3.5.1.1.A	3.5.1.1.A
10CFR60.132(e)	3.2.1.2.D	3.2.1.2.A
10CFR60.162	3.6.1.C	3.6.1.B
10CFR71.0(a), (b)	3.3.1.B	3.3.1.A
10CFR71.0(b)	Appendix A	3.2.4.3.1.A
10CFR71.0(c)	3.2.2.7	3.2.2.5.A
10CFR71.1(b)	3.4.8	3.4.8
10CFR71.5	3.7.2.2.H; 3.7.2.2.I	3.7.1.2.1.L
10CFR71.5(a)	3.3.1.B	3.3.1.A
10CFR71.5(a)(1)(ii)	3.7.2.2.H.2	3.3.3.G
10CFR71.5(a)(1)(iii)	3.7.2.2.H.3	3.3.3.H
10CFR71.5(a)(2)	3.7.2.2.I	3.2.2.4.B
10CFR71.12	3.9.A	3.9.A
10CFR71.13	3.2.2.7	3.7.1.2.1.D
10CFR71.37(c)(3), (d)(3)	3.2.4.3.1.B	3.2.3.2.2.A
10CFR71.43(a)	3.2.2.7	3.7.1.2.1.H.1
10CFR71.43(b)	3.2.2.7; 3.7.2.2.K	3.7.1.2.1.H.2
10CFR71.43(b)	3.7.2.2.K	3.2.3.2.1.E
10CFR71.43(c)	3.2.2.7	3.7.1.2.1.H.3
10CFR71.43(d)	3.2.2.7	3.7.1.2.1.H.4
10CFR71.43(e)	3.2.2.7	3.7.1.2.1.H.5
10CFR71.43(f)	3.2.2.7	3.7.1.2.1.C.1
10CFR71.43(f)	3.2.2.7	3.7.1.2.1.H.6
10CFR71.43(g)	3.2.2.7	3.7.1.2.1.C.2

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
10CFR71.43(h)	3.2.2.7	3.7.1.2.1.H.7
10CFR71.45(a)	3.2.2.7	3.7.1.2.1.I
10CFR71.45(b)(1)	3.2.2.7	3.7.1.2.1.J.1
10CFR71.45(b)(2)	3.2.2.7	3.7.1.2.1.J.2
10CFR71.45(b)(3)	3.2.2.7	3.7.1.2.1.J.3
10CFR71.47	3.2.2.4.B	3.2.2.4.A
10CFR71.47	3.2.2.7	3.7.1.2.1.B
10CFR71.47(d)	3.2.1.1.G	3.2.2.2
10CFR71.51	3.2.1.3; 3.2.2.7	3.7.1.2.1.E
10CFR71.55(b), (d), (e)	3.2.5.1.C; 3.2.2.5; 3.2.2.7	3.7.1.2.1.F
10CFR71.63	3.2.2.7	3.7.1.2.1.G
10CFR71.71	3.3.1.C	3.7.1.2.4
10CFR71.71(a)	3.2.6.2.C	3.2.6
10CFR71.73	3.3.1.C	3.7.1.2.4
10CFR71.73(a)	3.2.6.2.D	3.2.6
10CFR71.83	Appendix A	3.2.3.2.1.L
10CFR71.85(a)	3.2.2.7	3.7.1.2.1.K.1
10CFR71.85(b)	3.2.2.7	3.7.1.2.1.K.2
10CFR71.85(c)	3.2.2.7	3.7.1.2.1.K.3
10CFR71.85(c)	Appendix A	3.3.3.I
10CFR71.87	3.5.1.4	3.2.3.2.1.J
10CFR71.87	3.5.1.4	3.2.3.2.2.I
10CFR71.87	3.5.1.4	3.2.3.2.3.K

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
10CFR71.87(i)	3.2.2.4.B	3.2.2.4.A
10CFR71.87(i)	Appendix A	3.2.3.2.1.G
10CFR71.87(i)	Appendix A	3.2.3.2.2.G
10CFR71.87(i)	Appendix A	3.2.3.2.3.I
10CFR71.91(a), (b), (c)	Appendix A	3.7.4.2.2.A
10CFR71.93(b)	3.5.1.4	3.2.3.2.1.J
10CFR71.93(b)	3.5.1.4	3.2.3.2.2.I
10CFR71.93(b)	3.5.1.4	3.2.3.2.3.K
10CFR71.101	3.9.A	3.9.A
10CFR71.105(d)	3.6.1.A	3.6.1.A
10CFR71.105(d)	3.6.2.1.E	3.6.2.1.D
10CFR71.105(d)	5.2	5.2.A
10CFR71.107	3.4.1.A	3.4.1.1.A
10CFR71.107	3.4.1.A	3.4.1.2
10CFR71.107	3.4.2.A	3.4.2
10CFR71.107	3.4.3	3.4.3
10CFR71.111	3.4.1.B	3.4.1.3
10CFR71.113	Appendix A	3.4.5.2.B
10CFR71.115(a)	3.3.8.1.C	3.4.5.1
10CFR71.115(b)	3.5.3.C	3.3.8.2.2
10CFR71.117	3.3.8.1.A; 3.3.8.2.B	3.3.8.1.1
10CFR71.119	3.3.4.A; 3.6.1.B	3.3.4.1
10CFR71.123	Appendix A	3.4.4.A
10CFR71.125	3.5.1.2	3.5.1.2

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
10CFR71.127	3.5.3.C	3.3.8.2.2
10CFR71.127	3.5.3.C	3.5.3.C
10CFR71.127	3.5.3.C	3.7.2.2.4.A
10CFR71.127	3.5.3.C	3.7.2.2.4.B
10CFR71.127	3.5.3.C	3.7.2.2.4.C
10CFR71.131	3.3.8.1.B	3.3.8.1.2
10CFR71.135	3.4.5	3.4.5.2.C
10CFR71.135	3.4.5	3.4.5.2.D
10CFR71.135	3.4.8	3.4.5.2.E
10CFR71.135	3.5.3.A	3.5.3.A
10CFR72.122(f)	3.2.5.2.A	3.2.5.2.A
10CFR72.122(f)	3.5.1	3.5.1
10CFR72.122(i)	3.5.1.1.A	3.5.1.1.A
10CFR72.122(k)(3)	3.3.6.10.C	3.2.5.1.2.B
10CFR72.126(a)(5)	3.2.5.2.E	3.2.5.2.C
10CFR72.130	3.2.1.2.D	3.2.1.2.A
10CFR72.194	3.6.1.C	3.6.1.B
10CFR73.21(h)	3.2.4.3.1.B	3.2.4.3.2
10CFR73.37	3.2.4.3.1.B	3.2.4.3.1.A
10CFR73.37(a)(1), (a)(2)	3.2.4.3.1.B	3.7.4.2.6.A
10CFR73.37(b)(1), (b)(6)	3.2.4.3.1.B	3.7.4.2.6.B
10CFR73.37(b)(2), (b)(3), (b)(5)	3.2.4.3.1.B	3.7.4.2.2.B
10CFR73.37(b)(3)	3.2.4.3.1.B	3.7.4.2.6.D
10CFR73.37(b)(4)	Appendix A	3.7.4.2.5
10CFR73.37(b)(7)	Appendix A	3.7.4.2.3.A

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
10CFR73.37(b)(9), (b)(11)	3.2.4.3.1.B	3.7.4.2.6.C
10CFR73.37(c)(3)	3.2.4.3.1.B	3.7.4.2.6.I
10CFR73.37(c)(3)	3.2.4.3.1.B	3.7.4.2.6.J
10CFR73.37(c)(3), (d)(3)	3.2.4.3.1.B	3.2.3.2.1.H
10CFR73.37(c)(3), (d)(3)	3.2.4.3.1.B	3.2.3.2.2.A
10CFR73.37(c)(3), (d)(3)	3.2.4.3.1.B	3.2.3.2.3.A
10CFR73.37(c)(4)	3.2.4.3.1.B	3.7.1.2.3.A
10CFR73.37(c)(5)	3.2.4.3.1.B	3.7.4.2.8.A
10CFR73.37(d)(1), (d)(2)	3.2.4.3.1.B	3.7.4.2.6.E
10CFR73.37(d)(3)	3.2.4.3.1.B	3.7.4.2.6.K
10CFR73.37(e)(1), (e)(2)	3.2.4.3.1.B	3.7.4.2.6.F
10CFR73.37(e)(3)	3.2.4.3.1.B	3.7.4.2.6.L
10CFR73.37(f)(1), (f)(2), (f)(3), (f)(4)	3.2.4.3.1.B	3.7.4.2.4.A
10CFR73.71(a)(1), (a)(2)	3.2.4.3.1.B	3.7.4.2.4.B
10CFR75.1	3.3.8.2.C	3.3.8.2.1.B
10CFR961.11 Art II	3.2.1.1.E	3.2.1.1.D
10CFR961.11 Art IV.B.1	3.2.1.B	3.2.1.1.B
10CFR961.11 Art IV.B.2	3.2.1.1.F	3.2.1.1.G
10CFR961.11 Art IV.B.2	3.2.1.1.F	3.2.3.2.1.A
10CFR961.11 Art IV.B.2	3.2.1.1.F	3.2.3.2.1.C
10CFR961.11 Art IV.B.2	3.2.1.1.F	3.2.3.2.1.D
10CFR961.11 Art IV.B.2	3.2.1.1.F	3.2.3.2.2.E
10CFR961.11 Art IV.B.2	3.2.1.1.F	3.2.3.2.3.G
10CFR961.11 Art IV.B.2	3.2.1.1.F; 3.5.1.4; 3.7.2.2.J	3.2.3.2.1.F

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
10CFR961.11 Art IV.B.2	3.2.1.1.F; 3.5.1.4	3.2.3.2.2.F
10CFR961.11 Art IV.B.2	3.2.1.1.F; 3.5.1.4	3.2.3.2.3.H
10CFR961.11 Art IV.B.2(b)	3.6.2.1.A	3.7.3.2.7
10CFR961.11 Art IV.B.2(c)	3.5.1.4	3.7.2.2.5
10CFR961.11 Art VI.B.2	Appendix A	3.2.3.2.1.K
29CFR1910 Subpart D	3.3.6.9.B	3.3.6.8.B
29CFR1910 Subpart H	3.3.6.3.G	3.3.6.3.B
29CFR1910 Subpart I	3.3.6.4.A	3.3.6.4.A
29CFR1910 Subpart J	3.3.6.6.A	3.3.6.5.A
29CFR1910 Subpart O	3.3.6.3.G	3.3.6.3.B
29CFR1910.36(a)	3.3.6.6.C	3.3.6.5.B
29CFR1910.66(a)	3.3.6.9.A	3.3.6.8.A
29CFR1910.66(a)	3.3.6.9.B	3.3.6.8.B
29CFR1910.94	3.3.6.3.E	3.3.6.3.A
29CFR1910.95	3.3.6.4.B	3.3.6.4.B
29CFR1910.132	3.3.6.4.C	3.3.6.4.C
29CFR1910.147(a)(i)	3.3.6.8.B	3.3.6.7.B
29CFR1910.151(c)	3.3.6.8.F	3.3.6.7.D
29CFR1910.179(i)	3.3.6.8.A	3.3.6.7.A
29CFR1910.212(a)(1)	3.3.6.8.C	3.3.6.7.A
29CFR1910.212(b)	3.3.6.8.C	3.3.6.7.E
29CFR1910.242(a)	3.3.6.8.D	3.3.6.7.A
29CFR1910.242(a)	3.3.6.8.D	3.3.6.7.F
29CFR1910.252(a), (b), (c)	3.3.6.8.E	3.3.6.7.C

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
29CFR1910.301	3.3.6.10.A	3.3.6.9.A
29CFR1910.301	3.3.6.10.D	3.3.6.9.C
29CFR1926 Subpart E	3.3.6.4.A	3.3.6.4.A
29CFR1926 Subpart H, I, O	Appendix A	3.3.6.7.A
40CFR50.6(a)	3.3.11.B	3.3.11.B
40CFR60.13(a)	3.3.11.B	3.3.11.B
40CFR141.3	3.3.11.D	3.3.11.C
40CFR143	3.3.11.D	3.3.11.C
40CFR165.2(a)	3.3.11.F	3.3.11.E
40CFR261.1(a)	3.3.11.G	3.3.11.F
40CFR262.11	3.3.11.G	3.3.11.F
40CFR263.10(a)	3.3.11.G	3.3.11.F
40CFR270.1(a)(2)	3.3.11.G	3.3.11.F
41CFR101-19.603	3.3.7.13	3.3.7.13.A
49CFR171.15(a), (b)	Appendix A	3.7.4.2.6.G
49CFR171.2(b)	Appendix A	3.7.1.2.1.L
49CFR172.600, .602, .604	3.2.1.3	3.2.1.3
49CFR172.600(c)	Appendix A	3.7.3.2.6.A
49CFR172.602(a), (b)	Appendix A	3.7.3.2.6.B
49CFR172.602(c)(1)	Appendix A	3.7.3.2.6.C
49CFR172.604	Appendix A	3.7.4.2.5
49CFR172.604(a)(1), (a)(2)	Appendix A	3.7.3.2.6.D
49CFR172.702(b)	3.6.2.1.F	3.6.2.1.E
49CFR173.3(a)	Appendix A	3.2.2.5.A
49CFR173.441(b)	3.7.2.2.F	3.7.1.2.1.B

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
49CFR173.442(a)	3.2.2.7; 3.3.6.3.H.1	3.7.1.2.1.C.1
49CFR173.442(b)(2)	3.3.6.3.H.2	3.7.1.2.1.C.2
49CFR173.443(a)	Appendix A	3.2.2.4.A
49CFR173.443(a)	Appendix A	3.2.3.2.1.G
49CFR173.443(a)	Appendix A	3.2.3.2.2.G
49CFR173.443(a)	Appendix A	3.2.3.2.3.I
49CFR174.7	Appendix A	3.7.1.2.3.B
49CFR174.700(d)	Appendix A	3.7.1.2.3.C
49CFR174.715(a)	Appendix A	3.2.2.4.B
49CFR176.13	Appendix A	3.7.1.2.3.D
49CFR176.715(a)	Appendix A	3.2.2.4.B
49CFR177.804	Appendix A	3.7.1.2.3.E
49CFR177.825(a), (b), (c)	Appendix A	3.7.4.2.3.A
49CFR177.825(d)(1)	3.7.2.2.B	3.6.2.1.E
49CFR177.825(e)	Appendix A	3.7.4.2.6.H
49CFR177.842(f)	Appendix A	3.7.1.2.3.F
49CFR177.842(g)	Appendix A	3.2.2.2
49CFR177.843(a)	Appendix A	3.2.2.4.B
49CFR392.7	Appendix A	3.7.1.2.3.G
49CFR392.8	Appendix A	3.7.1.2.3.H
C00000000-AA-08-00001-00; A00000000-01717-0200-00002	3.2.1; 3.7.2.2.E	3.2.1.1.E
C00000000-AA-08-00001-00; A00000000-01717-0200-00002	3.2.1; 3.7.2.2.E	3.2.3.2.1.B

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
C00000000-AA-08-00001-00; A00000000-01717-0200-00002	3.2.1; 3.7.2.2.E	3.2.3.2.2.D
C00000000-AA-08-00001-00; A00000000-01717-0200-00002	3.2.1; 3.7.2.2.E	3.2.3.2.3.F
DOE Order 1540.1A Ch I 4(c)	Appendix A	3.2.7.1
DOE Order 4330.4A Ch I 3.1.4	3.5.3.D	3.5.3.D
DOE Order 4330.4A Ch I 3.5	3.5.1.1.C	3.5.1.1.C
DOE Order 4330.4A Ch I 3.1.4	3.6.2.1.C	3.6.2.1.B
DOE Order 4700.1 Att III-1 1.a, 1.c(6)(b)3	3.3.8.1.D	3.3.5.B
DOE Order 4700.1 Att III-1 1.a, 1.c(6)(b)3	3.5.1.1.B	3.5.1.1.B
DOE Order 4700.1 Att III-1 1.a, 1.c(6)(b)3	3.5.2; 3.5.4	3.5.2.1
DOE Order 4700.1 Att III-1 1.a, 1.c(6)(b)3	3.5.3.E	3.5.3.E
DOE Order 4700.1 Att III-1 1.c(6)(b)3	5.2	5.2.B
DOE Order 4700.1 Chg 1 Ch I.D.2	5.1	5.1A
DOE Order 4700.1 Chg 1 Att I-2	5.1	5.1B
DOE Order 4700.1 Chg 1 Att II-4 2.s	5.2	5.2.C
DOE Order 5000.3B 7	Appendix A	3.7.4.2.5
DOE Order 5000.3B 8.a(10), 8.b(3), 8.b(9), 8.c(1), 8.c(2), 8.e(3)	Appendix A	3.7.4.2.3.B
DOE Order 5000.3B 8.e	Appendix A	3.7.4.2.8.B
DOE Order 5000.3B 9.d	Appendix A	3.7.4.2.1.A
DOE Order 5000.3B 9.f, 9.h	Appendix A	3.7.4.2.1.B
DOE Order 5480.3 10.c	Appendix A	3.7.1.2.1.K.1
DOE Order 5480.3 10.c	Appendix A	3.7.1.2.1.K.2
DOE Order 5480.3 10.c	Appendix A	3.7.1.2.1.K.3

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
DOE Order 5480.3 10.d	3.5.1.4	3.2.3.2.1.J
DOE Order 5480.3 10.d	3.5.1.4	3.2.3.2.2.I
DOE Order 5480.3 10.d	3.5.1.4	3.2.3.2.3.K
DOE Order 5480.3 10.e	Appendix A	3.7.4.2.2.C
DOE Order 5480.3 9.b(7)	3.5.1.4	3.2.3.2.1.J
DOE Order 5480.3 9.b(7)	3.5.1.4	3.2.3.2.2.I
DOE Order 5480.3 9.b(7)	3.5.1.4	3.2.3.2.3.K
DOE Order 5480.3 9.b(8)	Appendix A	3.7.4.2.8.C
DOE Order 6430.1A 0109	3.3.1.C; 3.3.4.B	3.3.4.2
DOE Order 6430.1A 0110-13.1	3.2.4.3.1.C	3.2.4.3.1.B
DOE Order 6430.1A 0110-99.8.4	3.3.2.C	3.3.2.C
DOE Order 6430.1A 0200-99.8.1	3.3.2.A	3.3.2.A
DOE Order 6430.1A 0900-99.0	3.2.4.1	3.2.4.1.A
DOE Order 6430.1A 0900-99.0	3.2.4.1	3.2.4.1.B
DOE Order 6430.1A 0950-1	3.2.4.1	3.2.4.1.C
DOE Order 6430.1A 1300-11.2	3.2.1.2.E	3.2.1.2.B
DOE Order 6430.1A 1300-12.4.10	Appendix A	3.2.5.2.C
DOE Order 6430.1A 1300-12.4.11	3.3.3	3.3.3.A
DOE Order 6430.1A 1300-12.4.11	3.3.3	3.3.3.B
DOE Order 6430.1A 1300-12.4.11	3.3.3	3.3.3.C
DOE Order 6430.1A 1300-12.4.11	3.3.3	3.3.3.D
DOE Order 6430.1A 1300-12.4.11	3.3.3	3.3.3.E
DOE Order 6430.1A 1300-12.4.11	3.3.7.8	3.3.7.8
DOE Order 6430.1A 1300-12.4.2	3.3.7.10	3.3.7.10

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
DOE Order 6430.1A 1300-12.4.3	3.2.4.2.1	3.2.4.2.1
DOE Order 6430.1A 1300-12.4.3	3.2.4.2.2	3.2.4.2.2
DOE Order 6430.1A 1300-12.4.3	3.2.4.2.3	3.2.4.2.3
DOE Order 6430.1A 1300-12.4.3	3.2.4.2.5	3.2.4.2.5
DOE Order 6430.1A 1300-12.4.3	3.3.6.7.A	3.3.6.6.A
DOE Order 6430.1A 1300-12.4.3	3.3.6.7.B	3.3.6.6.B
DOE Order 6430.1A 1300-12.4.3	3.3.6.7.C	3.3.6.6.C
DOE Order 6430.1A 1300-12.4.3	3.2.4.2.4	3.2.4.2.4
DOE Order 6430.1A 1300-12.4.4	3.3.7.6	3.3.7.6
DOE Order 6430.1A 1300-12.4.5	3.3.6.4.A	3.3.6.4.A
DOE Order 6430.1A 1300-12.4.6	3.3.7.5	3.3.7.5
DOE Order 6430.1A 1300-12.4.7	3.3.7.4	3.3.7.4
DOE Order 6430.1A 1300-12.4.8	3.3.7.3	3.3.7.3
DOE Order 6430.1A 1300-12.4.9	3.3.7.2	3.3.7.2
DOE Order 6430.1A 1605-1	3.3.6.10.B	3.3.6.9.B
DOE Order 6430.1A 1655-99.8	3.3.2.B	3.3.2.B
DOE/RW-0005	3.2.1.1.F	3.2.3.2.1.A.1
DOE/RW-0005	3.2.1.1.F	3.2.3.2.1.A.2
DOE/RW-0005	3.2.1.1.F	3.2.3.2.1.A.3
DOE/RW-0005	3.2.1.1.F	3.2.3.2.3.C
DOE/RW-0187	3.2.1.1.F	3.2.3.2.1.A.2
DOE/RW-0187	3.2.1.1.F	3.2.3.2.1.A.3
DOE/RW-0194P Sect. 6.1-6.4b	Appendix A	3.4.5.2.E
DOE/RW-0239	3.7.2.2.G	3.2.3.2.2.C
DOE/RW-0239	3.7.2.2.G	3.2.3.2.3.D

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
DOE/RW-0247	3.2.1.1.E	3.2.1.1.D
DOE/RW-0270P	3.2.1.1.F	3.2.3.2.1.A.2
DOE/RW-0270P	3.2.1.1.F	3.2.3.2.1.A.3
DOE/RW-0316P	3.2.1.1.F	3.2.3.2.3.E
DOE/RW-0316P	3.2.1; 3.7.2.2.E	3.2.1.1.E
DOE/RW-0316P	3.2.1; 3.7.2.2.E	3.2.3.2.1.B
DOE/RW-0316P	3.2.1; 3.7.2.2.E	3.2.3.2.3.F
DOE/RW-0331P	3.2.1; 3.7.2.2.E	3.2.1.1.E
DOE/RW-0331P	3.2.1; 3.7.2.2.E	3.2.3.2.1.B
DOE/RW-0331P	3.2.1; 3.7.2.2.E	3.2.3.2.2.D
DOE/RW-0331P	3.2.1; 3.7.2.2.E	3.2.3.2.3.F
DOE STD-HFAC 10.3	3.3.6.6.B	3.3.3.F
MIL-STD-1472D 5.9.11.3.1	3.2.9; 3.2.5.2.B	3.2.9
MIL-STD-1472D 5.13.3	3.3.6.6.B	3.3.3.F
MOA DP/RW, 1986	Appendix A	3.2.3.2.1.K
MOA NS/RW, 04/16/92	3.8.B	3.8.B
NWPA 9	3.3.11.A; 3.7.2.2.C	3.3.11.A
NWPA 9	3.7.2.2.C	3.3.1.A
NWPA 111(a)(4)	3.2.1.A	3.2.1.1.A

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
NWPA 137(a)(1)	3.7.2.2.A	3.2.2.5.B
NWPA 137(a)(1)	3.7.2.2.A	3.7.1.2.1.A
NWPA 302(a)(5)	3.2.1.1.E	3.2.1.1.D
NWPAA 180(a)	3.7.2.2.A	3.7.1.2.1.A
NWPAA 180(b)	Appendix A	3.7.4.2.4.A
NWPAA 180(c)	Appendix A	3.6.2.3
ORNL/Sub/89-SD841/2	3.2.1; 3.7.2.2.E	3.2.1.1.E
Presidential Memo, 1985	3.2.1.1.D	3.2.1.1.C
QARD (DOE/RW-0333P)	3.3.8.1.A; 3.3.8.2.B	3.3.8.1.1
QARD (DOE/RW-0333P)	3.3.8.1.B	3.3.8.1.2
QARD (DOE/RW-0333P)	3.3.8.1.C	3.4.5.1
QARD (DOE/RW-0333P)	3.4.1.A	3.4.1.1.A
QARD (DOE/RW-0333P)	3.4.1.A	3.4.1.2
QARD (DOE/RW-0333P)	3.4.1.B	3.4.1.3
QARD (DOE/RW-0333P)	3.4.2.A	3.4.2
QARD (DOE/RW-0333P)	3.4.3	3.4.3
QARD (DOE/RW-0333P)	3.4.5	3.4.5.2.A
QARD (DOE/RW-0333P)	3.4.7	3.4.7
QARD (DOE/RW-0333P)	3.5.3.A	3.5.3.A
QARD (DOE/RW-0333P)	3.9.A	3.9.B
QARD (DOE/RW-0333P) 3.2.1	3.3.1.C	3.3.1.B
QARD (DOE/RW-0333P) 3.2.1	3.3.1.C	3.7.1.2.5
QARD (DOE/RW-0333P) 3.2.1	3.3.1.C	3.7.1.2.6
(7USC136 et seq.)	3.3.11.F	3.3.11.E

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
(42USC4321 et seq.)	Appendix A	3.4.1.1.B
(42USC6901 et seq.)	3.3.11.G	3.3.11.F
(42USC7401)	3.3.11.B	3.3.11.B
(42USC9601 et seq.)	Appendix A	3.4.1.1.B
(10CFR19.12)	Appendix A	3.7.1.2.1.B
(10CFR51)	Appendix A	3.4.1.1.B
(10CFR71.10)	Appendix A	3.7.4.2.2.A
(10CFR71.12)	Appendix A	3.7.1.2.1.D
(10CFR71.41 - 47)	Appendix A	3.7.1.2.1.E
(10CFR71.57(a))	Appendix A	3.7.1.2.1.F
(10CFR71.59(b)(1))	Appendix A	3.7.1.2.1.F
(10CFR71.61(a))	Appendix A	3.7.1.2.1.F
(10CFR71.71)	Appendix A	3.7.1.2.1.E
(10CFR71.71)	Appendix A	3.7.1.2.1.F
(10CFR71.71)	Appendix A	3.7.1.2.1.H.6
(10CFR71.71)	Appendix A	3.7.1.2.4
(10CFR71.73)	Appendix A	3.7.1.2.1.E
(10CFR71.73)	Appendix A	3.7.1.2.1.F
(10CFR71.73)	Appendix A	3.7.1.2.4
(10CFR71.85)	Appendix A	3.7.4.2.2.A
(10CFR71.85(c))	Appendix A	3.7.1.2.1.D
(10CFR71.111)	Appendix A	3.4.5.2.C
(10CFR75)	3.3.8.2.C	3.3.8.2.1.B
(10CFR1021)	Appendix A	3.4.1.1.B
(29CFR1910)	3.2.4.1	3.2.4.1.C

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
(29CFR1910 Subpart E)	3.3.6.6.C	3.3.6.5.B
(29CFR1910 Subpart F)	3.3.6.9.A	3.3.6.8.A
(29CFR1910 Subpart F)	3.3.6.9.B	3.3.6.8.B
(29CFR1910 Subpart N)	3.3.6.8.A	3.3.6.7.A
(29CFR1910 Subpart O)	3.3.6.8.C	3.3.6.7.A
(29CFR1910 Subpart P)	3.3.6.8.D	3.3.6.7.A
(29CFR1910 Subpart Q)	3.3.6.8.E	3.3.6.7.C
(29CFR1910 Subpart S)	3.3.6.10.A	3.3.6.9.A
(29CFR1910 Subpart S)	3.3.6.10.D	3.3.6.9.C
(29CFR1910.95)	3.2.4.2.4	3.2.4.2.4
(29CFR1926)	3.2.4.1	3.2.4.1.C
(33CFR1-199)	Appendix A	3.4.1.1.B
(40CFR110 - 136)	3.5.3.B	3.5.3.B
(40CFR240 - 272)	3.5.3.B	3.5.3.B
(40CFR747)	3.3.11.E	3.3.11.D
(40CFR761)	3.3.11.E	3.3.11.D
(49CFR171 - 174)	Appendix A	3.7.1.2.1.L
(49CFR172 Subpart B)	Appendix A	3.3.3.H
(49CFR172 Subpart C)	Appendix A	3.3.3.H
(49CFR172 Subpart D)	3.7.2.2.H.2	3.3.3.G
(49CFR172 Subpart G)	Appendix A	3.7.3.2.6.A
(49CFR172)	3.7.2.2.H.3	3.3.3.H
(49CFR172.400 - 407)	Appendix A	3.3.3.G
(49CFR172.403)	Appendix A	3.7.1.2.3.C
(49CFR172.403)	Appendix A	3.7.1.2.3.F

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
(49CFR172.436 - 440)	Appendix A	3.3.3.G
(49CFR172.500 - 519)	Appendix A	3.3.3.H
(49CFR172.556)	Appendix A	3.3.3.H
(49CFR176 - 178)	Appendix A	3.7.1.2.1.L
(49CFR177.816)	Appendix A	3.6.2.1
(49CFR180)	3.7.2.2.H	3.7.1.2.1.L
(49CFR200 - 236)		3.4.1.1.B
(49CFR350 - 399)		3.4.1.1.B
(49CFR390 - 397)	Appendix A	3.7.1.2.3.E
(49CFR393.95)	Appendix A	3.7.1.2.3.H
(ANSI/ASA 38)	Appendix A	3.2.4.2.5
(ANSI/HFS Std. No. 100-1988)	Appendix A	3.3.7.9
(ANSI/NFPA 70)	Appendix A	3.3.6.9.C
(ANSI Standard C2)	Appendix A	3.3.6.9.C
(ANSI N14.6)	3.3.1.C	3.7.1.2.5
(ANSI N14.19)	3.3.1.C	3.7.1.2.4
(ANSI N14.19)	3.3.1.C	3.7.1.2.6
(ANSI N14.24-1985)		3.4.1.1.B
(ASTM D4256)	Appendix A	3.2.4.1.B
(ASTM D5144-91)		3.2.4.1.B
(DOD-HDBK-743A)	Appendix A	3.3.7.10
(DOE Order 1332.1A)		3.4.1.1.B
(DOE Order 1540.2)	Appendix A	3.4.1.1.B
(DOE Order 1540.3A)	Appendix A	3.4.1.1.B
(DOE Order 5500.1B)		3.4.1.1.B

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
(DOE Order 5500.4A)	Appendix A	3.4.1.1.B
(DOE Order 5900.2A)		3.4.1.1.B
(DOE Order 6430.1A, 1300-13)	Appendix A	3.3.7.13.B
(DOE Order 6430.1A, Division 16)	3.3.6.10.B	3.3.6.9.B
(MIL-STD-882B)	Appendix A	3.2.5.1.2.A
(MIL-STD-1388)	3.5.2; 3.5.4	3.5.2.1
(MIL-STD-1472D 5.3.10)	Appendix A	3.3.7.2
(MIL-STD-1472D 5.6.3)	Appendix A	3.3.7.10
(MIL-STD-1472D 5.8.1)	Appendix A	3.2.4.2.2
(MIL-STD-1472D 5.8.2)	Appendix A	3.2.4.2.3
(MIL-STD-1472D 5.8.3)	Appendix A	3.2.4.2.4
(MIL-STD-1472D 5.8.4)	Appendix A	3.2.4.2.5
(MIL-STD-1472D 5.10)	Appendix A	3.3.7.11
(MIL-STD-1472D 5.12, 5.14.1)	Appendix A	3.3.7.12
(MIL-STD-1472D 5.13.5)	Appendix A	3.3.6.7.A
(MIL-STD-1472D 5.13.7.1)	Appendix A	3.3.6.9.C
(MTR 10090)	Appendix A	3.3.7.14
(NRC Reg Guide 8.8, 8.10)	3.2.2.1.C; 3.2.2.1.D	3.2.2.1
(NUREG-0700 Sec. 6.1)	Appendix A	3.3.7.1
(NUREG-0700 Sec. 6.1.5)	Appendix A	3.2.4.2.3
(NUREG-0700 Sec. 6.1.5)	Appendix A	3.2.4.2.2
(NUREG-0700 Sec. 6.1.5)	Appendix A	3.2.4.2.4
(NUREG-0700 Sec. 6.1.5.4.a)	3.3.6.7.B	3.3.6.6.B
(NUREG-0700 Sec. 6.1.5.4.b)	3.3.6.7.A	3.3.6.6.A

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
(NUREG-0700 Sec. 6.1.5.4.c)	3.3.6.7.C	3.3.6.6.C
(NUREG-0700 Sec. 6.2.1)	Appendix A	3.3.7.2
(NUREG-0700 Sec. 6.2.2, 6.3)	Appendix A	3.3.7.3
(NUREG-0700 Sec. 6.4)	Appendix A	3.3.7.4
(NUREG-0700 Sec. 6.5)	Appendix A	3.3.7.5
(NUREG-0700 Sec. 6.6)	Appendix A	3.3.7.8
(NUREG-0700 Sec. 6.8)	Appendix A	3.3.7.6
(NUREG-0700 Sec. 6.9)	Appendix A	3.3.7.7
Derived	3.2.1.1.F	3.2.3.2.2.B
Derived	3.2.1.1.F	3.2.3.2.3.B
Derived		3.2.1.1.F
Derived		3.4.1.1.B
Derived by CRD	3.1.6.B	3.2.3.2.2.J
Derived by CRD	3.1.6.B	3.2.3.2.3.L
Derived by CRD	3.2.3.1	3.2.3.1
Derived by CRD	3.2.3.2; 3.7.2.1.2	3.7.1.1.2
Derived by CRD	3.2.3.2; 3.7.2.1.2	3.7.2.1.2
Derived by CRD	3.2.3.2; 3.7.2.1.2	3.7.3.1.2
Derived by CRD	3.2.3.2; 3.7.2.1.2	3.7.4.1.2
Derived by CRD	3.2.4	3.2.4
Derived by CRD	3.2.5.1.A	3.2.5.1
Derived by CRD	3.2.5.1.B	3.2.5.1.1

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
Derived by CRD	3.2.5.1.D	3.2.5.1.2.A
Derived by CRD	3.2.5.1.E	3.2.5.1.3
Derived by CRD	3.2.5.2.B; 3.2.5.2.D	3.2.5.2.B
Derived by CRD	3.2.5.3.A	3.2.5.3
Derived by CRD	3.2.5.4	3.2.5.4
Derived by CRD	3.2.5.5.A	3.2.5.5.A
Derived by CRD	3.2.5.5.B	3.2.5.5.B
Derived by CRD	3.2.7	3.2.7.2
Derived by CRD	3.2.8	3.2.8
Derived by CRD	3.3.7.11	3.3.7.11
Derived by CRD	3.3.7.12	3.3.7.12
Derived by CRD	3.3.10.A	3.3.10
Derived by CRD	3.3.10.B	3.2.3.2.1.I
Derived by CRD	3.3.10.B	3.2.3.2.2.H
Derived by CRD	3.3.10.B	3.2.3.2.3.J
Derived by CRD	3.3.5	3.3.5.A
Derived by CRD	3.3.6.2.A	3.3.6.2.A
Derived by CRD	3.3.6.2.B	3.3.6.2.B
Derived by CRD	3.3.6.2.C	3.3.6.2.C
Derived by CRD	3.3.6.2.D	3.3.6.2.D
Derived by CRD	3.3.7.1	3.3.7.1
Derived by CRD	3.3.7.13	3.3.7.13.B
Derived by CRD	3.3.7.14	3.3.7.14
Derived by CRD	3.3.7.7	3.3.7.7

Table 6-1. Requirements Cross-Reference (continued)

Source Document	CRD Paragraph	Trans-SRD Paragraph
Derived by CRD	3.3.7.9	3.3.7.9
Derived by CRD	3.3.8.2.A	3.3.8.2.1.A
Derived by CRD	3.3.9.B	3.3.9.A
Derived by CRD	3.3.9.C	3.3.9.B
Derived by CRD	3.4.4	3.4.4.B
Derived by CRD	3.4.6.A	3.4.6
Derived by CRD	3.6.2.1.A	3.6.2.1.A
Derived by CRD	3.6.2.1.D	3.6.2.1.C
Derived by CRD	3.6.2.2	3.6.2.2
Derived by CRD	3.8.A	3.8.A

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APPENDIX A Transportation Function Descriptions

Purpose

This appendix provides the description for the functions comprising the Transport Waste function. These functions are allocated to the physical architecture of the Transportation system element. The functions and interfaces in this appendix provide the foundation for the allocation. The function allocation to architecture is contained in Appendix B.

Content

The following is a description of the Transport Waste (1.2) function and its subfunctions, the Transportation functional hierarchy, and function flow diagrams. The flow diagrams include N-Square charts describing the interfaces between functions and the function flow block diagrams are contained at the end of this appendix.

Transport Waste Functions

1.2 Transport Waste

The Transport Waste function establishes the acceptance by OCRWM of loaded casks for transport, the movement of loaded and unloaded casks between Purchaser/Producer sites and retrieval from DOE CRWMS facilities, and the movement of loaded and unloaded casks between DOE CRWMS facilities.

Inputs:	**From:**
• SNF	1.1, 1.3, 1.4
• HLW	1.1, 1.4
• Loaded Cask Systems/Documents	1.1, 1.3, 1.4
• Unloaded Cask Systems/Documents	1.1, 1.3, 1.4
• New Cask/Documents	Private Industry

Outputs:	**To:**
• SNF	1.3, 1.4
• HLW	1.4
• Loaded Cask Systems/Documents	1.3, 1.4
• Unloaded Cask Systems/Documents	1.1, 1.3, 1.4
• Federally-Limited Radiation Exposure	Accessible Environment
• Federally-Limited Release of Radionuclides	Accessible Environment

1.2.1 Manage Transportation System

The Manage Transportation System function includes planning, directing, managing CRWMS traffic, and conducting field operations, and ensuring regulatory compliance.

Inputs:	**From:**
• Schedules/Documents	1.1 (Purchaser/Producer), 1.3, 1.4
• Records	1.2.3

Outputs:	**To:**
• Schedules/Documents	1.1 (Purchaser/Producer), 1.3, 1.4 1.2.2, 1.2.3
• Policy	1.2.2, 1.2.3
• Reports	1.2.2, 1.2.3

1.2.1.1 Direct Transportation System

This function directs the overall operations of the Transportation System by managing and controlling resources of the Manage Transportation System, Ship Cask System, and Support Transportation System functions. This direction is determined by inputs from the progress and status provided from other functions.

Inputs:	**From:**
• Plans	1.2.1.2.1
• Reports	1.2.1.2.4
• Reports	1.2.1.3

Outputs:	**To:**
• Policy	1.2.12, 1.2.1.3, 1.2.1.4, 1.2.3.2

1.2.1.2 Plan Transportation Operations

This function develops, assembles, and distributes campaign and route planning information to the operations management organizations at CRWMS receiving facilities and to the affected waste generator facilities. In addition, this information is distributed to the Transportation System organizations responsible for field service, traffic management, maintenance, and others whose work schedules are directly affected by the campaign planning activities. This information covers the deployment status not only of casks and vehicles, but also of ancillary equipment, reconfiguration components (cask baskets), and maintenance and field service resources. An

important part of this planning function involves coordinating transportation operations schedules with the waste generators and the repository or MRS receiving facilities. Route planning is coordinated with State and local officials as required.

Inputs:	**From:**
• Annual Acceptance Rates	1.0
• Approved Delivery Commitment Schedules	1.1
• Approved DCS Exchange Requests	1.1
• Approved Final Delivery Schedules	1.1
• Evaluation Request	1.1
• Policy	1.2.1.1
• Reports	1.2.1.3

Outputs:	**To:**
• Plans	1.2.1.1, 1.2.1.3
• Reports	1.2.1.1
• Schedules, Plans	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.1.4, 1.2.1.5, 1.2.3.3

1.2.1.2.1 Prepare Long-Range Plans

This function develops long-range (1 - 10 years) plans for pick-up and delivery of Purchasers' spent fuel. Strategies are developed based on Purchaser/Producer 5-year Delivery Commitment Schedules and 10-year discharge projections. Estimates of resources including cask fleet size and ancillary equipment by year during the 10-year period are developed.

This function also provides a means for evaluation and proposed implementation of good practices, lessons learned, and enhancements in the Transportation industry and the Transportation System. This evaluation includes trend analysis to determine appropriate corrective actions to prevent incident/event recurrence and to improve the system's effectiveness and efficiency.

Inputs:	**From:**
• Annual Acceptance Rates	1.0
• Approved Delivery Commitment Schedules	1.1
• Approved DCS Exchange Requests	1.1
• Approved Final Delivery Schedules	1.1
• Evaluation Request	1.1
• Policy	1.2.1.1
• Schedules, Plans	1.2.1.2.2

Outputs:	**To:**
• Long-Range Schedules, Plans	1.2.1.2.2, 1.2.1.2.3, 1.2.1.2.4

1.2.1.2.2 Plan Campaigns and Transportation System Operations

This function develops, modifies, assembles, and distributes campaign planning information to the operations management organizations at CRWMS receiving facilities and at the affected waste generator facilities. In addition, planning information is distributed to the Transportation System organizations responsible for field service, traffic management, maintenance, and others whose work schedules are directly affected by the campaign planning activities.

On the basis of final delivery schedules, campaign plans are developed and distributed to affected parties that identify shipping schedules, equipment requirements, technical support requirements, operations contingencies, transport mode requirements, and advanced preparations requirements.

Transportation System master plans are developed using campaign plans and equipment maintenance requirements.

Whenever external factors or variances change the existing campaign plans, planning is re-initiated. Revised plans, which reflect the external factor and coordination with those affected, will be reissued.

Inputs:	**From:**
• Annual Acceptance Rates	1.0
• Approved DCS and Exchange Request	1.1
• Approved Final Delivery Schedules	1.1
• Evaluation Request	1.1
• Policy	1.2.1.1
• Long-Range Schedules, Plans	1.2.1.2.1
• Facility Interface Capability Assessment	1.1

Outputs:	**To:**
• Schedules, Plans	1.1 (Purchaser/Producer), 1.3, 1.4 1.2.1.2.1, 1.2.1.2.3, 1.2.1.2.4, 1.2.1.4, 1.2.1.5, 1.2.3.3

1.2.1.2.3 Prepare Contingency Plans

This function addresses the advance preparation of concept plans to describe alternative means of operating the Transportation System in the event of significant interruption. Examples of interruptions include the following: a strike by workers within some portion of the CRWMS;

serious weather conditions that would cause long periods of delay; a natural or manmade disaster; unexpected legal action against a part or all of the CRWMS; a shift in public opinion that could impede or block some activity or function within the CRWMS.

Inputs:	**From:**
• Long Range Schedules, Plans	1.2.1.2.1
• Schedules, Plans	1.2.1.2.2
• Reports	1.2.1.3

Outputs:	**To:**
• Plans	1.2.1.1, 1.2.1.2.4, 1.2.1.3

1.2.1.2.4 Analyze Transportation Operations

This function provides Transportation System management and planners with the analytical means to closely examine the various operations of the CRWMS. Some specific means of analysis include the following: plan reviews, alternative planning, performance assessment, and cost analysis.

Inputs:	**From:**
• Policy	1.2.1.1
• Long Range Schedules, Plans	1.2.1.2.1
• Schedules, Plans	1.2.1.2.2
• Plans	1.2.1.2.3
• Reports	1.2.1.3

Outputs:	**To:**
• Reports	1.2.1.1

1.2.1.3 Conduct Regulatory Compliance Activities

This function involves interaction with permitting, certification and licensing organizations for the acquisition and maintenance of licenses, certificates, permits and other authorizations from government agencies. Compliance functions also plan and coordinate appropriate recertification of transportation cask systems.

Compliance functions include activities to maintain conformance with industry and other standards of practice. These various activities necessitate the monitoring of new developments and change in the regulations, laws, standards, and industry practices. Compliance with the

transportation-related part of the DOE standard contract for disposal of SNF and HLW is also monitored.

Inputs:	**From:**
• Laws and Regulations	Provide Regulation (NRC, DOT, EPA, States, Tribal, and Local)
• Policy	1.2.1.1
• Plans	1.2.1.2.3
• Procedures	1.2.3.5
• CoCs, Permits, Licenses	1.2.1.4.4

Outputs:	**To:**
• Reports	1.2.1.1, 1.2.1.2.3, 1.2.3.4, 1.2.3.5, 1.2.3.7

1.2.1.3.1 Monitor Compliance with Applicable Regulatory Requirements

This function monitors the Transportation System for compliance with regulatory requirements to identify items of noncompliance. Changes to the Transportation System are recommended to ensure the necessary corrective actions.

Inputs:	**From:**
• Laws and Regulations	Provide Regulation (NRC, DOT, EPA, States, Tribal, and Local)
• Policy	1.2.1.1
• Plans	1.2.1.2.3
• Reports	1.2.1.3.4, 1.2.1.3.2
• Procedures	1.2.3.5

Outputs:	**To:**
• Reports	1.2.1.1, 1.2.1.2.3

1.2.1.3.2 Monitor Changes in Regulatory Requirements and Standards

This function monitors regulatory requirements and standards to identify changes that may impact the Transportation System. The impact of the changes on the Transportation System are assessed, and necessary changes to the Transportation System are recommended.

Inputs:	**From:**
• Laws and Regulations	Provide Regulation (NRC, DOT, EPA, States, Tribal, and Local)
• Policy	1.2.1.1
• Procedures	1.2.3.5

Outputs:	**To:**
• Reports	1.2.1.3.1, 1.2.1.3.3

1.2.1.3.3 Notify Other Functions of Changes in Requirements

This function utilizes the identified changes from the Monitor Changes in Regulatory Requirements and Standards function and notifies other functions of the changes.

Inputs:	**From:**
• Procedures	1.2.3.5
• Reports	1.2.1.3.2, 1.2.1.3.4

Outputs:	**To:**
• Reports	1.2.1.1, 1.2.3.4, 1.2.3.5, 1.2.3.7

1.2.1.3.4 Monitor NRC Certificates of Compliance/Other Permits and Licenses

This function monitors the status of NRC Certificates of Compliance (CoC) and other permits and licenses appropriate to the Transportation System to ensure that they are current, and provides documentation to the appropriate authorizing agency for necessary renewals.

Inputs:	**From:**
• CoCs, Permits, Licenses	1.2.1.4.4
• Procedures	1.2.3.5

Outputs:	**To:**
• Reports	1.2.1.3.1, 1.2.1.3.3

1.2.1.4 Manage Traffic

The Manage Traffic function provides both administration and operations functions that arrange and coordinate, respectively, the shipment of loaded casks. The administrative function arranges for the arrival of prime movers for shipments based on the Campaign Plans. The operations function coordinates the movement of the loaded casks systems from the Purchaser/Producer sites to the CRWMS facility and between CRWMS facilities. The operations function performs communications, control, support, and oversight. Traffic management is a level-of-effort activity that commences when the shipping activities begin, and runs throughout the life of the Transportation System.

The Manage Traffic function also provides the communications, control, oversight, and transport of unloaded casks. Incorporated within this function are the following: dispatch operations that involve scheduling and coordination of traffic flow; issuing of dispatch orders; notification of appropriate authorities; and monitoring of all transportation activities and communications. Also addressed are support activities that include providing assistance for obtaining special transport permits en route, and emergency response and communications for incidents that might occur during the transport operations.

Inputs:	**From:**
• Policy	1.2.1.1
• Permits, Licenses	Provide Regulation
• Carrier Services	Private Industry
• Security Services	Private Industry
• Schedules, Plans	1.2.1.2.2
• Information	1.2.1.5
• Information	1.2.1.6
• Status	1.2.2.3
• Shipping Documents	1.2.2.4
• Maintenance Records	1.2.3.2
• CoC	1.2.3.3
• QA Records	1.2.3.5
• Documentation	1.2.3.7

Outputs:	**To:**
• Dispatch Order	Private Industry
• Schedules, Plans	1.2.1.2.2
• Revised Operations Orders (Loaded Casks)	1.2.2.3.1
• Incident Information (Loaded Casks)	1.2.1.5
• Incident Notification	1.2.1.6
• Carrier Services	1.2.2.2
• Security Services	1.2.2.2
• Shipping Documents	1.2.2.2

• Schedules, Plans	1.2.3.3
• Notifications	Provide Regulation, 1.3, 1.4

1.2.1.4.1 Prepare/Coordinate Transportation Schedules and Routing

This functions supports campaign planning. Responsible operational personnel will develop and coordinate transportation schedules that will identify and provide for the equipment, services, and support to meet the objectives and milestones within the campaign plans. This will include integration of physical movements of equipment and loaded casks to resolve competing demands for services, equipment, facilities, and support, and to ensure that special conditions and restrictions are properly fulfilled. Traffic management personnel will coordinate all schedules with the Purchaser/Producer or shipping activity, the field operations teams and security escorts, the applicable receiving activity, the supporting transportation service organization(s) (railroads, trucking companies, barging companies, riggers, etc.), and applicable State officials. While most schedules may be campaign specific, the coordination of these schedules is a level-of-effort activity that commences when shipping activities begin, and runs throughout the life of the Transportation System.

Inputs:	**From:**
• Schedules, Plans	1.2.1.2.2

Outputs:	**To:**
• Schedules, Plans	1.2.1.2.2, 1.2.1.4.2, 1.2.1.4.3, 1.2.1.4.5, 1.2.3.3

1.2.1.4.2 Provide Carrier Services

This function provides the carrier services, as contracted, for the transport of cask systems in coordination with established schedules and routes.

Inputs:	**From:**
• Carrier Services	Private Industry
• Schedules, Plans	1.2.1.4.1

Outputs:	**To:**
• Carrier Services	1.2.2.2

1.2.1.4.3 Provide In-Transit Physical Security/Escort Services

This function provides the physical security necessary to minimize and cope with circumstances that threaten deliberate damage to a SNF/HLW shipment or other safeguards emergencies.

Inputs:	**From:**
• Security Services	Private Industry
• Schedules, Plans	1.2.1.4.1
Outputs:	**To:**
• Security Service	1.2.2.2.1.3

1.2.1.4.4 Obtain Transport Permits

This function obtains transport permits required by Federal, State, and local laws and regulations prior to commencement of each shipment. These include State and local permits for loaded cask movements where oversize or overweight conditions exist along the route. This activity commences with completion of a coordinated campaign plan, and terminates with delivery of the permits to the carrier's operators; or, it commences with notification of operational personnel that an event has occurred that has generated the requirement for a special permit, and terminates when the operator of the equipment requiring the permit receives the permit.

Inputs:	**From:**
• Permits, Licenses	Provide Regulation (NRC, State, Tribal, and local)
Outputs:	**To:**
• Shipping Documents	1.2.2.2

1.2.1.4.5 Issue Transportation Notifications

This function issues appropriate notices to NRC, appropriate State and Tribal authorities, and shipping and receiving activities, in accordance with the operational procedures, campaign plans, and coordinated schedules.

Inputs:	**From:**
• Schedules, Plans	1.2.1.4.1

Outputs:	**To:**
• Notifications, Advanced Notices	Provide Regulation (NRC, State, Tribal, and local), 1.3, 1.4

1.2.1.4.6 Control Transportation

This function controls the interaction between a central control center and the operating activities of the Transportation System. The primary focus is on monitoring and providing direction for the operators of cask system equipment while it is engaged in physically transporting SNF/HLW.

Inputs:	**From:**
• Information	1.2.1.5, 1.2.1.6
• Status	1.2.2.3

Outputs:	**To:**
• Information	1.2.1.5
• Incident Notification	1.2.1.6
• Revised Operations Orders	1.2.3.3

1.2.1.4.7 Collect/File Transportation Records

This function addresses all log books, documents, and records prepared during the life of the Transportation System operations that must be collected and retained to fulfill legal and fiscal requirements. Records and documents will be generated that are campaign specific, while operational records will be generated that cover the overall program as well as multiple campaigns. Records collection, filing, and management for Transportation System operations and equipment is a level-of-effort activity that will run throughout the life of the Transportation System.

Inputs:	**From:**
• Shipping Documents	1.2.2.4
• Maintenance Records	1.2.3.2
• Certificate of Compliance	1.2.3.3
• QA Records	1.2.3.5
• Documentation	1.2.3.7

Outputs:	**To:**
• None identified at this time	

1.2.1.5 Conduct Field Operations

This function conducts Field Operations support to the Purchaser/Producer in shipment preparations and cask loading, including training, equipment readiness, loading observation, and documentation preparation. Other support provided by this function includes the following: intermodal planning and execution; MRS and MGDS training and technical assistance; Transportation Operations incident recovery, emergency response support, and technical assistance; and Waste Acceptance (as requested) training and observation.

Inputs:	**From:**
• Schedules, Plans	1.2.1.2.2
• Campaign Kits	1.2.3.3.5
• Campaign Kits	1.1, 1.3, 1.4

Outputs:	**To:**
• Information and Training	1.1, 1.3, 1.4
• Campaign Kits	1.1 (Purchaser/Producer), 1.3, 1.4
• Campaign Kits	1.2.3.2, 1.2.3.3
• Incident Information	1.2.1.4.6

1.2.1.5.1 Support Waste Acceptance (Purchaser/Producer)

This functions provides support for cask loading operations. This function provides the resources needed by Waste Acceptance to conduct site training, review, modify and concur with cask operating procedures, and verify readiness to initiate a campaign. It also includes providing assistance as requested to the Purchaser/Producer in cask handling and loading, identifying site-specific equipment and supplies needed in the shipping campaign, and monitoring carrier performance at the site. Finally, it provides technical support to the Accept Cask System for transportation function.

A major function of Field Operations is to ensure that personnel involved in operations at origin sites are properly trained and qualified to carry out required tasks. This includes the training of: (1) Purchaser/Producer personnel as requested and required; (2) contractor personnel who may be employed in the shipping campaign; and (3) other Field Operations personnel. Field Operations will consult with Purchaser/Producer to determine training aids, documentation, manuals, video tapes, and procedures needed and will arrange for classroom and hands-on training of Purchaser/Producer and contractor personnel at their facility.

The Field Operations function will provide technical advice and assistance to Purchasers/Producers during cask handling, loading, and preparation for shipment. Occasionally, problems may be encountered that require modification of procedures, incidental maintenance,

or minor repair to the cask systems. Minor repairs might require a review of utility actions or, conceivably, require Field Operations to accomplish these repairs and/or modifications at the reactor site or other off-site locations.

Field Operations, when at the Purchaser/Producer site, will also ensure that all documentation (e.g., check-off lists, certifications, inspection records, and off-site shipment records) is collected and forwarded to the appropriate recipients.

Inputs:	**From:**
• Schedules, Plans	1.2.1.2.2
Outputs:	**To:**
• Information, Training	1.1 (Purchaser/Producer)

1.2.1.5.2 Support MRS/MGDS

This function supports MRS and MGDS activities through training and technical support.

Inputs:	**From:**
• Schedules, Plans	1.2.1.2.2
Outputs:	**To:**
• Information, Training	1.3, 1.4

1.2.1.5.3 Support In-Transit Operations

In this function, Field Operations supports transportation operations with training and technical assistance for in-transit maintenance.

Inputs:	**From:**
• Schedule, Plans	1.2.1.2.2
Outputs:	**To:**
• Status	1.2.1.4.6

1.2.1.5.4 Support In-Transit Incident Responses

This function provides support activities to recover a cask in the event of an accident.

Inputs:	**From:**
• None identified at this time	

Outputs:	**To:**
• Incident Information	1.2.1.4.6

1.2.1.5.5 Manage Campaign Kit Design

This function physically accepts the Campaign Kits from inventory for delivery to the Purchaser's site. This also includes the responsibility for identifying necessary items and ensuring that the kits are complete and that all prescribed items are present and serviceable. When the campaign is completed, the unused or nonexpendable items that composed the Campaign Kits are repackaged and then returned to the designated activity of the CRWMS.

Inputs:	**From:**
• Campaign Kits	1.2.3.3.5
• Campaign Kits	1.1, 1.3, 1.4

Outputs:	**To:**
• Campaign Kits	1.1, 1.3, 1.4
• Campaign Kits	1.2.3.2, 1.2.3.3.5

1.2.1.6 Manage Incident Response

This function provides communications during incidents/emergencies among on-scene personnel, CRWMS personal, and Federal, State, local, and Tribal officials. Communications to monitor activities and progress is also provided. The incident/emergency response communications capability will be required from the commencement of transportation operations and will run throughout the life of the program; however, this capability would only be employed from notification of an incident/emergency until the appropriate authorities declare an end of the incident/emergency.

Inputs:	**From:**
• Notification	1.2.1.4.6

Outputs:	**To:**
• Information	Provide Regulation (NRC, State, Tribal, and local), 1.2.1.4.6

1.2.2 Ship Cask System

In this function, the loaded, unloaded, or new cask on the transporter is prepared for shipment (delivery to the carrier). The loaded cask system is transported from the Purchaser/Producer site to a CRWMS site (or between CRWMS sites). The unloaded cask system is transported to a Purchaser/Producer site or a CRWMS site. The new cask system is transported to a CRWMS site. Delivery of the cask system to its designated location terminates this function.

Inputs:	**From:**
• SNF	1.1, 1.3, 1.4
• HLW	1.1, 1.4
• Cask Systems/Documents	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.3.1
• Carrier Services	1.2.1.4.2
• Security Services	1.2.1.4.3

Outputs:	**To:**
• SNF	1.3, 1.4
• HLW	1.4
• Cask Systems/Documents	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.3.1
• Carrier Services	Private Industry
• Security Services	Private Industry

1.2.2.1 Contain Waste for Transportation

This function is initiated upon final closure of the cask. The cask must be loaded by the Purchasers/Producers/MRS/MGDS in accordance with the approved procedure and the requirements of the NRC-issued CoC regarding the following: requirements for cask preparation prior to loading; the payload or contents specifications; and the requirements for cask closure and preparation prior to delivery to the carrier. These preparations include certificate-required and regulation-required inspections and tests. Loading and preparation of the cask in accordance with the certificate ensures that the cask contents and conditions comply with the assumptions that were the basis for the cask design and the subsequent NRC concurrence that the cask containment system meets the requirements of 10CFR71. In addition, certain inspections confirm compliance with regulations related to radiation and contamination limits for the cask. This function is terminated upon opening of the cask, following delivery of the shipment to the DOE facility.

Inputs:	**From:**
• SNF	1.1, 1.3, 1.4
• HLW	1.1, 1.4
• Information	1.1 (Purchaser/Producer), 1.3, 1.4

Outputs:	**To:**
• SNF	1.3, 1.4
• HLW	1.4
• Information	1.2.2.2.1.1
• Documentation	1.1, 1.2.2.2.1.4

1.2.2.2 Accept Cask System

This function accepts the loaded, unloaded, or new cask system for transport from Waste Acceptance (Purchaser/Producer), the MRS, the MGDS, cask maintenance facility, or private industry. The cask system is verified as ready for transport before the responsibility of the cask and its contents is transferred.

Inputs:	**From:**
• Cask Systems	1.1, 1.3, 1.4, 1.2.3.3.1, Private Industry
• Documentation and Findings	1.1 (Purchaser/Producer), 1.3, 1.4, Private Industry
• Carrier Services	1.2.1.4.2
• Security Services	1.2.1.4.3
• Shipping Documents	1.2.1.4.4
• CoC	Private Industry

Outputs:	**To:**
• Cask Systems	1.2.2.3
• Shipping Documents	1.2.2.3
• Carrier Services	1.2.2.3
• Security Services	1.2.2.3.1.1
• CoC	1.2.2.3.3

1.2.2.2.1 Accept Loaded Cask System

In this function, OCRWM accepts a loaded cask for transport from the Purchaser/Producer after determining that the criteria of 10CFR961 or the MOA between EM (or other DOE organization as appropriate) and OCRWM have been met. The cask is loaded by the Purchaser/Producer in accordance with the approved procedure and the requirements of the cask CoC. OCRWM may

observe loading operations, verify the payload characteristics, and verify loaded cask compliance with the CoC and NRC regulations through review of the Purchaser/Producer documentation. The acceptance of the loaded cask by OCRWM is complete upon signature on the shipment documentation by the designated OCRWM representative.

Inputs:	**From:**
• Loaded Cask Systems	1.1, 1.3, 1.4
• Information	1.1 (Purchaser/Producer), 1.3, 1.4
• Operations Orders	1.2.1.4
• Carrier Services	1.2.1.4.2

Outputs:	**To:**
• Loaded Cask Systems/Documents	1.2.2.3.1

1.2.2.2.1.1 Observe Transport Preparations

In this function, OCRWM may observe (1) loading the cask, and (2) preparing the loaded cask for shipment. The OCRWM representative(s) will verify adherence to procedures, completion of check-off lists, compliance with cask certificate requirements (including monitoring measurements taken during loadings), and verification of results of tests and inspections required by regulations.

Inputs:	**From:**
• Documentation	1.1, 1.3, 1.4
• Findings, Required Repair Findings	1.1, 1.3, 1.4

Outputs:	**To:**
• Documentation	1.2.2.2.1.2
• Findings, Required Repair Findings	1.2.2.2.1.2

1.2.2.2.1.2 Verify Loaded Cask Contents

In this function, the physical characteristics and conditions of the loaded cask and its contents will be verified against the characteristics specified by the transportation cask CoC. These may include identification numbers, overall length, weight, cross section, active fuel length, enrichment, burn-up, out-of-reactor time, thermal output, cladding conditions, and deformation. Canister characteristics may also be notable. In the case of HLW waste or nonfuel components, these characteristics may include source term, thermal output, physical and chemical make-up,

and canister configuration. For either payloads, any special sampling requirements would be noted.

Verification of the above characteristics, classifications, and condition of the waste may be accomplished by (1) physical inspection, (2) review of analysis, (3) reliance on certifications made by the waste generator, or (4) any combination of the above.

Inputs:	**From:**
• Documentation	1.2.2.2.1.1
• Findings, Required Repair Findings	1.2.2.2.1.1

Outputs:	**To:**
• Verified Waste Description Documents	1.2.2.2.1.4
• Verified Cask Contents Documents	1.2.2.2.1.4
• Documentation	

1.2.2.2.1.3 Prepare for Shipment

In this function, the carrier inspects the load to ensure compliance with regulatory requirements. The OCRWM representative prepares all documentation, briefs the transporter crew and escorts, and confirms compliance with regulatory requirements. The OCRWM representative certifies the shipment is in proper condition for transportation, and provides required documentation to the carrier crew. The carrier acknowledges acceptance of the shipment by signing the bill of lading.

Input:	**From:**
• Shipping Documents	1.2.1.4.4
• Carrier Services	1.2.1.4.2
• Security Services	1.2.1.4.3

Output:	**To:**
• Shipping Documents	1.2.2.2.1.4
• Carrier Services	1.2.2.3.1
• Security Services	1.2.2.3.1.1

1.2.2.2.1.3.1 Inspect Vehicles

In this function, the driver connects the tractor to the trailer for truck shipments, and the connection and king pin locking are verified by a second knowledgeable person. The other responsibilities of the driver include the 49CFR-required inspections, ensuring that placarding is

correct and visible, raising the trailer's landing gear, removing chocks, and connecting the trailer brake and electric lines. The driver verifies the load is secure and that the communications link and physical security features are operational. Load positioning and attachment, personnel barrier installation, and labeling are also checked. A survey for loose parts is also completed.

For rail shipments the receiving railroad will conduct a pre-departure inspection at each location where the cask car is placed in the train. [49CFR215.13]

Prior to movement by truck or rail, cask loading documentation and the smear and radiation surveys would be completed. Verification of cask tiedown, tamper-indicating seal, and personnel barrier attachments would be completed during mechanical condition walk-around inspection.

The carrier also verifies that all documentation, including permits, emergency action plans, and security information is appropriately carried in the prime mover.

The origin State may initiate a vehicle inspection. Arrangements for the inspection are the responsibility of DOE. Any record of the vehicle inspection will become part of the shipping documentation because such inspections may be a part of a broad national program for verification of vehicle road-worthiness.

Inputs:	**From:**
• Carrier Services	1.2.1.4.2
Output:	**To:**
• Carrier Services	1.2.2.2.1.3.3

1.2.2.2.1.3.2 Prepare Shipping Documents

In this function, the tractor driver, barge captain, or train crew is required to have certain information regarding the material being transported. OCRWM, as the shipper, will ensure that the following documentation is provided and is in possession of the driver, captain or train crew: (1) a bill of lading (completed as required by the regulations); (2) a route plan; (3) radiation survey and smear results; (4) an "instructions to driver/engineer" for the maintenance of exclusive use; (5) other important shipment information or data; and (6) any required permits. Other shipment information will include the following: a cask loading map; escort arrangement information; notifications to be made in the event of an accident; detailed emergency response data; copies of pertinent regulations and cask certifications; vehicle inspection reports; and tamper indicating seals. Verification of required contents of the packet will be supported by a checklist.

Inputs:	**From:**
• Shipping Documents	1.2.1.4.4

Outputs:	**To:**
• Shipping Documents	1.2.2.3.1

1.2.2.2.1.3.3 Brief Transportation and Security Crews

In this function, a pre-dispatch briefing of the carrier crew will be conducted to ensure that each crew understands the nature of the cargo and is familiar with emergency response actions, the route plan, and physical security procedures. The crew credentials may also be reviewed at this time, if not done earlier. Credentials include pertinent operator licenses, training certifications and hours-of-service logbook.

The briefing includes a review of the checklist of all compliance items, closure of any open items from previous functions, a review of all documentation related to the shipment (including the results of vehicle inspections). At the completion of the briefing, the shipment is ready for movement, the bill of lading is signed by the OCRWM representative, and the shipment is accepted by the carrier.

The shipment is considered ready for interstate commerce when the bill of lading is signed by the shipper and accepted by the carrier.

Input:	**From:**
• Security Services	1.2.1.4.3
• Carrier Services	1.2.2.2.1.3.1

Output:	**To:**
• Security Services	1.2.2.3.1.1
• Carrier Services	1.2.2.3.1

1.2.2.2.1.4 Transfer Responsibility for Shipment

In this function, OCRWM accepts the loaded casks for transport through acknowledgement that the cask is properly loaded, packaged, marked, labeled and ready for transport by the carrier in compliance with the cask CoC and other regulatory requirements. This acceptance is concurrent with, or subsequent to, the delivery/transfer of custody of the SNF or HLW from the Purchaser/Producer to OCRWM. Documentation of cask contents, completion of appropriate loading operations, and results of tests and inspections are reviewed to ensure compliance with requirements. Documentation for each cask shipment is expected to include the following:

1) Data on cask contents
2) Radiation readings and smear survey results

3) Cask loading map
4) Procedure check-off lists
5) Results of tests and inspections required by the cask certificate
6) Results of impact limiter and tie-down inspections
7) Results of vehicle inspection
8) Results of other special measurements that may be required
9) Results of analyses (e.g., source term or thermal analyses of material shipped that demonstrate that the material shipped is in compliance with cask certificate limitations and/or receiving site limits)
10) Records of any servicing, maintenance, and repair operations related to the shipment.
11) A complete off-site radioactive material shipment record including a signed DOT certificate.

Based on satisfactory review results, the OCRWM representative accepts the loaded cask from the Purchaser/Producer by signature on the appropriate documents.

Inputs:	**From:**
• Loaded Cask Systems	1.1, 1.3, 1.4
• Verified Waste Description/Documents	1.2.2.2.1.2
• Documentation	1.2.2.2.1.2
• Verified Cask Contents Documents	1.2.2.2.1.2
• Shipping Document	1.2.2.2.1.3

Outputs:	**To:**
• Loaded Cask Systems	1.2.2.3.1
• Shipping Documents	1.2.2.3.1

1.2.2.2.2 Accept Unloaded Cask System

In this function, the unloaded cask is accepted from the Purchaser/Producer site, MRS, MGDS, or Cask Maintenance Facility for transport in accordance with DOT regulations. The unloaded cask is to be transported to Purchaser/Producer site, MRS, MGDS, or Cask Maintenance Facility.

Inputs:	**From:**
• Unloaded Cask System	1.1, 1.3, 1.4, 1.2.3.3.1
• Carrier Services	1.2.1.4.2
• Security Escort Service	1.2.1.4.3

Outputs:	**To:**
• Unloaded Cask System	1.1, 1.3, 1.4, 1.2.2.3.2

1.2.2.2.2.1 Verify Cask System Readiness

This function verifies, the physical characteristics and conditions of the unloaded cask against the characteristics specified by the transportation cask CoC. These may include overall length, weight, and cross section.

Verification of the above characteristics may be accomplished by (1) physical inspection, (2) review of analysis, (3) reliance on certifications made by the maintenance facility, or (4) any combination of the above.

Inputs:	**From:**
• Documentation	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.3.1
• Findings	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.3.1
• Required Repair Findings	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.3.1

Outputs:	**To:**
• Verified Cask Documents	1.2.2.2.2.3

1.2.2.2.2.2 Prepare for Shipment

In this function, the carrier inspects the load to ensure compliance with regulatory requirements. The OCRWM representative prepares all documentation, briefs the transporter crew and escorts, and confirms compliance with regulatory requirements. The OCRWM representative certifies the shipment is in proper condition for transportation, and provides required documentation to the carrier crew. The carrier acknowledges acceptance of the shipment by signing the bill of lading.

Input:	**From:**
• Carrier Services	1.2.1.4.2
• Shipping Documents	1.2.1.4.4

Output:	**To:**
• Shipping Documents	1.2.2.2.2.3
• Carrier Services	1.2.2.2.3.2

1.2.2.2.2.2.1 Inspect Vehicles

In this function, the driver connects the tractor to the trailer for truck shipments, and the connection and king pin locking are verified by a second knowledgeable person. The other responsibilities of the driver include the 49CFR-required inspections, ensuring that placarding is correct and visible, raising the trailer's landing gear, removing chocks, and connecting the trailer brake and electric lines. The driver verifies the load is secure and that the communications link and physical security features are operational. Load positioning and attachment, personnel barrier installation, and labeling are also checked. A survey for loose parts is also completed.

For rail shipments the receiving railroad will conduct a pre-departure inspection at each location where the cask car is placed in the train. [49CFR215.13]

Prior to movement by truck or rail, cask loading documentation and the smear and radiation surveys would be completed. Verification of cask tiedown, tamper-indicating seal, and personnel barrier attachments would be completed during mechanical condition walk-around inspection.

The carrier also verifies that all documentation, including permits, emergency action plans, and security information is appropriately carried in the prime mover.

The origin State may initiate a vehicle inspection. Arrangements for the inspection are the responsibility of DOE. Any record of the vehicle inspection will become part of the shipping documentation because such inspections may be a part of a broad national program for verification of vehicle road-worthiness.

Inputs:	**From:**
• Carrier Services	1.2.1.4.2
Output:	**To:**
• Carrier Services	1.2.2.3.2

1.2.2.2.2.2.2 Prepare Shipping Documents

In this function, the tractor driver, barge captain, or train crew is required to have certain information regarding the material being transported. OCRWM, as the shipper, will ensure that the following documentation is provided and is in possession of the driver, captain or train crew: (1) a bill of lading (completed as required by the regulations); (2) a route plan; (3) radiation survey and smear results; (4) an "instructions to driver/engineer" for the maintenance of exclusive use; (5) other important shipment information or data; and (6) any required permits. Other shipment information will include the following: a cask loading map; escort arrangement information; notifications to be made in the event of an accident; detailed emergency response

data; copies of pertinent regulations and cask certifications; vehicle inspection reports; and tamper indicating seals. Verification of required contents of the packet will be supported by a checklist.

Inputs:	**From:**
• Shipping Documents	1.2.1.4.4

Outputs:	**To:**
• Shipping Documents	1.2.2.3

1.2.2.2.2.3 Transfer Responsibility for Shipment

In this function, unloaded casks are accepted for transport through acknowledgement that the cask is properly secured, marked, labeled and ready for transport by the carrier in compliance with the cask CoC and other regulatory requirements. Documentation of completion of appropriate maintenance operations, and results of tests and inspections are reviewed to ensure compliance with requirements. Documentation for each cask shipment is expected to include the following:

1) Radiation readings and smear survey results
2) Procedure check-off lists
3) Results of tests and inspections required by the cask certificate
4) Results of impact limiter and tie-down inspections
5) Results of vehicle inspection
6) Results of other special measurements that may be required
7) Records of any servicing, maintenance, and repair operations related to the shipment.
8) A complete off-site radioactive material shipment record including a signed DOT certificate.

Inputs:	**From:**
• Unloaded Cask Systems	1.1, 1.3, 1.4, 1.2.3.3.1
• Verified Documents	1.2.2.2.2.1
• Shipping Documents	1.2.2.2.2.2

Outputs:	**To:**
• Unloaded Cask Systems	1.2.2.3.2
• Shipping Documents	1.2.2.3.2

1.2.2.2.3 Accept New Cask System

This function begins the cask system life cycle within the CRWMS.

Inputs:	**From:**
• New Cask System	Private Industry
• Certificate of Compliance	Private Industry

Outputs:	**To:**
• New Cask System	1.2.2.3.3
• Certificate of Compliance	1.2.1.4.7

1.2.2.2.3.1 Verify Cask System Readiness

In this function, the CoC is verified.

Inputs:	**From:**
• Certificate of Compliance	Private Industry

Outputs:	**To:**
• Certificate of Compliance	1.2.2.2.3.3

1.2.2.2.3.2 Prepare for Shipment

In this function, the new cask is loaded onto carrier and the system inspected.

Inputs:	**From:**
• Carrier Services	1.2.1.4.2
• Shipping Documents	1.2.1.4.4

Outputs:	**To:**
• Shipping Documents	1.2.2.3.3
• Carrier Services	1.2.2.3.3

1.2.2.2.3.2.1 Inspect Vehicles

In this function, the driver connects the tractor to the trailer for truck shipments, and the connection and king pin locking are verified by a second knowledgeable person. The other responsibilities of the driver include the 49CFR- required inspections, raising the trailer's landing

gear, removing chocks, and connecting the trailer brake and electric lines. A survey for loose parts is also completed.

For rail shipments the receiving railroad will conduct a pre-departure inspection at each location where the cask car is placed in the train. [49CFR215.13]

The origin State may initiate a vehicle inspection. Arrangements for the inspection are the responsibility of DOE. Any record of the vehicle inspection will become part of the shipping documentation because such inspections may be a part of a broad national program for verification of vehicle road-worthiness.

Inputs:	**From:**
• Carrier Services	1.2.1.4.2
Output:	**To:**
• Carrier Services	1.2.2.3.3

1.2.2.2.3.2.2 Prepare Shipping Documents

In this function, the tractor driver, barge captain, or train crew is required to have certain information regarding the material being transported. OCRWM, as the shipper, will ensure that the following documentation is provided and is in possession of the driver, captain or train crew: (1) a bill of lading (completed as required by the regulations); (2) a route plan; (3) other important shipment information or data; and (4) any required permits. Other shipment information will include the following: copies of pertinent regulations and cask certifications; vehicle inspection reports; and tamper indicating seals. Verification of required contents of the packet will be supported by a checklist.

Inputs:	**From:**
• Shipping Documents	1.2.1.4.4
Outputs:	**To:**
• Shipping Documents	1.2.2.3.3

1.2.2.2.3.3 Transfer Responsibility for Shipment

In this function, the CoC and ownership of the cask system is transferred to the CRWMS.

Inputs:	**From:**
• Certificate of Compliance	1.2.2.2.3.1
• New Cask System	Private Industry

Outputs:	**To:**
• Certificate of Compliance	1.2.2.3.3
• New Cask System	1.2.2.3.3

1.2.2.3 Move Cask System

In this function, the SNF or HLW (loaded in a transportation cask) is moved over a designated route from the Purchaser/Producer site to the CRWMS facility, or between CRWMS facilities following acceptance of the shipment by the carrier. Movement is by road, rail, or barge and includes any intermodal transfers of the loaded cask. Included in this function is the performance of in-transit security function. This function concludes upon acceptance of the loaded cask by the CRWMS facility.

Input:	**From:**
• Cask System	1.2.2.2
• Shipping Documents	1.2.2.2
• Carrier Services	1.2.2.2
• Security Escort Service	1.2.2.2

Output:	**To:**
• Cask System	1.2.2.4
• Shipping Documents	1.2.2.4
• Shipment Status Information	1.2.1.4.6
• Carrier Services	1.2.2.4
• Security Escort Service	1.2.2.4

1.2.2.3.1 Move Loaded Cask System

In this function, the loaded cask is moved over a designated road, rail or barge route in accordance with a specific plan. It includes the integration of both escort and inspection activities that may occur en route.

Input:	**From:**
• Loaded Cask System	1.2.2.2.1.4
• Shipping Document	1.2.2.2.1.4
• Security Services	1.2.2.2.1.3.3
• Carrier Services	1.2.2.2.1.3.3
• Revised Operations Orders	1.2.1.4.6

Output:	**To:**
• Loaded Cask System	1.2.2.4.1
• Shipment Status Information	1.2.1.4.6
• Security Services	1.2.2.4.1
• Carrier Services	1.2.2.4.1
• Shipping Documents	1.2.2.4.1

1.2.2.3.1.1 Secure/Escort Cask System

In this function, in-transit security is implemented in accordance with requirements of the Physical Security procedures developed for the shipment. The procedures provide the requirements for escorts and supplementary security during rest stops or repairs, the requirements for carrier and Manage Traffic Function communications during movement, stops and repairs, and the requirements for written log maintenance. The procedures also provide requirements to be implemented in response to security incidents.

Inputs:	**From:**
• Security Services	1.2.2.2.1.3.3

Outputs:	**To:**
• Security Services	1.2.2.4.1

1.2.2.3.1.2 Transport Between Sites

In this function, the loaded cask is physically transported over the planned route from the Purchaser/Producer sites, the MRS, or the MGDS.

Input:	**From:**
• Carrier Services	1.2.2.2.1.3.3
• Loaded Cask System	1.2.2.2.1.4
• Revised Operations Orders	1.2.1.4.6
• Shipping Documents	1.2.2.2.1.4

Output:	**To:**
• Loaded Cask System	1.2.2.4.1
• Carrier Services	1.2.2.4.1
• Shipment Status Information	1.2.1.4.6
• Shipping Documents	1.2.2.4.1

1.2.2.3.2 Move Unloaded Cask System

The movement of unloaded casks has been addressed as a separate support activity. In this function, the casks are referred to as unloaded rather than empty because an internally contaminated cask without fuel assemblies may not be considered empty according to Department of Transportation (DOT) definitions. These unloaded casks could come from the MRS, MGDS, and CMF, or originate from other facilities where repair or maintenance operations have been carried out.

Inputs:	**From:**
• Carrier Services	1.2.2.2.2.2
• Shipping Documents	1.2.2.2.2.3
• Unloaded Cask System	1.2.2.2.2.3

Outputs:	**To:**
• Unloaded Cask Systems	1.2.2.4.2
• Shipping Documents	1.2.2.4.2
• Carrier Services	1.2.2.4.2

1.2.2.3.3 Move New Cask System

In this function, the new cask system is physically transported from the private industry cask fabricator.

Inputs:	**From:**
• New Cask Systems	1.2.2.2.3
• Carrier Services	1.2.2.2.3
• Shipping Documents	1.2.2.2.3

Outputs:	**To:**
• New Cask Systems	1.2.2.4.3
• Shipping Documents	1.2.2.4.3
• Carrier Services	1.2.2.4.3

1.2.2.4 Deliver Cask System

In this function, the cask system is delivered and positioned, as required, at the destination. The cask is inspected and shipping papers are transferred.

Input:	**From:**
• Cask System	1.2.2.3
• Shipping Documents	1.2.2.3
• Carrier Services	1.2.2.3
• Security Escort Service	1.2.2.3

Output:	**To:**
• Cask System	1.1, 1.3, 1.4, 1.2.3.2.2
• Shipping Documents	1.1, 1.3, 1.4, 1.2.3.2.2
• Carrier Services	Private Industry
• Security Escort Service	Private Industry

1.2.2.4.1 Deliver Loaded Cask System

In this function, the loaded cask is delivered to the MRS, the MGDS, or other designated location.

Inputs:	**From:**
• Loaded Cask System	1.2.2.3.1
• Carrier Services	1.2.2.3.1
• Security Escort Service	1.2.2.3.1
• Shipping Documents	1.2.2.3.1

Outputs:	**To:**
• Loaded Cask Systems	1.3, 1.4
• Shipping Documents	1.3, 1.4
• Carrier Services	Private Industry
• Security Escort Service	Private Industry

1.2.2.4.1.1 Position Loaded Cask System

In this function, the carrier positions the transporter with loaded cask at the designated site location, disconnects the prime mover, sets brakes, and chocks wheels. Subsequent repositioning is expected to be the responsibility of the receiver. If a vehicle or transporter requires repair, as identified during the debrief, it is sent for service.

Inputs:	**From:**
• Carrier Services	1.2.2.3.1
• Loaded Cask System	1.2.2.3.1

Outputs:	**To:**
• Carrier Services	1.2.2.4.1.2
• Loaded Cask System	1.2.2.4.1.3
• Vehicles and Transporters Needing Repair	1.2.3.2.2.2

1.2.2.4.1.2 Debrief Transportation and Security Crews

In this function, the carrier crew is debriefed by OCRWM upon delivery of the loaded cask to the designated site. The results of the inspection and survey of the prime mover, the transporter, and cask may be available for the debriefing.

Inputs:	**From:**
• Security Escort Services	1.2.2.3.1
• Carrier Services	1.2.2.4.1.1

Outputs:	**To:**
• Security Escort Services	Private Industry
• Carrier Services	Private Industry

1.2.2.4.1.3 Conduct Inspection on Cask System

In this function, a physical inspection of the loaded cask upon its arrival at the designated site is conducted.

Inputs:	**From:**
• Loaded Cask System	1.2.2.4.1.1
Outputs:	**To:**
• Loaded Cask System	1.3, 1.4

1.2.2.4.1.4 Transfer Shipping Documents

In this function, the entire shipping documents package is delivered to the consignee, along with any supplemental documentation provided by the shipper.

Inputs:	**From:**
• Shipping Documents	1.2.2.3.1
Outputs:	**To:**
• Shipping Document	1.3, 1.4

1.2.2.4.2 Deliver Unloaded Cask System

This function consists of the delivery of an unloaded cask to the proper site. Prior to delivery, the Plan Campaigns and Transportation System Operations function will determine that the cask, transporter, and ancillary equipment are suitable for use in the Purchaser/Producer facilities, MRS, or MGDS. This determination will be supported by the Final Delivery Schedule (FDS), pre-delivery survey documents, the Service Planning Documents, and the Site Specific Servicing Plans.

Inputs:	**From:**
• Unloaded Cask System	1.2.2.3.2
• Shipping Documents	1.2.2.3.2
• Carrier Services	1.2.2.3.2

Outputs:	**To:**
• Unloaded Cask Systems	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.2.2
• Shipping Documents	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.2.2
• Carrier Services	Private Industry

1.2.2.4.2.1 Position Unloaded Cask System

In this function, the carrier will perform initial transporter spotting at a location designated by the Purchaser/Producer or DOE, disconnect the tractor or locomotive, set brakes, and chock wheels. Subsequent repositioning is the responsibility of the receiver. If a vehicle or transporter requires repair, as identified during the debrief, it is sent for service.

Inputs:	**From:**
• Unloaded Cask System	1.2.2.3.2
• Carrier Services	1.2.2.3.2

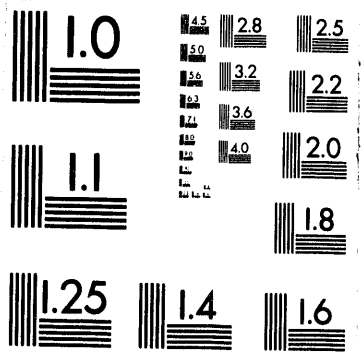
Outputs:	**To:**
• Unloaded Cask System	1.2.2.4.2.3
• Carrier Services	1.2.2.4.2.3
• Vehicles and Transporters Needing Repair	1.2.3.2.2.2

1.2.2.4.2.2 Debrief Transportation Crew

In this function, the transportation crew is debriefed by the Manage Traffic function or the Field Operations function upon arrival at the Purchaser/Producer or CRWMS site with respect to road or rail conditions, equipment problems related to repair or modification of the transporter or the prime mover, cask/transporter interface concerns, and security concerns.

Inputs:	**From:**
• Carrier Services	1.2.2.4.2.1

Outputs:	**To:**
• Carrier Services	Private Industry


1.0
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7.1
8.0
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3 of 3

1.2.2.4.2.3 Conduct Inspection of Cask System

In this function, a physical inspection of the unloaded cask system is performed upon its arrival at the Purchaser/Producer or CRWMS site. This will be conducted in coordination with site representatives, who will be accepting the cask for loading SNF/HLW.

Inputs:	**From:**
• Unloaded Cask System	1.2.2.4.2.1

Outputs:	**To:**
• Unloaded Cask System	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.2.2

1.2.2.4.2.4 Transfer Shipping Documents

In this function, the entire shipping documents package is delivered to the Purchaser/Producer or DOE, along with any supplemental documentation provided by the shipper. Receipt of shipment is confirmed by signature of the Purchaser/Producer or CRWMS representative on the freight bill, with a copy of the bill retained by the carrier. Designation of the Purchaser/Producer or CRWMS representative will be determined by an approved Site-Specific Service procedure.

Inputs:	**From:**
• Shipping Documents	1.2.2.3.2

Outputs:	**To:**
• Shipping Documents	1.1 (Purchaser/Producer), 1.3, 1.4, 1.2.3.2.2

1.2.2.4.3 Deliver New Cask System

In this function, the new cask system is delivered to the destination ready for use.

Inputs:	**From:**
• New Cask System	1.2.2.3.3
• Shipping Documents	1.2.2.3.3
• Carrier Services	1.2.2.3.3

Outputs:	**To:**
• New Cask System	1.2.3.3.1
• Shipping Documents	1.2.3.3.1
• Carrier Services	Private Industry

1.2.3 Support Transportation System

This function assists the Manage Transportation System function and the Ship Cask System function by inspecting and maintaining transportation cask systems, keeping inventory of transportation cask systems, providing training and outreach support, and other administrative support efforts.

Inputs:	**From:**
• Policy	1.2.1.1
• Schedules, Plans	1.2.1.2
• Reports	1.2.1.3.3
• Cask Systems	1.2.2.4
• Campaign Kits	1.2.1.5.5
• Proposals	Private Industry
• Spare Parts and Consumables, Ancillary Equipment, Campaign Kits	Private Industry

Outputs:	**To:**
• Reports	1.2.1.1
• QA Records, Technical Modifications, Maintenance Procedures	1.2.1.4.7
• Cask Systems	1.2.2.2
• Campaign Kits	1.2.1.5.5
• RFPs, Orders, Contract	Private Industry

1.2.3.1 Protect Environment, Public, Workers, and Facilities

This function manages environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, process and facilities safety, nuclear safety, emergency preparedness, QA, and radioactive and hazardous waste in compliance with applicable Federal and State regulatory requirements and DOE Orders. Applicable State regulations must be evaluated as facilities are sited and related operations at those sites are defined.

Inputs:	**From:**
• None identified at this time	

Outputs: **To:**

- None identified at this time

1.2.3.2 Maintain Cask System

This function maintains the cask system, which includes the cask, cask transporter and vehicle, and ancillary and related equipment. The cask system is maintained in accordance with regulatory and design requirements by providing routine inspections and maintenance, conducting annual/periodic tests and inspections and required maintenance, and repairing or replacing components as required. This function also includes the final decommissioning of the Cask System. These activities may be conducted at the maintenance facility, at the Purchaser/Producer site, or in-transit as appropriate.

Inputs: **From:**

- Spare Parts and Consumables 1.2.3.3.4
- Cask Systems Needing Repair 1.2.2.2.1, 1.2.2.3, 1.2.2.4.2
- Unloaded Cask Systems at End of Life Cycle 1.2.2.4.2
- Campaign Kits 1.2.3.3.5
- Schedules, Plans 1.2.1.4.1, 1.2.1.2.2
- Technical Modification 1.2.3.7.4

Outputs: **To:**

- Maintenance Records 1.2.1.4.7
- Maintenance Procedures 1.2.1.4.7
- Repaired Cask Systems 1.2.2.2.1, 1.2.2.4.2, 1.2.2.3, 1.2.3.3.1, 1.2.3.3.2
- Campaign Kits 1.2.3.3.5
- Decommissioned Cask 1.2.3.8

1.2.3.2.1 Manage Maintenance

This function provides the overall direction, establishes service and maintenance policies, determines maintenance priorities, coordinates service and maintenance procedures, and conducts maintenance planning for the Transportation System. This includes service and maintenance activities performed at cask maintenance facilities (primary maintenance), site/facility maintenance, and in-transit maintenance.

Inputs: **From:**

- Technical Modification 1.2.3.7.4

Outputs:	**To:**
• Maintenance Policy and Procedures	1.2.3.2.2, 1.2.3.2.3, 1.2.3.2.4, 1.2.3.2.5

1.2.3.2.2 Perform Primary Maintenance

This function includes all service and maintenance activities performed at CRWMS cask maintenance facilities. Activities included are regular and scheduled maintenance and services performed on the casks, transporters, and ancillary equipment; nonscheduled cask systems repairs except those performed in-transit and at Purchaser sites; cask configuration; cask system decontamination; cask system rework; and cask system testing.

Inputs:	**From:**
• Spare Parts and Consumables	1.2.3.3.4
• Cask Systems Needing Repair	1.2.2.4.2
• Vehicles Needing Repair	1.2.2.4.2
• Ancillary Equipment Needing Repair	1.2.2.4.2
• Maintenance Policy and Procedures	1.2.3.2.1

Outputs:	**To:**
• Repaired Unloaded Cask Systems	1.2.3.3.1
• Repaired Vehicles Cask Systems	1.2.3.3.2
• Repaired Ancillary Equipment	1.2.3.3.3
• Maintenance Records	1.2.1.4.7

1.2.3.2.2.1 Maintain Casks

This function repairs, modifies, maintains, and reconfigures casks as documented in a work order or a maintenance schedule. The repair, modification, maintenance, or reconfiguration is performed in accordance with QA requirements.

Reconfiguration of casks may be required in order to accept the next scheduled waste type. Reconfiguration can vary from changing inserts in spent fuel baskets to allow for the shipment of different lengths of fuel to a complete basket change-out to permit the movement of a different type of waste (e.g., canistered fuel).

Inputs:	**From:**
• Unloaded Cask	1.2.2.4.2
• Spare Parts and Consumables	1.2.3.3.4
• Maintenance Policy and Procedures	1.2.3.2.1

Outputs:	**To:**
• Unloaded Cask	1.2.3.3.1
• Maintenance Records	1.2.1.4.7

1.2.3.2.2.2 Service and Maintain Vehicles

This function repairs, modifies, and maintains vehicles and transporters, including rail cars, trailers, and tractors.

Inputs:	**From:**
• Vehicles and Transporters Needing Repair	1.2.2.4.1.1, 1.2.2.4.2.1
• Spare Parts and Consumables	1.2.3.3.4
• Maintenance Policy and Procedures	1.2.3.2.1

Outputs:	**To:**
• Repaired Vehicles and Transporters	1.2.3.3.2

1.2.3.2.2.3 Service and Maintain Ancillary Equipment

This function repairs, modifies, and maintains ancillary equipment in accordance with QA requirements.

Inputs:	**From:**
• Ancillary Equipment Needing Repair	1.2.2.4.2
• Spare Parts and Consumables	1.2.3.3.4
• Maintenance Policy and Procedures	1.2.3.2.1

Outputs:	**To:**
• Repaired Ancillary Equipment	1.2.3.3.3

1.2.3.2.3 Perform In-Transit Maintenance

In this function, the carrier determines the need for repairs to the prime mover, the transporter, or the cask system to transporter interface. The carrier confirms this determination with the Manage Traffic Function and, in accordance with the Manage Traffic Function, identifies the location at which repairs will be made. Additional security actions may be required by the carrier and the Security Function.

Inputs:	**From:**
• Cask Systems Needing Repair	1.2.2.3
• Maintenance Policy and Procedures	1.2.3.2.1
• Spare Parts and Consumables	1.2.3.3.4
• Maintenance Policy and Procedures	1.2.3.2.1

Outputs:	**To:**
• Repaired Cask Systems	1.2.2.3

1.2.3.2.4 Perform Incidental Maintenance

In this function, incidental maintenance is performed, as required. Incidental maintenance is the correction of minor problems experienced or identified by the Purchaser/Producer, MRS, or MGDS during acceptance, preparation for use, loading or preparation for shipment of the transportation cask. Such minor problems may be associated with the cask or with the ancillary equipment.

All such corrections will be performed pursuant to written cask handling procedures using OCRWM supplied parts. Incidental maintenance is limited to those corrections that are necessary to meet a test or inspection requirement or to perform a step or activity described in the cask handling procedures. The recovery action is outside the normal flow of work but is described in detail in the cask handling procedures that are supplied to the Purchaser/Producer, MRS, or MGDS by Transportation.

Inputs:	**From:**
• Cask Systems Needing Repair	1.2.2.2.1, 1.2.3.3.1
• Spare Parts and Consumables	1.2.3.3.4
• Maintenance Policy and Procedures	1.2.3.2.1

Outputs:	**To:**
• Repaired Cask Systems	1.2.2.2.1, 1.2.3.3.1

1.2.3.2.5 Decommission Cask

In this function, the cask is decommissioned after it has exceeded its usefulness. Decommissioning includes any decontamination, modification, or packaging necessary for disposal.

Inputs:	**From:**
• Unloaded Cask System at End of Life Cycle	1.2.2.4.2
• Maintenance Policy and Procedures	1.2.3.2.1

Outputs:	**To:**
• Decommissioned Cask	1.2.3.8

1.2.3.3 Manage Inventories

This function manages the inventory of cask system components, which includes the casks, transporters, ancillary equipment, special tools and fixtures, spare parts and consumable supplies that are utilized by Transportation. This function should: (1) provide assurance that the necessary items are available in a suitable condition to support planned operations; and (2) provide accountability for program and DOE property.

Inputs:	**From:**
• New Cask Systems	1.2.2.4.3
• Unloaded Cask Systems	1.2.3.2.2.1
• Schedules, Plans	1.2.1.2.2
• Spare Parts and Consumables	1.2.3.7.3
• Campaign Kits	1.2.3.7.3, 1.2.3.2.2, 1.2.1.5.5

Outputs:	**To:**
• Unloaded Casks, Equipment	1.2.2.2.2
• Vehicles	1.2.2.2
• Spare Parts and Consumables	1.2.3.2
• Campaign Kits	1.2.1.5.5, 1.2.3.2.2

1.2.3.3.1 Manage Unloaded Casks

This function provides for temporary storage and maintenance of records for inventory and accountability purposes. Unloaded and new casks are received, inspected, placed in storage, removed from storage, reinspected prior to release.

Inputs:	**From:**
• Schedules, Plans	1.2.1.2.2
• New Casks	1.2.2.4.3
• Unloaded Casks	1.2.3.2.2
Outputs:	**To:**
• Unloaded Casks	1.2.2.2.2

1.2.3.3.2 Manage Vehicles

This function provides for temporary storage and maintenance of records for inventory and accountability purposes. Vehicles are received, inspected, placed in storage, removed from storage, reinspected prior to release.

Inputs:	**From:**
• Vehicles	1.2.2.4.3, 1.2.3.2.3
Outputs:	**To:**
• Vehicles	1.2.2.2.2

1.2.3.3.3 Manage Ancillary Equipment

This function manages ancillary equipment that includes but is not limited to lifting devices, special tools, test equipment, vacuum drying equipment, adapters, etc. Ancillary equipment is received, inspected, placed in storage, removed from storage, and reinspected prior to release. Additionally, the ancillary equipment is load tested, as required. This function also provides for temporary storage and maintenance of records for inventory and accountability purposes.

Inputs:	**From:**
• Ancillary Equipment	1.2.2.4.3, 1.2.3.2.2
• Ancillary Equipment	1.2.3.7.3
Outputs:	**To:**
• Ancillary Equipment	1.2.2.2.2

1.2.3.3.4 Manage Spare Parts and Consumables

This function manages spare parts and consumables by maintaining adequate supplies to meet demands of the maintenance function.

Inputs:	**From:**
• Spare Parts and Consumables	1.2.3.7.3

Outputs:	**To:**
• Spare Parts and Consumables	1.2.3.2.2, 1.2.3.2.3, 1.2.3.2.4

1.2.3.3.5 Manage Campaign Kit Inventory

This function collects the spare parts, ancillary equipment, special tools, fixtures, and technical publications that have been specifically identified as necessary for the conduct of cask system handling and loading at a Purchaser/Producer or CRWMS site. Management activities include the following: ensuring that the required items are available when needed and certified to meet appropriate testing criteria (e.g., load test for lifting equipment, etc.); temporary storage as required; preparing items for shipment; loading, documenting and releasing items for transport; and accepting returned items when the specific campaign is completed.

Inputs:	**From:**
• Campaign Kits	1.2.3.7.3
• Campaign Kits	1.2.3.2.2, 1.2.1.5.5

Outputs:	**To:**
• Campaign Kits	1.2.1.5.5, 1.2.3.2.2

1.2.3.4 Provide Outreach

This function supports the CRWMS interactions with all public and private organizations external to the DOE systems that are interested in matters that would impact the operating Transportation System. The functions that must be carried out include:

1) Supporting CRWMS interactions with outside organizations including States, local governments and Indian Tribes with respect to routing issues
2) Developing transport operations-related information as requested
3) Supporting CRWMS international programs

4) Maintaining of Transportation System policies and plans for external distribution as requested
5) Supporting CRWMS management in DOE national energy policy activity
6) Monitoring legislative, and legal activities that impact Transportation System
7) Implementing informational plans and developing materials
8) Supporting CRWMS by providing media material and a speaker's bureau.

This function includes policy development activities to ensure that the Transportation System works in concert with other DOE organizations and within the guidelines and requirements of the NWPA and its amendments.

Inputs:	**From:**
• Reports	1.2.1.3.3

Outputs:	**To:**
• None identified at this time	

1.2.3.5 Administer Quality Assurance

This function establishes and implements an effective quality assurance system for the Transportation System that complies with DOE and/or regulatory requirements. The quality assurance controls imposed will be structured to meet programmatic needs; that is, the controls will be graded to meet the requirements depending on the importance of the item or task activity to safety, transportation, or other program objectives.

Inputs:	**From:**
• Reports	1.2.1.3.3
• Policy	1.2.1.1

Outputs:	**To:**
• Procedures	1.2.1.3, 1.2.3.7

1.2.3.6 Provide Training

This function conducts the training activities to orient staff or enhance their skill level. All personnel are trained to perform their functions within the Transportation System. The degree of training depends on the organizational affiliation of the trainee. These affiliations could include the following: (1) transportation operations; (2) subcontractors; (3) Purchasers/Producers; and (4) other organizations.

Inputs: **From:**

- None identified at this time

Outputs: **To:**

- None identified at this time

1.2.3.7 Administer General Support

This function provides the support services of records management, engineering support, training, procurement, financial accounting, public information, and human resources.

Inputs: **From:**

- None identified at this time

Outputs: **To:**

- None identified at this time

1.2.3.7.1 Manage Information

This function acquires and stores in a readily retrievable manner data, drawings, descriptions, reports, analyses, quality records, etc., needed to support the following: (1) traffic planning; (2) cask fleet management; (3) cask maintenance activities; (4) cask and facility licensing activities; and (5) maintenance of radiation records and other activities. The information will be stored in various formats, depending on the nature and quantity of the data, and on the needs of users.

The information to be acquired includes the following: CoC data; licensing data; as-built cask facility drawings and quality records; Purchaser/Producer interface description information; State interface and requirements data; Federal and State legislative data; shipping records; maintenance and repair records; accountability records (as required); health physics records; operations plans data; and data and information on cask system configuration, location, and maintenance status.

Inputs: **From:**

- Policy 1.2.1.1

Outputs: **To:**

- None identified at this time

1.2.3.7.2 Maintain Operations Facilities

This function maintains the Transportation System facilities that are essential to the operations of the system. During normal operation, these facilities will require maintenance so that they can continue to perform their assigned functions. Also included within this function is the maintenance of installed equipment within the facility that is essential to the operations of the Transportation System. Facility modifications and upgrades are also included in the "Maintain Operations Facilities" function.

Inputs:	**From:**
• Policy	1.2.1.1

Outputs:	**To:**
• None identified at this time	

1.2.3.7.3 Procure/Contract Goods and Services

This function procures cask systems and ancillary equipment, tools, spare parts, and services in order to supply and operate the Transportation System. Procurement includes both a purchasing activity and a contracting activity, and requires technical support from other functions.

Inputs:	**From:**
• Proposals	Private Industry
• Policy	1.2.1.1
• Procedures	1.2.3.5

Outputs:	**To:**
• RFP, Orders	Private Industry
• Spare Parts, Consumables, Ancillary Equipment, Campaign Kits	1.2.3.3

1.2.3.7.4 Provide Engineering Support

This function provides engineering support to the Transportation System for licensing, certification, equipment acquisition, repair and modification activities for cask systems and facilities, as well as for Field Operations and Maintenance functions.

Inputs:	**From:**
• Policy	1.2.1.1

Outputs:	**To:**
• Technical Modifications	1.2.1.4.7, 1.2.3.2

1.2.3.7.5 Provide for Human Resources

This function provides the human resources necessary to properly operate the Transportation System.

Inputs:	**From:**
• Policy	1.2.1.1
Outputs:	**To:**
• Reports	1.2.1.1

1.2.3.7.6 Conduct Financial and Accounting Services

This function provides financial and accounting services for the Transportation System. This also includes contracting for annual auditing services by outside organizations.

Inputs:	**From:**
• Policy	1.2.1.1
Outputs:	**To:**
• Reports	1.2.1.1

1.2.3.8 Manage Transportation System Waste

This function manages Transportation System wastes in accordance with regulatory requirements and DOE Orders. These wastes are categorized as: (1) low-level radioactive wastes; (2) high-level radioactive wastes; (3) mixed wastes; (4) hazardous wastes; and (5) nonhazardous solid wastes. These wastes may include, but are not limited to, radioactive liquids from cask cleaning and decontamination, radioactively contaminated tools, out-of-service casks, and rubber tires and oil from transporters and ancillary equipment.

The majority of the waste generated by the Transportation System will be associated with cask operations. Each waste stream that the Transportation System is responsible for will be nonitored for activity and characterized by placing it into one of the following categories:

1) Low-level radioactive waste (LLW)
2) High-level radioactive wastes (HLW)
3) Mixed wastes
4) Hazardous wastes
5) Nonhazardous solid wastes

Hazardous wastes are those that are defined as hazardous by the Resources Conservation and Recovery Act (RCRA). The waste in the above categories can be in a gaseous, liquid, or solid form.

Transportation will provide centralized control and monitoring of all cask system decontamination activities and is expected to provide for control, monitoring, collection, and treatment of all other Transportation radioactive wastes. The majority of the Transportation wastes are expected to be LLW. These wastes will be packaged appropriately and sent off-site for ultimate disposal by an approved method.

Inputs:	**From:**
• Waste	1.2.3.2
Outputs:	**To:**
• Waste	Accessible Environment

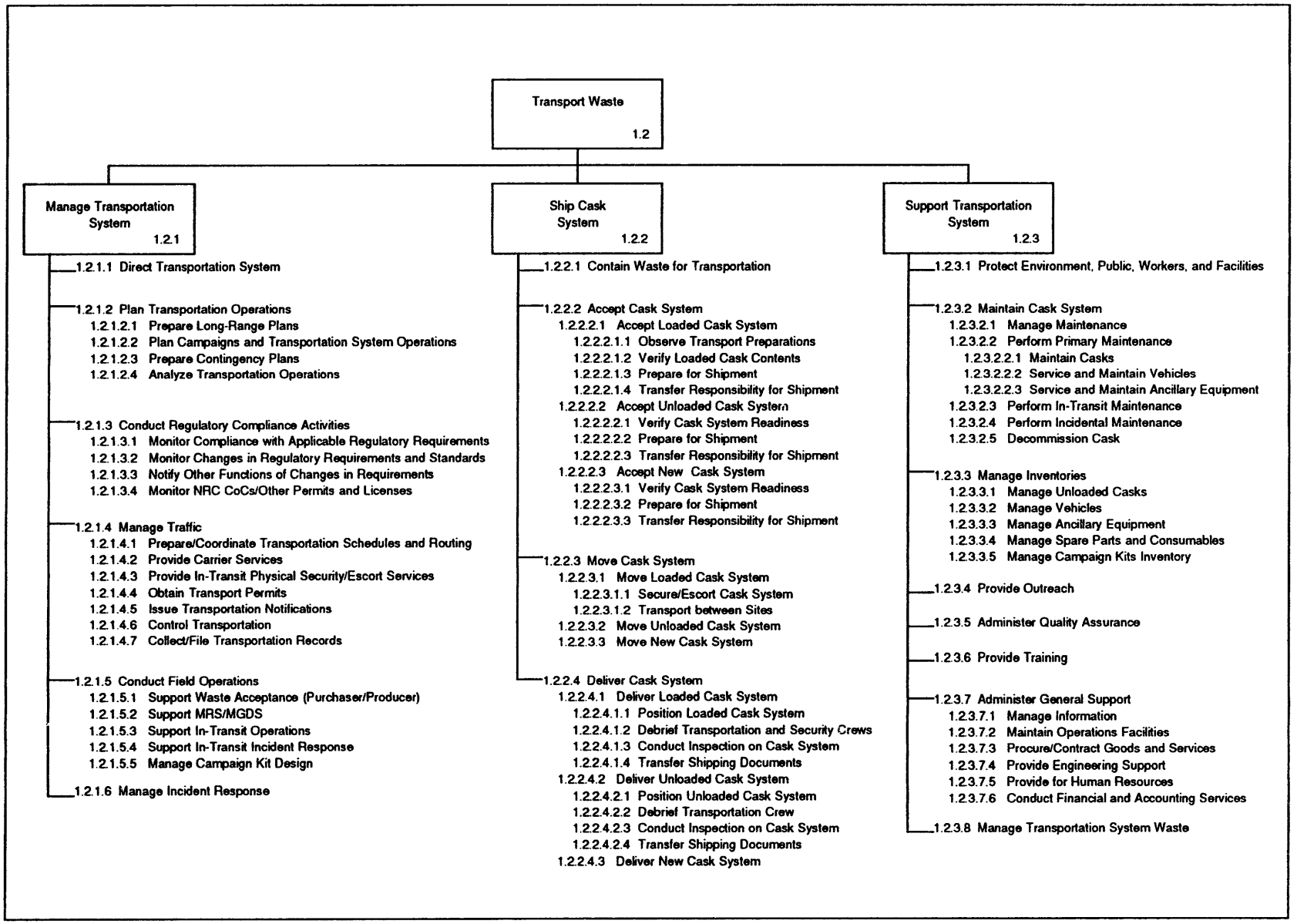

Figure A-1. Transport Waste 1.2 Function Hierarchy

Provide Regulation (NRC, DOT, State, Tribal, Local)					- Laws, Regulations	- Permits, Licenses						
	Private Industry					- Carrier Services - Security Services			- Cask Systems			
		1.1 Accept Waste		- Approved DCS, Exchange Requests - Approved FDS - Evaluation Request			- Campaign Kits		- Cask Systems - SNF, HLW			
			1.2.1.1 Direct Trans. System	- Policy	- Policy	- Policy				- Policy		
		- Schedules, Plans	- Plans - Reports	1.2.1.2 Plan Transport. Operations	- Plans	- Schedules, Plans	- Schedules, Plans		- Carrier Services - Security Services - Shipping Documents	- Schedules, Plans	- Schedules, Plans	- Schedules, Plans
			- Reports	- Reports	1.2.1.3 Conduct Reg. Compliance Act.					- Reports		
- Notifications	- Dispatch Orders			- Schedules, Plans	- CoCs, Licenses, Permits	1.2.1.4 Manage Traffic	- Information	- Notification	- Revised Ops Orders - Carrier Services - Security Ser. - Shipping Doc.	- Schedules, Plans	- Notifications	- Notifications
		- Campaign Kits - Information, Training				- Status, Information	1.2.1.5 Conduct Field Ops.				- Campaign Kits - Information, Training	- Campaign Kits - Information, Training
- Information						- Information		1.2.1.6 Manage Incident Response				
						- Shipping Documents - Status			1.2.2 Ship Cask System	- Cask Systems	- Cask Systems - SNF	- Cask Systems -SNF, HLW
			- Reports		- Procedures	- Procedures - Records - Documentation	- Campaign Kits		- Cask Systems	1.2.3 Support Transportation System		
							- Campaign Kits		- Cask Systems - SNF		1.3 Store Waste	
							- Campaign Kits		-Cask Systems - SNF, HLW			1.4 Dispose of Waste

Figure A-2. N-Square Chart for 1.2.1 Manage Transportation System

1.1 Accept Waste		- Approved DCS and Exchange Requests - Approved FDS - Evaluation Request	- Approved DCS and Exchange Requests - Approved FDS - Evaluation Request - FICA									
	1.2.1.1 Direct Transportation System	- Policy	- Policy		- Policy	- Policy	- Policy		- Policy			
		1.2.1.2.1 Prepare Long Range Plans	- Long Range Schedules, Plans	- Long Range Schedules, Plans	- Long Range Schedules, Plans							
- Schedules, Plans		- Schedules, Plans	1.2.1.2.2 Plan Campaigns and Transportation System Operations	- Schedules, Plans	- Schedules, Plans		- Schedules, Plans	- Schedules, Plans		- Schedules, Plans	- Schedules, Plans	- Schedules, Plans
	- Plans			1.2.1.2.3 Prepare Contingency Plans	- Plans	- Plans						
	- Reports				1.2.1.2.4 Analyze Transportation Operations							
	- Reports			- Reports	- Reports	1.2.1.3 Conduct Regulatory Compliance Activities						
							1.2.1.4 Manage Traffic					
								1.2.1.5 Conduct Field Operations				
									1.2.3.2 Maintain Cask System			
										1.2.3.3 Manage Inventories		
											1.3 Store Waste	
												1.4 Dispose of Waste

Figure A-3. N-Square Chart for 1.2.1.2 Plan Transportation Operations

Provide Regulation (NRC, DOT, EPA, State, Tribal, Local)			- Laws, Regulations	- Laws, Regulations						
	1.2.1.1 Direct Transportation System	- Policy	- Policy	- Policy				- Policy	- Policy	
		1.2.1.2.3 Prepare Contingency Plans	- Plans							
	- Reports	- Reports	1.2.1.3.1 Monitor Compliance With Applicable Regulatory Requirements							
			- Reports	1.2.1.3.2 Monitor Changes in Regulatory Requirements and Standards	-Reports					
	- Reports				1.2.1.3.3 Notify Other Functions of Changes in Requirements			- Reports	- Reports	- Reports
			- Reports		- Reports	1.2.1.3.4 Monitor NRC CoCs/Other Permits and Licenses				
						- CoCs, Permits, Licenses	1.2.1.4.4 Obtain Transport Permits			
								1.2.3.4 Provide Outreach		
			- Procedures	- Procedures	- Procedures	- Procedures			1.2.3.5 Provide Quality Assurance	- Procedures
	- Reports					.				1.2.3.7 Administer General Support

Figure A-4. N-Square Chart for 1.2.1.3 Conduct Regulatory Compliance Activities

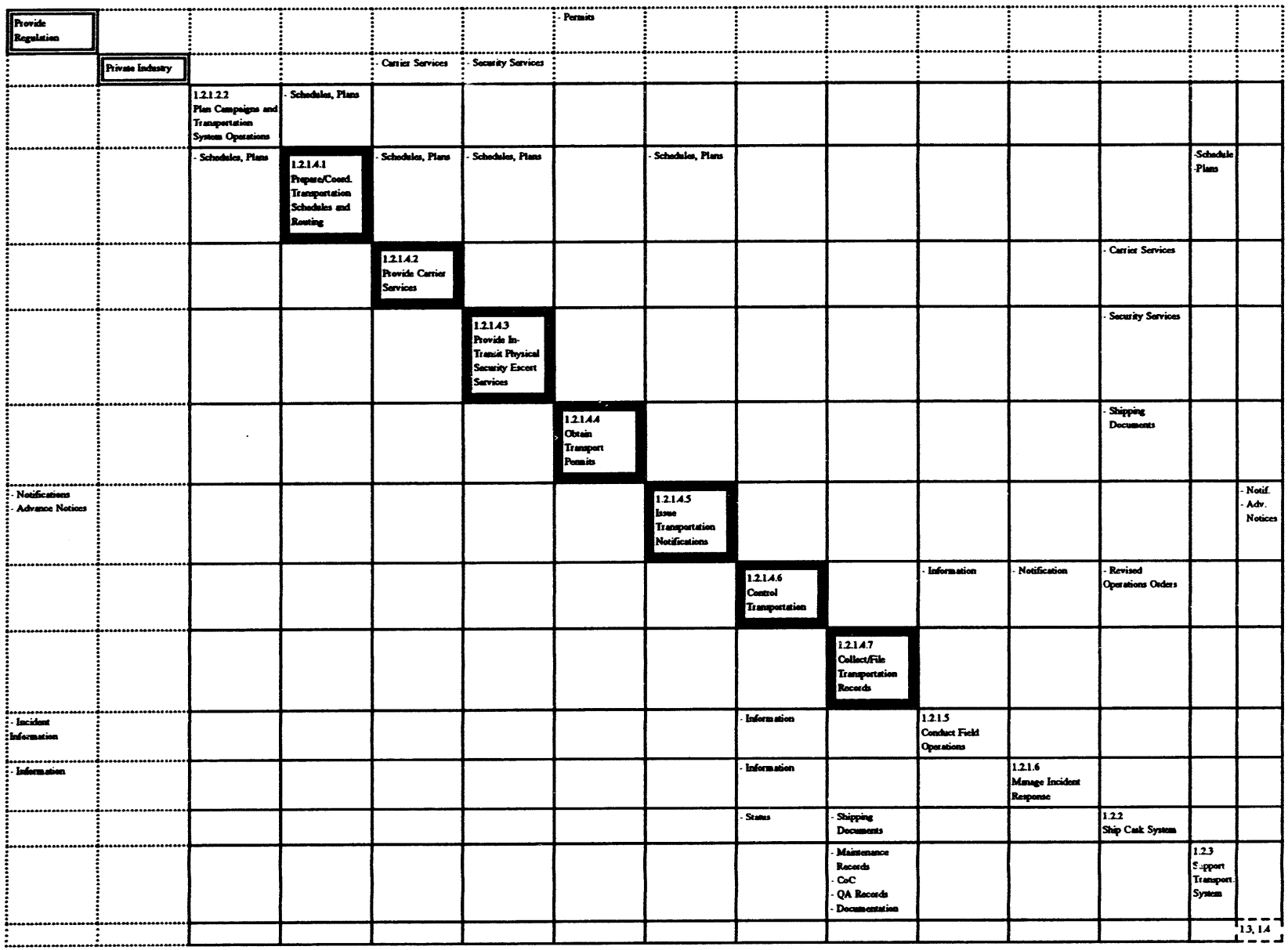

Figure A-5. N-Square Chart for 1.2.1.4 Manage Traffic

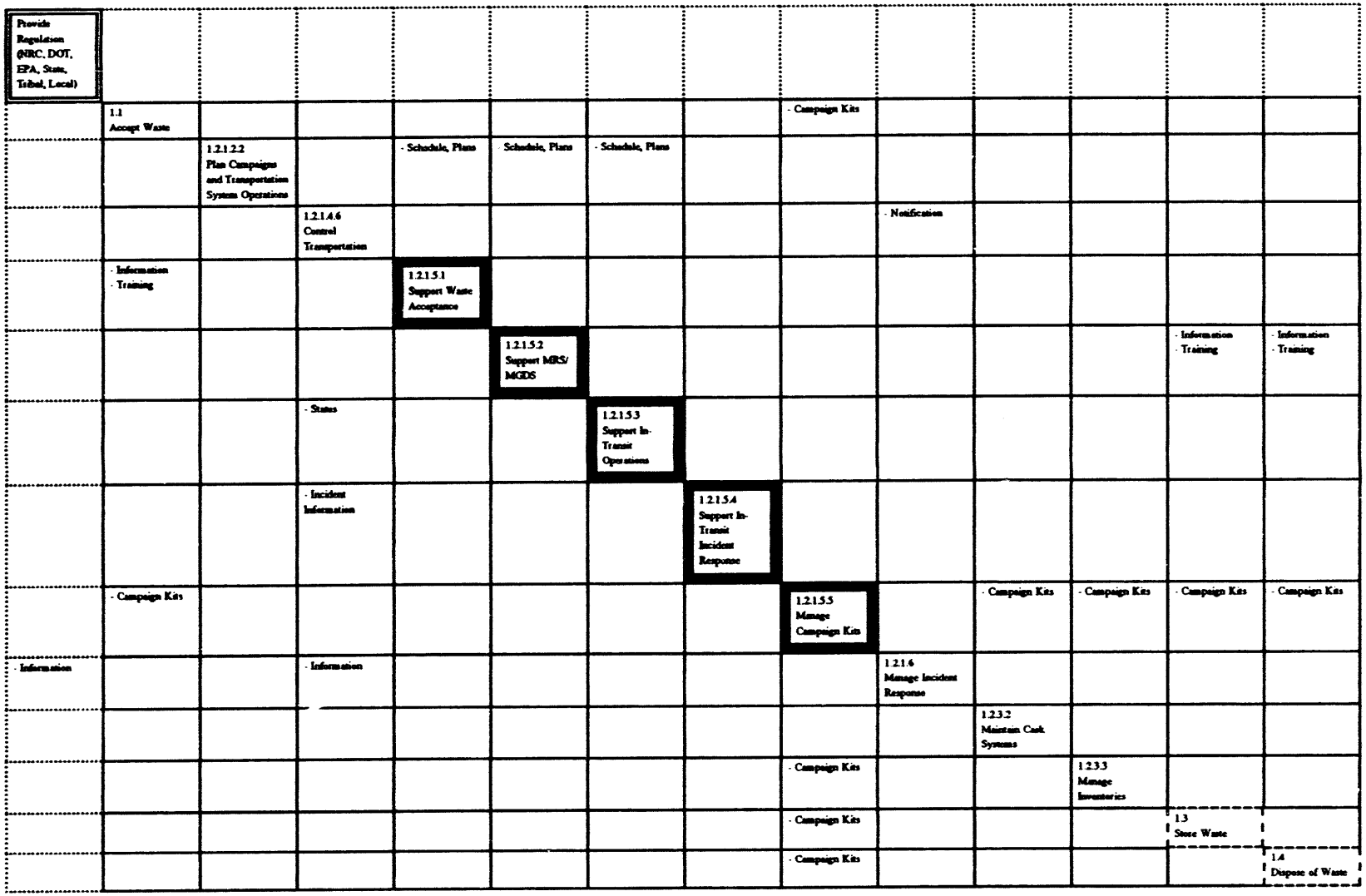

Figure A-6. N-Square Chart for 1.2.1.5 Conduct Field Operations

Private Industry		- Carrier Services - Security Services - Cask System		- CoC					
	1.1 Accept Waste		- SNF - HLW - Information	- Cask System - Documentation					
		1.2.1 Manage Trans. System		- Carrier Services - Security Services - Shipping Documents					
	- Information		1.2.2.1 Contain Waste for Transportation	- Information - Documentation				- SNF	- SNF, HLW
				1.2.2.2 Accept Cask System	- Cask System - Shipping Documents - Carrier Services - Security Services				
		- Status			1.2.2.3 Move Cask System	- Cask System - Shipping Documents - Carrier Services - Security Services			
- Carrier Services - Security Services		- Shipping Documents				1.2.2.4 Deliver Cask System	- Cask System - Shipping Documents - Carrier Services	- Cask System - Shipping Documents - Carrier Services - Security Services	- Cask System - Shipping Documents - Carrier Services - Security Services
		- Documents		- Cask System			1.2.3 Support Trans. System		
			- SNF - Information	- Cask System - Documentation				1.3 Store Waste	
			- SNF, HLW - Information	- Cask System - Documentation					1.4 Dispose of Waste

Figure A-7. N-Square Chart for 1.2.2 Ship Cask System

Private Industry							- New Cask System -CoC						
	1.1 Accept Waste				- Loaded Cask System - Information	- Unloaded Cask System							
		1.2.1.4.2 Provide Carrier Services			- Carrier Services	- Carrier Services	- Carrier Services						
			1.2.1.4.3 Provide In-Transit Physical Security Escort		- Security Services	- Security Services							
				1.2.1.4.4 Obtain Transport Permits	- Shipping Documents	- Shipping Documents	- Shipping Documents						
					1.2.2.2.1 Accept Loaded Cask System			- Loaded Cask System - Carrier Services - Security Services - Shipping Documents					
						1.2.2.2.2 Accept Unloaded Cask System			- Unloaded Cask System - Carrier Services - Shipping Documents				
							1.2.2.2.3 Accept New Cask System			- New Cask System - Carrier Services - CoC - Shipping Documents			
								1.2.2.3.1 Move Loaded Cask System					
									1.2.2.3.2 Move Unloaded Cask System				
										1.2.2.3.3 Move New Cask System			
						- Unloaded Cask System					1.2.3.3.1 Manage Unloaded Casks		
					- Loaded Cask System	- Unloaded Cask System						1.3 Store Waste	
					- Loaded Cask System	- Unloaded Cask System							1.4 Dispose of Waste

Figure A-8. N-Square Chart for 1.2.2.2 Accept Cask System

1.1 Waste Acceptance 1.3 Store Waste 1.4 Dispose of Waste				- Documentation - Findings, Requred Repair Findings			- Loaded Cask System		
	1.2.1.4.2 Provide Carrier Services					- Carrier Services			
		1.2.1.4.3 Provide In-Transit Physical Security Escort Services				- Security Services			
			1.2.1.4.4 Obtain Transport Permits			- Shipping Documents			
				1.2.2.2.1.1 Observe Transport Preparations	- Documentation - Findings, Required Repair Findings				
					1.2.2.2.1.2 Verify Loaded Cask Contents		- Verified Waste Description Documents - Documentation - Verified Cask Contents Documents		
						1.2.2.2.1.3 Prepare for Shipment	- Shipping Documents	- Carrier Services	- Security Services
							1.2.2.2.1.4 Transfer Responsibility for Shipment	- Loaded Cask System - Shipping Documents	
								1.2.2.3.1 Move Loaded Cask System	
									1.2.2.3.1.1 Security Escort Cask System

Figure A-9. N-Square Chart for 1.2.2.2.1 Accept Loaded Cask System

1.2.1.4.2 Provide Carrier Services			- Carrier Services				
	1.2.1.4.3 Provide In-Transit Physical Security Escort Services				- Security Services		
		1.2.1.4.4 Obtain Transport Permits		- Shipping Documents			
			1.2.2.2.1.3.1 Inspect Vehicles		- Carrier Services		
				1.2.2.2.1.3.2 Prepare Shipping Documents		- Shipping Documents	
					1.2.2.2.1.3.3 Brief Transportation and Security Crews	- Carrier Services	- Security Services
						1.2.2.3.1 Move Loaded Cask System	
							1.2.2.3.1.1 Security Escort Cask System

Figure A-10. N-Square Chart for 1.2.2.2.1.3 Prepare for Shipment (Loaded Cask System)

1.1 Waste Acceptance 1.3 Store Waste 1.4 Dispose of Waste 1.2.3.3.1 Manage Unloaded Cask Systems			- Documentation - Findings - Required Repair Findings		- Unloaded Cask System	
	1.2.1.4.2 Provide Carrier Services			- Carrier Services		
		1.2.1.4.4 Obtain Transport Permits		- Shipping Documents		
			1.2.2.2.2.1 Verify Cask System Readiness		- Verified Documents	
				1.2.2.2.2.2 Prepare for Shipment	- Shipping Documents	- Carrier Services
					1.2.2.2.2.3 Transfer Responsibility for Shipment	- Unloaded Cask System - Shipping Documents
						1.2.2.3.2 Move Unloaded Cask System

Figure A-11. N-Square Chart for 1.2.2.2.2 Accept Unloaded Cask System

1.2.1.4.2 Provide Carrier Services		- Carrier Services		
	1.2.1.4.4 Obtain Transport Permits		- Shipping Documents	
		1.2.2.2.2.2.1 Inspect Vehicles		- Carrier Services
			1.2.2.2.2.2.2 Prepare Shipping Documents	- Shipping Documents
				1.2.2.3.2 Move Unloaded Cask System

Figure A-12. N-Square Chart for 1.2.2.2.2.2 Prepare for Shipment (Unloaded Cask System)

Private Industry			- CoC		- New Cask System	
	1.2.1.4.2 Provide Carrier Services			- Carrier Services		
		1.2.1.4.4 Obtain Transport Permits		- Shipping Documents		
			1.2.2.2.3.1 Verify Cask System Readiness		- CoC	
				1.2.2.2.3.2 Prepare for Shipment		- Carrier Services - Shipping Documents
					1.2.2.2.3.3 Transfer Responsibility for Shipment	- New Cask System - CoC
						1.2.2.3.3 Move New Cask System

Figure A-13. N-Square Chart for 1.2.2.2.3 Accept New Cask System

1.2.1.4.2 Provide Carrier Services		- Carrier Services		
	1.2.1.4.4 Obtain Transport Permits		- Shipping Documents	
		1.2.2.2.3.2.1 Inspect Vehicles		- Carrier Services
			1.2.2.2.3.2.2 Prepare Shipping Documents	- Shipping Documents
				1.2.2.3.3 Move New Cask System

Figure A-14. N-Square Chart for 1.2.2.2.3.2 Prepare for Shipment (New Cask System)

1.2.1.4.6 Control Transportation				- Revised Operations Orders						
	1.2.2.2.1 Accept Loaded Cask			- Carrier Services - Security Services - Loaded Cask System - Shipping Documents						
		1.2.2.2.2 Accept Unloaded Cask			- Carrier Services - Unloaded Cask System - Shipping Documents					
			1.2.2.2.3 Accept New Cask System			- Carrier Services - New Cask System - Shipping Documents				
- Status				1.2.2.3.1 Move Loaded Cask System			- Carrier Services - Security Services - Loaded Cask System - Shipping Documents			- Cask System Needing Repairs
					1.2.2.3.2 Move Unloaded Cask System			- Carrier Services - Unloaded Cask System - Shipping Documents		- Cask System Needing Repairs
						1.2.2.3.3 Move New Cask System			- Carrier Services - New Cask System - Shipping Documents	- Cask System Needing Repairs
							1.2.2.4.1 Deliver Loaded Cask System			
								1.2.2.4.2 Deliver Unloaded Cask System		
									1.2.2.4.3 Deliver New Cask System	
				- Repaired Cask System	- Repaired Cask System	- Repaired Cask System				1.2.3.2.3 Perform In-Transit Maintenance

Figure A-15. N-Square Chart for 1.2.2.3 Move Cask System

1.2.1.4.6 Control Transportation				- Revised Operations Orders	
	1.2.2.2.1.3.3 Brief Transportation and Security Crews		- Security Services	- Carrier Services	
		1.2.2.2.1.4 Transfer Responsibility for Shipment		- Loaded Cask System - Shipping Documents	
			1.2.2.3.1.1 Secure/Escort Cask System		- Security Services
- Status				1.2.2.3.1.2 Transport Between Sites	- Loaded Cask System - Carrier Services - Shipping Documents
					1.2.2.4.1 Deliver Loaded Cask System

Figure A-16. N-Square Chart for 1.2.2.3.1 Move Loaded Cask System

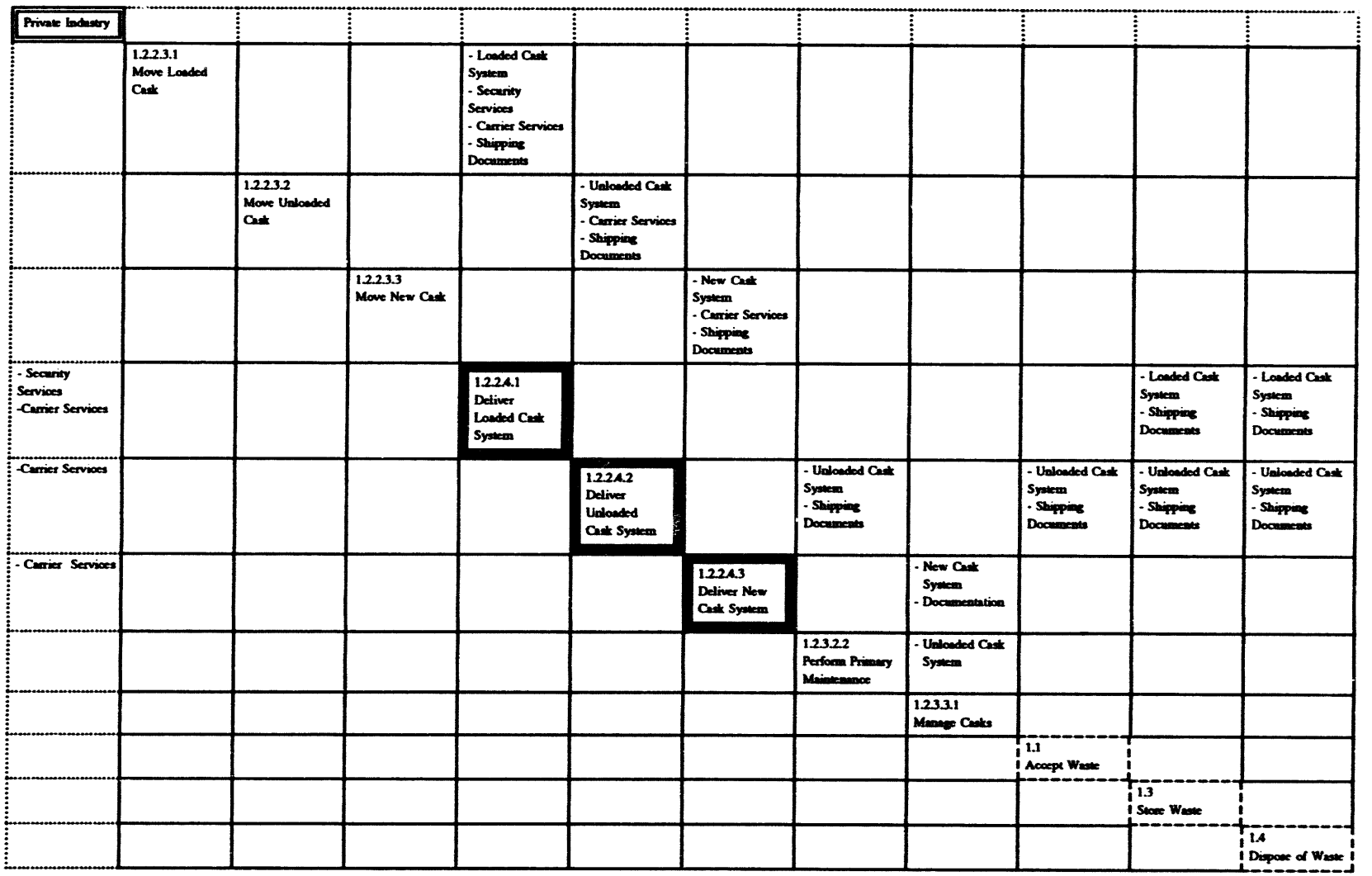

Figure A-17. N-Square Chart for 1.2.2.4 Deliver Cask System

Private Industry							
	1.2.2.3.1 Move Loaded Cask System	- Carrier Services - Loaded Cask System	- Security Services		- Shipping Documents		
		1.2.2.4.1.1 Position Loaded Cask	-Carrier Services	- Loaded Cask System		- Vehicles and Transporters Needing Repair	
- Carrier Services - Security Services			1.2.2.4.1.2 Debrief Transportation and Security Crews				
				1.2.2.4.1.3 Conduct Inspection on Cask System			- Loaded Cask System
					1.2.2.4.1.4 Transfer Shipping Documents		- Shipping Documents
						1.2.3.2.2 Service and Maintain Vehicles	
							1.3 Store Waste 1.4 Dispose of Waste

Figure A-18. N-Square Chart for 1.2.2.4.1 Deliver Loaded Cask System

Private Industry							
	1.2.2.3.2 Move Unloaded Cask System	- Carrier Services - Unloaded Cask System			- Shipping Documents		
		1.2.2.4.2.1 Position Unloaded Cask System	-Carrier Services	- Unloaded Cask System			
- Carrier Services			1.2.2.4.2.2 Debrief Transportation Crew			- Vehicles and Transporters Needing Repair	
				1.2.2.4.2.3 Conduct Inspection on Cask System		- Unloaded Cask System	- Unloaded Cask System
					1.2.2.4.2.4 Transfer Shipping Documents	- Shipping Documents	- Shipping Documents
						1.2.3.2.2 Perform Primary Maintenance	
							1.1 Accept Waste 1.3 Store Waste 1.4 Dispose of Waste

Figure A-19. N-Square Chart for 1.2.2.4.2 Deliver Unloaded Cask System

Private Industry									- Proposals - Ancillary Equipment, Campaign Kits		
	1.2.1 Manage Transportation System			- Schedules, Plans	- Schedules, Plans - Campaign Kits	- Reports	- Reports		- Policy - Reports	- Policy	
		1.2.2 Ship Cask System		- Unloaded Cask System	- New Cask System						
			1.2.3.1 Protect Environment, Public, Workers, and Facilities								
	- Records - Procedures			1.2.3.2 Maintain Cask System	- Unloaded Cask System - Repaired Campaign Kits					- Decommissioned Casks	
	- Campaign Kits	- Unloaded Cask System		- Campaign Kits - Spare Parts, Consumables	1.2.3.3 Manage Inventories						
						1.2.3.4 Provide Outreach					
	- QA Records						1.2.3.5 Administer Quality Assurance		- Procedures		
								1.2.3.6 Provide Training			
- RFPs - Orders, Contracts	- Technical Modifications			- Technical Modifications	- Ancillary Equipment, Campaign Kits				1.2.3.7 Administer General Support		
										1.2.3.8 Manage Transportation Waste	- Waste
											Accessible Environment

Figure A-20. N-Square Chart for 1.2.3 Support Transportation System

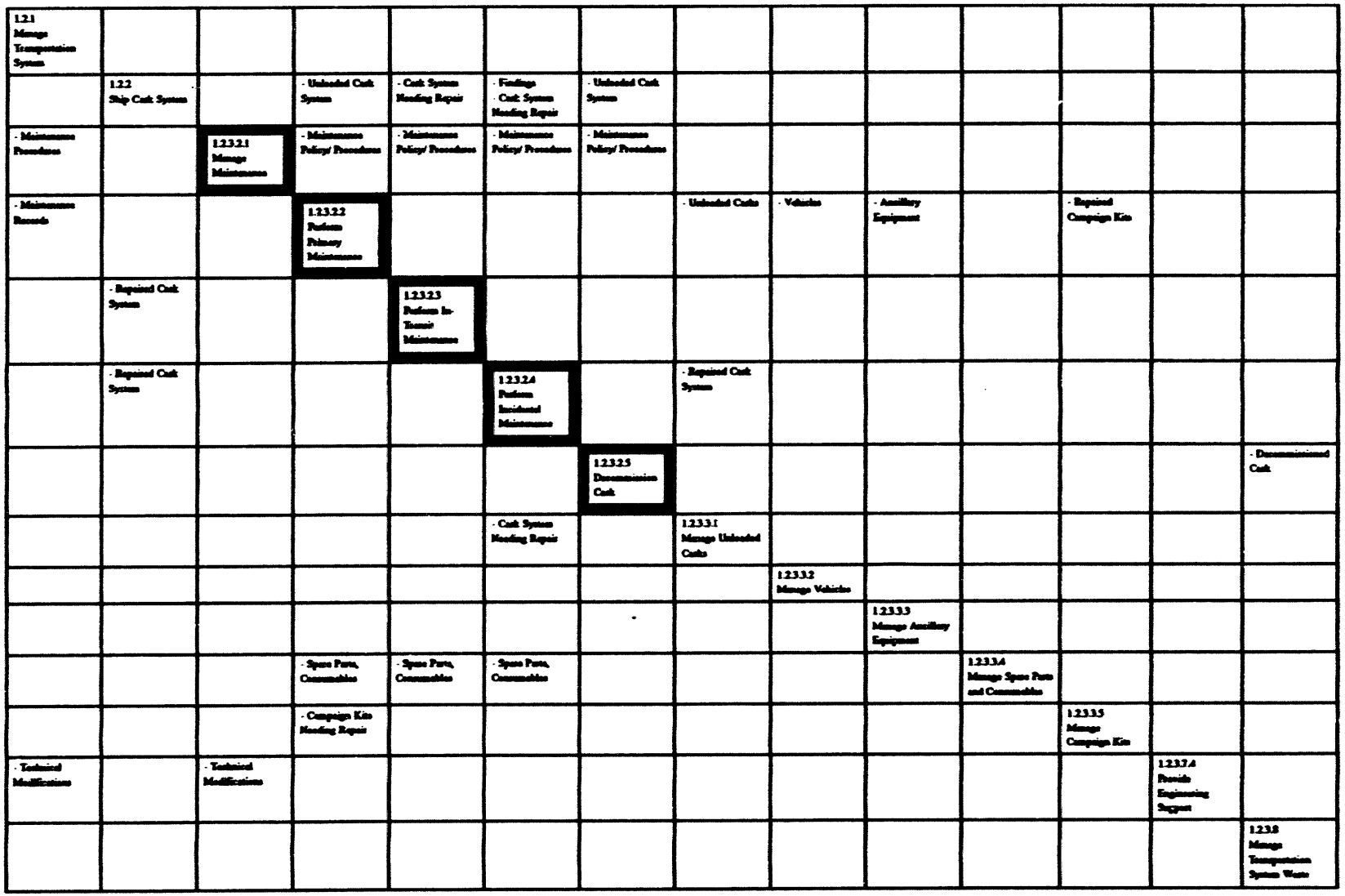

Figure A-21. N-Square Chart for 1.2.3.2 Maintain Cask System

1.2.1.4.7 Collect/File Transportation Records									
	1.2.2.4.2.4 Deliver to Maintenance Facility		- Unloaded Cask - Shipping Documents	- Vehicles	- Ancillary Equipment				
		1.2.3.2.1 Manage Maintenance	- Maintenance Policy/ Procedures	- Maintenance Policy/ Procedures	- Maintenance Policy/ Procedures				
- Maintenance Records			1.2.3.2.2.1 Maintain Casks			-Unloaded Cask			
				1.2.3.2.2.2 Service and Maintain Vehicles			- Vehicles		
					1.2.3.2.2.3 Service and Maintain Ancillary Equipment			- Ancillary Equipment	
						1.2.3.3.1 Manage Cask Systems			
							1.2.3.3.2 Manage Vehicles		
								1.2.3.3.3 Manage Ancillary Equipment	
			- Spare Parts, Consumables	- Spare Parts, Consumables	- Spare Parts, Consumables				1.2.3.3.4 Manage Spare Parts and Consumables

Figure A-22. N-Square Chart for 1.2.3.2.2 Perform Primary Maintenance

12122 Plan Campaign and Transportation Operations							Schedules, Plans	Schedules, Plans	Schedules, Plans	Schedules, Plans	Schedules, Plans	
	12155 Manage Campaign Kits										Campaign Kits	
		12222 Assign Unloaded Cask System										
			12243 Deliver New Cask Systems				New Cask	Vehicles	Ancillary Equipment			
				12322 Perform Primary Maintenance			Unloaded Cask	Vehicles	Ancillary Equipment		Repaired Campaign Kits	
					12323 Perform In-Transit Maintenance							
						12324 Perform Incidental Maintenance						
		Unloaded Cask					12331 Manage Unloaded Casks					
		Vehicles						12332 Manage Vehicles				
		Ancillary Equipment							12333 Manage Ancillary Equipment			
				Spare Parts, Consumables	Spare Parts, Consumables	Spare Parts, Consumables				12334 Manage Spare Parts and Consumables		
	Campaign Kits			Campaign Kits Needing Repair							12335 Manage Campaign Kits	
									Ancillary Equipment	Spare Parts and Consumables	Campaign Kits	12373 Process Contract Goods/Services

Figure A-23. N-Square Chart for 1.2.3.3 Manage Inventories

Private Industry								- Proposals -Documentation			
	1.2.1.1 Direct Transportation System					- Policy	- Policy	- Policy	- Policy	- Policy	- Policy
		1.2.1.4.7 Collect/File Transportation Records									
			1.2.3.2 Maintain Cask Systems								
				1.2.3.3 Manage Inventories							
		- Procedures, Records	- Procedures	- Procedures	1.2.3.5 Administer Quality Assurance			- Procedures	- Procedures		
						1.2.3.7.1 Manage Information					
							1.2.3.7.2 Maintain Operations Facilities				
- RFPs - Orders, Contracts				- Spare Parts, Consumables - Ancillary Equipment - Campaign Kits				1.2.3.7.3 Procure/ Contract Goods and Services			
		- Technical Modifications	- Technical Modifications						1.2.3.7.4 Provide Engineering Support		
	- Reports									1.2.3.7.5 Provide for Human Resources	
	- Reports										1.2.3.7.6 Conduct Financial and Accounting Services

Figure A-24. N-Square Chart for 1.2.3.7 Administer General Support

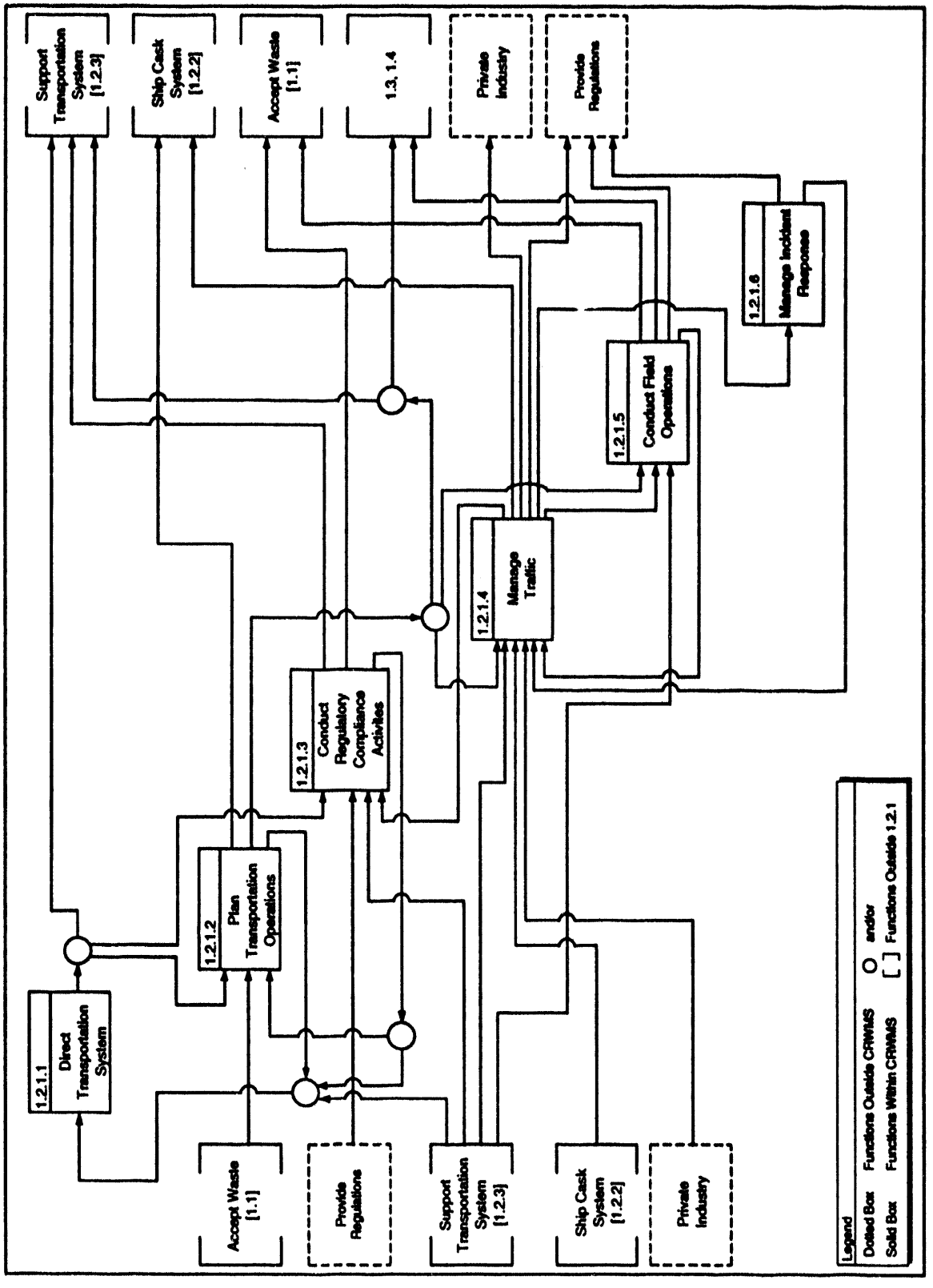

Figure A-25. 1.2.1 Manage Transportation System Function Flow Diagram

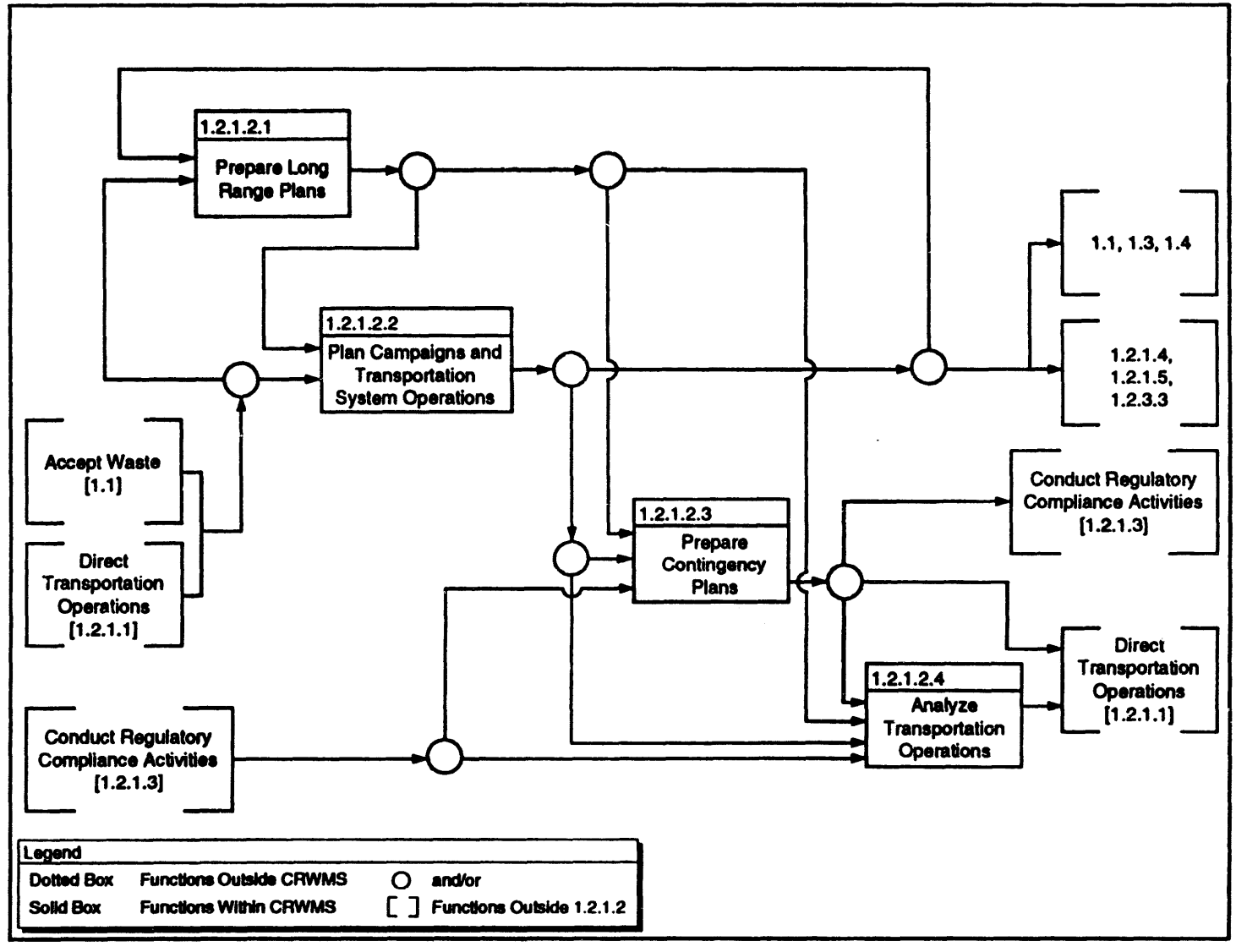

Figure A-26. 1.2.1.2 Plan Transportation Operations Function Flow Diagram

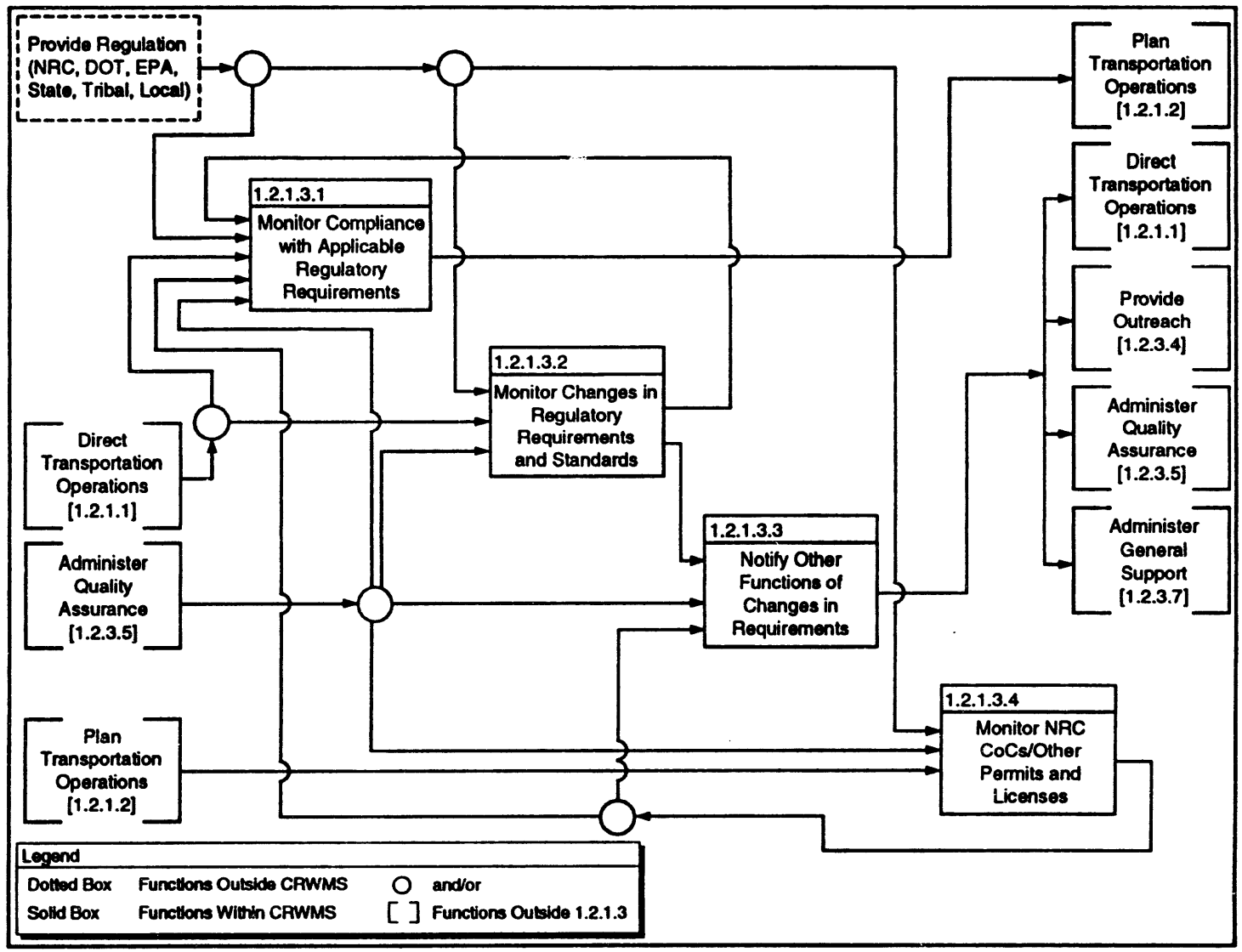

Figure A-27. 1.2.1.3 Conduct Regulatory Compliance Activities Function Flow Diagram

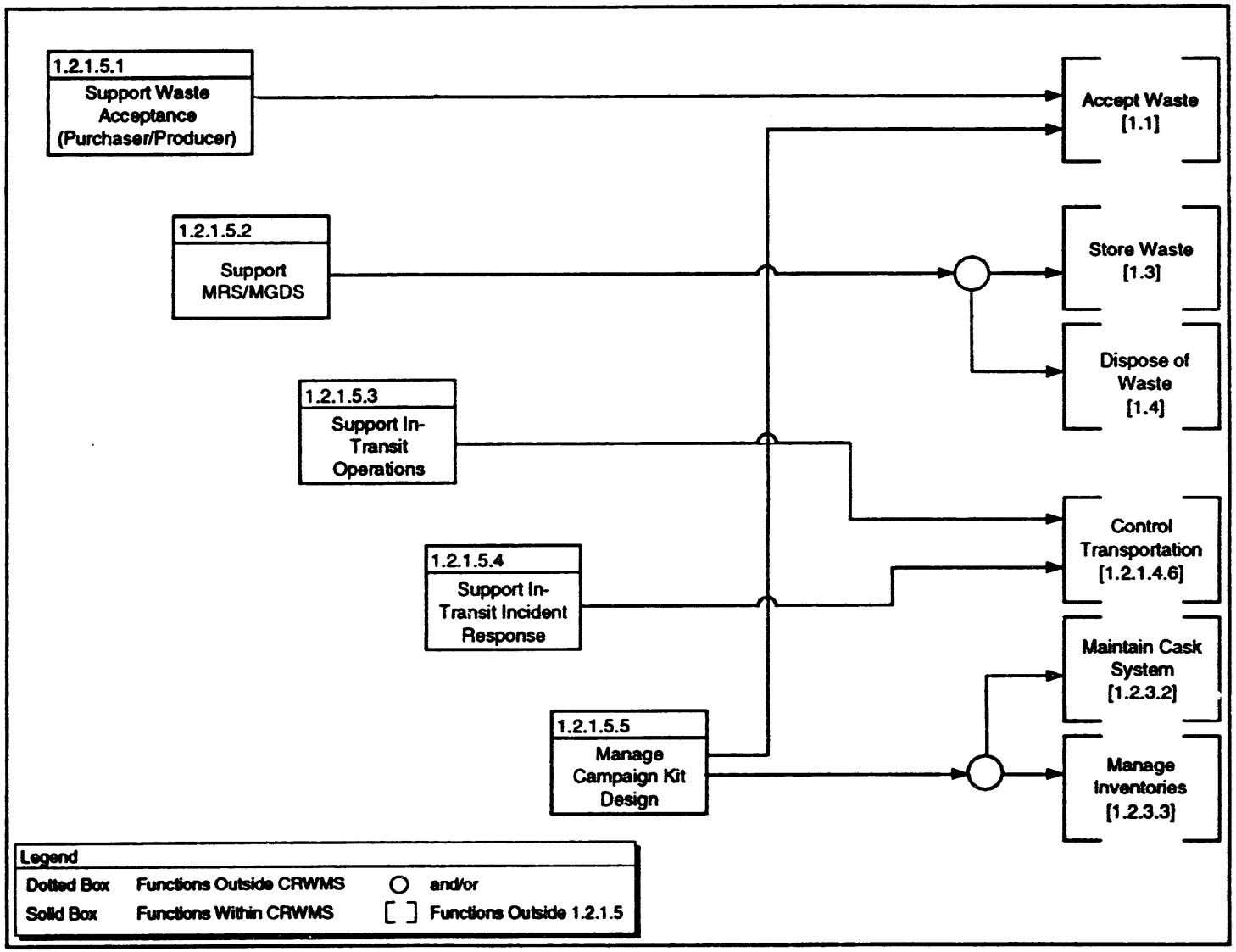

Figure A-28. 1.2.1.5 Conduct Field Operations Function Flow Diagram

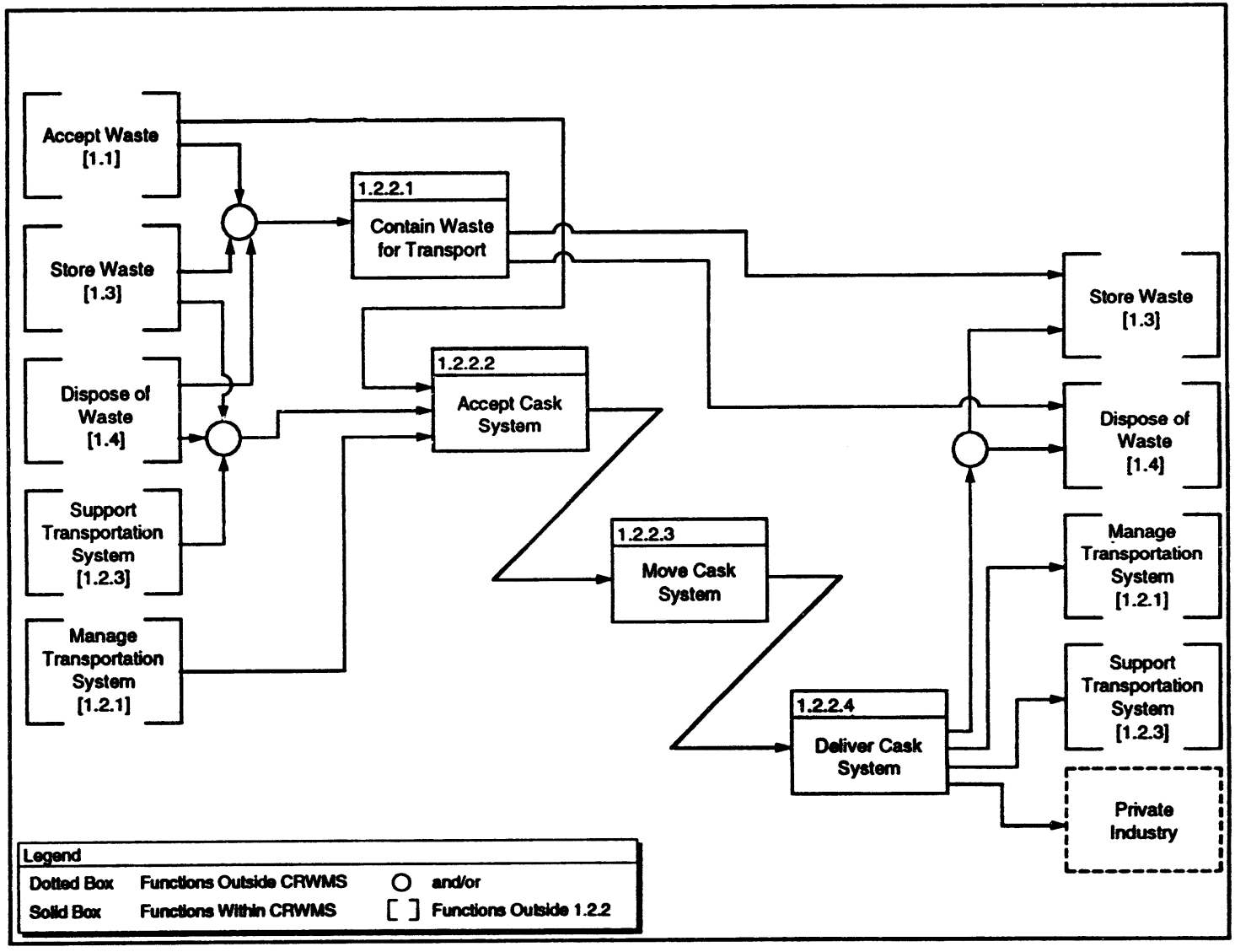

Figure A-29. 1.2.2 Ship Cask System Function Flow Diagram

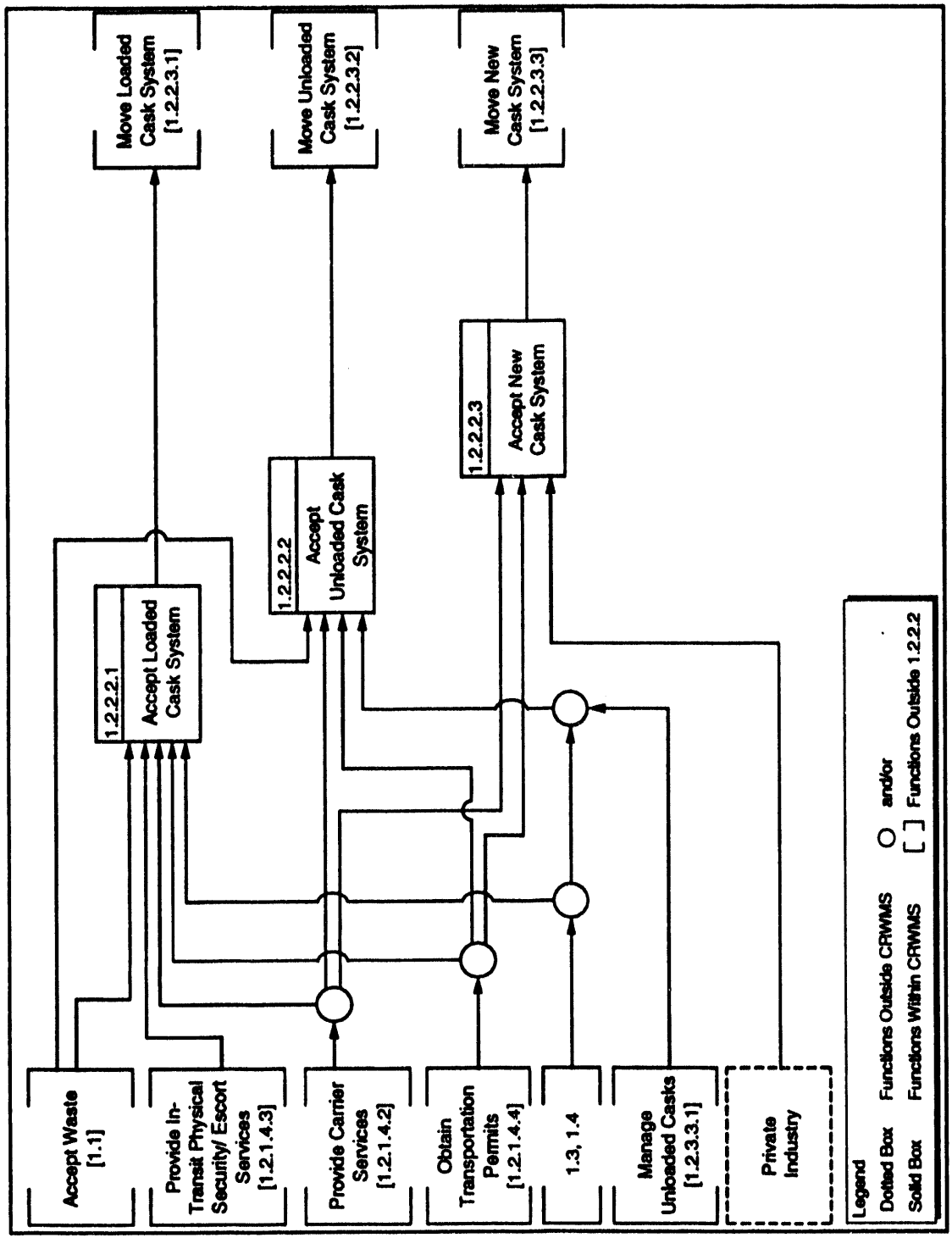

Figure A-30. 1.2.2.2 Accept Cask System Function Flow Diagram

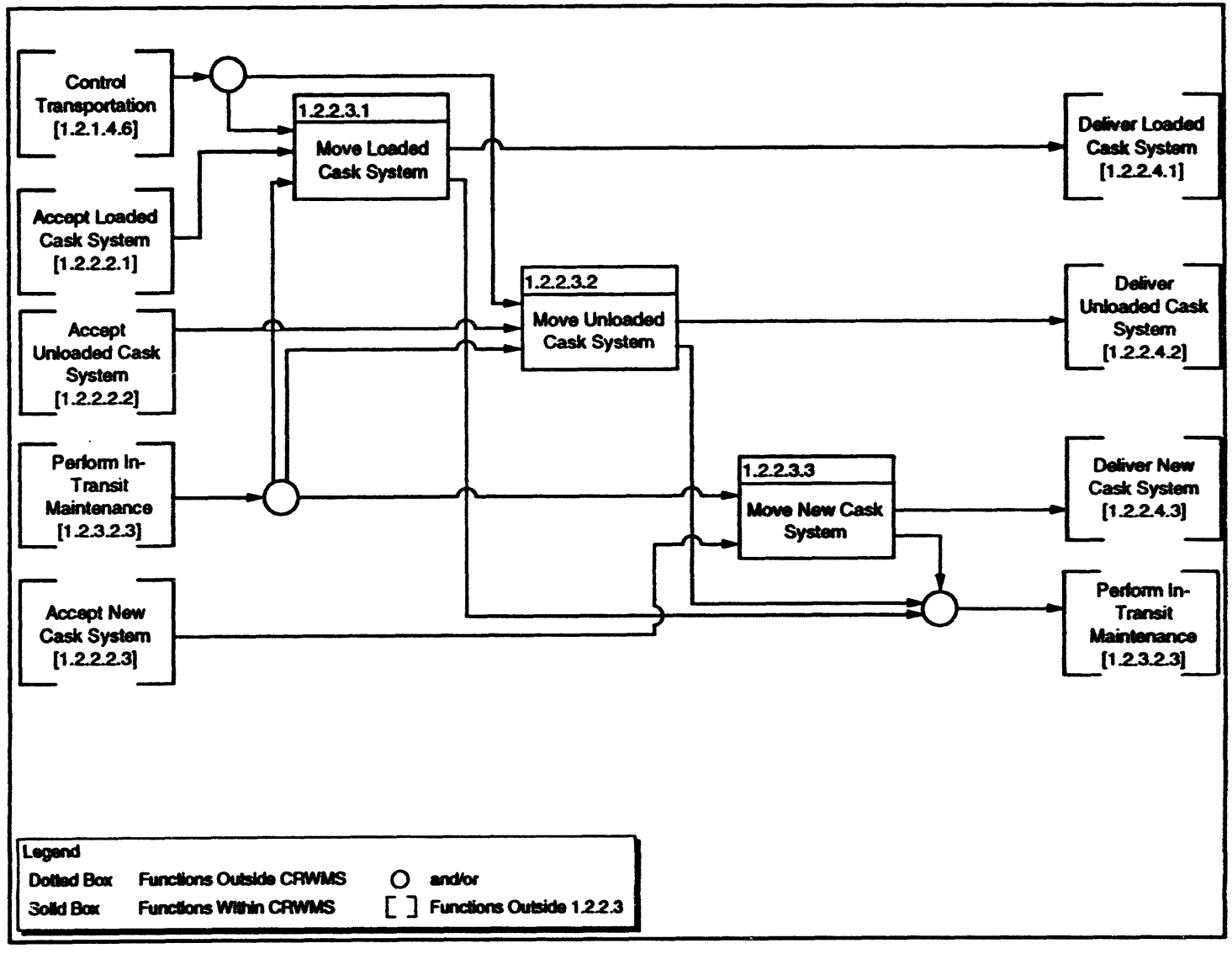

Figure A-31. 1.2.2.3 Move Cask System Function Flow Diagram

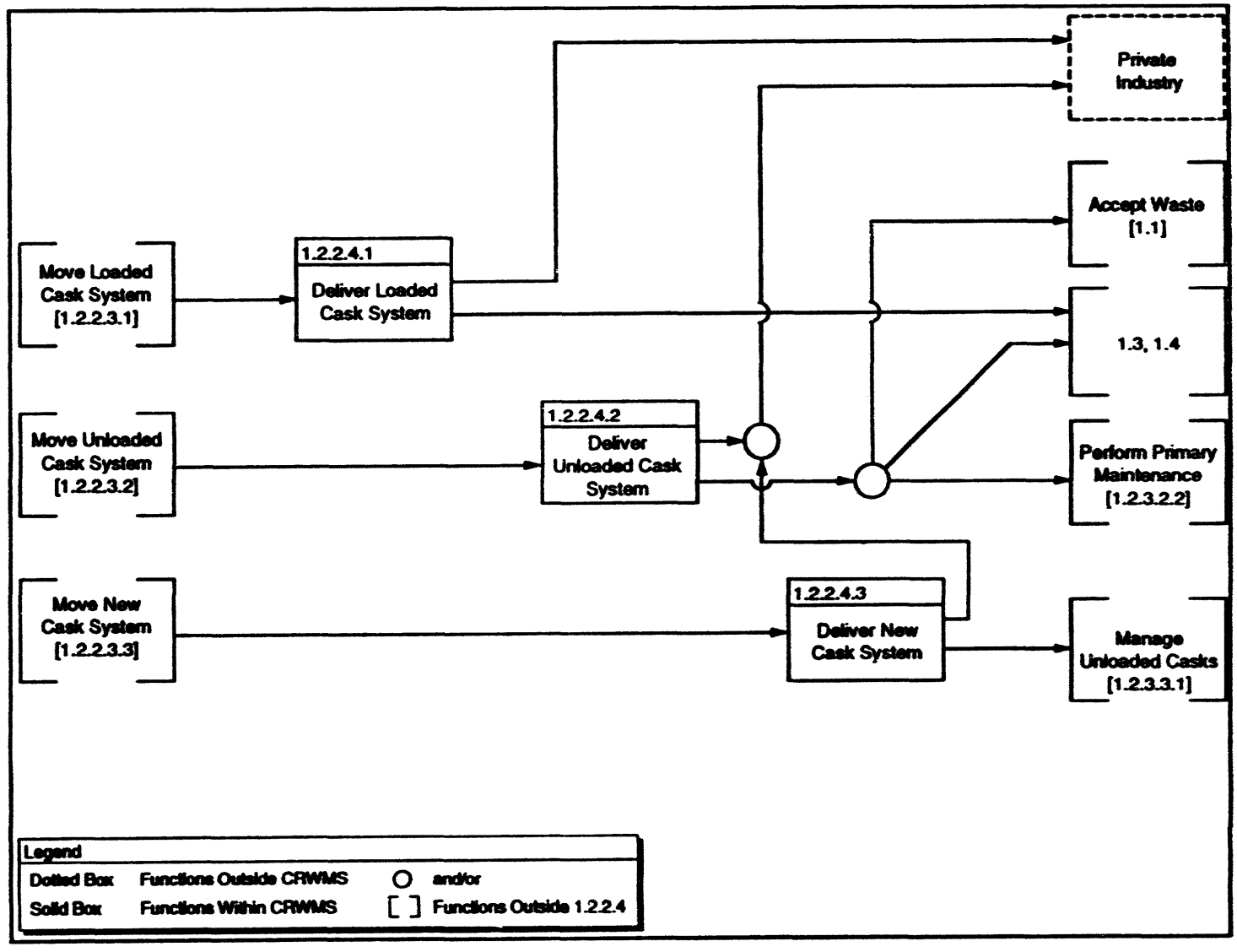

Figure A-32. 1.2.2.4 Deliver Cask System Function Flow Diagram

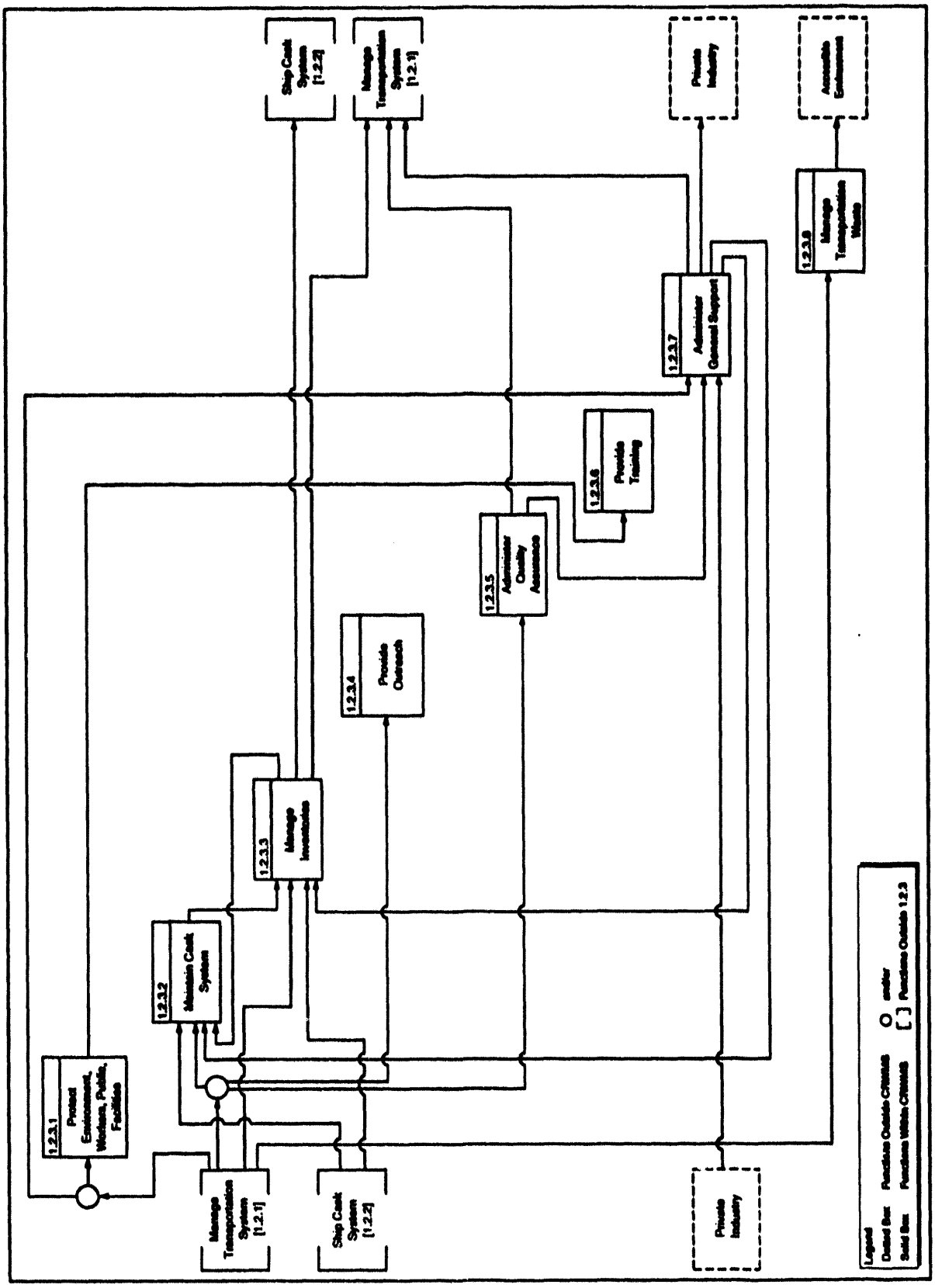

Figure A-33. 1.2.3 Support Transportation System Function Flow Diagram

APPENDIX B Transportation Function Allocation Table

Table B-1. Allocation of Functions to Architecture

Function Title (Number)	Transportation Segments			
	A	B	C	D
Transport Waste (1.2)	X	X	X	X
Manage Transportation System (1.2.1)			X	X
Direct Transportation System (1.2.1.1)				X
Plan Transportation Operations (1.2.1.2)				X
Prepare Long Range Plans (1.2.1.2.1)				X
Plan Campaigns and Transportation System Operations (1.2.1.2.2)				X
Prepare Contingency Plans (1.2.1.2.3)				X
Analyze Transportation Operations (1.2.1.2.4)				X
Conduct Regulatory Compliance Activities (1.2.1.3)				X
Monitor Compliance with Applicable Regulatory Requirements (1.2.1.3.1)				X
Monitor Changes in Regulatory Requirements and Standards (1.2.1.3.2)				X
Notify Other Functions of Changes in Requirements (1.2.1.3.3)				X
Monitor NRC CoCs/Other Permits and Licenses (1.2.1.3.4)				X
Manage Traffic (1.2.1.4)				X
Prepare/Coordinate Transportation Schedule and Routing (1.2.1.4.1)				X
Provide Carrier Services (1.2.1.4.2)				X
Provide In-Transit Physical Security/ Escort Services (1.2.1.4.3)				X
Obtain Transport Permits (1.2.1.4.4)				X
Issue Transportation Notifications (1.2.1.4.5)				X
Control Transportation (1.2.1.4.6)				X
Collect/File Transportation Records (1.2.1.4.7)				X
Conduct Field Operations (1.2.1.5)			X	

Transportation Segments:
A - Transportation Cask Systems
B - Service and Maintenance Support
C - Field Operations
D - Planning and Control

Table B-1. Allocation of Functions to Architecture (continued)

Function Title (Number)	Transportation Segments			
	A	B	C	D
Support Waste Acceptance (Purchaser/Producer) (1.2.1.5.1)			X	
Support MRS/MGDS (1.2.1.5.2)			X	
Support In-Transit Operations (1.2.1.5.3)			X	
Support In-Transit Incident Response (1.2.1.5.4)			X	
Manage Campaign Kit Design (1.2.1.5.5)			X	
Manage Incident Response (1.2.1.6)				X
Ship Cask System (1.2.2)	X	X	X	X
Contain Waste for Transportation (1.2.2.1)	X	X		
Accept Cask System (1.2.2.2)		X	X	X
Accept Loaded Cask System (1.2.2.2.1)			X	X
Observe Transport Preparations (1.2.2.2.1.1)			X	
Verify Loaded Cask Contents (1.2.2.2.1.2)			X	
Prepare for Shipment (1.2.2.2.1.3)			X	X
Inspect Vehicles (1.2.2.2.1.3.1)			X	
Prepare Shipping Documents (1.2.2.2.1.3.2)			X	X
Brief Transportation and Security Crews (1.2.2.2.1.3.3)			X	
Transfer Responsibility for Shipment (1.2.2.2.1.4)			X	
Accept Unloaded Cask System (1.2.2.2.2)		X	X	X
Verify Cask System Readiness (1.2.2.2.2.1)		X	X	
Prepare for Shipment (1.2.2.2.2.2)		X	X	X
Inspect Vehicles (1.2.2.2.2.2.1)		X	X	
Prepare Shipping Documents (1.2.2.2.2.2.2)		X	X	X
Transfer Responsibility for Shipment (1.2.2.2.2.3)		X	X	
Accept New Cask System (1.2.2.2.3)		X		

Transportation Segments:
A - Transportation Cask Systems
B - Service and Maintenance Support
C - Field Operations
D - Planning and Control

Table B-1. Allocation of Functions to Architecture (continued)

Function Title (Number)	Transportation Segments			
	A	B	C	D
Verify Cask System Readiness (1.2.2.2.3.1)		X		
Prepare for Shipment (1.2.2.2.3.2)		X		
Inspect Vehicles (1.2.2.2.3.2.1)		X		
Prepare Shipping Documents (1.2.2.2.3.2.2)		X		
Transfer Responsibility for Shipment (1.2.2.2.3.3)		X		
Move Cask System (1.2.2.3)	X			X
Move Loaded Cask System (1.2.2.3.1)	X			X
Secure/Escort Cask System (1.2.2.3.1.1)				X
Transport between Sites (1.2.2.3.1.2)	X			X
Move Unloaded Cask System (1.2.2.3.2)	X			X
Move New Cask System (1.2.2.3.3)	X			
Deliver Cask System (1.2.2.4)	X		X	X
Deliver Loaded Cask System (1.2.2.4.1)	X			X
Position Loaded Cask System (1.2.2.4.1.1)	X			X
Debrief Transportation and Security Crews (1.2.2.4.1.2)				X
Conduct Inspection on Cask System (1.2.2.4.1.3)				X
Transfer Shipping Documents (1.2.2.4.1.4)				X
Deliver Unloaded Cask System (1.2.2.4.2)	X		X	X
Position Unloaded Cask System (1.2.2.4.2.1)	X			X
Debrief Transportation Crew (1.2.2.4.2.2)			X	X
Conduct Inspection on Cask System (1.2.2.4.2.3)			X	X
Transfer Shipping Documents (1.2.2.4.2.4)			X	X
Deliver New Cask System (1.2.2.4.3)	X			X
Support Transportation System (1.2.3)	X	X	X	X

Transportation Segments:
A - Transportation Cask Systems
B - Service and Maintenance Support
C - Field Operations
D - Planning and Control

Table B-1. Allocation of Functions to Architecture (continued)

Function Title (Number)	Transportation Segments			
	A	B	C	D
Protect Environment, Public, Workers, and Facilities (1.2.3.1)	X	X	X	X
Maintain Cask System (1.2.3.2)		X		
Manage Maintenance (1.2.3.2.1)		X		
Perform Primary Maintenance (1.2.3.2.2)		X		
Maintain Casks (1.2.3.2.2.1)		X		
Service and Maintain Vehicles (1.2.3.2.2.2)		X		
Service and Maintain Ancillary Equipment (1.2.3.2.2.3)		X		
Perform In-Transit Maintenance (1.2.3.2.3)		X		
Perform Incidental Maintenance (1.2.3.2.4)		X		
Decommission Cask (1.2.3.2.5)		X		
Manage Inventories (1.2.3.3)		X		
Manage Unloaded Casks (1.2.3.3.1)		X		
Manage Vehicles (1.2.3.3.2)		X		
Manage Ancillary Equipment (1.2.3.3.3)		X		
Manage Spare Parts and Consumables (1.2.3.3.4)		X		
Manage Campaign Kit Inventory (1.2.3.3.5)		X		
Provide Outreach (1.2.3.4)		X	X	X
Administer Quality Assurance (1.2.3.5)		X	X	X
Provide Training (1.2.3.6)		X	X	X
Administer General Support (1.2.3.7)				X
Manage Information (1.2.3.7.1)				X
Maintain Operations Facilities (1.2.3.7.2)				X
Procure/Contract Goods and Services (1.2.3.7.3)				X
Provide Engineering Support (1.2.3.7.4)				X

Transportation Segments:
A - Transportation Cask Systems
B - Service and Maintenance Support
C - Field Operations
D - Planning and Control

Table B-1. Allocation of Functions to Architecture (continued)

Function Title (Number)	Transportation Segments			
	A	B	C	D
Provide for Human Resources (1.2.3.7.5)				X
Conduct Financial and Accounting Services (1.2.3.7.6)				X
Manage Transportation System Waste (1.2.3.8)		X		

Transportation Segments:
A - Transportation Cask Systems
B - Service and Maintenance Support
C - Field Operations
D - Planning and Control

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