OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SYSTEM DESCRIPTION DOCUMENT COVER SHEET

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arrier Preparation Building Materials Handling System Description Document

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3. Revision	4. Description of Revision
00	Initial Issue (issued using document identifier BCB000000-01717-1705-00001).
01	This revision is a complete rewrite of the previous issuance, driven largely by the use of an alternate source of regulatory requirements, the implementation of the License Application Design Selection effort, and the use of a new document development procedure.
ICN 01	The purpose of ICN 01 is to incorporate initial design description input into Section 2 of the SDD. All changes in the document that have been made as a result of this ICN are indicated by revision bars. Major changes are as follows: • All page headers list the document identifier as SDD-CMH-SE-000001 REV 01 ICN01. • Deleted Sections 1.4.1 and 1.4.2. Reason for deletion - management direction • Added Section 2. • Added acronyms to Section C.1. • Added/deleted references • Changes necessary to comply with current procedures were made as needed. • Editorial changes were made to the document as needed.

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SUMMARY

The Carrier Preparation Building Materials Handling System receives rail and truck shipping casks from the Carrier/Cask Transport System, and inspects and prepares the shipping casks for return to the Carrier/Cask Transport System. Carrier preparation operations for carriers/casks received at the surface repository include performing a radiation survey of the carrier and cask, removing/retracting the personnel barrier, measuring the cask temperature, removing/retracting the impact limiters, removing the cask tie-downs (if any), and installing the cask trunnions (if any). The shipping operations for carriers/casks leaving the surface repository include removing the cask trunnions (if any), installing the cask tie-downs (if any), installing the impact limiters, performing a radiation survey of the cask, and installing the personnel barrier.

There are four parallel carrier/cask preparation lines installed in the Carrier Preparation Building with two preparation bays in each line, each of which can accommodate carrier/cask shipping and receiving. The lines are operated concurrently to handle the waste shipping throughputs and to allow system maintenance operations. One remotely operated overhead bridge crane and one remotely operated manipulator is provided for each pair of carrier/cask preparation lines servicing four preparation bays. Remotely operated support equipment includes a manipulator and tooling and fixtures for removing and installing personnel barriers, impact limiters, cask trunnions, and cask tie-downs. Remote handling equipment is designed to facilitate maintenance, dose reduction, and replacement of interchangeable components where appropriate. Semi-automatic, manual, and backup control methods support normal, abnormal, and recovery operations. Laydown areas and equipment are included as required for transportation system components (e.g., personnel barriers and impact limiters), fixtures, and tooling to support abnormal and recovery operations.

The Carrier Preparation Building Materials Handling System interfaces with the Cask/Carrier Transport System to move the carriers to and from the system. The Carrier Preparation Building System houses the equipment and provides the facility, utility, safety, communications, and auxiliary systems supporting operations and protecting personnel.

QUALITY ASSURANCE

The quality assurance (QA) program applies to the development of this document. The "SDD Development/Maintenance (Q SDDs) (WP# 16012126M5)" activity evaluation has determined the development of this document to be subject to "Quality Assurance Requirements and Description" requirements. This document was developed in accordance with AP-3.11Q, "Technical Reports."

1. SYSTEM FUNCTIONS AND DESIGN CRITERIA

The functions and design criteria for the system are identified in the following sections. Throughout this document the term "system" shall be used to indicate the Carrier Preparation Building Materials Handling System. The system architecture and classification are provided in Appendix B.

1.1 SYSTEM FUNCTIONS

1.1.1 The system accommodates carriers with empty or loaded casks from, and returns them to, the Carrier/Cask Transport System.

1.1.2 The system removes/retracts and reinstalls the personnel barriers.

1.1.3 The system performs a physical inspection of the cask and carrier.

1.1.4 The system performs a contamination survey of the cask and associated carrier.

1.1.5 The system measures the external temperature of the transportation cask.

1.1.6 The system removes/retracts and reinstalls the transportation cask impact limiters.

1.1.7 The system removes and reinstalls cask tie-down devices.

1.1.8 The system removes and installs cask trunnions.

1.1.9 The system supports the collection of material control and accounting data.

1.1.10 The system operates within the environmental conditions of the Carrier Preparation Building.

1.1.11 The system provides features to minimize radiation exposure to workers.

1.1.12 The system provides features and equipment for reducing the risk of, responding to, and recovering from off-normal events and credible design basis events.

1.1.13 The system provides features for the inspection, testing, and maintenance of system equipment.

1.1.14 The system facilitates decontamination and decommissioning prior to repository closure.

1.1.15 The system decontaminates transportation systems, excluding the casks and overpacks.

1.2 SYSTEM DESIGN CRITERIA

This section presents the design criteria for the system. Each criterion in this section has a corresponding Criterion Basis Statement in Appendix A that describes the need for the criterion as well as a basis for the performance parameters imposed by the criterion. Each criterion in this section also contains bracketed traces indicating traceability, as applicable, to the functions (F) in Section 1.1, the "Monitored Geologic Repository Requirements Document" (MGR RD) and "Revised Interim Guidance Pending Issuance of New U.S. Nuclear Regulatory Commission (NRC) Regulations (Revision 01, July 22, 1999), for Yucca Mountain, Nevada." In anticipation of the interim guidance being promulgated as a Code of Federal Regulations, it will be referred to as "10 CFR 63" in this system description document. For the applicable version of the codes, standards, and regulatory documents, refer to Appendix E.

1.2.1 System Performance Criteria

1.2.1.1 The system shall have an operational life of 40 years.

[F 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.11][MGR RD 3.2.C]

1.2.1.2 The system shall be designed to accommodate rail and truck transportation casks and associated carriers identified in Table 1.

Table 1. Transportation Systems

Cask Designation/Proposed System Name	Manufacturer or Owner	NRC Docket Number	Mode of Transportation
GA-9	GA	71-9221	LWT
GA-4		71-9226	LWT
NAC-LWT	NAC	71-9225	LWT
NAC-STC		71-9235	Rail
NUHOMS® MP-187	Vectra	71-9255	Rail
HI-STAR 100	Holtec	71-9261	Rail
Large MPC (21P/44B)	WGESCO	71-9264 and 71-9265	HHT or Rail
Small MPC (12P/24B)		71-9266 and 71-9267	HHT or Rail
WESFLEX	-	-	-
TranStor™	SNC	71-9268	Rail
NAC-UMS™ UTC (MPC)	NAC	71-9270	Rail
Navy 192- and 160-Canister System	Bettis	-	Rail
Proposed SRS and WVDP HLW System	-	-	-
Proposed Hanford 15-ft HLW System	-	-	Rail
Proposed Long South Texas Project	-	-	Rail

See Appendix C for acronym definitions. The character "-" indicates that the information was not available from the source referenced in Appendix A.

[F 1.1.1][MGR RD 3.3.D, 3.3.H, 3.4.2.B]

1.2.1.3 The system shall have the capability to handle transportation casks at the annual throughput rates specified in Sections 5.1.4.3 and 5.1.4.4 of the "Monitored Geologic Repository Project Description Document."

[F 1.1.1][MGR RD 3.2.C, 3.2.E]

1.2.1.4 The system shall support a transportation cask turnaround time (TBD-4443).

[F 1.1.1][MGR RD 3.4.2.B]

1.2.1.5 This system shall remove/retract and reinstall transportation cask/carrier personnel barriers.

[F 1.1.2][MGR RD 3.2.C, 3.4.2.B]

1.2.1.6 This system shall remove/retract and reinstall transportation cask impact limiters.

[F 1.1.6][MGR RD 3.2.C, 3.4.2.B]

1.2.1.7 The system shall remove and reinstall cask tie-downs.

[F 1.1.7][MGR RD 3.2.C, 3.4.2.B]

1.2.1.8 The system shall install and remove cask trunnions.

[F 1.1.8][MGR RD 3.2.C, 3.4.2.B]

1.2.1.9 The system shall perform physical and radiation inspections and tests of loaded and unloaded transportation casks in accordance with the cask's Certificate of Compliance.

[F 1.1.3, 1.1.4][MGR RD 3.1.G, 3.2.C, 3.4.2.B, 3.4.2.E, 3.4.2.G]

1.2.1.10 The system shall measure the accessible external surface temperature of a transportation cask.

[F 1.1.5][MGR RD 3.2.C, 3.4.2.B]

1.2.1.11 Reserved

1.2.1.12 The system shall provide features to facilitate permanent closure and decontamination or dismantlement.

[F 1.1.14][MGR RD 3.1.C][10 CFR 63.21(c)(17)]

1.2.1.13 The system shall provide features to remediate damaged casks such that they may be safely handled by the Carrier/Cask Handling System.

[MGR RD 3.2.C]

1.2.1.14 The system shall provide features for decontamination of transporters and equipment on transporters to allow transport in compliance with "General Requirements for Shipments and Packagings" (49 CFR 173 Section 443).

[F 1.1.15][MGR RD 3.4.2.H]

1.2.2 Safety Criteria

1.2.2.1 Nuclear Safety Criteria

1.2.2.1.1 The system cranes shall be designed to retain suspended loads during and after a loss of electrical power.

[F 1.1.12][MGR RD 3.1.B, 3.1.C, 3.4.2.C][10 CFR 63.111(a)(1), 63.111(a)(2), 63.111(b)(2), 63.112(e)(8)]

1.2.2.1.2 The system cranes shall be designed to retain suspended loads during and after Frequency Category 2 (TBV-1246) design basis earthquake.

[F 1.1.12][MGR RD 3.1.B, 3.1.C, 3.4.2.C][10 CFR 63.111(a)(1), 63.111(a)(2), 63.111(b)(2), 63.112(e)(8)]

1.2.2.1.3 The system cranes shall be designed to remain on their rails during and after a Frequency Category 2 (TBV-1246) design basis earthquake.

[F 1.1.12][MGR RD 3.1.B, 3.1.C, 3.4.2.C][10 CFR 63.111(a)(1), 63.111(a)(2), 63.111(b)(2), 63.112(e)(8)]

1.2.2.1.4 The system remote manipulators shall provide features to recover from loss of power and Frequency Category 1 (TBV-1246) design basis earthquakes, including backup measures to place and release loads, fixtures, instruments, and tooling in a safe manner.

[F 1.1.11, 1.1.12][MGR RD 3.1.B, 3.1.C][10 CFR 63.111(a)(1)]

1.2.2.1.5 The system shall be designed in accordance with the project ALARA (as low as reasonably achievable) program goals (TBD-406) and the applicable guidelines in "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low as is Reasonably Achievable" (Regulatory Guide 8.8).

[F 1.1.11, 1.1.12][MGR RD 3.1.B, 3.1.C, 3.1.G][10 CFR 63.111(a)(1)]

1.2.2.1.6 The system shall maintain at least 20 ft (6 m) separation between loaded transportation casks.

[F 1.1.11, 1.1.12][MGR RD 3.1.B, 3.1.C][10 CFR 63.111(a)(1)]

1.2.2.1.7 The system shall permit prompt termination of operations and evacuation of personnel during an emergency.

[F 1.1.12][MGR RD 3.1.C][10 CFR 63.112(e)(10)]

1.2.2.1.8 The system shall provide overload limit sensing and alarming capabilities to automatically stop handling operations and warn operators of unsafe conditions.

[F 1.1.12][MGR RD 3.1.C, 3.3.A][10 CFR 63.112(e)(8)]

1.2.2.2 Non-nuclear Safety Criteria

Non-nuclear safety criteria will be provided in a future revision, if required.

1.2.3 System Environment Criteria

1.2.3.1 The system components shall be designed to withstand and operate in the temperature environment defined in Table 2 for the area in which the component is located.

Table 2. Temperature Environment

Location of System Component	Normal Environment	Off-Normal Environment
Normally Occupied Areas (e.g., Offices, Maintenance Areas, Access Control)	70 - 78°F	(TBD-395) °F for (TBD-395) Hours
Normally Unoccupied Areas (e.g., Mechanical & Electrical Equipment Rooms, Cask Receiving & Handling Areas, Pool Areas)	63 - 92°F	(TBD-395) °F for (TBD-395) Hours
Unoccupied Areas (e.g., Assembly Cells, Canister Transfer Cells, DC Handling Cells, Emergency Generator Room)	63 - 106°F	(TBD-395) °F for (TBD-395) Hours
Electronics Equipment Areas (e.g., Control Rooms, Computer Rooms, Communications Equipment Rooms, Data Processing and Recording Equipment Rooms)	70 - 74°F Note 1	70 - 74°F Note 1

Note 1: It is intended to maintain these areas at the specified temperature under all anticipated conditions. However, due to economic or design impracticability, areas that house less sensitive electronic components may not be maintained at this temperature. In these cases, cooling will be provided for the electronic components, but not necessarily the entire area.

[F 1.1.10][MGR RD 3.3.A]

1.2.3.2 The system components shall be designed to withstand and operate in the humidity environment defined in Table 3 for the area in which the component is located.

Table 3. Humidity Environment

Location of System Component	Normal Environment
Normally Occupied Areas (e.g., Offices, Maintenance Areas, Access Control)	30% - 60%
Normally Unoccupied Areas (e.g., Mechanical & Electrical Equipment Rooms, Cask Receiving & Handling Areas, Pool Areas)	Humidity Not Controlled (TBD-409) Note 1
Unoccupied Areas (e.g., Assembly Cells, Canister Transfer Cells, DC Handling Cells Emergency Generator Room)	Humidity Not Controlled (TBD-409) Note 1
Electronics Equipment Areas (e.g., Control Rooms, Computer Rooms, Communications Equipment Rooms, Data Processing and Recording Equipment Rooms)	40% - 50%

Note 1: Humidity control is not provided in most of these areas. Therefore, components susceptible to extreme humidity conditions must be evaluated for low and/or high humidity environments since special provisions (e.g., heater strips, humidifier) may be necessary.

[F 1.1.10][MGR RD 3.3.A]

1.2.3.3 All structures, systems, and components (SSCs) that exist or are operating within 6.6 ft. (2 m) of the surface of transportation casks/carriers shall be designed such that components susceptible to radiation can withstand and operate in a 1 rad/hr environment.

[F 1.1.10][MGR RD 3.3.A]

1.2.4 System Interfacing Criteria

1.2.4.1 The system shall receive and provide the operational information, status, and control data defined in Table 4 to the MGR Operations Monitoring and Control System.

Table 4. System Inputs/Outputs

Inputs	Outputs
Radiation monitoring system data and status	Equipment status and status of operations
Transportation cask and carrier tracking data	Equipment alarm status
Facility system status	Control equipment status and alarms
Facility, interfacing and support system readiness status	Interlock status
Operational message advisory	Video signals
Activity plans and procedures	Communications equipment status
Emergency response commands	Timeout warnings for handling equipment
MGR operational alarm status	Control loads left in improper states (suspended loads, unattended controls, etc.)
Supervisory control	

[F 1.1.9, 1.1.12][MGR RD 3.2.C, 3.3.K]

1.2.4.2 The system shall receive electrical power from the Carrier Preparation Building System electrical power subsystem.

[F 1.1.2, 1.1.6, 1.1.7, 1.1.8][MGR RD 3.2.C]

1.2.4.3 The system shall limit handling and dynamic loads to the shipping casks, carriers, facility, and support systems to within their design limits.

[F 1.1.1, 1.1.2, 1.1.6, 1.1.7, 1.1.8][MGR RD 3.3.A, 3.4.2.C]

1.2.4.4 The system shall interface with the Carrier/Cask Transport System to provide adequate clearance for the on-site prime movers.

[F 1.1.1][MGR RD 3.2.C]

1.2.4.5 The system shall provide features to obtain the transportation cask identification numbers and cask locations for data input into the Safeguards and Security System.

[F 1.1.9][MGR RD 3.1.C, 3.1.D, 3.3.K, 3.4.2.F][10 CFR 63.78]

1.2.4.6 The system shall be designed in accordance with the interface agreements defined in "Interface Control Document for the Transportation System and the Mined Geologic Disposal System Surface Repository Facilities and Systems for Mechanical and Envelope Interfaces."

[F 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8][MGR RD 3.2.C]

1.2.5 Operational Criteria

1.2.5.1 The system shall include provisions for the inspection, testing, and maintenance of system equipment.

[F 1.1.13][MGR RD 3.1.C, 3.3.A][10 CFR 63.112(e)(13)]

1.2.5.2 The Inherent Availability for the system shall be greater than 0.9711 (TBV-4655).

[MGR RD 3.2.C, 3.2.E, 3.3.A]

1.2.6 Codes and Standards Criteria

1.2.6.1 The system shall provide for worker safety and maintenance in accordance with "Occupational Safety and Health Standards" (29 CFR 1910).

[MGR RD 3.1.E]

1.2.6.2 Top running bridge and gantry type multiple girder electric overhead traveling cranes, if used, shall be designed in accordance with "Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes" (CMAA-70-94).

[MGR RD 3.3.A]

1.2.6.3 Top running and under running single girder electric overhead traveling cranes utilizing under running trolley hoists, shall be designed in accordance with "Specifications for Top Running & Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist" (CMAA-74-1994).

[MGR RD 3.3.A]

1.2.6.4 The system shall be designed in accordance with the applicable provisions of "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992).

[MGR RD 3.3.A]

1.2.6.5 The system shall be designed in accordance with applicable sections of "Department of Defense Design Criteria Standard, Human Engineering" (MIL-STD-1472E).

[MGR RD 3.3.A]

1.2.6.6 The system shall be designed in accordance with applicable sections of "Human Factors Design Guidelines for Maintainability of Department of Energy Nuclear Facilities" (UCRL-15673).

[MGR RD 3.3.A]

1.2.6.7 The system shall be designed in accordance with applicable sections of Volume 1 of "Human-System Interface Design Review Guideline" (NUREG-0700).

[MGR RD 3.1.G, 3.3.A]

1.2.6.8 The system shall be designed in accordance with applicable sections of "Safety Color Code" (ANSI Z535.1-1998), "Environmental and Facility Safety Signs" (ANSI Z535.2-1998), "Criteria for Safety Symbols" (ANSI Z535.3-1998), "Product Safety Signs and Labels" (ANSI Z535.4-1998), and "Accident Prevention Tags (for Temporary Hazards)" (ANSI Z535.5-1998).

[MGR RD 3.3.A]

1.2.6.9 The system shall be designed in accordance with applicable sections of "Accessible and Usable Buildings and Facilities" (CABO/ANSI A117.1-1992), and "Americans With Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities" (36 CFR 1191, Appendix A).

[MGR RD 3.1.G, 3.3.A]

1.2.6.10 The system shall be designed in accordance with applicable sections of "American National Standard for Human Factors Engineering of Visual Display Terminal Workstations" (ANSI/HFS 100-1988), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 3: Visual Display Requirements" (ISO 9241-3), and "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 8: Requirements for Displayed Colours" (ISO 9241-8).

[MGR RD 3.3.A]

1.2.6.11 The system shall be designed in accordance with applicable sections of "Guidelines for Designing User Interface Software" (ESD-TR-86-278), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 10: Dialogue Principles" (ISO 9241-10), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 14: Menu Dialogues" (ISO 9241-14), and "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 15: Command Dialogues" (ISO 9241-15).

[MGR RD 3.3.A]

1.2.6.12 The system shall be designed in accordance with the applicable sections of the "National Electrical Code" (NFPA 70).

[MGR RD 3.3.A]

1.2.6.13 The system shall be designed in accordance with the applicable sections of "Standard for the Protection of Electronic Computer/Data Processing Equipment" (NFPA 75).

[MGR RD 3.3.A]

1.2.6.14 The system shall be designed in accordance with the applicable sections of "IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment" (IEEE Std 1100-1992).

[MGR RD 3.3.A]

1.2.6.15 The system shall be designed in accordance with the applicable sections of "IEEE Standard for Information Technology - Open Systems Interconnection (OSI) Abstract Data Manipulation - Application Program Interface (API) [Language Independent]" (IEEE Std 1224-1993).

[MGR RD 3.3.A]

1.2.6.16 The system shall be designed in accordance with the applicable sections of "Application of Safety Instrumented Systems for the Process Industries" (ANSI/ISA-S84.01-1996).

[MGR RD 3.3.A]

1.2.6.17 The system shall comply with the applicable assumptions contained in the "Monitored Geologic Repository Project Description Document."

1.2.6.18 The system shall be designed in accordance with the applicable provisions of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988).

[MGR RD 3.3.A]

1.2.6.19 The design and construction of electric overhead and gantry multiple girder cranes with top running bridge and trolley shall be in accordance with the applicable sections of "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)" (ASME NOG-1-1995) for Type II cranes.

[MGR RD 3.3.A]

1.2.6.20 Design of steel SSCs shall be in accordance with "Manual of Steel Construction, Allowable Stress Design" or "Manual of Steel Construction, Load and Resistance Factor Design."

[MGR RD 3.3.A]

1.3 SUBSYSTEM DESIGN CRITERIA

There are no subsystem design criteria for this system.

1.4 CONFORMANCE VERIFICATION

This section will be completed in a future revision.

2. DESIGN DESCRIPTION

Section 2 of this SDD summarizes information which is contained in other references. By assembling system specific information contained elsewhere (i.e., analyses, technical reports, etc.), Section 2 provides insight into the current state of the design of this system. However, due to the nature of design development, the information contained in this section will continue to change as the design matures.

2.1 SYSTEM DESIGN SUMMARY

The system design summary provided below is based on Section 1.3 contained in Attachment II of the "Engineering Files for Site Recommendation."

The Carrier Preparation Building (CPB) houses the system. The system prepares incoming carrier/cask configurations for unloading at the Waste Handling Building (WHB) and empty carrier/cask configurations for offsite shipment. The system receives carriers and casks from, and delivers them to, the Carrier/Cask Transport System (CCTS).

As shown in the carrier transportation flow diagram for the surface facilities, Figure 1, the CPB receives rail and truck transportation carriers/casks from the CCTS. The carriers are delivered to the CPB from either the rail or truck carrier parking areas at the North Portal surface facilities as shown in Figure 2. The system inspects and prepares carriers with loaded transportation casks prior to unloading operations performed in the WHB. After the casks are unloaded, the carriers and empty casks are returned to the CPB by the CCTS for preparation and inspection by the system. These transport and system operations occur prior to offsite shipment of the carrier/cask (see Figure 1). After system operations are complete, empty carriers can be transported either to the rail or the truck carrier parking areas in the opposite direction shown in Figure 2.

The CPB houses the system's equipment and provides the facility, utility, safety, communications, and auxiliary systems supporting operations. The system interfaces with the CCTS, the CPB System and its support facilities (including electrical power), and the Monitored Geologic Repository Operations Monitoring and Control System (MGR OMCS).

2.2 DESIGN ASSUMPTIONS

The principal assumptions that were used (in addition to the design criteria defined in Section 1) to develop the system design concept and features are provided below (Attachment II, Section 1.3.2.2 of "Engineering Files for Site Recommendation").

2.2.1 Carrier/cask preparation operations will be performed in a contact operation area using manual and remote handling equipment. Readily available remote/robotic technology in the nuclear industry will be used to assist carrier/cask preparation

operations and ensure that radiation exposure rates for manual operation are ALARA.

2.2.2 The system will be operated 3-shifts per day, 120 hours per week, 50 weeks per year to meet throughput requirements of the WHB systems.

2.3 DETAILED DESIGN DESCRIPTION

The detailed design description provided below is based on Attachment II Sections 1.3.2.3 and 1.3.2.4 of the "Engineering Files for Site Recommendation," Section 7.4.1 of the "Surface Nuclear Facilities Space Program Analysis" and Section 7.2.5 of the "Mined Geologic Disposal System Advanced Conceptual Design Report."

The system receives rail and truck transportation cask carriers from the CCTS, and inspects and prepares the carriers for transportation to the WHB. Carrier preparation operations for carriers/casks arriving at the MGR include performing a radiation survey, removing or retracting the cask personnel barriers, sampling for contamination, measuring the cask external temperature, removing the cask impact limiters, removing the cask tie-downs, and installing the cask trunnions, as required. The operations for carriers/casks leaving the MGR include removing the cask trunnions, installing the tie downs, installing the impact limiters, performing a radiological survey of the cask, and installing the personnel barriers, as required.

Material handling operations in the CPB utilize four equipment items; two bridge cranes and two bridge-mounted manipulators. Four parallel tracks/roadways (lines) for the passage of both truck and rail carriers, are provided. The two exterior lines are dedicated to incoming carriers and the two interior lines are dedicated to outgoing carriers. The system will be capable of handling the throughput quantities to support WHB operations. Each pair of rail/truck lines is serviced by a bridge crane and bridge-mounted manipulator.

Carriers with DOE disposable canister waste forms are routed only to one of the incoming lines in the CPB. Commercial fuel assembly carriers can be routed to either incoming line.

Figure 3 provides a system overview. Figures 4 and 5 provide a floor plan and section showing the general arrangement of the CPB. The CPB is designed using recessed rails/flush tracks to accommodate four parallel tracks/roadways (lines) for the passage of both truck and rail carrier over the same surface. The external rails/track and roadway allow any necessary shunting. The primary area size is determined by the four lines, their required separation, and the additional overhang to accommodate the overall span and outside-wall rail supports of the two 15-ton bridge cranes, which run the length of the building and service two sets of tracks. The bridge cranes provide vertical clearance over the bridge-mounted manipulators that service the same tracks down the length of the

building. The manipulator is equipped with a telescoping mast, an articulated arm, and an impact wrench to remove and install the bolts that attach the impact limiters and tie-downs on the transportation cask.

The system receives cask carriers, either from the radiologically controlled area parking area or the WHB, for carrier preparation operations. The carrier/cask preparation in the CPB is a contact or remote operation using manual and remote equipment.

A carrier containing a loaded cask is hauled from the radiologically controlled area parking area by a site prime mover to the CPB (see Figure 2). The radiation level near the cask is measured to assess conformance to applicable regulatory exposure dose limits. The cask personnel barrier(s) are removed/retracted using the bridge crane. The truck cask personnel barrier is removed and stored in the lay down area and the rail cask personnel barrier is retracted and stored on the carrier. After removal or retraction of the personnel barriers, cask tie-down bolts are removed, cask trunnions are installed as required, and the contamination levels at the exposed external surfaces of the transportation cask are sampled and measured. In order to limit occupational radiation exposure, the radiation and contamination measurements may be performed remotely by using a bridge-mounted manipulator arm to maneuver the radiation monitoring instruments. Temperature measurements of the cask external surface are also taken in a similar manner.

2.4 COMPONENT DESCRIPTION

This information will be provided in a future revision.

2.5 CRITERIA COMPLIANCE

The surface facility is developed conceptually at this time without criteria compliance analyses. The criteria compliance for this system will be addressed in future issues of this SDD as the design and analysis of the system matures.

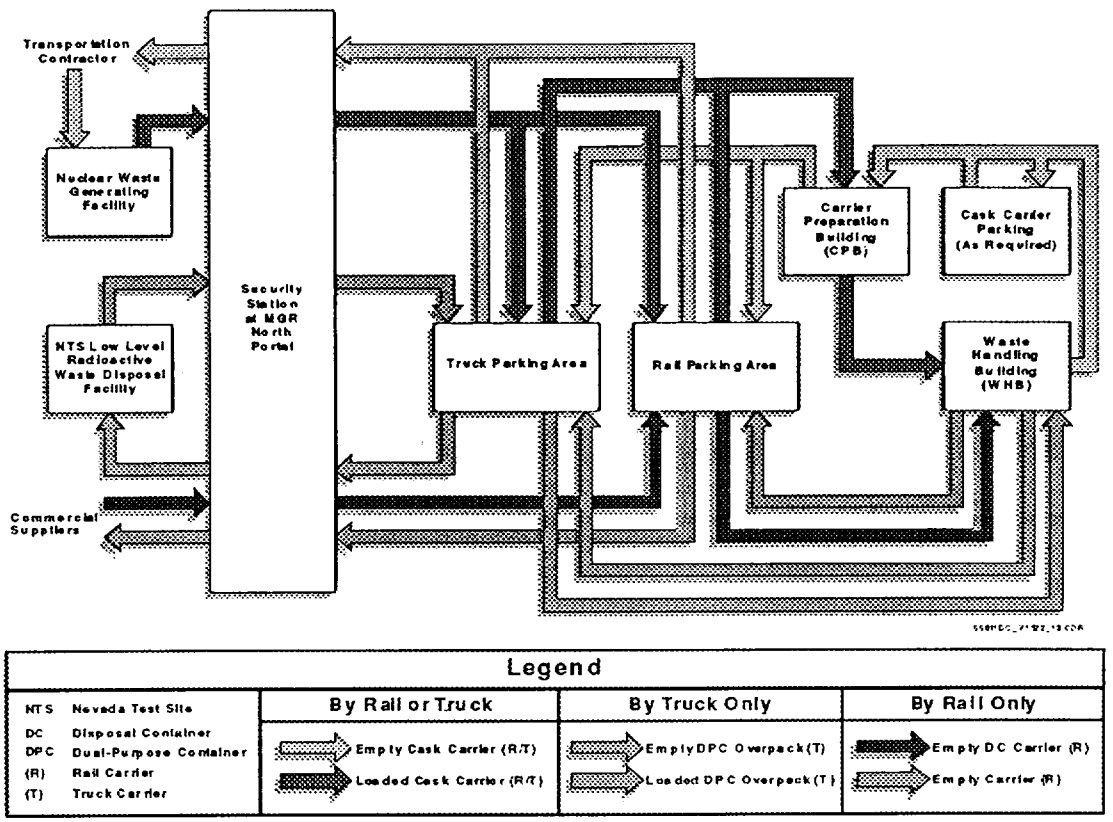

Figure 1. MGR Surface Facility Carrier Transportation Flow Diagram

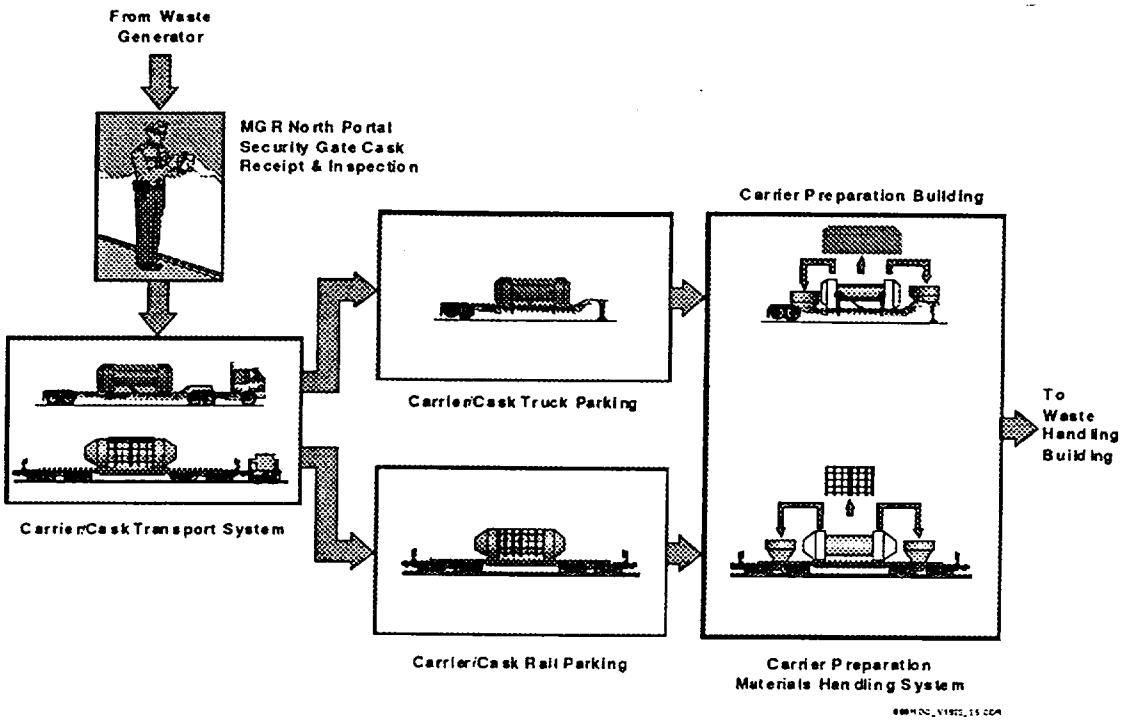

Figure 2. Carrier/Cask Receiving and Delivery to the Carrier Preparations Building

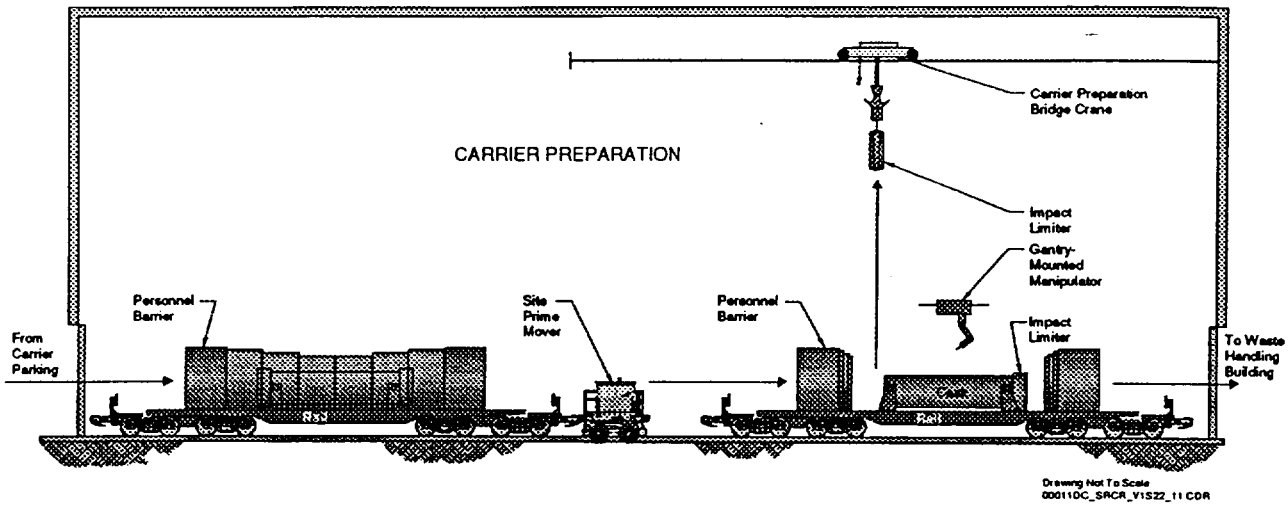

Figure 3. Carrier Preparation Building Materials Handling System

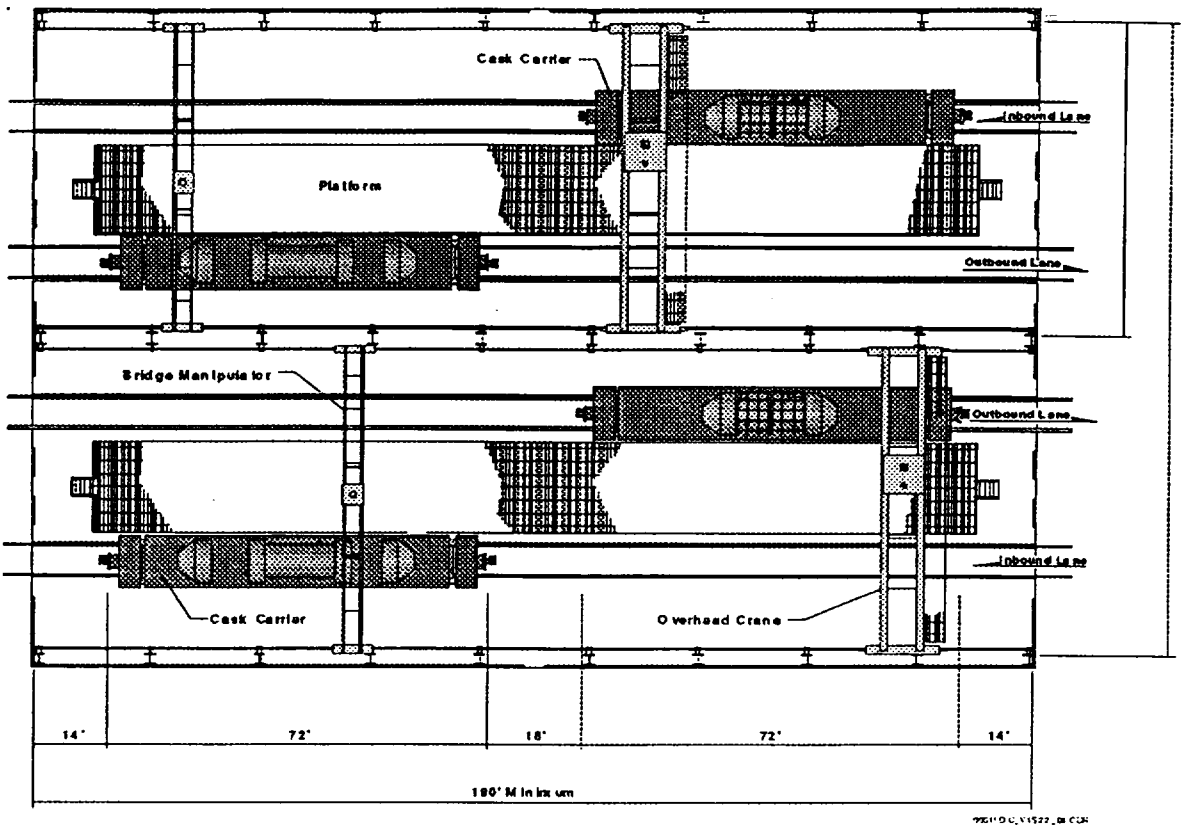

Figure 4. Carrier Preparation Building Floor Plan

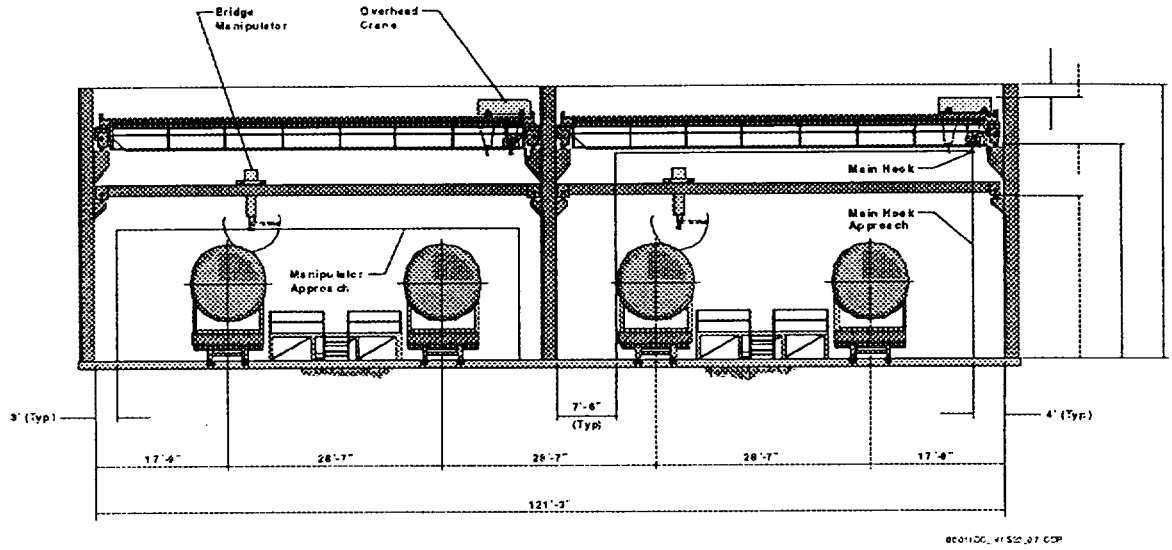

Figure 5. Carrier Preparation Building Section

3. SYSTEM OPERATIONS

A system operations description for this system will be provided in a future revision.

4. SYSTEM MAINTENANCE

A system maintenance description for this system will be provided in a future revision.

APPENDIX A CRITERION BASIS STATEMENTS

This section presents the criterion basis statements for criteria in Section 1.2. Descriptions of the traces to "Monitored Geologic Repository Requirements Document" (MGR RD) and "Revised Interim Guidance Pending Issuance of New U.S. Nuclear Regulatory Commission (NRC) Regulations (Revision 01, July 22, 1999), for Yucca Mountain, Nevada" are shown as applicable. In anticipation of the interim guidance being promulgated as a Code of Federal Regulations, it will be referred to as "10 CFR 63" in this system description document (SDD).

1.2.1.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the operational life of the system. This criterion is required because this system supports the waste handling operations at the repository as required by MGR RD 3.2.C.

II. Criterion Performance Parameter Basis

MGR RD 3.2.C requires the MGR to be capable of receiving, packaging, emplacing, and isolating nuclear waste at the annual rates specified in Table 3-2 of the MGR RD. Table 3-2 of the MGR RD indicates that waste receipt will commence in the year 2010 and is expected to be completed by the year 2041, spanning a total of 32 years. To account for future potential schedule fluctuations caused by uncertainties in waste remediation, early receipt, and nuclear power plant life extensions, a 25 percent margin is added, resulting in an operational life of 40 years.

1.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion explicitly identifies the transportation casks that the system must be able to handle. This criterion is needed to ensure that the system is able to handle the transportation systems that will be received at the surface repository. This criterion supports MGDS RD 3.3.D, 3.3.H, and 3.4.2.B.

II. Criterion Performance Parameter Basis

The casks and associated information, except the mode of transportation, are identified in the "Interface Control Document for the Transportation System and the Mined Geologic Disposal System Surface Repository Facilities and Systems for Mechanical Envelope Interfaces," Table 7-2. The mode of transportation for each cask is identified in Tables 7-3, 7-4, and 7-5 of the same document.

The WESFLEX transportation system was also added to the list in the interface control document because it is known that a transportation system with that name will potentially

be developed and may be used to deliver spent nuclear fuel to the repository, based on Section 5.20 of the interface control document.

1.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion defines how fast the system has to annually process Truck, SPC Rail, and DPC Rail casks so that the overall MGR rates can be met. This criterion supports MGR RD 3.2.C and 3.2.E.

II. Criterion Performance Parameter Basis

Three annual arrival scenarios for CSNF are presented in Tables 5-1 through 5-3 and the annual cask receipt rates of DOE SNF and HLW are shown in Table 5-4 of Sections 5.1.4.3 and 5.1.4.4 of the "Monitored Geologic Repository Project Description Document."

1.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion defines the figure of merit for how fast the system must return transportation casks back to the Carrier/Cask Transport System in support of the higher level requirement for returning a usable transportation cask to service for the Regional Servicing Contractor. This criterion supports MGR RD 3.4.2.B.

II. Criterion Performance Parameter Basis

N/A

1.2.1.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.2.C and 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to the cask/carrier entering the Waste Handling Building. This criterion further supports MGR RD 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to shipment off-site.

II. Criterion Performance Parameter Basis

N/A

1.2.1.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.2.C and 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to the cask/carrier entering the Waste Handling Building. This criterion further supports MGR RD 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to shipment off-site.

II. Criterion Performance Parameter Basis

N/A

1.2.1.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.2.C and 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to the cask/carrier entering the Waste Handling Building. This criterion further supports MGR RD 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to shipment off-site.

II. Criterion Performance Parameter Basis

N/A

1.2.1.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.2.C and 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to the cask/carrier entering the Waste Handling Building. This criterion further supports MGR RD 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to shipment off-site. It should be noted that some transportation casks are not transported with the cask supported on its trunnions. On such casks, the trunnions are unbolted from the cask for transportation, and must be reinstalled for handling at the MGR.

II. Criterion Performance Parameter Basis

N/A

1.2.1.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports 3.1.G, 3.2.C, 3.4.2.B, 3.4.2.E, and 3.4.2.G by ensuring the system is able to perform the needed operations prior to the cask/carrier entering the Waste Handling Building and prior to shipment off-site. Radiological inspections are required prior to off-site shipment by "General Requirements for Shipments and Packagings," 49 CFR 173.441 and 173.443.

II. Criterion Performance Parameter Basis

N/A

1.2.1.10 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports 3.2.C and 3.4.2.B by ensuring the system is able to perform the needed operations to prepare the cask/carrier prior to the cask/carrier entering the Waste Handling Building. Temperature measurement is necessary to confirm that the cask was loaded with fuel in accordance with the cask's license/certificate of compliance. Temperature measurement is also necessary to protect equipment and personnel in close proximity or contact with the transportation cask.

II. Criterion Performance Parameter Basis

N/A

1.2.1.12 Criterion Basis Statement

I. Criterion Need Basis

This criterion ensures that features to facilitate permanent closure and decontamination or dismantlement are incorporated into the design of the system, as required by MGR RD 3.1.C and 10 CFR 63.21(c)(17).

II. Criterion Performance Parameter Basis

N/A

1.2.1.13 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to allow safe handling of transportation casks that may arrive at the MGR with some amount of damage that prevents safe handling of the casks by the Carrier/Cask Handling System. This criterion supports MGR RD 3.2.C.

This criterion is supported by guidance contained in the "MGR Compliance Program Guidance Package for the Carrier Preparation Building Materials Handling System," Guidance Statement 6.4g2.

II. Criterion Performance Parameter Basis

N/A

1.2.1.14 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.4.2.H by providing the capability to decontaminate transporters and support equipment prior to releasing them back to the Regional Service Agent. Casks and transporters offered for shipment must comply with "General Requirements for Shipments and Packagings" (49 CFR 173, Section 443).

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to define the required response of the system to the identified design basis event. This criterion supports the implementation of MGR RD 3.1.B, 3.1.C, and 3.4.2.C; "Standards for Protection Against Radiation" (10 CFR 20); and 10 CFR 63.111(a)(1), 63.111(a)(2), 63.111(b)(2), and 63.112(e)(8).

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to define the required response of the system to the identified design basis event. This criterion supports the implementation of MGR RD 3.1.B, 3.1.C, and 3.4.2.C; "Standards for Protection Against Radiation" (10 CFR 20); and 10 CFR 63.111(a)(1), 63.111(a)(2), 63.111(b)(2), and 63.112(e)(8).

Design analyses to determine the seismic characteristics of the system cranes have not been completed. In the absence of such data, good engineering judgement requires that a conservative approach to designing system cranes be used. When adequate analyses are complete, this criterion may be modified.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to define the required response of the system to the identified design basis event. This criterion supports the implementation of MGR RD 3.1.B, 3.1.C, and 3.4.2.C; "Standards for Protection Against Radiation" (10 CFR 20); and 10 CFR 63.111(a)(1), 63.111(a)(2), 63.111(b)(2), and 63.112(e)(8).

This criterion is supported by guidance contained in the "MGR Compliance Program Guidance Package for the Carrier Preparation Building Materials Handling System," Guidance Statements 6.3g1 and 6.4g1.

Design analyses to determine the seismic characteristics of the system cranes have not been completed. In the absence of such data, good engineering judgement requires that a conservative approach to designing system cranes be used. When adequate analyses are complete, this criterion may be modified.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to define the required response of the system to the identified design basis event. This criterion supports the implementation of MGR RD 3.1.B, and

3.1.C; "Standards for Protection Against Radiation" (10 CFR 20); and 10 CFR 63.111(a)(1).

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.5 Criterion Basis Statement

I. Criterion Need Basis

MGR RD 3.1.C requires compliance with 10 CFR 63. MGR RD 3.1.B and 10 CFR 63.111(a)(1) require compliance with "Standards for Protection Against Radiation" (10 CFR 20). Section 1101(b) of 10 CFR 20 states: "The licensee shall use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to the members of the public that are as low as is reasonably achievable (ALARA)."

Compliance with "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low as is Reasonably Achievable" (Regulatory Guide 8.8) is invoked because this regulatory guide is one of the primary regulatory documents that addresses ALARA and is acceptable to the U.S. Nuclear Regulatory Commission. This regulatory guide provides guidelines on achieving the occupational ALARA goals during the planning, design, and operations phases of a nuclear facility. According to Section B of this guide, "Effective design of facilities and selection of equipment for systems that contain, collect, store, process, or transport radioactive material in any form will contribute to the effort to maintain radiation doses to station personnel ALARA." Section C.2 addresses facility and equipment design features. The design process of each system must include an evaluation of the applicable requirements in Section C.2 of Regulatory Guide 8.8.

In addition to compliance with the applicable guidelines in Regulatory Guide 8.8, the design of the system must meet the project ALARA program goals. The project ALARA program will include both qualitative and quantitative goals. Regarding the ALARA program of a licensee, Section C.1.a(2) of Regulatory Guide 8.8 states: "The policy and commitment should be reflected in written administrative procedures and instructions for operations involving potential exposures of personnel to radiation and should be reflected in station design features. Instructions to designers, constructors, vendors, and station personnel specifying or reviewing station features, systems, or equipment should reflect the goals and objectives to maintain occupational radiation exposures ALARA."

This criterion supports MGR RD 3.1.G.

This criterion is supported by guidance contained in the "MGR Compliance Program Guidance Package for the Carrier Preparation Building Materials Handling System," Guidance Statements 6.4g3 and 6.5g1.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.6 Criterion Basis Statement

I. Criterion Need Basis

This requirement is needed to ensure that occupational exposures are not unnecessarily high, due to close spacing of loaded transportation casks. Materials handing operations will require some personnel in the general vicinity of the casks (e.g., a crane operator). Close spacing of loaded casks will increase occupational exposures. Limiting the minimum distances between loaded transportation casks will reduce the dose rate for those personnel working in the vicinity and therefore should reduce the occupational exposures, contributing to compliance with "Standards for Protection Against Radiation" (10 CFR 20, Subpart C), as required by MGR RD 3.1.B and 3.1.C, and 10 CFR 63.111(a)(1).

II. Criterion Performance Parameter Basis

The spacing between transportation casks is taken from "General Requirements for Shipments and Packagings" (49 CFR 173, Section 447(a)). No fundamental change in the nuclear properties of a transportation cask take place upon its receipt at the repository, and the same occupational exposure limits that are considered in transportation also apply to materials handling at the repository. Thus, the spacing required for storage incident to transportation is considered valid for storage and handling at the surface repository.

1.2.2.1.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to define the required response of the system to an emergency. This criterion supports the implementation of MGR RD 3.1.C and 10 CFR 63.112(e)(10).

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.1.C, 3.3.A, and 10 CFR 63.112(e)(8) for the identification of applicable regulatory requirements to reduce the potential for design basis events. Specifically, this criterion identifies the need to detect changes in lifting loads during handling to protect SSCs from damage and reduce the potential for design

basis events. This criterion is supported by "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988, paragraph 6.5.2.16).

II. Criterion Performance Parameter Basis

N/A

1.2.3.1 Criterion Basis Statement

I. Criterion Need Basis

Temperature can directly affect the performance or result in advanced degradation of a component. To ensure proper performance, many equipment manufacturers specify the normal temperature environment in which the component must operate. Manufacturers may also specify the maximum off-normal temperature environment that the components can be exposed to or operate in for a limited time. The off-normal condition may be caused by loss of electric power or failure of the ventilation system.

This criterion supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

Temperature values are obtained from Criterion 1.2.1.1 in the "Waste Handling Building Ventilation System Description Document." Temperature values for off-normal conditions are considered TBD.

1.2.3.2 Criterion Basis Statement

I. Criterion Need Basis

Humidity can affect performance of computers, electronic, electrical, and mechanical components. Low humidity may result in static discharge in electrical and electronic equipment. High humidity can result in advanced corrosion or biological growth within the component. High humidity may also affect the operation of recorders that use paper. High humidity is not expected to be a major concern at the MGR due to the generally dry climate; however, depending on the nature of the operations, some areas may exhibit high humidity conditions. To ensure proper performance, many equipment manufacturers specify the humidity environment in which the component must operate. This criterion establishes the indoor humidity environment in which components are expected to operate based on the intended installation location.

Humidity is not controlled during off-normal conditions because of the generally mild humidity environment at the repository, and the expected short-term duration of off-normal conditions, such as loss of power or ventilation system failure.

This criterion supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

Humidity values are obtained from Criterion 1.2.1.2 in the "Waste Handling Building Ventilation System Description Document." Humidity values for unoccupied areas are TBD.

1.2.3.3 Criterion Basis Statement

I. Criterion Need Basis

Radiation from fuel assemblies, HLW canisters, or other radioactive sources can affect electrical and electronic components. Accumulated doses of radiation (also referred to as Total Integrated Dose) can cause eventual degradation of components containing organic compounds, such as electrical insulation and lubricants. Accumulated doses can also cause damage to components containing polymers. In addition to the material degradation issue, real-time operation of an electronic device may be compromised by the type of radiation it receives, such as neutrons colliding with the lattice atoms of the semiconductor.

Most of the electronic and electrical components will be located in mild environments with small radiation doses. Components that will be installed in radiation environments should be evaluated for the radiation doses that they can receive, and, where applicable, susceptibility to the type of radiation (X-ray, Gamma, and neutron) should be considered.

Shielding, distance, and duration of exposure can significantly reduce the radiation dose and type of radiation that a component receives. Therefore, detailed analyses on a case by case basis will determine the economic feasibility and practicability of providing shielding, distance from the source, minimizing exposure time, frequent replacement of the affected component, or qualification of the component for the radiation environment.

It should be emphasized that this criterion addresses the radiation doses that can affect operability of the components during normal operations, and is not intended to invoke environmental qualification requirements for post-accident operability.

This criterion supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

The 1 rad/hr radiation level given in this paragraph is obtained from "General Requirements For Shipments And Packagings" (49 CFR 173, Section 441). The maximum surface dose of 1000 mrem/hr in 49 CFR 173.441(b) is converted to rad/hr for use in this criterion. The 1 rad/hr SSC design environment is only applied to SSCs that exist within 2 m of the cask/carrier because the dose rate at any point 2 m (6.6 ft) from the outer lateral surfaces of the vehicle (excluding the top and underside of the vehicle), or in the case of a flat-bed style vehicle, at any point 2 m (6.6 ft) from the vertical planes

projected by the outer edges of the vehicle (excluding the top and underside of the vehicle), are limited to 10 mrem/hr by 49 CFR 173.441. This low dose rate is judged unnecessary for specific design consideration.

1.2.4.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with interfacing MGR systems. Specifically, this criterion identifies interfaces with the Monitored Geologic Repository Operations Monitoring and Control System for centralized monitoring and control. This criterion supports the waste handling operations of MGR RD 3.2.C and 3.3.K.

II. Criterion Performance Parameter Basis

N/A

1.2.4.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with interfacing MGR systems. This criterion supports MGR RD 3.2.C.

II. Criterion Performance Parameter Basis

N/A

1.2.4.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with transportation systems and interfacing MGR systems. This criterion implements MGR RD 3.4.2.C and 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.4.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion is necessary to identify the physical clearance interface between the site prime movers of the Carrier/Cask Transport System and this system.
This criterion supports MGR RD 3.2.C.

II. Criterion Performance Parameter Basis

N/A

1.2.4.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion provides for the tracking of all transportation casks handled by the system. This criterion supports MGR RD 3.3.K and 3.4.2.F requirements to maintain nuclear inventories and support safeguards and security activities. This requirement supports the MGR RD 3.1.D requirement to implement applicable provisions of "Physical Protection of Plants and Materials" (10 CFR 73, Section 45(d)(1)(iii)). This requirement also supports MGR RD 3.1.C for the interim guidance of 10 CFR 63.78 which invokes "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste" (10 CFR 72, Section 72(a)).

II. Criterion Performance Parameter Basis

N/A

1.2.4.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure mechanical interface consistency between the design of this system and the transportation systems. This is done by specifying the design be done in accordance with the interface agreements defined in "Interface Control Document for the Transportation System and the Mined Geologic Disposal System Surface Repository Facilities and Systems for Mechanical Envelope Interfaces."

This criterion supports MGR RD 3.2.C.

II. Criterion Performance Parameter Basis

N/A

1.2.5.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies the need to perform inspection, testing, and maintenance on system equipment. This criterion responds to MGR RD 3.1.C, 3.3.A and 10 CFR 63.112(e)(13).

II. Criterion Performance Parameter Basis

N/A

1.2.5.2 Criterion Basis Statement

I. Criterion Need Basis

The subject requirement addresses and quantifies the parent requirement for availability. This criterion supports MGR RD 3.2.C, 3.3.A, and 3.2.E.

II. Criterion Performance Parameter Basis

The parameter is taken from "Bounded Minimum Inherent Availability Requirements for the System Description Documents," Table 7.2-1. This value is from an uncontrolled source and is therefore TBV.

1.2.6.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion implements MGR RD 3.1.E. This criterion requires that system safety criteria be considered in the design of the MGR. This criterion establishes the requirement that the system design meets the applicable requirements of "Occupational Safety and Health Standards" (29 CFR 1910).

II. Criterion Performance Parameter Basis

N/A

1.2.6.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion ensures that the design complies with "Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes" (CMAA-70-94), which supports MGR RD 3.3.A.

This criterion is supported by guidance contained in the "MGR Compliance Program Guidance Package for the Carrier Preparation Building Materials Handling System," Guidance Statement 7.6g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion ensures that the design complies with "Specifications for Top Running & Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist" (CMAA-74-1994), which supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion ensures that the design complies with "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992), which supports MGR RD 3.3.A.

This criterion is supported by guidance contained in the "MGR Compliance Program Guidance Package for the Carrier Preparation Building Materials Handling System," Guidance Statement 7.2g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.5 Criterion Basis Statement

I. Criterion Need Basis

Design, selection, arrangement, configuration, and integration of SSCs involve many elements, including monitoring, operating, maintaining, and observing the facilities and systems. To accomplish an effective and safe work environment, the human-system interface must incorporate human factors engineering (HFE) criteria. Use of the "Department of Defense Design Criteria Standard, Human Engineering" (MIL-STD-1472E), in conjunction with the other HFE standards and guidelines cited in this system

description document, will provide a human-system interface that maximizes performance and minimizes risk to personnel.

In support of MGR RD 3.3.A, this criterion ensures that the system will be designed to be safely and effectively used by all expected users. The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1), endorses the use of MIL-STD-1472E (GPG-FM-027 references the earlier version of MIL-STD-1472).

II. Criterion Performance Parameter Basis

N/A

1.2.6.6 Criterion Basis Statement

I. Criterion Need Basis

Maintainability of system equipment involves many factors, including the human-machine interface. This interface must address the design for maintainability through the incorporation of HFE criteria. In support of MGR RD 3.3.A, this criterion ensures that the system will be designed to be safely and effectively maintained through compliance with applicable industry standards. The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1), endorses the use of "Human Factors Design Guidelines for Maintainability of Department of Energy Nuclear Facilities" (UCRL-15673) for addressing HFE maintainability design criteria.

II. Criterion Performance Parameter Basis

N/A

1.2.6.7 Criterion Basis Statement

I. Criterion Need Basis

Design, selection, arrangement, configuration, and integration of control rooms, operating galleries, and related SSCs (e.g., controls, displays, labels, workspaces, human-computer interfaces) involve many factors, including the human-machine interface. Through compliance with Volume 1 of "Human-System Interface Design Review Guideline" (NUREG-0700), when used in conjunction with other HFE standards and guidelines, this criterion ensures that control rooms, operating galleries, and related SSCs will be designed in a safe and effective manner.

This criterion supports MGR RD 3.1.G and 3.3.A. The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1), supports the use of NUREG-0700. NUREG-0700, Sections 6.1 through 6.9, provide specific HFE design guidelines for control room elements.

II. Criterion Performance Parameter Basis

N/A

1.2.6.8 Criterion Basis Statement

I. Criterion Need Basis

Information being communicated by safety signs and tags must be quickly and easily read and uniformly understood. The ANSI Z535 series (e.g., "Safety Color Code" (ANSI Z535.1-1998), "Environmental and Facility Safety Signs" (ANSI Z535.2-1998), "Criteria for Safety Symbols" (ANSI Z535.3-1998), "Product Safety Signs and Labels" (ANSI Z535.4-1998), and "Accident Prevention Tags (for Temporary Hazards)" (ANSI Z535.5-1998)) are recognized standards in the nuclear industry for the design and use of safety signs and tags. In support of MGR RD 3.3.A, this criterion ensures that, when used in conjunction with other HFE standards and guidelines, the design of safety signs and tags will help provide a safer working environment.

II. Criterion Performance Parameter Basis

N/A

1.2.6.9 Criterion Basis Statement

I. Criterion Need Basis

In support of MGR RD 3.1.G, the "Americans With Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities" (36 CFR 1191, Appendix A) provides specific HFE design guidelines for providing personnel with physical disabilities access to and use of system resources. In addition, in support of MGR RD 3.3.A, "Accessible and Usable Buildings and Facilities" (CABO/ANSI A117.1-1992) establishes configurations and design criteria for allowing accessibility to and usability of system components by persons with physical disabilities. When used in conjunction with other HFE standards and guidelines, these codes and standards will ensure a safe and efficient design.

This criterion is not applicable to facility workspaces and activities (e.g., walking underground) where physical disabilities endanger the individual or other personnel, preclude execution of tasks, or cannot be economically accommodated.

II. Criterion Performance Parameter Basis

N/A

1.2.6.10 Criterion Basis Statement

I. Criterion Need Basis

Design, selection, and integration of computer display terminals and workstations, equipment, and workspaces involve many factors including the human-computer interface. "American National Standard for Human Factors Engineering of Visual Display Terminal Workstations" (ANSI/HFS 100-1988), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 3: Visual Display Requirements" (ISO 9241-3), and "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 8: Requirements for Displayed Colours" (ISO 9241-8) support MGR RD 3.3.A by ensuring that HFE criteria will be incorporated into the selection and design of computer equipment and workspaces through compliance with applicable industry standards. The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraph 2.3.1.3) endorses use of the ISO 9241 standard. When used in conjunction with other HFE standards and guidelines, these codes and standards will ensure a safe and efficient design.

II. Criterion Performance Parameter Basis

N/A

1.2.6.11 Criterion Basis Statement

I. Criterion Need Basis

Design, selection, and integration of software supporting the user interface in computer systems must consider the characteristics of the user population. In support of MGR RD 3.3.A, the application of "Guidelines for Designing User Interface Software" (ESD-TR-86-278), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 10: Dialogue Principles" (ISO 9241-10), "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 14: Menu Dialogues" (ISO 9241-14), and "Ergonomic Requirements for Office Work with Visual Display Terminals (VDTs) - Part 15: Command Dialogues" (ISO 9241-15), ensures that HFE criteria will be incorporated into the selection, design, and integration of user interface software.

The DOE Good Practices Guide "Human Factors Engineering" (GPG-FM-027, paragraphs 2.3.1.3 and 2.3.1.8) endorses the use of the ISO 9241 standard. When used in conjunction with other HFE standards and guidelines, these codes and standards will ensure a safe and efficient design implementation.

II. Criterion Performance Parameter Basis

N/A

1.2.6.12 Criterion Basis Statement

I. Criterion Need Basis

This criterion responds to MGR RD 3.3.A, which recommends compliance with industry codes and standards. The "National Electrical Code" (NFPA 70) contains provisions considered necessary for safeguarding of personnel and SSCs from hazards arising from the use of electricity.

II. Criterion Performance Parameter Basis

N/A

1.2.6.13 Criterion Basis Statement

I. Criterion Need Basis

This criterion responds to MGR RD 3.3.A, which recommends compliance with industry codes and standards. The "Standard for the Protection of Electronic Computer/Data Processing Equipment" (NFPA 75) provides minimum requirements for the protection of electronic computer/data processing equipment from damage by fire or its associated effects; i.e., smoke, corrosion, heat, water.

II. Criterion Performance Parameter Basis

N/A

1.2.6.14 Criterion Basis Statement

I. Criterion Need Basis

This criterion responds to MGR RD 3.3.A, which recommends compliance with industry codes and standards. The "IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment" (IEEE Std 1100-1992) provides a consensus of recommended practices in an area where conflicting information and confusion, stemming primarily from different view points of the same problem, have dominated. IEEE Std 1100-1992 addresses electronic equipment performance issues while maintaining a safe installation.

II. Criterion Performance Parameter Basis

N/A

1.2.6.15 Criterion Basis Statement

I. Criterion Need Basis

This criterion responds to MGR RD 3.3.A, which recommends compliance with industry codes and standards. The "IEEE Standard for Information Technology - Open Systems Interconnection (OSI) Abstract Data Manipulation - Application Program Interface (API) [Language Independent]" (IEEE Std 1224-1993) provides a language-independent specification of an interface and environment to support application portability at the source code level.

II. Criterion Performance Parameter Basis

N/A

1.2.6.16 Criterion Basis Statement

I. Criterion Need Basis

This criterion responds to MGR RD 3.3.A, which recommends compliance with industry codes and standards. The "Application of Safety Instrumented Systems for the Process Industries" (ANSI/ISA-S84.01-1996) provides design requirements for safety instrumented systems for process industries.

II. Criterion Performance Parameter Basis

N/A

1.2.6.17 Criterion Basis Statement

I. Criterion Need Basis

The "Monitored Geologic Repository Project Description Document" allocates controlled project assumptions to systems. This criterion identifies the need to comply with the applicable assumptions identified in the subject document. The approved assumptions will provide a consistent basis for continuing the system design.

II. Criterion Performance Parameter Basis

N/A

1.2.6.18 Criterion Basis Statement

I. Criterion Need Basis

This criterion ensures that the design complies with "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988), which supports MGR RD 3.3.A.

This criterion is supported by guidance contained in the "MGR Compliance Program Guidance Package for the Carrier Preparation Building Materials Handling System," Guidance Statement 7.1g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.19 Criterion Basis Statement

I. Criterion Need Basis

This criterion ensures that the design complies with the applicable sections (related to Type II cranes) of "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)" (ASME NOG-1-1995), which supports MGR RD 3.3.A.

This criterion is supported by guidance contained in the "MGR Compliance Program Guidance Package for the Carrier Preparation Building Materials Handling System," Guidance Statement 7.5g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.20 Criterion Basis Statement

I. Criterion Need Basis

This criterion ensures that the design complies with "Manual of Steel Construction, Allowable Stress Design" or "Manual of Steel Construction, Load and Resistance Factor Design."

This criterion supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

APPENDIX B ARCHITECTURE AND CLASSIFICATION

The system architecture and QA classification are identified in Table 5. The QA classifications are established in "Classification of the Carrier Preparation Building Materials Handling System." Definitions of the QA classifications may be found in QAP-2-3, "Classification of Permanent Items."

Table 5. System Architecture and QA Classification

Carrier Preparation Building Materials Handling System	QL-1	QL-2	QL-3	CQ
Control & Tracking System		X		
Handling Equipment				
Overhead Bridge Crane		X		
Remote Manipulator			X	
Tooling and Fixtures				X
Inspection Systems				X
Decontamination System		X		

APPENDIX C ACRONYMS, SYMBOLS, AND UNITS

C.1 ACRONYMS

This section provides a listing of acronyms used in this SDD.

ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ALARA	As Low as is Reasonably Achievable
CCTS	Carrier/Cask Transport System
CPB	Carrier Preparation Building
CQ	Conventional Quality
DC	Disposal Container
DOE	U.S. Department of Energy
F	Function
G	General Atomics
HFE	Human Factors Engineering
HHT	Heavy Haul Trucks
HI-STAR	Holtec International-Storage, Transport, and Repository
HLW	High-Level Waste
IEEE	Institute of Electrical and Electronics Engineers
LWT	Legal-Weight Truck
MGR	Monitored Geologic Repository
MGR OMCS	Monitored Geologic Repository Operations Monitoring and Control System
MGR RD	Monitored Geologic Repository Requirements Document
MPC	Multi-Purpose Canister
NAC	Nuclear Assurance Corporation (NAC) International, Inc.
NRC	U.S. Nuclear Regulatory Commission
NUHOMS®	Nutech Horizontal Modular System®
QA	Quality Assurance
QL	Quality Level
SDD	System Description Document
SSCs	Structures, Systems, and Components
SNC	Sierra Nuclear Corporation
SRS	Savannah River Site
STC	Storage and Transportation Cask or Canister
TBD	to be determined
TBV	to be verified
UMS™	Universal MPC System™
UTC	Universal Transport Canister
WGESCO	Westinghouse Government and Environmental Services Company
WHB	Waste Handling Building
WVDP	West Valley Demonstration Project

C.2 SYMBOLS AND UNITS

This section provides a listing of symbols and units used in this SDD.

%	percent
°F	degrees Fahrenheit
ft	feet
m	meters
mrem/hr	milli-Roentgen equivalent man per hour
rad/hr	radiation absorbed dose per hour
rem	Roentgen equivalent man
sec	second

APPENDIX D FUTURE REVISION RECOMMENDATIONS AND ISSUES

This appendix identifies issues and actions that require further evaluation. The disposition of these issues and actions could alter the functions and design criteria that are allocated to this system in future revisions to this document. However, the issues and actions identified in this appendix do not require TBDs or TBVs beyond those already identified.

Issue 1. Further analyses to determine if a crane failure during a design basis earthquake would be outside the licensing requirements of the transportation casks needs to be performed. Crane failures addressed by Criterion 1.2.2.1.2 (the crane's ability to retain a suspended load during/after a DBE) and Criterion 1.2.2.1.3 (the crane's ability to remain on its rails during/after a DBE) may need to be modified as a result of such analyses.

APPENDIX E REFERENCES

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