OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SYSTEM DESCRIPTION DOCUMENT COVER SHEET

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2. SDD Title
Disposal Container Handling System Description Document

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Enclosure 5

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SYSTEM DESCRIPTION DOCUMENT REVISION HISTORY

1. SDD Title
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3. Revision	4. Description of Revision
00	Initial issue using document identifier BCB000000-01717-1705-00026.
01	This document was previously issued using document identifier BCB000000-01717-1705-00026. This document supersedes the previous issuance. This document is a complete rewrite of the superseded document, driven largely by the use of an alternate source of regulatory requirements, the implementation of the License Application Design Selection effort,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: • 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.

DISCLAIMER

CONTENTS

TABLES

FIGURES

SUMMARY

The Disposal Container Handling System receives and prepares new disposal containers (DCs) and transfers them to the Assembly Transfer System (ATS) or Canister Transfer System (CTS) for loading. The system receives the loaded DCs from ATS or CTS and welds the lids. When the welds are accepted the DCs are termed waste packages (WPs). The system may stage the WP for later transfer or transfer the WP directly to the Waste Emplacement/Retrieval System. The system can also transfer DCs/WPs to/from the Waste Package Remediation System.

The Disposal Container Handling System begins with new DC preparation, which includes installing collars, tilting the DC upright, and outfitting the container for the specific fuel it is to receive. DCs and their lids are staged in the receipt area for transfer to the needed location. When called for, a DC is put on a cart and sent through an airlock into a hot cell. From this point on, all processes are done remotely. The DC transfer operation moves the DC to the ATS or CTS for loading and then receives the DC for welding. The DC welding operation receives loaded DCs directly from the waste handling lines or from interim lag storage for welding of the lids. The welding operation includes mounting the DC on a turntable, removing lid seals, and installing and welding the inner and outer lids. After the weld process and non-destructive examination are successfully completed, the WP is either staged or transferred to a tilting station. At the tilting station, the WP is tilted horizontally onto a cart and the collars removed. The cart is taken through an air lock where the WP is lifted, surveyed, decontaminated if required, and then moved into the Waste Emplacement/Retrieval System. DCs that do not meet the welding non-destructive examination criteria are transferred to the Waste Package Remediation System for weld preparation or removal of the lids.

The Disposal Container Handling System is contained within the Waste Handling Building System. This includes the primary hot cell bounded by the receiving area and WP transport exit air locks; and isolation doors at ATS, CTS, and Waste Package Remediation. The hot cell includes areas for welding, various staging, tilting, and WP transporter loading. There are associated operating galleries and equipment maintenance areas outside the hot cell. These areas operate concurrently to accommodate the DC/WP throughput rates and support system maintenance. The new DC preparation area is located in an unshielded structure.

The handling equipment includes DC/WP bridge cranes, tilting stations, and horizontal transfer carts. The welding area includes DC/WP welders and staging stations. Welding operations are supported by remotely operated equipment including a bridge crane and hoists, welder jib cranes, welding turntables, and manipulators. WP transfer includes a transfer/decontamination and transporter load area. The transfer operations are supported by a remotely operated horizontal lifting system, decontamination system, decontamination and inspection manipulator, and a WP horizontal transfer cart. All handling operations are supported by a suite of fixtures including collars, yokes, lift beams, and lid attachments. Remote equipment is designed to facilitate decontamination and maintenance. Interchangeable components are provided where appropriate. Set-aside areas are included, as required, for fixtures and tooling to support off-normal and recovery operations. Semi-automatic, manual, and backup control methods support normal, maintenance, and recovery operations.

The system interfaces with the ATS and CTS to provide empty and receive loaded DCs. The Waste Emplacement/Retrieval System interfaces are for loading/unloading WPs on/from the transporter. The system also interfaces with the Waste Package Remediation System for DC/WP repair. The system is housed, shielded, supported, and has ventilation boundaries by the Waste Handling Building (WHB). The system is ventilated by the WHB Ventilation System, which in conjunction with ventilation boundaries ensure that airborne radioactivity is confined by high efficiency particulate air filtration units. Electrical power is supplied by the Waste Handling Building Electrical System. The system also interfaces with each of the DC systems. New DCs are received from a commercial transport system.

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 Disposal Container Handling System. The system architecture and classification are provided in Appendix B.

1.1 SYSTEM FUNCTIONS

1.1.1 The system receives, prepares for loading, stages, and transfers empty DCs to the ATS and CTS.

1.1.2 The system receives loaded DCs from the ATS and CTS.

1.1.3 The system stages, positions, and welds the DC closure lids.

1.1.4 The system evacuates the DC internal gases and backfills the container with inert gas.

1.1.5 The system performs non-destructive examinations of DC weld integrity.

1.1.6 The system transfers DC/WPs to/from the Waste Package Remediation System.

1.1.7 The system decontaminates the WP external surfaces prior to delivery to the Waste Emplacement/Retrieval System.

1.1.8 The system provides lag storage for loaded DCs and WPs.

1.1.9 The system loads WPs onto the Waste Emplacement/Retrieval System emplacement pallet and bedplate of the WP transporter.

1.1.10 The system receives recovered WPs from the Waste Emplacement/Retrieval System.

1.1.11 The system reads DC/WP unique identifiers and provides inventory data for material control and accounting.

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, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10][MGR RD 3.2.C]

1.2.1.2 The system shall have the capability to transfer DCs to ATS/CTS and from ATS/CTS to the Waste Emplacement/Retrieval System at an annual average throughput of 559 WP/DCs (TBV-4545) with a Peak monthly surge capacity of 56 WP/DCs per month (TBV-4545).

[F 1.1.1, 1.1.2][MGR RD 3.2.C, 3.2.D, 3.2.E]

1.2.1.3 The system shall accommodate the Site Receipt Inspection process for the empty DCs.

[F 1.1.1]

1.2.1.4 The system shall remove temporary seals, supply lids, and install lids in support of the DC closure process.

[F 1.1.1, 1.1.2]

1.2.1.5 The system shall evacuate gases and backfill the DC with inert gas to a combined concentration of less than or equal to 0.25 volume percent for O_2, H_2, H_2O, CO_2, and CO (TBV-0094) as the final condition for Emplacement.

[F 1.1.4][MGR RD 3.1.C][10 CFR 63.113(b)]

1.2.1.6 The system shall provide features to obtain the DC/WP unique identifiers and inventory data.

[F 1.1.11][MGR RD 3.1.C, 3.2.D, 3.3.K][10 CFR 63.78]

1.2.1.7 The system shall stage loaded DCs and WPs to accommodate downstream outages of (TBD-0266) days.

[F 1.1.8][MGR RD 3.2.C, 3.2.E]

1.2.1.8 The system shall decontaminate the WP surface to less than (TBD-0169) dpm/100 cm^2 prior to delivery to the Waste Emplacement/Retrieval System.

[F 1.1.7][MGR RD 3.1.B, 3.1.C][10 CFR 63.111(a)(1)]

1.2.1.9 The system shall have lag storage capacity of (TBD-0343) for empty DCs in the DC Preparation Area and/or on site to accommodate shipping outages.

[F 1.1.1]

1.2.1.10 The system shall provide features to maintain the internal DC pressure during the lid placement and welding process.

[F 1.1.3, 1.1.4]

1.2.1.11 The system shall clean the DC lid weld preparation surfaces in accordance with the Lid Welding Procedure.

[F 1.1.3]

1.2.1.12 The system shall perform closure welds for the DC (i.e., multiple upper end lids) in accordance with Section III of the "1995 ASME Boiler and Pressure Vessel Code." Any deviation from the ASME code will be approved by the Office of Civilian Radioactive Waste Management or their representative.

[F 1.1.3][MGR RD 3.3.A]

1.2.1.13 The system shall confirm the quality of the DC closure welds (i.e., multiple upper end lids) by performing ultrasonic and visual tests, which are non-destructive examinations and inspections, in accordance with Section III of the "1995 ASME Boiler and Pressure Vessel Code" requirements.

[F 1.1.5][MGR RD 3.3.A]

1.2.1.14 The system design shall include provisions for decommissioning and decontamination, including the removal of potentially contaminated SSCs.

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

1.2.1.15 The system shall include provisions to support WP remediation activities required to support a deferral of closure for up to 300 years after initiation of waste emplacement.

[F 1.1.10][MGR RD 3.1.C, 3.2.H, 3.3.L][10 CFR 63.111(d), 63.131(b), 63.134(d)]

1.2.1.16 The system shall prepare empty DCs for loading.

[F 1.1.1]

1.2.1.17 All zircaloy fuel cladding shall be maintained at temperatures that will not accelerate the degradation of the cladding to the point that it affects the performance of the system.

[MGR RD 3.2.L][10 CFR 63.113(b)]

1.2.2 Safety Criteria

1.2.2.1 Nuclear Safety Criteria

1.2.2.1.1 The system shall limit the lift height such that the equivalent energy of any loaded and sealed WP does not exceed a 2 m vertical or 2.4 m horizontal drop. (TBV-0245)

[F 1.1.2, 1.1.6, 1.1.9, 1.1.10][MGR RD 3.1.C][10 CFR 63.111(a)(2), 63.111(b)(2), 63.112(e)(8)]

1.2.2.1.2 The system shall prevent the drop of any suspended DC/WP during and after a loss of power.

[F 1.1.1, 1.1.2, 1.1.9, 1.1.10][MGR RD 3.1.C, 3.3.A][10 CFR 63.112(e)(8)]

1.2.2.1.3 The bridge crane and lifting fixtures shall be designed to retain their load in the event of a Frequency Category 1 (TBV-1246) design basis earthquake.

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

1.2.2.1.4 Overhead cranes and Horizontal Lifting System shall be designed so that they will not be dislodged from their rails in the event of a Frequency Category 2 (TBV-1246) design basis earthquake.

[F 1.1.1, 1.1.2, 1.1.6, 1.1.9, 1.1.10][MGR RD 3.1.B, 3.1.C, 3.1.G][10 CFR 63.111(a)(1), 63.111(a)(2), 63.112(e)(8)]

1.2.2.1.5 The system shall be designed to ensure that occupational doses are as low as reasonably achievable (ALARA) in accordance with the project ALARA program goals (TBD-0406) 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).

[MGR RD 3.1.B, 3.1.C, 3.1.G][10 CFR 63.111(a)(1), 63.111(b)(1), 63.112(e)(2), 63.112(e)(3)]

1.2.2.1.6 The system shall be designed for criticality safety under normal and accident conditions. Criticality safety analyses for accident conditions are based on two unlikely, independent, and concurrent or sequential changes occurring in the conditions essential to nuclear criticality safety. Safety limits for criticality are met with a calculated effective multiplication factor (k_{eff}) below 0.95 after allowance for the bias in the method of calculation and the uncertainty in the experiments used to validate the method of calculation.

[MGR RD 3.1.C, 3.1.G, 3.3.A][10 CFR 63.112(e)(6)]

1.2.2.1.7 The DC welding system/configuration shall be designed to prevent a burn-through into Zircaloy cladding/fuel within the DC.

1.2.2.2 Non-nuclear Safety Criteria

1.2.2.2.1 The system shall incorporate the use of noncombustible and heat resistant materials to the extent practical.

[MGR RD 3.1.G]

1.2.2.2.2 The system shall be designed such that all operations can be shut down promptly while maintaining control, enabling the evacuation of system operators during an emergency.

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

1.2.2.2.3 The system design shall define safe load paths for the movement of heavy loads to minimize the potential for drops and to increase the potential for the structure to withstand the impact.

[F 1.1.1, 1.1.2, 1.1.6, 1.1.9, 1.1.10][MGR RD 3.1.C, 3.1.G][10 CFR 63.111(a)(2), 63.112(e)(8)]

1.2.3 System Environmental Criteria

1.2.3.1 The system components shall be designed to withstand and operate in the temperature environment defined in Table 1 for the areas of the Waste Handling Building in which the system components are located.

Table 1. 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.

[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 2 for the areas of the Waste Handling Building in which the components are located.

Table 2. 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.

[MGR RD 3.3.A]

1.2.3.3 The system shall be designed such that components susceptible to radiation can withstand and operate in the radiation environment (TBD-0405) in which the component is located.

1.2.4 System Interfacing Criteria

1.2.4.1 The system shall provide system and component status and variables input to, and receive control output signals from the Monitored Geologic Repository Operations Monitoring and Control System.

1.2.4.2 The system shall receive electrical power from the Waste Handling Building Electrical System.

1.2.4.3 The system shall limit static and dynamic loads to the DCs and WPs to within their design limits.

[MGR RD 3.3.A]

1.2.4.4 The system shall receive space, protection, physical support, shielding, ventilation boundaries, and environmental boundaries from the Waste Handling Building System.

1.2.4.5 The system interfaces with the Waste Emplacement/Retrieval System for the placement of the WPs on and removal from the emplacement pallet and bed plate of the WP transporter. The removal function supports the Performance Confirmation Program.

[F 1.1.9, 1.1.10][MGR RD 3.2.J, 3.3.L]

1.2.4.6 The system interfaces with the Carrier/Cask Transport System used to deliver empty DCs to the to the WHB.

[F 1.1.1]

1.2.4.7 The system shall deliver and receive selected DCs and WPs to or from the Waste Package Remediation System.

[F 1.1.6, 1.1.10][MGR RD 3.2.J]

1.2.4.8 The system shall be designed in accordance with the interface agreements defined in "Interface Control Document for the Waste Packages/Disposal Containers and the Surface Repository Facilities and Systems for Mechanical, Envelope and Functional Interfaces."

1.2.4.9 The system shall accommodate a loaded, sealed waste package maximum surface dose rate of 1410 rad/hr.

1.2.4.10 The system shall accommodate a maximum WP thermal output of 11.8 kW.

1.2.4.11 The system shall interface with the material control and accounting subsystem to identify movement and specific location of individual DCs/WPs.

[F 1.1.11][MGR RD 3.1.C, 3.3.K][10 CFR 63.78]

1.2.4.12 The system shall provide used decontamination fluids and solids to the Site Generated Radiological Handling System.

[MGR RD 3.3.G]

1.2.4.13 The system shall interface with the WHB Ventilation System for release of gases vented from DCs.

1.2.5 Operational Criteria

1.2.5.1 The system shall include provisions for the maintenance, periodic inspection, testing, and decontamination of system equipment including recovery of remotely operated equipment.

[MGR RD 3.1.C, 3.1.G][10 CFR 63.112(e)(13)]

1.2.5.2 The inherent availability for the system shall be greater than 0.9430 (TBV-4655). |

[F 1.1.1, 1.1.2, 1.1.4, 1.1.5, 1.1.6, 1.1.7, 1.1.8, 1.1.9, 1.1.10][MGR RD 3.2.E, 3.3.A]

1.2.6 Codes and Standards

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

[MGR RD 3.1.E]

1.2.6.2 The system shall be constructed in accordance with the applicable sections of "Safety and Health Regulations for Construction" (29 CFR 1926).

[MGR RD 3.1.F]

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

1.2.6.4 Overhead and Gantry Cranes shall be designed in accordance with the applicable sections of "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)" (ASME NOG-1-1995).

[MGR RD 3.1.G, 3.3.A]

1.2.6.5 The system shall be designed in accordance with the applicable sections of "Design Requirements for Light Water Reactor Fuel Handling Systems" (ANSI/ANS 57.1-1992).

[MGR RD 3.3.A]

1.2.6.6 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 3.1.G]

1.2.6.7 The system structural, mechanical, and electrical design of top-running bridge and gantry-type multiple-girder electric overhead traveling cranes, if used, shall be in accordance with the applicable sections of "Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes" (CMAA-70-94).

[MGR RD 3.1.G]

1.2.6.8 The system shall be designed in accordance with the applicable sections of "Specification for Top Running & Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist" (CMAA-74-1994).

[MGR RD 3.1.G]

1.2.6.9 The system shall be designed in accordance with the applicable sections of "Design Objectives for Highly Radioactive Solid Material Handling and Storage Facilities in a Reprocessing Plant" (ANSI N305-1975).

[MGR RD 3.1.G]

1.2.6.10 The system shall be designed in accordance with the applicable sections of "American National Standard for Radioactive Materials - Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4,500 kg) or More" (ANSI N14.6-1993).

[MGR RD 3.1.G]

1.2.6.11 The system shall be designed in accordance with the applicable sections of "IEEE Guide for the Installation of Electrical Equipment to Minimize Electrical Noise Inputs to Controllers from External Sources" (IEEE Std 518-1982).

[MGR RD 3.3.A]

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

[MGR RD 3.3.A]

1.2.6.13 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]

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

[MGR RD 3.3.A]

1.2.6.15 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]

1.2.6.16 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 3.3.A]

1.2.6.17 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]

1.2.6.18 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]

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

[MGR RD 3.3.A]

1.2.6.20 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]

1.2.6.21 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]

1.2.6.22 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]

1.2.6.23 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]

1.3 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 Attachment II Section 1.1.5.1 of the "Engineering Files for Site Recommendation."

Empty DCs fabricated at a commercial supplier's facility are received by the system via the on-site rail transport system. The system receives and prepares the empty DC for loading, and delivers the empty DC to the ATS or CTS for loading. Once loaded, the system receives the DC from the ATS or CTS and performs inner and outer lid closure welding, examination, and heat-treating. A DC that does not meet the weld examination criteria is transferred to the Waste Package Remediation System (WPRS) for repair or corrective action. The system stages loaded DCs and WPs, loads the WP onto the WP transporter and transfers any DC/WP requiring remedial processing to the WPRS.

System functions begin with empty DC preparation, which includes unloading the DC from a rail carrier, tilting the DC upright, staging the DC and its closure lids, installing collars to lift and handle the DC, and configuring the DC for loading. The system operations include staging the DC lids at the weld stations, and transferring the DC to the ATS or CTS for loading. Once loaded, the DC is returned to the DC handling cell for welding as shown in Figure 1. A number of DC welding stations are provided to receive loaded DCs from the ATS or CTS lines. The welding and DC closure operations include mounting the DC on a turntable, removing lid seals, and installing and welding the lids. The weld process for each lid includes post-weld heat treating (except for the inner lid) and non-destructive examination (NDE). The DC becomes a WP following NDE and weld acceptance. Once accepted, the WP is either staged or transferred to a tilting station for transfer to the subsurface repository. At the tilting station, the WP is tilted to a horizontal orientation and transferred to the WP transporter-loading cell. WP transporter loading operations include a contamination survey, WP decontamination, if required, loading the WP onto a pallet, and transfer of the WP into the WP transporter.

The system is contained within the Waste Handling Building System which includes areas for empty DC preparation, welding stations, loaded DC and WP staging, WP transporter docking and loading, and required equipment maintenance areas. The areas operate concurrently to accommodate the DC/WP throughput rates and support system maintenance. The empty DC preparation area is located in an unshielded structure. The handling equipment in this area includes a bridge crane, tilting station, transfer carts, staging racks for lids, and

DC collars. The DC handling cell includes eight DC welding stations, a loaded DC and WP staging area, and a DC tilting station. A robotic welding gantry and turntable supports each welding station. The WP transporter loading cell includes equipment for WP transfer, lifting, inspection, and decontamination. Operations are performed by a remotely operated horizontal transfer cart, a horizontal lifting system, decontamination and inspection manipulators, and a decontamination system. All handling operations are supported by a suite of fixtures including yokes, lift beams, collars, and attachments. The remote equipment is designed to facilitate decontamination and maintenance, and interchangeable components are provided where appropriate. Lay-down areas are included as required for fixtures and tooling to support off normal and recovery operations. Semiautomatic, manual, and backup control methods support normal, maintenance, and recovery operations.

The system is completely enclosed and housed in the WHB. The WHB contains the system's equipment, facilities for radiation protection, and provides utility, maintenance, safety, as well as, heating ventilation and air-conditioning (HVAC) systems required for operation. The system interfaces with the ATS, the CTS, the WPRS, the Waste Emplacement/ Retrieval System (WERS), the WHB System and its support utilities, the WHB Electrical System, the MGR Operations Monitoring and Control System, the Safeguards and Security System, the WHB Ventilation System, and the Carrier/Cask Transport System (CCTS).

2.2 DESIGN ASSUMPTIONS

The principal assumptions that were used (in addition to the design criteria defined in Section 1) to develop the design concept and/or system design features are provided below. Bases for the assumptions have been obtained from Attachment II, Section 1.1.5.2.2 of the "Engineering Files for Site Recommendation."

2.2.1 The DC is equipped with standardized lifting and base collars for handling purposes.

2.2.2 An empty DC is fitted with a device to temporarily seal the inner lid of the DC, before and after fuel assembly loading, to prevent spread of contamination from the ATS to other systems.

2.2.3 Individual WPs will not provide any additional shielding for personnel protection.

2.2.4 The system provides a two-week in-process loaded DC/WP storage capacity to account for unavailability of the subsurface repository. The two-week period is based on a preliminary estimate of anticipated outages for the subsurface repository.

2.2.5 The DC handling cell is equipped with redundant cranes to support continuous system operating schedules during waste emplacement. Redundant cranes are considered prudent design contingencies against unplanned crane outages and extensive crane maintenance activities.

2.3 DETAILED DESIGN DESCRIPTION

The detailed design description provided below is based on Attachment II Sections 1.1.5.1, 1.1.5.3, and 1.1.5.4 of the "Engineering Files for Site Recommendation" and Section 6.2.1.4 of the "WHB/WTB Space Program Analysis for Site Recommendation." General arrangement figures providing details of system layout are presented in Attachment I of the "WHB/WTB Space Program Analysis for Site Recommendation."

The system includes a DC handling cell, loaded DC staging area, eight DC handling cell weld stations, a DC handling cell crane maintenance bay, DC handling cell air lock, an empty DC preparation area, a WP transporter loading cell, and WP transporter airlock. The areas operate concurrently to meet system throughputs and to support system maintenance.

The empty DC preparation area operations include unloading DCs from a rail carrier, tilting DCs for vertical handling, staging empty DCs and closure lids, outfitting the empty DC with lids and fixtures, transferring the empty DC to a DC cart, and transferring it through an airlock to the DC handling cell. The DC handling cell provides loaded DC staging capabilities, DC transfer carts connecting to the ATS, CTS, WPRS, and a DC tilting station. DC handling cell operations include staging DC lids at the weld stations and transferring the empty DCs to the ATS or CTS for loading.

The system receives loaded and temporarily sealed DCs, then transfers them to the loaded staging area or the DC welding stations. A loaded, closed, welded, inspected, and accepted DC is called a WP. DC handling operations are performed by two remotely operated bridge cranes and hoists, as well as other support equipment. The operations include positioning the DCs at the weld station, removing temporary sealing devices, purging the DC lid area with inert gases for welding, turning and welding the inner lid, evacuating DC internal gases, back-filling the DC with helium, installing the two outer lids, and welding the two outer lids. Each weld operation includes post-weld stress relief (except for the inner lid) and NDE. Following examination and weld certification, the WP is either staged or prepared for transfer to the subsurface.

The final DC handling sequence involves repositioning the WP to a horizontal orientation, transferring the WP to the transporter loading cell, remotely conducting final decontamination, final inspection, identification and recording the WP closure data, and loading the WP on the WP transporter. These operations are performed using one of two DC handling cell overhead cranes, a WP tilting station for changing the WP orientation, a horizontal DC transfer cart, a WP horizontal lifting machine, a remotely operated WP decontamination system, and the subsurface WP transporter. Once the WP is loaded onto the WP pallet and the DC handling collars are removed, the transporter operator will retract the rolling bed plate into the shielded transporter, undock the WP transporter from the transporter loading cell, and close the WP transporter shield doors prior to hauling the WP into the subsurface repository.

System equipment is designed to facilitate manual decontamination, maintenance, and component replacement, when feasible. All handling operations are supported by a variety of remote handling fixtures including DC lifting and base collars, lifting trunnions, lifting yokes, lifting beams, tilting fixtures, staging fixtures, and DC lid sealing devices. A crane maintenance bay is provided at the far end of the DC handling cell to allow for contact maintenance and inspection of the DC handling cell cranes.

A remotely controlled robotic gantry is used to setup, prepare, weld, inert, and inspect the DC closure operations. The robotic gantry and its associated equipment are remotely removed from the DC handling cell through a gantry airlock into a welder maintenance bay for service, maintenance, and retooling. Lay-down areas are included as required for lids, fixtures, welder, NDE, tooling, and robotic end-effectors to support normal, off normal, and recovery operations.

The system interfaces with the CCTS for receipt of empty DCs from commercial suppliers. The system interfaces with the ATS and CTS to deliver empty DCs and receive loaded DCs. The system interfaces with the WERS when the WP is loaded into the subsurface WP transporter. The system also interfaces with the WPRS for WP inspection or repair. The WHB interface provides the facility, utility, maintenance, safety, and auxiliary systems required for supporting operations and radiation protection activities.

2.3.1 System Arrangement

The system includes a wide variety of remotely operated equipment including overhead bridge cranes, transfer carts, electromechanical manipulators, and specialized hardware designed for high radiation and contamination work environments. Figure 1, provides a mechanical flow diagram for the operations of the system. For clarity, the flow diagram does not show the empty DC preparation area and airlock. The following subsections describe the operational steps in the diagram for the system areas in the WHB.

2.3.1.1 Empty DC Preparation Area

The system is configured so that empty DCs can be brought into the DC handling cell ready for handling and loading. This permits manual preparation of each DC prior to transfer into the DC handling cell. In this area, an empty DC will be received, inspected, fitted with handling collars, oriented in a vertical position, and prepared for loading by installing fuel assembly spacers (if required), inner lid and the inner lid sealing devices. The DC is then placed on the empty DC transfer cart in preparation for transfer into the DC handling cell. The empty DC preparation area provides adequate space for staging 20 empty DCs and their lids, handling collars, and inner lid sealing devices.

2.3.1.2 Empty DC Preparation Airlock

The airlock consists of a shielded room through which the empty DC is transferred into the DC handling cell. The purpose of the airlock is to prevent transfer of any contamination that may be present in the DC handling cell into the empty DC preparation area. The shield walls and doors at the airlock also provide radiation protection from radioactive sources inside the DC handling cell.

2.3.1.3 DC Handling Cell

The DC handling cell is a large shielded structure containing areas for welding stations, loaded DC staging, transfer cart operations, tilting the DC to a horizontal position, and maintenance of the overhead cranes. DC handling operations utilize two remotely operated bridge cranes and hoists, as well as other peripheral equipment. An empty DC is lifted using one of the DC handling cell cranes and is either staged or directly transferred to a DC transfer cart servicing either one of the two ATS lines or the CTS line. The inner and/or outer lids are staged near the weld stations for later installation. The empty DC is transferred into the ATS or the CTS for loading. When loaded, the DC is returned from either the ATS or the CTS and is taken to the staging area or one of eight welding stations. The DC is placed on a turntable, the inner and/or outer DC lids are installed, and the turntable is used to rotate the DC while the DC lids are welded, inspected, and heat-treated.

A DC handling cell crane will be used to lift and transfer a loaded DC to one of eight independent DC lid weld stations. The weld station operations include securing the DC to the weld station turntable, removing temporary sealing devices, purging the DC lid area with inert gases for welding, back-filling the DC with helium prior to closure, turning the DC, welding the inner lid, installing the two outer lids, and welding the two outer lids. Welding of the DC lids will be performed using automatic welders deployed from a robotic gantry system that can be remotely removed from the cell through the gantry airlock for retooling, testing, and adjustments. This feature eliminates the need for personnel to enter the DC handling cell. The robotic gantry is withdrawn into a welder service bay where a number of contact change-out and service operations can be performed. The welder service bay is directly adjacent to the DC handling cell.

Each weld operation includes NDE and post-weld stress relief (except the inner lid weld). Post-weld stress relief methods under study include induction heating and laser shock hardening (peening). Following examination and weld certification, the WP is either staged or prepared for transfer to the subsurface. A completed WP is moved to either the loaded DC staging area or the WP tilting area where the WP is rotated to a horizontal position onto the WP horizontal transfer cart. This cart transfers the WP to the transporter loading cell. If an irreparable weld failure is detected, the DC is taken to another DC cart for transfer to the WPRS.

2.3.1.4 Loaded DC Staging Area

Waste handling simulations have shown that a two-week interruption in subsurface emplacement operations can be accommodated by staging 20 loaded DCs or WPs in the DC handling cell. The loaded DC staging area is used to stage loaded DCs or WPs waiting transfer to the WP transporter loading cell.

To reduce radiation levels in the crane maintenance bay and DC handling cell, loaded DCs will be staged in a separate area inside the DC handling cell with partial walls and an access door to facilitate DC transfers to and from staging locations. The partial walls will provide shadow shielding for the main portion of the cell and the maintenance bay. The design configuration incorporates both distance and shielding by isolating radiation sources to one area of the hot cell and by adding a wall separating the staged DCs and WPs from the welding, handling, and crane maintenance areas. This will significantly reduce radiation doses to equipment during normal operation, and radiation levels during manned entry into the cell for periodic maintenance and test operations.

2.3.1.5 WP Transporter Loading Cell

The last set of operations involve transferring the WP to a decontamination and WP transporter loading cell where final decontamination, final inspection, certification, data recording, and WP loading on the WP transporter occurs. These operations are performed using a horizontal transfer cart, a WP horizontal-lifting machine, a decontamination system, and the subsurface WP transporter. Only one line is available for the final decontamination, inspection, WP transfer, and loading onto the WP transporter. Once the WP is loaded onto the WP pallet, the transporter operator will retract the pallet and rolling bed plate into the shielded transporter, close the transporter shield doors, and undock the WP transporter from the airlock dock prior to hauling the WP into the subsurface repository.

The WP is lifted off the horizontal transfer cart using the collars and the horizontal-lifting machine. While suspended, the WP is decontaminated, inspected, certified, and identified. The WP pallet and rolling bed plate is transferred into the WP transporter loading cell and the WP is lowered onto the pallet. The collars will be remotely removed and taken out of the cell for reuse. Any contamination picked up during DC loading will be manually removed prior to reuse of the collars in the empty DC preparation area. The final operation occurs when the WP is pulled into the WP transporter to be taken into the subsurface repository.

2.3.1.6 Waste Package Transporter Airlock

The function of this cell is to provide an airlock where the WP transporter may be docked for loading. The airlock prevents movement of air between the WP transporter loading cell and the outside atmosphere.

2.3.1.7 Welder Airlocks

The function of these airlocks (one room for each of the eight welders) is to provide access to the robotic welding gantry, welder, NDE equipment, and post-weld heat treating equipment. Access and service work on the equipment is possible in these rooms without exposing the workers to the internal environment and radiation in the DC handling cell.

2.3.1.8 Welder Maintenance Bay

The welder maintenance bay (not shown in Figure 1) is provided as an area where equipment change-out, repair, replacements, and testing may be performed on any robotic welding gantry, welder, NDE equipment, and post-weld heat treating equipment that has been removed from the DC handling cell. Prompt maintenance and repair of failed or malfunctioning equipment is required to support a 24-hour per day operation 50-weeks per year.

2.4 COMPONENT DESCRIPTION

This information will be provided in a future issue.

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.

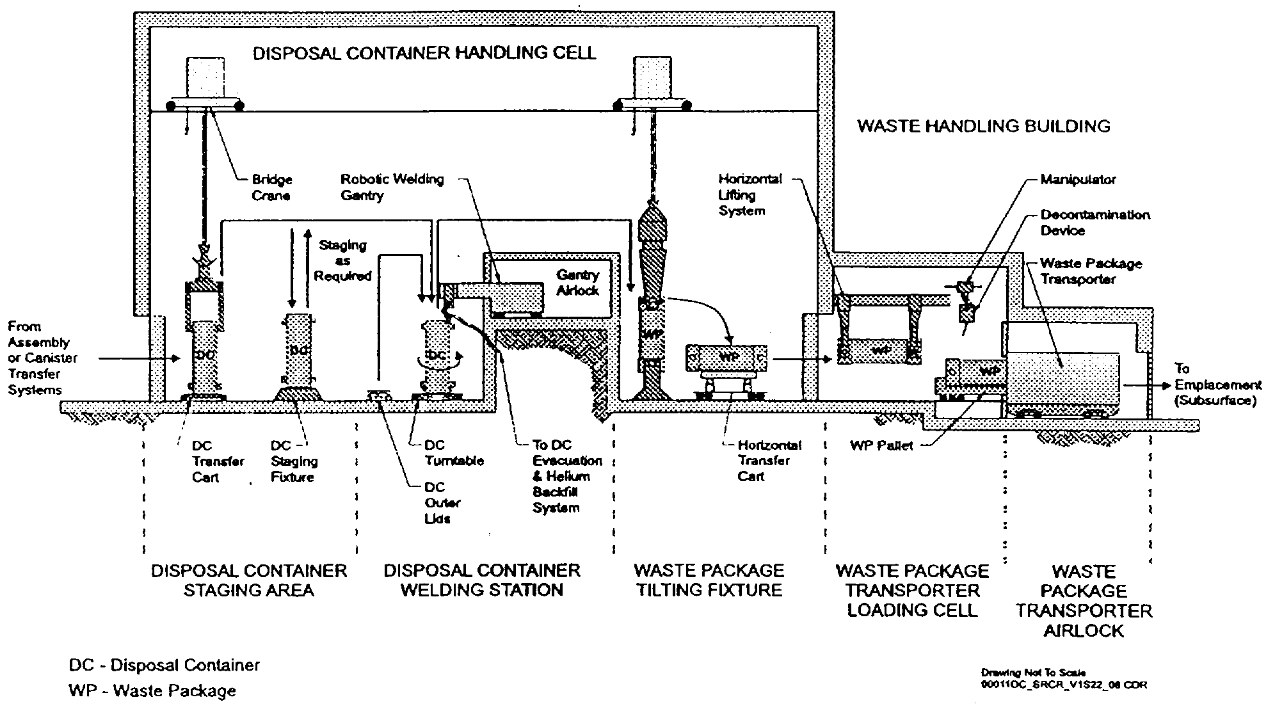

Figure 1. Disposal Container Handling System

3. SYSTEM OPERATIONS

This section will be completed in a later revision.

4. SYSTEM MAINTENANCE

This section will be completed in a later 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.

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 the system supports the waste handling operations at the repository as required by MGR RD 3.2.C. Additional system operating life that may be needed to support performance confirmation or retrieval operations conducted after cessation of waste emplacement operations is not covered by this criterion. To meet the operational life requirement, system components may require replacement in addition to any required preventive maintenance program.

II. Criterion Performance Parameter Basis

MGR RD 3.2.C requires the Monitored Geologic Repository (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. This table 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 plant life extensions, a 25 percent margin is added, bringing the required operational life of the system to 40 years.

1.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion defines the system required throughput for the system on an annual average basis and on a peak monthly surge capacity basis. This criterion supports MGR RD 3.2.C, 3.2.D, and 3.2.E.

II. Criterion Performance Parameter Basis

These values were obtained from data available in the "Monitored Geologic Repository Project Description Document," sections 5.1.4 and 5.2.

The annual value was obtained by first determining the average WP loading. The controlling WP package loading is about 5.95 and came from dividing 70,000 MTU (Metric Tones of Uranium) for Table 5-5 by the 11770 WPs found by adding the Quantity of each type WP.

It was then determined that the Maximum annual throughput was 3325 MTU. This came from reviewing tables 5-1, 2, and 3. Table 5-3 had this highest value and it was for years 2014 through 2022.

Annual throughput is then 3325 MTU/year divided by 5.95 MTU/WP yielding about 559 WPs per year.

The peak monthly surge capacity is then obtained by dividing the annual average throughput by 10 to obtain 56 WPs per month. The dividend of 10 was used give a surge capacity of about 20% over the average and will account for facility outages and for handling non throughput items like Recovered WP and sending DC/WPs to the Remediation system.

1.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies subsystem design criteria for expected Site Receipt Inspection capabilities of the empty DC preparation subsystem that may be used to establish a WP baseline condition for future performance confirmation activities.

II. Criterion Performance Parameter Basis

N/A

1.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies system activities required to support DC closure.

II. Criterion Performance Parameter Basis

N/A

1.2.1.5 Criterion Basis Statement

I. Criterion Need Basis

This requirement is intended to preserve the waste form condition and configuration by minimizing its corrosion due to interaction with oxygen or as a result of hydrogen embrittlement and is performed after the inner lid is welded. This criterion supports 10 CFR 63.113(b) and MGR RD 3.1.C.

II. Criterion Performance Parameter Basis

The value of 0.25 volume percent for assembly vacuum drying came from the "Standard Review Plan for Dry Cask Storage Systems" (p. 8-4). This value needs to be verified for long-term disposal and has been identified with a TBV.

1.2.1.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion provides for the tracking of all DC/WPs handled by the system. This criterion supports MGR RD 3.3.K to maintain nuclear inventories and support safeguards and security activities. This requirement supports MGR RD 3.1.D 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

1.2.1.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports the system's ability to handle WPs and to accommodate unplanned shutdowns of the subsurface repository or Waste Emplacement/Retrieval System. This criterion supports MGR RD 3.2.C and 3.2.E.

II. Criterion Performance Parameter Basis

The analysis to define the storage periods and DC and WP quantities has not been performed. This criterion has been identified with a TBD.

1.2.1.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.1.B and 3.1.C. This criterion reduces the spread of radioactive contamination and supports radiological safety for personnel as defined in "Standards for Protection Against Radiation" (10 CFR 20) as required by 10 CFR 63.111(a)(1). This criterion defines a final level of decontamination prior to delivery to the Waste Emplacement/Retrieval System.

II. Criterion Performance Parameter Basis

The actual parameters to be evaluated have not been confirmed. As a result, this criterion is identified with a TBD. Future analysis will resolve this parameter.

1.2.1.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion identified subsystem design criteria for lag storage of DCs in the event the supply mechanism is interrupted or terminated for some reason.

II. Criterion Performance Parameter Basis

The lag storage capacity needed has not been determined and is identified as a TBD.

1.2.1.10 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the requirement to control pressure as need during lid placement and welding operations.

II. Criterion Performance Parameter Basis

N/A

1.2.1.11 Criterion Basis Statement

I. Criterion Need Basis

This criterion identified the need for a DC Handling Cell Subsystem design criterion to prepare the DC lid weld surfaces to ensure that the lid welds can be completed successfully.

II. Criterion Performance Parameter Basis

N/A

1.2.1.12 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies the specific code requirements for conducting the DC lid welds and supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.1.13 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies the basic code for conducting the DC lid weld inspections and supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.1.14 Criterion Basis Statement

I. Criterion Need Basis

MGR RD 3.1.C requires compliance with 10 CFR 63. This criterion establishes the requirement for the system to incorporate features that facilitate decontamination and decommissioning. This criterion is based on 10 CFR 63.21(c)(17) which requires the content of the license application to include a safety analysis report with "A description of design considerations that are intended to facilitate permanent closure and decontamination or dismantlement of surface facilities."

II. Criterion Performance Parameter Basis

N/A

1.2.1.15 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to support MGR RD 3.3.L after the initial 125-year life. This criterion establishes the additional length of time these functions may be asked to support Performance Confirmation operations until closure. These functions must continue operations until repository closure, as required by MGR RD 3.1.C, 10 CFR 63.111(d), 63.131(b), and 63.134(d).

II. Criterion Performance Parameter Basis

The 300-year time period is taken directly from MGR RD 3.2.H.

1.2.1.16 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies subsystem design criteria for the preparation for loading process for the empty DC preparation subsystem.

II. Criterion Performance Parameter Basis

N/A

1.2.1.17 Criterion Basis Statement

I. Criterion Need Basis

This criterion is based on the concern that additional heat input from the welding and stress relief operations could result in temperature of the cladding reaching unacceptable levels. The basis for this criterion is MGR RD 3.2.L that states the requirement for zircaloy cladding and it supports 10 CFR 63.113(b).

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is derived from MGR RD 3.1.C, 10 CFR 63.111(a)(2), 63.111(b)(2), and 63.112(e)(8) to mitigate the effects from design basis events and ensure the SSCs important to safety will perform their necessary safety functions. The drop and breach of a loaded and sealed DC is the bounding consequence Category 2 event for the system, as identified in Table 8 of the "Preliminary Selection of MGR Design Basis Events." This criterion provides requirements for the DC handling SSCs to ensure that the drop and breach of a sealed DC is a Beyond Design Basis Event (BDBE) scenario. This criterion is consistent with ALARA objectives and provides a safety margin for establishing compliance with annual dose limits for Category 1 design basis events.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

The criterion is derived from MGR RD 3.1.C, 3.3.A, and 10 CFR 63.112(e)(8) to mitigate the effects from design basis events and ensure that SSCs important to safety will perform their necessary safety functions. This criterion reduces the probability of design basis events due to loss of power. The need to retain the load during power loss is identified in "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS 57.9-1992, p. 13, paragraph 6.2.1.1.5).

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion is derived from MGR RD 3.1.B, 3.1.C, 10 CFR 63.111(a)(1), 63.111(a)(2), 63.112(e)(8), and 10 CFR 20 to mitigate the effects from design basis events. This criterion minimizes radiological releases that result from seismic events to control off-site doses.

II. Criterion Performance Parameter Basis

Analysis will be performed to verify that a Frequency Category 1 event is applicable.

1.2.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion is derived from MGR RD 3.1.B, 3.1.C, 10 CFR 63.111(a)(1), 63.111(a)(2), 63.111(b)(2), 63.112(e)(8), and 10 CFR 20 to mitigate the effects from design basis events.

This criterion was identified by specific guidance specified in "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance statements 6.3g1, 6.4g1, and 6.4g5.

II. Criterion Performance Parameter Basis

Analysis will be performed to verify that a Frequency Category 2 event is applicable.

1.2.2.1.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion implements the requirements from MGR RD 3.1.B for the identification of "Standards for Protection Against Radiation" (10 CFR 20), MGR RD 3.1.C for the identification of 10 CFR 63.111(a)(1) and 10 CFR 63.112(e)(2), 63.112(e)(3), and MGR RD 3.1.G for the need to address radiological health and safety. This criterion is also supported by specific guidance contained in the "MGR Compliance Program Guidance

Package for the Disposal Container Handling System," Guidance Statements 6.5g1 and 6.6g1.

The primary requirement for ALARA is contained in 10 CFR 20.1101(b), which 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 address ALARA and is acceptable to the NRC. 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 following the 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."

II. Criterion Performance Parameter Basis

The project ALARA program goals are TBD.

1.2.2.1.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports criticality control for the system. This criterion is derived from MGR RD 3.1.C, 3.1.G, 3.3.A, and 10 CFR 63.112(e)(6). The need for criticality control is identified in "Preliminary Selection of MGR Design Basis Events" (Section 6.2.5.12).

II. Criterion Performance Parameter Basis

The performance parameters for this requirement are taken from the "Standard Review Plan for Dry Cask Storage Systems" (NUREG-1536, Sections IV.1 and IV.2, p. 6-1).

1.2.2.1.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to ensure that a welding burn-through into the DC is not a credible design basis event and thus can not damage the fuel cladding. It is assumed that standard design solutions exist to ensure that the event frequency for a welding burn-through that damages the waste form may be shown by analysis to be less than 10E-6 per year (i.e., beyond design basis event).

II. Criterion Performance Parameter Basis

N/A

1.2.2.2.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.1.G for fire safety requirements derived from NRC regulatory guides. The subject criterion is specifically identified in "General Fire Protection Guide for Fuel Reprocessing Plants" (Regulatory Guide 3.38, Sections C.2a and C.4a).

II. Criterion Performance Parameter Basis

N/A

1.2.2.2.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports 10 CFR 63.112(e)(10) and MGR RD 3.1.C, which requires permitting "...prompt termination of operations and evacuation of personnel during and emergency."

II. Criterion Performance Parameter Basis

N/A

1.2.2.2.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.1.C, 3.1.G, 10 CFR 63.111(a)(2), and 63.112(e)(8) for the identification of applicable criteria to reduce the potential for design basis events. Specifically, this criterion reduces the potential effects of dropping DC/WPs. This criterion was identified by specific guidance contained in the "MGR Compliance

Program Guidance Package for the Disposal Container Handling System," Guidance Statement 6.8g1.

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 environments 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 considered to be TBD.

1.2.3.3 Criterion Basis Statement

I. Criterion Need Basis

Radiation from radioactive sources can affect components. Accumulated doses of radiation (also referred to as Total Integrated Dose) can cause premature failure of components.

Components that will be installed in radiation environments should be evaluated for the radiation doses that they can receive.

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.

II. Criterion Performance Parameter Basis

The radiation environment is a TBD.

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 also supports the interface ability to provide communications and control of MGR RD 3.3.K with this waste handling system.

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 external interfacing MGR systems. Specifically, this criterion identifies interfaces with facility power.

II. Criterion Performance Parameter Basis

Future interface analysis will be performed to establish bounding design parameters for this interface criterion. The power requirement to support operations of the system equipment and components will be included in future revisions of this document.

1.2.4.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion supports MGR RD 3.3.A for engineering principles and practices. This criterion is needed to ensure that the system is compatible with DCs/WPs. Specifically, this criterion identifies interfaces with system equipment for static and dynamic loads.

II. Criterion Performance Parameter Basis

N/A

1.2.4.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the need to house the system components in the WHB while providing protection, support structures, shielding, and ventilation boundaries.

II. Criterion Performance Parameter Basis

N/A

1.2.4.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with external interfacing MGR systems. Specifically, this criterion identifies interfaces with system equipment for transferring WPs to and from the Waste Emplacement/Retrieval System. This criterion supports MGR RD 3.2.J and 3.3.L.

II. Criterion Performance Parameter Basis

N/A

1.2.4.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with external interfacing MGR systems. Specifically, this criterion identifies interfaces with Carrier Cask Transport System equipment for receiving DCs on site.

II. Criterion Performance Parameter Basis

N/A

1.2.4.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with external interfacing MGR systems. Specifically, this criterion identifies interfaces with system equipment for transferring DCs and WPs to the Waste Package Remediation System. This criterion supports MGR RD 3.2.J.

II. Criterion Performance Parameter Basis

N/A

1.2.4.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with external interfacing MGR systems. Specifically, this criterion identifies interfaces with DCs and WPs.

II. Criterion Performance Parameter Basis

N/A

1.2.4.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion defines bounding characteristics of loaded DCs the system will have to receive from the ATS and CTS lines in support of the MGR mission.

II. Criterion Performance Parameter Basis

The maximum Surface Dose Rate was obtained from Table 25 of "Dose Rate Calculation for the 44-BWR UCF Waste Package."

1.2.4.10 Criterion Basis Statement

I. Criterion Need Basis

The maximum thermal output is needed to ensure that the heat output of 11.8 kW is accounted for in the system.

II. Criterion Performance Parameter Basis

The maximum thermal output is obtained from "Monitored Geological Repository Project Description Document" (Section 5.2.13).

1.2.4.11 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure that the system is compatible with the material control and accounting subsystem and supports MGR RD 3.1.C, 3.3.K, and 10 CFR 63.78.

II. Criterion Performance Parameter Basis

N/A

1.2.4.12 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to ensure that contaminated materials used to clean up WPs prior to release are properly disposed of. This criterion supports MGR RD 3.3.G which LLW to be collected and packaged for transport.

II. Criterion Performance Parameter Basis

N/A

1.2.4.13 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to ensure that contaminated gaseous materials received from DCs are collected and sent to the Ventilation System allowing particulate removal.

II. Criterion Performance Parameter Basis

N/A

1.2.5.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion implements applicable regulatory guidance from MGR RD 3.1.C, 3.1.G, and 10 CFR 63.112(e)(13) for maintenance, periodic inspection, testing, and decontamination of system equipment. This criterion also addresses the recovery of remotely operated equipment located in radiation environments. This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance Statements 6.3g3 and 6.4g3.

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.E and 3.3.A.

II. Criterion Performance Parameter Basis

The availability number and the basis are described in "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 supports MGR RD 3.1.E for the identification of applicable codes of federal regulations. This criterion requires that system safety criteria be considered in the design of the repository in accordance with "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 supports MGR RD 3.1.F for the identification of applicable codes of federal regulations. This criterion requires that system safety criteria be considered in the construction of the repository in accordance with "Safety and Health Regulations for Construction" (29 CFR 1926).

II. Criterion Performance Parameter Basis

N/A

1.2.6.3 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

1.2.6.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards derived from NUREGs and Regulatory Guides and supports the requirements of MGR RD 3.3.A and 3.1.G. This criterion requires the design of equipment to be in accordance with "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)" (ASME NOG-1-1995). This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance Statement 7.14g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards derived from NUREGs and Regulatory Guides and supports the requirements of MGR RD 3.1.G. This criterion requires the design of equipment to be in accordance with "Design Requirements for Light Water Reactor Fuel Handling Systems" (ANSI/ANS-57.1-1992). This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance Statement 7.3g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards derived from NUREGs and Regulatory Guides and supports the requirements of MGR RD 3.1.G. This criterion requires the design of equipment to be in accordance with "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992). This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance Statement 7.4g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards derived from NUREGs and Regulatory Guides and supports the requirements of MGR RD 3.1.G. This criterion requires the design of equipment to be in accordance with "Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes" (CMAA-70-94). This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance Statement 7.1g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards derived from NUREGs and Regulatory Guides and supports the requirements of MGR RD 3.1.G. This criterion requires the design of equipment to be in accordance with "Specification for Top Running and Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist" (CMAA-74-1994). This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance Statement 7.2g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards derived from NUREGs and Regulatory Guides and supports the requirements of MGR RD 3.1.G. This criterion requires the design of equipment to be in accordance with "Design Objectives for Highly Radioactive Solid Material Handling and Storage Facilities in a Reprocessing Plant" (ANSI N305-1975). This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance Statement 7.7g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.10 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies applicable codes and standards derived from NUREGs and Regulatory Guides and supports the requirements of MGR RD 3.1.G. This criterion requires the design of equipment to be in accordance with "American National Standard for Radioactive Materials - Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4,500 Kg) or More" (ANSI N14.6-1993). This criterion was identified by specific guidance contained in the "MGR Compliance Program Guidance Package for the Disposal Container Handling System," Guidance Statement 7.6g1.

II. Criterion Performance Parameter Basis

N/A

1.2.6.11 Criterion Basis Statement

I. Criterion Need Basis

This criterion ensures that the design complies with "IEEE Guide for the Installation of Electrical Equipment to Minimize Electrical Noise Inputs to Controllers from External Sources" (IEEE Std 518-1982), which supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.12 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 "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 U.S. Department of Energy (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

1.2.6.13 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

1.2.6.14 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 "Human-System Interface Design Review Guideline" (NUREG 0700), 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 3.3.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

1.2.6.15 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 (i.e., "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

1.2.6.16 Criterion Basis Statement

I. Criterion Need Basis

In support of MGR RD 3.3.A, 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, "Accessible and Usable Buildings and Facilities" (CABO/ANSI A117.1-1992) also 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

II. Criterion Performance Parameter Basis

N/A

1.2.6.17 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) 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

1.2.6.18 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) 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

1.2.6.19 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

1.2.6.20 Criterion Basis Statement

I. Criterion Need Basis

This criterion responds to MGR RD 3.3.A which recommends compliance with industry codes and standards. "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

1.2.6.21 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

1.2.6.22 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

1.2.6.23 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

APPENDIX B ARCHITECTURE AND CLASSIFICATION

The system architecture and QA classification are identified in Table 3. The QA classifications are established in Table 1 of "Classification of the Disposal Container Handling System." Definitions of the QA classifications may be found in QAP-2-3, "Classification of Permanent Items."

Table 3. System Architecture and QA Classification

Disposal Container Handling System (DCH)	QL-1	QL-2	QL-3	CQ
Control and Tracking System		X		
DC Handling System				
DC Cell Bridge Crane		X		
DC Staging Fixtures				X
Lifting Fixtures		X		
DC Weld/Inspection Systems				
DC Inerting System		X		
DC Lid Weld System				X
DC Weld Inspection System				X
DC Weld Station Jib Crane		X		
DC Weld Station Turntable				X
Empty DC Preparation System				X
WP Emplacement Preparation System				
WP Decontamination System		X		
WP Horizontal Lifting System		X		
WP Horizontal Transfer Cart				X
WP Tilting Fixture				X

APPENDIX C ACRONYMS, SYMBOLS, AND UNITS

C.1 ACRONYMS

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

ALARA	as low as reasonably achievable
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ATS	Assembly Transfer System
CCTS	Carrier/Cask Transport System
CQ	conventional quality
CSNF	Commercial spent nuclear fuel
CTS	Canister Transfer System
DC	disposal container
DOE	U S Department of Energy
DPC	Dual Purpose Canister
F	Function
HFE	human factors engineering
HVAC	heating, ventilation, and air conditioning
MGR	Monitored Geologic Repository
MGR RD	Monitored Geologic Repository Requirements Document
MTU	Metric Tones of Uranium
N/A	not applicable
NDE	non-destructive examination
NRC	U.S. Nuclear Regulatory Commission
QA	quality assurance
QL	quality level
SDD	System Description Document
SSCs	structures, systems, and components
TBD	to be determined
TBV	to be verified
WERS	Waste Emplacement/Retrieval System
WHB	Waste Handling Building
WP	waste package
WPRS	Waste Package Remediation System

C.2 SYMBOLS AND UNITS

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

%	Percent	cm	centimeters
cm^2	square centimeters	CO	carbon monoxide
CO_2	carbon dioxide	dpm	disintegration per minute
°F	Fahrenheit	H_2	hydrogen
H_2O	water	k_{eff}	Effective neutron multiplier factor
kW	kilowatt	O_2	oxygen
hr	hour	rad	Unit of absorbed radiation dose

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.

D.1 Criterion 1.2.1.5 requires that this system backfill the disposal containers with inert gas until the combined concentration of O_2, H_2, H_2O, CO_2, and CO is less than or equal to 0.25 volume percent. The following issues regarding this criterion need to be addressed in a future revision of this SDD:

1) Specify the maximum pressure that the disposal container can be pressurized to and provide justification by analysis (TBV-0094) that the percent by volume of the "undesired" gases is appropriate for the specified maximum pressure.

2) The specified maximum pressure should consider expansion of the gas volume inside the disposal container and the subsequent increase in the internal pressure of the disposal container.

3) Criterion 1.2.1.5 should be broken into several criteria that are better defined.

APPENDIX E REFERENCES

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

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