


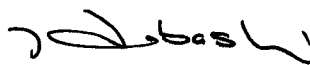
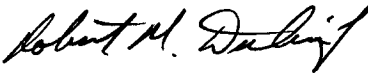
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM DESCRIPTION DOCUMENT COVER SHEET

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2. SDD Title
Waste Handling Building Fire Protection System Description Document

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**OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
SYSTEM DESCRIPTION DOCUMENT REVISION HISTORY**

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1. SDD Title

Waste Handling Building Fire Protection System Description Document

2. Document Identifier (Including Rev. No. and Change No., if applicable)

SDD-HBF-SE-000001 REV 01 ICN 1

3. Revision

4. Description of Revision

00

Initial issue as BCB000000-01717-1705-00028 Rev. 00, Waste Handling Building Fire Protection System Description Document.

01

This is a general revision and includes updating the SDD format to current procedural format requirements. This document supercedes BCB000000-01717-1705-00028 Rev. 00, Waste Handling Building Fire Protection System Description Document.

01 ICN 1

This ICN to the document deletes the contents of section 1.4, adds Section 2 to the document, revises the basis for 1.2.3.2 and 1.2.3.3, removes TBV-457 from Appendix B and TBV-3855, updates previous references, and makes other changes as marked.

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SUMMARY

The Waste Handling Building Fire Protection System provides the capability to detect, control, and extinguish fires and/or mitigate explosions throughout the Waste Handling Building (WHB).

Fire protection includes appropriate water-based and non-water-based suppression, as appropriate, and includes the distribution and delivery systems for the fire suppression agents. The Waste Handling Building Fire Protection System includes fire or explosion detection panel(s) controlling various detectors, system actuation, annunciators, equipment controls, and signal outputs.

The system interfaces with the Waste Handling Building System for mounting of fire protection equipment and components, location of fire suppression equipment, suppression agent runoff, and locating fire rated barriers. The system interfaces with the Waste Handling Building System for adequate drainage and removal capabilities of liquid runoff resulting from fire protection discharges. The system interfaces with the Waste Handling Building Electrical Distribution System for power to operate, and with the Site Fire Protection System for fire protection water supply to automatic sprinklers, standpipes, and hose stations. The system interfaces with the Site Fire Protection System for fire signal transmission outside the WHB as needed to respond to a fire emergency, and with the Waste Handling Building Ventilation System to detect smoke and fire in specific areas, to protect building high-efficiency particulate air (HEPA) filters, and to control portions of the Waste Handling Building Ventilation System for smoke management and manual override capability. The system interfaces with the Monitored Geologic Repository (MGR) Operations Monitoring and Control System for annunciation, and condition status.

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 requirements for the system are identified in the following sections. Throughout this document the term "system" shall be used to indicate the Waste Handling Building Fire Protection System. The system architecture and classification are presented in Appendix B.

1.1 SYSTEM FUNCTIONS

- 1.1.1** The system distributes and delivers fire suppressants (includes water and other agents) within the WHB.
- 1.1.2** The system provides the means to control the propagation, and extinguish WHB fires.
- 1.1.3** The system provides the means for prompt detection and annunciation of WHB fires.
- 1.1.4** Reserved
- 1.1.5** The system provides the means to detect, control, and suppress credible WHB explosion hazards.
- 1.1.6** The system provides occupant notification of WHB fire emergency/evacuation conditions.
- 1.1.7** The system provides fire protection signals.
- 1.1.8** The system completes fire barriers where penetrations exist.

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 provide an effective level of fire protection or explosion mitigation based on the fire/explosion hazards and occupancy classification as identified in the WHB fire hazards analysis (FHA).

[F 1.1.1, 1.1.5][MGR RD 3.1.G]

- 1.2.1.2** The system shall provide automatic fire suppression in facilities that have a ground floor area in excess of 5,000 square feet, or where the maximum fire loss exceeds \$1 million.

NOTE: Other circumstances where the maximum possible fire loss is less than \$1 million or the facility has a ground floor area less than 5,000 square feet may warrant the use of automatic fire suppression (e.g., required for protection of human life, high public visibility and sensitivity).

[F 1.1.1, 1.1.2, 1.1.3, 1.1.5][MGR RD 3.1.G]

- 1.2.1.3** The system shall provide redundant fire protection in areas where the maximum possible fire loss exceeds \$50 million.

[F 1.1.1, 1.1.2, 1.1.3, 1.1.5][MGR RD 3.1.G]

- 1.2.1.4** The system shall be designed to be self-reliant in providing adequate fire protection (that is, so as not to rely on off-site (non-MGR) fire response organizations for adequate fire protection).

[F 1.1.1, 1.1.2, 1.1.3, 1.1.5][MGR RD 3.3.A]

- 1.2.1.5** The system shall have an operational life of 40 years.

[F 1.1.1][MGR RD 3.2.C]

- 1.2.1.6** The system shall provide penetration seal designs that meet the fire barrier rating of the applicable fire barrier.

[F 1.1.8][MGR RD 3.3.A]

1.2.2 Safety Criteria**1.2.2.1 Nuclear Safety Criteria**

- 1.2.2.1.1** The system shall provide primary and backup fire suppression capability where redundant QL-1 structures, systems, and components (SSCs) are vulnerable to common fire.

[F 1.1.1, 1.1.2, 1.1.3][MGR RD 3.1.G]

- 1.2.2.1.2** The system shall be designed so that the effects of credible fires and explosions do not spread to multiple WHB fire areas.

[MGR RD 3.1.G]

- 1.2.2.1.3** The system shall be designed so actuation or failure of fire protection SSCs will not cause adverse effects to WHB QL-1 SSCs (i.e., cause them to become disabled) and maintain operation subcritical during credible events.

[F 1.1.1, 1.1.2, 1.1.3, 1.1.5][MGR RD 3.1.C, 3.1.G][10 CFR 63.112(e)(6)]

- 1.2.2.1.4** The system shall be designed so that the failure of any one component (equipment or control device) will not disable the entire WHB fire protection system.

[MGR RD 3.1.G]

1.2.2.2 Non-nuclear Safety Criteria

- 1.2.2.2.1** The system shall provide local visual and audible alarms and alarm and trouble annunciation in the Central Control Room.

[F 1.1.3, 1.1.5, 1.1.6][MGR RD 3.1.G]

- 1.2.2.2.2** The system shall provide manual alarm stations in accessible locations within WHB fire areas or other approved subdivisions.

[F 1.1.3, 1.1.6][MGR RD 3.1.G]

- 1.2.2.2.3** The system shall ensure WHB fire-fighting equipment is plainly marked, easily accessible, and conspicuously located.

[F 1.1.2, 1.1.3][MGR RD 3.1.G]

- 1.2.2.2.4** Fire protection system and components shall not be susceptible to loss of primary power.

[F 1.1.3, 1.1.5, 1.1.6][MGR RD 3.3.A]

1.2.3 System Environmental Criteria

- 1.2.3.1** 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.

[MGR RD 3.3.A]

- 1.2.3.2** The system components shall be designed to withstand and operate in the temperature environment defined in Table 1 for the areas of the WHB 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)	78 - 70°F	(TBD-395) °F for (TBD-395) Hours
Normally Unoccupied Areas (e.g., Mechanical & Electrical Equipment Rooms, Cask Receiving & Handling Areas, Pool Areas)	92 - 63°F	(TBD-395) °F for (TBD-395) Hours
Unoccupied Areas (e.g., Assembly Cells, Canister Transfer Cells, DC Handling Cells, Emergency Generator Room)	106 - 63°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)	74 - 70°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. For these components, cooling would be provided for the electronic components, but not necessarily the entire area.

[MGR RD 3.3.A]

- 1.2.3.3 The system components shall be designed to withstand and operate in the humidity environment defined in Table 2 for the areas of WHB 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]

1.2.4 System Interface Criteria

- 1.2.4.1 The system shall interface with the Waste Handling Building Ventilation System to provide control of airborne combustion products, airborne fire suppression agents, explosive gases, and for fire damper design.

[F 1.1.1, 1.1.2, 1.1.3, 1.1.5]

- 1.2.4.2** The system shall interface with the Waste Handling Building Ventilation System to ensure WHB airflow conditions are considered for proper fire detection design and for support of radiological confinement requirements.
[F 1.1.1, 1.1.2, 1.1.3]
- 1.2.4.3** The system shall provide signals for fire detection, fire alarm, fire suppression components, and loss of system supervision using negotiated signal protocol to the MGR Operations Monitoring and Control System.
[F 1.1.2, 1.1.3, 1.1.5, 1.1.6, 1.1.7][MGR RD 3.1.G]
- 1.2.4.4** The system shall interface with the Waste Handling Building Ventilation System for fire suppression and protection of the HEPA filter assemblies.
[F 1.1.3]
- 1.2.4.5** The system shall receive normal and standby electrical power for the fire control panels from the Waste Handling Building Electrical System.
[F 1.1.2, 1.1.3, 1.1.5, 1.1.6]
- 1.2.4.6** The system shall receive its fire protection water supply at the required flow rates, pressures, and duration from the Site Fire Protection System.
[F 1.1.1, 1.1.5]
- 1.2.4.7** The system shall interface with the Waste Handling Building System for adequate drainage and control of both non-contaminated and potential radiologically contaminated fire protection water runoff.
[F 1.1.1]
- 1.2.4.8** The system shall interface with the Waste Handling Building System for the location and design of fire barriers (e.g., fire boundaries, penetration seals, etc.) and for support of radiological confinement zones.
- 1.2.4.9** The system shall provide signals for fire detection, fire alarm, fire suppression components, and loss of system supervision using negotiated signal protocol to the Site Fire Protection System.
[F 1.1.2, 1.1.3, 1.1.6, 1.1.7][MGR RD 3.1.G]
- 1.2.5 Operational Criteria**
- 1.2.5.1** The system shall be designed so that areas with primary or backup fire suppression (e.g., automatic sprinkler with a standpipe and hose stations as backup) will be available during system maintenance or repairs.
[MGR RD 3.3.A]

1.2.6 Code and Standards Criteria

- 1.2.6.1** The system shall comply with the applicable provisions of "Occupational Safety and Health Standards" (29 CFR 1910).

[MGR RD 3.1.E]

- 1.2.6.2** The system shall comply with the applicable provisions 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 provisions of "Facility Safety" (DOE Order 420.1) and "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program." For requirements governed by both the NRC and DOE Order 420.1, NRC requirements take precedence.

[F 1.1.1, 1.1.2, 1.1.3, 1.1.6][MGR RD 3.1.G]

- 1.2.6.4** The system shall comply with the applicable provisions of "Standard for Portable Fire Extinguishers" (NFPA 10).

[MGR RD 3.1.G]

- 1.2.6.5** The system shall comply with the applicable provisions of "Standard for the Installation of Sprinkler Systems" (NFPA 13).

[MGR RD 3.1.G]

- 1.2.6.6** The system shall comply with the applicable provisions of "Standard for the Installation of Standpipe and Hose Systems" (NFPA 14).

[MGR RD 3.1.G]

- 1.2.6.7** The system shall comply with the applicable provisions of "Standard for Water Spray Fixed Systems for Fire Protection" (NFPA 15).

[MGR RD 3.1.G]

- 1.2.6.8** The system shall comply with the applicable provisions of "Standard for the Installation of Private Fire Service Mains and Their Appurtenances" (NFPA 24).

[MGR RD 3.1.G]

- 1.2.6.9** The system shall comply with the applicable provisions of "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems" (NFPA 25).

[MGR RD 3.1.G]

- 1.2.6.10** The system shall comply with the applicable provisions of "Standard on Explosion Prevention Systems" (NFPA 69) and "Guide for Venting of Deflagrations" (NFPA 68).

[MGR RD 3.1.G]

- 1.2.6.11** The system shall comply with the applicable provisions of "National Fire Alarm Code" (NFPA 72).
[MGR RD 3.1.G]
- 1.2.6.12** The system shall comply with the applicable provisions of "Standard for the Installation of Air Conditioning and Ventilating Systems" (NFPA 90A).
[MGR RD 3.1.G]
- 1.2.6.13** The system shall comply with the applicable provisions of "Standard for Fire Protection for Facilities Handling Radioactive Materials, 1998 Edition" (NFPA 801).
[MGR RD 3.1.G]
- 1.2.6.14** The system shall comply with the applicable provisions of "Standard for Fire Hose Connections" (NFPA 1963).
[MGR RD 3.1.G]
- 1.2.6.15** The system shall comply with the applicable provisions of "Life Safety Code" (NFPA 101).
[F 1.1.5, 1.1.6][MGR RD 3.1.G]
- 1.2.6.16** The system shall comply with the applicable provisions of "Department of Defense Design Criteria Standard, Human Engineering" (MIL-STD-1472E).
[MGR RD 3.3.A]
- 1.2.6.17** The system shall comply with the applicable provisions of "Human Factors Design Guidelines for Maintainability of Department of Energy Nuclear Facilities" (UCRL-15673).
[MGR RD 3.3.A]
- 1.2.6.18** The system shall comply with the applicable provisions of "Standards for Protection Against Radiation" (10 CFR 20).
[MGR RD 3.1.B]
- 1.2.6.19** The system shall comply with the applicable provisions of "1997 Uniform Building Code" (Volume 1, "Administrative, Fire- and Life-Safety, and Field Inspection Provisions"). Where conflicts exist between "1997 Uniform Building Code" requirements and other design code requirements, the more stringent requirements shall apply.
[MGR RD 3.1.G, 3.3.A]

- 1.2.6.20** The system shall comply with the applicable provisions of “1997 Uniform Building Code” (Volume 2, “Structural Engineering Design Provisions”). Where conflicts exist between “1997 Uniform Building Code” requirements and other design code requirements, the more stringent requirements shall apply.

[MGR RD 3.1.G, 3.3.A]

- 1.2.6.21** The system shall comply with the applicable provisions of “1997 Uniform Building Code” (Volume 3, “Material, Testing and Installation Standards”). Where conflicts exist between “1997 Uniform Building Code” requirements and other design code requirements, the more stringent requirements shall apply.

[MGR RD 3.1.G, 3.3.A]

- 1.2.6.22** The system shall comply with the applicable provisions of Regulatory Guide 3.38, “General Fire Protection Guide for Fuel Reprocessing Plants.”

[MGR RD 3.1.G, 3.3.A]

- 1.2.6.23** The system shall comply with the applicable assumptions contained in the “Monitored Geologic Repository Project Description Document.”

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 later 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.

Section 2 is based on "Engineering Files for Site Recommendation," Attachment II, Section 1.1.9.

2.1 SYSTEM DESIGN SUMMARY

The WHB fire protection system provides the capability to detect, control, and extinguish fires and/or mitigate explosions throughout the WHB. The WHB fire protection system includes fire or explosion detection panel(s) controlling various detectors, system actuation, annunciators, equipment controls, and signal outputs.

The WHB is divided into several functional areas in relation to tasks required to be performed. They are the Primary, Primary Support, Pool Support, Facility Support, Equipment, Miscellaneous Building Support areas, and the Building Structure.

2.2 DESIGN ASSUMPTIONS

No assumptions were used to supplement the system design criteria in development of the design concept.

2.3 DETAILED DESIGN DESCRIPTION

Preliminary fire hazards analyses are provided below. The areas for the preliminary fire hazards analyses follow the same general breakdown described above by combining several rooms of the same functional relationship together. Exterior building areas are not evaluated (i.e., yard transformers, exterior diesel fuel tanks) due to a lack of specific location on any site drawing and available hazard definition.

2.3.1 Primary Areas

The Primary Areas consist of the Carrier/Cask Handling System, Assembly Transfer System, Canister Transfer System, Disposal Container Handling System, and the Waste Package Remediation System. The HVAC confinement system in these areas is either primary or secondary. These primary confinement areas are not normally occupied and the secondary areas are either never occupied, or occupied on a very intermittent basis. These F-2 and H-7 occupancies are as defined by the "1997 Uniform Building Code," Volume I "Administrative, Fire-and Life-Safety, and Field Inspection Provisions." The fire hazards in these areas are low to moderate and are classified as an "Ordinary Hazard Group 1"

automatic sprinkler occupancy per "Standard for the Installation of Sprinkler Systems," (NFPA 13). Fire hazards are expected to be from electrical wiring, cable, and motors. Two exits and a maximum travel distance of 200 ft shall be maintained in any occupied area. All penetrations to these areas will require fire rated seals.

2.3.2 Primary Support Areas

The Primary Support Areas consist of the operating galleries, equipment transfer corridors, contaminated equipment rooms, low level waste collection and packaging, maintenance equipment rooms, weld material storage, maintenance shop, forklift staging and servicing rooms, and the waste handling operations center. The HVAC confinement system in these areas is either tertiary or none. These areas are normally occupied and may contain potentially radioactive contaminated materials. These are B or F-2 occupancies as defined by the "1997 Uniform Building Code," Volume I "Administrative, Fire- and Life-Safety, and Field Inspection Provisions." The fire hazards in these areas are defined as moderate and are classified as an "Ordinary Hazard Group 2" automatic sprinkler occupancy per "Standard for the Installation of Sprinkler Systems," (NFPA 13). Fire hazards are expected to be from ordinary combustible materials used in operation and maintenance. Two exits and a maximum travel distance of 200 ft shall be maintained in any occupied area. All penetrations from areas of greater hazard will require fire rated seals.

2.3.3 Pool Support Area

The Pool Support Area consists of the pool treatment equipment room that houses the equipment to maintain water temperature, quality, and remove contamination from the pool. The HVAC confinement system in the area is secondary. The room is normally occupied and may contain radioactively contaminated materials. The fire hazards in the area are defined as low to moderate and the sprinkler system occupancy classification is "Ordinary Hazard Group 1." The area is classified as F-2 by the "1997 Uniform Building Code," Volume I "Administrative, Fire- and Life-Safety, and Field Inspection Provisions." Fire hazards are expected to be from ordinary combustible materials used during operation and maintenance activities. Two stairway exits are provided from this area. All penetrations into this area will require fire rated seals.

2.3.4 Facility Support Areas

The Facility Support Areas consist of the radiation protection, security, operations, administration, maintenance, and building circulation areas. These areas support the primary systems areas in the WHB. The HVAC confinement in these areas is either tertiary or none. The areas are normally occupied and some of the areas may contain radioactively contaminated equipment. The fire hazard in the area is defined as medium and the sprinkler system classification is "Ordinary Hazard Group 1 or Group 2" occupancy. The areas are classified as B or F Occupancies by the "1997 Uniform Building Code," Volume I

“Administrative, Fire- and Life-Safety, and Field Inspection Provisions.” The area is classified as industrial by “Life Safety Code,” (NFPA 101). Two exits and a maximum travel distance of 200 ft are required from each area. All penetrations to the area from areas of greater hazard require fire rated seals.

2.3.5 HVAC Equipment Areas

The HVAC Equipment Areas consist of the HVAC equipment rooms and the associated equipment. These rooms contain the HVAC equipment that provides the confinement for the primary, secondary, and tertiary exhaust systems. The HVAC confinement in these areas is tertiary. This area is normally occupied and may contain some radioactively contaminated equipment. The areas are classified as F-2 by the “1997 Uniform Building Code,” Volume I “Administrative, Fire- and Life-Safety, and Field Inspection Provisions.” The fire hazard in the area is low to medium and the areas are classified as an “Ordinary Hazard Group 1” sprinkler occupancy. The areas are classified as industrial by “Life Safety Code,” (NFPA 101). Two exits and a maximum travel distance of 200 ft are required from each area. All penetrations into the area required fire rated seals.

2.3.6 Miscellaneous Building Support

The Miscellaneous Building Support Areas consist of the fire protection, electrical equipment, and communication equipment rooms. The rooms do not require a HVAC confinement system. The rooms are normally unoccupied and contain a medium to high fire hazard. The areas are classified as F-2 or H-3 by the “1997 Uniform Building Code,” Volume I “Administrative, Fire- and Life-Safety, and Field Inspection Provisions,” and as an industrial occupancy by “Life Safety Code,” (NFPA 101). The areas are classified as an “Ordinary Hazard Group 2” sprinkler system occupancy. Two exits and a maximum travel distance of 200 ft are required from each area. All penetrations into the area from an area of greater hazard require fire rated seals. The fire protection alarm system monitors all fire alarm and suppression devices in the facility and displays the alarm conditions on an annunciator panel in the main entry vestibule.

2.3.7 Building Structure

The WHB is a non-combustible structure as defined by the “1997 Uniform Building Code,” Volume I “Administrative, Fire- and Life-Safety, and Field Inspection Provisions.” The building is designed to withstand a design basis earthquake, extreme wind/tornado winds, and any potential tornado wind missiles. Based on these building design features, the external structure of the building shell will provide adequate protection from external fire events.

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.

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

"Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 4.5) requires an FHA to assess the risk from fire within the individual fire area. This criterion is needed to ensure that the system will provide protection for the WHB fire hazard types, hazard contents, and occupancy classes. "Fire protection" in this criterion means fire detection, suppression, and alarm features as needed to protect against the fire and explosion hazards. The FHA will be based on consideration of potential WHB fire ignition sources, combustibles, fire intensity, flame spreading, smoke generation, and production of toxic contaminants.

This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g1, 6.1g6, 6.1g12, 6.1g18, 6.2g4, 6.3g12, 6.3g13, 6.4g1, 6.4g3, and 7.1g1, by providing the fire/explosion hazards and occupancy classification as provided by the fire hazards analysis.

This criterion supports MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

The U.S. Department of Energy (DOE) imposes "Facility Safety" (DOE Order 420.1) on the MGR. The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section IV, paragraph 9.7) requires automatic fire suppression in facilities where the maximum possible fire loss exceeds \$1 million or the ground floor area is in excess of 5,000 square feet.

This criterion supports MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

The \$1 million fire-loss limit is based on the "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section IV, paragraph 9.7).

1.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section IV, paragraph 9.7) requires redundant fire protection in areas where the maximum possible fire loss exceeds \$50 million. As acknowledged by the "Implementation Guide," redundant fire protection can include items such as a fire barrier system, smoke detection in conjunction with a fully capable fire department, and other options. Redundant options which include a programmatic solution, such as a fire department, are not considered a part of the WHB Fire Protection System; however, programmatic solutions will be accounted for in the WHB Fire Protection System design.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

The \$50 million is based on the "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section IV, paragraph 9.7).

1.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

Although fire notification will be provided to fire response organizations, credit will not be taken for off-site fire response organizations to mitigate WHB fire events. The reason for this determination is the remoteness of the site (i.e., the time required for a response) and the potential nuclear safety impacts of a WHB fire that is beyond the incipient stage. This criterion is provided to ensure an adequate fire protection design without reliance on off-site fire response organizations.

This criterion meets MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.1.5 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. 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

Performance requirement 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 plant life extensions, a 25 percent margin is added, resulting in an operational life of 40 years.

1.2.1.6 Criterion Basis Statement

I. Criterion Need Basis

This system is responsible for penetration seal design. This criterion is needed to ensure that the fire barrier ratings for penetrations through fire barriers are maintained. The fire barrier ratings for WHB fire barriers will be determined by the FHA. These ratings will be used for penetration seals.

This criterion meets MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.1 Criterion Basis Statement

I. Criterion Need Basis

The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.3g1, states that total reliance shall not be placed on a single fire suppression capability for QL-1 SSCs. This criterion is provided for the portion of the system that provides fire protection to QL-1 SSCs. Backup fire protection (as an addition to the primary protection) is required to ensure reliable fire protection capability.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section IV, paragraph 9.6) requires a fire protection design to successfully control fires. The system must protect against the spread of fires and explosions in the WHB to prevent fire in one area from spreading outside the fire area. An example of the fire protection SSCs that will contribute to this criterion is acceptable fire barrier design (i.e., minimum fire resistance rating) for fire doors, dampers, and penetration seals. The required WHB fire hazard analysis identifies the required fire barrier features necessary to separate redundant SSCs and minimize fire loss.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g5 and 6.2g6, requires that the fire suppression systems include provisions to protect against adverse effects in the event of system operation or inadvertent system actuation. This criterion is provided to ensure that the fire suppression system will not cause adverse effects to QL-1 SSCs. "Facility Safety," Section 4.3.2, states: "operations with fissionable materials which pose a criticality accident hazard shall be evaluated and documented to demonstrate that the operation will be subcritical under both normal and credible abnormal conditions." Since the introduction of water could affect subcritical fissionable material, this criterion is provided to ensure that the selection of fire suppression agents considers potential criticality impacts, and maintains operation subcritical under both normal and credible abnormal conditions. This criterion supports 10 CFR 63.112(e)(6).

This criterion meets MGR RD 3.1.C and 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.1g2, requires that the system be designed

to prevent a failure of any one component from disabling the entire fire protection system. This criterion meets this requirement.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.2.2.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is provided to comply with "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g3 and 6.3g17. This criterion is needed to facilitate an efficient and timely response to fire situations. This enables responding personnel to identify the location of a fire quickly and accurately and to indicate the status of emergency equipment or fire safety functions. Visual alarms in the local areas are judged to be necessary for the hearing impaired.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.2.2.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion is provided to ensure manually actuated local alarms are included for personnel notification of fires. The criterion ensures local notification of fires in areas where automatic fire detectors are not installed while allowing for manual notification in areas where automatic detection does exist. This will help to provide a timely notification and response to an incipient fire. This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.1g25.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.2.2.3 Criterion Basis Statement**I. Criterion Need Basis**

This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.1g25. This criterion is expanded to include all fire-fighting equipment needed for incipient fires. This criterion is provided to ensure fire-fighting equipment (e.g., portable fire extinguishers, fire hose stations, manual fire alarm stations, etc.) is plainly marked, conspicuously located, and easily accessible to assist in a timely response to incipient fires.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.2.2.4 Criterion Basis Statement**I. Criterion Need Basis**

A loss of primary power during MGR operation is credible. "National Fire Alarm Code" (NFPA 72, Section 1-5.2.3) indicates that at least two independent and reliable power supplies are to be provided for fire alarm systems. This criterion is needed so a loss of primary power does not cause a loss of fire alarm, fire signal transmission, fire detection, and suppression capabilities. This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g2 and 6.1g4.

This criterion meets MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.3.1 Criterion Basis Statement**I. Criterion Need Basis**

This criterion establishes the requirement for equipment environmental compatibility. This criterion is based on the requirement in "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS 57.7-1988, Section 6.9.2), which states, "System components shall be designed and qualified to operate within environmental limits established for their location within the installation including but not limited to temperature, humidity, and radiation levels for the applicable performance requirements."

Radiation from fuel assemblies, high-level waste 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, neutrons) should also be considered.

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 radiation environment is TBD.

1.2.3.2 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 based on Performance Criteria 1.2.1.1 in "Waste Handling Building Ventilation System Description Document."

Temperature environment during off-normal conditions for all areas (except the electronics equipment areas) is TBD.

1.2.3.3 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 based on Performance Criteria 1.2.1.2 in "Waste Handling Building Ventilation System Description Document."

Humidity values for other areas are TBD.

1.2.4.1 Criterion Basis Statement

I. Criterion Need Basis

The Waste Handling Building Ventilation System provides and controls airflow. The purpose of this interface is to ensure appropriate air control during a WHB fire and fire barrier design. This criterion is provided to ensure these two systems (i.e., Waste Handling Building Ventilation System and Waste Handling Building Fire Protection System) are designed to ensure appropriate airflow control in the event of a WHB fire. The types of interface controls are design solution dependent and will be developed as part of final design.

II. Criterion Performance Parameter Basis

N/A

1.2.4.2 Criterion Basis Statement

I. Criterion Need Basis

The Waste Handling Building Ventilation System controls airflow in the WHB. The purpose of this interface is to ensure that WHB airflow is considered for fire detection design. To ensure early fire detection capabilities, the types, quantity, and location of detectors are impacted by the airflow conditions. Also, this criterion will ensure the radiological confinement requirements of the WHB Ventilation System are considered in the design of this system as applicable. The types of interface controls are design solution dependent and will be developed as part of final design.

II. Criterion Performance Parameter Basis

N/A

1.2.4.3 Criterion Basis Statement

I. Criterion Need Basis

The WHB Fire Protection System provides fire alarm signals to the Monitored Geologic Repository Operations Monitoring and Control System. The types of interface controls are design solution dependent and will be developed as part of final design. This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g23 and 6.4g5.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.4.4 Criterion Basis Statement

I. Criterion Need Basis

The Waste Handling Building Ventilation System is expected to have HEPA filters. HEPA filters mandate unique fire protection requirements. This system interfaces with the Waste Handling Building Ventilation System by providing fire protection for the HEPA filters. The types of interface controls are design solution dependent and will be developed as part of final design.

II. Criterion Performance Parameter Basis

N/A

1.2.4.5 Criterion Basis Statement

I. Criterion Need Basis

This system is expected to provide fire protection to QL-1 equipment. Loss of primary power is considered a credible event. This criterion is provided to ensure appropriate interface with the Waste Handling Building Electrical System for appropriate power supply. The types of interface controls are design solution dependent and will be developed as part of final design.

II. Criterion Performance Parameter Basis

N/A

1.2.4.6 Criterion Basis Statement

I. Criterion Need Basis

Assuming water will be used as a fire extinguishing agent, this criterion is needed to ensure the amount and water quality (required flow rates, pressures, and duration) required for WHB fire protection is supplied by the Site Water System. The types of interface controls are design solution dependent and will be developed as part of final design.

II. Criterion Performance Parameter Basis

N/A

1.2.4.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to ensure appropriate drainage for fire suppression runoff. This system interfaces with the Waste Handling Building System for adequate drainage. The types of interface controls are design solution dependent and will be developed as part of final design.

II. Criterion Performance Parameter Basis

N/A

1.2.4.8 Criterion Basis Statement

I. Criterion Need Basis

The Waste Handling Building System provides fire boundary design. This criterion is needed to ensure fire barrier design is coordinated with the WHB Fire Protection System and are completed as rated barriers. This criterion will ensure considerations for

applicable radiological confinement zones when fire penetrations are designed. The types of interface controls are design solution dependent and will be developed as part of final design.

II. Criterion Performance Parameter Basis

N/A

1.2.4.9 Criterion Basis Statement

I. Criterion Need Basis

The Site Fire Protection System is the site-wide fire control system and provides fire alarm signals to the fire response organization. This interface is required to provide automatic communications to the fire response organization and automatic support from the site fire pumps for example. The types of interface controls are design solution dependent and will be developed as part of final design.

This criterion supports MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.5.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is provided to ensure primary or backup fire suppression is maintained during system maintenance. The design of this system may use different fire suppression agents for primary and backup suppression; therefore, this criterion is written as a more general statement.

This criterion supports MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion identifies "Occupational Safety and Health Standard" (29 CFR 1910) as one of the applicable codes and standards necessary for this system design. This criterion supports MGR RD 3.1.E.

II. Criterion Performance Parameter Basis

N/A

1.2.6.2 Criterion Basis Statement**I. Criterion Need Basis**

This criterion identifies "Safety and Health Regulations for Construction" (29 CFR 1926) as one of the applicable codes and standards necessary for this system design. This criterion supports MGR RD 3.1.F.

II. Criterion Performance Parameter Basis

N/A

1.2.6.3 Criterion Basis Statement**I. Criterion Need Basis**

DOE invokes "Facility Safety" (DOE Order 420.1) on the MGR. DOE Order 420.1 is applicable with the following specific exclusion: "Activities that are regulated through a license by the Nuclear Regulatory Commission (NRC) or State under an Agreement with the NRC, including activities certified by the NRC under section 1701 of the Atomic Energy Act" [DOE Order 420.1, section 3.c (1)]. The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" facilitates the development of DOE fire protection programs to achieve the policy objectives and fulfill the requirements delineated in DOE Order 420.1. This criterion is provided to ensure this design complies with DOE Orders for fire protection design.

This criterion supports MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.4 Criterion Basis Statement**I. Criterion Need Basis**

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the National Fire Protection Association (NFPA). The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g7, 6.3g28 and 7.2g1, invokes "Standard for Portable Fire Extinguishers" (NFPA 10). NFPA 10 is the national code for portable fire extinguishers.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.5 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.3g24 and 7.3g1, invokes "Standard for the Installation of Sprinkler Systems" (NFPA 13). This NFPA code is the national code for fire sprinkler system design. This criterion is provided to ensure the applicable provisions of this code are addressed as applicable to the design of this system.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.6 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 7.4g1, invokes "Standard for the Installation of Standpipe and Hose Systems" (NFPA 14). The criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g21, 6.3g25, and 6.3g26. This NFPA code is the national code for standpipe and hose stations. The number and arrangement of the standpipes and hose stations for proper protection is governed by conditions such as occupancy classification, building layout and construction, and accessibility. These factors will be considered in the FHA so that a proper design can be specified. This criterion is provided to ensure the applicable provisions of this code are addressed as applicable to the design of this system.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.7 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.3g24 and 7.5g1, invokes "Standard for Water Spray Fixed Systems for Fire Protection" (NFPA 15). This NFPA code is determined to be applicable to water spray systems. This criterion is provided to ensure the applicable provisions of this code are addressed as applicable to the design of this system.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.8 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.3g20 and 7.6g1, invokes "Standard for the Installation of Private Fire Service Mains and Their Appurtenances" (NFPA 24). This NFPA code is the national code for installation of fire service mains. This criterion is provided to ensure the applicable provisions of this code are addressed as applicable to the design of this system.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.9 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection

System," Guidance Statement 6.1g7, invokes applicable NFPA codes. "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems" (NFPA 25) is determined to be applicable to the MGR since it applies standards for testing, inspection, and maintenance of water-based fire protection equipment. This criterion is provided to ensure the applicable provisions of this code are addressed as applicable to the design of this system.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.10 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.1g7, invokes applicable NFPA codes. "Standard on Explosion Prevention Systems" (NFPA 69) and "Guide for Venting of Deflagrations" (NFPA 68) are determined to be applicable to explosion control and deflagration control. This criterion is provided to ensure the applicable provisions of this code are addressed as applicable to the design of this system.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.11 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g24, 6.1g26, 6.3g15, and 6.3g19. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.3g14 and 7.8g1, invokes "National Fire Alarm Code" (NFPA 72). This NFPA code is the national code for fire alarm system design. This criterion is provided to ensure the applicable provisions of this code are addressed as applicable to the design of this system and to ensure the use of an NFPA 72 approved fire/explosion detection subsystem.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.12 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.1g7, invokes applicable NFPA codes. "Standard for the Installation of Air Conditioning and Ventilating Systems" (NFPA 90A) mainly applies to ventilation design. There are significant interfaces with the WHB ventilation design to control the spread of smoke and fire. This criterion is provided to ensure this system complies with the applicable requirements of NFPA 90A as required in "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System."

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.13 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g7 and 7.11g1, invokes applicable NFPA codes. "Standard for Fire Protection for Facilities Handling Radioactive Materials" (NFPA 801) is determined to be applicable to the MGR since it will be handling radioactive material. This criterion is provided to ensure the applicable provisions of this code are addressed as applicable to the design of this system. NFPA 801 requires that a FHA be performed to ensure that the fire protection requirements are considered in the facility design.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.14 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. The "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.1g7, invokes applicable NFPA codes. This system description document (SDD) is responsible for fire hose couplings and adapters; therefore, "Standard for Fire Hose Connections" (NFPA 1963) is determined to be applicable. This criterion is provided to ensure the applicable provisions of this code are addressed, as applicable, to the design of this system.

This criterion meets MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.15 Criterion Basis Statement

I. Criterion Need Basis

The "Implementation Guide for use with DOE Orders 420.1 and 440.1 Fire Safety Program" (Section III, paragraph 3.0), states that an acceptable fire protection program should meet the minimum requirements established by the NFPA. "Life Safety Code" (NFPA 101) deals with considerations that are essential to life safety, minimizing danger to life from fire, including smoke fumes, or panic, and other fire related safety hazards. There are design features from NFPA 101 that impact the design of this system. Therefore, NFPA 101 is invoked as applicable to the design of this system.

This criterion supports MGR RD 3.1.G.

II. Criterion Performance Parameter Basis

N/A

1.2.6.16 Criterion Basis Statement

I. Criterion Need Basis

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 "Department of Defense Criteria Standard Human Engineering" (MIL-STD-1472E) (GPG-FM-027 references an earlier version of MIL-STD-1472).

This criterion meets MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.17 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 human factors engineering 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 human factors engineering maintainability design criteria.

This criterion meets MGR RD 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.18 Criterion Basis Statement

I. Criterion Need Basis

MGR RD 3.1.B requires compliance with "Standards for Protection Against Radiation" (10 CFR 20). This criterion invokes 10 CFR 20 requirements on the design of this system.

II. Criterion Performance Parameter Basis

N/A

1.2.6.19 Criterion Basis Statement

I. Criterion Need Basis

MGR RD 3.3.A requires compliance with applicable industry codes and standards. This criterion identifies "1997 Uniform Building Code" (Volume 1, "Administrative, Fire- and

Life-Safety, and Field Inspection Provisions”) as applicable to the design of the system. This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.3g4.

This criterion meets MGR RD 3.1.G and 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.20 Criterion Basis Statement

I. Criterion Need Basis

MGR RD 3.3.A requires compliance with applicable industry codes and standards. This criterion identifies the "1997 Uniform Building Code" (Volume 2, "Structural Engineering Design Provisions") as applicable to the design of the system. This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.3g4.

This criterion meets MGR RD 3.1.G and 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.21 Criterion Basis Statement

I. Criterion Need Basis

MGR RD 3.3.A requires compliance with applicable industry codes and standards. This criterion identifies "1997 Uniform Building Code" (Volume 3, "Material, Testing and Installation Standards") as applicable to the design of the system. This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statement 6.3g4.

This criterion meets MGR RD 3.1.G and 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.22 Criterion Basis Statement

I. Criterion Need Basis

"General Fire Protection Guide for Fuel Reprocessing Plants" (Regulatory Guide 3.38) provides NRC guidance for fire protection design of fuel reprocessing plants. The MGR

is similar in that there will be radioactive material managed within the facility with attendant risks due to potential fire and explosion. These events could result in the release of radioactive material. Therefore, Regulatory Guide 3.38 is applicable to the design of the WHB Fire Protection System. This criterion supports "MGR Compliance Program Guidance Package for the Waste Handling Building Fire Protection System," Guidance Statements 6.1g1, 6.1g2, 6.1g3, 6.1g4, 6.1g5, 6.1g6, 6.1g7, 6.1g9, 6.1g12, 6.1g16, 6.1g17, 6.1g18, 6.1g19, 6.1g21, 6.1g23, 6.1g24, 6.1g25, and 6.1g26.

This criterion meets MGR RD 3.1.G and 3.3.A.

II. Criterion Performance Parameter Basis

N/A

1.2.6.23 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

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 MGR Waste Handling Building Fire Protection System," which defines the overall system as QL-2.

Table 3. System Architecture and QA Classification

	QL-1	QL-2	QL-3	CQ
Fire Detection System		X		
Fire Suppression System		X		

APPENDIX C ACRONYMS, SYMBOLS, AND UNITS

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

C.1 ACRONYMS

CQ	conventional quality
DOE	U.S. Department of Energy
F	Function
FHA	Fire Hazards Analysis
HEPA	High-Efficiency Particulate Air
HVAC	Heating Ventilating and Air Conditioning
MGR	Monitored Geologic Repository
MGR RD	Monitored Geologic Repository Requirements Document
N/A	not applicable
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
OMCS	Operations Monitoring and Control System
QA	quality assurance
QL	quality level
SDD	system description document
SSCs	structures, systems, and components
TBD	to be determined
TBV	to be verified
WHB	Waste Handling Building

C.2 SYMBOLS AND UNITS

°F	degrees Fahrenheit
%	percent
ft	feet

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 Issue 1—Fire Hazard Analysis

Perform a fire hazard analysis to determine the fire hazards class, occupancy classes and deflagration index.

D.2 Issue 2—System Architecture

The system architecture in Appendix B should be revised to identify explosion detection and suppression.

APPENDIX E REFERENCES

This section provides a listing of references used in this SDD. References list the Accession number or Technical Information Catalog number at the end of the reference, where applicable.

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"Monitored Geologic Repository Project Description Document." CRWMS M&O. TDR-MGR-SE-000004, Rev. 01 ICN 01. June 2000. Las Vegas, Nevada: CRWMS M&O. URN-0377.

"Monitored Geologic Repository Requirements Document." U.S. Department of Energy. YMP/CM-0025, Rev. 3, DCN 02. May 2000. Las Vegas, Nevada: U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Yucca Mountain Site Characterization Office. URN-0376.

"National Fire Alarm Code." National Fire Protection Association. NFPA 72, 1999 Edition. August 13, 1999. Quincy, Massachusetts: National Fire Protection Association. TIC: 247112.

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