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ICN 01	Issued Approved. This ICN adds Section 2, and updates Section 1 and Appendices A, B, C, and E for clarification of criteria, changes to references, and other editorial changes. Section 1 changes include clarification to Tables 1 and 3, and deletion of contents of Section 1.4. All changes are indicated by revision bars.

DISCLAIMER

CONTENTS

Page

SUMMARY 6

QUALITY ASSURANCE 7

1. SYSTEM FUNCTIONS AND DESIGN CRITERIA 8
   1.1 SYSTEM FUNCTIONS 8
   1.2 SYSTEM DESIGN CRITERIA 8
   1.3 SUBSYSTEM DESIGN CRITERIA 17
   1.4 CONFORMANCE VERIFICATION 17

2. DESIGN DESCRIPTION 18
   2.1 SYSTEM DESIGN SUMMARY 18
   2.2 DESIGN ASSUMPTIONS 19
   2.3 DETAILED DESIGN DESCRIPTION 19
   2.4 COMPONENT DESCRIPTION 23
   2.5 CRITERIA COMPLIANCE 23

3. SYSTEM OPERATIONS 27

4. SYSTEM MAINTENANCE 28

APPENDIX A CRITERION BASIS STATEMENTS 29

APPENDIX B ARCHITECTURE AND CLASSIFICATION 58

APPENDIX C ACRONYMS, SYMBOLS, AND UNITS 59

APPENDIX D FUTURE REVISION RECOMMENDATIONS AND ISSUES 60

APPENDIX E REFERENCES 61

TABLES

Page

1. Design Temperatures 9
2. Design Relative Humidity 9
3. Outside Design Conditions 10
4. Differential Pressures in WTB Areas 10
5. System Parameters Monitoring 12
6. Equipment Status 12
7. Ambient Relative Humidity Environment 14
8. System Architecture and Quality Assurance Classification 58

FIGURES

Page

1. Waste Handling/Waste Treatment Building Confinement Zone Configuration – Grade Level 24
2. Waste Handling/Waste Treatment Building Confinement Zone Configuration – 30' Above Grade Level 25
3. Waste Treatment Building HVAC Flow Diagram 26

SUMMARY

The Waste Treatment Building Ventilation System provides heating, ventilation, and air conditioning (HVAC) for the contaminated, potentially contaminated, and uncontaminated areas of the Monitored Geologic Repository's (MGR) Waste Treatment Building (WTB). In the uncontaminated areas, the non-confinement area ventilation system maintains the proper environmental conditions for equipment operation and personnel comfort.

In the contaminated and potentially contaminated areas, in addition to maintaining the proper environmental conditions for personnel comfort and equipment operation, the contamination confinement area ventilation system directs potentially contaminated air away from personnel in the WTB and confines the contamination within high-efficiency particulate air (HEPA) filtration units. The contamination confinement area ventilation system creates airflow paths and pressure zones to minimize the potential for spreading contamination within the building. The contamination confinement ventilation system also protects the environment and the public by limiting airborne releases of radioactive or other hazardous contaminants from the WTB.

The Waste Treatment Building Ventilation System confines the radioactive and hazardous material within the building such that the release rates comply with regulatory limits. The system design, operations, and maintenance activities incorporate ALARA (as low as is reasonably achievable) principles to maintain personnel radiation doses to all occupational workers below regulatory limits and as low as is reasonably achievable. The system provides status of important system parameters and equipment operation, and provides audible and/or visual indication of off-normal conditions and equipment failures.

The Waste Treatment Building Ventilation System interfaces with the Waste Treatment Building System by being located in the WTB, and by maintaining specific pressure, temperature, and humidity environments within the building. The system also depends on the WTB for normal electric power supply and the required supply of water for heating, cooling, and humidification. Interface with the Waste Treatment Building System includes the WTB fire protection subsystem for detection of fire and smoke.

The Waste Treatment Building Ventilation System interfaces with the Site Radiological Monitoring System for continuous monitoring of the exhaust air and key areas within the WTB, the Monitored Geologic Repository Operations Monitoring and Control System for monitoring and control of system operations, and the Site Generated Radiological Waste Handling System and Site Generated Hazardous, Non-Hazardous & Sanitary Waste Disposal System for routing of pretreated toxic, corrosive, and radiologically contaminated effluent from process equipment to the HEPA filter exhaust ductwork and air-cleaning unit.

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 DOE/RW-0333P, "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 Waste Treatment Building Ventilation System are identified in the following sections. Throughout this document, the term "system" is used to indicate the Waste Treatment Building Ventilation System. The system architecture and classification are provided in Appendix B.

1.1 SYSTEM FUNCTIONS

1.1.1 The system provides the proper environment for personnel comfort and equipment operation in the confinement and non-confinement areas of the WTB.

1.1.2 The system limits the spread of airborne contamination within the WTB.

1.1.3 The system limits the release of radionuclides to the accessible environment to maintain public and worker radiation exposures below regulatory limits.

1.1.4 The system provides status of system parameters and ventilation equipment operation.

1.1.5 The system provides active and passive features for the safety of personnel and for maintaining radiation doses ALARA in the WTB.

1.1.6 The system permits periodic inspection, testing, and maintenance of system components.

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 contains bracketed traces indicating traceability, as applicable, to the system 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 be designed to maintain nominal temperatures during normal and off-normal conditions in the areas within the WTB as defined in Table 1.

Table 1. Design Temperatures

Area	Summer/Winter Normal Conditions (Note 2)	Summer/Winter Off-Normal Conditions
Normally Occupied Areas (e.g., Offices, Maintenance Areas, Access Control)	76°F±2°F/72°F±2°F	Temperature Control Not Required Note 1
Normally Unoccupied Areas (e.g., Mechanical & Electrical Equipment Rooms, Waste Treatment Areas)	90°F±2°F/65°F±2°F	Temperature Control Not Required Note 1
Unoccupied Areas (e.g., Waste Evaporator Room)	104°F±2°F/65°F±2°F	Temperature Control Not Required Note 1
Electronics Equipment Areas	72°F±2°F/72°F±2°F	72°F±2°F/72°F±2°F Note 2

Note 1: Temperature control is not required during off-normal conditions such as loss of power or equipment failure.
Note 2: Design is to be based on the temperature values without consideration to the ± 2°F margin. The margin is provided for system performance variations.
For definition of acronyms, symbols, and units, see Appendix C.

[F 1.1.1][MGR RD 3.3.A]

1.2.1.2 The system shall be designed to maintain the nominal relative humidity values during normal and off-normal conditions in the areas within the WTB, as defined in Table 2.

Table 2. Design Relative Humidity

Area	Summer/Winter Normal Conditions	Summer/Winter Off-Normal Conditions
Normally Occupied Areas (e.g., Offices, Maintenance Areas, Access Control)	30%-60%/30%-60%	Humidity Control Not Required Note 2
Normally Unoccupied Areas (e.g., Mechanical & Electrical Equipment Rooms, Waste Treatment Areas)	Humidity Control Not Required Note 1	Humidity Control Not Required Note 2
Electronics Equipment Areas	40%-50%/40%-50%	Humidity Control Not Required Note 2

Note 1: Humidity control is not required in these areas. Special provisions may be provided to accommodate components with special humidity requirements.
Note 2: Humidity control is not required during off-normal conditions such as loss of power or equipment failure.
For definition of acronyms, symbols, and units, see Appendix C.

[F 1.1.1][MGR RD 3.3.A]

1.2.1.3 The system design shall be based on the outside design conditions as indicated in Table 3.

Table 3. Outside Design Conditions

Parameter	Design Data
Site: Mercury, Nevada	Latitude: 36° 37' 12" Longitude: 116° 01' 12" Elevation: 3310 ft
Heating Dry-Bulb	99.6%: 24° F (Note 1) 99%: 28° F (Note 2)
Cooling Dry-Bulb	0.4%: 102° F (Note 1) (Note 4) 1%: 100° F (Note 2)
Cooling Mean Coincident Wet-Bulb	0.4%: 65° F (Note 1) 1%: 64° F (Note 2)
Wet-Bulb	1%: 67° F (Note 3)
Dew-Point	0.4%: 64° F 1%: 60° F
Mean Coincident Dry-Bulb	0.4%: 72° F 1%: 77° F
Range of Dry-Bulb Temperature	25.9° F

Note 1: Use where close temperature and humidity control is required.
Note 2: Use for personnel comfort systems.
Note 3: Use for cooling towers.
Note 4: Use this value plus 5°F for air-cooled condensers.
For definition of acronyms, symbols, and units, see Appendix C.

[F 1.1.1][MGR RD 3.3.A]

1.2.1.4 The system shall maintain the differential pressures in the WTB during normal operational modes based on the level of potential for airborne contamination, in accordance with Table 4.

Table 4. Differential Pressures in WTB Areas

Definition	Pressure Requirement
Areas with high potential for contamination	at least -0.25 inwg to areas with low potential for contamination
Areas with low potential for contamination	-0.1 to -0.15 inwg to atmosphere
Areas with no potential for contamination	atmospheric to +0.15 inwg

Note: For definition of acronyms, symbols, and units, see Appendix C.

[F 1.1.2][MGR RD 3.1.B, 3.1.C, 3.3.A][10 CFR 63.111(a)(1), 63.112(e)(1)]

1.2.1.5 The system shall provide no less than the minimum quantity of outside air required for the safety and health of the personnel in the normally occupied areas, in accordance with Table 2 of "Ventilation for Acceptable Indoor Air Quality" (ANSI/ASHRAE 62-1989).

[F 1.1.1][MGR RD 3.3.A]

1.2.1.6 The system shall provide once-through ventilation in areas of the WTB with high potential for airborne radioactive contamination.

[F 1.1.2, 1.1.5][MGR RD 3.1.B, 3.1.C, 3.3.A][10 CFR 63.111(a)(1), 63.112(e)(1)]

1.2.1.7 The system shall be designed to provide an exhaust airflow pattern from areas of low potential for contamination to areas of higher potential for contamination.

[F 1.1.2, 1.1.5][MGR RD 3.1.B, 3.1.C, 3.3.A][10 CFR 63.111(a)(1), 63.112(e)(1)]

1.2.1.8 Reserved

1.2.1.9 The system shall be designed such that the ventilation subsystem serving areas with no potential for airborne contamination is completely separate and independent from the other subsystems.

[F 1.1.2, 1.1.5][MGR RD 3.1.C, 3.3.A][10 CFR 63.112(e)(1)]

1.2.1.10 The system shall be designed such that the confinement areas with potential for contamination are provided with separate and independent components.

[F 1.1.5][MGR RD 3.1.C, 3.3.A][10 CFR 63.112(e)(1)]

1.2.1.11 The system shall be designed to exhaust airflow from contamination confinement areas through air cleaning units equipped with at least 90 percent ASHRAE prefilters and 99.97 percent HEPA filters in series.

[F 1.1.3][MGR RD 3.1.B, 3.1.C, 3.3.A][10 CFR 63.111(a)(1), 63.112(e)(1), 63.112(e)(4)]

1.2.1.12 The system design shall include at least one stage of prefilters and HEPA filtration in any confinement area recirculation circuit.

[F 1.1.2, 1.1.3, 1.1.5][MGR RD 3.1.B, 3.1.C, 3.3.A][10 CFR 63.111(a)(1), 63.112(e)(1)]

1.2.1.13 The system shall prevent backflow, due to equipment failure, from areas of higher contamination potential to areas of lower contamination potential.

[F 1.1.2, 1.1.3, 1.1.5][MGR RD 3.1.B, 3.1.C, 3.3.A][10 CFR 63.111(a)(1), 63.112(e)(1)]

1.2.1.14 The system shall provide monitoring and alarms as required for the parameters identified in Table 5.

Table 5. System Parameters Monitoring

Parameter	Location / Characteristics
Space Temperature	All areas of the WTB
Air Flow Rate	All filter trains, stack
Differential Pressure	Filters, moisture eliminators, and all areas of the WTB which are required to be maintained at a specific pressure with respect to other areas/atmosphere
Radiation	Downstream of HEPA filtration units for each subsystem and at the stack discharge
Smoke	Ventilation ductwork

Note: For definition of acronyms, symbols, and units, see Appendix C.

[F 1.1.4][MGR RD 3.1.C, 3.3.A][10 CFR 63.112(e)(10), 63.112(e)(4)]

1.2.1.15 The system shall provide, as a minimum, equipment status for the items identified in Table 6.

Table 6. Equipment Status

Equipment	Status
All electrically powered or controlled equipment	On-Off
All motor and air operated valves and dampers	Open-Closed

[F 1.1.4][MGR RD 3.3.A]

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

[F 1.1.1, 1.1.2, 1.1.3, 1.1.5][MGR RD 3.2.C]

1.2.2 Safety Criteria

1.2.2.1 Nuclear Safety Criteria

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

[F 1.1.5][MGR RD 3.1.B, 3.1.C, 3.3.A][10 CFR 63.111(a)(1), 63.112(e)(2), 63.112(e)(3)]

1.2.2.2 Non-nuclear Safety Criteria

1.2.2.2.1 The system shall be designed to permit periodic inspection, testing, and maintenance, as necessary, to ensure continued functioning and readiness of the system.

[F 1.1.6][MGR RD 3.1.C][10 CFR 63.112(e)(13)]

1.2.2.2.2 The system shall be capable of filtering dust and toxic and noxious substances in the inlet air to the limits established in "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices."

[F 1.1.1, 1.1.2, 1.1.5][MGR RD 3.1.G, 3.3.A]

1.2.2.2.3 The system shall be designed with auditory and visual alarm systems to alert personnel to conditions that have the potential to affect personnel safety, result in equipment damage, and affect system performance.

[F 1.1.4, 1.1.5][MGR RD 3.3.A]

1.2.3 System Environment Criteria

1.2.3.1 System components shall be designed to withstand and operate in the normal and off-normal temperature environments defined in Criterion 1.2.1.1, for the area in which the component is located. During off-normal conditions for normally occupied and normally unoccupied areas, the temperature environment is (TBD-395).

[MGR RD 3.3.A]

1.2.3.2 The system components shall be designed to withstand and operate in the normal and off-normal humidity environments defined in Criterion 1.2.1.2, for the area in which the component is located. For normally unoccupied areas and unoccupied areas under normal conditions, the humidity environment is (TBD-409).

[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-405) in which the component is located.

[MGR RD 3.3.A]

1.2.3.4 The affected system components and outside structures shall be designed for a basic wind speed of 121 miles per hour.

[MGR RD 3.3.A]

1.2.3.5 The system shall be designed for an outside temperature environment of 5 degrees F to 117 degrees F.

[MGR RD 3.3.A]

1.2.3.6 The system components located outside shall be designed for an external environment with a maximum daily snowfall of 10 inches and maximum snowfall accumulation of 17 inches.

[MGR RD 3.3.A]

1.2.3.7 The system components located outside shall be designed for the ambient relative humidity environment defined in Table 7.

Table 7. Ambient Relative Humidity Environment

Parameter	Value
Annual mean value	28%
Minimum summer mean value	13%
Maximum winter mean value	46%

Note: For definition of acronyms, symbols, and units, see Appendix C.

[MGR RD 3.3.A]

1.2.3.8 The system components located outside shall be designed for an external environment with a maximum annual precipitation of 10 inches and maximum daily precipitation of 5 inches.

[MGR RD 3.3.A]

1.2.3.9 The system components susceptible to blockage or damage by sand (e.g., air intake louvers, outdoor units) shall be protected from and designed to operate in sandstorms.

[MGR RD 3.3.A]

1.2.4 System Interfacing Criteria

1.2.4.1 The system shall interface with the Waste Treatment Building System as required for housing and support of system components and ductwork; supply of water for heating, cooling, and humidification; supply of electric power; detection of fire and smoke, and maintaining the required pressures, temperatures, and humidity environments.

[F 1.1.1, 1.1.2, 1.1.3]

1.2.4.2 The system shall interface with the WTB fire protection subsystem for equipment installation and interlock requirements.

[F 1.1.1]

1.2.4.3 The system shall interface with the Site Radiological Monitoring System as required for continuous monitoring of exhaust air for radioactive contamination during normal and off-normal conditions.

[F 1.1.3]

1.2.4.4 The system shall interface with the Monitored Geologic Repository Operations Monitoring and Control System for remote control of the system.

[F 1.1.4]

1.2.4.5 The system shall interface with the Site Generated Radiological Waste Handling System and the Site Generated Hazardous, Non-Hazardous & Sanitary Waste Disposal System as required for the exhaust of pre-treated toxic, corrosive, and radiologically contaminated effluent to the HEPA filter exhaust ductwork and air-cleaning unit.

[F 1.1.3]

1.2.5 Operational Criteria

Operational criteria for this system will be identified in a later revision.

1.2.6 Codes and Standards Criteria

1.2.6.1 The system shall be designed in accordance with the applicable sections of "Standards for Protection Against Radiation" (10 CFR 20).

[MGR RD 3.1.B]

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

[MGR RD 3.1.E]

1.2.6.3 The system design shall comply with the applicable provisions of "Safety and Health Regulations for Construction" (29 CFR 1926).

[MGR RD 3.1.F]

1.2.6.4 The system shall comply with the applicable provisions of "Nuclear Power Plant Air-Cleaning Units and Components" (ASME N509-1989).

[MGR RD 3.3.A]

1.2.6.5 The system shall comply with the applicable provisions of "Testing of Nuclear Air Treatment Systems" (ASME N510-1989).

[MGR RD 3.3.A]

1.2.6.6 The system design shall comply with the applicable provisions of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)"

(ANSI/ANS-57.7-1988), and "Design of an Independent Spent Fuel Storage Installation (Water-Basin Type)" (Regulatory Guide 3.49).

[MGR RD 3.3.A]

1.2.6.7 The system design shall comply with the applicable provisions of "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992).

[MGR RD 3.3.A]

1.2.6.8 The system design shall comply with the applicable provisions in the "Nuclear Air Cleaning Handbook, Design, Construction, and Testing of High-Efficiency Air Cleaning Systems for Nuclear Application" (ERDA 76-21).

[MGR RD 3.3.A]

1.2.6.9 The system design shall comply with the applicable requirements of American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) "Fundamentals," "ASHRAE Handbook - Heating, Ventilating, and Air-Conditioning Systems and Equipment," "Heating, Ventilating, and Air-Conditioning Applications," and the ASHRAE handbook "Refrigeration."

[MGR RD 3.3.A]

1.2.6.10 The system shall be designed in accordance with applicable sections of "Standard for the Installation of Air Conditioning and Ventilating Systems" (NFPA 90A).

[MGR RD 3.3.A]

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

[MGR RD 3.3.A]

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

[MGR RD 3.3.A]

1.2.6.13 The system shall be designed in accordance with the 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]

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

1.2.6.15 The system shall be designed in accordance with the applicable sections of "Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants" (Regulatory Guide 1.140).

[MGR RD 3.1.G]

1.2.6.16 The system shall be designed in accordance with the applicable sections of "General Design Guide for Ventilation Systems for Fuel Reprocessing Plants" (Regulatory Guide 3.32).

[MGR RD 3.1.G]

1.2.6.17 The system shall be designed in accordance with the applicable sections of "Code on Nuclear Air and Gas Treatment" (ASME AG-1-1997).

[MGR RD 3.3.A]

1.2.6.18 The system shall be designed to ensure emissions comply with the air quality standards of "National Primary and Secondary Ambient Air Quality Standards" (40 CFR 50).

[MGR RD 3.1.G]

1.2.6.19 The system shall be designed in accordance with the applicable provisions of "National Emission Standards for Hazardous Air Pollutants" (40 CFR 61), Subpart H.

[MGR RD 3.1.G]

1.3 SUBSYSTEM DESIGN CRITERIA

Subsystem design criteria for this system will be identified in a later revision.

1.4 CONFORMANCE VERIFICATION

This section will be provided 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.

The information contained in this section has been obtained from "Engineering Files for Site Recommendation" (Attachment II Section 1.2.5) and "WHB/WTB Space Program Analysis for Site Recommendation" (Section 6.3.3).

2.1 SYSTEM DESIGN SUMMARY

The WTB Ventilation System provides heating, ventilation, and air-conditioning to the contaminated, potentially contaminated, and uncontaminated areas of the WTB. The system maintains the proper environmental conditions for equipment operation as well as for the comfort, health, and safety of the operating personnel in this facility. The system provides protection to the public and the environment by limiting the release of radioactive or other airborne contaminants in the effluents from the facility. Additionally, the system minimizes the spread of airborne radioactive contamination within the confines of the facility by maintaining pressure differential control in order to direct the flow of air successively from uncontaminated areas (non-confinement areas) to areas of greater potential for contamination (confinement areas).

The system is designed to remain operational, as required, to perform its safety functions during normal and off-normal operating modes. Where contamination confinement is required, the system, in conjunction with the building physical barriers, comprises the confinement system for the WTB. Effective confinement control is accomplished by compartmentalizing the facility into contamination confinement zones based on the level of potential airborne radioactive contamination. The confinement areas are separated from non-confinement areas by physical barriers and backflow isolation.

The system is completely enclosed and housed within the WTB, and includes features to provide for reliability, utility, maintenance, and safety measures required for operation.

The system interfaces with other MGR systems as described in Section 1.2.4.

2.2 DESIGN ASSUMPTIONS

The principal supplementary assumption that is used (in addition to the design criteria defined in Section 1) to develop the system's design concept and/or design features is summarized below:

2.2.1 The system maintenance will be conducted using a preventative maintenance approach. Since the system operates continually, it will be provided with enough redundancy so that maintenance can be performed without shutting the system down.

2.3 DETAILED DESIGN DESCRIPTION

The WTB Ventilation System is comprised of two separate and independent subsystems. One is a nuclear grade quality system that provides proper environmental conditions for equipment and for the health, comfort, and safety of the operating personnel in areas having potential for airborne radioactive or hazardous contamination (contamination confinement zones). The other is a conventional quality system that provides proper environmental conditions for equipment and for the health, comfort, and safety of the operating personnel in uncontaminated areas (non-confinement zones). Both systems provide at least the minimum quantity of outside air to meet the ventilation requirements for acceptable indoor air quality.

The arrangement of the system and the subsystems serving the confinement and non-confinement zones of the WTB are described in the following sections.

2.3.1 System Arrangement

The system arrangement is delineated in Figures 1 and 2. Figure 1 shows the confinement and non-confinement areas of the facility at grade level, and Figure 2 shows these areas at 30 feet above grade level. The confinement areas are separated from non-confinement areas by physical barriers, backflow isolation, and airlocks or vestibules.

The system is completely enclosed and housed within the WTB. The system equipment is housed in designated equipment rooms and configured so that the supply air (outside air) equipment and the exhaust side equipment are at opposite ends of the building.

Benefits provided by the manner in which the system is arranged are discussed in Section 2.3.2.3.

2.3.2 Contamination Confinement Zone

Effective contamination confinement control is accomplished by compartmentalizing the WTB into contamination confinement zones based on the level of potential for airborne radioactive contamination. Two contamination confinement zones are anticipated in the WTB.

- **Secondary Confinement Ventilation Zone.** This zone is considered to have high potential for low level contamination and comprises occupied areas such as process areas.
- **Tertiary Confinement Ventilation Zone.** This zone is considered to have low potential for contamination and comprises HVAC equipment areas.

The rationale for the compartmentalization will be confirmed by future analysis that considers the type, quantity, physical and chemical form, and packaging of the material handled in the facility.

2.3.3 Confinement Zone Ventilation System

The contamination confinement zone described in the previous section is provided with a separate, continuously operating ventilation system comprised of components for air moving, air-conditioning, air cleanup, air distribution, and for control and monitoring capabilities. The system is classified as Quality-Level 2 (QL-2) as indicated in Appendix B, Table 8.

2.3.3.1 System Functional Description

The confinement zone ventilation system is a once-through system suitable for areas with potential for airborne radioactive or hazardous contamination. The system flow diagram is illustrated in Figure 3.

The system is comprised of a supply air side that conditions the air for health, safety, and comfort; and an air exhaust side to clean the air before discharge to the outside environment. The air supply side of the system is comprised of air-handling units, fans, and associated air distribution ductwork. Each air-handling unit consists of pre-filters, final filters, heating coils, cooling coils, and a humidifier (where required). The outside air for the confinement zone system is introduced through a wall intake structure with bird screen designed to withstand the effects of rain, snow, tornado, high winds, dust, sand, debris, and wind-generated missiles. The supply air intake structure is located away from the exhaust air side of the system to prevent contamination of the supply air.

The exhaust air side of the system is comprised of air-cleaning units with HEPA filters, exhaust fans, associated exhaust ductwork, and an exhaust an air stack.

The air-cleaning units are equipped with 90 percent (minimum) prefilters/moisture separators and two stages of 99.97 percent HEPA filters that are arranged in banks with adequate spacing for routine in-place testing, filter element replacement, and monitoring. However, the number of stages of HEPA filtration necessary for the removal of airborne radioactive contaminants, as required to meet the quantity and concentration that may be released to the environment, is to be determined by safety analysis. In the absence of such analysis, a typical two-stage HEPA filtration system is provided in the air-cleaning unit for the contamination confinement zone.

The exhaust air from the confinement zone is picked up at strategic locations of the rooms/areas for efficient removal of heat and potential airborne contaminants. The exhaust air is drawn through exhaust ductwork and air-cleaning units. The exhaust fans discharge the air to the outside environment through a common exhaust stack. The stack is designed to withstand maximum predicted wind loads and applicable design basis events (DBEs). The air is continually discharged to the outside environment through HEPA filters and stack during normal and off-normal conditions. The filtered exhaust air is continuously monitored for radioactive contamination by a stack Continuous Air Emission Monitoring System (CAEM) to ensure the discharge complies with the effluent control guidelines established in the project.

The air intake and air exhaust penetrations are provided with tornado dampers and missile protection. The tornado dampers are designed to close automatically to prevent the reversal of contaminated airflow and to protect the WTB from dangerous negative pressures induced by the effect of the high winds as depicted in Figure 3.

The monitoring and control of system operations are provided with audible and/or visual alarms for off-normal conditions and equipment failures. The operation of the supply air fans and the exhaust air fans is interlocked to prevent pressurization of the confinement zone. The system interfaces with the Monitored Geologic Repository Operations Monitoring and Control System and with the Site Radiological Monitoring System.

2.3.3.2 Major System Features and Characteristics

The objectives of efficient maintainability are achieved by housing the system structures, systems, and components (SSCs) in designated equipment rooms. The ventilation equipment rooms are sized to allow sufficient space for servicing and replacement operations, in-place testing, and space for associated or auxiliary systems. The equipment rooms/areas are configured so that the supply air intakes (clean-air side) of the system are located away from the effluents discharge from potentially contaminated areas. This feature minimizes the potential for re-entrainment of contaminants by the supply air intakes.

Confinement zone ventilation is isolated from the non-confinement area (uncontaminated area) ventilation to prevent cross contamination within the facility, and is maintained at a lower negative pressure differential relative to the outside environment.

Confinement zone ventilation SSCs essential to perform confinement functions are designed to ensure that they remain operational, as required, to perform their safety functions during normal and off-normal operating modes. To remain operational, the ventilation system includes appropriate redundancy to preclude shutdown for servicing, maintenance, and testing.

The confinement zone ventilation system is comprised of several modular components for system diversity so that any one component can be completely isolated due to failure or shutdown for maintenance while the remaining associated components continue to maintain the required system function. This system configuration provides a high degree of system reliability.

2.3.4 Non-Confinement Zone Ventilation System

Ventilation of the non-confinement zone (uncontaminated areas) is provided by a recirculation air system designed to supply mixed outside air and return air. The system is designed to have the capability for filtering any adverse elements in the air for protection of the health of the occupants. The system supplies at least the minimum quantity of outside air to meet the requirements for acceptable indoor air quality. The system is of conventional quality as indicated in Appendix B, Table 8.

The non-confinement ventilation system is comprised of components for air moving, air-conditioning, air distribution, and for control and monitoring capabilities. Outside air is introduced through outside air intake louvers and mixed with returned air. Each air-handling unit consists of a prefilter, final filter, heating coil, cooling coil, supply fan, and humidifier (if needed). The air-handling unit filters, conditions, and supplies mixed air to each room/area based on thermal considerations. Local thermostats control the thermal condition of the rooms/areas. Exhaust air from the system is discharged to the outside environment by exhaust fans and associated ductwork. The non-confinement (uncontaminated) area is maintained at a positive pressure differential relative to the confinement zone to prevent cross contamination. The flow diagram for the non-confinement ventilation system is illustrated in Figure 3.

Audible and visual alarms are provided to alert personnel to conditions that have potential to affect system performance. .

2.3.5 Other System Features or Characteristics

The WTB Ventilation System incorporates several additional features related to areas of safety, surveillance, ALARA, off-normal event and DBE mitigation, decontamination, and decommissioning. This section will be updated in future revisions of this SDD as the design of the system progresses.

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 mature.

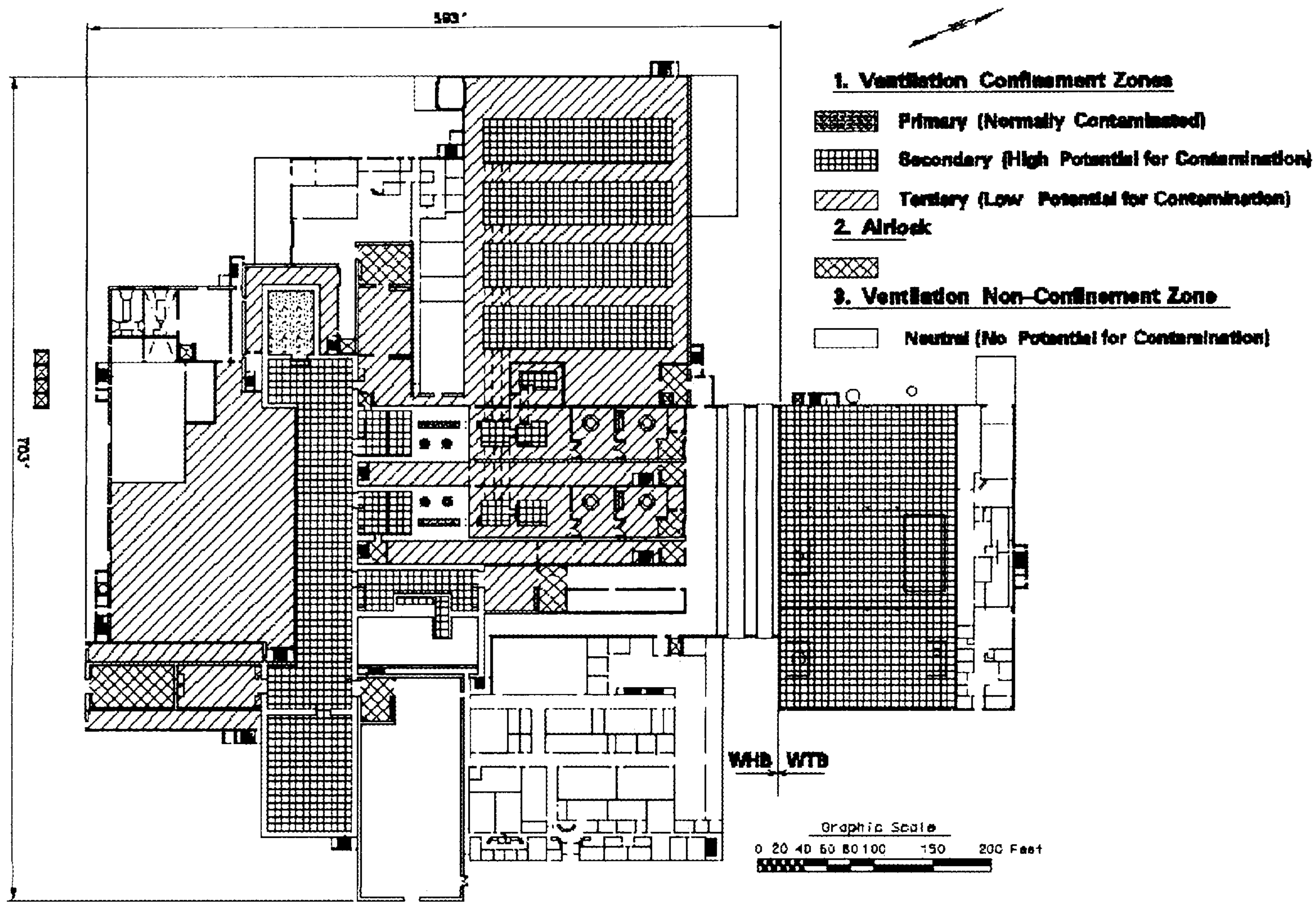

Figure 1. Waste Handling/Waste Treatment Building Confinement Zone Configuration – Grade Level

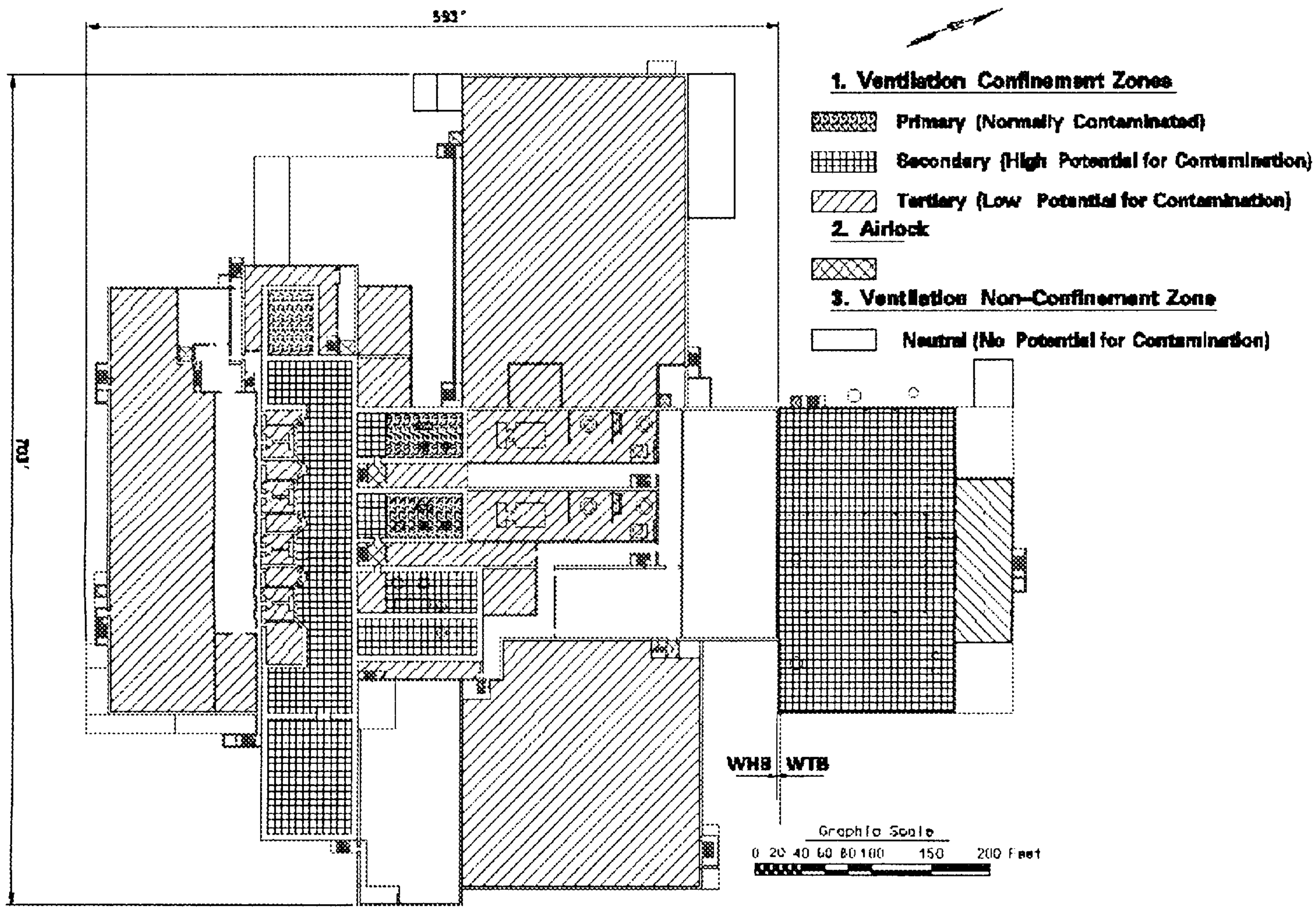

Figure 2. Waste Handling/Waste Treatment Building Confinement Zone Configuration – 30' Above Grade Level

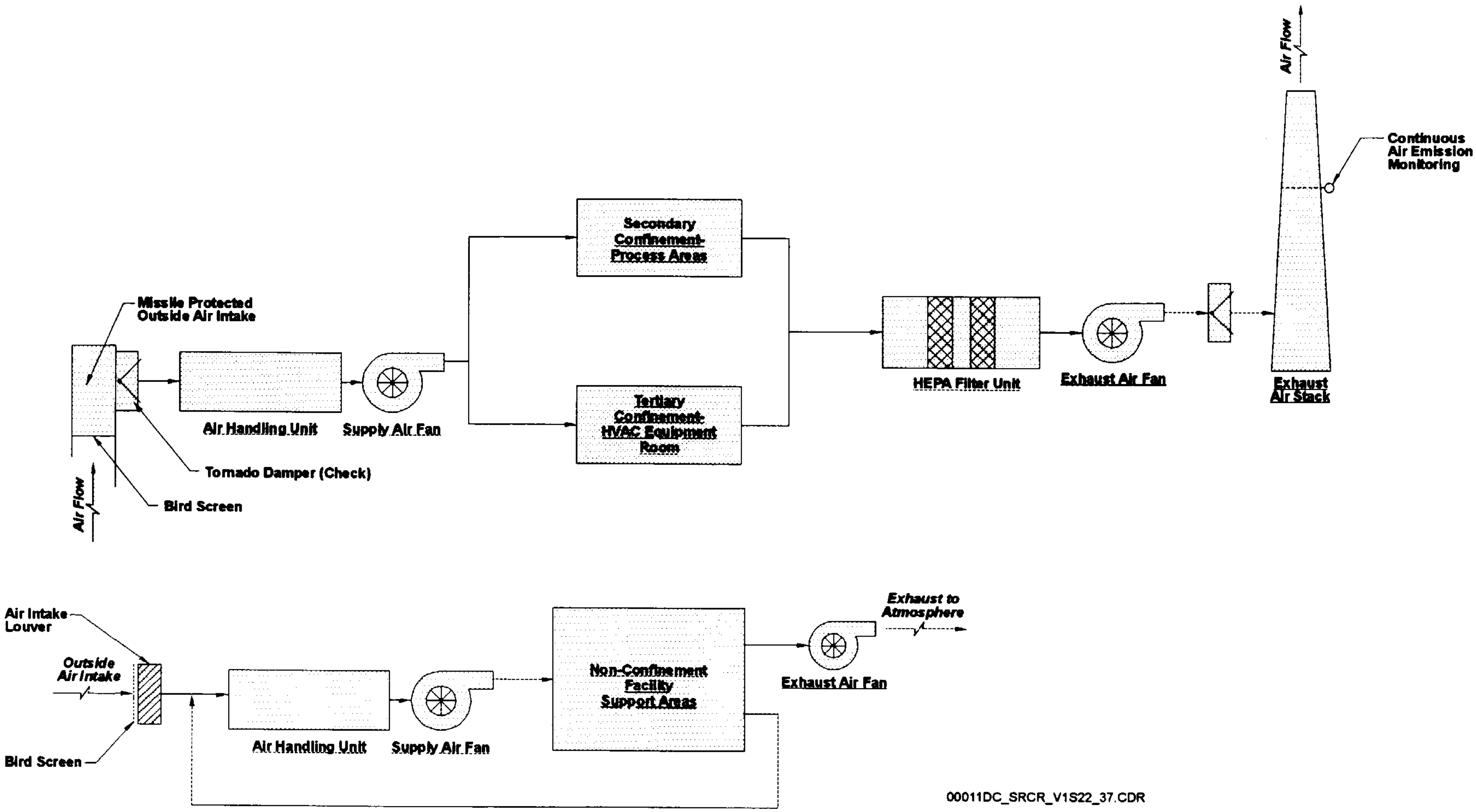

Figure 3. Waste Treatment Building HVAC Flow Diagram

3. SYSTEM OPERATIONS

An operations section for this system will be provided in a future revision.

4. SYSTEM MAINTENANCE

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

APPENDIX A CRITERION BASIS STATEMENTS

This section presents the criterion basis statements for criteria in Section 1.2. Descriptions of the traces to the "Monitored Geologic Repository Requirements Document" 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 is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion is based on the design requirement for the HVAC system in Section 6.6.2.1.5 of the "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988), which requires individual building areas to be thermostatically controlled to maintain temperature and humidity within limits defined by equipment and personnel requirements.

This criterion is supported by Guidance Statement 6.2g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

Normally Occupied Areas (Normal Conditions): Design temperatures of 76 degrees F for summer and 72 degrees F for winter are from Appendix E of ANSI/ANS-57.7-1988. Appendix E provides the typical normal temperatures for summer and winter for a spent fuel storage and handling facility similar to the MGR. The specified temperatures are within the ASHRAE recommended comfort zone shown in Chapter 8, Figure 4 of the ASHRAE "Fundamentals" handbook.

Normally Occupied Areas (Off-Normal Conditions): Temperature control during off-normal conditions (e.g., loss of power, equipment failure) is not required.

Normally Unoccupied Areas (Normal Conditions): Design temperatures of 90 degrees F for summer and 65 degrees F for winter are from Appendix E of ANSI/ANS-57.7-1988. Appendix E provides the typical normal temperature ranges for summer and winter for a spent fuel storage and handling facility similar to the MGR. The specified temperatures apply to areas that are not expected to be occupied for a full shift, but in which occasional or intermittent occupation may be required. These temperatures are deemed appropriate for short-term occupancy and most mechanical and electrical components. Special cooling/heating provisions must be provided if temperature limits specified by an equipment manufacturer do not fall within the range specified in Table 1 of this document.

Normally Unoccupied Areas (Off-Normal Conditions): Temperature control during off-normal conditions (e.g., loss of power, equipment failure) is not required.

Unoccupied Areas (Normal Conditions): Occupancy in the unoccupied areas is not expected except under special circumstances. Therefore, the main purpose of temperature control in these areas is protection of the electric equipment. Experience indicates that 104 degrees F is the typical maximum design ambient temperature during normal operations for areas that are not occupied but house electrical equipment in facilities similar to the MGR, such as nuclear power plants. The minimum design temperature of 65 degrees F for winter is from Appendix E of ANSI/ANS-57.7-1988. Appendix E provides the typical normal temperatures for summer and winter for a spent fuel storage and handling facility similar to the MGR. A temperature of 65 degrees F is deemed appropriate for most mechanical and electrical components. Special cooling/heating provisions must be provided if temperature limits specified by an equipment manufacturer do not fall within the range specified in Table 1 of this document.

Unoccupied Areas (Off-Normal Conditions): Temperature control during off-normal conditions (e.g., loss of power, equipment failure) is not required.

Electronics Equipment Areas (Normal Conditions): Design summer and winter temperature of 72 degrees F is from Table 1, Chapter 16 of the "Heating, Ventilating and Air-Conditioning Applications." According to this reference, the specified temperature is typical of the temperature environment recommended by most computer equipment manufacturers. The specified temperature of 72 degrees F is within the limits of 18 to 27 degrees C (64 to 81 degrees F) provided in Table 1 of the "Environmental Conditions for Process Measurement and Control Systems: Temperature and Humidity" (ANSI/ISA-S71.01-1985), for Class A (Air Conditioned - Severity Level 1) locations. This standard establishes temperature and humidity conditions for industrial process measurement and control equipment. It should be noted that the provided range does not allow the control system to modulate in the specified range, as Note 'd' of Table 1 requires that the operating temperature be selected from the limits provided in the standard. The specified temperature of 72 degrees F is also within the temperature limits of 20 to 23 degrees C (68 to 73 degrees F) for Equipment Group (1)(a)) provided in Table 10 of the "IEEE Standard Definition, Specification, and Analysis of Systems Used for Supervisory Control, Data Acquisition, and Automatic Control" (IEEE C37.1-1994). Section 6 of this standard contains a definition of the environment in which control and data acquisition equipment are required to operate. Strict compliance with this IEEE standard is not required; however, the information contained in the standard is used as a guideline.

Electronics Equipment Areas (Off-Normal Conditions): Equipment located in these areas are generally more sensitive to high temperatures and has a more significant impact on the overall operations at the repository. Therefore, the ventilation system is required to make provisions to maintain a temperature of 72 degrees F during off-normal (e.g., loss of power, equipment failure) conditions also. This requirement is especially important in cases where the computer, communications, or data processing equipment is required to operate during a power outage.

The 2-degree F margins shown in Table 1 are provided for system performance variations.

1.2.1.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion is based on the design requirement for the heating, ventilating, and air-conditioning system in Section 6.6.2.1.5 of the "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988), which requires individual building areas to be thermostatically controlled to maintain temperature and humidity within limits defined by equipment and personnel requirements.

Humidity is not controlled in WTB areas that are not normally occupied. This is due to 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. Generally, prolonged exposure to low or high humidity environments is required before a component is damaged. If a component located in normally unoccupied areas requires humidity control, as specified by the manufacturer, special provisions must be provided.

This criterion is supported by Guidance Statements 6.2g1 and 6.2g11 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

Normally Occupied Areas (Normal Conditions): The design humidity range of 30 to 60 percent for summer and winter is based on the human comfort criteria available in various sources. In Table 1 of Chapter 3 of the "Heating, Ventilating and Air-Conditioning Applications," a humidity value of 20 to 30 percent for winter, and 50 to 60 percent for summer is specified for office buildings. Considering the indoor temperature requirement of 72 degrees F in winter and 76 degrees F in summer, a humidity range of 30 to 60 percent would place the normally occupied areas within the ASHRAE summer and winter comfort zone in Chapter 8, Figure 4 of the ASHRAE "Fundamentals" handbook.

Electronics Equipment Areas: The design humidity range of 40 to 50 percent for summer and winter is based on several sources. Table 1 of Chapter 16 of the "Heating, Ventilating and Air-Conditioning Applications" specifies a humidity value of 50 percent for typical computer room design conditions based on the recommended value by most computer equipment manufacturers. The specified humidity range of 40 to 50 percent is within the limits (35 to 75 percent) provided in Table 1 of the "Environmental Conditions for Process

Measurement and Control Systems: Temperature and Humidity" (ANSI/ISA-S71.01-1985) for Class A (Air Conditioned Severity Level 1) locations. This standard establishes temperature and humidity conditions for industrial process measurement and control equipment. It should be noted that the provided range does not allow the control system to modulate in the specified range, as Note 'd' of Table 1 requires that the operating humidity environment be selected from the limits provided in the standard. The specified humidity range of 40 to 50 percent is also within the limits (40 to 60 percent for Equipment Group (1)(a)) provided in Table 10 of the "IEEE Standard Definition, Specification, and Analysis of Systems Used for Supervisory Control, Data Acquisition, and Automatic Control" (IEEE Std C37.1-1994). Section 6 of this standard contains a definition of the environment in which control and data acquisition equipment are required to operate. Strict compliance with this IEEE standard is not required; however, the information contained in the standard is used as a guideline.

1.2.1.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A. The criterion establishes the outside design requirements for heating and cooling load calculations. Use of applicable and accurate environmental data (and other parameters) is essential in calculation of heating and cooling loads. The data provided in Table 3 of this document is not intended to be all-inclusive (the design organization may obtain additional data from qualified sources as required). However, deviations from the specific parameters that are provided in Table 3 must be documented.

This criterion is supported by Guidance Statement 6.2g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The outside design conditions are obtained from Tables 1A and 1B in Chapter 26 of the ASHRAE "Fundamentals" handbook. Selection of Mercury, Nevada as the representative site is appropriate because it is close to and representative of the conditions in the North Portal area.

1.2.1.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion establishes the requirement for maintaining pressure zones in the WTB. Pressure zones are required for controlling contamination within the facility. The WTB will be analyzed by the design organization to determine the potential for airborne contamination in each area.

This criterion is based on the requirements, recommendations, and guidelines provided in Sections 1 and 2 of the "Heating, Ventilating, and Air-Conditioning Design Guide for Department of Energy Nuclear Facilities" (ASHRAE DG-1-93), and Section 6.6 of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988).

MGR RD 3.1.C requires compliance with 10 CFR 63. This criterion also supports the general requirement in 10 CFR 63.112(e)(1), which requires the performance analysis of the structures, systems, and components (SSCs) that are important to safety to include consideration of a means to limit concentrations of radioactive materials in air. Maintaining the specified negative pressures in areas with contamination present, or with potential for contamination, will help limit concentration of radioactive materials in air. This criterion also supports MGR RD 3.1.B and the performance objective in 10 CFR 63.111(a)(1), which requires the geologic repository operations area to provide protection against radiation exposures and release of radioactive material by meeting the requirements of "Standards for Protection Against Radiation" (10 CFR 20).

This criterion is supported by Guidance Statements 6.3g1, 6.5g1, and 7.1g3 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The pressure requirements in this criterion are based on the requirements, recommendations, and guidelines provided in Section 2 of the "Heating, Ventilating, and Air-Conditioning Design Guide for Department of Energy Nuclear Facilities," and Section 6.6.2.2.3.2 of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988).

Maintaining positive pressure in areas with no potential for contamination is a common industry practice. The specified +0.15 inwg is of similar magnitude to the required pressure differential between areas of high contamination potential and areas of low contamination potential.

1.2.1.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable industry codes and standards. The criterion establishes the requirement for the minimum outside air to be supplied to the occupied areas. Adequate outside air is one of the factors in the design of a ventilation system that can affect employee safety, health, and comfort.

II. Criterion Performance Parameter Basis

The minimum requirements are obtained from Table 2 of "Ventilation for Acceptable Indoor Air Quality" (ANSI/ASHRAE 62-1989).

1.2.1.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.C. The criterion is based on the general requirement in 10 CFR 63.112(e)(1), which requires the performance analysis of the SSCs that are important to safety to include consideration of a means to limit concentrations of radioactive materials in air. This criterion also supports MGR RD 3.1.B and the performance objective in 10 CFR 63.111(a)(1), which requires the geologic repository operations area to provide protection against radiation exposures and release of radioactive material by meeting the requirements of "Standards for Protection Against Radiation" (10 CFR 20).

This criterion also supports MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion is supported by the requirement in Section 6.6.2.2.3.1 of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988), which requires that subsystems with high potential for contamination be designed for once-through flow.

II. Criterion Performance Parameter Basis

N/A

1.2.1.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.C. The criterion is based on the general requirement in 10 CFR 63.112(e)(1), which requires the performance analysis of the SSCs that are important to safety to include consideration of a means to limit concentrations of radioactive materials in air. This criterion also supports MGR RD 3.1.B and the performance objective in 10 CFR 63.111(a)(1), which requires the geologic repository operations area to provide protection against radiation exposures and release of radioactive material by meeting the requirements of "Standards for Protection Against Radiation" (10 CFR 20).

This criterion also supports MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion is supported by the requirement in Section 6.6.2.1.2 of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988), which requires airflow to be from areas with lower potential for contamination to areas with higher potential for contamination.

This criterion is supported by Guidance Statements 6.5g1 and 7.1g3 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.1.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion is based on the general requirement of designing the ventilation subsystems based on the level of potential for airborne radioactive contamination. This requirement helps reduce the potential for cross contamination within the facility. This criterion is supported by the requirements in Sections 6.6 and 6.6.3.1 of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988).

MGR RD 3.1.C requires compliance with 10 CFR 63. This criterion is also based on the general requirement in 10 CFR 63.112(e)(1), which requires the performance analysis of the SSCs that are important to safety to include consideration of a means to limit concentrations of radioactive materials in air.

II. Criterion Performance Parameter Basis

N/A

1.2.1.10 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A. The criterion is based on the general requirement of designing the ventilation subsystems based on the level of potential for airborne radioactive contamination. This requirement helps reduce the potential for cross contamination within the facility. This criterion is supported by the requirements in Sections 6.6, 6.6.3.2, and 6.6.3.3 of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988).

MGR RD 3.1.C requires compliance with 10 CFR 63. This criterion is also based on the general requirement in 10 CFR 63.112(e)(1), which requires the performance analysis of the SSCs that are important to safety to include consideration of a means to limit concentrations of radioactive materials in air.

II. Criterion Performance Parameter Basis

N/A

1.2.1.11 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.B and 3.1.C. The criterion is based on the performance objective in 10 CFR 63.111(a)(1), which requires the geologic repository operations area to provide protection against radiation exposures and release of radioactive material by meeting the requirements of "Standards for Protection Against Radiation" (10 CFR 20). Use of HEPA filters will help maintain doses below 10 CFR 20 requirements. This criterion is also based on 10 CFR 63.112(e)(1) and 63.112(e)(4), which require the performance analysis of the SSCs that are important to safety to include consideration of means to limit concentration of radioactive material in air and control the dispersal of radioactive contamination.

This criterion also supports MGR RD 3.3.A, which requires compliance with applicable codes and standards. The requirement is based on the general performance requirement in Section 5.6.3 of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988), which requires the ventilation system to be designed and installed with the capability to collect airborne particulate radioactive materials during normal operations of the facility.

This criterion is supported by Guidance Statement 6.2g4 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The specific requirement for the use of 90 percent prefilters and 99.97 percent HEPA filters is based on ANSI/ANS 57.7-1988, Sections 6.6.2.2.2.1 and 6.6.2.2.3.1, which require the exhaust air from areas with potential for contamination be filtered through 90 percent ASHRAE prefilters and 99.97 percent HEPA filters in series.

1.2.1.12 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.C, which requires compliance with 10 CFR 63. The criterion is based on 10 CFR 63.112(e)(1), which requires the performance analysis of the SSCs that are important to safety to include consideration of means to limit concentration of radioactive material in air. This criterion also supports MGR RD 3.1.B and the performance objective in 10 CFR 63.111(a)(1), which requires the geologic repository operations area to provide protection against radiation exposures and release of radioactive material by meeting the requirements of "Standards for Protection Against Radiation" (10 CFR 20).

This criterion also supports MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion is supported by the requirement in Section 6.6.2.2.2.2 of "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988), which requires filtration of the recirculated air through a HEPA filter unit to prevent buildup of radioactive particulates in the air.

II. Criterion Performance Parameter Basis

N/A

1.2.1.13 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.C, which requires compliance with 10 CFR 63. The criterion is based on 10 CFR 63.112(e)(1), which requires the performance analysis of the SSCs that are important to safety to include consideration of means to limit concentration of radioactive material in air. This criterion also supports MGR RD 3.1.B and the performance objective in 10 CFR 63.111(a)(1), which requires the geologic repository operations area to provide protection against radiation exposures and release of radioactive material by meeting the requirements of "Standards for Protection Against Radiation" (10 CFR 20).

This criterion also supports MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion is supported by Section 6.5.1.1.4 of "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992), which invokes the requirement for precluding flow of air from areas of higher potential for contamination to areas of lower contamination. This requirement is supported by the general concept of minimizing the potential for spread of contamination within the WTB during system normal operations and operational transients.

This criterion is supported by Guidance Statements 6.3g15, 6.5g1, 7.1g3, and 7.1g4 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.1.14 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.C, which requires compliance with 10 CFR 63; and MGR RD 3.3.A, which requires compliance with applicable industry codes and standards. The criterion is based on 10 CFR 63.112(e)(4) and 63.112(e)(10), which require the performance analysis of the SSCs that are important to safety to include consideration of means to monitor and control the dispersal of radioactive contamination and radioactive effluents.

This criterion is also based on "Nuclear Air Cleaning Handbook, Design, Construction, and Testing of High-Efficiency Air Cleaning Systems for Nuclear Application" (ERDA 76-21), Section 5.6.7; and "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992, Section 6.5.3). These documents require adequate instrumentation and controls to assess system performance and continuous monitoring (and alarm) of radioactive material level in confinement exhaust systems. In addition, "Nuclear Power Plant Air-Cleaning Units and Components" (ASME N509-1989), Section 4.9.2, requires design of adequate instrumentation (with appropriate alarms setpoints) for safety related and non-safety related air cleaning units. Instrumentation requirements are tabulated in Tables 4-1 and 4-2 of ASME N509-1989.

This criterion is supported by Guidance Statements 6.2g12, 6.2g24, 6.3g16, 7.2g1, and 7.4g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.1.15 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A. The criterion is based on "Nuclear Power Plant Air-Cleaning Units and Components" (ASME N509-1989, Section 4.9.4), which requires status indication of all electrically powered or controlled equipment. The required indications are given in Tables 4-1 and 4-2 of ASME N509-1989.

This criterion is supported by Guidance Statements 6.2g12, 6.2g24, and 7.2g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.1.16 Criterion Basis Statement

I. Criterion Need Basis

This criterion establishes the operational life of the system, and 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

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 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.

1.2.2.1.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.C. This criterion also supports MGR RD 3.1.B and 10 CFR 63.111(a)(1), which require compliance with "Standards for Protection Against Radiation" (10 CFR 20).

Section 1101(b) of 10 CFR 20 states: "The licensee shall use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA)."

The requirement for compliance with ALARA principles is also based on 10 CFR 63.112(e)(2) and 63.112(e)(3), which require the performance analysis of the SSCs that are important to safety to include consideration of the means to limit the time required to perform work in the vicinity of radioactive materials, and consideration of suitable shielding.

This criterion also supports MGR RD 3.3.A, which requires compliance with applicable codes and standards. Compliance with "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low as is Reasonably Achievable" (Regulatory Guide 8.8), is invoked because this regulatory guide is one of the primary regulatory documents that addresses ALARA. Regulatory Guide 8.8 provides guidelines on achieving the occupational ALARA goals during the planning, design, and operations phases of a nuclear facility. According to Section B of this guide, "Effective design of facilities and selection of equipment for systems that contain, collect, store, process, or transport radioactive material in any form will contribute to the effort to maintain radiation doses to station personnel ALARA." Section C.2 addresses facility and equipment design features. The design process of each system must include an evaluation of the applicable requirements in Section C.2 of Regulatory Guide 8.8.

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

This criterion is supported by Guidance Statements 6.2g2 and 6.5g2 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The project ALARA program goals are to be determined.

1.2.2.2.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.C, which requires compliance with 10 CFR 63. The criterion is based on 10 CFR 63.112(e)(13), which requires the performance analysis of the SSCs that are important to safety to include consideration of the means to inspect, test, and maintain SSCs important to safety, as necessary, to ensure their continued functioning and readiness.

This criterion is supported by Guidance Statement 6.5g2 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.2.2.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable industry codes and standards, and MGR RD 3.1.G, which requires compliance with applicable DOE Orders.

This criterion is supported by Guidance Statement 6.2g3 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

As mandated by Section 4.l(1) of "Worker Protection Management for DOE Federal and Contractor Employees" (DOE O 440.1A), "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" must be used when threshold limit values are more protective than the Occupational Safety and Health Administration permissible exposure limits.

1.2.2.2.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A. In addition to Criteria 1.2.1.14 and 1.2.1.15 (system parameters monitoring and equipment status monitoring), this criterion invokes a requirement for auditory and visual alarms for conditions that have the potential to cause injury or death, result in equipment damage, and affect system performance.

II. Criterion Performance Parameter Basis

N/A

1.2.3.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A. The 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."

Temperature is one of the primary environmental parameters that can 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 is supported by Guidance Statements 6.2g1 and 6.2g18 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The Normal Environment temperatures for all areas and the Off-Normal Environment temperature for the Electronics Equipment Areas, are based on the performance requirements of the system, as specified in Criterion 1.2.1.1 of this document.

The Off-Normal Environment temperatures for areas that are not controlled by the ventilation system are to be determined.

1.2.3.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A. The 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."

Humidity is considered to be one of the primary environmental parameters that can affect the 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 SSCs 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 is supported by Guidance Statements 6.2g1 and 6.2g18 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The Normal Environment humidity values are based on the performance requirements of the system, as specified in Criterion 1.2.1.2 of this document. Humidity environments are not controlled in the Normally Unoccupied Areas and are to be determined.

1.2.3.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. The 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."

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.

In the WTB, most of the electronic and electrical components will be located in mild environments with small radiation doses. However, 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 should also be considered.

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

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

This criterion is supported by Guidance Statements 6.2g1 and 6.2g2 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The radiation environment is to be determined.

1.2.3.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. Wind is one of the primary external environmental parameters that can affect buildings and structures located outside. Proper consideration of wind is required to ensure that buildings and structures can withstand the wind forces, and that system components are adequately protected from the wind.

According to Section 6.5.2 of the standard for "Minimum Design Loads for Buildings and Other Structures" (ANSI/ASCE 7-95), the basic wind speed is to be used in the determination of the design wind loads for all buildings and structures. A similar discussion is provided in Sections 1615, 1616, and 1618 of the "1997 Uniform Building Code" (Volume 2, "Structural Engineering Design Provisions").

This criterion is supported by Guidance Statements 6.2g8 and 6.3g5 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The wind speed is obtained from "MGR Design Basis Extreme Wind/Tornado Analysis," Section 7.

1.2.3.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. Temperature is considered to be one of the primary environmental parameters that can affect component performance or result in advanced degradation. To ensure proper performance, many equipment manufacturers specify the temperature environment in which the component must operate. This criterion establishes the outdoor temperature environment in which SSCs are expected to operate.

This criterion is supported by Guidance Statements 6.2g1 and 6.2g18 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The extreme outside temperature range of 5 degrees F to 117 degrees F is based on the annual extreme minimum and maximum temperatures for the nine meteorological monitoring sites located in the Yucca Mountain area. Locations of the nine sites are shown in Figure 2-1 of "Engineering Design Climatology and Regional Meteorological Conditions Report." Extreme temperatures (and other data) are given in Tables A-1 through A-9 of the report.

The collected temperature data in Tables A-1 through A-9 are based on 11 years of monitoring at Sites 1 through 5 and four years of monitoring at Sites 6 through 9. Site 1 data are typically more representative of the nine sites because it is closest to the North Portal. However, due to the limited number of years that data was collected, the lowest and highest recorded temperatures for all nine sites are used to bound the extreme temperature range. Site 5 has the lowest recorded temperature of -13.1 degrees C and Site 9 has the highest of 45.1 degrees C. This temperature range was conservatively expanded to -15 degrees C (5 degrees F) to 47 degrees C (117 degrees F).

1.2.3.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable industry codes and standards. The criterion is based on the discussion provided in "Nuclear Air Cleaning Handbook, Design, Construction, and Testing of High-Efficiency Air Cleaning Systems for Nuclear Application" (ERDA 76-21).

Section 2.3.3 of ERDA 76-21 emphasizes the importance of protecting the supply air intakes from the environmental elements. Similar requirements are invoked in "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992, Sections 6.4.4.1.3 and 6.4.4.1.4). In addition, snowfall is one of the primary design parameters needed for exposed structures to ensure external loadings are accounted for.

This criterion is supported by Guidance Statements 6.2g8, 6.2g18, 6.3g5, and 7.4g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The "Engineering Design Climatology and Regional Meteorological Conditions Report" includes snowfall information for sites in the general area of the Yucca Mountain that are deemed adequate for bounding the snowfall environment for the Yucca Mountain site. The closest of these sites is Desert Rock Airport, south of Mercury. Snowfall data are also included for Tonopah. Although Desert Rock is closer to Yucca Mountain, the elevation of Tonopah is more representative of the elevation at the Yucca Mountain site (5,426 ft for Tonopah based on Table 1 of Chapter 24 of "Fundamentals," and 4,850 ft for Yucca Mountain based on Table 2-1 of the climatology report). Therefore, data for Tonopah is considered to be the conservative bound for Yucca Mountain.

Table A-14 of the "Engineering Design Climatology and Regional Meteorological Conditions Report" provides daily maximum and monthly maximum snowfall data. The maximum daily snowfall for Tonopah is 10 in. (rounded up from 9.7 in.). The monthly snowfall is used to establish and bound the maximum snowfall accumulation. This is based on the conservative nature of the maximum monthly snowfall and the consideration that all of the monthly snowfall occurs in a short period of time with no reduction for melting. The maximum monthly snowfall for Tonopah is 17 inches (Table A-14).

1.2.3.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. The criterion is based on the discussion provided in the "Nuclear Air Cleaning Handbook, Design, Construction, and Testing of High-Efficiency Air Cleaning Systems for Nuclear Application" (ERDA 76-21).

Section 2.3.3 of ERDA 76-21 emphasizes the importance of protecting the supply air intakes from the environmental elements. Similar requirements are invoked in "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992, Sections 6.4.4.1.3 and 6.4.4.1.4). In addition, humidity is a primary environmental parameter that can affect component performance and anticipated life expectancy. This criterion establishes the external humidity environment at the site.

This criterion is supported by Guidance Statements 6.2g1, 6.2g18, and 7.4g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The humidity values are taken from "Engineering Design Climatology and Regional Meteorological Conditions Report," Table A-1, Site 1 (NTS-60). Using Site 1 data is appropriate because the site is the closest and most representative of the North Portal, South Portal, and ventilation shafts. The annual mean humidity for Site 1 is 28 percent, which is the average of the yearly averages for each of the time periods (Hour 0400, 1000, 1600, 2200), from Table A-1. The minimum summer mean humidity for Site 1 is 13 percent which occurred in the month of June at hour 1600, from Table A-1. The maximum winter mean humidity for Site 1 is 46 percent (rounded up from 45.9), which occurred in the month of December at hour 0400, from Table A-1.

1.2.3.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable industry codes and standards. The criterion is based on the discussion provided in "Nuclear Air Cleaning Handbook, Design, Construction, and Testing of High-Efficiency Air Cleaning Systems for Nuclear Application" (ERDA 76-21).

Section 2.3.3 of ERDA 76-21 emphasizes the importance of protecting the supply air intakes from the environmental elements. Similar requirements are invoked in "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992, Sections 6.4.4.1.3 and 6.4.4.1.4). In addition, precipitation is an environmental parameter that can affect site drainage and erosion, buried utilities, outdoor equipment seals, and roof drain system sizing. This criterion establishes the rainfall rates through which the affected systems must be able to endure and function.

This criterion is supported by Guidance Statements 6.2g8, 6.2g18, 6.3g5, and 7.4g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

The maximum annual precipitation is derived from "Engineering Design Climatology and Regional Meteorological Conditions Report" (p. 4-10 and Figure 4-3). The report identifies a maximum annual precipitation that ranges from approximately 1 to 10 in. for the period of 1949 to 1995. The bounding maximum annual precipitation of approximately 10 in. is taken from the Amargosa Farms site. The Amargosa Farms site is deemed appropriate in the report based on its proximity to Yucca Mountain (p. 2-5, second paragraph).

The maximum daily precipitation is derived from "Engineering Design Climatology and Regional Meteorological Conditions Report" (p. 4-21, last paragraph). The reference paragraph states, "The conclusion from the statistical analyses of observed and estimated precipitation data performed for this report indicate that the maximum daily precipitation within 50 km of Yucca Mountain is not expected to exceed five inches."

1.2.3.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable industry codes and standards. The criterion is based on the discussion provided in the "Nuclear Air Cleaning Handbook, Design, Construction, and Testing of High-Efficiency Air Cleaning Systems for Nuclear Application" (ERDA 76-21). Section 2.3.3 of this document emphasizes the importance of protecting the supply air intakes from the environmental elements.

This criterion is supported by Guidance Statements 6.2g3, 6.2g8, 6.3g5, 7.1g2, and 7.4g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.4.1 Criterion Basis Statement

I. Criterion Need Basis

The Waste Treatment Building System will provide space for the system; supply water for heating, cooling, and humidification; and provide normal electric power for system operation. Interface with the Waste Treatment Building System also includes the WTB fire protection subsystem for detection of fire and smoke.

II. Criterion Performance Parameter Basis

N/A

1.2.4.2 Criterion Basis Statement

I. Criterion Need Basis

Smoke detectors and fire dampers will be installed in the ventilation ductwork, and interlocks with the WTB fire protection subsystem will be required upon detection of fire or smoke or initiation of the fire suppression system. Therefore, interface between the system and the WTB fire protection subsystem is required.

II. Criterion Performance Parameter Basis

N/A

1.2.4.3 Criterion Basis Statement

I. Criterion Need Basis

Radiation monitors will be installed in the ventilation ductwork. Also, interlocks may exist between radiation monitors and the ventilation system (e.g., fans, dampers), therefore, interface between the system and the Site Radiological Monitoring System is required.

II. Criterion Performance Parameter Basis

N/A

1.2.4.4 Criterion Basis Statement

I. Criterion Need Basis

The system will require control and monitoring of its operations. Therefore, interface with the Monitored Geologic Repository Operations Monitoring and Control System is required.

II. Criterion Performance Parameter Basis

N/A

1.2.4.5 Criterion Basis Statement

I. Criterion Need Basis

Certain processes associated with the Site-Generated Radiological Waste Handling System (e.g., shredders, liquid waste holdup tanks) and the Site Generated Hazardous, Non-Hazardous & Sanitary Waste Disposal System may require venting or installation of a vacuum pump system to control the spread of airborne contamination. The system will interface with the vent lines, piping, or ductwork associated with these processes as required for routing of any pre-treated gaseous effluent to the upstream side of the system HEPA filters for monitoring and exhaust.

II. Criterion Performance Parameter Basis

N/A

1.2.6.1 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.B, which requires compliance with applicable provisions of "Standards for Protection Against Radiation" (10 CFR 20).

II. Criterion Performance Parameter Basis

N/A

1.2.6.2 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.E, which requires compliance with the applicable provisions of "Occupational Safety and Health Standards" (29 CFR 1910).

II. Criterion Performance Parameter Basis

N/A

1.2.6.3 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.F, which requires compliance with the applicable provisions of "Safety and Health Regulations for Construction" (29 CFR 1926).

II. Criterion Performance Parameter Basis

N/A

1.2.6.4 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. "Nuclear Power Plant Air-Cleaning Units and Components" (ASME N509-1989) is deemed applicable because the system utilizes air cleaning units similar to those in a nuclear power plant. ASME N509-1989, which covers the requirements for the design of the nuclear air cleaning units, is accepted and widely utilized by the nuclear industry.

This criterion is supported by Guidance Statements 6.2g12, 6.2g13, 6.2g15, 6.2g16, 6.2g17, 6.2g20, 6.2g21, and 6.2g24 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.6.5 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. "Testing of Nuclear Air Treatment Systems" (ASME N510-1989) is deemed applicable because the system utilizes air cleaning units that require field testing similar to what is needed by those in nuclear power plants. ASME N510-1989, which covers the field testing requirements for the design of the nuclear air cleaning units, is accepted and widely utilized by the nuclear industry.

This criterion is supported by Guidance Statement 7.3g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.6.6 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. "Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)" (ANSI/ANS-57.7-1988), is a widely referenced standard that provides design criteria for systems and equipment of a facility designed for the receipt and storage of spent fuel. Operations at the WTB will be similar to such a facility. Therefore, the design criteria from this standard are deemed applicable to the system.

"Design of an Independent Spent Fuel Storage Installation (Water-Basin Type)" (Regulatory Guide 3.49) provides guidance from the NRC on the use of ANSI/ANS 57.7-1988.

II. Criterion Performance Parameter Basis

N/A

1.2.6.7 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. "Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type)" (ANSI/ANS-57.9-1992) is a widely referenced standard that provides design criteria for systems and equipment of a facility designed for the receipt and storage of spent fuel. Operations at the WTB will be similar to such a facility. Therefore, the design criteria from this standard are deemed applicable to the system.

This criterion is supported by Guidance Statements 6.4g1, 7.1g1, 7.1g2, and 7.1g3 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.6.8 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. "Nuclear Air Cleaning Handbook, Design, Construction, and Testing of High-Efficiency Air Cleaning Systems for Nuclear Application" (ERDA 76-21) is an extensive collection of design, construction, and testing requirements for air cleaning systems for nuclear applications, and is deemed applicable to this system.

This criterion is supported by Guidance Statement 7.4g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.6.9 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. The cited references, ASHRAE "Fundamentals," "ASHRAE Handbook - Heating, Ventilating, and Air-Conditioning Systems and Equipment," "Heating, Ventilating, and Air-Conditioning Applications," and the ASHRAE handbook "Refrigeration" provide industry-wide accepted guidelines and design information for all ventilation system applications, and are deemed applicable to the system.

II. Criterion Performance Parameter Basis

N/A

1.2.6.10 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable codes and standards. "Standard for the Installation of Air Conditioning and Ventilating Systems" (NFPA 90A) is used industry-wide and is deemed applicable to the design of the system.

II. Criterion Performance Parameter Basis

N/A

1.2.6.11 Criterion Basis Statement

I. Criterion Need Basis

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

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

II. Criterion Performance Parameter Basis

N/A

1.2.6.12 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 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

1.2.6.13 Criterion Basis Statement

I. Criterion Need Basis

Information communicated by safety signs and tags must be quickly and easily read and uniformly understood. The ANSI Z535 series standards (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 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 work environment.

II. Criterion Performance Parameter Basis

N/A

1.2.6.14 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

1.2.6.15 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.G, which requires compliance with applicable codes, standards, and regulations. "Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants" (Regulatory Guide 1.140) provides guidance for the design of a ventilation system that supports the containment of radioactive substances.

This criterion is supported by Guidance Statements 6.2g1, 6.2g2, 6.2g3, 6.2g4, 6.2g8, 6.2g11, 6.2g12, 6.2g13, 6.2g15, 6.2g16, 6.2g17, 6.2g18, 6.2g19, 6.2g20, 6.2g21, and 6.2g24 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.6.16 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.1.G, which requires compliance with applicable codes, standards, and regulations. "General Design Guide for Ventilation Systems for Fuel Reprocessing Plants" (Regulatory Guide 3.32) provides design guidance for ventilation systems required to prevent the uncontrolled release and dispersal of airborne radioactive material.

This criterion is supported by Guidance Statements 6.3g1, 6.3g5, 6.3g15, and 6.3g16 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.6.17 Criterion Basis Statement

I. Criterion Need Basis

This criterion is needed to support MGR RD 3.3.A, which requires compliance with applicable industry codes and standards. "Code on Nuclear Air and Gas Treatment" (ASME AG-1-1997) provides a methodology for the design of the components of HVAC systems and is deemed applicable to the system.

This criterion is supported by Guidance Statement 7.5g1 contained in the "MGR Compliance Program Guidance Package for the Waste Treatment Building Ventilation System."

II. Criterion Performance Parameter Basis

N/A

1.2.6.18 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to support MGR 3.1.G and to ensure exhaust air from the system, in combination with total site emissions, complies with federal regulations.

"National Primary and Secondary Ambient Air Quality Standards" (40 CFR 50) provides air quality standards with which the system must comply. Design of monitors described in the appendices to 40 CFR 50 are not applicable to this system.

II. Criterion Performance Parameter Basis

N/A

1.2.6.19 Criterion Basis Statement

I. Criterion Need Basis

This criterion is required to support MGR 3.1.G and to ensure exhaust air from the system complies with federal regulations. "National Emission Standards for Hazardous Air Pollutants" (40 CFR 61), Subpart H, provides exhaust emission standards with which the system must comply.

II. Criterion Performance Parameter Basis

N/A

APPENDIX B ARCHITECTURE AND CLASSIFICATION

The system architecture and QA classification are identified in Table 8. The QA classifications are established in "Classification of the MGR Waste Treatment Building Ventilation System."

Table 8. System Architecture and Quality Assurance Classification

Waste Treatment Building Ventilation System	**QL-1**	**QL-2**	**QL-3**	**CQ**
Confinement Area Ventilation System		X		
Non-Confinement Area Ventilation System				X

Note: Definitions for QA Classifications (QL-1, QL-2, etc.) may be found in "Classification of Permanent Items" (QAP-2-3), Section 3.13.

APPENDIX C ACRONYMS, SYMBOLS, AND UNITS

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

C.1 Acronyms

ALARA	As Low As Is Reasonably Achievable
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
CAEM	Continuous Air Emission Monitoring
CQ	Conventional Quality
F	Function
HEPA	High-Efficiency Particulate Air
HFE	Human Factors Engineering
HVAC	Heating, Ventilating, and Air Conditioning
MGR	Monitored Geologic Repository
MGR RD	Monitored Geologic Repository Requirements Document
NRC	U.S. Nuclear Regulatory Commission
QA	Quality Assurance
QL	Quality Level
SSCs	Structures, Systems, and Components
TBD	to be determined
TBV	to be verified
WTB	Waste Treatment Building

C.2 Symbols and Units

%	percent
"	minute
'	second
'	Foot (Used in Figures 1 and 2)
°F	degrees Fahrenheit
C	Celsius
ft	feet
in.	inch
inwg	inches of water gauge

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.

There are no identified recommendations or issues.

APPENDIX E REFERENCES

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