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NNA6507

CRWMS/M&O

System Description Document Cover Sheet

Complete only applicable items

QA: L

1. Page 1 of 16

2. SSC Name			
Waste Handling Building Ventilation System			
3. Document Identifier (Including Rev. No.)			4. Total Pages (All)
BCB000000-01717-1705-00031 REV 00			43
	Printed Name	Signature	Date
5. SDD Originator	Fariborz Habashi		9-17-98
6. SDD Checker	John Beesley	John Beesley	9-17-98
7. MGDS Requirements Manager	Roberta Stambaugh		9/17/98
8. Design Department Manager	Gary Griffith		9/17/98

9. Remarks

Document Title: *Waste Handling Building Ventilation System Description Document*

This document is a two-volume document. Block 1 indicates the number of pages in Volume I. Block 4 indicates the total number of pages in Volume I and Volume II.

The following TBVs are used in this document:
TBV-228, TBV-446

The following TBDs are used in this document:
TBD-345, TBD-346, TBD-347, TBD-348, TBD-349

Use additional sheets if necessary

Civilian Radioactive Waste Management System

Management & Operating Contractor

ENGINEERING CHANGE REQUEST LEVEL III

QA: L

2. Page 1 of: 3

1. ECR NO.	3. PRIORITY	4. QA	5.	6a. MODIFICATION TYPE	6b.
ENF-0072	☑ Normal ☐ At Risk	☑ QA ☐ N/A	☐ Non-CCB ☐ Field ☑ Non-Field	☑ Tech ☐ Cost ☐ Sched ☐ Incid	☐ Chge ☐ Rev ☑ Init Issue

7. Title of this ECR

Initial Issue of Waste Handling Building Ventilation System and Waste Treatment Building Ventilation System

8. Originator (Print/Signature)	Date	Ext.	Bldg./Room
Barry Thom	09/18/98	5-3952	7/706

9. AFFECTED ITEM: *(Use Continuation Pages as required)*

Document No. Various-See Continuation Page Rev.

Title

(Continuation Page N/A)

Job Package No.: N/A

CI Number: Various

10. REASON FOR CHANGE: *(Use Continuation Pages as required)*

This is the initial issue of the System Description Documents which are identified on the continuation page.

(Continuation Page N/A)

11. DESCRIPTION OF REQUESTED CHANGE: *(Include sketch as necessary)* *(Use Continuation Pages as Required)*

Add this document to the VA baseline and place under CCB control

(Continuation Page N/A)

12. ESTIMATED COST IMPACT: ☐ Increase ☐ Decrease $ ☑ None

Affected WBS No.: 1.2.1,1.2.2,1.2.4

13. ESTIMATED SCHEDULE IMPACT: ☐ Delayed By ☐ Improved By Days ☑ None

14. ATTACHMENTS:

None

(Continuation Page N/A)

15. Interim Approval Name (Print)	Organization	Signature	Date	Time
N/A				
N/A				

16. CMO Concurrence Name (Print)	Organization	Signature	Date	Time
N/A				

17. OTHER DOCUMENTS AFFECTED: (Document No. & Title)

None

(Continuation Page N/A)

18. RELATED CAUSE DOCUMENT(S) (ECR, CR, NCR, FDR, ETC.)

19. CAUSE CODE(s)

1. 23
2.
3.
4.

20. IMPACT IF CHANGE IS NOT MADE:

LA Design will not have criteria.

(Continuation Page)

21. Submittal Approval Name (Print)	Signature	Date	Ext.	Bldg./Room
Roberta Stambaugh	Roberta Stambaugh	9/18/98	5-3972	4/701

Civilian Radioactive Waste Management System

Management & Operating Contractor

ENGINEERING CHANGE REQUEST
CONTINUATION PAGE
LEVEL III

1. ECR NO. E98-0072

QA:

2. Page 2 of: 3

THE FOLLOWING ENTRIES ARE MADE BY CM AND THE BOARD MEMBERS

THESE ENTRIES ARE MADE BY CM AND THE BOARD MEMBERS, OR CMO/MGDS MANAGERS

22. At Risk Accepted By CM:	23. Normal Accepted By CM	24. CLASSIFICATION OF CHANGE	25. PRIOR CUSTOMER APPROVAL
Date: N/A Time:	Date: 9-18-98 Time: 1400	☐ Class 2 ☑ ~~Class 3~~	☐ Required ☑ ~~Not Required~~

26. FUNCTION	Yes	No	N/A	SIGNATURE/DATE	FUNCTION	Yes	No	N/A	SIGNATURE/DATE
(TW 9-23-98)					(TW 9-23-98)				
LARDT ~~BMO~~	☒	☐	☐	9/23/98	PPC ~~RPD~~	☑	☐	☐	9/23/98
EBSO ~~CMO~~	☑	☐	☐	9/23/98	REQ ~~RPE~~	☑	☐	☐	9/23/98
LIC ~~C&OPE~~	☑	☐	☐	9/23/98	SA ~~REQ~~	☑	☐	☐	9/23/98
~~MPE~~ ~~SA~~	☐	☐	☑		SCO ~~TCE~~	☑	☐	☐	9-23-98
MSH ~~EHS~~	☑	☐	☐	9/23/98	SE&I ~~TCS~~	☑	☐	☐	9-23-98
NEPO ~~ESD~~	☑	☐	☐	9/23/98	SFO ~~WPD~~	☑	☐	☐	9/23/98
OQA ~~QA~~	☑	☐	☐	9/23/98	SO	☑	☐	☐	9/23/98
PAO ~~REG~~	☑	☐	☐	23Sep98	WPO	☑	☐	☐	9/23/98 for

27. RECOMMENDED WITH CONDITIONS

FUNCTION	CONDITIONS
	N/A

(Continuation Page)

28. CCB/FCCB DISPOSITION: ☑ Approve ☐ Disapprove ☐ Conditions ☐ ECD Required ☐ CR Required

Chairperson Name: (Print/Signature) Dan Wilkins Dan Wilkins 9 23 98 Date

(Continuation Page)

29. NON-CCB/FCCB DISPOSITION: ☐ Approve ☐ Disapprove ☐ Conditions ☐ CCB Required

CMO Manager: (Print/Signature) Date

(Continuation Page)

☐ Approve ☐ Disapprove N/A ☐ Conditions ☐ CCB Required

MGDS Development Manager: (Print/Signature) Date

(Continuation Page)

Civilian Radioactive Waste Management System	1. ECR NO. E98-0072	CHANGE DOCUMENTATION CONTINUATION PAGE MGDS LEVEL III	3. ☑ ECR ☐ ECIR ☐ ECD	QA: L
Management & Operating Contractor	2. Page: 3 Of: 3			

4. BLOCK NUMBER	5. CONTINUATION INFORMATION
9	Waste Treatment Building Ventilation (BCB000000-01717-1705-00015) Waste Handling Building Ventilation System (BCB000000-01717-1705-00031)
23	Initial Issue of new documents.
12	The submitted SDDs do not dictate a design concept which is different than that which the VA cost estimate is based on.

CRWMS/M&O

System Description Document Revision Record

Complete only applicable items

QA: FH 9-17-98

2. SDD Title	
Waste Handling Building Ventilation System Description Document	
3. Document Identifier (Including Rev. No.)	
BCB000000-01717-1705-00031 REV 00	
4. Rev. No./ICN No.	5. Description of Revision
00	SDD Initial Issue

Use additional sheets if necessary.

TABLE OF CONTENTS

SUMMARY

The Waste Handling Building (WHB) Ventilation System provides heating, ventilation, and air conditioning for the confinement and non-confinement areas of the Waste Handling Building. In the non-confinement areas, the ventilation system maintains the proper environmental conditions for equipment operation and personnel comfort. In the confinement areas, in addition to maintaining the proper environmental conditions for equipment operation and personnel comfort, the ventilation system directs potentially contaminated air away from personnel in the WHB and confines the contamination within HEPA filtration units. The confinement areas ventilation system creates air flow paths and pressure zones that minimize the potential for spreading contamination within the building. Through confinement of airborne contamination and exhausting the air to the environment through a stack equipped with radiation monitors, the Waste Handling Building Ventilation System protects the personnel outside of the WHB and the public from radiation exposure.

The WHB Ventilation System is designed to performs its safety functions under all conditions resulting from natural and induced events such as earthquakes, fires, and loss of electric power. Additional system design features, such as independent subsystems, minimize the potential for cross contamination within the WHB. The system provides status of important system parameters and equipment operation, and provides audible and/or visual indication of off-normal conditions or equipment failures.

The WHB Ventilation System confines the radioactive and hazardous material within the building such that the release rates are within the regulatory limits. The system operations and maintenance activities incorporate the ALARA principles in order to maintain personnel radiation exposures within regulatory limits and as low as is reasonably achievable.

The WHB Ventilation System interfaces with the Waste Handling Building System by maintaining specific pressure differentials between the building confinement zones during all waste handling operations. The system interfaces with the WHB Radiological Monitoring System and the WHB Fire Protection System for detection and alarm or action in the presence of hazardous conditions such as radiological release or smoke.

QUALITY ASSURANCE

The Quality Assurance (QA) program applies to this document. The Classification of the Preliminary MGDS Repository Design document (TBV-228) has identified the Waste Handling Facility Ventilation System as an MGR item important to radiological safety (QA-1), important to potential interaction (QA-5), and important to occupational radiological exposure (QA-7). The MGR Requirements Manager has evaluated this activity in accordance with QAP-2-0 (Conduct of Activities). The SDD Development/Maintenance activity evaluation has determined the preparation, checking, and review of this document to be subject to the requirements of the Quality Assurance Requirements and Description document. Unverified and undetermined criteria and engineering data are identified and tracked in accordance with NLP-3-15 (To Be Verified (TBV) and To Be Determined (TBD) Monitoring System). This document was prepared in accordance with NLP-3-33 (System Description Documents).

1.0 FUNCTIONS AND DESIGN CRITERIA

The functions and design criteria for the Waste Handling Building (WHB) Ventilation System are identified in the following sections. Throughout this document, the term "system" shall be used to indicate the Waste Handling Building Ventilation System for both the confinement and non-confinement areas. Functions or criteria that apply to only the confinement or only the non-confinement areas are specified accordingly.

1.1 SYSTEM FUNCTIONS

1.1.1 The system maintains the proper environmental conditions for personnel comfort and supports equipment operation in the confinement and non-confinement areas of the Waste Handling Building.

1.1.2 The system minimizes the spread of radioactive contamination within the confinement areas of the Waste Handling Building by providing ventilation flow patterns and pressure zones based on potential airborne contamination levels.

1.1.3 The system limits the release of radionuclides to the accessible environment such that public and worker radiation exposures meet the applicable regulatory limits.

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

1.1.5 The system interfaces with other WHB systems (e.g. fire protection, radiological monitoring) to mitigate the consequences of accidents and events.

1.1.6 The system performs its safety functions during normal and off-normal conditions and during credible design basis events.

1.1.7 The system permits periodic testing, inspecting, cleaning, adjusting, and replacing of radioactive contaminated and non-contaminated system structures and components.

1.2 SYSTEM DESIGN CRITERIA

This section presents the design criteria for the WHB Ventilation System. Each criterion in this section has a corresponding Criteria Basis Statement in Volume II that describes the need for the criterion as well as a basis for the performance parameters imposed by the criterion. Also, each criterion traces, as applicable, to the system functions (F) in Section 1.1 of this document , and to the higher level requirements given in the Mined Geologic Disposal System Requirements Document (MGDS RD), and 10CFR60, Disposal of High-Level Radioactive Wastes in Geologic Repositories.

1.2.1 System Performance

1.2.1.1 The system shall maintain the temperatures in the Waste Handling Building (WHB) confinement and non-confinement areas in accordance with Table 1.2.1.1 below:

Table 1.2.1.1: WHB Temperatures

Area	Summer	Winter	Notes
Normally Occupied	76 °F DB **NOTE 1**	72 °F DB **NOTE 1**	1. Humidification is not required unless inside relative humidity is shown to be less than 30%. 2. These temperatures shall be maintained in the normally unoccupied areas unless more protective limits are specified by the manufacturer of the equipment required to operate in that area.
Normally Unoccupied	90 °F DB **NOTE 2**	65 °F DB **NOTE 2**	

[F1.1.1][MGDS RD 3.1.G]

1.2.1.2 The system design shall be based on the outside design conditions for NTS-60 as indicated in Table 1.2.1.2 below:

Table 1.2.1.2: Outside Design Conditions

Parameter	Design Data
Site: NTS-60	Latitude: 36° 50' 34" N Longitude: 116° 25' 50" W Elevation: 3750 FT
Winter Design Dry-Bulb	99%: 23 °F 97.5%: 27 °F
Summer Design Dry-Bulb & Mean Coincident Wet-Bulb	1%: 99 °F / 61 °F 2.5%: 97 °F / 61 °F
Summer Design Wet Bulb	1%: 64 °F 2.5%: 63 °F
Prevailing Winds	Summer: S Winter: NNW (10 FT/S)
Median of Annual Extremes	Summer: 102 °F Winter: 21 °F

[F1.1.1][MGDS RD 3.1.G]

1.2.1.3 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.

[F1.1.1][MGDS RD 3.1.G]

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

[F1.1.1, 1.1.2][MGDS RD 3.1.G]

1.2.1.5 The system shall provide no less than 4 air changes per hour in the confinement areas.

[F1.1.1][MGDS RD 3.1.G]

1.2.1.6 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.
[F1.1.2][MGDS RD 3.1.G]

1.2.1.7 The system shall maintain the pressure in the confinement areas of the Waste Handling Building during normal and off-normal operational modes in accordance with Table 1.2.1.7 below:

Table 1.2.1.7: Pressures in Confinement Areas

Confinement Area	Definition	Pressure Requirement
Primary	Areas where radioactive materials or contamination is present during normal operations.	-0.7 to -1.0 inwg to Secondary
Secondary	Areas where contamination levels are potentially high, or could become contaminated from an abnormal event.	-0.1 to -0.15 inwg to Tertiary, and at least -0.25 inwg to the atmosphere
Tertiary	Areas where potential for contamination is very low.	-0.1 to -0.15 inwg to atmosphere

[F1.1.2][MGDS RD 3.1.G]

1.2.1.8 The system shall exhaust all air flow from the confinement areas through air cleaning units equipped with 90% ASHRAE pre-filters and 99.97% HEPA filters in series.
[F1.1.3][MGDS RD 3.1.G][MGDS RD 3.1.C][10CFR60.111(a)]
[10CFR60.131(a)(4)][10CFR60.131(a)]

1.2.1.9 The system shall exhaust all air flow from the confinement areas to the environment through an elevated stack which is at least 12 feet higher than adjacent structures. Analysis shall show that the stack is of sufficient height to allow adequate dispersion.
[F1.1.3][MGDS RD 3.1.G]

1.2.1.10 The system stack shall be designed such that it can not fall on other structures, systems, or components, or cause blockage of airflow.
[F1.1.6][MGDS RD 3.1.G]

1.2.1.11 The system shall be designed with independent subsystems for each confinement area with minimum interface between the subsystems (i.e. furnishing supply air from areas with lower potential for contamination to areas with higher potential for contamination).
[F1.1.2][MGDS RD 3.1.G]

1.2.1.12 The system components (HEPA filtration units, dampers, ductwork, demisters, fans, etc.) shall be designed for the leakage, performance, and in-place efficiency tests required by ASME N509-1989.
[MGDS RD 3.1.G]

1.2.1.13 The system shall exhaust air flow from the primary confinement areas through two individually testable stages of HEPA filter banks in series.
[F1.1.3][MGDS RD 3.1.G]

1.2.1.14 The system shall be designed such that at least one stage of HEPA filtration is provided in any confinement area recirculation circuit.

[F1.1.3][MGDS RD 3.1.G]

1.2.1.15 The system shall provide, as a minimum, monitoring of parameters and annunciating/alarming the setpoints (TBD-345) identified in Table 1.2.1.15:

Table 1.2.1.15: System Parameters Monitoring

Parameter	Location / Characteristics	Setpoint
Space Temperature	All areas of the WHB	TBD
Differential Pressure	All filters and demisters	TBD
Air Flow Rate	All subsystems, stack	TBD
Air Pressure	All areas of the WHB which are required to be maintained at a specific pressure with respect to other areas/atmosphere	TBD
Radiation	Interface required with the WHB Radiological Monitoring System for providing sensors downstream of HEPA filtration units for each subsystem and at the stack discharge	Not applicable to this system
Smoke	Interface required with the WHB Fire Protection System for providing sensors in ductwork	Not applicable to this system

[F1.1.4][MGDS RD 3.1.G] [MGDS RD 3.1.C][10CFR60.131(i)]

1.2.1.16 The system shall provide, as a minimum, equipment status for the items identified in Table 1.2.1.16:

Table 1.2.1.16: Equipment Status

Equipment	Status
Fans, Pumps, Chillers, Cooling Towers, etc.	On-Off
Duct Heaters	On-Off
Valves/Dampers	Open-Closed

[F1.1.4][MGDS RD 3.1.G] [MGDS RD 3.1.C][10CFR60.131(i)]

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

[MGDS RD 3.2.B][F 1.1.1]

1.2.2 Safety Criteria

1.2.2.1 Nuclear Safety Criteria

1.2.2.1.1 The system shall limit the release of radionuclides to the accessible environment to the limits set in 10CFR20 and 10CFR60.136(b).

[F1.1.3][MGDS RD 3.1.B][MGDS RD 3.1.C][10CFR60.111(a)] [10CFR60.131(a)][10CFR60.132(b) & (c)(1)][10CFR60.136(b)]

1.2.2.1.2 The system shall be designed to perform its safety functions during a loss of primary electric power.

[F1.1.6][MGDS RD 3.1.G] [MGDS RD 3.1.C][10CFR60.131(f)(3)]

1.2.2.1.3 The system shall prevent back flow from areas of higher contamination potential to areas of lower contamination potential during system pressure transients.
[F1.1.6][MGDS RD 3.1.G]

1.2.2.1.4 The system shall be designed to detect and/or isolate equipment failures such that system safety functions are not affected.
[F1.1.6][MGDS RD 3.1.G]

1.2.2.1.5 The structures, systems, and components (SSCs) that perform confinement functions shall be designed to withstand a Design Basis Earthquake of Frequency Category 2. The remainder of the SSCs important to safety shall be designed to withstand a Design Basis Earthquake of Frequency Category 1 or Frequency Category 2, as appropriate to the seismic frequency classification assigned to a specific SSC. The seismic design criteria for the system are to be determined (TBD-346).
[F1.1.6][MGDS RD 3.1.G][MGDS RD 3.1.C][10CFR60.131(b)]
[10CFR60.132(c)(1)]

1.2.2.1.6 The system shall be designed such that failure of non-safety components and systems will not render the system incapable of performing its safety functions.
[F1.1.6][MGDS RD 3.1.G]

1.2.2.1.7 The system shall be designed to withstand dynamic effects such as internal missile impacts (TBD-347) that could lead to loss of system safety functions.
[F1.1.6][MGDS RD 3.1.C][10CFR60.131(c)]

1.2.2.1.8 The system shall be designed to perform its safety functions during and after credible fires or explosions.
[F1.1.6][MGDS RD 3.1.C][10CFR60.131(d)(1)]

1.2.2.1.9 The system shall be designed to withstand the effects of external missile impacts (TBD-348) that could lead to loss of system safety functions.
[F1.1.6][MGDS RD 3.1.C][10CFR60.131(b)]

1.2.2.1.10 The system shall be designed such that portions of the system serving the Assembly Transfer System hot cells are redundant, and can be shown by analysis to have a reliability of at least 2.5E-5/Year (TBV-446).
[F1.1.6][MGDS RD 3.1.C][10CFR60.131(b)]

1.2.2.1.11 The system shall be designed such that portions of the system serving the Canister Transfer System hot cells can be shown by analysis to have a reliability of at least 4.8E-4/Year (TBV-446).
[F1.1.6][MGDS RD 3.1.C][10CFR60.131(b)]

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.
[F1.1.7][MGDS RD 3.1.G] [MGDS RD 3.1.C][10CFR60.131(g)]

1.2.2.2.2 The system shall be capable of filtering dust, toxic, and noxious substances (TBD-

349) in the inlet air to the limits established in 29CFR1910, and the ACGIH Threshold Limit Values for Chemical Substances and Physical Agents Biological Exposure Indices.

[F1.1.1][MGDS RD 3.1.G][MGDS RD 3.1.E]

1.2.2.2.3 The system shall be designed, to the extent practicable, to incorporate the use of noncombustible and fire resistant materials.

[MGDS RD 3.1.C][10CFR60.131(d)(2)]

1.2.2.2.4 The system shall be designed with auditory and visual alarm systems to alert personnel to conditions that have the potential to cause injury or death, result in equipment damage, or affect system performance.

[MGDS RD 3.3.A]

1.2.2.2.5 The system shall be designed such that, during off-normal conditions (e.g. loss of power), WHB area temperatures do not reach the building structure thermal limits (i.e. concrete temperature limit).

[MGDS RD 3.3.A][F1.1.6]

1.2.3 Environments

1.2.3.1 The system components (air intake louvers/dampers, outdoor units, stack, etc.) shall be protected from, and designed to, operate in extreme climatic conditions such as freeze, rain, snow, wind, and dust (sand storms).

[F1.1.6][MGDS RD 3.1.G]

1.2.3.2 The system components shall be designed to operate as required while subjected to the extreme environmental conditions identified in Table 1.2.3.2:

Table 1.2.3.2: Environmental Conditions

Parameter	Characteristics
Extreme Temperatures	5 °F to 117 °F (-15 °C to 47 °C)
Wind Speed	Maximum One-Minute Continuous: 51 meters/sec Maximum One-Second Gust: 60 meters/sec

[F1.1.6][MGDS RD 3.1.G]

1.2.4 System Interfacing Criteria

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

[F1.1.5][MGDS RD 3.1.C][10CFR60.131(a)(4)][10CFR60.132(c)(2)]

1.2.4.2 The system shall be designed to interface with the Waste Handling Building Fire Protection System as required for detection of fire and protecting the systems, structures, and components important to safety against the adverse effects of either the operation or failure of the fire suppression systems.

[F1.1.5][MGDS RD 3.1.G][MGDS RD 3.1.C][10CFR60.131(d)(3)]
[10CFR60.131(d)(4)]

1.2.5 Operational Criteria

1.2.5.1 The design of the system shall incorporate ALARA principles, such as designing

the system for ease of maintenance, repair, and replacement, in order to minimize personnel exposures.
[MGDS RD 3.1.G][MGDS RD 3.1.C][10CFR60.131(a)(2) & (3)]

1.2.5.2 The system shall maintain the ability to detect, confine, and filter the exhaust air of airborne radioactive particulate during system maintenance.
[F1.1.6] [MGDS RD 3.1.C][10CFR60.131(a)]

1.2.5.3 The system shall be designed for an inherent availability of greater than 0.9825.
[MGDS RD 3.2.D, 3.3.A]

1.2.5.4 The design, selection, and integration of system equipment shall incorporate human factors engineering (HFE) practices and criteria so that the system is maintainable. HFE shall include the applicable sections of UCRL-15673.
[MGDS RD 3.3.A]

1.2.5.5 The design, selection, and integration of structures, systems, and components shall incorporate human factors engineering (HFE) practices and criteria in accordance with applicable industry standards. MIL-STD-1472E is recognized as the DOE preferred guidance for the design of the MGR SSCs, but application of specific requirements to the MGR has not yet been determined. Future engineering analyses will determine those applicable areas.
[MGDS RD 3.3.A]

1.2.6 Codes and Standards Criteria

1.2.6.1 The system shall comply with the applicable provisions of 29CFR1910, Occupational Safety and Health Standards.
[MGDS RD 3.1.E]

1.2.6.2 The system shall comply with the applicable provisions of 29CFR1926, Safety and Health Regulations for Construction.
[MGDS RD 3.1.F]

1.2.6.3 The system shall comply with the applicable provisions of ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components.
[MGDS RD 3.1.G]

1.2.6.4 The system shall comply with the applicable provisions of ASME N510-1989, Testing of Nuclear Air Treatment Systems.
[MGDS RD 3.1.G]

1.2.6.5 The HVAC heating and cooling water system components associated with the safety class portions of the system shall be designed to the ASME Boiler and Pressure Vessel Code (Section III).
[MGDS RD 3.1.G]

1.2.6.6 The system design shall comply with DOE Order 6430.1A Section 1550, Heating Ventilation and Air Conditioning.
[MGDS RD 3.1.G]

1.2.6.7 The system design shall comply with ANSI/ANS-57.7-1988, American National Standard Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type).

[MGDS RD 3.1.G]

1.2.6.8 The system design shall comply with ANSI/ANS-57.9-1992, American National Standard Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type).

[MGDS RD 3.1.G]

1.2.6.9 The system design shall comply with the Nuclear Air Cleaning Handbook ERDA 76-21.

[MGDS RD 3.1.G]

1.2.6.10 The system design shall comply with the requirements in ASHRAE Handbooks and Standards (e.g. 1997 Fundamentals, 1996 HVAC Systems and Equipment, 1995 HVAC Applications, 1994 Refrigeration, Indoor Air Quality Standard 62-1989, etc).

[MGDS RD 3.1.G]

1.2.6.11 The system ductwork shall be designed in accordance with NFPA 90A, Standards for the Installation of Air Conditioning and Ventilating Equipment.

[MGDS RD 3.1.G]

1.3 SUBSYSTEM DESIGN CRITERIA

There are no subsystem design criteria for this system.

1.4 CONFORMANCE VERIFICATION

The conformance verification matrix for this system will be provided in a future revision

2.0 DESIGN DESCRIPTION

The design description for this system will be provided in a future revision.

3.0 MAINTENANCE

The maintenance criteria for this system will be provided in a future revision.

4.0 OPERATIONS

The operations criteria for this system will be provided in a future revision.

APPENDIX A: REFERENCES

This section provides a listing of references used in Volume I.

10CFR20. *Standards for Protection Against Radiation.* Title 10, Part 20 of the Code of Federal Regulations. Washington, D.C.: U.S. Nuclear Regulatory Commission.

10CFR60. *Disposal of High Level Radioactive Wastes in Geologic Repositories.* Title 10, Part 60 of the Code of Federal Regulations. Washington, D.C.: U.S. Nuclear Regulatory Commission.

29CFR1910. *Occupational Safety and Health Standards.* Title 29, Part 1910 of the Code of Federal Regulations. Washington, D.C.: U.S. Government Printing Office.

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APPENDIX B ACRONYMS

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

10CFR60	Title 10, Part 60 of the Code of Federal Regulations
ACGIH	American Conference of Governmental Industrial Hygienists
ALARA	As Low As is Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-conditioning Engineers
ASME	American Society of Mechanical Engineers
°C	Degree Centigrade
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulations
DB	Dry Bulb
DOE	Department of Energy
ERDA	Energy Research and Development Administration
F	Function
°F	Degree Fahrenheit
FT/S	Feet per Second
HEPA	High Efficiency Particulate Air
HVAC	Heating, Ventilating, and Air Conditioning
inwg	Inches of Water Gauge
MGDS	Mined Geologic Disposal System
MGDS RD	Mined Geologic Disposal System Requirements Document
MGR	Monitored Geologic Repository
NLP	Nevada Line Procedure
NTS	Nevada Test Site
QA	Quality Assurance
SDD	System Description Document
SSC	Systems, Structures, and Components
TBD	To Be Determined
TBV	To Be Verified
WB	Wet Bulb
WBGT	Wet Bulb Globe Temperature
WHB	Waste Handling Building

Waste Handling Building Ventilation System Description Document

BCB000000-01717-1705-00031 REV 00

Volume II

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5.0 SDD CRITERIA BASIS STATEMENTS AND REFERENCES

5.1 SDD CRITERIA BASIS STATEMENTS

This section presents the criteria basis statements for criteria in Section 1.2 of Volume I.

1.2.1.1 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the indoor design temperature requirements for the normally occupied and normally unoccupied areas of the Waste Handling Building. Maintaining the proper temperature in the normally occupied areas is essential to personnel comfort, safety, and health. The normally unoccupied areas have to be maintained at specific temperatures to assure a proper environment for equipment operation, and in case short term occupancy becomes necessary.

II. Criteria Performance Parameter Basis

Normally Occupied Summer and Winter Dry-Bulb Temperatures: Temperature of 76 °F DB for the summer and 72 °F DB for the winter are taken from Appendix E of ANSI 57.7. The table in this Appendix provides the typical normal temperature ranges for a spent fuel storage facility. The summer temperature of 76 °F DB is more conservative than the 78 °F DB required by DOE Order 6430.1A (1550-1.2.2). The winter temperature of 72 °F DB from ANSI 57.7 is the same as the recommended temperature in DOE Order 6430.1A (1550-1.2.2). Both the summer and winter temperatures require an indoor relative humidity of at least 30%. This humidity requirement is specified in DOE Order 6430.1A (1550-1.2.2). The specified temperatures and humidity are within the comfort zone recommended by ASHRAE (as shown in ASHRAE 1981 Fundamentals Handbook, Page 8.21).

Normally Unoccupied Summer and Winter Dry-Bulb Temperatures: Temperature of 90 °F DB for the summer and 65 °F DB for the winter are taken from Appendix E of ANSI 57.7. The table in this Appendix provides the typical normal temperature ranges for a spent fuel storage facility. The specified temperatures apply to areas which are not expected to be normally occupied. These temperatures are deemed appropriate unless manufacturer specified temperature limits impose stricter requirements for equipment operation.

1.2.1.2 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the outside design requirements for the heating and cooling load calculations. Use of applicable and accurate outside temperature (and other parameters) is essential in calculation of heating and cooling loads. The data provided in this table is not intended to be all inclusive (design organization may obtain additional data from qualified

sources as required). However, deviations from the specific parameters that are provided in the table shall be documented.

II. Criteria Performance Parameter Basis

Table A-17 of the Engineering Design Climatology and Regional Meteorological Conditions Report is used because this table provides data summaries in the form recommended by ASHRAE for HVAC design. The data format is also consistent with the requirements in Table 1550-1.2.3, "Outside Design Conditions" of DOE Order 6430.1A. Selection of Site 1 (NTS-60) is appropriate because Site 1 is the closest and most representative of the conditions in the north portal area (see page 2-2 of the report referenced above).

1.2.1.3 Criteria Basis Statement

I. Criteria Need Basis

This 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. The minimum requirement may be obtained from various documents, such as ASHRAE Standard 62.

II. Criteria Performance Parameter Basis

N/A

1.2.1.4 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement for once-through (no recirculation) air flow for areas with high contamination potential. This requirement is based on ANSI 57.7, Section 6.6.2.2.3, and ANSI 57.9, Section 6.5.1.2.3, which require that subsystems with high potential for contamination be designed for once-through flow. This requirement is also supported by the Heating, Ventilating, and Air-conditioning Design Guide for the Department of Energy Nuclear Facilities, Section 6, which states that "The ventilation systems that serve process facilities are typically once-through systems (100% outside air) and, therefore, do not recirculate air." Providing once-through air flow in areas with high potential for contamination will minimize cross-contamination within the facility.

II. Criteria Performance Parameter Basis

N/A

1.2.1.5 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement for the minimum number of air changes in the contamination confinement areas. This requirement is based on the discussion provided in Section 6 of the Heating, Ventilating, and Air-conditioning Design Guide for the Department of Energy Nuclear Facilities, which states that many factors determine the final air change requirements for the different confinement areas of a nuclear facility. These factors include face velocity requirements, cleanliness requirements, heat removal requirements, and pressure requirements for each area.

II. Criteria Performance Parameter Basis

According to the Heating, Ventilating, and Air-conditioning Design Guide for the Department of Energy Nuclear Facilities (Section 6), a minimum number of four air changes per hour is considered to be good engineering practice.

1.2.1.6 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement for exhaust air flow pattern to be from areas of low potential for contamination to areas of higher potential for contamination. This requirement minimizes the potential for cross contamination within the facility. This requirement is based on the criteria in various documents such as DOE Order 6430.1A, Section 1550-99.0.1; ANSI 57.7, Section 6.6.2.1; ANSI 57.9, Section 6.5.1.1.3; NUREG-0800, Section 9.4.2; and Nuclear Air Cleaning Handbook ERDA 76-21, Section 2.2.1 (subsection "Air handling system").

II. Criteria Performance Parameter Basis

N/A

1.2.1.7 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement for maintaining pressure zones in the Waste Handling Building. Pressure zoning is required for controlling contamination within the facility. As required by various ventilation design standards, three confinement areas are defined for a facility: primary, secondary, and tertiary. The Waste Handling Building will be analyzed by the design organization to determine the confinement requirements based on the level of hazard in each zone. Maintaining the negative pressure for each confinement area is required during all modes of system operation, such as when personnel access doors or hatches are open, and emergency conditions.

This criterion is established based on the requirements, recommendations, and guidelines provided in the following documents: Nuclear Air Cleaning Handbook ERDA 76-21, Section 2.2.1; Heating, Ventilating, and Air-conditioning Design Guide for the Department of Energy Nuclear Facilities, Sections 1 and 2; DOE Order 6430.1A, Section 1550-99.0.2; ANSI 57.7, Section 6.6, and ANSI 57.9, Section 6.5.

II. Criteria Performance Parameter Basis

The primary, secondary, and tertiary confinement pressure requirement values are from Nuclear Air Cleaning Handbook ERDA 76-21, Section 2.2.1, and Heating, Ventilating, and Air-conditioning Design Guide for the Department of Energy Nuclear Facilities, Section 2. The additional requirement for secondary confinement (0.25 inwg with respect to atmosphere) is from ANSI 57.7, Section 6.6.2.2.3.2, and ANSI 57.9, Section 6.5.1.2.3. Based on this requirement, the secondary confinement area is not only required to be maintained at a negative pressure of 0.1 to 0.15 inwg with respect to the tertiary confinement area, but also, it is required to be maintained at a minimum of 0.25 inwg with respect to the atmosphere.

1.2.1.8 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement that the exhaust air from areas with potential for contamination are to be filtered through 90% ASHRAE prefilters and 99.97% HEPA filters in series. This criterion is based on the requirement established in 10CFR60.111(a) and 10CFR60.131(a), which require that the repository operations facilities be designed so that "...release of radioactive materials to unrestricted areas, will be maintained within the limits specified in part 20 of this chapter," and by providing means to "...control the dispersal of radioactive contamination" (10CFR60.131(a)(4)).

The requirement for primary and secondary confinement areas is also based on ANSI 57.7, Section 6.6.2.2.3, which states that the exhaust air from areas with higher potential for contamination (i.e. secondary and primary) shall be filtered through 90% ASHRAE prefilters and 99.97% HEPA filters in series. Similar requirements are invoked in ANSI 57.9. These standard establish the minimum design requirements for an independent (water pool and dry type) spent fuel storage facility. Some of the operations at the WHB are similar to those described in these standard. Therefore, specific criteria from this standard are invoked.

II. Criteria Performance Parameter Basis

N/A

1.2.1.9 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement that all air flow shall be exhausted through an elevated stack of sufficient height to allow adequate dispersion of the exhaust air. This criterion is based on the requirement in DOE Order 6430.1A, Section 1550-99.0.2, which states: "An elevated stack shall be used for confinement exhaust discharge," and that stack "...height shall also consider intakes on the facility and adjacent facilities to

preclude uptake." Examples of adjacent facilities to consider are intakes for the Waste Treatment Building and the North Portal.

II. Criteria Performance Parameter Basis

The stack height requirement of "at least 12 feet higher than any adjacent structure" is obtained from Nuclear Air Cleaning Handbook ERDA 76-21, Section 5.5.2. The Nuclear Air Cleaning Handbook (ERDA 76-21) states that low stacks should be avoided because nearby buildings or ground unevenness may cause eddies, whorls, or stagnant air pockets, and that "...in no case should the stack end be less than 12 ft above the building or any adjacent building."

1.2.1.10 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement that the system stack is to be designed or located such that it can not fall on other structures, systems, or components (such as a loaded transporter). This criterion is based on the requirement in DOE Order 6430.1A, Section 1550-99.0.2, which states: "The stack shall be located so that it can not fall on the facility or an adjacent facility containing safety class items. The alternative is the construction of a stack that shall remain functional following a DBE, severe natural phenomena, and man-made events." In addition, blockage of exhaust airflow shall be precluded by either designing a stack that will not fail, or by providing an alternative exhaust path in case of stack failure.

II. Criteria Performance Parameter Basis

N/A

1.2.1.11 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement for providing independent subsystems for each confinement area. This criterion is based on the requirement in ANSI 57.7, Section 6.6, which states: "The HVAC shall consist of subsystems based on the level of potential for airborne radioactive material contamination.". This ANSI 57.7 requirement in conjunction with the requirement that the potential for cross contamination should be minimized, result in this criterion which calls for "independent" subsystems for each confinement area. The required independence does not preclude some interface between the subsystems, such as providing supply air to the secondary or primary areas from the tertiary areas.

II. Criteria Performance Parameter Basis

N/A

1.2.1.12 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the general requirement for designing the system components such that they can be expected to pass the leakage, performance, and in-place efficiency tests required by ASME N509-1989. This American National Standard document for Nuclear Power Plant Air-Cleaning Units and Components is one of the most widely used and accepted standards which identifies and establishes the minimum requirements for filters, filter housings, ducts, dampers, fans, and other components of nuclear air treatment systems. Design of the components for the WHB Ventilation System shall be based on the requirements of this standard (e.g. withstanding leak test pressures or fan peak pressure).

II. Criteria Performance Parameter Basis

N/A

1.2.1.13 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirements for providing two stages of HEPA filter banks for the primary confinement area. This criterion is based on the requirement in the Nuclear Air Cleaning Handbook, ERDA 76-21, Section 2.2.1, which states: "Contaminated and potentially contaminated air exhausted from a hot cell, cave, canyon, glove box, or other primary containment structure or vessel shall be passed through at least two individually testable stages of HEPA filters in series plus prefilters, adsorbers, scrubbers, or other air cleaning facilities as required by the particular application."

II. Criteria Performance Parameter Basis

N/A

1.2.1.14 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement for providing at least one stage of HEPA filtration in any recirculation unit. This criterion is based on the requirement in DOE Order 6430.1A, Section 1550-99.0.2 9 (page 15-47), which states: "If room air is recirculated, at least one stage of HEPA filtration shall be provided in the recirculation circuit." This requirement is also based on ANSI 57.7, Section 6.6.2.2.2.2, and ANSI 57.9, Section 6.5.1.2.2 which require filtration of the recirculated air through a HEPA filter unit to prevent buildup of radioactive particulates in the air.

II. Criteria Performance Parameter Basis

N/A

1.2.1.15 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(i), which states that, "The design shall include provisions for instrumentation and control systems to monitor and control the behavior of systems important to safety, assuming occurrence of design basis events." This criterion is further supported by the requirements in DOE Order 6430.1A, Sections 1550-99.0.1 & 2; Nuclear Air Cleaning Handbook ERDA 76-21, Section 5.6.7; and ANSI 57.9, Sections 6.4.4.1.12 and 6.5.3, which require adequate instrumentation and controls to assess system performance and for continuous monitoring (and alarm) of radioactive material level in confinement exhaust systems. In addition, 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 this standard.

II. Criteria Performance Parameter Basis

Instrument setpoints are to be determined.

1.2.1.16 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(i), which states that, "The design shall include provisions for instrumentation and control systems to monitor and control the behavior of systems important to safety, assuming occurrence of design basis events." This criterion is further supported by the requirements in DOE Order 6430.1A, Section 1550-99.0.1 which require adequate instrumentation and controls to assess system performance. In addition, ASME N509-1989, Section 4.9.4, requires status indication of all equipment powered or controlled electrically. The required indications are tabulated in Tables 4-1 and 4-2 of this standard.

II. Criteria Performance Parameter Basis

N/A

1.2.1.17 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the operational life of the WHB ventilation system. This criterion is required because the ventilation system supports the waste handling operations at the repository, and an analysis has quantified the service life performance requirement for the Monitored Geologic Repository systems that receive, package, and emplace waste based on the receipt rates defined in MGDS RD paragraph 3.2.B.

II. Criteria Performance Parameter Basis

The 40 year operational life of the system is based on the following analysis:

Criteria Analysis: Waste Receiving, Packaging, and Emplacing Systems Operational Life (Revision 00)

1. Purpose

The purpose of this analysis is to quantify the operational life performance requirement for the Monitored Geologic Repository systems that receive, package, and emplace waste.

2. Assumptions:

2.1 Waste Quantity, Mix and Throughput Study Report (Appendix M1, Table M-0) identifies an extended baseline delivery schedule which could extend the number of years of waste receipt from 24 to 32 years. It is assumed that if the extended baseline is required (in the future), the facilities that receive, package, and emplace waste would be required to support this extended period.

The purpose of this assumption is to provide an upper bound for the maximum number of years the systems will be expected to operate based on the waste receipt schedules.

2.2 It is assumed that future waste receipt schedule changes will be bounded by the extended baseline delivery schedule plus 25% margin for uncertainty.

The purpose of this assumption is to define a margin for uncertainty in meeting the projected delivery schedules. The 25% margin will envelope potential schedule fluctuations of up to 8 years. These schedule fluctuations could be driven by uncertainties in performance confirmation/remediation, early receipt, and plant life extensions.

2.3 Performance Confirmation program requirements will not require waste handling systems to operate beyond what is required to support waste emplacement.

The purpose of this assumption is to bound the ability of the systems to support Performance Confirmation up to the maximum life of the facility/system (not the entire 150 year period). Specific requirements for an operational life greater than waste emplacement have not been specifically identified at this time.

3. Criteria Analysis: Operational Life

The Civilian Radioactive Waste Management System Receipt Rates defined in MGDS-RD paragraph 3.2.B Table 3-2 (Ref 4.1) indicates the total waste delivery schedule spans 24 years. Utilizing the Waste Quantity, Mix and Throughput Study Report (Ref 4.2) and assumption (2.1), the waste delivery schedule has been bounded to 32 years. Including a bounding margin of 25% from assumption (2.2), the delivery schedule upper bound is 40 years. Considering assumption (2.3), no additional operational life is required to support Performance Confirmation during the entire 150 year period.

4. References

4.1 Mined Geologic Disposal System Requirements Document, YMP/CM-0025 Rev 03, dated 2/27/98.

4.2 CRWMS M&O 1997, Waste Quantity, Mix and Throughput Study Report, B00000000-01717-5705-00059, Rev 01, Las Vegas, Nevada.*

5. Conclusion

The use of unqualified input* in this analysis was necessary to establish the bounding characteristics for the design criteria. The inclusion of this input does not disqualify the results of the analysis due to the conservative margin used in establishing the bounding design criteria.

The systems that receive, package, and emplace waste are required to have a minimum operational life of 40 years.

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Name	Signature		Date

1.2.2.1.1 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirements in 10CFR60.111(a), 10CFR60.131(a), and 10CFR60.132(b). These criteria require the surface facility ventilation system to control the release of radioactive material to the accessible and restricted environments, such that the limits set in 10CFR20 are not exceeded. In addition, criterion 10CFR60.132(c)(1) requires the ventilation system to control the release of the radioactive materials during Category 1 design basis events. Criterion 10CFR60.136(b) sets the release limits for the Category 2 events.

II. Criteria Performance Parameter Basis

Based on the nuclear safety criteria provided in the interoffice correspondence, Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System, one bank of HEPA filters with a minimum efficiency of 99.97% will limit radiation doses from radioactive airborne contaminants to the limits established in 10CFR20 and 10CFR60.136(b).

1.2.2.1.2 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(f)(3) which states that, following a loss of primary electric power, provisions for reliable emergency power shall be made for instruments, alarm systems, components, and systems important to safety. This requirement is further supported in various documents including DOE Order 6430.1A, Section 1550-99.0.2, which states, "...components and controls that require electric power to perform safety functions shall be supplied with safety class UPS and/or emergency power supply..." This requirement is also a nuclear safety criterion provided in the interoffice correspondence, Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System.

II. Criteria Performance Parameter Basis

N/A

1.2.2.1.3 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the nuclear safety criterion provided in the interoffice correspondence, Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System. ANSI 57.9, Section 6.5.1.1.4, also specifically invokes this criterion 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 Waste Handling Building under all credible circumstances, as required in DOE Order 6430.1A, Section 1550-99.0.2.

II. Criteria Performance Parameter Basis

N/A

1.2.2.1.4 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement to provide adequate instrumentation and controls to detect and isolate equipment failures. This criterion is based on DOE Order 6430.1A, Section 1550-99.0.1, which requires adequate instrumentation and controls to assess system performance and allow necessary control, and, Nuclear Air Cleaning Handbook ERDA 76-21, Section 5.6.5, which provides a discussion on the importance of designing a reliable control system for the ventilation system.

II. Criteria Performance Parameter Basis

N/A

1.2.2.1.5 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(b), which states: "The structures, systems, and components important to safety shall be designed so that they will perform their necessary safety functions, assuming occurrence of design basis events." In addition, criterion 10CFR60.132(c)(1) requires the ventilation system to control the release of the radioactive materials during Category 1 design basis events. The interoffice correspondence, Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System, has identified the Design Basis Earthquake applicable to the Waste Handling Building, and its ventilation system.

II. Criteria Performance Parameter Basis

Specific seismic criteria for this system are to be determined.

1.2.2.1.6 Criteria Basis Statement

I. Criteria Need Basis

This criterion establishes the requirement that failure of non-safety components or systems shall not render the system incapable of performing its safety functions. This criterion is an expansion of the requirement in DOE Order 6430.1A, Section 1550-99.0.1, which states that failure of non-safety related ventilation systems shall not prevent other safety related systems from performing their safety related functions. This requirement is supported in NUREG-0800, Section 9.4.2.III.3, which states (paraphrased here) that the system is evaluated to determine if failure of nonessential portions of the systems preclude operation of the essential portions of the ventilation system.

II. Criteria Performance Parameter Basis

N/A

1.2.2.1.7 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(c) which states: "The structures, systems, and components important to safety shall be designed to withstand dynamic effects such as missile impacts, that could result from equipment failure, and similar events and conditions that could lead to loss of their safety functions." In addition, the interoffice correspondence, Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System, has identified internal missile as a design basis event applicable to the WHB Ventilation System.

II. Criteria Performance Parameter Basis

Details of the internal missile (size, speed, etc.) are to be determined.

1.2.2.1.8 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(d)(1) which states: "The structures, systems, and components important to safety shall be designed to perform their safety function during and after credible fires or explosions in the geologic repository operations area."

II. Criteria Performance Parameter Basis

N/A

1.2.2.1.9 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(b), which states: "The structures, systems, and components important to safety shall be designed so that they will perform their necessary safety function, assuming occurrence of design basis events." The interoffice correspondence, Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System, has identified external missile as a design basis event applicable to the WHB Ventilation System.

II. Criteria Performance Parameter Basis

Details of the external missile (size, speed, etc.) are to be determined.

1.2.2.1.10 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(b), which states: "The structures, systems, and components important to safety shall be designed so that they will perform their necessary safety functions, assuming occurrence of design basis events."

The interoffice correspondence, Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System, has determined that based on the Category 1 DBEs applicable to the WHB Ventilation System, portions of the system serving the Assembly Transfer System hot cells are required to be redundant and have a reliability of at least 2.5E-5/Year. Verification of the specified reliability will be by analysis as system design progresses.

II. Criteria Performance Parameter Basis

The minimum reliability value of 2.5E-5/Year was extracted from the correspondence referenced above. This value was determined from a preliminary analysis performed by the Safety Analysis group. This analysis assumed a redundant ventilation train for the Assembly Transfer System hot cells (based on VA design). A fault tree was developed to determine the minimum reliability requirement for this portion of the ventilation system. The specified reliability is required to keep the frequency of DBEs, when HVAC system is unavailable, to below $1x10^{-6}$ (beyond design basis). This reliability value is based on a preliminary analysis and is therefore to be verified.

1.2.2.1.11 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(b), which states: "The structures, systems, and components important to safety shall be designed so that they will perform their necessary safety functions, assuming occurrence of design basis events."

The interoffice correspondence, Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System, has determined that based on the Category 2 DBEs applicable to the WHB Ventilation System, portions of the system serving the Canister Transfer System hot cells are required to have a reliability of at least 4.8E-4/Year. Verification of the specified reliability will be by analysis as system design progresses.

II. Criteria Performance Parameter Basis

The minimum reliability value of 4.8E-4/Year was extracted from the correspondence referenced above. This value was determined from a preliminary analysis performed by the Safety Analysis group. This analysis assumed a single ventilation train for the Canister Transfer System hot cells (based on VA design). A fault tree was developed to determine the minimum reliability requirement for this portion of the ventilation system. The specified reliability is required to keep the frequency of DBEs, when HVAC system is unavailable, to below $1x10^{-6}$ (beyond design basis).
This reliability value is based on a preliminary analysis and is therefore to be verified.

1.2.2.2.1 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(g) which states: "The structures, systems, and components important to safety shall be designed to permit periodic inspection, testing, and maintenance, as necessary, to ensure their continued functioning and readiness." This requirement is further supported in DOE Order 6430.1A, Nuclear Air Cleaning Handbook ERDA 76-21, and ANSI 57.7.

II. Criteria Performance Parameter Basis

N/A

1.2.2.2.2 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in the Mined Geologic Disposal System Requirements Document, Requirement 3.1.E, which states that the MGDS shall comply with the applicable provisions of 29CFR1910, "Occupational Safety and Health Standards." Table Z-1 of this standard provides indoor air quality limits. As mandated by DOE Order 440.1 (per Implementation Guide DOE G 440.1-3), the ACGIH Threshold Limit Values for Chemical Substances and Physical Agents Biological Exposure Indices will be used when the limits are more protective than the OSHA PELs (permissible exposure limits). The dust level and type and level of toxic and noxious substances that the ventilation system is required to filter are to be determined.

This criterion is also supported by the requirement in DOE Order 6430.1A (1550-1.5.5), which states that ventilation air in industrial type facilities shall be provided to maintain air quality in accordance with PELs established by 29CFR1910, and ACGIH TLVs.

II. Criteria Performance Parameter Basis

N/A

1.2.2.2.3 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(d)(2) which states: "To the extent practicable, the geologic operations area shall be designed to incorporate the use of noncombustible and heat resistant materials."

II. Criteria Performance Parameter Basis

N/A

1.2.2.2.4 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in the Mined Geologic Disposal System Requirements Document, Requirement 3.3.A, which states: "All MGDS SSCs shall be designed and fabricated in accordance with applicable industry codes; standards, engineering principles and practices with particular attention to those which incorporate system safety, human factors, reliability, availability, maintainability, and habitability standards."

In addition to the earlier criteria for system parameters monitoring and equipment status monitoring, this criterion invokes requirement for auditory and visual alarms for

conditions that have the potential to cause injury or death, result in equipment damage, or affect system performance.

II. Criteria Performance Parameter Basis

N/A

1.2.2.2.5 Criteria Basis Statement

I. Criteria Need Basis

This criterion addresses a non-nuclear safety requirement. The basis for this criterion is the concern that although maintaining the proper environment (temperature) may not be a radiological safety issue, it may be a structural safety issue. There are areas in the Waste Handling Building, such as the loaded disposal container staging area, that could have significant heat output potential (from the loaded containers). Under certain circumstances, such as loss of power, portions of the ventilation system serving this area may not be in service for extended periods. Continued heat output from the loaded disposal containers may result in area temperatures that could approach or exceed the structural thermal limits (e.g. concrete temperature).

Design features shall be considered, as required, to address this concern. Design features may include combination of high temperature alarms, providing backup power to the ventilation system serving these areas, providing backup ventilation from parts of the system which are designed to operate after loss of power, or providing separate cooling units for the affected area.

II. Criteria Performance Parameter Basis

N/A

1.2.3.1 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement identified in the General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants. Section C.1.d of this guide states that all intakes for the safety related ventilation systems shall be arranged so as to minimize the effects of high winds, rain, snow, ice, and debris on the operation of the system."

This criterion is also supported by the discussion provided in the Nuclear Air Cleaning Handbook, ERDA 76-21. Section 2.3.3 of this document emphasizes the importance of protecting the supply air intakes from rain, sleet, snow, ice, trash, leaves, etc. Similar requirements are invoked in ANSI 57.9, Sections 6.4.4.1.3 & 6.4.4.1.4.

II. Criteria Performance Parameter Basis

N/A

1.2.3.2 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement identified in DOE Order 6430.1A, Section1550-99.0.1, which states that ventilation system equipment shall be qualified to ensure reliable operation during normal operating condition.

Extreme temperatures can affect component specification. Wind may have minimal impact on the system flow, however, wind gusts could affect the atmospheric pressure sensors which provide input to system instruments and control systems.

II. Criteria Performance Parameter Basis

Extreme temperature and wind data are from the Engineering Design Climatology and Regional Meteorological Conditions Report.

Extreme Temperatures: Extreme maximum temperature of 47 °C (rounded off from 46.7 °C) is the highest recorded temperature at Las Vegas in the climatology report, Table A-14, Climatological Summary for Las Vegas and Tonopah. This temperature is higher than the extreme maximum (40.9 °C) for Site 1 (Table A-1). Site 1 (NTS-60) is considered most representative of the conditions at the north portal. Selection of this higher temperature bounds the extreme maximum temperature at Site 1.
Extreme minimum temperature of -15 °C (rounded off from -14.4 °C) is the lowest recorded temperature at Desert Rock in the climatology report, Table A-12, Climatological Summary for Caliente and Desert Rock. This temperature is lower than the extreme minimum (-11.7 °C) for Site 1 (Table A-1). Site 1 (NTS-60) is considered most representative of the conditions at the north portal. Selection of this lower temperature bounds the extreme minimum temperature at Site 1.

Wind Speed: The one-minute continuous wind speed of 51 meters/sec is the highest wind speed value in Table 4-4 (of the climatology report), Estimated and Observed Maximum Daily One-Minute Wind Speeds.
The one-second gust wind speed of 60 meters/sec (rounded off from 59.91 meters/sec) is the highest wind speed value in Table 4-6 (of the climatology report), Estimated and Observed Maximum 1-Second Gust Wind Speeds.

1.2.4.1 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.132(c)(2) which states: "The effluent monitoring systems shall be designed to measure the amount and concentration of radionuclides in any effluent ..." In addition, 10CFR60.131(a)(4) requires that for radiological protection, "Means to monitor and control the dispersal of radioactive contamination," shall be included in the design of the geological repository operations

area. Since the ventilation system discharge is considered a potentially contaminated effluent, radiological monitoring is required. Sample points for the WHB Radiological Monitoring System will be provided in ventilation ductwork. Interlocks with the ventilation system may also be required when specific setpoints are reached. Because the WHB Radiological Monitoring System is a separate system from the WHB Ventilation System, extensive interface will be required between these system.

II. Criteria Performance Parameter Basis

N/A

1.2.4.2 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in 10CFR60.131(d)(3) which states: "The geologic repository operations area shall be designed to include explosion and fire detection alarm systems ..." In addition, 10CFR60.131(d)(4) requires that for radiological protection, "The geologic repository operations area shall be designed to include means to protect systems, structures, and components important to safety against the adverse effects of either the operation or failure of the fire suppression systems." Most likely, smoke detectors and fire dampers will be installed in the WHB Ventilation System ductwork. Interlocks with the ventilation system may also be required upon detection of fire or smoke. Ventilation system design may require design features to protect systems (including the ventilation system components) from adverse impacts of the fire suppression system. However, since the WHB Fire Protection System is a separate system from the WHB Ventilation System, extensive interface will be required between these system.

Similar requirements for fire protection are invoked in ANSI 57.9, Section 6.5.1.1.

II. Criteria Performance Parameter Basis

N/A

1.2.5.1 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirements in 10CFR60.131(a)(2) & (3) and industry standards and guidelines which call for following the ALARA principles. Although many features of the ALARA program are operational and administrative, some are features that can be designed into the system. This is indicated in 10CFR60.131(a)(2) & (3) which require maintaining radiation doses within limits specified in 10CFR20 by providing design features such as "...designing equipment for ease of repair and replacement and providing adequate space for ease of operation", and "suitable shielding." In addition, DOE Order 6430.1A, Section 1550-99.0.2, requires providing radiation shielding for the air filtration units to maintain occupational exposures ALARA during operations and maintenance, and

providing features for convenient maintenance, decontamination, and replacement of components without exposure of maintenance personnel to hazardous materials.

II. Criteria Performance Parameter Basis

N/A

1.2.5.2 Criteria Basis Statement

I. Criteria Need Basis

This criterion is provided to emphasize that the general design criteria for radiological protection for the geologic repository operations area in the restricted areas as outlined in 10CFR60.131(a) apply during maintenance activities also.

II. Criteria Performance Parameter Basis

N/A

1.2.5.3 Criteria Basis Statement

I. Criteria Need Basis

This criterion is established based on the requirement that inherent availability of systems which have the potential to affect throughput must be bounded the analysis in Bounded Minimum Inherent Availability Requirement for the System Description Documents.

II. Criteria Performance Parameter Basis

The value of 0.9825 is from Table 7.2-1 of the document referenced above.

1.2.5.4 Criteria Basis Statement

I. Criteria Need Basis

The subject requirement addresses maintainability of the system in accordance with applicable industry standards in support of the MGDS RD Requirement 3.3.A. Maintainability of system equipment involves many factors including the human-machine interface. This interface must incorporate human factors engineering (HFE) practices and criteria into the design, selection, and integration of the system. GPG-FM-027, the Good Practices Guide for DOE human factors engineering provides reference to several HFE guidelines or criteria. GPG-FM-027 states in paragraph 2.3.1 "...Other sources for human engineering design criteria include UCRL 15673, "Human Factors Design Guidelines for Maintainability of DOE Nuclear Facilities,"...."UCRL-15673 specifically addresses HFE maintainability design criteria for DOE nuclear facilities.

II. Criteria Performance Parameter Basis

N/A

1.2.5.5 Criteria Basis Statement

I. Criteria Need Basis

The subject requirement addresses human factors engineering (HFE) practices for SSCs in support of the MGDS RD Requirement 3.3.A. Design, selection, and integration of system SSCs involve many factors including human-machine interface. This interface must incorporate HFE practices and criteria into the design, selection, and integration of the system SSCs. GPG-FM-027, the Good Practices Guide for DOE human factors engineering provides reference to several HFE guidelines or criteria.

GPG-FM-027 states in paragraph 2.3.1 "...The Department of Defense (DOD) has been at the forefront of HFE data generation and collection, and many applied HFE practitioners consider its 'Human Factors Engineering Design Criteria for Military Systems, Equipment, and Facilities', MIL-STD-1472, the premier aggregation of general human engineering design criteria...." MIL-STD-1472E provides specific HFE design guidelines for SSCs. The application of specific requirements contained in MIL-STD-1472E for human factors engineering practices and criteria to the design, selection, and integration of system equipment will be determined in future engineering analyses.

II. Criteria Performance Parameter Basis

N/A

1.2.6.1 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in the MGDS RD, Requirement 3.1.E, which requires compliance with the applicable provisions of 29CFR1910, Occupational Safety and Health Standards.

II. Criteria Performance Parameter Basis

N/A

1.2.6.2 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the requirement in the MGDS RD, Requirement 3.1.F, which requires compliance with the applicable provisions of 29CFR1926, Safety and Health Regulations for Construction.

II. Criteria Performance Parameter Basis

N/A

1.2.6.3 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components, is deemed applicable because the WHB Ventilation 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.

II. Criteria Performance Parameter Basis

N/A

1.2.6.4 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. ASME N510-1989, Testing of Nuclear Air Treatment Systems, is deemed applicable because the WHB Ventilation System utilizes air cleaning units which require field testing similar to those in a nuclear power plant. 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.

II. Criteria Performance Parameter Basis

N/A

1.2.6.5 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. ASME Boiler and Pressure Vessel Code (Section III) is potentially applicable to the pressurized components associated with the safety functions of the WHB Ventilation System (e.g. chillers, boiler piping, tanks, and boilers).

II. Criteria Performance Parameter Basis

N/A

1.2.6.6 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. DOE Order 6430.1A, General Design Criteria, is deemed applicable to the WHB Ventilation System because it provides criteria for nonreactor nuclear facilities which utilize confinement ventilation. Since the WHB falls under this category of special facilities, it is prudent to invoke specific requirements from this document. HVAC criteria are provided in Section 1550 of DOE Order 6430.1A.

II. Criteria Performance Parameter Basis

N/A

1.2.6.7 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. ANSI 57.7-1988, Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type), is a widely referenced standard which provides design criteria for systems and equipment of a facility designed for the receipt and storage of spent fuel. Operations at the WHB will be similar to such facility. Therefore, the design criteria from this standard are deemed applicable to the WHB Ventilation System. Heating, ventilating and air-conditioning criteria are provided in Section 6.6 of this standard.

II. Criteria Performance Parameter Basis

N/A

1.2.6.8 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. ANSI 57.9-1992, Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type), is a widely referenced standard which provides design criteria for systems and equipment of a facility designed for the receipt and storage of spent fuel. Operations at the WHB will be similar to such facility. Therefore, the design criteria from this standard are deemed applicable to the WHB Ventilation System. Heating, ventilating and air-conditioning criteria are provided in Section 6.5 of this standard.

II. Criteria Performance Parameter Basis

N/A

1.2.6.9 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. Nuclear Air Cleaning Handbook ERDA 76-21, is an extensive collection of design, construction, and testing requirements for air cleaning systems for nuclear application. The WHB Ventilation System is designed with this type of air cleaning systems. Although useful information and requirements are provided throughout, Sections 2 and 5 have proved particularly useful in developing the design criteria for the WHB Ventilation System.

II. Criteria Performance Parameter Basis

N/A

1.2.6.10 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. The ASHRAE handbooks and standards provide widely accepted and updated guidelines and design information applicable to the ventilation system for any type of facility, and are deemed applicable to the WHB Ventilation System.

II. Criteria Performance Parameter Basis

N/A

1.2.6.11 Criteria Basis Statement

I. Criteria Need Basis

This criterion is based on the general requirement in the MGDS RD, Requirement 3.1.G, which requires compliance with the applicable laws, codes, CFRs, NUREGs, DOE Orders, and other directives. NFPA 90A, Standards for the Installation of Air Conditioning and Ventilation Equipment, is used industry-wide and is deemed applicable to the design of the WHB Ventilation System.

II. Criteria Performance Parameter Basis

N/A

5.2 SDD CRITERIA BASIS STATEMENT REFERENCES

This section presents the references used in Section 5.1.

10CFR20. *Standards for Protection Against Radiation.* Title 10, Part 20 of the Code of Federal Regulations. Washington, D.C.: U.S. Nuclear Regulatory Commission.

10CFR60. *Disposal of High Level Radioactive Wastes in Geologic Repositories.* Title 10, Part 60 of the Code of Federal Regulations. Washington, D.C.: U.S. Nuclear Regulatory Commission.

29CFR1910. *Occupational Safety and Health Standards.* Title 29, Part 1910 of the Code of Federal Regulations. Washington, D.C.: U.S. Government Printing Office.

29CFR1926. *Safety and Health Regulation for Construction.* Title 29, Part 1926 of the Code of Federal Regulations. Washington, D.C.: U.S. Government Printing Office.

ACGIH Threshold Limit Values for Chemical Substances and Physical Agents Biological Exposure Indices. 1997 TLVs and BEIs. March 1, 1998. American Conference of Governmental Industrial Hygienists. Cincinnati, Ohio

ANSI 57.7. *Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type).* ANSI/ANS-57.7, 1988. American Nuclear Society.

ANSI 57.9. *Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type).* ANSI/ANS-57.9, 1992. American Nuclear Society.

ASHRAE 1981 Fundamentals Handbook, American Society of Heating, Refrigerating & Air-conditioning Engineers, Inc. Atlanta, GA.

ASHRAE Handbooks and Standards (1997 Fundamentals Handbook, 1996 HVAC Systems and Equipment Handbook, 1995 HVAC Applications Handbook, 1994 Refrigeration Handbook, Standard 62-1989). American Society of Heating, Refrigerating & Air-conditioning Engineers, Inc. Atlanta, GA.

ASHRAE Standard 62, *Ventilation for Acceptable Indoor Air Quality*. ANSI/ASHRAE 62-1989, (Including Addendum 62a-1990). American Society of Heating, Refrigerating & Air-conditioning Engineers, Inc. Atlanta, GA.

ASME Boiler and Pressure Vessel Code (Section III). 1998 Edition. The American Society of Mechanical Engineers

ASME N509-1989. *Nuclear Power Plant Air-Cleaning Units and Components*. The American Society of Mechanical Engineers.

ASME N510-1989. *Testing of Nuclear Air Treatment Systems*. The American Society of Mechanical Engineers.

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DOE Order 6430.1A. *General Design Criteria.* Section 1550, Heating Ventilation and Air Conditioning. April 6, 1989. Department of Energy.

Engineering Design Climatology and Regional Meteorological Conditions Report. B00000000-01717-5707-00066, Rev. 00. October 2, 1997. Las Vegas, Nevada: U.S. Department of Energy, CRWMS Management and Operating Contractor. MOL. 19980304.0028

General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants. Regulatory Guide 3.12, Revision 0, August 1973. U.S. Atomic Energy Commission.

GPG-FM-027. *Human Factors Engineering*. March 1996. U.S. Department of Energy. Office of Field Management. Office of Project and Fixed Asset Management.

Heating, Ventilating, and Air-Conditioning Design Guide for Department of Energy Nuclear Facilities. 1993. American Society of Heating, Refrigerating & Air-conditioning Engineers, Inc. Atlanta, GA.

Implementation Guide DOE G 440.1-3. *Occupational Exposure Assessment*. 30 March 1998. Department of Energy, Office of Worker Health and Safety.

MIL-STD-1472E. *Human Engineering Design Criteria for Military Systems, Equipment, and Facilities*. Military Standard. 31 October, 1996.

Mined Geologic Disposal System Requirements Document. YMP/CM-0025, Rev. 3. February 1998. Las Vegas, Nevada: U.S. Department of Energy, Office of Civilian Radioactive Waste Management System. MOL. 19980520.1022

NFPA 90A. *Standard for the Installation of Air Conditioning and Ventilating Equipment*. 1996 Edition. National Fire Protection Association.

Nuclear Air Cleaning Handbook ERDA 76-21. *Design, Construction, and Testing of High-Efficiency Air Cleaning Systems for Nuclear Application*. October 1979. Oak Ridge, Tennessee: Oak Ridge National Laboratory, Energy Research and Development Administration.

Nuclear Safety Criteria for SU22, Waste Handling Building Ventilation System & SU24, Waste Treatment Building Ventilation System. Interoffice Correspondence LV.SA.KJM.09/98-110. September 1, 1998. CRWMS, Management and Operating Contractor.

NUREG-0800. *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants*. June 1987. U.S. Nuclear Regulatory Commission

UCRL-15673. *Human Factors Design Guidelines for Maintainability of DOE Nuclear Facilities*. June 18, 1985. DOE Office of Nuclear Safety. Lawrence Livermore National Laboratory.

Waste Quantity, Mix and Throughput Study Report. B00000000-01717-5705-00059, Rev 01. CRWMS M&O 1997. Las Vegas, Nevada. MOL. 19971210.0628

APPENDIX A: FUTURE RECOMMENDATIONS AND CONSIDERTAIONS

1.0 Purpose

The purpose of this section is to document issues and actions that will be considered in the future.

2.0 Recommendations and Considerations

2.1 Evaluate system reliability requirements (Criteria 1.2.2.1.10 & 1.2.2.1.11) and system inherent availability requirements (Criterion 1.2.5.3) to determine the bounding quantifiable reliability/availability value for the system.