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August 24, 2012

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-12233

**Subject: MHI's Amended Response to US-APWR DCD RAI No.827-5812 Revision 0 (SRP 09.04.01)**

References: 1) "Request for Additional Information No. 827-5812 Revision 0, SRP Section: 09.04.01 – Control Room Area Ventilation System Application Section: Section 9.4.1", dated September 7, 2011 (ML112570334).
2) Letter MHI Ref: UAP-HF-11348 from Y. Ogata to U.S. NRC "MHI's Response to US-APWR DCD RAI No.827-5812 Revision 0 (SRP 09.04.01)", dated October 7, 2011 (ML11285A247).

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") the document entitled "Amended Response to Request for Additional Information No.827-5812 Revision 0".

Enclosed is the amended response to the 1 RAI question contained within Reference 1. This response is the amended version of the response previously transmitted in Reference 2.

Please contact Mr. Joseph Tapia, General Manager of Licensing Department, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of the submittal. His contact information is below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
Director - APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

Enclosures:

1. Amended Response to Request for Additional Information No. 827-5812 Revision 0

D081
NRO

CC: J. A. Ciocco
J. Tapia

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Enclosure 1

UAP-HF- 12233
Docket No. 52-021

# Amended Response to Request for Additional Information No. 827-5812 Revision 0

August 2012

## RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

**8/24/2012**

**US-APWR Design Certification**

**Mitsubishi Heavy Industries**

**Docket No. 52-021**

| | |
|---|---|
| **RAI NO.:** | **827-5812 REVISION 0** |
| **SRP SECTION:** | **09.04.01 -Control Room Area Ventilation System** |
| **APPLICATION SECTION:** | **DCD SECTION 9.4.1** |
| **DATE OF RAI ISSUE:** | **9/7/2011** |

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**Question No. : 09.04.01-28**

"Question on CR Intake Flow Rate"

There are three information sources related to CR intake flow rate from USAPWR DCD:

1. Rev 3 of DCD Tier 2 Section 6.4.2.3 (page 6.4.7).

"Make-Up flow < 1200 cfm".

2. Rev 3 of DCD Tier 2 Section 9.4.1.2.2.1 (page 9.4-5).

"Make-Up flow < 600 cfm".

3. Rev 3 of DCD Tier 2 Table 2.7.5.1-3 Sheet 3 Acceptance Criteria Item 4.b.ii (page 2.7-175).

"Intake flow < 1200 cfm"; "recirculation flow >2400 cfm".

Request for additional information: What is the correct CR intake flow rate? 1200 cfm or 600 cfm. The applicant's information seems contradicting itself.

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**ANSWER:**

The response to RAI 827-5812, Question 09.04.01-28 is amended as indicated below based on discussion with NRC staff on January 25, 2012 to provide further clarification of the air flowrate associated with operation of the MCR HVAC emergency filter units and air handling units in pressurization mode.

As described in DCD Section 6.4, two 100% capacity MCR emergency filtration units, which are part of the habitability systems for the MCR, are provided to allow operators to remain safely inside the control room envelope (CRE) and take the actions necessary to manage and control the plant under normal and abnormal plant conditions, including a LOCA. The MCR emergency filtration units are part of the MCR HVAC system.

As indicated in Table 9.4.1-1, each emergency filtration unit has an airflow capacity of 3,600 cfm. The system is designed to provide 600 cfm outside airflow and 3,000 cfm recirculation airflow for each train of emergency filtration. Each air handling unit provides 10,000 cfm conditioned air to the CRE.

The MCR HVAC system has two emergency modes: pressurization mode and isolation mode. The pressurization mode protects the MCR operators and staff within the CRE during the accident conditions. The pressurization mode is initiated automatically by the MCR isolation signal and provides outside airflow and recirculation for CRE pressurization and removal of airborne radioactive material, respectively.

The emergency pressurization mode establishes a CRE pressurization of a minimum of 0.125 inches w.g. higher than that of adjacent areas. On an automatic initiation of the emergency pressurization mode, the operating air handling units continue to run and the standby air handling units start, and both emergency filtration units start. With pressurization mode established, one MCR emergency filtration unit and two MCR air handling units may be stopped and placed in standby. One MCR emergency filtration unit is capable of establishing and maintaining the design positive pressure in the CRE with respect to the surrounding areas to minimize un-filtered in-leakage in pressurization mode. The air flow path of the MCR HVAC system in pressurization mode is shown in DCD Figure 6.4-3.

In pressurization mode, a portion of the return air flow from the CRE is directed into the emergency filtration units. Outside air is drawn in and is directed through the MCR emergency filtration units to the MCR air handling units.

DCD Section 6.4.2.3 describes the limits for CRE in-leakage and out-leakage and potential leakage sources. The make-up airflow rate in pressurization mode is stated as equal to or less than 1,200 cfm and refers to the maximum make-up airflow rate with both emergency filtration units in operation. As identified above, both emergency filtration units automatically start on a MCR isolation signal and each emergency filtration unit flowpath provides 600 cfm outside airflow. However, the makeup air flowrate required to establish and maintain positive pressure within the CRE is ≤600 cfm. DCD Section 6.4.2.3 will be clarified to indicate the air flowrate required to pressurize the CRE and the air flowrate and emergency filtration units in operation for in-leakage testing. A minor clarification will also be made to DCD Section 6.4.2.4.

DCD Section 9.4.1.2.2.1 describes the MCR HVAC system in pressurization mode. The last bulleted item states that MCR HVAC system design airflow rate is 20,000 cfm and the make-up design airflow rate is less than 600 cfm. This statement refers to system operation with the minimum required two MCR HVAC air handling units and one emergency filtration unit in operation. The last two bulleted items in DCD Section 9.4.1.2.2.1 will be revised to clarify the MCR HVAC units operating.

DCD Chapter 16, Technical Specifications, Subsection B 3.7.10, Bases, indicates in the eleventh paragraph of the Background that a single train of MCREFS operating at a flow ≤1200 cfm will pressurize the CRE to about 0.125 inches water gauge relative to external areas adjacent to the CRE boundary. This paragraph will be revised to indicate that ≤600 cfm will pressurize the CRE to about 0.125 inches water gauge. In addition, DCD Chapter 16, Technical Specifications, Subsection B 3.7.10, Bases, fifteenth paragraph will be deleted.

Tier 1 DCD Table 2.7.5.1-3, Sheet 2, Item 4.b provides ITAAC for the MCR HVAC system filter efficiencies and required system airflow as required in the safety analyses. Item 4.b.ii Acceptance Criteria are that the as-built MCR HVAC system provides filtered air intake flow of ≤1,200 cfm, filtered air recirculation flow of ≥2,400 cfm, and maintains positive pressure in the as-built CRE in the emergency pressurization mode. The intake flow rate acceptance criterion considers the outside airflow rate with two emergency filtration units in operation, each flowpath providing ≤600 cfm outside air flow. As described above, both emergency filtration units automatically start on a MCR isolation signal and each provides 600 cfm outside airflow. The filtered air recirculation flowrate of 2,400 cfm is a conservatively low value assumed in the analyses and is based on one emergency filtration unit in operation.

DCD Table 2.7.5.1-3, Sheet 2, Item 4.b.ii Acceptance Criteria will be revised to clarify the number of MCR HVAC units in operation for each of the air flowrate conditions stated.

Tier 1 DCD Table 2.7.5.1-3, Sheet 3, Item 4.c provides ITAAC for unfiltered CRE in-leakage. Item 4.c Acceptance Criteria will be revised to clarify the MCR HVAC units and MCREFS units in operation for the tests.

**Impact on DCD**

US-APWR DCD Revision 3 Tier 2 Subsection 6.4.2.3 will be revised as follows (See attachment):

> "The potential leak paths (out-leakage) of the CRE are cable, pipe, and ductwork penetrations, doors, and HVAC equipment. The extent of out-leakage (and therefore pressurization) is dependent on the sealing characteristics, and integrity, at penetrations and doors. ~~Total system inleakage in emergency pressurization mode is equal to or less than 120 ft$^3$/min, including 10 ft$^3$/min for egress and ingress.~~ The makeup (outside air ventilation) flow rate during emergency pressurization mode **required to establish and maintain positive pressure in the CRE** is equal to or less than ~~1,200~~ **600** ft$^3$/min. **The makeup air flow rate provided by a single 100% capacity MCR emergency filtration unit is equal to or less than 600 ft$^3$/min and the makeup air flow rate provided by two 100% capacity MCR emergency filtration units is equal to or less than 1,200 ft$^3$/min.** ~~Exfiltration, required to create (and maintain) the differential pressure across the CRE boundary, is expected to equal the amount of makeup air and occur at the potential leak paths mentioned above.~~ **Maximum CRE in-leakage in emergency pressurization mode is equal to or less than 120 ft$^3$/min, including 10 ft$^3$/min for egress and ingress regardless of number of operating MCR emergency filtration units.**
>
> System flow balancing and leakage tests are performed during the initial test program, as described in Chapter 14. The leakage tests establish exfiltration and infiltration rates to determine the MCR and emergency CRE flow balance necessary to achieve design Pressure with respect to surrounding areas, in accordance with ASTM E741-00 (Ref. 6.4-3). The ASTM E741 tests confirm inleakage test value of CRE (~110 ft3/min) in the emergency pressurization mode ~~and~~ **with the** makeup flow rate ~~(~1,200 ft3/min) in the emergency pressurization mode.~~ **from a single operating MCR emergency filtration unit (≤600 ft$^3$/min) and two operating MCR emergency filtration units (≤1,200 ft$^3$/min).**"

US-APWR DCD Revision 3 Tier 2 Subsection 6.4.2.4, first sentence, will be revised as follows (See attachment):

> "Positive pressure~~, due to exfiltration,~~ is maintained inside CRE when the main control room HVAC system is in the emergency pressurization mode."

US-APWR DCD Revision 3 Tier 2 Subsection 9.4.1.2.2.1, last two bulleted items, will be revised as follows (See attachment):

"• In the emergency pressurization mode of operation, the CRE is maintained at a positive pressure 0.125 inches w.g. as a minimum relative to external areas adjacent to the CRE boundary **with one of the emergency filtration units operating**.

• In the emergency pressurization mode of operation, the MCR HVAC system design airflow rate is 20,000 cfm **with two MCR air handling units operating** and the

make-up design airflow rate is less than **or equal to** 600 cfm **with one MCR emergency filtration unit operating**."

US-APWR DCD Revision 3 Tier 2 Chapter 16, Technical Specifications, Subsection B 3.7.10, Bases, Background eleventh paragraph, will be revised as follows (See attachment):

A single train of MCREFS operating at a flow ~~≤1200~~ **600** cfm will pressurize the CRE to about 0.125 inches water gauge relative to external areas adjacent to the CRE boundary. The MCRVS operation in maintaining the CRE habitable is discussed in Chapter 9, Subsection 9.4.1 (Ref. 2).

US-APWR DCD Revision 3 Tier 2 Chapter 16, Technical Specifications, Subsection B 3.7.10, Bases, Background fifteenth paragraph, will be deleted as follows (See attachment)

~~The periodic surveillance pressurization tests verify the integrity of the CRE with respect to potentially contaminated adjacent areas. It does not verify filtered inleakage internal to the filtration units and ductwork nor does it verify unfiltered inleakage from internal pressurized sources (e.g., instrument air). These sources of inleakage are addressed separately from TS surveillances.~~

US-APWR DCD Revision 3 Tier 1 Table 2.7.5.1-3, Item 4.b.ii and 4.c Acceptance Criteria, will be revised as follows (See attachment):

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|
| 4.b The MCR HVAC system provides filter efficiencies and system airflow as required in the safety analysis. | 4.b.i Type tests, tests and analyses will be performed to verify that the filter efficiencies of the as-built MCR HVAC system meet or exceed the design specification. | 4.b.i A report exists and concludes that the filters of the as-built MCR HVAC system meet or exceed the following filter efficiencies:<br>Elemental iodine 95%<br>Organic iodine 95%<br>Particulates 99% |
| | 4.b.ii Tests of the airflow for the as-built MCR HVAC system will be performed. | 4.b.ii The as-built MCR HVAC system provides filtered air intake flow of ≤1200 cfm **with two MCR emergency filtration units operating**, filtered air recirculation flow of ≥2400 cfm **with one** |

| | | |
|---|---|---|
| | | **emergency filtration unit operating**, and maintains positive pressure in the as-built CRE **relative to all adjacent areas to the CRE boundary** in the emergency pressurization mode **with one emergency filtration unit operating**. |
| 4.c The unfiltered CRE inleakage is within the performance value as specified in the safety analysis. | 4.c Tests and analyses of asbuilt unfiltered CRE inleakage will be performed. | **4.c.i** A report exists and concludes that the as-built CRE unfiltered inleakage is ≤ 120 cfm with the MCR HVAC system operating **in a system configuration of two of four MCR air handling units operating (two different AHUs from 4.c.ii) and the A-train MCREFS unit operating** in the emergency pressurization mode. **The 120 cfm unfiltered in-leakage value includes an assumed value of 10 cfm for CRE ingress/egress.** |
| | | **4.c.ii A report exists and concludes that the as-built CRE unfiltered inleakage is ≤ 120 cfm with the MCR HVAC system operating in a system configuration of two of four MCR air handling units operating (two different AHUs from 4.c.i) and the B-train MCREFS unit operating in the emergency pressurization mode. The 120 cfm unfiltered in-leakage value** |

| | | |
|---|---|---|
| | | **includes an assumed value of 10 cfm for CRE ingress/egress.** |
| | | **4.c.iii A report exists and concludes that the as-built CRE unfiltered inleakage is ≤ 120 cfm with the MCR HVAC system operating in a system configuration of four MCR air handling units operating and two MCREFS units operating in the emergency pressurization mode. The 120 cfm unfiltered in-leakage value includes an assumed value of 10 cfm for CRE ingress/egress.** |

**Impact on R-COLA**

R-COLA Part 4, Technical Specifications, Subsection B 3.7.10, Bases, Background eleventh paragraph, will be revised as follows:

> A single train of MCREFS operating at a flow ~~≤1200~~ **600** cfm will pressurize the CRE to about 0.125 inches water gauge relative to external areas adjacent to the CRE boundary. The MCRVS operation in maintaining the CRE habitable is discussed in Chapter 9, Subsection 9.4.1 (Ref. 2).

R-COLA Part 4, Technical Specifications, Subsection B 3.7.10, Bases, Background fifteenth paragraph, will be deleted as follows:

> ~~The periodic surveillance pressurization tests verify the integrity of the CRE with respect to potentially contaminated adjacent areas. It does not verify filtered inleakage internal to the filtration units and ductwork nor does it verify unfiltered inleakage from internal pressurized sources (e.g., instrument air). These sources of inleakage are addressed separately from TS surveillances.~~

**Impact on S-COLA**

S-COLA Part 4, Technical Specifications, Subsection B 3.7.10, Bases, Background eleventh paragraph, will be revised as follows:

> A single train of MCREFS operating at a flow ~~≤1200~~ **600** cfm will pressurize the CRE to about 0.125 inches water gauge relative to external areas adjacent to the CRE boundary. The MCRVS operation in maintaining the CRE habitable is discussed in Chapter 9, Subsection 9.4.1 (Ref. 2).

S-COLA Part 4, Technical Specifications, Subsection B 3.7.10, Bases, Background fifteenth paragraph, will be deleted as follows:

~~The periodic surveillance pressurization tests verify the integrity of the CRE with respect to potentially contaminated adjacent areas. It does not verify filtered inleakage internal to the filtration units and ductwork nor does it verify unfiltered inleakage from internal pressurized sources (e.g., instrument air). These sources of inleakage are addressed separately from TS surveillances.~~

**Impact on PRA**

There is no impact on the PRA.

**Impact on Technical / Topical Reports**

There is no impact on the Technical / Topical Reports.

**Table 2.7.5.1-3 Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 7)**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria | |
|---|---|---|---|
| 4.b The MCR HVAC system provides filter efficiencies and system airflow as required in the safety analysis. | 4.b.i Type tests, tests and analyses will be performed to verify that the filter efficiencies of the as-built MCR HVAC system meet or exceed the design specification. | 4.b.i A report exists and concludes that the filters of the as-built MCR HVAC system meet or exceed the following filter efficiencies:<br>Elemental iodine 95%<br>Organic iodine 95%<br>Particulates 99% | |
| | 4.b.ii Tests of the airflow for the as-built MCR HVAC system will be performed. | 4.b.ii The as-built MCR HVAC system provides filtered air intake flow of ≤1200 cfm (with two MCR emergency filtration units operating), filtered air recirculation flow of ≥2400 cfm (with one MCR emergency filtration unit operating), and maintains positive pressure in the as-built CRE relative to all adjacent areas to the CRE boundary in the emergency pressurization mode (with one MCR emergency filtration unit operating). | DCD_14.03.07-75<br>DCD_14.03.07-75<br>DCD_09.04.01-28 S01<br>DCD_14.03.07-75 |

**Table 2.7.5.1-3 Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 4 of 7)**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria | |
|---|---|---|---|
| 4.c The unfiltered CRE inleakage is within the performance value as specified in the safety analysis. | 4.c Tests and analyses of as-built unfiltered CRE inleakage will be performed. | 4.c.i ~~A report exists and concludes that the as-built CRE unfiltered inleakage is ≤ 120 cfm with the MCR HVAC system operating in the emergency pressurization mode.~~ A report exists and concludes that the as-built CRE unfiltered inleakage is ≤ 120 cfm with the MCR HVAC system operating in a system configuration of only two of four MCR AHUs operating (two different AHUs from 4.c.ii) and the A-train MCREFS unit operating in the emergency pressurization mode. The 120 cfm unfiltered in-leakage value includes an assumed value of 10 cfm for CRE ingress/egress. | DCD_09.04.01-28 S01<br>DCD_14.03.07-89 |
| | | 4.c.ii A report exists and concludes that the as-built CRE unfiltered inleakage is ≤ 120 cfm with the MCR HVAC system operating in a system configuration of only two of four MCR AHUs operating (two different AHUs from 4.c.i) and the B-train MCREFS unit operating in the emergency pressurization mode. The 120 cfm unfiltered in-leakage value includes an assumed value of 10 cfm for CRE ingress/egress. | DCD_09.04.01-28 S01 |

**Table 2.7.5.1-3 Main Control Room HVAC System Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 5 of 7)**

| Design Commitment | Inspections, Tests, Analyses | Acceptance Criteria | |
|---|---|---|---|
| | | 4.c.iii A report exists and concludes that the as-built CRE unfiltered inleakage is ≤ 120 cfm with the MCR HVAC system operating in a system configuration of all four MCR AHUs operating and both MCREFS unit operating in the emergency pressurization mode. The 120 cfm unfiltered in-leakage value includes an assumed value of 10 cfm for CRE ingress/egress. | DCD_09.04. 01-28 S01 |
| 5.a The remotely operated dampers, identified in Table 2.7.5.1-1 as having PSMS control, perform an active safety function after receiving a signal from PSMS. | 5.a Tests will be performed on the as-built remotely operated dampers identified in Table 2.7.5.1-1 as having PSMS control using simulated signals. | 5.a The as-built remotely operated dampers identified in Table 2.7.5.1-1 as having PSMS control perform the active safety function identified in the table after receiving a simulated signal. | |
| 5.b After loss of motive power, the remotely operated dampers, identified in Table 2.7.5.1-1, assume the indicated loss of motive power position. | 5.b Tests of the as-built remotely operated dampers identified in Table 2.7.5.1-1 will be performed under the conditions of loss of motive power. | 5.b Upon loss of motive power, each as-built remotely operated damper identified in Table 2.7.5.1-1 assumes the indicated loss of motive power position. | |
| 5.c The MCR HVAC system isolation dampers close within their design basis closure time after receiving a MCR isolation signal or a smoke detection signal. | 5.c Tests of the as-built MCR HVAC system isolation dampers will be performed using a simulated MCR isolation signal or a simulated smoke detection signal. | 5.c.i The following as-built MCR HVAC system isolation dampers close within ~~the required times:~~ ≤10 seconds after receiving a simulated smoke detection signal:<br>VRS-EHD-101 A,B, 102 A,B<br><br>5.c.ii The following as-built MCR HVAC system isolation dampers close within ≤10 seconds after receiving a simulated MCR isolation signal:<br>VRS-AOD-121, 122<br>VRS-AOD-131, 132 | DCD_14.03. 07-76<br>DCD_14.03. 07-76<br>DCD_14.03. 07-76<br>DCD_14.03. 07-76<br>DCD_14.03. 07-76 |

### 6.4.2.3 Leaktightness

The potential leak paths (out-leakage) of the CRE are cable, pipe, and ductwork penetrations, doors, and HVAC equipment. The extent of out-leakage (and therefore pressurization) is dependent on the sealing characteristics, and integrity, at penetrations and doors. ~~Total system inleakage in emergency pressurization mode is equal to or less than 120 ft$^3$/min, including 10 ft$^3$/min for egress and ingress.~~ The makeup (outside air ventilation) flow rate during emergency pressurization mode required to establish and maintain positive pressure in the CRE is equal to or less than ~~1,200~~600 ft$^3$/min. The makeup air flow rate provided by a single 100% capacity MCR emergency filtration unit is equal to or less than 600 ft$^3$/min and the makeup air flow rate provided by two 100% capacity MCR emergency filtration units is equal to or less than 1,200 ft$^3$/min. ~~Exfiltration, required to create (and maintain) the differential pressure across the CRE boundary, is expected to equal the amount of makeup air and occur at the potential leak paths mentioned above.~~Maximum CRE inleakage in emergency pressurization mode is equal to or less than 120 ft$^3$/min, including 10 ft$^3$/min for egress and ingress regardless of number of operating MCR emergency filtration units. DCD_09.04.01-28 S01 DCD_09.04.01-28 S01

System flow balancing and leakage tests are performed during the initial test program, as described in Chapter 14. The leakage tests establish exfiltration and infiltration rates to determine the MCR and emergency CRE flow balance necessary to achieve design pressure with respect to surrounding areas, in accordance with ASTM E741-00 (Ref. 6.4-3). The ASTM E741 tests confirm inleakage test value of CRE (~110 ft$^3$/min) in the emergency pressurization mode ~~and~~with the makeup flow rate ~~(~1,200 ft$^3$/min) in the emergency pressurization mode.~~ from a single operating MCR emergency filtration unit (≤600 ft$^3$/min) and two operating MCR emergency filtration units (≤1,200 ft$^3$/min). DCD_09.04.01-28 S01

### 6.4.2.4 Interaction with Other Zones and Pressure-Containing Equipment

Positive pressure~~, due to exfiltration,~~ is maintained inside CRE when the main control room HVAC system is in the emergency pressurization mode. This positive pressure reduces the infiltration of airborne radioactive contamination into the CRE during a Design Basis Accident. The positive pressure results in airflow in the outward direction from the CRE. In addition, the Class 1E electrical room HVAC system services rooms above, below and adjacent to the CRE. The auxiliary building HVAC system services the access corridor to CRE. These ventilation systems are configured and balanced to preclude airflow into the CRE, which harmonizes with the main control room HVAC system. DCD_09.04.01-28 S01

Other HVAC systems service areas adjacent to, above and below the CRE, however, no portion of these systems are connected to or pass through the CRE. The MCR toilet/ kitchen exhaust fans and the smoke purge fan provide service to the CRE. Any adverse interaction from these two systems is prevented since the fan motors are de-energized and associated CRE isolation boundary dampers are closed, when emergency CRE ventilation flow is automatically initiated. Any potential leak paths are addressed in Subsection 6.4.2.3. There are no pressure-containing tanks or piping systems in the CRE that could, on failure, transfer or introduce hazardous material(s) into the CRE.

- High differential pressure across the filter bank in the activated air handling units annunciates an alarm, alerting the plant personnel to a dirty filter that needs to be replaced.
- When air handling units are stopped all dampers and chilled water control valves revert to their fail position.
- In the normal mode operation, the MCR HVAC system design airflow rate is 20,000 cfm.
- The non-safety in-duct humidifier is controlled by a humidity instrument located in the MCR.

#### 9.4.1.2.2 Emergency Operation Mode

##### 9.4.1.2.2.1 Pressurization Mode

Upon receipt of the MCR isolation signal (Chapter 7), the MCR HVAC system is to automatically switch to pressurization mode by initiating the following control functions:

- The toilet/kitchen exhaust line and smoke purge line isolation dampers revert to the close position.
- The toilet/kitchen exhaust fans and smoke purge fan automatically shut down or remain in the shutdown status.
- The operating air handling units continue to run and the standby air handling units will start.
- All return air dampers of all air handling units remain in the open position allowing recirculation.
- Both emergency filtration units automatically start, their isolation dampers open, and their Class 1E electric heating coils are energized so that the air entering the charcoal adsorber has a relative humidity below 70%, which assures adsorption efficiency.
- The energized emergency filtration units continue to run to remove the airborne radioactivity from the CRE ambient air prior to circulation back to the CRE through the operating air handling units.
- Following automatic initiation of the emergency operation, two of the air handling units and one of the emergency filtration units may be manually de-energized and placed on standby status.
- In the emergency pressurization mode of operation, the CRE is maintained at a positive pressure 0.125 inches w.g. as a minimum relative to external areas adjacent to the CRE boundary with one of the emergency filtration units operating. DCD_09.04.01-28 S01
- In the emergency pressurization mode of operation, the MCR HVAC system design airflow rate is 20,000 cfm with two MCR air handling units operating and DCD_09.04.01-28

the make-up design airflow rate is less than or equal to 600 cfm with one MCR emergency filtration unit operating.

DCD_09.04.01-28 S01
DCD_09.04.01-28

#### 9.4.1.2.2.2 Isolation Mode

If the smoke detectors located in the outside air intake detect the presence of the smoke, they activate an alarm in the MCR. The MCR HVAC system will be automatically switched to the isolation mode and the following is to take place:

- MCR outside air intake isolation dampers, toilet/kitchen exhaust line isolation dampers and smoke purge line isolation dampers revert to the close position.
- The toilet/kitchen exhaust fans and smoke purge fan automatically shut down or remain in the shutdown status.
- The operating air handling units continue to run and the standby air handling units will start.
- Following automatic initiation of emergency isolation operation, two of the air handling units may be manually de-energized and placed on standby status.
- In the emergency isolation mode of operation, the MCR HVAC system design airflow rate is 20,000 cfm.

#### 9.4.1.2.3 Smoke Purge Operation Mode

If the smoke detectors located in the supply and return air ducts and the area smoke detectors in the CRE detect the presence of smoke, the air handling units automatically shut down and an alarm is annunciated in the MCR. The MCR operator manually initiates the smoke purge operation to line up the selected air handling units for once through operation and starts the smoke purge fan. Smoke purge operation can only be used, when the emergency operation mode is not in effect. During smoke purge operation, the emergency filtration units do not operate and their isolation dampers remain closed. At the initiation of the smoke purge operation, the following is to take place:

- The activated air handling units are lined-up for 100% outside air and their temperature control system is overridden.
- The redundant air intake isolation dampers open to allow for 100% outside airflow.
- The smoke purge line isolation dampers open and the smoke purge fan start.
- The chilled water cooling coil for the activated air handling units is automatically positioned for full chilled water flow to avoid the possibility of freeze-up during low outdoor ambient temperatures.
- In the smoke purge mode of operation, the MCR HVAC system design airflow rate is 20,000 cfm.

BASES

BACKGROUND (continued)

[The air entering the CRE is continuously monitored by radiation and toxic gas detectors. One detector output above the setpoint will cause actuation of the pressurization mode or isolation mode, as required. The actions of the isolation mode are more restrictive, and will override the actions of the pressurization mode].

A single train of MCREFS operating at a flow ~~≤1200~~600 cfm will pressurize the CRE to about 0.125 inches water gauge relative to external areas adjacent to the CRE boundary. The MCRVS operation in maintaining the CRE habitable is discussed in Chapter 9, Subsection 9.4.1 (Ref. 2). DCD_09.04.01-28 S01

Redundant supply and recirculation trains provide the required filtration should an excessive pressure drop develop across the other filter train. Normally open isolation dampers are arranged in series pairs so that the failure of one damper to shut will not result in a breach of isolation. The MCREFS is designed in accordance with Seismic Category I requirements.

Two trains of MCRATCS will provide the required temperature control to maintain the control room between 73°F and 78°F. The MCRVS operation in maintaining the control room temperature is discussed in Chapter 9, Section 9.4.1 (Ref. 2).

The CRE habitability is maintained by limiting the inleakage of potentially contaminated air into the CRE. The potential leakage paths for the CRE include the control room enclosure (e.g., walls, penetrations, floor, ceilings, joints, etc.) and other potential paths such as pressurized ductwork from other HVAC systems, pressurized air systems (e.g., instrument air) or isolated HVAC intakes.

~~The periodic surveillance pressurization tests verify the integrity of the CRE with respect to potentially contaminated adjacent areas. It does not verify filtered inleakage internal to the filtration units and ductwork nor does it verify unfiltered inleakage from internal pressurized sources (e.g., instrument air). These sources of inleakage are addressed separately from TS surveillances.~~ DCD_09.04.01-28 S01

The MCRVS is designed to maintain a habitable environment in the CRE for 30 days of continuous occupancy after a Design Basis Accident (DBA) without exceeding a 5 rem total effective dose equivalent (TEDE).