

2.6.8 Containment Building Ventilation System

1.0 Description

The containment building ventilation system (CBVS) controls the Containment Building temperature, humidity and air change rate for personnel comfort, personnel safety, and equipment protection during normal plant operation. The CBVS provides cooling, heating, and ventilation for the Containment Building to remove equipment heat, and heat generated from other sources. The CBVS also provides heat to maintain a minimum temperature in the building. The CBVS provides a minimal air change rate for the building and controls the building pressurization to reduce spreading of contamination.

The CBVS provides the following safety related functions:

- Upon receipt of a containment isolation signal, the CBVS provides automatic isolation of the containment atmosphere by quick closure of the system containment isolation valves.
- CBVS low flow purge exhaust to iodine filtration trains.

The CBVS provides the following non-safety related functions:

- Containment full flow purge supply and exhaust during outages.
- Containment low flow purge supply for containment entry during normal plant operation.
- Internal filtration to reduce radioactive contamination inside the equipment compartment.
- Supply of cool air to the reactor pit area to prevent concrete degradation.
- Containment cooling to maintain ambient conditions.

2.0 Arrangement

2.1 The functional arrangement of the CBVS is as shown in the Figure 2.6.8-1—Containment Building Ventilation System Functional Arrangement

2.2 The location of CBVS equipment is as listed in Table 2.6.8-1—Containment Building Ventilation System Containment Isolation Valves Mechanical Design, and Table 2.6.8-2—Containment Building Ventilation System Equipment Mechanical Design.

3.0 Mechanical Design Features

3.1 Equipment listed in Table 2.6.8-1 as ASME Code Section III is designed, welded, and hydrostatically tested in accordance with ASME Code Section III.

3.2 Equipment listed in Table 2.6.8-2 as ASME AG-1 is designed, installed, and tested per ASME AG-1.

- 3.3 Equipment listed in Tables 2.6.8-1 and 2.6.8-2 perform the functions listed in Tables 2.6.8-1 and 2.6.8-2.
- 3.4 Equipment identified as Seismic Category I in Tables 2.6.8-1 and 2.6.8-2 can withstand seismic design basis loads without loss of safety function as listed in Tables 2.6.8-1 and 2.6.8-2.

4.0 Displays and Controls

- 4.1 Displays listed in Table 2.6.8-3—Containment Ventilation System Equipment I&C and Electrical Design are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed.
- 4.2 The CBVS equipment controls that are provided in the MCR and RSS are as listed in Table 2.6.8-3.
- 4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.6.8-3 responds to the state requested by a test signal.
- 4.4 The CBVS provides containment pressure indication.

5.0 Electrical Power Design Features

- 5.1 The equipment designated as Class 1E in Table 2.6.8-3 are powered from the Class 1E division as listed in Table 2.6.8-3 in a normal or alternate feed condition.
- 5.2 Motor operated dampers listed in Table 2.6.8-3 fail to the position as shown in Table 2.6.8-3 on loss of power.

6.0 Environmental Qualifications

- 6.1 Electrical drivers for equipment listed in Table 2.6.8-3 for harsh environment can perform the safety function in Tables 2.6.8-1 and 2.6.8-2 following exposure to the design basis environments for the time required.

7.0 Equipment and System Performance

- 7.1 The CBVS low flow purge exhaust subsystem exhausts through a CBVS iodine filtration train.

8.0 Inspections, Tests, Analyses and Acceptance Criteria (ITAAC)

Table 2.6.8-4 lists the CBVS ITAAC.

**Table 2.6.8-1—Containment Building Ventilation System Containment Isolation Valves
Mechanical Design**

Equipment Description	Equipment Tag Number⁽¹⁾	Equipment Location	ASME Code Section III	Function	Seismic Category
Containment Isolation Valve	30KLA10AA001	Fuel Building	Yes	Close	I
Containment Isolation Valve	30KLA10AA003	Reactor Building	Yes	Close	I
Containment Isolation Valve	30KLA30AA002	Fuel Building	Yes	Close	I
Containment Isolation Valve	30KLA30AA003	Reactor Building	Yes	Close	I
Containment Isolation Valve	30KLA20AA003	Fuel Building	Yes	Close	I
Containment Isolation Valve	30KLA20AA001	Reactor Building	Yes	Close	I
Containment Isolation Valve	30KLA40AA002	Fuel Building	Yes	Close	I
Containment Isolation Valve	30KLA40AA001	Reactor Building	Yes	Close	I

1) Equipment tag numbers are provided for information only and are not part of the certified design.

**Table 2.6.8-2—Containment Building Ventilation System Equipment Mechanical Design
(2 Sheets)**

Equipment Description	Equipment Tag Number (1)	Equipment Location	ASME AG-1 Code	Function	Seismic Category
Reactor Pit Cooling Fans					
Reactor Pit Cooling Fan	30KLA65AN001	Reactor Building	Yes	Run	I
Reactor Pit Cooling Fan	30KLA66AN001	Reactor Building	Yes	Run	I
Reactor Pit Cooling Fan	30KLA65AN002	Reactor Building	Yes	Run	I
Reactor Pit Cooling Fan	30KLA66AN002	Reactor Building	Yes	Run	I
Low Flow Purge Exhaust					
Motor operated dampers	30KLA21AA004 30KLA22AA004	Fuel Building	Yes	Open	I
Electric Heaters	30KLA21AH005 30KLA22AH005	Fuel Building	Yes	On	I
Prefilters	30KLA21AT001 30KLA22AT001	Fuel Building	Yes	N/A	I
Upstream HEPA filters	30KLA21AT002 30KLA22AT002	Fuel Building	Yes	N/A	I
Carbon Adsorbers	30KLA21AT003 30KLA22AT003	Fuel Building	Yes	N/A	I
Downstream HEPA filters	30KLA21AT004 30KLA22AT004	Fuel Building	Yes	N/A	I
Motor operated dampers	30KLA21AA007 30KLA22AA007	Fuel Building	Yes	Open	I
Exhaust Fans	30KLA21AN001 30KLA22AN001	Fuel Building	Yes	Run	I

**Table 2.6.8-2—Containment Building Ventilation System Equipment Mechanical Design
(2 Sheets)**

Equipment Description	Equipment Tag Number (1)	Equipment Location	ASME AG-1 Code	Function	Seismic Category
Backdraft Dampers	30KLA21AA003 30KLA22AA003	Fuel Building	Yes	N/A	I
Motor operated dampers	30KLA21AA001 30KLA22AA001	Fuel Building	Yes	Close	I
Internal Filtration Train					
Motor operated damper	30KLA50-AA002	Reactor Building	Yes	Open	I
Electric Heater	30KLA50-AH001	Reactor Building	Yes	On	I
Prefilter	30KLA50-AT001	Reactor Building	Yes	N/A	I
Upstream HEPA filters	30KLA50-AT002	Reactor Building	Yes	N/A	I
Carbon Adsorber	30KLA50-AT003	Reactor Building	Yes	N/A	I
Downstream HEPA filters	30KLA50-AT004	Reactor Building	Yes	N/A	I
Motor operated damper	30KLA50-AA004	Reactor Building	Yes	Open	I
Manual dampers	30KLA51AA006 30KLA52AA006	Reactor Building	Yes	Open	I
Recirculation Fans	30KLA51AN001 30KLA52AN001	Reactor Building	Yes	Run	I
Backdraft Dampers	30KLA51AA007 30KLA52AA007	Reactor Building	Yes	N/A	I

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**Table 2.6.8-3—Containment Building Ventilation System Equipment I&C and Electrical Design
(3 Sheets)**

Equipment Description	Equipment Tag Number ⁽¹⁾	Equipment Location	IEEE Class 1E Source ⁽²⁾	Failure Position	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Reactor Pit Cooling Fan	30KLA65AN001	Reactor Building	Division 1	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Reactor Pit Cooling Fan	30KLA66AN001	Reactor Building	Division 4	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Reactor Pit Cooling Fan	30KLA65AN002	Reactor Building	Division 1	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Reactor Pit Cooling Fan	30KLA66AN002	Reactor Building	Division 4	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Low Flow Purge Exhaust								
Motor operated damper	30KLA21AA004	Fuel Building	Division 1 ^N Division 2 ^A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor operated damper	30KLA22AA004	Fuel Building	Division 4 ^N Division 3 ^A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Electric Heater	30KLA21AH005	Fuel Building	Division 1 ^N Division 2 ^A	N/A	Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Electric Heater	30KLA22AH005	Fuel Building	Division 4 ^N Division 3 ^A	N/A	Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Motor operated damper	30KLA21AA007	Fuel Building	Division 1 ^N Division 2 ^A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor operated damper	30KLA22AA007	Fuel Building	Division 4 ^N Division 3 ^A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor operated dampers	30KLA21AA001	Fuel Building	N/A	Close	N/A	N/A	Position / Position	Open-Close / Open-Close

**Table 2.6.8-3—Containment Building Ventilation System Equipment I&C and Electrical Design
(3 Sheets)**

Equipment Description	Equipment Tag Number ⁽¹⁾	Equipment Location	IEEE Class 1E Source ⁽²⁾	Failure Position	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Motor operated dampers	30KLA22AA001	Fuel Building	N/A	Close	N/A	N/A	Position / Position	Open-Close / Open-Close
Internal Filtration Train								
Motor operated damper	30KLA50AA002	Reactor Building	Division 2 ^N Division 1 ^A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Electric Heater	30KLA50AH001	Reactor Building	Division 2 ^N Division 1 ^A	N/A	Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Motor operated damper	30KLA50AA004	Reactor Building	Division 2 ^N Division 1 ^A	Close	Yes	Yes	Position / Position	Open-Close / Open-Close
Recirculation Fans	30KLA51AN001	Reactor Building	Division 2 ^N Division 1 ^A	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Recirculation Fans	30KLA52AN001	Reactor Building	Division 1 ^N Division 2 ^A	N/A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Instruments								
Containment Pressure Sensor	30KLA70CP801	Fuel Building	Yes	N/A	Yes	N/A	Pressure	N/A
Containment Pressure Sensor	30KLA70CP802	Safeguard Building	Yes	N/A	Yes	N/A	Pressure	N/A
Containment Pressure Sensor	30KLA70CP803	Safeguard Building	Yes	N/A	Yes	N/A	Pressure	N/A
Containment Pressure Sensor	30KLA70CP804	Fuel Building	Yes	N/A	Yes	N/A	Pressure	N/A

1) Equipment tag numbers are provided for information only and are not part of the certified design.

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- 2) ^N denotes division the component is normally powered from, while ^A denotes division the component is powered from when alternate feed is implemented.

**Table 2.6.8-4—Containment Building Ventilation System
ITAAC (4 Sheets)**

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the CBVS is as shown on Figure 2.6.8-1.	Inspections of the as-built system will be conducted.	The as-built CBVS conforms to the functional arrangement as shown in Figure 2.6.8-1.
2.2	Equipment shown on Figure 2.6.8-1 is located as listed in Tables 2.6.8-1 and 2.6.8-2.	An inspection will be performed of the location of the equipment listed in Tables 2.6.8-1 and 2.6.8-2.	The equipment listed in Tables 2.6.8-1 and 2.6.8-2 is located as listed in Tables 2.6.8-1 and 2.6.8-2.
3.1	Equipment listed in Table 2.6.8-1 as ASME Code Section III is designed, welded, and hydrostatically tested in accordance with ASME Code Section III.	<ul style="list-style-type: none"> a. Analysis of the equipment identified in Table 2.6.8-1 as ASME Code Section III will be performed per ASME Code Section III design requirements. b. Inspections will be conducted on the equipment identified in Table 2.6.8-1 as ASME Code Section III to verify welding has been performed per ASME Code Section III welding requirements. c. Hydrostatic testing of the equipment identified in Table 2.6.8-1 as ASME Code Section III will be performed per ASME Code Section III hydrostatic testing requirements. 	<ul style="list-style-type: none"> a. ASME Code Section III Design Reports (NCA-3550) exist and conclude that the equipment identified in Table 2.6.8-1 as ASME Code Section III meets ASME Code Section III design requirements. b. Equipment identified in Table 2.6.8-1 as ASME Code Section III has been welded per ASME Code Section III welding requirements. c. Equipment identified in Table 2.6.8-1 as ASME Code Section III has been hydrostatically tested per ASME Code Section III hydrostatic testing requirements.
3.2	Equipment listed in Table 2.6.8-2 as ASME AG-1 is designed, installed, and tested per ASME AG-1.	<ul style="list-style-type: none"> a. Analysis of the equipment identified in Table 2.6.8-2 as ASME AG-1 will be performed per ASME AG-1 design requirements. 	<ul style="list-style-type: none"> a. ASME AG-1 reports exist and conclude that the equipment identified in Table 2.6.8-2 as ASME AG-1 meets ASME AG-1 design requirements.

**Table 2.6.8-4—Containment Building Ventilation System
ITAAC (4 Sheets)**

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		<ul style="list-style-type: none"> b. Inspections will be conducted on the equipment identified in Table 2.6.8-2 as ASME AG-1 to verify that the equipment is installed as specified on the construction drawings. c. Testing of the equipment identified in Table 2.6.8-2 as ASME AG-1 will be performed per ASME AG-1 testing requirements. 	<ul style="list-style-type: none"> b. Equipment identified in Table 2.6.8-2 as ASME AG-1 has been installed as specified on the construction drawings c. Equipment identified in Table 2.6.8-2 as ASME AG-1 has been tested per ASME AG-1 testing requirements.
3.3	Equipment listed in Tables 2.6.8-1 and 2.6.8-2 can perform the function listed in Tables 2.6.8-1 and 2.6.8-2 under system design basis conditions.	Tests will be performed.	Equipment listed in Tables 2.6.8-1 and 2.6.8-2 performs the function listed in the table under system design basis conditions.
3.4	Equipment identified as Seismic Category I in Tables 2.6.8-1 and 2.6.8-2 can withstand seismic design basis loads without loss of safety function as listed in Tables 2.6.8-1 and 2.6.8-2.	<ul style="list-style-type: none"> a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment designated as Seismic Category I in Tables 2.6.8-1 and 2.6.8-2 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. Inspections will be performed of the as-installed Seismic Category I equipment listed in Tables 2.6.8-1 and 2.6.8-2 to verify that the equipment including anchorage is installed as specified on the construction drawings. 	<ul style="list-style-type: none"> a. Tests/analysis reports exist and conclude that the Seismic Category I equipment listed in Tables 2.6.8-1 and 2.6.8-2 can withstand seismic design basis loads without loss of safety function. b. Inspection reports exist and conclude that the as-installed seismic Category I equipment listed in Tables 2.6.8-1 and 2.6.8-2 including anchorage is installed as specified on the construction drawings.

**Table 2.6.8-4—Containment Building Ventilation System
ITAAC (4 Sheets)**

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.1	Displays listed in Table 2.6.8-3 are retrievable in the MCR and RSS as listed.	Inspections will be performed for the existence or retrievability of the displays in the MCR and the RSS as listed in Table 2.6.8-3.	<ul style="list-style-type: none"> a. The displays listed in Table 2.6.8-3 as being retrieved in the MCR can be retrieved in the MCR. b. The displays listed in Table 2.6.8-3 as being retrieved in the RSS can be retrieved in the RSS.
4.2	Controls exist in the MCR and the RSS as identified in Table 2.6.8-3.	Test will be performed for the existence of control signals from the MCR and the RSS to the equipment listed in Table 2.6.8-3.	<ul style="list-style-type: none"> a. The controls listed in Table 2.6.8-3 as being in the MCR exist in the MCR. b. The controls listed in Table 2.6.8-3 as being in the RSS exist in the RSS.
4.3	Equipment listed as being controlled by a PACS module in Table 2.6.8-3 responds to the state requested by a test signal.	A test will be performed using test signals.	Equipment listed as being controlled by a PACS module in Table 2.6.8-3 responds to the state requested by the signal.
4.4	The CBVS provides containment pressure indication.	A test will be performed.	<ul style="list-style-type: none"> a. Containment pressure sensors listed in Table 2.6.8-3 provide containment pressure indication in the MCR. b. Containment pressure sensors listed in Table 2.6.8-3 provide containment pressure indication in the RSS.
5.1	The components designated as Class 1E in Table 2.6.8-3 are powered from the Class 1E division as listed in Table 2.6.8-3 in a normal or alternate feed condition.	<ul style="list-style-type: none"> a. Testing will be performed for the components designated as Class 1E in Table 2.6.8-3 by providing a test signal in each normally aligned division. 	<ul style="list-style-type: none"> a. The test signal provided in the normally aligned division is present at the respective Class 1E components identified in Table 2.6.8-3.

**Table 2.6.8-4—Containment Building Ventilation System
ITAAC (4 Sheets)**

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		<p>b. Testing will be performed for the components designated as Class 1E in Table 2.6.8-3 by providing a test signal in each division with the alternate feed aligned to the divisional pair.</p>	<p>b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E components identified in Table 2.6.8-3.</p>
5.2	<p>Motor operated dampers listed in Table 2.6.8-3 will fail to the position as shown in Table 2.6.8-3 on loss of power.</p>	<p>Testing will be performed for the motor operated dampers listed in Table 2.6.8-3 to verify the position of dampers on loss of power.</p>	<p>Following loss of power, the motor operated dampers listed in Table 2.6.8-3 fail to the position as shown in Table 2.6.8-3.</p>
6.1	<p>Electrical drivers for equipment listed in Table 2.6.8-3 for harsh environment can perform the safety function in Tables 2.6.8-1 and 2.6.8-2 following exposure to the design basis environments for the time required.</p>	<p>a. Type tests, tests, analyses or a combination of tests and analyses will be performed to demonstrate the ability of the equipment listed for harsh environment in Table 2.6.8-3 to perform the function listed in Tables 2.6.8-1 and 2.6.8-2 for the environmental conditions that could occur before and during a design basis accident.</p> <p>b. For equipment listed for harsh environment in Table 2.6.8-3, an inspection will be performed of the as-installed Class 1E equipment and the associated wiring, cables and terminations.</p>	<p>a. The Class 1E equipment listed for harsh environment in Table 2.6.8-3 can perform the function listed in Tables 2.6.8-1 and 2.6.8-2 before and during design basis accidents for the time required to perform the listed function.</p> <p>b. Inspection concludes that the as-installed Class 1E equipment and associated wiring, cables, and terminations as listed in Table 2.6.8-3 for harsh environment conform with the design.</p>
7.1	<p>The CBVS low flow purge exhaust subsystem exhausts through a CBVS iodine filtration train.</p>	<p>Tests will be performed on the capability of the low flow purge exhaust subsystem to exhaust through a CBVS iodine filtration train.</p>	<p>The CBVS exhausts through a CBVS iodine filtration train when the CBVS low flow purge exhaust subsystem is operating.</p>

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