

2.6.3 Annulus Ventilation System

1.0 Description

The annulus ventilation system (AVS) maintains a negative pressure in the annulus to collect leaks from the Reactor Containment Building. The exhaust air is filtered before releasing to the environment via the vent stack.

The AVS consists of three trains, one for normal operation and two accident trains for abnormal plant operating conditions.

The AVS provides the following safety-related functions:

- Isolation of the secondary containment.
- Maintain a negative pressure in the annulus during accident operation.
- Collection of containment building leakage and removal of particulates from the contaminated air prior to release to the plant vent stack.

The AVS provides the following non-safety related functions:

- Maintain ambient air temperature in the annulus.
- Maintain a negative pressure in the annulus during normal plant operation.

2.0 Arrangement

2.1 The functional arrangement of the AVS is as shown on the following figures:

- Figure 2.6.3-1—Annulus Ventilation System Normal Operation Train Functional Arrangement.
- Figure 2.6.3-2—Annulus Ventilation System Accident Filtration Train Functional Arrangement.

2.2 The location of the AVS equipment is as listed in Table 2.6.3-1—Annulus Ventilation System Equipment Mechanical Design.

2.3 Physical separation exists between the AVS iodine filtration trains located in the Fuel Building.

3.0 Mechanical Design Features

3.1 Deleted.

3.2 Equipment listed in Table 2.6.3-1 can perform the functions listed in Table 2.6.3-1 under system operating conditions.

- 3.3 Components identified as Seismic Category I in Table 2.6.3-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.6.3-1.
- 3.4 Components listed in Table 2.6.3-1 as ASME AG-1 Code are designed in accordance with ASME AG-1 Code requirements.
- 3.5 Components listed in Table 2.6.3-1 as ASME AG-1 Code are fabricated in accordance with ASME AG-1 Code requirements, including welding requirements.
- 3.6 Components listed in Table 2.6.3-1 as ASME AG-1 Code are inspected and tested in accordance with ASME AG-1 Code requirements.

4.0 Displays and Controls

- 4.1 Displays listed in Table 2.6.3-2—Annulus Ventilation System Equipment I&C and Electrical Design, are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.6.3-2.
- 4.2 The AVS equipment controls exist in the MCR and RSS as listed in Table 2.6.3-2.
- 4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.6.3-2 responds to the state requested by a test signal.

5.0 Electrical Power Design Features

- 5.1 The equipment designated as Class 1E in Table 2.6.3-2 are powered from the Class 1E division as listed in Table 2.6.3-2 in a normal or alternate feed condition.
- 5.2 Deleted.

6.0 Environmental Qualifications

- 6.1 Components in Table 2.6.3-2, that are designated as harsh environment, will perform the function listed in Table 2.6.3-1 in the environments that exist during and following design basis events.

7.0 Equipment and System Performance

- 7.1 The AVS provides a negative pressure between the inner and outer containment shells during postulated accidents.
- 7.2 Upon receipt of containment isolation signal, the following actions occur automatically:
- Isolation of the normal operation train by closing the isolation dampers listed in Table 2.6.3-1 for Normal Operation Train.
 - Start of the accident filtration trains and opening of the dampers listed in Table 2.6.3-1 for Accident Filtration Train.

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

Table 2.6.3-3 lists the AVS ITAAC.

Table 2.6.3-1—Annulus Ventilation System Equipment Mechanical Design

Description	Tag Number ⁽¹⁾	Location	ASME AG-1 Code	Function	Seismic Category
Normal Operation Train					
Motor Operated Supply Air Dampers	30KLB34AA002 30KLB34AA003	30UFA21095 30UFA21095	Yes	Close	I
Motor Operated Exhaust Air Dampers	30KLB44AA002 30KLB44AA003	30UFA29054 30UFA29054	Yes	Close	I
Accident Filtration Train					
Motor Operated Dampers	30KLB21AA003 30KLB24AA003	30UFA17084 30UFA17082	Yes	Open	I
Electric Heaters	30KLB21AH001 30KLB24AH001	30UFA17084 30UFA17082	Yes	On	I
Prefilters	30KLB21AT001 30KLB24AT001	30UFA17084 30UFA17082	Yes	N/A	I
Upstream HEPA Filters	30KLB21AT002 30KLB24AT002	30UFA17084 30UFA17082	Yes	N/A	I
Carbon Absorbers	30KLB21AT003 30KLB24AT003	30UFA17084 30UFA17082	Yes	N/A	I
Downstream HEPA Filters	30KLB21AT004 30KLB24AT004	30UFA17084 30UFA17082	Yes	N/A	I
Motor Operated Dampers	30KLB21AA004 30KLB24AA004	30UFA17084 30UFA17082	Yes	Open	I
Exhaust Fans	30KLB21AN001 30KLB24AN001	30UFA17083 30UFA17081	Yes	Run	I
Backdraft Dampers	30KLB21AA006 30KLB24AA006	30UFA17083 30UFA17081	Yes	N/A	I

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

Table 2.6.3-2—Annulus Ventilation System Equipment I&C and Electrical Design (3 Sheets)

Description	Tag Number ⁽¹⁾	Location	IEEE Class 1E ⁽²⁾	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Normal Operation Train							
Motor Operated Supply Air Damper	30KLB34AA002	Fuel Building	Division 1 ^N Division 2 ^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Supply Air Damper	30KLB34AA003	Fuel Building	Division 4 ^N Division 3 ^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Air Damper	30KLB44AA002	Fuel Building	Division 1 ^N Division 2 ^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Air Damper	30KLB44AA003	Fuel Building	Division 4 ^N Division 3 ^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Accident Filtration Train							
Motor Operated Supply Air Damper	30KLB21AA003	Fuel Building	Division 1 ^N Division 2 ^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Supply Air Damper	30KLB24AA003	Fuel Building	Division 4 ^N Division 3 ^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Air Dampers	30KLB21AA004	Fuel Building	Division 1 ^N Division 2 ^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Motor Operated Exhaust Air Dampers	30KLB24AA004	Fuel Building	Division 4 ^N Division 3 ^A	Yes	Yes	Position / Position	Open-Close / Open-Close
Exhaust Fan	30KLB21AN001	Fuel Building	Division 1 ^N Division 2 ^A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Exhaust Fan	30KLB24AN001	Fuel Building	Division 4 ^N Division 3 ^A	Yes	Yes	On-Off / On-Off	Run-Stop / Run-Stop

Table 2.6.3-2—Annulus Ventilation System Equipment I&C and Electrical Design (3 Sheets)

Description	Tag Number ⁽¹⁾	Location	IEEE Class 1E ⁽²⁾	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Electrical Heater	30KLB21AH001	Fuel Building	Division 1 ^N Division 2 ^A	Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Electrical Heater	30KLB24AH001	Fuel Building	Division 4 ^N Division 3 ^A	Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Instruments							
Annulus Pressure	30KLB21CP001 30KLB24CP001	Fuel Building	N/A	Yes	N/A	Press / Press	N/A
Temperature Upstream of Heaters	30KLB21CT001 30KLB24CT001	Fuel Building	N/A	Yes	N/A	Temp / Temp	N/A
Temperature Limit Switch for Heaters	30KLB21CT002 30KLB24CT002	Fuel Building	N/A	Yes	N/A	Temp / Temp	N/A
Temperature Regulation for Heaters	30KLB21CT003 30KLB24CT003	Fuel Building	N/A	Yes	N/A	Temp / Temp	N/A
Temperature downstream of carbon adsorbers	30KLB21CT004 30KLB24CT004	Fuel Building	N/A	Yes	N/A	Temp / Temp	N/A
Pressure Limit Switch Exhaust Fans	30KLB21CP002 30KLB24CP002	Fuel Building	N/A	Yes	N/A	Press / Press	N/A
Accident Filtration Train Differential Pressure	30KLB21CP505 30KLB24CP505	Fuel Building	N/A	Yes	N/A	Press / Press	N/A

Table 2.6.3-2—Annulus Ventilation System Equipment I&C and Electrical Design (3 Sheets)

Description	Tag Number ⁽¹⁾	Location	IEEE Class 1E ⁽²⁾	EQ – Harsh Env.	PACS	MCR / RSS Displays	MCR / RSS Controls
Accident Filtration Train Flow	30KLB21CF001 A 30KLB21CF001 B	Fuel Building	N/A	Yes	N/A	Flow / Flow	N/A

- 1) Equipment tag numbers are provided for information only and are not part of the certified design.
- 2) ^N denotes division the component is normally powered from, while ^A denotes the component is powered from when alternate feed is implemented.

**Table 2.6.3-3—Annulus Ventilation System ITAAC
(4 Sheets)**

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the AVS is as shown on Figures 2.6.3-1 and 2.6.3-2.	Inspections of the as-built system will be conducted.	The as-built AVS conforms to the functional arrangement as shown on Figures 2.6.3-1 and 2.6.3-2.
2.2	The location of the AVS equipment is as listed in Table 2.6.3-1.	An inspection will be performed of the location of the equipment listed in Table 2.6.3-1.	The equipment listed in Table 2.6.3-1 is located as listed in Table 2.6.3-1.
2.3	Physical separation exists between AVS iodine filtration trains located inside the Fuel Building.	An inspection will be performed to verify that AVS iodine filtration trains are located in separate rooms. .	The AVS iodine filtration trains are located in separate rooms of the Fuel Building as listed in Table 2.6.3-1.
3.1	Deleted.	Deleted.	Deleted.
3.2	Equipment listed in Table 2.6.3-1 can perform the function listed in Table 2.6.3-1 under system operating conditions.	Tests will be performed.	Equipment listed in Table 2.6.3-1 performs the function listed in the table under system operating conditions.
3.3	Components identified as Seismic Category I in Table 2.6.3-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.6.3-1.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the components identified as Seismic Category I in Table 2.6.3-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Seismic qualification reports (SQDP, EQDP, or analyses) exist and conclude that the Seismic Category I components identified in Table 2.6.3-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.6.3-1 including the time required to perform the listed function.

**Table 2.6.3-3—Annulus Ventilation System ITAAC
(4 Sheets)**

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		b. Inspections will be performed of the Seismic Category I components identified in Table 2.6.3-1 to verify that the components, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).	b. Inspection reports exist and conclude that the Seismic Category I components identified in Table 2.6.3-1, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).
3.4	Components listed in Table 2.6.3-1 as ASME AG-1 Code are designed in accordance with ASME AG-1 Code requirements.	Inspections will be performed for the existence of ASME AG-1 Code Design Verification Reports.	ASME AG-1 Code Design Verification Reports (AA-4400) exist for components listed as ASME AG-1 Code in Table 2.6.3-1.
3.5	Components listed in Table 2.6.3-1 as ASME AG-1 Code are fabricated in accordance with ASME AG-1 Code requirements, including welding requirements.	Inspections will be performed to verify components are fabricated in accordance with ASME AG-1 Code requirements.	For components listed as ASME AG-1 Code in Table 2.6.3-1, reports exist and conclude that the component meets ASME AG-1 Code requirements, including welding requirements.
3.6	Components listed in Table 2.6.3-1 as ASME AG-1 Code are inspected and tested in accordance with ASME AG-1 Code requirements.	Inspections and tests will be performed on the components.	For components listed as ASME AG-1 Code in Table 2.6.3-1, reports exist and conclude that the component meets ASME AG-1 Code inspection and testing requirements.
4.1	Displays listed in Table 2.6.3-2 are retrievable in the MCR and the RSS as listed in Table 2.6.3-2.	<p>a. Tests will be performed for the retrieve-ability of the displays in the MCR as listed in Table 2.6.3-2.</p> <p>b. Tests will be performed for the retrieve-ability of the displays in the RSS as listed in Table 2.6.3-2.</p>	<p>a. The displays listed in Table 2.6.3-2 as being retrieved in the MCR can be retrieved in the MCR.</p> <p>b. The displays listed in Table 2.6.3-2 as being retrieved in the RSS can be retrieved in the RSS.</p>

**Table 2.6.3-3—Annulus Ventilation System ITAAC
(4 Sheets)**

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.2	Controls exist in the MCR and the RSS as identified in Table 2.6.3-2.	<ul style="list-style-type: none"> a. Test will be performed for the existence of control signals from the MCR to the equipment listed in Table 2.6.3-2. b. Test will be performed for the existence of control signals from the RSS to the equipment listed in Table 2.6.3-2. 	<ul style="list-style-type: none"> a. The controls listed in Table 2.6.3-2 as being in the MCR exist in the MCR. b. The controls listed in Table 2.6.3-2 as being in the RSS exist in the RSS.
4.3	Equipment listed as controlled by a PACS module in Table 2.6.3-2 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 2.6.3-2 responds to the state requested by the test signal.
5.1	The equipment designated as Class 1E in Table 2.6.3-2 are powered from the Class 1E division as listed in Table 2.6.3-2 in a normal or alternate feed condition.	<ul style="list-style-type: none"> a. Testing will be performed for the equipment designated as Class 1E in Table 2.6.3-2 by providing a test signal in each normally aligned division. b. Testing will be performed for the equipment designated as Class 1E in Table 2.6.3-2 by providing a test signal in each division with the alternate feed aligned to the divisional pair. 	<ul style="list-style-type: none"> a. The test signal provided in the normally aligned division is present at the respective Class 1E equipment identified in Table 2.6.3-2. b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E equipment identified in Table 2.6.3-2.
5.2	Deleted.	Deleted.	Deleted.
6.1	Components in Table 2.6.3-2, that are designated as harsh environment, will perform the function listed in Table 2.6.3-1 in the environments that exist during and following design basis events.	<ul style="list-style-type: none"> a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as harsh environment in Table 2.6.3-2 to perform the function listed in Table 2.6.3-1 for the environmental conditions that could occur during and following design basis events. 	<ul style="list-style-type: none"> a. Environmental Qualification Data Packages (EQDP) exist and conclude that the components listed as harsh environment in Table 2.6.3-2 can perform the function listed in Table 2.6.3-1 during and following design basis events including the time required to perform the listed function.

**Table 2.6.3-3—Annulus Ventilation System ITAAC
(4 Sheets)**

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		b. Components listed as harsh environment in Table 2.6.3-2 will be inspected to verify installation in accordance with the construction drawings including the associated wiring, cables and terminations. Deviations to the construction drawings will be reconciled to the EQDP.	b. Inspection reports exists and conclude that the components listed in Table 2.6.3-2 as harsh environment has been installed per the construction drawings and any deviations have been reconciled to the EQDP.
7.1	The AVS provides a negative pressure between the inner and outer containment shells during postulated accidents.	Tests will be performed on the capability of the system to provide a negative pressure between the inner and outer containment shells during postulated accidents.	The AVS provides a negative pressure of at least 0.25 inches water gauge within 305 seconds from initiation of signal.
7.2	<p>Upon receipt of containment isolation signal, the following actions occur automatically:</p> <p>a. Isolation of the normal operation train by closing the isolation dampers listed in Table 2.6.3-1 for Normal Operation Train.</p> <p>b. Start of the accident filtration trains and opening of the dampers listed in Table 2.6.3-1 for Accident Filtration Train.</p>	<p>A test will be performed to verify that upon receipt of containment isolation signal, the following actions occur automatically:</p> <p>a. The normal operation train isolates by closing the isolation dampers listed in Table 2.6.3-1 for Normal Operation Train.</p> <p>b. The accident filtration trains start, and the dampers listed in Table 2.6.3-1 for Accident Filtration Train to the iodine filtration train are aligned to the open position.</p>	<p>A test confirms that upon receipt of containment isolation signal, the following actions occur automatically within 60 seconds:</p> <p>a. The normal operation train is isolated by closing the isolation dampers listed in Table 2.6.3-1 for Normal Operation Train.</p> <p>b. The accident filtration trains start, and the dampers listed in Table 2.6.3-1 for Accident Filtration Train are aligned to the open position.</p>

Next File