7.3.1.2.17 Control Room Isolation and Air Supply Initiation

Signals to initiate isolation of the main control room, to initiate the air supply, and to open the control room pressure relief isolation valves are generated from either of the following conditions:

1. High-2 control room air supply radioactivity level

~~2. Low pressurizer pressure~~

2. Loss of ac power sources (low Class 1E battery charger input voltage)

3. Manual initiation

Condition 1 is the occurrence one of two control room air supply radioactivity monitors detecting a radioactivity level above the High-2 setpoint.

~~Condition 2 results from a coincidence of two of the four divisions of pressurizer pressure below the Low setpoint. Control room isolation and air supply initiation on this condition may be manually blocked when the pressurizer pressure is below the P-11 setpoint. This function is automatically unblocked when the pressurizer pressure is above the P-11 setpoint.~~

Condition 2 results from the loss of all ac power sources. A preset time delay is provided to permit the restoration of ac power from the offsite sources or from the onsite diesel generators before initiation. The loss of all ac power is detected by undervoltage sensors that are connected to the input of each of the four Class 1E battery chargers. Two sensors are connected to each of the four battery charger inputs. The loss of ac power signal is based on the detection of an undervoltage condition by each of the two sensors connected to two of the four battery chargers. The two-out-of-four logic is based on an undervoltage to the battery chargers for divisions A or C coincident with an undervoltage to the battery chargers for divisions B or D.

In addition, the loss of all ac power sources coincident with main control room isolation will de-energize the main control room radiation monitors in order to conserve the battery capacity.

Condition 3 consists of two momentary controls. Manual actuation of either of the two controls will result in control room isolation and air supply initiation.

The functional logic relating to control room isolation and air supply initiation is illustrated in Figure 7.2-1, sheet 13.

Table 7.3-1 (Sheet 7 of 9)

ENGINEERED SAFETY FEATURES ACTUATION SIGNALS

Actuation Signal	No. of Divisions/ Controls	Actuation Logic	Permissives and Interlocks
d. High-2 containment radioactivity	4	2/4-BYP[1]	None
e. Manual initiation	2 controls	1/2 controls	None
f. Flux doubling calculation	4	2/4-BYP[1]	Manual block permitted when critical or intentionally approaching criticality Automatically unblocked below P-6
15. Steam **Dump Block** (Figure 7.2-1, Sheet 10)[(8)]			
a. Low reactor coolant temperature (Low-2 T_{avg})	2/loop	2/4-BYP[1]	None
b. Mode control	2 controls	1/division	None
c. Manual stage 1 cooldown control	2 controls	1/division	None
d. Manual stage 2 cooldown control	2 controls	1/division	None
16. Main Control Room Isolation and Air Supply Initiation (Figure 7.2-1, Sheet 13)			
a. High-2 control room supply air radiation	2	1/2	None
~~b. Low pressurizer pressure~~	~~4~~	~~2/4-BYP[1]~~	~~Manual block permitted below P-11 Automatically unblocked above P-11~~
~~e~~b. Undervoltage to Class 1E battery chargers[(8)]	2/charger	2/2 per charger and 2/4 chargers[5]	None
c~~d~~. Manual initiation[(8)]	2 controls	1/2 controls	None
17. Auxiliary Spray and Purification Line Isolation (Figure 7.2-1, Sheet 12)			
a. Low-1 pressurizer level	4	2/4-BYP[1]	Manual block permitted below P-12 Automatically unblocked above P-12
b. Manual initiation of chemical and volume control system isolation	(See item 14e)		
c. Manual initiation of auxiliary spray isolation	1	1/1	None

Table 7.3-2 (Sheet 1 of 4)

INTERLOCKS FOR ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

Designation	Derivation	Function
P-3	Reactor trip breaker open	Permits manual reset of safeguards actuation signal to block automatic safeguards actuation
$\overline{\text{P-3}}$	Reactor trip breakers closed	Automatically resets the manual block of automatic safeguards actuation
P-4	Reactor trip initiated or reactor trip breakers open	(a) Isolates main feedwater if coincident with low reactor coolant temperature (b) Trips turbine (c) Blocks boron dilution
$\overline{\text{P-4}}$	No reactor trip initiated and reactor trip breakers closed	Removes demand for isolation of main feedwater, turbine trip and boron dilution block
P-6	Intermediate range neutron flux channels above setpoint	None
$\overline{\text{P-6}}$	Intermediate range neutron flux channels below setpoint	Automatically resets the manual block of flux doubling actuation of the boron dilution block
P-11	Pressurizer pressure below setpoint	(a) Permits manual block of safeguards actuation ~~and MCR isolation~~ on low pressurizer pressure, low compensated steam line pressure, or low reactor coolant inlet temperature (b) Permits manual block of steam line isolation on low reactor coolant inlet temperature (c) Permits manual block of steam line isolation and steam generator power-operated relief valve block valve closure on low compensated steam line pressure (d) Coincident with manual actions of (b) or (c), automatically unblocks steam line isolation on high negative steam line pressure rate

		(e) Permits manual block of main feedwater isolation on low reactor coolant temperature

Table 7.3-2 (Sheet 2 of 4)

INTERLOCKS FOR ENGINEERED SAFETY FEATURES ACTUATION SYSTEM

Designation	Derivation	Function
P-11 (continued)	Pressurizer pressure below setpoint	(f) Permits manual block of startup feedwater isolation on low reactor coolant inlet temperature (g) Permits manual block of steam dump block on low reactor coolant temperature (h) Permits manual block of normal residual heat removal system isolation on high containment radioactivity.
P-11	Pressurizer pressure above setpoint	(a) Prevents manual block of safeguards actuation ~~and MCR isolation~~ on low pressurizer pressure, low compensated steam line pressure, or low reactor coolant inlet temperature (b) Prevents manual block of steam line isolation on low reactor coolant inlet temperature (c) Prevents manual block of steam line isolation and steam generator power-operated relief valve block valve closure on low compensated steam line pressure (d) Automatic block of steam line isolation on high negative steam line pressure rate (e) Prevents manual block of feedwater isolation on low reactor coolant temperature (f) Prevents manual block of startup feedwater isolation on low reactor coolant inlet temperature (g) Prevents manual block of normal residual heat removal system isolation on high containment radioactivity

Table 7.5-1 (Sheet 12 of 12)

POST-ACCIDENT MONITORING SYSTEM

Variable	Range/ Status	Type/ Category	Qualification		Number of Instruments Required	Power Supply	QDPS Indication (Note 2)	Remarks
			Environmental	Seismic				
Main steam line radiation level	10^{-1} - 10^{3} μCi/cc	C2, E2	Mild	None	1/line	Non-1E	No	
Control support area radiation	10^{-1} - 10^{4} mR/hr	E3	None	None	1	Non-1E	No	
Meteorological parameters	N/A	E3	None	None	N/A	Non-1E	No	Site specific
Primary sampling station area radiation level	10^{-1} - 10^{7} mR/hr	E3	None	None	1	Non-1E	No	
VES Passive Air Filtration Flow	0-2000 cfm	E3	None	None	1	Non-1E	No	

Table 7.5-8

SUMMARY OF TYPE E VARIABLES

Function Monitored	Variable	Type/Category
Containment Radiation	Containment area high range radiation level	E2
Area Radiation	Control support area radiation level	E3
	Primary sampling station area radiation level	E3
Airborne Radioactivity Released from Plant	Turbine island vent discharge radiation level	E2
	Plant vent radiation level	E2
	Plant vent air flow	E2
	Main steam line radiation level	E2
	Boundary environs radiation	E3
	Main control room supply air radiation level	E3
Environs Radiation and Radioactivity	Site specific	E3
Meteorology	Site specific	E3

Accident Sampling	Primary coolant	E3
	Containment air	E3
MCR Filtration Flow	MCR passive filtration induced flow rate	E3

Table 8.3.2-1

250V DC CLASS 1E DIVISION A BATTERY NOMINAL LOAD REQUIREMENTS

Load Description	**Power Required (kW)**	
	Momentary	**Continuous**
Bus IDSA DS 1 (24 hr Battery Bank)		
Inverter		
Protection and Safety Monitoring System	0	10.6
Emergency Lighting	0	0.3
Containment High Range Monitor	0	0.1
Subtotal	0	11.0
250 Vdc Panel		
Reactor Trip Swgr & Solenoid Valves	7	0.5
250 Vdc MCC		
Motor Operated Valves	~~450~~ 453	
Total	~~457~~ 460	11.5

Table 8.3.2-3

250V DC CLASS 1E DIVISION C BATTERY NOMINAL LOAD REQUIREMENTS

Load Description	Power Required (kW)	
	Momentary	**Continuous**
Bus IDSC DS 1 (24 hr Battery Bank)		
Inverter		
Protection and Safety Monitoring System	0	10.1
Emergency Lighting and Panel Lighting	0	0.5
Subtotal	0	10.6
250 Vdc Panel		
Reactor Trip Swgr, RCP Trip & Solenoid Valves	12	0.5
250 Vdc MCC		
Motor Operated Valves	~~170~~ 173	
Total	~~182~~ 185	11.1
BUS IDSC DS 2 (72 hr Battery Bank)		
Inverter		
Protection and Safety Monitoring System	0	3.15
Emergency Lighting and Panel Lighting	0	0.63
Containment High Range Monitor	0	0.12
MCR Supply Duct Radiation Monitor	1.8	0.24
Total	1.8	4.14

9.2.5 Potable Water System

9.2.5.1 Design Basis

The potable water system (PWS) is designed to furnish water for domestic use and human consumption. It complies with the following standards:

- Bacteriological and chemical quality requirements as referenced in EPA "National Primary Drinking Water Standards," 40 CFR Part 141.
- The distribution of water by the system is in compliance with 29 CFR 1910, Occupational Safety and Health Standards, Part 141.

9.2.5.1.1 Safety Design Basis

The potable water system penetrates the main control room envelope boundary. A safety related loop seal in the PWS piping that penetrates the main control room envelope boundary prevents in-leakage into the main control room envelope during VES operation. ~~serves no safety-related function and therefore has no nuclear safety design basis.~~

9.2.5.1.2 Power Generation Design Basis

- Potable water is supplied to provide a quantity of 50 gallons/person/day for the largest number of persons expected to be at the station during a 24-hour period during normal plant power generation or outages.
- Water heaters provide a storage capacity equal to the probable hourly demand for potable hot water usage and provide hot water for the main lavatory, shower areas, and other locations where needed.
- A minimum pressure of 20 psig is maintained at the furthermost point in the distribution system.
- No interconnections exist between the potable water system and any potentially radioactive system or any system using water for purposes other than domestic water service.

9.2.5.2 System Description

9.2.5.2.1 General Description

Classification of components and equipment for the potable water system is given in Section 3.2.

The source of water for the potable water system is a site-specific water system. The potable water system consists of a distribution header around the power block, hot water storage heaters, and necessary interconnecting piping and valves. All other components of the potable water system outside the power block are site-specific and will be addressed in accordance with subsection 9.2.11.

9.2.5.2.2 Component Description

Hot Water Heaters

Electric immersion heating elements located inside the potable water hot water tank are used to produce hot water. This hot water is routed to the shower and toilet areas and to other plumbing fixtures and equipment requiring domestic hot water service. Point of use, inline electric water heating elements are used to generate hot water for the main control room and the turbine building secondary sampling laboratory.

9.2.5.3 System Operation

Filtered water is supplied from a site-specific water source for the potable water distribution system.

The onsite water supply system will maintain an appropriate pressure throughout the distribution system.

Potable water is supplied to areas that have the potential to be contaminated radioactively. Where this potential for contamination exists, the potable water system is protected by a reduced pressure zone type backflow prevention device.

No interconnections exist between the potable water system and any system using water for purposes other than domestic water service including any potentially radioactive system. The common supply from the onsite raw water system is designed to use an air gap to prevent contamination of the potable water system from other systems supplied by the raw water system.

9.2.5.4 Safety Evaluation

The potable water system has no safety-related functions other than to prevent in-leakage into the main control room envelope during VES operation. A loop seal in the safety-related PWS piping that penetrates the main control room envelope boundary prevents in-leakage into the main control room envelope. ~~and therefore requires no nuclear safety evaluation.~~

9.2.5.5 Tests and Inspections

The potable water system is hydrostatically tested for leak-tightness in accordance with the Uniform Plumbing Code. Inspection of the system is in compliance with the Uniform Plumbing Code or governing codes having jurisdiction. The system is then disinfected, flushed with potable water, and placed in service. The presence of residual chlorine can be confirmed through laboratory tests of samples at sampling points as required. Tests for microbiological and bacteria presence in potable water are conducted periodically.

9.2.5.6 Instrumentation Applications

Thermostats, high-temperature limit controls, and temperature indication are installed on the potable water system hot water tank. Thermostats and high-temperature limit controls are installed on the inline water heaters. Pressure regulators are employed in those parts of the distribution system where pressure restrictions are imposed.

9.2.6 Sanitary Drainage System

The sanitary drainage system (SDS) is designed to collect the site sanitary waste for treatment, dilution and discharge.

9.2.6.1 Design Basis

9.2.6.1.1 Safety Design Basis

The sanitary drainage system isolates the SDS vent penetration in the main control room boundary on high-high particulate or iodine concentrations in the main control room air supply or on extended loss of ac power to support operation of the main control room emergency habitability system as described in Section 6.4. The SDS vent line that penetrates the main control room envelope is safety related and designed as seismic category I to provide isolation of the main control room envelope from the surrounding areas and outside environment in the event of a design basis accident. An additional penetration from the SDS into the main control room envelope is maintained leak tight using a loop seal in the safety related seismic category I piping. ~~serves no safety-related function and therefore has no nuclear safety design basis.~~

9.2.6.1.2 Power Generation Design Basis

The sanitary drainage system within the scope of the plant covered by Design Certification is designed to accommodate 25 gallons/person/day for up to 500 persons during a 24-hour period.

9.2.6.2 System Description

9.2.6.2.1 General Description

The sanitary drainage system collects sanitary waste from plant restrooms and locker room facilities in the turbine building, auxiliary building, and annex building, and carries this waste to the treatment plant where it is processed.

The sanitary drainage system does not service facilities in radiologically controlled areas (RCA).

Although this sanitary drainage system transports sanitary waste to the waste treatment plant, the waste treatment plant is site specific and is outside the scope of the standard AP1000 certification. This system description provides a conceptual basis for the site interface design.

9.2.6.2.2 Component Description

Isolation Valves

The main control room pressure boundary penetration includes isolation valves, interconnecting piping, and vent and test connections. The isolation valves are classified as Safety Class C (see subsection 3.2.2.5 and Table 3.2-3) and seismic Category I. Their boundary isolation function will be tested in accordance with ASME N510 (Reference 3).

The main control room pressure boundary isolation valves have motor operators. The valves are designed to fail as is in the event of loss of electrical power. The valves are qualified to shut tight against control room pressure

Trunk Line

The trunk line is the primary line that the sanitary drainage system piping connects into for transport of the sanitary drainage to the site treatment plant.

Branch Lines

Branch lines are the sanitary drainage lines that connect the restroom facilities to the trunk line.

Manholes

Manholes are required in the trunk line at the connection of the branch lines into the trunk line, at the change in direction of the trunk line, or at the change in slope or direction of the trunk line. Quantity and location are site specific.

Lift Stations

Lift stations are required in the trunk line when the uniform slope of the trunk line results in excessively deep and costly excavation. Quantity and location are site specific.

9.2.6.3 Safety Evaluation

The sanitary drainage system has no safety-related function other than main control room envelope isolation. Redundant safety-related isolation valves are provided in the vent line penetrating the main control room. Therefore, there are no single active failures which would prevent isolation of the main control room envelope. ~~and therefore requires no nuclear safety evaluation.~~

There are no interconnections between this system and systems having the potential for containing radioactive material. Potentially radioactive drains are addressed in subsection 9.3.5 dealing with the radioactive waste drain system.

9.2.6.4 Test and Inspection

The sanitary drainage system is tested by water or air and established to be watertight in accordance with the Uniform Plumbing Code Section 318. System inspection is performed in compliance with the Uniform Plumbing Code Section 318 or governing codes specific to the site.

9.2.6.5 Instrument Application

The instruments associated with this system are part of the waste treatment plant which is site specific. Sufficient instrumentation for operation is provided with the treatment plant.

9.2.9 Waste Water System

The waste water system collects and processes equipment and floor drains from nonradioactive building areas.

9.2.9.1 Design Basis

9.2.9.1.1 Safety Design Basis

The waste water system isolates the WWS drain line that penetrates the main control room boundary. The WWS drain lines that penetrates the main control room envelope are safety related and designed as seismic category I to provide isolation of the main control room envelope from the surrounding areas and outside environment in the event of a design basis accident.~~serves no safety-related function and therefore has no safety-related design basis.~~

9.2.9.1.2 Power Generation Design Basis

The power generation design basis is:

- Remove oil and/or suspended solids from miscellaneous waste streams generated from the plant.
- Collect system flushing wastes during startup prior to treatment and discharge.
- Collect and process fluid drained from equipment or systems during maintenance or inspection activities.
- Direct nonradioactive equipment and floor drains which may contain oily waste to the building sumps and transfer their contents for proper waste disposal. The radioactive equipment and floor drain system is described in subsection 9.3.5.

9.2.9.2 System Description

9.2.9.2.1 General Description

The waste water system is capable of handling the anticipated flow of waste water during normal plant operation and during plant outages. The classification of components and equipment is given in Section 3.2.

Wastes from the turbine building floor and equipment drains (which include laboratory and sampling sink drains, oil storage room drains, the main steam isolation valve compartment, auxiliary building penetration area and the auxiliary building HVAC room) are collected in the two turbine building sumps. Drainage from the diesel generator building sumps, the auxiliary building sump – north (a nonradioactive sump) and the annex building sump is also collected in the turbine building sumps. The turbine building sumps provide a temporary storage capacity and a controlled source of fluid flow to the oil separator. In the event radioactivity is present in the turbine building sumps, the waste water is diverted from the sumps to the liquid radwaste system (WLS) for processing and disposal. A radiation monitor located on the common discharge piping of the sump pumps provides an alarm upon detection of radioactivity in the waste water. The radiation monitor also trips the sump pumps on detection of radioactivity to isolate the contaminated waste water. Provisions are included for sampling the sumps.

The turbine building sump pumps route the waste water from either of the two sumps to the oil separator for removal of oily waste. The diesel fuel oil area sump pump also discharges waste water to the oil separator. A bypass line allows for the oil separator to be out of service for maintenance. The oil separator has a small reservoir for storage of the separated oily waste which flows by gravity to the waste oil storage tank. The waste oil storage tank provides temporary storage prior to removal by truck for offsite disposal.

The waste water from the oil separator flows by gravity to the waste water retention basin for settling of suspended solids and treatment, if required, prior to discharge.

Design and routing of the condenser waterbox drains will be incorporated in the site-specific Circulating Water System (CWS) design.

9.2.9.2.2 Component Description

Isolation Valve

The main control room pressure boundary penetration includes a normally closed isolation valve and interconnecting piping. The isolation valve is classified as Safety Class C (see subsection 3.2.2.5 and Table 3.2-3) and seismic Category I. Their boundary isolation function will be tested in accordance with ASME N510 (Reference 3).

Turbine Building Sumps

The two sumps collect waste water from the floor and equipment drains, laboratory drains, sampling waste drains, and plant washdowns from the turbine building. Selected drains from both the annex and auxiliary buildings are also collected in these sumps.

Turbine Building Sump Pumps

Each sump has one pneumatic, double diaphragm pump which routes the waste water to the oil separator. Interconnecting piping between the suction of the sump pumps allows for either pump to transfer waste water from either or both sumps. The plant service air system provides the supply of air for operation of the pumps. Operation of the pump is automatic based on sump level with controls provided for manual operation.

Oil Separator

The oil separator has internal, vertical coalescing tubes for removal of oily waste and an oil holdup tank. Sampling provisions are included on the oil holdup tank to confirm that the oil does not require handling and disposal as a hazardous waste. A sampling connection is also provided at the discharge of the oil separator.

Waste Oil Storage Tank

Waste oil from the oil separator reservoir and other plant areas is stored in a waste oil storage tank. A sampling connection is provided on the tank to verify that the oil does not require handling and disposal as a hazardous material. A truck connection on the tank allows for removal of the waste oil from the tank for offsite disposal.

Waste Water Retention Basin

The waste water retention basins and associated basin transfer pumps and piping are site-specific components as addressed in subsection 9.2.11.

Waste Water Sumps

Waste water collection sumps are provided for the auxiliary building, the diesel generator building, the annex building and the diesel fuel oil area. These collection sumps are drained by air operated pumps and the effluent from the sumps, except the effluent from the diesel fuel oil area, is directed to the turbine building sumps for processing and release. The effluent from the diesel fuel oil area is pumped directly to the oil separator.

Sump Pumps

The waste water sump pumps are pneumatic, double diaphragm pumps. The plant service air system provides the supply of air for operation of these pumps. Operation of the pumps is automatic based on sump level with controls provided for manual operation.

9.2.9.3 Safety Evaluation

The waste water system has no safety-related function other than main control room envelope isolation. A normally closed safety-related isolation valve is provided in the drain line penetrating the main control room. The drain line is safety related up to the isolation valve to assure the main control room habitability pressure boundary is maintained. ~~and therefore requires no nuclear safety evaluation.~~

9.2.9.4 Tests and Inspections

System performance and integrity during normal plant operation are verified by system operation and visual inspections.

9.2.9.5 Instrumentation Applications

Level instrumentation and associated pump controls on the turbine building sumps, the auxiliary building sump, the diesel generator building sumps, and the diesel fuel oil sump are provided to prevent overflow of these waste water collection points. High alarms indicate tank level where operator action is required.

A radiation monitor located on the turbine building sump common discharge piping initiates an alarm and trips the turbine building sump pumps when radioactivity above a preset high level point is detected in the waste stream.

9.4.1.2.1.1 Main Control Room/Control Support Area HVAC Subsystem

The main control room/control support area HVAC subsystem serves the main control room and control support area with two 100 percent capacity supply air handling units, return/exhaust air fans, supplemental air filtration units, associated dampers, instrumentation and controls, and common ductwork. The supply air handling units and return/exhaust air fans are connected to common ductwork which distributes air to the main control room and CSA areas. The main control room envelope consists of the main control room, shift manager's office, operation work area, toilet, and operations break room area. The CSA area consists of the main control support area operations area, conference rooms, NRC room, computer rooms, shift turnover room, kitchen/rest area, and restrooms. The main control room and control support area toilets have separate exhaust fans.

Outside supply air is provided to the plant areas served by the main control room/control support area HVAC subsystem through an outside air intake duct that is protected by an intake enclosure located on the roof of the auxiliary building at elevation 153′-0″. The outside air intake duct is located more than 50 feet below and more than 100 feet laterally away from the plant vent discharge. The supply, return, and toilet exhaust are the only HVAC penetrations in the main control room envelope and include redundant safety-related seismic Category I isolation valves that are physically located within the main control room envelope. Redundant safety-related radiation monitor~~s~~ sample line connections are located ~~inside the main control room~~ upstream of the VBS supply air isolation valves. These monitors initiate operation of the nonsafety-related supplemental air filtration units on high gaseous radioactivity concentrations and isolate the main control room from the nuclear island nonradioactive ventilation system on high-high particulate or iodine radioactivity concentrations. See Section 11.5 for a description of the main control room supply air radiation monitors.

Both redundant trains of supplemental air filtration units and one train of the supply air handling unit are located in the main control room mechanical equipment room at elevation 135′-3″ in the auxiliary building. The other supply air handling unit subsystem is located in the main control room mechanical equipment room at elevation 135′-3″ in the annex building. The main control room toilet exhaust fan is located at elevation 135′-3″ in the auxiliary building. A humidifier is provided for each supply air handling unit. The supply air handling unit cooling coils are provided with chilled water from air-cooled chillers in the central chilled water system. See subsection 9.2.7 for the chilled water system description.

The main control room/control support area HVAC subsystem is designed so that smoke, hot gases, and fire suppressant will not migrate from one fire area to another to the extent that they could adversely affect safe shutdown capabilities, including operator actions. Fire or combination fire and smoke dampers are provided to isolate each fire area from adjacent fire areas during and following a fire in accordance with NFPA 90A (Reference 27) requirements. These combination smoke/fire dampers close in response to smoke detector signals or in response to the heat from a fire. See Appendix 9A for identification of fire areas.

~~No silicone sealant or other patching material is used on the main control room/control support area HVAC subsystem filters, housing, mounting frame, ducts or penetrations.~~

Isolation Dampers and Valves

Nonsafety-related isolation dampers are bubble tight, single- or parallel-blade type. The isolation dampers have spring return actuators which fail closed on loss of electrical power. The isolation dampers are constructed, qualified, and tested in accordance with ANSI/AMCA 500 (Reference 14) or ASME AG-1 (Reference 36), Section DA.

The main control room pressure boundary penetrations include isolation valves, interconnecting piping, and vent and test connection with manual test valves. The isolation valves are classified as Safety Class C (see subsection 3.2.2.5 and Table 3.2-3) and seismic Category I. Their boundary isolation function will be tested in accordance with ASME N510 (Reference 3).

The main control room pressure boundary isolation valves have ~~electro-hydraulic~~ motor operators. The valves are designed to fail ~~closed~~ as is in the event of loss of electrical power. The valves are qualified to shut tight against control room pressure.

Supplemental Air Filtration Units

Each supplemental air filtration unit includes a high efficiency filter bank, an electric heating coil, a charcoal adsorber with upstream HEPA filter bank, a downstream postfilter bank and a fan. The filtration unit configurations, including housing, internal components, ductwork, dampers, fans and controls, and the location of the fans on the unfiltered ~~filtered~~ side of units are designed, constructed, and tested to meet the applicable performance requirements of ASME AG-1, ASME N509, and ASME N510 (References 36, 2, and 3) to satisfy the guidelines of Regulatory Guide 1.140 (Reference 30).

9.4 Air-Conditioning, Heating, Cooling, and Ventilation System

The air-conditioning, heating, cooling, and ventilation system is comprised of the following systems that serve the various buildings and structures of the plant:

- Nuclear island nonradioactive ventilation system (subsection 9.4.1)
- Annex/auxiliary buildings nonradioactive HVAC system (subsection 9.4.2)
- Radiologically controlled area ventilation system (subsection 9.4.3)
- Containment recirculation cooling system (subsection 9.4.6)
- Containment air filtration system (subsection 9.4.7)
- Radwaste building HVAC system (subsection 9.4.8)
- Turbine building ventilation system (subsection 9.4.9)
- Diesel generator building heating and ventilation system (subsection 9.4.10)
- Health physics and hot machine shop HVAC system (subsection 9.4.11)

9.4.1 Nuclear Island Nonradioactive Ventilation System

The nuclear island nonradioactive ventilation system (VBS) serves the main control room (MCR), control support area (CSA), Class 1E dc equipment rooms, Class 1E instrumentation and control (I&C) rooms, Class 1E electrical penetration rooms, Class 1E battery rooms, remote shutdown room, reactor coolant pump trip switchgear rooms, adjacent corridors, and the passive containment cooling system (PCS) valve room during normal plant operation.

The main control room emergency habitability system provides main control room habitability in the event of a design basis accident (DBA) and is described in Section 6.4.

9.4.1.1 Design Basis

9.4.1.1.1 Safety Design Basis

The nuclear island nonradioactive ventilation system provides the following nuclear safety-related design basis functions:

- Monitors the main control room supply air for radioactive particulate and iodine concentrations

- Isolates the HVAC penetrations in the main control room boundary on high-high particulate or iodine concentrations in the main control room supply air~~, or when the pressurizer pressure falls below the low setpoint,~~ or on extended loss of ac power to support operation of the main control room emergency habitability system as described in Section 6.4

Those portions of the nuclear island nonradioactive ventilation system which penetrate the main control room envelope are safety-related and designed as seismic Category I to provide isolation of the main control room envelope from the surrounding areas and outside environment in the event of a design basis accident. Other functions of the system are nonsafety-related. HVAC equipment and ductwork whose failure could affect the operability of safety-related systems or components are designed to seismic Category II requirements. The remaining portion of the system is nonsafety-related and nonseismic. The equipment is procured to meet the environmental qualifications used in standard building practice.

The nuclear island nonradioactive ventilation system is designed to control the radiological habitability in the main control room within the guidelines presented in Standard Review Plan (SRP) 6.4 and NUREG 0696 (Reference 1), if the system is operable and ac power is available.

Portions of the system that provide the defense-in-depth function of filtration of main control room/control support area air during conditions of abnormal airborne radioactivity are designed, constructed, and tested to conform with Generic Issue B-36, as described in Section 1.9 and Regulatory Guide 1.140 (Reference 30), as described in Appendix 1A, and the applicable portions of ASME AG-1 (Reference 36), ASME N509 (Reference 2), and ASME N510 (Reference 3).

Power to the ancillary fans to provide post-72-hour ventilation of the control room and I&C rooms is supplied from divisions B and C regulating transformers through two series fuses for isolation. The fuses protect the regulating transformers from failures of the non-1E fan circuits. When normal ventilation is available the ancillary fan circuits are disconnected from the supply with manual normally-open switches.

The nuclear island nonradioactive ventilation system is designed to provide a reliable source of heating, ventilation, and cooling to the areas served when ac power is available. The system equipment and component functional capabilities are to minimize the potential for actuation of the main control room emergency habitability system or the potential reliance on passive equipment cooling. This is achieved through the use of redundant equipment and components that are connected to standby onsite ac power sources.

9.4.1.2.3.1 Main Control Room/Control Support Area HVAC Subsystem

Normal Plant Operation

During normal plant operation, one of the two 100 percent capacity supply air handling units and return/exhaust air fans operates continuously. Outside makeup air supply to the supply air handling units is provided through an outside air intake duct. The outside airflow rate is automatically controlled to maintain the main control room and CSA areas at a slightly positive pressure with respect to the surrounding areas and the outside environment.

The main control room/control support area supply air handling units are sized to provide cooling air for personnel comfort, equipment cooling, and to maintain the main control room emergency habitability passive heat sink below its initial ambient air design temperature. The temperature of the air supplied by each air handling unit is controlled by temperature sensors located in the main control room return air duct and in the computer room B return air duct to maintain the ambient air design temperature within its normal design temperature range by modulating the electric heat or chilled water cooling. Some spaces have convection heaters for temperature control.

The outside air is continuously monitored by smoke monitors located at the outside air intake plenum and the return air is monitored for smoke upstream of the supply air handling units. The supply air to the main control room is continuously monitored for airborne radioactivity while the supplemental air filtration units remain in a standby operating mode.

The standby supply air handling unit and corresponding return/exhaust fans are started automatically if one of the following conditions shuts down the operating unit:

Airflow rate of the operating fan is above or below predetermined setpoints.

Return air temperature is above or below predetermined setpoints.

Differential pressure between the main control room and the surrounding areas and outside environment is above or below predetermined setpoints.

Loss of electrical and/or control power to the operating unit.

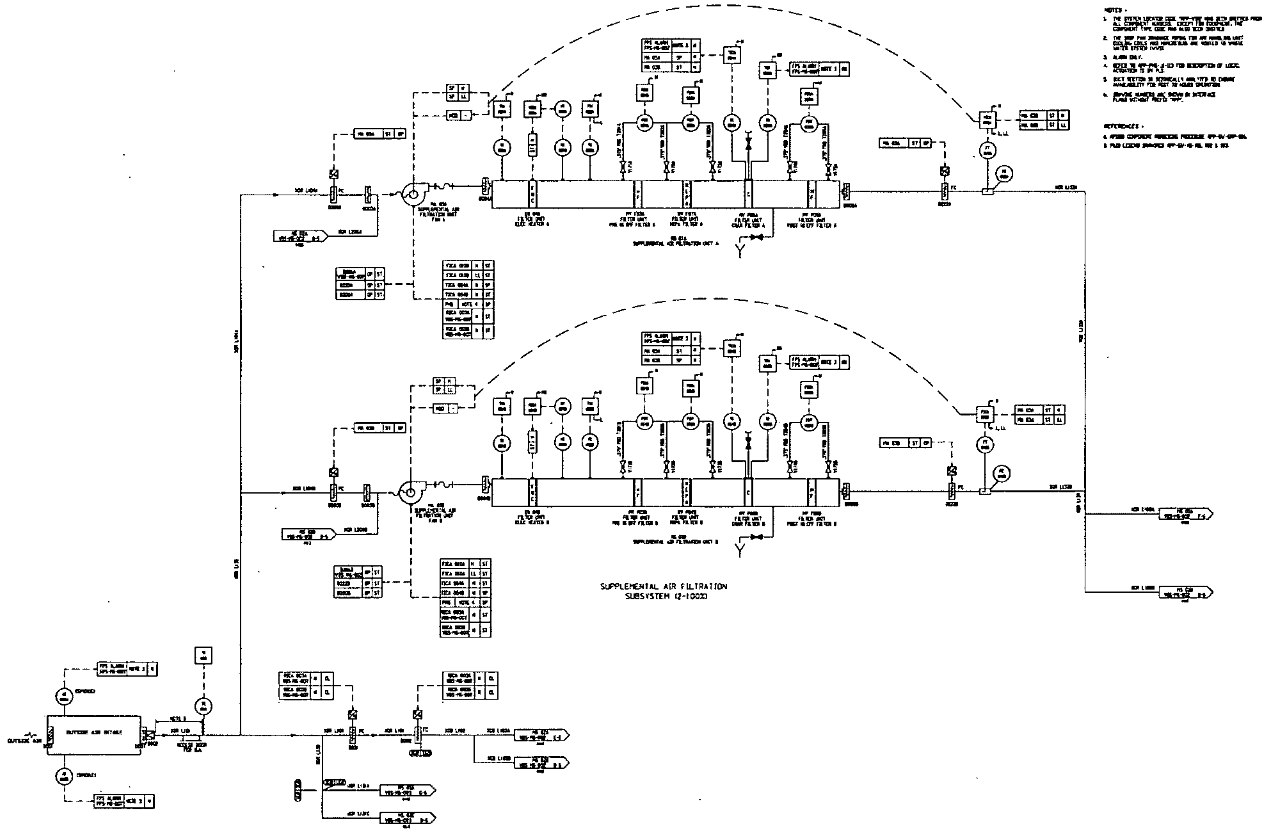
Abnormal Plant Operation

Control actions are taken at two levels of radioactivity as detected in the main control room supply air duct. The first is "high" radioactivity based upon gaseous radioactivity instrumentation. The second is "high-high" radioactivity based upon either particulate or iodine radioactivity instruments.

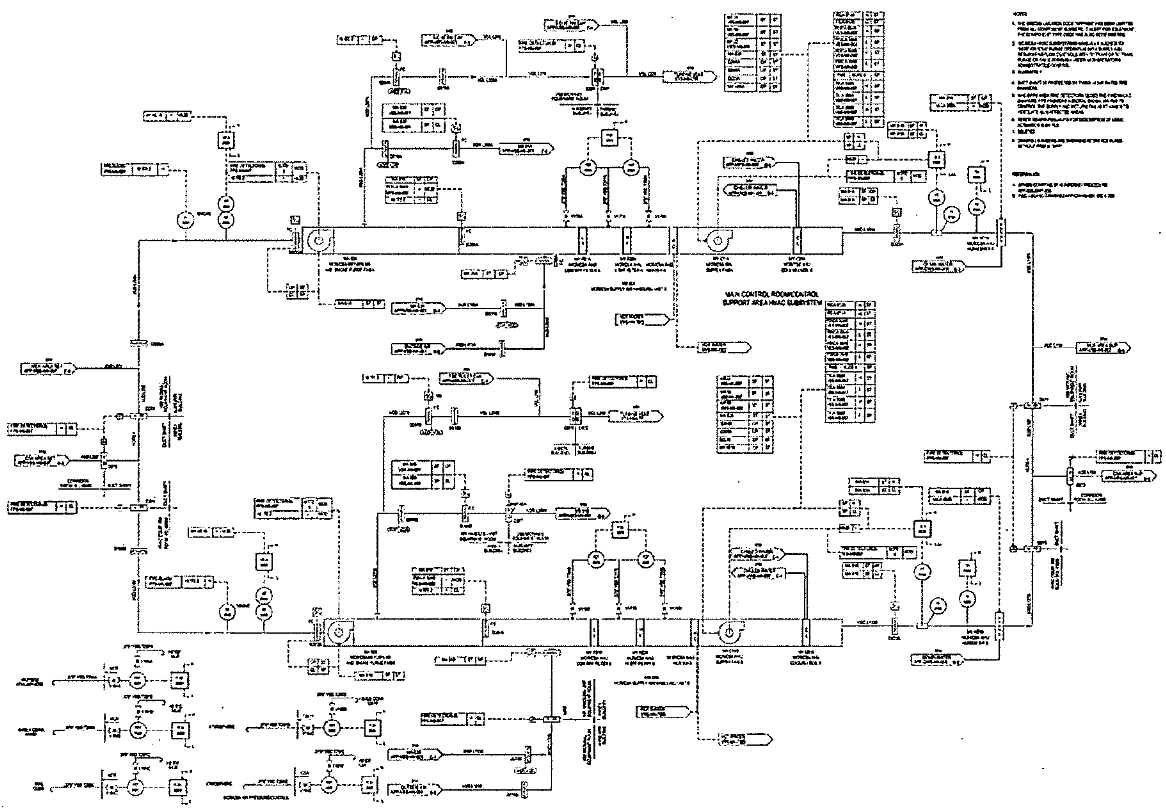
If "high" gaseous radioactivity is detected in the main control room supply air duct and the main control room/control support area HVAC subsystem is operable, both supplemental air filtration units automatically start to pressurize the main control room and CSA areas to at least 1/8 inch wg with respect to the surrounding areas and the outside environment using filtered makeup air. ~~After the room is pressurized, one of the supplemental air filtration units is manually shut down.~~ The normal outside air makeup duct and the main control room and control support area toilet exhaust duct isolation dampers close. The smoke/purge exhaust isolation dampers close, if open. The main control room/control support area supply air handling unit continues to provide cooling with recirculation air to maintain the main control room passive heat sink below its initial ambient air design temperature and maintains the main control room and CSA areas within their design temperatures. The supplemental air filtration subsystem pressurizes the combined volume of the main control room and control support area concurrently with filtered outside air. A portion of the recirculation air from the main control room and control support area is also filtered for cleanup of airborne radioactivity. The main control room/control support area HVAC equipment and ductwork that form an extension of the main control room/control support area pressure boundary limit the overall infiltration (negative operating pressure) and exfiltration (positive operating pressure) rates to those values shown in Table 9.4.1-1. Based on these values, the system is designed to maintain personnel doses within allowable General Design Criteria (GDC) 19 limits during design basis accidents in both the main control room and the control support area.

If ac power is unavailable for more than 10 minutes~~, pressurizer pressure falls below the low setpoint,~~ or if "high-high" particulate or iodine radioactivity is detected in the main control room supply air duct, which would lead to exceeding GDC 19 operator dose limits, the protection and safety monitoring system automatically isolates the main control room from the normal main control room/control support area HVAC subsystem by closing the supply, return, and toilet exhaust isolation valves. Main control room habitability is maintained by the main control room emergency habitability system, which is discussed in Section 6.4.

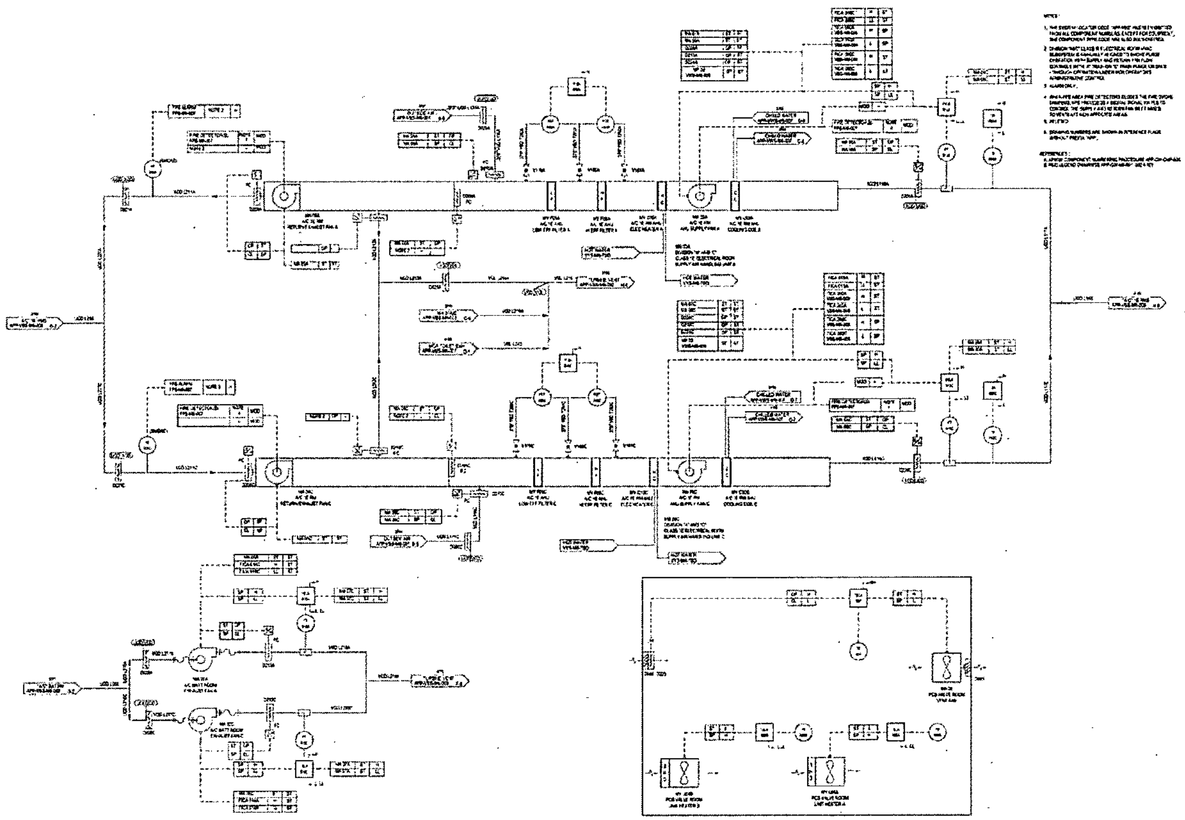
DCD Figure 9.4.1-1 (Sheet 1 of 7)



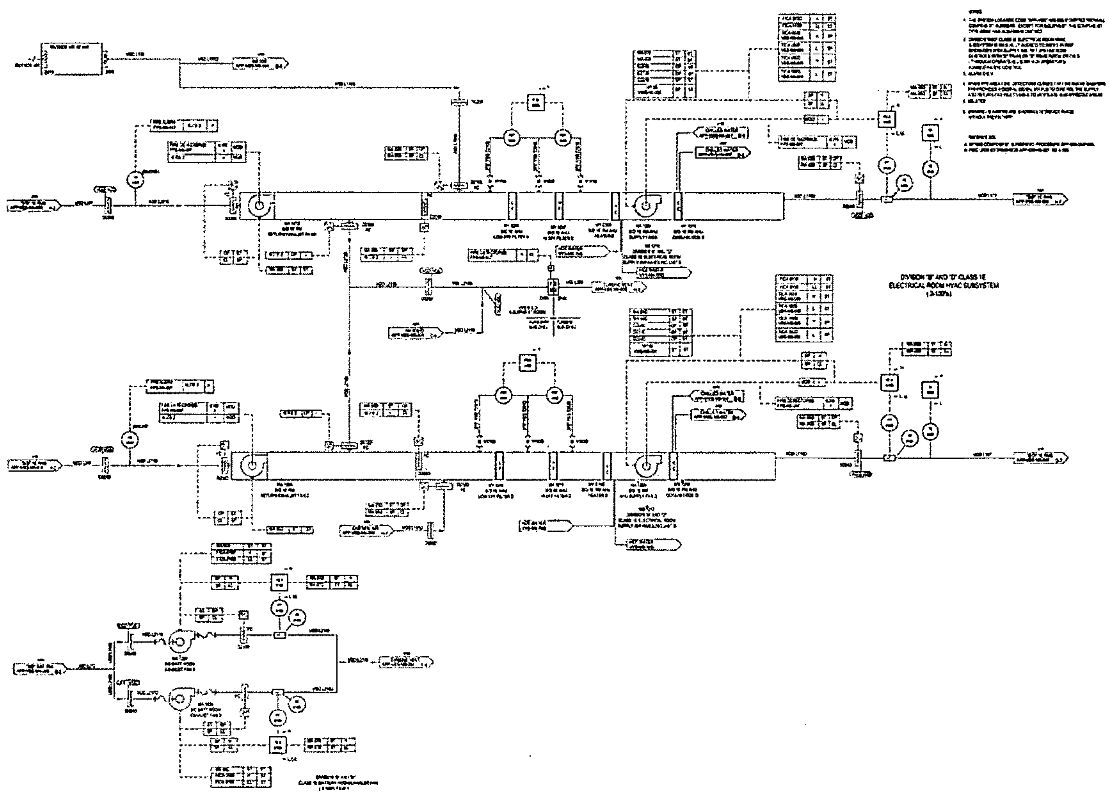
DCD Figure 9.4.1-1 (Sheet 2 of 7)



DCD Figure 9.4.1-1 (Sheet 3 of 7)



DCD Figure 9.4.1-1 (Sheet 4 of 7)



DCD Figure 9.4.1-1 (Sheet 5 of 7)

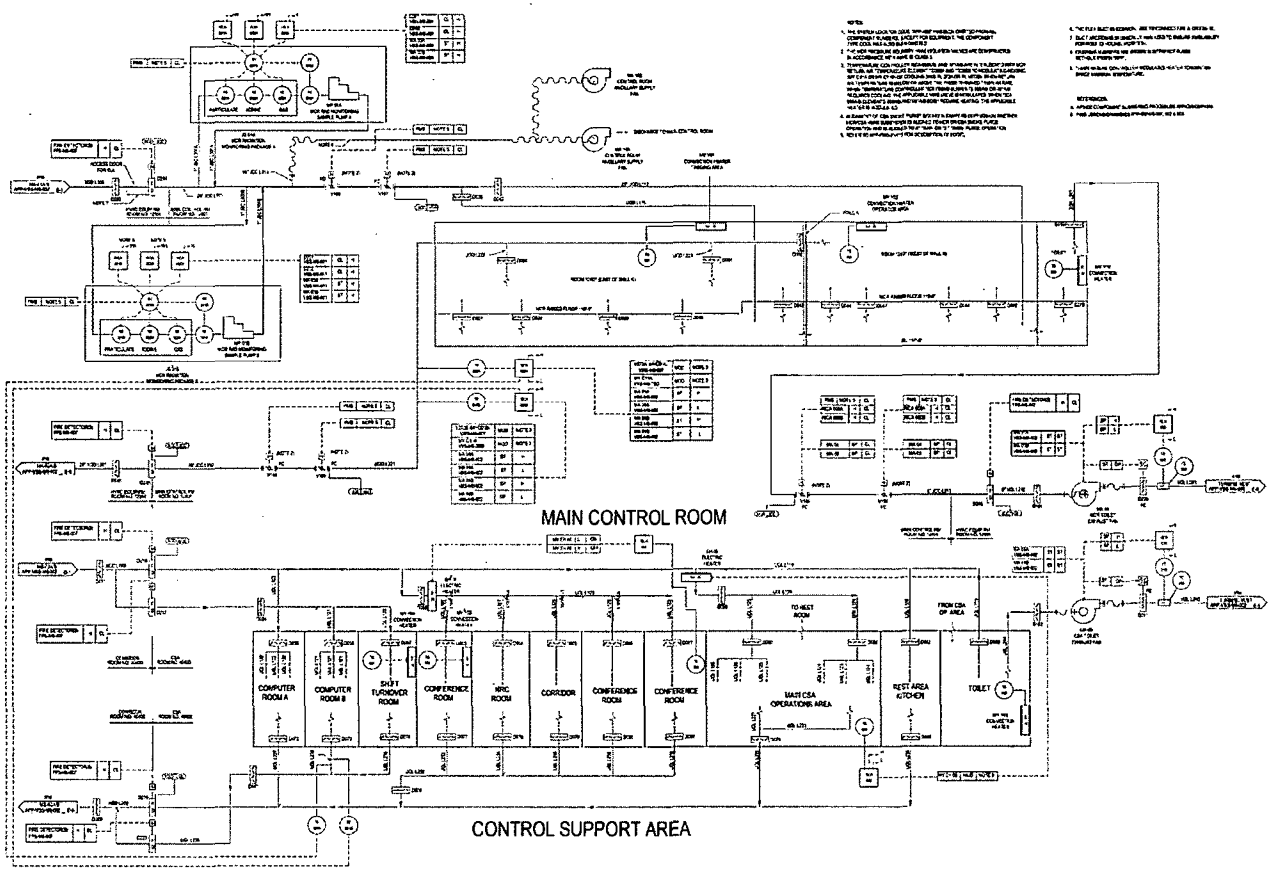


Table 9.5.1-1 (Sheet 7 of 33)

AP1000 FIRE PROTECTION PROGRAM COMPLIANCE WITH BTP CMEB 9.5-1

BTP CMEB 9.5-1 Guideline	Paragraph	Comp(1)	Remarks
42. Fire barrier penetrations that must maintain environmental isolation or pressure differentials should be qualified by test.	C.5.a (3)	C	Fire penetration seals that also perform other barrier functions are qualified by test for intended functions. The fire barrier penetration seal does not perform other barrier functions simultaneously.
43. Penetration designs should use only noncombustible materials.	C.5.a (3)	AC	Penetration designs shall use fire resistant silicone based seal material in accordance with the guidance of NUREG-1552. The seal design and tests demonstrates that the seals are capable of preventing the spread of fire and perform their intended safety function.
44. The penetration qualification tests should use the time-temperature exposure curve specified by ASTM E-119.	C.5.a (3)	C	
45. Criteria for penetration qualification tests.	C.5.a (3)	C	
46. Penetration openings for ventilation systems should be protected by fire dampers having a rating equivalent to that required of the barrier.	C.5.a (4)	C	Penetration openings are protected in accordance with NFPA 90A. Fire dampers generally not provided for roof or exterior wall penetrations.
47. Flexible air duct couplings in ventilation and filter systems should be noncombustible.	C.5.a (4)	C	
48. Door openings in fire barriers should be protected with equivalently rated doors, frames, and hardware that have been tested and approved by a nationally recognized lab.	C.5.a (5)	C	

49. Fire doors should be self-closing or provided with closing mechanisms.	C.5.a (5)	C	
50. Fire doors should be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable.	C.5.a (5)	WA	See Note 2
51. Alternative means for verifying that fire doors protect the door opening as required in case of fire.	C.5.a (5)	WA	See Note 2
52. The fire brigade leader should have ready access to keys for any locked fire doors.	C.5.a (5)	WA	See Note 2

Table 9.5.1-1 (Sheet 17 of 33)

AP1000 FIRE PROTECTION PROGRAM COMPLIANCE WITH BTP CMEB 9.5-1

BTP CMEB 9.5-1 Guideline	Paragraph	Comp(1)	Remarks
104. Engineered safety feature filters should be protected in accordance with the guidelines of Regulatory Guide 1.52.	C.5.f (4)	NAC	There are no engineered safety feature filters on AP1000.
105. Air intakes for ventilation systems serving areas containing safety-related equipment should be located remote from the exhaust air outlets and smoke vents of other fire areas.	C.5.f (5)	C	
106. Stairwells should be designed to minimize smoke infiltration during a fire.	C.5.f (6)	C	Stair towers are provided with self-closing doors. Additional measures to minimize smoke infiltration to stair-wells are described in Appendix 9A.
107. Where total flooding gas extinguishing systems are used, ventilation dampers should be controlled in accordance with NFPA 12 and NFPA 12A.	C.5.f (7)	NA	Fixed flooding gas suppression systems are not used on AP1000.

Table 9A-3 (Sheet 11 of 24)

FIRE PROTECTION SUMMARY

Fire Area/ Zone(1)	Safety Area?(2)	Floor Area Sq Ft	Combust. Material(3)	Fire Sev. Cat.	Amount	Heat Value (Btu)	Comb. Load, Btu/ Sq Ft	Equiv. Dur. (Min)	Boundary Fire Res.(4) (Hours)	Detect. Cap.	Fixed Suppression Capability(5)
1242 AF 01	YES								3	SMOKE	HOSE STATION
1242 AF 12401A			CABLE INS	C	4000	4.1E+07					
MCR MAIN CONTROL			PAPER	C	3500	2.7E+07					
AREA/TAGGING			PLASTIC	D	1000	1.3E+07					
ROOM/VESTIBULE			CARPET	D	1545	2.0E+07					
		1545	NET CAT.	C	TOTAL:	1.0E+08	65000	53			
1242 AF 12401B			CABLE INS	C	2000	2.0E+07					
MCR SHIFT SUP'R/			PAPER	C	3500	2.7E+07					
CLERK/OPERATOR			PLASTIC	D	1000	1.3E+07					
AREAS			CARPET	D	845	1.1E+07					
			CHARCOAL	C	100	1.5 E+06					
		845	NET CAT.	C	TOTAL:	~~7.2E~~8.2E+07	~~85000~~ 97000	~~75~~88			
FIRE AREA TOTAL:		2390	NET CAT.	C	TOTAL:	1.84E+08	77~~2~~000	67~~2~~			
1242 AF 02	YES								3	SMOKE	HOSE STATION
DIVISION A ELECTRICAL PENETRATION ROOM			CABLE INS	C	2000	2.0E+07					
FIRE AREA TOTAL:		450	NET CAT.	C	TOTAL:	2.0E+07	45000	34			
1243 AF 01	YES								3	SMOKE	HOSE STATION
REACTOR TRIP SWITCHGEAR 1			CABLE INS	C	500	5.1E+06					
FIRE AREA TOTAL:		95	NET CAT.	C	TOTAL:	5.1E+06	54000	42			
1243 AF 02	YES								3	SMOKE	HOSE STATION
REACTOR TRIP SWITCHGEAR 2			CABLE INS	C	500	5.1E+06					
FIRE AREA TOTAL:		95	NET CAT.	C	TOTAL:	5.1E+06	54000	42			
1250 AF 01	NO								3	SMOKE	HOSE STATION
VBS MCR/A&C			CABLE INS	C	12000	1.2E+08					
EQUIPMENT ROOM			CHARCOAL	C	5000	7.3E+07					CHARCOAL BED
			LUBE OIL	E	20	3.0E+06					DELUGE
			VOLATILES	E	10	1.4E+06					
FIRE AREA TOTAL:		3575	NET CAT.	D	TOTAL:	2.0E+08	56000	44			

14.2.9.1.6 Main Control Room Emergency Habitability System Testing

Purpose

The purpose of the main control room emergency habitability system testing is to verify that the as-installed components properly perform the safety-related functions described in Section 6.4, including the following:

- Provide sufficient breathable quality air to the main control room
- Maintain the main control room at positive pressure
- Provide passive cooling of designated equipment

In addition, the following safety-related functions performed by the nuclear island nonradioactive ventilation system described in subsection 9.4.1 are tested:

- Provide isolation of the main control room from the surrounding areas and outside environment during a design basis accident if the nuclear island nonradioactive ventilation system becomes inoperable.

- Monitor the radioactivity in the main control room normal air supply and provide signals to isolate the incoming air and actuate the main control room emergency habitability system.

Prerequisites

The construction testing of the main control room habitability system has been successfully completed. The required preoperational testing of the compressed and instrument air system, Class 1E electrical power and uninterruptible power supply systems, normal control room ventilation system, and other interfacing systems required for operation of the above systems is available as needed to support the specified testing and system configurations. The main control room air supply tanks are filled with air acceptable for breathing. The main control room construction is complete and its leak-tight barriers are in place.

General Test Acceptance Criteria and Methods

Performance of the main control room habitability system is observed and recorded during a series of individual component and integrated system testing. The following testing demonstrates that the habitability system operates as specified in Section 6.4 and as specified in the appropriate design specifications:

a) Proper operation of safety-related valves is verified by the performance of baseline in-service tests as described in subsection 3.9.6.

b) Proper calibration and operation of safety-related and system readiness instrumentation, controls, actuation signals and interlocks is verified. This testing includes the following:

Air storage tank pressure
Refill line connection pressure
Main control room differential pressure
Air supply line flow rate
Controls for the main control room pressure relief valves
Controls for the air supply isolation valves
Controls for the main control room air inlet isolation valves
Air intake radiation
Passive filtration line flow rate
Filter performance

c) The proper flow rate of emergency air to the main control room is verified, demonstrating proper sizing of each air flow limiting orifice, proper operation of each air supply pressure regulator, and the ability to maintain proper control room air quality. The MCR passive filtration system flow rate and filter performance will also be verified at this time to verify a filtration flow rate of at least 600 cfm. This testing demonstrates the control room pollutant concentrations during the first 6 hours of operation. To determine the control room air quality at 72 hours, the CO_2 concentrations can be predicted based on calculations. The other pollutants described in Table 1 and Appendix C, Table 1 of ASHRAE Standard 62-1989 can be predicted by extrapolating their concentrations for the entire 72 hour time period.

d) The ability of the emergency air supply to maintain the main control room at the proper positive pressure is demonstrated, verifying proper operation of the main control room pressure relief dampers.

e) The ability of the emergency air supply to limit air inleakage to the main control room is verified by inleakage testing as specified in subsection 6.4.5.4.

f) The ability to maintain the main control room environment within specified limits for 72 hours (Reference subsection 6.4.3.2) is verified with a test simulating a loss of the nuclear island nonradioactive ventilation system. This testing demonstrates the control room heatup from 0 to 6 hours with the actual heat loads from the battery powered equipment and personnel specified for this time period. This testing period includes the high 0 to 3 hour heat load and subsequent control room temperature changes versus time that occur when the equipment heat load is decreased when the 2 hour batteries are expended, for the 3 to 6 hour testing time period. The control room temperature versus time versus heat load data are used to verify the analysis basis used to assure that the control room conditions remain within specified limits for the 72 hour time period. Periodic grab samples will be taken of the control room air environment to support analyses to confirm that specified limits would not be exceeded for 72 hours.

g) The ability to maintain temperatures in the protection and safety monitoring system cabinet and emergency switchgear rooms within specified limits for 72 hours (Reference subsection 6.4.3.2) is verified with a test simulating a loss of the nuclear island nonradioactive ventilation system. This testing demonstrates the room heatup from 0 to 6 hours with the actual heat loads from battery powered equipment. The room temperature versus time versus heat load data are used to verify the analysis basis used to assure that the room temperature will not exceed the specified limit for the 72 hour time period.

15.6.5.3.5 Main Control Room Dose Model

There are two approaches used for modeling the activity entering the main control room. If power is available, the normal heating, ventilation, and air-conditioning (HVAC) system will switch over to a supplemental filtration mode (Section 9.4). The normal HVAC system is not a safety-class system but provides defense in depth. ~~The normal HVAC system will be isolated on a low pressurizer pressure signal. Following a LOCA, low pressurizer pressure will occur isolating the normal HVAC system. Additional dose cases are analyzed assuming normal HVAC switching to the supplemental filtration mode.~~

Alternatively, if the normal HVAC is inoperable or, if operable, the supplemental filtration train does not function properly resulting in increasing levels of airborne iodine in the main control room, the emergency habitability system (Section 6.4) would be actuated when high iodine activity is detected. The emergency habitability system provides passive pressurization of the main control room from a bottled air supply to prevent inleakage of contaminated air to the main control room. The bottled air also induces flow through the passive air filtration system which filters contaminated air in the main control room. There is a 72-hour supply of air in the emergency habitability system. After this time, the main control room is assumed to be opened and unfiltered air is drawn into the main control room by way of an ancillary fan. After 7 days, offsite support is assumed to be available to reestablish operability of the control room habitability system by replenishing the compressed air supply. As a defense-in-depth measure, the nonsafety-related normal control room HVAC would be brought back into operation with the supplemental filtration train if power is available.

The main control room is accessed by a vestibule entrance, which restricts the volume of contaminated air that can enter the main control room from ingress and egress. The design of the emergency habitability system (VES) provides 65 scfm ±5 scfm to the control room and maintains it in a pressurized state. The path for the purge flow out of the main control room is through the vestibule entrance and this should result in a dilution of the activity in the vestibule and a reduction in the amount of activity that might enter the main control room. However, no additional credit is taken for dilution of the vestibule via the purge. ~~Without this purge through the vestibule,~~The projected ~~unfiltered~~ inleakage into the main control room through ~~-the~~ ingress/egress is 5 cfm. An additional 10 cfm of unfiltered inleakage is conservatively assumed from other sources. ~~The impact of the purge flow is to reduce the effective unfiltered inleakage rate to 1.5 cfm.~~

Activity entering the main control room is assumed to be uniformly dispersed. ~~No credit is taken for the removal of airborne activity in the main control room although elemental iodine and particulates would be removed by deposition and sedimentation.~~—With the VES in operation, airborne activity is removed from the main control room via the passive recirculation filtration portion of the VES.

The main control room dose calculation models are provided in Appendix 15A for the determination of doses resulting from activity which enters the main control room envelope.

Table 15.6.5-2 (Sheet 2 of 3)

ASSUMPTIONS AND PARAMETERS USED IN CALCULATING RADIOLOGICAL CONSEQUENCES OF A LOSS-OF-COOLANT ACCIDENT

Main control room model (cont.)	
– Occupancy	
• 0 - 24 hr	1.0
• 24 - 96 hr	0.6
• 96 - 720 hr	0.4
– Breathing rate (m^3/sec)	3.5 E-04
Control room with emergency habitability system credited (VES Credited)	
– Main control room emergency habitability system actuation	~~Pressurizer Pressure - Low~~2.0 E-06
– ~~Time to switch from normal HVAC to emergency habitability system operation (min)~~Response time to actuate VES based on radiation monitor response time and VBS isolation (sec)	~~10~~180
– Interval with operation of the emergency habitability system	
• Flow from compressed air bottles of the emergency habitability system (cfm)	60
• ~~Effective~~ unfiltered inleakage via ingress/egress (scfm)	~~1.5~~(1)5
• Unfiltered inleakage from other sources (scfm)	10
• Recirculation flow through filters (scfm)	~~Not applicable~~600
• Filter Efficiency (%)	
• Elemental Iodine	90
• Organic Iodine	30
• Particulates	99
– Time at which the compressed air supply of the emergency habitability system is depleted (hr)	72
– After depletion of emergency habitability system bottled air supply (>72 hr)	
• Air intake flow (cfm)	1700
• Intake flow filter efficiency (%)	Not applicable
• Recirculation flow (cfm)	Not applicable

– Time at which the compressed air supply is restored and emergency habitability system returns to operation (hr)	168
Control room with credit for continued operation of HVAC (VBS Supplemental Filtration Mode Credited)	
– Time to switch from normal operation to the supplemental air filtration mode (sec)	60
– Unfiltered air inleakage (cfm)	25
– Filtered air intake flow (cfm)	860
– Filtered air recirculation flow (cfm)	2740
– Filter efficiency (%)	
• Elemental iodine	90
• Organic iodine	90
• Particulates	99

Note:

1. ~~The effective unfiltered inleakage is based on a total inleakage of 5 cfm with credit taken for purging of the vestibule volume and the incomplete mixing of the vestibule and control room volumes with outside air following ingress/egress.~~

Table 15.6.5-3

RADIOLOGICAL CONSEQUENCES OF A LOSS-OF-COOLANT ACCIDENT WITH CORE MELT

	TEDE Dose (rem)
Exclusion zone boundary dose (1.4 - 3.4 hr)(1)	24.6
Low population zone boundary dose (0 - 30 days)	23.4
Main control room dose (emergency habitability system in operation)	
– Airborne activity entering the main control room	~~3.66~~4.25
– Direct radiation from adjacent structures	0.15
– Sky-shine	0.01
– Spent fuel pooling boiling	0.01
– Total	~~3.83~~4.41
Main control room dose (normal HVAC operating in the supplemental filtration mode)~~(2)~~	
– Airborne activity entering the main control room	4.56
– Direct radiation from adjacent structures	0.15
– Sky-shine	0.01
– Spent fuel pooling boiling	0.01

– Total	4.73

Note:

1. This is the 2-hour period having the highest dose.
2. ~~Although the dose is reported for the case in which the normal HVAC operates in the supplemental filtration mode, following a LOCA, the normal HVAC will be isolated on low pressurizer pressure and the emergency habitability system will be actuated.~~

TABLE 3.3.2-1 (PAGE 11 OF 13)
ENGINEERED SAFEGUARDS ACTUATION SYSTEM INSTRUMENTATION

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE	TRIP SETPOINT
20. Main Control Room Isolation and Air Supply Initiation						
a. Control Room Air Supply Radiation – High 2	1,2,3,4	2	F,O	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6	≤ 1.5×10^{-6} curies/m^3 DOSE EQUIVALENT I-131	1×10^{-6} curies/m^3 DOSE EQUIVALENT I-131
	Note (h)	2	G,K	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6	≤ 1.5×10^{-6} curies/m^3 DOSE EQUIVALENT I-131	1×10^{-6} curies/m^3 DOSE EQUIVALENT I-131
~~b. Pressurizer Pressure – Low~~	~~1,2,3[(a)]~~	~~4~~	~~B,M~~	~~SR 3.3.2.1~~ ~~SR 3.3.2.4~~ ~~SR 3.3.2.5~~ ~~SR 3.3.2.6~~	~~≥ 1794.9 psig~~	~~1795.3 psig~~
21. Auxiliary Spray and Purification Line Isolation						
a. Pressurizer Water Level – Low 1	1,2	4	B,L	SR 3.3.2.1 SR 3.3.2.4 SR 3.3.2.5 SR 3.3.2.6	≥ 19.95% span	20.0% span
b. Manual Initiation	1,2	Refer to Function 16.e (Manual Chemical Volume Control System (Makeup Isolation) for requirements.				
22. In-Containment Refueling Water Storage Tank (IRWST) Injection Line Valve Actuation						
a. Manual Initiation	1,2,3,4[(j)]	2 switch sets	E,N	SR 3.3.2.3	NA	NA
	4[(n)],5,6	2 switch sets	G,Y	SR 3.3.2.3	NA	NA
b. ADS 4th Stage Actuation	Refer to Function 10 (ADS 4th Stage Actuation) for initiating functions and requirements.					

(a) ~~Above the P-11 (Pressurizer Pressure) interlock, when the RCS boron concentration is below that necessary to meet the SDM requirements at an RCS temperature of 200°F.~~

(h) During movement of irradiated fuel assemblies.

(j) With the RCS not being cooled by the Normal Residual Heat Removal System (RNS).

(n) With the RCS being cooled by the RNS.

3.7 PLANT SYSTEMS

3.7.6 Main Control Room Habitability System (VES)

LCO 3.7.6 The Main Control Room (MCR) Habitability System shall be OPERABLE.

- NOTE -

The MCR boundary may be opened intermittently under administrative control.

APPLICABILITY: MODES 1, 2, 3, and 4,
During movement of irradiated fuel assemblies.

ACTIONS

- NOTE -

LCO 3.0.8 is not applicable.

CONDITION		REQUIRED ACTION		COMPLETION TIME
A.	One ~~VES~~ valve or damper inoperable.	A.1	Restore ~~VES~~ valve or damper to OPERABLE status.	7 days
B.	MCR air temperature not within limit.	B.1	Restore MCR air temperature to within limit.	24 hours
C.	VES inoperable due to inoperable MCRE boundary in MODE 1, 2, 3, or 4.~~Loss of integrity of MCR pressure boundary.~~	C.1 AND	Initiate action to implement mitigating actions~~Restore MCR pressure boundary to OPERABLE status.~~	~~24 hours~~Immediately
		C.2	Verify mitigating actions ensure MCRE occupant exposures to radiological, chemical, and smoke	24 hours

	AND	hazards will not exceed limits.	
	C.3	Restore MCRE boundary to OPERABLE status	90 days
D. One bank of VES air tanks (8 tanks) inoperable	D.1 AND	Verify pressure in the OPERABLE tanks is at least 3400 psig.	2 hours
	D.2 AND	Verify VBS MCR ancillary fans and supporting equipment are available	24 hours
	D.3	Restore VES to OPERABLE status.	7 days
~~D~~ E. Required Action and associated Completion Time of Conditions A, B, ~~or~~ C, or D not met in MODE 1, 2, 3, or 4. OR VES inoperable for reasons other than Conditions A, B, C, or D in MODE 1, 2, 3, or 4.	~~D~~E.1 AND ~~D~~E.2	Be in MODE 3. Be in MODE 5.	6 hours 36 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
~~E~~F. Required Action and associated Completion Time of Conditions A, B, ~~or~~ C, or	~~E~~F.1	Suspend movement of irradiated fuel assemblies.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D not met during movement of irradiated fuel. OR VES inoperable for reasons other than Conditions A, B, C, or D during movement of irradiated fuel. OR VES inoperable due to inoperable MCRE boundary during movement of irradiated fuel.		
~~F. VES inoperable in MODE 1, 2, 3, or 4.~~	~~F.1 Be in MODE 3.~~ ~~AND~~ ~~F.2 Be in MODE 4.~~ ~~AND~~ ~~F.3 Restore VES to OPERABLE status.~~	~~6 hours~~ ~~12 hours~~ ~~36 hours~~
~~G. VES inoperable during movement of irradiated fuel.~~	~~G.1 Suspend movement of irradiated fuel assemblies.~~	~~Immediately~~

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.7.6.1	Verify Main Control Room air temperature is ≤ 75°F.	24 hours
SR 3.7.6.2	Verify that the compressed air storage tanks are pressurized to ≥ 3400 psig.	24 hours
SR 3.7.6.3	Verify that each VES air delivery isolation valve is OPERABLE.	In accordance with the Inservice Testing Program
SR 3.7.6.4	Verify that each VES air header manual isolation valve is in an open position.	31 days

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.7.6.5	Verify that the air quality of the air storage tanks meets the requirements of Appendix C, Table C-1 of ASHRAE Standard 62.	92 days
SR 3.7.6.6	Verify that all ~~VBS~~ Main Control Room isolation valves are OPERABLE and will close upon receipt of an actual or simulated actuation signal.	24 months
SR 3.7.6.7	Verify that each VES pressure relief isolation valve within the MCR pressure boundary is OPERABLE.	In accordance with the Inservice Testing Program
SR 3.7.6.8	Verify that each VES pressure relief damper is OPERABLE.	24 months
SR 3.7.6.9	Verify that the self-contained pressure regulating valve in each VES air delivery flow path is OPERABLE.	In accordance with the Inservice Testing Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.6.10	Perform required MCRE unfiltered air inleakge testing in accordance with the Main Control Room Envelope Habitability Program.~~Verify that one VES air delivery flow path maintains a 1/8-inch water gauge positive pressure in the MCR envelope relative to the adjacent areas at the required air addition flow rate of 65 ± 5 scfm using the safety related compressed air emergency air storage tanks.~~	In accordance with the Main Control Room Envelope Habitability Program~~24 months~~
SR 3.7.6.11	Perform required MCR Passive Filtration system filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP

5.5.11 Battery Monitoring and Maintenance Program

This Program provides for battery restoration and maintenance, based on the recommendations of IEEE Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," or of the battery manufacturer including the following:

a. Actions to restore battery cells with float voltage < 2.13 V, and

b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the minimum established design limit.

5.5.12 Main Control Room Envelope Habitability Program

A Main Control Room Envelope (MCRE) Habitability Program shall be established and implemented to ensure that MCRE habitability is maintained such that, with an OPERABLE Main Control Room Emergency Habitability System (VES), MCRE occupants can control the reactor safely under normal conditions and maintain it in a safe condition following a radiological event, hazardous chemical release, or a smoke challenge. The program shall ensure that adequate radiation protection is provided to permit access and occupancy of the MCRE under design basis accident (DBA) conditions without personnel receiving radiation exposures in excess of 5 rem total effective dose equivalent (TEDE) for the duration of the accident. The program shall include the following elements:

a. The definition of the MCRE and the MCRE boundary.

b. Requirements for maintaining the MCRE boundary in its design condition including configuration control and preventive maintenance.

c. Requirements for (i) determining the unfiltered air inleakage past the MCRE boundary into the MCRE in accordance with the testing methods and at the Frequencies specified in Sections C.1 and C.2 of Regulatory Guide 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," Revision 0, May 2003, and (ii) assessing MCRE habitability at the Frequencies specified in Sections C.1 and C.2 of Regulatory Guide 1.197, Revision 0.

d. Measurement, at designated locations, of the MCRE pressure relative to all external areas adjacent to the MCRE boundary during the pressurization mode of operation of one VES air delivery flow path, operating at the required flow rate of 65 ± 5 scfm, at a Frequency of 24 months on a STAGGERED TEST BASIS. The results shall be trended and used as part of the 24 month assessment of the MCRE boundary.

e. The quantitative limits on unfiltered air inleakage into the MCRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of MCRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing MCRE habitability, determining MCRE unfiltered inleakage, and measuring MCRE pressure and assessing the MCRE boundary as required by paragraphs c and d, respectively.

5.5.13 Ventilation Filter Testing Program (VFTP)

A program shall be established to implement the following required testing of Engineered Safety Feature (ESF) filter ventilation systems at the frequencies specified in accordance with Regulatory Guide 1.52, Revision 3, ASME N510-1989, and AG-1.

a. Demonstrate for the ESF system that an inplace test of the high efficiency particulate air (HEPA) filters shows a penetration and system bypass ≤ 0.5% when tested in accordance with Regulatory Guide 1.52, Revision 3, and ASME N510-1989 at a flow rate at least 600 cfm greater than the flow measured by VES-003A/B. The flow rate being measured is a combination of the VES supply flow and the recirculation flow drawn through the eductor.

Demonstrate for the ESF system that an inplace test of the charcoal adsorber shows a penetration and system bypass ≤ 0.05% when tested in accordance with Regulatory Guide 1.52, Revision 3, and ASME N510-1989 at a flow rate at least 600 cfm greater than the flow measured by VES-003A/B.

b. Demonstrate for the ESF system that a laboratory test of a sample of the charcoal adsorber, when obtained as described in Regulatory Guide 1.52, Revision 3, shows the methyl iodide penetration less than the value specified below when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86°F) and the relative humidity specified below.

ESF Ventilation System	Penetration	RH
VES	5%	95%

c. Demonstrate for the ESF system that the pressure drop across the combined HEPA filter, the charcoal adsorber, and the post filter is less than the value specified below when tested in accordance with Regulatory Guide 1.52 Revision 3, and ASME N510-1989 at the system flow rate specified below +/- 10%.

ESF Ventilation System	Delta P	Flow rate
VES	5 in. water gauge	660 cfm

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the VFTP test frequencies.

B 3.3 INSTRUMENTATION

B 3.3.2 Engineered Safety Feature Actuation System (ESFAS) Instrumentation

20. Main Control Room Isolation and Air Supply Initiation

Isolation of the main control room and initiation of the air supply provides a protected environment from which operators can control the plant following an uncontrolled release of radioactivity. This Function is required to be OPERABLE in MODES 1, 2, 3, and 4, and during movement of irradiated fuel because of the potential for a fission product release following a fuel handling accident, or other DBA.

20.a. Control Room Air Supply Radiation – High 2

Two radiation monitors are provided on the main control room air intake. If either monitor exceeds the High 2 setpoint, control room isolation is actuated.

~~20.b. Pressurizer Pressure – Low~~

~~This signal provides protection against a potential release of radioactivity due to a LOCA.~~

~~The transmitters are located inside containment, with the taps in the vapor space region of the pressurizer, and thus possibly experiencing adverse environmental conditions (LOCA, SLB inside containment). Therefore, the Trip Setpoint reflects the inclusion of both steady-state and adverse environmental instrument uncertainties.~~

~~The LCO requires four channels of Pressurizer Pressure – Low to be OPERABLE in MODES 1, 2, and 3 (above P-11, when the RCS boron concentration is below that necessary to meet the SDM requirements at an RCS temperature of 200°F), to mitigate the consequences of a high energy line rupture inside containment. Four channels are provided to permit one channel to be in trip or bypass indefinitely and still ensure no single random failure will disable this trip Function. This signal may be manually blocked by the operator below the P-11 setpoint.~~

~~This Function is not required to be OPERABLE in MODE 3 below the P-11 setpoint.~~

B 3.7 PLANT SYSTEMS

B 3.7.6 Main Control Room Emergency Habitability System (VES)

BASES

BACKGROUND

The Main Control Room Habitability System (VES) provides a protected environment from which operators can control the plant following an uncontrolled release of radioactivity, hazardous chemicals, or smoke. The system is designed to operate following a Design Basis Accident (DBA) which requires protection from the release of radioactivity. In these events, the Nuclear Island Non-Radioactive Ventilation System (VBS) would continue to function if AC power is available. If AC power is lost or a High-2 main control room envelope (MCRE) radiation signal is received, the VES is actuated. The major functions of the VES are: 1) to provide forced ventilation to deliver an adequate supply of breathable air (Ref. 4) for the MCR occupants; 2) to provide forced ventilation to maintain the MCR at a 1/8 inch water gauge positive pressure with respect to the surrounding areas; 3) provide passive filtration to filter contaminated air in the MCRE; and 4~~3~~) to limit the temperature increase of the MCR equipment and facilities that must remain functional during an accident, via the heat absorption of passive heat sinks.

The VES consists of compressed air storage tanks, two air delivery flow paths, an eductor, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), associated valves or dampers, piping, and instrumentation. The tanks contain enough breathable air to supply the required air flow to the MCR for at least 72 hours.

The VES system is designed to maintain CO_2 concentration less than 0.5% for up to 11 MCR occupants.

The MCRE is the area within the confines of the MCRE boundary that contains the spaces that control room operators inhabit to control the unit during normal and accident conditions. This area encompasses the main control area, operations work area, operational break room, shift supervisor's office, kitchen, and toilet facilities (Ref. 1). The MCRE is protected during normal operation, natural events, and accident conditions. The MCRE boundary is the combination of walls, floor, roof, electrical and mechanical penetrations, and access doors. The OPERABILITY of the MCRE boundary must be maintained to ensure that the inleakage of unfiltered air into the MCRE will not exceed the inleakage assumed in the licensing basis analysis of design basis accident (DBA) consequences to MCRE occupants. The MCRE and its boundary are defined in the Main Control Room Envelope Habitability Program.

Sufficient thermal mass exists in the surrounding concrete structure (including walls, ceiling and floors) to absorb the heat generated inside the MCRE, which is initially at or below 75°F. Heat sources inside the MCRE include operator workstations, emergency lighting and occupants. Sufficient insulation is provided surrounding the MCRE pressure boundary to preserve the minimum required thermal capacity of the heat sink. The insulation also limits the heat gain from the adjoining areas following the loss of VBS cooling.

In the unlikely event that power to the VBS is unavailable for more than 72 hours, MCR envelope habitability is maintained by operating one of the two MCR ancillary fans to supply outside air to the MCR ~~envelope~~E.

The compressed air storage tanks are initially pressurized to 3400 psig. During operation of the VES, a self contained pressure regulating valve maintains a constant downstream pressure regardless of the upstream pressure. An orifice downstream of the regulating valve is used to control the air flow rate into the MCRE. The MCRE is maintained at a 1/8 inch water gauge positive pressure to minimize the infiltration of airborne contaminants from the surrounding areas. The VES operation in maintaining the MCRE habitable is discussed in Ref. 1.

BASES

APPLICABLE SAFETY	The compressed air storage tanks are sized such that the set of tanks has a combined capacity that provides at least 72 hours of VES operation.

BASES

ANALYSES

Operation of the VES is automatically initiated by the following safety related signal~~s: 1)~~ high-2 particulate or iodine radioactivity ~~or 2) low pressurizer pressure~~.

In the event of a loss of all AC power, the VES functions to provide ventilation, pressurization, and cooling of the MCR pressure boundary.

In the event of a high level of gaseous radioactivity outside of the MCRE, the VBS continues to operate to provide pressurization and filtration functions. The MCRE air supply downstream of the filtration units is monitored by a safety related radiation detector. Upon high-2 particulate or iodine radioactivity setpoint, ~~or low pressurizer pressure,~~ a safety related signal is generated to isolate the MCRE ~~from the VBS~~ and to initiate air flow from the VES storage tanks. Isolation of the ~~VBS~~ MCRE consists of closing safety related valves in the ~~supply and exhaust ducts~~ lines that penetrate the MCRE pressure boundary. Valves in the VBS supply and exhaust ducts and the Sanitary Drain System (SDS) vent lines are automatically isolated. VES air flow is initiated by a safety related signal which opens the isolation valves in the VES supply lines.

The VES provides protection from smoke and hazardous chemicals to the MCRE occupants. The analysis of hazardous chemical releases demonstrates that the toxicity limits are not exceeded in the MCRE following a hazardous chemical release (Ref. 1). The evaluation of a smoke challenge demonstrates that it will not result in the inability of the MCRE occupants to control the reactor either from the control room or from the remote shutdown room (Ref. 2).

The VES functions to mitigate a DBA or transient that either assumes the failure of or challenges the integrity of the fission product barrier.

The VES satisfies the requirements of Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The VES limits the MCRE temperature rise and maintains the MCRE at a positive pressure relative to the surrounding environment.

Two air delivery flow paths are required to be OPERABLE to ensure that at least

BASES

one is available, assuming a single failure.

The VES is considered OPERABLE when the individual components necessary to deliver a supply of breathable air to the MCR are OPERABLE. This includes components listed in SR 3.7.6.2 through 3.7.6.89. In addition, the MCRE pressure boundary must be maintained, including the integrity of the walls, floors, ceilings, electrical and mechanical penetrations, and access doors. The MCRE pressure boundary includes the Potable Water System (PWS) and SDS running (piping drain) traps that retain a fluid level sufficient to maintain a seal preventing gas flow through the piping. The MCRE pressure boundary also includes the Waste Water System (WWS) drain line which is isolated by a normally closed isolation valve.

In order for the VES to be considered OPERABLE, the MCRE boundary must be maintained such that the MCRE occupant dose from a large radioactive release does not exceed the calculated dose in the licensing basis consequence analysis for DBAs, and that MCRE occupants are protected from hazardous chemicals and smoke.~~In addition, the control room boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors.~~

LCO (continued)

The LCO is modified by a Note allowing the ~~control room~~MCRE boundary to be opened intermittently under administrative controls. For entry and exit through doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls should be proceduralized and consist of stationing a dedicated individual at the opening who is in continuous communication with the ~~control room~~operators in the MCRE. This individual will have a method to rapidly close the opening and to restore the MCRE boundary to a condition equivalent to the design condition when a need for ~~control room~~MCRE isolation is indicated.

APPLICABILITY

~~The VES is required to be OPERABLE in~~In MODES 1, 2, 3, and 4 and during movement of irradiated fuel assemblies, the VES must be OPERABLE to ensure that the MCRE will remain habitable during and ~~because of the potential for a fission product release~~ following a DBA.

The VES is not required to be OPERABLE in MODES 5 and 6 when irradiated fuel is not being moved because accidents resulting in fission product release are

BASES

not postulated.

ACTIONS

LCO 3.0.8 is applicable while in MODE 5 or 6. Since irradiated fuel assembly movement can occur in MODE 5 or 6, the ACTIONS have been modified by a Note stating that LCO 3.0.8 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, the fuel movement is independent of shutdown reactor operations. Entering LCO 3.0.8 while in MODE 5 or 6 would require the optimization of plant safety, unnecessarily.

A.1

When a VES valve ~~or~~, a VES damper, or a main control room boundary isolation valve is inoperable, action is required to restore the component to OPERABLE status. A Completion Time of 7 days is permitted to restore the valve or damper to OPERABLE status before action must be taken to reduce power. The Completion Time of 7 days is based on engineering judgment, considering the low probability of an accident that would result in a significant radiation release from the fuel, the low probability of not containing the radiation, and that the remaining components can provide the required capability.

B.1

When the ~~main control room~~MCRE air temperature is outside the acceptable range during VBS operation, action is required to restore it to an acceptable range. A Completion Time of 24 hours is permitted based

ACTIONS (continued)

upon the availability of temperature indication in the MCR. It is judged to be a sufficient amount of time allotted to correct the deficiency in the nonsafety ventilation system before shutting down.

C.1, C.2, and C.3

If the unfiltered inleakage of potentially contaminated air past the MCRE boundary and into the MCRE can result in MCRE occupant radiological dose greater than the calculated dose of the licensing basis analyses of DBA consequences (allowed to be up to 5 rem TEDE), or inadequate protection of MCRE occupants from hazardous chemicals or smoke, the MCRE boundary is inoperable. Actions must be taken to restore an OPERABLE

BASES

MCRE boundary within 90 days.

During the period that the MCRE boundary is considered inoperable, action must be initiated to implement mitigating actions to lessen the effect on MCRE occupants from the potential hazards of a radiological or chemical event or a challenge from smoke. Actions must be taken within 24 hours to verify that in the event of a DBA, the mitigating actions will ensure that MCRE occupant radiological exposures will not exceed the calculated dose of the licensing basis analyses of DBA consequences, and that MCRE occupants are protected from hazardous chemicals and smoke. These mitigating actions (i.e., actions that are taken to offset the consequences of the inoperable MCRE boundary) should be preplanned for implementation upon entry into the condition, regardless of whether entry is intentional or unintentional. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of mitigating actions. The 90 day Completion Time is reasonable based on the determination that the mitigating actions will ensure protection of MCRE occupants within analyzed limits while limiting the probability that MCRE occupants will have to implement protective measures that may adversely affect their ability to control the reactor and maintain it in a safe shutdown condition in the event of a DBA. In addition, the 90 day Completion Time is a reasonable time to diagnose, plan and possibly repair, and test most problems with the MCRE boundary.~~C.1~~

~~If the MCR pressure boundary is damaged or otherwise degraded, action is required to restore the integrity of the pressure boundary and restore it to OPERABLE status within 24 hours. A Completion Time of 24 hours is permitted based upon operating experience. It is judged to be a sufficient amount of time allotted to correct the deficiency in the pressure boundary.~~

D.1, D.2, and D.3

If one bank of VES air tanks (8 tanks out of 32 total) is inoperable, then VES is able to supply air to the MCR for 54 hours (75% of the required 72 hours). If VES is actuated, operator must take actions to maintain habitability of the MCR once the air in the tanks has been exhausted. The VBS supplemental filtration mode or MCR ancillary fans are both capable of maintaining the habitability of the MCR after 54 hours.

~~Increasing the pressure in the OPERABLE tanks from the minimum pressure~~

BASES

~~of 3400 psig to the upper portion of the system operating band maximizes the time the VES will be able to supply air to the MCR. The 12-hour Completion Time provides sufficient time to achieve the increased pressure.~~

With one bank of VES air tanks inoperable, action must be taken to restore OPERABLE status within 7 days. In this Condition, the remaining OPERABLE VES air tanks, along with compensatory operator actions, are adequate to protect the main control room envelope habitability. The 7 day Completion Time is based on engineering judgment, considering the low probability of an accident that would result in a significant radiation release from the reactor core, the low probability radioactivity release, and that the remaining components and compensatory systems can provide the required capability. ~~D.1 and D.2~~ Dose calculations verify that the MCR dose limits will remain within the requirements of GDC 19 with the compensatory actions taken at 54 hours.

~~In MODE 1, 2, 3, or 4 if Conditions A, B, or C cannot be restored to OPERABLE status within the required Completion Time, the plant must be placed in a MODE that minimizes accident risk. This is done by entering MODE 3 within 6 hours and MODE 5 within 36 hours.~~

E.1 and E.2

In MODE 1, 2, 3, or 4 if the Required Actions and Completion Times of Conditions A, B, C or D are not met, or the VES is inoperable for reasons other than Conditions A, B, C or D, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.
~~E.1~~

~~During movement of irradiated fuel assemblies, if the Required Action A.1, B.1, or C.1 cannot be completed within the required Completion Time, the movement of fuel must be suspended. Performance of Required Action E.1 shall not preclude completion of actions to establish a safe condition.~~

F.1

During movement of irradiated fuel assemblies, if the Required Action s and Completion Times of Conditions A, B, C or D are not met, or the VES is inoperable for reasons other than Conditions A, B, C or D, or the VES is inoperable due to an inoperable MCRE boundary, action must be taken

BASES

immediately to suspend the movement of fuel. This does not preclude the movement of fuel to a safe position.

F.1, F.2, and F.3

If the VES is inoperable in MODE 1, 2, 3, or 4, the VES may not be capable of performing the intended function, and the plant must be brought to MODE 4, where the probability and consequences of an event are minimized, and the VES must be restored to OPERABLE status within 36 hours. This is accomplished by placing the plant in MODE 3 within 6 hours and in MODE 4 within 12 hours.

G.1

During movement of irradiated fuel assemblies with the VES inoperable, the Required Action is to immediately suspend activities that present a potential for releasing radioactivity that might enter the MCR. This places the plant in a condition that minimizes risk. This does not preclude the movement of fuel to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.7.6.1

The MCRE air temperature is checked at a frequency of 24 hours to verify that the VBS is performing as required to maintain the initial condition temperature assumed in the safety analysis, and to ensure that the MCRE temperature will not exceed the required conditions after loss of VBS cooling. The surveillance limit of 75°F is the initial heat sink temperature assumed in the VES thermal analysis. The 24 hour Frequency is acceptable based on the availability of temperature indication in the MCRE.

SR 3.7.6.2

Verification every 24 hours that compressed air storage tanks are pressurized to ≥ 3400 psig is sufficient to ensure that there will be an adequate supply of breathable air to maintain MCRE habitability for a period of 72 hours. The Frequency of 24 hours is based on the availability of pressure indication in the MCRE.

SR 3.7.6.3

VES air delivery isolation valves are required to be verified as OPERABLE. The

BASES

Frequency required is in accordance with the Inservice Testing Program.

SR 3.7.6.4

VES air header isolation valves are required to be verified open at 31 day intervals. This SR is designed to ensure that the pathways for supplying breathable air to the MCRE are available should loss of VBS occur. These valves should be closed only during required testing or maintenance of downstream components, or to preclude complete depressurization of the system should the VES isolation valves in the air delivery line open inadvertently or begin to leak.

SR 3.7.6.5

Verification that the air quality of the air storage tanks meets the requirements of Appendix C, Table C-1 of ASHRAE Standard 62 is required every 92 days. If air has not been added to the air storage tanks since the previous verification, verification may be accomplished by confirmation of the acceptability of the previous surveillance results along with examination of the documented record of air makeup. The purpose of ASHRAE Standard 62 states: "This standard specifies minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to minimize the potential for adverse health

SURVEILLANCE REQUIREMENTS (continued)

effects." Verification of the initial air quality (in combination with the other surveillances) ensures that breathable air is available for 11 MCRE occupants for at least 72 hours.

SR 3.7.6.6

Verification that ~~all~~ the VBS isolation valves and the Sanitary Drain System (SDS) isolation valves are OPERABLE and will actuate upon demand is required every 24 months to ensure that the MCRE can be isolated upon loss of VBS operation.

SR 3.7.6.7

Verification that each VES pressure relief isolation valve within the MCRE pressure boundary is OPERABLE is required in accordance with the Inservice Testing Program. The SR is used in combination with SR 3.7.6.~~7~~8 to ensure that

BASES

adequate vent area is available to mitigate MCR overpressurization.

SR 3.7.6.8

Verification that the VES pressure relief damper is OPERABLE is required at 24 month intervals. The SR is used in combination with SR 3.7.6.~~6~~7 to ensure that adequate vent area is available to mitigate MCRE overpressurization.

SR 3.7.6.9

Verification of the OPERABILITY of the self-contained pressure regulating valve in each VES air delivery flow path is required in accordance with the Inservice Testing Program. This is done to ensure that a sufficient supply of air is provided as required, and that uncontrolled air flow into the MCRE will not occur.

SR 3.7.6.10

This SR verifies the OPERABILITY of the MCRE boundary by testing for unfiltered air inleakage past the MCRE boundary and into the MCRE. The details of the testing are specified in the Main Control Room Envelope Habitability Program.

The MCRE is considered habitable when the radiological dose to MCRE occupants calculated in the licensing basis analyses of DBA consequences is no more than 5 rem TEDE and the MCRE occupants are protected from hazardous chemicals and smoke. This SR verifies that the unfiltered air inleakage into the MCRE is no greater than the flow rate assumed in the licensing basis analyses of DBA consequences. When unfiltered air inleakage is greater than the assumed flow rate, Condition C must be entered. Required Action C.3 allows time to restore the MCRE boundary to OPERABLE status provided mitigating actions can ensure that the MCRE remains within the licensing basis habitability limits for the occupants following an accident. Compensatory measures are discussed in Regulatory Guide 1.196, Section C.2.7.3, (Ref. 3) which endorses, with exceptions, NEI 99-03, Section 8.4 and Appendix F (Ref. 5). These compensatory measures may also be used as mitigating actions as required by Required Action C.2. Temporary analytical methods may also be used as compensatory measures to restore OPERABILITY (Ref. 6). Options for restoring the MCRE boundary to OPERABLE status include changing the licensing basis DBA consequence analysis, repairing the

BASES

MCRE boundary, or a combination of these actions. Depending upon the nature of the problem and the corrective action, a full scope inleakage test may not be necessary to establish that the MCRE boundary has been restored to OPERABLE status.~~Per Reference 1, a functional test is required to establish that one VES air delivery flow path, using the safety related compressed air storage tanks, pressurizes the MCR envelope to at least a positive 1/8 inch water gauge pressure relative to the surrounding spaces at the required air addition flow rate of 65 ± 5 scfm (Ref. 3). The test need not last 72 hours, only long enough to demonstrate the ability to achieve the required differential pressure. The MCR envelope leakage rate must be within the design capacity of the VES to pressurize the MCR for 72 hours. One air~~

SR 3.7.6.11

This SR verifies that the required VES testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The VES filter tests are in accordance with Regulatory Guide 1.52 (Ref. 7). The VFTP includes testing the performance of the HEPA filter, charcoal adsorber efficiency, minimum flow rate, and the physical properties of the activated charcoal. Specific test frequencies and additional information are discussed in detail in the VFTP.

BASES

~~SURVEILLANCE REQUIREMENTS (continued)~~

~~delivery flow path is tested on an alternating basis. The system performance test demonstrates that the MCR pressurization assumed in dose analysis is maintained.~~

REFERENCES

1. Section 6.4, "Main Control Room Habitability Systems."
2. Section 9.5.1, "Fire Protection System."~~Section 9.4.1, "Nuclear Island Non-Radioactive Ventilation System."~~
3. Regulatory Guide 1.196, "Control Room Habitability at Light-Water Nuclear Power Reactors".~~SECY-95-132, "Policy and Technical Issues Associated With The Regulatory Treatment of Non-Safety Systems (RTNSS) In Passive Plant Designs (SECY-94-084),"~~

BASES

~~May 22, 1995.~~

4. ASHRAE Standard 62-1989, "Ventilation for Acceptable Indoor Air Quality."

5 NEI 99-03, "Control Room Habitability Assessment," June 2001. ~~Regulatory Guide 1.78, "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," Revision 1, December 2001.~~

6. Letter from Eric J. Leeds (NRC) to James W. Davis (NEI) dated January 30, 2004, "NEI Draft White Paper, Use of Generic Letter 91-18 Process and Alternative Source Terms in the Context of Control Room Habitability." (ADAMS Accession No. ML040300694).

7. Regulatory Guide 1.52, "Design, Inspection, and Testing Criteria for Airfiltration and Adsorption Units of Post-Accident Engineered-Safety- Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Revision 3.