VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

August 9, 1979

Mr. Harold R. Denton
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Serial No. 045B/020177
PO/RWC:svm
Docket Nos.: 50-280
50-281
License Nos.: DPR-32
DPR-37

Attn: Mr. Albert Schwencer
Operating Reactors Branch 1

Dear Mr. Denton:

This letter provides the final design basis for the modification of the auxiliary building ventilation system at Surry Power Station. Our letter dated July 28, 1978 presented the conceptual design and promised additional information as it became available.

The auxiliary building ventilation system is to be upgraded according to the eight items presented in Attachment I. The detailed operation of the modified system is presented in the System Description and flow diagram (Attachment III).

The deviations of the modified safety-related filtration system from the positions of Regulatory Guide 1.52, Rev. 2 and the justification for these deviations are provided in Attachment II.

The final design is nearly complete. Construction has begun and is scheduled to be completed during the Unit No. 1 Steam Generator Repair Outage. This letter meets our commitment to provide additional information. We would be glad to answer any questions or provide further information as requested.

Very truly yours,

C. M. Stallings

C. M. Stallings
Vice President - Power Supply
And Production Operations

RWC/svm:1I2

cc: Mr. J. P. O'Reilly, Director
Office of Inspection and Enforcement-Region II

50-280/281
Ltr 8-9-79
7908130452

MODIFICATIONS TO AUXILIARY BUILDING VENTILATION SYSTEM

A. Filtering ECCS Leakage Following a LOCA Without Exceeding Filter Capacity

Filtration of ECCS equipment area exhaust air following a LOCA without exceeding the filter design capacity is required to limit control room doses resulting from ECCS leakage (postulated in Reference 2) within the guidelines of CDC-19.

The existing auxiliary building central area exhaust system draws air from all six charging pump cubicles, regardless of the operating status of the pumps. The design flow rate of this stream alone exceeds the existing filter capacity. Furthermore, the air distribution across the faces of the filters and the absorbers was not designed to be uniform. Nonuniform air velocities can decrease the residence time and prevent assurance of satisfactory removal of particulate and gaseous iodines.

The following four modifications are to be made to the system to ensure proper filtration of exhaust air from ECCS leakage following a LOCA. The first two changes will reduce the flow rate of the charging pump exhaust system to 22,000 cfm following a LOCA. The total ECCS equipment area exhaust flow rate becomes 36,000 cfm, which is the capacity of one filter train. There is 12,000 cfm from either Unit 1 or Unit 2 safeguards exhaust system and 2,000 cfm allowance for damper leakages.

1. Installation of a two-position damper in the exhaust duct of each charging pump cubicle to open and exhaust air when the pump operates and close when the pump stops.

2. Disconnection of the exhaust ducts of nonsafety-related equipment cubicles from the charging pump exhaust system and connection to the auxiliary building general area exhaust system.

3. Installation of a perforated plate air distribution and straightening subplenum in the inlet and outlet plenums of the two safety-related filter housings to provide uniform airflow through the filter elements.

4. Seismically supporting the charging pump exhaust ducts to qualify the entire ECCS leakage collection and filtration system as a safety-grade system.

B. Maintaining Thermal Ambient of ECCS Equipment Areas Following a LOCA

Limiting the design temperatures of ECCS equipment areas to the original design temperatures simultaneously with filtration of exhaust air is a safety requirement following a LOCA.

The ECCS equipment areas are ventilated and cooled by three separate exhaust systems designed to limit area temperatures to a maximum of 120°F. The exhaust fans are presently sized to draw design flow rates when the exhaust systems are aligned to bypass the filters. When these exhaust systems are diverted through the filters, the additional resistance of the filters reduces the flow rates of the systems which in turn increases temperatures above 120°F.

To limit the temperature following a LOCA to 120°F with airflow from ECCS equipment areas diverted through the filters requires the installation of two safety-related, high head fans, (1-VS-F-58 A & B) sized to draw 36,000 cfm each.

C. Periodic Verification of Filter Performance

Monitoring the performance and availability of safety-related filters is required by references 2 and 3 in the form of a new technical specification.

The existing technical specification (Section 4.12) requires laboratory analysis of charcoal absorbent once every 12 months. In the present design, charcoal samples are withdrawn from a charcoal tray, new charcoal inserted, and the tray reinstalled. Implementation of the new technical specifications would require charcoal sampling and analysis after every 720 hours of filter operation and in-place halogen leakage testing of the absorbent bank after each complete, or partial, replacement of charcoal trays.

To permit periodic laboratory analysis of charcoal absorbent, without a monthly halogen test of the absorbent bank or breaking their gasket seals, requires the installation of 18 charcoal canisters in parallel with the main absorber trays for the two safety-related filter trains. The canisters will be filled with the same absorbent as the main absorber trays and will be removable from the outlet plenum.

D. Relocation of Filtered ECCS Leakage Release Point

Relocation of the release point of the filtered ECCS leakage is required to limit control room doses resulting from changes in site meterology (imposed by reference 1) within the guidelines of CDC-19.

The existing release point of the ventilation exhaust air is on top of the service building. A new stack will be installed on the roof of the personnel hatch of Unit No. 2 containment and the discharges of all exhaust fans will be diverted from the old stack to the new stack. The sampling point of the continous radiation monitor will be relocated to the new stack.

E. Redundancy of Safety-Related Components

Redundancy of safety-related components is required by reference 2 when the auxiliary building ventilation system is aligned to cool and filter ECCS equipment area exhaust air following a LOCA.

1. Redundancy of safety-related filtration capacity - The 36,000 cfm capacity of each filter train equals the maximum design exhaust flow rate from the ECCS equipment areas (discussed in Item A).

2. Redundancy of the high head fans to draw design flow rates through the filters - The capacity of each high-head fan is 100 percent capacity (disccused in Item B).

3. Redundancy of dampers to ensure diversion of ECCS equipment area exhaust air through the safety-related filters - This requires

the installation of parallel dampers for each of the safeguards and charging pump exhaust systems to provide redundant flow paths to the filter following a LOCA and the installation of dampers in series in the other exhaust systems to provide redundant closure following a LOCA.

4. Redundancy of safety-related controls and power supplies - These changes will be made as required.

F. Upgrade Purge Exhaust Duct and Safety Classification

To limit off site doses within 10CFR100 guidelines requires upgrading the containment purge portion of the auxiliary building ventilation system to mitigate the consequences of a refueling accident inside the containment, as postulated in reference 4.

The entire exhaust ventilation system required to filter the purge air following a refueling accident has a safety grade classification, except the purge exhaust duct between the containment isolation valves and the safety-related filter trains. This duct is not seismically supported. To permit filtration of purge air following a refueling accident, simultaneously with a design basis earthquake, requires the seismic support of the Unit No. 1 and 2 purge exhaust ducts between the containment purge exhaust isolation valves and the safety-related filters.

An alternative method for handling the consequences of a refueling accident would have been containment isolation. This approach would have required:

1. Upgrading the radiation monitors and the purge air exhaust distribution ductwork inside the containment to a safety-grade classification.

2. Changing the power supply of the containment isolation valves from normal to emergency.

3. Periodically testing the closure time of the valves.

This approach was discussed with your staff at various times and our decision not to pursue this approach was presented in our letter, Serial No. 059/012478 dated March 7, 1978.

G. Filtering Frequently Contaminated Exhaust Air

The technical specifications of references 2 and 3 impose surveillance testing requirements based on total hours of safety-related filter operation. Minimizing filtration of contaminated exhaust systems through the safety-related filters will therefore reduce the frequency of testing and the possible outage of the filters for maintenance.

Frequent contamination of some exhaust systems (auxiliary building general area and purge) and unreliable diversion dampers on all exhaust systems has necessitated, as a temporary operational measure, diversion of all exhaust systems through the existing filters, regardless of need. To mini-

mize the use of the safety-related filters during normal station operation requires:

1. A new nonsafety-related filter to treat the auxiliary building general area exhaust air system, which is in continuous operation.

2. Replacement of all defective diversion dampers with heavy-duty dampers having specified and tested leakage characteristics to permit the alignment of noncontaminated exhaust systems around the filters.

3. Containment purge air may continue to be filtered through the safety-related filters. The duration of station operation in the shutdown purge mode would not significantly affect filter availability.

H. Restoring Original Design Airflow Rates for Auxiliary Building and Purge Exhaust Systems

Restoration of the original cooling design conditions in the auxiliary building and the purge exhaust rate of the containment simultaneously with filtration of contaminated exhaust air is a nonsafety requirement which facilitates station operations and availability.

The existing exhaust fans, serving the containment purge and auxiliary building general area, are sized to draw design flow rates when the exhaust air is aligned to bypass the existing filters. When these exhaust systems are diverted through the filters, the additional resistance of the filters reduces the flow rates of the systems which, in turn, increases auxiliary building cubicle temperatures and the duration of containment purging.

The changes to the system operation are accomplished by the following modifications:

1. Installation of a nonsafety-related high-head fan, (2-VS-F-59), sized to draw the design flow rate of the auxiliary building general area exhaust system through the nonsafety-related filter.

2. Installation of automatic capacity control for fans 1-VS-F59 A & B to draw any of the other exhaust systems, including the purge, through the safety-related filters, each at its respective design flow rate.

3. All existing fans will be used only to draw the exhaust systems when bypassing the filters. Removal of the purge exhaust fans (1-VS-F-5A and B) since purge air is rarely released without filtration.

SAFETY IMPLICATIONS

During Normal Operation, the modified ventilation system maintains design flow rates, which, in turn, limit the temperature in the ventilated areas to design conditions whether the exhaust streams are routed through or around the filters.

In the LOCA mode, the system maintains design flow rates of the charging pump cubicles and safeguards building streams through the safety-related filters. This ensures adequate cooling for all ECCS pump motors and adequate filtering of potential ECCS leakage into the exhaust air.

Upgrading the containment purge portion of the auxiliary building ventilation system improves the safety performance in the event of a fuel handling accident in the containment. The system will perform its safety function, assuming the worst single failure, without taking credit for the proper operation of any nonsafety systems.

During Refueling, the modified ventilation system will still have to be manually aligned as in the existing design. However, the isolation trips dampers at the safety-related filter inlet header would be manually deenergized from the control room to prevent a spurious signal from changing isolation damper alignment. A refueling accident in the fuel building or the containment would not require a change in system alignment. A LOCA in the operating unit during a refueling operation in the shutdown unit would require closure of the containment and fuel building exhaust dampers and permit filtration of the safeguards and charging pump cubicle exhaust air. This would be accomplished by manually reenergizing and closing the isolation trip dampers from the control room.

In the modified ventilation system, the two safety-related filtered exhaust fans are powered from the Unit 1 and Unit 2 orange buses. Provisions have also been made to supply electric power to the fans from the purple emergency buses of either unit. This prevents a force shutdown of both units in the event of an extended outage of an orange diesel generator of either unit.

The Categroy II filter bank is provided with automatic fire detection and manually initiated fire suppression (water). This is consistant with the fire protection requirements for the Category I filter banks (T.S. 3.21, 4.18) but the fire protection for the Category II filter will not be subject to the requirements of the technical specifications.

REFERENCES

1. The NRC's request for additional information, dated July 9. 1976.

2. The NRC's request for additional information, dated February 1, 1977.

3. The model technical specification, enclosed in the NRC letter, dated December 23, 1974, and referenced in question no. 14 of Reference 2.

4. The NRC's request for additional information, dated May 20, 1977.

AUXILIARY BUILDING VENTILATION SYSTEM MODIFICATIONS

ITEM	REGULATORY GUIDE 1.52 POSITION	DEVIATION	JUSTIFICATION FOR DEVIATION: LOCA MODE OF OPERATION	JUSTIFICATION FOR DEVIATION: REFUELING ACCIDENT MODE OF OPERATION
1	C.2.a	The existing safety-related filter trains do not include demisters	Moisture release is postulated not to exceed 4,800 cc/hr due to ECCS leakage. This results in a relative humidity less than 85 percent. See Item 3, below.	There is no potential for entrained water droplet in the exhaust air stream.
2	C.2.a	The existing safety-related filter trains do not include HEPA filters after the absorber banks.	The release of carbon fines from the absorbers to the environment is not part of the original design basis of of the station. The omission of the filters has been reviewed and found not to be an unreviewed safety question.	Same as for LOCA.
3	C.2.a	The existing safety-related filter trains do not include heaters	The acceptance criterion for the laboratory analysis of charcoal samples in 95 percent methyl iodide removal efficiency at a relative humidity of less than 85 percent is calculated on the following basis: a. Assuming 100 percent relative humidity outdoor air is supplied to ECCS equipment areas b. Taking credit for heat release from the minimum number of operating ECCS equipment c. Assuming a maximum internal moisture release of 4,800 cc/hr due to ECCS leakage	Charcoal samples tested to 95 percent methyl iodide removal efficiencies at a relative humidity 85 percent, will exhibit methyl iodine removal efficiency in excess of 70 percent with no control of relative humidity.
4	C.2.b	The existing safety-related filter trains are not protected against tornadoes	The probability of a LOCA followed by a tornado within 30 days is less than 10-7.	The filter system mitigates the consequences of the accident in two hours before the long term tornado could take place.

ITEM	REGULATORY GUIDE 1.52 POSITION	DEVIATION	JUSTIFICATION FOR DEVIATION: LOCA MODE OF OPERATION	JUSTIFICATION FOR DEVIATION: REFUELING ACCIDENT MODE OF OPERATION
5	C.2.f	Each existing safety-related filter train has 36,000 cfm capacity.	This nonconformance does not affect system safety function.	Same as for LOCA.
6	C.2.j	The existing safety-related filter trains are not designed for replacement as intact units or in a minimum number of segmented sections without removal of individual filter components.	Cutting the ESF filter system into segments without revmoval of individual components exposes the local environment and the personal working in it to unncessary contamination. When components are individually removed for packaging, shielding, and shipment, operating exposure is minimized. After all components are removed and the housing has been washed down, it is then determined whether the housing has been satisfactorily decontaminated for reuse or whether cutting for shipment and burial off site is required.	Same as for LOCA.
7	C.2.1	The filter ductwork is designed to exhibit on test a leakage rate of approximately 1 percent of system flow.	Since leakage is into the system, contamination of personnel is not a problem.	Same as for LOCA.
8	C.3.c	The existing prefilters do not meet UL Class 1 requirements.	The combustible material contained in the prefilters is insignificant (less than 20 percent) in comparison with the charcoal in the absorbers.	Same as for LOCA.
9	C.3.c	The existing prefilters do not have 45 percent atmospheric dust spot efficiency rating.	The low efficiency prefilters merely shorten the life of the HEPA filters; they do not affect system safety function.	Same as for LOCA.

ITEM	REGULATORY GUIDE 1.52 POSITION	DEVIATION	JUSTIFICATION FOR DEVIATION: LOCA MODE OF OPERATION	JUSTIFICATION FOR DEVIATION: REFUELING ACCIDENT MODE OF OPERATION
10	C.3.i	The 2 in. thick absorber beds are designed for an average residence time of 0.125 sec.	Laboratory analysis on charcoal samples is based on tests conducted at design residence time.	Same as for LOCA.
11	C.3.k	No decay heat removal system is provided.	The total decay energy (integrated to infinity) and the decay heat generation rate of the iodines released from 4,800 cc/hr of ECCS leakage is insufficient to raise the temperature at any point in the absorber bed to 200 F, assuming: a. 10 percent of the iodines in the ECCS leakage (at less than 212 F) becomes airborne, as per Standard Review Plan 15.6.5, Appendix B. b. An initial absorber bed equilibrium temperature of 125 F. c. Transient heat transfer and storage in the absorber bed is by conduction through a homogeneous medium.	Same as for LOCA, except that the airborne iodine inventory is in accordance with Regulatory Guide 1.25.
12	C.4.b	No space is provided between HEPA filter and absorber mounting frames for personnel access.	The lack of access space between the HEPA filter and absorber mounting frame makes in-place testing less convenient. It does not affect the system safety function.	Same as for LOCA.
13	C.5.c	The acceptance criterion for in-place hologen test is 99 percent efficiency.	Dose calculation take credit for 90 percent particulate removal efficiency. Therefore, the demonstration of 99 percent efficiency ensures that the required capability of filters is met or exceeded.	Dose calculations take credit for 70 percent particulate removal efficiency. Therefore, the demonstration of 99 percent efficiency ensures that the required capability of the filters is met or exceeded.

ITEM	REGULATORY GUIDE 1.52 POSITION	DEVIATION	JUSTIFICATION FOR DEVIATION: LOCA MODE OF OPERATION	JUSTIFICATION FOR DEVIATION: REFUELING ACCIDENT MODE OF OPERATION
14	C.5.d	The acceptance criterion for in-place test is 99 percent efficiency.	Dose calculations take creidt for 90 percent removal efficiency for all species of iodine. Therefore, the demonstration of 99 percent efficiency fore the in-place halogen test combined with the 95 percent methyl iodine removal efficiency for the laboratory test ensures that the required capability of the filters is met or exceeded.	Dose calculations take credit for 90 percent removal efficiency for all species of iodine. Therefore, demonstration of 99 percent efficiency for the in-place halogen test combined with the 95 percent methyl iodide removal efficiency for the laboratory test ensures that the required capability of the filters is met or exceeded.

Attachment III

Issue Date: July 25, 1979

MODIFIED AUXILIARY BUILDING VENTILATION SYSTEM DESCRIPTION

SURRY POWER STATION

UNITS 1 AND 2

VIRGINIA ELECTRIC AND POWER COMPANY

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

SUMMARY

The auxiliary ventilation system consists of the following subsystems:

1. Fuel building supply and exhaust ventilation
2. Decontamination building supply and exhaust ventilation
3. Unit 1 safeguards building supply and exhaust ventilation
4. Unit 2 safeguards building supply and exhaust ventilation
5. Auxiliary building central area supply and charging pump exhaust ventilation
6. Auxiliary building general area supply and exhaust ventilation
7. Containment purge supply and exhaust ventilation
8. Safety-related auxiliary exhaust filtration (CAT I filters)
9. Nonsafety-related auxiliary building exhaust filtration (CAT II filters)

The above exhaust streams are manifolded at the top floor of the auxiliary building, discharged through a common ventilation vent and continuously monitored for radioactivity. This release is in the wake of Unit 2 containment.

1.0 SYSTEM DESIGN 2.11

1.1 DETAILED SYSTEM DESIGN DESCRIPTION 2.13

The following design description is based on the flow diagram 2.15
11448-FKS-24 included in this document. The scope of this 2.15/
document is to describe the modified auxiliary ventilation system
design and operation.

1.1.1 Fuel Building Supply and Exhaust Ventilation 2.17

The fuel building ventilation exhaust rate of 35,500 cfm is based 2.19
on inhibiting condensation, from the spent fuel storage pool with 2.20
summer design temperatures to 140°F. The supply and exhaust 2.21
ventilation subsystem is also designed to limit indoor design
temperature to a minimum of 75°F in the winter and a maximum of 2.22
105°F in the summer.

The ventilation system is designed with a larger exhaust flow 2.24
rate than supply flow rate to ensure only inward leakage. 2.25

The air supply stream is filtered to help maintain the fuel pool 2.27
water clarity. The ventilation air supply subsystem consists of 2.28
an outdoor air intake without shutoff dampers; an air filtration 2.29
unit (1-VS-FL-2), a face and bypass damper, heating coil
(1-HS-E-2), two supply fans (1-VS-F-6 and 1-VS-F-39), an 2.30
indicating flow meter, distribution ductwork, dampers, and
control instrumentation to supply 34,000 cfm. 3.1

This subsystem is Quality Category II, Quality Group D (CAT II). 3.3
This subsystem is powered from the normal electric bus. 3.4

The ventilation exhaust subsystem is designated in this document 3.6
as exhaust stream "F." It consists of two 50 percent capacity 3.7
exhaust fans (1-VS-F-7A&7B) and exhaust ductwork to the 3.8
ventilation vent with a connection through isolation trip dampers
to the CAT I filters. Within the fuel building the exhaust 3.9
ductwork is CAT II. The subsystem classification changes to 3.10
CAT I at the penetration through the fuel building wall. The 3.11
exhaust subsystem is powered from the normal electric bus. It 3.12
draws air across the surface of the pool and exhausts 35,500 cfm
from the fuel building and the waste gas compressor and surge 3.13
drum room. The exhaust air is monitored for radioactivity at the 3.14
building exhaust duct. The air is exhausted outdoors through the 3.15
ventilation vent which is also monitored.

1.1.2 Decontamination Building Supply and Exhaust 3.19
Ventilation 3.20

The decontamination building ventilation subsystem is designed to 3.23
maintain a maximum temperature of 120°F in storage spaces and 3.24
100°F in work spaces and a minimum of 50°F and 65°F in these
areas during winter. The ventilation system is designed with a 3.26

larger exhaust flow rate than supply flow rate to ensure inward leakage. 3.27

The decontamination building air supply subsystem consists of: 3.29
outdoor air intake without shutoff dampers and one heating and 3.30
ventilating unit (1-VS-HV-5) which includes filter, face and
bypass damper, heating coil and air supply fan, as well as 4.1
distribution ductwork and control instrumentation. This 4.2
subsystem is CAT II. This subsystem is powered from the normal 4.3
electric bus. It delivers 9,000 cfm to the decontamination 4.4
building. From the boron pump house 2,200 cfm infiltrates for a 4.4/1
total supply of 11,200 cfm.

The ventilation exhaust subsystem is designated in this document 4.6
as exhaust stream "D." It consists of two 50 percent capacity 4.7
exhaust fans (1-VS-F-56A&B), a ducted exhaust connection from the
ultrasonic cleaning tanks complete with a demister, high 4.8
efficiency filter and a booster fan (1-VS-F-57), dampers and 4.9
control instrumentation and exhaust ductwork to the ventilation 4.10
vent with a connection through isolation trip dampers to the
CAT I filters.

The whole exhaust system with the exception of the exhaust fans 4.12
is CAT II. The exhaust fans and associated dampers are CAT I. 4.13

The exhaust subsystem is powered from the normal electric bus. 4.15
It draws 12,300 cfm from the entire decontamination building 4.16
including 2,200 cfm in filtration from the boron pump house into 4.16/
the decontamination building.

The exhaust air stream from the building is monitored for 4.18
radioactivity and discharged through the ventilation vent which 4.19
is also monitored.

1.1.3 Unit 1 and Unit 2 Safeguards Building Supply and Exhaust Ventilation 4.23 4.24

For purposes of this system description the following space 4.26/
designations are used:

Safeguards Room: The building enclosing the containment 4.26/
recirculation spray pump and the low head 4.26/
safety injection pump 4.26/

Spray Pumps Room: The building enclosing the containment 4.26/
spray pumps, refueling water 4.26/
recirculation pumps, and subsurface
discharge pumps 4.26/

Containment Air 4.26/
Compressor Cubicle: Self-explanatory 4.26/

Safeguards 4.26/
Building: The entire enclosure consisting of the 4.26/
safeguards room, spray pumps room, and
containment air compressor cubicle

The safeguards building ventilation subsystem is designed for a 5.14
maximum space temperature of 120°F in the summer with all safety- 5.15
related equipment in operation and a minimum space temperature of 5.15/
60°F in the winter.

The ventilation system is designed with a larger exhaust flow 5.17
rate than supply flow rate to ensure inward leakage. 5.18

The safeguards building air supply subsystem consists of an 5.20
outdoor air intake without shutoff dampers and a heating and 5.21
ventilating unit (1-VS-HV-4 for Unit 1 and 2-VS-HV-4 for Unit 2)
which includes filters, face and bypass dampers, heating coil and 5.22
fan, distribution ductwork and control instrumentation. The 5.23
supply subsystem is CAT II. powered from the normal electric
bus. It is powered from the normal electric bus. The subsystem 5.23/
delivers a total of 16,000 cfm; 4,000 cfm to the spray pump room 5.24
and 12,000 cfm to the rest of the building.

The safeguards building exhaust subsystem is designated in this 5.26
document as exhaust stream "SG1" ("SG2" for Unit 2). It consists 5.28
of two 50 percent capacity exhaust fans (1-VS-F-40A&B for Unit 1
and 2-VS-F-40A&B for Unit 2), a ducted exhaust branch with 5.29
isolation trip dampers for the containment instrument air
compressor cubicle, control instrumentation and exhaust ductwork 5.30
to the ventilation vent with a connection through isolation trip 6.1
dampers to the CAT I filters. The exhaust flow rate of an SG 6.2
stream at 12,000 cfm is based on the LOCA mode of operation with 6.3
the isolation dampers to the air compressor cubicle duct closed.
A two-speed roof fan (1-VS-F-43 for Unit 1 and 2-VS-F-43 for 6.5
Unit 2) exhausts the balance of the air from the spray pump room. 6.6

Each exhaust subsystem is CAT I except for the air exhaust branch 6.9
duct for the containment instrument air compressor cubicle and
the roof exhaust fan. 6.10

The exhaust subsystem is powered from the emergency electric bus 6.12
and the roof fan is connected to the normal electric bus. 6.13
Exhaust stream SG1 (SG2) is monitored for radioactivity prior to 6.15
release.

1.1.4 Auxiliary Building Central Area Supply and Charging Pumps Exhaust Ventilation 6.21 6.22

The auxiliary building ventilation subsystem is designed to limit 6.25
the maximum temperature in normally occupied spaces to 105°F and 6.25/
in normally unoccupied machinery spaces to 120°F.

The ventilation equipment is designed with a larger exhaust flow 6.29
rate than supply flow rate to ensure inward leakage. 6.30

The auxiliary building air supply subsystems for both the central 7.2
and general areas are common and identical. They consist of 7.3
outdoor air intakes without shutoff dampers and two heating and
ventilating units (1-VS-HV-1A&B) which include: filter, face and
bypass damper, heating coil and air supply fans, distribution 7.4
ductwork and control instrumentation.

These supply subsystems are classified CAT II and are powered 7.7
from the normal electric bus. The system is rated to deliver a 7.7/1
total of 62,000 cfm (31,000 cfm each unit) to the auxiliary 7.8
building.

The charging pump exhaust ventilation subsystem designated in 7.10
this document as exhaust stream "C" consists of two 100 percent 7.11
capacity exhaust fans (1-VS-F-9A&B), control instrumentation and 7.12
exhaust ductwork to the ventilation vent with a connection
through isolation dampers to the CAT I filters. The subsystem 7.13
has two position motor-operated dampers on the exhaust duct from
each charging pump cubicle. The damper motors from the pump 7.15
cubicles are interconnected with the charging pump motor to open
when the pump operates and close when the pump stops. The "C" 7.16/
stream also exhausts air from the cubicles of the seal water and
nonregenerative heat exchangers, purification, and sump pumps, 7.16/
and high and low level waste drain filters. The maximum design 7.17
exhaust rate of the "C" stream of 22,000 cfm is based on the LOCA
mode of operation when a maximum of 3 charging pumps are 7.18
postulated to operate: 2 charging pumps on the unit requiring 7.19
high head safety injection and one charging pump for the other
unit. During normal station operation the "C" stream exhaust is 7.19/
15,500 cfm.

The exhaust subsystem is classified CAT I and powered from the 7.21
emergency electric bus. The exhaust air stream from the building 7.22
is continuously monitored for radioactivity.

1.1.5 Auxiliary Building General Area Supply and Exhaust 7.27
Ventilation 7.28

The general area supply ventilation was described in 8.2
Section 1.1.4.

The general area exhaust ventilation subsystem is designated in 8.4
this document as exhaust stream "G" and consists of ductwork, two 8.5
50 percent capacity exhaust fans (1-VS-F-8A&B) control
instrumentation and exhaust ductwork to the ventilation vent with 8.6
a connection through isolation trip dampers to the CAT II filter.

Roof exhaust fan (1-VS-F-10) may be used intermittently, as 8.8
required, to exhaust the cement storage and drumming areas.

Exhaust stream "G" is classified CAT II except for the exhaust 8.10
fans and dampers which are CAT I. The exhaust subsystem "G" and 8.11
the roof fan are powered from the normal electric bus. Exhaust 8.12
stream G and the roof fan exhaust flow rates are 47,300 cfm and
2,500, respectively.

The exhaust air stream "G" from the building is monitored for 8.14
radioactivity during discharge.

1.1.6 Containment Purge Supply and Exhaust Ventilation 8.18

The purge system is designed for one air change of a containment 8.20
per hour and to maintain a minimum of 60°F inside the 8.20/
containment.

Motor-operated butterfly valves are installed on both sides of 8.24
the containment penetrations for isolation. A branch connection 8.25
fitted with an intake filter and motor-operated butterfly valve
is installed in the supply stream between the outer isolation 8.26
valve and the containment boundary. This connection will enable 8.26/
the containment to be brought to atmospheric pressure prior to 8.27
operation of the purge supply and exhaust subsystems.

Containment purge supply subsystem consists of a filter, face and 8.29
bypass damper and heating coil (1-HS-E-1), two supply fans rated 8.30
at 14,500 cfm each (1-VS-F-4A and B), distribution ductwork,
controls, and instrumentation.

This supply air stream is CAT II, except for the containment 9.2
isolation butterfly valves which are CAT I. This subsystem is 9.3
powered from the normal electric bus.

The purge exhaust ventilation stream rated at 30,000 cfm is 9.5
designated in this document as exhaust stream "RC1" and "RC2",
for Unit 1 and Unit 2, respectively. The stream consists of 9.6/1
isolation valves, instrumentation, and exhaust ductwork
connecting to the CAT I filters.

The exhaust streams "RC1" and "RC2" are classified CAT II inside 9.8
containment, and CAT I outside containment, and CAT I Group B 9.8/1
between and including the containment isolation valves. 9.9

1.1.7 Safety-Related Auxiliary Exhaust Filtration 9.12
(CAT I Filters) 9.12/

The CAT I filter subsystem is designed to provide for radioactive 9.14
iodine and methyl iodide removal from the exhaust air streams F, 9.15
D, SG1, SG2, C, and RC1 or RC2 described above. The filter 9.18
provides for: (1) uniform air distribution within ±20 percent of
average flow across the face of the filter, (2) 99.0 percent 9.19
particulate removal efficiency, and (3) 1.0 percent halogen
leakage and 95 percent methyl iodide removal efficiency with 9.20

influent air at maximum of 125°F, 85 percent relative humidity 9.21
and 0.125 seconds residence time.

The CAT I filter subsystem consists of an inlet header, redundant 9.23
filter trains (1-VS-FL-3A&B) with prefilter, HEPA filter and 9.24
charcoal adsorber, exhaust fans (1-VS-F-58A and B), dampers,
control instrumentation and exhaust ductwork to the continuously 9.25
monitored ventilation vent. The capacity of each filter train 9.26
and fan (36,000 cfm) will meet the LOCA mode of operation when 9.27
the "C" and "SG" streams at 22,000 and 12,000 cfm, respectively,
are diverted through the filters to treat ECCS leakage postulated 9.28
to have evaporated within the spaces served by these two exhaust
streams. The 2,000 cfm excess filter capacity is an allowance 9.28/
for damper leakage.

With periodic verification of filters performance, credit is 10.1
taken for 90 percent iodine removal efficiency for LOCA
conditions.

The safety-related auxiliary exhaust filtration subsystem is 10.9
classified CAT I. The redundant exhaust fans, 1-VS-F-58A and B, 10.10
are powered from the Unit 1 orange and the Unit 2 orange
emergency buses, respectively. 10.11

Provisions have been made for supplying an alternate source of 10.13
power from Unit 2 purple bus to fan 1-VS-F-58A to prevent forced 10.14
Unit 2 shutdown due to the loss of CAT I filter subsystem
redundancy during extended outage of Unit 1 orange diesel 10.15
generator.

Provisions have also been made for supplying an alternate source 10.17
of power from Unit 1 purple bus to fan 1-VS-F-58B to prevent 10.18
forced Unit 1 shutdown due to the loss of CAT I filter redundancy 10.19
during extended outage of Unit 2 orange diesel generator.

1.1.8 Nonsafety-Related Auxiliary Building Exhaust Filtration 10.23 (CAT II Filter) 10.24

The CAT II filter subsystem is designed to provide for 10.27
radioactive iodine and methyl iodide removal from exhaust stream 10.28
"G." Specifically, it provides for: (1) uniform air distribution 10.30
within ±20 percent of average flow across the face of the filter, 11.1
(2) 99.95 percent particulate removal efficiency, and
(3) 0.05 percent halogen leakage and 90 percent methyl iodide 11.2
removal efficiency with influent air at a maximum of 125°F,
70 percent relative humidity, and 0.25 seconds residence time. 11.3

The CAT II filter subsystem consists of a filter assembly 11.5
(1-VS-FL-14) containing prefilter, HEPA filter charcoal adsorber, 11.6
air exhaust fan (1-VS-F-59), dampers, control instrumentation and
exhaust ductwork with isolation trip dampers to the ventilation 11.7
vent. The capacity of the filter assembly and fan (48,000 cfm) 11.8

is based on the mode which routes the "G" air stream (47,300 cfm) through the filter. 11.9

The nonsafety-related auxiliary building exhaust filtration 11.11
subsystem is classified CAT II up to isolation trip dampers which 11.12
connect to the CAT I breeching at the ventilation vent. The 11.13
subsystem fans are powered from the normal bus.

1.1.9 <u>Design Conditions</u> 12.15

1. Outdoors: 12.18

Summer	dry bulb,°F	93	12.20
	wet bulb,°F	78	12.21
	dew point,°F	73	12.22
Winter	dry bulb,°F	10	12.23

2. Indoors: 12.27

Fuel Building 12.29

With a 140°F fuel pool water temperature 13.1
75°F minimum temperature 13.2
105°F maximum and 79°F dew point 13.3

Decontamination Building 13.7

120°F maximum, 50°F minimum for storage and tank spaces 13.9
100°F maximum, 65°F minimum for work spaces 13.10

Safeguards Building 13.14

120°F maximum in pump cubicles 13.16
50°F minimum 13.17

Auxiliary Building 13.21

120°F maximum, 50°F minimum nuclear auxiliary equipment 13.23
cubicles 13.24

105°F maximum, 50°F minimum for the balance of the building 13.28
and ventilation equipment room 13.29

Reactor Containment - shut down conditions 14.3

60°F minimum with purging system in operation 14.5

1.2 ARRANGEMENT 14.11

The arrangement of the system described above is shown on the 14.13
drawings (later).

Special design features of the individual subsystems are as 14.16
follows:

a. Isolation trip dampers 14.18

The fuel building (F), decontamination building (D), and 14.19
purge (RC) exhaust streams connect to the CAT I filter 14.21
subsystem through air-operated isolation trip dampers to 14.23
ensure the isolation of these streams from the filter
following LOCA. For a refueling accident, automatic 14.25
opening of the F and RC isolation trip dampers is not
required since they are opened prior to the start of 14.26
refueling operations and designed to remain open for two
hours which is the postulated duration for mitigating 14.27
the consequences of a refueling accident (NRC Regulatory
Guide 1.25, position C.1.i.).

The charging pumps (C) and safeguards (SG1 or SG2) 14.29
exhaust streams are each connected to the CAT I filter 14.30
subsystem through two isolation trip dampers in parallel
to ensure the opening of these streams to the filters 15.1
following a LOCA. Unlike all the other isolation trip 15.2
dampers, the safeguards dampers are motor-operated since
only the "SG" stream at the unit with LOCA is to remain 15.3
open and the "SG" stream of the unit without a LOCA is
to remain closed for an extended period following a LOCA 15.3/
when compressed air is not available.

All exhaust streams which bypass the CAT I filter and 15.5
connect to the breaching at ventilation vent are 15.6
provided with air-operated isolation trip dampers to
ensure closure following a LOCA. 15.7

Redundant isolation trip dampers are provided at all 15.9
safety class changes in ductwork to ensure the 15.9/
maintenance of design air flows during and after
accident conditions. 15.9/

b. Isolation dampers 15.14

Manual dampers DMP60A, DMP60B, and DMP64 are provided 15.16
for isolation of the filters during maintenance and 15.17
testing.

Manual dampers DMP61A, DMP61B, DMP62, and DMP63 are 15.20
provided to facilitate operation during the construction 15.21
phase of the ventilation system modification. These 15.22
dampers have no function in the final modified system
and will be locked in the open or closed position as
shown on the flow diagram. 15.23

c. Air distribution within filters 15.26

The inlet and outlet plenums of the CAT I filters are 15.28
provided with subplenums of approximately the same 15.29
dimensions as the filter banks. Perforated sheet metal 16.2
in the inlet and outlet subplenums reduce entering and 16.3
leaving air turbulence to provide uniform air
distribution through the filter banks to meet technical 16.3/
specification requirements.

d. Charcoal filter test canister arrangement 16.6

A set of 18 test canisters is installed across the 16.9
adsorber bank of each CAT I filter train to permit
charcoal sampling for periodic laboratory analysis 16.11
without breaking the adsorber/frame seal. The canisters 16.12
provide an air flow path in parallel to the main
adsorbers and are removable from the outlet plenum.

1.3 COMPONENT DESIGN 16.15

The following description covers only principal design features 16.17
of major air supply and exhaust system components. For 16.18
additional information, refer to the component specifications.

1.3.1 Heating and Ventilating Units 16.22

The air is supplied to each building by heating and ventilating 16.24
units which are listed in the following table: 16.24

Building	Heating and Ventilation Supply Unit Mark No.	Component Mark No.	Air Supply Capacity, Cfm	Pressure, In W.G.	
					17.15 17.15 17.15 17.15
Fuel	None	1-VS-FL-2			17.20
	(Built up	1-HS-E-2			17.20
	Unit)	1-VS-F-6	29,000	2.75	17.20
		1-VS-F-39	5,000	5.00	17.20
Decon.	1-VS-HV-5	None	9,000	2.25	17.24
		(Factory			17.24
		Assembled			17.24
		Unit)			17.24
Safeguards	2-VS-HV-4	None	16,000	2.25	17.27
Safeguards	1-VS-HV-4	None	16,000	2.25	17.28
Auxiliary	1-VS-HV-1A	None	31,000	Later	18.1
	1-VS-HV-1B	None	31,000	Later	18.2

Building	Heating and Ventilation Supply Unit Mark No.	Component Mark No.	Air Supply Capacity, Cfm	Pressure, In W.G.	
Contain-	None	1-HS-E-1			18.5
ment Purge		1-VS-F-4A	14,500	5.0	18.6
		1-VS-F-4B	14,500	5.0	18.6/

1.3.2 Exhaust Fans 18.14

The filter bypass exhaust fans which discharge directly to the ventilation vent as well as the filtered exhaust fans are nonoverloading, centrifugal type with single speed motors. 18.16 18.17

The capacity and static pressure are as follows: 18.20

System	No. of Fans	Equip. No.	Capacity Each, Cfm	Pressure in In, W.G.	Inlet Vanes	18.25 18.26 18.27
"F" Stream	2	1-VS-F-7A 1-VS-F-7B	17,750	9.25	Yes	18.29 18.30
"D" Stream	2	1-VS-F-56A 1-VS-F-56B	6,150	5.5	No	19.13 19.14
"SG2" Stream	2	2-VS-F-40A 2-VS-F-40B	6,000	5.5	No	19.18 19.19
"SG1" Stream	2	1-VS-F-40A 1-VS-F-40B	6,000	5.5	No	19.23 19.24
"C" Stream	2	1-VS-F-9A 1-VS-F-9B	15,500*	9.0	Yes	19.28 19.29
"G" Stream	2	1-VS-F-8A 1-VS-F-8B	23,650*	9.0	Yes	20.3 20.4
Safety-related Filters	2	1-VS-F-58A 1-VS-F-58B	36,000	Later	Yes	20.8 20.9
Nonsafety Filter	1	1-VS-F-59	48,000	Later	Yes	20.12

*Original design capacity - fan capacity to be reduced during 20.20
system balancing. 20.21

1.3.3 Safety-Related Auxiliary Exhaust Filtration Assemblies 20.26
(CAT I Filters) 20.27

The safety-related auxiliary building filtration assemblies 20.30
consist of the following sections: prefilter, HEPA filter, and 21.2
charcoal adsorber.

Prefilters are disposable type, faced with screen and bound with 21.5
metal edges. The filtering material is glass fiber, coated with 21.6
an adhesive and is temperature resistant to 250°F. 21.7

Filter efficiency is not less than 10 percent based on National 21.9
Bureau of Standards Discoloration Test Method with Atmospheric 21.10
Dust. The initial clean filter air resistance does not exceed 21.11
0.12 in. W.G. (±10 percent) at 300 fpm face velocity.

High Efficiency Particulate Air (HEPA) filters meet the 21.13
construction, materials, test, and qualification requirements of 21.14
ANSI Standard N509-1976, as well as military specification
MIL-F-0051068D, "Filter, Particulate, High Efficiency Fire 21.15
Resistant" and have fiberglass media conforming to the 21.16
requirements of military specification MIL-F-1079D, "Filter
Medium, Fire Resistant, High Efficiency. 21.17

Charcoal adsorbers are tray type filled with new adsorbent 21.19
charcoal meeting the requirements of ANSI 509-1976, Table 5-1, 21.20
except that the acceptance criterion of test 5.a for methyl 21.20
iodide removal efficiency is 98 percent at a residence time of
0.125 sec.

The acceptance criterion for periodic retest of representative 21.24
samples of used charcoal is 95 percent methyl iodide removal 21.25
efficiency at 125°F, 80 percent relative humidity and 0.125 sec
residence time.

The inlet and outlet air straighteners are shown on 21.27
Sketch 11448-BKS-10.

1.3.4 Nonsafety-Related Auxiliary Building Exhaust Filtration 22.1
(CAT II Filter) 22.2

The nonsafety-related auxiliary building filtration assembly is a 22.6
shop-fabricated, skid-mounted unit consisting of the following
sections: prefilter, HEPA filter, and charcoal adsorber. 22.7

Prefilters are replaceable type, surface dry type media with 22.10
minimum 80 percent efficiency as determined by the ASHRAE 22.11
Standard 52 method. Media are moisture resistant. 22.12

HEPA filters meet the construction, materials, test, and qualifi- 22.14
cation requirements of ANSI Standard N509-1976, as well as 22.15
military specification MIL-F-0051068D, "Filter, Particulate, High 22.16

Efficiency, Fire Resistant" and have fiberglass media conforming 22.17
to the requirements of military specification MIL-F-1079B, 22.18
"Filter Medium, Fire Resistant, High Efficiency."

Charcoal adsorbers are filled with new adsorbent charcoal meeting 22.20
the requirements of Reg Guide 1.140, Table 1.

The acceptance criterion for periodic retest of representative 22.20
samples of used charcoal is in accordance with Reg Guide 1.140, 22.20
Table 2.

1.3.5 Ducts 22.23

Nonsafety-related ducts and supports are constructed in 22.25
accordance with the applicable SMACNA Standards.

Ducts and supports for the upgraded safety-related systems are 22.28
designed in accordance with the Specification entitled, 22.29
"Installation of Ventilation and Air Conditioning," and the 22.30
Technical Guideline (Stone & Webster) EMTG-11-A dated
December 10, 1976, entitled "Design of Category I Duct Supports 23.1
for Seismic Installations."

1.3.6 Dampers 23.4

The design pressure for all dampers equals fan shutoff pressure. 23.6

The design leakage differential pressure for dampers is as 23.9
follows:

AOD-VS-105, 205, 109, and 110	2" W.G.	23.12
AOD-VS-102, 104, 106, 206, and 108	10" W.G.	23.13
AOD-VS-101, 103, 107, and 111	8" W.G.	23.14
MOD-VS-100, 101, 200, 201	8" W.G.	23.15
1-VS-DMP-60, 61, 62, 63, and 64	10" W.G.	23.16

All dampers are heavy-duty, opposed blade, Leakage Class II as 23.19
classified in ANSI N509.

1.4 INSTRUMENTATION AND CONTROL 23.22

Refer to logic and functional control diagrams to supplement the 23.24
design description below.

(Later) 23.27

1.5 ELECTRICAL POWER SYSTEMS 23.29

Electrical power is provided to the components of the auxiliary 23.30
ventilation system as described in Section 1.1 of this
specification. 23.30

Those components which are CAT I will be powered from the station 23.30
emergency buses. All other system components will be powered 23.30
from the station normal buses.

2.0 SYSTEM OPERATION 24.2

2.1 NORMAL OPERATION 24.4

2.1.1 Both Units On Line 24.6

2.1.1.1 No Radiation Alarm in Any Exhaust Stream 24.8

During this mode of station operation, the ventilation system is 24.10
aligned to operate as follows: 24.11

a. Fuel building 24.15

- The supply subsystem delivers 34,000 cfm 24.17
- The exhaust stream "F" is discharged at the rate of 24.20
35,500 cfm through the ventilation vent by fans 24.21
1-VS-F-7A and B.

b. Decontamination building 24.24

24.27
The supply subsystem supplies a total of 9,000 cfm.

- Exhaust stream "D" is discharged at the rate of 24.30
12,300 cfm through the ventilation vent by fans 25.1
1-VS-F-56A and B.

c. Unit 1 safeguards building 25.4

- The supply subsystem delivers 16,000 cfm. 25.7
- Exhaust stream "SG1" is discharged directly through 25.10
the ventilation vent by fans 1-VS-F-40A and B with 25.11
1,000 cfm drawn from the containment air compressor 25.12
cubicle and approximately 11,000 cfm from the
safeguards room. 25.13
- Roof fan 1-VS-F-43 exhausts 4,000 cfm from the 25.15
spray pump room. 25.16

d. Unit 2 safeguards building 25.19

The ventilation system operation for this building is 25.22
identical to that of Unit 1.

e. Auxiliary building 25.25

- The supply subsystem delivers 62,000 cfm. 25.28

- Exhaust stream "G" is discharged at the rate of 26.1
47,300 cfm directly through the ventilation vent by 26.2
fans 1-VS-F-8A and B.

- Exhaust stream "C" draws 15,500 cfm (if two 26.5
charging pumps are in operation) or 22,000 cfm (if 26.6
three charging pumps are in operation) by fan
1-VS-F-9A or B and is discharged directly through 26.7
the ventilation vent.

- Roof fan 1-VS-F-10 exhausts 2,500 cfm if required. 26.9
26.10

f. Reactor containment purge 26.13

This subsystem is not in operation. 26.15

g. CAT I filter 26.18

This subsystem is not in operation. 26.20

h. CAT II filter 26.23

This subsystem is not in operation. 26.25

2.1.1.2 Radiation Alarm in Exhaust Stream "G" 26.29

Upon detection and alarm of radiation activity in exhaust stream 27.1
"G," this one is manually diverted through the CAT II filter 27.2
subsystem and the ventilation system operates as follows: 27.4

a. Fuel building 27.7

- The supply subsystem delivers 34,000 cfm. 27.9

- Exhaust stream "F" is discharged at the rate of 27.12
35,500 cfm directly through the ventilation vent by 27.13
fans 1-VS-F-7A and B.

b. Decontamination building 27.16

27.19
The supply subsystem delivers 9,000 cfm.

- Exhaust stream "D" is discharged at the rate of 27.22
12,300 cfm directly through the ventilation vent by 27.23
fans 1-VS-F-56A and B.

c. Unit 1 safeguards building 27.26

- The supply subsystem delivers 16,000 cfm. 27.29

- Exhaust stream "SG1" is discharged directly through 28.2
  the ventilation vent by fans 1-VS-F-40A and B with 28.3
  1,000 cfm drawn from the containment air compressor 28.4
  cubicle and approximately 11,000 cfm from the
  safeguards room. 28.5

- Roof fan 1-VS-F-43 exhausts 4,000 cfm from the 28.7
  spray pump room. 28.8

d. Unit 2 safeguards building 28.11

The ventilation system operation for this building is 28.14
identical to that of Unit 1.

e. Auxiliary building 28.17

- The supply subsystems deliver 62,000 cfm. 28.20

- Fans 1-VS-F-8A and B are stopped, and exhaust 28.23
  stream "G" at the rate of 47,300 cfm is diverted to 28.24
  the CAT II filter subsystem as described below.

- Exhaust stream "C" draws 15,500 cfm (if two 28.27
  charging pumps are in operation) or 22,000 cfm (if 28.28
  three charging pumps are in operation) by fan
  1-VS-F-9A or B and is discharged directly through
  the ventilation vent. 28.29

- Roof fan 1-VS-F-10A exhausts 2,500 cfm, if 29.1
  required. 29.2

f. Reactor containment purge 29.5

This subsystem is not in operation. 29.7

g. CAT I filter 29.10

This subsystem is not in operation. 29.12

h. CAT II filter 29.15

Exhaust fan 1-VS-F-59 draws the "G" stream at the rate 29.17
of 47,300 cfm through the filter. 29.18

2.1.1.3 Radiation Alarm in Exhaust Streams "G" and "F" 29.22

Upon detection and alarm of radiation activity in exhaust 29.24
streams "G" and "F," stream "G" is manually diverted through the 29.25
CAT II filter subsystem, the "F" stream is manually diverted 29.27
through the CAT I filter subsystem, and the ventilation system 29.28
operates as follows:

a. Fuel building 30.1

- The supply subsystem delivers 34,000 cfm. 30.4

- Exhaust fans 1-VS-F-7A and B are stopped, and ex- 30.7
haust stream "F" is diverted to the CAT I filter 30.8
subsystem as described below.

b. Decontamination building 30.11

30.14
The supply subsystem delivers 9,000 cfm.

- Exhaust stream "D" is discharged at the rate of 30.17
12,300 cfm directly through the ventilation vent by 30.17
fans 1-VS-F-56A and B.

c. Unit 1 safeguards building 30.21

- The supply subsystem delivers 16,000 cfm. 30.24

- Exhaust stream "SG1" is discharged directly through 30.27
the ventilation vent by fans 1-VS-F-40A and B with 30.28
1,000 cfm drawn from the containment air compressor 30.29
cubicle and approximately 11,000 cfm from the
safeguards room. 30.30

- Roof fan 1-VS-F-43 exhausts 4,000 cfm from the 31.2
spray pump room. 31.3

d. Unit 2 safeguards building 31.6

The ventilation system operation for this building is 31.9
identical to that of Unit 1.

e. Auxiliary building 31.12

- The supply subsystem delivers 62,000 cfm. - The 31.15
supply subsystem delivers 62,000 cfm.

- Fans 1-VS-F-8A and B are stopped and exhaust stream 31.19
"G" at 47,300 cfm is diverted to the CAT II filter 31.19
subsystem as described below.

- Exhaust stream "C" draws 15,500 cfm (if two 31.22
charging pumps are in operation) or 22,000 cfm (if 31.23
three charging pumps are in operation) by fan
1-VS-F-9A or B and is discharged directly through 31.24
the ventilation vent.

- Roof fan 1-VS-F-10 exhausts 2,500 cfm if required. 31.26

f. Reactor containment purge 31.29

- This subsystem is not in operation. 32.1

g. CAT I filter 32.4

Damper AOD-VS-101 is opened, and exhaust fan 1-VS-F-58A 32.7
or B is operated to draw the "F" stream through filter 32.9
1-VS-FL-3A or B, respectively. The exhaust flow rate of 32.10
the "F" stream is automatically controlled at
35,500 cfm.

h. CAT II filter 32.13

Exhaust fan 1-VS-F-59 is operated to draw the "G" stream 32.15
at a rate of 47,300 cfm through the filter.

2.1.1.4 Radiation Alarm in Exhaust Streams "G," "F," and "D" 32.19

Upon detection and alarm of radiation activity in exhaust streams 32.21
"G," "F," and "D," stream "G" is manually diverted through the 32.22
CAT II filter subsystem, the "F" and "D" streams are manually 32.24
diverted through the CAT I filter subsystem, and the ventilation 32.25
system operates as follows:

a. Fuel building 32.28

- The supply subsystem delivers 34,000 cfm. 32.30

- Exhaust fans 1-VS-F-7A and B are stopped, and 33.4
exhaust stream "F" is diverted to the CAT I filter 33.5
subsystem as described below.

b. Decontamination building 33.8

33.11
The supply subsystem delivers 9,000 cfm.

- Exhaust fans 1-VS-F-56A and B are stopped, and 33.14
exhaust stream "D" at a rate of 12,300 cfm is 33.15
diverted to the CAT I filter subsystem as described
below.

c. Unit 1 safeguards building 33.18

- The supply subsystem delivers 16,000 cfm. 33.21

- Exhaust stream "SG1" is discharged directly through 33.24
the ventilation vent by fans 1-VS-F-40A and B with 33.25
1,000 cfm drawn from the containment air compressor 33.26
cubicle and approximately 11,000 cfm from the
safeguards room. 33.27

- Roof fan 1-VS-F-43 exhausts 4,000 cfm from the 33.29
spray pump room. 33.30

d. Unit 2 safeguards building 34.3

The ventilation system operation for this building is 34.6
identical to that of Unit 1.

e. Auxiliary building 34.9

- The supply subsystems deliver 62,000 cfm. 34.12

- Fans 1-VS-F-8A and B are stopped, and exhaust 34.15
stream "G" at a rate of 47,300 cfm is diverted to 34.16
the CAT II filter subsystem as described below.

- Exhaust stream "C" draws 15,500 cfm (if two 34.19
charging pumps are in operation) or 22,000 cfm (if 34.20
three charging pumps are in operation) by fan
1-VS-F-9A or B and is discharged directly through 34.21
the ventilation vent.

- Roof fan 1-VS-F-10A exhausts 2,500 cfm, if 34.23
required. 34.23

f. Reactor containment purge 34.26

This system is not in operation. 34.28

g. CAT I filter 35.2

Dampers AOD-VS-101 and AOD-VS-103A and B are opened and 35.5
exhaust fans 1-VS-F-58A and B are operated to draw the 35.7
"F" and "D" streams through filters 1-VS-FL-3A and B.
The exhaust flow rates of the "F" and "D" stream are 35.8
automatically controlled at a rate of 35,500 and
12,300 cfm, respectively.

h. CAT II filter 35.11

The exhaust fan 1-VS-F-59 draws the "G" stream at a rate 35.14
of 47,300 cfm through the filter.

2.1.1.5 Radiation Alarm in Other Exhaust Stream Combinations 35.17

In other combinations of radiation in exhaust streams "F," "D," 35.19
"SG1," "SG2," and "C," the ventilation system operation remains 35.20
similar to that described above.

Any three-stream combination may be filtered simultaneously by 35.23
the CAT I filter subsystem. Any four-stream combination may also 35.24
be filtered provided "F" and "C" are not the two of the four
contaminated streams. All five streams cannot be filtered 35.25
simultaneously. If "F," "C," and two other streams or all five 35.26
streams are diverted through the CAT I filter subsystem, the 35.27
capacity of the filter trains will be exceeded resulting in
degraded filter performance as well as reduced exhaust flow rate. 35.28
The reduced exhaust flow rate will pressurize the buildings and 35.29
result in exfiltration of contaminated air from the buildings to 35.30
outdoors and adjacent areas.

2.1.2 Unit 1 On Line and Unit 2 Off Line 36.3

2.1.2.1 Cooldown and Purging of Unit 2 36.5

During this mode of station operation, the ventilation system is 36.7
aligned to operate as follows: 36.8

a. Fuel building 36.12

- The supply subsystem delivers 34,000 cfm. 36.15

- Exhaust stream "F" is discharged at a rate of 36.17
12,300 cfm directly through the ventilation vent by 36.18
fans 1-VS-F-7A and B.

b. Decontamination building 36.21

36.24
The supply subsystem delivers 9,000 cfm.

- Exhaust stream "D" is discharged at a rate of 36.27
12,300 cfm directly through the ventilation vent by 36.28
fans 1-VS-F-56A and B.

c. Unit 1 safeguards building 37.1

- The supply subsystem delivers 16,000 cfm. 37.4

- Exhaust stream "SG1" is discharged directly through 37.7
  the ventilation vent by fans 1-VS-F-40A and B with 37.8
  1,000 cfm drawn from the containment air compressor 37.9
  cubicle and approximately 11,000 cfm from the
  safeguards room. 37.10

- Roof fan 1-VS-F-43 exhausts 4,000 cfm from the 37.12
  spray pump room. 37.13

d. Unit 2 safeguards building 37.16

The ventilation system operation for this building is 37.19
identical to that of Unit 1.

e. Auxiliary building 37.22

- The supply subsystem delivers 62,000 cfm. 37.25

- Exhaust stream "G" is released at the rate of 37.29
  47,300 cfm directly through the ventilation vent by
  fans 1-VS-F-8A and B.

- If all the charging pumps of Unit 2 have been shut 38.1
  down, then one of the MOD-VS-101 or MOD-VS-201 38.2
  dampers in the cubicle of a nonoperating charging 38.2/
  pump is manually opened. This open damper, 38.3
  together with the open damper of an operating
  charging pump of Unit 1, allows stream "C" to be 38.4
  exhausted at a rate of 15,500 cfm through the
  ventilation vent by fans 1-VS-F-9A and B, thus 38.5
  preventing the pressurization of the auxiliary
  building.

- Roof fan 1-VS-F-10A exhausts 2,500 cfm, if 38.7
  required. 38.7/

f. Reactor containment purge 38.10

- The supply subsystem delivers 29,000 cfm to Unit 2 38.13
  containment.

- Exhaust stream "RC2" is diverted to the CAT I 38.16
  filter subsystem as described below. 38.17

g. CAT I filter 38.20

Damper AOD-VS-111 is opened and exhaust fan 1-VS-F-58A 38.22
or B draws the "RC2" stream through the filter train 38.25
1-VS-FL-3A or B, respectively. The exhaust flow rate of 38.26
the "RC2" stream is automatically controlled at a rate
of 30,000 cfm.

h. CAT II filter 38.29

This subsystem is not operating. 39.1

2.1.2.2 Refueling Unit 2 39.4

During this mode of station operation, the ventilation system is 39.6
aligned to operate as follows: 39.7

a. Fuel building 39.10

- The supply subsystem delivers 34,000 cfm. 39.13

- Exhaust fans 1-VS-F-7A and B are stopped, isolation 39.16
trip damper AOD-VS-102 is closed, and exhaust 39.17
stream "F" is diverted to the CAT I filter sub- 39.18
system as described below.

b. Decontamination building 39.21

39.24
The supply subsystem delivers 9,000 cfm.

- Exhaust stream "D" is discharged at a rate of 39.27
12,300 cfm directly through the ventilation vent by 39.28
fans 1-VS-F-56A and B.

c. Unit 1 safeguards building 40.1

- The supply subsystem delivers 16,000 cfm. 40.4

- Exhaust stream "SG1" is discharged directly through 40.7
the ventilation vent by fans 1-VS-F-40A and B with 40.8
1,000 cfm drawn from the containment air compressor 40.9
cubicle and approximately 11,000 cfm from the
safeguards room. 40.10

- Roof fan 1-VS-F-43 exhausts 4,000 cfm from the 40.12
spray pump room. 40.13

d. Unit 2 Safeguards Building 40.16

The ventilation system operation for this building is 40.19
identical to that of Unit 1.

e. Auxiliary building 40.22

- The supply subsystem delivers 62,000 cfm. 40.25

- Exhaust stream "G" is discharged at a rate of 40.28
47,300 directly through the ventilation vent by 40.29
fans 1-VS-F-8A and B.

- If all the charging pumps of Unit 2 have been shut 40.30
down, then one of the MOD-VS-101 or MOD-VS-201 40.30
dampers in the cubicle of a nonoperating charging 41.2
pump is manually opened. This open damper, 41.2/
together with the open damper of an operating
charging pump of Unit 1, allows stream "C" to be
exhausted at a rate of 15,500 cfm through the 41.2/
ventilation vent by fans 1-VS-F-9A and B, thus
preventing the pressurization of the auxiliary 41.2/
building.

- Roof fan 1-VS-F-10 exhausts 2,500 cfm if required. 41.6

f. Reactor containment purge 41.9

- The supply subsystem delivers 29,000 cfm to Unit 2 41.10
containment.

- Exhaust stream "RC2" is diverted to the CAT I 41.10
filter subsystem as described below. 41.10

g. CAT I filter 41.14

Isolation trip dampers of "F" and "RC" streams 41.16
(AOD-VS-101 and AOD-VS-111) to the CAT. I filter header
are opened. Isolation trip dampers of "SG1, "SG2" and 41.17
"C" streams (MOD-VS-100A and B, MOD-VS-200A and B and
AOD-VS-107A and B) to the CAT. I filter header are 41.19
closed. All eight dampers are electrically deenergized 41.20
to prevent accidental change of damper position.
Exhaust fans 1-VS-F-58A and B draw the "F" and "RC2" 41.21
streams through both filter trains 1-VS-FL-3A and B. 41.22
The exhaust flow rates of the "F" and "RC2" streams are 41.23
automatically controlled at 35,500 and 30,000 cfm,
respectively.

h. CAT II filter 41.26

This system is not in operation. 41.28

2.1.2.3 Misc. Maintenance on Unit 2 Following Refueling 42.2

During this mode of station operation, the ventilation system is 42.5
aligned to operate in the same manner as in Section 2.1.2.1.
(This means that the dampers which were deenergized in refueling 42.7
mode described in Section 2.1.2.2 are electrically reenergized 42.7/
during this mode.

2.1.2.4 Misc. Maintenance on Unit 2 Following Refueling with 42.12
Radiation Activity in Exhaust Stream "F" 42.13

If radiation activity is detected in the "F" stream following the 42.16
movement and storage of spent fuel, the ventilation system 42.17
alignment and operation are identical to those described in 42.19
Section 2.1.2.2, except that power is restored to the open 42.20
dampers AOD-VS-101 and AOD-VS-111.

2.1.3 Unit 1 Off Line and Unit 2 On Line 42.23

The operation of the ventilation system during the shutdown, 42.25
purging, and refueling of Unit 1 is identical to that described 42.26
for Unit 2 in Section 2.1.2.

2.2 ACCIDENT OPERATION 42.30

2.2.1 Both Units On Line Followed by LOCA in Unit 1 43.2

With the ventilation system aligned in any one of the modes 43.4
described above in Sections 2.1.1.1 through 2.1.1.5, a LOCA in 43.5
Unit 1 would realign the ventilation system to operate as 43.6
follows:

a. Fuel building 43.9

- The supply subsystem may continue to operate if 43.11
  normal power remains available. 43.12

- The exhaust isolation trip damper AOD-VS-102 closes 43.16
  automatically and exhaust fans 1-VS-F-7A and B stop
  automatically.

b. Decontamination building 43.19

- The supply subsystem may continue to operate if 43.21
  normal power remains available. 43.22

- The exhaust isolation trip damper AOD-VS-104 closes 43.26
  automatically and exhaust fans 1-VS-F-56A and B
  stop automatically.

c. Unit 1 safeguards building 43.29

- The supply subsystem is tripped automatically. 44.1

- Isolation trip dampers AOD-VS-105A and B close 44.4
  automatically to establish design flow rate in 44.5
  stream "SG1," isolation trip damper AOD-VS-106 44.6
  closes automatically, and exhaust fans 1-VS-F-40A
  and B stop automatically to divert "SG1" to the 44.6/
  CAT I filter subsystem as described below. 44.7

- Roof fan 1-VS-F-43 is tripped automatically. 44.9

d. Unit 2 safeguards building 44.12

- The supply subsystem may continue to operate if 44.14
normal power remains available. 44.15

- Exhaust stream "SG2" is discharged directly through 44.18
the ventilation vent by fans 2-VS-F-40A and B with 44.19
1,000 cfm drawn from the containment air compressor 44.20
cubicle and approximately 11,000 cfm from the
safeguards room.

- Roof fan 2-VS-F-43 may continue to exhaust 44.22
4,000 cfm from the spray pump room if normal power 44.23
remains available.

e. Auxiliary building 44.26

- The supply subsystem is tripped automatically. 44.28

- Exhaust stream "G" isolation trip damper AOD-VS-110 45.1
closes automatically, and exhaust fans 1-VS-F-8A 45.2
and B stop automatically.

- Exhaust stream "C" isolation trip damper AOD-VS-108 45.4
closes automatically, and exhaust fans 1-VS-F-9A 45.5
and B stop automatically to divert the "C" stream 45.5/
to the CAT I filter subsystem as described below.

- Roof fan 1-VS-F-10 stops automatically. 45.7

f. Reactor containment purge 45.10

This subsystem is not in operation. 45.12

g. CAT I filter 45.15

Isolation trip dampers of "SG1" and "C" streams 45.17
(MOD-VS-100A and B and AOD-VS-107A and B) open to the 45.18
filter header. Isolation trip dampers of the "F," "D," 45.20
and "SG2," streams (AOD-VS-101, AOD-VS-103A and B, and 45.21
MOD-VS-200A and B) are closed. Both exhaust fans 45.22
1-VS-F-58A and B start automatically. Total exhaust 45.23
flow rate through both filter trains would be
automatically controlled at 36,000 cfm. 45.24

h. CAT II filter 45.27

Isolation trip dampers AOD-VS-109A and B close and 45.30
exhaust fan 1-VS-F-59 stops automatically.

2.2.2 Both Units On Line Followed by LOCA in Unit 2 46.3

Ventilation system operation following LOCA in Unit 2 would be 46.5
similar to its operation following LOCA in Unit 1, except for the 46.8
reversed role of the Unit 1 and Unit 2 safeguards.

2.2.3 Unit 1 On Line and Unit 2 Off Line Followed by LOCA 46.12
in Unit 1 46.13

With the ventilation system aligned in the Unit 2 cooldown and 46.16
purge modes described in Sections 2.1.2.1, 2.1.2.3, and 2.1.2.4, 46.17
LOCA in Unit 1 would realign the ventilation system to operate as 46.19
follows:

a. Fuel building 46.22

- The supply subsystem may continue to operate if 46.24
normal power remains available. 46.25

- The exhaust isolation trip damper AOD-VS-102 closes 46.29
automatically, and exhaust fans 1-VS-F-7A and B
stop automatically.

b. Decontamination building 47.2

- The supply subsystem may continue to operate if 47.4
normal power remains available. 47.5

- The exhaust isolation trip damper AOD-VS-104 closes 47.9
automatically, and exhaust fans 1-VS-F-56A and B
stop automatically.

c. Unit 1 safeguards building 47.12

- The supply subsystem is tripped automatically. 47.14

- Isolation trip dampers AOD-VS-105A and B close 47.17
automatically to establish design flow rate in 47.18
stream "SG1" and isolation trip damper AOD-VS-106 47.19
closes automatically, and exhaust fans 1-VS-F-40A 47.19
and B stop automatically to divert "SG1" to the
CAT I filter subsystem as described below. 47.20

- Roof fan 1-VS-F-43 stops automatically. 47.22

d. Unit 2 safeguards building 47.25

- The supply subsystem may continue to operate if 47.27
normal power remains available. 47.28

- Exhaust stream "SG2" is released directly through 48.1
the ventilation vent by fans 2-VS-F-40A and B with 48.2

1,000 cfm drawn from the containment air compressor 48.3
cubicle and approximately 11,000 cfm from the 48.4
safeguards room.

- Roof fan 2-VS-F-43 may continue to exhaust 48.6
4,000 cfm from the spray pump room if normal power 48.7
remains available.

e. Auxiliary building 48.10

- The supply subsystem is tripped automatically. 48.12

- Exhaust stream "G" isolation trip damper AOD-VS-110 48.15
closes automatically, and exhaust fans 1-VS-F-8A 48.16
and B stop automatically.

- Exhaust stream "C" isolation trip damper AOD-VS-108 48.18
closes automatically, and exhaust fans 1-VS-F-9A 48.19
and B stop automatically to direct "C" stream to 48.19
the CAT I filter subsystem as described below.

- Roof fan 1-VS-F-10 stops automatically. 48.21

f. Reactor containment purge 48.24

- The supply subsystem fans to Unit 2 containment are 48.27
stopped automatically.

- The exhaust stream "RC2" is isolated from the CAT I 48.30
filter subsystem as described below. 49.1

g. CAT I filter 49.4

Isolation trip dampers of "SG1" and "C" streams (MOD-VS- 49.6
100A and B and AOD-VS-107A and B) open to the filter 49.7
header. Isolation trip dampers of the "F," "D," "SG2," 49.9
and "RC" streams (AOD-VS-101, AOD-VS-103A and B, MOD-VS- 49.10
200A and B and AOD-VS-111) are closed. Both exhaust 49.11
fans 1-VS-F-58A and B start automatically. Total 49.12
exhaust flow rate through both filter trains would be
automatically controlled at 36,000 cfm. 49.13

h. CAT II filter 49.18

Isolation trip dampers AOD-VS-109A and B close and 49.21
exhaust fan 1-VS-F-59 stops automatically.

2.2.4 Unit 1 On Line and Unit 2 Refueling Followed by LOCA 49.25
in Unit 1 49.26

With the ventilation system aligned in the refueling mode des- 49.29
cribed in Section 2.1.2.2, a LOCA in Unit 1 would realign the 49.30
ventilation system to operate as follows:

a. Fuel building 50.3

- The supply subsystem may continue to operate if 50.5
  normal power remains available. 50.6

- The exhaust isolation trip damper AOD-VS-102 closes 50.10
  automatically, and exhaust fans 1-VS-F-7A and B
  stop automatically.

b. Decontamination building 50.13

- The supply subsystem may continue to operate if 50.15
  normal power remains available. 50.16

- The exhaust isolation trip damper AOD-VS-104 closes 50.19
  automatically, and exhaust fans 1-VS-F-56A and B
  stop automatically.

c. Unit 1 safeguards building 50.22

- The supply subsystem is tripped automatically. 50.24

- Isolation trip dampers AOD-VS-105A and B close 50.27
  automatically to establish design flow rate in 50.28
  stream "SG1" and isolation trip damper AOD-VS-106 50.29
  closes automatically, and exhaust fans 1-VS-F-40A
  and B stop automatically to divert "SG1" to the 50.29
  CAT I filter subsystem as described below. 50.30

- Roof fan 1-VS-F-43 stops automatically. 51.2

d. Unit 2 safeguards building 51.5

- The supply subsystem may continue to operate if 51.7
  normal power remains available. 51.8

- Exhaust stream "SG2" is discharged directly through 51.11
  the ventilation vent by fans 2-VS-F-40A and B with 51.12
  1,000 cfm drawn from the containment air compressor 51.13
  cubicle and approximately 11,000 cfm from the 51.14
  safeguards room.

- Roof fan 2-VS-F-43 may continue to exhaust 51.16
  4,000 cfm from the spray pump room if normal power 51.17
  remains available.

e. Auxiliary building 51.20

- The supply subsystem is tripped automatically. 51.22

- Exhaust stream "G" isolation trip damper AOD-VS-110 51.25
closes and exhaust fans 1-VS-F-8A and B stop 51.26
automatically.

- Exhaust stream "C" isolation trip damper AOD-VS-108 51.28
closes automatically, and exhaust fans 1-VS-F-9A 51.29
and B stop automatically to direct "C" stream to 51.29
the CAT I filter subsystem as described below.

- Roof fan 1-VS-F-10 stops automatically. 52.1

f. Reactor containment purge 52.4

- The supply subsystem fans to Unit 2 containment are 52.7
stopped automatically.

- The exhaust subsystem is isolated from the CAT I 52.10
filter subsystem as described below. 52.11

g. CAT I filter 52.14

Isolation trip dampers of the "D," streams (AOD-VS-103) 52.15
close. Isolation trip dampers of the "F," "RC," SG1," 52.15
SG2" and "C" streams to the CAT I filter header (which 52.15
were electrically deenergized as described in
Section 2.1.2.2) are electrically reenergized. This 52.15
allows dampers MOD-VS-100A and B and AOD-VS-107A and B
to open automatically and dampers AOD-VS-101, 52.15
AOD-VS-103A and B, MOD-VS-200A and B, and AOD-VS-111 to
close automatically. Both exhaust fans 1-VS-F-58A and B 52.15
start automatically. Total exhaust flow rate through 52.15
both filter trains would be automatically controlled at
36,000 cfm. 52.16

52.17
52.18
52.19
52.20

52.22

52.23
52.24

h. CAT II filter 52.28

Isolation trip dampers AOD-VS-109A and B close and 53.1
exhaust fan 1-VS-F-59 stops automatically.

2.2.5 Unit 1 On Line & Unit 2 Refueling Followed by a 53.5
Refueling Accident Inside Unit 2 Containment or 53.6
Fuel Building 53.7

With the ventilation system aligned in the refueling mode de- 53.10
scribed in Section 2.1.2.2, a refueling accident inside Unit 2 53.11
containment or the fuel building would leave the system alignment 53.13
unchanged, and the ventilation system would continue to operate 53.14
as described in Section 2.1.2.2 if normal power remains 53.15
available.

2.2.6 Unit 2 On Line and Unit 1 Off Line and/or Refueling 53.18

Ventilation system operation following a LOCA in Unit 2 or a re- 53.20
fueling accident in Unit 1 would be similar to its operation des- 53.21
cribed in Sections 2.2.3, 2.2.4, and 2.2.5, except for the 53.23
reversed role of the Unit 1 and Unit 2. 53.24

3.0 SYSTEM FEATURES FOR POTENTIAL EMERGENCIES 53.27

The operation of the ventilation system during the accident modes 53.29
described in Section 2.2 was based on the availability of 53.30
nonsafety-related equipment, normal electric power, and station 54.2
compressed air and with no single failure in Quality - Category I 54.3
equipment. The following sections describe system features and 54.4
performances when these failures occur simultaneously with the 54.5
accidents.

3.1 LOSS OF NONSAFETY-RELATED EQUIPMENT 54.8

Nonsafety-related equipment consists of the seven ventilation 54.11
supply subsystems and the CAT II filter subsystem serving the "G" 54.12
stream of the auxiliary building.

All supply subsystem designs include outdoor air intakes without 54.15
shutoff dampers. This feature permits the exhaust ventilation 54.16
subsystems to draw air into the buildings without the benefit of 54.17
supply subsystem operation.

The CAT II filter subsystem is automatically tripped following a 54.19
LOCA to prevent it from drawing and exhausting ECCS leakage 54.20
released inside the auxiliary building. The loss of operation or 54.21
the continued operation of the CAT II filter subsystem following
a refueling accident is immaterial since it does not affect the 54.22
performance of the CAT I filter subsystem to mitigate the 54.23
consequences of the accident in the fuel building or the
containment.

Thus, loss of nonsafety-related equipment does not affect system 54.25
safety functions.

3.2 LOSS OF NORMAL POWER 54.28

In addition to the nonsafety-related equipment discussed in 54.30
Section 3.1 above, other equipment powered from the normal bus 55.1
consist of the filter bypass exhaust fans of the "F," "D," and 55.3
"G" streams (1-VS-F-7A and B, 1-VS-F-56A and B, and 1-VS-F-8A and 55.4
B, respectively).

The effect of the loss of nonsafety-related equipment due to the 55.6
loss of normal power on system safety functions was discussed in 55.7
Section 3.1 above.

The "F" stream filter bypass exhaust fans are automatically 55.9
stopped following a LOCA and manually taken out of operation 55.10
prior to the start of refueling.

The loss or continued operation of the "D" and "G" stream filter 55.12
bypass exhaust fans following a refueling accident is immaterial 55.13
since it neither affects the performance of the CAT I filter
subsystem nor does it bypass contaminated air around the CAT I 55.14
filter subsystem.

The D and G stream filter bypass exhaust fans are automatically 55.15
tripped following a LOCA. 55.15

Thus loss of normal power does not affect system safety 55.16
functions.

3.3 LOSS OF STATION COMPRESSED AIR 55.19

The use of station compressed air during accident mode operation 55.21
of the ventilation system is to maintain the isolation trip 55.29
dampers of the "F," "RC," and "C" stream to the CAT I filter 55.30
inlet header (AOD-VS-101, AOD-VS-111, and AOD-VS-107A and B) in a 56.1
position opposite to their failure position following a refueling
accident.

If station compressed air is lost, then compressed air is 56.1/
supplied to dampers AOD-VS-101, AOD-VS-111 and AOD-VS-107A and B 56.1/
from a compressed air accumulator with sufficient capacity to 56.1/
maintain these isolation trip dampers in the position opposite to
their failure modes for two hours. Two hours is the maximum 56.12
duration which Regulatory Guide 1.25 postulates for mitigating
the consequences of a refueling accident. 56.13

Thus, loss of station compressed air does not affect system 56.13
safety functions.

3.4 SINGLE FAILURE OF EQUIPMENT 56.16

The capability of the exhaust ventilation system to withstand a 56.18
single component failure while performing its safety functions is 56.19
analyzed in the following table:

AUXILIARY VENTILATION SYSTEM
SINGLE FAILURE ANALYSIS

Component & QA Cat.	Safety Function	Component Subject to Failure	Consequence of Single Failure	Remarks
1-VS-F-58A and B I	1. Exhaust 36,000 cfm following Unit 1 or 2 LOCA	Yes	Exhaust by redundant fan	
	2. Exhaust containment and fuel building to produce inflow of air into both buildings following a refueling accident	Yes	Exhaust by redundant fan	Trip ventilation supply units of both buildings to produce a total exhaust flow rate of less than 36,000 cfm from both buildings
1-VS-FL-3A and B I	1. Filter 36,000 cfm following Unit 1 or 2 LOCA	Yes	Filter with redundant train	
	2. Filter exhaust flow of less than 36,000 cfm from both containment and fuel building following a refueling accident	Yes	Filter with redundant train	
AOD-VS-101 I	1. Close following Unit 1 or Unit 2 LOCA	Yes	Total exhaust flow rate increases to 71,500 cfm	See Note 2
	2. Remain open following a refueling accident	No	None	See Note 1
AOD-VS-103A and B I	1. Close following Unit 1 or 2 LOCA	Yes	Close redundant damper	Dampers in series
MOD-VS-200A and B I	1. Close following Unit 1 LOCA	Yes	Total exhaust flow increases to 48,000 cfm	See Note 2
	2. Open following Unit 2 LOCA	Yes	Open redundant damper	Dampers in parallel
	3. Remain closed following a refueling accident	No	None	See Note 1
MOD-VS-100A and B I	1. Open following Unit 1 LOCA	Yes	Open redundant damper	Dampers in parallel
	2. Close following Unit 2 LOCA	Yes	Total exhaust flow increases to 48,000 cfm	See Note 2
	3. Remain closed following a refueling accident	No	None	See Note 1
AOD-VS-107A and B I	1. Open following Unit 1 or 2 LOCA	Yes	Open redundant damper	Dampers in parallel
	2. Remain closed following a refueling accident	No	None	See Note 1
AOD-VS-111 I	1. Close following Unit 1 or 2 LOCA	Yes	Total exhaust flow rate increases to 66,000 cfm	See Note 2
	2. Remain open following a refueling accident	No	None	See Note 1

AUXILIARY VENTILATION SYSTEM
SINGLE FAILURE ANALYSIS

Component & QA Cat.	Safety Function	Component Subject to Failure	Consequence of Single Failure	Remarks
MOD-VS-101A,B, and C &MOD-VS-201A,B,and C I	1. Open on operating charging pump following Unit 1 or 2 LOCA	Yes	Loss of one charging pump	See Note 3
	2. Close on nonoperating charging pump following Unit 1 or 2 LOCA	Yes	Total exhaust flow increases to 42,500 cfm	See Note 2
AOD-VS-205A and B I	1. Close following Unit 2 LOCA	Yes	Close redundant damper	Dampers in series
AOD-VS-105A and B I	1. Close following Unit 1 LOCA	Yes	Close redundant damper	Dampers in series
AOD-VS-102 I	1. Close following Unit 1 or 2 LOCA	Yes	Stop 1-VS-F-7A and B by tripping CAT II MCC's which close backdraft dampers	No adverse effect even if fans with CAT II MCC's do not trip
	2. Remain closed following a refueling accident	No	None if 1-VS-F-7A and B remain off. See below for the case where 1-VS-F-7A and B do not remain off.	AOD-VS-102 remains closed by redundant SOV's in series
AOD-VS-104 I	1. Close following Unit 1 or 2 LOCA	Yes	Stop 1-VS-F-56A and B by tripping CAT II MCC's which close backdraft damper	No adverse effect
AOD-VS-108 I	1. Close following Unit 1 or 2 LOCA	Yes	Stop 1-VS-F-9A and B by tripping CAT I MCC's which close backdraft dampers	No adverse effect
AOD-VS-109A and B I	1. Close following Unit 1 or 2 LOCA	Yes	Close redundant damper and stop 1-VS-F-59, by tripping CAT I MCC.	No adverse effect. (If 1-VS-F-59 is not tripped by CAT I MCC, unfiltered release of auxil. bldg. ECCS leakage through closed AOD-VS-109A or B increases control room dose approx. 16%)
AOD-VS-110 I	1. Close following Unit 1 or 2 LOCA	Yes	Stop 1-VS-F-8A and B by tripping CAT I MCC's which close backdraft dampers.	No adverse effect. (If 1-VS-F-8A and B are not tripped by CAT I MCC's, unfiltered release of auxil. bldg. ECCS leakage through open AOD-VS-110 increases control room dose multifold).

AUXILIARY VENTILATION SYSTEM
SINGLE FAILURE ANALYSIS

Component & QA Cat.	Safety Function	Component Subject to Failure	Consequence of Single Failure	Remarks
AOD-VS-106 I	1. Close following Unit 1 LOCA	Yes	Stop 1-VS-F-40A and B by tripping CAT I MCC's which close backdraft dampers	No adverse effect
	2. Close following Unit 2 LOCA with MOD-VS-100A or B failed open	Yes	Stop 1-VS-F-40A and B by tripping CAT I MCC's which close backdraft dampers	No adverse effect
AOD-VS-206A and B I	1. Close following Unit 2 LOCA	Yes	Stop 2-V-F-40A and B by tripping CAT I MCC's which close backdraft dampers	No adverse effect
	2. Close following Unit 1 LOCA with MOD-VS-200A or B failed open	Yes	Stop 2-V-F-40A and B by tripping CAT I MCC's which close backdraft dampers	No adverse effect
1-VS-F-7A and B II	1. Stop following Unit 1 or 2 LOCA	Yes	Unfiltered release of noncontaminated fuel bldg. air leakage through closed AOD-VS-102	No adverse effect
	2. Remain off following a refueling accident	Yes	Unfiltered release of contaminated fuel building leakage through closed AOD-VS-102 increasing site boundary dose approx. 3%	
1-VS-F-56A and B II	1. Stop following Unit 1 or 2 LOCA	Yes	Unfiltered release of noncontaminated decontamination bldg. air leakage through closed AOD-VS-104	No adverse effect
2-VS-F-40A and B I	1. Stop following Unit 2 LOCA	Yes	Unfiltered release of contaminated safeguards bldg. ECCS leakage through closed AOD-VS-206 increases control room dose approx. 5%	
1-VS-F-40A and B I	1. Stop following Unit 1 LOCA	Yes	Unfiltered release of contaminated safeguards bldg. ECCS leakage through closed AOD-VS-106 increases control room dose approx. 5%	

AUXILIARY VENTILATION SYSTEM
SINGLE FAILURE ANALYSIS

Component & QA Cat.	Safety Function	Component Subject to Failure	Consequence of Single Failure	Remarks	
1-VS-F-9A and B I	1. Stop following Unit 1 or 2 LOCA	Yes	Unfiltered release of contaminated auxiliary bldg. ECCS leakage through closed AOD-VS-108 increases control room dose approx. 10%		3.55 3.56 3.57 3.58 3.59 4.1
1-VS-F-8A and B II	1. Stop following Unit 1 or 2 LOCA	Yes	Unfiltered release of contaminated auxiliary bldg. ECCS leakage through closed AOD-VS-110 increas- control room dose approx. 15%		4.4 4.5 4.6 4.7 4.8 4.9
1-VS-F-59 II	1. Stop following Unit 1 or 2 LOCA	Yes	Unfiltered release of contaminated auxiliary bldg. ECCS leakage through closed AOD-VS-109A and B increases control room dose approx. 12%		4.12 4.13 4.14 4.15 4.16 4.17
1-VS-F-6 II	1. Stop following a refueling accident with single failure of 1-VS-F-58A or B	No	None	Fan tripped by Cat. I MCC. (If not so tripped unfiltered leakage of refueling accident air increases site boundary dose multifold.)	4.20 4.21 4.22 4.23 4.24 4.25
1-VS-HV-5 II	None	-	-		4.28 4.29
2-VS-HV-4 II	None	-	-		4.32 4.33
1-VS-HV-4 II	None	-	-		4.36 4.37
1-VS-HV-1A and B II	1. Stop following Unit 1 or 2 LOCA	No	None	Fans tripped by redundant CAT I MCC's. (If not so tripped unfiltered leakage of contaminated auxiliary bldg. air due to pressuriza- tion of bldg. increases control room dose multifold.)	4.40 4.41 4.42 4.43 4. 4.45 4

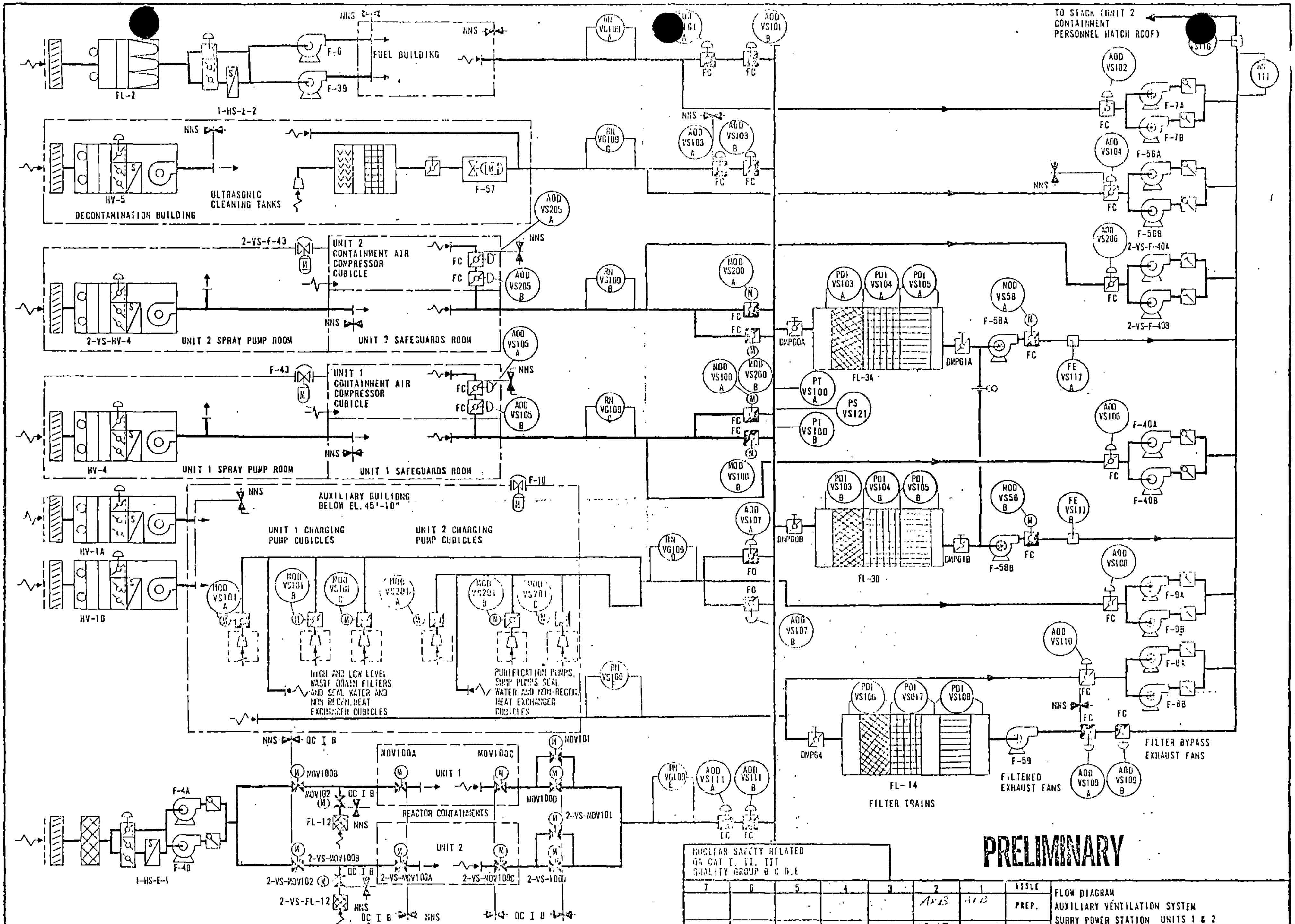
AUXILIARY VENTILATION SYSTEM
SINGLE FAILURE ANALYSIS

Component & QA Cat.		Safety Function	Component Subject to Failure	Consequence of Single Failure	Remarks
1-VS-F-4A and B II	1.	Stop following a refueling accident with single failure of 1-VS-F-58A or B	No	None	Fans tripped by CAT 1 MCCs. (If not so tripped, unfiltered leakage of refueling accident air increases site boundary dose multifold.)

Note 1 These dampers are not subject to single active failure during the two-hour period following a refueling accident because they have been electrically deenergized as described in Section 2.1.2.2g.

Note 2 Failure of the damper to close constitutes the single failure. Two filter trains and fans at 36,000 cfm each remain available to treat the increased exhaust flow rate.

Note 3 Failure of the damper of an operating charging pump to remain open would result in overheating of the pump motor and the possible loss of the pump. If the failed pump belongs to the unit which has had a LOCA, then the accident is handled with minimum safeguards. If the failed pump belongs to the other unit, then the standby pump is used to shut down the unit.



NOTES:
1. ALL EQUIPMENT NUMBERS TO BE PREFIXED WITH "1VS-" EXCEPT WHERE A DIFFERENT PREFIX IS SHOWN.
2. ALL EQUIPMENT LOCATED IN AUXILIARY BUILDING - ELEVATION 45'-10" UNLESS SHOWN OTHERWISE.
3. ALL DUCTWORK AND COMPONENTS ARE QUALITY CATEGORY I UNLESS DESIGNATED AS NON NUCLEAR SAFETY (NNS) OR QUALITY CATEGORY I QUALITY GROUP B (QCIB).

NUCLEAR SAFETY RELATED
QA CAT I, II, III
QUALITY GROUP B C D E

7	6	5	4	3	2	1	ISSUE
							PREP.
							REVIEW
							APPR.
					2-16-79	9-15-78	DATE

FLOW DIAGRAM
AUXILIARY VENTILATION SYSTEM
SURRY POWER STATION UNITS 1 & 2
VIRGINIA ELECTRIC AND POWER COMPANY

STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 11448-FKS-24