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1.0 SYSTEM PURPOSE

The Containment Ventilation System (VV) consists of five (5) subsystems as follows:

1.1 LOWER CONTAINMENT COOLING SYSTEM

The purpose of this system is to cool the Lower Containment maintaining a maximum temperature of 120°F. This system performs no function during a LOCA and is not Nuclear Safety Related. The system is available on "blackout" power.

1.2 CONTROL ROD DRIVE MECHANISM COOLING SYSTEM

The purpose of this system is to cool the Control Rod Drive Mechanism during normal plant operation. This system performs no function during a LOCA and is not Nuclear Safety Related. The system is available on "blackout" power.

1.3 INCORE INSTRUMENTATION ROOM COOLING SYSTEM

The purpose of this system is to cool the Incore Instrumentation Room maintaining a maximum room temperature of 100°F during normal operation. This system performs no function during a LOCA and is not Nuclear Safety Related. The system is available on "blackout" power.

1.4 UPPER CONTAINMENT COOLING SYSTEM

The purpose of this system is to cool the Upper Containment maintaining a maximum temperature of 110°F in the compartment during normal plant operation. This system performs no function during a LOCA and is not Nuclear Safety Related. The system is available on "blackout" power.

1.5 LOWER CONTAINMENT CLEANUP FILTER SYSTEM

The purpose of this system is to reduce the radioactivity level or cleanup the lower containment by circulating air in the lower containment through carbon cleanup filters. This system performs no function during a LOCA and is not Nuclear Safety Related. Neither is this system available on "blackout" power.

2.0 SYSTEM DESCRIPTION AND FUNCTION (PER UNIT BASIS)

2.1 LOWER CONTAINMENT COOLING SYSTEM

This system consists of four (4) cooling units containing water cooling coils and associated ductwork. Booster fans are provided in the ducts serving the containment pipe tunnel (2 fans) and the incore instrumentation tunnel (2 fans).

The cooling water supply is a non-safety leg of the Nuclear Service Water System (RN). During normal operation, the lower containment portion of the RN System is supplied with demineralized chilled water from the Containment Chilled Water System (YV). During blackout conditions, the YV System is not operational and directs the water supply to the RN System (raw lake water). See the YV System Description in Duke File No. CN-1211.00-18 (CNSD-1211.00-17) for additional information.

Dampers consist of shut-off dampers with electro-hydraulic operators in the return ducts from the CRDM Cooling System. There are manual balancing dampers in the discharge duct from each cooling unit. Also, each cooling unit and each booster fan has a backdraft damper in the discharge duct for isolation.

The four (4) cooling units are provided with two-speed fans. Low or high speed can be used as necessary to maintain lower containment temperature below 120°F. During low speed operation, the chilled water supply to each unit is controlled using redundant thermostats to maintain the return air temperature at 100°F. Sensing bulbs are located in the return air openings in the crane wall. During high speed operation, there is no thermostatic control of the water supply and the control valve for each unit remains fully open.

The Containment Pipe Tunnel Booster fans also have two-speed capabilities and will operate in conjunction with the Lower Containment Cooling Units. The speed selection of the booster fans should correspond to the operating speed of the Lower Containment Cooling Units. High speed will double the booster fan air flow.

2.2 CONTROL ROD DRIVE MECHANISM COOLING SYSTEM

This system consists of four (4) vane-axial fans with associated suction and discharge ductwork.

Dampers consist of a check damper located in the ductwork on the discharge of each fan for isolation.

This system is designed to operate three (3) of the four (4) fans under normal operating conditions.

2.3 INCORE INSTRUMENTATION ROOM COOLING SYSTEM

This system consists of two (2) 100% capacity air handling units containing water cooling coils and associated ductwork common to both air handling units. Both air handling units have free air return.

The cooling water supply is a non-safety leg of the Nuclear Service Water System (RN). This portion of the RN System is served with chilled water during normal operation and lake water during blackout operation. See Paragraph 2.1.2.

The water supply to the air handling units is thermostatically controlled using redundant thermostats for each air handling unit. Thermostats and bulbs are mounted in the return air to each unit. Thermostats are set to maintain 90°F.

Dampers consist of manual volume dampers located in branch lines to control air flow. Each air handling unit has a check damper located in the ductwork on the discharge of the unit for isolation.

2.4 UPPER CONTAINMENT COOLING SYSTEM

This system consists of four (4) cooling units containing water cooling coils and four (4) return air fans with associated ductwork.

The cooling water supply is a non-safety leg of the Nuclear Service Water System (RN). The water supply to the units is thermostatically controlled using redundant thermostats for each cooling unit. The thermostats and bulbs are located in the return air to each unit. Thermostats are set to maintain 90°F.

2.5 LOWER CONTAINMENT CLEANUP FILTER SYSTEM

The system consists of two (2) filter trains containing prefilters, HEPA filters, charcoal absorber and fans.

3.0 COMPONENT DESIGN PARAMETERS

3.1 LOWER CONTAINMENT COOLING UNITS

a.	Tag Numbers	LCVU-1A, 1B, 1C & 1D, 2A, 2B, 2C & 2D
b.	Design Flow/AH Unit (Hi-spd/Lo-spd)	53,300/35,500 CFM
c.	Static Pressure (Hi-spd/Lo-spd)	15.0/6.66 in. w.g.
d.	Air Density (Max.)	0.072 lbs/cu. ft.
e.	Ent. Air Temp. (Hi-spd)	133°F db/74°F wb
f.	Lvg. Air Temp. (Hi-spd)	49.5°F db/49°F wb
g.	GPM (Hi-spd/Lo-spd)	696/696 (max.)
h.	Ent. Wtr. Temp.	44°F
i.	BHP (Hi-spd/Lo-spd)	171/33
j.	Motor HP	200/80
k.	Electrical Characteristics	575v/3Ø/60hz

3.2 CONTAINMENT PIPE TUNNEL BOOSTER FANS

a.	Tag Numbers	CPTBF-1A & 1B, 2A & 2B
b.	Design Flow/Fan (Hi-spd/Lo-spd)	9,520/4,760 cfm
c.	Total Pressure (Hi-spd/Lo-spd)	12.55/3.12 in. w. g.
d.	Air Density (Max.)	0.075 lbs/cu. ft.
e.	BHP (Hi-spd/Lo-spd)	30/4
f.	Motor HP	41/10
g.	Electrical Charcteristics	575v/3Ø/60 hz.

3.3 CRDM FANS

a.	Tag Numbers	CRDMF-1A, 1B, 1C & 1D, 2A, 2B, 2C & 2D
b.	Design Flow/Fan	24,000 cfm
c.	Total Pressure	12.7 in. w.g.
d.	Air Density (Max.)	0.075 lbs/cu. ft.
e.	BHP	76
f.	Motor HP	100
g.	Electrical Characteristics	575v/3Ø/60 hz.

3.4 INCORE INSTRUMENTATION ROOM COOLING UNITS

a.	Tag Numbers	IIRVU-1A and 1B, 2A & 2B
b.	Design Flow/AH Unit	5,100 cfm
c.	Static Pressure	0.75 in. w.g.
d.	Air Density (Max.)	0.075 lbs/cu. ft.
e.	Ent. Air Temp.	110°F db, 71°F wb
f.	Lvg. Air Temp.	71°F db, 60.9°F wb
g.	GPM	10
h.	Ent. Water Temp.	44°F
i.	BHP	3
j.	Motor HP	5
k.	Electrical Characteristics	575v/3Ø/60 hz.

3.5 INCORE INSTRUMENTATION PIPE TUNNEL BOOSTER FANS

a. Tag Numbers	IITBF-1A & 1B, 2A & 2B
b. Design Flow/Fan	12,800 cfm
c. Total Pressure	2.9 in. w.g.
d. Air Density (Max.)	0.075 lbs/cu. ft.
e. BHP	8.3
f. Motor HP	10
g. Electrical Characteristics	575v/3Ø/60 hz.

3.6 UPPER CONTAINMENT COOLING UNITS

a. Tag Numbers	UCVU-1A, 1B, 1C & 1D, 2A, 2B, 2C & 2D
b. Design Flow/AH Unit	11,730 cfm
c. Static Pressure	0.75 in. w.g.
d. Air Density (Max.)	0.075 lbs/cu. ft.
e. Ent. Air Temp.	110°F db, 96°F wb
f. Lvg. Air Temp.	94°F db, 91°F wb
g. GPM	100
h. Ent. Wtr. Temp.	88°F
i. BHP	6.4
j. Motor HP	7½
k. Electrical Characteristics	575v/3Ø/60 hz.

3.7 UPPER CONTAINMENT RETURN AIR FANS

a. Tag Numbers	UCRAF-1A, 1B, 1C & 1D, 2A, 2B, 2C, & 2D
b. Design Flow/Fan	6,000 cfm
c. Total Pressure	0.87 in. w.g.
d. Air Density (Max.)	0.075 lbs/cu. ft.
e. BHP	1.75
f. Motor HP	7½
g. Electrical Characteristics	575v/3Ø/60 hz.

3.8 CONTAINMENT AUXILIARY CHARCOAL FILTER

a. Design Flow/Train	8,000 cfm
b. Static Pressure	4.5 inches w.g.
c. Air Density (Max.)	0.075 lbs/cu. ft.
d. BHP Motor HP	7.75
e. Motor HP	10
f. Electrical Characteristics	575v/3Ø/60 hz.
g. Tag Numbers	CACFU-1A, 1B, 2A & 2B

4.0 INSTRUMENTATION AND CONTROL

4.1 ELECTRICAL

For detailed information concerning electrical instrumentation and control refer to Electrical System Description CNSD-0156-02.

4.2 PNEUMATIC

For detailed information concerning pneumatic instrumentation and control, refer to System Control Description in Duke File Number CNM-1211.00-335.

4.3 CONTROL PANELS

Control panels are located on the following Duke drawings:

Control Panel	Drawing Number
1CV-CP-1, 2CV-CP-1	CNM-1211.00-335
1CV-CP-2, 2CV-CP-2	CNM-1211.00-335
1CV-CP-3, 2CV-CP-3	CNM-1211.00-335
1CV-CP-4, 2CV-CP-4	CNM-1211.00-335
1CV-CP-5, 2CV-CP-5	CNM-1211.00-335
1CV-CP-6, 2CV-CP-6	CNM-1211.00-335
1CV-CP-7, 2CV-CP-7	CNM-1211.00-335
1CV-CP-8, 2CV-CP-8	CNM-1211.00-335
1CV-CP-9, 2CV-CP-9	CNM-1211.00-335
1CV-CP-10, 2CV-CP-10	CNM-1211.00-335
1RB-ECP-1, 2RB-ECP-1	
HVAC-MCB	

4.4 START UP AND OPERATIONAL SEQUENCE

4.4.1 LOWER CONTAINMENT COOLING SYSTEM

Place thermostat override switch on the HVAC-MCB to NORMAL position. Place damper selector switch on the HVAC-MCB to AUTO position. Place the desired containment pipe tunnel booster fan selector switch on the HVAC-MCB to LOW SPEED position. Verify fan start with its respective indicator light. Place the desired Incore Instrumentation Tunnel Booster Fan selector switch on the HVAC-MCB to ON position. Verify fan start with its respective indicator light. Place three (3) of the four (4) Lower Containment Cooling Unit Selector Switches on the HVAC-MCB to ON-LOW SPEED position. Verify selected cooling units start with their respective indicator lights.

4.4.2 CRDM COOLING SYSTEM

Place three (3) of the four (4) CRDM Fan start-stop switches on the MCB, near the CRDM controls, to ON position. Verify selected fans start with their respective indicator lights.

4.4.3 INCORE INSTRUMENTATION ROOM COOLING SYSTEM

Place the desired air handling unit selector switch on the HVAC-MCB to ON-NORMAL COOLING position. Verify air handling unit start with its respective indicator light.

4.4.4 UPPER CONTAINMENT COOLING SYSTEM

Place the four (4) Upper Containment Return Air Fan selector switches on the HVAC-MCB to AUTO position. Place three (3) of the four (4) Upper Containment Cooling Unit selector switches on the HVAC-MCB to ON-NORMAL position. Verify cooling units and their associated return air fans start with respective indicator lights.

4.4.5 LOWER CONTAINMENT CLEANUP FILTER SYSTEM

Place either or both containment auxiliary charcoal filter(s) start-stop switch(es) on the HVAC-MCB to ON position. Verify filter start with respective indicator light(s).

5.0 SYSTEM OPERATION

5.1 LOWER CONTAINMENT COOLING SYSTEM

Normal operating condition for this system is three (3) cooling units operating at LOW SPEED with one (1) cooling unit OFF, one (1) pipe tunnel booster fan operating at LOW SPEED with one (1) pipe tunnel booster fan OFF, and one (1) incore instrumentation tunnel booster fan operating with one (1) incore instrumentation tunnel booster fan OFF.

If the lower containment temperature goes above 120°F, place the fourth cooling unit in LOW SPEED operation and operate all four (4) cooling units at LOW SPEED until conditions allow a return to the normal mode of operation; i.e., three (3) cooling units operating at LOW SPEED and one (1) cooling unit OFF. If the lower containment temperature remains above 120°F after placing all four (4) cooling units in LOW SPEED operation or if the fourth unit is not available for operation, place two (2) cooling units in HIGH SPEED operation with two (2) cooling units OFF. If the lower containment temperature remains above 120°F after placing two (2) cooling units in high speed operation, place three (3) cooling units in HIGH SPEED operation with one (1) cooling unit OFF.

Refer to Catawba Nuclear Station Technical Specification Section 3/4.6, subparagraph 3.6.1.5 for operating temperature range and shutdown requirements.

During a "Blackout" condition, the four (4) lower containment cooling units and both pipe tunnel booster fans at LOW SPEED and both incore instrumentation tunnel booster fans automatically start. Verify all cooling units and fans start. After verifying lower compartment temperature is within Technical Specification limits and the sequencer is reset, the Operator may return the system to the normal operating mode. Refer to the Electrical System Description in Duke File Number CNSD-0156-02 for power assignment to cooling units and booster fans.

The pipe tunnel booster fan must be operated at the same speed as the lower containment cooling units; i.e., the booster fan at LOW SPEED when the cooling units are at LOW SPEED and HIGH SPEED when the cooling units are at HIGH SPEED.

Under No circumstance can one (1) or more cooling units be operated at HIGH SPEED with the remaining units at LOW SPEED. All operating units must be at the same speed.

Alternate the operation of the cooling units and booster fans monthly.

Thermostat override switch for each cooling unit is to remain in NORMAL position at all times except in the event of failure of both redundant thermostats for a given cooling unit. At this time, move this switch to the MAX. COOL position for the cooling unit having failure of both thermostats.

5.2 CRDM COOLING SYSTEM

Operate three (3) of the four (4) fans. Alternate the operation of the fans monthly.

During a "Blackout" condition, the four (4) fans automatically start. Verify all fans start. After verifying lower compartment temperature is within Technical Specification limits and the sequencer is reset, the operator may return the system to the normal operating mode. Refer to the Electrical System Description in Duke File Number CNSD-0156-02 for power assignment to fans.

5.3 INCORE INSTRUMENTATION ROOM COOLING SYSTEM

This system is designed for operation of one (1) air handling unit under normal operating conditions. However, provisions are made for operating both air handling units simultaneously for quick cool down. This is accomplished by placing both air handling unit selector switches on the HVAC-MCB to ON-MAX COOLING position.

If the room temperature exceeds 100°F, place the operating air handling unit selector switch on the HVAC-MCB to ON-MAX COOLING position.

If the room temperature exceeds 105°F place both air handling unit selector switches on the HVAC-MCB to ON-MAX COOLING position.

During "Blackout" condition, both (2) units automatically start. Verify both air handling units start. After verifying room temperature is less than 100°F and the sequencer is reset, the Operator may return the system to normal operating mode. Refer to Electrical System Description in Duke File Number CNSD-0156-02 for power assignment to air handling units.

Alternate the operation of units A and B at one (1) month intervals.

5.4 UPPER CONTAINMENT COOLING SYSTEM

Operate three (3) of the four (4) cooling units and associated return air fans under normal operating conditions.

If the upper containment temperature goes above 110°F, the operator must manually start the fourth cooling unit and associated return air fan. Operate all four (4) cooling units and associated return air fans until conditions allow a return to the normal mode of operation; i.e., three (3) cooling units and associated return air fans operating with one (1) cooling unit and associated return air fan off. If upper containment temperature remains above 110°F after placing all four (4) cooling units and associated return air fans in operation, place selector switches on HVAC-MCB to ON-MAX COOLING position.

Refer to Catawba Nuclear Station Technical Specification, Section 3/4.6, sub-paragraph 3.6.1.5 for operating temperature range and shutdown requirements.

During a "Blackout" condition, the four (4) cooling units and associated return air fans automatically start. Verify all cooling units and associated return air fans start. After verifying upper compartment temperature is within Technical Specification limits and the sequencer is reset, the operator may return the system to the normal operating mode. Refer to the Electrical System Description in Duke File Number CNSD-0156-02 for power assignment to units.

Alternate operation of cooling units and return air fans monthly.

5.5 LOWER CONTAINMENT CLEANUP FILTER SYSTEM

Either one (1) or both filter trains may be operated at the Operator's discretion, depending upon the degree and rate of cleanup desired.

If only one (1) filter train is used at a time, alternate use of trains.

6.0 MAINTENANCE

At the beginning of shutdown at every schedule outage, not to exceed 18 months, the following maintenance shall be performed:

a. Direct-drive equipment shall be maintained and lubricated in accordance with manufacturer's instructions.

b. Belt-driven equipment: bearings shall be lubricated and belts shall be changed.

c. Visually inspect operation of check dampers and electro-hydraulic damper operators making sure they are closing tight and opening fully. Repair or replace any bent or damaged parts as necessary.

d. Visually inspect valves 1RN410, 1RN415, 1RN420, 1RN425, 1RN443, 1RN447, 1RN451, 1RN455, 1RN100, 1RN976, 1RN469, 1RN473, 1RN477, 1RN481, 1RNA83, 1RNC02, 1RNC03, 1RNC04, 2RN410, 2RN415, 2RN420, 2RN425, 2RN410, 2RN415, 2RN420, 2RN425, 2RN443, 2RN447, 2RN451, 2RN455, 2RN100, 2RN976, 2RN469, 2RN473, 2RN477, 2RN481, 2RNA83, 2RNC02, 2RNC03, 2RNC04. Check diaphram and spring operation.

e. Check pneumatic controls operation. Visually check for bent or damaged air tubing and replace if necessary. Repair or replace damaged or malfunctioning controls as necessary.

f. For maintenance of filter trains, refer to Farr Company Maintenance Manual in Duke File Number CNM-1211.00-46.

The Mechanical Contractor responsible for the installation work is Bahnson Service Company, P. O. Box 10458, Winston-Salem, North Carolina 2710, Telephone: (919) 724-1581. Contact this firm for other than routine maintenance problems.

The pneumatic controls sub-contractor to Bahnson Service Company is Powers Regulator Company, Charlotte, North Carolina. They may be contacted directly for what appears to be a pneumatic control problem; although, preferably they should be contacted through Bahnson Service Company.

None of the electrical controls for this system are vendor (Powers Regulator Company) supplied.