

GPO-STARLW

FINAL

SYSTEM DESCRIPTION  
(Index No. 36)

HEATING AND VENTILATING SYSTEM, AUXILIARY BUILDING  
(B&R Dwg. No. 2042, Rev. 14)

JERSEY CENTRAL POWER AND LIGHT COMPANY  
THREE MILE ISLAND NUCLEAR STATION  
UNIT NO. 2

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Prepared by:  
J. K. Humphreys  
Burns and Roe, Inc.  
700 Kinderkamack Road  
Oradell, N.J.  
07649

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## HEATING & VENTILATION SYSTEM

### AUXILIARY BUILDING

#### 1.0 INTRODUCTION

#### 1.1 System Functions

The functions of the Auxiliary Building Heating and Ventilating System are:

- a. To provide fresh, filtered, tempered ventilating air to all spaces within the Auxiliary Building in sufficient quantity to produce and maintain room temperatures suitable for the operating personnel and the mechanical and electrical equipment.
- b. To provide air flows within the building from clean areas toward potentially contaminated areas and to exhaust from the latter, so as to minimize the chance of spreading contamination.
- c. To treat the exhaust air by filtration, as necessary, so that discharges from the plant vent will be less than MPC (maximum permissible concentration) requirements of 10CFR20.
- d. To maintain an average pressure within the Auxiliary Building slightly lower than atmospheric, so as to reduce the likelihood of spreading radioactive contamination to the atmosphere.

#### 1.2 Summary Description of System (Refer to B&R Dwg. No. 2042, Rev.7)

The system is a push-pull heating and ventilating system consisting of a supply air system and an exhaust air system, which provides once-through ventilation with no recirculation. The supply air system consists of two 50% capacity centrifugal fans together with prefilters, final filters, electric preheat

coils and necessary sheet metal ducts arranged to take outside air from the Air Intake Tunnel and deliver it to the various spaces within the Auxiliary Building in proportion to the ventilation requirements. Electric reheat coils are provided in the branch ducts supplying air to the various floor levels, to give individual zone control.

The Exhaust Air System consists of four 50% capacity centrifugal fans, two 50% capacity filter trains, and the necessary sheet metal ducts arranged to exhaust air from the ventilated spaces in such a manner that air flow within the building is from clean areas toward potentially contaminated areas. The exhaust air is discharged to the station vent. Each filter train consists of a prefilter, a high efficiency particulate air (HEPA) filter, a charcoal filter and a second HEPA filter. To prolong the life of the filter trains, exhaust air is bypassed around the filters whenever monitoring instruments do not indicate radioactivity in the exhaust air stream.

### 1.3 System Design Requirements

The Ventilating System is designed to provide fresh air to maintain temperature below 104°F in areas where personnel and electrical equipment are located and below 120°F in other spaces. The supply fans are designed to provide approximately 84,000 CFM of fresh air from the Air Intake Tunnel which is sufficient for three air changes per hour. Three air changes are sufficient to remove heat from people, lights and equipment and maintain the above temperature limits with an outside air temperature of 98°F.

The system is designed to minimize the spread of radioactive contamination by distributing air so that it flows from lesser potentially contaminated spaces to more potentially contaminated spaces. No recirculation is permitted. The Exhaust System contains a filter bank which is normally bypassed, but is used to remove contaminated particles in an emergency. Additionally the Auxiliary Building is maintained at a slight vacuum so that any leakage is into the building rather than out. The vacuum is maintained by a differential pressure indicating controller which controls the inlet vanes on the Auxiliary Building exhaust fans.

The system is designed to heat the supply air so that a minimum indoor temperature of 70°F is maintained. A pre-heater upstream of the supply fans and electric heaters in the supply ducts to the various spaces maintains this temperature.

Ductwork and equipment components that could contain radioactive material are designed to withstand forces due to a Class I seismic occurrence. All other ducting and equipment are Class II seismic. The design cleanliness rating is Class D.

## 2.0 DETAILED DESCRIPTION OF SYSTEM

### 2.1 Components

The following major components are employed in the Auxiliary Building Heating and Ventilating System:

## 2.1.1 Major System Dampers

### 2.1.1.1 System Inlet Damper, AH-D-4002

One quick closing, pneumatic cylinder operated opposed-blade damper with a positioner is located in the inlet of the Auxiliary Building supply air filter train. The damper is controlled by a differential pressure indicating controller to maintain a constant differential pressure across the supply damper, supply filter train and pre-heater. The damper is interlocked with the supply fans to open when either fan is energized and shut when both fans are de-energized. The damper is equipped with return springs to effect closing within 5 seconds after the system receives a fire protection signal.

### 2.1.1.2 Supply Fan Discharge Dampers, AH-D-4001A or B

One pneumatic cylinder operated parallel-blade damper is located in the discharge of each Auxiliary Building supply fan to open automatically when the associated fan starts and close automatically when the fan stops. Air is supplied from the Instrument Air System.

### 2.1.1.3 Exhaust Filter Bypass Damper, AH-D-4020

One pneumatic cylinder operated opposed-blade damper is located in the bypass duct around the exhaust filter trains. The damper is open during normal operation but shuts when radioactive contamination is detected in the exhaust duct. The damper is controlled by a pushbutton on Panel No. 25 in the Control Room. A red light on Panel No. 25 indicates when the damper is open. Air to the damper operator is supplied from the Instrument Air System.

2.1.1.4 Exhaust Filter Outlet Dampers, AH-D-4020C & D

One pneumatic cylinder operated, opposed-blade damper is located in the outlet duct from each exhaust filter train. The dampers are shut in normal operation but open when radioactive contamination is detected in the exhaust duct. The dampers are controlled by a pushbutton on Panel No. 25 in the Control Room. A red light on Panel No. 25 indicates when the damper is open. Air is supplied to the damper operators from the Instrument Air System.

2.1.1.5 Exhaust Filter Inlet Dampers, AH-D-4020B & E

One pneumatic cylinder operated, opposed-blade damper is located in the inlet duct to each exhaust filter train. The dampers are shut in normal operation but open when radioactive contamination is detected in the exhaust duct. The dampers are controlled by a pushbutton on Panel No. 25 in the Control Room. A red light on Panel No. 25 indicates when the damper is open. Air is supplied to the damper operators from the Instrument Air System.

2.1.1.6 Exhaust Fan Discharge Dampers, AH-D-4016A & B and AH-D-4017A & B

One pneumatic cylinder operated parallel-blade damper located in the discharge of each Auxiliary Building exhaust fan opens automatically when the associated fan starts and closes when the fan stops. Air is supplied from the Instrument Air System.



### 2.1.1.7 Miscellaneous Dampers

In addition to the dampers described above parallel-blade gravity dampers are provided in the system discharge ducts in the H&V Penthouse. Hand operated parallel-blade dampers are provided to isolate filter trains and exhaust fans and hand operated opposed-blade dampers are provided in supply and exhaust ducts throughout the system to balance air flow.

### 2.1.2 Auxiliary Building Supply Fans, AH-E-7A and 7B

The Auxiliary Building Supply Fans (see Table 1) are located on Elev. 328.0'. The fans are centrifugal and have a rated capacity of 42,000 CFM. Both supply fans are interlocked with the Auxiliary Building Exhaust Fans to start 10 seconds after any pair of exhaust fans start and to stop immediately after one or both exhaust fans are de-energized. The supply fans may be controlled locally from a pushbutton station with indicating lights or from an SMB switch on Panel No. 25 in the Control Room. The fans receive power from 480v Buses 2-36 for 7A and 2-45 for 7B.

### 2.1.3 Auxiliary Building Exhaust Fans, AH-E-8A, 8B, 8C & 8D

The Auxiliary Building Exhaust Fans (see Table 2) are located on Elev. 328.0'. The fans are centrifugal with adjustable inlet vanes and have a rated capacity of 42,000 CFM. The inlet vanes are controlled to maintain a vacuum in the Auxiliary Building. The fans are operated in pairs, and interlocked such that if one fan in the operating pair trips the standby pair will start and then

the other fan will be stopped. The fans may be controlled locally from a pushbutton station with indicating lights or from Panel No. 25 in the Control Room. The fans receive power from 480v Buses 2-36 for 8A and 8B and 2-45 for 8C and 8D.

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2.1.4 Auxiliary Building Supply Air Filter, AH-F-7

The Auxiliary Building Supply Filter (see Table 3) is located in the supply duct upstream of the supply fans. The filter consists of an automatically progressed roll-aire type filter followed by a replaceable cartridge type filter. The roll type filter is made of 2" thick glass fiber reinforced by steel wires and is automatically progressed to maintain a uniform pressure drop across the filter. The roll-aire filter 1/6 HP motor has local controls with indicating lights and is powered from 120v power panel MP2-35.

2.1.5 Auxiliary Building Supply Duct Preheater, AH-C-9

The Auxiliary Building Supply Duct Preheater (see Table 4) is located in the supply duct between the supply filter and the supply fans. The preheater consists of 10 stages, each rated at 142.2 KW. The preheater is interlocked with the supply fans so the preheater cannot be energized unless both fans are energized. The preheater is controlled by outside air temperature. The preheater is provided with a local OFF-AUTO switch with local indicating lights and a manual snap action thermal cutout which trips the MCC breaker in the event the heating element overheats; the breaker must be manually reset. The preheater receives power from 480v Bus 2-36.

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### 2.1.6 Auxiliary Building Duct Heaters, AH-C-10, 42 & 43

The three Auxiliary Building Duct Heaters (see Table 5) are located in the ducts which supply air to the various levels in the Auxiliary Building; AH-C-10 heats Elev. 328.0', AH-C-42 heats Elev. 305.0', and AH-C-43 heats Elev. 280.5'. Heater AH-C-10 consists of 6 resistance heating coils, A(A&B), B(A&B) and C(A&B) each rated at 78.9 KW, heater AH-C-42 consists of 3 resistance heating coils, A through C, each rated at 113 KW and heater AH-C-43 consists of 2 resistance heating coils, A and B, each rated at 98 KW. An interlock prevents the heaters from being energized unless both supply fans are running. The heaters are controlled by thermostats located on the corresponding elevations of the Auxiliary Building. Each heater is provided with local OFF-AUTO switches with local indicating lights and a manual snap action thermal cut-out which trips the MCC breaker in the event the heating element overheats; the breaker must be reset manually. All the heaters receive power from 480V Bus 2-45.

### 2.1.7 Auxiliary Building Exhaust Filter Units

The Auxiliary Building Exhaust Filters (see 2.1.7.1 through 2.1.7.3) are two, 50% capacity (42,000 CFM); parallel filter trains located at Elev. 328.0' in the Auxiliary Building. Each filter train consists of the following component filters:

#### 2.1.7.1 Roll-Aire Filters, AH-F-8A and 8B

The Roll-Aire Filters (see Table 6) are located at the upstream end of each filter train. The filter is constructed of 2" thick fiber glass reinforced by steel wires and is

automatically progressed to maintain a uniform pressure across the filter. The Roll-Aire Filters have a 1/6 HP motor with local controls and indicating lights and are powered from 120v power panel MP2-35.

2.1.7.2 HEPA Filters, AH-F-9A & 9B and AH-F-30A & 30B

The high efficiency particulate air filters (see Table 7) are the second and fourth filters in each filter train. The HEPA Filters are constructed of a dry, fibrous, high interception, sub-micron glass fiber which has an efficiency of 99.97% for particles larger than .3 microns. The pressure drop across a clean filter at rated capacity is 1.2 inches (H<sub>2</sub>O).

2.1.7.3 Activated Carbon Filters, AH-F-10A & 10B

The Activated Carbon Filters (see Table 8) are located between the HEPA Filters in each filter train. The carbon filters are constructed of impregnated activated charcoal and are water repellent and fire resistant. The carbon filters are designed to trap and remove gaseous contaminants from the air stream. Sprinkler systems are provided for spraying cells at a minimum flow rate of 1.5 gpm on the air entering side of the bank for fire protection.

2.1.8 Elevator Machinery Room Ventilation Fan, AH-E-41

The Elevator Machinery Room Ventilation Fan (see Table 9) is located in the Elevator Machinery Room, Elev. 347.0'. It is a single stage, centrifugal fan rated at 1400 CFM. The fan takes filtered air from the 328.0' elevation of the Auxiliary Building, circulates the air through the

Elevator Machinery Room and returns the air to the Auxiliary Building when room temperature exceeds 90°F. The fan is driven by a 3/8 HP motor which receives power from 120v power panel MP2-46. A local ON-OFF-AUTO switch is provided.

## 2.2 Instruments, Controls, Alarms and Protective Devices

The following devices are used for the Auxiliary Building Heating and Ventilating System instrumentation. (See Table 10).

Control switches, with pilot lights to indicate operation, are furnished on HVAC Control Panel No. 25 in the Control Room, for remote operation of the four 50% capacity exhaust fans which are operated in pairs to provide 100% of design capacity. Electrical interlocks automatically start the two supply air fans when any pair of exhaust fans is operated. Pilot lights on Panel No. 25 indicate operation of the supply fans. Control switches are also furnished on Panel No. 25 for manually testing the operation of the supply fans. A solenoid valve is energized and allows instrument air to open the automatic damper located in the discharge air stream of each supply and exhaust fan when the associated fan motor is energized.

The quick closing damper in the outside supply air duct is made operable through a pneumatic relay when either of the supply fan motors is energized, and is positioned by a differential pressure indicating controller to produce a uniform pressure drop across the filters, heating coil and damper. The purpose is to provide a constant quantity of outside air, regardless of the buildup of filter resistance, up to the limit where filters should be changed. An

alarm at the annunciator on Panel No. 25 will be energized through a pressure switch when the damper is no longer able to maintain the set differential pressure, i.e. when the damper is fully open.

A differential pressure indicating controller maintains a  $1/16''$   $H_2O$  vacuum in the Auxiliary Building by controlling the inlet vanes on the exhaust fans. The differential pressure indicating controller, AH-DPIC-5304A, compares the pressure in the supply duct from the Air Intake Tunnel and the 305.0' level of the Auxiliary Building. The differential pressure is indicated locally and in the Control Room on Panel No. 25 and an alarm is actuated also on Panel No. 25 when the vacuum is less than  $1/32''$   $H_2O$ .

The roll type prefilters in the Supply Air System and in the two filter trains of the Exhaust Air System are progressed automatically by local motors actuated by differential pressure switches. When the filters have reached the end of their travel an alarm is annunciated at Panel No. 25 in the Control Room.

Flow measuring and indicating devices are provided to indicate the air flow rate in the main supply and main exhaust ducts. Flow rates are indicated on Control Panel 25 as well as locally in the Auxiliary Building.

Control of the preheat coil in the supply air duct consists of a temperature indicating controller which senses the temperature of the incoming air and positions a locally mounted step controller which energizes the various stages

of the electric preheat coil. Setting of the temperature controller is such that the first stage of heating is energized at 50°F incoming air and all stages are energized at 0°F. Reheat coils at the three floor levels (328'-0", 305'-0", and 280'-6") are controlled by local thermostats through pneumatic step controllers. Indication of ambient temperatures at four floor levels (328'-0", 305'-0", 280'-6" and 258'-6") is given through the multipoint temperature recorder on Control Panel 25.

Flow of air normally bypasses the exhaust filters. If radioactive contamination reaches a predetermined level a radiation monitoring device, HP-R-222, located in the exhaust duct upstream of the exhaust filters, closes the bypass damper, opens the exhaust filter isolation damper, and annunciates an alarm on Panel 25. If the radioactive contamination level continues to rise a radiation monitoring device, HP-R-228, located downstream of the exhaust filters, shuts down the supply fans which will significantly increase the vacuum in the Auxiliary Building. If the contamination level continues to increase a radiation monitor located in the station vent, HP-R-219, de-energizes the exhaust fans and annunciates another alarm on Panel No. 25. Refer to System Description No. 52 for Radiation Monitor Set Points.

When the contamination has been reduced to acceptable levels the ventilation fans must be restarted manually. The dampers must be repositioned manually by depressing the Filter Bypass damper pushbutton on Panel No. 25. The pushbutton also has a test position which will position the dampers for air flow through the filters.

### 3.0 PRINCIPAL MODES OF OPERATION

#### 3.1 Startup

The Auxiliary Building is started up as follows:

One pair, either AH-E-8A & B or AH-E-8C & 8D, of exhaust fans is started manually. Auxiliary contacts in the exhaust fan control circuit open the corresponding exhaust fan discharge damper and start the pair of Auxiliary Building supply fans. Auxiliary contacts in the supply fans open the corresponding supply fan discharge damper and the system inlet damper.

#### 3.2 Normal Operation

In normal operation, both supply fans and two of the four exhaust fans are operating. The charcoal and HEPA filters in the exhaust system are in the by-pass position as long as the radiation level in the exhaust air is below the setting of the monitoring instruments. Winter tempering and heating is controlled automatically to provide a minimum 70°F average space temperature.

Two differential-pressure-indicating controllers are employed; AH-dPIC-5312 has its probes connected across the filter-inlet damper combination. The controller is set to maintain a constant pressure drop across the filter-damper assembly. The dampers, therefore, throttle the flow when the filters are clean, gradually opening as they become fouled. The purpose is to provide a constant quantity of outside air, regardless of the buildup of filter resistance. An alarm at the annunciator on Panel No. 25 will be energized through a pressure switch when the differential



pressure exceeds 125% of the differential pressure controller setting, indicating the need to change filters.

AH-dPIC-5304A has its probes connected between a point in the Air Intake Tunnel and a location near the ceiling of Elevation 305'-0". The desired differential of .063" W.G. negative (tunnel minus building) is maintained through control of the inlet vane dampers position in the exhaust blower inlet ports. An alarm on Panel 25 will be energized through a pressure switch when the differential pressure decreases to 1/32" W.G. negative.

Heating is accomplished in two phases:

- a. Incoming air is pre-heated by passing it through electric resistance elements (AH-C-9A thru AH-C-9J), energized in 142 KW steps, starting at 50°F with the last step powered at 0°F. The controller senses outside air temperature.
- b. Heating of each of the air streams delivered to the three floor levels is controlled by local thermostats through pneumatic step controllers which energize the electric heaters AH-C-42A through C, Elev. 305', AH-C-43A & B, Elev. 286.5', and AH-C-10A through 10F, Elev. 328.0' in appropriate increments to maintain the minimum 70°F temperature.

Air Supply rate and the exhaust rate are read from flow indicators located both locally and in the Control Room.

Pitot tubes in the air stream deliver a differential pressure to a flow transmitter which transfers the 0-3" W.G.

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signal to an outlet pressure of 3-15 psi. This is then fed to the flow indicators.

A thermostat located in the Elevator Machinery Room energizes a ventilating fan when the room temperature exceeds 90°F. The fan cools the Elevator Machinery Room by circulating air from the 328.0' elevation of the Auxiliary Building through the room.

### 3.3 Shutdown

The Auxiliary Building Ventilation System is shutdown by stopping the exhaust fans. The idle pair of exhaust fans must have their control switches in PULL-TO-LOCK to override the automatic backup interlock. The supply fans will automatically stop immediately after the first exhaust fan is de-energized. The system inlet damper and the fan discharge dampers will shut automatically. The Elevator Machinery Room fan control switch must be placed in OFF.

Shutdown of the Auxiliary Building Ventilation System should be minimized. Plant shutdown will not allow securing of equipment located in the Auxiliary Building which requires ventilation. Also, shutdown of the Ventilation System will break the vacuum in the Auxiliary Building and eliminate the flow of air from clean areas to potentially contaminated areas.

### 3.4 Special or Infrequent Operation

A fire protection signal shuts down the Auxiliary Building Ventilating System. Smoke and fumes must be removed by placing the exhaust fan override switch on the Fire Protection Panel No. 7 to OVERRIDE and energizing the exhaust fans. When the smoke or fumes have been reduced sufficiently to reset the Fire Protection System, the Auxiliary Building Ventilation System should immediately be placed in normal operation to complete evacuation of the building.

### 3.5 Emergency

Should an incident or accident occur that causes the release of radioactive particles and gases into the Auxiliary Building the radiation monitoring devices will function to limit the spread of the contamination by performing as described in section 2.2. When the source of radioactivity has been contained and the contamination removed the operator, upon notification from the proper authority, will manually restart the ventilation system.

A signal from the Fire Protection System de-energizes the exhaust, supply and Elevator Machine Room fans. De-energizing the exhaust fans closes their corresponding discharge dampers. De-energizing the supply fans closes their corresponding discharge dampers and also closes the system inlet damper. The system must be restarted manually after the emergency signals have cleared.

HAZARDS AND PRECAUTIONS

Since the Auxiliary Building Ventilation System is ventilating potentially contaminated spaces the system must be considered potentially contaminated. Special care must be exercised when changing exhaust filters especially after their use during a radioactive contamination emergency.

In a high radiation emergency, after radiation monitor HP-R-228 stops the supply fans, and the inlet damper shuts, the exhaust fans will continue to run increasing the vacuum in the Auxiliary Building. The vacuum may increase to the point (exhaust fans have a 12" W.G. static head) where it would be dangerous or impossible to enter or leave the Auxiliary Building while the exhaust fans are running, because of abnormally high differential pressure across the doors.

TABLE 1

AUXILIARY BUILDING SUPPLY FANS

FAN DETAILS

Identification	Supply Fans AH-E-7A & 7B
Number Installed	2
Manufacturer	Buffalo Forge
Model No.	805 D.W.D.I.
Type	Centrifugal
Rated Capacity, CFM	42,000
Static Press., (In. H <sub>2</sub> O)	4
Rated Speed, RPM	912
Drive	V-Belt

Fan Motor Details

Manufacturer	Westinghouse
Type	Squirrel Cage Induction Motor
Enclosure	Open
Rated H.P.	40
Rated Speed, RPM	1800
Lubricant-Coolant	Oil/Air
Power Requirements	460V, 3Ø, 60 Hz
Power Source, AH-E-7A	Bus 2-36
AH-E-7B	Bus 2-45

Classification

Code	C
Quality	4
Seismic	II
Cleanliness	D

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TABLE 2  
AUXILIARY BUILDING EXHAUST FANS

FAN DETAILS

Identification	Exhaust Fans AH-E-8A, 8B, 8C & 8D
Number Installed	4
Manufacturer	Buffalo Forge
Model No.	660 D.W.D.I.
Type	Centrifugal
Rated Capacity, CFM	42,000
Static Press., in. H <sub>2</sub> O	12
Rated Speed, RPM	1739
Other	Variable Inlet Vanves

Fan Motor Details

Manufacturer	Westinghouse
Type	Squirrel Cage Induction Motor
Enclosure	Open
Rated H.P.	100
Rated Speed, RPM	1800
Lubricant-Coolant	Oil/Air
Power Requirements	230/460v, 3 Ø, 60 Hz
Power Source	AH-E-8A&8B      Bus 2-36 AH-E-8C&8D      2-45

Classification

Code	C
Quality	4
Seismic	II
Cleanliness	D

TABLE 3

AUXILIARY BUILDING SUPPLY AIR FILTER

Filter Details

Identification	AH-F-7
Number Installed	1
Manufacturer	MSA
Type	Horizontal Roll-Aire & Cartridge
Model No.	V66AC & Dustfoe, Series S
Size	19' x 11'-8"
Capacity, CFM	84,000
Pressure Drop, Clean (in H <sub>2</sub> O)	0.16
Efficiency	85%

Drive Motor Details

Manufacturer	Von Weise Gear Co.
Type	Induction
Enclosure	Open
Rated HP	1/16
Rated Speed, RPM	6
Lubricant-Coolant	Oil/Air
Power Requirements	11.5/1Ø/60 Hz
Power Source	120V Power Panel MP 2-35

Classification

Code	C
Quality	4
Seismic	II
Cleanliness	D

TABLE 4

AUXILIARY BUILDING SUPPLY DUCT PREHEATER

Heater Details

Identification	AH-C-9A through 9J
Number Installed	10
Manufacturer	Chromalox
Model No.	DHF
Type	Resistance Duct Heater
Capacity/Heater, KW	142.2
Power Requirements (Heating Element)	480V/3 $\phi$ /60 Hz
Power Source (Heating Element)	480V Bus 2-36

Classification

Code	C
Quality	4
Seismic	II
Cleanliness	D



TABLE 5  
AUXILIARY BUILDING DUCT HEATER

Heater Details

Identification	AH-C-10A through F
Number Installed	6
Manufacturer	Chromalox
Model No.	DHF
Type	Resistance Duct Heater
Capacity (KW)	100
Power Requirements (Heating Element)	480V/3 $\phi$ /60 Hz
Power Source (Heating Element)	480V Bus 2-45

Heater Details

Identification	AH-C-42A Through C
Number Installed	3
Manufacturer	Chromalox
Model No.	DHF
Type	Resistance Duct Heaters
Capacity (KW)	114
Power Requirements (Heating Element)	480V/3 $\phi$ /60 Hz
Power Source (Heating Element)	480V Bus 2-45

Heater Details

Identification	AH-C-43A & B
Number Installed	2
Manufacturer	Chromalox
Model No.	DHF
Type	Resistance Duct Heater
Capacity (KW)	98
Power Requirements (Heating Element)	480V/3 $\phi$ /60 Hz
Power Source (Heating Element)	480V Bus 2-45

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TABLE 5 (CONTINUED)

AUXILIARY BUILDING DUCT HEATER

Classification

Code	C
Quality	4
Seismic	II
Cleanliness	D

TABLE 6

AUXILIARY BUILDING EXHAUST AIR ROLL-AIRE FILTER

Filter Details

Identification	AH-F-8A & B
No. Installed	2
Manufacturer	MSA
Type	Horizontal Roll-Aire
Model No.	Type V #104-10 Design 4
Size	10' x 10' 4"
Capacity, CFM	42,000
Pressure Drop, Clean (in H <sub>2</sub> O)	0.16
Efficiency	85%

Drive Motor Details

Manufacturer	Von Weise Gear Co.
Type	Induction
Enclosure	Open Dripproof
Rated HP	1/6
Rated Speed (RPM)	6
Lubricant-Coolant	Oil/Air
Power Requirements	115v/1Ø/60 Hz
Power Source	120v Panel MP2-35

Classification

Code	C
Quality	3
Seismic	I
Cleanliness	D

TABLE 7

AUXILIARY BUILDING EXHAUST HEPA AIR FILTERS

Filter Details

Identification	AH-F-9A & B, AH-F-30A & B
No. Installed	4
Manufacturer	American Air Filter
Type	HEPA
Model No.	Astrocel
Size	24" x 24"
Capacity, CFM	42,000
Pressure Drop, Clean (in H <sub>2</sub> O)	1.2
Efficiency	99.97%

Classification

Code	C
Quality	3
Seismic	I
Cleanliness	D

TABLE 8

AUXILIARY BUILDING EXHAUST ACTIVATED CARBON AIR FILTER

Filter Details

Identification	AH-F-10A & B
No. Installed	2
Manufacturer	MSA
Type	Carbon Filter
Model No.	MSA-8581
Size	24" x 40"
Capacity	42,000
Pressure Drop, Clean (in H <sub>2</sub> O)	1.0
Efficiency	99.9%

Classification

Code	C
Quality	3
Seismic	I
Cleanliness	D

TABLE 9

AUXILIARY BUILDING ELEVATOR MACHINERY ROOM VENTILATION FAN

Fan Details

Identification	AH-E-41
Number Installed	1
Manufacturer	Buffalo Forge
Model No.	ILG-CWF-122
Type	Centrifugal
Rated Capacity, CFM	1400
Static Press., in. H <sub>2</sub> O	1/8
Rated Speed, RPM	1750

Fan Motor Details

Manufacturer	Westinghouse
Type	Induction
Enclosure	Open Dripproof
Rated HP	3/8
Rated Speed, RPM	1750
Lubricant-Coolant	Oil/Air
Power Requirements	120v/1Ø/60 Hz
Power Source	120v panel MP2-46

Classification

Code	C
Quality	4
Seismic	II
Cleanliness	D

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TABLE 10  
 INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Set Point
AH-ES-5200/5201/ 5207/5208	Control Switch	Provide (auto-on-off) control to exhaust fans AH-E-BC/BD/BA/BB respectively	Panel-25	SBM Switch	N/A	N/A	N/A
AH-EL-5200/5201/ 5207/5208	Indicating Light	Indicate (Power-On/Power-Off) on the control panel for exhaust fans AH-E-BC/BD/BA/BB respectively	Panel-25	Red-Green	N/A	N/A	N/A
AH-ES-5202/5203/ 5205/5210	Flow Switch	Detect flow in the discharge duct of exhaust fans AH-E-BD/BC/BA/BB respectively	Duct	Vane Actuated	30 FPS	N/A	N/A
AH-EL-5202/5203/ 5205/5210	Indicating Light	Indicate (Flow-No Flow) condition on the control panel for exhaust fans AH-E-BD/BC/BA/BB respectively	Panel-25	Red-Green	N/A	N/A	N/A
AH-PE-5204/5206	Annubar Flow Element	Measure dynamic pressure head and indicate flow from pairs of exhaust fans AH-E-BC & BD and AH-E-BA & BB respectively	Duct	Head Meter	0-83890 CFM	0-1.05" SG	N/A
AH-dPT-5204/5206	Differential Pressure Transmitter	Transmit a differential pressure signal from the discharge of exhaust fans pairs AH-E-BC & BD and AH-E-BA & BB respectively to square root converters	Duct	Press. Xmr.	0-3" WG	10-50 ma DC	N/A
AH-EY-5204/5206	Square Root Converter	Converts output signal proportional to the square root of the input signal from AH-dPT-5204/5206 respectively	Cabinet-175	Foxboro Model 66AT	10-50 ma DC	10-50 ma DC	N/A
AH-PR-5206	Flow Recorder	Records flow on control panel from exhaust fan AH-E-BA/BB/BC/BD	Panel-25	Dual Pen	10-50 ma DC	0 to 90H, CFM	N/A
AH-EL-5209	Indicating Light	Indicate (Flow-NoFlow) condition in the exhaust filter by-pass duct	Panel-25	Red-Green	N/A	N/A	N/A
AH-ES-5210	Limit Switch	Provide (Open-Shut) indication of solenoid valve in control air supply line to the exhaust filter by-pass damper D4020A	Valve	Vane Actuated	N/A	N/A	N/A
AH-EL-5210	Indicating Light	Indicate position (Open-Shut) on control panel of solenoid valve in control air supply line to exhaust filter by-pass damper D4020A.	Panel-25	Red-Green	N/A	N/A	N/A
AH-dPS-5201/5202	Differential Pressure Switch	Provide indication of high differential pressure across exhaust filter banks ASU respectively	Exh. Unit A/ Exh. Unit B	Joinson Press. Sw.	0-4" WG	N/A	5.5 $\Delta$ P
AH-ES-5201/5202	Limit Switch	Provide indication of when replacement of prefilter on exhaust filter banks ASU is necessary	Motor	DPDT	N/A	N/A	N/A
AH-TI-5211	Thermometer	Indicate temperature of exhaust air (local)	Duct	Bourdon Tube	30 <sup>o</sup> -180 <sup>o</sup> F	0-270 <sup>o</sup> Arc	N/A

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TABLE 10 (Cont'd)  
 INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Set Point
AH-RHS-5295	Pushbutton	Return Exhaust Filter dampers to normal (bypass) position after the high radiation signal has cleared.	Panel-25	Push Button	N/A	N/A	N/A
AH-TE-5296/5298/ 5300/5306	Resistance Thermometer	Detect room/floor temperatures at elevations 258'-6"/280'-6"/ 305'-0"/ 328'-0" respectively and transmit signal to its corresponding point on the multipoint temperature recorder	At specified elevation	Resistance Element	0-200°F	10-50 ma DC	N/A
AH-MTP-5296/5298/ 5300/5306	Recorder Point	Record on the multipoint temperature recorder temperature signals received from resistance thermometers AH-TE-5296/5298/5300/5306 respectively	Panel-25	One point of precision multipoint recorder	N/A	N/A	N/A
AH-TS-5297/5302 5307	Thermostat	Control room/floor temperatures for elevations 280'-6"/305'-0"/ 328'-0" respectively by operating the associated pneumatic step controller (air operated DTDT Switches) for the operation of duct heaters	At specified elevations	Pneumatic TIC	50-80°F	3-15 psi	70°F
AH-TS-5301/5305/ 5314/5317	Thermostat	Provide indication of high room/floor temperatures at elevations 305'-0"/328'-0"/280'-6"/258'-6" respectively	At specified elevations	Elect 2 posi- tion controller (SPDT Contacts)	60-120°F	N/A	120°F
AH-SC-5302/5307	Step Controller	Convert pneumatic signal from thermostat AH-TS-5302/5307 to elec- trical signal which operates heaters AH-C-42A-C and AH-C-10A-C respectively	Aux. Bldg. Elev. 305'/328'	Pneumatic DPDT switches	3-15 PSI	N/A	70°F
AH-DPT-5303	Differential Pressure Transmitter	Transmits differential pressure between Auxiliary Building and intake tower to AH-DPIS-5303	Panel-25B	Bourdon Tube	0-0.4" W.C.	10-50 ma DC	N/A
AH-DPIS-5303	Pressure Switch	Provides indication of high building pressure on a differential pressure signal from AH-DIT-5303	Panel-25	Diaphragm SPDT Switch	10-50 ma DC	0-0.4" W.C.	1/8" WG Neg
AH-DPIC-5303	Differential Pressure Controller	Controls auxiliary building pressure by operating the inlet vane damper on the exhaust fans	Johnson Control Cab, AQ-A61 Elev. 328'-0	Spring loaded Diaphragm	-1 to +1" H <sub>2</sub> O	3-15 psi	1/8" WG Neg



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TABLE 10 (Cont'd)  
 INSTRUMENTATION AND CONTROLS

Identification	Description	Function	Location	Type	Input Range	Output Range	Set Point
AH-FS-5308/5309	Flow Switch	Detect flow in the discharge duct of supply fans AH-E-7B/7A respectively	Duct	Paddle	30 FFS	N/A	15 FFS
AH-FL-5308/5309	Indicating Light	Indicate (Flow- No Flow) condition on the control panel for supply fans AH-E-7B/7A respectively	Panel-25	Red-Green	N/A	N/A	N/A
AH-MS-5310/5311	Motor Operator	Provide (auto-on-off) control to supply fans AH-E-7A/7B respectively	Panel-25	SBM Switch	N/A	N/A	N/A
AH-AL-5310/5311	Indicating Light	Indicates (Power On-Power Off) on the control panel for supply fans AH-E-7A/7B respectively	Panel-25	Red-Green	N/A	N/A	N/A
AH-ES-5311	Limit Switch	Provide indication of when replacement of prefilter on supply filter bank is necessary	Motor	DPDT Switch	N/A	N/A	N/A
AH-DPIC-5312	Differential Pressure Indicating Controller	Maintains constant supply flow by keeping pressure drop across inlet damper, filter and preheater constant. As pressure drop across filter increases, constant pressure is maintained by opening the inlet damper	Johnson Cont. ATC Cab. at AQ-A64 Elev.-328'-0"	Spring Loaded Diaphragm	0-3" WG	3-15 psi	2.5" WG
AH-PS-5312	Pressure Switch	Provide indication of high differential pressure across the inlet damper, filter and preheater	Johnson Cont. ATC Cab. at AQ-A64	Diaphragm SPDT Switch	3-20 psi	N/A	2.5 WG
AH-DPT-5313	Differential Pressure Transmitter	Transmit a differential pressure signal from supply duct upstream of filters to square root converter AH-FY-5313	AUX BLDG AQ-A62B	Diaphragm Sensing Element	0-14" WG	10-50 ma IC	N/A
AH-FY-5313	Square Root Converter	Converts output signal proportional to the square root of the input signal from AH-DPT-5313	CAB-175	Fosboro Model 66AT	10-50 ma DC	10-50 ma IC	N/A
AH-FR-5313	Flow Recorder	Record flow on control panel from supply duct upstream of filters	Panel-25	5", single pen solid state flush mounted	10-50 ma DC	0-83890 CFM	N/A
AH-FE-5313	Annular Flow Element	Measure dynamic pressure head and indicate flow from supply duct upstream of filters	Duct	Head Meter	0-83890 CFM	0-1" WG	N/A
AH-TIC-5315	Temperature Indicating Controller	Control supply fan inlet temperature by operating a pneumatic step controller (air operated DTD switches) for operation of preheater AH-C-9A	Inlet Duct	Bulb & Diaphragm	25°-224°F.	3-15 psi	50°F
AH-SC-5315	Step Controller	Convert pneumatic signal from Temperature Controller AH-TIC-5315 to electrical signal which operates heater AH-C-9A-F	Johnson Cont. ATC Cab. A64-AR	Pneumatic DPDT Switches	3-15 PSI	10-Steps	50°F
AH-TS-5320	Thermostat	Provide indication of high room temperature in the elevator machine room	Elevator Machinery Room	Electric 2 position controller (SPDT Contact)	25°-215°F.	N/A	90°F
AH-EL-5320	Indicating Light	Indicate on control panel a high temperature condition in the elevator machine room	Panel-25	Amber	N/A	N/A	N/A

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TABLE 11  
 PANEL MOUNTED AIRVARIABLES

Identification	Measured Description, Units	Alarm Set		Input Source	Variable Range	Panel
		High	Low			
MI-PSA-3291	End of travel on Auxiliary Building Exhaust Roll-Air Filter MI-P-0A	M/A	M/A	MI-ES-3291	M/A	25
MI-PSA-3291	High differential pressure across Auxiliary Building Exhaust Filter Train A, In. H <sub>2</sub> O	5.5	M/A	MI-PS-3291	0-12" WG	25
MI-ESB-3292	End of travel on Auxiliary Building Exhaust Roll-Air Filter MI-P-0A	M/A	M/A	MI-ES-3292	M/A	25
MI-PHE-3292	High differential pressure across Auxiliary Building Exhaust Filter Train B, In. H <sub>2</sub> O	6	M/A	MI-PS-3292	0-12" WG	25
MI-TBI-5101	High temperature Auxiliary Building Elev. 305.0°, °F	120°F	M/A	MI-TS-5101	60°-120°F	25
MI-PNI-5203	High pressure Auxiliary Building, In. H <sub>2</sub> O vacuum	1/2 - Neg	M/A	MI-PS-5103	3-20 psig	25
MI-TBI-5205	High temperature Auxiliary Building Elev. 326.0°, °F	120°F	M/A	MI-TS-5305	60°-120°F	25
MI-ESA-5311	End of travel on Auxiliary Building Supply Roll-Air Filter MI-P-7	M/A	M/A	MI-ES-5311	M/A	25
MI-PNI-5312	High differential pressure across Auxiliary Building Supply Filter MI-P-7, l	2.5" WG	M/A	MI-PS-5312	3-20 psig	25
MI-TBI-5314	High temperature Auxiliary Building Elev. 280.5°, °F	120°F	M/A	MI-TS-5314	25-215°F	25
MI-TBI-5317	High temperature Auxiliary Building RD Spray Pump Room, °F	120°F	M/A	MI-TS-5317 & 5318	25-215°F	25
MI-TBI-5325	High temperature Auxiliary Building Oil Cooler and Pump Room, °F	120°F	M/A	MI-TS-5325 & 5326	25-215°F	25
	Auxiliary Building Supply Fan Trip	M/A	M/A	OLX	M/A	25
	Auxiliary Building Exhaust Fan Trip	M/A	M/A	OLX	M/A	25

COMPUTER INPUTS

IMI DOCUMENTS

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Wilda R. Mullinix, NRC

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