9.4 Air Conditioning, Heating, Cooling and Ventilating Systems

The information in this section of the reference ABWR DCD, including all subsections, tables, and figures is incorporated by reference with the following departures and supplements.

STD DEP T1 2.14-1 (Figure 9.4-3)

STP DEP T1 5.0-1

STP DEP 9.4-1

STD DEP 9.4-2 (Figure 9.4-1, Sheets 1 through 5)

STD DEP 9.4-3

STD DEP 9.4-4 (Tables 9.4-3, 9.4-5, 9.4-5a, 9.4-5b, 9.4-5c, and 9.4-5d), (Figures 9.4-2a, 9.4-2b Sheet 2, and 9.4-2c)

STD DEP 9.4-5 (Figure 9.4-10, Sheets 1, 2, and 3)

STD DEP 9.4-6 (Figure 9.4-1, Sheets 1 and 2)

9.4.1 Control Building HVAC

9.4.1.1.4 Safety Evaluation

STD DEP 9.4-2

Upon detection of smoke in the CRHA, the operating division of the HVAC System is put into smoke removal mode by the main control room operators. For smoke removal, one or both exhaust fans ~~are started at high speed~~ are operated in *conjunction with a supply fan.~~, the~~* The *recirculation damper is closed* and the damper in the bypass duct around the ACU is opened*. Either division of the CRHA HVAC System can be used as a smoke removal system.*

9.4.1.1.6 Instrumentation Application

STD DEP 9.4-6

Differential pressure indicators show the pressure drop across the prefilters and the HEPA filters. The switch causes an alarm to be actuated if the pressure drop exceeds a preset limit.

One *~~A~~ flow switch* located at each fan discharge duct *in the emergency filtration ~~system~~* unit *~~fan discharge duct~~ automatically starts the standby ~~system~~* fan in the same division *and initiates an alarm on low flow or operating fan failure.* On detection of low flow by both flow switches in an emergency filtration unit, the emergency filtration unit fan, and the air conditioning unit in the redundant division are started and alarm is initiated.

9.4.1.2.6 Instrumentation Application

STD DEP 9.4-2

On a smoke alarm in a division of the Control Building safety-related electrical equipment area HVAC System, that division of the HVAC System shall be put into smoke removal mode. No other division is affected by this action. For smoke removal, the recirculation duct damper is closed, the damper in the bypass duct around the ACU is opened*, and* one or *both exhaust fans are started in conjunction with a supply fan. Normal once through ventilation of the battery rooms also removes smoke from the battery rooms.*

9.4.4 Turbine Island HVAC System

STD DEP 9.4-4

The Turbine Island heating, ventilating, and air conditioning system consists of the Turbine Building (T/B) HVAC System and the Turbine Building *Electrical* ~~*Building (E/B)*~~ Equipment Areas (EEA) *HVAC System*.

9.4.4.1 Design Bases

9.4.4.1.1 Safety Design Bases

The T/B HVAC and ~~*E/B*~~ EEA *HVAC Systems do not serve or support any safety function and have no safety design bases*.

9.4.4.1.2 Power Generation Design Bases

(1) The T/B HVAC and ~~*E/B*~~ EEA *HVAC are designed to supply filtered and tempered air to all Turbine Island spaces during all modes of normal plant operation, including plant startup and shutdown. The systems are also designed to maintain inside air temperatures above 15°C and below the following upper design limits:*

General Turbine Building areas: 40°C

Condenser compartment: 43°C

Resin tank room: 43°C

Steam tunnel: 49°C

Moisture separator compartments: 49°C

Electrical ~~*Building*~~ Equipment *areas: 40°C*

(2) The ~~*E/B*~~ EEA *HVAC is designed to provide independent supply and exhaust ventilation to the electrical* ~~*switchgear*~~ rooms, combustion turbine generator and electric boiler rooms, *chillers and air compressor rooms, and*

independent exhaust for the combustion turbine generator and ~~auxiliary~~ electric boiler rooms. The ventilation exhaust for these areas is discharged directly to the atmosphere. Recirculation from clean areas is provided.

9.4.4.2.1 T/B HVAC General Description

The T/B HVAC airflow diagram is shown on Figure 9.4-2a; the system instruments and controls are illustrated on Figure 9.4-2b; T/B Ventilation System flow rate and equipment design parameters are listed in ~~Table~~ Tables 9.4.3 and 9.4-5, respectively.

9.4.4.2.1.3 Turbine Building Equipment Compartment Exhaust (TBCE) System

The TBCE System consists of two 100% capacity exhaust fans, one common medium efficiency particulate filter (bag type) unit and associated controls. One fan is normally in operation, and the other fan is on automatic standby. The system also includes a 100% capacity filter bypass duct for purging smoke in case of fire.

Except when smoke removal is required, air is exhausted from the potentially high airborne concentration compartments and equipment vents, filtered through a medium efficiency particulate filter (bag type) before it is released to the atmosphere through the plant stack.

9.4.4.2.1.5 T/B HVAC Unit Coolers and Electric Unit Heaters

Local unit coolers and electric unit heaters are provided as required in the following areas: condenser compartment level 2 and 3, condensate pump room, heater drain/RFP pump ~~rooms~~ room, condensate booster pump room, filter pump and valve room, demineralizer pump and valve room, TCW heat exchanger area, ~~condensate control station,~~ reactor feed pump power supply room, demineralizer room ~~and filter maintenance area,~~ TCW pump area, SJAE and recombiner rooms, upper level above the turbine operating floor.

9.4.4.2.2 ~~E/B~~ EEA HVAC General Description

The ~~E/B~~ EEA HVAC schematic diagram is shown on Figure 9.4-2c.

9.4.4.2.2.1 Electrical ~~Building~~ Equipment Areas HVAC System

The Electrical ~~Building~~ Equipment area HVAC System is provided with two 100% capacity air supply fans and two 100% capacity exhaust fans.

The air supply fan draws outside air through louvers, control dampers, low efficiency filters, and chilled water coils, and discharges air directly into the ~~switchgear~~ electrical rooms, chiller, combustion turbine generator, ~~house~~ electric boiler room and air compressor rooms. Return air ~~Ductwork~~ ductwork ~~and bypass dampers are~~ is provided to allow recirculation of air from the ~~switchgear~~ electrical rooms and ~~chiller rooms~~ air compressor room.

The ~~E/B~~ EEA HVAC system maintains the Electrical ~~Building~~ Equipment Areas at a positive pressure with respect to atmosphere.

9.4.4.2.2.2 ~~E/B~~ EEA HVAC Unit Coolers and Electric Unit Heaters

Local unit coolers and/or electric unit heaters are provided as required in the chiller, air compressor and combustion turbine generator rooms. The unit coolers are supplied with chilled water from the Chilled Water System.

9.4.4.3 Evaluation

The TBS and ~~E/B~~ EEA HVAC have no safety design bases and serve no safety function.

Evaluation of the T/B HVAC and ~~E/B~~ EEA HVAC with respect to fire protection is discussed in Subsection 9.5.1.

9.4.4.5 Instrumentation Application

All control actuations, indicators, and alarms for normal plant operation are located in local control panels in the T/B HVAC and ~~E/B~~ EEA HVAC equipment areas.

Controls and instrumentation for the T/B HVAC and ~~E/B~~ EEA HVAC include:

9.4.5 Reactor Building HVAC System

STD DEP T1 2.14-1

The Flammability Control System (FCS) was eliminated in accordance with pages C-67 through C-69 of ABWR Licensing Topical Report NEDE-33330P, “Advanced Boiling Water Reactor (ABWR) Hydrogen Recombiner Requirements Elimination,” dated May 18, 2007. The information in the Licensing Topical Report is incorporated by reference.

9.4.6 Radwaste Building HVAC Systems

STD DEP 9.4-5

STP DEP T1 5.0-1

9.4.6.1 Design Bases

9.4.6.1.2 Power Generation Design Bases

STD DEP 9.4-5

The Radwaste Building HVAC System is designed to provide an environment with controlled temperature and airflow patterns to insure both the comfort and safety of plant personnel and the integrity of equipment and components. The Radwaste Building is divided into ~~two~~ three zones for air conditioning and ventilation purposes. These zones are the clean radwaste control room; the clean non-Class 1E electrical room, HVAC equipment room, air filtration equipment room, and Radwaste Building entrance; and the balance of the Radwaste Building which has the potential for airborne radioactive contamination.

A positive static pressure with respect to the balance of the building and to the atmosphere is maintained in the radwaste control room, the non-Class 1E electrical room, HVAC equipment room, air filtration equipment room and Radwaste Building entrance. *The balance of the Radwaste Building is maintained at a negative static pressure with respect to the atmosphere* and adjacent clean areas.

STP DEP T1 5.0-1

The system design is based on ~~*an outdoor summer maximum of 46°C. Summer indoor temperatures include 24°C in the radwaste control room, 32°C in operating areas and corridors, a maximum temperature of 40°C in areas that may be occupied and 43°C in the equipment cells. Winter indoor design temperatures include 16°C in occupied areas, 21°C in the radwaste control room and 16°C in the equipment cells, based on an outdoor design temperature of 40°C.*~~ the following 1% exceedance site temperatures:

- Summer design conditions, 32.8°C. (91°F) dry bulb and 26.3°C. (79.3°F) wet bulb (coincident).
- Winter design condition, 2.1°C. (35.8°F).

STD DEP 9.4-5

The system is designed to:

- Maintain indoor design condition of 24°C (75°F) and RH 55% or less in the radwaste control room throughout the year at the outdoor design conditions specified above.
- Maintain indoor design temperature range between maximum of 32°C (90°F) and minimum of 15°C (59°F) in the electrical and HVAC equipment rooms throughout the year at the outdoor design conditions specified above.
- Maintain indoor design temperature range between maximum of 40°C (104°F) and minimum of 15°C (59°F) in the radwaste process areas throughout the year at the outdoor design conditions specified above.
- Limit airborne fission product release to the atmosphere from the ventilation system exhaust during normal plant operation.
- Limit concentration of airborne radioactivity to levels below the allowable values set by Appendix B of 10CFR20.
- Provide accessibility for adjustment and periodic inspection and testing of the system equipment and components to ensure continuous functional reliability.
- Provide sufficient back-up equipment and components to ensure continuous reliable performance during normal plant operation.

- Air filtration system equipment housing and ductwork design, construction, and testing shall be in compliance with requirements of ASME AG-1.

9.4.6.2 System Description

The following site-specific supplement addresses COL License Information Item 9.17.

The Radwaste Building HVAC System flow rates are indicated in the Radwaste Building HVAC System P&ID Figure 9.4.10, sheets 1, 2, and 3 located in Chapter 21. Equipment data and performance are listed in Table 9.4-6a through Table 9.4-6m. Compliance with RG 1.140 is included in the following relevant subsections.

9.4.6.2.1 Radwaste Building Control Room

STD DEP 9.4-5

Heating, cooling, and pressurization of the control room are accomplished by ~~*an air-conditioning system. The air conditioning system is a unit air conditioner consisting of a water cooled condenser, compressor, cooling coil, heating coil, filters and fan. Outdoor air and recirculating air are mixed and drawn through a prefilter, a high efficiency filter, a heating coil, a cooling coil, and two 100% supply fans. One fan is normally operating and the other fan is on standby. A pressure differential controller regulates the exfiltration from the control room to maintain it at a positive static pressure, preventing airborne radioactive contamination from entering.*~~ two redundant 100% capacity air conditioning units served by a common air distribution system. Each air conditioning unit is a factory-assembled unit consisting of, in the direction of airflow, a return/outside air plenum, a pre-filter bank, a high efficiency filter bank, an electric heating coil, a chilled water coil, a supply air fan, and an isolation damper. Chilled water for the cooling coil is supplied from the HVAC normal cooling water system. *No separate exhaust fan system is required.*

The Radwaste Control Room HVAC Smoke Removal System consists of one 100% fan. This fan is operated manually. Smoke from the control room is released directly to the atmosphere. Make up for smoke removal is provided by the active air handling unit after its dampers have been automatically aligned for 100% outdoor air. During smoke removal operation the cooling coil valve automatically reverts to full flow to prevent coil freezing during the cold season.

An area radiation monitor is provided in the radwaste control room and will alarm on high radiation to alert personnel in the area.

One of the air conditioning units is manually placed in operation and runs continuously on a return airflow of approximately 80% of the total supply air to the room. Approximately 20% of the total supply air to the room is drawn by the unit from the outdoor air to be mixed with the return air and delivered to provide ventilation and control room pressurization.

Upon detection of smoke in the supply or return air ducts, the system shuts down and an alarm sounds in the radwaste and main control room.

9.4.6.2.2 Radwaste Building Process Area HVAC System and Electrical and HVAC Equipment Rooms Ventilation System

The Radwaste Building Process Area HVAC System is a once-through type. Outdoor air is filtered, tempered, and delivered to the non-contaminated areas of the building. The supply air system consists of outdoor air intake*, a prefilter, a high efficiency filter, heating coil, cooling coil, and two 100%* capacity *supply fans. One fan is normally operating and the other fan is on standby. The supply fan furnishes conditioned air through ductwork and diffusers, or registers to* the non-contaminated and *work areas of the building. Electric unit heaters are provided in the trailer bays, the sorting table area,* and other areas of the building with significant heat loss. *Air from the work* and non-contaminated *areas is exhausted through the tank and pump rooms* and other contaminated areas*. Thus, the overall airflow pattern is from the least potentially contaminated areas to the most contaminated areas.* Supply airflow temperature, in an inverse proportion, is controlled by a space temperature controller to maintain the space temperature within the design range through the modulation in sequence of the air handling unit, chilled water cooling coil valve and the silicon controlled rectifier (SCR) controller of the air tempering electric coil. *The exhaust air system consists of three 50% exhaust fans, two normally operating and one on standby.* ~~*Exhaust*~~ Monitored *exhaust air from the Radwaste Building is* normally routed through a bypass to the plant stack. Upon radiation detection in the main exhaust duct, the exhaust air is automatically realigned and *filtered through a prefilter and a high efficiency* particulate air (HEPA) *filter before* ~~*release*~~ *discharge* to *the plant stack*. A radiation monitor downstream of the HEPA filter monitors the discharge airflow and upon detection of high levels of radioactivity, activates an alarm in the Radwaste Control Room and the Main Control Room, and shuts down and isolates the system.~~*, and it is monitored for airborne radioactivity. A high level of radioactivity activates an alarm in the main control room, simultaneously isolating the process area. The exhaust air is monitored before it is released to the main plant stack.*~~ Smoke removal is accomplished by the exhaust air fans by-passing the air-filtration equipment. Make up air for smoke removal is provided by the air handling unit. During smoke removal operation the cooling coil valve automatically reverts to full flow to prevent freezing during the cold season.

The non-Class 1E electrical room, HVAC equipment room, air filtration equipment room and Radwaste Building entrance heating, cooling, and pressurization is accomplished by an air conditioning unit with two redundant 100% capacity supply air fans. Supply air is distributed by an overhead air distribution system. The air conditioning unit is a factory-assembled unit consisting of, in the direction of airflow, a return/outside air plenum, pre-filter bank, high efficiency filter bank, chilled water coil, two redundant supply air fans, and isolation dampers. Chilled water for the cooling coil is supplied from the HVAC Normal Cooling Water System. Return air from the electrical equipment room, the HVAC equipment rooms, and the building entrance is ducted back to the air conditioning unit by one of the two 100% capacity redundant return air fans. Air supplied to the air filtration equipment room is exhausted by the filtered exhaust air system of the Process Area HVAC System.

The air conditioning unit is manually placed in operation and runs continuously with one supply fan activated and with a minimum outdoor air supply of approximately 20% of the total supply air for pressurization. The return airflow of approximately 80% of the total supply air to the room is drawn by the activated return air fan and delivered back to the air conditioning unit.

Smoke removal is accomplished by one of the return air fans, which is operated manually. Exhausted smoke is discharged directly to the outdoors. Makeup air for smoke removal is provided by the air handling unit after its dampers have been automatically aligned for 100% outdoor air. During smoke removal operation the cooling coil valve automatically reverts to full flow to prevent coil freezing during the cold season.

9.4.6.3 Safety Evaluation

Although the HVAC ~~System is~~ systems are *not safety-related as defined in Section 3.2, several features are provided to ensure safe operation. ~~A c~~*C*ompletely separate HVAC ~~System is~~* systems are *provided for the radwaste control room* and the non-Class 1E electrical room, HVAC equipment room, air filtration equipment room and Radwaste Building entrance. *Pressure control fans for radwaste areas are redundant, with provision for automatic start of the standby unit. Area and process exhaust radiation detectors and isolation dampers are provided to permit isolation of ~~the radwaste process areas~~* the redundant equipment. Duct penetrations and transfer air opening in equipment and tank rooms, with radiation shielding, are carefully configured for radiation shine geometry to prevent impingement of direct radiation on personnel. The exhaust system air filtration equipment is in compliance with Regulatory Guide 1.140.

When high radiation is detected downstream of the air-filtration equipment, the operator should shutdown the system as a precaution. The source of the high radioactivity should be identified and corrective action should be taken prior to restart of the system.

9.4.6.4 Tests and Inspections

The system is designed to permit periodic inspection of important components, such as fans, motors, belts, coils, filters, ductwork, piping and valves, to ensure the integrity and capability of the system. Local display and/or indicating devices are provided for periodic inspection of vital parameters such as room temperature, and test connections are provided in exhaust filter trains and piping for periodic checking of air and water ~~Air Conditioning, Heating, Cooling and Ventilating Systems 9.4-33~~ flows for conformance to the design requirements. All major components are tested and inspected as separate components prior to installation to ensure design performance. The system is pre-operationally tested in accordance with the requirements of Chapter 14. The system air filtration units are tested in place for casing leakage, in place aerosol leak test for HEPA filters frame or bypass leakage in accordance with ASME N510. HEPA combined penetration and bypass leakage limitations are in compliance with Regulatory Guide 1.140. Ductwork, isolation dampers, and connections associated with air filtration systems are tested in accordance with ASME AG-1.

9.4.6.5 Instrumentation Application

9.4.6.5.1 Radwaste Building Control Room HVAC

The air conditioning unit for the radwaste control room HVAC is started manually. A temperature indicating controller modulates the air conditioning system via chilled water cooling coil *valve and an electric heating coil* SCR to *maintain space conditions. A differential pressure indicating controller modulates ~~inlet vanes in the supply fan air inlets~~* outdoor and return air dampers *to maintain the positive static room pressure. Differential pressure indicators measure the pressure drop across the filter bank* and provide an alarm when the filter is due for replacement. Detection of smoke in the supply or the return air duct will sound an alarm and automatically shut down the activated unit. Furthermore, alarms shall be generated upon airflow failure, high supply air temperature, radiation detection, and lack of space pressure differential.

9.4.6.5.2 Radwaste Building Process Area HVAC

The information in this section of the reference ABWR DCD is incorporated by reference with the following supplement.

The air exhaust and supply fans for the Radwaste Building Process Area HVAC are started manually. The fan ~~inlet~~ isolation *dampers open when the fan is started. A flow switch installed in the exhaust* and supply *fan discharge duct activates an alarm on indication of fan failure in the main and radwaste control rooms and automatically starts the standby fan. The exhaust ~~fan is~~* fans *are interlocked with ~~supply fan~~* the air handling unit supply fans *~~to prevent the supply fan from operating if the exhaust fan is shut down~~* so that the operation of two exhaust fans is a prerequisite to starting the supply air fans. Local heating shall be provided by electric unit heaters provided with integral controls. *~~Two~~* Command signals from multiple *pressure-indicating controllers modulate variable inlet vanes ~~in the supply fan~~* of the activated exhaust air fans *to maintain the area at a negative static pressure with respect to the atmosphere* and the adjacent clean areas in the building. Upon negative static pressure rise after the activated exhaust fans have reached maximum flow, the variable inlet vanes on the activated supply air fans modulate to reduce supply airflow to the radwaste process areas. *~~The switch causes an~~* An *alarm ~~to be~~* is *activated if the negative pressure ~~falls below~~* rises above *the preset limit. Differential pressure indicators measure the pressure drop across the filter section~~. The switch~~* and *causes an alarm to be activated if the pressure drop exceeds the preset limit.*

~~Radiation monitors are installed in the radwaste process area exhaust duct to the main plant stack. A high radiation signal in the duct causes alarms to annunciate in the main control room and the radwaste control room. If the radwaste process area exhaust radiation alarm continues to annunciate, the work area branch ducts are manually isolated selectively to locate the affected building area. Should this technique fail, because the airborne radiation has generally spread throughout the building, control room air conditioning continues operating. However, the air conditioning for the balance of the building is shut down. The operators, using approved plant health physics procedures, then enter the work areas to locate and isolate the leakage source. The supply and exhaust air ductwork have manual balancing dampers~~

~~*provided in the branch ducts for balancing purposes. The dampers are locked in place after the system is balanced.*~~ Upon detection of smoke in the supply or exhaust air ducts, the system shuts down and an alarm sounds in the radwaste and main control room. The system shall be provided with airflow and differential pressure monitoring and recording. Furthermore, alarms shall be generated upon airflow failure of the activated supply and exhaust fans, high and low supply air temperature, radiation detection in the exhaust air ducts, high differential pressure across the filter banks, and lack of space sub atmospheric pressure.

9.4.6.5.3 ~~*Incinerator Exhaust Stack*~~ Not Used

~~*Radiation monitors are installed in the incinerator exhaust stack. A high radiation signal in the stack causes alarms to annunciate in the main control room and the radwaste control room. See Subsection 11.5.2.2.11 and Table 11.5-2.*~~

9.4.6.5.4 Electrical Room, HVAC Equipment Room, Air Filtration Equipment Room, and Radwaste Building Entrance HVAC

STD DEP 9.4-5

The air conditioning unit for the electrical and HVAC equipment rooms, air filtration room, and building entrance is started manually. One of the two 100% capacity supply fans is activated and run continuously. Differential flow switch across the fan will alarm in the control room upon airflow failure and initiate the operation of the standby supply fan. A temperature-indicating controller modulates, in sequence, the outdoor air, the return air, and the relief air dampers of the air conditioning unit for free cooling using outdoor air. Upon further room temperature rise the unit dampers revert to minimum outdoor airflow and modulate, in sequence, the chilled water cooling coil valves. Heating is provided either by electric unit heaters with integral control or by heating coil with SCR to maintain space conditions. A differential pressure indicating controller overrides temperature control and modulates outdoor and return air dampers to maintain the positive static pressure in the served areas. Differential pressure indicators measure the pressure drop across the filter bank and provide an alarm when the filter is due for replacement. Detection of smoke in the supply or the return air duct will sound an alarm and automatically shutdown the activated unit. Furthermore, alarms are generated upon airflow failure of the activated supply and return air fans; high and low supply air temperature, and lack of space sub atmospheric pressure.

9.4.8 Service Building HVAC System

STP DEP 9.4-1

STD DEP 9.4-3

The Service Building HVAC System supplies air to ~~*consists of two subsystems;*~~ *the Clean Area* ~~*HVAC System*~~ *and the Controlled Area* ~~*HVAC System*~~*.*

9.4.8.1.2 Power Generation Design Bases

STD DEP 9.4-3

(1) *The* Service Building ~~*Clean Area*~~ *HVAC System is designed to maintain a quality environment suitable for personnel health and safety in the Service Building. It is designed to limit the maximum temperature in the Service Building to 29°C. The temperature in each area conforms to the equipment requirements in that area.*

(2) *The* Service Building ~~*Clean Area*~~ *HVAC System provides a quantity of filtered outdoor air to purge any possible contamination.*

(3) ~~*Both the Clean Area HVAC System and the Controlled Area HVAC System operate manually and*~~ The Service Building HVAC System is started manually and operates *continuously. Isolation dampers at each supply fan, each exhaust fan, and each filter package close when the respective equipment is not operating. There is an additional isolation damper at the supply air inlet which closes when the supply air system is not operating. An automatic damper in the supply system ductwork regulates the flow of air to maintain the Service Building clean areas at a positive pressure with respect to the atmosphere.*

(4) *In the event of a loss of offsite electric power, the Service Building HVAC System is shut down.* The combustion turbine generator (CTG) backed power is available for manual loading by the operator to start the Service Building HVAC System.

(5) *The clean areas served by the* Service Building ~~*clean area*~~ *HVAC System has an emergency filter train. It is manually operated. In an emergency it supplies filtered air for the TSC, OSC, lunch room, offices, health physics lab, security offices, and other normally clean areas.*

9.4.8.2 System Description

STD DEP 9.4-3

(1) *The* Service Building ~~*Clean Area*~~ *HVAC System supplies filtered, heated or cooled air to both the clean and controlled areas through a central fan system consisting of an outside air intake, Air Conditioning Unit consisting of filters, heating coils, cooling coils, two 50% capacity supply air fans and supply air ductwork.*

(2) Two 50% capacity exhaust air fans serve the ~~*The*~~ *Clean Area* ~~*HVAC System has two 50% capacity exhaust air fans.*~~ *They take air from the clean areas through the exhaust ducts and discharge the air on the Service Building roof.*

(3) Two 50% capacity exhaust air fans serve the ~~*The*~~ *Controlled Area.* ~~*HVAC System routes*~~ They route *potentially contaminated air* ~~*to two 50% capacity exhaust air fans to*~~ from the controlled areas and *discharge the air to the common plant stack*.

(6) The Service Building *~~clean area~~ HVAC System is provided with an emergency filter train consisting of a heater/demister, prefilter, HEPA filter, 5.1 cm charcoal filter bed, a second HEPA filter, and two fans.*

(7) Controls and Instrumentation

STP DEP 9.4-1

(c) Radiation monitors ~~and provisions for toxic gas monitors~~ at the supply air inlet with alarms to TSC.

STD DEP 9.4-3

(d) On manual initiation, the Service Building *~~clean area~~ HVAC System can be put into high radiation mode. On switch over, exhaust fans stop and emergency filter train starts. System pressurizes clean areas of the service building.*

9.4.10 COL License Information

9.4.10.1 Service Building HVAC System

The following site-specific supplement addresses COL License Information Item 9.16.

The Service Building HVAC System P&ID is shown in Figure 9.4-11. Flow rates and component capacities are given in Tables 9.4-3, 9.4-4h, 9.4-7a and 9.4-7b. Radiation monitors are provided at the supply air inlet as shown in Figure 9.4-11 and discussed in Section 9.4.8.2 (7c). As discussed in Subsection 2.2S.3, no hazardous chemicals with quantities exceeding the criteria of Regulatory Guide 1.78 have been identified. Instrumentation to detect and alarm a hazardous chemical release in the STP 3 & 4 vicinity and to isolate the Service Building Clean Area from such releases is not provided.

The Service Building Clean Area emergency filter unit complies with all applicable provisions of Regulatory Guide 1.140, Rev. 2, Section C.

9.4.10.2 Radwaste Building HVAC System

The following site-specific supplement addresses COL License Information Item 9.17.

The detailed equipment lists, system flow rates, and compliance with RG 1.140 for Radwaste Building HVAC System is addressed in Subsection 9.4.6.2.

Table 9.4-3 HVAC Flow Rates ~~(Response to Question 430.243)~~

Safety-Related HVAC System	Flow Rates (m^3/h)
R/B Electrical HVAC Division A	30,000
R/B Electrical HVAC Division B	30,000
R/B Electrical HVAC Division C	30,000
DG HVAC Division A	160,000
DG HVAC Division B	160,000
DG HVAC Division C	160,000
C/B Electrical HVAC Division A	35,000
C/B Electrical HVAC Division B	35,000
C/B Electrical HVAC Division C	35,000
CRHA HVAC Division B	80,000
CRHA HVAC Division C	80,000
Non-Safety-Related HVAC Systems	**Flow Rates (m^3/h)**
R/B Secondary Containment HVAC	168,500
T/B Ventilation System	~~341,500~~ **385,500**
RIP ASD HVAC Division A	50,000
RIP ASD HVAC Division B	50,000
Service Building Emergency Filtration Unit	**5,300**
Service Building Air Conditioning Unit	**55,200**

Table 9.4-4h HVAC System Component Descriptions—Non-Safety-Related Fileters ~~(Response to Question 430.243)~~

Filters	Quantity	Capacity (m^3/h)
R/B Secondary Containment HVAC	3 (1 on standby)	86,250
R/B Primary Containment Intake HEPA Filter	1	22,000
R/B Secondary Containment Exhaust Fans	3	57,500 (each)
Service Building Air Conditioning Unit	**1**	**55,200**
Service Building Emergency Filtration Unit	**1**	**5,300**

Table 9.4-5 Turbine Building ~~*and Electrical Building*~~ HVAC System—Non-Safety-Related Equipment ~~*~~

Item	Turbine Building Air Supply ~~*TRV*~~ TBV–F–1A thru C	T/B Clean Area Return/Exhaust TBV–F–2A thru C	T/B Equipment Compartment Exhaust TBV–F–24A & –24B	T/B Lube Oil Exhaust TBV–F–4A & B	Condensate Pump Room Recirc. Unit TBV–F–8A thru C
Type	Builtup unit	Central station air handler	Builtup unit	Fan	Central station air handler
Number of units	1	3	1	2	3-50% each
Flow rate (m^3/h)	~~*341,500*~~ **385,500**	~~*168,000*~~ **189,900**/unit	272,000	12,600	51,000/**unit**
Fan:					
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
No. of fans per unit	3	1	2	1	1
No. of running fans	2	2	1	1	2
Heating coils:		None		None	None
No. of banks per unit	1	–	~~*1*~~ **None**		–
Capacity, each (MJ/h)	~~*11,605.81*~~ **13,133**	–	~~*369.28*~~ **None**		–
Cooling coils:		None	None	None	
No. of banks per unit	6	–	–	–	
Capacity, each (MJ/h)	~~*1582.61*~~ **1788**	–	–	–	949.57
Prefilters:		None	None	None	
Type	Glass, roll	–	–		–
Capacity (m^3/h)	~~*341,500*~~ **385,500**	–	–		–
ASHRAE 52 eff.	35%	–	–		–
Filters:				None	
Type	High eff.	Bag type,	Bag type,	–	~~*Medium*~~ **High** eff
Capacity (m^3/h)	~~*341,500*~~ **385,500**	~~*168,000*~~ **189,900**/unit	272,000	–	51,000/**unit**
ASHRAE 52 eff.	85%	90%	90%	–	85%

* ~~*Response to Question 430.242C.*~~

Table 9.4-5a Turbine Building ~~and Electrical Building~~ HVAC System—Non-Safety-Related Equipment (Continued)

Item	Heater Drain/RFP Pump ~~P1A~~ Room Recirc. Unit TBV–F–9A thru C	~~Heater Drain~~ Condensate Booster Pump ~~P1B~~ Room Recirc. Unit TBV–F–9D thru F	Filter Pump ~~Recirc.~~ and Valve Room Recirc. Unit TBV–F–10A thru C	Demineralizer Pump and Valve Room Recirc. Unit TBV–F–12A thru C	Reactor Feed Pump Power Supply Room Recirc. Unit TBV–F– 13A thru C
Type	Central station air handler	Central station air handler	Central station air handler	Central station air handler	Central station air handler
Number of units	3-50% each	3-50% each	3-50% each	3-50% **each**	3-50% **each**
Flow rate (m^3/h)/unit	~~11,900~~ **42,400**	~~11,900~~ **5,100**	5,200	~~8,700~~ **18,000**	1,825
Fan:					
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
No. of fans per unit	1	1	1	1	1
No. of running fans	2	2	2	2	2
Heating coils:	None:	None:	None:	None:	None
No. of banks per unit	–	–	–	–	–
Capacity, each (MJ/h)	–	–	–	–	–
Cooling coils:					
Capacity, each (MJ/h)	~~221.57~~ **796.0**	~~221.57~~ **94.50**	97.13	335.36	34.33
Filters:					
Type	~~Medium~~ **High** eff	~~Medium~~ **High** eff	~~Medium~~ **High** eff	~~Medium~~ **High** eff	~~Medium~~ **High** eff
Capacity (m^3/h)**/unit**	~~11,900~~ **42,400**	~~11,900~~ **5,100**	5,200	~~8,700~~ **18,000**	1,825
ASHRAE 52 eff.	85%	85%	85%	85%	85%

Table 9.4-5b Turbine Building ~~and Electrical Building~~ HVAC System—Non-Safety-Related Equipment (Continued)

Items	TCW Heat Exchanger Area Recirculation Unit TBV–F–14A thru C	Condenser Compt. Room Level 2 Recirculation Unit TBV–F–15A thru C	SJAE A and Recombiner Room Recirculation Unit TBV–F–17A thru C	SJAE B and Recombiner Room Recirculation Unit TBV–F–17D thru F	Demineralizer Room Recirculation Unit TBV–F–18A thru C
Type	Central station air handler	Central station air handler	Central station air handler	Central station air handler	Central station air handler
Number of units	3-50% each	3-50% each	3-50% each	3-50% **each**	3-50% **each**
Flow rate (m^3/h)/unit	8,200	24,300	22,100	22,100	2,635
Fan:					
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
No. of fans per unit	1	1	1	1	1
No. of running fans	2	2	2	2	2
Heating coils:	None	None	None	None	None
No. of banks per unit	–	–	–	–	–
Capacity, each (MJ/h)	–	–	–	–	–
Cooling coils:					
Capacity, each (MJ/h)	154.07	454.69	417.84	417.84	48.99
Filters:					
Type	~~Medium~~ **High** eff	~~Medium~~ **High** eff	~~Medium~~ **High** eff	~~Medium~~ **High** eff	~~Medium~~ **High** eff
Capacity (m^3/h)**/unit**	8,200	24,300	22,100	22,100	2,635
ASHRAE 52 eff.	85%	85%	85%	85%	85%

Table 9.4-5c Turbine Building ~~*and Electrical Building*~~ HVAC System—Non-Safety-Related Equipment (Continued)

Item	Condenser Compt. Room Level 3 Recir. Unit ~~*TRV*~~ TBV–F–19A thru C	TCW Pump Area Recirculation Unit ~~*TRV*~~ TBV –F–20A thru C	Turbine Area Recirculation Unit ~~*TRV*~~ TBV –F–21A thru C	Steam to Hot Water Heat Exchanger Area TBV–E–01A& 1B
Type	Central station air handler	Central station air handler	Central station air handler	Heat exchanger
Number of units	3-50% each	3-50% each	3-50% **each**	2-100% each
Flow rate (m^3/h)/unit	23,800	11,900	28,900	
Fan:				
Type	Centrifugal	Centrifugal	Centrifugal	–
No. of fans per unit	1	1	1	–
No. of running fans	2	2	2	–
Heating coils:	None	None	None	–
No. of banks per unit	–	–	–	–
Capacity, each (MJ/h)	–	–	–	–
Cooling coils:				
Capacity, each (MJ/h)	444.22	221.48	542.19	–
Filters:				
Type	~~*Medium*~~ **High** eff	~~*Medium*~~ **High** eff	~~*Medium*~~ **High** eff	–
Capacity (m^3/h)**/unit**	23,800	~~*11,800*~~ **11,900**	28,900	–
ASHRAE 52 eff.	85%	85%	85%	–
Heat Exchanger:				
Type				Shell and Tube
Capacity (MJ/h)				22,156.55

Table 9.4-5d Turbine Building Electrical Equipment Areas HVAC System-Non-Safety-Related Equipment

Item	Electrical Equipment Areas HVAC Supply Air Unit TBV-F-3A & 3B	Electrical Equipment Areas HVAC Exhaust Air Unit TBV-F-6A & 6B	Electrical Room #1 (El. 12300 mm) Recirculation Unit TBV-F-16A & 16B	Electrical Room #2 (El. 12300 mm) Recirculation Unit TBV-F-22A & 22B	Electrical Room #3 (El. 20300 mm) Recirculation Unit TBV-F-23A & 23B	Air Compressor Room Recirculation Unit TBV-F-5A & 5B
Type	Central station air handler	Central station air handler	Central station air handler	Central station air handler	Central station air handler	Central station air handler
Number of units	2-100% each	2-100% each	2-100% each	2-100% each	2-100% each	2-100% each
Flow rate (m^3/h)/unit	28,900	20,300	135,800	15,200	570,500	284,200
Fan:						
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal
No. of fans per unit	1	1	1	1	1	1
No. of running fans	1	1	1	1	1	1
Heating Coils:	None	None	None	None	None	None
No. of banks per unit	-	-	-	-	-	-
Capacity, each (MJ/h)	-	-	-	-	-	-
Cooling coils:						
Capacity, each (MJ/h)	580.0	-	2550.0	285.0	10,716.0	485.00
Filter:						
Type	Low eff	-	High eff	High eff	High eff	High eff
Capacity (m^3/h)/unit	28,900	-	135,800	15,200	570,500	284,200/unit
ASHRAE 52 efficiency	35%	-	85%	85%	85%	85%

Table 9.4-6a Radwaste Building Control Room Air Conditioning Unit

Equipment Name	Radwaste Building Control Room Air Conditioning Unit
Equipment ID Number	ACU 001A, ACU 001B
Number of Units	2
Air Flow Capacity, m^3/h	12,750
Supply Air Fan Number per Unit	1 × 100%
Supply Air Fan Motor kW	11.2
Cooling Coil Capacity, Mj/h	304
Heating Coil Heating Capacity, MJ/h	151.6
Pre-Filters Type	Disposable
Final-Filter Efficiency – NBS Dust Spot Test	60%

Table 9.4-6b Electrical and HVAC Equipment Room Air Conditioning Unit

Equipment Name	Electrical and HVAC Equipment Room Air Conditioning Unit
Equipment ID Number	ACU 002
Number of Units	1
Air Flow Capacity, m^3/h	26,000
Supply Air Fan Number per Unit	2 × 100%
Supply Air Fan Motor kW	22.38
Cooling Coil Capacity, MJ/h	830
Pre-Filters Type	Disposable
Final-Filter Efficiency – NBS Dust Spot Test	60%

Table 9.4-6c Radwaste Process Areas Air Conditioning Unit

Equipment Name	Radwaste Process Areas Air Conditioning Unit
Equipment ID Number	ACU 003
Number of Units	1
Air Flow Capacity, m^3/h)	71,560
Supply Air Fan Number per Unit	2 × 100%
Supply Air Fan Motor, kW	56
Cooling Coil Capacity, MJ/h	2704
Heating Coil Heating Capacity, MJ/h	1318
Pre-Filters Type	Disposable
Final-Filter Efficiency – NBS Dust Spot Test	60%

Table 9.4-6d HVAC Equipment Room Unit Heaters

Equipment Name	HVAC Equipment Room Unit Heaters
Tag Number	EUH 1, EUH 2, EUH 3
Quantity	3
Type	Electric
Total Heating Capacity (kW)	15

Table 9.4-6e Air Filtration Equipment Room Unit Heaters

Equipment Name	Air Filtration Equipment Room Unit Heaters
Tag Number	EUH 4
Quantity	1
Type	Electric
Total Heating Capacity (kW)	5

Table 9.4-6f Building Entrance Area Duct Heater

Equipment Name	Building Entrance Area Duct Heater
Tag Number	DH-001
Quantity	1
Type	Electric
Total Heating Capacity (kW)	36

Table 9.4-6g Building Entrance Area Cabinet Heater

Equipment Name	Building Entrance Area Cabinet Heaters
Tag Number	CUH-1
Quantity	1
Type	Electric
Total Heating Capacity (kW)	18

Table 9.4-6h Radwaste Process Area Unit Heaters

Equipment Name	Radwaste Process Area Unit Heaters
Tag Number	EUH 5, EUH 6, EUH 7, EUH 8, EUH 9, EUH 10
Quantity	6
Type	Electric
Total Heating Capacity (kW)	50

Table 9.4-6i Tank and Pump Area Unit Heaters

Equipment Name	Tank and Pump Area Unit Heaters
Tag Number	EUH 11, EUH 12, EUH 13, EUH 14
Quantity	4
Type	Electric
Total Heating Capacity (kW)	25

Table 9.4-6j Control Room Smoke Purge Fan

Equipment Name	Control Room Smoke Purge Fan
Equipment ID Number	FAN 001
Number of Units	1 × 100%
Fan Flow, m^3/h	12,750
Fan Motor, kW	2.24

Table 9.4-6k Electrical and HVAC Equipment Rooms Return Air Fans

Equipment Name	Electrical and HVAC Equipment Rooms Return Air Fans
Equipment ID Number	FAN 002A, FAN 002B
Number of Units	2 × 100%
Service	Electrical and HVAC Equipment Rooms HVAC System (recirculation and smoke exhaust)
Fan Flow, m^3/h)	17,750
Fan Motor, kW	5.6

Table 9.4-6l Radwaste Process Areas Exhaust Air Fans

Equipment Name	Radwaste Process Areas Exhaust Air Fans
Equipment ID Number	FAN 003A, FAN 003B, FAN 003C
Number of Units	3 × 50%
Fan Flow, m^3/h	45,050
Fan Motor, kW	56

Table 9.4-6m Radwaste Process Areas Air Exhaust Filtration Units

Equipment Name	Radwaste Process Areas Air Exhaust Filtration Units
Equipment ID Number	FLT 001A, FLT 001B, FLT 001C
Number of Units	3
Unit Air-Flow, m^3/h	45,040
HEPA Filter Efficiency, on 0.30 micron particles	99.9%

Table 9.4-7a Service Building HVAC System Component Descriptions
Non-Safety Related Heating/Cooling Coils

Heating/Cooling Coils	Quantity	Cooling (MJ/h)	Heating (MJ/h)
Service Building Air Conditioning Unit	1	1,688	640
Service Building Emergency Filtration Unit	1	No Coil Required	36

Table 9.4-7b Service Building HVAC System Component Descriptions
Non-Safety Related Fans

Fans	Quantity	Capacity (m^3/h) (each)	Rated Power (KW) (each)
S/B Air Conditioning Unit Supply Fans	2	27,600	22.5
S/B Clean Area Exhaust Fans	2	1,200	1.2
S/B Controlled Area Exhaust Fans	2	11,900	5.6
S/B Emergency Filtration Unit Fans	2	2,650	3.75

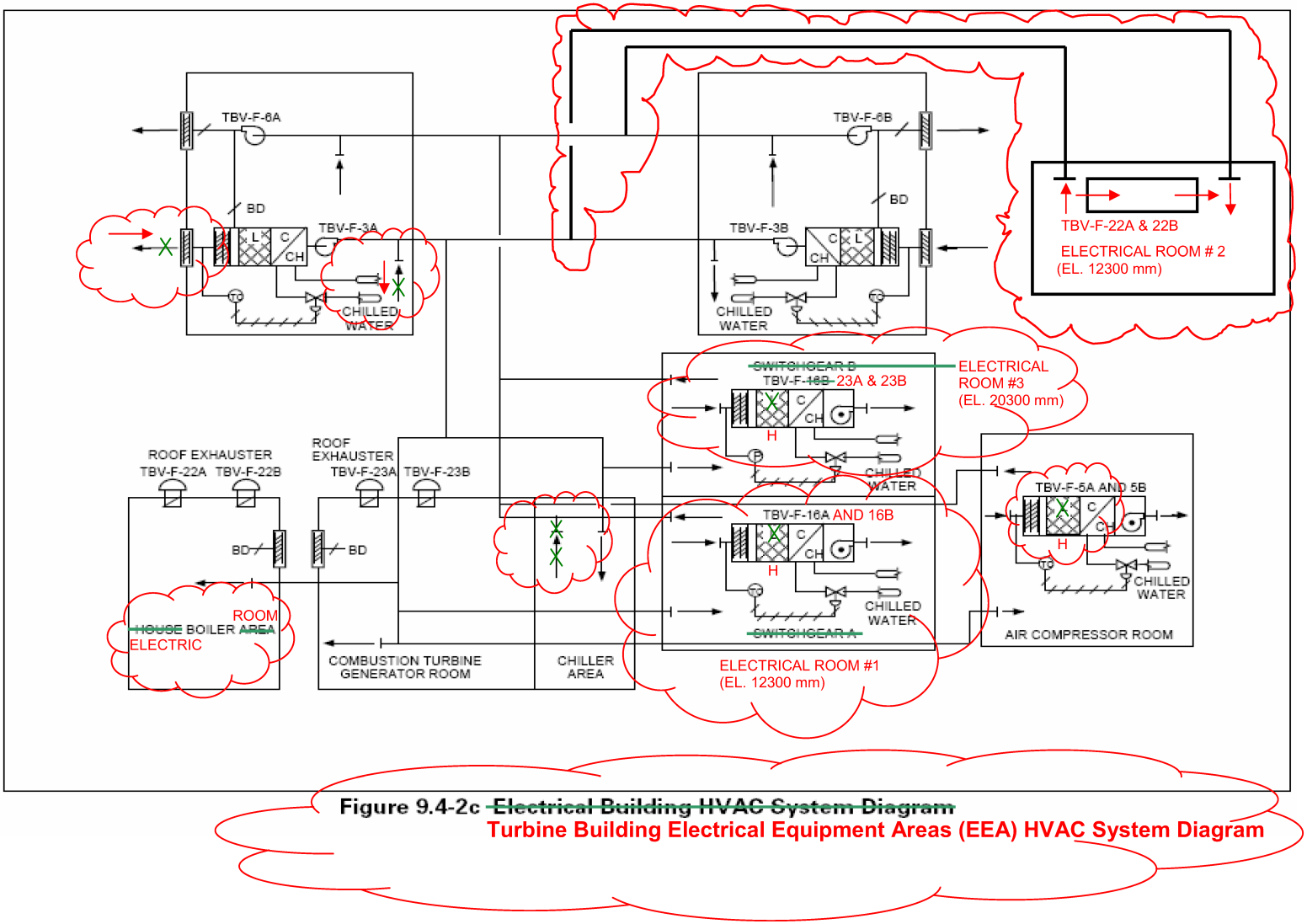

Figure 9.4-2c ~~Electrical Building HVAC System Diagram~~
Turbine Building Electrical Equipment Areas (EEA) HVAC System Diagram

Figure 9.4-2c Electrical Building HVAC System Diagram
Turbine Building Electrical Equipment Areas (EEA) HVAC System Diagram

The following figures are located in Chapter 21:

- *Figure 9.4-10 Radwaste Building HVAC (Sheets 1-3)*
- Figure 9.4-11 Service Building HVAC P&ID (Sheets 1 and 2)