

### 9.3 Process Auxiliaries

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 Admin

STP DEP 1.1-2

STD DEP 9.3-1

STD DEP 9.3-2

STD DEP 9.3-3 (Table 9.3-2)

#### 9.3.2 Process and Post Accident Sampling System

STD DEP Admin

STD DEP 9.3-3

##### 9.3.2.1.1 Safety Design Bases

- (4) *The sampling panels are designed to minimize contamination and radiation at the sample stations. Appropriate shielding, where required, and area radiation monitors minimize radiation effects. Radiation exposure to the individual shall be limited as given in ITAAC ~~3.7~~ 3.2.*

### 9.3.3 Non-Radioactive Drainage System

#### 9.3.3.2 Non-Radioactive Drains (Interface Requirements)

The design of the continuation of the non-radioactive drain system from the ABWR Standard Plant Buildings to the site discharge outfall is provided in Figure 9.3-12 and is discussed in this subsection.

##### 9.3.3.2.3 System Description

The conceptual design information in this subsection of the reference ABWR DCD is replaced with the following site-specific supplement.

The non-radioactive drain system collects waste water from plant buildings (Reactor, Turbine, Control, Service, and other buildings). A system composed of collection piping, curbs, and pumps is provided. Non-radioactive waste water from the Turbine Building, Reactor Building, hot machine shop and the Control Building is routed to a dedicated oil/water separator where oil and settled solids are removed for off-site disposal. The non-oily, non-radioactive effluent is sent to dual settling basins. Non-radioactive waste water from the Service Building and other buildings is sent directly to the dual settling basins. Means are provided to perform any required tests or analyses required by the discharge permit. The non-radioactive liquid effluent is

discharged to the Main Cooling Reservoir through permitted outfall(s). If radioactivity levels exceed the limits for discharge, the flow from the non-radioactive drains has the capability to be diverted to the radioactive effluent portion of the radwaste system. Normally, if low levels of radioactivity are detected, it is quantified and discharged via the normal outfall. Higher levels of radioactivity may require a permitted "batch" discharge via the radwaste effluent radiation monitor. The non-radioactive drainage system is illustrated in Figure 9.3-12.

### 9.3.7 Service Air System

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

#### 9.3.7.2 System Description

STD DEP 9.3-2

*The SAS provides compressed air for tank sparging, filter/demineralizer backwashing, air-operated tools and other services requiring air of lower quality than that provided by the IAS. ~~Breathing air requirements are provided by the SAS.~~ The Breathing Air System (BAS) is discussed in Subsection 9.3.7.6.*

#### Service Air

Pressure (design)	0.69 0.87 MPa
Dewpoint (°C)	no requirement

### 9.3.7.6 Breathing Air System

#### 9.3.7.6.1 Design Bases

##### 9.3.7.6.1.1 Safety Design Bases

The BAS is classified as non-safety related with the exception of the primary containment isolation function.

The primary containment penetration of the BAS is equipped with a locked closed manual isolation valve outside and a locked closed manual isolation valve inside containment (GDC 56). The BAS primary containment penetration and associated isolation valves are designed to Seismic Category I, ASME Code, Section III, Class 2, Quality Group B and Quality Assurance B requirements.

##### 9.3.7.6.1.2 Power Generation Design Bases

The functions of BAS are to provide the following:

- (1) Supply low pressure breathable air for use by workers during periods when actual or potential airborne contamination exists.
- (2) A means for charging high pressure self-contained breathing apparatus.

### **9.3.7.6.2 System Description**

The BAS is designed to provide compressed air of suitable breathing quality for nonsafety-related functions.

The BAS provides a continuous supply of low pressure breathing air for protection against airborne contamination while performing maintenance inspection and cleaning work. The BAS also provides a means for charging high pressure self-contained breathing apparatus.

The BAS is sized to provide 100% of the peak air consumption using the bottled breathing air supply and a portable permanent breathing air compressor supply system, as needed. The compressor(s) will be of the oil-less, breathing air type.

The BAS is also sized to charge high pressure self-contained breathing apparatus.

The BAS flow diagram is shown in Figure 9.3-10.

The BAS process quality requirements are listed below.

#### **Breathing Air**

<u>Pressure (design of BAS)</u>	<u>689 kPaG</u>
<u>Pressure (design of self-contained breathing apparatus charging)</u>	<u>17.23 MPaG</u>
<u>ANSI Compressed Gas Association (CGA) 7.1-1997, "Commodity Specification for Air"</u>	<u>Air Quality Grade D</u>

The BAS is designed to meet applicable regulatory requirements regarding limiting personnel exposure to airborne radioactivity and maintaining breathing air quality, including those defined by the NRC in 10 CFR 20 and Occupational Safety and Health Act Requirements (OSHA) in 29 CFR 1910. In addition, the BAS design is consistent with Regulatory Guide 8.15.

The BAS containment and penetration and associated isolation valves are designed to Seismic Category I, ASME Code, Section III, Class 2, Quality Group B and Quality Assurance B requirements.

The bottled breathing air supply and a portable or permanent breathing air compressor supply system, as needed, are operated during normal operation.

Outside and inside primary containment manually-operated valves are kept closed and locked during normal plant operation. During refueling, the valves are opened to provide air inside the containment. This arrangement meets GDC 56, Option (1).

### **9.3.7.6.3 Safety Evaluation**

The availability of breathing air is not required to assure any of the following:

- (1) Integrity of the reactor coolant pressure boundary.

- (2) Capability to shut down the reactor and maintain it in a safe shutdown condition.
- (3) Ability to prevent or mitigate the consequences of accidents which can result in potential offsite exposures comparable to the guideline exposures of 10 CFR 100.

However, the containment penetration and isolation valves associated with the breathing air system are relied upon to maintain the integrity of the containment pressure boundary as discussed in Section 9.3.7.6.1.1. The operability of this containment pressure boundary function is necessary to assure (3) above.

#### **9.3.7.6.4 Inspection and Testing Requirements**

The BAS is proved operable by its use during normal plant operation. Portions of the system normally closed to airflow can be tested to ensure system operability and integrity.

#### **9.3.7.6.5 Instrumentation Application**

Instrumentation for the BAS is primarily local, consisting of pressure, differential pressure and temperature indication and/or control. Pressure transmitters and pressure switches provide control room pressure indications and alarms. The system is maintained at constant pressure, with local pressure reduction provided as required.

#### **9.3.8.2.3 Component Description**

STD DEP 9.3-1

*Drain System components are as follows:*

- (1) *Collection Piping— In all area of potential radioactivity contamination, the collection system piping for the liquid system is of stainless steel for embedded and chemical drainage, and ~~carbon steel~~ for suspended drainage. Offsets in the piping are provided, where necessary, for radiation shielding. In general the fabrication and installation of the piping provides for a uniform slope that causes gravity to flow to the appropriate sump. During construction, equipment drain piping is terminated not less than 5 cm above the finished floor or drain receiver at each location where the discharge from equipment is to be collected. The connections to the individual equipment are made after the equipment is installed in its proper location.*

### **9.3.9 Hydrogen Water Chemistry System**

#### **9.3.9.2 System Description**

STP DEP 1.1-2

*The HWC System (Figure 9.3-8) is composed of hydrogen and oxygen supply systems, systems to inject hydrogen into the feedwater and oxygen into the offgas and*

*subsystems to monitor the effectiveness of the HWC System. These systems monitor the oxygen levels in the Offgas System and the reactor water.*

*The hydrogen supply system will be site dependent. Hydrogen can be supplied either as a high-pressure gas or as a cryogenic liquid. Hydrogen and oxygen can also be generated on site by the dissociation of water by electrolysis. The HWC hydrogen supply system may be integrated with the generator hydrogen supply system to save the cost of having separate gas storage facilities for both systems. However, bulk hydrogen storage will be located outside ~~but near~~ the Turbine Building, at least 100m from any safety related building or structure, as stated in Subsection 10.2.2.2.*

*The oxygen supply system will be site dependent. A single oxygen supply system could be provided to meet the requirements of the HWC System and the condensate Oxygen Injection System described in Subsection 9.3.10.*

### **9.3.12 COL License Information**

#### **9.3.12.4 Radioactive Drain Transfer System**

The following standard supplement addresses COL License Information Item 9.15.

Equipment and floor drain P & I Ds are provided in Figure 9.3-11, Sheets 1 through 22. See Subsection 9.3.8.1.1.

Table 9.3-2 Water Quality Instrumentation

Field System ID	Instrument Sensor	Sensor Location*	Indicator Location	Recorder Location	Instrument Range	Instrument Accuracy	Recommended Alarm Setpoints	
							High	High-High
Treated condensate combined treatment unit outlet	Conductivity	Sample Line	Condensate sample station panel	Sample station panel	0 to 1 NL 0.1 $\mu$ S/cm MS	$\pm 1\%$ FS	0.1 $\mu$ S/cm	—
	Oxygen analyzer	Sample line <sup>f</sup>	Condensate sample station panel	Control room	0 to 400 250 ppb <sup>‡</sup> Oxygen	+5% FS	200 ppb O <sub>2</sub>	—
	Oxygen analyzer	Sample line	Condensate sample station	Control room	0 to 250 ppb Oxygen	+5% FS	200 ppb O <sub>2</sub>	—
	Corrosion products monitor	Sample line	Feedwater sample station	Control room	0 to 1 ppm <sup>f</sup>	—	—	—
Feedwater	Conductivity	Sample line	Condensate sample station or feedwater sample station	Control room	0 to 1 NL 0.1 $\mu$ S/cm MS	$\pm 1\%$ FS	0.1 $\mu$ S/cm	—
	Oxygen analyzer	Sample line	Reactor sample station panel	Control room	0 to 1000 ppb Oxygen	$\pm 5\%$ FS	200 ppb O <sub>2</sub>	—
Control rod drive water	Conductivity	Sample line	Reactor sample station panel	Control room	0 to 1 NL 0.1 m S/cm MS	+1% FS	0.2 m S/cm	—
	Oxygen analyzer	Sample line	Reactor sample station panel	Control room	0 to 10 NL 0.1 $\mu$ S/cm MS	$\pm 1\%$ FS	0.7 $\mu$ S/cm	3.5 $\mu$ S/cm
Reactor water cleanup system inlet (high temp) <sup>f</sup>	Conductivity	Sample line	Reactor sample station panel	Control room	0 to 10 ppm Oxygen	+5% FS	—	—
	Oxygen analyzer	Sample line	Reactor sample station panel	Control room				
FS = Full Scale Range		MS = Midscale		NL = Nonlinear				

Table 9.3-2 Water Quality Instrumentation (Continued)

Field System ID	Instrument Sensor	Sensor Location*	Indicator Location	Recorder Location	Instrument Range	Instrument Accuracy	Recommended Alarm Setpoints		
							High	High-High	
RHR Heat Exchanger Outlet (3)	Conductivity	Sample Line	Local Panel	Main control Room	0 to 10 NL 1 $\mu$ S/cm MS	$\pm$ 1% FS	3 $\mu$ S/cm	10 $\mu$ S/cm	
Condensate Transfer Pump Outlet	Conductivity	Sample Line	Condensate Sample Station Panel	Sample Station Panel	0 to 1 NL 0.1 $\mu$ S/cm MS	$\pm$ 1% FS	0.1 $\mu$ S/cm	—	
Suppression Pool Cleanup Outlet	Conductivity	Sample Line	Local Panel	Main control Room	0 to 1 NL 0.1 $\mu$ S/cm MS	$\pm$ 1% FS	0.1 $\mu$ S/cm	0.2 $\mu$ S/cm	
LCW Process Line	Conductivity	Process Line	Local Panel	Radwaste Control Room	0 to 20 NL 0.1 $\mu$ S/cm MS	$\pm$ 1% FS	—	—	
HCW Process Line	Conductivity	Process Line	Local Panel	Radwaste Control Room	0 to 200 NL 0.1 $\mu$ S/cm MS	$\pm$ 1% FS	—	—	
Additional sample lines are in the footnote †									
FS = Full Scale Range		MS = Midscale		NL = Nonlinear					

\* The following sampling lines are provided which do not have any instruments, grab sampling only: control rod drive system main stream, high pressure drains, gland steam evaporator drain, TCW heat exchanger outlet, standby liquid control tank, HECW (3), HNCW, LCW sump, HCW sump, HWH, condensate filter outlet (4), condensate demineralizer outlet (6), RCW (12) and all tanks and major process streams in the liquid radwaste system. Sampling for the Offgas System is discussed in Section 11.3.

† Sample location downstream of oxygen injection point.

‡ ppb = Parts per billion

f ppm = Parts per million

\*\* One of the two CUW sampling lines (high temp.) takes the sample before the CUW heat exchangers, and the other (low temp.) takes the sample after the CUW heat exchangers.

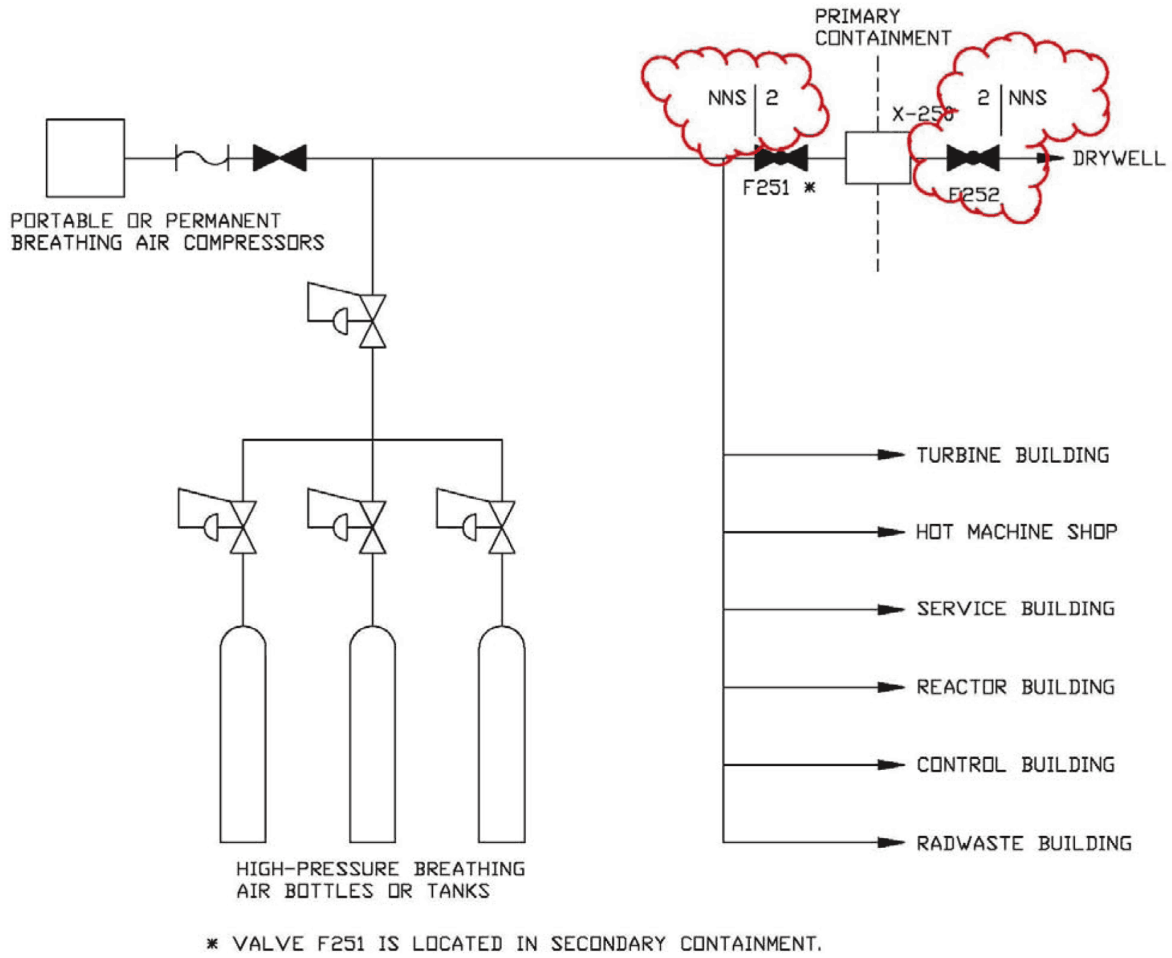


Figure 9.3-10 Breathing Air System Flow Diagram



The following figures are located in Chapter 21:

- **Figure 9.3-11 Radioactive Drain Transfer System P&ID (Sheets 1-22)**

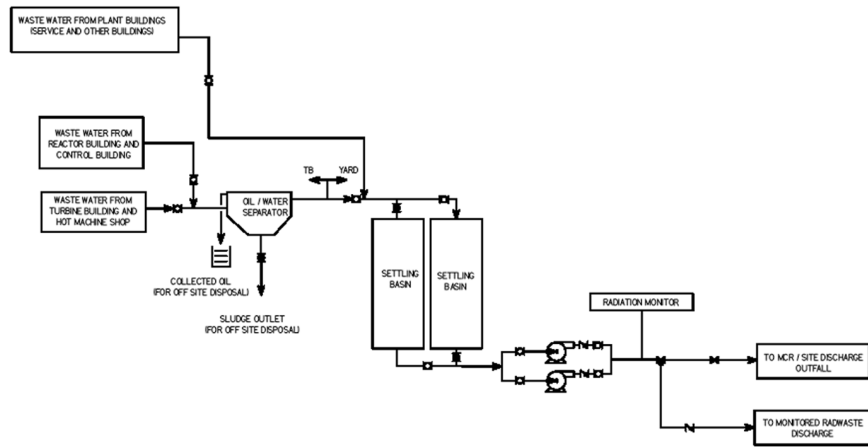


Figure 9.3-12 Non-Radioactive Drainage System