11.4 Solid Waste Management System

This section of the reference ABWR DCD including all subsections, figures, and tables is replaced completely. This is due to a departure in the design of the solid waste management system. This departure deletes the solidification, incineration and compacting process.

STD DEP 11.4-1

11.4.1 Design Bases

11.4.1.1 Design Objective

The Solid Waste Management System (SWMS) is designed to control, collect, handle, process, package, and temporarily store wet and dry solid radioactive waste prior to shipment. This waste is generated as a result of normal operation and anticipated operational occurrences, including refueling operation and back to back refueling.

The SWMS is located in the radwaste building. It consists of the following four subsystems:

- Spent resins and sludge collection and processing subsystem
- Mobile dewatering processing subsystem
- Dry active waste accumulation and conditioning subsystem
- Container storage subsystem

The SWMS Process Flow Diagram is provided in Figure 11.2-1. Radwaste System Piping and Instrumentation Diagrams are provided in Figures 11.2-2. The radwaste building general arrangement drawing are provided in Figures 1.2-23a through 1.2-23e. The expected annual wet and dry waste volume generated from the SWMS subsystems are provided in Table 11.4-1 and 11.4-2, respectively. The estimated annual shipped waste volumes generated from the SWMS subsystems are provided in Table 11.4-3. The SWMS component capacities are provided in Table 11.4-4. Capability of the SWMS to process expected waste is provided in Table 11.4-5. The isotopic inventory of the as-shipped waste is provided by waste type in Section 12.2.

Process and effluent radiological monitoring systems are described in Section 11.5.

No subsystems of the SWMS and the radwaste building that house the SWMS are shared between STP 3 & 4.

11.4.1.2 Design Criteria

The SWMS is designed to provide collection, processing, packaging, and storage of sludge, spent resin, filter backwash, and dry solid waste resulting from normal operations.

- The SWMS is designed to meet the guidance of Regulatory Guide 1.143. SWMS component classifications are described in Table 3.2-1 (K1, U13).
- The SWMS is designed to keep the exposure to plant personnel “as low as reasonably achievable” (ALARA) during normal operation and plant maintenance, in accordance with Regulatory Guide 8.8.
- The SWMS is designed to package solid waste in Department of Transportation (DOT)-approved containers for off-site shipment and burial.
- The SWMS is designed to prevent the release of significant quantities of radioactive materials to the environment so as to keep the overall exposure to the public within 10 CFR 20 limits.
- The SWMS is designed to package the wet and dry types of radioactive solid waste for off-site shipment and burial, in accordance with the requirements of applicable NRC and Department of Transportation (DOT) regulations, including 10 CFR 61, 10 CFR 71 and 49 CFR 171 through 180, as applicable. This design results in radiation exposures to individuals and the general population within the limits of 10 CFR 20.
- The seismic and quality group classification and corresponding codes and standards that apply to the design of the SWMS components and piping, and the structures housing the SWMS are discussed in Section 3.2.
- The non-safety related SSC Quality Control Programs for the SWMS is described in the STP 3 & 4 Quality Assurance Program description in section 17.5S..
- On-site storage space for 6-month's volume of packaged waste is provided in the radwaste building. Radioactive Waste produced at STP 3 & 4 will normally be shipped to a licensed facility for disposal. However, should disposal circumstances change, an Onsite Staging Facility (OSF) as described in the Unit 1 & 2 UFSAR Section 11.4 is available to provide a staging area for the waste generated.
- All atmospheric collection and storage tanks are provided with an overflow connection at least the size of the largest inlet connection. The overflow is connected below the tank vent and above the high-level alarm setpoint. Each tank room is designed to contain the maximum liquid inventory in the event that the tank ruptures per NUREG-0800, Standard Review Plan, BTP 11-6. Each tank compartment is stainless steel-lined up to a height equivalent to the tank capacity in the room as described in Section 15.7.3.1.
- The SWMS has no safety-related function. There is no liquid plant discharge from the SWMS. Failure of the subsystem does not compromise any safety-related system or component nor does it prevent shutdown of the plant. No interface with the safety-related electrical system exists.

Radionuclide influents to the SWMS are presented in Section 12.2. Any resultant gaseous and liquid wastes are routed to other plant sections. Gaseous radionuclides from the SWMS are processed by the monitored radwaste building ventilation system. The monitored ventilation system is described in Section 9.4 and Section 11.5. Liquid waste is processed by the monitored LWMS system as described in Section 11.2. Process and effluent radiological monitoring systems are described in Section 11.5.

Section 12.3 describes systems to detect conditions that may result in excessive radiation levels per Title 10 Code of Federal Regulations Part 50, Appendix A, GDC 63. Section 11.5 describes systems to monitor the effluent discharge paths for radioactive material per Title 10 Code of Federal Regulations Part 50, Appendix A, GDC 64.

A description of the SWMS design features addressing 10 CFR 20.1406 requirements for permanently installed systems is in Subsection 11.2.1.2.4. These design features apply to the SWMS permanent equipment and skid mounted mobile units.

The Area Radiation Monitors for the Radwaste Building spent resins and sludge collection subsystem area, dewatering equipment area, DAW and wet solid waste accumulation area, and high activity waste storage area are depicted on Figure 12.3-41 and discussed in Subsection 12.3.4.

The mobile dewatering processing equipment is located within the radwaste building as shown in Figure 1.2-23c. Effluents from the SWMS (such as dewatering liquid) are treated by the LWMS. Any airborne activity will be processed through the radwaste building exhaust as discussed in subsection 9.4.6.

STP 3 & 4 is responsible, initially and subsequently, for the identification of mobile/portable LWMS connections that are considered non-radioactive, but later may become radioactive through interfaces with radioactive systems; i.e., a non-radioactive system becomes contaminated due to leakage, valving errors or other operating conditions in radioactive systems. STP 3 & 4 uses operating procedures to ensure the guidance and information in Inspection and Enforcement (IE) Bulletin 80-10 (May 6, 1980) is followed. The SWMS mobile systems are not connected to the potable or sanitary water system. All non-radioactive connections (e.g., makeup water for flushing, service air for sluicing process) to the radwaste system (including the mobile system) contain double isolation e.g., check valves and isolation valve to prevent cross contamination of the non-radioactive system.

Subsection 11.2.1.2.4 addresses the design requirements to minimize contamination of the facility and environment, facilitate decommissioning, and minimize the generation of radioactive waste, in compliance with 10 CFR 20.1406. This includes the design requirements for connections that are considered non-radioactive, but later may become radioactive through interfaces with radioactive systems. ‘Minimization’ is based on good engineering practice, and/or cost benefit analysis to keep waste generation and dose to as low as reasonably achievable.

11.4.2 System Description

11.4.2.1 General Description

The SWMS controls, collects, handles, processes, packages, and temporarily stores solid waste generated by the plant prior to shipping the waste offsite. The SWMS processes the filter backwash sludge, reverse osmosis rejects, powdered resin sludge and spent resins generated by the Liquid Waste Management System (LWMS), Reactor Water Cleanup System (CUW), the Fuel Pool Cooling and Cleanup System (FPCS), the Suppression Pool Cleanup System and the Condensate Purification System. Contaminated solids such as High Efficiency Particulate Air (HEPA) and cartridge filters, rags, plastic, paper, clothing, tools, and equipment are also disposed of in the SWMS.

The SWMS is capable of receiving, processing, and dewatering the solid radioactive waste inputs for permanent off-site disposal. Liquids from SWMS operations are sent to the appropriate LWMS section for processing as depicted in Figure 11.2-1 and described in Section 11.2.

11.4.2.2 System Operation

11.4.2.2.1 General Requirements

The SWMS complies with Regulatory Guide 1.143, Revision 2, November 2001, as noted in Subsection 11.4.1. The radwaste building is designed to meet the guidance of Regulatory Guide 1.143. Regulatory Guide 1.143, Section 4.1, instructs that the design of radioactive waste management systems, structures and components should follow the direction in Regulatory Guide 8.8. Demonstration of compliance with Regulatory Guide 8.8, Revision 3, June 1978 is located in Subsection 12.1.1.3 and Subsection 12.3.1.

The SWMS consists of four process subsystems described in Subsections 11.4.2.2.2, 11.4.2.2.3, 11.4.4, and 11.4.5.

11.4.2.2.2 Spent Resins and Sludges

The spent resins and sludge collection subsystem collects the filter backwash sludge, reverse osmosis rejects, powdered resin slurry and spent resin into one of the five tanks in accordance with the waste characteristics. The spent resin and sludge tanks are categorized as follows:

- One CUW Backwash Receiving Tank for receiving CUW and FPCS sludge (spent resin) fitted with a filter in its vent line prior to exhaust to the HVAC system.
- One CF Backwash Receiving Tank for receiving the Condensate Polishing System filter sludge
- One Liquid Waste (LW) Backwash Receiving Tank for receiving the LWMS filter sludge and reverse osmosis rejects

- Two Spent Resin Storage Tanks for receiving LWMS spent bead resin and Condensate Purification System spent bead resin

The capability exists to keep the spent resins from the Condensate Purification System and the spent resins from the LWMS ion exchangers in separate spent resin storage tanks for radioactive decay and storage. Excess water from the spent resin storage tanks is sent to the LCW collector tank or HCW collector tank by a pump. The used condensate polishing resin from the Condensate Purification System may be used in the HCW demineralizer (A) in the high conductivity waste subsystem.

When sufficient spent bead resins have been collected in the spent resin storage tank, they are sent to the mobile dewatering processing subsystem via the spent resin slurry pump. When condensate spent bead resins have been collected in the spent resin storage tank, they are mixed via the spent resin slurry pump and sent to the HCW demineralizer (A) for reuse or to the mobile dewatering processing subsystem via the spent resin slurry pump.

The sludges from the Reactor Water Cleanup (CUW) System, the Fuel Pool Cooling and Cleanup System, the Suppression Pool Cleanup System are collected in the CUW backwash receiving tank. The filter backwashings from the Condensate Polishing System are collected in the CF backwash receiving tank. The sludges from the LWMS are collected in the LW backwash receiving tank. Sludges from powdered resins are transferred to two phase separators.

The capability exists to keep the higher activity sludges and the lower activity sludges in two separate phase separators. The segregation of the high activity sludge and low activity sludge in the phase separators is maintained by administrative control. Excess water from the phase separators is sent to the LCW collector tank or HCW collector tank by a pump.

The two phase separators receive suspended solid slurries from the CUW backwash receiving tank, the CF backwash receiving tank, and the LW backwash receiving tank. The suspended solids are allowed to settle and the residual water is transferred by the phase separator decant pump to the LCW collector tanks or HCW collector tanks for further processing. When sufficient sludges have been collected in the tank, the sludges are mixed and sent to the mobile wet solid waste processing subsystem by the slurry/recirculation sludge pump.

During transfer operations of the spent bead resins, the powdered spent resin slurries and the sludges, the suspended solids are kept suspended by the recirculating process to prevent the suspended solids from agglomerating and possibly clogging lines. Flush connections are provided to prevent resin or slurry possibly clogging of the lines after transfer operations.

The LW backwash receiving tank receives suspended solid slurries from such streams as the filter backwashes and rejects from the reverse osmosis units of the LWMS mobile systems. When sufficient waste has been collected in the tank, the waste is sent to the mobile dewatering processing subsystem by the LW backwash transfer pump or to the phase separator. The rejects from the mobile reverse osmosis system of the LWMS collected in the LW backwash receiver tank may be sent to the HCW demineralizer (A) by the LW backwash transfer pump to be treated using the condensate resin prior to disposal.

Mobile Dewatering Processing Subsystem

The mobile dewatering processing subsystem consists of a dewatering station for high activity sludge and a dewatering station for low activity spent resin and sludge. An empty high integrity container (HIC) is lifted off of a transport trailer and placed in each empty dewatering station. The tractor/trailer may then be released. The HIC closure lid is removed and placed in a laydown area. Spent cartridge filters may be placed in the HIC at this point, if not shipped in separate containers.

Next, the fill head is positioned over the HIC with a crane. The fillhead assembly is provided with a level detection system, a camera and light assembly, a mechanical level indicator and a temperature measurement. The fill head closed circuit television camera allows for remote viewing of the fill operation. The level detection system will automatically close the waste control valve on high level. The HIC is then filled with designated wet solid waste. The capability to obtain samples during the fill operation is provided. A radiation monitor on the transfer line to the HIC allows for the monitoring of the dose rate of the slurry being added to the HIC.

Excess water is removed from the HIC and sent by a pump to the HCW collector tank that is in the receiving mode. Sufficient water is removed to ensure there is very little or no free standing water left in the HIC to meet burial site or offsite processors waste acceptance criteria. Drying of the HIC contents may also be performed with heated air or pressure reduction. Condensate from drying is drained to the LWMS. The HICs are vented to the radwaste building HVAC system.

The fill head is then removed and placed in a laydown area. The closure head is then placed on the HIC. The HIC is inspected to insure the surface is clean before it is moved to the temporary storage area. The HIC is provided with a passive vent to prevent gas buildup. Radiation shielding is provided around the HIC stations.

The estimated annual shipped waste volumes from processing wet solid wastes are presented in Table 11.4-3. The mobile dewatering processing subsystem is connected to the SWMS tanks and pumps as shown in Figure 11.2-2 (Sheet 17 of 36).

11.4.2.2.3 Dry Active Waste (DAW)

Dry solid wastes consist of air filters, miscellaneous paper, rags, etc., from contaminated areas; contaminated clothing, tools, and equipment parts that cannot be effectively decontaminated; and solid laboratory wastes. The off gas system activated carbon is rejuvenated by the off gas system and does not normally generate dry solid waste. Project specific actions will be developed regarding the removal, replacement, and processing of off gas activated carbon in the unlikely event that significant quantity of off gas system activated carbon requires replacement during the life of the plant. The activity of much of the dry solid wastes is low enough to permit handling by contact. These wastes are collected in containers or bags located in appropriate areas throughout the plant, as dictated by the volume of wastes generated during operation and maintenance. The filled containers or bags are sealed and moved to controlled-access enclosed areas for temporary storage.

Most dry waste is expected to be sufficiently low in activity to permit temporary storage in unshielded, cordoned-off areas. Dry Active Waste (DAW) is sorted and packaged in a suitably sized container that meets DOT requirements for shipment to either an off-site processor or for ultimate disposal. The DAW is normally separated into three categories: non-contaminated wastes (clean), contaminated metal wastes, and the other wastes, i.e., clothing, plastics, HEPA filters, components, etc. Higher dose rate DAW is separated from other DAW to reduce dose during handling and facilitate shipment of shielded containers. Non-contaminated (clean) materials identified during the sorting process are removed for plant reuse or general debris disposal.

In some cases, large pieces of miscellaneous waste are packed into larger boxes. Because of its low activity, this waste can be stored until enough is accumulated to permit economical transportation to an off-site burial ground for final disposal.

The capability exists to bring a shipping container into the radwaste building truck bay. Bagged DAW can be directly loaded into the shipping container for burial or processing in off-site facilities. A weight scale is provided to ensure optimum shipping/disposal weight of the shipping container.

Cartridge filters that are not placed in HICs are placed in suitability-sized containers meeting DOT requirements.

The estimated shipped waste volumes from processing DAWs are presented in Table 11.4-3.

11.4.2.2.4 Environmental and Exposure Control

During the operation of the wet waste processing and dewatering equipment, the individual component vent systems assure that dust or contaminated air are not released to the work spaces.

11.4.2.2.5 Malfunction Analysis

The process system is protected from component failure and operator error through a series of safety measures. These safety measures include:

- Verification that the fillhead dewatering assembly is properly covering the container prior to start of filling and dewaterign process
- High level alarm with automatic waste control valve shutoff
- Remote viewing of the container during filling and dewatering processes using a camera and light assembly
- Verification of the waste radiation dose rate using a radiation monitor on the transfer line to the container

11.4.2.2.6 Shipment

Waste is classified as A, B, or C and meet the requirements of the waste treatment facility or repository per 10 CFR 61.55 and 61.56. The packaging and shipment of radioactive solid waste for disposal will be in compliance with 10 CFR 20 Appendix G and 49 CFR 173, Subpart I. The expected annual volumes of solid radioactive waste to be shipped offsite for each unit are estimated in Table 11.4-3. The number and types of containers required to ship this volume of waste are estimated in Table 11.4-6. Specific container types are determined by STP 3 & 4 operating procedures and may be different from the containers identified in Table 11.4-6. It is expected that all of the dry waste and more than 90% of the wet waste will be Class A waste. The remaining waste will be Class B waste. Number of shipments is determined by STP to support plant operations.

11.4.2.2.7 Contingencies for Class B and C Wastes

It is expected that Class B and C wastes will constitute about 5% of the low level radioactive waste (LLRW) that will be generated by the plant, with the balance being Class A waste (with small amounts of greater than Class C wastes that are subject to separate disposal provisions). As of July 1, 2008, the LLRW disposal facility in Barnwell, South Carolina is no longer accepting Class B and C waste from sources in states such as Texas that are outside of the Atlantic Compact. However, the disposal facility in Clive, Utah, is still accepting Class A waste from out of state.

STP 3 & 4 plans to load fuel in 2015 and begin operation no earlier than 2016 and therefore will not be generating Class B and C waste until then. Typically it takes about a year after fuel load before a sufficient quantity of B/C waste is generated to warrant a shipment for disposal. By that time, it is probable that a commercial disposal facility for the Texas Compact will be available to accept Class B and C waste from sources in Texas. In particular, in 2004, Waste Control Specialists applied for a license from the Texas Commission on Environmental Quality (TCEQ) to develop a disposal facility in Andrews County, Texas for Class A, B and C waste.

However, in the event that there are no disposal facilities that will accept Class B and C wastes from sources in Texas at the time the plant begins operation, there are several options available for storage of such waste pending shipment offsite once a disposal facility becomes available:

- As provided in the Section 11.4.1.2, STP 3 & 4 Radwaste Building is designed to have 6 months of storage capacity for LLRW. Since Class B and C waste constitute only about 5% of the total LLRW, the Radwaste Building has about 10 years of safe storage capacity if it used solely for storage of Class B and C waste and if Class A waste is promptly shipped offsite. Also the waste tables in Section 11.4 are not based on a volume reduction (VR) process. Hence it is possible to extend this storage time frame by utilizing commercially available off-site waste processors. For example a VR of 8 to 10 is presently being achieved for resins.

- As provided in Section 11.4.1.2, STP 1 & 2 have an Onsite Staging Facility (OSF) that could be used to store waste from STP 3 & 4 if that should become necessary. As explained in the Section 11.4.2.3.2 of the STP 1 & 2 UFSAR, the OSF has a 5-year LLRW storage capacity for Units 1 and 2. If that storage capacity were to be devoted to Class B and C waste, the OSF would have approximately 100 years of safe storage capacity for two units or 50 years for four units, assuming that Class A waste is shipped offsite in the normal course of business. Just as explained above, the storage duration could be extended by utilizing VR.
- If still additional storage capacity were eventually to be needed, STP 3 & 4 could construct storage facilities in accordance with applicable NRC guidance, such as Regulatory Issue Summary (RIS) 2008-12, Considerations for Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licenses, and NUREG 0800 Section 11.4.

If STP 3 & 4 were to need to store Class B and C waste for an extended period of time, it would implement the provisions of RIS 2008-12 and NUREG 0800 Section 11.4.

11.4.3 COL License Information

11.4.3.1 Plant-Specific Solid Radwaste Information

The following site-specific supplement addresses COL License Information Item 11.3.

(1) STP 3 & 4 do not utilize an incinerator system.

(2) The wet waste solidification process and the spent resin and sludge dewatering process will result in products that comply with 10 CFR 61.56 for STP 3 & 4 as provided in Radioactive Waste Process Control Program (PCP). The site PCP utilized by Units 1 & 2 is provided with the COL application, and will be implemented by Units 3 & 4. The latest revision will be provided as per the schedule in Table 13.4S-1. The PCP will incorporate the guidance from NEI 07-10A, "Generic FSAR Template Guidance for Process Control Programs (PCP)".

(3) Establishment and implementation of a process control program (PCP) for the dewatering processing of the spent resins and filter sludges for STP 3 & 4 is provided in Radioactive Waste Process Control Program (PCP). The site PCP utilized by Units 1 & 2 is provided with the COL application, and will be implemented by Units 3 & 4. The latest revision will be provided as per the schedule in Table 13.4S-1. The PCP will incorporate the guidance from NEI 07-10A, "Generic FSAR Template Guidance for Process Control Programs (PCP)".

(4) On-site storage space for 6-months volume of packaged waste is provided. Packaged waste includes HICs, shielded filter containers and 55-gallon (200-liter) drums and boxes as necessary. The projected 6-months solid waste containers required to be stored on-site in the radwaste building are summarized in Table 11.4-6. The on-site storage area in the Radwaste

Building is located along the left or west wall of the truck bay area shown in Figure 1.2-23c. Moveable shielding is used to shield the high activity containers located in the on-site storage area.

(5) Radioactive waste shipping packages meet the requirements in 10 CFR 71 for STP 3 & 4 as provided in the plant radiation protection program as described in Section 12.5.3.

(6) Based on the as-built design, set points for the liquid discharge radiation monitor are established in Section 11.5.

11.4.4 Mixed Waste Processing

STP 3 & 4 is not expected to generate any mixed waste. The mixed waste volumes generated and shipped, if any, are anticipated to be less than or equal to the volumes provided in Table 11.4-3. If mixed waste is generated, it will be collected primarily in 55-gallon collection drums and sent offsite to an appropriately permitted vendor processor. However, should circumstances dictate the storage or disposal of larger quantities of mixed waste, other approved containers, such as HICs, or use of multiple approved containers can be used. Storage and disposal of mixed waste will be in accordance with the facility's NRC license, DOT transportation regulations, EPA mixed waste regulations, state and local regulations and associated permits.

11.4.5 Detailed System Component Description

The major components of the SWMS are as follows:

11.4.5.1 Pumps

Typically three types of pumps are utilized in the SWMS.

The SWMS process pumps are usually centrifugal or progressive cavity pumps constructed of materials suitable for the intended service. Air-operated diaphragm type pumps are generally utilized in dewatering stations.

Pump codes for the SWMS are per RG 1.143 guidance as shown in Table 11.2-1.

11.4.5.2 Tanks

Tanks are sized to accommodate a sufficient volume of waste sludges or spent resin to fill a HIC. The SWMS tanks are sized for normal plant waste volumes with sufficient excess capacity to accommodate equipment downtime and expected maximum volumes that may occur. Each phase separator is capable of accommodating at least 60 days of waste generation at normal generation rates of powdered resins from the CUW system, FPC System, and the Suppression Pool Cleanup System. Each spent resin storage tank is capable of accommodating at least 30 days of waste generation at normal generation rates of spent resins from the Condensate Polishing System and the LWMS. The LW backwash receiving tank is capable of accommodating at least 30 days of waste generation at normal generation rates of slurries (filter backwashing and reverse osmosis reject) from the LWMS. Table 11.4-5 includes the holdup times for the phase separators, LW backwash receiving tank and the spent resin storage tanks.

The tanks are constructed of stainless steel to provide a low corrosion rate during normal operation. They are provided with mixing eductors and/or air spargers. The capability exists to sample all SWMS tanks. All SWMS tanks are vented through a filtration unit and the exhausted air is eventually discharged via the radwaste building HVAC system into the plant vent.

Each collection tank compartment is designed to contain the maximum liquid inventory in the event that the tank ruptures. Each collection tank compartment is steel-lined up to a height equivalent to the tank capacity in the room as described in Section 15.7.3.1.

The vent and overflow nozzles of the spent resin tank are equipped with fine mesh screens to minimize spread of particulate contamination to the radwaste tank vent system.

Tank codes for the SWMS are per RG 1.143 guidance as shown in Table 11.2-1.

11.4.5.3 Piping

Piping used for hydraulic transport of slurries such as ion exchange resins, filter backwash (sludge), and waste tank sludge are specifically designed to assure trouble-free operation. Pipe flow velocities are sufficient to maintain a flow regime appropriate to the slurry being transported (ion exchange resins, filter backwash, or tank sludge). An adequate water/solids ratio is maintained throughout the transfer. Slurry piping is provided with manual and automatic flushing with a sufficient water volume to flush the pipe clean after each use, i.e., at least two pipe volumes.

Piping codes for the SWMS are per RG 1.143 guidance as shown in Table 11.2-1.

11.4.5.4 Venting

Exhaust ventilation is described in Section 9.4.

11.4.5.5 Mobile Dewatering Processing Subsystem

The radwaste treatment systems include modular mobile system skids that are designed to be readily replaced during the life of the plant. In-plant supply and return connections from permanently installed equipment to the mobile system are provided to ensure operational flexibility.

The mobile subsystem consists of equipment modules, with subcomponents, piping and instrumentation and controls necessary to operate the subsystem. Components are in module(s) designed for installation and replacement due to component failure and/or technology upgrade. The modules include shielding required between the radiation sources of the modules and access and service areas in the radwaste building. The modules are permanently installed in the radwaste building.

The SWMS mobile dewatering processing system is located in the Liquid Waste Treatment System bay area of the radwaste building to allow truck access and mobile system skid loading and unloading. Modular shield walls are provided in the RW to allow shield walls to be constructed, as necessary, to minimize exposure to personnel during operation and routine maintenance. Solid radwaste processing is performed using mobile dewatering processing subsystem.

The mobile dewatering processing subsystem is comprised of dewatering fillhead assembly, dewatering pump skid, ~~waste~~ control valves, control console and dewatering container. The fillhead assembly is provided with a level detection system, a camera and light assembly, a mechanical level indicator and a temperature measurement. The dewatering containers include both HICs and carbon steel liners. The containers internal design includes elaborate filtration arrays, for dewatering the varying resin and filtration media. The mobile dewatering processing equipment is anticipated to be modernized as more effective technologies are discovered and proved throughout the life of plant operation. To effect this modernization, the various systems, structures and components associated with the mobile dewatering processing system may be grouped or associated on or in skids or assemblies, including ancillary equipment such as instrumentation, electrical components, mounting connections. The mobile dewatering processing subsystem is connected to the SWMS tanks and pumps as shown in Figure 11.2-2.

Solid waste system permanent equipment (tanks and pumps) is described throughout Section 11.4. Liquid waste processing is described in Section 11.2. Ventilation is described in Section 9.4. Instrumentation requirements are described in Section 11.4.5.

11.4.6 Testing and Inspection Requirements

The SWMS is tested during the preoperational test program as discussed in 14.2.12.1.75. The SWMS equipment will be performance tested to demonstrate conformance with design process capabilities. An integrity test is performed on the system upon completion.

Provisions are made for periodic inspection of major components to ensure capability and integrity of the systems. Display devices are provided to indicate parameters (such as process radiation levels) required in routine testing and inspection.

11.4.7 Instrumentation Requirements

The SWMS is operated and monitored from the radwaste control room or local operating stations within the facility. Major system parameters, i.e., tank levels, process flow rates, etc., are indicated and alarmed to provide operational information and performance assessment. Priority system alarms (such as process radiation levels) are repeated in the main control room. Instruments, including back flushing provisions, are located in low radiation areas when possible, as described in Section 12.3. These back flushing provisions are designed with the guidance of IE Bulletin 80-10.

Requirements for sampling are set forth in Subsection 9.3.2.

11.4.8 References

11.4-1 ANSI 55.1 –July 28, 1992, American National Standard for Solid Radioactive Waste Processing System for Light Water Reactor Plants.

Table 11.4-1 Expected Waste Volume Generated Annually by Each "Wet" Solid Waste and Tank Capacities

Wet Waste Source	Volume Generated (m^3/yr)	Typical Waste Classification
CUW F/D sludge[(a)]	4.7	B
FPC F/C sludge[(a)]	1.8	B
Condensate Filter sludge[(a)]	4.6	A
LCW Filter B sludge[(b)] HCW Filter B sludge[(b)] HCW Filter A sludge[(e)] HCW Reverse Osmosis Unit Reject[(b)]	0.6 2.4 1.4 73.0	A A A A
Condensate Demineralizer resin[(c)]	18.0	A
LCW Demineralizer resin[(d)]	1.8	A
HCW Demineralizer resin[(d)]	1.8	A

(a) The first three items in the table above are stored in either of two CUW phase separators which have a capacity of 100 m^3 each. During a normal period these three wastes are generated at a rate of about 2m^3 in 60 days.

(b) The LCW and HCW sludge (including RO reject) are stored in the LW backwash receiving tank. The LW backwash receiving tank has a capacity of 50 m^3. During a normal period about 10 m^3 is generated in 30 days.

(c) The condensate demineralizer resin is stored in one of the two spent resin storage tanks, each has a capacity of 50 m^3. During a normal period spent resin is generated at a rate of about 2m^3 in 30 days.

(d) The LCW and HCW demineralizers resin is stored in the one of the two spent resin storage tanks, each has a capacity of 50 m^3. During a normal period spent resin is generated at a rate of about 4m^3 every 365 days.

(e) The HCW Filter A sludge of 1.4 m^3 is generated every 365 days and collected in a container.

Thus, the storage requirements in BTP ETSB 11.3, Part B.III.1 are met.

Table 11.4-2 Estimate of Expected Annual "Dry" Solid Wastes

Dry Waste Source	Volume Generated(m^3/yr)
Combustible waste	225
Compactible waste	38
Other waste	100

Table 11.4-3 Estimated Shipped Solid Waste Volumes

Waste Type	Shipped Volume (m^3/yr)
Combustible Waste	225
Compactable Waste	38
Resins and Sludges	110
Other Waste	100
Mixed Waste	0.5

Table 11.4-4 Solid Waste System Component Data Summary

Component	Quantity	Standards	Type	Internal Vol per tank (m^3)	Design Pressure (kg/cm^2)	Design Temp (ºC)	Normal Operating Pressure (kg/cm^2)	Normal Operating Temp (ºC)	Material
Tanks									
CUW Backwash Receiving Tank	1	API-650/API-620	Cylindrical, Vertical	28	atm	80	atm	66	SS
CF Backwash Receiving Tank	1	API-650/API-620	Cylindrical, Vertical	60	atm	80	atm	66	SS
LW Backwash Receiving Tank	1	API-650/API-620	Cylindrical, Vertical	50	atm	80	atm	66	SS
Spent Resin Storage Tank	2	API-650/API-620	Cylindrical, Vertical	50	atm	80	atm	66	SS
Phase Separator	2	API-650/API-620	Cylindrical, Vertical	100	atm	80	atm	66	SS
CUW Backwash Transfer Pump	2	API-610; API-674; API-675; ASME Code Section VIII, Div. 1 or Div. 2	Centrifugal or Progressive Cavity/ Mechanical Seal	120	20	80	10	66	SS
CF Backwash Transfer Pump	2	API-610; API-674; API-675; ASME Code Section VIII, Div. 1 or Div. 2	Centrifugal or Progressive Cavity/ Mechanical Seal	120	20	80	10	66	SS

Table 11.4-4 Solid Waste System Component Data Summary (Continued)

Component	Quantity	Standards	Type	Internal Vol per tank (m^3)	Design Pressure (kg/cm^2)	Design Temp (ºC)	Normal Operating Pressure (kg/cm^2)	Normal Operating Temp (ºC)	Material
LW Backwash Transfer Pump	2	API-610; API-674; API-675; ASME Code Section VIII, Div. 1 or Div. 2	Centrifugal or Progressive Cavity/ Mechanical Seal	120	20	80	10	66	SS
Phase Separator Decant Pump	2	API-610; API-674; API-675; ASME Code Section VIII, Div. 1 or Div. 2	Centrifugal/ Mechanical Seal	10	20	80	10	66	SS
Phase Separator Slurry Recirculation/ Transfer Pump	2	API-610; API-674; API-675; ASME Code Section VIII, Div. 1 or Div. 2	Centrifugal or Progressive Cavity/ Mechanical Seal	200	20	80	10	66	SS
Spent Resin Decant Pump	2	API-610; API-674; API-675; ASME Code Section VIII, Div. 1 or Div. 2	Centrifugal/ Mechanical Seal	10	20	80	10	66	SS
Spent Resin Slurry Recirculation/ Transfer Pump	2	API-610; API-674; API-675; ASME Code Section VIII, Div. 1 or Div. 2	Centrifugal or Progressive Cavity/ Mechanical Seal	100	20	80	10	66	SS
Mobile Dewatering Processing Subsystem									
Mobile Dewatering Processing Subsystem	1	RG 1.1.43 (as applicable to components)	NA	NA	NA	NA	NA	NA	Based on component

Table 11.4-5 Capability of Solid Radwaste Subsystems to Process Expected Wastes

Wet Waste Source	Volume Generated (m^3/yr)	Batch Frequency (days)	Batch Volume (m^3)	Batch Transfer Mixture Factor	Total Batch Transfer Volume (m^3)	Designated Storage Unit(s)	Storage Unit Capacity (m^3)	Combined Batch Volume per Designated Storage Unit (m^3)	Number of Batches per Storage-Unit	Holdup Time (days)[c]
CUW F/D sludge	4.7[a]	60[a]	0.77	8.0	6.18	Phase Separator A	100	8.55	11.7	702
FPC F/C sludge	1.8[a]	60[a]	0.30	8.0	2.37					
Condensate Filter sludge	4.6[a]	60[a]	0.76	5.0	3.78	Phase Separator B	100	3.78	26.4	1587
LCW Filter B sludge	0.6	30	0.05	5.0	0.25	LW Backwash Receiving Tank	50	13.23	3.8	113
HCW Filter B sludge	2.4	30	0.20	5.0	0.99					
HCW Reverse Osmosis Unit Reject	73.0	30	6.00	2.0	12.00					
HCW Filter A sludge (charcoal)[b]	1.4	365	1.40	8.0	11.20	Spent Resin Storage Tank B	50	40.00	1.3	456
LCW Demineralizer resin	1.8	365	1.80	8.0	14.40					
HCW Demineralizer resin	1.8	365	1.80	8.0	14.40					
Condensate Demineralizer resin	18.0[a]	30[a]	1.48	8.0	11.84	Spent Resin Storage Tank A	50	11.84	4.2	127

Notes:

(a) Values from ABWR DCD Chapter 11, Section 11.4 Solid Waste Management System Table 11.4-1 for CUW F/D, .

(b) Spent charcoal from HCW Filter A is normally sent to a container.

(c) The holdup time for each storage tank meets the storage requirements in BTP ETSB 11.3, Part B.III.1.

Table 11.4-6 Projected Six months Storage Area in the Radwaste Building

Solid Waste	Volume Generated (m^3/yr)[a]	Volume Generated (m^3/ 6 months)	Radwaste Container Type and Max Weight	Diameter of Outside Radwaste Container (m)	Radwaste Container Usable Volume (m^3)	Quantity of Containers (6 months)	10% Container Increase for Filling Inefficiency (6 months)	Footprint Area needed (m^2)	Adjusted Footprint Area for 2-High Stacking (m^2)	20% Increase Footprint Area for Passage Ways (m^2)	Maximum Weight of Filled Containers (kg)
CUW F/D sludge	4.7	2.35	HIC (20,000 lbs)	1.9	5.13	1	1.1	4.05	4.05	4.85	9979
FPC F/C sludge	1.8	0.90	HIC (20,000 lbs)	1.9	5.13	1	1.1	4.05	4.05	4.85	9979
Condensate Filter sludge	4.6	2.30	HIC (20,000 lbs)	1.9	5.13	1	1.1	4.05	4.05	4.85	9979
LCW Filter B sludge	0.6	0.30	HIC (20,000 lbs)	1.9	5.13	1	1.1	4.05	4.05	4.85	9979
HCW Filter B sludge	2.4	1.20	HIC (20,000 lbs)	1.9	5.13	1	1.1	4.05	4.05	4.85	9979
HCW Reverse Osmosis Unit Reject	73.0	36.50	HIC (20,000 lbs)	1.9	5.13	8	8.8	32.36	32.36	38.84	79832
Total (Rounded Up)						**13**	**15**	**53.00**	**53.00**	**64.00**	**129727**
HCW Filter A sludge (Charcoal)	1.4	0.70	HIC (20,000 lbs)	1.9	5.13	1	1.1	4.05	4.05	4.85	9979
LCW Demineralizer resin	1.8	0.90	HIC (20,000 lbs)	1.9	5.13	1	1.1	4.05	4.05	4.85	9979
HCW Demineralizer resin	1.8	0.90	HIC (20,000 lbs)	1.9	5.13	1	1.1	4.05	4.05	4.85	9979
Condensate Demineralizer resin	18.0	9.00	HIC (20,000 lbs)	1.9	5.13	2	2.2	8.09	8.09	9.71	19958
Total (Rounded Up)						**5**	**6**	**21.00**	**21.00**	**25.00**	**49895**

Table 11.4-6 Projected Six months Storage Area in the Radwaste Building

Solid Waste	Volume Generated (m^3/yr)[(a)]	Volume Generated (m^3/ 6 months)	Radwaste Container Type and Max Weight	Diameter of Outside Radwaste Container (m)	Radwaste Container Usable Volume (m^3)	Quantity of Containers (6 months)	10% Container Increase for Filling Inefficiency (6 months)	Footprint Area needed (m^2)	Adjusted Footprint Area for 2-High Stacking (m^2)	20% Increase Footprint Area for Passage Ways (m^2)	Maximum Weight of Filled Containers (kg)
Dry Solid Waste											
Dry Combustible waste	225.0	112.50	Drum (882 lbs)	0.6096	0.2209	510	561	208.47	104.24	125.08	224438
Dry Compactible waste	38.0	19.00	Drum (882 lbs)	0.6096	0.2209	87	95.7	35.56	17.78	21.34	38287
Total (Rounded Up)						**597**	**657**	**245.00**	**123.00**	**147.00**	**262725**
Other Dry waste	100.0	50.00	B-25 Box (10735 lbs)	1.8288 x 1.1684[(b)]	2.5485	20	22	47.01	23.50	28.21	107125
Total (Rounded Up)						**20**	**22**	**48.00**	**24.00**	**29.00**	**107125**
									Grand Total	**265.00**	**5.49E+05**

(a) Values from ABWR DCD Chapter 11, Section 11.4 Solid Waste Management System Tables 11.4-1 and 11.4-2 and Attachment C.

(b) Base length and width dimensions for B-25 Box.