11.4 Solid Waste Management System

The solid waste management system (SWMS) is designed to provide the means to collect, segregate, store, process, and pack the various types of solid radioactive waste. The SWMS processes both wet solid active waste and dry active waste (DAW) for onsite interim storage and shipment to the offsite disposal facility.

The lessons learned program provides guidance on the integration of industry, operating, and construction experience into the APR1400 design. Under this program, NRC generic communications and industry operating and construction experience are maintained in a database that is reviewed, assessed, and integrated into the design as appropriate. The construction and operating experience of nuclear power plants have been incorporated into the database for design improvement.

The SWMS is designed with hard piping between radioactive and non-radioactive systems in accordance with the IE Bulletin 80-10 (Reference 1). Demineralized water is used for flushing pipe after each transfer of contaminated fluid. Such connections are hard pipes and are equipped with double barriers to prevent unintended contamination in accordance with NRC RG 4.21 (Reference 2).

11.4.1 Design Bases

11.4.1.1 Design Objectives

The design objectives of the SWMS are:

a. To collect, segregate, process, package, and store various solid radioactive wastes generated from the normal operation, maintenance, refueling, and anticipated operational occurrences (AOOs).

b. To store, process, and package the radioactive spent resin transported from the liquid waste management system (LWMS), the chemical and volume control system (CVCS), the spent fuel pool cooling and cleanup system (SFPCCS), and the steam generator blowdown system (SGBDS).

c. To temporarily store the high- and low-activity waste, and to retrieve and ship wastes.

d. To process and package wastes into drums or high-integrity containers (HICs) that satisfy the required regulations of the U.S. Department of Transportation (DOT) and the disposal facility.

e. To satisfy federal regulations and protect the workers and the general public from radiation exposures ALARA.

11.4.1.2 Design Criteria

The SWMS design criteria are as follows:

a. The SWMS is designed to meet the requirements of 10 CFR 50, Appendix A, GDC 61 (Reference 3), to provide reasonable assurance of adequate safety under normal and postulated accident conditions, and GDC 63 (Reference 3) so the SWMS has an ability to detect conditions that may result in excessive radiation levels and to initiate appropriate safety actions.

   Spent resin is sampled for analysis, and the volume to be transferred into the high integrity container is predetermined. After the filling operation, the radiation level of the container is monitored prior to offsite shipment, providing reasonable assurance that the containers meet regulatory radiation limit and waste acceptance criteria, achieving compliance with 10 CFR 50, Appendix A, GDC 64 (Reference 3).

b. Liquid and gaseous effluents arising from the operation of the SWMS are within the effluent concentration limits of 10 CFR 20, Appendix B (Reference 4). The liquid and gaseous waste from the SWMS during normal operation and AOOs are released to the environment through the LWMS, which is addressed in Section 11.2, and the compound building heating, ventilation, and air conditioning (HVAC) system, which is addressed in Section 9.4. Sections 11.2 and 11.3 provide estimates of releases from the LWMS and the GWMS based on the methodology in NUREG-0017 (Reference 5), which includes contributions from the SWMS.

c. Solid waste is classified, processed, and disposed in accordance with requirements of 10 CFR 61 (Reference 6) and packaged in accordance with the requirements of 10 CFR 71 (Reference 7). For the transportation and disposal of waste, the SWMS conforms to the transportation requirements of 49 CFR 173, Subpart I (Reference 8).

d. Spent resins in storage tanks are sampled and surveyed to verify that the dewatering process is completed in accordance with the guidance of NRC Branch Technical Position (BTP) 11-3 (Reference 9).

e. The SWMS is designed to stabilize solid waste into a suitable form for disposal or package the solid waste in drum or high-integrity container (HIC) approved for disposal. The drum and HIC meet the requirement of 49 CFR 171 (Reference 10).

f. Wet solid waste collection tanks are sized to collect all waste inputs to allow satisfactory operation of the solid waste processing system. The size of the components of the spent resin subsystem allows at least a 30-day decay of short-lived radionuclide prior to processing in accordance with ANSI/ANS 55.1 (Reference 11). Spent resin tanks have the capacity to hold at least two batches of spent resin from the source of the greatest input.

g. The SWMS satisfies design objectives of performance without interfering with normal operation including AOOs.

h. The SWMS design conforms to NRC RG 1.143 (Reference 12). The compound building where radioactive waste management equipment is located is designed as seismic Category II, and the design of radioactive waste management SSCs follows the guidance in NRC RG 8.8 (Reference 13). Demonstration of compliance with NRC RG 8.8 (Reference 13) is provided in Chapter 12.

i. The design of the shielding of the solid waste areas is based on the design basis source term in Section 11.1. The spent filters and spent resins are assumed to be fully loaded with suspended solids and dissolved solids using the design basis source term, which is also used to determine the thicknesses of the shield walls.

j. Cubicles containing radioactive liquid are lined with an epoxy coating to minimize the potential contamination to the groundwater system and to facilitate maintenance and decontamination. Epoxy coatings in cubicles are Service Level II coatings as defined in NRC RG 1.54 (Reference 14).

11.4.1.3 Other Design Considerations

The following features satisfy the design criteria:

a. The SWMS accommodates mobile equipment, which may provide an economical option at certain times or meet particular waste requirements.

b. Active and replaceable components are installed in locations that are accessible by crane or monorail hoist to facilitate removal, repair, and replacement.

c. The SWMS is designed, manufactured, and tested in accordance with the codes and standards listed in Table 1 of NRC RG 1.143 (Reference 12), as shown in Table 11.4-4.

d. Materials used for pressure-retaining portions in the SWMS are designed in accordance with requirements in ASME Section II (Reference 15). Materials used in the SWMS are compatible with the chemical, physical, and radioactive environment during normal and anticipated operating conditions. Malleable, wrought, or cast iron and plastics are not used in the SWMS.

e. The components in the SWMS that are used to store, collect, and process wet solid waste and DAW are not designed to conform to the seismic criteria specified in Regulatory Position C.6 of NRC RG 1.143 (Reference 12) except for two spent resin storage tanks (SRSTs). The SRSTs are designed as seismic Category II.

f. The SWMS is designed to prevent liquid and gases generated during processing the wet solid waste and DAW from direct discharge to the environment. The SWMS is designed to route liquids removed during the dewatering process of wet solid waste to the LWMS for processing. Gases collected in the DAW processing area are filtered, monitored, and discharged to the environment via the compound building HVAC system. In addition, spaces to facilitate access, operation, inspection, testing, and maintenance are provided in the compound building to maintain personnel exposures ALARA in accordance with NRC RG 8.8 (Reference 13) guidelines.

g. The quality assurance (QA) program for the design, installation, procurement, and fabrication of components complies with Regulatory Position C.7 of NRC RG 1.143 (Reference 12) and NRC RG 1.33 (Reference 16). In addition, the seismic category and quality group classifications applicable to the design of the SWMS are described in Section 3.2.

h. All piping in the SWMS is hydrostatically pressure tested in accordance with regulatory position C.4.4 of NRC RG 1.143 (Reference 12). Testing of piping systems during the operation phase is performed in accordance with ASME B31.3 (Reference 17) or system piping specifications.

i. The SWMS is designed to allow periodic testing to evaluate operability of components in accordance with Regulatory Position C.4.5 of NRC RG 1.143 (Reference 12).

j. The SWMS is designed to comply with 10 CFR 50.34a (Reference 18), 10 CFR 50, Appendix I (Reference 19), and NRC RG 1.110 (Reference 20).

k. The SWMS is designed to meet the applicable requirements of NUREG-0800 11.4, Appendix 11.4-A (Reference 21) and branch technical position (BTP) 11-3 (Reference 9).

l. The SWMS is designed to be remotely controlled from the radwaste control room of the compound building, which allows operators to more effectively coordinate operating activities.

m. The SWMS is designed to reduce the volume of DAWs.

n. Sufficient temporary storage is provided to store packaged solid waste for at least 30 days in accordance with ANSI/ANS 55.1 (Reference 11).

o. The current design provides collection and packaging of potentially contaminated clothing for offsite shipment and/or disposal. Depending on site-specific requirements, the COL applicant is to send the wastes to an offsite laundry facility for processing and/or bring in a mobile compaction unit for volume reduction (COL 11.4(1)).

11.4.1.4 Method of Treatment

In order to treat and handle the different waste types including spent resins, spent filter cartridges, reverse osmosis (R/O) membrane, R/O concentrate, mixed waste, and DAW, the SWMS provides separate treatment and handling methods.

The DAW is compressed or packaged in the disposable drum. Gases collected during DAW operations are filtered, monitored, and discharged to the environment through the compound building HVAC system. The dry active waste includes the following:

a. Contaminated clothing, gloves, rags, and shoe coverings

b. Compressible materials such as HVAC filters

c. Contaminated metallic materials and incompressible solid objects such as contaminated wood, small tools, and equipment or subcomponents

Wet solid wastes are dewatered and packaged in a 200 L (DOT-17H 55 gal) drum or HIC. All wet solid wastes are collected based on the radiation level of waste and monitored the radiation before processing. The major wet solid wastes are spent resins, spent filters, R/O membrane, R/O concentrate, and mixed waste. The methods of treatment of wet wastes are as follows:

a. Two SRSTs are used to collect and store the spent resins generated during operation. The spent resins collected in SRSTs are dewatered and packaged in a HIC by the dewatering system.

b. Wet spent filters are dewatered and packaged in a 200 L (55 gal) drum (or HIC). The drum is then placed in the shielded storage area prior to processing and shipment to an offsite disposal facility.

c. R/O membranes are dewatered and packaged in a 200 L (55 gal) drum.

d. R/O concentrates are dried to reduce the volume and convert to a granular or bead form. The dried concentrates are packaged in a 200 L (55 gal) drum or HIC.

The generation of mixed waste is minimized by prohibiting the use of hazardous materials. However, if mixed waste cannot be avoided, the mixed wastes are collected separately in a 200 L (55 gal) drums and stored prior to shipment to an appropriately licensed processor.

The SWMS contains a 30-day storage of processed wastes in accordance with the guidance of ANSI/ANS 55.1 (Reference 11). The storage facility is designed with adequate shielding to minimize the radiation dose to the operators.

11.4.1.5 Radioactive Source Terms in SWMS

Source terms for solid radwaste are calculated for high activity spent resin, low activity spent resin, spent filter, and reverse osmosis concentrate. Table 11.4-2 presents the expected radioactivity in various solid radioactive wastes.

The spent resin long-term storage tank (SRLST) in the SWMS is designed to contain high activity spent resins of purification, deborating, pre-holdup, and boric acid condensate ion exchangers of the CVCS for 10 years. The source terms in SRLST are calculated by summing the source terms in each CVCS ion exchanger considering decay for 10 years.

The low-activity spent resin tank (LASRT) contains spent resins from the LWMS, SFPCCS, and SGBDS. The source term in the LASRT is determined based on spent resin generation assuming a one-time replacement of each ion exchanger. Because the buildup activities of SGBD and SFPCC spent resins are low, it is conservatively assumed that the LASRT is filled only with spent resins generated from the LWMS.

High-activity spent filters generated from the CVCS, SFPCCS, and SGBDS are removed by means of a shielded plug and a shielded cask and transferred to the filter capping area in the compound building via the filter transporter and capped in a 200 L (55 gal) drum for offsite storage. The activities of all spent filters entered into the SWMS for 1 year are determined by summing the buildup activities in each filter.

The R/O concentrate is collected, drummed, and moved to the waste drum storage area in the compound building. The activities in the concentrate are determined using the inflow activities in each liquid waste stream to an R/O package and the corresponding decontamination factor of the R/O. The expected radioactive concentrations of the inflows to the equipment waste tank, chemical waste tank, and floor drain tanks and their flow rates are used to calculate the annual buildup activities in the R/O concentrate.

The methodology that is used to determine SWMS component safety classification, which is according to NRC RG 1.143 (Reference 12), is described in Subsection 11.2.1.4. The results are in Table 11.4-3.

11.4.1.6 Site-Specific Cost-Benefit Analysis

The SWMS is designed to be used for any site. The design is flexible so that site-specific requirements, such as preference of technologies, degree of automated operation, and radioactive waste storage, can be incorporated with minor modifications to the design.

NRC RG 1.110 (Reference 20) outlines compliance with 10 CFR 50, Appendix I (Reference 19), numerical guidelines for offsite radiation doses from gaseous or liquid radioactive effluents during normal operations, including AOOs.

The cost-benefit numerical analysis as required by 10 CFR 50, Appendix I (Reference 19), Section II, Paragraph D, demonstrates that the addition of items of reasonably demonstrated technology would not provide a favorable cost-benefit. The COL applicant is to perform a site-specific cost-benefit analysis to demonstrate compliance with NRC RG 1.110 (Reference 20) (COL 11.4(2)).

11.4.1.7 Mobile Equipment

The spent resin dewatering system is applied to the mobile and modular design. The purpose of the mobile design is to facilitate replacing the equipment when advanced treatment technologies are developed or when the equipment is broken or both. The mobile system of SWMS is designed to meet the provision and conformance requirements of ANSI/ANS-40.37-2009, Mobile Radioactive Waste Processing Systems (Reference 22). The COL applicant is to provide reasonable assurance that the provisions and requirements of ANSI/ANS-40.37-2009 (Reference 22) are met (COL 11.4(3)).

The COL applicant is to provide reasonable assurance that mobile and temporary solid radwaste processing equipment and its interconnections to plant systems conform to regulatory requirements and guidance such as 10 CFR 50.34a (Reference 18), 10 CFR 20.1406 (Reference 23), and NRC RG 1.143 (Reference 12) (COL 11.4(3)). The COL applicant is to prepare a plan to develop and use operating procedures so the guidance and information in inspections and enforcement (IE) Bulletin 80-10 (Reference 1) are followed (COL 11.4(3)).

11.4.2 System Description

The primary functions of the SWMS are to process, package, and store the dry and wet solid wastes generated from the plant in accordance with regulatory guidelines, and to handle and store dry and low-activity wastes prior to shipment to the offsite disposal facility.

The SWMS is divided into the following subsystems:

a. Spent resin transfer, packaging and storage subsystem

b. Filter handling subsystem

c. Dry active waste subsystem

d. Concentrate treatment subsystem

e. Waste storage subsystem

The expected and maximum annual waste volumes are shown in Table 11.4-1. The expected activities of solid waste in the SWMS are presented in Table 11.4-2.

<u>Spent Resin Transfer, Packaging, and Storage Subsystem</u>

The spent resin transfer and storage subsystem is designed to transfer spent radioactive resins of demineralizers from their vessels to the spent resin tanks where the resin is held up prior to being processed. The major components of this subsystem are the low-activity spent resin tank and the spent resin long-term storage tank. The process flow diagrams for the spent resin transfer and storage subsystem are shown in Figure 11.4-1. The COL applicant is to provide piping and instrumentation diagrams (P&IDs) (COL 11.4(4)).

The spent resin tanks provide a settling capacity for radioactive resins transferred from various demineralizers. The spent resin long-term storage tank and a low-activity spent resin tank are provided to hold up the spent resin for decay prior to processing. The spent resins in demineralizers of the CVCS are transferred to the spent resin long-term storage tank. The relatively low-activity spent resins from the LWMS, SFPCCS, and SGBDS are transferred to the low-activity spent resin tank. Each spent resin tank has a connection for transfer of spent resins to the dewatering system.

<u>Filter Handling Subsystem</u>

The filter handling subsystem provides the capability to replace normally radioactive filters with a minimum of personnel exposure to radiation. Spent filters are removed from the filter vessel by means of a shield plug and a shielded transfer cask. Filters are transferred to the compound building via the filter transporter and then placed and capped in a 200 L (55 gal) drum. Low-activity filters, such as a drain filter of the detergent waste system and a HEPA filter of the GWMS, are removed manually.

<u>Dry Active Waste Subsystem</u>

A space is also provided to sort miscellaneous contaminated dry solids from uncontaminated solids for appropriate and cost effective packaging and temporary storage. Miscellaneous solid waste consisting of contaminated or potentially contaminated rags, paper, clothing, glass, and other small items is collected at the DAW sorting area located in the compound building. All DAWs are sorted as either radioactive waste or clean waste depending upon their radiation level. Parts sorted as radioactive waste are compacted into a 200 L (55 gal) drums by the solid waste compactor and transferred to and stored in a temporary storage area in the compound building prior to shipment to the offsite disposal facility.

Charcoal used in the GWMS is not expected to be replaced. Therefore, spent charcoal is not generated routinely. If spent charcoal is generated from the GWMS, it is processed in accordance with process control program, which the COL applicant is to provide (COL 11.4(5)).

Concentrate Treatment Subsystem

Concentrate waste generated from the R/O membrane separation process is dried by the concentrate treatment system, and then dried concentrate waste is packaged in a 200 L (55 gal) drum or HIC.

Waste Storage Subsystem

A shielded waste drum storage area in the compound building is provided to allow for interim storage of higher activity packaged wastes. The storage area is sized to accommodate the number of drums and HICs generated in a 6-month period of normal operation. The process and storage areas include a dedicated overhead crane with direct access to adjacent truck bays with sufficient overhead clearance to facilitate direct trailer loading of waste packages. Crane operation may be performed remotely with the aid of crane-mounted video cameras or locally to provide additional flexibility.

11.4.2.1 Dry Solid Waste

11.4.2.1.1 Dry Active Waste

A sorting and staging space is provided in the SWMS area to separate contaminated and non-contaminated material prior to processing. Filtered hoods are provided to remove airborne contamination during sorting of DAWs.

DAWs such as rags, contaminated clothing, sweepings, and other items are compressed into a 200 L (55 gal) drum by a solid waste compactor. During compactor operation, a fan is used to pull gases through the HEPA filter and exhaust them to the compound building HVAC system. When the drum is full, it is manually sealed and moved to the low-level waste storage area for shipment by using the drum cart and the overhead crane. The overhead crane with a capacity of 15 Tons is provided to move the drums to and from the waste storage area. The drums are surveyed prior to shipment. Table 11.4-1 provides an estimate of annual dry solid wastes generated. The dry active waste handling and storage operation is outlined in Figure 11.4-1.

11.4.2.1.2 HVAC Filters Handling

The HVAC filters are placed into directly the drums without disassembly in order to reduce personnel exposure. Filter hoods are also provided for handling filters where airborne contamination may occur.

11.4.2.2 Wet Solid Waste

11.4.2.2.1 Spent Resin Storage and Handling

The various spent resins generated from demineralizers or ion exchangers are sluiced to spent resin tanks in the compound building where they are allowed to settle prior to processing. Spent resins are segregated based on level of activity. High-activity spent resins from demineralizers used to process the reactor coolant, such as the purification and pre-holdup ion exchangers in the CVCS, are sluiced to the spent resin long-term storage tank located in the compound building. Low-activity spent resins from the demineralizers in the LWMS and the SFPCCS are sluiced to the low-activity spent resin tank. Figure 11.4-1 is a process flow diagram of the spent resin handling subsystem.

The spent resin of demineralizers in the SGBDS is sluiced to the low-activity spent resin tank only if the resin is radioactive.

Service air or water injected through the resin outlet line at the bottom of each demineralizer vessel is used to agitate the resins prior to transfer to the spent resin tank. The spent resins are transferred to the spent resin tank by opening the resin discharge valve on the resin outlet line after pressurization by demineralized water or the reactor makeup pump.

Low-activity resin is sluiced to the low-activity spent resin tank to allow for settling and holdup prior to processing. Spent resin is then transferred to and dewatered by the dewatering system. The processing of the spent resins results in less than 1 percent of the waste volume as free-standing water in the HIC. Packaged spent resin drums are transferred to the waste drum storage area. The spent resins stored in the long-term storage tanks are processed in the same manner as the low-activity spent resins after sufficient radioactive decay in long-term storage.

Water in the spent resin is removed from the dewatering system during the dewatering process and directed back to the LWMS for processing prior to release to the environment. Non-clogging screens are provided to prevent the carryover of spent resin beads or fines to the LWMS during the dewatering process.

11.4.2.2.2 Spent Filter Storage and Handling

An area is provided in the compound building for storage of process filters used throughout the plant. The services are summarized as follows:

a. High-activity cartridge filters

   When a cartridge filter is replaced, it is first taken out of service. If the fluid in the housing potentially contains dissolved fission product gases, the contents are flushed to the equipment drain tank (EDT). The filter housing is then vented and allowed to drain. An overhead hoist is used to remove the shield hatch above the filter. The filter cartridge is remotely removed from its housing and brought to a filter-handling cask. The filter-handling cask is transferred to the filter handling area by use of a hoist and a cask transporter. The cartridges are then lowered into 200 L (55 gal) drums and capped. The drums are then placed in the shielded storage area prior to final processing and shipment to an offsite disposal facility.

b. Low-activity LWMS cartridge filters

Cartridge filters are replaced based on differential pressure of it or on radiation level of it. During replacement, water is drained from the filter housing and the filter media is dried by using compressed process air. The cartridge is then lifted from the housing and placed into a drum. The drum is moved to the shielded storage area for shipment and disposal.

11.4.2.2.3 R/O Concentrate Processing

The concentrate generated from the R/O system is dried by the concentrate treatment system. Packaged waste is stored in a temporary storage area in the compound building prior to shipment to the offsite disposal facility.

11.4.2.3 Packaging, Storage, and Shipping

The SWMS is designed to package wastes in a 200 L (55 gal) drum or a HIC, which is a DOT-approved container, for temporary storage and offsite shipment. The HIC is used to package dewatered and dried spent resin. Radioactive wastes such as concentrate, cartridge filters, and miscellaneous solid wastes are packaged in a 200 L (55 gal) drum. Large components that have been contaminated and are not amenable to compaction are prepared appropriately for packaging in shipping casks.

Waste is classified as class A, B, C, or greater than class C in accordance with 10 CFR 61.55 (Reference 6). Estimates of the expected and maximum volume of solid radwaste and its classification to be shipped offsite are provided in Table 11.4-1.

Packaged solid radioactive waste is transported to a shielded waste storage area in the compound building via bridge crane. The bridge crane is also used for waste onsite movement and offsite shipment. The COL applicant is to provide a mobile crane to retrieve waste packages that become stuck in the lifted condition or are dropped (COL 11.4(6)).

The plant provides adequately shielded storage space for solid waste in the compound building to accommodate the expected solid waste generated during a 6-month period.

The storage facilities are designed in accordance with NRC Standard Review Plan, Section 11.4 (Reference 21), EPRI Utility Requirements Document Chapter 12.5 (Reference 24), and NRC RG 1.143 (Reference 12) as follows:

a. Potential release pathways are controlled and monitored in accordance with 10 CFR 50, Appendix A (Reference 3) (General Design Criteria 60 and 64), by the following:

   1) Furnishing curb-stone or dike to retain spills of waste, such as dewatered resins or sludges

   2) Furnishing floor drains to collect and route spills back to LWMS for processing

   3) Furnishing area, airborne, and process radiation monitors

b. Sufficient shielding is provided to limit the radiation levels to less than the designated upper limit of the radiation zones in adjacent areas.

c. High-radiation drums are retrievable on a row-by-row basis.

d. Video monitoring is used for remote viewing of high-radiation areas.

e. Automatic fire detection and suppression are provided.

A truck bay in the compound building is provided with a 15-Ton crane used for loading packaged waste onto a transport vehicle for offsite transportation. The crane is manually operated and controlled remotely.

11.4.2.4 Operation and Personnel Doses

In order to reduce occupational radiation exposure, operations for process and transfer of low and intermediate level radioactive waste are conducted remotely. Operator access is provided for work related to low-level radioactive waste such as DAW. The SRSTs are located in individually shielded cubicles in the compound building. The cubicles are coated with an impermeable epoxy liner coating, up to the cubicle wall height equivalent to the full tank volume, to facilitate decontamination of the facility in the event of tank failure. The design minimizes contact handling.

Control of the dewatering operation is performed in a separately shielded cubicle and/or in the radwaste control room. This approach minimizes personnel radiation doses and complies with the dose limits of NRC RG 8.8 (Reference 13) and NRC RG 8.10 (Reference 25). In conjunction with early leak detection, drainage and transfer capabilities minimize the release of the radioactive liquid to the groundwater and environment in accordance with the BTP 11-6 (Reference 26), 10 CFR 20.1302 (Reference 27) and 10 CFR 20.1406 (Reference 23). As an additional precaution, the COL applicant is to provide an environmental monitoring system (COL 11.4(7)). Design provisions incorporated into the equipment and facility design to reduce occupational radiation exposures, leakages, and spills are addressed in Subsection 11.4.1.

11.4.2.5 Design Features

11.4.2.5.1 Design Features for Minimization of Contamination

The APR1400 is designed with features to meet the requirements of 10 CFR 20.1406 (Reference 23) and NRC RG 4.21 (Reference 2). The basic principles of NRC RG 4.21 (Reference 2), and the methods of control suggested in the regulations are delineated into four design objectives and two operational objectives, which are defined in Subsection 12.3.1.10. The primary features that address the design and operational objectives for the SWMS are summarized below.

The SWMS SSCs, including the facility that houses the components, are designed to limit leakage and/or control the spread of contamination. In accordance with NRC RG 4.21 (Reference 2), the SWMS has been evaluated for leakage identification from the SSCs that contain radioactive or potentially radioactive materials, the areas and pathways where probable leakage may occur, and the methods of leakage control incorporated into the design of the system. The leak identification evaluation indicated that the SWMS is designed to facilitate early leak detection and provide the capability to assess collected fluid and respond to manage the collected fluids quickly. Thus, unintended contamination of the facility and the environment is minimized and/or prevented by the SSC design, supplemented by operational procedures and programs and inspection and maintenance activities.

a. The system components, including the low-activity spent resin tank and the spent resin long-term storage tank, are designed with stainless steel material and welded construction for life-cycle planning. The tanks are designed to have sufficient capacity to contain the spent resins for a decay period to reduce radioactivity.

b. The concentrate treatment subsystem and the spent resin dewatering subsystem are designed as skid packages with self-containing drip pans to contain leakage. The drains connected to the drip pan are routed to a floor drain sump for collection and then pumped to the LWMS for treatment and release.

c. The waste storage area is designed with epoxy-coated floors and drain pipes to direct drainage to a floor drain sump for collection and subsequent pumping to the LWMS for treatment and release.

d. Cubicles in which contaminated materials are handled and stored have floors that are sloped and epoxy-coated to facilitate cleaning. Sump tanks are equipped with level switches to detect liquid accumulation, and pumps are provided to transfer the fluid for proper treatment.

e. The SWMS is designed with above-ground piping to the extent practicable. Buried and/or embedded piping is minimized. A covered concrete trench is provided for drainage piping to the extent possible. In the event that buried and/or embedded piping cannot be avoided, double-walled piping and leak detection instruments are considered and evaluated based on the risks and the radiological consequences associated with the contamination of the facility and the environment.

Adequate and Early Leak Detection

a. The low-activity spent resin tank and the spent resin long-term storage tank are designed with level instrumentation to provide reasonable assurance of the integrity of the SSCs including the associated piping and to provide alarms to warn the operators of leakages.

b. The waste storage area is designed with remote cameras for waste handling operation as well as for periodic surveillance.

c. Other components are designed for batch operation and are provided with adequate space to enable prompt assessment and response when required, reduction of cross-contamination, decontamination, and waste generation.

d. The SSCs are designed with life-cycle planning through the use of nuclear industry-proven materials compatible with the chemical, physical, and radiological environment, thus minimizing cross-contamination and waste generation.

e. The process piping containing contaminated slurry is sized to facilitate flow and provide velocities that are sufficient to prevent settling. The piping is designed to reduce fluid traps, thus reducing decontamination and waste generation. Decontamination fluid is collected and routed to the LWMS for processing and release.

f. Utility connections are designed with a minimum of two barriers to prevent contamination of non-radioactive systems from potentially radioactive systems.

<u>Decommissioning Planning</u>

a. The SSCs are designed for the full service life and are fabricated, to the maximum extent practicable, as individual assemblies for easy removal.

b. The SSCs are designed with decontamination capabilities. Design features such as welding techniques and surface finishes are included to minimize the need for decontamination and minimize waste generation.

Operations and Documentation

a. The spent resin removal and packaging is designed for remote and automated operations. The system is equipped with instruments to provide alarms for operator actions in the event leakage is detected.

b. Operational procedures and maintenance programs related to leak detection and contamination control are to be prepared by the COL applicant (COL 11.4(8)). Procedures and maintenance programs are to be completed before fuel is loaded for commissioning.

c. A leak identification program is to be developed by the COL applicant to identify site-specific components that contain radioactive materials, buried piping, embedded piping, leak detection methods and capabilities, and the methods utilized for the prevention of unnecessary contamination of clean components, facility areas, and the environment (COL 11.4(9)). The leak identification program, which if part of the process control program, is to be designed to facilitate the timely identification of leaks, prompt assessment, and appropriate responses to isolate and mitigate leakage.

d. Complete documentation of the system design, construction, design modifications, field changes, and operations is to be maintained by the COL applicant. Documentation requirements are included as a COL information (COL 11.4(10)).

Site Radiological Environmental Monitoring

a. The SWMS is part of the plant and is included in the site process control program and the site radiological environmental monitoring program for monitoring of facility and environmental contamination. The site radiological environmental monitoring program includes sampling and analysis of effluent to be released, meteorological conditions, hydrogeological parameters, and potential migration pathways of radioactive contaminants. Both programs are included as COL information items (COL 11.4(11)).

11.4.3 Radioactive Effluent Releases

Liquid radioactive wastes that leaks from components in the SWMS are collected and transferred to the LWMS through the radioactive drain system. This liquid waste is collected and processed in the LWMS prior to discharge to the environment. Radioactive liquid effluents released from the LWMS are evaluated in Subsection 11.2.3.

To handle the airborne radioactive materials generated during SWMS operation, a fan is used to pull gases through the HEPA filter and exhaust them to the compound building HVAC system to reduce the releases to the environment. Potentially contaminated air in the compound building where the SWMS components are installed is exhausted though the air cleaning unit and radiation monitors of the compound building HVAC system. Radioactive gaseous effluents released from the compound building are evaluated in Subsection 11.3.3.

All liquid and gaseous radioactive waste generated during the SWMS operation, even during operator error or equipment malfunctions, can be processed by the LWMS and the HVAC system. Uncontrolled and unmonitored release from the SWMS is therefore prevented.

11.4.4 Process Control Program

Solid waste is processed in accordance with the process control program, which contains site-specific requirements. The COL applicant is to provide the process control program (COL 11.4(5)). The process control program provides reasonable assurance of the production of a solid waste matrix in accordance with 10 CFR 71 (Reference 7) and the guidance of NRC Branch Technical Position (BTP) 11-3 (Reference 9).

The process control program contains the planned effluent discharge flow rates and addresses the numerical guidelines in 10 CFR 50 Appendix I (Reference 19). The program is prepared in accordance with the requirements of 10 CFR 71 (Reference 7) and the guidance of NUREG-1301 (Reference 28), NUREG-0133 (Reference 29), NRC RG 1.109 (Reference 30), NRC RG 1.111 (Reference 31), or NRC RG 1.113 (Reference 32). The program includes a description of how NUREG, NRC RG, and alternative methods are implemented.

11.4.5 Component Descriptions

A description of the SWMS components, including the design of the tanks and pumps, is shown in Table 11.4-3. The capacities, materials of construction, and applicable codes are included.

11.4.5.1 Tanks

11.4.5.1.1 Spent Resin Storage Tank

Each of the two SRSTs is a cylindrical vertical tank with a hemispherical head and bottom and has a connection for transfer of spent resins to the dewatering system.

The SRST for low-activity spent resin is sized to collect a volume to hold at least two batches of spent resin from the source of the greatest input, and the SRST for high-activity spent resin is sized to collect a volume of spent resin for 10 years of generation.

The SRSTs have a thermal dispersion type level instrument to monitor the water and resin level. A high-water-level alarm is provided for the SRSTs to prevent water overflow to the drain sump, as presented in Table 11.4-5.

The exhaust air is discharged to the compound building HVAC system.

11.4.5.2 Piping and Valves

Piping used for the hydraulic transport of ion exchange resins is designed for trouble-free operation. Pipe-flow velocities are maintained in a turbulent flow regime appropriate for the slurry being transported (ion exchange resins). Appropriate valves and pipe fittings are used to maintain unhindered flow. An adequate water/solids ratio is maintained throughout the transfer. Slurry piping is provided with a washing and flushing capability with sufficient water to flush the pipe after each use (e.g., at least two pipe volumes).

Valves are ball or plug valves and are selected for minimum flow resistance, minimum pockets for trapping solids, and flushability.

11.4.5.3 Solid Waste Compactor

The solid waste compactor is used to reduce the volume of DAW. The wastes sorted as radioactive are compacted into a 200 L (55 gal) drum by the solid waste compactor equipped with a hydraulic ram, hooded exhaust fan and HEPA filter to control airborne dust. Sorting and staging space is available in the low-level waste handling and packing area.

11.4.5.4 Sorting and Shredding Facility

All DAWs are collected at appropriate locations of the plant during operation and maintenance. Also, potentially clean wastes are collected separately. The sorting and shredding facility are used to segregate DAWs from the potentially clean wastes. The wastes sorted as clean waste are shredded and collected to the clean waste collecting bags. These clean wastes are shipped offsite for disposal after bag monitoring.

11.4.5.5 Traveling Bridge Crane

The traveling bridge crane is remotely operated in the radwaste control room of the compound building or on local control panel for transporting drums or HICs. The crane moves waste drums and HICs from the processing area to the waste drum storage area. It also moves waste drums and HICs from the waste drum storage area to the shipping area. It is equipped with CCTV cameras to facilitate remote handling.

11.4.5.6 R/O Concentrate Treatment System

The concentrate generated from the R/O system is dried by the concentrate treatment system. Packaged waste is stored in a temporary storage area in the compound building prior to shipment to the onsite interim storage facility or the offsite disposal facility.

11.4.6 Malfunction Analysis

There are no requirements to design the systems against a single failure criterion or multiple component train separations. The following internal hazards, however, are considered in the system design:

a. Safety interlock

The spent resin handling subsystem is protected from component failure and operator error through a series of safety interlocks such as the level and temperature alarms.

b. Drum holding

In case of loss of electric power during handling a waste drum with the bridge crane, the bridge crane has a function to hold a waste drum during the operation in spite of loss of electric power.

11.4.7 Testing and Inspection Requirements

The SWMS is operated intermittently during normal plant operation. Therefore, periodic visual inspection and preventive maintenance are performed for the SWMS in accordance with industrial standards.

Epoxy coatings in cubicles that contain significant quantities of radioactive material, including the SRST rooms, are Service Level II coatings as defined in NRC RG 1.54 (Reference 14), and are subject to the limited QA provisions, selection, qualification, application, testing, maintenance, and inspection provisions of NRC RG 1.54 (Reference 14) and standards referenced therein, as applicable to Service Level II coatings. Post-construction initial inspection is performed by personnel qualified using ASTM D 4537 (Reference 33) using the inspection plan guidance of ASTM D 5163 (Reference 34).

11.4.8 Instrumentation Requirements

The SWMS is operated and monitored from the radwaste control room in the compound building. Major system parameters of SWMS instrumentation and indications are as follows:

a. Level indicators

High-level alarms are provided to prevent overflow of tanks during filling and resin transfer/sluice operations. These indicators are provided in the radwaste control room of the compound building.

b. Radiation monitoring

Area radiation monitors are described in Subsection 12.3.4.

Instruments, including back flushing provisions, are located in low radiation areas when possible for accessibility and fulfillment of the ALARA provisions. A list of alarm instruments and location of readouts is presented in Table 11.4-5.

11.4.9 Combined License Information

COL 11.4(1) The COL applicant is to send wastes to an offsite laundry facility for processing and/or bring in a mobile compaction unit for volume reduction.

COL 11.4(2) The COL applicant is to perform a site-specific cost-benefit analysis to demonstrate compliance with NRC RG 1.110.

COL 11.4(3) The COL applicant is to provide reasonable assurance that the provisions and conformance requirements of ANSI/ANS-40.37-2009 are met. The COL applicant is to provide reasonable assurance that mobile and temporary solid radwaste processing and its interconnection to plant systems conform to regulatory requirements and guidance such as 10 CFR 50.34a, 10 CFR 20.1406, and NRC RG 1.143. The COL applicant is to prepare a plan to develop and use operating procedures so the guidance and information in inspection and enforcement (IE) Bulletin 80-10 are followed.

COL 11.4(4) The COL applicant is to provide piping and instrumentation diagrams (P&IDs).

COL 11.4(5) The COL applicant is to provide a process control program.

COL 11.4(6) The COL applicant is to provide a mobile crane to retrieve waste packages that become stuck in a lifted condition or that are dropped.

COL 11.4(7) The COL applicant is to provide an environmental monitoring system.

COL 11.4(8) The COL applicant is to provide the operational procedures and maintenance programs as related to leak detection and contamination control.

COL 11.4(9) The COL applicant is to develop a leak identification program.

COL 11.4(10) The COL applicant is to maintain the complete documentation of system design, construction, design modifications, field changes, and operations.

COL 11.4(11) The COL applicant is to prepare the site process control program and the Site Radiological Environmental Monitoring Program.

11.4.10 References

1. IE Bulletin No. 80-10, "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity to Environment," U.S. Nuclear Regulatory Commission, May 6, 1980.

2. NRC RG 4.21, "Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning," U.S. Nuclear Regulatory Commission, June 2008.

3. 10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants."

4. 10 CFR 20, Appendix B, "Standards for Protection Again Radiation."

5. NUREG-0017, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors," Rev. 1, U.S. Nuclear Regulatory Commission, April 1985.

6 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

7. 10 CFR 71, "Packaging and Transportation of Radioactive Material."

8. 49 CFR 173, "Shippers-General Requirements for Shipments and Packaging."

9. Branch Technical Position 11-3, "Design Guidance for Solid Radioactive Waste Management Systems Installed in Light Water Cooled Nuclear Power," Rev. 3, NUREG-0800, U.S. Nuclear Regulatory Commission, March 2007.

10. 49 CFR 171, "General Information, Regulations, and Definitions."

11. ANS/ANSI 55.1, "Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants."

12. NRC RG 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, November 2001.

13. NRC RG 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable," Rev. 3, U.S. Nuclear Regulatory Commission, June 1978.

14. NRC RG 1.54, "Service Level I, II, and III Protective Coating Applied to Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, 2000.

15. ASME Section II, "Material Specification."

16. NRC RG 1.33, "Quality Assurance Program Requirements (Operation)," U.S. Nuclear Regulatory Commission, February 1978.

17. ASME B31.3, "Process Piping."

18. 10 CFR 50.34a, "Design Objectives for Equipment to Control Releases of Radioactive Material in Effluents-Nuclear Power Reactors."

19. 10 CFR 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation To Meet the Criterion 'As Low as Is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents."

20. NRC RG 1.110, "Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors," U.S. Nuclear Regulatory Commission, March 1976.

21. NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission.

22. ANSI/ANS-40.37-2009, “Mobile Low-level Radioactive Waste Processing System,” 2009.

23. 10 CFR 20.1406, “Minimization of Contamination.”

24. EPRI URD Section 12.5, “Solid Radioactive Waste Processing System.”

25. NRC RG 8.10, “Operating Philosophy for Maintaining Occupational Radiation Exposures as low as Is Reasonably Achievable,” Rev. 1, U.S. Nuclear Regulatory Commission, May 1977.

26. NUREG-0800, Branch Technical Position 11-6, “Postulated Radioactive Releases Due to Liquid-Containing Tank Failures,” U.S. Nuclear Regulatory Commission, Washington DC., March 2007.

27. 10 CFR 20.1302, “Compliance with Dose Limits for Individual Members of the Public.”

28. NUREG-1301, “Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors,”

29. NUREG-0133, “Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants.”

30. NRC RG 1.109, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I,” Rev. 1, October 1977.

31. NRC RG 1.111, “Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors,” Rev. 1, July 1977.

32. NRC RG 1.113, “Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I,” Rev. 1, April 1977.

33. ASTM D 4537-04a, "Standard Guide for Establishing Procedures to Qualify and Certify Personnel Performing Coating Work Inspection in Nuclear Facilities," American Society for Testing and Materials.

34. ASTM D 5163-08, "Standard Guide for Establishing a Program for Condition Assessment of Coating Service Level I Coating Systems in Nuclear Power Plants," American Society for Testing and Materials.

Table 11.4-1

Estimated Annual Solid Waste Generation

(Unit: m^3/yr-unit)

Waste Stream		Expected Generation	Expected Shipped Volume(1)	Maximum Generation	Maximum Shipped Volume(1)	Waste Classification(2)
Spent Filter	High Activity	0.19	0.21	0.38	0.42	B
	Low Activity	0.15	0.17	0.29	0.32	A
Spent Resin	High Activity	2.72	—	5.43	—	B
	Low Activity	8.64	8.64	17.28	17.28	A
R/O Membrane		3.24	3.6	3.24	3.6	A
R/O Concentrate		4.2	4.2	12	12	A
Dry Active Waste		—	50.19	—	141.68	A
Total		—	67.01	—	175.30	—

(1) Shipped volume is estimated based upon the following:
- Spent filter is packed in a 200 L (55 gal) drum or HIC. Packing efficiency of 90% is considered.
- Spent resin is packed in HIC.
- High activity spent resins generated from CVCS are stored in the spent resin long-term storage tank for 10 years.
- R/O membrane is packed in a 200 L (55 gal) drum. Packing efficiency of 90% is considered.
- Volume of DAWs is estimated using the 1000MWe plant's average and maximum packaged volume during 10 years. The factor for the increment of electric power generation (1400/1000) is reflected.

(2) Waste classification per 10 CFR 61.55

(3) Generation of mixed waste is prevented and minimized by prohibiting use of hazardous material.

(4) GWMS delay bed charcoal is expected to be essentially permanent.

Table 11.4-2 (1 of 2)

Expected Activities of Solid Radwaste in the SWMS (Bq/year)

Nuclide	High Activity Spent Resin	Low Activity Spent Resin	High Activity Spent Filter	Reverse Osmosis Sludge
Na-24	7.00E+11	7.16E+10	2.93E+07	1.02E-02
Cr-51	2.12E+12	1.86E+11	1.82E+12	9.22E+10
Mn-54	1.45E+13	2.37E+10	2.67E+12	9.42E+10
Fe-55	3.40E+13	1.79E+10	2.17E+12	7.38E+10
Co-58	8.28E+12	6.60E+10	5.17E+12	2.15E+11
Fe-59	3.34E+11	4.20E+09	2.63E+11	1.19E+10
Co-60	2.38E+13	7.90E+09	1.01E+12	3.30E+10
Zn-65	3.57E+12	7.53E+09	1.36E+09	2.95E+10
Br-84	8.28E+09	3.46E+08	9.05E+06	0.00E+00
Rb-88	3.64E+10	2.27E+10	1.22E+08	0.00E+00
Sr-89	1.72E+11	1.16E+10	1.48E+05	5.83E+09
Y-89m	0.00E+00	1.16E+06	0.00E+00	0.00E+00
Sr-90	8.65E+11	8.23E+08	1.38E+04	7.53E+08
Y-90	0.00E+00	4.97E+08	0.00E+00	0.00E+00
Sr-91	9.20E+09	1.23E+09	5.92E+05	8.92E-13
Y-91m	5.50E+07	7.83E+08	3.50E+05	6.75E-252
Y-91	6.99E+05	1.84E+09	9.40E+03	2.29E+08
Y-93	5.20E+08	3.10E+07	3.72E+06	8.87E-11
Zr-93	0.00E+00	3.13E-01	4.85E+08	0.00E+00
Zr-95	6.33E+11	5.56E+09	0.00E+00	1.77E+10
Nb-95m	0.00E+00	5.63E+07	0.00E+00	0.00E+00
Nb-95	2.41E+11	2.25E+09	2.92E+05	9.74E+09
Mo-99	4.30E+11	4.37E+11	4.78E+06	2.08E+08
Tc-99m	2.80E+10	4.03E+11	2.81E+06	2.82E-25

Table 11.4-2 (2 of 2)

Nuclide	High Activity Spent Resin	Low Activity Spent Resin	High Activity Spent Filter	Reverse Osmosis Sludge
Tc-99	0.00E+00	2.33E+04	7.86E+06	0.00E+00
Ru-103	7.33E+12	6.10E+08	0.00E+00	2.78E+11
Rh-103m	0.00E+00	6.07E+08	0.00E+00	0.00E+00
Ru-106	9.67E+14	1.34E+12	1.02E+08	5.36E+12
Rh-106	0.00E+00	1.34E+12	0.00E+00	0.00E+00
Ag-110m	9.29E+12	1.92E+10	1.45E+06	7.52E+10
Ag-110	0.00E+00	2.50E+08	0.00E+00	0.00E+00
Te-129m	1.61E+11	2.60E+09	1.91E+05	6.43E+09
Te-129	2.62E+10	4.53E+09	1.41E+07	2.03E-175
I-129	0.00E+00	3.87E+00	0.00E+00	0.00E+00
Te-131m	4.44E+10	4.57E+09	9.94E+05	5.53E+03
Te-131	3.13E+09	1.19E+09	4.32E+06	0.00E+00
I-131	1.31E+11	2.41E+10	1.79E+06	9.84E+09
Te-132	1.41E+11	1.15E+10	1.29E+06	1.79E+08
I-132	1.31E+11	2.60E+10	3.46E+07	2.10E-82
I-133	5.65E+11	5.74E+10	1.76E+07	6.27E+01
I-134	8.58E+10	9.91E+09	5.75E+07	3.47E-235
Cs-134	5.50E+11	5.94E+08	5.05E+04	2.46E+09
I-135	3.73E+11	3.82E+10	3.33E+07	5.49E-21
Cs-136	1.83E+11	1.11E+10	1.01E+06	1.21E+10
Cs-137	2.57E+12	8.53E+08	7.24E+04	3.60E+09
Ba-137m	2.57E+12	7.96E+08	7.24E+04	3.60E+09
Ba-140	4.11E+12	1.55E+11	1.22E+07	1.61E+11
La-140	1.00E+12	2.18E+11	1.77E+07	6.34E+06
Ce-141	1.20E+11	2.05E+09	1.54E+05	4.97E+09
Ce-143	9.31E+10	9.33E+09	1.96E+06	4.68E+04
Pr-143	0.00E+00	2.70E+09	0.00E+00	2.33E+11
Ce-144	3.23E+13	5.90E+10	4.50E+06	0.00E+00
Pr-144	0.00E+00	5.90E+10	0.00E+00	0.00E+00
W-187	6.00E+10	6.07E+09	1.67E+06	1.24E+02
Np-239	1.30E+11	1.18E+10	1.60E+06	2.00E+07

Table 11.4-3 (1 of 2)

Equipment List for the SWMS

Tanks	
Equipment Quantity Design Capacity, L (ft^3) Material Radwaste Safety Class	Low-Activity Spent Resin Tank 1 22,654 (800) Stainless Steel RW-IIa
Equipment Quantity Design Capacity, L (ft^3) Material Radwaste Safety Class	Spent Resin Long Term Storage Tank 1 90,189 (3,185) Stainless Steel RW-IIa
Equipment Quantity Design Capacity, L (ft^3) Material Radwaste Safety Class	New Resin Tank 1 5,678 (200) Stainless Steel N/A(1)
Miscellaneous	
Equipment Quantity Design Capacity, Ton Operation/Control Material Radwaste Safety Class	Traveling Bridge Crane 1 15 Remote, televideo Carbon Steel N/A(1)
Equipment Quantity Radwaste Safety Class	Concentrate Treatment System 1 RW-IIa
Equipment Quantity Radwaste Safety Class	Solid Waste Compactor 1 N/A(1)

Table 11.4-3 (2 of 2)

Miscellaneous (Cont'd)	
Equipment Quantity Material Radwaste Safety Class	Sorting Table 1 Stainless Steel N/A[(1)]
Component Quantity Material Radwaste Safety Class	Shredder 1 Carbon Steel N/A[(1)]

(1) The equipment classified as N/A is non-radwaste component.

Table 11.4-4

Codes and Standards for SWMS Equipment

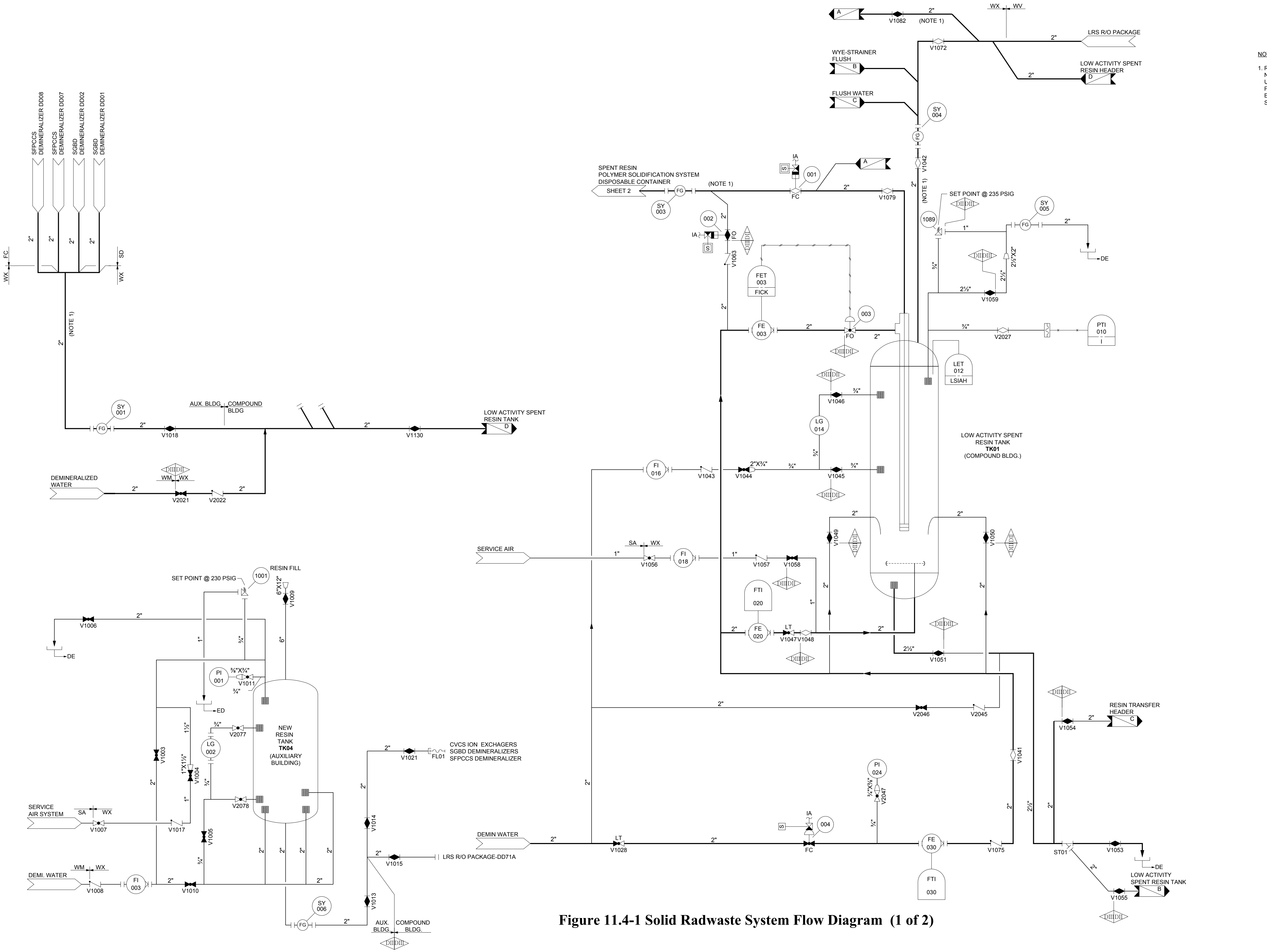
Equipment	Design and Fabrication	Material	Welder Qualifications and Procedures	Inspection and Testing
Atmospheric Tank	API 650	ASME Sec. II	ASME Sec. IX	API 650 (atmospheric)
Pressure Vessels	ASME Sec. VIII, Div. 1 or Div. 2	ASME Sec. II	ASME Sec. IX	ASME Sec. VIII, Div. 1 or Div. 2
Piping and Valves	ASME B31.3	ASME Sec. II	ASME Sec. IX	ASME B31.3

Table 11.4-5

Instrument Indication and Alarm Information

Equipment	Parameter	Record	Indication	Alarm		Location
				High	Low	
Low Activity Spent Resin Tank	Tank level		X[(1)]	X		Radwaste Control Room
	Tank Pressure		X			Radwaste Control Room
	Demin. Water Inlet Flow Rate		X			Radwaste Control Room
Spent Resin Long-Term Storage Tank	Tank level		X	X		Radwaste Control Room

(1) X : provided



NOTES

1. ROUTE SPENT RESIN SLUICING PIPING WITH A MINIMUM NUMBER OF DIRECTION CHANGES AND VERTICAL RUNS. USE 5 DIAMETER BENDS OR LONG RADIUS ELBOWS AS POSSIBLE. IF NECESSARY, 45° LATERALS AND/OR 45° ELBOWS MAY BE USED. ALL THESE LINES SHOULD BE SLOPED 1/16" PER FOOT MINIMUM.

Figure 11.4-1 Solid Radwaste System Flow Diagram (1 of 2)

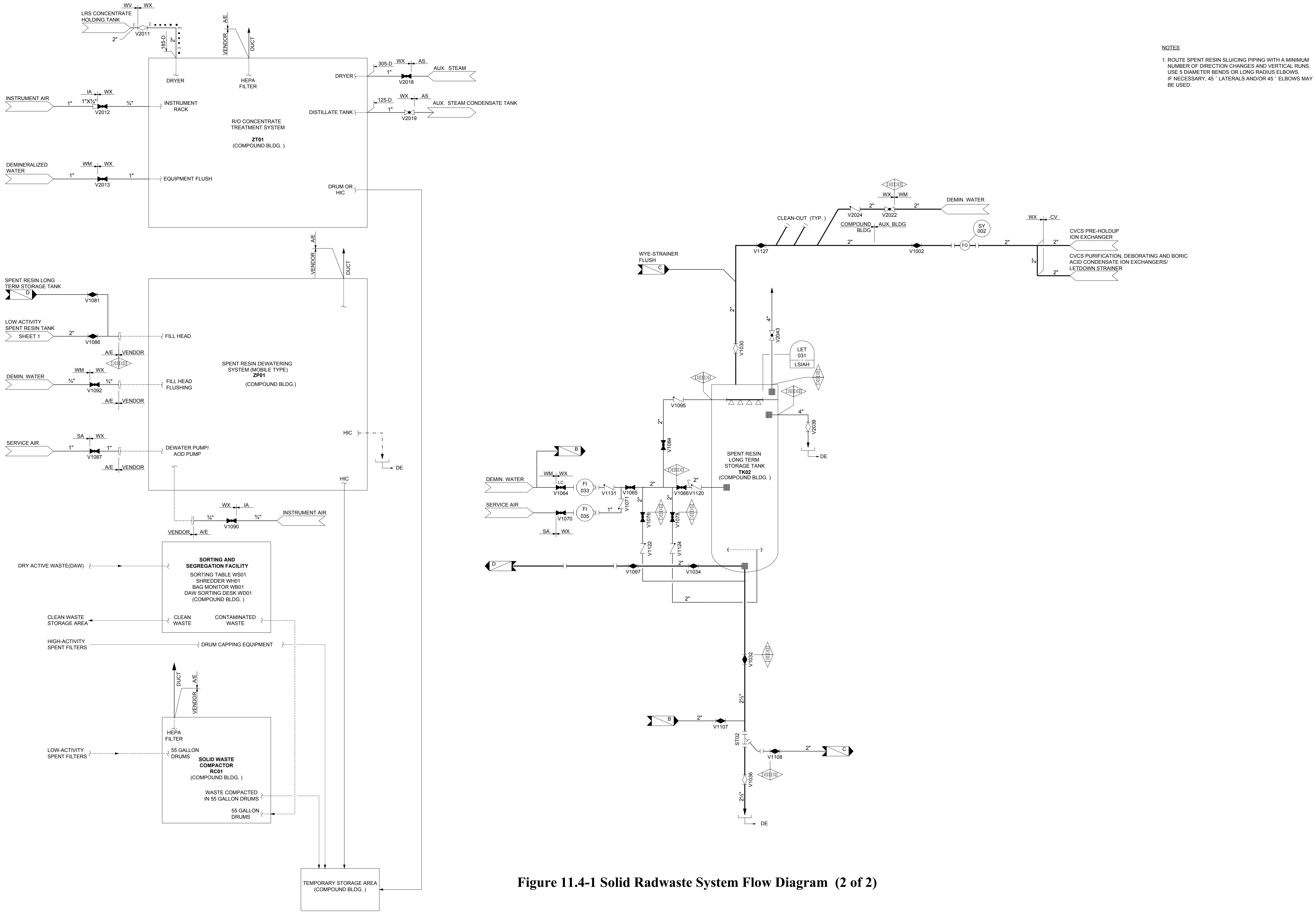


Figure 11.4-1 Solid Radwaste System Flow Diagram (2 of 2)